CHAPTER 3

Airside Facilities

3.0 AIRSIDE OVERVIEW

This chapter focuses on airside facilities at Spokane International Airport (GEG or “the Airport”). Airside facilities include runways, taxiways, support facilities, and non-terminal building areas. Airside facility planning is largely driven by criteria and standards developed by the Federal Aviation Administration (FAA) that emphasize safety and efficiency while protecting federal investment in airport transportation infrastructure. This chapter begins with an assessment of the runway system and airport geometry, and then evaluates the taxiway system, airside support facilities, and development areas. The chapter concludes with an assessment of real property: land needed to support aviation-related development and surplus land which may accommodate compatible non-aviation uses.

Two major airside projects have been completed since the 2003 Master Plan (2003 Plan). In 2010, Runway 3/21 was extended 2,000 feet to the southwest. In 2011, the northern portion of Runway 3/21 was re-graded and reconstructed to meet FAA standards for providing a clear line of sight between the runway ends. Analysis indicates that the airside environment is compliant with FAA design standards; therefore, airside improvement priorities will focus on near-term taxiway system improvements and accommodating growth in the demand for Maintenance Repair and Overhaul (MRO) facilities. Longer-term improvements relate to the runway system. These improvements consider alignment of a new runway on the west side of the Airport, and a phasing strategy for new runway implementation that considers adding or replacing runways at GEG. Airfield capacity influences the evaluation of runway alignment and construction phasing; therefore, a discussion of airfield capacity at GEG is presented in the following section.

3.1 AIRFIELD CAPACITY

Airfield capacity is the number of aircraft operations the runway and taxiway system can accommodate before delays frequently occur, and does not refer the size or weight of an aircraft that can use the Airport. Airports that operate over capacity are generally less efficient and have higher operating costs. This section evaluates capacity, delay, and airfield geometry at GEG, and establishes trigger points for comprehensive planning and implementation of a new runway to increase airfield capacity.

3.1.1 Factors that Influence Capacity

There are many variables that influence airport capacity. Some are independent and some are interrelated. The most significant variables are summarized below.

Visual versus instrument flight conditions—Runway capacity is higher during visual flight conditions (high visibility) than it is during instrument flight conditions (low visibility). In visual flight conditions, pilots can operate closer to other aircraft, and fly shorter flight segments around the Airport. During visual flight conditions, airport capacity is limited by runway occupancy time. Aircraft attempt to exit the runway as quickly as possible to avoid delaying the aircraft following them. Wake turbulence from larger aircraft may also cause delay during visual conditions as smaller aircraft must wait longer than normal when a large aircraft departs before them. During instrument flight conditions, aircraft must maintain additional distance from each other, which reduces airfield capacity. Controllers use radar and predictive tools to meet aircraft separation requirements. Controllers may be unable to see the aircraft on the ground during instrument flight conditions. Aircraft taxi at a slower speed when the controllers are unable to see them. Slower taxi speeds increases runway and taxiway occupancy times, which reduces airfield capacity and increases delays. There are technological enhancements that can improve safety and situational awareness in the air and on the ground during instrument visual conditions, reducing the impact of low visibility conditions on airport operations.

Operating dependencies—Runways that have overlapping arrival and departure corridors are dependent on each other, while runways that are parallel with each other have fewer dependencies. Aircraft operating on one runway must consider aircraft operating on the other runway, which can cause delay for one aircraft if both wish to operate simultaneously. The two intersecting runways at GEG are dependent, as are flight operations at GEG and Fairchild Air Force Base (FAFB), located five miles west of GEG. The extended centerline of GEG Runway 7/25 crosses over FAFB. The close proximity and converging runway alignments of GEG and FAFB require a high level of air traffic controller coordination. When aircraft are arriving from the north and departing to the south, arrivals into both facilities converge in the final approach area to GEG Runway End 21. When aircraft are arriving from the south and departing to the north, air traffic controllers protect for missed approaches to FAFB Runway End 5. The airfield proximity and converging traffic patterns of GEG and FAFB are shown in **Figure 3-1.**

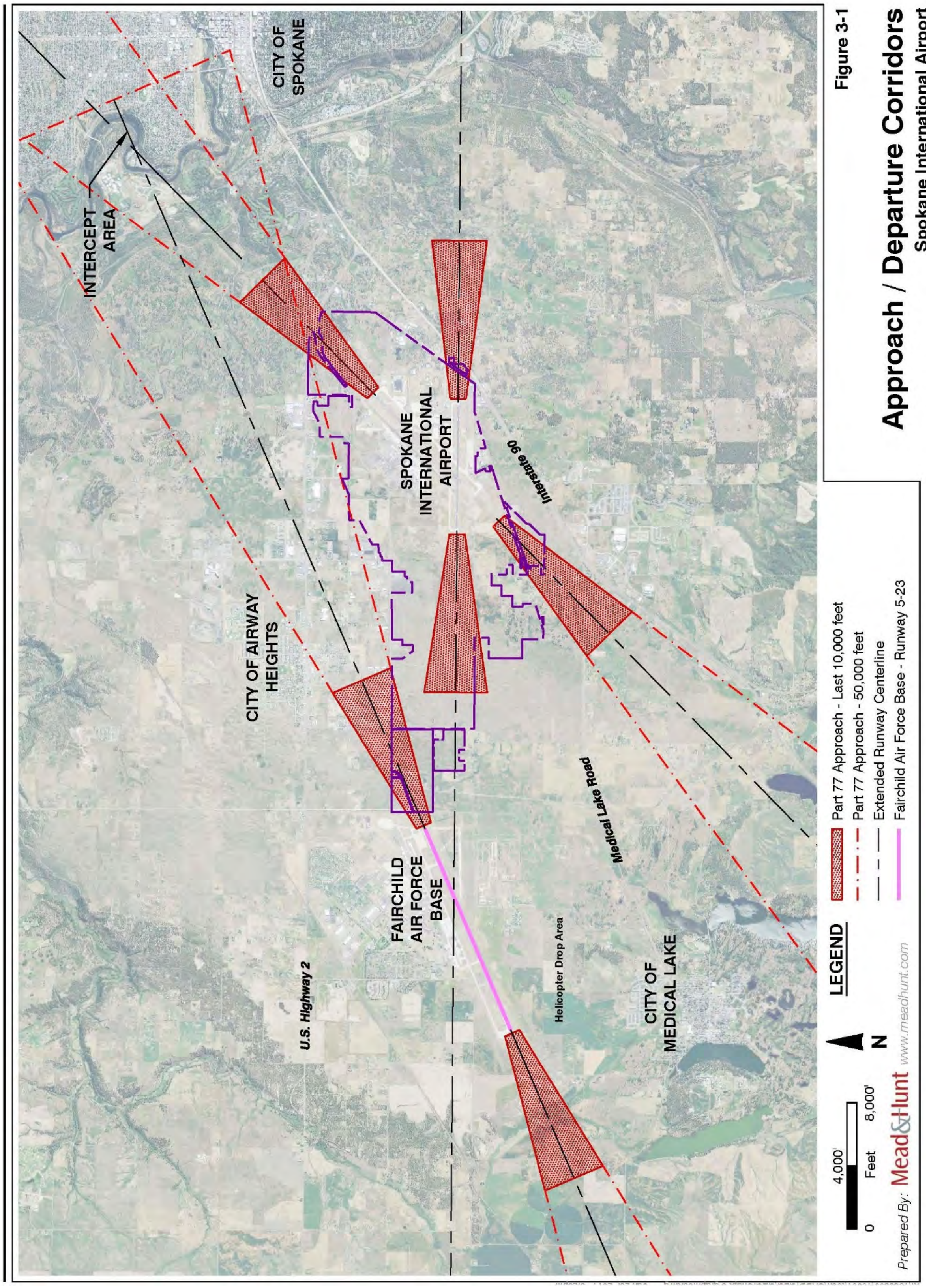


Figure 3-1
Approach / Departure Corridors
Spokane International Airport
CITY OF SPOKANE
INTERCEPT AREA
SPOKANE INTERNATIONAL AIRPORT
Interstate 90
CITY OF AIRWAY HEIGHTS
FAIRCHILD AIR FORCE BASE
Medical Lake Road
Helicopter Drop Area
U.S. Highway 2
CITY OF MEDICAL LAKE
LEGEND
Part 77 Approach - Last 10,000 feet
Part 77 Approach - 50,000 feet
Extended Runway Centerline
Fairchild Air Force Base - Runway 5-23
N
0 4,000' 8,000'
Feet
Prepared By: Mead&Hunt www.meadhunt.com

Aircraft operating mix—Differences between aircraft size and speed affect airfield capacity. A more diverse operating mix can reduce capacity as slower aircraft may require a faster aircraft coming in after them to slow down or otherwise maneuver to maintain separation. Lighter aircraft need to avoid the wake turbulence generated by heavier ones. Secondary runways can be helpful in separating the larger aircraft from smaller aircraft, which produces a more even flow rate and reduces unnecessary delay.

Operating flow pattern—Wind determines the direction of takeoff and landing at an airport. Airports often have two or more "flow patterns" to account for different wind, weather, and demand combinations. Each pattern has its own unique set of operating efficiencies and dependencies.

Parallel runway separation—Parallel runways separated by less than 4,300 feet are not entirely independent of each other due to concern of wake turbulence. Light winds may push the wake turbulence across the parallel runway or flight path. The degree of dependency between the runways is affected by the amount of lateral separation and runway end stagger.

3.1.2 Capacity / Delay Measures

Quantifying airport capacity and delay can be simplified by averaging the variables to create typical operating conditions experienced over the course of a year. An airport's annual capacity is known as the Annual Service Volume (ASV), which is the number of flight operations an airfield can accommodate during the course of a year. Annual demand, existing or forecast, is compared with the ASV to determine what percent of capacity the airport is operating at, and to gauge the timing of airfield capacity improvements. As annual demand approaches ASV, average delays will increase. A typical goal is to construct a new runway by the time delays average 10 to 15 minutes per operation. This requires planning, environmental, and design work to be completed before delays reach this threshold.

In 2009, GEG completed a Third Runway Study, included in Appendix A, which assessed two runway alignment alternatives. At the same time, the FAA Capacity Branch assessed traffic flow, capacity and delay using an airfield capacity simulation model (SIMMOD), included in Appendix B. The studies determined that GEG has an ASV of 215,000 annual operations. It is expected that average delay will be 15 minutes per operation when GEG reaches this level of annual operations if improvements are not made to the airfield. The ASV has been verified using the capacity and delay calculations for long range planning contained in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

3.1.3 Third Runway Trigger Points

New runway implementation generally requires a 10 year lead time to work through the planning, environmental, design, and construction processes. Operational trigger points from which to launch planning initiatives and implement activity are identified so that the runway will open before delays become unmanageable. The triggering mechanism provides the flexibility necessary should demand increase more rapidly or more slowly than forecast. Planning guidelines recommend initiating runway planning when actual aircraft operations reach 60% of the ASV, which is 129,000 annual operations at GEG. Runway construction should begin when aircraft operations reach 80% of the ASV, which is 172,000 annual operations at GEG.

Figure 3-2 provides an indication of the average delays to be expected as demand increases. It also illustrates the annual aircraft operations and percent of ASV trigger points to initiate planning and construction of a parallel runway. **Figure 3-3** shows that based on the capacity of the existing runway system configuration, the need to initiate planning of a future runway is beyond the 20-year planning horizon of this master plan. New technologies associated with the FAA NextGen program may increase the ASV in the future by increasing the throughput during instrument conditions and defer implementation of a new runway.

Figure 3-2. Capacity and Delay

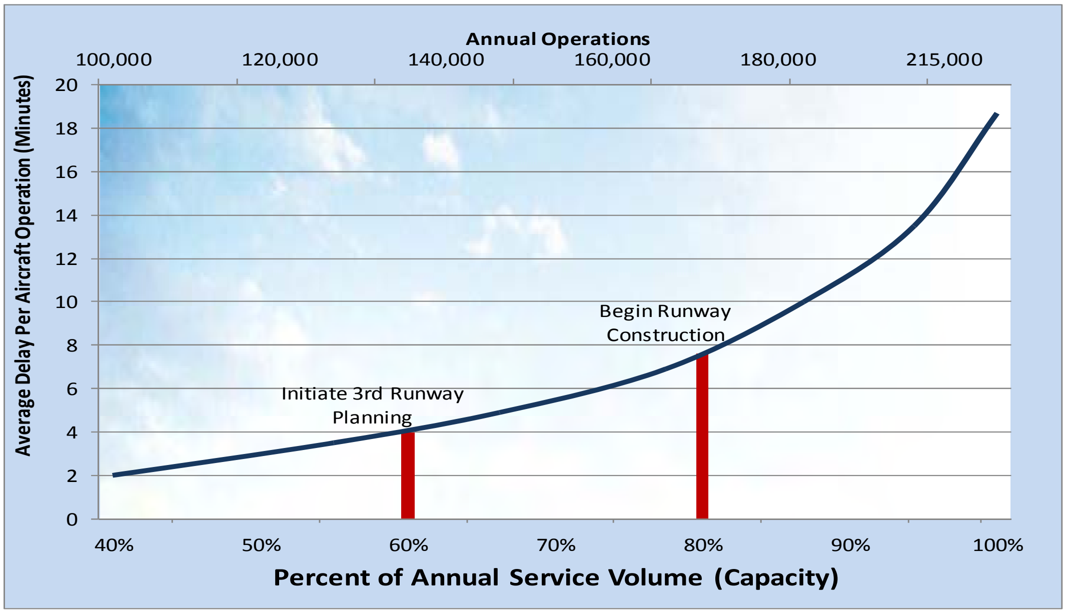
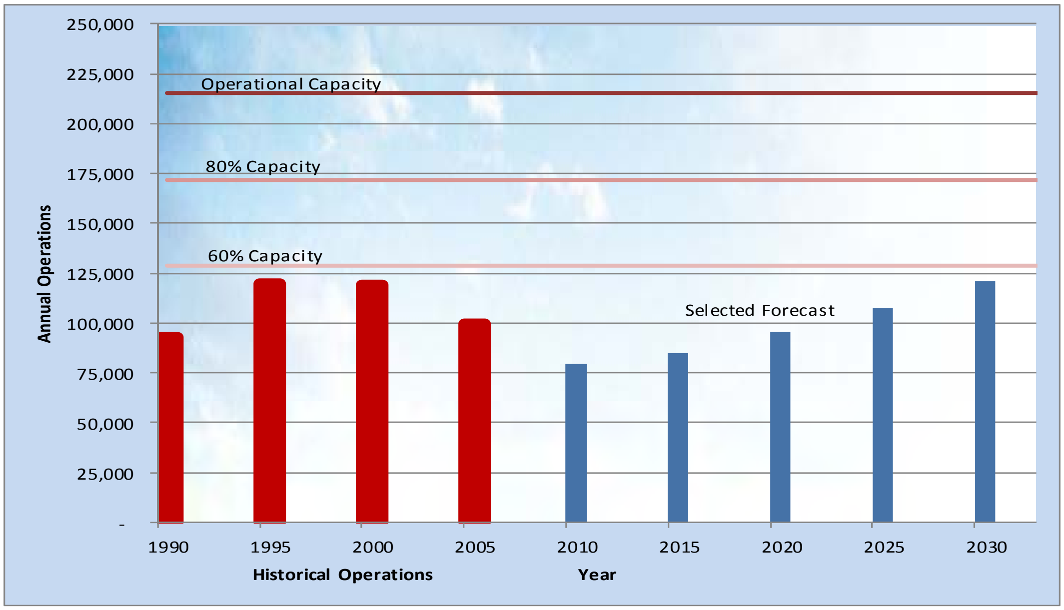


