REDLANDS

MUNICIPAL AIRPORT

LAND USE COMPATIBILITY PLAN REVIEW

NOVEMBER 2015

LAND USE COMPATIBILITY REVIEW

REDLANDS MUNICIPAL AIRPORT

Prepared For

THE CITY OF REDLANDS

By

COFFMAN ASSOCIATES, INC.

NOVEMBER 10, 2015

TABLE OF CONTENTS

TABLE OF CONTENTS

LAND USE COMPATIBILITY PLAN REVIEW
REDLANDS MUNICIPAL AIRPORT
REDLANDS, CALIFORNIA

APPENDICES

LAND USE COMPATIBILITY PLAN REVIEW

Redlands Municipal Airport
Land Use Compatibility Plan Review

INTRODUCTION

This report provides an overview of the current airport land use compatibility plan, consistency review of the 2008 Airport Master Plan, airport operational evaluation, noise measurement program, and noise element/ordinance review. During the inventory phase of the report, discrepancies were identified in the documents and data collected regarding the location of the helicopter traffic pattern. These include the Redlands Municipal Airport California State Airport Permit, the Airport's Rules and Regulations within Chapter 12.56 of the City Code, City Council Resolution 6152, and the helicopter traffic pattern currently being used at the airport. These discrepancies are identified throughout this report and affect the final recommendations. Therefore, these discrepancies need to be resolved before moving forward with updates/amendments to the Redlands Municipal Airport Land Use Compatibility Plan, City of Redlands General Plan Noise Element, and Noise Ordinance.

This document includes the following sections:

- Section 1: Overview of Airport Land Use Compatibility Plans
- Section 2: Redlands Municipal Airport Land Use Compatibility Plan (ALUCP) Review
- Section 3: Redlands Municipal Airport Master Plan Consistency Review
- Section 4: Redlands Municipal Airport Operational Evaluation
- Section 5: Noise Measurement Program (October 12-15, 2015)
- Section 6: City of Redlands General Plan Noise Element and Noise Ordinance Review

SECTION 1: OVERVIEW OF AIRPORT LAND USE COMPATIBILITY PLANS

Airports play a vital role in the transportation system and economy of cities and counties throughout the nation. In recognition of the important role airports play and the goal of proper land use compatibility planning within the State of California, the California State Legislature enacted laws that mandate the creation of Airport Land Use Commissions (ALUCs). Adopted in 1967 to assist local agency land use compatibility efforts, the laws are intended to protect:

> "… public health, safety, and welfare by encouraging orderly expansion of airports and the adoption of land use measures that minimize exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses."

As discussed in the 2011 *California Airport Land Use Planning Handbook* (Handbook), a county and each affected city may incorporate airport compatibility concerns into their land use planning and permitting processes per Public Utilities Code (PUC) Section 21670.1(c) as an alternative to the creation of an ALUC. Subject to Division review and approval, the county and each affected city determine the processes to accomplish proper land use planning and determine the agency responsible for preparation of each ALUCP.

This format of compatibility planning has the same responsibilities as an ALUC county, including general and specific plan consistency with the ALUCP(s).

In 1993, San Bernardino County and its incorporated cities elected to dissolve the airport land use commission in accordance with PUC Section 21670.1(c). With legislative adoption of the subsequent requirement for local government to continue to engage in airport land use planning, the county and affected cities determined that the alternative process outlined by the legislation was appropriate for all airports within San Bernardino County. Furthermore, the county and cities delegated to each airport owner the responsibility for preparation of an airport land use compatibility plan and established an Airport Mediation Board to help resolve any disputes which may arise out of the plans' preparation. For Redlands Municipal Airport, the City of Redlands is the designated agency and airport land use compatibility matters are reviewed concurrently with the development review process by Development Services Department.[1]

In its role as the designated agency for airport land use compatibility planning, the City of Redlands has two primary responsibilities:

- To prepare and adopt an ALUCP with a 20-year planning horizon for each airport within its jurisdiction.

- Review local agency land use actions and airport plans for consistency with the land use compatibility policies and criteria in the ALUCP.

As outlined in Public Utility Code §21675(a), the ALUCP is based on three planning assumptions for the airport:

- the updated Airport Layout Plan (ALP);
- the updated aviation activity forecasts; and
- the updated noise exposure forecasts.

It should be noted that the designated agency, when performing the roles of an ALUC, has no authority over airport operations. Therefore, nothing in an ALUCP shall be interpreted as regulating or conveying any recommendations concerning aircraft operations to/from/at an airport. (Pub. Util. Code, Section 21674[e]).

Additionally, an ALUCP is not a specific development plan and does not designate specific land uses for any particular parcel or parcels of land. Also, the land use compatibility policies and criteria are intended to promote compatible land development in the vicinity of the airport.

As outlined in **Exhibit 1**, the general process for maintaining an ALUCP for an airport commences with the periodic update of an airport's master plan, which occurs every five to ten years, with long range operational forecasts, and an airport layout plan. Once completed, these items are forwarded to the City for review. If significant changes are outlined in

[1] 1997 Redlands Municipal Airport Land Use Compatibility Plan

Exhibit 1
ALUCP UPDATE PROCESS

This page intentionally left blank

the master plan, such as construction of a new runway, projected increase in airport operations or changes in the noise contours, the City should take actions to update the ALUCP to reflect these changes. Once the changes are made to the ALUCP, local jurisdictions are required to make their general plans and zoning consistent with the ALUCP or override the ALUCP policies. Periodic revisions of all airport and planning documents will ensure decision-makers have the most up-to-date information when considering land use proposals.

SECTION 2: REDLANDS MUNICIPAL AIRPORT LAND USE COMPATIBILITY PLAN REVIEW

Policy Comparison

Table 2A of the Handbook provides a checklist of core ALUCP contents. The 2003 *Redlands Municipal Airport Land Use Compatibility Plan* (2003 ALUCP) was reviewed for consistency with the recommended policies outlined in the checklist of ALUCP contents to determine if any essential components are missing. **Exhibit 2** summarizes the 29 checklist items, the status of the 2003 ALUCP with regard to the checklist, and any recommended changes.

Of the 29 checklist items, there are 16 recommended changes. The highest priority changes to the 2003 ALUCP are summarized below. The rationale for these changes is described on **Exhibit 2**:

- Include a copy of Redlands City Council Resolution No. 5344 which was used to adopt the original land use compatibility plan in 1997.

- Amend the plan to include a discussion of the limitations of the plan as related to existing land uses, airport operations and development plans in the vicinity of the airport.

- Amend the plan to reference the approval date of the current ALP, activity forecasts, and adoption date for the Airport Master Plan.

- Consideration should be given to adopting interior noise standards. Additional information on this topic can be found on pages 3-3 through 3-5 in the Handbook, which states, "Although the building code does not apply the 45 CNEL interior noise level standard to detached single-family residences, the Division of Aeronautics encourages communities to adopt this standard (or lower) for these uses. Many communities have done so as part of their general plan noise element policies."

- Update noise exposure contours to reflect 20-year forecast conditions.

- Update Part 77 drawing to reference the current drawing from the 2008 Redlands Municipal Airport Master Plan.

- Recommend adopting a policy stating time limits for the review of development projects. As outlined in the Handbook, agencies should, at a minimum, submit projects 60 days prior to approval in order to allow the fully allotted amount of time for City review. See Section 5.3.1.

- Adopt a policy which outlines the process for a preliminary consistency review. A preliminary consistency review allows the City to assess whether the project is subject to ALUC review and, if so, whether the information is sufficiently complete to enable a consistency determination to be made. See Section 6.3.1.

In addition to the items outlined in the ALUCP Contents Checklist, the following policy items, also outlined in the Handbook, should be considered for inclusion in the Redlands ALUCP:

- *Adopt a policy which outlines procedures for major and minor amendments to the plan:* California State law limits major amendments (revising the policies in a manner that would change their applicability to a public agency, adding new policies, or revising maps) of the ALUCP to no more than once per calendar year (Pub. Util. Code, Section 21675 [a]). Minor amendments (addressing grammatical, typographical, or minor technical errors that do not affect policies or the manner in which those policies are applied) may be adopted as needed.

- *Adopt a policy which outlines the timeline for a comprehensive review:* As outlined in the Handbook, a comprehensive review and update is recommended at least every five years. See Section 2.4.2.

- *Consideration should be given to adopting a policy for reconstruction of non-conforming schools or hospitals within the AIA*: The Handbook suggests ALUC consider different policies on reconstruction for residential versus nonresidential land uses. See Section See Section 4.6.1.

- *Consideration should be given to adopting a policy which defines limitations for discontinuance of a non-conforming use:* The Handbook example suggests a permit deemed complete by the local jurisdiction within twenty-four (24) months of the date the damage occurred is needed; otherwise, the nonconforming use is not allowed to be rebuilt. See Section See Section 4.6.1.

- *Consideration should be given to adopting a policy regarding the approach for evaluating parcels located in multiple land use compatibility zones:* The Handbook example suggests that parcels located within two or more zones be considered as if it were multiple parcels divided at the safety zone boundary line. See Table 4F.

CALIFORNIA AIRPORT LAND USE PLANNING HANDBOOK CHECKLIST	STATUS	RECOMMENDATION
Scope of the Plan—In a preface or introductory chapter, provide a clear statement describing the scope and function of the plan.		
Purpose and Authority: Refer to PUC statute that requires the formation of ALUCs and requires preparation of an ALUCP. Include the resolution that formed the ALUC and the resolution that adopts this ALUCP. The plan's purpose should be defined as a vehicle for conducting airport land use compatibility planning.	Purpose and information can be found on Page 1-2; Redlands City Council Resolution No. 6152, which was used to adopt an amendment to the plan, is included as part of the document. Redlands City Council Resolution No. 5344, which was used to adopt the original is not included in the document; Redlands City Council Resolution No. 5175 assigning the Community Development Department as the agency responsible for the preparation, amendment, and adoption of the ALUCP.	Include a copy of Redlands City Council Resolution No. 5344.
Airport Identification: List the airport(s) addressed by the plan and the city or unincorporated county in which they are located.	See Section 1.1	None.
Airport Influence Area: Provide a general description and map of the area that comprises the jurisdiction of the ALUC. Also include a map covering the planning boundary of the ALUCP if it varies from the AIA boundary.	See Section 1.2	None.
Jurisdictions Affected: Identify all local jurisdictions and any military facilities that are affected by the ALUCP. Listing the general and specific plans of local jurisdictions also may be valuable.	See Section 1.1	None.
Limitations of the Plan: Note the limitations on ALUC jurisdiction over existing land uses; state, federal and tribal land; and airport operations as stated in the law and how they are applied by the individual ALUC.	Limitations with regard to existing land uses; state, federal and tribal land; and airport operations are not specifically identified in the 1993 Land Use Compatibility Plan.	Amend the plan to include a discussion of the limitations of the plan as related to existing land uses, airport operations and development plans in the vicinity of the airport.
Airport Information—Include essential information about the airport(s) that shows the ALUCP has been based upon an FAA-adopted AMP or ALP.		
Planning Status: Indicate the FAA approval date of the current ALP and activity forecasts (see below). Indicate local government or airport adoption date for the AMP.	Figure 3A includes the ALP prepared as part of the 1993 Redlands Municipal Airport Master Plan. Airport activity forecasts are sourced from the 1993 Redlands Municipal Airport Master Plan as "enhanced forecasts 2015." Section 1.6.1 references the 1993 Redlands Municipal Airport Master Plan. The most recent Master Plan was adopted by Redlands City Council on November 18, 2008.	Amend the plan to reference the approval date of the current ALP and activity forecasts and adoption date for the AMP.
ALP: Include a copy of the FAA-approved ALP.	Figure 3A includes the ALP prepared as part of the 1993 Redlands Municipal Airport Master Plan.	Amend plan to include the most current ALP.
Airport Activity: Document existing and projected airport operational levels. Include data indicating the known or estimated distribution of operations by type of aircraft, time of day, and runway used. As necessary, extend the 20 year forecasts included in adopted AMPs to ensure that the ALUCP reflects the anticipated growth of airport activity over a 20 year period.	Table 3C (Page 3-4) presents existing operations for 1993/94 estimated by CALTRANS from an activity data counter. The operations estimate for that time period is 41,600. See note above regarding operations forecasts.	Amend the plan to include documentation of existing and 20-year operational forecast levels.
Compatibility Policies and Criteria—State all policies and criteria as clearly, precisely, and completely as possible, in a separate chapter from background information. As appropriate, use tables to present primary criteria. Address each of the following compatibility concerns:		
Noise: Indicate maximum normally acceptable exterior noise levels for new residential and other noise-sensitive land uses. Note interior noise level standards.	Regarding exterior noise levels, single family residential uses are considered "Clearly Acceptable "between 50-55 CNEL; "Normally Acceptable between 55-60 CNEL; "Normally Unacceptable" between 60-65 CNEL; and "Clearly Unacceptable" above 65 CNEL. Guidance is also provided for additional land use types. No interior noise level standards are included in the noise policies. See Table 2B.	Consideration should be given to adopting interior noise standards. Additional information on this topic can be found on pages 3-3 through 3-5 in the Handbook, which states "Although the building code does not apply the 45 CNEL interior noise level standard to detached single-family residences, the Division of Aeronautics encourages communities to adopt this standard (or lower) for these uses. Many communities have done so as part of their general plan noise element policies."

	CALIFORNIA AIRPORT LAND USE PLANNING HANDBOOK CHECKLIST	STATUS	RECOMMENDATION
	Overflight: Indicate how aircraft overflight noise concerns are addressed.	See Section 3.4.	None.
	Safety: Indicate maximum acceptable land use densities and intensities and the manner in which they are to be measured. List any uses explicitly prohibited from certain zones.	See Section 3.2.	
	Airspace Protection: Note reliance upon FAR Part 77 and Terminal Instrument Procedures (TERPS) if relevant. If applicable, indicate policies addressing objects where ground level exceeds FAR Part 77 criteria. List criteria regarding hazards to flight such as bird strikes, solar panels, wind turbines, stationary smoke plumes and electronic interferences with flight operations.	See Section 3.3. Section 3.3.5 addresses: glare or distracting lights; sources of dust, steam or smoke; sources of electrical interference; landfills as wildlife hazards.	Land use compatibility policies which specifically address solar panels and wind turbines should be considered.
Compatibility Zone Maps—For each airport, provide either a composite compatibility zone map or individual compatibility zone maps. On base map, identify roads, water courses, section lines, and other major natural and man-made features. Showing the local government zoning as a background layer is also helpful.			
	Noise Contours: Show CNEL contours to be used for planning purposes.	See Figure 3B.	Update noise exposure contours to reflect 20-year forecast conditions.
	Compatibility Policies: If compatibility policies are based on separate assessment of compatibility concerns, indicate boundaries and dimensions of safety zones. When basing zones on guidelines in Chapter 3 of this Handbook, make adjustments as appropriate to reflect traffic pattern locations and other factors particular to each individual airport.	See Figure 2A.	Update compatibility map to reflect current ALP and guidance found in the 2011 California Airport Land Use Planning Handbook.
	FAA Airspace Protection Surfaces: Include map derived from FAR Part 77 standards indicating allowable heights of objects relative to the airport elevation. Indicate locations where ground exceeds these limits. Base map should show topography.	See Figure 3C.	Update Part 77 drawing to reference the current drawing from the 2008 Redlands Municipal Airport Master Plan.
	Composite Compatibility Zones: When using compatibility criteria representing a composite of the above individual compatibility concerns (noise, overflight, safety, and airspace protection) provide a map showing the boundaries of each zone. Indicate distances of boundaries from the airport runways.	Not applicable. Compatibility zones are depicted on separate exhibits.	None.
	Airport Influence Area: Clearly identify the AIA boundary on a map and with a written description.	See Figure 2A and Section 1.2.	None.
Review Policies—Describe the process and list the steps that the ALUC will use in reviewing local government plans and projects.			
	Types of Actions for ALUC Review: List the types of local government plans or projects that are to be submitted to the ALUC. Distinguish between mandatory and voluntary submittals.	See Section 1.4 for types of government plans to be submitted. No distinction is made between mandatory and voluntary submittals.	Adopt a policy which provides guidance regarding mandatory and voluntary submittals. See Handbook Section 2.5.1.
	Project Information: List the types of information to be included when a project or plan is submitted for an ALUC consistency decision.	See Section 1.5.3.	None.
	Timing: Define when ALUC reviews are to be conducted and the time limits within which the ALUC must respond.	The plan does not include a specific policy regarding ALUC response time.	Agencies should, at a minimum, submit projects 60 days prior to approval in order to allow the fully allotted amount of time for ALUC review. See Handbook Section 5.3.1.

CALIFORNIA AIRPORT LAND USE PLANNING HANDBOOK CHECKLIST	STATUS	RECOMMENDATION
Preliminary Review of Plans and Projects for Consistency determinations—If applicable, describe the steps involved when an affected local jurisdiction requests the ALUC to provide a preliminary assessment of the general plans, specific plans, and relevant land use ordinances and regulations prior to their official submission for an ALUC determination. The ALUC should make a reasonable effort to identify any direct conflicts needing to be resolved as well as criteria and procedures that need to be defined in order for the local plans to be considered consistent with the ALUCP.	The plan does not include specific guidance on preliminary review of projects for consistency evaluations.	Adopt a policy which outlines the process for a preliminary consistency review.
Land Use Information—Include maps such as the following:		
Existing Land Use Development: Show locations in the airport vicinity where development exists by using current, high-altitude aerial photographs and/or GIS data.	An existing land use map is not included as part of the Land Use Compatibility Plan.	Amend the plan to include existing land use information.
Planned Land Uses: Show locations in the airport vicinity where development is planned by including current general plan and zoning maps.	A general plan land use map is not included as part of the Land Use Compatibility Plan.	Amend the plan to include general plan land use information.
Discussion of Compatibility Issues—Discuss the basic concepts and rationale behind the compatibility policies and criteria.	See Chapter 2, Section 3.	None.
Local Government Implementation—Discuss the general plan and specific plan ALUCP consistency requirement. Refer Local jurisdictions to the Handbook appendices for sample implementation documents such as, Methods for Calculating Usage Intensities, Buyer Awareness Measures, and an Airport Overlay Zone Ordinance.	Regarding general plan and specific plan consistency, see Section 1.4.4 and Page 1-3. For methods of calculating usage intensities, see Appendix C. For buyer awareness measures, see Appendix E. For Overlay Zone, see Appendix E.	Regarding all suggested implementation materials, its is recommended that the most recent materials from the 2011 Handbook be inserted into the Redlands Municipal Airport Land Use Compatibility Plan.
Supporting Materials—For quick reference, include:		
State Aeronautics Act: Provide a copy of the current state laws pertaining to airport land use commissions (PUC Sections 21670-21679.5). Indicate the date of the most current legislative amendment.	Appendix A includes California state laws related to airport land use planning as of December 2002.	The California State Aeronautics Act was most recently amended in August 2012. Recommend updating Appendix A to include the most recent copy of the State Aeronautics Act.
Federal Aviation Regulations Part 77: Provide a copy of regulations governing objects affecting navigable airspace.	Appendix B includes a copy of 14 CFR Part 77 as of September 25, 1989.	14 CFR Part 77 was last updated on January 18, 2011. Recommend updating Appendix B to include most recent version of these regulations.
Glossary: Prepare a glossary of common aviation terms, particularly those associated with airport land use compatibility planning topics.	See Appendix I.	Update as needed.
A website link to the Caltrans Division of Aeronautics	A website line to the Caltrans Division of Aeronautics is not included in the document.	Recommend updating the plan to include the following website link: http://www.dot.ca.gov/hq/planning/aeronaut/index.htm

This page intentionally left blank

Safety Zone Comparison

Existing Safety Zones and Criteria

The safety zones from the existing 2003 ALUCP are based upon criteria from the *Airport Land Use Planning Handbook* published by Caltrans in 1993 and the 1993 Redlands Municipal Airport ALP. Six zones were established based upon these criteria.

- Zone A contains the runway sideline safety zone (SSZ) and runway protection zones (RPZ).
- Zone B1 contains the inner approach/departure zones (IADZ) and inner turning zones (ITZ).
- Zone B2 contains the outer approach/departure zones (OADZ).
- Zone C contains the common traffic pattern zone (TPZ).
- Zone D is defined as other airport environs.
- Zone E is defined as an area of special compatibility concern and is intended to serve as a reminder that airport impacts should be carefully considered in any decision to change the current land use designation. This area is not part of the Redlands Municipal Airport influence area per Policy 2.2.4 and, therefore, is not listed in Table 2A, Primary Compatibility Criteria.

The Redlands City Council revised these zones by Resolution No. 6152 on May 6, 2003 to reduce the size of the B2 zone south of the airport and replace it with Zone C. It should be noted that the B2 Zone on the south side of the airport was established as a result of helicopter operations in this area. As discussed in Appendix G of the 2003 ALUCP and Resolution No. 6152, if the City were to adopt an airport operational policy prohibiting helicopter training in this location, the Zone B2 could be changed to Zone C or D. **Table 1** provides the compatibility criteria and **Exhibit 3** depicts the 2003 ALUCP safety zones.

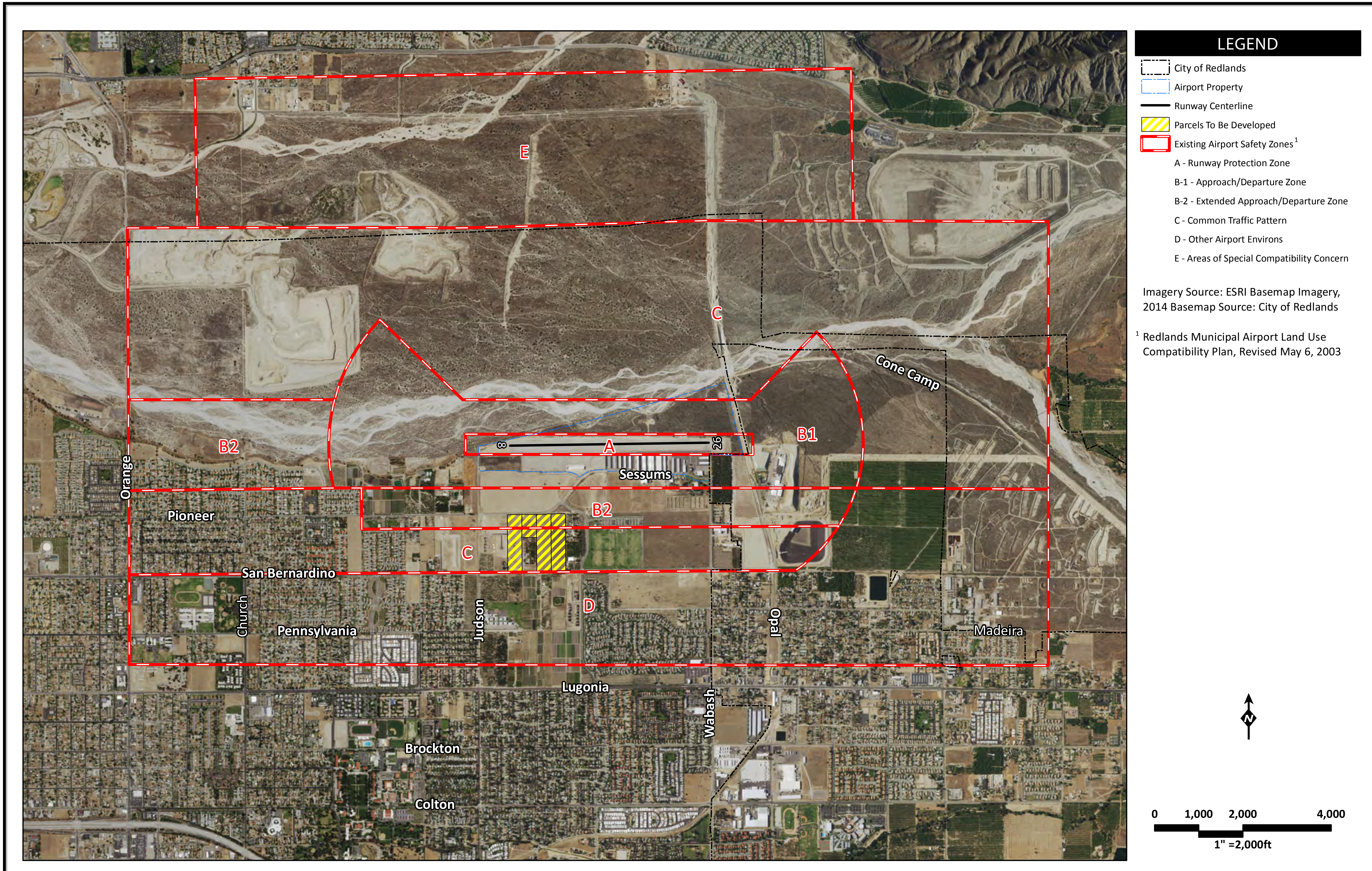
TABLE 1
Safety Zone Comparison

Zone	Location	Impact Elements	Maximum Density/Intensity: Residential (du/ac)[1]	Maximum Density/Intensity: Other Uses (people/ac)[2]	Required Open Land
Current Redlands Municipal Airport Land Use Compatibility Plan[1]					
A	Runway Protection Zone or within Building Restriction Line	• High risk • High noise levels	0	10	All Remaining
B1	Approach/Departure Zone and Adjacent to Runway	• Substantial risk – aircraft commonly below 400 ft. above ground level (AGL) or within 1,000 ft. of runway • Substantial noise	0.1 (10-acre parcel)	60	30%
B2	Extended Approach/ Departure Zone	• Moderate risk – aircraft commonly below 800 ft. AGL • Significant noise	0.5 (2-acre parcel)	90	30%
C	Common Traffic Pattern	• Limited risk – aircraft at or below 1,000 ft. AGL • Frequent noise intrusion	6	150	15%
D	Other Airport Environs	• Negligible risk • Potential for annoyance from overflights	No limit	No limit	No Requirement
Updated Compatibility Criteria[2]					
1 (RPZ)	Runway Protection Zone	• Very high risk • Aircraft less than 200 ft. above runway elevation	None	None	All Unused
2 (IADZ)	Inner Approach/ Departure Zone	• High risk • Aircraft between 200 and 400 ft. above runway elevation	1 per 10 - 20 acres	40 - 60	25 - 30%
3 (ITZ)	Inner Turning Zone	• Moderate to high risk • Aircraft less than 500 ft. above runway elevation	1 per 2 -5 acres	70 - 100	15 - 20%
4 (OADZ)	Outer Approach/ Departure Zone	• Moderate risk • Aircraft less than 1,000 ft. above runway elevation	1 per 2 -5 acres	100 - 150	15 - 20%
5 (SSZ)	Sideline Safety Zone	• Low to moderate risk • Aircraft at runway elevation	1 per 1 -2 acres	70 - 100	25 - 30%
6 (TPZ)	Traffic Pattern Zone/ Airport Influence Area	• Low risk • Aircraft ranging from 1,000 to 1,500 ft above runway elevation	No limit	200 - 300	10%

1 Redlands Municipal Airport Land Use Compatibility Plan, Revised May 6, 2003
2 California Airport Land Use Planning Handbook, October 2011

Updated Safety Zones and Criteria

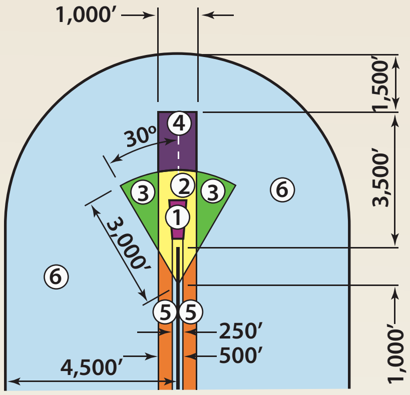
The Handbook provides guidance for establishing safety zones and criteria for airports. The example zones, as described in the Handbook and shown on **Exhibit 4**, are based on



Source: City of Redlands, ESRI Basemap Imagery 2014

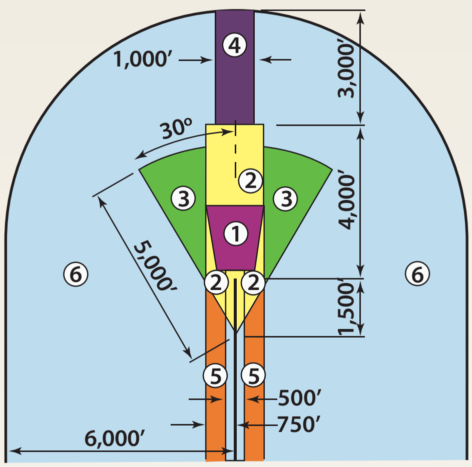
Exhibit 3
EXISTING 2003 ALUCP SAFETY ZONES

This page intentionally left blank



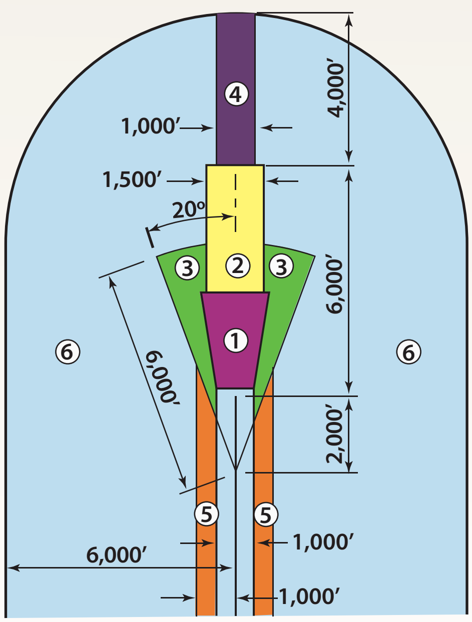
SHORT GENERAL AVIATION RUNWAY

Assumptions:
- Length less than 4,000 feet
- Approach visibility minimums ≥ 1 mile or visual approach only
- Zone 1 = 250′ x 450′ x 1,000′



MEDIUM GENERAL AVIATION RUNWAY

Assumptions:
- Length 4,000 to 5,999 feet
- Approach visibility minimums ≥ ¾ mile and < 1 mile
- Zone 1 = 1,000′ x 1,510′ x 1,700



LONG GENERAL AVIATION RUNWAY

Assumptions:
- Length 6,000 or more
- Approach visibility minimums < ¾ mile
- Zone 1 = 1,000′ x 1,750′ x 2,500

LEGEND

- 1 Runway Protection Zone
- 2 Inner Approach/Departure Zone
- 3 Inner Turning Zone
- 4 Outer Approach/Departure Zone
- 5 Sideline Safety Zone
- 6 Traffic Pattern Zone

Source: California Airport Land Use Planning Handbook, 2011.

Exhibit 4
SAFETY COMPATIBILITY ZONE EXAMPLES
-GENERAL AVIATION RUNWAYS

This page intentionally left blank

mathematical analyses of National Transportation Safety Board (NTSB) aircraft accident data and aircraft flight characteristics. The purpose of the zones is to delineate areas with relatively uniform risk levels. **Table 2** provides the Handbook's analysis of the safety zones, including the distribution of accident data points within each zone.

