

Appendix C

Noise Analysis

THIS PAGE INTENTIONALLY LEFT BLANK

Ascend Fleet Mix

Categories	Suggested Aircraft Types	Number of Aircraft	Annual	Subtotal	Aircraft Modeled	Daily
Piston	C-421, C-414, Baron 58, Baron 58	1	208.00	208.00	use BEC58P	0.28
Small Jet	King Air 200, Eclipse 500, Premier One, Citation Mustang	9	208.00	1872.00	use DHC6	2.66
Turboprop	King Air 200, King Air 300, MU2, Commander 695	1	208.00	208.00	use DHC6 = .14, CNA441 = .14	0.28
Mid-Size Jet	Hawker, Falcon 50, Lear 35	13	156.00	2028.00	use LEAR35 = 1.86, LEAR25 = .93	2.78
Large Jet	G-4, Global Express	8	104.00	832.00	use GIV	1.14
Airline Class Jet	B737-300	1	52.00	52.00	use 7373B2	0.07

* Formula used to find the "Daily" total: 'Subtotal' / 365 / 2.

* For the category "Turboprop", two aircraft models were used so the daily total was divided by two.

* For the category "Mid-Size Jet", two aircraft models were used but the daily total was divided by three. One third was applied to LEAR25 and two thirds was applied to LEAR35.

JetStar Fleet Mix

Categories	Reported Aircraft Types	Aircraft Modeled	Monthly LTOs	Daily Ops	Daytime	Nighttime
Heavy Jets	Challenger 604 and Falcon 900	CL600	24	0.79	0.71	0.08
Medium Jets	Hawker 800, Citation Excel, Lear 45	IA1125 Lear35	24	0.79	0.71	0.08
Light Jets	Citation II, Citation I, Eclipse	CNA500	76	2.50	2.25	0.25
Turbo Prop	King Air 200 and King Air 350	DHC6	92	3.02	2.72	0.30
Single Engine Piston	PA28 and C172	PA28 CNA172	40	1.32	1.18	0.13
			40	1.32	1.18	0.13

*Some of the aircraft reported were not available in the AEM model. Substitutions were made based on weight and engine types.

For the two models, the 2005 fleet mix used for the Part 150 study was used as the baseline.

Using the FAA’s Air Traffic Activity System (ATADS) data for Austin-Bergstrom International Airport, it was determined that the annual operations have not significantly changed since 2005, therefore represents current conditions. (Figure 1)

