

I. Background

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to disclose to decision makers and the interested public a clear, accurate description of potential environmental impacts of proposed federal actions and reasonable alternatives to those actions. Through NEPA, Congress directed federal agencies to integrate environmental factors in their planning and decision making processes and to encourage and facilitate public involvement in decisions that affect the quality of the human environment. Under NEPA, federal agencies are required to consider the environmental effects of a proposed action, alternatives to the proposed action, and a no action alternative (assessing the potential environmental effects of not undertaking the proposed action). The Federal Aviation Administration (FAA) has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*.¹

This Environmental Assessment (EA), prepared in accordance with FAA Order 1050.1E, documents the potential environmental effects associated with the optimization of air traffic routes and the supporting airspace management structure serving aircraft operating under instrument flight rules (IFR) while departing or arriving at one of three airports in Southern Nevada—McCarran International Airport (LAS), North Las Vegas Airport (VGT), and Henderson Executive Airport (HND). These three airports are referred to in this EA as the EA Airports. The Proposed Action, the subject of this EA, is referred to as Las Vegas Area Optimization or LAS Optimization.

The EA comprises the following sections and materials:

- Section I: Background—provides background information on the air traffic system, the airspace serving the EA Airports, and the facilities and activity at the EA Airports to assist the reader in understanding the technical materials presented in later sections.
- Section II: Purpose and Need—documents the purpose and need for optimization of air traffic routes in the Las Vegas area and identifies the Proposed Action that is the subject of this EA.
- Section III: Alternatives—discusses the alternatives to the Proposed Action analyzed as part of the environmental review process. It includes a discussion of the criteria for evaluation and an identification of alternatives eliminated from further consideration.
- Section IV: Affected Environment—discusses the existing conditions of the surrounding environment, the environmental resources that would not be anticipated to be affected by the Proposed Action, and the environmental resources that could potentially be affected by the Proposed Action.
- Section V: Environmental Consequences—compares the potential environmental impacts associated with the Proposed Action and reasonable alternatives, as well as the no action alternative.
- Appendix A: Agency and Public Coordination—discusses the coordination and public involvement opportunities associated with the EA process and documents comments received during agency and public coordination and responses to these comments.

¹ U.S. Department of Transportation, Federal Aviation Administration, Order 1050.1E, *Environmental Impacts: Policies and Procedures*, June 8, 2004, Change 1 effective March 20, 2006.

- Appendix B: List of Preparers and List of Receiving Parties—lists the preparers of the EA and the local agencies and parties that received a copy of the Draft and Final EA documents.
- Appendix C: References—lists the references used in the preparation of the document.
- Appendix D: List of Acronyms and Glossary—lists acronyms and provides a glossary of terms used in the EA.
- Appendix E: Aircraft Noise Analysis—presents the methodology followed and assumptions used in the analysis of aircraft noise.
- Appendix F: Supporting Data—presents technical data used in various analyses conducted in support of this EA.
- Appendix G: Coordination and Comments—documents the coordination conducted in support of this EA and comments received on the EA.

1.1 National Airspace System

The Federal Aviation Act of 1958, as amended (recodified at 49 United States Code [U.S.C.] 40101 *et seq.*), delegates responsibilities to the FAA that include controlling the use of the nation’s navigable airspace and regulating civil and military aircraft operations in that airspace in the interest of the safety and efficiency of all operations.² To assist in fulfilling this FAA mandate, the National Airspace System (NAS) was established.

Within the NAS, the FAA manages aircraft takeoffs and landings and the flow of aircraft between airports through a system of infrastructure (such as air traffic control facilities), people (such as air traffic controllers, maintenance and support personnel), and technology (sensors such as radar or communications equipment). The system is governed by rules and regulations to ensure safe and efficient use of navigable airspace.

The NAS comprises one of the most complex aviation networks in the world. Therefore, when changes are proposed for portions of the NAS, the FAA’s intention is to (1) increase system flexibility, predictability, and access; (2) maintain or improve system safety; (3) improve efficiency and reduce delays; and (4) support the evolution of emerging technologies.³ The FAA Air Traffic Organization (ATO) is the organization within the FAA that is responsible for the safe and efficient use of navigable airspace. In designing or redesigning airspace and procedures for use in the NAS, the FAA ATO must comply with NEPA and other applicable laws and regulations.

The general flow of aircraft through the NAS and the FAA’s role in managing these aircraft to ensure safe use of the airspace are described in this section. The discussion in this section provides a general understanding of the NAS to facilitate readers’ understanding of the technical concepts discussed throughout this EA, including definitions of technical terms and acronyms, which are also provided in the glossary and list of acronyms in Appendix D.

1.1.1 Air Traffic Control within National Airspace System

The combination of infrastructure, people, and technology used to monitor and guide or direct aircraft on their routes within the NAS is referred to collectively as Air Traffic Control (ATC). ATC is responsible for separating aircraft—keeping minimum distances between aircraft—to maintain safety and for expediting the flow of traffic operating in the NAS.

² Title 49 *United States Code*, Section 40101(d)4.

³ U.S. Department of Transportation, Federal Aviation Administration, Order JO 7400.2G, Change 3, *Procedures for Handling Airspace Matters*, Section 32-3-5(b) “National Airspace Redesign,” April 10, 2008.

Described in Title 14 Code of Federal Regulations (CFR) Part 91, aircraft operate under two distinct categories of flight rules: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). These flight rules generally correspond to two categories of weather conditions: Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC).⁴

VMC generally occur during fair to good weather, when good visibility conditions exist. IMC occur during periods when visibility falls to less than 3 statute miles or the cloud ceiling (i.e., the distance from the ground to the bottom layer of clouds, defined as the point where the clouds cover more than 50 percent of the sky) drops to lower than 1,000 feet. Correspondingly, a pilot is responsible to “see and avoid” under VFR to maintain safe separations from other aircraft and obstacles. IFR are designed for use when separation from other flying aircraft and terrain is maintained by cockpit instrument reference and radar separation. Pilots must follow IFR during IMC. Regardless of weather conditions, however, the majority of commercial air traffic operates under IFR.⁵

Based on factors such as aircraft type and weather, among others, air traffic controllers apply criteria defined in FAA Order 7110.65T, *Air Traffic Control*⁶ to maintain defined minimum distances (referred to as separations) between aircraft:

- **Vertical Separation**—separation between aircraft operating at different altitudes;
- **Longitudinal Separation**—also referred to as in-trail separation, the separation between two aircraft operating along the same flight route referring to the distance between a lead and a following aircraft; and
- **Lateral Separation**—separation between aircraft operating along two separate but proximate flight routes.

For aircraft operating under IFR, air traffic controllers maintain separation by monitoring and directing, as needed, pilots of aircraft following standard instrument procedures. Standard instrument procedures define routes along which aircraft operate. Air traffic controllers monitor aircraft routes, altitudes, and airspeeds using various sensors such as radar. Procedures are intended to provide predictable, efficient flight routes to move aircraft through the airspace in an orderly manner and to minimize the need for communication between the controller and pilot. Standard instrument procedures are considered “conventional” if they are based on ground-based navigational aids (NAVAIDs), which provide instrument guidance to a pilot as the aircraft flies over each NAVAID, or if they are based on verbal instructions from an air traffic controller. Under efforts to modernize the NAS (discussed further in Section 1.1.3), the FAA has developed alternate technologies to develop routes defined in standard instrument procedures. One alternate technology is Area Navigation (RNAV). RNAV technology allows an RNAV-trained pilot operating an RNAV-equipped aircraft to fly a more direct route than under a conventional procedure, as illustrated in **Exhibit I-1**, based on instrument guidance that references an aircraft’s position within the coverage of ground-based NAVAIDS or space-based navigational aids using Global Positioning System (GPS) technology.

⁴ Title 14 Code of Federal Regulations 91.151 through 91.193, “Visual Flight Rules” and “Instrument Flight Rules.”