Figure 3-3. Operations and Capacity



3.1.4 Capacity Recommendations

In 2013, aircraft operations at GEG did not routinely experience excessive delays; however, it is expected delays will increase as operations increase, becoming exponentially worse as the Airport nears ASV. The most effective means of adding capacity and combatting delay is to add an independent arrival and departure stream by constructing a parallel runway. GEG has been proactive in planning for a new runway for over 30 years, acquiring properties on which to construct the runway, and monitoring land uses in the future arrival and departure corridors. Forecasted aircraft operations are not expected to trigger the need to initiate construction of a new runway during the 20-year planning horizon. The Airport desires to continue the protecting and planning for a new runway in this location.

3.1.5 Airspace Compatibility

Implementation of Runway 3L/21R will put GEG traffic closer to aircraft operating at Fairchild Air Force Base. It is recommended that the Airport, FAA air traffic control, and Fairchild officials develop a resolution to solve potential airspace conflicts prior to construction of Runway 3L/21R.

3.2 FUNDAMENTALS OF AIRPORT DESIGN

Planning and development of airside facilities is heavily predicated on complying with the FAA design standards in AC 150/5300-13A, *Airport Design* (5300-13A). This section summarizes the design standards contained 5300-13A, and identifies the conditions unique to GEG that influence design recommendations.

3.2.1 Design Standards Concept and Terminology

The FAA is responsible for the overall safety of civil aviation in the United States (U.S.); therefore, FAA design standards are primarily driven by safety. Secondary goals including efficiency and utility are also reflected in FAA standards and policy. Changes affecting safety and efficiency are constantly evolving as the aviation industry continues its rapid development, and it is expected that design standards will continue to evolve with technologies and procedures.

Design Aircraft

FAA design standards for an airport are determined by a coding system that relates the physical and operational characteristics of an aircraft to the design and safety setback distances of the airfield facility. The design aircraft is the most demanding aircraft operating or forecast to operate at that facility on a regular basis, which the FAA defines as an aircraft with scheduled operations, or a non-scheduled aircraft with more than 500 or more operations per year. Characteristics of the design aircraft that are used in facility planning include approach speed, wingspan, tail height, main gear width, cockpit to main gear length, aircraft weight, and takeoff and landing distances. Dimensions of airfield facilities determined by the design aircraft include: runways, taxiways, taxilanes, and aprons, and associated setbacks and clearances. The design aircraft may be a specific aircraft type, or a composite of aircraft characteristics.

Runway Design Code (RDC)

The RDC is three-component code that defines the applicable design standards that apply to a specific runway. The first component, depicted by a letter (A-E) is the Aircraft Approach Category (AAC), and relates to the approach speed of the design aircraft. The second component, Airplane Design Group (ADG), depicted by a Roman numeral (I-VI), relates to the greatest wingspan or tail height of the design aircraft. The third component relates to runway visibility minimums as expressed in Runway Visual Range (RVR) equipment measurements. RVR-derived values represent feet of forward visibility that have statute mile equivalents (e.g. 2400 RVR = ½-mile). RDC classifications are summarized in **Table 3-1**.

Table 3-1. Runway Design Code System

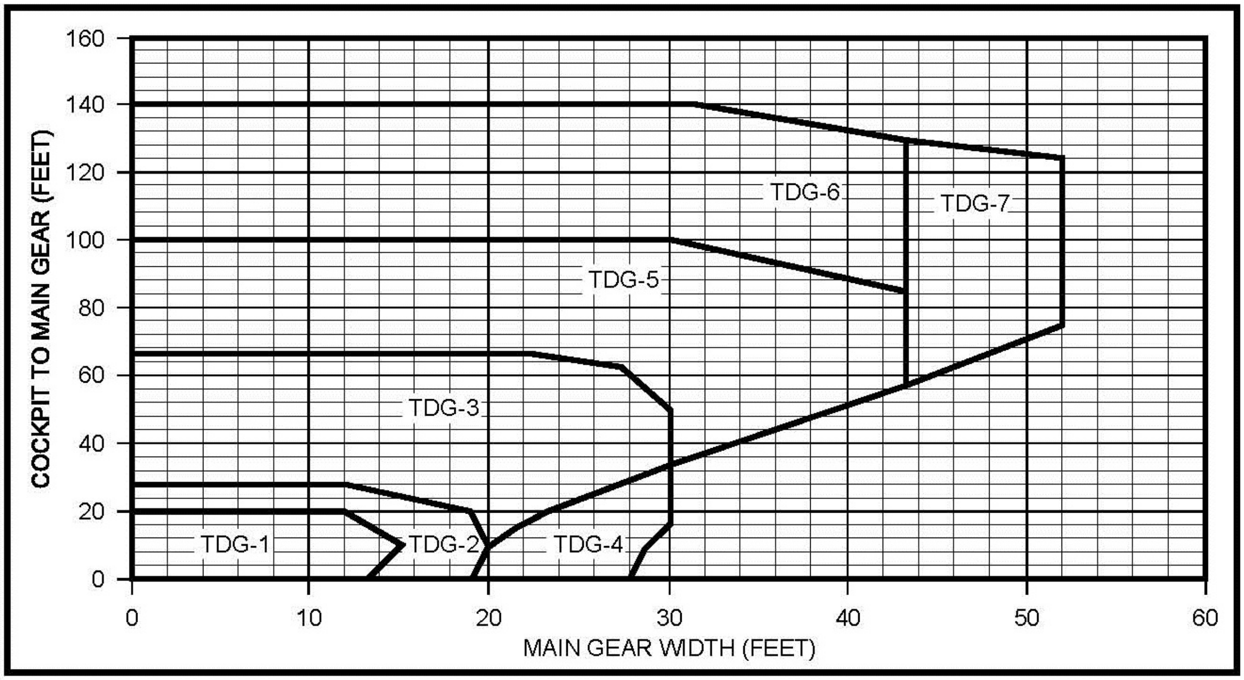
Aircraft Approach Category (AAC)		
AAC	**Approach Speed**	
A	Approach Speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
Airplane Design Group (ADG)		
Group #	**Tail height (ft)**	**Wingspan (ft)**
I	< 20’	< 49’
II	20’ - < 30’	49’ - < 79’
III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
IV	66’ - < 80’	214’ - < 262’
Approach Visibility Minimums		
RVR (ft)[1]	**Flight Visibility Category (statue mile)**	
4000	Lower than 1 mile but not lower than ¾ mile (APV ¾ but< 1 mile	
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I PA)	
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II PA)	
1200	Lower than ¼ mile (CAT-III PA)	

1. RVR- Runway Visual Range. The approximate visibility (in feet) as measured by the RVR light transmission/reception equipment or equivalent weather observer report.

Taxiway Design Group (TDG)

Separation between runways, taxiways, taxilanes, and objects is related to the aircraft characteristics encompassed by the ADG: wingspan and tail height. The Taxiway Design Group (TDG) takes into account the dimensions of the aircraft landing gear to determine taxiway widths and pavement fillets to be provided at taxiway intersections. Fillet pavement is required to accommodate the inner wheel of the airplane as it turns. There are seven (1-7) TDG classifications that represent a function of main gear width and wheel base, which is the distance from nose gear to main gear. TDG classifications are presented in **Figure 3-4**.

Figure 3-4. Taxiway Design Group Determination



Other Airfield Design Considerations

In addition to RDC and TDG, the following design considerations affect airport geometry and development patterns.

- **Approach and departure protection**—Runway approach minimums and flight procedures are determined by imaginary surfaces that originate from the runway. These surfaces typically extend along the extended runway centerline, or branch out laterally from the runway. Runways are typically aligned to avoid terrain and tall structures that can impose operational restrictions and reduce airport utility. New construction can impose restrictions on aircraft operations if the construction penetrates the imaginary surfaces. Airports typically work with nearby communities to adopt land use planning techniques to minimize incompatible development. Imaginary surfaces are often used to determine whether the height and location of a structure will adversely impact aircraft operations.
- **Prevailing winds and weather patterns**—Runways are generally aligned so that aircraft can arrive and depart into the prevailing winds. Multiple runway alignments may be necessary in locations that

experience high crosswinds on the primary runway more than five percent of the year. Instrument approach procedures and related navigational aids (NAVAIDs) are developed based on the prevailing wind and weather patterns to maximize utility. Commonly, the operating pattern needed during inclement weather is opposite of that used during fair weather as a result of wind circulation patterns.

- **Controller line of sight**—Air traffic controllers require an uninterrupted line of sight between the air traffic control tower (ATCT) and approach and departure corridors, runways, taxiways, and aprons. Protection of controller line of sight often restricts building placement.
- **Critical areas**—Airports have an abundance of electronic equipment used for navigation, communication, security, and surveillance. Most of these items require clear and graded areas, setbacks from certain objects and construction materials, and a clear corridor between transmitters and receivers. Development and the types of activities that may occur is restricted in these areas.
- **Visual aids to navigation**—Certain visual aids, including the airport beacon, runway approach lighting, and runway glide path indicator lights require unobstructed views to aircraft in flight that need to be considered in the planning and design of airport facilities.
- **Airfield line of sight**—Operations on intersecting runways cannot be operated independently of one another. The runway visibility zone (RVZ) must be clear of obstructions so that an aircraft approaching the intersection of the runways can see if there is other traffic. Similarly, runway grading standards are predicated on providing line of sight between aircraft operating at opposite ends of the same runway.
- **Independent versus dependent operating streams**—Runways that intersect or that have intersecting approach and departure corridors are dependent on each other. During high levels of activity, these dependencies cause delay. As delays increase, it may be necessary to provide an independent operating stream which can be accomplished by providing a parallel runway. Airplane wake turbulence is a consideration for determining the amount of space needed between parallel runways.

3.3 DESIGN AIRCRAFT SELECTION

The first step in airside facility planning is the selection of the design aircraft that will determine the scale and setbacks of airfield facilities. The process of determining a design aircraft is described in Section 3.3.1. The design aircraft at GEG is determined through an analysis of the existing fleet utilizing GEG, and considers the aviation forecasts in Chapter 2 and national fleet mix trends.

3.3.1 Runway 3/21 and Runway 7/25 Operational Analysis

Table 3-2 categorizes common scheduled and charter commercial aircraft operations at GEG from 2006 to 2010 by AAC, ADG, and TDG.

Table 3-2. Common Scheduled and Charter Commercial Operations (2006 – 2010)

Aircraft	AAC	ADG	TDG	Operations by Year				
				2006	2007	2008	2009	2010
Airbus A318	C	III	3			442	542	170
Airbus A319	C	III	3			1,108	1,692	1,826
Airbus A320	C	III	3	1,770	1,748	2,326	2,202	1,552
Boeing (Douglas) DC-9	C	III	3	532	530	532	50	40
Boeing 737-300	C	III	3	9,738	10,010	8,266	3,550	3,226
Boeing 737-400	C	III	3	2,146	1,360	894	770	472
Boeing 737-500	C	III	3	914	672	926	164	70
Embraer E170	C	III	3	0	522	904	226	340
Embraer E190	C	III	3	0	0	0	144	486
Bombardier CRJ-200	D	II	3	2,984	2,486	1,566	2,898	3,440
Bombardier CRJ-700	D	II	3	3,338	4,088	6,280	2,972	2,042
Bombardier CRJ-900	D	II	3	334	66	90	664	1,964
Embraer ERJ-145	D	II	3	2	4,010	4,442	6	6
Boeing 737-700	D	III	3	3,238	4,580	5,270	8,100	9,192
Boeing 737-800	D	III	3	374	1,290	1,780	1,870	1,958
Boeing 737-900	D	III	3	1,150	896	290	166	234
Bombardier Q400	C	III	5	9,104	10,780	9,074	10,556	10,886
Boeing (Douglas) MD-83	C	III	5	80	600	156	14	18
Boeing (Douglas) MD-87	C	III	5	0	0	12	12	28
Boeing (Douglas) MD-88	C	III	5	12	2	0	6	56
Boeing (Douglas) MD-90	C	III	5	378	566	1,038	370	898
Boeing 727-200	C	III	5	940	538	266	10	46
Airbus A300	C	IV	5	904	1,206	1,406	1,390	1,762
Airbus A310	C	IV	5	828	448	316	328	220
Boeing 757-200	C	IV	5	90	194	320	278	218
Boeing 767-300	D	IV	5	792	748	740	718	706
			Total	**39,648**	**47,340**	**48,444**	**39,698**	**41,856**

Source: FAA Enhanced Traffic Management System Counts

The most demanding commercial aircraft from 2006 to 2010 was the Boeing 767-300, which currently operates at GEG as a cargo transport and as a charter passenger transport. The Boeing 767 is an AAC-D, ADG-IV, TDG-5 aircraft.