TABLE 2
Analysis of Safety Zone Examples

	% of Points	Acres	% / Acres
Primary Surface	15%	-	-
Zone 1: Runway Protection Zone	21%	49	0.40
Zone 2: Inner Approach/Departure Zone	10%	101	0.10
Zone 3: Inner Turning Zone	7%	151	0.05
Zone 4: Outer Approach/Departure Zone	5%	69	0.07
Zone 5: Sideline Zone	5%	-	-
Zone 6: Traffic Pattern Zone	23%	-	-
Total Zones 1-6 + Primary Surface	85%	-	-

Source: *California Airport Land Use Planning Handbook* (2011), Table 3A, Example 2

Figure 3A of the Handbook provides three example zones for general aviation airports, which are differentiated by runway length. Redlands Municipal Airport, with a runway length of 4,504 feet, fits within the Medium General Aviation Airport classification. The Handbook zone examples are provided as a starting point for developing safety zones specific to an airport. Using the compatibility factors, such as NTSB accident data, flight tracks, field observations, and noise exposure contours, shown on **Exhibit 5**, help support the safety zone boundaries from the Handbook. Six zones are defined by these guidelines:

- Zone 1 contains the runway protection zone (RPZ).
- Zone 2 contains the inner approach/departure zone (IADZ).
- Zone 3 contains the inner turning zone (ITZ).
- Zone 4 contains the outer approach/departure zone (OADZ).
- Zone 5 contains the sideline safety zone (SSZ).
- Zone 6 contains the traffic pattern zone/airport influence area (TPZ/AIA).

As depicted on the exhibit, the helicopter training pattern is located on the south side of the airport. Helicopter training operations occur below 500 feet above ground level (AGL). Because these operations occur below 500 feet AGL, the ITZ south of the airport is extended to San Bernardino Avenue, incorporating the majority of the helicopter training flight tracks. This is consistent with the description of the ITZ requirements for aircraft flying less than 500 feet AGL. It should be noted that City Council established the helicopter traffic pattern to be 1,000 feet north of San Bernardino Avenue via Resolution 6152. Resolution 6152 is not consistent with the State of California Airport Permit SBd-032. As stated in the Handbook, helicopters have distinct noise characteristics and usually follow different flight tracks than those used by airplanes. Therefore, the location of common helicopter flight tracks and helicopter overflights may be appropriate to consider in compatibility planning.

Additionally, the 14 CFR Part 77 conical surface from Redlands Municipal Airport was used to define the TPZ and AIA. The conical surface defines the airport air traffic airspace per FAA's guidelines and is a good indicator of where aircraft will be flying in the airport vicinity. The TPZ/AIA encompasses a slightly larger area than the example provided in the Handbook and in the 2003 ALUCP. **Table 1** provides the compatibility criteria and **Exhibit 6** depicts the updated ALUCP safety zones.

Safety Zone and Criteria Comparison

Table 1 is color-coded to correlate the existing 2003 ALUCP safety zones and the safety zones based on the 2011 Handbook that are similar in description and level of risk. The A and RPZ zones (shaded red in **Table 1**) in both the 2003 ALUCP and updated scenarios provide similar compatibility criteria. However, the updated safety RPZ zone is larger and matches FAA's criteria for RPZ.

The (shaded yellow in **Table 1**) B1, IADZ, ITZ, and SSZ zones are similar in risk level and in size. The 2003 ALUCP B1 zone does extend approximately 400 feet farther south than the updated IADZ, ITZ, and SSZ safety zones. The 2003 ALUCP is more restrictive in the B1 zone for new residential land uses (0.1 dwelling per 10 acres compared to 1 dwelling unit per 10-20 acres). Nonresidential intensity (number of people allowed per acre) and open land requirements between these zones are similar.

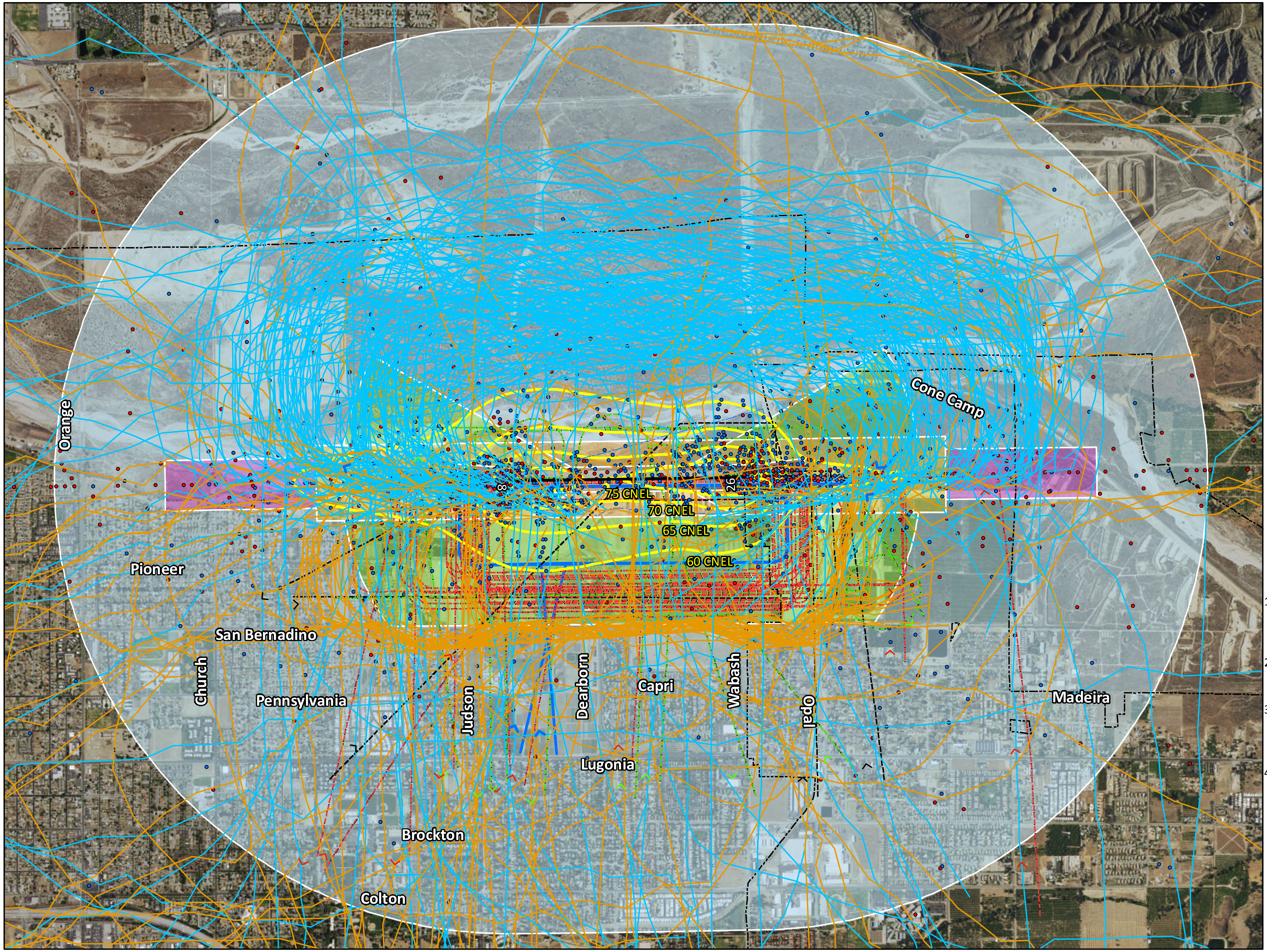
The 2003 ALUCP zone B2 and the OADZ are similar in risk (shaded blue in **Table1**). The B2 zone is split into two areas. The first covers the outer approach/departure area west of the airport and the second covers the helicopter traffic pattern area to the south of the airport. There is no outer approach/departure zone defined east of the airport in the existing ALUCP. The residential density criteria are similar between the existing ALUCP and updated zones. Nonresidential intensity and open land requirements are more restrictive in the 2003 ALUCP for these zones.

The C and D zones in the existing 2003 ALUCP and the TPZ/AIA are low risk areas generally representing the traffic pattern airspace for Redlands Municipal Airport (shaded orange in **Table 1**). Based upon the flight track data from **Exhibit 5**, the Part 77 conical surface used to define the TPZ /AIA provides a better representation of where aircraft fly in the vicinity of the airport. The C and D zones have no development restrictions. The TPZ/AIA suggest some intensity limitations and a 10 percent open land requirement. Further discussion regarding flight operations can be found in Section 4 of this document.

Recommendations

The following recommendations for updating the 2003 ALUCP should be considered in order to meet the 2011 Handbook guidelines:

- Updated safety zones should be developed based upon the FAA and Caltrans approved 2008 ALP for Redlands Municipal Airport.



LEGEND

ANOMS Flight Tracks

- Fixed Wing
- Helicopter
- City of Redlands
- Airport Property
- RunwayCenterline
- Arrival Accidents [1]
- Departure Accidents [1]
- 2027 Noise Contours [2]
- Training Helo Tracks [3]
- Other Helo Tracks [3]
- Fixed Wing Tracks [3]
- Helo Training Patterns [3]

Safety Zones [4]

- 1 Runway Protection Zone
- 2 Inner Approach/Departure Zone
- 3 Inner Turning/Low Traffic Pattern Zone
- 4 Outer Approach/Departure Zone
- 5 Sideline Zone
- 6 Airport Influence Area

Imagery Source: ESRI Basemap Imagery, 2014
Basemap Source: City of Redlands

1 Accident Data: California Airport Land Use Planning Handbook, 2011 - Nominalized from other airports across the U.S.

2 Final Airport Master Plan for Redlands Municipal Airport, Nov. 18, 2008

3 Redlands Municipal Airport Flight Operations Review and Analysis for the city of Redlands, Sept. 21, 2012

4 California Airport Land Use Planning Handbook Oct. 2011 and Coffman Associates Analysis

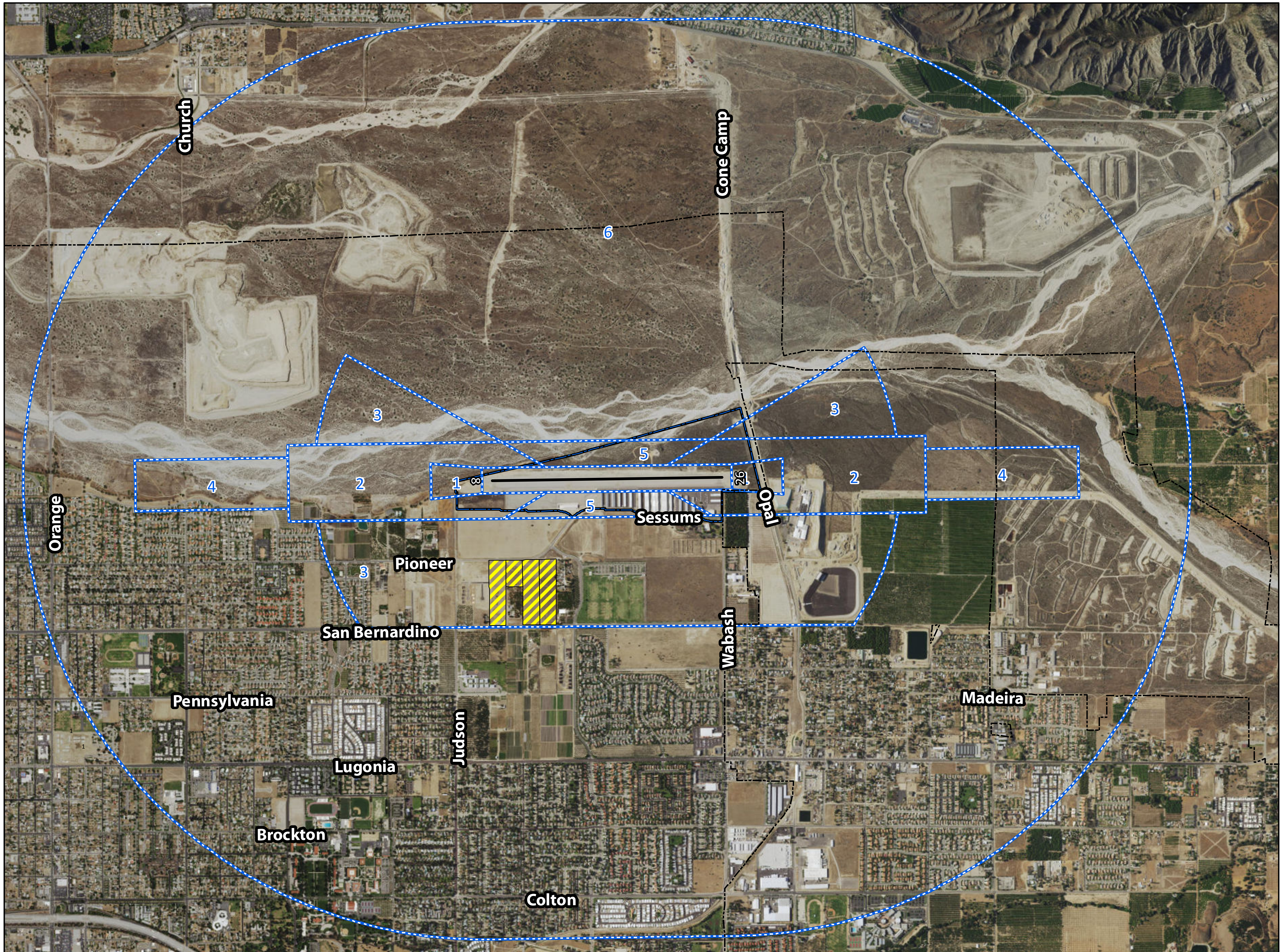
N

0 1,000 2,000 4,000

1" =2,000ft

Exhibit 5
COMPATABILITY FACTORS MAP

This page intentionally left blank



LEGEND

- City of Redlands
- Airport Property
- Runway Centerline
- Proposed Airport Safety Zones
  - 1 - Runway Protection Zone
  - 2 - Inner Approach/Departure Zone
  - 3 - Inner Turning/Low Traffic Pattern Zone
  - 4 - Outer Approach/Departure Zone
  - 5 - Sideline Zone
  - 6 - Airport Influence Area
- Airport Property
- Proposed Development

Imagery Source: ESRI Basemap Imagery, 2014 Basemap Source: City of Redlands

[1] California Airport Land Use Planning Handbook,Oct. 2011 and Coffman Associates Analysis

0 1,000 2,000 4,000

1" =2,000ft

Source: ESRI Basemap Imagery 2014

Exhibit 6

UPDATED ALUCP SAFETY ZONES

This page intentionally left blank

- The City should analyze and select the appropriate helicopter training pattern, amend the Airport's Rules and Regulations, Airport Permit, and FAA's Airport Facility Directory. Additionally, a pilot education program, including a pilot's guide/brochure, should be completed on the selected helicopter training pattern. Safety zones boundary for helicopters training should be based upon selected helicopter training pattern flight tracks, specified traffic pattern altitude for these operations, and standard rate turn radius for common helicopters operating at the airport. These elements are discussed further in Section 4 of this report.
- Updated safety compatibility criteria should be used based upon the 2011 Handbook.
- The 14 CFR Part 77 airspace drawing from the 2008 Redlands Municipal Airport Layout Plan set should be used to define the airspace protection surfaces for the ALUCP update.

SECTION 3: REDLANDS MUNICIPAL AIRPORT MASTER PLAN CONSISTENCY REVIEW

This section provides a consistency review of the 2003 ALUCP and the 2008 *Redlands Municipal Airport Master Plan* (AMP). Specifically, runway, noise exposure contours, aviation forecasts, and airspace protection surfaces from the 2003 ALUCP will be compared to the AMP.

2003 Redlands Airport Land Use Compatibility Plan

The ALUCP was originally adopted by the Redlands City Council on February 18, 1997 and revised in May 2003. This ALUCP was based upon the Handbook published by CALTRANS in 1993. The future runway configuration from the 1993 airport layout plan (ALP) was used as the basis for the safety and airspace zones (see **Exhibit 7**). The 1993 ALP planned for Runway 8-26 to be extended to 5,310 feet with displaced thresholds on each runway end.

Helipad facilities were planned on the west side of the ramp area south of Runway 8-26. City Council passed Resolution 6152 that planned for the elimination of Zone B2 when helicopter flight training is permanently discontinued. Discontinuance of flight training was defined in Resolution 6152 to involve construction of a training helipad north of Runway 8-26 or could be accomplished through flight procedure changes. This resolution also shifted the southern boundary of the helicopter training pattern 1,000 feet north of San Bernardino Avenue.

Noise exposure contours were developed using aviation forecasts from the 1993 AMP which includes 100,980 fixed-wing operations and 1,020 helicopter operations. **Table 3** summarizes the ALUCP baseline information.

2008 Redlands Municipal Airport Master Plan

The Redlands City Council unanimously approved the Redlands Municipal Airport Master Plan on November 18, 2008. The Federal Aviation Administration conditionally approved the ALP prepared as part of the Redlands Municipal Airport Master Plan on January 19, 2010 (see **Exhibit 8**). The 2008 AMP recommended that the current length of Runway 8-26 remain 4,505 feet throughout the long range planning period. The runway threshold displacements identified in the 1993 AMP were no longer in place at the time the 2008 AMP was prepared.

TABLE 3
Airport Land Use Compatibility Plan
Information Comparison

Category	ALUCP[1]	2008 AMP[2]	Current Condition
Runway Length	5,310[3]	4,505	4,504[4]
Displaced Thresholds	Runway 8- 900’ Runway 26- 800’	None	None
Helipad	Southwest Ramp	South Ramp Area	South Ramp Area
Traffic Pattern	<u>Fixed Wing</u> Runway 8- Right Runway 26- Left <u>Helicopter</u> Runway 8- Left Runway 26- Right	<u>Fixed Wing</u> Runway 8- Right Runway 26- Left <u>Helicopter</u>[5] Runway 8- Left Runway 26- Right	<u>Fixed Wing</u> Runway 8- Right Runway 26- Left <u>Helicopter</u>[6] Runway 8- Left Runway 26- Right
Approaches	Visual	Non-precision GPS A Circling	Non-precision GPS A[7] Circling
Existing Operations	Fixed Wing-64,905 Helicopter- 195	Fixed Wing-80,300 Helicopter- 1,700	Fixed Wing-70,100[8] Helicopter- 6,900[9]
Forecast Operations	Fixed Wing-100,980 Helicopter- 1,020	Fixed Wing-146,000 Helicopter- 3,000	NA

1 Redlands Municipal Airport Land Use Compatibility Plan as revised in May 6, 2003
2 Redlands Municipal Airport Master Plan, November 18, 2008
3 1993 Airport Master Plan extended Runway 8 350’ to the west and Runway 26 450’ to the east.
4 Federal Aviation Administration Facility Directory, October 2015
5 Per City Council Resolution 6152, it was deemed advisable and desirable to relocate the southern boundary of the helicopter flight training pattern 1,000 feet to the north of San Bernardino Avenue
6 Based upon coordination between FAA, City of Redlands, and Aero Tech Academy, established the southern boundary of the helicopter traffic pattern approximately 600 feet north of San Bernardino Avenue
7 Federal Aviation Administration Approach Plate, October 2015
8 Federal Aviation Administration’s *Model for Estimating General Aviation Operations at Non-Towered Airports* (See Appendix A for the details on this analysis)
9 Operator estimate of 100 hours of training per month with four approaches and four departures per hour.

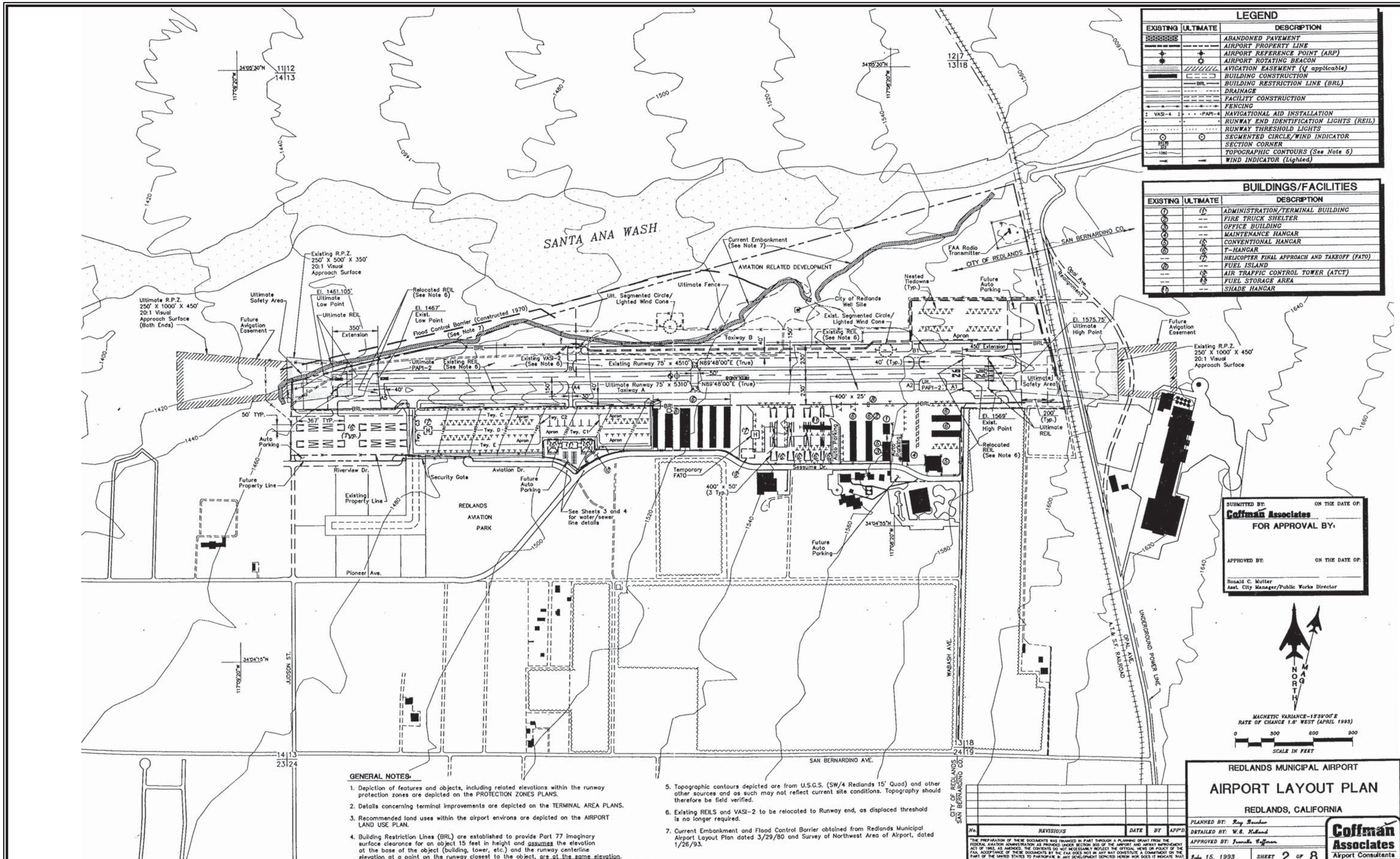


Exhibit 7
1993 AIRPORT LAYOUT PLAN

This page intentionally left blank

RUNWAY DATA

RUNWAY DATA	RUNWAY 8-26			
	EXISTING		ULTIMATE	
	8	26	8	26
AIRCRAFT APPROACH CATEGORY-DESIGN GROUP	B-I [1]		B-I [1]	
APPROACH VISIBILITY MINIMUMS (LOWEST)	1 MILE	1 MILE	1 MILE	1 MILE
CRITICAL AIRCRAFT	BEECH KING AIR F90		BEECH KING AIR F90	
CRITICAL AIRCRAFT WINGSPAN	45.9'		45.9'	
CRITICAL AIRCRAFT UNDERCARRIAGE WIDTH	13.0'		13.0'	
CRITICAL AIRCRAFT APPROACH SPEED (KNOTS)	108		108	
CRITICAL AIRCRAFT MAXIMUM CERTIFIED TAKEOFF WEIGHT (LBS.)	10,950		10,950	
14 C.F.R. PART 77 CATEGORY	C	C	C	C
PERCENTAGE OF WIND COVERAGE (ALL WEATHER IN MPH)	97.21%-12/97.67%-15/98.13%-18/98.83%-23		97.21%-12/97.67%-15/98.13%-18/98.83%-23	
LINE OF SIGHT REQUIREMENT MET	YES		YES	
MAXIMUM ELEVATION (ABOVE MSL)	1574.2		1574.2	
LOWEST ELEVATION (ABOVE MSL)	1471.5		1471.5	
RUNWAY DIMENSIONS	4,505' x 75'		4,505' x 75'	
RUNWAY BEARING (TRUE BEARING - DECIMAL DEGREES)	89.6615	296.6698	89.6615	296.6698
RUNWAY APPROACH SURFACES (14 C.F.R. PART 77)	20:1	20:1	20:1	20:1
RUNWAY END ELEVATION	1468.8	1571.4	1468.8	1571.4
RUNWAY THRESHOLD DISPLACEMENT	0'	0'	0'	0'
RUNWAY THRESHOLD SITING REQUIREMENTS (APPENDIX 2, CATEGORY)	2	2	2	2
RUNWAY STOPWAY	0'	0'	0'	0'
RUNWAY SAFETY AREA (RSA)	4,985' x 120'		4,985' x 120'	
RUNWAY SAFETY AREA (RSA) BEYOND RUNWAY STOP END	240'	240'	240'	240'
RUNWAY OBSTACLE FREE ZONE (OFZ)	4,905' x 120'		4,905' x 120'	
RUNWAY OBSTACLE FREE ZONE (OFZ) BEYOND RUNWAY STOP END	200'	200'	200'	200'
RUNWAY OBJECT FREE AREA (OFA)	4,822' x 250'		4,985' x 250'	
RUNWAY OBJECT FREE AREA (OFA) BEYOND RUNWAY STOP END	77'	240'	240'	240'
RUNWAY PAVEMENT SURFACE MATERIAL	ASPHALT		ASPHALT	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.) [2]	12.5(S)		12.5(S)	
RUNWAY EFFECTIVE GRADIENT	2.28%		2.28%	
RUNWAY MAXIMUM GRADIENT	2.28%		2.28%	
RUNWAY TOUCHDOWN ZONE ELEVATION (ABOVE MSL)	1556.4	1551.2	1556.4	1551.2
RUNWAY MARKING	BASIC	BASIC	NONPRECISION	NONPRECISION
RUNWAY LIGHTING	MIRL		MIRL	
RUNWAY APPROACH LIGHTING	NONE	NONE	NONE	NONE
RUNWAY TO TAXIWAY SEPARATION (FROM CENTERLINE TO CENTERLINE)	150'		150'	
RUNWAY HOLD LINE POSITION (FROM RUNWAY CENTERLINE)	125'		125'	
TAXIWAY TO TAXILANE SEPARATION (FROM CENTERLINE TO CENTERLINE)	69'		69'	
TAXIWAY CENTERLINE TO FIX OR MOVEABLE OBJECT	44.5'		44.5'	
TAXIWAY LIGHTING	MITL		MITL	
TAXIWAY MARKING	CENTERLINE		CENTERLINE	
TAXIWAY SURFACE MATERIAL	ASPHALT		ASPHALT	
TAXIWAY WINGTIP CLEARANCE	20'		20'	
TAXIWAY WIDTH	40' TO 116'		40' TO 116'	
TAXIWAY SAFETY AREA WIDTH	49'		49'	
TAXIWAY OBJECT FREE AREA WIDTH	89'		89'	
RUNWAY VISUAL NAVIGATIONAL AIDS	REIL PAPI-2L	REIL	REIL PAPI-2L	REIL PAPI-2L

[1] Small aircraft exclusively.
[2] Pavement strengths are expressed in Single(S) wheel loading capacities.

AIRPORT DATA

REDLANDS MUNICIPAL AIRPORT (REI)

CITY: REDLANDS, CALIFORNIA | COUNTY: SAN BERNARDINO, CA | RANGE: 3 W | TOWNSHIP: 1 S

		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		GENERAL AVIATION	GENERAL AVIATION
AIRPORT REFERENCE CODE		B-I [1]	B-I [1]
DESIGN AIRCRAFT		BEECH KING AIR F90	BEECH KING AIR F90
AIRPORT ELEVATION		1571.4 MSL	1571.4 MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		94° F (AUGUST)	94° F (AUGUST)
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	LATITUDE	34° 05' 06.940" N	34° 05' 06.940" N
	LONGITUDE	117° 08' 46.960" W	117° 08' 46.960" W
AIRPORT AND TERMINAL NAVIGATIONAL AIDS		SEGMENTED CIRCLE PAPI-2L (8) GPS-A	SEGMENTED CIRCLE PAPI-2L GPS-A ATCT
GPS APPROACH		YES	YES

[1] Small aircraft exclusively.

