Appendix C

ANALYSIS OF AIRCRAFT NOISE-INDUCED AWAKENINGS

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Appendix C

ANALYSIS OF AIRCRAFT NOISE-INDUCED AWAKENINGS

This appendix describes the analysis of awakenings undertaken for the FAR Part 161 Study. It begins with a review of the recent research into noise-induced awakenings. It includes a description of the alternate approaches taken to estimate awakenings in the study area, and concludes with a discussion of the methodology and findings of the analysis. A summary of the findings are presented in Chapter 5.

The analysis described in this appendix is a predictive and theoretical analysis based on noise/awakenings relationships developed through studies in other settings. The findings of this analysis cannot be taken as conclusive proof of a given number of awakenings being caused by the specific noise pattern in the Bob Hope Airport area. The analysis is most appropriately interpreted as an order-of-magnitude comparison of the relative awakenings effects of the unrestricted case and the alternative curfews in the Airport area.

C.1 REVIEW OF RECENT RESEARCH

Recent studies of noise-induced awakenings are reviewed in this section. Older studies that are important in understanding the context of the awakenings research are also reviewed. The studies include "meta-analyses" and individual research efforts. Meta-analysis involves the statistical analysis of the results of multiple studies to seek patterns that all have in common. The individual research studies involve the observation of subjects in the field to evaluate their responses to noise during sleep.

Field studies generally are of two types – those that measure "behavioral awakenings" and those that measure awakenings using instruments, including EEG monitors, to record brain activity and other physical indicators of sleep stage. Behavioral awakenings are indicated by the subjects, typically by pressing a button on a counting or recording device. Some studies have used motility – body movements – as indicators of awakening. Motility is typically measured using actimeters fitted on the subjects' wrists.

For the most part, the studies reviewed here are field studies undertaken in the homes of study participants. Studies have shown conclusively that people are much more sensitive to noise-induced awakenings in laboratory settings than in their own homes. This is due, at least in part, to the tendency for most people to become habituated to the ambient noise at their homes.

C.1.1 Noise Metrics

A basic review of noise metrics is presented here to aid in understanding the subsequent discussions of the awakenings research.

Studies of the effects of noise on people rely on two general kinds of noise descriptors – single event metrics and cumulative metrics. Metrics that have been used in sleep disturbance research are described in Table C-1.

Table C-1

SELECTED NOISE METRICS USED IN SLEEP DISTURBANCE STUDIES
Bob Hope Airport FAR Part 161 Study

Single Event Maximum Sound Level Metrics	
A-Weighted Sound Level (LA_{max} or L_{max}), expressed in dB	Sound pressure level which has been filtered using the A-weighting matrix. A-weighting reflects the sensitivity of the human ear by reducing the influence of low and high frequency extremes on the measured sound level.
Perceived Noise Level (PNL), expressed in dB	Computed from sound pressure levels measured in octave or one-third octave frequency bands. Designed to estimate the perceived noisiness of broadband sounds.
Single Event Dose Metrics	
Sound Exposure Level (SEL), expressed in dB	A measure of the effect of duration and magnitude for a single event measured in A-weighted sound level. It is computed by integrating the sound levels occurring throughout the duration of the event over a one-second period.
Effective Perceived Noise Level (EPNL), expressed in dB	Derived from PNL and includes adjustment terms for the duration of an aircraft flyover and the presence of audible pure tones or discrete frequencies (such as the whine of a jet aircraft) in the noise signal.
Cumulative Metrics	
Equivalent Sound Level (Leq), expressed in dB	Computed by integrating the varying sound levels (usually A-weighted) during a given period of time over that period. The result is a value that is equal to a steady sound level of sound energy over the period.
Day-Night Sound Level (DNL), expressed in dB	Computed in the same way as Leq, but only over periods of 24 hours. A 10 dB adjustment is added to nighttime (10 p.m. to 7 a.m.) sound levels to account for the presumed greater annoyance caused by nighttime noise.
Community Noise Equivalent Level (CNEL), expressed in dB	Similar to DNL, with an additional 4.8 dB adjustment applied to evening (7 p.m. to 10 p.m.) sound levels.

