Asheville Regional Airport Master Plan Update

Master Plan Technical Report

October 2024

U.S. Department
of Transportation
**Federal Aviation
Administration**

Memphis Airports District Office
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June 28, 2025

Mr. Jared Merrill
Vice President of Planning
Asheville Regional Airport
61 Terminal Drive, Suite 1
Fletcher, NC 28732

Dear Mr. Merrill:

We have reviewed the Master Plan Update for the Asheville Regional Airport (AVL) and find it *acceptable* for use in making planning level decisions for future development of airport property.

The recommendations contained in an Airport Master Plan represent the views, policies and development plans of the Airport Sponsor and do not necessarily represent the views of the Federal Aviation Administration (FAA). Acceptance of the Asheville Regional Airport Master Plan Update by the FAA does not constitute a commitment on the part of the United States to participate in any development depicted in the plan, nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public law. The FAA reviews all elements of Airport Master Plans to ensure that sound planning techniques have been applied.

We recognize that as local, global, economic and industry changes evolve, your planning elements will evolve as well. Any project development and/or funding requests made beyond this planning period or as a result of significant deviations from the FAA approved forecast data may require additional information and FAA justification prior to concurrence. As a result, we encourage you to remain in close relationship with us as has been the practice over the years so that we may effectively partner with you to meet the aeronautical demands of the National Airspace System (NAS) and across the globe.

Please contact me directly with any questions you may have regarding this matter.

Respectfully,

JAMAL R STOVALL

Digitally signed by JAMAL R STOVALL
Date: 2025.06.28 15:05:37 -05'00'

Jamal R. Stovall
Lead Community Planner
FAA Memphis ADO

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ACRONYMS

A	
A	*Area*
AA	*American Airlines*
AAC	*Aircraft Approach Category*
AAGR	*Average Annual Growth Rate*
AAGR	*Average Annual Growth Rate*
AC	*Advisory Circular*
ACIP	*Airport Capital Improvement Plan*
ACN	*Aircraft Classification Number*
ACRP	*Airport Cooperative Research Program*
ACS	*U.S. Census Bureau American Community Survey*
ADG	*Airplane Design Group*
ADIP	*Airport Data and Information Portal*
ADRM	*Air Development Reference Manual*
AGL	*Above Ground Level*
AIG	*Airport Infrastructure Grants*
AIP	*Airport Improvement Program*
AIT	*Advanced Imaging Technology*
ALP	*Airport Layout Plan*
ALS	*Approach Lighting Systems*
APE	*Area of Potential Effect*
APM	*Aircraft Performance Manual*
APV	*Approach Procedure with Vertical Guidance*
ARC	*Airport Reference Code*
ARFF	*Aircraft Rescue and Firefighting*
ASHRAE	*American Society of Heating, Refrigerating, and Air-Conditioning Engineers*
ASR	*Airport Surveillance Radar*
ASV	*Air Service Volume*
ATC	*Air Traffic Control*
ATCT	*Airport Traffic Control Tower*
ATO	*Airline Ticketing Offices*
ATP	*Airport Terminal Program*
AVL	*Asheville Regional Airport*

M	
M&G	*Meeters & Greeters*
MALS	*Medium Intensity Approach Lighting System*
MALSR	*Medium-Intensity Approach Lighting System with Runway Alignment Indicators*
MIN	*Minutes*
MITL	*Medium Intensity Taxiway Lights*
MOA	*Military Operations Area*
MOD	*Modules*
MPF	*Master Plan Forecast*
MSA	*Metropolitan Statistical Area*
MSL	*Mean Sea Level*
MTOW	*Maximum Takeoff Weight*

N	
NA	*Not Applicable*
NAAQS	*National Ambient Air Quality Standards*
NACO	*National Aeronautical Charting Office*
NAS	*National Airspace System*
NAVAID	*Navigation Aid*
NBEG	*Narrow-body Equivalent Gates*
NC	*North Carolina*
NCDEQ	*N.C. Department of Environmental Quality*
NDB	*Non-Directional Beacon*
NEPA	*National Environmental Policy Act*
NFHL	*FEMA's National Flood Hazard Layer*
NHDE	*National Heritage Data Explorer*
NHPA	*National Historic Preservation Act*
NM	*Nautical Miles*
NO	*Number of, Number*
NOTAM	*Notice to Airmen*
NO2	*Nitrogen dioxide*
NOAA	*National Oceanic and Atmospheric Administration*
NPA	*Non-Precision Approach*
NPDES	*National Pollutant Discharge Elimination System*

AWOS	*Automated Weather Observation System*

B

BIL	*Bipartisan Infrastructure Law Deal*
BMU	*Baggage Make-Up*
BRL	*Building Restriction Line*
BSO	*Baggage Service Office*
BTS	*Bureau of Transportation Statistics*
B2C	*Business-to-Center*

C

CAAA	*Clean Air Act Amendments*
CATEX	*Categorical Exclusion*
CBIS	*Checked Baggage Inspection System*
CCR	*Coal Combustion Residuals*
CDG	*Checkpoint Design Guideline*
CEQ	*Council of Environmental Quality*
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFC	*Customer Facility Charge*
CFR	*Code of Federal Regulations*
CIP	*Capital Improvement Program*
CO	*Carbon Monoxide*
COC	*Communities of Comparison*
CPE	*Cost per Enplaned Passenger*
CWA	*Clean Water Act*

D

DCOH	*# of Days with Cash-On-Hand*
DHS	*Department of Homeland Security*
DL	*Delta Air Lines*
DME	*Distance Measuring Equipment*
DNL	*Day-Night Average Noise Level*
DOT	*Department of Transportation*
DPS	*Department of Public Safety*

E

EA	*Environmental Assessment*
EB	*Engineering Brief*
EDS	*Explosive Detection System*
EJ	*Environmental Justice*
EMAS	*Engineered Materials Arresting System*
EMP	*Employment District*
EPA	*Environmental Protection Agency*
EQA	*Equivalent Aircraft*
NPIAS	*National Plan of Integrated Airport Systems*
NPL	*National Priorities List*
NRCS	*Natural Resource Conservation Service*

O

O&D	*Origin & Destination*
O&M	*Operating & Maintenance*
O3	*Ozone*
OFA	*Object Free Area*
OFZ	*Object Free Zone*
OPBA	*Operations Per Based Aircraft*
Ops	*Operations*
OPSNET	*FAA Operations Network*
OSR	*On-Screen Resolution*

P

P2P	*Peer-to-Peer*
PA	*Precision Approach*
PAC	*Planning Advisory Committee*
PAL	*Planning Activity Level*
PAPI	*Precision Approach Path Indicator*
PAX	*Passengers*
Pb	*Lead*
PCN	*Pavement Condition Index*
PFC	*Passenger Facility Charges*
POFZ	*PHP*
PMAD	*Peak Month-Average Day*
POFZ	*Precision Obstacle Free Zone*
POFZ	*Precision Obstacle Free Zone*
PPE	*Personal Protective Equipment*
PREPs	*Pilot Reports*
PS	*Public Service District*

Q

QTA	*Quick Turnaround Area*

R

R/R	*Ready and Return*
RAILS	*Runway Alignment Indicator Lights*
RCRA	*Resource Conservation and Recovery Act*
RDC	*Runway Design Code*
REIL	*Runway End Indicator Lights*
RF	*Radio Frequencies*
R-LD	*Low-Density Residential*

ERG	*Effective Runway Gradient*
ETD	*Electronic Trace Detection*
eVTOL	*Electric Vertical Takeoff & Landing*

F

FAA	*Federal Aviation Administration*
FATO	*Final Approach and Takeoff Area*
FBO	*Fixed-Base Operator*
FEMA	*Federal Emergency Management Agency*
FP	*Fire Protection*
FPPA	*Farmland Protection Policy Act*
FY	*Fiscal Year*

G

GA	*General Aviation*
GAMA	*General Aviation Manufactures Association*
GARAA	*Greater Asheville Regional Airport Authority*
GARBs	*General Airport Revenue Bonds*
GLS	*GNSS Landing System*
GNSS	*Global Navigation Satellite System*
GPS	*Global Positioning System*
GS	*Glide Slope*
GSF	*Gross Square Foot*
GTC	*Ground Transportation Center*
G4	*Allegiant*

H

HIRL	*High Intensity Runway Lights*

I

IT	*Information Technology*
IAP	*Instrument Approach Procedure*
IATA	*International Air Transportation Association*
ICAO	*International Civil Aviation Organization*
IFR	*Instrument Flight Rules*
ILS	*Instrument Landing System*
IPac	*USFWS Information for Planning and Conservation*
ISA	*International Standard Atmosphere*
ISD	*NOAA's Integrated Surface Database*

K

KPIs	*Key Performance Indicators*
KTS	*Knots*
kWh	*Kilowatt Hour*
RNAV	*Area Navigation*
RNP	*Required Navigation Performance*
ROFA	*Runway Object Free Area*
ROFZ	*Runway Object Free Zone*
RON	*Remain Overnight*
RPZ	*Runway Protection Zone*
RSA	*Runway Safety Area*

S

SARA	*Service Animal Relief Area*
SHPO	*N.C. State Historic Preservation Office*
SID	*Standard Instrument Departures*
SIDA	*Security Identification Display Area*
SIP	*State Implementation Plan*
SO2	*Sulfur Dioxide*
Sq. Ft.	*Square Foot (SF)*
SRE	*Snow Removal Equipment*
SSCP	*Security Screening Checkpoint*
STD	*Standard*
SWPPP	*Stormwater Pollution Prevention Plan*
SY	*Square Yards*

T

TAF	*Terminal Area Forecast*
TCH	*Threshold Crossing Height*
TDC	*TSA Document Checkers*
TDG	*Taxiway Design Group*
TDZ	*Touch Down Zone*
TDZL	*Touch Down Zone Lights*
TFMSC	*Traffic Flow Management System Count*
TIX	*Ticket Lobby*
TLOF	*Touchdown and Liftoff Area*
TNC	*Transportation Network Companies*
TODA	*Takeoff Distance Available*
TOFA	*Taxiway Object Free Area*
TORA	*Takeoff Runway Available*
TRACON	*Terminal Radar Approach Control*
TSA	*Transportation Security Administration*
TSA	*Taxiway Safety Area*

U

UA	*United Airlines*

L

LAZ	*Parking Operator*
LBS	*Pounds - Weight*
LF	*Linear Feet*
LNAV	*Lateral Navigation*
LOC	*Localizer*
LOI	*Letter of Intent*
LOS	*Level of Service*
LP	*Localizer Performance*
LPV	*Localizer Performance with Vertical Guidance*
LWCF	*Land and Water Conservation Fund*

UAM	*Urban Air Mobility*
ULCC	*Ultra-Low-Cost Carrier*
USACE	*U.S. Army Corps of Engineers*
USFWS	*U.S. Fish and Wildlife Service*
USGS	*U.S. Geological Survey*

V

V	*Visual Approach*
VFR	*Visual Flight Rules*
VHF	*Very High Frequency*
VNAV	*Visual Navigation Aids*
VOC	*Volatile Organic Compounds*
VOR	*Very High Frequency Omnidirectional Range*
VPH	*Vehicles Per Hour*

W

WHMP	*Wildlife Hazard Management Plan*
WOTUS	*Waters of the United States*
WQU	*Water Quality Certifications*

GLOSSARY

A

Advisory Circular (AC) – A document published by the Federal Aviation Administration (FAA) giving guidance on aviation issues and which becomes binding on those airports receiving federal grant funding.

Aeronautical Study – A study performed [pursuant to Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*] concerning the effect of proposed construction or alternation on the use of air navigation facilities or navigable airspace by aircraft. The conclusion of each study is normally a determination as to whether the specific proposal studied would be a hazard to air navigation and/or a determination for marking and/or lighting.

Air Cargo - Freight, mail and express traffic transported by air, including: Freight and Express - commodities of all kinds, including small-package counter services, express services and priority reserved freight; and Mail - all classes of mail transported for the U.S. Postal Service (USPS)

Air Carrier – Operations with aircraft designed to have a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers.

Air Taxi & Commuter – Operations with aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.

Air Traffic Control Tower (ATCT) – A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated IFR room if radar equipped, using air/ground communications and/or radar, visual signaling, and other devices to provide safe and expeditious movement of terminal air traffic.

Aircraft Approach Category (AAC) – An aircraft approach category is a FAA grouping of aircraft based on approach speed.

Airline – A business that provides scheduled or chartered air transport of passengers and/or cargo.

Airplane Design Group (ADG) - The FAA Airplane Design Group subdivides airplanes by wingspan or tail height, whichever is more restrictive.

Airport – Any area of land or water that is used, or intended for use, for the landing and take–off of aircraft, and any appurtenant areas that are used, or intended for use, for airport buildings or other airport facilities or rights of way, together with all airport buildings and facilities located thereon.

Airport Elevation – The established elevation of the highest point on the usable landing area.

Airport Hazard – Any structure, tree, or use of land that obstructs the airspace required for, or is otherwise hazardous to, the flight of aircraft in landing or taking off at the airport; and any use of land which is hazardous to persons or property because of its proximity to the airport.

Airport Improvement Program (AIP) – Established under the ***Airport and Airway Improvement Act of 1982***, this program provides grants to public agencies - and, in some cases, to private owners and entities - for the planning and development of public-use airports that are included in the National Plan of Integrates Airport Systems. Eligible projects include those improvements related to enhancing airport safety, capacity, security and environmental concerns.

Airport Layout Plan (ALP) – A scaled drawing of existing and proposed airside and landside facilities necessary for the operation and development of the airport. The ALP shows boundaries and proposed additions to areas owned or controlled by the sponsor, the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed non-aviation areas and improvements. The ALP may also depict those properties adjacent to the airport ownership that may have legal access to the airport.

Airport Layout Plan Set – This document typically contains a set of drawings which illustrate the existing and future development of the airport. An ALP set may often contain the following: Title Sheet, Airport Data Sheet, Existing Airport Layout Plan, Future Airport Layout Plan, Airspace Plans, Inner Approach Surfaces, Terminal Area Plan, Land Use Plan, Airport Property Map & Tables, etc. The drawings depict existing and proposed airport facilities, land uses, approach zones and other defined areas of airspace, and environmental features that may influence airport usage and expansion capabilities.

Airport Master Plan – Long-term development plan for the airport adopted by the airport sponsor.

Airport Noise Abatement Program – A program designed to reduce noise around an airport through changes in the manner in which aircraft are flown, or changes in the operation or layout of the airport.

Airport Reference Code (ARC) – The ARC is an FAA coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. ARC designations are made up of the Aircraft Approach Category and Airplane Design Group and accordingly indicated in an alpha-numeric fashion.

Airport Sponsor – The municipality or authority of the airport allowed to apply for and receive grants. Synonymous with owner. For the Asheville Regional Airport, the sponsor is the Greater Asheville Regional Airport Authority ('the Authority' or 'GARAA').

Airport Vicinity – The land use and people in the areas surrounding an airport which can be directly affected by the operation of the airport.

Airside – That portion of the airport facility where aircraft movements take place, airline operations areas, and areas that directly serve the aircraft, such as taxiway, runway, maintenance, and fueling areas.

Airspace – Space above the ground in which aircraft travel. Often airspace is divided into corridors, routes, and restricted zones. Differing categories of airspace, as defined by the FAA, have specific equipment and operational requirements to operate within that airspace.

Approach Procedure with Vertical Guidance (APV) – An Instrument Approach Procedure (IAP) providing both vertical and lateral electronic guidance.

Approach Surface – A surface (defined by Title 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*) that is longitudinally centered on the runway centerline and extends outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based on the type of approach available or planned for that runway end.

Apron - The part of an airport provided for the stationing of aircraft for embarking and debarking of passengers, aircraft parking, etc.

Area Navigation (RNAV) – RNAV is a system that allows navigation on any desired flight path, rather than one defined by ground-based fixed airways. An RNAV system can determine position by referencing the position of ground- or space-based navigation aids, such as the Global Positioning System (GPS), using onboard flight management computers.

Aviation Gasoline (Avgas) – Gasoline that has been manifested as "aviation gasoline" and meets the specifications in ASTM specification D 910-96. Used for piston engine aircraft.

Avigation Easement – A grant of a property interest in land over which a right of unobstructed flight in the airspace is established; which prohibits any structures, growth, or other obstructions from penetrating the approach surface (not limited to approach surfaces); and which provides a right of entry to remove, mark, or light any structure or any such obstruction.

B

Based Aircraft – Aircraft that spend more than six months of the year at a given airport and that have an agreement with the airport or a tenant for storage, that can perform takeoffs and landings, and that have a valid (current) FAA airworthiness certificate.

Building Restriction Line (BRL) – A reference line that provides generalized guidance on location and height restrictions for buildings on airports.

Bypass Taxiway – A taxiway used to reduce aircraft queuing demand by providing multiple takeoff points.

C

Commercial Service Airport – As defined by Federal law, an airport receiving scheduled passenger service and having at least 2,500 or more enplaned passengers per year.

Compatible Land Use – As defined in Title 14 CFR Part 150, *Airport Noise Compatibility Planning*,: The use of land (e.g., commercial, industrial, agricultural) that is normally compatible with aircraft and airport operations, or sound insulated land uses (e.g., sound insulated homes, schools, nursing homes, hospitals, libraries) that would otherwise be considered incompatible with aircraft and airports operations.

Conical Surface – A surface (defined by Title 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*) that extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet as measured outward from the periphery of the horizontal surface.

Crossover Taxiway – A taxiway connecting two parallel taxiways (also referred to as a transverse taxiway).

Crosswind – Wind that has a perpendicular component to the direction of travel making landings and takeoffs more difficult than if the wind were blowing straight down the runway.

D

Day-Night Average Sound Level (DNL) – The noise metric adopted by the U.S. Environmental Protection Agency for measurement of environmental noise. It represents the average daytime noise level during a 24-hour day, measured in decibels and adjusted to account for the lower tolerance of people to noise during nighttime periods.

Decibel (dB) – A unit for describing the intensity or level of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to a standard reference pressure.

Design Aircraft – An aircraft with characteristics that determine the application of airport design standards for a specific runway, taxiway, taxilane, apron, or other facility. This aircraft can be a specific aircraft model or a composite of several aircraft using, expected, or intended to use the airport or part of the airport. Also called the "critical aircraft" or "critical design aircraft."

Distance Measuring Equipment (DME) – Equipment (airborne and ground) used to measure, in nautical miles, the slant ranged distance of an aircraft from the DME navigational aid.

E

Enplaned Passengers – The total number of revenue-paying passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

Enplanement – A passenger boarding of a commercial flight.

Entrance Taxiway – A taxiway designed to be used by an aircraft entering a runway. Entrance taxiways may also be used to exit a runway.

Environmental Assessment (EA) – In accordance with the National Environmental Policy Act, an EA is a concise document that assesses the potential environmental impacts of a proposed federal action. The EA discusses the purpose and need for the proposed action as well as the alternatives considered, the potential environmental impacts, the proposed mitigation measures and documents the public involvement process. An EA should provide sufficient evidence and analysis for a federal determination whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

Environmental Impact Statement (EIS) – In accordance with the National Environmental Policy Act, an EIS is a document that provides full and fair discussion of the significant environmental

impacts that could occur as a result of a proposed project and informs decision makers and the public of the reasonable alternatives that would avoid or minimize adverse impacts.

Exit Taxiway – A taxiway designed to be used by an aircraft only to exit a runway

F

Federal Aviation Administration (FAA) – The federal agency charged with regulating air commerce to promote its safety and development; encouraging and developing civil aviation, air traffic control, and air navigation; and promoting the development of a national system of airports

Finding of No Significant Impact (FONSI) – In accordance with the National Environmental Policy Act, a FONSI is issued if the agency determines that the proposed projects or actions will not have significant environmental impacts, and the reasons behind the finding is included in the documentation.

Fixed Base Operator (FBO) – A provider of service to users of an airport. Such services include, but are not limited to, fueling, aircraft storage, flight training, repair, and maintenance.

Frangible – An object on the airfield that retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

General Aviation (GA) – All civil aircraft and aviation activity except that of the certified air carriers and military operations. GA includes corporate flying and private flying (recreation or personal).

Glide Slope – Vertical guidance provided by a ground-based radio transmitter to an aircraft landing by use of an Instrument Landing System. This guidance informs the pilot if the aircraft is either too high or too low when flying an approach to the runway for landing.

Global positioning system (GPS) – A worldwide radio-navigation system formed from a matrix of satellites and their ground stations. GPS is funded by and controlled by the U. S. Department of Defense (DOD). While there are thousands of civil users of GPS world-wide, the system was designed for and is operated by the Department of Defence. GPS provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity and time.

H

Helipad – A small, designated area, usually with a prepared surface, on a heliport or airport, used for the landing and takeoff of helicopters

High Intensity Runway Lights (HIRL) – One of three types of lighting systems that may be installed for runways, with low intensity runway lights or medium intensity runway lights being the other options. HIRL systems are the brightest of the three and are typical to runways operating under Instrument Flight Rules or Runway Visual Range.

High Speed Exit Taxiway – An acute-angled exit taxiway forming a 30-degree angle with the runway centerline, designed to allow an aircraft to exit a runway without having to decelerate to typical taxi speed.

Horizontal Surface– An airspace surface 150 feet above the established airport elevation. The shape of the surface is created using radial arcs from the ends of the primary surface of the runway at AVL, connected by lines tangent to the arcs.

Hot Spot – A location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.

I

Incompatible Land Use – The use of land which is normally incompatible with aircraft and airport operations (i.e., homes, schools, nursing homes, hospitals, and libraries).

Instrument Approach Procedure (IAP) – A series of predetermined maneuvers for the orderly transfer of an 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. It is prescribed and approved for a specific airport the FAA.

Instrument Departure Route – Published flight procedures followed by aircraft on an IFR flight plan immediately after takeoff from an airport. Also referred to as departure procedures

Instrument Flight Rules (IFR) – Rules governing flight and relying on the aircraft's instruments and navigation aids. IFR permits aircraft to fly in certain limited visibility and cloud conditions. Virtually any commercial operation - including airlines and business jets - utilizes the IFR system.

Instrument Landing System (ILS) – A precision instrument approach system which provides radio-based horizontal and vertical guidance to an aircraft approaching a runway. It is used to guide landing aircraft during conditions of low visibility.

Itinerant Operation – Arrivals or departures, other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius.

K

Knot – An abbreviation for one nautical mile per hour.

L

Landside – That part of an airport used for activities other than the movement of aircraft, such as vehicular access roads and parking.

Load Factor (LF) – The percentage of available seats that are filled with paying passengers.

Local Operation – Any operation performed by an aircraft that operates in the local traffic pattern, an operation that is known to be departing for or arriving from flight in local practice areas located within a 20-mile radius, or an aircraft that executes a simulated instrument approach or low pass at the airport.

Localizer (LOC) – The component of an ILS which provides horizontal guidance to the runway centerline for aircraft during approach and landing by radiating a directional pattern of radio waves modulated by two signals which, when received with equal intensity, are displayed by compatible airborne equipment as an "on-course" indication, and when received in unequal intensity are displayed as an "off-course" indication.

M

Medium Intensity Taxiway Lights (MITL) – One of three types of lighting systems that may be installed for taxiways, with low intensity taxiway lights or high intensity runway lights being the other options.

Military Operation – An aircraft operation conducted by either a fixed-wing or rotor-wing military aircraft.

Movement Area – The runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft including helicopters and tilt-rotors, exclusive of loading aprons and aircraft parking areas (reference Part 139).

N

National Airspace System (NAS) – The common network of U.S. airspace, air navigation facilities, equipment and services, airports or landing areas.

National Plan of Integrated Airport Systems (NPIAS) – Prepared by the FAA, a primary purpose of the NPIAS is to identify the airports that are considered significant to national air transportation and are thus eligible to receive grants under the Airport Improvement Program (AIP). The NPIAS is composed of all commercial service airports, all reliever airports, and selected general aviation airports.

Nautical Mile (NM) – A measure of distance equal to one minute of arc on the earth's surface, which is approximately 6,080 feet.

Navigation Aids (NAVAIDs) – Any signal, marker, or guidance equipment used by an aircraft for guiding or controlling flight in the air or the landing or take-off of an aircraft.

Noise – Defined subjectively as unwanted sound, the measurement of noise evaluates three characteristics of sound: intensity, frequency, and duration.

Noise Abatement Procedures – Changes in runway usage, flight approach and departure routes and procedures, and vehicle movement, such as ground maneuvers or other air traffic procedures that shift aviation impacts away from noise sensitive areas.

Noise Exposure Contours – Lines drawn around a noise source indicating constant energy levels of noise exposure. DNL is the measure used to describe community exposure to noise.

Noise-Sensitive Area – Areas where aircraft noise may interfere with existing or planned use of the land. Whether noise interferes with a particular use depends upon the level of noise exposure and the types of activities that are involved. Residential neighborhoods, educational, health, and religious structures and sites, outdoor recreational, cultural and historic sites may be noise sensitive areas.

Non-directional Beacon (NDB) – A radio beacon transmitting non-directional signals that a pilot of an aircraft equipped with direction finding equipment can determine his/her bearing to or from the radio beacon and "home in" on or track to or from the station. When the radio beacon is installed in conjunction with the instrument landing system marker, it is normally called a compass locator.

Non-movement Area – The areas of an airport that are used for taxiing or hover taxiing, or air taxiing aircraft including helicopters and tilt-rotors but are not part of the movement area (i.e., the loading aprons and aircraft parking areas).

Non-precision Approach Procedure – A straight-in instrument approach procedure that provides course guidance, with or without vertical path guidance, with visibility minimums not lower than 3/4 mile (4000 RVR), such as VOR, GPS, RNAV, ASR, LDA, SDF, TACAN, NDB, or LOC.

O

Object – Includes but is not limited to, above ground structures, Navigational Aids (NAVAIDs), equipment, vehicles, natural growth, terrain, and parked or taxiing aircraft.

Object Free Area (OFA) – An area centered on the ground on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle – An existing object at a fixed geographical location or which may be expected at a fixed location within a prescribed area with reference to which vertical clearance is or must be provided during flight operation.

Obstacle Free Zone (OFZ) – Thr three-dimensional airspace along the runway and extended runway centerline that is required to be clear of obstacles for protection for aircraft landing or taking off from the runway and for missed approaches.

Obstruction to Air Navigation – An object of greater height than any of the heights or surfaces presented in Subpart C (Standards for Determining Obstructions to Air Navigation or Navigational Aids or Facilities) of Title 14 CFR Part 77.

On-Airport Property – Property that is within the boundary of land owned by the airport sponsor.

P

Passenger – Revenue paying individual boarding an aircraft for scheduled service.

Passenger Facility Charge (PFC) – A tax authorized by Congress, approved by FAA, assessed by airports and collected by airlines (on behalf of airports) as an add-on to the passenger airfare. PFCs are used by airports to fund FAA-approved projects that enhance safety, security or capacity; reduce noise; or increase air carrier competition. The PFC program authorizes the collection of fees up to $4.50 for every enplaned passenger at commercial airports controlled by public agencies.

Peak Operation – Peak hour aircraft operational projections are required to determine the peak period capacity of a runway system, as well as for determining the size of the various functional areas of a passenger terminal.

Precision Approach (PA) – An instrument approach procedure that provides course and vertical path guidance with visibility below 3/4 mile (4000 RVR).

Precision Approach Path Indicator (PAPI) – A NAVAID used primarily under VFR conditions. The PAPI provides visual decent guidance to aircraft on approach to landing through a single row of two to four lights, radiating a high intensity red or white beam to indicate whether the pilot is above or below the required approach path to the runway. The PAPI has an effective visual range of 5 miles during the day and 20 miles at night.

Precision Instrument Runway – A runway having an existing instrument landing system (ILS).

Primary Surface –A primary surface is longitudinally centered on a runway and extends 200 feet beyond each end of that runway. The width of a primary surface ranges from 250 feet to 1,000 feet, depending on the existing or planned approach system. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

R

Radar – Term coined from the phrase "Radio Detecting and Ranging." It is based on the principle that ultra-high frequency radio waves travel at a precise speed and are reflected from objects they strike. It is used to determine an object's direction and distance.

Ramp – see Apron.

Revenue Bonds – Bonds which are payable solely from the revenues derived from the operation of a facility which was constructed or acquired with the proceeds of the bonds.

Rotating Beacon – A visual NAVAID operated at many airports. At civil airports, alternating white and green flashes indicate the location of the airport.

Runway – Any existing or planned paved surface or turf covered area of the airport which is specifically designated and used or planned to be used for the landing and/or taking off of aircraft.

Runway Blast Pad – A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

Runway End Identifier Lights (REIL) – Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

Runway Gradient – The average gradient consisting of the difference in elevation of the two ends of the runway divided by the runway length. This is provided that no intervening point on the runway profile lies more than five feet above or below a straight line joining the two ends of the runway. In excess of five feet the runway profile will be segmented, and aircraft data will be applied for each segment separately.

Runway Protection Zone (RPZ) – The RPZ is defined by the FAA as a trapezoid-shaped area centered about the extended runway centerline that is used to enhance the safety of aircraft operation. It begins 200 feet beyond the end of the runway or area usable for takeoff or landing. The RPZ dimensions are functions of the design aircraft, type of operation, and visibility minimums for the particular runway. The depth of the RPZ can vary from 1,000 feet to 2,500 feet depending on the type of aircraft and approach minimums designated for that specific runway.

Runway Safety Area (RSA) – A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

S

Scheduled Service – Air transport service which is based on published flight schedules.

Shoulder – An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

Slope – An incline from the horizontal expressed in an arithmetic ratio of horizontal magnitude to vertical magnitude.

Special Use Airspace (SUA) – A part of airspace that is reserved for flight operations that are not in a "normal" category. The aircraft participating in the SUA activities are separated from other controlled traffic by the boundaries of the SUA airspace. In some cases, non-participating aircraft may enter SUA, but have limitations imposed on their operations. Generally, SUA is used for military activity, but civilians use such airspace to test new aircraft. The space program is also a large user of SUA.

Stage length – The distance traveled by an aircraft from takeoff to landing. Average stage length is computed as the ratio of aircraft miles (or kilometers) to aircraft departures.

Structure – An object anchored, constructed, attached, erected, gathered, located, placed, piled, or installed by man, either on the ground or in or over a body of water, either moveable or immovable, and either temporary or permanent. The term “structure” includes, but is not limited to, antennae, buildings, cranes, fences, overhead transmission lines, patios and decks, man-made ponds, signs and sign structures, smokestacks, towers, utility poles, wires, and anything attached to any of the foregoing either temporarily or permanently.

T

Taxilane – The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

Taxiway – A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Design Group (TDG) – A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear distance (CMG).

Taxiway Safety Area (TSA) – A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

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

Terminal Area Forecast (TAF) – An annual FAA forecast of aviation activity throughout the US used in the FAA's planning and decision making.

Threshold – The beginning of that portion of the runway usable for landing. In some instances, the threshold may be displaced. "Threshold" always refers to landing, not the start of takeoff.

Touch-and-Go - An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway.

Traffic Pattern - The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach.

Transitional Surface – An element of the Imaginary Surfaces extending outward and upward at right angles to the runway centerline and runway centerline extended at a slope of 7:1 from the sides of the primary and approach surfaces to where they intersect the horizontal and conical surfaces.

V

Very High Frequency Omnidirectional Range Station (VOR) – A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

Visual Approach – An approach operating in VFR conditions under the control of an air traffic facility and having an air traffic control authorization.

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

W

Wind Coverage – Amount of the time an airport's runway allows landings due to crosswind requirements, based on average wind directions and speeds.

Wingspan – The maximum horizontal distance from one wingtip to the other wingtip, including the horizontal component of any extensions such as winglets or raked wingtips.

Z

Zoning – The partitioning of land parcels in a community by ordinance into zones and the establishment of regulations in the ordinance to govern the land use and the location, height, use and land coverages of buildings within each zone.

EXECUTIVE SUMMARY

The Greater Asheville Regional Airport Authority ('GARAA' or 'the Authority') undertook an Airport Master Plan Update to effectively prepare for and accommodate growing demand at the Asheville Regional Airport ('AVL' or 'the Airport'). The intent of this planning effort was to maintain an efficient and effective air transportation facility for airport users, tenants, customers, and other stakeholders.

The GARAA began the Master Plan Update process in August 2021 to address the need for and improvements of facilities at the Airport over the next 20 years or until annual passenger enplanements reach approximately 1.8 million.

This Executive Summary is intended to provide an overview of the findings and recommendations, as well as the processes and methodologies used in developing the recommendations in the Master Plan Update for AVL in the short-, medium-, and long-term.

Background

The Greater Asheville region was previously served by a nearby, much smaller airport, just east of the existing location. In 1957, municipal leadership began making plans for development of the present-day Asheville Regional Airport, with the current location opening in 1961.

When the Study commenced, the Airport supported non-stop service to 25 destinations and now supports 27 non-stop domestic destinations via six airlines: Allegiant Air, American Airlines, Delta Air Lines, JetBlue Airways, Sun Country Airlines, and United Airlines.

AVL also supports general aviation (GA) activity, which is primarily handled through the Airport's Fixed-Base Operator, Signature Flight Support.

Goals and Objectives

During the development of the Master Plan Update, goals were established to assist the Authority in meeting the initial objectives. The GARAA's goals support their objective to keep airport users, tenants, employees, and customers safe in an efficient well-functioning facility. The overall Master Plan Update helps to ensure that the airfield complies with safety standards, that the runway and taxiway systems meet the long-term needs of users, that roadway access, traffic flow, and parking accommodations adequately serve users, the GA area and support facilities can accommodate future demand, and that the terminal building is functional, safe, secure, and aesthetically pleasing. It was also important to the Authority that the goals and objectives be sustainable, economical, environmentally friendly, and financially feasible.

The following actions were completed with respect to meeting the goals of the Master Plan Update:

- An inventory of the existing and under construction physical conditions and operational characteristics of the Airport and its surrounding area was developed to give the GARAA

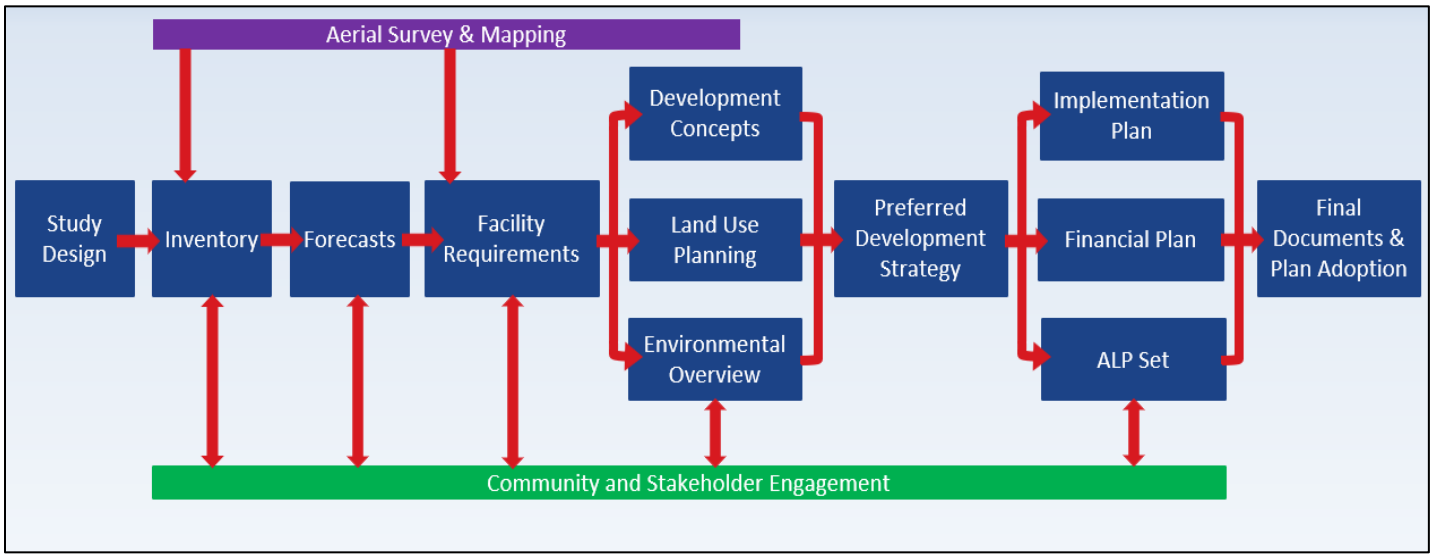
an overview of the Airport's status in terms of airfield and terminal facilities, tenants, and services offered (i.e., non-stop service routes, concessions, etc.).

- Historical and current operations, industry trends, and economic conditions within AVL's market area were evaluated, followed by the production of activity demand forecasts through 2041.
- Using the preferred aviation activity forecasts, the airport facility needs were determined, which then formed the basis of the development concepts.
- An environmental overview was conducted to draw attention to environmental issues that may arise and that may require additional analysis. The area surrounding the Airport was also evaluated to identify if the uses of the properties are compatible with the operations at AVL.
- The short-, mid-, and long-term recommendations were developed for each component of the Airport.
- The Airport Capital Improvement Program (ACIP) and Financial Plan were developed for the recommendations included in the Master Plan Update.

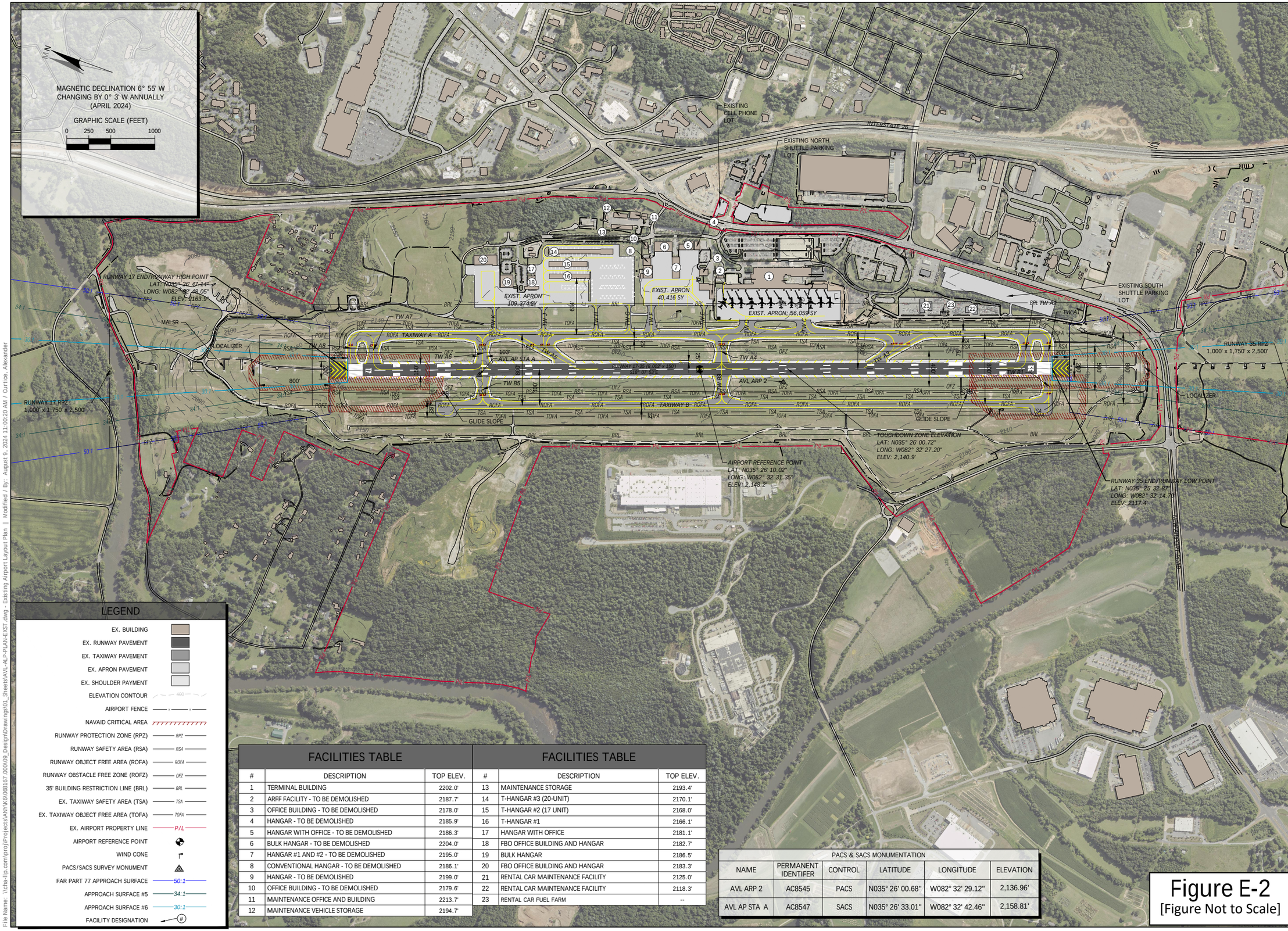
Master Planning Process

The master plan process, methods, and ultimate products are consistent with guidance contained in FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. Efforts were made throughout the process to share information, engage, and collaborate with stakeholders, which included the airport sponsor (GARAA), airlines, tenants, users and travelers, local businesses, residents, resource agencies, elected and appointed officials, and the general public.

Figure E-1 – Master Planning Public and Stakeholder Involvement Program



Source: CHA.



FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'
4	HANGAR - TO BE DEMOLISHED	2185.9'
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'
9	HANGAR - TO BE DEMOLISHED	2199.0'
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'
11	MAINTENANCE OFFICE AND BUILDING	2213.7'
12	MAINTENANCE VEHICLE STORAGE	2194.7'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
13	MAINTENANCE STORAGE	2193.4'
14	T-HANGAR #3 (20-UNIT)	2170.1'
15	T-HANGAR #2 (17 UNIT)	2168.0'
16	T-HANGAR #1	2166.1'
17	HANGAR WITH OFFICE	2181.1'
18	FBO OFFICE BUILDING AND HANGAR	2182.7'
19	BULK HANGAR	2186.5'
20	FBO OFFICE BUILDING AND HANGAR	2183.3'
21	RENTAL CAR MAINTENANCE FACILITY	2125.0'
22	RENTAL CAR MAINTENANCE FACILITY	2118.3'
23	RENTAL CAR FUEL FARM	--

PACS & SACS MONUMENTATION

NAME	PERMANENT IDENTIFER	CONTROL	LATITUDE	LONGITUDE	ELEVATION
AVL ARP 2	AC8545	PACS	N035° 26' 00.68"	W082° 32' 29.12"	2,136.96'
AVL AP STA A	AC8547	SACS	N035° 26' 33.01"	W082° 32' 42.46"	2,158.81'

Figure E-2
[Figure Not to Scale]

Asheville REGIONAL AIRPORT

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Designed By:	Drawn By:	Checked By:
CHA	ARC	PM
Issue Date:	Project No:	Scale:
Aug 2024	68167	AS SHOWN

REV.	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: EXISTING AIRPORT LAYOUT PLAN

DRAWING NO. 3 OF 14

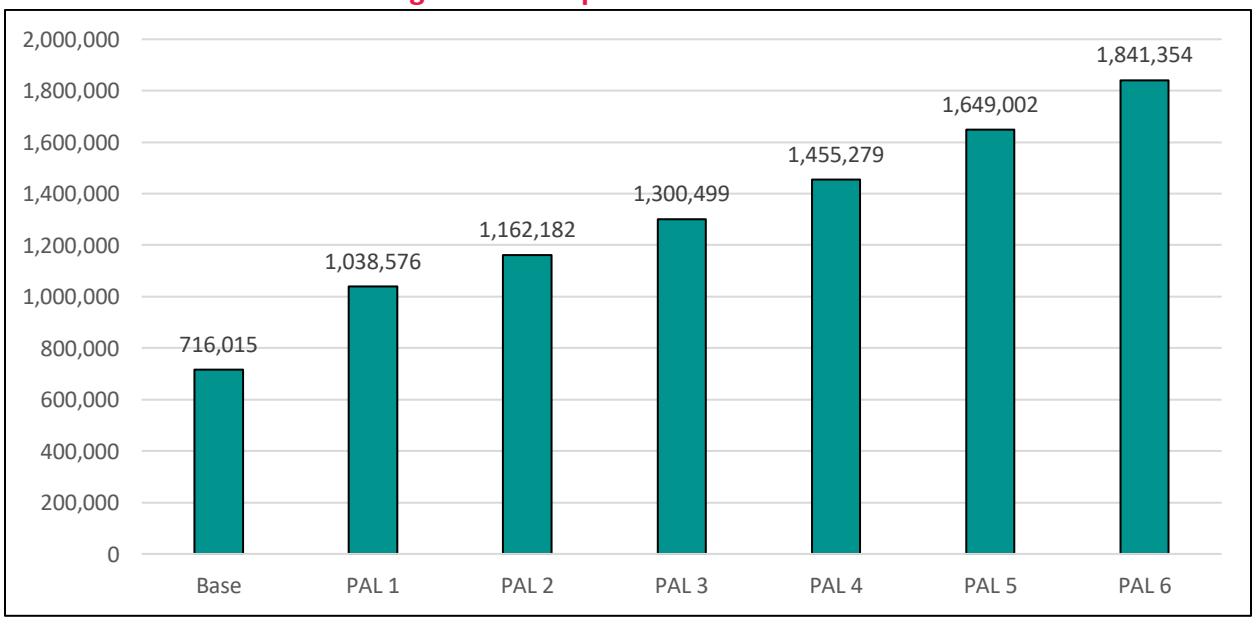
File Name: \\cha-l1p.com\proj\Projects\ANYK\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-EXST.dwg - Existing Airport Layout Plan | Modified / By: August 9, 2024 11:00:20 AM / Curtice, Alexander

Forecasts of Aviation Activity

A key part of the Master Plan Update was forecasting aviation activity. Timing of demand can vary; therefore, Planning Activity Levels (PALs), rather than calendar years, were established to identify significant demand thresholds for facility enhancement projects. The PALs used for this Study correspond with the Base Year of 2021 and the planning horizon years 2026 (PAL 1), 2031 (PAL 2), 2036 (PAL 3), 2041 (PAL 4). To further provide a range of potential activity levels in addition to the preferred forecast, PALs 5 and Pal 6 were established to provide alternate (i.e., higher) passenger and commercial operations activity levels, which further served as the basis for future facility planning should potential air service developments occur (i.e., a new entrant airline, service to new markets, etc.) or should activity increase beyond the preferred forecast's projections.

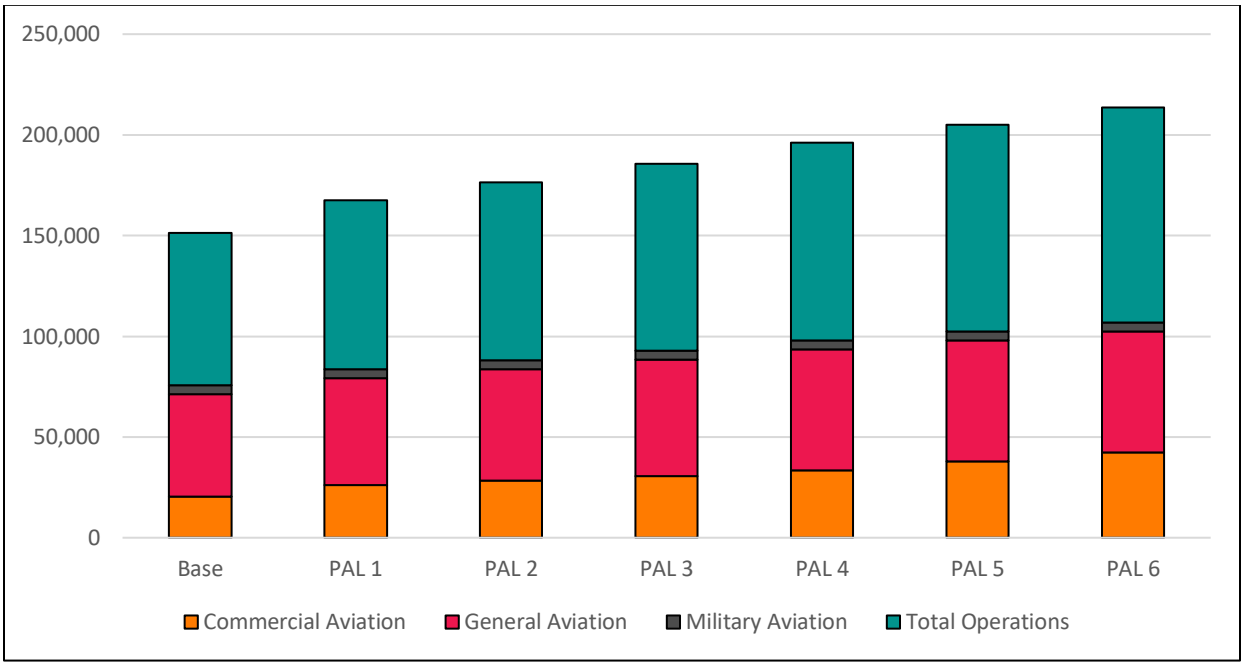
The two key components of the aviation demand forecasts are projected passenger enplanements and aircraft operations. Enplanements refer to the number of passengers boarding a departing aircraft. In 2021, AVL had 716,015 enplaned passengers, which is forecast to grow to approximately 1.4 million by PAL 4 and to approximately 1.8 million by PAL 6. As of the end of 2023, AVL has been exceeding the enplanements forecasts. Operations are the number of arriving and departing flights. AVL had 20,328 airline operations in 2021 which is expected to increase to 33,360 operations by PAL 4 and 42,220 by PAL 6. Together, commercial, general aviation, and military activities at AVL totaled nearly 75,740 operations in 2021, which are expected to growth to about 98,000 in PAL 4 and 106,850 operations in PAL 6.

Figure E-3 – Enplanements Forecasts



Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

Figure E-4 – Operations Forecasts



Source: FAA 2021 TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2022.

Facility Requirements and Airport Development Concepts

Projected increases in enplanements and aircraft operations also increase the demand on facilities and infrastructure. During the Master Plan Update, evaluations were conducted to help ensure that AVL's airfield, passenger terminal, general aviation, and support facilities can adequately accommodate existing and anticipated activity levels. Based on these evaluations, numerous development concepts were created and reviewed for the various components of the Airport. The concepts deemed most reasonable to support the long-term operational sustainability of the Airport formulate the Recommended Development Plan.

Runway Length

While no deficiencies in runway design standards were identified, the potential need for a future runway extension of approximately 1,000 feet was recommended to achieve a runway length of 9,002 feet, thus supporting further stage lengths on hot days and/or with 90%+ payloads of the Critical Aircraft. Property acquisition may be needed for land use compatibility within the future limits of the Runway 17 runway protection zone (RPZ).

Taxiways

While no deficiencies in taxiway design standards were identified, potential future development recommendations include a Taxiway B extension to the Runway 17 end and new bypass taxiways. The recommended extension will create a full-length parallel taxiway on the west side of Runway 17-35 to support development in that area of the Airport. The bypass taxiways are recommended to increase airfield capacity and better accommodate future demand.

General Aviation Hangars & Helipads

The projection for additional hangar space to accommodate future aircraft demand is approximately 120,000 square feet (82,000 SF for based aircraft + 38,000 SF for transient aircraft), by PAL 4. As hangars are developed, this may result in a loss of apron and tie-down parking. Future recommendations for proposed development in the GA area include additional hangars in both the existing developed area, and expansion to the north, with capability for over 200,000 SF of new hangar space. This expansion would be capable of accommodating up to two 30,000 SF hangars and two 40,000 SF hangars. This expansion will further require reconfiguration of the existing taxilanes and construction of a new taxiway and apron. New perimeter fencing and a roadway would be needed to provide access.

Development in the Northwest Area is also recommended, which could support future GA and FBO development. This would provide GA facilities and access to the west side of the airfield rather than activity being restricted to the east side of the airfield. There are approximately 15 acres in the southwest area, which could support potential corporate GA or air cargo operations.

Aviation Fueling Facilities

In the Base Year, a need for additional fuel storage was identified, with recommended expansion to the north of the existing aviation fuel tanks. Current plans include installation of two 40,000-gallon Jet-A fuel tanks, which will double existing fuel capacity (i.e., increasing capacity from 80,000 gallons to 160,000 gallons) in the short-term. It is further recommended that additional tanks be installed in each planning phase as needed.

Airport Rescue and Fire Righting (ARFF) Station

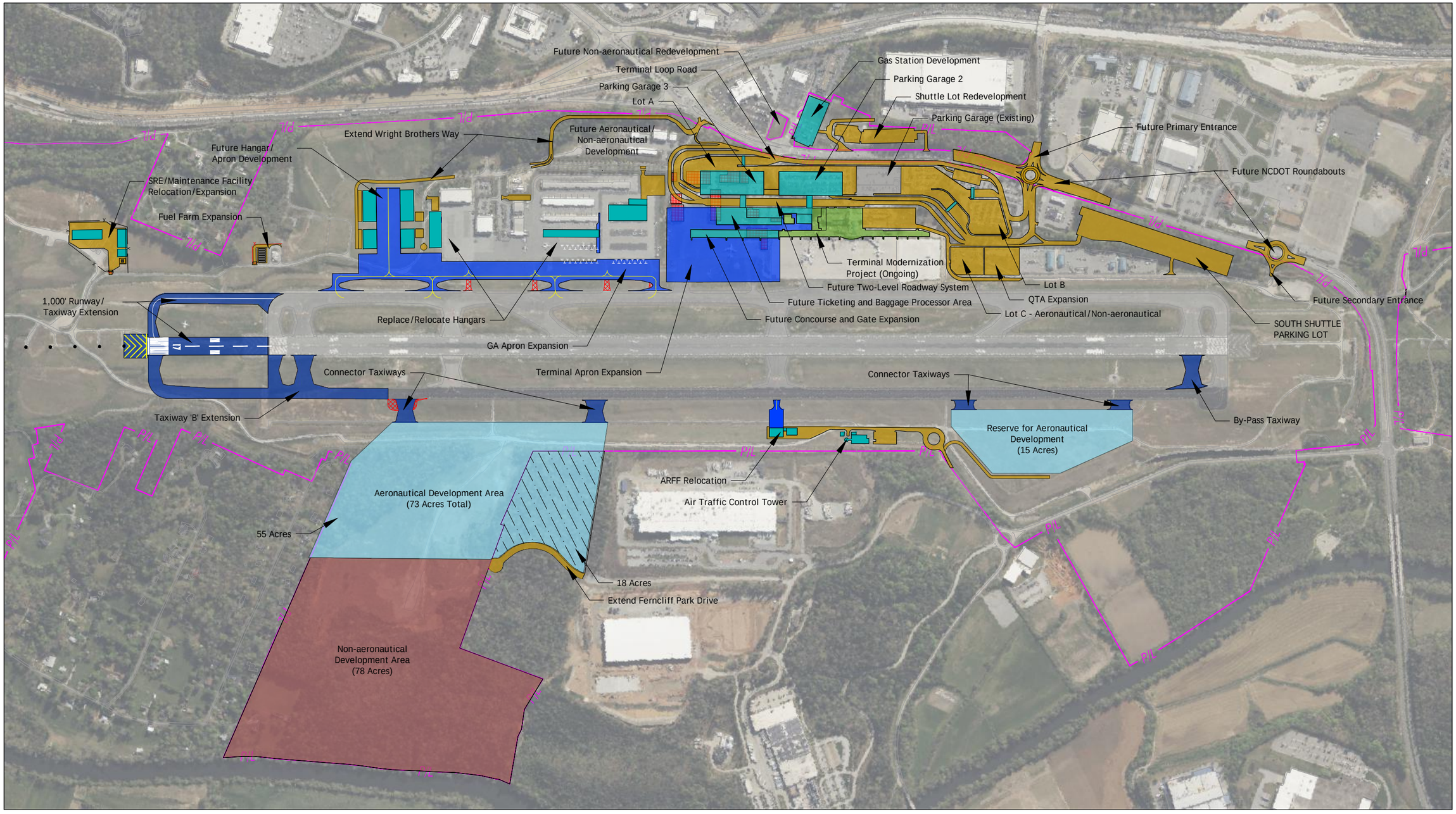
To enable future expansion of the passenger terminal facilities, it is recommended that the ARFF facilities and functions be relocated west of Taxiway B, adjacent to the new Airport Traffic Control Tower (ATCT).

Maintenance Facilities & Equipment Storage

It is recommended that the maintenance facilities and equipment storage be relocated to a new location inside the airport security fence, thus opening the existing area for improvement to the on-airport roadways, parking, and future non-aeronautical development with the potential for revenue through land and/or facility leases. The new five-acre maintenance facility site would be accommodated on airport property at the north end of the airfield.

Passenger Terminal Complex

As the Terminal Modernization Project nears completion, future expansion of the terminal complex will still be necessary to support the fast-growing passenger activity level need to be examined. The development of terminal complex concepts, and subsequent evaluations include an ultimate two-level terminal complex to support the maximum potential enplanement levels for PAL 6 and beyond. A long-term phase expansion is recommended for additional gates, concourse, ticketing, baggage claim, concessions, curbside, parking, etc.



Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

CHA

GRAPHIC SCALE (FEET)

0 400 800 1600

LEGEND:

- Future Airside Pavement
- Future Landside Pavement
- Future Building
- Pavement Removal
- Building Removal
- Terminal Modernization Project
- Potential Land Acquisition
- Development Area
- Potential Development Area/Land Release

Figure E-5 - Recommended Development Plan

File: \\CHA-LLP.COM\PROJ\PROJECTS\ANY\K6\068167.000\09_DESIGN\EXHIBITS\RECOMMENDED ALTERNATIVES SHEET\RECOMMENDED DEVELOPMENT PLAN - MASTER SHEET.DWG Saved: 6/7/2024 2:31:33 PM Plotted: 6/7/2024 2:32:03 PM Current User: Curtice, Alexander LastSavedBy: 8400

Environmental Overview & Compatible Land Use

During the Master Plan Update, environmental resources capable of affecting future development of the Airport were identified, as well as the environmental issues requiring additional environmental analysis prior to implementing future projects. Environmental impact categories evaluated included the following:

- Compatible Land Use and Zoning
- Airport Noise
- Social and Economic Environment
- Air Quality
- Water Quality
- Hazardous Materials
- Historical, Architectural, Archaeological, and Cultural Resources
- Biological Resources
- Wetlands and Watercourses
- Floodplains
- Prime and Unique Farmlands

Once project details are available, if appropriate under the National Environmental Policy Act, Categorical Exclusions or Environmental Assessments will be prepared in accordance with FAA guidance. Based on past studies and types of projects recommended in the Master Plan, it is anticipated that impacts can be successfully mitigated, thus allowing implementation of the recommended plan.

Financial Plan

All airports receiving federal Airport Improvement Program (AIP) funding are required to maintain a current Capital Improvement Program (CIP) with the FAA. The purpose of the CIP is to prioritize projects to properly accommodate the forecasted aviation demand, setting a timeframe in which projects should be accomplished.

The CIP is funded through federal, state, and local entities. Federal funds are provided through entitlement grants, which are distributed by a formula based on the number of enplanements by individual airports, and through discretionary grants. In recent years, additional funding has become available via the Bipartisan Infrastructure Law (BIL), providing funds for infrastructure and terminal development at airports.

State grants are provided by the North Carolina Department of Transportation (NCDOT) Division of Aviation through the State Airport Aid Program.

The Authority may also choose to seek out private third-party investment for revenue generating facilities (e.g., parking and fuel facilities) that are not ordinarily eligible for federal funding.

The remaining costs of the ACIP are funded by customer facility charge (CFC) revenues, General Airport Revenue Bonds, and the Authority's surplus fund.

Table E-1 – Capital Improvement Plan Costs by Planning Activity Level (in 000s)

Years	Project Costs	Entitlement	Discretionary	BILs		TSA	State	Third Party	Authority				Total Funding Sources
				AIG	ATP				CFCs	22A & 23 Bonds	Series 2035	AVL	
2024-2026	$378,715	$8,824	$0	$13,753	$20,000	$16,000	$16,778	$19,000	$2,232	$189,009	$0	$93,119	$378,715
2027-2031	$177,782	$26,126	$11,331	$0	$0	$3,309	$0	$41,916	$0	$89,620	$0	$5,480	$177,782
2032-2036	$142,310	$18,827	$98,491	$0	$0	$0	$0	$12,500	$0	$6,392	$0	$6,100	$142,310
2037-2041	$637,789	$29,442	$88,394	$0	$0	$0	$0	$1,000	$0	$0	$293,173	$225,779	$637,789
Total ACIP	**$1,336,595**	**$83,219**	**$198,216**	**$13,753**	**$20,000**	**$19,309**	**$16,778**	**$74,416**	**$2,232**	**$285,021**	**$293,173**	**$330,478**	**$1,336,595**

Source: DKMG Consulting, LLC, 2024.

1 INTRODUCTION

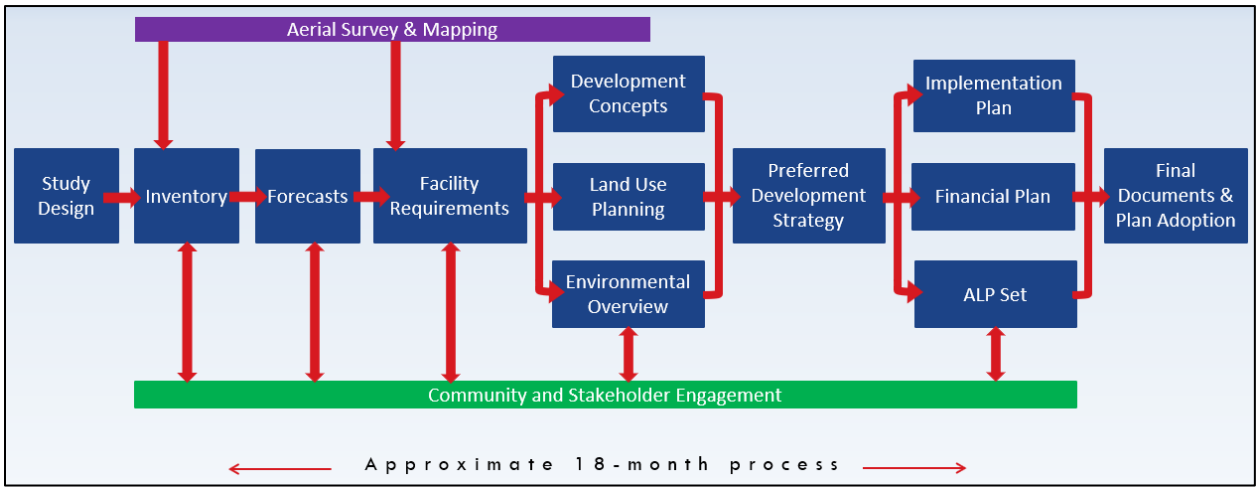
The Greater Asheville Regional Airport Authority ('GARAA' or 'the Authority') retained CHA Consulting, Inc. ('CHA') to prepare a Master Plan Update (Study) for the Asheville Regional Airport ('AVL or 'the Airport'). The purpose of the Study was to evaluate the current space utilization and operational characteristics of the airfield, terminal facility, support facilities, ground access, and land development considerations. The Study then identified and considered alternatives for the best use of space and logical guidance for the continued improvements necessary to accommodate projected aviation activity in a logical and financially feasible manner throughout the 20-year planning period.

This introductory chapter provides a description of the project and a background overview of the Airport and its facilities. Additional information about the Airport and the Study can be found on the Airport's website. The website also has destination and flight information, airport maps, driving directions, ground transportation, and parking information.

1.1 PROJECT DESCRIPTION

An airport master plan is a comprehensive study that is conducted via a systematic process that evaluates existing facility and market conditions, identifies anticipated stakeholders' needs, and formulates short-, medium-, and long-term development plans to meet future aviation demand. The process, methods and ultimate products are guided by Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. Consistent with this guidance, the process followed for preparing the AVL Master Plan Update is outlined in **Figure 1-1**.

Figure 1-1 – Master Planning Process



Source: CHA.

1.1.1 Purpose and Objectives

The purpose of this Study was to provide long-term guidance for continued airport improvements necessary to satisfy projected aviation demand in a logical and financially feasible manner.

Consistent with this purpose, the Authority indicated the goals and objectives of the Study to include, at a minimum, the following:

- Airfield safety and standards, such as Runway Safety Areas (RSAs), Runway Protection Zones (RPZs), etc.
- Long-term passenger terminal facility needs
- Surface access/parking considerations
- Development of General Aviation (GA) and support facilities and evaluation of existing infrastructure
- Land use/economic development issues, such as infrastructure, access, and best use of surplus lands for aeronautical and non-aeronautical development
- Environmental considerations, including air quality, storm water management, and sustainability
- Financial viability of recommended actions

In addition to addressing these objectives, this Study also fulfills the broad master planning goals set forth by the FAA in AC 150/5070-6B *Airport Master Plans*. These goals are:

- Document issues that the proposed development will address.
- Justify the proposed development through the technical, economic and environmental investigation of concepts and alternatives.
- Provide an effective graphic presentation of the development of the Airport and anticipated land uses in the vicinity of the Airport.
- Establish a realistic schedule for the implementation of the development proposed in the study, particularly the short-term capital improvement program.
- Propose an achievable financial plan to support the implementation schedule.
- Provide sufficient project definition and detail for subsequent environmental evaluations that may be required before the project is approved.
- Present a plan that adequately addresses the issues and satisfies local, state, and federal regulations.
- Document policies and future aeronautical demand to support municipal or local deliberations on spending, debt, land use controls, and other policies necessary to preserve the integrity of the Airport and its surroundings.
- Set the stage and establish the framework for a continuing planning process. Such a process should monitor key conditions and permit changes in plan recommendations as required.

1.1.2 Public and Stakeholder Involvement Program

Public and stakeholder involvement is an integral part of any significant airport planning study, as it encourages information-sharing and collaboration among the community and airport stakeholders that hold a collective interest in the outcome of the Study. For the purpose of this Study, stakeholders included the airport sponsor, airlines, general aviation representatives, tenants, users and travelers, local businesses, military interests, residents, resource agencies, local jurisdiction planning representatives, and the general public. A variety of forums, such as committees, public information meetings/workshops, and public awareness campaigns, were necessary to mitigate setbacks that may arise from having a large, diverse stakeholder group.

For this Study, a Planning Advisory Committee (PAC) was established. The PAC consisted of technical level representatives of the Authority, airlines, airport tenants, general aviation users, the FAA, the North Carolina Department of Aviation, Division of Aviation (NCDOT), and other key agencies and interest groups. In addition, the PAC included representation from local municipalities, regional planning agencies, economic development organizations, and land use and transportation planning groups. The PAC was asked to provide guidance and advice on technical and local issues and will also review working papers at various milestones throughout the course of the project to ensure that all relevant issues were adequately addressed. The PAC was also asked to provide broad input and insight on non-technical issues affecting the community.

Table 1-1 – Project Meetings & Workshops

Meeting	Date
Project Kickoff Meeting	9/16/2021
PAC Meeting #1 (Introduction and Inventory of Facilities & Existing Conditions)	11/17/2021
PAC Meeting #2 (Forecasts of Aviation Demand Overview)	06/29/2022
Project Meeting (Master Plan Review)	12/16/2022
PAC Meeting #3 (Facility Requirements Overview)	07/31/2023
Project Meeting (Development Concepts Workshop)	08/01/2023
Board Briefing #1 (Briefing on Alternative Development Options)	10/13/2023
Public Meeting #1 (Public Information Meeting)	10/26/2023
PAC Meeting #4 (Airport Development Concepts)	02/06/2024
Board Briefing #2 (Briefing on Recommended Development Plan)	04/12/2024

PAC meetings, as well as project meetings (as necessary), were held throughout the duration of the program as part of a coordinated series of meetings at key decision points in the Study process. In addition to the PAC meetings and project meetings, briefings for the Airport Authority Board and public meetings were held. The Airport Authority Board briefings were scheduled, as needed, and covered topics of special concern or interest to the Authority. The purpose of the public meetings and workshops was to provide opportunities for the Authority to engage the public in purposeful conversation about the Airport and the Master Plan Update. Other briefings were organized with key agencies, stakeholders, or public officials as needed for various topics. A Master Plan Update website, located on the Airport's website, was provided to enable the public to conveniently access project specific information in a narrative and graphical format

throughout the Study's duration. The table above lists each of the key involvement briefings, workshops, and meetings carried out during the Study process.

1.2 AIRPORT BACKGROUND

Understanding the background of an airport and the region it serves is essential in making informed decisions pertaining to airport-related improvements. This section discusses AVL in the context of its history, location, service area, and role in the National Airspace System (NAS).

1.2.1 History

The greater Asheville region was previously served by a nearby, much smaller airport, just east of the existing location. In 1957, municipal leadership began making plans for development of the present Asheville Regional Airport. Significant milestones in its history include:

- 1961 – Air service begins at Asheville Regional Airport; present-day Terminal facility and Air Traffic Control Tower (ATCT) open; Instrument Landing System (ILS) capabilities begin one year later
- 1979 – The Asheville Regional Airport Authority Board was established under North Carolina Statutes by Buncombe County and the City of Asheville to maintain, operate, regulate, and improve the airport while enhancing the economy of the region
- 1980 – Runway increased to present length of 8,002 feet; Terminal facility undergoes first major expansion to baggage claim and gate areas
- 1992 – Terminal facility again significantly expanded, increasing ticketing, baggage claim, holdroom/gate space, and administrative space; New loop road developed to improve access from Airport Road
- 2003 – Terminal facility again expands holdroom/gate areas
- 2006 – Terminal apron and maintenance/support facilities expanded
- 2008 – Consolidated rental car service/QTA facility developed
- 2010 – Fourth major expansion/renovation to Terminal facility completed
- 2012 – The North Carolina legislature voted to change the structure of the board to a state-sanctioned independent Airport Authority with more regional representation and governance. The Greater Asheville Regional Airport Authority (GARAA) is now the governing body for the Airport and is comprised of seven members
- 2017 – Parking garage and rental car pick-up/return facility developed
- 2018 – Terminal Building Assessment Study concluded that existing and forecast growth would best be served by a new Terminal facility, built around the existing apron, parking, and curbside.
- 2020 – Planning and design commences for a new terminal and ATCT

- 2021 – Airfield improvement program completed, reconstructing runway and taxiways

1.2.2 Location and Service Area

Asheville Regional Airport is the primary gateway for Western North Carolina. As shown in **Figure 1-2** and **Figure 1-3**, the Airport is approximately 15 miles south of downtown Asheville and 12 miles north of downtown Hendersonville, located directly off of Interstate 26. As the primary commercial service airport in the region, the Airport's service area extends beyond Asheville and into all parts of Western North Carolina and portions of northern South Carolina. AVL's location, regarding time[1] and distance in nautical miles (nm), in comparison to other major airports in the region is as follows:

- Charlotte Douglas International Airport (CLT) – 80 nm; 1-hour,40-minute drive; east of AVL
- Greenville-Spartanburg International Airport (GSP) – 40 nm; 1-hour drive; south of AVL
- McGhee Tyson Airport (TYS) – 75 nm; 2-hour drive; west of AVL
- Tri-Cities Airport (TRI) – 65 nm; 1 ½-hour drive; north of AVL

The Airport is located within the Asheville NC Metropolitan Statistical Area (MSA). The MSA, with a population of approximately 420,000 per the latest census data, consists of the following counties:

- Buncombe
- Haywood
- Henderson
- Madison
- Transylvania

1.2.3 Airport Role

In addition to connecting Western North Carolina to the global transportation network, the Airport plays a significant role in the nation's air travel system. The National Plan of Integrated Airports Systems (NPIAS) identifies existing and proposed airports that are important to national air transportation and provides a forward-looking estimate of the type and cost of Airport Improvement Program (AIP)-eligible development needed to meet the needs of civil aviation. Airports included in the NPIAS are considered significant to national air transportation and are eligible to receive grants under the FAA's Airport Improvement Program (AIP).

The NPIAS further categorizes the nation's airports based on types of service provided and quantity of passengers enplaned. In the 2021-2025 NPIAS, AVL is classified as a small-hub primary commercial service airport. Small hubs are defined as airports that enplane 0.05 percent to 0.25 percent of total U.S. passenger enplanements. The 72 small hub airports account for nine percent of all U.S. enplanements. **Table 1-2** outlines the specifics of each NPIAS category and provides examples of each type in the region.

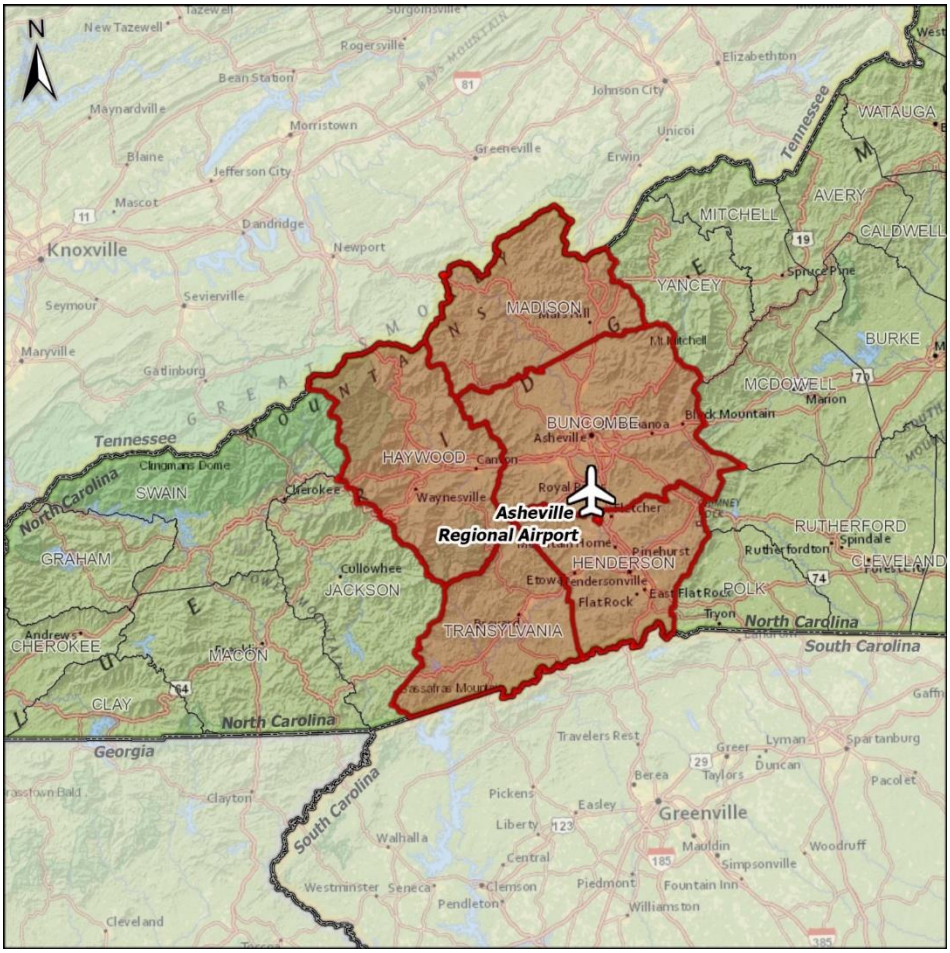
[1] Drive times may be impacted during certain times of the day due to traffic congestion and/or construction activity.

Table 1-2 – NPIAS Airport Classifications

Airport Classifications		Hub Type: % of Annual Passenger Boardings	Example Airport
Commercial Service: *Publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service*	**Primary**: *Have more than 10,000 passenger boardings each year*	**Large Hub**: *1% or more*	Charlotte Douglas International Airport (CLT)
		Medium Hub: *At least .25%, but less than 1%*	Raleigh-Durham International Airport (RDU)
		Small Hub: *At least .05%, but less than .25%*	**Asheville Regional Airport (AVL)**
		Non-hub Primary: *More than 10,000, but less than .05%*	Coastal Carolina Regional Airport (EWN)
	Non-primary	**Non-primary Commercial Service**: *At least 2,500, and no more than 10,000*	McKellar-Sipes Regional Airport (MKL)
Non-primary (*Except Commercial Service*)		**Reliever**	Charlotte-Monroe Executive Airport (EQY)
		General Aviation	Jackson County Airport (24A)

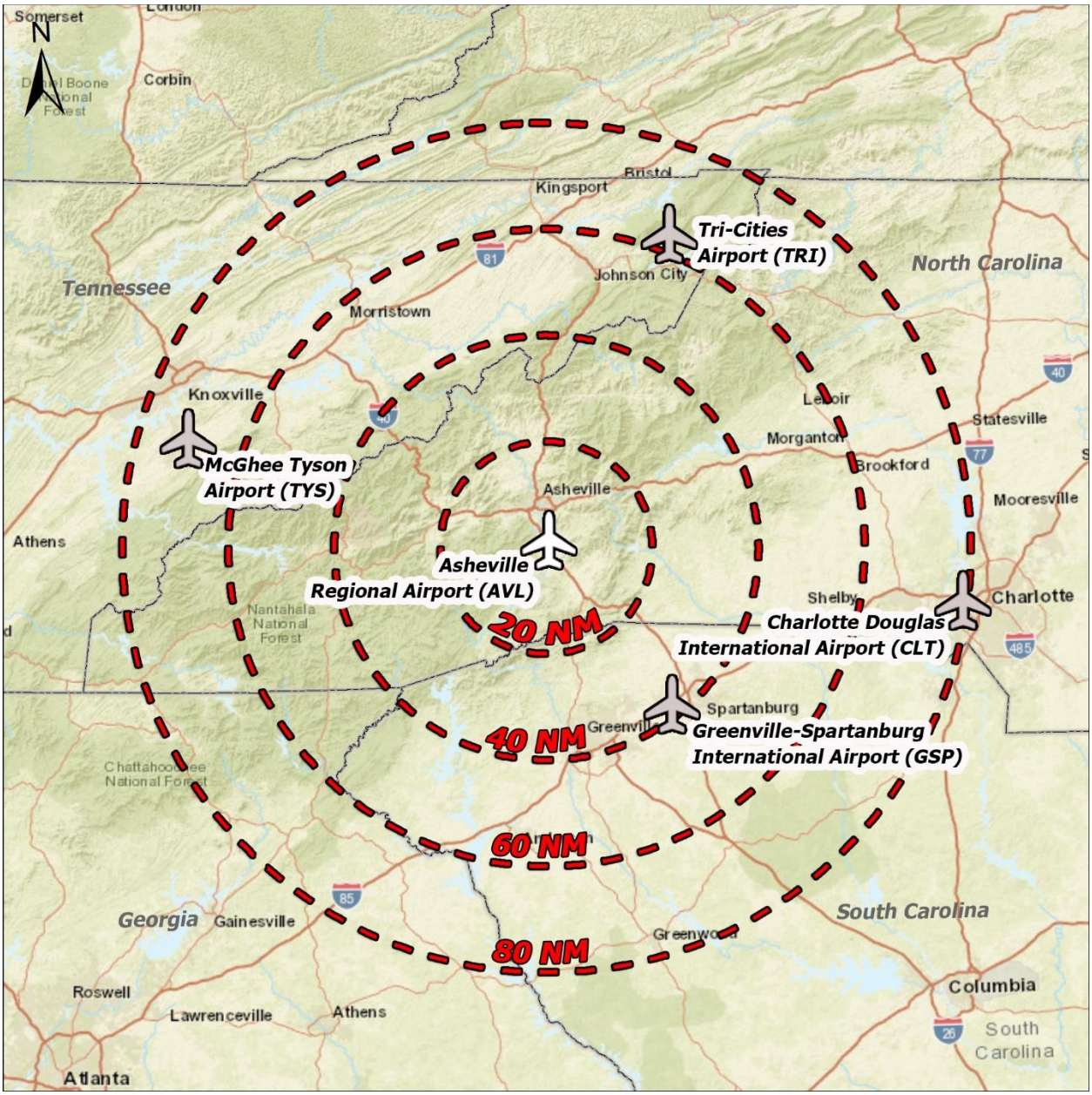
Source: FAA 2021-2025 NPIAS Report, CHA, 2022.

Figure 1-2 – Location Map



Source: CHA, 2022.

Figure 1-3 – Vicinity Map



Source: CHA, 2022.

1.3 AIRPORT GOVERNANCE

The GARAA is a political subdivision of the State of North Carolina and is an independent airport authority. The Authority is governed by a seven-member Board of Commissioners consisting of representation from the Asheville City Council, Buncombe County Commission, Henderson County Commission, and one regional at-large appointment by the six board members.

1.4 MAJOR AIRPORT TENANTS

The Airport hosts a variety of aviation and non-aviation tenants that provide services to the traveling public and aviation community. The major tenants include the airlines, general aviation businesses, FBO/GA users, federal government (FAA/TSA), concessionaires, and rental car companies, as well as the DreamCatcher Hotel and the Broadmoor Golf Links.

1.4.1 Passenger Airlines

According to the FAA, in 2021, AVL was ranked as the 107th busiest airport in the United States in passenger arrivals and departures, serving 1.6 million total passengers annually (2019, pre-COVID). Five airlines currently provide scheduled passenger service at the Airport. Between these airlines, AVL offers daily, non-stop service to 25 domestic destinations, as depicted in **Table 1-1** and **Figure 1-4**, Domestic service is primarily to key markets and hubs in the Northeast, Midwest, and South, as well as leisure markets in Florida.

In 2022, the commercial passenger service airlines operating at AVL are:

Allegiant Air (Allegiant)

American Airlines (American)

Delta Air Lines (Delta)

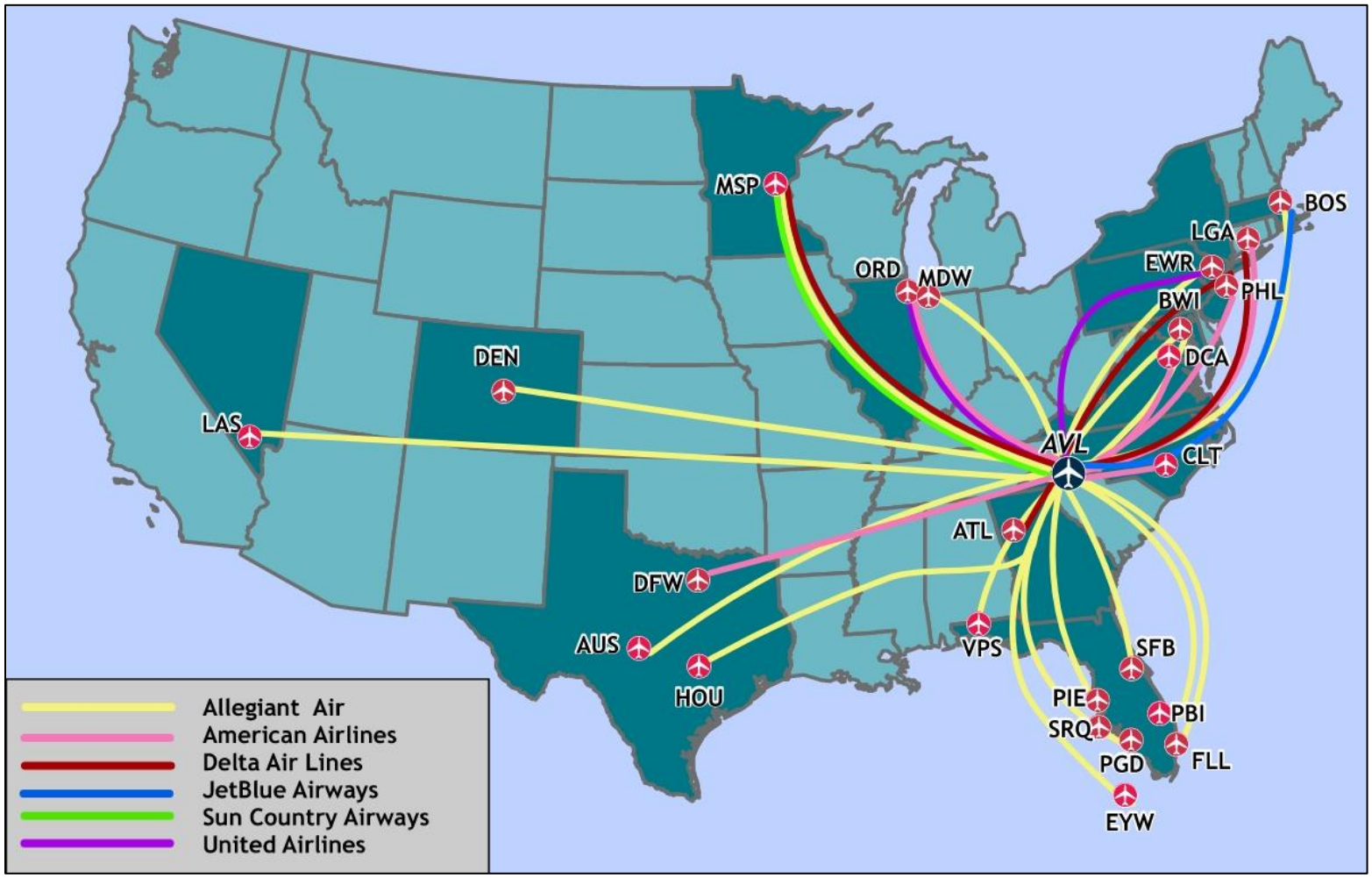
JetBlue Airways (JetBlue)[2]

Sun Country Airlines (Sun Country)

United Airlines (United)

[2] JetBlue Airways is scheduled to inaugurate service in June of 2022.

Figure 1-4 – Air Service Destinations



Delta Air Lines scheduled to begin service to MSP on April 16, 2022; JetBlue Airways scheduled to inaugurate service to BOS in June of 2022.

Table 1-3 – Current Non-Stop Air Service Destinations

Airlines	Destinations
Allegiant	Austin-Bergstrom (AUS)*, Baltimore-Washington (BWI), Boston Logan (BOS)*, Chicago-Midway (MDW)*, Denver (DEN), Destin/Fort Walton Beach (VPS), Fort Lauderdale-Hollywood (FLL), Houston-Hobby (HOU)*, Key West (EYW), Las Vegas-McCarran (LAS), Minneapolis/St. Paul (MSP), Newark Liberty (EWR), Orlando/Sanford (SFB), Punta Gorda (PGD), St. Petersburg/Clearwater (PIE), Sarasota/Bradenton (SRQ), Palm Beach (PBI)
American	Charlotte Douglas (CLT), Chicago-O'Hare (ORD)*, Dallas/Fort Worth (DFW), New York-LaGuardia (LGA)*, Philadelphia (PHL)*, Washington-Reagan (DCA)*
Delta	Atlanta Hartsfield-Jackson (ATL), New York-LaGuardia (LGA)*
Sun Country	Minneapolis/St. Paul (MSP)
United	Chicago-O'Hare (ORD), Newark Liberty (EWR)*

*indicates seasonal service
Source: GARAA, 2022.

In addition to the air service and destinations noted above, JetBlue Airways will be starting service to Boston Logan (BOS) in June of 2022, and Delta will begin seasonal service to Minneapolis/St. Paul (MSP) on April 16, 2022.

1.4.2 Rental Car Companies

As of December 2021, eight rental car companies provide services at AVL. Each on-site company has grouped counters accordingly, in the baggage claim area, dedicated ready parking and return parking in the parking garage, with Quick Turn Around (QTA) services and vehicle maintenance located in a consolidated area south of the terminal and parking areas along Rental Car Drive.

The rental car companies operating at AVL are:

Alamo

Avis

Budget

Dollar Rent a Car

Enterprise

Hertz

National

Thrifty

1.4.3 Concessionaires

Concessionaires at an airport provide travelers in the sterile and non-sterile/non-secured areas, as well as meeters/greeters in the non-sterile area, with amenities such as restaurants / food vendors, newsstands, and gift shops. All concessions at AVL are operated by Paradies Lagardere.

1.4.4 Department of Homeland Security

The Department of Homeland Security provides AVL with services from the Transportation Security Administration (TSA). Airports and Airlines are required to meet security regulations established in Title 49 Code of Federal Regulations (CFR) Part 1542, *Airport Security,* and Title 49 CFR Part 1540, *Civil Aviation Security: General Rules*. As set forth in Title 49 CFR Part 1540.5, the "sterile area" refers to the most restrictive areas of the Airport (e.g., the concourses) and cannot be accessed by the public or badged personnel until being processed through security measures specified in 49 CFR Part 1542. "Secured areas" are areas outside the concourse that are accessible only to badged personnel (proximity of baggage makeup and aircraft parking). "Non-sterile/non-secure areas" do not have regulated security measures and are accessible to the general public.

1.4.5 Fixed-Base Operator (FBO)

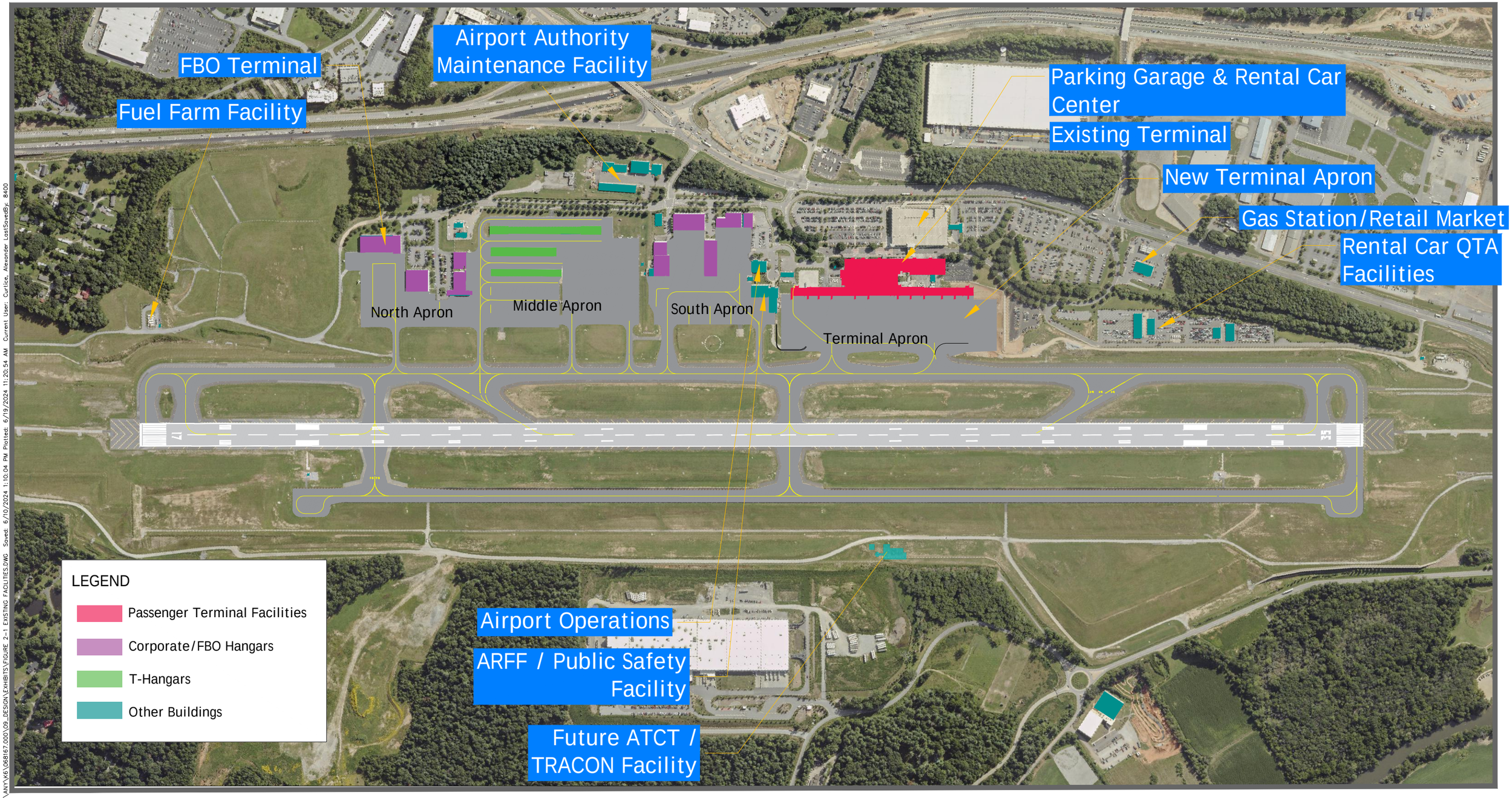
Signature Flight Support is the full-service FBO providing aviation services and amenities to the airlines, GA users, and pilots operating out of AVL. Signature Flight Support is the world's largest FBO and distribution network for business aviation services. A summary of the services offered by Signature includes aircraft fueling, deicing, ground handling, hangar storage, and tie-down areas, as well as a business center, conference rooms with conference call capabilities, crew transportation services and capabilities, and crew rooms and rest areas. In addition to Signature Flight Support, WNC Aviation and Belle Aircraft Maintenance provide services to general aviation users at the Airport. WNC Aviation is a flight school providing Private Pilot, Instrument, Commercial, Multi-Engine, CFI, CFII, MEI and Airline Transport Pilot training. Belle Aircraft Maintenance provides annual inspections, aircraft maintenance and repair, and aircraft detailing services.

2 INVENTORY OF EXISTING FACILITIES AND CONDITIONS

The initial step in the master planning process was to develop an inventory of the existing physical conditions and operational characteristics of the Airport and its surroundings. The information presented in this Chapter is the basis for evaluating the Airport's existing and future facility requirements. The following elements are detailed in this Chapter:

- Airfield
  - Airport Design Criteria
  - Runway System
  - Taxiway System
  - Aircraft Parking Aprons
  - Airfield Markings
  - Airfield Signage
  - Airside Pavement Condition
- Navigational Aids (NAVAIDs) and Instrument Procedures
  - Types of Instrument Approach Procedures and Instrument Approach NAVAIDs
  - Standard Instrument Departures
  - Airfield Lighting
- Terminal Facility
  - Terminal Facility Layout
  - Terminal Building Functional Areas
  - Airline Ticketing Lobby
  - Checked Baggage Screening
  - Passenger Security Screening
  - Airline Gates and Holdrooms
  - Terminal Concessions and Amenities
  - Baggage Claim
  - Rental Car Counters
- Automobile Access and Parking
  - Passenger Parking
  - Rental Car QTA & Parking
  - Consolidated Rental Car Service Facility
  - Employee Parking
  - Ground Transportation
  - Vehicular Circulation
  - Signage and Wayfinding
- Support Facilities
  - Airport Perimeter Fence
  - Airport Equipment Storage and Maintenance
  - Air Traffic Control Tower (ATCT)
  - Aircraft Rescue and Firefighting (ARFF)
  - Aircraft Fueling
  - Snow and Ice Control
  - General Aviation (GA) Facilities and Activities
- Airspace Environment
- Meteorological Conditions
  - Local Climate
  - Wind Coverage

The existing facilities, as well as the Airport's general layout and key areas are depicted in **Figure 2-1**.



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MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)
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Figure 2-1
Existing Facilities

File: \\CHA-LLP.COM\PROJ\PROJECTS\ANY\K6\068167.000\09_DESIGN\EXHIBITS\FIGURE 2-1 EXISTING FACILITIES.DWG Saved: 6/10/2024 1:10:04 PM Plotted: 6/19/2024 11:20:54 AM Current User: Curlice, Alexander LastSavedBy: 8400

2.1 AIRFIELD

The Airport's airside and airfield facilities generally include the facilities located within the airport perimeter fence that are most closely associated with the movement and operation of aircraft, such as taxiing, takeoff, landing, and parking. Additional elements related to airfield activity and infrastructure include the runway and taxiway systems, aircraft parking aprons and hangars, and airfield pavement, markings, signage, lighting, and NAVAIDs.

2.1.1 Airport Design Criteria

The FAA uses a classification system, known as the Airport Reference Code (ARC), to signify the airport's highest Runway Design Code (RDC), the design standards to which the runway is to be built. RDC consists of three components: aircraft approach speed (AAC), airplane design group (ADG) relating to either the aircraft wingspan or tail height (whichever is more restrictive), and visibility minimums. ARC is determined by taking the highest RDC minus the visibility component. It affects runway and taxiway dimensions, separation standards, pavement marking standards, and other safety standards. Furthermore, it is used for planning and design only and does not limit the aircraft that may be able to operate safely at the airport. The relationship between the ARC and design standards is further described in FAA AC 150/5300-13A, *Airport Design*. Typical aircraft types operating at AVL are shown in **Table 2-1**, while the characteristics of the RDC are shown in **Table 2-2**.

Table 2-1 – Typical Aircraft Types Operating at AVL

As noted, the ARC is based on an aircraft's approach speed and wingspan or tail height, whichever is most restrictive. The most demanding aircraft is commonly referred to as the critical, or design, aircraft and must account for a minimum of 500 annual itinerant operations. An itinerant operation is the takeoff or landing of an aircraft going from one airport to another, at least 20-miles from each other. The ARC consists of a letter designating the aircraft approach category and a Roman numeral designating the Airplane Design Group (ADG).

Approach categories A and B include small piston-engine aircraft and corporate jets with approach speeds of less than 121 knots, while categories C, D, and E include larger aircraft with approach speeds of 121 knots or greater (those typically associated with commercial or military use).

Similarly, design groups I and II typically include small piston-engine aircraft and light to midsize corporate jets, as well as single- and twin-engine turboprop aircraft. Design groups III, IV, and V include larger corporate jets and the majority of the commercial jet fleet, as well as numerous military aircraft. Design group VI includes very large jets such as the Airbus A380 and the military C-5 transport aircraft.

While the 737-800 is currently the most demanding aircraft with over 500 itinerant operations, the runway has been designed to ARC C-IV standards, with the critical aircraft established as the Boeing 757-200. The existing and future ARC are analyzed in greater detail in **Chapter 4**, *Facility Requirements*.

Table 2-2 – Airport Reference Code

Approach Categories			
Approach Category	**Airspeed (Knots)**		**Example Aircraft**
A	<91		Beechcraft-E33 Bonanza, Cessna 152
B	91 ≤ 121		CRJ-200, ERJ-135/140/145
C	121 ≤ 141		B737-700W, MD-88
D	141 ≤ 166		A300, B757
E	166+		B-52H, B-2 Spirit
Airplane Design Group			
Design Group	**Tail Height (feet)**	**Wingspan (feet)**	**Example Aircraft**
I	<20	<49	Beechcraft-E33 Bonanza, Cessna 152
II	20-<30	49 ≤ 79	CRJ-700, ERJ-145
III	30-<45	79 ≤ 118	A319, CRJ-900
IV	45-<60	118 ≤ 171	Boeing 757, MD 11
V	60-<66	171 ≤ 214	A300, B757
VI	66-<80	214 ≤ 262	B-52H, B-2 Spirit

Source: FAA AC 150/5300-13 *Airport Design*, CHA, 2021.

2.1.2 Runway System

The existing airfield configuration at AVL consists of a single runway, identified as Runway 17/35, oriented in a north/south direction. This runway is newly reconstructed, opening in December 2020, replacing the Airport's original runway, in the same orientation (Runway 16-34). **Table 2-3** presents the characteristics of the runway.

The runway, situated west of the terminal building, is 150 feet wide and has a length of 8,002 feet, with no displacements. It is constructed of asphalt, has a grooved surface, and is supplemented by 25-foot wide, paved shoulders along the entire length. The runway's load-bearing capacity is 120,000 pounds single-wheel; 219,000 pounds dual-wheel; and 404,000 pounds dual tandem landing gear.

Table 2-3 – Existing Runway Specifications

	Runway 17/35
Runway Length (feet)	8,002
Displaced Threshold (feet)	N/A
Width (feet)	150
Runway End Elevation (feet above MSL)	**Runway 17:** 2,164 **Runway 35:** 2,117
Pavement Type	Asphalt /Grooved
Maximum Pavement Load Bearing	404,000 lbs. (Dual Tandem)
Effective Runway Gradient	0.67%
Aircraft Approach Category	C
Airplane Design Group	IV
Runway Markings	PIR
Runway and Approach Lighting	HIRL **Runway 17:** PAPI-4, MALSR **Runway 35:** PAPI-4, MALSR
Navigational Aids	ILS/DME, RNAV (GPS)
Runway Design Code	C-IV

Sources: AirNav.com; FAA Form 5010-1, *Airport Master Record-November 2021*, CHA, 2021.

DME – Distance Measuring Equipment
GPS – Global Positioning System
HIRL – High Intensity Runway Lights
ILS – Instrument Landing System
MALSR – Medium-Intensity Approach Lighting System with Runway Alignment Indicator
PAPI-4 – Four-Box Precision Approach Path Indicator
RNAV – Area Navigation

2.1.3 Taxiway System

An airport's taxiway system connects the runways to aircraft parking aprons, storage hangars and other facilities. AVL has parallel taxiways on both sides or the runway, and 19 stub or connector taxiways, for a total of 21 operative and designated taxiways. The Airfield does not provide taxiway holding bays for runway approach end, but both ends are equipped with by-pass taxiways. While individual Taxiway Design Groups vary, the overall TDG for the Airport was classified as TDG-5 in the August 2016 runway design report; additionally, while the FAA-approved TDG and ADG vary by taxiway, much of the infrastructure has been designed to accommodate up to ADG V. **Table 2-4** provides the characteristics and specifications of each taxiway. **Figure 2-2** displays the existing taxiway system at AVL.

Table 2-4 – Existing Taxiway Specifications

Taxiway	Description	Width (feet)	Airplane Design Group (ADG)	Taxiway Design Group (TDG)	Taxiway Shoulder (feet)
A	Parallel to east side of RW 17-35, providing access to aprons	75	V	5	25
B	Parallel to west side of RW 17-35	75	V	5	12.5
C, D	Connects Terminal Apron to TW A	75+	V	5	0
E	Connects South FBO Apron to TW A	35	IV	2	0
F	Connects South FBO Apron to TW A	50	V	4	0
G	Connects Middle FBO Apron to TW A	35	II	2	0
H	Connects Middle FBO Apron to TW A	35	II	2	0
J	Connects Middle FBO Apron to TW A	35	II	2	0
K	Connects North FBO Apron to TW A	35	II	2	0
A1, A2	Connectors for TW A at RW 35 End	75	V	5	25
A3, A5	High-Speed Exit Taxiway Connectors to TW A	75	V	5	25
A4, A6	Connectors to TW A	75	V	5	25
A7, A8	Connectors for TW A at RW 17 End	75	V	5	25
B1, B3, B5	Connectors to TW B	75	V	5	25

Source: FAA Airport Diagram, AC 150/5300-13A, CHA 2021.

RW – Runway

TW – Taxiway

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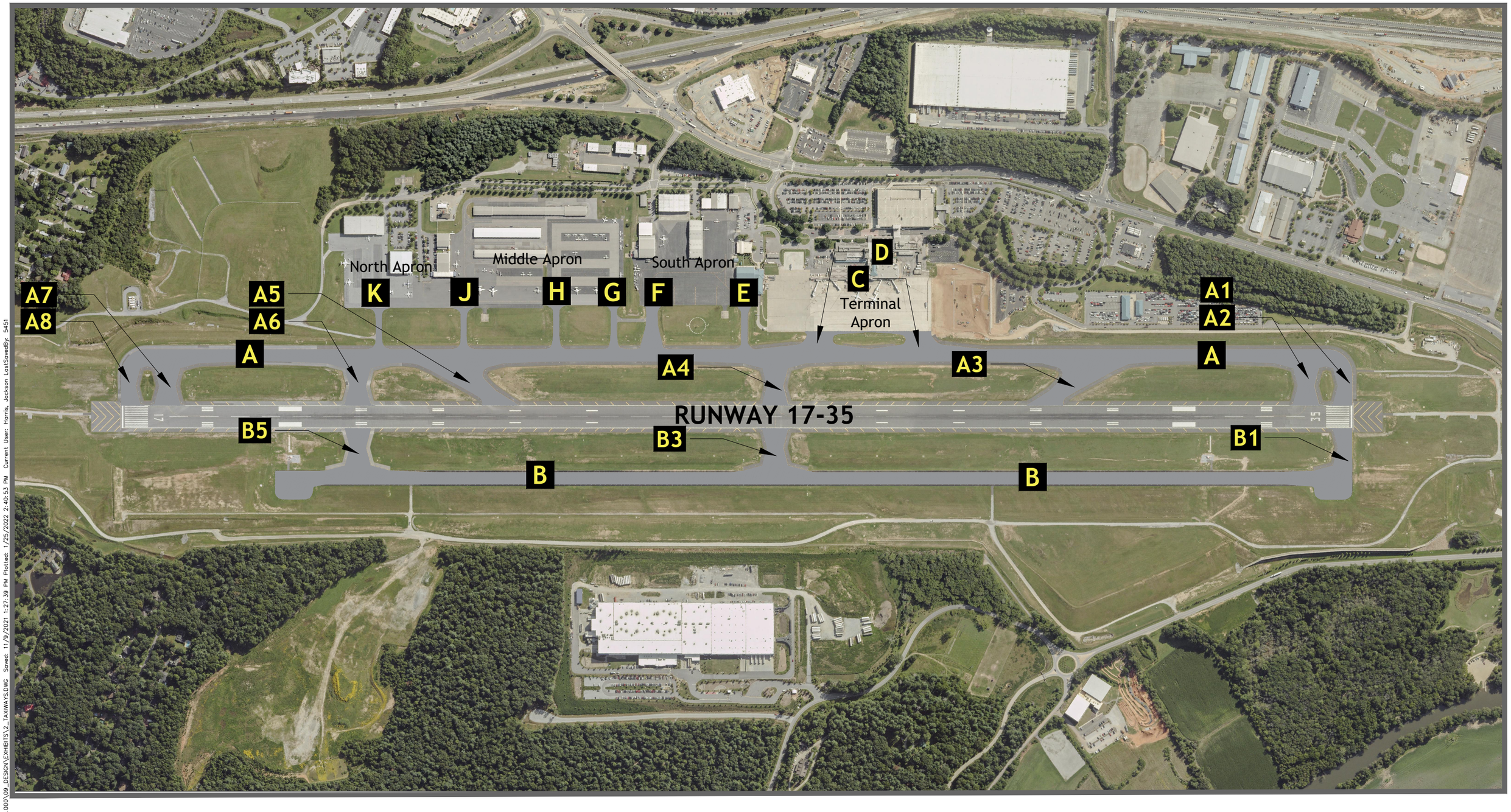

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GRAPHIC SCALE (FEET)
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Figure 2-2
Taxiway Configuration

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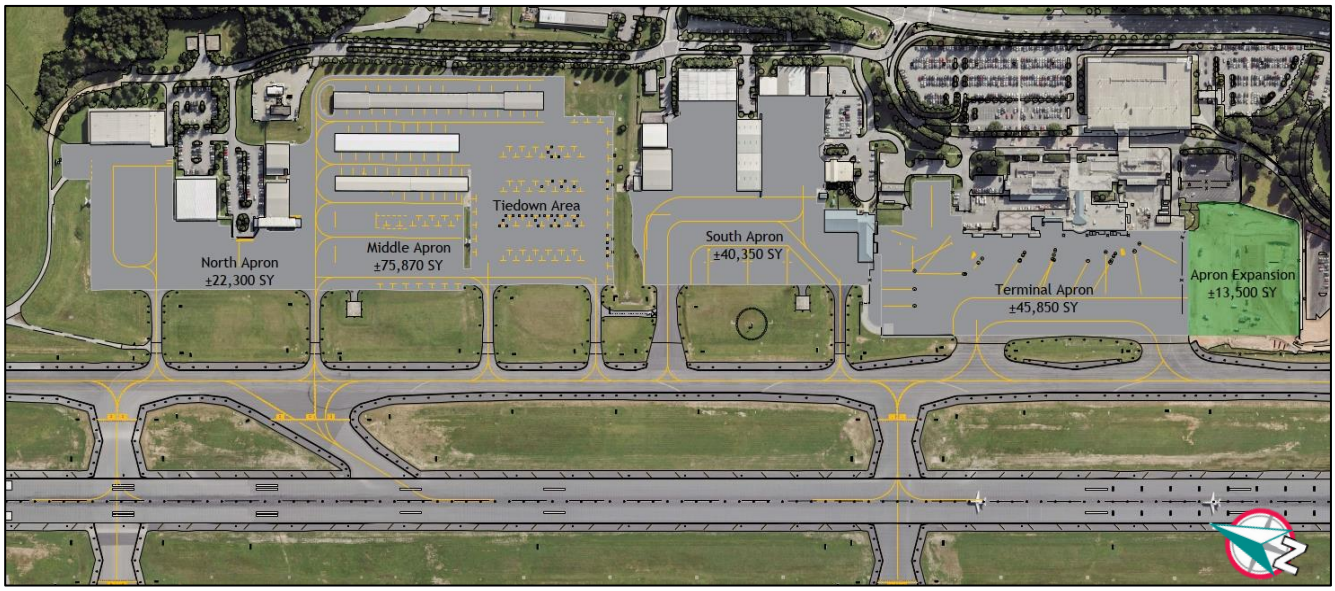
2.1.4 Aircraft Parking Aprons

Airport aprons, also referred to as ramps, provide space for short-term and long-term aircraft parking and deicing operations, as well as the loading/unloading of passengers and goods. As depicted in **Figure 2-3** and described below, AVL has various aprons for the terminal and general aviation/hangar areas.

Figure 2-3 – Aircraft Parking Aprons

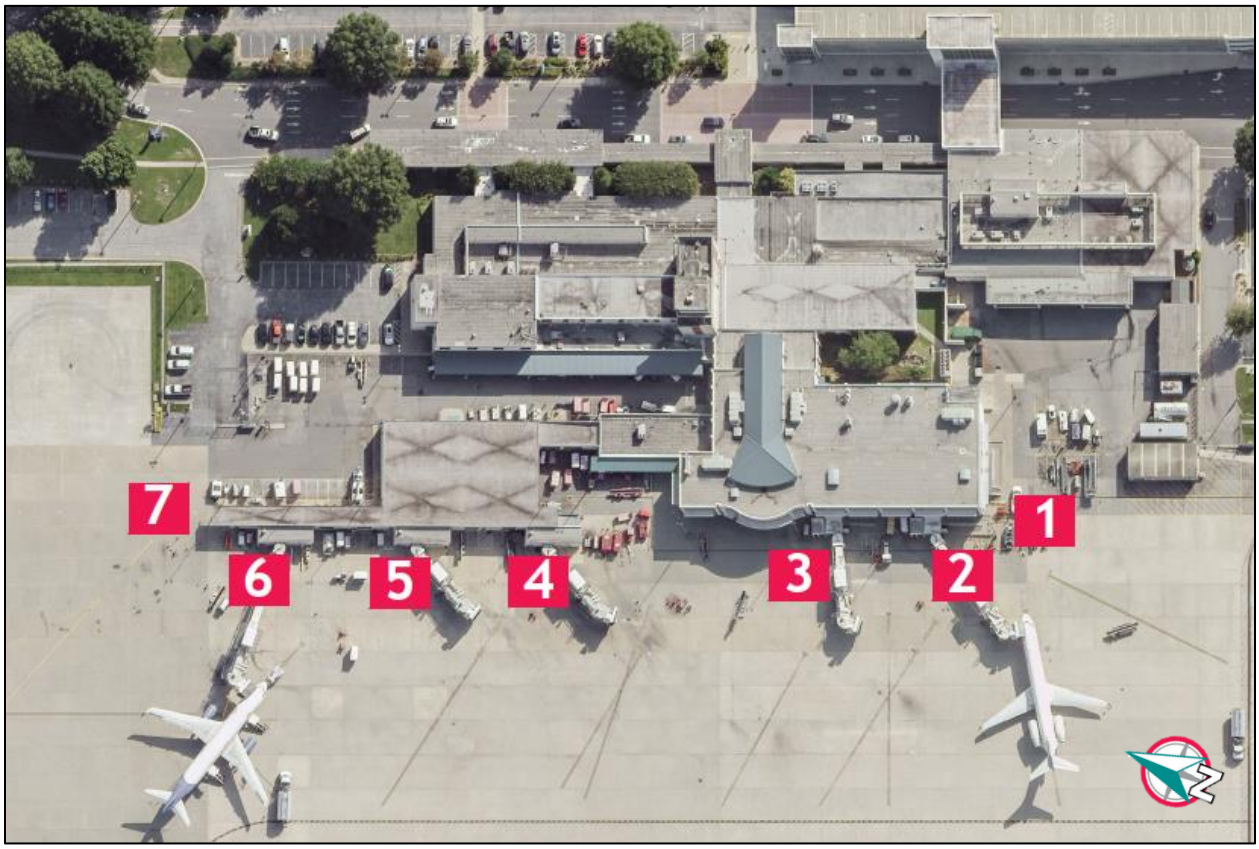


Source: CHA 2021.

Terminal Apron

The terminal apron consists of approximately 45,850 square yards of concrete pavement. Activities on the terminal apron primarily include passenger airline and belly cargo loading and unloading. The terminal currently has seven gate positions, with three on the south half and four along the northern half. Additionally, the apron is currently being expanded to the south in association with the Airport's ongoing Terminal Facility Improvement Program. This will add approximately 13,500 square yards of additional apron space. A schematic of the current gate layout is presented in **Figure 2-4**.

Figure 2-4 – Gate Layout



Source: CHA, 2021.

General Aviation (GA) Use Aprons

AVL maintains three separate aprons for General Aviation use: the North Apron (22,300 square yards), the Middle Apron (75,870 square yards, with tiedown areas), and the South Apron (40,350 square yards). The North Apron contains the Fixed Base Operator (FBO) facilities for Signature Flight Support and the GA Terminal, as well as three corporate hangars. The Middle Apron contains three T-Hangars and the two tiedown ramps for transient aircraft. Finally, the South Apron maintains seven box/corporate hangars and is the location of the Airport's Operations Building. The South GA Apron has recently been converted into a Remain Overnight (RON) aircraft parking ramp that accommodates three large commercial aircraft simultaneously. The Authority is in the design phase of having this apron area reconstructed to improve the integrity and strength of the pavement, allowing it to serve as a large aircraft parking apron over the long-term period. Additionally, the Aircraft Rescue and Firefighting (ARFF) facility is located between the South GA Apron and the Terminal Apron, with direct access to Taxiway A and the terminal building.

2.1.5 Airfield Markings

FAA AC150/5340-1L, *Standards for Airport Markings*, provides the standards for surface markings used on airfield roadways and airfield pavements, such as runways, taxiways, and aprons, assuming the surfaces are built in accordance with the standard dimensions and layouts in AC 15/5300-13, *Airport Design* (this excludes privately owned apron areas). The most recent version of this guidance was published in September 2013; however, FAA released a draft version of FAA AC 150/5340-1M in March 2021, and includes new standards for enhanced taxiway centerline markings, surface-painted hold sign markings and the extension of the runway holding position markings onto the paved shoulders.

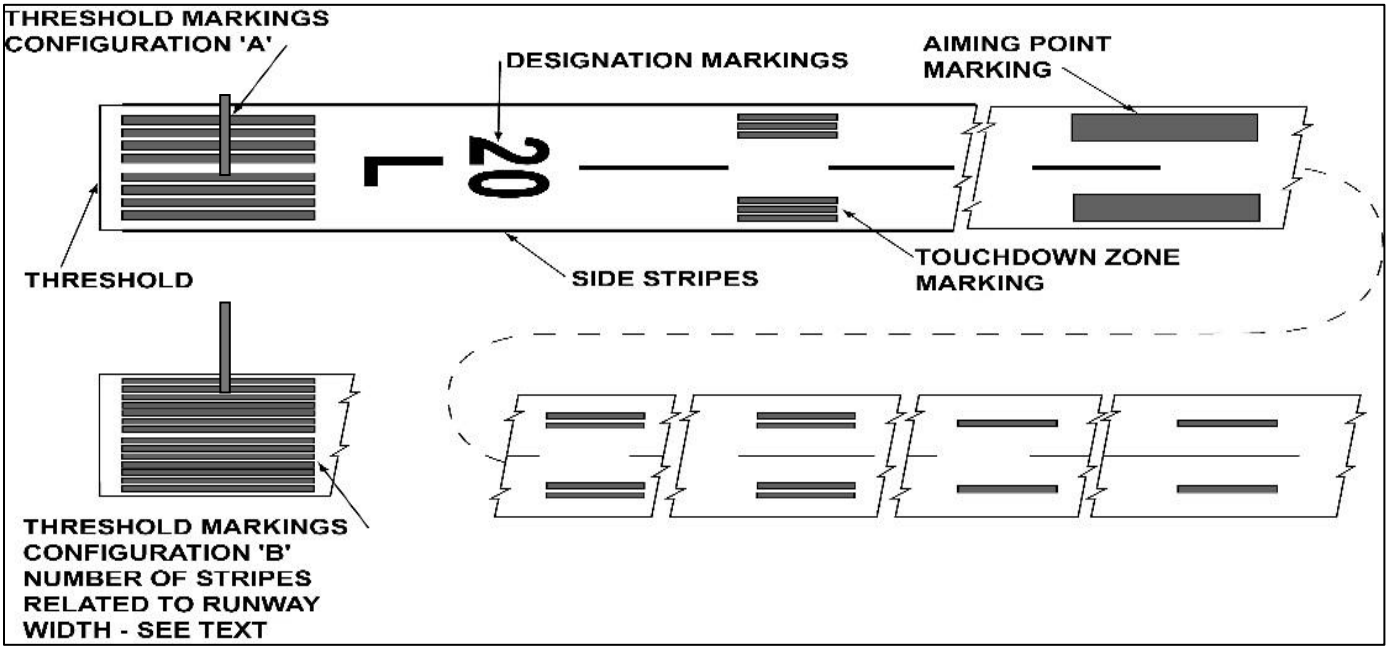
These standards apply to all airports certificated under Title 14 CFR Part 139, which establishes certification requirements for airports serving scheduled air carrier operations. Examples of airfield markings are provided in **Table 2-5**, **Figure 2-5**, and **Table 2-6**.

Table 2-5 – Runway Markings

Type of Marking	Purpose of Marking
Designation	Numbers and letters are determined from approach direction; labeled according to Compass Rose. Runway 17 is short for a magnetic bearing of approximately 170 degrees.
Centerline	Identifies the center of the runway; Provides alignment guidance during takeoff and landings
Threshold	Delineates the beginning of the runway that is available for landing
Aiming Point	Serve as a visual aiming point for a landing aircraft, located approximately 1,000 feet from the landing threshold
Touchdown Zone	Identify the touchdown zone for landing operations and are coded to provide distance information in 500 feet increments
Runway Edge Marking	Define the edge of the usable, full-strength surface

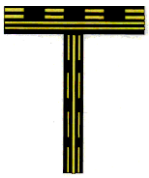
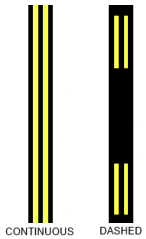
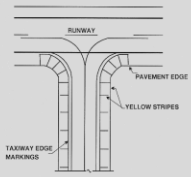
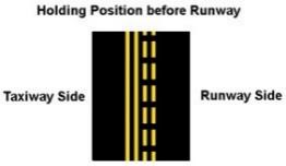
Source: FAA AC 150/5340-18F.

Figure 2-5 – Runway Markings



Source: FAA AC 150/5340-18F.

Table 2-6 – Taxiway Markings

Type of Marking	Purpose of Marking	Visual Representation of Marking
Normal Centerline	Provides a visual cue to permit taxiing along a designated path	
Enhanced Centerline	Intended to warn the pilot that he/she is approaching a runway holding position marking and should prepare to stop unless he/she has been cleared onto or across the runway by ATC; Usually at larger, commercial service airports	
ILS Hold Line	Identifies runway holding position where a pilot stops until being cleared onto or across the runway by ATC; at boundary of ILS Critical Area	
Edge Markings	Continuous- Define the taxiway edge from the shoulder or other abutting paved surface not intended for use by aircraft; Dashed- Defines the taxiway edge from the adjoining pavement intended for use by aircraft	
Shoulder Markings	Identifies paved shoulders (areas intended to prevent blast and water erosion); not intended for use by aircraft (may not be full-strength pavement)	
Runway Holding Position	Indicate where an aircraft is supposed to stop when approaching a runway	
Taxiway/Taxiway Intersection	Indicate where an aircraft is supposed to stop when approaching intersecting taxiways	

Source: FAA AC 150/5340-18F.

2.1.6 Airfield Signage

According to Title 14 CFR Part 139.311, *Marking, Signs, and Lighting*, each certificate holder, such as AVL, must provide and maintain sign systems for air carrier operations on the airport that are authorized by the Administrator and consist of at least the following:

- Signs identifying taxiing routes on the movement area.
- Holding position signs.
- Instrument Landing System (ILS) critical area signs.

The holding position signs, as well as the ILS critical area signs, must be internally illuminated. FAA AC 150/5340-18F, *Standards for Airport Sign Systems*, contains all regulations pertaining to airfield signage for Part 139 airports, while specifications are contained in AC 150/5345-44K, *Specifications for Runway and Taxiway Signs*. A further description of typical airfield signage is included in **Table 2-7**. See AC 150/5340-18F, Glossary of sign types, for additional sign type descriptions.

Upon visual inspection, lighted airfield signage currently found on AVL's airfield consists of all required signage for a Part 139 certificated airport including airfield location signage, mandatory instruction signage, and runway hold position signage. Additional signage may be required to accommodate future improvements or additions to airfield pavements.

Table 2-7 – Airfield Signage

Type of Sign	Purpose of Sign	Visual Description of Sign
Mandatory Instruction Sign	Denote taxiway/runway intersections, runway/runway intersections, Instrument Landing System (ILS) critical areas, Precision Obstacle Free Zone (POFZ) boundaries, runway approach areas, CAT II/III operations area, military zones, and no entry zones	White Inscription/Red Background
Location Sign	Identify the taxiway or runway apron upon which the aircraft is located	Yellow Inscription/Black Background
Boundary Sign	Identify the boundary of the Runway Safety Area (RSA)/Object Free Zone (OFZ), or ILS critical area for a pilot exiting the runway	Black Inscription/Yellow Background
Directional Sign	Indicate directions of other taxiways leading out of an intersection	Black Inscription/Yellow Background; Always Contains an Arrow
Destination Sign	Indicate the direction to a remote location	Black Inscription/Yellow Background; Always Contains an Arrow
Runway Distance Remaining Sign	Provide distance remaining information to pilots during takeoff and landing operations	White Inscription/Black Background
Taxiway End Sign	Indicates the termination of the taxiway, located at the far end of the final intersection	Yellow Crosshatch/Black Background

Source: FAA AC 150/5340-18F.

2.1.7 Runway Pavement Condition

The load-carrying capacity of airfield pavement for unrestricted operations is expressed as a Pavement Classification Number (PCN). According to AC 150/5335-5C, *Standardized Method of Reporting Airport Pavement Strength-PCN*, in 1977, the International Civil Aviation Organization (ICAO) adopted the Aircraft Classification Number-Pavement Classification Number (ACN-PCN)

method. The PCN is a five-part number which includes a numerical PCN value [indicating the load-carrying capacity of a pavement (between 0 and 100)], pavement type (flexible-F or rigid-R), subgrade category (high-A, medium-B, low-C, ultra-low-D), allowable tire pressure (unlimited/no pressure-W, high/pressure limited to 254 psi-X, medium/pressure limited to 181 psi-Y, and low/pressure limited to 73psi-Z), and the method used to determine the PCN (via technical study-T or evaluation based on using aircraft experience-U). The PCN for the runway at AVL is shown in **Table 2-8**.

Table 2-8 – Runway Pavement Condition

Runway	PCN Classification	Numerical Value (0-100)	Pavement Type	Subgrade Strength Category	Allowable Tire Pressure	Method
17-35	54 F/B/X/U	54	Flexible	Medium	Unlimited / No-Pressure	Evaluation

Source: GARAA, 2021.
psi: pounds per square inch

2.1.8 Navigational Aids (NAVAIDs) and Instrument Procedures

Pilots utilize a variety of navigational aids (NAVAIDs), instrument approach procedures (IAPs) approach lighting systems (ALS), airfield lighting, and rotating beacons. By providing point-to-point guidance information or position data, NAVAIDs assist pilots to safely and efficiently locate airports, land aircraft, taxi aircraft, and depart from airports during nearly all meteorological conditions. **Table 2-9** summarizes the Airport's existing instrument approach procedures, by runway, and the NAVAIDs required.

Table 2-9 – Navigational Aids (NAVAIDs) and Airfield Lighting

Runway	Runway Markings	Navigational Aids	Lighting	Minimum Ceiling (AGL)/ Visibility	Instrument Approach Types
17	Precision	ILS/DME, GPS	HIRL, PAPI-4, MALSR	200 ft. / ½ mile	ILS or LOC, RNAV (GPS)
35	Precision	ILS/DME, GPS	HIRL, PAPI-4, MALSR	200 ft. / ½ mile	ILS or LOC, RNAV (GPS)

Source: FAA Airport Master Record (Form 5010), Accessed 2021.
DME – Distance Measuring Equipment
GPS – Global Positioning System
HIRL – High Intensity Runway Lights
ILS – Instrument Landing System
MALSR – Medium-Intensity Approach Lighting System with Runway Alignment Indicator
PAPI-4 – Four-Box Precision Approach Path Indicator
RNAV – Area Navigation

2.1.9 Types of Instrument Approach Procedures (IAPs) and Instrument Approach NAVAIDs

Based on current FAA classifications, there are four types of instrument approach categories:

- Visual (V) – Approaches performed under visual flight rules only, when meteorological conditions include a cloud ceiling height of 1,000 feet or greater and visibility of 3 miles or greater. All runways enable Visual Approaches, but AVL does not operate strictly under this category.

- Non-Precision Approach (NPA) – Instrument approach procedures providing only lateral guidance with a ceiling minimum of 400 feet above the threshold. These can include VHF Omnidirectional Range (VOR), non-directional beacon (NDB), area navigation (RNAV), lateral navigation (LNAV), localizer performance (LP), and localizer (LOC) equipment. Both runway ends have a NPA procedure.
- Approach Procedure with Vertical Guidance (APV) – Instrument approach procedures providing vertical guidance minimums of 250 feet above the threshold and visibility minimums as low as ¾ mile. These can include an ILS, LNAV/Visual Navigation Aids (VNAV), Localizer Performance with Vertical Guidance (LPV) or Area Navigation (RNAV) Required Navigation Performance (RNP). Both runway ends maintain this type of procedure.
- Precision Approach (PA) – Instrument approach procedures providing vertical guidance less than 250 feet above the threshold and visibility minimums lower than ¾ mile. These can include an ILS, LPV, and Global Navigation Satellite System (GNSS) Landing System (GLS). This category applies to both runway ends.

The precision approaches enable the lowest ceiling and visibility for each runway (i.e., minimums). Variables that may influence the minimums include obstructions to the approach, buildings, terrain, etc. The NAVAIDs that make up the ground-based equipment required to perform the approach procedures are divided into two categories: precision and non-precision. The NAVAIDs supporting traditional ground-based precision approaches are collectively called an Instrument Landing System (ILS). According to FAA Order 6750.16E, *Siting Criteria for Instrument Landing Systems*, the ILS provides guidance to pilots of properly equipped aircraft to assist them in landing safely under the lowest conditions of reduced ceilings and lowered visibility. The Airport operates an ILS for approaches to Runway 17 and Runway 35.

Two components of an ILS include: a localizer (LOC) and a glide slope (GS). A localizer is situated 1,000 feet past the departure-end of the runway that has the approach and provides lateral positioning guidance to pilots. It utilizes radio frequencies (RF) to transmit signals to aircraft by focusing the RF beam down the centerline of the runway toward the approach end of the runway for approximately 10 miles, focused within 35 degrees to the left or right of the runway centerline. The glide slope is located near the runway approach end at a distance from the threshold to provide optimum crossing height, with a preferred offset of 400 feet from the runway centerline.

It transmits a signal for approximately 10 nautical miles, with a horizontal coverage of eight degrees on each side of the localizer course, measured from the origin of the glide slope beam. The glide slope must be established between 2.0 and 4.0 degrees and is typically established with a glide path angle of 3.00 degrees.

Additionally, the runway utilizes Global Positioning System (GPS) based technology to enable vertically guided instrument approach procedures with approach capabilities similar to ILS

approaches without the need for the traditional ground-based ILS NAVAID components. All precision and vertically guided procedures at AVL have a 3.0-degree glide slope and a Threshold Crossing Height (TCH) of 55 or 56 feet.

Approach Lighting Systems (ALS)

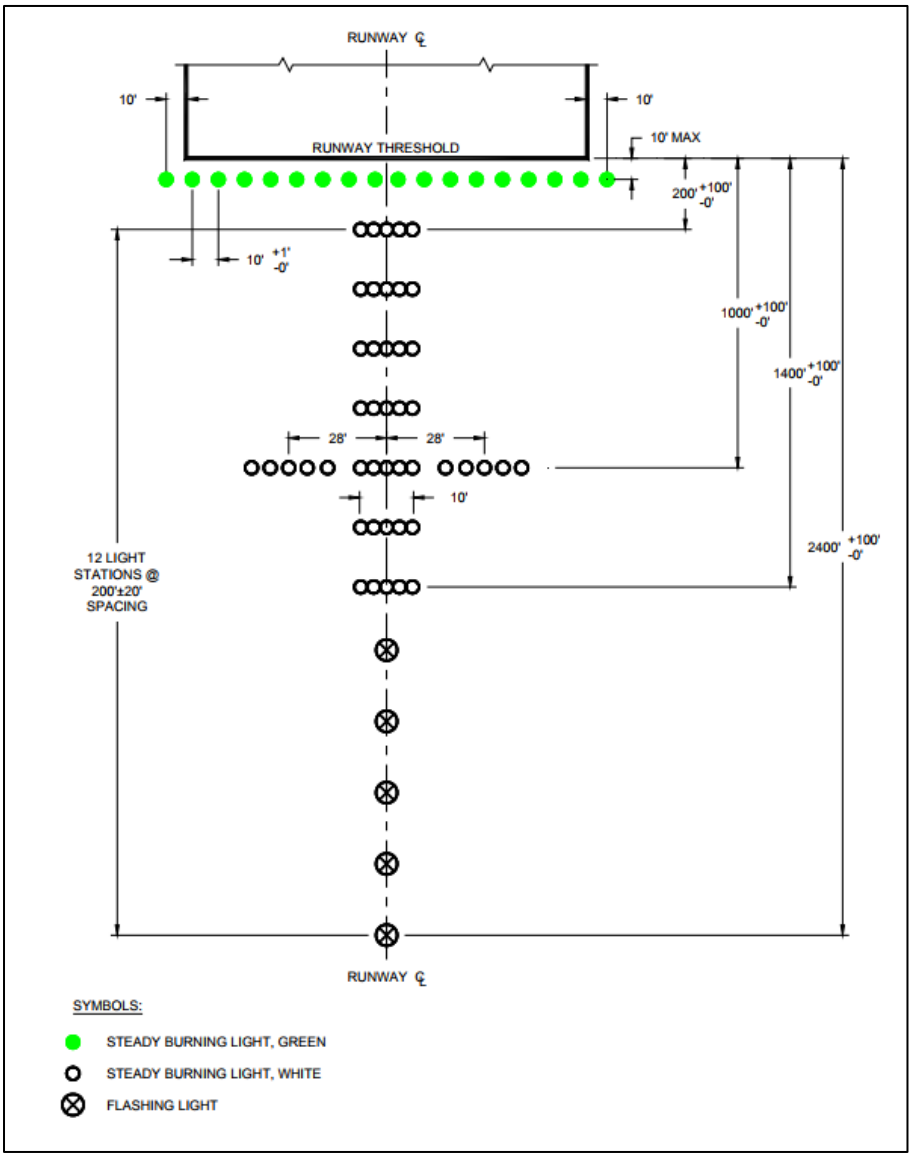
The third component of an ILS, in addition to the localizer and glideslope, is the approach lighting system (ALS). The ALS provides a lighted approach path along the extended centerline of the runway. Runway alignment indicator lights flash in sequence as a series of white lights moving toward the runway threshold, which emphasize runway centerline alignment. Roll indication is emphasized by a single row of white lights located on either side of, and symmetrically, along the column of approach lights.

Typically, airports with precision approaches utilize Medium Intensity Approach Lighting Systems (MALS), along with Runway Alignment Indicator Lights (RAILS). Together, these systems form the Medium Intensity Approach Lighting Systems with Runway Alignment Indicator Lights (MALSR) that are utilized for precision runways, such as Runway 17 and Runway 35 at AVL.

According to FAA Order 6850.2B, *Visual Guidance Lighting Systems*, the MALSR consists of a threshold light bar and seven five-light bars located on the extended runway centerline, the first bar being located 200 feet from the runway threshold, with the remaining bars each at 200-foot intervals out to 1,400 feet from the threshold. One additional five-light bar is located on each side of the centerline bar, 1,000 feet from the runway threshold, to form a 66-foot-long crossbar known as a roll bar. The individual lights in all bars are approximately 2½ feet apart and are aimed into the approach to the runway, away from the runway threshold. All lights in the MALSR system are steady burning white, except for the threshold lights, which have green filters. The threshold lights are a row of lights on 10-foot centers located coincident with and within the runway edge lights near the threshold and extend across the runway threshold.

RAIL's consist of five sequenced flashers located on the extended runway center line, the first being located 200 feet beyond the approach end of the MALS with successive units at each 200-foot interval, out to 2,400 feet from the runway threshold. All lights are aimed into the approach to the runway, away from the runway threshold, and flash in sequence toward the threshold at the rate of twice per second. A diagram for the commonly used MALSR configuration is depicted in **Figure 2-6**.

Figure 2-6 – MALSR Configuration



Source: FAA Order 6850.2B, *Visual Guidance Lighting Systems*.

2.1.10 Standard Instrument Departures (SIDs)

Standard Instrument Departure (SID) routes, also known as departure procedures, are published flight procedures followed by aircraft on an IFR flight plan immediately after takeoff from an airport. They provide an easy-to-understand departure procedure that airports use to balance terrain and obstacle avoidance, noise abatement (if necessary), and other airspace management considerations. SIDs are always printed graphically and textually.

AVL has one SID procedure for departing IFR aircraft. The SID, identified as *ASHEVILLE SEVEN*, instructs aircraft to climb on an assigned heading after departure and expect ATC to advise the radar vectors to the assigned route. AVL also has published Special Take-Off Minimums based on height of terrain that surrounds the airport.