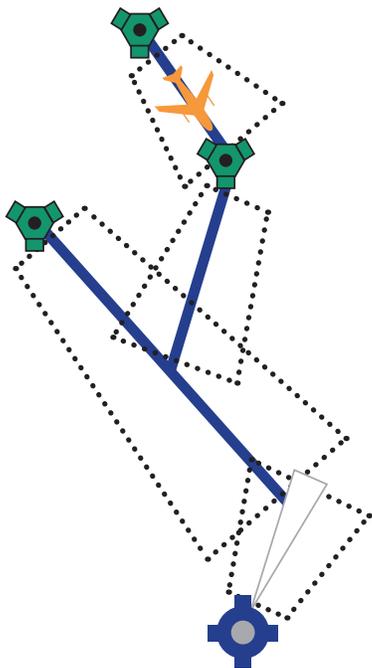
⁵ Title 14 Code of Federal Regulations Part 121, “Operating Requirements: Domestic, Flag, and Supplemental Operations,” current as of February 15, 2011.

⁶ U.S. Department of Transportation, Federal Aviation Administration, Order 7110.65T, *Air Traffic Control*, August 26, 2010.

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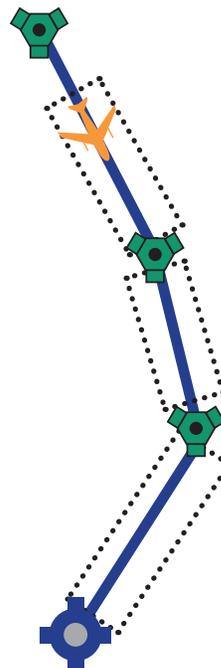
Conventional Procedure

(Defined using ground-based NAVAIDs)



RNAV Procedure

(Defined by referencing an aircraft's position within the coverage of ground-based NAVAIDs or GPS-based navigational aids.)



Legend

-  Navigational Aid
-  Route
-  Airport
-  Aircraft
-  Route Deviations

Notes:
 NAVAID – navigational aid
 RNAV – Area Navigation

Source: U.S. Department of Transportation, Federal Aviation Administration, "Performance-Based Navigation (PBN)" brochure, 2009.
 Prepared by: Ricondo & Associates, Inc., January 2010.

Exhibit I-1

Not to Scale.

Comparison of Routes following Conventional versus RNAV Procedures

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Without sufficient standard instrument procedures in the terminal airspace (either the procedures do not exist or the demand exceeds the ability of the existing procedures to accommodate that demand), air traffic controllers must maintain safety within the airspace they control by using one or a combination of the following management tools and coordination techniques:

- **Vectoring**—Issuing a series of headings to a pilot to route an aircraft, which can increase aircraft flight distance and flight time, decrease flight route predictability, and increase air traffic controller/pilot communication requirements and workload;
- **Speed Control**—Reducing or increasing aircraft speed, which can increase aircraft flight time if speed is reduced, decrease flight route predictability, and increase air traffic controller/pilot communication requirements and workload;
- **Hold Pattern/Ground Hold**—Assigning an aircraft to a holding pattern in the air or holding an aircraft on the ground before departure, which can delay an aircraft if holding on the ground, increase flight time if the aircraft is holding during flight, and increase air traffic controller/pilot communication requirements and workload;
- **Level-off**—Leveling off an aircraft during its ascent or descent, which increases flight time and distance by disrupting a continuous ascent or descent and increases air traffic controller/pilot communication requirements and workload;
- **Reroute**—Rerouting aircraft to terminal airspace entry or exit points other than the preferred or most direct entry or exit point, which can increase flight time and distance, decrease flight route predictability, and increase air traffic controller/pilot communication requirements and workload; or
- **Point-out**—Pointing out, or notifying an air traffic controller of an adjacent sector of the proximity of an aircraft to the adjacent sector’s boundary, which increases air traffic controller communication requirements and workload.

Use of these tools and coordination techniques increases air traffic controller and pilot workload and can result in aircraft delays. The more frequently a controller must use one or several of these tools or coordination techniques, the more complex his/her workload becomes.

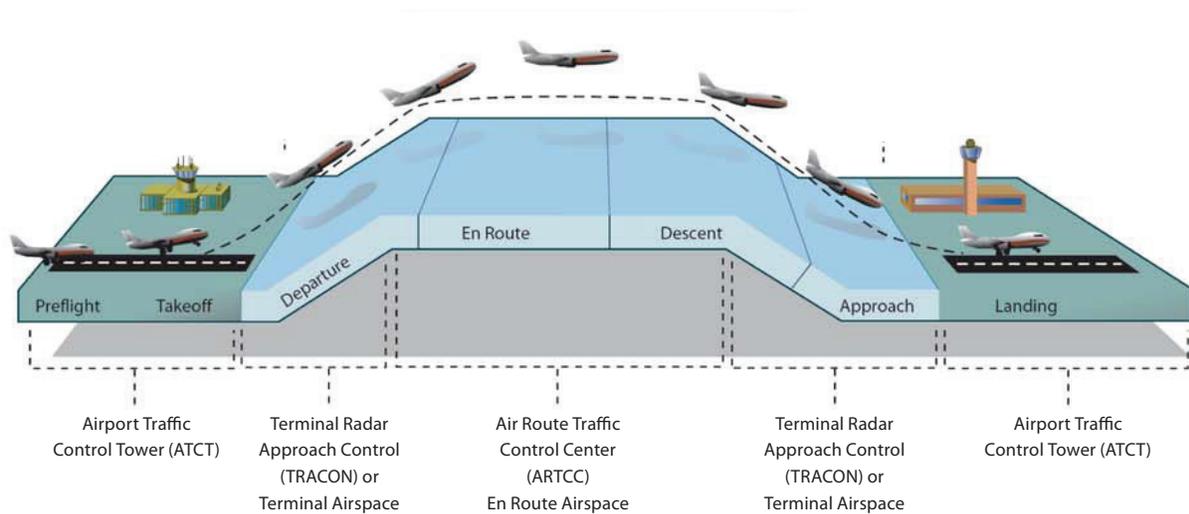
As an aircraft moves from origin to destination, ATC personnel function as a team and transfer control of the aircraft from one controller to the next and from one ATC facility to the next. This process of managing a safe flow of aircraft and transferring control is discussed in the next section. Overall, managing the departure flow is less complicated because aircraft can often be held on the ground to maintain aircraft separation if conflicts are anticipated. Managing the arrival flow tends to be more complicated because arriving aircraft are airborne and thus require more complicated management to maintain a safe airspace environment.

1.1.2 Aircraft Flow within the National Airspace System

An aircraft traveling from airport to airport typically operates through six phases of flight (plus a “preflight” phase), as illustrated on **Exhibit I-2**. These phases are:

- **Preflight Phase of Flight**—The preflight planning and checks as well as the ground movement of the aircraft (referred to as “taxiing”) to the departure end of a runway.
- **Takeoff Phase of Flight**—The transition of an aircraft from a runway to flight.

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Source: United States Department of Transportation, Federal Aviation Administration, *Houston Area Air Traffic System, Airspace Redesign, Final Environmental Assessment*, Figure 1.1.1-1, March 2008. Prepared by: Ricondo & Associates, Inc., January 2010.

Exhibit I-2

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Typical Phases of a Commercial Aircraft Flight

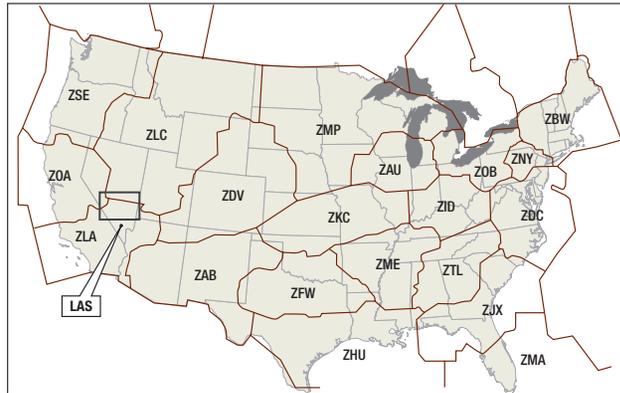
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- **Departure Phase of Flight**—The in-flight transition of an aircraft from take-off to the en route phase of flight, during which the aircraft climbs to its assigned cruising altitude following a standard instrument procedure (predefined set of guidance instructions that define a route for a pilot to follow) or a series of verbally issued instructions from an air traffic controller.
- **En route Phase of Flight**—The generally level segment of flight (“cruise altitude”) between the departure and destination airports.
- **Descent Phase of Flight**—The in-flight transition of an aircraft from the assigned cruising altitude to the point at which the pilot initiates the approach to a runway at the destination airport.
- **Approach Phase of Flight**—The segment of flight during which a pilot follows a standard procedure or series of verbal instructions from an air traffic controller to guide the aircraft to the landing runway.
- **Landing Phase of Flight** —Touch-down of the aircraft on a runway at the destination airport and taxiing from the runway end to the gate or parking position.