RUNWAY END COORDINATES (NAD 83)

RUNWAY		EXISTING	ULTIMATE
Runway 8	Latitude	34° 05' 06.810" N	34° 05' 06.810" N
	Longitude	117° 09' 13.740" W	117° 09' 13.740" W
Runway 26	Latitude	34° 05' 07.070" N	34° 05' 07.070" N
	Longitude	117° 08' 20.190" W	117° 08' 20.190" W

VICINITY MAP

LOCATION MAP

ULTIMATE BUILDINGS/FACILITIES

BLDG. NO.	DESCRIPTION
101	TERMINAL BUILDING
102	AIR TRAFFIC CONTROL TOWER (ATCT)
103	CONVENTIONAL HANGAR
104	CONVENTIONAL HANGAR
105	CONVENTIONAL HANGAR
106	CONVENTIONAL HANGAR
107	CONVENTIONAL HANGAR
108	CONVENTIONAL HANGAR
109	CONVENTIONAL HANGAR
110	CONVENTIONAL HANGAR
111	STORAGE HANGAR
112	STORAGE HANGAR
113	STORAGE HANGAR
114	STORAGE HANGAR
115	STORAGE HANGAR
116	STORAGE HANGAR
117	STORAGE HANGAR
118	STORAGE HANGAR
119	STORAGE HANGAR
120	STORAGE HANGAR
121	STORAGE HANGAR
122	STORAGE HANGAR
123	STORAGE HANGAR
124	STORAGE HANGAR
125	STORAGE HANGAR
126	STORAGE HANGAR
127	STORAGE HANGAR
128	STORAGE HANGAR
129	AIRCRAFT WASH RACK
130	AIRPORT MAINTENANCE
131	CONSOLIDATED FUEL STORAGE

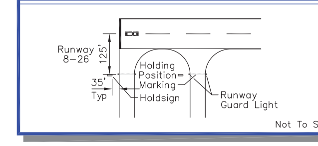
EXISTING BUILDINGS/FACILITIES

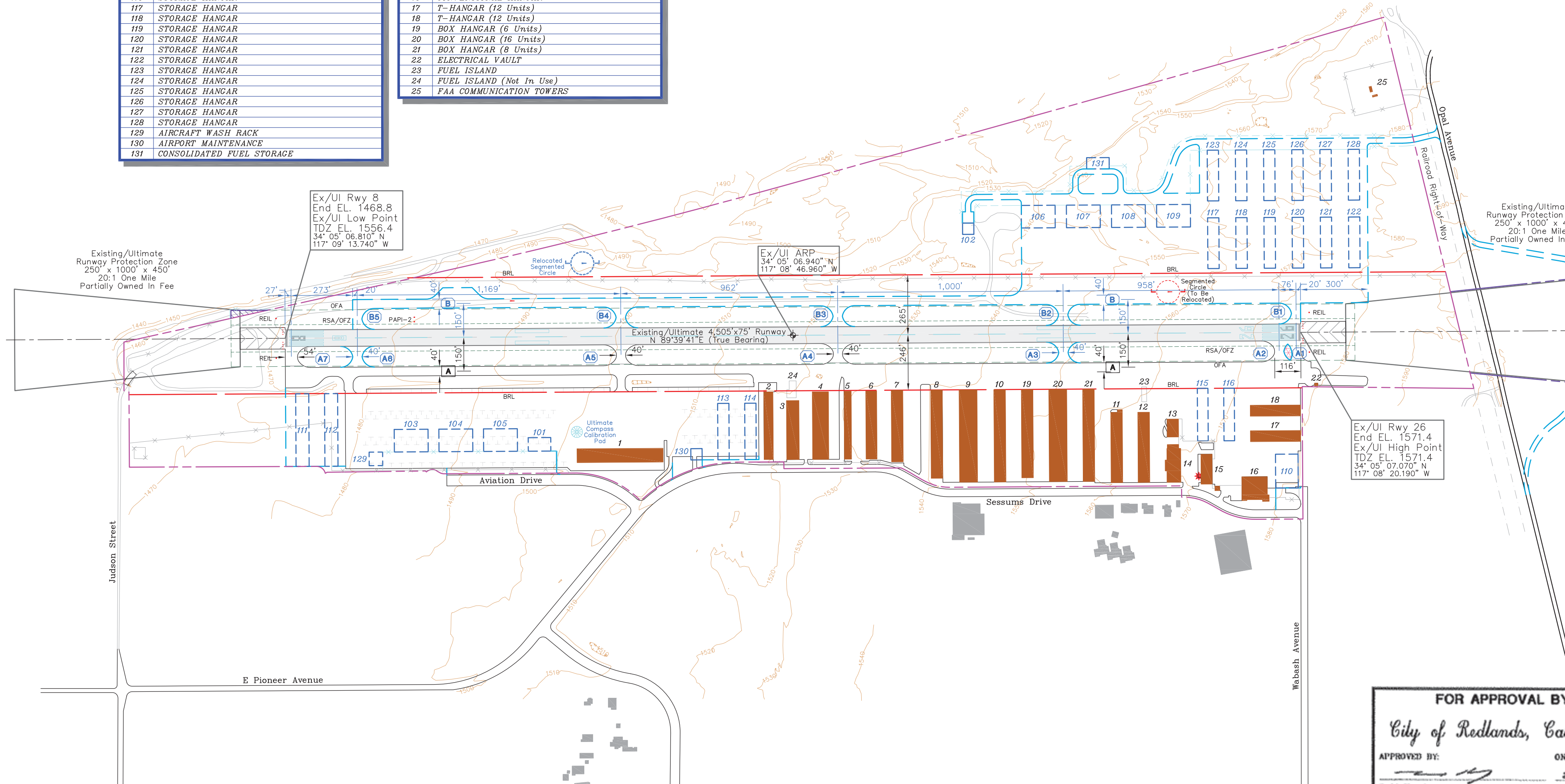
BLDG. NO.	DESCRIPTION
1	T-HANGAR (16 Units)
2	BOX HANGAR (12 Units)
3	T-HANGAR (11 Units)
4	BOX HANGAR (12 Units)
5	BOX HANGAR (7 Units)
6	BOX HANGAR (14 Units)
7	BOX HANGAR (14 Units)
8	BOX HANGAR (6 Units)
9	BOX HANGAR (16 Units)
10	BOX HANGAR (8 Units)
11	T-HANGAR (14 Units)
12	T-HANGAR (14 Units)
13	TERMINAL BUILDING
14	CONVENTIONAL HANGAR (3 Units)
15	CONVENTIONAL HANGAR
16	CONVENTIONAL HANGAR
17	T-HANGAR (12 Units)
18	T-HANGAR (12 Units)
19	BOX HANGAR (6 Units)
20	BOX HANGAR (16 Units)
21	BOX HANGAR (8 Units)
22	ELECTRICAL VAULT
23	FUEL ISLAND
24	FUEL ISLAND (Not In Use)
25	FAA COMMUNICATION TOWERS

THRESHOLD SITING SURFACE OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
RUNWAY 26 - ROAD	6'	RELOCATE ROAD

HOLDING POSITION MARKINGS/SIGN





OBSTACLE FREE ZONE (OFZ) OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
Fence Off End Of Runway 8	1'	Lease Property/Relocate Fence

LEGEND

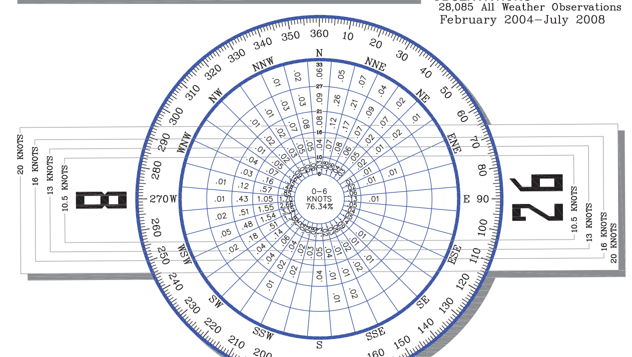
EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		LEASE PARCEL
PAPI-2	PAPI-2	PRECISION APPROACH PATH INDICATOR
xOFA	uOFA	RUNWAY OBJECT FREE AREA
xOFZ	uOFZ	RUNWAY OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE (RPZ)
xRSA	uRSA	RUNWAY SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
34 35 3 2	34 35 3 2	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
A1	B1	TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
1080	1080	TOPOGRAPHY
		WIND INDICATOR (Lighted)

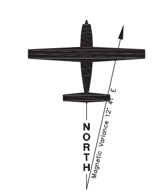
ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 8-26	97.21%	97.67%	98.13%	98.83%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
San Bernardino International Airport (SBD)
San Bernardino, California

OBSERVATIONS:
28,085 All Weather Observations
February 2004-July 2008





Magnetic Variance
12° 41' East (August 2008)
Annual Rate of Change
00° 05' West (August 2008)

0 300 600
SCALE IN FEET

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway depicted on the INNER PORTION APPROACH SURFACE DRAWINGS.
2. Building Restriction Line (BRL) is established in accordance with 14 C.F.R. Part 77 criteria.
3. All Elevations are in NAVD 88.
4. Fence extends along property line except where shown.
5. There are no Primary Airport Control (PAC) or Secondary Airport Control (SAC) points within five miles of Redlands Municiapl Airport (REI).

FOR APPROVAL BY:

City of Redlands, California

APPROVED BY: ON THE DATE OF: 2-3-2010

Todd Housley
Airport Manager

FAA APPROVAL STAMP

Approved conditionally JAN 19 2010
Subject to comments contained in our letter dated JAN 19 2010
FEDERAL AVIATION ADMINISTRATION
Western-Pacific Region
By
Manager - LAX/ADO

NO.	REVISIONS	BY	DATE APP'D.

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982., AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN, NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

REDLANDS MUNICIPAL AIRPORT (REI)

AIRPORT LAYOUT PLAN

REDLANDS, CALIFORNIA

PLANNED BY: Christopher M. Hugunin
DETAILED BY: Richard A. Lally
November 18, 2008 SHEET 1 OF 6

Coffman Associates Airport Consultants

Exhibit 8
2008 AIRPORT LAYOUT PLAN

This page intentionally left blank

Dedicated helipad facilities were studied in the 2008 AMP but the area north of Runway 8-26 was deemed necessary for future landside development and sufficient area is not available on the south of the runway for this type of facility. As a result of these findings, it was determined that helicopters would continue to operate to Taxiway A and portions of the west apron on the south side of Runway 8-26.

Redlands Municipal Airport also has a Global Positioning System (GPS) non-precision approach to the airport which was not available in 1993. Long range aviation forecasts for Redlands Municipal Airport were projected to reach 146,000 annual operations for fixed-wing aircraft and 3,000 for helicopters. **Table 3** summarizes the 2008 AMP baseline information.

Current Conditions

Federal Aviation Administration's October 2015 Facility Directory lists Redlands Municipal Airport with a runway length of 4,504 feet with a GPS approach to the airport. Helicopter operations continue to operate to Taxiway A and portions of the west apron on the south side of Runway 8-26.

Concern over helicopter noise raised by residents in neighborhoods located in Mentone (located southeast of the intersection of San Bernardino Avenue and Wabash) resulted in adjustments to the southern boundary of the helicopter training pattern. Based on an interview with the manager of the fixed base operator, coordination between FAA, City of Redlands, and Aero Tech Academy (ATA) was undertaken in 2012 regarding relocation of the southern boundary of the helicopter traffic pattern to an alignment approximately 600 feet north of San Bernardino Avenue.[2] The City has no record of this meeting and no City Council action was taken on this helicopter pattern coordination effort.

The helicopter training school, ATA, is under new management since the 2008 AMP was completed. The helicopter training school focuses on international pilot training and has increased its annual operations to approximately 6,900, based on an interview with the owner of ATA.[3] This exceeds the 2008 AMP forecast for helicopter operations by more than 100 percent.

Consistency Determination

The 2008 AMP and 2008 ALP are not consistent with the 2003 ALUCP for the following reasons:

- The planned runway length from these two documents is not the same.
- The airport no longer has displaced runway thresholds.

[2] Jim Ott, interview by Kory Lewis, Redlands Municipal Airport, October 14, 2015.
[3] Nobumsa Ezuka, interview by Kory Lewis, Redlands Municipal Airport, October 14, 2015.

- The Title 14 of the Code of Federal Regulations (CFR) Part 77 airspace surfaces that are based upon the runway are not the same.
- The helipad planned in the 1993 AMP on the southwest side ramp was not carried forward in the 2008 AMP.
- As indicated in **Table 3** and **Exhibit 15** (see Section 6), future aviation forecast operations and corresponding noise exposure contours are noticeably different.

As previously discussed, PUC Section 21675(a) requires that each ALUCP "shall include and be based either on a long range master plan or an airport layout plan, as determined by the Division of Aeronautics of the California Department of Transportation, that reflects the anticipated growth of the airport during at least the next 20 years." When an airport layout plan (ALP) or AMP is amended, the ALUC must review their ALUCP for any changes that may be needed as a result of the airport updating its plan(s) Section 1.3.1 of the Handbook.

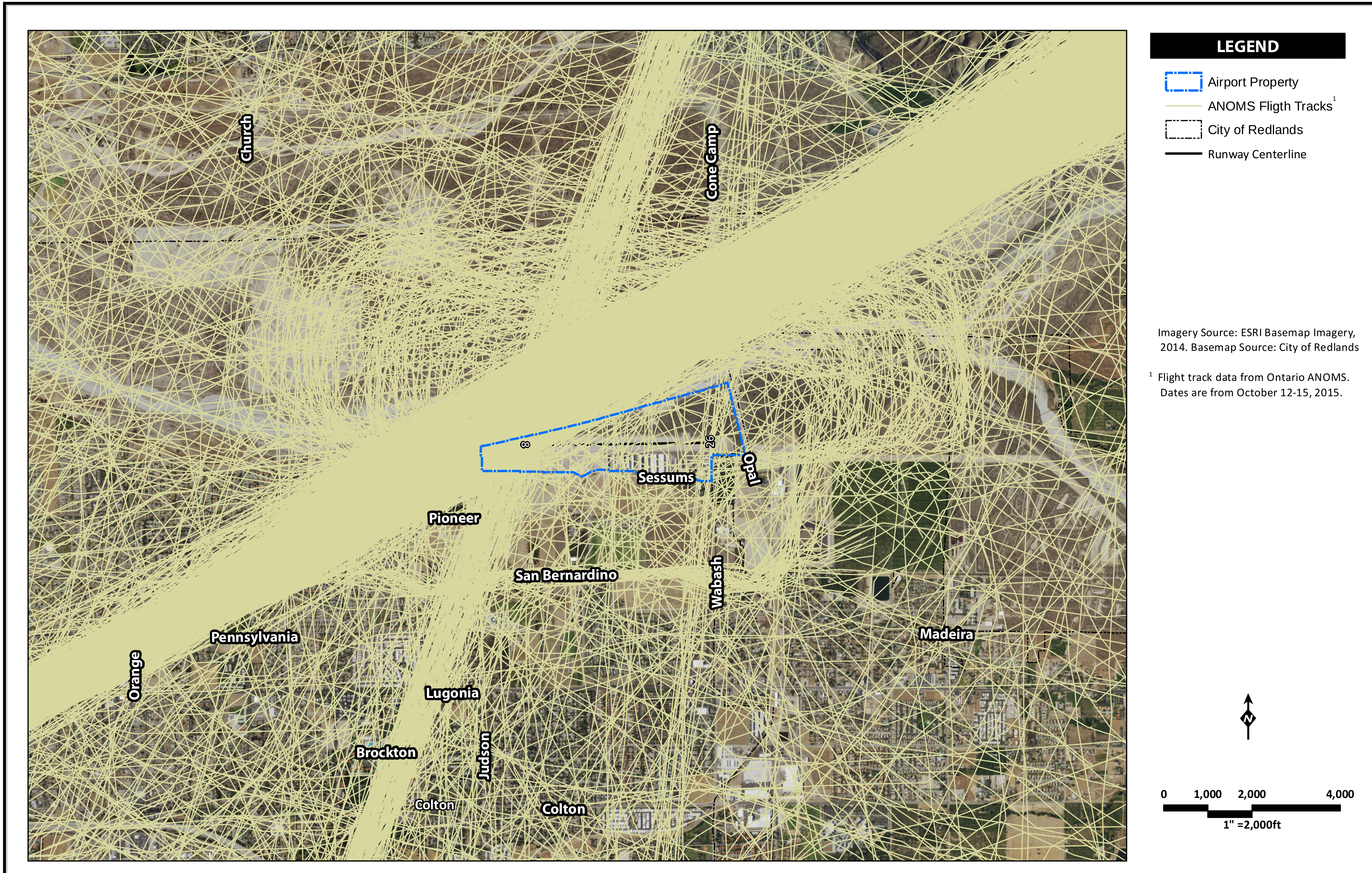
Recommendations

The following measures should be considered by the City of Redlands:

- Per PUC Section 21675(a) and Caltrans guidelines, the 2003 ALUCP should be updated based upon the 2008 AMP and ALP and guidance from the Handbook. This update should include revised noise contours (discussed below), safety zones, and new overflight and airspace protection policies.
- Updated aviation forecasts should be developed based upon operation changes at Redlands Municipal Airport.
- Updated 20-year noise exposure contours should be prepared for the ALUCP update based upon updated aviation forecasts.

SECTION 4: REDLANDS MUNICIPAL AIRPORT OPERATIONAL EVALUATION

Aircraft operations within the vicinity of Redlands Municipal Airport consist of high level overflights by commercial aircraft arriving to and departing from locations west and southwest of Redlands, such as Ontario International Airport (25 miles west), Los Angeles International Airport (70 miles west), and Long Beach Airport (60 miles southwest). As indicated on **Exhibit 9**, which includes radar flight track data from the Ontario International Airport noise and operation monitoring system (ANOMS) for October 12-15, 2015, there are two primary corridors for these flights which occur at more than 5,000 feet above mean sea level (MSL). Based on the data provided, the most heavily used corridor is oriented along a northeast and southwest axis, while the less active corridor is oriented more closely along a north and south axis. These aircraft have sophisticated navigation systems and their pilots are in communication with air traffic controllers which assist pilots by coordinating a route to their destination. In comparison, general aviation traffic, which occurs at Redlands Municipal Airport, relies on pilot-to-pilot communication over aviation radios in a less technically sophisticated manner. This type of airspace environment requires pilots to "see and avoid" other aircraft.



Source: City of Redlands, ESRI Basemap Imagery 2014

Exhibit 9

Vicinity Radar Flight Tracks

This page intentionally left blank

As indicated on **Exhibit 10**, traffic occurring at less than 5,000 feet MSL can be described as traffic pattern activity. The traffic pattern is the flow prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach. For each runway, a traffic pattern direction is specified as either "left" or "right." This information can be found in an airport's entry in the FAA *Airport/Facility Directory,* which includes useful information for pilots intending to operate their aircraft at a particular airport. For aircraft staying within the traffic pattern, the pilot would make a series of left turns which would ultimately align the aircraft with the runway for landing. Repetition of this type of flying is commonly referred to as a touch and go's. Touch and go's are best described as an operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. This maneuver is commonly used by pilots to gain proficiency in landing an aircraft. The path of these flights is generally oval shaped as can be seen on **Exhibit 10**.

As outlined in FAA Advisory Circular, 90-66A, *Recommended Standard Traffic Patterns for Aeronautical Operations at Airports without Operating Control Towers*, aircraft operators, in coordination with the FAA, are responsible for establishing traffic patterns and state that left traffic patterns should be established except where obstacles, terrain, and noise-sensitive areas dictate otherwise.

For operations at Redlands Municipal Airport, the FAA *Airport/Facility Directory* indicates that fixed-wing aircraft using Runway 8 (departing to the east) should fly a standard left-hand traffic pattern (north of the airport) and aircraft using Runway 26 (departing to the west) should fly in a right-hand traffic pattern (north of the airport). The purpose of this deviation from the standard left-hand traffic pattern is to separate helicopter traffic from fixed-wing traffic at the airport. As a result, helicopters performing training operations are located south of the airport. Although performing similar operations, helicopters have different flight characteristics than fixed-wing aircraft; for example, they tend to fly more slowly and approach the airport at steeper angles. There are no specifications for helicopter training in the FAA *Airport/Facility Directory* entry for Redlands Municipal Airport. However, this is specified in Chapter 12.56 of the Redlands Municipal Code at 2,000 MSL, or just under 500 feet AGL.

In addition to specifying the location of the traffic pattern, a traffic pattern altitude is also identified. The typical traffic pattern altitude for fixed-wing aircraft is 1,000 feet AGL and 500 feet AGL for helicopters; however, these may be adjusted based on local conditions. As noted in the FAA *Airport/Facility Directory,* traffic pattern altitude for Redlands Municipal Airport is 2,503 feet MSL or 929 feet AGL. There is no traffic pattern altitude specified in the FAA *Airport/Facility Directory* for helicopter operations at Redlands Municipal Airport.

Helicopter Training Pattern Location History

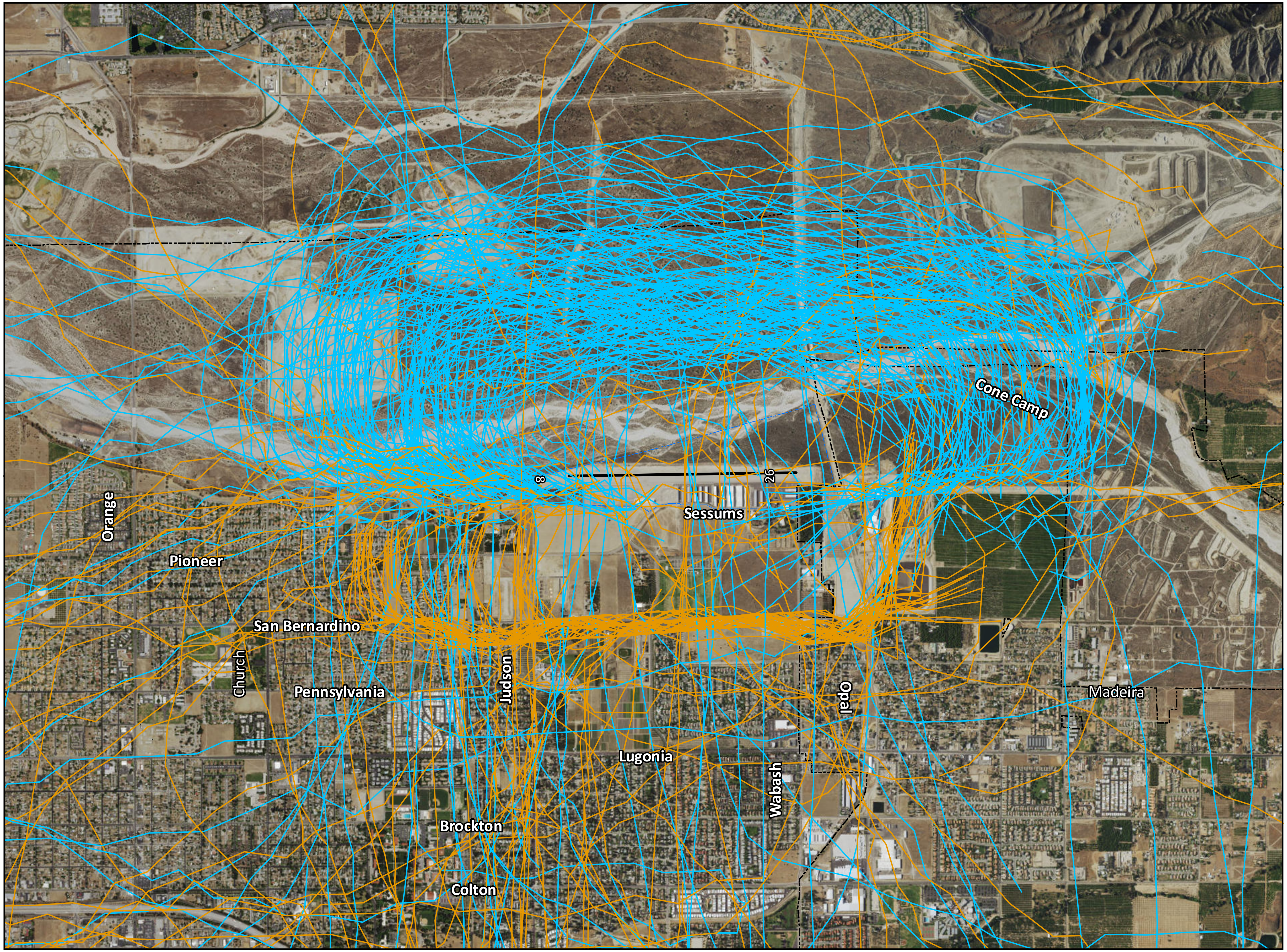
Redlands Municipal Airport has a long history of helicopter training operations. As previously discussed, the location of the traffic pattern to the south of the airport was enacted by the under Chapter 12.56 of the Municipal Code to separate fixed-wing and helicopter operations. The location of the southern edge of the helicopter training pattern has been discussed and reviewed by the City of Redlands at several points dating back to at least 1997. The following items summarize the chronology of events or actions taken by the City of Redlands related to the location of the helicopter training pattern. Supporting information, including copies of City Resolutions, can be found in **Appendix B**.

1971 – Under City Ordinance 1431, the City of Redlands adopted rules and regulations governing the operation of Redlands Municipal Airport. Item 11 under Section C. – Airfield Operations states that the established traffic pattern is a right-hand pattern at an altitude of 2,400 feet MSL.

1997 – Under City Ordinance 2343 and later 2381[4], the City of Redlands adopted the following items related to the traffic pattern as part of the Airport's Rules and Regulations maintained as Chapter 12.56 of the City of Redlands Municipal Code:
12.56.160: Traffic Pattern Establishment: The established traffic pattern is a right-hand pattern at an altitude of two thousand four hundred feet (2,400') above sea level. Aircraft shall enter the traffic pattern from straight and level flight.
12.56.460: Traffic Pattern Information (see **Exhibit 11**):

> "1. The traffic pattern for Runway #26 is right hand; the traffic pattern for Runway #8 is left hand.
>
> 2. The down-wind leg lies north of the runway.
>
> 3. The use of Runway #8 or #26 is dependent on wind conditions. If the easterly wind is over 10 knots, the use of Runway #8 is recommended.
>
> 4. The traffic pattern at Redlands Municipal Airport (RMA) is established at 829 feet above ground level. Ground level at RMA is 1,571 above sea level (MSL). Thus, the altitude of the traffic pattern above sea level at RMA is 2,400 feet MSL.
>
> 5. The cross wind leg for Runway #26 is over the west end of the runway. (Over the 8.)
> 6. For traffic departing on Runway #26 westerly or southerly:
>
> > A. Do not fly over the SBD traffic pattern below 3000 MSL.
> >
> > B. Do not fly over residential areas south of the river wash less than 2200 feet MSL.
> >
> > C. Turn left before reaching Orange Street (the first street west of the airport which crosses the river wash) and west bound traffic follow I-10.

[4] Ordinance 2381 updated item 6 of Section 12.56.460 which does not pertain to traffic pattern location.



LEGEND

ANOMS Flight Tracks

- Fixed Wing [1]
- Helicopter
- Airport Property
- City of Redlands
- Runway Centerline

Imagery Source: ESRI Basemap Imagery, 2014 Basemap Source: City of Redlands

[1] Flight track data from Ontario ANOMS. Dates are from October 12-15, 2015. Tracks filtered for maximum altitude less than 5,000ft.

0 1,000 2,000 4,000

1" =2,000ft

Source: City of Redlands, ESRI Basemap Imagery 2014

Exhibit 10

FLIGHT TRACKS BELOW 5,000FT MSL

This page intentionally left blank

CITY OF REDLANDS MUNICIPAL CODE
Chapter 12.56.460: Traffic Pattern

REDLANDS MUNICIPAL AIRPORT
TRAFFIC PATTERN
(Wind From West)

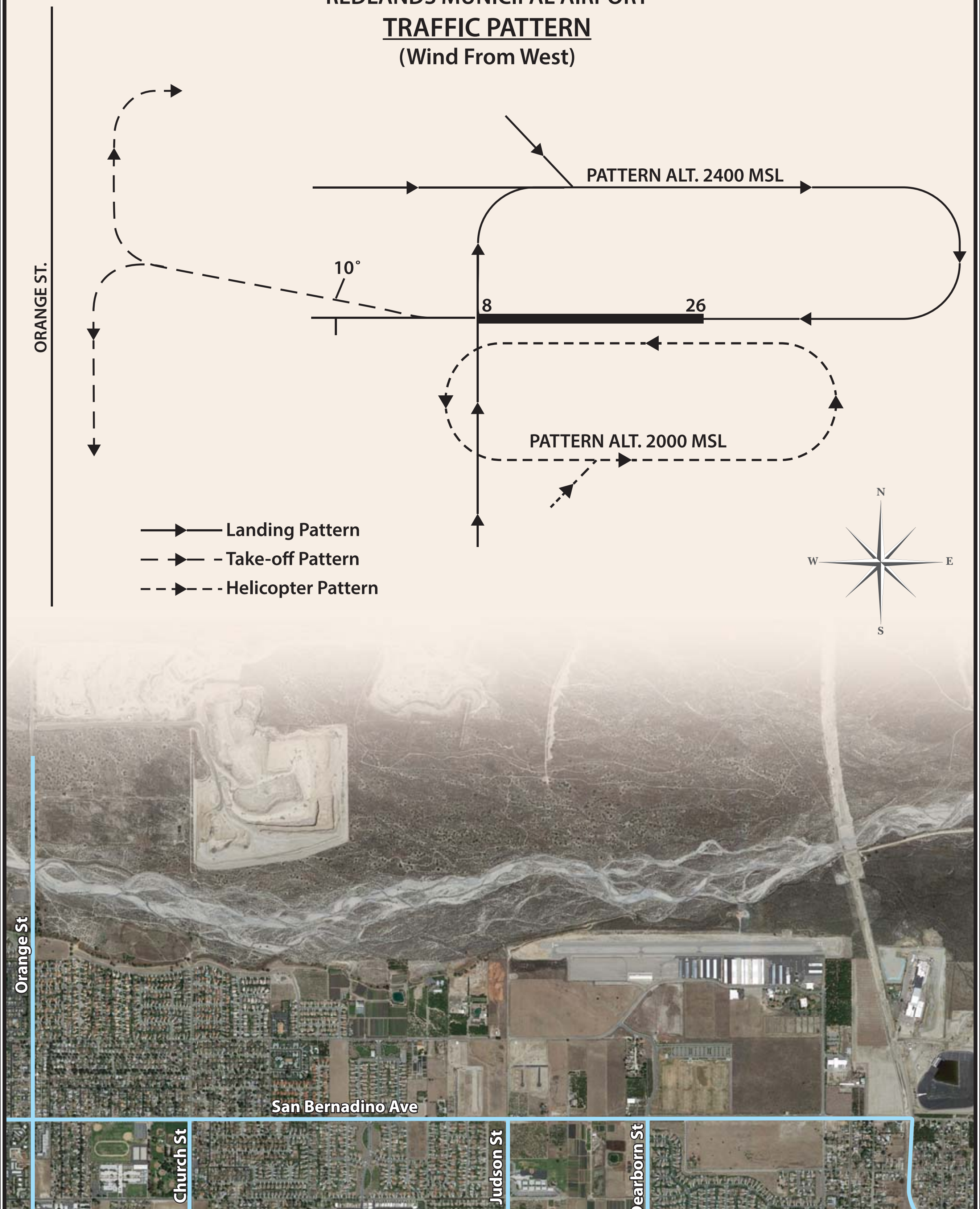


Exhibit 11
REDLANDS MUNICIPAL AIRPORT
TRAFFIC PATTERN

This page intentionally left blank

D. If 2200 feet MSL is not attained before Orange Street, use right hand down wind departure to gain altitude.

7. *No information is listed.*

8. Helicopters operate south of the airport using a left-hand pattern. Helicopter pattern altitude is 2,000 MSL.

9. Runway #8 is suggested as the primary runway for night landings, if winds permit.

10. Aircraft preparing to land at Redlands Municipal Airport must observe the traffic pattern altitude, the direction of turns in the pattern, the use of the down-wind leg, and must exercise discretion concerning wind conditions and other aircraft in the pattern or aircraft preparing to land or take off. The observance of these requirements is essential for safety at the airport.

11. Pilots landing contrary to wind indicator or established pattern assume all responsibility for such action. This practice is discouraged in that it does not promote flying safely."

1997 – Figure 3B of the 1997 Land Use Compatibility Plan depicts the Helicopter Training Pattern on the south side of the airport approximately 300 feet north of San Bernardino Avenue. In that document, Section 2.1.3(b) states:

"Also included within the Redlands Municipal Airport Zone B2 are the standard helicopter approach and departure routes and flight training pattern as currently established south of the airport. The south-side pattern is the result both of the landing site's location south of the runway and the preferred practice of separating helicopter traffic from airplane traffic. The Redlands Airport Advisory Board has recommended to the City Council that the existing helicopter flight training pattern be regarded as an interim pattern for use only until such time as residential development occurs within the area affected. In the meantime, efforts will be made to determine an alternative pattern location potentially on the north side of the airport with construction of a new helipad in the airport's northeast corner). If a future amendment of the airport rules and regulations officially eliminates the present south-side helicopter flight training pattern, most of the Zone B2 adjacent to the south side of the airport can be re-designated as a Zone C. A portion of the area may need to remain as Zone B2 to reflect the flight route of helicopters approaching and departing the airport from and to the south."

1997 – Land Use Compatibility Plan, Appendix H – CEQA Initial Study includes the following discussion and Mitigation Measures to reduce the impact to *Less Than Significant* in the Land Use section:

"The only direct land use designation conflict between the two plans is with respect to the *Very Low-Density Residential* land uses indicated for the area east of Judson Street, between Pioneer Avenue and San Bernardino Avenue south of the airport. This *General Plan* designation allows 2.7 dwelling units per acre. *The Compatibility Plan zone proposed for this area is Zone B2 which limits residential uses to 0.5 dwelling units per acre.* The land use restrictions proposed for this area are a reflection *of* the established helicopter flight training traffic pattern on the south side of the airport. With regard to this conflict, the Redlands Airport Advisory Board has unanimously recommended to the City Council that this helicopter pattern be considered as an interim location. This interim pattern should only be used until such time as development takes place on this residentially zoned property.