2.1.11 Airfield Lighting

In addition to the NAVAIDs previously described lighting on the airfield includes a rotating beacon, Precision Approach Path Indicator (PAPI) lights, runway threshold lighting, runway edge lighting, Runway End Identifier Lights (REILs), taxiway edge lighting and apron lighting. Each of the lighting systems/types are described below:

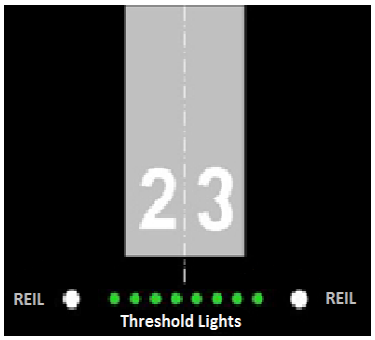
Rotating Beacon:

The rotating beacon functions as the universal indicator for locating an airport at night. For a civilian airport, it has one clear and one green lens, 180 degrees apart, and is generally visible 10 miles from the airport. According to the Aeronautical Information Manual, October 2021, at Class C airports, the operation of the airport beacon during the hours of daylight often indicates that the ground visibility is less than three miles, and/or the ceiling is less than 1,000 feet. The rotating beacon at AVL is currently located atop the Air Traffic Control Tower. In light of the fact that the Air Traffic Control Tower is being relocated with the ongoing Terminal Facility Improvement Program, the rotating beacon will be relocated as well. This is further discussed in subsequent chapters.

Precision Approach Path Indicator (PAPI) Lights:

A PAPI is a system of lights located near a runway end. It provides pilots with visual glide slope guidance information during an approach to the runway. PAPIs typically have an effective visual range of at least three miles during the day and up to 20 miles at night and inform pilots if they are high, low or on the correct approach descent path for the threshold. Both runway ends are equipped with PAPI-4 (four-light unit) systems.

Runway Threshold Lighting:



Runway threshold lighting emits green light outward from the runway and red light toward the runway to mark the ends of the runway. The green lights indicate the landing threshold to arriving aircraft, whereas the red lights indicate the end of the runway for landing aircraft. The red and green lights are usually combined into single fixtures and special lenses or filters are used to emit the desired light in the appropriate direction.

Runway Edge Lighting:

Runway edge lighting varies in color (white, except for the last 3,000-feet in length, where it is amber) and is used to outline the edges of a runway during periods of darkness or restricted visibility. The runway edge lights are positioned parallel to the runway centerline 10 feet from the edge of the full-strength pavement. The spacing of the light units must not exceed 200 feet. These systems are classified according to their intensity, or brightness: At AVL, High-Intensity Runway Lights (HIRL) are provided with threshold lights owned by the Airport.

Taxiway Edge Lighting:

Taxiway lighting delineates the taxiway's edge and provides guidance to pilots during periods of low visibility and at night. The most commonly used type of taxiway lighting is a series of blue fixtures, which are sometimes supplemented by blue edge reflectors, set at 100-foot intervals along the taxiway edges, 10 feet outward from the edge of the full-strength pavement. All of the Airport's taxiways are equipped with Medium-Intensity Taxiway Lighting (MITL).

Apron Lighting:

Apron floodlight systems illuminate the Terminal Apron, and the General Aviation Aprons.

Helipad Lighting:

AVL maintains two helipads: one where Taxiway E meets the South Apron, and one where Taxiway J meets the North Apron. Typical heliport lighting, required for heliports supporting nighttime operations, surround the designated Touchdown and Liftoff area (TLOF) and Final Approach and Takeoff (FATO) area. At AVL, perimeter lights are installed around the TLOF area. Nine perimeter lights surround each heliport and access taxiway, spaced 30 feet apart. The latest guidance prescribed in FAA AC 150/5930-2C *Heliport Design* recommend green lights, which are in use at AVL.

2.2 TERMINAL FACILITY

A thorough assessment of the existing AVL terminal was completed in 2018. This study, the *Asheville Regional Airport Terminal Building Assessment Study* was used as a guide for this Inventory effort, as well as discussions with Airport tenants regarding recent changes. This section provides a general understanding of the existing terminal facility. It is important to note that a terminal replacement program is currently underway and is presently in the design stage. This new terminal will ultimately replace the entire existing building on the existing location and is expected to be completed in 2025. The new terminal will utilize the existing terminal facility roadways, curbside, parking, and aircraft apron.

2.2.1 Terminal Facility Layout

The terminal facility at AVL is comprised of two levels and is categorized into the following main functional areas:

- Ticketing/Check-in Lobby
- Checked Baggage Inspection System (CBIS) and Baggage Make-up (BMU)
- Passenger Security Screening Checkpoint (SSCP)
- Holdrooms
- Baggage Claim Lobby and Inbound Baggage Handling

- Concessions
- Rental Car Facilities
- Other Areas

The existing lower-level and upper-level building floor plans are shown in **Figure 2-7** and **Figure 2-8**.

The airlines currently serving AVL (January 2022) include Allegiant Air (G4), American Airlines (AA), Delta Air Lines (DL), Sun Country Airlines (SY), and United Airlines (UA). JetBlue Airways (B6) is scheduled to begin service in June of 2022.

As part of the existing facility analysis, the space was analyzed as a complete system for each functional category and not subdivided by the individual airlines.

It should be noted that in some cases, functional areas being used for other purposes are included as part of the total functional area for that category. As an example, airline operations is occupying space that would be classified as check-in facilities, therefore the space has been categorized as check-in facilities.

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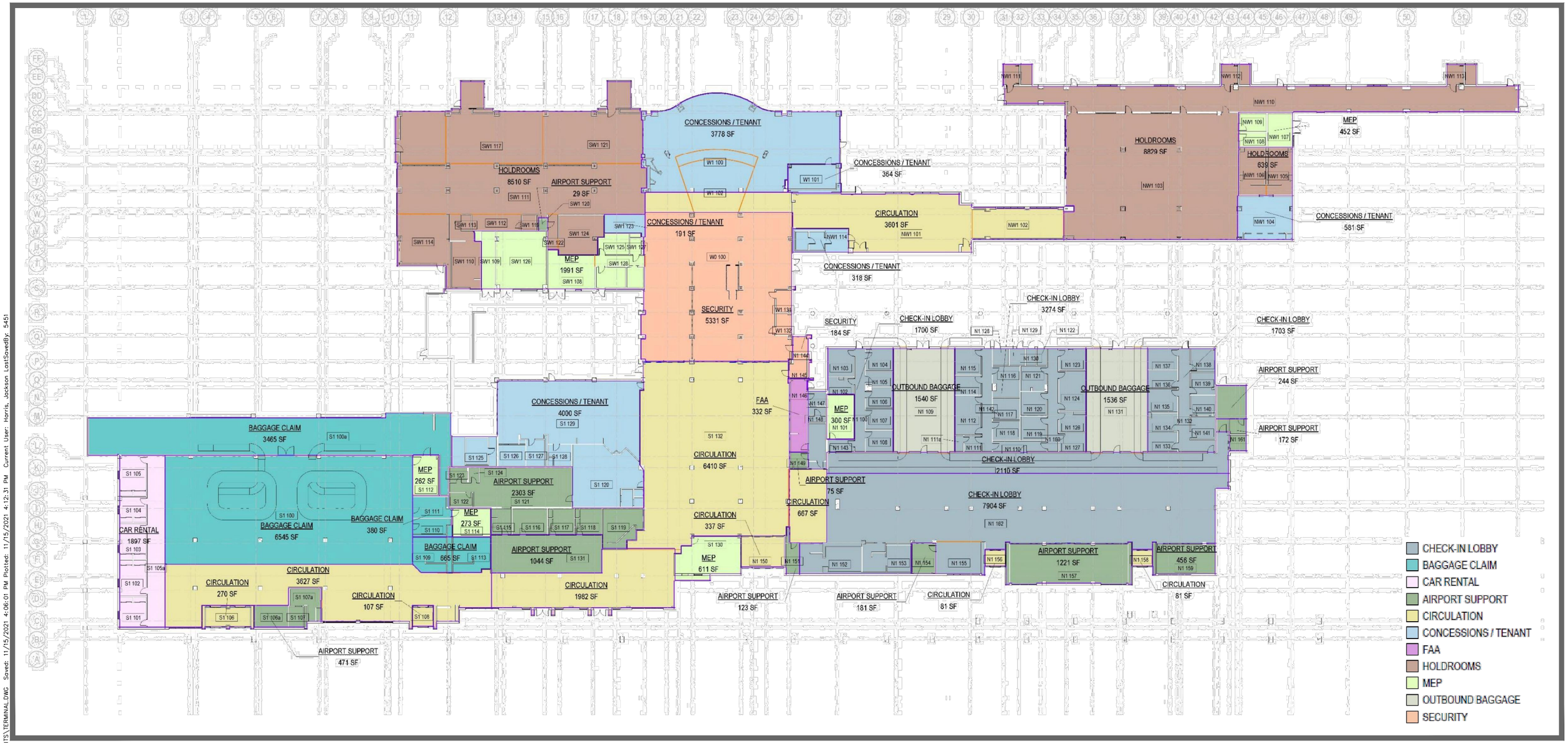

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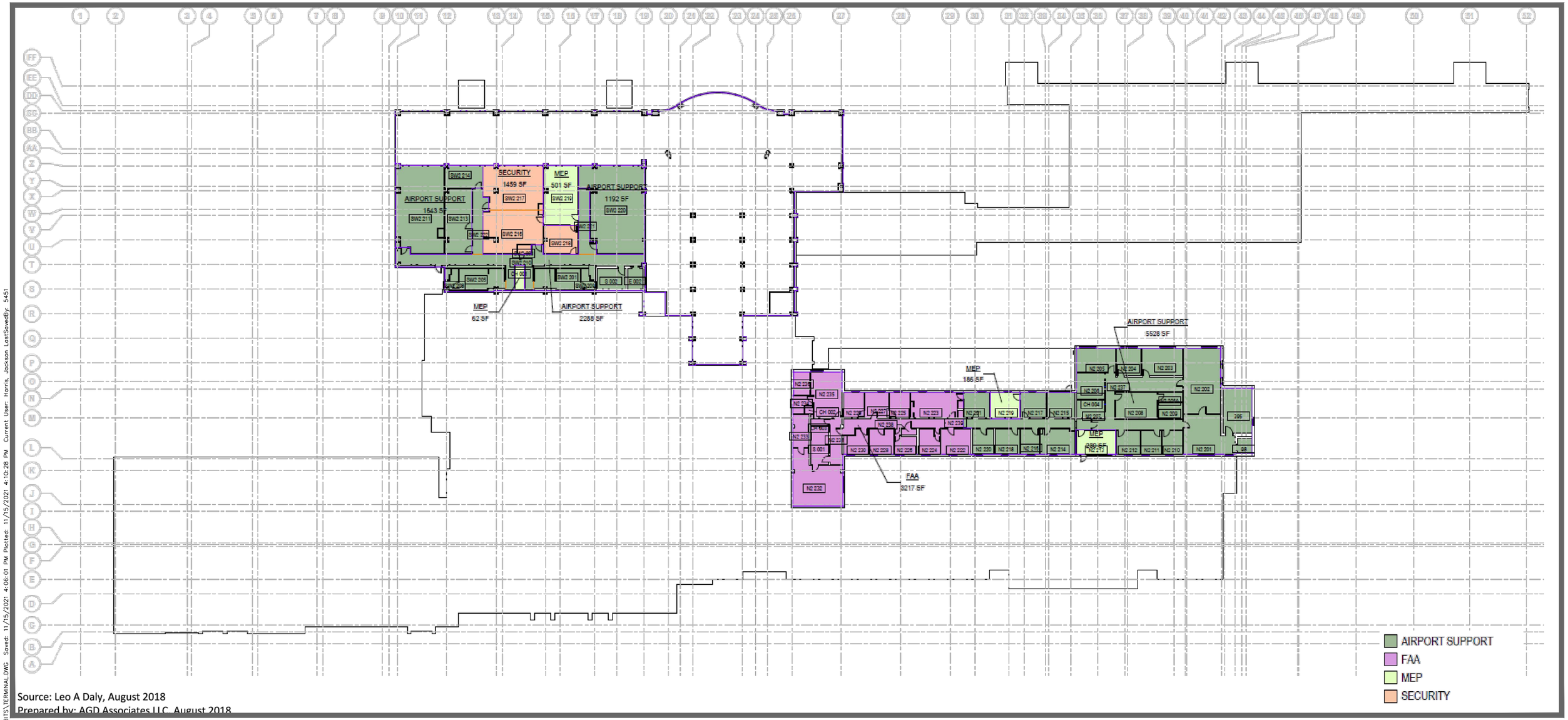
Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

Figure 2-7
Passenger Terminal - First Level



Source: Leo A Daly, August 2018
Prepared by: AGD Associates LLC, August 2018

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Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

Figure 2-8
Passenger Terminal - Second Level

2.2.2 Check-in Lobby

The check-in lobby consists of the functional spaces between the departures curb and the airline ticket offices (ATO), located behind the passenger check-in facilities. The functional areas include: two entry vestibules; non-secure public circulation; public amenities such as restrooms and seating areas; airline check-in facilities with full-service agent positions, self-service kiosk positions; queuing areas for check-in facilities. **Table 2-10** shows the area of the various elements of the existing check-in lobby.

Table 2-10 – Check-In Lobby Functional Areas

Function Area	Size	
Check-In Facilities (includes Queue Area and Circulation)	39 Positions	2,110 SF
Check-In Lobby	7,904 SF	
Airline Ticketing Office (ATO)	6,116 SF	
Other Public Areas	1,698 SF	
Public Restrooms	845 SF	
TOTAL CHECK-IN LOBBY	**18,673 SF**	

Source: Leo Daly Associates/CHA, 2018.

2.2.3 CBIS and BMU

The Checked Baggage Inspection System (CBIS) functional space includes the area needed for baggage screening equipment such as explosive detection system (EDS) machines, on-screen resolution (OSR) or electronic trace detection (ETD) stations as well as the conveyor equipment needed to queue the baggage before and after the CBIS equipment. The existing screening function consists of four in-line screening devices behind the ticketing counter back wall where bags are screened and directly loaded onto baggage carts. No separate resolution area is currently provided. The baggage make-up area consists of an accumulation device to collect bags once they have been screened, cart staging area adjacent to the accumulation device and circulation space for baggage tug and cart maneuvering. **Table 2-11** shows the area of the elements of the existing CBIS and baggage make-up (BGU) functions.

Table 2-11 – Existing CBIS and Baggage Make-Up Areas

Function Area	Size
CBIS/Outbound Baggage Make-Up Area	8,553 SF

Source: Leo Daly Associates/CHA, 2018.

2.2.4 Security Screening Checkpoint (SSCP)

The SSCP at AVL is used for all passenger and employee screening. The functional areas include queuing space, Transportation Security Administration (TSA) passenger screening lanes consisting of document check positions, walk-through metal detectors, carry-on baggage screening machines/devices, advanced imaging technology (AIT) whole-body imaging devices, passenger divestiture and recomposing areas, and TSA space to support the passenger/employee screening operations. **Table 2-12** shows the area of the existing SSCP functions.

Table 2-12 – Existing Security Screening Checkpoint (SSCP)

Function Area	Size
Security Screening Checkpoint	3,243 SF
Other TSA Spaces	2,112 SF
TOTAL SSCP	**5,355 SF**

Source: Leo Daly Associates/CHA, 2018.

2.2.5 Holdrooms

Holdrooms at AVL are located on the ground level. The lower level holdroom areas are large, combined spaces for gates 4 through 7 and use a common corridor for enplaning and deplaning passenger flows. There are designated areas for seating and passenger enplaning and deplaning; as well as a separate corridor flanking the north and south holdrooms. **Table 2-13** shows the area for the various elements of the existing holdrooms.

Table 2-13 – Existing Holdrooms

Function Area	Size
Gates	7
NW Holdroom	8,829 SF
SW Holdroom	8,510 SF
Restrooms	**18,643 SF**

Source: Leo Daly Associates/CHA, 2018.

2.2.6 Baggage Claim Lobby

The existing baggage claim lobby has two baggage claim devices with active queue and baggage retrieval area. Additionally, the lobby includes entry vestibules, non-secure public circulation, and public amenities such as restrooms and seating areas. The rental car counters are adjacent to the baggage claim lobby and share the public circulation corridor with the baggage claim function. **Table 2-14** shows the area for the various elements of the baggage claim.

Table 2-14 – Baggage Claim Lobby

Function Area	Size	
Baggage Claim Device	2	1,532 SF
Baggage Claim Queue/Retrieval Area	6,475 SF	
Circulation	5,489 SF	
Other Areas	1,945 SF	
Rental Car Facilities	1,800 SF	
TOTAL BAG CLAIM LOBBY	**17,241 SF**	

Source: Leo Daly Associates/CHA, 2018.

2.2.7 Concessions

Concessions at AVL can be categorized into two main groups – Pre-SSCP concessions and Post-SSCP concessions. Within each group are food and beverage, retail/news-gift, and specialty. It is important to note that the pre-SSCP Concessions facilities were closed in 2020 due to the COVID-19 pandemic and has not yet reopened (as of December 2021). This space is currently being utilized for storage. The available area is shown in **Table 2-15**.

Table 2-15 – Existing Concessions

Function Area	Size
Pre-SSCP Concessions/Storage	4,000 SF
Post-SSCP Concessions/Storage	5,232 SF
TOTAL CONCESSIONS	**9,232 SF**

Source: Leo Daly Associates/CHA, 2018.

2.2.8 Other Functional Areas

The last major category of space is referred to as Other Areas. This category is used mainly to capture the remaining functional space within a terminal facility that is not calculated based on passenger volumes. These other areas are either a direct requirement expressed by the airport operator or a percentage of total functional areas typical at other airport terminal facilities. The functional areas contained is this category include:

- Non-secure (pre-SSCP) public circulation not listed above
- Non-public circulation includes egress stairs and corridors
- Mechanical, electrical plumbing and building systems (walls, structure, etc.)
- Airport operators' administrative spaces
- Welcome and information centers (i.e., display areas, business centers, and pet relief areas)
- TSA offices, custodial spaces, etc.

These spaces are non-revenue generating but provided significant value to the Airport users and Airport Operator. These areas also include factors for net to gross area allowing for structure, wall thicknesses, mechanical shafts, etc. that are necessary, but do not contribute to useable space.

2.3 AUTOMOBILE ACCESS AND PARKING

This section of the report details the existing inventory of parking. The data presented was gathered from a variety of sources, including on-site observations by CHA, information provided by the Airport, its parking operator (LAZ Parking), and other public data sources.

2.3.1 Existing AVL Parking

The on-Airport parking facilities are owned by GARAA and operated by LAZ Parking, and provide parking for a combination of public parkers, GARAA and other airport employees, rental cars, and other ground transportation operators.

The Airport parking functions consist of: one five-level parking garage, which has rental car ready-return operations on the first level; an Hourly lot directly across from the Terminal; a series of Daily parking lots (lettered G-M); three Employee lots (lettered A, B, and C); Shuttle lots (N and O) located across Airport Road, along with a Cell Phone Waiting Lot initiating construction in Spring 2022; and a Ground Transportation lot directly adjacent to the baggage claim area. The Airport estimates that there is an excess of up to 18% beyond capacity at some of these times,

leaving passengers parking in grass areas. This is further discussed in **Chapter 4**, *Facility Requirements*.

Ground Transportation Lot and Employee Lots

The Ground Transportation lot is immediately south of the Terminal, adjacent to the Baggage Claim area. This lot serves as both a staging area, and a pick-up area for taxis, courtesy vehicles, and TNC/rideshare operators (Uber, Lyft, etc.). TNC operators and users are directed to a designated pick-up point in this lot, and drop-off passengers along the departures curbside. Employee parking is at multiple lots around the Airport, primarily south of the Terminal (near the Overflow lots), immediately north of the Terminal, and adjacent to the Operations building. It is important to note that the Terminal reconstruction program will significantly alter the location of some of these Employee lots.

Shuttle Lots and Cell Phone Waiting Lot

The two Shuttle Lots are located remotely, across Airport Road. Shuttle buses are currently used to transport passengers from the Shuttle lots across Airport Road to the Terminal facility. Passengers park at these lots and then board shuttle buses to take them to the Terminal. Additionally, there is a 53-space Cell Phone Waiting Lot initiating construction in Spring 2022, located adjacent to these two lots.

Table 2-16, **Table 2-17**, ***Table 2-18***, and **Figure 2-9** present a breakdown of the existing AVL parking inventory by facility and type of user served.

2.3.2 Rental Car Operations

When picking up rental cars, passengers first proceed to the rental car counters, located in the Baggage Claim area of the Terminal. After being processed, passengers pick up rental cars at the Rental Car Ready area, located on the first floor of the Airport Parking Garage. Rental cars can be returned to the proper rental car company at the Rental Car Return Facility (ready/return lot), located on the first floor of the Parking Garage. When dropping off vehicles, passengers will see signage in the parking lot corresponding to each rental car agency. Rental car operators have booths in this part of the garage, where passengers can complete rental return paperwork. After rental cars have been returned, the vehicles are taken to a remote Quick Turn Around (QTA) facility, located south of the Terminal complex, along Terminal Drive.

Table 2-16 – Existing Garage Parking Facilities

	Public	Rental Car	Employee	
Level One	0	224	0	
Level Two	265	0	0	
Level Three	277	0	0	
Level Four	291	0	0	
Level Five	248	0	0	
Total	**1,081**	**224**	**0**	**1,305**

Source: GARAA, LAZ Parking, 2021.

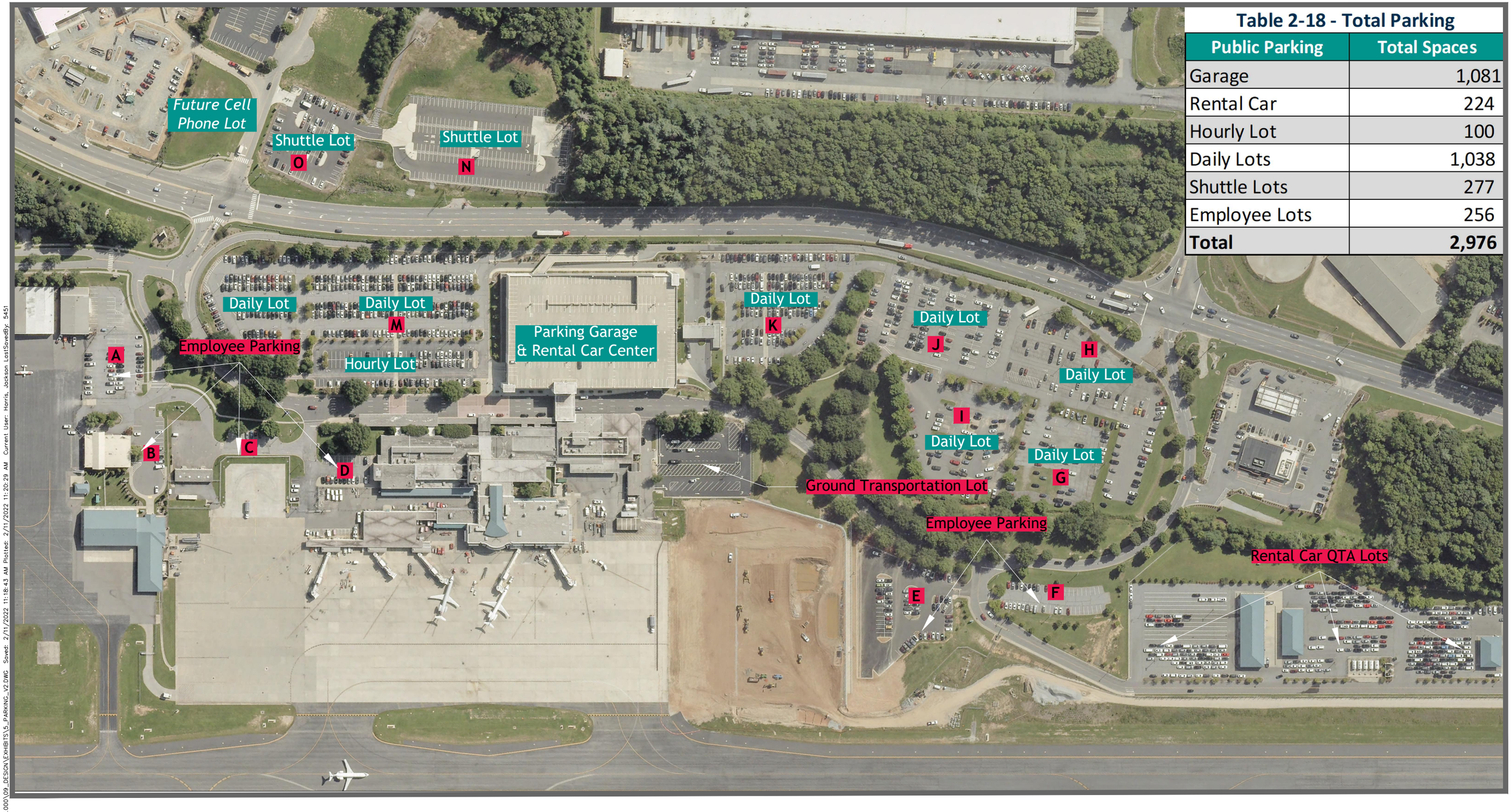

Table 2-18 - Total Parking

Public Parking	Total Spaces
Garage	1,081
Rental Car	224
Hourly Lot	100
Daily Lots	1,038
Shuttle Lots	277
Employee Lots	256
Total	**2,976**

GRAPHIC SCALE (FEET)

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Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

Figure 2-9
Public Parking

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Table 2-17 – Existing Surface Lot Parking Facilities

Lot	Use	Spaces	
		Regular	ADA Accessible
A	Employee	40	0
B	Employee	14	1
C	Employee	12	0
D	Employee	22	0
E	Employee	120	0
F	Employee	48	0
G	Daily	102	0
H	Daily	167	0
I	Daily	126	0
J	Daily	149	0
K	Daily	175	0
M	Daily	319	0
	Hourly	100	16
N	Shuttle	193	0
O	Shuttle	84	0
Total		1,688	

Source: GARAA, LAZ Parking, 2021.

Table 2-18 – Total Public Parking

Public Parking	Total Spaces
Garage	1,305*
Hourly Lots	435
Daily Lots	324
Shuttle Lots	277
Overflow Lots	395
Employee Lots	257
Total	**2,746**

**includes 224 rental car spaces*

One central toll plaza, immediately south of the parking garage, serves revenue collection for all public parking facilities (including the shuttle lot). Additionally, two electric vehicle charging stations are located at no cost in the Hourly lot.

2.3.3 Current Parking Rates

Table 2-19 presents the current rates charged for public parking in each of the AVL facilities.

Table 2-19 – Existing AVL Public Parking Facility Rates

Facilities	Current Parking Rates
Hourly Lot	First 30 Minutes - $1.00 Each Additional 30 Mins - $1.00 4+ Hours/Daily Max - $25.00
Daily Lot	First Hour - $2.00 Each Additional Hour - $2.00 4+ Hours/Daily Max - $10.00 Weekly Max - $60.00

Facilities	Current Parking Rates
Garage	First Hour - $2.00 Each Additional Hour - $2.00 4+ Hours/Daily Max - $13.00 Weekly Max - $78.00
Shuttle Lot	First Hour - $2.00 Each Additional Hour - $2.00 4+ Hours/Daily Max - $10.00 Weekly Max - $60.00

Source: LAZ Parking, 2021.

2.3.4 Off-Airport Competing Parking

At this time, independent companies do not offer off-airport competing parking locations in the vicinity of AVL. However, some local hotels are providing this service to their guests.

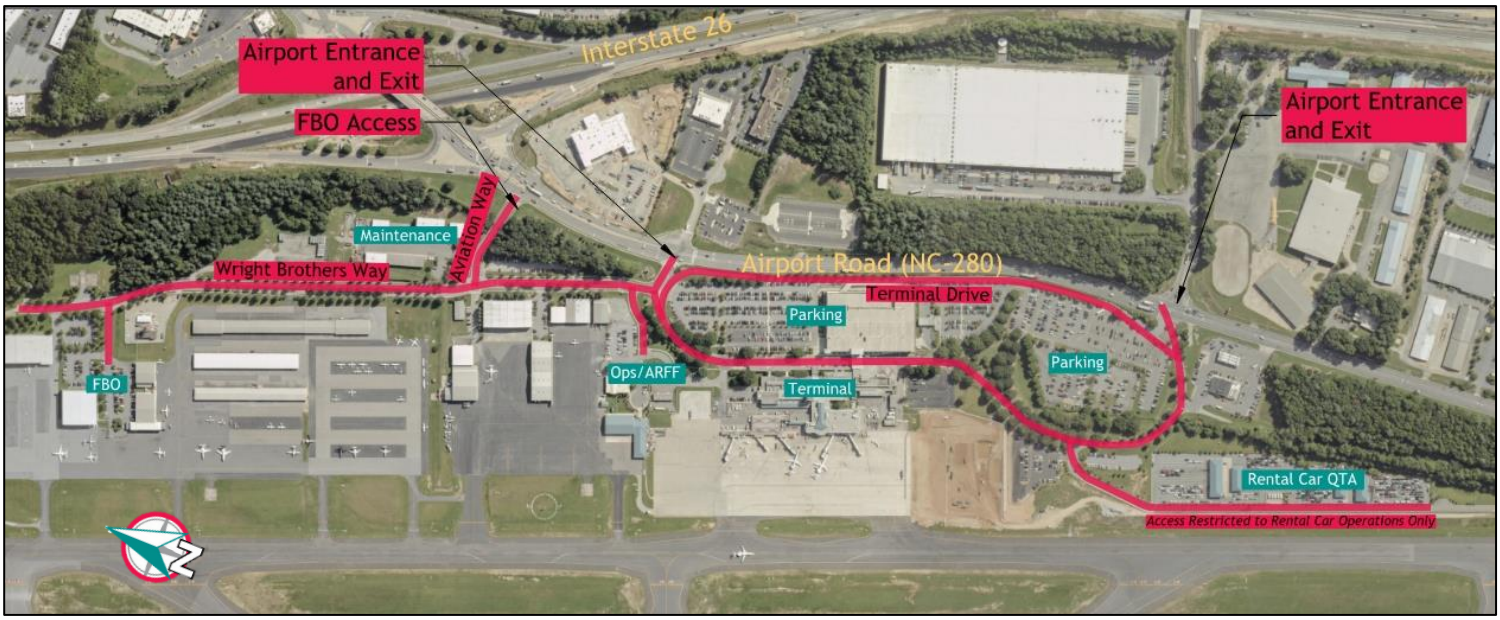
2.3.5 Regional Roadway Network

Primary regional access to the airport terminal is provided from Airport Road (NC-280) via Interstate-26. Access to all existing functional areas of the Airport is provided from Airport Road.

Interstate-26 is a six-lane Interstate providing access to Asheville to the north, and Hendersonville to the south. Airport Road is a currently a four-lane arterial road that is being expanded to six lanes. It connects the Airport with I-26, US Highway 25, and points to the north and south.

Together, these and other adjacent roads provide convenient access to the local and regional roadway network. Access in and out of the Airport, and circulation within the Airport is shown in **Figure 2-10**.

Figure 2-10 – Existing Airport Circulation



Source: CHA, 2021.

2.4 BASED AND ITINERANT GA AIRCRAFT STORAGE

The operations and facilities of Signature Flight Support include hangars, a terminal building, and apron space. Signature operates a GA Terminal, two bulk hangars for itinerant aircraft, T-hangars (with 68 total bays), and approximately 140,000 square yards of ramp space. The FBO also operates a passenger lounge area which includes office space and conference rooms. Additional hangar and apron space development is currently being pursued, discussed in later chapters.

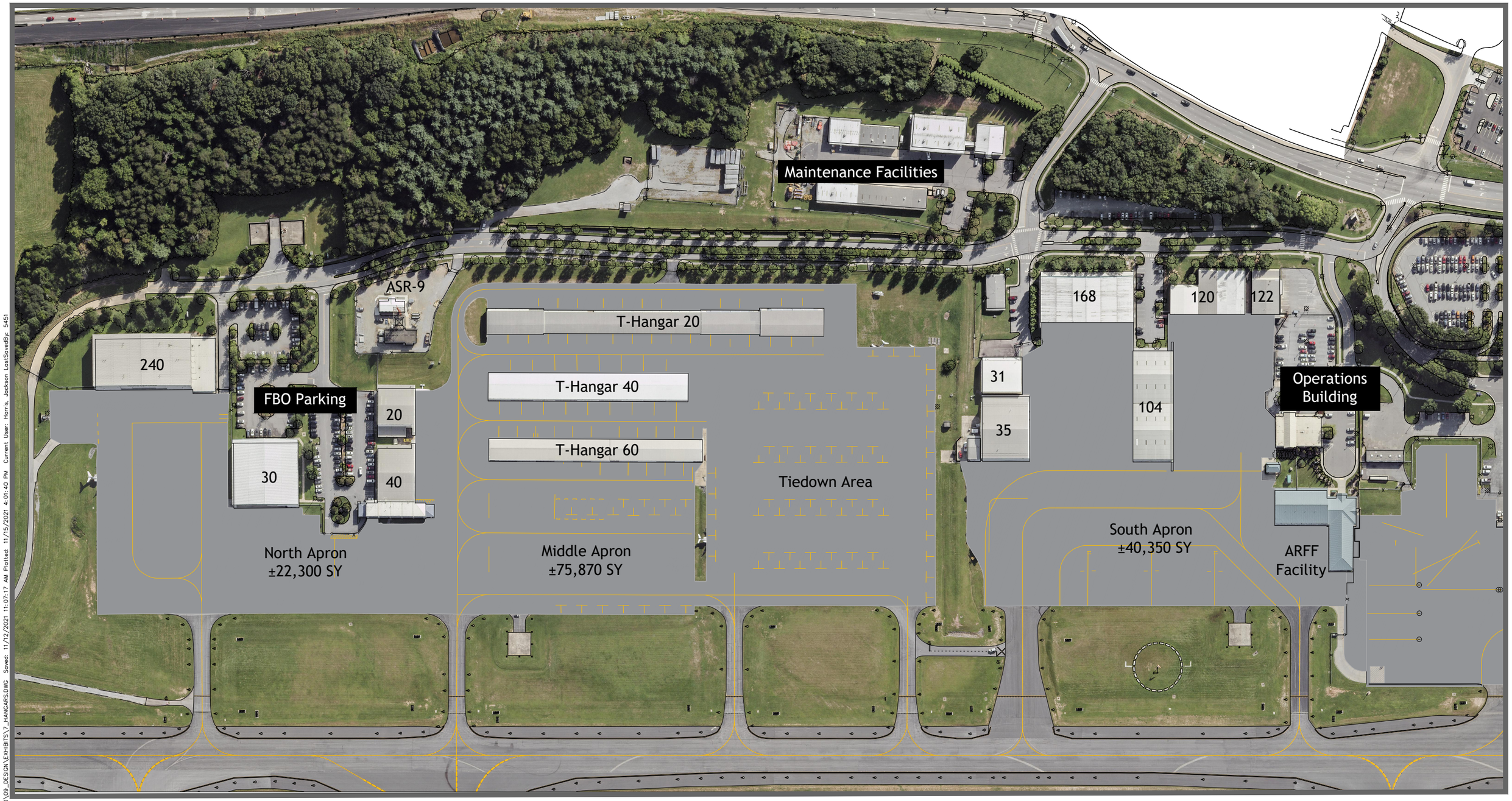
A large apron area that can provide up to 89 tie-down positions (depending on aircraft size), is used for short term storage of transient aircraft parking. In addition to supporting GA parking and infrastructure, Signature provides fueling services to tenants and operators at AVL. Aircraft maintenance is handled by a third party, Belle Aircraft Maintenance. A detailed depiction of Signature Flight Support's facilities is shown in **Table 2-20** and **Figure 2-11**.

Table 2-20 – Existing Based Aircraft Storage

Building Number	Description	Size (SF)
20	Bulk Hangar with Office	8,480
30	Bulk Hangar*	19,600
31	Bulk Hangar	7,130
35	Bulk Hangar with Office	14,730
40	FBO Facility and Bulk Hangar*	15,220
104	Bulk Hangar	10,920
104	Bulk Hangar	10,920
120	Bulk Hangar with Office**	14,430
122	Bulk Hangar**	6,090
168	Bulk Hangar*	28,648
240	FBO Facility and Bulk Hangar	31,980
T-Hangar 20	T-Hangar (30 bays)	22,830
T-Hangar 40	T-Hangar (17 bays)*	26,490
T-Hangar 60	T-Hangar (21 bays)	39,370

Source: CHA, GARAA, 2021.
**Buildings 30, 40, 168, and T-Hangar 40 are currently leased to Signature Flight Support.*
***Buildings 120 and 122 are currently leased to Allegiant Air for storage of aircraft parts and Equipment.*

In total, the 11 bulk hangars comprise nearly 170,000 square feet of space. Additionally, the three T-Hangars include approximately 88,000 square feet with the 72 individual hangar bays.



Asheville REGIONAL AIRPORT
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GRAPHIC SCALE (FEET)
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Figure 2-11
General Aviation Facilities

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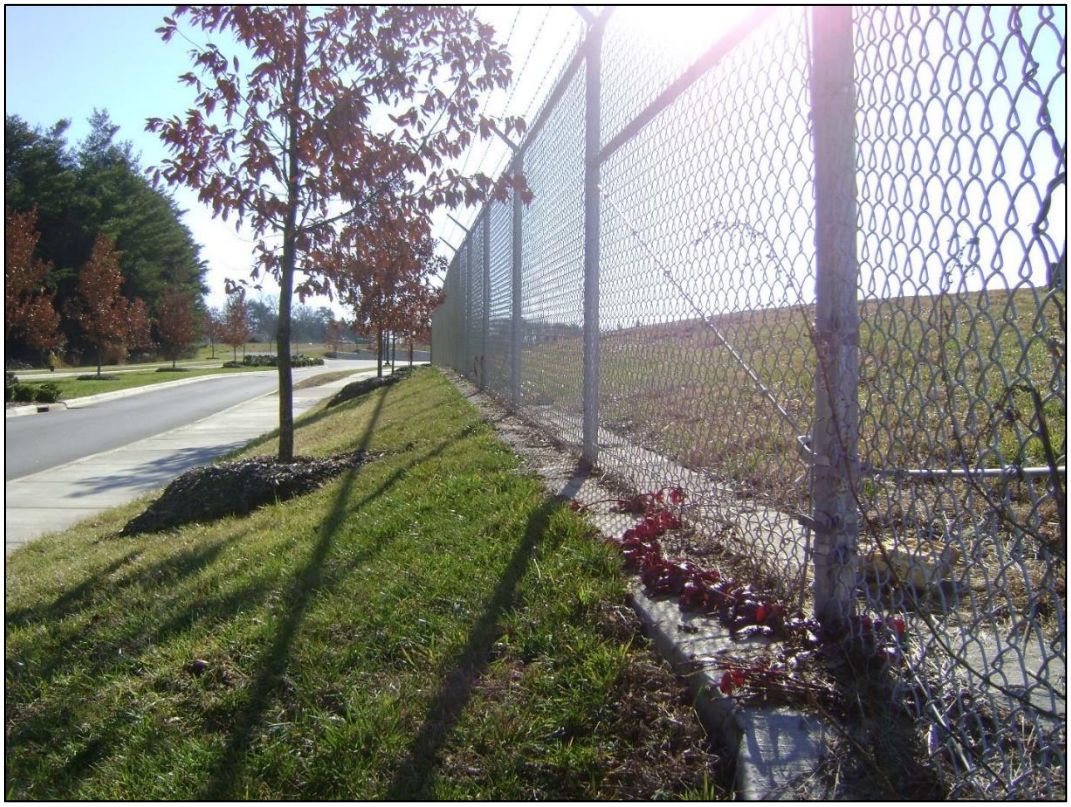
2.5 SUPPORT FACILITIES

Support facilities provide vital functions related to the overall operation of the Airport. At AVL, these facilities include: airport fencing and security systems, airport equipment storage and maintenance, Air Traffic Control Tower (ATCT), Aircraft Rescue and Firefighting (ARFF), aircraft fueling, snow and ice control, and rental car operations.

2.5.1 Airport Perimeter Fence

As required by FAA regulations, the airfield is currently protected by a security fence that encloses the runways, taxiways, and aircraft movement and non-movement areas. The airfield chain-link fence has 28 vehicle gates and 7 pedestrian gates that provide access to various points of the airfield. The barrier is eight feet high, with various areas of fencing reaching 10 feet high for wildlife hazard mitigation. The fence, in its geometry, also includes a 35' retaining wall with an anti-climb system at the near southwest corner. The entire airfield fence is topped with three-strands of barbed wire, totaling approximately one-foot high.

Figure 2-12 – Airport Perimeter Fence



Source: GARAA, 2022.

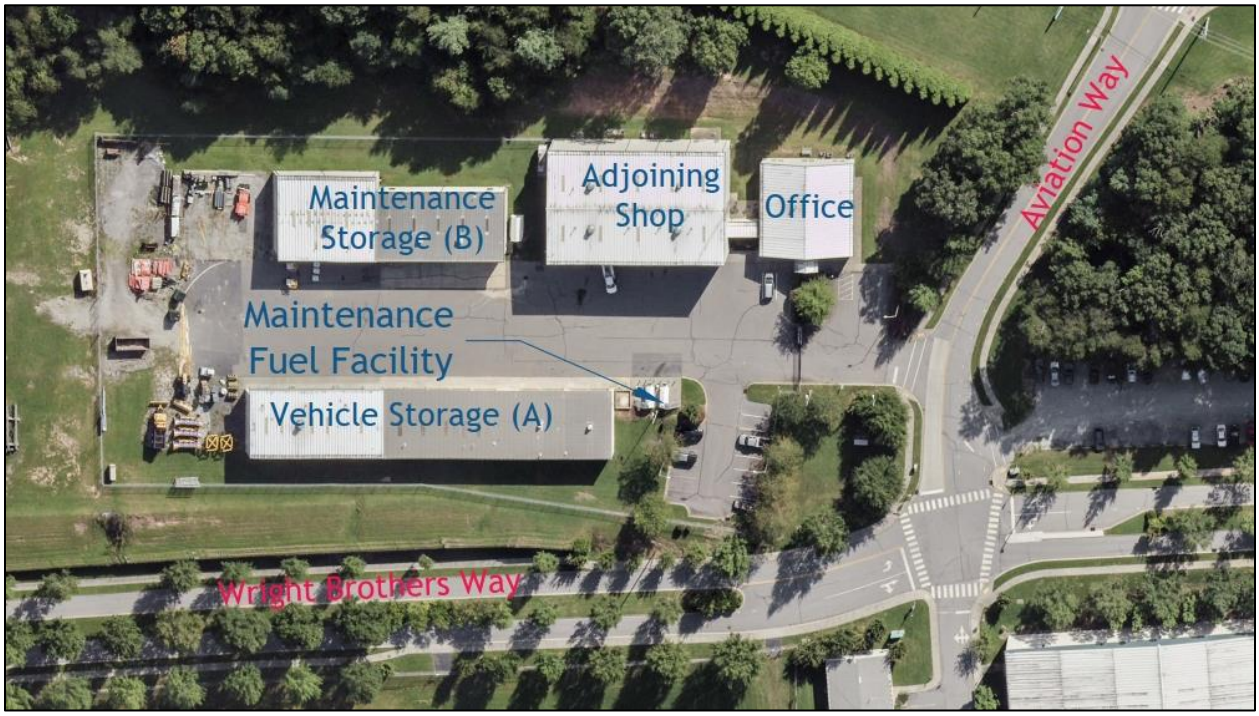
2.5.2 Airport Equipment Storage and Maintenance

Essential AVL maintenance, storage, and equipment is located on Aviation Way, near the intersection of Wright Brothers Way. GARAA presently operates four buildings devoted to airport equipment and storage, as documented in **Table 2-21** and depicted in **Figure 2-13**. The

maintenance facility buildings can be subdivided into two groups: the main office building which contains GARAA staff offices, bunk rooms, a conference room, and a kitchen—while the other three maintenance facilities are primarily devoted to vehicle bays, storage, and shops.

The maintenance buildings store equipment for service on airport grounds, which includes mowers, tractors, vehicles, snow removal related equipment, a vehicle lift, an overhead crane, and various necessary supplies.

Figure 2-13 – Airport Maintenance Facilities



Source: CHA, 2021.

Table 2-21 – Airport Maintenance Facilities

GARAA Owned Maintenance Building	Size (Square Feet)	Use
Main Office Building	3,600	GARAA Staff and Support Facilities
Adjoining Shop	8,468	Vehicle Bays, Storage
Building B	3,500	Storage/ Shops
Building A	3,360	Storage/ Shops

Source: CHA, 2021.

2.5.3 Air Traffic Control Tower (ATCT)

Presently, AVL's ATCT is located on top of the terminal building complex. Built in 1961, this tower serves administrative and support facilities for local FAA operations at AVL, while also containing the Asheville Tower Terminal Radar Approach Control (TRACON) facility. The control tower serves to assist safe approaches of aircraft that are on final approach, climb out post departure, and vehicle/ aircraft traffic on the airfield—with this, the TRACON facility provides guidance for safe entry/ departure of AVL's airspace. This tower manages traffic within the AVL airspace, with radar

coverage provided by an ASR-9 (Airport Surveillance Radar) system with a six-level weather detection capability. This ASR-9 system is located between the FBO facilities and Maintenance facility. The ATCT operates daily from 6:30 a.m. to 11 p.m. EST. It is important to note that along with the ongoing Terminal Building Improvement Program, the ATCT will be relocated to an entirely new site on the western side of the Airfield (estimated completion by year-end 2025). This has been further discussed in subsequent chapters.

Figure 2-14 – Air Traffic Control Tower

Source: GARAA, 2022.

2.5.4 Aircraft Rescue and Firefighting (ARFF)

ARFF vehicles are designed to provide an invaluable service to the commercial and private users of the Airport and the passengers and cargo they transport. The aviation industry is reliant on prompt and effective fire and rescue services during aircraft emergencies. These services include fire containment and suppression, passenger and crew rescue, airframe and cargo preservation, and maintenance of the site to aid in after-incident investigations. The vehicles that airport fire departments employ serve as the medium to deliver firefighters, specialized tools and equipment, and firefighting agents to the scene of an aircraft incident. They are designed to perform specific functions, constructed for longevity and ease of maintenance, and tailored to the airport's needs.

Figure 2-15 – ARFF and Operations Facilities

Per FAA requirements, within three minutes from the initial alarm, a minimum of one required ARFF vehicle must be able to reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or must reach any other specified point of comparable distance on the movement area that is available to air carriers and begin application of the extinguishing agent. Within four minutes from the initial alarm, all other required vehicles must reach the previously stated locations and begin application of the extinguishing agent. AVL has one ARFF facility located near the center of Airport grounds, specifically placed east of the runway to the north of the terminal building. The location of the ARFF facility allows firefighting equipment to access any airfield pavement within the required time established by Federal regulations. The current ARFF and Department of Public Safety (DPS) building is approximately 16,500 square feet and located at 136 Wright Brothers Way.

The Airport's ARFF Index is determined by Title 14 CFR Part 139.315, *Aircraft Rescue and Firefighting: Index Determination*. AVL operates as an ARFF Index B. The requirements for ARFF vehicles to transport a specific quantity and type of firefighting agents are established by Title 14 CFR Part 139.317, *Airport Rescue and Firefighting: Equipment and Agents*. As an ARFF Index B, the Airport can choose to have a minimum of either one or two vehicles.

However, specifications of the vehicles depend upon the total number of vehicles chosen. AVL has currently has three ARFF vehicles and exceed the FAA minimum requirements. The FAA-required equipment for these standards are:

- One vehicle carrying the following extinguishing agents:
  - 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and
  - 1,500 gallons of water and the commensurate quantity of AFFF for foam production
- Two vehicles:
  - One vehicle carrying 500 pounds of sodium-based dry chemical, halon 1211, and clean agent and
  - One vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.

2.5.5 Aircraft Fueling

Signature Flight Support is responsible for operating the fuel storage facility and the fuel dispensing area at AVL. These operations include services to all aircraft operated at AVL. The Airport's fuel storage facility is located beyond the North Apron and FBO area, and includes six above-ground fuel tanks:

- Four 20,000-gallon Jet-A tanks
- One 12,000-gallon 100LL AvGas tank
- One 1,000-gallon self-serve tank for light piston aircraft (adjacent to the FBO facility)

Existing expansion plans include adding two new 40,000-gallon Jet-A tanks. Present storage capacity includes less than two days of fuel reserve.

Presently, the existing fuel storage capacity includes less them two days for fuel. Signature Flight Support receives fuel deliveries every day. Fuel is then transported from the dispensing area to aircraft via specialized fuel trucks, as needed.

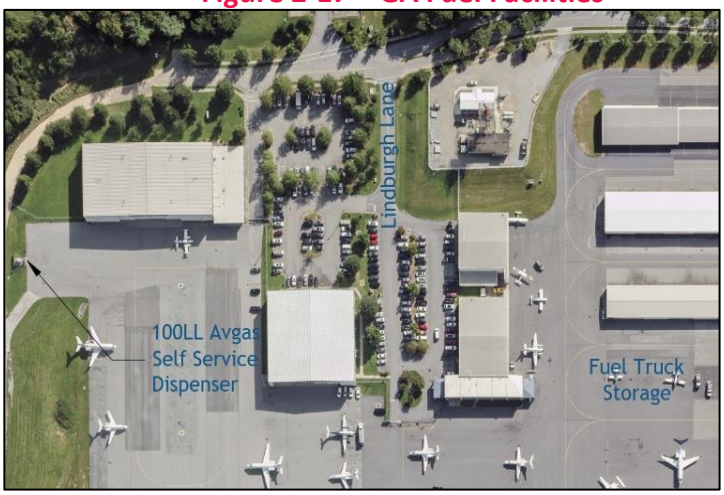
The types of fuel trucks at the Airport and their carrying capacities are as follows:

- Two 1,000-gallon trucks (Avgas)
- One 5,000-gallon truck (Jet-A)
- Three 7,000-gallon trucks (Jet-A)

The FBO support facilities and fuel dispensers are located south of the fuel facility along Lindbergh Lane. The Airport additionally maintains automotive fuel storage and dispensing at the Maintenance Facility for Airport maintenance vehicles, and at the Consolidated Rental Car Service Center for rental cars.

Figure 2-16 – Fuel Farm

Figure 2-17 – GA Fuel Facilities



Source: CHA, 2021.

2.5.6 Snow and Ice Control

As guided by FAA AC 150/5200-30D, *Airport Winter Safety and Operations,* snow, ice, and slush should be removed as expeditiously as practicable to maintain runways, high-speed turnoffs, and taxiways in a "no worse than wet" (i.e., no contaminant accumulation) condition. To meet these guidelines during the winter months, personnel at AVL are on-call for snow removal to ensure adequate response to weather events. In addition to regularly mandated inspections, airfield conditions are monitored throughout the day, or as often as needed by the on-duty airfield maintenance and airport operations personnel. The inspections are conducted visually and with runway friction measuring equipment. Airfield conditions are transmitted electronically to pilots via Notice to Airmen (NOTAMS). Other sources of information include reports from the National Weather Service (NWS), the Airport's Automated Weather Observation System (AWOS) weather station, and pilot reports (PIREPs). Based on these observations and information, Airport personnel can determine the proper equipment and surface treatment to be used. Approved equipment for contaminant removal includes high-speed rotary plows, snowplows, material spreaders, and runway brooms. Approved chemicals include fluid deicers/anti-icers and solid deicers/anti-icers. Fluid deicers/anti-icers consist of glycol-based fluids, potassium acetate base, and potassium formate-based fluids. Solid deicer/anti-icers consists of sodium formate and sodium acetate.

Most equipment is stored in the airfield maintenance building so that it is protected from weather and to prolong its operational life expectancy. Deicing operations are currently carried out at each individual gate, as the Airport has no dedicated deicing facilities.

2.6 AIRSPACE ENVIRONMENT

The National Airspace System (NAS) is made up of a network of air navigation facilities, Air Traffic Control (ATC) facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system. The FAA created the NAS to protect persons and property on the ground, and to establish a safe and efficient airspace environment for civil, commercial, and military aviation within the United States. Airspace is broken down into two categories: regulatory and non-regulatory. Within the regulatory airspace category, there are two types of airspace, controlled and uncontrolled. Categories and types of airspace are defined based on their complexity or density of aircraft movements, or the nature of the operations conducted within the airspace, which dictates the level of safety required and the level of national and public interest.

The purpose of controlled airspace is to provide adequate separation between aircraft operating under Instrument Flight Rules (IFR) and Visual Flight Rules (VFR). For airlines, IFR services are available and required, within all controlled airspace. Airspace designated as Class A, B, C, D, and E is controlled airspace.

VFR aircraft operating in Class B, C, or D airspace must be in contact with ATC. This gives ATC the authority to manage IFR and VFR traffic in the proximity to airports and ensure proper separation.

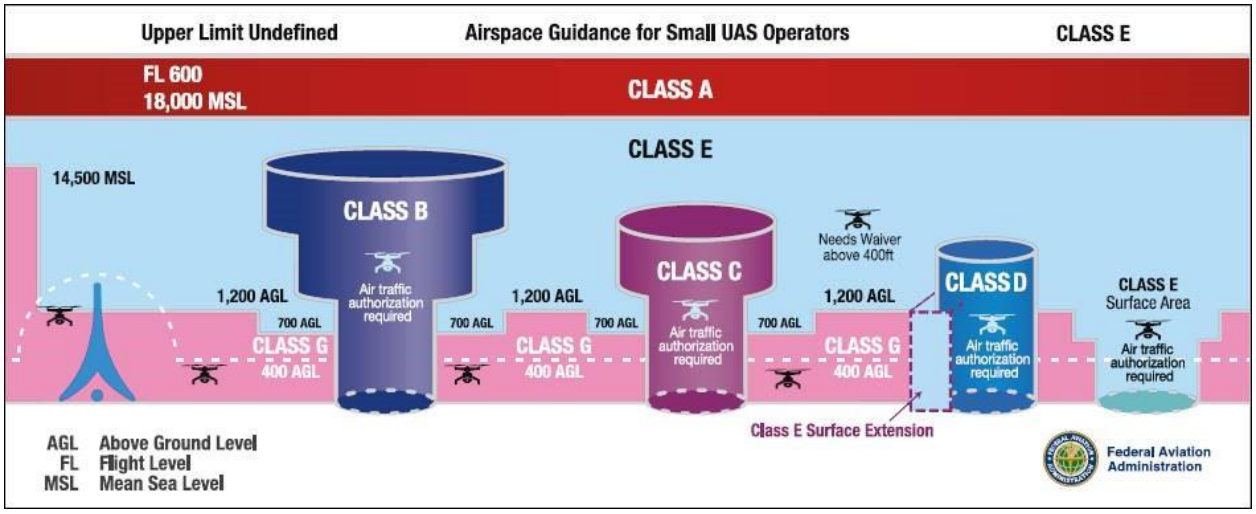
Controlled airspace designations do not directly affect IFR traffic as all IFR traffic is cleared through controlled airspace by ATC.

Class G airspace is uncontrolled and IFR services may or may not be available.

Large sections of controlled and uncontrolled airspace have been designated as special use airspace. Special use airspace is further defined as prohibited, restricted, warning, military operations, and alert areas. Civil operations within special use airspace may be limited or even prohibited, depending on the area, as operations within these areas is considered hazardous to civil aircraft.

AVL is located within Class C airspace, extending from the runway surface up to 4,000 feet above ground, or to 6,200 feet above mean sea level (MSL) for a 5-nm radius, and from 4,300 feet MSL to 6,200 feet MSL for a 10-nm radius. A graphic of the U.S. Airspace Profile is presented in **Figure 2-18**.

Figure 2-18– U.S. Airspace Profile



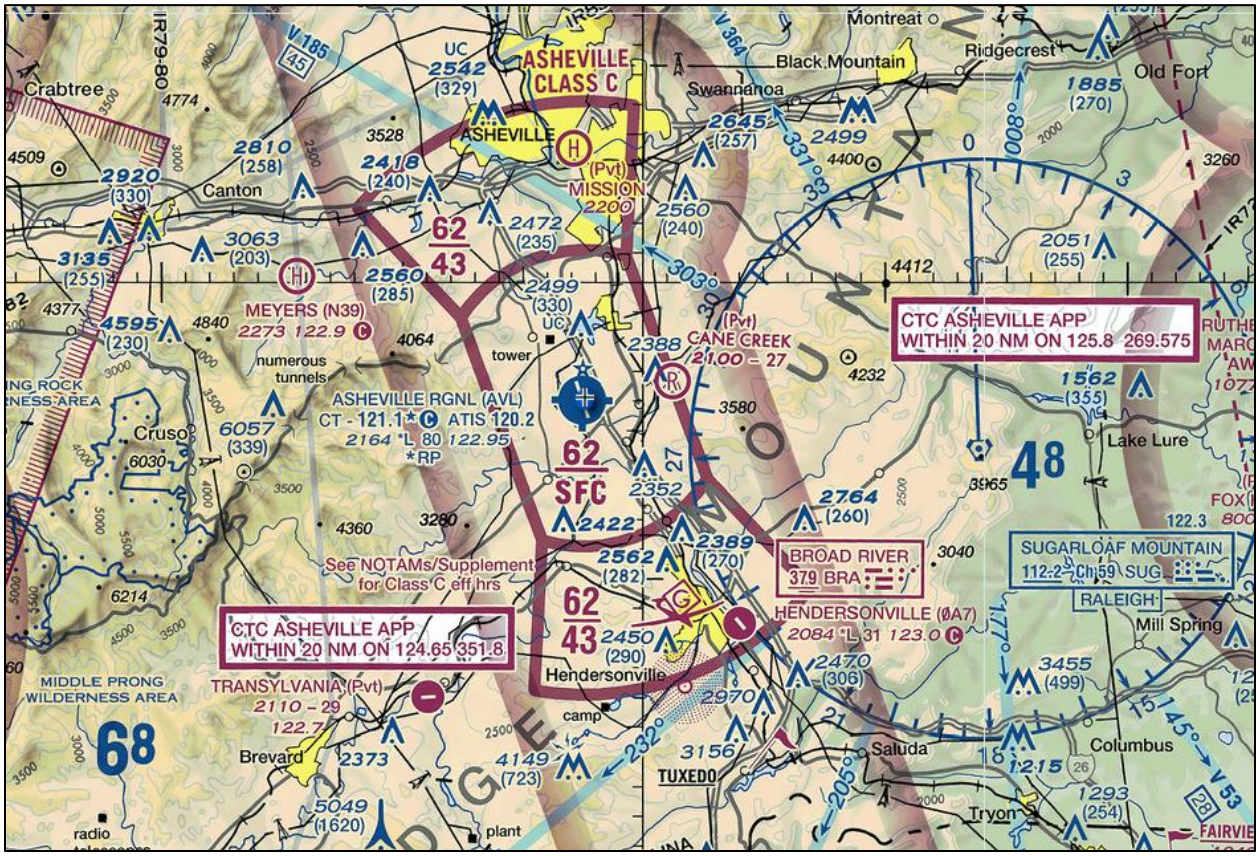
Source: Federal Aviation Administration.

The National Aeronautical Charting Office (NACO) of the FAA publishes special aeronautical charts used by pilots to navigate through the National Airspace System. These charts are called sectional charts, or sectionals. A sectional chart provides detailed information on airspace classes, ground-based NAVAIDS, radio frequencies, longitude and latitude, navigational waypoints, and navigational routes. It also offers topographical features, such as terrain elevations and ground features that are important to aviators, such as landmarks that will be identifiable from a given altitude. Although these charts are used for VFR and IFR navigation, they are a VFR pilot's primary navigation tool.

Figure 2-19 displays a segment of the Atlanta Sectional Chart, centered on AVL. With only a single runway, the Class C airspace has been truncated on the east and west sides of the airport. Beyond the Class C is Class G controlled airspace above 700' or 1,200' AGL depending on the

location. The Special Use airspace area, the Snowbird Military Operations Area (MOA) is located approximately 15 miles to the west.

Figure 2-19 – Atlanta Sectional, 103rd Edition [Effective 1 Feb 2018]



Source: aeronav.faa.gov

2.7 METEOROLOGICAL CONDITIONS

Meteorological conditions affect airport operations in many ways. Winds, precipitation, and temperature influence decisions pertaining to NAVAIDs, runway orientation, and required runway length. AVL is equipped with an Automatic Weather Observation System (AWOS), a highly sophisticated weather data sensing, processing, and dissemination system that is designed to support real-time weather activities and aviation operations. While meteorological readings are taken every minute, 24-hours a day, every day of the year, these systems generally report at hourly intervals, but also report special observations if weather conditions change rapidly and cross aviation operation thresholds. Maintained, controlled, and operated by the FAA and the National Weather Service (NWS), the AWOS automatically observes, formats, archives, and transmits observations.

2.7.1 Local Climate

The daily mean annual temperature in Asheville, North Carolina is 57.3 degrees Fahrenheit; The average low is 46.3 degrees Fahrenheit, while the average high is 68.2 degrees Fahrenheit. July

is typically the warmest month, with an average high of 85.3 degrees Fahrenheit, and a mean maximum of 90 degrees Fahrenheit. Average monthly precipitation ranges from 3.4 inches to 4.8 inches, with annual precipitation averaging 49.6 inches.

Average monthly snowfall during the months of November through April ranges from a fraction of an inch to four inches, with an annual average of ten inches of snowfall. The local climate requires the Airport to support snow removal and aircraft deicing services. This climate data for Asheville, North Carolina was obtained from the National Oceanic and Atmospheric Administration (NOAA) and the NWS.

2.7.2 Wind Coverage

In addition to climate data, the AWOS (Station 723150 – Asheville Regional Airport) collects wind speed and direction data, which can influence airfield development decisions on runway orientation and length. Local wind conditions at an airport are a key factor in determining runway use. Aircraft operational safety and performance is enhanced when aircraft depart and land into the wind, therefore, runways that are not oriented to take full advantage of the prevailing wind patterns are not utilized as frequently as runways that are appropriately oriented. According to FAA AC 150/5300-13A, *Airport Design*, the desirable wind coverage for an airport is at least 95 percent at all speeds, meaning that the primary runway at an airport has at least 95 percent wind coverage and that the wind at the airport is within certain limits of crosswind conditions. Wind coverage is calculated using the highest crosswind component that is acceptable for the type of aircraft expected to use the runway system. Larger aircraft have a higher tolerance for crosswinds than smaller aircraft due to their size, weight, and operational speed.

Table 2-22 provides the standard crosswind component by aircraft size. **Table 2-23** outlines the weather classification criteria and the number of recorded observations at AVL between 2011 and 2020.

Table 2-22 – Crosswind Components

Runway Design Code (RDC)	Maximum Crosswind Component
A-I and B-I aircraft	10.5 knots
A-II and B-II aircraft	13.0 knots
A-III, B-III, C-I through D-III D-I through D-III	16.0 knots
A-IV, B-IV, C-IV through C-VI, D-IV through D-VI	20.0 knots
E-I through E-VI	20.0 knots

Table 2-23 – Weather Classification Criteria

Weather Class	Recorded Observations at AVL (2011-2020)
All Weather	136,644
VFR Conditions	95,719
IFR Conditions	30,102

Source: NOAA, National Climate Center; Station 723150 (2011-2020)
VFR – Visual Flight Rule
IFR – Instrument Flight Rule

The combination of the crosswind and the weather classification allows for the calculation of the wind coverage, which is presented in **Table 2-24** for AVL. Wind coverage is the percent of time crosswind components are below an acceptable velocity. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for ARC A-I and B-I; 13 knots for ARC A-II and B-II; 16 knots for ARC A-III, B-III, and C-I through D-III, and 20 knots for ARC A-IV through D-VI. The calculated wind coverage for AVL facilities shows that observations exceed the 95 percent wind coverage threshold in all modeled weather conditions (all weather, VFR-only, and IFR-only). As a result, crosswind coverage is not an issue at the Airport.

Table 2-24 – AVL Wind Coverage

	Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
All Weather	17-35	99.60%	99.89%	99.98%	100%
VFR		99.55%	99.89%	99.89%	100%
IFR		99.74%	99.87%	99.96%	99.99%

Source: NOAA, National Climate Center; Station 723150 (2011-2020)

Weather observations are presented in a format that is specifically designed by the FAA to be useful for evaluating weather conditions at an airport. Wind direction is grouped according to a 16-point compass rose (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW and NNW).

Wind speed is organized into groups of 0-3, 4-6, 7-10, 11-16, 17-21, 22-27, 28-33, 34-40, and 41 knots per hour or greater. This data is displayed on a wind rose for each weather classification and included on the formal Airport Layout Plan (ALP).

3 FORECASTS OF AVIATION ACTIVITY

This Chapter of the Airport Master Plan Update (Study) presents the comprehensive forecast of aviation activity and demand at Asheville Regional Airport ('AVL' or 'the Airport') over the 20-year planning horizon (2021 – 2041). The forecast consists of projections for all categories of activity at the Airport, including passenger enplanements, air carrier operations and fleet mix, general aviation operations, based aircraft, military operations, and peak activity levels. While the Airport does not currently have cargo activity, it was important to analyze the potential for cargo activity for the purposes of facility sizing.

The forecasts of aviation activity provide the Greater Asheville Regional Airport Authority ('GARAA,' 'Airport Authority,' or 'Authority') with guidance to determine facility sizing and capacity recommendations, both airside and landside, that directly impact future development at the Airport. The forecasts will also facilitate the long-term strategic planning and development plans depicted on the updated Airport Layout Plan (ALP).

The developed forecasts account for the impacts due to COVID-19 ('COVID' or 'the pandemic') and incorporate projected recovery levels based on industry trends and recent activity levels at AVL. The resulting preferred forecast were submitted to the Federal Aviation Administration (FAA) for approval and acceptance[3].

It is important to note that the historical and projected activity levels herein represent calendar year data (January through December), while the FAA's Terminal Area Forecast (TAF) is organized according to the FAA fiscal year (October through September).

3.1 FORECAST CATEGORIES

Aviation demand forecasts are prepared for a variety of aviation categories, which are determined based on the type and level of activity expected at an airport over the planning horizon. These categories vary in relevance depending on the size and category of an airport and the basic objectives of a specific master plan.

As previously discussed, this Study evaluated and projected commercial activity (enplanements, operations, and fleet mix), general aviation activity (operations and based aircraft), and military activity. A description of each category is provided below.

- Commercial Enplanements – A revenue-paying passenger boarding an aircraft at a given airport.
- Commercial Operations – Operations performed by aircraft designed to have a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. These operations include

[3] FAA Approval: Received on January 17, 2023.

scheduled air carriers and regional partners (including all 50-seat regional jet operations), as well as U.S. and foreign flagged carriers.

- Commercial Fleet Mix – The grouping of aircraft performing commercial operations at the airport. This includes 50-seat regional jets.
- General Aviation Operations – Includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations.
- General Aviation Based Aircraft – Aircraft that spend more than six months of the year at a given airport and that have an agreement with the airport or a tenant for storage, that can perform takeoffs and landings, and that have a valid (current) FAA airworthiness certificate.
- Military Operations – Activity performed by the United States military.

3.2 IMPACTS OF COVID-19 ON THE AVIATION INDUSTRY AND AVL

In March 2020, COVID-19 (commonly referred to as Coronavirus or 'COVID') began impacting the aviation industry and air travel. The impacts of COVID on the aviation system have been split in terms of types of users.

With this, it was important to analyze and become familiar with industry trends, as well as historical activity trends at AVL prior to 2020, to properly evaluate the level of impact COVID-19 has had on the Airport's activity. These figures also assisted in determining later recovery efforts. Based on these analyses, recent activity trends were compared to both previous activity levels at AVL and the wider aviation industry, which were then integrated into the forecasts accordingly.

3.2.1 COVID-19 Impacts on Commercial Aviation

Commercial activity levels (especially passenger levels) in the United States were impacted more heavily than other users, such as cargo and general aviation (GA).

Industry Impacts

The Transportation Security Administration (TSA) has been tracking national passenger throughput activity for 2019 through 2022 and comparing the activity levels side-by-side[4], as seen below in **Table 3-1**. Further analysis of this data for 2019 and 2020 indicated an approximate 61.9 percent decrease in national throughput passengers; however, activity trends in 2021 were positive and have continued to remain positive in 2022. Month-over-month data from January through December for 2020 and 2021 indicated approximately an 80.9 percent increase in passenger throughput. When analyzing month-over-month data from January through July for 2021 and 2022, national passenger throughput increased nearly 43.9 percent.

[4] Transportation Security Administration. "TSA Checkpoint Travel Numbers (Current Year Versus Prior Years(s)/Same Weekday)." 18 August 2022. https://www.tsa.gov/coronavirus/passenger-throughput

As airlines experienced a decrease in passenger activity and fewer service routes being flown, several airlines opted to transition to larger airframes. This allowed for more passengers to be flown during each flight, which subsequently decreased costs due to fewer operations. Recently, several airlines have begun reinstating routes that were temporarily put on hold.

Table 3-1 – TSA: Total Customer Throughput (National)

Month	2019	2020	2021	2022*	% Difference		
					2019 vs. 2020	2020 vs. 2021	2021 vs. 2022*
January	59,357,493	61,673,279	23,421,229	46,000,046	3.9%	-62.0%	96.4%
February	57,525,435	60,463,775	24,867,048	48,528,013	5.1%	-58.9%	95.1%
March	72,683,832	31,029,383	38,562,607	63,643,054	-57.3%	24.3%	65.0%
April	68,107,494	3,198,527	40,263,920	63,436,314	-95.3%	1158.8%	57.6%
May	74,452,226	7,347,527	49,883,982	67,182,736	-90.1%	578.9%	34.7%
June	76,668,787	14,755,057	56,712,872	68,163,881	-80.8%	284.4%	20.2%
July	79,332,046	20,823,298	63,188,017	70,290,673	-73.8%	203.4%	11.2%
August	74,445,793	21,515,106	57,484,123	-	-71.1%	167.2%	-
September	66,941,195	21,828,103	51,089,715	-	-67.4%	134.1%	-
October	72,108,333	25,716,680	57,162,404	-	-64.3%	122.3%	-
November	68,608,532	25,357,178	57,644,161	-	-63.0%	127.3%	-
December	70,250,692	26,417,472	58,863,955	-	-62.4%	122.8%	-
Total	**840,481,858**	**320,125,385**	**579,144,033**	**427,244,717***	**-61.9%**	**80.9%**	**43.9%****

*Activity through July 31, 2022.

**Comparison of January-July 2021 (296,899,675 passengers) vs. January-July 2022 (427,244,717 passengers).

Source: Transportation Security Administration, CHA, 2022.

Impact at AVL

As shown in **Table 3-2**, upward trends in passenger enplanements are also being experienced at AVL. Enplanements were higher month-over-month from March 2021 to June 2022 when compared to the respective months in the preceding year. Month-over-month data from January through December for 2020 and 2021 indicated approximately a 102 percent increase in passenger enplanements.

Based on conversations with the GARAA, and in line with upcoming airline service schedules and recent trends, enplanements are expected to continue increasing with the anticipation of surpassing the FAA 2021 TAF at the end of the year (2022) before stabilizing.

As shown in **Table 3-3**, commercial operations at AVL were also negatively impacted by COVID-19, with operations decreasing by approximately 38.2 percent in 2020 when compared to activity the previous year. As previously discussed, the decrease in operations was a direct result of airlines temporarily cutting back service routes and altering fleet mixes as airlines transitioned to larger bodied aircraft.

Table 3-2 – Covid-19: Impact on Enplanements at AVL

Month	2019	2020	2021	2022*	% Difference		
					2019 vs. 2020	2020 vs. 2021	2021 vs. 2022*
January	45,770	58,017	22,658	41,920	26.8%	-60.9%	85.0%
February	43,707	52,746	22,977	47,636	20.7%	-56.4%	107.3%
March	60,805	31,418	39,029	67,677	-48.3%	24.2%	73.4%
April	61,230	1,210	48,371	70,179	-98.0%	3897.6%	45.1%
May	71,960	7,717	62,546	79,946	-89.3%	710.5%	27.8%
June	77,313	20,183	77,489	90,410	-73.9%	283.9%	16.7%
July	81,749	27,034	91,609	-	-66.9%	238.9%	-
August	75,825	27,853	71,735	-	-63.3%	157.5%	-
September	69,344	25,151	65,120	-	-63.7%	158.9%	-
October	81,495	38,732	85,762	-	-52.5%	121.4%	-
November	69,003	34,804	65,431	-	-49.6%	88.0%	-
December	70,892	29,543	63,288	-	-58.3%	114.2%	-
Total	**809,093**	**354,408**	**716,015**	**397,768***	**-56.2%**	**102.0%**	**45.7%****

*Activity through June 30, 2022.

**Comparison of January-June 2021 (273,070 enplanements) vs. January-June 2022 (397,768 enplanements).

Source: GARAA, CHA, 2022.

Table 3-3 – Covid-19: Impact on Commercial Operations at AVL

Month	Commercial Operations	% Difference
2019	21,150	-
2020	13,064	-38.2%
2021	20,328	55.6%

Source: GARAA, CHA, 2022.

3.2.2 COVID-19 Impact on General Aviation

GA users were not impacted by the COVID-19 pandemic to the same extent of commercial operators. While travel and route restrictions were placed on the commercial industry, route restrictions were not placed on civil aviation. However, business and travel restrictions did have an impact on itinerant GA travel, though recreational flying has largely been stable throughout the pandemic. In addition, during 2020 GA pilots began assisting with COVID-19 relief efforts by aiding in delivery of personal protective equipment to medical facilities.

Industry Impacts

As shown in **Figure 3-1**, GA Aircraft Shipment Reports, published by the General Aviation Manufactures Association (GAMA), aircraft

Figure 3-1 – GA Aircraft Shipments

Aircraft Shipments & Billings: Comparison of Last THREE Full Years				
AIRPLANE SHIPMENTS	2019	2020	2021	% CH. 20-21
Piston Airplanes (*)	1,336	1,332	1,409	+5.8%
Turboprop Airplanes	525	443	527	+19.0%
Business Jets	809	644	710	+10.2%
TOTAL AIRPLANE SHIPMENTS	**2,670**	**2,419**	**2,646**	**+9.4%**
TOTAL AIRPLANE BILLINGS	**$23.5B**	**$20.0B**	**$21.6B**	**+7.6%**
HELICOPTERS SHIPMENTS	2019	2020	2021	% CHANGE 20-21
Piston Helicopters	179	142	181	+27.5%
Turbine Helicopters (*)	698	567	679	+19.8%
TOTAL HELICOPTER SHIPMENTS	**877**	**709**	**860**	**+21.3%**
TOTAL HELICOPTER BILLINGS	**$3.8B**	**$3.4B**	**4.2B**	**+22.6%**

Source: General Aviation Manufactures Association.

shipments in the United States declined from 2,670 aircraft in 2019 to 2,419 aircraft in 2020. In 2021, aircraft shipments improved by approximately 9.4 percent, with shipments totaling 2,646 aircraft[5].

Impact at AVL

Similar to the national GA industry, GA activity at AVL was not as heavily impacted as commercial activity. Based on conversations with Signature Flight Support (Signature) and data collected via the FAA Operations Network (OPSNET) and GARAA, GA activity experienced a decrease of approximately 16.0 percent from 2019 to 2020. Although experiencing a decrease in operations at the beginning of the pandemic, GA activity increased in 2021 by approximately 19.1 percent, surpassing activity prior to the pandemic. The trends regarding GA activity levels at AVL are further discussed in **Section 3.3.2**.

3.3 HISTORICAL AVIATION ACTIVITY LEVELS

Prior to performing forecast methodologies, it was important to analyze and understand the historical activity levels at AVL.

3.3.1 Historical Enplanements

From 2011 through 2021, enplanements at AVL fluctuated alongside the entrance and exit of service operators, as well as with expansion into new market areas. In November 2011, Allegiant began offering non-stop service between AVL and Orlando, Florida. Although a new ultra-low-cost carrier (ULCC) was introduced at AVL, enplanements decreased approximately 12.3 percent from 2011 to 2012 as a result of airlines exiting AVL's market. In August 2011, Vision Airlines discontinued service at the Airport, which was soon followed by the loss of AirTran Airways in January 2012. In 2014, Allegiant expanded non-stop service to include new market areas, thus attributing to an increase in enplanements from the previous year, with the Airport seeing an approximate 15.1 percent increase.

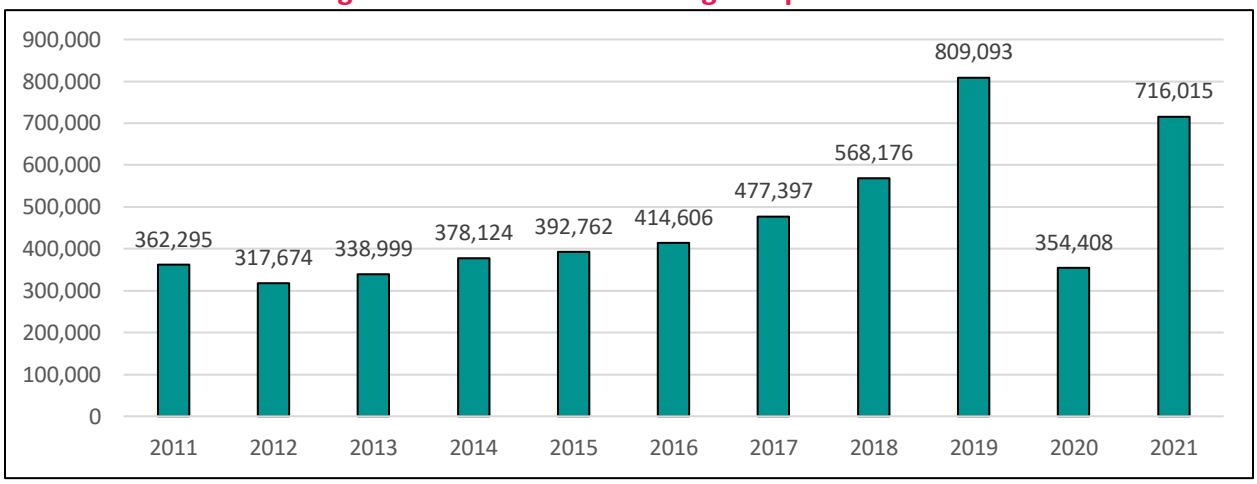
In 2019, AVL experienced a record high number of passenger enplanements at 809,093. As was the case with the commercial service airports as a whole in the US, AVL saw a drastic decrease in passenger enplanements in 2020 as a direct impact of COVID-19, which resulted in extreme changes in services offered by airlines. From 2019 to 2020, enplanements at AVL dropped from 809,093 enplanements to 354,408 enplanements, or by approximately 56.2 percent, as a result of loss in services and frequencies.

AVL primarily caters to the leisure market. As discussed in the FAA Aerospace Forecast (2021-2041), 'domestic leisure travel has led the recovery.' This is evident at AVL. In 2021, airlines began increasing services and the public became more comfortable with traveling, thus enabling activity at the Airport to begin recovering. In 2021, enplanements were within approximately 10.9

[5] General Aviation Manufactures Association. *Aircraft Shipments & Billings: Comparison of Last Three Full Years*. https://gama.aero/facts-and-statistics/quarterly-shipments-and-billings/. Accessed 18 May 2022.

percent of reaching 2019 activity levels, with 716,015 enplaned passengers. These trends are depicted in **Figure 3-2**.

Figure 3-2 – Historical Passenger Enplanements

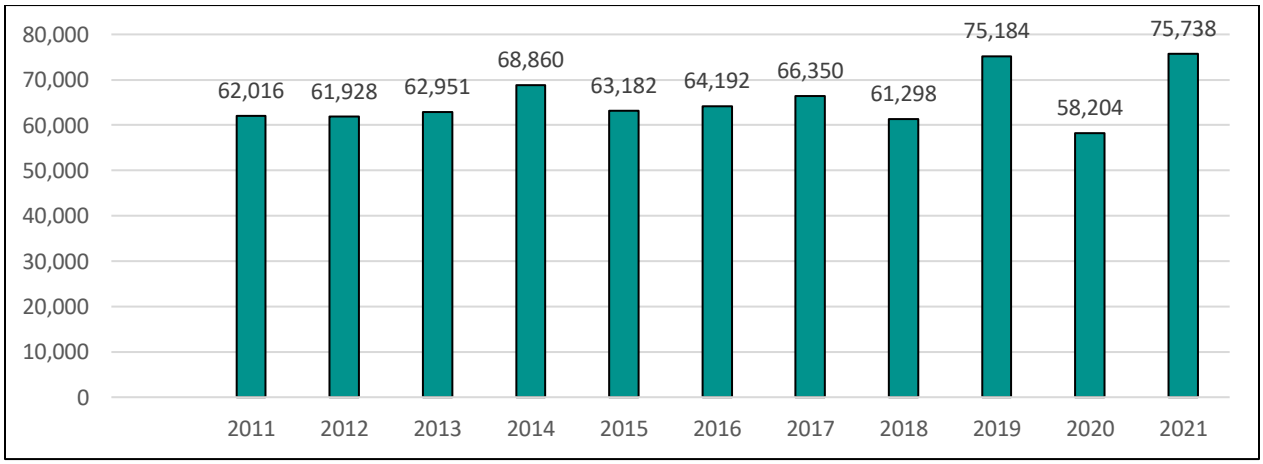


Source: GARAA, CHA, 2022.

3.3.2 Historical Operations

As shown in **Figure 3-3**, operations were relatively steady at AVL from 2011 through 2018, with operations ranging between 61,298 and 68,860. In 2019, operations reached a record peak with 75,184 operations before decreasing by approximately 22.6 percent to a nine-year historical low of 58,204 operations due to COVID-19. In 2021, commercial, GA, and military operations each increased, resulting in an overall increase in operations by approximately 30.1 percent with 75,738 operations—a new record high at AVL. The increase in commercial travel can be partially attributed to the return of commercial services and routes that were previously reduced, while factors leading to the increase of GA operations could be attributed to an increase in disposable income.

Figure 3-3 – Historical Operations

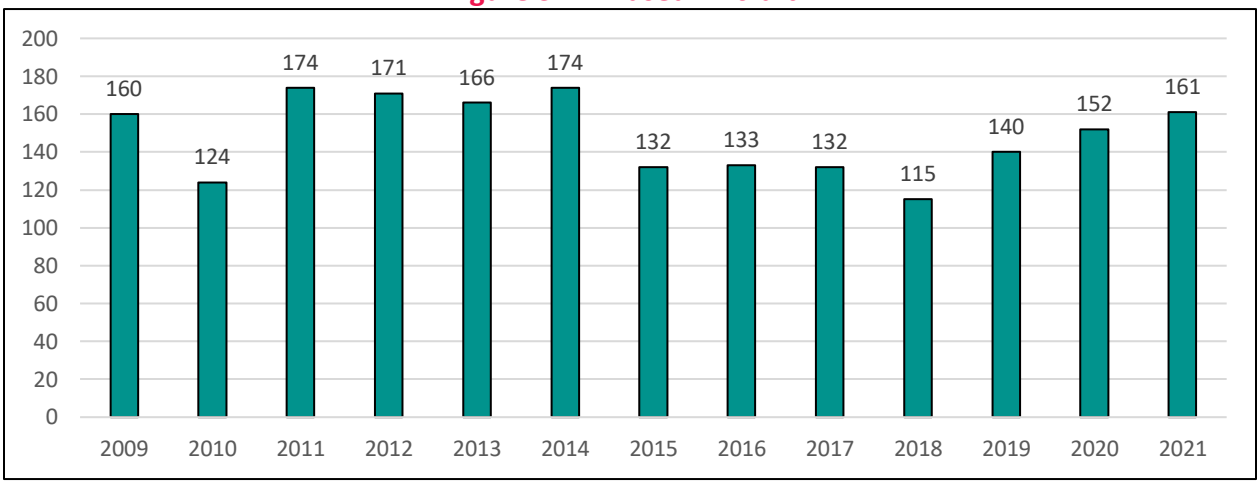


Note: 2011 through 2021 average activity breakdowns – Commercial Operations (24.3%), General Aviation Operations (69.1%), & Military Operations (6.6%).
Source: FAA OPSNET, GARAA, CHA, 2022.

3.3.3 Historical Based Aircraft

The number of based aircraft at AVL have experienced several periods of fluctuation between 2011 and 2021, as seen in **Figure 3-4**. Based aircraft were lowest in 2018 with 115 aircraft and highest in 2011 / 2014 at 174. In 2021, AVL had 161 full-time based aircraft (144 single-engine, 9 multi-engine, 5 jets, and 3 helicopters).

Figure 3-4 – Based Aircraft



Note: Based aircraft from 2009 through 2020 were provided by the FAA 2021 TAF, while based aircraft in 2021 were provided by Airport Master Record (Form 5010).
Source: FAA 2021 TAF, Airport Master Record (Form 5010), GARAA, CHA, 2022.

3.4 FACTORS INFLUENCING ACTIVITY AT AVL

As mentioned in **Chapter 1**, ***Inventory,*** the Authority completed a Terminal Building Assessment Study in 2018 to evaluate the aging of the existing terminal facility. It was ultimately recommended that the existing facility be replaced – a process that is currently concluding its design stage and is anticipated to be completed in 2026. This Study recommended a 12-gate facility by 2038. Furthermore, the Authority has recently completed a runway reconstruction program and development of a parking garage at the Airport.

As a result of the previously mentioned Study, the Authority began programming and designing a new terminal facility in the same location as the existing one, with development to occur in phases. These efforts include significant financial investments by the Authority with the intent to accommodate the expected increase in passenger demand, as well as a new entrant airline and increases in service at AVL.

In addition to the facility improvements, several external factors were included in the evaluation of passenger activity at the Airport:

- Actual passenger enplanement numbers indicate AVL passenger enplanements are on track to recover in 2022.
- Socioeconomic growth in the Asheville MSA (population, per capita income, etc.).

- The presence of a growing ULCC market at the Airport (Allegiant, Sun Country, etc.) further detailed in subsequent sections.
- The previously mentioned significant investments by the Airport Authority to improve the terminal to accommodate long-term passenger growth.
- The recent growth in air service from new airlines [Sun Country (October 2021) and Jet Blue (June 2022)], as well as added and returning routes via existing airlines (refer to **Section 3.7.1**).

3.5 FORECAST DATA SOURCES

Information factored into both planning and forecasting efforts included aviation operational trends and anticipated changes in aircraft fleet mix operating at AVL. The data and assumptions used to define the baseline conditions and future activity trends were derived from multiple sources, including:

- Airport Management – Airport management provided the most accurate historical data for the Airport. This included passenger and operational activity, facility needs, gate requirements, fleet mix transition, and upcoming service growth. Recent activity data at AVL was provided by the Authority.
- FAA 2021 Terminal Area Forecast (TAF)[6] & FAA 2022 Draft TAF[7] - TAF activity estimates are derived by the FAA from national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast.
- FAA Traffic Flow Management System Counts (TFMSC) – The FAA's TFMSC contains air traffic activity data and fleet mix data for the National Aerospace System.
- FAA Operations Network (OPSNET) – This data system is maintained by the FAA and provides operation counts at towered airports within the National Airspace System.
- Airport Master Record (Form 5010) – This data and form can be accessed via the FAA's Airport Data and Information Portal (ADIP) and includes airport and aeronautical data, organized by facility/airport. For the purposes of this Study, this data set was used to determine current based aircraft.
- Bureau of Transportation Statistics (Air Carriers: T-100) – The Bureau of Transportation Statistics (BTS), part of the Department of Transportation (DOT), provided statistical data

[6] Note, the 'FAA 2021 TAF' was published in March 2022 and represents activity at AVL through 2020, with activity beyond 2020 representing the FAA's activity projections.

[7] Note, the 'FAA 2022 Draft TAF' has not been formally published but is included for comparison against the recommended Master Plan forecast.

relating to commercial aviation, multimodal freight activity, and transportation economics. The T-100 data contains market data reported by U.S. carriers, including the air carrier, flight origin and destination, equipment type and seat information, and number of enplaned passengers.

- Boeing Commercial Market Outlook (2021-2040) & Airbus Global Market Forecast (2021-2040) – These market outlooks provide information detailing future fleet mix transitions, such as new aircraft entering the market and future equipment retirements, for commercial carriers.
- Ailevon Pacific Aviation Consulting – Ailevon Pacific, the air service development consultant for AVL, provided insight and data on upcoming new and enhanced commercial air service at the Airport, as well as information regarding potential activity.
- Airline Management – Airline representatives provided insight on upcoming route and airframe changes, which were directly factored into the assumptions and methodologies of the demand projections herein.
- Fixed-Base Operator (FBO) Representatives – Representatives with Signature Flight Support, the sole FBO operator at AVL, provided insight on recent general aviation activity levels and based aircraft activity, as well as insight regarding plans for future growth.
- FAA Aerospace Forecast (FY 2021-2041) – This forecast provided an overview of aviation industry trends and expected growth for the commercial passenger air carrier and general aviation activity segments. National growth rates of enplanements, operations, and fleet mixes are provided over a 20-year forecast horizon. For the purposes of forecast development, the FAA Aerospace Forecasts were used as comparisons for the basis of determining the growth of the general aviation fleet. This forecast also provided insight into future air cargo growth trends on a national and international level.
- Woods & Poole Economics, Inc. – Woods & Poole Economics, Inc. is an independent firm that specializes in developing long-term economic and demographic projections, utilizing more than 900 economic and demographic variables. The database includes every state, Metropolitan Statistical Area (MSA), and county in the U.S. For the purposes of this Study, data contained within the 2021 State Profile for North Carolina was utilized, which contained historical data through 2019 and projections from 2020 to 2050.

3.6 SOCIOECONOMIC OVERVIEW

The factors that have the greatest impact on the growth prospects of an airport are the socioeconomic characteristics (i.e., population, employment, and personal income per capita) present within the airport's catchment, or market, area.

An airport's catchment area is defined as the locale in which an airport captures the majority of its uses. To determine the catchment area, an evaluation using socioeconomic factors was

conducted to identify which airports the local area population are most likely to use based on proximity to other airports in the region[8], with respect given to drive-time and demographics.

For the purposes of this Study, the catchment area for AVL consisted of the following counties within North Carolina (NC): Buncombe, Haywood, Henderson, Jackson, Madison, and Transylvania County. Socioeconomic factors were also analyzed for the Asheville Metropolitan Statistical Area (MSA)[9], State of North Carolina, and the United States.

COVID-19 Disclaimer

Although 2019 represents the last year of historical socioeconomic data provided, Woods & Poole has continued to analyze the effects of COVID-19 on the economy and the impacts on the provided projections. Per Woods & Poole's 2021 State Profile for North Carolina, "COVID-19 itself does not appear to have made a quantifiable long-term economic impact that would affect U.S. economic growth beyond 2022 and through 2050."

3.6.1 Population

From 2011 through 2021, the AVL catchment area, Asheville MSA, the State of North Carolina, and the United States all experienced steady growth year-over-year and are projected to continue steadily increasing throughout the forecast horizon.

In 2021, the Asheville MSA had an estimated population of approximately 470,200, while the AVL catchment area had an estimated population of approximately 549,760 (or approximately 5.1 percent of the State's population). The Average Annual Growth Rate (AAGR) from 2011 to 2021 for the AVL catchment area and Asheville MSA were both approximately 0.9 percent, which were below the AAGR for the State (1.0 percent) but above the percent AAGR for the United States (0.6 percent).

The population growth rate from 2021 through 2041 for the catchment area and MSA are equally projected, with AAGRs of approximately 0.8 percent, which are both also lower than the AAGR for the State (0.9 percent) but higher than the national AAGR of 0.6 percent. The lesser growth rate of the catchment area and MSA when compared to the State indicates that the Airport is dependent upon more than resident and seasonal/leisure travelers for passenger activity growth and relies on passenger leakage from nearby airports, such as from Charlotte Douglas International Airport (CLT) and Greenville-Spartanburg International Airport (GSP). According to AVL's previous Leakage Study, approximately 83 percent of AVL's originating passengers resided in the Airport's catchment area. These trends are depicted in **Table 3-4** and **Figure 3-5**.

[8] Refer to Chapter 1, *Inventory,* Section 1.2.2 – Location and Service Area

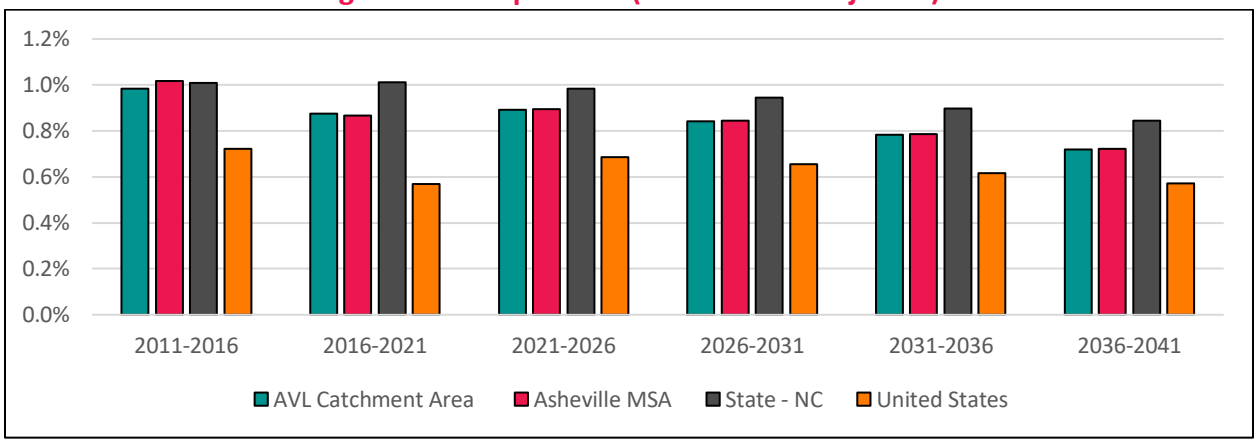
[9] Per Woods & Poole Economics, Inc., the Asheville, NC MSA consists of the following locations: Buncombe, NC; Haywood, NC; Henderson, NC; and Madison, NC.

Table 3-4 – Population (Historical & Projected)

Year	AVL Catchment Area	AAGR	Asheville MSA	AAGR	State - NC	AAGR	United States	AAGR
Historical								
2011	501,160	-	428,113	-	9,657,592	-	311,556,806	-
2016	526,325	1.0%	450,310	1.0%	10,154,788	1.0%	322,946,138	0.7%
2021	549,762	0.9%	470,196	0.9%	10,679,082	1.0%	332,219,513	0.6%
AAGR 2011-2021	-	**0.9%**	-	**0.9%**	-	**1.0%**	-	**0.6%**
Projected								
2026	574,725	0.9%	491,597	0.9%	11,214,397	1.0%	343,776,826	0.7%
2031	599,300	0.8%	512,678	0.8%	11,753,489	0.9%	355,171,046	0.7%
2036	623,109	0.8%	533,118	0.8%	12,290,084	0.9%	366,230,596	0.6%
2041	645,805	0.7%	552,621	0.7%	12,818,124	0.8%	376,799,404	0.6%
AAGR 2021-2041	-	**0.8%**	-	**0.8%**	-	**0.9%**	-	**0.6%**
Growth Rate 2021-2041	-	**17.5%**	-	**17.5%**	-	**20.0%**	-	**13.4%**

Note: Average Annual Growth Rate (AAGR); Metropolitan Statistical Area (MSA)
Source: Woods & Poole Economics, Inc., CHA, 2022.

Figure 3-5 – Population (Historical & Projected)



Note: Depicts Average Annual Growth Rates (AAGR).
Source: Woods & Poole Economics, Inc., CHA, 2022.

3.6.2 Employment

In 2020, the number of jobs within the AVL catchment decreased by approximately 9.2 percent, which could have possibly been a result of COVID-19. Despite a decrease in jobs the previous year, the number of jobs increased in 2021 to approximately 338,000, exceeding the number of jobs in 2019 (approximately 328,000). Jobs within the AVL catchment area in 2021 represented approximately 5.3 percent of all jobs within North Carolina.

Like the AVL catchment area, the Asheville MSA, North Carolina, and United States experienced a decrease in jobs in 2020, followed by increases in 2021 that exceeded the number of jobs available prior to COVID-19. The number of jobs prior to COVID-19 (2019) and in 2020 were as follows:

- Asheville MSA
  - 2019 (288,000 jobs); 2020 (260,200 jobs)

- North Carolina
  - 2019 (6,189,000 jobs); 2020 (5,820,800 jobs)
- United States
  - 2019 (203,809,500 jobs); 2020 (191,619,500 jobs)

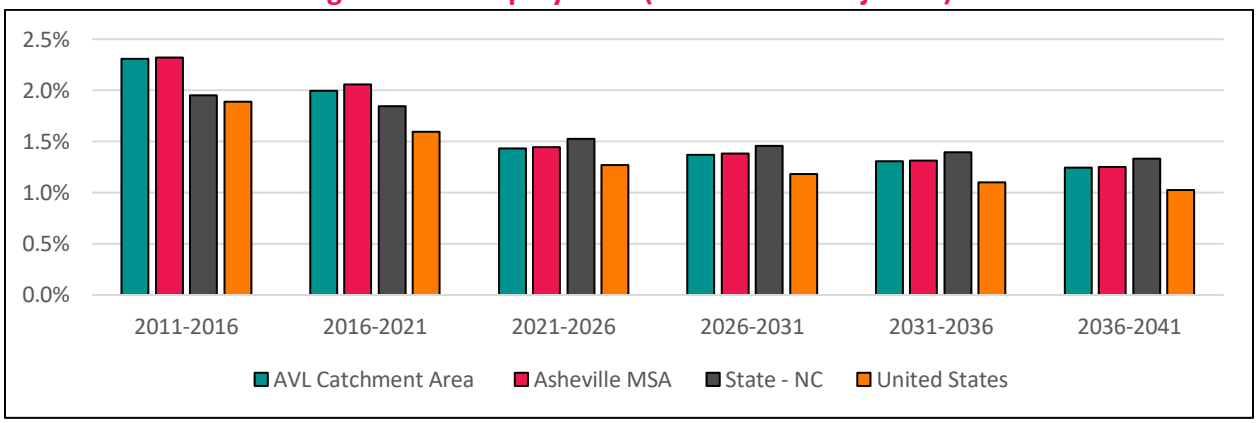
As depicted in **Table 3-5**, the number of jobs within the AVL catchment area, Asheville MSA, North Carolina, and United States are each expected to steadily increase throughout the forecast horizon.

Table 3-5 – Employment (Historical & Projected)

Year	AVL Catchment Area	AAGR	Asheville MSA	AAGR	State - NC	AAGR	United States	AAGR
Historical								
2011	273,126	-	238,794	-	5,292,806	-	176,091,617	-
2016	306,166	2.3%	267,795	2.3%	5,829,004	1.9%	193,378,928	1.9%
2021	337,951	2.0%	296,550	2.1%	6,386,673	1.8%	209,319,103	1.6%
AAGR 2011-2021	-	**2.2%**	-	**2.2%**	-	**1.9%**	-	**1.7%**
Projected								
2026	362,878	1.4%	318,563	1.4%	6,889,180	1.5%	222,948,195	1.3%
2031	388,434	1.4%	341,149	1.4%	7,407,165	1.5%	236,437,342	1.2%
2036	414,463	1.3%	364,160	1.3%	7,938,288	1.4%	249,724,570	1.1%
2041	440,923	1.2%	387,548	1.3%	8,482,533	1.3%	262,828,819	1.0%
AAGR 2021-2041	-	**1.3%**	-	**1.3%**	-	**1.4%**	-	**1.1%**
Growth Rate 2021-2041	-	**30.5%**	-	**30.7%**	-	**32.8%**	-	**25.6%**

Note 1: Table depicts number of jobs within the designated area.
Note 2: Average Annual Growth Rate (AAGR); Metropolitan Statistical Area (MSA)
Source: Woods & Poole Economics, Inc., CHA, 2022.

Figure 3-6 – Employment (Historical & Projected)



Note: Depicts Average Annual Growth Rates (AAGR).
Source: Woods & Poole Economics, Inc., CHA, 2022.

3.6.3 Personal Income Per Capita

Despite experiencing a decrease in jobs from 2019 to 2020, personal income per capita within the AVL catchment area, Asheville MSA, North Carolina, and United States increased consistently through 2021.

In 2021, the AVL catchment area had an average personal income per capita of approximately $44,700, which was lower than that of the Asheville MSA, North Carolina, and United States. The Asheville MSA had a personal income per capita of approximately $50,670, which was similar to the State of North Carolina (approximately $51,240), but about 16.3 percent less than the United States ($60,540).

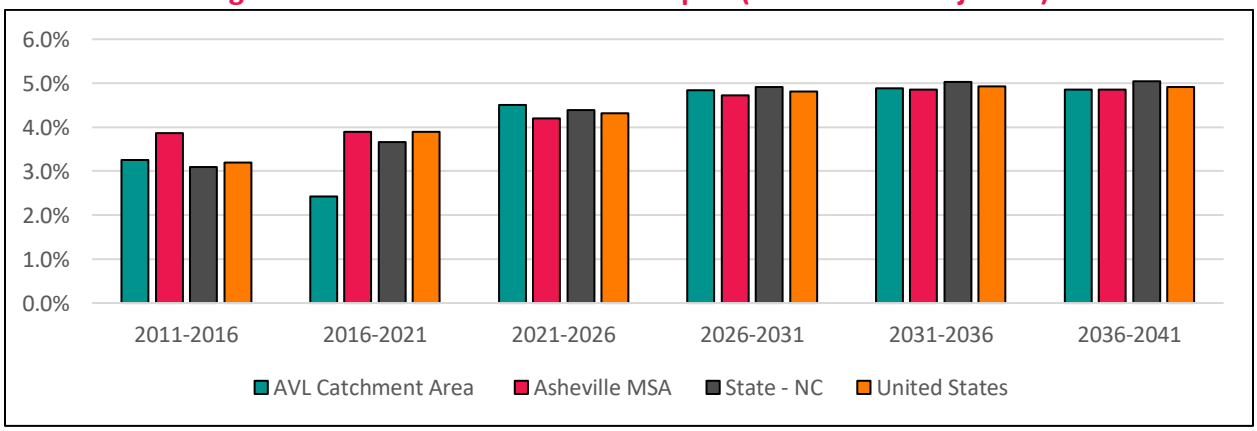
The AVL catchment area, Asheville MSA, and United States are projected to grow by approximately 4.7 percent annually throughout the forecast horizon, which is slightly slower than the State of North Carolina's projected annual growth (4.8 percent).

Table 3-6 – Personal Income Per Capita (Historical & Projected)

Year	AVL Catchment Area	AAGR	Asheville MSA	AAGR	State - NC	AAGR	United States	AAGR
Historical								
2011	$31,111	-	$34,630	-	$36,764	-	$42,739	-
2016	$37,221	3.3%	$41,862	3.9%	$42,816	3.1%	$50,014	3.2%
2021	$44,699	2.4%	$50,667	3.9%	$51,242	3.7%	$60,536	3.9%
AAGR 2011-2021	-	**3.7%**	-	**3.9%**	-	**3.4%**	-	**3.5%**
Projected								
2026	$54,968	4.5%	$62,236	4.2%	$63,521	4.4%	$74,774	4.3%
2031	$69,318	4.8%	$78,409	4.7%	$80,729	4.9%	$94,592	4.8%
2036	$87,914	4.9%	$99,369	4.9%	$103,195	5.0%	$120,277	4.9%
2041	$111,498	4.8%	$125,954	4.9%	$131,956	5.0%	$152,921	4.9%
AAGR 2021-2041	-	**4.7%**	-	**4.7%**	-	**4.8%**	-	**4.7%**
Growth Rate 2021-2041	-	**149.4%**	-	**148.6%**	-	**157.5%**	-	**152.6%**

Note 1: Depicts average personal income per capita. Note 2: Average Annual Growth Rate (AAGR);
Source: Woods & Poole Economics, Inc., CHA, 2022.

Figure 3-7 – Personal Income Per Capita (Historical & Projected)



Note: Depicts Average Annual Growth Rates (AAGR).
Source: Woods & Poole Economics, Inc., CHA, 2022.

3.7 COMMERCIAL ACTIVITY FORECASTS

To determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand at AVL, a forecast of annual enplaned passengers and annual

commercial aircraft operations was developed. The prime indicator of activity demand for a commercial service airport is the number of annual enplaned passengers, as enplanements drive passenger terminal sizing requirements, and to a lesser extent, commercial carrier operations and fleet mix. This section provides the methodologies for the development of the commercial enplanements at AVL over the 20-year planning horizon.

3.7.1 Commercial Enplanements Forecast

Enplanements are the primary measure of a commercial service airport's passenger activity and are key factors for terminal building and parking facility requirements. In addition to being an important trend tracking tool for airport management, an airport's reported annual enplanements are also used by the FAA to calculate Airport Improvement Program (AIP) passenger entitlement funding through an apportionment formula. For the purposes of this Study, forecasted enplanements serve as the basis for both the Airport's facility requirements and financial projections. Several forecast methodologies and statistical analyses were utilized to provide a range of potential passenger activity levels at AVL. From these projections, a recommended forecast was developed that represents the most reasonable projection of future activity based on existing data and current trends in passenger activity. Each of the methodologies that were analyzed, along with the accompanying enplanement forecasts, are described in the subsequent sections.

FAA TAF-Based Growth Scenario

The FAA TAF-based growth scenario (**Table 3-7**) methodology assumed the FAA 2021 TAF's projected year-over-year growth from 2021 through 2041 for enplanements and applied that assumption to actual airport-reported data. Per the FAA 2021 TAF, enplanements in 2021 at AVL were projected at 591,035; however, actual enplanements were 716,015. The year-over-year TAF growth rate was then applied to the actual 716,015 enplanements and projected through 2041 assuming the TAF growth rate for the respective years. The result of this methodology projected 1,482,177 enplanements by 2041, with an overall average annual growth rate of approximately 3.7 percent.

Table 3-7 – FAA TAF-Based Growth Scenario (Enplanements)

Year	FAA 2021 TAF	TAF-Based Scenario
2021	591,035	716,015
2026	928,427	1,124,752
2031	1,032,306	1,250,597
2036	1,131,805	1,371,136
2041	1,223,464	1,482,177
AAGR 2021-2041	**3.7%**	**3.7%**
Growth Rate 2021-2041	**107.0%**	**107.0%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, GARAA, CHA, 2022.

Historical Trend Scenario

For the purpose of the historical trend forecast scenario, it was assumed that enplanements would grow at the AAGR of enplanements from 2011 through 2021 which was approximately 7.0

percent. As shown in **Table 3-8**, this resulted in a projected 290.6 percent growth in enplanements over the 20-year planning horizon.

Upon further evaluation, it appears likely that enplanements will increase at a strong rate in the short-term (through 2024) as the Airport continues to rapidly recover; however, it is not likely that enplanements will continue this rapid rate of growth during the forecast horizon once activity has recovered. Thus, the historical trend analysis was not chosen to represent the recommended enplanements forecast.

Table 3-8 –Historical Trend Scenario (Enplanements)

Year	FAA 2021 TAF	Historical Trend (10-Year)
2021	591,035	716,015
2026	928,427	1,006,500
2031	1,032,306	1,415,100
2036	1,131,805	1,989,400
2041	1,223,464	2,796,600
AAGR 2021-2041	**3.7%**	**7.0%**
Growth Rate 2021-2041	**107.0%**	**290.6%**

Note: Average Annual Growth Rate (AAGR).
Source: GARAA, CHA, 2022.

Regression Scenarios

The regression-based scenarios examined passenger activity to determine if a causal relationship exists between the passenger activity levels and the socioeconomic conditions prevalent during that period. Several different regression analyses were performed for each of the pre-determined periods. The socioeconomic factors that were analyzed included population, income, and employment. The output of a regression analysis is the 'coefficient of determination,' or R^2, which ranges from 0 to 1.0. If the R^2 of an analysis falls between 0.85 and 1.0, there is a strong statistical correlation; if it falls below 0.85, there is less correlation. In other words, the higher the R^2 value, the stronger the correlation is between the variables.

For the purpose of this forecast, three separate periods were examined: 10-year historical period (2011-2021), pre-COVID (2011-2019), and excluding COVID (2011-2019 and 2021). The results of each scenario are summarized in **Table 3-9**.

<u>Regression Scenario 1: 10-Year Historical Period (2011-2021)</u>

The first regression scenario looked at the relationships between socioeconomic conditions and passenger enplanements over a 10-year historical period (2011 through 2021). This period took into consideration conditions prior to COVID, during peak COVID intervals, and during economic recovery over the past year.

- Population-Based Regression: R^2-value = 0.50
- Employment-Based Regression: R^2-value = 0.80
- Income-Based Regression: R^2-value = 0.48

- Population-Income-Based Regression: R^2-value = 0.51
- Employment-Income-Based Regression: R^2-value = 0.82
- Population-Employment-Income-Based Regression: R^2-value = 0.86

Regression Scenario 2: Pre-COVID (2011-2019)

The second scenario only examined conditions prior to COVID, as COVID greatly impacted the economy and enplanements.

- Population-Based Regression: R^2-value = 0.71
- Employment-Based Regression: R^2-value = 0.76
- Income-Based Regression: R^2-value = 0.76
- Population-Income-Based Regression: R^2-value = 0.78
- Employment-Income-Based Regression: R^2-value = 0.76
- Population-Employment-Income-Based Regression: R^2-value = 0.85

Regression Scenario 3: Excluding COVID (2011-2019 & 2021)

The third regression scenario examined conditions prior to COVID (2011 through 2019), as well as COVID recovery (2021).

- Population-Based Regression: R^2-value = 0.79
- Employment-Based Regression: R^2-value = 0.82
- Income-Based Regression: R^2-value = 0.81
- Population-Income-Based Regression: R^2-value = 0.82
- Employment-Income-Based Regression: R^2-value = 0.82
- Population-Employment-Income-Based Regression: R^2-value = 0.89

Regression Summary

The population-employment-income-based scenarios were the only regression scenarios with R^2 values that indicated strong correlations between historical enplanements at AVL and the socioeconomic factors within the Airport's catchment area; therefore, the remaining regression scenarios were not chosen to represent the recommended enplanements forecast.

Although the R^2 values for the population-employment-income-based scenarios indicated strong correlations between the socioeconomic factors and enplanements, the scenarios resulted in unrealistic trends. In the first scenario, enplanements were projected to increase with an average annual growth rate of approximately 7.8 percent throughout the forecast horizon. While the growth may be realistic in the short-term, it is not likely that enplanements would sustain that level of rapid growth long-term. In the second and third scenarios, enplanements were projected to decrease by approximately 4.9 and 3.0 percent, respectively. With planned route expansions in the short-term as the airline industry recovers and with the entrance of a new air carrier (Jet

Blue) at AVL, enplanements are not expected to decrease; therefore, the population-employment-income-based scenarios were also eliminated from consideration as the recommended enplanements forecast.

Similar to historic trends, it is not surprising that the regression analyses did not provide realistic projections of future activity at AVL. As enplanements have had significant variability in the past 10-years, with significant swings both up and down, correlations with more stable socioeconomic variables does not have much predictive value.

Table 3-9 – Regression Scenarios (Enplanements)

Year	FAA 2021 TAF	Regressions					
		Population-Based	Employment-Based	Income-Based	Population-Income-Based	Employment-Income-Based	Population-Employment-Income-Based
Regression Scenario 1: 10-Year Historical Period (2011-2021)							
2021	591,035	716,015	716,015	716,015	716,015	716,015	716,015
2026	928,427	806,506	884,884	888,586	707,533	816,968	1,039,403
2031	1,032,306	975,754	1,059,547	1,235,902	680,597	879,426	1,530,403
2036	1,131,805	1,139,727	1,237,443	1,686,000	532,854	895,814	2,236,229
2041	1,223,464	1,296,034	1,418,284	2,256,826	240,215	856,954	3,196,947
AAGR 2021-2041	**3.7%**	**3.0%**	**3.5%**	**5.9%**	**-5.3%**	**0.9%**	**7.8%**
Growth Rate 2021-2041	**107.0%**	**81.0%**	**98.1%**	**215.2%**	**-66.5%**	**19.7%**	**346.5%**
Regression Scenario 2: Pre-COVID (2011-2019)							
2021	591,035	716,015	716,015	716,015	716,015	716,015	716,015
2026	928,427	942,921	892,889	1,132,415	1,355,285	1,063,610	536,912
2031	1,032,306	1,165,650	1,066,987	1,649,118	2,245,329	1,481,070	397,035
2036	1,131,805	1,381,435	1,244,307	2,318,728	3,497,825	2,007,947	301,488
2041	1,223,464	1,587,134	1,424,563	3,167,946	5,178,689	2,663,099	262,978
AAGR 2021-2041	**3.7%**	**4.1%**	**3.5%**	**7.7%**	**10.4%**	**6.8%**	**-4.9%**
Growth Rate 2021-2041	**107.0%**	**121.7%**	**99.0%**	**342.4%**	**623.3%**	**271.9%**	**-63.3%**
Regression Scenario 3: Excluding COVID (2011-2019 & 2021)							
2021	591,035	716,015	716,015	716,015	716,015	716,015	716,015
2026	928,427	942,487	888,783	1,091,135	1,189,524	957,971	556,416
2031	1,032,306	1,165,039	1,061,453	1,578,739	1,863,624	1,237,304	441,445
2036	1,131,805	1,380,654	1,237,320	2,210,641	2,790,875	1,567,459	380,591
2041	1,223,464	1,586,189	1,416,098	3,012,035	4,016,903	1,956,751	388,298
AAGR 2021-2041	**3.7%**	**4.1%**	**3.5%**	**7.4%**	**9.0%**	**5.2%**	**-3.0%**
Growth Rate 2021-2041	**107.0%**	**121.5%**	**97.8%**	**320.7%**	**461.0%**	**173.3%**	**-45.8%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

Econometric Scenarios

As defined by Merriam-Webster, econometrics is "the application of statistical methods to the study of economic data and problems." [10] The econometric scenarios were a result of examining the year-over-year socioeconomic projections and applying incremental growth rates to AVL enplanements throughout the forecast horizon. For the purposes of this forecast, the following econometric analyses were performed: population-based, employment-based, and income-based.

As previously stated, it is anticipated that enplanements will likely increase at a rapid rate in the short-term as the Airport recovers from COVID-related activity loss, followed by a more conservative growth in the medium- to long-term. Socioeconomic trends can correlate to the rate of increase in future activity but are not the only contributing factors to activity growth. Thus, the econometric scenarios were not chosen to represent future activity at the Airport. This is due to the scenarios being limited to only socioeconomic factors, rather than the broader range of elements that are anticipated to have the most influence on the number of enplaned passengers (i.e., changes in service routes, new services providers, growth in tourism, etc.) at the Airport.

Table 3-10 – Econometric Scenarios (Enplanements)

Year	FAA 2021 TAF	Econometrics		
		Population Based	Employment-Based	Income-Based
2021	591,035	716,015	716,015	716,015
2026	928,427	748,527	768,828	880,515
2031	1,032,306	780,534	822,973	1,110,377
2036	1,131,805	811,543	878,121	1,408,261
2041	1,223,464	841,102	934,181	1,786,046
AAGR 2021-2041	**3.7%**	**0.8%**	**1.3%**	**4.7%**
Growth Rate 2021-2041	**107.0%**	**17.5%**	**30.5%**	**149.4%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

Air Service Econometric Scenarios

The air service econometric scenarios were more qualitative in nature and based on familiarity with local conditions, specific plans of airlines (both announced and anticipated), and a number of logical assumptions. To develop these forecasts, interviews were conducted with the Greater Asheville Regional Airport Authority (GARAA) staff and Airport stakeholders. Potential air service developments occurring during the forecast horizon were evaluated, including expanded services to existing destinations, services to new destinations, and entrant airlines (i.e., Jet Blue and other potential service providers). Additional elements that were analyzed included historical activity trends, fleet mix, load factors, and econometric trends. The resulting forecasts are therefore

[10] Merriam-Webster. *Econometric Definition & Meaning - Merriam-Webster*. https://www.merriam-webster.com/dictionary/econometric. Accessed 24 May 2022.

potential 'scenarios' of future activity. For this Master Plan Update, three such scenarios were evaluated: a medium-growth, medium-high-growth, and high-growth/ultimate.

Medium-Growth Scenario

The historical trend analysis was used as a foundation from 2022 through 2024, along with activity resulting from assumed increases in load factors. The Airport Authority provided information regarding known activity, including a new entrant airline (Jet Blue), route expansion via existing carriers, and the return of some services that were previously suspended due to COVID—resulting in an AAGR of approximately 11.5 percent from 2021 through 2024.

The returning activity and known 'new' activity to begin in 2022 and 2023 that were incorporated into this evaluation included:

- Returning Activity (Transitioning from seasonal, back to daily):
  - American: Philadelphia International Airport (PHL)
- New Seasonal Service:
  - American: Ronald Reagan Washington National Airport (DCA), LaGuardia Airport (LGA), Miami International Airport (MIA), Chicago O'Hare International Airport (ORD)
  - Jet Blue: Boston Logan International Airport (BOS)
  - Delta: Minneapolis-Saint Paul International Airport (MSP)
  - United: Newark Liberty International Airport (EWR)

Once enplanements were shown to surpass 1 million (in 2024), enplanements were projected by applying the average econometric AAGRs shown in **Table 3-10** (2.3%), thus increasing enplanements at a slower incremental growth rate. This result of this scenario are shown in **Table 3-11**.

Table 3-11 – Medium-Growth Air Service Econometric Scenario (Enplanements)

Year	FAA 2021 TAF	Medium-Growth
2021	591,035	716,015
2026	928,427	1,038,576
2031	1,032,306	1,162,182
2036	1,131,805	1,300,499
2041	1,223,464	1,455,279
AAGR 2021-2041	**3.7%**	**3.6%**
Growth Rate 2021-2041	**107.0%**	**103.2%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

Medium-High Growth Enplanements Forecast[11]

The medium-high growth scenario (**Table 3-12**) was added onto the medium-growth air service econometric analysis to include assumptions regarding potential service activity such as expanded services, new markets, and the entrance of a new ULCC.

- Assumed Services to Begin in 2023:
  - New daily, seasonal service (13-weeks) via an A220 with an 80 percent load factor, with the load factor increasing incrementally to 85 percent by 2041.
  - New daily, year-round service via a 76-seat regional jet with an 80 percent load factor, with the load factor increasing incrementally to 85 percent by 2041.
  - Assumed United's services to IAD will resume.
- Assumed Services to Begin in 2024:
  - Entrant of a new ULCC providing one flight to three new destinations for three days per week via an A320 with a 75 percent load factor, with the load factor increasing incrementally to 80 percent and with services transitioning to four days weekly by 2029 and five days weekly by approximately 2037.

Table 3-12 – Medium-High Growth Air Service Econometric Scenario (Enplanements)

Year	FAA 2021 TAF	Medium-High Growth
2021	591,035	716,015
2026	928,427	1,183,319
2031	1,032,306	1,322,750
2036	1,131,805	1,477,394
2041	1,223,464	1,649,002
AAGR 2021-2041	**3.7%**	**4.3%**
Growth Rate 2021-2041	**107.0%**	**130.3%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

High Growth/Ultimate Enplanements Forecast

The final scenario included all activity discussed in the medium-growth and the medium-high growth scenarios and was built out to also include the entrance of two additional airlines in five-years (2026), thus resulting in the high-growth/ultimate scenario, shown in **Table 3-13**. One carrier was assumed to provide seasonal service (34 weeks), once daily, via a 76-seat regional jet. The second carrier was assumed to provide one daily flight to four new destinations year-round

[11] Note, the services discussed as part of the medium-high growth and high-growth/ultimate scenarios were only assumptions and do not represent committed service routes or activity. The potential for these described services was evaluated to provide the Airport Authority with additional tools for planning future infrastructure and facility improvements.

via a B737-700. All routes for each carrier were assumed to begin with a load factor of 80 percent, which would later increase incrementally to 85 percent by the end of the forecast horizon.

Table 3-13 – High Growth/Ultimate Air Service Econometric Scenario (Enplanements)

Year	FAA 2021 TAF	High-Growth/ Ultimate
2021	591,035	716,015
2026	928,427	1,364,356
2031	1,032,306	1,507,559
2036	1,131,805	1,665,974
2041	1,223,464	1,841,354
AAGR 2021-2041	**3.7%**	**4.8%**
Growth Rate 2021-2041	**107.0%**	**157.2%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

Recommended Enplanements Summary

After evaluating each scenario, the medium-growth air service econometric scenario was chosen to represent AVL's recommended enplanements forecast, as this forecast was qualitative in nature. This forecast encompassed local economic and airline industry trends, as well as anticipated and announced changes in service routes specific to AVL. Historical activity, fleet mix, and changes in load factors were also incorporated within this forecast scenario. The comparison of the recommended forecast versus the FAA 2021 TAF and FAA 2022 Draft TAF can be found in **Section 3.10**. See **Appendix A** for the complete 20-year forecast.

Low-Growth Enplanements Forecast

To provide a range of potential passenger activity levels, the FAA 2021 TAF was chosen to represent the low-growth forecast. Although the overall growth rate is projected to be higher, this forecast was chosen as the low-growth forecast because it reflects a slower recovery, with enplanements not surpassing 2019 activity levels until 2023.

Alternate Enplanements Forecasts

To further provide a range of potential passenger activity levels, the medium-high growth and high-growth/ultimate air service econometric scenarios were chosen to represent alternate commercial enplanements forecasts, which represent growth beyond the recommended enplanements forecast. These forecasts built upon the recommended forecast to address varying levels of enplanements should potential air service developments occur within the forecast horizon (i.e., a new entrant airline, service to new markets, etc.). These alternate forecast scenarios will serve as the basis for future facility planning when examining facility requirements.

A summary of the low-growth, recommended, and alternate enplanements forecasts is presented in **Table 3-14**.

Table 3-14 – Enplanements Forecast Summary

Year	Low-Growth Enplanements	Recommended Enplanements	Alternate Forecasts	
	(FAA 2021 TAF)	(Medium-Growth)	(Medium-High Growth)	(High-Growth/Ultimate)
2021	591,035	716,015	716,015	716,015
2026	928,427	1,038,576	1,183,319	1,364,356
2031	1,032,306	1,162,182	1,322,750	1,507,559
2036	1,131,805	1,300,499	1,477,394	1,665,974
2041	1,223,464	1,455,279	1,649,002	1,841,354
AAGR 2021-2041	**3.7%**	**3.6%**	**4.3%**	**4.8%**
Growth Rate 2021-2041	**107.0%**	**103.2%**	**130.3%**	**157.2%**

Source: FAA 2021 TAF, Woods & Poole Economics, GARAA, CHA, 2022.

3.7.2 Commercial Operations Forecast

In addition to determining projected passenger enplanements, a commercial operations forecast was developed to further determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand at AVL. Commercial aircraft operations will influence the requirements for the passenger terminal and airside infrastructure. The total forecasted commercial operations are depicted in **Table 3-15**.

The average commercial load factor in 2021 was approximately 72.6 percent. The forecast of percentage of seats filled in 2022 was assumed to resume to pre-COVID levels, consistent with the average load factor for 2018 and 2019 (73.5 percent). This resulted in a projected increase of approximately 0.9 percent, which was assumed to incrementally increase in the short term. Aircraft size, seat configuration, and service routes were both taken into consideration when determining load factors.

In the short-term, departure seats were projected by evaluating known returning activity and 'new' activity announcements beginning in 2022 and 2023. Load factors that were projected when developing the preferred enplanements forecast were also taken into consideration when determining future departure seats, as well as industry trends regarding changes in fleet mix. For the purposes of this forecast, it was assumed that arrival seats would equal departure seats. To project commercial operations, total annual seats (departure and arrival seats) available by aircraft type were divided by the average number of seats for the respective aircraft.

Table 3-15 – Commercial Operations Forecast

Year	Departure Seats	Commercial Operations
2021	986,776	20,328
2026	1,415,957	26,054
2031	1,537,787	28,292
2036	1,670,099	30,723
2041	1,813,795	33,363
AAGR 2021-2041	**3.1%**	**2.5%**
Growth Rate 2021-2041	**83.8%**	**64.1%**

Note: Average Annual Growth Rate (AAGR).
Source: Bureau of Transportation Statistics (T-100 Data), GARAA, CHA, 2022.

3.7.3 Commercial Fleet Mix

The commercial aircraft fleet mix projections are a function of the scheduled commercial passenger air carriers that operate or are expected to operate at AVL during the forecast period. Industry trends (i.e., aircraft acquisitions, aircraft phase-outs, retirements, route demand, etc.) and forecast enplanement levels influence a carrier's aircraft type and level of operations. This data was then coupled with the forecasted commercial air carrier operations to determine the number of annual departures by aircraft category to the greatest extent practical. The operational fleet mix forecast provided within this section serves as a practical planning tool for developing airside and terminal development initiatives.

When projecting the future commercial fleet mix at AVL, it was important to identify the overall market trends driving airline fleet mixes. Over the last few years, airlines began retiring older aircraft, while also beginning to phase out the use of smaller 50-seat aircraft—replacing them with larger 70- and 90-plus seat regional jets, as well as larger narrow-body aircraft. Due to COVID-19 impacts, and a decrease in passenger travel, several airlines began temporarily altering the fleet mixes being flown, decreasing the number of aircraft being purchased.

According to the Boeing Commercial Outlook (2021-2040), a 10-year forecast was developed which indicated that overall aircraft deliveries will be approximately 7 percent lower than was predicted prior to the pandemic, with widebody aircraft deliveries expected to be approximately 8 percent lower than in 2019. Over the next 20-years, Boeing predicts that single-aisle passenger aircraft will be the highest in demand through 2040, with these aircraft making up approximately 75 percent of future deliveries. Per the Airbus Global Market Forecast (2021-2040), Airbus is projected to deliver approximately 6,030 aircraft domestically, comprised of approximately 83.8 percent small aircraft (i.e., A220 & A320), 10.6 percent medium aircraft (i.e., A320XLR & A330neo), and 5.6 percent large aircraft (i.e., A350-900 & A350-1000).

This is reflected at AVL, as the Airport is expected to experience an increase in narrow-body aircraft such as the A320, B737, and CRJs. In line with industry trends, 50-seat aircraft are expected to be retired (i.e., CRJ-200, ERJ-145, etc.) and replaced with larger aircraft (i.e., E-175).

The projected commercial fleet mix by Aircraft Approach Category (AAC) category and Airplane Design Group (ADG) group at AVL is presented in **Table 3-16.**

Table 3-16 – Commercial Fleet Mix

AAC & ADG		2021	2026	2031	2036	2041
Subtotal by AAC	A	0	0	0	0	0
	B	0	0	0	0	0
	C (i.e., A220, A319, B717-200, B737-700, ERJ-145/175, etc.)	20,278	25,644	27,807	30,152	32,695
	D (i.e., B737-800/900, etc.)	50	410	486	571	668
Subtotal by ADG	I	0	0	0	0	0
	II (i.e., CRJ-200/700, ERJ 145, etc.)	6,656	3,412	3,705	4,024	4,370
	III (i.e., A220, A319/320, B737-700/800/900, etc.)	13,672	22,642	24,587	26,699	28,993
	IV	0	0	0	0	0

Source: Bureau of Transportation Statistics (T-100 Data), CHA, 2022.

3.8 GENERAL AVIATION ACTIVITY FORECASTS

General aviation (GA) includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. GA represents the largest percentage of civil aircraft in the U.S. and accounts for most operations handled by towered and non-towered airports. GA activities include flight training, sightseeing, recreational, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations. General aviation aircraft encompass a broad range of types: from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and home-built/kit aircraft.

General aviation operations are further categorized as either itinerant or local operations. Local operations are those performed by aircraft that remain in the local traffic pattern or within a 20-mile radius of the tower. Local operations are commonly associated with training activity and flight instruction, while also including touch-and-go operations. Itinerant operations are arrivals or departures, other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius.

3.8.1 Based Aircraft Forecast

The FAA provides multiple methodologies to be used to forecast GA based aircraft. To determine the most reasonable scenario for AVL, it was necessary to compare and eliminate those forecasts that did not support the key factors and variables that comprise the specific direction of the Airport and its market. This section provides the methodologies that were analyzed for the development of the forecast of GA based aircraft at AVL. As previously stated in **Section 3.3.3**, in 2021 AVL had 161 based aircraft.

FAA Aerospace Forecast Analysis

In the FAA Aerospace Forecast methodology, annual fleet mix growth projections—provided in the FAA Aerospace Forecasts (FY 2021 – 2041)—were used to project the number of based aircraft throughout the forecast period. This methodology assumed that AVL GA based aircraft will grow at the FAA projected national rate and maintain their respective share of fleet and operations throughout the forecast period, as shown in **Table 3-17**. The FAA Aerospace Forecast indicates that piston aircraft (single- and multi-engine) will steadily decrease, jet aircraft and helicopters are projected to increase presence at airports. Based aircraft at AVL are primarily comprised of piston aircraft, with jets and helicopters representing the smallest groupings. Founded on these national projected trends, and as shown in **Table 3-18**, single- and multi-engine aircraft at AVL would decrease by approximately 16.7 percent and 7.8 percent, respectively. Jet aircraft would increase by approximately 56.2 percent, and helicopters would increase by approximately 31.1 percent.

While AVL may experience a slight shift in based aircraft mix as jets replace piston aircraft, it is not likely that the shift away from single-engine aircraft will be as aggressive as indicated using

this methodology; therefore, this scenario was not chosen to represent future based aircraft at AVL.

Table 3-17 – FAA Aerospace National GA Fleet Growth Rates

Period	Single-Engine	Mutli-Engine	Jet	Helicopter
AAGR 2021-2026	-1.0%	-0.6%	2.6%	1.1%
AAGR 2026-2031	-0.9%	-0.4%	2.5%	1.4%
AAGR 2031-2036	-0.9%	-0.3%	2.1%	1.5%
AAGR 2036-2041	-0.8%	-0.3%	1.8%	1.5%

Note: Average Annual Growth Rate (AAGR).
Source: FAA Aerospace Forecast (2021-2041), CHA, 2022.

Table 3-18 – FAA Aerospace Forecast Analysis (AVL GA Based Aircraft)

Period	Single-Engine	Mutli-Engine	Jet	Helicopter	Total
2021	144	9	5	3	161
2026	137	9	6	3	155
2031	131	9	6	3	149
2036	125	8	7	4	144
2041	120	8	8	4	140
AAGR 2021-2041	**-0.9%**	**-0.4%**	**2.3%**	**1.4%**	**-0.7%**
Growth Rate 2021-2041	**-16.7%**	**-7.8%**	**56.2%**	**31.1%**	**-13.1%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA Aerospace Forecast (2021-2041), Airport Master Record (Form 5010), CHA, 2022.

Econometrics Scenarios

The GA based aircraft econometric scenarios were a result of examining the year-over-year socioeconomic projections within the AVL catchment area, and then applying incremental growth rates to AVL based aircraft throughout the forecast horizon. A population-based, employment-based, and income-based scenario were all performed. The population-based and employment-based scenarios indicated conservative growth, while the income-based and population-employment-income based scenarios were more aggressive. The results of these scenarios are depicted in **Table 3-19**. After further evaluation, the econometric scenarios were not chosen to represent the preferred GA based aircraft forecast at AVL, as factors outside of just socioeconomics (such as national trends in fleet mix replacement) can impact based aircraft levels.

Table 3-19 – Econometric Scenarios (GA Based Aircraft)

Year	Population-Based	Employment-Based	Income-Based	Population-Employment-Income Based
2021	161	161	161	161
2026	168	173	198	179
2031	176	185	250	201
2036	182	197	317	226
2041	189	210	402	252
AAGR 2021-2041	**0.8%**	**1.3%**	**4.7%**	**2.3%**
Growth Rate 2021-2041	**17.5%**	**30.5%**	**149.4%**	**56.8%**

Note: Average Annual Growth Rate (AAGR).
Source: Woods & Poole Economics, Inc., Airport Master Record (Form 5010), CHA, 2022.

FAA TAF-Based Growth Scenario

The FAA TAF-based growth scenario methodology assumed the FAA 2021 TAF's projected based aircraft year-over-year growth from 2021 through 2041 for AVL and applied that assumption to actual airport-reported data. Per the FAA 2021 TAF, based aircraft in 2021 at AVL were projected at 155 aircraft; however, the actual based aircraft count in 2021 was 161 aircraft. The year-over-year TAF growth rate for AVL based aircraft was then applied to the actual 161 based aircraft and projected through 2041, assuming the TAF growth rate for the respective years. The result of this methodology projected 223 based aircraft by 2041, which is was believed to be too aggressive. Thus, this scenario was not chosen to represent recommended based aircraft at AVL.

Table 3-20 – TAF-Based Growth Scenario (GA Based Aircraft)

Year	TAF-Based Growth
2021	161
2026	177
2031	192
2036	208
2041	223
AAGR 2021-2041	**1.6%**
Growth Rate 2021-2041	**38.7%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF (AVL), Airport Master Record (Form 5010), CHA, 2022.

FAA National TAF-Based Growth Scenario

The FAA National TAF-based growth scenario methodology assumed the FAA 2021 TAF's projected based aircraft year-over-year growth from 2021 through 2041 for national based aircraft and applied that assumption to actual airport-reported data. For example, per the FAA' national TAF, national based aircraft are projected to increase by approximately 0.86 percent from 2021 to 2022. This growth rate of 0.86 percent was applied to actual 2021 based aircraft (161) for a total of 162 based aircraft projected in 2022. This methodology was carried out through 2041.

As previously discussed in **Section 3.3.3**, the number of based aircraft at AVL has historically fluctuated; therefore, given the conservative growth of this scenario and that it encompasses local and national economic conditions, the National TAF-based growth scenario was chosen to represent the recommended GA based aircraft forecast at AVL.

It is important to note that growth in GA based aircraft will likely be tied directly to future GA hangar development projects. As additional hangar and based aircraft capacity is added, more aircraft will likely be attracted to the based count at AVL.

Table 3-21 – National TAF-Based Growth Scenario (GA Based Aircraft)

Period	Total
2021	161
2026	168
2031	175
2036	182
2041	190
AAGR 2021-2041	**0.8%**
Growth Rate 2021-2041	**17.8%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF (National), Airport Master Record (Form 5010), CHA, 2022.

Based Aircraft by Type

To project the future breakdown of based aircraft by type at AVL, national based aircraft and projected trends regarding future general aviation fleet mix were considered, as well as fleet mix activity trends at AVL. The projected breakdown is depicted in **Table 3-22**.

Table 3-22 – Recommended GA Based Aircraft Forecast (By Aircraft Type)

Period	Single-Engine	Multi-Engine	Jet	Helicopter	Total
2021	144	9	5	3	161
2026	147	9	9	3	168
2031	150	10	12	3	175
2036	154	10	15	3	182
2041	157	11	19	3	190
AAGR 2021-2041	**0.4%**	**1.0%**	**6.9%**	**0.0%**	**0.8%**
Growth Rate 2021-2041	**9.0%**	**22.2%**	**280.0%**	**0.0%**	**17.8%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, Airport Master Record (Form 5010), CHA, 2022.