The NAS is organized into three-dimensional areas (i.e., defined by a floor, a ceiling, and a lateral boundary) of navigable airspace, which are managed by different ATC facilities. Airspace areas assigned to ATC facilities are further segregated into sectors. Air traffic controllers at each ATC facility are assigned sectors within the control of their ATC facility to manage and ensure the safe operation of aircraft operating under IFR within their assigned sector. The three types of ATC facilities that manage IFR aircraft, correlated to the typical phases of flight as illustrated on Exhibit I-2, are:

- **Airport Traffic Control Tower**—Controllers at an Airport Traffic Control Tower (ATCT) located at an airport manage phases of flight associated with an aircraft taking off from and landing at the airport; therefore, the range of ATCT control typically includes the airspace extending from the airport out to a distance of several miles.
- **Terminal Radar Approach Control**—Controllers at a Terminal Radar Approach Control (TRACON) facility manage the departure, descent, and approach phases of flights, as aircraft transition between an airport and the en route phase of flight. “Terminal airspace” surrounds the airspace under control of an ATCT and extends out to a distance of 30 to 60 miles from an airport or a group of airports. TRACON controllers are responsible for separating aircraft operating within the terminal airspace, which is divided into sectors. As an aircraft moves through the terminal airspace sectors, management responsibility for that aircraft is transferred from controller to controller. The terminal airspace in the Las Vegas area is referred to as “L30” and is shown on **Exhibit I-3**.
- **Air Route Traffic Control Centers**—Controllers at Air Route Traffic Control Centers (ARTCCs or “Centers”) manage the flow of traffic to/from and within the en route airspace. The delegation of en route airspace to ARTCCs in the Las Vegas area is shown on Exhibit I-3. The en route airspace managed by each ARTCC is divided into sectors, similar to the terminal airspace.

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Legend

- Special Use Airspace
- Nellis Air Traffic Control Facility Airspace
- L30 – Las Vegas Terminal Radar Approach Control Airspace
- ZXX – Air Route Traffic Control Centers Airspace
- TRACON Airspace Entry Points
- TRACON Airspace Exit Points

Notes:

- VGT – North Las Vegas Airport
- LAS – Las Vegas McCarran International Airport
- HND – Henderson Executive Airport
- TRACON – Terminal Radar Approach Control

Source: Terminal Area Route Generation, Evaluation and Traffic Simulation (TARGETS), January 2010.
 Prepared by: Ricondo & Associates, Inc., January 2010.

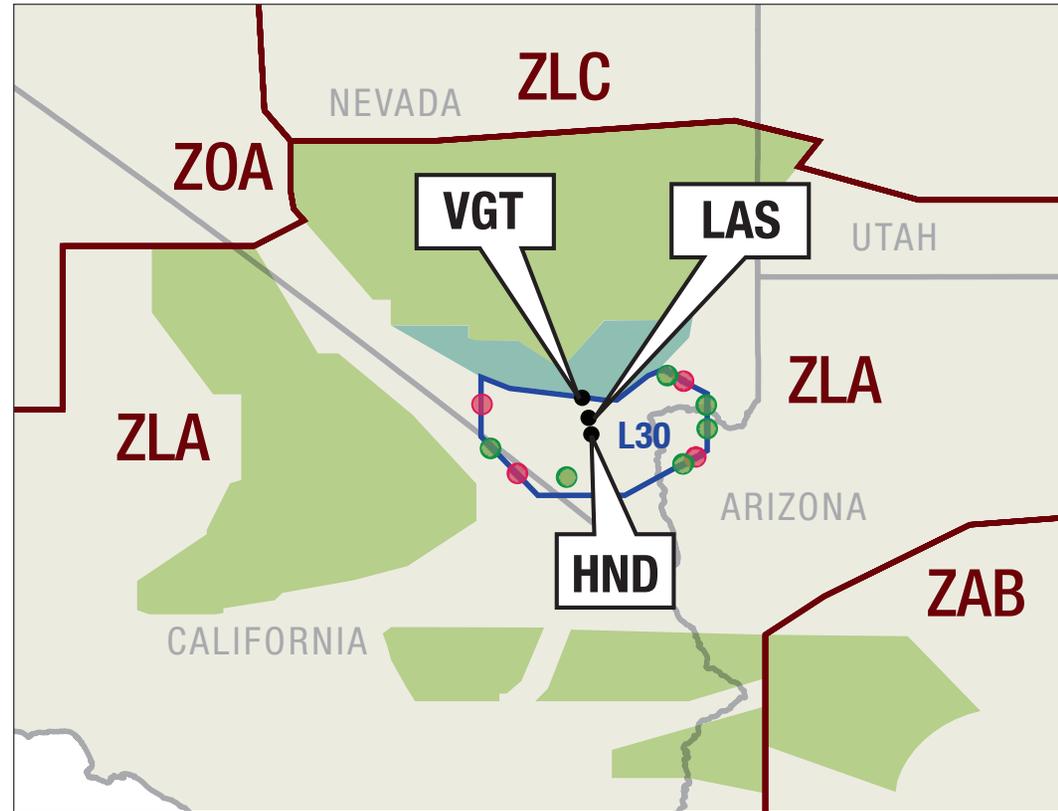


Exhibit I-3

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Airspace in the Las Vegas Area

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An overview of how air traffic controllers at these ATC facilities control the phases of flight of IFR aircraft is provided in the following paragraphs. The discussion is organized by “departure flow,” which includes the phases of flight from departure to en route, and “arrival flow,” which includes the en route to the descent and approach phases of flight. These are the phases of flight that would be affected by LAS Optimization.

1.1.2.1 Departure Flow

As an aircraft operating under IFR departs a runway and follows its assigned heading, it moves from the ATCT airspace, through the terminal airspace, and then to a route in the en route airspace, which is referred to as a “jet airway.” Once on a jet airway, an aircraft proceeds along the route until it nears its destination airport. This section focuses on the flow of IFR traffic through the terminal airspace and onto a route in the en route airspace.

Within the terminal airspace, TRACON controllers are responsible for controlling a departing aircraft from the ATCT airspace to an exit point. An exit point is the point along the terminal airspace-en route airspace boundary at which the aircraft exits the terminal airspace and enters the en route airspace and control of the aircraft is passed from TRACON to ARTCC controllers. Exhibit I-3 depicts the locations of the L30 exit points. From the terminal airspace exit point, the aircraft enters the en route airspace where ARTCC controllers direct the aircraft on to a jet airway.

A standard instrument procedure for a departing aircraft is referred to as a Standard Instrument Departure (SID). A SID provides a pilot standard and predictable lateral and vertical guidance to facilitate safe and predictable navigation from an airport through the terminal airspace (while remaining clear of obstacles such as cell towers, buildings, and trees) and to a jet airway in the en route airspace. If following a conventional SID, an aircraft may either be directed to the exit point by vectoring or by following a standard instrument procedure defined by ground-based NAVAIDs or a combination of both. An RNAV SID, which provides standard guidance using ground-based NAVAIDs or GPS-based navigation, defines a more direct, standard, and predictable route through the airspace than does a conventional SID.

