# VOLUME 1:
# NOISE EXPOSURE MAP REPORT

## FAR Part 150 Noise Compatibility Study Update
## McCarran International Airport

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# I. Introduction

## 1.1 Airport Location and Setting

McCarran International Airport (the Airport) is owned by Clark County, Nevada, and operated by the Clark County Board of County Commissioners through the Clark County Department of Aviation. As shown on **Exhibit I-1**, Clark County is located at the southern tip of Nevada, bordering California and Arizona.

The Airport is approximately 5 miles south of downtown Las Vegas and east of and adjacent to the southern end of Las Vegas Boulevard (the Las Vegas Strip). As the primary air carrier airport serving Clark County and the surrounding region, McCarran International Airport supports the strong tourist and convention industries that drive the economy of southern Nevada.

The Airport occupies about 3,000 acres of land[1] and the Airport Reference Point is at an elevation of 2,181 feet above mean sea level (MSL). The average annual temperature at the Airport is 75°F, and the mean maximum temperature during the hottest month of the year (July) is 104°F. Primary access to the Airport terminal and public parking area is provided via Paradise Road (southbound) from Tropicana Avenue, via the Airport Connector from the Interstate Highway 215 (I-215) Beltway through a tunnel under east-west Runways 7L-25R and 7R-25L, and via Russell Road from Eastern Avenue.

## 1.2 Airport History

American aviator George Crockett established an airfield in 1942 on the site currently occupied by McCarran International Airport. Clark County purchased the site (Alamo Airport) in 1948, and established the Clark County Public Airport. Later the same year, the airport was renamed McCarran Field in honor of longtime Nevada politician, aviator, and U.S. Senator, Pat McCarran. At about the same time, all commercial flights in Las Vegas were relocated to McCarran Field.

Facilities at McCarran Field, including the terminal, were originally located just east of Las Vegas Boulevard South. In 1963, the passenger terminals were moved to their present location near Paradise Road. Major expansions to the terminal, runways, and parking areas were completed in the 1960s, 1970s, 1980s, and 1990s to accommodate the increasing demand placed on the Airport by the burgeoning tourism industry.

[1] Clark County owns approximately 7,000 additional acres of land west and south of the Airport that, although not contiguous to the primary Airport property, is under the administrative jurisdiction of the County's Department of Real Property Management. Some of the land was acquired as an element of the Airport's noise compatibility program. Other parcels were acquired through a land transfer from the U.S. Department of the Interior, Bureau of Land Management for compatible-land-use-planning purposes.

## Exhibit I-1 Airport Location Map

Over the past 20 years, passenger terminal facilities have been developed at the Airport through incremental improvements and expansions, including:

- New Terminal 1 ticketing and baggage claim buildings (1985)
- Concourse C construction – 16 gates (1987)
- Terminal 2 (Charter/International Terminal) rehabilitation project (1991)
- Concourse C – Four-gate expansion (1994)
- Long-Term Parking Garage – 6,000 spaces (1996)
- Terminal 1 ticketing building expansion (1998)
- Terminal 1 baggage claim expansion (1998)
- Concourse D construction – 26 gates (1998)
- Northeast extension of Concourse D – a net of 10 additional gates (2005)

The current landside configuration of Terminal 1 – with separate ticketing and baggage claim buildings – was implemented as part of the McCarran 2000 Plan in 1985. Concourse C, which is connected to Terminal 1 by the initial automated transit system (ATS) at the Airport, became operational in 1987, with 16 gates. Existing buildings were rehabilitated and entered into service in 1991 to create the existing configuration of Terminal 2, which serves most international and charter flights at the Airport. Concourse D, also served by an ATS, initially entered into service in 1998 with 26 gates, and was expanded to 36 gates with the opening of the northeast wing of the concourse in April 2005.

The northwest wing of Concourse D, planned to provide a net increase of seven gates, is in the design phase. Construction began in early 2006, with completion anticipated in early 2008. The project will result in a total of 43 aircraft parking positions (gates) on Concourse D, all served from Terminal 1 via the existing ATS. The new gates will be served by an expanded aircraft ramp area north of Concourse D, providing dual Airplane Design Group (ADG) IV taxilanes as well as single ADG V/VI taxilane capability[2] around the entire east end of Concourse D. In 2010, the first phase of a new passenger terminal (Terminal 3) is scheduled to be completed. Ultimately, Terminal 3 is planned to provide 14 frontal gates, additional landside passenger processing capability, including ticketing, baggage claim, concessions, passenger services, federal inspection services (FIS) facilities, access and curbside roadways, and vehicular parking facilities. When the terminal and concourse expansions are completed, the Airport will have approximately 120 gates.

The Airport currently has four air carrier runways. Runway 7L-25R (formerly Runway 7-25) and Runway 1R-19L (formerly Runway 1-19) were constructed in the 1940s. Runway 1L-19R was constructed in the 1970s and Runway 7R-25L was constructed in the late 1980s and opened in 1990. Major runway extensions were completed during the mid to late 1990s on Runways 7L-25R and 7R-25L and Runway 1L-19R was upgraded to a full air carrier runway and extended in the late 1990s. No expansion or modifications to the runways are proposed or anticipated in the future.

[2] As defined in FAA Advisory Circular 150/5300-13, *Airport Design* **[I-1]**, ADG IV aircraft wingspans range from 118 feet $\leq$ 171 feet, ADG V aircraft wingspans range from 171 feet $\leq$ 214 feet, and ADG VI aircraft wingspans range from 214 feet $\leq$ 262 feet. ADG IV parallel taxilane separation is 198 feet from taxilane centerline to taxilane centerline, while the distance from the centerline of an ADG V taxilane to a fixed or movable object is 160 feet and the distance from the centerline of an ADG VI taxilane to a fixed or movable object is 193 feet.

## 1.3 Airport Noise Compatibility Planning Overview

The first documented noise studies for the Airport were prepared in the early 1980s An Airport Noise Control and Land Use Compatibility (ANCLUC) study was completed in 1981 and subsequently updated in 1983. The ANCLUC studies provided several recommendations to reduce the effects of aircraft noise on the community, some of which were implemented.

ANCLUC studies were phased out across the United States in the early 1980s after the issuance of Federal Aviation Regulations (FAR) Part 150, *Airport Noise Compatibility Planning* **[I-2]**. Compared to ANCLUC studies, FAR Part 150 studies increased the amount of funding available to airport operators for implementing recommended noise abatement and mitigation programs, especially when the programs involved off-airport land uses.

The Airport's first FAR Part 150 Noise Compatibility Study, completed by KPMG Peat Marwick in 1989, included noise exposure maps for 1987 and 1992 and a detailed noise compatibility program (NCP) for the Airport. In May 1992, the Clark County Board of County Commissioners retained Brown-Buntin Associates, Inc., to assist in updating the FAR Part 150 Noise Exposure Maps and NCP for the Airport. The 1994 FAR Part 150 study update included noise exposure maps for 1992 and 1997 and a new noise compatibility program. The Department of Aviation also developed noise exposure maps in 1998 in support of a proposed amendment to the Clark County Airport Environs Overlay District map that was codified in May 1990. Although the 1998 noise exposure maps were not submitted to the FAA as a formal NEM submittal, they have been used by the Department of Aviation and other government agencies in support of airport/community land use compatibility planning.

## 1.4 Purpose of the Current Noise Compatibility Study Update

The Department of Aviation is updating the FAR Part 150 Noise Compatibility Study for McCarran International Airport to reflect changes in aircraft operations, fleet mix, and land uses in the Airport environs since the last FAR Part 150 study was approved in February 1995. In addition to updating the noise exposure maps, the study update process provides the Department of Aviation an opportunity to: (1) review the status and effectiveness of those noise abatement and mitigation measures recommended in the previous NCP, (2) identify which NCP measures should be maintained for continued implementation, (3) incorporate noise reduction measures currently being pursued by the Department of Aviation which are not in the previous NCP, and (4) identify new measures to further reduce aircraft noise exposure and its effects in the Airport environs.

As mentioned above, the last official FAR Part 150 study for McCarran International Airport was completed in 1994 and approved in 1995. While FAR Part 150 recommends updating noise compatibility programs every 5 years to address changes in aircraft activity, because of extenuating circumstances, such as the dramatic decreases in passenger traffic and aircraft operations caused by the terrorist attacks on September 11, 2001, the Department of Aviation delayed updating the FAR Part 150 study until 2005. Updating the FAR Part 150 study was also delayed in light of changes in airspace and air traffic control procedures at the Airport resulting from the FAA's implementation of the June 2001 Las Vegas Four Corner-Post Plan (FCPP) and recent amendments, as part of the National Airspace Redesign (NAR) initiative.

The noise exposure maps included in the 1994 FAR Part 150 Noise Compatibility Study report do not reflect the fleet of aircraft that currently operate at the Airport. At the time the previous FAR

Part 150 study was prepared, the airlines were under federal mandate to eliminate FAR Part 36 Stage 2 aircraft (weighing more than 75,000 pounds) from their fleets. All civilian airline aircraft fleets became 100 percent Stage 3 compliant by January 1, 2000. Although some airlines elected to modify their existing Stage 2 aircraft (with hushkits) rather than purchase new aircraft, the phase-out of Stage 2 aircraft has resulted in a decrease in the area exposed to aircraft noise at nearly all airports despite nationwide growth in aviation activity. The federal government, in conjunction with its European counterparts, is now studying the feasibility of enacting Stage 4 regulations, which would reduce aircraft noise even more. However, while aircraft are getting quieter, they still generate considerable noise and will continue to create annoyance in noise-sensitive areas around the Airport.

The 1994 FAR Part 150 study noise exposure maps also do not reflect changes in runway use at the airport since 1994 or the significant increase in aircraft operations at the Airport in the late 1990s and early 2000s. An update to the FAR Part 150 Noise Compatibility Study will provide the Department of Aviation with current information regarding aircraft noise exposure in the vicinity of McCarran International Airport. Working closely with the Clark County Department of Comprehensive Planning and other local jurisdictions, the Department of Aviation intends to use the FAR Part 150 Noise Compatibility Study update findings to: (1) revise the codified Airport Environs Overlay District map for McCarran International Airport, (2) amend comprehensive land use plans and zoning programs for communities in the vicinity of the Airport, and (3) update boundaries for remedial noise mitigation measures, which could include revising the boundaries for voluntary land acquisition areas.

## 1.5 Approach to Planning

In March 2005, the Department of Aviation retained a team of consultants to assist in updating the McCarran International Airport FAR Part 150 Noise Compatibility Study in accordance with FAR Part 150. Ricondo & Associates, Inc. was retained as the overall project manager for the process, and also to conduct operational analyses, to manage FAA coordination efforts, and to prepare all FAR Part 150 documentation. Brown-Buntin Associates, Inc. was retained as the acoustical consultant, responsible for the noise measurement program and development of the noise exposure maps. Katz & Associates was retained to assist with the public and community involvement program, public meeting facilitation and notices, and with the public hearing aspects of the FAR Part 150 Noise Compatibility Study update. Kaplan Kirsch Rockwell was retained to provide outside legal counsel and advice regarding the legal implications of FAR Part 150 Noise Compatibility Study recommendations.

This FAR Part 150 Noise Compatibility Study update consists of two primary elements: Airport noise exposure maps and a noise compatibility program. The noise exposure maps depict existing and future aircraft noise levels in the areas around the Airport. This report describes the analysis, methodology, assumptions and findings associated with development of the noise exposure maps. For McCarran International Airport, the existing noise exposure map is based on aircraft operations at the Airport in calendar year 2004, the most recent full calendar year for which aircraft operations (landings and takeoffs) information were available when the maps were prepared. Future noise exposure maps were prepared for 2011 conditions in conformance with FAR Part 150, which requires preparation of a noise exposure map representing forecast aircraft operations 5 years after the NCP date of submittal to the FAA (anticipated in 2006). A noise exposure map for 2017 was also prepared, to assist Clark County and other jurisdictions with long-range land use planning.

Development of the Noise Compatibility Program (NCP, or the Program) update consisted of the following steps:

1. Identifying and evaluating the various noise abatement measures available to the Department of Aviation, the FAA, and Airport airlines/tenants to reduce the extent of aircraft noise exposure over existing and planned noise-sensitive land uses in the Airport environs.

2. Following consultation with the Department of Aviation, the FAA, the airlines, other Airport tenants and users, local planning agencies, local elected officials, and the general public, recommending feasible and noise abatement measures for the Airport and developing a process and timetable for implementation.

3. Revising the noise exposure map for 2011 and documenting the benefits to be derived from implementation of the noise abatement measures.

4. Considering that aircraft noise will continue to affect residents in the vicinity of the Airport after implementation of the noise abatement measures, identifying and evaluating other options (i.e., noise mitigation measures) available to the local jurisdictions to lessen the effects of aircraft noise on people living and working in the aircraft noise exposure area. These noise mitigation measures include programs such as property acquisition and soundproofing to assist affected residents, and land use controls such as zoning and comprehensive planning to limit the development of future incompatible land uses in areas exposed to high levels of aircraft noise.

5. Recommending feasible noise mitigation measures for the McCarran International Airport environs following consultation with the Department of Aviation, the FAA, the airlines, other Airport tenants and users, local planning agencies, local elected officials, and the general public. Also, developing a process, timetable, and financial plan for implementing the noise mitigation measures.

## 1.6 Consultation and Public Involvement

The airlines serving the Airport, other Airport tenants and users, the FAA, local planning agencies, local elected officials, and the general public were involved in the development of the noise exposure maps. At the beginning of the project, a Public Working Group was formed. The Public Working Group was composed of representatives from the following organizations, agencies, and groups:

- Community representatives: Rhodes Ranch area, Summerlin/Redrock County Club area, The Lakes area, Enterprise area, Paradise area, Spanish Trail area, Southern Highlands area, and Winchester area.
- Cities of Henderson, Boulder City, Las Vegas, and North Las Vegas
- Clark County Department of Comprehensive Planning
- FAA McCarran Airport Traffic Control Tower
- FAA Burlingame Airports District Office
- Southwest Airlines and U.S. Air
- National Business Aviation Association, Inc.
- Las Vegas Convention and Visitors Authority
- Greater Las Vegas Association of Realtors

Meetings of the Public Working Group that were focused on the 2004, 2011, and 2017 noise exposure maps were held on:

Meeting #1 - Tuesday, June 21, 2005
Meeting #2 - Tuesday, July 26, 2005
Meeting #3 - Tuesday, August 23, 2005
Meeting #4 - Tuesday, September 27, 2005
Meeting #5 - Tuesday, October 25, 2005

Members of the general public were invited to attend the Public Working Group meetings. To ensure adequate public involvement during the development of the noise exposure maps, the Project Team also held two public open houses (on August 24, 2005, and October 26, 2005), at which citizens provided oral and written comments about the Airport and Airport-related noise issues. The published notices for the public open houses and comments received during preparation of the noise exposure maps are included in Volume 3 of this FAR Part 150 Noise Compatibility Study Update "Compilation of Public Comments and Responses".

## 1.7 Report Organization

This report provides the noise exposure maps for McCarran International Airport and the technical documentation required under FAR Part 150. The remainder of this report is organized as follows:

| | |
|---|---|
| Section II: | Summary of the aviation activity forecasts for the Airport. |
| Section III: | Description of the existing Airport and currently planned improvements that could affect future noise exposure; existing and planned land use in the Airport environs; and zoning and other land use controls available to the local jurisdictions to achieve land use compatibility. |
| Section IV: | Summary of the aircraft noise analysis, including the assumptions and inputs used to develop the existing and future noise exposure maps. |
| Section V: | Delineation of the noise exposure maps and documentation of the number of people and types of noise-sensitive land uses exposed to aircraft noise. |
| Section VI: | A list of references used in preparing the documentation for the FAR Part 150 noise exposure maps for the Airport. |
| Appendix A: | Glossary of Terms |
| Appendix B: | Community Land Use Plans |
| Appendix C: | Radar and Generalized Flight Tracks for McCarran International Airport |
| Appendix D: | Aircraft Noise Monitoring Report – Summer 2005 |

# II. Aviation Activity Forecasts

## 2.1 Introduction

FAR Part 150 requires that noise exposure maps (NEMs) be prepared for two scenarios—existing conditions and conditions 5 years into the future. Each map reflects the annual average number of daily aircraft operations for the specified year. Typically, data for the most recent full calendar year for which data are available at the time the maps are prepared are used to represent existing conditions. In this FAR Part 150 Noise Compatibility Study Update, operations data for 2004 were used to represent existing conditions and forecast operations in 2011 were used to represent 5-year future conditions. Although not required under FAR Part 150, the Department of Aviation also decided to quantify aircraft noise exposure for calendar year 2017 to assist local jurisdictions with long-range land use compatibility planning in the Airport environs.

Because the number of operations on the average day of the year is determined by dividing the total number of operations throughout the year by 365, the number of aircraft operations on any given day at McCarran International Airport will be higher than the average number on some days and lower than the average number on other days. Factors that typically cause fluctuations in the daily number of aircraft operations include weekly, monthly, and seasonal variations in demand, weather conditions, patterns of tourism or business travel, and the economy.

Actual aircraft operations data were used to develop the 2004 baseline noise exposure maps. Aviation activity forecasts included in an airport's master plan are typically used as the basis for the activity forecasts used in the INM for the purpose of preparing future noise exposure maps in FAR Part 150 studies. The most recent FAA-approved forecasts for McCarran International Airport were prepared in June 2005 by URS Corporation (URS).

## 2.2 The 2005 Forecast

The most recent FAA-approved aviation activity forecasts for the Airport are documented in the report *Draft Forecast of Commercial Service Airport Activity in the Las Vegas Metropolitan Area* (the 2005 Forecast) **[II-1]**.[1] Recent economic concerns and the events of September 11, 2001, affected the accuracy of short-term aviation activity forecasts nationwide. In its latest forecast of the U.S. aviation industry, *FAA Aerospace Forecasts, Fiscal Years 2005-2016,* published in March 2005 **[II-2]**, the FAA estimated that national aviation activity would return to pre-September 11, 2001, levels by the end of 2005. Given continued economic uncertainty, international political concerns, and the current conflict with Iraq, it is difficult to accurately forecast near-term aviation activity. The 2005 Forecast reflects the expected near-term effects of recent events on local aviation activity; however, in developing the forecasts, URS assumed that growth in aviation activity would be relatively unconstrained beyond 2005.

The following sections present information regarding historical and forecast enplaned passengers and aircraft operations (takeoffs and landings) at McCarran International Airport, as derived from the 2005 Forecast.

[1] This forecast is also being used in support of planning and environmental studies for the proposed supplemental air carrier airport in the Ivanpah Valley.

## 2.3 Enplaned Passengers

### 2.3.1 Historical Enplaned Passengers

As shown in **Table II-1**, the number of enplaned passengers at the Airport increased from approximately 9.6 million in 1990 to approximately 18.4 million in 2000, a total increase of over 91 percent. The increase represents an average annual growth rate of approximately 6.8 percent over the period, compared with 3.4 percent average annual growth for the nation as a whole. Between 2000 and 2004, the number of enplaned passengers at the Airport increased an average of 3.0 percent per year compared with an average annual decrease of 0.6 percent in total U.S. enplaned passengers. The highest percentage increases in the numbers of passengers at the Airport since 1990 occurred in 1994, 1999, 2000, and 2004. The year-over-year increases can be attributed primarily to the rapid expansion of the Las Vegas economy, resident population growth, the development of major new resort complexes, and airlines providing service to Las Vegas at attractive fares.

**Table II-1**

Enplaned Passengers in the United States and at McCarran International Airport—1990-2004

| | United States (Domestic Only) | | McCarran International Airport | | |
|---|---|---|---|---|---|
| Year | Enplaned Passengers | Percent Change [1/] | Enplaned Passengers | Percent Change [1/] | Market Share [2/] |
| 1990 | 457,169,000 | — | 9,578,514 | — | 2.1% |
| 1991 | 445,299,315 | -2.6% | 10,116,566 | 5.6% | 2.3 |
| 1992 | 463,670,761 | 4.1 | 10,444,992 | 3.2 | 2.3 |
| 1993 | 469,310,401 | 1.2 | 11,237,945 | 7.6 | 2.4 |
| 1994 | 510,031,965 | 8.7 | 13,451,154 | 19.7 | 2.6 |
| 1995 | 529,980,056 | 3.9 | 14,035,404 | 4.3 | 2.6 |
| 1996 | 556,972,388 | 5.1 | 15,269,439 | 8.8 | 2.7 |
| 1997 | 577,845,747 | 3.7 | 15,165,412 | -0.7 | 2.6 |
| 1998 | 590,417,191 | 2.2 | 15,132,220 | -0.2 | 2.6 |
| 1999 | 610,924,928 | 3.5 | 16,886,869 | 11.6 | 2.8 |
| 2000 | 641,200,000 | 5.0 | 18,443,481 | 9.2 | 2.9 |
| 2001 | 626,800,000 | -2.3 | 17,550,371 | -4.8 | 2.8 |
| 2002 | 574,500,000 | -8.3 | 17,483,007 | -0.4 | 3.0 |
| 2003 | 587,900,000 | 2.3 | 18,078,897 | 3.4 | 3.1 |
| 2004 | 627,200,000 | 6.7 | 20,717,217 | 14.6 | 3.3 |
| | | Average Annual Growth Rate | | | |
| 1990-2000 | | 3.4% | | 6.8% | |
| 2000-2004 | | -0.6% | | 3.0% | |

Notes:
1/ Percent change compared with previous year.
2/ Percentage of all U.S. passengers enplaned at McCarran International Airport.

Sources: Clark County Department of Aviation records and the Federal Aviation Administration.
Prepared by: Ricondo & Associates, Inc.

## 2.3.2 Forecast Enplaned Passengers

Forecasts of enplaned passengers were prepared on the basis of linear regression and market share analyses. **Table II-2** presents the forecasts of enplaned passengers used in this FAR Part 150 Study Update. The forecasts presented in Table II-2 reflect:

- The correlation between available hotel/motel rooms in the Las Vegas Region and the number of enplaned passengers at McCarran International Airport.
- Projections of available hotel/motel rooms provided by the Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas, along with other known or anticipated resort development projects.
- The historical share of total U.S. passengers enplaned at McCarran International Airport and the anticipated share of U.S. passengers to be enplaned at the Airport over the planning period.
- A large airline base, competitive airfares, and growth in service by the low-cost carriers, including Southwest Airlines.

**Table II-2**

Forecast Enplaned Passengers in the United States and at McCarran International Airport—2004-2025

| | United States | | McCarran International Airport | | |
|---|---|---|---|---|---|
| Year | Enplaned Passengers | Percent Change [1/] | Enplaned Passengers | Percent Change [1/] | Market Share [2/] |
| 2004 | 627,200,000 | — | 20,717,217 | | 3.3% |
| Forecast | | | | | |
| 2011 | 801,800,000 | 27.8% | 24,725,814 | 19.3% | 3.1% |
| 2017 | 956,600,000 | 52.5 | 29,020,181 | 40.1 | 3.0 |
| 2025 | 1,158,600,000 | 84.7 | 35,927,981 | 73.4 | 3.1 |
| | | Average Annual Growth Rate | | | |
| 2004-2025 | 3.0% | | 2.7% | | |

Notes:
1/ Overall percentage change from calendar year 2004 number of enplaned passengers.
2/ Percentage of all U.S. passengers enplaned or forecast to be enplaned at McCarran International Airport.

Sources: URS Corporation, *Draft Forecast of Commercial Service Airport Activity in the Las Vegas Metropolitan Area*, June 8, 2005; Federal Aviation Administration (historical and forecast U.S. through 2016); Ricondo & Associates, Inc. (U.S. extrapolated 2017 through 2025).
Prepared by: Ricondo & Associates, Inc.

The number of enplaned passengers in the Las Vegas Region is forecast to increase from approximately 20.7 million in 2004 to approximately 35.9 million in 2025, representing an annual average growth rate of 2.7 percent, compared with an annual average growth rate of 3.0 percent forecast by the FAA for the nation as a whole. As shown, the Region's share of U.S. enplaned passengers is expected to remain between 3.0 percent and 3.1 percent, consistent with its recent historical share. Additional information regarding the forecast of enplaned passengers is provided in Section 5.3 of the URS report.

## 2.4 Aircraft Operations

### 2.4.1 Historical Aircraft Operations

Historical aircraft operations at McCarran International Airport for 1990 through 2004 are presented in **Table II-3.** Numbers of operations have fluctuated over the past 15 years, with exceptional growth in some years and negative growth in other years.

### 2.4.2 Forecast Aircraft Operations

**Table II-4** presents forecast aircraft operations at the Airport in 2011, 2017, and 2025. As shown in the table, total aircraft operations at the Airport are forecast to increase from 544,679 in 2004 to 643,947 in 2011. If airfield, airspace, or roadway capacity does not constrain operations at the Airport, annual aircraft operations at the Airport are forecast to number 746,641 in 2017 and 922,316 in 2025.

#### 2.4.2.1 Air Carrier Aircraft Operations

As shown in Table II-4, the number of air carrier aircraft operations at McCarran International Airport is forecast to increase from 366,578 in 2004 to 454,391 in 2011; 525,657 in 2017; and 646,253 in 2025. The increase represents average annual growth of 2.7 percent between 2004 and 2025.

#### 2.4.2.2 Air Taxi and Other Aircraft Operations

Table III-4 also presents forecasts of air taxi and other aircraft operations at the Airport between 2004 and 2025. These categories, which are further defined in **Appendix A**, include all non-passenger airline aircraft operations, including military, air taxi, air tour, and general aviation operations. By definition, these aircraft do not access the passenger airline terminals (Terminals 1 and 2) at McCarran International Airport and would not use facilities at Terminal 3. While the demand for non-passenger airline aircraft services is expected to grow over the 20-year planning period, it is expected that demand in some aviation sectors, notably general aviation, will be served at other airports in the Clark County Airport System. Efforts by the Department of Aviation to enhance existing reliever airports, primarily North Las Vegas Airport and Henderson Executive Airport, are expected to enable these facilities to accommodate a higher share of the region's corporate and general aviation operations. At McCarran International Airport, the numbers of general aviation and corporate operations are forecast to remain almost constant over the planning period. Similarly, military operations are expected to remain constant. Air taxi operations, which include helicopters used for air tours, are expected to increase at an average annual rate of 3.2 percent between 2004 and 2025.

## 2.5 Passenger and Cargo Airlines Serving McCarran International Airport

**Table II-5** lists the 21 scheduled airlines and 27 international/charter passenger airlines serving the Airport as of the fourth quarter of 2005. Several other charter airlines provide seasonal service at the Airport. The Airport is also served by four all-cargo carriers.

**Table II-3**

Historical Aircraft Operations at McCarran International Airport—1990-2004

| | Itinerant Operations | | | | Local Operations | | |
|---|---|---|---|---|---|---|---|
| Year | Air Carrier | Air Taxi | General Aviation | Military | General Aviation | Military | Total Operations |
| 1990 | 202,850 | 81,326 | 91,490 | 4,660 | 19,234 | 201 | 399,761 |
| 1991 | 210,127 | 81,904 | 82,946 | 5,311 | 17,758 | 200 | 398,246 |
| 1992 | 199,591 | 96,908 | 89,690 | 8,446 | 16,785 | 180 | 411,600 |
| 1993 | 211,472 | 105,474 | 105,170 | 16,693 | 18,152 | 274 | 457,235 |
| 1994 | 238,518 | 107,374 | 112,692 | 15,917 | 21,268 | 171 | 495,940 |
| 1995 | 258,516 | 104,221 | 105,663 | 17,818 | 17,325 | 155 | 503,698 |
| 1996 | 281,214 | 71,998 | 89,038 | 18,484 | 15,727 | 50 | 476,511 |
| 1997 | 294,822 | 52,843 | 92,929 | 21,069 | 11,464 | 0 | 473,127 |
| 1998 | 297,000 | 40,374 | 93,714 | 28,784 | 10,818 | 17 | 470,707 |
| 1999 | 326,872 | 66,706 | 118,993 | 15,529 | 14,822 | 0 | 542,922 |
| 2000 | 336,682 | 57,633 | 102,061 | 21,930 | 2,994 | 0 | 521,300 |
| 2001 | 323,579 | 78,646 | 73,694 | 17,746 | 57 | 0 | 493,722 |
| 2002 | 318,119 | 86,440 | 71,558 | 20,639 | 89 | 0 | 496,845 |
| 2003 | 313,654 | 93,053 | 72,855 | 21,368 | 99 | 0 | 501,029 |
| 2004 | 366,578 | 106,348 | 69,482 | 2,208 | 63 | 0 | 544,679 |
| | Average Annual Growth Rate | | | | Average Annual Growth Rate | | |
| | 4.3% | 1.9% | -1.9% | -5.2% | -33.5% | -100.0% | 2.2% |

Source: FAA Air Traffic Activity Data Systems (ATADS) data.
Prepared by: Ricondo & Associates, Inc.

**Table II-4**

Forecast Aircraft Operations at McCarran International Airport—2004-2025

| Year | Air Carrier [1/] | Air Taxi [2/] | Other Aircraft Operations [3/] | Total Aircraft Operations |
|---|---|---|---|---|
| 2004 | 366,578 | 106,348 | 71,753 | 544,679 |
| Forecast | | | | |
| 2011 | 454,391 | 117,818 | 71,738 | 643,947 |
| 2017 [4/] | 525,657 | 149,810 | 71,174 | 746,641 |
| 2025 | 646,253 | 204,297 | 71,766 | 922,316 |
| Average Annual Growth Rate | | | | |
| 2004-2025 | 2.7% | 3.2% | 0.0% | 2.6% |

Notes:
1/ Air Carrier includes passenger, commuter, and air cargo aircraft operations.
2/ Air Taxi includes fixed wing and helicopter air tour operations.
3/ Other Aircraft Operations include general aviation and military operations.
4/ Interpolated.

Sources: Clark County Department of Aviation (historical); URS Corporation, *Draft Forecast of Commercial Service: Airport Activity in the Las Vegas Metropolitan Area,* June 8, 2005 (forecast).
Prepared by: Ricondo & Associates, Inc.

**Table II-5**

Passenger Airlines Serving McCarran International Airport in Fourth Quarter 2005

| Scheduled Domestic | International/Charter | All-Cargo Carriers |
|---|---|---|
| AirTran Airways | AeroMexico | Airborne Express |
| Alaska Airlines | Air Atlanta Icelandic | Ameriflight |
| Allegiant Air | Air Canada | FedEx |
| Aloha Airlines | Air North | West Air |
| America West Airlines | Air Tours International | |
| American Airlines | Air Transat | |
| American Trans Air (ATA) | Allegro | |
| Continental Airlines | Aviacsa Airlines | |
| Delta Air Lines | British Midland Airways (bmi) | |
| Frontier Airlines | Casino Express Airlines | |
| Independence Air | Champion Air | |
| JetBlue Airways | Condor Airlines | |
| Midwest Express | Eagle/Scenic Airlines | |
| Northwest Airlines | Harmony Air | |
| Song | Hawaiian Airlines | |
| Southwest Airlines | Hooters Air | |
| Spirit Airlines | Japan Airlines | |
| Sun Country Airlines | Mexicana de Aviacion | |
| Ted | Omni Air International | |
| United Airlines | Philippine Airlines | |
| US Airways | Ryan International Airlines | |
| | Sky King | |
| | Sky Service | |
| | Thomas Cook Airlines | |
| | TransMeridian Airlines | |
| | Virgin Atlantic Airways | |
| | WestJet Airlines | |

Source: Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

# III. Existing Airport and Environs Conditions

McCarran International Airport is located in Clark County Nevada, about 5 miles south of downtown Las Vegas, Nevada near the southern end of the Las Vegas Strip. The Airport primarily serves the air carrier and air cargo demand of the Las Vegas Region. The FAA defines Las Vegas as a large hub, and the Airport is a primary commercial service airport in the National Plan of Integrated Airport Systems (NPIAS). Primary commercial service airports have the capability to provide nonstop commercial passenger service to destinations farther than 1,500 miles.

## 3.1 Existing Airport Facilities

**Exhibit III-1** depicts the location of the Airport with respect to local jurisdictions. The Airport is located in unincorporated Clark County, south of the City of Las Vegas and northwest of the City of Henderson. The Airport is bordered by Sunset Road to the south, Las Vegas Boulevard to the west**,** Tropicana Avenue and Russell Road to the north, and Paradise Road and Eastern Avenue to the east. As shown on **Exhibit III-2**, all vehicular traffic to the passenger terminal buildings currently enters the Airport from one of three entrances: along Paradise Road from the north, through the Airport Tunnel (I-215) from the south, or along Russell Road from the east. Access to the Air Cargo Center is provided via Russell Road either from Eastern Avenue, Paradise Road and Swenson Street, or the Airport Connector Tunnel. Las Vegas Boulevard (U.S. Highway 91), Tropicana Avenue, and Koval Lane are the primary access roadways to the Eagle Air Terminal and the fixed base operators (FBO) and general aviation facilities on the west side of the Airport.

### 3.1.1 Airfield Facilities

Airfield facilities include runways, taxiways, aprons and airfield lighting. These facilities are described in the following sections and depicted on Exhibit III-2.

#### 3.1.1.1 Runways

The Airport has four runways: Runway 7L-25R is 14,505 feet long and 150 feet wide; Runway 7R-25L is 10,525 feet long and 150 feet wide; Runway 1R-19L is 9,770 feet long and 150 feet wide; and Runway 1L-19R is 8,985 feet long and 150 feet wide. Exhibit III-2 shows the layout of the Airport and the runway system. Runway data are summarized in **Table III-1**.

#### 3.1.1.2 Taxiways

The existing taxiway system is also depicted on Exhibit III-2. As shown, a series of taxiways and taxilanes connect the four runways to the passenger terminal complex, the air cargo apron, FBO facilities, and the general aviation area. Each of the four runways has a full-length parallel taxiway. Runways 7R-25L and 1R-19L have angled exit taxiways to expedite aircraft exiting the runways after landing.

Aircraft holding pads are located at the east ends of Runways 7L-25R and 7R-25L, at the north ends of and between Runways 1L-19R and 1R-19L, and southwest of Terminal 1, adjacent to Taxiway B.

## Exhibit III-1 Airport Vicinity Map

## Exhibit III-2 Airport Layout Plan, McCarran International Airport

**Table III-1**

Runway Characteristics, McCarran International Airport

| | Runway 7L-25R | | Runway 7R-25L | | Runway 1L-19R | | Runway 1R-19L | |
|---|---|---|---|---|---|---|---|---|
| | 7L | 25R | 7R | 25L | 1L | 19R | 1R | 19L |
| Runway pavement length (feet) | 14,505 | 14,505 | 10,525 | 10,525 | 8,985 | 8,985 | 9,770 | 9,770 |
| Runway pavement width (feet) | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Displaced arrival threshold (feet) | 2,132 | 1,400 | None | None | 588 | None | 491 | 878 |
| Runway landing length (feet) [1/] | 11,961 | 12,750 | 10,525 | 10,525 | 8,401 | 8,397 | 8,676 | 8,740 |
| Effective gradient | 1.04% | 1.04% | 1.05% | 1.05% | 0.99% | 0.99% | 0.99% | 0.99% |
| Approach surface slope | 20:1 | 50:1 | 20:1 | 50:1 | 50:1 | 34:1 | 34:1 | 34:1 |
| Runway threshold elevation (feet above MSL) | 2,156 | 2,044 | 2,157 | 2,048 | 2,179 | 2,089 | 2,170 | 2,081 |
| Runway marking | Nonprecision | Precision | Nonprecision | Precision | Nonprecision | Precision | Nonprecision | Nonprecision |
| Runway lighting | HIRL, PAPI | HIRL, PAPI, MALSR | HIRL, PAPI, REIL | HIRL, PAPI, MALSF | HIRL, PAPI, MALSF, REIL | HIRL, PAPI, REIL | MIRL, PAPI, REIL | MIRL, PAPI, REIL |
| Instrument runway | Visual | Precision (ILS equipped) | Visual | Precision (ILS equipped) | Precision (ILS equipped) | Visual | Nonprecision | Visual |

Notes:
HIRL = High-intensity runway lights.
ILS = Instrument landing system.
MALSF = Medium intensity approach lighting system with sequenced flashers on the last three light bars.
MALSR = Medium intensity approach lighting system with runway alignment indicator lights.
MIRL = Medium intensity runway lights.
MSL = Mean sea level.
PAPI = Precision approach path indicator.
REIL = Runway end identifier lights.

1/ Declared landing distance available (LDA), which accounts for displaced landing thresholds and provisions for the necessary Runway Safety Area.
2/ Minimum visibility for approaches, in statute miles.

Source: Airport Layout Plan, McCarran International Airport, February 2005
Prepared by: Ricondo & Associates, Inc.

#### 3.1.1.3 Airfield Lighting

McCarran International Airport is equipped with a variety of lighting aids that assist pilots with approach guidance and landing and taxiing operations at night and during instrument meteorological conditions (IMC). Airfield lighting equipment at the Airport is described in the following paragraphs and generally consists of approach lighting systems, visual approach slope indicators (VASIs), and runway and taxiway lighting.

**Approach lighting systems** assist pilots with the transition from instrument flight to visual flight during landing operations. Approach lighting systems also provide visual guidance for nighttime approaches during visual flight rule (VFR) conditions. The 25R end of Runway 7L-25R is equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). The 25L end of Runway 7R-25L and the 1L end of Runway 1L-19R are equipped with a medium intensity approach lighting system with flashing sequenced lights (MALSF).

A number of **visual approach slope indicators** have been developed to aid pilots in judging the correct approach slope of the aircraft toward the touchdown zone of the runway in conditions of poor visibility and at night. One such visual approach slope indicator is the precision approach path indicator (PAPI), which has a single wingbar consisting of four light units on one or both sides of the runway adjacent to the touchdown point. A combination of red and white signals/lights indicates to the pilot the slope at which the aircraft is descending towards the touchdown point. Each runway end at McCarran International Airport is equipped with a PAPI.

**Runway and taxiway lighting** includes runway edge lights, which outline the edges of runways during periods of darkness or restricted visibility. These lights are classified according to the intensity or brightness they are capable of producing. Both ends of Runways 7L-25R, 7R-25L, and 1L-19R are equipped with high intensity runway lights (HIRL). Both ends of Runway 1R-19L are equipped with medium intensity runway lights (MIRL).

Runway end identifier lights (REIL), which consist of a pair of synchronized flashing lights located laterally on each side of a runway threshold, provide pilots with positive identification of the approach end of the runway. REILs are typically installed on runways where approach lighting is not available. The 7R end of Runway 7R-25L is equipped with REIL, and both ends of Runways 1R-19L and 1L-19R are equipped with REIL.

### 3.1.2 Airline Support Facilities

Airline support facilities include inflight catering, ground support equipment (GSE) storage and maintenance, and other aviation-related maintenance facilities. Two inflight catering facilities are located at the Airport—one east of Terminal 2 and one on Russell Road east of Tamarus Street. GSE is maintained and stored at several locations near the passenger terminal complex. The main GSE buildings, used for maintenance and storage of GSE owned by the airlines and ground handling companies, are located east of Terminal 1 near the Airport traffic control tower (ATCT) and at the northwest corner of the air cargo ramp. GSE is also maintained at a facility on the west side of Runways 1L-19R and 1R-19L and is stored in an area north of Terminal 2.

Major engine and airframe repair facilities are available for general aviation aircraft at the Airport. Fuel types 100-130, 100 LL, Jet A1, and Jet AP are available, along with oxygen in high-pressure

bottles. Other services available at the Airport include air freight and air cargo, air ambulance, avionics, charter flights, flight instruction, aircraft rental, aircraft sales, and aerial surveying.

### 3.1.3 Ground Access and Parking Facilities

As previously mentioned, all vehicular traffic to the primary passenger terminal buildings currently enters the Airport from one of three entrances: along Paradise Road from the north, through the Airport Tunnel (I-215) from the south, or along Russell Road from the east. Vehicular traffic from Tropicana Avenue and from the Airport Tunnel uses Paradise Road and the Paradise Road/Swenson Street one-way couplet—public roads that links Tropicana Avenue to the Airport Tunnel—to access Terminals 1 and 2. Vehicular traffic from Russell Road passes through the single point urban interchange at the junction of Paradise Road and Russell Road to access Terminals 1 and 2. Paradise Road/Swenson Street, the Airport Tunnel, and Russell Road, in addition to serving the Airport, are public thoroughfares that also serve non-Airport traffic.

Five curbsides are used for loading and unloading passengers and their baggage at Terminal 1. The curbsides accommodate personal vehicles, rental car shuttle vehicles, taxicabs, and other courtesy vehicles. Drop-off and loading areas are also provided for limousines and shuttle busses. Charter buses, private/hotel limousines, and other designated limousines are accommodated at a lower-level of Terminal 1. Roadway and curbside facilities also serve Terminal 2.

Vehicular parking at the Airport is provided primarily in two multilevel parking structures connected to Terminal 1. Other parking facilities accommodate visitor and employee parking at Terminal 2 and a remote parking facility that is available at Kelly Lane and Russell Road.

### 3.1.4 Rental Car Facilities

Most of the rental car companies that operate at the Airport have individual ready and return lots and maintenance facilities north of Terminal 2 and west of Paradise Road. Two other companies operate facilities south of the Airport near the I-215 Beltway. The Department of Aviation is currently constructing a new consolidated rental car facility south of the Airport near the I-215 Beltway.

### 3.1.5 Fuel Farms

On-Airport aircraft fuel storage facilities include the east-side and west-side fuel farms. The east-side fuel farm is east of Terminal 2. The west-side fuel farm is west of Runways 1L-19R and 1R-19L and just north of Hacienda Avenue.

### 3.1.6 Airport Support Facilities

Airport support and Airport-compatible facilities at McCarran International Airport include the Airport maintenance building, the aircraft rescue and fire fighting (ARFF) facility, an airlift facility, the automotive building and warehouse annex, office buildings, a compressed natural gas fueling facility, and a Nevada Power Company substation.

The Airport maintenance building, automotive building, and warehouse annex are located northeast of the airfield. The ARFF facility is located east of the passenger terminal complex and contains approximately 22,500 square feet. The compressed natural gas (CNG) fueling facility is located east of Paradise Road and south of Russell Road, and will most likely be relocated prior to Terminal 3 construction. The facility provides fueling for the Department of Aviation and other operators of CNG-powered vehicles. The Nevada Power Company substation was relocated in 1999 from an area

near Concourse D to an area on-Airport near the intersection of Eastern Avenue and Oquendo Road. Several office buildings are also located on Airport property.

### 3.1.7 Other Facilities

#### 3.1.7.1 Passenger Terminal Complex

The passenger terminal complex includes two terminal buildings (Terminals 1 and 2), containing approximately 1,977,000 square feet of space. Terminal 1 provides ticketing, baggage claim, and parking facilities to serve Concourses A, B, C, and D. Concourses C and D are connected to Terminal 1 by two separate automated transit systems. Concessions and gaming areas are located throughout Terminal 1. Terminal 2 primarily serves passengers on charter or international flights. Terminal 2 is located to the north of, and separate from, Terminal 1, and provides ticketing, baggage claim, FIS, and parking facilities, as well as concessions and gaming areas**.**

#### 3.1.7.2 Air Cargo Facilities

The Las Vegas International Air Cargo Center is located near the east end and north of Runway 7L-25R, and includes three buildings with a total of approximately 180,000 square feet, parking and truck maneuvering space, and an aircraft parking apron that can accommodate up to Group V aircraft.

#### 3.1.7.3 General Aviation Facilities

FBO, aircraft maintenance, and air taxi/commuter facilities (primarily serving air tour operators) are located on the west side of the airfield. Facilities for general aviation include hangars and aircraft tiedown areas, fueling, and maintenance facilities.

## 3.2 Airspace

Airspace in the United States is classified as controlled, uncontrolled, or special use. Controlled airspace encompasses those areas where there are specific certification, communication, and navigation equipment requirements that pilots and aircraft must meet to operate in that airspace. Airspace is classified as either Class A, B, C, D, E, G, or special use airspace. The following paragraphs describe each airspace classification, as well as the applicability of each classification to airspace in the vicinity of McCarran International Airport. **Exhibit III-3** depicts the airspace in the vicinity of the Airport.

**Class A airspace** is designated for positive control of the aircraft and ranges from 18,000 feet above MSL to 60,000 feet above MSL. Within Class A airspace, only instrument flight rule (IFR)[1] operations are authorized. The aircraft must have specific equipment and an air traffic control (ATC) clearance before entering the airspace.

[1] IFR refers to procedures used by pilots when operating in accordance with Federal Aviation Regulations that require an instrument flight plan.

## Exhibit III-3 Area Airspace

All airspace at and above 18,000 feet above MSL in the vicinity of McCarran International Airport is classified as Class A.

**Class B airspace** extends from the surface up to a designated altitude (generally 10,000 feet above MSL) and is established at the nation's busiest airports in terms of numbers of IFR operations or enplaned passengers. There is no universal set of Class B airspace dimensions since the flow of traffic, geography, and other considerations determine the exact architecture of each Class B airspace area. Therefore, the configuration of each Class B airspace area is individually tailored to each airport and consists of a surface area and two or more layers. Class B airspace is designed to contain all published instrument procedures once an aircraft enters the airspace. Aircraft must have specific equipment and an ATC clearance before entering the airspace.

The Las Vegas Class B airspace area surrounding McCarran International Airport extends up to 9,000 feet above MSL. As depicted on Exhibit III-3, the Las Vegas Class B airspace area is outlined in concentric solid blue circles that are indented or extended in certain places due to geography or air traffic rules. The top and bottom of each layer of airspace are specified in what looks like a fraction (e.g., 90/40). The fraction indicates that this particular layer of airspace lies between 4,000 feet and 9,000 feet above MSL. Nellis Air Force Base, located approximately 10 nautical miles (nm) northeast of the Airport, is also within the Las Vegas Class B airspace area.

**Class C airspace** is the airspace from the surface to 4,000 feet above the airport elevation. Class C airspace is only found at airports that have an operational control tower, are serviced by radar approach control, and have a certain number of IFR operations or enplaned passengers. Although Class C airspace is individually tailored to meet the needs of the airport, the airspace usually consists of a surface area with a 5 nm radius, an outer circle with a 10 nm radius that extends from 1,200 feet to 4,000 feet above the airport elevation, and an outer area. Pilots must establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering the airspace. VFR[2] aircraft are separated from IFR aircraft within the airspace.

No Class C airspace areas are located in the vicinity of McCarran International Airport.

**Class D airspace** is generally that airspace from the surface to 2,500 feet above ground level (AGL). The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Class D airspace only surrounds airports that have an operational control tower. Pilots are required to establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering the airspace and no separation services are provided to VFR aircraft.

Two airports in the vicinity of McCarran International Airport have Class D airspace areas: Henderson Executive Airport and North Las Vegas Airport. These airspace areas are depicted on Exhibit III-3 with a dashed blue circle around each airport, which is carved out where it adjoins the Las Vegas Class B surface area. While the ceiling of Class D airspace generally extends upward to 2,500 feet AGL, the exact upper limit varies. The upper limit of the Henderson Executive Airport

[2] VFR refers to procedures used by pilots when operating in visual meteorological conditions (VMC) in accordance with Federal Aviation Regulations that do not require an instrument flight plan.

Class D airspace area is up to, but not including, 4,000 feet above MSL. The Class D airspace area surrounding North Las Vegas Airport extends up to, but not including, 4,500 feet above MSL.

**Class E airspace** is generally that controlled airspace that is not Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. Also in this class are Victor airways, airspace beginning at either 700 feet or 1,200 feet AGL used to transition to/from the terminal or en route environment, and offshore airspace areas designated below 18,000 feet above MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 feet above MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous states and Alaska. It does not include the airspace 18,000 feet above MSL or above. Class E airspace ensures that IFR aircraft remain in controlled airspace when approaching airports without Class D airspace or when flying on Victor airways that are below 18,000 feet above MSL.

Most of the country has a Class E airspace lower limit of 1,200 feet AGL. Where it decreases to 700 feet AGL is depicted on Exhibit III-3 by a broad magenta line with a fuzzy side. The fuzzy side is the side where the floor of Class E airspace is 700 feet AGL, while the more defined side of the line indicates areas where the floor of Class E airspace rises to 1,200 feet AGL. As shown on Exhibit III-3, McCarran International Airport is surrounded by Class E airspace with a lower limit of either 700 feet or 1,200 feet AGL underlying the Las Vegas Class B airspace area.

**Class G airspace** is uncontrolled airspace. While VFR aircraft can operate in Class G airspace, IFR aircraft cannot operate in Class G airspace. This airspace covers almost the entire country and ends where it meets Class B, C, D, or E airspace. Class G airspace begins at ground level and in very remote areas, it has an upper limit of 14,500 feet above MSL. The top of Class G airspace is usually where the floor of the overriding Class E airspace begins. Where Class B, C, D, or E airspace extends to the surface, there is no surface Class G airspace. Class G airspace begins at the surface throughout much the area surrounding McCarran International Airport, except for the areas where Class B or D airspace extends to the surface.

**Special use airspace** consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed on aircraft operations that are not a part of those activities, or both. Types of special use airspace in the vicinity of McCarran International Airport include restricted areas, alert areas, and military operations areas (MOAs). These special use airspace designations are described in the following paragraphs and are depicted on Exhibit III-3.

- **Restricted areas** contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed on aircraft operations that are not a part of those activities, or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles.
- **Alert areas** are depicted on aeronautical charts to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance in alert areas.

- **Military operations areas (MOAs)** consist of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever an MOA is being used, nonparticipating IFR traffic may be cleared through an MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. Examples of activities conducted in MOAs include, but are not limited to, air combat tactics, air intercepts, aerobatics, formation training, and low-altitude tactics.

## 3.3 Air Traffic Control

Air traffic control in the United States is managed by three primary types of facilities: ATCTs, Terminal Radar Approach Control (TRACON) facilities, and Air Route Traffic Control Centers (ARTCCs). A brief overview of these facilities and how they control flight to and from the Airport is provided in the following paragraphs.

The FAA Las Vegas ATCT is located southeast of Terminal 1 and west of Concourse D. The ATCT controllers are responsible for separating aircraft in the air and on the ground, sequencing aircraft in the traffic pattern, expediting arrivals and departures from the Airport, and providing clearances and weather information to pilots. From the ATCT, FAA personnel maintain air traffic control and communications with pilots operating aircraft on the runways or within the Terminal Control Area, which is the airspace in the vicinity of the Airport.

Pilots of aircraft departing the Airport contact controllers in the ATCT for authorization to taxi to a particular runway and for clearance to take off. Once the aircraft is airborne, the controller will instruct the pilot to contact the Las Vegas TRACON. The TRACON is co-located in the ATCT. Controllers in the TRACON are responsible for separating and sequencing arrival and departure operations to airports within the Las Vegas area. The ARTCC is responsible for controlling aircraft across a multi-state area including California, Arizona, and Nevada. Controllers at the ARTCC provide separation services for aircraft as well as traffic advisories. Generally, aircraft departing from or arriving at the Airport are transitioned to and from ARTCC control near the boundary of the TRACON airspace at designated arrival and departure "gates". Most aircraft enter or exit the Las Vegas area via one of the numerous federal (i.e., Victor) airways. Aircraft above 18,000 feet above MSL use the Jet Route System.

## 3.4 Navigational Aids

Navigational aids are electronic and visual devices that provide guidance or position information to aircraft while they are in flight. There are a number of different navigational aids at McCarran International Airport and in the surrounding area. The primary types of navigational aids used to guide aircraft in the Las Vegas area airspace are discussed in the following paragraphs.

The **nondirectional beacon (NDB)** is the simplest form of radio navigation aid used by aircraft. It is a ground-based transmitter that transmits low-frequency or medium-frequency radio waves in all directions. The automatic direction finder installed in an aircraft has a needle that indicates the direction from which the signals of the selected NDB ground station are being received.

The **very high frequency omnidirectional range (VOR)** radio station is a navigation aid that is extensively used in instrument flying. A VOR ground transmitter radiates individual signals in all directions. By convention, there are 360 different tracks extending away from the VOR, each

separated from the next by one degree, and each with its own direction related to magnetic north. Each of these 360 VOR courses is called a radial. Using an onboard VOR indicator coupled with a very high frequency (VHF) navigation radio, a pilot is able to indicate the desired course and the angular deviation from that course, as well as to navigate an aircraft directly to or from the VOR station along any of the 360 radials.

**Distance measuring equipment (DME)** is used to provide a pilot with the distance from a DME ground station. DME uses radar principles to measure this distance, which is the slant distance (in nautical miles), rather than the horizontal distance (or range). However, for most practical purposes, the DME distance can be considered as a range, except when the aircraft is within a few miles of the DME ground station. Most civil VOR stations have an associated DME, therefore providing both azimuth and distance information, and are known as VOR/DMEs.

The military has developed a different navigation system, called a **tactical air navigation (TACAN)** system, which also provides both azimuth and distance information. TACAN requires special onboard equipment (installed only in military aircraft) for the azimuth information to be received. However, civil aircraft can receive the TACAN distance information using the DME.

When a TACAN ground station has been integrated with a VOR/DME ground station, the combined facility is known as a **VORTAC**. The end result for a civil pilot using a VORTAC is the same as that using a VOR/DME – both VOR and DME information is available.

At McCarran International Airport, Runway 1L, Runway 25L, and Runway 25R are equipped with an **instrument landing system (ILS)**. An ILS is a navigational aid that provides vertical and horizontal guidance to pilots during inclement weather when visual navigation is difficult or impossible. An ILS consists of electronic horizontal and vertical guidance components that allow pilots (with properly equipped aircraft) to make a precision approach to a specific decision height. If the pilot cannot see the runway when reaching the decision height, a missed approach is executed. Further discussion of ILS approaches at the Airport is provided in Section 3.6.5.

Navigational aids within a 40 nm to 50 nm radius of McCarran International Airport are shown on Exhibit III-3. The Las Vegas VORTAC, used for en route navigation and non-precision approaches to the Airport, is located in the southwest portion of the airfield. The VORTAC provides course and distance information to pilots approaching and departing from the Airport. The Boulder City VORTAC, located approximately 15 nm southeast of the Airport, is also used by pilots operating into and out of McCarran International Airport. **Table III-2** provides information for all navigational aids in the vicinity of the Airport.

**Table III-2**

Navigational Aids in the Vicinity of McCarran International Airport

| Name | ID | Type | Distance (nm) | Course (degrees) |
|---|---|---|---|---|
| Las Vegas | LAS | VORTAC | 0.4 | 267 |
| Nellis | LSV | TACAN | 11.6 | 32 |
| Boulder City | BLD | VORTAC | 14.9 | 110 |
| Indian Springs | INS | TACAN | 39.3 | 320 |
| Mercury | MCY | NDB | 53.6 | 308 |
| GOFFS | GFS | VORTAC | 56.9 | 181 |
| Mormon Mesa | MMM | VORTAC | 59.2 | 45 |
| Kingman | IGM | VOR/DME | 77.2 | 129 |
| Peach Springs | PGS | VORTAC | 83.0 | 109 |

Note:
Distance (nautical miles) and course (degrees true) are both measured from the Airport Reference Point.

Source: Aeroplanner.com
Prepared by: Ricondo & Associates, Inc.

## 3.5 Runway Assignments

As discussed in Section 3.1.1.1, McCarran International Airport has two sets of parallel runways. One set is oriented east/west (Runways 7L-25R and 7R-25L), while the other set is oriented north/south (Runways 1L-19R and 1R-19L). The runway assigned to an arriving or departing aircraft depends primarily on wind direction and velocity, ATC procedures, air traffic demand, as well as other local factors.

**Exhibit III-4** illustrates the eight basic operating patterns or flow directions used at the Airport. The runway use diagrams represent airfield operations during peak periods and under VFR and IFR weather conditions. The primary flow/operating configuration at the Airport is in a south/west flow. During calm wind conditions, this primary flow is generally used, with both arrivals to and departures from Runways 19L and 19R and Runways 25L and 25R.

In general, larger aircraft are encouraged to operate on the east/west runways (Runway 7L-25R and Runway 7R-25L) as much as possible, with the inner north/south runway (Runway 1R-19L) used for overflow during peak periods. Smaller aircraft primarily use the outer north/south runway (Runway 1L-19R). East flow is primarily used during hot weather, since the gradient of Runway 7L-25R is downhill to the east.

**Exhibit III-4 Primary Airfield Flow Configurations, McCarran International Airport**

## 3.6 Airspace Structure and Procedures

This section describes, in general, the structure of the Las Vegas TRACON airspace, as well as the procedures used by air traffic controllers to safely and efficiently direct aircraft to and from McCarran International Airport. Local ATC personnel may not follow these procedures as written for a variety of reasons including weather, traffic, and pilot requests.

### 3.6.1 Airspace Structure

The Las Vegas TRACON airspace is structured so that arriving aircraft can be safely and efficiently transitioned from the en route environment to the approach control environment and from the approach control environment to the airfield proper. Likewise, the airspace is structured so that departing aircraft can transition from the airfield to the terminal environment and ultimately to the en route environment. The system used by air traffic controllers to direct aircraft in the TRACON airspace is a four corner-post system, which was implemented in October 2001. The four corner-post system is a direction-based system that organizes aircraft from similar directions over a specific geographic position (referred to as an airspace fix). The four corner-post system further organizes aircraft so that aircraft arriving from similar directions are directed over a specific fix and aircraft departing to similar directions are directed over a different fix. This system separates arrival traffic from departure traffic, allowing for more efficient aircraft operations throughout the TRACON airspace.

The location of an airspace fix is defined for pilots and controllers in one of two ways, depending on the type of arrival or departure procedure being used by the pilot. In conventional procedures, fixes are defined by the location of a navigational aid (e.g., VORTACs and VORs) or determined by reference to one or more navigational aids (e.g., Victor airways and airspace intersections). Prior to implementation of the four corner-post system, all arrival and departure procedures into and out of McCarran International Airport were designed and published as conventional procedures.

Implementation of the four corner-post system was prompted, in part, by the emergence and benefits of area navigation (RNAV) technology. RNAV uses global positioning system (GPS) technology, allowing a properly equipped aircraft to fly point-to-point on a direct course without having to overfly ground-based navigation aids. In RNAV procedures, fixes are defined by latitude and longitude and are referred to as waypoints.[3] Rather than flying from VORTAC to VORTAC along Victor airways, aircraft equipped with RNAV technology may fly directly from the departure airport to the destination airport, or from waypoint to waypoint. An RNAV procedure, a combination of lateral, vertical, and speed commands along a set of waypoints, is typically pre-programmed into a flight management system (FMS) and executed upon ATC clearance. Additionally, ATC has the ability to send any aircraft directly to any waypoint along the route for purposes of spacing, merging, or expediting aircraft. Use of RNAV procedures provides benefits to both ATC and pilots by reducing communications, reducing flight time and distance, lowering fuel burn due to a more efficient flight profile, and increasing predictability.

McCarran International Airport became the first major airport to use RNAV arrival and departure procedures for all runways. Current arrival and departure procedures at the Airport include a mix of conventional and RNAV procedures. These procedures are described in the following sections.

[3] For the purpose of this study, the term "fix" is used to refer to both fixes defined in conventional procedures and waypoints defined in RNAV procedures.

### 3.6.2 IFR Arrival Procedures

As previously described, McCarran International Airport arrival flows are arranged in a four corner-post system. Arrival flows are handled by one of two feeder air traffic controllers and are divided between the feeder controllers based on the aircraft's geographic entry point into the TRACON airspace. Arrivals from the west and southwest are handled by one feeder controller, while arrivals from the east and southeast are handled by the other feeder controller. The feeder controllers eventually hand aircraft off to final airspace controllers, who issue radar vectors to position aircraft in the proper arrival traffic flow prescribed for aircraft landing at the Airport. The usual components of an arrival traffic flow in a radar environment are the downwind leg, base leg, and final approach. These components have the following structure and characteristics:

- **Downwind Leg** – Flight path parallel to the landing runway in the direction opposite to landing.
- **Base Leg** – Flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.
- **Final Approach** – Flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway.

TRACON air traffic controllers use nine Standard Terminal Arrival Routes (STARs) to efficiently manage arriving aircraft at McCarran International Airport. A STAR is a published IFR arrival procedure that provides transition from the en route structure to a fix in the terminal area leading into the instrument approach.[4] As stated previously, arrival procedures at the Airport include a mix of conventional and RNAV procedures. **Table III-3** shows the name of each published STAR at the Airport, the type of STAR (conventional/RNAV), as well as the direction from which aircraft enter the TRACON airspace using the STAR.

[4] Instrument approach procedures published for McCarran International Airport are described in Section 3.6.5.

**Table III-3**

Standard Terminal Arrival Routes

| Procedure Name | Procedure Type | Arrival Direction |
|---|---|---|
| Arrivals from the West | | |
| FUZZY SIX Arrival | Conventional | West/Northwest |
| SUNST ONE Arrival | RNAV | West/Northwest |
| CLARR TWO Arrival | Conventional | Southwest |
| CRESO THREE Arrival | Conventional | Southwest |
| KEPEC ONE Arrival | RNAV | Southwest |
| Arrivals from the East | | |
| GRNPA ONE Arrival | RNAV | East/Northeast |
| LUXOR TWO Arrival | Conventional | East/Northeast |
| KADDY ONE Arrival | Conventional | Southeast |
| TYSSN ONE Arrival | RNAV | Southeast |

Note:
RNAV = Area navigation

Source: Aeroplanner.com
Prepared by: Ricondo & Associates, Inc.

As shown in Table III-3, both conventional and RNAV arrival procedures are available from each arrival direction. In the Las Vegas TRACON airspace, each STAR is designed to position aircraft over one of the four fixes that make up the four corner-post system and then to lead aircraft from the corner-post fix into position for landing at the Airport with the aid of radar vectors. The four arrival corner-post fixes are FUZZY (west/northwest), CLARR (southwest), LUXOR (east/northeast), and KADDY (southeast). These fixes, along with a composite of all published arrival procedures for the Airport, are depicted on **Exhibit III-5**. The following sections describe the arrival procedures, by arrival direction, working in from each of the four arrival corner-posts.

### 3.6.2.1 Arrivals from the West/Northwest

Aircraft entering TRACON airspace from the west or northwest are generally assigned to either the FUZZY SIX arrival or the SUNST ONE arrival.

From the FUZZY corner-post fix, aircraft landing on Runway 1L or 1R are generally vectored north of the Airport, followed by a downwind turn east of the Airport, before turning on a base leg and intercepting the final approach course. Alternatively, aircraft may be vectored south toward Jean Airport on an extended base leg before turning to intercept the final approach course.

Aircraft landing on Runway 7L or 7R are often vectored from either the FUZZY or TRAGR fix for a straight-in visual approach.

After reaching the FUZZY corner-post fix, aircraft landing on Runway 19L or 19R are generally vectored east on an extended base leg before intercepting the final approach course.

Aircraft landing on Runway 25L or 25R usually follow the published arrival procedure until reaching the SUNST fix where they are vectored on a base leg to intercept the final approach course.

## Exhibit III-5 Standard Terminal Arrival Routes

#### 3.6.2.2 Arrivals from the Southwest

Arrival procedures for aircraft arriving from the southwest include the CLARR TWO arrival, the CRESO THREE arrival, and the KEPEC ONE arrival.