3.8.2 General Aviation Operations Forecast

Like commercial operations forecasts and GA based aircraft forecasts, more than one methodology exists that could be used to forecast GA operations. To determine the most plausible and reasonable scenario for AVL, it was necessary to compare and eliminate those forecasts that did not support the key factors and variables that comprise the specific operational environment at the Airport.

FAA TAF-Based Growth Scenario

The FAA TAF-based GA operations scenario assumed the FAA 2021 TAF's projected annual growth from 2021 to 2041 for GA itinerant and local operations, and then independently applied those assumptions to actual airport-reported itinerant and local GA activity data. From 2021 to 2022, the FAA 2021 TAF projected itinerant GA operations to increase by approximately 0.1 percent. After 2022, itinerant operations were projected to remain static throughout the remainder of the forecast period, resulting in an AAGR from 2021 to 2041 of approximately 0.004 percent. Unlike itinerant GA operations, the FAA projected civil (local) GA operations to steadily increase throughout the forecast at an average annual rate of approximately 1.1 percent.

The results from applying these growth assumptions are shown in **Table 3-23**. This scenario was not chosen to represent future GA operations at AVL. Itinerant operations are expected to grow rather than remain static; therefore, the FAA's AAGR projection is not predicted to be the most realistic representation of future general aviation activity.

Table 3-23 – TAF-Based Growth Scenario (GA Operations)

Year	TAF-Based Growth
2021	51,008
2026	53,849
2031	54,017
2036	54,186
2041	54,357
AAGR 2021-2041	**0.3%**
Growth Rate 2021-2041	**6.6%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA 2021 TAF, FAA OPSNET, GARAA, CHA, 2022.

Historical Trend Scenario

The historical growth scenario was a time trend analysis that utilized the Airport's historical activity as a metric to provide future growth projections. For the purposes of this forecast, data from 2011 through 2021 was analyzed.

From 2011 through 2021, AVL experienced fluctuations in GA activity, ranging between a low of 39,191 operations in 2012 and a high of 51,008 operations in 2021. The 10-year historical average annual growth rate (2.4 percent) was applied to 2021 actuals and assumed throughout the forecast horizon, resulting in an overall growth of 61.9 percent as presented in **Table 3-24**.

Due to the fluctuations in historical GA operations, it cannot be assumed that operations will reflect past trends; therefore, this scenario was not chosen to represent the preferred GA operations forecast at AVL.

Table 3-24 –Historical Trend Scenario (GA Operations)

Year	Historical Trend
2021	51,008
2026	57,533
2031	64,893
2036	73,194
2041	82,557
AAGR 2021-2041	**2.4%**
Growth Rate 2021-2041	**61.9%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA OPSNET, GARAA, CHA, 2022.

Operations Per Based Aircraft Scenario

The Operations Per Based Aircraft (OPBA) scenario is a straightforward forecasting methodology which assumes the total number of annual operations is representative of the number of aircraft based at AVL. When projecting operations using OPBA for AVL, it was assumed that OPBA will remain static throughout the forecast period at levels consistent with actual activity in 2021 (317

operations per based aircraft). When applying the OPBA of 317 to the preferred based aircraft forecast, GA operations were projected to grow by approximately 0.8 percent annually as shown in **Table 3-25**.

Historically, local operations accounted for an average of 32 percent of all GA operations, which can often be linked to based aircraft activity. Given the high makeup of local activity, it can be assumed that based aircraft will drive GA operations at AVL; therefore, this scenario was chosen to represent the preferred GA operations forecast.

Table 3-25 – Operations Per Based Aircraft (GA Operations)

Year	Based Aircraft (Recommended)	GA Operations	OPBA
2021	161	51,008	317
2026	168	53,256	317
2031	175	55,475	317
2036	182	57,694	317
2041	190	60,230	317
AAGR 2021-2041	**0.8%**	**0.8%**	**-**
Growth Rate 2021-2041	**18.0%**	**18.1%**	**-**

Note: Average Annual Growth Rate (AAGR).
Source: FAA OPSNET, GARAA, CHA, 2022.

Projected GA operations were further broken down and categorized as either itinerant or local. To project the percent split in activity, future operations were projected to retain the average historical split: approximately 68.0 percent itinerant and 32.0 percent local as shown **in Table 3-26**.

Table 3-26 – Recommended GA Operations Forecast (Itinerant Vs. Local)

Year	Itinerant	Local	Total
2021	34,665	16,343	51,008
2026	36,193	17,063	53,256
2031	37,701	17,774	55,475
2036	39,209	18,485	57,694
2041	40,932	19,298	60,230
AAGR 2021-2041	**0.8%**	**0.8%**	**0.8%**
Growth Rate 2021-2041	**18.1%**	**18.1%**	**18.1%**

Note: Average Annual Growth Rate (AAGR).
Source: FAA OPSNET, GARAA, CHA, 2022.

3.9 MILITARY ACTIVITY FORECAST

Military operations have fluctuated over the last decade; however, unlike other types of operations, historical trends in military activity levels are not representative of future activity. Rather, military operations are a function of military decisions, national security priorities, and budget pressures; therefore, military operations are not projected in the same manner as other types of operations occurring at the Airport.

During the baseline year (2021), AVL had 4,402 military operations (3,477 itinerant and 925 local). For the purposes of this forecast, projected military operations are assumed to remain static at the baseline year levels throughout the forecast horizon.

Similar to military operations, the standard methodologies used for determining general aviation-based aircraft cannot be applied when determining military based aircraft, thus military based aircraft are assumed to remain static.

Currently, the military does not have any based aircraft stationed at AVL; therefore, it was assumed that AVL will not have military owned based aircraft during the forecast period.

3.10 RECOMMENDED FORECAST SUMMARY

The following tables present a summary of the recommended aviation activity forecasts for air carrier (enplanements and operations), GA, and military activity levels as detailed in the previous sections. The recommended forecasts were used as the basis for future planning for the Airport. **Table 3-27** presents the complete summary of the recommended forecast.

Table 3-27 – Recommended Forecast Summary

Year	Based Aircraft	Enplanements	Operations					
			Commercial	General Aviation		Military		Total
				Itinerant	Local	Itinerant	Local	
2021	161	716,015	20,328	34,665	16,343	3,477	925	75,738
2026	168	1,038,576	26,054	36,193	17,063	3,477	925	83,712
2031	175	1,162,182	28,292	37,701	17,774	3,477	925	88,169
2036	182	1,300,499	30,723	39,209	18,485	3,477	925	92,819
2041	190	1,455,279	33,363	40,932	19,298	3,477	925	97,995
AAGR 2021-2041	**0.8%**	**3.6%**	**2.5%**	**0.8%**	**0.8%**	**0.0%**	**0.0%**	**1.3%**
Growth Rate 2021-2041	**18.0%**	**103.2%**	**64.1%**	**18.1%**	**18.1%**	**0.0%**	**0.0%**	**29.4%**

Note: Average Annual Growth Rate (AAGR).

Source: FAA 2021 TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2022.

Per FAA requirements, in order for Master Plan forecasts to be approved the forecast should be within 10 percent of the TAF in the first 5 years and 15 percent in 10 years—as set forth by the FAA in AC 150/5070-6B, *Airport Master Plans*. **Table 3-28** details the recommended forecast of enplanements and total airport operations (all activity types) in comparison to the FAA TAF forecast.

In 5-years (2026), enplanements are projected to be 11.9 percent above the FAA 2021 TAF projections. Although enplanements are projected to be 1.9 percent above the acceptable range of 10 percent, the recommended forecast is justifiable. As portrayed in **Table 3-28**, activity at the Airport is recovering quicker than the FAA initially anticipated. The FAA projected that enplanements would not surpass 2019 activity levels until 2023; however, at the current rate of recovery and with new service confirmed to be provided by Jet Blue, enplanements are

anticipated to fully recover by the end of 2022. This growth is further supported by the FAA 2022 Draft TAF, which projects enplanements now recovering in 2022 rather than in 2023. When comparing the Master Plan's projected enplanements to the FAA 2022 Draft TAF, enplanements are projected to be within the FAA's acceptable range with a difference of approximately 5.7 percent in 5 years.

In 10 years (2031), enplanements are projected at approximately 12.6 percent above the FAA 2021 TAF and 7.8 percent above the FAA 2022 Draft TAF, which are within the FAA's criteria.

Commercial operations are projected to be within FAA parameters in 5 and 10 years when comparing the Master Plan forecast to the FAA 2021 TAF and to the FAA 2022 Draft TAF.

Table 3-28 – FAA Appendix C: Comparing Airport Planning and TAF Forecasts

Specified Base Year: 2021	Year	Master Plan Forecast (MPF)	FAA 2021 TAF	MPF/FAA 2021 TAF (% Difference)	FAA 2022 Draft TAF	MPF/FAA 2022 Draft TAF (% Difference)
Passenger Enplanements						
Base yr.	2021*	716,015	591,035	21.1%	611,321	17.1%
Base yr. + 5yrs.	2026	1,038,576	928,427	11.9%	982,575	5.7%
Base yr. + 10yrs.	2031	1,162,182	1,032,306	12.6%	1,078,336	7.8%
Base yr. + 15yrs.	2036	1,300,499	1,131,805	14.9%	1,174,055	10.8%
Commercial Operations						
Base yr.	2021*	20,328	25,071	-18.9%	25,071	-18.9%
Base yr. + 5yrs.	2026	26,054	30,308	-14.0%	29,346	-11.2%
Base yr. + 10yrs.	2031	28,292	32,079	-11.8%	31,746	-10.9%
Base yr. + 15yrs.	2036	30,723	33,896	-9.4%	34,160	-10.1%
Total Operations						
Base yr.	2021*	75,738	73,121	3.6%	73,121	3.6%
Base yr. + 5yrs.	2026	83,712	81,258	3.0%	84,335	-0.7%
Base yr. + 10yrs.	2031	88,169	83,201	6.0%	86,916	1.4%
Base yr. + 15yrs.	2036	92,819	85,191	9.0%	89,512	3.7%

* Master Plan Forecast data depicts calendar years, while the FAA TAFs depict fiscal year data.
Source: FAA 2021 TAF, FAA 2022 Draft TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2022.

The full recommended enplanements, alternate enplanements, and operations forecasts can be found in **Appendix A**. In accordance with FAA requirements, a summary of forecasted levels and growth rates, as well as operational factors, is included in **Appendix B**.

The FAA Approval Letter can be found in **Appendix C**.

Pilot Shortage and Changes in Activity

After developing the proposed enplanements forecast, several airlines announced changes in service due to a nation-wide pilot shortage, with changes scheduled to occur in June. In response to a shortage of pilots, American, Delta, and Allegiant have announced changes in frequencies, as shown in **Table 3-29**. When comparing the previously published and current June schedules, AVL is expected to lose 25 departures per week, for a loss of 3,241 seats per week.

Although activity in June is expected to be less than previously anticipated, activity is scheduled to be slightly higher than in May, with an additional 23 flights and 2,143 available seats per week. As of May 12, 2022, the published schedules for July at AVL depict an overall increase in activity from June. Allegiant, Delta, and Jet Blue have each scheduled additional flights, while Sun Country and United expect to retain May and June activity levels. In July, American is currently scheduled to decrease activity by two operations per week.

Table 3-29 – June Scheduling Changes

Destination	Departures Per Week			Destination	Departure Seats Per Week		
	Previous	Current	Departures Lost		Previous	Current	Seats Lost
Allegiant				**Allegiant**			
AUS	2	2	0	AUS	354	342	12
BOS	4	4	0	BOS	708	744	-36
BWI	3	2	1	BWI	531	372	159
DEN	4	4	0	DEN	687	714	-27
EWR	4	3	1	EWR	645	468	177
EYW	2	2	0	EYW	312	312	0
FLL	12	9	3	FLL	1,998	1,494	504
HOU	2	2	0	HOU	312	342	-30
LAS	2	2	0	LAS	312	372	-60
MDW	2	2	0	MDW	312	312	0
MSP	2	2	0	MSP	354	372	-18
PBI	3	2	1	PBI	510	372	138
PGD	7	6	1	PGD	1,134	996	138
PIE	12	8	4	PIE	2,019	1,368	651
SFB	12	8	4	SFB	2,019	1,338	681
SRQ	2	2	0	SRQ	354	372	-18
VPS	1	1	0	VPS	156	156	0
Total	**76**	**61**	**15**	**Total**	**12,717**	**10,446**	**2,271**
American				**American**			
AUS	1	1	0	AUS	76	76	0
BOS	1	1	0	BOS	76	76	0
CLT	56	54	2	CLT	4,179	4,049	130
DCA	9	9	0	DCA	684	684	0
DFW	15	15	0	DFW	1,140	1,140	0
LGA	1	1	0	LGA	76	76	0
MIA	7	7	0	MIA	532	532	0
ORD	7	7	0	ORD	532	532	0
PHL	7	7	0	PHL	455	455	0
Total	**104**	**102**	**2**	**Total**	**7,750**	**7,620**	**130**
Delta				**Delta**			
ATL	42	35	7	ATL	4,620	3,850	770
LGA	14	13	1	LGA	985	915	70
MSP	1	1	0	MSP	132	132	0
Total	**57**	**49**	**8**	**Total**	**5,737**	**4,897**	**840**
All Carriers	**277**	**252**	**25**	**All Carriers**	**28,626**	**25,385**	**3,241**

Source: GARAA, CHA, 2022.

Although activity in June is expected to be less than previously anticipated, activity is scheduled to be slightly higher than in May, with an additional 23 flights and 2,143 available seats per week. As of May 12, 2022, the published schedules for July at AVL depict an overall increase in activity from June as shown in **Table 3-30**. Allegiant, Delta, and Jet Blue have each scheduled additional flights, while Sun Country and United expect to retain May and June activity levels. In July, American is currently scheduled to decrease activity by two operations per week.

Table 3-30 – Weekly Schedules (May, June, & July)

	May	June	July
Departures Per Week			
	Allegiant		
	58	61	77
	American		
	85	102	100
	Delta		
	49	49	57
	Jet Blue		
	0	3	5
	Sun Country		
	2	2	2
	United		
	35	35	35
Total	**229**	**252**	**276**

	May	June	July
Departure Seats Per Week			
	Allegiant		
	9,993	10,446	12,894
	American		
	6,229	7,620	7,454
	Delta		
	4,898	4,897	5,731
	Jet Blue		
	0	300	500
	Sun Country		
	372	372	372
	United		
	1,750	1,750	2,078
Total	**23,242**	**25,385**	**29,029**

Source: GARAA, CHA, 2022.

Despite the changes in activity levels, the changes that are anticipated are not expected to heavily impact the recommended forecast.

3.11 PEAK ACTIVITY LEVELS

Airports experience peaks in total operations and enplanements that drive demand for various areas of airport infrastructure. To properly plan, size, and design passenger terminal facilities, an understanding of peak month-average day (PMAD) and peak hour is necessary. The peak month, PMAD, and peak month-peak hour forecasts are key elements in defining the future facility requirements needed to accommodate above average levels of utilization (or peak activity).

The peak month is the calendar month of the year when the highest level of enplanements and operations typically occur. Peak month-average day is simply the total operations or passengers divided by the number of days in the peak month. To provide the necessary metrics for the demand/capacity analysis, PMAD was projected for the following:

- Commercial Operations
- Total Airport Operations (All Users)
- Enplanements and Total Passengers

To determine peak hour during the PMAD, FAA Traffic Flow Management System Counts (TFMSC) hourly data and airline schedules were examined. For the purposes of this Study, the 15 minutes

prior and 15 minutes following the peak hour were included to represent the likely demand placed on the terminal facility. This additional 30 minutes is known as the surge factor, which accounts for passengers arriving at the Airport early for their flight and for schedule slippage and delays.

Each peak element must be presented separately:

- Peak commercial air carrier operations - define the demand for airside facilities (gates and ramp)
- Peak hour airport operations - determine runway capacity and airfield needs
- Peak enplanements and total passengers - direct impact on terminal (e.g., ticketing and baggage claim) and landside (e.g., access roads and parking) facilities

Terminal facilities are generally designed to accommodate enplanements on the average day during the peak month, rather than the absolute peak level of activity. A review of historical enplanements and operations at AVL was performed to identify the peak month for commercial activity.

3.11.1 Peak Commercial Operations

In 2021, peak commercial operations at AVL occurred in July. To estimate the PMAD, peak month commercial operations (2,361) was divided by the number of days in the peak month of July (31). The percent share of peak month and PMAD commercial operations was assumed to remain static throughout the forecast horizon, or at 11.6 percent and 3.2 percent, respectively.

To determine the average number of commercial operations occurring during the peak hour, TFMSC hourly data and scheduling data were examined. In July 2021, AVL experienced approximately 11 commercial operations during the Airport's peak hour (11:45 am -1:15 pm). In 2022, the peak hour in July is projected to be between 12:30 pm and 2:00 pm with approximately 17 commercial operations, or 18.5 percent of PMAD activity. For the purposes of this forecast, it was assumed that future peak hour commercial operations will consist of approximately 18.5 percent of the PMAD activity.

The peak commercial operations forecast is presented in **Table 3-31**.

Table 3-31 – Peak Commercial Operations

Year	Annual Commercial Operations	Peak Month Percent	Peak Month Operations	Percent of Peak Month	PMAD	Percent of Peak Hour	Peak Hour
2021	20,328	11.6%	2,361	3.2%	76	14.4%	11
2026	26,054	11.6%	3,026	3.3%	100	18.5%	19
2031	28,292	11.6%	3,286	3.3%	109	18.5%	20
2036	30,723	11.6%	3,568	3.3%	118	18.5%	22
2041	33,363	11.6%	3,875	3.3%	128	18.5%	24

Source: FAA OPSNET, Bureau of Transportation Statistics (T-100 Data), GARAA, CHA, 2022.

3.11.2 Peak Airport Operations (All Users)

Although peak commercial operations in 2021 occurred in July, peak total operations (combined air carrier, general aviation, and military) occurred in August. To estimate the PMAD, peak month operations (7,737) was divided by the number of days in the peak month of August (31).

In August 2021, AVL experienced 28 airport operations during the Airport's peak hour for total operations, which occurred at approximately 11:00 AM. The peak operation forecast is illustrated below in **Table 3-32**.

Table 3-32 – Peak Operations (All Users)

Year	Annual Airport Operations	Peak Month Percent	Peak Month Airport Operations	Percent of peak Month	Peak Month Average Day	Peak Hour Percent	Peak Hour
2021	75,738	10.2%	7,737	3.2%	250	11.2%	28
2026	83,712	10.2%	8,552	3.2%	276	11.2%	31
2031	88,169	10.2%	9,007	3.2%	291	11.2%	33
2036	92,819	10.2%	9,482	3.2%	306	11.2%	34
2041	97,995	10.2%	10,011	3.2%	323	11.2%	36

Source: FAA OPSNET, Bureau of Transportation Statistics (T-100 Data), GARAA, CHA, 2022.

3.11.3 Peak Enplanements and Total Passengers

When developing the forecast, the peak month for total passengers and enplanements (July) was determined by examining monthly passengers and enplanements statistics provided by the Airport. To determine the PMAD, peak month activity levels were divided by the number of days in the peak month of July (31).

Peak hour passenger and enplanement levels in 2021 and 2022 were determined based on scheduling data and load factors. In 2021, the peak hour for passengers was around 11:45 am to 1:15 pm with approximately 849 passengers. Peak hour enplanements (approximately 616 enplanements) occurred between approximately 6:00 am and 7:30 am. Scheduling data for July 2022 indicated projections of approximately 1,354 peak hour passengers between 12:30 pm and 2:00 pm (or 19.6 percent of PMAD passengers), as well as approximately 732 enplanements from 11:30 am to 1:00 pm (or 21.3 percent of PMAD enplanements). For the purposes of this Study, the percent of the PMAD passenger and enplanement activity levels occurring within the peak hour were assumed to remain static throughout the forecast horizon. The peak passengers forecast is illustrated below in **Table 3-33**, while the peak enplanements forecast is shown in **Table 3-34**.

Table 3-33 – Peak Passengers

Year	Passengers	Peak Month Percent	Peak Month Passengers	Percent of Peak month	Peak Month Average Day	Percent of Peak Hour	Peak Hour
2021	1,428,266	12.8%	182,470	3.2%	5,886	14.4%	849
2026	2,077,152	12.8%	265,369	3.2%	8,571	19.6%	1,684
2031	2,324,364	12.8%	296,952	3.2%	9,591	19.6%	1,885
2036	2,600,999	12.8%	332,294	3.2%	10,733	19.6%	2,109
2041	2,910,557	12.8%	371,842	3.2%	12,010	19.6%	2,360

Source: GARAA, CHA, 2022.

Table 3-34 – Peak Enplanements

Year	Enplanements	Peak Month Percent	Peak Month Enplanements	PMAD Percent	PMAD	Peak Hour Percent	Peak Hour
2021	716,015	12.8%	91,609	3.2%	2,955	20.8%	616
2026	1,038,576	12.8%	132,878	3.2%	4,277	21.3%	910
2031	1,162,182	12.8%	148,693	3.2%	4,787	21.3%	1,019
2036	1,300,499	12.8%	166,390	3.2%	5,356	21.3%	1,140
2041	1,455,279	12.8%	186,192	3.2%	5,994	21.3%	1,276

Source: GARAA, CHA, 2022.

3.12 POTENTIAL FOR CARGO ACTIVITY

AVL does not currently have cargo activity; however, it was important to evaluate the potential the impact services would have on the Airport should they occur. The cargo activity discussed herein was used for assessing facility requirements.

For planning purposes, cargo activity was assumed to begin operating two times per week in the short-term (or approximately 5 years) via an ATR-42 or Cessna 208 Caravan, which would result in 208 operations annually.

Operations were assumed to transition to three times per week in the mid-term (approximately 10 years) to long-term (between approximately 15 and 20 years), for a total of 312 operations annually.

3.13 CRITICAL AIRCRAFT AND AIRPORT REFERENCE CODE

The foundation of facility planning and design of federally obligated airports are based on the specifications and dimensional requirements of the critical aircraft, making the critical aircraft an important component of the airport planning process. Per FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination*, the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use[12] of the airport.

The FAA classifies airports and runways by Airport Reference Codes (ARC) based on their existing and planned operational capabilities. ARC is an airport designation that represents the Aircraft Approach Category (AAC) category and Airplane Design Group (ADG) group of the aircraft that the airfield is intended to accommodate on a regular basis (at least 500 annual operations). The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

3.13.1 Critical Aircraft and Airport Reference Code

To determine the current critical aircraft for AVL, FAA Traffic Flow Management System (TFMSC) and Bureau of Transportation statistics operational data were evaluated to identify trends by AAC category and ADG grouping. **Table 3-35** presents the operations by groupings. As shown,

[12] Regular use is defined has an aircraft or grouping of aircraft with more than 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations.

AVL experienced more than 500 annual operations for AAC Category D and ADG Group III aircraft in 2021; therefore, based on the analysis of TFMSC operations data, D-III represents the current ARC and current group of aircraft with similar characteristics, or the current critical aircraft grouping. An example of a D-III aircraft operating at AVL is the B737-800.

Table 3-35 – AVL Operations by AAC Category and ADG Group (FY 2021)

AAC & ADG		2021
Subtotal by AAC	A	6,769
	B	12,227
	C	23,511
	D	648
Subtotal by ADG	I	11,242
	II	17,451
	III	14,408
	IV	54

*The totals shown within this table only include those reported in the TFMSC, or those with filed flight plans.
Source: FAA TFMSC, CHA, 2022.

Future Airport Reference Code

When projecting future aircraft groupings, it was assumed that operations would retain the percent makeup by user class (i.e., commercial, general aviation, and military) from 2021. As shown in **Table 3-36**, the future ARC at AVL is predicted to remain at D-III, with the B737-800 representing an aircraft within the future critical aircraft family.

Table 3-36 – AVL Operations by AAC Category and ADG Group (Projected) – All

AAC & ADG		2026	2031	2036	2041
Subtotal by AAC	A	21,616	22,511	23,407	24,430
	B	27,824	28,868	29,912	31,105
	C	32,262	34,676	37,272	40,101
	D	2,009	2,114	2,229	2,359
Subtotal by ADG	I	37,573	39,070	40,567	42,278
	II	21,953	22,950	23,972	25,122
	III	23,990	25,954	28,085	30,400
	IV	195	195	195	195

Source: FAA TFMSC, Bureau of Transportation Statistics (T-100 Data), GARAA, CHA, 2022.

4 DEMAND/CAPACITY AND FACILITY REQUIREMENTS

To ensure that Asheville Regional Airport (AVL) can support the increase in forecasted aviation activity, evaluations were conducted to verify that the recommendations of this Master Plan adequately accommodate existing and anticipated activity levels. The purpose of this Chapter was to identify the Airport's facility development needs over the 20-year planning horizon. Using the preferred aviation activity forecast presented in **Chapter 3**, the airport facility needs were determined, which forms the basis of the development concepts discussed in **Chapter 5**.

The airport demand, capacity, design standards, and the overall facility requirements at AVL were evaluated using guidance contained in several FAA publications, including:

- Advisory Circular 150/5060-5, *Airport Capacity and Delay*
- AC 150/5190-4B, *Airport Land Use Compatibility Planning*
- AC 150/5300-13B, *Airport Design*
- AC 150/5325-4B*, Runway Length Requirements for Airport Design*
- AC 150/5360-13A, *Airport Terminal Planning*
- Title 14 Code of Federal Regulations (CFR) Part 77*, Safe, Efficient Use, and Preservation of the Navigable Airspace*
- Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP)*
- Airport Cooperative Research Program (ACRP), *Report 25: Airport Passenger Terminal Planning and Design*
- ACRP, *Report 25 – Airport Passenger Terminal Planning and Design, Volume 1: Guidebook*
- ACRP, *Report 25 – Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide*
- ACRP, *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design*
- ACRP, *Report 54 – Resource Manual for In-Terminal Concessions 2011*
- International Air Transportation Association (IATA*), Airport Development Reference Manual (ADRM), 12th Edition*
- U.S. Department of Transportation, Federal Aviation Administration, Systems Research & Development Service *Report No. FAA-RD-75-191 – The Apron & Terminal Building Planning Manual July 1975*

The following elements of the Airport were addressed in this assessment:

- Airfield Capacity

- Airfield Facility Requirements
- Support Facilities (General Aviation, Airfield Maintenance, etc.)
- Passenger Terminal Facilities
- Surface Transportation & Parking Facilities

4.1 PLANNING FACTORS

Before the facility requirements for AVL could be determined, it was first necessary to establish the Planning Activity Levels (PALs) based on the preferred forecasts, the design aircraft family, and the appropriate airport, runway, and taxiway classifications that are associated with FAA design standards. These parameters are discussed in the following subsections.

4.1.1 Planning Activity Levels (PALs)

Since aviation activity is highly susceptible to fluctuations in economic conditions and industry trends, identifying recommended facility improvements based solely on specific years can be a challenge. The timeline associated with the preferred forecast is representative of the anticipated timing of demand (in 5-year increments – 2026, 2031, 2036, and 2041). The actual timing of demand can vary; therefore, Planning Activity Levels (PALs), rather than calendar years, were established.

The PALs represent the activity levels believed to trigger the need for additional capacity or other development at the Airport, thus identifying significant demand thresholds for implementing recommended facility improvements and providing the Greater Asheville Regional Airport Authority (GARAA) with the flexibility to advance or slow the rate of development in response to actualized demand. In other words, if the preferred forecast proves conservative (i.e., the alternate forecast scenarios are realized because of successful airport marketing and route development initiatives, etc.), some recommended improvements may be advanced in schedule. In contrast, if demand occurs at a rate that is slower than the preferred forecast projects, the improvements should be deferred accordingly. As actual activity levels approach a PAL and trigger the need for a facility improvement, sufficient lead time for planning, design, and construction must be also given to ensure that the facilities are available for the impending demand.

Table 4-1 identifies the Base Year and PALs used for this Study. The Base Year and PALs 1 through 4 correspond with the preferred aviation activity forecast for the Base Year of 2021 and the planning horizon years 2026, 2031, 2036, and 2041. To further provide a range of potential activity levels in addition to the preferred forecast, PALs 5 and 6 were established to provide alternate (I.e., higher) passenger and commercial operations activity levels, which will further serve as a basis for future facility planning should potential air service developments occur (i.e., a new entrant airline, service to new markets, etc.) or should activity increase beyond the preferred forecast's projections.

Note, general aviation and military operations were assumed to remain static in PALs 5 and 6.

Table 4-1 – Planning Activity Levels (PALs)

Passenger Activity								
Enplanements		**Base**	**PAL 1**	**PAL 2**	**PAL 3**	**PAL 4**	**PAL 5**	**PAL 6**
Annual		716,015	1,038,576	1,162,182	1,300,499	1,455,279	1,649,002	1,841,354
Peak Month		91,609	132,878	148,693	166,390	186,192	210,978	235,588
Peak Month Average Day		2,955	4,277	4,787	5,356	5,994	6,792	7,584
Peak Hour		616	910	1,019	1,140	1,276	1,446	1,614
Operations								
Category	**Activity**	**Base**	**PAL 1**	**PAL 2**	**PAL 3**	**PAL 4**	**PAL 5**	**PAL 6**
Commercial Aviation	Annual	20,328	26,054	28,292	30,723	33,363	37,804	42,214
	Peak Month	2,361	3,026	3,286	3,568	3,875	4,391	4,903
	Peak Month Average Day	76	100	109	118	128	146	163
	Peak Hour	11	19	20	22	24	27	30
General Aviation	Annual	51,008	53,256	55,475	57,694	60,230	60,230	60,230
Military Aviation	Annual	4,402	4,402	4,402	4,402	4,402	4,402	4,402
Total Operations	**Annual**	**75,738**	**83,712**	**88,169**	**92,819**	**97,995**	**102,436**	**106,846**
	Peak Month	**7,737**	**8,552**	**9,007**	**9,482**	**10,011**	**10,464**	**10,915**
	Peak Month Average Day	**250**	**276**	**291**	**306**	**323**	**338**	**352**
	Peak Hour	**28**	**31**	**33**	**34**	**36**	**38**	**40**

Source: FAA 2021 TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2023.

4.1.2 Aircraft Classification

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems were used to determine the appropriate airport design standards for specific runway, taxiway, taxilane, apron, or other facilities at AVL, as described in FAA AC 150/5300-13B, *Airport Design*.

As discussed in **Chapter 3**, the standard classifications are the Aircraft Approach Category (AAC), the Airplane Design Group (ADG), and the Taxiway Design Group (TDG). **Table 4-2** presents the applicability of these classification systems to the FAA airport design standards for individual airport components (such as runways, taxiways, or aprons).

Table 4-2 – Applicability of Aircraft Classifications

Aircraft Classification	Related Design Components
Aircraft Approach Category (AAC)	Runway Safety Area (RSA), Runway Object Free Area (ROFA), Runway Protection Zone (RPZ), runway width, runway-to-taxiway separation, runway-to-fixed object
Airplane Design Group (ADG)	Runway, Taxiway, and apron Object Free Areas (OFAs), parking configuration, taxiway-to-taxiway separation, runway-to-taxiway separation
Taxiway Design Group (TDG)	Taxiway width, radius, fillet design, apron area, parking layout

Source: FAA AC 150/5300-13B, CHA, 2023.

4.1.3 Design Aircraft Family

The "critical aircraft" or "design aircraft family" represents the most demanding aircraft, or grouping of aircraft, with similar characteristics (relative to AAC, ADG, TDG) that are currently using or are anticipated to use an airport on a regular basis. The design aircraft family was identified for AVL (see **Table 4-3**) after review of the FAA's Traffic Flow Management System Counts (TFMSC) data, T100 data[13], airport-reported data, and forecast fleet mix assumptions (as described in **Chapter 3**). This grouping represents the typical commercial aircraft anticipated to operate at AVL over the planning horizon. These aircraft generally have higher AAC, ADG, and TDG classifications than the other regularly scheduled commercial aircraft. Determining the critical aircraft is important when planning airfield and landside facilities as they may require specific facility design accommodations within their designated areas of operation.

Table 4-3 – Commercial Fleet Mix

AAC & ADG		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Subtotal by AAC	A	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0
	C	20,278	25,644	27,807	30,152	32,695	37,047	41,369
	D	50	410	486	571	668	757	845
Subtotal by ADG	I	0	0	0	0	0	0	0
	II	6,656	3,412	3,705	4,024	4,370	4,952	5,529
	III	13,672	22,642	24,587	26,699	28,993	32,852	36,684
	IV	0	0	0	0	0	0	0

Note 1: AAC: Group C (i.e., A220, A319, B717-200, B737-700, ERJ-145/175, etc.); Group D (i.e., B737-800/900, etc.)
Note 2: ADG: Group II (i.e., CRJ-200/700, ERJ 145, etc.); Group III (i.e., A220, A319/320, B737-700/800/900, etc.)
Source: GARAA, CHA 2023.

4.1.4 Airport & Runway Classification

The FAA classifies airports and runways based on their current and planned operational capabilities. These classifications, described below, combined with the aircraft classifications defined previously, were used to determine the appropriate FAA standards (as per AC 150/5300-13B) for airfield facilities.

Airport Reference Code (ARC)

ARC is an airport designation that represents the AAC and ADG of the aircraft that the airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The Airport's previous 2013 Airport Layout Plan (ALP) identified the Boeing 737-700 as the critical aircraft for airfield and pavement design.

[13] The Bureau of Transportation Statistics (BTS) uses a form (Form T-100) to gather monthly traffic reports from certificated air carriers in the United States. These traffic reports provide information regarding domestic and international markets, as well as domestic and international segments. The data collected is then made available to the public via BTS's Air Carrier Statistics Database, also known as the T-100 data bank.

Based on changes to the fleet mix in the years following the previous ALP, the current critical aircraft has been identified as the Boeing 737-800. Allegiant Air, the largest carrier operating at AVL, will be phasing out their Airbus A319 and A320 aircraft during the planning period, in favor of Boeing 737 MAX 7 and 737 MAX 8-200 aircraft. Given this, and characteristic similarities to the existing design aircraft, it is recommended the future design aircraft revised as the Boeing 737-800 MAX. Although the specific critical aircraft model has changed since the previous Master Plan and ALP, the past, present, and future models consist of ARC C/D-III. As such, the overall airfield classification will remain consistent over time.

4.2 AIRFIELD CAPACITY REQUIREMENTS

Airfield capacity refers to the maximum number of aircraft operations (takeoffs or landings) an airfield can accommodate in a specified amount of time. Assessments of AVL's airfield's current and future capacity were performed using common methods described in FAA AC 150/5060-5, *Airport Capacity and Delay*.

4.2.1 FAA AC 150/5060-5, Airport Capacity and Delay

FAA AC 150/5060-5, *Airport Capacity and Delay*, explains how to compute airfield capacity for the purposes of airport planning and design. This evaluation helped to determine any capacity-related improvements or expansions that may be needed to support flight activity levels. The estimated capacity of the airfield at AVL was expressed in the following measurements:

- Hourly Capacity – The maximum number of aircraft operations an airfield can safely accommodate under continuous demand in a one-hour period. This expression accounts for Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) conditions and is used to identify any peak-period constraints on a given day.
- Annual Service Volume (ASV) – The maximum number of aircraft operations an airfield can accommodate in a one-year period without excessive delay. This calculation is typically used in long-range planning and referenced for capacity-related improvement.

AC 150/5060-5 provides estimated hourly airfield capacity for VFR and IFR operations, as well as the ASV based on runway configurations and the type of aircraft operating (or projected to operate) at an airport. The runway configuration and aircraft fleet mix, as they pertain to AVL, are further examined in the subsequent sections.

Calculating Hourly Capacity and Air Service Volume

This section details the methodology for calculating hourly capacity and air service volume.

<u>Aircraft Fleet Mix Index</u>

The first step in evaluating air service volume is to determine the aircraft fleet mix index. An airport's fleet mix index is determined by the size of typical aircraft and the frequency of their operations. To identify the aircraft mix index, AC 150/5060-5, *Airport Capacity and Delay*, establishes four categories in classifying an aircraft by its maximum takeoff weight (MTOW), as depicted in **Table 4-4**.

Table 4-4 – Aircraft Capacity Classifications

Aircraft Class	MTOW (lbs)	Number of Engines	Wake Turbulence
A	<12,500	Single	Small (S)
B		Multi	
C	12,500 – 300,000	Multi	Large (L)
D	>300,000	Multi	Heavy (H)

Source: FAA AC 150/5060-5, CHA, 2023.

The aircraft mix index is calculated using the formula *% (C + 3D)*, the letters corresponding with the aircraft class. This product falls into one of the FAA-established mix index ranges listed below and is used in capacity calculations herein:

- 0 to 20
- 21 to 50
- 51 to 80
- 81 to 120
- 121 to 180

The current facilities at the Airport can accommodate all four aircraft classes. The following operations percentages for aircraft categories C and D were gathered from a review of operations that occurred in 2021 (Base Year):

- Class C = 31.0 percent of the Airport's operations
- Class D = 0.9 percent of the Airport's operations

As such, the Base Year aircraft mix index is 33.6 [31.0 + 3(0.9) = 33.6], which falls within the 21 to 50 mix index range.

The projected operation percentages by aircraft class depicted in **Table 4-5** were utilized to project the future aircraft fleet mix index for each PAL.

Table 4-5 – Projected Operations by Aircraft Class (%)

Aircraft Class	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
A	25.8%	25.5%	25.2%	24.9%	23.8%	22.9%
B	33.2%	32.7%	32.2%	31.7%	30.4%	29.1%
C	38.5%	39.3%	40.2%	40.9%	43.4%	45.6%
D	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%

Source: FAA TFMSC, Bureau of Transportation Statistics (T-100 Data), GARAA, CHA, 2023.

Based on the fleet mix changes described in **Chapter 3**, specifically related to commercial activity, the aircraft fleet mix index is anticipated to slightly increase from the Base Year mix index of 33.6, with the projected mix indexes continuing to fall within the 21 to 50 mix index range through PAL 5; however, in PAL 6, the mix index is projected to fall within the 51 to 80 mix index range. The projected fleet mix indexes by PAL are depicted in **Table 4-6**.

Table 4-6 – Aircraft Mix Index

Timeframe	Aircraft Fleet Mix Index	Aircraft Mix Index Range
Base	33.6	21 to 50
PAL 1	45.7	21 to 50
PAL 2	46.5	21 to 50
PAL 3	47.4	21 to 50
PAL 4	48.1	21 to 50
PAL 5	50.6	21 to 50
PAL 6	52.8	51 to 80

Source: FAA AC 150/5060-5, CHA 2023.

Runway Use Configuration

The principal determinants of an airfield's layout or configuration are the number and orientation of runways. The efficiency and functionality of the runways used in conjunction with the taxiways and aprons during the various levels of aviation activity directly affects an airport's operational capacity.

AVL has one runway, Runway 17/35, which has a generally north/south orientation. Thus, a single runway configuration was assumed throughout the planning horizon when using the methodologies presented in AC 150/5060-5.

Runway-use Configuration No. 1 from AC 150/5060-5 *Figure 2-1, Capacity and ASV for Long Range Planning*, was chosen to represent the runway configuration at AVL, which is presented in **Table 4-7.**

Table 4-7 – Capacity and ASV for Long Range Planning

Mix Index	Hourly Capacity (Ops/Hr)		Annual Service Volume (Ops/Yr)
% (C+3D)	VFR	IFR	
0 to 20	98	59	230,000
21 to 50	74	57	195,000
51 to 80	63	56	205,000
81 to 120	55	53	210,000
121 to 130	51	50	240,000

Source: FAA AC 150/5060-5 [*Figure 2-1]*, CHA, 2023.

Table 4-8 further depicts how the previously discussed aircraft mix index relates to the Capacity and ASV for Long Range Planning table.

Table 4-8 – Capacity and ASV for Long Range Planning (AVL Aircraft Mix Index)

Mix Index	Hourly Capacity (Ops/Hr)		Annual Service Volume (Ops/Yr)
% (C+3D)	VFR	IFR	
0 to 20	98	59	230,000
21 to 50	74	57	195,000
51 to 80	63	56	205,000
81 to 120	55	53	210,000
121 to 130	51	50	240,000

Source: FAA AC 150/5060-5 [*Figure 2-1*].

Hourly Capacity

As outlined in AC 150/5060-5, *Chapter 2: Capacity and Delay Calculations for Long Range Planning,* hourly capacity estimates were made under the following assumptions:

- Percent Arrivals: Arrival operations equal departure operations.
- Percent Touch and Goes: Percent of touch and goes is within the ranges shown in AC 150/5060-5, *Table 2-1*. Based on AVL's Aircraft Mix Index, the percent of touch and go operations were assumed between 0 and 40 percent through PAL 5 and between 0 and 20 percent in PAL 6, which aligns with projected activity levels at AVL (between 17.8 and 20.5 percent through PAL 5 and approximately 17.0 percent in PAL 6).
- Taxiways: Full-length parallel taxiway, ample runway entrance/exit taxiways, and no taxiway crossing problems. These assumptions accurately represent the taxiway layout at AVL.
- Airspace Limitations: There are no airspace limitations which would adversely impact flight operations or otherwise restrict aircraft which could operate at the Airport.
- Runway Instrumentation: The airport has at least one runway end equipped with an Instrument Landing System (ILS) and has the necessary Air Traffic Control (ATC) facilities and services to carry out operations in a radar environment. This assumption is true for AVL, as Runways 17 and 35 are both equipped with an ILS, and the Airport has the necessary ATC facilities and services.

Based on the runway-way use configuration and aircraft mix index at AVL, and in accordance with FAA AC 150/5060-5, current and future hourly capacity (or operations per hour) through PAL 5 under VFR and IFR conditions are approximately 74 and 57 operations, respectively. In PAL 6, hourly capacity under VFR and IFR conditions is projected at approximately 63 and 56 operations, respectively. See **Table 4-9**.

Table 4-9 – Capacity and ASV for Long Range Planning (AVL Hourly Capacity)

Mix Index	Hourly Capacity (Ops/Hr)		Annual Service Volume (Ops/Yr)
% (C+3D)	VFR	IFR	
0 to 20	98	59	230,000
21 to 50	**74**	**57**	195,000
51 to 80	**63**	**56**	205,000
81 to 120	55	53	210,000
121 to 130	51	50	240,000

Source: FAA AC 150/5060-5 [*Figure 2-1*].

When evaluating AVL's ability to accommodate hourly activity levels, average hourly activity and peak hour activity levels were independently examined. Per TFMSC data, from 2019 through 2022, AVL averaged approximately 10 hourly operations. As previously shown in **Table 4-1**, AVL had approximately 28 operations during the Airport's peak hour in the Base Year, which is projected to increase to approximately 36 operations by PAL 4, extending to 40 operations by PAL 6. Based on the hourly capacity parameters presented in **Table 4-9**, AVL is anticipated to accommodate average hourly operations and peak hourly operations throughout the forecast horizon.

Annual Service Volume

Annual Service Volume (ASV) is an expression of the total number of aircraft operations that an airfield can support per annum. As outlined in AC 150/5060-5, *Chapter 2: Capacity and Delay Calculations for Long Range Planning,* air service volume estimates were made under the following assumptions:

- VFR weather conditions occur roughly 10 percent of the time
- Runway-Use Configuration: Roughly 80 percent of the time the airport is operated with the runway-use configuration which produces the greatest capacity

Based on the runway-use configuration and mix index, and as shown in **Table 4-10**, annual air service volume at AVL is expected to remain approximately 195,000 operations per year through PAL 5. In PAL 6, ASV is expected to be approximately 205,000 operations.

Table 4-10 – Capacity and ASV for Long Range Planning (AVL ASV)

Mix Index	Hourly Capacity (Ops/Hr)		Annual Service Volume (Ops/Yr)
% (C+3D)	VFR	IFR	
0 to 20	98	59	230,000
21 to 50	74	57	195,000
51 to 80	63	56	205,000
81 to 120	55	53	210,000
121 to 130	51	50	240,000

Source: FAA AC 150/5060-5 [*Figure 2-1*].

If the annual aircraft operations exceed the ASV, the airport is likely to see significant delays; however, an airport can still experience delays before capacity is reached. Activity levels that may trigger capacity planning and development are discussed in FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP)*, which indicates (via Table 4-4 of Order 5090.5). This allows an airport to make necessary improvements and avoid delays before they are anticipated to occur.

Per the previously discussed FAA Order, 60 percent ASV is the trigger for planning a new runway or extended runway to increase hourly capacity and the trigger for development is being within five years of the ASV reaching 80 percent.

As shown in **Table 4-11**, airfield capacity at AVL is expected to range from 38.8 percent in the Base Year to 52.5 percent in PAL 5 and only reaching 52.1 percent by PAL 6.

Table 4-11 – Annual Service Volume

Factor	Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Annual Operations	75,738	83,712	88,169	92,819	97,995	102,436	106,846
Annual Service Volume	195,000	195,000	195,000	195,000	195,000	195,000	205,000
Capacity Level	**38.8%**	**42.9%**	**45.2%**	**47.6%**	**50.3%**	**52.5%**	**52.1%**

Source: FAA AC 150/5060-5, CHA, 2023.

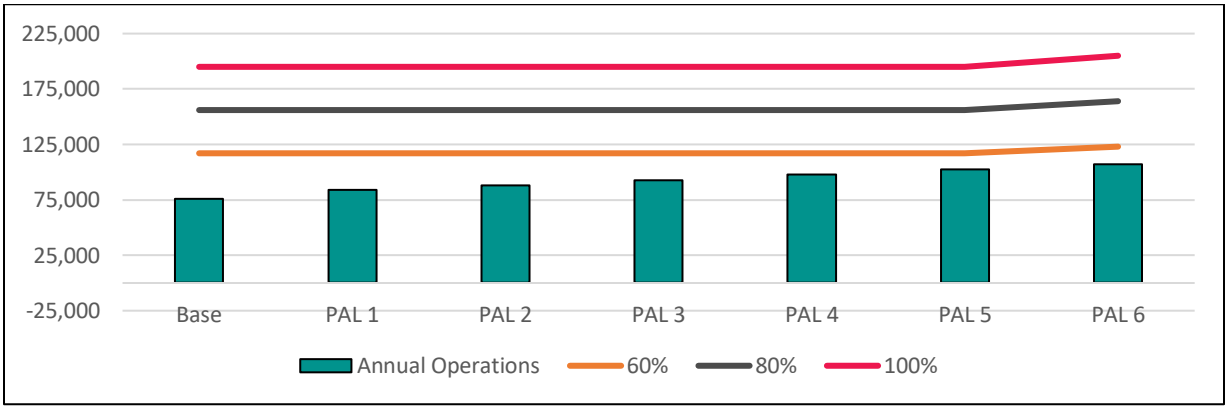
Table 4-12 presents the forecasted operational limits at specific capacity levels to trigger future planning for another runway at AVL. As shown, the current runway capacity should be adequate to serve the Airport's activity well beyond the planning horizon. As activity at AVL is forecast to reach a maximum of approximately 50 percent capacity, improvements in airfield capacity are not necessary. Projected demand and capacity levels are further depicted in **Figure 4-1**.

Table 4-12 – Capacity Levels

Capacity Level	Base Year – PAL 5	PAL 6
60%	117,000	123,000
80%	156,000	164,000
100%	195,000	205,000

Source: FAA AC 150/5060-5, CHA, 2023.

Figure 4-1 – Projected Demand



Source: FAA AC 150/5060-5, CHA, 2023.

4.3 RUNWAY AND TAXIWAY REQUIREMENTS

Airfield improvements are planned and developed according to the established ARC, ADG, and TDG for an airport. The associated design criteria are applied when planning upgrades or improvements for a runway or taxiway. An airport's ARC is determined by the critical aircraft (aircraft with the longest wingspan, highest tail, and fastest approach speeds) that makes "regular use" of the airport or a specific runway. FAA AC 150/5000-17, defines "regular use" as 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations (an operation is either an arrival or departure).

4.3.1 Runway Requirements

In 2020, AVL completed a runway reconstruction project--replacing Runway 16/34 with Runway 17/35. The newly constructed runway is 8,002 feet by 150 feet and can accommodate up to C-IV aircraft. While the new runway is the same dimensions, the centerline was shifted 75 feet west to provide a standard 400 feet of separation between the runway and the parallel taxiway (Taxiway A).

Airfield Configuration & Wind Coverage

The general configuration of the airfield, including the number of runways along with their location/orientation, should allow the airport to meet anticipated air traffic demands and maximize wind coverage and operational utility for all types of aircraft. It is a FAA recommendation that the runway system at an airport be oriented to provide at least 95 percent wind coverage. This means that 95 percent of the time in a given year, the crosswind coverage at an airport is within acceptable limits for the types of aircraft operating on the runways. As shown in **Table 4-13**, the current single runway configuration at AVL provides wind coverage greater than the FAA recommended 95 percent for the design aircraft. Furthermore, Runway 17/35 alone provides well over 95 percent wind coverage for all crosswind components. **Table 4-13** also includes the annual wind coverage separately during both IFR and VFR conditions. That evaluation also demonstrates nearly 100 precent wind coverage at AVL under all conditions. **Figure 4-2** provides a depiction of the average wind speed and direction at AVL. The graph illustrates that the predominant of wind from the north-northwest and south-southwest is in direct alignment of Runway 17/35.

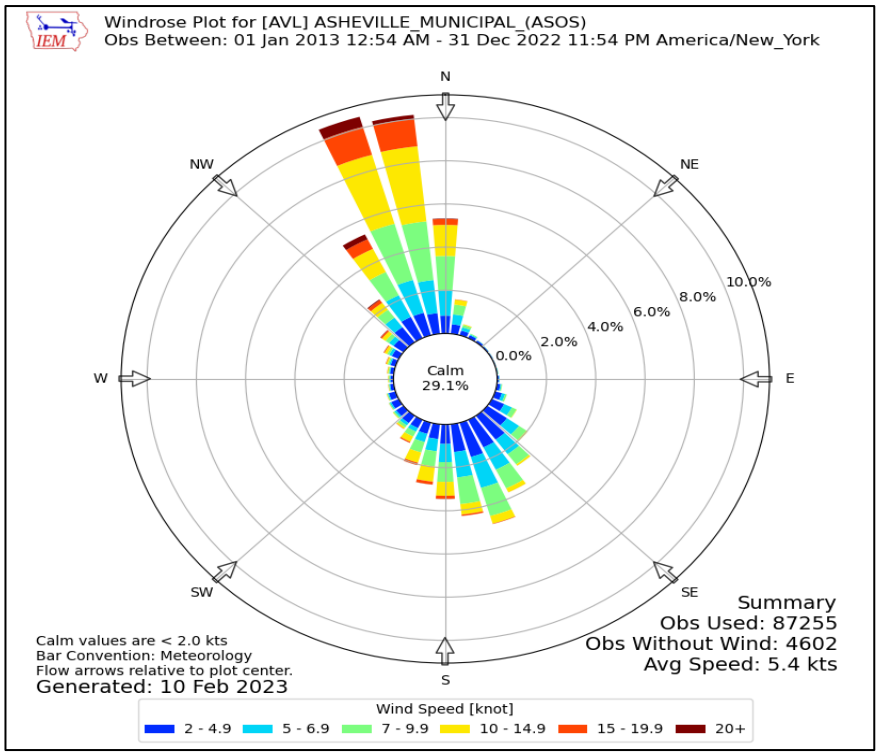
Table 4-13 – AVL Wind Coverage (Runway 17/35)

Weather Condition	10.5 Knots	13 Knots	16 Knots	20 Knots
All Weather	99.60%	99.89%	99.98%	100%
IFR	99.69%	99.87%	99.96%	100%
VFR	99.55%	99.89%	99.99%	100%

Note: Data is provided by NOAA's Integrated Surface Database (ISD). Data available from 2013 through 2022. Data accessed 14 September 2022 via FAA's Airport Data and Information Portal (ADIP).
Source: NOAA, FAA, CHA, 2023.

As such, it was concluded that no changes to the runway configuration are recommended during the planning horizon to accommodate wind conditions.

Figure 4-2 – All-Weather Windrose



Source: Iowa State University Environmental Mesonet, 2023.[14]

Runway Designations

Due to the changes in the earth's magnetic declination over time, the compass heading of a runway and its associated runway end number designations can change. Current magnetic declination information was derived from the National Oceanic and Atmosphere Administration (NOAA). The current headings and declinations[15] of the runway ends at AVL are as follows:

- Runway 17
  - Current headings: 167° magnetic (rounds and truncates to 17), 160° true
  - Declination: 6° 51' 25'' W ± 0° 22' changing by 0° 3' 6'' W per year

[14] Iowa State University. *Environmental Mesonet*. https://mesonet.agron.iastate.edu/sites/dyn_windrose.phtml?station=AVL&network=NC_ASOS&bin0=2&bin1=5&bin2=7&bin3=10&bin4=15&bin5=20&conv=from&units=kts&nsector=36&fmt=png&dpi=100&year1=2013&month1=1&day1=1&hour1=0&minute1=0&year2=2023&month2=12&day2=31&hour2=23&minute2=59. Accessed 09 February 2023.

[15] National Oceanic and Atmospheric Administration (NOAA) / National Centers for Environmental Information. "Magnetic Field Calculators." 19 January 2023. https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm

- Runway 35
  - Current headings: 347° magnetic (rounds and truncates to 35), 340° true
  - Declination: 6° 51' 38'' W ± 0° 22' changing by 0° 3' 7'' W per year

Currently, no changes in the runway designations of 17/35 are needed; however, since magnetic declination changes slowly over time, the runway numbers may need to be reevaluated by PAL 4, at which time the magnetic declination may have changed more significantly.

Runway Design Standards

During this master planning effort, FAA design and safety standards related to the airfield facilities were identified so that the airport may review and work to achieve compliance where needed. The standards include dimensions, separation distances, protection zones, clearance requirements, etc., which are based on the critical aircraft.

Runways are assigned a Runway Design Code (RDC), which signifies the required design standards that the runway must satisfy. As detailed in **Chapter 3, *Forecasts of Aviation Demand*,** D-III represents the current and future critical aircraft grouping at AVL, with a B737-800 being an example of a D-III aircraft operating at AVL. When constructed, Runway 17/35 was built to D-IV standards, thus accommodating the Airport's critical aircraft.

The key FAA design and safety standards related to Runway 17/35 at AVL (as defined in AC 150/5300-13B, *Airport Design*) are described below. Refer to **Figure 4-3**.

Runway Width – Runway width requirements are based on the critical aircraft associated with the runway. ARC D-III runways are required to have a runway width of 150 feet when the critical aircraft has a maximum certified takeoff weight greater than 150,000 pounds, such as the B737-800.

Runway 17/35 is 150 feet wide, thereby meeting this design requirement.

Runway Shoulders – Shoulders provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment and the occasional passage of an airplane veering from the runway. The FAA recommends paved shoulders for runways accommodating Group C/D-III aircraft and higher. FAA AC 150/5300-13B indicates the required shoulder width to be 25 feet on either side of a Group C/D-III runway.

Runway 17/35 is equipped with paved shoulders that are 25 feet in width, thus meeting the runway shoulder requirements.

Runway Safety Area (RSA) – The RSA is a rectangular area bordering a runway that is intended to reduce the risk of damage to aircraft in the event of an undershoot, overrun, or excursion from the runway. The RSA is required to be cleared and graded such that it is void of potentially hazardous ruts, depressions, or other surface variations. Additionally, the RSA must be drained by grading or storm sewers to prevent water accumulation, be able to support snow removal and firefighting equipment, and be free of objects except those required because of their function.

The RSA for a Group C/D-III or Group C/D-IV runway is required to be 500 feet wide and extend 1,000 feet beyond the runway end. The longitudinal grade beyond the end of the runway should be between 0.0 percent to -3.0 percent for the first 200 feet and no more than -5.0 percent for the remaining 800 feet of the RSA. Transverse grades should be -1.5 percent to -3.0 percent away from the runway shoulder edge and beyond the runway ends.

The RSAs for Runway 17/35 meet the required design standards.

Runway Object Free Area (ROFA) – The ROFA is a rectangular area bordering a runway intended to provide enhanced safety for aircraft operations. This is accomplished by ensuring the area remains clear of parked aircraft or other equipment not required to support air navigation or the ground maneuvering of aircraft. The ROFA design standard for Group C/D-III and Group C/D-IV runways is 800 feet wide, centered about the runway centerline, and extends 1,000 feet beyond each runway end.

The ROFA for Runway 17/35 meets FAA design standards; however, for both runway ends the FAA ILS glideslope antenna and equipment building are located within the ROFA. The FAA may consider relocating the equipment buildings outside the ROFA.

Runway Object Free Zone (ROFZ) – The ROFZ is a volume of airspace centered above the runway that is required to be clear of all objects, except for frangible navigational aids that need to be in the ROFZ because of their function. The ROFZ provides clearance protection for aircraft landing or taking off from the runway. The ROFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline.

As required per FAA standards, the Runway 17/35 ROFZ extends 200 feet beyond each end of the runway, and its width is based on visibility minimums and aircraft size, with a 400-foot width requirement. AVL satisfies the ROFZ standards.

Runway Blast Pads - Like runway shoulders, blast pads are intended to provide erosion protection at the runway ends. Conformance to FAA design criteria for C/D-III runways consists of a blast pad having a width of 200 feet and length of 200 feet, placed symmetrically at each of the runway.

Runway 17/35 has a blast pad at each runway end providing the required dimensions.

Building Restriction Line (BRL) – Though not a specific FAA design standard, the BRL is a reference line which provides generalized guidance on building location and height restrictions. The BRL is typically established with consideration to OFAs and RPZs, as well airspace protection by identifying areas of allowable building heights (e.g., 35 feet above ground level). It should be noted that site-specific terrain considerations (i.e., grade/elevation changes) may allow buildings taller than indicated by the generalized BRL to be developed within the limits of the BRL. These height restrictions are based on FAR Part 77 parameters and are evaluated for each specific site development plan. The facilities at AVL do not penetrate the existing BRL.

Table 4-14 identifies the existing conditions at AVL and the geometric requirements of the above standards relative to ARC D-III.

Table 4-14 – FAA Runway Design Standards

Design Standard	FAA Runway Design Standards D-III * (< ¾ mile visibility)	AVL Runway 17/35: Meet or Exceed (Yes / No)
Runway Width	150’	Yes
RSA Width	500’	Yes
RSA Length Beyond Runway End	1,000’	Yes
ROFA Width	800’	Yes
ROFA Length Past Runway End	1,000’	Yes
Runway OFZ Width	400’	Yes
Separation Between:		
Runway Centerline to Parallel Taxiway Centerline	400’	Yes
Runway Centerline to Hold line	250’	Yes
Approach Runway Protection Zone (RPZ):		
Length	2,500’	Yes
Inner Width	1,000	Yes
Outer Width	1,750	Yes
Departure Runway Protection Zone (RPZ):		
Length	1,700	Yes
Inner Width	500	Yes
Outer Width	1,010	Yes

*With a critical aircraft over 150,000 pounds MTOW.
Source: FAA AC 150/5300-13B, CHA 2023.

Runway Protection Zone (RPZ)

The RPZ is a land use control that is primarily meant to enhance the protection of people and property on the ground through airport control. Such control includes clearing of RPZ areas of incompatible objects and activities.

RPZ Dimensions

Runways may have two types of RPZs, the Approach RPZ and Departure RPZ, which have varying dimensions based on the design aircraft’s AAC and ADG, as well as the runways’ visibility minimums. The RPZ is a trapezoidal area located 200 feet beyond the runway end and centered on the extended runway centerline.

The Approach RPZ under Group C/D-III and -IV design standards when the visibility is less than ¾ miles requires an inner width of 1,000 feet, outer width of 1,750 feet, and a length of 2,500 feet. The Departure RPZ under these same conditions are an inner width of 500 feet, outer width of 1,010 feet, and length of 1,700 feet. Departure RPZs are used if and when a runway displaced threshold is in place. Currently the runway ends at AVL do not contain a displaced threshold.

The RPZs for Runway 17/35 meet the RPZ dimensions. See **Figure 4-4**.

Incompatible Land Use Within the RPZs

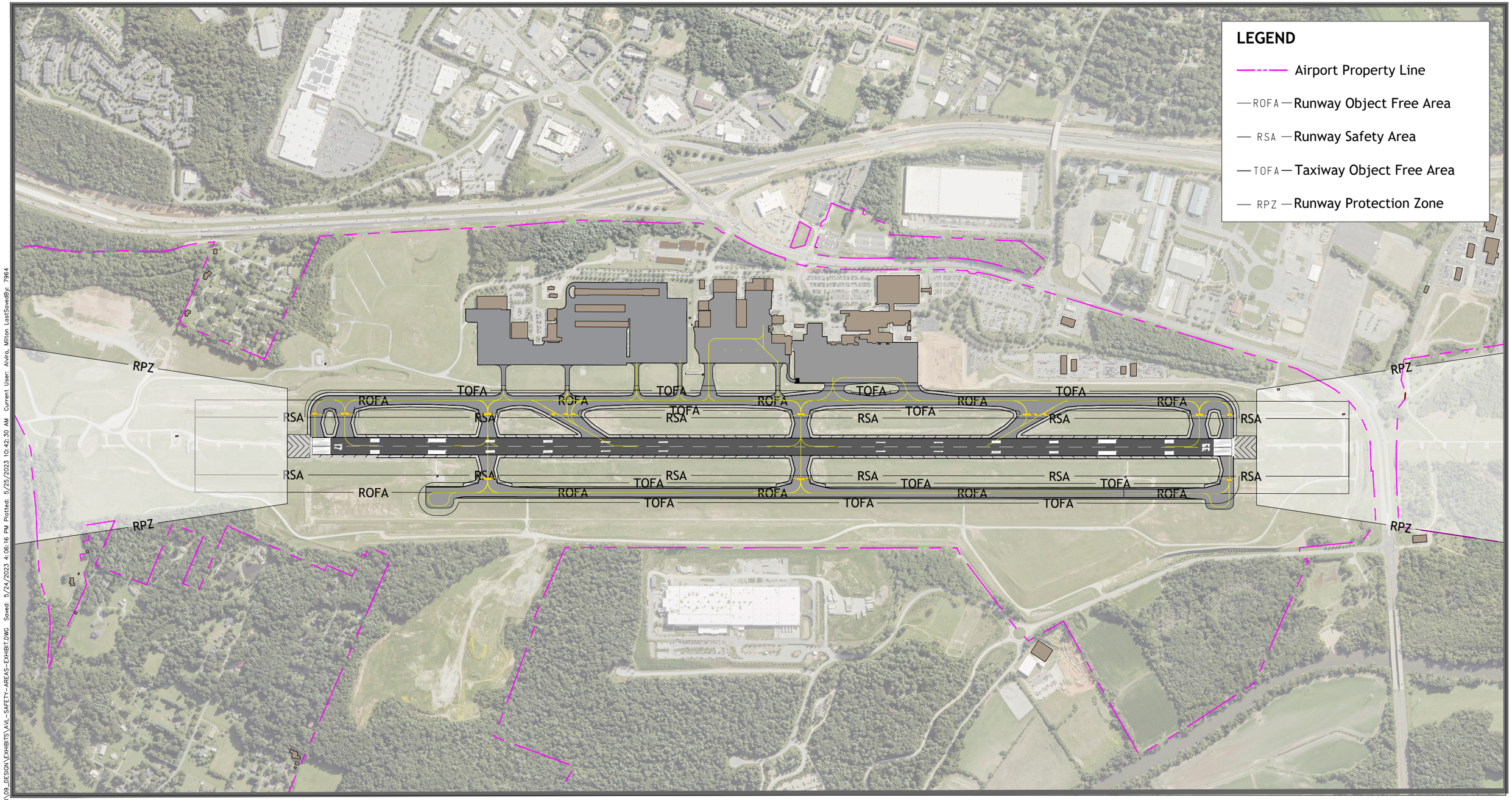
Incompatible land uses consist of homes, or any other development that contains a concentration of people such as occupied buildings of any type. Incompatible land uses can also consist of physical obstructions, visual distractions, or wildlife attractants which can threaten the safety of aircraft operations. According to AC 150/5190-4B, *Airport Land Use Compatibility Planning,* compatible land uses consist of "those that can coexist with a nearby airport without constraining the safe and efficient operation of the airport or exposing people living and/or working nearby to significant environmental impacts." The primary characteristics that are typically considered when determining land use compatibility include:

- Noise
- Airspace
- Visual/Atmospheric Interference
- Wildlife
- Protection of People and Property
- Development Density

Each of the previously defined RPZs were evaluated at a high-level for incompatible land uses, with an emphasis given to airspace and protection of people and property. Land use within the existing RPZs at AVL were determined to satisfy the key FAA standards.

The Runway 17 RPZ contains several roadways, some of which pass through Airport-owned property. Roadways within the RPZ include portions of State Road 3496 and Pinner Road. Runway 35 RPZ contains portions of New Airport Road and State Highway 280, portions of Hunter Airport Drive, French Broad Lane, and areas operated by Broadmoor Golf and Event Center (i.e., public parking, private roadways, etc.).

It is recommended that GARAA seek opportunities to eliminate, reduce, or mitigate existing incompatible land uses; however, it is acknowledged that roadways and parking exist in most airport RPZs. While not ideal, such land uses are not prohibited unless traffic lights and intersections result in standing traffic and associated concentrations of people. Options to address incompatible land uses within the RPZ are further discussed during the Alternatives evaluation.



Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

GRAPHIC SCALE (FEET)
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Figure 4-3
Airfield Design Standards

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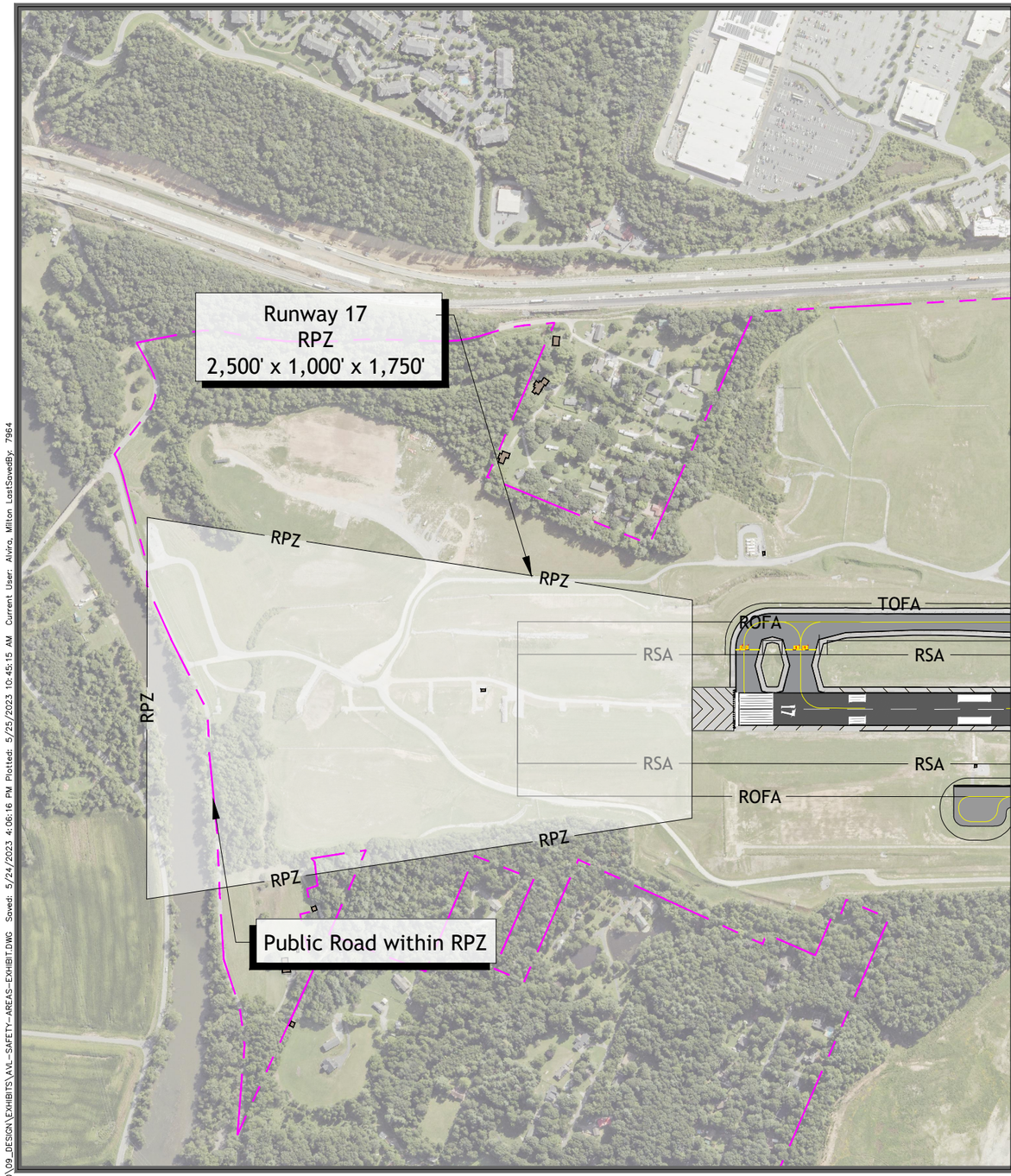

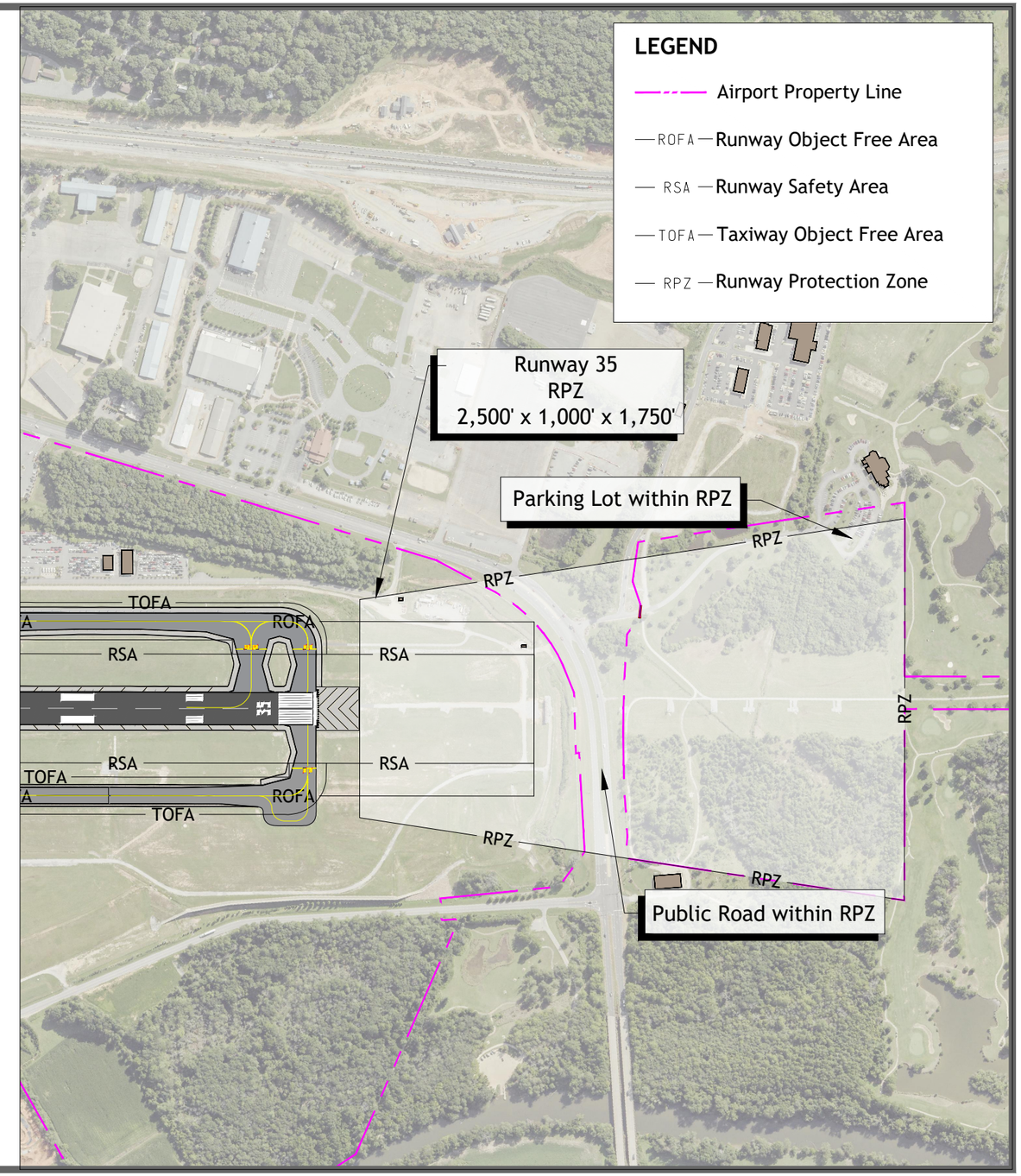

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Figure 4-4
Runway Protection Zones (RPZs)

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Runway Length Requirements

To ensure that AVL can support existing and anticipated aircraft and airline operational demands, a detailed runway length analysis was performed based on specific aircraft performance characteristics as documented in the manufacturer's Aircraft Planning Manuals (APMs). Inadequate runway length can limit the operational capability of an airport, including the aircraft types that can operate and the destinations that the airport serves. Runway lengths can place restrictions on the allowable takeoff weight of the aircraft, which then reduces the amount of fuel, passengers, or cargo that can be carried. The runway analysis herein was conducted using the guidance provided in AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

Aircraft Specifics

Factors specific to aircraft operating at AVL that were included within the runway length calculations were as follows:

- Model and Engine Type – the calculations specified herein represent the takeoff & landing length requirements for the Airbus A320-200, Boeing B737-800 and the B737 MAX 8 during the hottest mean day temperature (85.9°F) at a 2,000-foot Airport Altitude for AVL. Note, for calculation purposes, aircraft takeoff and landing performance charts with International Standard Atmosphere/Standard (ISA/STD) plus 15°C were utilized to represent the hottest mean day temperature of 85.9°F.
- Payload – represents the carrying capacity of the aircraft, including passengers, baggage, and cargo. For this analysis, both 90 percent and 100 percent were chosen as the payload for planning purposes.[16]
- Estimated Takeoff Weight – the estimated weight at takeoff, which includes the payload and the fuel required to reach the intended destination (with reserve fuel). The estimated takeoff weight varies by aircraft, payload, and destination.
- Estimated Landing Weight – the estimated weight at landing. For this analysis, maximum landing weight was used to determine runway landing requirements.

Airport Specifics

- Temperature – the atmospheric temperature at the airport. Warmer air requires longer runway lengths because the air is less dense, thus generating less lift on the aircraft. The average temperature (85.9°F) of the hottest month (July) at AVL was used in the calculations.[17]

[16] It should be noted that fuel burn was not accounted for within the evaluations; therefore, the calculations presented herein would need reassessed to include fuel burn prior to any runway reconstruction.

[17] Source: https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&location=NC&station=USW00013872

- Elevation – the elevation above sea level at the airport. As elevation increases, air density decreases, making takeoffs longer and landings faster. The elevation at AVL is established at 2,163.9 feet above mean sea level (MSL).
- Effective Runway Gradient – the difference between the highest and lowest elevations along the runway centerline, divided by the runway length.[18]
- Stage Length (flight distance) – the length in nautical miles (nm) to the intended destination. The stage length determines the amount of fuel an aircraft will require on takeoff to complete its flight, thus impacting aircraft weight and runway length requirements. For this Study, the length analysis was evaluated for the farthest destination currently served [Harry Reid International/Las Vegas Airport (LAS) – stage length: approximately 1,580.8 nautical miles], as well the farthest potential destination [Seattle-Tacoma International Airport (SEA) – stage length: approximately 1,908 nautical miles].
- Obstacles impacting departure climb were not included.

The runway length analysis was conducted to indicate current and the worst-case scenario, thus providing GARAA with the capability to plan long-term. The calculations discussed herein represent the takeoff and landing length requirements for the A320-200, B737-800, and the B737 MAX 8 during the hottest mean day temperature (approximately 85.9°F) at a 2,000-foot Airport Pressure Altitude.[19] These aircraft were chosen because they are the largest and most demanding aircraft currently and forecast to use AVL.

Takeoff Length Calculations

Table 4-15 depicts the aircraft takeoff weight for LAS, the current longest non-stop flight, and SEA, the longest anticipated future non-stop destination per the activity forecasts. These values were used along with the associated aircraft manufacturer performance charts (relevant to each aircraft/engine) to calculate the takeoff length requirements shown in **Table 4-16**.

It is pertinent to note, these calculations represent the worst-case scenario, which may only occur during peak activity levels, not daily. The runway's current length supports existing activity on an average day. Also, manufacturer data herein is generalized. Detailed discussions would need to occur with airlines operating at AVL, as airlines often have specific operations data to consider.

Based on the analysis for LAS, the aircraft with the most demanding takeoff length is the Boeing 737-800 at 8,666 feet. With adjustments for effective runway gradient (ERG), the determined takeoff length requirements for AVL based on a 2,000-foot pressure altitude and an ISA/STD of plus 15°C is 9,131 feet.

[18] Runway 17 Elevation (2,163.9 feet); Runway 35 Elevation (2,117.4 feet).

[19] Note: For calculation purposes, aircraft takeoff and landing performance charts with ISA/STD plus 15 degrees Celsius were utilized to represent the hottest mean day temperature of 86 degrees Fahrenheit.

Based on the analysis for SEA, the aircraft with the most demanding takeoff length is the Boeing 737-800 at 9,087 feet. With adjustments for effective runway gradient (ERG), the determined takeoff length requirements for AVL based on a 2,000-foot pressure altitude and an ISA/STD of plus 15°C is 9,552 feet.

Calculations were performed for takeoff length requirements at field elevation (2,163.9 feet MSL). Although the calculations focused on values based on a 2,000-foot pressure altitude, the field elevation takeoff lengths were slightly greater than the values calculated at a 2,000-foot pressure altitude. The maximum potential takeoff length requirement for AVL, based on the airport's field elevation (2,163.9 feet MSL) and an ISA/STD of plus 15°C is 9,296 feet when traveling to LAS and 9,892 feet for SEA.

Table 4-15 – Takeoff Weight to Destination (At 90% Max Payload)

Aircraft	Takeoff Weight to LAS (Pounds)	Takeoff Weight to SEA* (Pounds)
Airbus A320-200 (V2500 Engines)	156,405	161,969
Airbus A320-200 (CFM56 Engines)	155,494	161,000
Boeing 737-800 (CFM56-7 Engines)	170,087	177,522
Boeing 737 Max 8 (LEAP 1B Series Engines)	168,450	174,085

Source: Aircraft Performance Manuals (A320, B737-800, B737 MAX 8), CHA, 2023.

Table 4-16 – Takeoff Length Requirement (At 90% Max Payload)

Aircraft	Takeoff Length Requirement to LAS (Feet)*	Takeoff Length Requirement to SEA (Feet)*
Airbus A320-200 (V2500 Engines)	6,115	6,599
Airbus A320-200 (CFM56 Engines)	6,180	6,727
Boeing 737-800 (CFM56-7 Engines)	8,666	9,087
Boeing 737 Max 8 (LEAP 1B Series Engines)	8,066	9,000

Note: *Values have not been adjusted for effective runway gradient or wet runway conditions.

Source: Aircraft Performance Manuals (A320, B737-800, B737 MAX 8), CHA, 2023.

Landing Length Calculations

Landing length requirements were derived from the specific maximum landing weight values, both of which are presented in **Table 4-17**. The emergency landing weight, or the approximate landing weight for an aircraft needed to return to the airfield immediately after takeoff, was also determined.

Table 4-17 – Maximum Landing Weight & Landing Length Requirements

Aircraft	Maximum Landing Weight (Pounds)	Landing Length Requirements (Feet)	Emergency Landing Weight From LAS (Pounds)*	Emergency Landing Weight From SEA (Pounds)*
Airbus A320-200 (V2,500 Engines)	145,505	5,079	156,405	161,969
Airbus A320-200 (CFM56 Engines)	145,505	5,218	155,494	161,000
Boeing 737-800 (CFM56-7 Engines)	146,300	6,081	170,087	177,522
Boeing 737 Max 8 (LEAP 1B Series Engines)	152,800	6,128	168,450	174,085

Note: * The emergency landing length requirement values are a scenario-based calculation and does not represent actual operating procedures or manufacturer weight limitations during emergency return landings.
Source: Aircraft Performance Manuals (A320, B737-800, B737 MAX 8), CHA, 2023.

With the exception of the Airbus A320-200, the landing length requirement values for the B737-800 and B737 MAX 8 were calculated using only the maximum landing weight identified in the specific aircraft manufacturer APM. The calculated emergency landing weight for both Boeing aircraft exceeds the landing performance chart parameters and could not be used to calculate landing length requirements. Even so, the aircraft with the most demanding landing length is the B737 MAX 8 at 6,128 feet. With adjustments for wet runway conditions, the determined landing length requirement for AVL based on a 2,000-foot pressure altitude and an ISA/STD of plus 15°C is 7,047 feet for LAS and SEA.

Calculations were performed for landing length requirements at field elevation (2,163.9 feet MSL). Although the calculations focused on values based on a 2,000-foot pressure altitude, the field elevation takeoff lengths were slightly greater than the values calculated at a 2,000-foot pressure altitude. The determined landing length requirement for AVL is 7,077 feet if traveling from LAS and SEA. As such, it is concluded that the existing runway provides adequate length for landing throughout the planning period.

Runway Length Recommendation

To accommodate the future potential runway takeoff length requirements presented herein, a runway extension of approximately 1,000 feet is recommended to achieve a runway length of 9,002 feet, thus supporting farther stage lengths on hot days and/or with 90%+ payloads. This should be considered a future goal for AVL, but not a facility requirement. More detailed evaluations for specific airline requirements would be presented prior to advancing a runway extension.

4.3.2 Taxiway Requirements

The overall goal of airfield planning and design is to enhance efficiency and the margin of safety for operational activities. Per FAA guidance, and consultation with the airport operations and air traffic control personnel, the following specific goals were identified for the taxiway system at AVL:

- Accommodate all existing and projected users (commercial and general aviation)
- Reduce risk of pilot confusion

- Complexity of the taxiway system can lead to pilot confusion, which can lead to human error and the increased potential for runway incursions. Reducing the risk for pilot confusion includes:
  - Reducing the number of taxiways intersecting at a single location
  - Increasing the pilot's situational awareness (i.e., through proper signage and marking)
  - Avoiding wide expanses of pavement
  - Avoid potential "hot spots"
  - Increasing visibility

✈ Allow for expandability

- The taxiway system should be designed to enable the long-term expansion of other aviation facilities and the ability to provide efficient airside access to developable parcels of the airport.

✈ Adhere to all FAA design standards (based on ADG and TDG).

- Taxiways should be developed to the appropriate FAA standards associated with the ADG and TDG of the design aircraft

During construction of the new runway (Runway 17/35), a temporary runway was constructed on the west side of the airfield to allow the Airport to remain operational. After the new runway opened, the temporary runway was decommissioned and converted to a permanent parallel taxiway, designated as Taxiway B. For the purpose of this Study, all taxiways and connectors were evaluated to identify if each meet current FAA design standards based on the Airport's design aircraft (B737-800, ADG D-III and TDG-3). Design standards are addressed below.

Taxiway Design Standards

Similar to runways, taxiways are subject to FAA design requirements such as pavement width, edge safety margins, shoulder width, and safety and object free area dimensions. Note, while the taxiway system is adequate to meet TDG-4 requirements, the taxiway design standards evaluated herein are based on TDG-3 based on the critical aircraft.

The FAA standards in relation to taxiways (as defined in AC 150/5300-13A, *Airport Design*) are described below. See **Table 4-18**, **Table 4-19**, and **Figure 4-3**.

Table 4-18 – Taxiway Design Standards based on Airplane Design Group (ADG)

Design Standard	ADG-III
Protection Standards	
Taxiway Safety Area (TSA) Width	118 feet
Taxiway Object Free Area (TOFA) Width	171 feet
Taxiway Wingtip Clearance	26.5 feet
Separation Standards	
Taxiway Centerline to Parallel Taxiway	144.5 feet
Taxiway Centerline to Fixed or Moveable Object	85.5 feet

Source: FAA AC 150/5300-13B, CHA 2023.

Table 4-19 – Taxiway Design Standards based on Taxiway Design Group (TDG)

Design Standard	TDG-3
Taxiway Width	50 feet
Taxiway Edge Safety Margin	10 feet
Taxiway Shoulder Width	20 feet

Source: FAA AC 150/5300-13B, CHA 2023.

Taxiway Width – Taxiway widths and standards are based on the Airport's TDG, which is TDG-3. Based on FAA design standards, the recommended taxiway width for TDG-3 is 50 feet for the taxiways that serve the critical aircraft. For corporate/general aviation taxiways, TDG-2A/2B is appropriate at a width of 35 feet to accommodate large corporate jets (i.e., Gulfstreams, Global Express). Presently, all taxiways meet required design standard width of 50 feet, or 35 feet for general aviation taxiways (Taxiways G, H, J, and K).

Taxiway Shoulders – Airports, such as AVL, with a critical aircraft of ADG-III should provide stabilized or paved taxiway shoulders. AVL has a mix of paved and turf taxiway shoulders, all of which meet FAA standards.

Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA) – TSAs are designed to support the occasional passage of aircraft, as well as ARFF equipment. Per FAA AC 150/5030-13B, TOFAs are the "area adjacent to the TSA that is clear of objects not fixed-by-function to provide a vertical and horizontal wingtip clearance." Based on the critical aircraft grouping (ADG-III), the taxiway safety area (TSA) and taxiway object free area (TOFA) width requirements are required to be 118 feet and 171 feet, respectively, centered about the taxiway. The taxiway TSAs and TOFAs at AVL comply with FAA standards.

Taxiway Fillets – For taxiway turns onto runways, aprons, or additional taxiways, there are FAA design standards for the geometry of the fillets, based on the ADG and the angle of the turn. In conjunction with the runway reconstruction and the new taxiway, taxiway fillets at AVL have been updated to adhere to current FAA standards.

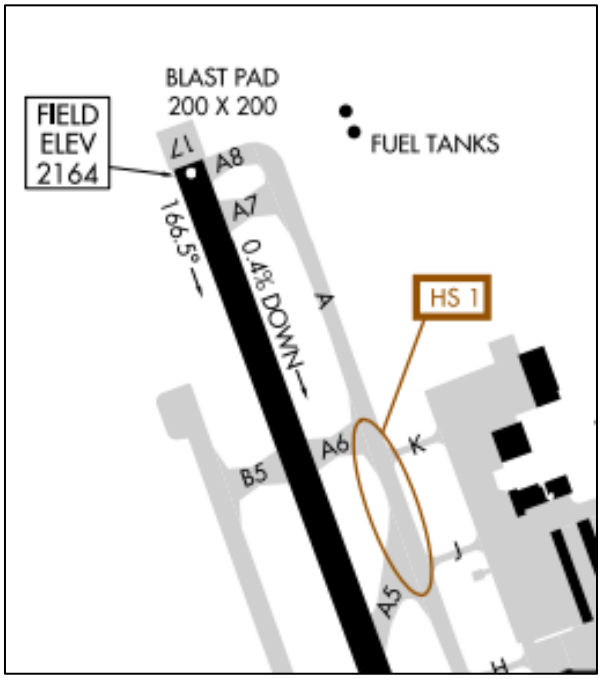
Parallel Taxiway Lengths – Per FAA standards, a parallel taxiway is "a continuous taxiway path located laterally to the runway it serves, providing access to one or both runway ends without entering the RSA or OFZ."

Two parallel taxiways exist at AVL. Taxiway A, located on the east side of Runway 17/35, is a full-length parallel taxiway and provides access to both runway ends. Taxiway B, located on the west side of Runway 17/35, is a partial length parallel taxiway. Taxiway B provides access to the Runway 35 approach end, as well as to taxiway connectors B3 and B5. It is recommended that Taxiway B be extended to a full-length taxiway, thus providing greater accessibility to the west side of the airfield and eliminating the need to cross the runway to access the north end of the runway.

Hot Spots – A hot spot is defined by the FAA as a "location on an airport movement area with a history of potential risk of a collision or runway incursion. Heightened attention by pilots/drivers/controllers is necessary when maneuvering through a hot spot."

One hot spot has been identified at AVL due to limited visibility from the tower of Taxiway A between taxiway connectors A5 and A6, as shown in **Figure 4-5**.

Figure 4-5 – Airfield Design Standards



Note: Full Airport Diagram available at aeronav.faa.gov.
Source: AVL Airport Diagram, 2023.

4.4 AIRFIELD LIGHTING AND NAVIGATIONAL AIDS REQUIREMENTS

Airfield lighting allows for the safe operation of aircraft during nighttime hours and low visibility conditions. Lighting on the airfield includes runway and taxiway lighting systems, approach lighting and navigational aids, and the rotating beacon.

4.4.1 Runway and Taxiway Lighting

Runway & Taxiway Edge Lighting

Edge lighting systems assist pilots in defining the edge of the runway and taxiway pavements during times of limited or low visibility.

Runway 17/35 is a precision runway. Thus, in accordance with FAA standards for precision runways, is equipped with High Intensity Runway Lights (HIRL). At AVL, the runway edge lights are white for the first 6,001 feet in either direction, with the last 2,000 feet being amber. The amber lights provide caution to pilots after landing that the runway end is approaching. Runway edge lighting must be positioned between 2 and 10 feet from the edge of full-strength pavement,

and not more than 200 feet apart. The Runway 17/35 edge lighting is currently positioned 10 feet from the edge of full-strength pavement, with each unit having 200 feet of separation.

All taxiways at the Airport are equipped with Medium-Intensity Taxiway Light (MITL) systems, which is the standard used for taxiways. To provide a distinct difference between runway and taxiway edges, taxiway edge lights are blue. Like runway edge lights, taxiway edge lights are required to be positioned between 2 and 10 feet from the edge of full-strength pavement; however, spacing between the lights is dependent upon taxiway section lengths.

All runway and taxiway edge lights at AVL adhere to FAA standards.

Runway Centerline Lighting

Runway 17/35 is equipped with bi-directional runway centerline lights, equally spaced 50 feet apart. Per FAA design standards, the centerline lights are white except for the last 3,000 feet. The centerline lights located between 3,000 and 1,000 feet from the runway ends are alternately placed white and red, with the final 1,000 feet being all red to provide an additional visual aid that the end of the runway is approaching.

Touchdown Zone Lighting

The TDZLs indicate the touchdown zone when landing under adverse visibility conditions. Runway 35 is equipped with touchdown zone lights, as it is the predominately used runway end at AVL. Per FAA standards, the touchdown zone lights consist of three lights grouped perpendicular to the centerline, with lights on either side of the centerline. The lights are placed starting 100 feet from the runway threshold, extending to 3,000 feet. The lights are only visible from the Runway 35 approach end.

Threshold Lighting

At AVL, Runways 17 and 35 have standard runway threshold lighting. As required by FAA for precision runways with HIRL, the threshold lighting system are grouped in fours on both sides of the runway thresholds, with each light spaced 10 feet (center to center). Since each runway has a blast pad, the threshold lights are placed between the threshold and blast pad. The threshold lights are red/green, with red lights being visible from departure and green lights being visible upon approach.

Precision Approach Path Indicators (PAPIs)

A PAPI is a system of lights, located near a runway end, that provides pilots with visual glide slope guidance information during an approach to the runway. PAPIs typically have an effective visual range of at least three miles during the day and up to 20 miles at night and inform pilots if they are high, low, or on the correct approach descent path for the threshold. A 4-box PAPI system (PAPI-4) is provided at the ends of Runway 17 and Runway 35 and are set at the standard 3-degree angle.

4.4.2 Approach Procedures and Navigational Aid (NAVIAD) Requirements

Based on current FAA classifications, there are three types of approach categories: visual, non-precision, and precision.

- Visual (V) – Approaches performed under visual flight rules only when meteorological conditions include a cloud ceiling height of 1,000 feet or greater and visibility of 3 miles or greater.
- Precision Approach (PA) – Instrument approach procedures providing both horizontal and vertical guidance less than 250 feet above the threshold and visibility minimums lower than ¾ mile.
- Non-Precision Approach (NPA) – Instrument approach procedures providing only lateral guidance with a ceiling minimum of 400 feet above the threshold.

Runway 17 and 35 each provide a precision approach using an ILS and one non-precision approach using RNAV GPS.

Precision Approach – ILS

The ILS systems each consists of three components: a localizer (LOC), a glideslope (GS), and the approach lighting system (ALS).

A localizer is situated 1,000 feet past the departure-end of each runway approach and provides lateral positioning guidance to pilots. The system uses radio frequencies (RF) to transmit signals to aircraft by focusing the RF beam down the centerline of the runway toward the approach end of the runway for approximately 10 miles, focused within 35 degrees to the left or right of the runway centerline.

The glide slope is located near the runway approach end (each on the west side of Runway 17/35) at a distance from the threshold to provide optimum crossing height. The glide slopes transmit a signal for approximately 10 nautical miles, with a horizontal coverage of eight degrees on each side of the localizer course, measured from the origin of the glide slope beam. Note, if the glide slope is inoperative, then the precision ILS approach can still be flown as a non-precision localizer-only procedure.

The ALS provides a lighted approach path along the extended centerline of the runway to provide a visual alignment, height perception, roll guidance, and horizontal reference for the pilot. At AVL, the ALS consists of a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). The MALSR at AVL adheres to FAA design standards.

Non-Precision Approaches: RNAV (GPS)

The Global Positioning System (GPS) based technology for Runway 17 and Runway 35 enables vertically guided approach procedures with approach capabilities similar to ILS approaches, without the need for the traditional ground-based ILS NAVAID components. The RNAV (GPS) systems follow FAA standards. Airfield lighting and instrumentation is summarized in **Table 2-9**.

Table 4-20 – Airfield Lighting & Instrumentation

Runway	Runway Markings	Lighting	Minimum Ceiling (AGL)/ Visibility	Instrument Approach Types
17	Precision	HIRL, PAPI-4, MALSR	200 ft. / ½ mile	ILS or LOC, RNAV (GPS)
35	Precision	HIRL, PAPI-4, MALSR	200 ft. / ½ mile	ILS or LOC, RNAV (GPS)

Source: FAA Airport Master Record (Form 5010), Accessed 2021.

GPS – Global Positioning System
HIRL – High Intensity Runway Lights
ILS – Instrument Landing System
MALSR – Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights
PAPI-4 – Four-Box Precision Approach Path Indicator
RNAV – Area Navigation

4.4.3 Other Airfield Lighting Requirements

Rotating Beacon

The rotating beacon at AVL is currently located on top of the existing Air Traffic Control Tower (ATCT). Relocation of the ATCT will require that the rotating beacon also be relocated, with the location being planned on top of the newly relocated tower.

4.5 SUPPORT FACILITY REQUIREMENTS

Support facilities provide vital functions related to the overall operation of the Airport and include facilities related to general aviation operations, aircraft fueling and deicing, Aircraft Rescue and Firefighting (ARFF) / Department of Public Safety, Airport maintenance, Air Traffic Control Tower (ATCT), and Urban Air Mobility (UAM). As airport operations increase, the use of these facilities and infrastructures increases, creating greater demand and less available capacity to meet this demand over the 20-year planning horizon. The following sections detail the current capacity and projected demand for the previously mentioned facilities.

4.5.1 General Aviation Facility Requirements

Hangar requirements are generally a function of the number and type of based aircraft, owner preferences, hangar rental costs, and area climate. In the winter, snowstorms, frost, ice, and intense wind can cause damage to parked aircraft. Additionally, during warmer months, heat and sun exposure can damage avionics and fade paint. Thunderstorms and hailstorms also occur, with the potential to cause considerable amounts of damage. All these factors make hangars desirable.

Aircraft Storage Facilities

Locally based operators and private owners at AVL employ use of hangar space. These hangars are fully enclosed and secured. **Table 4-21** lists each storage hangar at the Airport, as well as the owner, current use, and approximate storage capacity.

Table 4-21 – Existing Aircraft Storage Facilities

Building Number	Hangar Type	Hangar Size (Square Feet)
North Apron		
Building 240	Corporate Hangar	31,980
Building 30	Corporate Hangar	19,600
Building 20	Corporate Hangar	8,480
Building 40	Corporate Hangar	15,220
Total Storage		**75,280**
Middle Apron		
Building 20	T-Hangar (30 Units)	22,830
Building 40	T-Hangar (18 Units)	26,490
Building 60	T-Hangar (22 Units)	39,370
Total Storage		**88,690**
South Apron		
Building 104	Hangar 1	10,920
Building 104	Hangar 2	10,920
Building 31	Bulk Hangar	7,130
Building 35	Bulk Hangar	14,730
Building 168	Bulk Hangar	28,648
Building 120	Bulk Hangar	14,430
Building 122	Bulk Hangar	6,090
Total Storage		**92,868**
All Hangars (Total)		
Total Hangar Storage Capacity		**256,838**

Note: Square Feet (SF) – not adjusted for office space;
Reference **Chapter 2**, **Figure 2-11**.
Source: GARAA, CHA, 2023.

All hangars at AVL are controlled by Signature Flight Support, with Signature leasing hangars to numerous tenants. Based on the Inventory of Existing Conditions, all hangars are currently under lease, thus there is currently no excess capacity.

Over the forecast horizon, the Airport is projected to experience an increase in based aircraft, consisting predominately of single-engine aircraft (see **Table 4-22**). Additional hangars will be required to accommodate projected demand.

To develop a projection of required hangar space, assumptions were made based on average square feet of space required to store each type of aircraft and the forecasted fleet mix during the planning horizon. **Table 4-23** provides an overview of anticipated hangar space requirements based on the following assumptions:

- 1,100 SF (single- and multi-engine aircraft)
- 4,700 SF (jet aircraft)

Table 4-22 – Based Aircraft Forecast

Period	Base	PAL 1	PAL 2	PAL 3	PAL 4
Single-Engine	144	147	150	154	157
Multi-Engine	9	9	10	10	11
Jet	5	9	12	15	19
Helicopter	3	3	3	3	3
Total	**161**	**168**	**175**	**182**	**190**

Source: FAA 2021 TAF (National), Airport Master Record (Form 5010), CHA, 2023.

Table 4-23 – Projected Hangar Space Requirements

Aircraft Type	Base	PAL 1	PAL 2	PAL 3	PAL 4
Current & Projected Based Aircraft					
Single- & Multi Engine Aircraft	153	156	160	164	168
Jet Aircraft	5	9	12	15	19
Helicopters	3	3	3	3	3
Total	**161**	**168**	**175**	**182**	**190**
Additional Based Aircraft to Be Accommodated Each Planning Period					
Single- & Multi Engine Aircraft; Helicopters	-	3	4	4	4
Jet Aircraft	-	4	3	3	4
Helicopters	-	0	0	0	0
Total	**-**	**7**	**7**	**7**	**8**
Additional Hangar Storage Required (SF)					
Single- & Multi Engine Aircraft; Helicopters	-	3,300	4,400	4,400	4,400
Jet Aircraft	-	18,800	14,100	14,100	18,800
Helicopters	-	0	0	0	0
Total	**-**	**22,100**	**18,500**	**18,500**	**23,200**
Total Additional Hangar Space Through PAL 4		**82,300**			

Source: CHA, 2023.

Based on these assumptions and starting with current conditions, AVL is expected to need approximately 82,300 SF of additional hangar space by PAL 4: 16,500 SF for single- and multi-engine aircraft and 65,800 SF for jet aircraft. The single- and multi-engine aircraft could be accommodated within 15 T-hangar bays at 1,100 SF each, while bulk hangars could be constructed to accommodate jet aircraft.

Per conversations with Signature, over 75 additional aircraft, ranging from TBM 900 to the Challenger 300, frequent AVL. Depending on the need and length of stay, these aircraft require hangar storage or tie-down locations, as well as fuel. These additional aircraft further constrain current capacity. For the purposes of this Study, it was assumed that 20 percent of these additional aircraft will require accommodation at any given time, or approximately 15 aircraft. For these aircraft, an assumption of 2,500 SF per aircraft was assumed, for a total demand of 37,500 SF of storage.

In total, the projection for additional hangar space to accommodate future aircraft demand is approximately 119,800 (82,300 SF for based aircraft + 37,500 SF for transient aircraft), by PAL 4.

Note, as hangars are developed, this may result in a loss of tie-down parking. Locations for future hangar development are further examined in the Alternatives Chapter.

Helipad Facility Requirements

The demand for helipads was also evaluated. Three helicopters are currently based at the Airport, with no more than three anticipated to be based at the Airport throughout the forecast period. Currently, the Airport has two helipads: one adjacent to the Middle Apron and one adjacent to the South GA Apron. The existing helipads are adequate to support current and future demand. Parking and storage of based and transient helicopters is accommodated with fixed-wing aircraft.

4.5.2 Aviation Fueling Facilities

Signature Flight Support is responsible for operating the Airport's fuel storage and dispensing facilities. As stated in **Chapter 2**, the fueling area consists of six above-ground fuel tanks:

- Four 20,000-gallon Jet-A tanks
- One 12,000-gallon 100LL AvGas tank
- One 1,000-gallon self-serve tank for light piston aircraft (adjacent to the FBO facility)

This analysis focuses on Jet-A fuel storage. Presently, the existing fuel storage capacity provides less than two days of reserve fuel, which is less than the industry's standard of five to seven days reserve. For an airport like AVL, the minimum for current capacity would be around a three-day fuel reserve. An analysis was conducted to project the number of 40,000-gallon Jet-A storage tanks required to accommodate projected demand while maintaining a three-day reserve. See **Table 4-24**.

Current plans include installation of two additional 40,000-gallon Jet-A tanks, thus doubling fuel storage capacity as capacity would increase from 80,000 gallons to 160,000 gallons. This increase in capacity would provide three days reserve in the Base Year. Two more tanks would be required by PAL 1 (for a total of four new tanks), with one more additional tank needed in PAL 3 (for a total of five new tanks), and one final additional tank in PAL 5 (for a total of six new tanks) which will satisfy demand through PAL 6.

[Intentional Page Break]

Table 4-24 – Fuel Requirements

	Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Commercial Operations (Annually)	20,328	26,054	28,292	30,723	33,363	37,804	42,214
Commercial Operations (Daily Average) *	55	71	77	83	91	98	107
Approximate Daily Jet-A Fuel Usage (In gallons per day)	53,333	68,356	74,228	80,606	87,532	95,054	103,222
Total Jet-A Fuel Storage Capacity (In gallons)	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Approximate Days Fuel Reserve at Current Capacity	1.5	1.2	1.1	1.0	0.9	0.8	0.8
3-Day Reserve							
Total Fuel Storage Capacity Required for a 3-Day Reserve (In gallons)	160,000	205,069	222,684	241,818	262,597	285,162	309,666
Total Fuel Storage Capacity Deficit if wanting a 3-Day Reserve (In gallons)	(80,000)	(125,069)	(142,684)	(161,818)	(182,597)	(205,162)	(229,666)
Recommended Additional Tanks to Provide a 3-Day Reserve (At 40,000 gallons each)	2	4	4	5	5	6	6

*Note: Daily average was used, not peak day.
Source: FAA OPSNET, CHA, 2023.

4.5.3 Aircraft Rescue and Firefighting (ARFF) / Department of Public Safety (DPS) Facilities

ARFF / Department of Public Safety Building

AVL's Aircraft Rescue and Firefighting (ARFF) / Department of Public Safety facility is located between the South GA Apron and the Terminal Apron, with direct access to a taxiway and the terminal building. The facility was constructed in 2014, replacing the former 30-year-old public safety building. This facility was constructed in accordance with building design requirements found in AC 150/5210-15A, *Aircraft Rescue and Firefighting (ARFF) Station Building Design.*

ARFF Equipment

AVL currently operates as an ARFF Index B. To transition to an Index C, five or more average daily departures of aircraft measuring at least 126 feet, but less than 159 feet would be required. Based on projected activity levels throughout the forecast horizon and airlines' operating schedules, AVL is anticipated to receive more than five commercial departures in a day via aircraft measuring between 126 feet and 159 feet (i.e., B737-800, B737-900). Thus, it is anticipated that AVL will transition to an ARFF Index C.

4.5.4 GARAA Maintenance Facilities & Equipment Storage

The Greater Asheville Regional Airport Authority (GARAA) presently owns and operates the four buildings that house the airport maintenance and vehicle storage functions. This space includes an adjoining shop and office for AVL's needs. A map and details of the land-use plans of the GARAA facilities can be found in **Chapter 2**. The current maintenance facility is in need of

upgrades due to the age of the facility. In addition, expansion is recommended to accommodate future needs. The expansion should be of a size capable of supporting the storage of snow removal equipment (SRE) as well.

4.5.5 Air Traffic Control Facilities

Currently, at AVL, the Air Traffic Control Tower (ATCT) is located on the terminal building. The location of the ATCT has been a convenient and resourceful placement for the airport's operations. However, going forward with Asheville's ongoing terminal development and improvement plans, AVL is relocating the tower to the west side of the airfield. This relocation is necessary as part of the Terminal Building Improvement Program.

4.5.6 Urban Air Mobility

In recent years, many advancements have been made in the next generation of airborne transportation, focus on both crewed and uncrewed aircraft, primarily electric powered, operating both traditional winged and vertical takeoff and landing aircraft. With the support of NASA, the FAA, and aviation stakeholders, this industry has been termed Urban Air Mobility (UAM), for the potential to expand transportation networks in metropolitan areas. AVL serves the Asheville Metropolitan Statistical Area (MSA), thus it is important to look ahead at how the potential for UAM activity will impact the Airport and basic facility requirements to accommodate demand.

In April 2023, the FAA released the *UAM Concept of Operations (ConOps), Version 2.0*. That publication described "the envisioned operational environment that supports the expected growth of flight operations in and around urban areas." The advancement of UAM will eventually aide in supporting passenger and cargo operations in hard to reach or underserved areas. Per the FAA, UAM advancement will take place in series of increasing levels of autonomy and operational tempo.

The initial phases of implementing UAM will utilize existing helicopter routes, helipads, rules and regulations, and air traffic control (ATC) services. As previously discussed, the Airport currently has two helipads, which could be utilized. As demand for UAM activity increases, so should the demand on infrastructure and procedures. Over time, the FAA will establish and define UAM Corridors from specific aerodromes[20] based on performance requirements. This will also trigger changes to and enforcement of new UAM regulations. As the state of operations mature to become more advanced, and as frequency increases throughout the UAM sector, the previously formed UAM Corridors may form a new network, thus optimizing paths between aerodromes. The number of aerodromes would also increase as demand increases. One primary difference between the stages of activity is that once operations have increased to be considered 'Mature,' the UAM vehicles will be piloted remotely or autonomously rather than having an onboard pilot in control.

[20] Per the FAA an aerodrome is "a location from which UAM flight operations depart or arrive."

As the previously discussed advancements are made, the FAA will continue to define, maintain, and make publicly available the standards and regulations regarding the UAM system; therefore, it is important that GARAA review and apply the standards to ensure accommodations of this newly emerging technology. Advancements to current infrastructure at AVL could include, but is not limited to:

- Installing charging stations in the GA areas for the aircrafts' electric motors and batteries
- Designated operations areas, including for electric Vertical Takeoff & Landing (eVTOL) aircraft in the terminal area
- Construction of new hangars to accommodate the new aircraft

These advancements are further evaluated in the subsequent Alternatives Chapter.

4.6 PASSENGER TERMINAL FACILITY BUILDING AND GATE REQUIREMENTS

This section explores the parameters required for the AVL terminal to ensure productive and efficient use of all terminal components across all planning activity levels (PALs). The subsections herein are labeled with their appropriate focus and cover all aspects of terminal needs. It is the goal of this Chapter to provide detailed guidance to effectively grow the AVL terminal to meet the needs of an evolving future.

The first step in determining the facets of new terminal requirements was establishing the future timelines and metrics for which terminal planning efforts are designed. With this, terminal analyses performed throughout this Chapter are based upon forecasted data seen in **Table 4-1**. This can be seen as the first, preliminary, step in determining what formulations provided are needed to be able to handle growth in activity. Information that follows provides an examination of Airport and terminal facilities, which will serve to better contextualize this Study at hand.

Airport Terminal Modernization

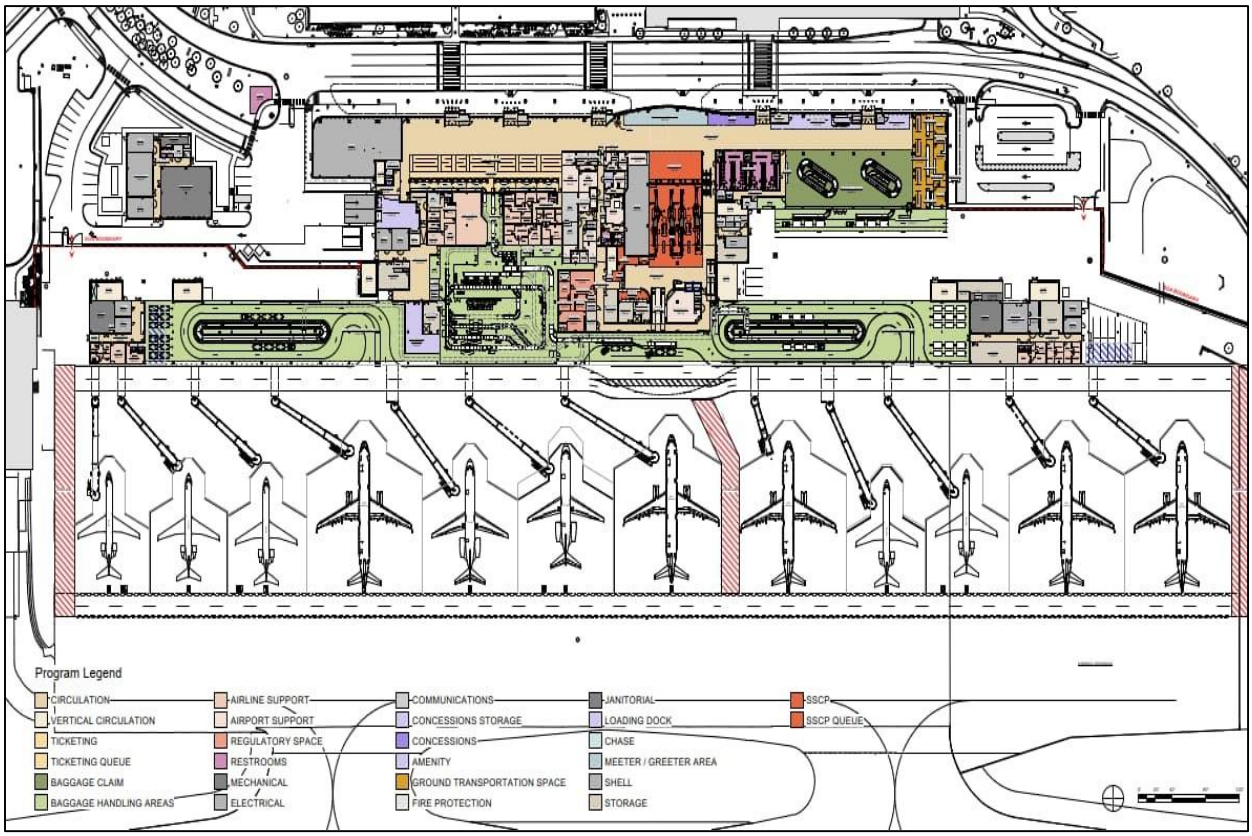
AVL is embarking on a significant terminal modernization project, yet to be constructed, and realized. The Master Plan terminal facility needs are based upon the assumptions that the proposed plans for the terminal modernization project are the basis for comparison to determine all the Planning Activity Levels (PALs) facility needs for compliance and/or non-compliance conditions. Therefore, the "Base," or Terminal Modernization Project, yet to be realized, shall be construed as the existing conditions for purposes of terminal facility needs.

The *"(Base)"* in the forthcoming Tables indicate the existing conditions expressed in area or quantities, unless otherwise indicated. What is most important to understand is the Base Year is a COVID year so the activity data that could be used to determine a reasonable and accurate snapshot of terminal facility needs would be flawed or produce false-positive (negative) outcomes as to the comparisons to the Terminal Modernization Project, yet to be realized for surpluses and/or deficits. It is assumed that the timing and completion of the Base Terminal Modernization Project aligns with PAL 1 analyses, and this is where the needed facility needs,

or surpluses are indicated as compared to the Base Terminal Modernization Project, or existing conditions.

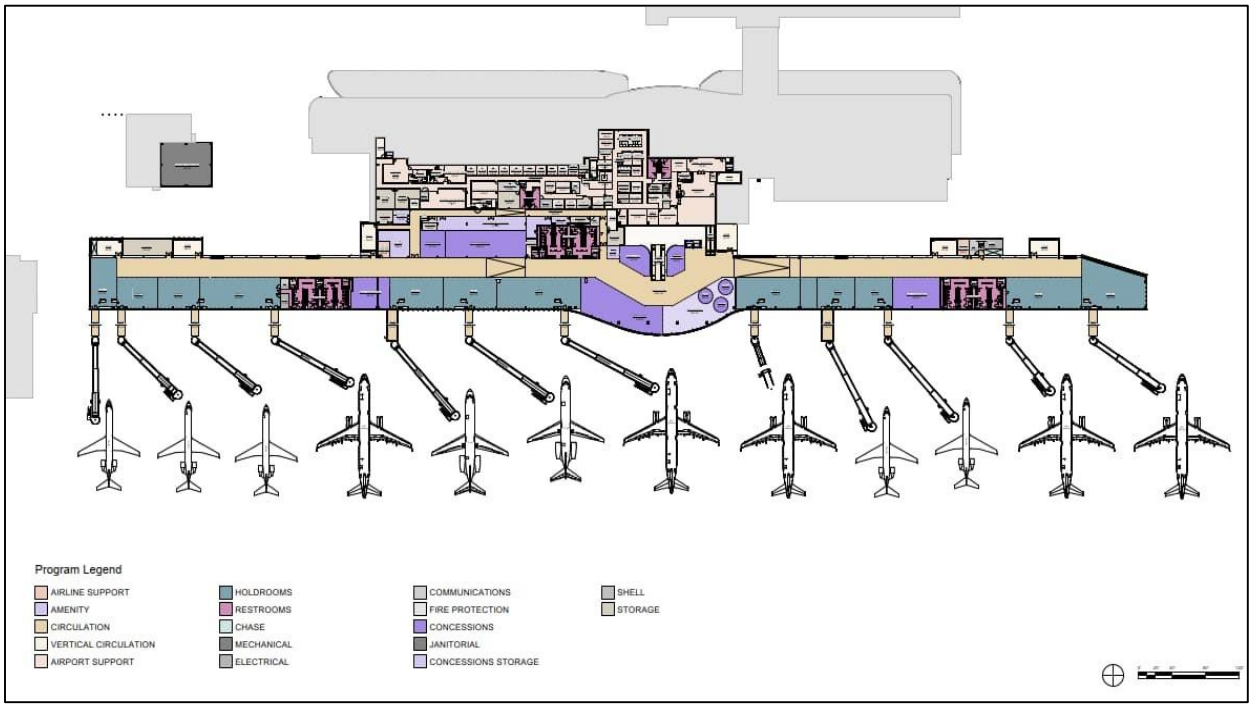
See **Table 4-1**. See **Figure 4-6** and **Figure 4-7**.

Figure 4-6 – Base Terminal Modernization Project; Ground Level



Source: Gresham Smith, 2022.

Figure 4-7 – Base Terminal Modernization Project; Upper Level



Source: Gresham Smith, 2022.

4.6.1 Approach – Level of Service (LOS), and Processor Areas and Other Areas Evaluated

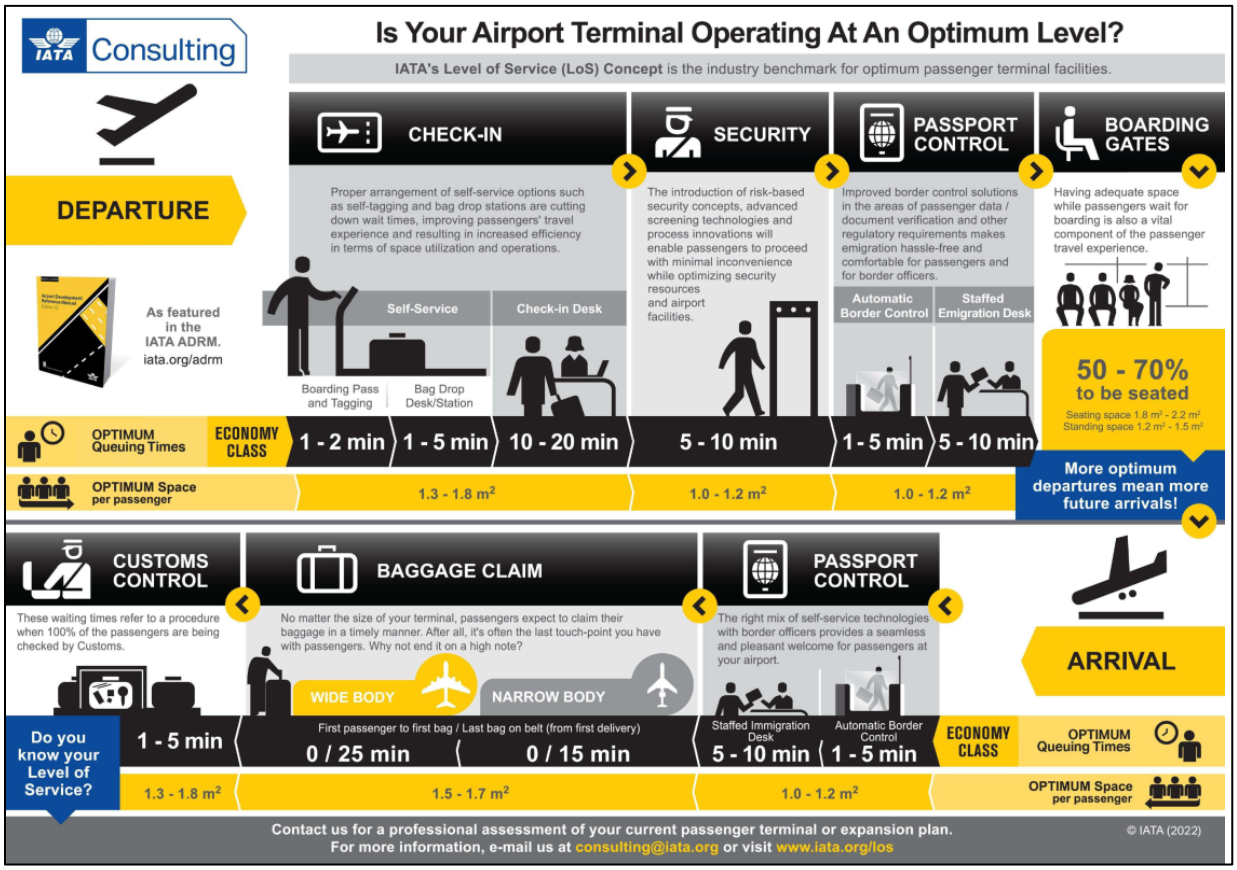
Level of Service (LOS) is an accepted value system of space standards and guidelines that are used to assess performance and congestion levels within terminal facilities. The International Air Transport Association (IATA), Airport Development Reference Manual, 12th Edition was used to define the recommended LOS standards applicable for AVL. The IATA 12th edition utilizes the following categories, or types of LOS to evaluate airport processor areas for effectiveness and efficiencies:

- Under-Provided
- Sub-Optimum
- Optimum
- Over-Design

Unless superseded by AVL, airline and/or other stakeholder preferences "Optimum" is typically used as baseline performance criteria target for most airport terminals and is recommended by IATA as the minimum design standard as it denotes "optimum level service."

Table 4-25 defines acceptable processor rates and wait times for "Optimum" level. These processor rates and wait times are criteria used in the evaluations to determine the facility needs for those processor areas identified in the table.

Table 4-25 – IATA Optimum Level of Service



Source: The International Air Transport Association (IATA), Airport Development Reference Manual, 12th Edition

Additional evaluation was conducted to further determine programmatic terminal requirements to accommodate the accelerating passenger activity and trends at AVL. Specific facility demands, quantified by area square footages, and amounts for various components of the terminal, were generated by applying FAA and International Air Transport Association (IATA) industry standards with other supporting guidelines. Development of the program projections encompassed:

- Annual and peak hour passenger enplanement data
- Peak hour passenger deplanement data
- Annual and peak month, peak day aircraft operations data
- Fleet mix changes through the planning activity levels
- Load factor changes though the planning activity levels
- International Air Transport Association (IATA) Level of Service (LOS) Standards

Industry standards and guidelines were applied in the analyses with appropriate modifications to reflect AVL airline tenant needs, passenger processor functions, and passenger activities.

Processor Areas Evaluated

Terminal master plans typically address each major processor area of the passenger terminal building. To do this, facilities are evaluated via a value system of acceptable industry space standards and guidelines presided over by The International Air Transport Association (IATA). For AVL, Level of Service (LOS) standards for Level C were considered an appropriate goal. Following is a recapitulation of the major processor areas evaluated, and referenced Sections in this Chapter:

- Gate Demand Analysis – Section 4.6.3
- Narrow-body Equivalent Gates (NBEG) and Equivalent Gate Analysis (EQA) – Section 4.6.4
- Concourse Hold Rooms – Section 4.6.5
- Concourse Circulation – Section 4.6.6
- Check-In, Ticketing, and Baggage Drop Lobby (Ticket Lobby) – Section 4.6.7
- Airline Ticket Offices (ATO) – Section 4.6.8
- Airline Operations Areas at Gates (Concourses) - Section 4.6.9
- Passenger Security Screening Checkpoint (SSCP) and Queuing – Section 4.6.10
- Checked Baggage Inspection System (CBIS) Outbound Baggage Screening – Section 4.6.11
- Outbound Baggage Make-up – Section 4.6.12
- Inbound Baggage Load-Belt Feeds – Section 4.6.13
- Inbound Baggage Claim – Section 4.6.14
- Airline Baggage Services Offices (BSO) – Section 4.6.15

As a part of the evaluation, additional publications served strictly as technical references (thus not substituting FAA policy), including:

- Airport Cooperative Research Program (ACRP), Report 25 – *Airport Passenger Terminal Planning and Design, Volume 1: Guidebook*
- ACRP, Report 25 – *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide*
- ACRP, Report 130 - *Guidebook for Airport Terminal Restroom Planning and Design*
- ACRP, Report 54 – *Resource Manual for In-Terminal Concessions, 2011*
- International Air Transportation Association (IATA), *Airport Development Reference Manual (ADRM), 12th Edition*
- U.S. Department of Transportation, Federal Aviation Administration, Systems Research & Development Service Report No. FAA-RD-75-191 – *The Apron & Terminal Building Planning Manual, July 1975*

- US Customs and Border Protection, *Airport Technical Design Standard, 2016*

Non-Processor Areas Evaluated

Additional non-processor function areas were evaluated and included in this Chapter. They are indicated below with referenced Sections in this Chapter:

- Concessions: Gift and News, Food and Beverage, Services, and Rental Car – Section 4.6.16
- Airport Administration – Section 4.6.17
- Airport Terminal Operations – Section 4.6.18
- TSA Office Administration – Section 4.6.19
- Restroom Facilities– Section 4.6.20
- Mechanical, Electrical, Plumbing, and Information Technology Requirements – Section 4.6.21
- Other Considerations – Section 4.6.22
  - Service Area Relief Areas
  - Storage Requirements
  - Meeter and Greeter Lobby (Well-Wishers)
- Curb Front Analysis – Section 4.6.23
- Parking Capacity and Analysis – Section 4.6.24

The programmatic spatial facility requirements for each PAL are compared to the Base Year (2021), or existing conditions, as described herein **Chapter 4** for the Modernization Project, yet to be realized. For AVL, the forecasted passenger demand throughout the planning horizon period shows steady increase. It is important to understand the projected planning horizons for enplanement growth does not predetermine equal or proportional expansion across all passenger processor areas. Decisions pertaining to expanding or decreasing space take several factors into consideration aside from enplanements, passenger behaviors, and industry trends. For instance, typical aviation patterns indicate that passengers are becoming more self-reliant and are using self-service functions, especially a by-product of COVID. In addition, it also appears that airlines at AVL are transitioning their fleet to include larger narrowbody aircraft.

In addition, security, passenger screening and checked baggage screening requirements as administered by the federally legislated U.S. Department of Homeland Security (DHS) under the guise of Transportation Security Administration (TSA) at airports, will often be perceived as growing disproportionally relative to other passenger processor areas.

For the purposes of determining spatial needs of the terminal areas throughout the PALs, the analyses were conducted as a “free-body-analysis.” This is to say area determinations did not strongly consider the existing layout, size, and configuration as a variable in determining

spatial needs; however, it should be noted that the existing terminal was built in a post-generational age before technological advancements, enhanced concessions and security affecting passenger behaviors and needs. These realities were addressed in the development of planned alternatives for present and future needs and improvements driven by demand.

4.6.2 Facility Needs Summary

Table 4-26 provides a summary of the needs of each of the terminal areas analyzed and evaluated. To better understand the needs presented, the table also provides references for additional information within this Chapter.

Abbreviated text and abbreviations used throughout **Section 4.6, *Passenger Terminal Facility Building and Gate Requirements***, include, but are not limited to the following:

Abbreviations

A = Area

NO. = Number of, Number

ATO = Airline Ticketing Offices

BHS = Baggage Handling System

BSO = Baggage Service Office

CBIS = Checked Baggage Inspection System

CBRA = Checked Baggage Resolution Area

EQA = Equivalent Aircraft

FT = Feet / Foot

FP = Fire Protection

GSF = Gross Square Feet

HR = Hour

IT = Information Technology

LF = Linear Feet

LOS = Level of Service

MAP = Million Annual Passengers

MIN = Minute

PAX = Passenger

NBEG = Narrowbody Equivalent Gate

NA = Not Applicable

OSR = On-Screen Resolution

PM = Peak Month

PMAD = Peak Month, Average Day

RC = Rental Car

SARA = Service Animal Relief Area

SF = Square Feet

TIX = Ticket Lobby

USF = Usable Square Feet

& = and

-- = No Data Provided, or Known

% = Percent

Table 4-26 – Facility Needs Summary

Area	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Gates							
Preferred Gate Demand Summary – *NO*	*(12)*	12	13	15	17	19	20
Narrow-body Equivalent Gates (NBEG) – *NO*	*(11.1)*	11.4	12.4	14.4	16.4	18.4	19.4
Equivalent Aircraft Gates (EQA) – *NO*	*(8.2)*	8.3	9.3	10.8	13.8	13.8	14.8
Concourse Processors							
Single NBEG Hold Room Area - *SF*	*(2,496 avg.)*	2,631	2,714	2,766	2,827	2,827	2,827

Area	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Total Hold Room Space Required - *SF*	*(29,959)*	29,933	33,530	39,830	46,363	52,017	54,844
Concourse Single-Loaded Corridor Length - *LF*	*(1,140)*	1,620	1,773	2,059	2,345	2,631	2,774
Circulation - Single-Loaded Corridor Area - *SF*	*(28,273)*	32,400	35,460	41,180	46,400	52,620	55,480
Airline – Check-in, ATO & Operations Processors							
Total Passenger Check-in Modules - *NO*	*(40)* [3]	38	40	40	50	48	54
Traditional Ticketing – Agent Assist – *NO*	*(40)*	18	18	16	14	12	10
Self-Service Kiosk - *NO*	--	10	10	10	18	14	16
Bag Drop Positions – Agent Assist - *NO*	--	10	12	14	18	16	18
PAX Self-Service Bag Drops - *NO*	--	0	0	0	0	6	10
Check-in Processes (Ticketing) - *SF*	*(6,588)*	6,811 [1]	7,240 [1]	7,240 [1]	8,313 [1]	7,267 [1]	7,294 [1]
Check-in (Ticketing) Circulation – *SF*	*(4,941)*	3,406	3,620	3,620	4,157	3,624	3,647
Airline Ticketing Offices (ATO) - *SF*	*(8,737)*	4,200	4,900	4,900	4,900	4,900	4,900
Concourse Airline Operation Areas - *SF*	*(4,336)*	9,100	10,190	11,400	12,760	11,460	16,140
Passenger Security Screening Checkpoint (SSCP) Processors							
Security Screening Area *(10-Minute Queue Wait Used*							
Number of Lanes - *NO*	*(4)*	6	6	7	8	9	10
10-Minute Queue Security Screening Area – *SF*	*(7,682)*	11,340	11,340	13,230	15,120	17,010	18,900
Circulation/Exit Lane - *SF*	*(2,740)*	3,402	3,402	3,969	4,536	5,103	5,670
TSA Support Area/LEO - *SF*	*(171)*	275	275	275	275	275	275
Baggage – CBIS, Outbound, and Inbound Processors							
Outbound Baggage Screening (CBIS) – *SF*	*(19,656)*	12,075	15,915	15,915	15,915	15,915	19,656
Outbound Bag Make-Up (BHS) – *SF*	*(41,732)*	23,300	26,200	30,400	38,800	38,800	41,500
Inbound Sort Make-Up and Feed – *SF*	*(4,379)*	4,100	4,300	4,300	4,300	4,300	4,300
Inbound Baggage Claim Area – *SF*	*(8,546)*	6,720	9,998	12,942	13,608	14,508	15,354
Circulation – Baggage Claim - *SF*	*(4,120)*	3,360	4,999	6,471	6,804	7,254	7,677
Airline Baggage Service Offices (BSO) -- *SF*	*(365)*	800	1,000	1,200	1,200	1,400	1,400
Concessions							
Pre-Security Concessions – Food and Beverage, Gift and News							
Food and Beverage – *SF*	--	708	793	887	993	1,125	1,256
Gift and News - *SF*	--	219	245	274	307	348	388
Services - *SF*	--	361	404	452	505	573	639
SUBTOTAL PRE - *SF*	*(633)*	1,288	1,441	1,613	1,805	2,045	2,283
Post Security Concessions – Food and Beverage, Gift and News							
Food and Beverage – *SF*	--	7,882	8,820	9,869	11,044	12,514	13,974
Gift and News - *SF*	--	3,593	4,021	4,499	5,035	5,705	6,370
Services - *SF*	--	116	130	145	162	184	205
SUBTOTAL POST - *SF*	*(16,995)*	11,591	12,970	14,514	16,241	18,403	20,550
Total Concessions Area – *SF*	*(17,328)*	12,879	14,411	16,126	18,045	20,488	22,833
Concession Storage and Circulation							
Concession Storage - *SF*	*(3,889)*	2,576	2,882	3,225	3,609	4,090	4,567
Concession Circulation - *SF*	--	3,854	4,323	4,838	5,414	6,134	6,850
Rental Car Concessions							
Rental Car Companies - *NO*	*(7)*	7	7	7	8	8	9
No. of Rental Car Modules - *NO*	*(4)*	4	4	4	5	5	6
Total Rental Car Concessionaires Area – *SF*	*(3,515)*	3,600	3,600	3,600	4,500	4,500	4,500
Circulation – Rental Car Counters - *SF*	*(1,350)*	1,080	1,080	1,080	1,350	1,350	1,350
Airport Areas							
Total Airport Administration – *SF*	*(25,174)* [2]	19,460	21,167	24,581	27,995	31,401	33,116
Total Airport Terminal Operations Area – *SF*	*(18,210)*	18,707	20,348	23,630	26,912	30,194	31,835

Area	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Airport Information Area – *SF*	*(150)*	150	150	150	150	150	150
TSA Administration Areas							
TSA Administration Area – *SF*	*(2,187)*	2,296	2,411	2,531	2,658	2,791	2930
Public Restroom Facilities							
Concourse – Secure Airside							
Total Concourse Restroom Area M & W – *SF*	*(7,211)*	2,730	3,270	3,810	4,605	4,890	5,430
Total Lactation Room Area – *SF*	*(299)*	255	255	255	255	255	255
Total Family Room Area – *SF*	*(331)*	315	315	315	315	315	315
Total Custodial Area – *SF*	*(260)*	495	495	496	495	495	496
Single Module - Check-In Restrooms Combined with Baggage Claim Restrooms – Non-Secure Landside							
Total Check-in / Bag Claim Restrooms – SF	*(2,192)*	2,340	2,890	3,070	3,430	3,790	4,245
Lactation Room Area – SF	*(93)*	85	85	85	85	85	85
Family Room Area – SF	*(121)*	105	105	105	105	105	105
Custodial Area – SF	*(87)*	165	165	165	165	165	165
Mechanical, Electrical, Information Technologies, and Distribution Chases							
Total MEP & IT Areas – *SF*	*(14,858)*	16,344	17,978	19,776	21,754	23,929	26,322
Other Considerations							
Service Animal Relief Areas (SARAs) – *SF*	*(123)*	225	225	225	225	225	225
Total Storage Area – *SF*	*(8,751)*	9,189	9,648	10,130	10,637	11,169	11,717
Meeter and Greeter Lobby - *SF*	*(7,709)*	2,616	2,930	3,278	3,669	4,157	4,640
Curb Front Analysis							
Curb Front Length - *LF*	*(650)* 791	1,061	1,199	1,287	1,425	1,579	1,789
Public Parking Capacity							
Public Parking at 3,500 per Mil PAX - *NO*	*(2,496)* *(3,096)* [4]	3,633	4,067	4,550	5,093	5,772	6,444

Footnotes:
[1] See **Figure 4-8** for future available ticketing processor area
[2] Includes assigned and future Airport Administration areas
[3] Types of check-in and baggage check modes subject to change once airline's passenger service requirements and preferences are known
[4] Figure in parenthesis indicates total public parking with the future 600 space south lot included
Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.3 Gate Demand Analysis

The terminal gate configuration prior to the Terminal Modernization Project had five (5) aircraft gates, and two (2) ground level gates. With all seven (7) gates assumed to be operationally equal, each gate has approximately 5.30 ± departures per peak month/peak average day. Using the definition of "gate" in the context of gate planning, one aircraft parking position per one aircraft gate, with 5.30 ± departures per day, per gate as exhibited in (*2019)* is a high gate utilization at non-hub and small hub airports with multiple airline carriers. Historically small hub airports have lower departures per gates, per average day than medium or large hub airports. It is assumed the intent and goals of the Terminal Modernization Project is to provide relief to the operational limitations of the high gate utilization rate, take pressure

off the need for "Remain Overnight" (RON) aircraft parking, and provide opportunity of new air service growth.

In benchmarking other airports with ultra-low-cost carriers, Allegiant, Breeze, Frontier, Spirit, Sun Country, Volaris, etc., of comparable size and characteristic, 3.0 departures per gate, per day to 3.75 departures per gate, per day is common, acceptable for efficient operations, and have the ability to attract and accommodate new airline service.