C.1.2 Federal Interagency Committee on Noise (FICON) 1992

In 1992, FICON published a summary of the state of the knowledge relating to a variety of aircraft noise effects. The document included a recommended interim dose-response curve relating noise-induced awakenings to varying SELs. The interim curve was developed by Finegold et al. (1994), based on a meta-analysis of laboratory and field studies of noise-induced awakenings undertaken over the previous 25 years and compiled by Pearsons et al., 1989 and data sets from Lucas (1975) and Griefahn (1980).

The equation for the awakenings function developed by Finegold is:

$$\%awakening = 7.079 * 10^{-6} * SEL^{3.496} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

C.1.3 Pearsons et al. (1995)

Pearsons, et al., conducted a meta-analysis of the results of 21 studies of noise-induced awakenings undertaken in laboratory and field settings. The reevaluation considered the effect of noise on awakenings or arousals from sleep, which had been examined in all 21 of the considered studies, and on changes to lighter sleep stages, examined in 12 of the studies.

Noise metrics used in the sleep research included single event and cumulative descriptors over the entire night or 24-hour period. The single event metrics included maximum A-weighted sound level (LA_{max}), sound exposure level (SEL) perceived noise level (PNL), effective perceived noise level (ENPL), and C-level (LC). The authors estimated SELs for studies that reported only LA_{max} levels using customary conversion equations developed for aircraft flyovers (sounds with a triangular time pattern) and for steady sounds with a rectangular time pattern. The cumulative metrics included equivalent sound level (Leq), composite noise level (CNL), day-night average sound level (DNL), community noise equivalent level (CNEL), and cumulative centile levels (L%).

Additional independent variables were considered in the meta-analysis, including gender of the study participants, study setting (laboratory or in-home), background sound level, and number of nights of the study.

Key findings were as follows:

- A markedly greater percentage of people were awakened or experienced sleep stage changes in laboratory settings than in home settings, providing strong evidence of a tendency for people to become habituated to nighttime noise intrusion.

- Relatively strong correlations of awakenings and sleep stage changes with noise described by single-event metrics were observed. SEL was more strongly correlated with awakenings than LA_{max}, but less strongly correlated with sleep stage changes.

C.1.4 Fidell et al. (1995)

The authors conducted a study of awakenings in the vicinity of Castle Air Force Base and Los Angeles International Airport, in addition to neighborhoods lacking appreciable nighttime aircraft noise. Fifteen households were studied in the Castle AFB area, 18 in the LAX area, and 12 in the other areas. Test subjects were asked to push a button connected to a computer to confirm an awakening. They also responded to questionnaires in the evening and morning. Noise measurements were taken inside the participants' bedrooms. Outdoor measurements were also taken in the two airport-vicinity neighborhoods.

Awakenings were positively correlated with aircraft noise events described with the SEL metric, although the relationship was not particularly strong. A 10 dB increase in noise was associated with only a 1.6% increase in the prevalence of awakening. No statistically significant relationship was found between awakenings and cumulative aircraft noise exposure described using the cumulative Leq metric.

The study also found that the number of recalled awakenings in the morning recorded by the subjects was not statistically different from the number of awakenings recorded by the button pushes.

The authors also did multiple regression analysis, including gender, age of the subject, duration of residence, number of nights in the study, ambient noise levels and other independent variables.

The linear regression of SEL and noise-related awakenings produced the following equation:

$$Y = -10.24 + .167X \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where Y equals the prevalence of event-related awakening, in percent, and X equals the indoor SEL of the event.

The authors also did a meta-analysis, adding their data to data from six field studies reported by Pearsons, et al. (1995) and data reported by Ollerhead (1992). The authors' data was generally consistent with the prior data. The linear regression of the combined data produced this equation:

$$Y = -6.72 + 0.13X \text{ . ……..} \quad (3)$$

where Y equals the prevalence of awakening, in percent, and X equals the indoor SEL. This curve is plotted in Figure C-1.

C.1.5 Federal Interagency Committee on Aviation Noise (1997)

In 1997, the Federal Interagency Committee on Aviation Noise (FICAN) published a dose-response curve for predicting awakenings. It was offered as an update to the interim dose-response curve recommended by the Federal Interagency Committee on Noise (FICON) in 1992. While FICON's interim curve was based on a combination of field and laboratory awakenings studies, the recommended FICAN curve was developed from a meta-analysis of field studies only.

FICAN's dose-response curve was developed from a meta-analysis of nine awakenings studies, including three recent studies and six older studies that were considered by FICON in developing its 1992 recommendations. (Data for the older studies was assessed in Pearsons, et al. 1989. The other studies are discussed in Ollerhead, et al. 1992; Fidell, et al. 1994 and 1995.) All studies considered in the meta-analysis assessed behavioral awakenings.