From the CLARR corner-post fix, arrivals to Runways 1L and 1R are generally vectored directly onto the final approach course.

Arrivals to Runways 7L and 7R normally follow the published arrival procedure to the SKEBR fix and then proceed on a northwesterly heading before turning north on a base leg for a visual approach to the runway.

Arrivals to Runways 19L and 19R generally pick up radar vectors around the SKEBR fix and proceed on a northerly heading west of the Airport until turning east on a base leg to intercept the final approach course.

Similar to approaches from the west/northwest, arrivals to Runways 25L and 25R from the southwest generally arrive at the designated corner-post fix and follow the published arrival procedure until reaching the SUNST fix where they are vectored on a base leg to intercept the final approach course.

#### 3.6.2.3 Arrivals from the East/Northeast

Either the GRNPA ONE arrival or the LUXOR TWO arrival is usually assigned to aircraft entering the TRACON airspace from the east or northeast.

From the LUXOR corner-post fix, arrivals to Runways 1L and 1R are generally vectored on a southwesterly heading followed by a downwind turn east of the Airport before turning on a base leg and intercepting the final approach course.

Arrivals to Runways 7L and 7R normally proceed on a southwesterly heading followed by a downwind turn south of the Airport before turning on a base leg for a visual approach to the runway.

Arrivals to Runways 19L and 19R generally follow the GRNPA ONE arrival to the PAIGW fix where they intercept the final approach course. Alternatively, aircraft are sometimes vectored on a southwesterly course from the LUXOR fix before entering a base leg and intercepting the final approach course.

The GRNPA ONE and LUXOR TWO arrival procedures end near the final approach course for Runways 19L and 19R. Therefore, arrivals to Runways 25L and 25R that enter the TRACON airspace on these routes are often vectored onto the final approach course well before completion of the published procedures.

#### 3.6.2.4 Arrivals from the Southeast

Aircraft entering the TRACON airspace from the southeast are generally assigned to either the KADDY ONE arrival or the TYSSN ONE arrival.

From the KADDY corner-post fix or the TYSSN fix, arrivals to Runways 1L and 1R are normally vectored west toward the CRESO or BOACH fix before turning to intercept the final approach course.

Arrivals to Runways 7L and 7R are generally vectored toward the CRESO fix followed by a turn to the northwest before entering on a base leg for a visual approach to the runway.

Arrivals to Runways 19L and 19R usually follow published arrival procedures to the SUZSI fix where they are vectored onto an extended base leg before intercepting the final approach course.

Arrivals to Runways 25L and 25R may follow the published arrival procedures to the PRINO fix where they begin the final approach to the runway. Alternatively, aircraft may be vectored from the KADDY or TYSSN fix to the PRINO fix.

### 3.6.3 IFR Departure Procedures

Aircraft departing McCarran International Airport are often assigned a specific standard instrument departure (SID) procedure. A SID is a published IFR procedure providing a standard route from the runway to the appropriate en route structure. In some cases, a SID may have an associated transition, which is a published procedure connecting the end of the SID to one of several en route structures. SIDs are designed to separate departing aircraft from arriving aircraft, provide for the efficient interception of an outbound course, avoid noise-sensitive areas near an airport, simplify the issuance of departure clearances, and reduce radio communication.

Similar to the published arrival procedures, departure procedures at the Airport include a mix of conventional and RNAV procedures. Additionally, two basic navigation methods are used in SIDs published for McCarran International Airport: pilot navigation SIDs and vector SIDs. Under pilot navigation SIDs, the pilot has primary responsibility for navigation along the published SID route. Under vector SIDs, ATC provides radar vectors to a filed or assigned route or to a fix depicted on the SID. **Table III-4** shows the name of each published SID at the Airport, the type of SID (conventional/RNAV), the navigation method used in the SID, and the direction to which aircraft depart TRACON airspace using the SID.

Similar to arrival flows into the Airport, departure flows out of the Airport are arranged in a four corner-post system. However, to separate arriving and departing aircraft, the departure corner-post fixes differ from the arrival corner-post fixes. The four departure corner post-fixes include SHEAD (west/northwest), BOACH (southwest), TRALR (east/northeast), and COWBY (southeast).

**Table III-4**

Standard Instrument Departures

| Procedure Name | Procedure Type | Navigation Method | Departure Direction |
|---|---|---|---|
| Departures to the West | | | |
| SHEAD THREE Departure | RNAV | Pilot Navigation | West/Northwest |
| MCCARRAN THREE Departure | Conventional | Vector | West/Northwest and Southwest |
| BOACH TWO Departure | RNAV | Pilot Navigation | Southwest |
| Departures to the East | | | |
| LAS VEGAS TWO Departure | Conventional | Vector | East/Northeast |
| OVETO THREE Departure | Conventional | Pilot Navigation | East/Northeast |
| TRALR TWO Departure | RNAV | Pilot Navigation | East/Northeast |
| COWBY TWO Departure | RNAV | Pilot Navigation | Southeast |
| HOOVER THREE Departure | Conventional | Vector | Southeast |
| PRFUM TWO Departure | RNAV | Pilot Navigation | Southeast |
| Departures to the East and West | | | |
| STAAV TWO Departure | RNAV | Pilot Navigation | West/Northwest and East/Northeast |

Note:
RNAV = Area navigation

Source: Aeroplanner.com
Prepared by: Ricondo & Associates, Inc.

Controllers assign SIDs based on aircraft destination and arrival aircraft traffic flows. Most SIDs at the Airport are designed to position aircraft over one of these four fixes and then to lead aircraft outbound from the corner-post fix onto the appropriate en route structure. While other SIDs are available, ATC often only assigns SIDs directing aircraft to one of the four corner-post fixes. These fixes, along with a composite of all published departure procedures for the Airport, are depicted on **Exhibit III-6**. The following sections describe the departure procedures, by runway pair, working out to each of the four departure corner-posts.

## Exhibit III-6 Standard Instrument Departures

### 3.6.3.1 Departures to the West/Northwest

Aircraft departing Las Vegas TRACON airspace to the west/northwest are generally assigned to either the MCCARRAN THREE departure or the SHEAD THREE departure.

Departures from Runways 1L and 1R assigned to the MCCARRAN THREE departure climb on a heading of 10 degrees until reaching 2,500 feet above MSL, followed by a climbing left turn to 315 degrees until reaching 4,500 feet above MSL, and another climbing left turn to 180 degrees. From this point, ATC issues vectors to direct aircraft to the SHEAD corner-post fix. Aircraft assigned to the SHEAD THREE departure cross the MEDUW/PAWEK fix on a heading of 10 degrees, followed by a left turn direct to BESSY, then direct to MDDOG, TARRK, and then to SHEAD.

Departures from Runways 7L and 7R assigned to the MCCARRAN THREE departure proceed on a heading of 75 degrees before receiving vectors to the SHEAD corner-post fix. Aircraft assigned to the SHEAD THREE departure cross the WASTE/JESJI fix on a heading of 75 degrees, then proceed direct to BAKRR, MINEY, HITME, and then to SHEAD.

Departures from Runways 19L and 19R assigned to the MCCARRAN THREE departure climb on a heading of 190 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. Following a right turn to a heading of 210 degrees, aircraft are vectored to the SHEAD corner-post fix. Aircraft assigned to the SHEAD THREE departure fly on a heading of 190 degrees to the JAKER/FIXIX fix, then proceed direct to ROPPR, MDDOG, TARRK, and then to SHEAD.

Departures from Runways 25L and 25R assigned to the MCCARRAN THREE departure proceed on a heading of 255 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. After turning left to a heading of 190 degrees, aircraft are vectored to the SHEAD corner-post fix. Aircraft assigned to the SHEAD THREE departure proceed on a heading of 255 degrees to the RBELL/PIRMD fix, then fly direct to ROPRR, MDDOG, TARRK, and then to SHEAD.

### 3.6.3.2 Departures to the Southwest

Aircraft departing Las Vegas TRACON airspace to the southwest may be assigned to either the MCCARRAN THREE departure or the BOACH TWO departure.

Departures from Runways 1L and 1R assigned to the MCCARRAN THREE departure climb on a heading of 10 degrees until reaching 2,500 feet above MSL, followed by a climbing left turn to 315 degrees to 4,500 feet above MSL, and another climbing left turn to 180 degrees. From this point, ATC issues vectors to direct aircraft to the BOACH corner-post fix. Aircraft assigned to the BOACH TWO departure cross the MEDUW/PAWEK fix on a heading of 10 degrees, followed by a left turn direct to BESSY, then direct to JEBBB, and then to BOACH.

Departures from Runways 7L and 7R assigned to the MCCARRAN THREE departure proceed on a heading of 75 degrees before receiving vectors to the BOACH corner-post fix. Aircraft assigned to the BOACH TWO departure cross the WASTE/JESJI fix on a heading of 75 degrees, then proceed direct to BAKRR, MINEY, HITME, and then to BOACH.

Departures from Runways 19L and 19R assigned the MCCARRAN THREE departure climb on a heading of 190 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. Following a right turn to a heading of 210 degrees, aircraft are vectored to the BOACH corner-post fix. Aircraft

assigned to the BOACH TWO departure fly on a heading of 190 degrees to the JAKER/FIXIX fix, then proceed direct to ROPPR, RODDD, and then to BOACH.

Departures from Runways 25L and 25R assigned to the MCCARRAN THREE departure proceed on a heading of 255 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. After turning left to a heading of 190 degrees, aircraft are vectored to the BOACH corner-post fix. Aircraft assigned to the BOACH TWO departure proceed on a heading of 255 degrees to the RBELL/PIRMD fix, then fly direct to ROPRR, RODDD, and then to BOACH.

#### 3.6.3.3 Departures to the East/Northeast

Aircraft departing Las Vegas TRACON airspace to the east/northeast primarily use the LAS VEGAS THREE departure and the TRALR TWO departure.

Departures from Runways 1L and 1R assigned to the LAS VEGAS THREE departure climb on a heading of 10 degrees to 2,500 feet above MSL, followed by a climbing right turn to a heading of 50 degrees. From this point, radar vectors are used to direct aircraft to the TRALR corner-post fix before exiting the airspace on their assigned transition. Aircraft assigned to the TRALR TWO departure cross the MEDUW/PAWEK fix on a heading of 10 degrees before turning right to a heading of 65 degrees direct to the NAPSE fix and then direct to TRALR.

Departures from Runways 7L and 7R assigned to the LAS VEGAS THREE departure fly on a heading of 75 degrees before receiving vectors to the TRALR corner-post fix. Aircraft assigned to the TRALR TWO departure cross the WASTE/JESJI fix on a heading of 75 degrees, then proceed direct to BAKRR, and then direct to TRALR.

Departures from Runways 19L and 19R assigned to the LAS VEGAS THREE departure climb on a heading of 190 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. Following a right turn to a heading of 210 degrees, aircraft are vectored to the TRALR corner-post fix. Aircraft assigned to the TRALR TWO departure fly on a heading of 190 degrees to the JAKER/FIXIX fix, then proceed south of the Airport direct to ROPPR, CEASR, FORGE, WILLW, and then to TRALR.

Departures from Runways 25L and 25R assigned to the LAS VEGAS THREE departure proceed on a heading of 255 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. After turning left to a heading of 190 degrees, aircraft are vectored to the TRALR corner-post fix. Aircraft assigned to the TRALR TWO departure proceed on a heading of 255 degrees to the RBELL/PIRMD fix, then fly direct to ROPRR, CEASR, FORGE, WILLW, and then to TRALR.

#### 3.6.3.4 Departures to the Southeast

Aircraft departing Las Vegas TRACON airspace to the southwest primarily use the COWBY TWO departure and the HOOVER TWO departure.

Departures from Runways 1L and 1R assigned to the COWBY TWO departure cross the MEDUW/PAWEK fix on a heading of 10 degrees before turning right to a heading of 65 degrees direct to the NAPSE fix and then direct to the COWBY corner-post fix. Aircraft assigned to the HOOVER TWO departure climb on a heading of 10 degrees to 2,500 feet above MSL, followed by a climbing right turn to a heading of 50 degrees. From this point, radar vectors are used to direct aircraft to the COWBY corner-post fix before the aircraft exits the airspace on its assigned transition.

Departures from Runways 7L and 7R assigned to the COWBY TWO departure cross the WASTE/JESJI fix on a heading of 75 degrees, then proceed direct to BAKRR and direct to the COWBY corner-post fix. Aircraft assigned to the HOOVER TWO departure proceed on a heading of 75 degrees before receiving vectors to the COWBY corner-post fix.

Departures from Runways 19L and 19R assigned to the COWBY TWO departure fly on a heading of 190 degrees to the JAKER/FIXIX fix, then proceed south of the Airport direct to ROPPR, CEASR, HITME, and then to the COWBY corner-post fix. Aircraft assigned to the HOOVER TWO departure climb on a heading of 190 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. Following a right turn to a heading of 210 degrees, aircraft are vectored to the COWBY corner-post fix.

Departures from Runways 25L and 25R assigned to the COWBY TWO departure proceed on a heading of 255 degrees to the RBELL/PIRMD fix, then fly direct to ROPRR, CEASR, HITME, and then to the COWBY corner-post fix. Aircraft assigned to the HOOVER TWO departure proceed on a heading of 255 degrees until reaching a distance of 3 nm from the Las Vegas VORTAC. After turning left to a heading of 190 degrees, aircraft are vectored to the COWBY corner-post fix.

### 3.6.4 VFR Arrival, Departure, and Local Procedures

As discussed in Section 3.2, the airspace immediately surrounding McCarran International Airport is classified as Class B airspace. All VFR aircraft must obtain ATC clearance prior to entering the airspace and maintain two-way radio communications with ATC while within the airspace. The Las Vegas TRACON separates arriving and departing VFR aircraft from IFR aircraft within the airspace. Additionally, the Las Vegas TRACON sets the approach sequence for VFR aircraft arriving at the Airport.

ATCT personnel are responsible for the ATC services provided to aircraft operating in the local traffic pattern within sight of the ATCT. ATCT personnel ensure that aircraft operating in the local traffic pattern are separated from other aircraft operating in the local traffic pattern and from itinerant arrival and departure traffic.

### 3.6.5 Published Instrument Approach Procedures

A number of instrument approach procedures are published for McCarran International Airport. These procedures, which are published by the U.S. Department of Commerce, describe in graphic and tabular form the headings and altitudes that pilots must observe when flying the approach procedure. These procedures allow pilots to land aircraft safely at the Airport during poor weather conditions or when cloud cover is very low and visibility conditions are very limited.

Two types of instrument approaches are available at McCarran International Airport: precision approaches and non-precision approaches. In a precision approach, electronic glide slope guidance, as well as tracking (course) guidance is provided. A non-precision approach is flown by reference to navigation aids and glide slope information is not available. An approach using RNAV/GPS technology is also classified as a non-precision approach. **Table III-5** summarizes the published instrument approach procedures available at the Airport.

**Table III-5**

Instrument Approach Procedures

| Procedure Name | Approach Type | Runway |
|---|---|---|
| ILS or LOC/DME RWY 1L | Precision | 1L |
| RNAV (GPS) RWY 1L[1/] | Non-precision | 1L |
| RNAV (GPS) RWY 1R[1/] | Non-precision | 1R |
| RNAV (GPS) RWY 19L[1/] | Non-precision | 19L |
| RNAV (GPS) RWY 19R[1/] | Non-precision | 19R |
| ILS RWY 25L | Precision | 25L |
| RNAV (GPS) RWY 25L[1/] | Non-precision | 25L |
| ILS or LOC RWY 25R | Precision | 25R |
| RNAV (GPS) RWY 25R[1/] | Non-precision | 25R |
| VOR RWY 25L/R | Non-precision | 25L and 25R |
| VOR/DME-A | Non-precision | All runways |

Notes:
DME = Distance measuring equipment
GPS = Global positioning system
ILS = Instrument landing system
LOC = Localizer
RNAV = Area navigation
VOR = Very high frequency omnidirectional range

1/ While RNAV/GPS approaches published for the Airport are traditionally considered non-precision approaches, they may be flown as precision approaches if the RNAV/GPS equipment onboard the aircraft is properly certified for precision approaches.

Source: Aeroplanner.com
Prepared by: Ricondo & Associates, Inc.

As shown in Table III-5, McCarran International Airport has 11 published instrument approach procedures. As discussed in Section 3.4, three of these procedures are ILS precision approaches to Runways 25L, 25R, and 1L. The ILS approach for Runway 25R has approach minimums of a 200-foot ceiling and 0.5-statute-mile visibility. The ILS approach for Runway 25L has approach minimums of an 100-foot ceiling and 0.75-statute-mile visibility. The ILS approach for Runway 1L has approach minimums of a 300-foot ceiling and 1.0-statute-mile visibility.

Two types of non-precision approach procedures are published for the Airport, including VOR approaches and RNAV/GPS approach procedures. These approach procedures provide horizontal guidance only to the runway end. With non-precision approach procedures, pilots are allowed to descend to a minimum descent altitude (MDA) and look for the runway. These procedures generally have much higher cloud ceiling and visibility minimums than the precision approaches provided by an ILS.

Runways 25L and 25R have published VOR approach procedures, in which VORs are the primary navigation aid. For landings on Runway 25R, the approach minimums are an MDA of 2,560 feet above MSL and 1.0-statute-mile visibility.[5] Approach minimums for aircraft landing on Runway 25L are an MDA of 2,560 feet above MSL and 0.75-statute-mile visibility. The second type of non-precision approach established for the Airport is an RNAV/GPS approach, which is published for all runways except Runways 7L and 7R. The RNAV/GPS approaches published for the Airport may be flown as either precision or non-precision approaches. While any aircraft flying an RNAV/GPS approach must be properly equipped, additional equipment functionality is required for a precision RNAV/GPS approach to be conducted at the Airport.

Although instrument approach procedures are not published for Runways 7L and 7R, a non-precision VOR/DME approach is published, allowing for visual maneuvering to any runway. Visual maneuvering is also known as circling, or as circle-to-land. These terms are used to describe the visual phase of flight after an instrument approach is completed, with the aim of maneuvering an aircraft into position for a landing on a runway to which a straight-in approach is not possible. The approach minimums for aircraft landing on any runway using the VOR/DME-A (performance category A) approach are an MDA of 3,020 feet above MSL and 1.0-statute-mile visibility.

## 3.7 Neighboring Airports

In addition to McCarran International Airport, Clark County owns and operates five other airports in southern Nevada including: North Las Vegas Airport, Henderson Executive Airport, Jean Airport, Overton Municipal Airport-Perkins Field, and Searchlight Airport. Searchlight Airport is not discussed herein because of its distance from McCarran International Airport and its limited number of operations. Two additional airports or aviation facilities operated by sponsors other than Clark County are also located in the vicinity of McCarran International Airport: Boulder City Municipal Airport and Nellis Air Force Base.

### 3.7.1 North Las Vegas Airport

North Las Vegas Airport, the second busiest airport in Nevada, is located about 8 miles northwest of McCarran International Airport. North Las Vegas Airport currently serves as the primary general aviation reliever airport to McCarran International Airport. In this role, the Airport accommodates general aviation aircraft operations that would otherwise occur at McCarran International Airport, thereby reducing delays and airfield congestion at McCarran International Airport. The Airport also accommodates corporate, recreation, and Grand Canyon tour operations. North Las Vegas Airport has three runways: two parallel runways that are oriented northeast-southwest and one runway oriented east-west. Runway 12R-30L is 5,000 feet long and 75 feet wide; Runway 12L-30R is 4,000 feet long and 75 feet wide; and Runway 7-25 is 5,004 feet long and 75 feet wide.

### 3.7.2 Henderson Executive Airport

Henderson Executive Airport is located about 6 miles south of McCarran International Airport within the City of Henderson, Nevada. Henderson Executive Airport is primarily a general aviation reliever

[5] The approach minimums for any instrument approach depend, in part, on the performance category of the aircraft, which is based on its maneuverability. The categories are based on 1.3 multiplied by the stall speed of the aircraft in the landing configuration at maximum landing weight (VS0). 1.3VS0 is a measure of maneuvering speed, and is the speed that would normally be used on approach. Approach minimums stated in this text for the VOR RWY 25L/R approach procedure at McCarran International Airport assume a performance category of A or B, which generally applies to most general aviation aircraft.

airport for McCarran International Airport. The Airport also accommodates some Grand Canyon tour operations The airport has one set of parallel runways oriented north-south. Runway 17R-35L is 6,500 feet long and 100 feet wide. Runway 17L-35R is 5,000 feet long and 75 feet wide.

### 3.7.3 Jean Airport

Jean Airport is located within unincorporated Clark County, about 20 miles south of McCarran International Airport. Jean Airport is primarily a sport aviation airport and the Department of Aviation has developed facilities and procedures to support such activity. Jean Airport has one set of parallel runways. Runway 2L-20R is 4,600 feet long and 75 feet wide. Runway 2R-20L is 3,700 feet long and 60 feet wide.

### 3.7.4 Overton Municipal Airport-Perkins Field

Overton Municipal Airport-Perkins Field is a general aviation airport located in northeastern Clark County, about 70 miles northeast of Las Vegas, and two miles north of the City of Overton. The airport primarily serves aircraft operators in the Overton area and provides access to the Lake Mead National Recreation Area. The airport has one runway that is oriented northwest-southeast. Runway 13-31 is 4,800 feet long and 75 feet wide. This airport is not ATCT-controlled.

### 3.7.5 Boulder City Municipal Airport

Boulder City Municipal Airport is located about 25 miles southeast of McCarran International Airport, and accommodates general aviation, sport aviation, and Grand Canyon air tours. Boulder City Municipal Airport has three runways: two parallel runways oriented east-west, and one runway oriented southeast-northwest. The two parallel runways, Runways 9R-27L and 9L-27R, are 4,800 feet long and 75 feet wide and 2,200 feet long and 60 feet wide, respectively. Runway 15-23 is 3,850 feet long and 75 feet wide. This airport is not ATCT-controlled.

### 3.7.6 Nellis Air Force Base

Nellis Air Force Base is located 10 miles northeast of McCarran International Airport and is owned and operated by the U.S. Department of Defense and the U.S. Air Force. The restricted airspace serving the Base extends south to within about six miles of McCarran International Airport and to within about 3 miles of North Las Vegas Airport. Nellis Air Force Base has two parallel runways, oriented northeast-southwest. Runway 3L-21R is 10,123 feet long and 200 feet wide. Runway 3R-21L is 10,055 feet long and 150 feet wide.

## 3.8 Existing Land Use in the Airport Environs

**Exhibit III-7** depicts the generalized existing land uses in the vicinity of McCarran International Airport, based on information obtained from the Clark County Assessor's Office and the Department of Aviation. As shown on Exhibit III-7, the Airport is located just south of an extensively developed area. The Las Vegas Strip, with a wide variety of casinos, hotels, and restaurants, begins northwest of the Airport and extends southward to and along the west side of the Airport boundary. Recent trends have included expansion of the Strip further to the south as the demand for new resorts and hotel facilities has increased. The areas north and east of the Airport are primarily occupied by high-density residential development, but also include some small office developments, schools, religious

## Exhibit III-7 Generalized Existing Land Uses

## In The Vicinity Of McCarran International Airport

facilities, and neighborhood shopping centers. The University of Nevada, Las Vegas, is less than 1/8th of a mile northeast of the Airport. The land to the south, southeast, and southwest of the Airport was mostly undeveloped until the late 1980s and early 1990s. Since then, low-density single-family residential, high-density residential, and commercial and industrial developments have been built in those areas. Industrial developments are located southwest of the Airport near the interchange of I-15 and Blue Diamond Road, with the largest concentration west of the Airport near the Union Pacific Railroad's Boulder Junction station. Beyond and to the west of I-15 are new industrial uses extending almost to Valley View Boulevard.

## 3.9 Planned Land Use in the Airport Environs

Clark County is divided into numerous planning areas covering incorporated and unincorporated areas. **Exhibit III-8** depicts the planning areas in the vicinity of the Airport. **Exhibit III-9** depicts generalized planned land uses in the Airport vicinity, based on information obtained from Clark County and the Cities of Henderson and Las Vegas. Planned land use recommendations for unincorporated portions of Clark County are addressed in land use plans developed by the Clark County Department of Comprehensive Planning and approved by the Clark County Board of County Commissioners. The Clark County Board of County Commissioners has adopted development plans and guides for the unincorporated areas of Enterprise (southwest of the Airport), Sunrise Manor (northeast of the Airport), and Whitney (east of the Airport). The Clark County Board of County Commissioners has also adopted development plans and guides for the unincorporated towns of Spring Valley (west of the Airport) and Winchester and Paradise (immediately north, west, east, and south of the Airport). The Department adopted the *Enterprise Land Use Plan* **[III-1]** in 2004, the amended *Spring Valley Land Use Plan* **[III-2]** in 2004, the amended *Winchester and Paradise Land Use and Development Guide* **[III-3]** in August 2005, the *Sunrise Manor Land Use Plan* **[III-4]** in 1999, and the *Whitney Land Use Plan* **[III-5]** in 2000. The City of Henderson *Comprehensive Plan* **[III-6]** was adopted in 2006 and the City of Las Vegas *2020 Master Plan* **[III-7]** was adopted in 2000. These plans consist of land use maps and written policies that identify specific land uses and general development patterns intended to encourage orderly development within the boundaries of each planning area. **Appendix B** provides definitions of the planned land use categories included in each of these plans and also describes other land use plans that have been prepared for adjacent communities.

## 3.10 Land Use Control Regulations

Zoning is the traditional mechanism used by local governments to control land use and implement the goals and policies of their master plans. Zoning controls the location, type, and intensity of new urban land uses, and is an important tool for preventing incompatible land uses from locating around airports. The legal basis for zoning powers is to protect the health, safety, and welfare of the public. Since the establishment of zoning powers in the early 1900s, the courts have been consistent in confirming broad discretion to local governments in exercising their zoning powers, provided that zoning designations are based on sound land use policy and plans.

**Exhibit III-10** depicts the generalized zoning in the Airport vicinity. The zoning designations were obtained from Clark County and the Cities of Las Vegas and Henderson, and are summarized in **Table III-6**. Land uses in unincorporated areas are regulated by Title 30 of the *Clark County Unified Development Code* **[III-8]**. The zoning classifications for the Cities of Henderson and Las Vegas also are shown in Table III-6.

## Exhibit III-8 Clark County Planning Areas

**Exhibit III-9 Generalized Planned Land Uses In The Vicinity Of McCarran International Airport**

**Exhibit III-10 Generalized Zoning**
**In The Vicinity Of McCarran International Airport**

**Table III-6 (1 of 4)**

Summary of Existing Zoning in the Vicinity of McCarran International Airport

| General Title | Unincorporated areas of Clark County | City of Henderson | City of Las Vegas | Remarks |
|---|---|---|---|---|
| Rural Residential | R-U: Rural open land. Single-family residential and agriculture; up to 0.5 dwelling unit per acre; minimum lot size 80,000 square feet.<br>R-A: Residential agricultural. Single-family residential and agriculture; up to 1 dwelling unit per acre; minimum lot size 40,000 square feet.<br>R-E: Rural estates, residential. Single-family residential and agriculture; up to 2 dwelling units per acre; minimum lot size 20,000 square feet. | RS-1A: Low-density single-family residential. Single-family residential (minimum lot size 1 acre) and limited day care. | R-A: Ranch acres. Low-density residential units located on 40,000 square foot minimum lots.<br>R-E: Residence estates. Low-density residential units located on 20,000 square foot minimum lots. | Most permitted uses are not compatible with Airport operations. |
| Single-family Residential | R-D: Suburban estates, residential. Single-family residential; up to 3 dwelling units per acre; minimum lot size 10,000 square feet.<br>R-1: Single family residential. Single-family residential; up to 5 dwelling units per acre; minimum lot size 5,200 square feet.<br>R-2: Medium density residential. Single- and multi-family residential; up to 8 dwelling units per acre; minimum lot size 7,000 square feet.<br>RUD: Residential urban density Compact-single-family residential; up to 14 dwelling units per acre; minimum lot size 2,000 square feet. | RS-2: Low-density single-family residential. Single-family residential, up to 2 dwelling units per acre.<br>RS-4: Low-density single-family residential. Single-family residential, up to 4 dwelling units per acre.<br>RS-6: Low-density single-family residential. Single-family residential, up to 6 dwelling units per acre. | R-D: Single-family residential-restricted. Low-density single-family units on 11,000 square foot minimum lots.<br>R-1: Single-family residential. Single-family units on 6,500 square foot minimum lots.<br>R-CL: Single-family compact-lot. Single-family units on 3,500 square foot minimum lots. | Most permitted uses are not compatible with Airport operations. |
| Multi-family Residential | R-3: Multiple-family residential. Single- and multi-family residential; up to 18 dwelling units per acre; minimum lot size 7,000 square feet.<br>R-4: Multiple-family residential (high density). Single- and multi-family residential; up to 25 dwelling units per acre; minimum lot size 7,000 square feet.<br>R-5: Apartment residential. Single- and multi-family residential; up to 50 dwelling units per acre; minimum lot size 7,000 square feet. | RM: Medium-density residential. Medium-density residential uses, including single-family housing, duplexes, townhouses, apartments, or cluster housing at a density of up to 8 dwelling units per acre in RM-8 district, 10 dwelling units per acre in RM-10 district, 16 dwelling units per acre in RM-16 district.<br>RH: High-density residential. Single-family housing, duplexes, townhouses, apartments, or cluster housing at a density of up to 20 dwelling units per acre in RH-20 district, 24 dwelling units per acre in RH-24 district, 30 dwelling units per acre in RH-30 district, 36 dwelling units per acre in RH-36 district. | R-2: Medium-low density. Medium- to low-density single-family units and duplex units on 6,500 square foot minimum lots; up to 12 dwelling units per acre.<br>R-3: Medium density residential and apartment. Multi-family units on 6,500 square foot minimum lots; up to 25 dwelling units per acre.<br>R-4: High density residential and apartment. Multi-family units on 6,500 square foot minimum lots; up to 50 dwelling units per acre.<br>R-5: Apartment. High-density multi-family units on 7,000 square foot minimum lots. | Most permitted uses are not compatible with Airport operations. |

**Table III-6 (2 of 4)**

Summary of Existing Zoning in the Vicinity of McCarran International Airport

| General Title | Unincorporated areas of Clark County | City of Henderson | City of Las Vegas | Remarks |
|---|---|---|---|---|
| Mobile Home Residential | R-T: Manufactured home residential. Subdivided lots: up to 5 dwelling units per acre; minimum lot size 5,200 square feet. Manufactured home park: up to 8 dwelling units per acre; minimum lot size 3,000 square feet or 4,000 square feet for doublewide unit.<br>R-V-P: Recreational vehicle park. Temporary or transient lodging in recreational vehicles; up to 20 dwelling units per acre. | RX-5: Mobile home. Up to 5 dwelling units per acre.<br>RX-8: Mobile home. Up to 8 dwelling units per acre. | R-MH: Mobile/manufactured home residence. Subdivision lots primarily for mobile or manufactured homes on 6,500 square foot minimum lots.<br>R-MHP: Residential mobile/manufactured home park. Medium density residential district designed primarily for the rental of spaces for occupied mobile or manufactured homes on 4,000 square foot minimum lots. | Most permitted uses are not compatible with Airport operations. |
| Mixed Use | CRT: Commercial residential transitional. Intended to preserve existing single-family residential buildings for commercial reuse as a transition between viable residential districts and major streets.<br>C-2: General commercial. Established to accommodate a full range of commercial uses, or mixed commercial and residential uses.<br>H-1: Limited resort and apartment. Provided for the development of gaming enterprises, compatible commercial, and mixed commercial and residential uses.<br>H-2: General highway frontage. Established to provide for a variety of residential, office, and commercial uses.<br>U-V: Urban village. Intended to accommodate a mixture of residential, commercial/ employment, and recreational uses. | CH: Highway commercial. To provide sites for automobile-oriented commercial uses, including casinos, hotels, motels, resort complexes, commercial recreation facilities, restaurants, travel trailer and RV facilities, and limited residential development in a mixed-use project.<br>CT: Tourist commercial. To provide sites for visitor-oriented uses, including casinos, hotels, motels, resort complexes, commercial recreation facilities, restaurants, travel trailer and RV facilities, and limited residential development in a mixed-use project. | | Some permitted uses (such as dwellings) are not usually compatible with Airport operations. |
| Commercial | C-P: Office and professional. Provided for the development of office and professional uses as a buffer between the more intensive commercial districts and the residential districts.<br>C-1: Local business. Provided for the development of retail business uses or personal services. | CN: Neighborhood commercial. To provide sites for businesses serving the daily needs of nearby residential areas and for small-scale offices.<br>CO: Commercial office. To provide areas primarily for high-quality, low-rise office development. | P-R: Professional office and parking. Transitional zone to allow low intensity administrative and professional offices.<br>N-S: Neighborhood service. Convenience retail shopping, services, and professional offices principally serving neighborhood needs. | Generally compatible with Airport operations. |

**Table III-6 (3 of 4)**

Summary of Existing Zoning in the Vicinity of McCarran International Airport

| General Title | Unincorporated areas of Clark County | City of Henderson | City of Las Vegas | Remarks |
|---|---|---|---|---|
| Commercial (continued) | | CC: Community commercial. To provide sites for community and regional retail shopping centers containing a wide variety of commercial establishments.<br>CA: Auto mall commercial. To provide sites for new automobile dealerships and related uses.<br>CH: Highway Commercial District. To provide sites for auto-oriented commercial uses including hotels, motels, service stations, car washes, automobile sales and services, drive-in restaurants, offices, limited warehousing, and commercial services.<br>CT: Tourist Commercial District. To provide sites for visitor-oriented uses, including casinos, hotels, motels, resort complexes, commercial recreation facilities, restaurants, travel trailer and RV facilities, and limited residential development in a mixed-use project.<br>CM, Mixed-Use Commercial. To provide sites for a mixture of residential uses with commercial, office, research and development, and/or public uses. Such uses shall provide innovative opportunities for mixed, unified developments with distinguishable design features. | O: Office. Office uses, supporting service uses and low intensity commercial uses performing administrative, professional, and personal services.<br>C-D: Designed commercial. Light commercial uses in harmony with the neighborhood.<br>C-1: Limited commercial. Retail shopping and personal services located on the periphery of residential neighborhoods.<br>C-2: General commercial. Retail, service, automotive, wholesale, office and other general business uses of an intense character. | |
| Industrial | M-D: Designed manufacturing. Established to provide area suitable for the development of light manufacturing establishments with limited outside uses.<br>M-1: Manufacturing. Established to provide area suitable for the development of light manufacturing establishments.<br>M-2: Industrial. Established to provide areas suitable for the most intense manufacturing and industrial activities. | IL: Limited industrial. To provide areas appropriate for low-intensity industrial uses, including light manufacturing, warehousing and distribution, research and development, and commercial services.<br>IG: General industrial. To provide and protect existing industrial sites and allow for continued operation of existing general industry, manufacturing, extraction, salvage, and related activities.<br>IP: Industrial park. To provide and protect sites for research and development facilities and limited industrial activities, including non-nuisance production, distribution, and storage of goods. | C-PB: Planned business park. Industrial uses, including light manufacturing, assembling and processing, warehousing and distribution, research, development, testing laboratories, and ancillary commercial uses.<br>C-M: Commercial/industrial. General commercial and restricted industrial district designed to provide for a variety of compatible business, warehouse, wholesale, office, and limited industrial uses.<br>M: Industrial. Heavy manufacturing industries located away from all residential development. | Generally compatible with Airport operations. |
| Public | P-F: Public facility. Public and quasi-public services and facilities. | PS: Public and semipublic. Public and quasi-public services and facilities. | C-V: Civic. Provided for the continued public uses and the development of new schools, libraries, public parks, public flood control facilities, police, fire, and electrical transmission facilities. | Some permitted uses (such as dwellings) are not usually compatible with Airport operations. |
| Open Space | O-S: Open space. Single-family dwellings on 5-acre minimum lots; flood control channels; scenic drives; recreation areas; agriculture and cattle grazing. | | | Some permitted uses (such as dwellings) are not usually compatible with Airport operations. |

**Table III-6 (4 of 4)**

Summary of Existing Zoning in the Vicinity of McCarran International Airport

| General Title | Unincorporated areas of Clark County | City of Henderson | City of Las Vegas | Remarks |
|---|---|---|---|---|
| Overlay | AE: Airport environs overlay.<br>See Section 30.48.010 of the *Clark County Unified Development Code*.<br>Airport airspace overlay.<br>See Section 30.48.090 of the *Clark County Unified Development Code*.<br>RNP: Residential neighborhood preservation overlay.<br>See Section 30.48.170 of the *Clark County Unified Development Code*.<br>Gaming enterprise.<br>See Section 30.48.240 of the *Clark County Unified Development Code*. | AE: Airport environs overlay.<br>See Section 19.5.2 of the *Development Code*.<br>MP: Master plan overlay.<br>See Section 19.5.3 of the *Development Code*.<br>G: Gaming enterprise overlay.<br>See Section 19.5.5 of the *Development Code*.<br>E: Efficiency lot overlay.<br>See Section 19.5.6 of the *Development Code*.<br>RD: Redevelopment overlay.<br>See Section 19.5.7 of the *Development Code*.<br>C: Center overlay.<br>See Section 19.5.8 of the *Development Code*.<br>H: Hillside overlay.<br>See Section 19.5.9 of the *Development Code*.<br>SLO: Sensitive lands overlay.<br>See Section 19.5.10 of the *Development Code*. | CBD: Central business district overlay.<br>See Section 19A.06.060 of the *Zoning Code*.<br>G-O: Gaming enterprise overlay.<br>See Section 19A.06.050 of the *Zoning Code*.<br>A-O: Airport overlay.<br>See Section 19A.06.080 of the *Zoning Code*.<br>H: Historic designation.<br>See Section 19A.06.090 of the *Zoning Code*.<br>Downtown casino overlay.<br>See Section 19A.06.100 of the *Zoning Code*.<br>T-C: Town center.<br>See Section 19A.06.110 of the *Zoning Code*. | |
| Planned unit development/other | P-C: Planned community overlay.<br>See Section 30.48.220 of the *Clark County Unified Development Code*. | PUD: Planned unit development overlay.<br>See Section 19.5.4 of the *Development Code*.<br>DH: Development holding.<br>See Section 19.5.11 of the *Development Code*. | P-C: Planned community. Established to permit and encourage the development of comprehensively planned communities, with a minimum of 3,000 contiguous acres of land under one ownership or control.<br>R-PD: Residential planned development.<br>See Section 19A.06.040 of the *Zoning Code*.<br>PD: Planned development.<br>See Section 19A.06.050 of the *Zoning Code*. | |

Note: See zoning ordinances for conditionally permitted uses.

Sources: Clark County, Nevada, *Title 30, Clark County Unified Development Code*, June 21, 2000, as amended; City of Henderson, Nevada, *Title 19, Development Code (Zoning)*, July 2006; City of Las Vegas, Nevada, *Chapter 19, Zoning Code*, November 1998.
Prepared by: Ricondo & Associates, Inc.

Most of the area west of the Airport is zoned for light manufacturing (M-1) and limited resort and rental housing development (H-1), and single family residential. Most of the area east of the Airport is zoned for light manufacturing (M-1, M-D), single-family residential (R-E, R-1), medium-density residential (R-2), and limited multi-family residential (R-3). Several business parks are located east of the Airport between Sunset Road and Russell Road. Most of the area south of the Airport is zoned R-E and manufacturing (M-D, M-1), with some limited H-1 zoning along Las Vegas Boulevard. R-E zoning also is used as a "holding zone" until a property owner applies for a zoning change to permit a specific development.

### 3.10.1 Airport Environs Overlay District

In 1986, the Clark County Board of County Commissioners adopted an Airport Environs Overlay District as part of its zoning ordinance to regulate land uses in the vicinity of the Airport (See **Exhibit III-11**). The current Airport Environs Overlay District, which was codified in 1990 and reflects information as shown on the projected 1992 Noise Exposure Map prepared for the 1989 *FAR Part 150 Noise Compatibility Program*, is shown on **Exhibit III-12.** The airport environs overlay district establishes a range of land uses that are compatible with Airport hazard and noise exposure zones AE-65, AE-70, AE-75, and AE-80[6], which define areas exposed to aircraft noise of day-night average sound level (DNL)[7] 65-70, DNL 70-75, DNL 75-80, and DNL 80 and higher, respectively. Most commercial and manufacturing uses are permitted in the airport environs overlay district, but some service and recreational uses are restricted. Schools and religious facilities are only permitted with noise-attenuated construction. Residential development is permitted with noise-attenuated construction. Land use compatibility standards within the subdistricts of the AE Overlay District are summarized in Table 30.48-AE of the *Clark County Unified Development Code*.

Chapter 30.48, Part B, "Airport Airspace Overlay District" of the *Clark County Unified Development Code* establishes an Airport Airspace Overlay District that includes land beneath airspace surfaces defined by FAR Part 77, *Objects Affecting Navigable Airspace* **[III-9]**, including the primary, approach, transitional, horizontal, and conical surfaces. The Airport Airspace Overlay District specifies that no structure shall be erected, altered, or maintained within the height zones that would: (a) constitute a hazard to air navigation, (b) result in an increase in minimum flight altitudes during any phase of flight, or (c) otherwise be determined to pose a significant adverse impact on airport of aircraft operations.

The City of Henderson adopted an Airport Environs Overlay District on June 15, 1993. The Airport Environs Overlay District adopted by the City of Henderson includes areas exposed to aircraft noise of DNL 65 and higher originating from McCarran International Airport based upon the 1997 noise exposure map from the 1994 FAR Part 150 Study.

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[6] At McCarran International Airport, the AE-80 zone is within the Airport boundary and, therefore, is not depicted on Exhibit III-11, Airport Environs Overlay District.

[7] DNL is expressed in A-weighted decibels and represents the average noise level over a 24-hour period. For each hour during the nighttime period (10:00 p.m. to 6:59 a.m.), the average sound levels are increased by a 10-decibel weighting penalty (equivalent to a 10 times increase in aircraft operations) before the 24-hour average is computed. The weighting penalties account for the intrusive nature of noise during the evening and nighttime hours. DNL, as used in the noise analysis for this FAR Part 150 Study Update is expressed as an average noise level on the basis of annual aircraft operations for a calendar year.

**Exhibit III-11 1986 Airport Environs Overlay District**
**McCarran International Airport**

**Exhibit III-12 1990 Airport Environs Overlay District McCarran International Airport**

### 3.10.2 Mixed Use Overlay District

In January 2005, the Clark County Board of County Commissioners established a Mixed Use Overlay District for unincorporated areas of Clark County. The purpose of the Mixed Use Overlay District is to allow a diversity of compatible land uses to encourage the development of dense, pedestrian friendly neighborhoods with convenient access to employment, schools, and various services. The Mixed Use Overlay District consists of four subdistricts, MUD-1, MUD-2, MUD-3, and MUD-4, reflecting criteria ranging from heavily concentrated urban development to less intense, suburban-oriented development. Land use compatibility criteria within each subdistrict are described in detail in Chapter 30.48.760 (b) of the *Clark County Unified Development Code*. The boundaries of the Mixed Use Overlay District and subdistricts are depicted on **Exhibit III-13.**

Mixed-use development is permissible in a number of zoning districts, including urban village (U-V), commercial (C-1, C-2), and limited resort and rental housing development (H-1), subject to MUD subdistrict criteria. Proposed developments that do not comply with the minimum height, setback, and landscaping requirements of the MUD subdistrict criteria require special use permits, subject to approval through a public hearing.

All proposed mixed-use developments within the boundaries of the Major Flight Corridor zone are subject to additional sound attenuation requirements. All subdistricts require land developers to complete noise disclosure forms, which are recorded with the Department of Aviation and presented to future property buyers. Additionally, mixed-use development in subdistricts MUD-1, MUD-2, and MUD-3 is subject to sound attenuation requirements. The sound attenuation requirements specify a 30-decibel (dB) reduction in interior noise levels in habitable buildings exceeding 35 feet in height, a 35-dB reduction in noise levels in habitable buildings exceeding 35 feet in height within the AE-65 subdistrict, and enclosure of passive activity areas in residential buildings.[8]

## 3.11 Cooperative Management Area

In November 1992, a Cooperative Management Area was established through an agreement between Clark County and the U.S. Department of the Interior, Bureau of Land Management. As shown on **Exhibit III-14**, the Cooperative Management Area is located to the west and south of the Airport, and its boundaries are defined by aircraft departure flight corridors and the area exposed to DNL 60 as delineated on the 1992 Noise Exposure Map prepared for the 1989 *FAR Part 150 Noise Compatibility Program* for the Airport. The objectives of the agreement were as follows:

- To provide proper land use planning and management to protect against the encroachment of incompatible land uses on federal land under the airspace used for aircraft departing to the west and southwest from McCarran International Airport.
- To facilitate the efficient management and protect against unlawful use of public land in these areas.
- To ensure that the affected areas are regularly patrolled and monitored to reduce unlawful disposal of trash.

[8] Clark County, Nevada. *Title 30, Clark County Unified Development Code*, Chapter 30.48, Section 770(C)(9).

## Exhibit III-13 Clark County Mixed Use Overlay District

## Exhibit III-14 Cooperative Management Area

- To prevent the transfer of public lands to private ownership without the concurrence of Clark County.

The Cooperative Management Area boundary contains approximately 20,543 acres and is located in the southwest portion of the Spring Valley planning area and the northwest portion of the Enterprise planning area. Under the provisions of the *Southern Nevada Public Land Management Act (SNPLMA) of 1998* **[III-10]**, approximately 5,226 acres of federal land holdings and interests located within the CMA were transferred to Clark County in March 1999. Only those land uses deemed compatible with the Airport are permitted on the CMA parcels acquired by Clark County under the terms of the Act. The current revision to the Spring Valley land use plan reflects the long-term compatible development of lands in the portion of the Cooperative Management Area under the control of Clark County.

# IV. Aircraft Noise Analysis

## 4.1 General Characteristics of Aircraft Noise

Aircraft noise originates from both the engines and the airframe of an aircraft, but the engines are usually the more significant source of noise. Although noise from propeller-driven aircraft (mostly commuter and general aviation aircraft) can be annoying, jet aircraft are the primary source of disturbing noise from aircraft operations at McCarran International Airport. However, because of the flight procedures specific to propeller-driven aircraft, these aircraft may represent a primary aircraft noise source in certain areas.

The measurement and human perception of sound involve two basic physical characteristics: intensity and frequency. Intensity is a measure of the acoustic energy of sound vibrations, expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency, which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. The loudest sounds that can be detected comfortably by the human ear have intensities that are 1,000,000,000,000 times higher than those of sounds that can just be detected. Because of this vast range, it is difficult to represent the intensity of sound using a linear scale. As a result, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such representation is called a sound level.

Sound frequency is measured in terms of cycles per second, or hertz (Hz). The normal human ear can detect sound frequencies ranging from about 20 Hz to about 15,000 Hz. However, over this wide range of frequencies, people do not hear all sounds equally. The human ear is most sensitive to sounds in the 1,000 Hz to 4,000 Hz range and least sensitive to frequencies less than 100 Hz. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's lower sensitivity to those frequencies, resulting in the A-weighted decibel, or dBA, scale.

Some common sounds on the dBA scale are listed in **Table IV-1**. As shown in the table, the relative perceived loudness of a sound doubles for each increase of 10 dBA, although a 10-dBA change corresponds to a *factor* of 10 in relative sound energy. Whereas a person can detect a change of as little as 1 dB under very carefully controlled laboratory conditions, under normal conditions, the minimum change in the sound level of individual events that an average human ear can detect is about 3 dB.

**Exhibit IV-1** illustrates the range of sound produced and the average sound level of several types of aircraft that operate at McCarran International Airport, compared with other sounds, such as sirens, motorcycles, and garbage disposals.

**Table IV-1**

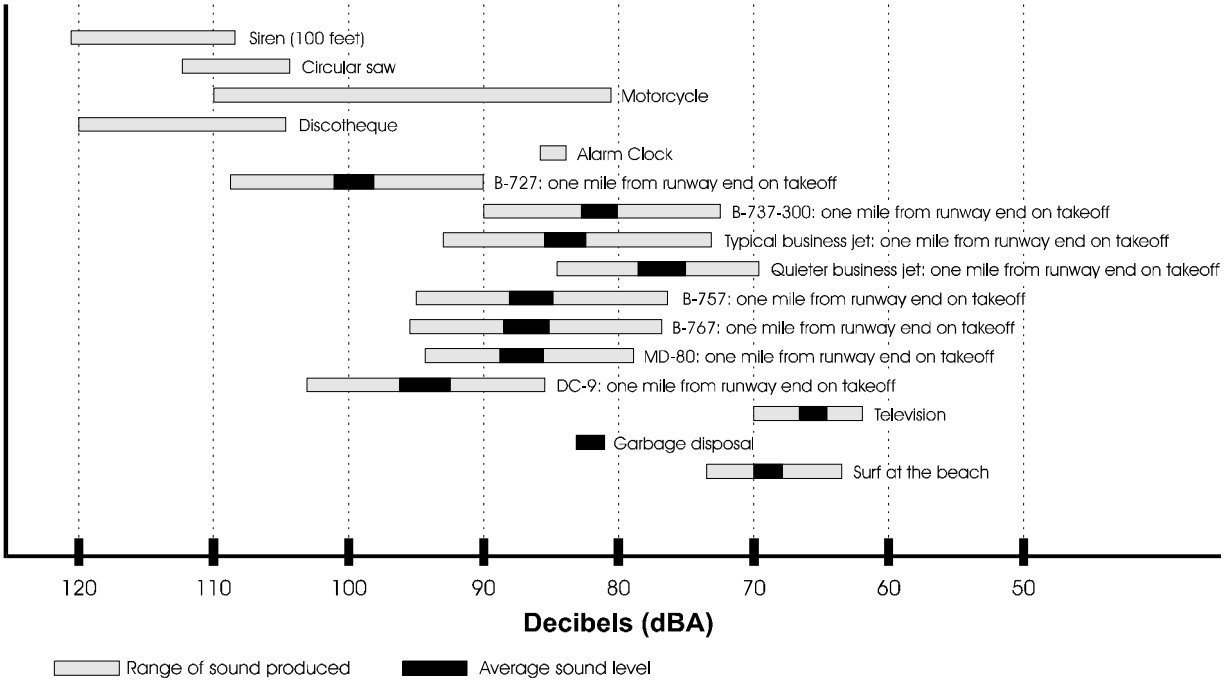
Common Sounds on the A-Weighted Decibel Scale

| Sound | Sound Level (dBA) | Relative Loudness (approximate) | Relative Sound Energy |
|---|---|---|---|
| Rock music, with amplifier | 120 | 64 | 1,000,000 |
| Thunder, snowmobile (operator) | 110 | 32 | 100,000 |
| Boiler shop, power mower | 100 | 16 | 10,000 |
| Orchestral crescendo at 25 feet, noisy kitchen | 90 | 8 | 1,000 |
| Busy street | 80 | 4 | 100 |
| Interior of department store | 70 | 2 | 10 |
| Ordinary conversation, 3 feet away | 60 | 1 | 1 |
| Quiet automobiles at low speed | 50 | 1/2 | 0.1 |
| Average office | 40 | 1/4 | 0.01 |
| City residence | 30 | 1/8 | 0.001 |
| Quiet country residence | 20 | 1/16 | 0.0001 |
| Rustle of leaves | 10 | 1/32 | 0.00001 |
| Threshold of hearing | 0 | 1/64 | 0.000001 |

Source: U.S. Department of Housing and Urban Development, *Aircraft Noise Impact—Planning Guidelines for Local Agencies*, 1972.
Prepared by: Ricondo & Associates, Inc.

**Exhibit IV-1**

Typical Sound Levels




Source: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

## 4.2 Noise Analysis Methodology

The methodology used for this aircraft noise analysis involved (1) the use of noise descriptors developed for airport noise analyses, (2) development of basic data and assumptions as input to the computer model, and (3) application of a computer model that provides estimates of aircraft noise levels.

## 4.3 Noise Descriptors

Noise levels are measured using a variety of scientific metrics. As a result of extensive research into the characteristics of aircraft noise and human response to that noise, a standard system of descriptors has been developed for aircraft noise exposure analyses. These descriptors, as used for this aircraft noise analysis, are described in the sections below.

### 4.3.1 A-Weighted Sound Pressure Level

The decibel is a unit used to describe sound pressure level. When expressed in dBA, the sound has been filtered to reduce the effect of very low- and very high-frequency sounds, similar to the way the human ear hears sounds. Without this filtering, calculated and measured sound levels would include events that the human ear cannot hear, such as the frequencies of dog whistles and the low frequencies of "groans" made by large buildings with changes in temperature and wind. The A-weighting used for noise calculations and by sound monitoring equipment approximates the human ear's sensitivity to sounds of different frequencies.

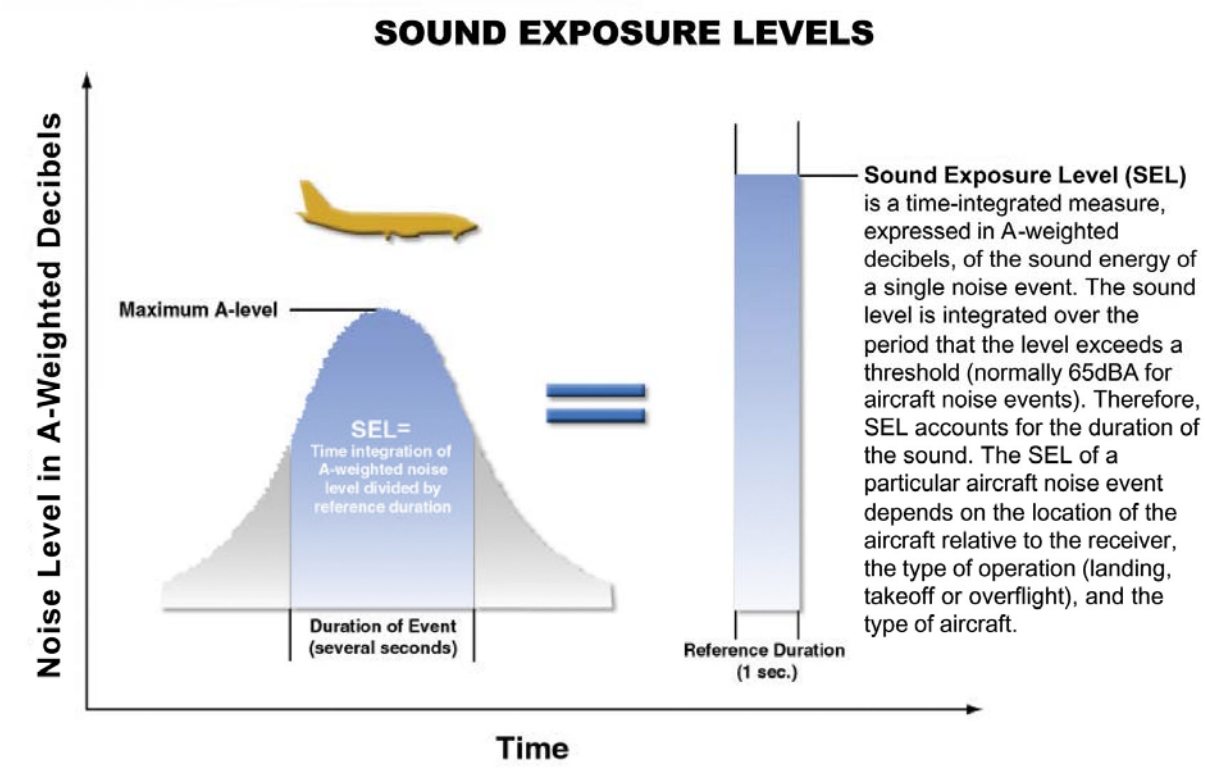
### 4.3.2 Maximum A-Weighted Sound Level

The maximum A-weighted sound level ($L_{max}$) is the loudest part of a noise event, measured in decibels. As an aircraft passes an observer overhead, the noise increases to a maximum level and then decreases. Some sound-level meters measure the maximum, or $L_{max}$, level.

### 4.3.3 Sound Exposure Level

Sound exposure level (SEL) is a time-integrated measure, expressed in decibels, of the sound energy of a single noise event at a reference duration of 1 second. The sound level is integrated over the period that the sound level exceeds a threshold. Therefore, SEL accounts for both the maximum sound level and the duration of the sound. The standardization of discrete noise events into a 1-second duration allows the calculation of the cumulative noise exposure of a series of noise events that occur over a period of time. Because of this compression of sound energy, the SEL of an aircraft noise event is typically 7 to 12 dBA greater than the $L_{max}$ of the event. SELs for aircraft noise events depend on the location of the aircraft relative to the noise receptor, the type of operation (landing, takeoff, or overflight), and the type of aircraft. The SEL concept is depicted on **Exhibit IV-2**.

**Exhibit IV-2**
Sound Exposure Level Concept




Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

### 4.3.4 Day-Night Average Sound Level

Day-night average sound level (DNL) is a method used to describe the existing and predicted cumulative noise exposure from aircraft operations in an airport vicinity. DNLs are expressed in dBA and represent the noise level over a 24-hour period. The DNL metric was introduced by the U.S. Environmental Protection Agency (EPA) in 1976 as a single number measurement of community noise exposure. The FAA adopted DNL as the noise metric for measuring cumulative aircraft noise under FAR Part 150, *Airport Noise Compatibility Planning.* The U.S. Department of Housing and Urban Development, the Veterans Administration, the U.S. Department of Defense, the U.S. Coast Guard, and the Federal Transit Administration have also adopted the use of DNL for measuring cumulative noise exposure. DNL is widely accepted as the best available method to describe aircraft noise exposure and is the noise descriptor required for use in aircraft noise exposure analyses, land use compatibility planning, and environmental assessments and environmental impact statements for airport improvement projects. Although additional noise metrics may be used to characterize aircraft noise and environmental impacts, neither Clark County nor the State of Nevada mandate the use of metrics other than DNL.

In calculating DNL, for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.), the sound levels are increased by a 10-decibel-weighting penalty before the 24-hour value is computed. The weighting penalty accounts for the more intrusive nature of noise during the nighttime hours.

DNL is expressed as an average noise level on the basis of annual aircraft operations for a calendar year, not on the average noise levels associated with different aircraft operations. To calculate the DNL at a specific location, the SELs at that location associated with each aircraft operation (landing or takeoff) are determined. Using the SEL for each noise event and applying the 10-decibel penalty for nighttime operations as appropriate, a partial DNL is then calculated for each aircraft operation.

The partial DNLs are then added logarithmically – with the appropriate penalty for operations occurring during the nighttime hours – to determine the total noise exposure for the calendar year. The logarithmic addition process, whereby the partial DNLs are combined, can be approximated by the following guidelines:

**How to Add Decibels**

| When two DNLs differ by: | Add the following amount to the higher value | For Example |
|---|---|---|
| 0 or 1 dBA | 3 dBA | |
| 2 or 3 dBA | 2 dBA | 70 dBA + 70 dBA = 73 dBA |
| 4 to 9 dBA | 1 dBA | |
| 10 dBA or more | 0 dBA | |

Adding the noise from a relatively quiet event (60 dBA) to that of a relatively noisy event (70 dBA) results in a value of 70 dBA because the quieter event has only one-tenth of the sound energy of the noisier event. As a result, the quieter noise event is "drowned out" by the noisier one, and there is no increase in the overall noise as perceived by the human ear.

DNL is used to describe existing and predicted noise exposure in communities in an airport vicinity based on the average number of daily operations over the year and the average annual operational conditions at the airport. Therefore, at a specific location near an airport, the noise exposure on a particular day is likely to be higher or lower than the annual average exposure, depending on the specific operations at the airport that day.

## 4.4 Integrated Noise Model

The Integrated Noise Model (INM) is a computer model developed by the FAA and required for use in developing aircraft noise exposure maps. The INM contains a database of aircraft operational and noise data that reflect average aircraft operating conditions at an airport.

Version 6.1 of the INM[1]—the latest accepted, state-of-the-art tool for determining the total effect of aircraft noise at and around airports at the time the noise exposure maps for this FAR Part 150 Study were prepared—was used for the noise analysis. The INM Version 6.1 aircraft database contains representative data for commercial, general aviation, and military aircraft powered by turbojet, turbofan, or propeller-driven engines. For each aircraft in the database, the following information is provided: (1) a set of departure profiles for each applicable trip length, (2) a set of approach parameters, and (3) SEL versus distance curves for several thrust settings. This information is needed to develop the noise exposure maps based on the DNL metric.

The aircraft type designations were selected from the INM database based on single-event aircraft noise level measurements collected during the Department of Aviation's noise monitoring programs in 2004 and 2005. Measured SELs for single representative aircraft events were compared with

[1] Version 6.1 of the INM was released on March 4, 2003.

SELs predicted using the INM to assist in determining the aircraft type designations that provided the best agreement while complying with applicable FAA guidelines. Because DNL is fundamentally based on the noise levels produced by individual aircraft operations, selection of appropriate aircraft type designations from the INM database is of critical importance.

DNLs calculated by the INM for existing aircraft operations at McCarran International Airport have also been validated by the results of long-term noise measurement studies at 10 representative locations around the Airport as discussed in Section 4.6. Aircraft DNLs were measured at these sites for 14-day periods during the winter and summer of 2005. Predicted annual average DNLs for existing (2004) aircraft operations fall within the range of DNLs measured during those studies.

### 4.4.1 DNL and Noise Exposure Ranges

Noise exposure values of DNL 75, 70, 65, and 60 were used as the criterion levels for the noise analysis. Four specific ranges of noise exposure were estimated: (1) DNL 75 and higher, (2) DNL 70 to 75, (3) DNL 65 to 70, and (4) DNL 60-65. Although the FAA considers aircraft noise exposure lower than DNL 65 to be compatible with residential land uses, persons residing outside the area exposed to DNL 65 and higher may still be annoyed by aircraft noise. The frequently cited "Schultz Curve" **[IV-1]** shows that, at an aircraft noise exposure of DNL 65, approximately 15 percent of the population would be expected to be "highly annoyed". At DNL 60, approximately 9% of the population would be expected to be highly annoyed by aircraft noise. At DNL 55, approximately 5 percent of the population would be expected to be highly annoyed by aircraft noise.

### 4.4.2 The DNL Descriptor

The validity and accuracy of DNL calculations depend on the basic information used in the calculations. For future airport activities, the reliability of DNL calculations is affected by a number of variables:

- Future aviation activity levels—the forecast number of aircraft operations, the types of aircraft serving the airport, the times of operations (daytime and nighttime), and aircraft flight tracks—are estimates. The activity forecasts were developed using the best available information at the time they were prepared and achievement of the estimated levels of activity may not occur.
- Acoustical and performance characteristics of future aircraft types are also estimates. When new aircraft designs are introduced, aircraft noise data and flight characteristics may vary from current model aircraft. The INM uses existing aircraft data to represent future aircraft types.
- The noise descriptors used as the basis for calculating DNL represent typical human response (and reaction) to aircraft noise. Because people vary in their responses to noise and because the physical measure of noise accounts for only a portion of an individual's reaction to that noise, DNL can only be used to obtain an average response to aircraft noise that might be expected from a community.
- Single flight tracks used in computer modeling represent a wider band of actual flight tracks.