The gate demand analysis also takes into consideration several factors unique to AVL; ultra-low-cost air carriers provide most of the passenger air service traffic, and AVL has a common use gate management resource that is used to better manager gate utilization, especially in seasonal peak traffic conditions.

For the purposes of determining gate demand using accepted planning guidelines and benchmarking with similar airports and their gate requirement recommendations, this analysis did not account for gate demand exceeding 3.75 daily departures per gate, except were indicated in **Table 4-30**.

Again, this is consistent with the historic nature and practice of gate utilization at non-hub and small hub airports. Even though it is not the norm at small-hub airports for high average utilization of gates daily, if the airline carriers at AVL could effectively align their schedules and maximize preferential gate usage, the number of departures per gate, per day would increase, resulting in an overall reduction in gate demand brought on by the increased efficiency and use of the active gates.

Gate demand is driven by gate utilization as mentioned above. Other sub-variables impacting gate utilization are fleet mix, and departure load factors. Gate demand is not driven solely by enplanement growth with all the other variables staying constant. The forecast data indicated that as airlines transition their fleet to include larger aircraft with more seats, passengers per departure increase; therefore, the airlines can conduct fewer departures to accommodate the increase. Over the 20-year planning horizon, planning forecast assumptions were made, and noted where applicable in the following Tables to come to a forecasted gate demand analysis.

The following table depicts a straight-line, annualized enplaned passengers per gate forecast. This table does not depict a peak month enplaned passenger per gate forecast.

Table 4-27 – Annual Enplaned Passenger per Gate Forecast Approach (PALs)

Year/Activity Level	Annual Enplaned PAX	Annual Departures [1]	# Of Gates	Annual Enplaned PAX per Gate	Annual Enplaned PAX per Departure
(2018)	*(568,176)*	*(7,629)*	*(7)*	*(81,168)*	*(74.48)*
(2019)	*(809,093)*	*(10,575)*	*(7)*	*(115,585)*	*(76.51)*
(2020)[3]	*(354,408)*	*(6,532)*	*(7)*	*(50,630)*	*(54.26)*
(Base)[2]	***(716,015)***	***(10,164)***	***(12)***	***(59,668)***	***(70.26)***

Year/Activity Level		Annual Enplaned PAX	Annual Departures [1]	# Of Gates	Annual Enplaned PAX per Gate	Annual Enplaned PAX per Departure
Forecast	PAL 1	1,038,567	13,027	12	86,548	79.72
	PAL 2	1,162,182	14,146	13	89,399	82.16
	PAL 3	1,300,499	15,362	15	86,700	84.66
	PAL 4	1,455,279	16,682	17	85,605	87.24
	PAL 5	1,649,002	18,902	19	86,790	87.24
	PAL 6	1,841,354	21,107	20	92,068	87.24

Footnotes:
[1] Assumes Total Annual Operation ÷ 2 = Annual Departures. See **Table 4-1.**
[2] Terminal Modernization Project
[3] COVID Year
Note: Those numbers depicted in parentheses indicate existing conditions
Source: Airport Cooperative Research Program (ACRP) Report 25 – Airport Passenger Terminal Planning and Design Guidebook, CHA, 2023.

The following table depicts a peak month enplaned passenger per gate forecast:

Table 4-28 – Peak Month Enplaned Passenger per Gate Forecast Approach (PALs)

Activity Level		PM Enplaned PAX	PM Departures [1]	# Of Gates	PM Enplaned PAX per Gate	PM Enplaned PAX per Departure
(Base)[2]		*(91,609)*	*(1,181)*	*(12)*	*(7,634)*	*(77.60)*
Forecast	PAL 1	132,878	1,513	12	11,073	87.82
	PAL 2	148,693	1,643	13	11,438	90.50
	PAL 3	166,390	1,784	15	11,093	93.27
	PAL 4	186,192	1,938	17	10,952	96.10
	PAL 5	210,978	2,195	19	11,104	96.10
	PAL 6	235,588	2,452	20	11,779	96.10

Footnotes:
[1] Assumes Total PM Operation ÷ 2 = PM Departures. See **Table 4-1.**
[2] Terminal Modernization Project
Note: Those numbers depicted in parentheses indicate existing conditions.
Source: Airport Cooperative Research Program (ACRP) Report 25 – Airport Passenger Terminal Planning and Design Guidebook, CHA, 2023.

The following table depicts a straight-line, annualized daily departure per gate forecast. This table does not depict a peak month, average day departures per gate forecast.

Table 4-29 – Daily Departures per Gate Forecast Approach (PALs)

Year/Activity Level		Annual Enplaned PAX	Annual Departures [1]	# Of Gates	Annual Departures per Gate	Daily Departures per Gate
(2018)		*(568,176)*	*(7,629)*	*(7)*	*(1,090)*	*(2.98)*
(2019)		*(809,093)*	*(10,575)*	*(7)*	*(1,511)*	*(4.14)*
(2020)[3]		*(354,408)*	*(6,532)*	*(7)*	*(933)*	*(2.56)*
(Base)[2, 3]		***(716,015)***	***(10,164)***	***(12)***	***(847)***	***(2.32)***
Forecast	**PAL 1**	**1,038,567**	**13,027**	**12**	**1,086**	**2.97**
	PAL 2	**1,162,182**	**14,146**	**13**	**1,179**	**3.23**
	PAL 3	**1,300,499**	**15,362**	**15**	**1,280**	**3.51**
	PAL 4	**1,455,279**	**16,682**	**17**	**1,283**	**3.51**
	PAL 5	**1,649,002**	**18,902**	**19**	**1,350**	**3.70**
	PAL 6	**1,841,354**	**21,107**	**20**	**1,319**	**3.61**

Footnotes:

[1] Assumes Total Annual Operation ÷ 2 = Annual Departures. See **Table 4-1** [2] Terminal Modernization Project

[3] COVID Year

Note: Those numbers depicted in parentheses indicate existing conditions.

Source: Airport Cooperative Research Program (ACRP) Report 25 – Airport Passenger Terminal Planning and Design Guidebook, CHA, 2023.

The following table depicts a peak month, average day departures per gate forecast. This table illustrate the sensitivities to **Table 4-29**, existing year *(2019)* with *(4.14)* daily departures per gate, and what AVL might experience with a gate forecast and implementation program with over 4.00 daily departures per gate.

Table 4-30 – PMAD Departures per Gate Forecast Approach (PALs)

Activity Level		PM Enplaned PAX	PM Departures [1]	# Of Gates	PM Departures per Gate	PMAD Departures per Gate
(Base)[2]		***(91,609)***	***(1,181)***	***(12)***	***(98)***	***(3.24)***
Forecast	**PAL 1**	**132,878**	**1,513**	**12**	**126**	**4.15**
	PAL 2	**148,693**	**1,643**	**13**	**126**	**4.16**
	PAL 3	**166,390**	**1,784**	**15**	**119**	**3.91**
	PAL 4	**186,192**	**1,938**	**17**	**114**	**3.75**
	PAL 5	**210,978**	**2,195**	**19**	**116**	**3.80**
	PAL 6	**235,588**	**2,452**	**20**	**123**	**4.03**

Footnotes:

[1] Assumes Total PM Operation ÷ 2 = PM Departures. See **Table 4-1**

[2] Terminal Modernization Project

Note: Those numbers depicted in parentheses indicate existing conditions

Source: Airport Cooperative Research Program (ACRP) Report 25 – Airport Passenger Terminal Planning and Design Guidebook, CHA, 2023.

Table 4-31 – Gate Forecast Demand (PALs)

	See Table	Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Annual Enplaned Passenger / Gate Approach[1]	**4.27**	***(12)***	**12**	**13**	**15**	**17**	**19**	**20**
Peak Month Enplaned Passenger / Gate Approach	**4.28**	***(12)***	**12**	**13**	**15**	**17**	**19**	**20**
Daily Departures per Gate Forecast Approach	**4.29**	***(12)***	**12**	**13**	**15**	**17**	**19**	**20**
PMAD Departures / Gate Forecast Approach	**4.30**	***(12)***	**12**	**13**	**15**	**17**	**19**	**20**
Contingency Factor = No.	--	*(NA)*	*(NA)*	*(NA)*	*(NA)*	*(NA)*	*(NA)*	*(NA)*

Footnote:
[1] Recommended Gate Forecast
Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.4 Narrow-body Equivalent Gates and Equivalent Aircraft Gate Analysis

As discussed in prior Sections, the "design aircraft" or "design aircraft family" represent the most demanding aircraft or grouping of aircraft with similar characteristics (relative to AAC, ADG, TDG) that are currently using AVL, or the airfield infrastructure can allow its use. See **Chapter 2.1.1, Airport Design Criteria**.

Preliminary review of operations data for 2021 indicated that the Boeing 737-800 is the most demanding aircraft, which is especially relative to terminal planning analysis below.

The current and projected design aircraft family, as presented in **Table 4-3**, was used as the basis for normalizing the terminal gates at the Airport and for conducting the gate equivalencies analyses. Gate equivalency analyses were useful in determining hold room spatial requirements, as well as in determining other processor evaluations and aircraft ramp frontage requirements at the terminal concourses. The results of the analyses are presented in **Table 4-32.**

It is important to note that the definition of the term "gate" refers only to a parking position assigned to a scheduled aircraft for enplanement and departure of passengers. The term is applied as a number without consideration of the size of aircraft. To standardize the definition of gates when determining processor sizing requirements, two metrics were developed: *Narrowbody Equivalent Gates* (NBEG), specifically for sizing hold rooms and *Equivalent Aircraft* (EQA) to size other processor areas.

Table 4-32 – Gate Equivalencies (PALs)

Design Group	Class and Aircraft	# Of Gates[1]	NBEG		*EQA*	
			Maximum Wingspan (Feet)	Index	*Typical Seats Average*	*Index*
Base Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**(3)**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**(4)**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**(5)**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**(12)**	**NBEG**	**11.1**	***EQA***	***8.2***
PAL 1 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**5**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**5**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**12**	**NBEG**	**11.4**	***EQA***	***8.3***
PAL 2 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**5**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**6**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**13**	**NBEG**	**12.4**	***EQA***	***9.3***
PAL 3 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**6**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**7**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*

Design Group	Class and Aircraft	# Of Gates[1]	NBEG		*EQA*	
			Maximum Wingspan (Feet)	Index	*Typical Seats Average*	*Index*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**15**	**NBEG**	**14.4**	***EQA***	***10.8***
PAL 4 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**7**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**8**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**17**	**NBEG**	**16.4**	***EQA***	***13.8***
PAL 5 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**8**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**9**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**19**	**NBEG**	**18.4**	***EQA***	***13.8***
PAL 6 Gate Equivalencies						
I	Small Regional (Metro, B99, J31)	0	49	0.4	*25*	*0.2*
II	**Medium Regionals (SF340, CRJ-200)**	**2**	**79**	**0.7**	***50***	***0.4***
III	**Large Regionals (E175, CRJ-900)**	**8**	**118**	**1.0**	***75***	***0.5***
III	**Narrow-body (A320, B737)**	**10**	**118**	**1.0**	***186***	***1.0***
IIIa	B757 (B757, B757 w/Winglets)	(0)	135	1.1	*185*	*1.3*
IV	Wide-body (MD-11, B767)	(0)	171	1.4	*280*	*1.9*
V	Jumbo (B747, B777, A330, A340)	(0)	214	1.8	*400*	*2.8*
VI	A380 (A380, B747-8)	(0)	262	2.2	*525*	*3.6*
Totals		**20**	**NBEG**	**19.4**	***EQA***	***14.8***

Footnote:

[1] Based on aircraft parking shown on **Figure 4-6**

Notes:

Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook*, CHA, 2023.

4.6.5 Concourse Hold Rooms

Analysis conducted for combined hold room square footage assumed all gates are equalized to meet Narrow-Body Aircraft hold room standards. Taking this data, ensuing calculations sought to determine the optimum NBEG hold room size at AVL. For the Airport specifically, it was assumed that all gates are equalized to accommodate the Design Group III narrow-body fleet mix. The evaluation could have also been conducted to address gate utilization with a specific anticipated Design Group for each individual gate, which may have been appropriate in the short-term; however, long-term needs are based on the Design Group III-Narrow-Body Fleet Mix. This determination was made to align with aviation trends that indicate fleet mix alterations will cede to a more prevalent Design Group III.

Concourse calculations, as indicated in **Table 4-33** below, followed this progression of growth throughout the planning horizon. Evaluations conducted were based on a LOS B/C which mandates 15-square feet for seated passengers and 10 square feet for standing passengers. In comparison, LOS A would allot 17-square feet for seated passengers and 12-square feet for standing passengers. Following this calculation, analysis performed concluded with computing the inclusive hold room space requirements throughout the planning horizon (represented by given PALs), with this information presented in **Table 4-34**.

Table 4-33 – Single NBEG Hold Room Area Evaluation

	(Base)	PAL 1		PAL 2		PAL 3	
		Input	Out	Input	Out	Input	Out
Seats on Design Aircraft – *NO.*		186		186		186	
Load Factors (%)		73.3%		75.6%		77.9%	
# of Design Passengers		**136**		**141**		**145**	
% PAX Seated		70%	95	70%	98	70%	101
% PAX Standing		30%	41	30%	43	30%	44
Seated PAX Area - *SF*		15	1,425	15	1,470	15	1,515
Standing PAX Area - *SF*		10	410	10	430	10	440
Seated & Standing Area - *SF*			1,835		1,900		1,955
% Increase for Amenities		10%	184	10%	190	10%	196
% Increase for High Utilization		5%	92	5%	95	5%	98
Hold Room Share Factor - *(Decrease)*		*(3%)*	*(55)*	*(3%)*	*(57)*	*(3%)*	*(59)*
Adj. Seated/Standing Area (sq. ft.)		**2,055**		**2,128**		**2,190**	
Podium Width /Position - *FT*		4		4		4	
Depth of Podium to Back Wall - *FT*		8		8		8	
Podium Queue Depth - *FT*		15		15		15	
Area / Podium Position - *SF*			92		92		92
Podium Positions – *NO.*		2		2		2	
Total Podium & Queue - *SF*			184		184		184
Boarding/Exit Corridor Width - *FT*		6		6		6	

	(Base)	PAL 1		PAL 2		PAL 3	
		Input	Out	Input	Out	Input	Out
Depth of Hold Room - *FT*		25		25		25	
Boarding/Egress per Bridge - *SF*			150		150		150
Bridges/Gate – *NO.*		1		1		1	
Boarding Corridor Area - *SF*			150		150		150
NBEG Hold Room Area (sq. ft.)	*(2,496 Average)*	2,631		2,704		2,766	

	PAL 4		PAL 5		PAL 6	
	Input	Out	Input	Out	Input	Out
Seats on Design Aircraft – *NO.*	186		186		186	
Load Factors (%)	80.2%		80.2%		80.2%	
# of Design Passengers	149		149		149	
% PAX Seated	70%	104	70%	104	70%	104
% PAX Standing	30%	45	30%	45	0%	45
Seated PAX Area - *SF*	15	1,560	15	1,560	15	1,560
Standing PAX Area - *SF*	10	450	10	450	10	450
Seated & Standing Area - *SF*		2,010		2,010		2,010
% Increase for Amenities	10%	201	10%	201	10%	201
% Increase for High Utilization	5%	101	5%	101	5%	101
Hold Room Share Factor - *(Decrease)*	*(3%)*	*(60)*	*(3%)*	*(60)*	*(3%)*	*(60)*
Adj. Seated/Standing Area (sq. ft.)	2,251		2,251		2,251	
Podium Width /Position - *FT*	4		4		4	
Depth of Podium to Back Wall - *FT*	8		8		8	
Podium Queue Depth - *FT*	15		15		15	
Area / Podium Position - *SF*		92		92		92
Podium Positions – *NO.*	2		2		2	
Total Podium & Queue - *SF*		184		184		184
Boarding/Exit Corridor Width - *FT*	6		6		6	
Depth of Hold Room - *FT*	25		25		25	
Boarding/Egress per Bridge - *SF*		150		150		150
Bridges/Gate – *NO.*	1		1		1	
Boarding Corridor Area - *SF*		150		150		150
NBEG Hold Room Area (sq. ft.)	2,827		2,827		2,827	

Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook,* CHA, 2023.

Table 4-34 – Inclusive Hold Room Space Requirements (PALs)

Function	*Base*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NBEG Factor – *NO.*	*(11.1)*	11.4	12.4	14.4	16.4	18.4	19.4
Each Hold Room Area - *SF*	--	2,631	2,704	2,766	2,827	2,827	2,827
Total Hold Room Area - *SF*	***(29,959)***	**29,993**	**33,530**	**39,830**	**46,363**	**52,017**	**54,844**

Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.6 Concourse Circulation

Expanded concourse circulation square footage is necessary to support forecasted passenger activity. In the case of this planning study, concourses without moving walkways, a corridor width of 20 feet is acceptable for single-loaded concourses and a 30-foot width for double-loaded concourses as defined as follows:

- Single-loaded Concourse: Gates on one-side of concourses only
- Double-loaded Concourse: Gates on both-sides of concourse

The existing gates at AVL provide a single-loaded condition.

For concourses with moving walkways, 15 feet on both sides of the walkway is recommended to allow uncongested circulation. Other factors also impact corridor width such as use of people mover carts, advertising, vending machines, drinking fountains, etc. For the purposes of this evaluation, single-loaded concourses were assumed throughout the planning horizon.

Analysis, shown below, considers the number of NBEG aircraft and associated width requirements of 118 feet as indicated in **Table 4-32** and added 25 feet for wingtip clearance between NBEG aircraft for a NBEG aircraft frontage factor of 143 feet, multiplied by the planning horizon number of NBEG, and then multiplied by 20 feet of width as the methodology to determine concourse circulation area for each planning activity.

- The NBEG single-loaded corridor lengths are indicated in **Table 4-35**.
- The NBEG single-loaded corridor areas are indicated in **Table 4-36**.

Table 4-35 – NBEG Single-Load Concourse Corridor Length (PALs)

Function	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NBEG Factor – *NO.*	(11.1)	11.4	12.4	14.4	16.4	18.4	19.4
Single - loaded Concourse Length [1] - *LF*	***(1,140)***	**1,620**	**1,773**	**2,059**	**2,345**	**2,631**	**2,774**

Footnotes:
[1] based on the theoretical NBEG determination, the single-loaded corridor length and areas were calculated. This does not reflect the existing conditions, but represents the theoretical lengths required for a single-loaded corridor by normalizing the existing gates to accommodate Aircraft Design Group III - Narrow-body Aircraft
Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

Table 4-36 – NBEG Single-Loaded Concourse Corridor Circulation Area (PALs)

Function	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NBEG Factor – *NO.*	*(11.1)*	11.4	12.4	14.4	16.4	18.4	19.4
Concourse Corridor Circulation Area - *SF*	***(28,273)***	**32,400**	**35,460**	**41,180**	**46,900**	**52,620**	**55,480**

Footnote:
[1] based on the theoretical NBEG determination, the single-loaded corridor length and areas were calculated. This does not reflect the existing conditions, but represents the theoretical lengths required for a single-loaded corridor by normalizing the existing gates to accommodate Aircraft Design Group III - Narrow-body Aircraft.
Notes: Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

For planning purposes, it was presumed that the single-loaded corridor was the most practical, efficient, and usable function to support the gates, especially when coupled with the fact that the existing concourses are single-loaded.

4.6.7 Check-In, Ticketing, and Baggage Drop Lobby (Ticket Lobby)

Shifting landscapes of available, and emerging, technology continue to alter the patterns of passenger check-in procedures. As self-service options become more prevalent, the aviation industry must also remain cognizant of retaining passenger demand to utilize traditional check-in functions—such as checking in with a physical airline representative. Addressing this, airport authorities must maintain an acceptable level of service (LOS) for passengers who commonly forgo self-service in pursuit of airline agent check-in options, even as the push for non-agent procedures become more commonplace. This LOS demand for both non-agent and agent procedures is influenced by surrounding socioeconomic factors, which can sway preferences of those likely to utilize a given airport.

Self-service technologies have brought in an influx of benefits to airports, primarily in relation to streamlined services that pertain to printing boarding passes, baggage tags, and self-bag check. Self-service also allows for these processes to occur both on and off airport grounds, boosting efficiency and lessening the demand for ticket lobby space and occupied ticket agent positions. Despite any airport technological advances, spatial demand for passengers to check-in, obtain a boarding pass and check baggage remains constant—even if space dedicated for these purposes decreases with time.

As the future continually unfolds, and time carries new advances, ticketing halls will reflect the needs and desires of passengers at AVL. Future ticketing halls may be repurposed or reimagined into new spaces, especially as demand for square footage for their once agent-directed function diminishes. Though this is an undeniable possibility, the present and foreseeable future will still demand some devotion of space to the traditional role of paper boarding passes, oversize/ out-of-gauge baggage requirements, and tangible access to customer services. These functions may be intercepted by new technological shifts in terminal design, but for now it is important to account for their existence across the planning horizon.

This idea is reflected in the analysis conducted for ticketing functions. Calculations performed for the check-in processors addressed and assumed certain passenger trends through the planning horizon with a mix of full-service agent positions (where passengers complete their entire transaction with an airline agent), airline agent assisted bag drops (where passengers drop bags after checking-in online or at a kiosk), self-service kiosks, curbside, check-in offsite (i.e., at home, web browser, or via mobile device, etc.) , and passenger self-service bag tag and bag drop.

For this planning Study, PAL 5 is given as the introductory point for passenger self-bag tag, and bag drop processes. Larger, busier, hub terminals have begun to introduce this technology, but aviation trends appear to often show that small hub, and non-hub airports, like AVL, do not necessitate technological adoption as quickly. Even with this, it is still important to consider that all airports will likely adopt self-interfacing passenger services in the future—

especially as streamlined automation advances allow for heightened efficiency and levels of service.

- Automatic Check-in: An example of automatic check-in is if you hold an elite status with the airline, the airline will automatically check you in for your flight 36 hours in advance, putting you ahead of other passengers for boarding preferences and upgrades. In addition, many airlines have apps available that will automatically check-in a passenger without prompting.
- Baggage Drop Positions: Airline staff or agents accept bags from passengers who check-in via internet PC/mobile device or at a kiosk for a two-step process.
- Bypass (Internet browser/PC/Mobile Device) Check-in: Passengers who do not check bags and are able to check-in remotely, prior to arriving to the terminal and do not use terminal check-in processors.
- Curbside Check-in Processors: Typically, curbside check-in facilities are equipped with conveyor belts located at the check-in podiums for direct input of bags into the outbound baggage system. At smaller airports (or for airlines who do not wish to pay for conveyors) checked bags may be placed on carts and taken into the check-in lobby to be transferred to the ticket counter baggage conveyor.
- Full Service (Agent) Check-in: Airline staff or agents may assist passengers with boarding passes, rebooking, and where check-in bags are accepted
- Passenger Self-Service Baggage Tag and Baggage Drop: Without the assistance of an airline agent, passengers can complete the checked baggage processes.
- Self-Service Kiosk Check-in: Stand-alone kiosks can be located at the ticket counter, remote from the ticket counter or throughout the terminal. Kiosks can print boarding passes and bag tags. When kiosks are located at the ticket counter, they are typically configured in pairs with a bag well, which often includes a baggage scale between pairs.

The LOS assumptions for passenger check-in behaviors at AVL through the planning horizon are shown in **Table 4-37** and **Table 4-38**.

Table 4-37 – IATA Level of Wait Time Standard for Check-In (Minutes)

Type of Service	Short to Acceptable (min.)	Acceptable to Long (min.)
Full Assist Economy Check-in	0-10	10-20
Kiosk Boarding Pass	1-2	2-5
Agent Assist Bag Drop	1-5	5-10

Source: International Air Transport Association (IATA), ADRM, 12th Edition, CHA, 2023.

Table 4-38 – IATA Level of Service Space Standard for Check-In (Sq. Ft. per PAX)

	OPTIMUM LEVEL – 1.5 – 1.7 m² or 16.1 – 18.3 ft²
Space Requirements for All Types of Service – *SF/PAX*	16.1 – 18.3

Notes: Recommended row width between stanchions is 4.0 to 4.5 feet

Source: International Air Transport Association (IATA), ADRM, 12th Edition, CHA, 2023.

For planning purposes, this Study assumed 70 percent of all originating passengers check baggage through to their destination at the actual "ticketing" lobby, with an additional 10 percent checking baggage through at the departure gate. When combined, this came to a total of 80 percent of all passengers checking a bag with an agent. Without curbside check-in and remote baggage drop locations, it was assumed at AVL that 70 percent of the originating passengers drop baggage off in the check-in processor area. This percentage of baggage drop utilization was assumed to remain constant throughout the planning horizon.

A major piece of analysis conducted was to determine the effects of new technology, passenger demographics, passenger trust in check-in procedures, online function uses (mobile check-in, online check-in, etc.), and passenger acceptance of new procedures played in determining the make-up of future ticketing halls. Survey data suggests that age demographics factor into passengers' level of trust in handling their own technology processes, thus driving the need for full-service check-in processors and agent assistance.

For AVL, it is predicted, over time, the need for agent assisted check-in at the podium will decrease while technology-based check-in will increase**.** A note worth mentioning, passengers who are checking bags to their destination are more likely to check-in at the airport as part of the baggage drop and screening process. In addition, without self-bag tagging and self-drop of baggage, each passenger checking baggage through will need an interface with an agent.

The assumptions for passenger check-in behaviors at AVL through the planning horizon are shown in **Table 4-39**.

Table 4-39 – Enplaned Passenger Check-In Utilizations (PALs)

Check-in and Checked Bag Drop		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Passenger Check-in by Methodology								
Traditional Ticketing Counter & Bag Drop Function - Agent Assist [1]		--	32%	27%	22%	17%	12%	9%
Terminal Kiosk Check-in Only		--	5%	5%	4%	3%	3%	3%
Terminal Kiosk Check-in & Bag Drop Function – Agent Assist		--	18%	18%	17%	15%	13%	8%
Remote/Automatic Check-in & Bag Drop Function – Agent Assist		--	26%	29%	35%	41%	27%	20%
Curbside Check-in Processors		--	0%	0%	0%	0%	0%	0%
By-Pass Remote Check-in (Browser or Mobile App)		--	9%	11%	11%	12%	10%	8%
Automated Check-in		--	10%	10%	11%	12%	15%	20%
Remote/Automatic Check-in & PAX Self-Service Bag Tag & Drop		--	0%	0%	0%	0%	8%	18%
Terminal Kiosk Check-in & PAX Self-Service Bag Tag & Drop		--	0%	0%	0%	0%	12%	14%
Total PAX Utilization		**--**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Baggage Check and Drop Locations Utilization								
Terminal Building	Location	*(100%)*	100%	100%	100%	100%	100%	100%
	PAX Utilization	*(70%)*	70%	70%	70%	70%	70%	70%
Curbside	Location	*(0%)*	0%	0%	0%	0%	0%	0%
	PAX Utilization	*(0%)*	0%	0%	0%	0%	0%	0%
Off-Airport Location	Location	*(0%)*	0%	0%	0%	0%	0%	0%

Check-in and Checked Bag Drop		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
	PAX Utilization	*(0%)*	0%	0%	0%	0%	0%	0%

Footnote:
[1] Accounts for high PAX utilization with ultra-low-cost airline carriers, specifically at AVL
Note: Those numbers depicted in parentheses indicate existing conditions
Source: CHA, 2023.

This analysis assumed that curbside services are not going to be factors in addressing passenger check-in or checked baggage/bag drop functions. In addition, remote off-airport baggage drop locations are not foreseeable in the planning horizon. If these two functions were utilized, the demand to provide area within the terminal for these check-in processor functions may be reduced.

Assumptions

- Transaction time for checking in at a kiosk is 2.5 minutes.
  - Maximum desired queue time: 2.5 minute +/-
  - Maximum average queue time: 1.5 minutes +/-
- Transaction time for agent assistance is 5.0 minutes.
  - Maximum desired queue time: 10 minutes +/-
  - Maximum average queue time: 6 minutes +/-
- Transaction time for checking a bag (baggage drop and self-service bag drop) is 1.7 minutes.
  - Maximum desired queue time: 10 minutes +/-
  - Maximum average queue time: 6 minutes +/-
- Ticketing check-in and bag drop counters area assumes 5.5 linear feet per position (includes baggage scale), 11-foot depth from back wall to public face of counter, 8-foot circulation easement from face of counter to queuing line.
- Kiosk area, assuming free standing kiosks not integral to counter, are 9 square feet per kiosk with 25 square feet of circulation space.
- 70 percent of passengers check baggage in the traditional ticket lobby throughout the planning horizon:
  - Curbside positions are not a service provided through the planning horizons.
  - The quantity of agent assist positions decreases incrementally.
- The quantity of baggage check and drop positions increases incrementally as passengers arrive at the terminal with checked-in status only needing to check and drop baggage in the check-in hall.
- The quantity of passenger self-service kiosks within the terminal facility decreases incrementally as passenger's check-in remote and/or with mobile devices.

Table 4-40 – Passenger Check-In Station Modes Required (PALs)

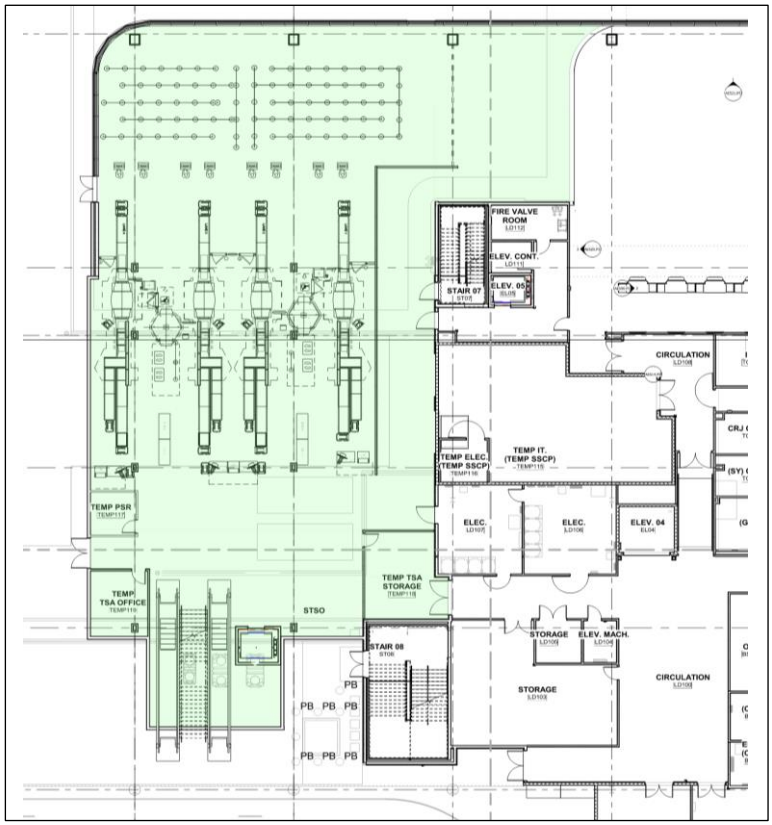
Check-in Modes	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Traditional Ticketing Counter & Bag Drop (Agent Assist) – *NO.*	*(--)*	18	18	16	14	12	10
Self-Service Kiosks (Check-in, Bag Drop, & Self Bag Tag – *NO*	*(--)*	10	10	10	18	14	16
Baggage Drop Positions (Agent Assist)	*(--)*	10	12	14	18	16	18
PAX Self-Service Bag Drops	*(--)*	0	0	0	0	6	10
Totals Modes	***(--)***	**38**	**40**	**40**	**50**	**48**	**54**

Note: Those numbers depicted in parentheses indicate existing conditions

Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook,* CHA, 2023.

Relative to AVL's Terminal Modernization Project, yet to be realized, a temporary security screening checkpoint is going to be built as new construction adjacent to the existing ticketing processor area. The intention is that once the permanent security screening checkpoint is constructed and operational, this checkpoint will be decommissioned, and this area will be available to address future ticketing requirements, or other terminal processor needs. This is shown in **Figure 4-8** as new construction highlighted in "green." Note: The (4) four SSCP lanes shown depicts the temporary SSCP needs only and is not meant to be construed as a permanent or long term SSCP solution. See paragraph **4.6.10 Passenger Security Screening Checkpoint (SSCP) and Queuing** for SSCP requirements.

Figure 4-8 – Future Ticketing Lobby Processor Area



Source: Gresham Smith, 2022.

Table 4-41 indicates the area requirements for each type of passenger check-in mode based on the station modes required in **Table 4-40**.

Table 4-41 – Passenger Check-In Area Requirements (PALs)

Size & Areas	Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Traditional Ticket (TIX) Counter Processor Functions – Agent Assist							
Effective Length – *LF*	--	99	99	88	77	66	55
Queue Depth - *FT*	--	20	20	20	20	20	20
Agent Area (Behind Counter) - *SF*	--	1,089	1,089	968	847	726	605
Front Circulation - SF	--	792	792	704	616	528	440
Queuing - *SF*	--	1,980	1,980	1,760	1,540	1,320	1,100
Subtotal – Traditional TIX Counter	--	3,861	3,861	3,432	3,003	2,574	2,145
Kiosks – Check-in, Checked Baggage & Bag Tag Processor Functions - Self Serve							
Effective Length - *LF*	--	55	55	55	99	77	88
Queue Depth - *FT*	--	13	13	13	13	13	13
Kiosk Area - *SF*	--	90	90	90	162	126	144
Queuing - *SF*	--	715	715	715	1,287	1,001	1,144
Subtotal - Kiosks	--	805	805	805	1,449	1,261	1,288
Bag Drop Stations – Agent Assist							
Effective Length – *LF*	--	55	66	77	99	88	99
Queue Depth - *FT*	--	20	20	20	20	20	20
Agent Area (Behind Counter) - *SF*	--	605	726	847	1,089	968	1,089
Front Circulation - *SF*	--	440	528	616	792	704	792
Queuing - *SF*	--	1,100	1,320	1,540	1,980	1,760	1,980
Subtotal – Bag Drop Stations - *SF*	--	2,145	2,574	3,003	3,861	3,432	3,861
PAX Self-Service Bag Drop Stations							
Effective Length – *LF*	--	0	0	0	0	30	50
Queue Depth - *FT*	--	0	0	0	0	20	20
Front Circulation - *SF*	--	0	0	0	0	240	400
Queuing - *SF*	--	0	0	0	0	600	1.000
Subtotal – PAX Self-Service Bag Drop- *SF*	--	0	0	0	0	840	1,400
Total	***(6,588)***	**6,811**	**7,240**	**7,240**	**8,313**	**7,267**	**7,294**
Circulation Factor of 1.50[1] - *SF*	*(4,941)*	3,406	3,620	3,620	4,157	3,634	3,647
TOTAL PAX CHECK-IN HALL AREA - *SF*	***(11,529)*[3]**	**10,217[2]**	**10,860[2]**	**10,860[2]**	**12,470[2]**	**10,901[2]**	**10,941[2]**

Footnotes:

[1] A generally acceptable circulation factor is 0.30 times the *Base Area* for passenger "ticket" lobby area requirements. This analysis concluded that a more practicable circulation factor is 0.50 to address any errant airline operational policies and/or procedures, non-common equipment and facilities use, and inherent inefficiencies with the existing structure common with future renovation projects.

[2] Deficiencies in space or quantities can be accommodated by the future ticket lobby processor areas in **Figure 4-8.**

[3] Future ticket lobby processor areas in **Figure 4-8** not included in area

Notes:

Those numbers depicted in parentheses indicate existing conditions.

Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions.

Source: CHA, 2023.

It should be noted that during periods of low demand, the check-in lobby may be perceived as oversized. AVL has migrated towards common-use facilities to address the ultra-low-cost airline carriers business models and enhance capacities and improve efficiencies. These efforts

should continue when advancing common-use facilities to help balance demand loads between the airlines and achieve a higher level of efficiency in the check-in lobby. Partial or full common-use facilities would allow for the ticketing lobby to adequately serve demand beyond the planning period and for more flexibility in adjusting to changing conditions, such as the addition of new carriers.

4.6.8 Airline Ticket Offices (ATO)

For the planning ATO space, 900 square feet of office space per air carrier is typically assumed in calculating airline ticketing office (ATO) square footage. However, we must consider the downsizing in overhead costs legacy carriers have been implementing—following in the wake of ultra-low-cost competitors (Allegiant, Sun Country, etc.). These carriers often seek to curtail many traditional overhead costs by scaling back passenger services, including overall terminal visibility. Considering this, calculations to determine the size of ATO space for each air carrier utilizes a figure of 700 square feet of office space per air carrier to account for mentioned downsizing. In addition, future projections assume that AVL may have (1) one additional air carrier during the planning period through PAL 6.

Table 4-42 – Airline Ticketing Offices (ATO)

Function	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NO. of Airlines – *NO.*	*(6)*	6	7	7	7	7	7
Airline Ticketing Offices – *SF*	***(8,747)***	**4,200**	**4,900**	**4,900**	**4,900**	**4,900**	**4,900**

Note: Those numbers depicted in parentheses indicate existing conditions.
Source: CHA, 2023.

4.6.9 Airlines Operations Areas at Gates (Concourse)

Spaces found beneath concourses can exist to support both airline and Airport interests, but for planning purposes these areas can be succinctly considered as leased space for airline use. Examining these areas, as well as others, an analysis was conducted to determine the programmatic area required to support airline activities at AVL. Like ATO space above, airline trends have indicated an overall reduction in square footage consumption in pursuit of cost savings, leading to less demand for overall operational areas. Operational areas still provide essential functions to airlines, and relegated space must be accounted for as activities reliant on their need have not dissipated. To determine area needs for airline operational areas at the concourse locations, a factor of 1,000 square feet for every 100 peak hour enplaned passengers was assumed, as shown in **Table 4-43**.

Table 4-43 – Airline Operational Areas at Gates (OPS)

Function	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Peak Hour Enplaned Pax – *NO.*	--	910	1,019	1,140	1,276	1,446	1,614
Airline Operation Areas at Gates – *SF*	***(4,336)***	**9,100**	**10,190**	**11,400**	**12,760**	**14,460**	**16,140**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.10 Passenger Security Screening Checkpoint (SSCP) and Queuing

Security screening size requirements are determined with guidance from the Transportation Security Administration (TSA), which provides standards and functionality requirements for all applicable airports. These areas are subject to change at any time due to relevant level of threats, technological advancement in security screening equipment, and stated TSA requirements. AVL operates one (1) distinct security check point, with four (4) security screening checkpoint queue lanes.

Checkpoint requirements define the number of TSA document checkers (TDC), the number of checkpoint lanes, and the amount of queue area required to support terminal activity. A checkpoint lane consists of a single or paired advanced imaging technology (AIT) and magnetometer, an x-ray unit with an attached divest and recompose rollers and tables, manual search stations, and benches. A supervisor station is used to monitor each checkpoint area. Demand is affected by airline flight schedules and the upstream flight check-in process.

Overall screening lane processing rates, typically stated in terms of passengers per hour per lane, were divesting personal items requires the use of multiple bins per passenger; similarly, passenger recompose activity, post AIT/magnetometer scanning can extend the throughput of the x-ray units. Lack of adequate divest and recompose table lengths impede materials reaching the x-ray units, resulting in decreased lane throughput. Extension and/or adding area and table lengths for divesting and recomposing has proven to yield above-average site-specific processing rates.

Checkpoint demand was analyzed against level of service standards that address performance in terms of the time passengers wait for processing, as well as the space allotted for each waiting passenger. The IATA LOS guidelines for checkpoint (same as passport control outbound) wait times are measured by identifying the total number of passengers passing through the AIT or magnetometer; however, multiple processes within the screening process affect overall throughput. TSA requires that each passenger pass the following screening procedures in sequence to complete the checkpoint screening process: ticketing (boarding pass and passenger identification) document check, divesture of TSA regulated items, AIT, or magnetometer scans, recompose, and, if necessary, secondary screening (carry-on baggage and passenger search, or private personal search room screening). Checkpoint processing rates vary at each specific airport, with further impacts dependent on passenger characteristics and time of year. For accuracy in this planning process, these factors were considered when determining the processing rate to be used for calculating the number of checkpoint lanes and the size of the required areas.

Table 4-44, below, describes the International Air Transport Association (IATA) standards in gauging space needed for passengers waiting in a single queue to be screened.

Table 4-44 – IATA Level of Service Standards for Security Screening Checkpoints

	OPTIMUM LEVEL – 1.0 – 1.2 m^2 or 10.8 – 12.9 ft^2
Checkpoint (IATA Passport Control) – *SF/PAX*	10.8

Source: International Air Transport Association (IATA), ADRM, 12th Edition, CHA, 2023.

Divesting and recomposing activities are the largest time consumer actions. With this, these functions were critical determinants of throughput in TSA checkpoints. IATA level of service standards for processing times are short-to-acceptable = 0-5 minutes; and acceptable-to-long = 5-10 minutes. Please note that IATA's Airport Development Reference Manual (ADRM) 12th Edition indicates optimum wait times for security are set at 5 to 10 minutes.

These standards provide valuable input in providing necessary guidance in determining how much space is needed for wait times and queuing as the TSA does not provide such data. TSA does provide minimum area allocations for each screening lane, as well as associated support square footage. These figures must be met for complete functionality of TSA procedures.

The processing rate per lane in this analysis initially assumed 175 passengers per hour, which was lowered at a rate of 150 passengers per hour per checkpoint lane, taking into consideration TSA Pre✓TM and non-passenger, employees, crew, etc.

TSA issued *Checkpoint Design Guideline* (CDG), recommends that airports and local TSA authorities collaborate to establish acceptable goals for airport-terminal-specific wait times and screening lane processing rates.

Extended queue depths and areas have a dimensional effect on a pair of checkpoint lanes ranging in time, as depicted in **Table 4-45,** depending on processing rates and wait time variables, to determine queue areas.

The basis of determining screening lane requirements with constant LOS C, 150 passengers per hour, per lane (0.40 MIN/PAX) along with square feet of queue area required that corresponds to wait times per lane of about 30.00 minutes, 20.00 minutes, 10.00 minutes, 8.00 minutes, and 4.00 minutes, as indicated in **Figure 4-9**.

Figure 4-9 – Wait Time Circulation

$$\textit{Wait Time/Lane (MIN)} = \frac{\text{Total Queue Area (SF)}}{\text{LOS (SF/PAX)}} \times \text{Screening Lane Throughput (MIN/PAX)}$$

Therefore

$$30.00 \ \textit{Wait Time/Lane MIN} = \frac{810 \text{ SF}}{10.8 \text{ (SF/PAX)}} \times 0.40 \text{ Screening Lane Throughput (MIN/PAX)}$$

$$20.00 \ \textit{Wait Time/Lane MIN} = \frac{540 \text{ SF}}{10.8 \text{ (SF/PAX)}} \times 0.40 \text{ Screening Lane Throughput (MIN/PAX)}$$

$$10.00 \ \textit{Wait Time/Lane MIN} = \frac{270 \text{ SF}}{10.8 \text{ (SF/PAX)}} \times 0.40 \text{ Screening Lane Throughput (MIN/PAX)}$$

$$8.00 \ \textit{Wait Time/Lane MIN} = \frac{220 \text{ SF}}{10.8 \text{ (SF/PAX)}} \times 0.40 \text{ Screening Lane Throughput (MIN/PAX)}$$

$$4.00\ \textit{Wait Time/Lane MIN} = \frac{110\ \text{SF}}{10.8\ (\text{SF/PAX})} \times 0.40\ \text{Screening Lane Throughput (MIN/PAX)}$$

Table 4-45, below, tabulates the calculations made and highlights the demand generated from a 10-minute queue analysis. In addition, the table also displays lane requirements for 30.00 minutes, 20.00 minutes, 8.00 minutes, and 4.00 minutes for comparison to be made.

Table 4-45 – Passenger Security Screening Checkpoint Lane Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Peak Hour Enplaned - *NO*	*(616)*	910	1,019	1,140	1,276	1,446	1,614
Peak 30-Min. Originating PAX – *NO*	--	441	494	553	619	701	783
Additional Traffic – *NO.* [1, 2]	--	66	74	83	93	105	117
Total Peak 30-Min. Originating PAX - *NO*	--	507	568	636	712	806	900
4-Minute Queue Wait – No. of Lanes Required [3]							
Demand [4] - *NO.*	*(4)*	6	7	8	9	10	11
8-Minute Queue Wait – No. of Lanes Required [3]							
Demand [4] - *NO.*	*(4)*	6	6	7	8	9	11
10-Minute Queue Wait – No. of Lanes Required [5]							
Demand [4] - *NO.*	***(4)***	**6**	**6**	**7**	**8**	**9**	**10**
20-Minute Queue Wait – No. of Lanes Required [3]							
Demand [4] - *NO.*	*(4)*	5	5	6	6	7	8
30-Minute Queue Wait – No. of Lanes Required [3]							
Demand [4] - *NO.*	*(4)*	4	4	5	5	6	7

Footnotes:

[1] 15-percent of peak 30-minute originating PAX

[2] Non-passenger, employees, crew, etc.

[3] Shown as a reference only as to the requirements with a higher LOS for waiting at the SSCP

[4] Normalized to 0.40 minutes per passenger process rate, or 150 PAX per lane, per hour

[5] Indicated in **Table 4-26**

Notes:

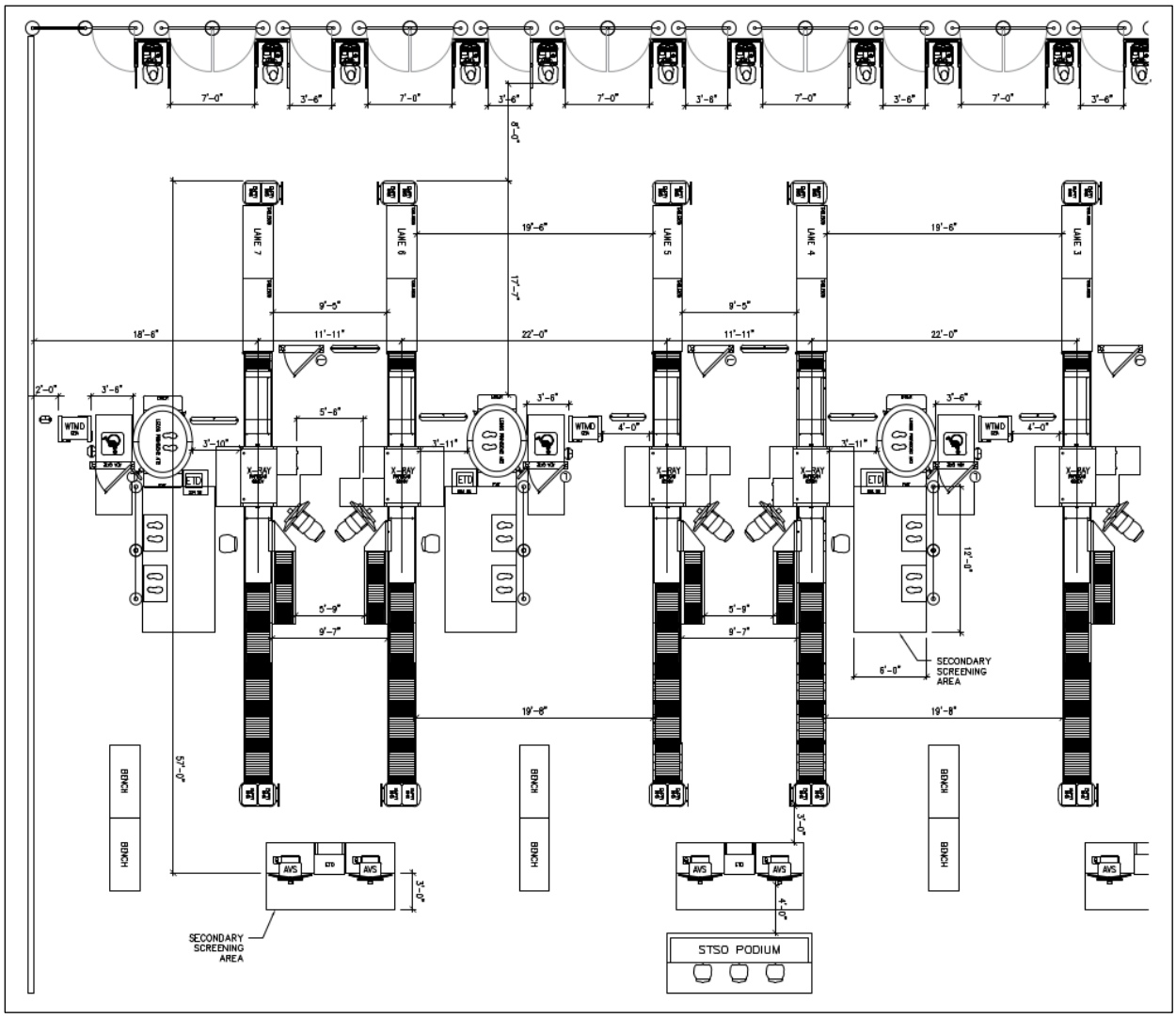
Those numbers depicted in parentheses indicate existing conditions

Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions

Source: ACRP Report 25, *Airport Passenger Terminal Planning and Design*, CHA, 2023.

Shifts in the LOS offered, the processor rate per lane, and accepted wait times for the queuing area will result in fluctuations of the forecasted number of screening lanes required throughout the planning horizon. To visualize the layout of a generic pair of TSA security checkpoint lanes, refer to **Figure 4-10**. This helps provide a background in calculating SSCP processor areas.

Figure 4-10 – Standard TSA Security Screening Checkpoint Lane



Source: Transportation Security Administration (TSA) of the U.S. Department of Homeland Security, Checkpoint Requirements and Planning Guide: Appendix A, 2022-09-30.

Utilizing the assumptions, the dimensional guideline for a checkpoint lane pair with Advanced Imaging Technology (AIT) and magnetometer was approximately 3,240 square feet, without queueing as depicted in **Figure 4-10**, and consisted of:

- Screening lane pair consisting of the length of each screening lane, including divest tables, x-ray
- Machine, agent work area, recompose tables, AIT body scanner, magnetometer, divest bins, and recompose benches
- Private search rooms, manual carry-on baggage search tables, and screening equipment
- Circulation aisle separating the screening lane area from the boarding pass document check agent podium

- Queue stanchions
- Stanchions for ADA-accessible and family queue lanes

Table 4-46 tabulates the total security screening checkpoint (SSCP) areas needed at AVL. The demand generated from a 10-minute queue analysis is highlighted in the table. In addition, the table also displays area requirements for 30.00 minutes, 20.00 minutes, 8.00 minutes, and 4.00 minutes for comparison to be made.

For consistency across all study modules, a 0.30 circulation factor was applied to the SSCP total area. This accounts for SSCP exit lanes from the secure airside concourse to the non-secured public area.

Table 4-46 – Passenger Security Screening Checkpoint (SSCP) Area Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
4-Minute Queue Wait							
Total Area Required [1] – *SF*	*(7,682)*	10,380	12,110	13,840	15,570	17,300	19,030
TSA/LEO Support Areas - *SF*	*(171)*	275	275	275	275	275	275
Circulation/Exit Lane [2] – *SF*	*(2,740)*	3,114	3,633	4,152	4,671	5,190	5,709
8-Minute Queue Wait							
Total Area Required [1] - *SF*	*(7,682)*	11,040	11.040	12,880	14,720	16,560	20,240
TSA/LEO Support Areas - *SF*	*(171)*	275	275	275	275	275	275
Circulation/Exit Lane [2] – *SF*	*(2,740)*	3,312	3,312	3,864	4,416	4,968	6,072
10-Minute Queue Wait							
Total Area Required [1] - *SF*	***(7,682)***	**11,340 [3]**	**11,340 [3]**	**13,230 [3]**	**15,120 [3]**	**17,010 [3]**	**18,900 [3]**
TSA/LEO Support Areas - *SF*	***(171)***	**275 [3]**	**275 [3]**	**275 [3]**	**275 [3]**	**275 [3]**	**275 [3]**
Circulation/Exit Lane[2] – *SF*	***(2,740)***	**3,402 [3]**	**3,402 [3]**	**3,969 [3]**	**4,536 [3]**	**5,103 [3]**	**5,670 [3]**
20-Minute Queue Wait							
Total Area Required [1] – *SF*	*(7,682)*	10,800	10,800	12,960	12,960	15,120	17,280
TSA/LEO Support Areas - *SF*	*(171)*	275	275	275	275	275	275
Circulation/Exit Lane [2] – *SF*	*(2,740)*	3,240	3,240	3,888	3,888	4,536	5,184
30-Minute Queue Wait							
Total Area Required [1] – *SF*	*(7,682)*	9,720	9,720	12,150	12,150	14,580	17,010
TSA/LEO Support Areas - *SF*	*(171)*	275	275	275	275	275	275
Circulation/Exit Lane [2] – *SF*	*(2,740)*	2,916	2,916	3,645	3,645	4,374	5,103

Footnote:
[1] Number of lanes required indicated in **Table 4-24**, multiplied by [(3,240 SF ÷ 2) + (Queueing Area by Minutes)] = Area Requirements
[2] a factor of 0.30 was applied to the total SSCP area to determine the SSCP circulation and Exit Lane needs
[3] Areas indicated in **Table 4-26**
Note: Those numbers depicted in parentheses indicate existing conditions. Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.11 CBIS Outbound Baggage Screening

TSA has (3)-three in-line screening devices located behind the ticketing counter back wall. This location consists of Explosive Detection Systems (EDS) machines and Explosive Trace Detectors (ETD) stations. The locations are in a designated CBIS series environment. The outbound

baggage from the ticket counter is set through an EDS automated array format. Oversized baggage is checked via trace detection and inspection.

As peak hour passengers increase during the forecast horizons, the demand for baggage screening equipment and space is expected to continue increasing, as shown below in **Table 4-47**.

Table 4-47 – Checked Baggage Inspection System Requirements (CBIS)

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Design Hour Baggage Load							
Peak Hour Originating PAX Checking In[1] – *NO*	--	883	988	1,106	1,238	1,403	1,566
PAX Checking Bags at TIX– *NO*	--	70%	70%	70%	70%	70%	70%
Average # of Bags per PAX – *NO*	--	1.6	1.6	1.6	1.6	1.6	1.6
Bags to Process in Peak Hour – *NO*	--	989	1,107	1,239	1,387	1,571	1,754
10 Minute Baggage Flow Rate – *NO*	--	165	184	206	231	262	292
TSA Surge Factor (Based on a 10 Minute Baggage Flow Rate)	--	1.16	1.15	1.14	1.13	1.12	1.12
Equivalent Baggage Surge Rate	--	1,143	1,270	1,411	1,569	1,713	1,959
% of Bags That are Over-sized & Too Big For EDS	--	3%	3%	3%	3%	3%	3%
NO. of Over-sized Bags Requiring ETD Inspections	--	34	38	42	47	53	59
Bags to Process Through Level 1 EDS Units – *NO*	--	1,109	1,231	1,369	1,522	1,713	1,900
EDS/ETD Equipment Requirements							
Level 1 EDS Screening – Process Rate (bags/hour) – *NO*	--	500	500	500	500	500	500
Level 1 EDS Units Required – *No.*	*(3)*	3	3	3	4	4	4
% of Scanned Bags Requiring Level 2 Screen **(Alarm Rate)**	--	25%	25%	25%	25%	25%	25%
Bags Requiring Level 2 OSR – *NO*	--	277	308	342	380	428	475
Level 2 OSR Rate (Bags/Hour per Operator) - *NO.*	--	120	120	120	120	120	120
Level 2 OSR Stations Required (1 Operator/Station) – *NO*	--	3	3	3	4	4	4
% of Resolved OSR Bag reviews **(Clear Rate)**	---	80%	80%	80%	80%	80%	80%
Bags Needing Level 3 Screening in Peak Hour – *NO*	--	90	100	111	124	139	154
Level 3 ETD Screening - Process (Bags/Hour/Screener)	--	24	24	24	24	24	24
Level 3 ETD Units Required (2 Screeners/Unit) – *NO*	--	2	3	3	3	3	4
Baggage Screening Requirements							
Level 1 Area Per EDS Screening Unit - *SF*	--	800	800	800	800	800	800
Required EDS Units – *NO*	--	3	3	3	4	4	4
Level 2 Area per OSR Station - *SF*	--	40	40	40	40	40	40
OSR Stations Required – *NO*	--	3	3	3	4	4	4

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Area per ETD Screening Units - *SF*	--	100	100	100	100	100	100
Required ETD Units – *NO*	*(3)*	2	3	3	3	3	4
Conveyance Equipment - *SF*	*(11,447)*	5,724	8,585	8,585	8,585	8,585	10,507
CBRA - *SF*	*(2,504)*	1,252	1,878	1,878	1,878	1,878	2,504
Oversized Baggage Screening - *SF*	*(1,013)*	507	760	760	760	760	1,013
Subtotal Area for CBIS – *SF*	***(17,784)***	**10,203**	**14,043**	**14,043**	**14,043**	**14,043**	**17,507**
Ancillary Support Areas							
CBIS Parts Room - *SF*	*(155)*	155	155	155	155	155	155
CBIS Maintenance Room - *SF*	*(360)*	155	155	155	155	155	155
OSR Office -*SF*	*(260)*	260	260	260	260	260	260
CBIS IT Room - *SF*	*(114)*	114	114	114	114	114	114
CBIS Electrical Room - *SF*	*(107)*	107	107	107	107	107	107
TIX to CBIS Conveyance Tunnel - *SF*	*(1,081)*	1,081	1,081	1,081	1,081	1,081	1,081
Subtotal for Ancillary Support Areas – *SF*	*(1,872)*	1,872	1,872	1,872	1,872	1,872	1,872
Total Area Requirements for CBIS – *SF*	***(19,656)***	**12,075**	**15,915**	**15,915**	**15,915**	**15,915**	**19,656**

Footnotes:
[1] 97% originating PAX with pre-applied surge factor
Note: Those numbers depicted in parentheses indicate existing conditions
Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook*, CHA, 2023.

4.6.12 Outbound Baggage Make-Up

The general assumption is that baggage make-up processor areas consist of a baggage sortation device or system, baggage carts/ tug circulation, and staging areas. The analysis is for enclosed baggage make-up areas only are shown in **Table 4-48**.

Table 4-48 – Outbound Baggage Make-Up

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 5
Required Bag Make-Up Area Space[1] - *SF*	*(41,732)*	23,300	26,200	30,400	38,800	38,800	41,500

Note: Those numbers depicted in parentheses indicate existing conditions
Source: ACRP Report 25, *Airport Passenger Terminal Planning and Design*, CHA, 2023.

4.6.13 Inbound Baggage Load-Belt Feeds

Inbound baggage areas are essential spaces that allow deplaning passengers a space dedicated to retrieving their luggage inside the terminal building. The inbound baggage-load-belt feeds connect to the baggage claim devices in the baggage claim hall. AVL currently has two (2) baggage claim carousels in operation. A third device is projected to be needed in the short term, as shown in **Table 4-49**.

Table 4-49 – Inbound Load-Belt Feed Systems

NO. Required Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4
Load-Belt Feeds - *NO.*	*(2)*	3	3	3	3
Total Load-Belt Feeds System Area - *SF*	*(4,379)*	4,100	4,300	4,300	4,300

Note: Those numbers depicted in parentheses indicate existing conditions
Source: CHA, 2023.

4.6.14 Inbound Baggage Claim

The encompassing analyses below addressed both the baggage claim spatial needs for the passenger areas, as well as the capacity and requirements for the baggage claim device.

The methodology for determining claim device capacities and requirements is based on a peak 20-minute deplaning arrivals analysis, which was defaulted to establish a variable at the peak 30-minute deplaning demand, or 47 percent of peak hour deplaning passenger.

For planning purposes, these assumptions are utilized throughout the baggage claim processor area analyses.

- Percent of passengers checking bags: 70 percent ticketing lobby
- Average number of bags per passenger checking bags: 1.6
- Average traveling party size: 1.3
- Percent additional passengers at claim: 30 percent
- Claim frontage per person: 1.5 linear feet
- Area per person in active retrieval area: 18 square feet (LOS C)

As shown below, **Table 4-50** provides the sizes and capacities of the existing carousels and is used as the bases for meeting the capacity needs through the planning horizons. The analyses to meet the capacity needs for display on the carousel, and ultimately the number and size of carousels units for arrival flight schedules and fleet mix is solely based on satisfying the requirements for practical baggage display on the carousel.

Table 4-50 – Baggage Carousel Claim Frontage and Baggage Display Capacities

Oval Sloped Bed Device (Approx. Device Size)	Frontage Linear Feet (LF)	Theoretical Baggage Display on Carousel *(NO)*[1]	Practical Baggage Display on Carousel *(NO)*[1]
Bag Claim Carousel Size (68' x 18')[1] Narrow Body	154	308 Bags	205 Bags
Bag Claim Carousel Size (52' x 20')[1, 2] Large Regional	121	242 Bags	162 Bags
Bag Claim Carousel Size (120' x 20')	237	529 Bags	375 Bags

Footnote:
[1] US Department of Transportation, FAA *The Apron & Terminal Building Planning Manual*, Report No. FAA-RD-75-191 – Mechanized Claim Devises, Figure 4-18
[2] AVL currently has two (2) 52' x 20' sloped bed carousels
Source: CHA, 2023.

For planning purposes and added accuracy, calculations also were conducted to estimate the number of bags that may need to be displayed or retrieved from each individual carousel. Data generated was made to coincide with fleet mix and load factors.

Data calculated is illustrated in **Table 4-51** to determine the number of baggage claim carousels required though the planning horizons (PALs). It should be noted, baggage demands on the carousels may be achieved for the forecasted flights arriving in a 20-minute cycle using a mix of 52' x 20' oval sloped bed carousel devices (large regional aircraft), larger 68' x 18' oval

sloped bed carousels (narrow body aircraft), and 120' x 20' oval slope bed carousels able to accommodate multiple flights on the carousel at one time.

Practical and theoretical baggage storage capacities on carousels were utilized to determine the number and size of baggage claim carousels required. This approach extends the capacity of the bag claim carousels into their theoretical limits before it is suggested to add another carousel. This slightly aggressive approach provides a more financially feasible response to meet the demands over time.

Table 4-51 – Claim Device Baggage Display Capacity Analysis – 20 Minute Period

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Narrow-body Seats – *NO*	--	186[1]	186[1]	186[1]	186[1]	186[1]	186[1]
Large Region Seats - *NO*	--	75	75	75	75	75	75
% Load Factor	--	75.3	75.6	77.9	80.2	80.2	80.2
Arrival 1 PAX / Flight – Narrow body - *NO*	--	140	141	145	149	149	149
Arrival 2 PAX / Flight – Narrow body - *NO*	--	140	141	145	149	149	149
Arrival 3 PAX / Flight – Large Regional - *NO*	--	--	57	58	60	60	60
Arrival 4 PAX / Flight – Narrow Body - *NO*	--	--	--	58	60	60	60
Arrival 5 PAX / Flight – Large Regional *NO*	--	--	--	145	149	149	149
Arrival 6 PAX / Flight – Large Regional - *NO*	--	--	--	--	--	60	60
No. of PAX in 20 Minute Period	**--**	**280**	**399**	**551**	**567**	**627**	**627**
Average No. Bags per PAX checking Bags – *NO*	--	1.6	1.6	1.6	1.6	1.6	1.6
Arrival 1 Bags to Retrieve / Flight – *NO*	--	224	226	232	239	239	239
Arrival 2 Bags to Retrieve / Flight – *NO*	--	224	226	232	239	239	239
Arrival 3 Bags to Retrieve / Flight – *NO*	--	--	91	93	96	96	96
Arrival 4 Bags to Retrieve / Flight – *NO*	--	--	--	93	96	96	96
Arrival 5 Bags to Retrieve / Flight – *NO*	--	--	--	232	239	239	239
Arrival 6 Bags to Retrieve / Flight – *NO*	--	--	--	--	--	--	96
Total Bags to Claim in 20 Minute Period	**--**	**448**	**543**	**882**	**909**	**909**	**1,005**
Existing Bag Claim Devices[2] – *NO.*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*
Total Practical Bag Display Capacity *(Deficit)* - *NO*	**--**	***(124)***	***(219)***	***(558)***	***(605)***	***(605)***	***(681)***
Total Theoretical Bag Display Capacity *(Deficit)* - *NO*	**--**	**+36**	***(59)***	***(398)***	***(425)***	***(425)***	***(521)***

Footnotes:
[1] Assumes Allegiant A320 Narrow Body with 186 seats
[2] AVL currently has two (2) 52' x 20' sloped bed carousels
Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook*
Source: CHA, 2023.

Table 4-52 suggests baggage claim carousel configurations to meet the display and frontage requirements for the PALs.

Table 4-52 – No. and Size of Bag Claim Carousels

	(Base)[1]	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Practical Bag Claim Carousel Size (52' x 20') 954=A	*(2)*	*(2)* + 1	*(2)* + 2	--	--	--	--
Theoretical Bag Claim Carousel Size (52' x 20') 954=A	*(2)*[2]	*(2)*[2, 3]	*(2)* + 1	*(2)* + 2	--	--	--
Practical Bag Claim Carousel Size (68' x 18') 1,054=A	--	3[4]	3[4]	5	5	5	5
Theoretical Bag Claim Carousel Size (68' x 18') 1,054=A	--	2[3]	2[4]	3	3	3	4
Practical Bag Claim Carousel Size (120' x 20') 2,314=A	--	2	2[2, 3]	3[2]	3[2]	3[2]	3[2, 4]
Theoretical Bag Claim Carousel Size (120' x 20') 2,314=A	--	1	2	2	2	2	2
Suggested No. of Baggage Carousels - *NO*	***(2)***	***(2)***	**2**	**3**	**3**	**3**	**3**

Abbreviations:
A = Area displaced by carousel.
Footnotes:
[1] AVL currently has two (2) 52' x 20' sloped bed carousels
[2] Suggested size and number highlighted in "yellow"
[3] Three (3) required to meet LF test. See **Table 4-53**
[4] Four (4) required to meet LF test. See **Table 4-53**
Notes:
Suggest No. of Baggage Carousel and corresponding sizes are used to calculate Areas in **Table 4-52**
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions.
Source: CHA, 2023.

Table 4-53 – Terminating PAX Baggage Claim Space Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Peak Hour Deplaned PAX	--	910	1,019	1,140	1,270	1,446	1,614
Peak 20-min. Terminating PAX – *NO*	--	441	494	553	616	701	783
% PAX Bags Check – *NO*	--	70.0	70.0	70.0	70.0	70.0	70.0
Total PAX Checking Bags - *NO*	--	309	346	387	431	491	543
Average Travel Party Size – *NO*	--	1.3	1.3	1.3	1.3	1.3	1.3
Number of Parties – *NO*	--	238	266	298	332	378	422
Additional Persons at Bag Claim - *%*	--	30%	30%	30%	30%	30%	30%
Total Persons at Carousel – *NO*	--	259	290	325	362	412	459
Claim Frontage Required – 1.5 *LF/PAX*	--	389[2]	435[2]	487[3]	542[3]	617[3]	689[2]
Area / Person in Active Retrieval - *SF*	--	18	18	18	18	18	18
Total Area for Active Retrieval - *SF*	*(6,638)*	4,662	5,220	5,850	6,516	7,416	8,262
Carousel Device Area - *SF*	*(1,908)*	1,908	4,628	6,942	6,942	6,942	6,942
Oversize Baggage Claim - *SF*	*(150)*	150	150	150	150	150	300
Subtotal	***(8,546)***	6,720	**9,998**	**12,942**	**13,608**	**14,508**	**15,354**
Circulation[1] (0.50 x Factor)	*(4,120)*	3,360	4,999	6,471	6,804	7,254	7,677
Total Bag Claim Processor Area[2] - *SF*	***(12,666)***	**10,080**	**14,997**	**29,413**	**20,412**	**21,762**	**23.031**

Footnotes:
[1] Generally acceptable circulation factor is 0.30 times the *Subtotal* for baggage claim area requirements. This analysis concluded that a more practicable circulation factor is 0.50 to address any errant airline operational policies and/or procedures, non-common equipment and facilities use, and inherent inefficiencies with the existing structure common with future renovation projects.
[2] Suggested baggage claim carousel number and sizes fail LF test. See **Table 4-50.**
[3] Suggested baggage claim carousel number and sizes exceeds LF test. See **Table 4-50.**
Notes:
Those numbers depicted in parentheses indicate existing conditions.

Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions.
Source: Airport Cooperative Research Program (ACRP) *Report 25 – Airport Passenger Terminal Planning and Design Guidebook*, CHA, 2023.

Summary of Baggage Claim Carousels Through the PALs

PAL 1: It is suggested that at the time PAL 1 occurs, and the Terminal Modernization Project is completed, the two (2) existing 52' x 20' oval sloped bed carousels can meet the theoretical baggage display capacities, but fails the test for baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel. To meet the requirements for both display and clam frontage, three (3) carousels would need to be provided.

PAL 2: It is suggested that at the time PAL 2 occurs two (2) new 120' x 20' oval sloped bed carousels can meet the practical baggage display capacities and is in the acceptable range for baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel. To meet the baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel, three (3) carousels would be needed.

PAL 3, PAL 4, PAL 5: It is suggested that at the time PAL 3 occurs three (3) new 120' x 20' oval sloped bed carousels can meet the practical baggage display capacities and the baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel.

PAL 6: It is suggested that at the time PAL 6 occurs three (3) new 120' x 20' oval sloped bed carousels can meet the practical baggage display capacities and is in the acceptable range for baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel. To meet the baggage claim frontage, in linear feet (LF) required for active baggage retrieval from the carousel, four (4) carousels would be needed.

4.6.15 Airline Baggage Services Offices (BSO)

Baggage service offices, generally found adjacent to the baggage claim devices, are areas equipped for both secure baggage storage as well as public service that measure approximately 200 square feet. **Table 4-54** provides a summary of the area needed for airline baggage service offices with the anticipated number of air carriers serving the AVL market.

Table 4-54 – Airline Baggage Service Offices (PALs)

NO. Required Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Airlines BSO- *NO.*	*(1)*	4	5	6	6	7	7
Average BSO Area - *SF*	*(365)*	200	200	200	200	200	200
Total BSO - *SF*	***(365)***	**800**	**1,000**	**1,200**	**1,200**	**1,400**	**1,400**

Note: Those numbers depicted in parentheses indicate existing conditions. Numbers in RED represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.16 Concessions: Gift and News, Food and Beverage, Services, and Rental Car

Gift and News, Food and Beverage, and Services Concessions

Terminal concession areas refer to the space dedicated at AVL for a variety of concessions, including both airside and landside, alongside necessary storage. For planning purposes, concession area requirements were divided into specific concession types: food and beverage,

gift and news, and services, such as advertising, information desks, banking, health counters, ATM, foreign currency exchange, etc. *ACRP, Report 54, Resource Manual for In-Terminal Concessions 2011* is the standard and source for evaluation concession requirements.

Using the suggested square feet of concessions per 1,000 enplaned passengers, as referenced in the *ACRP, Report 54, Resource Manual for In-Terminal Concessions* for total concession requirements for airports with 1 to 2 million enplanements, a factor of 12.4 was used to calculated the needs using the formula given in **Figure 4-11**.

Figure 4-11 – Total Concession Calculation

$$\text{Total Concession Area (SF)} = \frac{\text{Enplaned PAX}}{1{,}000} \times 12.4 \text{ SF}$$

Aviation industry standards and guidelines split concession areas in the O&D terminal facility between pre-security and post-security locations, with the general percentage split consisting of 10 percent located pre-security, and 90 percent post-security. The analysis did not strongly consider the validity of the percentage splits between food and beverage, gifts and news, and services; however, the percentage splits indicated for use in the analysis represented industry guidelines that have been generically applied. For this analysis, the splits between food and beverage, gifts and news, and services located pre-security were assumed at 55, 17, and 28 percent, respectively; however, post-security, the splits were assumed at 68, 31, and 1 percent, respectively.

Changes to the terminal building will result in shifts in the share of concession percentages applied. Due to this, AVL conducted a comprehensive concession plan done with the current design plan for the new terminal to address the market-centric variables to produce the best concessions plan moving forward.

As noted, storage and back of the house for concessions is also considered in the analysis performed. The square footage calculated for these purposes can be found in **Table 4-34**, in which a factor of 1.20 was applied to the total concessions area. An additional factor of 0.30 was also applied to account for public circulation needs, just as in other public processor areas. This calculation is also shown in **Table 4-55**.

Table 4-55 – Concessions Areas

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Pre-Security Concessions (10% of total)							
Food and Beverage - *SF*	--	708	793	887	993	1,125	1,256
Gifts and News - *SF*	--	219	245	274	307	348	388
Services [1] - *SF*	--	361	404	452	505	573	639
Subtotal - *SF*	***(633)***	**1,288**	**1,441**	**1,613**	**1,805**	**2,045**	**2,283**
Post-Security Concessions (90% of total)							
Food and Beverage - *SF*	--	7,882	8,820	9,869	11,044	12,514	13,974
Gifts and News – *SF*	--	3,593	4,021	4,499	5,035	5,705	6,370
Services [1] - *SF*	--	116	130	145	162	184	205
Subtotal - *SF*	***(16,955)***	**11,591**	**12,970**	**14,514**	**16,241**	**18,403**	**20,550**

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Total Concessions Area - *SF*	***(17,328)***	**12,879**	**14,411**	**16,126**	**18,045**	**20,488**	**22,833**
Concessions Storage [2] - *SF*	*(3,889)*	2,576	2,882	3,225	3,609	4,090	4,567
Circulation [3] - *SF*	--	3,864	4,323	4,838	5,414	6,134	6,850

Footnotes:
[1] includes ATM/Foreign Currency Exchange/Mailbox Drop and Business Center as a Service concession
[2] a factor of 0.20 was applied to the total concession area to determine the concession storage needs
[3] a factor of 0.30 was applied to the total concession area to determine the public concession circulation needs
Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
The analysis of concessions does not include the Airport's conference centers, or rental car/transportation functions; however, a separate analysis is conducted for rental car/ground transportation processor areas
Source: CHA, 2023.

Rental Car Concessions

There are three (3) rental car companies operating eight (8) rental car brands at AVL. These include Alamo, AVIS, Budget, Thrifty, Dollar, Enterprise, Hertz, and National. Outside of counters, rental car companies also generally require office space, automobile service, maintenance site, quick turnaround facilities, and ready return parking spaces. It is assumed the rental car companies are grouped as follows:

- Alamo – National—Enterprise
- AVIS – Budget
- Hertz – Dollar – Thrifty

From a planning perspective, the number of rental car concessionaires on-site is usually pre-determined as part of a Request-for-Proposal renewal process for rental car concessions.

It is recommended that an additional rental car counter module be added via a Request-for-Proposals renewal process for rental car companies to provide eight (8) rental car counters in PAL 4 and nine (9) rental car counters in PAL 6.This analysis assumed an average module square footage of 900 square feet in the terminal for each public rental car concession. Rental car concession is considered a public place, so an additional factor of 0.30 was applied to account for public circulation needs, as shown in **Table 4-56.**

Table 4-56 – Rental Car Concessions Areas

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NO of RC Concessionaires - *SF*	*(8)*	8	8	8	8	8	9
NO of Modules Required - *NO*	*(4)*	4	4	4	5	5	5
Average RC Mod Size [2] - *SF*	*(879)*	900	900	900	900	900	900
Total RC Concessions Area [1] - *SF*	***(3,515)***	**3,600**	**3,600**	**3,600**	**4,500**	**4,500**	**4,500**
Circulation [2] - *SF*	*(1,350)*	1,080	1,080	1,080	1,350	1,350	1,350

Footnotes:
[1] Included transaction counter and queuing area inside the terminal building
[2] a factor of 0.30 was applied to the total rental car concession area to determine the public circulation needs
Notes:

Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

Airport Information

Ground transportation services comprise an area of 150 square feet at AVL. It is assumed it will be part of the Welcome Center located in the baggage claim area. The area indicated will meet the present demand and is expected to adequately support projected demand; therefore, there is not a need for the Airport to allocate additional space for use by ground transportation services during the planning horizon.

Table 4-57 – Airport Information

Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Airport Information- *SF*	*(150)*	150	150	150	150	150	150

Note: Those numbers depicted in parentheses indicate existing conditions
Source: CHA, 2023.

4.6.17 Airport Administration

Airport Administration areas at AVL are used by staff for varying operations/ functions, which typically include administrative offices, board meeting room, private restrooms, break area, conference rooms, etc. Functional areas considered as airport operation are evaluated separately in another section. i.e., airfield resources, airport police, security, security badging offices, maintenance, mail, receiving, etc. Future needs for administrative office and support space, future staffing levels, and future facility needs correlate to passenger and facility growth, and what staffing levels and facilities are necessary, to support the overall administration needs. The analysis for determining *Airport Administration* areas was conducted using **Figure 4-12**.

Figure 4-12 – Calculation of Airport Administration Areas

FA = PAL NBEG No. x NBEG Factor (SF):

- FA = Future Airport Administration program requirements, in square feet
- BYA = Base Airport Administration area in square feet = 18,951 SF
- NBEG Factor (SF), for Base = BYA ÷ Base NBEG No. = 18,951 SF ÷11.1 = SF

Source: CHA 2023, Quantitative analysis for increase of area requirements based on forecasted NBEG

Table 4-58 represents Airport Administration requirements throughout the planning horizon.

Table 4-58 – Airport Administration Requirements

NBEG Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NBEG – *NO.*	*(11.1)*	11.4	12.4	14.4	16.4	18.4	19.4
NBEG Factor - *SF*	*(1,707)*	1,707	1,707	1,707	1,707	1,707	1,707
Available Airport Admin Area - *SF*	*(25,174)*[1]	--	--	--	--	--	--
Future Airport Admin Program Requirements[2] - *SF*	***(18,951)*[3]**	**19,460**	**21,167**	**24,581**	**27,995**	**31,401**	**33,116**

Footnote:
[1] Includes unassigned and future office space
[2] Includes circulation area specific to function group
[3] Designated Airport Administration area, not including unassigned and future office space
Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

In completing this analysis, it was assumed all airport administration space is currently occupied by a function requirement meeting the definition for an airport administration area.

4.6.18 Airport Terminal Operations

Future needs for airport terminal operations correlate to passenger and facility growth, while considering both future staffing levels and what staffing levels/ facilities are necessary to support the overall operational needs specific to AVL.

The analysis for determining *Airport Terminal Operations* areas was conducted using **Figure 4-13**.

Figure 4-13 – Calculation of Airport Operation Areas

FA = PAL NBEG No. x NBEG Factor (SF):

- FA = future Airport Terminal Operations program requirements, in square feet
- BYA = Base (Existing) Airport Operations area, in square feet = 18,210 SF
- NBEG Factor (SF) = BYA ÷ Base NBEG No. = 18,210 SF ÷ 11.1 = 163 SF

Source: CHA 2023, Quantitative analysis for increase of area requirements based on forecasted NBEG

Table 4-59 represents Airport Operations requirements throughout the planning horizon.

Table 4-59 – Airport Terminal Operations Requirements

NBEG Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
NBEG – *NO*	*(11.1)*	11.4	12.4	14.4	16.4	18.4	19.4
NBEG Factor - *SF*	*(1,641)*	1,641	1,641	1,641	1,641	1,641	1,641
FA Airport Operation[1] - *SF*	***(18,210)***	**18,707**	**20,348**	**23,630**	**26,912**	**30,194**	**31,835**

Footnote:
[1] Includes circulation area specific to functional group

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

In completing this analysis, it was assumed all airport operations space is currently occupied by a function requirement meeting the definition for an airport operations area.

4.6.19 TSA Office Administration

TSA office administration analysis examines the footprint of TSA square footage at AVL, with a focus on staff operations, administrative offices, and internal circulation. The areas evaluated under this section are separate from CBIS and SSCP processor areas. To account for any staffing fluctuations throughout the planning horizon, the analysis assumed a five (5) percent growth rate from one planning activity level to the next, as indicated in **Table 4-60.**

Table 4-60 – TSA Administration Area

Area Requirements	*(Base)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Total TSA Administration – *SF*	***(2,187)***	**2,296**	**2,411**	**2,531**	**2,658**	**2,791**	**2,930**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.20 Restroom Facilities

Terminal restroom facilities play a vital role in assuring passenger safety and comfort while at an airport. Facility analysis conducted examined the demand for restrooms on both non-secure (landside) and secure (airside) sections of the terminal building. It must be noted that private/ non-public restrooms were not considered when completing this analysis. When computing the non-secure areas of the terminal, analysis shown was done collectively—instead of parsing the terminal restrooms needed by each specific function, the non-secure area was treated as if it was one continuous room. Moreover, the analysis for the secure portions of the airport terminal building (the concourse) was conducted with the following assumption:

- The fixture counts and area requirements in square feet are established using the methodology in the Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design*.

Restroom location should be diligently thought through, with optimal layout plans allowing terminal flexibility. Building plans should allow staff to close-off sections of the restroom for daily maintenance activities, or more long-term renovations, without impeding separate facilities that need to remain open to meet appropriate levels of service.

In addition, airports need to consider additional amenities vital for efficient, and equitable, passenger experience. In the case of this analysis, the study affords lactation rooms, changing rooms, and family rooms specifically. Though not available at every airport, and not always mandated by building codes, aviation trends have shown a greater emphasis on such facilities.

The analysis calculated the square footage requirements to support the optimal restroom layout based on the number of fixtures required for each module. The areas calculated included a diaper changing station and the door-less privacy entryway from the concourse circulation. Each restroom module was assumed to have a lactation room, family room, as well as a custodial and service sink room, which were calculated separately with a standard square foot area.

Equivalent Aircraft (EQA) is the overarching basis of all analyses for restroom facilities. The EQA requirements throughout the planning horizons are indicated in **Table 4-11**. For this analysis, a restroom module is defined as having separate men's and women's facilities, mother's room (family room), and a custodial area with a service sink.

Secure Airside Terminal Restroom Facilities – Concourse Analysis

The first step of the analysis was to determine the number of restroom modules necessary to service a concourse. **Figure 4-14** highlights the methodology used when determining the number of modules.

Figure 4-14 – Restroom Demand

$$\text{No. of Restroom Modules} = \frac{EQA}{8}$$

Table 4-61 shows the total number of restroom modules required for each concourse throughout the planning horizon. The concourse layout was considered when determining the number of modules, e.g., single vs. double-loaded concourses. For example, the spacing distance for modules in a double-loaded concourse is less than the required spacing distance for modules in a single-loaded concourse. When reaching these results, the single-loaded corridor length indicated in **Table 4-35**, and **Figure 4-14** was used to determine the number of restroom modules at AVL.

Table 4-61 – Number of Restroom Modules (Mods) Required at Concourse

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
EQA[1]	--	8.3	9.3	10.8	12.3	13.8	14.8
No. of Mods – Theoretical[2]	--	1.04	1.16	1.35	1.54	1.73	1.85
No. of Modules[3]	***(3)***	**3**	**3**	**3**	**3**	**4**	**4**

Footnotes:

[1] the EQA values is the PAL EQA value from **Table 4-32**.

[2] represents calculated theoretical value for number of modules required

[3] the theoretical value is rounded up to the next whole number

Notes:

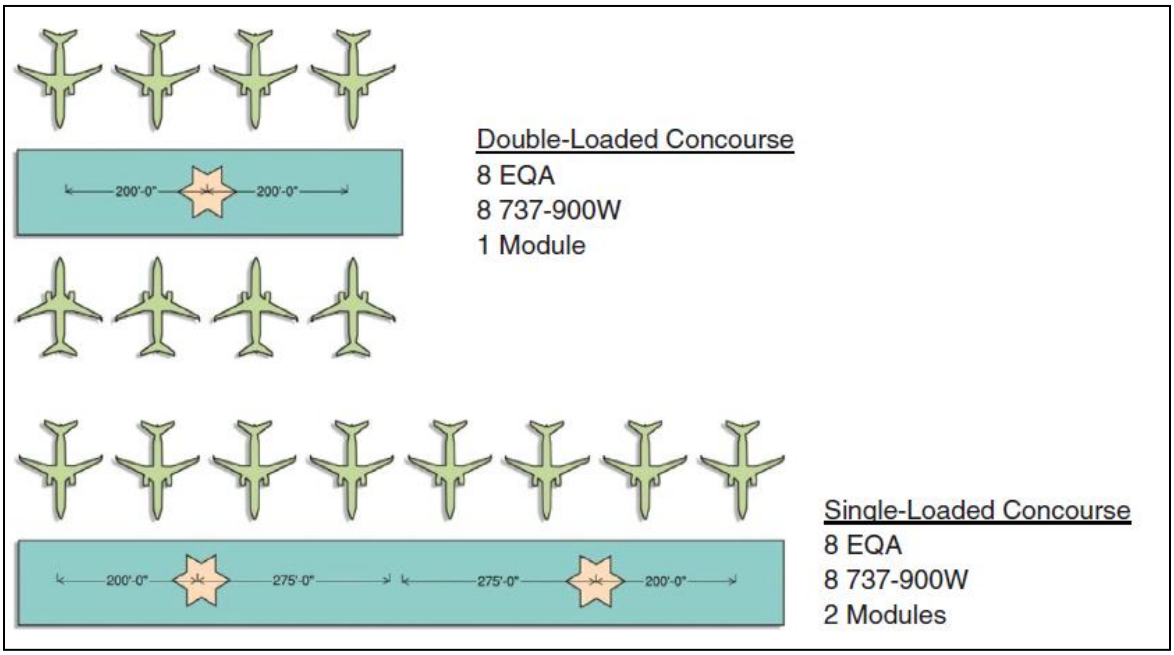
Those numbers depicted in parentheses indicate existing conditions

Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions

Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design*, CHA, 2023.

Figure 4-15 below depicts the spacing of modules for single-loaded concourses and double-loaded concourses. The figure represents spacing of restroom modules in each concourse scenario for eight EQA. The frequency and spacing of restroom modules were consistent with the formula in **Figure 4-14**, which determined the number of restroom modules required based on a factor of eight EQA.

Figure 4-15 – Single Loaded vs. Double-Loaded Concourse Exhibit



The data for EQA in **Table 4-61** and the load factors for each PAL, the peak passenger capacity (Design Passengers) was calculated using the formula shown in **Figure 4-16**. The results of the analysis are presented in **Table 4-62**.

Figure 4-16 – Design Passengers Restroom Calculation

Design Passengers = EQA x [186 Seats = (1.0 EQA)] x Load Factor

Table 4-62 – Concourses: Design Passengers

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Load Factor – *NO.*	--	73.3%	75.6%	77.9%	80.2%	80.2%	80.2%
Design Passenger (PAX) – *NO.*	**--**	**1,132**	**1,308**	**1,565**	**1,835**	**2,059**	**2,208**

Note: Those numbers depicted in parentheses indicate existing conditions

Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design*, CHA, 2023.

The next step in the analysis was determining the Peak 20 minute Passenger Demand for restroom facilities, using the formula in **Figure 4-17**, and indicated in **Table 4-63**.

Figure 4-17 – Concourse Restroom Demand (20 Min Peak)

Peak 20 Minute Passenger Demand = Design Passenger x Peak 20-Minute %

For concourse with only origin and destination (O & D) assume the Peak 20-Minute % = 50%

Table 4-63 – Concourse: Peak 20 Minute Restroom Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Concourse 20- Minute Peak	--	566	654	783	918	1,030	1,104

Note: Those numbers depicted in parentheses indicate existing conditions
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The Design Factors were calculated using the formula in **Figure 4-18** and the variables allowed the calculate of fixtures required. These factors are tabulated in **Table 4-64**.

Figure 4-18 – Concourse Restroom Design Factor (20 Min Peak)

Design Factor = Peak 20-Minute Passenger Demand x % Using Restroom *(utilization)*

Note: The general utilization rate planning standard = 50% to 60%. For this analysis, 60% is used

Table 4-64 – Concourse: Peak 20-Minute Design Factors

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Concourse Design Factor	--	334	392	470	551	618	662

Note: Those numbers depicted in parentheses indicate existing conditions.
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The formulas represented in **Figure 4-19** and **Figure 4-20** was used to determine the total number of men's and women's fixtures respectively. A fixture is defined as a toilet or urinal. These fixture requirements are tabulated in **Table 4-65**.

Figure 4-19 – Men's Fixtures Calculation

Men's Fixtures = Design Factor x Male % ÷ 13

Note: The passenger gender mix ratio is assumed to be a 50%/50% ratio

Figure 4-20 – Women's Fixtures Calculation

Women's Fixtures = Male Fixtures x Female Increase Factor

Note: The passenger gender mix ratio is assumed to be a 50%/50% ratio; The Female Increase Factor = 1.25

Table 4-65 – Concourse: Total Required Fixtures for all Modules

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Men's	*(36)*	13	16	18	22	24	26
Women's	*(35)*	16	19	23	25	30	32

Notes:
Those numbers depicted in parentheses indicate existing conditions.
Fixture count round up to nearest whole fixture
Source: CHA, 2023.

Fixtures required for each module was then calculated with the formula in **Figure 4-21** and fixtures tabulated in **Table 4-66**.

Figure 4-21 – Restroom Fixture Calculation

Fixtures Required for Each Modules = Required Fixtures ÷ No. Modules Required

Table 4-66 – Concourse: Fixtures Required per Module

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
	Fixture No. per Mod	**Fixture No. per Mod**	**Fixture No. Per Mod**	**Fixture No. Per Mod**	**Fixture No. per Mod**	**Fixture No. per Mod**	**Fixture No. per Mod**
Men's	--	4	5	6	8	8	9
Women's	--	6	7	8	9	10	11

Footnotes:
[1] Number of restroom modules required is shown in **Table 4-61**.
Notes:
Those numbers depicted in parentheses indicate existing conditions
Fixture count round up to nearest whole fixture
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The formulas used for calculating Men's and Women's restroom areas in the concourse are shown in **Figure 4-22** and **Figure 4-23**, respectively, and the areas are tabulated in **Table 4-67** and **Table 4-68**, respectively.

Figure 4-22 – Men's Restroom Area Calculation

Men's Restroom Area = Required Fixtures x 85 SF per Fixture Required

Figure 4-23 – Women's Restroom Area Fixture Calculations

Women's Restroom Area = Required Fixtures x 95 SF per Fixture Required

Table 4-67 – Concourse: Single Module Area Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Men's - *SF*	--	340	425	510	680	680	765
Women's - *SF*	--	570	665	760	855	950	1,045
Lactation Room - *SF*	--	85	85	85	85	85	85
Family Room - *SF*	--	105	105	105	105	105	105
Custodial - *SF*	--	165	165	165	165	165	165
Concourse Module Total - *SF*	**--**	**1,265**	**1,445**	**1,625**	**1,890**	**1,985**	**2,165**

Footnote:
[1] One-Lactation Room shared with both modules. Total Lactation Room = 70 SF
Note: Those numbers depicted in parentheses indicate existing condition
Source: CHA, 2023.

Table 4-68 – Concourse: Total Restroom Module Area Requirements

(Base)		PAL 1		PAL 2		PAL 3	
Modules	***Total Area***	**No. of Mods**	**Total Area**	**No. of Mods**	**Total Area**	**No. of Mods**	**Total Area**
(3)	*(8.101)*	3	3,795	3	4,335	3	4,875
PAL 4		**PAL 5**		**PAL 6**			
No. of Modules	**Total Area**	**No. of Mods**	**Total Area**	**No. of Mods**	**Total Area**		
3	5,670	3	5.955	3	6,495		

Note: Those numbers depicted in parentheses indicate existing conditions
Source: CHA, 2022.

Non-Secure Landside Terminal Restroom Facilities – Baggage Claim and Ticketing; Pre-Security

Landside restrooms are typically located within the major terminal areas such as the check-in lobby, baggage claim, and concessions areas. Calculations were based on the total peak-hour O&D passenger demand (PHP) and the visitors of those passengers. Visitor ratios were assumed to increase the demand by a factor of 20 percent for well-wishers (WW) and 30 percent for meeters and greeters (M&G). For clarity, well-wishers are visitors associated with departing passengers, whereas meeters and greeters are visitors associated with arriving passengers.

AVL is a single level terminal, and the ticketing and check-in lobby, and baggage claim restroom modules are combined into a single restroom module, which serves both processor areas. The analysis assumed evaluation methodologies associated with a multi-level terminal building. The scenario began by determining the landside Design Passenger Demand for each of the functional areas and then combining the requirements into a single restroom module. In the event AVL has the need to have restroom facilities for each processor area, i.e., ticketing and check-in lobby, and baggage claim restroom, the following analysis depicts these requirements for each. The combined ticketing and check-in lobby, and baggage claim restroom needs are represented in **Table 4-26.**

Check-In Restroom Facilities Determinations

The Check-in Design Demand was calculated with the formula in **Figure 4-24**. The design demands are shown in **Table 4-69**.

Figure 4-24 – Check-In Fixtures Calculation

Check-in Design Demand = Enplaning Peak-Hour Passengers x WW Ratio

Note: WW Ratio = 1.20

Table 4-69 – Non-Secure Landside: Check-In Restroom Design Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Peak-hour Enplaning PAX[1] - *NO.*	--	883	988	1,106	1,238	1,403	1,566
Design Demand – *NO.*	--	1,059	1,186	1,327	1,485	1,683	1,879

Footnotes:

[1] 97% of peak-hour enplaning PAX

Note: Those numbers depicted in parentheses indicate existing conditions

Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The quantity of fixtures was determined from the Design Demand for Men's and Women's restroom facilities as shown by the formulas in **Figure 4-25** and **Figure 4-26**, respectively, and the number of fixtures required was based on gender as indicated in **Table 4-46**.

Figure 4-25 – Check-In Male Fixtures Calculation

Check-in Total Male Fixtures = Design Demand ÷ Ratio

Note: Ratio = 1 fixture per 70 enplaning PHP for first 400 enplaning PHP + 1 fixture per 200 enplaning PHP in excess of 400 enplaning PHP

Figure 4-26 – Check-In Female Fixtures Circulation

Check-in Total Female Fixtures = Total Male Fixtures x Female Increase Factor

Note: Female Increase Factor = 1.25

Table 4-70 – Non-Secure Landside: Check-In Men's and Women's Fixture Requirements

	(Base)		PAL 1		PAL 2		PAL 3		PAL 4		PAL 5		PAL 6	
	M	*W*	M	W	M	W	M	W	M	W	M	W	M	W
Check-in [1]	*(0)*	*(0)*	4	5	5	7	5	7	6	8	7	9	8	10

Footnotes:
[1] Number of fixtures in the Check-in level and area only
Abbreviations:
M = Men's & W = Women's
Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Fixture count round up to nearest whole fixture
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

Baggage Claim Restroom Facilities Determinations

The terminal Design Demand was calculated with the formula in **Figure 4-27** and the Design Demands are indicated in **Table 4-71**.

Figure 4-27 – Baggage Claim Restroom Demand

Baggage Claim Design Demand = Deplaning Peak-Hour Passengers x M & G Ratio

Note: M & G Ratio = 1.30

Table 4-71 – Non-Secure Landside: Baggage Claim Restroom Design Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Peak-hour Originating PAX[1] - *NO*	--	883	988	1,106	1,238	1,403	1,566
Design Demand	--	1,148	1,285	1,438	1,609	1,823	2,035

Footnotes: [1] 97% of peak-hour enplaning PAX
Note: Those numbers depicted in parentheses indicate existing conditions
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The quantity of fixtures could be determined from the Design Demand for Men's and Women's restroom facilities as indicated in **Figure 4-28** and **Figure 4-29**, respectively, and the fixture requirements are depicted in **Table 4-72**.

Figure 4-28 – Baggage Claim Male Fixtures Calculation

Baggage Claim Total Male Fixtures = Design Demand ÷ Ratio

Note: Ratio = 1 fixture per 70 deplaning PHP for first 400 deplaning PHP + 1 fixture per 200 deplaning PHP in excess of 400 deplaning PHP

Figure 4-29 – Baggage Claim Female Fixtures Calculation

Baggage Claim Total Female Fixtures = Total Male Fixtures x Female Increase Factor

Note: Female Increase Factor = 1.25

Table 4-72 – Non-Secure Landside: Bag Claim Men's/Women's Fixture Requirements

No.	*(Base)*		PAL 1		PAL 2		PAL 3		PAL 4		PAL 5		PAL 6	
	M	*W*	M	W	M	W	M	W	M	W	M	W	M	W
Baggage Claim	*(14)*	*(14)*	4	5	5	7	6	8	7	9	8	10	9	12

Footnotes:
[1] number of fixtures in the Baggage Claim level and area only
Abbreviations:
M = Men's & W = Women's
Notes:
Those numbers depicted in parentheses indicate existing conditions
Fixture count round up to nearest whole fixture
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.

The methodology for calculating the required number of toilet fixtures was determined using the analytics for a multi-level terminal and addressed toilet fixture requirements for only the check-in lobby and baggage claim area. For multi-level terminals, restrooms should be in proximity to the major passenger processing functions such as check-in, baggage claim, security screening, meeter and greeter areas, and major landside concession nodes.

The following analysis took the physical configuration, locations of the functional areas, and passenger flow for the Airport's terminal into consideration.

Table 4-73, below, tabulates total fixture requirements and allows a comparison of existing fixtures to fixtures required in future planning levels.

Table 4-73 – Non-Secure Landside: Total Fixtures Required – Check-In & Baggage

No.	*(Base)*		PAL 1		PAL 2		PAL 3		PAL 4		PAL 5		PAL 6	
	M	*W*	M	W	M	W	M	W	M	W	M	W	M	W
Check-in	*(0)*	*(0)*	4	5	5	7	5	7	6	8	7	9	8	10
Baggage Claim	*(14)*	*(14)*	4	5	5	7	6	8	7	9	8	10	9	12
Totals	***(14)***	***(14)***	**8**	**10**	**10**	**14**	**11**	**15**	**13**	**17**	**15**	**19**	**17**	**22**

Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Fixture count round up to nearest whole fixture
Source: Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design,* CHA, 2023.
Abbreviations: M = Men's & W = Women's

When conducting restroom area calculations, it was assumed that each processor area (check-in lobby and baggage claim) will each have one restroom module. **Table 4-73** displays total fixture requirements for each processor area, with each module including a diaper changing station, as well as door-less privacy entryway from the public circulation area. In addition, each restroom module was assumed to have a lactation room, family room, as well as a custodial and service sink room, which were calculated separately.

The formulas used for calculating landside Men's and Women's restroom areas are shown in **Figure 4-30** and **Figure 4-31**, respectively, and the requirements are shown in **Table 4-74**.

Figure 4-30 – Men's Restroom Area Calculation

Men's Restroom Area = Required Fixtures x 85 SF per Fixture Required

Figure 4-31 – Women's Restroom Area Calculation

Women's Restroom Area = Required Fixtures x 95 SF per Fixture Required

Table 4-74 – Non-Secure Airside: Single Restroom Module Area Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Check-in Men's - *SF*	*(170)*	340	425	425	510	595	680
Check-in Women's - *SF*	*(285)*	475	665	665	760	855	950
Lactation Room - *SF*	*(85)*	85	85	85	85	85	85
Family Room - *SF*	*(105)*	105	105	105	105	105	105
Custodial - *SF*	*(165)*	165	165	165	165	165	165
Check-in Module Total - *SF*	***(810)***	**1,170**	**1,445**	**1,445**	**1,625**	**1,805**	**1,985**
Baggage Claim Men's - *SF*	*(255)*	340	425	510	595	680	765
Baggage Claim Women's - *SF*	*(380)*	475	665	760	855	950	1,140
Lactation Room - *SF*	*(85)*	85	85	85	85	85	85
Family Room - *SF*	*(105)*	105	105	105	105	105	105
Custodial - *SF*	*(165)*	165	165	165	165	165	165
Baggage Claim Module Total - *SF*	***(990)***	**1,170**	**1,445**	**1,625**	**1,805**	**1,985**	**2,260**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

The fixture counts are established using the methodology in the Airport Cooperative Research Program (ACRP) *Report 130 - Guidebook for Airport Terminal Restroom Planning and Design*. It is suggested that detailed design will incorporate any State or Local code fixture requirements and provided the most stringent fixture counts required.

4.6.21 Mechanical, Electrical, Plumbing and Information Technology Requirements

Mechanical, electrical, plumbing, and information technology (IT) systems all play a vital role in keeping a terminal fully operational. These areas are calculated on a needs basis factor of about 1.10 based on the existing conditions and applied to the overall usable square footage / net square footage requirements for each PAL indicated in **Table 4-75**.

Table 4-75 – Mechanical, Electrical, Plumbing, and Information Technology Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
MEP & IT Area[1] - *SF*	***(14,858)***	**16,344**	**17,978**	**19,776**	**21,754**	**23,929**	**26,322**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

4.6.22 Other Considerations

Service Animal Relief Areas

Per Title 49 Code of Federal Regulations (CFR) Part 27.71 (h), *Service Animal Relief Areas*, "each airport with 10,000 or more annual enplanements shall provide wheelchair-accessible Service

Animal Relief Areas (SARAs) for service animals that accompany passengers departing, connecting, or arriving at airports." Furthermore, per AC 150/5360-14A (Appendix A), *Guidelines for Service Animal Relief Area*, "at least one SARA must be located in each public sterile area of each terminal." Each SARA is planned for 225 square feet and preferably located near a restroom module after security—square footage indicated in **Table 4-76**.

Table 4-76 – Service Animal Relief Area (SARA)

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
SARA - *SF*	***(123)***	**225**	**225**	**225**	**225**	**225**	**225**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

Storage Requirements

This Section addresses storage requirements within the terminal building. These areas evaluated under this section assumed a five (5) percent growth rate from one planning activity level to the next, as indicated in **Table 4-77**.

Table 4-77 – Storage Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Storage Area - *SF*	***(8,751)***	**9,189**	**9,648**	**10,130**	**10,637**	**11,169**	**11,727**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

Meeter and Greeter Lobby (Well-Wishers)

The meeter and greeter area is an area set aside for passenger congregation, with the intended use to provide an area in which well-wishers, friends, family, and others can embrace departing passengers. Generally, this area is found before the passenger security checkpoint processing area, adjacent to an exit from the secure concourse into a public area.

This analysis assumed a generic factor of 10 percent for the peak hour terminating passengers, along with a 1.25 surge factor, to account for the meeter and greeters. The result was then multiplied by 23 square feet, per the IATA LOS C standard, to determine the overall meeter and greeter area requirements. Figures are shown in **Table 4-78**.

Table 4-78 – Meeter and Greeter Area Requirements

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Terminating PAX Factor [1] – *NO.*	--	1,138	1,274	1,425	1,595	1,808	2,018
10-percent of Peak-terminating PAX Factor	--	114	127	143	160	181	202
Meeter and Greeter Area – *SF*	***(7,709)***	**2,616**	**2,930**	**3,278**	**3,669**	**4,157**	**4,640**

Footnote:
[1] 97% of peak hour deplanement with pre-applied surge factor and x 1.25 additional surge factor
Notes:
Those numbers depicted in parentheses indicate existing conditions

Numbers in RED represent a deficiency in space or quantities when compared to Base Year conditions
Source: ACRP Report 25, *Airport Passenger Terminal Planning and Design*, CHA, 2023.

4.6.23 Curb Front Analysis

Sufficient curbside and roadway functions at an airport serve a vital role in guaranteeing safe and efficient customer experiences for passengers and visitors alike. These functions provide access to an airport, allowing those who visit the facility a location to quickly access the terminal building, as well as guide traffic to appropriate parking locations. As the Airport is expected to continually grow throughout the planning horizon, it is essential for planning purposes to take these areas into account and provide metered guidance in determining effective, and optimized sizing parameters.

With analyses derived from *ACRP Report 40: Airport Curbside and Terminal Area Roadway Operations*, AVL curbside spaces can be addressed to meet the demands for future curbside needs. Roadways at AVL are an important component of efficient vehicular flow and should be analyzed specifically with smooth circulation in mind. Industry trends and developed norms are introduced and discussed with AVL landside facilities. The following section is intended to provide insight on how to best plan, and develop, the curbside and associated roadways leading to the terminal based on industry best practice standards.

Airport Terminal Access

The AVL terminal facility is located off Interstate 26, on Airport Road (State Route 280). Per NCDOT, Airport Road is a bidirectional 5 (five) lane principal arterial roadway, which consists of 4 (four) travel lanes and 1 (one) middle lane reserved for left turns. The terminal building itself is located along Terminal Drive, a one-way local roadway which consists of 3 (three) lanes for travel/circulation and 1 (one) innermost lane reserved for passenger drop off and loading.

Forecasted data projects that AVL will see an estimated 162% increase in peak hour enplanements across the PALs. This statistic correlates with an increase in traffic, primarily by private vehicles, which make up the vast majority of traffic at AVL. This increase necessitates an expansion of terminal curbside facilities, as discussed in greater detail below.

Current Terminal Curbside Conditions

The curb front at AVL extends an effective length of 650 feet, including both canopied and non-canopied areas. The listed area serves as the primary way passengers enter and exit the terminal building. The length is shared across four (4) service lanes, each with a recognized purpose:

- Lane 1: This lane runs parallel to the curbside terminal entrance, and directly borders the building for efficient curbside access. This lane is designed for active unloading and loading of personal vehicles, and/or any other recognized airport vehicle. Rideshare apps, taxis, shuttles, and buses utilize a separate lot off the south end of the terminal. Partial sections of this lane are covered by the AVL terminal canopy. This lane is often utilized as a short-term parking area, which should be discouraged and monitored.

- Lane 2: Located next to Lane 1, Lane 2 provides additional space to load and unload, as needed. When excess space is not needed to assist in curb front parking traffic, Lane 2 is commonly used as an additional circulation lane.
- Lane 3: This lane is primarily used for terminal maneuvering for traffic that is exiting or entering recognized loading/unloading lanes. Lane 4 merges into Lane 3 at the end of the effective length before vehicles exit Terminal Road.
- Lane 4: This lane is located furthermost away from the terminal facility and serves as a pathway to pass through the terminal facility curbside area. Lane 4 also provides access to a left turn lane that guides visitors into the parking garage entrance. This lane merges into Lane 3 after the listed effective terminal curbside length.

All lanes flow in a southernly direction as they merge with routes used by traffic exiting airport parking and rental car facilities. One-way traffic direction eventually culminates with traffic exiting Terminal Drive onto Airport Road. Current lane totals (four) coincide with recommended standards found in *ACRP* guidance.

Further curbside analysis will examine accepted industry formulation to determine if AVL's curbside design satisfies the demand dictated by future forecasted traffic.

Future Curbside Requirements

Requirements for future curb front sizing can be calculated and measured via curbside utilization rates. These rates indicate the ability for a given terminal curb front to accommodate projected vehicular demand across planning horizons. To ensure adequate LOS across all planning scenarios, facilities are assessed with peak/ design hour data. Design Criteria C, as shown in **Table 4-79**, is generally considered an acceptable LOS for terminal curbsides.

Table 4-79 – ACRP Levels of Service Criteria for Curbside Roadways

Criteria	Airport Curbside Levels of Service					
	A	B	C	D	E	F
When double (and triple) parking is allowed at the curbside						
Maximum Demand for Curbside Standing or Parking/ Effective Curbside Length (a)	0.09	1.10	1.30	1.70	2	>2
Maximum Service Flow Rate						
5-Lane Curbside Roadway (vph)	3,400	3,280	3,100	2,710	2,400	Up to 2,400
4-Lane Curbside Roadway (vph)	2,830	2,790	2,680	2,220	1,800	Up to 1,800
3-Lane Curbside Roadway (vph)	2,200	1,950	1,580	860	750	Up to 750
When double parking is prohibited at the curbside						
Maximum Demand for Curbside Standing or Parking/ Effective Curbside Length (a)	0.70	0.85	1.00	1.20	1.35	>1.35
Maximum Service Flow Rate						
4-Lane Curbside Roadway (vph)	2,830	2,830	2,800	2,730	2,600	Up to 2,600
4-Lane Curbside Roadway (vph)	2,350	2,250	2,000	1,760	1,600	Up to 1,600
Maximum through lane volume/capacity ratio	0.25	0.40	0.60	0.80	1.00	1.00

Note: vph = Vehicles per hour

Note: a = The Ratio between the calculated curbside demand and the available effective curbside length.
Source: *ACRP Report 40: Airport Curbside and Terminal Area Roadway Operations,* CHA, 2023.

In addition to acceptable LOS, terminal facilities must consider the standard traffic patterns of the vehicles that visit the Airport. Typical analysis uses historic traffic data to calculate area needed. This study, however, lacked sufficient data for that approach, so industry standard averages served as adequate analysis points. Assumptions made are listed as follows:

- Peak 15 minute period traffic demand consists of 30 percent of peak hour volume
- On average there are 1.5 enplaned passengers per vehicle
- Peak 15 minute traffic volumes will grow across planning horizons
- A multiple stop factor of 1.0 for all vehicle types

In addition to listed items, vehicle type breakdowns for traffic share, size, and dwell time can be found in **Table 4-80**.

Table 4-80 – Traffic Volume Assumptions

Vehicle Variable	Vehicle Type					
	Private Automobile	Taxis/ Rideshare	Shuttles (Hotel/ Rental Car)	Airport Authority Vehicles	Buses (Charter and Public)	Other
Traffic Volume Share – *%*	80	8	5	1	5	1
Dwell Time – *Minutes*	3.0	2.0	3.0	2.0	5.0	2.0
Length – *Feet*	22.0	22.0	50.0	22.0	50.0	35.0

Note: Assumptions are made in alignment with *ACRP Report 40: Airport Curbside and Terminal Area Roadway Operations* standards.
Source: CHA, 2023.

Existing curb front length for Lane 1 consists of an effective 650 feet. This indicates the primary loading and unloading footage available at AVL. Planning analyses conducted concluded the following necessary linear feet across all planning horizons, as tabulated in **Table 4-81**.

Table 4-81 – Calculated Curb Front Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Total Vehicle Count in Peak 15 Minutes	*(123)*	182	204	228	255	289	323
Total Vehicles Per Spot Adjusted for Dwell Times	*(29)*	40	45	49	54	61	68
Conclusions							
Total Curb Length Needed – *Linear Feet*	***791***	**1,061**	**1,199**	**1,287**	**1,425**	**1,579**	**1,789**
Total Existing Curb – *Linear Feet*	***(650)***	***(650)***	***(650)***	***(650)***	***(650)***	***(650)***	***(650)***
Projected v. Existing Comparison – *Linear Feet*	***(141)***	**(411)**	**(548)**	**(637)**	**(775)**	**(929)**	**(1,139)**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

As shown above, **Table 4-81** demonstrates that present curb front space is inadequate across all given PALs. Curb front length should be expanded by the Authority to ensure an efficient LOS for increased visitors. For further, more in-depth analysis, it is recommended that the Airport Authority commission a traffic study to better identify the vehicular demand generated by terminal activity.

4.6.24 Parking Capacity and Analysis

Automobile parking at AVL provides an essential service in allowing efficient space devoted to short term and long-term storage of visitors' cars to the Airport. For an airport to continue to operate at a high LOS, specific attention must be paid to allot adequate parking supply. In recent years, AVL has been experiencing a shortage in parking availability. As such, the authority has continually been adding additional remote surfaces where possible.

At AVL, parking is divided into six (6) named categories: garage, rental car, hourly, daily, shuttle, and employee lots. As identified in the inventory analysis, Airport parking provided by AVL consists of one (1) five-level parking garage, one (1) hourly lot (M), six (6) daily lots (labeled G-K, M), six (6) employee lots (labeled A-F), two shuttle lots (labeled O and N), and a Cell Phone Waiting lot constructed in the Spring of 2022. The Airport also possess an area dedicated to Rental Car parking and QTA, as well as a ground transportation lot. See **Figure 4-32.**

Figure 4-32 – Referenced Available Parking

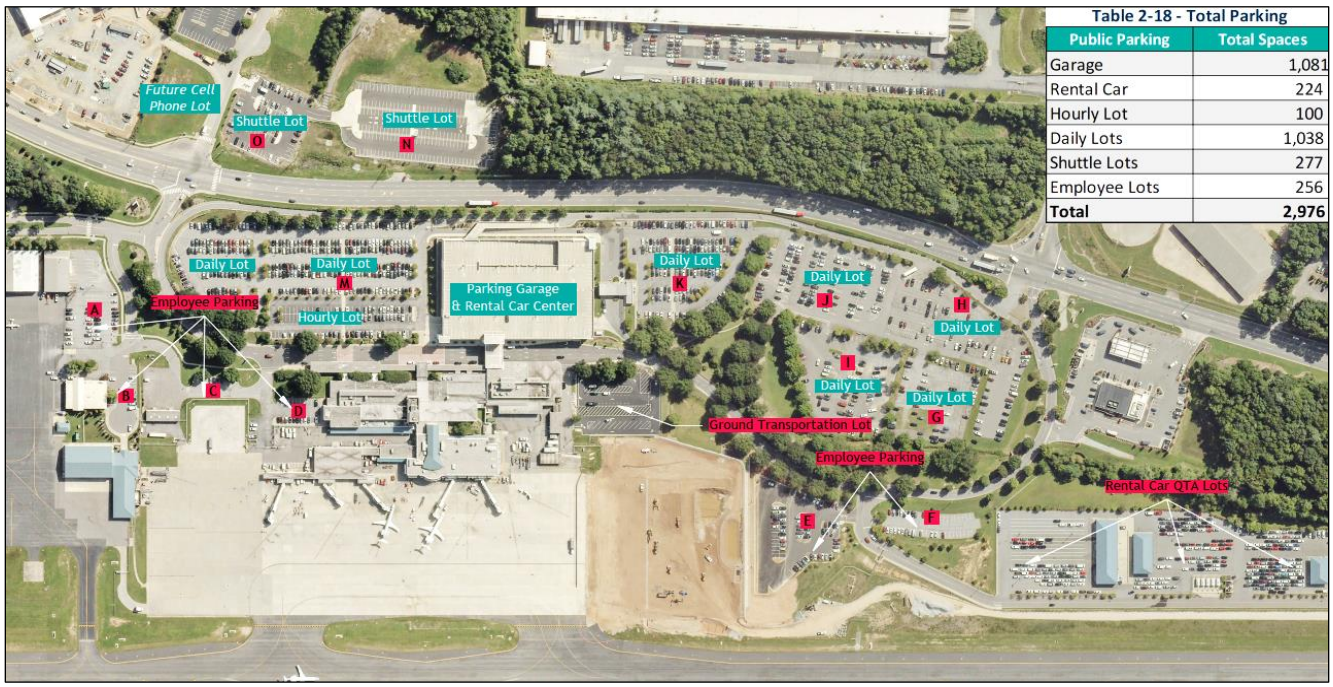


Table 2-18 - Total Parking

Public Parking	Total Spaces
Garage	1,081
Rental Car	224
Hourly Lot	100
Daily Lots	1,038
Shuttle Lots	277
Employee Lots	256
Total	**2,976**

Source: CHA, 2023.

The total number of parking made available by the Airport currently amounts to 2,976 spots—with specific allocations clarified in **Table 4-82**. An additional 660 spaces will be available in the new south lot, pending completion in 2023.

Table 4-82 – Available Parking Totals

Lot Category	Garage	Rental Car	Hourly Lot	Daily Lots	Shuttle Lots	Employee Lots	South Lot [1]
Spaces Provided	1,067	238	100	1,038	277	256	660 [1]
Total Airport Spaces	**2,976 (3,636[2])**						

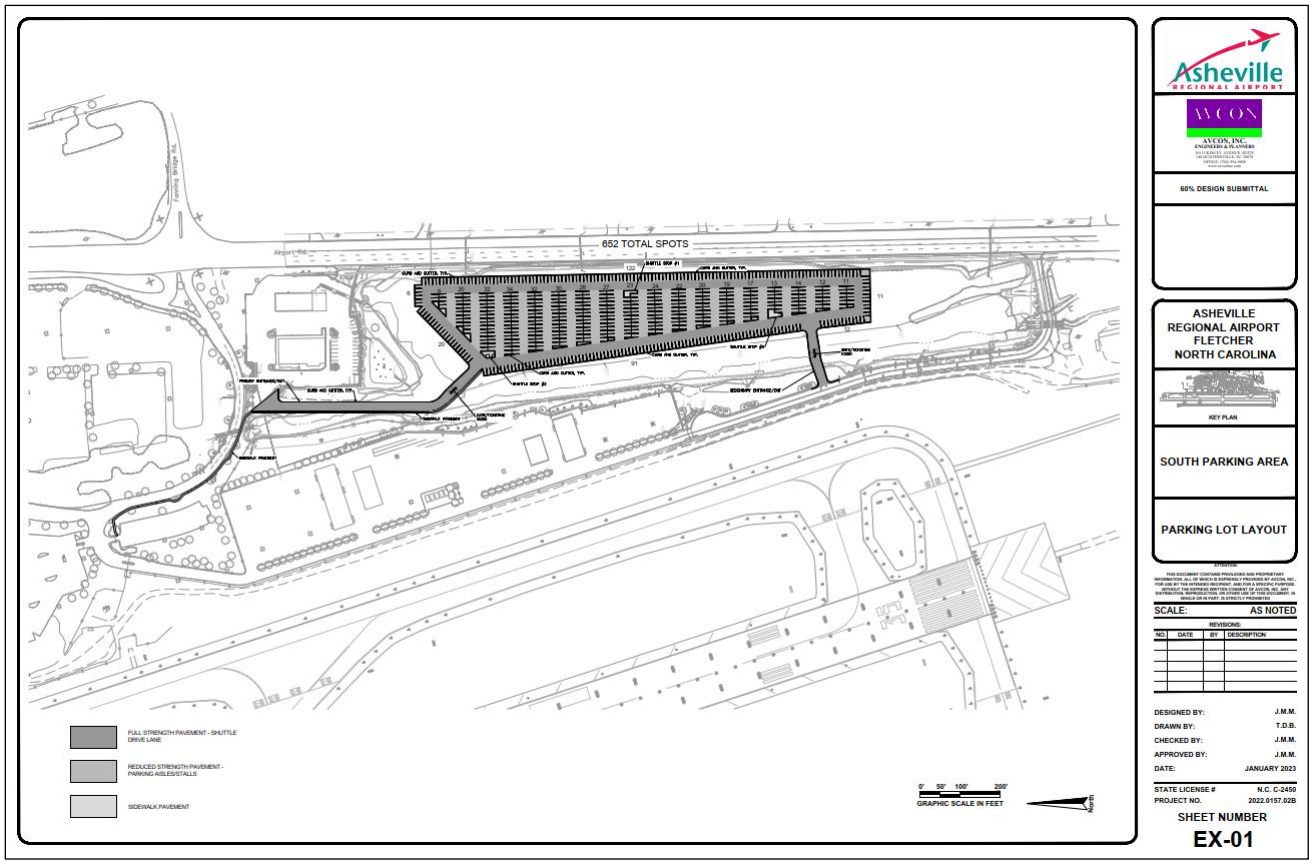
Source: LAZ Parking, 2022.

[1] Construction due to be completed in 2023

[2] Figure in parenthesis indicates total parking with the future 660 space south lot included

Figure 4-33 indicates AVL's parking expansion plans for additional parking currently underway.

Figure 4-33 – Future 660 Space South Lot



Source: AVCON, Inc. – Engineers and Planners, January 2023.

Public Parking Requirements

Future parking needs are a product of forecasted enplanements. As enplanements are expected to increase across all planning horizons to maintain an acceptable level of service.

During the inventory and interview processes with AVL, as part of this master planning effort, it was communicated, based on empirical evidence, that AVL currently has a public parking supply deficiency—particularly during busy periods. Specific to AVL, this is likely exacerbated by the predominance of ultra-low-cost carrier service and the seasonal periods of high passenger activity, parking rate structures, and AVL's tendency to be more of an origination-based airport. This leads AVL to a near-term solution to construct a temporary public parking lot on the general

aviation transient aircraft apron to provide additional stalls as a stop-gap solution. Interesting to note, these additional public parking spaces are currently not needed during non-peak activity periods, and do not operate during these periods.

From **Table 4-82** it can be determined AVL current has 2,496 public parking stalls available across all public lots. This public lot total is calculated by taking the given total (2,976) and subtracting employee (256) and rental car spaces (224). As mentioned previously, during non-peak periods this supply seems adequate, but during peak periods the temporary lot needs to be in operation, with additional parking lot construction needed in the near future.

To determine a methodology to forecast public parking demand at AVL, several airports like AVL were benchmarked (TYS, CAK, ORF) and a parking needs factor was determined to forecast parking needs at AVL as shown in **Table 4-83**, below.

Table 4-83 – Future Public Parking Needs

		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Annual Enplanements (In Millions)		*(0.716)*	1.038	1.162	1.300	1.455	1.649	1.841
Total Required Public Parking Range	3,500 per Mil. PAX Parking Needs Factor	*(2,496)* **2,506**	**3,633**	**4,067**	**4,550**	**5,093**	**5,772**	**6,444**
Hourly Parking								
Required Hourly Public Parking Range	25%	*(624)* **627**	**908**	**1,017**	**1,138**	**1,273**	**1,443**	**1,611**
	30%	*(749)* **752**	**1,090**	**1,220**	**1,365**	**1,528**	**1,732**	**1,933**
Daily Parking								
Required Daily Public Parking Range	75%	*(1,872)* **1,880**	**2,725**	**3,050**	**3,413**	**3,820**	**4,329**	**4,833**
	70%	*(1,747)* **1,754**	**2,543**	**2,847**	**3,185**	**3,565**	**4,040**	**4,511**

Notes:
Public parking facilities are forecasted through the planning horizons. It should be noted that on the near term, PALS 1 through 3, these are probable expectation for AVL to realize. Past PAL 3 it is somewhat uncertain as to the actual facilities needs may be with future modes of ground transportation arrival at AVL and changing passenger behaviors
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

Employee Parking Requirements

AVL currently has 256 total employee parking spaces, spread between three separate lots. Taking ACRP guidance and industry standards into account, general guidelines mandate one parking space per every 2.5 to 3.0 employees, or alternatively, 250 to 400 spaces per million enplanements. These numbers allow flexibility in sizing employee lots at AVL in consideration of the shifting nature of airport employment.

Lacking an employment growth calculation, spaces calculated below are based off forecasted enplanements totals in each PAL. It is assumed that more enplanements across planning horizons

dictates the need for increased staffing at AVL. Results of the analysis are tabulated in **Table 4-84** below.

Table 4-84 – Future Employee Parking Needs

		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Annual Enplanements (In Millions)		*(0.716)*	1.038	1.162	1.300	1.455	1.649	1.841
Required Parking Range	250 Spaces/ Mil. PAX	*(256)* 179	**260**	**291**	**325**	**364**	**412**	**460**
	400 Spaces / Mil. PAX	*(256)* **286**	**415**	**465**	**520**	**582**	**660**	**737**
Estimated Staff Totals								
Estimated Staff Totals	2.5 Employees/ 250 Spaces	*(640)* 448	**649**	**726**	**813**	**910**	**1,031**	**1,151**
	3.0 Employees/ 250 Spaces	*(768)* 537	**779**	**872**	**975**	**1,091**	**1,237**	**1,381**
	2.5 Employees/ 400 Spaces	*(640)* **716**	**1,039**	**1,162**	**1,300**	**1,455**	**1,649**	**1,841**
	3.0 Employees/ 400 Spaces	*(768)* **859**	**1,246**	**1,395**	**1,561**	**1,746**	**1,979**	**2,210**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: *ACRP Report No. 25: Airport Passenger Terminal and Design*
CHA, 2023.

Current baseline figures indicate that AVL possesses 256 spaces across all employee lots. If the ACRP minimal standard of 250 spaces per million enplanements model is satisfactory by Airport standards, minimum parking requirements are not met after PAL 1. PALs 2 through 6 will require additional parking for minimal ACRP standards to be met regardless of passenger ratio metrics.

Rental Car Parking and Facility Requirements

Rental car parking and facility locations provide the space for companies to allow car pickup up, as well as storage and maintenance on airport property. At AVL, ready and return (R/R) spaces for rental cars is located on the first floor of the parking garage, whereas storage and maintenance facilities are located at the Rental Car QTA area. QTA, or quick turnaround, areas afford the rental car companies a location to service, clean, and refuel vehicles for them to return for customer use. These spaces are vital for AVL car rental companies to meet the demands of enplaned passengers, with each dedicated area performing a necessary role for transactions across the planning horizon.

Presently, there are 238 R/R spots dedicated to rental car parking at AVL. It is assumed that this number will need to grow as forecasted enplanement numbers increase, as indicated in **Table 4-85** below. The formulation considered for **Table 4-85** analyzed annual enplanements and applied an industry factor of 0.04% and 0.05% to those enplanement figures to calculate parking spaces needed for 'low' and 'high' estimates, respectively. This factor was determined by benchmarking efforts involving similar airports, with results found below.

Table 4-85 – Future Rental Car Ready and Return Requirements

		Base	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Annual Enplanements		*(716,015)*	1,038,576	1,162,182	1,300,499	1,455,279	1,649,002	1,841,354
Ready/ Return Spaces Calculated	Low	*(238)*	**415**	**465**	**520**	**582**	**660**	**737**
	High	*(238)*	**519**	**581**	**650**	**728**	**825**	**921**
Base Ready/Return Supply								
Base Ready/ Return Supply		***238***	**238**	**238**	**238**	**238**	**238**	**238**
Space **(Deficit)/ Surplus**	Low	--	**(177)**	**(227)**	**(282)**	**(344)**	**(422)**	**(499)**
	High	--	**(281)**	**(343)**	**(412)**	**(490)**	**(587)**	**(683)**

Notes:
Those numbers depicted in parentheses indicate existing conditions
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions
Source: CHA, 2023.

As seen above, when applying industry standards, AVL has insufficient R/R parking. This data reflects a need for the airport to expand R/R parking to better accommodate growing rental car usage throughout the planning horizon.

Peer-To-Peer Private Car Rentals

In addition to the analysis given above, it is also essential for airports to account for growing trends of peer-to-peer (*P2P*) private car rentals. Mobile apps like Turo, amongst others, continue to grow more popular among consumers as an alternative to traditional business-to-consumer (*B2C*) models. This emerging technology affords private individuals the ability to list owned cars on the app for paid use by others—with listed "carshares" made available at select locations.

Airports have increasingly been the site where *P2P* users select to pick up rental cars. To gain access to specific drop off locales, *P2P* providers must enter into agreements with the airport authority. AVL is no exception; Turo currently lists specified user agreements at AVL on their website that users must follow to access the service. Importantly, a critical piece of this contract are the mandated lots in which drop offs/ pick-ups can be completed and where they are prohibited. In the case of AVL, *P2P* activity is only allowed at the hourly, daily, and shuttle lots—as well as the parking garage.

Peer-to-peer services present both opportunities and drawbacks. Beginning with the former, *P2P* apps can allow an airport to increase rental car stock. With lingering impacts of COVID-19 rippling through the rental car market, the availability and flexibility of rental fleets could be bolstered by *P2P* app presence. In addition, user agreements assert that the airport does not pay for parking fees for Turo, meaning the airport will gain revenue when users pay to exit the facility.

Additionally, *P2P's* customer convenience and user-friendly applications may draw in customers who may otherwise not rent a car, capitalizing on otherwise uncaptured revenue. Customer demand may also set an expectation that *P2P* cars are available as well, increasing the LOS for enplaned passengers seeking such access. Moreover, *P2P* business platforms also lessen the need for more dedicated rental car facilities in the terminal as the app does not require kiosk or agent

space. With newfound streamlined efficiency, customers could go to the specified lots immediately and bypass terminal facilities—freeing space and limiting congestion.

This technology may also bring with it a host of downsides, especially if it continues to expand operations. Parking is already an identified issue at AVL, thus bringing more private vehicles onto airport grounds may increase traffic congestion and compound present issues of parking lot consumption. *P2P* is a new trend, meaning its influence may prove less predictable than established *B2C* modules—this makes it hard to accurately plan for and adjust how many stalls may be needed at a given time at AVL for *P2P* to function.

P2P modules will also introduce another variable into the airport, with additional attention needing to be paid alongside the regular facets of airport function. Long-term data regarding *P2P* behavior is not available, accountability and liability concerns could become a large issue as ambiguous responsibility impacts driver behavior. There are also questions regarding fees, a method must be developed to ensure appropriate revenue is collected from the *P2P* services. These concerns are especially relevant when considering the current rental car operators at AVL. Until stakeholder meetings are held, it is difficult to know how legacy companies (*B2C*) will react to market encroachment.

Ultimately, as with any evolving technology many unknowns are present as AVL looks forward to best provide for customer behavior and demand. As *P2P* modules grow in popularity, The Airport Authority needs to continue to remain vigilant of the impacts applications have on air travel. Currently the FAA is undertaking research on *P2P* businesses, with findings being made available in December of 2023 in *ACRP 03-67*. Research is still underway, but it is expected to cover the wide range of impacts/ opportunities of *P2P* applications.

4.7 AIRPORT DRAINAGE AND GRADING REQUIREMENTS

The Airport Authority has identified a steep slope to the east of Taxiway A (south) near Rental Car Road and the rental car service facility. This area extends from approximately the terminal apron to the approach end of Runway 35. This slope has contributed to erosion and slope failures, thus requiring Airport personnel to perform substantial repairs on an annual basis. It is recommended that the Airport Authority grade this area to mitigate the existing slope.

An open-stream ditch is located around the south end of the Airport. GARAA has expressed an interest in enclosing this area to elevate required maintenance in the long-term. Note, a small portion of this area will be addressed in an upcoming airport-project.

5 AIRPORT DEVELOPMENT CONCEPTS

This Chapter analyzes future development concepts for Asheville Regional Airport ('AVL' or 'the Airport') to satisfy the facility requirements previously identified in **Chapter 4**. Numerous concepts, site configurations, and development options were created and reviewed for the various components of the Airport to satisfy future demand over the 20-year planning horizon. In many circumstances, multiple alternatives were identified but eliminated early in the planning process from further consideration, as they failed to align with the Master Plan goals and objectives. The concepts deemed most reasonable to support the long-term operational sustainability of the Airport were identified and carried forward in this evaluation.

This Chapter includes separate concepts and configurations for the airfield, support facilities, passenger terminal facility, terminal curb front, and vehicular parking facilities. Multiple concepts were analyzed to ensure alignment with the Master Plan goals and objectives, cohesion with other Master Plan development and/or the Airport's Capital Improvement Plan (CIP), implementation timeline, and financial or environmental feasibility.

As such, recommendations presented within this Chapter were further modified or narrowed during the environmental overview and financial planning components of the Master Plan Update. The overall effort refined the final strategy into actionable recommended projects for implementation using a phased approach to reduce operational and/or financial impact.

5.1 CONCEPT EVALUATION

Regardless of timeframe or activity level, the overarching principles guiding facility recommendations are to provide an elevated level of customer service while promoting regional economic wellbeing for the Airport and its stakeholders. In addition, concept development took into consideration the evolving business model of the airlines and airport tenants. For some functional areas, such as the airfield, the logical recommendations were distinctly apparent as they are driven largely by Federal Aviation Administration (FAA) design standards as well as by existing infrastructure and available property. In contrast, improvements related to the passenger terminal building and vehicular parking facilities have variability in their configurations. This is due to future activity levels, varying airline operational requirements, potential financing and implementation challenges, and their influence on surrounding Airport facilities.

During the identification of facility requirements, it became evident that the Master Plan Update would not consist of all-encompassing or competing alternatives for development of the Airport. Rather, an overall development strategy would best serve the Airport to meet future demand. As such, individual components were reviewed and recommended separately to develop the preferred improvements program.

5.2 AIRFIELD IMPROVEMENT CONCEPTS

AVL currently operates on a single runway (Runway 17/35), which has unique capabilities and constraints. The runway was evaluated based on its operational requirements. To satisfy operational efficiency, access to and from the runway, improvements and expansions to the associated taxiway systems, and FAA design standards were identified. Concepts relating to runway standards are presented in **Section 5.2.1**, while taxiway standards are discussed in **Section 5.2.2**.

5.2.1 Runway 17/35

As discussed in **Chapter 4**, Runway 17/35 provides at least 95 percent wind coverage and adheres to all FAA design standards. While no deficiencies in design standards were identified, the potential need for a future runway extension of approximately 1,000 feet was recommended to achieve a runway length of 9,002 feet, thus supporting further stage lengths on hot days and/or with 90%+ payloads via a Boeing 737 Max 8. Thus, two runway alternatives were developed for long-term planning purposes.

Runway Alternative 1 – Runway Extension with Blast Pad

As shown in **Figure 5-1**, Runway Alternative 1 consists of a 1,000-foot runway extension to the north, for a total runway length of 9,002 feet. The runway would include a blast pad having a width of 200 feet and length of 200 feet, placed symmetrically at the runway end to provide erosion protection. This would provide Runway 17/35 with 9,002 feet for takeoff run, takeoff distance, accelerate to stop distance, and landing distances.

Declared distances are the distances that are identified as being available for an aircraft to perform a takeoff run, available takeoff distance, available accelerated-stop distance, and landing distance requirements.

See **Table 5-1**.

Table 5-1 – Declared Distances (Runway Alternative 1)

Declared Distances	Runway 17	Runway 35
Takeoff Runway Available (TORA)	9,002 ft.	9,002 ft.
Takeoff Distance Available (TODA)	9,002 ft.	9,002 ft.
Accelerate to Stop Distance Available	9,002 ft.	9,002 ft.
Landing Distance Available	9,002 ft.	9,002 ft.

Source: CHA, 2023.

Furthermore, the runway safety area (RSA) and runway object free area (ROFA) would extend 1,000 feet beyond the new runway end, with the MALSR requiring relocation to the new north end of Runway 17. As the MALSR would extend to the north of the French Broad River, it is likely that a catwalk may be needed to support and maintain the lighting system. Prior to constructing the runway extension, the GARAA would need to acquire the land or obtain an easement over the land encompassing the extended RPZ and MALSR. Constructing the 1,000-foot extension would also require significant fill, which can be costly.

Runway Alternative 2 – Runway Extension with Displaced Threshold and EMAS

Similar to the previous runway alternative, Runway Alternative 2 consists of a 1,000-foot runway extension to the north. The runway extension would provide 9,002 feet of runway length but would include a 1,000-foot displaced threshold. The displaced threshold would reduce the landing distance available for Runway 17 by 1,000 feet. If an Engineered Materials Arresting System (EMAS) is installed, the full 9,002 feet of runway length would be available when operating on Runway 35. If an EMAS is not installed, the accelerated stop distance available and landing distance available for Runway 35 would also be reduced by 1,000', for a total available distance of 8,002 feet.

See **Figure 5-2** and **Table 5-2**.