The *Compatibility Plan,* however; is based upon aircraft operational procedures which are currently in effect or have been adopted as part of an airport master plan or other official airport policy; leaving the *Zone B2* designation will highlight the fact that a conflict will exist unless specific actions are taken to mitigate the impact. *The Compatibility Plan,* therefore, should continue to indicate a *Zone B2* for this area on the same interim basis as the helicopter pattern.

One alternative location for a future training helipad is on existing airport property, north of the runway's east end. This location would allow establishment of a helicopter flight training pattern north of the runway over the Santa Ana Wash. Although specifics of any such pattern would need to be examined for land use compatibility in accordance with provisions of the *Compatibility Plan,* no need for land use restrictions additional to those proposed in the plan are anticipated.

The City of Redlands Public Works Department [now Quality of Life Department] should continue to pursue options for an alternative location for a training helipad and associated training pattern. A new helipad and pattern should be established at the earliest opportunity.

The Redlands City Council should adopt an airport operational policy indicating the interim nature of the current helicopter pattern.

At such time as the south-side helicopter flight training pattern is eliminated, the area designated *Zone B2* can be changed to a *Zone D* classification. This classification is consistent with the current *General Plan* land use designations for the area."

2003 – Redlands Municipal Airport Land Use Compatibility Plan Revision:
Section 2.1.3 (b) was revised to state:

"Also included with Compatibility Zone B2 is the area beneath the modified helicopter flight training pattern south of the airport.

(1) Zone B2 as depicted in Figure 2A is reduced in size from the zone originally adopted in the Compatibility Plan in February 1997. The smaller zone

shall become effective as of when the City formally establishes the modified flight patterns as the preferred route for helicopter flight training at the airport.

(2) This Zone B2 segment can be eliminated with the affected area then being placed within Zone C at such time as the helicopter flight training is permanently discontinued. Permanent discontinuance is assumed to involve construction of a training helipad north of the runway, but could be accomplished through flight procedure changes."

2003 – City of Redlands submits FAA Form 7480 – Notice of Landing Area Proposal requesting an airspace review of a proposed change in the southern boundary of the helicopter training pattern from San Bernardino Avenue to a location 1,000 feet north of San Bernardino Avenue at 2,000 feet MSL. This form was also transmitted to Caltrans for review. In their response, FAA states that the change in the helicopter traffic pattern "is acceptable from an airspace utilization standpoint." FAA and Caltrans had no objection to the proposal, provided the following conditions were met:

a. The landing area operator shall ensure and maintain obstruction-free routes of ingress/egress to the landing area.
b. The proposed change in helicopter flight traffic pattern for the airport may change the size of the noise contours over the community. Therefore, it was recommended that the noise impacts be thoroughly analyzed and evaluated prior to implementation of these changes.
c. Conduct a pilot awareness program to ensure that all users of the airport are thoroughly familiar with this new non-standard pattern configuration.
d. Prior to making any changes to the helicopter flight traffic pattern, the City of Redlands must contact the California Department of Transportation to ensure that the proposed change does not affect the status of the airport permit.

2005 – Commercial helicopter training operations ceased due to death of the owner.

2005 – California Department of Transportation – Division of Aeronautics issues corrected Airport Permit No. SBd-032 for Redlands Municipal Airport which indicates the designated traffic pattern for the airport is right-hand traffic for Runway 26 and left-hand traffic for Runway 8. The permit does not specify different traffic patterns for fixed wing and helicopter traffic.

2008 – Redlands Municipal Airport Master Plan, adopted by Redlands City Council on November 18, 2008, states:

Page 1-7:

"A helicopter training pattern is located south of Runway 8-26 so as to not conflict with the fixed-wing aircraft. Helicopters are asked to maintain as close a pattern to the airport as possible and not extend more than 1,000 feet north of San Bernardino Avenue (approximately 2,000 feet south of Runway 8-26).

Page 5-7:
The area north of Runway 8-26 is planned to accommodate long term growth. This area is planned for T-hangars/box hangars, conventional hangars, a large apron area, a consolidated fuel farm, and a future airport traffic control tower (ATCT). Vehicle access would be via Opal Avenue. Development on the north side of the airport will require utility extensions. No helipad is planned for helicopter operations. The area north of Runway 8-26 is needed for future landside development. Sufficient area is not available on the south side of the runway to accommodate a designated helipad. Helicopters are planned to continue to operate to Taxiway A or portions of the west apron for training activity."

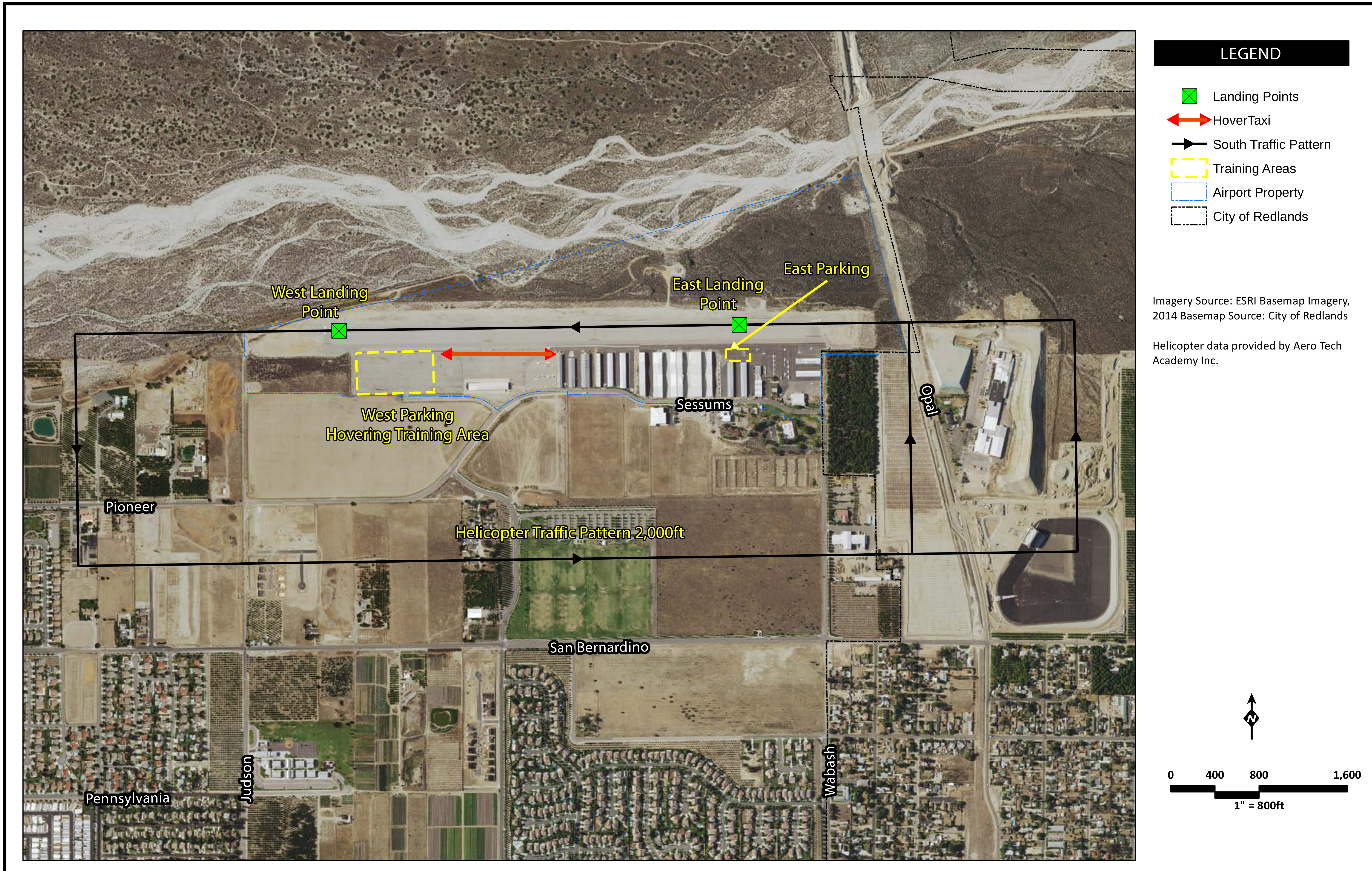
2010 – Current training school opened, begins using San Bernardino Avenue alignment for helicopter training operations.[5]

2012 – Due to complaints from neighborhood in Mentone (located southeast of the intersection of San Bernardino Avenue and Wabash), a meeting between the City of Redlands, FAA and the current training school was held. As a result of the meeting, helicopter training operator adjusted training route to an alignment approximately 600 feet north of San Bernardino Avenue.[6] The City has no record of this meeting and no City Council action was taken on this helicopter pattern coordination effort. This adjustment to the traffic pattern is not consistent with the traffic pattern established in City Council Resolution 6152 and was not brought before the City Council for approval or inclusion in the Airport's rules and regulations. This information is distributed to all student helicopter pilots operating at Redlands Municipal Airport. A current copy of the student guide is included in **Appendix B** and the ATA recommended traffic pattern is depicted on **Exhibit 12**.

In summary, since amendment of the Redlands Municipal Airport Rules and Regulations in 1997, the helicopter training pattern has been located on the south side of the airport. Although acknowledged at times as a temporary condition, this practice has been common at the airport for more than 15 years. However, as previously discussed, there are inconsistencies regarding the correct location of the helicopter traffic pattern. As illustrated on **Exhibit 13**, California Airport Permit SBd-032, reissued on December 5, 2005 indicates the airport traffic pattern for both runway ends is on the north side of the airport; the Airport Rules and Regulations amended on March 18, 1997, outlined in city ordinance Chapter 12.56, indicate the helicopter traffic pattern is on the south side of the airport; City Council Resolution 6152, adopted on May 6, 2003, specifies the helicopter training pattern is on the south side of the airport aligned with Pioneer Avenue; and the current radar flight track data indicates the southern boundary of the helicopter training activity occurs generally between San Bernardino Avenue and a path approximately 600 feet north of San Bernardino Avenue.

Additionally, during preparation of the Master Plan, consideration was given to relocating the helicopter operations to the north side of the airport; however, it was determined that

[5] Jim Ott, interview by Kory Lewis, Redlands Municipal Airport, October 14, 2015.
[6] Jim Ott, interview by Kory Lewis, Redlands Municipal Airport, October 14, 2015.



Source: City of Redlands, ESRI Basemap Imagery 2014

Exhibit 12

ATA RECOMMENDED HELICOPTER TRAINING FLIGHT PATTERN

This page intentionally left blank

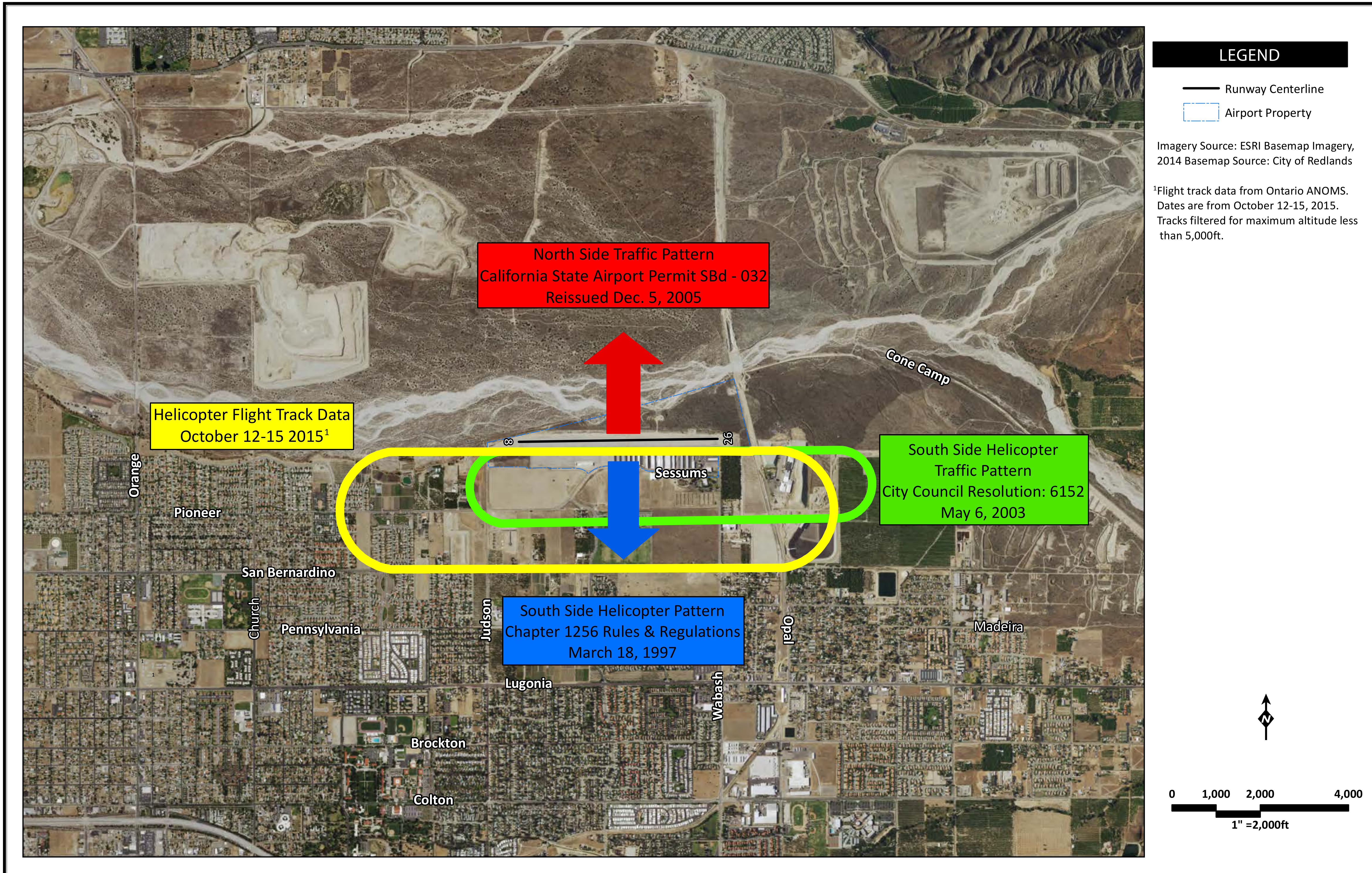


Exhibit 13
HELICPOTER TRAFFIC PATTERN LOCATIONS

This page intentionally left blank

land north of Runway 8-26 is needed for future landside development and sufficient area is not available south of the runway. The Master Plan was unanimously approved by City Council on January 29, 2009. As a result, it was determined that helicopters would continue to operate on the south side of Runway 8-26. As previously mentioned, this is not consistent with Airport Permit No. SBd-032 for Redlands Municipal Airport.

Considerations for Changing the Helicopter Training Pattern

As outlined in FAA AC 90-66A, Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports Without Operating Control Towers, a helicopter operating in the traffic pattern may fly a pattern similar to the airplane pattern at a lower altitude (500 AGL) and closer to the airport. This would essentially create two concentric traffic patterns on the same side of the airport, with the helicopters flying a smaller pattern lower to the ground, and fixed wing aircraft flying a wider pattern at a higher tude. When considering relocating the helicopter traffic pattern to the north side of the airport, it is important to note that helicopter-specific facilities should be considered on the north side of the airfield to prevent helicopters from crossing Runway 8-26 to perform operations. The following bullets outline the general steps that would need to be followed, each of which may require State or Federal grant funding, to provide the facilities to support helicopter training on the north side of the airport:

- Coordination with FAA and airport users/tenants on the safety and feasibility of a traffic pattern change.
- Revise the Airport Layout Plan to depict the proposed helicopter improvements. This would include a helipad, lighting, utilities, training apron, and access roads at a minimum. Additional facilities, such as helicopter hangars and fueling island may also be considered.
- Conduct appropriate National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) documentation.
- Secure engineering and design services for the facilities.
- Construct and maintain the helicopter facilities.
- Amend the Redlands Municipal Airport Rules and Regulations to specify the new location of the helicopter training pattern.
- Amend the State of California Airport Permit to clarify the location of both fixed wing and helicopter traffic patterns and specify the traffic pattern altitude.

Helicopter Training Pattern Dimensions

As discussed above, the location of the southern alignment of the helicopter training pattern has ranged between San Bernardino Avenue to an alignment approximately 300 feet south of Pioneer Avenue. Performance characteristics and safety of aircraft operations should be considered when contemplating adjustments to the traffic pattern; therefore, this discussion is provided for informational purposes only to demonstrate potential operational limitations for shifting the southern alignment of the helicopter traffic pattern farther north consistent with City Council Resolution 6152. Any changes to the helicopter training pattern should be evaluated for safety by the FAA.

When evaluating the alignment of helicopter training, it is important to consider the rate of turn for the aircraft using the traffic pattern. Currently, the aircraft most frequently used for helicopter training at Redlands Municipal Airport is the Robinson R22. As discussed in the FAA's *Pilot's Handbook of Aeronautical Knowledge,* the rate of turn is the number of degrees, expressed in degrees per second, of heading change that an aircraft makes. A standard rate turn is defined as a 3-degree per second turn which results in a 360-degree turn in two minutes and a 180-degree turn in one minute. Two important factors in calculating the radius of the turn are the aircraft's airspeed and bank angle. For the purposes of this discussion, the aircraft's airspeed is the true airspeed expressed in knots. The bank angle is described as the angle at which the longitudinal incline of the aircraft compares to the horizontal axis. When the bank angle is held constant, the rate of turn decreases as the airspeed increases. Therefore, the bank angle must increase as airspeed increases to maintain the same rate of turn. Using this information, the radius of an aircraft's standard rate of turn can be calculated with the following formula (Figure 4-51 from the FAA's *Pilot's Handbook of Aeronautical Knowledge*):

$$R = \frac{V^2}{11.26\ x\ tangent\ of\ bank\ angle}$$

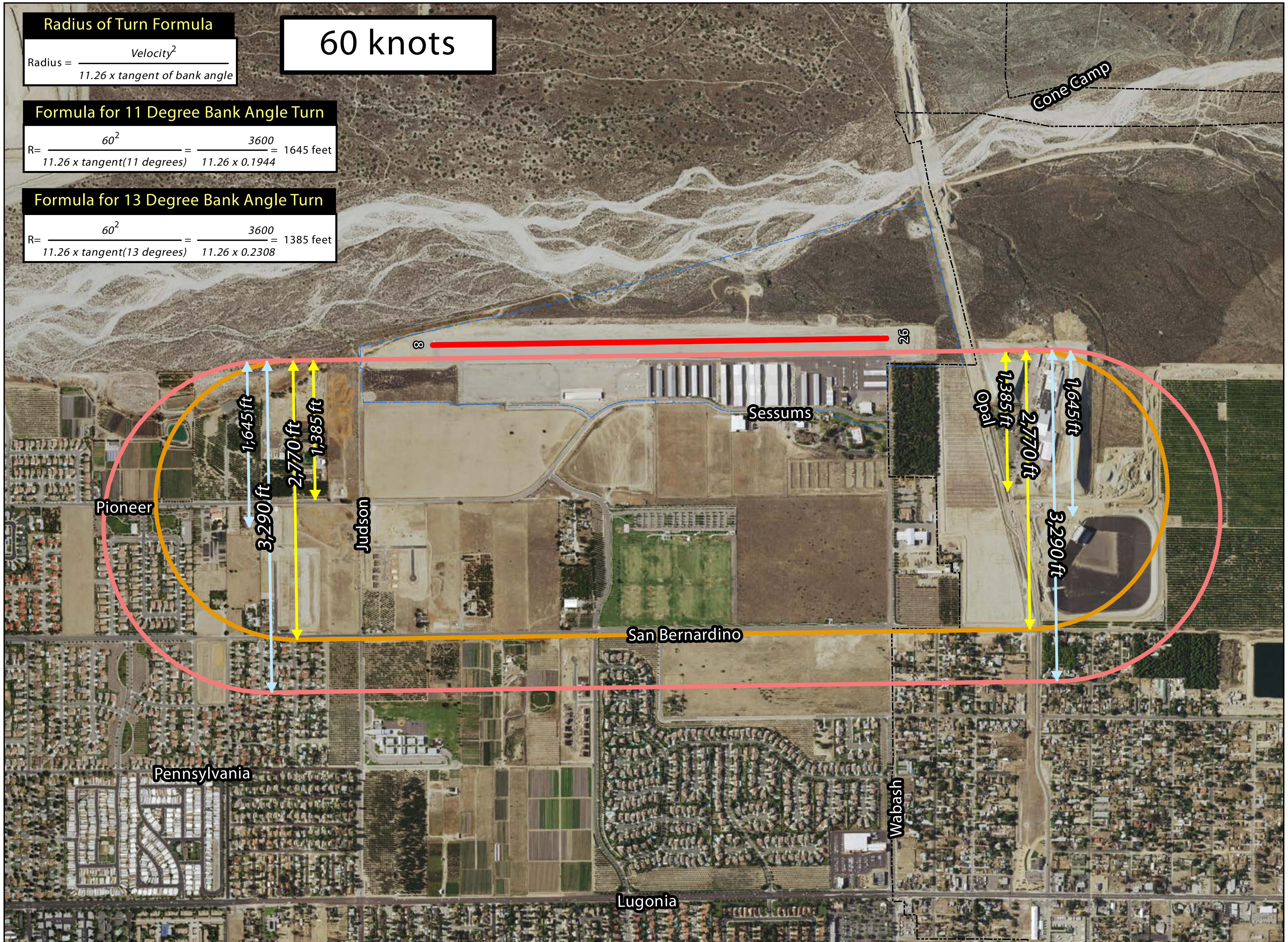
In the formula, V is the velocity of the aircraft in knots, 11.26 is a constant, and the tangent of the bank angle is expressed in radians.

Each aircraft manufacturer is required to prepare a flight manual which is submitted for approval by the FAA. The manual describes all characteristics of the aircraft and recommended operating procedures. As outlined in Section 4 of the Robinson R22 flight manual, the recommended takeoff and climb airspeed is 60 knots. Based on observations of helicopter training at Redlands Municipal Airport, helicopter students generally perform a 15 minute circuit which includes one traffic pattern flight followed by hover taxiing exercises in a training area at the west end of the airport. The student pilots repeat this circuit approximately four times in one hour. From the west training area, the helicopter does a climbing turn to enter the southern traffic pattern. Assuming the aircraft is operating at the recommended 60 knots, the bank angle is assumed to be 11 degrees based on FAA guidance[7]. Using this information, the radius of a standard turn for the Robinson R22 is approximately 1,645 feet and the diameter of the turn is 3,290 feet.

$$R = \frac{60^2}{11.26\ x\ tangent(11\ degrees)} = \frac{3600}{11.26\ x\ 0.1944} = 1645\ feet$$

As depicted on **Exhibit 14**, the standard rate left turn for a helicopter departing from Taxiway A at 60 knots at a bank angle of 11 degrees would result in an alignment south of San Bernardino Avenue. To align with San Bernardino Avenue, the bank angle would need to increase to 13 degrees, which would result in radius of 1385 feet.

[7] Table 2-4, Bank Angles, FAA Order 8260.42B, United States Standard for Helicopter Area Navigation



LEGEND

- 11 Degree Bank Angle Turn at 60kts
- 13 Degree Bank Angle Turn at 60kts
- Airport Property
- City of Redlands
- Runway Centerline

This illustration is provided for informational purposes only to demonstrate potential limitations for shifting the southern alignment of the traffic pattern farther north. Any changes to the helicopter training pattern should be evaluated for safety by the FAA.

Imagery Source: ESRI Basemap Imagery, 2014 Basemap Source: City of Redlands

N

0 500 1,000 2,000

1" = 1,000ft

Source: City of Redlands, ESRI Basemap Imagery 2014

Exhibit 14

EXAMPLE HELICOPTER STANDARD RATE TURNS

$$R = \frac{60^2}{11.26\ x\ tangent(13\ degrees)} = \frac{3600}{11.26\ x\ 0.2308} = 1385\ feet$$

Based on these calculations, shifting the southern alignment of the helicopter training pattern farther north would require reduction in airspeed below the manufacturer's specified airspeed or increasing the bank angle.

Recommendations

- The inconsistencies between the helicopter training pattern specified in the Airport Rules and Regulations, City Council Resolution 6152, and the State of California Airport Permit need to be resolved.

- If the southern helicopter training pattern is maintained, the southern boundary of the helicopter traffic pattern should be developed through coordination with the airport stakeholders, helicopter training operators, and appropriate city boards and commissions and should consider performance characteristics of specific helicopters or groups of helicopters.

SECTION 5: NOISE MEASUREMENT PROGRAM (OCTOBER 12-15, 2015)

Acoustical Measurements

Two Larson Davis Model 831 sound level meters were used to collect data during the noise measurement program. The measurement program began at 9:30 am on Monday, October 12, 2015 and concluded at 9:30 am on Thursday, October 15, 2015. A total of 72 hours, or three complete days, were monitored at each site. The measurement procedures, outlined below, were conducted in accordance with SAE Aerospace Recommended Practice 4721, *Monitoring Aircraft Noise and Operations in the Vicinity of Airports: System Description, Acquisition, and Operation* which provides industry standard guidance for temporary airport noise monitoring.

Each noise monitor unit was equipped with an external microphone and a weatherproof case to protect the equipment from inclement weather. The pictures on **Exhibit 15** illustrate the typical equipment used to conduct the measurements and the location of the noise monitors on the subject site. As indicated on the exhibit, Site 1 was located at the northern boundary of the site on the south side of Pioneer Avenue. Site 2 was located approximately 450 feet south of Pioneer Avenue.

To ensure consistency between measurement locations, each unit was calibrated with a Larson Davis calibration device. A calibrator, with an accuracy of 0.5 decibels (dB), was used for all instruments.

Logged noise data was retrieved from the monitors during routine site visits and stored on a laptop computer. The raw data from each unit is included in the analysis discussed later in this section.

Measurement Procedures

To minimize the potential for non-aircraft noise measurements, thresholds for noise levels and duration were established. These thresholds are programmed as part of the initial set-up for the noise monitoring equipment. A minimum threshold of approximately 5 to 10 dB greater than the ambient level was established for the noise measurements. This excludes any noise event below the threshold. For Site 1, which was located approximately 40 feet south of the center of Pioneer Avenue, the triggering threshold was set at 55 dB to reduce the number of noise events related to automobiles. The triggering threshold for Site 2, which is located farther from an active roadway, was set at 47 dB.

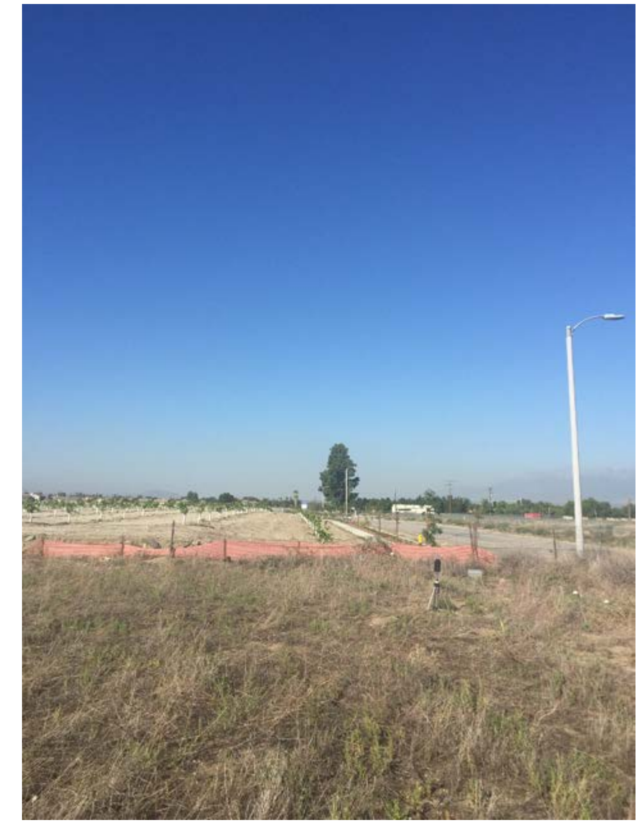
Additionally, a minimum event duration of five seconds was set to ensure that brief events (door slam, dog barking, etc.) were not recorded. These two thresholds limit the single noise events logged by the noise monitor. Only those events which exceed both thresholds were noted as noise events and included as part of the raw data.

Single events that met both criteria were retained and analyzed to consider all noise present at the site, regardless of its level, and provide hourly summations of equivalent noise levels (Leq). Also, the equipment provides information on SEL values for each event which exceeded the preset threshold and duration, and distributions of decibel levels throughout the measurement period. The Larson Davis Model 831 sound level meters are equipped to make a digital recording of an event that exceeds the programmed thresholds. This feature aids the user in identifying aviation-related events when calculating noise exposure for the location. A sound file of up to 19 seconds, depending on the type and duration of the event, is saved within the instrument's memory.

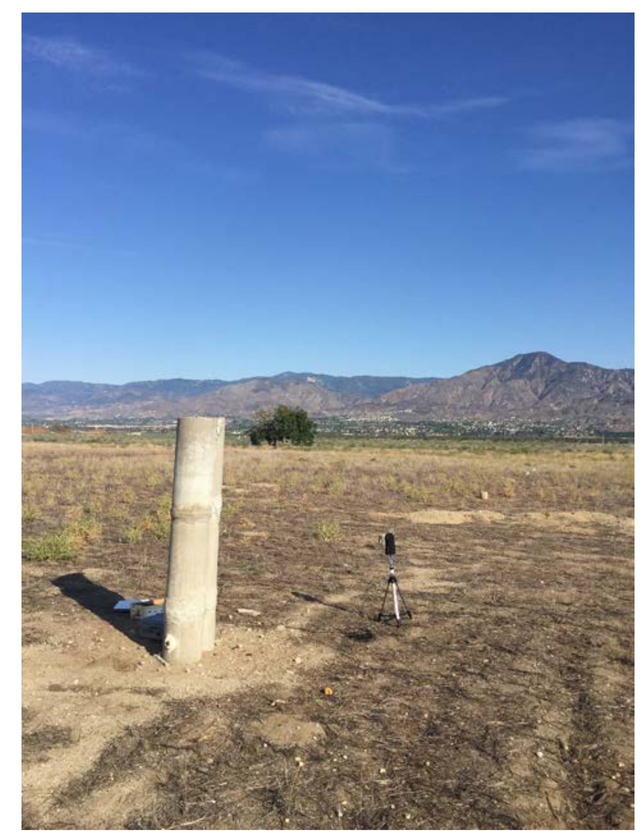
Weather Information

Weather can influence aviation activity at an airport. Severe weather, such as strong thunderstorms, is likely to reduce the number of operations at an airport, while unseasonably warm weather may increase the number of operations at an airport. **Table 4** summarizes the weather observed during the noise measurement program as reported from the Redlands Municipal Airport weather station. As indicated in the table, daily high temperatures ranged between 81 and 93 degrees Fahrenheit (F), while low temperatures ranged between 66 and 73 degrees F. In comparison to the monthly average for October, the daily high temperatures during the measurement period were at or above the average high of 81 degrees F, and the daily low temperatures were above the average low of 51 degrees.