These uncertainties aside, DNL mapping was developed as a tool to assist in land use planning around airports. The mapping is best used for comparative purposes rather than for providing

absolute values. DNL calculations provide valid comparisons between different projected conditions, as long as consistent assumptions and basic data are used for all calculations.

Thus, sets of DNL calculations can show anticipated changes in aircraft noise exposure over time, or can indicate which of a series of simulated situations is better, and generally how much better, from the standpoint of noise exposure. However, a line drawn on a map does not imply that a particular noise condition exists on one side of the line and not on the other. DNL calculations are merely a means for comparing noise effects, not for precisely defining them relative to specific parcels of land.

Nevertheless, DNL contours can be used to (1) highlight an existing or potential aircraft noise problem that requires attention, (2) assist in the preparation of noise compatibility programs, and (3) provide guidance in developing land use controls, such as zoning ordinances, subdivision regulations, and building codes. DNL is still considered to be the best methodology available for depicting aircraft noise exposure.

### 4.4.3 Graphic Representation of Aircraft Noise Exposure

Contours are lines on a map that connect points of equal DNLs, much like topographic contour lines are drawn on maps to indicate ground elevation. For example, a contour may be drawn to connect all points of DNL 70; another may be drawn to connect all points of DNL 65; and so forth. Generally, noise contours are plotted at 5-DNL intervals. Noise contours were developed for the Airport in conformance with FAA guidelines included in FAA Orders 5050.4B, *National Environmental Policy Act (NEPA) Implementation Instructions for Airport Actions* **[IV-2]** and 1050.1E, *Environmental Impacts: Policies and Procedures* **[IV-3]** and FAR Part 150.

For this analysis, the INM was used to produce contours to delineate areas exposed to DNL 60, 65, 70, and 75. These contours were used in conjunction with U.S. Census data and land use data provided by the Clark County Assessor and the Clark County Department of Comprehensive Planning to estimate the numbers of dwelling units, residents, and noise-sensitive facilities located within the areas exposed to aircraft noise (1) of DNL 75 and higher, (2) between DNL 70 and 75, (3) between DNL 65 and 70, and (4) between DNL 60-65**.**

## 4.5 Basic Data and Assumptions for Developing Noise Exposure Maps

The primary data required to develop noise exposure maps using INM Version 6.1 are:

- The existing and forecast number of aircraft operations by time of day, aircraft type, and stage length (nonstop departure trip length from the airport).
- Operational information, including runway use, location and use of flight tracks (the paths that pilots fly to arrive at and depart from the airport), departure profiles, existing noise abatement procedures, etc.

### 4.5.1 Aircraft Operations

To determine existing and projected aircraft noise exposure using the INM, aircraft operations associated with the average day of the year are used as input to the model. The aircraft types in the INM database that were selected for use in the analysis are listed in **Table IV-2** along with examples of the types of aircraft that are represented by each INM type selected.

The numbers of aircraft operations by type of operation, aircraft type, time of day, and departure trip length for the average day in 2004, 2011, and 2017 are provided in **Tables IV-3, IV-4,** and **IV-5,** respectively. The operations for the average day in 2004 were based on actual data provided by the FAA Airport Traffic Control Tower, Clark County's Aircraft Flight Tracking and Environmental Monitoring System (AFTEMS) records, published airline schedule data, and other sources. The forecasts of operations for the average day in 2011 and 2017 were derived from the annual forecasts presented in Section II of this report.

**Table IV-2**

INM Aircraft Types Selected for Analysis

| INM Aircraft Types | Representative Types of Aircraft Modeled |
|---|---|
| A310 | A306, A310, A331, A332, A343 |
| 747400 | B744, B742 |
| 767300 | B762, B763, B764, B767, B769 |
| DC1030 | DC10, L1011, MD10, MD11 |
| 777300 | B777 |
| 777200 | B7E7 |
| A320 | A32, A320, A321 |
| MD9028 | MD90 |
| 757RR | B751, B752, B753, B757 |
| 737800 | B738, B739 |
| 727EM2 | B721, B722, B727, B727Q |
| 717200 | B717 |
| 737N17 | B732, B73Q, B73S |
| 73QEGG (737N17)[1/] | B73Q (EG&G) |
| 733EGG (737300)[1/] | B733 (EG&G) |
| A319 | A318, A319 |
| 737300 | B733 |
| 737400 | B734 |
| 737500 | B735 |
| 737700 | B737 |
| DC93LW | DC9, DC93, DC9Q |
| MD81 | MD80, MD81, MD87 |
| MD82 | MD82 |
| MD83 | MD83, MD88 |
| CR700 (GV) | CR7, CR9, E170, E190 |
| CRJ200 (EMB 145) | CRJ-200, E135, E145 |
| EMB120 | E120 |
| DHC6 | Large Twin Turboprop |
| GIIB | Large Stage 2 Business Jet |
| GIV | Large Stage 3 Business Jet |
| LEAR35 | Medium/Small Stage 3 Business Jet |
| COMJET | Medium/Small Stage 2 Business Jet |
| CNA441 | Twin Turboprop |
| BEC58P | Twin Piston Prop |
| GASEPV | Single Engine Prop |
| AS350 | Tour Helicopter |
| EC130 | Tour Helicopter |
| F-18 | Military Jets |

Note:
1/ User-defined aircraft in the INM. Aircraft types used to model operations performed by EG&G.

Source: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc

**Table IV-3**

Average Daily Aircraft Operations by Representative Aircraft Types—2004

| INM Aircraft Type | Arrivals | | | Departures | | | Departures by Trip Length Category [1/] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Stage 1 | | Stage 2 | | Stage 3 | | Stage 4 | | Stage 7 | |
| | Day | Night | Total | Day | Night | Total | Day | Night | Day | Night | Day | Night | Day | Night | Day | Night |
| 717200 | 1.8 | 0.1 | 1.9 | 1.8 | 0.2 | 1.9 | 1.4 | 0.1 | 0.3 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 727EM2 [2/] | 4.4 | 1.7 | 6.1 | 5.0 | 1.1 | 6.1 | 0.0 | 0.0 | 0.8 | 0.0 | 1.8 | 0.0 | 2.4 | 1.1 | 0.0 | 0.0 |
| 737300 | 118.6 | 11.1 | 129.7 | 116.4 | 13.3 | 129.7 | 84.2 | 9.5 | 16.4 | 1.8 | 13.9 | 1.4 | 2.0 | 0.6 | 0.0 | 0.0 |
| 737400 | 2.7 | 0.5 | 3.2 | 2.9 | 0.3 | 3.2 | 0.0 | 0.0 | 2.9 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737500 | 8.2 | 0.5 | 8.7 | 7.8 | 0.9 | 8.7 | 6.0 | 0.8 | 1.1 | 0.1 | 0.6 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| 737700 | 76.3 | 6.7 | 83.0 | 75.7 | 7.3 | 83.0 | 33.2 | 5.8 | 3.3 | 0.5 | 12.3 | 0.5 | 26.9 | 0.4 | 0.0 | 0.0 |
| 737800 | 14.4 | 1.9 | 16.4 | 12.1 | 4.3 | 16.3 | 0.7 | 0.0 | 1.9 | 0.0 | 4.1 | 1.1 | 5.3 | 3.1 | 0.0 | 0.0 |
| 737N17 [2/] | 4.5 | 0.8 | 5.3 | 3.8 | 1.5 | 5.3 | 3.5 | 1.5 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 73QEGG [2/] | 10.3 | 1.9 | 12.2 | 8.8 | 3.4 | 12.3 | 8.8 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 747400 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 | 1.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 757RR | 58.2 | 15.2 | 73.4 | 53.1 | 20.2 | 73.4 | 8.9 | 1.5 | 1.2 | 0.5 | 13.8 | 2.8 | 29.2 | 15.5 | 0.0 | 0.0 |
| 767300 | 7.4 | 1.4 | 8.8 | 7.4 | 1.4 | 8.8 | 1.4 | 0.5 | 0.0 | 0.0 | 0.2 | 0.0 | 5.1 | 0.9 | 0.6 | 0.0 |
| A310 | 1.6 | 0.9 | 2.5 | 1.8 | 0.6 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 0.6 | 0.0 | 0.0 |
| A319 | 18.3 | 5.1 | 23.4 | 16.2 | 7.2 | 23.4 | 7.1 | 1.9 | 2.9 | 0.4 | 0.8 | 0.6 | 5.5 | 4.3 | 0.0 | 0.0 |
| A320 | 63.2 | 17.8 | 80.9 | 56.5 | 24.5 | 80.9 | 19.6 | 8.2 | 1.3 | 0.4 | 6.7 | 0.0 | 28.9 | 15.8 | 0.0 | 0.0 |
| DC1030 | 1.2 | 0.4 | 1.5 | 1.4 | 0.1 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.1 | 0.0 | 0.0 |
| DC93LW [2/] | 0.3 | 0.5 | 0.8 | 0.8 | 0.0 | 0.8 | 0.4 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD81 | 9.8 | 1.9 | 11.8 | 10.0 | 1.8 | 11.8 | 2.6 | 0.2 | 3.3 | 0.0 | 4.1 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD82 | 8.2 | 1.1 | 9.3 | 8.5 | 0.8 | 9.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.5 | 0.8 | 0.0 | 0.0 |
| MD83 | 6.7 | 1.1 | 7.8 | 5.7 | 2.1 | 7.8 | 0.8 | 0.0 | 1.6 | 0.0 | 3.3 | 0.0 | 0.0 | 2.1 | 0.0 | 0.0 |
| MD9028 | 2.8 | 0.1 | 2.9 | 2.8 | 0.0 | 2.8 | 1.9 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRJ200 | 6.6 | 2.3 | 8.9 | 3.3 | 5.6 | 8.9 | 1.9 | 2.7 | 1.3 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRJ700 | 7.0 | 3.3 | 10.3 | 4.2 | 6.2 | 10.3 | 4.2 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EMB120 | 5.6 | 0.0 | 5.6 | 5.6 | 0.0 | 5.6 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| BEC58P | 17.8 | 1.7 | 19.5 | 16.7 | 2.7 | 19.5 | 16.7 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CNA441 | 5.9 | 0.7 | 6.6 | 5.8 | 0.8 | 6.6 | 5.8 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GASEPV | 18.1 | 2.2 | 20.3 | 17.8 | 2.5 | 20.3 | 17.8 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LEAR35 | 29.4 | 1.9 | 31.3 | 28.6 | 2.7 | 31.3 | 28.6 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIIB | 3.5 | 0.4 | 3.9 | 3.5 | 0.4 | 3.9 | 3.5 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COMJET | 4.3 | 0.4 | 4.7 | 4.2 | 0.5 | 4.7 | 4.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIV | 20.6 | 1.3 | 21.9 | 20.0 | 1.9 | 21.9 | 20.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| F-18 | 0.5 | 0.0 | 0.5 | 0.5 | 0.0 | 0.5 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| AS350 [3/] | 86.9 | 10.7 | 97.6 | 86.9 | 10.7 | 97.6 | 86.9 | 10.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EC130 [3/] | 21.7 | 2.7 | 24.4 | 21.7 | 2.7 | 24.4 | 21.7 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Totals | 647.5 | 98.6 | 746.1 | 618.5 | 127.6 | 746.1 | | | | | | | | | | |

Notes:
Columns and rows may not add to totals shown because of rounding.
Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.

1/ Stage 1 = 0 to 500 nautical miles (nm). Stage 2 = 501 to 1,000 nm; Stage 3 = 1,001 to 1,500 nm; Stage 4 = 1,501 to 2,500 nm; Stage 7 = 4,500+ nm.
2/ Aircraft manufactured to meet FAR Part 36 Stage 2 noise standards that have been modified to meet FAR Part 36 Stage 3 standards.
3/ User-defined aircraft based on FAA noise level and performance data obtained from local helicopter operators. Helicopter operations presented in this table include touch-and-go operations.

Source: Brown-Buntin Associates, Inc. using data from the Airport's Aircraft Flight Tracking and Environmental Monitoring System (AFTEMS/AirScene) for calendar year 2004, McCarran International Airport Traffic Control Tower records, and Official Airline Guides, Inc., data.
Prepared by: Ricondo & Associates, Inc.

**Table IV-4**

Average Daily Aircraft Operations by Representative Aircraft Types—2011

| INM | Arrivals | | | Departures | | | Departures by Trip Length Category [1/] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Stage 1 | | Stage 2 | | Stage 3 | | Stage 4 | | Stage 5 | | Stage 7 | |
| Aircraft Type | Day | Night | Total | Day | Night | Total | Day | Night | Day | Night | Day | Night | Day | Night | Day | Night | Day | Night |
| 717200 | 2.7 | 0.2 | 2.9 | 2.7 | 0.2 | 2.9 | 2.0 | 0.2 | 0.4 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 727EM2 [2/] | 1.6 | 0.6 | 2.2 | 1.9 | 0.4 | 2.2 | 0.0 | 0.0 | 0.3 | 0.0 | 0.7 | 0.0 | 0.9 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| 733EGG | 10.3 | 1.9 | 12.2 | 8.8 | 3.4 | 12.2 | 8.8 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737300 | 132.8 | 12.5 | 145.3 | 130.4 | 14.9 | 145.3 | 93.1 | 10.5 | 19.0 | 2.1 | 16.0 | 1.7 | 2.2 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737400 | 0.8 | 0.1 | 0.9 | 0.8 | 0.1 | 0.9 | 0.0 | 0.0 | 0.8 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737500 | 3.8 | 0.2 | 4.0 | 3.6 | 0.4 | 4.0 | 2.8 | 0.4 | 0.5 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737700 | 103.9 | 9.1 | 113.0 | 103.1 | 9.9 | 113.0 | 44.1 | 7.9 | 4.6 | 0.8 | 17.0 | 0.8 | 37.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737800 | 16.0 | 2.1 | 18.1 | 13.4 | 4.8 | 18.1 | 0.7 | 0.0 | 2.2 | 0.0 | 4.6 | 1.3 | 5.9 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737N17 [2/] | 2.6 | 0.5 | 3.1 | 2.2 | 0.9 | 3.1 | 2.0 | 0.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 747400 | 3.0 | 0.0 | 3.0 | 3.0 | 0.1 | 3.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 |
| 757RR | 65.5 | 17.1 | 82.6 | 59.8 | 22.8 | 82.6 | 9.7 | 1.6 | 1.4 | 0.6 | 15.6 | 3.1 | 33.1 | 17.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 767300 | 10.6 | 2.0 | 12.6 | 10.6 | 2.0 | 12.6 | 2.0 | 0.6 | 0.0 | 0.0 | 0.3 | 0.0 | 7.5 | 1.3 | 0.8 | 0.0 | 0.1 | 0.0 |
| 777200 | 1.9 | 0.3 | 2.3 | 2.3 | 0.0 | 2.3 | 0.4 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 1.6 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| 777300 | 0.8 | 0.1 | 1.0 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| A310 | 1.6 | 1.0 | 2.6 | 1.9 | 0.7 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| A319 | 27.7 | 7.8 | 35.5 | 24.6 | 11.0 | 35.5 | 10.5 | 3.6 | 4.4 | 0.2 | 1.2 | 0.0 | 8.5 | 7.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| A320 | 74.4 | 20.9 | 95.4 | 66.6 | 28.8 | 95.4 | 28.7 | 3.4 | 4.8 | 2.7 | 7.2 | 2.1 | 25.9 | 20.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| DC93LW [2/] | 0.6 | 1.1 | 1.8 | 1.8 | 0.0 | 1.8 | 0.9 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD81 | 10.2 | 2.0 | 12.3 | 10.4 | 1.9 | 12.3 | 2.6 | 0.2 | 3.4 | 0.0 | 4.3 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD82 | 10.3 | 1.4 | 11.7 | 10.7 | 1.0 | 11.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.7 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD83 | 6.2 | 1.0 | 7.2 | 5.2 | 2.0 | 7.2 | 0.7 | 0.0 | 1.5 | 0.0 | 3.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD9028 | 2.7 | 0.1 | 2.8 | 2.8 | 0.0 | 2.8 | 1.8 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CR200 | 6.8 | 2.4 | 9.1 | 3.3 | 5.8 | 9.1 | 1.9 | 2.7 | 1.4 | 3.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CR700 | 15.5 | 7.3 | 22.8 | 9.2 | 13.6 | 22.8 | 9.2 | 13.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EMB120 | 10.5 | 0.0 | 10.5 | 10.5 | 0.0 | 10.5 | 10.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DHC6 | 6.0 | 0.5 | 6.5 | 5.8 | 0.7 | 6.5 | 5.8 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| BEC58P | 22.3 | 2.2 | 24.5 | 21.0 | 3.4 | 24.5 | 21.0 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CNA441 | 6.5 | 0.8 | 7.3 | 6.4 | 0.9 | 7.3 | 6.4 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GASEPV | 18.2 | 2.2 | 20.3 | 17.9 | 2.5 | 20.3 | 17.9 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LEAR35 | 23.6 | 1.5 | 25.2 | 23.0 | 2.1 | 25.2 | 23.0 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIIB | 2.2 | 0.3 | 2.5 | 2.2 | 0.2 | 2.5 | 2.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COMJET | 3.9 | 0.3 | 4.2 | 3.8 | 0.4 | 4.2 | 3.8 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIV | 13.9 | 0.9 | 14.7 | 13.5 | 1.3 | 14.7 | 13.5 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| F-18 | 0.4 | 0.0 | 0.4 | 0.4 | 0.0 | 0.4 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| AS350 [3/] | 82.0 | 10.1 | 92.2 | 82.0 | 10.1 | 92.2 | 82.0 | 10.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EC130 [3/] | 61.6 | 7.6 | 69.2 | 61.6 | 7.6 | 69.2 | 61.6 | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Totals | 763.8 | 118.4 | 882.1 | 728.3 | 153.8 | 882.1 | | | | | | | | | | | | |

Notes: Columns and rows may not add to totals shown because of rounding. Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.
1/ Stage 1 = 0 to 500 nautical miles (nm), Stage 2 = 501 to 1,000 nm; Stage 3 = 1,001 to 1,500 nm; Stage 4 = 1,501 to 2,500 nm; Stage 5= 2,501-3,500 nm; Stage 7 = 4,500+ nm.
2/ Aircraft manufactured to meet FAR Part 36 Stage 2 noise standards that have been modified to meet FAR Part 36 Stage 3 standards.
3/ User-defined aircraft based on FAA noise level and performance data obtained from local helicopter operators. Helicopter operations presented in this table include touch-and-go operations

Source: Brown-Buntin Associates, Inc. on the basis of the forecasts presented in Section II.
Prepared by: Ricondo & Associates, Inc.

**Table IV-5**

Average Daily Aircraft Operations by Representative Aircraft Types—2017

| INM Aircraft Type | Arrivals | | | Departures | | | Departures by Trip Length Category [1/] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Stage 1 | | Stage 2 | | Stage 3 | | Stage 4 | | Stage 5 | | Stage 7 | |
| | Day | Night | Total | Day | Night | Total | Day | Night | Day | Night | Day | Night | Day | Night | Day | Night | Day | Night |
| 717200 | 3.4 | 0.2 | 3.6 | 3.3 | 0.3 | 3.6 | 2.5 | 0.3 | 0.5 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 733EGG | 10.3 | 1.9 | 12.3 | 8.8 | 3.4 | 12.2 | 8.8 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737300 | 144.4 | 13.6 | 158.0 | 141.8 | 16.2 | 157.9 | 99.8 | 11.2 | 21.4 | 2.3 | 18.0 | 1.9 | 2.5 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737700 | 122.1 | 10.7 | 132.8 | 121.2 | 11.6 | 132.8 | 50.4 | 9.2 | 5.6 | 0.9 | 20.4 | 0.9 | 44.8 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 737800 | 22.7 | 3.0 | 25.7 | 19.0 | 6.7 | 25.7 | 1.0 | 0.0 | 3.1 | 0.1 | 6.6 | 1.8 | 8.3 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 747400 | 5.8 | 0.0 | 5.8 | 5.7 | 0.1 | 5.8 | 3.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 |
| 757RR | 71.5 | 18.7 | 90.2 | 65.3 | 24.9 | 90.2 | 10.1 | 1.6 | 1.5 | 0.6 | 17.2 | 3.5 | 36.4 | 19.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 767300 | 14.7 | 2.8 | 17.5 | 14.8 | 2.7 | 17.5 | 2.6 | 0.9 | 0.0 | 0.0 | 0.4 | 0.0 | 10.6 | 1.9 | 1.0 | 0.0 | 0.1 | 0.0 |
| 777200 | 5.1 | 0.8 | 5.9 | 5.9 | 0.0 | 5.9 | 1.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 4.2 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 |
| 777300 | 1.5 | 0.3 | 1.8 | 1.8 | 0.0 | 1.8 | 1.3 | 0.0 | 0.3 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A310 | 2.9 | 1.8 | 4.7 | 3.5 | 1.2 | 4.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| A319 | 37.7 | 10.6 | 48.3 | 33.4 | 14.9 | 48.3 | 13.9 | 4.7 | 6.1 | 0.2 | 1.7 | 0.0 | 11.7 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A320 | 72.4 | 20.4 | 92.8 | 64.8 | 28.0 | 92.8 | 27.2 | 3.2 | 4.7 | 2.6 | 7.1 | 2.0 | 25.7 | 20.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| DC93LW [2/] | 0.4 | 0.8 | 1.2 | 1.2 | 0.0 | 1.2 | 0.6 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD81 | 10.7 | 2.1 | 12.8 | 10.9 | 1.9 | 12.8 | 2.6 | 0.2 | 3.6 | 0.0 | 4.6 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD82 | 8.3 | 1.1 | 9.4 | 8.6 | 0.8 | 9.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.6 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD83 | 5.8 | 1.0 | 6.8 | 5.0 | 1.8 | 6.8 | 0.6 | 0.0 | 1.4 | 0.0 | 2.9 | 0.0 | 0.0 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| MD9028 | 3.0 | 0.1 | 3.1 | 3.1 | 0.0 | 3.1 | 2.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EMB120 | 13.1 | 0.0 | 13.1 | 13.1 | 0.0 | 13.1 | 13.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRJ200 | 8.4 | 3.0 | 11.4 | 4.2 | 7.2 | 11.4 | 2.3 | 3.3 | 1.8 | 3.9 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRJ700 | 37.4 | 17.6 | 55.0 | 22.2 | 32.8 | 55.0 | 22.2 | 32.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DHC6 | 7.5 | 0.6 | 8.1 | 7.2 | 0.9 | 8.1 | 7.2 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| BEC58P | 22.0 | 2.1 | 24.1 | 20.7 | 3.4 | 24.1 | 20.7 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CNA441 | 5.9 | 0.7 | 6.6 | 5.8 | 0.8 | 6.6 | 5.8 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GASEPV | 18.0 | 2.2 | 20.2 | 17.8 | 2.4 | 20.2 | 17.8 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LEAR35 | 23.4 | 1.5 | 24.9 | 22.8 | 2.1 | 24.9 | 22.8 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIIB | 2.1 | 0.3 | 2.4 | 2.2 | 0.2 | 2.4 | 2.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COMJET | 3.9 | 0.3 | 4.2 | 3.8 | 0.4 | 4.2 | 3.8 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIV | 13.8 | 0.9 | 14.7 | 13.4 | 1.3 | 14.7 | 13.4 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| F-18 | 0.3 | 0.0 | 0.3 | 0.3 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| AS350 [3/] | 83.6 | 10.3 | 94.0 | 83.6 | 10.3 | 94.0 | 83.6 | 10.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| EC130 [3/] | 99.0 | 12.2 | 111.2 | 99.0 | 12.2 | 111.2 | 99.0 | 12.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Totals | 881.2 | 141.6 | 1,022.8 | 833.9 | 188.9 | 1,022.8 | | | | | | | | | | | | |

Notes:
Columns and rows may not add to totals shown because of rounding.
Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.

1/ Stage 1 = 0 to 500 n.m., Stage 2 = 501 to 1000 n.m.; Stage 3 = 1001 to 1500 n.m.; Stage 4 = 1501 to 2500 n.m.; Stage 5= 2501-3500 n.m.; Stage 7 = 4500+ n.m.
2/ Aircraft manufactured to meet FAR Part 36 Stage 2 noise standards that have been modified to meet FAR Part 36 Stage 3 standards.
3/ User-defined aircraft based on FAA noise level and performance data obtained from local helicopter operators. Helicopter operations presented in this table also include touch-and-go operations.

Source: Brown-Buntin Associates, Inc. on the basis of the forecasts presented in Section II.
Prepared by: Ricondo & Associates, Inc.

#### 4.5.1.1 Aircraft Fleet Mix

The INM aircraft types listed in Tables IV-3, IV-4, and IV-5 have noise characteristics representative of a large variety of aircraft types that operate or are anticipated to operate at the Airport. In certain circumstances, it is appropriate to combine aircraft with similar engine types, numbers of engines, weights, performance characteristics, and (most importantly) noise exposure characteristics for the purposes of noise modeling. Examples of such circumstances include:

- A particular aircraft type that may not be included in the INM database may be modeled using a similar aircraft type that is included in the database.
- Only a small number of operations by a particular aircraft type may occur at an airport while a large number of operations by a similar aircraft type occur at the airport. The small number of operations of the first type could be combined with the operations of the more predominant aircraft type without resulting in a measurable effect on the noise analysis.
- The FAA has provided some aircraft types that are representative of a wide variety of specific aircraft types and can be used to represent the wide variety of aircraft types. The best examples of this are corporate and general aviation aircraft that can be modeled using a series of aircraft types that are representative of the overall fleet. For example, the INM aircraft type "COMJET" is representative of a wide variety of corporate jet aircraft that are compliant with FAR Part 36 Stage 2 noise standards.

The FAA has provided a list of pre-approved aircraft substitutions that can be used for noise modeling purposes using the INM. Aircraft substitutions used in this analysis were consistent with the pre-approved list.

Takeoff noise levels (in dBA) associated with several aircraft types using the Airport are shown on **Exhibit IV-3**. The noise level estimates are documented in FAA Advisory Circular (AC) 36-3H, *Estimated Airplane Noise Levels in A-Weighted Decibels* **[IV-4]**, and are based on certificated aircraft noise levels measured at 21,325 feet (6,500 meters) from the start of the takeoff roll. Aircraft noise characteristics can be classified according to federal noise level standards specified in FAR Part 36, *Noise Standards, Aircraft Type and Airworthiness Certification* **[IV-5]**, as meeting Stage 1 (noisiest), Stage 2 (quieter), or Stage 3 (quietest) standards. As of January 1, 1985, Stage 1 aircraft were no longer allowed to operate in the United States. In accordance with the *Airport Noise and Capacity Act* **[IV-6],** the FAA established a schedule for phasing out the use of FAR Part 36 Stage 2 aircraft weighing more than 75,000 pounds in favor of FAR Part 36 Stage 3 aircraft within the 48 contiguous states. FAR Part 91, *General Operating and Flight Rules*, **[IV-7]** specifies that, after December 31, 1999, no person may operate an FAR Part 36 Stage 2 aircraft over 75,000 pounds in the contiguous United States.

Airlines and other operators of Stage 2 jet aircraft weighing more than 75,000 pounds were provided the option of (1) replacing those aircraft with Stage 3 aircraft or (2) modifying the Stage 2 aircraft through re-engining or hushkitting, or modifying the operational procedures of the aircraft to meet Stage 3 noise standards. Most of the major airlines used a combination of the two methods and relied, to a certain extent, on modifying Stage 2 aircraft to meet Stage 3 noise standards. Some of the McDonnell Douglas DC-9, Boeing 727, and Boeing 737 aircraft that operated at the Airport in 2004, which are included in Table IV-3, had been modified to meet Stage 3 noise standards and were modeled as such. The numbers of operations of these aircraft are noted in Table IV-3.

## Exhibit IV-3 Comparison of Takeoff Noise Values Aircraft Operating at McCarran International Airport

Although the modified aircraft do meet FAR Part 36 Stage 3 noise standards, they typically produce the highest single-event noise levels of civil aircraft weighing more than 75,000 pounds and operating at U.S. airports. These aircraft are still primary contributors to overall noise exposure in the environs of air carrier airports. Therefore, estimating the number of operations of the modified Stage 2 aircraft was important in projecting the fleet mix and related noise exposure for 2011 and 2017. Although the specific retirement/aircraft modification plans or the planned use of the modified Stage 2 aircraft by each aircraft operator (e.g., the airlines) were not known at the time the 2011 and 2017 forecasts were developed, general industry knowledge and data were used to establish assumptions regarding the use of aircraft originally manufactured as Stage 2 aircraft, but modified to meet Stage 3 noise standards.

It should also be noted that no schedule has been established for phasing out Stage 2 jet aircraft weighing less than 75,000 pounds. Practically every corporate or general aviation jet aircraft that operates in the United States weighs less than 75,000 pounds. According to a report by the General Accounting Office, as of October 1, 1999, about 69 percent of the 9,000 civil jet aircraft operating in the United States and weighing less than 75,000 pounds were Stage 3 compliant.

#### 4.5.1.2 Time of Day

FAA Airport Traffic Control Tower data, Clark County's AFTEMS records, and airline schedule data were used to determine the number of operations occurring during the daytime hours (7:00 a.m. to 9:59 p.m.) and nighttime hours (10:00 p.m. to 6:59 a.m.) at McCarran International Airport, listed by aircraft types in Tables IV-3, IV-4, and IV-5. As mentioned earlier, the calculation of DNL includes a 10-decibel weighting penalty for those operations occurring during the nighttime hours. It was assumed that the split between daytime and nighttime operations for each aircraft type would be the same in 2011 and 2017 as that recorded in 2004.

#### 4.5.1.3 Departure Trip Length (Stage Length)

Departure trip length, also called stage length (unrelated to "stage" classifications of aircraft for FAR Part 36 noise certification), refers to the nonstop distance an aircraft travels after departure. This information is needed to determine average gross takeoff weights for the different aircraft types. The noise generated by departures of a specific aircraft type varies depending on the takeoff weight of the particular operation. For example, a fully loaded aircraft departing on a long flight will weigh more on departure than the same fully loaded aircraft departing on a shorter flight because the longer flight requires more fuel on board. It usually takes the heavier aircraft longer to reach its takeoff velocity, thereby using more runway length and climbing at a slower rate than a lighter aircraft, particularly on hot days. Therefore, more land area will be exposed to higher levels of aircraft noise by departures of heavier aircraft than by departures of the same aircraft with lighter loads.

In the INM, up to seven different stage length categories have been established, representing different departure trip length distances, as presented in **Table IV-6**.

**Table IV-6**

INM Departure Stage Length Categories

| Stage Length Category | Range of Departure Trip Length (nautical miles) |
|---|---|
| 1 | 0 – 500 |
| 2 | 500 – 1,000 |
| 3 | 1,000 – 1,500 |
| 4 | 1,500 – 2,500 |
| 5 | 2,500 – 3,500 |
| 6 | 3,500 – 4,500 |
| 7 | 4,500 + |

Source: U.S. Department of Transportation, Federal Aviation Administration, *INM User's Guide*. September 1999. **[IV-8]**
Prepared by: Ricondo & Associates, Inc.

Published airline schedules and air cargo operator data were used to determine the departure stage lengths as presented in Tables IV-3, IV-4, and IV-5. The INM uses the stage length category for each operation to determine which profile to use for a specific aircraft departure. In most cases, using the published departure distances to determine the stage length and therefore the departure profile to be used provides good correlation between noise levels estimated by the INM and measured noise levels.

### 4.5.2 Airport Operational Information

The existing and assumed future uses of the runways and flight tracks to and from an airport are important in determining where aircraft are flying and, consequently, the noise levels generated in the airport vicinity.

Runway use at an airport is typically a function of prevailing wind and weather conditions, the lengths and widths of the runways, runway instrumentation, and the effects of other airports or air facilities in the area. To a certain extent, runway use is also determined based on the destination of a departing aircraft or origination of an arriving aircraft and the location of the aircraft parking position on the airfield. All of these factors, to varying degrees, affect runway use at McCarran International Airport.

The runways available for departure and arrival are a function of the designated flow configuration at the airport. Typically, prevailing wind and weather conditions determine the flow configuration at McCarran International Airport and at other facilities in the region. The actual runways that are used when the Airport is in a specific flow configuration are not limited to those that are oriented in the direction of the flow configuration. This is especially true during periods of calm to light winds. A visual depiction of the airfield flow configurations in use at the Airport is presented on Exhibit III-4 in Section III. **Table IV-7** provides a summary of the available runways in each flow configuration.

Helicopter tour operations (Grand Canyon and Las Vegas Strip tours) were also modeled in the INM. Helicopter operations were assumed to originate/terminate at a location on the west side of McCarran International Airport near the Quail Air Center. Helicopter arrival and departure flight tracks are discussed in Section 4.5.2.3.

**Table IV-7**

Airfield Flow Configurations and Runways Available at McCarran International Airport

| Flow Configuration [1/] | Available Departure Runways | | Available Arrival Runways | |
|---|---|---|---|---|
| | Primary | Secondary | Primary | Secondary |
| South / West (19L, 19R,25L, 25R) | 25R, 19L | 19R | 25L, 19R | 25R, 19L |
| North / West (1R, 1L, 25R, 25L) | 1R | 1L | 25L, 1L | 25R, 1R |
| North / East (1L, 1R, 7L) | 7L, 1R | 1L | 1L | 1R |
| South / East (7L, 7R, 19L,19R) | 7L | 7R | 19R | 19L |
| North (1R and 1L) | 1R | 1L | 1L | 1R |
| South (19L and 19R) | 19L | 19R | 19R | 19L |
| East (7L and 7R) | 7L | None | 7R | None |
| West (25R and 25L) | 25R | None | 25L | 25R |

Note:
1/ The runways listed are typically available for aircraft departures and arrivals during the various flow configurations.

Source: Ricondo & Associates, Inc, on the basis of discussions with ATCT personnel and Clark County Department of Aviation staff.
Prepared by: Ricondo & Associates, Inc.

PASSUR Pulse Operations Archive data for the Airport were obtained and analyzed to determine the monthly use of the primary airfield flow configurations in 2004. The purpose of this analysis was to determine if there were variations in airfield configuration use during the year and highlight times when there were heavier than average departures to the north or to the east of the Airport. The results of this analysis are presented in **Table IV-8**.

**Table IV-8**

2004 Monthly Airfield Configuration Use

| Month | Airfield Flow Configuration | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | South/West (19R/L, 25R/L) | North/West (1R/L, 25R/L) | North/East (1R/L, 7L) | South/East (7R/L, 19R/L) | North (1R/L) | South (19R/L) | East (7R/L) | West (25R/L) |
| January | 85.9% | 8.7% | 4.4% | 0.0% | 0.6% | 0.4% | * | * |
| February | 73.9% | 18.7% | 5.8% | 0.0% | 1.6% | 0.1% | * | * |
| March | 78.7% | 15.5% | 5.0% | 0.0% | 0.7% | 0.2% | * | * |
| April | 80.1% | 11.0% | 6.7% | 0.0% | 2.1% | 0.2% | * | * |
| May | 94.4% | 4.7% | 0.5% | 0.0% | 0.3% | 0.1% | * | * |
| June | 88.0% | 1.7% | 2.5% | 7.5% | 0.2% | 0.2% | * | * |
| July | 78.5% | 1.8% | 0.9% | 18.4% | 0.3% | 0.1% | * | * |
| August | 93.0% | 3.2% | 1.8% | 1.7% | 0.2% | 0.2% | * | * |
| September | 84.9% | 11.6% | 0.8% | 1.6% | 0.7% | 0.3% | * | * |
| October | 84.2% | 8.4% | 4.9% | 1.6% | 0.7% | 0.2% | * | * |
| November | 69.7% | 17.9% | 9.4% | 0.0% | 2.9% | 0.1% | * | * |
| December | 73.4% | 17.9% | 7.9% | 0.0% | 0.6% | 0.2% | * | * |
| Annual Average | 82.2% | 10.1% | 4.2% | 2.4% | 0.9% | 0.2% | * | * |

* Less than 0.1%

Source: PASSUR Pulse Operations Archive for McCarran International Airport, January through December 2004.
Prepared by: Ricondo & Associates, Inc.

Average runway use in 2004 by arrivals and departures and time of day for air carrier aircraft is summarized in **Table IV-9**. Because runway use statistics are different for daytime and nighttime periods and the potential for annoyance from aircraft overflights is greater during the nighttime hours, different runway use statistics were developed for air carrier operations during daytime and nighttime.

**Table IV-9**

Average Air Carrier Aircraft Runway Use by Time of Day and Type of Operation – 2004

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 6.80% | 5.64% | 0.04% | 1.91% | 8.14% | 4.32% | 72.02% | 1.13% |
| | Departures | 1.61 | 10.52 | 8.55 | 0.08 | 23.64 | 1.25 | 0.42 | 53.93 |
| Night [1/] | Arrivals | 4.01 | 3.14 | 0.12 | 0.36 | 15.64 | 2.97 | 67.29 | 6.47 |
| | Departures | 1.10 | 7.35 | 1.43 | 0.01 | 7.75 | 0.81 | 1.00 | 80.55 |

Notes:
Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.

1/ Pertains only to large air carrier jet or propeller aircraft (75,000 pounds gross takeoff weight or greater). The Airport's existing noise abatement plan restricts such aircraft from using Runway 1L-19R between 8:00 p.m. and 8:00 a.m. unless weather conditions or other operational factors require use of the runways. For other types of aircraft, daytime and nighttime runway use was assumed to be the same.

Source: Ricondo & Associates, Inc, on the basis of data obtained from the Airport's Aircraft Flight Tracking and Environmental Monitoring System (AFTEMS/AirScene) for calendar year 2004.
Prepared by: Ricondo & Associates, Inc.

Average runway use in 2004 by arrivals and departures and time of day for commuter and general aviation aircraft is summarized in **Table IV-10**.

**Table IV-10**

Average Commuter and General Aviation Aircraft Runway Use by Time of Day and Type of Operation – 2004

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 13.84% | 1.84% | 0.39% | 1.00% | 5.81% | 60.98% | 15.49% | 0.65% |
| | Departures | 9.65 | 5.93 | 7.78 | 0.59 | 33.95 | 30.44 | 1.83 | 9.84 |
| Night | Arrivals | 9.24 | 2.37 | 1.35 | 0.35 | 7.98 | 53.41 | 12.46 | 12.84 |
| | Departures | 5.69 | 3.37 | 3.88 | 0.18 | 18.83 | 41.80 | 4.51 | 21.73 |

Source: Ricondo & Associates, Inc, on the basis of data obtained from AFTEMS/AirScene for calendar year 2004.
Prepared by: Ricondo & Associates, Inc.

### 4.5.2.2 Future Runway Use

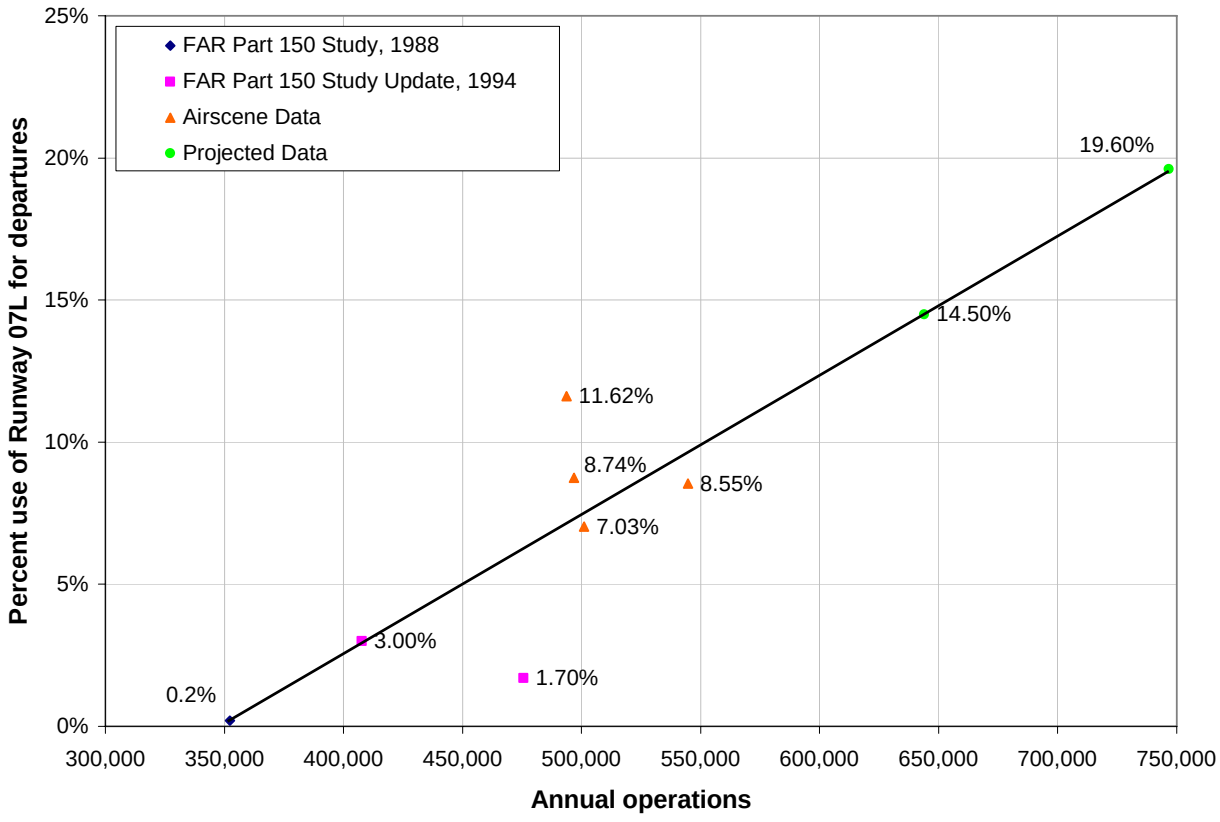
Future runway use was estimated using the 2004 runway use data and projections of changes in runway use expected to occur by 2017. Several factors will influence future runway use at the airport including airfield congestion, aircraft delay, and airfield layout. For instance, Runway 7L-25R slopes downward to the east and as a result on hot days ATCT personnel often assign departures to Runway 7L during the summer months when the winds allow. In addition, during peak periods

ATCT personnel use Runway 1L-19R and 1R-19L more frequently to reduce delays. Three primary runway use changes are expected to occur by 2017 as the number of annual aircraft operations increases and capacity constraints dictate more frequent use of higher capacity airfield configurations:

- Based on the trend of increased Runway 7L departures with the increase in aircraft operations at the Airport between 1986 and 2004, by 2017, departures by air carrier aircraft on Runway 7L are expected to increase to almost 20 percent during the INM daytime period. This trend is depicted on **Exhibit IV-4**.
- Similarly, the percent of air carrier aircraft departures on Runway 7L is expected to increase during the INM nighttime period. This trend is depicted on **Exhibit IV-5**.
- Finally, as the number of nighttime aircraft departures increases and Runway 25R is no longer able to accommodate the volume of traffic, the percent of air carrier aircraft departures on Runway 19L is expected to increase during the INM nighttime period. This trend is depicted on **Exhibit IV-6**.

**Exhibit IV-4**

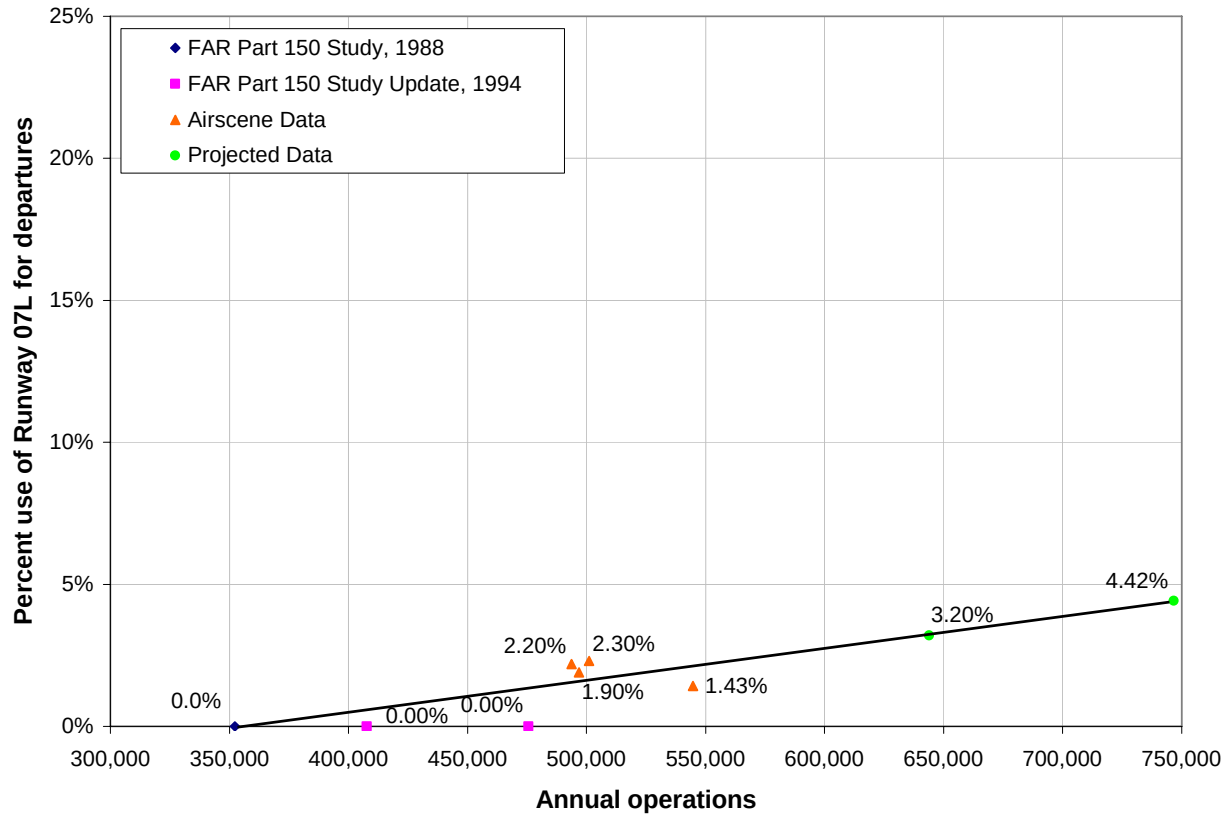
Projected Use of Runway 7L for Departures – INM Daytime Period




Sources: FAR Part 150 Study, 1988 (1986 data); FAR Part 150 Study Update, 1994 (1992 and 1997 data); AFTEMS/AirScene data (2001 through 2004 data); Ricondo & Associates, Inc. (projected 2011 and 2017 data).
Prepared by: Ricondo & Associates, Inc.

**Exhibit IV-5**

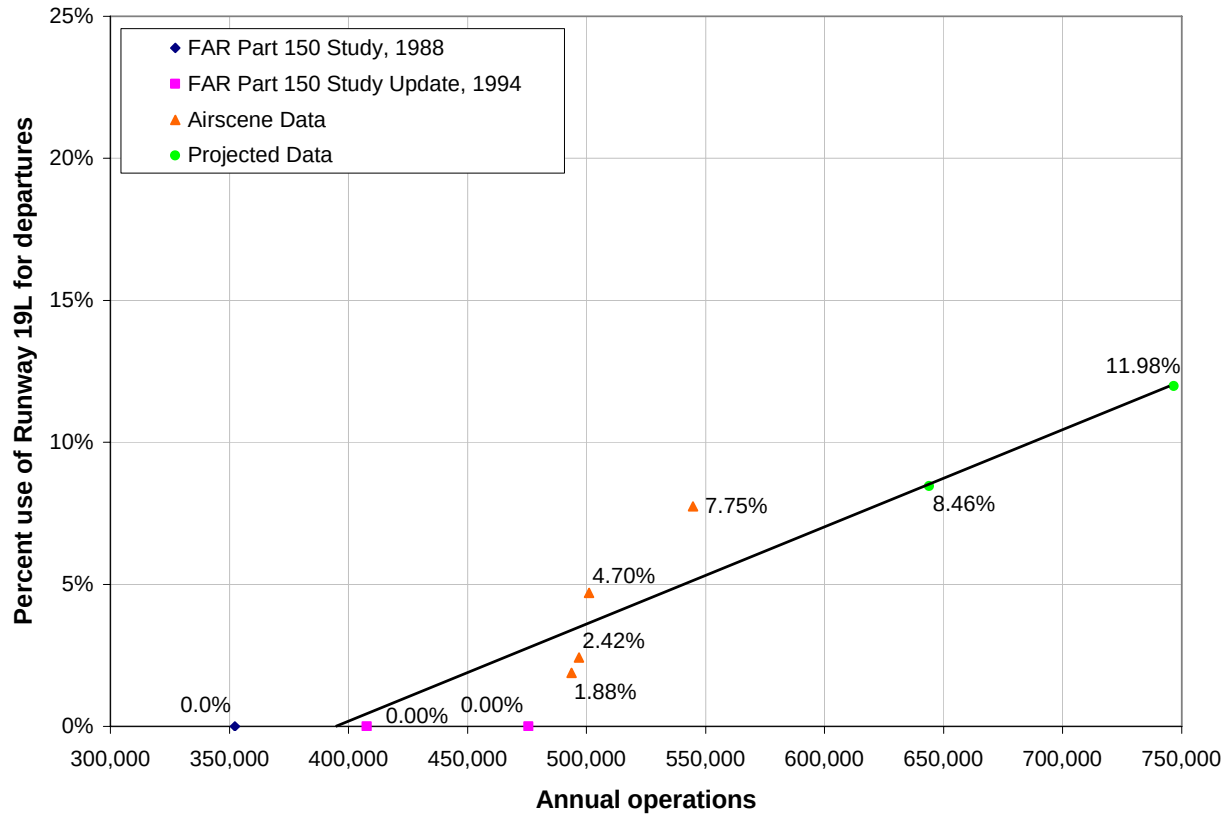
Projected Use of Runway 7L for Departures – INM Nighttime Period




Sources: FAR Part 150 Study, 1988 (1986 data); FAR Part 150 Study Update, 1994 (1992 and 1997 data); AFTEMS/AirScene data (2001 through 2004 data); Ricondo & Associates, Inc. (projected 2011 and 2017 data).
Prepared by: Ricondo & Associates, Inc.

**Exhibit IV-6**

Projected Use of Runway 19L for Departures – INM Nighttime Period




Sources: FAR Part 150 Study, 1988 (1986 data); FAR Part 150 Study Update, 1994 (1992 and 1997 data); AFTEMS/AirScene data (2001 through 2004 data); Ricondo & Associates, Inc. (projected 2011 and 2017 data).
Prepared by: Ricondo & Associates, Inc.

These expected increases in individual runway use drive the increased use of the airfield configurations in which the individual runways are used. For example, increased operations on Runway 7L translate into an increase in the use of the north/east (Runways 1R, 1L, and –7L) and south/east (Runways 7R, 7L, 19R, and 19L) airfield configurations. This methodology was used to derive the expected runway use percentages in 2011 and 2017.

Average annual runway use data for 2011 and 2017 by arrivals and departures and time of day for air carrier aircraft are shown in **Tables IV-11** and **IV-12,** respectively.

**Table IV-11**

Projected Average Air Carrier Aircraft Runway Use by Time of Day and Type of Operation – 2011

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 8.52% | 7.07% | 0.05% | 2.32% | 9.45% | 5.03% | 66.52% | 1.04% |
| | Departures | 1.55 | 13.87 | 14.53 | 0.14 | 20.83 | 1.15 | 0.39 | 47.54 |
| Night [1/] | Arrivals | 4.42 | 3.46 | 0.13 | 0.37 | 16.30 | 3.10 | 65.88 | 6.34 |
| | Departures | 1.09 | 7.56 | 3.03 | 0.03 | 10.03 | 0.79 | 0.95 | 76.52 |

Notes:
Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.

1/ Pertains only to large air carrier jet or propeller aircraft (75,000 pounds gross takeoff weight or greater). The Airport's existing noise abatement plan restricts such aircraft from using Runway 1L-19R between 8:00 p.m. and 8:00 a.m. unless weather conditions or other operational factors require use of the runway. For other types of aircraft, daytime and nighttime runway use was assumed to be the same.

Source: Ricondo & Associates, Inc, on the basis of conversations with ATC personnel and the results of airfield simulation modeling.
Prepared by: Ricondo & Associates, Inc.

**Table IV-12**

Projected Average Air Carrier Aircraft Runway Use by Time of Day and Type of Operation – 2017

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 10.00% | 8.29% | 0.06% | 2.66% | 10.59% | 5.63% | 61.80% | 0.97% |
| | Departures | 1.51 | 16.74 | 19.65 | 0.19 | 18.44 | 1.06 | 0.35 | 42.06 |
| Night [1/] | Arrivals | 4.77 | 3.74 | 0.13 | 0.39 | 16.87 | 3.21 | 64.67 | 6.22 |
| | Departures | 1.08 | 7.74 | 4.40 | 0.04 | 12.00 | 0.78 | 0.90 | 73.06 |

Notes:
Day = 7:00 a.m. – 9:59 p.m.; Night = 10:00 p.m. – 6:59 a.m.

1/ Pertains only to large air carrier jet or propeller aircraft (75,000 pounds gross takeoff weight or greater). The Airport's existing noise abatement plan restricts such aircraft from using Runway 1L-19R between 8:00 p.m. and 8:00 a.m. unless weather conditions or other operational factors require use of the runways. For other types of aircraft, daytime and nighttime runway use was assumed to be the same.

Source: Ricondo & Associates, Inc, on the basis of conversations with ATC personnel and the results of airfield simulation modeling.
Prepared by: Ricondo & Associates, Inc.

Average annual runway use data for 2011 and 2017 by arrivals and departures and time of day for commuter and general aviation aircraft are shown in **Tables IV-13** and **IV-14,** respectively.

**Table IV-13**

Projected Average Commuter and General Aviation Aircraft Runway Use by Time of Day and Type of Operation – 2011

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 18.41% | 2.45% | 0.39% | 1.00% | 5.36% | 56.25% | 15.49% | 0.65% |
| | Departures | 13.47 | 8.28 | 8.10 | 0.65 | 30.92 | 27.73 | 1.70 | 9.15 |
| Night | Arrivals | 9.84 | 2.52 | 1.35 | 0.35 | 7.89 | 52.75 | 12.46 | 12.84 |
| | Departures | 6.15 | 3.65 | 4.06 | 0.21 | 18.61 | 41.29 | 4.47 | 21.56 |

Source: Ricondo & Associates, Inc, on the basis of conversations with ATC personnel and the results of airfield simulation modeling.
Prepared by: Ricondo & Associates, Inc.

**Table IV-14**

Projected Average Commuter and General Aviation Aircraft Runway Use by Time of Day and Type of Operation – 2017

| Time of Day | Type of Operation | Percent of Operations on Runway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1L | 1R | 7L | 7R | 19L | 19R | 25L | 25R |
| Day | Arrivals | 22.32% | 2.97% | 0.39% | 1.00% | 4.98% | 52.20% | 15.49% | 0.65% |
| | Departures | 16.75 | 10.29 | 8.38 | 0.70 | 28.32 | 25.40 | 1.59 | 8.57 |
| Night | Arrivals | 10.34 | 2.65 | 1.35 | 0.35 | 7.80 | 52.21 | 12.46 | 12.84 |
| | Departures | 6.55 | 3.88 | 4.21 | 0.25 | 18.41 | 40.86 | 4.44 | 21.40 |

Source: Ricondo & Associates, Inc, on the basis of conversations with ATC personnel and the results of airfield simulation modeling.
Prepared by: Ricondo & Associates, Inc.

### 4.5.2.3 Aircraft Flight Tracks

Flight track information is another important input to the INM. However, inputting individual tracks for each aircraft operation is not practical and the FAA suggests that flight tracks be consolidated into a set of generalized flight tracks that are representative of all flight tracks into and out of the airport. Deviations from the generalized flight tracks occur because of weather conditions, pilot technique, air traffic control procedures, and aircraft weight. However, the generalized flight tracks are representative of the arrival and departure flight tracks at an airport.

As of October 2001, aircraft at the Airport began operating in accordance with the flight tracks developed in the FAA's Four Corner-Post Plan. The generalized arrival and departure flight tracks used in the INM to develop the 2004 noise exposure map are presented on **Exhibits IV-7** and **IV-8**, respectively, and are based on information contained in the *Four Corner-Post Plan Final Environmental Assessment* **[IV-9]**, and actual flight track data obtained from AFTEMS/AirScene for calendar year 2004. **Exhibit IV-9** shows the departure flight tracks used in the INM to develop the 2011 and 2017 noise exposure maps. The departure flight tracks for future conditions (2011 and 2017) reflect the reinstatement of a right-hand turn for aircraft departing on Runways 25L and 25R and headed to destinations north, northeast, and east of Las Vegas. Exhibit IV-8 also reflects modifications that the FAA made to the Runway 25L and 25R RNAV departure procedures in February 2005. Arrival flight tracks used in the INM to develop the 2011 and 2017 noise exposure maps are identical to the flight tracks used to develop the 2004 noise exposure map. Aircraft

assignments to the arrival and departure flight tracks in 2004, 2011, and 2017 are presented in **Tables IV-15** through **IV-20**.

Arrival and departure flight tracks used by helicopters are also presented on Exhibits IV-7 through IV-9. For the FAR Part 150 noise analysis, it was assumed that Las Vegas Strip tours would be evenly divided between the HSTR1 and HSTR2 tracks for arrivals and departures. All Las Vegas Strip tours were modeled as touch-and-go operations in the INM. Helicopter operations departing for the Grand Canyon and other tourist attractions to the east of McCarran International Airport were assigned to HDT. Helicopters returning from the Grand Canyon and other tourist attractions were split evenly between HAC and HAC3.

Plots of Automated Radar Terminal System Version III (ARTS III) derived from the Airport's AFTEMS system superimposed with the generalized arrival and departure tracks used in the INM are included in **Appendix C**. Exhibits in Appendix C also depict the INM subtracks that were included in the model files to capture the dispersion in actual aircraft flight tracks represented by the radar flight track data.