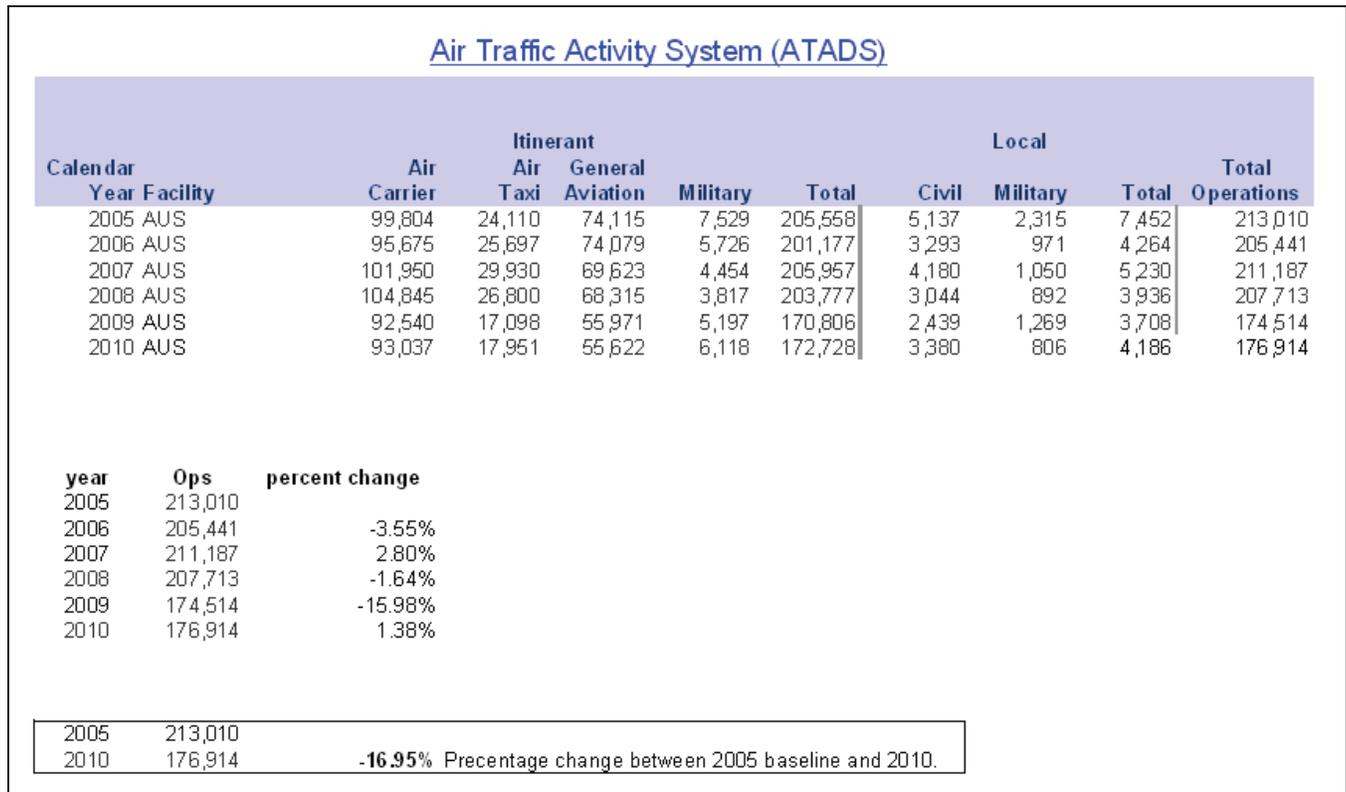


Figure 1

The Area Equivalent Method (AEM) does not allow for the modeling of helicopters. Therefore, all helicopters were omitted from the modeling process.

Night time operations were calculated based on an average for general aviation operations.

The proposed fleet mix and annual operations was provided by Advanced Services Inc., ABIA FBO Project in an e-mail dated December 14, 2011. Using the information provided, Figure 1 on the following page illustrates the proposed changes Advanced Services would add to the baseline data.

Included in this report are two AEM studies. Study 1 only includes Advanced Services Inc. data in the alternative case. Study 2 includes Advance Services and Ascend data in the alternative case.

Study 2: AEM using Ascend and Advanced Services Inc. data added to the alternative case.

Area Equivalent Method (AEM) Version 7.0

Airport Name/Code:	AUS
--------------------	-----

DNL (dBA)	Baseline Area (sq.mi.)	Alternative Area (sq.mi.)	Change in Area (sq.mi.)
65	4.4	4.4	1.3%
70	1.8	1.8	1.2%
75	0.7	0.7	1.2%
80	0.3	0.3	1.3%
85	0.1	0.1	1.3%
90	0.1	0.1	1.4%

Aircraft Type	BASE Case		ALTERNATIVE Case	
	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
1900D	0.21	0.18	0.21	0.18
707				
707120				
707320				
707QN				
717200				
720				
720B				
727100				
727200				
727D15				
727D17				
727EM1				
727EM2	0.66	1.23	0.66	1.23
727Q15				
727Q7				
727Q9				
727QF				
737				
737300	33.27	3.02	33.27	3.02
7373B2			0.07	
737400	15.81	1.22	15.81	1.22
737500				
737700	11.74	1.47	11.74	1.47
737800	5.64	0.93	5.64	0.93
737D17				
737N17	4.63	0.42	4.63	0.42
737N9				
737QN				
747100				
74710Q				
747200				
74720A				
74720B				

Aircraft Type	BASE Case		ALTERNATIVE Case	
	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
747400				
747SP				
757300	0.28	0.07	0.28	0.07
757PW	0.37	0.55	0.37	0.55
757RR	0.78	0.88	0.78	0.88
767300				
767400				
767CF6				
767JT9	1.37	0.69	1.37	0.69
777200				
777300				
A300-622R	0.18	0.07	0.18	0.07
A300B4-203	0.01	0.01	0.01	0.01
A310-304	0.02	0.01	0.02	0.01
A319-131	0.90	0.14	0.90	0.14
A320-211	2.98	1.21	2.98	1.21
A320-232	0.11	0.02	0.11	0.02
A321-232				
A330-301				
A330-343				
A340-211				
A7D				
BAC111				
BAE146	1.17	0.14	1.17	0.14
BAE300				
BEC58P	0.33	0.40	7.45	0.40
C130				
C130E				
CIT3	3.64	0.21	3.64	0.21
CL600	2.69	0.19	3.40	0.27
CL601	16.80	2.72	16.80	2.72
CNA172			1.18	0.13
CNA206				
CNA20T				
CNA441	9.29	0.52	9.86	0.52
CNA500	5.29	0.32	7.54	0.57
CNA55B				
CNA750	2.62	0.17	2.62	0.17
COMJET				
COMSEP				
CONCRD				
CVR580				
DC1010	0.54	0.50	0.54	0.50
DC1030	0.54	0.50	0.54	0.50
DC1040				
DC3				
DC6				
DC820				