The FICAN dose-response curve is interpreted as the maximum percentage of people expected to be awakened by a given indoor noise level (SEL). The curve was developed to show the maximum relationship rather than the mean relationship (via a standard regression line) because of FICAN's concern that a measure of central tendency could underestimate the potential for awakenings in some settings.

The FICAN dose response relationship is shown in the equation below:

$$\%Awakenings = 0.0087 * (SEL - 30)^{1.79} \text{ . ……..} \quad (4)$$

This curve is shown in Figure C-1.

C.1.6 Finegold and Elias (2002)

Finegold and Elias (2002) conducted a meta-analysis of data from several field studies (Fidell et al., 1995a, 1995 b, 1998; Pearsons, et al., 1973, 1989; Ohrstrom, et al., 1988; Vernet, 1979; Vallet, et al., 1980; Ollerhead, et al., 1992). They developed a database of awakenings as a function of SELs based on this data. The final dataset consisted of 100 data points.

The authors developed a curvilinear power function relating awakenings with SELs, as shown in the equation below.

$$\text{Percent Awakened} = 0.58 + (4.30 * 10^{-8}) * \text{SEL}^{4.11} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

This awakenings function is applicable within the range of 45 to 105 dB. Outside this range there were too few data points to have sufficient confidence to extend the function. This curve is presented in Figure C-1.

C.1.7 Passchier-Vermeer, et al. (2002)

The authors report on a study of aircraft noise-induced awakenings in the vicinity of Schiphol Airport. The study included 418 subjects who participated for 11 days and nights. The final dataset included 4,500 subject-nights.

The study considered three methods of measuring awakenings – motility, measured with actimeters; behavioral awakenings, indicated by the subjects pressing buttons on the actimeters; and remembered awakenings indicated through a computerized a morning diary.

Aircraft noise was described using the LA_{max} and the SEL metrics. An Leq for all aircraft noise during the period when each subject was asleep (Li) was also computed. The researchers computed two metrics indicative of the ambient indoor noise level in the subjects' bedrooms – (1) a median sound level during sleep in the absence of aircraft noise, indicated by L50 (the level which is exceeded 50% of the time; and (2) Lbi23-07h – the 8-hour Leq for the period from 2300 to 0700.

They found that motility (m) increased with increases in the level of individual aircraft noise events, described with either the LA_{max} or the SEL metrics, although the relationship with LA_{max} was stronger than with SEL. The relationship between motility and indoor SEL, at levels between SEL 38 dBA and 80 dBA, was described with the following equation:

$$m = 0.000532 * (SEL - 38) + 2.68 * 10^{-5} * (SEL - 38)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

The researchers found a similar relationship between "onset of motility" (k) and individual aircraft noise events at levels between SEL 40 dBA and 80 dBA:

$$k = 0.000273 * (SEL-40) + 3.57 * 10^{-6} * (SEL - 40)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

These curves are graphed in Figure C-1.

The researchers found that motility was also associated with other factors:

- Motility was higher for subjects with a low Li (the Leq from all aircraft noise events during the subject's sleep period), possibly indicating a tendency for people to become habituated to more frequent aircraft noise events
- motility increases with time after sleep onset; after 7 hours of sleep, m is 1.3 times higher than at the start of sleep
- motility increases later in the nighttime period; from 0600 to 0700, motility is 1.2 times larger than during the period from 2300 to 0600.
- Age has a small effect, with motility being highest for those between 40 and 50 years and somewhat smaller in older and younger subjects.

The researchers also assessed the relationship between cumulative aircraft noise exposure (Li) over the sleep period for each subject over the 11-day study. They found that as the Li increased, the mean motility and onset of motility also increased.

C.1.8 Basner et al. (2004)

This report describes a polysomnographic study undertaken by the German Aerospace Center (DLR) to investigate the effects of nighttime aircraft noise in the Cologne-Bonn Airport area. It is the largest polysomnographic awakenings study undertaken thus far, with 64 participants evaluated over 576 subject-nights. Polysomnography was used in order to identify the effects of noise on the structure of sleep. Data were developed from the electroencephalogram, electrooculogram (eye movements), electrocardiogram, respiratory movements, finger pulse amplitude, position in bed, and actigraphy.