**Exhibit IV-7 Generalized Arrival Flight Tracks – 2004, 2011, 2017**

**Exhibit IV-8 Generalized Departure Flight Tracks – 2004**

**Exhibit IV-9 Generalized Departure Flight Tracks – 2011 and 2017**

**Table IV-15**

Estimated Flight Track Use – 2004 Arrivals

| Runway | Flight Track | Air Carrier Jet Aircraft [1/] Percent Day | Air Carrier Jet Aircraft [1/] Percent Night | General Aviation/Commuter Aircraft Percent Day | General Aviation/Commuter Aircraft Percent Night |
|---|---|---|---|---|---|
| 1L | A01L-1 | 36.90% | 39.19% | 37.80% | 40.21% |
| | A01L-2 | 31.92% | 32.17% | 32.70% | 33.00% |
| | A01L-3 | 5.86% | 13.06% | 6.00% | 13.39% |
| | A01L-4 | 22.94% | 13.06% | 23.50% | 13.39% |
| | A01L-5 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | A01R-1 | 36.90% | 39.18% | 37.80% | 40.25% |
| | A01R-2 | 31.92% | 32.17% | 32.70% | 32.98% |
| | A01R-3 | 5.86% | 13.06% | 6.00% | 13.39% |
| | A01R-4 | 22.94% | 13.06% | 23.50% | 13.39% |
| | A01R-5 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | A07L-1 | 4.88% | 3.67% | 5.02% | 4.03% |
| | A07L-2 | 49.97% | 40.10% | 50.99% | 41.00% |
| | A07L-3 | 30.26% | 18.74% | 31.00% | 18.98% |
| | A07L-4 | 15.07% | 37.48% | 12.99% | 35.99% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | A07R-1 | 4.88% | 3.88% | 5.01% | 4.08% |
| | A07R-2 | 49.78% | 39.96% | 50.99% | 40.82% |
| | A07R-3 | 30.26% | 18.58% | 31.00% | 18.95% |
| | A07R-4 | 15.07% | 37.58% | 13.00% | 36.15% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | A19L-1 | 33.58% | 29.14% | 34.40% | 29.92% |
| | A19L-2 | 1.07% | 12.28% | 1.10% | 12.60% |
| | A19L-3 | 3.71% | 2.83% | 3.80% | 2.89% |
| | A19L-4 | 21.18% | 16.18% | 21.70% | 16.61% |
| | A19L-5 | 38.07% | 37.04% | 39.00% | 37.98% |
| | A19L-6 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | A19R-1 | 33.58% | 29.15% | 34.40% | 29.90% |
| | A19R-2 | 1.07% | 12.28% | 1.10% | 12.60% |
| | A19R-3 | 3.71% | 2.83% | 3.80% | 2.90% |
| | A19R-4 | 21.18% | 16.18% | 21.70% | 16.60% |
| | A19R-5 | 38.07% | 37.04% | 39.00% | 38.00% |
| | A19R-6 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | A25L-1 | 65.02% | 77.79% | 66.60% | 79.81% |
| | A25L-2 | 0.00% | 1.95% | 0.00% | 2.00% |
| | A25L-3 | 16.79% | 7.90% | 17.20% | 8.09% |
| | A25L-4 | 15.81% | 9.85% | 16.20% | 10.09% |
| | A25L-5 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | A25R-1 | 65.02% | 77.79% | 66.58% | 79.81% |
| | A25R-2 | 0.00% | 1.95% | 0.00% | 2.00% |
| | A25R-3 | 16.79% | 7.90% | 17.20% | 8.10% |
| | A25R-4 | 15.81% | 9.84% | 16.22% | 10.09% |
| | A25R-5 [2/] | 2.38% | 2.52% | 0.0% | 0.0% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.
2/ Applies only to the Boeing 737-200 (737N17) operated by EG&G in 2004.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Table IV-16**

Estimated Flight Track Use – 2004 Departures

| Runway | Flight Tracks | Air Carrier Jet Aircraft [1/] Percent Day | Air Carrier Jet Aircraft [1/] Percent Night | General Aviation/Commuter Aircraft Percent Day | General Aviation/Commuter Aircraft Percent Night |
|---|---|---|---|---|---|
| 1L | D01L-1 | 57.92% | 71.70% | 59.20% | 74.19% |
| | D01L-2 | 19.96% | 8.99% | 20.40% | 9.30% |
| | D01L-3 | 19.96% | 15.96% | 20.40% | 16.51% |
| | D01L-4 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | D01R-1 | 57.92% | 71.72% | 59.20% | 74.21% |
| | D01R-2 | 19.96% | 8.99% | 20.40% | 9.30% |
| | D01R-3 | 19.96% | 15.95% | 20.40% | 16.49% |
| | D01R-4 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | D07L-1 | 32.58% | 35.76% | 33.30% | 37.04% |
| | D07L-2 | 27.69% | 34.81% | 28.30% | 35.98% |
| | D07L-3 | 17.81% | 10.63% | 18.20% | 10.98% |
| | D07L-4 | 19.76% | 15.45% | 20.20% | 16.01% |
| | D07L-5 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | D07R-1 | 32.62% | 35.76% | 33.31% | 36.84% |
| | D07R-2 | 27.65% | 34.81% | 28.31% | 35.96% |
| | D07R-3 | 17.75% | 10.63% | 18.18% | 10.96% |
| | D07R-4 | 19.81% | 15.45% | 20.20% | 16.23% |
| | D07R-5 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | D19L-1 | 20.16% | 35.09% | 20.60% | 36.30% |
| | D19L-2 | 23.19% | 26.39% | 23.70% | 27.30% |
| | D19L-3 | 28.27% | 15.66% | 28.90% | 16.20% |
| | D19L-4 | 26.22% | 19.52% | 26.80% | 20.20% |
| | D19L-5 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | D19R-1 | 20.15% | 35.11% | 20.60% | 36.30% |
| | D19R-2 | 23.19% | 26.35% | 23.70% | 27.30% |
| | D19R-3 | 28.27% | 15.70% | 28.90% | 16.20% |
| | D19R-4 | 26.22% | 19.49% | 26.80% | 20.20% |
| | D19R-5 [2/] | 2.16% | 3.35% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | D25L-1 | 0.99% | 10.74% | 1.00% | 11.10% |
| | D25L-2 | 35.52% | 23.38% | 36.30% | 24.22% |
| | D25L-3 | 26.71% | 22.42% | 27.30% | 23.19% |
| | D25L-4 | 17.80% | 6.85% | 18.20% | 7.09% |
| | D25L-5 | 16.82% | 33.26% | 17.20% | 34.40% |
| | D25L-6 [2/] | 2.16% | 3.35% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | D25R-1 | 0.98% | 10.73% | 1.00% | 11.10% |
| | D25R-2 | 35.52% | 23.39% | 36.30% | 24.20% |
| | D25R-3 | 26.71% | 22.42% | 27.30% | 23.20% |
| | D25R-4 | 17.81% | 6.86% | 18.20% | 7.10% |
| | D25R-5 | 16.83% | 33.25% | 17.20% | 34.40% |
| | D25R-6 [2/] | 2.16% | 3.34% | 0.00% | 0.00% |
| Total | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.
2/ Applies only to the Boeing 737-200 (737N17) operated by EG&G in 2004.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Table IV-17**

Projected Flight Track Use – 2011 Arrivals

| Runway | Flight Track | Air Carrier Jet Aircraft [1/] Percent Day | Air Carrier Jet Aircraft [1/] Percent Night | General Aviation/Commuter Aircraft Percent Day | General Aviation/Commuter Aircraft Percent Night |
|---|---|---|---|---|---|
| 1L | A01L-1 | 37.04% | 39.35% | 37.80% | 40.18% |
| | A01L-2 | 32.04% | 32.31% | 32.70% | 33.01% |
| | A01L-3 | 5.88% | 13.12% | 6.00% | 13.40% |
| | A01L-4 | 23.03% | 13.12% | 23.50% | 13.40% |
| | A01L-5 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | A01R-1 | 37.04% | 39.35% | 37.80% | 40.24% |
| | A01R-2 | 32.04% | 32.30% | 32.70% | 32.99% |
| | A01R-3 | 5.88% | 13.12% | 6.00% | 13.38% |
| | A01R-4 | 23.03% | 13.12% | 23.50% | 13.38% |
| | A01R-5 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | A07L-1 | 4.86% | 3.80% | 4.99% | 3.94% |
| | A07L-2 | 49.97% | 40.13% | 51.04% | 41.06% |
| | A07L-3 | 30.41% | 18.66% | 30.99% | 19.05% |
| | A07L-4 | 14.76% | 37.42% | 12.98% | 35.96% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | A07R-1 | 4.90% | 3.89% | 5.01% | 3.51% |
| | A07R-2 | 49.97% | 40.17% | 51.00% | 40.94% |
| | A07R-3 | 30.38% | 18.59% | 30.99% | 19.01% |
| | A07R-4 | 14.75% | 37.35% | 13.00% | 36.55% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | A19L-1 | 33.71% | 29.27% | 34.40% | 29.90% |
| | A19L-2 | 1.08% | 12.34% | 1.10% | 12.60% |
| | A19L-3 | 3.72% | 2.84% | 3.80% | 2.91% |
| | A19L-4 | 21.26% | 16.25% | 21.70% | 16.60% |
| | A19L-5 | 38.22% | 37.20% | 39.00% | 37.99% |
| | A19L-6 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | A19R-1 | 33.71% | 29.28% | 34.40% | 29.90% |
| | A19R-2 | 1.08% | 12.34% | 1.10% | 12.60% |
| | A19R-3 | 3.72% | 2.83% | 3.80% | 2.90% |
| | A19R-4 | 21.26% | 16.24% | 21.70% | 16.60% |
| | A19R-5 | 38.22% | 37.20% | 39.00% | 38.00% |
| | A19R-6 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | A25L-1 | 65.26% | 78.12% | 66.60% | 79.79% |
| | A25L-2 | 0.00% | 1.96% | 0.00% | 2.00% |
| | A25L-3 | 16.85% | 7.93% | 17.20% | 8.11% |
| | A25L-4 | 15.87% | 9.89% | 16.20% | 10.10% |
| | A25L-5 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | A25R-1 | 65.26% | 78.13% | 66.59% | 79.79% |
| | A25R-2 | 0.00% | 1.96% | 0.00% | 1.99% |
| | A25R-3 | 16.85% | 7.93% | 17.20% | 8.11% |
| | A25R-4 | 15.87% | 9.89% | 16.21% | 10.11% |
| | A25R-5 | 2.01% | 2.10% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Table IV-18**

Projected Flight Track Use – 2011 Departures

| Runway | Flight Tracks | Air Carrier Jet Aircraft [1/] Percent Day | Air Carrier Jet Aircraft [1/] Percent Night | General Aviation/Commuter Aircraft Percent Day | General Aviation/Commuter Aircraft Percent Night |
|---|---|---|---|---|---|
| 1L | D01L-1 | 58.12% | 72.14% | 59.20% | 74.21% |
| | D01L-2 | 20.02% | 9.05% | 20.40% | 9.29% |
| | D01L-3 | 20.02% | 16.05% | 20.40% | 16.50% |
| | D01L-4 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | D01R-1 | 58.11% | 72.15% | 59.20% | 74.21% |
| | D01R-2 | 20.03% | 9.04% | 20.40% | 9.29% |
| | D01R-3 | 20.03% | 16.05% | 20.40% | 16.50% |
| | D01R-4 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | D07L-1 | 32.69% | 35.98% | 33.30% | 37.02% |
| | D07L-2 | 27.78% | 35.01% | 28.30% | 35.99% |
| | D07L-3 | 17.87% | 10.70% | 18.20% | 11.02% |
| | D07L-4 | 19.83% | 15.55% | 20.20% | 15.97% |
| | D07L-5 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | D07R-1 | 32.65% | 35.98% | 33.31% | 36.64% |
| | D07R-2 | 27.73% | 35.01% | 28.29% | 35.78% |
| | D07R-3 | 17.92% | 10.70% | 18.20% | 11.64% |
| | D07R-4 | 19.86% | 15.55% | 20.19% | 15.95% |
| | D07R-5 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | D19L-1 | 20.22% | 35.30% | 20.60% | 36.30% |
| | D19L-2 | 23.27% | 26.55% | 23.70% | 27.30% |
| | D19L-3 | 28.37% | 15.75% | 28.90% | 16.20% |
| | D19L-4 | 26.31% | 19.64% | 26.80% | 20.20% |
| | D19L-5 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | D19R-1 | 20.22% | 35.33% | 20.60% | 36.30% |
| | D19R-2 | 23.27% | 26.53% | 23.70% | 27.30% |
| | D19R-3 | 28.37% | 15.73% | 28.90% | 16.20% |
| | D19R-4 | 26.31% | 19.64% | 26.80% | 20.20% |
| | D19R-5 | 1.83% | 2.76% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | D25L-2 | 4.55% | 0.97% | 4.59% | 4.27% |
| | D25L-3 | 26.77% | 5.30% | 27.31% | 23.21% |
| | D25L-4 | 17.86% | 1.62% | 18.20% | 7.10% |
| | D25L-5 | 16.87% | 7.86% | 17.20% | 34.42% |
| | D25L-6 | 1.84% | 0.65% | 0.00% | 0.00% |
| | D25L-7 | 32.12% | 83.60% | 24.90% | 20.65% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | D25R-2 | 4.52% | 23.46% | 27.30% | 23.20% |
| | D25R-3 | 26.80% | 7.18% | 18.20% | 7.10% |
| | D25R-4 | 17.87% | 34.78% | 17.20% | 34.41% |
| | D25R-5 | 16.88% | 2.87% | 32.70% | 31.00% |
| | D25R-6 | 1.83% | 31.34% | 0.00% | 0.00% |
| | D25R-7 | 32.10% | 0.37% | 6.04% | 6.45% |
| Total | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Table IV-19**

Projected Flight Track Use – 2017 Arrivals

| Runway | Flight Track | Air Carrier Jet Aircraft [1/] Percent Day | Air Carrier Jet Aircraft [1/] Percent Night | General Aviation/Commuter Aircraft Percent Day | General Aviation/Commuter Aircraft Percent Night |
|---|---|---|---|---|---|
| 1L | A01L-1 | 37.14% | 39.49% | 37.80% | 40.21% |
| | A01L-2 | 32.13% | 32.42% | 32.70% | 33.00% |
| | A01L-3 | 5.89% | 13.17% | 6.00% | 13.39% |
| | A01L-4 | 23.09% | 13.17% | 23.50% | 13.39% |
| | A01L-5 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | A01R-1 | 37.14% | 39.49% | 37.80% | 40.20% |
| | A01R-2 | 32.13% | 32.43% | 32.69% | 33.03% |
| | A01R-3 | 5.89% | 13.16% | 6.00% | 13.39% |
| | A01R-4 | 23.09% | 13.16% | 23.50% | 13.39% |
| | A01R-5 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | A07L-1 | 4.91% | 3.64% | 5.01% | 4.04% |
| | A07L-2 | 50.08% | 40.35% | 50.99% | 41.08% |
| | A07L-3 | 30.46% | 18.67% | 30.99% | 18.92% |
| | A07L-4 | 14.55% | 37.34% | 13.01% | 35.96% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | A07R-1 | 4.91% | 3.92% | 4.99% | 3.51% |
| | A07R-2 | 50.11% | 40.33% | 51.00% | 40.94% |
| | A07R-3 | 30.46% | 18.66% | 31.00% | 19.01% |
| | A07R-4 | 14.52% | 37.09% | 13.01% | 36.55% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | A19L-1 | 33.80% | 29.38% | 34.40% | 29.91% |
| | A19L-2 | 1.08% | 12.38% | 1.10% | 12.60% |
| | A19L-3 | 3.73% | 2.85% | 3.80% | 2.90% |
| | A19L-4 | 21.32% | 16.31% | 21.70% | 16.61% |
| | A19L-5 | 38.32% | 37.33% | 39.00% | 37.98% |
| | A19L-6 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | A19R-1 | 33.80% | 29.38% | 34.40% | 29.90% |
| | A19R-2 | 1.08% | 12.38% | 1.10% | 12.60% |
| | A19R-3 | 3.73% | 2.85% | 3.80% | 2.91% |
| | A19R-4 | 21.32% | 16.31% | 21.70% | 16.60% |
| | A19R-5 | 38.32% | 37.33% | 39.00% | 38.00% |
| | A19R-6 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | A25L-1 | 65.43% | 78.40% | 66.60% | 79.79% |
| | A25L-2 | 0.00% | 1.97% | 0.00% | 2.00% |
| | A25L-3 | 16.90% | 7.96% | 17.20% | 8.11% |
| | A25L-4 | 15.92% | 9.92% | 16.20% | 10.10% |
| | A25L-5 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | A25R-1 | 65.43% | 78.41% | 66.60% | 79.79% |
| | A25R-2 | 0.00% | 1.96% | 0.00% | 2.00% |
| | A25R-3 | 16.90% | 7.96% | 17.21% | 8.11% |
| | A25R-4 | 15.92% | 9.92% | 16.19% | 10.10% |
| | A25R-5 | 1.75% | 1.75% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Table IV-20**

Projected Flight Track Use – 2017 Departures

| Runway | Flight Tracks | Air Carrier Jet Aircraft [1/] | | General Aviation/Commuter Aircraft | |
|---|---|---|---|---|---|
| | | Percent Day | Percent Night | Percent Day | Percent Night |
| 1L | D01L-1 | 58.25% | 72.55% | 59.20% | 74.21% |
| | D01L-2 | 20.07% | 9.09% | 20.40% | 9.29% |
| | D01L-3 | 20.07% | 16.14% | 20.40% | 16.50% |
| | D01L-4 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 1R | D01R-1 | 58.24% | 72.55% | 59.20% | 74.17% |
| | D01R-2 | 20.07% | 9.09% | 20.40% | 9.30% |
| | D01R-3 | 20.07% | 16.14% | 20.40% | 16.53% |
| | D01R-4 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7L | D07L-1 | 32.76% | 36.18% | 33.30% | 37.01% |
| | D07L-2 | 27.84% | 35.20% | 28.30% | 36.02% |
| | D07L-3 | 17.91% | 10.76% | 18.20% | 10.97% |
| | D07L-4 | 19.87% | 15.64% | 20.20% | 16.01% |
| | D07L-5 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 7R | D07R-1 | 32.77% | 36.18% | 33.29% | 36.64% |
| | D07R-2 | 27.83% | 35.20% | 28.30% | 35.78% |
| | D07R-3 | 17.91% | 10.76% | 18.20% | 11.21% |
| | D07R-4 | 19.88% | 15.64% | 20.21% | 16.38% |
| | D07R-5 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19L | D19L-1 | 20.27% | 35.49% | 20.60% | 36.30% |
| | D19L-2 | 23.32% | 26.69% | 23.70% | 27.30% |
| | D19L-3 | 28.43% | 15.84% | 28.90% | 16.20% |
| | D19L-4 | 26.37% | 19.75% | 26.80% | 20.20% |
| | D19L-5 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 19R | D19R-1 | 20.27% | 35.49% | 20.60% | 36.30% |
| | D19R-2 | 23.32% | 26.71% | 23.70% | 27.30% |
| | D19R-3 | 28.43% | 15.82% | 28.90% | 16.20% |
| | D19R-4 | 26.36% | 19.76% | 26.80% | 20.20% |
| | D19R-5 | 1.62% | 2.22% | 0.00% | 0.00% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25L | D25L-2 | 0.83% | 1.02% | 4.60% | 4.28% |
| | D25L-3 | 4.94% | 5.51% | 27.30% | 23.21% |
| | D25L-4 | 3.29% | 1.69% | 18.20% | 7.08% |
| | D25L-5 | 3.11% | 8.18% | 17.20% | 34.42% |
| | D25L-6 | 0.30% | 0.54% | 0.00% | 0.00% |
| | D25L-7 | 87.54% | 83.06% | 24.73% | 20.91% |
| | | 100.00% | 100.00% | 100.00% | 100.00% |
| 25R | D25R-2 | 28.04% | 23.59% | 27.30% | 23.20% |
| | D25R-3 | 18.69% | 7.22% | 18.20% | 7.09% |
| | D25R-4 | 17.67% | 34.98% | 17.20% | 34.40% |
| | D25R-5 | 1.69% | 2.31% | 32.70% | 31.00% |
| | D25R-6 | 33.59% | 31.52% | 0.00% | 0.00% |
| | D25R-7 | 0.32% | 0.39% | 6.08% | 6.37% |
| Total | | 100.00% | 100.00% | 100.00% | 100.00% |

Notes:
Columns may not add to totals shown because of rounding.
1/ Includes air cargo jets, regional jets, and military jets.

Source: Brown-Buntin Associates, Inc. based on information obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

#### 4.5.2.4 Other Assumptions

In addition to the runway use and flight track information, the following assumptions were incorporated in developing the noise exposure maps for the Airport:

- Departure profiles for air carrier jet aircraft, general aviation jet aircraft, general aviation and commuter turboprop aircraft, and general aviation single-engine propeller aircraft are those typical of aircraft in these classifications.
- Helicopter noise and performance data were derived from the FAA Helicopter Noise Model for the AS350, with input from Las Vegas area helicopter operators concerning approach and departure procedures and pattern altitudes in the vicinity of the Airport. The AS350 is the most commonly used helicopter by local air tour operators, and produces noise levels comparable to other less frequently used helicopters, such as the Bell 206-L.
- All approaches flown by jet and turboprop aircraft follow a flight track descending along a 3-degree glide-slope, with touchdown at a point 1,000 feet beyond the runway threshold.
- All approaches flown by multi-engine piston and single-engine piston aircraft follow a flight track descending at a 5-degree glide-slope, with a touchdown point 575 feet beyond the runway threshold.
- Noise, thrust, and altitude information for each aircraft type is as specified in the INM Version 6.1 aircraft database.

## 4.6 Noise Monitoring Programs

Aircraft operational procedures and noise emission characteristics can vary widely from airport to airport, depending on local weather, topography, airspace conditions, and pilot technique. Therefore, to reflect prevailing conditions at the Airport, noise in the vicinity of the Airport was measured over two 14-day periods in 2004 and two 14-day periods in 2005, and the measurements were used to verify the INM results.

The noise measurements were conducted by Brown-Buntin Associates, Inc. A sample report generated by Brown-Buntin Associates, Inc. for the summer 2005 noise monitoring period is provided in **Appendix D** of this report. This section provides a summary of the results of the winter and summer noise monitoring programs conducted in 2004 and 2005.

### 4.6.1 Objectives

The primary objective of the noise monitoring program was to validate the INM results for the Airport by measuring the noise levels of individual aircraft types operating at the Airport. The noise monitoring program was not used to develop noise contours directly or to fully describe the aircraft noise environment. Noise exposure maps were developed using the INM, as required by the FAA. The noise monitoring program provided additional information that validated the computer modeling results. A secondary objective of the noise monitoring program was to compare the contribution of aircraft sounds in the environment (ambient noise) to the overall sound energy in the Airport environs during various time periods.

### 4.6.2 Measurement Locations and Times

Noise from aircraft and other sources was measured continuously at 10 locations using automated noise-monitoring equipment for four periods: from January 28 through February 10, 2004 (winter),

from July 8 through July 22, 2004 (summer), from January 26 through February 8, 2005 (winter), and from July 13 through July 26, 2005 (summer). Most of the sites were used during previous noise monitoring studies, including the FAR Part 150 Update completed in 1994. Short-term noise measurements were also conducted at the sites using additional monitors to document single event aircraft noise levels and to verify the correct operation of the long-term noise monitors.

Noise monitoring sites used in the summer and winter noise monitoring programs are described below, and their locations relative to the Airport are shown on **Exhibit IV-10**. The site numbering system used during the 2004 and 2005 noise monitoring programs was the same.

Site M1 - Located on the University of Nevada, Las Vegas (UNLV) campus, north of the Airport, on the roof of the Tennis Complex building. This site is exposed to noise from departures on Runways 1L and 1R and arrivals on Runways 19L and 19R. The site is near the extended centerline of Runway 1R-19L.

Site M2 - Located at 2900 Oquendo Road, a residence just east of the Airport. This site is north of the extended centerline of Runway 7L-25R and is exposed to noise from departures on Runways 7L and 7R and arrivals on Runways 25L and 25R. This site is also exposed to backblast noise during departures on Runways 25L and 25R.

Site M3 - Located at the "Gardens West" pool in the Spanish Trails development northwest of the Airport. This site is exposed to noise from departures on Runways 25L and 25R, but only receives direct overflights when aircraft turn northward after departing on Runways 25L and 25R.

Site M4 - Located on the roof of the 24-Hour Fitness facility on Green Valley Road, east of the Airport. The site is located between the extended centerlines of Runways 7L-25R and 7R-25L and is exposed to noise from arrivals on Runways 25L and 25R and departures on Runways 7L and 7R.

Site M5 - Located at 1585 Roughrider Circle, a residence in the Whitney Ranch development in the City of Henderson. This site is located near the extended centerline of Runway 7R-25L and is exposed to noise from arrivals on Runways 25L and 25R and departures on Runways 7L and 7R.

Site M6 - Located on the Sierra Vista High School campus, southwest of the Airport, on the roof of the main classroom building. This site is exposed to noise from departures on Runways 25L and 25R, after the aircraft have turned south from the runway heading.

Site M7 - Located at 7428 Comanche Canyon, a residence in the Nevada Trails development southwest of the Airport. This site is exposed to noise from departures on Runways 25L and 25R after the aircraft have turned south from the runway heading.

Site M8 - Located at 3765 W. Robindale Road, a residence south of the Airport. This site is located near the extended centerline of Runway 1L-19R and is exposed to noise from arrivals on Runways 1L and 1R and departures on Runways 19L and 19R.

**Exhibit IV-10 Noise Monitoring Sites**

Site M9 - Located at 5296 Esparon Avenue, a residence in the Southern Highlands development. This site is about 6 miles south of the Airport and is exposed to noise from arrivals on Runways 1L and 1R and departures on Runways 19L and 19R. Because of the distance from the Airport, aircraft overflights (especially departures) occur at a relatively high altitude.

Site M10 - Located at 6285 Mohawk Street, a residence west of the Airport between the extended centerlines of Runways 7L-25R and 7R-25L. This site is exposed to noise from departures on Runways 25L and 25R and arrivals on Runways 7L and 7R.

### 4.6.3 Instrumentation

The equipment used for continuous and short-term measurements consisted of Larson-Davis Laboratories Model LDL 820 sound level analyzers equipped with Bruel & Kjaer (B&K) Type 4176 0.5-inch microphones. The equipment was calibrated with B&K Type 4230 acoustical calibrators to ensure the accuracy of the measurements. Microphones were located on tripods or booms at approximately 5 feet to 10 feet above the ground (or roof, for roof-top locations). Microphones were situated so that there were no obstructions between them and the aircraft noise source and so that they were as far as possible from reflective surfaces.

The LDL Model 820 sound level analyzers can measure noise continuously for extended periods of time. The analyzers are programmed to distinguish between aircraft noise and noise from other sources using sound level and event duration thresholds. Typical noise measurement threshold settings for this study were 65 dBA for a minimum of 5 seconds. Therefore, the noise level had to equal or exceed 65 dBA for at least 5 seconds for the noise event to be considered aircraft-related. The LDL Model 820 analyzers are effective in discriminating between aircraft noise events and noise from other sources provided that the measurement sites are carefully chosen and measurement thresholds are appropriate for the sites.

### 4.6.4 Cumulative Noise Exposure

The DNL metric is used to evaluate community noise sources and, particularly, aircraft noise events, as discussed in Section 4.3.4. **Table IV-21** provides a summary of measured aircraft noise levels at the noise monitoring sites during the 2004 and 2005 measurement periods, as defined by the DNL metric. Presented in Table IV-21 are the energy mean (average) aircraft DNLs for the entire noise monitoring period and the range of daily DNLs measured during the period. The aircraft noise levels reported in Table IV-21 were determined from the noise event data collected by the LDL 820 sound level analyzers using the pre-programmed event noise level and duration thresholds. The noise event data collected by the instrumentation were further analyzed to remove noise level data that were clearly not aircraft-related.

**Table IV-21**

Summary of Measured Aircraft DNLs – 2004 and 2005 Noise Monitoring Periods

| Site | Description | 2004 Winter Measured Aircraft DNL (dB) 1/ | | 2004 Summer Measured Aircraft DNL(dB) 1/ | | 2005 Winter Measured Aircraft DNL (dB) 1/ | | 2005 Summer Measured Aircraft DNL(dB) 1/ | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Range | Mean | Range | Mean | Range | Mean | Range |
| M1 | UNLV-Tennis Complex | 68.3 | 60.6-72.6 | 66.6 | 65.3-68.0 | 69.2 | 63.4-72.9 | 62.6 | 59.1-68.3 |
| M2 | 2900 Oquendo Road | 55.8 | 43.9-59.6 | 63.6 | 59.7-65.2 | 59.6 | 43.6-63.3 | 62.1 | 56.6-64.9 |
| M3 | Spanish Trails- Gardens West Pool | 51.4 | 45.8-55.7 | 51.9 | 40.3-56.1 | 52.2 | 46.4-54.4 | 50.8 | 43.0-54.4 |
| M4 | 24-Hour Fitness, Green Valley Road | 65.6 | 62.0-68.0 | 67.3 | 66.0-68.4 | 67.4 | 63.2-71.5 | 67.4 | 65.5-68.9 |
| M5 | 1585 Roughrider Circle, Henderson | 61.6 | 59.2-63.5 | 62.9 | 61.9-64.1 | 63.5 | 60.2-68.0 | 63.0 | 61.0-64.7 |
| M6 | Sierra Vista High School | 59.5 | 49.6-62.0 | 60.5 | 56.4-64.5 | 58.9 | 51.2-63.0 | 60.0 | 56.2-62.6 |
| M7 | 7428 Comanche Canyon | 55.6 | 36.1-59.6 | 55.5 | 51.0-57.8 | 56.7 | 47.0-61.2 | 55.7 | 51.9-57.9 |
| M8 | 3765 W. Robindale Road | 61.6 | 59.2-64.6 | 58.9 | 53.9-62.8 | 62.9 | 57.9-66.5 | 56.0 | 46.2-61.6 |
| M9 | 5296 Esparon Avenue | 55.4 | 48.3-58.8 | 48.5 | 43.0-52.5 | 52.8 | 48.5-55.2 | 50.7 | 44.5-56.9 |
| M10 | 6285 Mohawk Street | 66.3 | 52.0-69.4 | 68.4 | 65.3-70.9 | 67.9 | 44.0-71.9 | 67.5 | 64.6-70.4 |

Note:
1/ Shown are the mean (average) DNL for the entire measurement period and the range of daily DNLs.

Source: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

### 4.6.5 Single-Event Noise Exposure

Detailed single-event noise level measurements were conducted at each of the noise measurement sites to provide information on the noise levels produced by specific types of aircraft. During the single-event measurement period, a trained observer noted the type of aircraft, owner/operator, $L_{max}$, SEL, and azimuth (angle of the aircraft relative to the microphone) for each event. The results of the summer 2005 single-event noise level measurements are summarized in **Appendix D**.

### 4.6.6 Background and Ambient Noise

In addition to aircraft noise, FAR Part 150 recommends documentation of background and ambient noise levels in the vicinity of an airport. The purpose of this recommendation is to determine the relative contribution of aircraft noise to all other noise sources, such as surface traffic, railroad trains, and general background noise in a community. Documentation of the ambient noise levels helps put the effects of aircraft noise into perspective.

The background noise level, the level against which all recognizable sounds are heard, is reported to provide a sense of how quiet or noisy the community is in the absence of aircraft or other intermittent community noise sources. The data from all four community noise measurement periods provided readings of ambient and background noise as well as noise related to specific aircraft events in the Airport environs.

The ambient noise levels and total noise levels (including aircraft noise) at the measurement sites are presented in **Table IV-22**. Community noise is generally caused by a combination of sources both near to and far from the location of interest. Typical community noise sources include traffic on highways and major streets, railroad operations, barking dogs, children playing, mechanical equipment, wind in the trees, and residential maintenance activities. Sometimes aircraft noise, as "heard" by a noise monitor at a particular site, is audible, but not significantly louder than noise from other sources unless aircraft are following a specific flight track close to the measurement site. In such situations, actual aircraft noise levels fall somewhere between the total noise and the aircraft noise component determined from single events that exceed programmed aircraft noise measurement thresholds.

**Table IV-22**

Summary of Community, Aircraft, and Total DNLs – 2004 and 2005 Noise Monitoring Periods

| | 2004 Winter Period | | | 2004 Summer Period | | | 2005 Winter Period | | | 2005 Summer Period | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | Community DNL | Aircraft DNL | Total DNL | Community DNL | Aircraft DNL | Total DNL | Community DNL | Aircraft DNL | Total DNL | Community DNL | Aircraft DNL | Total DNL |
| M1 | 65.8 | 68.3 | 70.3 | 62.8 | 66.6 | 68.1 | 66.4 | 69.2 | 71.0 | 61.4 | 62.6 | 65.1 |
| M2 | 58.7 | 55.8 | 60.5 | 65.1 | 63.6 | 67.4 | 62.9 | 59.6 | 64.6 | 63.4 | 62.1 | 65.8 |
| M3 | 54.3 | 51.4 | 56.1 | 58.0 | 51.9 | 59.0 | 54.3 | 52.2 | 56.4 | 58.8 | 50.8 | 59.4 |
| M4 | 62.2 | 65.6 | 67.3 | 63.5 | 67.3 | 68.8 | 64.0 | 67.4 | 69.0 | 65.9 | 67.4 | 69.8 |
| M5 | 60.5 | 61.6 | 64.1 | 60.7 | 62.9 | 64.9 | 61.3 | 63.5 | 65.5 | 60.5 | 63.0 | 64.9 |
| M6 | 62.2 | 59.5 | 64.1 | 60.9 | 60.5 | 63.7 | 61.2 | 58.9 | 63.3 | 59.3 | 60.0 | 62.7 |
| M7 | 59.0 | 55.6 | 60.7 | 59.5 | 55.5 | 61.0 | 57.5 | 56.7 | 60.1 | 59.9 | 55.7 | 61.3 |
| M8 | 60.2 | 61.6 | 64.0 | 58.2 | 58.9 | 61.6 | 60.9 | 62.9 | 65.0 | 59.6 | 56.0 | 61.2 |
| M9 | 55.4 | 55.4 | 58.4 | 56.7 | 48.5 | 57.3 | 52.8 | 52.8 | 55.8 | 56.0 | 50.7 | 57.1 |
| M10 | 62.6 | 66.2 | 67.8 | 63.9 | 68.4 | 69.7 | 61.6 | 67.9 | 68.9 | 62.6 | 67.5 | 68.7 |

Note:
Shown are the mean (average) DNLs, in decibels, for the entire measurement period.

Source: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

### 4.6.7 Results and Model Validation

Aircraft noise data collected during the noise measurement periods were used to validate the accuracy of the INM in predicting noise exposure around the Airport as it would have occurred during the measurement period. The objective of the validation process was to select aircraft types from the INM database that provided the best agreement between measured and predicted SELs and that contribute to the cumulative aircraft noise exposure in the Airport environs. Table IV-2 lists the aircraft types from the INM Version 6.1 database that were selected based on meeting these criteria.

**Table IV-23** presents a comparison of measured and predicted DNLs at five of the primary noise measurement sites. Predicted DNLs represent existing (2004) average annual conditions in terms of runway use, numbers of aircraft operations, weather conditions, and aircraft fleet mix. Predicted DNLs are discussed further in Section V. Measured DNLs are representative of conditions that occurred during the summer and winter noise monitoring periods in 2004 and 2005. As shown in Table IV-23, DNLs predicted by the INM for existing (2004) conditions are within +/- 1.5 dB of the average of the measured aircraft DNLs at all five sites. Therefore, the noise measurement data is consistent with the predicted noise levels for the existing conditions.

**Table IV-23**

Comparison of Measured and Predicted DNLs in the Vicinity of McCarran International Airport

| Year | Noise Monitoring Site (Average Measured DNL, in decibels) | | | | |
|---|---|---|---|---|---|
| | M-1 | M-4 | M-6 | M-8 | M-10 |
| Winter 2004 | 68.3 | 65.6 | 59.5 | 61.2 | 66.3 |
| Summer 2004 | 66.6 | 67.3 | 60.5 | 58.9 | 68.4 |
| Winter 2005 | 69.2 | 67.4 | 58.9 | 62.9 | 67.9 |
| Summer 2005 | 62.6 | 67.4 | 60.0 | 56.0 | 67.5 |
| | 66.7 | 66.9 | 59.7 | 59.8 | 67.5 |
| | Predicted DNL, in decibels | | | | |
| 2004 Noise Exposure Map | 67.8 | 66.8 | 59.9 | 61.2 | 67.5 |

Source: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

### 4.6.8 Land Use Compatibility Guidelines

Estimates of total noise exposure resulting from aircraft operations, as expressed in DNL, can be interpreted in terms of probable effect on land uses. Suggested compatibility guidelines for evaluating land uses in aircraft noise exposure areas were developed by the FAA and are shown in **Table IV-24**. The guidelines reflect the statistical variability of the responses of large groups of people to noise. Therefore, any particular noise level might not accurately assess an individual's perception of the actual noise environment. Compatible or incompatible land use is determined by comparing the predicted or measured DNL at a site with the DNLs in the table.

Each generalized land use listed in Table IV-24 includes a wide range of human activities having various sensitivities to noise intrusions. DNLs listed in the table should be interpreted only as indications of the effect aircraft noise has on people living and working in areas surrounding an airport. Although specific DNLs are obtained from a noise analysis, they do not dictate certain consequences. Rather, they are intended to guide a community in land use development.

**Table IV-24**

Suggested Land Use Compatibility Guidelines in Aircraft Noise Exposure Areas

| Land use | DNL 65 to 70 | DNL 70 to 75 | DNL 75+ |
|---|---|---|---|
| Residential | | | |
| Residential other than mobile homes and transient lodgings | NLR required[1] | NLR required[1] | Incompatible |
| Mobile homes | Incompatible | Incompatible | Incompatible |
| Transient lodgings | NLR required[1] | NLR required*1* | Incompatible |
| Public use | | | |
| Schools, hospitals, and nursing homes | NLR required[1] | NLR required[1] | Incompatible |
| Churches, auditoriums, and concert halls | NLR required[1] | NLR required[1] | Incompatible |
| Governmental services | Compatible | NLR required | NLR required |
| Transportation | Compatible | Compatible[2] | Compatible[2] |
| Parking | Compatible | Compatible[2] | Compatible[2] |
| Commercial use | | | |
| Offices, business, and professional | NLR required | NLR required | NLR required[2] |
| Wholesale and retail—building materials, hardware, and farm equipment | Compatible | Compatible[2] | Compatible[2] |
| Retail trade—general | NLR required | NLR required | NLR required |
| Utilities | Compatible | Compatible[2] | Compatible[2] |
| Communication | NLR required | NLR required | NLR required |
| Manufacturing and production | | | |
| Manufacturing—general | Compatible | Compatible[2] | Compatible[2] |
| Photographic and optical | Compatible | NLR required | NLR required |
| Agriculture (except livestock) and forestry | Compatible | Compatible | Compatible |
| Livestock farming and breeding | Compatible | Compatible | Incompatible |
| Mining and fishing resources production and extraction | Compatible | Compatible | Compatible |
| Recreational | | | |
| Outdoor sports arenas and spectator sports | Compatible[3] | Compatible[3] | Incompatible |
| Outdoor music shells, amphitheaters | Incompatible | Incompatible | Incompatible |
| Nature exhibits and zoos | Compatible | Incompatible | Incompatible |
| Amusements, parks, resorts, and camps | Compatible | Compatible | Incompatible |
| Golf courses, riding stables, and water recreation | Compatible | Compatible | Incompatible |

DNL = Day-night average sound level, in A-weighted decibels.

Compatible = Generally, no special noise attenuating materials are required to achieve an interior noise level of DNL 45 in habitable spaces, or the activity (whether indoors or outdoors) would not be subject to a significant adverse effect by the outdoor noise level.

Incompatible = Generally, the land use, whether in a structure or an outdoor activity, is considered to be incompatible with the outdoor noise level even if special attenuating materials were to be used in the construction of the building.

NLR = Noise Level Reduction. NLR is used to denote the total amount of noise transmission loss in decibels required to reduce an exterior noise level in habitable interior spaces to DNL 45. In most places, typical building construction automatically provides an NLR of 20 decibels. Therefore, if a structure is located in an area exposed to aircraft noise of DNL 65, the interior noise level would be about DNL 45. If the structure is located in an area exposed to aircraft noise of DNL 70, the interior noise level would be about DNL 50, so an additional NLR of 5 decibels would be required if not afforded by the normal construction. This NLR can be achieved through the use of noise attenuating materials in the construction of the structure.

Note*:* 1/ The land use is generally incompatible with aircraft noise and should only be permitted in areas of infill in existing neighborhoods or where the community determines that the use must be allowed.

2/ NLR required in offices or other areas with noise-sensitive activities.

3/ Provided special sound reinforcement systems are installed.

Source: U.S. Department of Transportation, Federal Aviation Administration, Federal Aviation Regulations Part 150, *Airport Noise Compatibility Planning*, Code of Federal Regulations, Title 14, Chapter I, Subchapter I, Part 150, Table 1, January 18, 1985, as amended.

Prepared by: Ricondo & Associates, Inc.

For a specific site, some adjustments to or interpretations of the land use compatibility guidelines may be desirable. Typical influences to be considered include the following:

- **Previous community experience and previous complaint history** in the immediate vicinity of the airport in question.
- **Local building construction, particularly as influenced by climatic considerations**. In the north-central region of the United States, wall and roof construction may be heavier or more insulated than in comparable houses in warmer climates, thus decreasing the extent of noise leakage paths. On this basis, one might select a higher DNL as the boundary for noise compatibility interpretation. Similarly, a lower DNL might be suitable for a warmer climate where homes are not as tightly constructed.
- **Use of air conditioning.** In areas where air conditioning is used in homes, schools, offices, and public buildings during the summer months, doors and windows are normally kept closed for this portion of the year, thus reducing exterior-to-interior sound transmission. However, some homes in the Las Vegas area are not equipped with central air conditioning and doors and windows are often kept open for ventilation. This factor should be considered when selecting an appropriate DNL for noise compatibility interpretation.
- **Noise effect on outdoor environments.** Land use compatibility, particularly in residential environments, usually refers to the compatibility of noise with interior environments. In the Airport environs, an important consideration might be the effect of noise on outdoor environments. Although sound-insulating a structure can provide a satisfactory interior noise environment, the area where the structure is located may still not be desirable for certain land uses. For example, an existing single-family residence that is sound-insulated could have an acceptable interior noise level in areas exposed to noise up to DNL 75. However, noise of DNL 75 will likely interfere with many peoples' enjoyment of any outdoor activities on the site.
- **The effect of industrial or surface transportation noise on the existing noise environment**. The introduction of aircraft noise into a rural area where existing background noise levels are very low produces a much more apparent change in the noise environment than introducing aircraft operations in more developed areas long exposed to surface traffic and other noise sources. Conversely, some residents feel that they already experience enough noise from other sources and they are resistant to being exposed to additional noise from aircraft.
- **Time of land use activities.** One of the key factors in assessing residential compatibility is the frequency of flights at times of the day when people are at home. The land use compatibility table (Table IV-24) does not provide information about the time of day that aircraft fly or that noise-sensitive activities occur. Land use planners are advised to consider these time factors during the planning process.

# V. Noise Exposure Maps and Effects on Land Use

The effect of aircraft noise on existing and future noise-sensitive land uses is important in relation to the forecast growth of the Airport and its environs. The achievement of land use compatibility in the Airport environs is the principal objective of this FAR Part 150 Noise Compatibility Study Update.

The existing noise exposure map relating to aircraft operations at the Airport in 2004 and the preliminary noise exposure maps relating to forecast operations in 2011 and 2017 are provided in this section. The maps for existing conditions (2004 in this case) and for 2011 (5 years into the future) are required under FAR Part 150. While not yet required by FAR Part 150, a map for 2017 was also prepared to facilitate long-term land use compatibility planning in the Airport environs. The 2011 and 2017 noise exposure maps are considered preliminary, as they are subject to change as a result of noise abatement recommendations described in Volume II of the FAR Part 150 Noise Compatibility Study Update, the Noise Compatibility Program Report.

The noise exposure maps were prepared on the basis of the aviation activity forecasts presented in Section II and the assumptions and data underlying the aircraft noise analysis described in Section IV. In addition to the maps, this section provides a description of existing noise-sensitive land uses that are or may be exposed to aircraft noise of DNL 60 and higher.

## 5.1 Existing Noise Exposure: 2004

The noise exposure map for 2004 is provided on **Exhibit V-1**. The map shows DNL contours superimposed on a map of generalized existing (2004) land use in the Airport environs. The DNL contours reflect actual aircraft operations during the last full calendar year for which data were available when this study was initiated.

In accordance with FAR Part 150, noise exposure contours for areas exposed to aircraft noise of DNL 65, 70, and 75 are depicted on the exhibit. To assist local communities with airport/community land use compatibility planning efforts and consistent with existing Clark County land use planning guidelines, the area exposed to DNL 60 (dashed-line contour) is also depicted on Exhibit V-1.

As shown on the exhibit, although noise-sensitive land uses throughout the Airport vicinity are exposed to aircraft noise of DNL 65 and higher, the highest levels of aircraft noise exposure occur in areas west/southwest of the Airport. The primary contributors to aircraft noise in areas west/southwest of the Airport are overflights by aircraft departing on Runways 25L and 25R. As shown in Table IV-9, in 2004, approximately 54 percent of daytime air carrier aircraft departures and 82 percent of nighttime air carrier aircraft departures from the Airport occurred on Runways 25L and 25R. Departures on Runways 19L and 19R (accounting for approximately 25 percent of daytime departures and 9 percent of nighttime departures at the Airport in 2004) also contribute to aircraft noise in areas south and southwest of the Airport.

The area north/northeast of the Airport is also exposed to high levels of aircraft noise associated primarily with overflights by aircraft departing on Runways 1L and 1R and arriving on Runways 19L and 19R. As shown in Table IV-9, in 2004, approximately 12 percent of daytime air carrier aircraft departures and 8 percent of nighttime air carrier aircraft departures occurred on Runways 1L and 1R.

## Exhibit V-1 2004 Noise Exposure Map, McCarran International Airport

Runways 19L and 19R accommodated approximately 12 percent of daytime air carrier aircraft arrivals and approximately 19 percent of nighttime air carrier aircraft arrivals in 2004.

Areas east of the Airport, including portions of the City of Henderson, are also exposed to aircraft noise of DNL 65 and higher. Aircraft arriving on Runways 25L and 25R and departing on Runway 7L contribute to noise in areas east of the Airport. As shown in Table IV-9, in 2004, approximately 73 percent of daytime air carrier aircraft arrivals and 74 percent of nighttime air carrier aircraft arrivals occurred on Runways 25L and 25R. Runway 7L accounted for approximately 9 percent of daytime and 1 percent of nighttime air carrier aircraft departures at the Airport in 2004.

## 5.2 Forecast Noise Exposure: Preliminary 2011

Preliminary noise exposure contours for an annual average day in 2011 over existing (2004) land use are depicted on **Exhibit V-2**. A comparison of the 2004 noise exposure map and the preliminary 2011 noise exposure map is presented on **Exhibit V-3**. As shown on Exhibit V-3, the area exposed to DNL 65 and higher in 2011 is expected to decrease slightly west of the Airport compared to existing (2004) conditions. It is also anticipated that there will be a corresponding increase in the area exposed to DNL 65 and higher to the north, south and east of the Airport. The changes in aircraft noise exposure would result from: (1) the quieter mix of aircraft projected to operate at McCarran International Airport in the future, (2) increased arrival operations on Runways 25L and 25R, (3) increased use of Runway 19L for air carrier departures during nighttime hours, and (4) decreased use of Runways 25L and 25R for air carrier aircraft departures during daytime and nighttime hours. In addition, the 2011 noise exposure contours reflect the reinstatement of a right-hand turn procedure for aircraft departing on Runways 25L and 25R and headed to destinations north, northeast, and east of Las Vegas. As discussed previously, the right-hand turn procedure is the subject of an ongoing Supplemental Environmental Assessment being conducted by the FAA.

## 5.3 Forecast Noise Exposure: Preliminary 2017

Preliminary noise exposure contours for an annual average day in 2017 over existing (2004) land use are depicted on **Exhibit V-4**. A comparison of the 2004 noise exposure map and the preliminary 2017 noise exposure map is presented on **Exhibit V-5**. As shown on Exhibit V-5, the area exposed to DNL 65 and higher is expected to increase between 2004 and 2017, as a result of increased air carrier aircraft operations at the Airport. While the largest area increases in aircraft noise exposure are anticipated to occur east and south of the Airport, by 2017, the area exposed to DNL 65 will also extend further north of the Airport compared to existing (2004) conditions. In 2017, it is anticipated that the area exposed to aircraft noise of DNL 65 and higher and west of the Airport will be smaller than the area inside the DNL 65 contour and west of the Airport in 2004.

## Exhibit V-2 Preliminary 2011 Noise Exposure Map, McCarran International Airport

**Exhibit V-3 Comparison of 2004 and 2011 Noise Exposure Maps, McCarran International Airport**

## Exhibit V-4 Preliminary 2017 Noise Exposure Map, McCarran International Airport

**Exhibit V-5 Comparison of 2004 and 2017 Noise Exposure Maps, McCarran International Airport**

## 5.4 Noise Effects on Existing and Planned Land Use

Suggested land compatibility standards in aircraft noise exposure areas, as developed by the FAA, are provided in Table IV-24. The standards differentiate between noise-sensitive land uses that are considered incompatible with or require noise attenuation to be acceptable in areas exposed to specified ranges of aircraft noise and other land uses that are considered to be compatible with certain levels of aircraft noise.

**Table V-1** presents the estimated effects of existing and predicted future noise exposure on existing residential and other noise-sensitive land uses in the Airport environs in 2004, 2011, and 2017. As shown in the table, the overall area exposed to DNL 65 and higher was 11.75 square miles in 2004, which is estimated to decrease to 11.52 square miles in 2011. In 2017, it is estimated that 12.05 square miles will be exposed to aircraft noise of DNL 65 and higher. The number of households and people estimated to have been exposed to aircraft noise of DNL 65 and higher in 2004 were 2,189 and 4,286, respectively, and is expected to increase to 2,412 and 4,775, respectively, in 2011. In 2017, it is estimated that 2,883 households and 5,742 people will be exposed to aircraft noise of DNL 65 and higher. No households or people were located in areas exposed to aircraft noise of DNL 75 and higher in 2004. Despite the predicted increases in aircraft noise between 2004 and 2017, it is estimated that no households or people will be exposed to aircraft noise of DNL 75 and higher in 2011 or 2017.

Specific locations where increases and decreases in aircraft noise exposure are predicted to occur are illustrated on **Exhibit V-6** through **Exhibit V-9**. Changes in the effects of noise exposure between 2004 and 2017 for areas west of the Airport are presented on Exhibit V-6. Changes in the effects of noise exposure between 2004 and 2017 for areas south of the Airport are presented on Exhibit V-7. Changes in the effects of noise exposure between 2004 and 2017 for areas east of the Airport are presented on Exhibit V-8. Changes in the effects of noise exposure between 2004 and 2017 for areas north of the Airport are presented on Exhibit V-9. A table with population and household summary counts is provided on each exhibit to illustrate the effects of aircraft noise exposure in each analysis year (2004, 2011, and 2017) for each quadrant (west, south, east, and north).

Because the intent of this FAR Part 150 Noise Compatibility Study Update is to further identify noise abatement procedures for McCarran International Airport, the actual effects of aircraft noise exposure in 2006, and beyond, may be lower than that reported in Tables V-1. The anticipated aircraft noise exposure and the effects of that noise exposure with the recommended noise abatement programs in effect are reported in the Noise Compatibility Program Report.

**Table V-1**

Estimated Effects of Noise Exposure in the Airport Environs – 2004, 2011, and 2017

| Range of Noise Exposure | Area (Square Miles) | Households | Population | Percent Change from 2004 Households | Percent Change from 2004 Population | Schools | Religious Facilities | Hospitals | Other |
|---|---|---|---|---|---|---|---|---|---|
| 2004[1/] | | | | | | | | | |
| DNL 75+ | 2.2 | 0 | 0 | - | - | 0 | 0 | 0 | 0 |
| DNL 70 to 75 | 4.28 | 93 | 219 | - | - | 0 | 1 | 0 | 0 |
| DNL 65 to 70 | 5.27 | 2,096 | 4,067 | - | - | 0 | 2 | 0 | 3 |
| DNL 60 to 65 | 11.02 | 13,993 | 32,136 | - | - | 8 | 8 | 0 | 7 |
| Total DNL 60+ | 22.77 | 16,182 | 36,422 | - | - | 8 | 11 | 0 | 10 |
| Total DNL 65+ | 11.75 | 2,189 | 4,286 | - | - | 0 | 3 | 0 | 3 |
| 2011[2/] | | | | | | | | | |
| DNL 75+ | 2.11 | 0 | 0 | 0.0% | 0.0% | 0 | 0 | 0 | 0 |
| DNL 70 to 75 | 4.11 | 81 | 190 | -12.9 | -13.2 | 0 | 2 | 0 | 0 |
| DNL 65 to 70 | 5.3 | 2,331 | 4,585 | 11.2 | 12.7 | 2 | 0 | 0 | 3 |
| DNL 60 to 65 | 11.15 | 14,834 | 33,989 | 6.0 | 5.8 | 9 | 9 | 3 | 10 |
| Total DNL 60+ | 22.67 | 17,246 | 38,764 | 6.6 | 6.4 | 11 | 11 | 3 | 13 |
| Total DNL 65+ | 11.52 | 2,412 | 4,775 | 10.2 | 11.4 | 2 | 2 | 0 | 3 |
| 2017[3/] | | | | | | | | | |
| DNL 75+ | 2.15 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 |
| DNL 70 to 75 | 4.24 | 136 | 273 | 46.2 | 24.7 | 0 | 2 | 0 | 0 |
| DNL 65 to 70 | 5.66 | 2,747 | 5,469 | 31.1 | 34.5 | 3 | 0 | 0 | 3 |
| DNL 60 to 65 | 12.25 | 16,642 | 38,316 | 18.9 | 19.2 | 8 | 10 | 3 | 11 |
| Total DNL 60+ | 24.3 | 19,525 | 44,058 | 20.7 | 21.0 | 11 | 12 | 3 | 14 |
| Total DNL 65+ | 12.05 | 2,883 | 5,742 | 31.7 | 34.0 | 3 | 2 | 0 | 3 |

Notes:
DNL = Day-night average sound level, expressed in A-weighted decibels.
1/ See Exhibit V-1.
2/ See Exhibit V-2.
3/ See Exhibit V-3.

Source: Ricondo & Associates, Inc., based on population and household data obtained from the Clark County Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

**Exhibit V-6 Noise Exposure Contours – 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail West)**

**Exhibit V-7 Noise Exposure Contours – 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail South)**

**Exhibit V-8 Noise Exposure Contours – 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail East)**

**Exhibit V-9 Noise Exposure Contours – 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail North)**

## 5.5 Comparison with Previous Noise Exposure Maps

As discussed in Section III, the Clark County Board of County Commissioners codified the 1992 noise exposure map that was developed in 1988/89 during preparation of the original FAR Part 150 Noise Compatibility Program for McCarran International Airport. **Exhibit V-10** presents a comparison of the area exposed to DNL 65 in calendar year 2004 with the 1992 DNL 65 noise exposure contour (composed of grids) adopted by the Clark County Board of County Commissioners.[1] As shown on Exhibit V-4, the area exposed to aircraft noise of DNL 65 was substantially smaller in 2004 than in 1992. The gridded 1992 DNL 65 noise exposure contour encompasses approximately 20 square miles[2]. In comparison, the 2004 DNL 65 noise exposure contour encompasses 11.75 square miles; which represents a reduction of 41 percent in total area exposed to DNL 65 in 2004.

The reduction in the size of the DNL 65 noise exposure area between 1992 and 2004 was largely the result of changes in the aircraft fleet mix serving the Airport since the 1992 noise exposure map was prepared in 1989. At the time the 1992 noise exposure contours were developed to represent "projected" conditions, 51 percent of the aircraft fleet operating at the Airport consisted of FAR Part 36 Stage 2 aircraft. The 2004 noise exposure map presented in this document reflects the complete phase-out of civilian Stage 2 aircraft weighing over 75,000 pounds as of January 1, 2000. The reduction in the size of the 2004 noise contour is also partly explained by refinements that have been made in the last 10+ years to the FAA's noise prediction methodology. The 1992 noise exposure map was developed using INM Version 3.8, whereas the 2004 noise exposure map was developed using INM Version 6.1.

**Exhibit V-11** presents a comparison of the areas exposed to DNL 65 in calendar year 2004, as prepared for this document, and in 1997, as prepared for the 1994 FAR Part 150 Noise Compatibility Program for McCarran International Airport. The 1997 DNL 65 noise exposure contour encompasses approximately 13.06 square miles, approximately 10 percent more land area than encompassed by the 2004 DNL 65 noise exposure contour. The 1997 noise exposure contours, which were developed using INM Version 3.10, were based on the assumption that 31 percent of the aircraft fleet operating at the Airport would be FAR Part 36 Stage 2 aircraft.

[1] Before being codified, the projected noise exposure contours for 1992 were "squared off" to better match section lines, streets, and parcel boundaries. The methodology used to modify the contours was developed by the Clark County Department of Aviation. Areas provided in this section correspond to the "squared off" contours.

[2] Before it was "squared off", the INM calculated 1992 DNL 65 contour enclosed 19.3 square miles.

## Exhibit V-10 Comparison of 1992 and 2004 Noise Exposure, McCarran International Airport

## Exhibit V-11 Comparison of 1997 and 2004 Noise Exposure, McCarran International Airport

# VI. References

I-1. U.S. Department of Transportation. Federal Aviation Administration. Advisory Circular 150/5300-13. *Airport Design*. September 29, 1989, as amended.

I-2. U.S. Department of Transportation. Federal Aviation Administration. Federal Aviation Regulations Part 150, *Airport Noise Compatibility Planning*. January 18, 1985, as amended.

II-1. URS Corporation. *Draft Forecast of Commercial Service Airport Activity in the Las Vegas Metropolitan Area*. June 8, 2005.

II-2. U.S. Department of Transportation. Federal Aviation Administration. *FAA Aerospace Forecasts, Fiscal Years 2005 – 2016*. March 2005.

III-1. Clark County, Nevada. Department of Comprehensive Planning. *Enterprise Land Use Plan.* Las Vegas: December 2004.

III-2. Clark County, Nevada. Department of Comprehensive Planning. *Spring Valley Land Use Plan*. Las Vegas: August 19, 1997, as amended.

III-3. Clark County, Nevada. Department of Comprehensive Planning. *Winchester and Paradise Land Use and Development Guide.* Las Vegas: 1996.

III-4. Clark County, Nevada. Department of Comprehensive Planning. *Sunrise Manor Land Use Plan*. Las Vegas: April 1999.

III-5. Clark County, Nevada. Department of Comprehensive Planning. *Whitney Land Use Plan*. Las Vegas: April 2000.

III-6. City of Henderson, Nevada. Department of Community Development. *Comprehensive Plan.* 2006.

III-7. City of Las Vegas, Nevada. Planning and Development Department. *2020 Master Plan.* 2000.

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III-9. U.S. Department of Transportation. Federal Aviation Administration. Federal Aviation Regulations Part 77, *Objects Affecting Navigable Airspace*. January 1975, as amended.

III-10 U.S. Congress. *Southern Nevada Public Land Management Act (SNPLMA) of 1998.* P.L. § 105-263. 1998.

IV-1 Schultz, T.J. "Synthesis of Social Surveys on Noise Annoyance." *Journal of the Acoustical Society of America*. V. 64 (2). 1978.

IV-2 U.S. Department of Transportation. Federal Aviation Administration. Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions.* April 28, 2006.

IV-3 U.S. Department of Transportation. Federal Aviation Administration. Order 1050.1E, *Environmental Impacts: Policies and Procedures.* June 8, 2004.

IV-4 U.S. Department of Transportation. Federal Aviation Administration. Advisory Circular 36-3H, *Estimated Airplane Noise Levels in A-Weighted Decibels*. April 25, 2002.

IV-5 U.S. Department of Transportation. Federal Aviation Administration. Federal Aviation Regulations Part 36, *Noise Standards, Aircraft Type and Airworthiness Certification.* September 16, 1992.

IV-6 U. S. Congress. *Airport Noise and Capacity Act.* (49 U.S.C. § 47528). 1990.

IV-7 U.S. Department of Transportation. Federal Aviation Administration. Federal Aviation Regulations Part 91, *General Operating and Flight Rules*. August 18, 1989.

IV-8 U.S. Department of Transportation. Federal Aviation Administration. *INM User's Guide*. September 1999.

IV-9 Landrum & Brown. *Four Corner-Post Plan Final Environmental Assessment.* June 2001.

# Appendix A Glossary of Terms

**A-WEIGHTED SOUND LEVEL (dBA)**-The ear does not respond equally to different frequencies of sound. It is less efficient at low and high frequencies than it is at medium or speech-range frequencies. Thus, to obtain a single number representing the sound level of a noise having a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are decibels (dB); hence, the abbreviation is dBA. The A-weighted sound level is also referred to as the noise level. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

**ABSORPTION**-Absorption is a property of materials that reduces the amount of sound energy reflected. Thus, introduction of an "absorbent" into the surfaces of a room will reduce the sound pressure level in that room because sound energy striking the room's surfaces will be partially absorbed rather than totally reflected. The process of absorption is different from that of transmission loss through a material, which determines how much sound enters a room via the walls, ceiling, and floor. Absorption reduces the resultant sound level in the room produced by energy that has already entered the room.

**ACCEPTABLE**-relating to noise-*Day-night average sound level (DNL) not exceeding 65 decibels*-Noise exposure may be of some concern, but common building construction will make the indoor environment acceptable, and the outdoor environment will be reasonably pleasant for recreation and play. As defined by Federal Aviation Regulations, Part 150, "Airport Noise Compatibility Planning" (see FAR PART 150). (See DAY-NIGHT AVERAGE SOUND LEVEL).

**ACOUSTICS**- (1) The science of sound, including the generation, transmission, and effects of audible and inaudible sound waves. (2) The physical qualities (such as size and shape) of a room or other enclosure that determine the audibility and perception of speech and music.

**ADVISORY CIRCULAR (AC)**-An external Federal Aviation Administration (FAA) publication consisting of non-regulatory material of a policy, guidance, or informational nature.

**AFFECTED LOCAL GOVERNMENT AGENCIES**-The local government agencies that have the authority to control land uses in areas that may be adversely affected by aviation activities.

**AIP**-See AIRPORT IMPROVEMENT PROGRAM.

**AIR CARRIER, CERTIFICATED ROUTE**-An airline company that: (1) performs at least five round trips per week between two or more points and publishes flight schedules that specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a contract with the U.S. Postal Service, certificated in accordance with Federal Aviation Regulations (FAR) Parts 121 and 127.

**AIR CARRIER, COMMUTER**-An air taxi operator that (1) performs at least five round trips per week between two or more points and publishes flight schedules that specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a contract with the U.S. Postal Service.

**AIRCRAFT DELAY**-The additional travel time, caused by airfield or airspace congestion, needed by an aircraft to move from point A to point B.

**AIRCRAFT OPERATION**-An aircraft arrival (landing) or an aircraft departure (takeoff) represents one aircraft operation. A low approach, below traffic pattern or a touch-and-go operation is counted as both a landing and a takeoff, i.e., two operations. The Federal Aviation Administration (FAA) records aircraft operations in four categories: air carrier, air taxi, general aviation, and military.

**AIR CARRIER**-Operations performed in revenue service by certificated route air carriers. (See AIR CARRIER, CERTIFICATED ROUTE and AIR CARRIER, COMMUTER).

**AIR TAXI/COMMUTER**-Operations performed by operators of aircraft holding an air taxi certificate. This category includes commuter airline operations (excluding certificated commuter airlines), mail carriers under contract with the U.S. Postal Service, and operators of nonscheduled air taxi service.

**GENERAL AVIATION**-All civil aircraft operations not classified as air carrier or air taxi operations.

**MILITARY**-Operations performed by military groups, such as the Air National Guard, the U.S. Air Force, or the U.S. Marine Corps.

Aircraft operations may also be described as local or itinerant:

> **LOCAL**-Local operations are performed by aircraft that (1) operate in the local traffic pattern or within sight of the airport, (2) are known to be departing for, or arriving from, local practice areas within a 20-mile radius of the airport, or (3) execute simulated or practice instrument approaches or low passes at the airport. Touch-and-go operations are counted as two local operations.
>
> **ITINERANT**-All aircraft operations other than local operations.

**AIRCRAFT PARKING APRON**-See APRON.

**AIRCRAFT PARKING POSITION**-The area on the apron where aircraft park for servicing and preparation for flight.

**AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)**-The aircraft rescue and firefighting capability required at airports under FAR Part 139. Formerly called CRASH/FIRE/RESCUE.

**AIRFIELD CAPACITY (HOURLY)**-Airfield capacity refers to the maximum number of aircraft operations (landings or takeoffs) that can take place on an airfield in one hour under specific conditions.

**AIR NAVIGATION FACILITY (NAVAID)**-A facility designed for use as an aid to air navigation, including landing aids, lights, any apparatus or equipment for disseminating weather information; for signaling for radio direction-finding or for radio or other electronic communication; and any other

structure or mechanism having a similar purpose for guiding and controlling flight in the air or the landing or takeoff of aircraft.

**AIRPORT APPROACH AND RUNWAY PROTECTION ZONE LAYOUT PLAN**-A plan map showing the imaginary surfaces that specify the maximum height of structures, trees, and other phenomena around an airport and that is prepared in accordance with FAR Part 77, "Objects Affecting Navigable Airspace." The plan is required as part of an airport master plan.

**AIRPORT ELEVATION**-The highest point of an airport's usable runways measured in feet above mean sea level (msl).

**AIRPORT ENVIRONS**-The area surrounding an airport that is considered to be directly affected by the presence and operation of the airport.

**AIRPORT IMAGINARY SURFACES**-Imaginary surfaces established at an airport for the purposes of identifying obstructions to air navigation. The imaginary surfaces consist of primary, approach-departure, horizontal, vertical, conical, and transition surfaces.

**AIRPORT IMPROVEMENT PROGRAM (AIP)**-A program administered by the FAA to provide financial grants-in-aid for airport planning, airport development projects, and noise compatibility programs. The AIP was established through the Airport and Airway Improvement Act of 1982, which was incorporated as Title V of the Tax Equity and Fiscal Responsibility Act of 1982 (Public Law 97-248). Funds are appropriated by the U.S. Congress for the AIP annually.

**AIRPORT LAND USE PLAN**-A generalized plan depicting proposed land uses within the airport boundary. The land use plan is a required element of an airport master plan.

**AIRPORT LAYOUT PLAN (ALP)**-A plan showing boundaries and proposed additions to all areas owned or controlled by the airport sponsor for airport purposes, the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed nonaviation areas and improvements thereon. The ALP is a required element of an airport master plan.

**AIRPORT MASTER PLAN**-An assembly of appropriate documents and drawings addressing the development of a specific airport from physical, economic, social, and political jurisdictional perspectives. The airport master plan includes forecasts of aviation demand, an airport land use plan, airport layout plan, airport approach and runway protection zone plan, terminal area plan, airport access and parking plan, staging plan, capital improvement plan, and financial plan.

**AIRPORT NOISE AND CAPACITY ACT OF 1990**-Commonly referred to as the national noise policy; the Act was enacted on November 5, 1990 (Public Law 101-508). Two important provisions of the Act were the establishment of a national aviation noise policy (Sections 9308 and 9309) and the creation of a passenger facility charge (Sections 9110 and 9111), which enables airport sponsors to impose fees on the tickets issued to eligible enplaning passengers. An amendment to FAR Part 91, "Transition to an All Stage 3 Fleet Operating in the 48 Contiguous United States and the District of Columbia," and new FAR Part 161, "Notice and Approval of Airport Noise and Access Restrictions", implement the national noise policy. New FAR Part 158, "Passenger Facility Charges," implements that portion of the Act authorizing the imposition of such a charge.

**AIRPORT NOISE CONTROL AND LAND USE COMPATIBILITY (ANCLUC) STUDY**-A study designed to minimize aircraft noise and maintain compatible land use around airports. Certain noise control and land use compatibility studies are eligible for federal funding participation. (See FAR PART 150.)