Aircraft Type	BASE Case		ALTERNATIVE Case	
	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
DC850				
DC860				
DC870	0.14		0.14	
DC8QN				
DC910				
DC930				
DC93LW	2.30	0.71	2.30	0.71
DC950				
DC95HW	0.04	0.02	0.04	0.02
DC9Q7				
DC9Q9				
DHC6	13.07	0.94	18.49	1.24
DHC6QP				
DHC7				
DHC8	0.02		0.02	
DHC830				
EMB120				
EMB145	3.63	0.44	3.63	0.44
EMB14L				
F10062				
F10065				
F16A				
F16GE				
F16PW0				
F16PW9				
F28MK2				
F28MK4				
F4C				
FAL20	1.62	0.19	1.62	0.19
GASEPF	0.09		0.09	
GASEPV	0.39	0.04	0.39	0.04
GII	0.70	0.08	0.70	0.08
GIIB	1.66	0.24	1.66	0.24
GIV	4.35	0.25	5.63	0.25
GV	1.81	0.08	1.81	0.08
HS748A	0.06	0.01	0.06	0.01
IA1125	3.75	0.33	4.46	0.41
KC135				
KC135B				
KC135R				
L1011				
L10115				
L188				
LEAR25	2.15	0.17	2.43	0.17
LEAR35	27.35	2.11	28.91	2.19
MD11GE	0.20	0.03	0.20	0.03
MD11PW				
MD81	3.76	0.79	3.76	0.79

Aircraft Type	BASE Case		ALTERNATIVE Case	
	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
MD82	23.98	3.03	23.98	3.03
MD83	7.84	1.46	7.84	1.46
MD9025				
MD9028				
MJ3001	19.21	1.05	19.21	1.05
PA28			1.18	0.13
PA30				
PA31				
SABR80				
SD330	0.40		0.40	
SF340				



Figure 6-1
FAR Part 150
2019 Noise Contours

Source: Noise Compatibility Program, November 7, 2000.

EDMS MODEL

Scenario - Airport	Baseline - Austin-Bergstrom Intl										Year	2013	Units	Short Tons
Category	CO2	CO	THC	NMHC	VOC	TOG	NOx	SOx	PM-10	PM-2.5	Fuel Consumption			
Aircraft	36.985	0.570	0.129	0.149	0.148	0.149	0.058	0.015	0.002	0.002	11.723			
GSE	N/A	0.216	N/A	0.007	0.007	0.008	0.021	0.001	0.001	0.001	N/A			
APUs	N/A	0.009	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	N/A			
Parking Facilities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Roadways	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Stationary Sources	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Training Fires	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Grand Total	36.985	0.795	0.129	0.156	0.155	0.157	0.080	0.016	0.003	0.003	11.723			

Scenario - Airport	Alternative - Austin-Bergstrom Intl										Year	2013	Units	Short Tons
Category	CO2	CO	THC	NMHC	VOC	TOG	NOx	SOx	PM-10	PM-2.5	Fuel Consumption			
Aircraft	41.976	1.080	0.154	0.176	0.174	0.177	0.061	0.017	0.003	0.003	13.305			
GSE	N/A	0.243	N/A	0.008	0.008	0.009	0.024	0.001	0.001	0.001	N/A			
APUs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Parking Facilities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Roadways	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Stationary Sources	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Training Fires	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Grand Total	41.976	1.324	0.154	0.184	0.183	0.186	0.085	0.018	0.003	0.003	13.305			

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix D

Biological Impact Assessment

THIS PAGE INTENTIONALLY LEFT BLANK

**ENVIRONMENTAL ASSESSMENT IN ACCORDANCE WITH THE CITY
OF AUSTIN LAND DEVELOPMENT CODE FOR
GENERAL AVIATION AVENUE TRACT
TRAVIS COUNTY, TEXAS**

PREPARED FOR
**REYNOLDS, SMITH AND HILLS, INC.
8140 NORTH MOPAC EXPRESSWAY
BUILDING 2, SUITE 100
AUSTIN, TX 78759**

PREPARED BY
**ZEPHYR ENVIRONMENTAL CORPORATION
TEXAS REGISTERED ENGINEERING FIRM F-102
2600 VIA FORTUNA, SUITE 450
AUSTIN, TEXAS 78746**

AUGUST 16, 2013



CONTENTS

1.0	PURPOSE.....	1
2.0	PROJECT DESCRIPTION.....	2
3.0	EXISTING ENVIRONMENT.....	3
3.1	HYDROLOGY.....	3
3.2	TOPOGRAPHY.....	3
3.3	GEOLOGY.....	3
3.4	SOILS.....	3
3.5	VEGETATION	4
4.0	CRITICAL ENVIRONMENTAL FEATURES.....	5
5.0	SPECIES INCLUDED UNDER THE COA ENDANGERED SPECIES ORDINANCE ENDANGERED SPECIES ASSESSMENT	7
5.1	BRACTED TWISTFLOWER	7
5.2	CANYON MOCK-ORANGE.....	8
5.3	BLACK-CAPPED VIREO	8
5.4	GOLDEN-CHEEKED WARBLER.....	8
5.5	WHOOPING CRANE	9
5.6	RED WOLF	9
5.7	BARTON SPRINGS SALAMANDER	9
5.8	KARST INVERTEBRATES	10
5.9	OTHER SPECIES OF CONCERN	10
6.0	STATEMENT OF FINDINGS	12
7.0	REFERENCES.....	13