Table 5-2 – Declared Distances (Runway Alternative 2)

Declared Distances	Runway 17	Runway 35 (With EMAS)	Runway 35 (Without EMAS)
Takeoff Runway Available (TORA)	9,002 ft.	9,002 ft	9,002 ft
Takeoff Distance Available (TODA)	9,002 ft	9,002 ft	9,002 ft
Accelerate to Stop Distance Available	9,002 ft	9,002 ft	8,002 ft
Landing Distance Available	8,002 ft	9,002 ft	8,002 ft

Source: CHA, 2023.

Although having a reduced landing distance in comparison to Runway Alternative 1, the runway's takeoff length would still be suitable for supporting further stage lengths and would accommodate projected demand. It is also important to note that, unlike the first runway alternative, Runway Alternative 2 would not require significant fill, property acquisition, or MALSR relocation.

Furthermore, it is important to note that installation of an EMAS will require long-term maintenance, with a useful life of approximately 20-years.

5.2.2 Taxiways

Aircraft ground movement at AVL is supported by a system of taxiways providing access to all portions of the airfield. While the taxiway system adheres to all FAA design standards, six alternatives were evaluated and are summarized below. Refer to **Figure 5-3**.

Taxiway Alternative 1 – Taxiway Extension

As discussed in **Chapter 4**, full parallel taxiways are recommended. Taxiway B, which is located on the west side of Runway 17/35, is a partial length parallel taxiway providing access to the Runway 35 approach end and to taxiway connector B5, approximately 1,500 feet short of Runway 17. Extending Taxiway B to a full-length parallel taxiway would provide greater accessibility to the west side of the airfield and would eliminate the need to cross the runway when accessing the north end of the runway.

Taxiway Alternative 2 – Taxiway Extension (Ultimate)

Taxiway Alternative 2 builds upon Taxiway Alternative 1. In this alternative, Taxiway A is extended, and Taxiway B is further extended, to the north concurrent to the potential future

1,000-foot runway extension, thus providing two full-length parallel taxiways to the extended runway.

Taxiway Alternative 3 – Bypass Taxiways

This alternative includes construction of two bypass taxiways on Taxiway B. The bypass taxiways would increase runway capacity by better managing the aircraft queue for accessing the runway, as the bypass taxiway would provide for additional runway access points near the runway end. The bypass taxiway on the south side of the airfield would provide an additional access point to Runway 35 from Taxiway B. Prior to constructing a runway extension or taxiway extension, the bypass taxiway on the north side could be constructed to provide an additional access point to Runway 17 from Taxiway B.

Taxiway Alternative 4 – Crossover Taxiway

Taxiway Alternative 4 consists of constructing a crossover taxiway, or transverse taxiway, toward the south side of the airfield. Like taxiway connectors A4 and B3 which are located at midfield, the new taxiway connectors would connect the two parallel taxiways (Taxiway A and Taxiway B). Construction of the crossover taxiway would require removal of taxiway connector A3.

Taxiway Alternative 5 – Remove Highspeed Taxiways

Taxiway Alternative 5 proposes the removal of the two highspeed exit taxiways, A3 and A5. For airports without capacity constraints, the FAA does not recommend high speed taxiways due to potential costs associated with the taxiway as well as the potential for pilot confusion associated with the expanse of pavement area.

Removing highspeed Taxiway A3 would allow for construction of the crossover taxiway identified in Taxiway Alternative 4.

Taxiway Alternative 6 – Holding Bays

Taxiway Alternative 6 proposes construction of four holding bays: one east of Taxiway A at the Runway 17 approach end, one east of Taxiway A at the Runway 35 approach end, one west of the extended Taxiway B at the Runway 17 approach end, and one west of Taxiway B at the Runway 35 end. These holding bays would serve as a standing/holding space for an aircraft that is waiting to receive takeoff clearance or a small piston aircraft performing ground run-up procedures, while allowing aircraft cleared for takeoff to move to the runway takeoff position.

Note, Taxiway Alternative 3 and Alternative 6 should be analyzed independently of one another. Both alternatives would not be necessary, as each satisfy the need for aircraft queuing for the runway.

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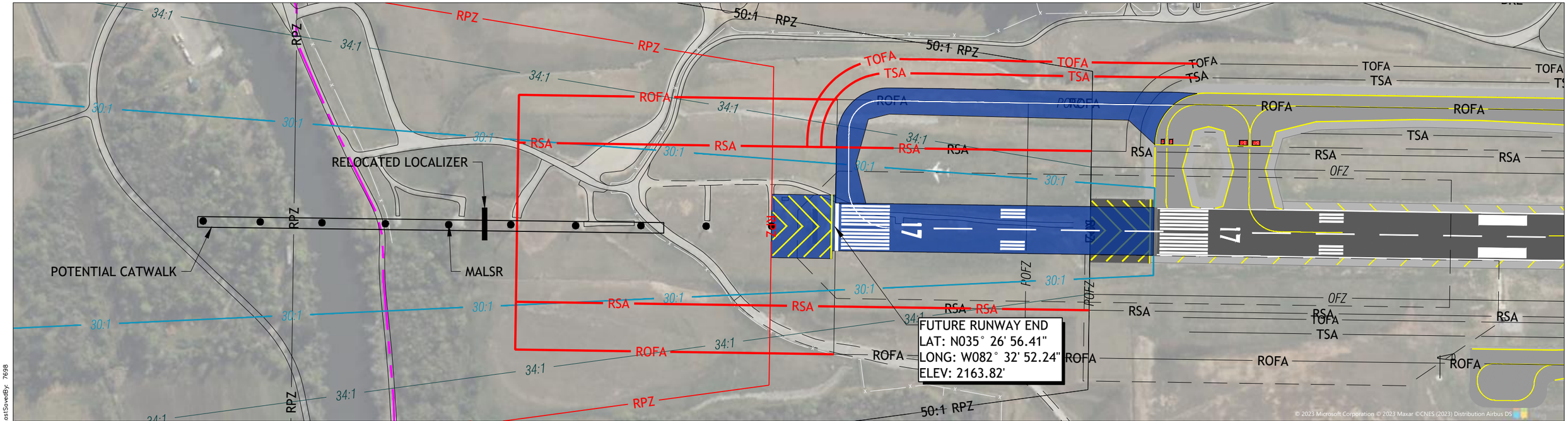

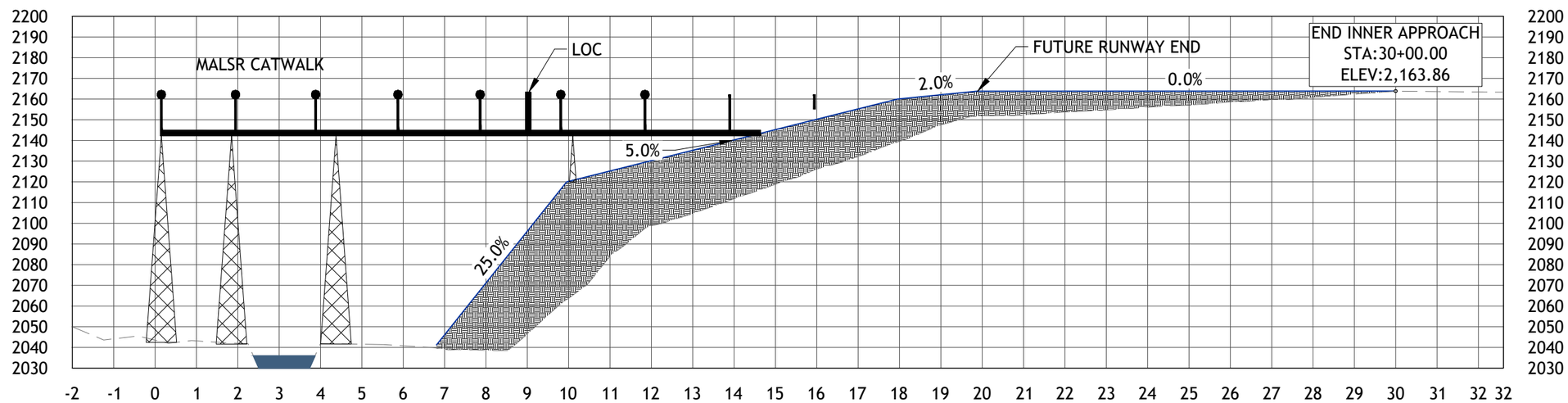

DECLARED DISTANCES	17	35
TAKEOFF RUN AVAILABLE (TORA)	9,002'	9,002'
TAKEOFF DISTANCE AVAILABLE (TODA)	9,002'	9,002'
ACCELERATE TO STOP DISTANCE AVAILABLE	9,002'	9,002'
LANDING DISTANCE AVAILABLE	9,002'	9,002'

Asheville REGIONAL AIRPORT
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Figure 5-1 - Runway Alternative 1
Runway Extension with Blast Pad

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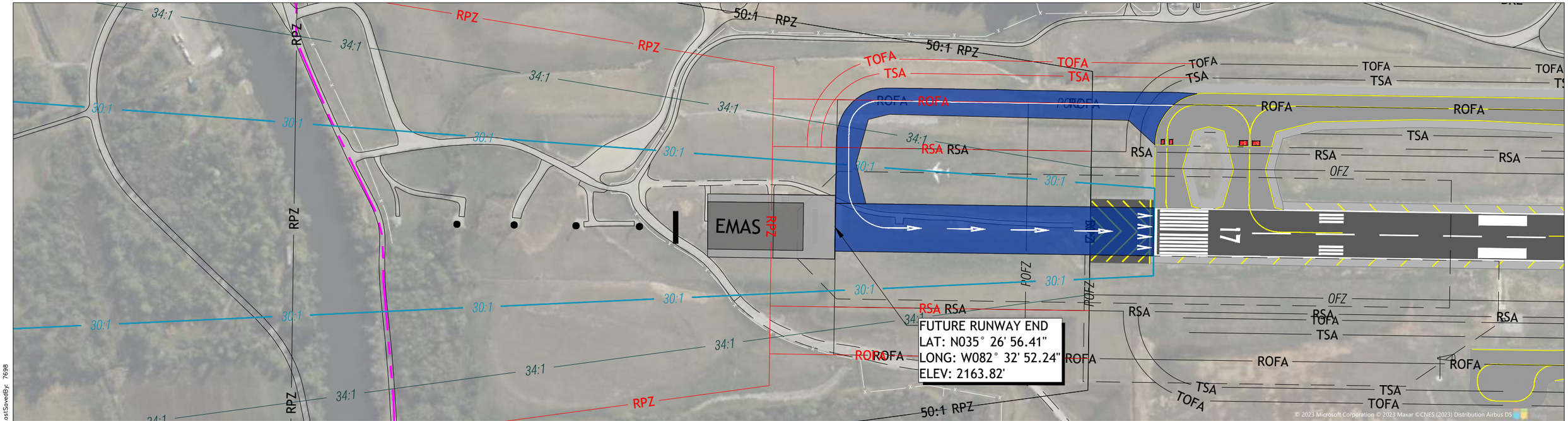

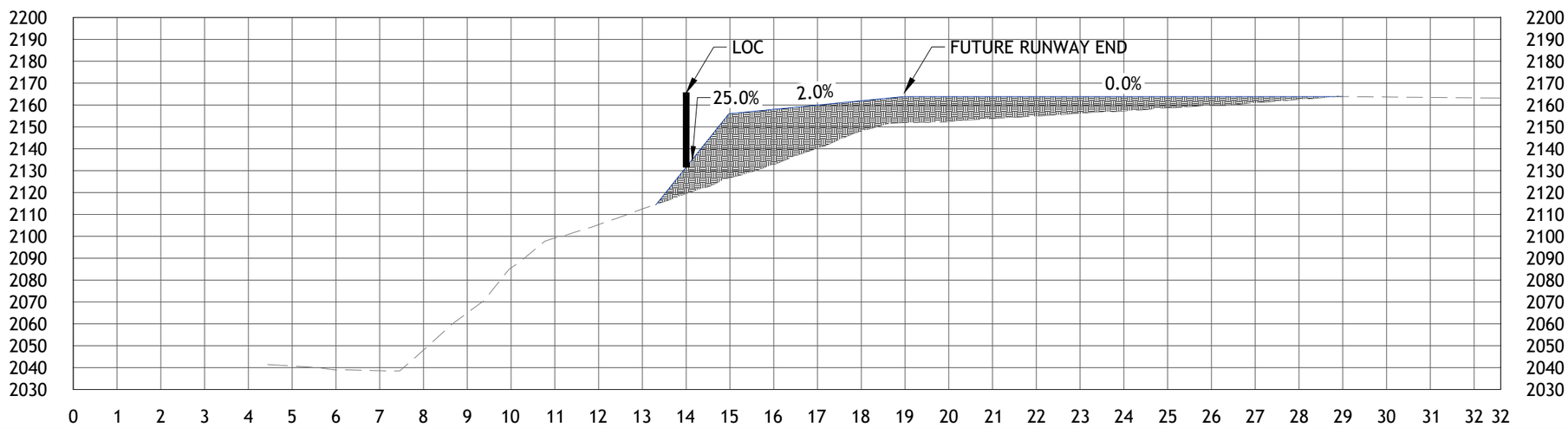

DECLARED DISTANCES	17	35 W/ EMAS	35 W/O EMAS
TAKEOFF RUN AVAILABLE (TORA)	9,002'	9,002'	9,002'
TAKEOFF DISTANCE AVAILABLE (TODA)	9,002'	9,002'	9,002'
ACCELERATE TO STOP DISTANCE AVAILABLE	9,002'	9,002'	8,002'
LANDING DISTANCE AVAILABLE	8,002'	9,002'	8,002'

Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

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GRAPHIC SCALE (FEET)
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VERTICAL

Figure 5-2 - Runway Alternative 2
Runway Extension with EMAS

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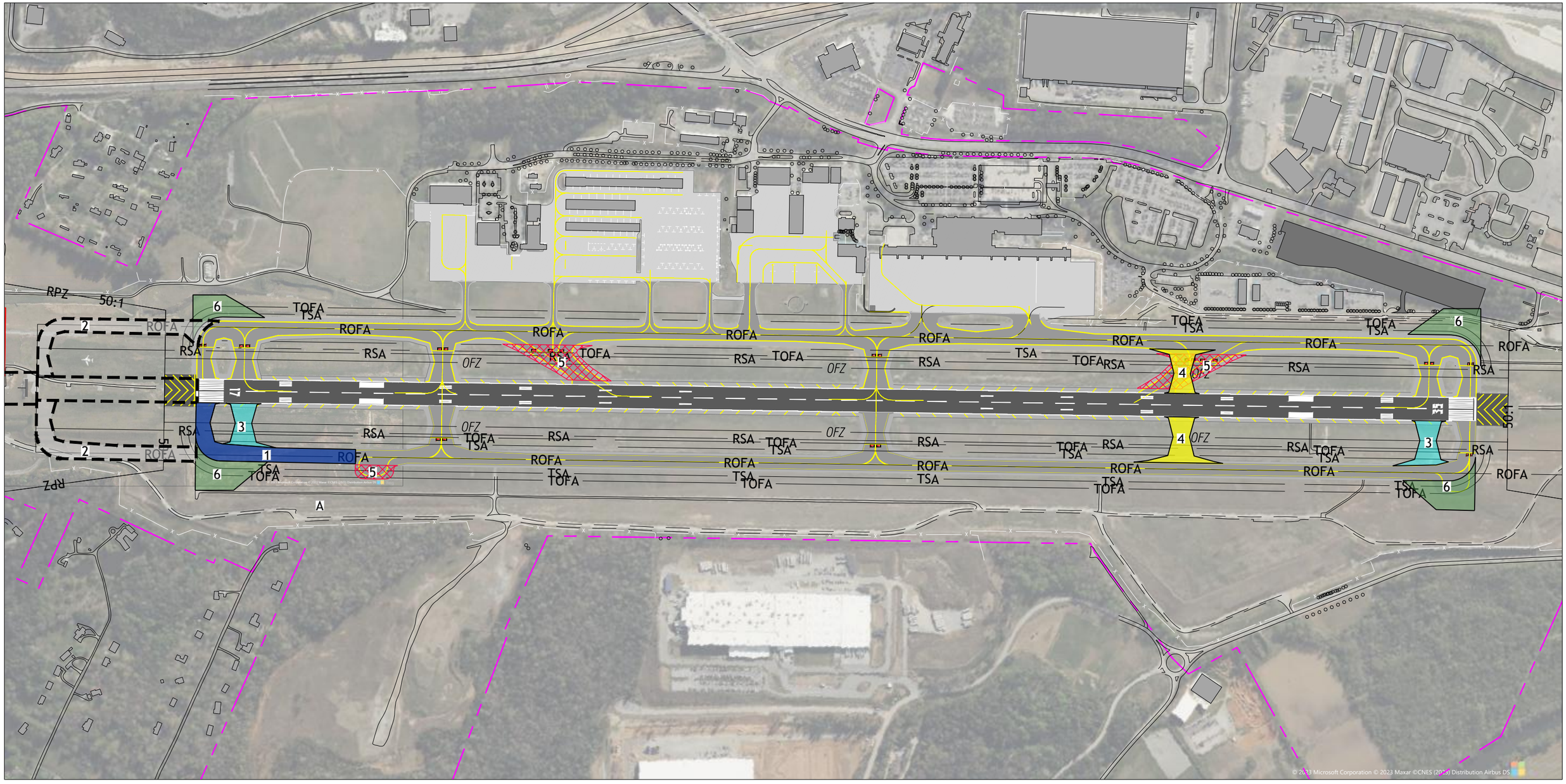

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MASTER PLAN UPDATE

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GRAPHIC SCALE (FEET)

0 300 600 1200

LEGEND:

1: TAXIWAY EXTENSION
2: TAXIWAY EXTENSION (ULTIMATE)
3: BYPASS TAXIWAY
4: CROSSOVER TAXIWAY
5: REMOVE HIGHSPEED EXITS
6: HOLDING BAYS

Figure 5-3 - Taxiway Alternatives 1-6

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5.3 SUPPORT FACILITIES DEVELOPMENT CONCEPTS

As discussed in **Chapter 4**, support facilities enable the Airport to provide vital services necessary for the overall function and operation of activities related to general aviation aircraft storage, aircraft fueling, Aircraft Rescue and Firefighting (ARFF), Department of Public Safety (DPS), GARAA maintenance services and equipment storage, and Air Traffic Control, as well as the future of urban air mobility (UAM).

Concepts relating to each of these functions are provided in the subsequent sections.

5.3.1 General Aviation Facilities Alternatives

GA activity at AVL represents approximately 67.3 percent of total annual airport operations and includes various types of private, corporate, and business aircraft flights. GA services and activities are accommodated by the Fixed Base Operator (FBO), which is located north of the passenger terminal facility and east of Runway 17/35.

The following sections discuss the existing GA infrastructure, as well as potential concepts to accommodate forecasted demand and future buildout, as identified in **Section 4.5.1**. As discussed, AVL is expected to need approximately 119,800 SF of additional hangar storage (82,300 SF for based aircraft and 37,500 SF for transient aircraft) by PAL 4. Locations for future aircraft storage were identified, as well as associated apron space and facility access.

GA Alternative 1 – Development in Existing GA Area

GA Alternative 1 (**Figure 5-4**) depicts an option to accommodate approximately 108,200 SF of additional aircraft parking, which would accommodate all projected based aircraft needs and approximately 30.9 percent of projected transient aircraft parking needs.

The development includes an additional box hangar, measuring approximately 30,000 SF, on the north side of the North Apron. An additional T-hangar providing 15 T-hangar bays at approximately 1,900 SF each is also depicted west of the existing T-hangar units at the Middle Apron. A corporate box hangar measuring approximately 42,000 SF and an adjoining office/support space measuring approximately 7,650 SF are also depicted south of the existing T-hangars.

Note, construction of each of the hangar facilities would result in loss of tie-down parking on the associated apron. The existing taxilanes connecting Taxiway A and the North and Middle Aprons would also be eliminated. A new taxilane extending the length of the North and Middle Aprons would be developed, along with development of three new connectors to Taxiway A. The new taxilane would be designed as an ADG-III, TDG-2 taxilane.

To further support new and existing hangar development, three new surface lots would be developed for vehicular parking.

GA Alternative 2 – Development in Existing GA Area & Northern Expansion (Option A)

GA Alternative 2 (**Figure 5-5**) includes all development shown in GA Alternative 1 and expands upon that concept to include additional development north of the North Apron. The additional development includes 11 hangars measuring 3,600 SF each, 4 hangars measuring 6,400 SF each, and 2 sections of T-hangars providing a total of 26 bays at 1,100 SF each (or 13 bays per T-hangar). Overall hangar development would include a total of 202,000 SF of new infrastructure for aircraft storage, which would accommodate projected activity levels.

The northern expansion would be accessible via an extension of Wright Brothers Way. The concept would result in realignment of private Airport access roadways to accommodate the new taxilane and connectors, as well as hangar development. The new access roadway would require a section of the existing perimeter fence to be removed and a new section of fencing installed.

GA Alternative 3 – Development in Existing GA Area & Northern Expansion (Option B)

GA Alternative 3 (**Figure 5-6**) includes all development shown in GA Alternative 1 and expands upon the concept to include additional development north of the North Apron, similar to GA Alternative 2. While GA Alternative 2 included the construction of multiple individual hangars, GA Alternative 3 focuses on bulk hangars, or community hangars. The northern expansion includes development of two 30,000 SF hangars and two 40,000 SF hangars. This concept would provide up to approximately 208,200 SF of additional hangar storage capacity, which would satisfy projected activity levels.

For each of these GA alternatives, the hangar configurations shown are logical options that demonstrate the general capacity and integration with existing facilities. However, numerous other configurations are possible, with the actual layout refined based on the future users/tenants.

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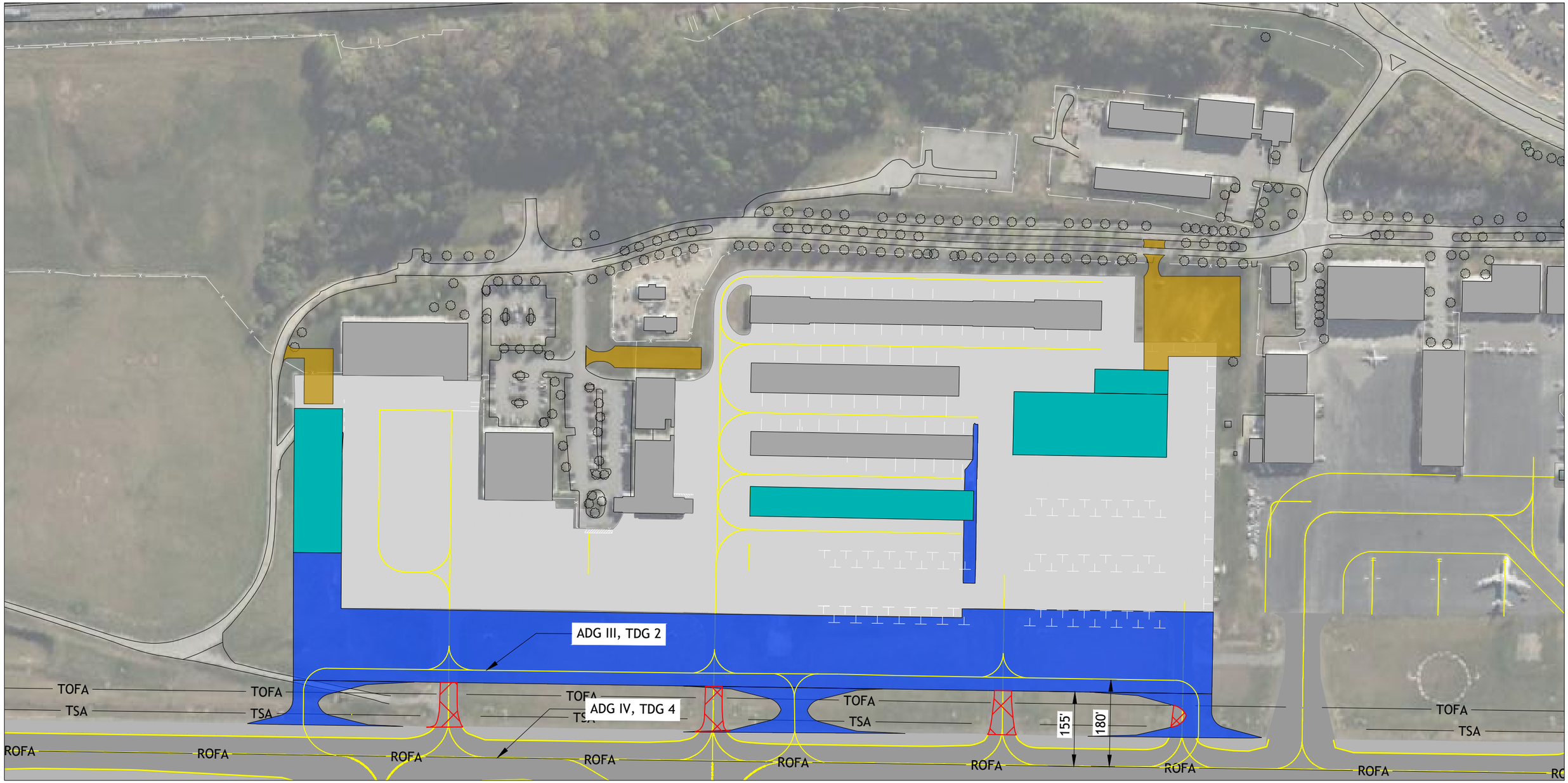

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GRAPHIC SCALE (FEET)

0 100 200 400

LEGEND:

- PAVEMENT REMOVAL
- FUTURE HANGAR
- FUTURE AIRSIDE PAVEMENT
- FUTURE LANDSIDE PAVEMENT

Figure 5-4 - GA Alternative 1
Development in Existing GA Area

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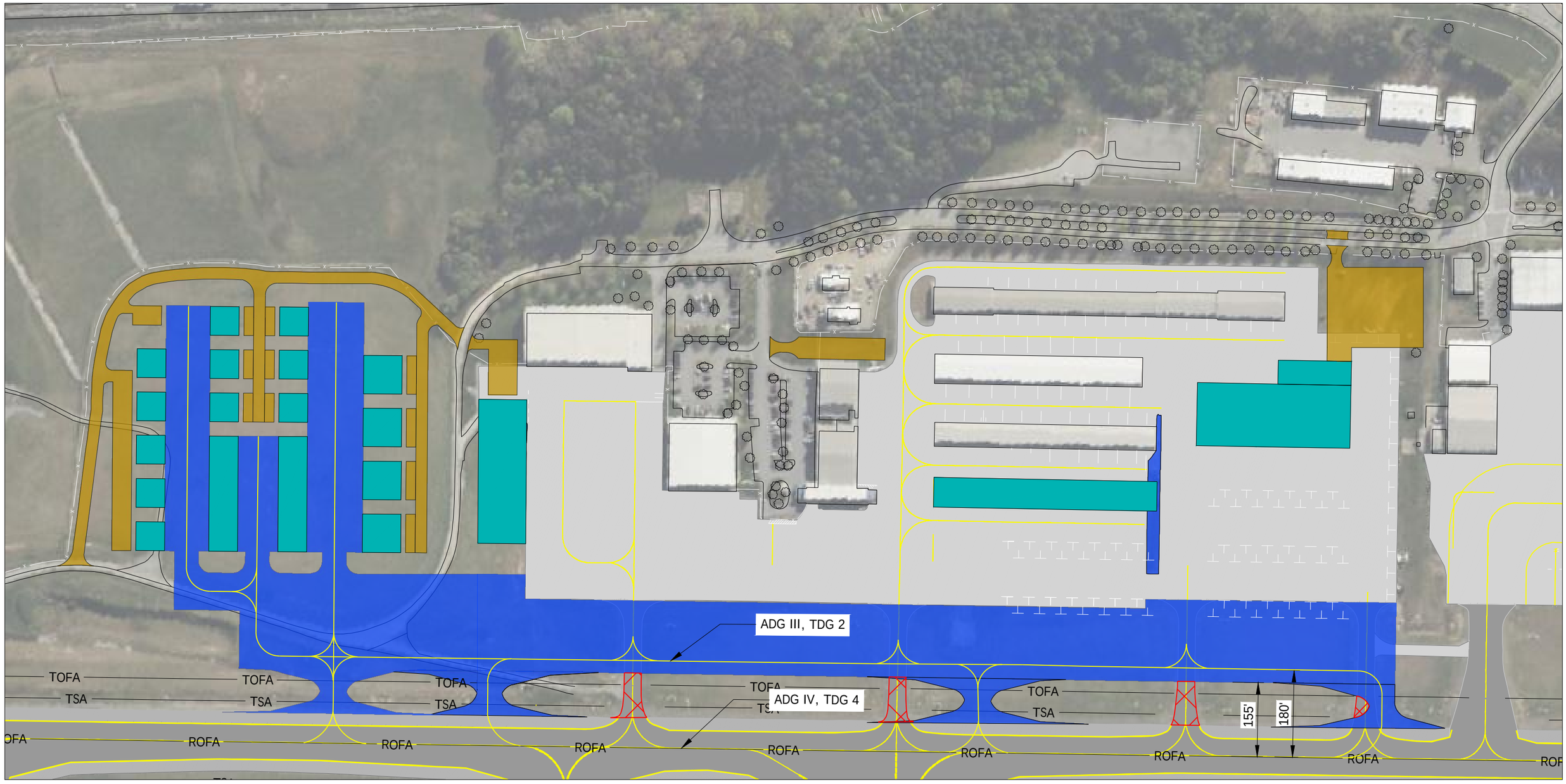

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GRAPHIC SCALE (FEET)
0 100 200 400

LEGEND:
- PAVEMENT REMOVAL
- FUTURE HANGAR
- FUTURE AIRSIDE PAVEMENT
- FUTURE LANDSIDE PAVEMENT

Figure 5-5 - GA Alternative 2
Development in Existing GA Area & Northern Expansion Option A

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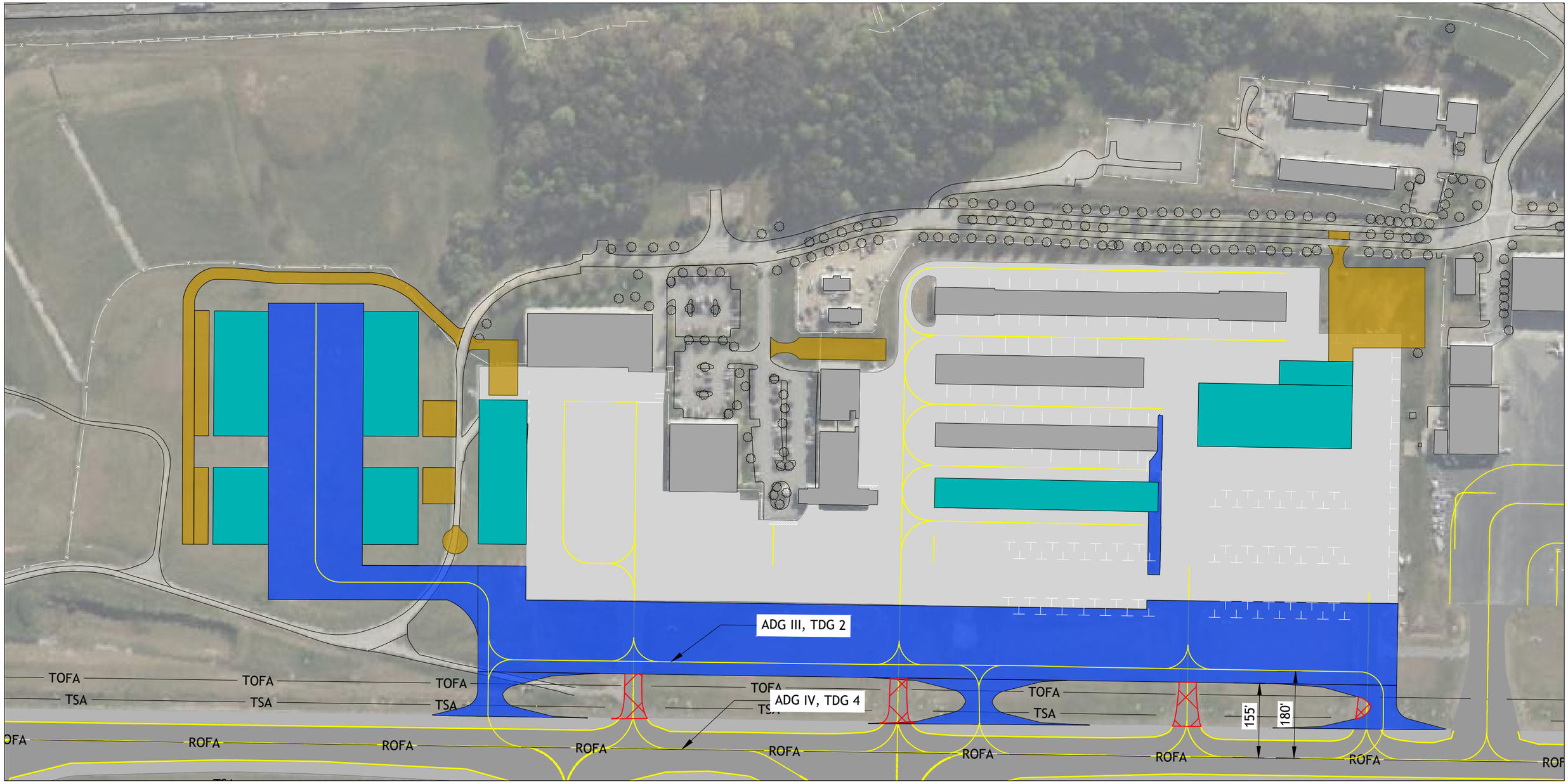

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LEGEND:

- PAVEMENT REMOVAL
- FUTURE HANGAR
- FUTURE AIRSIDE PAVEMENT
- FUTURE LANDSIDE PAVEMENT

Figure 5-6 - GA Alternative 3

Development in Existing GA Area & Northern Expansion Option B

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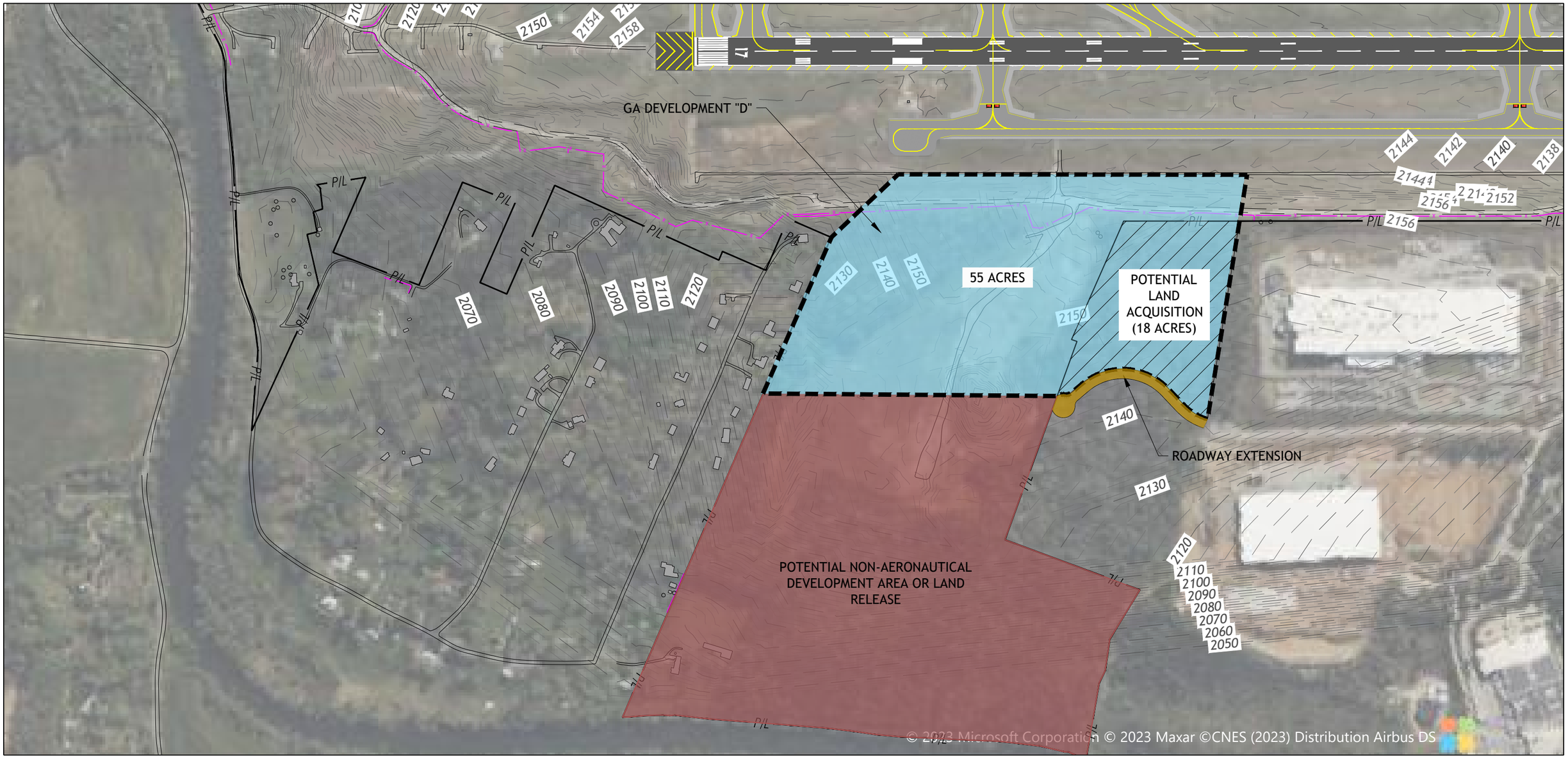

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LEGEND:

- FUTURE LANDSIDE PAVEMENT
- NON-AERONAUTICAL DEVELOPMENT AREA
- GA DEVELOPMENT AREA
- LAND ACQUISITION

Figure 5-7 - GA Alternative 4

GA - Northwest Development

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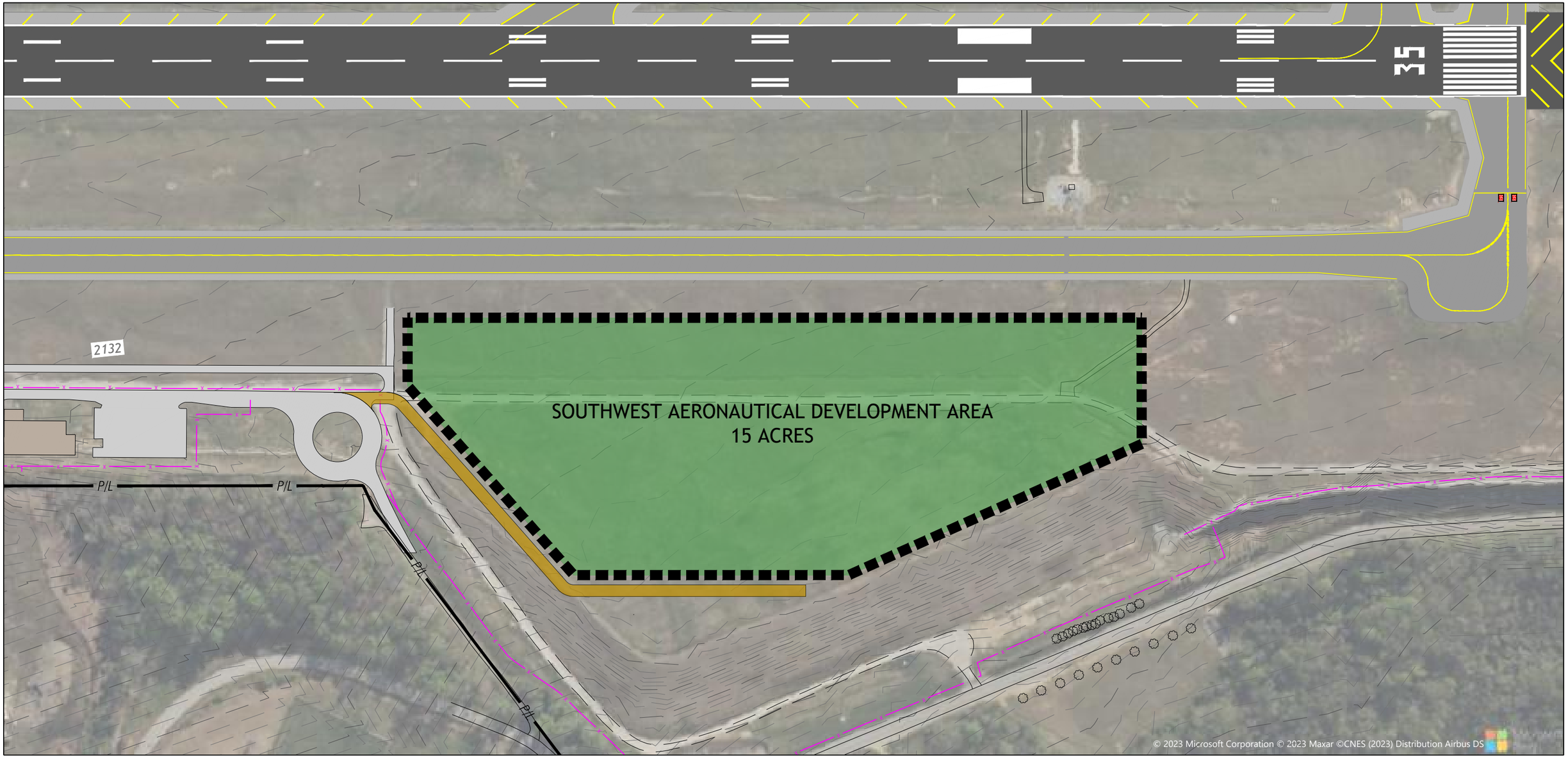

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LEGEND:

- FUTURE LANDSIDE PAVEMENT
- SOUTHWEST DEVELOPMENT AREA
- EXISTING AIRPORT PAVEMENT
- EXISTING AIRPORT BUILDING

Figure 5-8 - GA Alternative 5

GA or Cargo - Southwest Development

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GA Alternative 4 – Northwest Development

GA Alternative 4 (**Figure 5-7**) reserves the northwest portion of airport property for future development. This location does not currently have public roadway access, but an extension from the adjacent Ferncliff Industrial Park is possible. Due to the shape of the parcel, this alternative includes the concept of a 'land swap', where the western portion of airport property furthest from the runway may be exchanged or released for a smaller parcel on the industrial park that borders the Airport. This airport property was acquired with federal funds; therefore, if releasing this land, the Authority would have to adhere to the FAA's land release process. Although more remote from the developed locations of the Airport, this property may be reserved to support future corporate GA and Fixed-Base Operator (FBO) development.

If not needed for GA development, portions of this area could ultimately be leased or sold for airport-compatible commercial/industrial use, with the Airport property within ¼ mile or 1,200 feet of the runway retained for unforeseen airport needs. If any Airport property were released or sold in the future, GARAA would retain a permanent avigation easement to protect the Airport against airspace obstructions and incompatible development.

GA Alternative 5 – Southwest Development

GA Alternative 5 (**Figure 5-8**) identifies approximately 15 acres for future land development that would further support GA activity at AVL. The land in the southwest area is currently owned by the GARAA and could support future potential corporate, cargo, or other aviation-related development.

5.3.2 Aviation Fueling Facilities Development Concept

Aviation Fueling Facilities Alternative 1 – Fuel Farm Expansion

During the review of facility requirements, a need for additional fuel storage was identified. Existing plans include installation of two additional 40,000-gallon Jet-A tanks, which will increase storage capacity from 80,000 gallons to 160,000 gallons and will meet the demand in the Base Year. The new tanks would be installed directly north of the existing aviation fuel tanks on the north end of the airfield, east of Runway 17/35.

To meet demand through PAL 4 and beyond, it is recommended that the Airport Authority further expand upon the planned growth of the aviation fuel farm to accommodate a minimum of 300,000 gallons of Jet-A storage. To meet demand, this concept reserves space for up to six additional fuel tanks providing 40,000 gallons to 50,000 gallons each. Expanding the fuel farm to the north would require the Airport's perimeter fence to be realigned and a new gate to be installed. **Figure 5-9** illustrates the additional tanks as six horizontal 50,000-gallon units; however, not that while this is the most common form of tank used at small hub airports, there are numerous configurations that could be installed.

5.3.3 ARFF / DPS Facilities Alternatives

Until recently, the ARFF and DPS services have been co-located in a facility north of the terminal; however, as part of the ongoing Terminal Modernization Project, the DPS offices can potentially

be relocated within the terminal facility. It has been further recommended that ARFF functions also be relocated. To allow for and support the future expansion of the passenger terminal facility, an initial site selection for ARFF facilities was evaluated and considered six potential locations. The recommended location for ARFF related facilities and functions would be west of Taxiway B and taxiway connector 'B3', immediately north of the new airport traffic control tower (ATCT). Two alternatives were identified within this area.

ARFF Alternative 1 – Consolidated Facility

ARFF Alternative 1 consists of a 19,000 SF consolidated ARFF facility, which would include storage for ARFF vehicles and equipment, as well as offices and crew quarters. The associated apron area would be approximately 18,000 SF. A vehicular parking lot measuring approximately 15,000 SF would also be constructed.

Construction of this concept would require significant grading, as the site is approximately 15 feet higher than Taxiway B. A retaining wall may also be required. As shown in **Figure 5-10**, development would impact the existing airside roadway, which would require it to be reconfigured.

ARFF Alternative 2 – Adjoined Facilities

As shown in **Figure 5-11**, ARFF Alternative 2 would consist of two adjoining facilities. The northern facility would be approximately 9,000 SF and would house the ARFF vehicles and equipment. The southern facility, measuring approximately 10,000 SF, would consist of offices and crew quarters. Like Alternative 1, the associated apron area would be approximately 18,000 SF. A vehicular parking lot measuring approximately 14,000 SF would also be constructed. The layout of these facilities would not encumber the existing airside roadway and a retaining wall would not be required. The location of the infrastructure in Alternative 2 would require less grading than required for development of the buildings in Alternative 1.

5.3.4 Airport Traffic Control Tower (ATCT) Relocation

As discussed in **Chapter 4**, a new ATCT is currently under construction on the west side of the airfield, south of the proposed future ARFF locations. This location will support AVL's ongoing terminal development and improvement plans. Construction of the new ATCT is scheduled for completion by year-end 2025. The new ATCT location is incorporated within **Figure 5-10** and **Figure 5-11**.

5.3.5 GARAA Maintenance Facilities & Equipment Storage Alternatives

The GARAA airport maintenance facilities, maintenance vehicles, and equipment are located east of the GA area, located on Aviation Way, immediately adjacent to Route 280 and Interstate 26. As discussed in **Chapter 4**, several of the Airport's maintenance facilities have exceeded their useful life and require replacement. Additional storage to accommodate snow removal equipment (SRE) is also necessary. This area does not have direct access to the airfield.

Locations for future GARAA maintenance facilities and equipment storage have been identified and are shown in **Figure 5-12** and **Figure 5-13**.

GARAA Maintenance Facilities & Equipment Storage Alternative 1 – New Location

In GARAA Maintenance Facilities & Equipment Storage Alternative 1, the existing GARAA maintenance facilities and equipment storage areas would be decommissioned, and a new site would be selected. As shown in **Figure 5-12**, the new site selection would be in a 5+-acre area at the north end of the airfield. The site could include construction of a 20,000 SF, a 10,000 SF, and a 5,000 SF facility, as well as approximately 79,000 SF of pavement for equipment operation and parking/storage. To support maintenance activity, one 10,000-gallon diesel fuel tank and one 10,000-gallon unleaded fuel tank would be installed in proximity to the new facilities. The Airport's perimeter fence would be extended to enclose the facilities, and a new airfield gate would be installed.

GARAA Maintenance Facilities & Equipment Storage Alternative 2 – Reconfigure Existing Area

Alternative 2 (**Figure 5-13**) takes advantage of the existing site's location, east of the GA area. This alternative preserves the use of the two buildings on the southeast side of the maintenance area, while demolishing the building to the north and constructing a new 14,000 SF facility in its place. In addition, the western facility would be partially demolished, with the northern section being retained and expanded to the north by approximately 6,000 SF. Additional surface pavements to the north would also be constructed to support equipment storage. A new 10,000-gallon diesel fuel tank and new 10,000-gallon unleaded fuel tank could be installed to the north of the existing fuel tanks. Reconfiguring the existing area may be more cost effective then relocating all facilities and functions to a new location. However, the existing site is size constrained and does not include direct-airport access.

Furthermore, this alternative would result in loss of the existing Viewing Area, which is a location provided by GARAA for spectators to park and watch aircraft takeoff and land at the Airport. With this alternative, the Authority may choose an alternate site for viewing activities.

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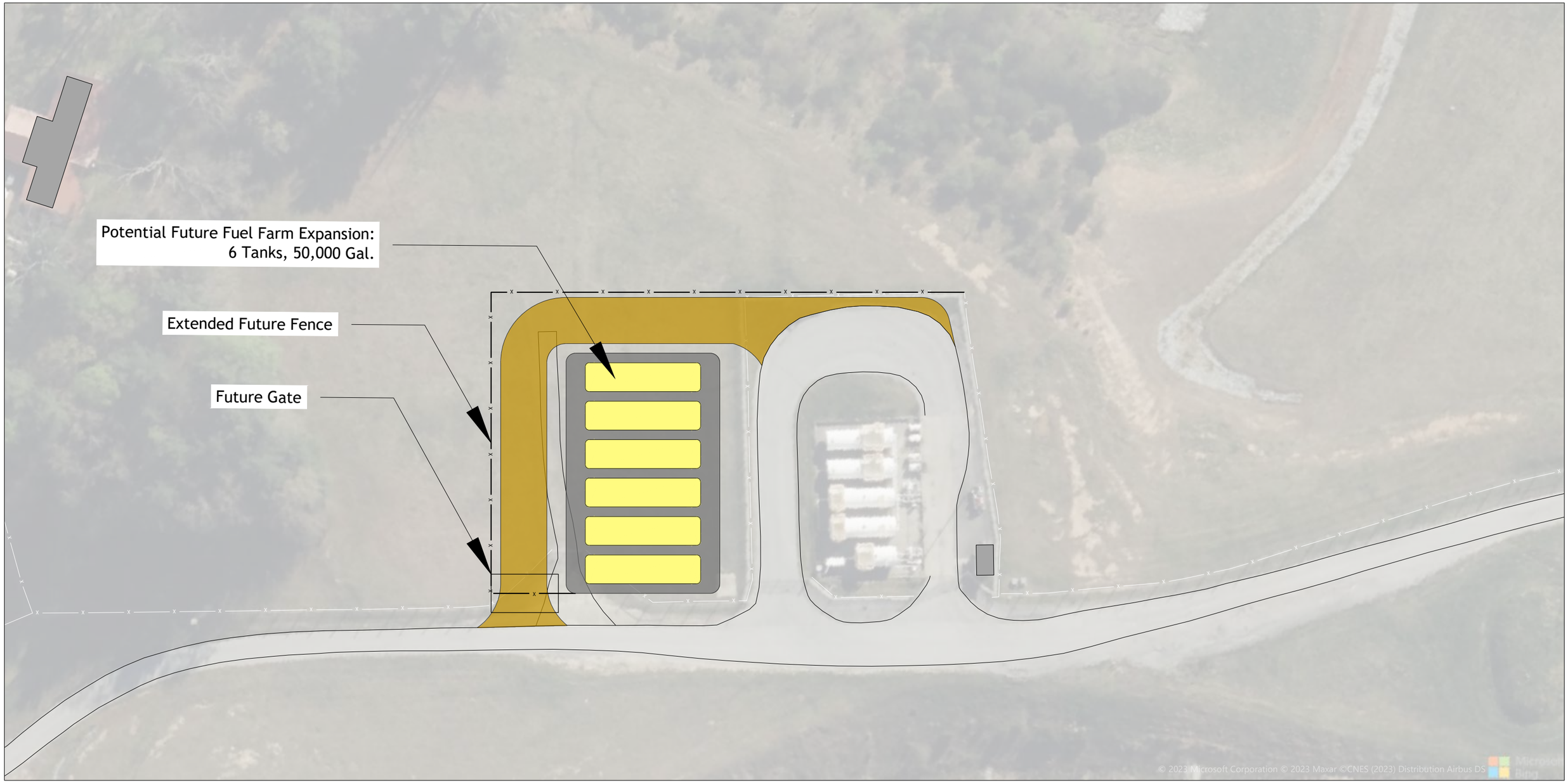

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LEGEND:

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- FUTURE FUEL FARM PAVEMENT
- FUTURE LANDSIDE PAVEMENT

Figure 5-9 - Aviation Fuel Farm Alternative 1
Fuel Farm Expansion

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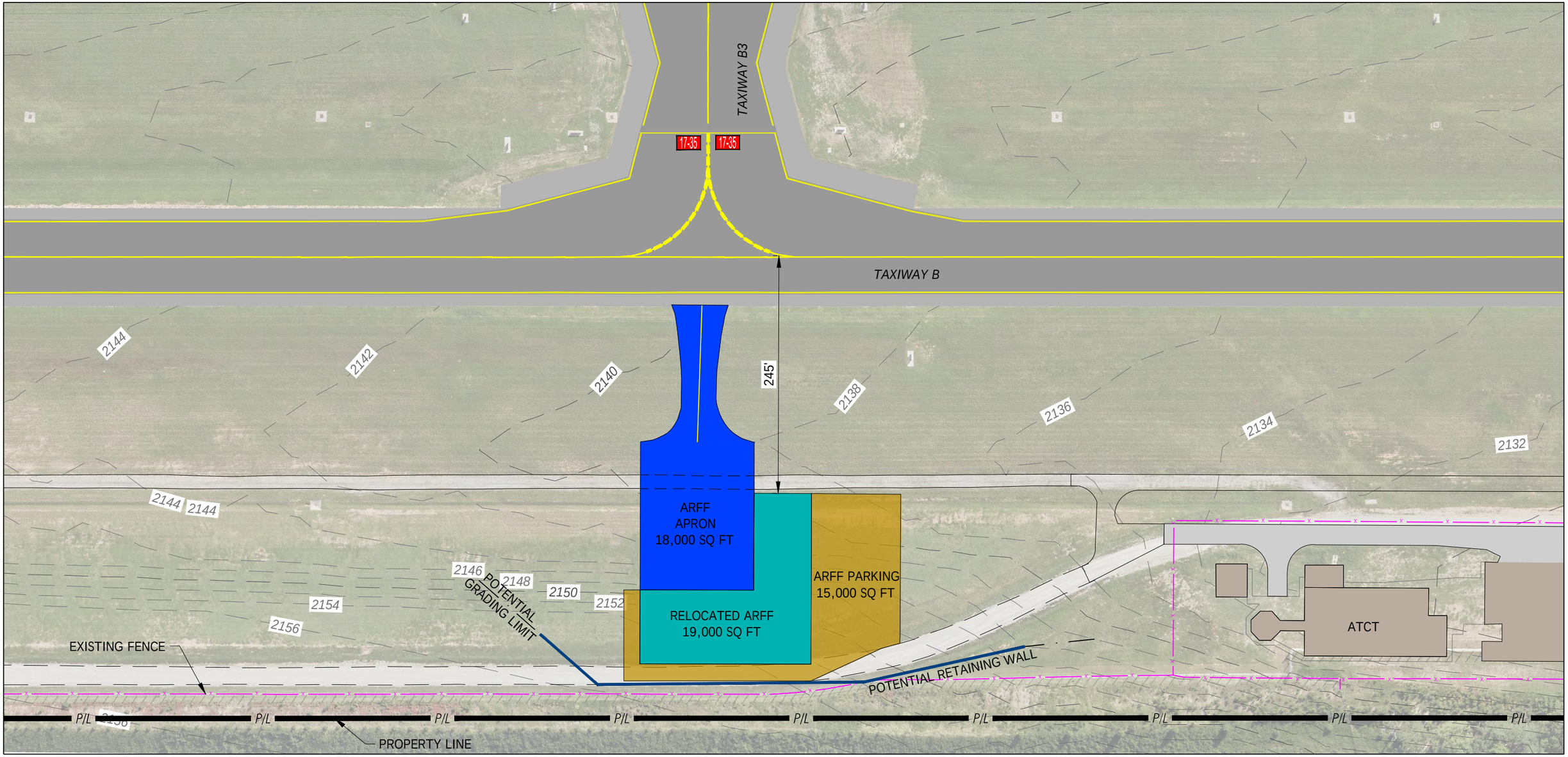

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LEGEND:
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- FUTURE ARFF FACILITIES
- FUTURE ARFF APRON
- EXISTING AIRPORT FACILITIES
- EXISTING AIRPORT BUILDING

Figure 5-10 - ARFF Alternative 1
Consolidated Facility

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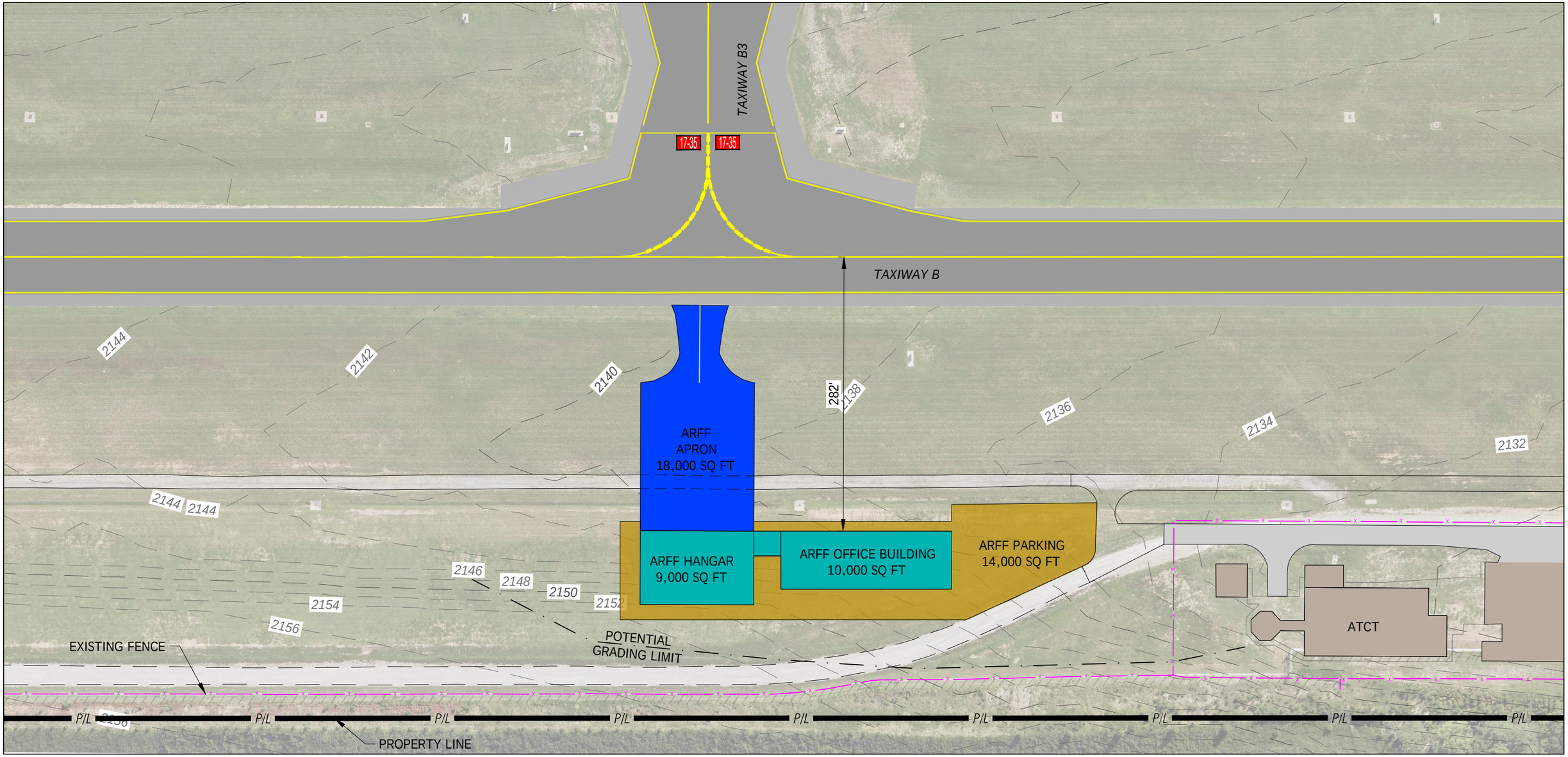

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LEGEND:
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- FUTURE ARFF FACILITIES
- FUTURE ARFF APRON
- EXISTING AIRPORT FACILITIES
- EXISTING AIRPORT BUILDING

Figure 5-11 - ARFF Alternative 2
Adjoined Facility

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LEGEND:

- FUTURE 10,000 GAL. FUEL TANK
- FUTURE FUEL FARM PAVEMENT
- FUTURE SRE BUILDING
- FUTURE LANDSIDE PAVEMENT

Figure 5-12
GARAA Maintenance Facilities & Equipment Storage
Alternative 1
Reconfigure Existing Area

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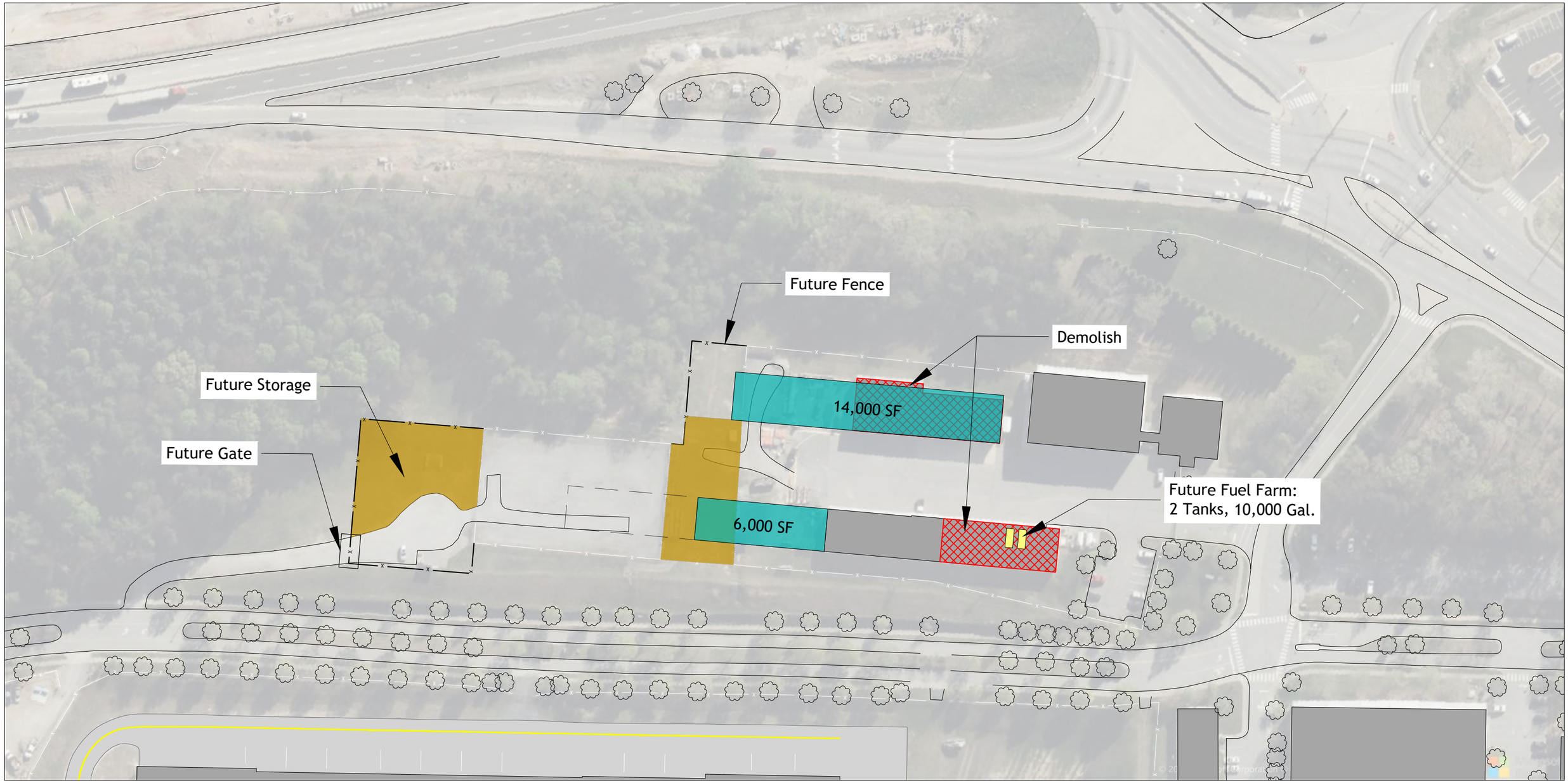

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LEGEND:

- FUTURE 10,000 GAL. FUEL TANK
- BUILDING REMOVAL
- FUTURE SRE BUILDING
- FUTURE LANDSIDE PAVEMENT

Figure 5-13
GARAA Maintenance Facilities & Equipment Storage

Alternative 2
New Location

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5.3.6 Urban Air Mobility Alternatives

In recent years, many advancements have been made in the next generation of airborne transportation. These advancements have been focused on both crewed and uncrewed aircraft, electric powered aircraft, traditional winged aircraft, and aircraft with vertical takeoff and landing. With the support of NASA, the FAA, and aviation stakeholders, this industry has been termed Urban Air Mobility (UAM) for the potential to expand transportation networks in metropolitan areas. AVL serves the Asheville Metropolitan Statistical Area (MSA), thus it is important to look ahead at how the potential for UAM activity could impact the Airport and basic facility requirements and alternatives to accommodate demand.

In April 2023, the FAA released the *UAM Concept of Operations (ConOps), Version 2.0*. The publication describes "the envisioned operational environment that supports the expected growth of flight operations in and around urban areas." The advancement of UAM is anticipated to eventually aide in supporting passenger and cargo operations in hard to reach, congested, or underserved areas. Per the FAA, UAM advancement will take place in series of increasing levels of autonomy and operational tempo.

The initial phases of implementing UAM will utilize existing helicopter routes, helipads, aircraft aprons, rules and regulations, and air traffic control (ATC) services. As demand for UAM activity increases, the demand on infrastructure and procedures will increase and be impacted. Over time, the FAA will establish and define UAM Corridors from specific aerodromes[21] based on performance requirements. This will also trigger changes to and enforcement of new UAM regulations. As the state of operations mature to become more advanced, and as frequency increases throughout the UAM sector, the previously formed UAM Corridors may form a new network, thus optimizing paths between aerodromes. The number of aerodromes or vertiports would also increase as demand increases. One primary difference between the stages of activity is that once operations have increased to be considered 'mature,' the UAM vehicles may be piloted remotely or autonomously rather than having an onboard pilot in control.

[21] Per the FAA, an aerodrome is "a location from which UAM flight operations depart or arrive."

Figure 5-14 –Sample UAM Aircraft

As the previously discussed advancements are made, the FAA will continue to define, maintain, and make publicly available the standards and regulations regarding the UAM system; therefore, it is important that AVL review and apply the standards to ensure accommodations of this newly emerging technology. Advancements to current infrastructure at AVL could include, but is not limited to:

- Installing charging stations in the FBO and other GA areas for the aircrafts' electric motors and batteries
- Designated operations areas, including locations for electric Vertical Takeoff & Landing (eVTOL) aircraft in the terminal area, with defined takeoff and landing routes.
- Construction of one or more vertiports, apron parking, and hangars to accommodate the new aircraft.

FBO Apron

It is anticipated that private charters will be the early adopters of UAM usage. As such, infrastructure must be in place at the FBO to support such operations. Since AVL currently has established helicopter departure and arrival routes that are controlled by air traffic control, it is expected that the only addition to the FBO apron is the capability to support electric charging of the UAM aircraft, at a designated parking position. Aircraft may taxi or hover-taxi to the position. Note, coordination with the local utility provider would be necessary prior to installation of the electric charging stations.

Passenger Terminal Apron

Small electric traditional fixed-wing aircraft have the capability of providing regularly scheduled commuter service. Should such service occur at AVL, the terminal passenger gates would need to be capable of supporting the operations from a passenger capacity standpoint. Similar to the FBO Apron, the only additional infrastructure required would be electric charging stations and modified or alternative types of Passenger Boarding Bridges. Prior to installation of the electric charging stations, coordination with the local utility provider would be necessary.

eVTOL Vertiport

In September 2022, the FAA published *Engineering Brief (EB) 105, Vertiport Design*, specifically catered to eVTOLs. A vertiport is the broad term consisting of the area dedicated for the eVTOLs Touchdown and Liftoff Area (TLOF), Final Approach and Takeoff Area (FATO), corresponding Safety Area, and any support facilities and buildings servicing the eVTOL.

Commercial Passengers

The initial adoption of eVTOL operations is expected to serve as a shuttle/ferry service connecting the surrounding downtown areas to the Airport, providing a quicker alternative to private/hired car and/or public road transportation methods. The service may cater to passengers continuing onto a regularly scheduled commercial flight. As such, the eVTOL would be required to land and disembark passengers landside. As such, a standalone vertiport adjacent to the terminal would be ideal, with the vertiport being located outside the Airport's Security Identification Display Area (SIDA).

A possible location for an eVTOL vertiport would be on the top-roof level of the proposed new parking garage. This elevated location would provide clear airspace. Construction of the new garage would need to accommodate the infrastructure required to support the eVTOL operations (i.e., exclusion of lamp posts, construction of electric aircraft charging station, and a small passenger holdroom facility for those departing the airport towards the downtown areas, etc.). Coordination with the local utility provider would be necessary.

It is important to note that EB 105 serves as an interim design guideline to the initial development of eVTOL vertiports as their performance data has not been fully evaluated by the FAA and the technology is rapidly changing. As such, standards may change if development of an eVTOL vertiport should be advanced in the future.

Air Cargo

Currently, the largest users of eVTOLs are air cargo operators. While AVL does not currently have cargo activity, it is important to assess what infrastructure would need to be in place if a dedicated cargo area is developed. Electric charging would need to be made available and helicopter procedures in place with ATC, with the capability of supporting eVTOL operations. Prior coordination with the local utility provider would also be necessary.

5.4 PASSENGER TERMINAL COMPLEX DEVELOPMENT CONCEPTS

The development of the overall passenger terminal complex alternatives can be collectively categorized as "Landside", "Terminal", and "Airside" components. These components are interdependent of each other, and together, all components needed to be considered inclusively to determine the best overall alternatives to pursue. The overall terminal complex alternatives were developed from the facility needs determined in **Chapter 4**, which were summarized in **Table 4-26**. These individual components are further described in the following paragraphs.

The terminal complex alternatives were developed in accordance with projected aviation activity through PAL 4, which corresponds to the 20-year planning horizon identified in this Master Plan Update. The basis of the facility needs was compared to the Base Year passenger activity level (previously identified in **Chapter 4**, **Table 4-1**) which also is synonymous with the improvements completed or currently being completed under the Terminal Modernization Project. See **Chapter 4**, **Figure 4-6** and **Figure 4-7**. As a note, PALs 5 and 6 were established to provide alternate (i.e., higher) passenger and commercial operation activity levels, which will further serve as a basis for future facility planning should activity increase beyond the preferred forecast projections (e.g., air service developments such as a new entrant airline, service to new markets, etc.).

Two distinct alternatives are presented in this Chapter with decision points (timeline or triggers) as to when the GARAA will need to consider a definite development direction.

The two distinct alternatives are referred to as:

- Single Level Terminal Complex Alternative
- Two-Level Terminal Complex Alternative

Single Level Terminal Complex Alternative – In summary, this alternative was developed from the initial concept that the vehicular circulation at the terminal curb front remains single level, or all at grade. The AVL terminal building is a traditional single level concept with ticketing and baggage claim processor areas at grade level and with ticketing processor areas "first on curb", along with supporting airside and landside development.

Two-Level Terminal Complex Alternative – In summary, this alternative was developed from the concept that the vehicular circulation at the terminal curb front is two levels with a departing passenger upper-level roadway and curb front (i.e., elevated roadway deck.) and arrivals passengers at the lower-level baggage claim roadway and curb (or grade level), along with supporting airside and landside development.

Both alternatives presented have distinct advantages and disadvantages. The following sections elaborate on these advantages and disadvantages with timelines, or developmental trigger points for a direction to develop a two-level terminal complex or stay with a single level terminal complex. An advantage of both alternatives is that they achieve PAL 4 facility needs, particularly for curb front requirements, as well as parking needs.

The terminal complex buildout through PAL 4 can be found in **Figure 5-15**, **Figure 5-16**, and **Figure 5-17**, while the buildout through PAL 6 is portrayed in **Figure 5-18**, **Figure 5-19**, and **Figure 5-20**.

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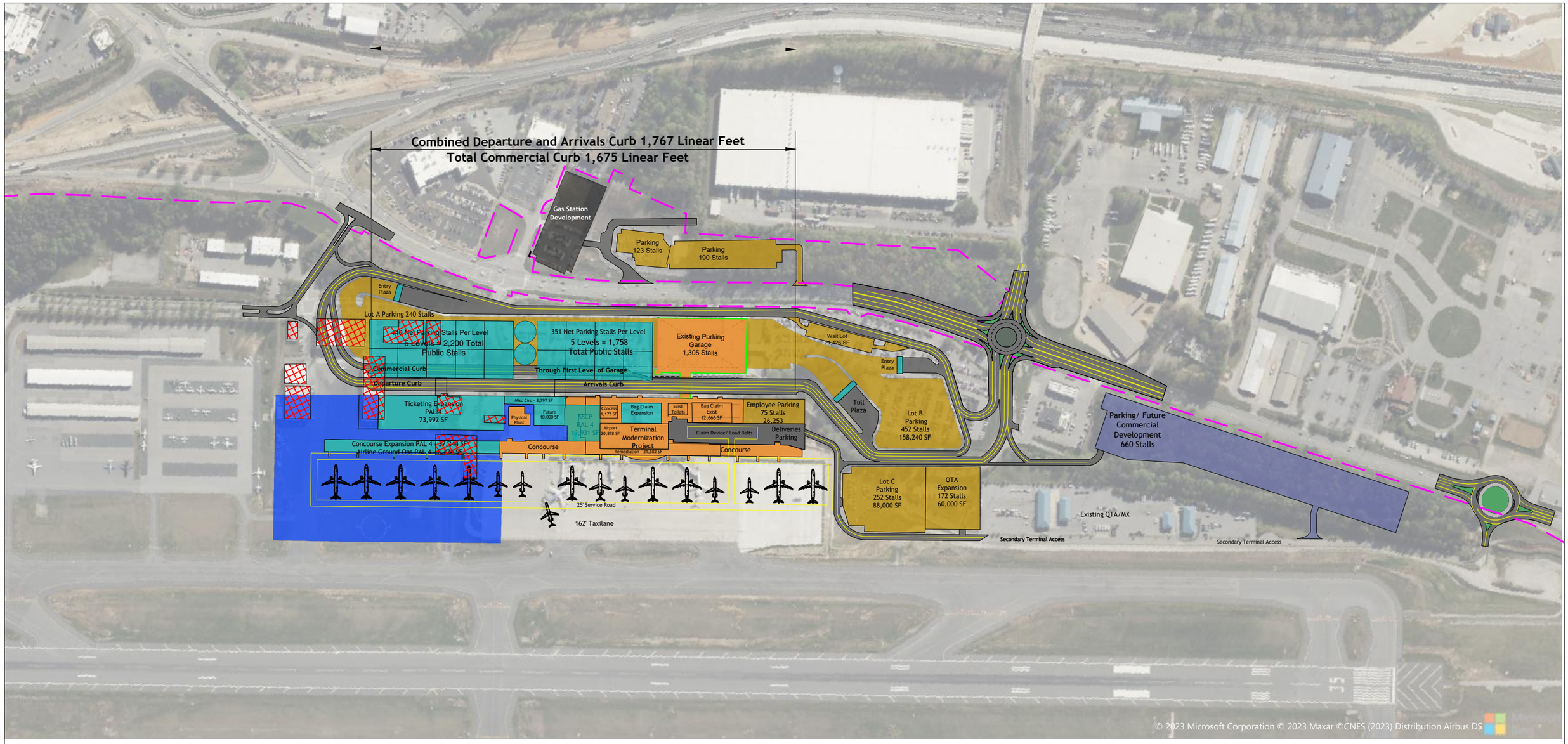

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- TERMINAL & PARKING GARAGE DEVELOPMENT
- AIRSIDE PAVEMENT DEVELOPMENT
- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-15
Single Level Terminal Complex Alternative - PAL 4

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- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-16
Two-Level Terminal Complex Alternative - Arrivals Level - PAL 4

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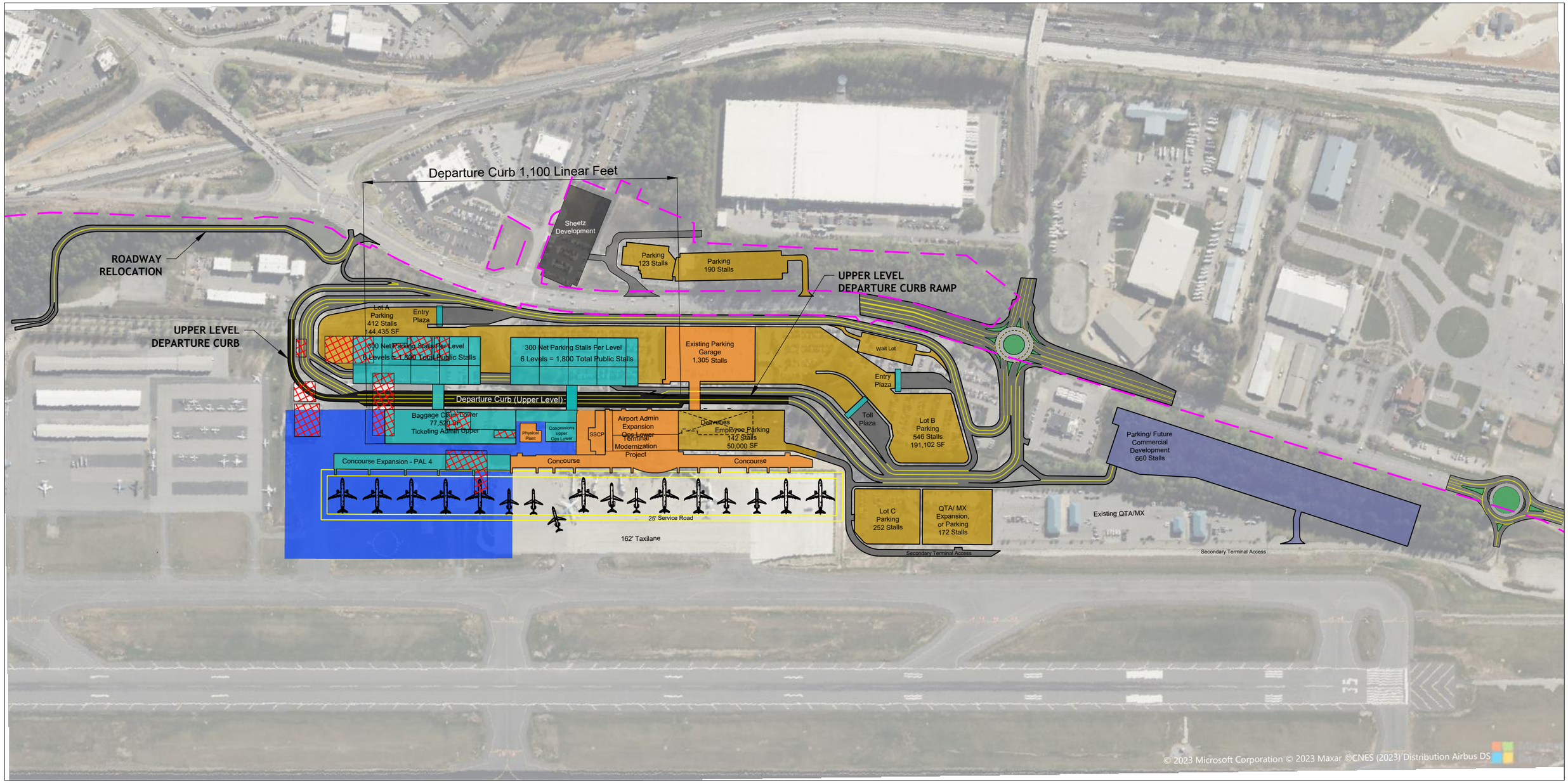

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- TERMINAL & PARKING GARAGE DEVELOPMENT
- AIRSIDE PAVEMENT DEVELOPMENT
- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-17
Two-Level Terminal Complex Alternative - Departure Level - PAL 4

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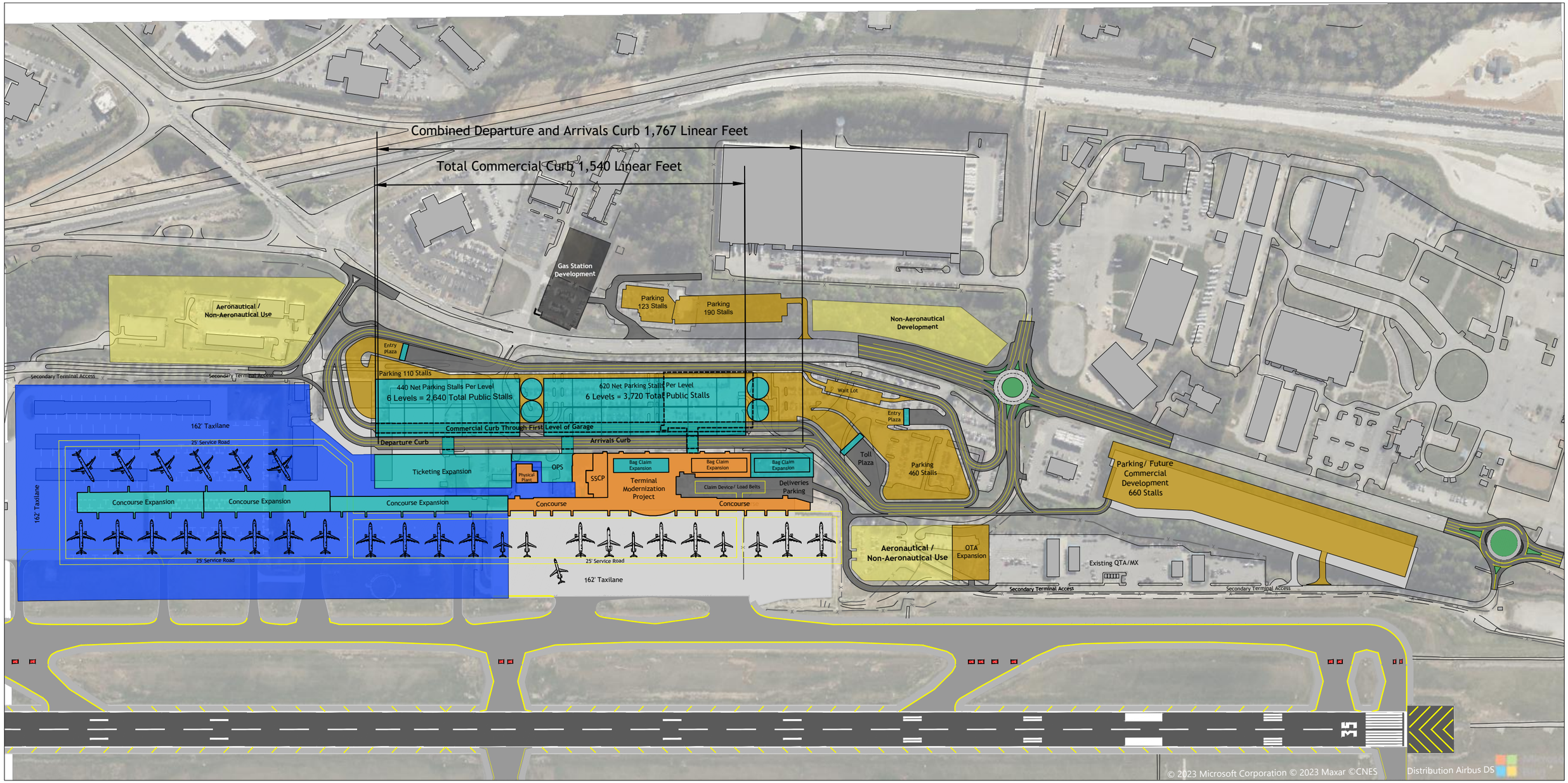

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- TERMINAL & PARKING GARAGE DEVELOPMENT
- AIRSIDE PAVEMENT DEVELOPMENT
- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-18
Single Level Terminal Complex Alternative - PAL 6

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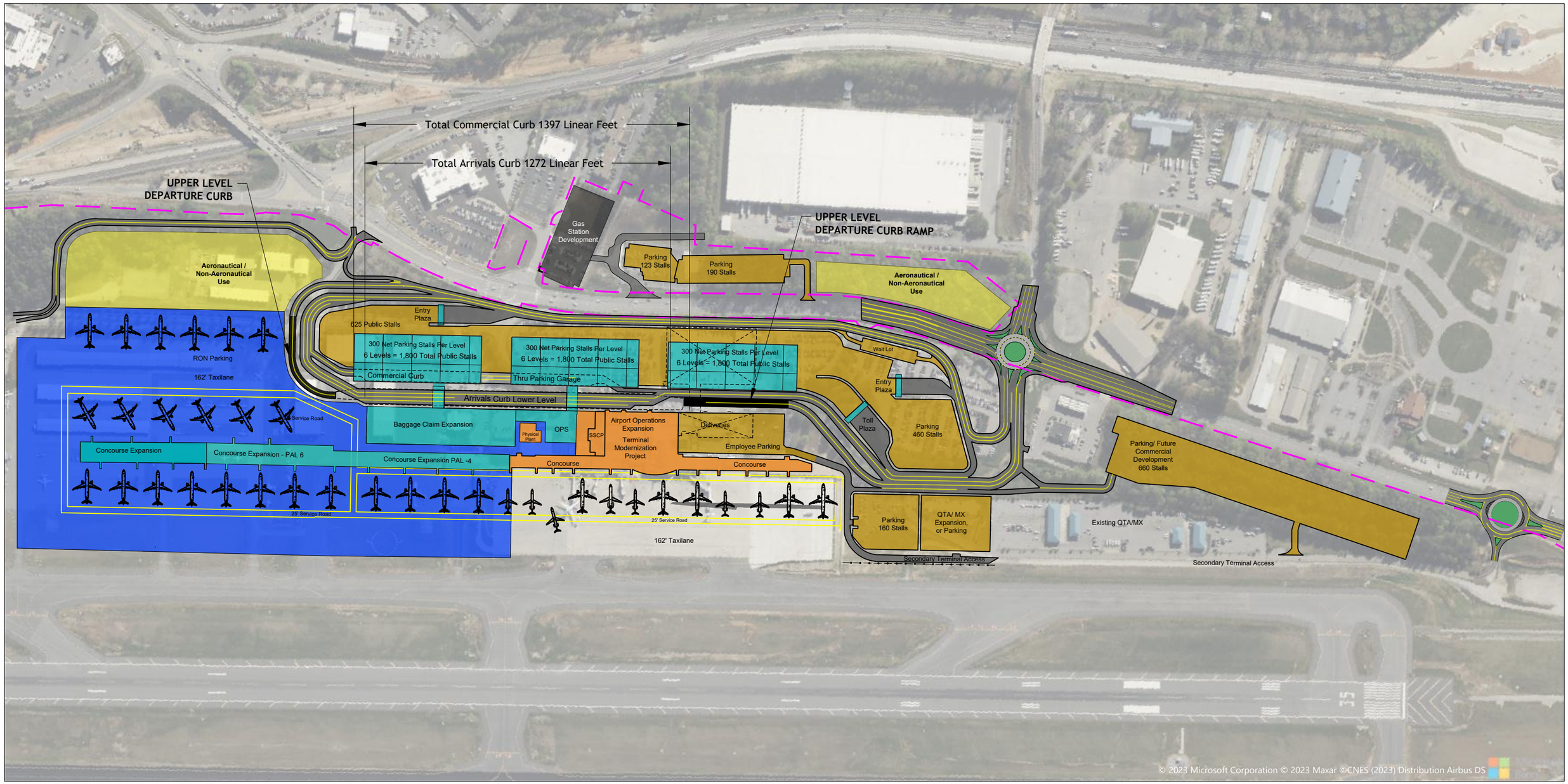

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- TERMINAL & PARKING GARAGE DEVELOPMENT
- AIRSIDE PAVEMENT DEVELOPMENT
- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-19
Two-Level Terminal Complex Alternative - Arrivals Level - PAL 6

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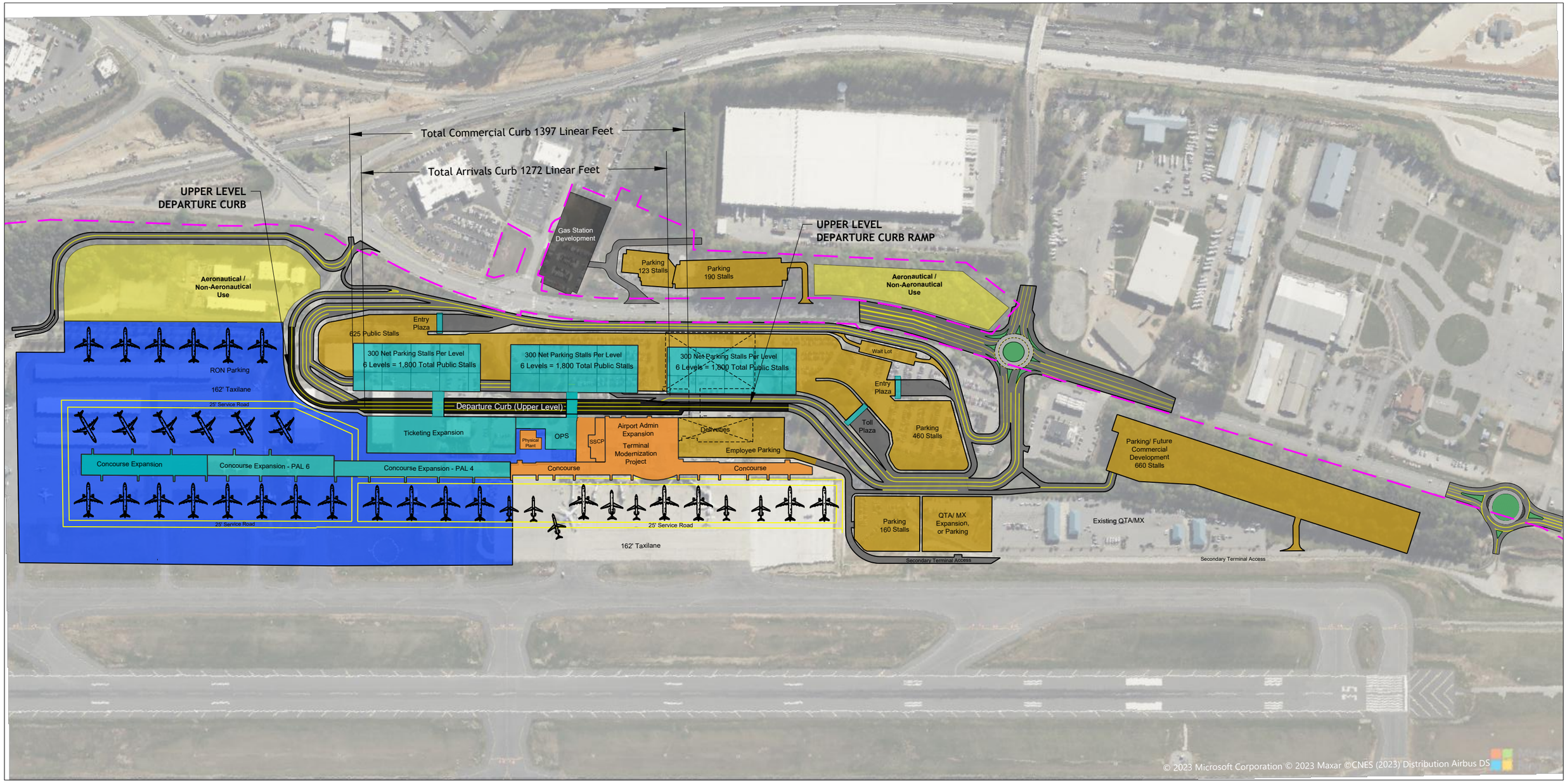

GRAPHIC SCALE (FEET)

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LEGEND:

- ROADWAY DEVELOPMENT
- TERMINAL & PARKING GARAGE DEVELOPMENT
- AIRSIDE PAVEMENT DEVELOPMENT
- LANDSIDE PAVEMENT DEVELOPMENT
- TERMINAL MODERNIZATION PROJECT

Figure 5-20
Two-Level Terminal Complex Alternative - Departure Level - PAL 6

5.4.1 Landside Alternative Evaluations

The elements of the landside development within the context of this evaluation are roadway systems, both on airport property (internal) and off airport property (external), parking, and other support facilities. At AVL, the two elements most critical for GARAA to address are the terminal curb front and parking needs. The biggest driver, excluding costs, to consider is the ability of the alternatives to efficiently operate a terminal curb front without level of service failures.

Roadway and Curb Front Systems

The need to address adequate curb front facilities (lanes and length), along with a commercial curb [sometimes referred to as a ground transportation center (GTC)] is of paramount importance, as well as impacts to the overall internal roadway system at GARAA. See **Figure 5-15**, **Figure 5-16**, and **Figure 5-17**.

Table 5-3 summarizes the findings for the Base Year curb front facilities and the curb front facilities needed to meet PAL 4 and beyond, which were developed in from **Chapter 4**, **Table 4-81**.

Table 5-3 – Calculated Curb Front Demand

	(Base)	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Total Curb Length Needed – *Linear Feet*	*791*	1,061	1,199	1,287	1,425	1,579	1,789
Total Existing Curb – *Linear Feet*	*(650)*	*(650)*	*(650)*	*(650)*	*(650)*	*(650)*	*(650)*
Projected v. Existing Comparison – *Linear Feet*	*(141)*	(411)	(548)	(637)	(775)	(929)	(1,139)

Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions.
Source: CHA, 2023.

Both the single level and two-level terminal complex alternatives can satisfy the PAL 4 curb front needs. As depicted on **Figure 5-18**, **Figure 5-19**, and **Figure 5-20**, PAL 5 and PAL 6 can conceivably be achieved to meet the needs. With the inherent terminal complex site constraints, the maximum passenger curb length available with the single level terminal complex alternative becomes deficient after PAL 6 with little ability to mitigate.

For both the single level and two-level terminal complex alternatives, the initial path to achieve additional curb front is with the reconfiguration of the terminal access roadway system in PAL 2. This would involve closing the main terminal entry road at the intersection of Airport Road (NC-280) and Terminal Drive, and the development of a new main airport entrance at the existing intersection of Airport Road (NC-280) and Fanning Bridge Road. This will allow for the construction of the terminal loop road to expand further at grade to the north, allowing for the additional length for the curb front at the face of the terminal building and the development of a new main airport entry with associated roadway systems at the Airport Road (NC-280) and Fanning Bridge Road intersection. Expanding the curb front in this manner will also allow the development of a separate adjacent commercial curb, or GTC with entry to the commercial curb areas without traveling through the terminal curb front area with active loading and unloading

of passengers. In addition, the enlarged terminal roadway loop area allows for two new planned parking garages to be constructed under the ingress and egress of the parking system inventory and control equipment. The commercial curb can be planned and developed within the parking garage structures, or the parking garages can be sited to the east to separate the commercial curb from the parking garages; however, either design approach impacts the footprint of a new parking structure for maximum yield of stalls at the most economical cost.

This development does not dictate a direction for a single level or two-level terminal complex alternatives but does address meeting curb front requires through PAL 4, and perhaps beyond; however, the terminal complex area is constricted for capacity expansion, particularly for linear expansion of a curb front system. AVL has experienced aggressive enplanement growth over the past several years that is beyond what is normally experienced. As such, it is important for the Airport to strategically meet the planning and capitalization of projects to keep up with the demand for facilities in a timely manner.

If enplanement activity growth continues to exceed forecasts over time, the two-level terminal alternative would be the recommendation due to its greater capacity; therefore, that alternative is carried forward in the Master Plan; however, if growth tapers in the future and remains within the parameters of PAL 4, the single level concept would have adequate capacity. The final decision can be deferred until the end of PAL 2 or early PAL 3, when the phased recommended improvements would be specific to the single- or two-level terminal. At that time, a decision needs to be made as to a single level or two-level terminal complex. If aggressive passenger growth has tapered, advancing the single level terminal complex and curb front system would be adequate.

Throughout PAL 2, the recommended improvements to expand the terminal roadway systems with the loop road, main entry, expanded curb front capacities, commercial curb, or GTC implementation are compatible with either the single level or two-level terminal complex alternatives moving into the future.

Automobile Parking Facilities

The need to address adequate vehicular parking facilities is important for the successful operation of GARAA. The development of the roadway system projects would enable GARAA to successfully develop additional user-friendly and efficient parking facilities.

A summary of the existing (Base Year) parking conditions that were identified in **Chapter 4** is provided in **Table 5-4**, which also identifies the parking needs for each of the PALs and the stalls provided for the single level and two-level terminal complex alternatives.

Table 5-4 – Automobile Parking Needs Summary

Type / Stalls	*(BASE)*	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5	PAL 6
Public	*(3,142)*	*3,633*	*4,067*	*4,550*	*5,093*	*5,772*	*6,444*
Rental Car Return/Ready - Medium	*(238)*	*467*	*523*	*585*	*655*	*743*	*829*
Employee - Medium	*(256)*	*338*	*378*	*423*	*473*	*536*	*599*
TOTAL	*(3,636)*	*4,438*	*4,968*	*5,558*	*6,221*	*7,051*	*7,872*
Single Level Terminal Parking Development - Provided	*(3,636)*	5,080 [1, 4]	5,520 [2]	7,005 [3]	7,427	--	7,903
Two-Level Terminal Parking Development - Provided	*(3,636)*	5,172 [4, 5]	5,560 [2]	6,978 [6]	7,123	--	7,865

Footnotes:
[1] Construct 5-Level Parking Structure 2.
[2] Construct new terminal loop road, and curb front and net additional surface parking.
[3] Construct 5-Level Parking Structure 3.
[4] Includes the additional of 36 remote stalls from the Sheetz development at the intersection of Airport Road (NC-280) and Terminal Drive.
[5] Construct 6-Level Parking Structure 2.
[6] Construct 6-Level Parking Structure 3.
Notes:
Those numbers depicted in parentheses indicate existing conditions.
Numbers in **RED** represent a deficiency in space or quantities when compared to Base Year conditions.
Source: CHA, 2024.

As previously discussed, the single level and two-level terminal complex alternatives meet the need for overall parking stall requirements through PAL 4. Similarities between the two alternates include parking entrance and exit plazas, the commercial curb (or GTC integrated within the parking structures), and the wait lot that is incorporated within the terminal loop roadway system for easier, and more efficient use. In addition, the relocation of the wait lot from the east side of Airport Road (NC-280) and Terminal Drive may make this area a prime location for non-aeronautical development opportunities.

A notable nuance between the two alternatives, as indicated by the footnotes in **Table 5-4**, is the difference in parking structure levels proposed to meet overall parking requirements in PAL 4. The single level terminal complex alternative indicates five-level parking structures, and the two-level terminal alternative indicates a six-level parking structure.

For both alternatives, other facilities that will need relocated to allow development are: aircraft hangars, airport operations, etc. Alternatives for relocation of these facilities are presented herein.

Other Landside Support Development

This section captures and documents other conditions for landside development applicable to both the single level and two-level terminal complex alternatives.

Terminal Building Services and Delivery

The alternatives relocate the terminal building services and deliveries to the south side of the building and site area. This is reflected in both alternatives and allows building service or delivery traffic to the terminal building without passing through the passenger curb front area. This access

is provided by the existing intersection at Airport Road (NC-280) and Rental Car Drive. Along with this, additional parking for employees can be developed. Note, additional perimeter fencing and access gates may be necessary to secure the QTA facility.

Quick Turn Around Maintenance Facilities (QTA MX)

An area has been designated to accommodate any future growth and expansion needs related to the rental car companies' Quick Turn Around Maintenance Facilities (QTA MX). The reconfigured terminal loop roadway system allows direct and efficient return/ready rental operations between the QTA MX and the customer return/ready area in the existing parking garage.

Employee Parking Lots (North and South)

This area has been designated in both alternatives. Note, the parking capacity of this lot was not included in **Table 5-4**, as this area presents an opportunity for additional parking, or other aeronautical or non-aeronautical uses.

Roundabouts

As shown in the alternative figures (**Figure 5-15** through **Figure 5-20**), roundabouts are recommended at the new terminal main entry at the existing intersection of Airport Road (NC-280) and Fanning Bridge Road, and further south at the intersection of Airport Road (NC-280) and Rental Car Drive. The roundabouts would improve capacity for traffic to and from the Airport. These roundabouts and associated roadway work are within the state highway system off-airport property and are considered external roadway system improvements. These improvements would alleviate capacity driven issues; however, the specific use of roundabouts to provide effective traffic movement and capacity issues is not the only solution available for consideration. The intersection may be able to achieve an acceptable capacity rating with improvements to the existing signalization system, added signalization, and lane definition strategies.

In addition to the roundabouts, the roadway concept includes:

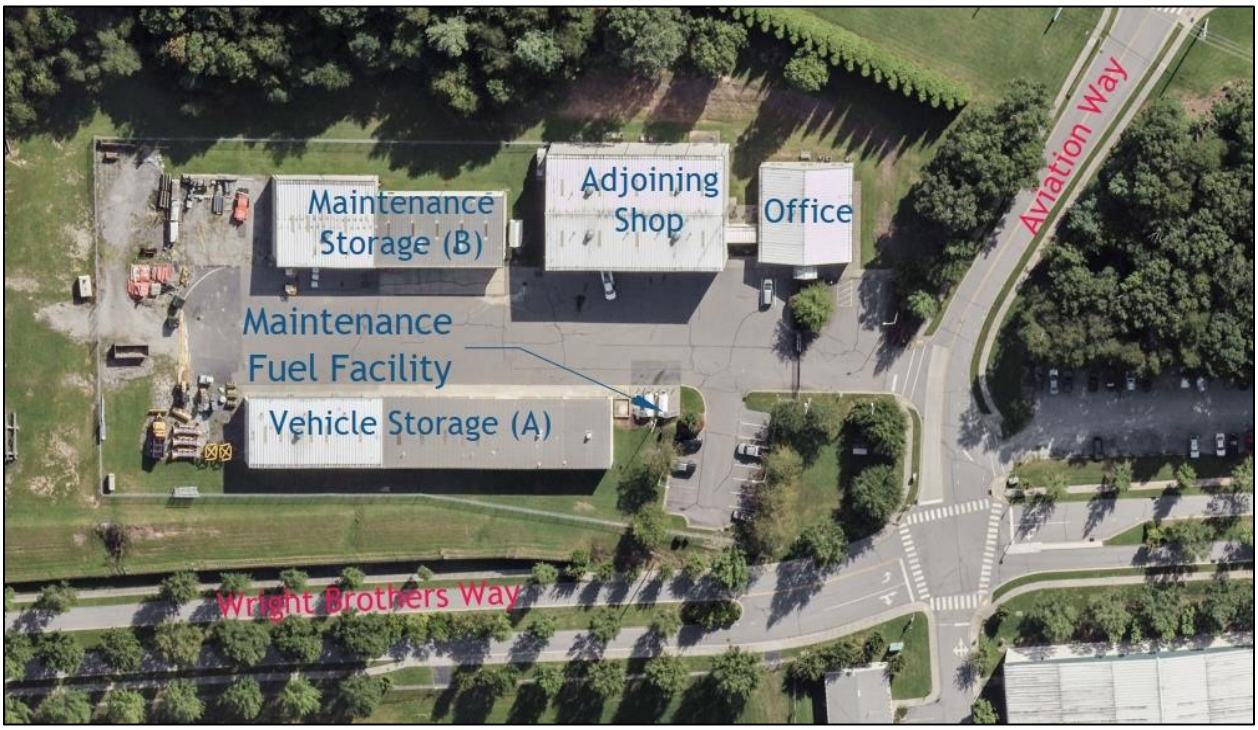
- A new primary airport entrance (at Airport Road / NC-280 and Fanning Bridge Road
- The closure of the existing airport entrance, and
- A new secondary entrance at Rental Car Drive for services and deliveries to the terminal building.
- Partial relocation of Wright Brothers Way to maintain access to the General Aviation area

GARAA has coordinated with the North Carolina Department of Transportation (NCDOT), who has offered their concurrence that the roundabout solution may be viable to alleviate other capacity issues of this intersection. As off airport facilities, these roundabouts would be a project undertaken by NCDOT and not a part of AVL's Capital Planning; however, these improvements should be evaluated in further detail in coordination with GARAA so that they may be considered as a future programmed improvement by the State.

GARAA Maintenance Facilities & Equipment Storage

The recommended roadway improvements would eliminate the fuel farm and the equipment storage facility [identified as Vehicle Storage (A) in **Figure 5-21**] within the GARAA maintenance yard; therefore, a new site location and facility for equipment storage was identified, which would provide for all existing and future needs for airport vehicles. If the maintenance facilities are relocated and replaced along with the equipment storage development, this area provides opportunities for other aeronautical or non-aeronautical uses.

Figure 5-21 – Airport Maintenance Facilities & Equipment Storage



Source: CHA, 2024.

5.4.2 Terminal Building Alternative Evaluations

The terminal building alternatives builds upon the work completed as part of the Terminal Modernization Project. The single level and two-level terminal complex alternatives meet PAL 4 criteria for development and are compatible within the constricted site for the terminal complex area. From a timeline perspective, the two alternatives share similarities in progression for development:

- PAL 1
  - New structured parking facilities
- PAL 2
  - New terminal loop roadway improvements (refer to **Section 5.4.1**)
    - Note: These improvements are a precursor for construction parking structure 3
  - Airside ramp improvements (refer to **Section 5.4.3**)

- Note: These improvements are a precursor for the additional concourse areas and gates identified in PAL 3

✈ PAL 3

- Additional concourse area
- Five (5) additional aircraft gates

As indicated above, the completion of the Terminal Modernization Project significantly limits the need to execute projects to add terminal processor capacity within the terminal until PAL 3. The facility expansion included in both alternatives requires the redevelopment and use of existing airport property to the north, with the relocation of several existing facilities (i.e., hangars, airport public Safety, etc.). Alternatives and concepts for these relocated facilities were previously discussed and identified.

The Terminal Building Alternatives are explained in greater detail below.

Single Level Terminal

This alternative was developed to maximize building frontage with the expanded length of the current curb front in PAL 2 as a single level concept similar to the existing terminal layout with the ticketing processor area and related improvements to the north. The entire ticketing processor areas will be moved from its current location into the new terminal building addition. By moving the existing ticketing processor area out of its current location, this area can be repurposed as a baggage claim processor area. The existing southernmost baggage claim processor area will remain as-is. The Security Screening Checkpoint (SSCP) processor area would be relocated to the location constructed as the temporary SSCP for the Terminal Modernization Project. This layout will address need capacity, while balancing ticketing processor areas and baggage claim processor areas in a symmetrical manner internal to the building. The expansion also improves the departures and arrivals curb front and enhances passenger intuitive wayfinding and flow.

Two-Level Terminal

If the two-level terminal concept is advanced, the terminal building will be developed as a traditional two-level terminal with ticketing processor areas on the upper departure curb and baggage claim on the lower arrivals curb. Development of the terminal curb front with the roadway system was previously detailed in **Section 5.4.1**.

This alternative illustrates a maximize building frontage with the development of a two-level curb front system. The existing ticketing processor area and baggage claim processor area will be repurposed or demolished, and a new two-level facility will be developed north of the existing terminal building. The SSCP processor area can be relocated to the area that was constructed as the temporary SSCP for the Terminal Modernization Project, vertically balancing ticketing processor areas and baggage claim processor areas and enhancing passenger intuitive wayfinding and flow.

5.4.3 Airside Alternative Evaluations

Airside improvements include the aircraft parking ramps, stormwater and utility considerations, and the relocation of existing facilities that impede the airside development. At a high level, the airside development needs are virtually the same for the single level and two-level terminal complex alternatives.

A new aircraft parking ramp will need to be constructed to support additional concourse expansion and adding more aircraft gates. With the new concourse areas and gates constructed under the Terminal Modernization Project, the facility requirements identified that additional concourse area and gates will be needed in PAL 3 to support projected activity levels; therefore, the aircraft parking ramp area should be constructed during PAL 2 timeframe to support the addition of the concourse and gates. Other facilities that will need to be relocated to allow development are aircraft hangars, airport operations, and the ARFF facility. Alternatives for their relocation were previously presented in **Section 5.3**.

5.5 RECOMMENDED DEVELOPMENT PLAN SUMMARY

Based on a review of the Airport Authority's goals and objectives, as well as the identified needs and constraints, specific alternatives were identified as the most reasonable to form the recommended development plan for AVL. This plan improves the safety, operational efficiency, and functionality of the airfield while incorporating all anticipated necessary facilities. This section provides a summary of the major concepts in support of the short- and long-term operation of the Airport.

It should be emphasized that this is a long-term plan and some of the desired improvements may not be financially or environmentally feasible. Prior to implementation of some of the proposed development projects, an Environmental Assessment (EA) or Categorical Exclusion (CATEX) would be required in accordance with regulations covered under the National Environmental Policy Act (NEPA).

A summary of each recommended alternative or concept is presented below, while the overall recommended plan for AVL is illustrated in **Figure 5-22**.

Airfield Development Plan

The airfield development plan includes the recommended alternatives pertaining to the runway and taxiway system.

<u>Runway Alternative 1 – Runway Extension with Blast Pad</u>

Based on the evaluations of airfield development concepts, GARAA has chosen Runway Alternative 1 as the preferred alternative, which consists of a 1,000-foot runway extension with a standard blast pad (200 feet x 200 feet). This extension is included for long-term planning purposes, as current non-stop destinations can be served by the existing 8,002-foot runway. This alternative would provide a full 9,002 feet of usable runway length when taking off from or landing on either runway end without restricting future potential stage lengths and destinations.

While the 1,000-foot extension will be located on property owned by GARAA, the MALSR will extend off airport-owned property. Prior to constructing the extension and installing the MALSR, it is necessary that GARAA acquire the land where the MALSR will be installed or obtain an easement over the property.

The future limits of the Runway 17 RPZ was evaluated at a high-level for incompatible land uses, with an emphasis given to airspace and protection of people and property. Potential incompatible land uses found within the future Runway 17 RPZ include portions of State Road 3496 and Pinner Road. A local business and residential property were also found to be within the future RPZ, which would be considered incompatible. Thus, property acquisition may be needed for land use compatibility. It is further recommended that GARAA seek opportunities to eliminate, reduce, or mitigate incompatible land uses within the future limits of the RPZ; however, it is acknowledged that roadways and parking exist in most airport RPZz. While not ideal, land uses such as roads and parking are generally not prohibited.

Taxiway Alternative 1 – Taxiway Extension, Taxiway Alternative 2 – Taxiway Extension (Ultimate), and Taxiway Alternative 3 – Bypass Taxiways

Of the six taxiway alternatives presented, three are recommended to be carried forward. Potential future development recommendations include two Taxiway B extensions (initial and ultimate) to the Runway 17 end and new bypass taxiways. The first recommended extension will extend Taxiway B, to create a full-length parallel taxiway (Taxiway Alternative 1). It is further recommended that Taxiway A and B be further extended if Runway 17 was extended by 1,000 feet. (Taxiway Alternative 2). The extensions would prevent the need to cross the runway when accessing the north end of the runway, thus improving safety when operating on the airfield. Two bypass taxiways are also recommended, one on either side of the airfield, which would increase airfield capacity and better accommodate future demand (Taxiway Alternative 3).

Support Facilities Development Plan

The support facilities development plan includes the recommended alternatives pertaining to the GA, aviation fueling, ARFF, GARAA maintenance and equipment storage, and urban air mobility facilities.

GA Alternatives 1 and 3 – Development in Existing GA Area & Northern Expansion

On the east side of the airport, two of the three GA alternatives are recommended. The first focused on hangar development at or in the vicinity of the existing GA area. Of these alternatives, GA Alternative 1 has been chosen as the recommended development concept in the short-term. This concept includes development within the existing GA footprint. Proposed development includes an additional 30,000 SF hangar on the north side of the North Apron, a T-hangar with 15 bays (1,900 SF each) on the Middle Apron, and a 42,000 SF box hangar and adjoining T-hangar (approximately 7,650 SF) to the south of the existing T-hangars.

Additionally, Alternative 3 is recommended for GA development expansion for future corporate aircraft. This development concepts further builds out the GA area with an expansion to the north

of the North Apron, capable of accommodating up to two 30,000 SF hangars and two 40,000 SF hangars. To provide access to new development north of the North hangar, the existing taxilane connectors connecting Taxiway A and the North and Middle Aprons would also be eliminated and a new taxilane (ADG-III, TDG-2) would be constructed. The new taxilane would extend the length of the Middle Apron, North Apron, and new development area. Three new connectors would also be constructed, with two providing access to the Middle Apron and one providing access to the North Apron and northern expansion.

To secure the area, new perimeter fencing will be installed. Additionally, a new roadway would be constructed to provide access (i.e., extending Wright Brother Way), connecting into the existing roadway system for the Airport.

GA Alternative 4 – Northwest Development and GA Alternative 5 – Southwest Development

GA Alternatives 4 and 5 are also recommended. The Northwest Area could support future GA and FBO development, providing GA facilities and access to the west side of the airfield rather than activity being restricted to the east side of the airfield. Within this location, potential for a property swap is possible, the acquisition of property in proximity to Taxiway B, and release of property to the west (along the French Board River). Adjacent to these 55 acres, an additional 18 acres have been identified for potential acquisition, which would further support future aeronautical development. GA Alternative 5 includes the 15 acres in the southwest area, which could support potential corporate GA, or cargo development and eVTOL air cargo operations.

Aviation Fueling Facilities Alternative 1 – Fuel Farm Expansion

As previously discussed, a need for additional fuel tanks in the Base Year was identified; therefore, it is recommended that GARAA expand the fuel farm to the north of the existing aviation fuel tanks. Current plans include installation of two 40,000-gallon Jet-A fuel tanks, which will double existing fuel capacity (i.e., increasing capacity from 80,000 gallons to 160,000 gallons) in the Base Year. It is further recommended that additional tanks be installed in each planning phase as needed.

ARFF Alternative 2 – Adjoined Facilities

To enable future expansion of the passenger terminal facilities, it is recommended that the ARFF facilities and functions be relocated west of Taxiway B and taxiway connector B3 and north of the new ATCT. ARFF Alternative 2 has been chosen as it requires less grading than Alternative 1 and does not encumber the existing roadway or require installation of a retaining wall. ARFF functions would be accommodated within two adjoined facilities, with one containing ARFF vehicles and equipment and one facility consisting of offices and crew quarters. An apron measuring approximately 18,000 SF would also be constructed, as well as approximately 14,000 SF for vehicular parking.

GARAA Maintenance Facilities & Equipment Storage Alternative 1 – New Location

After further evaluation of the two alternatives presented for the GARAA maintenance facilities and equipment storage, GARAA has chosen Alternative 1 as the preferred development concept.

Moving these functions to a new location will open the existing area for improvement to the on-airport roadways and future non-aeronautical development with the potential for revenue through land and/or facility leases.

The new site could be accommodated on approximately 5+ acres that have been identified on the north end of the airfield, with the land owned by GARAA. It is recommended that three facilities be constructed, measuring approximately 20,000 SF, 10,000 SF, and 5,000 SF. A surface lot will also need constructed to support the equipment operation, storage, and parking. Additionally, it is recommended that one 10,000-gallon diesel fuel tank and one 10,000-gallon unleaded fuel tank be installed for use in maintenance equipment and vehicles.

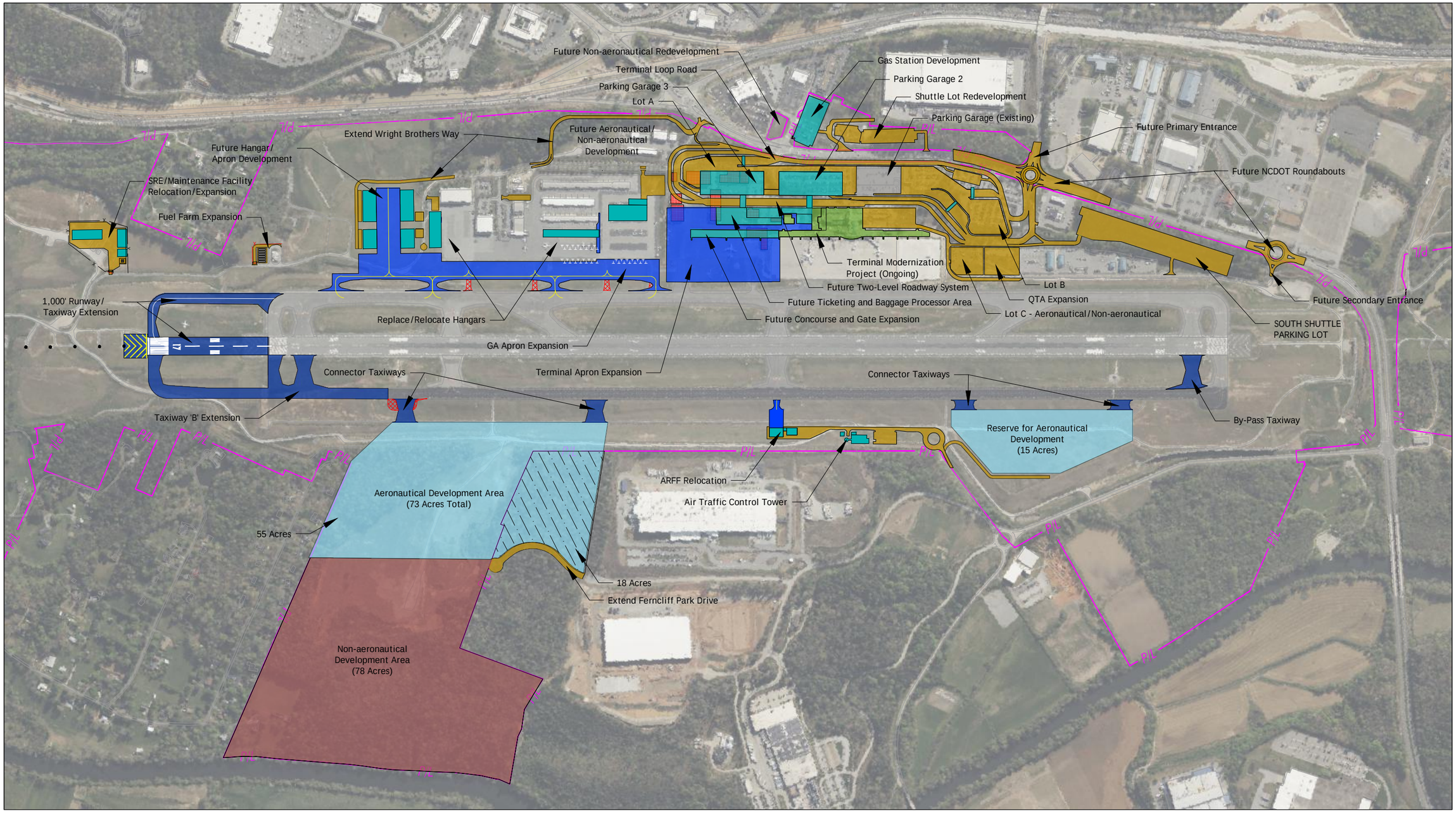
Urban Air Mobility

As the FAA continues to define, maintain, and make publicly available the standards and regulations regarding the UAM system and eVTOL vertiports, it is recommended that GARAA begin planning for future implantation and establishing how the Airport can accommodate such activity. One measure is installing charging stations for electric aircraft. The charging stations should be installed at the existing and at any future FBO and GA areas, as well as at the passenger terminal gates. GARAA should also plan for the installation of a vertiport on the top level/roof of the proposed parking garage. Should the Airport develop a dedicated cargo area, a vertiport is recommended for accommodating potential eVTOL cargo operations.

Prior to installation of electric parking stations and infrastructure, GARAA should be in coordination with the local utility provider. Note, it can be assumed that the installation of the electric parking stations will have an impact to the utility costs at the Airport. The extent of this impact is unknown at this time and should be discussed with the local utility provider.

Passenger Terminal Complex Development Plan

As GARAA's Terminal Modernization Project nears completion, future improvements in the terminal complex area (Landside, Terminal, Airside) that are necessary to support the fast growing passenger activity level need to be contemplated. The development of terminal complex concepts, and subsequent evaluations include the two-level terminal complex to support the maximum potential enplanement levels for PAL 6 and beyond. To a certain degree, the suggested terminal complex improvements up to PAL 3 are the same for both the single level, or two-level terminal complex. At the end of PAL 2 or early PAL 3, GARAA will need to confirm the need to pursue the two-level alternative for terminal complex development.



Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

CHA

GRAPHIC SCALE (FEET)
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LEGEND:

- Future Airside Pavement
- Future Landside Pavement
- Future Building
- Pavement Removal
- Building Removal
- Terminal Modernization Project
- Potential Land Acquisition
- Development Area
- Potential Development Area/Land Release

Figure 5-22 - Recommended Development Plan

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6 ENVIRONMENTAL OVERVIEW

This section provides a preliminary assessment of the environmental factors to be considered as part of the development and implementation of the proposed Airport Master Plan projects. This review was conducted in accordance with Federal Aviation Administration (FAA) Orders 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* and 1050.1F, *Environmental Impacts: Policies and Procedures*. This review does not provide a complete investigation sufficient for obtaining environmental permits or compliance with environmental documentation, such as an Environmental Assessment (EA) under the requirements of NEPA, as amended. Previous environmental documentation completed for the Greater Asheville Regional Airport Authority ('GARAA' or 'Authority'), along with publicly available resources, were relied upon to identify potential impacts.

The purpose of this overview was to identify the potential environmental issues and environmentally sensitive areas that may affect future Airport projects and to identify those environmental issues that may require additional analysis and permits prior to implementation.

The environmental impact categories evaluated herein are:

- Compatible Land Use and Zoning
- Airport Noise
- Social and Economic Environment
- Air Quality
- Water Quality
- Department of Transportation Act, Section 303 (i.e., Section 4(f))
- Section 6(f) Resources
- Historic, Architectural, Archaeological, and Cultural Resources
- Biological Resources
- Wetlands and Watercourses
- Floodplains
- Prime and Unique Farmlands
- Hazardous Materials

6.1 COMPATIBLE LAND USE AND ZONING

The following sections detail compatible land use and zoning in the vicinity of the Airport.

6.1.1 Compatible Land Use

AVL is located in Asheville, North Carolina, approximately 9 miles south of downtown Asheville. The town of Mills River is located directly west of the Airport's property, while the town of Fletcher is directly east. The Airport borders Henderson County to the south but is primarily located in Buncombe County, with a small portion of the Airport in Henderson County. **Figure 5-2** displays land use in the vicinity of the Airport.

Land use considerations for this Master Plan Update are primarily limited to on-Airport property associated with Airport roadways, parking areas, commercial properties, and operational facilities, but also includes small areas off-Airport. Land use compatibility is of greatest concern in the locations immediately beyond the runway ends where obstructions may penetrate the

Runway Protection Zone (RPZ). At AVL, some of the RPZ is contained to Airport property and is left undeveloped and is maintained by the GARAA. South of the runway, the RPZ overlaps Broadmoor Golf Links, previously purchased by the GARAA. North of the runway, at the Runway 17 end, the RPZ is primarily agricultural and open land, and includes the French Broad River and forested areas. Properties in the RPZ with obstructions to the approach or departure surfaces are eligible for FAA funding for easements or acquisition for safety purposes. Land uses that may not be compatible with Airport use based on noise sensitivity associated with each use are defined in FAA Order 1050.1F, *Environmental Desk Reference*. Potentially incompatible land uses based on noise sensitivity include residential areas and facilities such as schools, hospitals, and libraries. Potential noise impacts are discussed in more detail in **Section 6.2**.

6.1.2 Zoning

According to Buncombe and Henderson County zoning data, AVL is zoned as Airport Industrial (AI). Zoning in the immediate vicinity of AVL is primarily Low-Density Residential (R-LD), Employment District (EMP), and Industrial (I) to the north and Industrial (I) and Public Service District (PS) to the south. **Figure 6-2** depicts zoning surrounding the Airport. Since the Master Plan recommendations would occur on Airport property within areas zoned as AI and would be consistent with current airport use, impacts to zoning are not anticipated.

6.2 AIRPORT NOISE

The land area within the RPZ of Runway 17/35, including areas off-Airport property, have the potential to experience heightened noise from aircraft operations. Airport and aircraft noise are regulated at the federal level, and communities often consider the impact parameters to be very loud before they are considered a significant impact. Impacts are determined based on average airport noise levels rather than peak noise levels that may occur during a single aircraft takeoff; this noise metric is represented as the day-night average noise level (DNL). Residential development and other noise sensitive uses such as schools, hospitals, nursing homes, and places of worship are considered incompatible with airport noise above 65 DNL. All land uses are considered compatible with noise levels of less than 65 DNL.

According to the 2019 noise contour chart and the 2025 predicted noise contour chart completed as part of the Focused Environmental Assessment for the Passenger Terminal Building, the area within the 65 DNL contour is primarily undeveloped Airport property. The 65 DNL contour does extend off Airport property to the south, toward Broadmoor Golf Links; however, this property is compatible with current noise levels. Schools, hospitals, nursing homes, and places of worship surrounding AVL are currently not exposed to noise levels above 65 DNL. Depending on the action, a project specific noise analysis may be required should future Airport expansion be warranted.

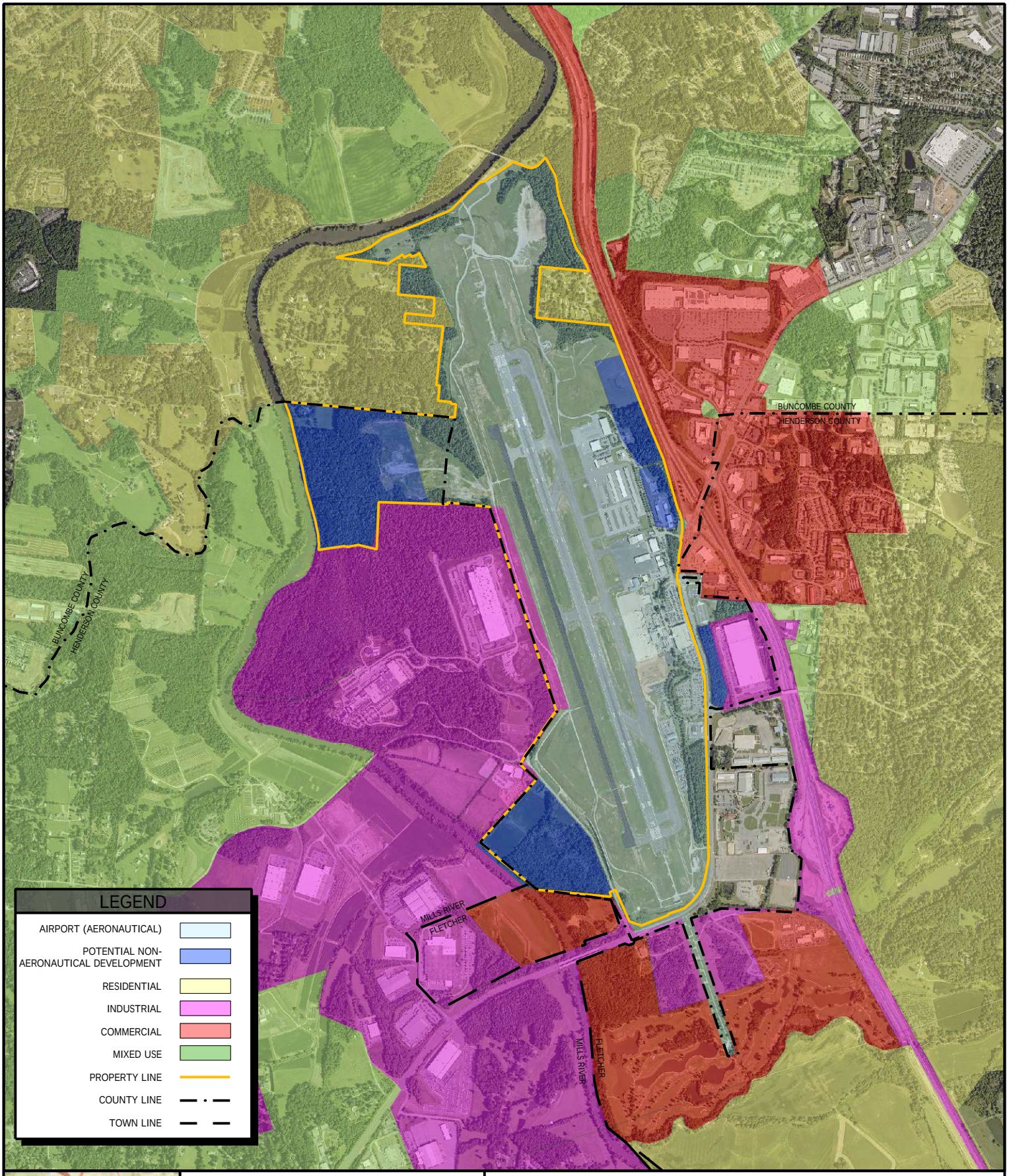

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Figure 6-1
Land Use Map
Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo and the GIS User Community.
Zoning-Buncombe County Open Data Explorer, Henderson County GIS Data Catalog

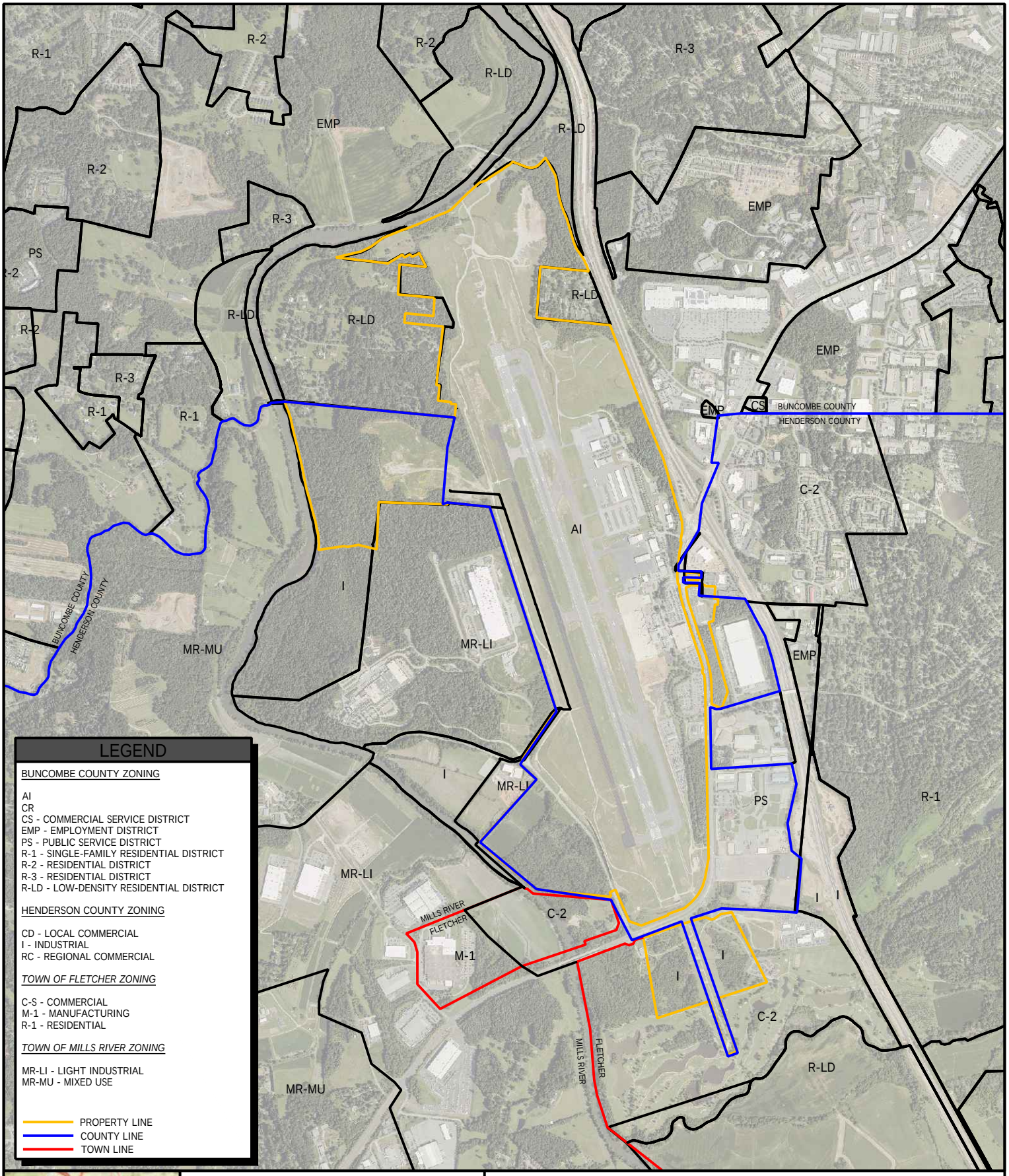

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Figure 6-2
Zoning Map

Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo and the GIS User Community.
Zoning-Buncombe County Open Data Explorer, Henderson County GIS Data Catalog

6.3 SOCIAL AND ECONOMIC ENVIRONMENT

The sections herein provide an overview of the analyses conducted regarding social and induced socioeconomic impacts and environmental justice.

6.3.1 Socioeconomic Resources

According to FAA Order 1050.1F, *Environmental Desk Reference*, socioeconomics is an umbrella term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action and alternative(s). In general, the project area is limited to the area immediately surrounding the Airport. Socioeconomic data, including population and housing data, based on information available through the U.S. Census Bureau American Community Survey (ACS), is provided below for the City of Asheville, Buncombe County, Henderson County, and the State of North Carolina.

Table 6-1 – Socioeconomic Study Area, Population, and Median Household Income

Location	2020 Population	2010 Population Density (population/sq mile)	Population Percent Change 2020-2021	2020 Median Household Income
Asheville	459,344	1,855.9	-0.5%	$54,992
Buncombe County	259,576	362.9	0.8%	$55,032
Henderson County	116,574	311.8	0.5%	$46,350
North Carolina	10,386,227	196.1	1.1%	$56,642

Source: United States Census Bureau, accessed June 2022/June 2024. Woods & Poole Economics, Inc., CHA, 2022.