Average wind speeds ranged from 2 to 4 miles per hour, with maximum wind speeds of up to 12 miles per hour. No precipitation was recorded during the monitoring period; however, a thunderstorm occurred in the airport vicinity between approximately 11:00 pm on October 14 and 1 am on October 15. The weather during the noise measurement program indicates favorable conditions for aviation activity.



Noise Monitor Site One (View to the West)



Noise Monitor Site Two (View to the North)

LEGEND

NoiseMonitorSites
Airport Property
City of Redlands
Runway Centerline

Imagery Source: ESRI Basemap Imagery, 2014 Basemap Source: City of Redlands

0 400 800 1,600
1" = 800ft

Source: City of Redlands, ESRI Basemap Imagery 2014

Exhibit 15
NOISE MONITOR LOCATIONS

This page intentionally left blank

TABLE 4
Noise Measurement Program Weather Conditions
Redlands Municipal Airport

	October Average	Date (2015) 10/12	10/13	10/14	10/15
Mean Temperature (°F)	-	82.8	81.2	77.1	73.7
Maximum Temperature (°F)	81.0	93	91	90	81
Minimum Temperature (°F)	51.3	73	73	68	66
Precipitation (in)	0.69	0.0	0	0	0
Wind Speed Average(MPH)	-	3	4	2	2
Wind Direction	-	WSW	WSW	WSW	W
Maximum Wind Speed (MPH)	-	9	10	12	8

Source: San Bernardino International Airport Weather Reporting Station, October 12-15, 2015
http://www.wunderground.com/history/airport/KSBD/2015/10/23/MonthlyCalendar.html
Monthly Climate Summary, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7306

Aircraft Noise Measurement Summary

The purpose of this noise measurement is to obtain Community Noise Equivalent Level (CNEL) noise level values for the proposed development site. It is important to note that the following information is representative of the noise conditions at these sites for the time period analyzed. The results from noise monitors represent noise conditions at a specific point for the duration of the measurement period. The 72-hour noise measurement sample covers only 0.8 percent of the total hours in a year.

To determine aircraft noise levels, FAA regulations require airport sponsors to calculate noise exposure contours with noise modeling software rather than field noise measurements. The software used by FAA is the Airport Environmental Design Tool (AEDT). AEDT calculates noise based on an annual average condition. There is no methodology for estimating future noise conditions at a location using noise monitoring equipment.

A summary of the single event noise data collected during the measurement period is presented in **Table 5.** This information includes:

- Maximum recorded noise level in dB (L_{max});
- Longest single event duration in seconds (Max Duration);
- Total number of events above 60 dB SEL;
- Number of single events within the ranges of 60-70 dB, 70-80 dB, 80-90 dB, 90-100 dB, and above 100 dB SEL; and
- Number of events above 60 dB SEL identified as aircraft operations associated with Redlands Municipal Airport based on audio recordings of the events.

TABLE 5
Noise Measurement Single Event Data Summary
Redlands Municipal Airport

Site/Day	L_{max}	L_{max} Event Trigger	Max Duration (sec)	Max Duration Event Trigger	Sound Exposure Level Event Summary: Above 60 dB	60-70 dB	70-80 dB	80-90 dB	90-100 dB	100+ dB	Aircraft Events
Site 1											
Day 1	88.2	Automobile	71	Automobile	1075	829	238	7	1	0	74
Day 2	92.7	Automobile	70	Automobile	1158	835	306	16	1	0	66
Day 3	81.8	Automobile	69	Automobile	1261	927	310	24	0	0	57
Site 2											
Day 1	72.6	Helicopter	303	Helicopter	196	146	47	3	0	0	187
Day 2	88.4	Fixed Wing	251	Fixed Wing	233	152	77	4	0	0	172
Day 3	94.3	Thunderstorm	660	Commercial Jet Overflight	247	176	57	10	1	0	174

Source: Coffman Associates analysis

As indicated in the table, the maximum recorded sound level (L_{max}) for Site 1 was 92.7 dB, the source of which was an automobile. At Site 2, the L_{max} during the measurement period was 94.3 dB, which was identified as thunder. The longest duration event at Site 1 was 660 seconds and the trigger, or sound which first exceeded the threshold, was a commercial jet overflight. Due to file size limits, the Larson Davis Model 831 can only record a maximum of 19 seconds per event; therefore; the source of the remaining 641 seconds for this event cannot be identified. At Site 2, the longest event was 71 seconds, which was triggered by an automobile.

Table 6 summarizes the L_{max} values for fixed-wing and helicopter events associated with Redlands Municipal Airport during the noise measurement period. As indicated in the table, the L_{max} values for Site 1 ranged between 72.3 and 77.9 dB for fixed-wing aircraft and between 56.7 amd 62.9 dB for helicopters. At Site 2, the fixed-wing L_{max} ranged between 68.0 dB and 81.1 dB and the helicopter L_{max} ranged between 71.6 dB and 74.4 dB.

TABLE 6
Noise Measurement - Maximum Aircraft Noise Level (L_{max})
Redlands Municipal Airport

	Fixed-Wing	Helicopter
Site 1		
Day 1	76.0	62.9
Day 2	77.9	61.0
Day 3	72.3	56.7
Site 2		
Day 1	72.6	71.6
Day 2	81.1	72.9
Day 3	68.0	74.4

Due to the proximity of Site 1 to Pioneer Avenue, a majority of the events were identified as vehicles (trucks, cars, motorcycles) passing the site. At Site 2, non-aviation events, such as landscaping, vehicles, and animal noises, were recorded.

At Site 1, a total of 197 aircraft events most likely associated with activity at Redlands Municipal Airport were recorded during the three day period. This includes all events identified through recordings as propeller-driven fixed-wing aircraft and helicopters. Other aircraft events, such as high-level commercial jet overflights, are not included in this total. Additionally, recordings which included simultaneous events, such as an aircraft operation and an automobile, are not included in this total.

At Site 2, a total of 533 aircraft events associated with activity at Redlands Municipal Airport were recorded. The identification process described above was used for both sites. The difference in aircraft events between the two sites may be attributed to contamination of the recordings by the presence of automobile activity on Pioneer Avenue. Greater ambient noise observed at Site 1 resulted in a higher triggering threshold (55 dB at Site 1 and 47 at Site 2), which may have excluded some aircraft events at Site 1. Additionally, because the noise monitors do not give an indication of the direction of the noise source in relation to the microphone, the location of the monitors in relation to the aircraft traffic pattern may influence the results. For example, although Site 2 is farther from the airport, it may have recorded events from aircraft approaching the airport from the south or helicopters operating in the southern traffic pattern.

During the thunderstorm event, which occurred in the airport vicinity between approximately 11:00 pm on October 14 and 1 am on October 15, a measurement overload was noted. Based on Larson Davis Model 831 documentation, an overload occurs when a signal from the preamplifier exceeds the calibrated input range of Model 831. An overload occurs when the peak input exceeds 143 dB. As a result of the overload, 6 records, identified as either thunderstorm events or electronic interference associated with the overload, were determined to be invalid and not included in the calculations.

Table 7 includes a summary of the cumulative data collected for each site, which includes the CNEL(24), and CNEL(24t) for each site. The CNEL(24) value represents the noise condition from all noise sources logged with the sound level meter. The CNEL(24t) is a reasonable approximation of the CNEL attributable to aircraft noise alone. Only those events identified as aircraft noise assumed to be associated with Redlands Municipal Airport, based on sound recordings, are included in the CNEL(24t) calculation. This calculation does not include noise events associated with high-level commercial overflights. In addition to the daily CNEL(24) and CNEL(24t) values, a logarithmic average for the 72-hour observation at each site is presented.

Appendix C includes additional information regarding the calculation of noise metrics.

TABLE 7
Noise Measurement Cumulative Data Summary
Redlands Municipal Airport

	Day 1	Day 2	Day 3	3-Day Logarithmic Average
Site 1				
All Sources – CNEL(24)	56.4	56.7	57.1	56.7
Redlands Municipal Airport – Aircraft Sources – CNEL(24t)	42.9	47.8	42.2	45.1
Site 2				
All Sources – CNEL(24)	45.7	52.4	54.6	52.2
Redlands Municipal Airport – Aircraft Sources – CNEL(24t)	43.1	48.1	43.7	45.6

Source: Coffman Associates analysis

Note: During the thunderstorm event which occurred in the airport vicinity between approximately 11:00 pm on October 14 and 1 am on October 15, a measurement overload was noted. Based on Larson Davis Model 831 documentation, an overload occurs when a signal from the preamplifier exceeds the calibrated input range of the Model 831. An overload occurs when the peak input exceeds 143 dB. As a result of the overload, 6 records, identified as either thunderstorm events or electronic interference associated with the overload, were determined to be invalid and not included in the calculations.

As indicated in the table, CNEL(24) for Site 1 ranged between 56.4 for all sources and 42.2 for aircraft sources (CNEL(24t)). Using the logarithmic values, the three-day average for Site 1 was 56.7 for all sources and 45.1 for Redlands Municipal Airport aircraft events. At Site 2, the three-day average for all events was calculated at 52.2 and 45.6 for aircraft events.

SECTION 6: CITY OF REDLANDS GENERAL PLAN NOISE ELEMENT AND NOISE ORDINANCE REVIEW

City of Redlands General Plan Noise Element

The City of Redlands General Plan Noise Element was prepared in 1998 to provide a comprehensive program for achieving and maintaining land use compatibility with environmental noise levels. This element of the General Plan is based upon transportation traffic projections for a build-out noise scenario developed as part of the Master Environmental Assessment prepared in 1994. Compatibility criteria for the Noise Element is based on hearing loss, communication interference, sleep interference, physiological responses, and annoyance.

The Noise Element establishes the 60 CNEL airport noise exposure contour as the threshold for restricting residential development. This is generally consistent with the 2003 ALUCP. The 2003 ALUCP states that single family residential is clearly unacceptable above 65 CNEL and normally unacceptable between 60 to 65 CNEL noise contours. These CNEL noise standards are also consistent with the Handbook (see Table 4B on page 4-7). The Handbook states that individual noise events within the 60 CNEL will occasionally cause significant interference with residential land use activities, particularly outdoor activities, in quiet suburban/rural communities.

The airport noise exposure contour source for the Noise Element is the AMP prepared in 1993. As previously mentioned, the 1993 AMP noise exposure contours were based upon a forecast of 100,980 fixed-wing operations and 1,020 helicopter operations. The 1993 AMP aviation forecast is 45 percent lower than the 2008 AMP aviation forecast. Noise exposure contours from the 1993 AMP and 2008 AMP are depicted on **Exhibit 16**. As seen in **Exhibit 16**, the 2008 AMP noise exposure contours are noticeably wider from north to south than the 1993 AMP reflecting the higher operations levels and training activity. It should be noted that the current helicopter training school operator's most recent estimate of activity has exceeded the 2008 AMP projection by more than 50 percent. This increase in helicopter activity should be considered in future land use planning efforts.

City of Redlands Noise Ordinance

In 2004, the City of Redlands adopted the Noise Ordinance to implement the noise control provisions of the Redlands General Plan by establishing comprehensive regulations for the control of noise within the city. Table 1 of the Noise Ordinance specifies the residential exterior threshold for noise to be 50 A-weighted decibels (dBA) from 10:00 p.m. to 7:00 a.m. and 60 dBA from 7:00 a.m. to 10:00 p.m. Please note that noise levels in dBA are intended to represent single event noise levels. CNEL noise levels discussed in the previous Noise Element section are cumulative (i.e., represent noise events generated over a 24-hour period).

The Noise Ordinance provides the following guidance for determining exterior noise levels:

> No person shall operate, or cause to be operated, any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person which causes the noise level when measured on any other property to exceed:
>
> 1. The noise standard for that land use specified in table 1 of this section for a cumulative period of more than thirty (30) minutes in any hour; or
> 2. The noise standard specified in table 1 of this section plus five (5) dB for a cumulative period of more than fifteen (15) minutes in any hour; or
> 3. The noise standard specified in table 1 of this section plus ten (10) dB for a cumulative period of more than five (5) minutes in any hour; or
> 4. The noise standard specified in table 1 of this section plus fifteen (15) dB for a cumulative period of more than one minute in any hour; or
> 5. The noise standard specified in table 1 of this section plus twenty (20) dB or the maximum measured ambient level, for any period of time.

Measuring noise related impacts with dBA and CNEL are significantly different processes. For example: mowing your lawn generating a noise of 75 dBA for thirty minutes is a violation of the City of Redlands Noise Ordinance but not for the Noise Element because the 30-minute noise event is averaged over a 24-hour period. Using single event noise metrics such as dBA can be problematic for determining transportation noise impacts as it is often the number of trucks driving by or aircraft flying overhead (frequency) and not the noise event level (magnitude) that generates noise annoyance.

Based upon the noise measurement program, summarized in **Table 5** and previously discussed, there are no single events that exceed the exterior Noise Ordinance standards for residential at either of the noise measurement sites for the 72-hour measurement period.

It should be noted that using the Noise Ordinance to restrict the Redlands Municipal Airport's operations without following Title 14 of the Code of Federal Aviation Regulations Part 161 (Part 161) protocols is a violation of Federal law under the *Airport Noise and Capacity Act* (ANCA) *of 1990* (49 U.S.C. App. 2153, 2154, 2155, and 2156). The Part 161 process requires the airport to overcome a heavy procedural burden by proving by "substantial evidence" that six statutory requirements have been met. These statutory requirements include: (1) be reasonable, nonarbitrary, and nondiscriminatory; (2) not create an undue burden on interstate or foreign commerce; (3) maintain safe and efficient use of airspace; (4) not conflict with any existing federal statute or regulation; (5) provide adequate opportunity for public comment; and (6) create no undue burden on the national aviation system. The Noise Ordinance does not apply to any activity in which state or federal law has preempted the regulation of such activity. (Ord. 2579 § 1, 2004)

2003 ALUCP Compatibility Zone C

Compatibility Zone C in the 2003 ALUCP is defined as the area commonly overflown by aircraft at an altitude of 1,000 feet or less above ground level. Included within Zone C are locations beneath the traffic pattern and pattern entry points.

The current development proposal located between Pioneer Avenue and San Bernardino Avenue is depicted on **Exhibit 17**. The total acreage of the development proposal is approximately 33 acres. Approximately 9 acres of green space are planned within Zone B2, and 24 acres and 55 residential parcels within Zone C. Based on the 2003 ALUCP, residential development is limited in Zone C to 6 dwelling units per acre. Based upon these criteria, the proposed development is consistent with the 2003 ALUCP.

The 2003 ALUCP and 2008 AMP 60 CNEL noise exposure contours do not extend into Compatibility Zone C. As previously stated, the current helicopter training school operator's most recent estimate of activity has exceeded the 2008 AMP projection by more than 50 percent. This increase in helicopter activity should be considered in future operations forecasting and land use planning efforts.

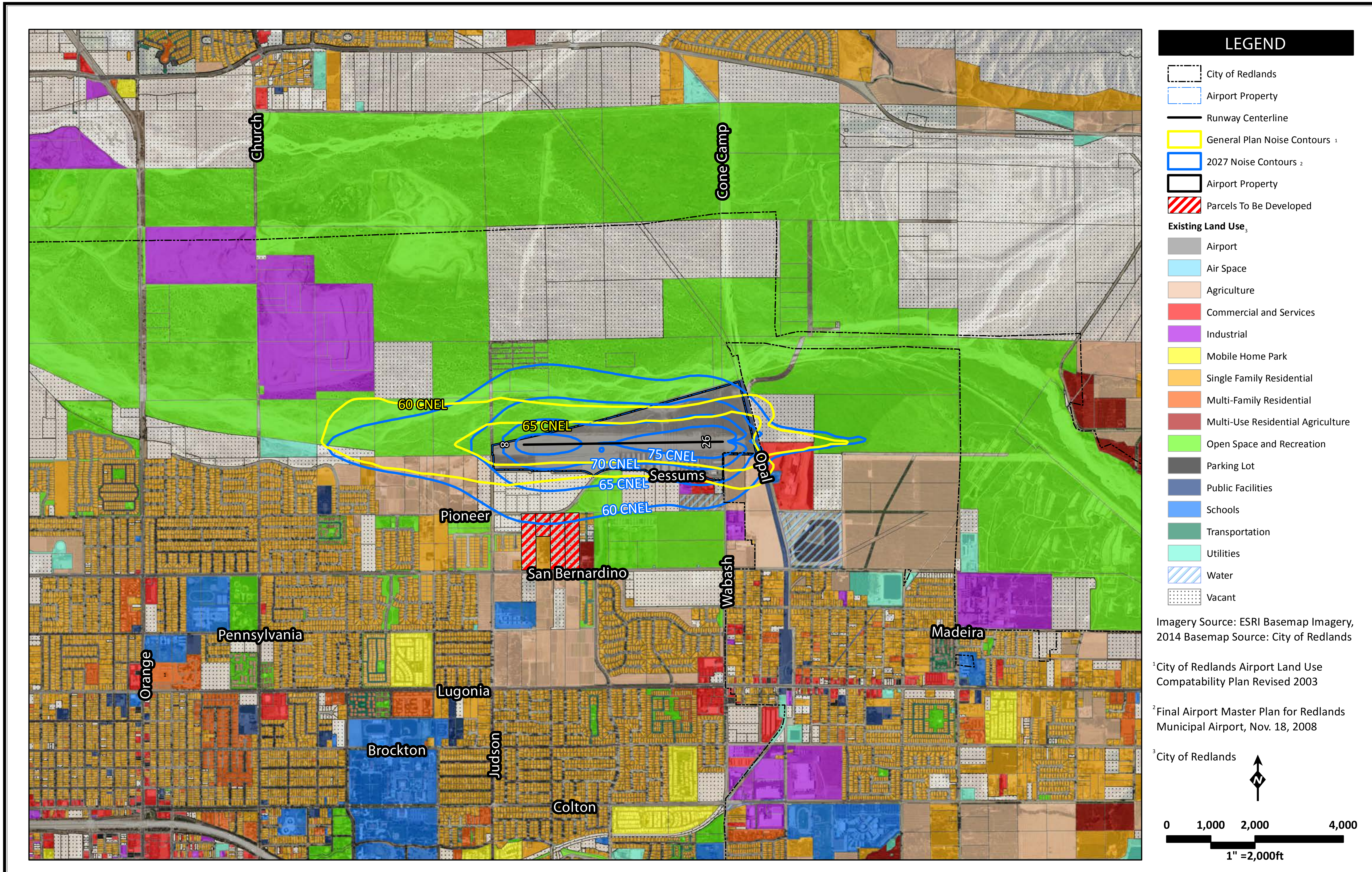


Exhibit 16
NOISE EXPOSURE CONTOUR COMPARISON

This page intentionally left blank

Source: ESRI Basemap Imagery 2014

Exhibit 17
PLANNED DEVELOPMENT IN ZONES B2 & C

This page intentionally left blank

Recommendations

The following recommendations should be considered for the City of Redlands General Plan Noise Element, Noise Ordinance, and 2003 ALUCP Compatibility Zone C:

- Updated 20-year noise exposure contours for the ALUCP and Noise Element of the General Plan.
- If the ALUCP is updated, the Noise Element should reference the updated ALUCP and its noise compatibility criteria.
- Amending the Noise Ordinance to include CNEL noise metric criteria for transportation noise should be considered for consistency with the Noise Element.

APPENDIX A

REDLANDS MUNICIPAL AIRPORT OPERATIONS ESTIMATE

Appendix A
Redlands Municipal Airport Operations Estimate

Since the Redlands Municipal Airport is not equipped with an airport traffic control tower (ATCT), precise operational (takeoff and landing) counts are not available. Therefore, a method for estimating operations was utilized. This method, the *Model for Estimating General Aviation Operations at Non-Towered Airports*, was prepared for the FAA Statistics and Forecast Branch in July 2001. This report develops and presents a regression model for estimating general aviation operations at non-towered airports. The model was derived using a combined data set for small towered and non-towered general aviation airports and incorporates a dummy variable to distinguish the two airport types. In addition, the report applies the model to estimate activity at 2,789 non-towered general aviation airports contained in the FAA *Terminal Area Forecast*. The estimate of annual operations at Redlands Municipal Airport was computed using equation (#15) for non-towered airports. Independent variables used in the equation include the following:

- Based aircraft – 250
- Registered aircraft within a 100 nautical mile (nm) radius of the Airport – 13,004. The source for this data is the FAA's aircraft registry database.
- On-site Part 141 certificated flight schools – Aero Tech Academy
- Population within a 25 nm and 100 nm radius of the Airport – 2,618,872 and 20,721,878 respectively. The source for this data is the U.S. Census Bureau.

The results of the model indicate an estimated 77,000 annual operations are conducted at Redlands Municipal Airport.

APPENDIX B

SUPPORTING INFORMATION

ORDINANCE NO. 1431

AN ORDINANCE OF THE CITY OF REDLANDS ESTABLISHING RULES AND REGULATIONS GOVERNING OPERATIONS OF REDLANDS MUNICIPAL AIRPORT

The City Council of the City of Redlands does ordain as follows:

A. GENERAL

1. The purpose of this document is to establish policies and procedures to be followed by persons operating aircraft, ground vehicles, and equipment on and in the vicinity of the Redlands Municipal Airport both in the air and on the ground. Deviations are permitted only during periods of emergency or as directed by the Director of Aviation, City of Redlands, or his appointed representative.

2. It shall be the responsibility of aircraft owners, aircraft operators, and users of the airfield and surrounding support facilities to become familiar

with the provisions of this document and adhere to its intent in the interests of safe and efficient utilization of the Redlands Airport.

B. AIRFIELD

1. With the exception of properly authorized special activities, all airport facilities are provided for the primary purpose of promoting commercial, general, private and recreational flying activities. The airport shall be open for these uses at all reasonable hours of the day and night, subject to restrictions created by inclement weather, special events, emergencies, or like causes so designated by the

Director of Aviation.

2. The airport shall not be used as a base for conducting commercial and business activities, for the carrying for hire of passengers, freight, express or mail, for instruction in aviation in any of its phases, for the sale of fuels, refreshments or any commodity or service or for any other commercial purpose unless a lease, permit or license to conduct such business has been granted by the city or its authorized agents. No signs, posters or other advertising material will be posted or distributed on airport property without prior authority from the Director of

Aviation, City of Redlands.

3. Damage to airport facilities, buildings, or other city/leased properties will be reported immediately to the Director of Aviation, City Hall, Redlands, or, in his absence, to the Redlands Police Department. Repair or replacement cost will be levied against the party deemed responsible.

C. <u>AIRCRAFT OPERATIONS</u>

1. The rules and regulations promulgated by the Federal Aviation Administration and presently in effect and all additions or amendments thereto are hereby referred to, adopted and made a part of these regulations in every respect

as if they were fully set forth herein.

2. No person shall navigate any aircraft over, land upon, or take off from, or service, repair, or maintain any aircraft on the airport, or conduct any operation on or from the airport otherwise than in conformity with this chapter and the rules and regulations of the Federal Aviation Administration.

3. The Director of Aviation, or his appointed representative, may restrict or suspend any or all flight operations when required in the interest of safety, military need or special circumstances.

4. No person shall operate or assist

in the operation of any aircraft while under the influence of, or using, any intoxicating liquor or habit-forming or hallucinatory or narcotic drug. No alcoholic beverage may be consumed or sold on the airport unless the City Council shall have approved and designated the place for the sale and consumption thereof.

5. Only properly certificated aircraft, operated by properly certificated personnel are authorized on the aircraft landing areas or areas designated for aircraft taxiing and parking.

6. No person shall taxi any aircraft unless there will be no danger of collision with any person or

object. Aircraft shall not be taxied at speeds in excess of 15 miles per hour and will be under complete control at all times. No taxiing shall be done except on areas designated for taxiing.

7. Aircraft approaching the runway for take-off shall be stopped at least 100 feet from the runway in use and shall not be taxied onto the runway without the pilot first having made a visual check of air traffic.

8. All aircraft, except in an emergency, shall conform to the established traffic patterns (see Exhibit "A").

9. Formation take-offs are prohibited.

10. After take-off, no turn shall be made until the airport boundary has been reached and the pilot of the aircraft has determined that such a turn can be made safely (see Exhibit "A").

11. The established traffic pattern is a right-hand pattern at an altitude of 2,400 feet above sea level. Aircraft shall enter the traffic pattern from straight and level flight (see Exhibit "A").

12. Aircraft entering or leaving the traffic pattern shall exercise extreme caution and shall not cause other aircraft in the pattern to deviate from their course.

13. Safe distances shall be maintained

between aircraft in the traffic pattern and there shall be no passing or cutting in front of other aircraft in the pattern.

14. Except in an emergency, no person shall board or disembark from any aircraft on the taxiway, landing or take-off area of the airport

15. No aircraft shall be permitted to remain on any part of the taxiway, landing or take-off area for the purpose of repairs. All repairs shall be effected at places designated therefor. Only minor prevention maintenance shall be permitted in areas other than authorized maintenance shops.

16. An aircraft engine shall not be

started unless a competent operator is at the controls and adequate brakes are fully set or the wheels are set with blocks. Aircraft engines may be runup only after it is determined that propwash will not endanger other aircraft, property, or persons.

17. No aircraft shall be taxied into or out of any hangar. Aircraft being taxied and scheduled for service in a hangar shall be halted 20 feet from the hangar doors and the engine stopped. Approved power operated industrial trucks may be used to move aircraft into, about and out of hangars. Aircraft engines shall

not be operated within hangars, but may be electrically turned over during servicing operations.

18. Upon the direction of the City Director of Aviation, when required for public health, safety, or welfare, or the proper operation of the airport, the operator, owner or pilot of any aircraft on the airport shall move the aircraft to any place designated on the airport; if the operator, owner, or pilot refuses to comply with the directions, or the operator, owner, or pilot cannot be located after a reasonable effort has been made to do so, the aircraft may be moved to such place at the owner's expense and

without liability for any damage that may result from such moving.

19. In the event of an accident, the damaged aircraft may be removed from the landing areas, ramps, aprons, or other areas at the expense of the owner and without liability for damage resulting from such moving.

20. Accidents of any nature occurring on the airport shall be reported as soon as practicable to the Director of Aviation or his authorized representative together with names and addresses of persons involved and witnesses. In the event the Director of Aviation is not available, the

Redlands Police Department will be notified.

21. No aircraft shall be left unattended unless properly secured.

22. Any person electing to base his aircraft on the airport shall register the aircraft with the airport authorities. Change of ownership or removal of the aircraft from the airport shall not relieve the registered owner from payment of applicable fees unless prior written notice is given.

23. Privately owned aircraft shall be parked only in designated parking areas assigned to them.

24. Transient aircraft shall be parked only in designated areas.

25. Airport tenants shall park aircraft owned by them or in their custody only on areas leased to them.

26. No ladders, cans, boxes, etc. of any nature may be left in aircraft storage areas without prior approval of the Director of Aviation (see Paragraph E, 16).

D. <u>GROUND OPERATED VEHICLES AND EQUIPMENT</u>

1. Unless authorized by the Director of Aviation, no highway vehicles shall be operated on the airport except on roadways, auto parking areas, or places that are designated for such vehicles.

2. No person shall operate any vehicle in a careless or negligent

manner or in disregard for the safety of others, or in excess of posted speed traffic signs, and in no event in excess of twenty-five miles per hour. On ramps and in building areas maximum speed shall not exceed ten miles per hour.

3. Highway vehicles shall always yield the right of way to aircraft on the ground or in the process of landing or taking off.

4. Any accident involving motor vehicles on the airport shall be reported immediately to the Director of Aviation or his authorized representative. In the event the Director of Aviation is not available, the Redlands

Police Department will be notified.

5. Vehicles shall only be parked in areas so designated for such purpose. Aircraft owners, who rent hangar space from a base operator, may be permitted to park one vehicle within that hangar space at the discretion of the base operator.

6. Gasoline tank trucks, automotive or aircraft gas tenders, and trucks delivering flammable materials, shall be prohibited from entry, parking or storage in hangars.

7. Illegally parked vehicles may be issued parking violation citations or moved to designated

parking areas. A charge for such towing will be levied and the city shall not assume any liability for damage while moving such vehicles.

FIRE REGULATIONS

1. No aircraft shall be fueled or drained while the engine is running or while the aircraft is in a hangar. Exception: see Paragraph E, 7, herein.

2. During all fuel operations the aircraft and appurtenances used in fueling shall be grounded by an approved method.

3. Passengers shall deplane from any aircraft being fueled unless an attendant is stationed at the

cabin door during such operation.

4. Personnel engaged in fueling operations shall exercise care to prevent overflow of fuel.

5. Personnel not engaged in fueling or maintenance of the aircraft, except as provided in Subsection 3, above, shall not be permitted within 50 feet of such aircraft.

6. Smoking or the lighting of any open flame shall be prohibited within 50 feet of any fuel operation.

7. When fuel truck is servicing aircraft in hangar, doors shall be completely open, tow bar in place, and grounding of plane and truck completed. A flammable

liquid type fire extinguisher will be readily available.

8. Flammable liquid type fire extinguishers shall be within ready reach of personnel engaged in fuel operations. Extinguishers shall not be located near fuel hoses, pumps, meters or valves.

9. No electrical or radio equipment shall be operated during fuel operations.

10. All fuel dispensing equipment shall be kept in a safe and non-leaking condition.

11. No aircraft shall be started when there is fuel on the ground, under or near the aircraft.

12. Hangar floors shall be kept

sufficiently clear to permit ready access to buildings to combat fires.

20. The storage handling and use of all flammable liquids shall be in accordance with the Fire Code of the City of Redlands.

21. Whenever the provisions of City Ordinances, or State and Federal laws are not applicable for any reason to any situation involving the protection of persons and property from the hazards of fire and explosions, the materials, methods of construction, installations, practices or operation necessary to provide such protection shall be in accordance with nationally recognized and

accepted standards.

F. PENALTIES

1. Any violation of this ordinance is a misdemeanor; and any person found guilty thereof is punishable by a fine and imprisonment as provided by law.

2 In addition to the above, any violation of this ordinance shall be deemed sufficient cause for the Director of Aviation to deny or prohibit access to or use of the airport by the responsible person or firm.

G. LIABILITY OF CITY

The privilege of using the airport and its facilities shall be conditioned upon the assumption of full

responsibility and risk by the user thereof, and he shall release, hold harmless and indemnify the City of Redlands, its officers, and employees from any liability or loss resulting from such use, as well as against claims of third persons so using the airport. The exercise of the privilege of use shall constitute an acknowledgement that the City of Redlands maintains said airport in a governmental capacity.

H. LANDING FEES

Privately owned aircraft are not charged landing fees. Operations of aircraft engaged in the business of transporting persons or things for a profit, may be charged landing fees as determined by the Council.

TIE-DOWN AND HANGAR FEES

1. Monthly tie-down, transient tie-down, and hangar rental fees for facilities on the land leased from the City by the Base Operator will be established by the Operator.

2. Monthly tie-down, transient tie-down and hangar rental fees on city land not leased to Base Operations will be as established by the Director of Aviation.

Effective date: This ordinance shall be in force and take effect as provided by law.