Scientists have defined six stages of sleep: S1, S2, S3, S4, REM, and wakefulness. The lightest stage, S1, appears to contribute little to the recuperative value of sleep. Deep or slow wave sleep (S3 and S4) is important for the consolidation of explicit memories, and REM is important for the consolidation of implicit memory contents.

Even during sleep, people unconsciously recognize, evaluate, and react to environmental noise. The reactions can express themselves in changes in sleep structure. Noise may interfere with the restorative power of sleep through recurring activations.

In the study, polysomnography was synchronized with the measurement of aircraft noise events. Where the data indicated that the subject had awakened or that the sleep stage had changed to S1, the change was classified as an "awakening." Most of the awakenings were found to last one epoch (15 to 45 seconds) and were too brief to be recalled the next morning.

The study included both laboratory and field investigations of subjects in their own homes, exposed to normally occurring nighttime aircraft noise. The study found substantially higher levels of noise-induced awakenings in the laboratory setting than in the field. The highest noise level (LA_{max}) measured in the bedroom was 73.2 dB. At that level, the probability of awakening was 19%, compared with 47.4% in the lab.

Regression analysis of the results of the lab study found greater agreement with awakenings predicted by noise described in terms of LA_{max} than by SEL. (Results of the field study were presented in terms of LA_{max}, without reference to SEL.)

The study found that background noise levels interacted with the awakening effect of an aircraft noise event, with the effect of background noise lessening as the aircraft event increased. It was also found that short aircraft events with steeply rising noise levels (dB/sec) were associated with higher awakening probabilities than longer events with less pronounced rise rates. (This was also observed by Brink, et al. 2006.)

They note that the probability of a recalled awakening in the morning increases with the awakening duration, and that the duration of an awakenings increases with the loudness of the event. Awakenings induced by events louder than LA_{max} 70 dB were markedly longer than spontaneous awakenings.

Awakenings from light sleep stage S2 were more pronounced than from deeper sleep stages. Further, the awakening probability increased with elapsed sleep time. That is, awakenings were more common in the early morning than late at night.

The authors present dose-response for the findings of the laboratory and field studies. The equation for the dose response curve, published in a subsequent paper (Basner, et al. 2006), is:

$$PAWR = (1.894 * (10^{-3} * LA_{max}^{2})) + (4.008 * (10^{-2} * LA_{max})) - 3.3243 \quad \ldots\ldots\ldots\ldots\ldots \quad (11)$$

where PAWR is the probability of being awakened (in percent) and LA_{max} is the maximum A-weighted sound level between 32.7 and 73.2 dB. A version of this curve, with LA_{max} converted to SEL, is shown in Figure C-1.

The duration of aircraft noise event-induced awakenings for low noise levels (45 dB to 60 dB) was not substantially longer than for spontaneous awakenings. For events above 65 dB, however, the duration of awakenings was considerably longer than for spontaneous awakenings. (Thirty seconds after spontaneous awakening, 53% of

subjects would fall asleep, but after an awakening induced by a loud noise event, only 41% of subjects would be asleep.) This gap closes over time, but after 4 minutes, the percentage of subjects awakened by loud noise events who remain awake is still 2% higher than those spontaneously awakened. (The 4-minute duration is significant because that is the duration at which awakenings are likely to be remembered the next day.)

The study found that people tended to take longer to fall back to sleep after awakening in the second half of the night than the first half. The time required to fall asleep tended to be longer for aircraft noise event-induced awakenings than for spontaneous awakenings. This effect was more pronounced in the second half of the night.

The authors express skepticism in regard to using Leq and the Number of Events Above a Threshold as bases for criteria for policies to protect residents from adverse nighttime noise effects. The use of a Leq criterion would imply an equivalent relationship between total sound energy and awakenings effects. Their results, on the other hand, found that louder aircraft noise events have a proportionally more substantial effect on awakenings than the equal energy rule would imply. Their data, for example, show that 10.6 events of 72 dBA would cause one additional awakening (compared with spontaneous awakenings). According to the equal energy rule, twice as many events at half the noise level (21.2 events at 69 dBA) would be required to cause the same number of awakenings. The data, however, indicate that it takes only 11.8 events of 69 dBA to produce the same number of awakenings as 10.6 events of 72 dBA.