A SID may provide full guidance from one or more runway ends to an exit point or to a common segment along the path that is shared with aircraft taking off from other runway ends, which then leads to an exit point. The path linking a runway end to an exit point or a common segment of the SID is referred to as a “runway transition.” A SID can also provide partial guidance through the terminal airspace (e.g., it may not include runway transitions, so air traffic controllers would vector aircraft from a runway end to a common segment of the SID). From the common segment of the SID, guidance is then provided in the SID to an exit point and then join one or multiple routes (jet airways) in the en route airspace, referred to as “en route transitions.”

As TRACON controllers manage the flow of aircraft in the terminal airspace, they maintain the following separations between aircraft:

- **Vertical Separation**—At least 1,000 feet when operating below 29,000 feet above mean sea level and by at least 2,000 feet when operating above 29,000 feet above mean sea level.
- **Longitudinal Separation**—Within 40 miles of the primary TRACON radar antenna site, the minimum longitudinal separation of aircraft is 3 miles, while beyond 40 miles from the primary radar site, the minimum longitudinal separation of aircraft increases to 5 miles, due

to radar coverage capabilities.⁷ Longitudinal separation within the en route airspace is 5 miles, so terminal airspace air traffic controllers must increase departure aircraft separation to 5 miles as the aircraft nears the exit point regardless of the distance from the primary radar antenna site. To ensure that the minimum 5-mile separation is maintained, air traffic controllers may separate aircraft as much as 7 miles in practice.

- **Lateral Separation**—Similar to longitudinal separation, the minimum lateral separation between aircraft in the terminal airspace must be at least 3 miles within 40 miles of the primary radar antenna site, and at least 5 miles beyond 40 miles from the primary radar antenna site.

1.1.2.2 Arrival Flow

A pilot will initiate the descent phase of flight within the en route airspace. Along the aircraft's descent, it will enter the terminal airspace for the destination airport at an entry point, which is the point along the terminal airspace-en route airspace boundary at which the aircraft exits the en route airspace and enters the terminal airspace and control of the aircraft is passed from ARTCC to TRACON controllers. Exhibit I-3 depicts the locations of entry points on the terminal airspace-en route airspace boundary in the Las Vegas area. To maintain safe distances between aircraft within the terminal airspace, TRACON controllers must maintain the same separations (i.e., those for vertical, longitudinal, and lateral separation) for arriving aircraft (as well as between arriving and departing aircraft) as those defined for departing aircraft in Section 1.1.2.1.

Arriving aircraft within the terminal airspace follow a standard instrument procedure, referred to as a Standard Terminal Arrival Route (STAR), from a route in the en route airspace to the final approach to a runway—the segment of flight along which an aircraft is aligned with the landing runway and operates along a straight route at a constant descent rate to the runway. Conventional and RNAV STARs are similar to conventional and RNAV SIDs with the exception that a single STAR can serve multiple airports. A STAR can provide full guidance from a route or multiple routes in the en route airspace through a terminal airspace entry point (referred to as an “en route transition”), to a common segment of the STAR in the terminal airspace, and then to the final approach to one or more runways at one or more airports. Guidance from the common segment of the STAR in the terminal airspace to the final approach to a runway end is referred to as a “runway transition.” A STAR can also provide partial guidance through the terminal airspace (e.g., it may not include runway transitions, so air traffic controllers would vector aircraft to the final approach to a runway).

1.1.3 Next Generation Air Transportation System

The Next Generation Air Transportation System (NextGen)⁸ is the FAA's plan to modernize the NAS through evolution from a ground-based system of air traffic control to a GPS-based system of air traffic control. To achieve NextGen goals, the FAA is implementing Performance-Based Navigation (PBN)⁹ procedures that leverage newer technologies and aircraft navigation capabilities

⁷ Michael S. Nolan, Chapter 9, “Radar Separation,” in *Fundamentals of Air Traffic Control*, Fourth Edition, 2004, pages 363–367.

⁸ U.S. Department of Transportation, Federal Aviation Administration's Fact Sheet, “NextGen Goal: Performance-Based Navigation,” April 24, 2009 [http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (Accessed January 20, 2010 and February 11, 2011)].

⁹ Additional information on Performance-Based Navigation is provided on the U.S. Department of Transportation, Federal Aviation Administration's Fact Sheet, “NextGen Goal: Performance-Based Navigation,” April 24, 2009 [http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (Accessed January 20, 2010 and February 11, 2011)].

that are becoming more readily available. PBN is a framework that provides a basis for design and implementation of automated flight routes and the supporting airspace management structure with the intent of modernizing the existing NAS.

RNAV is one PBN technique. RNAV facilitates more efficient design of airspace and procedures that collectively result in improved safety, access, capacity, predictability, and operational efficiency with reduced emissions and fuel consumption.¹⁰ As discussed in Section 1.1.1, RNAV enables aircraft traveling through terminal and en route airspace to follow any desired flight route within the coverage of ground-based navigational aids or GPS-based navigational aids rather than flying a point-to-point route over NAVAIDs following a conventional procedure (Exhibit I-1 illustrates a comparison of conventional and RNAV routes). RNAV can provide pilots the ability to choose a more direct route for their flight than using conventional procedures. In addition, controllers can assign an RNAV procedure to an RNAV-equipped aircraft operated by an RNAV-trained pilot. The predictability of routes following RNAV procedures can reduce the need for controllers to employ management tools (described in Section 1.1.1), such as vectoring and holding, and therefore, reduces workload and airspace complexity.

1.1.4 National Airspace System Efficiency

As discussed in Section 1.1.2, an aircraft flight transitions between runways and areas of airspace managed by different ATC facilities corresponding to the typical phases of flight. Inefficiencies in the NAS, from the runway through the various stages of flight, can affect the efficiency of the NAS, and result in inefficient air traffic control operations, such as the need to vector aircraft, change aircraft speed, hold aircraft in the air or on the ground, level off aircraft during ascent or descent, or reroute aircraft. A discussion of how runway, airfield, and airspace efficiency is measured and how airfield and airspace constraints, more specifically, can affect one another is provided in this section. The three measures of efficiency discussed in this section are:

- **Runway Throughput**—A runway can accommodate a defined number of aircraft operations, which can be measured by runway throughput, or the expected number of operations (arrivals and/or departures) that a runway can accommodate in one hour while maintaining safe operating standards.
- **Airfield Throughput**—Airfield throughput is a measure of the expected number of operations that multiple runways at an airport can accommodate in one hour, considering the operating dependencies between runways to maintain safe operating standards. At an airport with more than one runway, runway operating configurations are established to define optimal combinations of two or more runways to accommodate arriving and departing aircraft under differing conditions such as weather, prevailing winds, type of traffic (i.e., predominately arrivals or departures), and amount of traffic. Furthermore, to ensure safe operating standards, the use of one runway end¹¹ for an operation may be dependent on how another runway end is being used. It is possible for ATC to change the runway operating configuration throughout the day to adjust to changing weather, wind, and traffic conditions.

¹⁰ U.S. Department of Transportation, Federal Aviation Administration, “Fact Sheet – NextGen Goal: Performance-Based Navigation,” April 24, 2009, http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (Accessed January 12, 2010).

¹¹ Although a runway has two “ends” (i.e., can be operated in two directions), typically only one end of a runway would be identified for use in a runway operating configuration to accommodate departing and/or arriving aircraft to ensure that all aircraft using that runway are operating in the same direction or “flow.”

Therefore, both the throughput of an individual runway as well as the airfield throughput can vary as the runway operating configuration varies.

- **Airspace Throughput**—Similar to a runway or an airfield, an area of airspace managed by an ATC facility has a finite throughput, representing the number of aircraft that can operate through the airspace in an hour in a safe manner based on the design of routes through the airspace and the management structure of the airspace. Airspace throughput can quantify how efficiently the airspace is operating.

In addition to runway, airfield, and airspace throughput, sustained throughput refers to the greatest number of operations per hour that can be accommodated for *successive hours* without eventually resulting in delays. During some hours, the runways or airspace can accommodate more operations than what is considered to be sustainable; in other words, the higher level of operations that may be accommodated during some hours could not be sustained during every hour of the day.