Social and induced socioeconomic impacts are typically defined by disruptions to surrounding communities, such as shifts in patterns of population movement and growth, changes in public service demands, loss of tax revenue, and changes in employment and economic activity stemming from airport development. These impacts may result from the closure of roads, increased traffic congestion, acquisition of business districts or neighborhoods, and/or by disproportionately affecting low-income or minority populations.

Development at AVL is not expected to have the potential for these types of broad impacts. Impacts to housing that would result in the relocation of residents, impacts or relocation of businesses that would create severe economic hardship on the community, and substantial loss to the community tax base are not anticipated. Past FAA studies have identified that social and induced socioeconomic impacts are not normally significant unless substantial impacts are anticipated in other categories (e.g., noise, land use, property acquisition), and this is not expected to be the case with the Master Plan projects being considered at AVL.

6.3.2 Environmental Justice

The U.S. Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental

laws, regulations, and policies. Title VI of the Civil Rights Act of 1964 was enacted to protect against discrimination based on race, color, and national origin in programs and activities receiving federal financial assistance.

Executive Order 12989, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," enacted in 1994, requires all federal agencies to identify and address the disproportionately high and/or adverse human health environmental impacts of their programs and policies on minority and low-income populations and communities. The guidance provides six principles for consideration, which are: 1) composition of affected area and whether there are low-income populations, minorities, or Indian tribes, 2) public health and industry data for assessment of environmental hazards, 3) recognition of interrelated cultural, social, occupational, historical, or economic factors that could amplify environmental effects, 4) encouragement of public participation and accommodations to overcome linguistic, cultural, institutional, geographic, and other barriers, 5) meaningful community representation with awareness of diverse constituencies, and 6) soliciting tribal representation.

The Council on Environmental Quality's (CEQ) "Environmental Justice Guidance Under the National Environmental Policy Act" provides guidance to federal agencies on how to determine the presence of low-income and minority populations within an appropriate unit of geographic analysis. The guidance defines the identification of a minority population where either "(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis."

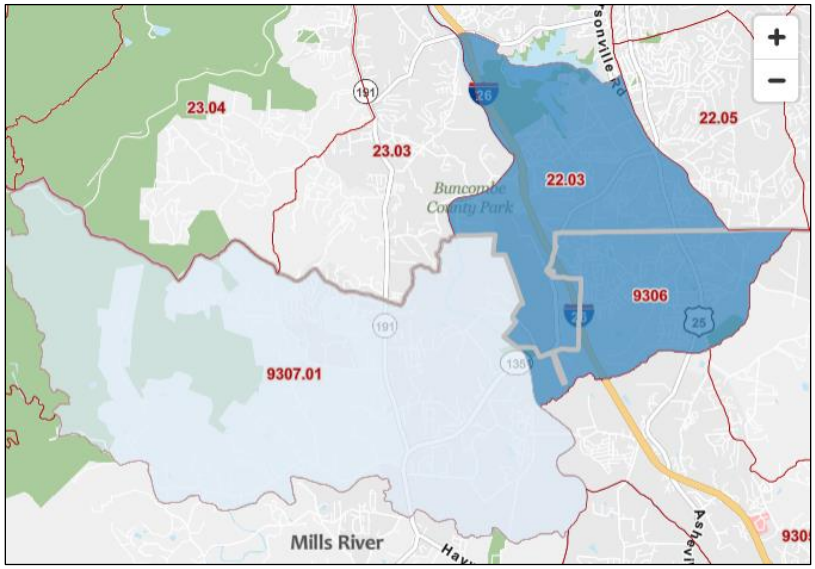

Photo: Census Tracts surrounding AVL

To assess the presence of minority and/or low-income populations near the Airport, an environmental justice (EJ) analysis was completed using the U.S. Census Bureau website. Because the Airport lies on the border of two counties, Buncombe County and Henderson County were both selected as the Communities of Comparison (COC), as they are representative of the area surrounding the Airport. Census tracts 22.03, 9306, and 9307.01 contain or are adjacent to the Airport and can be described as the Affected Communities (AC). Per CEQ guidance, ACs that are greater than 50 percent minority or low-income are automatically

designated as EJ populations. The ACs surrounding AVL do not have minority or low-income populations greater than 50 percent. ACs are also designated as EJ populations if the low-income or minority populations are 125 percent of the COC in which they are located. **Table 6-2** displays the EJ analysis for AVL. According to the U.S. Census Bureau, 2020 ACS 5-Year Estimates, Census Tract 22.03 is a minority EJ population.

Table 6-2 – EJ Analysis

	Buncombe County (COC)	Census Tract 22.03	Henderson County (COC)	Census Tract 9306	Census Tract 9307.01
Total Survey Population Determined	259,576	4,985	116,298	5,850	3,752
Minority Persons	43,316	2,199	19,880	1,010	374
Percent Minority	16.7%	44.1%	17.1%	17.3%	10.0%
125% COC	20.9%		21.4%		
Potential Minority EJ Impact?		**Yes**		**No**	**No**
Total Survey Population Determined	252,803	4,985	114,899	5,760	3,752
Low Income	29,057	500	12,038	507	244
Percent Low Income	11.5%	10.0%	10.5%	8.8%	6.5%
125% COC	14.4%		13.1%		
Potential Low Income EJ Impact?		**No**		**No**	**No**

Source: U.S. Census, 2020 ACS Survey (5-year estimate), CHA.

Overall, based on available economic and demographic data, an environmental justice population does exist in the immediate vicinity of AVL. Projects and improvements recommended in the Master Plan are on Airport property, so they are not anticipated to result in direct impacts to these populations; however, each project and improvement proposed would have to be individually evaluated for potential indirect adverse impacts. Future EJ evaluations would also be required to account for changes over time in the demographic and economic characteristics of the surrounding area.

6.3.3 Children's Health and Safety

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" requires that federal agencies make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. Such disproportionate impacts would be likely to occur at schools, day care centers, or similar facilities with higher concentrations of children. Such facilities within 1 miles of the Airport include:

- Montessori Footprints Learning Center (158 Bradley Branch Rd)
- Bell's School – People Under Six (31 Park Ridge Dr)
- Day Car Academy (15 Brian Blvd)
- Glenn C. Marlow Elementary (1985 Butler Bridge Rd)

The proposed Master Plan projects would occur on Airport property and, as identified above, away from areas where children are likely to be present on a consistent basis.

A separate noise study would assess any potential changes in noise levels in neighborhoods and at schools near the Airport. Development on lands previously filled with coal ash creates the potential for the release of materials hazardous to children's health. Proper precautions during construction can eliminate risks to surrounding populations caused by airborne particulates and leaching. Coal ash hazards and management are discussed in depth in **Section 6.13**. The Master Plan recommendations are not anticipated to have significant impacts on children's health and safety.

6.4 AIR QUALITY

The Clean Air Act Amendments (CAAA) of 1990 require the EPA to set National Ambient Air Quality Standards (NAAQS) for six "criteria" pollutants considered harmful to public health and the environment. The NAAQS identify two types of air quality standards: primary and secondary. Primary standards provide public health protection, including protecting the health of "sensitive" populations, such as asthmatics, children, and the elderly. Secondary standards were established to provide public welfare protection, including protection against impaired visibility and damage to animals, soils, crops, vegetation, and buildings. The six "criteria air pollutants" that have been established by the EPA to protect public health and welfare include:

- Ozone (O3)
- Carbon monoxide (CO)
- Particulates (PM10 and PM2.5)
- Sulfur dioxide (SO2)
- Nitrogen dioxide (NO2)
- Lead (Pb)

In accordance with the CAAA, all areas within North Carolina are designated with respect to compliance. Buncombe County, the county in which the airport is located, and Henderson County, the county that the airport borders and is partially located in, are both part of the Western Mountain Intrastate Air Quality Control Region, which is the agency responsible for the State Implementation Plan (SIP), designation activities for the NAAQS, transportation conformity activity, regional haze, and general air quality planning. Nonattainment for an air pollutant is assigned when one or more of the standards have been violated. According to the EPA's Greenbook, both Buncombe County and Henderson County are in attainment with the NAAQS for all criteria pollutants.

Section 176(c) of the CAAA requires that Federal actions conform to applicable federal and state air quality plans and, ensure that the actions will not:

- Cause or contribute to any new violation of any standard in any area.
- Increase the frequency or severity of any existing violation of any standard in any area.

- Delay timely attainment of any standard of any required interim emission reductions or other milestones in any area.

No air quality modeling was conducted as part of this Study; however, it is anticipated that the proposed Airport improvements may require air quality modeling that would be conducted during preparation of environmental reviews under NEPA (i.e., before construction). The results of the air quality modeling will establish whether the above requirements are met and/or if additional actions are required by GARAA to ensure compliance.

In the short-term, any construction project could result in minor impacts on air quality at and in the immediate vicinity of AVL related to the use of construction vehicles and equipment. It is anticipated that pollutants from the use of such vehicles and equipment would include volatile organic compounds (VOCs), nitrogen oxide (NO_x), and CO. Proper precautions would be taken during construction to control the exposure of coal ash containing soils during the development of those areas to prevent or manage airborne dust emissions.

6.5 WATER QUALITY

Water quality standards applicable to the Airport are established under the federal Clean Water Act (CWA) and North Carolina's General Statutes. Together, these regulations establish requirements for controlling discharges into surface water and groundwater, develop wastewater treatment management plans and practices, and establish permitting requirements for discharges (Section 402 of the CWA) and dredged and fill materials (Sections 404 and 401 of the CWA). The North Carolina Department of Environmental Quality (NC DEQ) Division of Water Resources (DWR) is responsible for the protection and quality of North Carolina's water resources. Existing surface water and groundwater resources at AVL are described below.

6.5.1 Surface Water

As designated by the U.S. Geological Survey (USGS), AVL is located in the Upper French Broad watershed (HUC_8 06010105). The French Broad River surrounds the airport to the west. Avery Creek flows northwest of the airport while Line Creek and McDowell Creek are located directly west, with each of these streams flowing into the French Broad River. Higgins Branch and Frady Stream (connected to Frady Lake) flow into Kimsey Creek and are both located east of the airport. Kimsey Creek flows into Cane Creek. Crane Creek runs parallel to the Airport's southern boundary, flowing into the French Broad River from the east. This creek forms the southern boundary of Broadmoor Golf Links. Derived from the DWR's Surface Water

Classification map, **Figure 6-3** identifies surface waters surrounding the Airport.

With very few exceptions, all surface waters in North Carolina carry a classification. Surface water classifications are designations applied to streams, rivers, and lakes that indicate the waterways best uses (i.e. swimming, fishing, drinking, etc.). Each designation carries a set of water quality standards designed to protect the designated uses. Many of the classifications, especially those that protect drinking water supply, have protection rules which regulate activities, such as

development, that may impact surface water quality. Line Creek, McDowell Creek, Cane Creek, Kimsey Creek, Frady Lake and its connecting stream, and Higgins Branch are designated as class C waters. The French Broad River and Avery Creek are designated as class B waters.

According to the NC DEQ's website, Class C waters are protected for uses such as aquatic life propagation, survival and maintenance of biological integrity, wildlife, secondary contact recreation (wading, boating, and other uses not involving human body contact with water), and agriculture. Class B waters are protected for all Class C uses in addition to primary contact recreation (swimming, water skiing, and other activities involving human body contact with the water on a frequent basis). Wetlands are designated as Class WL and are protected for storm and flood water storage, moderation of water level fluctuations, habitat for wetland-dependent species, hydrologic function, filtration, and shoreline protection. Wetlands surrounding the Airport are discussed in **Section 6.10**.

To protect surface water quality from stormwater impacts, a general permit (NCG010000 or NCG250000) will typically be required for construction activities that involve ground disturbance of more than one acre under the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Program. A Sedimentation and Erosion Control Plan is required as part of the general permit. An individual NPDES Industrial Permit, an NCDEQ Sedimentation and Erosion Control Permit, and an NCDEQ Stormwater Permit are required for the Passenger Terminal Building Expansion & Air Traffic Control Tower Relocation project. A Stormwater Pollution Prevention Plan (SWPPP) and Discharge Monitoring Program are required under the permits.

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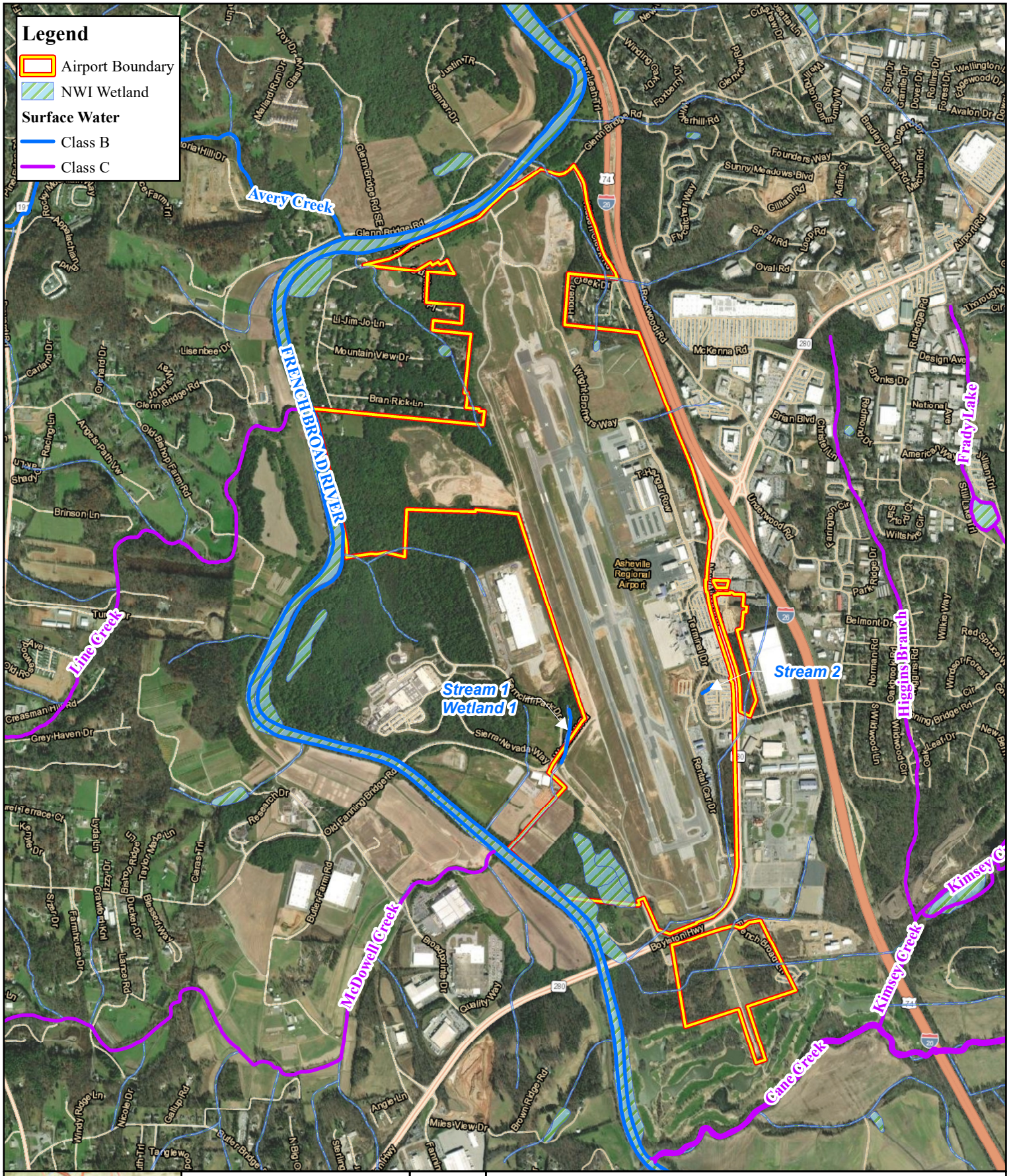

Figure 6-3
Water Resources Map

Asheville Regional Airport (AVL)
Asheville, NC

0 1,000 2,000 Feet

Scale 1" = 2,000'

N

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
NC Surface Water Classifications-North Carolina Environmental Quality
National Wetlands Inventory-USGS

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6.5.2 Groundwater

The EPA's sole source aquifer mapping tool, used to identify aquifers that are the sole or principal drinking water source for an area, indicates that AVL is not located in a sole source aquifer. The DWR's Classifications, Standards, & Rules Review Branch is responsible for the development and maintenance of North Carolina's groundwater standards. The DWR's Water Supply Watersheds map identifies Critical Areas and Protected Areas that are either adjacent or upstream to a drinking water supply. In a Critical Area, the risks of polluting the drinking water supply are greater than the risks in the other areas of the watershed.

A Protected Area is upstream of the Critical Area. Pollution protection measures are required in Protected Areas. AVL does not lie within a Critical or Protected Area.

6.5.3 Stormwater

According to the SWPPP for AVL, stormwater is collected via stormwater drains located throughout the graded air operations area and conveyed off-Airport property via channelized ditches, stormwater pipes, lateral riprap drainage ditches, and naturally draining topography. Stormwater is ultimately directed towards one of the 21 outfalls located along the boundaries of the Airport. The outfalls primarily drain to several tributaries of the French Broad River, and the subbasin directly west of Runway end 35 drains to the adjacent wetland.

6.6 DEPARTMENT OF TRANSPORTATION ACT, SECTION 303

Section 303 of the U.S. Department of Transportation (DOT) Act of 1966 [49 USC 303, commonly referred to as Section 4(f)] provides for the protection of publicly owned recreational resources and requires the analysis of potential impacts to these resources arising from DOT actions. Resources protected include public parks and recreation areas, as well as wildlife and waterfowl refuges or management areas of national, state, or local significance. This section also applies to historic sites of national, state, or local significance as determined by the official that has jurisdiction over these historic resources. Such sites include those that are listed or eligible for inclusion in the National Register of Historic Places (NRHP), as well as those identified by appropriate state or local agencies as having historic significance.

Glen Bridge River Park and Corcoran Paige River Park, both owned by Buncombe County, are located north of AVL. These parks are two of Buncombe County's seven river parks which offer picnic tables, grills, and access to the French Broad River. Buncombe County also manages a greenway and trail system. The Buncombe County Greenways & Trails Master Plan, a guide to trail investments in the county within the next ten to twenty years, identifies eight "Priority Corridors". The Lake Julian Greenway Corridor includes a proposed 3 to 8-foot walking trail along the west side of the French Broad River. While the exact alignment of the trail has not been established, the proposed location passes through the Runway 17/35 RPZ. Glen Bridge River Park and Corcoran Paige River Park are directly adjacent to the RPZ. Westfeldt River Park, owned by Henderson County, is located southwest of AVL on the French Broad River and has river access, a boat ramp, picnic tables, and walking trails. Broadmoor Golf Links, a public golf course, is

located directly south of the Airport. The golf course includes an 18-hole course, driving range, and club house. Review of the North Carolina Wildlife Resources Commission mapping resources indicates that there are no wildlife management areas surrounding the Airport. Review of the National Register of Historic Places web-based map shows no NRHP resources near the Airport. The North Carolina State Historic Preservation Office (SHPO) web mapping application indicates several state-listed resources surround AVL. Historic resources are discussed in further detail in **Section 6.8**. The location of each Section 4(f) resource is shown in **Figure 6-4**.

Significant impacts to Section 4(f) resources can result from both physical and constructive uses. A physical use involves an action that physically occupies the resource and causes a change in its use. A constructive use does not physically occupy the property but instead substantially impairs the resource's intended use, features, or attributes. Airport development projects recommended in the Master Plan would need to be evaluated through coordination with the SHPO for impacts to the above listed Section 4(f) resources.

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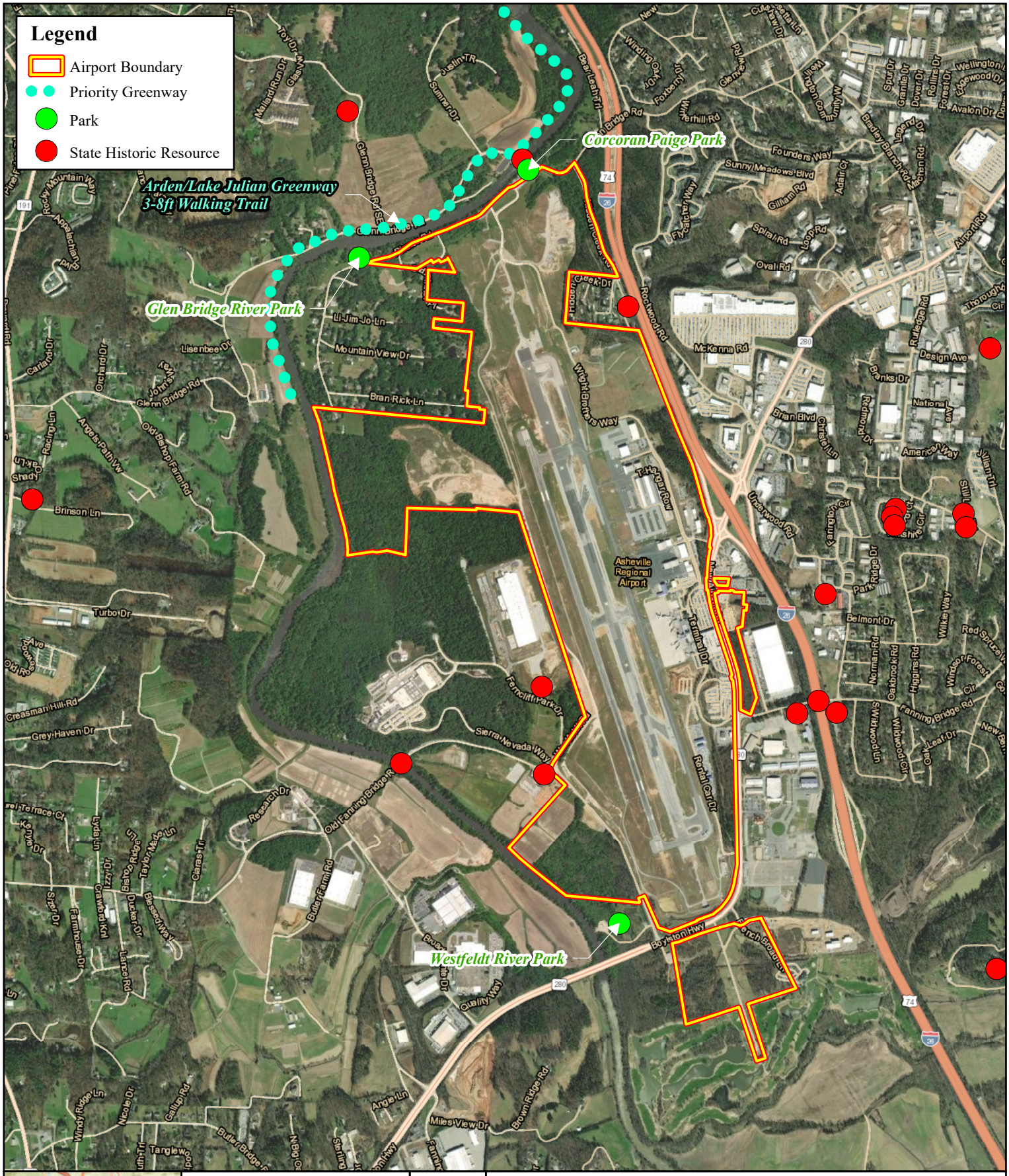

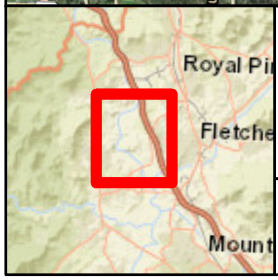

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Scale 1" = 2,000'

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Figure 6-4
Section 4(f) Map

Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
Buncombe County, Henderson County, NC Department of Natural and Cultural Resources

Date Saved: 6/12/2024 • Author: E.Butterfield

6.7 SECTION 6(F) RESOURCES

The U.S. Land and Water Conservation Fund Act of 1965 established the Land and Water Conservation Fund (LWCF), which was created to preserve, develop, and assure accessibility to outdoor recreational resources. Section 6(f) of this Act prohibits the conversion of lands purchased with LWCF monies to a non-recreation use. A review of 6(f) properties on the LWCF website revealed one LWCF project. Westfeldt Park was funded as part of the LWCF's State and Local Assistance Program. Impacts to Westfeldt Park are not anticipated as a result of the proposed projects.

6.8 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act (NHPA) of 1966 protects properties that are listed or determined to be eligible for inclusion in the NRHP. The NHPA requires Federal agencies to consider the effects of their undertakings on historic properties and to consult with the State Historic Preservation Office (SHPO) and other parties to develop and evaluate alternatives and modifications to the undertaking that could avoid or minimize potential impacts to historic resources.

To account for the effect an undertaking may have on properties listed on or eligible for listing on the NRHP, an Area of Potential Effect (APE) must first be identified. According to 36 CFR Part 800.16(d), the APE is the geographic area or areas within which an undertaking may directly or indirectly alter the character or use of historic properties. Such changes may include physical destruction, damage, or alternation of a property, change in the character of the property's use or of physical features within its setting that contribute to its historic significance, and introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

A GIS and file record review was conducted which indicated that there are no NRHP-listed resources within the vicinity of the Airport. Several state-listed resources surround AVL (see **Figure 6-4**) including one indicated as potentially eligible for the NRHP.

A past study was conducted in 2020 in preparation for the redevelopment and expansion of the passenger terminal facility. This study included an early coordination/scoping package that was sent to the SHPO which detailed the project and discussed the purpose and need. The SHPO responded in a letter dated September 3, 2020, indicating that they were aware of no historic resources which would be affected by the project. The FAA also contacted representatives from the Eastern Bank of Cherokee Nations, Muscogee (Creek) Nation, and Catawba tribes as part of the project.

Future projects will require coordination with the SHPO to determine the presence and/or absence of federal and state listed historic and archaeological resources within the project's APE prior to planned developments or improvements. The FAA may also determine that coordination

with local tribes is necessary. If any archeological artifacts or human remains are uncovered during construction, demolition, or earthmoving activities, construction in the immediate area should be stopped, and the SHPO should be notified immediately.

6.9 BIOLOGICAL RESOURCES

Information regarding biological resources at AVL was obtained through a review of online resources and previous reports in which coordination with the North Carolina Natural Heritage Program and the U.S. Fish and Wildlife Service (USFWS) was conducted.

6.9.1 Biotic Communities Surrounding AVL

The French Broad River surrounding the Airport to the west makes for a very diverse ecosystem that coexists with the surrounding residential, commercial, and industrial development as well as the Airport itself. The North Carolina Natural Heritage Data Explorer (NHDE) identifies Fanning Bridge Swamp 0.5 miles west of AVL, along the French Broad River. Fanning Bridge Swamp is a 74.4-acre natural area with a 'Very High' representational rating. Natural areas in North Carolina are rated based on the prevalence of rare plant and animal species, rare or high-quality natural communities, and special animal habitats that indicates the area's natural diversity. Fanning Bridge Swamp has high conservation value.

6.9.2 Biotic Communities at AVL

The biotic communities within Airport property are predominantly areas of maintained grass and herbaceous species that are adjacent to paved surfaces including the runway, taxiways, buildings, and airplane and automobile parking areas. Little to no area remains unmanaged. A limited number of small trees and shrubs are present on the borders of the property. Aquatic habitats that are located on the property include small to medium sized creeks and man-made ditches.

Wildlife at AVL is managed to prevent or reduce wildlife strikes. The Airport's Wildlife Hazard Management Plan (WHMP), which is currently in the process of being updated, is intended to discourage breeding and other usage of the airfield by wildlife through both passive and active means. For both security purposes and to prevent large animals from traversing the airfield, GARAA maintains contiguous perimeter fencing around the airfield.

6.9.3 Threatened and Endangered Species

Section 7(c) of the Endangered Species Act of 1973 (16 USC 1531 et sec.) requires that potential impacts to rare, threatened, and endangered species of flora and fauna and their critical habitats be identified to avoid adverse impacts to these species. Analysis of the USFWS Information for Planning and Conservation (IPaC) summary indicates that the following federally protected species have the potential to occur at AVL:

- Gray Bat (*Myotis grisescens*) – Endangered Mammal
- Northern Long-eared Bat (*Myotis septentrionalis*) – Threatened Mammal
- Bog Turtle (*Glyptemys muhlenbergii*) – Similarity of Appearance, Threatened

- Appalachian Elktoe (*Alasmidonta raveneliana*) – Endangered Clam
- Monarch Butterfly (*Danaus plexippus*) – Candidate Insect
- Bunched Arrowhead (*Sagittaria fasciculata*) – Endangered Flowering Plant
- Mountain Sweet Pitcher-plant (*Sarracenia rubra ssp. Jonesii*) – Endangered Flowering Plant
- Small Whorled Pogonia (*Isotria medeoloides*) – Threatened Flowering Plant
- Swamp Pink (*Helonias bullata*) – Threatened Flowering Plant
- Virginia Spiraea (*Spiraea virginiana*) – Threatened Flowering Plant
- Rock Gnome Lichen (*Gymnoderma lineare*) – Endangered Lichens

No critical habitats were identified within the Air Operations Area of the Airport. Additionally, the IPaC summary identifies 13 Birds of Conservation Concern, including the Bald Eagle (*Haliaeetus leucocephalus*), with the potential to occur at AVL. The North Carolina Natural Heritage Program manages a rare and protected species search. Based on review of this resource, 361 protected plant and animal species are known to occur within Buncombe County and 241 species occur in Henderson County.

More detailed environmental analysis would be conducted prior to the implementation of Master Plan recommendations, including formal consultation with federal and state agencies, potential confirmation of existing species within the project area through species specific surveying, and evaluation of potential impacts to those species and their habitat areas. If appropriate, mitigation measures to address adverse impacts would be pursued. As required for past Airport development projects, proper erosion and sedimentation controls may be required to address concerns for potential indirect impacts to species inhabiting the French Broad River.

6.10 WETLANDS AND WATERCOURSES

Wetlands and watercourses at AVL are regulated and protected under both Federal and State regulatory programs. It is anticipated that prior to initiating specific projects identified in the Master Plan, a current wetland delineation would be required to determine the federally and state regulated wetland and watercourse boundaries in the project area. Work occurring within designated Federal or State wetlands or watercourses will require securing the appropriate permits from the U.S. Army Corps of Engineers (USACE) and/or NC DWR, as applicable.

6.10.1 Wetland Regulations

In North Carolina, wetlands are regulated under three categories:

- 404 wetlands
- Isolated/non-404 wetlands
- Coastal wetlands

404 wetlands are regulated by the USACE under Section 404 of the federal Clean Water Act (CWA). Federally regulated wetlands, as defined in 33 CFR Part 328, are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." A federal 404 permit may be required from the USACE for projects that include the discharge of dredged or fill material into Waters of the United States (WOTUS) including wetlands. The NC DWR is responsible for issuing 401 Water Quality Certifications (WQC) under the Clean Water Act, required for any federally permitted or licensed activity that may result in a discharge to or filling of wetlands. 401 WQC usually corresponds with the permits issued by the USACE.

Isolated/non-404 wetlands are regulated under North Carolina Administrative Codes. When the proposed action involves impacts to wetlands that the USACE determines are not jurisdictional under Section 404 of the CWA, an Isolated or Other Non-404 Jurisdictional Wetlands and Waters Permit may be required. The NC DWR determines the presence of Isolated/Non-404 wetlands. Coastal wetlands are regulated under the Coastal Area Management Act, but is not applicable to Asheville as it is not in a coastal region.

Wetland impacts that exceed applicable permit thresholds require mitigation in the form of mitigation credits from an in-lieu fee program (either an approved mitigation bank or the North Carolina Division of Mitigation Services) or through project specific mitigation. Project specific mitigation can occur at the project site or at an off-site location. Projects at the Airport will require mitigation for impacts equal to or exceeding 0.10 acres of wetlands.

6.10.2 Wetland Delineation and Mapping

Based on review of the USFWS NWI mapper (shown in **Figure 6-3**), there are wetlands on or adjacent to the Airport. Several Freshwater Forested/Shrub Wetlands (PFO1A and PSS1A) and a Freshwater Emergent Wetland (PEM1C) are located directly southwest of the airfield, surrounding Westfeldt Park. Freshwater Forested/Shrub Wetlands (PFO1A) are also located west of the Airport, adjacent to the French Broad River in the area known as Fanning Bridge Swamp and northwest of AVL adjacent to the French Broad River and the Glen Bridge River Park. Riverine Wetlands (R3UBH) and Freshwater Ponds (PUSAh) are shown traversing the airfield.

Wetlands have been field delineated in different parts of the Airport over the past 20+ years related to several improvement projects. In preparation for the South Terminal Apron Expansion, two jurisdictional streams and a jurisdictional wetland were confirmed through a Preliminary Jurisdictional Determination issued by the USACE on April 2, 2018. Each identified resource was impacted by the project and compensatory mitigation was proposed. A Waters of the U.S. Survey was completed in June 2020 for the proposed Air Traffic Control Tower development project. The locations of each known jurisdictional stream and wetland are shown in **Figure 6-3,** labeled as *Stream 1*, *Stream 2*, and *Wetland 1*.

Wetlands and watercourses were not formally delineated as part of this Study. It is anticipated that prior to initiating specific projects, a current wetland delineation would be required to determine federal and state regulated wetland boundaries within the proposed project area.

6.11 FLOODPLAINS

Executive Order 11988 defines floodplains as the "lowland and relatively flat areas adjoining inland and coastal waters, including flood prone areas of offshore islands, including at a minimum, the area subject to a one percent or greater chance of flooding in a given year." The intent of Order 11988 is to ensure that floodplains and floodways are kept clear of obstructions and facilities that could restrict or increase flow rates or volumes during flood conditions. Encroachment is defined as any action that would cause the 100-year water surface profile to rise by one foot or more. The 100-year floodplain has been adopted by the Federal Emergency Management Agency (FEMA) as the base floodway for floodplain management. Both Federal and state laws regulate development within floodplains and floodways.

The FEMA designated flood zones are displayed in **Figure 6-5**. According to FEMA's National Flood Hazard Layer (NFHL) dated January 6, 2010 (Panel Number 3700964300K and 3700964200K), the area along the French Broad River is identified as within the 100-year floodplain, and therefore, a portion of the airport's RPZ and Broadmoor Golf Links are within the jurisdictional floodplain. The implementation of Master Plan recommendations will require agency coordination. A permit will be required for projects located within the special flood hazard areas.

6.12 PRIME AND UNIQUE FARMLAND

The Farmland Protection Policy Act (FPPA) limits the conversion of significant agricultural lands to non-agricultural uses as a result of federal actions (7 USC § 4201, et seq.). The determination of whether farmlands are subject to FPPA requirements is based on soil type; thus, the land does not have to be actively used for agriculture. Farmland subject to FPPA requirements can be pastureland, forested, or other land types, but not open water or developed urban or transportation areas. The FPPA regulates four types of farmland soils:

- Prime Farmland;
- Unique Farmland;
- Farmland of Statewide Importance; and,
- Farmland of Local Importance.

Prime farmland is defined by the Natural Resources Conservation Service (NRCS) as "land that has the best combination of physical and chemical characteristics" for agriculture. This includes land with these characteristics used for livestock or timber production but not land that is already urbanized or used for water storage. Unique farmland is defined as "land other than prime farmland that is used for production of specific high-value food and fiber crops," with such crops defined by the Secretary of Agriculture. Farmland of statewide or local importance is farmland

other than prime or unique farmland that "is used for the production of food, feed, fiber, forage or oilseed crops." As defined by the NRCS Web Soil Survey, Airport property primarily consists of soils rated as not prime farmland. **Figure 6-6** shows soil types and farmland classifications of soils at AVL.

Prior to implementation of airfield recommendations, a project-specific environmental analysis would be conducted to confirm the location of the improvements relative to farmland soils. Potential impacts would be quantified and, if appropriate, recommended mitigation measures would be taken to address adverse impacts.

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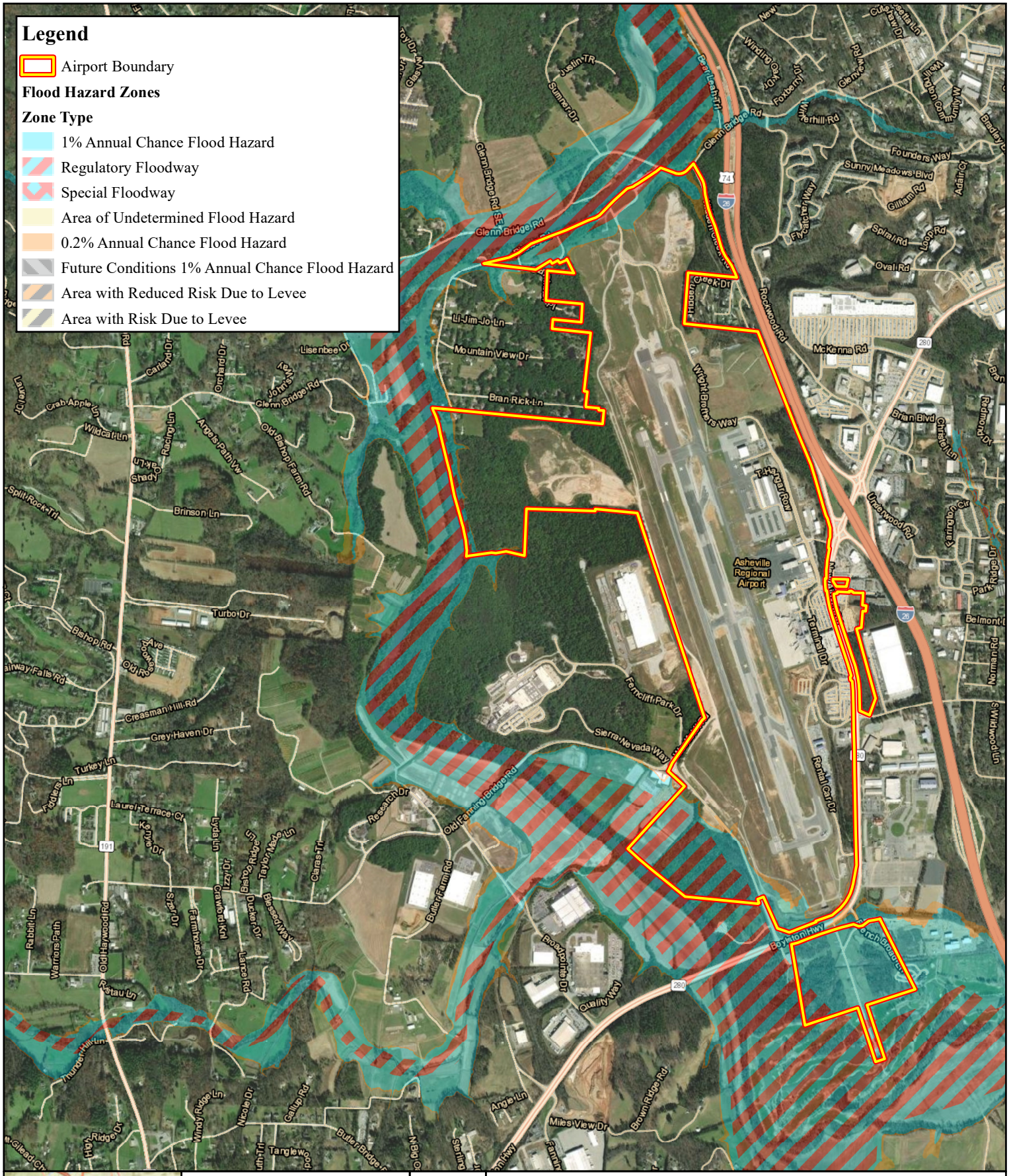

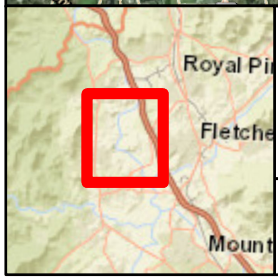

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Figure 6-5
FEMA Map

Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
FEMA-National Flood Hazard Layer

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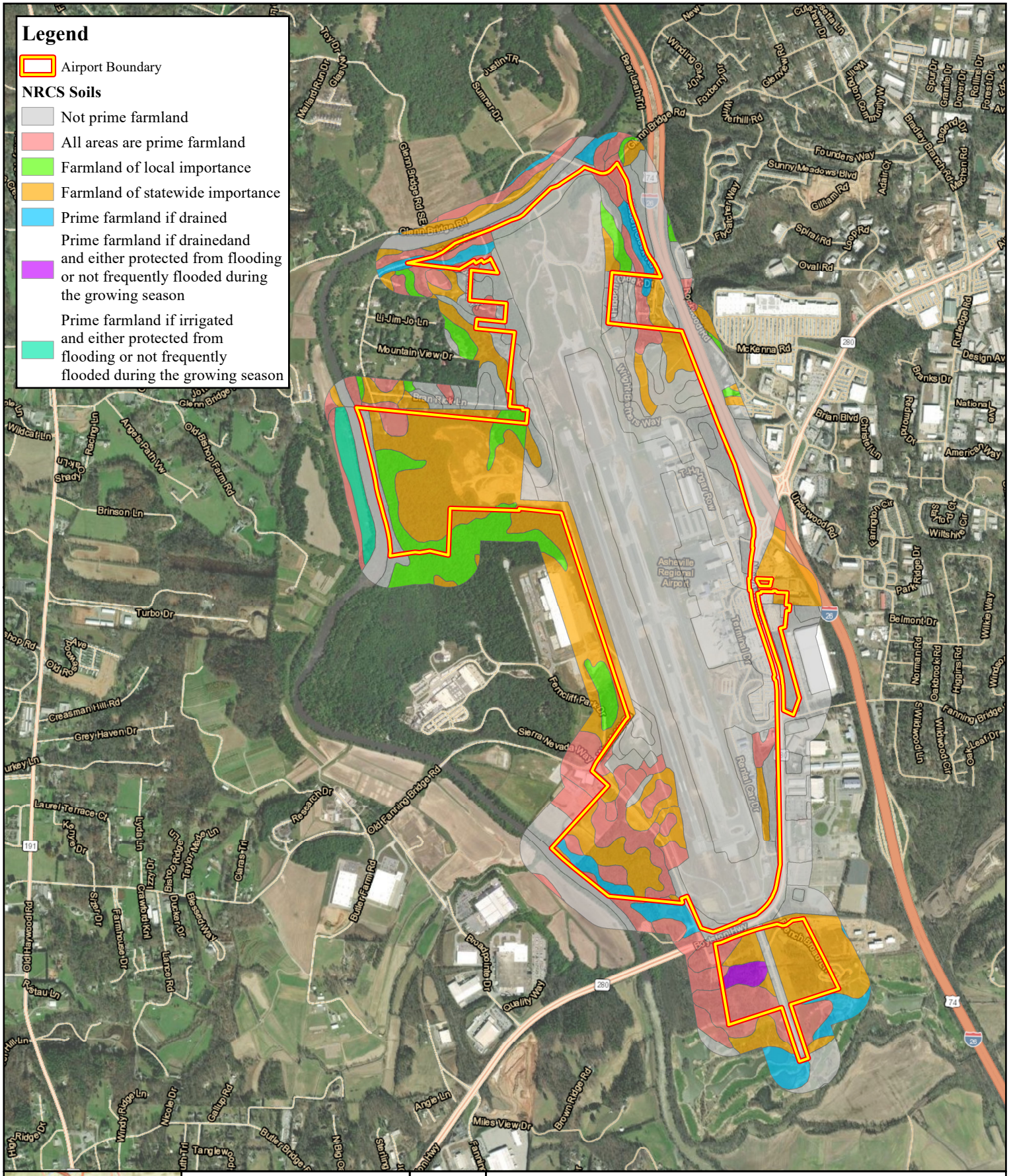

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Figure 6-6
NRCS Soils Map

Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
Soil Data Natural Resource Conservation Service

Date Saved: 6/12/2024 • Author: E.Butterfield

6.13 HAZARDOUS MATERIALS

Hazardous waste is a general term relating to spills, dumping, and releases of substances that could threaten human and animal life. To identify these materials and protect the environment from harmful interaction with hazardous wastes, federal laws and regulations such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource, Conservation, and Recovery Act (RCRA) have been enacted. CERCLA prescribes a very specific process for the investigation and cleanup of sites listed on the National Priorities List (NPL), also referred to as Superfund sites. RCRA is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. Hazardous waste impacts are typically associated with the current or future use, transfer, or generation of hazardous materials within the limits of the proposed improvements or the acquisition of properties that contain hazardous materials. Environmental concerns related to solid waste disposal range from adequate landfills for normal urban trash to the safe disposal of industrial waste.

Based on available data from the EPA, there are no Superfund sites near AVL. Several RCRA reporting facilities are within and surrounding the Airport. The locations of those facilities are shown in **Figure 6-7**. Additionally, coal ash, also referred to as coal combustion residuals (CCR), has previously been utilized as fill material at AVL. Beneficial reuse of coal ash has many environmental and cost benefits including reducing CO_2 emissions, waste management, and decreasing use of newly sourced materials. Originally, the topography surrounding the Airport was unsuitable for development because a significant amount of structural fill was necessary. Concurrently, the Duke Energy electric production plant located 3 miles from the Airport was nearing capacity for CCR storage. In partnership with Duke Energy, 14 acres of AVL property received fill in 2008, allowing the GARAA to turn previously unsuitable areas into land for further development. Additional projects, including the development of a temporary runway now used as a permanent taxiway and the leveling of several other sites, were completed utilizing coal ash as fill. All projects met EPA, FAA, and State requirements. A liner system (see photo) was utilized in all areas except one, which utilized the lower liner but did not include a cap liner. That site is currently undergoing renovation to fully encapsulate the fill material. The approximate locations of coal ash fill at AVL are shown in **Figure 6-7**.

Future development in areas with coal ash fill present potential concerns to workers and the environment, as puncturing the liner during excavation could result in the release of chemicals into the environment. In large quantities, the addition of coal ash into surface waters will cause the pH to rise and may reduce oxygen availability creating a potentially toxic impact on aquatic life. Ingestion, inhalation of airborne dust emissions, and skin contact can harm humans and other living things. Leaching of mercury and metals into ground water can contaminate vegetation and impact the food chain. Development projects that do not require puncturing the liner system should take special precautions to avoid the liner. Development that requires puncturing the liner system will require a specialized contractor, resulting in added project costs,

and will require the use of Personal Protective Equipment (PPE), specific construction techniques, and baseline and on-going groundwater monitoring.

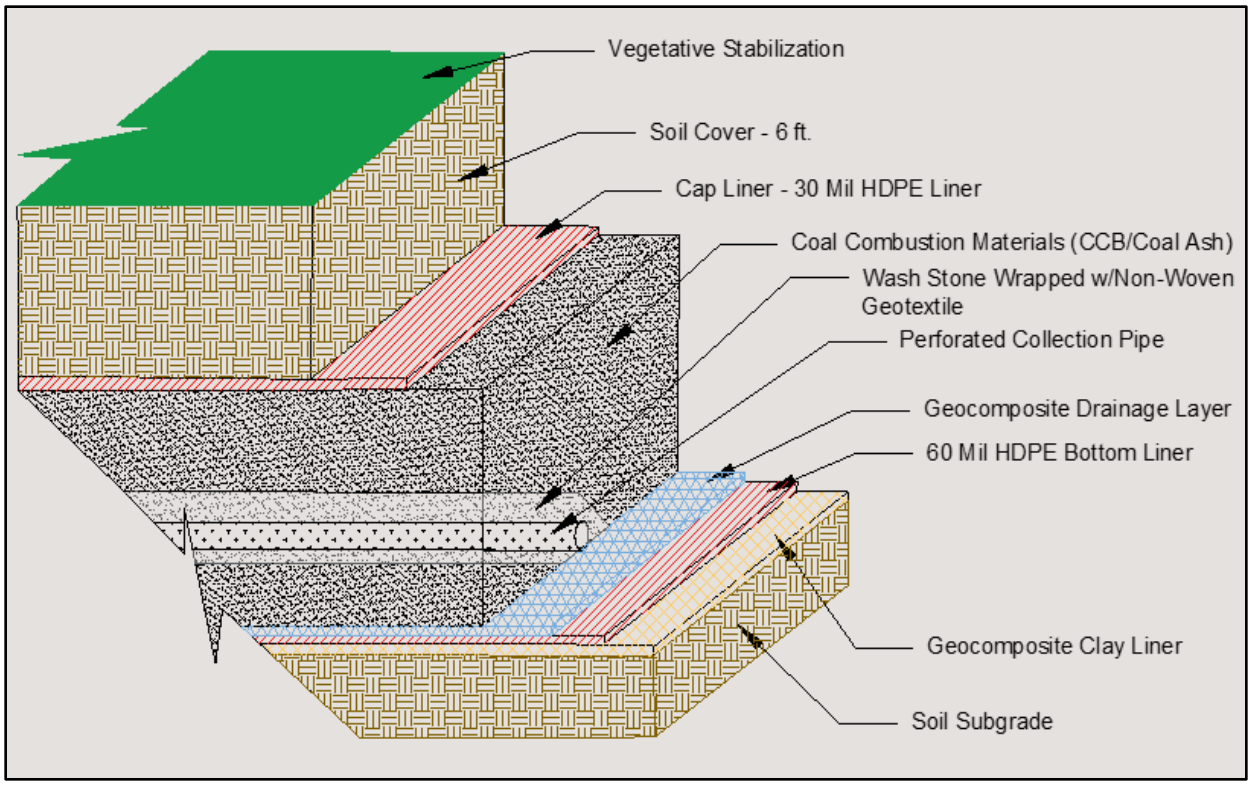
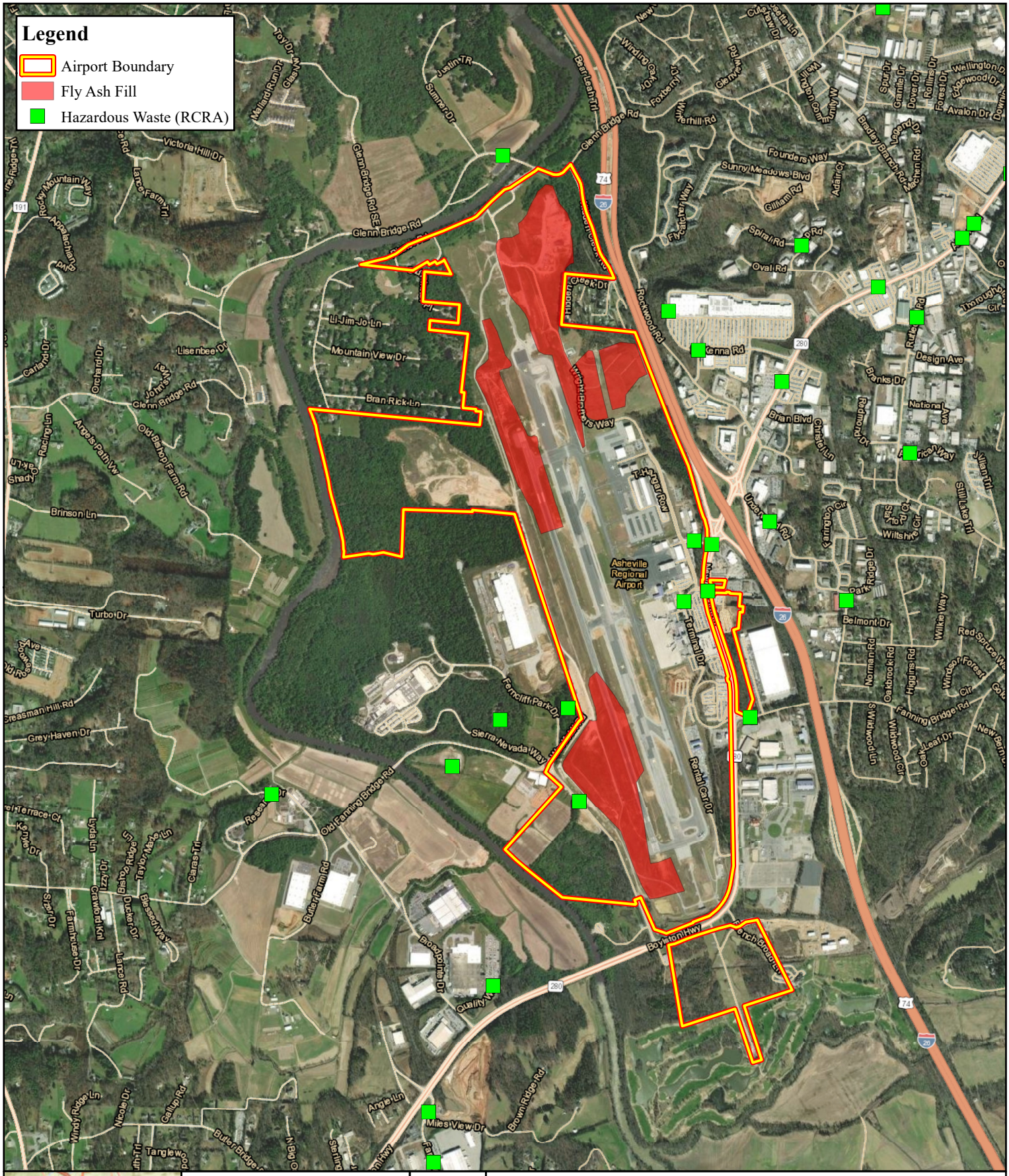
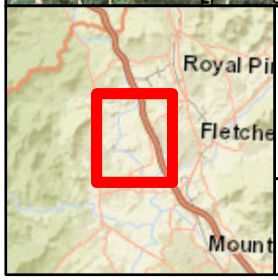


Photo: Liner System.

Overall, modifications to existing Airport facilities should be evaluated for the potential to generate hazardous materials. Development in areas where coal ash was used as fill will require extra precautions; however, it is not expected that any recommended project would produce wastes that could not be properly mitigated and addressed. Any hazardous waste generated from construction, demolition, maintenance, or other airport activities should be managed in accordance with the North Carolina Hazardous Waste Rules.





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Scale 1" = 2,000'

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Figure 6-7
Hazardous Materials Map

Asheville Regional Airport (AVL)
Asheville, NC

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
FAC - RCRA Facilities (EPA 2020)

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6.14 SUMMARY

Projects recommended in this Airport Master Plan Update are anticipated to have some impacts on the environment, with concerns generally focused on biological resources, Section 4(f) resources, floodplain development, and hazardous materials. As noted under each of the resource-specific sections, before implementation of the proposed development projects, further environmental documentation will be required to document existing conditions at that time, determine impacts on each resource, and if necessary, identify mitigation measures to address any adverse impacts. If appropriate under NEPA, a Categorical Exclusion or Environmental Assessment (CATEX) will be prepared in accordance with FAA guidance for each project. Based on past studies and the types of projects recommended in the Master Plan Update, it is anticipated that impacts can be successfully mitigated allowing implementation of the plan recommendations.

Supplemental to the Environmental Overview, an *Energy Audit* and a *Recycling, Ruse, and Waste Reduction Plan* were completed. See **Appendix D** and **Appendix E**, respectively.

7 FINANCIAL PLAN

This Chapter presents the description of the airport capital improvement program (ACIP) and the resulting financial forecast for the Greater Asheville Regional Airport Authority (Authority), which operates Asheville Regional Airport (AVL). The ACIP is developed under the assumption that various demand-based indicators, such as annual operations, annual passenger enplanements, and based aircraft grow in-line with the aviation demand forecast presented in the AVL Master Plan **Chapter 3**.

7.1 ACTIVITY FORECAST

A summary of the activity forecast by five-year increments used to develop the financial plan is presented in **Table 7-1**. **Table 7-9** included at the end of this Chapter presents the activity forecast for each year of the analysis. Since the activity forecast included in **Chapter 3, Table 3-27** of the Master Plan was prepared, actual 2022, 2023, and 2024 data became available. As a result, 2022 and 2023 activity reflect actual activity, 2024 activity reflects actual to date annualized, 2025 activity reflects budget, and 2026 through 2041 activity is forecast to achieve the growth rates included in **Chapter 3, Table 3-27** for the same time period. As shown in the table, enplanements are budgeted to be approximately 1.4 million in 2025 and are forecast to increase to approximately 2.1 million in 2041, reflecting an average annual growth rate (AAGR) of 2.6 percent.

Table 7-1 – Summary of Activity Forecast (in 000s)

Year	Enplanements		Operations	Landed Weight
	Per Table 3-27	Reforecast (a)	Per Table 3-27	Forecast (b)
2021	716		76	
2022	771	841	77	934
2023	831	1,010	79	1,109
2024	895	1,224	80	1,129
2025	964	1,375	82	1,458
Planning Periods				
2026	1,039	1,481	84	1,488
2031	1,162	1,658	88	1,567
2036	1,300	1,855	93	1,650
2041	1,455	2,075	98	1,742
AAGR				
2021-2041	**3.6%**		**1.3%**	
2025-2041	**2.6%**	**2.6%**	**1.1%**	**1.1%**

Source: Table 7-9, DKMG Consulting, LLC, 2024.

Since landed weight was not included in **Chapter 3, Table 3-27** and is necessary to calculate the landing fee for the financial forecast, the 2025 through 2041 landed weights were assumed to grow with the growth in operations. As shown in the table, landed weights are budgeted to be approximately 1.5 million in 2025 and are forecast to increase to approximately 1.7 million in 2041, reflecting an AAGR of 1.1 percent.

7.2 AIRPORT CAPITAL IMPROVEMENT PROGRAM

All airports receiving federal Airport Improvement Program (AIP) funding are required to maintain a current ACIP with the Federal Aviation Administration (FAA), which identifies projects to be undertaken at an airport over a specified period of time. The Authority's ACIP includes the projects recommended in **Chapter 5** of this Airport Master Plan Update. The project costs were based on a planning level of detail. While accurate for master planning purposes, actual project costs will likely vary from these planning estimates once project design and engineering estimates are developed. The project costs are presented in 2023 dollars and include contingencies, design costs, and construction management costs.

Table 7-2 presents a summary of the project costs and funding sources of the recommended ACIP by planning period and cost center. The detailed ACIP by project and funding source is presented at the end of this chapter in **Table 7-10**. As shown in the tables, the ACIP is estimated to cost approximately $1.3 billion, of which approximately $806.3 million are terminal-related projects.

The Terminal Rehabilitation and Expansion program at AVL will replace most of the existing passenger terminal building and air traffic control tower (ATCT) expanding the square footage to that which meets the requirements of the FAA planning criteria based on current passenger demands. Phases I through IV of the Terminal Rehabilitation and Expansion program began in 2022 and is not included in the current ACIP. Phases V through VIII and the ATCT are included in the current ACIP and total approximately $319.6 million (see Project #1, #2, #7, #12, and #15 on **Table 7-10**). Since AVL has been experiencing record passenger growth over the past few years, the terminal capacity after the completion of Phase VIII of the Terminal Rehabilitation and Expansion program will not be sufficient meet then current demand. As a result, the ACIP includes passenger terminal expansions in addition to the Terminal Rehabilitation and Expansion program that total approximately $486.7 million (see Project #21, #27, #32, #36, #42, #47 and #52 on **Table 7-10**).

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Table 7-2 – Summary of ACIP (in 000s)

Years	Project Costs	Federal	State	Third Party	Authority				Total Funding Sources
					CFCs	22A & 23 Bonds	Series 2035	AVL	
Summary by Planning Period									
2024-2026	$378,715	$58,577	$16,778	$19,000	$2,232	$189,009	$0	$93,119	$378,715
2027-2031	$177,782	$40,765	$0	$41,916	$0	$89,620	$0	$5,480	$177,782
2032-2036	$142,310	$117,318	$0	$12,500	$0	$6,392	$0	$6,100	$142,310
2037-2041	$637,789	$117,837	$0	$1,000	$0	$0	$293,173	$225,779	$637,789
Total ACIP	**$1,336,595**	**$334,497**	**$16,778**	**$74,416**	**$2,232**	**$285,021**	**$293,173**	**$330,478**	**$1,336,595**
Summary by Cost Center									
Terminal									
Phase V-VIII & ATCT	$319,577	$55,522	$16,778	$0	$0	$247,277	$0	$0	$319,577
Future Tml Expansion	$486,744	$32,596	$0	$0	$0	$37,744	$190,000	$226,404	$486,744
Subtotal	$806,321	$88,118	$16,778	$0	$0	$285,021	$190,000	$226,404	$806,321
Airfield	$177,346	$156,089	$0	$17,500	$0	$0	$0	$3,757	$177,346
Parking & Roads	$250,967	$58,122	$0	$0	$0	$0	$103,173	$89,672	$250,967
Other	$101,961	$32,168	$0	$56,916	$2,232	$0	$0	$10,645	$101,961
Total ACIP	**$1,336,595**	**$334,497**	**$16,778**	**$74,416**	**$2,232**	**$285,021**	**$293,173**	**$330,478**	**$1,336,595**

Source: Table 7-10, DKMG Consulting, LLC, 2024.

The funding plan for the ACIP is described in the following subsections.

7.2.1 Federal Grants

Federal grants by planning period are presented in **Table 7-3**. As shown, approximately $334.5 million in federal grants are forecast to fund the ACIP projects.

Table 7-3 – Summary of Federal Grants (in 000s)

Years	Entitlements (a)	Discretionary (b)	BILs		TSA	Total Federal	Applied to ACIP
			AIG	ATP			
2024-2026	$12,294	$0	$13,753	$20,000	$16,000	$62,047	($58,577)
2027-2031	$22,655	$11,331	$0	$0	$3,309	$37,295	($40,765)
2032-2036	$23,630	$98,491	$0	$0	$0	$122,121	($117,318)
2037-2041	$24,639	$88,394	$0	$0	$0	$113,034	($117,837)
Total Federal	**$83,219**	**$198,216**	**$13,753**	**$20,000**	**$19,309**	**$334,497**	**($334,497)**

(a) Based on the FAA's entitlement formula, which allocates funds to airports based on enplanements. See Table 7-11.

(b) AVL has more AIP-eligible projects than available AIP entitlement grant proceeds. As a result, AIP discretionary grants are assumed to fund the shortfall.

Source: Table 7-10, DKMG Consulting, LLC, 2024.

The application of the federal grants by project is presented at the end of this chapter in **Table 7-10**. Federal grants are described in greater detail in the following subsections.

Airport Improvement Program (AIP)

Grants administered by the FAA through the AIP are a critical capital funding source to implement the projects recommended in the ACIP. Passenger entitlement grants are allocated to airports by a formula based on enplanements, cargo entitlement grants are allocated based on historical cargo landed weight market share, and discretionary grants are allocated in accordance with FAA

guidelines. FAA grants are subject to annual Congressional appropriation. The AIP expires periodically, and federal reauthorization is required to continue. In October 2018, Congress passed a five-year reauthorization bill for the FAA — the FAA Reauthorization Act of 2018. Despite the multi-year reauthorization, the FAA must receive annual appropriation approval from Congress. Congress is currently reviewing a new five-year reauthorization bill for the FAA, which has not yet been approved.

The U.S. DOT classifies AVL as a small hub airport; therefore, the AIP formula stipulates that AVL is entitled to receive 90 percent in federal funding for AIP-eligible projects. AIP funds can be used for most improvement needs, but not operating costs; however, AIP funds are typically not available for revenue-generating projects, so for the purpose of this analysis, AIP funds were not assumed for revenue-generating projects. The following describes the two types of AIP grants:

- Entitlement Grants – AVL is estimated to receive approximately $83.2 million in passenger entitlement grants through 2041. Entitlement funds are distributed through grants by formula based on the number of enplanements at individual airports and the amount of landed weight of arriving cargo at individual airports for the most recent federal fiscal year. In cases where entitlement funds are not used during the current federal fiscal year, these funds are redistributed to other airport sponsors as discretionary funds in the next federal fiscal year. **Table 7-11** included at the end of this chapter presents AVL's AIP passenger entitlement calculation. Given that AVL has more AIP-eligible projects than available AIP entitlement grant proceeds, AVL will need AIP discretionary funds to fund the shortfall.
- Discretionary Grants – At the beginning of each federal fiscal year, the FAA sets aside the amount of discretionary funds to cover the Letter of Intent (LOI) payment schedules. LOIs are entered into with the FAA to help fund large-scale capacity projects at primary or reliever airports by providing funds over multiple budget cycles. The total discretionary funds in all LOIs subject to future obligation are limited to approximately 50 percent of the forecast discretionary funds available for that purpose. The authorizing statute directs the FAA to allocate certain discretionary funding to specific airport types and set aside categories (noise, reliever airports, and military airport program) and projects relating to capacity, safety, security and noise. However, the FAA has some discretion in funding specific projects within these discretionary funding set-aside categories. The FAA approves discretionary funds for use on specific projects, after consideration of project priority and other selection criteria.

  Approximately $198.2 million in discretionary grants is needed to fund the shortfall in available entitlement funds through 2041. If AVL does not receive this discretionary funding, it will need to identify alternative funding sources, delay the projects until funding sources become available, or cancel the projects.

Bipartisan Infrastructure Law (BIL) Airport Infrastructure Grants (AIG)

In 2021, the federal Infrastructure Investment and Jobs Act of 2021, usually referred to as BIL, was passed providing approximately $20 billion in grants for infrastructure development at U.S.

airports for 2022 through 2026. Up to approximately $2.9 billion per year of BIL funds is to be awarded to primary airports as AIG, allocated on the same basis as AIP entitlement grants. AVL was allocated $4.3 million in 2022 and 2023 and $4.6 million in 2024 in AIG grants. This analysis assumes AVL will be allocated approximately $4.6 million for 2025 and 2026. AVL has committed all of the AIG grants to the Terminal Rehabilitation and Expansion program.

Bipartisan Infrastructure Law (BIL) Airport Terminal Program (ATP)

An additional $5.0 billion is to be provided in grants under the ATP provisions of BIL. ATP grants are to be awarded at FAA's discretion following a competitive application process. AVL was awarded $20 million in 2023 in ATP grants of which $10 million is allocated to the air traffic control tower (ATCT) replacement and $10 million is allocated to the Terminal Rehabilitation and Expansion program. No additional ATP grants are assumed in this analysis.

Transportation Security Administration (TSA)

AVL received a TSA grant to fund certain project costs of the baggage handling system related to the Terminal Rehabilitation and Expansion program in the amount of approximately $19.3 million. No additional TSA grants are assumed in this analysis.

7.2.2 State Grants

AVL receives grant funds from the North Carolina Department of Transportation (NCDOT) Division of Aviation through the State Airport Aid Program. NCDOT is authorized to provide state aid in the forms of loans and grants to cities, counties, and public airport authorities for the purpose of planning, acquiring, constructing, or improving municipal, county and other publicly owned or controlled airport facilities, and to authorize related programs of aviation safety, promotions, and long-range planning. For the purposes of the financial analysis herein, state grants received during construction of the Terminal Rehabilitation and Expansion program are assumed to be used on a pay-go basis in the amount of approximately $16.8 million (see **Table 7-10**). Grants received after the completion of the Terminal Rehabilitation and Expansion program in the amount of approximately $7.3 million annually are assumed to be used to offset debt service on the Series 2022A Bonds and Series 2023 Bonds (see **Table 7-4**).

7.2.3 Third Party

Many airports use private third-party investment when the planned improvements will primarily be used by a private business or other organization. Such projects are not ordinarily eligible for federal funding. Projects of this kind typically include cargo facilities, hangars, FBO facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation use facilities, non-aviation office/ commercial/industrial developments, and similar projects. Private development proposals are considered by an airport on a case-by-case basis. Often, airport funds for infrastructure, preliminary site work, and site access are required to facilitate privately developed projects on airport property.

The ACIP includes third party funding for the northwest and southwest development sites, general aviation and corporate apron rehabilitation, and the fuel farm expansion in the amount

of approximately $74.4 million (see **Table 7-10**). If AVL does not receive this funding, it will need to identify alternative funding sources, delay the projects until funding sources become available, or cancel the projects.

7.2.4 Authority Funds

The remaining costs of the ACIP are funded with customer facility charge (CFC) revenues, GARBs, and the Authority's surplus fund. These funding sources are described in greater detail in the following sub-sections.

Customer Facility Charge (CFC)

On May 17, 2004, the Authority instituted a CFC at AVL to be used to pay, or to reimburse the Authority, for capital costs for construction and improvement of rental car facilities at the Airport. The CFC was initially $2.00 per transaction day and subsequently increased to $5.00 effective March 2024. As shown in **Table 7-2**, the Authority intends to fund approximately $2.2 million of rental car-related repairs and replacements from CFC revenues (see Project #6 and #9 on **Table 7-10**).

Passenger Facility Charges (PFCs)

As shown in **Table 7-2**, approximately $285.0 million in ACIP projects (excluding financing costs) are assumed to be funded with the proceeds of the Series 2022A Bonds and the Series 2023 Bonds, of which the resulting debt service is funded by either passenger facility charge (PFC) revenues or Authority funds.

PFC Application #22-09-C-00-AVL is AVL's only open PFC application. Under this application, the Authority has approval to collect a $4.50 per enplaned passenger fee for $25 million in PFC revenues expiring in July 2029. This application was approved to offset debt service associated with the Series 2022A Bonds related to the costs of the baggage handling system included in the initial phases of the Terminal Rehabilitation and Expansion program.

The Authority is in the process of preparing an additional PFC application to fund the project and financing costs of the remainder of the Terminal Rehabilitation and Expansion program and plans on submitting the PFC application to the FAA by spring 2024. The PFC charge expiration date for this application is expected to extend through 2053, which is the term of the Series 2023 Bonds. Upon approval of this application, PFCs will be used to offset PFC-eligible debt service on the Series 2022A Bonds and Series 2023 Bonds (see **Table 7-4**). As a result, PFCs are not available to fund the ACIP other than the Terminal Rehabilitation and Expansion program.

General Airport Revenue Bonds (GARBs)

As also shown in **Table 7-2**, approximately $293.2 million in ACIP projects (excluding financing costs) are assumed to be funded with the proceeds of future GARBs assumed to be issued in 2035. The future GARBs are described in greater detail in the next section.

Surplus Fund

As shown in **Table 7-2**, approximately $330.5 million in Authority surplus funds are required to fund the remainder of the ACIP on a pay-go basis, of which approximately $85.2 million is required to fund the parking expansion in FY 2026 (see Project #14 on **Table 7-10**). The ability of the Authority to fund these projects is discussed in greater detail in the next section.

7.3 FINANCIAL FEASIBILITY

Financial feasibility was analyzed as part of this Study and is discussed in the following sections.

7.3.1 Accounting Structure

The Authority was established in 1980 and operates as an enterprise fund governed by seven member board. The Authority employs a President and Chief Executive Officer, who manages AVL including the financial operations. The Authority is financially self-sustaining with revenues generated from airline and other tenant fees, grants, PFCs, concession fees, and other Revenues of AVL. The Authority's Fiscal Year (FY) ends June 30. The FY 2023 numbers included in this section reflect the amounts presented in the Authority's Annual Financial Report for the year ended June 30, 2023, the FY 2024 numbers reflect the Authority's 2024 budget approved by the Board in May 2023 (FY 2024 Budget), and the FY 2025 numbers reflect the Authority's 2025 budget to be presented to the Board in May 2024 (FY 2025 Budget). All financial tables are included at the end of this chapter.

The Amended and Restated General Trust Indenture establishes and creates the following special funds:

- Airport System Operating Fund
- PFC Revenue Fund
- Debt Service Fund
- Construction Fund
- Reserve Fund
- Operating and Maintenance (O&M) Reserve Fund
- Surplus Fund

Money held in the Surplus Fund is to be applied in the following order of priority: (1) to the Airport System Operating Fund to make up any deficiency therein to meet the obligations therefor; (2) to the Debt Service Fund to make up any deficiency therein in accordance with the order of priorities established in the General Indenture; (3) to pay a termination payment under a Derivative Agreement; (4) to the payment of any principal, premium, if any, or interest on any Subordinate Indebtedness, an amount equal to the principal, premium or interest then due and owing; (5) to the payment with respect to any Other Indebtedness, an amount equal to the payment then due and owing; and (6) for any lawful purpose from time to time authorized by the Authority.

7.3.2 Debt Service

Table 7-4, presents the Authority's outstanding and future GARB debt service. As shown, the Authority currently has three outstanding debt obligations: Series 2016A Bonds, which were issued to fund parking improvements at AVL, and the Series 2022A Bonds and the Series 2023 Bonds which were issued to fund a portion of the Terminal Rehabilitation and Expansion program. As shown, annual outstanding debt service is approximately $1.7 million in FY 2023, increasing to $27.3 million in FY 2027 when the Series 2022A Bond and Series 2023 Bond debt service commences. Approximately $7.3 million of the annual Series 2022A Bond and Series 2023 Bond debt service is funded with state grants, approximately $7.8 million is funded with PFC revenues, and the remaining $10.5 million is included in the terminal rental rate calculation.

Table 7-4 – Debt Service (in 000s)

	Outstanding Debt Service				Funding for Outstanding Debt Service					Series 2035 Bonds		
Year	Series 2016A	Series 2022A	Series 2023	Total	Parking	Terminal Rate	PFC	State	Total	Parking	Terminal Rate	Total Future
2023	$1,701	$0	$0	$1,701	$1,701	$0	$0	$0	$1,701	$0	$0	$0
2024	$1,703	$0	$0	$1,703	$1,703	$0	$0	$0	$1,703	$0	$0	$0
2025	$1,705	$0	$0	$1,705	$1,705	$0	$0	$0	$1,705	$0	$0	$0
2026	$1,700	$9,839	$0	$11,539	$1,700	$0	$2,952	$6,887	$11,539	$0	$0	$0
2027	$1,705	$13,389	$12,222	$27,315	$1,705	$10,468	$7,800	$7,343	$27,315	$0	$0	$0
2028	$1,704	$13,386	$12,219	$27,309	$1,704	$10,462	$7,800	$7,343	$27,309	$0	$0	$0
2029	$1,702	$13,385	$12,223	$27,310	$1,702	$10,465	$7,800	$7,343	$27,310	$0	$0	$0
2030	$1,704	$13,385	$12,219	$27,307	$1,704	$10,460	$7,800	$7,343	$27,307	$0	$0	$0
2031	$1,705	$13,384	$12,221	$27,310	$1,705	$10,462	$7,800	$7,343	$27,310	$0	$0	$0
2032	$0	$13,389	$12,219	$25,608	$0	$10,465	$7,800	$7,343	$25,608	$0	$0	$0
2033	$0	$13,387	$12,223	$25,610	$0	$10,467	$7,800	$7,343	$25,610	$0	$0	$0
2034	$0	$13,385	$12,221	$25,605	$0	$10,462	$7,800	$7,343	$25,605	$0	$0	$0
2035	$0	$13,385	$12,219	$25,604	$0	$10,461	$7,800	$7,343	$25,604	$0	$0	$0
2036	$0	$13,388	$12,220	$25,608	$0	$10,465	$7,800	$7,343	$25,608	$0	$0	$0
2037	$0	$13,388	$12,220	$25,608	$0	$10,465	$7,800	$7,343	$25,608	$8,217	$15,132	$23,349
2038	$0	$13,389	$12,223	$25,612	$0	$10,469	$7,800	$7,343	$25,612	$8,220	$15,138	$23,358
2039	$0	$13,385	$12,218	$25,603	$0	$10,460	$7,800	$7,343	$25,603	$8,224	$15,144	$23,368
2040	$0	$13,385	$12,220	$25,605	$0	$10,462	$7,800	$7,343	$25,605	$8,227	$15,151	$23,378
2041	$0	$13,387	$12,222	$25,609	$0	$10,466	$7,800	$7,343	$25,609	$8,231	$15,158	$23,389

Source: DKMG Consulting, LLC, 2024.

Due to a difference in the timing of the project spend versus the availability of funds in the Surplus Fund, this analysis assumes future bonds are required to be issued in 2035 to fund the future parking and terminal expansion projects included in the ACIP (see Project #41 and #42 on **Table 7-10**) of approximately $293.2 million (excluding financing costs). Future bond debt service was calculated for a 30-year bond issued at a par amount of approximately $356.0 million using a 5 percent interest rate, two-year capitalized interest period, and funding of a debt service reserve equaling maximum annual debt service. This translates into annual debt service of approximately $23.3 million beginning in 2037, of which approximately $15.1 million is allocated to the terminal rental rate. Please note that this analysis does not make any recommendations on the type of debt obligation the Authority will undertake, and we recommend that the Authority review the debt service and Amended and Restated General Trust Indenture reserve assumptions with its municipal advisor.

7.3.3 Operating Expenses

Operating expenses at AVL include personnel services, professional services, utilities, promotional activities, maintenance and repairs, contracted services, insurance, materials and supplies, and other expenses. Operating expenses are projected based on a review of historical trends and the anticipated effects of inflation assumed at 3 percent annually. Terminal expenses have been increased in FY 2027 and FY 2037 to reflect the completion of the terminal projects.

Table 7-5 presents a summary of the operating expenses for FY 2024 through FY 2041. **Table 7-12** included at the end of this chapter presents the details of the operating expenses by line item. As shown, operating expenses are budgeted to be approximately $22.2 million in FY 2025 and are forecast to increase to approximately $44.3 million in FY 2041, reflecting an AAGR of 4.4 percent.

Table 7-5 – Summary of Operating Expenses (in 000s)

Year	Operating Expenses	Less: Rate Base Adjust	Adjusted expenses	Allocation to cost centers		
				Airfield	Terminal	Other
Budget						
2024	$17,180	($845)	$16,335	$4,246	$7,492	$4,597
% to total				26%	46%	28%
2025	$22,163	($405)	$21,758	$5,572	$9,755	$6,432
% to total				26%	45%	30%
Forecast						
2026	$22,828	($52)	$22,777	$5,833	$10,211	$6,733
2027	$27,394	($62)	$27,332	$6,008	$14,389	$6,935
% to total (a)				22%	53%	25%
2028	$28,216	($64)	$28,152	$6,188	$14,821	$7,143
2029	$29,062	($66)	$28,997	$6,373	$15,266	$7,357
2030	$29,934	($68)	$29,866	$6,565	$15,724	$7,578
2031	$30,832	($70)	$30,762	$6,762	$16,195	$7,805
2032	$31,757	($72)	$31,685	$6,964	$16,681	$8,040
2033	$32,710	($74)	$32,636	$7,173	$17,182	$8,281
2034	$33,691	($76)	$33,615	$7,389	$17,697	$8,529
2035	$34,702	($78)	$34,623	$7,610	$18,228	$8,785
2036	$35,743	($81)	$35,662	$7,838	$18,775	$9,049
2037	$39,317	($89)	$39,228	$8,074	$21,835	$9,320
% to total (a)				21%	56%	24%
2038	$40,496	($92)	$40,405	$8,316	$22,489	$9,600
2039	$41,711	($94)	$41,617	$8,565	$23,164	$9,888
2040	$42,962	($97)	$42,865	$8,822	$23,859	$10,184
2041	$44,251	($100)	$44,151	$9,087	$24,575	$10,490
AAGR 2025-2041	4.4%					

(a) Terminal expenses have been increased in FY 2027 and FY 2037 to reflect the completion of the terminal projects.

Source: Table 7-12, DKMG Consulting, LLC, 2024.

As shown in the table, certain expenses are deducted from operating expenses prior to being allocated to the cost centers used to determine airline rates and charges. These include items

such as contingencies, emergency repairs and business development. In addition, the allocation to the terminal increases in future years to reflect the additional costs required to operate a larger facility due to the terminal expansion.

7.3.4 Operating Revenues

Table 7-6 presents a summary of the operating revenues for FY 2024 through FY 2041. **Table 7-13** included at the end of this chapter presents the details of the operating revenues by account. As shown, operating revenues are budgeted to be $33.2 million in FY 2025 and are forecast to increase to approximately $107.2 million in FY 2041, reflecting an AAGR of 7.6 percent.

Table 7-6 – Summary of Operating Revenues (in 000s)

	Airline Revenues			Non-airline Revenues				Total
Year	Landing Fees	Terminal Rentals	Security Fees	Parking	Rental Car MAG & Conc	Terminal Concessions	Other	
Budget								
2024	$2,880	$3,120	$845	$10,000	$4,458	$804	$3,335	$25,441
2025	$4,769	$4,764	$1,254	$12,500	$4,534	$1,254	$4,088	$33,163
% to total	14%	14%	4%	38%	14%	4%	12%	
	33%			67%				
Forecast								
2026	$3,727	$4,567	$1,400	$13,465	$4,890	$1,340	$4,110	$33,500
2027	$4,324	$14,888	$1,440	$23,703	$5,000	$1,447	$4,210	$55,012
2028	$4,716	$14,408	$1,480	$24,243	$5,110	$1,480	$4,310	$55,748
2029	$5,174	$15,528	$1,520	$24,794	$5,220	$1,510	$4,410	$58,156
2030	$5,330	$15,723	$1,570	$25,357	$5,340	$1,540	$4,510	$59,371
2031	$5,492	$15,934	$1,620	$25,935	$5,460	$1,570	$4,610	$60,621
2032	$5,531	$15,772	$1,670	$26,525	$5,580	$1,600	$4,710	$61,388
2033	$5,704	$16,004	$1,720	$27,129	$5,700	$1,630	$4,810	$62,696
2034	$5,882	$16,238	$1,770	$27,745	$5,830	$1,660	$4,910	$64,036
2035	$6,067	$16,484	$1,820	$28,376	$5,970	$1,690	$5,010	$65,416
2036	$6,257	$16,747	$1,870	$29,020	$6,110	$1,720	$5,110	$66,834
2037	$5,881	$37,490	$1,930	$42,116	$6,250	$1,855	$5,210	$100,732
2038	$6,046	$36,753	$1,990	$43,073	$6,390	$1,890	$5,310	$101,452
2039	$6,231	$37,076	$2,050	$44,053	$6,540	$1,940	$5,410	$103,299
2040	$6,422	$37,426	$2,110	$45,054	$6,690	$1,990	$5,510	$105,202
2041	$6,619	$37,792	$2,170	$46,080	$6,840	$2,040	$5,620	$107,160
% to total	6%	35%	2%	43%	6%	2%	5%	
	43%			57%				
AAGR 2025-2041	**2.1%**	**13.8%**	**3.5%**	**8.5%**	**2.6%**	**3.1%**	**2.0%**	**7.6%**

Source: Table 7-13, DKMG Consulting, LLC, 2024.

Major sources of operating revenue at AVL are derived from airline and non-airline sources, which are described in greater detail below.

Airline Revenues

Airline revenues are budgeted to be approximately 33 percent of AVL's operating revenue in FY 2025 and include revenues generated primarily from airline landing fees and terminal rentals.

The Authority's Airline Rates, Fees & Charges Ordinance (Rate Ordinance), ratified by the General Assembly of North Carolina on June 28, 2012, gives the Authority the ability to make all reasonable rules, regulations, and policies necessary for the proper maintenance and operation of AVL and the authority to charge and collect fees, rents, and other charges for the use of the Airport. Under federal law, the Authority is obligated to maintain an airport user fee structure that is fair and reasonable to all users and that makes AVL as financially self-sustaining as possible.

As provided in the Rate Ordinance, in any FY the Airport Director may apply revenue credits to the terminal net requirement and airfield net requirement to reduce airline rentals and fees. The Authority determines the net gross revenue available for revenue sharing by taking budgeted revenues prior to revenue sharing less budgeted operating expenses and other obligations. The Authority then determines the revenue share allocation percentages between the Authority and the airlines based on the amounts available and Authority needs. The resulting airline share is then allocated between the airfield and the terminal cost centers at the Authority's discretion.

Table 7-7 presents a summary of AVL's airline rates and charges, as well as the revenue share percentages.

Table 7-7 – Summary of Airline Rates and Charge

				Revenue Share			
					Rate Base		
Year	Landing Fee	Terminal Rental Rate	CPE	AVL	Airline	Airfield	Terminal
Budget							
2024	$2.55	$87.67	$6.50	65%	35%	60%	40%
2025	$3.27	$148.09	$7.95	74%	26%	71%	30%
Forecast							
2026	$2.51	$131.02	$6.64	70%	30%	70%	30%
2027	$2.88	$134.15	$13.73	60%	40%	25%	75%
2028	$3.10	$129.84	$13.39	65%	35%	25%	75%
2029	$3.37	$138.98	$14.12	70%	30%	25%	75%
2030	$3.44	$140.73	$14.05	70%	30%	25%	75%
2031	$3.50	$142.62	$13.99	70%	30%	25%	75%
2032	$3.49	$141.17	$13.64	70%	30%	25%	75%
2033	$3.57	$143.24	$13.60	70%	30%	25%	75%
2034	$3.64	$145.34	$13.56	70%	30%	25%	75%
2035	$3.72	$147.54	$13.52	70%	30%	25%	75%
2036	$3.79	$149.89	$13.50	70%	30%	25%	75%
2037	$3.53	$158.37	$23.96	70%	30%	25%	75%
2038	$3.59	$155.25	$23.17	70%	30%	25%	75%
2039	$3.66	$156.62	$22.94	70%	30%	25%	75%
2040	$3.73	$158.10	$22.73	70%	30%	25%	75%
2041	$3.80	$159.64	$22.52	70%	30%	25%	75%

Source: Table 7-14, Table 7-15, Table 7-16, DKMG Consulting, LLC, 2024.

Pursuant to the Rate Ordinance, the Authority establishes a schedule of rates, fees, and charges at the beginning of each fiscal year. The following is a description of AVL's airline rates and charges:

- The landing fee is calculated by dividing the net requirement for the airfield by total landed weight. The calculation of the airfield's net requirement and the landing fee is presented in **Table 7-14**. As shown in **Table 7-7**, the landing fee is forecast to increase from FY 2025 budgeted amount of $3.27 per 1,000 pounds to $3.80 per 1,000 pounds in FY 2041. This analysis assumes that all the ACIP airfield projects are funded with sources other the GARBs; therefore, there is no debt service in the landing fee rate base.
- The terminal rental rate is calculated by dividing the net requirement for the terminal by rentable terminal space. The calculation of the terminal's net requirement and the terminal rental rate is presented in **Table 7-15**. As shown in **Table 7-7**, the terminal rental rate is forecast to increase from FY 2025 budgeted amount of $148.09 square feet to $159.64 square feet in FY 2041. The terminal rental rate increases in FY 2027 and FY 2037 because of increased debt service related to the terminal projects in the ACIP.
- A key performance indicator for airline costs at an airport is the airline cost per enplanement (CPE). The calculation of AVL's CPE is presented in **Table 7-16**. As shown in **Table 7-7**, the CPE is forecast to increase from FY 2025 budgeted amount of $7.95 per enplanement to $22.52 per enplanement in FY 2041. The CPE increases in FY 2027 and FY 2037 because of increased debt service related to the terminal projects in the ACIP.

Non-airline Revenues

Non-airline revenues are budgeted to be approximately 67 percent of AVL's total operating revenues in FY 2025 and include parking, rental car revenues, terminal concessions, and other operating revenues. Non-airline revenues are projected based on the following:

- Historical trends, lease provisions, and inflation.
- Revenues from parking, rental car concessions, and terminal concessions are projected to increase with prospective enplanement growth.
- Concession leases that expire during the planning period would be renegotiated with terms and conditions that would implement changes in rate structures and business practices, as necessary, to maintain positive financial performance.
- Parking revenues are assumed to increase in FY 2027 and FY 2037 to coincide with the completion of parking garages in the ACIP (see Project #14 and #41 on **Table 7-10**).

7.3.5 Pro Forma Cash Flow

Table 7-17 presents the pro forma cash flow of AVL for FY 2024 through FY 2041, based on the projection of operating revenues, operating expenses, and debt service previously discussed. **Table 7-8** presents a summary of the data included in **Table 7-17**.

Table 7-8 – Summary of Pro Forma Data (in 000s)

Year	Net revenues	Total debt service	Debt service coverage	Surplus Fund				Days cash on hand
				Beginning Balance	Plus: net remaining revenues	Less: CIP funded with AVL funds	Ending Balance	
Budget								
2024	$10,661	$1,703	6.26x	$40,360	$8,958	($4,620)	$44,698	860
2025	$15,381	$1,705	9.02x	$44,698	$13,676	($3,216)	$55,158	736
Forecast								
2026	$15,350	$1,700	9.03x	$55,158	$13,650	($85,283)	($16,475)	882
2027	$32,395	$12,172	2.66x	($16,475)	$20,222	($5,480)	($1,733)	(220)
2028	$32,409	$12,166	2.66x	($1,733)	$20,243	$0	$18,510	(22)
2029	$34,072	$12,167	2.80x	$18,510	$21,905	$0	$40,415	233
2030	$34,519	$12,164	2.84x	$40,415	$22,355	$0	$62,770	493
2031	$34,978	$12,167	2.87x	$62,770	$22,810	$0	$85,580	743
2032	$34,929	$10,465	3.34x	$85,580	$24,464	$0	$110,044	984
2033	$35,396	$10,467	3.38x	$110,044	$24,929	($3,600)	$131,373	1,228
2034	$35,868	$10,462	3.43x	$131,373	$25,405	($2,500)	$154,279	1,427
2035	$36,354	$10,461	3.48x	$154,279	$25,893	$0	$180,172	1,623
2036	$36,850	$10,465	3.52x	$180,172	$26,385	$0	$206,556	1,840
2037	$67,295	$33,814	1.99x	$206,556	$33,481	($97,662)	$142,375	1,918
2038	$66,960	$33,827	1.98x	$142,375	$33,133	($97,662)	$77,846	1,283
2039	$67,719	$33,828	2.00x	$77,846	$33,891	$0	$111,736	683
2040	$68,500	$33,841	2.02x	$111,736	$34,660	($3,000)	$143,396	949
2041	$69,303	$33,855	2.05x	$143,396	$35,447	($27,455)	$151,388	1,183

Source: Table 7-17, DKMG Consulting, LLC, 2024.

The Authority is obligated under the Amended and Restated General Trust Indenture to produce net revenues that are at least equal in such FY to 125% of the annual debt service (debt service coverage). While the Authority has not designated PFCs and grant funds as revenues under the General Indenture, the General Indenture provides that if PFCs or Grant Funds have either been applied to pay debt service on the Bonds then the debt service to be paid from the PFCs or Grant Funds is excluded in calculating the Authority's compliance with its rate covenant. The debt service coverage calculation is also presented in **Table 7-8** for the planning periods. As shown, the Authority meets is debt service coverage requirement in every year of the planning period.

As shown in **Table 7-10**, it is assumed that the Authority will use approximately $330.5 million of its unrestricted cash to fund the ACIP. At the beginning of FY 2023, the Authority had approximately 804 days cash on hand (DCOH) and intends on maintaining at least 600 DCOH during the planning period. As a result of funding the parking expansion (Project #14 on **Table 7-10**), the Authority has insufficient funds in its Surplus Fund in FY 2026 and FY 2027 and from FY 2027 through FY 2030 DCOH falls below the Authority's target of 600 DCOH. The Authority would not undertake this project unless a viable plan of finance has been established and may consider other funding options for the parking garage such as a public/private partnership.

However, the Authority's DCOH exceeds its target in future years; and therefore, in FY 2037 and FY 2038 is used to fund future terminal projects in an amount that still maintains the desired 600 DCOH by FY 2039.

7.4 SUMMARY

The financial feasibility of future projects will be determined by existing and future leases, funding levels of federal grant programs, the availability of PFC and CFC revenues and other funding sources, bonding capacity, and the ability to generate internal cash flow from operations at AVL.

The financial projections were prepared based on available information and assumptions set forth in this Chapter. It is believed that such information and assumptions provide a reasonable basis for the projections to the level of detail appropriate for planning purposes. Some of the assumptions used to develop the projections may not be realized, and unanticipated events or circumstances may occur; therefore, the actual results will vary from those projected, and such variations could be material.

If actual results are less favorable than the forecast, the Authority may need additional grants, PFCs, CFCs, and Authority funds to fund the ACIP as it is presented; therefore, as the Authority has done in the past, it should continue to monitor its financial situation to determine which projects should be undertaken and when. In addition, the Authority should review and evaluate current leases and service incentives to enhance revenues and provide financial solvency, while improving the facilities.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections were made as to when the terminal and parking expansions may be needed at AVL. The timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate the development. Although every effort was made in this planning process to conservatively estimate when facility development may be needed, aviation demand will dictate when facility improvements need to be delayed or accelerated.

Table 7-9 – Activity Forecast (in 000s)

Year	Enplanements		Operations	Landed Weight
	Per Table 3-27	Reforecast (a)	Per Table 3-27	Forecast (b)
2021	716		76	
2022	771	841	77	934
2023	831	1,010	79	1,109
2024	895	1,224	80	1,129
2025	964	1,375	82	1,458
2026	1,039	1,481	84	1,488
2027	1,062	1,515	85	1,503
2028	1,086	1,549	85	1,519
2029	1,111	1,585	86	1,535
2030	1,136	1,621	87	1,551
2031	1,162	1,658	88	1,567
2032	1,189	1,695	89	1,583
2033	1,216	1,734	90	1,600
2034	1,243	1,773	91	1,616
2035	1,272	1,814	92	1,633
2036	1,300	1,855	93	1,650
2037	1,330	1,897	94	1,668
2038	1,360	1,940	95	1,686
2039	1,391	1,984	96	1,704
2040	1,423	2,029	97	1,723
2041	1,455	2,075	98	1,742
AAGR				
2021-2041	**3.6%**		**1.3%**	
2025-2041	**2.6%**	**2.6%**	**1.1%**	**1.1%**

(a) 2022 and 2023 activity reflects actual activity, 2024 activity reflects actual annualized, 2025 activity reflects budget, and 2026 through FY 2041 activity is forecast to achieve the growth rates included in Chapter 3, Table 3-27 for the same time period.
(b) Landed weights are assumed to grow with the growth in operations included in Chapter 3, Table 3-27.

Source: DKMG Consulting, LLC, 2024.

Table 7-10 – ACIP Project Costs and Funding Sources (in 000s)
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Proj #	Project Description	Year	Cost Center	Project Costs	Funding Sources												Total Funding Sources
					Federal								Authority				
							BILs										
					Entitle	Discret	AIG	ATP	TSA	Total Federal	State	Third Party	CFCs	22A & 23 Bonds	Series 2035	AVL	
1	Terminal Rehab & Expansion-Air Traffic Control Tower	2024	Terminal	$58,000	$0	$0	$0	$10,000	$0	$10,000	$0	$0	$0	$48,000	$0	$0	$58,000
2	Terminal Rehabilitation & Expansion (Ph V)	2024	Terminal	75,000	2,460	0	4,553	10,000	10,000	27,013	8,389	0	0	39,598	0	0	75,000
3	ARFF Vehicle	2024	Airfield	1,200	1,080	0	0	0	0	1,080	0	0	0	0	0	120	1,200
4	Northwest Development - Site Design & Utilities	2024	Other	2,000	0	0	0	0	0	0	0	2,000	0	0	0	0	2,000
5	Lower Parking Lot Rehabilitation	2024	Parking	4,500	0	0	0	0	0	0	0	0	0	0	0	4,500	4,500
6	Rental Car Facility Repairs & Replacement (Ph III)	2024	Other	294	0	0	0	0	0	0	0	0	294	0	0	0	294
7	Terminal Rehabilitation & Expansion (Ph VI)	2025	Terminal	50,000	0	0	4,600	0	3,000	7,600	8,389	0	0	34,011	0	0	50,000
8	Taxiway A Rehabilitation	2025	Airfield	7,000	3,784	0	0	0	0	3,784	0	0	0	0	0	3,216	7,000
9	Rental Car Facility Repairs & Replacement (Ph IV)	2025	Other	1,938	0	0	0	0	0	0	0	0	1,938	0	0	0	1,938
10	Northwest Apron & Taxiway Design & Construction	2025	Other	15,000	0	0	0	0	0	0	0	15,000	0	0	0	0	15,000
11	Fuel Farm Expansion (Phase 1)	2025	Airfield	2,000	0	0	0	0	0	0	0	2,000	0	0	0	0	2,000
12	Terminal Rehabilitation & Expansion (Ph VII)	2026	Terminal	75,000	0	0	4,600	0	3,000	7,600	0	0	0	67,400	0	0	75,000
13	Runway/Taxiway Sealcoat	2026	Airfield	1,111	1,000	0	0	0	0	1,000	0	0	0	0	0	111	1,111
14	Landside Improvements: Parking Expansion	2026	Parking	85,672	500	0	0	0	0	500	0	0	0	0	0	85,172	85,672
15	Terminal Rehabilitation & Expansion (Ph VIII)	2027	Terminal	61,577	0	0	0	0	3,309	3,309	0	0	0	58,268	0	0	61,577
16	Terminal Apron Rehabilitation (north section)	2027	Airfield	3,093	2,784	0	0	0	0	2,784	0	0	0	0	0	309	3,093
17	Terminal Apron Maint (center & southern sections)	2027	Airfield	1,000	1,000	0	0	0	0	1,000	0	0	0	0	0	0	1,000
18	Wright Brothers Way Extension	2027	Other	4,204	3,784	0	0	0	0	3,784	0	0	0	0	0	420	4,204
19	Roadway Improvements/Rehabilitation	2027	Other	4,750	0	0	0	0	0	0	0	0	0	0	0	4,750	4,750
20	Fuel Farm Expansion (Phase 2)	2027	Airfield	2,000	0	0	0	0	0	0	0	2,000	0	0	0	0	2,000
21	Terminal Building Expansion/Improvements	2028	Terminal	31,257	2,405	0	0	0	0	2,405	0	0	0	28,852	0	0	31,257
22	Northeast Development Site Preparation	2028	Other	6,000	2,414	1,369	0	0	0	3,784	0	2,216	0	0	0	0	6,000
23	Northeast Development Site - Construction	2029	Other	20,000	0	0	0	0	0	0	0	20,000	0	0	0	0	20,000
24	Southwest Development Ste Preparation	2029	Other	6,000	0	0	0	0	0	0	0	6,000	0	0	0	0	6,000
25	GA/Corporate Apron Rehabilitation	2030	Other	11,700	0	0	0	0	0	0	0	11,700	0	0	0	0	11,700
26	Relocate ARFF Station (for concourse expansion)	2031	Airfield	20,000	13,739	6,261	0	0	0	20,000	0	0	0	0	0	0	20,000
27	Terminal Area Facility Rehabilitation	2031	Terminal	5,000	0	2,500	0	0	0	2,500	0	0	0	2,500	0	0	5,000
28	Sealcoat-Runway/Taxiway, with Remarking	2031	Airfield	1,200	0	1,200	0	0	0	1,200	0	0	0	0	0	0	1,200

Source: DKMG Consulting, LLC, 2024.

Table 7-10 – ACIP Project Costs and Funding Sources (in 000s)
(Page 2 of 2)

Proj #	Project Description	Year	Cost Center	Project Costs	Funding Sources												
					Federal								Authority				Total Funding Sources
							BILs			Total		Third		22A & 23	Series		
					Entitle	Discret	AIG	ATP	TSA	Federal	State	Party	CFCs	Bonds	2035	AVL	
29	Apron Expansion - GA/Corporate	2032	Airfield	16,700	4,651	12,049	0	0	0	16,700	0	0	0	0	0	0	16,700
30	Existing Hangar Relocation/Replacement	2032	Other	8,000	0	8,000	0	0	0	8,000	0	0	0	0	0	0	8,000
31	Landside Impr: Tml loop road & expand curb front	2033	Other	20,050	0	16,450	0	0	0	16,450	0	0	0	0	0	3,600	20,050
32	Terminal Building Expansion Improvements	2033	Terminal	8,917	0	2,526	0	0	0	2,526	0	0	0	6,392	0	0	8,917
33	Airside Improvements: Terminal Apron Expansion	2033	Airfield	31,442	4,688	26,754	0	0	0	31,442	0	0	0	0	0	0	31,442
34	SRE & Mowing Equipment Replacement (3 vehicles)	2033	Airfield	1,500	0	1,500	0	0	0	1,500	0	0	0	0	0	0	1,500
35	Terminal Apron Rehabilitation - Center Section	2034	Airfield	7,000	4,725	2,275	0	0	0	7,000	0	0	0	0	0	0	7,000
36	Terminal Area Facility Rehabilitation	2034	Terminal	5,000	0	2,500	0	0	0	2,500	0	0	0	0	0	2,500	5,000
37	Fuel Farm Expansion (Phase 3)	2035	Airfield	2,000	0	0	0	0	0	0	0	2,000	0	0	0	0	2,000
38	Runway Rehabilitation (mill & overlay), to hold lines	2035	Airfield	30,000	4,764	25,236	0	0	0	30,000	0	0	0	0	0	0	30,000
39	ARFF Vehicle	2035	Airfield	1,200	0	1,200	0	0	0	1,200	0	0	0	0	0	0	1,200
40	SRE & Maintenance Facility Relocation (northeast site)	2036	Airfield	10,500	0	0	0	0	0	0	0	10,500	0	0	0	0	10,500
41	Landside Improv: Upper road deck, Parking Garage 3	2037	Parking	160,795	9,647	47,975	0	0	0	57,622	0	0	0	0	103,173	0	160,795
42	Terminal Improv: 2 level ticketing & bag claim, conc	2037	Terminal	402,432	0	17,108	0	0	0	17,108	0	0	0	0	190,000	195,324	402,432
43	Taxiway 'B' Ext to Rnwy 17, bypasses (B2, B6 & B7)	2037	Airfield	7,200	0	7,200	0	0	0	7,200	0	0	0	0	0	0	7,200
44	Taxiway 'B' Rehab (mill & overlay), with B1, B3 & B5	2038	Airfield	12,000	4,885	7,115	0	0	0	12,000	0	0	0	0	0	0	12,000
45	Taxiway 'A' Rehab (mill & overlay), with A1 - A8	2039	Airfield	13,500	4,927	8,573	0	0	0	13,500	0	0	0	0	0	0	13,500
46	Vertiport - eVTOL Operations (outside security)	2040	Other	500	0	0	0	0	0	0	0	0	0	0	0	500	500
47	Terminal Area Facility Rehabilitation	2040	Terminal	5,000	2,500	0	0	0	0	2,500	0	0	0	0	0	2,500	5,000
48	Terminal Apron Rehabilitation - North Section	2041	Airfield	3,500	3,500	0	0	0	0	3,500	0	0	0	0	0	0	3,500
49	Sealcoat - Runway/Taxiway, with Remarking	2041	Airfield	1,200	1,200	0	0	0	0	1,200	0	0	0	0	0	0	1,200
50	Fuel Farm Expansion (Phase 4)	2041	Airfield	1,000	0	0	0	0	0	0	0	1,000	0	0	0	0	1,000
51	Landside Improvements: QTA MX expansion	2041	Other	1,525	150	0	0	0	0	150	0	0	0	0	0	1,375	1,525
52	Terminal Building Improvements	2041	Terminal	29,138	2,634	423	0	0	0	3,057	0	0	0	0	0	26,081	29,138
	Total			$1,336,595	$83,219	$198,216	$13,753	$20,000	$19,309	$334,497	$16,778	$74,416	$2,232	$285,021	$293,173	$330,478	$1,336,595

Source: DKMG Consulting, LLC, 2024.

Table 7-11 – Application of Federal Grants (in 000s)

	Source Table	Total	Budget 2024	Budget 2025	Forecast 2026	Forecast 2027	2028	2029	2030	2031	Forecast 2032	2033	2034	2035	2036	Forecast 2037	2038	2039	2040	2041
Enplanements (in 000s)	7-9		1,224	1,375	1,481	1,515	1,549	1,585	1,621	1,658	1,695	1,734	1,773	1,814	1,855	1,897	1,940	1,984	2,029	2,075
% increase				12.3%	7.7%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
FAA Formula																				
$7.80 for 1st 50,000 enpl			$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390	$390
$5.20 for next 50,000 enpl			260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
$2.60 for next 400,000 enpl			1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,040
$0.65 for next 500,000 enpl			325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325
$0.50 for the remaining enpl			112	188	241	257	275	292	310	329	348	367	387	407	427	448	470	492	515	538
Total entitlements			$2,127	$2,203	$2,256	$2,272	$2,290	$2,307	$2,325	$2,344	$2,363	$2,382	$2,402	$2,422	$2,442	$2,463	$2,485	$2,507	$2,530	$2,553
Calculated entitlement x2			$4,254	$4,405	$4,511	$4,545	$4,579	$4,615	$4,651	$4,688	$4,725	$4,764	$4,803	$4,844	$4,885	$4,927	$4,970	$5,014	$5,059	$5,105
2 yr lag in receipt of grant				$4,040	$4,254	$4,405	$4,511	$4,545	$4,579	$4,615	$4,651	$4,688	$4,725	$4,764	$4,803	$4,844	$4,885	$4,927	$4,970	$5,014
Beginning balance		$0	$0	$460	$717	$3,471	$308	$0	$4,545	$9,125	$0	$0	$0	$0	$0	$4,804	$0	$0	$0	$2,470
Plus: federal grants																				
BILs AIG		$13,753	$4,553	$4,600	$4,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
BILs ATP		$20,000	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Entitlement	see above	$83,219	$4,000	$4,040	$4,254	$4,405	$4,511	$4,545	$4,579	$4,615	$4,651	$4,688	$4,725	$4,764	$4,803	$4,844	$4,885	$4,927	$4,970	$5,014
Discretionary		$198,216	$0	$0	$0	$0	$1,369	$0	$0	$9,961	$20,049	$47,230	$4,775	$26,436	$0	$72,283	$7,115	$8,573	$0	$423
TSA		$19,309	$10,000	$3,000	$3,000	$3,309	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Less: CIP funded with federal	7-10	($334,497)	($38,093)	($11,384)	($9,100)	($10,877)	($6,189)	$0	$0	($23,700)	($24,700)	($51,918)	($9,500)	($31,200)	$0	($81,930)	($12,000)	($13,500)	($2,500)	($7,907)
Ending balance		$0	$460	$717	$3,471	$308	$0	$4,545	$9,125	$0	$0	$0	$0	$0	$4,804	$0	$0	$0	$2,470	$0

Source: DKMG Consulting, LLC, 2024.

Table 7-12 – Operating Expenses (in 000s)

	Actual	Budget	Budget	Forecast	Forecast					Forecast					Forecast				
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Summary by Line Item																			
Personnel services	$7,860	$10,802	$13,637	$14,046	$16,856	$17,361	$17,882	$18,419	$18,971	$19,540	$20,126	$20,730	$21,352	$21,993	$24,192	$24,918	$25,665	$26,435	$27,228
Professional services	501	702	887	914	1,096	1,129	1,163	1,198	1,234	1,271	1,309	1,348	1,389	1,430	1,573	1,621	1,669	1,719	1,771
Utilities	468	496	628	647	776	800	824	848	874	900	927	955	983	1,013	1,114	1,148	1,182	1,217	1,254
Promotional activities	217	338	464	478	573	591	608	627	646	665	685	705	727	748	823	848	873	899	926
Maintenance and repairs	393	305	562	579	695	716	737	759	782	805	830	855	880	907	997	1,027	1,058	1,090	1,122
Contracted services	2,080	2,214	3,761	3,874	4,649	4,788	4,932	5,080	5,232	5,389	5,551	5,717	5,889	6,065	6,672	6,872	7,078	7,291	7,509
Insurance	332	399	480	494	593	611	629	648	668	688	708	730	751	774	851	877	903	930	958
Material and supplies	596	657	1,028	1,059	1,271	1,309	1,349	1,389	1,431	1,474	1,518	1,563	1,610	1,659	1,824	1,879	1,936	1,994	2,053
Other	727	1,269	716	737	885	911	939	967	996	1,025	1,056	1,088	1,121	1,154	1,270	1,308	1,347	1,387	1,429
Expenses funded with ARPA (a)	694	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total operating expenses (b)	**$13,869**	**$17,180**	**$22,163**	**$22,828**	**$27,394**	**$28,216**	**$29,062**	**$29,934**	**$30,832**	**$31,757**	**$32,710**	**$33,691**	**$34,702**	**$35,743**	**$39,317**	**$40,496**	**$41,711**	**$42,962**	**$44,251**
% change over prior year		23.9%	29.0%	3.0%	20.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	10.0%	3.0%	3.0%	3.0%	3.0%
AAGR from 2025				3.0%	11.2%	8.4%	7.0%	6.2%	5.7%	5.3%	5.0%	4.8%	4.6%	4.4%	4.9%	4.7%	4.6%	4.5%	4.4%
Less adjustments to rate base:																			
Contingency		($100)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Emergency repairs		(50)	(50)	(52)	(62)	(64)	(66)	(68)	(70)	(72)	(74)	(76)	(78)	(81)	(89)	(92)	(94)	(97)	(100)
Business development		(400)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Budget adjustment (c)		(178)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TSA LEO grant		(117)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contracted services																			
Contract security-exit lanes			(55)																
Ramp management contract			(100)																
Material and supplies																			
Supply costs-boarding passes			(70)																
Supply costs-bag tags			(130)																
Adjusted expenses		**$16,335**	**$21,758**	**$22,777**	**$27,332**	**$28,152**	**$28,997**	**$29,866**	**$30,762**	**$31,685**	**$32,636**	**$33,615**	**$34,623**	**$35,662**	**$39,228**	**$40,405**	**$41,617**	**$42,865**	**$44,151**
Allocation percentages																			
Airfield		26.0%	25.6%	25.6%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	20.6%	20.6%	20.6%	20.6%	20.6%
Terminal		45.9%	44.8%	44.8%	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	55.7%	55.7%	55.7%	55.7%	55.7%
Other		28.1%	29.6%	29.6%	25.4%	25.4%	25.4%	25.4%	25.4%	25.4%	25.4%	25.4%	25.4%	25.4%	23.8%	23.8%	23.8%	23.8%	23.8%
Total allocation percentages		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Allocation to cost centers																			
Airfield		$4,246	$5,572	$5,833	$6,008	$6,188	$6,373	$6,565	$6,762	$6,964	$7,173	$7,389	$7,610	$7,838	$8,074	$8,316	$8,565	$8,822	$9,087
Terminal		7,492	9,755	10,211	14,389	14,821	15,266	15,724	16,195	16,681	17,182	17,697	18,228	18,775	21,835	22,489	23,164	23,859	24,575
Other		4,597	6,432	6,733	6,935	7,143	7,357	7,578	7,805	8,040	8,281	8,529	8,785	9,049	9,320	9,600	9,888	10,184	10,490
Total allocation to cost centers		**$16,335**	**$21,758**	**$22,777**	**$27,332**	**$28,152**	**$28,997**	**$29,866**	**$30,762**	**$31,685**	**$32,636**	**$33,615**	**$34,623**	**$35,662**	**$39,228**	**$40,405**	**$41,617**	**$42,865**	**$44,151**

(a) Certain expenses in FY 2023 were funded using grants received from the American Rescue Plan Act (ARPA) which was enacted to fund costs related to the COVID-19 pandemic.

(b) Operating expenses are projected based on a review of historical trends and the anticipated effects of inflation assumed at 3 percent annually. Terminal expenses have been increased in FY 2027 and FY 2037 to reflect the completion of the terminal projects.

(c) The budgeted rates and charges are calculated prior the Authority's overall budget being finalized. As a result, this adjustment is required so the rates and charges foot to the budgeted rates and charges.

Source: DKMG Consulting, LLC, 2024.

Table 7-13 – Operating Revenues (in 000s)

	Actual	Budget	Budget	Forecast	Forecast					Forecast					Forecast				
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Airfield																			
Landing fees	$2,361	$2,880	$4,769	$3,727	$4,324	$4,716	$5,174	$5,330	$5,492	$5,531	$5,704	$5,882	$6,067	$6,257	$5,881	$6,046	$6,231	$6,422	$6,619
LEO services	126	117	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Security fee ID media	94	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Airfield	**$2,582**	**$3,067**	**$4,956**	**$3,797**	**$4,394**	**$4,786**	**$5,244**	**$5,400**	**$5,562**	**$5,601**	**$5,774**	**$5,952**	**$6,137**	**$6,327**	**$5,951**	**$6,116**	**$6,301**	**$6,492**	**$6,689**
Terminal																			
Terminal space rentals-airline																			
Terminal rental revenue	$2,513	$3,120	$4,764	$4,567	$14,888	$14,408	$15,528	$15,723	$15,934	$15,772	$16,004	$16,238	$16,484	$16,747	$37,490	$36,753	$37,076	$37,426	$37,792
Loading bridge and ramp fees	89	0	98	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Security fee	845	845	1,254	1,400	1,440	1,480	1,520	1,570	1,620	1,670	1,720	1,770	1,820	1,870	1,930	1,990	2,050	2,110	2,170
Terminal space rentals-non-airline	299	301	303	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450	460
Concessions (a)	1,120	804	1,254	1,340	1,447	1,480	1,510	1,540	1,570	1,600	1,630	1,660	1,690	1,720	1,855	1,890	1,940	1,990	2,040
Rental car																			
MAG & Concession Fee	4,287	4,458	4,534	4,890	5,000	5,110	5,220	5,340	5,460	5,580	5,700	5,830	5,970	6,110	6,250	6,390	6,540	6,690	6,840
Rental revenue & security fees	743	765	843	870	890	910	930	950	970	990	1,010	1,030	1,050	1,070	1,090	1,110	1,130	1,150	1,170
Other	64	65	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Terminal	**$9,959**	**$10,358**	**$13,110**	**$13,537**	**$24,145**	**$23,878**	**$25,208**	**$25,633**	**$26,074**	**$26,142**	**$26,604**	**$27,078**	**$27,574**	**$28,087**	**$49,195**	**$48,723**	**$49,336**	**$49,976**	**$50,632**
Ground Trans																			
Parking (b)	$9,595	$10,000	$12,500	$13,465	$23,703	$24,243	$24,794	$25,357	$25,935	$26,525	$27,129	$27,745	$28,376	$29,020	$42,116	$43,073	$44,053	$45,054	$46,080
Ground transportation fees	390	265	515	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840
Ground Trans	**$9,985**	**$10,265**	**$13,015**	**$14,005**	**$24,263**	**$24,823**	**$25,394**	**$25,977**	**$26,575**	**$27,185**	**$27,809**	**$28,445**	**$29,096**	**$29,760**	**$42,876**	**$43,853**	**$44,853**	**$45,874**	**$46,920**
General Aviation																			
Hangar rentals & land rent	$1,257	$1,216	$1,336	$1,380	$1,420	$1,460	$1,500	$1,540	$1,580	$1,620	$1,660	$1,700	$1,740	$1,780	$1,820	$1,860	$1,900	$1,940	$1,990
Fuel flowage fees	104	115	115	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
General Aviation	**$1,361**	**$1,331**	**$1,451**	**$1,500**	**$1,540**	**$1,580**	**$1,620**	**$1,660**	**$1,700**	**$1,740**	**$1,780**	**$1,820**	**$1,860**	**$1,900**	**$1,940**	**$1,980**	**$2,020**	**$2,060**	**$2,110**
Land use	**$362**	**$367**	**$567**	**$600**	**$610**	**$620**	**$630**	**$640**	**$650**	**$660**	**$670**	**$680**	**$690**	**$700**	**$710**	**$720**	**$730**	**$740**	**$750**
Other	**$103**	**$54**	**$64**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**	**$60**
Total operating revenues (c)	**$24,353**	**$25,441**	**$33,163**	**$33,500**	**$55,012**	**$55,748**	**$58,156**	**$59,371**	**$60,621**	**$61,388**	**$62,696**	**$64,036**	**$65,416**	**$66,834**	**$100,732**	**$101,452**	**$103,299**	**$105,202**	**$107,160**
% change over prior year		4.5%	30.4%	1.0%	64.2%	1.3%	4.3%	2.1%	2.1%	1.3%	2.1%	2.1%	2.2%	2.2%	50.7%	0.7%	1.8%	1.8%	1.9%
AAGR from 2025				1.0%	28.8%	18.9%	15.1%	12.4%	10.6%	9.2%	8.3%	7.6%	7.0%	6.6%	9.7%	9.0%	8.5%	8.0%	7.6%

(a) Terminal concession revenues are increased in FY 2027 and in FY 2037 to reflect the completion of the future terminal expansions.

(b) Parking revenues are increased in FY 2027 and FY 2037 to reflect the completion of future parking facilities.

(c) Non-airline revenues are projected based on historical trends, lease provisions, and inflation. Revenues from parking, rental car concessions, and terminal concessions are projected to increase with prospective enplanement growth.

Source: DKMG Consulting, LLC, 2024.

Table 7-14 – Landing Fee (in 000s)

	Source Table	Budget 2024	Budget 2025	Forecast 2026	Forecast 2027	2028	2029	2030	2031	Forecast 2032	2033	2034	2035	2036	Forecast 2037	2038	2039	2040	2041
Requirement																			
Operating expenses	7-12	$4,246	$5,572	$5,833	$6,008	$6,188	$6,373	$6,565	$6,762	$6,964	$7,173	$7,389	$7,610	$7,838	$8,074	$8,316	$8,565	$8,822	$9,087
Less: deicing chemicals		(40)	(40)	(41)	(42)	(44)	(45)	(46)	(48)	(49)	(51)	(52)	(54)	(55)	(57)	(59)	(61)	(62)	(64)
Deposit to O&M reserve (a)		349	663	130	87	89	92	95	98	101	104	107	110	113	117	120	124	128	131
Net depreciation (b)		224	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616
Net amortization (b)		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Capital outlay (b)		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Total requirement		$4,908	$6,941	$6,667	$6,798	$6,979	$7,166	$7,359	$7,557	$7,761	$7,972	$8,189	$8,412	$8,642	$8,879	$9,123	$9,374	$9,633	$9,900
Credits																			
Fuel flowage fees	7-13	(115)	(115)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)	(120)
Net requirement		$4,793	$6,826	$6,547	$6,678	$6,859	$7,046	$7,239	$7,437	$7,641	$7,852	$8,069	$8,292	$8,522	$8,759	$9,003	$9,254	$9,513	$9,780
Total landed weight	7-9	1,129	1,458	1,488	1,503	1,519	1,535	1,551	1,567	1,583	1,600	1,616	1,633	1,650	1,668	1,686	1,704	1,723	1,742
Landing fee prior to revenue share		$4.24	$4.68	$4.40	$4.44	$4.52	$4.59	$4.67	$4.75	$4.83	$4.91	$4.99	$5.08	$5.17	$5.25	$5.34	$5.43	$5.52	$5.61
Revenue share credit (c)		(1,917)	(2,051)	(2,819)	(2,353)	(2,143)	(1,872)	(1,909)	(1,946)	(2,111)	(2,148)	(2,186)	(2,225)	(2,265)	(2,878)	(2,957)	(3,024)	(3,091)	(3,161)
Adjusted net requirement		$2,876	$4,775	$3,727	$4,324	$4,716	$5,174	$5,330	$5,492	$5,531	$5,704	$5,882	$6,067	$6,257	$5,881	$6,046	$6,231	$6,422	$6,619
Total landed weight	7-9	1,129	1,458	1,488	1,503	1,519	1,535	1,551	1,567	1,583	1,600	1,616	1,633	1,650	1,668	1,686	1,704	1,723	1,742
Landing fee		**$2.55**	**$3.27**	**$2.51**	**$2.88**	**$3.10**	**$3.37**	**$3.44**	**$3.50**	**$3.49**	**$3.57**	**$3.64**	**$3.72**	**$3.79**	**$3.53**	**$3.59**	**$3.66**	**$3.73**	**$3.80**

(a) The O&M reserve is equal to six months of O&M expenses. This reflects the incremental amount.

(b) Reimbursement for the use of Authority funds for certain capital projects that are not bond financed.

(c) The Authority may apply revenue credits to reduce airline rentals and fees. The Authority determines the net gross revenue available for revenue sharing by taking budgeted revenues prior to revenue sharing less budgeted operating expenses and other obligations. The Authority then determines the revenue share allocation percentages between the Authority and the airlines based on the amounts available and Authority needs.

Source: DKMG Consulting, LLC, 2024.

Table 7-15 – Terminal Rental Rate (in 000s)

	Source Table	Budget 2024	Budget 2025	Forecast 2026	Forecast 2027	2028	2029	2030	2031	Forecast 2032	2033	2034	2035	2036	Forecast 2037	2038	2039	2040	2041
Requirement																			
Operating expenses	7-12	$7,492	$9,755	$10,211	$14,389	$14,821	$15,266	$15,724	$16,195	$16,681	$17,182	$17,697	$18,228	$18,775	$21,835	$22,489	$23,164	$23,859	$24,575
Deposit to O&M reserve (a)		588	1,131	228	2,089	216	222	229	236	243	250	258	265	273	1,530	327	337	347	358
Net depreciation (b)		480	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320
Net amortization (b)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital outlay (b)		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Debt service																			
Outstanding	7-4	0	0	0	10,468	10,462	10,465	10,460	10,462	10,465	10,467	10,462	10,461	10,465	10,465	10,469	10,460	10,462	10,466
Series 2035 Bond debt service	7-4	0	0	0	0	0	0	0	0	0	0	0	0	0	15,132	15,138	15,144	15,151	15,158
Debt service coverage (25%)		0	0	0	2,617	2,616	2,616	2,615	2,616	2,616	2,617	2,616	2,615	2,616	6,399	6,402	6,401	6,403	6,406
Total requirement		$8,610	$12,256	$11,809	$30,933	$29,485	$29,940	$30,398	$30,879	$31,375	$31,886	$32,403	$32,939	$33,500	$56,731	$56,196	$56,877	$57,593	$58,333
Credits																			
Security fee (c)	7-13	(858)	(1,393)	(1,400)	(1,440)	(1,480)	(1,520)	(1,570)	(1,620)	(1,670)	(1,720)	(1,770)	(1,820)	(1,870)	(1,930)	(1,990)	(2,050)	(2,110)	(2,170)
Loading bridge and ramp fees (c)		0	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Other		(16)	(16)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net requirement		$7,736	$10,746	$10,309	$29,393	$27,905	$28,320	$28,728	$29,159	$29,605	$30,066	$30,533	$31,019	$31,530	$54,701	$54,106	$54,727	$55,383	$56,063
Terminal square feet-rentable		62	62	62	149	149	150	150	150	150	150	150	150	150	281	281	281	281	281
Tml rental rate prior to rev share		$124.33	$172.71	$165.69	$197.77	$187.76	$189.25	$191.98	$194.86	$197.85	$200.92	$204.04	$207.29	$210.71	$194.84	$192.72	$194.94	$197.27	$199.69
Terminal square feet-airline leased		35	35	35	111	111	112	112	112	112	112	112	112	112	237	237	237	237	237
Airline requirement		$4,334	$6,020	$5,775	$21,948	$20,836	$21,144	$21,449	$21,771	$22,104	$22,448	$22,797	$23,160	$23,541	$46,125	$45,623	$46,147	$46,700	$47,273
Revenue share credit (d)		(1,278)	(858)	(1,208)	(7,060)	(6,428)	(5,616)	(5,726)	(5,837)	(6,332)	(6,444)	(6,559)	(6,676)	(6,794)	(8,635)	(8,870)	(9,071)	(9,274)	(9,482)
Adjusted net requirement		$3,056	$5,162	$4,567	$14,888	$14,408	$15,528	$15,723	$15,934	$15,772	$16,004	$16,238	$16,484	$16,747	$37,490	$36,753	$37,076	$37,426	$37,792
Terminal square feet-airline leased		35	35	35	111	111	112	112	112	112	112	112	112	112	237	237	237	237	237
Terminal rental rate		**$87.67**	**$148.09**	**$131.02**	**$134.15**	**$129.84**	**$138.98**	**$140.73**	**$142.62**	**$141.17**	**$143.24**	**$145.34**	**$147.54**	**$149.89**	**$158.37**	**$155.25**	**$156.62**	**$158.10**	**$159.64**
Terminal square feet-airline leased																			
Preferential space-assigned (e)		8.9	8.850	8.9	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	63.5	63.5	63.5	63.5	63.5
Joint use		26.0	26.0	26.0	82.7	82.7	83.4	83.4	83.4	83.4	83.4	83.4	83.4	83.4	173.2	173.2	173.2	173.2	173.2
Terminal rental rate																			
Preferential space-assigned (e)		$87.67	$87.67	$131.02	$134.15	$129.84	$138.98	$140.73	$142.62	$141.17	$143.24	$145.34	$147.54	$149.89	$158.37	$155.25	$156.62	$158.10	$159.64
Joint use		$87.67	$148.09	$131.02	$134.15	$129.84	$138.98	$140.73	$142.62	$141.17	$143.24	$145.34	$147.54	$149.89	$158.37	$155.25	$156.62	$158.10	$159.64
Terminal rental revenues																			
Preferential space-assigned (e)		$776	$776	$1,160	$3,799	$3,677	$3,936	$3,986	$4,039	$3,998	$4,057	$4,116	$4,178	$4,245	$10,058	$9,860	$9,947	$10,041	$10,139
Joint use		2,280	3,851	3,407	11,089	10,732	11,592	11,738	11,895	11,774	11,947	12,122	12,305	12,502	27,432	26,892	27,129	27,385	27,653
Terminal Rental Rate		$3,056	$4,627	$4,567	$14,888	$14,408	$15,528	$15,723	$15,934	$15,772	$16,004	$16,238	$16,484	$16,747	$37,490	$36,753	$37,076	$37,426	$37,792

(a) The O&M reserve is equal to six months of O&M expenses. This reflects the incremental amount.

(b) Reimbursement for the use of Authority funds for certain capital projects that are not bond financed.

(c) The budgeted rates and charges are calculated prior the Authority's overall budget being finalized. As a result, the 2024 and 2025 amount does not foot to the amount in Table 7-13.

(d) The Authority may apply revenue credits to reduce airline rentals and fees. The Authority determines the net gross revenue available for revenue sharing by taking budgeted revenues prior to revenue sharing less budgeted operating expenses and other obligations. The Authority then determines the revenue share allocation percentages between the Authority and the airlines based on the amounts available and Authority needs.

(e) For FY 2025, the terminal rental rate for preferential space is budgeted to remain at the FY 2024 rate. Joint use space is at the FY 2025 rate.

Source: DKMG Consulting, LLC, 2024.

Table 7-16 – Airline Cost per Enplanement (in 000s)

	Source Table	Budget 2024	Budget 2025	Forecast 2026	Forecast 2027	2028	2029	2030	2031	Forecast 2032	2033	2034	2035	2036	Forecast 2037	2038	2039	2040	2041
Airline revenues																			
Landing fees	7-14	$2,876	$4,775	$3,727	$4,324	$4,716	$5,174	$5,330	$5,492	$5,531	$5,704	$5,882	$6,067	$6,257	$5,881	$6,046	$6,231	$6,422	$6,619
Deicing chemicals	7-14	40	40	41	42	44	45	46	48	49	51	52	54	55	57	59	61	62	64
Terminal rentals	7-15	3,056	4,627	4,567	14,888	14,408	15,528	15,723	15,934	15,772	16,004	16,238	16,484	16,747	37,490	36,753	37,076	37,426	37,792
Loading bridge and ramp fees	7-15	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Security fee	7-15	858	1,393	1,400	1,440	1,480	1,520	1,570	1,620	1,670	1,720	1,770	1,820	1,870	1,930	1,990	2,050	2,110	2,170
Total airline revenues		$6,829	$10,935	$9,836	$20,794	$20,749	$22,367	$22,770	$23,194	$23,123	$23,579	$24,043	$24,524	$25,030	$45,457	$44,947	$45,517	$46,120	$46,745
Enplanements (a)	7-9	1,050	1,375	1,481	1,515	1,549	1,585	1,621	1,658	1,695	1,734	1,773	1,814	1,855	1,897	1,940	1,984	2,029	2,075
Airline cost per enplanement		**$6.50**	**$7.95**	**$6.64**	**$13.73**	**$13.39**	**$14.12**	**$14.05**	**$13.99**	**$13.64**	**$13.60**	**$13.56**	**$13.52**	**$13.50**	**$23.96**	**$23.17**	**$22.94**	**$22.73**	**$22.52**

(a) FY 2024 reflects budgeted enplanements, and therefore, does not foot to Table 7-1.

Source: DKMG Consulting, LLC, 2024.

Table 7-17 – Pro Forma Cash Flow (in 000s)

	Source Table	Total	Actual 2023	Budget 2024	Budget 2025	Forecast 2026	Forecast 2027	2028	2029	2030	2031	Forecast 2032	2033	2034	2035	2036	Forecast 2037	2038	2039	2040	2041
Revenues																					
Operating	7-13		$24,353	$25,441	$33,163	$33,500	$55,012	$55,748	$58,156	$59,371	$60,621	$61,388	$62,696	$64,036	$65,416	$66,834	$100,732	$101,452	$103,299	$105,202	$107,160
CFC			2,183	2,200	3,781	4,073	4,166	4,261	4,358	4,457	4,558	4,662	4,768	4,876	4,987	5,100	5,216	5,335	5,456	5,580	5,707
Interest income			1,149	100	500	505	510	515	520	526	531	536	541	547	552	558	563	569	575	580	586
Total revenues			$27,684	$27,741	$37,444	$38,078	$59,688	$60,524	$63,034	$64,353	$65,709	$66,586	$68,006	$69,459	$70,955	$72,493	$106,512	$107,356	$109,330	$111,363	$113,454
Less: operating expenses	7-12		($13,869)	($17,180)	($22,163)	($22,828)	($27,394)	($28,216)	($29,062)	($29,934)	($30,832)	($31,757)	($32,710)	($33,691)	($34,702)	($35,743)	($39,317)	($40,496)	($41,711)	($42,962)	($44,251)
Plus: expenses funded with ARPA			694	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plus: capital outlay			103	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Net revenues			$14,613	$10,661	$15,381	$15,350	$32,395	$32,409	$34,072	$34,519	$34,978	$34,929	$35,396	$35,868	$36,354	$36,850	$67,295	$66,960	$67,719	$68,500	$69,303
Outstanding bonds																					
Total debt service	7-4		$1,701	$1,703	$1,705	$11,539	$27,315	$27,309	$27,310	$27,307	$27,310	$25,608	$25,610	$25,605	$25,604	$25,608	$25,608	$25,612	$25,603	$25,605	$25,609
Less: PFC eligible debt service			0	0	0	(2,952)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)	(7,800)
Less: state funded debt service			0	0	0	(6,887)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)	(7,343)
Series 2035 Bond debt service	7-4			0	0	0	0	0	0	0	0	0	0	0	0	0	23,349	23,358	23,368	23,378	23,389
Total debt service			$1,701	$1,703	$1,705	$1,700	$12,172	$12,166	$12,167	$12,164	$12,167	$10,465	$10,467	$10,462	$10,461	$10,465	$33,814	$33,827	$33,828	$33,841	$33,855
Net remaining revenues			$12,912	$8,958	$13,676	$13,650	$20,222	$20,243	$21,905	$22,355	$22,810	$24,464	$24,929	$25,405	$25,893	$26,385	$33,481	$33,133	$33,891	$34,660	$35,447
Debt service coverage																					
Net revenues			$14,613	$10,661	$15,381	$15,350	$32,395	$32,409	$34,072	$34,519	$34,978	$34,929	$35,396	$35,868	$36,354	$36,850	$67,295	$66,960	$67,719	$68,500	$69,303
Debt service			$1,701	$1,703	$1,705	$1,700	$12,172	$12,166	$12,167	$12,164	$12,167	$10,465	$10,467	$10,462	$10,461	$10,465	$33,814	$33,827	$33,828	$33,841	$33,855
Debt service coverage			**8.59x**	**6.26x**	**9.02x**	**9.03x**	**2.66x**	**2.66x**	**2.80x**	**2.84x**	**2.87x**	**3.34x**	**3.38x**	**3.43x**	**3.48x**	**3.52x**	**1.99x**	**1.98x**	**2.00x**	**2.02x**	**2.05x**
Surplus Fund																					
Beginning balance (a)		$40,360		$40,360	$44,698	$55,158	($16,475)	($1,733)	$18,510	$40,415	$62,770	$85,580	$110,044	$131,373	$154,279	$180,172	$206,556	$142,375	$77,846	$111,736	$143,396
Plus: net remaining revenues		$441,506		$8,958	$13,676	$13,650	$20,222	$20,243	$21,905	$22,355	$22,810	$24,464	$24,929	$25,405	$25,893	$26,385	$33,481	$33,133	$33,891	$34,660	$35,447
Less: CIP funded with AVL funds	7-10	($330,478)		($4,620)	($3,216)	($85,283)	($5,480)	$0	$0	$0	$0	$0	($3,600)	($2,500)	$0	$0	($97,662)	($97,662)	$0	($3,000)	($27,455)
Ending balance (b)		$151,388		$44,698	$55,158	($16,475)	($1,733)	$18,510	$40,415	$62,770	$85,580	$110,044	$131,373	$154,279	$180,172	$206,556	$142,375	$77,846	$111,736	$143,396	$151,388
Days cash on hand (c)				860	736	882	(220)	(22)	233	493	743	984	1,228	1,427	1,623	1,840	1,918	1,283	683	949	1,183

(a) FY 2024 beginning balance equals the cash and cash equivalents in the Authority's Statement of Net Position as of June 30, 2023.

(b) Negative cash flow begins in the year the parking expansion (Project #14 in Table 7-10) needs to be funded. This also decreases the DCOH below 600 days, which is the Authority's target.

(c) Authority intends on maintaining at least 600 DCOH during the planning period. DCOH falls below this target between FY 2027 and FY 2031 as a result of funding the parking expansion. However, the Authority's DCOH exceeds the Authority's target in future and therefore, in FY 2037 and FY 2038 is used to fund future terminal projects in an amount that still maintains the desired 600 DCOH by FY 2039.

Source: DKMG Consulting, LLC, 2024.

8 AIRPORT LAYOUT PLAN

This Chapter presents the Airport Layout Plan (ALP) for the recommended developments at Asheville Regional Airport ('AVL' or 'the Airport'). The ALP illustrates the recommended future airport facilities, airspace, and serves as the official development plan for the Airport. A number of additional drawings that illustrate the surrounding airspace and land use were included to support the ALP. The combined set of drawings is termed the ALP Drawing Set. This Chapter contains the Summary of the Recommended Plan and a description of the ALP drawing set. The ALP can be found in **Appendix F**.

8.1 SUMMARY OF RECOMMENDED PLAN

The overall recommended airport developments for AVL were presented in Chapter 5 (**Figure 5-22**). The plan includes recommendations for the airfield, passenger terminal, landside, general aviation (GA), and support facilities, which have been organized into three implementation phases: short-term, mid-term, and long-term.

It should be noted that potential obstructions for removal/relocation (i.e., tree clearings,) and property acquisitions were not shown in the **Chapter 5** figures, as they occur beyond the property of the Airport; however, these potential projects are included in the recommendations.

8.2 AIRPORT LAYOUT PLAN

The ALP drawings illustrate all development projects identified for AVL throughout the 20-year planning horizon. Upon approval by the Federal Aviation Administration (FAA), the ALP becomes the official planning document for the Airport. The FAA requires that all new airport facilities be consistent with the ALP. As such, keeping the drawings updated to accurately reflect the current conditions at the Airport should be a high priority. Furthermore, any future development which will be funded by Airport Improvement Program funds must be on an approved ALP prior to grant issuance. At a minimum, the FAA requires that the ALP be updated at least every five years. Although the ALP is the only drawing that is signed by the FAA, it is part of a larger drawing set that includes the sheets listed below.