The City Clerk shall certify to the adoption of this ordinance and shall cause the same to be published once in the Redlands Daily Facts, a newspaper of general circulation printed and published in this city.

ATTEST:

s/ Jack B. Cummings
Mayor of the City of Redlands

Peggy A. Moseley
City Clerk

APPROVED FOR FORM:

s/ Edward F. Taylor
City Attorney

I, Peggy A. Moseley, City Clerk, City of Redlands, hereby certify that the foregoing ordinance was adopted by the City Council at a regular meeting thereof held on the 2nd day of February, 1971, by the following vote

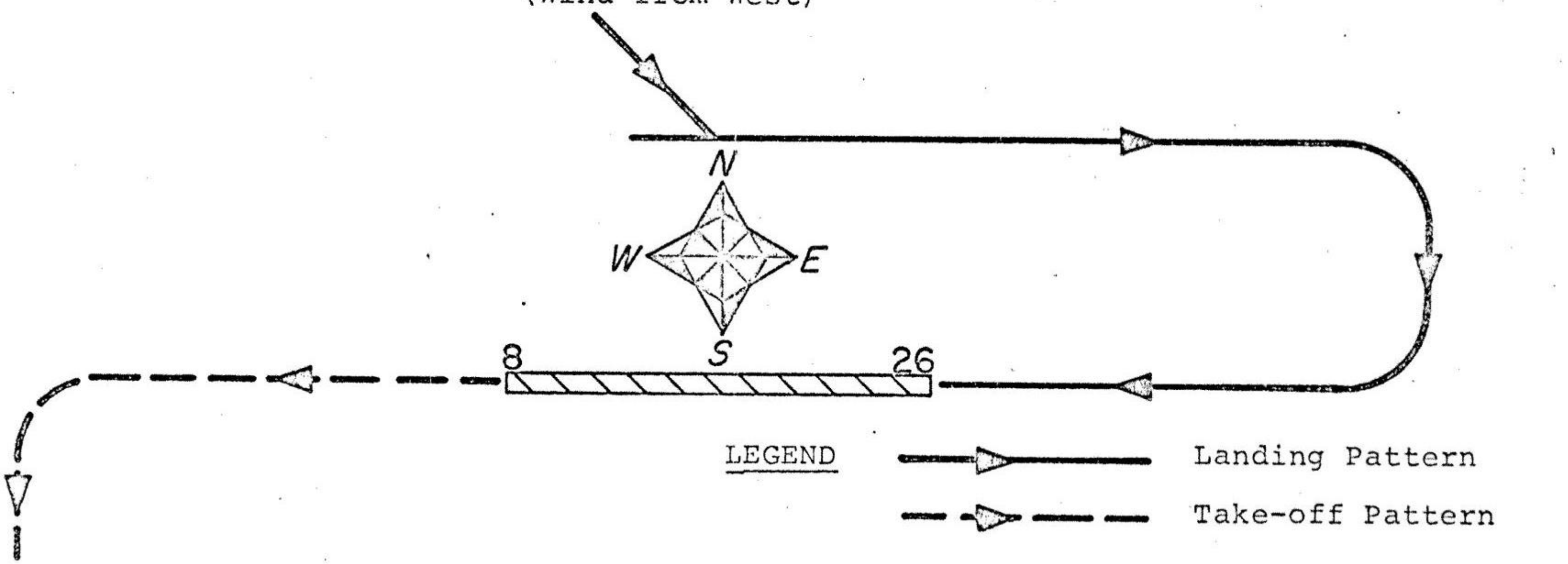
AYES:	Councilmen DeMirjyn, Knudsen, Miller, Sewell Mayor Cummings
NOES:	None
ABSENT:	None

Peggy A. Moseley
City Clerk, City of Redlands

CITY OF REDLANDS
REDLANDS MUNICIPAL AIRPORT

TRAFFIC PATTERN

(Wind from West)



a. The traffic pattern for Runway #26 is right-hand; traffic pattern for Runway #8 is left-hand.

b. The down-wind leg lies north of the runway.

c. The use of Runway #8 or #26 is dependent on wind conditions.

d. Traffic pattern at Redlands Municipal Airport is established at 828 feet above ground level. Ground level at Redlands Municipal Airport is 1,572 feet above sea level. Thus, the altitude of the traffic pattern above sea level at Redlands Municipal Airport is 2,400 feet.

(NAFB is 3,200 MSL; Norton AFB Aero Club traffic pattern is 2,100 MSL)

e. Aircraft preparing to land at Redlands Municipal Airport must observe the traffic pattern altitude, the use of the down-wind leg, and must exercise discretion concerning wind conditions and other aircraft in the pattern or aircraft preparing to land or take off. The observance of these requirements is essential for safety purposes due to the increasing traffic at the Airport.

f. Pilots landing contrary to wind indicator or established pattern assume all responsibility for such action. This practice is discouraged in that it does not promote flying safety.

Exhibit "A"

ORDINANCE NO. 2343

AN ORDINANCE OF THE CITY OF REDLANDS AMENDING CHAPTER 12.56 OF THE REDLANDS MUNICIPAL CODE RELATING TO THE MUNICIPAL AIRPORT

WHEREAS, the City of Redlands owns and operates the Redlands Municipal Airport; and

WHEREAS, the City Council of the City of Redlands has the authority to establish rules regulating use of the Redlands Municipal Airport; and

WHEREAS, the City Council of the City of Redlands has determined it is appropriate to update the rules regarding air traffic patterns at the Redlands Municipal Airport;

THE CITY COUNCIL OF THE CITY OF REDLANDS DOES ORDAIN AS FOLLOWS:

Section 1. Chapter 12.56 of the Redlands Municipal Code is hereby amended by the replacement of Exhibit "A" with the revised Exhibit "A", attached to this ordinance.

Section 2. The Mayor shall sign this ordinance and the City Clerk shall certify to the adoption of this ordinance and shall cause it, or a summary of it, to be published once in the Redlands Daily Facts, a newspaper of general circulation within the City , and thereafter, this ordinance shall take effect in accordance with law.

Susan Larson
Mayor, City of Redlands

ATTEST:

Lorrie Poyzer
City Clerk

DJM839PW

I, Lorrie Poyzer, City Clerk of the City of Redlands, hereby certify that the foregoing ordinance was duly adopted by the City Council at a regular meeting thereof held on the 18th day of March, 1997, by the following vote:

AYES:	Councilmembers Gilbreath, Cunningham, Banda; Mayor Larson
NOES:	None
ABSTAIN:	None
ABSENT:	Councilmember Gil

Lorrie Poyzer
City Clerk, City of Redlands

EXHIBIT "A"

REDLANDS MUNICIPAL AIRPORT

TRAFFIC PATTERN INFORMATION

1. The traffic pattern for Runway #26 is right-hand; the traffic pattern for Runway #8 is left-hand.

2. The down-wind leg lies north of the runway.

3. The use of Runway #8 or #26 is dependent on wind conditions. If the easterly wind is over 10 knots, the use of Runway #8 is recommended.

4. The traffic pattern at Redlands Municipal Airport (RMA) is established at 829 feet above ground level. Ground level at RMA is 1,571 above sea level (MSL). Thus, the altitude of the traffic pattern above sea level at RMA is 2,400 feet MSL.

5. The cross wind leg for Runway #26 is over the west end of the runway. (Over the 8.)

6. Departing from Runway #26, turn 10 degrees right to follow the Santa Ana River wash. Attain 2200 feet MSL before turning south and overflying the residential area.

7. Watch for traffic approaching/departing San Bernardino International Airport (SBD).

8. Helicopters operate south of the airport using a left-hand pattern. Helicopter pattern altitude is 2,000 MSL.

9. Runway #8 is suggested as the primary runway for night landings, if winds permit.

10. Aircraft preparing to land at Redlands Municipal Airport must observe the traffic pattern altitude, the direction of turns in the pattern, the use of the down-wind leg, and must exercise discretion concerning wind conditions and other aircraft in the pattern or aircraft preparing to land or take off. The observance of these requirements is essential for safety at the airport.

11. Pilots landing contrary to wind indicator or established pattern assume all responsibility for such action. This practice is discouraged in that it does not promote flying safely.

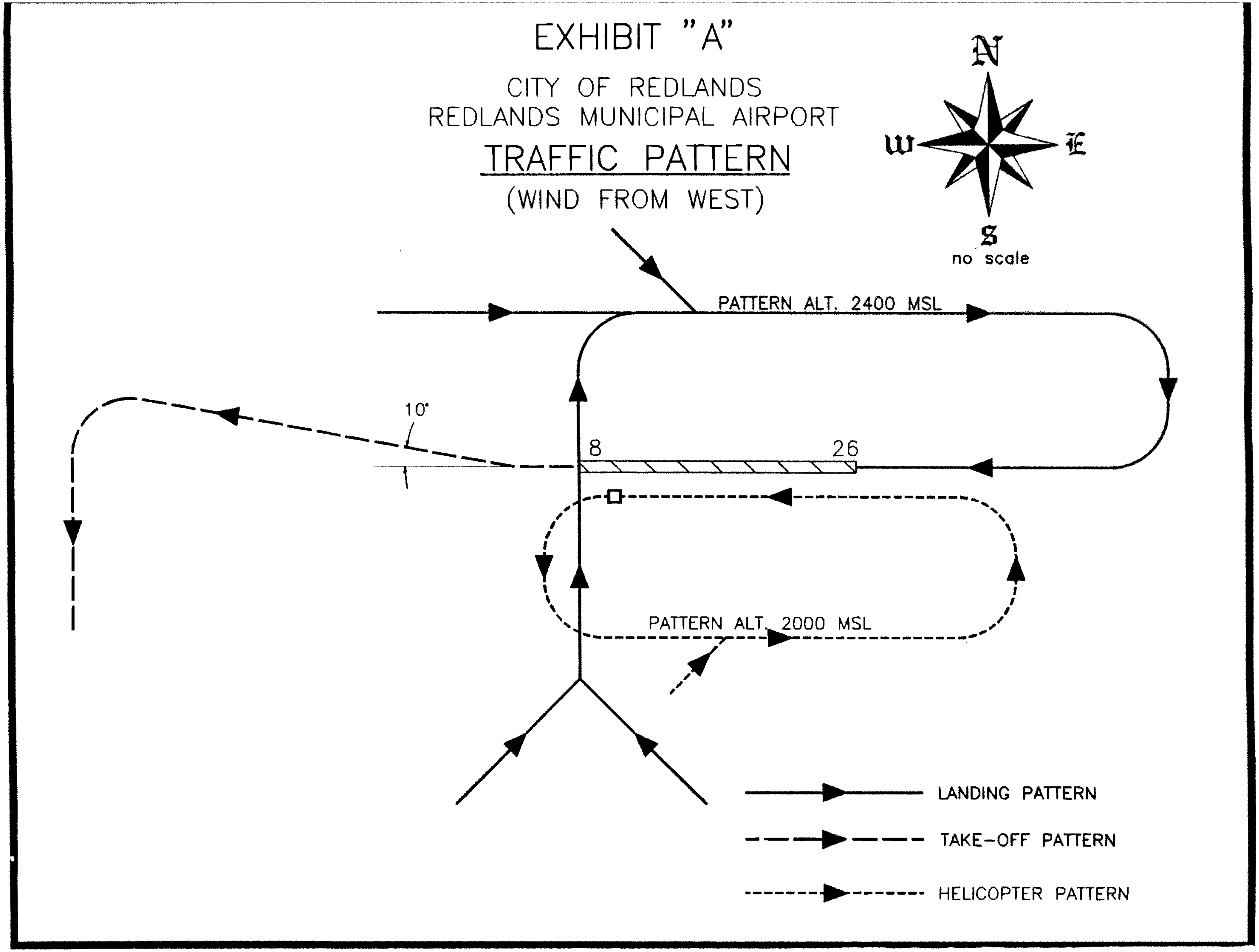


EXHIBIT "A"
CITY OF REDLANDS
REDLANDS MUNICIPAL AIRPORT
TRAFFIC PATTERN
(WIND FROM WEST)
N
W
E
S
no scale
PATTERN ALT. 2400 MSL
10°
8
26
PATTERN ALT. 2000 MSL
LANDING PATTERN
TAKE-OFF PATTERN
HELICOPTER PATTERN

ORDINANCE NO. 2381

AN ORDINANCE OF THE CITY OF REDLANDS AMENDING CHAPTER 12.56 OF THE REDLANDS MUNICIPAL CODE RELATING TO THE MUNICIPAL AIRPORT

WHEREAS, the City of Redlands owns and operates the Redlands Municipal Airport; and

WHEREAS, the City Council of the City of Redlands has the authority to establish rules regulating use of the Redlands Municipal Airport; and

WHEREAS, the City Council of the City of Redlands has determined it is appropriate to update the rules regarding air traffic patterns at the Redlands Municipal Airport;

THE CITY COUNCIL OF THE CITY OF REDLANDS DOES ORDAIN AS FOLLOWS:

Section 1. Chapter 12.56 of the Redlands Municipal Code is hereby amended by the replacement of Exhibit "A" with the revised Exhibit "A", attached to this ordinance.

Section 2. The Mayor shall sign this ordinance and the City Clerk shall certify to the adoption of this ordinance and shall cause it, or a summary of it, to be published once in the Redlands Daily Facts, a newspaper of general circulation within the City, and thereafter, this ordinance shall take effect in accordance with law.

Mayor, City of Redlands

ATTEST:

City Clerk

I, Lorrie Poyzer, City Clerk of the City of Redlands, hereby certify that the foregoing ordinance was duly adopted by the City Council at a regular meeting thereof held on the 4th day of August, 1998 by the following vote:

AYES: Councilmembers Banda, Gilbreath, George, Mayor Cunningham

NOES: None

ABSTAIN: None

ABSENT: Councilmember Freedman

Lorrie G. Poyzer
City Clerk, City of Redlands

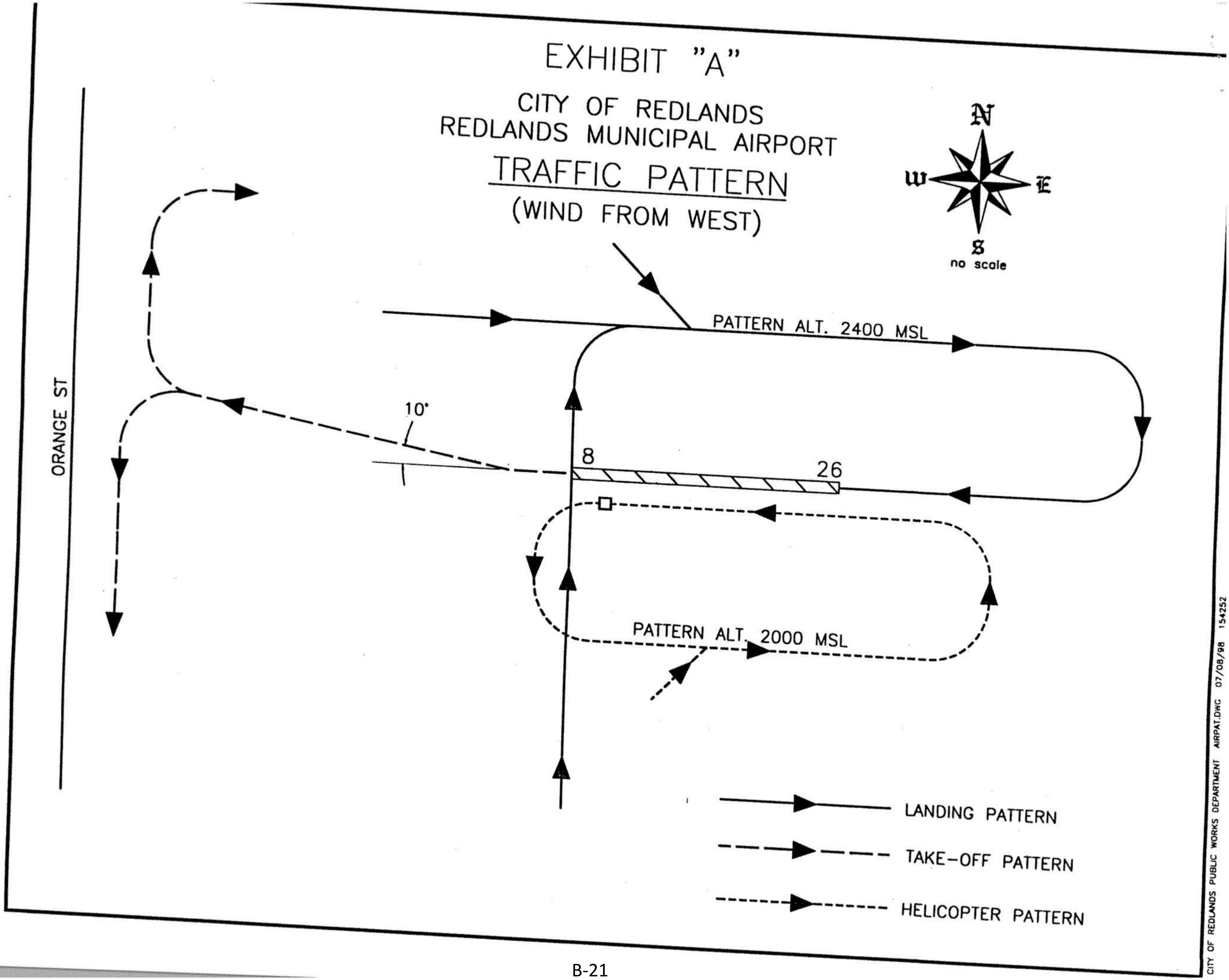


EXHIBIT "A"
CITY OF REDLANDS
REDLANDS MUNICIPAL AIRPORT
TRAFFIC PATTERN
(WIND FROM WEST)
N
W
E
S
no scale
ORANGE ST
PATTERN ALT. 2400 MSL
10°
8
26
PATTERN ALT. 2000 MSL
LANDING PATTERN
TAKE-OFF PATTERN
HELICOPTER PATTERN
CITY OF REDLANDS PUBLIC WORKS DEPARTMENT AIRPAT.DWG 07/08/98 154252

REDLANDS MUNICIPAL AIRPORT
TRAFFIC PATTERN INFORMATION

1. The traffic pattern for Runway #26 is right-hand; the traffic pattern for Runway #8 is left-hand.

2. The down-wind leg lies north of the runway.

3. The use of Runway #8 or #26 is dependent on wind conditions. If the easterly wind is over 10 knots, the use of Runway #8 is recommended.

4. The traffic pattern at Redlands Municipal Airport (RMA) is established at 829 feet above ground level. Ground level at RMA is 1,571 above sea level (MSL). Thus, the altitude of the traffic pattern above sea level at RMA is 2,400 feet MSL.

5. The cross wind leg for Runway #26 is over the west end of the runway. (Over the 8.)

6. For traffic departing on Runway #26 westerly or southerly:

   A. Do not fly over the SBD traffic pattern below 3000 feet MSL.

   B. Do not fly over residential areas south of the river wash less than 2200 feet MSL.

   C. Turn left before reaching Orange Street (the first street west of the airport which crosses the river wash) and west bound traffic follow I-10.

   D. If 2200 feet MSL is not attained before Orange Street, use right hand down wind departure to gain altitude.

8. Helicopters operate south of the airport using a left-hand pattern. Helicopter pattern altitude is 2,000 MSL.

9. Runway #8 is suggested as the primary runway for night landings, if winds permit.

10. Aircraft preparing to land at Redlands Municipal Airport must observe the traffic pattern altitude, the direction of turns in the pattern, the use of the down-wind leg, and must exercise discretion concerning wind conditions and other aircraft in the pattern or aircraft preparing to land or take off. The observance of these requirements is essential for safety at the airport.

11. Pilots landing contrary to wind indicator or established pattern assume all responsibility for such action. This practice is discouraged in that it does not promote flying safely.

Redlands City Council Resolution No. 5175

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF REDLANDS RELATING TO LAND USE PLANNING AROUND PUBLIC AIRPORTS

WHEREAS, prior to passage of Senate Bill No. 443 (effective June 30, 1993), Public Utilities Code Section 21670 (b) required each county in which there is located an airport that is served by a scheduled airline to establish an Airport Land Use Commission (ALUC); and

WHEREAS, Senate Bill No. 443 amended Public Utilities Code Section 21670(b) to change the term "shall" to "may" in order to relieve local entities such as the County of the duty to incur unnecessary expenses in certain aspects of airport land use; and

WHEREAS, the State of California no longer reimburses San Bernardino County for administration of the ALUC program; and

WHEREAS, Assembly Bill No. 2831 (effective January 1, 1995) amended Public Utilities Code section 21670(b) to change the term "may" to "shall" in order to reinstate the requirement that local entities establish an ALUC; and

WHEREAS, Assembly Bill No. 2831 further amended Public Utilities Code Section 21670.1 to provide an alternative procedure to the requirement for the establishment of an ALUC which allows local jurisdictions to make land use decisions for areas within a public use airport sphere of influence as designated by a comprehensive airport land use plan; and

WHEREAS, use of the alternative procedure set forth in Section 21670.1, rather than re-establishment of the County ALUC, will eliminate redundant reviews and streamline processes;

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF REDLANDS AS FOLLOWS:

Section 1. The alternative procedure set forth in Public Utilities Code Section 21670.1 subdivision (c) is hereby adopted based upon the determination that proper land use planning pursuant to Article 3.5 of Chapter 4 of Part 1 of Division 9 of the Public Utilities Code can be accomplished pursuant to Public Utilities Code Section 21670.1, subdivision (c).

Section 2. Proper land use planning may be accomplished within areas around public airports by using as guidelines the State Division of Aeronautics Airport Land Use Planning Handbook and any applicable federal aviation regulations.

Section 3. Proper land use planning may be accomplished within areas around public airports through local planning laws and ordinances which will address the preparation, adoption and amendment of the comprehensive airport land use plan.

Section 4. The planning efforts of the City around public airports will involve notification to the general public, landowners, interested groups and other public agencies regarding the preparation, adoption and amendment of the comprehensive airport land use plan.

Section 5. The Airport Mediation Board will serve as the mediator of disputes arising from the preparation, adoption and amendment of the comprehensive airport land use plan.

Section 6. The City's general and specific plans will be amended, when necessary, to be consistent with the adopted comprehensive airport land use plan.

Section 7. The City's Community Development Department shall be the agency responsible for the preparation, adoption and amendment of the comprehensive airport land use plan within the City boundaries in cooperation with adjacent impacted jurisdictions.

Section 8. The adoption of the alternative procedure described in Public Utilities Code Section 21670(c) is hereby determined exempt from the provisions of the California Environmental Quality Act per Public Resources Code Sections 21000 et seq.

ADOPTED, SIGNED AND APPROVED this 18th day of April, 1995.

Mayor of the City of Redlands

ATTEST:

City Clerk

RESOLUTION NO. 6152

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF REDLANDS ADOPTING REVISION 1 TO THE REDLANDS MUNICIPAL AIRPORT LAND USE COMPATIBILITY PLAN AND AMENDING RESOLUTION NO. 5344

WHEREAS, the City Council of the City of Redlands approved Resolution No. 5344 adopting the Redlands Municipal Airport Land Use Compatibility Plan on February 18, 1997; and

WHEREAS, it is deemed advisable and desirable to relocate the helicopter flight training pattern 1,000 feet to the north of San Bernardino Avenue and revise the Compatibility Zone designation from "B-2" (Extended Approach/Departure Zone) to "C" (Common Traffic Pattern) for the area between San Bernardino Avenue and 1,000 feet to the north extending from one-half mile west of Judson Street to approximately one-half mile east of Wabash Avenue; and

WHEREAS, all of the provisions of the Redlands Municipal Code and the California Government Code relating to the amendment of the Redlands Municipal Airport Land Use Compatibility Plan have been complied with, including publication of a notice on the 14th day of March, 2003 and the holding of a public hearing on the 25th day of March, 2003; and

WHEREAS, following the public hearing, the Planning Commission has determined that the health, safety and general welfare will be preserved by the proposed amendment of the Airport Land Use Compatibility Plan and recommends approval of the amendment to the City Council;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL AS FOLLOWS:

Section 1. Chapter 2 "Compatibility Review Criteria," subsection 2.1 "Basis for Compatibility Zone Boundaries," Policy 2.1.3 "Compatibility Zone B-2," subparagraph (b) is hereby deleted in its entirety and rewritten to read as follows:

"(b) Also included with Compatibility Zone B2 is the area beneath the modified helicopter flight training pattern south of the airport.

(1) Zone B2 as depicted in Figure 2A is reduced in size from the zone originally adopted in the Compatibility Plan in February, 1997. The smaller zone shall become effective as of when the City formally establishes the modified flight patterns as the preferred route for helicopter flight training at the airport.

(2) This Zone B2 segment can be eliminated with the affected area then being placed within Zone C at such time as the helicopter flight training is permanently discontinued. Permanent discontinuance is assumed to involve construction of a training helipad north of the runway, but could be accomplished through flight procedure changes."

Section 2. Table 2A "Primary Compatibility Criteria" (Page 2-11) Note No. 2 is deleted in its entirety and rewritten to read as follows:

> "2. The land use should not attract more than the indicated number of people per acre at any time, measured as an average over the entire site. In Compatibility Zones B1 and B2, no single acre (rectangular, not irregular in shape) should be occupied by more than double the average number of people per acre allowed for the specified compatibility zone. In Zone C, no single acre should attract more than triple the average allowable number of people per acre. These figures should include all individuals who may be on the property (e.g., employees, customers, visitors, etc.). These densities are intended as general planning guidelines to aid in determining the acceptability of proposed land uses."

Section 3. Figure 2A, "Compatibility Map" (Page 2-18) of the Airport Land Use Compatibility Plan is hereby replaced with the accompanying revised map attached as Exhibit "A."

Section 4. Figure 3B "Aircraft Noise Concerns" (Page 3-4) of the Airport Land use Compatibility Plan is hereby replaced with the accompanying revised map attached as Exhibit "B."

ADOPTED, SIGNED AND APPROVED this 6th day of May, 2003.

Mayor of the City of Redlands

ATTEST:

City Clerk

I:\ca\lem\Reso\6152 Airport Land Use Rev 1.wpd

I, Lorrie Poyzer, City Clerk of the City of Redlands, hereby certify that the foregoing resolution was duly adopted by the City Council at a regular meeting thereof held on the 6th day of May, 2003, by the following vote:

AYES:	Councilmembers Peppler, Gilbreath, George, Harrison; Mayor Haws
NOES:	None
ABSENT:	None
ABSTAIN:	None

Lorrie Poyzer

Lorrie Poyzer, City Clerk
City of Redlands

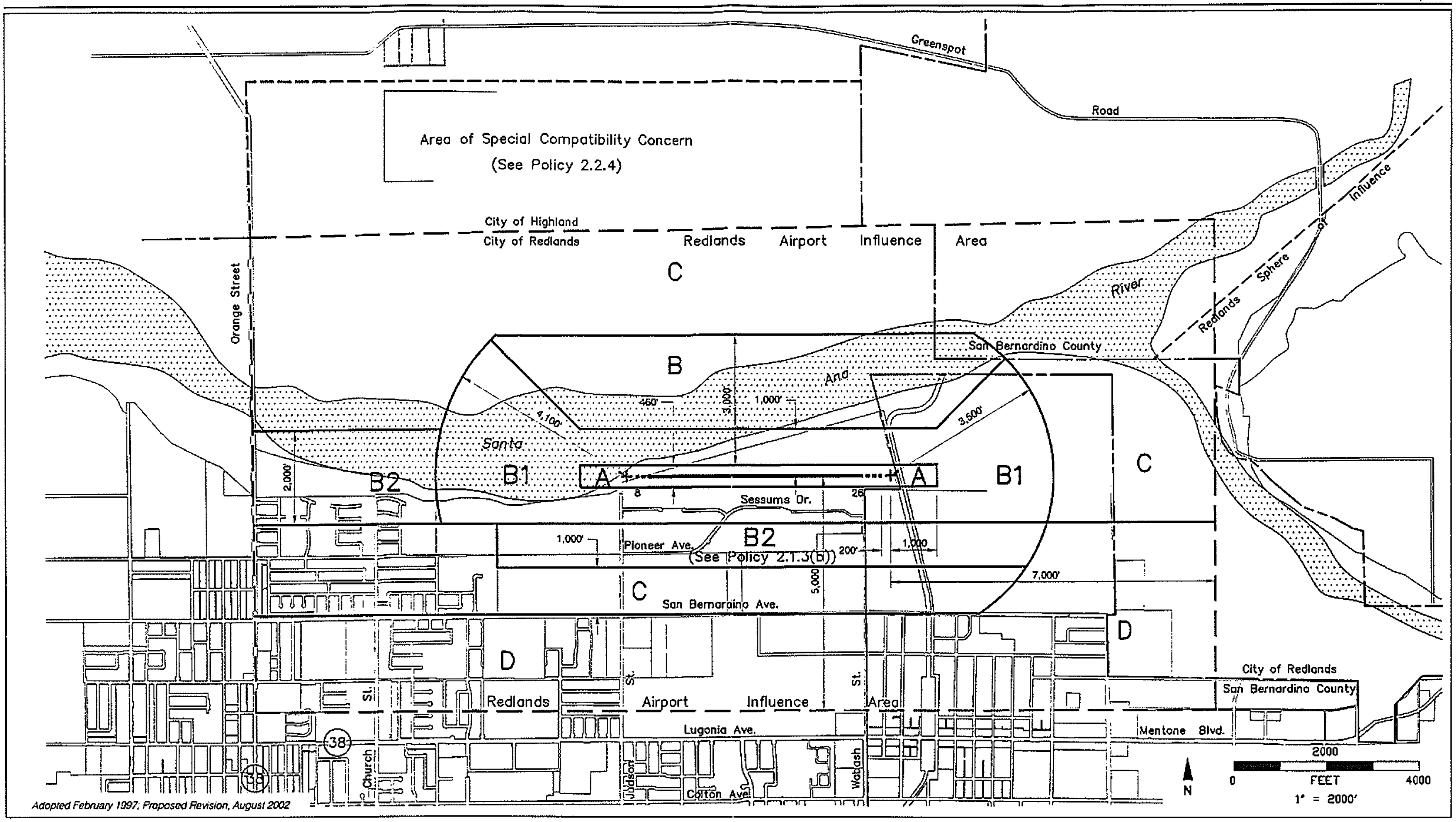


Figure 2A

Compatibility Map
Redlands Municipal Airport

EXHIBIT "A"

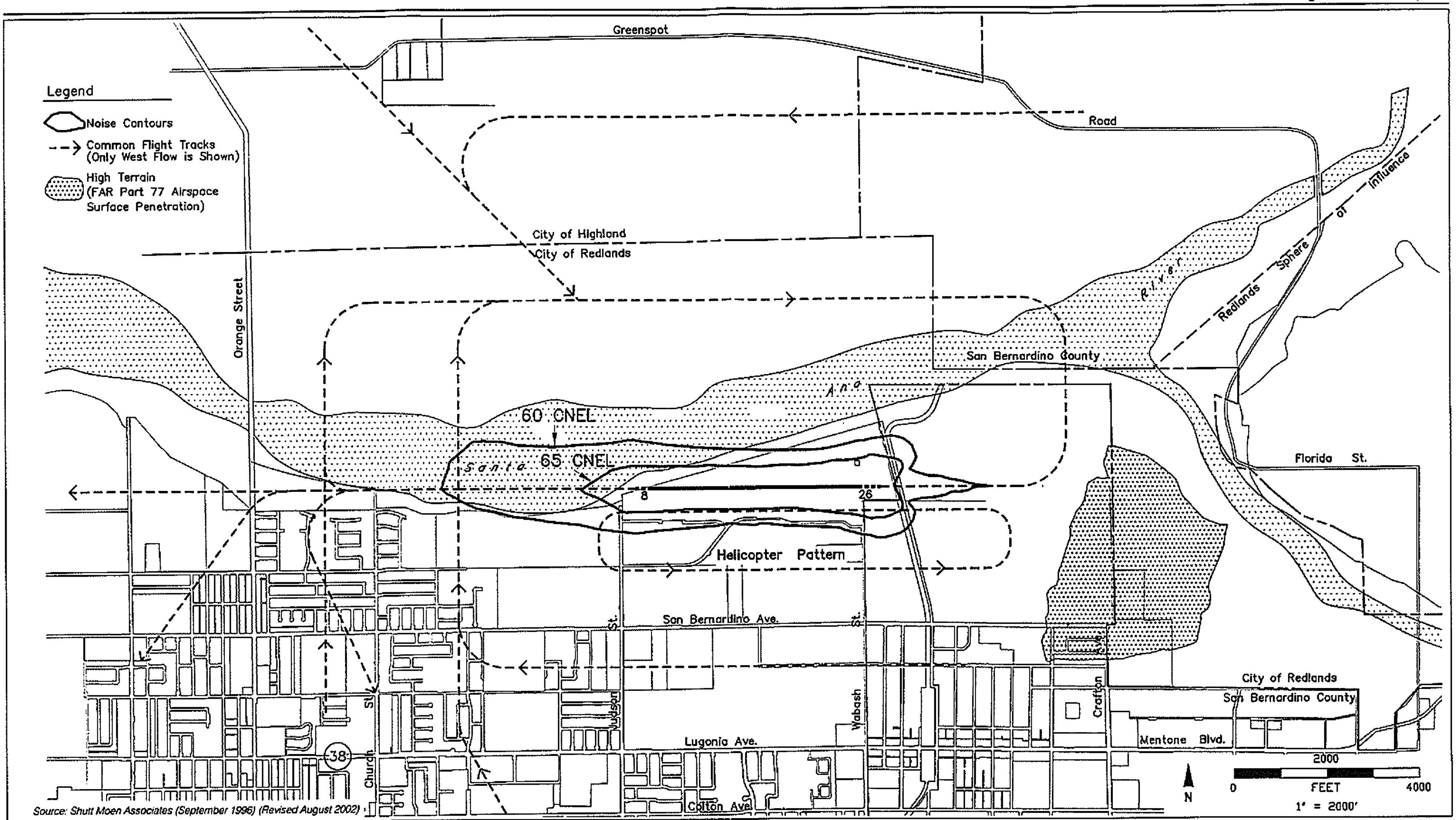


Figure 3B

Aircraft Noise Concerns
Redlands Municipal Airport

EXHIBIT "B"

DEPARTMENT OF TRANSPORTATION
DIVISION OF AERONAUTICS M.S. #40
1120 N STREET - ROOM 3300
P.O. BOX 942873
SACRAMENTO, CA 94273-0001
(916) 654-4959
FAX (916) 653-9531
TTY (916) 651-6827

Redlands Municipal Airport
San Bernardino County
Permit File

December 7, 2005

Mr. Gary Van Dorst
Airport Manager – Redlands Municipal Airport
City of Redlands Municipal Utilities Department
35 Cajon Street, Suite 15A
Redlands, CA 92373

Dear Mr. Van Dorst:

We are pleased to enclose corrected Airport Permit No. SBd-032 for the Redlands Municipal Airport in San Bernardino County. This corrected permit reflects a change in runway displaced threshold.