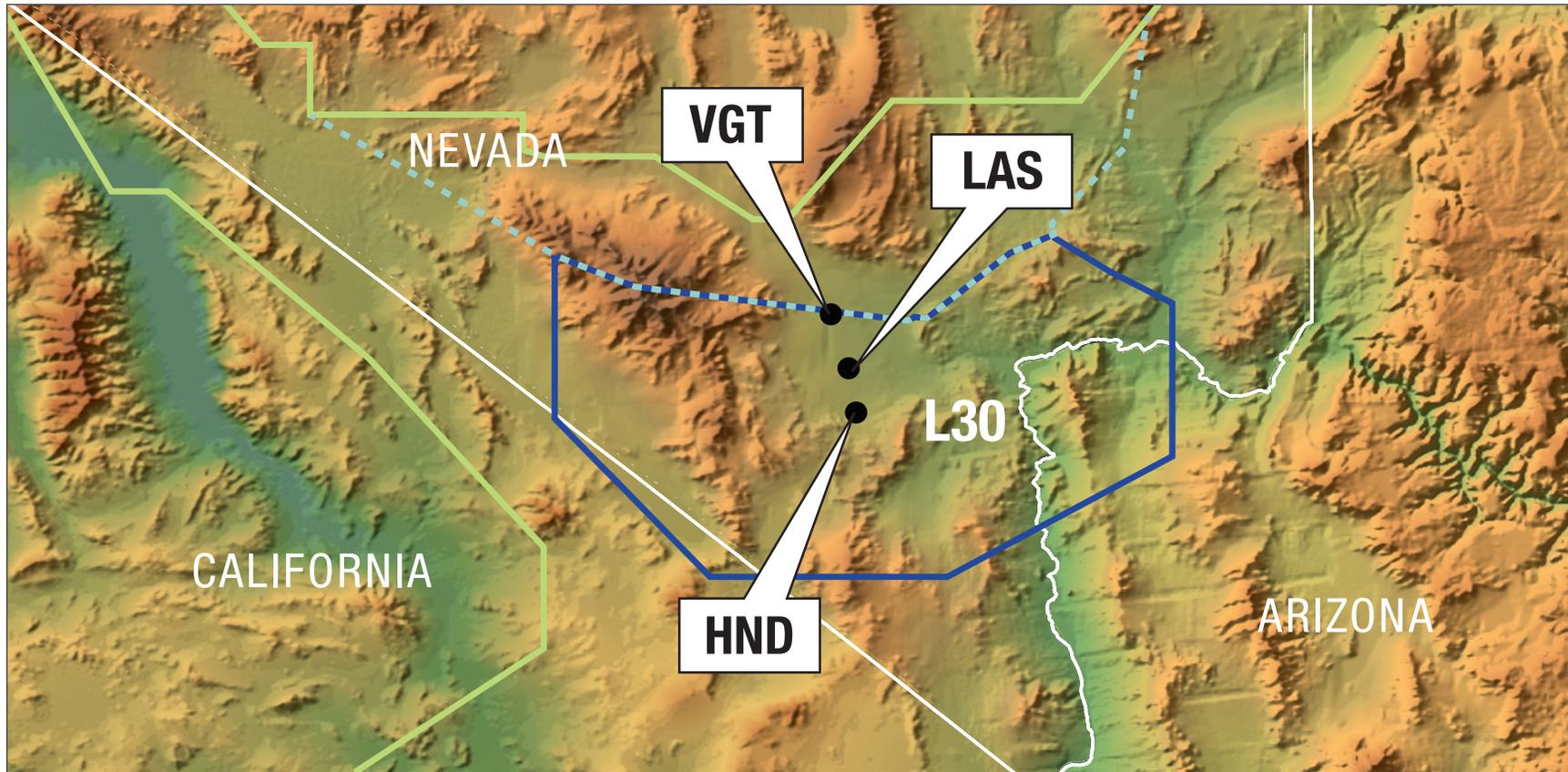
If the sustained throughput of one component of the NAS is not in balance with the sustained throughput of other components, the component with the lower throughput could limit the ability of other component(s) to achieve the throughput for which they were designed. For example, if the airspace throughput is not equivalent to or greater than the airfield throughput, the airspace would be considered a limitation on the ability to utilize the throughput for which an airfield was designed.

1.2 Existing Airspace Serving the EA Airports

This section summarizes the existing standard instrument procedures and airspace management structure of the Las Vegas area airspace that would be affected by LAS Optimization.

Air traffic controllers in the Las Vegas TRACON facility control a portion of airspace designated as L30 that is surrounded by the Los Angeles ARTCC (ZLA) airspace, as shown on Exhibit I-3. The lateral boundary of the L30 airspace is irregularly shaped, extending from LAS approximately 8 nautical miles to the north, 35 nautical miles to the east, and 30 nautical miles to the south and west. Excluding airspace delegated to the ATCTs at LAS, HND, VGT, and Nellis Air Force Base, L30 controllers currently manage the airspace within these boundaries from the surface to 19,000 feet above mean sea level. Controllers located in ZLA manage the airspace above and adjacent to the L30 airspace. Areas of airspace adjacent to the ZLA airspace managed by controllers in other ARTCCs are also shown on Exhibit I-3.

The physical configuration of the L30 airspace is constrained by the existence of numerous Special Use Airspace (SUA) areas, mountainous terrain, non-FAA controlled airspace associated with Nellis Air Force Base, and man-made obstructions, primarily tall structures. SUAs support activities, often of military nature, that may present a safety hazard for nonparticipating aircraft. Therefore, limitations are imposed on aircraft operations that are not a part of the defined activities, such as requiring nonparticipating aircraft to remain outside of the SUAs. The SUAs and the airspace delegated to the Nellis Air Traffic Control Facility are depicted on Exhibit I-3, and the terrain relative to the locations of the three EA Airports is depicted on **Exhibit I-4**.



Legend

- Special Use Airspace
- - - Nellis Air Traffic Control Facility Airspace

— L30 – Las Vegas Terminal Radar Approach Control Airspace

Notes:

- VGT – North Las Vegas Airport
- LAS – McCarran International Airport
- HND – Henderson Executive Airport

Sources: MapResources, 2007 (terrain); and Terminal Area Route Generation, Evaluation and Traffic Simulation (TARGETS), January 2010.
Prepared by: Ricondo & Associates, Inc., January 2010.

Exhibit I-4

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north

Las Vegas Area Terrain

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The airspace within which aircraft using the EA Airports operate is complex given these constraints. Furthermore, the design of the air traffic routes within the physically constrained area is inefficient, as discussed further in Section II of this EA. These conditions result in limitations on the terminal airspace throughput that can result in flight delays and unpredictable flight routings. As aircraft traffic increases in the future, the airspace will become less efficient and operating within the airspace will become less predictable. The effects of this inefficient and unpredictable airspace environment include increased flight distances and times, flight delays, and increased controller-to-pilot and controller-to-controller communications, thus increasing the complexity of the airspace environment. The need for frequent communications means that a controller must maintain a high workload (such as responding to a number of demands or performing a number of tasks) in order to maintain a safe operating environment.

During periods of heavy workload, a controller may not be able to accept additional aircraft into the airspace he/she is managing, resulting in rerouting aircraft or placing aircraft in holding patterns until they can safely be managed by that controller.

As of February 2012, 13 published STARs served the airports within the L30 terminal airspace. Of these, five are conventional STARs and eight are RNAV STARs. Of the RNAV STARs, three include runway transitions to LAS runways and four include runway transitions to HND runways.¹² Many of the STARs were developed as part of the Four Corner-Post Plan at LAS—a plan intended to increase airspace and air traffic control safety and efficiency and reduce aircraft delay by eliminating certain airspace conflicts through the realignment of STARs and SIDs. The Four Corner-Post Plan was evaluated in a 2001 Final Environmental Assessment,¹³ and the FAA issued a Finding of No Significant Impact (FONSI) and Record of Decision (ROD) in June 2001.¹⁴

Following implementation of the Four Corner-Post Plan, rapid increases in aviation activity occurred at LAS, which revealed a constraint on departing aircraft caused by assigning eastbound traffic to a single SID. The plan was therefore modified to provide an additional SID to accommodate eastbound departures to improve airspace efficiency and reduce departure delays. A FONSI/ROD was issued in November 2006 based on the Final Supplemental Environmental Assessment for Modification to the Las Vegas Four Corner-Post Plan.^{15, 16}

¹² Subsequent to the initiation of this EA, four STARs that included runway transitions to HND were implemented. Although these STARs are not reflected in baseline conditions for the EA, they have been included in the future No Action alternative as presented in Chapter 3, Alternatives, of this EA.