Table 8-1 – ALP Drawing Index

SHEET INDEX	
SHEET NO.	**DESCRIPTION**
1	Title Sheet
2	Data Sheet
3	Existing Airport Layout Plan
4	Future Airport Layout Plan
5	Airspace Plan (1 of 2)
6	Airspace Plan (2 of 2)
7	Inner Approach Surface – Runway 17
8	Inner Approach Surface – Runway 35
9	Terminal Area Plan (1 of 3)

SHEET INDEX	
10	Terminal Area Plan (2 of 3)
11	Terminal Area Plan (3 of 3)
12	Land Use Plan
13	Airport Property Map
14	Airport Property Map Tables

Source: CHA, 2024.

The Greater Asheville Regional Airport Authority ('GARAA' or 'the Authority') and the FAA maintain full size copies of the final approved ALP Set. Each of the drawings is described below in the subsequent sections.

The following publications were used during the preparation of the drawing set:

- FAA Advisory Circular 150/5300-13B, *Airport Design*
- FAA Advisory Circular 150/5070-6B, *Airport Master Plans*
- Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*

8.2.1 Title Sheet

The Title Sheet includes a Sheet Index, Location Map, and State Map. Space is provided for signatures of approval.

8.2.2 Airport Data Sheet

The Data Sheet includes the following information: Airport Data, Runway Data, and Windrose Diagrams & Weather Coverage [Visual Flight Rules (VFR), Instrument Flight Rules (IFR), and All Weather].

A majority of the information contained in the Airport Data Sheet is reflected graphically within the ALP drawings (Existing ALP and Future ALP).

8.2.3 Existing and Future Airport Layout Plan

The next two sheets of the drawing set consist of the Existing ALP and Future ALP.

Existing ALP

The Existing Airport Layout Plan depicts the Airport as it exists today. The drawing identifies all key FAA airfield design standards [e.g., Runway Safety Areas (RSA), Object Free Areas (OFA), Object Free Zones (OFZ), Runway Protection Zones (RPZ), etc.], traverse ways, and illustrates all landside facilities.

Future ALP

The Future ALP include all features of the Existing ALP, as well as all proposed facilities, airfield improvements, and recommendations. This drawing is reviewed by several offices within the FAA for consistency with airport design standards, flight procedures, airspace, and environmental requirements. Approval indicates the FAA's endorsement of the proposed project types and

locations, but development may still be predicated upon environmental approvals and demand/capacity justification.

Note that projects illustrated on the ALP do not commit GARAA to pursue their development, nor does it ensure that FAA funding will be available. The projects are intended to depict the 'build-out' of the Airport within the 20- year planning period and through Planning Activity Level (PAL) 4. Also note, that the FAA considers ALP approval as 'conditional', pending environmental review under the National Environmental Policy Act (NEPA).

The ALP drawings were prepared in accordance with the FAA design standards for Airport Reference Code (ARC) C-III; however, Runway 17-35 can currently accommodate up to C-IV aircraft (i.e., B757-200).

The future ALP also addresses Runway 17/35 to be extended an additional 1,000 feet, from 8,002 feet in length to 9,002 feet in length if needed in the future. The extension will alter and extend parallel Taxiway A and B and modify the Taxiway A6 connector. These modifications will bring each taxiway connector up to current FAA standards (i.e., pavement geometry, crossing the middle third of the runway, runway to taxiway separation, clear runway safety area, etc.) and will allow for improved operational flexibility. The existing hotspot on Taxiway A will be eliminated by the new Air Traffic Control Tower (ATCT) under construction.

The most significant landside development is the expansion of the terminal complex in the mid and long-term, following the ongoing terminal improvement. Additional future development is attributed to terminal apron expansion, additional taxiway connectors to reach corporate aeronautical development plans, and advancing non-aeronautical spaces to gain supporting infrastructure needed for operation with an extended runway. As shown in the ALP drawing (Sheet 4), the RPZ for Runway 17 extends beyond airport property and will require acquisition or easement.

8.2.4 Airspace Plans

The next several sheets of the ALP drawing set illustrate the airspace requirements described in Title 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. Part 77.19 identifies a series of geometric planes (imaginary surfaces) that extend outward and upward from civil airports' runways and define the obstruction clearing requirements. These surfaces identify the maximum acceptable height of objects by defining three-dimensional areas surrounding all sides of the airfield. When an object penetrates an imaginary surface, it is considered an airspace obstruction, and all obstructions are treated as potential hazards to air navigation (unless a FAA aeronautical study determines otherwise).

Imaginary Surfaces

The height and dimensions of the imaginary surfaces are determined by the airfield and runway end elevations, the type of aircraft using the facilities, and the availability of instrument approaches to the runway ends (approach type and visibility minimums). The first sheet of the Airspace Plan provides an overall depiction of these surfaces. For AVL, the specific surfaces are described below. The Airspace Plan (Sheet 5) depicts the surfaces as they relate to the entire

facility followed by those surfaces relating to specific runway ends (Sheet 6).

A brief description of each surface is provided in the subsections to follow.

Primary Surface

The primary surface is longitudinally centered on each runway and extends 200 feet beyond the runway ends. Per Title 14 CFR Part 77, the width of the primary surface for precision runways, such as Runway 17/35, is 1,000 feet.

The elevation of the primary surface is equal to the elevation of the nearest point of a runway centerline. Note that the highest point of the primary surface determines the official airport elevation [i.e., for AVL: 2,164 feet mean sea level (MSL)].

Horizontal Surface

The horizontal surface consists of the horizontal plane 150 feet above the Airport's elevation of 2,164 feet MSL; therefore, the horizontal surface at AVL is situated at 2,314 feet above MSL. The shape of the surface is created using radial arcs of 10,000 feet from the ends of the primary surface of the runways at AVL, connected by lines tangent to the arcs.

Conical Surface

The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20 to 1, for a horizontal distance of 4,000 feet. At AVL, the elevation of the outer edge of the conical surface is 2,514 feet MSL.

Approach Surface

Approach surfaces are longitudinally centered on the runway centerlines and extend outward and upward from the ends of the primary surfaces. The inner edge of the approach surface is the same width as the primary surface and extends uniformly to a designated width dependent on the type of runway (i.e., utility, civil, visual, precision, non-precision, etc.). The approach surface extends for a horizontal distance at a specified slope, also dependent upon whether the runway is a visual, non-precision instrument, or a precision instrument runway. For AVL, both runway end are precision instrument, with the dimensions and slopes listed in **Table 8-2**.

Table 8-2 – Approach Surface Dimensions (Existing & Future)

Runway End	Inner Width (Ft.)	Outer Width (Ft.)	Length (Ft.)	Slope
Runway 17	1,000	16,000	10,000 (+40,000)	50:1 (40:1)
Runway 35	1,000	16,000	10,000 (+40,000)	50:1 (40:1)

Note: A Precision Approach Runway has a 50,000-foot-long Approach Surface. The first 10,000 feet slope upward at a 50:1 slope, the remaining 40,000' slope upward at 40:1.
Source: CHA, 2024.

Transitional Surface

Transitional surfaces extend outward and upward at right angles from the sides of the primary and approach surfaces at a slope of 7 to 1 (7:1), with the transitional surfaces terminating at the

overlying horizontal surface. The full dimensions of the Part 77 surfaces and obstructions located within the outer portions of the approach, horizontal, and conical surfaces are provided within the Airspace Plan drawing sheets.

Inner Approach Surfaces

The inner approach surface at the end of each runway is illustrated in greater detail within Sheet 7 (Runway 17) and Sheet 8 (Runway 35). By definition, the inner portion of the surface extends outward to the point where the approach reaches 100 feet above the runway end elevation. These sheets illustrate approach obstructions in a greater level of detail to identify specific objects, such as trees, poles, and building penetrations. Significant objects within the approach surfaces which are not obstructions are also shown to illustrate the Airport operating environment. As common to most airports, multiple penetrations to the surrounding airspace were identified for Runway 17, in particular the Part 77 approach surface and the adjacent location of the horizontal surface. No obstructions were identified within the Runway 35 Part 77 inner approach surface.

8.2.5 Terminal Area Plan

The Terminal Area Plan is depicted across three sheets (Sheets 9, 10, and 11) and illustrates existing and future infrastructure, including but not limited to, those pertaining to the terminal building, vehicular parking, support facilities (i.e., general aviation, Aircraft Rescue and Firefighting, maintenance and equipment storage, etc.), non-aeronautical use facilities, and rental cars. The facilities depicted are identical to that depicted on the ALP, but at a larger scale and in greater detail.

- Highlights of the proposed new facilities on the Terminal Area Plan include, but are not limited to: Expansion of the Passenger Terminal Complex and Parking
- Expanded General Aviation Apron and New Taxiway Connectors
- Future hangar development
- Terminal Apron Expansion
- Fuel Farm Expansion
- Future Parking Garages and Parking Areas
- Roadway Realignment
- Aeronautical or Non-Aeronautical Development Areas

The construction of the new and expanded terminal facilities will be conducted via a phased approach, thus limiting impacts to passenger activity. Financial planning and financing will be required when undertaking each phased approach; therefore, availability of funding will also affect the timing and ultimate level of development.

Non-Aeronautical Development

The Terminal Area Plan includes some development that is categorized as non-aeronautical development, which can include support facilities (e.g, airport hotel) and airport-compatible commercial development.

8.2.6 Land Use Plan

As discussed in **Chapter 6**, the land surrounding the Airport contains a diverse mix of uses. As shown within Sheet 12, existing land use for off-airport land uses identified include: industrial, residential, commercial, and mixed use.

Airport development has the potential to impact sensitive areas such as residences, schools, churches, etc.; however, airports are typically considered to be compatible with commercial, industrial, and agricultural activities. The future Land Use planning identifies a change in noise contours within the 0 to 5 year planning horizon. Note that no noise sensitive land uses are located within the noise contours. Furthermore, within the area shown on this sheet, there are no school or churches.

8.2.7 Airport Property Map and Tables

The final sheets of the ALP set are the Airport Property Map (Sheet 13) and Airport Property Data Tables (Sheet 14). The Airport Property Map drawing is often called the "Exhibit A" when it includes all the required property data. The property map is a required attachment for FAA grant applications, and is attached as Exhibit A.

The primary purpose of this drawing and the associated data tables is to provide information indicating how various tracts of airport property were acquired (i.e., federal programs, local funds only, etc.). The map helps the FAA identify the current and future aeronautical uses of properties acquired with federal funds. The map also identifies each location that is proposed or planned for ultimate acquisition. An "Exhibit A" is for illustration purposes and does not constitute a property boundary survey or other legal documentation.

APPENDIX A – RECOMMENDED FORECAST

Table A1 – Recommended Forecast (2021-2041)

Year	Based Aircraft	Enplanements	Operations					
			Commercial	General Aviation		Military		Total
				Itinerant	Local	Itinerant	Local	
2021	161	716,015	20,328	34,665	16,343	3,477	925	75,738
2022	162	834,995	23,896	34,900	16,454	3,477	925	79,652
2023	164	930,882	25,861	35,331	16,657	3,477	925	82,251
2024	165	992,896	26,683	35,547	16,758	3,477	925	83,390
2025	167	1,015,479	26,376	35,977	16,962	3,477	925	83,717
2026	168	1,038,576	26,054	36,193	17,063	3,477	925	83,712
2027	169	1,062,198	26,487	36,408	17,165	3,477	925	84,462
2028	171	1,086,357	26,927	36,839	17,368	3,477	925	85,536
2029	172	1,111,066	27,374	37,055	17,469	3,477	925	86,300
2030	173	1,136,337	27,830	37,270	17,571	3,477	925	87,073
2031	175	1,162,182	28,292	37,701	17,774	3,477	925	88,169
2032	176	1,188,616	28,762	37,916	17,876	3,477	925	88,956
2033	178	1,215,650	29,241	38,347	18,079	3,477	925	90,069
2034	179	1,243,300	29,727	38,563	18,180	3,477	925	90,872
2035	181	1,271,578	30,221	38,994	18,383	3,477	925	92,000
2036	182	1,300,499	30,723	39,209	18,485	3,477	925	92,819
2037	184	1,330,079	31,234	39,640	18,688	3,477	925	93,964
2038	185	1,360,331	31,753	39,855	18,790	3,477	925	94,800
2039	187	1,391,271	32,281	40,286	18,993	3,477	925	95,962
2040	188	1,422,915	32,817	40,502	19,094	3,477	925	96,815
2041	190	1,455,279	33,363	40,932	19,298	3,477	925	97,995
AAGR 2021-2041	**0.8%**	**3.6%**	**2.5%**	**0.8%**	**0.8%**	**0.0%**	**0.0%**	**1.3%**
Growth Rate 2021-2041	**18.0%**	**103.2%**	**64.1%**	**18.1%**	**18.1%**	**0.0%**	**0.0%**	**29.4%**

Note: Average Annual Growth Rate (AAGR).

Source: FAA 2021 TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2022.

APPENDIX B – FORECASTS, GROWTH RATES, & OPERATIONAL FACTORS

Table B1 – FAA Appendix B: Airport Planning Forecasts

A. Forecast Levels and Growth Rates (Sample Data Shown)

						Average Annual Compound Growth Rates			
Specified Base Year: 2021	**Base Yr. Level**	**Base Yr. +1yr.**	**Base Yr. +5yrs.**	**Base Yr. +10yrs.**	**Base Yr. +15yrs.**	**Base Yr. to +1**	**Base Yr. to +5**	**Base Yr. to +10**	**Base Yr. to +15**
Passenger Enplanements									
Air Carrier	716,015	834,995	1,038,576	1,162,182	1,300,499	16.6%	7.7%	5.0%	4.1%
Operations									
Itinerant									
Air carrier	20,328	23,896	26,054	28,292	30,723	17.6%	5.1%	3.4%	2.8%
General aviation	34,665	34,900	36,193	37,701	39,209	0.7%	0.9%	0.8%	0.8%
Military	3,477	3,477	3,477	3,477	3,477	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	16,343	16,454	17,063	17,774	18,485	0.7%	0.9%	0.8%	0.8%
Military	925	925	925	925	925	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	**75,738**	**79,652**	**83,712**	**88,169**	**92,819**	**5.2%**	**2.0%**	**1.5%**	**1.4%**
Peak Hour Operations	28	30	31	33	35	5.81%	2.3%	1.7%	1.4%
Cargo/mail (enplaned + deplaned tons)	0	0	0	0	0	-	-	-	-
Based Aircraft									
Single-Engine	144	145	147	150	154	0.69%	0.4%	0.4%	0.4%
Multi-Engine	9	9	9	10	10	0.86%	0.0%	1.1%	0.7%
Jet	5	5	9	12	15	0.00%	12.5%	9.1%	7.6%
Helicopter	3	3	3	3	3	-	-	-	-
TOTAL	**161**	**162**	**168**	**175**	**182**	**0.7%**	**0.9%**	**0.8%**	**0.8%**

B. Operational Factors

	Base Yr. Level	**Base Yr. +1yr.**	**Base Yr. +5yrs.**	**Base Yr. +10yrs.**	**Base Yr. +15yrs.**
Average aircraft size (seats per departure)	97	98	109	109	109
Average enplaning load factor	72.6%	71.6%	73.3%	75.6%	77.9%
GA operations per based aircraft	317	317	317	317	317

Source: FAA 2021 TAF, FAA OPSNET, Bureau of Transportation Statistics, Woods & Poole Economics, Airport Master Record (Form 5010), GARAA, CHA, 2022.

APPENDIX C – FAA FORECAST APPROVAL LETTER

U.S. Department of Transportation
Federal Aviation Administration

Memphis Airports District Office
2600 Thousand Oaks Blvd, Suite 2250
Memphis, Tennessee 38118

Phone: 901-322-8180

January 17, 2023

Mr. Michael A. Reisman, A.A.E.
Chief Operating Officer
Asheville Regional Airport
61 Terminal Drive, Suite 1
Fletcher, NC 27832

Master Plan/Aviation Activity Forecast
Asheville Regional Airport (AVL)

Dear Mr. Reisman:

We have reviewed the Aviation Demand Forecasts for AVL dated September 14, 2022. As a result of our review, we find it consistent with the 2021 Federal Aviation Administration (FAA) Terminal Area Forecast (TAF). Based on this finding, the master plan baseline forecast is approved for use. Should you have any questions, please feel free to contact me by e-mail at Jamal.Stovall@faa.gov or via telephone at 901-322-8185.

Sincerely,

JAMAL R STOVALL
Digitally signed by JAMAL R STOVALL
Date: 2023.01.17 16:16:45 -06'00'

Jamal Stovall, Community Planner
Memphis Airports District Office

Asheville Regional Airport Master Plan Update

Energy Audit

September 2024

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REPORT DISCLAIMER

This audit was conducted in accordance with the standards developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for a Level II Audit. Cost and savings calculations for a given measure were estimated to within ±20 percent, and are based on data obtained from the owner, data obtained during site observations, professional experience, and standard engineering practice. Cost data does not include soft costs such as engineering fees, legal fees, project management fees, financing, etc.

A walkthrough of the building was performed, which included gathering nameplate information and operating parameters for all accessible equipment and lighting systems. Unless otherwise stated, model, efficiency, and capacity information included in this report were collected directly from equipment nameplates and /or from documentation provided by the owner during the site visit. Typical operation and scheduling information were obtained from interviewing staff and spot measurements taken in the field.

EXECUTIVE SUMMARY

As part of the Airport Master Plan Update, the Greater Asheville Regional Airport Authority (GARAA) requested a review of up to 10 buildings at Asheville Regional Airport ('AVL' or 'the Airport), except for the terminal building due to a renovation design that was underway. Buildings 15, 15A, 15B, 21, 65, 87, 70, 134, and 136, as well as the Aircraft Rescue and Fire Fighting (ARFF) facility, were evaluated on August 15, 2022. The Parking Garage Roof Assessment, which was previously completed, was also reviewed by CHA Consulting, Inc. ('the Consultant) for comment.

Generally, the lighting, heating, ventilation, and air conditioning (HVAC), domestic hot water (DHW), and other building electric and gas loads were reviewed for potential energy conservation measures. Utility bills from July 2022 were provided for several of the meters at the Airport. The terminal electric rate was excluded from the blended rate calculation. A July 2022 natural gas bill was used for the Building 15 garage shed to determine the natural gas utility rate of $1.094 per therm. The following table shows the details obtained from the electric bills provided by GARAA. The overall utility rate was used in calculating savings for each of the measures.

Table E-1 – Electric Utility Rates

Building	Jul-21					Annual
	kWh	kW	LF	Cost ($)	$/kWh	kWh
DPS	23,972	47.8	50%	$ 2,081.77	$ 0.09	227,608
House Meter	9,649	19.4	63%	$ 1,040.91	$ 0.11	108,134
Maintenance	10,413	33.1	38%	$ 1,143.18	$ 0.11	114,817
Meter Svc (134)	4,249	15.4	35%	$ 493.32	$ 0.12	52,709
Overall	**48,283**	**115.7**		**$ 4,759.18**	**$ 0.10**	**503,268**

Source: July 2022 Electric Bills (provided by GARAA), CHA, 2022.

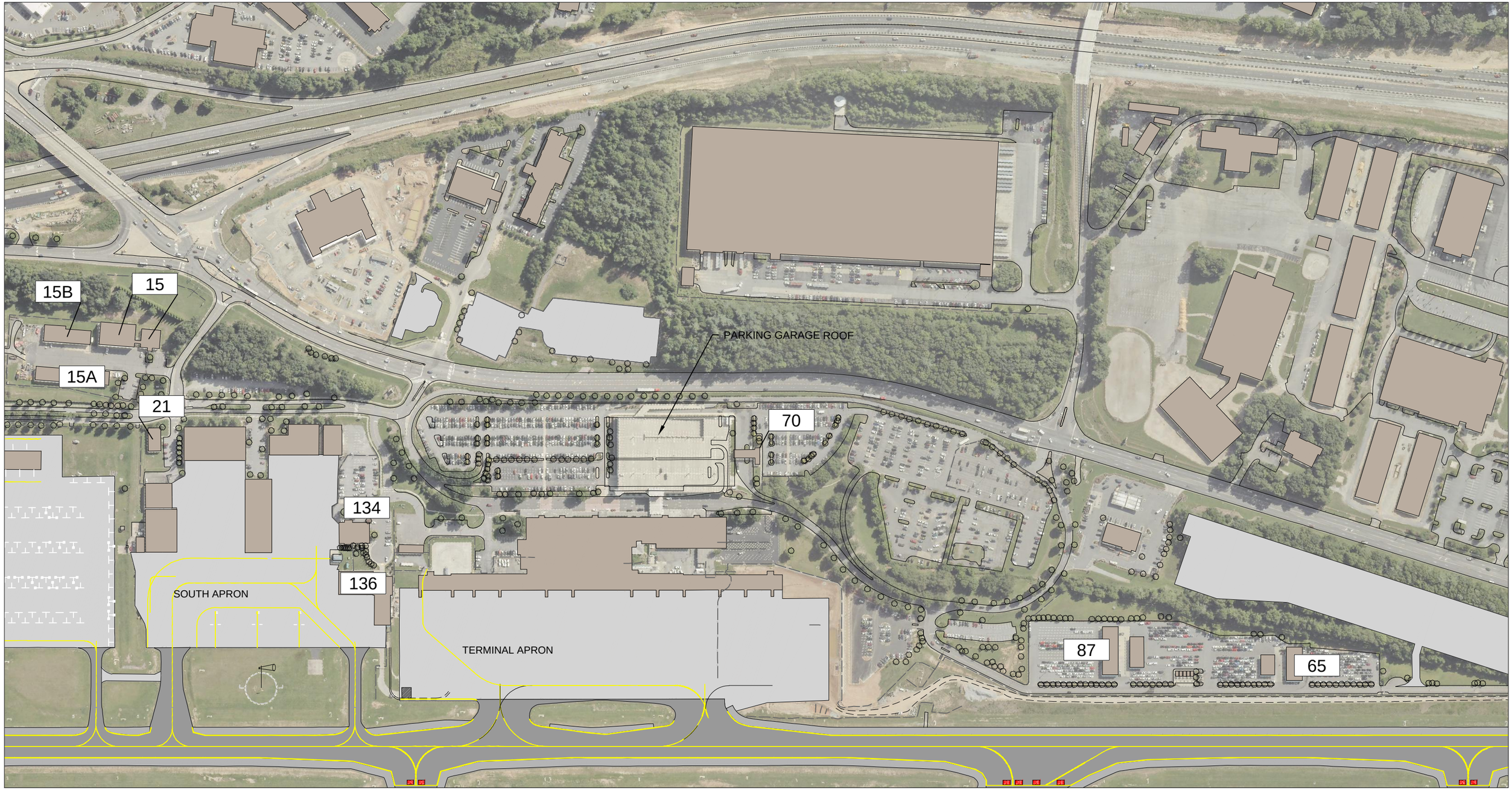
Based on the inspection of the buildings, it is evident that GARAA is committed to reducing utilities through building energy efficiency. At the time the fieldwork was performed, the operations building (Building 134) was under reconstruction, with new HVAC equipment, tankless DHW, and LED lighting already being installed. Department of Public Safety (Building 136) and the ARFF buildings, which were recently constructed in 2014, contain energy-efficient equipment such as LED lighting, VRF system, tankless DHW, destratification fans, and efficient infrared heaters. The following recommendations do not include any changes for these three buildings. See **Table E-2**. A building location map is provided in **Figure E-1**.

All savings calculations and vendor cost estimates are found in **Appendix A** and **Appendix B**.

Table E-2 –Recommended Energy Conservation Measures

Recommended	ECM	Description	Buildings	kW Savings	kWh Savings	Natural Gas Savings (Therms)	Cost Savings	Budgetary Estimate	Simple Payback (Years)
Yes	1	LED Lighting Replacement	15/A/B, 21, 65/87, 70	5.8	38,548	0	$3,799.63	$27,200.00	7.2
Yes	2	Lighting Controls	15/A/B, 21, 65/87, 71	0.0	10,557	0	$1,040.57	$11,800.00	11.3
No	3	HVAC Upgrades	15/15 Shed, 21, 65, 87	3.3	4,061	0	$400.29	$35,400.00	88.4
Yes	4	Replace Unit Heaters with Infrared Heaters	15A, 15B, 65, 87	0.0	0	1,347	$1,473.62	$50,100.00	34.0
Yes	5	Install Destratification Fans in Maintenance Shed	15 Shed	-0.7	-3,526	1,502	$1,296.20	$12,200.00	9.4
Yes	6	Night Setback	15/15 Shed, 21, 65, 87	1.1	3,958	0	$390.14	$500.00	1.3
Yes	7	Replace Car Wash Bay Doors with Quick Open/Close	65, 87	-1.9	-3,577	8,268	$8,694.61	$161,500.00	18.6
Yes	8	Replace Vacuum System with Energy Efficient Model (Car Wash)	65, 87	7.5	127,250	0	$12,542.81	$102,100.00	8.1
No	9	Replace Storage Water Heaters with Tankless Water Heaters	15, 15 Shed, 21, 65, 87	0.0	812	106	$196.43	$8,300.00	42.3
Yes	10	PV Roof for Parking Garage		737.0	1,316,921	0	$129,806.85	$3,298,291.00	25.4
			Totals	**748.7**	**1,490,130**	**11,117**	**$159,044.44**	**$3,663,691.00**	**23.0**

Source: CHA, 2022.



Asheville REGIONAL AIRPORT
MASTER PLAN UPDATE

CHA

GRAPHIC SCALE (FEET)

0 150 300 600

Figure E-1
Building Location Map

File: \\CHA-LLP.COM\PROJ\PROJECTS\ANY\K6\068167.000\09_DESIGN\EXHIBITS\EXH-AVL-ENERGY.DWG Saved: 7/8/2024 4:15:11 PM Plotted: 7/10/2024 9:13:55 AM Current User: Curtice, Alexander LastSavedBy: 8400

1 EXISTING CONDITIONS

As part of the Airport Master Plan Update for AVL, Buildings 15, 15A, 15B, 21, 65, 87, 70, 134, and 136, and the ARFF facility were reviewed for energy usage opportunities. The focus of the fieldwork was to evaluate the energy-consuming equipment, such as lighting, HVAC, and controls. The energy audit utilized nameplate data, site observations, and interviews with the staff to understand the control and operation of equipment. Airport staff provided supplemental information regarding the age, condition, and operation of several pieces of equipment.

1.1 MAINTENANCE BUILDINGS (15, 15A, 15B)

The Maintenance Department is supported by three separate structures Building 15, Building 15A, and Building 15B.

Building 15

The main building, Building 15, consists of two distinct building types: commercial and a high-bay garage. Typical operating hours for the Maintenance Department are Monday through Friday from 8:00 a.m. to 5:00 p.m. In inclement weather, these hours will fluctuate on an as-need basis.

Figure 1-1 – Building 15 and 15 Garage Shed

Source: CHA, 2022.

Commercial Area

The main building envelope is half stone exterior with metal siding and a metal roof. The maintenance shed has metal siding and a metal roof. The entrance to the main building leads to the lobby with a conference room, dorm rooms, lockers/restrooms, and a kitchen. Facility personnel advised that due to being located next to an embankment, the dorm rooms and hallways experience humidity issues, thus, making staff unable to setback temperatures during the summer. The dorm/locker rooms, offices, and conference rooms are served by 3.5-ton, 5-ton, and 3-ton Packaged HVAC units that provide DX cooling and gas heat. Each area has local programable thermostats with both cooling and heating setpoints of 70°F and 68°F, respectively.

The thermostats need to be turned from heating to cooling manually. The domestic hot water (DHW) is supplied by an 80-gallon natural gas storage tank-type water heater with a setpoint of ~130°F and tempered with make-up water to be delivered at 100°F. The DHW serves the sinks, showers, and the kitchen. The interior lighting is made up of both T8 and LED fixtures; however, it was noted that staff typically only keep the LED fixtures on with manual switches. The exterior lighting was standard metal halide wall-pack style.

Completion of this inspection concluded that there are opportunities within this building to replace exterior lighting with more efficient LED lighting, implement HVAC temperature setbacks, and lower the DHW generation setpoint.

High-Bay Garage Area

The high-bay garage is a two-story structure that contains an enclosed office space, a tool room, individual men's/women's restroom, a mezzanine, and garage space to service the maintenance vehicle fleet. The walls and roof are metal and are minimally insulated.

The office, tool room, and restroom conditioning are provided by 2.5-ton and 2-ton Packaged HVAC units that provide DX cooling and natural gas furnace. Each unit is controlled with a programmable thermostat. While these thermostats had setback programmed, the programs were overridden with a 72°F setpoint. Four exhaust fans are in each quadrant of the garage bay, each having its control based on temperature. The thermostat is a dial with each setpoint set at the max value of 85°F. There is a vacuum system installed which is intended to remove exhaust from the vehicles if the bay doors are not able to be opened. The facility personnel indicated that this system was never utilized.

Heating to the bay area is provided by eight natural gas infrared heaters. The heaters are controlled by two thermostats (4 front and 4 back) with a 65°F setpoint. There is no cooling supplied to the garage bay. There is an opportunity to add destratification fans to circulate air in the winter and reduce heating. DHW is supplied by a 65-gallon natural gas storage tank-type water heater.

Lighting is (28) T5HO 6-lamp high bay fixtures controlled by switches. The tools used are supplied with compressed air supplied by a 10 HP, 120-gallon reciprocating air compressor with an additional air receiver at approximately 90 psig.

There was no air dryer, and the facility staff reported they have not had any issues with moisture in the compressed air equipment.

Building 15B

The next building inspected was Maintenance Building 15B. The building is constructed of metal walls and roof with minimal insulation and uninsulated metal garage bay doors. This building is divided into two sections.

The first is a storage garage for the facility's large roadway/runway maintenance equipment. There are two ceiling exhaust fans, as well as two relief air dampers on the rear side of the garage. They all have individual thermostats set at 85°F and an on/off switch for operation. Neither the exhaust fans nor the relief air dampers are open and in use due to the function of this building. When needed, heating is provided by two natural gas unit heaters with a nominal capacity of 75 MBH with an efficiency of 81 percent.

The extension to Building 15B houses two very large runway cleaning vehicles for each of the two bay doors. There are two infrared unit heaters with a thermostat set at a minimum of 40°F. There is one exhaust fan for the space which is normally switched off and has a thermostat set to its maximum of 85°F for when it operates. Two relief dampers have local switches at the source. The lighting fixtures were replaced 7 to 8 years ago with 6-lamp T8 fluorescent fixtures.

Figure 1-2 – Building 15B and 15B Extension (Left Two Bays)

Source: CHA, 2022.

Building 15A

Maintenance Building 15A is made up of five sections with multiple bay doors per section. The building envelope is similar to Building 15B. In the first section (starting from the right side when looking at the building), the space is used as another storage bay for large equipment. There is one exhaust fan that is set to a 62°F setpoint. Three infrared unit heaters serve the space with

manual thermostats set to 45°F. There are two relief dampers, one open and one closed at the time of the site visit. The lighting consists of (17) T8 2-lamp 8' fixtures.

The next two bay doors make up a woodworking shop. There is a dust collector system that has a manual on/off switch. It was not in use at the time and presumably is only used when needed. There is one exhaust fan at the back wall, and it's controlled with an older-style thermostat at a 75°F setpoint. The shop is fitted with fiberglass insulation along the walls and ceiling. There is one unit heater with a rated capacity of 60,000 BTU/hr and a thermal efficiency of 81%. The same thermostat is controlling the unit heater to a 50°F setpoint. The lighting consists of eight 6-lamp 4' T8 fluorescent fixtures.

The following section has two bay doors and houses snowplows, trailers, and grounds maintenance equipment as needed. The unit heater in this space is only five years old; it is a Trane unit heater with a 60,000 BTU/hr capacity and 83% thermal efficiency. The lighting consists of eight 6-lamp 4' T8 fluorescent fixtures. There are small toilet and kitchen exhaust fans along the old exterior cinderblock wall that is no longer in use.

The following single-bay section is the abandoned original maintenance shop with a vehicle bay, office, kitchen, and washroom. It's currently used for storage and the unit heaters are kept running when the temperature drops below 60°F to prevent any freezing. There is an exhaust fan with a manual switch (normally off) and a window relief damper not in use. The unit heater is rated for 100k BTU/hr. The lighting consists of (12) 6-lamp 8' T5 fluorescent fixtures.

The last section is a single-bay storage area which contains a unit heater rated for 60,000 BTU/hr. There is a single exhaust fan on the roof and the lighting consists of nine 6-lamp 8' T5 fixtures.

Figure 1-3 – Building 15A

Source: CHA, 2022.

1.2 AVIATION CENTER (21)

Building 21 accommodates the staff and students at the Western North Carolina Aviation flight school. Typical occupied hours are Monday through Friday from 8:00 a.m. to 5:00 p.m., with some occasional use on the weekends.

The exterior has metal siding and roof material. The interior has eight-foot ceilings and is typical building construction with fiberglass insulation and double paned windows. The facility is comprised of a lobby, a large classroom with three cubbies along the back wall, a kitchenette, a bathroom, offices, a training room, and a flight simulator room.

The packaged DX air conditioning unit capacities are 3.5 tons and 4 tons, with both natural gas heating units having an input of 84 MBH and an output of 68 MBH. The space is controlled by a typical programmable thermostat set to 73°F. The kitchen and bathroom sinks are served by a small 19-gallon electric domestic hot water tank. Two air conditioning units provide forced hot air heating when needed. The lights are made up mostly of 4' T8 fluorescent fixtures and are switch-controlled.

Figure 1-4 – Building 21

Source: CHA, 2022.

1.3 RENTAL CAR FACILITIES (65 & 87)

The rental car fleet for the airport is supported by two buildings: Building 65 and Building 87. Building 65 houses National/Alamo and Enterprise and Building 87 houses Hertz, Avis, and previously Dollar/Thrifty. Typical operating hours for the rental facilities are 7:00 a.m. to 9:00 p.m., seven days a week. Overnight hours from 9:00 p.m. through 1:00 a.m. are used for the car wash and vacuuming, as needed.

The buildings, which are two stories high, are constructed of exterior stone walls and a metal roof. Each rental car company has an office area, a pull-through car wash, and a mechanical bay with a car lift. The interior of the car wash and mechanical bay areas are uninsulated and have manually operated garage bay doors. The office area has sheet rock and insulation typical for a commercial space.

Building 65 has two Carrier A/C units that serve each company bay. The IT room that stores the control equipment is cooled by a Daikin A/C unit. Heating is provided by natural gas unit heaters that are programmed to heat at 50°F. There are two relief dampers controlled when there is a call for heat. There is a 40-gallon electric domestic water heater that serves the bathroom and sinks. The bay doors for the car wash and mechanical bays are controlled with an electric switch and a 1/3 HP motor. The car wash bay doors are typically always kept open due to the frequency of car washing throughout the day and night. The water for the car wash is recycled for water and energy conservation. Of the two car washes in Building 65, only one was operational. At the time of the site visit in summer of 2022, the supervisor mentioned some of the car washes were being replaced in a couple of months. Since the writing of this report, all car washes have been replaced by 2023. Air-powered tools used in the mechanical bay are served by a 5HP reciprocating tank air compressor with a condensate drain timer.

Inside the mechanical and car wash bays there are vapor tight wall-pack lighting that is switch controlled. The IT room has one 2-lamp T8 fluorescent fixture that is normally off, as the room is unoccupied. The mechanical and electrical rooms on the mezzanine of the Enterprise office space have 2-lamp T8 fixtures that are controlled with a wall occupancy sensor. The office and kitchen space has three 3-lamp T8 and one 2’ lamp T8 fixtures that are controlled by an occupancy sensor.

Building 87 was reviewed and found to have an identical configuration but with three rental car agencies. The Hertz car wash bay was retrofitted with two new Reznor 100 MBH natural gas unit heaters as well as new LED wall packs. The Thrifty/Dollar rental bays were not in use, but the lighting remained on.

Five vacuum systems are always kept on. They are located between the two rental car buildings in their own outdoor canopy. Electric service to the vacuum pumps is unknown but assumed to be served by one or both buildings. According to rental car personnel, the vacuums do not behave well when they are shut off and on repeatedly. Each vacuum is equipped with a 10-horsepower blower motor. There is limited variable volume capability which could be an opportunity for newly upgraded models that save energy.

Figure 1-5 – Building 87

Source: CHA, 2022.

Figure 1-6 – Rental Car Fuel and Vacuum Carport

Source: CHA, 2022.

1.4 TOLL BOOTH PLAZA (70)

The toll booth plaza consists of serval areas: entry, office, kitchen/breakroom, and server room. This is a single-story building with a stone exterior and metal roof. The interior is constructed of sheet rock with fiberglass insulation and double-paned windows, typical of commercial space. All areas are served by Daiken heat pumps with supplemental heat provided by electric baseboard units in each space. The temperature setpoint for the server room is 65°F, with the remaining spaces at 72°F. The baseboard heat is controlled by the outside air temperature. Two heads are serving the office and kitchen, with two heads serving each of the booths connected to a single condensing unit located outside. The server room has its own dedicated inside condensing units. There is a small 6-gallon electric water heat for domestic water use. The lighting consists of eight 2-lamp T8 fluorescent troffer fixtures.

1.5 OPERATIONS (134)

At the time of the site visit, approximately 50 percent of Building 134 was under renovation. This included adding and removing walls, changing lighting from T12 to LED, and updating the HVAC to a newer model standard DX unit. This is a typical office building and contains two mechanical rooms, offices, conference rooms, a break area, and restrooms. The spaces are controlled with standalone thermostats with unknown setpoints.

1.6 DPS (136)

The Department of Public Safety (DPS) building, Building 136, is open 24/7. The building contains a recreational area, kitchen, lobby, visual ground monitoring, and offices throughout. The heating and cooling are provided by a Variable Refrigerant Flow (VRF) system with no backup heating. The building has 23 units inside to a single outside condenser, as well as an additional unit that provides ventilation to the building. During colder spells, the building will sometimes have trouble being able to maintain setpoint, and the temperature inside has been observed to drop as low as 60°F. There is a Delta Aire CRAC unit that provides cooling to the electrical equipment room. The domestic hot water is supplied at 120°F by a natural gas tankless water heater and it serves a kitchen and bathrooms. This is a recently built facility and has all LED lighting and occupancy sensors already installed throughout.

1.7 ARFF FACILITY (PART OF DPS – BUILDING 136)

This large garage structure was built in 2014 and primarily houses fire trucks and emergency vehicles. A bathroom and some storage areas are located at the back of the garage. The facility contains five Space-ray infrared radiant heaters and no direct cooling units and are controlled by local thermostats. There is an outdoor make-up air unit with heat recovery, air purifiers, and BAFs for air destratification. It was observed during the site visit that the building was noticeably negative, and the fan controls should be investigated to ensure the fans are operating at the designed intent. The lighting is LED throughout the facility. The DHW is supplied by natural gas

tankless water heaters and serves sinks. A small air compressor for instrument air is in the bay below.

Figure 1-7 – ARFF

Source: CHA, 2022.

1.8 PARKING GARAGE ROOF

The parking garage was not surveyed as part of the field visit, but the proposed solar project was reviewed for comment. Forge Solar completed solar glare analysis for the parking garage roof. The purpose of the glare analysis was to ensure the position of the solar panels do not provide a blinding glare to the aircraft in route to/from the Airport. They utilized the US FAA 2013 Policy as the guideline for adherence. Three sizes (different quantities of panels) were evaluated for cost and savings. The analysis seems sound; however, it is suggested that GARAA get updated pricing now since the raw material pricing may have come down. More room is available on the parking lot roof should the Authority decide to expand their electrification efforts.

2 ENERGY CONSERVATION MEASURES

This section outlines the existing and proposed conditions for each measure identified as part of the evaluation conducted during the site visit in August 2022.

2.1 LED LIGHTING REPLACEMENT

Many of the linear lighting fixtures found throughout the surveyed buildings were previously retrofitted with T8 fluorescent tube lamps. The newest generation of LED linear lighting is currently manufactured in two categories: Type A and Type B. Type A LED linear tube replacements can replace an existing fluorescent linear tube if the lighting fixture contains an electronic ballast (as they typically do). For Type A, the power will still be regulated through the existing ballast and be limited to the life of the ballast. New LED tubes have a long lifespan of 50,000 hours which may require more maintenance and replacements in this scenario. Type B linear tubes have an internal LED driver and bypass the ballast. While these may come with a slightly higher price tag, they do increase reliability and reduce additional maintenance by providing a longer lifespan. Both Type A and Type B LED replacements will have the same performance capabilities.

In addition to the linear LED replacements, there is an opportunity to replace the metal halide fixtures in the car wash bays. Lighting replacement opportunities were evaluated for the following buildings:

- Buildings 15, 15A, 15B
- Building 21
- Buildings 65 & 87
- Building 70

The cost estimate included Type B LED replacements for all applicable lighting fixtures recommended for this upgrade. The labor is assumed to be performed internally at a $75 hourly rate. Hours were estimated based on previous project experience. The maintenance savings is not quantified in the calculation due to variability in the age of the existing equipment but are worth noting. Details for the calculations and cost breakdown can be found in **Appendix A** and **Appendix B**.

2.2 LIGHTING CONTROLS

In many of the spaces evaluated in the previous measure, there is an opportunity to add occupancy control. This measure was evaluated assuming that ECM-1 is implemented as well. Ceiling occupancy sensors are recommended in large high bay areas, while wall sensors are recommended in offices and conference rooms. It was assumed that there will be a 25 percent reduction in operating hours with the addition of sensors. For the toll booth, a 10 percent reduction was used due to the 24/7 nature of the operation. Lighting control opportunities were evaluated for the following buildings:

- Buildings 15, 15A, 15B
- Building 21
- Buildings 65 & 87
- Building 70

The labor is assumed to be performed internally at a $75 hourly rate. Hours were estimated based on previous project experience. Details for the calculations and cost breakdown can be found in the **Appendix A** and **Appendix B**.

2.3 HVAC UPGRADES

The buildings surveyed as part of this Study are cooled by smaller split A/C units ranging in capacity from 2 to 5 tons. Many of the units are 10+ years old and operate at standard efficiency of around 13 SEER. Newer technology is available that is more efficient and will be able to save the Airport cooling energy for these spaces. This measure evaluates replacing these units with in-kind higher efficiency units of 15 SEER.

The payback for this measure is high due to the high cost of these units. It is recommended that GARAA replace individual units at the end of their useful life with a higher efficiency unit and use the incremental cost difference to understand the return on investment (ROI). As the Authority moves towards sustainability and decarbonization, electrification may be evaluated in a future study. Replacement of these packaged A/C units with natural gas heating should be replaced with heat pumps or VRF for higher efficiency. HVAC opportunities were evaluated for the following buildings:

- Buildings 15, 15 Shed
- Building 21
- Buildings 65 & 87

2.4 REPLACE UNIT HEATERS WITH EFFICIENT INFRARED HEATERS

Most natural gas unit heaters operate at around 80 percent efficiency. These unit heaters were found in the maintenance buildings that were not either renovated or recently built. They were also found in the car wash and mechanical bays of the rental buildings.

New construction will specify infrared heaters in high bay garage buildings for their high efficiency and ability to direct heat down toward the equipment and occupants. This was found to be the case in the maintenance shed and the ARFF building. A typical unit heater will hang from the roof and blow hot air parallel to the ground which may quickly result in heat stratification of the space. This means that much of that heated air may rise to the roof and then be exhausted out, further detracting from the system efficiency. This measure only evaluates the savings based on the efficiency gain alone. There are likely additional savings due to the direction

of heat delivery of infrared heaters which makes them a preferred option over a traditional unit heater. This measure is recommended.

Infrared replacement opportunities were evaluated for the following buildings:

- Buildings 15A & 15B
- Buildings 65 & 87

2.5 INSTALL DESTRATIFICATION FANS IN THE MAINTENANCE GARAGE SHED

The maintenance garage building is comprised of an office/breakroom, bathrooms, a tool room, and a large open work area for vehicles and staff. The main space has eight infrared heaters installed, which are controlled by two thermostats for comfort heating in colder months. With a ceiling height of just over 34 feet, it is common to see the temperature of the room stratify, leaving the warm air to rise and get trapped at the roof, increasing the heat loss at that source. Even though the heat is directed downward initially as previously mentioned, there is still an opportunity to prevent stratification and heat loss in the space.

This measure proposes to add jet-type destratification fans to the ceiling to circulate warm air in the colder months. Typically, all fans would be connected to a wall control that can vary the speed of the fan to the desired comfort level. Studies have shown that these fans can reduce energy loss by approximately 29 percent. This measure used the gas utility bill to estimate the savings from installing these fans. It was assumed that five fans would be needed to accomplish the task, but the details should be evaluated by the vendor before completing quantities and selections. This measure is recommended.

2.6 NIGHT SETBACK

In many of the rooms and areas where small split air conditioning units are installed, there seemed to be programmable thermostats controlling the space. In many situations, these thermostats were found to not have a night setback programmed in them or it was overridden on hold. This measure proposes to review all thermostats and set an 80F cooling setback and 60F heating setback for after-hours. In some scenarios, if the schedules are continuously being overridden by staff, a locking thermostat can be used. This measure was unable to quantify savings for heating due to a lack of heating equipment information or utility bills. The cost is extremely minimal with just a few hours required to program the thermostats and the payback is nearly immediate. This measure is recommended. Night setback opportunities were evaluated for the following buildings:

- Buildings 15, 15 Shed
- Building 21
- Buildings 65 & 87

2.7 QUICK OPEN DOORS FOR CAR WASH

The car wash bays are used constantly throughout the day during operation hours of 7:00 a.m. to 9:00 p.m., 7 days per week. The current doors are manually controlled electric actuated doors. The doors are only closed at the end of the shift, despite the outside weather, due to the fast-paced nature of the operation. Each car wash bay has (2) 100 MBH unit heaters installed which run when the outside temperatures are between 40F to 50F (based on a local thermostat). The heaters are used to prevent the freezing of the car wash components. With both doors open, the bay acts as a wind tunnel allowing for a cooling effect during colder months and wasting all the natural gas used to heat the space.

This measure proposed installing quick open and close vinyl doors on the outside of the building in addition to the existing steel doors, which can still be used at night when the car wash is closed for the evening. These doors will open based on a motion sensor and close based on a sensor across the threshold. This will allow the warm air to mostly remain inside the car wash bay and save a significant amount of natural gas. The proposed equipment will open and close at 32” per second. The additional electric demand needed to operate the doors was calculated and included as part of the savings calculation. This calculation assumes all five car washes are in operation. At the time of the site visit, there was one rental agency vacancy. This measure is recommended.

2.8 VACUUM SYSTEM REPLACEMENT FOR CAR WASH

There are five canister-style 10 HP vacuum systems under the canopy in between Buildings 65 and 87. These systems are located next to fuel pumps and are always kept on. The supervisor reported that the vacuum systems have trouble starting back up after shutdown, which is why the systems are constantly kept running. It is assumed that the existing system motors are 2-speed and will drop to a low speed at 50 percent load, which is based on system pressure.

This measure proposed to replace all five separate canister systems with a single central system with 10 drops. This centrifugal blower vacuum system would be equipped with a 30 HP motor and a variable frequency drive (VFD) controlled by the pressure of the system. In this case, the energy use will follow the need based on how many drops are open and in use. Also, a VFD will allow for a soft start at the beginning of the day, eliminating the current issues that are being experienced with the existing equipment startup. The cost estimate was provided by a vendor and includes the equipment costs. Estimates were made for shipping, contracting, and installation. Please note that the quote is for a typical VFD and is not explosion-proof. Therefore, the VFD will have to be installed a certain distance away from the fuel pumps unless an alternative explosion-proof VFD is sourced. This measure is recommended.

2.9 REPLACE TANK WATER HEATERS WITH TANKLESS HEATERS

The maintenance buildings contain two natural gas domestic hot water (DHW) tanks: one small electric DHW tank in the flight school building (Building 21) and one electric DHW tank in each of the Car Wash Buildings. This measure evaluated replacing these units with a tankless option.

Tankless water heaters reduce standby losses from the water always sitting in the tank at 120F. Despite the tanks being highly insulated, the DOE claims there can be 2.5 percent energy loss attributed to standby losses. The savings alone do not justify the replacement of existing DHW heaters, but it is recommended as renovations and remodeling occur in these spaces, that the Airport replaces the storage tank version with a tankless option. This was seen in both the Operations Building (Building 134) under renovation and DPS facility (Building 136) which was constructed in 2014. This measure is not recommended until the equipment is at the end of its useful life.

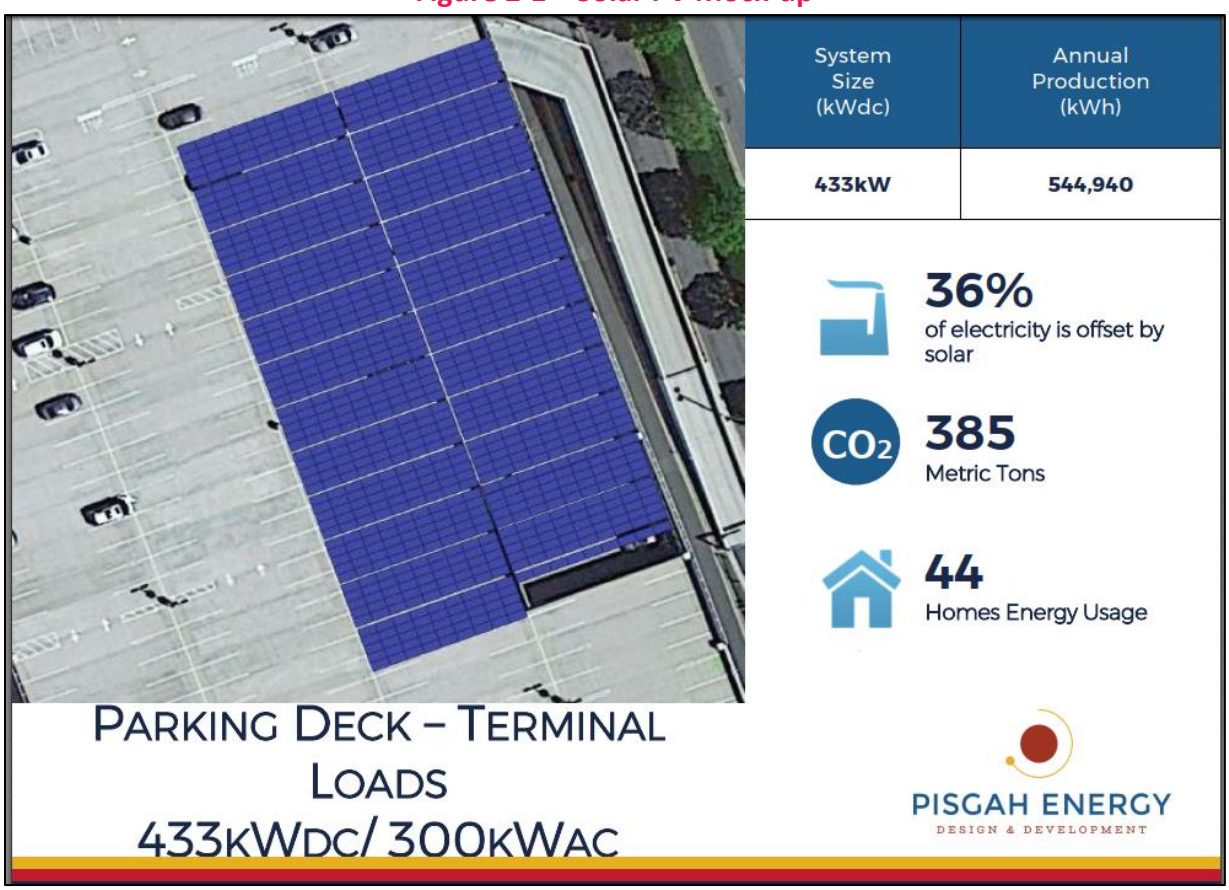
Tankless DHW opportunities were evaluated for the following buildings:

- Buildings 15, 15 Shed
- Building 21
- Buildings 65 & 87

2.10 PV ROOF FOR PARKING GARAGE

As the world moves away from fossil fuel consumption, renewable energy is becoming more realistic to help achieve these more aggressive carbon reduction goals. In 2021, GARAA received a survey of their parking garage structure for solar PV panel installation.

Figure 2-1 – Solar PV Mock-up



Based on the review of this report, it is recommended to re-evaluate the costs, as some of the materials costs may have come down since the original quote. More importantly, this assessment was completed based on an existing electric demand profile for the Airport. Space is available on the parking garage roof for an expansion. As sustainability and decarbonization move into view, this expanded assessment should be completed in conjunction with building electrification feasibility analysis. If GARAA were to convert natural gas heat to electricity, it is likely that they would benefit from on-site electric generation. Additionally, it is recommended to consult the utility, state, or federal government on grants related to the installation of solar PV at the Airport.

2.11 RECOMMENDATIONS

It is recommended to implement the reviewed ECMs. As mentioned previously, GARAA is focused on achieving energy efficiency when applicable through building renovations and construction. Going forward, the Authority should evaluate more ways in which they may be able to convert natural gas usage into electricity, with a focus on carbon reduction and sustainability. The potential next step would be an electrification study to understand the electricity demand require to make a full switch from natural gas to electricity. This would include load modeling for each building with potential geothermal, solar PV, and battery storage proposed solutions. There has been federal and state/local support for these types of feasibility studies and designs.

ATTACHMENT A – SAVINGS CALCULATIONS

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-1 LED Lighting Replacement

Building Schedule:
Existing conditions (master switch): 0 hrs/week
Blended Electric Rate $ 0.10 /kWh

Instructions and notes:
Input existing fixtures and retrofit fixtures. Use light table

	EXISTING CONDITIONS									RETROFIT CONDITIONS									COST ANALYSIS			
Area Description	**Number of Fixtures**	**Fixture Code**	**Lamps per Fixture**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Daily Hours**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Fixture Code**	**Total Lamps**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Daily Hours**	**Annual Hours**	**Annual kWh**	**kW Saved**	**Annual kWh Saved**	**Annual $ Saved**	**Recommended?**
Building 15 garage	28	F46GHL	6	351	9.8	Switch	12	4,380	43,047	28	LED/T5HO/6	168	144	4.032	Switch	12	4,380	17,660	5.8	25,386	$ 2,502	Yes
Building 15B (Storage)	12	F46ILL	6	175	2.1	Switch	2	730	1,533	12	LED/T8/6	72	147	1.764	Switch	2	730	1,288	0.3	245	$ 24	Yes
Building 15A	17	F82ILL	2	109	1.9	Switch	8	2,920	5,411	17	LED96/T8/2	34	80	1.36	Switch	8	2,920	3,971	0.5	1,440	$ 142	Yes
Building 15A- Wood Shop	8	F46ILL	6	175	1.4	Switch	8	2,920	4,088	8	LED/T8/6	48	147	1.176	Switch	8	2,920	3,434	0.2	654	$ 64	Yes
Building 15A- Truck/Equip Storage	8	F46ILL	6	175	1.4	Switch	8	2,920	4,088	8	LED/T8/6	48	147	1.176	Switch	8	2,920	3,434	0.2	654	$ 64	Yes
Building 21-Flight School	19	F44ILL	4	112	2.1	Switch	10	2,600	5,533	19	LED/T8/4	76	98	1.862	Switch	10	2,600	4,841	0.3	692	$ 68	Yes
Building 21-Flight School	8	F42ILL	2	59	0.5	Switch	10	2,600	1,227	8	LED/T8/2	16	49	0.392	Switch	10	2,600	1,019	0.1	208	$ 21	Yes
Building 65/87 (Car Wash)	12	MH175/1	1	215	2.6	Switch	15	3,900	10,062	12	LED/WP50	12	50	0.6	Switch	15	3,900	2,340	2.0	7,722	$ 761	Yes
Building 65/87 (Mech bay)	10	F43ILL	3	89	0.9	Switch	15	3,900	3,471	10	LED/T8/3	30	73.5	0.735	Switch	15	3,900	2,867	0.2	605	$ 60	Yes
Building 65/87 (Mech bay)	5	F43ILL	3	89	0.4	Occ Sensor	15	3,120	1,388	5	LED/T8/3	15	73.5	0.3675	Occ Sensor	15	3,120	1,147	0.1	242	$ 24	Yes
Building 70 (Toll Plaza)	8	F42ILL	2	59	0.5	Switch	24	8,760	4,135	8	LED/T8/2	16	49	0.392	Switch	24	8,760	3,434	0.1	701	$ 69	Yes
TOTALS -	**135**				**24**				**83,983**	**135**				**14**				**45,434**	**5.8**	**38,548**	**$ 3,800**	

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-1 LED Lighting Replacement
Cost Estimate

Multipliers	
Material:	1.15
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
T5HO Type B Replacement LED Bulbs	168	EA	$26.46	$150	$0	$5,112	$4,200	$0	$9,312	Internet quote
T8 4' Type B Replacement LED Bulbs	14	case	$352.61	$313	$0	$5,677	$4,375	$0	$10,052	Internet quote; 25 in case
T8 8' Type B Replacement LED Bulbs	4	case	$176	$375	$0	$807	$1,500	$0	$2,307	Internet quote; 10 in case
LED Wallpack	12	EA	$90	$150	$0	$1,242	$1,800	$0	$3,042	

1-Assumes in-house labor at $75/hr

2-Added 15% to equipment for tax and shipping

$ 24,713	Subtotal	
$ 2,500	10%	Contingency
$ -	0%	Contractor O&P
$ -	0%	Engineering
$ 27,200	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-2 Lighting Controls

Building Schedule:
Existing conditions (master switch): 0 hrs/week
Supply Electric Rate $ 0.10 /kWh

Instructions and notes:
Assumes occupancy sensors reduce use by 25% for all except toll booth. Use reduced by 10% in that space due to 24/7 operation.

	EXISTING CONDITIONS									RETROFIT CONDITIONS									COST ANALYSIS					
Area Description	**Number of Fixtures**	**Fixture Code**	**Lamps per Fixture**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Daily Hours**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Fixture Code**	**Total Lamps**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Daily Hours**	**Annual Hours**	**Annual kWh**	**kW Saved**	**Annual kWh Saved**	**Annual $ Saved**	**Occ Sensors Needed**	**Occ Sensor Type**	**Recommended?**
Building 15 garage	28	F46GHL	6	351	9.8	Switch	12	4,380	43,047	28	LED/T5HO/6	168	144	4.032	Occ Sensor	12	3,285	13,245	-	4,415	$ 435	4	Ceiling	Yes
Building 15B (Storage)	12	F46ILL	6	175	2.1	Switch	2	730	1,533	12	LED/T8/6	72	147	1.764	Occ Sensor	2	548	966	-	322	$ 32	2	Ceiling	Yes
Building 15A	17	F82ILL	2	109	1.9	Switch	8	2,920	5,411	17	LED96/T8/2	34	80	1.36	Occ Sensor	8	2,190	2,978	-	993	$ 98	3	Ceiling	Yes
Building 15A- Wood Shop	8	F46ILL	6	175	1.4	Switch	8	2,920	4,088	8	LED/T8/6	48	147	1.176	Occ Sensor	8	2,190	2,575	-	858	$ 85	1	Ceiling	Yes
Building 15A- Truck/Equip Storage	8	F46ILL	6	175	1.4	Switch	8	2,920	4,088	8	LED/T8/6	48	147	1.176	Occ Sensor	8	2,190	2,575	-	858	$ 85	1	Ceiling	Yes
Building 21-Flight School	19	F44ILL	4	112	2.1	Switch	10	2,600	5,533	19	LED/T8/4	76	98	1.862	Occ Sensor	10	1,950	3,631	-	1,210	$ 119	8	Wall	Yes
Building 21-Flight School	8	F42ILL	2	59	0.5	Switch	10	2,600	1,227	8	LED/T8/2	16	49	0.392	Occ Sensor	10	1,950	764	-	255	$ 25	0	Wall	Yes
Building 65/87 (Car Wash)	12	MH175/1	1	215	2.6	Switch	15	3,900	10,062	12	LED/WP50	12	50	0.6	Occ Sensor	15	2,925	1,755	-	585	$ 58	4	Ceiling	Yes
Building 65/87 (Mech bay)	10	F43ILL	3	89	0.9	Switch	15	3,900	3,471	10	LED/T8/3	30	73.5	0.735	Occ Sensor	15	2,925	2,150	-	717	$ 71	5	Ceiling	Yes
Building 70 (Toll Plaza)	8	F42ILL	2	59	0.5	Switch	24	8,760	4,135	8	LED/T8/2	16	49	0.392	Occ Sensor	24	7,884	3,091	-	343	$ 34	4	Wall	Yes
TOTALS -	**130**				**23.1**				**82,594**	**130**				**13.5**				**33,731**	**0.0**	**10,557**	**$ 1,041**	**32**		

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-2 Lighting Controls
Cost Estimate

Multipliers	
Material:	1.15
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Wall Occupancy Sensors	12	EA	$70.00	$150	$0	$966	$1,800	$0	$2,766	Internet quote
Ceiling Occupancy Sensors	20	EA	$150	$225	$0	$3,450	$4,500	$0	$7,950	Internet quote
Electrical Wiring to Fixture	20	EA	$100	$50	$0	$2,300	$1,000	$0		Estimate

1-Assumes in-house labor at $75/hr

2-Added 15% to equipment for tax and shipping

$ 10,716	Subtotal	
$ 1,100	10%	Contingency
$ -	0%	Contractor O&P
$ -	0%	Engineering
$ 11,800	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-3-HVAC Upgrades

Description:
There are several standard DX Air Conditioning units with gas heat throughout the buildings. These units could be replaced with high-efficiency units for energy savings.

Inventory:

Building	Capacity (tons)	Quanitity	Model	Year	EER/**SEER**	kW	Proposed Model	Proposed EER/**SEER**	Proposed kW	
15	3.5	1	H1RA042S06		**13**	3.2	Heat Pump	**15**	2.8	
15	5	1	H1RA060S06		**13**	4.6	Heat Pump	**15**	4.0	
15	3	1	H1RA036S07		**13**	2.8	Heat Pump	**15**	2.4	
15 Shed	2.5	1	PA13NR030-K		**13**	2.3	Heat Pump	**15**	2.0	
15 Shed	2	1	PA13NR024-J		**13**	1.8	Heat Pump	**15**	1.6	
21	4	1	NXA448GKC101	2017	**14**	3.4	Heat Pump	**15**	3.2	
21	3.5	1	NXA442GKC101	2017	**14**	3.0	Heat Pump	**15**	2.8	
65/87	1.5	5	25HBR318A330		**13**	6.9	Heat Pump	**15**	6.0	
70	3	1	RXTQ36TAVJ9	2018	**18.2**		Keep			*Heat Pumps
134	10	1	PURY-P120TKMU-A	2014	13.2		Keep	13.8		*VRF
	Total:	**31**				**28.1**			**24.8**	

					Baseline		**Proposed**		**Savings**	
Start	**End**	**Average**	**Total**	**Load Factor**	**kW**	**kWh**	**kW**	**kWh**	**kW**	**kWh**
95	100	97.5	2	100%	28.1	56	24.8	50	3.3	7
90	95	92.5	18	88%	24.6	443	21.7	391	2.9	52
85	90	87.5	137	75%	21.1	2,889	18.6	2,548	2.5	341
80	85	82.5	358	63%	17.6	6,292	15.5	5,549	2.1	743
75	80	77.5	534	50%	14.1	7,508	12.4	6,622	1.7	887
70	75	72.5	610	38%	10.5	6,433	9.3	5,673	1.2	760
65	70	67.5	1021	25%	7.0	7,178	6.2	6,330	0.8	848
60	65	62.5	1021	13%	3.5	3,589	3.1	3,165	0.4	424
55	60	57.5	861	0%	0.0	0	0	0	0	0
			3701						**3.3**	**4,061**

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-3-HVAC Upgrades
Cost Estimate

Multipliers	
Material:	1.00
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
1.5 ton air-to-air split heat pump	4	EA	$1,575	$268	$0	$6,300	$1,074	$0	$7,374	RS Means
2 ton air-to-air split heat pump	1	EA	$1,700	$321	$0	$1,700	$321	$0	$2,021	RS Means
2.5 ton air-to-air split heat pump	1	EA	$1,875	$404	$0	$1,875	$404	$0	$2,279	RS Means
3 ton air-to-air split heat pump	1	EA	$2,075	$537	$0	$2,075	$537	$0	$2,612	RS Means
3.5 ton air-to-air split heat pump	2	EA	$2,225	$648	$0	$4,450	$1,296	$0	$5,746	RS Means
4 ton air-to-air split heat pump	1	EA	$2,400	$802	$0	$2,400	$802	$0	$3,202	RS Means
5 ton air-to-air split heat pump	1	EA	$2,625	$1,296	$0	$2,625	$1,296	$0	$3,921	RS Means

$ 27,154	Subtotal	
$ 4,100	15%	Contingency
$ 4,100	15%	Contractor O&P
$ -	0%	Engineering
$ 35,400	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-4-Replace Unit Heaters with Infrared Heaters

Description: Many of the infrared heaters are older technology and can be replaced with higher efficiency equipment.

Inventory:

Building	Square Foot	Ceiling Height (ft)	Cubic foot (CF)	Annual NG Utility (Therms)	Input Capacity (BTUh)	Output Capacity (BTUh)	Thermal Efficiency	Quantity	Temp Setpoint (F)	Heating Output (Therms)	Proposed Thermal Efficiency	Proposed Savings (Therms)	Heating Rate (Therms/CF)	
15 Shed	*7661.7*	*34.75*	*266,244*	*5,180*	*100,000*	*85,000*	*85%*	*8*	*65*	*4,403*	*90%*	*288*	*0.0165*	**example from utility data, not included in calculation*
15A	10803	17	183,651	2,589	Varies		81%	4	55	2,097	90%	259		*B15 buildings are alike
15B	3689	17	62,713	1,065	75,000	60,750	81%	2	60	863	90%	107		*B15 buildings are alike
65 & 87				8,831	125,000	100,000	80%	10	50	7,065	90%	981		*load from ECM-7
Totals								**16**				**1347**		

Start	End	Total			
60	65	1021			
55	60	861			
50	55	734			
45	50	790			
40	45	752			
35	40	618			
30	35	509			
25	30	407			
20	25	252			
15	20	96			
10	15	21			
5	10	14			
0	5	5	**<60**	**<55**	**<50**
	Hours	**6080**	5059	4198	3464
	Percent from 65F		17%	31%	43%

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-4-Replace Unit Heaters with Infrared Heaters
Cost Estimate

Multipliers	
Material:	1.00
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Infrared Heater (80 High fire)	6	EA	$2,344	$242	$0	$14,061	$1,449	$0	$15,510	RS Means
Infrared Heater (100 High fire)	10	EA	$2,344	$279	$0	$23,435	$2,794	$0	$26,229	RS Means

$ 41,739	Subtotal	
$ 4,200	10%	Contingency
$ 4,200	10%	Contractor O&P
$ -	0%	Engineering
$ 50,100	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-5 Install Destratification Fans in Maintenance Shed

Description: The facility staff noticed the temperature on the mezzanine was noticeably different from the ground level. During the heating season, installing destratification fans allow for more uniform airflow and less heat loss through the roof. Studies show that as much as 29% savings are projected by adding a high volume low-velocity fan. Due to the available ceiling space, alternative Air Pear fans are suggested.

Building 15 Shed Total SF	8,513	SF
Percent Warehouse	90%	*Removing Tool room and Storage
Conditioned Space	7,662	SF
Building height	34.8	feet
Annual Therms	5,180	*utility bill
NG Savings	29%	*Note (1)*
NG Savings	**1,502**	**Therms**
Air Pear-EC-45	5	QTY
Power	**-0.73**	**kW**
LF	0.8	
Operating Hours	6,080	Hours
Fan Electric Consumption	**-3,526**	**kWh**

Notes

(1) Taber, Christian, and Brandon A. Steele. "Impact of HVLS Fans On Airplane Hangar Air Destratification ." ASHRAE Journal , ASHRAE.org, no. April 2020, Apr. 2020, pp. 26–32. Technical Feature.

Start	End	Average	Total
60	65	62.5	1,021
55	60	57.5	861
50	55	52.5	734
45	50	47.5	790
40	45	42.5	752
35	40	37.5	618
30	35	32.5	509
25	30	27.5	407
20	25	22.5	252
15	20	17.5	96
10	15	12.5	21
5	10	7.5	14
0	5	2.5	5
Totals:		**46.0**	**6,080**

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-5 Install Destratification Fans in Maintenance Shed
Cost Estimate

Multipliers	
Material:	1.15
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
AirPear Premium 45 EC	5	EA	$750	$300	$0	$4,313	$1,500	$0	$5,813	
Electrical - Connection	5	EA	$75	$500	$0	$431	$2,500	$0	$2,931	

**Assumes in-house labor at $75/hr*

$ 8,744	Subtotal	
$ 1,300	15%	Contingency
$ 1,300	15%	Contractor O&P
$ 900	10%	Engineering
$ 12,200	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-7 Replace Car Wash Bay Doors with Quick Open/Close

Description: The bay doors are usually left open for the car wash at all times. This leads to unnecessary heating when the outside temp is below 50F. The measure proposes to install quick open and close doors to limit the exfiltration of heat.

Proposed Electric Use

Doors	Height of Door (in)	Speed of Door ("/sec)	Time to open & close (hr)	Cycles (per hour)	Hours of Operation	Hours of Use (per door)	Max kW (per door)	Working kW (80%)	Annual kWh
10	140	32	0.00243	15	5110	186	2.4	-1.92	-3,577

Existing NG Unit Heaters

Quantity	Output Capacity (MBH)	Max Input Capacity (MBH)	Min Input Capacity (MBH)	Thermal Efficiency
10	100	125	62.5	80%

				Baseline Use				Proposed Use				
Start	End	Average	Total Hours	Operating Hours*	Output (MBH)	Load Factor	NG Use (Therms)	Operating Hours**	Output (MBH)	Load Factor	NG Use (Therms)	NG Savings (Therms)
45	50	47.5	790	230	50	0.7	1008	14.7	50	0.7	64.3	944
40	45	42.5	752	219	56	0.7	1066	14.0	56	0.7	68.0	998
35	40	37.5	618	361	61	0.7	1928	23.0	61	0.7	123.0	1,805
30	35	32.5	509	297	67	0.7	1732	18.9	67	0.7	110.5	1,622
25	30	27.5	407	237	72	0.7	1500	15.1	72	0.7	95.7	1,405
20	25	22.5	252	147	78	0.7	1000	9.4	78	0.7	63.8	937
15	20	17.5	96	56	83	0.7	408	3.6	83	0.7	26.1	382
10	15	12.5	21	12	89	0.7	95	0.8	89	0.7	6.1	89
5	10	7.5	14	8	94	0.7	67	0.5	94	0.7	4.3	63
0	5	2.5	5	3	100	0.7	26	0.2	100	0.7	1.6	24
Totals:			**3464**	**1571**			**8,831**				**563**	**8,268**

*Baseline case assumes the doors are kept open currently during operating hours of 7AM to 12AM. Bin hours in red are reduced by 50% based on estimate of heating between OA temperatures from 40-50F.

**Proposed case assumes heating for 50% more than twice the time for a single door to open and close (accounting for entrance and exit to each bay being open at different times)

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-7 Replace Car Wash Bay Doors with Quick Open/Close
Cost Estimate

Multipliers	
Material:	1.00
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Auto Roll Vinyl Doors	10	EA	$10,915.54	$1,500	$0	$109,155	$15,000	$0	$124,155	Vendor Quote
Electrical	10	EA	$250	$250	$0	$2,500	$2,500	$0	$5,000	Engineering Estimate

$	129,155	Subtotal	
$	12,900	10%	Contingency
$	19,400	15%	Contractor O&P
$	-	0%	Engineering
$	**161,500**	**Total**	

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-6 Night Setback

Description: There are many local programmable thermostats that were found held at a certain temperature rather than operating night setback. This measure proposes to implement a standard night setback temperature for cooling to be implemented across all buildings. Current setpoints are around 70F. This measure proposes to set back to 80F during the cooling season and 60F during the heating season. There was no information provided for these buildings on heating, therefore the savings could not be quantified but should be considered.

Inventory:

Building	Capacity (tons)	Quanitity	Model	Year	EER/**SEER**	kW	Proposed Model	Proposed EER/**SEER**	Proposed kW	
15	3.5	1	H1RA042S06		**13**	3.2	Heat Pump	**15**	2.8	
15	5	1	H1RA060S06		**13**	4.6	Heat Pump	**15**	4.0	
15	3	1	H1RA036S07		**13**	2.8	Heat Pump	**15**	2.4	
15 Shed	2.5	1	PA13NR030-K		**13**	2.3	Heat Pump	**15**	2.0	
15 Shed	2	1	PA13NR024-J		**13**	1.8	Heat Pump	**15**	1.6	
21	4	1	NXA448GKC101	2017	**14**	3.4	Heat Pump	**15**	3.2	
21	3.5	1	NXA442GKC101	2017	**14**	3.0	Heat Pump	**15**	2.8	
65/87	1.5	4	25HBR318A330		**13**	5.5	Heat Pump	**15**	4.8	
70	3	1	RXTQ36TAVJ9	2018	**18.2**		Keep			*Heat Pumps
134	10	1	PURY-P120TKMU-A	2014	13.2		Keep	13.8		*VRF
	Total:	**29.5**				**26.7**			**23.6**	

					Baseline		**Proposed**			**Savings**	
Start	**End**	**Average**	**Total**	**Load Factor**	**kW**	**kWh**	**Load Factor***	**kW**	**kWh**	**kW**	**kWh**
95	100	97.5	2	100%	26.7	53	96%	25.7	51	1.1	2
90	95	92.5	18	88%	23.4	421	84%	22.3	402	1.1	19
85	90	87.5	137	75%	20.1	2,747	71%	19.0	2,601	1.1	147
80	85	82.5	358	63%	16.7	5,982	59%	15.6	5,599	1.1	383
75	80	77.5	534	50%	13.4	7,139	46%	12.3	6,567	1.1	571
70	75	72.5	610	38%	10.0	6,116	34%	9.0	5,464	1.1	652
65	70	67.5	1021	25%	6.7	6,824	21%	5.6	5,733	1.1	1,092
60	65	62.5	1021	13%	3.3	3,412	9%	2.3	2,320	1.1	1,092
			3701							**1.1**	**3,958**

**Implement a 4% reduction in cooling load*

Attachment A (Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-8 Replace Vacuum System with Energy Efficient Model (Car Wash)

Description: The existing vacuum system is kept on 24/7 and has no variability. The proposed system is a central vacuum system withVFD which allows for greater turn down and energy savings.

Savings Calculations

	Quantity	Make	Model	Motor HP	LF (2)	kW	Operating Hours (1)	kWh
Baseline	5	Spencer	SC-410-MOD	10	0.75	28.0	8760	191,964
Proposed	1	EuroVac	III	30		20.4	5840	64,715
Savings						**7.5**		**127,250**

* assuming 2 stage blower, low is 50% load

Notes:

(1)- The site noted that the existing system does not function properly when turned off/on, therefore they keep the vacuums on 24/7. Typical operating hours are from 7AM - 9PM, but can go as late as 12AM every day. (Assumes 16 hours/day)

(2)- The Load Factor is applied here to account for variability in the use of the vacuum system even though the motors are not variable, the load will still not operate at 100% all the time

Motor HP	30
Load Factor	0.9
Motor kW	20.1
VFD Efficiency	98.5%
Fan Law Exponent	2.8

			Existing		Proposed	
Load	**% Hours***	**Hours**	**kW**	**kWh**	**kW**	**kWh**
100%	10%	847	28.0	23,689	20.4	17,316
90%	16%	1,402	28.0	39,210	15.2	21,339
80%	16%	1,402	28.0	39,210	10.9	15,344
70%	10%	876	28.0	24,506	7.5	6,598
60%	5%	438	28.0	12,253	4.9	2,143
50%	5%	438	14.0	6,127	2.9	1,286
40%	5%	438	14.0	6,127	1.6	689
30%	0%	0	14.0	0	0.7	0
20%	0%	0	14.0	0	0.2	0
10%	0%	0	14.0	0	0.0	0
0%	33%	2,920	14.0	40,844	0.0	0
Totals	**100%**	**8,760**	**28.0**	**191,964**	**20.4**	**64,715**

**estimated values based on supervisor interviews*

Baseline Product
https://www.howden.com/en-us/products/other-products/industravac-vacuum-units

Proposed Product
https://www.eurovac.com/products/eurovac-iii-10hp-to-100hp-multi-stage-pump-central-vacuum-4-to-30-user-system/

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-8 Replace Vacuum System with Energy Efficient Model (Car Wash)
Cost Estimate

Multipliers	
Material:	1.00
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
30 HP Central Canister System with VFD	1	EA	$57,610	$5,761	$0	$57,610	$5,761	$0	$63,371	Vendor
Shipping (8%)	1	EA	$4,608.80			$4,609	$0	$0	$4,609	engineering estimate
Electrical Connection Allowance	1	EA	$5,000.00	$1,000	$0	$5,000	$1,000	$0	$6,000	engineering estimate

$	73,980	Subtotal	
$	11,100	15%	Contingency
$	11,100	15%	Contractor O&P
$	5,900	8%	Engineering
$	**102,100**	**Total**	

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-9 Replace Storage Water Heaters with Tankless Water Heaters

Variables

Water temp	65	*estimate
DHW	120	
Delta T	55	
Standby Losses	2.5%	(2.5% of stored capacity per hour, per U.S. Department of Energy)

Building	Type	People	Usage per person (per day)	Size (Gal)	Efficiency	Operating Days	Total Usage (Therms)	Standby Losses (Therms)	Standby Losses (kWh)	
15	NG	8	3	80	80%	284	3,749	94		
15 Shed	NG	4	1	65	80%	284	508	13		
21	Electric	5	1	19	99%	255	135	*3*	99	
65/87	Electric	6	1	80	99%	365	973	*24*	713	*2 DHW tanks
							Totals	**106**	**812**	

Attachment A
(Continued)

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-2 Lighting Controls
Cost Estimate

Multipliers	
Material:	1.15
Labor:	1.00
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Building 21 DHW Replacement	1	EA	$350.00	$150	$0	$403	$150	$0	$553	Internet quote
Building 15 DHW Replacement	1	EA	$1,000.00	$600	$0	$1,150	$600	$0	$1,750	Internet quote
Building 15 Shed DHW Replacement	1	EA	$850.00	$600	$0	$978	$600	$0	$1,578	Internet quote
Building 65/87 Shed DHW Replacement	2	EA	$600.00	$500	$0	$1,380	$1,000	$0	$2,380	Internet quote

**Assumes in-house labor at $75/hr*

$ 6,260	Subtotal	
$ 900	15%	Contingency
$ 600	10%	Contractor O&P
$ 500	8%	Engineering
$ 8,300	**Total**	

AVL Master Plan-Task 7.4
CHA Project #068167.000

ECM-10 PV Roof for Parking Garage

Description: The finding of the provided glare and feasibility report was found to be reasonable. Energy savings are presented for each of the options. The total package is recommended.

Option	Baseline Annual Usage (kWh)	Baseline Peak Demand (kW)	kW	kWh	Offset	Cost
House Loads	360,200	67	62	112,860	31%	$ 311,840.00
Terminal Loads	1,502,800	308	300	544,940	36%	$ 1,363,048.00
480V Airfield/Terminal Loads	1,475,800	388	375	659,121	45%	$ 1,623,403.00
Total	**3,338,800**	**763**	**737**	**1,316,921**	**39%**	**$ 3,298,291.00**

QUOTE

PAYLON ROLL UP DOORS

PH: 989-402-1075 Fax: 888-515-3183
5603 Firethorne Dr. - Bay City MI - 48706

Quotation #: **23-2826 -2**
Date: 4/11/2023

BILL TO:
Cha
Jessica Bull
jbull@chacompanies.com
607-725-9772
14605

SHIP TO:
TBD

ORDERING TERMS & CONDITIONS
* Orders Are To Be Paid In Advance w/o Credit Approval
* No Refunds Are Possible On Any Custom Made Orders
* Prices Are Subject To Change And Are Not Guaranteed
* Ship Dates Are Estimates, And Cannot Be Guaranteed
* This Product Is Not Intended For High Wind Applications

Shipping Terms	Delivery	Payment Type
Pre-Paid	**6-7 Weeks**	Credit Card - Bank Wire

Qty	Part #	Description				Unit Cost	Line Total
		Commercial Roll-up Carwash Doors					
	AL-XRS- 23-2826	**PRODUCT**	W	H	[Size Represents]		-
10		Dimensions:	120	148	Clear Opening	10,110.06	101,100.63
							-
		MATERIAL:					-
		Curtain:	22oz PVC Coated Polyester				-
		Spec.	Full Vision Window				-
		Color:	See Color Chart				-
							-
							-
		MOUNTING:					-
		Door Location:	A. Door Mounted Outside Building				-
		Door Mounting:	Stand-Off (With Other Door)				-
							-
							-
		OPERATION:					-
10	**XRS - Premium**	Motorized	110V 1-Phase 34"/Sec. Travel Speed				-
							-
							-
							-
		MOTOR OPTIONS:					-
0	Remote Control	Controller Option:	Remote Control Operation (Ea.)		(Optional)	157.30	-
10	Motion Sensors	Controller Option:	Motion Sensor Operation (Ea.)		(Optional)	607.75	6,077.50
0	Close Timer	Controller Option:	Automatic Close Timer		(Optional)	371.80	-
							-
							-
							-
							-
							-
							-
							-
							-
			Doors Are Constructed With USA Components				-
			Overall Low Maintenance And Operating Cost				-
			One Year Warranty On All Parts and Curtain				-
							-
			Labor & Installation To Be Provided By Others				

MADE IN USA

ORDERING TERMS & CONDITIONS
Cancellation fees may apply 24hrs after placing order
Manufacture specs are based off approval drawings
SHIPPING TERMS & CONDITIONS
DAMAGE OR SHORTAGE MUST BE NOTED ON THE DRIVERS TICKET AND REPORTED WITHIN 2 DAYS

*Shipping Quoted By Request Or At Time Of Sale
*Shipping Can Be Higher to Non-Commercial Areas)

Subtotal	107,178.13
Shipping	1,977.23
Total Sale	109,155.36

PAYLON
ROLL UP DOORS

XRS Features

Extreme Roll Up Series

All ***XRS*** Extreme Roll Up Door Packages include these standard features:

- Intermediate full vision panels standard, option for bottom
- Complete weather seal with:
  - Heavy duty top rubber seal
  - Dual side vinyl seals
- Individually replaceable sections
- Inside or Outside Mount
- All stainless steel hardware
- Breakaway design with automatic reset
- Fiber reinforced pultruded plastic track

XRS Vinyl Door Packages

Elite Plus Model

- Includes all standard features
- 24" per sec. maximum speed
- No counterbalance system
- Requires 110v power source

Operator Options:

Electric Operator Only

Premium Plus Model

- Includes all standard features
- 34" per sec. maximum speed
- Patented Strapeze Counterbalance System
- Requires 110v power source

Operator Options:

Electric Operator

Chain Hoist

PAYLON
ROLL UP DOORS

FAST, RELIABLE, SIMPLE

The XRS Door Features:

- Intermediate full vision panels standard, option for bottom
- Complete weather seal included
- Speeds adjustable up to 34" per sec.
- Corrosion resistant components
- Low maintenance design
- Individually replaceable components
- Rated for up to 80 cycles per hour

Safety Features on the XRS Door

This door has the ability to breakaway from the door track and automatically reset itself upon impact.

The XRS Premium Model has an emergency pull rope that allows the door to open and close in case of a power failure.

So Many Color Options!

The XRS Door comes in many different colors allowing you to customize the look of your bay or car wash.

Actual color may vary slightly from the color shown. Consult factory for colored vinyl swatch. Additional colors options are available. Non-stock colors may be subject to longer lead time.

Eurovac
44 Milvan Drive
North York, ON M9L 1Z3

Ph: 800-265-3878
Fx: 416-744-8079
www.eurovac.com

April 10, 2023 **QT#AT23040**

CHA Companies

Attn: Jessica Bull

Ref: Airport Car Rental Site

Thank you for giving us an opportunity to quote on a Eurovac vacuum system for your facility.

From the information provided to us, we recommend the following equipment:

Part No.	Description	QTY
	Vac System	
SYS-30C-7538BS0B	**Eurovac III - 30HP & 38" Sep Detail Vacuum System** **(9-10 Tech Detail Vacuum System)** **Canister:** 30 Gal plastic tote canister **Separator Standard:** 6" Inlet M, 6" Outlet B **Typical Vacuum Levels:** 805CFM @ 7.5"Hg 880CFM @ 7.0"Hg **- Standard Set Up** 990CFM @ 6.5"Hg 1100CFM @ 6"Hg	**1**
SYS-B00-6IN00000-2	**6" Galvanized Tube, Bends & Compression Couplings to Separator Outlet** ● Based on blower and separator located beside each other	**1**
MPF-RCS-060	**6" Painted Steel Rain Cap - EIII 30HP**	**1**
SEP-B34-1800MSPC	**Manual Shaker Upgrade - 38" Bag Separator**	**1**
HAR-BAK-MAGKIT00	**Magnahelic Gauge with Signal Flag Upgrade** **Definitions:** ● **Magnahelic Gauge:** Reads pressure differential of the filters ● **Signal Flag:** Indicates when pressure differential is too high and filters need replacement **Includes:** ● Hardware for tapping to clean and dirty side of separator	**1**
SYS-E30-30UPG0EX	**EIII 30HP Motor & Starter Explosion Proof Upgrade**	**1**
	Electric Controls	
CPA-300-4603V011	**30HP 460/3/60 VFD Control Panel**	**1**
	Workstations	
SYS-050-20530	**Single Hanging Galvanized Vacuum Work Station**	**10**
	Accessories	
SYS-050-52300050	**Cast Shut Off Holster, 1-1/2" x 25' Hose & Claw Tool** ● **Anti Static Hose**	**10**
	Pipe	
SYS-030-423P	**Header Galvanized Pipe for 30HP**	**1**
Sub-total	**Equipment Only**	**$57,610**

Mech. Install	**By others**	**Not Incl**
Elect. Install	**By others**	**Not Incl**
Freight	**Additional**	**FOB North York, ON**
Total Price		**$57,610**

Attachment B (Continued)

All Taxes extra
F.O.B. Concord, Toronto with freight prepaid to job site
Terms: 1/2 with order; balance prior to shipment

Additional Pricing Information: The above quotation includes all pipe, bends, joins and installation materials between blower and separator assuming equipment is located beside each.

Excluded:
-Installation
-In ground PVC.
-Electrical connections.
-Roof/wall penetrations and flashing (if required)
-Unloading of equipment.
-Permits and/or Certificate of Air fees extra (if required).

Options:

Picture & Part No.		Description	List Price
	INT-012-S20SS0DL	**12" Single Stainless Steel Powder Coated Interceptor** - Work station upgrade that removes debris from the air before entering the pipe system	**$1,224/ea**

Thank you

Adam
Adam Thompson
Eurovac

44 Milvan Drive, North York, ON, M9L 1Z3
Ph: 800-265-3878 Ext: 230
Fx: 416-744-8079
Ce: 416-820-1450
Email: athompson@eurovac.com
Web Site: www.eurovac.com

Attachment B (Continued)

Terms & Conditions

These Terms and Conditions govern all sales of Equipment and Services by Clean Air Technologies Inc. dba Eurovac ("Seller). These terms and conditions constitutes the entire agreement between Seller and Customer regarding the sale of the applicable Equipment and Services and supersedes all prior oral and written understandings, representations and correspondence between the parties. Any modifications to the Contract must be agreed to in writing by Seller and Customer.

Proposal Term: Proposals are valid for 90 days. After 90 days, Seller is not bound by the terms of the Proposal, including the pricing. On approval of proposal, Customer must take delivery of equipment no later than 6 months from the date of acceptance unless otherwise agreed to in writing. If Customer cannot take delivery within 6 months, Seller reserves the right to make adjustments to pricing to account for current economic conditions.

Shipment and Delivery: Unless otherwise agreed to by Seller in writing, all shipments are F.O.B. Seller's factory and Customer is responsible for all shipping costs and insurance. The delivery dates specified in the Proposal are estimates only and Seller's failure to meet these dates will not be deemed a breach of the Contract. Seller shall ship the goods to the location designated by Customer via commercial carrier at the earliest available shipment date. Changes in the shipping schedule by Customer may result in fees for storage of the goods.

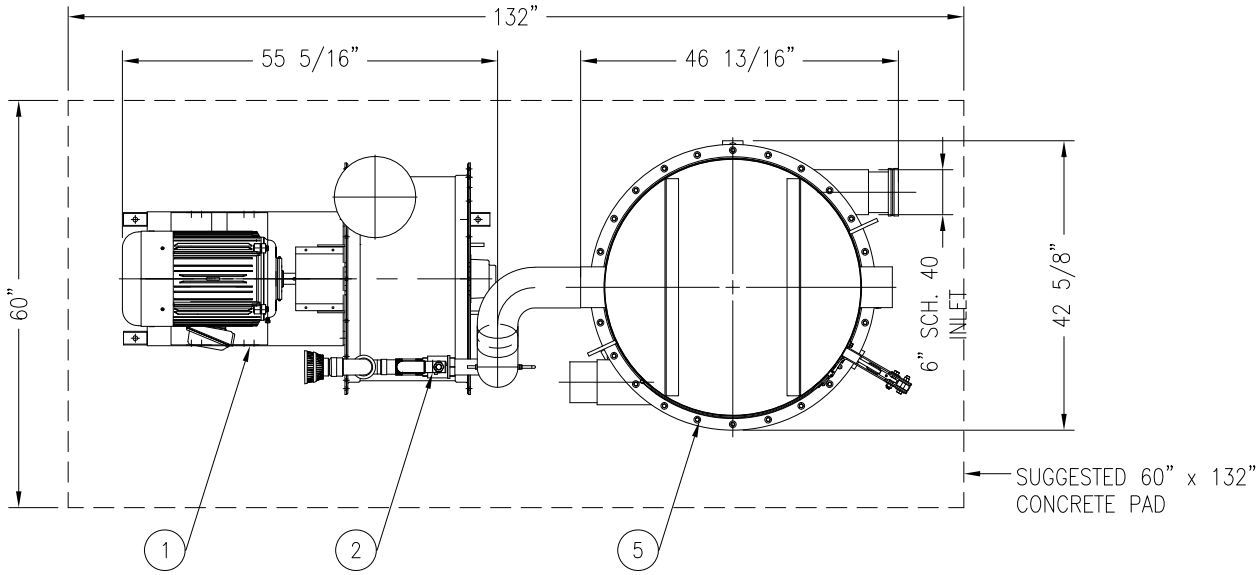
Title and Risk of Loss: Title to all goods and risk of loss shall pass to Customer at time the Goods are delivered to the carrier for shipment.

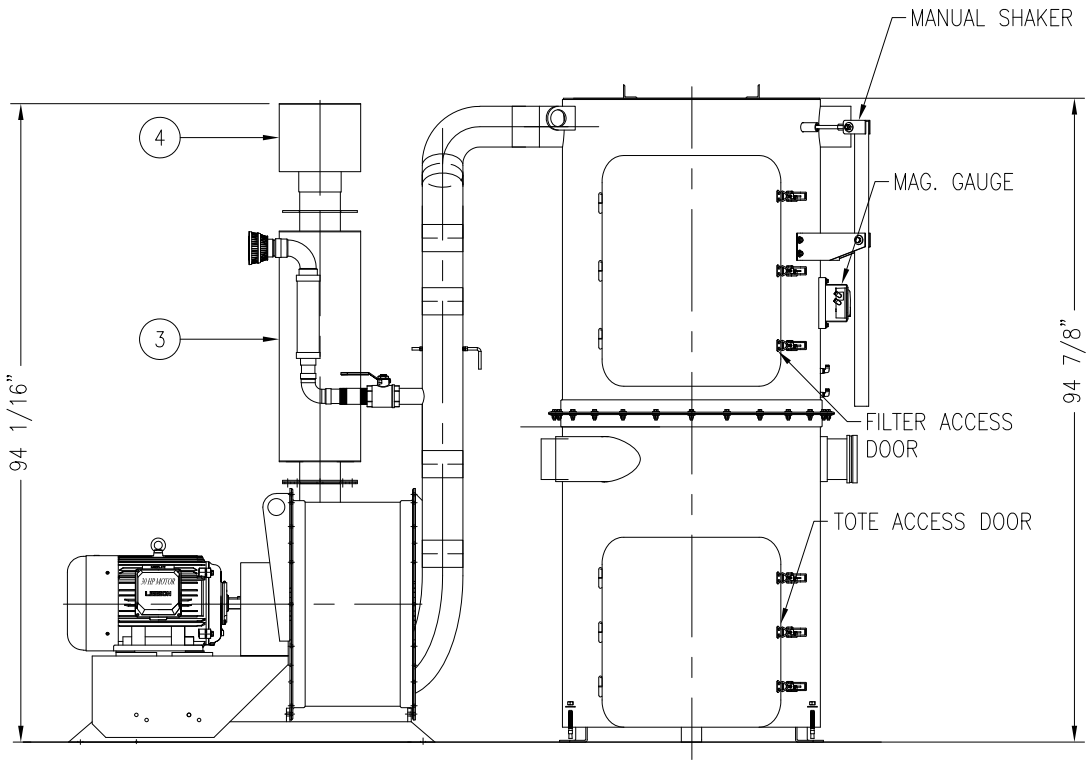
Design: Seller designs all equipment systems based on critical information provided by the Customer. Seller is not liable for errors or omissions on the part of the Customer.

Confidentiality: All specifications, documentation, pricing information and any other proprietary information of Seller are the confidential property of Seller.

Cancellation: Charges may apply if cancelled after the date of acceptance of proposal by Customer.

Limitations of Liability: Seller shall not have any liability to purchaser or any other person or entity for incidental, consequential, indirect or special damages of any description, including without limitation, loss of revenue or lost profits, whether arising out of warranty (including any implied warranties), breach of contract, strict liability, negligence, other tort, or otherwise, and regardless of whether such damage was foreseeable and whether Seller had been advised of the possibility of such damages, and notwithstanding the failure of any agreed or other remedy of its essential purpose. In no event will Seller's aggregate liability arising out of related to the equipment or services, as applicable, sold to purchaser, exceed the total amounts paid by purchaser for the equipment or services, as applicable.





Attachment B (Continued)

EUROVAC

TEL: 1-800-265-3878 www.eurovac.com

ITEM	DESCRIPTION	PART NO.
1	30 HP MOTOR	40E-06003
	MOTOR VOLTAGE – 208-230/460 (575)	
	MOTOR F.L. AMPS. – 76-68/34 (28)	
	SOUND LEVEL (dBA) – 83 @ 3M	
2	2" MANUAL BALL VALVE C/W BUTTERFLY VALVE	–
3	6" SILENCER	UNS-U26
4	6" RAIN CAP	RCS-060
5	ø38" BAG SEPARATOR & SHAKER	B38-2200
	FILTER BAG	–
	NUMBER OF FILTER/AREA – 22/130 SQ. FT.	

TOTAL EQUIPMENT WEIGHT: 2000 LBS.

REVISIONS		
REV. NO.	DESCRIPTION	DATE

TITLE: EUROVAC III – 30 HP SYSTEM W/ø38" BAG SEPARATOR W/SHAKER

DRAWN BY:	C.B.	SCALE:	1:32
CHECKED BY:	C.R.	DATE:	08/01/17
DWG. NO.:	BS 3822 30-00		

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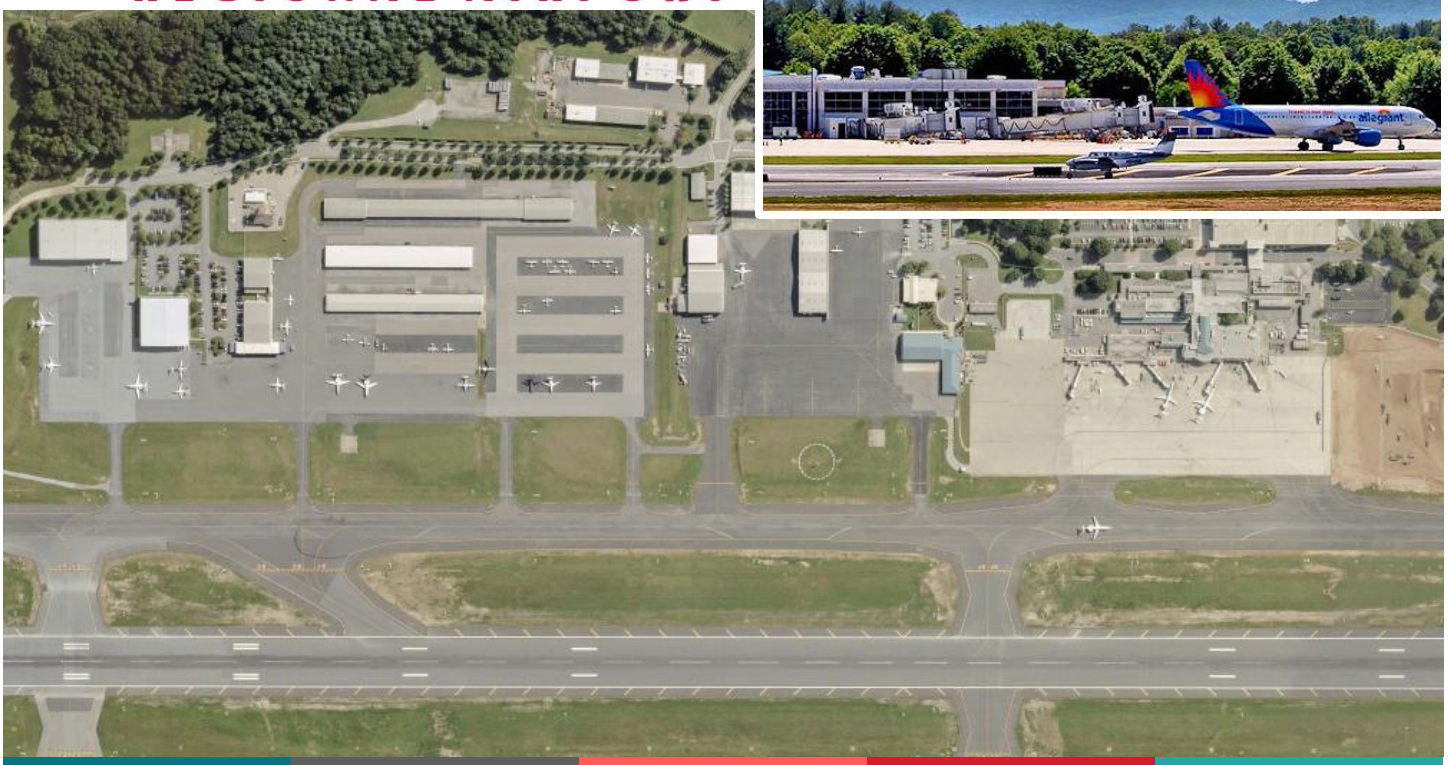

Asheville Regional Airport Master Plan Update

Recycling, Reuse, and Waste Reduction Plan

September 2024

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1 RECYCLING, REUSE, AND WASTE REDUCTION PLAN

The U.S. Congress passed the Federal Aviation Administration (FAA) Modernization and Reform Act (FMRA) in 2012. The law included several changes to the Airport Improvement Program (AIP), two of which relate to recycling, reuse, and waste reduction at airports. Section 132(b) of the FMRA expanded the definition of airport planning to include "*developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws, including the cost of a waste audit*." Section 133 of the FMRA added a provision requiring airports that are preparing a master plan to address issues relating to solid waste recycling at the airport. This includes:

- The feasibility of solid waste recycling at the airport
- Minimizing the generation of solid waste at the airport
- Operational and maintenance requirements
- Review of waste management contracts
- The potential for cost savings or the generation of revenue

As defined by Congress, "recycling" refers to any program, practice, or opportunity to reduce the amount of waste disposed of in a landfill. This includes reuse and waste reduction, as well as the recycling of materials. The FAA issued a memorandum on September 30, 2014 to provide guidance on preparing airport recycling, reuse, and waste reduction plans as an element of airport master plans within a sustainability document or as a standalone document. The guidance is mandatory when preparing an airport master plan. The purpose of this Study, which is concurrent with the Airport Master Plan Update, is to review the current recycling, reuse, and waste program and to provide guidance on ways to reduce waste and increase recycling and reuse at Asheville Regional Airport ('AVL' or 'the Airport') in compliance with the FAA's guidance.

This plan was developed with the assistance of Waste Reduction Partners (WRP), a non-profit organization administered by the Land of Sky Regional Council and working in special partnership with the North Carolina (NC) Division of Environmental Assistance and Customer Service with the goal of helping the state meet pollution prevention objectives through technical assistance and outreach. WRP can be a valuable partner for AVL moving forward.

1.1 AIRPORT DESCRIPTION

AVL, classified as a small hub primary commercial service airport with just over a million passenger enplanements as of year-end 2023, is located nine miles south of downtown Asheville, North Carolina in Buncombe County. AVL facility information is presented in **Chapter 1** of the Master Plan Study. The Airport is owned and operated by the Greater Asheville Regional Airport Authority (GARAA). GARAA's governing body is comprised of six members appointed by the Asheville City Council, the Buncombe County Commission, and the Henderson County

Commission, and in addition to one at-large appointee nominated by the other six board members. Together, the seven members make up the Airport Authority Board.

1.2 TYPES OF AIRPORT WASTE

The focus of this plan will be on municipal solid waste. Municipal solid waste generally consists of everyday items which can be legally disposed of in a landfill or equivalent state-permitted facility. FAA guidance identifies municipal solid waste as a type of waste produced at an airport but further defines the waste stream by separating construction and demolition debris, organic compostable materials (food and yard waste), and deplaned waste. These four types of waste commonly generated at an airport are described below:

- **Municipal Solid Waste (MSW)** includes common inorganic waste such as aluminum and steel, glass bottles and containers, plastic bottles and containers, packaging, newspapers, and other paper products.
- **Construction & Demolition (C&D) Debris** includes any non-hazardous solid waste from land clearing, excavation, or other types of construction, demolition, and/or renovation of buildings, roads, and utilities. C&D debris may include concrete, wood, metals, drywall, carpet, plastics, pipes, and salvaged building components.
- **Compostables** are sometimes referred to as “food” or “green” waste. They include trees, shrubs, grass clippings, leaves, weeds, and small branches, as well as food that is not consumed or generated during food preparation activities but discarded.
- **Deplaned Waste** is solid waste that is removed from passenger aircraft and can include bottles, cans, paper products, plastic cups, utensils, and food waste.

This plan will focus on the MSW listed above that can be recycled or disposed of in a landfill and will also touch on C&D waste and compostables. This plan does not address the management of other types of waste, specifically hazardous waste, universal waste (i.e., batteries, fluorescent light bulbs, and other electronics), or industrial waste (i.g., used solvents, etc.) given that these materials are subject to Federal, State, and local laws with specific disposal and recycling requirements. It should also be noted that any waste deplaned from international flights is regulated by separate laws.

Waste management at an airport includes many components and can be quite complex. In addition to the management of the waste generated by airport operations and passengers, AVL has tenants with a variety of tenancy agreements, differing operational requirements, and disposal processes that all contribute to the waste stream at the Airport. According to the FAA’s September 30, 2014 guidance, an airport’s waste management is broken down into three main areas:

- Areas where an airport has direct control over the waste stream
- Areas where an airport does not have direct control over the waste steam, but can influence waste management; and

- Areas where an airport has no control or influence over the waste stream.

In addition, the FAA's 2013 Recycling Synthesis further divides an airport's waste stream by locations such as the terminal, airfield, cargo hangars, aircraft, airport construction, flight kitchens, and administrative offices. The main generators of waste at the Airport are passengers, GARAA employees, and tenants.

1.3 AIRPORT LAYOUT

The Airport consists of multiple buildings and associated infrastructure owned by GARAA. Direct control of waste management exists in all airport operated buildings, but waste materials generated at tenant leased facilities are not under the direct control of GARAA. Pursuant to the FAA's guidance on airport recycling, areas that GARAA has direct control or influence over should be included in the recycling, reuse, and waste reduction plan. Buildings and areas that GARAA does not have direct control over may be excluded.

The terminal facility at AVL consists of two floors. The components that make up the non-secure area of the terminal, or the area prior to security screening, consist primarily of the airline ticketing counters, the check-in lobby, baggage claim, rental car counters, the passenger security screening area, and GARAA administrative offices located on the second floor. Seven gates (twelve gates will be in operation after renovation) and associated holdrooms are located within the secure area of the terminal, or post-security screening. Concessions are located in both the secure and non-secure areas although only the concession vendors post-security were in use at the time of the site visit. AVL's Air Traffic Control Tower (ATCT) is located on top of the terminal building. A terminal replacement program is currently underway, and Phase 1 is expected to be completed in 2025. A new terminal will replace the existing terminal building utilizing the building's current footprint, and the ATCT will be relocated to the western side of the airfield.

GARAA has direct control over solid waste generated in spaces devoted to GARAA staff. This includes offices, conference rooms, and break rooms, as well as the areas where other GARAA maintenance, janitorial, Aircraft Rescue Fire Fighting (ARFF), and police staff operate from. GARAA-influenced areas include the passenger focused public areas of the terminal, the leased concession areas in the terminal building, the airline and rental car tenant areas within the terminal, and quick turnaround rental car areas. **Table 1-1** summarizes the control or influence GARAA has on waste management in each building or area of AVL. The facilities listed in **bold** will be the primary focus of this plan.

Table 1-1 – Airport Waste Management Areas

GARAA Control	GARAA Influence	No GARAA Control /Influence
Terminal - GARAA Staff Areas	**Terminal - Passenger Areas (Baggage Claim, Check-in Lobby, Holdrooms)**	Aircraft Deplaned Waste
Airfield Equipment Storage and Maintenance Facilities	**Concessions**	Airfield Hangars/Facilities – Signature Flight Support, WNC Aviation, Belle Aircraft Maintenance
Aircraft Rescue & Firefighting (ARFF) Facility	**Airline Ticket Counters/ Gates and Rental Car Counters**	DreamCatcher Hotel
	TSA Checkpoint/Offices	Broadmoor Golf Links
	Parking Garage & Rental Car Pick up	
	Air Traffic Control Tower (ATCT)	
	Rental Car Quick Turn Around (QTA)/ Consolidated Rental Car Service Facility	

Source: CHA, 2024.

1.4 EXISTING PROGRAM

While recycling does occur at the airport, AVL currently has an undefined waste management program. GARAA maintains a waste services contract that includes both waste and recyclable disposal. Infrastructure for recycling has been introduced in certain areas, and construction projects often consider reuse and reduction of waste. Still, while the Airport has identified an Environmental Policy for AVL, the organization has not identified strategic goals around waste management, formalized specific policies and procedures, or assigned a staff member to champion the program. Some of the drivers and challenges to having a plan and implementing waste management policies at AVL include:

DRIVERS

- FAA Master Plan Requirements
- Internal and External Stakeholder Support
- Improved Sustainability
- Contamination Fees & Rebates
- Local Recycling/Composting Resources

CHALLENGES

- Lack of Formal Goals, Procedures, and Responsibilities
- Employee Turnover
- Funding for Program & Initiatives
- Airport Layout and Logistics

1.4.1 Infrastructure

As previously stated, GARAA has already introduced recycling infrastructure at AVL. Waste and recycling infrastructure is a critical part of waste management, which begins with an initial point

of collection. At AVL, a variety of trash and recycling receptacles are stationed around the campus, ranging in size and appearance. Recycling infrastructure is most prevalent in the passenger facing portions of the terminal. CHA, aided by Waste Reduction Partners, conducted a one-day site visit at the Airport in July 2022 to collect data on existing operations. Observations of the visit are discussed below.

Trash & Recycling Bins

Waste and recycling receptacles seen during the site visit are detailed in the following sections.

Passenger Areas of the Terminal

Waste and recycling receptacles located throughout the pre- and post-security, passenger-facing portions of the terminal building primarily consist of two types of receptacles:

1. Silver, metallic cylinder receptacles designed for trash collection only

2. Teal, 3-hole receptacles designed to collect trash and recyclables separately

The photos to the right were taken pre-security and are representative of the diversity of receptacles throughout the terminal. The check-in lobby in front of the ticketing counters, the baggage claim area, the holdrooms/gates, and the entrance to the Transportation Security Administration (TSA) screening area primarily contain only silver trash cans. The teal, combined receptacles were typically found in the corridors between each area adjacent to a wall or window. The teal receptacles have shaped openings cut into the lid made to divert certain materials. The largest opening is labeled as “Trash Only”. The elongated opening is labeled as “Paper Only”. The smaller, circular opening is labeled as “Bottles and Cans Only”. A mixed recycling program is offered at AVL. Utilizing receptacles that specify paper, bottles, and cans as the only recyclable materials allowed in the waste stream can limit the amount of materials being recycled. Observations of the materials disposed of in the recyclable collection slots indicate that contamination of the recycling waste stream is kept to a minimum within these receptacles. However, observations of the silver trash cans and the trash opening of the combined receptacles indicates that more of the waste stream could be diverted as recyclable materials.

Airline Ticketing Counters and Gates

The airline ticketing counters are located at the entrance of the terminal on the northern most side of the first floor. Allegiant, American Airlines, Delta, Jet Blue, Sun Country Airlines, and United operate out of AVL. Each ticket counter and gate utilize its own trash can(s). Passengers are asked not to dispose of trash in these receptacles. Certain airlines offer trash receptacles in front of their counter in addition to the GARAA owned receptacles. Recycling is not offered behind the ticketing counters or at the airline counter in front of each gate. Airlines typically generate paper waste in both areas.

Security Checkpoint

Waste from passengers and TSA employees is collected at the TSA checkpoint in silver trash receptacles supplied by GARAA. A significant amount of liquids are collected in the TSA queuing area due to TSA restrictions. Liquids add weight to the waste stream. Given that WM (formerly known as Waste Management), the Airport's current waste service provider, charges a per ton rate for trash compactor disposal, the added weight from these liquids results in increased costs to the Airport. Additionally, without liquid collection, the trash bags in these receptacles need to be emptied more frequently to prevent exceedance of comfortable or safe handling weights. Liquids disposed of in a recycling receptacle can contaminate other materials like paper, and may cause rejection by a recycler, which will result in the entire load being landfilled. Liquid collection stations encourage passengers to empty their reusable and disposable water bottles before approaching the TSA check point. Instead of throwing the bottle away, it can be refilled in the sterile area with the previously installed water bottle fill stations after screening. The liquid collection stations also act as a final reminder to passengers about to enter the screening area that liquids greater than 3.3 fluid ounces are not allowed through screening, thereby expediting the screening process. While there is an upfront cost for purchasing a liquid collection station, the cost is offset by lessening waste hauling fees and potentially future contamination fees. Liquid collection containers are utilized in this area of the terminal. Additionally, specialty items confiscated by TSA are collected in TSA-owned receptacles and transported off-site; these items are then sold, donated, or disposed of by TSA staff.

GARAA plans to purchase new receptacles for all areas of the terminal building as part of the on-going terminal replacement project.

Dumpsters & Compactors

After initial collection, the bags of trash and recyclables are transported from the initial collection point to a dumpster or compactor provided by the Airport's waste services contractor, WM . Three dumpsters and a compactor are located outside of the terminal on the south side of the facility behind baggage claim. When the terminal replacement program is complete, these dumpsters will be relocated to the north side of the terminal. Dumpsters are also stationed outside of the Consolidated Rental Car Service Facility and the Airfield Equipment Storage and Maintenance Facilities. The Airport typically uses flat top dumpsters with attached flip-over lids labeled to specify the waste stream. Dumpsters and compactors seen during the site visit are described in the following sections.

Terminal Collection

The main area for waste collection is located south of the terminal within the airfield fence. This area contains three 8-yard, front-load dumpsters and a 30-yard compactor primarily used by GARAA janitorial staff and tenants housed within the terminal. Although clear signage is not present, the compactor is utilized for trash collection. One of the three dumpsters is designated as trash while the other two are designated as mixed recycling. Signage on the western-most recycling dumpster incorrectly indicates that the dumpster is "Cardboard Only" and utilizes an elongated opening created for broken down cardboard.

Grease Collection Area

A grease collection receptacle is stationed outside of the terminal on the northwest side of the building. Blue Ridge Tavern is the sole user of the grease collection system. The location of this collection system was chosen to allow for easy access by this concessionaire. A new grease collection system will be installed as part of the terminal renovations.

Consolidated Rental Car Service Facility

Through the contract with WM, GARAA provides dumpsters for the Consolidated Rental Car Service Facility. After receiving feedback that there was a contamination issue within these dumpsters, GARAA replaced the one dumpster designated as mixed recycling with a trash dumpster. While one dumpster was labeled as recycling, the three dumpsters located at this facility are currently collected and disposed of as trash. A brick containment structure was built for two of the three dumpsters with wooden doors for containment and aesthetic purposes. The third dumpster is not contained in a structure (see photo). As requested by WM, the doors on each structure remain open at all times for easy access during pick up.

Airfield Equipment Storage and Maintenance Building

Two 8-yard, front-load trash dumpsters and a 20-yard, open top roll off dumpster are located near the Airfield Equipment Storage and Maintenance Buildings. A separate bin is used to collect metal that can be recycled.

As part of the waste services contract with WM, the Airport can request a dumpster be replaced at any time. Reasons to replace a dumpster may include leaking fluids, missing lid, or broken doors, among other defects. WM is also responsible for placing the correct signage on each dumpster provided to the Airport. GARAA can request that signage be replaced if necessary to identify correct waste disposal practices.

1.4.2 Waste Collection

GARAA staff are primarily responsible for transferring waste generated at AVL from the initial point of collection to the dumpsters or compactor. GARAA janitorial staff are responsible for receptacles in the terminal, outside of concessionaire areas. Because plastic bags are detrimental to the machinery used to sort mixed recyclables, bags of recyclable materials must be emptied into a recycling dumpster and placed into the trash. Plastic bags thrown into the recyclable dumpsters contribute to contamination and may result in the rejection of a load and the assessment of a fee by WM.

Concessionaires along with GARAA staff at the maintenance and ARFF/police building are responsible for transferring waste generated in their areas to the nearest dumpster. Rental car company staff transport waste from the Consolidated Rental Car Service Facility to the dumpsters near their facilities. Rental car companies are responsible for collecting and recycling oils collected in their facilities.

Once waste is collected and placed in the appropriate dumpster, WM is responsible for hauling the trash and recyclables to the next destination. Trash is hauled to a landfill owned by WM. WM does not own a recycling facility in the Asheville area, so WM hauls the mixed recyclables from AVL to one of two facilities: Curbside Management and American Recycle. The trash compactor is emptied based on capacity, while the dumpsters are picked up on a set schedule.

1.5 CURRENT RECYCLING, REUSE, AND WASTE REDUCTION EFFORTS

GARAA currently has an undefined recycling program. However, impactful recycling, reuse, and reduction practices are still present around the Airport. These successes are listed below.

Water Bottle Fill Stations

Water bottle fill stations have been installed throughout the terminal to reduce the number of disposable bottles discarded at the Airport. AVL's website indicates the availability and locations of the stations to allow passengers to plan accordingly.

Construction and Demolition Debris

Many construction projects at the Airport, inside and outside of the terminal, involve the reuse or recycling of construction and demolition debris. In preparation for construction of the new

terminal building, GARAA is working with Waste Reduction Partners (WRP), a state/Council of Government technical assistance group focused on waste reduction, to locate recyclers or local donation programs that accept the waste that will be generated during demolition of the current terminal.

TSA

TSA currently collects confiscated items in restricted containers, with certain items then being donated to schools, nonprofits, and even to the police. These items may include toiletries that are too large to pass through security, scissors, weapons, etc.

Deplaned Waste

While AVL is not a designated hub airport for recycling, certain airlines do separate recyclables generated onboard their aircraft which are then retained onboard until the aircraft returns to a designated hub airport to be recycled.

Coal Ash Reuse

In partnership with Duke Energy, AVL was able to utilize coal combustion residuals (CCR), also known as coal ash, as fill material to alter the topography surrounding the Airport; this area was previously considered undevelopable because of the vast amount of structural fill required for development. Beneficial reuse of coal ash has many environmental and cost benefits, including the reduction of waste.

1.6 WASTE MANAGEMENT CONTRACTS

The FMRA requires a review of existing waste management contracts to address solid waste recycling at the Airport. The purpose of this exercise is to potentially identify opportunities to improve recycling scope and efficiency.

1.6.1 Waste & Recycling Contracts

Waste services at AVL are contracted to WM. The actual contract was not readily available for review; however, details of the contract have been communicated through discussions with GARAA and WM staff, and 12 months of solid waste invoices were provided for a comprehensive review. As part of the contract, WM provides and services the dumpsters and compactor and hauls the waste to a landfill or facility to be recycled. GARAA can alter the number of dumpsters provided by WM, including the number of dumpsters dedicated to trash and recycling without altering the contract. To select a new waste services provider, GARAA would have to release a Request for Proposals and select from the available bidders once the current contract expires.

The Airport's MSW compactor is hauled when at capacity, and GARAA is charged a fixed fee for each load in addition to a per ton rate for the contents. The 30-yard roll off dumpster is also hauled when at capacity, with a similar fixed fee for each load plus a per ton rate for the contents. The review of invoices revealed an additional "inactivity charge" assessed during periods when the roll off dumpster was not hauled. This surcharge has been addressed and removed from future invoicing.

The remaining trash dumpsters are hauled on a regular schedule, with a fixed monthly fee based upon the collection frequency.

The recycling dumpsters are also hauled on a regular schedule, with a fixed monthly fee based on the collection frequency. This fee is higher than an equivalent trash dumpster on a similar hauling frequency. Additionally, WM currently charges a surcharge termed the "Recyclable Materials Offset" for each recyclable dumpster. WM provided the following explanation of this surcharge.

The Recyclable Material Offset (RMO) is a price adjustment that applies to recycle collection customers, that allows our WM operating companies to achieve an acceptable operating margin despite increased recycling costs and/or declines in the value of processed recyclables in the global commodities market. The RMO is usually a charge and is calculated based on the amount that (a) our applicable WM operating company processing cost per ton, including costs of disposal for contamination and profit margin, exceeds (b) an amount equal to the blended value per ton of processed recyclables, minus an amount for profit margin. The RMO, including profit margin, processing, and disposal costs and recyclables blended value shall be determined by the company from time-to-time, in its sole discretion, based on applicable operating data and market information. If recyclables blended value exceeds processing costs, plus profit margin, an RMO credit may apply, at the company's sole discretion. We will monitor changes in the recycling commodities market and recycling costs and may adjust this charge, in our discretion, as appropriate in the future. The RMO is subject to a customer's applicable service terms.

If a recyclable dumpster is determined to be contaminated, GARAA is charged an additional fee per instance of contamination. WM Haul truck drivers have been trained to identify contamination in the dumpsters to prevent contamination of the entire hauler's load, which is done by using a camera that provides an image of the dumpster contents at the time of pickup. If caught upon initial inspection, contaminated dumpsters are reported for pick up as trash. Additionally, WM trucks utilize video surveillance to further identify the source of any missed contamination that is identified at the recycling facility. These videos can be requested by GARAA as necessary. Ultimately, Curbside Management and American Recycle, the two recycling facilities used by WM, are given the final say on contamination. If contamination is found at the recycling facility, WM is charged a fee so that the waste can be hauled to a landfill. WM then charges GARAA.

Communications with WM indicated that AVL had not had significant incidences of rejection due to contamination. An example of recycling contamination was provided by WM, as shown below. Note the black bags in the bottom center, and bottom right of the image.

However, based upon the review of the WM invoices provided by AVL, a total of seventeen (17) loads were rejected as contaminated by the WM haul truck drivers. This inconsistency should be addressed by GARAA with WM.

Within a period of a year (July 2021 through June 2022), GARAA was charged $47,300 for waste services at AVL. A summary of the dumpsters, locations, and average monthly cost is provided in **Table 1-2**.

Table 1-2 – Airport Waste Management Areas

Dumpster Location	Quantity	Type	Average Monthly Cost
Terminal	1	8-yard Trash	$ 48.51
Terminal	1	8-yard Recycling	$ 301.19
Terminal	1	30-yard Compactor	$ 2,499.40
Maintenance	1	8-yard Trash	$ 143.57
Maintenance	1	8-yard Recycling	$ 113.30
Maintenance	1	30-yard Roll-off	$ 383.54
Rental Car Facility	2	8-yard Trash	$ 253.64
Rental Car Facility	1	8-yard Recycling	$ 198.46
		Total	**$ 3,743.15**

Source: GARAA, CHA, 2024.

1.6.2 Tenant Leases

GARAA is responsible for managing tenant leases in the terminal building as well as outlying facilities. Tenant leases do not currently require participation in the airport recycling program or standalone recycling and waste management efforts.

1.7 WASTE AUDIT

CHA, aided by Waste Reduction Partners, conducted a visual waste audit during the site visit on June 18, 2022. The audit assessed the characteristics of materials in the AVL terminal waste stream. During the solid waste audit, the terminal trash and recycling receptacles both pre- and post-security, along with the dumpsters located at the terminal and Consolidated Rental Car Service Facility, were visually examined.

Visual audit of the teal combination trash and recyclable collection receptacles in the terminal showed low levels of contamination. The side-by-side disposal options, along with the physical structure of the receptacles, appear to provide sufficient guidance to the public. However, upon inspection of the silver trash and recycling receptacles, there was not appropriate separation of recyclable materials prior to disposal, resulting in the significant mixing of the solid waste and recyclable material disposal streams. This likely results in the GARAA janitorial staff aggregating the contents of both the trash and recycling receptacles together and disposing of both as trash.

A visual estimate of the contents of several bags selected from the 8-yard trash dumpster outside of the terminal building indicated that approximately 25 percent to 35 percent of the waste stream is made up of recyclable material, primarily including plastic, aluminum, glass, and cardboard.

1.8 RECYCLING FEASIBILITY

Federal, State, and local guidelines ensure appropriate waste handling and disposal. This section identifies some of the guidelines.

1.8.1 Federal

The U.S. Environmental Protection Agency (EPA) and the FAA have established the guidelines that regulate solid waste at AVL. EPA guidelines that affect waste handling at the Airport include the Resource Conservation and Recovery Act (RCRA), which describes proper waste management procedures and programs mandated by Congress. RCRA establishes a national framework for waste management procedures, including both non-hazardous solid waste as well as hazardous waste. The laws and guidelines authorized by RCRA are monitored by state officials to ensure that all federal guidelines are followed by local entities. All waste produced at AVL falls under regulations established by RCRA, which includes guidelines for the safe disposal of materials including landfill materials, acceptance of industrial waste, their location, and proper mitigation guidelines for contamination cleanup.

As described earlier, the FMRA includes planning requirements for recycling and waste minimization when completing a new airport master plan. GARAA is required to address solid waste as part of an airport master planning project. The FAA September 2014 memorandum also provides guidance on airport waste and recycling, as discussed in this plan.

1.8.2 State

The North Carolina Department of Environmental Quality (NCDEQ) Division of Waste Management (DWM) oversees solid waste management at the state level. The Solid Waste Program ensures safe management of solid waste in North Carolina through guidance, technical assistance, regulations, permitting, environmental monitoring, and compliance enforcement. It regulates material recovery facilities, transfer stations, and landfills for sanitary or municipal solid waste, industrial waste, farming wastes, and construction and demolition waste, some of which are subject to EPA RCRA Subtitle D. The DWM and the state's waste management program are defined in North Carolina General Statutes Chapter 130A Article 9 Solid Waste Management. WM, Curbside Management, and American Recycle's facilities are permitted under this regulation.

1.8.3 Local

AVL is located in Asheville, North Carolina. The City of Asheville Office of Sustainability finalized a Sustainability Management Plan (SMP) in 2009 that identified solid waste as a focus area and specifically identified reducing solid waste disposed of in city landfills. Resolution No. 14-27 indicates that the Buncombe County landfill is projected to reach full capacity by 2035, after which the county would need to choose between outsourcing waste or taking on the considerable costs of opening a new landfill. As a result, waste reduction goals have been established with an ultimate goal of 50 percent reduction by 2035. Buncombe County manages local recycling and composting resources. Local municipalities and waste service providers determine the limits of what can be recycled in their area.

1.8.4 Community

Waste and recycling projects at other airports have confirmed that passengers have an interest in recycling. Based on the area's recycling programs, area residents have opportunities to recycle and are familiar with general recycling practices. As has been previously discussed, the City of Asheville has a commitment to reducing and recycling waste. Passengers and employees who recycle at home or at other businesses around North Carolina are likely to expect AVL to have a recycling program and to participate in that program. Sierra Nevada Brewing Company, located directly adjacent to the Airport, is an example of a facility that familiarizes the public with recycling practices. Additionally, this facility demonstrates a fully functioning composting program.

1.9 RECOMMENDATIONS

An organizational commitment to an official waste reduction program, as present at AVL, is a major success factor in any recycling plan. Without the commitment of resources such as funding, labor, time, space, and access to secure areas, a recycling program will struggle to succeed. This section presents recommendations for reducing, reusing, and recycling at AVL based on the information presented in previous sections of this document.

1.9.1 Reduce & Reuse Waste at AVL

According to the U.S. EPA's Waste Management Hierarchy, waste reduction and reuse are the most environmentally preferred waste management strategies. It is recommended that GARAA focus on reduction and reuse strategies first to lessen the facility's environmental impact. The following reduction and reuse strategies should be evaluated by GARAA to determine which, if any, are feasible and prudent for implementation at AVL.

Source: www.epa.gov, 2022

- Set GARAA's printers and copiers to default to double-sided printing
- Purchase reusable/recyclable printer cartridges
- Donate surplus food to local charities or organizations
- Develop a sustainable procurement policy
- Supply reusable drinkware for GARAA break rooms or kitchens

1.9.2 Rejuvenate the Recycling Program

Recycling, which can be defined as processing waste materials into raw materials to make new products, is the second most preferred waste management strategy in the U.S. EPA's waste management hierarchy. FAA guidance expects an airport's recycling, reuse, and waste reduction plan to document, at a minimum, the facility's existing program to recycle paper, plastic bottles, and aluminum cans. As previously discussed, recycling of these materials is carried out to various degrees at AVL. The following recommendations will increase the efficacy of the program and reduce the Airport's environmental impact.

Consolidation of Responsibility

It is recommended that GARAA select one individual to be the champion of the waste management program at AVL. Responsibilities of that person would include the coordination of collaboration between departments to make decisions and set goals, encouragement of participation in the program from staff and tenants, and monitoring/reporting progress. Most importantly, the champion of the waste management program would implement the recommendations of this plan and assess their efficacy, periodically re-evaluating the need for new initiatives. Designation of one individual as responsible for the program will ultimately determine the effectiveness of the overall waste management program, leading to not only improved recycling but a decrease in redundancy, which could lead to cost savings and operational efficiency. During the site visit, an individual was identified whose role within the organization is dedicated to special projects. This individual could become the champion of the waste management program.

Recycling Team

To aid in coordination efforts, it is recommended that GARAA initiate a "Recycling Team", led by the program champion, that meets on a quarterly basis to assess needs and valuable changes to the program. The Recycling Team could consist of GARAA administrative staff but could also invite representatives of each tenant, including airlines and concessionaires, whose participation in the waste management program is crucial. These individuals can then act to relay information between the GARAA and their employees.

The Recycling Team can be modified as GARAA sees fit. It could be as simple as a group of individuals that do an annual training or as hands on as a handful of individuals who shape and contribute to the program. The Recycling Team should allow for two-way communication in which GARAA can communicate goals and responsibilities throughout AVL, and feedback should be solicited from those utilizing the program. In the future, the group could potentially progress to addressing more than recycling efforts, evolving into a sustainability task force.

Clear Identification of Program Goals and Details

AVL's Environmental Policy, as defined in the Airport's Administration Policies & Procedures Section 119.00, details the Authority's goal of minimizing the Airport's operational impact on the environment. However, the Policy does not specify goals for waste management. Goals and details of the waste management program at AVL should be clearly identified before any operational changes are made. When establishing goals, the following should be addressed:

- Why are we establishing goals?
  - An open discussion about each question with key stakeholders at the Airport would provoke discussion and generate internal buy-in from management. Internal buy-in is important to the success of the program.
- What will be recycled in the terminal? Ancillary buildings?
  - It is recommended that AVL maintains a mixed recycling program in the terminal that abides by WM's designated acceptable materials. Ancillary buildings such as the maintenance facility may operate more efficiently if recycling is limited to cardboard only. It is recommended that mixed recycling is added to the ARFF facility.
- What are our Construction and Demolition goals?
- How will we re-evaluate the goals we set?
- What metrics will we use?

Goals can be quantitative or qualitative. A full waste audit can help determine quantitative goals such as a percentage of materials recycled and could be followed by annual audits to determine progress. Quantitative goals can also be set around the number of hauls and would require regular reporting from WM as currently provided. Qualitative goals could include implementing the recommendations identified in this plan. A task list summarizing the recommendations of this Plan is found in **Appendix A** and can be used as qualitative goals. **Appendix A** is meant to be

amended based on discussions after this plan and to be updated as new tasks are developed. Ultimately, the goal(s) of the program can be as simple as a Vision Statement about what GARAA believes it can achieve in terms of managing waste at AVL, or it can be as complex as setting several quantitative goals with annual reporting.

Along with each goal, GARAA should identify key performance indicators (KPIs) that indicate progress towards each goal. For example, if the goal is to reduce overall waste at AVL by 10 percent, a KPI would be to reduce C&D waste by 7 percent and municipal solid waste by 3 percent. Similarly, if the goal is to implement a Green Team, the KPIs would describe the steps to achieving the goals (e.g., create a contact list, contact those on the list, and schedule the first meeting).

Decisions made after establishing program goals (e.g., number of new trash/recycling receptacles, selection of a waste services provider, etc.) should be confirmed with the program champion to assure that the actions align with the goals of the program. Goals should be clearly communicated, internally and externally, and then revisited to assess changes as the program evolves. Goals should not be communicated externally until the goals and details of the program have been clearly defined to prevent further confusion.

Update Collection Protocol

Currently, collection protocol by the janitorial staff involves the simultaneous collection of trash and recycling bags, which are then placed in separate compartments of the carts for transport to the dumpsters. Trash bags are placed in the trash dumpsters, while the bags containing recyclable materials have to be re-opened, examined for contamination, and then emptied into the recycling dumpster if contamination is not present. The presence of the black plastic bags in the recyclable dumpsters are used by WM haul truck drivers as evidence of contamination.

This method of collection requires an extra step for recyclable materials. Instead of determining contamination upon collection and placing the materials directly into the appropriate compartment, janitorial staff is forced to re-open each bag outside to determine contamination. This extra step causes staff to work harder or results in contamination. With less time spent outside at the dumpsters with open trash bags, less foreign object debris (FOD) will be susceptible to blowing onto the airfield. Additionally, the black plastic bags currently used to aggregate both trash and recyclable materials are used as the visual cue for contamination and may result in the inappropriate rejection of fully recyclable material. Creating an efficiency system where the tasks of workers are simplified will result in a more effective recycling system.

Infrastructure Modification

The following sections identify infrastructure modifications to further support recycling, reuse, and reduction at AVL.

Receptacles

GARAA's silver, metallic receptacles are dispersed throughout the terminal. These containers are typically used by passengers. Passengers flying out of AVL are unfamiliar with the location of each receptacle and are often moving quickly, focused on arriving to their flight on time. A best practice for waste diversion is to offer separate trash and recycling receptacles directly adjacent to one another or to offer a single combined receptacle. For convenience, most people are not willing to walk further to find the appropriate receptacle. They look for the nearest one, whether it's recycling or trash. It is recommended that receptacles that are not combined be placed directly adjacent to one another.

Several AVL branded collection receptacles with both trash and recycling collection are placed throughout the terminal. The additional signage associated with these receptacles, and the combined nature of the collection, resulted in less observed cross contamination between the trash and recycling containers.

Once the receptacles are placed together, it will be important to distinguish the trash receptacles from recycling. Passengers mistaking recycling receptacles for trash cans contribute to the prevalent contamination seen during the site visit. Instead of using black lettering on both receptacles, recycling receptacles can be indicated with green lettering, a green ring decal around the base or opening, and/or a green recycling symbol on the top of the lid. The more distinguishable, the more effective the system will be. Trash cans can continue to be marked with black lettering, but a trash decal can be added.

While recycling infrastructure was present in the passenger focused areas of the terminal, other areas were lacking recycling infrastructure. Airlines (Allegiant and United), concessionaires (Paradies), and GARAA staff who were interviewed expressed interest in recycling. Tenants are willing to transport recyclables separately to the dumpsters if GARAA provides receptacles in their designated areas. It is recommended that GARAA work with tenants to supply recycling infrastructure that works for their designated spaces, as space is typically limited. Infrastructure needs communicated during interviews are listed below.

Currently, tenant contracts do not include requirements around waste management. New tenant contracts should incorporate requirements around the proper disposal of trash and recyclables and for training of employees. Additionally, tenant contracts can also require representation on the Recycling Team.

Dumpsters

As previously discussed, dumpsters are stationed at various locations around the terminal and ancillary buildings. On the day of the site visit, several of the dumpsters were labeled with

misleading signage. WM is responsible for appropriate decals on each dumpster. GARAA staff should contact WM to correct the signage.

It is also recommended that GARAA work with WM to clearly identify the various waste streams, collection options and, most importantly, the costs to the Airport for those options.

Options most advantageous to recycling include:

Option 1: Add a Single-Stream Compactor

Option 2: Add a Cardboard-Only Compactor

Currently, incidences of contamination are determined solely by the haul truck drivers at the time of pick up. A review of the provided photos indicated the difficulty in making such a determination both quickly and accurately. A designated recycling compactor placed at the Terminal could enhance the collection of recyclables, reduce the potential for contamination, and increase the rate of recycling at AVL.

The benefit of introducing a cardboard-only compactor is the rebate that would be possible. Rebates are discussed in detail in **Section 1.10**.

The upcoming terminal replacement project will offer the opportunity to revised and consolidate both the distribution and use of dumpsters at the Airport.

Introduce Waste Management Requirements to Tenant Leases

The terminal replacement project will increase the number of concessionaires operating at AVL. Participation from airport tenants is required to secure a high waste diversion rate. It is recommended that GARAA add requirements about recycling to each new tenant's lease. Consideration should be given to the feasibility of adding requirements for all tenants, including current tenants, and to incorporating recycling requirements into AVL's Airport Rules and Regulations. Requirements can be expanded to include waste management training for tenant employees, requirements around eco-friendly product purchases and composting, and recommendations for surplus food donations in accordance with federal guidelines.