According to estimates by ATCT personnel, most commercial aircraft operations are conducted on Runway 3/21; however, approximately 10 percent of Bombardier Q400 operations occur on Runway 7/25, making it the most demanding aircraft using Runway 7/25 on a regular basis. The landing gear configuration of the Q400 has unique taxiway width and fillet design requirements for an aircraft of its size. Boeing 737 aircraft occasionally utilize Runway 7/25.

Table 3-3 categorizes GEG's larger general aviation (GA) aircraft operations by AAC, ADG, and TDG. These aircraft include a combination of private aircraft and for-hire air taxi operators.

Table 3-3. GA Operations (2006 – 2010)

Aircraft	AAC	ADG	TDG	Operations by Year				
				2006	2007	2008	2009	2010
Citation I	B	I	1	64	56	42	50	40
Beechjet 400	C	I	1	164	156	126	78	90
Learjet 25	C	I	1	18	24	48	28	24
Learjet 31	C	I	1	116	118	108	164	372
Learjet 35/36	D	I	1	386	350	276	204	248
Citation V/Ultra/Encore	B	II	1	216	222	212	214	262
Challenger 300	B	II	1	30	30	58	40	44
Citation III/VI/VII	C	II	1	244	284	206	180	192
Falcon 10	B	I	2	22	36	20	16	10
Raytheon Premier 1	B	I	2	28	32	14	20	18
IAI 1124 Westwind	C	I	2	50	60	44	36	14
IAI 1125 Astra	C	I	2	74	48	46	18	20
Learjet 40/45	C	I	2	170	172	220	192	242
Learjet 55/60	C	I	2	128	82	76	84	78
Citation II/Bravo	B	II	2	224	258	232	210	188
Citation Excel/XLS	B	II	2	154	194	130	92	152
CitationJet 1/2/3	B	II	2	532	490	388	294	332
Falcon 20	B	II	2	12	20	14	14	18
Falcon 2000	B	II	2	52	72	42	66	42
Gulfstream G150	C	II	2	0	16	30	18	14
Challenger 600/601/604	C	II	2	92	98	68	66	86
Citation X	C	II	2	92	114	96	110	110
Gulfstream G200	D	II	2	74	84	38	34	32
Falcon 50	B	II	3	32	34	30	20	30
Falcon 900	B	II	3	20	24	32	26	44
Citation Sovereign	B	II	3	32	92	118	88	122
Hawker 800/800XP	C	II	3	214	238	194	98	170
Gulfstream G300	C	II	3	8	22	4	8	14
Gulfstream G400	D	II	3	56	56	46	44	84
Bombardier BD-700	C	III	3	8	14	10	16	22
Gulfstream G500	D	III	3	16	24	12	24	42
			Total	**3,328**	**3,520**	**2,980**	**2,552**	**3,156**

Source: FAA Enhanced Traffic Management System Counts

The commercial aircraft are the most demanding operators at GEG in terms of aircraft size (ADG and TDG); however, the higher approach speed business jets contributed an average of 426 annual AAC D operations from 2006 to 2010.

Table 3-4 combines the commercial and GA aircraft operations into totals by ACC-D, ADG-IV, and TDG-5. This provides support that GEG is currently functioning as AAC-D, ADG-IV, and TDG-5 airport.

Table 3-4. Operations by ACC-D, ADG-IV and TDG-5 (2006 – 2010)

Design Component	Operations				
	2006	**2007**	**2008**	**2009**	**2010**
AAC-D	12,744	18,678	20,830	17,700	19,948
ADG-IV	2,614	2,596	2,782	2,714	2,906
TDG-5	13,128	15,082	13,328	13,682	14,838
Total	**28,486**	**36,356**	**36,940**	**34,096**	**37,692**

3.3.2 Forecast Trends

The aviation demand forecasts in Chapter 2 project that operations by AAC-D, ADG-IV, TDG-5 airplanes will increase in terms of total operations and as a percentage of total operations. Aviation demand forecasts do not specifically project the introduction of scheduled commercial aircraft that are more demanding than those operating at GEG in 2013.

3.3.3 Extended Outlook

The airport master plan is the sponsor's vision for the airport. The vision of GEG includes a future west-side parallel runway. From a capacity perspective, aviation demand forecasts project 121,000 annual operations at GEG within the 20-year planning horizon, which is 56% of the Airport's ASV. For this reason, the long-term vision extends beyond the 20-year. The Airport's vision for future airfield layout is similar to present-day Portland International Airport (PDX). PDX has two fully independent primary runways, a crosswind runway that intersects one of the primary runways, a midfield terminal, and several airline maintenance support facilities. The 2012 FAA Terminal Area Forecast indicates that PDX had 216,000 annual aircraft operations. PDX has scheduled Boeing 747-400 air cargo operations, and a paint facility for Boeing 747 and 777 aircraft.

Airport management is pursuing expansion of the MRO facilities and airplane manufacturing businesses located at the Airport. GEG has a paint facility and interior finishing centers that are considering expansion. New facilities could be developed in the near-term, which may potentially trigger additional development of related airplane fabrication businesses at GEG. MRO related facilities under consideration could potentially accommodate ADG-V or -IV aircraft such as the Boeing 747 and Airbus A380. GEG has a competitive advantage over other airports in the region due to existing adequate runway length, a category III precision instrument approach, ample property with aviation, rail, and road connectivity, a specialized aviation employment base in the Spokane area, and existing contractual relationships with Boeing and its service partners. GEG has property available to accommodate demand that is unable to be met at other airports in the region. The Master Plan positions GEG to be unconstrained and flexible.

3.3.4 Design Aircraft Selections and Recommendations

Design aircraft characteristics that will guide airside facility planning are summarized in **Table 3-5**. The Boeing 767-300 is the design aircraft for Runway 3/21 and associated facilities. Runway 7/25 and associated facilities will utilize a composite of two design aircraft types: the Bombardier Q400 and the Boeing 737-400. This section concludes with planning recommendations intended to facilitate the transition from an ADG-IV design aircraft to a larger ADG category (V or VI).

Table 3-5. Design Aircraft Characteristics

Design Characteristics	Runway 3/21 Facilities	Runway 7/25 Facilities
Design Aircraft	**Boeing 767-300F[1]**	**Bombardier Q400[2] / (Boeing 737-400[3])**
Airplane Approach Category	D	C
Airplane Design Group	IV	III
Taxiway Design Group	5	5
Approach Speed (NM/HR)	145	(139)
Wingspan (FT)	156.1	(94.8)
Tail Height (FT)	52.9	(36.6)
Length (FT)	180.3	(119.6)
Cockpit to Main Gear Length (FT)	89.9	43.5
Wheel Base (FT)	74.7	45.8
Main Gear Width (outer edge- FT)	30.5	28.8
Gear Configuration	2D	D
Maximum Takeoff Weight (LBS)	412,000	(150,000)

Sources:

1. 767 Airplane Characteristics for Airport Planning (September 2005)

2. Q400 Airport Planning Manual (May 2001)

3. 737 Airplane Characteristics for Airport Planning (October 2005)

The design aircraft are the most demanding aircraft to frequently operate at GEG; however, the Airport can accommodate a larger aircraft. This capability supports airport management initiatives aimed at bringing additional large aircraft MRO and manufacturing businesses to the Airport. As the Airport sees more routine operations by ADG-V and larger aircraft, it is recommended that the Airport plan to upgrade markings and separation distances to meet FAA design standards associated with the larger ADG. For Runway 3/21, it is recommended that runway-taxiway, taxiway-taxiway, taxilane, parking limit lines, and building restriction lines be evaluated for potential upgrade to ADG-V setback criteria as facilities require reconstruction. It is recommended that future taxiway development and reconstruction be evaluated to facilitate transition from TDG-5 to TDG-6.

The Airport's near-term strategy to transition from TDG-5 to TDG-6 focuses on applying TDG-6 setbacks to future taxiway and structure projects. TDG-6 taxiways and associated costs not be eligible for FAA reimbursement until GEG meets the FAA substantial use threshold, 500 annual unscheduled operations or scheduled operations by TDG-6 aircraft. The Airport can prepare for transition from TDG-5 to TDG-6 by developing outside of the TDG-6 object free area, which will facilitate TDG-6 transition when justified.

3.4 WIND COVERAGE AND WEATHER CONSIDERATIONS

> **Wind Coverage Requirements**
> **Source: AC 150/5300-13A**
>
> An airport must demonstrate the ability to provide 95% wind coverage with minimum crosswind velocities by AAC-ADG:
> - 10.5 knots for A-I and B-I.
> - 13 knots for A-II and B-II.
> - 16 knots for A-III, B-III, and C-I through D-III.
> - 20 knots for A-IV through D-VI.

One of the primary factors influencing runway orientation and the number of runways is wind. Ideally, runways are aligned so that airplanes may take-off and land into a headwind and that minimize the challenges associated with crosswinds. Small, light aircraft are more affected by crosswinds than are larger, heavier ones. Variations in wind patterns are assessed to determine if more than one runway alignment is needed to negate these effects. When the primary runway provides less than 95% wind coverage, a crosswind runway is recommended. Wind coverage is amount of time the crosswind component remains below the thresholds established for four AAC-ADG combination categories described in 5300-13A.

Wind data was acquired from the National Oceanic and Atmospheric Administration weather station in Spokane (# 72785) for a ten year period. This data was evaluated using 4 sets of weather conditions: all weather, visual meteorological conditions (VMC), instrument meteorological conditions (IMC), and poor visibility conditions (PVC). GEG is prone to fog and low visibility conditions in the winter. **Table 3-6** summarizes the ceiling and visibility conditions at GEG.

The Airport is under IMC (cloud ceiling < 1,000 feet and/or ceiling < 3 miles) during 10.4% of the year. Nearly a third of the time during IMC, airport weather is classified as PVC (ceiling < 200 feet and/or visibility < ½-mile). The high frequency of PVC (3.1% of the year), combined with the evenly distributed north and south prevailing winds, highlights a need to provide precision approach procedures in both directions that support continued operations in low visibility.

Table 3-6. Weather Occurrences

Condition	Total Observations	Percent Occurrence	Description	
			Ceiling	Visibility
VMC	74,162	89.6 %	> 1,000’	>3 miles
IMC	6,066	7.3 %	1,000’> and >200’	3 miles> and > ½ mile
PVC	2,578	3.1 %	< 200’	<1/2 mile
ALL	82,806	100%	ALL	ALL

Source: NOAA, FAA Airport Design AC 150/5300-13, Mead & Hunt; Data Site: Spokane Weather Station (# 72785)
Period of Observations: Jan 2000 – Dec 2009; VMC: Cloud ceiling ≥ 1,000 FT and visibility ≥ ceiling ≥ 3 miles
IMC: Cloud ceiling < 1,000 FT and/or visibility < 3 miles, but ceiling > 200 feet and visibility < ½-mile
PVC: Cloud ceiling < 200 FT and/or visibility < ½-mile

As shown in **Table 3-7**, Runway 3/21 alone provides over 96% wind coverage and for each of the three cloud ceiling and visibility combinations. When combined with additional wind coverage of Runway 7/25, GEG has nearly 100% wind coverage. Wind analysis demonstrates that the alignment of Runway 3/21 provides the required wind coverage for even the lightest airplanes most impacted by crosswinds. The lack of east/west wind allows considerable planning flexibility at GEG, and Runway 7/25 provides operational flexibility. All-weather and instrument weather wind roses are depicted in **Figure 3-5**.