¹³ U.S. Department of Transportation, Federal Aviation Administration, Western-Pacific Region *Four Corner-Post Plan Final Environmental Assessment*, Section 4.2.1.6, July 2001.

¹⁴ U.S. Department of Transportation, Federal Aviation Administration, Western-Pacific Region, *Finding of No Significant Impact/Record of Decision for the Las Vegas Four Corner-Post Plan, McCarran International Airport, Las Vegas, Nevada*, June 2001.

¹⁵ U.S. Department of Transportation, Federal Aviation Administration, Western-Pacific Region, *Finding of No Significant Impact and Record of Decision for the Modification to the Las Vegas Four-Corner Post Plan, Las Vegas TRACON, Las Vegas, NV*, November 2006.

¹⁶ U.S. Department of Transportation, Federal Aviation Administration, *Final Supplementation Environmental Assessment for Modification to the Las Vegas Four Corner-Post Plan*, November 2006.

At the time of the Four Corner-Post Plan, approximately 75 percent of the jet fleet operating at LAS was capable of using the RNAV procedures and the remaining 25 percent of the jet fleet was required to follow conventional procedures.¹⁷ Therefore, it was necessary to create conventional STARs and SIDs and RNAV STARs and SIDs that closely mimicked each other to allow for continued access by non-RNAV-equipped aircraft along the same routes as the RNAV-equipped aircraft. The necessity to overlay the two types of routes resulted in design limitations, which reduced the overall benefit gained by RNAV-equipped aircraft. Since that time, however, the percentage of aircraft capable of flying RNAV procedures has increased. By the end of 2009, 95 percent of all LAS flights operating under IFR procedures were conducted by aircraft properly equipped to fly RNAV procedures.¹⁸

1.3 EA Airports

The focus of the proposed LAS Optimization is on the EA Airports. The locations of the EA Airports within the Las Vegas area are depicted on Exhibits I-3 and I-4, and a general runway layout diagram of each airport is provided on **Exhibit I-5**. The general characteristics of the EA Airports are:

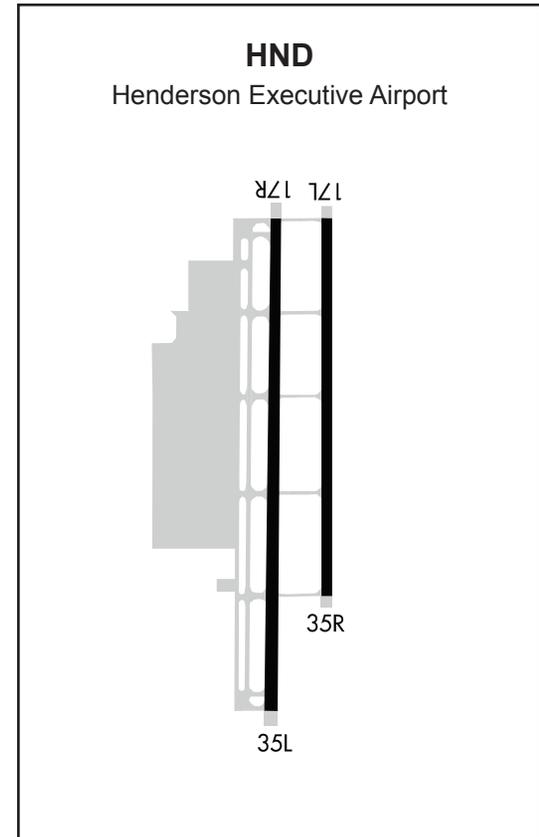
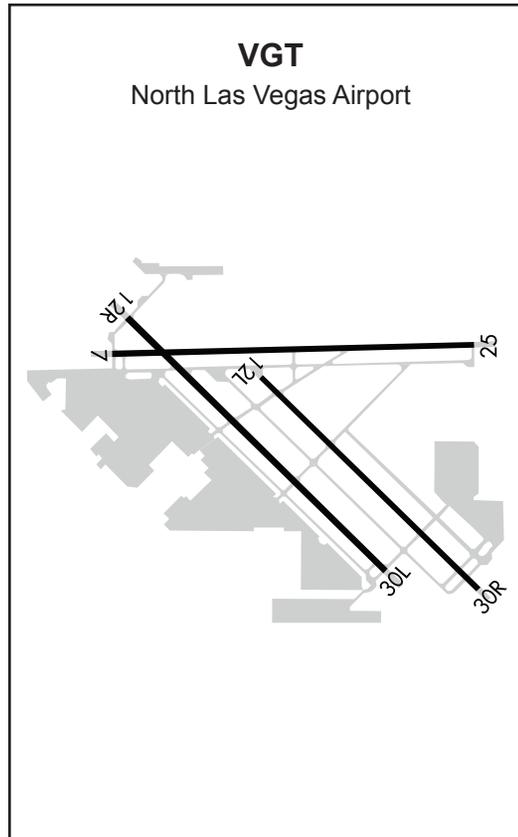
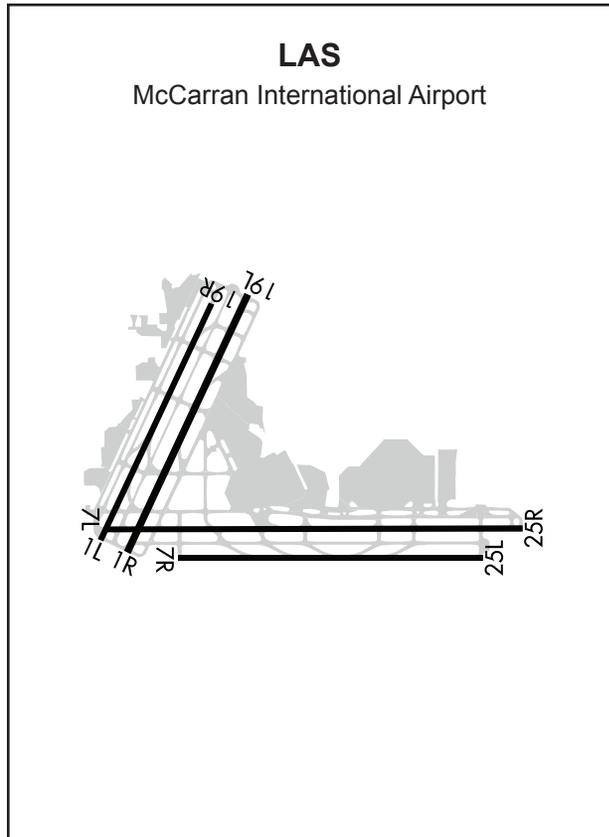
- **McCarran International Airport**—LAS is the primary commercial airport serving the Las Vegas metropolitan area and southern Nevada, and is classified as a large-hub primary commercial service airport under the National Plan of Integrated Airport Systems (NPIAS),¹⁹ the plan that defines the roles of airports in the NAS. A large-hub primary commercial service airport designation means that LAS receives scheduled commercial service and accommodates at least 1 percent of total U.S. enplaned passengers. LAS supports a mix of domestic and international passenger airlines, air cargo carriers, corporate aviation, general aviation, and air tour activity. LAS has two sets of parallel runways (Runways 7L-25R and 7R-25L, and Runways 1L-19R and 1R-19L). Aircraft arriving at LAS may be assigned one of four RNAV STARs or five conventional STARs. Departing aircraft may be assigned one of six RNAV SIDs or three conventional SIDs.²⁰

¹⁷ U.S. Department of Transportation, Federal Aviation Administration, *Four Corner-Post Plan Final Environmental Assessment*, Section 4.2.1.6, July 2001.

¹⁸ The MITRE Corporation's Center for Advanced Aviation System Development, *Performance Based Navigation Capability Report 2010*, p. 57.