C.1.9 European Commission Working Group on Health and Socio-economic Aspects, (2004)

This paper was prepared to set forth a position relating to potential policy guidance to European Union member states in assessing the effects of nighttime noise exposure on the public. It describes a dose-effect relationship for long-term nighttime noise exposure, defined as L_{night} – the 8-hour Leq for the period from 11:00 p.m. to 7:00 a.m.

The paper notes that much of the research has related awakenings to exposure to discrete noise events, described in terms of LA_{max} or SEL. An equation is presented which purports to estimate the maximum number of noise-induced awakenings (n_{max}) based on varying L_{night} levels:

$$n_{max} = 0.3504 * 10^{(Lnight-35.2)/10} \quad \text{..... (12)}$$

The paper recommends that Annex III of the Environmental Noise Directive be amended by incorporating the following dose-effect relationships:

- Percentage of noise-induced awakenings from commercial aircraft noise, measured indoors, described with the SEL metric for SEL 54 dBA to SEL 90 dBA:
  - n = -0.564 + 1.909 * 10-4 * (SEL)2
  - If SEL is less than 54 dBA, the percentage of noise-induced awakenings is presumed to be 0.
- Maximum number of behavioral awakenings from aircraft noise described in terms of L_{night}:
  - $n_{max} = 0.3504 * 10^{(Lnight-35.2)/10}$
- Increase in body movements (mean motility - m) from aircraft noise described in terms of L_{night}:
  - $m = 0.000192 * L_{night} – 0.004032$;
  - This equation was developed from noise levels measured indoors in terms of LA_{max}.

C.1.10 Brink, et al. (2006)

The authors note that most of the research on the effects of nighttime noise on sleep has accounted for the probability of awakening based on a noise event described by a given maximum sound level – LA_{max}. Conceptually, this approach implies that reactions to noise events are independent of each other. Thus, different temporal distributions of identical noise events throughout the night would be presumed to have the same effect on awakenings among the same population.

The authors argue that this presumption is almost certainly incorrect, since sleep stages are known to vary systematically throughout the night, with deeper sleep stages tending to be more common sooner after sleep and lighter stages later after falling asleep. Further, it is possible that the probability of awakening increases with each succeeding event, if the events are closely spaced. In such a situation, the assumption of equal probabilities of awakening ascribed to each event would tend to under-predict awakenings. On the other hand, if closely spaced noise events make it difficult for a person awakened by the first event to fall back asleep, the assumption of equal probabilities of awakening would tend to over-predict awakenings. At the same time, the prolonged awakening caused by multiple, closely spaced events would seem to be a more serious disruption of sleep than a simple awakening caused by an isolated single event. The authors note that the

weighting of prolonged awakenings has not yet been satisfactorily incorporated into models of noise impact on sleep.

The authors describe research they undertook to understand the effects of the spacing of noise events soon after sleep onset in the evening and before wakeup in the early morning. The study used recorded aircraft noise levels played in the study participants' bedrooms. The response of the participants to the noise events was recorded using "seismosomnographic" instrumentation, which tracked motility and cardiac and respiratory parameters.

The study found that motility reactions generally declined with each successive noise event, when 16 noise events were played over a 90-minute period. It also found that motility was substantially greater early in the morning than in the evening, soon after falling asleep.

A particularly interesting finding was that motility was substantially more pronounced for noise events with faster rise times (dB/sec), even if the LA_{max} level was the same as an event with a slower rise time. The study compared motility for an arrival (fast rise time) with a departure (slow rise time). Even though both events had a LA_{max} (at the subject's ear) of 60 dBA, the arrival caused substantially more motility. This was despite the 4dB ***lower*** SEL of the arrival event. The authors suggest that this finding calls for a reconsideration of noise judgments that are based only on average sound metrics, such as Leq.

C.1.11 Anderson and Miller (2007)

Rather than presenting the results of a research study, the authors demonstrate a method for estimating the number of awakenings in a typical airport environment. Their intent was to develop a model that could be followed in developing analyses of the noise impact analyses for environmental analysis.

The authors demonstrated their methodology using the datasets obtained by Fidell, et al. (1994 and 1995) in awakenings studies undertaken near three airports—Los Angeles International Airport (LAX), Denver International Airport (DIA), and Castle Air Force Base (Castle). They develop an SEL-based dose-response curve representing the probability of awakening by an average subject. They then show how to extend it for multiple noise events.