FIGURES

- FIGURE 1: Site Location Map
- FIGURE 2: Edwards Aquifer Zone Map
- FIGURE 3: FEMA Floodplain Map
- FIGURE 4: National Wetland Inventory Map
- FIGURE 5: Geologic Map
- FIGURE 6: Data Point Map

APPENDICES

APPENDIX A:	PROJECT MAPS
APPENDIX B:	SITE PHOTOGRAPHS
APPENDIX C:	CITY OF AUSTIN CRITICAL ENVIRONMENTAL FEATURE WORKSHEET
APPENDIX D:	USACE WETLAND DATA SHEETS

1.0 PURPOSE

The purpose of this environmental assessment is to evaluate the General Aviation Avenue tract, hereafter referred to as the subject area, in accordance with the City of Austin (COA) Land Development Code ("LDC") §25-8-121. Specifically, this assessment evaluates the subject area for the occurrence of critical environmental features (CEFs) as defined in the LDC and for potential endangered species habitat. The on-site investigation was performed by Zephyr Environmental Corporation scientists on August 1, 2013. This is subsequent to an inspection of the northern half of the site by the COA in 2009 and ACI Consultants in June of 2013. Additionally, an inspection of the southern half of the site was accomplished by Terracon Consultants in January 2009. The results of all three previously mentioned site inspections resulted in a determination that no significant environmental resources were present onsite.

2.0 PROJECT DESCRIPTION

The subject area is approximately 53.8 acres located immediately south of Austin-Bergstrom International Airport on Emma Browning Avenue (General Aviation Avenue), Travis County, Texas (Figure 1, Appendix A). The subject area is located 1.3 miles east of U.S. Highway 183 and 2.2 miles south of State Highway 71. The subject site is proposed for future development of Austin-Bergstrom Airport.

3.0 EXISTING ENVIRONMENT

3.1 HYDROLOGY

According to the COA website (<http://www.austintexas.gov/GIS/FindYourWatershed/>, accessed 8/1/2013), the subject area lies within the Onion Creek watershed, which is within the City's suburban watershed regulation area. Drainage on the property is predominately south towards an unnamed tributary of Onion Creek, which is located immediately south of the subject area. According to Edwards Aquifer Recharge Zone maps, the subject area is not within the recharge, transition, or contributing zones of the Edwards Aquifer (Edward's Aquifer Viewer, <http://gis3.tceq.state.tx.us/website/iredwards2/viewer.htm>, accessed 7/30/2013) (Figure 2, Appendix A).

3.2 TOPOGRAPHY

According to COA contour maps, the elevation of the subject area ranges from approximately 454 feet above mean sea level within a man-made drainage canal along the eastern boundary to 480 feet above mean sea level along Emma Browning Avenue. Figure 3 of Appendix A indicates that the man-made drainage canal and a small area along the southern boundary of the subject area are within the Federal Emergency Management Agency (FEMA) mapped 100-year floodplain. Review of the US Fish and Wildlife Service (USFWS) Montopolis National Wetland Inventory (NWI) quadrangle indicates the presence of the unnamed tributary of Onion Creek to be classified as a temporarily flooded, deciduous broad-leaved forested, palustrine water (PFO1A) (Figure 4, Appendix A). However, no portion of the subject area is indicated to exhibit wetlands or waters of the US.

3.3 GEOLOGY

Fluviatile terrace deposits (Qt) underlay the subject area. Qt indicates stream terrace deposits consisting of gravel, sand, silt, and clay in various proportions. Sand is generally quartz. Gravel is siliceous and consists mostly of various igneous and metamorphic rocks from the Llano region (Barnes 1974) in addition to chert, quartz, dolomite, limestone (Figure 5, Appendix A). The property is not located over the Edwards Aquifer Recharge Zone.

3.4 SOILS

Soils in this area are identified as the Lewisville-Patrick Association. Soils in this association are moderately deep to deep, calcareous, clayey soils overlying old gravelly alluvium (SCS 1974). Soil units occurring within the subject area include:

Altoga silty clay, 1 to 6 percent slopes, (AgB and AgC2) – These soils typically occur as narrow bands paralleling streams. The surface layer is light brownish-gray silty clay to a depth of

approximately 5 inches. The second layer consists of very pale brown silty clay loam to a depth of approximately 29 inches. The third layer is pale-yellow silty clay loam to a depth of approximately 90 inches. Permeability is moderate, and the available water capacity is high. Altoga silty clay is described as non-hydric.