¹⁹ U.S. Department of Transportation, Federal Aviation Administration, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 47103 of Title 49, United States Code, *National Plan of Integrated Airport Systems (NPIAS), 2011-2015*, Appendix B: State Maps.

²⁰ AirNav.com, see instrument procedures plates for RNAV STARs (GRNPA, TYSSN, KEPEC, and SUNST), Conventional STARs (LUXOR, KADDY, CLARR, CRESO, and FUZZY), Conventional SIDs (HOOVER, LAS VEGAS, and MCCARRAN) and RNAV SIDs (TRALR, STAAV, COWBY, PRFUM, BOACH, and SHEAD) [<http://www.airnav.com/airport/KLAS>, accessed February 17, 2011].



Source: AirNav.com, January 2010.
Prepared by: Ricondo & Associates, Inc., January 2010.

Exhibit I-5

Not to Scale.

Diagrams of EA Airports

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- **North Las Vegas Airport**—VGT is located approximately 8 nautical miles northwest of LAS and accommodates a mix of corporate and general aviation activity as well as Grand Canyon air tour operators. This airport has been planned and developed to serve as a general aviation reliever, meaning that it provides general aviation pilots alternative access to the Las Vegas metropolitan area. Also, based on the level of enplaned passengers VGT is expected to accommodate annually (more than 10,000 enplaned passengers annually on scheduled commercial service), VGT is classified as a nonhub primary commercial service airport in the NPIAS.²¹ The airport has three runways (Runway 7-25, Runway 12R-30L, and Runway 12L-30R). Depending on where VGT IFR arrivals enter the terminal airspace, they may be assigned one of five conventional STARs shared with LAS and HND traffic. VGT departures may be assigned to one conventional SID from VGT, or air traffic controllers may assign VGT departures to join one of the three LAS conventional SIDs.²²
- **Henderson Executive Airport**—HND is located approximately 6 nautical miles south of LAS. Similar to VGT, HND has been planned and developed to serve as a general aviation (particularly corporate aviation) reliever to LAS, and it is classified as a reliever airport under the NPIAS.²³ HND has two parallel runways (Runways 17L-35R and 17R-35L). Similar to VGT, HND arrivals may be assigned one of five conventional STARs, which are shared with LAS and VGT traffic, air traffic controllers may assign HND departures to join one of the three LAS conventional SIDs.²⁴ In 2011, four RNAV STARs and three RNAV SIDs were published for HND.²⁵

The EA Airports together accommodated 87.3 percent of all IFR traffic under FAA control in the State of Nevada in 2009²⁶ and all of the IFR traffic under FAA control in and out of the Las Vegas area, as shown in **Table I-1**. Three other aviation facilities in the Las Vegas area were not included in the LAS Optimization study: Nellis Air Force Base, Jean Airport, and Boulder City Airport. As shown in Table I-1, these three aviation facilities did not accommodate IFR traffic under FAA control in 2009, and thus were not included in LAS Optimization, which assessed the optimization of IFR procedures under the FAA's control. Nellis Air Force Base, operated by the U.S. Air Force, is located 11 nautical miles northeast of LAS. The U.S. Air Force controls all IFR operations at the Air Force Base. Jean Airport, 21 nautical miles south of LAS, primarily serves the sport aviation community as a base of operations for parachute jumpers and gliders in addition to small general

²¹ U.S. Department of Transportation, Federal Aviation Administration, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 47103 of Title 49, United States Code, *National Plan of Integrated Airport Systems (NPIAS), 2011-2015*, Appendix B: State Maps.

²² AirNav.com, see instrument procedures plates for Conventional STARs (LUXOR, KADDY, CLARR, CRESO [LAS], and FUZZY), and Conventional SIDs (NORTHTOWN, HOOVER [LAS], LAS VEGAS [LAS], and MCCARRAN [LAS]). [<http://www.airnav.com/airport/KLAS>, accessed February 17, 2011].

²³ U.S. Department of Transportation, Federal Aviation Administration, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 47103 of Title 49, United States Code, *National Plan of Integrated Airport Systems (NPIAS), 2011-2015*, Appendix B: State Maps.

²⁴ AirNav.com, see instrument procedures plates for Conventional STARs (LUXOR, KADDY, CLARR, CRESO [LAS], and FUZZY), and Conventional SIDs (HOOVER [LAS], LAS VEGAS [LAS], and MCCARRAN [LAS]) [<http://www.airnav.com/airport/KHND> and <http://www.airnav.com/airport/KLAS>, accessed February 17, 2011].

²⁵ AirNav.com, see instrument procedures plates for RNAV STARs (NOOTN, KNGMN, JOMIX, and ADDEL] and RNAV SIDs (ASCIN, FLAMZ, and PALLY) [<http://www.airnav.com/airport/KHND>, accessed March 2, 2012].

²⁶ U.S. Department of Transportation, Federal Aviation Administration, Air Traffic Activity Data System (ATADS) Report, 2009, <http://aspm.faa.gov/opsnet/sys/Airport.asp> (Accessed November 11, 2010).

aviation aircraft. Boulder City Airport is a non-towered public use facility located 16 nautical miles southeast of LAS.

Table I-1

Distribution of IFR Traffic under FAA Control among Nevada Airports, 2009

| <u>Airport</u> | <u>Number of IFR Flights</u> | <u>Percent of Total</u> |
|-------------------------------------|------------------------------|-------------------------|
| Las Vegas Area Airports | | |
| McCarran International Airport | 416,803 | 82.2% |
| North Las Vegas Airport | 13,349 | 2.6% |
| Henderson Executive Airport | 12,477 | 2.5% |
| Nellis Air Force Base | — | — |
| Jean Airport | — | — |
| Boulder City Airport | — | — |
| Subtotal | 442,629 | 87.3% |
| Other Nevada Airports ^{1/} | 64,417 | 12.7% |
| Total | 507,046 | 100.0% |

Notes:

— None reported

1/ Reno-Tahoe International Airport was the only other Nevada airport outside of the Las Vegas area for which IFR activity under FAA control was reported.

Source: U.S. Department of Transportation, Federal Aviation Administration, Air Traffic Activity Data System (ATADS) Report, 2009, <http://aspm.faa.gov/opsnet/sys/Airport.asp> (Accessed November 11, 2010).

Prepared by: Ricondo & Associates, Inc., November 2010.

While this EA evaluates the effects of the LAS Optimization project at three airports within the Las Vegas area supporting IFR activity, it is important to note that the Clark County Department of Aviation (CCDOA) operates a system of airports within Clark County. This system includes several of the airports mentioned above that are located within the Las Vegas area—LAS, VGT, HND, and Jean Airport. Clark County also operates Overton-Perkins Field, located approximately 70 miles from Las Vegas. Overton-Perkins Field serves VFR traffic and is therefore not affected by LAS Optimization. Furthermore, the County is planning the development of a new supplemental commercial service airport in the Ivanpah Valley between Jean and Primm. This airport has been the subject of an Environmental Impact Statement (EIS) that was being jointly prepared by the FAA and the Bureau of Land Management. In 2010, the CCDOA postponed additional funding for the EIS for the Southern Nevada Supplemental Airport in response to the economic downturn and reduced traffic at LAS. The County continues to work on long-term planning for the Southern Nevada Supplemental Airport. When traffic levels warrant, the County plans to resume funding of the EIS and will request that the FAA and Bureau of Land Management (BLM) resume work on the EIS. ^{27, 28} Because the purpose of LAS Optimization is to optimize air traffic routes and the supporting airspace management structure, the Southern Nevada Supplemental Airport is not

²⁷ Clark County Department of Aviation, Ivanpah Airport Information website, www.mccarran.com/ga_ivanhap.aspx (accessed March 11, 2011).

²⁸ U.S. Department of Transportation, Federal Aviation Administration and Bureau of Land Management, Southern Nevada Supplemental Airport Environmental Impact Statement website, <http://www.snvairsteis.com/> (accessed November 8, 2010).

included in LAS Optimization. Prior to operation of a future Southern Nevada Supplemental Airport, an airspace and procedure design to support IFR traffic using the facility would be required.