Food Waste

According to industry case studies, food waste is a major component of the waste stream at an airport, averaging about 35 percent of the total waste stream. The potential implementation of a food composting program at AVL could result in significant waste reduction. Composting is the second most preferred method of waste management in the EPA's Waste Management Hierarchy, categorized alongside of recycling. Composting is the accelerated biological decomposition of organic matter under aerobic conditions, resulting in a stabilized product that can be used as a soil additive. In an airport terminal, pre-consumer food waste, distinguished as waste generated by food preparation activities, is generally easier to compost. Unlike most passengers, restaurant employees visit the terminal on a recurrent basis making them easier to educate on composting practices and requirements. The specific items accepted by a composting facility are dependent on the receiving facility's design and the process used to break down the

waste. Some facilities accept all food waste (i.e., meat, bones, and breads) while others accept only vegetables and fruit.

WM does not offer composting services. Composting of food waste at AVL is largely dependent on the availability of a local composting facility. Unlike other areas, Asheville does offer a variety of composting resources. Based on a recommendation from WRP, the CHA Team interviewed Atlas Organics, a public/private partnership composting company in Asheville, to determine the feasibility of composting at AVL. Details of those discussions are provided as an example of how a composting program at the Airport could be designed.

Example of a Composting Program

Atlas Organics accepts yard waste, certified compostable materials, cooked meat and fish, and all other foods as part of their composting program. Grease is not allowed. Compostable bags (BioBags or similar) can be utilized during collection. AVL is in the company's service area, as they currently pick up compost in the residential area surrounding the Airport. If Atlas Organics were to be used for composting services, the Airport would rent two or more carts, similar to a residential garbage can (pictured left), that would be swapped out on a regular basis. One or more carts would be stationed at the Airport in an area easily accessible to concessionaires and maintenance personnel.

Employees with food waste would collect the materials in a smaller toter (pictured right) to be transported to the larger cart(s). Once the cart is full, the cart can be picked up by Atlas Organics from the Airport in exchange for the other rented cart(s). The cart should be permanently stationed in a publicly accessible area or should be moved to a public area for pick up to prevent the need for a staff escort. Atlas Organics uses a semitruck to pick up the carts. Once emptied, Atlas Organics washes and sanitizes the carts before they are returned for their next use. If the amount of materials exceeds the capacity of a cart, roll-off dumpsters and compactors are also available. Collected materials are scanned for items that have not or will not ever break down upon their arrival at the facility. The goal is to have less than 3 percent contamination. If contamination is found on a recurrent basis, the company will notify GARAA and work with the Airport to reduce contamination issues. Fees are only charged if the customer is completely unresponsive.

Often times, smell can be a deterring factor for those composting. However, with this system, Atlas Organics has seen limited issues with odor. The smell is dependent on the waste stream, but the Airport's waste stream would be consistent with what is already being collected in the

Airport's dumpsters and would most likely have a similar odor. If the waste stream is large enough, use of a compactor could reduce odor. Compactors can be picked up on a set schedule or when at capacity. The use of compostable bags also lessens odor issues and minimizes wildlife attractants.

Costs associated with a composting program can include the cost of renting containers, a tip fee, and a haul fee. Fuel surcharges are itemized separately on each receipt. The 2-gallon toter pictured above can be purchased for $15.00, while several others can be purchased on Amazon depending on the size and shape requested. Atlas Organics provides impact reports to their customers so that the benefits of the program are recognized and can be publicized. Given the prevalence of food waste at AVL and the local availability of a composting stream, the introduction of a composting program would have a significant impact on the waste stream, reducing the costs associated with hauling waste to a landfill.

Source: Port of Seattle.

The example program described in this section details a moderately sized organic waste collection system. However, it can be sized based on funding availability and the desired level of commitment. The program can initially focus on coffee grounds generated by restaurants in the terminal. Coffee grounds have a pleasant odor, are easily and easy to separate, are typically uncontaminated by other materials, and are generated in a predictable manner and quantity. Once tenants are comfortable composting coffee grounds, other specific materials can be added (i.e., eggshells, banana peels, apple cores, etc.) and/or by type (i.e., fruits, vegetables, etc.) until all food waste appropriate for composting is included. In contrast, the Authority can seize the opportunity to introduce a full-scale composting program with the opening of the new terminal. Given the generous resources in the surrounding area, it is recommended that composting become a main feature at AVL that allows not only concessionaires, but passengers and employees, to compost. The Asheville area is trending towards requiring organics collection. While the 2021 law did not pass, organics collection requirements were on the area's legislative docket. It is reasonably foreseeable that legislation around composting will pass within the next ten years. Initiating the program as part of the terminal reconstruction project would put the Airport on the right track to support city-wide goals and requirements. When purchasing new receptacles for the terminal, a receptacle with a "compost" compartment can be selected. Port of Seattle's (SEA) combined waste receptacles are shown as an example of appropriate signage and size.

1.9.3 Construction & Demolition Waste

After establishing goals around reducing, reusing, and recycling C&D debris, GARAA can implement standard procedures around waste tracking during a C&D project. Waste tracking requirements and possibly reduce, reuse, recycle requirements, should be included in every construction or demolition project's specifications section.

1.9.4 Education & Outreach

The FAA's *Recycling, Reuse, and Waste Reduction at Airports: A Synthesis Document* outlines the essential components of an effective education and outreach program. The program consists of three tasks: initial communication, continuing education, and on-going facilitation with each stakeholder.

Initial Communication

Once program goals are established and the waste stream is defined, GARAA must communicate the goals and relevant procedures to each person responsible for waste management. Communications with employees and tenants can include written communication (i.e., emails, newsletters, etc.) or in-person conversations. Initial communication should include introducing appropriate signage. This includes updating old, mislabeled items such as the dumpsters, along with introducing new signage in the terminal to communicate what can and cannot be recycled to passengers and employees. It is recommended that GARAA work to improve terminal messaging for passengers by providing consistent instructions for recycling at AVL. Consistent receptacle signage is a large contributor to effective communication. Social media and public relations were recognized as a strong suit at AVL. These resources, including the graphic design artist, can be utilized to educate and publicize the successes of the program.

Continuing Education

Employee turnover can be significant at an airport. Initial training should be followed by recurrent training to assure that each staff member is aware of program requirements. The training should include reminders about the materials that are accepted and information about some of the positive effects the program is having to reduce, reuse, and recycle at AVL.

On-going Facilitation

As the program progresses, changes may need to be made. Those changes must then be communicated effectively to staff at the Airport. Monthly airline Section Manager Meetings can be used to regularly update the airlines on changes or progress made. Ongoing communication should be two-way. Tenants should be able to ask questions and provide feedback. Interviews can be utilized to determine if the message is being communicated effectively. It is recommended that GARAA identify a contact email or specific contact person for tenants to ask questions about the program. The Buncombe County waste coordinator and Asheville Greenworks offer brown bag lunch and learn sessions for employees on recycling. Atlas Organics offers education services on composting.

Waste Reduction Partners (https://wastereductionpartners.org/) provides a unique opportunity for GARAA to leverage existing non-profit resources to assist with the development and implementation of awareness and education efforts revolving around the recycling program at AVL. Waste Reduction Partners is a unique technical assistance program which engages the expertise of retired and volunteer engineers to serve businesses and institutions in North Carolina. Jan Hardin, Solid Waste Manager, assisted tremendously in the assessment of the existing solid waste stream at AVL and would be an asset for the Airport moving forward.

1.10 COST SAVINGS & REVENUE GENERATION

The costs associated with a recycling program are dependent on locally available resources, material markets, and the type of waste generated. These costs often include capital costs for containers, landfill tipping fees, hauling costs, recycled material rebates, and labor. Generally, demonstrated reductions in cost are an important part of ensuring the viability and success of an airport's recycling and waste reduction efforts. As a result, the FMRA requires an evaluation of the potential cost savings and revenue generation opportunities for an Airport Recycling, Reuse, and Waste Reduction Plan.

Based on the information gathered in this plan, the main cost savings mechanism would involve decreasing the number of hauls required to service the Airport. The introduction of an organics program could lessen the amount of municipal solid waste hauled to a landfill from AVL. Depending on the amount collected, this could be significant and could result in cost savings depending on how many trash dumpsters are still necessary.

The introduction of a compactor would lessen the number of dumpsters necessary and the number of hauls by assuring that cardboard or mixed recyclables are condensed. Current cost savings initiatives would need to be coordinated with WM to determine the cost of making upgrades versus the cost saved. Cost savings initiatives should be negotiated whenever a new waste hauler is selected or if a contract is renewed. Existing contracts are not structured to reduce costs by diverting materials to recycling. Should a new fee structure be implemented for recycling collection versus waste collection, it is possible that GARAA could achieve a financial benefit from diversion to recycling.

The most feasible method of revenue generation would be through the use of rebates. Rebates are only available when waste can be tracked back to a certain facility. WM stated that cardboard collected in a cardboard only compactor could produce a rebate. The rebate amount would be negotiated at the time of switching to a compactor because markets for secondary materials fluctuate, particularly for wastepaper and cardboard.

NCDEQ GRANT OPPORTUNITIES

Food Waste Reduction Grant

New opportunity to reduce food waste disposed of in a landfill. Will focus on food donation and composting programs. More information will be released in October of 2022.

Community Waste Reduction & Recycling (CWRAR) Grant Program

Recurring annual grant to support public recycling programs and recycling public awareness. RFP issues late fall. Applications due in February. Grants available July 1st.

Subsequent funding opportunities are available in the form of a grant through NCDEQ. The NCDEQ website lists several "Recycling Grant Programs for Local Governments" that may apply to AVL. GARAA can reach out to NCDEQ at any time to discuss available funding opportunities as they become available. Grants currently listed on the NCDEQ website that may apply to AVL include a Food Waste Reduction Grant and the Community Waste Reduction and Recycling Grant Program.

1.11 CONCLUSION

GARAA currently offers a mixed recycling program throughout the terminal building, but the program lacks universal policies and procedures. The findings in this plan describe opportunities to increase the reduction, reuse, and recycling of waste materials at AVL. Implementation of the recommendations will expand upon current efforts and ensure that the quantity of materials diverted from a landfill increases, lessening the environmental footprint of the Airport, and creates an efficient and effective program.

2024 Waste Diversion Task List

Reduce, Reuse, Recycle

	Responsible Person	Started	Completed
Reduce/Reuse			
Introduce liquid collection station		☐	☒
Locate floor drains with access		☐	☒
Purchase/Fabricate Station		☐	☒
Default In-house printers and copiers to double-sided print		☐	☐
Recycle			
Select a Program Champion		☐	☐
Create a Recycling Team		☐	☐
Create a contact list		☐	☐
Schedule the first meeting		☐	☐
Establish program goals and KPIs		☐	☐
Determine Key Players		☐	☐
Conduct a meeting with Key Players		☐	☐
Update Collection Protocol		☐	☐
Switch out carts for dual-compartment carts		☐	☐
Train janitorial staff		☐	☐
		☐	☐

Notes:

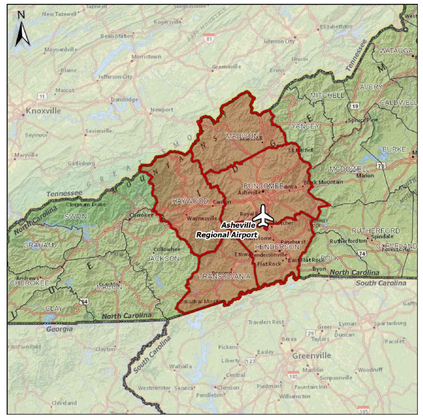
Liquid collection containers are now utilized in the TSA queuing area.

Update infrastructure		☐	☐
Place terminal trash/recycling bins side by side		☐	☐
Add decals to recycling/trash receptacles		☐	☐
Supply tenants/GARAA staff with recycling bins		☐	☐
Assess feasibility of a compactor (space, safety)		☐	☐
Discuss dumpster/compactor needs with WM		☐	☐
Discuss rebates with WM (if compactor installed)		☐	☐
Re-evaluate available organic waste collectors in the area		☐	☐
Introduce composting pilot program			
Insert standard C&D waste tracking specifications		☐	☐
Communicate program goals (once established)		☐	☐
Introduce appropriate signage around the terminal		☐	☐
Send an email/newsletter to all tenants providing program information		☐	☐
Add tenant recycling requirements to standard lease agreement		☐	☐
Refine Goals and Procedures		☐	☐
Schedule Annual Audit/Interviews		☐	☐
Schedule annual waste/recycling training		☐	☐
Establish an email or contact person for questions		☐	☐
Perform interviews with AVL and tenant staff to assess needs and effectiveness of communication (similar to site visit)		☐	☐

APPENDIX F – AIRPORT LAYOUT PLAN

[Attached]

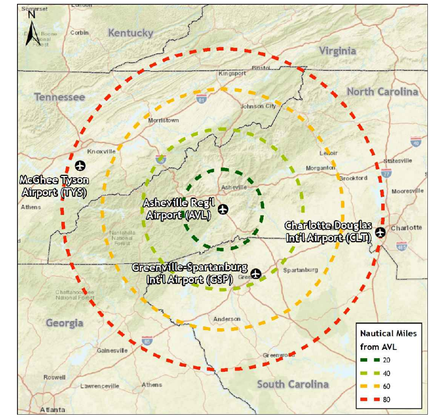
ASHEVILLE REGIONAL AIRPORT (AVL)
AIRPORT LAYOUT PLAN
January 2026



LOCATION MAP

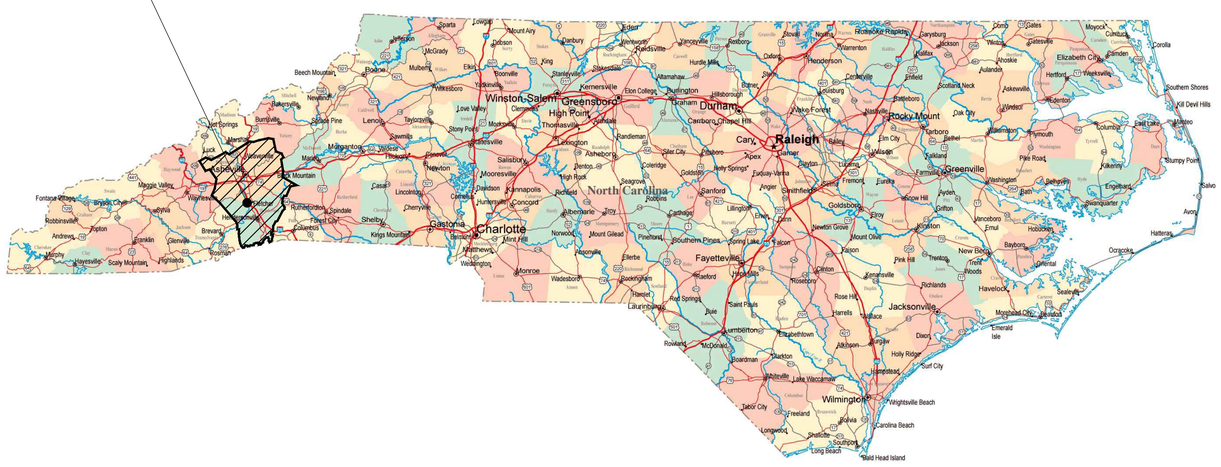
TABLE OF CONTENTS

SHEET NUMBER	SHEET TITLE
1	Title Sheet
2	Data Sheet
3	Existing Airport Layout Plan
4	Future Airport Layout Plan
5	Airspace Plan (1 of 2)
6	Airspace Plan (2 of 2)
7	Inner Approach Surfaces - Runway 17
8	Inner Approach Surfaces - Runway 35
9	Terminal Area Plan (1 of 3)
10	Terminal Area Plan (2 of 3)
11	Terminal Area Plan (3 of 3)
12	Land Use Plan
13	Airport Property Map
14	Airport Property Map Tables



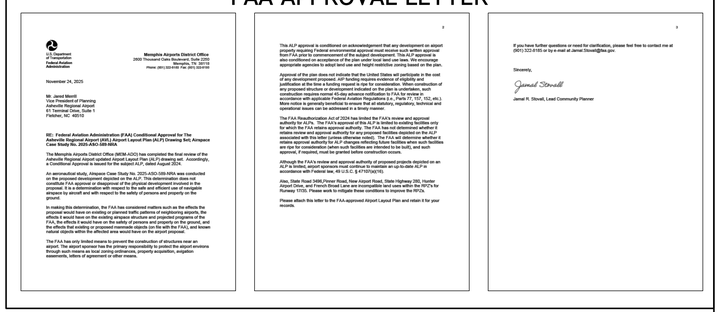
VICINITY MAP

ASHEVILLE REGIONAL AIRPORT



STATE MAP

FAA APPROVAL LETTER



U.S. Department of Transportation Federal Aviation Administration

Memphis Airports District Office
2600 Thousand Oaks Boulevard, Suite 2250
Memphis, TN 38118-7554
Phone: (901) 322-8190 Fax: (901) 322-8192

November 24, 2025

Mr. Jamal Merritt
Vice President of Planning
Asheville Regional Airport
61 Terminal Drive, Suite 1
Fletcher, NC 28732

RE: Federal Aviation Administration (FAA) Conditional Approval for The Asheville Regional Airport (AVL) Airport Layout Plan (ALP) Drawing Set; Airspace Case Study No. 2025-ASO-088-NRA

The Memphis Airports District Office (MEM-ADO) has completed the first review of the Asheville Regional Airport (AVL) Airport Layout Plan (ALP) drawing set. Accordingly, a Conditional Approval is issued for the subject ALP, dated August 2024.

An aeronautical study, Airspace Case Study No. 2025-ASO-088-NRA was conducted on the proposed development depicted on the ALP. This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination that the FAA's ability to carry out its statutory responsibilities relative to aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effect it would have on the navigation system and communication facilities of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. Airport sponsors should take every possibility to protect the airport environs through such means as local zoning ordinances, property acquisition, avigation easements, letters of agreement or other means.

This ALP approval is conditioned on acknowledgement that any development on airport property will be in accordance with the approved ALP and that any deviation from the ALP must be cleared by FAA prior to commencement of the subject development. This ALP approval is also conditioned on acceptance of the plan under local land use laws. We encourage appropriate agencies to adopt land use and height restrictive zoning based on the plan.

Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration. When construction of airport improvements adjacent to navigable airspace is being proposed, the construction requires normal 45-day advance notification to FAA for review in accordance with applicable Federal Aviation Regulations (i.e., Parts 77, 157, 152, etc.). Other aspects of the proposed development affecting safety, regulatory, technical and operational issues can be addressed in a timely manner.

The FAA Reauthorization Act of 2024 has limited the FAA's review and approval authority for ALPs. The FAA's approval of this ALP is limited to existing facilities only for which the FAA retains approval authority. The FAA has not determined whether if proposed projects depicted on an ALP are eligible for approval under Section 163 or associated with this letter (unless otherwise noted). The FAA will determine whether it retains approval authority for ALP changes reflecting future facilities when such facilities are ready for consideration (when a project is ready to bid, fund, and/or build), and such approval, if required, must be granted before construction occurs.

Although the FAA's review and approval authority of proposed projects depicted on an ALP is limited, airport sponsors must continue to maintain an up-to-date ALP in accordance with Federal law, 49 U.S.C. § 47107(a)(16).

Also, State Road 3456 (Fenner Road), New Airport Road, State Highway 280, Hunter Airport Drive, and French Broad Lane are incompatible land uses within the RPZ's for Runway 17/35. Please work to mitigate these conditions to improve the RPZs.

Please attach this letter to the FAA-approved Airport Layout Plan and retain it for your records.

If you have further questions or need for clarification, please feel free to contact me at (901) 322-8185 or by e-mail at James.Stovall@faa.gov.

Sincerely,

James R. Stovall, Lead Community Planner

FEDERAL AVIATION ADMINISTRATION APPROVAL	JAMAL R STOVALL — Digitally signed by JAMAL R STOVALL Date: 2026.02.10 15:40:13 -06'00'	2/10/2026
	FEDERAL AVIATION ADMINISTRATION APPROVED SUBJECT TO COMMENTS AND CONDITIONS NOTED IN LETTER FROM MANAGER, MEMPHIS AIRPORTS DISTRICT OFFICE DATED 11/24/2025.	DATE
GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY APPROVAL	PRESIDENT & CEO	2-4-26 DATE

Asheville REGIONAL AIRPORT

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CHA
201 N. Illinois Street, Suite 800
Indianapolis, IN 46204
317.786.0461 . www.chasolutions.com

Designed By:	Drawn By:	Checked By:
CHA	ARC	PM
Issue Date: Feb 2026	Project No: 68167	Scale: AS SHOWN

REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT AIRPORT LAYOUT PLAN

TITLE: TITLE SHEET

DRAWING NO.

File Name: \\cha-llp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-TITL.dwg - Title Sheet | Modified / By: February 9, 2026 12:36:40 PM / Curtice, Alexander

AIRPORT DATA

ASHEVILLE REGIONAL AIRPORT		
61 TERMINAL DRIVE		
FLETCHER, NC 28732		
BUNCOMBE COUNTY		
ITEM	EXISTING	FUTURE
AIRPORT OWNER	GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY	
STATE SERVICE LEVEL	AIR CARRIER	
NPIAS SERVICE LEVEL	PRIMARY - SMALL HUB / COMMERCIAL SERVICE	
AIRPORT REFERENCE CODE	C-III	
MEAN MAX. TEMPERATURE HOTTEST MONTH	85.3°	
AIRPORT ELEVATION (MSL)	2,164'	
RUNWAY DESIGN CODE	C-IV	
AIRPORT REFERENCE POINT (NAD83)	35° 26' 10.01" N	35° 26' 14.65" N
	82° 32' 31.37" W	82° 32' 33.44" W
AIRPORT TERMINAL AREA NAVAIDS	ROTATING BEACON, SEGMENTED CIRCLE, LOCALIZER, GLIDE SLOPE, PAPI	ROTATING BEACON, SEGMENTED CIRCLE, LOCALIZER, GLIDE SLOPE, PAPI
MAGNETIC DECLINATION	6° 55' W CHANGING BY 0° 3' W ANNUALLY (APRIL 2024)	
	NOAA NATION CENTERS FOR ENVIRONMENTAL INFORMATION	

RUNWAY DATA

DESCRIPTION		RUNWAY 17-35			
		EXISTING		FUTURE	
		17	35	17	35
RUNWAY LENGTH		8,002'		9,002'	
RUNWAY WIDTH		150'		150'	
PAVEMENT TYPE / SURFACE TYPE		ASPHALT - GROOVED		ASPHALT - GROOVED	
PAVEMENT STRENGTH (SINGLE)		120,000		120,000	
PAVEMENT STRENGTH (DUAL)		219,000		219,000	
PAVEMENT STRENGTH (DUAL TANDEM)		404,000		404,000	
PAVEMENT STRENGTH (DOUBLE DUAL TANDEM)		837,000		837,000	
EFFECTIVE RUNWAY GRADIENT		0.67		0.67	
APPROACH TYPE		PRECISION		PRECISION	
APPROACH VISIBILITY MINIMUM		½ MILE		½ MILE	
RUNWAY CATEGORY (14 CFR PART 77)		PRECISION		PRECISION	
APPROACH SLOPE (14 CFR PART 77)		50:1		50:1	
DESIGN AIRCRAFT		BOEING 737-800		BOEING 737-800	
RUNWAY DESIGN CODE (RDC)		C-IV		C-IV	
APPROACH RUNWAY REFERENCE CODE (APRC)		D / IV / 2400		D-IV / 2400	
DEPARTURE RUNWAY REFERENCE CODE (DPRC)		D / IV D / V		D / IV D / V	
DEPARTURE RUNWAY SURFACE		YES		YES	
APPROACH SURFACE TYPE		#5 & #6		#5 & #6	
TOUCHDOWN ZONE ELEVATION		2,140.9'		2.140.9'	
HORIZONTAL / VERTICAL DATUM		NAV 83 / NAVD 88			
AERONAUTICAL SURVEY		VERTICALLY GUIDED			
RUNWAY MARKINGS		PRECISION		PRECISION	
RUNWAY LIGHTING		HIRL	HIRL	HIRL	HIRL
APPROACH LIGHTING		MALSR	MALSR	MALSR	MALSR
INSTRUMENT & NAVIGATIONAL AIDS		MALSR, PAPI (P4R), CENTERLINE LIGHTING	MALSR, PAPI (P4L), TDZ & CENTERLINE LIGHTING	MALSR, PAPI (P4R), CENTERLINE LIGHTING	MALSR, PAPI (P4L), TDZ & CENTERLINE LIGHTING
"RUNWAY END COORDINATES & ELEVATIONS"	LATITUDE	35° 26' 48.97" N	35° 25' 32.86" N	35° 26' 56.41" N	35° 25' 32.86" N
	LONGITUDE	82° 32' 49.00" W	82° 32' 14.72" W	82° 32' 52.24" W	82° 32' 14.72" W
	ELEVATION	2,163.9'	2,117.4'	2163.9'	2,117.4'
DECLARED DISTANCES	TORA	8,002'	8,002'	9,002'	9,002'
	TODA	8,002'	8,002'	9,002'	9,002'
	ASDA	8,002'	8,002'	9,002'	9,002'
	LDA	8,002'	8,002'	9,002'	9,002'

APPROACH SURFACES

		RUNWAY 17-35			
		EXISTING		FUTURE	
		17	35	17	35
SURFACE #		#5/#6	#5/#6	#5/#6	#5/#6
APPROACH DIMENSIONS	A	200'/0'	200'/0'	200'/0'	200'/0'
	B	400'/350*	400'/350*	400'/350*	400'/350*
	C	3,400'/1,520'	3,400'/1,520'	3,400'/1,520'	3,400'/1,520'
	D	10,000'/10,200'	10,000'/10,200'	10,000'/10,200'	10,000'/10,200'
SLOPE		34:1/30:1	34:1/30:1	34:1/30:1	34:1/30:1

*(RUNWAY WIDTH + 200')

MODIFICATION TO FAA STANDARDS

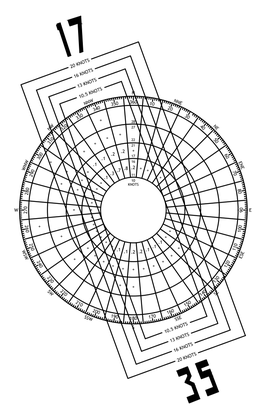
NONE

RUNWAY SAFETY AREA DATA

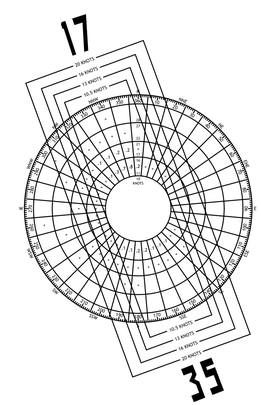
DESCRIPTION		RUNWAY 17-35			
		EXISTING		FUTURE	
		17	35	17	35
RUNWAY SAFETY AREA (RSA)	(R) LENGTH BEYOND RUNWAY END	1,000'	1,000'	1,000'	1,000'
	(P) LENGTH PRIOR TO RUNWAY END	600'	600'	600'	600'
	(C) WIDTH	500'	500'	500'	500'
RUNWAY OBJECT FREE AREA (ROFA)	(R) LENGTH BEYOND RUNWAY END	600'	600'	600'	600'
	(P) LENGTH PRIOR TO RUNWAY END	800'	800'	800'	800'
	(Q) WIDTH	800'	800'	800'	800'
APPROACH RUNWAY PROTECTION ZONE (RPZ)	(L) LENGTH	2,500'	2,500'	2,500'	2,500'
	(U) INNER WIDTH	1,000'	1,000'	1,000'	1,000'
	(V) OUTER WIDTH	1,750'	1,750'	1,750'	1,750'
DEPARTURE RUNWAY PROTECTION ZONE (RPZ)	(L) LENGTH	1,700'	1,700'	1,700'	1,700'
	(U) INNER WIDTH	500'	500'	500'	500'
	(V) OUTER WIDTH	1,010'	1,010'	1,010'	1,010'
RUNWAY OBSTACLE FREE ZONE (ROFZ)	LENGTH BEYOND RUNWAY END	200'	200'	200'	200'
	WIDTH	400'	400'	400'	400'

TAXIWAY DATA

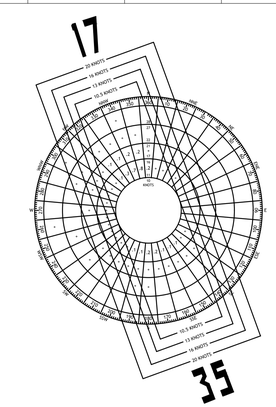
TAXIWAY NAME		TAXIWAY LIGHTING		TAXIWAY DESIGN GROUP		TAXIWAY WIDTH		TAXIWAY SAFETY AREA		TAXIWAY OBJECT FREE AREA	
EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
A	A	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
B	B	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
C	C	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
D	D	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
E	E	MITL	MITL	2	2	35'	35'	79'	79'	124'	124'
F	F	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
G	G	MITL	MITL	2	2	35'	35'	79'	79'	124'	124'
H	H	MITL	MITL	2	2	35'	35'	79'	79'	124'	124'
J	J	MITL	MITL	2	2	35'	35'	79'	79'	124'	124'
K	K	MITL	MITL	2	2	35'	35'	79'	79'	124'	124'
A1	A1	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A2	A2	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A3	A3	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A4	A4	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A5	A5	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A6	A6	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A7	A7	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
A8	A8	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
B1	B1	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
B3	B3	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'
B5	B5	MITL	MITL	5	5	75'	75'	171'	171'	243'	243'



Visual Flight Rules Weather Coverage				
Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
17-35	99.55%	99.89%	99.99%	100%



All Weather Coverage				
Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
17-35	99.60%	99.89%	99.98%	100%



Instrument Flight Rules Weather Coverage				
Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
17-35	99.74%	99.87%	99.96%	99.99%

SOURCE: NOAA, NATIONAL CLIMATE CENTER; STATION 723150 (2013-2022, ASHEVILLE REGIONAL AIRPORT

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Issue Date: Feb 2026	Project No: 68167	Scale: AS SHOWN

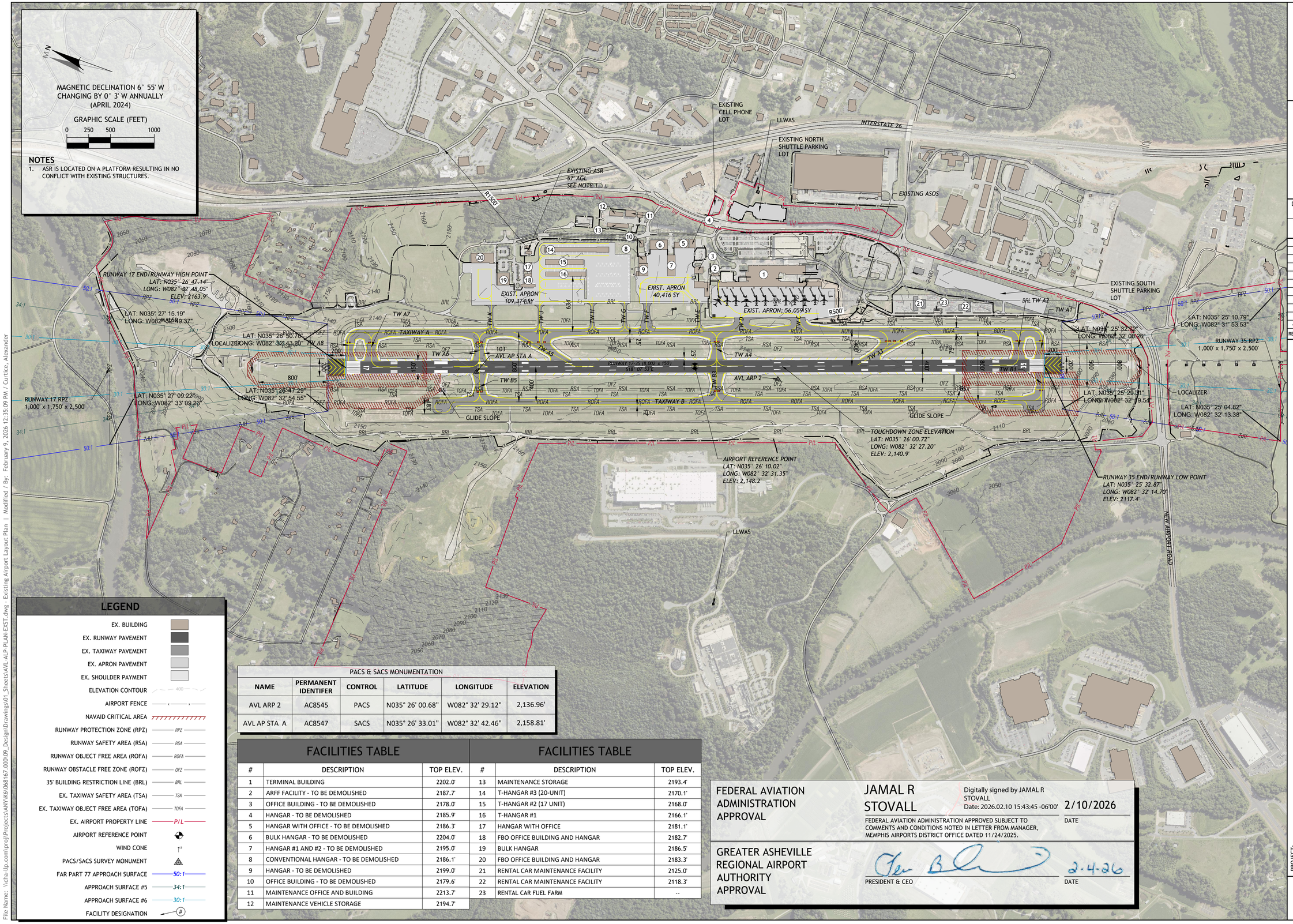
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT AIRPORT LAYOUT PLAN

TITLE: DATA SHEET

DRAWING NO. 2 OF 14

File Name: \\cha-llp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-DATA.dwg - Data Sheet | Modified / By: December 18, 2025 4:58:57 PM / Curtice, Alexander



PACS & SACS MONUMENTATION

NAME	PERMANENT IDENTIFER	CONTROL	LATITUDE	LONGITUDE	ELEVATION
AVL ARP 2	AC8545	PACS	N035° 26' 00.68"	W082° 32' 29.12"	2,136.96'
AVL AP STA A	AC8547	SACS	N035° 26' 33.01"	W082° 32' 42.46"	2,158.81'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'
4	HANGAR - TO BE DEMOLISHED	2185.9'
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'
9	HANGAR - TO BE DEMOLISHED	2199.0'
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'
11	MAINTENANCE OFFICE AND BUILDING	2213.7'
12	MAINTENANCE VEHICLE STORAGE	2194.7'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
13	MAINTENANCE STORAGE	2193.4'
14	T-HANGAR #3 (20-UNIT)	2170.1'
15	T-HANGAR #2 (17 UNIT)	2168.0'
16	T-HANGAR #1	2166.1'
17	HANGAR WITH OFFICE	2181.1'
18	FBO OFFICE BUILDING AND HANGAR	2182.7'
19	BULK HANGAR	2186.5'
20	FBO OFFICE BUILDING AND HANGAR	2183.3'
21	RENTAL CAR MAINTENANCE FACILITY	2125.0'
22	RENTAL CAR MAINTENANCE FACILITY	2118.3'
23	RENTAL CAR FUEL FARM	--

FEDERAL AVIATION ADMINISTRATION APPROVAL

JAMAL R STOVALL

Digitally signed by JAMAL R STOVALL
Date: 2026.02.10 15:43:45 -06'00'

2/10/2026
DATE

FEDERAL AVIATION ADMINISTRATION APPROVED SUBJECT TO COMMENTS AND CONDITIONS NOTED IN LETTER FROM MANAGER, MEMPHIS AIRPORTS DISTRICT OFFICE DATED 11/24/2025.

GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY APPROVAL

PRESIDENT & CEO

2.4.26
DATE

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Issue Date:	Project No:	Scale:
Feb 2026	68167	AS SHOWN

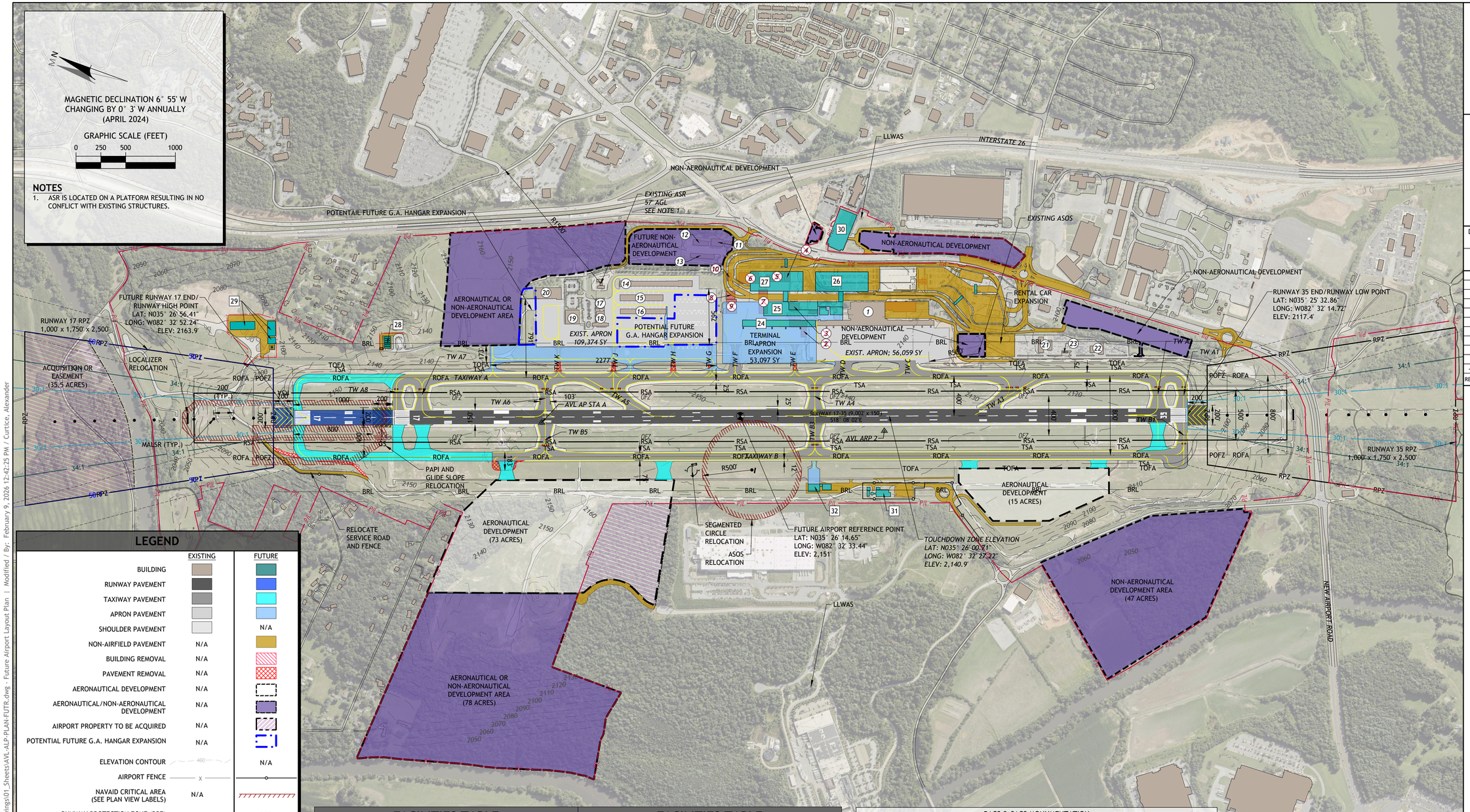
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: EXISTING AIRPORT LAYOUT PLAN

DRAWING NO.

File Name: \\cha-llp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-EXST.dwg - Existing Airport Layout Plan | Modified / By: February 9, 2026 12:35:09 PM / Curtice, Alexander



LEGEND

	EXISTING	FUTURE
BUILDING		
RUNWAY PAVEMENT		
TAXIWAY PAVEMENT		
APRON PAVEMENT		
SHOULDER PAVEMENT		N/A
NON-AIRFIELD PAVEMENT	N/A	
BUILDING REMOVAL	N/A	
PAVEMENT REMOVAL	N/A	
AERONAUTICAL DEVELOPMENT	N/A	
AERONAUTICAL/NON-AERONAUTICAL DEVELOPMENT	N/A	
AIRPORT PROPERTY TO BE ACQUIRED	N/A	
POTENTIAL FUTURE G.A. HANGAR EXPANSION	N/A	
ELEVATION CONTOUR	400	N/A
AIRPORT FENCE	x	
NAVAID CRITICAL AREA (SEE PLAN VIEW LABELS)	N/A	
RUNWAY PROTECTION ZONE (RPZ)	N/A	RPZ
RUNWAY SAFETY AREA (RSA)	N/A	RSA
RUNWAY OBJECT FREE AREA (ROFA)	N/A	ROFA
RUNWAY OBSTACLE FREE ZONE (ROFZ)	N/A	OFZ
35' BUILDING RESTRICTION LINE (BRL)	N/A	BRL
TAXIWAY SAFETY AREA (TSA)	N/A	TSA
TAXIWAY OBJECT FREE AREA (TOFA)	N/A	TOFA
AIRPORT PROPERTY LINE	N/A	P/L
AIRPORT REFERENCE POINT	N/A	
WIND CONE		
PACS/SACS SURVEY MONUMENT		N/A
FAR PART 77 APPROACH SURFACE	N/A	50:1
APPROACH SURFACE #5	N/A	34:1
APPROACH SURFACE #6	N/A	30:1
FACILITY DESIGNATION	#	#

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.	#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'	17	HANGAR WITH OFFICE	2181.1'
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'	18	FBO OFFICE BUILDING AND HANGAR	2182.7'
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'	19	BULK HANGAR	2186.5'
4	HANGAR - TO BE DEMOLISHED	2185.9'	20	FBO OFFICE BUILDING AND HANGAR	2183.3'
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'	21	RENTAL CAR MAINTENANCE FACILITY	2125.0'
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'	22	RENTAL CAR MAINTENANCE FACILITY	2118.3'
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'	23	RENTAL CAR FUEL FARM	--
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'	24	FUTURE CONCOURSE AND GATE EXPANSION	TBD
9	HANGAR - TO BE DEMOLISHED	2199.0'	25	FUTURE TICKETING AND BAGGAGE PROCESSOR AREA	TBD
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'	26	PARKING GARAGE 2	TBD
11	MAINTENANCE OFFICE AND BUILDING	2213.7'	27	PARKING GARAGE 3	TBD
12	MAINTENANCE VEHICLE STORAGE	2194.7'	28	FUEL FARM EXPANSION	TBD
13	MAINTENANCE STORAGE	2193.4'	29	SRE/MAINTENANCE FACILITY RELOCATION/EXPANSION	TBD
14	T-HANGAR #3 (20-UNIT)	2170.1'	30	COMMERCIAL DEVELOPMENT (NON-AERONAUTICAL)	TBD
15	T-HANGAR #2 (17 UNIT)	2168.0'	31	AIR TRAFFIC CONTROL TOWER	TBD
16	T-HANGAR #1	2166.1'	32	ARFF RELOCATION	TBD

PACS & SACS MONUMENTATION

NAME	PERMANENT IDENTIFER	CONTROL	LATITUDE	LONGITUDE	ELEVATION
AVL ARP 2	AC8545	PACS	N035° 26' 00.68"	W082° 32' 29.12"	2,136.96'
AVL AP STA A	AC8547	SACS	N035° 26' 33.01"	W082° 32' 42.46"	2,158.81'

FEDERAL AVIATION ADMINISTRATION APPROVAL

JAMAL R STOVALL — Digitally signed by JAMAL R STOVALL Date: 2026.02.10 15:46:10 -06'00' — 2/10/2026 DATE

FEDERAL AVIATION ADMINISTRATION APPROVED SUBJECT TO COMMENTS AND CONDITIONS NOTED IN LETTER FROM MANAGER, MEMPHIS AIRPORTS DISTRICT OFFICE DATED 11/24/2025.

GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY APPROVAL

PRESIDENT & CEO — 2.4.26 DATE

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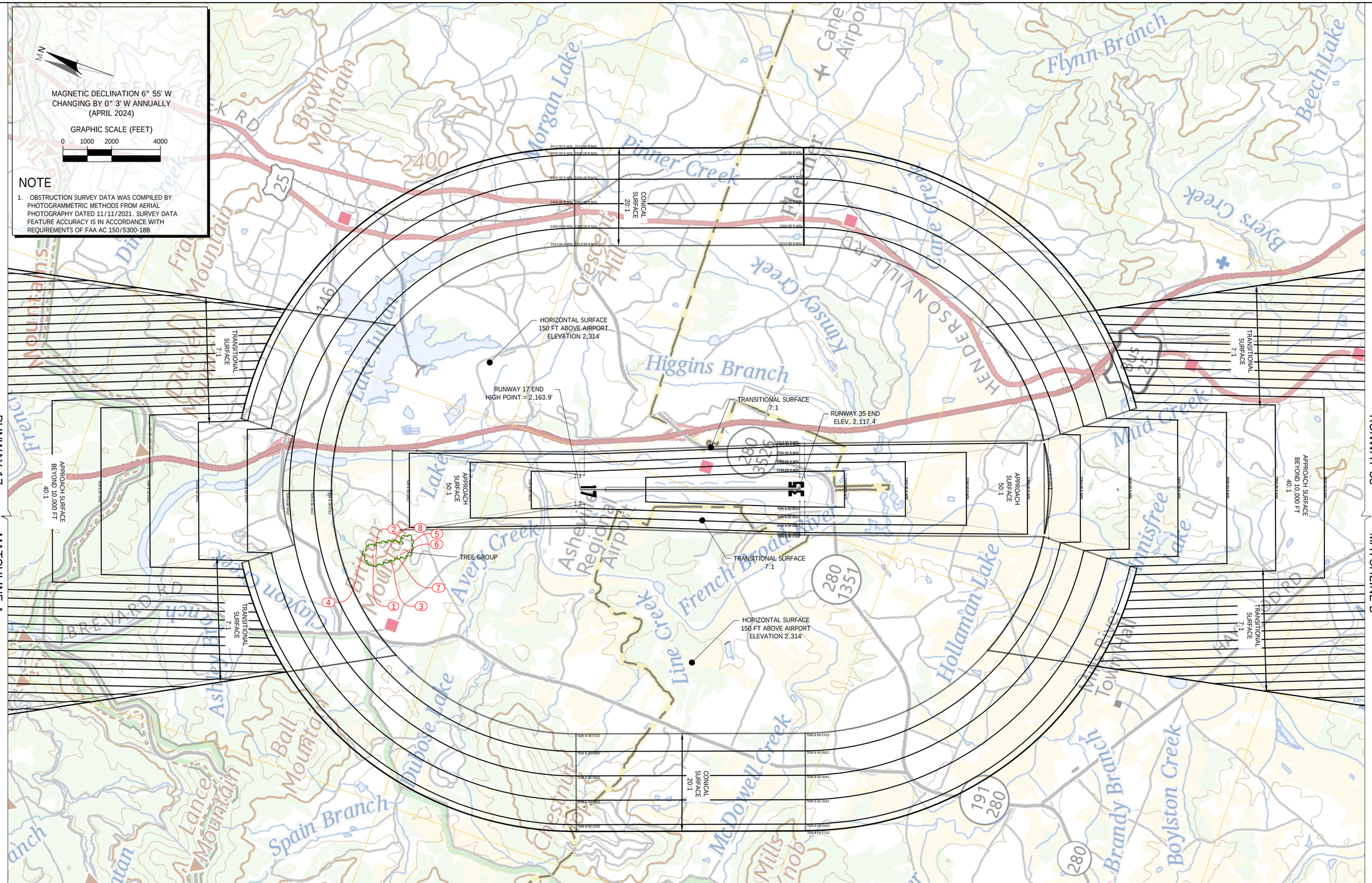
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT AIRPORT LAYOUT PLAN

TITLE: FUTURE AIRPORT LAYOUT PLAN

DRAWING NO. 4 OF 14

File Name: \\cha-llp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-FUTR.dwg - Future Airport Layout Plan | Modified / By: February 9, 2026 12:42:25 PM / Curtice, Alexander



OBSTRUCTION TABLE								
OBJECT ID	OBJECT TYPE	EASTING	NORTHING	OBJECT ELEV. [ft MSL]	SURFACE ELEV. [ft MSL]	PENETRATION [ft]	SURFACE	PROPOSED ACTION
1	CELL TOWER	938460.503	644506.909	2557.7	2313.9	-243.8	HORIZONTAL	LIGHTED, NO ACTION
2	CELL TOWER	938384.194	644350.175	2544.5	2313.9	-230.6	HORIZONTAL	LIGHTED, NO ACTION
3	TREE GROUP	938490.179	643748.019	2584.4	2313.9	-270.5	HORIZONTAL	PROPOSED OBSTRUCTION LIGHT
4	TREE GROUP	938373.379	644868.129	2427.5	2315.7	-111.7	CONICAL	PROPOSED OBSTRUCTION LIGHT
5	POWER TRANSMISSION LINE	939463.381	643100.350	2354.7	2313.9	-40.8	HORIZONTAL	
6	PUBLIC ROAD	938803.403	643435.964	2463.0	2313.9	-149.1	HORIZONTAL	NO ACTION
7	PUBLIC ROAD	938673.805	643515.606	2490.1	2313.9	-176.2	HORIZONTAL	NO ACTION
8	BUILDING	938780.348	644016.790	2380.2	2313.9	-66.3	HORIZONTAL	NO ACTION

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Aug 2024	68167	AS SHOWN

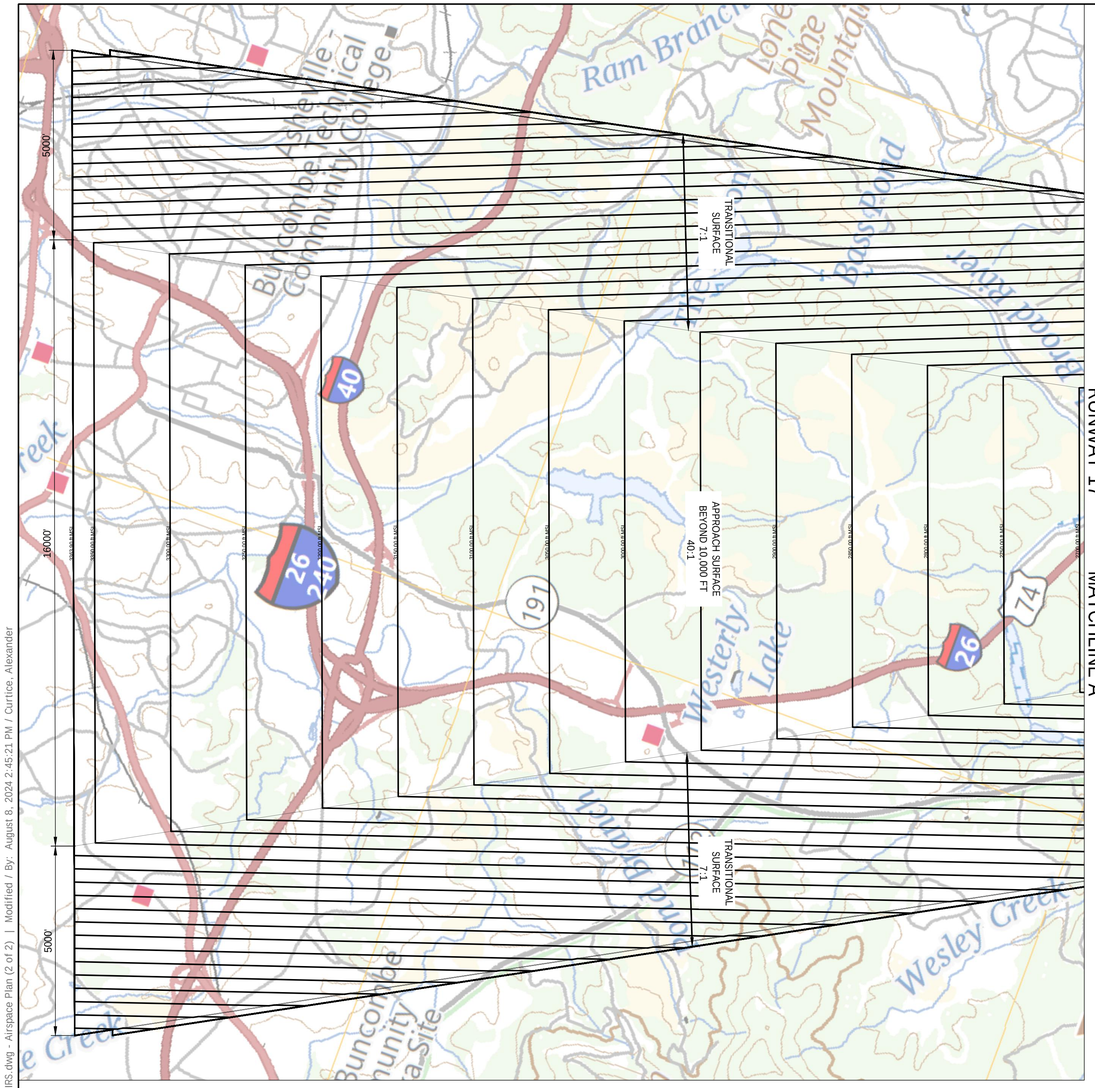
REV	BY	DESCRIPTION	DATE
-	-	-	-

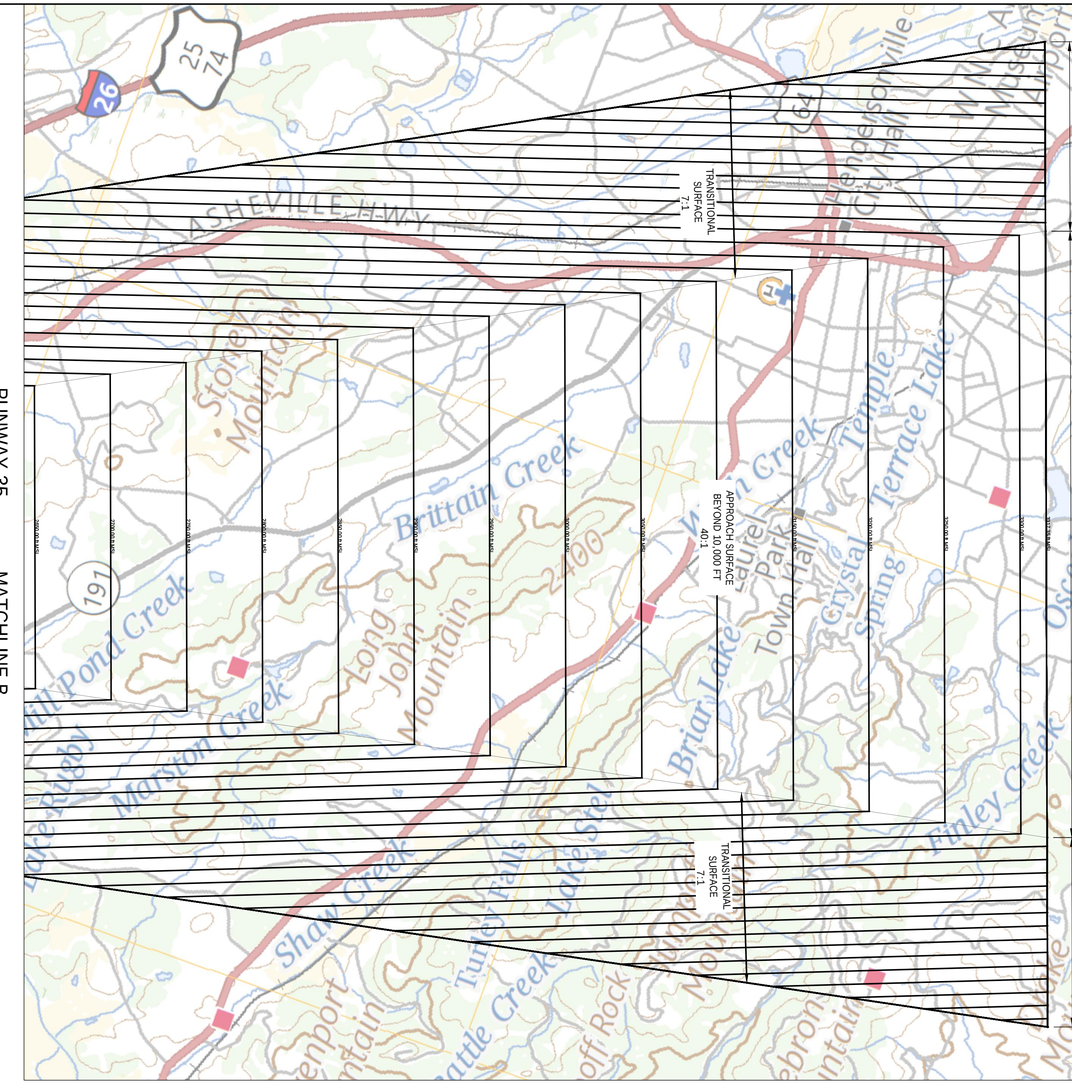
PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: AIRSPACE PLAN (1 OF 2)

DRAWING NO. 5 OF 14

File Name: \\cha-lip.com\proj\Projects\ANY\K6\068167.00\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-AIR5.dwg - Airspace Plan (1 of 2) | Modified / By: August 8, 2024 2:45:21 PM / Curtice, Alexander





MN

MAGNETIC DECLINATION 6° 55' W
CHANGING BY 0° 3' W ANNUALLY
(APRIL 2024)

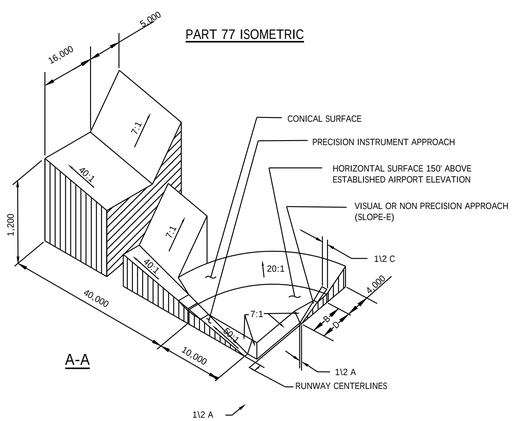
GRAPHIC SCALE (FEET)

0 1000 2000 4000

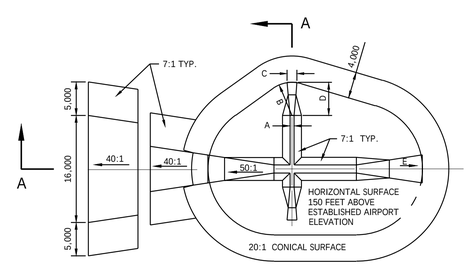
NOTE

1. OBSTRUCTION SURVEY DATA WAS COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 11/11/2021. SURVEY DATA FEATURE ACCURACY IS IN ACCORDANCE WITH REQUIREMENTS OF FAA AC 150/5300-18B

PART 77 ISOMETRIC



A-A



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B		B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A- UTILITY RUNWAYS
B- RUNWAYS LARGER THAN UTILITY
C- VISIBILITY MINIMUMS GREATER THAN 3\4 MILE
D- VISIBILITY MINIMUMS AS LOW AS 3\4 MILE
* PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

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Aug 2024	68167	AS SHOWN

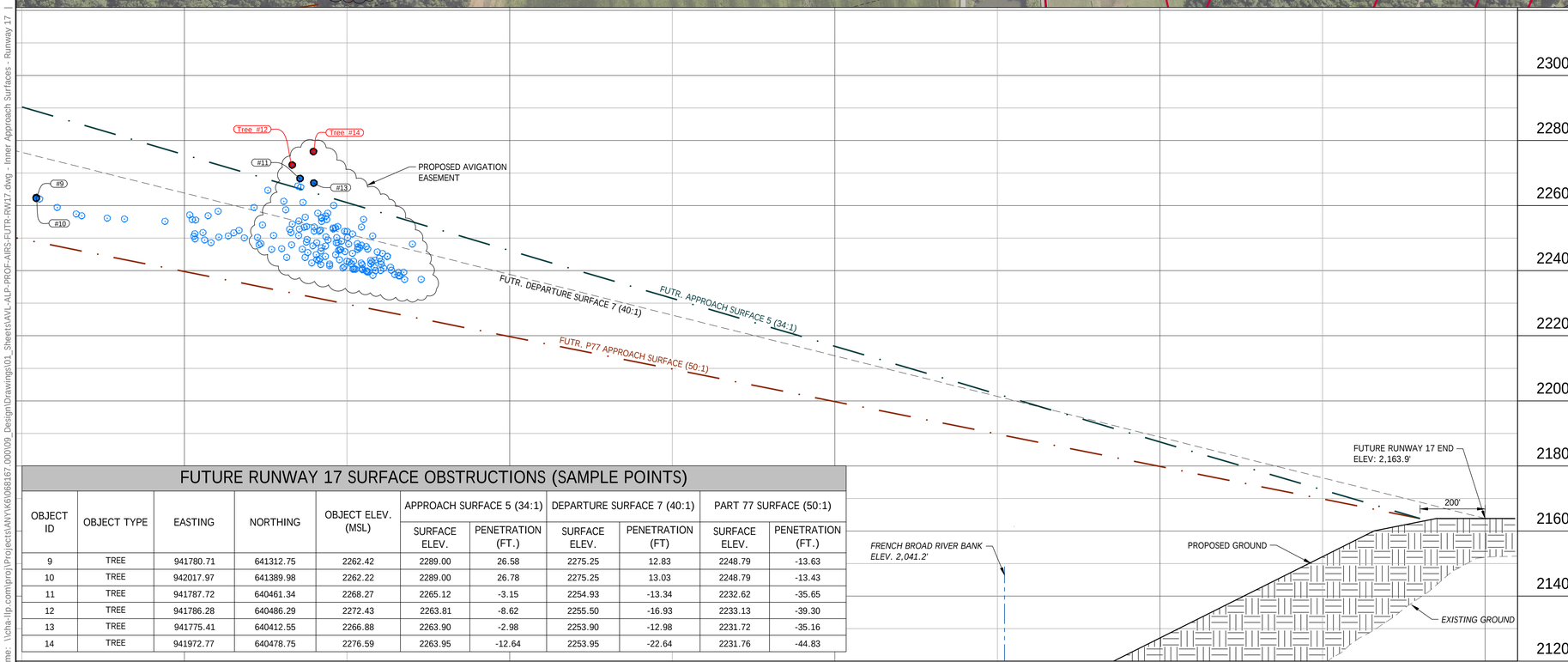
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: AIRSPACE PLAN (2 OF 2)

DRAWING NO.

File Name: \\cha-llp.com\proj\Projects\ANY\K0\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-AIRS.dwg - Airspace Plan (2 of 2) | Modified / By: August 8, 2024 2:45:21 PM / Curtice, Alexander



FUTURE RUNWAY 17 SURFACE OBSTRUCTIONS (SAMPLE POINTS)

OBJECT ID	OBJECT TYPE	EASTING	NORTHING	OBJECT ELEV. (MSL)	APPROACH SURFACE 5 (34:1)		DEPARTURE SURFACE 7 (40:1)		PART 77 SURFACE (50:1)	
					SURFACE ELEV.	PENETRATION (FT.)	SURFACE ELEV.	PENETRATION (FT)	SURFACE ELEV.	PENETRATION (FT.)
9	TREE	941780.71	641312.75	2262.42	2289.00	26.58	2275.25	12.83	2248.79	-13.63
10	TREE	942017.97	641389.98	2262.22	2289.00	26.78	2275.25	13.03	2248.79	-13.43
11	TREE	941787.72	640461.34	2268.27	2265.12	-3.15	2254.93	-13.34	2232.62	-35.65
12	TREE	941786.28	640486.29	2272.43	2263.81	-8.62	2255.50	-16.93	2233.13	-39.30
13	TREE	941775.41	640412.55	2266.88	2263.90	-2.98	2253.90	-12.98	2231.72	-35.16
14	TREE	941972.77	640478.75	2276.59	2263.95	-12.64	2253.95	-22.64	2231.76	-44.83

LEGEND

	EXISTING	FUTURE
BUILDING		
RUNWAY PAVEMENT		
TAXIWAY PAVEMENT		
ELEVATION CONTOUR	400	N/A
AIRPORT FENCE		
NAVAID CRITICAL AREA	N/A	
RUNWAY PROTECTION ZONE (RPZ)	N/A	RPZ
RUNWAY SAFETY AREA (RSA)	N/A	RSA
RUNWAY OBJECT FREE AREA (ROFA)	N/A	ROFA
RUNWAY OBSTACLE FREE ZONE (ROFZ)	N/A	OFZ
35' BUILDING RESTRICTION LINE (BRL)	N/A	BRL
EX. TAXIWAY SAFETY AREA (TSA)	N/A	TSA
EX. TAXIWAY OBJECT FREE AREA (TOFA)	N/A	TOFA
EX. AIRPORT PROPERTY LINE	N/A	P/L
FAR PART 77 APPROACH SURFACE	N/A	
APPROACH SURFACE #5	N/A	
APPROACH SURFACE #7	N/A	
TREE BELOW PART 77 APPROACH SURFACE (WITHIN 15 FEET)	N/A	####
TREE ABOVE PART 77 APPROACH SURFACE	N/A	####
POLE ABOVE PART 77 APPROACH SURFACE	N/A	####
TREE ABOVE PART 77 APPROACH SURFACE (SAMPLE POINT)	N/A	####
TREE ABOVE PART 77 APPROACH SURFACE & APPROACH SURFACE #5 (SAMPLE POINT)	N/A	####
TRAVERSE WAY (ROADWAY)	N/A	R-#

NOTES:
1. TRAVERSEWAYS ARE APPROXIMATELY 100' BELOW SURFACES.
2. EXISTING RUNWAY 17 SURFACES ARE CLEAR OF OBSTRUCTIONS.
3. OBSTRUCTIONS THAT REPRESENT TRAVERSEWAY ARE ADJUSTED UPWARD BY 23 FEET FOR RAILROADS, 17 FEET FOR HIGHWAYS, 15 FEET FOR PUBLIC ROADS, AND 10 FEET FOR PRIVATE ROADS. RUNWAY 17 TRAVERSEWAYS ARE BELOW THE PROFILE VIEW ELEVATION.

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Aug 2024	68167	AS SHOWN

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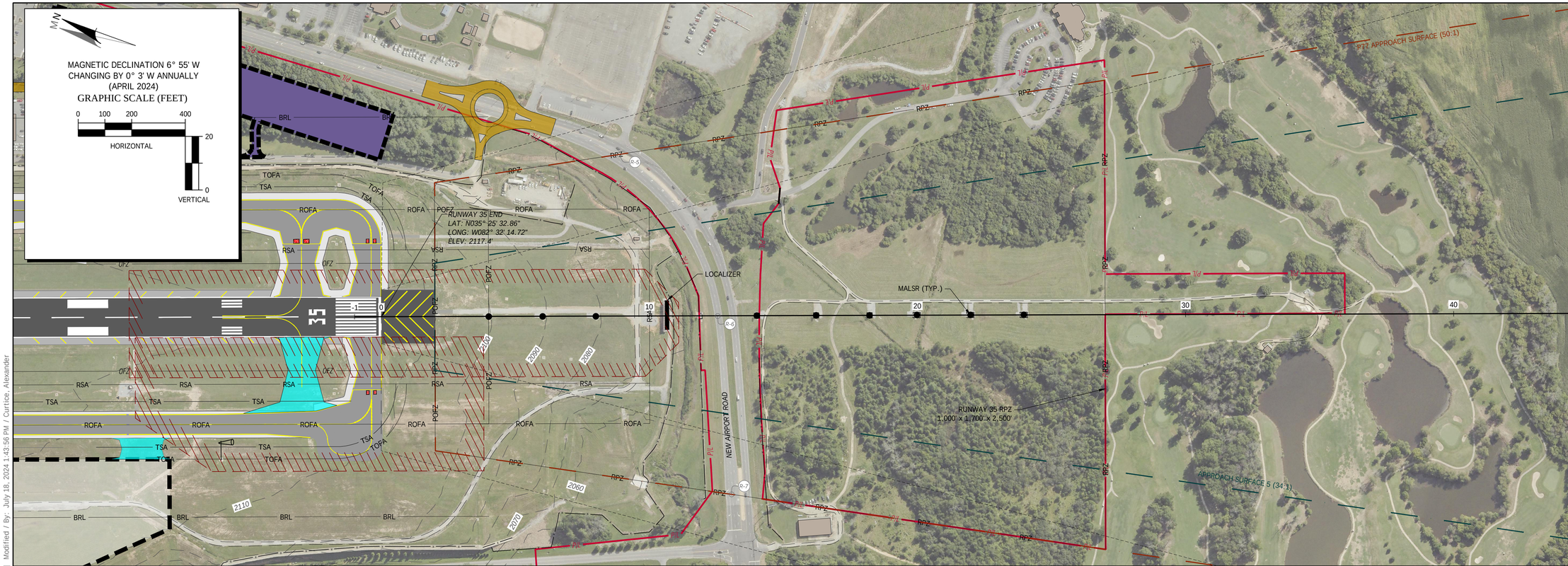
PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

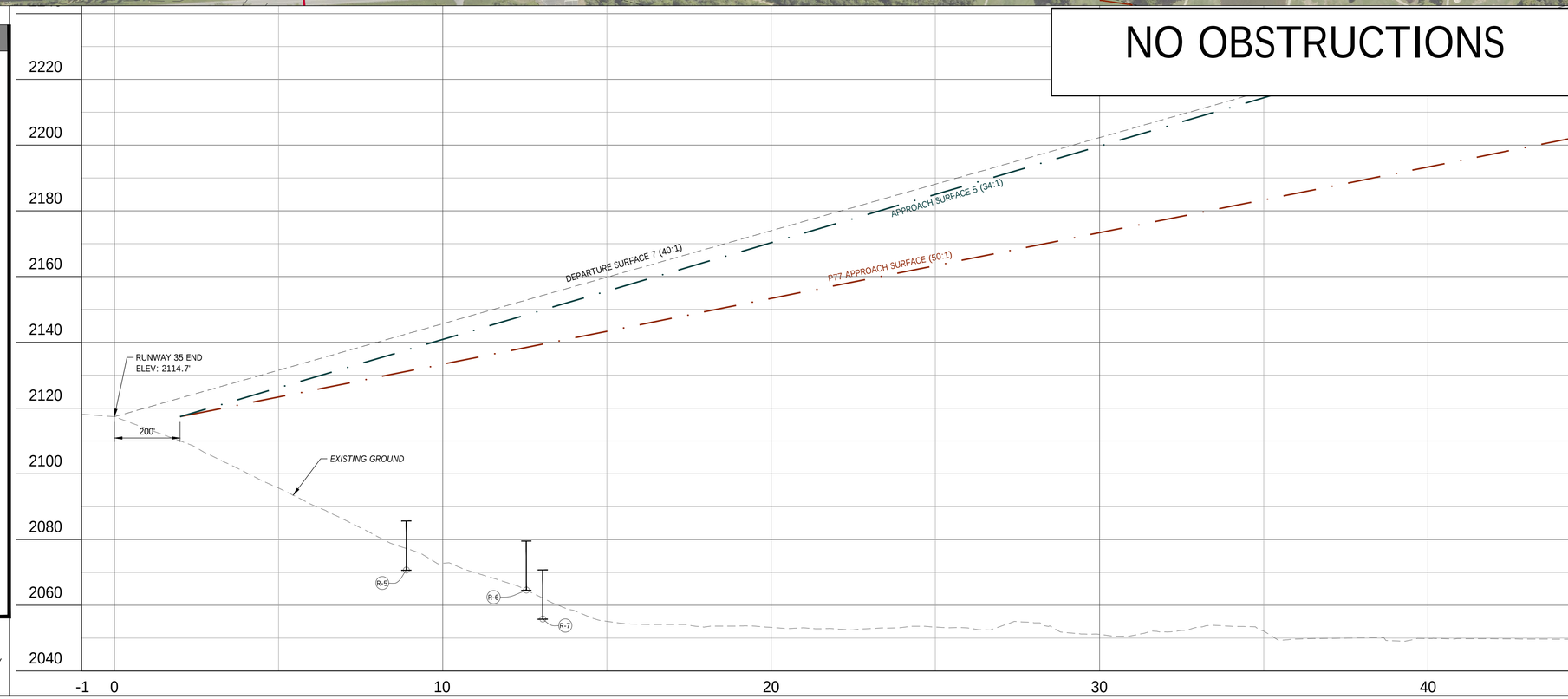
TITLE: INNER APPROACH SURFACES - RUNWAY 17

DRAWING NO. 7 OF 14

File Name: \\cha-lp.com\pro\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PROF-AIRS-FUTR-RW17.dwg - Inner Approach Surfaces - Runway 17 | Modified / By: August 8, 2024 1:06:52 PM / Curtice, Alexander



NO OBSTRUCTIONS



LEGEND

	EXISTING	FUTURE
BUILDING		N/A
RUNWAY PAVEMENT		N/A
TAXIWAY PAVEMENT		
ELEVATION CONTOUR	400	N/A
AIRPORT FENCE	x	N/A
NAVAID CRITICAL AREA		N/A
RUNWAY PROTECTION ZONE (RPZ)	RPZ	N/A
RUNWAY SAFETY AREA (RSA)	RSA	N/A
RUNWAY OBJECT FREE AREA (ROFA)	ROFA	N/A
RUNWAY OBSTACLE FREE ZONE (ROFZ)	OFZ	N/A
35' BUILDING RESTRICTION LINE (BRL)	BRL	N/A
EX. TAXIWAY SAFETY AREA (TSA)	TSA	N/A
EX. TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	N/A
EX. AIRPORT PROPERTY LINE	P/L	N/A
FAR PART 77 APPROACH SURFACE		N/A
APPROACH SURFACE #5		N/A
APPROACH SURFACE #7		N/A
TREE BELOW PART 77 APPROACH SURFACE (WITHIN 15 FEET)	####	N/A
TREE ABOVE PART 77 APPROACH SURFACE	####	N/A
POLE ABOVE PART 77 APPROACH SURFACE	####	N/A
TREE ABOVE PART 77 APPROACH SURFACE (SAMPLE POINT)	####	N/A
TREE ABOVE PART 77 APPROACH SURFACE & APPROACH SURFACE #5 (SAMPLE POINT)	####	N/A
TRAVERSE WAY (ROADWAY)	R-#	N/A

NOTES:
1. TRAVERSEWAYS ARE APPROXIMATELY 100' BELOW SURFACES.
2. EXISTING RUNWAY 17 SURFACES ARE CLEAR OF OBSTRUCTIONS.
3. OBSTRUCTIONS THAT REPRESENT TRAVERSEWAY ARE ADJUSTED UPWARD BY 23 FEET FOR RAILROADS, 17 FEET FOR HIGHWAYS, 15 FEET FOR PUBLIC ROADS, AND 10 FEET FOR PRIVATE ROADS.

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Designed By:	Drawn By:	Checked By:
CHA	ARC	PM
Issue Date:	Project No:	Scale:
Aug 2024	68167	AS SHOWN

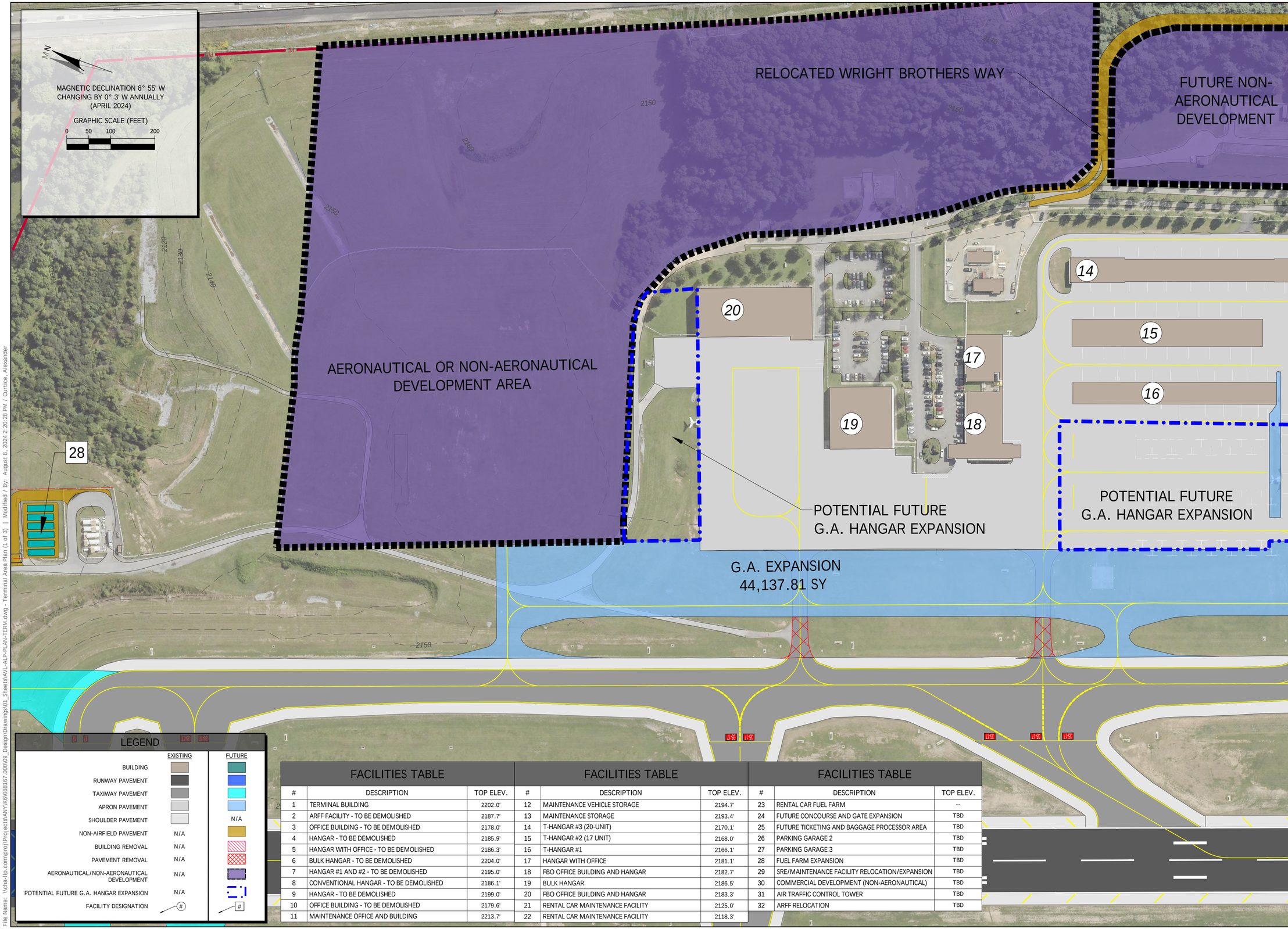
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: INNER APPROACH SURFACES - RUNWAY 35

DRAWING NO. 8 OF 14

File Name: \\cha-lfp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PROF-AIRS-FUTR-RW35.dwg - Inner Approach Surfaces - Runway 35 | Modified / By: July 18, 2024 1:43:56 PM / Curtice, Alexander



FACILITIES TABLE			FACILITIES TABLE			FACILITIES TABLE		
#	DESCRIPTION	TOP ELEV.	#	DESCRIPTION	TOP ELEV.	#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'	12	MAINTENANCE VEHICLE STORAGE	2194.7'	23	RENTAL CAR FUEL FARM	--
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'	13	MAINTENANCE STORAGE	2193.4'	24	FUTURE CONCOURSE AND GATE EXPANSION	TBD
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'	14	T-HANGAR #3 (20-UNIT)	2170.1'	25	FUTURE TICKETING AND BAGGAGE PROCESSOR AREA	TBD
4	HANGAR - TO BE DEMOLISHED	2185.9'	15	T-HANGAR #2 (17 UNIT)	2168.0'	26	PARKING GARAGE 2	TBD
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'	16	T-HANGAR #1	2166.1'	27	PARKING GARAGE 3	TBD
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'	17	HANGAR WITH OFFICE	2181.1'	28	FUEL FARM EXPANSION	TBD
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'	18	FBO OFFICE BUILDING AND HANGAR	2182.7'	29	SRE/MAINTENANCE FACILITY RELOCATION/EXPANSION	TBD
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'	19	BULK HANGAR	2186.5'	30	COMMERCIAL DEVELOPMENT (NON-AERONAUTICAL)	TBD
9	HANGAR - TO BE DEMOLISHED	2199.0'	20	FBO OFFICE BUILDING AND HANGAR	2183.3'	31	AIR TRAFFIC CONTROL TOWER	TBD
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'	21	RENTAL CAR MAINTENANCE FACILITY	2125.0'	32	ARFF RELOCATION	TBD
11	MAINTENANCE OFFICE AND BUILDING	2213.7'	22	RENTAL CAR MAINTENANCE FACILITY	2118.3'			

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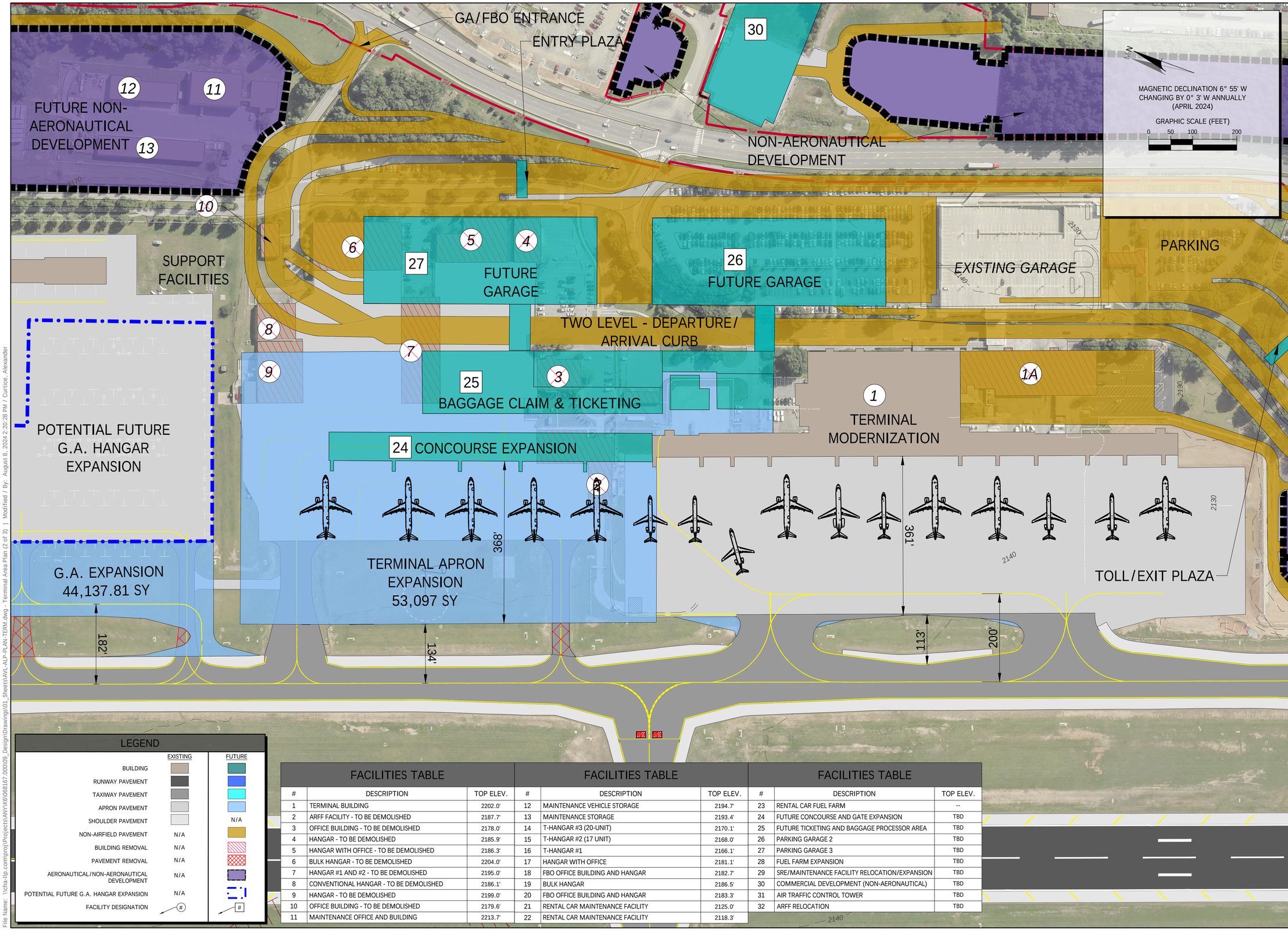
REV	BY	DESCRIPTION	DATE
-	-	-	-

PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: TERMINAL AREA PLAN (1 OF 3)

DRAWING NO.
9 OF 14

File Name: \\cha-llp.com\proj\Projects\AVY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-TERM.dwg - Terminal Area Plan (1 of 3) | Modified / By: August 8, 2024 2:20:28 PM / Curtice, Alexander



LEGEND

	EXISTING	FUTURE
BUILDING		
RUNWAY PAVEMENT		
TAXIWAY PAVEMENT		
APRON PAVEMENT		
SHOULDER PAVEMENT		N/A
NON-AIRFIELD PAVEMENT	N/A	
BUILDING REMOVAL	N/A	
PAVEMENT REMOVAL	N/A	
AERONAUTICAL/NON-AERONAUTICAL DEVELOPMENT	N/A	
POTENTIAL FUTURE G.A. HANGAR EXPANSION	N/A	
FACILITY DESIGNATION	#	#

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'
4	HANGAR - TO BE DEMOLISHED	2185.9'
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'
9	HANGAR - TO BE DEMOLISHED	2199.0'
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'
11	MAINTENANCE OFFICE AND BUILDING	2213.7'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
12	MAINTENANCE VEHICLE STORAGE	2194.7'
13	MAINTENANCE STORAGE	2193.4'
14	T-HANGAR #3 (20-UNIT)	2170.1'
15	T-HANGAR #2 (17 UNIT)	2168.0'
16	T-HANGAR #1	2166.1'
17	HANGAR WITH OFFICE	2181.1'
18	FBO OFFICE BUILDING AND HANGAR	2182.7'
19	BULK HANGAR	2186.5'
20	FBO OFFICE BUILDING AND HANGAR	2183.3'
21	RENTAL CAR MAINTENANCE FACILITY	2125.0'
22	RENTAL CAR MAINTENANCE FACILITY	2118.3'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
23	RENTAL CAR FUEL FARM	--
24	FUTURE CONCOURSE AND GATE EXPANSION	TBD
25	FUTURE TICKETING AND BAGGAGE PROCESSOR AREA	TBD
26	PARKING GARAGE 2	TBD
27	PARKING GARAGE 3	TBD
28	FUEL FARM EXPANSION	TBD
29	SRE/MAINTENANCE FACILITY RELOCATION/EXPANSION	TBD
30	COMMERCIAL DEVELOPMENT (NON-AERONAUTICAL)	TBD
31	AIR TRAFFIC CONTROL TOWER	TBD
32	ARFF RELOCATION	TBD

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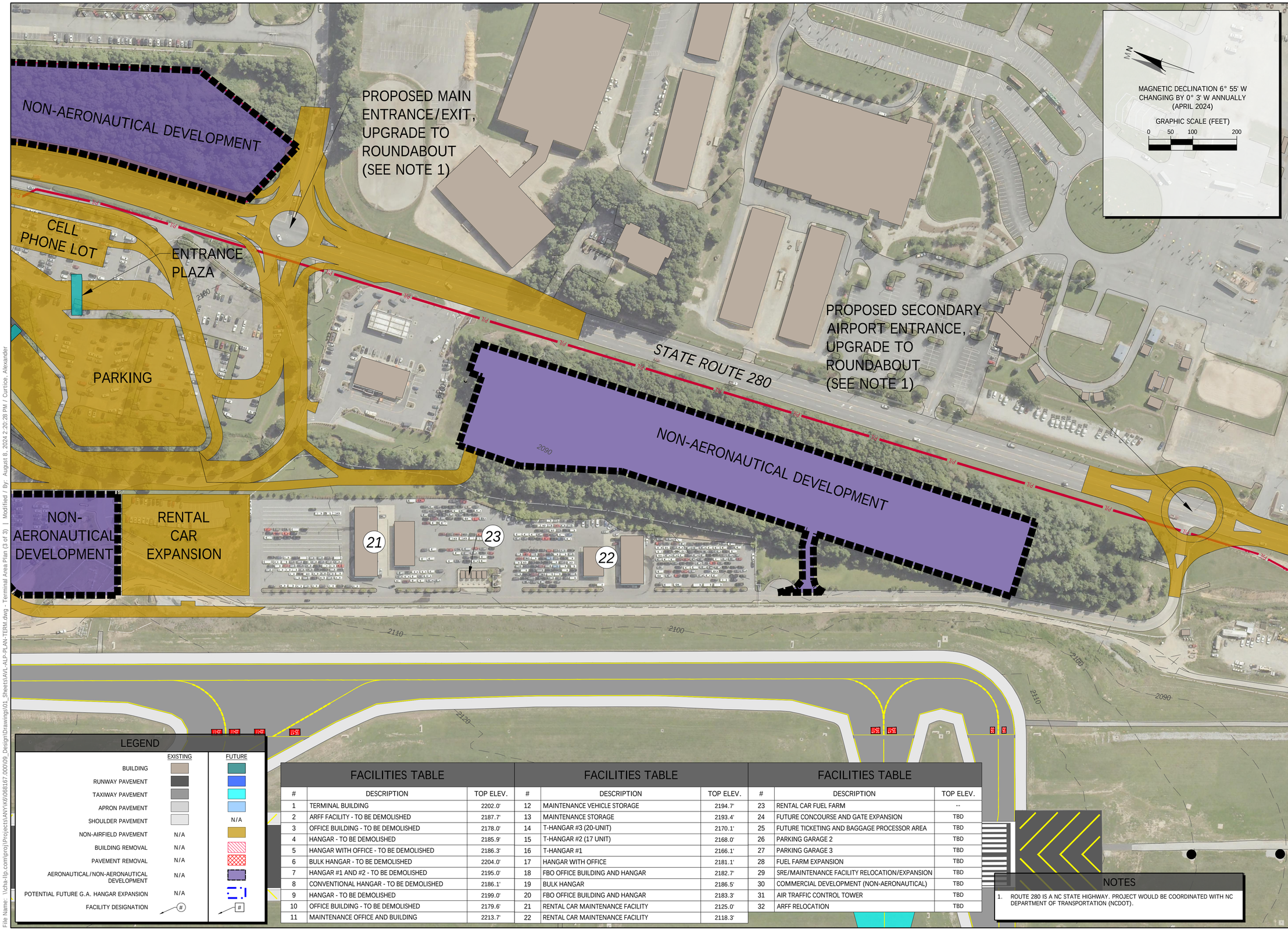
PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: TERMINAL AREA PLAN (2 OF 3)

DRAWING NO.
10 OF 14

File Name: \\cha-llp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-TERM.dwg - Terminal Area Plan (2 of 3) | Modified / By: August 8, 2024 2:20:28 PM / Curtice, Alexander



FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
1	TERMINAL BUILDING	2202.0'
2	ARFF FACILITY - TO BE DEMOLISHED	2187.7'
3	OFFICE BUILDING - TO BE DEMOLISHED	2178.0'
4	HANGAR - TO BE DEMOLISHED	2185.9'
5	HANGAR WITH OFFICE - TO BE DEMOLISHED	2186.3'
6	BULK HANGAR - TO BE DEMOLISHED	2204.0'
7	HANGAR #1 AND #2 - TO BE DEMOLISHED	2195.0'
8	CONVENTIONAL HANGAR - TO BE DEMOLISHED	2186.1'
9	HANGAR - TO BE DEMOLISHED	2199.0'
10	OFFICE BUILDING - TO BE DEMOLISHED	2179.6'
11	MAINTENANCE OFFICE AND BUILDING	2213.7'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
12	MAINTENANCE VEHICLE STORAGE	2194.7'
13	MAINTENANCE STORAGE	2193.4'
14	T-HANGAR #3 (20-UNIT)	2170.1'
15	T-HANGAR #2 (17 UNIT)	2168.0'
16	T-HANGAR #1	2166.1'
17	HANGAR WITH OFFICE	2181.1'
18	FBO OFFICE BUILDING AND HANGAR	2182.7'
19	BULK HANGAR	2186.5'
20	FBO OFFICE BUILDING AND HANGAR	2183.3'
21	RENTAL CAR MAINTENANCE FACILITY	2125.0'
22	RENTAL CAR MAINTENANCE FACILITY	2118.3'

FACILITIES TABLE

#	DESCRIPTION	TOP ELEV.
23	RENTAL CAR FUEL FARM	--
24	FUTURE CONCOURSE AND GATE EXPANSION	TBD
25	FUTURE TICKETING AND BAGGAGE PROCESSOR AREA	TBD
26	PARKING GARAGE 2	TBD
27	PARKING GARAGE 3	TBD
28	FUEL FARM EXPANSION	TBD
29	SRE/MAINTENANCE FACILITY RELOCATION/EXPANSION	TBD
30	COMMERCIAL DEVELOPMENT (NON-AERONAUTICAL)	TBD
31	AIR TRAFFIC CONTROL TOWER	TBD
32	ARFF RELOCATION	TBD

NOTES

1. ROUTE 280 IS A NC STATE HIGHWAY. PROJECT WOULD BE COORDINATED WITH NC DEPARTMENT OF TRANSPORTATION (NCDOT).

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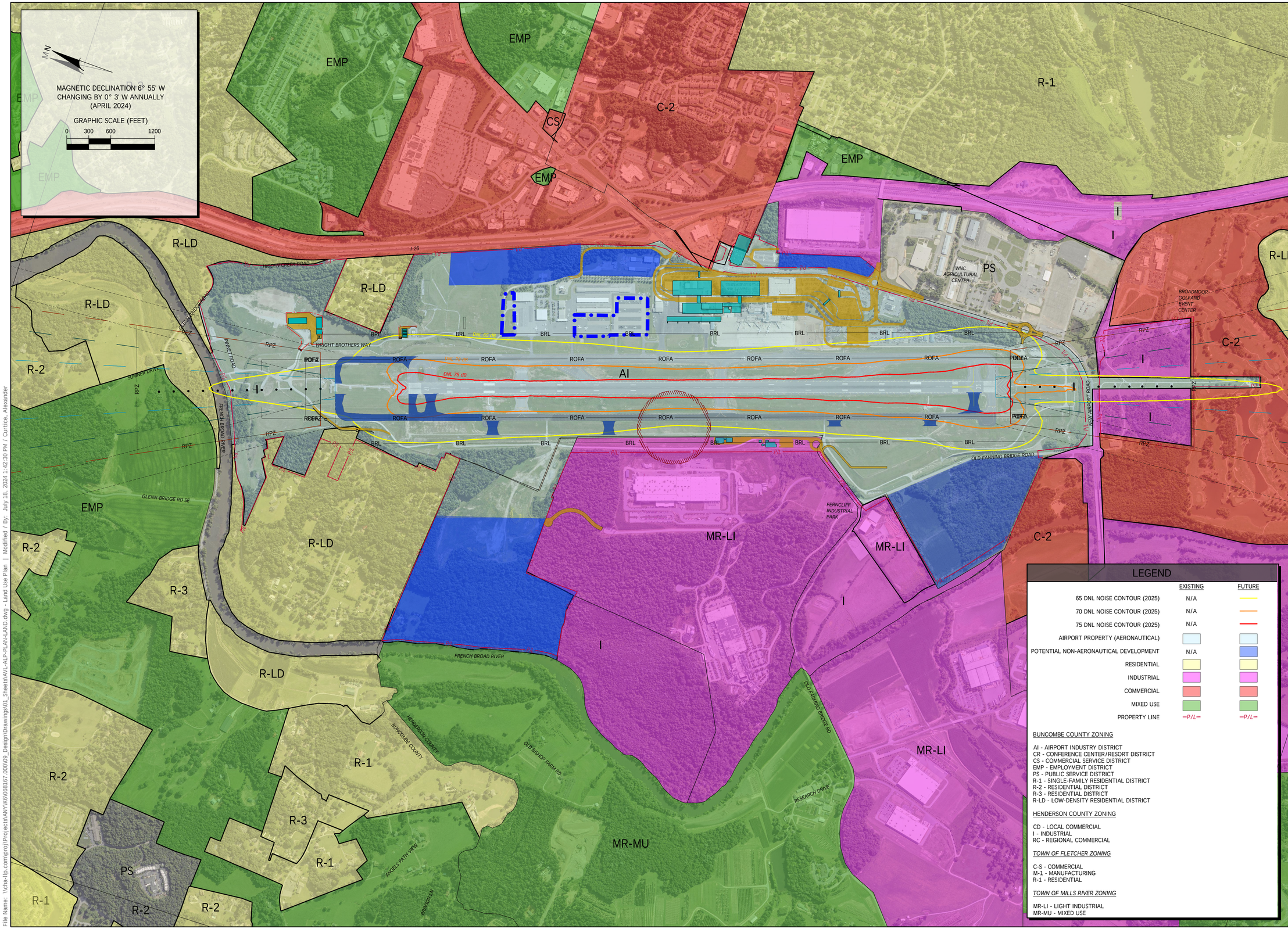
PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: TERMINAL AREA PLAN (3 OF 3)

DRAWING NO. 11 OF 14

File Name: \\cha-lfp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-TERM.dwg - Terminal Area Plan (3 of 3) | Modified / By: August 8, 2024 2:20:28 PM / Curtice, Alexander



LEGEND

	EXISTING	FUTURE
65 DNL NOISE CONTOUR (2025)	N/A	
70 DNL NOISE CONTOUR (2025)	N/A	
75 DNL NOISE CONTOUR (2025)	N/A	
AIRPORT PROPERTY (AERONAUTICAL)		
POTENTIAL NON-AERONAUTICAL DEVELOPMENT	N/A	
RESIDENTIAL		
INDUSTRIAL		
COMMERCIAL		
MIXED USE		
PROPERTY LINE	—P/L—	—P/L—

BUNCOMBE COUNTY ZONING

AI - AIRPORT INDUSTRY DISTRICT
CR - CONFERENCE CENTER/RESORT DISTRICT
CS - COMMERCIAL SERVICE DISTRICT
EMP - EMPLOYMENT DISTRICT
PS - PUBLIC SERVICE DISTRICT
R-1 - SINGLE-FAMILY RESIDENTIAL DISTRICT
R-2 - RESIDENTIAL DISTRICT
R-3 - RESIDENTIAL DISTRICT
R-LD - LOW-DENSITY RESIDENTIAL DISTRICT

HENDERSON COUNTY ZONING

CD - LOCAL COMMERCIAL
I - INDUSTRIAL
RC - REGIONAL COMMERCIAL

TOWN OF FLETCHER ZONING

C-S - COMMERCIAL
M-1 - MANUFACTURING
R-1 - RESIDENTIAL

TOWN OF MILLS RIVER ZONING

MR-LI - LIGHT INDUSTRIAL
MR-MU - MIXED USE

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PROJECT: ASHEVILLE REGIONAL AIRPORT AIRPORT LAYOUT PLAN

TITLE: LAND USE PLAN

DRAWING NO. 12 OF 14

File Name: \\cha-fp.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-LAND.dwg - Land Use Plan | Modified / By: July 18, 2024 1:42:30 PM / Curtice, Alexander

NOTES

1. AIRPORT PROPERTY LINE AND ADJACENT OWNER INFORMATION IS BASED UPON A BOUNDARY SURVEY PROVIDED BY HUTCHISON-BIGGS & ASSOCIATES, INC., DATED MARCH 22, 2012.
2. LAND FOR INITIAL AIRFIELD CONSTRUCTION WAS COMPRISED OF 25 PARCELS AND IS DOCUMENTED BY THE ASHEVILLE AIRPORT PROPERTY MAP DATED MARCH 26, 1959, AS PREPARED BY SIX ASSOCIATES, INC. NO TOTAL ACREAGE WAS PROVIDED.
3. ACREAGE LISTED IN TABLES WERE CALCULATED FROM RECORDED DEED INFORMATION; NO INDIVIDUAL PARCEL ACREAGE.
4. AN AIRPORT BOUNDARY SURVEY WAS CONDUCTED BY RICHARD M. BIGGS, RLS ON MAY 26, 1980. THIS EFFORT WAS REPRESENTATIVE OF INTERIOR PARCELS 1 AND 2 ENCOMPASSING APPROXIMATELY 750 ACRES. WITH CONSIDERATION TO RELEASE PARCELS R1, R2, AND R3, EFFECTIVE ACREAGE IN 1980 IS ESTIMATED TO BE APPROXIMATELY 713 ACRES.
5. TOTAL ACREAGE ENCOMPASSED BY HUTCHISON-BIGGS & ASSOCIATES, INC., DATED MARCH 22, 2012 REPORTED AS 927.99 ACRES.
6. SEE "AIRPORT PROPERTY MAP TABLES," SHEET 14, FOR COORDINATING PROPERTY OWNER AND EASEMENT INFORMATION NOTED ABOVE.
7. LEGEND ELEMENTS REPRESENT DEPICTIONS ON DRAWING BUT MAY VARY IN SIZE DUE TO SCALING ON DRAWING.

PARCEL/EASEMENT LEGEND

1	INTERIOR PARCEL
A01	ADJACENT PARCEL
S3	EXISTING ENCUMBRANCE
R1	RELEASED PARCEL

SEE "EXISTING ENCUMBRANCE TABLE"
DU = DRAINAGE UTILITY
E = ELECTRICAL
PD = PERMANENT DRAINAGE
RD = ROAD/ RIGHT OF WAY
S = SEWER
TC = TEMPORARY CONSTRUCTION
TS = TEMPORARY SLOPEP
U = PERMANENT UTILITY

LEGEND

	EXISTING	FUTURE
BUILDING		
RUNWAY PAVEMENT		
TAXIWAY PAVEMENT		
APRON PAVEMENT		
SHOULDER PAVEMENT		N/A
NON-AIRFIELD PAVEMENT	N/A	
BUILDING REMOVAL	N/A	
PAVEMENT REMOVAL	N/A	
RUNWAY OBJECT FREE AREA (ROFA)	N/A	ROFA
RUNWAY PROTECTION ZONE (RPZ)	N/A	RPZ
AIRPORT PROPERTY LINE	P/L	P/L

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PROJECT: ASHEVILLE REGIONAL AIRPORT
AIRPORT LAYOUT PLAN

TITLE: AIRPORT PROPERTY MAP

DRAWING NO.
13 OF 14

File Name: \\cha-lip.com\proj\Projects\ANY\K6\068167.000\09_Design\Drawings\01_Sheets\AVL-ALP-PLAN-PROP.dwg - Airport Property Map | Modified / By: August 8, 2024 3:08:03 PM / Curtice, Alexander

PARCEL LINE TABLE

LINE #	LENGTH	DIRECTION
L1	291.40	S3° 36' 05.26"W
L2	447.10	N84° 14' 52.94"W
L3	149.79	S5° 20' 05.82"W
L4	612.16	S84° 14' 51.25"E
L5	437.64	S6° 24' 20.49"W
L6	59.99	S6° 24' 20.49"W
L7	430.86	S6° 24' 20.49"W
L8	49.26	S84° 37' 30.36"E
L9	212.22	S5° 28' 44.45"W
L10	29.98	S5° 28' 44.45"W
L11	206.96	S84° 25' 15.55"E
L12	32.47	S5° 22' 44.45"W
L13	83.27	S87° 11' 25.55"E
L14	212.71	S5° 33' 07.85"W
L15	2695.69	N84° 37' 14.45"W
L16	37.78	S20° 02' 17.00"E
L17	57.73	S23° 07' 00.00"E
L18	51.07	S21° 14' 19.00"E
L19	65.35	S19° 25' 23.00"E
L20	31.96	S14° 05' 57.00"E
L21	28.23	S22° 23' 00.00"E
L22	169.82	S11° 39' 42.00"E
L23	421.63	S13° 40' 07.00"E
L24	191.56	S13° 35' 41.93"E
L25	133.25	S11° 25' 58.66"E
L26	128.45	S9° 49' 08.00"E
L27	118.75	S12° 57' 23.00"E
L28	161.48	S15° 38' 46.00"E
L29	176.06	S14° 56' 35.00"E
L30	112.91	S16° 00' 58.00"E
L31	53.21	S15° 55' 18.00"E
L32	105.71	S12° 02' 24.00"E
L33	114.41	S11° 17' 00.00"E
L34	128.60	S4° 48' 55.00"E
L35	20.58	S14° 27' 12.48"E
L36	100.22	S5° 00' 46.00"W
L37	23.47	N78° 18' 48.15"E
L38	377.64	N81° 37' 35.99"E
L39	70.24	S81° 46' 06.95"E
L40	165.10	N80° 11' 23.07"E
L41	296.63	S76° 47' 01.00"E
L42	741.50	N2° 17' 03.78"E
L43	1086.96	S88° 09' 20.64"E
L44	30.03	N1° 42' 53.01"E
L45	666.98	S84° 20' 29.81"E
L46	3310.59	S18° 08' 27.97"E
L47	83.78	S18° 17' 16.05"E
L48	55.18	S46° 51' 40.00"W
L49	821.86	S34° 47' 50.62"W
L50	50.85	S25° 30' 54.25"W
L51	92.32	S25° 47' 13.36"W
L52	346.16	S47° 30' 39.79"E
L53	1329.48	S42° 16' 37.24"W
L54	250.28	S46° 51' 29.03"E
L55	229.85	S49° 52' 17.69"E
L56	698.44	S51° 15' 10.66"E
L57	1158.73	S84° 28' 31.02"E
L58	12.14	N21° 18' 14.99"W
L59	18.34	N88° 23' 07.84"E
L60	64.26	N21° 42' 11.67"W
L61	99.98	N68° 17' 28.15"E
L62	545.26	S23° 48' 15.21"E
L63	200.18	S71° 44' 01.10"E
L64	89.40	N68° 34' 29.35"E
L65	363.02	N68° 34' 22.23"E
L66	15.00	N22° 01' 42.19"W
L67	277.02	N70° 03' 58.44"E
L68	138.57	N50° 06' 42.85"E
L69	309.60	N10° 14' 39.41"E
L70	460.85	N1° 06' 52.98"W
L71	399.91	N1° 06' 52.98"W
L72	599.87	N1° 06' 52.98"W
L73	399.91	N1° 06' 52.98"W
L74	239.95	N1° 06' 52.98"W
L75	329.93	N1° 06' 52.98"W
L76	312.28	N1° 11' 00.40"W
L77	152.80	N5° 23' 15.18"W
L78	34.44	N45° 26' 48.77"W
L79	43.74	N8° 58' 09.20"W
L80	27.00	N34° 38' 14.84"E
L81	197.64	N15° 36' 52.42"W
L82	459.29	N18° 18' 01.65"W
L83	311.64	N18° 15' 29.69"W
L84	18.54	S84° 08' 04.97"W
L85	18.15	N89° 41' 49.62"E
L86	15.05	N75° 41' 13.93"W
L87	123.06	N4° 27' 54.09"E
L88	53.29	N18° 40' 02.00"E
L89	142.31	N0° 43' 58.03"W

PARCEL LINE TABLE

LINE #	LENGTH	DIRECTION
L90	148.30	N14° 50' 22.70"W
L91	63.17	N25° 54' 25.99"W
L92	139.01	N17° 32' 45.41"W
L93	494.32	N15° 48' 39.63"W
L94	194.70	N16° 46' 26.32"W
L95	642.92	N22° 48' 53.41"W
L96	176.00	N21° 29' 33.93"W
L97	1446.23	N21° 15' 59.06"W
L98	1168.40	N84° 00' 04.76"W
L99	804.55	N4° 19' 58.32"E
L100	737.94	S84° 36' 12.47"E
L101	33.82	S84° 36' 12.47"E
L102	83.67	N22° 07' 04.47"W
L103	245.20	N16° 23' 46.47"W
L104	63.23	N22° 09' 17.47"W
L105	262.12	N29° 09' 10.47"W
L106	137.40	S42° 49' 15.53"W
L107	236.39	N69° 13' 04.47"W
L108	105.46	S57° 07' 24.52"W
L109	224.14	S56° 26' 04.61"W
L110	101.35	S71° 58' 02.53"W
L111	269.11	S47° 31' 41.00"W
L112	337.42	S45° 01' 25.20"W
L113	70.22	S57° 50' 17.05"W
L114	57.78	S68° 52' 36.13"W
L115	77.85	S70° 11' 00.00"W
L116	373.17	S66° 09' 00.00"W
L117	180.24	S69° 20' 00.00"W
L118	114.12	S69° 20' 00.00"W
L119	295.73	S68° 20' 00.00"W
L120	241.46	S53° 41' 00.00"W
L121	166.50	S64° 29' 00.00"W
L122	413.38	S76° 24' 00.00"W
L123	540.54	S83° 25' 00.00"E
L124	46.59	S83° 25' 00.00"E
L125	238.99	S83° 25' 00.00"E
L126	267.55	N59° 06' 11.27"E
L127	51.84	S31° 40' 00.00"E
L128	105.62	N61° 45' 00.00"E
L129	49.28	S35° 31' 00.00"E
L130	108.66	N65° 44' 00.00"E
L131	23.74	N29° 23' 03.00"E
L132	253.29	S26° 39' 37.10"E
L133	421.51	N84° 31' 00.03"W
L134	473.86	S2° 43' 52.62"W
L135	575.81	S85° 07' 13.72"E
L136	894.02	S18° 10' 12.81"E
L137	149.92	N71° 49' 30.56"E
L138	893.90	N18° 09' 59.97"W
L139	797.71	N71° 52' 13.66"E
L140	539.97	N26° 33' 26.16"W
L141	696.74	N26° 44' 24.58"W
L142	179.86	S80° 08' 17.52"W
L143	118.43	S53° 28' 00.47"W
L144	58.50	S77° 14' 54.92"W
L145	92.90	N70° 35' 44.07"W
L146	193.18	S75° 26' 07.27"W
L147	198.21	S68° 13' 51.99"W
L148	24.37	S68° 03' 44.33"W
L149	1283.49	S9° 35' 55.59"E
L150	802.31	N71° 52' 13.66"E
L151	189.25	S88° 23' 55.07"E
L152	187.99	S4° 55' 50.04"W
L153	221.24	S84° 59' 17.15"E
L157	1138.23	S15° 23' 46.50"E
L158	281.14	S19° 59' 37.59"W
L159	169.29	N65° 08' 12.11"W
L160	312.28	N1° 10' 59.70"W
L161	32.32	N18° 17' 58.00"W
L162	459.30	N18° 17' 58.00"W
L163	281.54	N18° 15' 33.36"W
L164	57.19	N79° 26' 44.00"E
L165	24.42	N2° 48' 17.70"E
L166	97.01	S31° 15' 37.90"E
L167	160.35	S88° 06' 44.72"E
L168	114.49	N11° 39' 28.68"E
L169	234.43	N88° 06' 44.83"W
L170	1278.21	S09° 37' 25"E
L171	76.79	S67° 58' 22"W
L172	75.84	N71° 51' 02"E

EXISTING AIRPORT PROPERTY TABLE

REF. NO.	PREVIOUS AIRPORT PROPERTY MAP REFERENCE NO.	FAA GRANT #	TYPE OF INSTRUMENT (FEE)	DEED REFERENCE			PROPERTY OWNER(S) (AS NOTED ON DEED)		ACREAGE	PURPOSE
				RECORD DATE	BOOK	PAGE	PREVIOUS OWNERS NAME(S)	CURRENT OWNERS NAME(S)		
1	1-1	FAAP-01	DEED	7/1/1957	789	227	T. A. PINNER, JR.	CITY OF ASHEVILLE	112.4	INITIAL AIRFIELD CONSTRUCTION
1	1-2	FAAP-01	DEED	9/5/1957	791	497	SIDNEY WELLS	CITY OF ASHEVILLE	25.50	INITIAL AIRFIELD CONSTRUCTION
1	1-3	FAAP-01	DEED	8/5/1957	790	34	EDITH HAWES	CITY OF ASHEVILLE	17.50	INITIAL AIRFIELD CONSTRUCTION
1	1-4	FAAP-01	DEED	7/19/1957	789	215	W. L. PEARSON	CITY OF ASHEVILLE	66.60	INITIAL AIRFIELD CONSTRUCTION
1	1-5	FAAP-01	DEED	7/31/1957	361 (H)	489	R. L. DAVIS	CITY OF ASHEVILLE	5.00	INITIAL AIRFIELD CONSTRUCTION
1	1-6	FAAP-01	DEED	7/19/1957	361 (H)	196	COLEEN LANCE	CITY OF ASHEVILLE	30.80	INITIAL AIRFIELD CONSTRUCTION
1	1-7	FAAP-01	DEED	8/20/1957	362 (H)	348	ROBERT M. CASE	CITY OF ASHEVILLE	3.10	INITIAL AIRFIELD CONSTRUCTION
1	1-8	FAAP-01	DEED	10/2/1957	363 (H)	246	G. Z. ROGERS	CITY OF ASHEVILLE	22.50	INITIAL AIRFIELD CONSTRUCTION
1	1-9	FAAP-01	DEED	7/3/1957	360 (H)	543	A. J. FRANCIS	CITY OF ASHEVILLE	37.60	INITIAL AIRFIELD CONSTRUCTION
1	1-10	FAAP-01	DEED	9/4/1957	362 (H)	392	D. B. SHEEHAN	CITY OF ASHEVILLE	33.00	INITIAL AIRFIELD CONSTRUCTION
1	1-11	FAAP-01	DEED	12/27/1957	364 (H)	595	ROY LEE WARD	CITY OF ASHEVILLE	27.69	INITIAL AIRFIELD CONSTRUCTION
1	1-12	FAAP-01	DEED	12/27/1957	364 (H)	597	FLOYD LEE WARD	CITY OF ASHEVILLE	1.00	INITIAL AIRFIELD CONSTRUCTION
1	1-13	FAAP-01	DEED	12/27/1957	364 (H)	598	ARNOLD H. WARD	CITY OF ASHEVILLE	1.10	INITIAL AIRFIELD CONSTRUCTION
1	1-14	FAAP-01	DEED	8/24/1957	362 (H)	68	ELBERT L. LANNING	CITY OF ASHEVILLE	4.00	INITIAL AIRFIELD CONSTRUCTION
1	1-15	FAAP-01	DEED	8/20/1957	368 (H)	193	ELBERT L. LANNING	CITY OF ASHEVILLE	3.00	INITIAL AIRFIELD CONSTRUCTION
1	1-15	FAAP-01	DEED	5/8/1958	368 (H)	191	GEORGE G. WESTFELDT	CITY OF ASHEVILLE	3.00	INITIAL AIRFIELD CONSTRUCTION
1	1-16	FAAP-01	DEED	3/5/1958	366 (H)	290	W. F. KILPATRICK	CITY OF ASHEVILLE	17.50	INITIAL AIRFIELD CONSTRUCTION
1	1-17 & 17a	FAAP-01	DEED	2/28/1958	366 (H)	314	LUCILLE SALES	CITY OF ASHEVILLE	54.00	INITIAL AIRFIELD CONSTRUCTION
1	1-18	FAAP-01	DEED	2/24/1958	366 (H)	177	ROBERT BRUCE	CITY OF ASHEVILLE	12.00	INITIAL AIRFIELD CONSTRUCTION
1	1-19	FAAP-01	DEED	4/4/1958	366 (H)	607	CITY LOANS INC.	CITY OF ASHEVILLE	NA	INITIAL AIRFIELD CONSTRUCTION
1	1-20	FAAP-01	DEED	3/31/1958	366 (H)	602	ETHEL JANE W. BUNTING	CITY OF ASHEVILLE	19.70	INITIAL AIRFIELD CONSTRUCTION
1	1-21	FAAP-01	DEED	3/25/1958	366 (H)	505	THOMAS D. WESTFELDT	CITY OF ASHEVILLE	7.17	INITIAL AIRFIELD CONSTRUCTION
1	1-22	FAAP-01	DEED	6/23/1958	368 (H)	335	MARTHA J. G. WESTFELDT	CITY OF ASHEVILLE	36.78	INITIAL AIRFIELD CONSTRUCTION
1	1-23 & 23a	FAAP-01	DEED	6/5/1958	368 (H)	167	GEORGE G. WESTFELDT	CITY OF ASHEVILLE	11.41	INITIAL AIRFIELD CONSTRUCTION
2	2	ADAP-05	DEED	7/28/1978	1195	458	JINJA RUANDA REID	CITY OF ASHEVILLE	3.90	RUNWAY EXTENSION
2	2	ADAP-05	DEED	8/10/1978	1197	457	JOSEPH L. MCDOWELL	CITY OF ASHEVILLE	3.40	RUNWAY EXTENSION
3	3	ADAP-05	DEED	5/1/1981	1270	712	ROGER E. PINNER	CITY OF ASHEVILLE	5.70	RUNWAY EXTENSION
3	3	ADAP-05	DEED	11/6/1981	1284	352	RICHARD E. HENNINGER	CITY OF ASHEVILLE	1.30	RUNWAY EXTENSION
3	3	ADAP-05	DEED	10/21/1982	1306	113	PAUL N. PAGE ESTATE	CITY OF ASHEVILLE	4.27	RUNWAY EXTENSION
4	4	ADAP-05	DEED	4/2/1981	1269	33	CARL LEE STEVENS	CITY OF ASHEVILLE	3.37	RUNWAY EXTENSION
4	4	ADAP-05	DEED	5/19/1981	1272	205	C. H. Q. INVESTMENTS, INC.	CITY OF ASHEVILLE	1.67	RUNWAY EXTENSION
4	4	ADAP-05	DEED	11/15/1982	1307	669	T. O. YOUNGBLOOD	CITY OF ASHEVILLE	3.93	RUNWAY EXTENSION
5a	5a	AIP-07	DEED	8/14/1990	761 (H) TRACT TWO	791	BENJAMIN ESHLEMAN ET. AL.	CITY OF ASHEVILLE	20.77	RUNWAY PROTECTION ZONE
5b	5b	AIP-07	DEED	8/14/1990	761 (H) TRACT ONE	791	BENJAMIN ESHLEMAN ET. AL.	CITY OF ASHEVILLE	20.20	RUNWAY PROTECTION ZONE
5c	5c	AIP-07	DEED	6/15/1991	1610	412	GRADY PINNER	CITY OF ASHEVILLE	2.75	RUNWAY PROTECTION ZONE
6	6	AIP-11	DEED	7/6/1990	1613	569	GRACE A. HENNINGER	CITY OF ASHEVILLE	4.64	RUNWAY PROTECTION ZONE
6	6	AIP-11	DEED	4/22/1999	2088	406	B. DAN MARKS	CITY OF ASHEVILLE	7.38	RUNWAY PROTECTION ZONE
6	6	AIP-11	DEED	12/12/1990	1633	128	FLORENE STEPPLETON	CITY OF ASHEVILLE	1.29	RUNWAY PROTECTION ZONE
6	6	AIP-11	DEED	2/5/1991	1639	122	ROGER E. PINNER	CITY OF ASHEVILLE	9.89	RUNWAY PROTECTION ZONE
6	6	AIP-11	DEED	2/12/1991	1639	707	OPAL P. CRYMBLE ET. AL.	CITY OF ASHEVILLE	17.21	RUNWAY PROTECTION ZONE
7	7	AIP-12	DEED	7/11/1991	779 (H)	8	DANIEL BOONE COUNCIL, INC. BSA	CITY OF ASHEVILLE	47.93	BORROW SITE; RWY34 ERSA
8	8	AIP-16	DEED	8/17/1993	827 (H)	161	DOROTHY L. ALLEN ET. AL.	CITY OF ASHEVILLE	28.63	BORROW SITE; RWY16 ERSA
9	9	AIP-16	DEED	10/25/1993	831 (H)	546	WILLIAM J. CORN, JR.	CITY OF ASHEVILLE	24.56	BORROW SITE; RWY16 ERSA
10	10	NON-AIP	DEED	9/13/2004	3771	434	GRACE A. HENNINGER	CITY OF ASHEVILLE	5.86	RUNWAY PROTECTION ZONE
11	11	NON-AIP	DEED	10/13/1995	1873	296	OPAL P. CRYMBLE ET. AL.	CITY OF ASHEVILLE	33.62	RUNWAY PROTECTION ZONE
11	11	NON-AIP	DEED	6/15/2005	4049	269	SOUTHRIDGE ASSOCIATES	CITY OF ASHEVILLE	0.12	RUNWAY PROTECTION ZONE
12	-	NON-AIP	DEED	12/20/2016	5173	830	ROGER E. & WANDA B. PINNER	GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY	4.00	PURCHASED WITH LOCAL FUNDS
13a	13b	AIP-44	DEED	8/8/2014	1584	350	BRIGHTSTAR ASSOCIATES, INC. & BRITE STARS, LLC	GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY	7.84	PART 77 TEMPORARY RUNWAY 17-35
13b	-	AIP-44	DEED	8/8/2014	1584	350	BRITE STARS, LLC	GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY	7.50	PART 77 TEMPORARY RUNWAY 17-35
14	-	NON-AIP	DEED	5/26/2017	1584	350	WARRIOR GOLF MANAGEMENT, LLC	GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY	2.2	RUNWAY PROTECTION ZONE

(H) HENDERSON COUNTY DEEDS

ADJACENT PROPERTY OWNER(S)

REF. NO.	TAX PARCEL ID #	DEED REFERENCE			CURRENT PROPERTY OWNER(S) (AS NOTED ON DEED)	ACREAGE
		RECORD DATE	BOOK	PAGE		
A01	9643-35-1449	3/11/2005	3949	809	DAVID O. KACKMAN & MARTHA C. KACKMAN	0.12
A02	9643-25-8581	6/22/1999	2100	17	JEFFREY EATON & ELIZABETH ROACH EATON	0.63
A03	9643-25-6582	10/31/2003	3448	123	ANGELA MARIE ROBERTS	0.42
A04	9643-25-5533	10/17/2011	4922	1530	SANDRA PATRICE JONES LIVING TRUST	0.43
A05	9643-25-3584	5/31/1996	1908	466	MELISSA L. HARRIS	0.48
A06	9643-25-2545	8/31/1999	2158	793	PHILIP S DORSEY & ANGELEIGH E DORSEY	0.51
A07	9643-25-0586	1/7/2011	4852	1703	JORDAN H COUNCILL & TIFFANY W COUNCILL	0.55
A08	9643-15-9537	8/17/2010	4808	1109	LAWRENCE DEZIC	0.57
A09	9643-15-7588	5/6/2011	4882	233	DAVID SWANGER JR	0.63
A10	9643-15-6539	11/13/1987	1499	66	WILLIAM S HALL & BONNIE H HALL	0.70
A11	9643-15-4680	8/16/1990	1618	466	KEVIN W BURNETTE & MARIE U BURNETTE	0.72
A12	9643-15-3631	10/6/2006	4297	126	DAVID S GREGG	0.73
A13	9643-15-1692	3/2/1998	2010	725	KEVIN BRUCE RUFF	0.73
A14	9643-15-0633	12/27/2002	3040	641	SONIA COVINGTON WEEKLEY	0.73
A15	9643-05-8674	6/27/2008	4582	688	JULIA C HEWITT & MICHAEL LIGHTWEAVER	0.85
A16	9643-05-6660	4/30/1998	2021	419	SARAH J BUMGARNER ET AL JT	0.92
A17	9643-25-9722	9/30/2011	4919	639	Y L PHILLIPS	0.73
A18	9643-26-6586	11/26/2002	3006	889	PETER HALL & ARUNIMA DHAR	13.90
A19	9643-26-6586	11/26/2002	3006	889	PETER HALL & ARUNIMA DHAR	13.90
A20	9643-26-7997	2/14/1991	1640	228	ROGER E PINNER & WANDA B PINNER	3.87
A21	9643-27-2436	8/15/2006	4268	1485	ROGER E PINNER & WANDA B PINNER	3.00
A22	9643-27-4768	4/5/2004	3599	244	JAMES D ELMORE	1.65
A23	9643-17-7565	11/13/1969	1010	355	NAOMI M. CONNOR	8.74
A24	9643-57-2546	9/28/2000	2345	519	REBECCA GAIL SWEEZY	0.43
A25	9643-57-0528	11/13/1969	1325	3	LARRY WAYNE BARNWELL	0.72
A26	9643-47-7621	3/28/1971	1336	352	WOODROW MACK JR & PATRICIA A MACK	0.74
A27	9643-47-6552	3/28/1971	1336	352	WOODROW MACK JR & PATRICIA A MACK	0.20
A28	9643-47-6319	11/15/2010	4835	995	PRISCILLA MOSS WALKER	0.47
A29	9643-47-5198	4/9/2010	4774	1152	GEORGE BASHAM	0.47
A30	9643-46-5977	11/14/1995	1878	79	CHARLES RAY GIBSON	0.50
A31	9643-46-7930	4/4/2007	4385	753	ARTURO OSORINO	0.51
A32	9643-46-7931	11/16/1991	1672	167	JAMES EDNEY MCKINNEY	0.51
A33	9643-46-7932	10/13/1987	1495	46	CLOTA J MCFALLS	0.48
A34	9643-46-7933	5/8/2009	4679	848	PEGGY MCKINNEY	0.50
A35	9643-56-2901	5/8/2009	4679	848	PEGGY MCKINNEY	0.50
A36	9643-56-3931	8/24/1988	1530	749	GAIL BARBARA GREEN	0.72
A37	9643-56-4993	3/29/1993	1738	318	ALVIN JOSEPH CASE JR	1.78
A38	9643-63-9087	10/29/1971	491(H)	571	YOUNGBLOOD OIL CO INC	1.77
A39	9643-72-3740	4/24/1992	797(H)	87	BGA ASSOCIATES LTD PARTNERSHIP	2.29
A40	9643-72-5564	6/30/2005	1233(H)	592	JAI PRABHU LLC	2.02
A41	9643-72-2526	2/6/2007	1306(H)	110	JAI PRABHU RESTAURANT LLC	0.72
A42	9643-71-7581	5/13/2002	2798	490	MINKLES LLC	27.75
A43	9642-77-9241	5/30/2003	1141(H)	350	CHARLES PUTMAN, KARL V LITTEN & LAWREN KASSOUF	4.42
A44	9642-65-7368	3/5/2010	1422(H)	693	WARRIOR GOLF MANAGEMENT LLC	173.91
A45	9642-57-2403	7/14/1994	848(H)	645	HENDERSON COUNTY	15.19
A46	9642-39-7277	12/21/2011	1485	45	VAUGHAN FITZPATRICK, ET AL	17.39
A47	9643-40-4606	10/15/1992	807(H)	655	BRIGHTSTAR ASSOC. INC	19.12
A48	9643-32-2633	7/11/2007	1326(H)	6	BRITE STARS LLC NC LL COMPANY	110.74
A49*	0702152	6/15/2012	1499	291	WILD RIVER CORPORATION	83.00
(H) HENDERSON COUNTY DEED						TOT. ACRE
						522.3600

*NOTE: PARCEL A49 UPDATED MARCH 1, 2012 BASED ON INFORMATION PROVIDED ON HENDERSON COUNTY GIS WEBSITE.

CURVE TABLE

CURVE #	LENGTH	RADIUS	DELTA	CHORD DIRECTION	CHORD LENGTH
C1	458.22	728.34	36.05	N29° 05' 36"E	450.70
C2	426.97	2066.26	11.84	N11° 41' 07"W	426.22
C3	192.27	1985.03	5.55	N3° 05' 18"W	192.19
C4	480.35	2098.38	13.12	N5° 58' 20"E	479.31
C5	230.73	899.80	14.69	N29° 27' 50"W	230.10
C6	231.53	649.86	20.41	N26° 36' 10"W	230.31
C7	155.75	1549.66	5.76	N19° 16' 31"W	155.69
C8	495.73	1669.63	17.01	N13° 38' 56"W	493.91
C9	167.59	399.91	24.01	N17° 08' 52"W	166.36
C10	219.39	184.96	67.96	S76° 48' 06"W	206.75
C11	113.88	559.88	11.65	S51° 17' 47"W	113.68
C12	81.46	1719.07	2.72	S55° 51' 07"W	81.45
C13	150.14	5617.27	1.53	S73° 37' 48"W	150.13
C14	389.01	5617.27	3.97	S70° 52' 49"W	388.94
C15	439.31	1578.87	15.94	N10° 19' 15"W	437.89
C16	62.68	5688.76	0.63	N18° 02' 37"W	62.68
C17	309.22	1996.35	8.87	N12° 03' 53"W	308.91
C18	31.65	1867.14	0.97	S1° 01' 33"E	31.65

EXISTING ENCUMBRANCE(S)

REF. NO.	ACQUISITION REFERENCE			ENCUMBERANCE TO - NAME(S)	TYPE**	PURPOSE
	RECORD DATE	BOOK	PAGE			
RD1	9/9/77	PB 42	132	CITY OF ASHEVILLE	O	DRIVEWAY
RD2	2/5/91	1639	125	ROGER PINNER	O	DRIVEWAY
S3	3/4/82	611(H)	953	METROPOLITAN SEWERAGE DISTRICT	S	SEWER
RD4	8/14/90	761(H)	791	WARRIOR GOLF MANAGEMENT	O	ACCESS ROAD
RD5	12/21/05	4155	1353	METROPOLITAN SEWERAGE DISTRICT	O	ROAD
RD6	9/19/83	PB 50	11	RIVERPORT SUBDIVISION	O	60' ROAD R/W
RD7	10/25/93	831 (H)	546	WILLIAM J. CORN	O	30' ROAD R/W
W8	3/26/09	PB 143	174	LANDMARK AVIATION	W	WATER
W9	6/19/09	PB 145	142	CITY OF ASHEVILLE	W	WATER
W10	1/12/10	PB 149	83	CITY OF ASHEVILLE	W	WATER
W11	3/17/10	PB 149	27	CITY OF ASHEVILLE	W	WATER
*S12	9/28/81	1281	541	METROPOLITAN SEWERAGE DISTRICT	S	SEWER
*W13	10/4/10	4822	872	CITY OF ASHEVILLE	W	WATER
*E14	1/8/91	1636	121	CAROLINA POWER & LIGHT	E	ELECTRIC
*E15	9/2/92	1710	592	CAROLINA POWER & LIGHT	E	ELECTRIC
*E16	5/21/93	1745	684	CAROLINA POWER & LIGHT	E	ELECTRIC
*E17	5/4/09	4677	140	CAROLINA POWER & LIGHT	E	ELECTRIC
*E18	5/4/09	4677	143	CAROLINA POWER & LIGHT	E	ELECTRIC
*E19	10/5/09	4729	115	CAROLINA POWER & LIGHT	E	ELECTRIC
PD1	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #1
PD2	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #2
PD3	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #3
PD4	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #4
PD5	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #5
PD6	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #6
PD7	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #7
PD8	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #8
PD9	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #9
PD10	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE #10
PD11	PENDING	PENDING	PENDING	NC DEPARTMENT OF TRANSPORTATION	D	PERMANENT DRAINAGE
TS1	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 1
TS2	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 2
TS3	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 3
TS4	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 4
TS5	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 5
TS6	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 6
TS7	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 7
TS8	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 8
TS9	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 9
TS10	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 10
TS11	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 11
TS12	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 12
TS13	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 13
TS14	5/16/96	1906	324	NC DEPARTMENT OF TRANSPORTATION	O	TEMPORARY SLOPE # 14
TS

U.S. Department
of Transportation
**Federal Aviation
Administration**

Memphis Airports District Office
2600 Thousand Oaks Boulevard, Suite 2250
Memphis, TN 38118
Phone: (901) 322-8180 Fax: (901) 322-8195

November 24, 2025

Mr. Jared Merrill
Vice President of Planning
Asheville Regional Airport
61 Terminal Drive, Suite 1
Fletcher, NC 40510

RE: Federal Aviation Administration (FAA) Conditional Approval for The Asheville Regional Airport (AVL) Airport Layout Plan (ALP) Drawing Set; Airspace Case Study No. 2025-ASO-589-NRA

The Memphis Airports District Office (MEM-ADO) has completed the final review of the Asheville Regional Airport updated Airport Layout Plan (ALP) drawing set. Accordingly, a Conditional Approval is issued for the subject ALP, dated August 2024.

An aeronautical study, Airspace Case Study No. 2025-ASO-589-NRA was conducted on the proposed development depicted on the ALP. This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. The airport sponsor has the primary responsibility to protect the airport environs through such means as local zoning ordinances, property acquisition, avigation easements, letters of agreement or other means.

This ALP approval is conditioned on acknowledgement that any development on airport property requiring Federal environmental approval must receive such written approval from FAA prior to commencement of the subject development. This ALP approval is also conditioned on acceptance of the plan under local land use laws. We encourage appropriate agencies to adopt land use and height restrictive zoning based on the plan.

Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration. When construction of any proposed structure or development indicated on the plan is undertaken, such construction requires normal 45-day advance notification to FAA for review in accordance with applicable Federal Aviation Regulations (i.e., Parts 77, 157, 152, etc.). More notice is generally beneficial to ensure that all statutory, regulatory, technical and operational issues can be addressed in a timely manner.

The FAA Reauthorization Act of 2024 has limited the FAA's review and approval authority for ALPs. The FAA's approval of this ALP is limited to existing facilities only for which the FAA retains approval authority. The FAA has not determined whether it retains review and approval authority for any proposed facilities depicted on the ALP associated with this letter (unless otherwise noted). The FAA will determine whether it retains approval authority for ALP changes reflecting future facilities when such facilities are ripe for consideration (when such facilities are intended to be built), and such approval, if required, must be granted before construction occurs.

Although the FAA's review and approval authority of proposed projects depicted on an ALP is limited, airport sponsors must continue to maintain an up-to-date ALP in accordance with Federal law, 49 U.S.C. § 47107(a)(16).

Also, State Road 3496,Pinner Road, New Airport Road, State Highway 280, Hunter Airport Drive, and French Broad Lane are incompatible land uses within the RPZ's for Runway 17/35. Please work to mitigate these conditions to improve the RPZs.

Please attach this letter to the FAA-approved Airport Layout Plan and retain it for your records.

If you have further questions or need for clarification, please feel free to contact me at (901) 322-8185 or by e-mail at Jamal.Stovall@faa.gov.

Sincerely,

Jamal Stovall

Jamal R. Stovall, Lead Community Planner

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