**AIRPORT SPONSOR**-A public agency or tax-supported organization, such as an airport authority, authorized to own and operate an airport, obtain property interests, obtain funds, and be legally, financially, and otherwise able to meet all applicable requirements of current laws and regulations.

**AIRPORT SURVEILLANCE RADAR (ASR)**-Radar providing aircraft position data in terms of azimuth and range. ASR does not provide altitude data. It is designed for range coverage up to 60 nautical miles and is used by terminal area air traffic control.

**AIRPORT TRAFFIC CONTROL TOWER (ATCT)**-A central operations facility in the terminal area air traffic control system, consisting of a tower cab structure and an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling, and other devices, to provide safe and expeditious movement of terminal area air traffic.

**AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC)**-A facility established to provide air traffic control service to aircraft operating on an instrument flight rule (IFR) flight plan within controlled airspace and principally during the en route phase of flight.

**AIRSPACE**-Space in the air above the surface of the earth or a particular portion of such space, usually defined by the boundaries of an area on the surface projected upward.

**AIR TRAFFIC CONTROL (ATC)**-A service operated by appropriate authority (the FAA) to promote the safe, orderly, and expeditious flow of air traffic.

**AMBIENT NOISE**-The total of all noise in a system or situation, independent of the presence of the specific sound to be measured. In acoustical measurements, strictly speaking, ambient noise means electrical noise in the measurement system. However, in popular usage, ambient noise is also used to mean "background noise" or "residual noise."

**APRON**-A paved area that provides the connection between the terminal buildings and the airfield. The apron includes aircraft parking areas, called ramps, and aircraft circulation and taxiing areas for access to these ramps. On the ramp, aircraft park in locations typically designated as gate positions or gates.

**ARFF**-See AIRCRAFT RESCUE AND FIRE FIGHTING.

**ATC**-See AIR TRAFFIC CONTROL

**AUTOMATED RADAR TERMINAL SYSTEM (ARTS)**-Computer-aided radar display subsystems capable of associating alphanumeric data with radar returns.

**AVIATION SAFETY AND NOISE ABATEMENT ACT OF 1979**-Public Law 96-193 enacted February 18, 1980. The purpose of the Act is to assist airport sponsors in preparing and carrying out

noise compatibility programs and in assuring continued safety for aviation. The Act also contains provisions extending to January 1, 1988, the requirement for certain types of aircraft to comply with Part 36 of the Federal Aviation Regulations. (See FEDERAL AVIATION REGULATIONS (FAR) PART 36).

**AVIGATION EASEMENT**-A type of land acquisition that involves less-than-fee purchase (see also LESS-THAN-FEE ACQUISITION). One form of avigation easement grants the right to perform aircraft operations over the designated property, including operations that might cause noise, vibration, and other effects. A stronger form of easement is a deed restriction that may include (1) the right to perform aircraft operations over the property, and (2) public acquisition of a landowner's rights restricting future development of the property in any use more intensive than that existing at the time of the transaction. This easement may also include specific prohibitions as to the uses for which the property may be developed. Maximum heights of structures and other objects may also be specified.

**BACKBLAST**-Noise generated by jet exhaust on takeoff characterized by high acoustic energy, low frequency, and high velocity air behind the aircraft engine.

**BACKGROUND NOISE**-See AMBIENT NOISE.

**BUILDING CODE**-A legal document that sets forth requirements to protect the public health, safety, and general welfare as they relate to the construction and occupancy of buildings and structures. The code establishes the minimum acceptable conditions for matters found to be in need of regulation. Topics generally covered are exits, fire protection, structural design, sanitary facilities, lighting, and ventilation. Sound insulation may also be included.

**BUILDING PERMIT**-A permit issued by a local political jurisdiction (village, town, city, or county) to erect or modify a structure.

**BUILDING RESTRICTION LINE (BRL)**-The BRL should be located on an Airport Layout Plan to identify suitable locations for building areas on airports. It is recommended that the BRL encompass the runway protection zones, the runway visibility zone, areas required for airport traffic control tower clear lines of sight, and all airport areas with less than 35-foot clearance under the FAR Part 77 surfaces.

**CAPITAL IMPROVEMENT PROGRAM (CIP)**-A multiyear (sometimes a single year) schedule of capital expenditures for construction or equipment at an airport.

**CEILING**-The height above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and not classified as "thin" or "partial."

**CEQ (COUNCIL ON ENVIRONMENTAL QUALITY) REGULATIONS**-CEQ Regulations implementing the National Environmental Policy Act of 1969 (NEPA) were published in the Federal Register on November 29, 1978. References to the regulations in FAA Order 5050.4A (Airport Environmental Handbook) identify specific sections, e.g., CEQ 1500 or CEQ 1508.8. (See IMPACT.)

**CLEAR ZONE**-See RUNWAY PROTECTION ZONE.

**COMMUTER AIRCRAFT –**Aircraft that may be in regularly scheduled passenger or cargo service, seating 72 passengers or less. A typical commuter aircraft flies trip distances less than 300 miles.

**CONTOURS**-See NOISE CONTOURS.

**CRASH/FIRE/RESCUE**-See AIRCRAFT RESCUE AND FIRE FIGHTING.

**DAY-NIGHT AVERAGE SOUND LEVEL (DNL)**-A measure used to predict, by a single number rating, cumulative aircraft noise that affects communities in airport environs. DNL represents decibels of noise as measured by an A-weighted sound-level meter (see also). In the DNL procedure, the noise exposure from each aircraft takeoff or landing is calculated at ground level around an airport, and these noise exposure levels are accumulated for a typical 24-hour period. (The 24-hour period often used is the average day of the peak month for aircraft operations during the year being analyzed.) Daytime and nighttime noise exposure is considered separately. A weighting factor equivalent to a penalty of 10 decibels is applied to operations between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to nighttime noise. DNLs can be expressed graphically on maps using either contours or grid cells.

**dBA**-See A-WEIGHTED SOUND LEVEL.

**DECIBEL (dB)**-A unit for measuring the volume of a sound, equal to the logarithm of the ratio of the intensity of the sound to the intensity of an arbitrarily chosen standard sound.

**DE MINIMIS**-Below the level of significance.

**DEPLANED PASSENGERS**-The passengers inbound to an airport on an arriving aircraft. The total annual number of passengers at an airport is the total of deplaned and enplaned passengers (see also).

**DEREGULATION ACT**-Airline regulatory reform act of 1978. Designed, among other things, to encourage competition among domestic airlines, the Act allows an airline greater freedom to enter and leave any given market.

**DEVELOPMENT PLAN**-A detailed land use plan for all or specific areas of an airport. The plan usually includes a plot map depicting parcel size and configuration, access, land use categories, utilities, improvements, and performance standards for each parcel and use category.

**DEVELOPMENT RIGHTS**-Rights of landowners to develop a parcel of land according to the zoning of that parcel. Land is often assessed on a combination of its “resource” value and its “commodity” value. The resource value is the value of the property in its natural state; while the commodity value is an artificial value placed on it by the marketplace (that is, its value for development purposes). In less-than-fee acquisition (see also), the airport sponsor may purchase only the development rights; the ownership of the land remains unchanged.

**DISPLACED THRESHOLD**-A runway threshold that is located at a point other than the designated beginning of the runway.

**DISTANCE MEASURING EQUIPMENT (DME)**-Equipment (ground and airborne) used to measure and report to the pilot the slant range distance, in nautical miles, of an aircraft from the DME navigational aid.

**DNL**-See DAY-NIGHT AVERAGE SOUND LEVEL.

**DURATION**-The length of time that a noise event, such as an aircraft flyover, is experienced (typically reported in seconds) . "Duration" may also refer to the length of time that the noise event exceeds a specified threshold noise level.

**EA**-See ENVIRONMENTAL ASSESSMENT.

**EFFECT**-See IMPACT.

**EIS**-See ENVIRONMENTAL IMPACT STATEMENT.

**EMINENT DOMAIN (POWER OF)**-In common law, power of a governmental unit (federal, state, or local) to condemn land for public purposes after having paid the owner of the land just compensation.

**ENGINE RUNUP AREA**-An area on an airport where aircraft engines are serviced or tested. The noise from such servicing or testing can affect neighborhoods adjacent to the airport.

**ENPLANED PASSENGERS**-The passengers on aircraft outbound (departing) from an airport. The total annual number of passengers at an airport is the total of enplaned and deplaned passengers (see also).

**ENVIRONMENTAL ASSESSMENT (EA)**-An assessment of the environmental effects of a proposed action for which federal financial assistance is being requested or for which federal action or authorization is required. The EA serves as the basis for an FAA Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI), as specified in FAA Order 5050.4A.

**ENVIRONMENTAL IMPACT STATEMENT (EIS)**-A statement prepared under the requirements of the National Environmental Policy Act of 1969 (NEPA), Section 102(2)(c). The EIS represents a federal agency's evaluation of the effects of a proposed action on the environment. Regulations relating to the preparation of an EIS are published in FAA Order 5050-4A.

**EPA**-U.S. Environmental Protection Agency.

**FAA-**See FEDERAL AVIATION ADMINISTRATION

**FAA ADVISORY CIRCULAR (AC) 150/5300-13**-This document, titled "Airport Design," contains airport design standards, including descriptions of various subdivisions of FAR Part 77 (see also) such as obstacle free zones (OFZs), object free areas (OFAs), and runway protection zones (RPZs)--formerly referred to as "clear zones"--on airports. According to Paragraph 211, "Safe and efficient operations at an airport require that certain areas on and near the airport be clear of objects or restricted to objects with a certain function, composition, and/or height." To achieve this

requirement, object clearing criteria contained in the AC describe the types of objects tolerated within various subdivisions of FAR Part 77. Aircraft are controlled by aircraft operating rules and not by these criteria. However, objects not in conformance with these criteria may result in aircraft operating restrictions.

**FAA HANDBOOK 7400.2**-This document, titled "Procedures for Handling Airspace Matters," contains procedures and guidelines for analyzing aeronautical operating conditions and determining the effects of existing or proposed objects that exceed FAR Part 77 (see also) standards. Objects that exceed FAR Part 77 standards are subject to an aeronautical review and are presumed to be hazards to air navigation unless an aeronautical review determines otherwise. However, once an aeronautical review is initiated, FAR Part 77 standards are no longer the basis for determining whether or not an object would be a hazard. Other criteria, including operational, procedural, and electronic requirements, are used to determine if the object in question would be a hazard to air navigation. The outcome of an FAA aeronautical review is either a "Determination of No Hazard" or "Determination of Hazard to Air Navigation."

**FAA HANDBOOK 8260.3B**-This document, titled "TERPS" (terminal instrument procedures), contains obstruction clearance criteria for instrument procedures. Imaginary surfaces for each type of instrument procedure are described. If an object would penetrate the imaginary surfaces for a particular instrument procedure and could not be relocated or sufficiently reduced in height, one of the following would be necessary: (1) alteration of the procedure to minimize or eliminate effects; (2) increase in the minimum cloud ceiling and/or visibility requirements for conducting the procedure; (3) some combination of (1) and (2); or (4) preclusion of the particular procedure.

**FAA ORDER 1050.1E**-This document, entitled “Environmental Impacts: Polices and Procedures,” was prepared in response to CEQ 1500 Regulations and provides guidance for preparing EAs and EISs for FAA actions.

**FAA ORDER 5050.4A-**This document, entitled "Airport Environmental Handbook," was published by the FAA on October 8, 1985. It contains all of the essential information an airport sponsor needs to meet both procedural and specific environmental requirements. The FAA issued a draft version of FAA Order 5050.4B for public review on December 16, 2004. The comment period ended on February 16, 2005. As of April 2005, the FAA has not issued the final document.

**FEDERAL AVIATION REGULATIONS (FAR) PART 36**-This regulation, titled "Noise Standards: Aircraft Type and Airworthiness Certification," establishes noise standards for the civil aviation fleet. Certain extensions for compliance are included in the Aviation Safety and Noise Abatement Act of 1979 (see also).

**FAR PART 77**-This regulation, titled "Objects Affecting Navigable Airspace," establishes standards for determining obstructions and their potential effects on aircraft operations. Objects are considered to be obstructions to air navigation according to FAR Part 77 if they exceed certain heights or penetrate certain imaginary surfaces established in relation to airport operations. Objects classified as obstructions are subject to an FAA aeronautical analysis to determine their potential effects on aircraft operations.

**FAR PART 91**- This regulation, titled "General Operating and Flight Rules," includes an amendment issued by the FAA on September 25, 1991 (to 14 CFR 91) in conformance with

requirements of the Airport Noise and Capacity Act of 1990 (see also). The amendment to the aircraft operating rules requires a phased transition to an all Stage 3 aircraft fleet operating in the 48 contiguous United States and the District of Columbia by December 31, 1999.

**FAR PART 150**-This regulation, titled "Airport Noise Compatibility Planning," sets forth criteria for developing an FAR Part 150 Noise Compatibility Program, an FAA-assisted program designed to increase the compatibility of land and land uses in the areas surrounding an airport that are most directly affected by operation of the airport. The specific purpose is to reduce the adverse effects of noise as much as possible by implementing both on-airport noise abatement measures and off-airport noise mitigation measures. The basic products of an FAR Part 150 program typically include (1) noise exposure maps for the existing condition and for 5 years in the future; (2) workable on-airport noise abatement measures (preferential runway use programs, new or preferential flight tracks), (3) off-airport noise mitigation measures (land acquisition, soundproofing, or special zoning); (4) an analysis of the costs and the financial feasibility of the recommended measures; and (5) policies and procedures related to the implementation of on- and off-airport programs. Community involvement opportunities are provided throughout all phases of noise compatibility program development.

**FAR PART 158**-This regulation, titled "Passenger Facility Charges," establishes a passenger facility charge (PFC) program. The regulation implements Sections 9110 and 9111 of the Airport Noise and Capacity Act of 1990 (see also), which requires the Department of Transportation to issue regulations under which a public agency may be authorized to impose a PFC of $1, $2, or $3 per enplaned passenger at a commercial service airport it controls. The proceeds from such PFCs are to be used to finance eligible airport-related projects that preserve or enhance safety, capacity, or security of the national air transportation system, reduce noise from an airport that is part of such system, or furnish opportunities for enhanced competition between or among airlines. The rule sets forth procedures for public agency applications for authority to impose PFCs, for FAA processing of such applications; for collection, handling, and remittance of PFCs by airlines; for record keeping and auditing by airlines and public agencies; for terminating PFC authority; and for reducing federal grant funds apportioned to large and medium hub airports where a PFC is imposed.

**FAR PART 161**-This regulation, titled "Notice and Approval of Airport Noise and Access Restrictions," establishes a program for reviewing airport noise and access restrictions on the operations of Stage 2 and Stage 3 aircraft. This regulation is in response to specific provisions in the Airport Noise and Capacity Act of 1990 (see also) and is a major element of the national aviation noise policy required by that Act. Even if such an airport noise and access restriction is proposed as an element of an FAR Part 150 Noise Compatibility Program, it is still subject to the guidelines of FAR Part 161 prior to approval. Some of the public notice requirements, however, may be met during development of the FAR Part 150 program.

**FEDERAL AVIATION ADMINISTRATION (FAA)**-The FAA, an agency of the U.S. Department of Transportation, is charged with (1) regulating air commerce to promote its safety and development; (2) achieving the efficient use of navigable airspace of the United States; (3) promoting, encouraging, and developing civil aviation; (4) developing and operating a common system of air traffic control and air navigation for both civilian and military aircraft; and (5) promoting the development of a national system of airports.

**FEE SIMPLE LAND ACQUISITION**-The full purchase of land and improvements by an airport sponsor. The land is usually maintained or leased for uses that are compatible with airport operations. Alternatively, the airport sponsor can resell the land with an avigation easement (see also) and deed restrictions that specify the compatible land uses that are permitted. One benefit of the resale option is that the land is returned to the local tax rolls.

**FINDING OF NO SIGNIFICANT IMPACT (FONSI)**-A finding by the FAA that a proposed action will have no significant impact (on the environment). Specific guidelines for preparing a report that receives a FONSI are included in FAA Order 5050.4A.

**FLIGHT TRACK**-The average flight path flown by aircraft within specific corridors. Deviation from these tracks occurs because of weather, pilot technique, air traffic control, and aircraft weight. Individual flight tracks within a corridor are "averaged" for purposes of modeling noise exposure using the FAA's Integrated Noise Model (see also).

**FONSI**-See FINDING OF NO SIGNIFICANT IMPACT.

**GATE**-The designated location in a terminal building that contains an airline podium area where ticketed passengers check in for a specific flight. (See APRON.)

**GENERAL AVIATION (GA)**-All civil aviation except that classified as air carrier, military, or air taxi. The types of aircraft typically used in GA activities vary from multiengine jet aircraft to single-engine piston aircraft.

**GENERAL PLAN (sometimes referred to as a comprehensive plan or community plan)**-An overall plan of a political jurisdiction setting forth the goals and objectives of the jurisdiction, policies for development and redevelopment, and maps showing the spatial arrangement of land uses, circulation routes, and community facilities.

**GEOGRAPHIC INFORMATION SYSTEM (GIS)-** A system of hardware and software used for storage, retrieval, mapping, and analysis of geographic data.

**GLIDE SLOPE**- (1) the vertical (or altitude) profile followed by an aircraft during the approach and landing. (2) electronic vertical guidance provided by airborne and ground instruments for instrument approaches (see PRECISION INSTRUMENT APPROACH PROCEDURE) using equipment such as an instrument landing system (ILS) (see also); as well as visual ground aids, such as a visual approach slope indicator (VASI) (see also), for a visual flight rule (VFR) approach or for the visual portion of an instrument approach and landing.

**GLOBAL POSITIONING SYSTEM (GPS)**-A navigational system that uses a series of satellites orbiting the earth to provide non-precision guidance in azimuth, elevation, and distance measurement.

**GROUND EFFECT**-The excess attenuation of sound associated with absorption or reflection of noise by manmade and physical features on the ground surface.

**GROUND TRACK**-The trajectory of an aircraft flight path projected onto the ground surface.

**HELIPAD**-A small area designated for takeoff, landing, or parking of helicopters.

**HUD**-U.S. Department of Housing and Urban Development.

**IFR**-See INSTRUMENT FLIGHT RULES.

**IFR AIRPORT**-An airport with an authorized instrument approach procedure.

**IFR CONDITIONS**-Weather conditions that require aircraft to be operated in accordance with instrument flight rules.

**IFR MINIMUMS AND DEPARTURE PROCEDURES (FAR PART 91)**-Prescribed takeoff rules. For some airports, obstructions or other factors require the establishment of nonstandard takeoff minimums or departure procedures, or both, to assist pilots in avoiding obstacles during climb to the minimum en route altitude.

**ILS**-See INSTRUMENT LANDING SYSTEM.

**IMPACT**-In environmental studies, the word "impact" is used to express the extent or severity of an environmental problem, e.g., the number of persons exposed to a given noise environment. As indicated in CEQ 1500 (Section 1508.8), impacts and effects are considered to be synonymous. Effects or impacts may be ecological, aesthetic, historic, cultural, economic, social, or health related, and they may be direct, indirect, or cumulative.

**INCOMPATIBLE LAND USE**-Residential, public, recreational, and certain other noise-sensitive land uses that are designated as unacceptable within specific ranges of cumulative (DNL) noise exposure as set forth in FAR Part 150, Appendix A, Table 2.

**INFILL**-The development of small pieces of property remaining in previously developed larger areas.

**INM**-See INTEGRATED NOISE MODEL.

**INSTRUMENT APPROACH**-An aircraft approach to an airport, with intent to land, by a pilot flying in accordance with an IFR flight plan, when the visibility is less than 3 miles and/or when the ceiling (see also) is at or below the minimum initial approach altitude.

**INSTRUMENT APPROACH RUNWAY**-A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved.

**INSTRUMENT FLIGHT RULES (IFR)**-Rules specified by the FAA for flight under weather conditions that do not meet the minimum requirements for visual flight rules (VFR). Under these conditions the pilot must rely on instruments to fly and navigate**.**

**INSTRUMENT LANDING SYSTEM (ILS)**-A system that provides, in the aircraft, the lateral and longitudinal (localizer), and vertical (guidance) electronic guidance necessary for an instrument landing.

**INSTRUMENT OPERATION**-An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility or air route traffic control center (see also).

**INSTRUMENT RUNWAY**-A runway equipped with electronic and visual air navigation aids and for which a straight-in (precision or nonprecision) approach procedure has been approved or is planned.

**INTEGRATED NOISE MODEL (INM)**-A computer model developed by the FAA and required by the FAA for use in environmental assessments, environmental impact statements, and FAR Part 150 studies for developing existing and future aircraft noise exposure maps.

**$L_{max}$ –** See MAXIMUM SOUND LEVEL

**LAND USE COMPATIBILITY**-The compatibility of land uses surrounding an airport with airport activities and particularly with the noise from aircraft operations.

**LAND USE COMPATIBILITY ASSURANCE**-Documentation provided by an airport sponsor to the FAA related to an application for an airport development grant. Its purpose is to assure that a reasonably appropriate action has been taken or will be taken to restrict the use of land adjacent to the airport or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including the landing and takeoff of aircraft.

**LAND USE CONTROLS**-Controls established by local or state governments to implement land use planning. The controls include zoning, subdivision regulations, land acquisition (in fee simple, lease-back, or easements), building codes, building permits, and capital improvement programs (to provide sewer, water, utilities, or other service facilities).

**LAND USE PLANNING**-Comprehensive planning carried out by units of local government, for all areas under their jurisdiction, to identify the optimum uses of land and to serve as a basis for the adoption of zoning or other land use controls.

**LESS-THAN-FEE ACQUISITION**-The purchase of development rights (see also) from landowners by airport sponsors in areas that should remain at very low densities or in open space uses. The airport sponsor negotiates with the landowner to determine the fair market value of the unused development rights. Once sold, the land cannot be developed except in specified uses. (See FEE SIMPLE LAND ACQUISITION.)

**LOCALIZER (LOC)**-Navigational equipment that provides electronic course guidance. The ground-based equipment sends two signals, which, when received and receded by airborne equipment with equal intensity, indicate that the aircraft is on course. If the received and receded signals have unequal intensity, then the aircraft is off course. A localizer is the part of an ILS (see also) that provides lateral and longitudinal course guidance to the runway.

**LOCALIZER-TYPE DIRECTIONAL AID (LDA)**-A navigational aid used for nonprecision instrument approaches with utility and accuracy comparable to a localizer; however, it is not part of a complete ILS and its signal is not typically aligned with the runway.

**LOUDNESS**-The judgment of the intensity of a sound by a person, loudness depends primarily on the sound pressure of the stimulus. Over much of the loudness range, it takes about a threefold increase in sound pressure (approximately 10 decibels) to produce a doubling of loudness.

**MAXIMUM SOUND LEVEL ($L_{max}$)** – The maximum a-weighted sound level, in dBA, for a given noise event.

**MISSED APPROACH**-An approach that is not completed with a landing due to lack of visual reference (see MISSED APPROACH POINT), the presence of other aircraft on or too near the runway, instructions from air traffic control to execute a missed approach, or other reasons.

**MISSED APPROACH POINT (MAP)**-A point during an instrument approach procedure at which, if the visual reference to continue the approach does not exist (i.e., the pilot cannot see the runway or visual guidance to the runway), a missed approach procedure must be executed.

**MITIGATION MEASURE**-An action that can be planned or taken to alleviate (mitigate) an adverse environmental impact. Mitigation includes:

(1) Avoiding the impact altogether by not taking a certain action or parts of an action.

(2) Minimizing the impact by limiting the degree or magnitude of the action and its implementation.

(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(5) Compensating for the impact by replacing or providing substitute resources or environments.

A proposed airport development project or alternatives to that project may constitute a mitigation measure.

**NAVAID**-See AIR NAVIGATION FACILITY.

**NEPA**-National Environmental Policy Act of 1969. (Public Law 91-190.)

**NOISE**-Noise is any sound that is considered to be undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

**NOISE ABATEMENT PROCEDURES**-Changes in runway use, flight approach and departure routes and procedures, and other air traffic procedures that are intended to shift adverse aviation effects away from noise-sensitive areas (such as residential neighborhoods).

**NOISE ATTENUATION OF BUILDINGS**-The use of building materials to reduce noise through absorption, transmission loss, and reflection of sound energy.

**NOISE CONTOURS**-Lines drawn on a map that connect points of equivalent noise exposure levels. For aircraft noise analyses conducted using DNL (see DAY-NIGHT AVERAGE SOUND LEVEL), noise contours are usually drawn in 5-DNL intervals, such as connections of DNL 75 exposure, DNL 70 exposure, DNL 65 exposure, and so forth.

**NOISE CONTROL PLANS**-Documentation by an airport sponsor of actions to be taken to reduce the effect of aviation-related noise. These actions are to be taken by the sponsor either alone or in cooperation with the FAA, airport users, and affected units of local government, and are developed and implemented considering appropriate comments from affected citizens. Alternative actions should be considered; particularly where proprietary use restrictions (see also) on aircraft operations are involved.

**NOISE EXPOSURE MAP (NEM)**-A map prepared in accordance with FAR Part 150 or other FAA environmental regulation that depicts actual (existing or historical conditions) or anticipated (future conditions) aircraft noise exposure and the affected land uses. NEMs for future conditions may take into account anticipated land use changes around the airport.

**NOISE LEVEL REDUCTION (NLR)**-The noise reduction between two areas or rooms is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. Noise reduction is measured by combining the effect of the transmission loss performance of structures separating the two areas or rooms and the effect of acoustic absorption in the receiving room.

**NOISE-SENSITIVE LAND USE**-A land use that can be adversely affected by high levels of aircraft noise. Residences, schools, hospitals, religious facilities, libraries, and other similar uses are typically considered to be noise-sensitive.

**NONDIRECTIONAL RADIO BEACON (NDB)**-A low/medium frequency radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction-finding equipment can determine the aircraft's bearing to or from the radio beacon and track to or from the station.

**NON-PRECISION INSTRUMENT APPROACH PROCEDURE**-A standard instrument approach procedure for which no glide slope guidance is provided. Typical non-precision instrument approach procedures include VOR (see VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE), GPS (see GLOBAL POSITIONING SYSTEM), NDB (see NONDIRECTONAL RADIO BEACON), and LOC (see LOCALIZER) approach procedures. (See PRECISION INSTRUMENT APPROACH PROCEDURE.)

**NORMALLY UNACCEPTABLE**-DNL higher than 65 but not higher than 75 decibels (see UNACCEPTABLE)-the noise exposure is significantly more severe; barriers may be necessary between the site and prominent noise sources to make the outdoor environment acceptable; special building construction may be necessary to ensure that people indoors are sufficiently protected from outdoor noise.

**OBJECT FREE AREA (OFA)**-See RUNWAY OBJECT FREE AREA.

**OBSTACLE FREE ZONE (OFZ)**-The OFZ is a three-dimensional section of airspace that supports the transition of ground-to-airborne-aircraft operations (and vice versa). The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible NAVAIDS, the location of which is fixed by function. The runway OFZ; when applicable, the inner-approach OFZ; and the inner-transitional OFZ compose the obstacle free zone.

**OBSTRUCTION**-An object that exceeds a limiting height or penetrates an imaginary surface described by FAR Part 77.

**PATTERN**-The configuration or form of a flight path flown by an aircraft, or prescribed to be flown, as in making an approach for landing.

**PRECISION APPROACH PATH INDICATOR (PAPI)**-An airport lighting facility in the terminal area navigation system used under VFR conditions (see also), through a single row of two to four lights, radiating high intensity red or white beams to indicate whether the aircraft is on, above, or below the required runway glide slope. (See VISUAL APPROACH SLOPE INDICATOR.)

**PRECISION INSTRUMENT APPROACH PROCEDURE**-A standard instrument procedure for a pilot to approach an airport, in which both electronic course guidance and an electronic glide scope are provided. For example, an approach using an ILS is considered a precision instrument approach.

**PREFERENTIAL RUNWAY USE (PROGRAM)**-A noise abatement action whereby the FAA Air Traffic Division, in conjunction with the FAA Airports Division and Aviation System Standards Division, assists the airport sponsor in developing a program that gives preference to the use of a specific runway(s), unless weather or other conditions prevail, to reduce overflights of noise-sensitive areas.

**PROPRIETARY USE RESTRICTIONS**-Restrictions by an airport sponsor on the number, type, class, manner, or time of aircraft operations at the airport. The ability of an airport sponsor to impose proprietary use restrictions was significantly affected by passage of the Airport Noise and Capacity Act of 1990 (see also).

**RAMP**-See APRON.

**RELIEVER AIRPORT**-An airport accommodating general aviation aircraft operations that might otherwise have to be accommodated at a congested air carrier airport.

**RETROFIT**-The retroactive modification of existing jet aircraft engines for noise reduction purposes.

**RUNWAY –** A defined rectangular area on an airport for the purpose of landing and taking off of aircraft. Runways are numbered in relation to their magnetic direction, rounded to the nearest 10 degrees (i.e., Runway 14, Runway 32).

**RUNWAY OBJECT FREE AREA**-The runway object free area (OFA) is a two-dimensional ground area surrounding the runway. The runway OFA clearing standard precludes parked aircraft and objects, except objects whose location is fixed by function.

**RUNWAY PROTECTION ZONE (RPZ)**-The RPZ (formerly referred to as the runway clear zone) is trapezoidal in shape and centered about the extended runway centerline. It begins 200 feet beyond the end of the area usable for takeoff or landing. Displacing the threshold does not change the beginning point of the RPZ unless declared runway distances have been established by the airport sponsor and approved by the FAA. The RPZ dimensions are functions of the design aircraft, type of operation, and visibility minimums.

**RUNWAY THRESHOLD**-The beginning of that portion of a runway usable for landing.

**RUNWAY USE PROGRAM**-See PREFERENTIAL RUNWAY USE PROGRAM.

**SHIELDING**-The attenuation of a sound by placing walls, buildings, plants, or other barriers between a sound source and the receiver. Also used with light to minimize impacts by introducing manmade or natural elements to reduce or eliminate glare.

**SIGNIFICANT EFFECT ON THE ENVIRONMENT**-A substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself is not considered a significant effect on the environment. However, a social or economic change that is related to a physical change may be considered in determining whether a physical change is significant**.**

**SIGNIFICANT NOISE IMPACT THRESHOLD**-A significant noise impact is defined as an increase in aircraft noise of DNL 1.5dB or greater in an area exposed to aircraft noise at or above DNL 65 dB and developed with noise sensitive land uses.

**SINGLE EVENT**-Noise generated by a single event, such as a single aircraft flyover.

**SOUND EXPOSURE LEVEL (SEL)**-SEL is a time-integrated measure, expressed in decibels, of the sound energy of a single noise event. The sound level is integrated over the period that the level exceeds a threshold (normally 65 dBA for aircraft noise events). Therefore, SEL accounts for the duration of the sound. SELs for aircraft noise events depend on the location of the aircraft, the type of operation (landing, takeoff, or overflight), and the type of aircraft.

**SOUND INSULATION**- (1) The use of structures and materials designed to reduce the transmission of sound from one room or area to another, or from the exterior to the interior of a building. (2) The degree of reduction in sound transmission, or noise level reduction (see also), by means of sound-insulating structures and materials.

**SOUND LEVEL (NOISE LEVEL)-**The weighted sound pressure level obtained by the use of a sound level meter having a standard frequency filter for attenuating part of the sound spectrum.

**SOUND LEVEL METER**-An instrument consisting of a microphone, an amplifier, an output meter, and frequency-weighting networks used to measure noise and sound levels in a specified manner.

**STANDARD TERMINAL ARRIVAL ROUTE (STAR)**-A preplanned and published instrumental arrival route.

**TERPS**-Certain airspace needs to be cleared for aircraft operations. This airspace is determined by the application of operating rules and terminal instrument procedures (TERPS). Removing obstructions to air navigation, except those that an FAA aeronautical analysis determined need not be removed, satisfies these requirements. Subpart C of FAR Part 77 defines obstructions to air navigation. (See FAA HANDBOOK 8260.3B.)

**TERMINAL RADAR APPROACH CONTROL (TRACON)**-Radar approach facility for an airport.

**TOWER**-See AIRPORT TRAFFIC CONTROL TOWER (ATCT).

**TRANSFER OF DEVELOPMENT RIGHTS (TDR)**-TDR involves separate ownership and use of the various rights associated with a parcel of real estate. Under TDR, some of the property's development rights (see also) are transferred to another location, where they may be used to intensify allowable development. For example, lands within an area affected by aircraft noise could be kept in open space or agricultural uses, and development rights for residential or other uses could be transferred to locations outside the area. Landowners could be compensated for the transferred rights by their sale at the new locations, or the airport sponsor could purchase the rights. Depending on market conditions and legal requirements, the airport sponsor could either hold or resell the rights.

**URBAN GROWTH MANAGEMENT**-The identification and management of the demands on municipal facilities, improvements, or services created by any proposed residential, commercial, industrial, or other type of development. Urban growth management is intended to (1) provide the means for satisfying such demands, (2) identify any harmful effects of development, and (3) protect the jurisdictions and their residents against such harmful effects by minimizing the costs of municipal facilities, improvements, and services. The intent of urban growth management is usually not to prevent development or growth, but rather to avoid free or disorganized development or growth in the urban growth management area, which is generally located in and around the fringe of an urban area. The urban growth management area usually is either relatively undeveloped or predominantly agricultural and lacks most, if not all, municipal facilities, improvements, or services.

**UNACCEPTABLE**-DNL above 75 decibels-Noise exposure at the site is so severe that the construction cost to make the indoor noise environment acceptable may be prohibitive and the outdoor environment would still be unacceptable.

**VERY HIGH FREQUENCY (VHF) OMNIDIRECTIONAL RANGE (VOR)**-A radio transmitter facility in the navigation system radiating a VHF radio wave modulated by two signals, the relative phases of which are compared, resolved, and displayed by a compatible airborne receiver to give the pilot a direct indication of bearing relative to the facility.

**VFR**-See VISUAL FLIGHT RULES.

**VFR AIRPORT**-An airport without an authorized or planned instrument approach procedure.

**VISUAL APPROACH**-An approach to an airport wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of a radar facility and having air traffic control authorization, may deviate from the prescribed instrument approach procedure and proceed to and land at the airport of destination, served by an operational ATCT, by visual reference to the surface.

**VISUAL APPROACH SLOPE INDICATOR (VASI)**-An airport lighting facility in the terminal area navigation system used primarily under VFR conditions. It provides vertical visual guidance to indicate whether the aircraft is on, above, or below the glide slope to the runway. (See PRECISION APPROACH PATH INDICATOR.)

**VISUAL FLIGHT RULES (VFR)**- A set of regulations that a pilot may operate under when weather conditions meet certain minimum requirements. The requirements are designed to provide sufficient visibility so that other aircraft can be seen and avoided. Under VFR, the pilot generally controls the attitude of the aircraft by relying on what can be seen out the window, although this may be supplemented by referring to the instrument panel.

**VISUAL FLIGHT RULE (VFR) CONDITIONS**- Meteorological conditions under which VFR flight is permitted. For VFR flight certain requirements for visibility, ceilings (for takeoffs and landings), and cloud clearances must be met.

**VISUAL RUNWAY**-A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved Airport Layout Plan, or by any planning document submitted to the FAA by competent authority.

**ZONING AND ZONING ORDINANCES**-Ordinances that divide a community into zones or districts according to the current and potential use of properties for the purpose of controlling and directing the use and development of those properties. Zoning is concerned primarily with the use of land and buildings, the height and bulk of buildings, the proportion of a lot that buildings may cover, and the density of population of a given area. As an instrument for noise compatibility plan implementation, zoning deals principally with the use and development of privately owned land and buildings. The objectives of zoning are to establish regulations that provide locations for all essential uses of land and buildings and ensure that each use is located in the most appropriate place. In noise compatibility planning, zoning can be used to achieve two major aims: (1) to reinforce existing compatible land uses and promote the location of future compatible uses in vacant or underdeveloped land, and (2) to convert existing incompatible uses to compatible uses over time.

# Appendix B. Community Land Use Plans

This appendix provides information regarding the land use plans referenced in Section 3.9. Clark County is divided into numerous planning areas encompassing incorporated and unincorporated areas. Exhibit III-8 shows an overview of the planning areas in the vicinity of McCarran International Airport. Planned land use recommendations for unincorporated portions of Clark County are addressed in land use plans developed by the Clark County Department of Comprehensive Planning and approved by the Clark County Board of County Commissioners. Comprehensive/master plans have been developed for the incorporated cities of Boulder City, Henderson, Las Vegas, and North Las Vegas.

The tables presented in this appendix summarize the planned land use categories for each incorporated and unincorporated area, according to the respective land use plans. These tables are intended as a reference, to be used in conjunction with the generalized planned land use exhibit presented in Section III. Land use plans are summarized in this appendix for the following:

- Incorporated Cities
  - City of Boulder City
  - City of Henderson
  - City of Las Vegas
  - City of North Las Vegas
- Unincorporated Planning Areas
  - Enterprise
  - Red Rock/Blue Diamond
  - Spring Valley
  - Summerlin South
  - Sunrise Manor
  - Whitney
  - Winchester and Paradise

# B.1 Incorporated Cities

## B.1.1 City of Boulder City

Boulder City is part of the Las Vegas metropolitan area, which has continued to be one of the fastest growing areas in the nation since the early 1990s. Much of the recent growth within the Las Vegas Valley has been concentrated in the cities of Henderson, Las Vegas, and North Las Vegas. Boulder City is located to the southeast, in the Eldorado and Hemenway Valleys.

Although the developed portion of Boulder City is approximately 5 square miles, the incorporated city limits encompass approximately 200 square miles. Las Vegas is 25 miles northwest of Boulder City and the Lake Mead National Recreation Area is located to the north and east.

On December 9, 2003, the Boulder City City Council adopted the Boulder City *Master Plan*. The Master Plan, developed by the Boulder City Department of Community Development, is an advisory document that outlines the community leaders' vision and goals for the future and provides guidance for elected and appointed officials in making decisions regarding the long-range needs of the community.

**Table B-1** provides definitions and descriptions of the planned land use categories included in the Boulder City *Master Plan*.

**Table B-1 (1 of 2)**

Planned Land Use Categories – City of Boulder City

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Low Density Residential | n.a. | Areas with a mix of low-density housing types in a neighborhood setting. Primary uses include large-lot and low-density detached single-family homes, mobile homes, and manufactured homes. | Residential Single-Family |
| Medium Density Residential | Up to 17 dwelling units/acre | Areas with a mix of low- to medium-density housing types in a neighborhood setting. Primary uses include single-family, single-family attached, duplex, and town homes; apartments, condominiums, and mobile home parks. | Residential Multi-Family |
| Central Business District | n.a. | Areas with traditional downtown urban fabric in a compact, vibrant setting at a pedestrian-friendly scale. Primary uses include a variety of civic, cultural, retail, commercial, business, hotel, professional offices, and financial institutions. | Commercial |
| Community Commercial | n.a. | Areas with a mix of retail and commercial services in a concentrated and unified center that serves the local community and may also provide a limited draw for tourists and the surrounding region. Primary uses include restaurants, supermarkets, specialty shops, drycleaners, drugstores, filling stations, retail and health services, and business and professional offices. | Commercial |
| Airport Related Commercial | n.a. | Intended to provide a range of services to support the daily needs of airport employees and visitors. Primary uses include restaurants, service stations, car rentals, and other accessory uses related to the day-to-day functions of the airport. | Commercial |
| Mixed-Use Commercial/Office | n.a. | Intended to provide concentrated areas of mixed-use commercial/office developments incorporated into a master-planned neighborhood, or located in close proximity to residential areas. Primary uses include high quality employment facilities, such as corporate office headquarters, research and development, and educational facilities in a planned, “campus-like” setting. | Mixed Use |
| Manufacturing | n.a. | Uses typically involve more intensive work processes, and may involve manufacturing or basic resource handling. Specific uses include light manufacturing, warehousing and distribution, indoor and screened outdoor storage, and a wide range of other manufacturing services, and operations. | Industrial |

**Table B-3 (2 of 2)**

Planned Land Use Categories – City of Boulder City

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Parks and Recreation | n.a. | Intended to provide for the active and passive recreational needs of the community. Land is generally provided by the City, although recreational facilities, such as privately operated golf courses, are also included. Uses include neighborhood or community parks, trails, and other recreational facilities. | Recreation |
| Open Lands | n.a. | Areas that have been preserved through public ownership, purchase, donation, land swap, conservation easement, or other means. Provides natural resource protection, view protection, protection of steep slopes or other sensitive areas, and buffering of noncompatible land uses. Active uses include unimproved trails for hiking, biking, equestrian use, and off-road vehicle use. | Park / Open Space |
| Public/Quasi-Public | n.a. | Areas provided by the City, County, State, or federal agency, or by a quasi-public organization. Uses include schools, government offices, community centers, fire stations, airports, libraries, hospitals, cemeteries, churches, and other places of worship. Also includes facilities needed for essential public services, such as electrical substations, water and wastewater facilities, and other similar uses. | Public |

Note:
n.a. = Not applicable.

Source: Boulder City *Master Plan*, 2003.
Prepared by: Ricondo & Associates, Inc.

## B.1.2 City of Henderson

The City of Henderson is located approximately 7 miles south of the Las Vegas Strip and about 1 mile from Lake Mead. Named the fastest growing large city in America by the U.S. Department of Commerce, Bureau of the Census in 2000, Henderson is recognized as the gateway community to the Las Vegas region. Henderson is separated from Boulder City and the Lake Mead National Recreation Area by mountains and desert. In terms of population, Henderson ranks as the second largest city in the State of Nevada, overtaking Reno in December 1999. The planning area encompasses approximately 94 square miles.

The City of Henderson *Comprehensive Plan* was adopted in 2006. **Table B-2** provides definitions and descriptions of the planned land use categories included in the City of Henderson *Comprehensive Plan*.

**Table B-2**

Planned Land Use Categories – City of Henderson

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Low Density Residential | From 2 dwelling units/acre to 6 dwelling units/acre | Single family detached homes, rural homes, lower density mobile homes | Residential Single-Family |
| Medium Density Residential | From 8 dwelling units/acre to 14 dwelling units/acre | Single family detached homes, lower density apartments/condominiums/town homes, higher density mobile homes | Residential Multi-Family |
| High Density Residential | Greater than 16 dwelling units/acre | Higher density apartments/condominiums/ town homes | Residential Multi-Family |
| Commercial | n.a. | Retail and service establishments, offices | Commercial |
| Tourist Commercial | n.a. | Hospitality and commercial tourist services, hotel and resort developments | Mixed Use |
| Business/Industry | n.a. | Business parks, light and heavy industrial manufacturing, warehouses | Industrial |
| Public/Semi-Public | n.a. | Parks, golf courses, recreational facilities, open spaces, public facilities, schools and education facilities | Public |

Note:
n.a. = not applicable

Source: City of Henderson *Comprehensive Plan*, 2006.
Prepared by: Ricondo & Associates, Inc.

### B.1.3 City of Las Vegas

The City of Las Vegas is situated at the southern tip of the State of Nevada in the Great Basin, the western region between the Sierra Nevada and Wasatch mountain ranges, which contains isolated mountains and has no drainage to the ocean.

Las Vegas is the largest city in Nevada. According to the Las Vegas Chamber of Commerce, more than 5,000 people move to Las Vegas each month, making it one of the country's fastest growing cities. The population of Las Vegas is distributed across the city at varying densities. Generally, the most densely populated areas are in the central downtown, the Penwood/Arville area, and along the U.S. 95/Interstate 515 corridor to the west and northwest. It is important to note that twice as many people live west of Decatur Boulevard compared to the number living east of Decatur Boulevard, and over 96 percent of the population growth over the next 20 years, assuming continuation of the current trend, is projected to occur in the western and northwestern portions of the city. According to the Las Vegas *2020 Master Plan*, over 300,000 residents are expected to be added to the city over the next 20 years, for a 2020 population projection of 760,000 to 800,000.

The Las Vegas *2020 Master Plan* was adopted in 2000. This Master Plan is intended to provide a broad and comprehensive level of policy direction for future land use decisions and related aspects of corporate planning in the City of Las Vegas through 2020. The Master Plan is also intended to ensure that the City of Las Vegas is in compliance with the requirements of all applicable State laws. Although this document is intended to provide guidance to City staff, the Clark County Planning Commission, and the City Council in making planning-related decisions, it is also intended to be a readable, handy reference for the development community and the general public.

**Table B-3** provides definitions and descriptions of the planned land use categories included in the City of Las Vegas *2020 Master Plan*.

**Table B-3 (1 of 2)**

Planned Land Use Categories – City of Las Vegas

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Desert Rural Density Residential | Up to 2 dwelling units/acre | Predominantly single-family homes on large lots, many including equestrian facilities. | Residential Single-Family |
| Rural Density Residential | From 2.1 dwelling units/acre to 3.5 dwelling units/acre | Similar to Desert Rural Density Residential, but with a smaller allowable lot size. | Residential Single-Family |
| Low Density Residential | From 3.6 dwelling units/acre to 5.5 dwelling units/acre | Single-family detached homes, manufactured homes on individual lots, gardening, residential planned developments, and planned community developments. | Residential Single-Family |
| Medium Low Density Residential | From 5.6 dwelling units/acre to 8 dwelling units/acre | Single-family compact lots and zero lot lines, manufactured homes, and residential planned developments. | Residential Single-Family |
| Medium Low Attached Density Residential | From 8.1 dwelling units/acre to 12 dwelling units/acre | Variety of multi-family units, such as townhouses, condominiums, and low-density apartments. | Residential Multi-Family |
| Medium Residential | From 12.5 dwelling units/acre to 25 dwelling units/acre | Higher density variety of multifamily unit types; typically allows buildings up to three stories in height. | Residential Multi-Family |
| High Density Residential | Greater than 25 dwelling units/acre | The highest-density residential category permitted within Las Vegas. | Residential Multi-Family |
| Planned Community Development | Up to 8 dwelling units/acre | Mix of residential uses (single family detached, single family attached, condominiums, apartments, townhouses). Accommodates orderly growth in developing parts of the city, but can also be used to encourage infill development within older neighborhoods. | Major Development Project/Planned Unit Development |
| Town Center | n.a. | This mixed-use category established the limits of the principal commercial and employment district for the Centennial Hills section of the city. | Mixed Use |
| Office | n.a. | Small lot office conversions as a transition, along major streets, from residential to commercial uses, and large planned office areas. | Commercial |
| Service Commercial | n.a. | Low to medium intensity retail, office, or other commercial uses that serve primarily local area patrons. | Commercial |

**Table B-3 (2 of 2)**

Planned Land Use Categories – City of Las Vegas

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| General Commercial | n.a. | More intense retail, service, wholesale, office, and other general business uses, and may include limited outdoor storage or display of products, noise, lighting, or other characteristics not generally considered compatible with adjoining residential areas with significant transition. | Commercial |
| Light Industrial/Research | n.a. | Areas appropriate for clean, low intensity industrial uses. | Industrial |
| Parks/Recreation/Open Spaces | n.a. | Large public parks and recreation areas, such as public and private golf courses, trails and easements, drainage-ways, and detention basins. | Park / Open Space |
| Resource Conservation | n.a. | Lands currently not envisioned for development. | Park / Open Space |
| Public Facilities | n.a. | Large governmental building sites, complexes, police and fire facilities, non-commercial hospitals and rehabilitation sites, sewage treatment and storm water control facilities, schools, and other uses considered public or quasi-public. | Public |

Note:
n.a. = not applicable

Source: City of Las Vegas. *2020 Master Plan*, 2000
Prepared by: Ricondo & Associates, Inc.

### B.1.4 City of North Las Vegas

Located at the northern tip of the Las Vegas Valley, the City of North Las Vegas is the second fastest growing city in the nation, encompassing approximately 79 square miles.

The City of North Las Vegas *Comprehensive Plan* provides maps, policies, goals, and objectives for future community growth. The plan addresses a wide range of issues and questions relating to land use, including transportation, land use mix, parks and open space, community facilities, community character and identity, housing and neighborhoods, and economic development for 20 to 30 years into the future.

The City of North Las Vegas *Comprehensive Plan* was most recently updated in 1999. Since that time, the city has undergone significant change. One major factor has been the decision by the U.S. Department of the Interior, Bureau of Land Management to sell lands under its control in the northern portion of the city for development. The additional developable land will enable more potential growth than was assumed when the *Comprehensive Plan* was last updated.

**Table B-4** provides definitions and descriptions of the planned land use categories included in the City of North Las Vegas *Comprehensive Plan*.

**Table B-4 (1 of 2)**

Planned Land Use Categories – City of North Las Vegas

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Very Low Density Residential | Up to 2 dwelling units/acre | Areas where rural residential development can take place. | Residential Single-Family |
| Low Density Residential | From 2 dwelling units/acre to 4.5 dwelling units/acre | Encompasses the majority of new detached single-family development. | Residential Single-Family |
| Medium-Low Density Residential | From 4.5 dwelling units/acre to 6 dwelling units/acre | n.a. | Residential Single-Family |
| Medium Density Residential | From 4.5 dwelling units/acre to 10 dwelling units/acre | Areas for development of single-family homes at densities higher than typical (town homes, patio homes. | Residential Multi-Family |
| Medium-High Density Residential | From 8 dwelling units/acre to 13 dwelling units/acre | Provides for lower density multiple family development. | Residential Multi-Family |
| High Density Residential | From 12 dwelling units/acre to 18 dwelling units/acre | Provides for multiple family development at the highest densities allowed by the city. | Residential Multi-Family |
| Resort Commercial | n.a. | Provides locations where casinos and related businesses and services may locate. | Mixed Use |
| Eldorado Development High Density Residential/Commercial | n.a. | Land subject to the Eldorado Development Agreement entered into by the City of North Las Vegas and Pardee Homes. | Mixed Use |
| Convenience Commercial | n.a. | Provides for commercial services used by the general public on a daily basis, such as convenience stores, gas stations, video rental stores, small restaurants. | Commercial |
| Neighborhood Commercial | n.a. | Neighborhood areas generally have a grocery store as the anchor tenant. Other uses in these areas include convenience commercial, drug stores, beauty/barber shops, small tenant retail, and single professional and medical offices. | Commercial |
| Community Commercial | n.a. | Provides for commercial services used by a large portion of the population and may include Neighborhood Commercial uses. | Commercial |
| Office | n.a. | Provides for low-rise office development. A limited amount of supporting commercial uses may also be allowed, such as: copying services, mailing services, restaurants. | Commercial |

**Table B-4 (2 of 2)**

Planned Land Use Categories – City of North Las Vegas

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Business/Research/ Development Park | n.a. | Provides for "campus" industrial development. Primary uses of the property should be offices, non-polluting research, indoor assembly of prototypes, and limited warehousing. | Industrial |
| Light Industrial | n.a. | Provides for assembly, non-polluting manufacturing, and warehousing uses that do not have significant environmental impacts. | Industrial |
| Heavy Industrial | n.a. | Provides for all manner of assembly, manufacturing, and warehousing. | Industrial |
| Wilderness Study Area | n.a. | n.a. | Park / Open Space |
| Open Space | n.a. | Areas where large tracts of land are to be kept relatively free from the development of habitable structures. | Park / Open Space |
| Public/Semi-Public | n.a. | Existing or planned significant permanent facilities of public agencies and semi-public entities. | Public |
| Redevelopment Area | n.a. | n.a. | Public |

Note:
n.a. = Not applicable.

Source: City of North Las Vegas *Comprehensive Plan*, 1999
Prepared by: Ricondo & Associates, Inc.

## B.2 Unincorporated Planning Areas

### B.2.1 Enterprise

The Enterprise planning area is in unincorporated Clark County and encompasses over 66 square miles in the southwestern part of the Las Vegas Valley. Enterprise is generally bounded by Sunset Road to the north, Larson Lane to the south, Bermuda Road to the east, and Hualapai Way to the west. The planning area is traversed north to south by Interstate-15 and east to west by Interstate-215 and Blue Diamond Road (State Highway 160). These highways serve as major transportation corridors for those in or passing through the area. The interstate corridors are supplemented by the typical grid street pattern predominant in the Las Vegas Valley. Enterprise has undergone many changes in the past several years, with considerable new residential development. Demand for commercial development still exists in the area.

The *Enterprise Land Use Plan* provides a guide for decision-making by the Enterprise Town Advisory Board, the Clark County Planning Commission, and the Clark County Board of County Commissioners concerning growth and development. While the land use plan is to be used by policy makers to guide their decisions, it also serves as a reference for the general public. The plan contains a series of goals and policies used to define development standards, guide public investment, and guide public and private decision-making. The Board of County Commissioners adopted the most recent update of the *Enterprise Land Use Plan* in December 2004. **Table B-5** provides definitions and descriptions of the planned land use categories included in the *Enterprise Land Use Plan*.

**Table B-5 (1 of 3)**

Planned Land Use Categories – Enterprise Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Residential Rural | Up to 0.5 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. | Residential Single-Family |
| Residential Agriculture | Up to 1 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. Also includes areas where the primary land use is commercial farming, including, but not limited to, crop production and raising livestock (not open range grazing). | Residential Single-Family |
| Rural Neighborhood | Up to 2 dwelling units/acre | The predominant housing type is detached single-family residential development at low densities. | Residential Single-Family |
| Rural Neighborhood Preservation | Up to 2 dwelling units/acre | Predominantly single-family homes on large lots, many including equestrian facilities. Intended to protect areas within the Las Vegas Valley that are already developed and rural in character. | Residential Single-Family |
| Residential Low | Up to 3.5 dwelling units/acre | Predominantly single-family detached residential development. Public infrastructure and services availability affect density within this category. | Residential Single-Family |
| Residential Suburban | Up to 8 dwelling units/acre | Predominantly single-family detached residential development. Local supporting public facility uses are also allowed with appropriate buffering and setbacks. | Residential Single-Family |
| Multi-Family | From 8 dwelling units/acre to 18 dwelling units/acre | Allows a variety of housing types, including single-family, residential multiplexes, town houses, and apartments. | Residential Multi-Family |
| Suburban Center | From 18 dwelling units/acre to 32 dwelling units/acre | Allows a variety of housing types, including single-family, residential multiplexes, town houses, and apartments. Mixed uses are permitted within appropriate zoning districts. | Residential Multi-Family |
| Urban Center | Greater than 32 dwelling units/acre | High density/intensity residential, supporting commercial and office professional uses. | Residential Multi-Family |

**Table B-5 (2 of 3)**

Planned Land Use Categories – Enterprise Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Office Professional | n.a. | Low intensity business and professional services and accessory service uses. Typical uses include offices providing medical, legal, financial, and day care services. | Commercial |
| Commercial Neighborhood | n.a. | Low to medium intensity retail and service commercial uses that serve primarily local area patrons, but does not include more intense general commercial characteristics. | Commercial |
| Commercial General | n.a. | Allows medium to high intensity retail and service commercial uses that serve primarily regional area patrons. | Commercial |
| Commercial Tourist | n.a. | Commercial establishments that primarily cater to tourists, including casinos, resorts, hotels, motels, recreational vehicle parks, time shared condominiums, amusement or theme parks. | Mixed Use |
| Major Development Projects | n.a. | Areas where land uses of greater densities than 2 dwelling units per acre are considered premature and/or inappropriate unless guided by the County's Major Projects Review Process. | Major Development Project/Planned Unit Development |
| Business and Design/Research Park | n.a. | Areas where commercial professional or manufacturing developments are designed to assure minimal impact on surrounding areas. Major uses include research and development, incubator businesses, food sales and distribution, postal and data processing centers, vehicle sales and repair, and general non-hazardous material warehousing. | Industrial |
| Industrial | n.a. | Areas of industrial use and areas for new and existing industrial development in proximity to major transportation facilities. | Industrial |
| Heavy Industrial | n.a. | Areas of industrial use and areas for intense industrial operation and development in proximity to major transportation facilities. These facilities are generally located outside the Las Vegas Valley for safety reasons. | Industrial |
| Open Land | Up to 1 dwelling unit/10 acres | Areas with highly limited availability of public services and facilities. Lands are primarily in public ownership. Grazing, open space, and recreational uses may occur. For lands in private ownership, only single-family/farm uses at densities no greater than one dwelling unit per 10 acres. | Park / Open Space |

**Table B-5 (3 of 3)**

Planned Land Use Categories – Enterprise Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Public Facilities | n.a. | Primary land uses are public and quasi-public services and facilities. Examples include: schools, libraries, museums, churches, police/fire stations, and cemeteries. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Enterprise Land Use Plan*, December 2004.
Prepared by: Ricondo & Associates, Inc.

## B.2.2 Red Rock/Blue Diamond

The Red Rock/Blue Diamond planning area encompasses 71 square miles and is part of the Northwest Clark County planning area, which encompasses 2,750 square miles. The Northwest Clark County planning area is generally bounded by the Northeast Clark County planning area and the urbanized Las Vegas Valley to the east; Lincoln County, Nevada, to the north; Nye County, Nevada, and Inyo County, California, to the west; and the South Clark County planning area to the south. Public lands and recreational land uses account for 99 percent of the planning area.

In 1991, an ordinance was adopted by the Clark County Board of County Commissioners to create the Blue Diamond Citizens Advisory Council (CAC) and the boundaries of the CAC area. Also in that year, an ordinance was adopted by the Clark County Board of County Commissioners to expand the boundaries of the unincorporated area served by the Blue Diamond CAC and to change the name of the CAC to the Red Rock Citizens Advisory Council. The Red Rock/Blue Diamond planning area boundary was expanded northward to include Calico Basin and eastward to include Blue Diamond Road (State Highway 160) up to the Enterprise planning area boundary.

The *Northwest Clark County Land Use and Development Guide* focuses on the private lands associated with population centers. Northwest Clark County is rural, and most of the communities (except Indian Springs) have populations less than 1,000 people. The area has a mix of residential, commercial, industrial, and open space recreation opportunities unique in Clark County. The Clark County Board of County Commissioners adopted the most recent update to the *Northwest Clark County Land Use and Development Guide* in 1996. An update is scheduled for 2006-2007. **Table B-6** provides definitions and descriptions of the planned land use categories included in the *Northwest Clark County Land Use and Development Guide*.

**Table B-6 (1 of 2)**

Planned Land Use Categories – Red Rock/Blue Diamond Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Residential Countryside | Up to 1 dwelling unit/2 acres | Primary land uses are large lot, single family residential. Single-family detached dwellings generally occupy lots of at least 2 acres and have limited access to public services and facilities. | Residential Single-Family |
| Residential Rural | Up to 1 dwelling unit/acre | Primary land uses are large lot, single family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. | Residential Single-Family |
| Residential Suburban | Up to 2 dwelling units/acre | Predominant housing type is detached single family developed at low densities. | Residential Single-Family |
| Residential Low | Up to 8 dwelling units/acre | Predominant housing type is detached single family developed at low to medium densities. Townhomes and mobile home developments may be appropriate. | Residential Single-Family |
| Residential Medium | Up to 18 dwelling units/acre | Predominant housing type is multiple family developed at medium densities. All apartments, condominiums, townhouses, mobile home park developments, and "plexes" are included in this designation. | Residential Multi-Family |
| Commercial Low | Up to 8 dwelling units/acre | Primary land use is mixed commercial. Uses include day care services and offices where medical, legal, financial, and other business/ professional services are performed. May be used as a buffer between more intense commercial and residential land uses. | Commercial |
| Commercial General | Up to 8 dwelling units/acre | Primary land use is mixed commercial. Typical uses include general retail sales, banks, eating and drinking establishments, indoor amusements and recreation, motels, car dealerships, and office buildings. | Commercial |
| Commercial/Industrial | n.a. | Primary land uses are commercial, professional, or industrial developments designed to assure minimal impact on surrounding areas. Includes research and development, food sales, postal and data processing centers, vehicle repair, and general non-hazardous material warehousing. | Commercial |

**Table B-6 (2 of 2)**

Planned Land Use Categories – Red Rock/Blue Diamond Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Commercial Tourist | n.a. | Commercial establishments that primarily cater to tourists. Land uses include casinos, resorts, hotels, motels, recreational vehicle parks, and amusement or theme parks. | Mixed Use |
| Industrial | n.a. | Primary land uses are medium to heavy intensity industries. Typical uses include assembly plants, heavy equipment repair, sales, salvage, or storage, outside storage facilities, and transmission facilities. | Industrial |
| Parks and Recreation | n.a. | Primary land uses are low intensity public, quasi-public or private outdoor recreation facilities. Includes parks, golf courses, tennis courts, and ball fields. | Recreation |
| Open Land | Up to 1 dwelling unit/10 acres | Areas with highly limited availability of public services and facilities. Lands are primarily in public ownership. Grazing, open space, and recreational uses may occur. For lands in private ownership, only single-family/farm uses at densities no greater than one dwelling unit per 10 acres or at densities in accordance with existing zoning for those private parcels. | Park / Open Space |
| Public Facility | n.a. | Areas where the primary land uses are public and quasi-public services and facilities. Includes schools, libraries, museums, hospitals, churches, police/fire stations, and cemeteries. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Northwest Clark County Land Use and Development Guide*, July 1996.
Prepared by: Ricondo & Associates, Inc.

### B.2.3 Spring Valley

The Spring Valley planning area encompasses 35 square miles or 22,870 acres in the southwest portion of the Las Vegas Valley. The major streets that form the general boundaries of this planning area are Sahara Avenue to the north, Wigwam Avenue to the south, Decatur Boulevard to the east, and Hualapai Way to the west. Allowing for easements and rights of way, there are approximately 18,189 acres of developable land. Of the developable land, 9,744 acres, or 53 percent, are developed. Of that, 34 percent is developed as single-family detached dwellings. The future developer of the vacant land in the southwest corner of the planning area will have to enter into a development agreement either through the Major Projects Review Process or through the Public Facilities Needs Assessment Process.

The majority of the vacant land is in the southern portion of the planning area, within the Cooperative Management Area (CMA). Future residential development is discouraged within the CMA. A significant portion of the vacant land in the CMA has deed restrictions, which prohibit the development of land uses incompatible with the operations of McCarran International Airport.

The *Spring Valley Land Use Plan* was originally adopted in 1990 and has been amended six times since 1997. In April 2000, the Clark County Board of County Commissioners amended the *Spring Valley Land Use Plan* to add new land use categories, goals, policies, and a separate land use plan map for the CMA. In 2003, the Clark County Board of County Commissioners selected the Spring Valley plan for a major update because Spring Valley was, and is, one of the fastest growing areas in the Las Vegas Valley.

The Clark County Board of County Commissioners adopted the most recent update of the *Spring Valley Land Use Plan* in November 2004. One significant change in the most recent update is the reintegration of the CMA. Additional policies were included in the plan at that time to address CMA issues. **Table B-7** provides definitions and descriptions of the planned land use categories included in the *Spring Valley Land Use Plan*.