The CCDOA also planned the development of the Southern Nevada Regional Heliport near Sloan. The CCDOA completed the Final EA for the Heliport in December 2008²⁹ and the FAA issued a FONSI and ROD in February 2009;³⁰ however, there are no immediate plans to build the heliport due to the economic downturn and budgetary constraints. If the heliport were to be built in the future, the associated helicopter operations would be operated under VFR, so the heliport would not accommodate IFR traffic and IFR procedure design would not be required. Thus, the heliport is not included in the LAS Optimization.

1.3.1 LAS Runway Operating Configurations

As mentioned in Section 1.1.4, airports such as LAS are often operated under several different runway operating configurations defined by conditions such as weather, prevailing wind, and traffic conditions. As a result, it is possible for the runway ends used for arrivals and departures to change multiple times throughout the day. FAA ATCT controllers at LAS generally use five different runway operating configurations, designating primary and secondary arrival and departure runway ends for each configuration. **Exhibit I-6** presents the five runway operating configurations at LAS.

1.3.2 Aircraft Operations Considered in Environmental Assessment

The level of flight activity expected to occur in the future is an important consideration when preparing an EA. The FAA's Terminal Area Forecast (TAF) is used as the activity forecast for this EA. The TAF is the official forecast of aviation activity at FAA facilities. **Table I-2** presents the historical and forecast aircraft operations for the three EA Airports. In general, annual operations at the EA Airports have decreased over the past few years. The FAA's forecast, however, includes increases in operations for all three airports beginning in 2011.

²⁹ Clark County Department of Aviation, *Final Environmental Assessment, Proposed Southern Nevada Regional Heliport, Clark County, Nevada*, December 2008.

³⁰ U.S. Department of Transportation, Federal Aviation Administration, Western-Pacific Region, *Finding of No Significant Impact and Record of Decision, Proposed Southern Nevada Regional Heliport, Las Vegas, Clark County, Nevada*, February 20, 2009.

Table I-2

Historical and Forecast Aircraft Operations at EA Airports

| Year ^{1/} | McCarran International Airport | | North Las Vegas Airport | | Henderson Executive Airport | |
|--------------------|--------------------------------|----------------|-------------------------|----------------|-----------------------------|----------------|
| | Annual Operations | Percent Change | Annual Operations | Percent Change | Annual Operations | Percent Change |
| <i>Historical</i> | | | | | | |
| 2004 | 556,083 | – | 229,512 | – | 85,356 | – |
| 2005 | 605,493 | 8.9% | 225,017 | -2.0% | 82,215 | -3.7% |
| 2006 | 618,717 | 2.2% | 232,794 | 3.5% | 70,605 | -14.1% |
| 2007 | 616,935 | -0.3% | 219,240 | -5.8% | 67,482 | -4.4% |
| 2008 | 606,486 | -1.7% | 179,521 | -18.1% | 65,781 | -2.5% |
| 2009 | 511,063 | -15.7% | 140,197 | -21.9% | 63,749 | -3.1% |
| <i>Forecast</i> | | | | | | |
| 2010 | 488,496 | -4.4% | 140,715 | 0.4% | 65,939 | 3.4% |
| 2011 | 514,200 | 5.3% | 142,487 | 1.3% | 66,671 | 1.1% |
| 2012 | 544,595 | 5.9% | 144,294 | 1.3% | 67,408 | 1.1% |
| 2013 | 571,236 | 4.9% | 146,129 | 1.3% | 68,152 | 1.1% |
| 2014 | 589,503 | 3.2% | 147,992 | 1.3% | 68,905 | 1.1% |
| 2015 | 608,637 | 3.2% | 149,884 | 1.3% | 70,939 | 3.0% |
| 2016 | 625,481 | 2.8% | 151,806 | 1.3% | 73,047 | 3.0% |

Note:

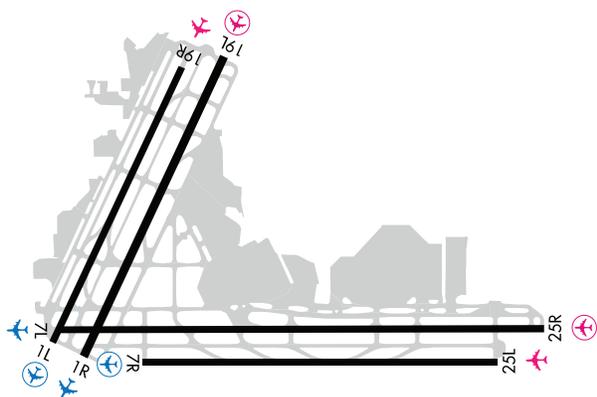
1/ Fiscal Year, beginning October 1 and ending September 30 (e.g., FY 2010 refers to October 1, 2009 through September 30, 2010).

Sources: U.S. Department of Transportation, Federal Aviation Administration, *2009 Terminal Area Forecast*, Fiscal Years 2004–2016, Issued December 2009.

Prepared by: Ricondo & Associates, Inc., January, 2010.

* * * * *

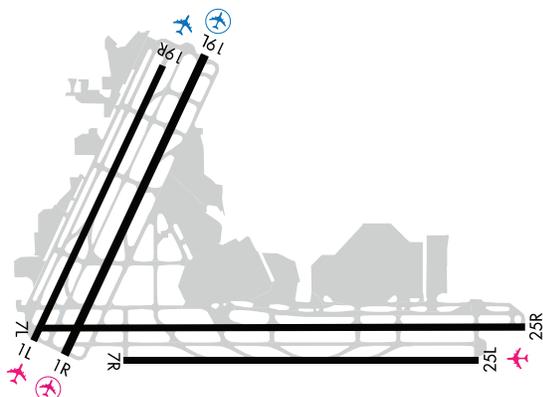
The information provided in this chapter (on the air traffic system, the airspace serving the EA Airports, and the facilities and activity at the EA Airports) serves as background material for understanding the technical issues discussed in the remaining sections of this EA.



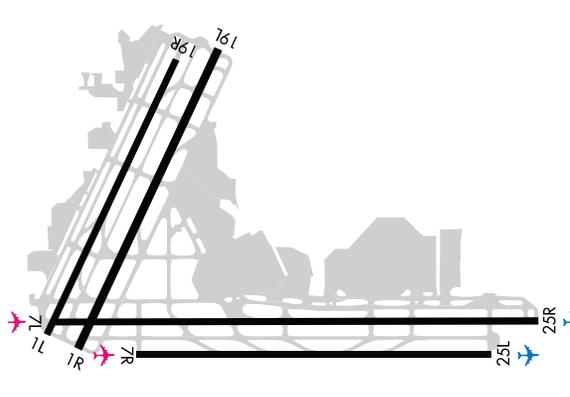
Configuration 1



Configuration 2



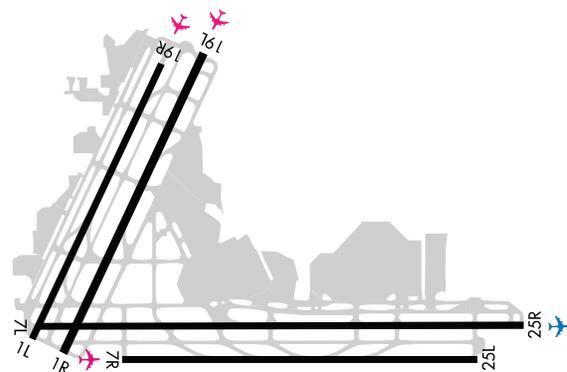
Configuration 3



Configuration 4

Legend

- Primary Departure
- Secondary Departure
- Primary Arrival
- Secondary Arrival



Configuration 6

Note: Configuration 5 is reserved for future use.

Source: Federal Aviation Administration, Las Vegas TRACON Facility Standard Operating Procedures Handbook, Order L30 7110.1K; and [MITRE]; AirNav.com, January 2010.
 Prepared by: Ricondo & Associates, Inc., January 2010.

Exhibit I-6

Not to Scale.

McCarran International Airport Runway Operating Configurations

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