Lewisville silty clay, 0 to 2 percent slopes (LcA and LcB) – These soils are described as calcareous and moderately permeable soil occupying slopes in broad or narrow strips as large as 80 acres in extent. Soil surface layer is dark grayish-brown silty clay for the approximately 13 inches, followed by a brown silty clay extending down to 29 inches. The underlying material is a very pale brown silt loam. This soil is moderately permeable, has a high available water capacity, and drains well. Lewisville silty clay is described as non-hydric.

3.5 VEGETATION

Dominant tree species observed within the subject area include: honey mesquite (*Prosopis glandulosa*), netleaf hackberry (*Celtis reticulata*), pecan (*Carya illinoensis*), western soapberry, (*Sapindus drummondii*) and Chinaberry (*Melia azedarach*). Trees within the subject area range in height from 10 to 30 feet and exhibit canopy coverage ranging from 0 to 80 percent depending upon the location. Dominant vegetation within the shrub layer includes: Roosevelt weed (*Baccharis neglecta*), Texas prickly pear (*Opuntia engelmannii*), annual ragweed (*Ambrosia artemisifolia*), mustang grapevine (*Vitis mustangensis*), poison ivy (*Toxicodendron radicans*), and saw greenbrier (*Smilax bona-nox*). The dominant herbaceous species observed include: broomweed (*Gutierrezia dracunculoides*), tall goldenrod (*Solidago gigantea*), croton (*Croton lindheimerianus*), Bermuda grass (*Cynodon dactylon*), silver bluestem (*Bothriochloa saccharoides*), night-shade (*Solanum triquetrum*) and various other grasses and forbs.

Review of the Texas Parks and Wildlife “Vegetation Types of Texas” map (McMahan et al. 1984) identified the subject area as occurring within the “Other Native or Introduced Grasses” vegetation area. This designation generally includes mixed native or introduced grasses and forbs on grassland sites or mixed herbaceous communities resulting from the clearing of woody vegetation. Inspection of the subject area indicated that much of the subject area was experiencing regular maintenance (mowing) and exhibited savanna-like (grassland with scattered isolated trees) conditions. Many portions of the subject area not actively managed exhibit mesquite/hackberry woodland. This includes southern portions of the subject area near the unnamed tributary.

A review of COA GIS Web Maps and Viewer (<http://www.austintexas.gov/GIS/developmentwebmap/Viewer.aspx>) indicated that no CEFs have been identified in or near the subject area. Additionally, no portion of the subject area is designated as priority or other significant woodlands, or priority grasslands. However, the riparian corridor along the unnamed tributary to Onion Creek is identified as priority woodlands. This area is immediately adjacent to the southern boundary of the subject area.

4.0 CRITICAL ENVIRONMENTAL FEATURES

CEFs are defined in Section 25-8-1 of the COA LDC as “features that are of critical importance to the protection of environmental resources, and include features such as bluffs, springs, canyon rim rocks, caves, sinkholes, recharge features, and wetlands.” A definition of each CEF is provided below.

Bluff

A bluff is defined by the COA as an "abrupt vertical change in topography of more than 40 feet with an average slope steeper than four feet of rise for one foot of horizontal travel (400% or 76 degrees)."

Canyon Rim Rocks

A canyon rim rock is defined by the COA as an "abrupt vertical rock outcrop of more than 60% slope (31 degrees), greater than 4 feet vertically, and a horizontal extent equal or greater than 50 feet."

Caves and Sinkholes

Caves are defined by the COA as "underground voids large enough for an adult to enter." Sinkholes are defined by the COA as "circular or oblong depressions formed in soluble rock by the action of subterranean water which is a potential point of significant recharge (with or without a surface opening)."

Springs

Springs are defined by the COA as "points or zones of natural groundwater discharge in upland and/or riparian zones which produce measurable flow down gradient of the source or a pool, or both, or (during drought conditions) an area characterized by the presence of a mesic plant community."

Wetlands

Wetlands are defined by the COA as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. An area shall be classified as a wetland if it meets the USACE three parameter technical criteria as outlined in the Corps of Engineers 1987 Wetlands Delineation Manual."

On August 1, 2013, Zephyr Environmental Corporation scientists conducted field investigations within the subject area in accordance with the COA LDC. The field investigations were performed by traversing all portions of the subject area.

Bing aerial photography, USGS 7.5-minute topographic maps, and USFWS National Wetland Inventory maps were reviewed prior to the field investigation. The entire subject area was inspected for the presence of CEFs as defined by the COA. A hand held Garmin Global Positioning System (GPS) receiver was utilized to record the locations of any potential CEFs.