**Table B-7 (1 of 3)**

Planned Land Use Categories – Spring Valley Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Residential Rural | Up to 0.5 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. | Residential Single-Family |
| Residential Agriculture | Up to 1 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. Also includes areas where the primary land use is commercial farming, including, but not limited to: crop production and raising livestock (not open range grazing). | Residential Single-Family |
| Rural Neighborhood | Up to 2 dwelling units/acre | Predominant housing type is detached single-family residential development at low densities. | Residential Single-Family |
| Rural Neighborhood Preservation | Up to 2 dwelling units/acre | Predominantly single-family homes on large lots, many including equestrian facilities. Intended to protect areas within the Las Vegas Valley that are already developed and rural in character. | Residential Single-Family |
| Residential Low | Up to 3.5 dwelling units/acre | Predominant housing type is single-family detached residential development. Public infrastructure and service availability affect the intensity and density within this category. | Residential Single-Family |
| Residential Suburban | Up to 8 dwelling units/acre | Predominant housing type is single-family detached residential development. Local supporting public facility uses are also allowed with appropriate buffering and setbacks. | Residential Single-Family |
| Residential Medium | From 3 dwelling units/acre to 14 dwelling units/acre | Allows for single-family uses and residential planned development, but not multiple family housing. | Residential Single-Family |
| Residential High | From 8 dwelling units/acre to 18 dwelling units/acre | Allows a variety of housing types, including single family, residential multiplexes, town houses, and low-density apartments. | Residential Multi-Family |
| Multi-Family | From 8 dwelling units/acre to 18 dwelling units/acre | Allows a variety of housing types, including single-family, residential multiplexes, town houses, and apartments. | Residential Multi-Family |

**Table B-7 (2 of 3)**

Planned Land Use Categories – Spring Valley Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Residential Urban Center | From 18 dwelling units/acre to 32 dwelling units/acre | Allows a variety of housing types, including single-family, residential multiplexes, town houses, and apartments. Mixed uses are permitted within appropriate zoning districts. | Residential Multi-Family |
| Residential High-Rise Center | Greater than 32 dwelling units/acre | High density/intensity residential, supporting commercial and office professional uses. | Residential Multi-Family |
| Office Professional | n.a. | Primary uses are low intensity business and professional services and accessory service uses. Typical uses include offices where medical, legal, financial, and day care services are performed. | Commercial |
| Commercial Neighborhood | n.a. | Low to medium intensity retail and service commercial uses that serve primarily local area patrons, but not more intense general commercial characteristics. | Commercial |
| Commercial General | n.a. | Allows medium to high intensity retail and service commercial uses that serve primarily regional area patrons. | Commercial |
| Commercial Tourist | n.a. | Commercial establishments that primarily cater to tourists, including casinos, resorts, hotels, motels, recreational vehicle parks, time shared condominiums, amusement or theme parks. | Mixed Use |
| Major Development Projects | n.a. | Areas where land uses of greater densities than 2 dwelling units per acre are considered premature and/or inappropriate unless guided by the County's Major Projects Review Process. | Major Development Project/Planned Unit Development |
| Business and Design/Research Park | n.a. | Areas where commercial professional or manufacturing developments are designed to assure minimal impact on surrounding areas. Major uses include research and development, incubator businesses, food sales and distribution, postal and data processing centers, vehicle sales and repair, and general nonhazardous warehousing. | Industrial |
| Industrial | n.a. | Areas of industrial use and areas for new and existing industrial development in proximity to major transportation facilities. | Industrial |
| Heavy Industrial | n.a. | Areas of industrial use and areas for intense industrial operation and development in proximity to major transportation facilities. These are generally located outside the Las Vegas Valley for safety reasons. | Industrial |

**Table B-7 (3 of 3)**

Planned Land Use Categories – Spring Valley Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Open Land | Up to 1 dwelling unit/10 acres | Areas with highly limited availability of public services and facilities. Lands are primarily in public ownership. Grazing, open space, and recreational uses may occur. For lands in private ownership, only single-family/farm uses at densities no greater than one dwelling unit per 10 acres or at densities in accordance with existing zoning for those private parcels. | Park / Open Space |
| Public Facilities | n.a. | Primary land uses are public and quasi-public services and facilities. Examples include: schools, libraries, museums, churches, police/fire stations, and cemeteries. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Spring Valley Land Use Plan*, November 17, 2004.
Prepared by: Ricondo & Associates, Inc.

## B.2.4 Summerlin South

The Summerlin South planning area is a Master Planned Community being developed by Howard Hughes Properties. The planning area is located on the western edge of the Las Vegas Valley and encompasses 9.6 square miles. It is generally bounded by Charleston Boulevard to the north, Russell Road to the south, Hualapai Way to the east, and the Red Rock National Conservation Area to the west.

The Clark County Board of County Commissioners adopted the *Summerlin South Land Use and Development Guide* on June 21, 1995. Individual village plans, which provide more detail on specific land uses, traffic circulation, and locations of schools, fire stations, parks, and libraries, are being submitted and reviewed as development plans. Summerlin South is proposed to be developed as generally presented in **Table B-8**.

**Table B-8**

Proposed Development – Summerlin South Planning Area.

| Type of Development | Development Acres |
|---|---|
| Residential Single-Family (up to 4 dwelling units/acre) | 2,760 |
| Residential Multi-family (up to 8 dwelling units/acre) | 540 |
| Retail/Service | 200 |
| Employment | 540 |
| Institutional | 180 |
| Open Space (includes golf courses) | 920 |
| Right-of-Way | 998 |

Source: Clark County Department of Comprehensive Planning.
Prepared by: Ricondo & Associates, Inc.

Summerlin South is limited to a maximum of 18,000 residential dwelling units, three separate hotel/casino sites, and up to 90 holes of golf. The proposed general locations of the hotel/casino sites are Charleston Boulevard and Town Center Drive, Town Center Drive and the future Town Wide Arterial, and Tropicana Avenue and Town Center Drive.

The Clark County Board of County Commissioners approved the development agreement and zone changes on February 7, 1996, for a period of 30 years. The development agreement stipulates that Summerlin South provide certain public facilities, in addition to other infrastructure improvements and impact mitigation, including:

- Construction and dedication of a fire station
- Dedication of land for a second fire station
- 5 acres for a satellite government center
- 20 acres for a planned community sports park
- Right-of-way dedication and excavation for that portion of the Western Beltway located within Summerlin South
- Traffic mitigation fee

In addition, neighborhood parks are being constructed in Summerlin South, which exceed the minimum Clark County requirement of 2 acres of park for every 1,000 residents, and Summerlin South is receiving credit toward the residential construction tax.

Village 14A, between Sahara Avenue and Desert Inn Road, west of Hualapai Way, was approved on June 5, 1996, for mixed uses on 732 acres. Village 14B, south of Desert Inn Road and west of Hualapai Way, was approved on September 16, 1998, for 1,514 residential units and other mixed uses on 356 acres. Village 15B, west of Hualapai Way and south of Flamingo Road, was approved on September 2, 1998, for 2,187 single family homes in a golf course and age-restricted community on 665 acres. Village 18C, west of the Las Vegas Beltway and north of Desert Inn Road was approved on December 17, 1997, for a private residential community with 1,350 residential units and two golf courses on 738 acres.

As of 2001, the County had issued 3,415 single-family residential building permits in addition to permits for the Summerlin Information Center, Red Rock Country Club golf course, and the Lutheran Church and High School complex.

## B.2.5 Sunrise Manor

The Sunrise Manor planning area encompasses approximately 40 square miles in unincorporated Clark County in the eastern portion of the Las Vegas Valley. The Sunrise Manor planning area is generally bounded by Interstate 15 to the north, Boulder Highway and Harmon Road to the south, the Frenchman and Sunrise Mountains to the east, and Pecos Road, Nellis Boulevard, and Boulder Highway to the west.

In the early 1930s, Boulder Highway was constructed from downtown Las Vegas to Railroad Pass during the construction of the Hoover Dam, and in the 1940s, the Las Vegas Army Airfield (now Nellis Air Force Base) was established as a training facility. These two facilities contributed to the development of commercial activity along Las Vegas Boulevard North, Boulder Highway, and Nellis Boulevard. In May 1957, the Clark County Board of County Commissioners created the unincorporated Town of Sunrise Manor and established the town boundary. The boundary was modified in 1996 when land to the east was added.

The *Sunrise Manor Land Use and Development Guide* was originally adopted in 1991. In 1999, an update, the *Sunrise Manor Land Use Plan*, was adopted. Since that time, some changes in development have occurred. This land use plan was recently updated to ensure that the policies and land use map are current and relevant. **Table B-9** provides definitions and descriptions of the planned land use categories included in the *Sunrise Manor Land Use Plan*.

**Table B-9 (1 of 2)**

Planned Land Use Categories – Sunrise Manor Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Rural Neighborhood Preservation | Up to 2 dwelling units/acre | Predominantly single-family homes on large lots, many including equestrian facilities. Intended to protect areas within the Las Vegas Valley that are already developed and rural in character. | Residential Single-Family |
| Rural Estates | Up to 2 dwelling unit/acre | Predominant housing type is detached single family developed at low densities. Local-supporting public facility uses are also allowed with appropriate buffering and setbacks. | Residential Single-Family |
| Suburban Residential | Up to 8 dwelling units/acre | Single-family detached homes, manufactured homes on individual lots within appropriate zoning districts, and residential planned developments are permitted. Building heights generally do not exceed 35 feet. | Residential Single-Family |
| Multiple Family Residential | Up to 18 dwelling units/acre | Areas where a variety of housing types, including single family, plexes, townhouses, manufactured home parks and low-density apartments, are allowed. Building heights generally do not exceed 35 feet. | Residential Multi-Family |
| Residential High | Up to 32 dwelling units/acre | Areas where a variety of housing types, including single family, plexes, townhouses, and apartments, are allowed. Building heights generally do not exceed 35 feet. | Residential Multi-Family |
| Office Professional | n.a. | Primary uses are low intensity business and professional services and accessory service uses. Typical uses include offices where medical, legal, financial, and day care services are performed. | Commercial |
| Neighborhood Commercial | n.a. | Low to medium intensity retail and service commercial uses that serve primarily local area patrons, but more intense general commercial characteristics are not included. | Commercial |
| Commercial General | n.a. | Allows medium to high intensity retail and service commercial uses that serve primarily regional area patrons. | Commercial |
| Regional Commercial | n.a. | Areas for commercial establishments that draw businesses, residents, visitors, and tourists from a wider area than do Commercial General uses. The predominant land uses include regional malls, “club or membership” stores, high-density apartments, casinos, resorts, hotels, motels, recreational vehicle parks, stadiums, and amusement or theme parks. | Mixed Use |

**Table B-9 (2 of 2)**

Planned Land Use Categories – Sunrise Manor Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Business Park/Industrial | n.a. | Primary land uses are commercial, professional, or industrial developments. Major uses include office, research and development, food sales and distribution, postal and data processing centers, vehicle repair, and general non-hazardous warehousing. | Industrial |
| Industrial | n.a. | Allows light and medium intensity industries and provides areas for new and existing industrial development in proximity to major transportation facilities. | Industrial |
| Heavy Industrial | n.a. | Allows high intensity industries. These uses are not compatible with urban or suburban development. New uses in this category are typically located outside the Las Vegas Valley. | Industrial |
| Open Land | Up to 1 dwelling unit/10 acres | Areas with highly limited availability of public services and facilities. Lands are primarily in public ownership. Grazing, open space, and recreational uses may occur. For lands in private ownership, only single-family/farm uses at densities no greater than one dwelling unit per 10 acres or at densities in accordance with existing zoning for those private parcels. | Park / Open Space |
| Public Facility/Parks and Recreation | n.a. | Allows large public parks and outdoor recreation facilities, such as public and private golf courses, trails and easements, drainage ways, and detention basins. | Recreation |
| Public Land Management Area | n.a. | Areas of publicly held land. The *Bureau of Land Management Resource Plan* provides comprehensive land use planning for public lands within the Las Vegas District. Clark County wishes to preserve these public lands for open space for regional environmental, economic, social, educational and recreational benefit. In this area, some privately held lands may be eligible for residential development at densities in accordance with the existing zoning for those private parcels. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Sunrise Manor Land Use Plan*, April 1999, as amended.
Prepared by: Ricondo & Associates, Inc.

## B.2.6 Whitney

The Whitney planning area encompasses approximately 37 square miles in the southeastern portion of the Las Vegas Valley, and includes the unincorporated Town of Whitney. The planning area is generally bounded by Desert Inn Road to the north, Russell Road to the south, the eastern border of the Desert Wetlands Park and the City of Henderson to the east, and Nellis Boulevard to the west.

In 1942, the Clark County Board of County Commissioners established the unincorporated Town of Whitney and set its boundaries. The vast majority of the land in Whitney is controlled by the Bureau of Land Management and is unavailable for development because of the presence of steep slopes. Development can also be influenced or impeded by threatened and endangered wildlife and plant species. The Desert Wetlands Park, along the Las Vegas Wash in the southern portion of Whitney, is being developed as a preserve and community resource.

The Clark County Board of County Commissioners adopted the most recent update to the *Whitney Land Use Plan* on February 2, 2000. The next update of the plan is scheduled for 2006-2007. **Table B-10** provides definitions and descriptions of the planned land use categories included in the *Whitney Land Use Plan*.

**Table B-10 (1 of 2)**

Planned Land Use Categories – Whitney Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Rural Estates | Up to 2 dwelling unit/acre | Predominant housing type is detached single family developed at low densities. Local-supporting public facility uses are also allowed with appropriate buffering and setbacks. | Residential Single-Family |
| Suburban Residential | Up to 8 dwelling units/acre | Single-family detached homes, manufactured homes on individual lots within appropriate zoning districts, and residential planned developments are permitted. Building heights generally do not exceed 35 feet. | Residential Single-Family |
| Multiple Family Residential | Up to 18 dwelling units/acre | Areas where a variety of housing types, including single family, plexes, townhouses, manufactured home parks and low-density apartments, are allowed. Building heights generally do not exceed 35 feet. | Residential Multi-Family |
| Residential High | Up to 32 dwelling units/acre | Areas where a variety of housing types, including single family, plexes, townhouses, and apartments, are allowed. Building heights generally do not exceed 35 feet. | Residential Multi-Family |
| Office Professional | n.a. | Primary uses are low intensity business and professional services and accessory service uses. Typical uses include offices where medical, legal, financial, and day care services are provided. | Commercial |
| Commercial General | n.a. | Allows medium to high intensity retail and service commercial uses that serve primarily regional area patrons. | Commercial |
| Business Park/Industrial | n.a. | Primary land uses are commercial, professional, or industrial developments. Major uses include office, research and development, food sales and distribution, postal and data processing centers, vehicle repair, and general nonhazardous warehousing. | Industrial |
| Major Development Projects | n.a. | Areas where land uses of greater densities than 2 dwelling units per acre are considered premature and/or inappropriate unless guided by the County's Major Projects Review Process. | Major Development Project/Planned Unit Development |

**Table B-10 (2 of 2)**

Planned Land Use Categories – Whitney Planning Area

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Open Land | Up to 1 dwelling unit/10 acres | Areas with highly limited availability of public services and facilities. Lands are primarily in public ownership. Grazing, open space, and recreational uses may occur. For lands in private ownership, only single-family/farm uses at densities no greater than one dwelling unit per 10 acres or at densities in accordance with existing zoning for those private parcels. | Park / Open Space |
| Public Facility/Parks and Recreation | n.a. | Allows large public parks and outdoor recreation facilities, such as public and private golf courses, trails and easements, drainage ways, and detention basins. | Recreation |
| Public Land Management Area | n.a. | Areas of publicly held land. The *Bureau of Land Management Resource Plan* provides comprehensive land use planning for public lands within the Las Vegas District. Clark County wishes to preserve these public lands for open space for regional environmental, economic, social, educational and recreational benefit. In this area, some privately held lands may be eligible for residential development at densities in accordance with the existing zoning for those private parcels. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Whitney Land Use Plan*, February 2, 2000, as amended.
Prepared by: Ricondo & Associates, Inc.

## B.2.7 Winchester and Paradise

The Winchester and Paradise planning area encompasses approximately 48 square miles of unincorporated Clark County in the southern portion of the Las Vegas Valley. The Winchester and Paradise planning area is generally bounded by Sahara Avenue to the north, Sunset Road and Silverado Ranch Road to the south, and Nellis Boulevard and Eastern Avenue to the east. This planning area contains some of the most urbanized and completely developed areas in the Las Vegas Valley, with only limited amounts of open space. The majority of the population is concentrated east of Las Vegas Boulevard. Land uses consist of a combination of single- and multi-family residences, commercial and industrial development, as well as a concentration of hotels and casinos along Las Vegas Boulevard.

The unincorporated Town of Paradise was created in December 1950. In 1951, the Town of Paradise-A was created, followed by the Town of Paradise-B in January 1952. In October 1953, Paradise-A was renamed Winchester, and Paradise-B became Paradise. In August 1973, a Citizens Advisory Council was created. The town boundaries were adjusted in January 1973, January 1976, and March 1976. In November 1979, the Winchester Town Advisory Board was created, followed by creation of the Paradise Town Advisory Board in December 1979.

The Clark County Board of County Commissioners adopted the most recent update of the *Winchester and Paradise Land Use and Development Guide* on August 3, 2005. **Table B-11** provides definitions and descriptions of the planned land use categories included in the *Winchester and Paradise Land Use and Development Guide.*

**Table B-11 (1 of 2)**

Planned Land Use Categories – Winchester and Paradise Planning Areas

| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Residential Countryside | Up to 1 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 2 acres and have limited access to public services and facilities. | Residential Single-Family |
| Residential Rural | Up to 1 dwelling unit/acre | Primary land uses are large lot, single-family residential. Single-family detached dwellings generally occupy lots of at least 1 acre and have limited access to public services and facilities. | Residential Single-Family |
| Residential Low | Up to 8 dwelling units/acre | Predominant housing type is detached single-family developed at low to medium densities. Townhouse and mobile home developments with densities up to 8 dwelling units/acre may be appropriate. | Residential Single-Family |
| Residential Suburban | Up to 2 dwelling units/acre | Predominant housing type is detached single-family developed at low densities. | Residential Single-Family |
| Residential Medium | From 3 dwelling units/acre to 14 dwelling units/acre | Allows for single-family uses and residential planned development, but not multiple family housing. | Residential Single-Family |
| Residential High | Up to 32 dwelling units/acre | Predominant housing type is multi-family developed at high densities. Allows any residential housing type, including single-family, multi-family, townhouse and mobile home developments up to 32 dwelling units/acre. | Residential Multi-Family |
| Residential High Rise | Up to 50 dwelling units/acre | Predominant housing type is multi-family developed at very high densities. Allows any residential housing type, including single-family, multi-family, townhouse, and mobile home developments up to 50 dwelling units/acre. | Residential Multi-Family |
| Commercial Low/Office/Professional | n.a. | Primary land uses are low intensity business and professional services. Typical uses include day care services and offices where medical, legal, financial, and other business/professional services are provided. Retail sales as a primary use is not appropriate. Commercial Low uses may be used as a buffer between more intense commercial and residential land uses. | Commercial |

**Table B-11 (2 of 2)**

Planned Land Use Categories – Winchester and Paradise Planning Areas

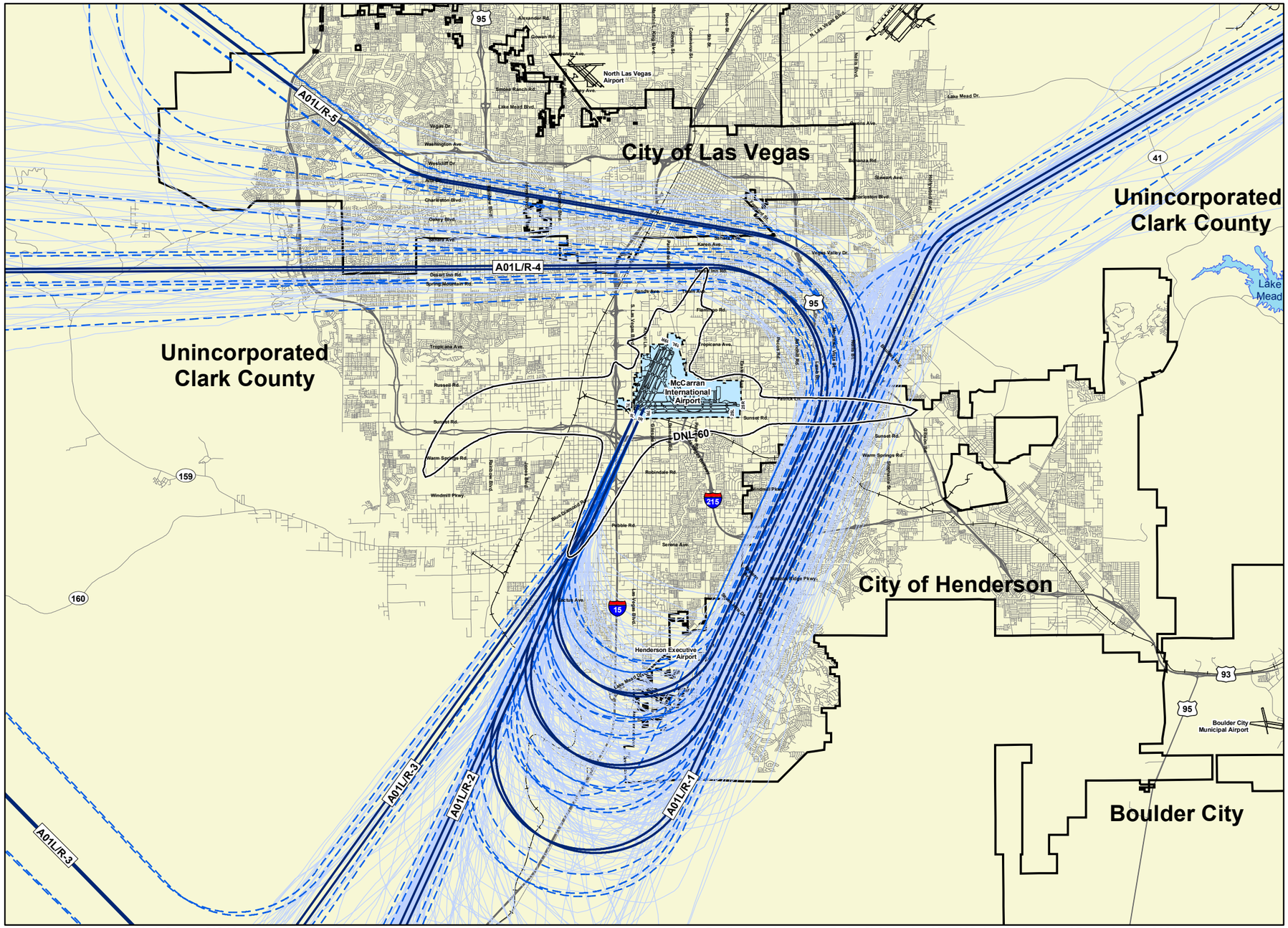
| Planned Land Use | Residential Density | Description | Generalized Planned Land Use |
|---|---|---|---|
| Commercial General | Up to 8 dwelling units/acre | Primary land use is mixed commercial. Typical uses include: general retail sales; banks; eating and drinking places; indoor amusements and recreation; miniature golf courses; mini-warehouses; motels (three stories or less); hospitals; car dealerships and office buildings. This land use category may allow Residential Low land uses (up to 8 dwelling units/acre) where appropriate. | Commercial |
| Commercial/Industrial | n.a. | Primary land uses are commercial, professional, or industrial developments, which are designed to assure minimal impact on surrounding areas. Major uses in the category include: research and development; food sales and distribution; postal and data processing centers; vehicle repair (inside); and general non-hazardous material warehousing. Outdoor business activities or storage are not appropriate. This category may be used as a buffer between residential and more intense industrial land uses. | Commercial |
| Commercial Tourist | n.a. | Commercial establishments that primarily cater to tourists, including casinos, resorts, hotels, motels, recreational vehicle parks, time shared condominiums, amusement or theme parks. | Mixed Use |
| Industrial | n.a. | Primary land uses are medium to high intensity industries. Typical uses include assembly plants; heavy equipment repair, sales, or storage; salvage; outside storage facilities; transmission facilities; and transportation facilities. | Industrial |
| Parks and Recreation | n.a. | Primary land uses are low intensity public, quasi-public or private outdoor recreation facilities. Examples include: parks, golf courses, tennis courts, and ball fields. | Park / Open Space |
| Public Facilities | n.a. | Primary land uses are public and quasi-public services and facilities. Examples include: schools, libraries, museums, churches, police/fire stations, and cemeteries. | Public |

Note:
n.a. = not applicable

Source: Clark County Board of County Commissioners. *Winchester and Paradise Land Use and Development Guide,* August 3, 2005.
Prepared by: Ricondo & Associates, Inc.

# Appendix C

## Radar and Generalized Flight Tracks For McCarran International Airport




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized arrival flight track
- Generalized arrival subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

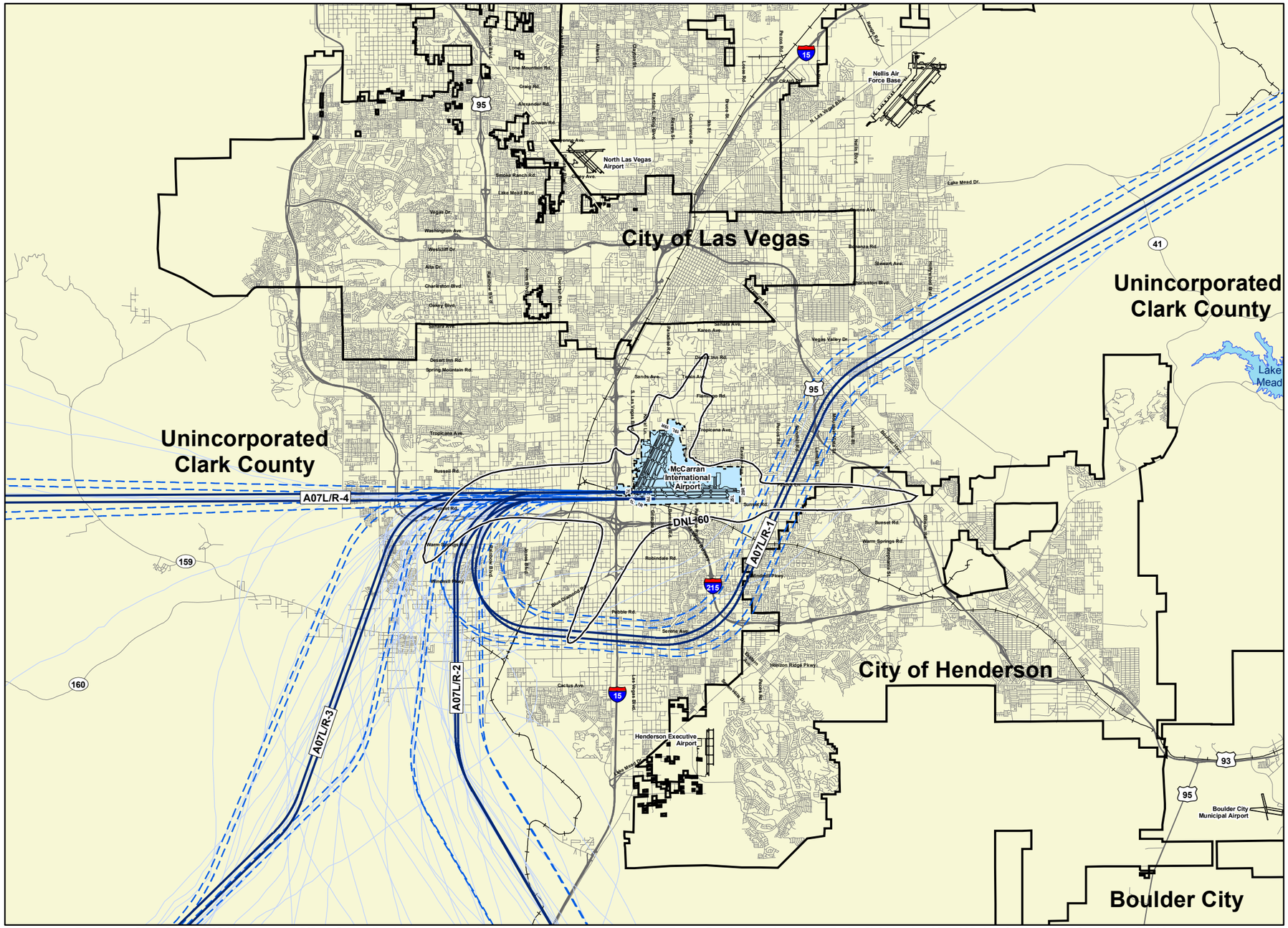
*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of December 22, 2004
Prepared by: Ricondo & Associates, Inc.

Exhibit C-1

north
0 3 miles

**Generalized and Radar Arrival Flight Tracks with 2004 Noise Exposure Contour - Runways 1L and 1R**




## Legend

2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized arrival flight track
- Generalized arrival subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

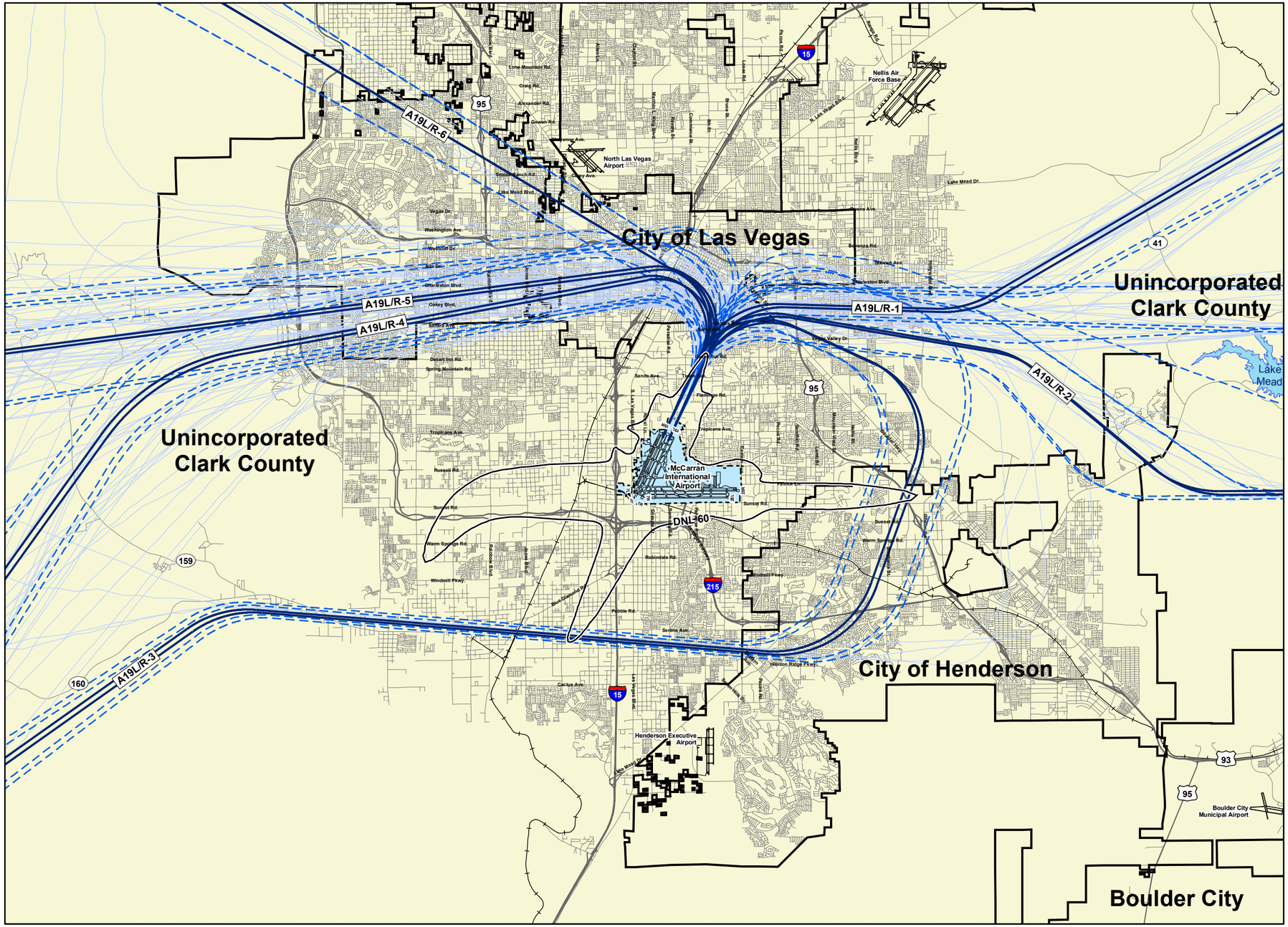
Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of September 8, 2004
Prepared by: Ricondo & Associates, Inc.

north

0 3 miles

Exhibit C-2

**Generalized and Radar Arrival Flight Tracks with 2004 Noise Exposure Contour - Runways 7L and 7R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized arrival flight track
- Generalized arrival subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

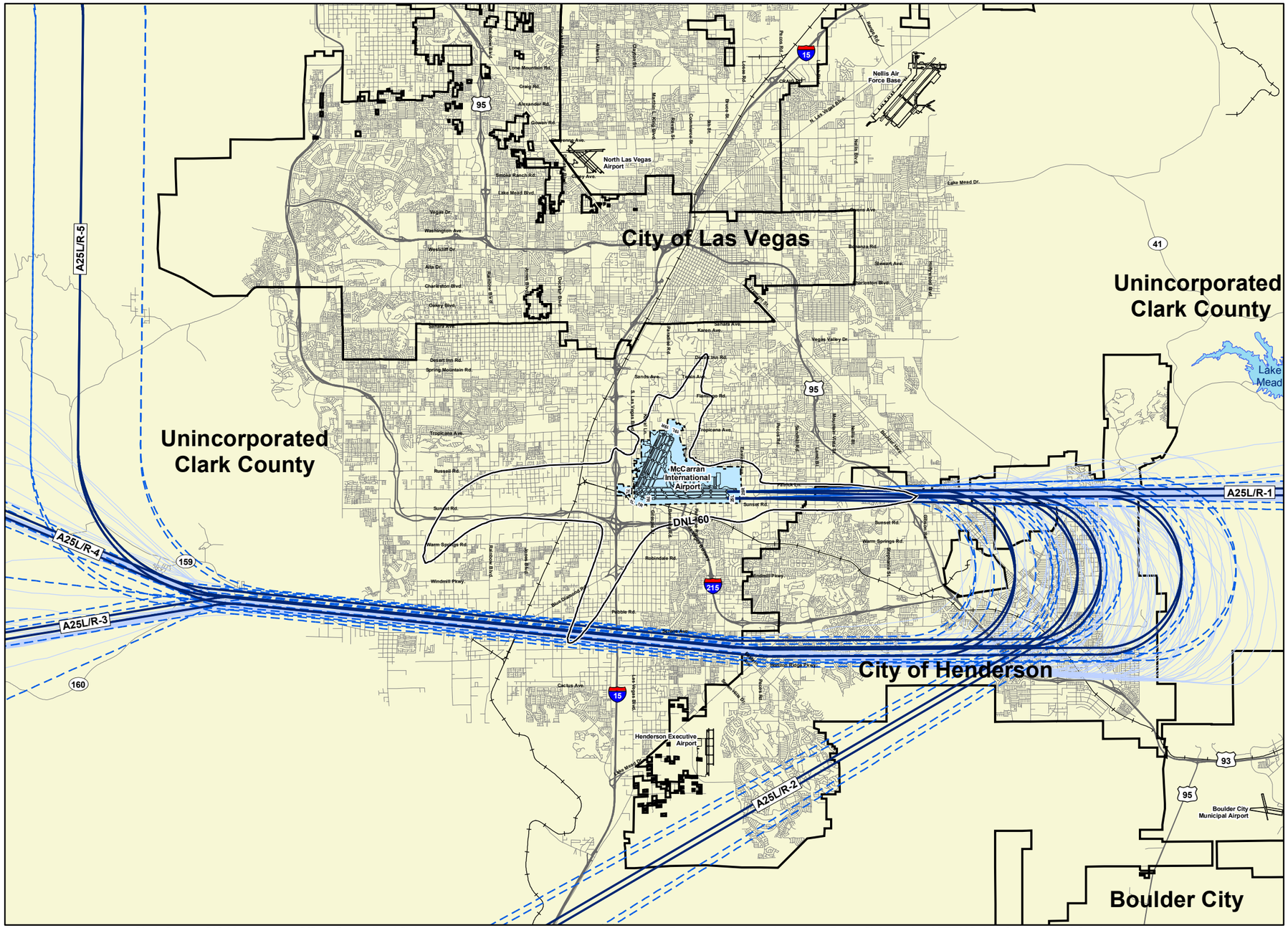
*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of September 8, 2004
Prepared by: Ricondo & Associates, Inc.

Exhibit C-3

north
0 3 miles

**Generalized and Radar Arrival Flight Tracks with 2004 Noise Exposure Contour - Runways 19L and 19R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized arrival flight track
- Generalized arrival subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

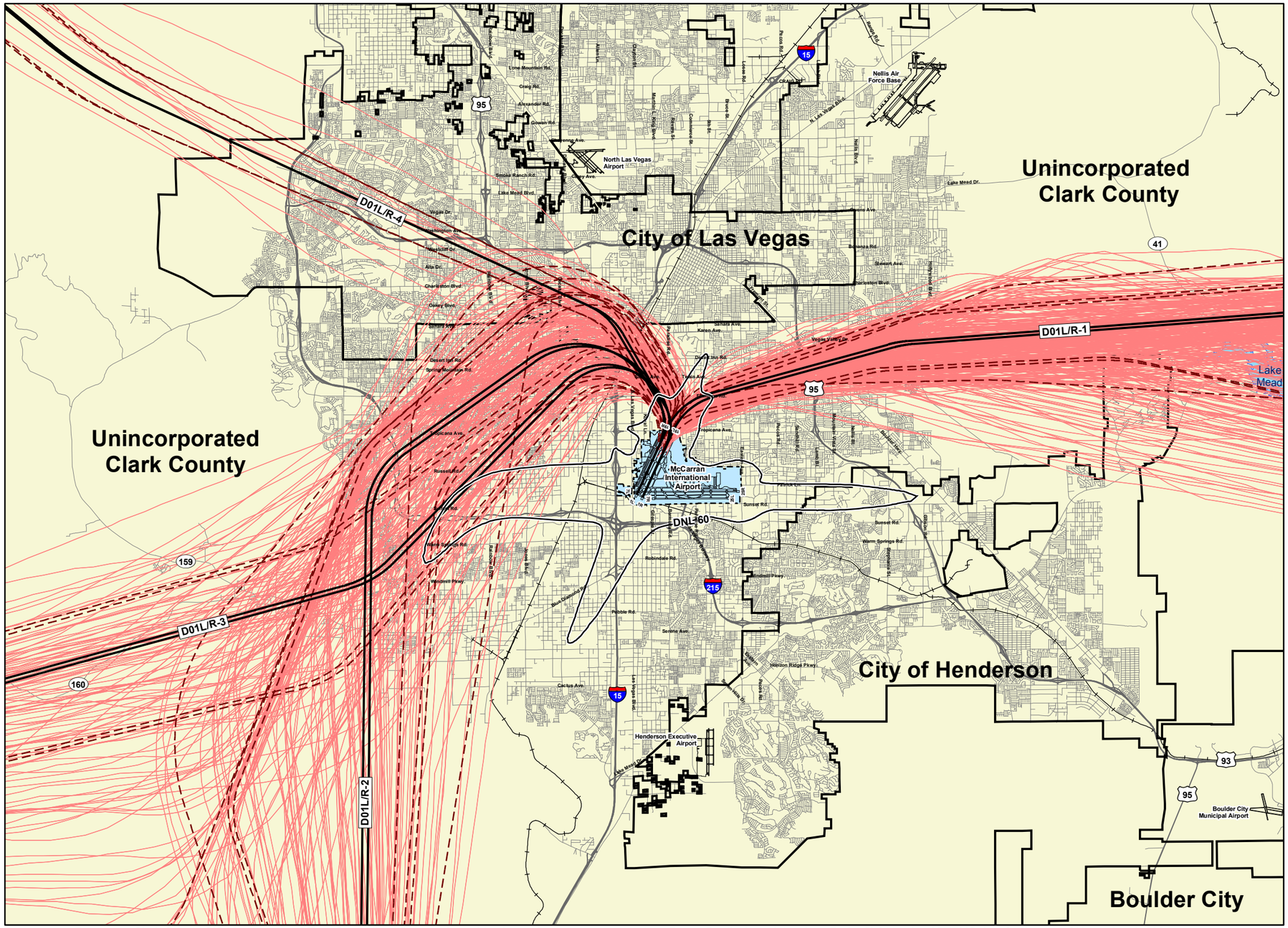
*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of October 26, 2004
Prepared by: Ricondo & Associates, Inc.

north
0 3 miles

Exhibit C-4

**Generalized and Radar Arrival Flight Tracks with 2004 Noise Exposure Contour - Runways 25L and 25R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized departure flight track
- Generalized departure subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

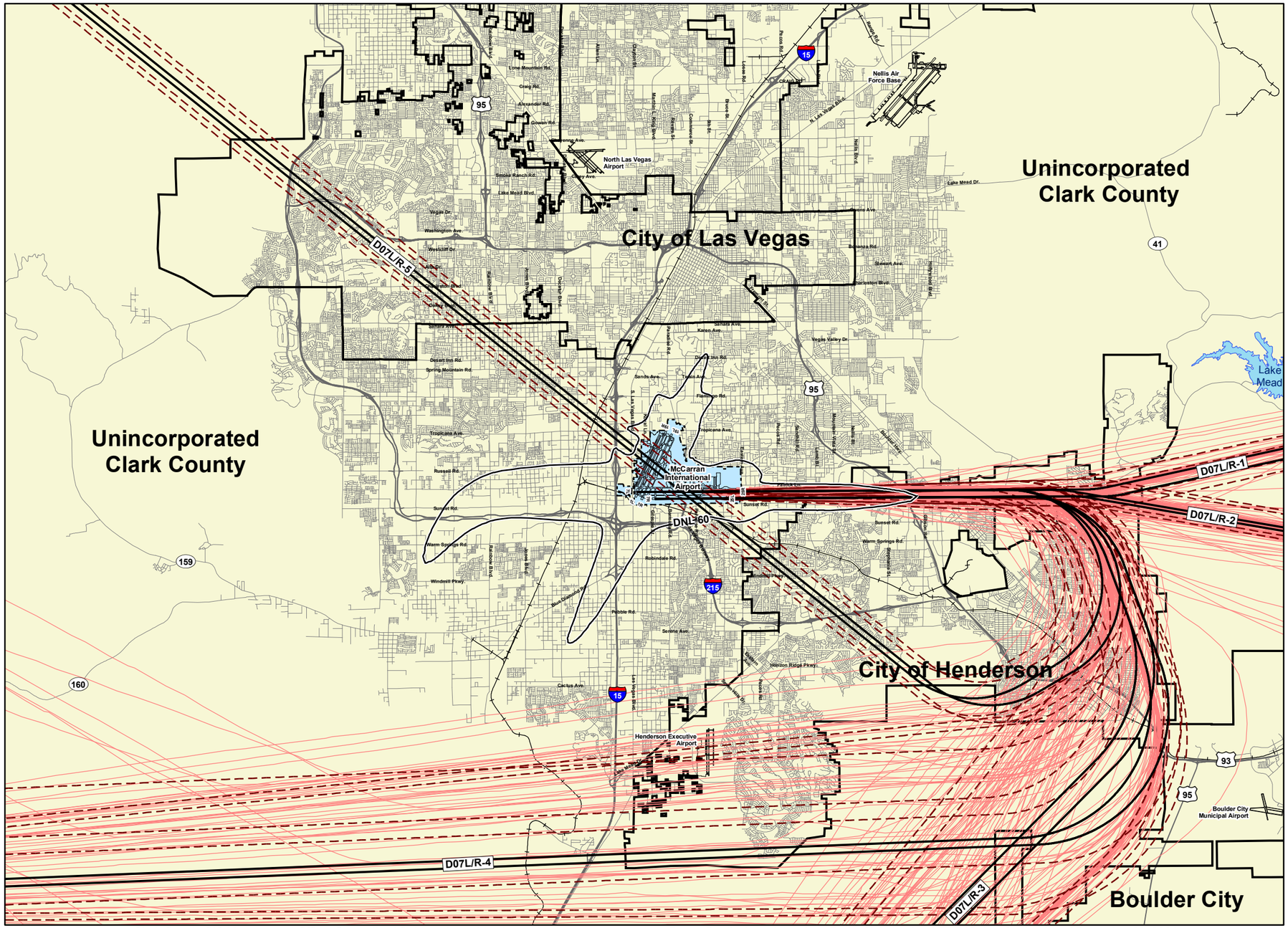
Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of November 1, 2004
Prepared by: Ricondo & Associates, Inc.

Exhibit C-5

north

0 3 miles

**Generalized and Radar Departure Flight Tracks with 2004 Noise Exposure Contour - Runways 1L and 1R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized departure flight track
- Generalized departure subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

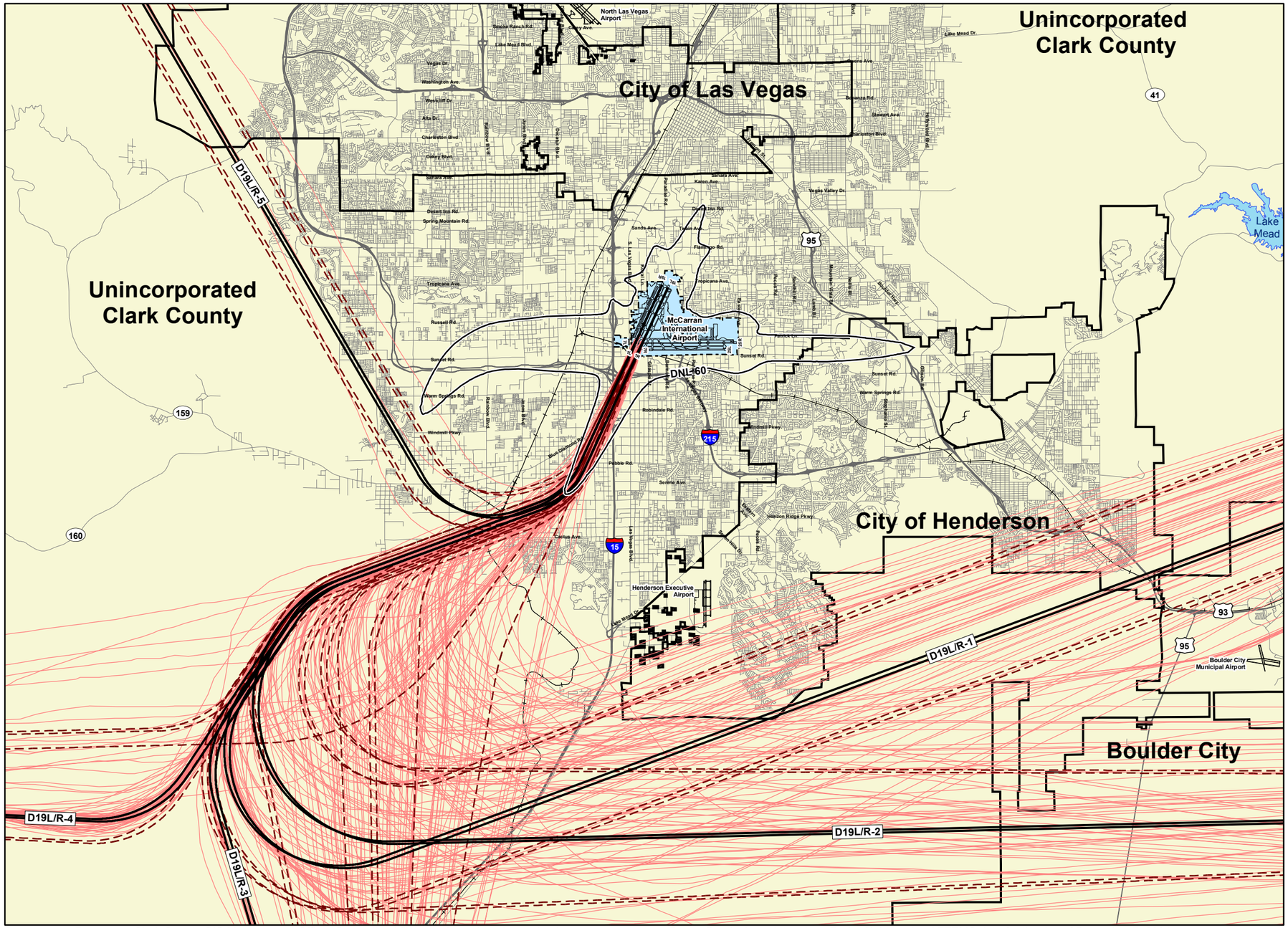
Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of December 22, 2004
Prepared by: Ricondo & Associates, Inc.

Exhibit C-6

north

0 3 miles

**Generalized and Radar Departure Flight Tracks with 2004 Noise Exposure Contour - Runways 7L and 7R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized departure flight track
- Generalized departure subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

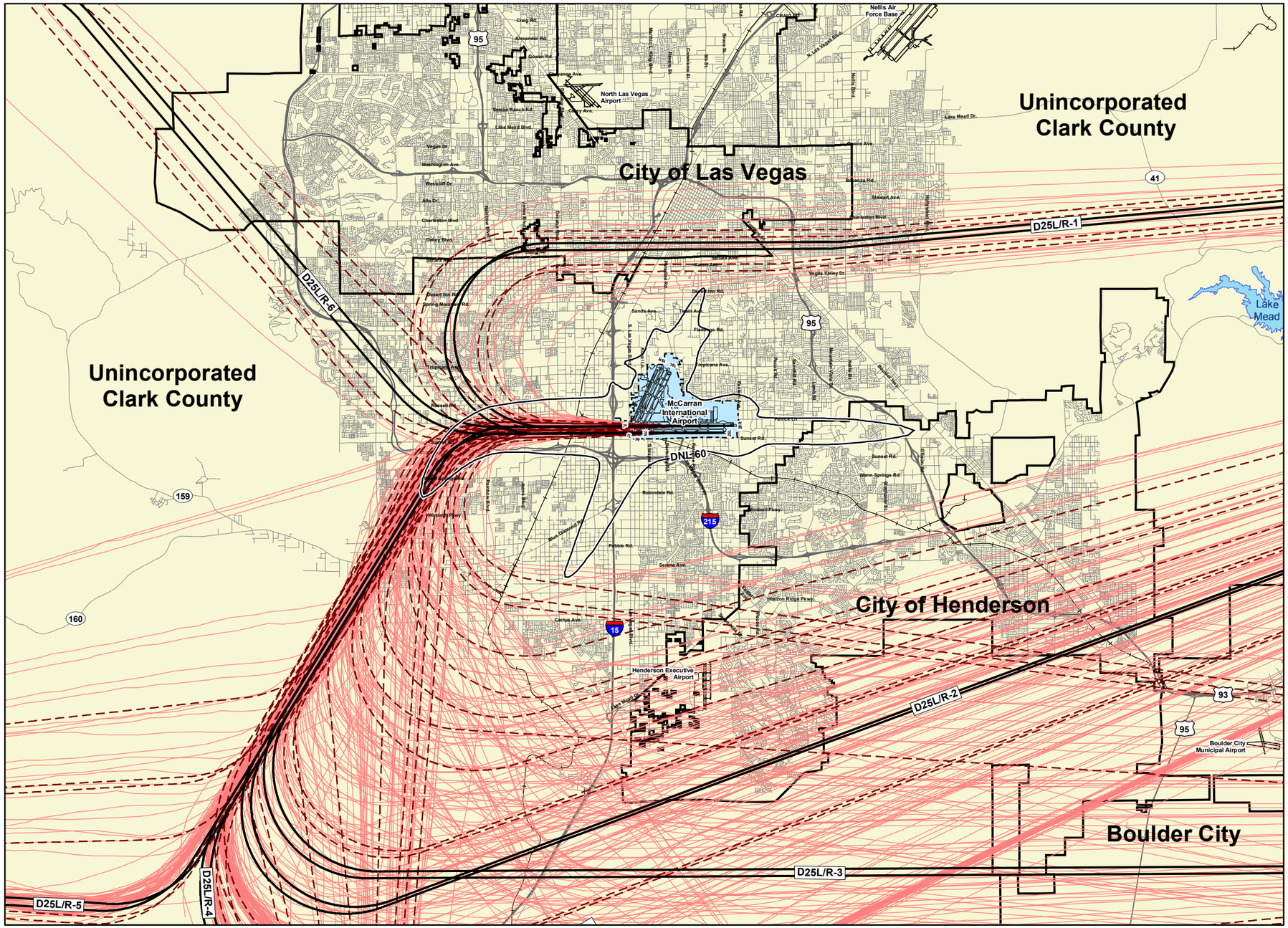
*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of December 7, 2004
Prepared by: Ricondo & Associates, Inc.

Exhibit C-7

north
0 3 miles

**Generalized and Radar Departure Flight Tracks with 2004 Noise Exposure Contour - Runways 19L and 19R**




## Legend

- 2004 DNL 60 noise exposure contour

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

- Generalized departure flight track
- Generalized departure subtrack
- AFTEMS radar flight track*
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

*AFTEMS = Aircraft Flight Tracking and Environmental Monitoring System

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks, subtracks, and noise exposure contour: Brown-Buntin Associates, Inc.; Radar flight tracks: AFTEMS data for the day of December 27, 2004
Prepared by: Ricondo & Associates, Inc.

north

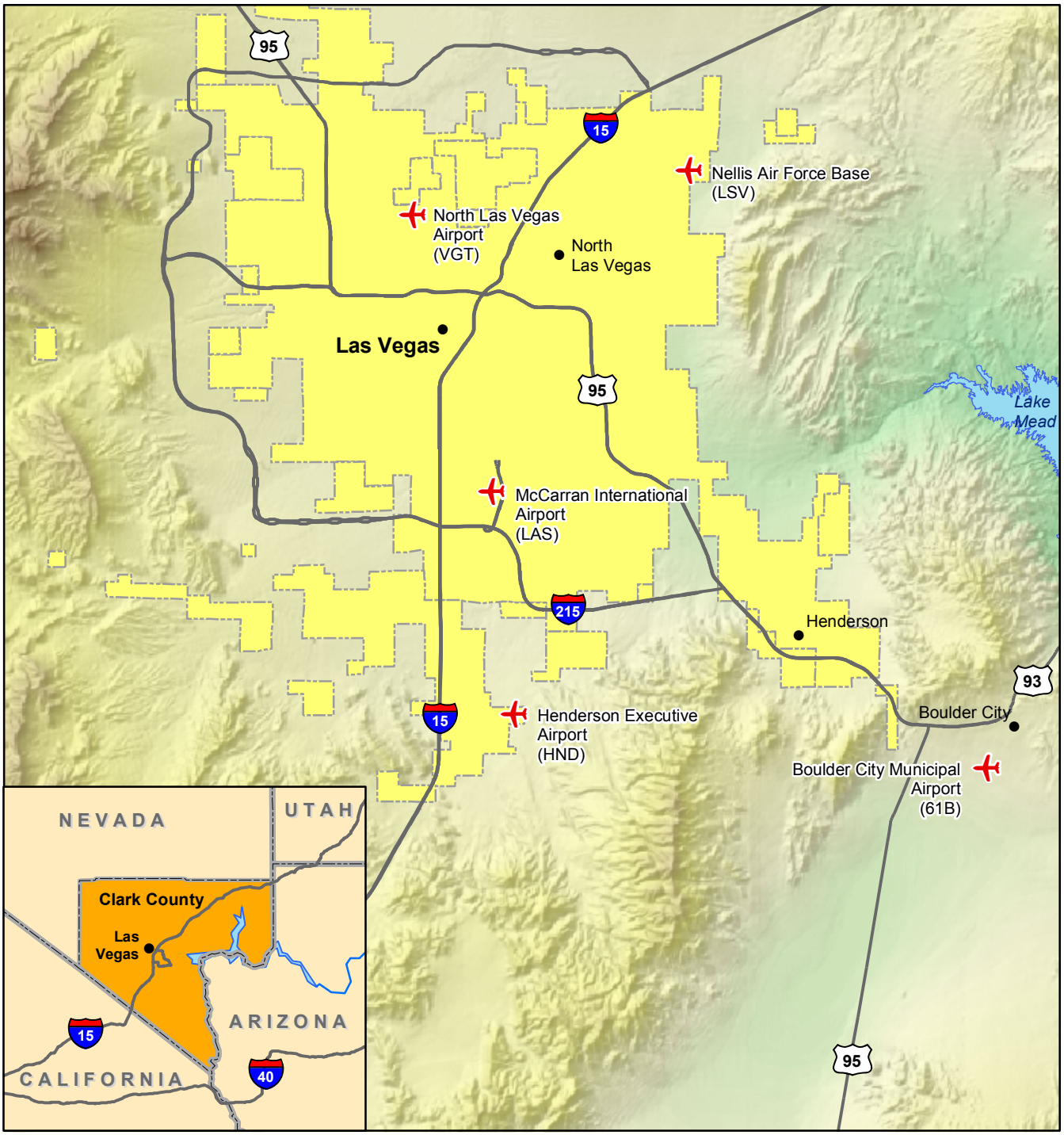
0 3 miles

Exhibit C-8

**Generalized and Radar Departure Flight Tracks with 2004 Noise Exposure Contour - Runways 25L and 25R**

# Appendix D

## Aircraft Noise Monitoring Report – Summer 2005




Scale of locator map is 1 inch = 100 miles

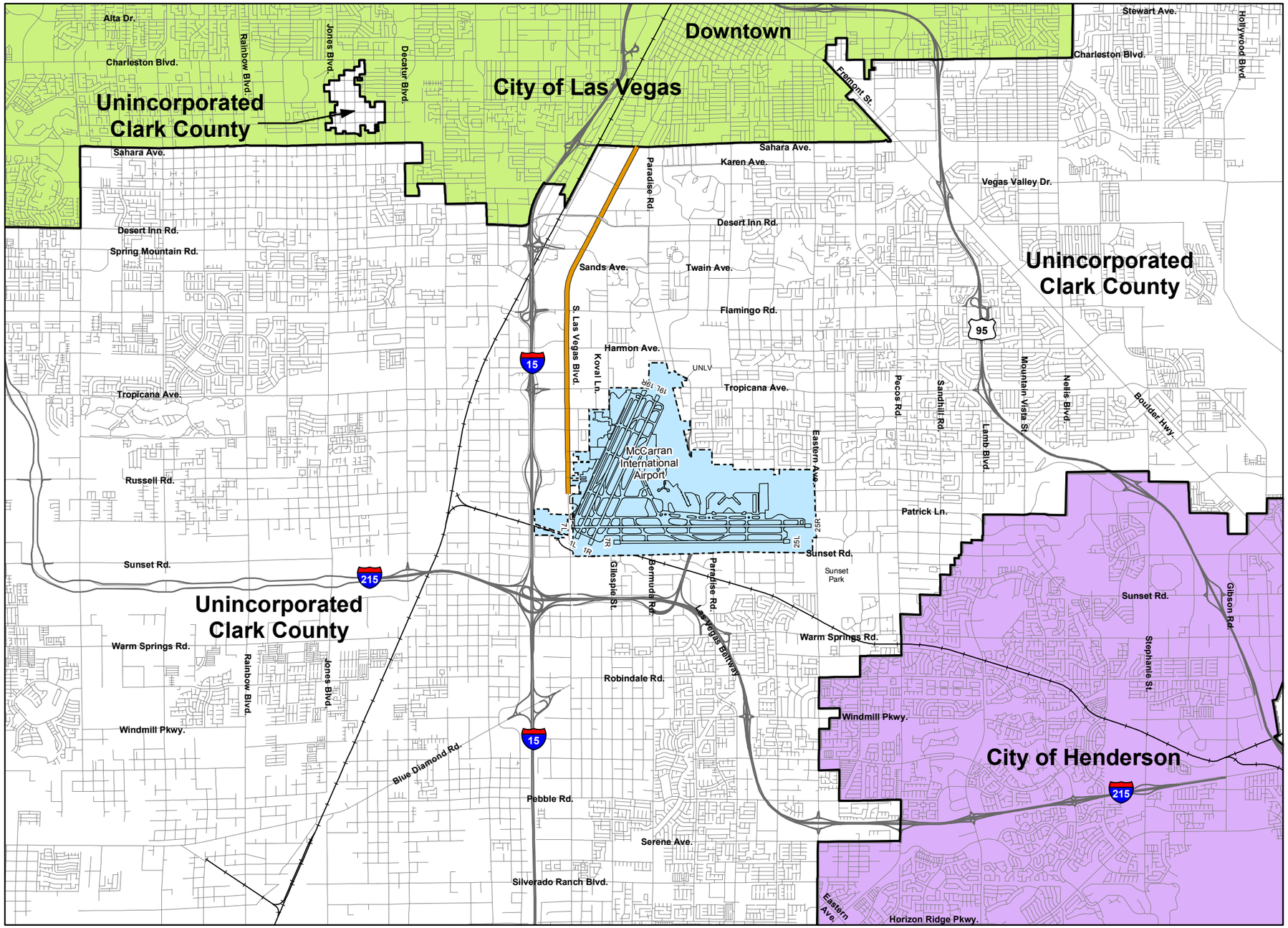
Airport
City
Las Vegas developed area
Clark County
State
Interstate highway
U.S. route

Sources: Clark County Department of Aviation and ESRI
Prepared by: Ricondo & Associates, Inc.

Exhibit I-1

north
0 5 miles

## Airport Location Map




## Legend

- Airport property
- Las Vegas Strip
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

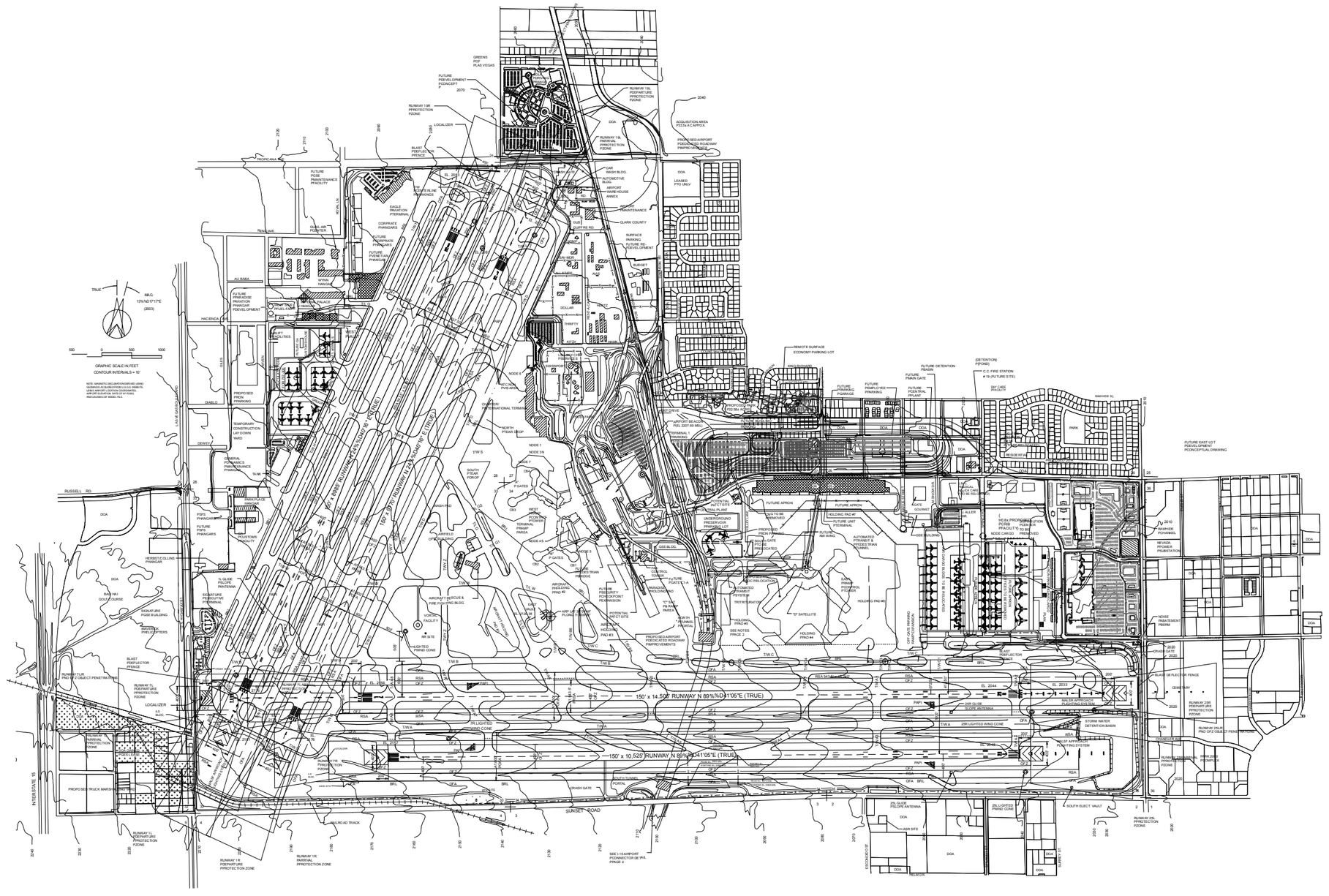
Source: Ricondo & Associates, based on data obtained from the Clark County GIS Management Office
Prepared by: Ricondo & Associates, Inc.