We have shown the physical status and the operating conditions for the airport on the permit. Prior to making any physical change to the airport, the airport's owner must notify the Division of Aeronautics to ensure that the proposed change does not affect the status of the airport's permit.

Also enclosed is a display certificate for the airport that you can post near the airport. If you have any questions or need assistance, please do not hesitate to contact us at (916) 654-5284 or by e-mail at kurt.o.haukohl@dot.ca.gov.

Sincerely,

Original Signed by

KURT O. HAUKOHL
Aviation Safety Officer

Enclosures

bc: William Mosby – District 08

KH:bsc s:\\z\permit\Airport\kh-SBd-032.ltr.doc

DAS-OBM-125

INITIALS/DATE				
KOH 12/7/05				

State of California

AIRPORT PERMIT

FOR A
PUBLIC-USE AIRPORT

Pursuant to California Public Utilities Code Section 21662, the California Department of Transportation, Division of Aeronautics, hereby issues this corrected Airport Permit No. SBd-032 for the:

REDLANDS MUNICIPAL AIRPORT
1745 Sessums Drive
Redlands, California

Latitude:	34°	05′	12″	N.
Longitude:	117°	08′	78″	W.

Owned and Operated by:	The City of Redlands 35 Cajon Street, Suite 15A Redlands, California 92373

This corrected permit reflects a removal of a displaced threshold and supersedes the permit dated August 23, 1978 and September 19, 1995. This permit is subject to the following conditions:

1. The airport is to be maintained in accordance with California Code of Regulations, Title 21, Sections 3525 through 3560 and plans approved by the Department.

2. The designated traffic pattern is as follows:

   - Right traffic for Runway 26

   - Left traffic for Runway 8

   - 1000 feet AGL

3. The airport is approved for day and night use.

The physical status of this public-use facility is described below:

Runway 8/26

- Physical length of the runway is 4505 feet.
- Runway is lighted.

This permit shall remain in effect so long as the airport meets the conditions under which the permit was issued or until action is taken by the Department to suspend, revoke, correct, or amend the permit pursuant to the California Public Utilities Code or the California Code of Regulations.

The airport's owner shall apply to the Department for an Amended/Corrected Airport Permit prior to any physical or operational changes at the airport which affect the conditions or physical status above or for a change in airport ownership.

Failure to maintain the airport in accordance with the conditions of this permit is a violation of Public Utilities Code Section 21666 and is punishable as a misdemeanor.

Mary C. Frederick

MARY C. FREDERICK, Acting Chief
Division of Aeronautics
Department of Transportation
State of California

December 7, 2005
Date

State of California

Department of Transportation
Division of Aeronautics
has issued an

AIRPORT PERMIT

For **REDLANDS MUNICIPAL AIRPORT**

Owned by The City of Redlands

Operated by The City of Redlands

Located at 1745 Sessums Drive, California

Latitude 34° 05' 12" N.; Longitude 117° 08' 78" W.

Has received Permit No. SBd-032

Operation of this airport is hereby authorized under this permit issued pursuant to the laws of the State of California and the rules and regulations of the Department of Transportation subject to any conditions imposed by the Department. This display certificate is not the Airport Permit.

December 7, 2005
DATE

MARY C. FREDERICK
CHIEF, Division of Aeronautics

Caltrans

Kurt

U.S Department
of Transportation

Federal Aviation Administration

Western-Pacific Region
Airports Division

P.O. Box 92007
Los Angeles, CA 90009

MAY 6 2003

FILE:
☒ A/P REDLANDS
☐ H/P
☐ OTHER
COUNTY: SBD

Mr. Tom Fujiwara
Assistant Public Works Director
City of Redlands
35 Cajon Street, P.O. Box 3005
Redlands, CA 92373

Dear Mr. Fujiwara:

Redlands Municipal Airport
Proposed Change in Helicopter Flight Traffic Pattern
Airspace Case No. 2003-AWP-124-NRA

The Federal Aviation Administration (FAA) has completed an airspace study from the airspace utilization standpoint of the proposal submitted by you, on FAA Form 7480-1, *Notice of Landing Area Proposal*, dated March 25, 2003. Our analysis determined that the proposal to change the helicopter flight traffic pattern is acceptable from an airspace utilization standpoint. The FAA has no objection to the proposal, provided the following conditions are met:

a. The landing area operator shall ensure and maintain obstruction-free routes of ingress/egress to the landing area.

b. The proposed change in helicopter flight traffic pattern for the airport may change the size of the noise contours over the community. Therefore, we recommend that the noise impacts be thoroughly analyzed and evaluated prior to implementation of these changes.

c. Conduct a pilot awareness program to ensure that all users of the airport are thoroughly familiar with this new non-standard pattern configuration.

d. Prior to making any changes to the helicopter flight traffic pattern, you must contact the California Department of Transportation to ensure that the proposed change does not affect the status of the airport permit. A corrected airport permit will be required, in accordance with the provisions of Title 21, Sections 3525 through 3560 of the California Code of Regulations.

California Department of Transportation
P.O. Box 942874
Sacramento, CA 94274
916-654-5284

This airspace study did not include an environmental review to determine whether or not the proposed development is environmentally acceptable in accordance with the National Environmental Policy Act of 1969 (Public Law 91-190).

2003-AWP-124-NRA

Form approved OMB No. 2120-0036

U.S. Department of Transportation
Federal Aviation Administration

NOTICE OF LANDING AREA PROPOSAL

Name of Proponent, Individual, or Organization	Address of Proponent, Individual, or Organization (No., Street, City, State, Zip Code)
Redlands Municipal Airport, City of Redlands ☐ Check if the property owner's name and address are different than above, and list property owner's name and address on the reverse.	35 Cajon Street, P.O. Box 3005 Redlands CA 92373

☐ Establishment or Activation ☐ Deactivation or Abandonment
☒ Alteration ☐ Change of Status
} OF ☐ Airport ☐ Ultraflight Flightpark ☐ Vertiport ☐ Heliport ☐ Seaplane Base ☐ Other (Specify) Helicopter Flight Pattern

A. Location of Landing Area

1. Associated City/State	2. County/State (Physical Location of Airport)			3. Distance and Direction From Associated City or Town	
Redlands CA	San Bernardino, California				
4. Name of Landing Area	5. Latitude ° ' "	6. Longitude ° ' "	7. Elevation	Miles: 0	Direction: within City

B. Purpose

Type Use	If Change of Status or Alteration, Describe Change		Construction Dates	
☒ Public ☐ Private ☐ Private Use of Public Land/Waters	Revise helicopter traffic pattern to a tighter pattern in the same location as previous. (see reverse side)	☒ Establishment or change to traffic pattern (Describe on reverse)	To Begin/Began: n/a	Est. Completion: n/a

C. Other Landing Areas

C. Other Landing Areas	Direction From Landing Area (Ref. A5 above)	Distance From Landing Area

D. Landing Area Data

	Existing (if any) Rwy #1	Rwy #2	Rwy #3	Proposed Rwy	Rwy	Rwy
1. Airport, Seaplane Base, or Flightpark						
Magnetic Bearing of Runway (s) or Sealane	N 89-48-00 E					
Length of Runway (s) or Sealane (s) in Feet	4510'					
Width of Runway (s) or Sealane (s) in Feet	75'					
Type of Runway Surface (Concrete, Asphalt, Turf, Etc.)	Asphalt					
2. Heliport						
Dimensions of Final Approach and Take off Area (FATO) in Feet						
Dimensions of Touchdown and Lift-Off Area (TLOF) in Feet						
Magnetic Direction of Ingress/Egress Routes						
Type of Surface (Turf, concrete, rooftop, etc.)						

3. All Landing Areas	Description of Lighting (If any)	Direction of Prevailing Wind

E. Obstructions

Type	Height Above Landing Area	Direction From Landing Area	Distance From Landing Area

F. Operational Data

1. Estimated or Actual Number Based Aircraft

Airport, Flightpark, Seaplane base	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence	Heliport	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Multi-engine			Under 3500 lbs. MGW		
Single-engine			Over 3500 lbs. MGW		
Glider					

2. Average Number Monthly Landings

	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence		Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Jet			Helicopter		
Turboprop			Ultralight		
Prop			Glider		

3. Are IFR Procedures For The Airport Anticipated
☐ No ☐ Yes Within ____ Years Type Navaid:

G. Other Considerations

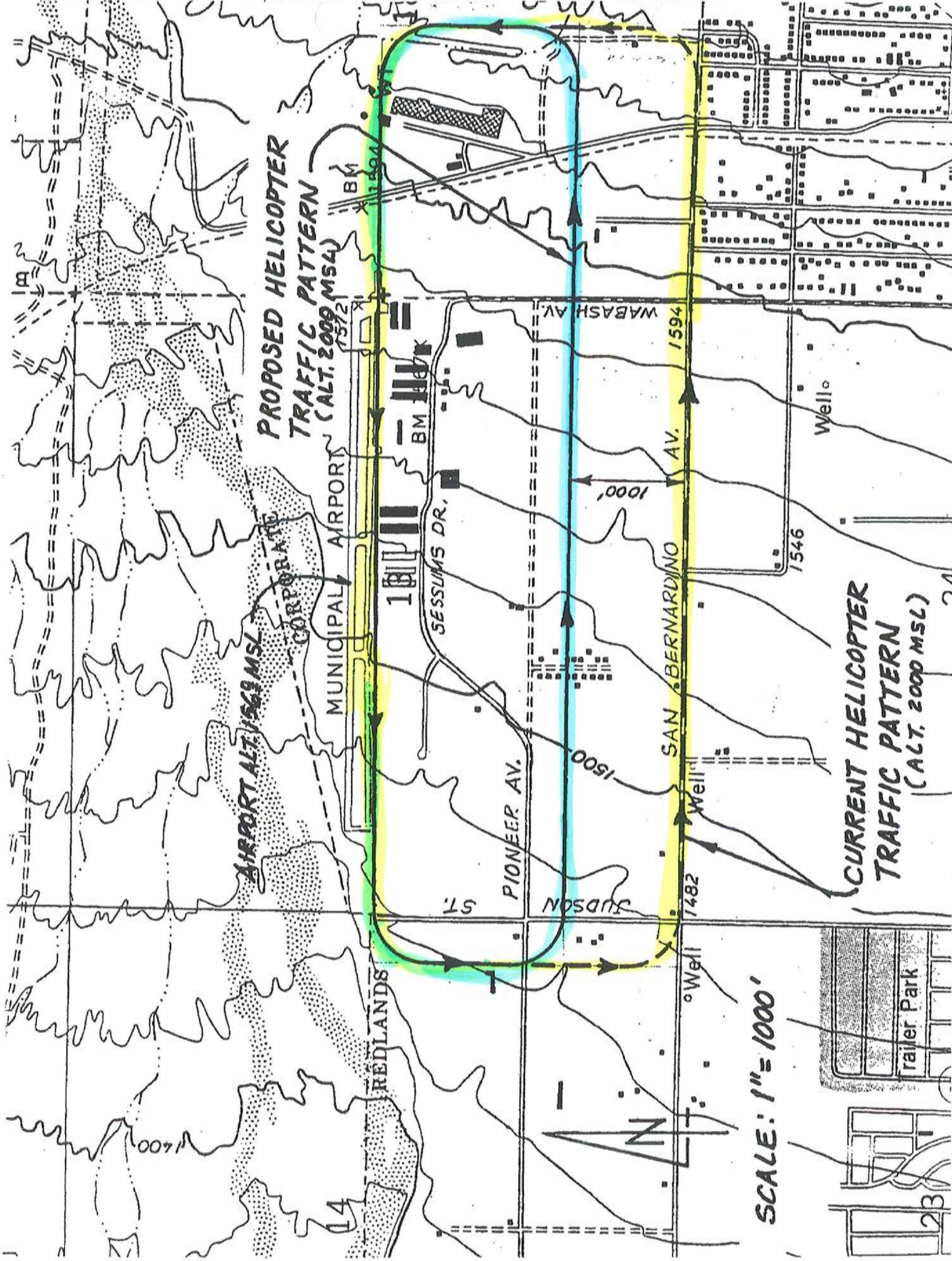
Identification	Direction From Landing Area	Distance From Landing Area

H. Application for Airport Licensing

☐ Has Been Made ☐ Not Required ☐ County
☐ Will Be Made ☐ State ☐ Municipal Authority

I. CERTIFICATION: *I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.*

Name, title (and address if different than above) of person filing this notice -- type or print	Signature (in ink)	
Tom T. Fujiwara, Assistant Public Works Director City of Redlands	Tom T. Fujiwara Date of Signature: 03/25/03	Telephone No. (Precede with area code) (909) 798-7655


PROPOSED HELICOPTER TRAFFIC PATTERN (ALT. 2000 MSL)
CURRENT HELICOPTER TRAFFIC PATTERN (ALT. 2000 MSL)
REDLANDS MUNICIPAL AIRPORT
CORPORATE AIRPORT
WABASH AV.
SAN BERNARDINO AV.
SESSUMS DR.
PIONEER AV.
JUDSON ST.
Well
1594
1546
1482
1000'
1500'
SCALE: 1" = 1000'
Trailer Park

DEPARTMENT OF TRANSPORTATION
DIVISION OF AERONAUTICS – M.S.#40
1120 N STREET
P. O. BOX 942873
SACRAMENTO, CA 94273-0001
PHONE (916) 654-4959
FAX (916) 653-9531
TTY (916) 651-6827

Redlands Airport
San Bernardino County

Flex your power!
Be energy efficient!

April 29, 2003

Mr. Mickeal Agaibi
Supervisor - Planning Section
FAA, Western-Pacific Region, Airports Division
PO Box 92007
Los Angeles, CA 90009

Dear Mr. Agaibi:

The California Department of Transportation (Department), Division of Aeronautics, received your request for comments regarding Airspace Case No. 2003-AWP-124-NRA for the proposed change in Helicopter Traffic Pattern at the Redlands Municipal Airport in San Bernardino County, California.

We are contact with Mr. Tom T. Fujiwara, the airport manager and have the following comments:

- The proposed change to re-orient the helicopter traffic pattern for the airport may change the size of the noise contours over the community. In the interests of airport land use compatibility, we recommend that the noise impacts be thoroughly analyzed, evaluated and shared with the underlying neighborhoods prior to implementation of these changes.

- From a safety perspective the proposed changes do not appear to materially impact flight safety. If this change is adopted, we highly recommended that the airport operator conduct a thorough pilot awareness program to ensure that all users of the airport are thoroughly familiar with this new non-standard pattern configuration.

- Based on the information that has been provided to our office, the Department has no objection to these proposed changes from a safety perspective provided all pilots using the airport are made aware of the non-standard helicopter pattern procedure.

"Caltrans improves mobility across California"

INITIALS/DATE				
RDH 4/29/03	DC 4/29/03			

- Prior to making any change to the airport traffic pattern, the airport owner must also notify the Department to be certain that the proposed change does not affect the status of the airport permit that has been issued by the Department. A corrected airport permit will be required, in accordance with the provisions of Title 21 Sections 3525 through 3560 of the California Code of Regulations.

If you have any additional questions or comments, please contact us at (916) 654-5284, or via e-mail: kurt.o.haukohl*@dot.ca.gov*.

Sincerely,

Original Signed by

KURT O. HAUKOHL
Aviation Safety Officer

c: Mr. Tom Fujiwara
Assistant Public Works Director
City of Redlands
35 Cajon Street
P. O. Box 3005
Redlands, CA 92373

bc: William Mosby – District 08

KH:bsc s:\\x\kh-L12.doc3

AEROTECH

AERO TECH ACADEMY, INC

Dear Whom It May Concern

This open letter addresses Aero Tech Academy helicopter training.
Our procedures for operation and safety policy is as follows for Aero Tech Academy and its staff of flight instructors, students and renter pilots.

Type of helicopter
Helicopter Robinson R22 (N31HJ) (N305NK) and R44 (N363SK)
Description of Robinson helicopter
R22 2 seat Maximum Gross weight 1,370LBS Endurance for approximately 2hrs for full tank of main tank
R44 4 seat Maximum Gross weight 2,400LBS Endurance for approximately 2hrs for full tank of main tank
Refer to appendix A

Type of Training
1, Dual basic training (Air work at practice area, South Traffic pattern and West parking at KREI and taxiway F at KSBD)
Student and instructor perform basic air work.
Refer to appendix B and C

2, Hovering solo training (KREI at West parking)
Students take off from East designated parking area, then hover taxi to West ramp via taxiway.
The student hover taxis to back to East parking when hover training is completed
Refer to appendix D

3, Solo training (South Traffic pattern training and Hovering training at West parking)

4, Time building for PIC (Air work at practice area and South Traffic pattern and Hovering training at West parking)

5, Frequently asked questions.

Q1, What is the departure procedure for take off from Designated East helicopter parking?
When the helicopter lifts to hover at East parking, the pilot performs hover taxi to taxiway and makes 360 ° clearing turn for check the traffic and situational awareness for airport operation. then takes off.
The pilot, when departing from taxiway, yields to the ground traffic and does not do so as fixed wing traffic is landing or departing.

Q2. What procedure is used to approach and land at East parking?
The helicopter primarily landings on the taxiway that intersects the runway and the west ramp.
Occasionally landing at opposite the Eastside parking area adjacent to the fuel station.

If the pilot landings at west intersection, the pilot hover taxi on the taxiway back to East parking. This procedure is designed to accommodate taxiing aircraft and vehicular ground traffic.

Q3. How and when does the helicopter fuel?
The rated pilot or flight instructor may hover taxi to fuel station and land adjacent to the fuel pumps. The student may never take hover to fuel station by themselves. The procedure is to land in the designated parking area, attach the ground handling wheels, push the aircraft to the fuel pumps, after refueling the helicopter, push the aircraft back to the parking area, remove the wheels, and preflight for take off.
If the pumps are vacant or the instructor or rated pilot has coordinated with and aircraft parked at the pumps, the rated pilot or flight instructor may take a hover to taxi for takeoff.

Q4. What is the procedure for the student or instructor to avoid airplane traffic on taxiway?
ATA's helicopter student or helicopter flight instructor are to yield right of way to fixed wing aircraft on the taxiway.

Q5. What training does the student receive in radio communication?
ATA, in ground school training Lesson 8, provides local radio communication procedure for Redlands Municipal Airport. Using AIM and ASA Radio communication book and actual radio equipment before flight instruction begins. This training is a mandatory requirement!!

Q6. Why the helicopter remain running for so long at the east parking area?
When starting, a warm up and preflight runup are done.
When the helicopter returns for fueling or student exchange, the engine requires a cool down period before engine shut down.
Refer to check list helicopter starting and shut down procedure appendix E

We feel it is important to note that not all helicopters operating at Redlands Municipal Airport are part of the Aero Tech Academy fleet. Aircraft from other flight schools use the facilities here as well and may not adhere to Aero Tech Academy's policies or procedures.

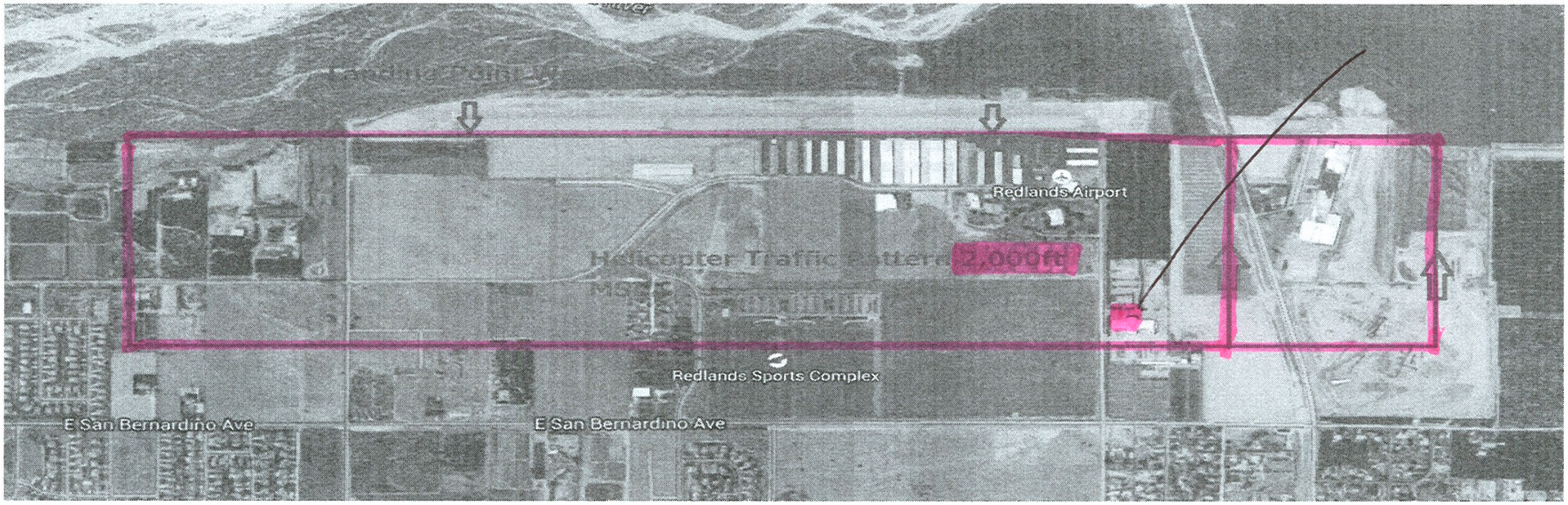
If you have any questions about ATA operations, training methods or its helicopters, please contact us !!

Sincerly,

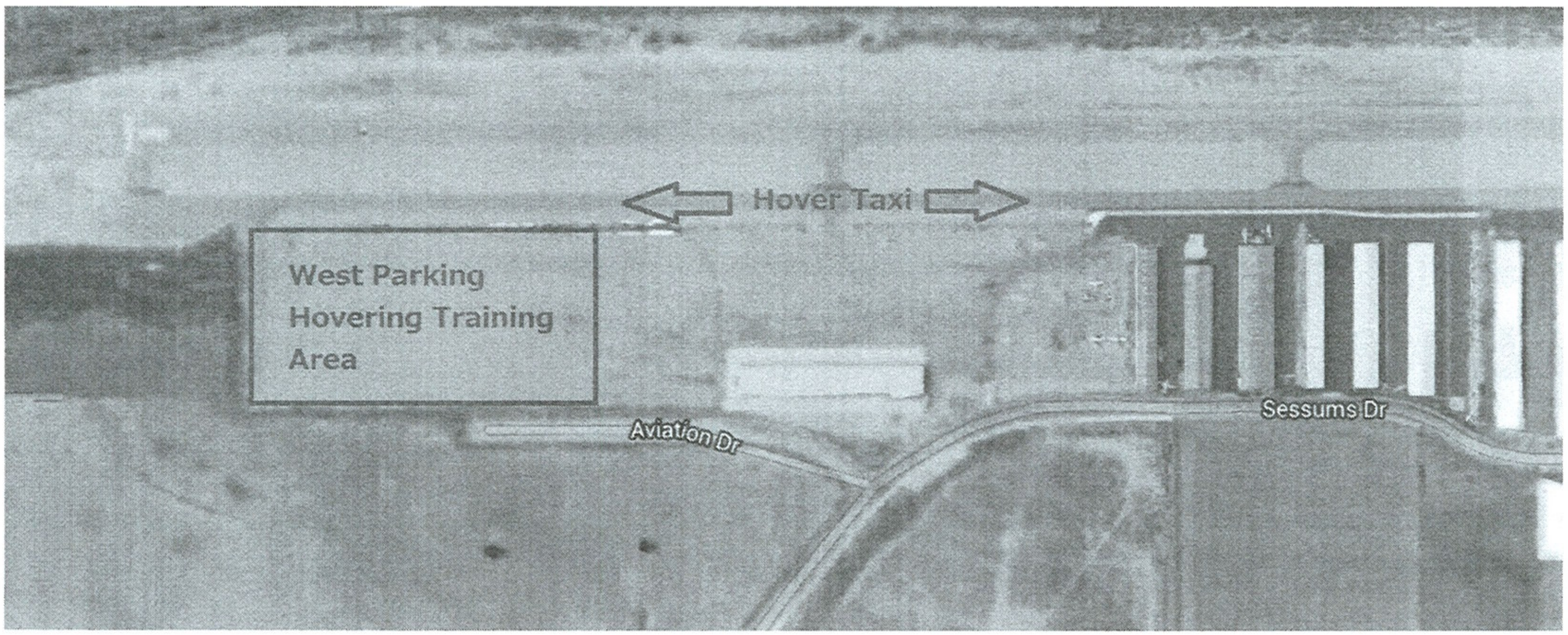
Aero Tech Academy, Inc
Nobumsa Ezuka (President)
1745 Sessums Dr Redlands CA 92374 USA
Ph & Fax 909-794-4046
e-mail ezuka@ata.bz
web www.ata.bz

Pilot certification Number 2548514
Airplane Single Engine Land, Airplane Multi Engine Land and Instrument airplane CFI,II
Rotorcraft helicopter and Instrument CFI,II
And FAA Part 141 Chief flight instructor school certification number 2AZS030L

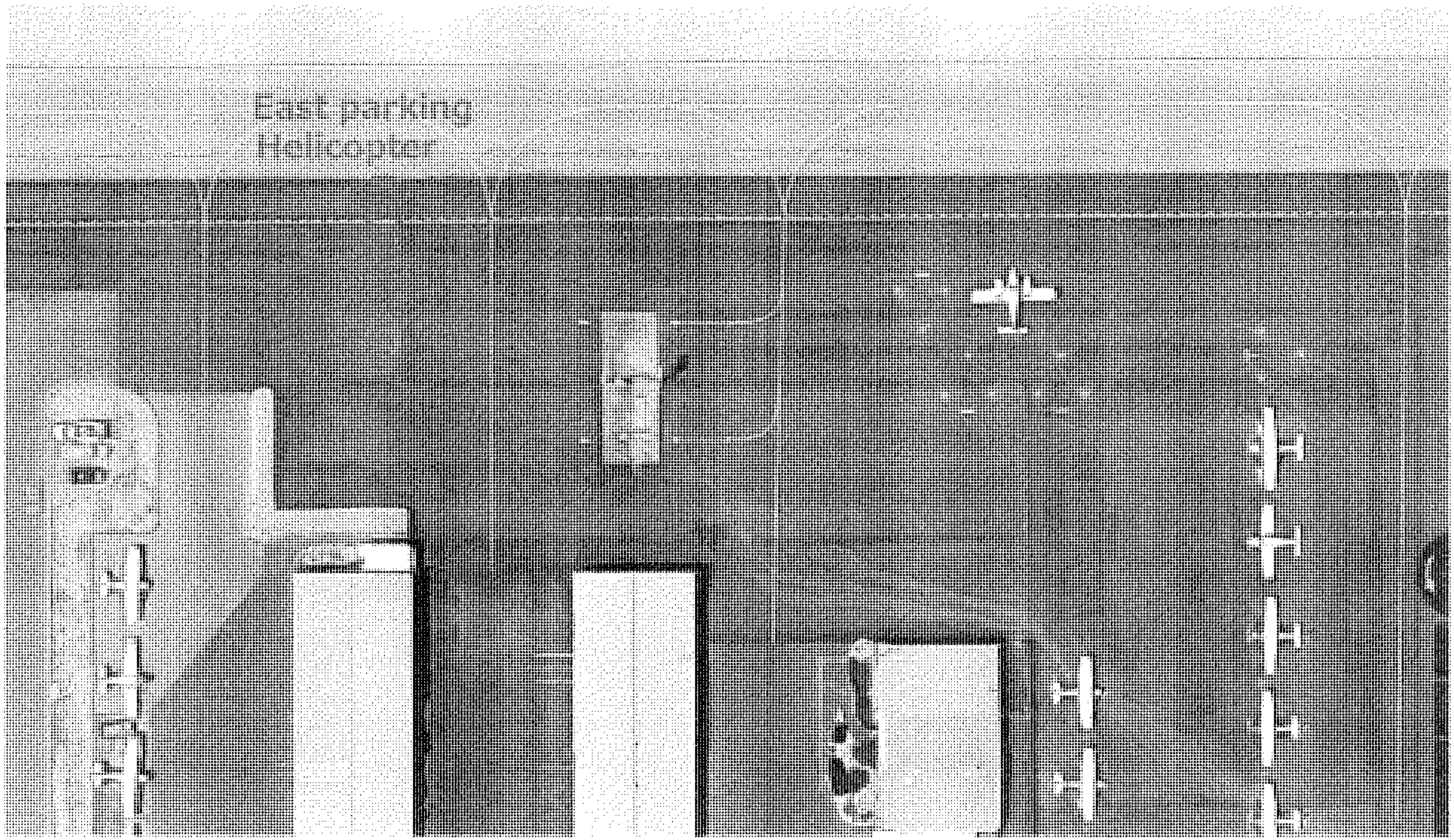
Your office



Appendix B



Appendix C



Appendix D

Appendix A

APPENDIX C

THE MEASUREMENT AND ANALYSIS OF SOUND

Coffman Associates
RESOURCE LIBRARY

The Measurement and Analysis of Sound

Sound is energy — energy that conveys information to the listener. Although measuring this energy is a straight- forward technical exercise, describing sound energy in ways that are meaningful to people is complex. This TIP explains some of the basic principles of sound measurement and analysis.