**ENVIRONMENTAL ASSESSMENT IN ACCORDANCE WITH THE CITY OF AUSTIN LAND DEVELOPMENT CODE
FOR THE GENERAL AVIATION AVENUE TRACT, TRAVIS COUNTY, TEXAS
REYNOLDS, SMITH, AND HILLS INC.**

No CEFs as defined by the COA LDC (bluffs, springs, canyon rim rocks, caves, sinkholes, recharge features, and wetlands) were identified within the subject area. No evidence of wetlands or natural drainage ways which might exhibit wetland characteristics was observed onsite. The subject site is located east of the Balcones escarpment and Edward's Aquifer recharge and contributing zones. No evidence of onsite geology indicating the potential for onsite seeps, springs, caves, sinkholes, rim rock, bluffs and/or recharge features was observed. A copy of the COA CEF worksheet is included as Appendix C.

5.0 SPECIES INCLUDED UNDER THE COA ENDANGERED SPECIES ORDINANCE ENDANGERED SPECIES ASSESSMENT

The COA Endangered Species Ordinance requires an endangered species habitat survey be conducted prior to site development (LDC §25-8-695). Species for which habitat surveys must be conducted include: bracted twistflower (*Streptanthus bracteatus*), canyon mockorange (*Philadelphus ernestii*), black-capped vireo (*Vireo atricapillus*), golden-cheeked warbler (*Dendroica chrysoparia*), whooping crane (*Grus americana*), red wolf (*Canis rufus*), Barton Springs salamander (*Eurycea sosorum*), as well as six species of karst invertebrates including: Tooth Cave ground beetle (*Rhadine persephone*), Kretschmarr Cave mold beetle (*Texamaurops reddelli*), Tooth Cave spider (*Neoleptoneta myopica*), Tooth Cave pseudoscorpion (*Tartarocreagris texana*), Bee Creek cave harvestman (*Texella reddelli*), and Bone Cave harvestman (*Texella reyesi*).

Habitat surveys were also conducted for species of concern (SOC) as designated by the COA due to their relative scarcity. The 25 COA SOCs include one flatworm (*Sphalloplana mohri*), one ostracod (*Candona* sp. nr. *Stagnalis*), three isopods (*Caecidotea reddelli*, *Trichoniscinae* N.S., *Miktoniscus* N.S.), 10 spiders (*Cicurina wartoni*, *Cicurina ellioti*, *Cicurina bandida*, *Cicurina reddelli*, *Cicurina reyesi*, *Cicurina cueva*, *Cicllrina travisae*, *Neoleptoneta cocinna*, *Neoleptoneta devia*, *Eidmannella recluse*), five pseudoscorpions (*Aphrastochthonius* N. S, *Tartarocreagris comanche*, *Tartarocreagris reddelli*, *Tartarocreagris intermedia*, *Tartarocreagris* N. S 3), one millipede (*Speodesmus* N. S), one harvestman (*Texella spinoperca*), and three ground beetles (*Rhadine austinica*, *Rhadine* s. *subterranean*, *Rhadine* s. *mitchelli*).

For the birds and plants, the Endangered Species Survey Ordinance (ESSO) generally applies to those lands lying to the west on the Balcones Escarpment; the COA defines this area as mainly west of Loop I (Mopac). For the karst invertebrates (flatworm, ostracod, isopods, spiders, pseudoscorpions, millipede, harvestman, and ground beetles), the ESSO applies to those lands lying within the Edwards Aquifer Recharge Zone. The proposed project area lies east of the Balcones Escarpment and outside of the Edwards Aquifer Recharge Zone. Thus, no habitat for any of the listed species is anticipated to occur on the property.

A habitat survey in accordance with LDC §25-8-695 and the COA Environmental Criteria Manual was conducted by Zephyr Environmental Corporation scientists. A discussion of the habitat within the subject area and potential habitat for each endangered species are included below.

5.1 BRACTED TWISTFLOWER

The bracted twistflower (twistflower) is an annual, occurring on thin clay soils overlying limestone. Usually no more than three feet tall, twistflower has delicate pink flowers and is found in oak-juniper woodland with canopy coverage ranging from 25 to 100 percent and thick underlying brush. Commonly associated species include: evergreen sumac (*Rhus virens*),

Mexican silktassel (*Garrya ovata* var. *lindheimeri*), shinoak (*Quercus sinuata* var. *breviloba*), elbowbush (*Forestiera angustifolia*), and myrtlecroton (*Bernardia myricifolia*) (BAT 1990).

Site investigation revealed the absence of necessary soils as well a lack of thick brush. None of the common associate species were observed onsite. No observations of twistflower were made during the site inspection.

5.2 CANYON MOCK-ORANGE

Canyon mock-orange (mock-orange) is a small shrub with drooping greyish branches with semi-evergreen leaves and numerous white flowers. Mock-orange is generally associated with limestone formations such as Cow Creek, Edwards, and Glen Rose. Mock-orange is found in both xeric and mesic juniper woodlands ranging from full shade to full sun in humid canyons. Commonly associated species include: elbowbush, shrubby boneset (*Eupatorium havanense*), shin oak, fragrant sumac (*Rhus aromatica*), Mexican silktassel, Texas mulberry (*Morus microphylla*), Ashe juniper (*Juniperus ashei*), and yaupon holly (*Ilex vomitoria*) (BAT 1990).