Table 3-7. Wind Coverage

All Weather					Visual (VMC)				
Runway	**10.5 kts**	**13 kts**	**16 kts**	**20 kts**	**Runway**	**10.5 kts**	**13 kts**	**16 kts**	**20 kts**
3/21	97.08 %	98.67 %	99.72 %	99.95 %	**3/21**	97.03 %	98.65 %	99.72 %	99.95 %
7/25	86.84 %	92.70 %	97.75 %	99.49 %	**7/25**	86.24 %	92.35 %	97.63 %	99.46 %
Combined	97.99 %	99.27 %	99.86 %	99.99 %	**Combined**	98.00 %	99.27 %	99.86 %	99.99 %
Instrument (IMC)					**Poor (PMC)**				
Runway	**10.5 kts**	**13 kts**	**16 kts**	**20 kts**	**Runway**	**10.5 kts**	**13 kts**	**16 kts**	**20 kts**
3/21	96.49 %	98.27 %	99.64 %	99.94 %	**3/21**	99.55 %	99.80 %	100 %	100 %
7/25	88.58 %	93.79 %	98.25 %	99.61 %	**7/25**	98.75 %	99.43 %	99.94 %	100 %
Combined	97.11 %	98.92 %	99.81 %	100 %	**Combined**	99.62 %	99.87 %	100 %	100 %

Sources: NOAA, FAA Airport Design AC 150/5300-13, Version 4.2, Mead & Hunt
Data Site: Spokane Weather Station (# 72785)
Period of Observations: Jan 2000 – Dec 2009
Number of Observations: 83,187

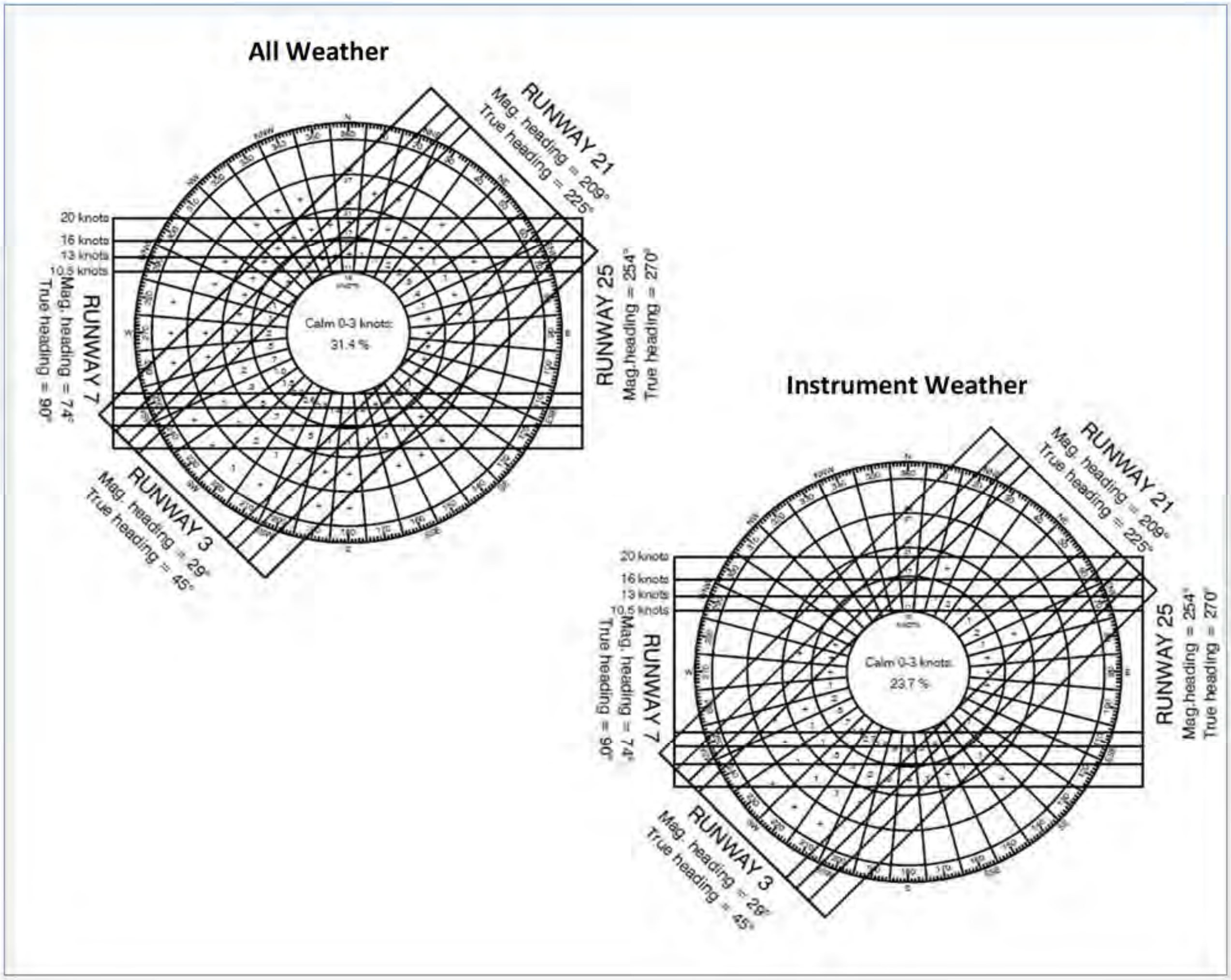


Figure 3-5

Wind Roses

Spokane International Airport

3.5 RUNWAY 3/21 FACILITIES

This section identifies the various FAA design standards associated with the primary runway system, and analyzes the degree to which GEG complies with these standards. This analysis includes the following elements.

- Identifying the runway design code.
- Assessing the degree to which design standards are met now and in the future.
- Presenting primary runway length and pavement strength requirements.
- Assessing ancillary facilities such as lighting and signage.
- Defining runway end protection surfaces and how they relate to off-airport development.

3.5.1 Runway 3/21 Runway Design Code (RDC)

The first two components of the RDC are AAC-D and ADG-IV, based on the Boeing 767 design aircraft. Over three percent of GEG's operations occur during poor visibility, often during wet and slippery runway surface conditions. To support operations in these conditions, Runway 3/21 has two instrument landing system (ILS) precision approach procedures, approach lighting, high intensity runway edge lighting, centerline lighting, and touchdown zone lights. ILS procedures on Runway Ends 3 and 21 allow continued landings to 600 feet runway visual range (RVR). The RDC for Runway 3/21 is D-IV-1200. The 1200 indicates a precision approach with less than 1200 RVR. Approach and lateral setbacks are more restrictive for runways capable of accommodating operations during low visibility.

The RDC for Runway 3/21 is D-IV-1200.

3.5.2 Runway 3/21 Design Standards

This section identifies the design standards associated with the existing and ultimate RDC for Runway 3/21. Future improvements should be made so that they are in compliance with the existing design standard. The Airport should use the ultimate setback standards when siting facilities that are expected to remain beyond the 20-year planning period to facilitate the transition to the ultimate design stands should they become justified. The ultimate RDC relates to the long-term vision for the Airport, which may not occur within the 20-year planning period. The runway design standards matrix is provided in **Table 3-8**.

Runway 3/21 currently meets or exceeds existing FAA design standards associated with RDC D-IV-1200. Existing facilities can accommodate the larger aircraft with minimal adjustment.

Table 3-8. Runway 3/21 Design Standards Matrix[1]

	Existing			Ultimate
Runway Design Code (RDC) Taxiway Design Group (TDG)	D-IV-1200 5			D-V-1200 6
Item	**FAA Standard**	**Actual**	**Standard Met**	**Ultimate**
Runway Design				
Runway Width	150 FT	150 FT	Yes	No change
Shoulder Width	25 FT	25 FT	Yes	35 FT
Blast Pad Width	200 FT	200 FT	Yes	220 FT
Blast Pad Length	200 FT	400 FT	Yes	400 FT
Crosswind Component	20 knots	20 knots	Yes	No change
Runway Protection				
Runway Safety Area (RSA)				
Length beyond departure end	1000 FT	1000 FT	Yes	No change
Length prior to threshold	600 FT	1000 FT	Yes	No change
Width	500 FT	500 FT	Yes	No change
Runway Object Free Area (ROFA)				
Length beyond departure end	1000 FT	1000 FT	Yes	No change
Length prior to threshold	600 FT	1000 FT	Yes	No change
Width	800 FT	500 FT	Yes	No change
Runway Obstacle Free Zone (ROFZ)				
Width	400 FT	400 FT	Yes	No change
Vertical (H)	27.6 FT	27.6 FT	Yes	20.1 FT
5:1 segment length from centerline (Y)	551.5 FT	551.5 FT	Yes	613.9 FT
6:1 final segment height above airport	150 FT	150 FT	Yes	No change
Precision Obstacle Free Zone (POFZ)				
Length	200 FT	200 FT	Yes	No change
Width	800 FT	800 FT	Yes	No change
Approach Runway Protection Zone (RPZ)				
Length	2500 FT	2500 FT	See notes 2 and 3.	No change
Inner Width	1000 FT	1000 FT		No change
Outer Width	1750 FT	1750 FT		No change
Acres	78.914	78.914		No change
Departure Runway Protection Zone (RPZ)				
Length	1700 FT	1700 FT	Yes	No change
Inner Width	500 FT	500 FT	Yes	No change
Outer Width	1010 FT	1010 FT	Yes	No change
Acres	29.465	29.465	Yes	No change
Runway Separation				
Runway centerline to:				
Holding position[4]	274 FT	313 FT	Yes	304 FT
Parallel taxiway/taxilane centerline	400 FT	TW A: 700 FT TW G: 600 FT	Yes	500 FT
Taxiway centerline with reverse turn	600 FT	TW A: 700 FT TW G: 600 FT	Yes	No change
Aircraft parking area	500 FT	760 FT	Yes	No change

Notes

1. Source: FAA Advisory Circular 150/5300-13A, Airport Design (September 2012)
2. Airport Drive traverses a small portion of the outer northwest corner of the Runway 21 approach RPZ.
3. Electric Avenue traverses the Runway 3 approach RPZ.
4. The holding position standard includes an elevation adjustment of 1 foot for every 100 feet above sea level.

The function of the runway protection zone (RPZ) is to protect persons and property on the ground. It is recommended that the Airport own and control the property, and maintain it clear to the maximum extent practical. There are roads in the RPZs at both approach ends of Runways 3 and 21. Using FAA guidelines, existing roads in the RPZ are acceptable as long as no additional roads are added, and as long as the runway end does not move closer to the road. GEG owns the property within its RPZs, and controls the area within the road right-of-ways. Historically, other land uses to be avoided within the RPZ included areas of public assembly; uses that generate glare, smoke, and dust; flammable material storage; and automobile parking within the central portion of the RPZ. Interim FAA policy is to either avoid future roads within an RPZ, or to incorporate design mitigations that reduce risk to people on the ground.

Guidance for RPZ-compatible activities is currently contained in FAA Memorandum, *Interim Guidance on Land Uses Within a Runway Protection Zone* (9/27/2012). New RPZ policy regarding existing/proposed land uses is expected in 2014. The current discussion focuses on whether or not public roadways are considered to be a permitted use. Improvements to an approach or runway that would extend an RPZ across a road, and road improvements within an existing RPZ that would increase roadway capacity or more the road closer to the runway end will require case-by-case evaluation and approval that is subject to the applicable guidance in effect at the time of the recommended improvement.

3.5.3 Runway 3/21 Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, states that a runway should be constructed to a length "that is suitable for the forecasted critical design aircraft," and the required runway length is "the longest resulting length after any adjustments for all the critical design aircraft under evaluation."

A generalized analysis was performed using airport planning manuals provided by aircraft manufacturers. A range of take-off runway lengths are presented in **Table 3-9**. Takeoff lengths will vary based on different engine options, aircraft weight, and ambient temperature. It is assumed, unless otherwise noted, that aircraft are operating at maximum take-off weight (MTOW) on hot weather days.

Runway length requirements range from 7,000 feet to 14,000 feet. Most aircraft operations can be accommodated using Runway 3/21, which is 11,002 feet long with minimal performance concessions. The Boeing 767-300 can require up to 12,000 feet during summer weather. Operations by the Boeing 767-300 and similarly demanding aircraft are forecast to increase, therefore; it is recommended that an ultimate runway length of 12,000 feet be preserved on the ALP. This recommendation is consistent with the 2003 Plan and ALP, which both illustrate a 1,000-foot extension to Runway End 3.

Table 3-9. Runway Length Requirements for Common Aircraft at GEG

Aircraft Type	Engine	MTOW	Temp. (˚F)	Required length for takeoff, at 2,400 feet	Notes
Boeing 737-800 and BBJ2	CFM56-7B24/-7B24/-7B27	174,200	95	14,000* 12,000^	*MTOW ^ @170K TOW
Boeing 767-300	JT9D-7R4D	350,000	77	12,600	
Boeing 767-300	CF6-80A	350,000	83	12,000	
Boeing 737-900	CFM 56-7B24/-7B26	174,200	95	12,000*	* @158K TOW
Boeing 767-ER	CF6-80C2B4* CF6-0C2B6	412,000	81 77	11,900	*MTOW 390k
Airbus 300F4-600	CF6-80C2	375,880	109	11,200	
Boeing 767-ER	CF6-80C2B7F; PW40062	412,000	81	11,000	
Boeing 767-300	CF6-80C2B2	350,000	81	10,000	
Airbus 300F4-600	CF6-80C2F	375,880	109	10,000	
Airbus 320-200	CFM56	162,040	109	7,000	
ERJ 190 - AR	ESA1	111,000	95	6,890’	
Airbus 310-200	CF6-80 A3	291,000	109	6,800	
Airbus 320-100	CFM56	145,505	109	5,500	

Sources: Aircraft Specifications and Airport Planning Manuals. Runway length requirements are estimations based on charts for planning purposes and should not be considered for actual operations.

3.5.4 Runway 3/21 Pavement Strength

Airfield pavements are designed to have a 20-year lifespan. Pavement load baring capacity is based on construction materials, thicknesses, and on aircraft weight and landing gear configuration. Published load bearing capacities relate to useful pavement life, and are not a threshold for pavement failure. Heavier aircraft may use the pavement on an infrequent basis, but regular use by aircraft that exceed a pavements load bearing capacity will accelerate pavement degradation.

Existing aircraft operations are conducted by a range of light (< 12,500 pounds) and heavy (> 300,000 pounds) airplanes, and those in between. Published pavement strengths for Runway 3/21 and associated primary taxiways and taxilanes are as follows.

- 200,000 pounds, single-gear
- 200,000 pounds, dual-wheel gear
- 400,000 pounds, dual-tandem gear

The heaviest scheduled aircraft by MTOW are presented in **Table 3-10**. The existing pavement strength rating is adequate for aircraft that use Runway 3/21, and it is recommended that the Airport maintain this pavement strength for the next 20 years. Pavement strength should be reevaluated as the Airport sees more operations by aircraft with a MTOW over 400,000 pounds, upon upgrading to RDG D-V-1200, and during pavement rehabilitation projects.

Table 3-10. Heaviest Airplanes Operating at GEG

Airplane	Wheel Configuration	MTOW (lbs.)
Boeing 767-ER	Dual- Tandem	412,000
Airbus 300F4-600	Dual- Tandem	375,880
Boeing 767-300	Dual- Tandem	350,000
Airbus 310-200	Dual- Tandem	312,000
Boeing 757-200	Dual- Tandem	255,000
Boeing 737-900	Dual- Tandem	187,700

Sources: Airport planning manuals and Aircraft specifications

3.5.5 Runway 3/21 Lighting, Marking, Signage, and Instrumentation

Lighting, signage, and markings are essential safety components of the airfield. Lighting, signage, and marking standards are intended to provide a consistent system of visual indications that promote safety and efficiency, and that are recognized worldwide.