Exhibit III-1

north

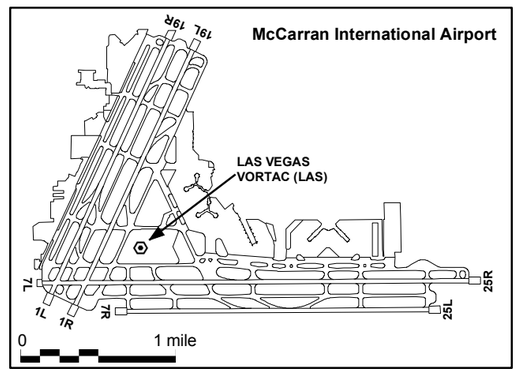
0 7,000 feet

**Airport Vicinity Map**


GRAPHIC SCALE IN FEET
CONTOUR INTERVALS = 10'
500 0 500 1000
TRUE
MAG. 13°51'ND (17.7°E (2003)
150' x 14,500' RUNWAY N 89°56'04"E (TRUE)
150' x 10,525' RUNWAY N 89°56'04"E (TRUE)
RUSSELL RD.
SUNSET ROAD
INTERSTATE 15
LOCALIZER
GLIDE SLOPE
RUNWAY 1L DEPARTURE PROTECTION ZONE
RUNWAY 1R DEPARTURE PROTECTION ZONE
RUNWAY 1R ARRIVAL PROTECTION ZONE
RUNWAY 19L DEPARTURE PROTECTION ZONE
RUNWAY 19R PROTECTION ZONE
RUNWAY 25L PROTECTION ZONE
RUNWAY 25R DEPARTURE PROTECTION ZONE
RUNWAY 7L/25R PAD OF OBJECT PENETRATIONS
RUNWAY 19L/1R PAD OF OBJECT PENETRATIONS
FUTURE PDEVELOPMENT PCONCEPT
FUTURE PDEVELOPMENT PCONCEPTUAL DRAWING
PROPOSED AIRPORT PDEDICATED ROADWAY PIMPROVEMENTS
ACQUISITION AREA P213a A.C.APPOX.
GREENS POF PLAS VEGAS
RUNWAY 7/25 PEXTARTURE PPROTECTION PZONE
RUNWAY 19L PDEPARTURE PPROTECTION PZONE
RUNWAY 7 PROTECTION PZONE
RUNWAY 19 PROTECTION PZONE
BLAST PDEFLECTOR PFENCE
LOCALIZER
GLIDE SLOPE
FUTURE PGSE PMAINTENANCE PFACILITY
EAGLE PAVIATION PTERMINAL
CORPORATE PHANGARS
FUTURE PCORPORATE PHANGARS
FUTURE PVENETION PHANGAR
DUAL AIR PTOWERS
WYNN HANGAR
FUTURE PAVIATION PAVIATION PHANGAR PDEVELOPMENT
PROPOSED PRON PARKING
TEMPORARY CONSTRUCTION LAY DOWN YARD
GENERAL DYNAMICS PMAINTENANCE PHANGARS
PSFS PHANGARS
HERBST COLLINS PHANGAR
IL GLIDE PSLOPE PANTENNA
SIGNATURE PGSE BUILDING
SIGNATURE PHELICOPTERS
BAYVIEW GOLF COURSE
PROPOSED TRUCK MARSHALLING YARD
AIRCRAFT RESCUE & FIRE FIGHTING BLDG.
AIRFIELD OPERATIONS
AIRPORT TRAFFIC CONTROL TOWER
AIRPORT ADMINISTRATION BUILDING
CAR WASH BLDG.
AUTOMOTIVE BLDG.
AIRPORT GAME HOUSE ANNEX
AIRPORT MAINTENANCE
CLARK COUNTY
SURFACE PARKING
FUTURE RE-PDEVELOPMENT
BUDGET
DOLLAR
THRIFTY
HERTZ
AVIS
NODE 1
NODE 3/N
NODE 3/S
NODE 4/S
NODE 5
NODE 6
NODE 7
NORTH PTRAIN PROP
SOUTH PTRAIN PORCH
P-GATES
CB1
CB2
CB3
CB4
CB5
CB6
CB7
WEST PCONCRETE PCONCOURSE PTOWER 3
PASSENGER TRAIN PTERMINAL
PASSENGER TRAIN PTERMINAL
SOUTH PTERMINAL
PROPOSED PTERMINAL
PROPOSED PTERMINAL
PROPOSED

## Legend

- Las Vegas Class B airspace
- 90 / 50 — Vertical extent of Class B airspace
  Floor and ceiling of the Class B airspace in hundreds of feet above mean sea level (MSL). In this example, the airspace exists between 5,000 and 9,000 feet above mean sea level.
- Class D airspace
- 40 — Vertical extent of Class D airspace
  Ceiling of Class D airspace in hundreds of feet above MSL. In this example, the airspace exists from the surface up to but not including 4,000 feet above mean sea level.
- Military operations area (MOA)
- Alert area or restricted area
- VORTAC
- V 235 — Federal (Victor) airway



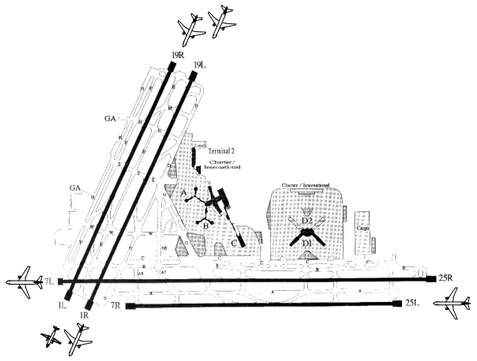

Source: Las Vegas sectional chart obtained from Aeroplanner.com; Las Vegas sectional chart effective September 1, 2005
Prepared by: Ricondo & Associates, Inc.

Exhibit III-3

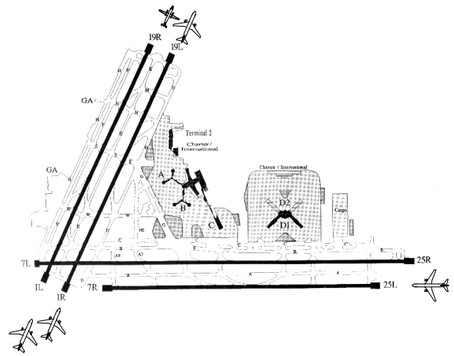
0 north 10 nautical miles

**Area Airspace**

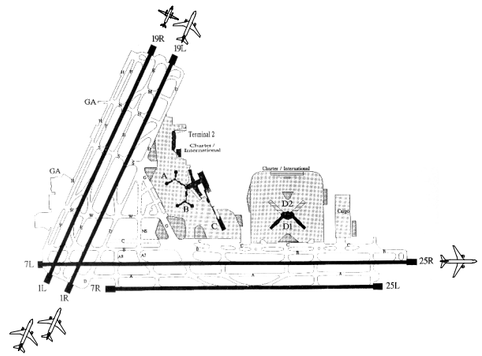
South/West (19-25)



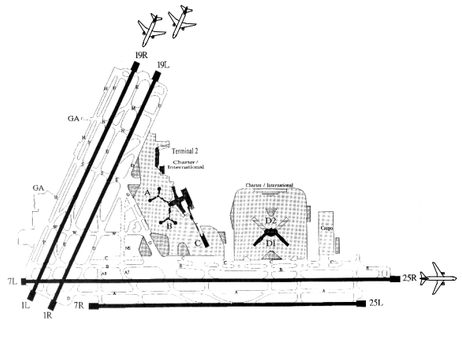

North/West* (01-25)



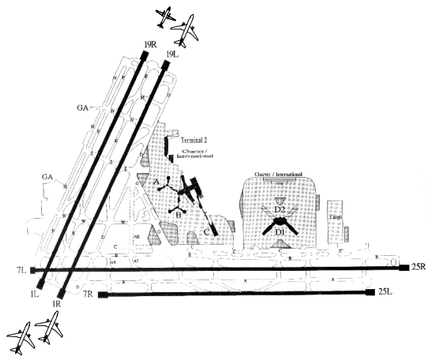

North/East (01-07)



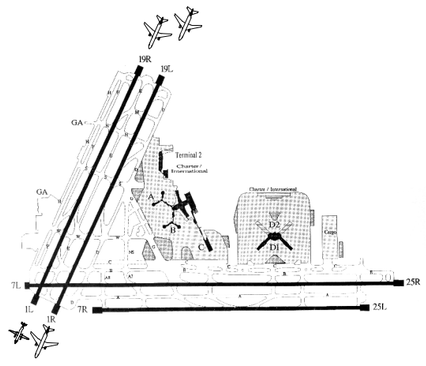

South/East (07-19)



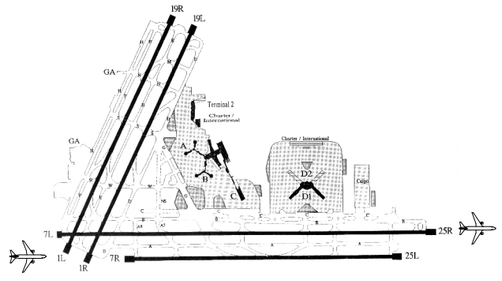

North (01's)



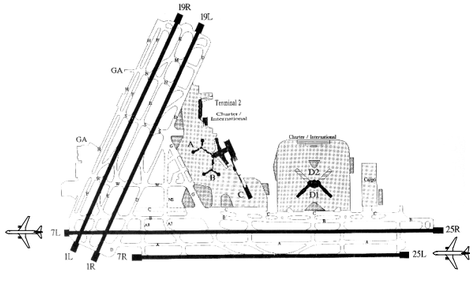

South (19's)




East (07's)




West (25's)



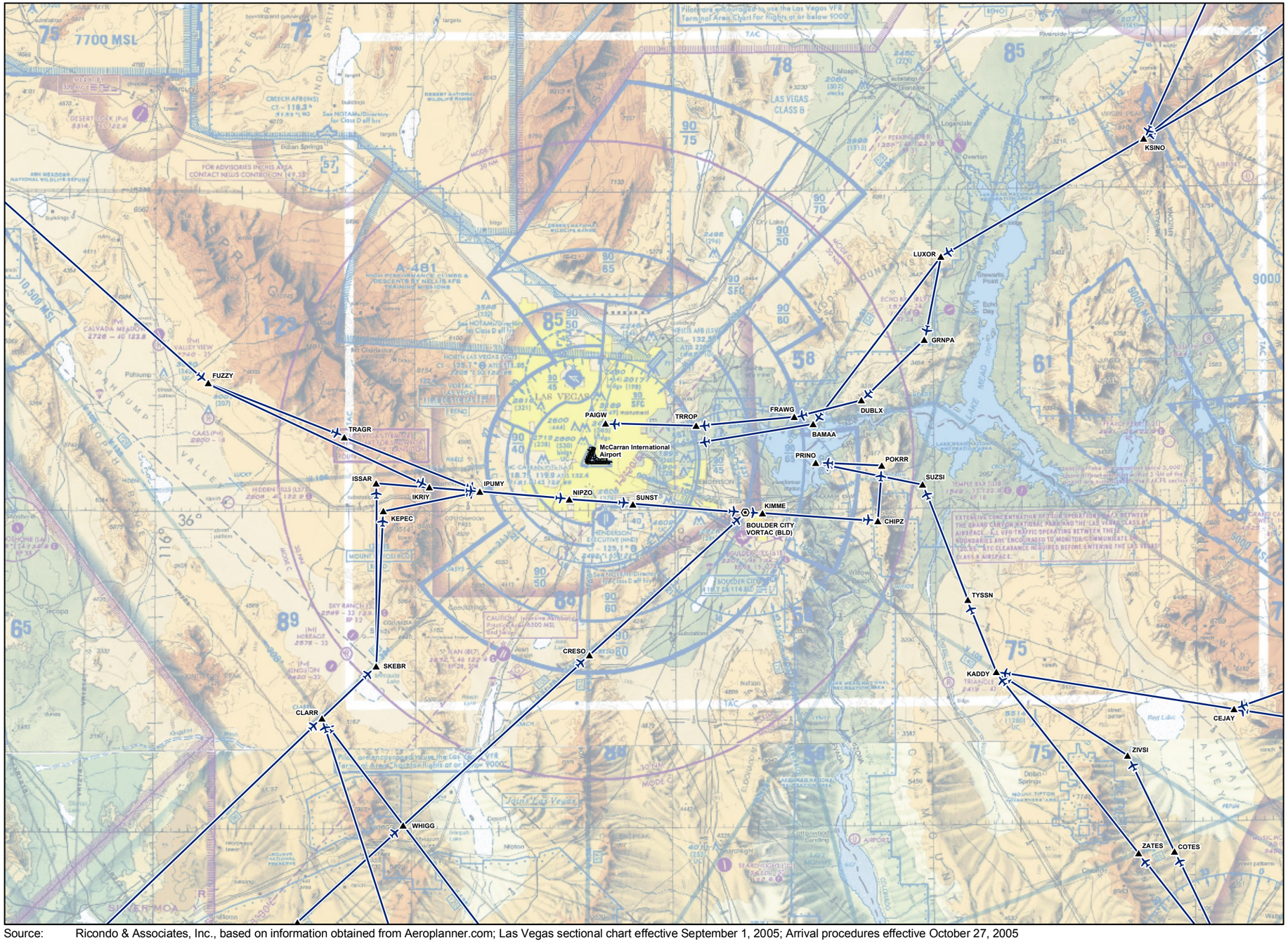

* The North/West flow is used in IFR conditions

Source: Las Vegas TRACON Facility, Standard Operating Procedures Handbook, L30 7110.1E, Effective September 15, 1999
Prepared by: Ricondo & Associates, Inc.

Exhibit III-4

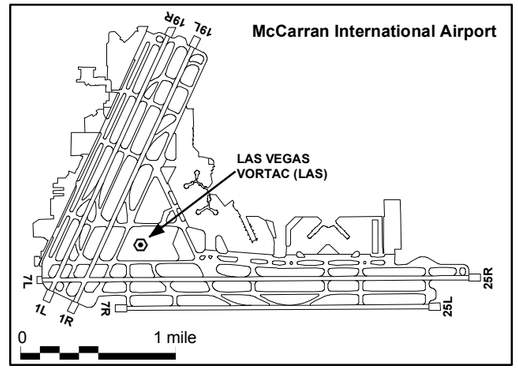
north
Not to Scale

**Primary Airfield Flow Configurations**
**McCarran International Airport**




## Legend

- Standard Terminal Arrival Route
- Airspace Fix
- VORTAC

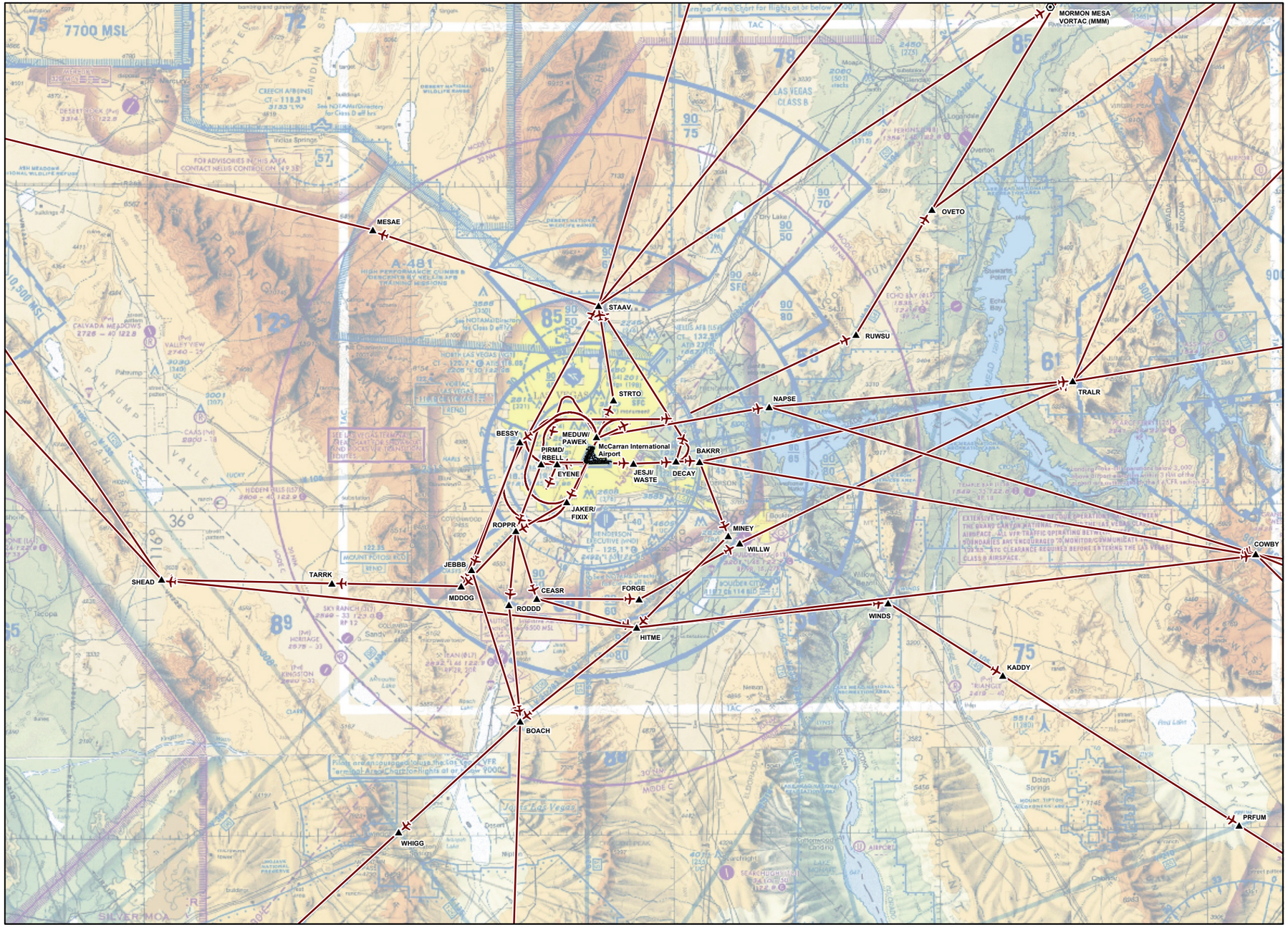



Source: Ricondo & Associates, Inc., based on information obtained from Aeroplanner.com; Las Vegas sectional chart effective September 1, 2005; Arrival procedures effective October 27, 2005
Prepared by: Ricondo & Associates, Inc.

Exhibit III-5

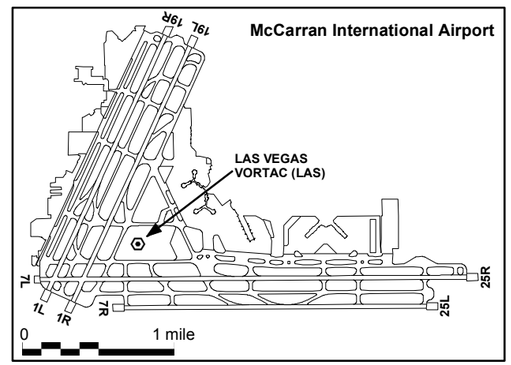
north
0 10 nautical miles

**Standard Terminal Arrival Routes**




## Legend

- Standard Instrument Departure Procedure
- Airspace Fix
- VORTAC

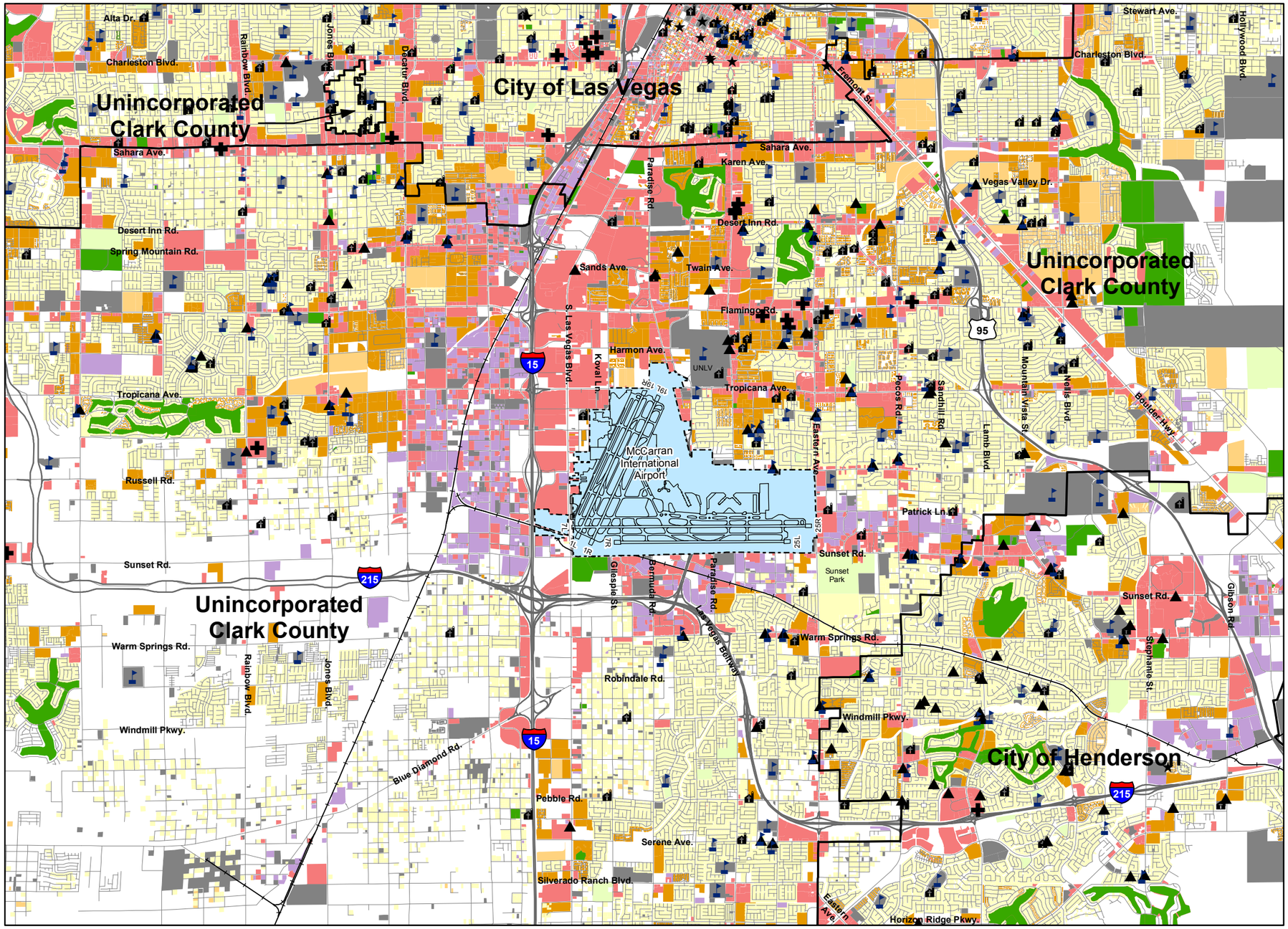



Source: Ricondo & Associates, Inc., based on information obtained from Aeroplanner.com; Las Vegas sectional chart effective September 1, 2005; Departure procedures effective October 27, 2005
Prepared by: Ricondo & Associates, Inc.

Exhibit III-6

north
0 10 nautical miles

**Standard Instrument Departures**




## Legend

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

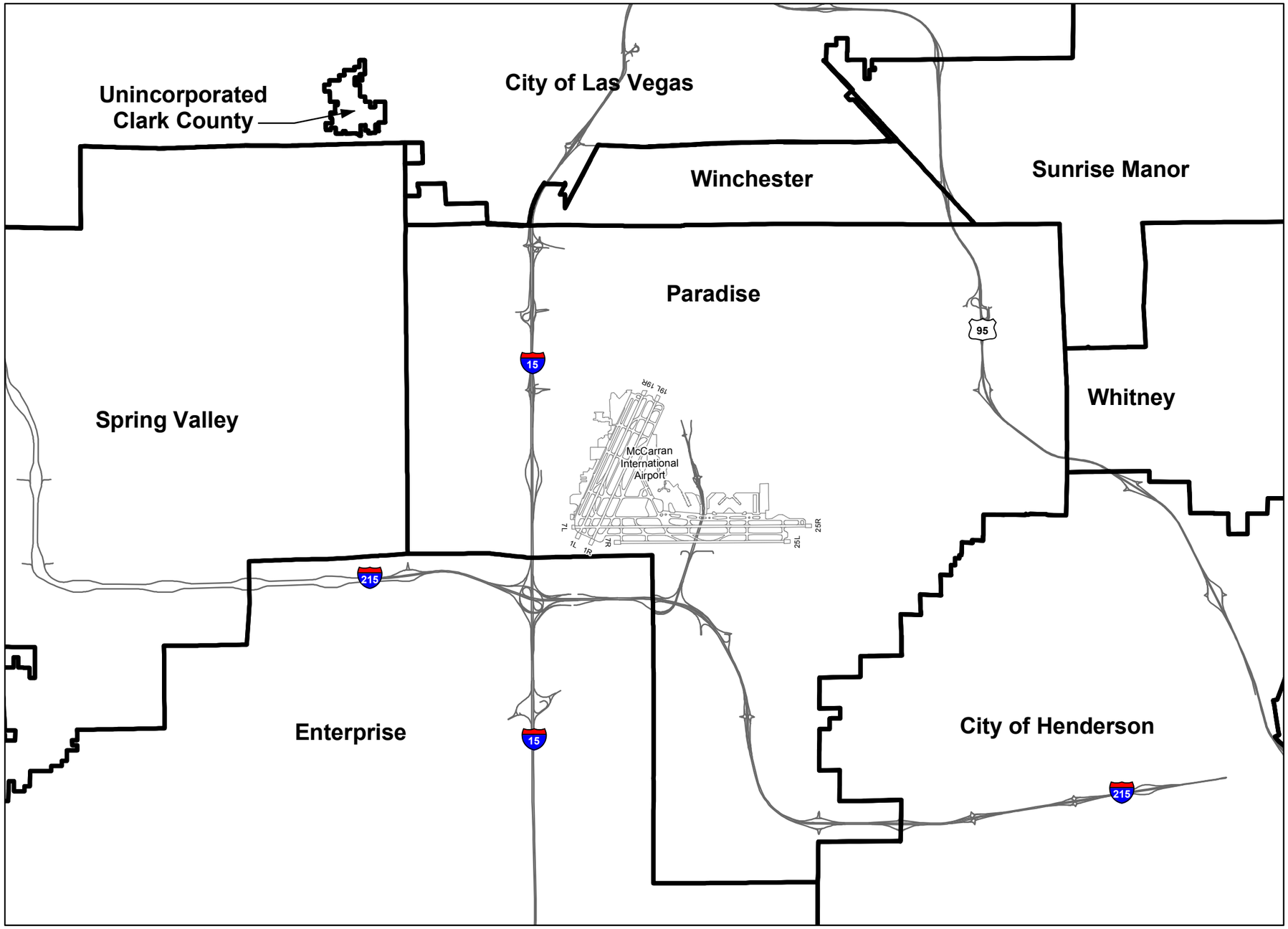
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Source: Existing land use: Clark County Department of Aviation, February 2005
Prepared by: Ricondo & Associates, Inc.

0 north 7,000 feet

Exhibit III-7

**Generalized Existing Land Uses**
**In The Vicinity Of McCarran International Airport**




Legend

- Planning area boundary
- Interstate highway
- U.S. route

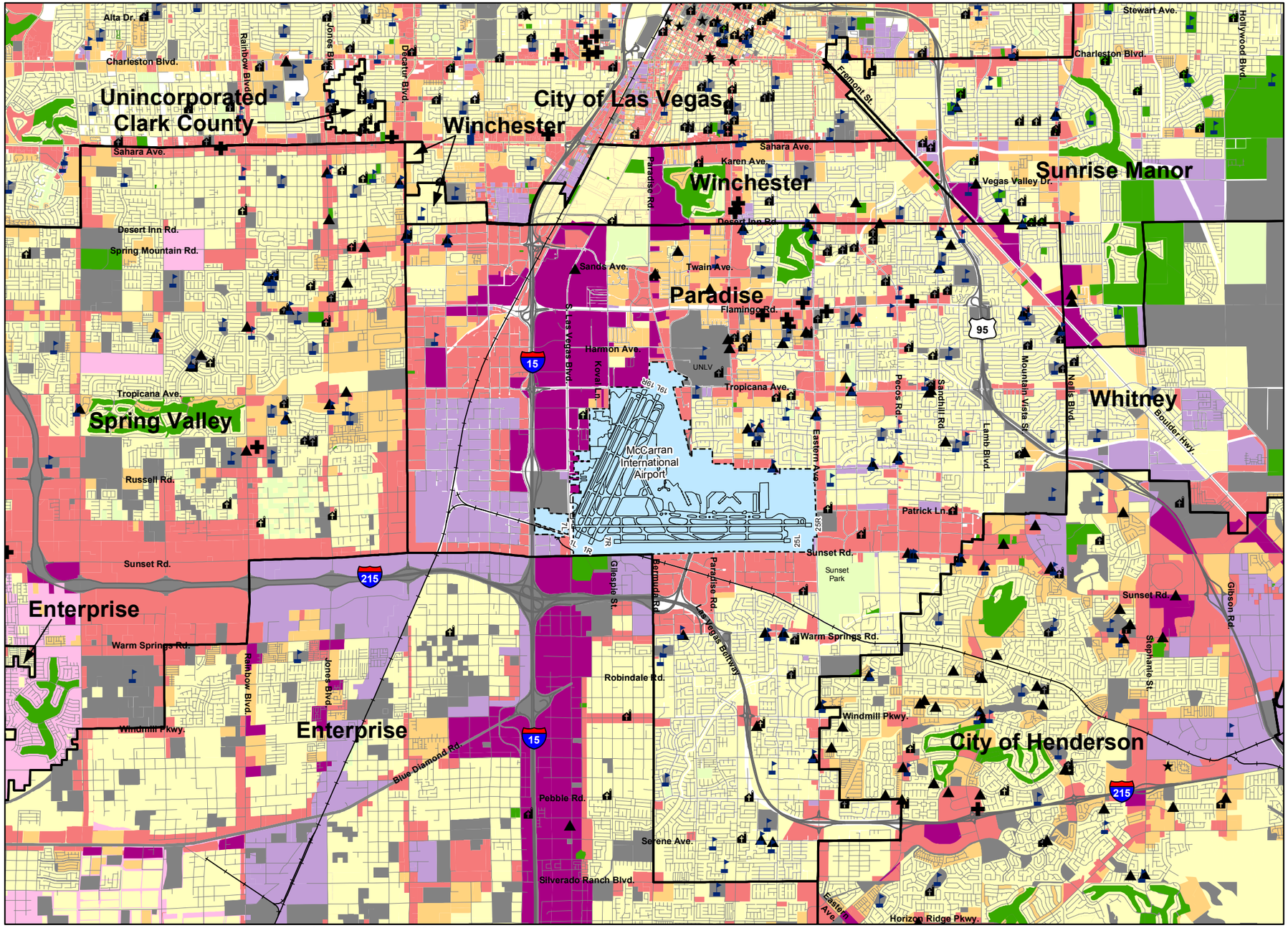
Source: Clark County Department of Aviation
Prepared by: Ricondo & Associates, Inc.

Exhibit III-8

north

0 7,000 feet

**Clark County Planning Areas**




## Legend

**Generalized planned land uses**

- Residential single-family
- Residential multi-family
- Commercial
- Mixed Use
- Industrial
- Major development project
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Planning area boundary
- Street
- Interstate highway
- U.S. route
- Railroad

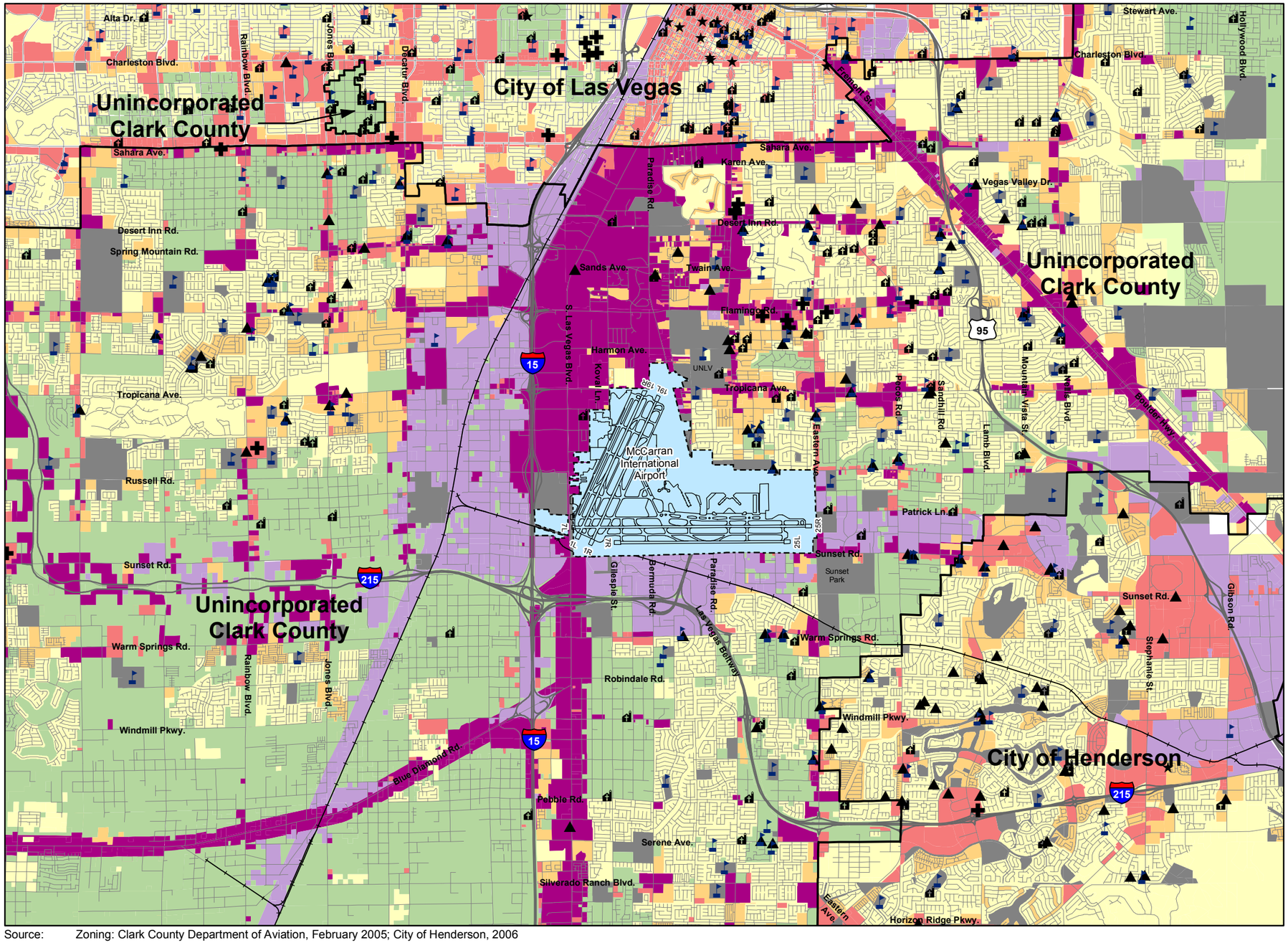
Source: Planned land use: Clark County Department of Aviation, February 2005; City of Henderson, 2006
Prepared by: Ricondo & Associates, Inc.

Exhibit III-9

north

0 7,000 feet

**Generalized Planned Land Uses**
**In The Vicinity Of McCarran International Airport**




## Legend

**Generalized zoning**

- Rural residential
- Residential single-family
- Residential multi-family
- Mobile home residential
- Mixed use
- Commercial
- Industrial
- Public
- Park / open space
- Airport property

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

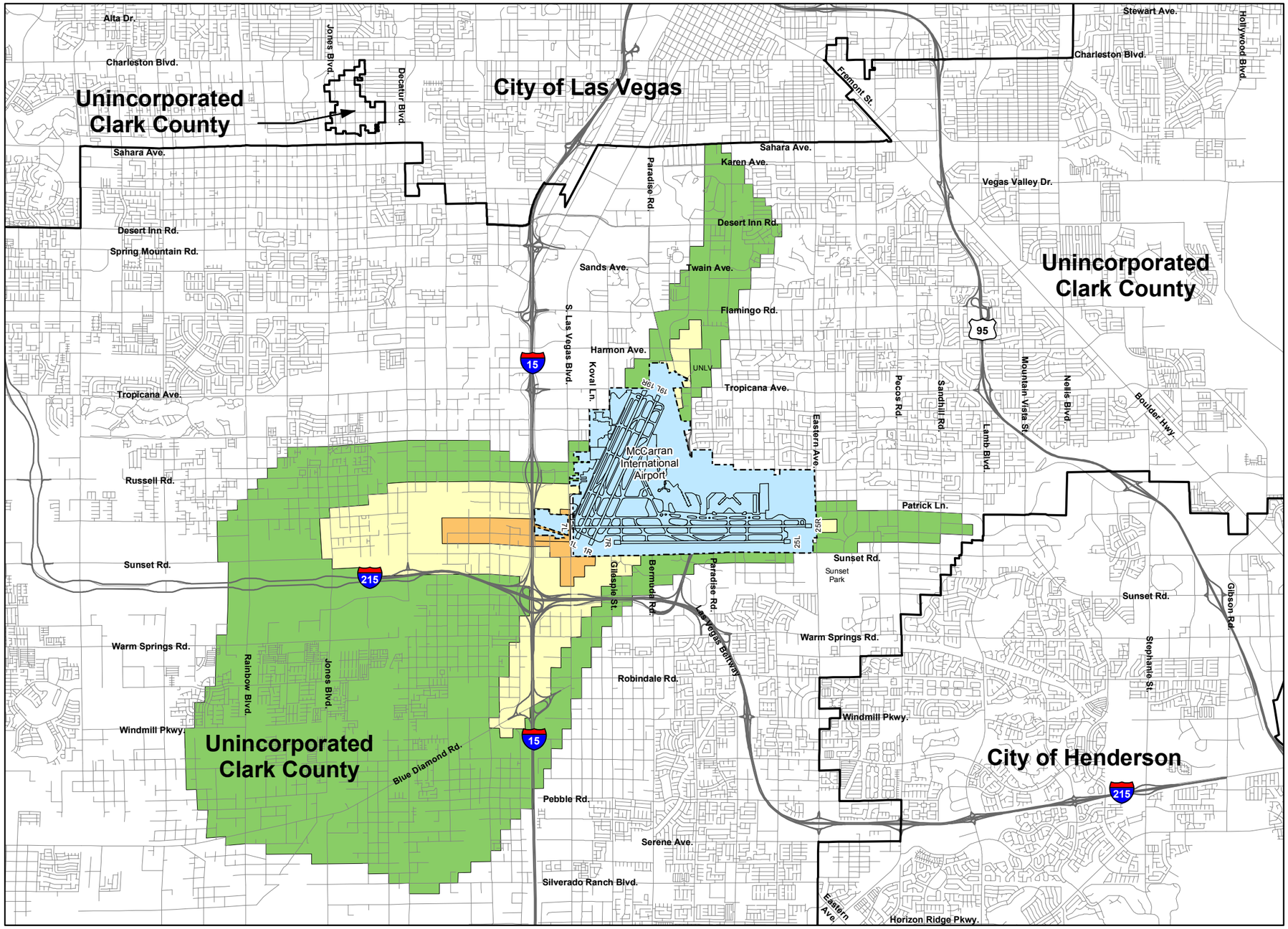
Source: Zoning: Clark County Department of Aviation, February 2005; City of Henderson, 2006
Prepared by: Ricondo & Associates, Inc.

Exhibit III-10

north

0 7,000 feet

**Generalized Zoning**
**In The Vicinity Of McCarran International Airport**




## Legend

**1986 Airport Environs Overlay District**

- AE-65
- AE-70
- AE-75

Notes: Most commercial/industrial uses are permitted in the Airport Environs Overlay District. Noise attenuation measures are required for offices and public portions of buildings in AE-70 and AE-75.

Noise sensitive commercial uses (e.g., health, educational, and religious) are not permitted in the areas exposed to DNL 75+, and require noise attenuation in the areas exposed to DNL 70-75 and DNL 65-70.

Residential developments having densities higher than two dwelling units per acre are not permitted in the areas exposed to DNL 70-75, with the exception of sites for which residential zoning was approved before the Airport Environs Overlay District was adopted by Clark County in 1986.

All residential development is permitted in the areas exposed to DNL 65-70 with implementation of noise attenuation measures. Because of recognized noise sensitivity, however, residential development is not encouraged in zones exposed to DNL 65 and above.

AE-65 = Airport Environs Overlay District DNL 65
AE-70 = Airport Environs Overlay District DNL 70
AE-75 = Airport Environs Overlay District DNL 75
DNL = Day-Night Average Sound Level, in A-weighted decibels

**Other features**

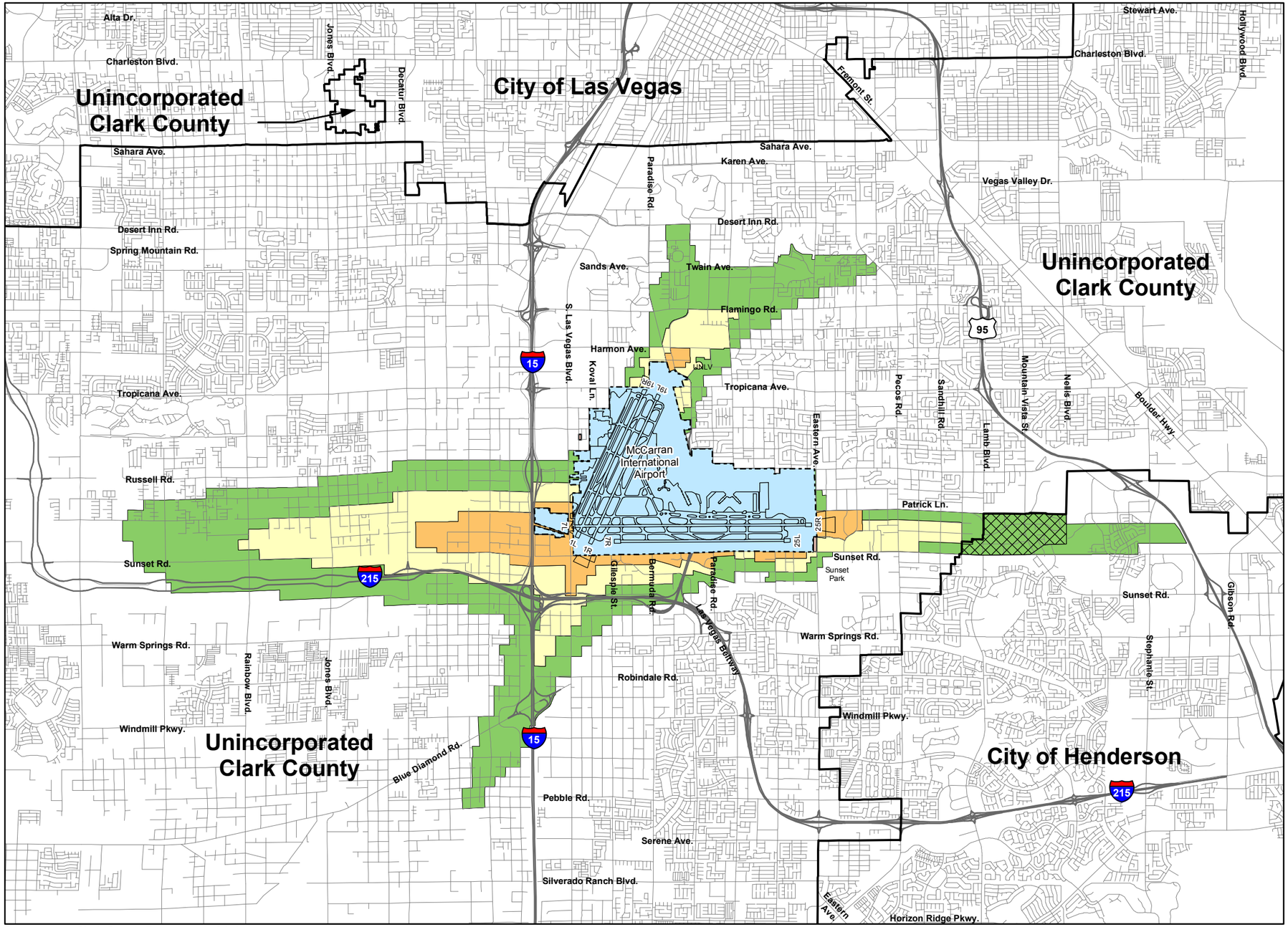
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route

Source: Clark County Department of Aviation
Prepared by: Ricondo & Associates, Inc.

Exhibit III-11

north
0 7,000 feet

**1986 Airport Environs Overlay District**
**McCarran International Airport**




## Legend

**Clark County Airport Environs Overlay District**

- AE-65
- AE-70
- AE-75

**City of Henderson Airport Environs Overlay District**

- AE-65

Notes: Most commercial/industrial uses are permitted in the Airport Environs Overlay District. Noise attenuation measures are required for offices and public portions of buildings in AE-70 and AE-75.

Noise sensitive commercial uses (e.g., health, educational, and religious) are not permitted in the areas exposed to DNL 75+, and require noise attenuation in the areas exposed to DNL 70-75 and DNL 65-70.

Residential developments having densities higher than two dwelling units per acre are not permitted in the areas exposed to DNL 70-75, with the exception of sites for which residential zoning was approved before the Airport Environs Overlay District was adopted by Clark County in 1986.

All residential development is permitted in the areas exposed to DNL 65-70 with implementation of noise attenuation measures. Because of recognized noise sensitivity, however, residential development is not encouraged in zones exposed to DNL 65 and above.

AE-65 = Airport Environs Overlay District DNL 65
AE-70 = Airport Environs Overlay District DNL 70
AE-75 = Airport Environs Overlay District DNL 75
DNL = Day-Night Average Sound Level, in A-weighted decibels

**Other features**

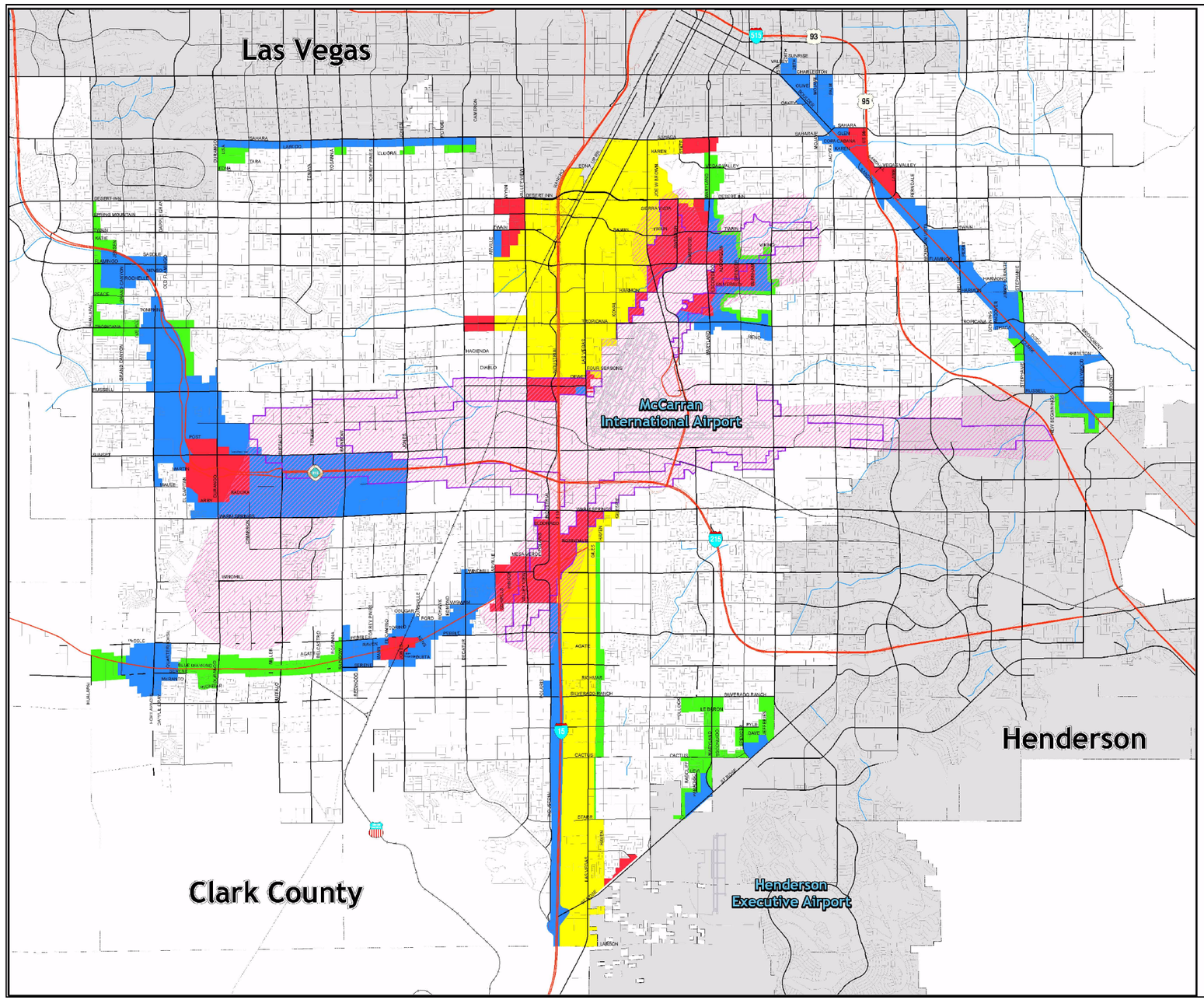
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route

Source: Clark County Department of Aviation
Prepared by: Ricondo & Associates, Inc.

north
0 7,000 feet

Exhibit III-12

**1990 Airport Environs Overlay District**
**McCarran International Airport**




## Comprehensive Planning

### Clark County
### Mixed Use Overlay District

- MUD 1 Most intense urban form
- MUD 2 Most intense suburban form
- MUD 3 Moderately intense suburban form
- MUD 4 Least intense suburban form
- Incorporated Cities
- Major Flight Corridor
- AE-65

| | Base Height | Maximum Height w/Special Use Permit | Density |
|---|---|---|---|
| MUD 1 : | 100' | No Limit (FAA)* | >50 du/a |
| MUD 2 : | 100' | 200'* | up to 50 du/a** |
| MUD 3 : | 50' | 100'* | up to 32 du/a** |
| MUD 4 : | 35' | 50'* | up to 18 du/a |

* FAA and/or BCC approval
3 to 1 setback from viable residential area

** Density incentives available for providing community amenities such as public plazas, expanded pedestrian areas, transit stops and grocery stores

du/a defined as "dwelling unit per acre"

Adopted May 2, 2005
Amended September 7, 2005

0 1 2 4 Miles

This information is for display purposes only. No liability is assumed as to the accuracy of the data delineated hereon.

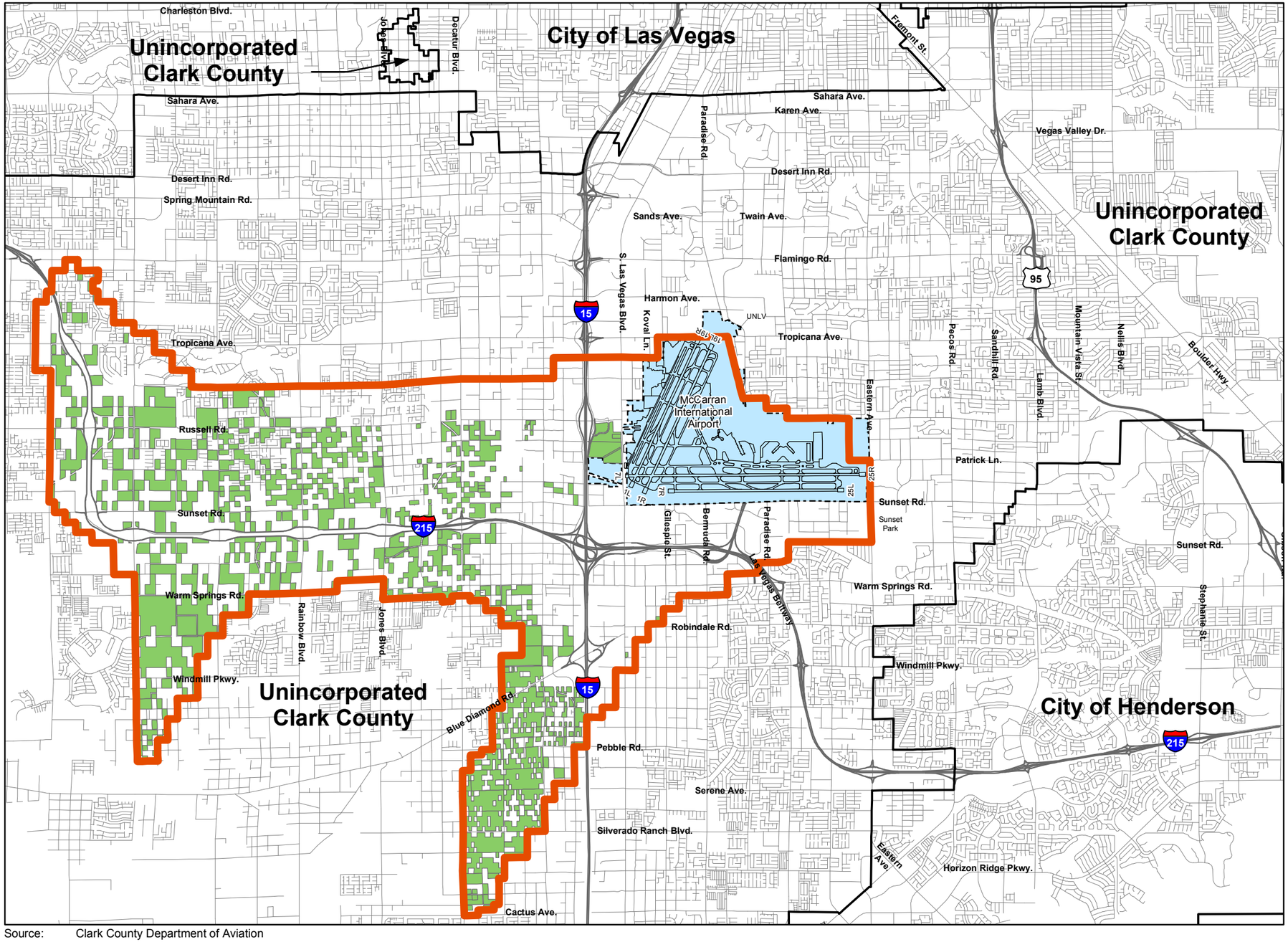
Plot Created on : September 14, 2005
\\ccgis1\gisdata\prds\zn\projects\zn0501\mud36x24.mxd

Source: Clark County Department of Comprehensive Planning, September 7, 2005
Prepared by: Ricondo & Associates, Inc.

Exhibit III-13

north
Not to Scale

**Clark County Mixed Use Overlay District**




## Legend

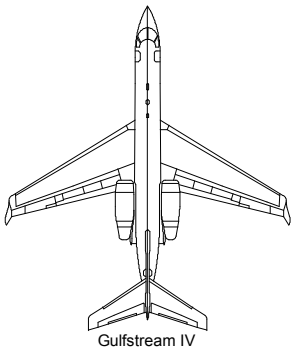
- Cooperative Management Area
- Airport property
- CMA lands owned by Clark County
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route

Source: Clark County Department of Aviation
Prepared by: Ricondo & Associates, Inc.

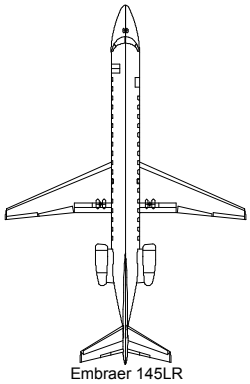
Exhibit III-14

0 north 7,000 feet

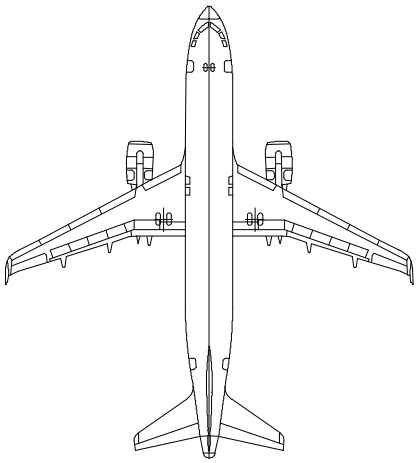
**Cooperative Management Area**



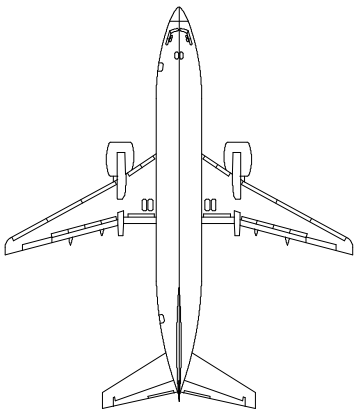
Gulfstream IV
Engine: RR TAY 611-8
Business Jet
64.2 dBA



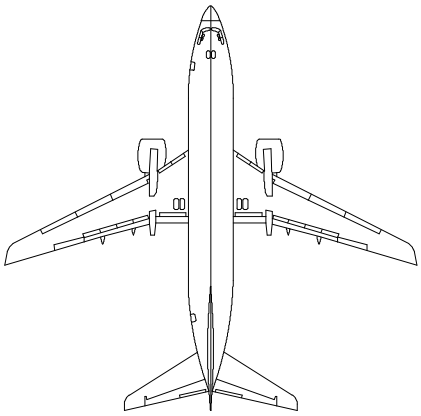
Embraer 145LR
Engine: AE3007A1/1
Regional Jet
68.0 dBA



Airbus A320
Engine: V2500-A1
Air Carrier
72.9 dBA



Boeing 737-300
Engine: CFM56-3B-2
Air Carrier
71.5 dBA



Boeing 737-700
Engine: CFM56-7B22
Air Carrier
68.7 dBA

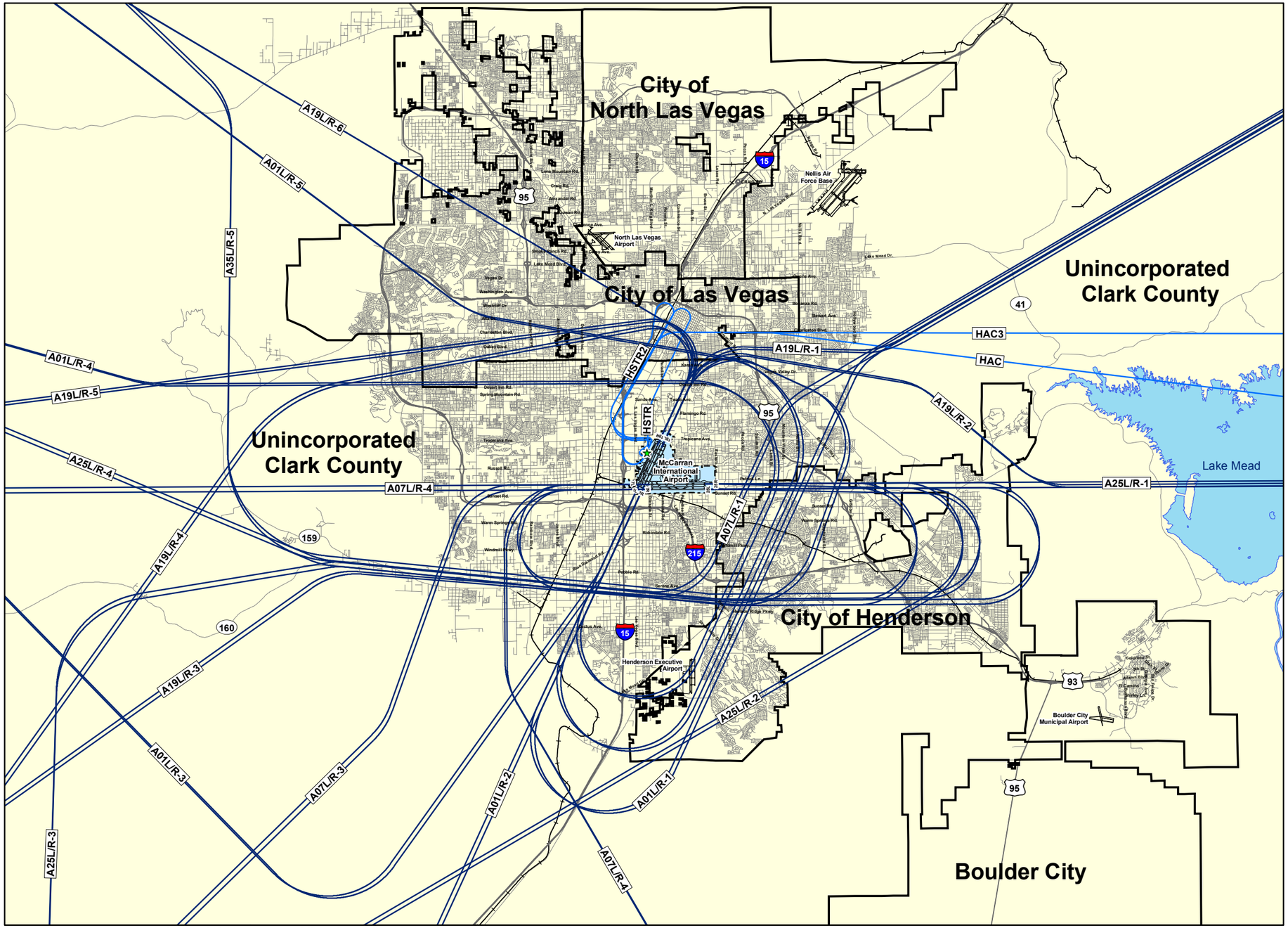
Source: The noise level estimates are documented in FAA Advisory Circular 36-3H, *Estimated Airplane Noise Levels in A-Weighted Decibels* (April 25, 2002), and are based on certificated aircraft noise levels measured at 21,325 feet (6,500 meters) from the start of the takeoff roll.