NOISE - UNWANTED SOUND

Noise is often defined as unwanted sound. For example, rock-and-roll on the stereo of the resident of apartment 3A is music to her ears, but it is intolerable racket to the next door neighbor in 3B. One might think that the louder the sound, the more likely it is to be considered noise. This is not necessarily true. In our example, the resident of apartment 3A is surely exposed to higher sound levels than her neighbor in 3B, yet she considers the sound as pleasant while the neighbor considers it "noise." While it is possible to measure the sound level objectively, characterizing it as "noise" is a subjective judgement.

The characterization of a sound as "noise" depends on many factors, including the information content of the sound, the familiarity of the sound, a person's control over the sound, and a person's activity at the time the sound is heard.

MEASUREMENT OF SOUND

A person's ability to hear a sound depends on its character as compared with all other sounds in the environment. Three characteristics of sound to which people respond are subject to objective measurement: magnitude or loudness; the frequency spectrum; and the time variation of the sound.

LOUDNESS

The unit used to measure the magnitude of sound is the decibel. Decibels are used to measure loudness in the same way that "inches" and "degrees" are used to measure length and temperature. Unlike the linear length and temperature scales, the decibel scale is logarithmic. By definition, a sound which has ten times the mean square sound pressure of the reference sound is 10 decibels (dB) greater than the reference sound. A sound which has 100 times (10 × 10 or 102) the mean square sound pressure of the reference sound is 20 dB greater (10 × 2).

The logarithmic scale is convenient because the mean square sound pressures of normal interest extend over a range of 11 trillion to one.

This huge number (a "1" followed by 14 zeros or 1014) is much more conveniently represented on the logarithmic scale as 140 dB (10 x 14).

The use of the logarithmic decibel scale requires different arithmetic than we use with linear scales. For example, if two equally loud but independent noise sources operate simultaneously, the measured mean square sound pressure from both sources will be twice as great as either source operating alone. When expressed on the decibel scale, however, the sound pressure level from the combined sources is only 3 dB higher than the level produced by either source alone. Furthermore, if we have two sounds of different magnitude from independent sources, then the level of the sum will never be more than 3 dB above the level produced by the greater source alone.

This equation describes the mathematics of sound level summation:

$$S_t = 10 \log \sum 10^{S_i/10}$$

where S_t is the total sound level, in decibels, and S_i is the sound level of the individual sources.

A simpler process of summation is also available and often used where a level of accuracy of less than one decibel is not required. **Table 1** lists additive factors applicable to the difference between the sound levels of two sources.

The noise values to be added should be arrayed from lowest to highest. The additive factor derived from the difference between the lowest and next highest noise level should be added to the higher level. An example is shown to the right.

TABLE 1

ADDITIVE FACTORS FOR SUMMATION OF TWO SOUND TYPES

DIFFERENCE IN SOUND LEVEL (DB)	ADD TO LARGER LEVEL (DB)	DIFFERENCE IN SOUND LEVEL (DB)	ADD TO LARGER LEVEL (DB)
0	3.0	8	0.6
1	2.5	9	0.5
2	2.1	10	0.4
3	1.8	12	0.3
4	1.5	14	0.2
5	1.2	16	0.1
6	1.0	> 16	0
7	0.8		

SOURCE: HUD 1985, p. 51.

Logarithmic math also produces interesting results when averaging sound levels. As the following example shows, the loudest sound levels are the dominant influence in the averaging process. In the example, two sound levels of equal duration are averaged. One is 100 dB; the other 50 dB. The result is not 75 as it would be with linear math but 97 dB. This is because 100 dB contains 100,000 times the sound energy as 50 dB.

Another interesting attribute of sound is the human perception of loudness. Scientists researching human hearing have determined that most people perceive a 10 dB increase in sound energy over a given frequency range as, roughly, a doubling of the loudness. Recalling the logarithmic nature of the decibel scale, this means that most people perceive a ten-fold increase in sound energy as a two-fold increase in loudness (Kryter 1984, p. 188). Furthermore, when comparing sounds over the same frequency range, most people cannot distinguish between sounds varying by less than two or three decibels.

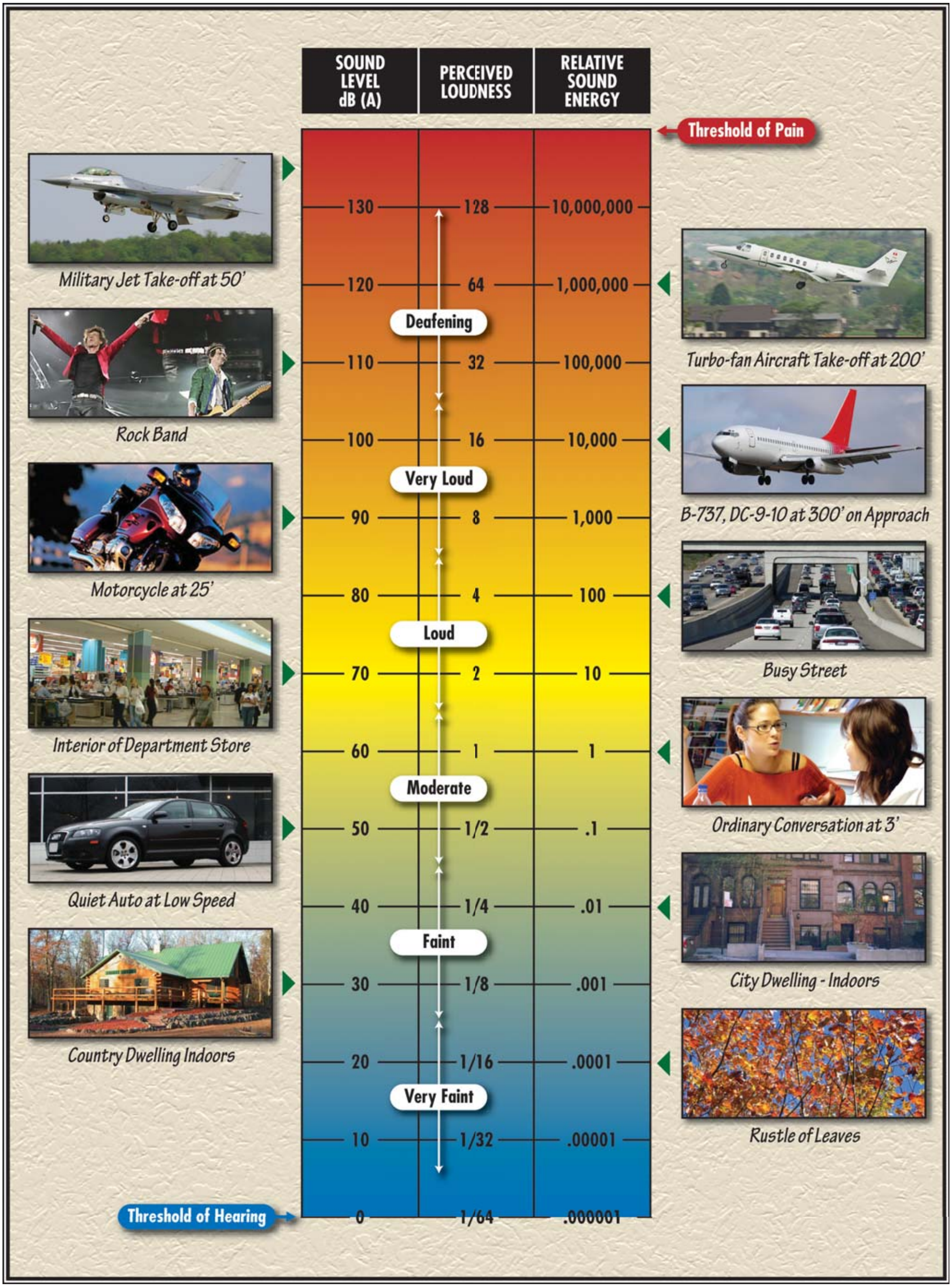
Exhibit A presents examples of various noise sources at different noise levels, comparing the decibel scale with the relative sound energy and the human perception of loudness. In the exhibit, 60 dB is taken as the reference or "normal" sound level. A sound of 70 dB, involving ten times the sound energy, is perceived as twice as loud. A sound of 80 dB contains 100 times the sound energy

EXAMPLE OF SOUND LEVEL SUMMATION

59.0 dB
60.0 dB } **Add 2.5 to 60 = 62.5**
66.5 dB } **Add 1.5 to 66.5 = 68**

59 dB+ 60 dB = 66.5 dB = 68 dB

EXHIBIT A


SOUND LEVEL dB (A)
PERCEIVED LOUDNESS
RELATIVE SOUND ENERGY
Threshold of Pain
130 128 10,000,000
120 64 1,000,000
Deafening
110 32 100,000
100 16 10,000
Very Loud
90 8 1,000
80 4 100
Loud
70 2 10
60 1 1
Moderate
50 1/2 .1
40 1/4 .01
Faint
30 1/8 .001
20 1/16 .0001
Very Faint
10 1/32 .00001
0 1/64 .000001
Threshold of Hearing
Military Jet Take-off at 50'
Rock Band
Motorcycle at 25'
Interior of Department Store
Quiet Auto at Low Speed
Country Dwelling Indoors
Turbo-fan Aircraft Take-off at 200'
B-737, DC-9-10 at 300' on Approach
Busy Street
Ordinary Conversation at 3'
City Dwelling - Indoors
Rustle of Leaves

and is perceived as four times as loud as 60 dB. Similarly, a sound of 50 dB contains ten times less sound energy than 60 dB and is perceived as half as loud.

FREQUENCY WEIGHTING

Two sounds with the same sound pressure level may "sound" quite different (e.g., a rumble versus a hiss) because of differing distributions of sound energy in the audible frequency range. The distribution of sound energy as a function of frequency is known as the "frequency spectrum." The spectrum is important to the measurement of sound because the human ear is more sensitive to sounds at some frequencies than others. People hear best in the frequency range of 1,000 to 5,000 cycles per second (Hertz) than at very much lower or higher frequencies. If the magnitude of a sound is to be measured so that it is proportional to its perception by a human, it is necessary to weight more heavily that part of the sound energy spectrum humans hear most easily.
Over the years, many different sound measurement scales have been developed, including the A-weighted scale (and also the B, C, D, and E-weighted scales). A-weighting, developed in the 1930s, is the most commonly used scale for approximating the frequency spectrum to which humans are sensitive. Because of its universality, it was adopted by the U.S. Environmental Protection Agency and other government agencies for the description of sound in the environment.

The zero value on the A-weighted scale is the reference pressure of 20 micro-newtons per square meter (or micro-pascals). This value approximates the smallest sound pressure that can be detected by a human. The average sound level of a whisper at a distance of 1 meter is 40 dB; the sound level of a normal voice at 1 meter is 57 dB; a shout at 1 meter is 85 dB; and the threshold of pain is 130 dB.

TIME VARIATION OF SOUND LEVEL

Generally, the magnitude of sound in the environment varies randomly over time. Of course, there are many exceptions. For example, the sound of a waterfall is steady with time, as is the sound of a room air conditioner or the sound inside a car or airplane cruising at a constant speed. But, in most places, the loudness of outdoor sound is constantly changing because it is influenced by sounds from many sources.

While the continuous variation of sound levels can be measured, recorded, and presented, comparisons of sounds at different times or at different places is very difficult without some way of reducing the time variation. One way of doing this is to calculate the value of a steady-state sound which contains the same amount of sound energy as the time-varying sound under consideration. This value is known as the Equivalent Sound Level (L_{eq}). An important advantage of the L_{eq} metric is that it correlates well with the effects of noise on humans. On the basis of research, scientists have formulated the "equal energy rule." It is the total sound energy perceived by a human that accounts for the effects of the sound on the person. In other words, a very loud noise lasting a short time will have the same effect as a quieter noise lasting a longer time if the total energy of both sound events (the L_{eq} value) is the same.

KEY DESCRIPTORS OF SOUND

Four descriptors or metrics are useful for quantifying sound. All are based on the logarithmic decibel (dB) scale and incorporate A-weighting to account for the frequency response of the ear.

Sound Level

The sound level (L) in decibels is the quantity read on an ordinary sound level meter. It fluctuates with time following the fluctuations in magnitude of the sound. Its maximum value (L_{max}) is one of the descriptors often used to characterize the sound of an airplane overflight. However, L_{max} only gives the maximum magnitude of a sound — it does not convey any information about the duration of the sound. Clearly, if two sounds have the same maximum sound level, the sound which lasts longer will cause more interference with human activity.

Sound Exposure Level

Both loudness and duration are included in the Sound Exposure Level (SEL), which adds up all sound occurring in a stated time period or during a specific event, integrating the total sound over a one-second duration. The SEL is the quantity that best describes the total noise from an aircraft overflight. Based on numerous sound measurements, the SEL from a typical aircraft overflight is usually four to seven decibels higher than the L_{max} for the event.

Exhibit B shows graphs of two different sound events. In the top half of the graph, we see that the two events have the same L_{max}, but the second event lasts longer than the first. It is clear from the graph that the area under the noise curve is greater for the second event than the first. This means that the second event contains more total sound energy than the first, even though the peak levels for each event are the same. In the bottom half of the graph, the SELs for each event are compared. The SELs are computed by mathematically compressing the total sound energy into a one-second period. The SEL for the second event is greater than the SEL for the first. Again, this simply means that the total sound energy for the second event is greater than for the first.

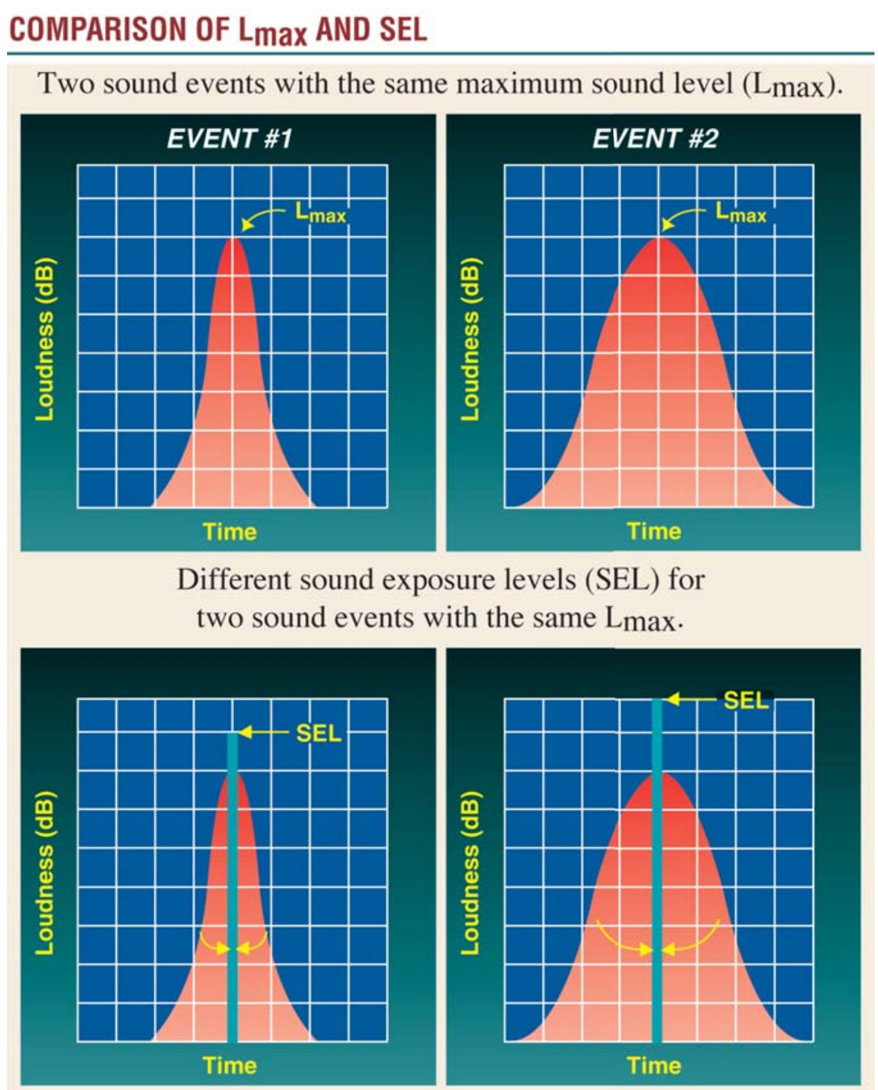
Equivalent Sound Level

The L_{eq} is simply the logarithm of the average value of the sound exposure during a stated time period. It is typically used for durations of one hour, eight hours, or 24 hours. In airport noise compatibility studies, use of the L_{eq} term applies to 24-hour periods unless otherwise noted. It is often used to describe sounds with respect to their potential for interfering with human activity.

Cumulative Noise Metrics

L_{eq} can be weighted to account for increased annoyance attributed to noise during the evening and nighttime when ambient noise levels are lower. Two weighted noise metrics commonly used for airports are the day-night sound level (DNL) and the community noise equivalent level (CNEL) which is used in the State of California. Both metrics are calculated using similar methodology, DNL is calculated by

EXHIBIT B



summing the sound exposure during daytime hours plus 10 times the sound exposure occurring during nighttime hours (2200-0700). The sum is averaged by dividing by the number of seconds during a 24 day. CNEL includes an additional evening penalty of 4.77 dB for sound events occurring between 1900 and 2200.

Exhibit C shows how the sound occurring during a 24-hour period is weighted and averaged by the DNL or CNEL metrics. In the examples, the sound occurring during the period, including aircraft noise and background sound, yields a DNL or CNEL value of 71. As a practical matter, this is a reasonably close estimate of the aircraft noise alone because, in this example, the background noise is low enough to contribute only a little to the overall DNL or CNEL value during the period of observation.

Where the basic element of sound measurement is L_{eq}, DNL is calculated from:

$$L_{dn} - 10_{\log} 1/24 \left(\sum_{d=1}^{15} 10^{[Leq(d)]/10} + \sum_{n=1}^{9} 10^{[Leq(n)+10]/10} \right)$$

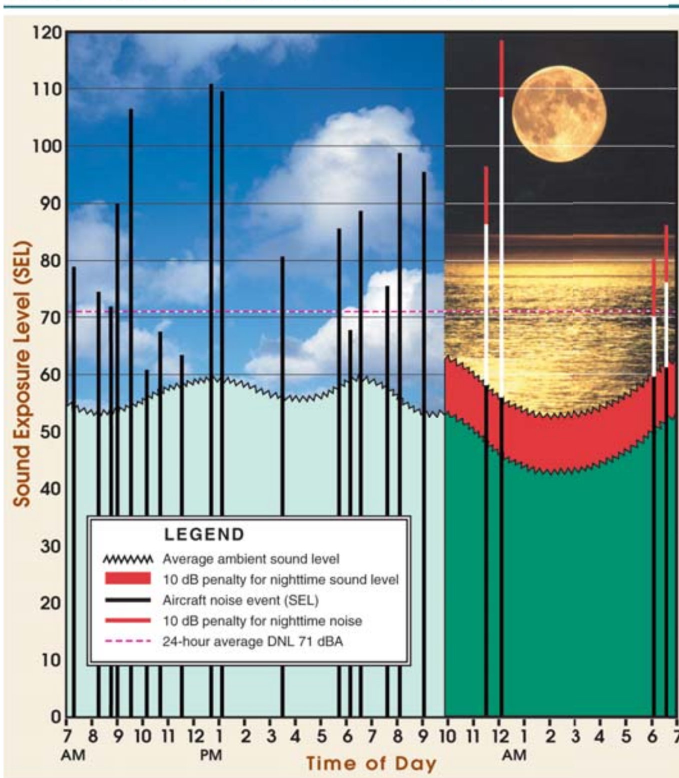
where DNL is represented mathematically as L_{dn}, and $L_{eq}(d)$ and $L_{eq}(n)$ are the daytime and nighttime hour values combined. This expression is convenient where L_{eq} values for only a few hours are available and the values for the remainder of the day can be predicted from a knowledge of day/night variation in levels. The hourly L_{eq} values are summed for the 15 hours from 0700 to 2200 and added to the sum of hourly L_{eq} figures for the 9 nighttime hours with a 10 dB penalty added to the nighttime L_{eq}s.

Use of the cumulative metric to describe aircraft noise is required for all airport noise studies developed under the regulations of 14 CFR Part 150. In addition, DNL and CNEL is preferred by all federal agencies as the appropriate single measure of cumulative sound exposure. These agencies include the FAA, the Federal Highway Administration, Environmental Protection Agency, Department of Defense, and Department of Housing and Urban Development.

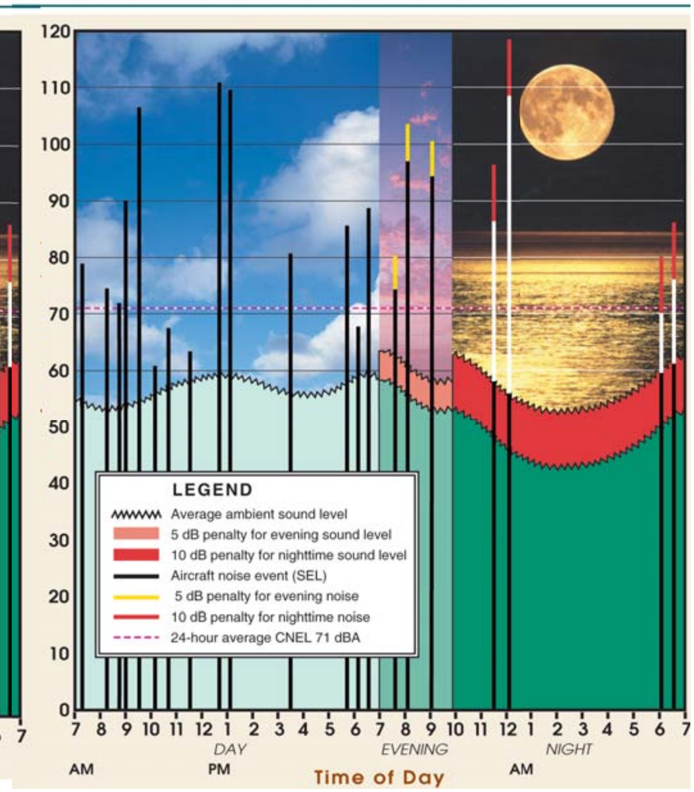
One might think of these metrics as a summary description of the "noise climate" of an area. DNL and CNEL accumulate the noise energy from passing aircraft in the same way that

EXHIBIT C

TYPICAL NOISE PATTERN AND DNL SUMMATION



TYPICAL NOISE PATTERN AND CNEL SUMMATION



Another way of computing DNL is described in this equation:

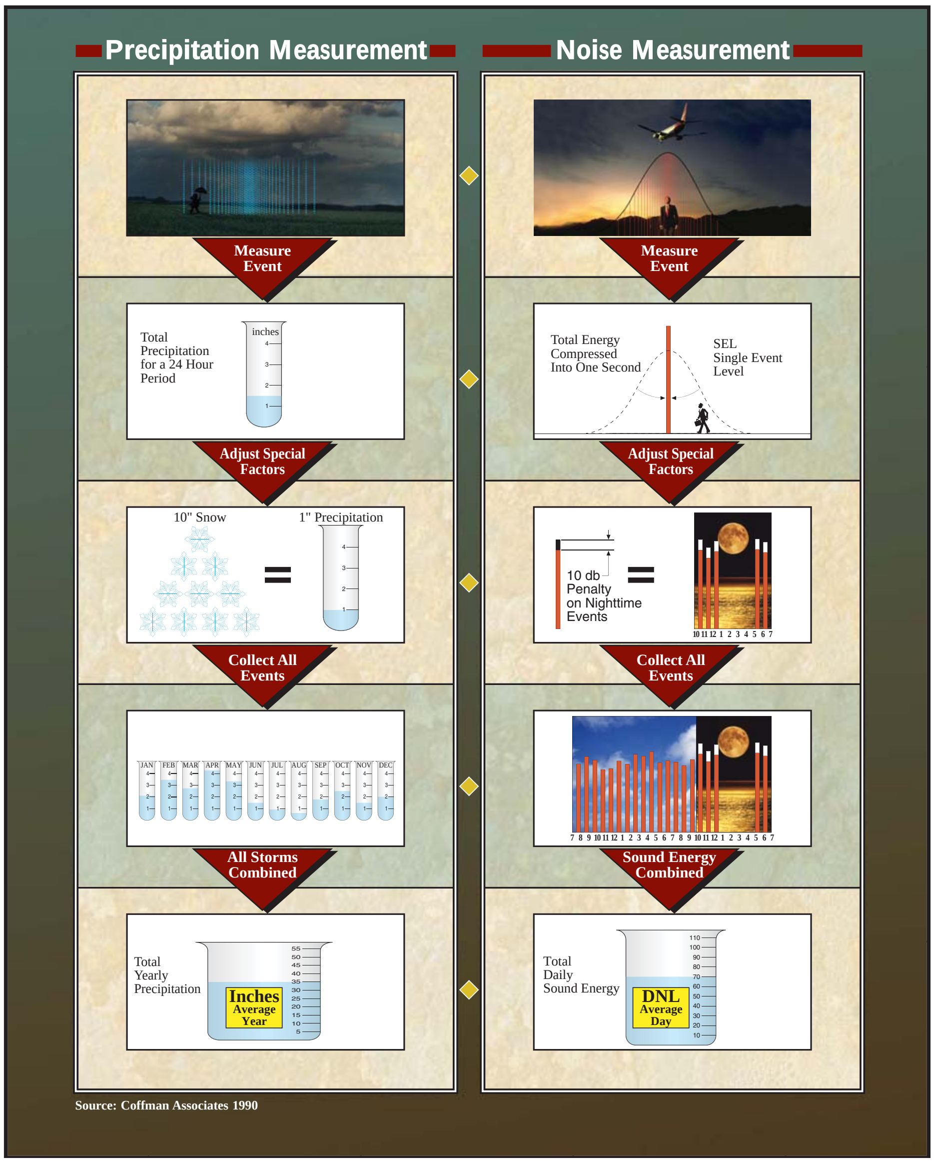
$$L_{dn} = 10\log \frac{1}{86400}\left(\int_{day} 10^{LA/10_{dt}} + \int_{night} 10^{LA+10_{dt}}\right)$$

where LA is the time-varying, A-weighted sound level, measured with equipment meeting the requirements for sound level meters (as specified in a standard such as ANSI SI.4-1971), and dt is the duration of time in seconds. The averaging constant of 86,400 is the number of seconds in a day. The integrals are taken over the daytime (0700 - 2200) and the nighttime (2200 - 0700) periods, respectively. If the sound level is sampled at a rate of once per second rather than measured continuously, the equation still applies if the samples replace LA and the integrals are changed to summations.

a precipitation gauge accumulates rain from passing storms. This analogy is presented in **Exhibit D**. Rain usually starts as a light sprinkle, building in intensity as the squall line passes over, then diminishing as the squall moves on. At the end of a 24-hour period, a rain gauge indicates the total rainfall received for that day, although the rain fell only during brief, sometimes intense, showers. Over a year, total precipitation is summarized in inches. When snow falls, it is converted to its equivalent measure as water. Although the total volume of precipitation during the year may be billions or trillions of gallons of water, its volume is expressed in inches because it provides for easier summation and description. We have learned how to use total annual precipitation to describe the climate of an area and make predictions about the environment.

Aircraft noise is similar to precipitation. The noise level from a single overflight begins quietly and builds in intensity as the aircraft draws closer. The sound of the aircraft is loudest as it passes over the receiver, diminishing as it passes. The total noise occurring during the event is accumulated and described as a SEL. Over a 24-hour period, the SELs can be summed, adding a special 10-decibel factor for nighttime noise, yielding a DNL value and an additional 4.77 dB for CNEL evening events. The DNL or CNEL developed over a long period of time, for example one year, defines the noise environment of the area, allowing us to make predictions about the average response of people living in areas exposed to various DNL or CNEL levels.

EXHIBIT D



HELPFUL RULES-OF-THUMB

Despite the complex mathematics involved in noise analysis, several simple rules-of-thumb can help in understanding the noise evaluation process.

- When sound events are averaged, the loud events dominate the calculation.
- A 10 decibel change in noise is equal to a tenfold change in sound energy. For example, the noise from ten aircraft is ten decibels louder than the noise from one aircraft of the same type, operated in the same way.
- Most people perceive an increase of 10 decibels as a relative doubling of the sound level.
- The DNL metric assumes one nighttime operation (between 10:00 p.m. and 7:00 a.m.) is equal in impact to ten daytime operations by the same aircraft.
- A doubling of aircraft operations results in a three decibel noise increase if done by the same aircraft operated in the same way.
- The CNEL metric assumes one evening operation (7:00 p.m. to 10:00 p.m.) is equal in impact to 4.77 daytime operations by the same aircraft and one nighttime operation (10:00 p.m. to 7:00 a.m.) is equal in impact to ten daytime operations by the same aircraft

REFERENCES

Kryter, K.D. 1984. Physiological, Psychological, and Social Effects of Noise, NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. Aviation Noise Effects. Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

HUD (U.S. Department of Housing and Urban Development) 1985. The Noise Guidebook, HUD-953-CPD Washington, D.C., Superintendent of Documents, U.S. Government Printing Office, March 1985.

United States Central Accounting Office, Aviation and the Environment: FAA's Role in Major Airport Noise Programs. April 2000

Coffman Associates
Airport Consultants
www.coffmanassociates.com

KANSAS CITY
(816) 524-3500

237 N.W. Blue Parkway
Suite 100
Lee's Summit, MO 64063

PHOENIX
(602) 993-6999

4835 E. Cactus Road
Suite 235
Scottsdale, AZ 85254