Next, they develop dose-response curves for the percentiles of study respondents based their awakenings sensitivities.

The authors then demonstrate a method of estimating awakenings among a population with varying sensitivities who are exposed to multiple nighttime events. For multiple aircraft events at night, first the probability of sleeping through all aircraft during the night was determined, and then this probability is subtracted from unity to obtain the probability of awakening at least once during the night.

The probability of sleeping through all aircraft equals the product of sleeping through each of the individual aircraft events, as shown in equation 13.

$$p_{sleep,multiple} = \prod_{a=1}^{N} (p_{sleep,single})_a \quad \text{..... 13)}$$

Where a = 1 to N is the index of all aircraft events during the night. The probability of awakenings due to multiple aircraft events is given by equation 14.

$$p_{awake,multiple} = 1 - p_{sleep,multiple} \quad \text{..... 14)}$$

Finally, the authors present a noise contour map, developed using the detailed grid analysis feature of the Integrated Noise Model, showing "percentage of people likely to be awakened on an average night." They note the contours were developed using the same input required for annual day-night average sound level (DNL) contours.

C.1.12 Implications of Research for Airport Noise Impact Analysis

Although the scientific understanding of the nature of noise-induced awakenings continues to advance, many gaps in our understanding of the phenomenon remain. Given the incomplete state of knowledge, aviation and land use policy-makers must be content with methods yielding order of magnitude estimates of the impact of aircraft noise on the sleep of airport-vicinity residents. If the objective of a particular study is to compare two or more alternative scenarios (as it is in this Part 161 Study), then estimating the impacts of each scenario on awakenings can yield a reasonable estimate of the relative differences in the scenarios, even if the absolute numbers may be subject to uncertainty.

Key research findings with implications for airport noise impact analysis include the following:

- At this time, the probability of being awakened by aircraft noise is best predicted by single event metrics – either LA_{max} or SEL.
- Despite the apparent predictive ability of single event metrics, some evidence indicates that other aspects of the noise event not reflected in either LAmax or SEL, specifically, onset rate may also be important in understanding awakenings (Basner 2004).
- More research is needed before awakenings can be reliably related to cumulative metrics, such as Leq.
  - Basner (2004) found that the tendency to be awakened does not appear to follow the "equal energy rule" – the implicit underpinning for the use of a cumulative metric in predicting awakenings.

- While the use of a single event metric in predicting awakenings implies that each noise event is independent of the other events, research indicates that the temporal clustering of events is important in explaining awakenings from sleep – and the difficulty in falling back to sleep.

- At this time, there is insufficient knowledge to ascribe to aircraft noise-induced awakenings any adverse health impacts or any adverse impacts on productivity.

C.2 SELECTED METHODOLOGY FOR ANALYZING AWAKENINGS

The methodology for estimating the number of awakenings with and without the alternative curfews is explained in this section. In concept, the process involved the following steps:

1. Select the dose-response curves to be used in estimating awakenings.

2. Define the study area and divide it into census blocks and block groups.

3. Using INM, compute SEL value for each nighttime operation (on an average day during each forecast year) at the centroid of each census block and block group.

4. Estimate the average outdoor-to-indoor noise level reduction for dwellings in the study area.

5. Compute estimated indoor SELs for dwellings, at each centroid, by adjusting the INM output (from Step 3) by the noise level reduction factors (from Step 4).

6. Using each dose-response curve (from Step 1), compute the percentage of people awakened for each indoor SEL at each centroid. (Because the detailed grid output includes fractions of an operation, the computation of the "percentage awakened" at any given SEL is multiplied by the number of operations or fractional operations at each SEL level.)

7. Sum all the awakenings computed at each centroid to get the raw count of "awakenings" on an average night for the corresponding census block or block group.

8. Recognizing that the nighttime SELs computed by the INM cover the 9-hour period from 10:00 p.m. to 7:00 a.m. and that recent studies of sleep behaviour among adults in the United States indicates that the typical adult sleeps 7 hours a night (National Sleep Foundation 2003), the raw count was multiplied by seven-ninths to derive an actual estimate of nightly awakenings.