Approach Lighting

Runway Ends 3 and 21 are equipped with High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2). These are standard systems for the low visibility operations occurring at GEG. No changes are recommended.

Visual Approach Aids

Runway Ends 3 and 21 are equipped with a Precision Approach Path Indicator (PAPI) lights. These assist in maintaining the optimal descent path to touchdown. No changes are recommended.

Runway and Taxiway Edge Lighting

AC 150/5340-30D, *Design and Installation Details for Airport Visual Aids*, and Joint Order 6850.2B, *Visual Guidance Lighting Systems*, provide guidance and recommendations on the installation of airport visual aids. This includes lighting standards for runways equipped with instrument approach procedures.

Runway 3/21 is equipped with high intensity runway edge lights, centerline lights and touchdown zone lights appropriate for the low visibility operations. No changes are recommended.

Airfield Signage

GEG is certificated under Code of Federal Regulations Title 14 (14 CFR), Part 139, which requires a Signage Plan in the Airport Certification Manual. The Signage Plan must show the sign system needed to identify hold positions and taxiing routes on the movement area for air carrier aircraft in accordance with AC 150/5340-18D, *Standards for Airport Sign Systems.* The airfield signage plan should be updated as needed to comply with current safety standards and operating conditions.

Airfield Markings

Standards for runway and taxiway markings are set in accordance with AC 150/5340-1K, *Standards for Airport Markings.* Types of markings on the runways and taxiways are described in Chapter 1. Other than routine maintenance and painting, no changes are recommended.

Each taxiway is marked with edge and centerline stripes. Enhanced taxiway and holding position markings are to be provided at the entrance and exit points of the runways. Future taxiways should be painted with edge and centerline markings and enhanced surface markings at all runway holding positions.

Runway Hold Positions

Runway holding position lines (holdlines) identify the location on a taxiway where operators are to stop and obtain clearance before proceeding onto the runway. Based on the airport elevation and RDC, the appropriate setback distance is 274 feet. GEG currently uses a 313-foot setback to the holdline, exceeding the standard. The Airport has the option to relocate holdlines closer to the runway centerline if it provides an operational benefit. For angled taxiways, the distance from centerline to holdline is measured from the edge of the holdline closest to the runway. Generally, the holdlines are to be installed perpendicular to the taxiway centerline. Hold position signs should coincide with marking locations.

Land and Hold Short Positions

On occasion, an airplane will be cleared to land and hold short on one runway while another airplane is operating on an intersecting runway. The hold short positions are marked on the runway with standard runway hold markings, signage, and in-pavement pulsing white lights. Hold short positions are located at a distance identical to the distance from runway centerline to hold position. The existing Runway 3/21 land and hold short markings, signage, and lighting are appropriately positioned. No changes are recommended.

ILS Critical Areas

ILS critical areas are identified with ILS hold markings and signage, and are located on the entrance taxiways at Runways Ends 3 and 21 for localizer protection, and on Taxiway G for Runway 21 glideslope protection. ILS critical areas identify the location where aircraft and vehicles are prohibited while the ILS is operational and an aircraft is on approach. This prevents interference with radio-signals vital to instrument operations. The critical areas will need to be adjusted when Runway 3/21 is extended, and if the NAVAIDs are relocated.

3.5.6 Runway 3/21 End Protections

The approach and departure corridor along the extended centerline of a runway is vitally important to the safe and efficient operation of an airport. The corridor is most critical (closest to the ground) at the runway departure end and landing threshold. The corridor generally becomes less critical as distance increases from the runway end, depending on topography. The corridor is used for transitioning departures and landings under visual flight conditions; providing clear paths during instrument flight conditions; providing one-engine inoperative safety routes; maintaining a line of sight between visual aids and aircraft; protecting persons and property on the ground near the airport; and avoiding land uses that are incompatible with aircraft operations on the basis of height, use, and noise sensitivity.

FAA Grant Assurances— Airport operators that accept FAA-administered financial assistance, such as Airport Improvement Program (AIP) grants, must agree to certain obligations to maintain and operate their facilities safely and efficiently and in accordance with the specified conditions that are generally intended to protect federal infrastructure investments.

FAA grant assurances require airport operators to protect the airspace near the airport to support a safe and efficient air transportation system. Airports are to take appropriate actions that restrict and otherwise maintain land use development patterns that are compatible with airport operations. Several criteria apply to runway ends, including: federal regulations pertaining to airport obstruction identification (14 CFR, Part 77), U.S. Terminal Instrument Procedures (TERPS), aircraft certification standards (one-engine inoperative climb standards and emergency route planning), and airport planning and design standards (5300-13A), including runway threshold siting surfaces and RPZs. No specific actions are needed other than to maintain continued vigilance with regard to future encroachment into airport-critical operational zones. An example illustration of these various obstacle clearance surfaces is graphically depicted in **Figure 3-6** and described below.

- **14 CFR, Part 77, *Civil Airport Imaginary Surfaces***—Establishes standards for determining obstructions to navigable airspace, notification requirements (for proposed construction), and forms the basis for aeronautical evaluation studies performed by the FAA. Paragraph 77.25 identifies "imaginary surfaces" that correspond to the runway type and elevation. Obstacles that penetrate these imaginary surfaces are mapped and tracked in various databases and aviation publications. The FAA evaluates proposed construction to determine potential impacts to aviation and possible mitigations techniques, such as lighting and marking. Key components of Part 77 include approach surfaces and transitional surfaces. The approach surface for Runway 3/21 extends at a slope of 50 feet horizontal (H):1 for vertical (V) for a distance of 10,000 feet from each runway end, and then 40H:1V for an additional 40,000 feet. The transitional surfaces has a slope of 7H:1V, and begin at 500 foot offsets from either side of the runway centerline.
- **Visual aid protections**—Runway Ends 3 and 21 are equipped with a high intensity approach lighting system. Each system is 2,400 feet in length with individual light stands spaced approximately 100 feet apart on the extended centerline. An imaginary plane extends through the lights above which no obstacle may penetrate. The PAPIs also have an associated clear area, although other clearance requirements are more restrictive.

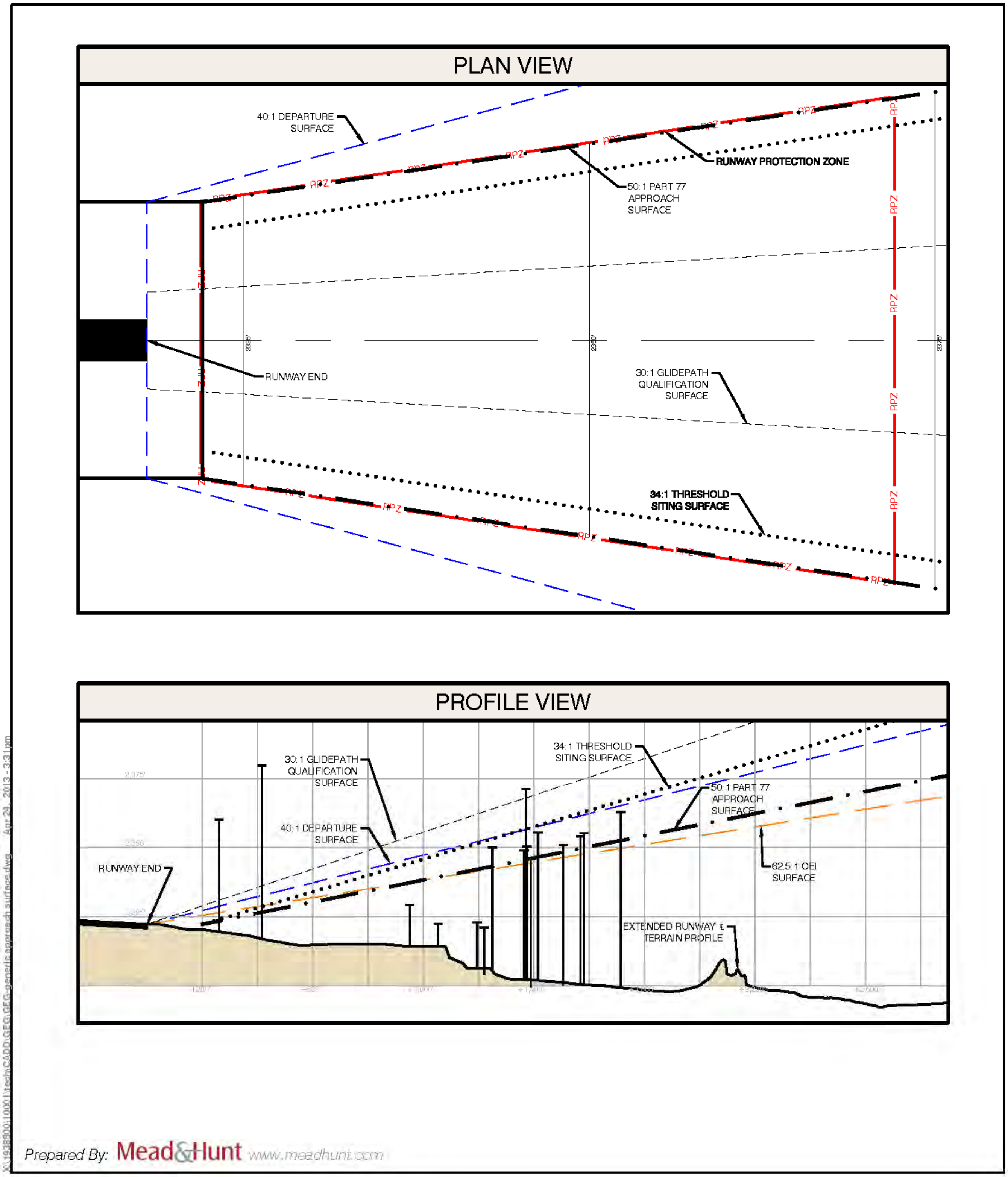


Figure 3-6

Example Runway End Protections

Spokane International Airport

- **US Terminal Instrument Procedures (TERPS**)—The criteria for developing instrument procedures are contained in a series of FAA orders (8260-series), with primary Order 8260.3B, *U.S. Standard for Terminal Instrument Procedures (*TERPS). The procedures are used to define corridors of airspace based on the type of operation (i.e., approach, departure, en-route, transition, etc.) and primary navigation type (i.e., GPS, VOR, ILS, RADAR, etc.). The TERPS surfaces tend to be less restrictive than Part 77 on and near an airport. Two notable exceptions include the departure surface and missed approach surfaces. The departure surface extends outward and upward beyond the departure end of the runway at 40V:1H. The missed approach area, particularly for low visibility approaches such as those that exist at GEG, can impose additional height restrictions and most often impact tall on-airport structures such as air traffic control towers.
- **Threshold Siting Surfaces (TSS)**—5300-13A includes several approach and departure surfaces for runway threshold siting. Objects penetrating the TSS require mitigation, and may require the displacement of the landing threshold. Landing threshold displacement reduces the landing distance available to arriving aircraft. Existing TSS at GEG are clear, but as with other runway end siting criteria, vigilance must be maintained to prevent future encroachment.
- **One Engine Inoperative (OEI) Surfaces**—Air carriers develop and maintain contingency procedures based on aircraft certification requirements to clear obstacles in the event that one engine becomes inoperative. OEI surfaces take into account the degraded climb performance associated with reduced power. The previous version of the 5300-13A attempted to incorporate OEI protections into airport planning since the standard FAA review process did not capture these impacts. The efforts were unsuccessful because of the shallow (62.5V:1H) slopes and relatively wide area of the surface typically contained an unmanageable number of obstructions. Impacts to OEI surfaces can reduce the utility of an airport to an airline, and can result in the discontinuation of service, or a change in aircraft type. While there is no uniform standard in place for OEI surfaces, airports should work with operators to identify critical corridors and review development proposals that extend obstacles above the current clear plane to each runway end. The ALP approach profile plans retain the 62.5:1 OEI surfaces to assist in the review of off-airport development proposals.

3.6 RUNWAY 7/25 FACILITIES

This section describes the planning process used for assessing Runway 7/25. Runway 7/25 provides the following benefits to the Airport.

- **Operational flexibility**—Aircraft operators are increasingly electing to use Runway 7/25 in order to achieve operational benefits. Alaska Airlines' Q400s and Southwest Airlines' Boeing 737s use Runway 7/25 to reduce taxi and departure queues, and to improve the alignment with their on-course heading. The prevalence of light and variable winds at GEG is support these requests.
- **Backup primary runway**—Runway 3/21 experiences periods of closure due to construction, maintenance, snow and ice removal operations and, emergency closure. The availability of the secondary runway ensures that air service for the region can continue uninterrupted. Scheduled passenger and cargo operators generally require a secondary runway for backup purposes.
- **Improved traffic efficiency**—Runway 7/25 enhances the air and ground operational flow. Slower traffic can be sequenced onto the secondary runway and remain clear of the primary traffic flow used by faster aircraft. GA facilities are located adjacent to Runway 7/25, which reduces taxi time and distance for these operators, which typically use smaller aircraft than commercial passenger and cargo operators. Despite these efficiencies, there are operational dependencies resulting from the runway intersection and the flight corridor that overlaps FAFB. A future parallel runway is expected to improve traffic efficiencies at GEG.
- **Enhanced capacity**—Despite the operating dependencies associated with the intersecting runway configuration and the convergent GEG-FAFB operating streams, GEG is able to increase the flow rate by operating both runways simultaneously, and by varying the flow direction during light winds. As total operations increase toward ASV, ATCT personnel will likely implement more efficient flight control procedures to avoid delays.