The limestone formations normally associated with mock-orange are not present within the subject area nor are the plants commonly associated with the canyon mock-orange. No observations of canyon mock-orange were made during the site inspection.

5.3 BLACK-CAPPED VIREO

The black-capped vireo (BCV) is present in Texas only during its breeding season from March through September. BCV habitat generally consists of shrub vegetation that extends from the ground to approximately 8 feet high, covering 30 to 60 percent or greater of the total area. Typical BCV habitat in the Edwards Plateau Region includes vegetation species such as shin oak, evergreen sumac, Texas persimmon (*Diospyros texana*), and agarita (*Berberis trifoliolata*). Ashe juniper typically exhibits low density and low cover in high quality BCV habitat (Campbell 1995).

The subject area does not exhibit the structural and compositional vegetative elements characteristic of BCV habitat. The potential for the subject area to be regularly utilized by BCV is highly unlikely. The BCV was not observed during the site inspection.

5.4 GOLDEN-CHEEKED WARBLER

The golden-cheeked warbler (GCW) is a migratory songbird which nests only in Texas from early March through early August. GCW habitat is generally described as mature juniper/oak woodland interspersed with other hardwood species. Optimum GCW habitat consists of large clumps (more 20 acres) of juniper/oak woodland with 50 to 100 percent closed canopy (Campbell 1995). Hardwood species common in GCW habitat include escarpment black cherry

(*Prunus serotina*), Texas black walnut (*Juglans microcarpa*), Texas oak (*Quercus buckleyi*), and cedar elm (*Ulmus crassifolia*).

The subject area does not possess the juniper/oak woodland typically described as GCW habitat. The potential for the subject area to be regularly utilized by GCWA is highly unlikely. The GCW was not observed during the site inspection.

5.5 WHOOPING CRANE

The whooping crane is a migrant species whose flyway from breeding grounds in Canada to wintering grounds along the gulf coast includes Travis County. Whooping cranes utilize a variety of habitat during migration, such as croplands for feeding as well as wetland areas for feeding and roosting. Secluded areas removed from human disturbance are preferred (Campbell 1995).

The subject area does not contain secluded wetland areas or croplands. Woodlands present along the unnamed Onion Creek tributary as well as southern portions of the subject site are generally avoided by whooping cranes since potential predators may utilize them for loafing and hunting areas. The probability of whooping cranes feeding or roosting in the subject area is considered very low. Whooping cranes were not observed during the site inspection.

5.6 RED WOLF

The red wolf is considered extirpated in Travis County and Texas. It was formerly known to inhabit brushy, forested, and coastal areas in the eastern half of Texas. The probability of red wolves occurring in the subject area is considered very low. Red wolves were not observed during the site inspection.

5.7 BARTON SPRINGS SALAMANDER

The Barton Springs salamander is an aquatic amphibian known only to occur around four spring outlets within Zilker Park, Austin, Texas, collectively known as Barton Springs [62 FR 23377] (USFWS 1997). The current knowledge of the salamander indicates that it is an inhabitant of areas near the spring openings where available food sources, water chemistry and temperature are relatively constant. Degradation of the quality and quantity of water that feeds Barton Springs is the primary threat to the Barton Springs salamander.

The Barton Springs salamander occurs within only four springs collectively known as Barton Springs. The subject area is located approximately nine miles southeast of Barton Springs. Additionally, the subject area is not located within the Barton Springs watershed. The probability of occurrence of the Barton Springs salamander within the subject area is considered unlikely. Salamanders were not observed during the site inspection.

5.8 KARST INVERTEBRATES

Karst invertebrates are subterranean arthropod species that have adapted to sub-surface caves and voids with consistent humidity and temperature levels and a continual influx of nutrients from the surface. Karst invertebrates occur in caves and voids which were formed as a result of dissolution of the limestone formations making up the Edwards aquifer.

Karst invertebrates such as the Tooth Cave ground beetle, Kretschmarr Cave mold beetle, Tooth Cave spider, Tooth Cave pseudoscorpion, and Bone Cave harvestman are known to exist north of the Colorado River only in Travis County. The Bee Creek cave harvestman is only known to occur in caves in the Jolleyville plateau, Round Rock, and Rollingwood areas (USFWS 2009). Both areas are at least 10 miles northwest of the subject area.

Features that can host these invertebrates include caves, enlarged rock joints, sinkholes, and smaller karst conduits. The USFWS has delineated four geographic zones in Travis County based on regional geologic controls and their influence on development of potential habitat for karst invertebrates. Zone designation was based on lithology, structure, hydrology, and the distribution of known caves and cave fauna. These zones are defined as follows:

- Zone 1: Areas known to contain one or more of the listed karst species;
- Zone 2: Areas that may contain the species;
- Zone 3: Areas that probably do not contain the species or their habitat; and
- Zone 4: Areas that do not contain the species.