Prepared by: Ricondo & Associates, Inc.

Exhibit IV-3

**Not To Scale**

## Comparison of Takeoff Noise Values
## Aircraft Operating at McCarran International Airport




## Legend

- Generalized fixed-wing aircraft arrival flight track
- Generalized helicopter arrival flight track
- Airport property
- Heliport
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

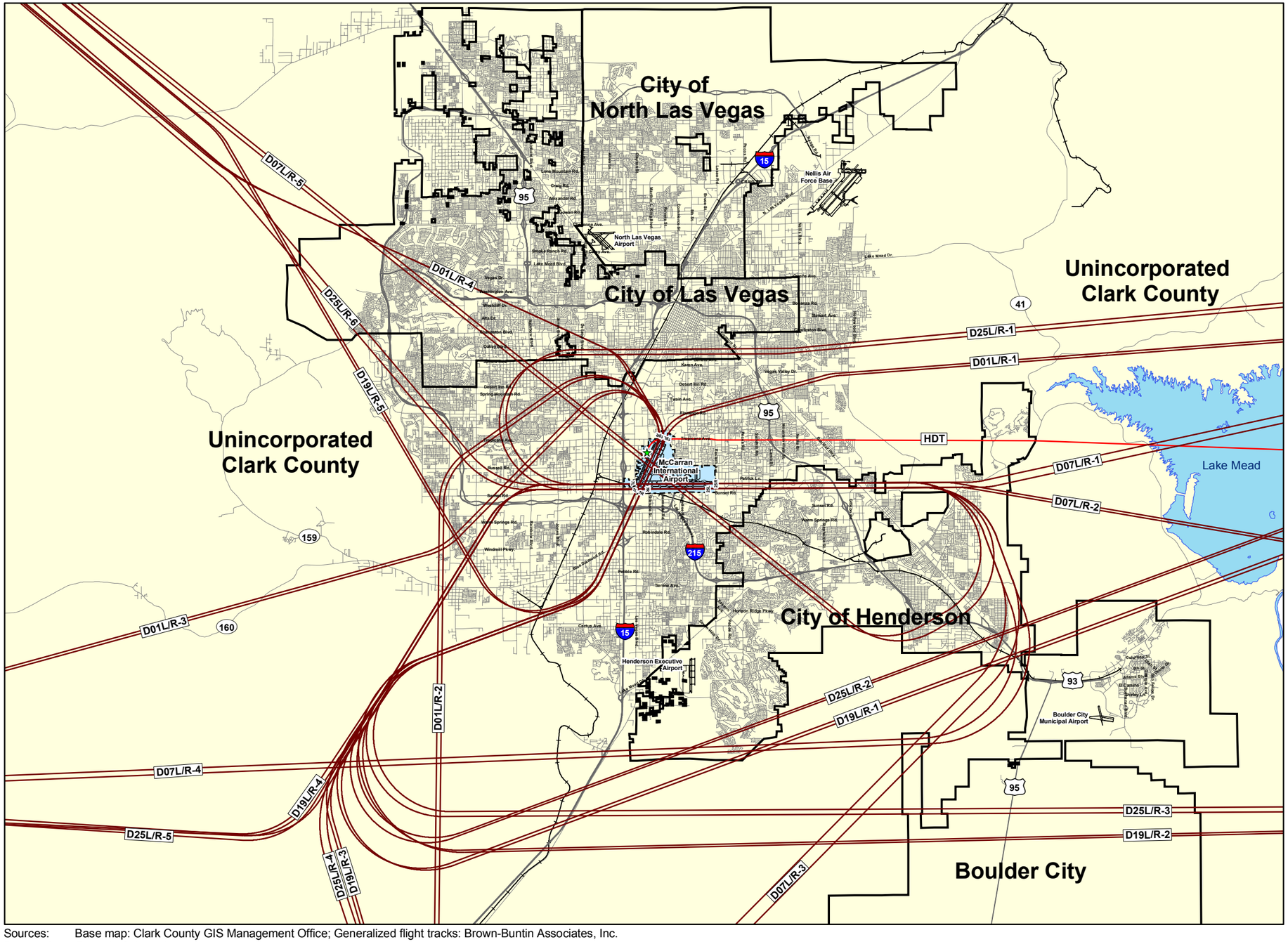
Sources: Base map: Clark County GIS Management Office; Generalized flight tracks: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 4 miles

Exhibit IV-7

**Generalized Arrival Flight Tracks**
**2004, 2011, and 2017**




## Legend

- Generalized fixed-wing aircraft departure flight track
- Generalized helicopter departure flight track
- Airport property
- Heliport
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

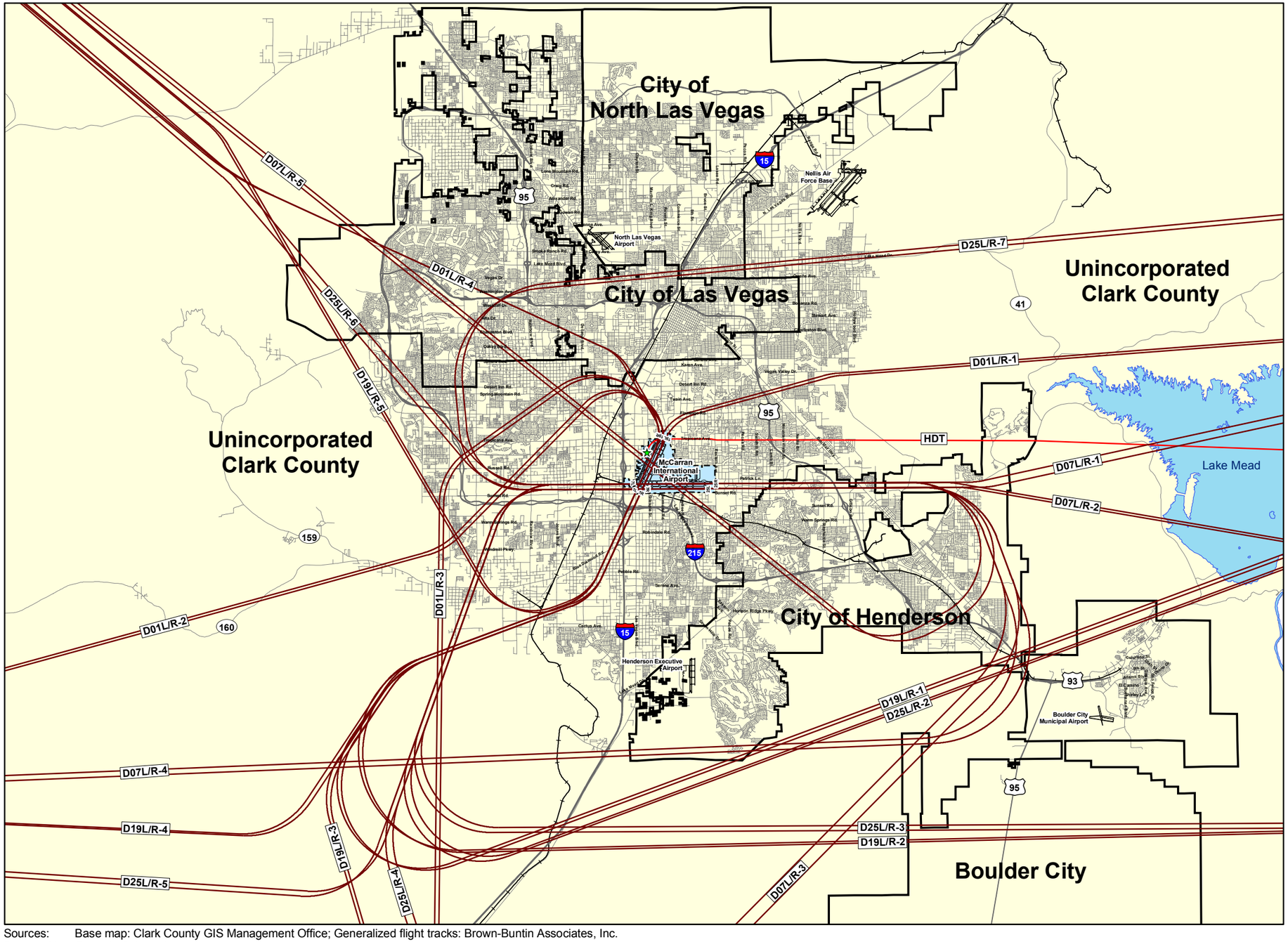
Sources: Base map: Clark County GIS Management Office; Generalized flight tracks: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 4 miles

Exhibit IV-8

**Generalized Departure Flight Tracks**
**2004**




## Legend

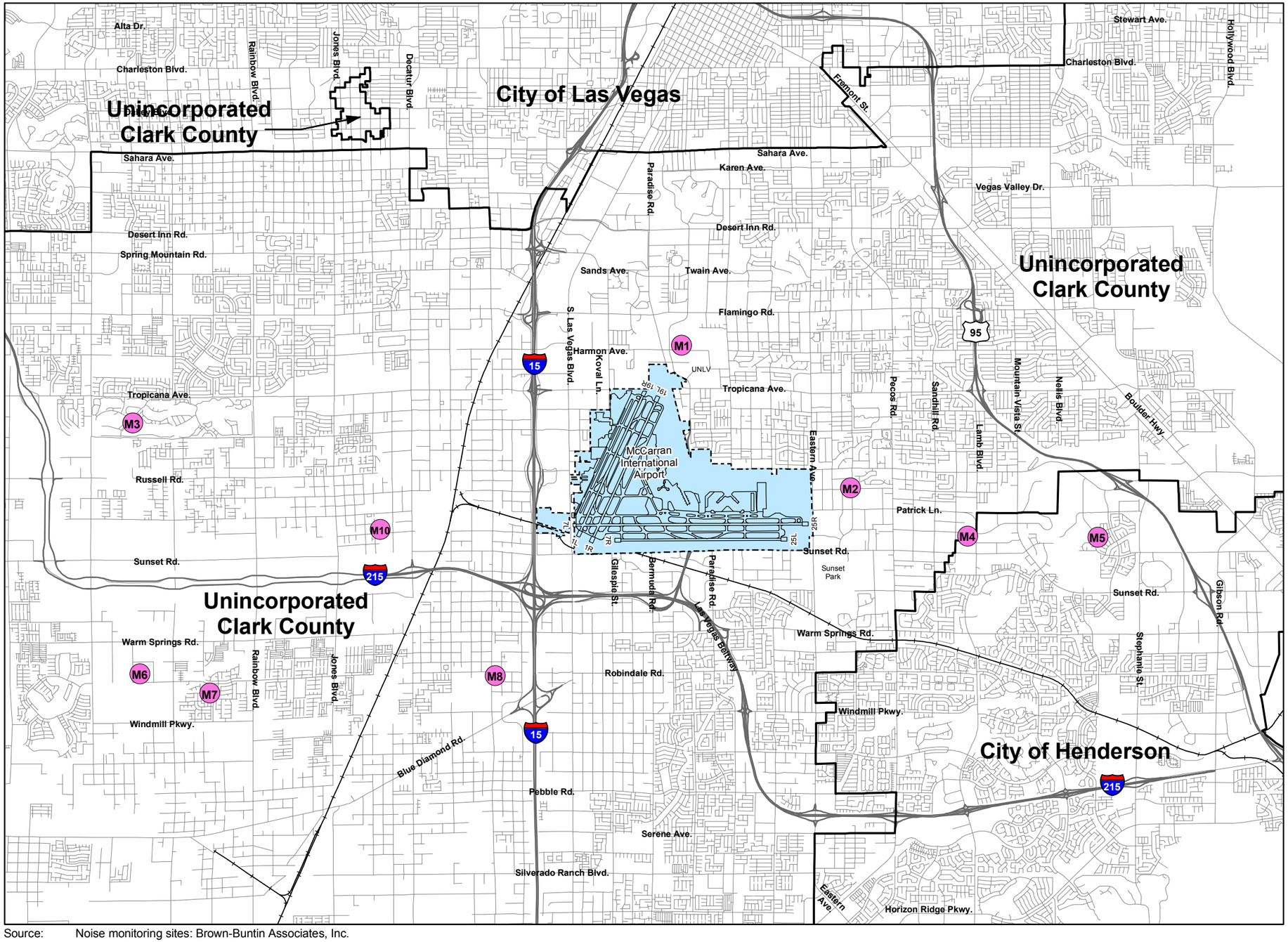
- Generalized fixed-wing aircraft departure flight track
- Generalized helicopter departure flight track
- Airport property
- Heliport
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- State route
- Railroad

Sources: Base map: Clark County GIS Management Office; Generalized flight tracks: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

0 north 4 miles

Exhibit IV-9

**Generalized Departure Flight Tracks 2011 and 2017**




Legend

- Noise monitoring site
- Airport property
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Note: Monitoring site M9 is not displayed.

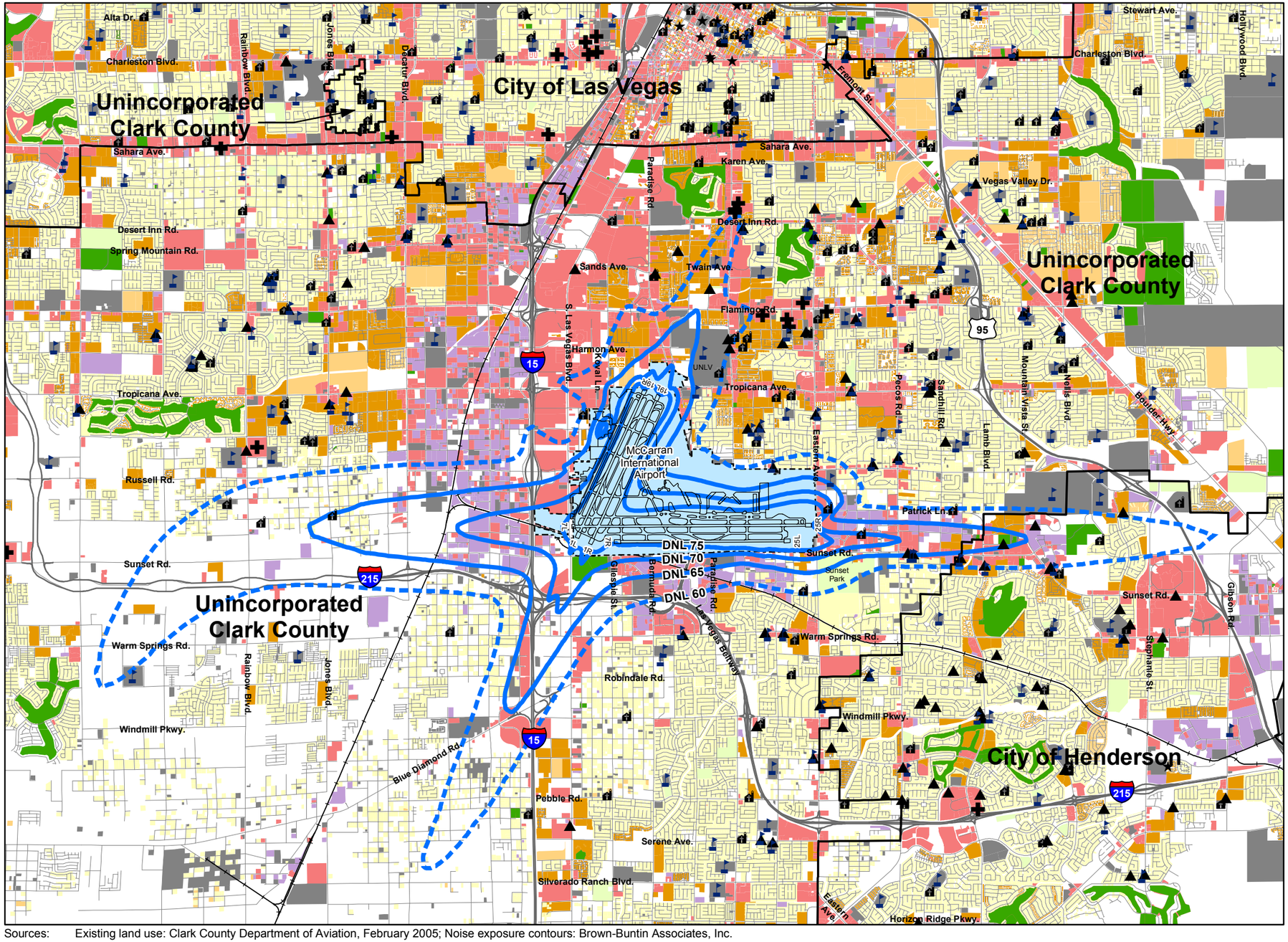
Source: Noise monitoring sites: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit IV-10

north

0 7,000 feet

**Noise Monitoring Sites**




## Legend

2004 noise exposure contour (expressed in DNL)

2004 DNL 60 noise exposure contour (shown for informational purposes only)

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

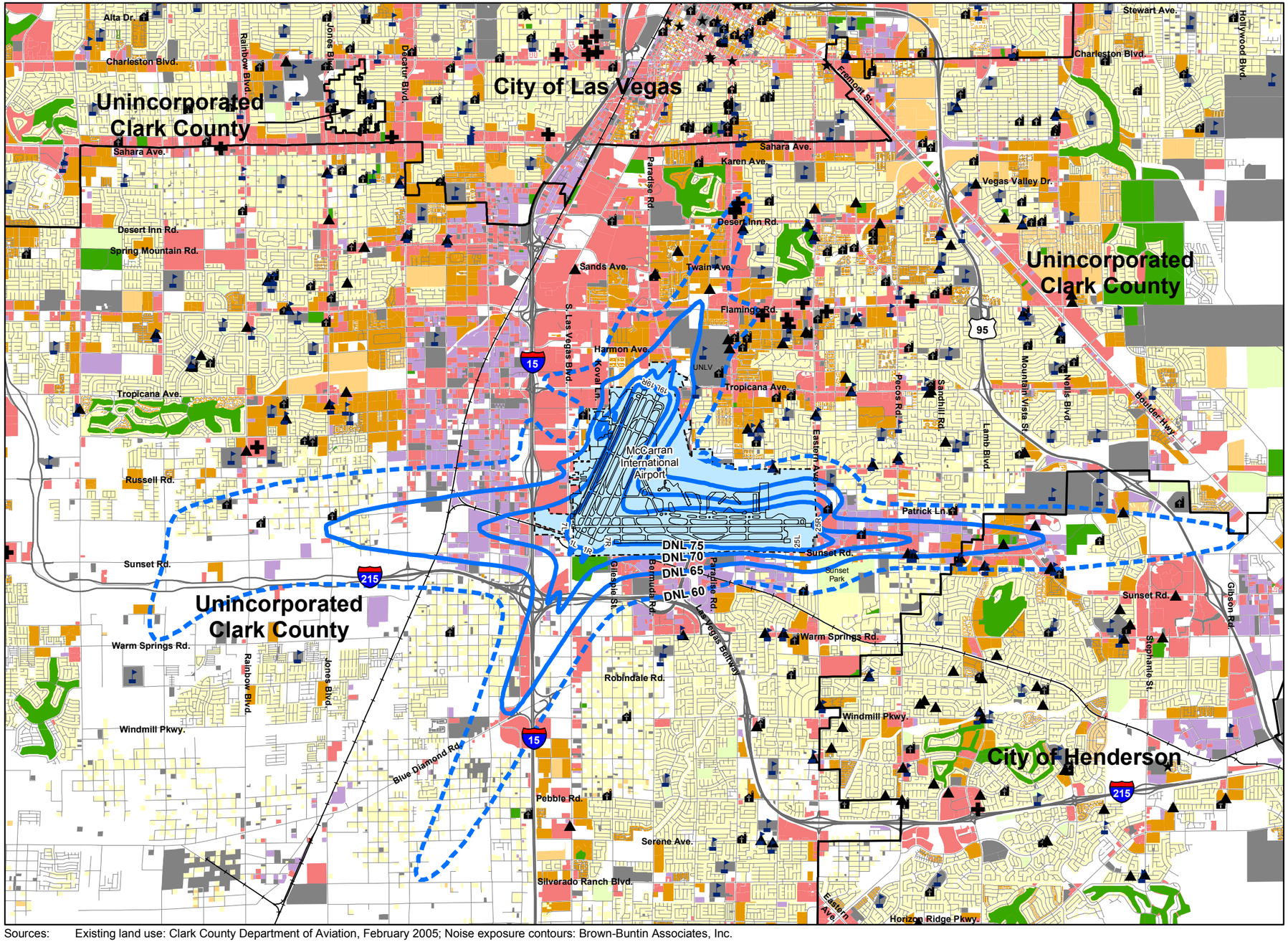
Sources: Existing land use: Clark County Department of Aviation, February 2005; Noise exposure contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 7,000 feet

Exhibit V-1

**2004 Noise Exposure Map**
**McCarran International Airport**




## Legend

- 2011 noise exposure contour (expressed in DNL)
- 2011 DNL 60 noise exposure contour (shown for informational purposes only)

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

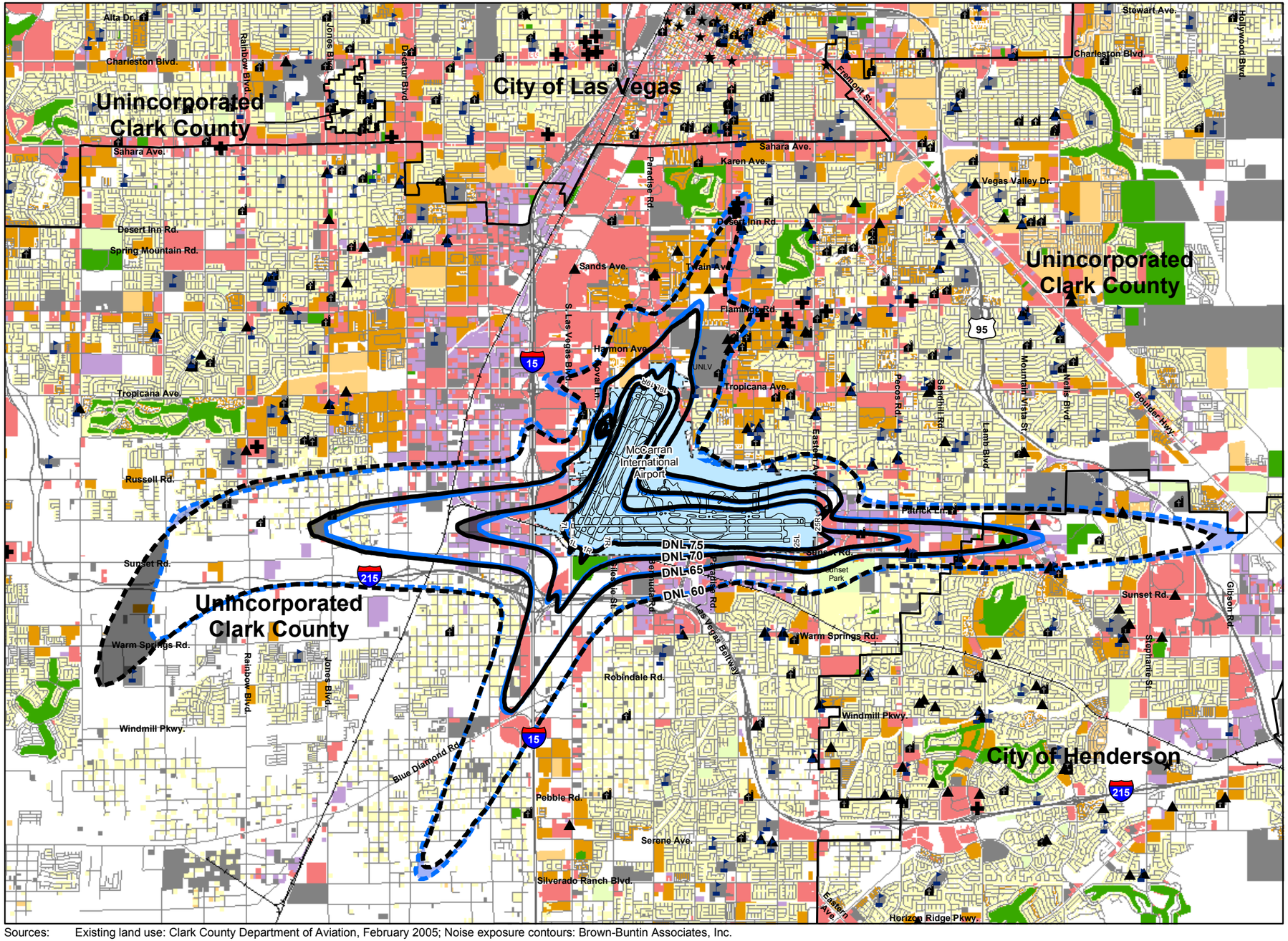
Sources: Existing land use: Clark County Department of Aviation, February 2005; Noise exposure contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit V-2

north

0 7,000 feet

**Preliminary 2011 Noise Exposure Map**
**McCarran International Airport**




## Legend

- 2004 noise exposure contour (expressed in DNL)
- 2011 noise exposure contour (expressed in DNL)
- 2004 DNL 60 noise exposure contour (shown for informational purposes only)
- 2011 DNL 60 noise exposure contour (shown for informational purposes only)

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

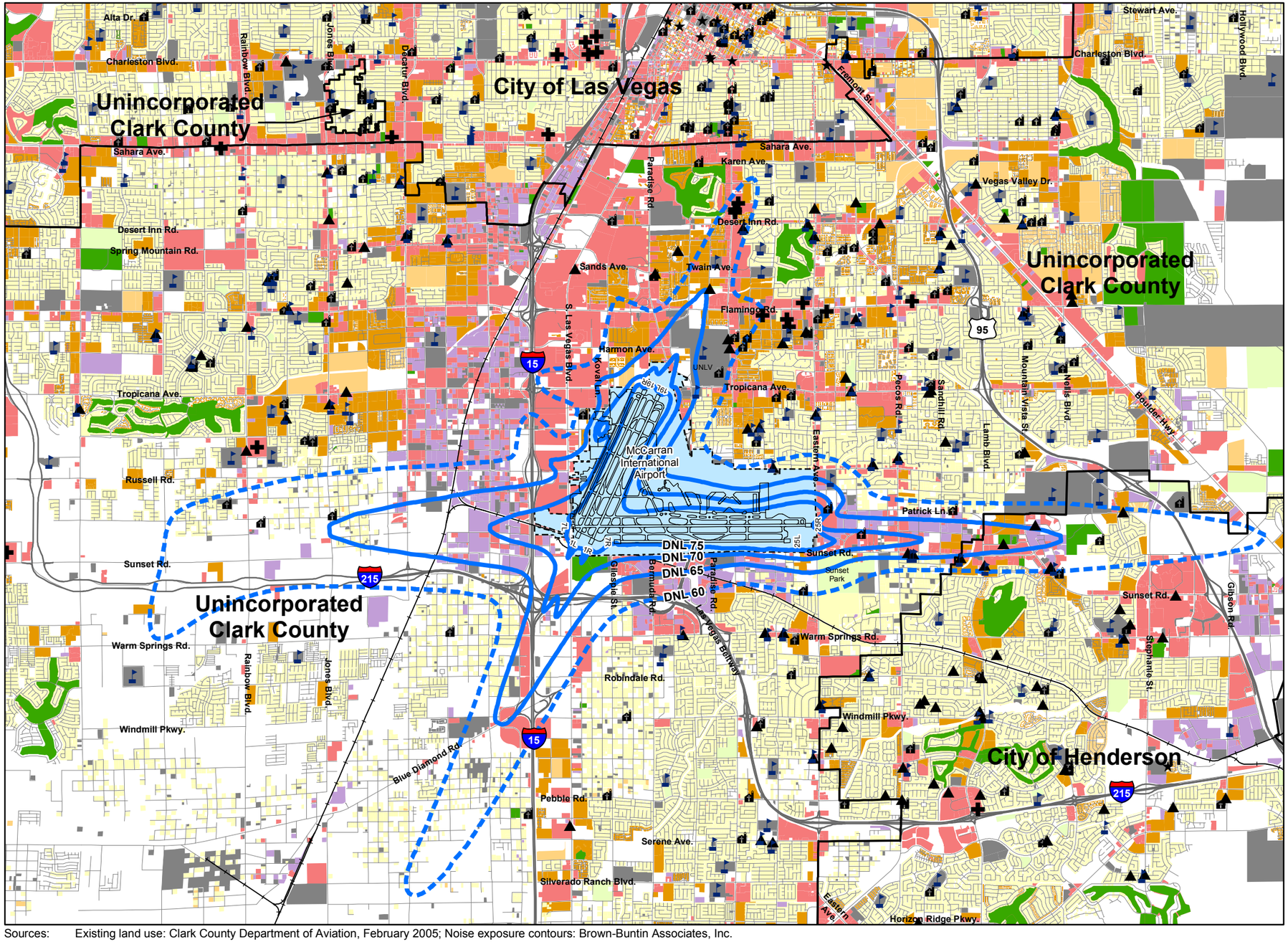
Sources: Existing land use: Clark County Department of Aviation, February 2005; Noise exposure contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit V-3

north

0 7,000 feet

**Comparison of 2004 and 2011 Noise Exposure Maps**
**McCarran International Airport**




## Legend

2017 noise exposure contour (expressed in DNL)

2017 DNL 60 noise exposure contour (shown for informational purposes only)

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

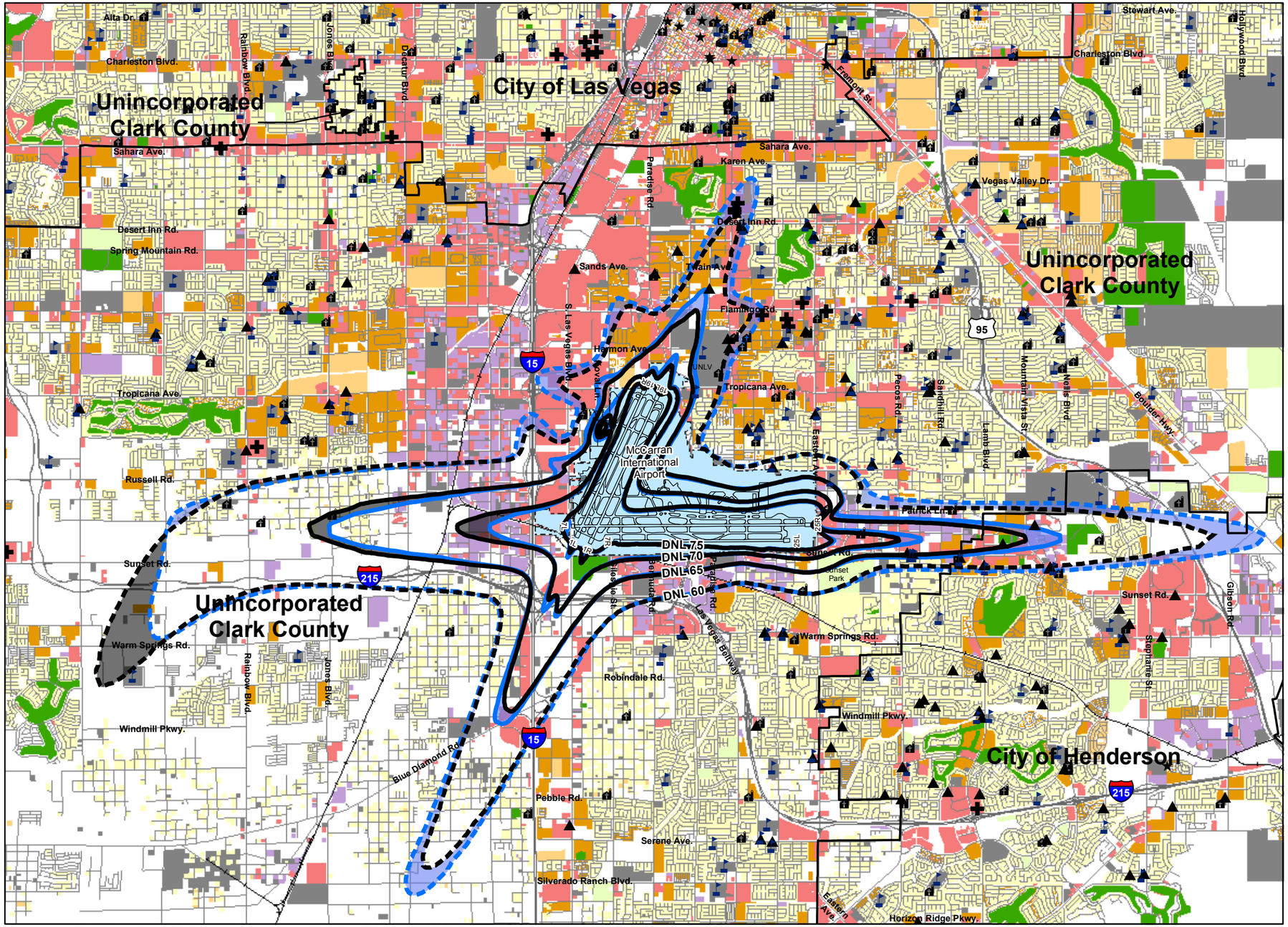
Sources: Existing land use: Clark County Department of Aviation, February 2005; Noise exposure contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 7,000 feet

Exhibit V-4

**Preliminary 2017 Noise Exposure Map**
**McCarran International Airport**




## Legend

- 2004 noise exposure contour (expressed in DNL)
- 2017 noise exposure contour (expressed in DNL)
- 2004 DNL 60 noise exposure contour (shown for informational purposes only)
- 2017 DNL 60 noise exposure contour (shown for informational purposes only)

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Sources: Existing land use: Clark County Department of Aviation, February 2005; Noise exposure contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit V-5

north

0 7,000 feet

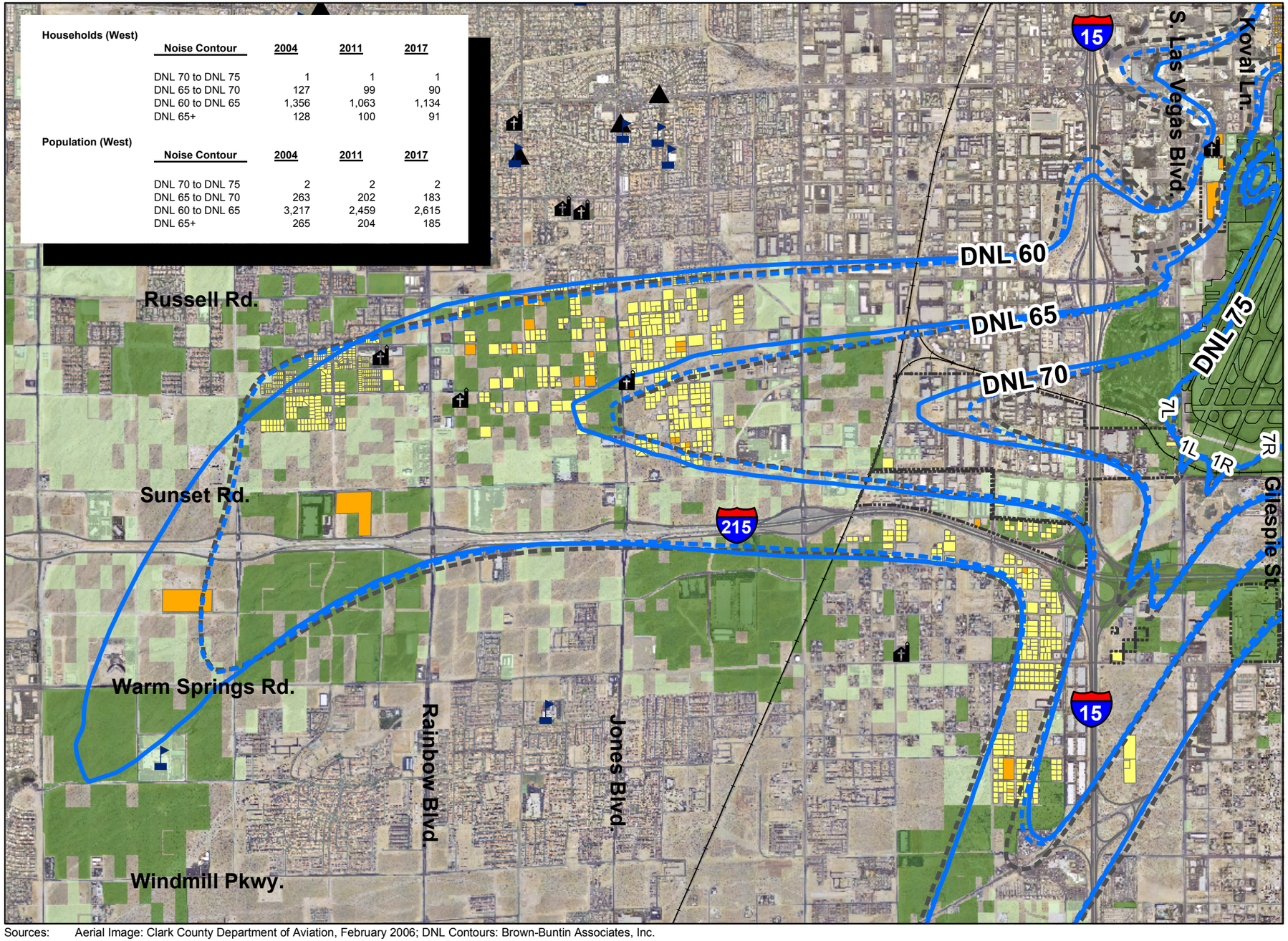
**Comparison of 2004 and 2017 Noise Exposure Maps**
**McCarran International Airport**

**Households (West)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 1 | 1 | 1 |
| DNL 65 to DNL 70 | 127 | 99 | 90 |
| DNL 60 to DNL 65 | 1,356 | 1,063 | 1,134 |
| DNL 65+ | 128 | 100 | 91 |

**Population (West)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 2 | 2 | 2 |
| DNL 65 to DNL 70 | 263 | 202 | 183 |
| DNL 60 to DNL 65 | 3,217 | 2,459 | 2,615 |
| DNL 65+ | 265 | 204 | 185 |




## Legend

- 2004 existing noise exposure contour (expressed in DNL)
- 2011 forecast noise exposure contour (expressed in DNL)
- 2017 forecast noise exposure contour (expressed in DNL)
- Airport land aquisition areas
- Residential single-family
- Residential multi-family
- Deed restricted property not currently owned by the Department of Aviation
- Deed restricted property currently owned by the Department of Aviation

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

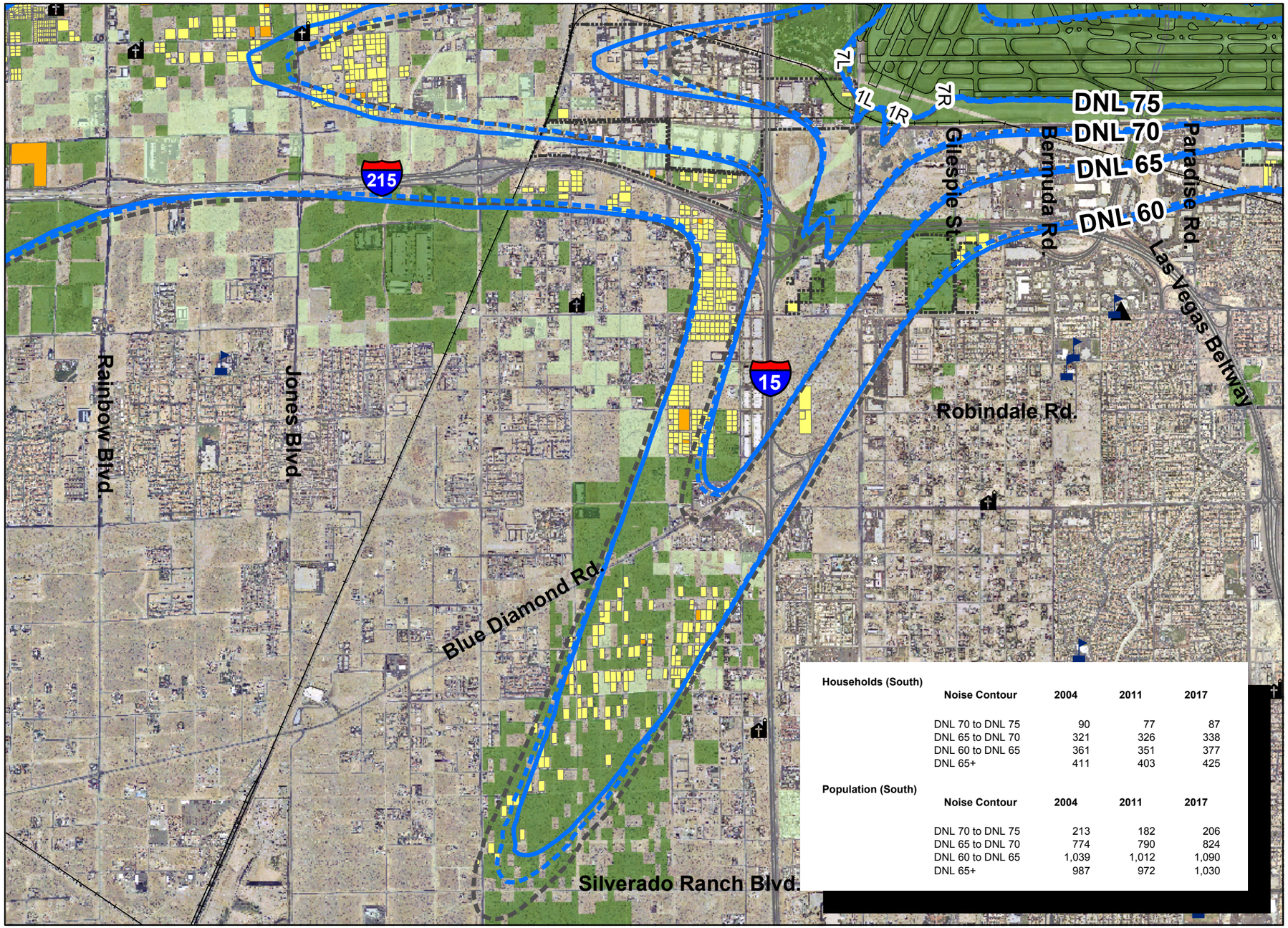
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Sources: Aerial Image: Clark County Department of Aviation, February 2006; DNL Contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

0 north 3,000 feet

Exhibit V-6

**Noise Exposure Contours - 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail West)**




## Legend

- 2004 existing noise exposure contour (expressed in DNL)
- 2011 forecast noise exposure contour (expressed in DNL)
- 2017 forecast noise exposure contour (expressed in DNL)
- Airport land aquisition areas
- Residential single-family
- Residential multi-family
- Deed restricted property not currently owned by the Department of Aviation
- Deed restricted property currently owned by the Department of Aviation

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

**Households (South)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 90 | 77 | 87 |
| DNL 65 to DNL 70 | 321 | 326 | 338 |
| DNL 60 to DNL 65 | 361 | 351 | 377 |
| DNL 65+ | 411 | 403 | 425 |

**Population (South)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 213 | 182 | 206 |
| DNL 65 to DNL 70 | 774 | 790 | 824 |
| DNL 60 to DNL 65 | 1,039 | 1,012 | 1,090 |
| DNL 65+ | 987 | 972 | 1,030 |

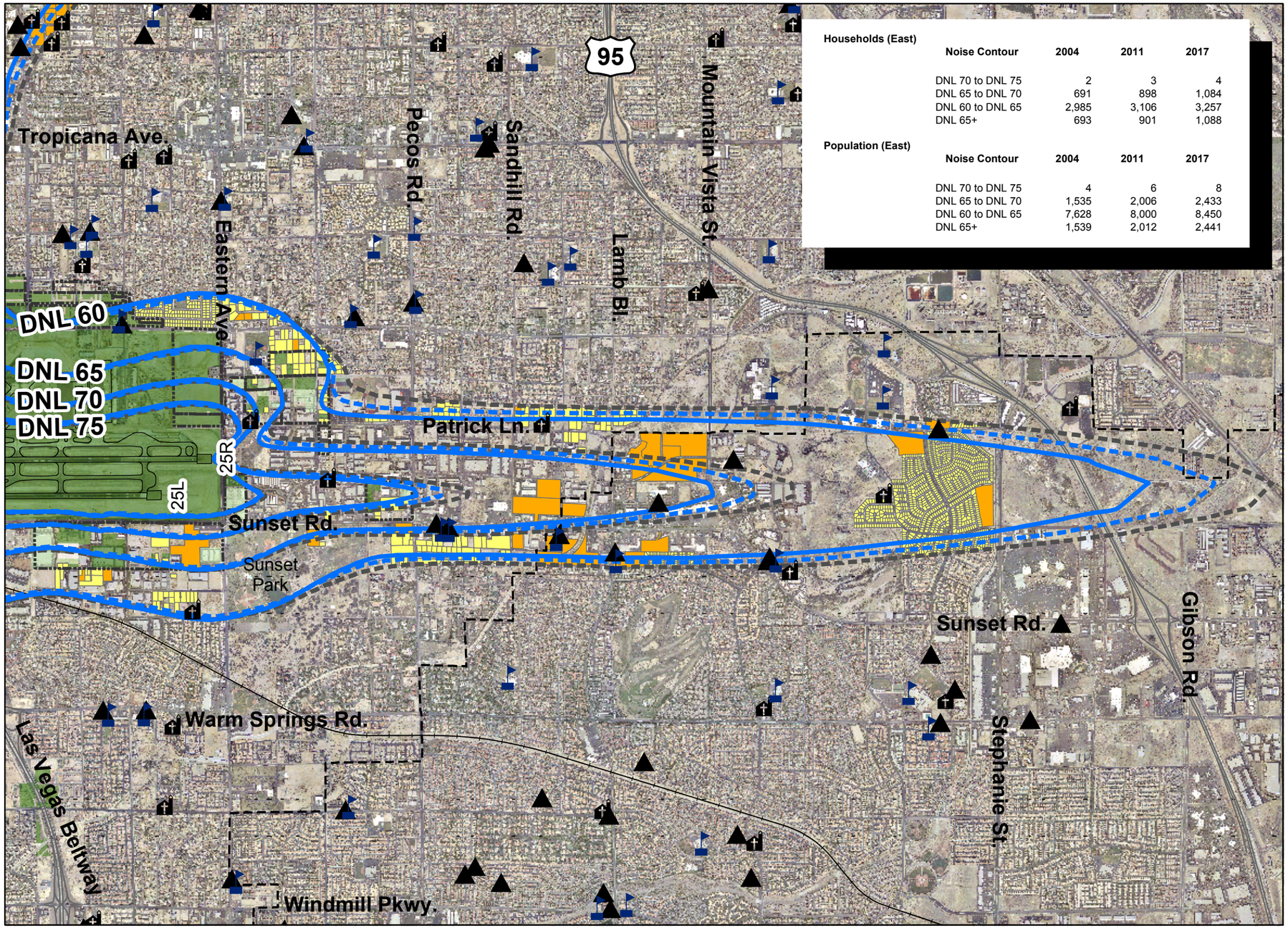
Sources: Aerial Image: Clark County Department of Aviation, February 2006; DNL Contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 3,000 feet

Exhibit V-7

**Noise Exposure Contours - 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail South)**




**Households (East)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 2 | 3 | 4 |
| DNL 65 to DNL 70 | 691 | 898 | 1,084 |
| DNL 60 to DNL 65 | 2,985 | 3,106 | 3,257 |
| DNL 65+ | 693 | 901 | 1,088 |

**Population (East)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 4 | 6 | 8 |
| DNL 65 to DNL 70 | 1,535 | 2,006 | 2,433 |
| DNL 60 to DNL 65 | 7,628 | 8,000 | 8,450 |
| DNL 65+ | 1,539 | 2,012 | 2,441 |

## Legend

- 2004 existing noise exposure contour (expressed in DNL)
- 2011 forecast noise exposure contour (expressed in DNL)
- 2017 forecast noise exposure contour (expressed in DNL)
- Airport land aquisition areas
- Residential single-family
- Residential multi-family
- Deed restricted property not currently owned by the Department of Aviation
- Deed restricted property currently owned by the Department of Aviation

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Sources: Aerial Image: Clark County Department of Aviation, February 2006; DNL Contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit V-8

north

0 3,000 feet

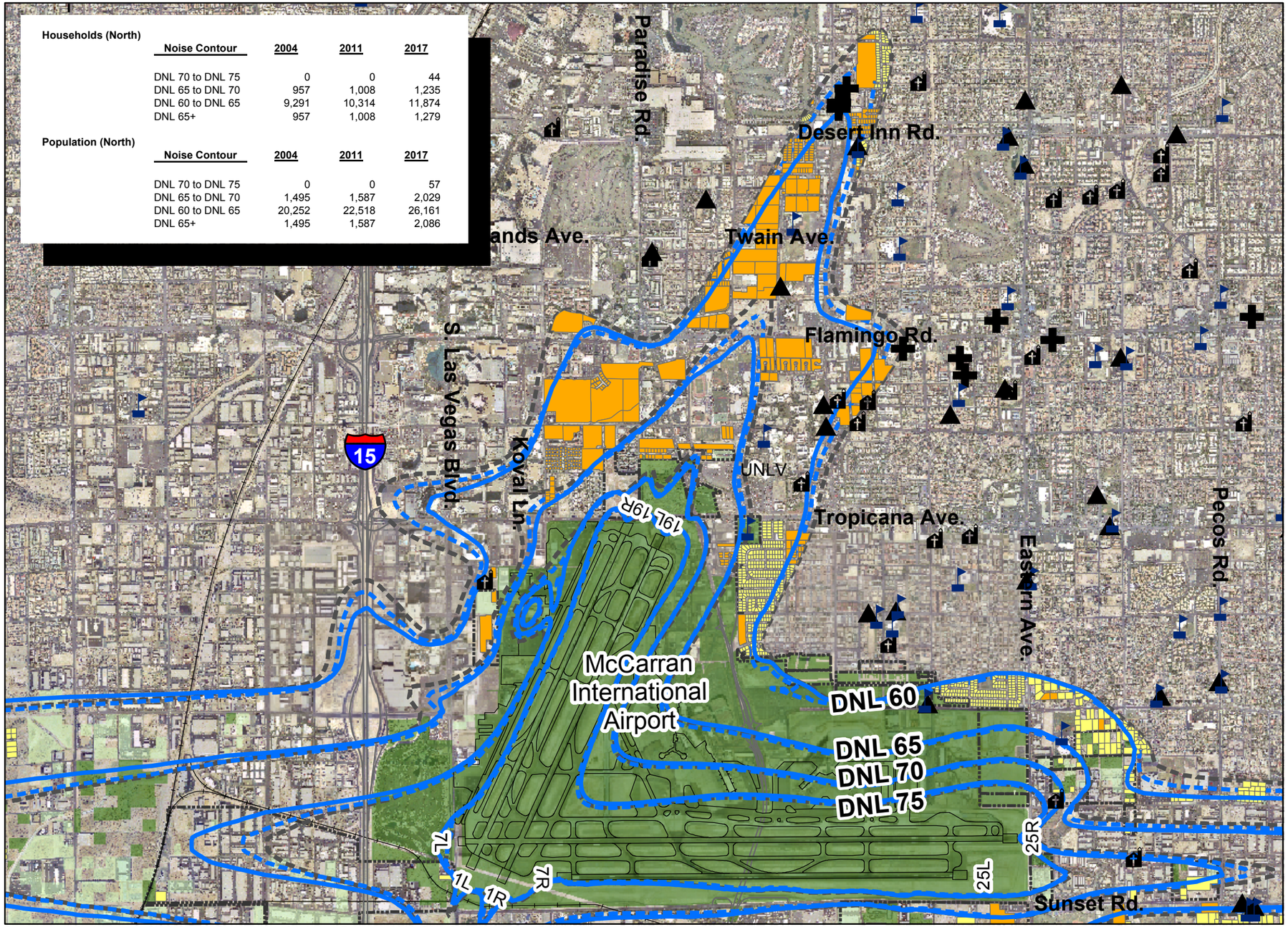
**Noise Exposure Contours - 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail East)**

**Households (North)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 0 | 0 | 44 |
| DNL 65 to DNL 70 | 957 | 1,008 | 1,235 |
| DNL 60 to DNL 65 | 9,291 | 10,314 | 11,874 |
| DNL 65+ | 957 | 1,008 | 1,279 |

**Population (North)**

| Noise Contour | 2004 | 2011 | 2017 |
|---|---|---|---|
| DNL 70 to DNL 75 | 0 | 0 | 57 |
| DNL 65 to DNL 70 | 1,495 | 1,587 | 2,029 |
| DNL 60 to DNL 65 | 20,252 | 22,518 | 26,161 |
| DNL 65+ | 1,495 | 1,587 | 2,086 |




## Legend

- 2004 existing noise exposure contour (expressed in DNL)
- 2011 forecast noise exposure contour (expressed in DNL)
- 2017 forecast noise exposure contour (expressed in DNL)
- Airport land aquisition areas
- Residential single-family
- Residential multi-family
- Deed restricted property not currently owned by the Department of Aviation
- Deed restricted property currently owned by the Department of Aviation

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

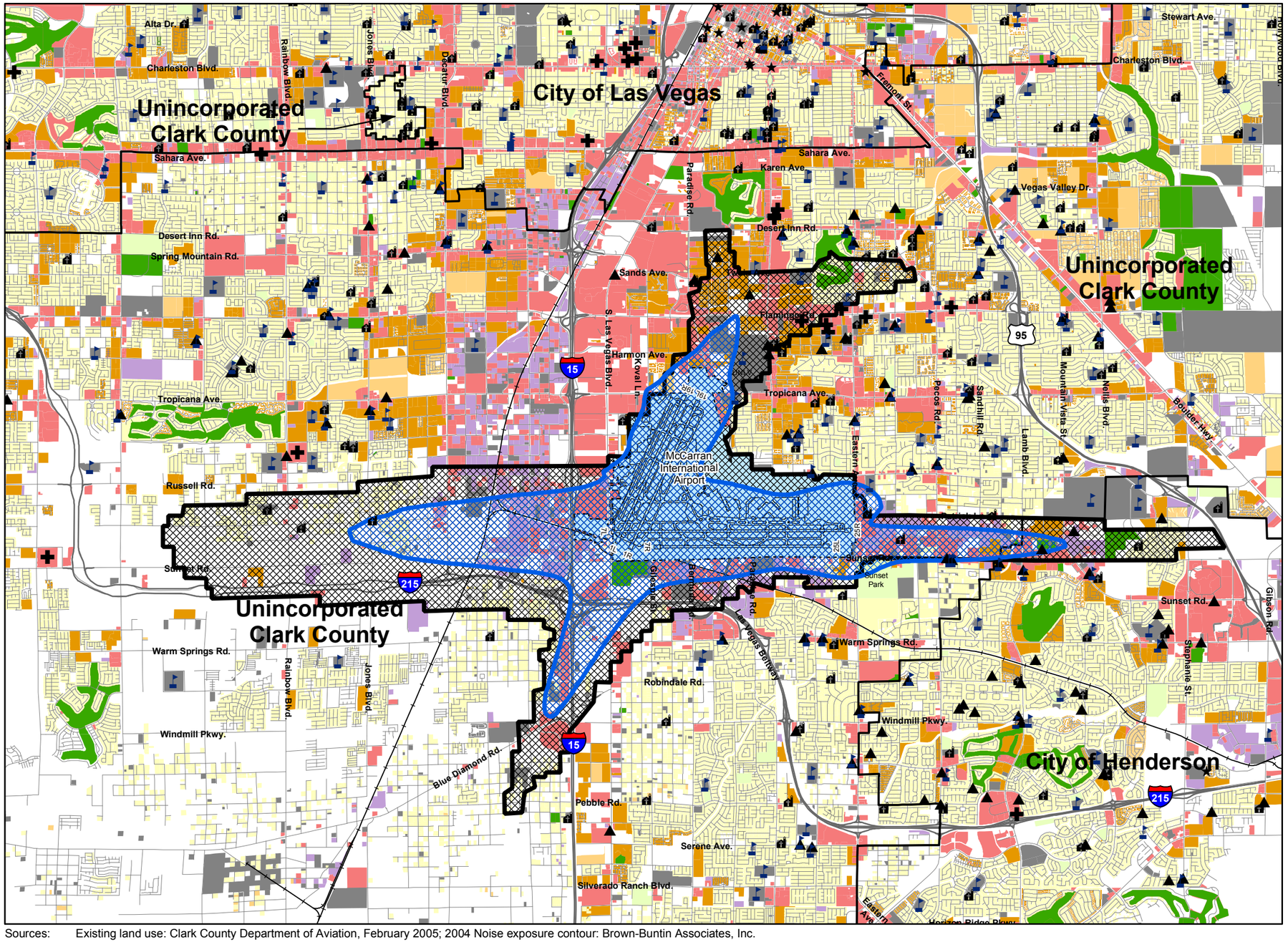
- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Sources: Aerial Image: Clark County Department of Aviation, February 2006; DNL Contours: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit V-9

0 north 3,000 feet

**Noise Exposure Contours - 2004, 2011, and 2017**
**Location of Existing Incompatible Land Uses (Detail North)**




## Legend

DNL 65 dB noise exposure contour - 2004

DNL 65 dB noise exposure contour - 1992

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

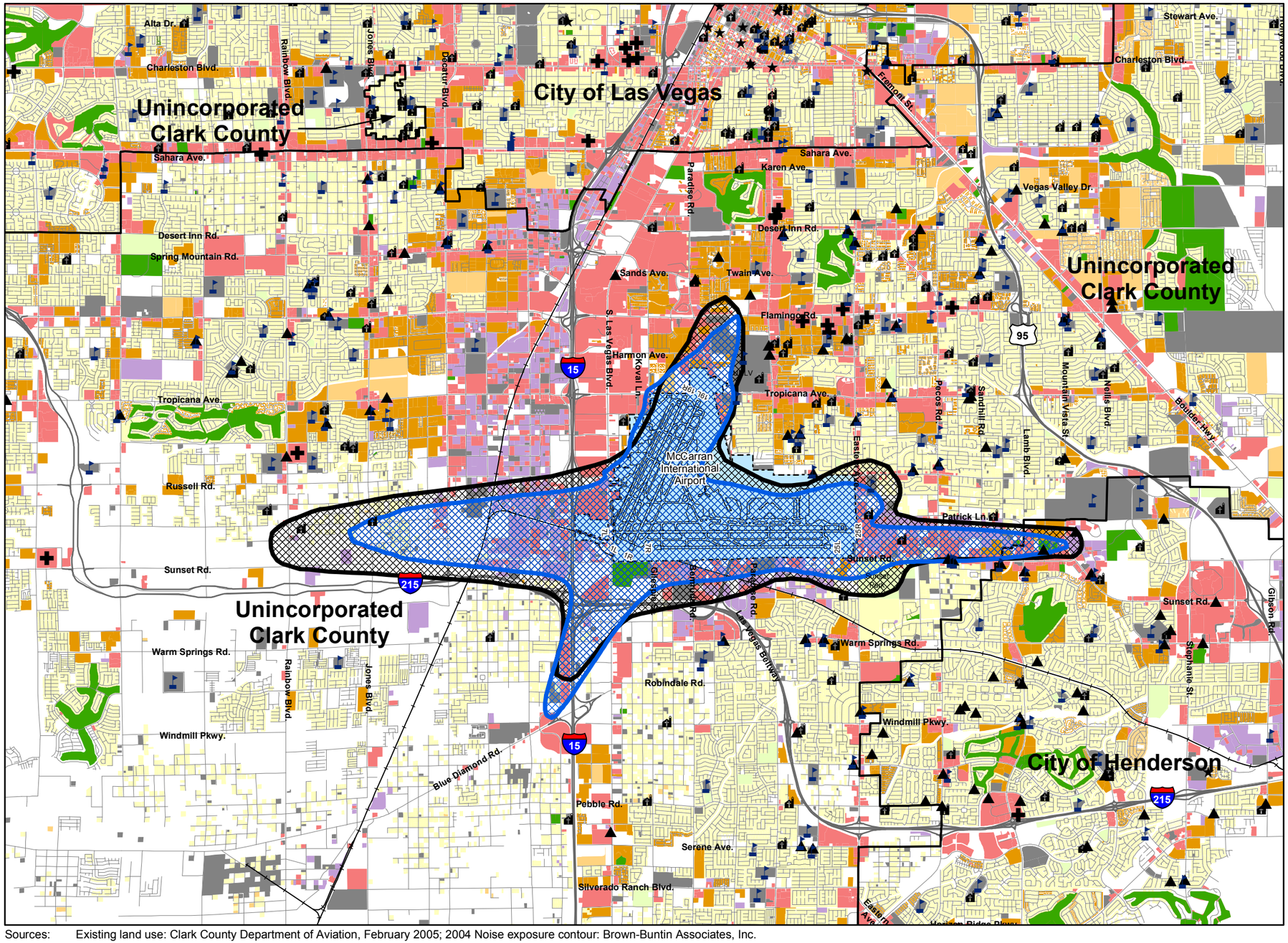
Sources: Existing land use: Clark County Department of Aviation, February 2005; 2004 Noise exposure contour: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 7,000 feet

Exhibit V-10

**Comparison of 1992 and 2004 Noise Exposure**
**McCarran International Airport**




## Legend

DNL 65 dB noise exposure contour - 2004

DNL 65 dB noise exposure contour - From 1994 FAR Part 150 Study Update

DNL = Day-Night Average Sound Level - A metric used to describe the existing and predicted cumulative noise exposure for communities surrounding an airport. DNL is expressed in A-weighted decibels (dBA) and represents the average noise level over a 24-hour period. In calculating DNL, the average sound level for each hour during the nighttime period (10:00 p.m. to 6:59 a.m.) is increased by a 10-decibel weighting penalty.

**Generalized existing land uses**

- Residential single-family
- Residential multi-family
- Mobile home
- Commercial
- Industrial
- Recreation*
- Public
- Park / open space
- Vacant / tax exempt
- Airport property

* Recreation includes commercial and non-profit recreational facilities.

**Noise sensitive facilities**

- School
- Religious facility
- Hospital
- Structure listed in National Register of Historic Places
- Day care

**Other features**

- Jurisdictional boundary
- Street
- Interstate highway
- U.S. route
- Railroad

Sources: Existing land use: Clark County Department of Aviation, February 2005; 2004 Noise exposure contour: Brown-Buntin Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

north

0 7,000 feet

Exhibit V-11

**Comparison of 1997 and 2004 Noise Exposure**
**McCarran International Airport**

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