3.6.1 Runway 7/25 Runway Design Code (RDC)

Section 3.3.4 identified a composite design aircraft consisting of the most demanding features associated with the Bombardier Q400 and Boeing 737-400. The first two components comprising the RDC are AAC-C and ADG-III. The third component applies the approach visibility minimums. Each runway end has two published GPS-based approaches (RNP and LPV). The LPV approaches have the lowest visibility minimums: ¾-mile for Runway 7 and 1-mile for Runway 25. Using the lowest visibility approach available, the RDC for secondary Runway 7/25 is C-III-4000.

Runway 7/25 functions as a backup to Runway 3/21, and will need to handle airport traffic when 3/21 is closed for maintenance and upgrade. It is recommended that the approaches into Runway End 7 and Runway End 25 are maintained, and that the Airport work to maintain land use compatibility within the approach corridors.

3.6.2 Runway 7/25 Design Standards

Design standards associated with Runway 7/25 are summarized in **Table 3-11.** Existing paved shoulders and blast pads do not meet FAA design standards for RDC C-III-2400. Improvements to meet design standards should be included in the next pavement rehabilitation project. Non-standard hold positions exist along Runway 7/25. Non-standard runway hold positions should be corrected to provide a minimum setback of 250 feet from the centerline of Runway 7/25. The table identifies Geiger Boulevard traversing a small portion of the outer southeast corner of the Runway 25 approach RPZ.

Table 3-11. Runway 7/25 Design Standards Matrix[1]

Runway Design Code (RDC) Taxiway Design Group (TDG)	Existing C-III-4000 5			Ultimate C-III-2400 5
Item	**FAA Standard**	**Actual**	**Standard Met**	**Ultimate**
Runway Design				
Runway Width[2]	150 FT	150 FT	Yes	No change
Shoulder Width	25 FT	10 FT	No	25 FT
Blast Pad Width 7/25	200/200 FT	None/160 FT	No	200/200 FT
Blast Pad Length 7/25	200/200 FT	None/100 FT	No	200/200 FT
Crosswind Component	16 knots	16 knots	Yes	No change
Runway Protection				
Runway Safety Area (RSA)				
Length beyond departure end	1000 FT	1000 FT	Yes	No change
Length prior to threshold	600 FT	1000 FT	Yes	No change
Width	500 FT	500 FT	Yes	No change
Runway Object Free Area (ROFA)				
Length beyond departure end	1000 FT	1000 FT	Yes	No change
Length prior to threshold	600 FT	1000 FT	Yes	No change
Width	800 FT	500 FT	Yes	No change
Runway Obstacle Free Zone (ROFZ)				
Width	400 FT	400 FT	Yes	No change
Vertical (H)	NA	NA	Yes	45.0 FT
5:1 segment length from centerline	NA	NA	Yes	NA
6:1 final segment height above airport	NA	NA	Yes	150 FT
Precision Obstacle Free Zone (POFZ)				
Length	NA	NA	Yes	200 FT
Width	NA	NA	Yes	800 FT
Approach Runway Protection Zone (RPZ)				
Length 7/25	1700/1700 FT	1700/1700 FT	Yes/See note 3.	1700/1700 FT
Inner Width 7/25	1000/500 FT	1000/500 FT		1000/500 FT
Outer Width 7/25	1510/1010 FT	1510/1010 FT		1510/1010 FT
Acres 7/25	48.978/29.465	48.978/29.465		48.978/29.465
Departure Runway Protection Zone (RPZ)				
Length	1700 FT	1700 FT	Yes/See note 3.	No change
Inner Width	500 FT	500 FT		No change
Outer Width	1010 FT	1010 FT		No change
Acres	29.465	29.465		No change
Runway Separation				
Runway centerline to:				
Holding position	250 FT	205 to 295 FT	No	250 to 295 FT
Parallel taxiway/taxilane centerline	400 FT	C: 400-487 FT K: 583 FT	Yes	No change
Taxiway centerline with reverse turn	600 FT	TW A: 760 FT TW G: 600 FT	NA	No change
Aircraft parking area	500 FT	560 FT	Yes	No change
Notes				

1. Source: FAA Advisory Circular 150/5300-13A, Airport Design (September 2012)
2. Runway width for C-III aircraft with MTOW > 150,000 pounds is 150' per AC 150/5300-13A, Table A7-9, Footnote 12
3. Geiger Boulevard traverses a small portion of the outer southeast corner of the Runway 25 approach RPZ (Runway 7 departure RPZ).

3.6.3 Runway 7/25 Length and Width

Runway 7/25 is 8,199 feet long and 150 feet wide. The FAA has noted that they will fund up to 100 feet in runway width unless the Airport can demonstrate that aircraft requiring more use the runway over 500 times a year. The full length of the runway is available for takeoffs and landings in both directions. The FAA Airport Design computer program evaluated the length of Runway 7/25. The results are presented in **Table 3-12**.

Based on the results of the table below and verified through discussions with operators and air traffic controllers, the existing length is adequate for most aircraft operating at GEG. If aircraft take on more weight or require greater length for departures during hot weather conditions, Runway 3/21 provides the necessary length.

Table 3-12. FAA Runway 7/25 Length Analysis

Airport and Runway Data	
Airport Elevation	2,385 Feet
Mean Daily Maximum Temperature of the Hottest Month	83.00 F.
Maximum Difference in Runway Centerline Elevation	4 Feet
Length of Haul for Airplanes of more than 60,000 pounds	1,500 miles
Wet and Slippery Runways	
Runway Lengths Recommended for Airport Design	
Large Airplanes	
Family Grouping	**Runway Length**
Airplanes ≤ 60,000 pounds	
75% at 60% Useful Load	5,500 Feet
75% at 90% Useful Load	7,000 Feet
100% at 60% Useful Load	6,130 Feet
100% at 90% Useful Load	**8,680 Feet**
Airplanes with > 60,000 pounds	7,950 Feet

Note: Useful load is the difference between the empty weight of the aircraft and the in MTOW. The empty weight of the aircraft does not include crew, usable fuel, passengers, baggage, or cargo. *Source: FAA Airport Design computer program 4.2D*

3.6.4 Runway 7/25 Pavement Strength

Runway pavement strength should accommodate the heaviest aircraft routinely using the runway. Published pavement strengths for Runway 7/25 are as follows:

- 150,000 pounds, single-gear
- 180,000 pounds, dual-wheel gear
- 280,000 pounds, dual-tandem gear

Commercial aircraft may use Runway 7/25. The existing pavement strength is adequate for the heaviest regularly scheduled aircraft using Runway 7/25. Occasional use by heavier aircraft when Runway 3/21 is closed is acceptable on a non-regular basis.

3.6.5 Runway 7/25 Lighting, Marking, Signage, and Instrumentation

Some of the hold positions on Runway 7/25 are too close to the runway centerline. Relocating non-standard hold positions to at least 250 feet from the runway centerline will also require the relocation of the holding markings, signage, and lights. Assuming the continued operation of Runway 7/25 into the long-term, additional recommendations include installing approach lighting on Runway End 7 and upgrading runway markings to the precision approach standard.

3.6.6 Runway Ends 7 and 25 Protection

Runway end protections surfaces are described in Section 3.5.6. Geiger Boulevard crosses through the southeast corner of the Runway 25 approach RPZ. Hayford Road is scheduled to be realigned or tunneled when a 3rd runway is constructed in the future, and will no longer be located within the RPZ. In order to promote compatible land use and noise protection, it is recommended that the Airport acquire property and work with the surrounding communities to protect the extended approach area of Runway End 25.

3.7 TAXIWAY SYSTEM

Taxiways enable the movement of aircraft between the various functional areas on an airport. The taxiway system at GEG is assessed in terms of design standards and guidelines intended to enhance safety and pilot situational awareness; the efficiency of the system and its effects on airfield capacity; and taxiway design standards that apply to setbacks and pavement design.

3.7.1 Taxiway Design Standards

Similar to the runway design standards, the separation of taxiways from other airfield facilities is highly dependent on the ADG. Unlike runways, taxiway design is also influenced by the landing gear configuration, and considers the gear type, width, length, and relation to the cockpit. These characteristics are incorporated into the TDG. These characteristics influence pavement width and pavement fillet radii inside of a taxi turn. Using the existing aircraft mix, Section 3.3.1 identifies the taxiways at GEG as TDG-5. Most of the taxiways were designed to accommodate even more demanding aircraft types. To the extent practical, new taxiways should be designed with adequate object free area setbacks to incorporate an upgrade to TDG-6 in the long-term. Future taxiway improvements should be made to TDG-5 standards until TDG-6 standards are justified. Applicable taxiway design standards are contained in **Tables 3-13** and **3-14**. Taxiway fillet design requirements are contained in **Table 3-15**.

Table 3-13. Taxiway Design Standards based on Airplane Design Group (ADG)

ITEM	PLANNED: ADG IV	ULTIMATE: ADG V
Taxiway Safety Area (TSA)[1]	171 FT	214 FT
Taxiway Object Free Area[2]	259 FT	320 FT
Taxilane Object Free Area[2]	225 FT	276 FT
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline	215 FT	267 FT
Taxiway Centerline to Fixed or Movable Object[3]	129.5 FT	160 FT
Taxilane Centerline to Fixed or Movable Object[3]	112.5 FT	138 FT
Taxiway Wingtip Clearance	44 FT	53 FT
Taxilane Wingtip Clearance	27 FT	31 FT

1. TSA—A clear, graded, and drained area on both sides of a taxiway/taxilane to protect the landing gear in the event of an excursion.
2. Taxiway/Taxilane Object Free Area— An area on both sides of a taxiway/taxilane intended to protect the airplane wing.
3. TDG standards are more critical at GEG when 180 degree turns between parallel taxiways are required.

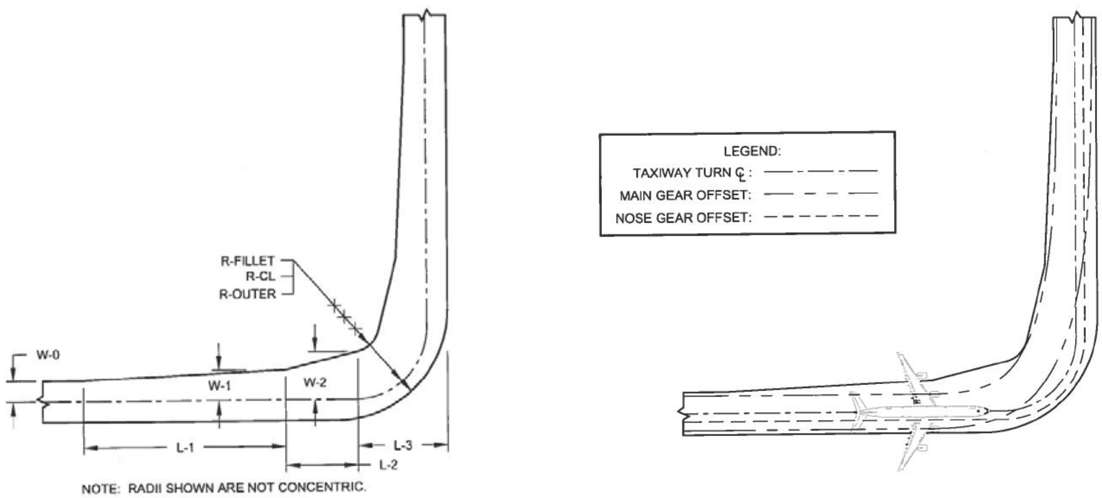
Table 3-14. Taxiway Design Standards based on Taxiway Design Group (TDG)

ITEM	PLANNED: TDG 5	ULTIMATE: TDG 6
Taxiway Width	75 FT	75 FT
Taxiway Edge Safety Margin[1]	15 FT	15 FT
Taxiway Shoulder Width	25 FT	35 FT
Taxiway/Taxilane Centerline to Parallel Taxiway/Taxilane Centerline[2]	240 FT	350 FT

1. Taxiway Edge Safety Margin— minimum pavement to be provided between the outer edge of the main gear tire and the edge of taxiway/taxilane pavement.
2. The TDG standard is more critical than the corresponding ADG standard when 180 degree turns between parallel taxiways are required.

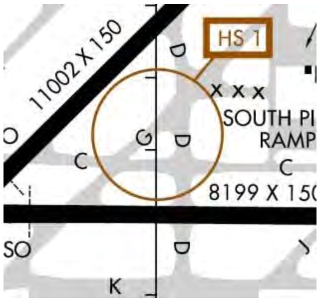
Table 3-15. Standard Intersection Details Based on Taxiway Design Group (TDG)

ITEM	PLANNED/ULTIMATE (TDG 5/6)							
Turn amount (degrees)	30	45	60	90	120	135	150	180
W-0 (FT)	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
W-1 (FT)	40/46	45/46	45/52	45/56	50/60	50/57	45/55	50/60
W-2 (FT)	52/60	60/71	65/82	65/85	72/95	73/102	73/107	88/105
W-3 (FT)	NA	NA	NA	NA	NA	NA	NA	150/184
L-1 (FT)	100/300	165/300	180/345	180/365	210/400	215/363	180/360	185/395
L-2 (FT)	120/111	90/157	95/137	90/125	70/110	70/145	100/165	90/120
L-3 (FT)	14/16	25/30	37/47	103/129	191/246	276/373	440/594	96/141
R-Fillet (FT)	0	0	0	50/60	50/60	50/60	50/60	35/75
R-CL (FT)	110/150	110/150	110/150	95/130	115/155	120/165	120/170	120/175
R-Outer (FT)	350/400	250/300	200/265	164/200	160/207	160/210	160/212	NA



3.7.2 System Design Principals

Ground maneuvering at an airport may be confusing due the distances involved, low visibility conditions, precipitation, wet and covered pavement conditions, multiple directional choices, unusual intersection angles, and confusing sign locations and markings. The FAA has design standards and guidelines that have evolved to maximize pilot situational awareness, avoid confusing intersections, and reduce the number of runway incursions. Analysis of the taxiway system at GEG identified existing deficiencies, and provides recommendations to correct them.