The property lies entirely within an area delineated as Zone 4. Occurrence of any of the karst species is extremely unlikely due to the lack of required geology. No sub-surface voids or caves were found within the subject area. The probability of occurrence of these species within the subject area is considered unlikely. Karst invertebrates were not observed during the site inspection.

5.9 OTHER SPECIES OF CONCERN

Other state or federal species of concern with the potential to occur in Travis county include: two salamanders Jollyville plateau salamander (*Eurycea tonkawae*), Austin blind salamander (*Eurycea waterlooensis*); five birds Sprague's pipit (*Anthus spragueii*), peregrine falcon (*Falco peregrinus*), American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum athalassos*), one fish smalleye shiner (*Notropis buccula*), five mollusks Texas fatmucket (*Lampsilis bracteata*), smooth pimpleback (*Quadrula houstonensis*), false spike mussel (*Quadrula mitchelli*), Texas pimpleback (*Quadrula petrina*), Texas fawnsfoot (*Truncilla macrodon*), and the Texas horned lizard (*Phrynosoma cornutum*).

Both salamander species, the bald eagle, interior least tern, smalleye shiner, and the mollusks require a stable sources of freshwater which does not occur on the subject site. The pipit is

generally restricted to native prairies or agricultural fields as it migrates through Texas. Neither of these habitat types exists on the subject site. The falcons are generally restricted areas with significant topographic relief (canyon walls and mountain sides) to nest on and hunt from. The subject area exhibits little topographic relief. Finally, the horned lizard requires undeveloped area with significant populations of harvester ants on which to feed. Harvester ants were not identified on the subject area. None of the other species of concern was observed onsite or is anticipated to occur on the subject site.

6.0 STATEMENT OF FINDINGS

No CEFs as defined by the COA (bluffs, springs, canyon rim rocks, caves, sinkholes, recharge features, and wetlands) were identified within the subject area at the time of the site investigation. Wildlife habitat within the subject area is unlikely to be utilized by the bracted twistflower, canyon mock-orange, BCVI, GCWA, whooping crane, red wolf, Barton Springs salamander, or endangered karst invertebrates. None of the protected species or species of concern with the potential to occur in Travis County was observed on the subject area or anticipated to occur on the subject area.

The results of the onsite investigation performed by Zephyr Environmental Corporation for the subject area are similar to those presented in previous report by environmental scientists from the COA and Terracon Consultants in 2009 and ACI Consultants in 2013.

Man-made feature such as a drainage canal and storm water detention ponds are present within the eastern portion of the subject area. Both features appear to hold water or carry flow to the unnamed tributary only immediately after a rainfall event. Neither feature contained water at the time of the field investigation. Additionally, neither feature exhibited vegetation or soil indicative of a wetland as defined by the USACE or City of Austin.

No areas exhibiting wetlands characteristics (hydrology, hydrophytic vegetation, and/or hydric soils) as defined by the USACE and COA were identified onsite. USACE data forms were completed for 11 sites across the subject area in accordance with the USACE 1987 Wetland Delineation Manual and Regional Supplement to the USACE Wetland Delineation Manual: Great Plains Region (Version 2.0). No areas exhibiting conditions which satisfy the USACE criteria to be considered a wetland were observed or identified. Completed data sheets for the eleven data points are provided in Appendix D. Figure 6 in Appendix A shows the locations of the 11 data points on the subject area.

7.0 REFERENCES

- Barnes, V.E. 1974. Geologic Atlas of Texas, Austin Sheet. Bureau of Economic Geology, The University of Texas at Austin.
- (BAT) Biological Advisory Team. 1990. Comprehensive Report of the Biological Advisory Team. Balcones Canyonlands Conservation Plan. Austin, Texas.
- Campbell, L. 1995. Endangered and Threatened Animals of Texas: Their Life History and Management. Texas Parks and Wildlife Resource Protection Division, Austin, Texas.
- McMahan, C.A., R.G. Frye, and K.L. Brown. 1984. The Vegetation Types of Texas. Texas Parks and Wildlife. Austin, Texas.
- (SCS) Soil Conservation Survey. 1974. Soil Survey of Travis County, Texas. United States Department of Agriculture. Texas Agriculture Experiment Station.
- (TCEQ) Texas Commission on Environmental Quality. <http://gis3.tceq.state.tx.us/website/iredwards2/viewer.htm>, accessed 7/30/2013.
- (USFWS) U.S. Fish and Wildlife Service. 1997. Final Rule to List the Barton Springs Salamander as Endangered. Federal Register, vol. 62, p. 23377.
- (USFWS) U.S. Fish and Wildlife Service. 2009. Bee Creek Cave Harvestman 5-Year Review. Austin Ecological Services Field Office, Austin, Texas. 13 pp.