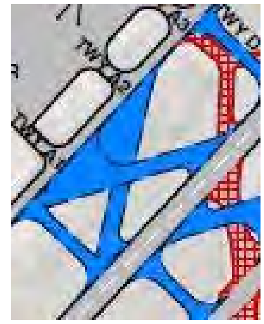
- **"Hot Spot" correction**—The triangular configuration formed by the intersection of Taxiways D, C, and G, combined with decommissioned Taxiway H can cause confusion due to the amount of pavement and number of directional choices. The term "Hot Spot" is an FAA designation that is a product of a FAA Runway Safety Area Team (RSAT) evaluation. The RSAT evaluation for GEG identified the Taxiway Hot Spot at an April 26, 2011 meeting, and assigned the tracking number GEG-2011-010 for the situation. Hot Spots appear on taxiway charts used by aircraft operators and are intended to encourage enhanced pilot awareness of potentially confusing operational conditions. Hot Spots are tracked by the FAA with the ultimate goal of funding improvement projects to correct the situation.
- **Direct Apron-Runway Access**—GEG does not have any taxiways directly connecting an apron to a runway; however, several taxiways connect apron to runway across an intervening parallel taxiway. It is recommended that these intersections are decoupled at the parallel taxiway, thereby requiring two turns to enter the runway from an apron.
- **Exit Taxiway Configuration**—GEG has seven exit taxiways that do not conform with either a right-angled or acute-angled exit design standard. It is recommended that these taxiways are reconfigured to comply with the design standard: two will be reconfigured as acute-angled, and the remaining five as will be right-angled. The next sub-section expands on the exit locations and the high-speed (or acute angled) recommendation.

3.7.3 Exit Taxiway Analysis

In addition to correcting non-standard configurations, the exit performance for Runway 3/21 was also considered. Optimally located exit taxiways help reduce runway occupancy time, and should be placed within the deceleration and stop zones for aircraft that frequently use the runway. Sources of information used for this evaluation include ACs 5300-13A 5060-5*,* input from GEG air traffic controllers and airport operations personnel, and a 2009 FAA Technical Center simulation model.

Discussions with air traffic controllers and airport personnel indicate that many aircraft landing on Runway 21 miss the exits at Taxiways E and D. When missing Taxiway E, aircraft generally come to a near complete stop in order to make the hard turn onto Taxiway D. When missing Taxiways D, aircraft taxi an additional 2,000 feet to exit at Taxiway C. The condition worsens during slippery and wet conditions, and during low visibility conditions as aircraft more frequently miss even the Taxiway C exit, and then cross Runway 7/25 to exit at Taxiway B, which is an additional 2,000 feet down the runway. Each 100 feet of additional taxi distance adds 0.75 seconds of delay to the next aircraft operation, resulting in an additional runway occupancy time of between 15 and 25 seconds for each occurrence. The individual occurrences translate backward along the arrival stream, further delaying aircraft sequenced for landing at GEG and FAFB. The resulting delay increases exponentially with each additional operation in the sequence. Based on these observations, placing and designing taxiways to reduce runway occupancy is an area of focus.

For the aircraft mix at GEG, the optimal location for right-angled exits is between 6,500 and 8,000 feet from the landing threshold with spacing between exits not less than 750 feet apart. The corresponding optimal high-speed exit location is between 5,000 and 5,500 feet. Twelve options consisting of right-angle only and high-speed mix taxiways were explored. These options each corrected the non-standard configurations while also improving exit performance. Collaboration with air traffic control and airport operations staff eliminated options with the following characteristics.

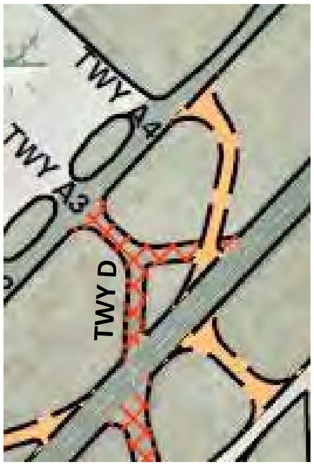


- **X-Pattern**—Options with overlapping high speed exits from opposing directions formed an 'X' pattern. These options were eliminated because of the "sea of pavement" effect, which could be disorienting. Additionally, these options had airplanes exiting onto the parallel taxiway in close proximity to the airline apron connector taxiways, creating a busy environment involving difficult maneuvering via closely-spaced turns.
- **Straight on to Taxiway**—Similar to the X-pattern, the reverse-turn added significant pavement area. The consensus was to apply a "spiral" design that would allow high speed spiral deceleration curve terminating with a right-angled intersection with Taxiway A. The 700-foot separation between Runway 3/21 and parallel Taxiway A is conducive to this design strategy. The terminal apron is position near the ideal exit locations, so there is only a need for a reverse turn onto Taxiway A. Pavement reduction is achieved by eliminating the straight on to taxiway option.

- **Multi-Turn Apron Entrances**—Both sets of right-angled only and mixed high-speed exit options included exits that terminated onto Taxiway A at the terminal entrance connections (Taxiways A1 – A5). These locations were complicated by the desire to decouple the apron to runway connections by avoiding straight-across runway access and the resulting tightly spaced turns that would then be required upon exit. The concept of bracketing the runway exits so as to occur on each side of the busy apron connections was considered more advantageous.
- **Three or More High Speed Taxiways**—The options that limited the number of high speed exits to one per direction and then only onto the west side (Taxiway A) resulted in the least amount of pavement; the right angled-only options all included one or two additional exits. Other options that had more high speeds or more total exits did not significantly reduce runway occupancy-related delay.

Two sets of refined alternatives were carried forward for further analysis: right-angled exit taxiways only, and two high-speed exits. In accordance with FAA policy, the need for a high-speed exit is driven by capacity. The threshold of significance set by the FAA is a throughput demand rate of 30 arrivals per hour during the design hour. GEG exceeded this threshold within the past five years, and is expected to exceed it again in the next five years with up to 41 arrivals forecasted in the design hour by 2030. Following a round-table discussion with representatives from the FAA, GEG tower, and GEG management, the high speed alternative was selected for the following reasons: high speed exits will be justified within the 20-year pavement life-cycle, and because of the reduced number of total exits, the high speed exits will require the least pavement to construct.

While the proposed concept is expected to significantly reduce runway occupancy for Runway End 21 arrivals, the impact for Runway End 3 arrivals is minimal. This is because exit performance onto Taxiway D improved when the runway was extended to the southwest. The high speed recommendation corrects two conditions related to existing Taxiway D: non-standard "Y" configuration and apron-runway connection across Taxiway A. A right-angled exit at the same exit point as the one recommended for the high speed would also provide similar exit performance, but would have two closely-spaced turns needed to enter the apron, increasing taxi time. Terminal bracketing is best achieved through a high speed exit that maintains runway exit performance and then reduces the aircraft maneuvering requirements and taxi time.



3.7.4 Taxiway Recommendations

Taxiway improvement recommendations are shown in **Figure 3-7**.

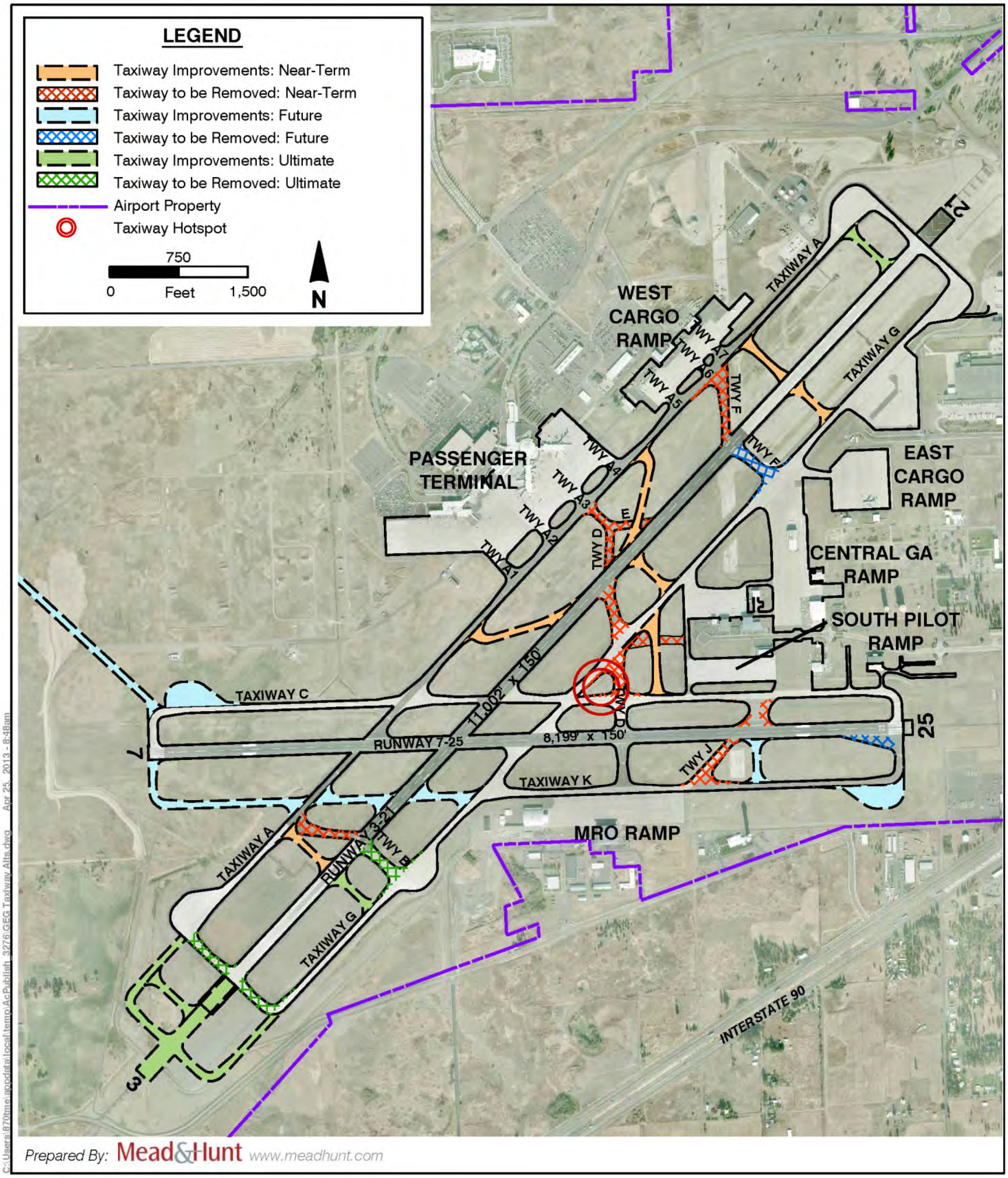


Figure 3-7

Taxiway Improvements

Spokane International Airport

3.8 FUTURE RUNWAY ALTERNATIVES

This section describes the runway development alternatives that have been evaluated. This first set of alternatives compares two alignment options for a new runway on the west side of the Airport. The second set of alternatives evaluates the potential of the new runway as a replacement for Runway 7/25. Current FAA policy supports funding of two runways at airports like GEG. The construction of a third runway would mean that Runway 7/25 would no longer be eligible for FAA funding.

3.8.1 Future Runway Alignment Alternatives

GEG has been planning for a future runway to the west of existing Runway 3/21 for over 30 years. The property necessary to implement the runway is already owned by the Airport; however GEG is planning on acquiring additional property for noise mitigation purposes. Two alternatives have been studied in depth, and are shown in **Figure 3-8**.

- Option A, Parallel to GEG Runway 3/21
- Option B, Parallel to Fairchild Air Force Base (FAFB) Runway 5/23

As described in Section 3.2, the best option for increasing capacity is to develop an independent departure and arrival stream. This can be accomplished by constructing a runway that is parallel to Runway 3/21. However, due to the close proximity between Runway 3/21 at GEG and Runway 5/23 at FAFB, some dependency will remain regardless of the option selected. The 2003 Plan adopted Option B as the preferred alternative; while earlier master plans selected Option A.

In 2009, GEG completed a runway alignment study, included in Appendix A, to determine which of the two runway alignments was the most advantageous for long-range planning, depiction on the ALP, and for local policy and land use protection purposes. The two alternatives scored very closely in the runway alignment study, but two key determinations resulted in the selection of Option A.

- ***Option B impacts to critical base functions and facilities***—These functions (munitions and training centers) would need to relocate or cease operation if Option B were selected. Option A would avoid this impact altogether.
- ***Contingency Scoring***—The alternatives were evaluated against several worst case scenarios. One of those was to consider the possibility of a future closure at FAFB. In this case, Option A, the operating dependency was removed, further enhancing traffic flow at GEG. Option B would retain a dependency indefinitely, likely necessitating realignment to Option A at some point in the future.

2009 3rd Runway Alignment Study

The Executive Summary from this report follows:

Alignment Recommendation

This study recommends that long-term planning and development of Spokane International Airport, Fairchild Air Force Base, and affected municipal and county jurisdictions proceed on the basis that a future 3rd runway will be constructed west of, and parallel to, Spokane's primary Runway 3/21. The other alternative, a similarly placed runway aligned parallel to Fairchild's Runway 5/23, significantly impacted operations and key facilities at Fairchild Air Force Base. On this basis, land use protection controls associated with a future Runway 3/21 alignment should be retained. Protections specifically intended to preserve for a future 5/23 alignment parallel to Fairchild can be lessened or removed. Reduced land use restrictions may allow increased non-aviation development to occur off-airport that will support local socioeconomic growth.

The recommendations summarized in this Executive Summary are based on a comparative assessment of the area's aviation needs, both civil and military. The technical investigations were conducted in a collaborative manner over a period of twelve months involving representatives from various branches of the Federal Aviation Administration, Washington Department of Transportation, Spokane International Airport, Fairchild Air Force Base, and Spokane County. This group reviewed, assessed, and provided valuable input concerning the technical evaluations provided by the Federal Aviation Administration and by Mead & Hunt, Inc.

Related Policy Recommendations

Policy recommendations associated with the selection of a preferred 3rd runway alignment are graphically depicted in the following exhibits. Historically, protections have been in place locally to preserve for either runway alignment. The identification of a preferred alignment enables planners to downgrade airport related development restrictions associated with the non-preferred alternative, in this case, the 5/23 alignment parallel to Fairchild's runway.

Although this study produced a recommendation for a preferred alignment, future conditions could alter the airport's development direction. This is particularly true at Spokane where formalized planning and implementation of the new runway could be five and fifteen years away, depending on actual activity. While the continued protection of two runway alignments may be impractical from a socio-economic development / policy standpoint, this study does recommend a conservative approach for protecting the preferred alignment to allow for future refinements such as runway length and minor differences in the runway end locations. The graphic depiction of the policy recommendations are based on the following:

- Continued preservation of Runway 3/21 alignment; reduced development restrictions for areas associated with 5/23 alignment.

- North runway end of new Runway 3L/21R is fixed per prior investigations and will not extend further north from the previously approved layout plan depicting this alignment.
- South runway end of new Runway 3L/21R is maximized to the south so that a precision approach Runway Protection Zone remains on property currently owned by the airport. Purpose is to protect for longer length or different runway end location than what was evaluated for this study.
- The approach protection areas extending outward from the runway ends assume that the ultimate length of the new 3rd runway will not exceed 10,000 feet, regardless of runway end placement.
- The Airport will look to purchase property beyond planned Runway End 3L for approach protection and land use compatibility purposes. Unlike property beyond planned Runway End 21R which has existing development, this property is undeveloped. It is recommended that the Airport obtain an interest in the property to keep it clear of future development. Acquisition is expected to accommodate the ultimate 65 DNL noise contour, described in **Chapter 6**.

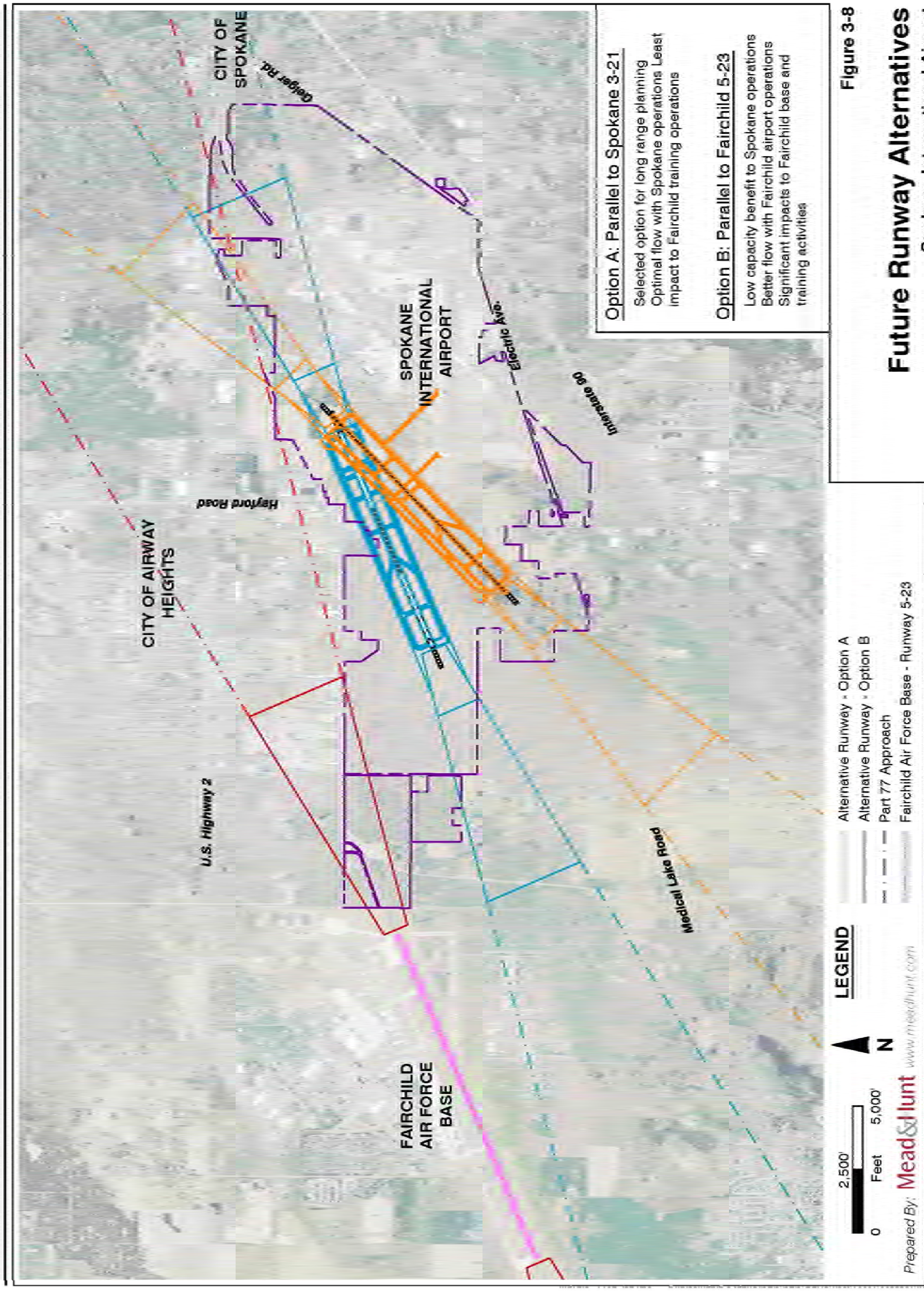
Background

Spokane International Airport has been planning for a new third runway at the location evaluated in this report for over thirty years. Both alignments were subsequently protected due to the uncertainties associated with a 30+ year planning horizon in a dynamic industry and location. In addition, the operational advantages of one alignment over the other were not clear. Over time, Spokane International Airport acquired property and local land use protections for two possible alignments. Meanwhile, the area developed and encroachment occurred. Development pressure continues to intensify and the continued protection for two runways restricts the economic development potential of the area. Lastly, the time horizon to construction has reduced and some of the operating conditions are more clearly understood; however, the air transportation industry and regional growth remain dynamic and difficult to predict with certainty.

Evaluation Summary

The recommendation of a 3/21 alignment is predicated on a detailed comparative assessment of six broad categories comprising thirty individual screening criteria that were weighted and then scored. The six categories include: airspace, airside, landside, environmental, engineering, and impacts to Fairchild Air Force Base. Four of the six categories were nearly evenly scored (two tied). Two categories significantly favored the 3/21 alignment: landside and Fairchild Air Force Base impacts. Alignment 3/21 was ranked more favorably than 5/23 in these categories on the following basis:

- West-field development at Spokane International Airport is less restrictive for Runway 3/21 than 5/23. The difference in reduced west-field development potential is not mitigated by additional mid-field development due to controller line of site and other airport protection surfaces.
- Controller line of site is a greater issue on the 5/23 alignment than 3/21. This includes reduced midfield development potential and also a higher percentage of time the airport would operate in “low visibility flow”, due to the extra ¼-mile visibility needed for controllers to see the Runway 5 end compared to the Runway 3L end.
- Fairchild Air Force Base will be more negatively impacted by a 5/23 alignment than a 3/21 alignment. Specifically, a 5-23 alignment would significantly impact Fairchild’s south training area, the high altitude drop zone, and the munitions storage facility.
- A separate decision risk assessment also revealed that a 3/21 alignment can accommodate a much wider set of future circumstances and is therefore a safer public investment.


CITY OF SPOKANE
Geiger Rd.
SPOKANE INTERNATIONAL AIRPORT
Electric Ave.
Interstate 90
Hayford Road
CITY OF AIRWAY HEIGHTS
U.S. Highway 2
Medical Lake Road
FAIRCHILD AIR FORCE BASE
Option A: Parallel to Spokane 3-21
Selected option for long range planning
Optimal flow with Spokane operations Least impact to Fairchild training operations
Option B: Parallel to Fairchild 5-23
Low capacity benefit to Spokane operations
Better flow with Fairchild airport operations
Significant impacts to Fairchild base and training activities
LEGEND
Alternative Runway - Option A
Alternative Runway - Option B
Part 77 Approach
Fairchild Air Force Base - Runway 5-23
N
0
2,500'
5,000'
Feet
Prepared By: Mead&Hunt www.meadhunt.com
Figure 3-8
Future Runway Alternatives
Spokane International Airport

3.8.2 Disposition of Runway 7/25

After Runway 3L/21R is built, the Airport may consider the option of taking Runway 7/25 out of service; however, the construction of 3L/21R is not expected within the next 20 years. It is expected that Runway 7/25 will continue to provide the Airport with operational flexibility and serve as a backup for existing Runway 3/21 over the next 20 years. The following improvements to Runway 7/25 are recommended to improve its operational utility.

- Improvements to connector and exit taxiways.
- Maintenance of existing approach minimums and land use compatibility efforts.
- Land use controls at the approach end of each runway to protect critical approach airspace.
- Scheduled pavement rehabilitation to maintain the existing pavement strength.

After Runway 3L/21R is constructed, there are two options for the future of Runway 7/25.

- **Option A**: Retain Runway 7/25 after construction of Runway 3L/21R with improvements during 20-year planning horizon.

An advantage associated with the Option A is that it would continue to serve its existing functions as a crosswind alternative for smaller aircraft, and enhancing capacity and operational flexibility.

- **Option B**: Construct Runway 3L/21R and decommission Runway 7/25.

An advantage associated with the Option B is that the resulting airport configuration removes development restrictions, thus allowing a more efficient use of airport property for aviation and aviation-related development. Such an arrangement may further enhance GEG's potential to attract MRO and aviation manufacturing to the airport, and the operational flow of aircraft would also be greatly improved.

Ultimately, a final decision on whether to retain or decommission Runway 7/25 will be made after Runway 3L/21R becomes fully operational.

Options A and B are shown in **Figure 3-9**.

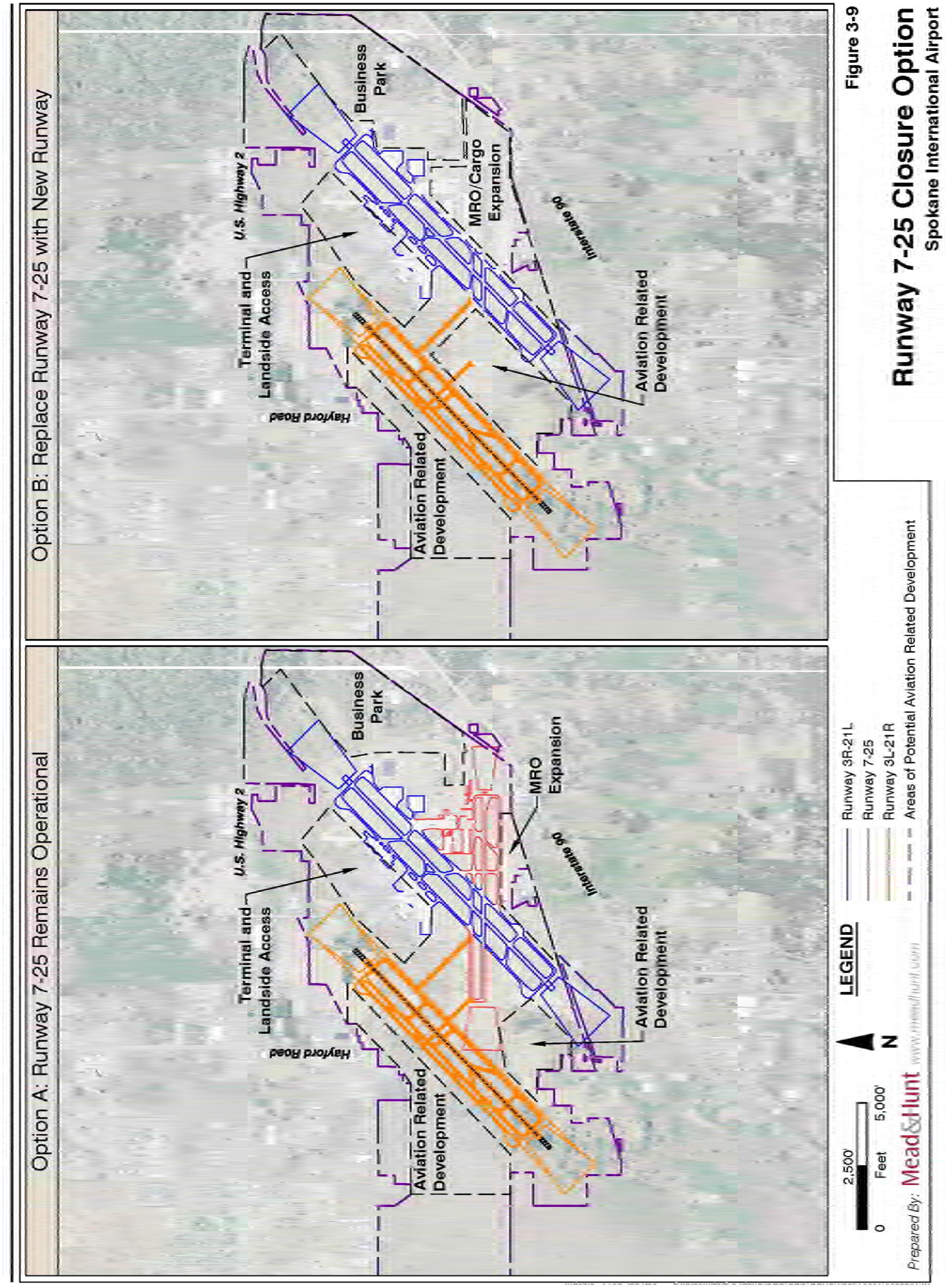


Figure 3-9
Runway 7-25 Closure Option
Spokane International Airport