9. Multiply the average nightly awakenings by 365 to yield an estimated total number of awakenings for each study year.

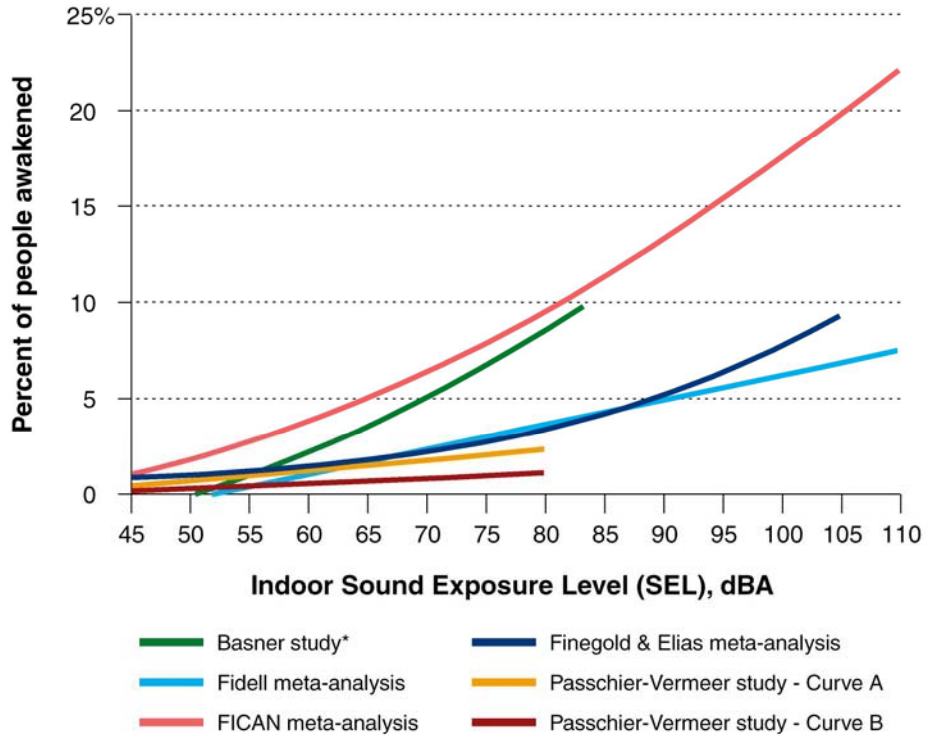
C.2.1 Selected Dose-Response Curves

Figure C-1 shows the various dose-response curves developed in the research reviewed in this section. The FICAN curve, based on a meta-analysis of several studies, shows the greatest sensitivity to awakenings, but it is based on a statistical approach showing the outer limit of sensitivity, essentially overstating the dose-response relationship. The Fidell and Finegold-Elias meta-analyses, which are based on nearly the same sources of behavioral awakenings data, are nearly identical. The differences primarily reflect different specifications of the regression models in each study. The Passchier-Vermeer curves, are similar to the Fidell and Finegold-Elias curves at levels below SEL 65 dBA, but are lower at higher noise levels. The Basner curve, the only one that is based on polysomnographic definition of awakenings, is steeper than the other curves. At levels below about SEL 57 dBA, it shows less sensitivity than the other curves (except for the FICAN curve). At higher noise levels, however, it shows a relatively steep increase in awakenings.

Figure C-1

COMPARISON OF NOISE-INDUCED AWAKENINGS FUNCTIONS

Bob Hope Airport FAR Part 161 Study



* Note: Basner Curve is based on observed awakenings and changes from deep to the lightest sleep stage, while others are based on "behavioral awakenings." Equation for curve is actually based on indoor LAmax, rather than SEL. For this graph, LAmax was converted to estimated SEL using the equation developed by Ollerhead 1992 from aircraft noise measurements: SEL = 23.9 + 0.81LAmax..

Sources: Basner, et al. 2006; FICAN 1997, *www.fican.org/pages/sleepdst.html*; Fidell, et al. 1995; Feingold, L.S. and B. Elias 2002; Ollerhead, J.B. et al. 1992; Passchier-Vermeer, W., et al. 2002—Curve A is based on "motility" during the noise event as a measure of awakening, Curve B is based on the "onset of motility" during the event.

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Given the incomplete state of knowledge relating to noise-induced awakenings, the methodology selected for the Part 161 Study relies on two alternative dose-response curves – the Finegold-Elias curve and the Basner curve. The intent is to estimate a plausible range within which the actual number of awakenings is likely to fall.

The studies and assumptions upon which these dose-response curves are based have different strengths and weaknesses.

Finegold-Elias Curve

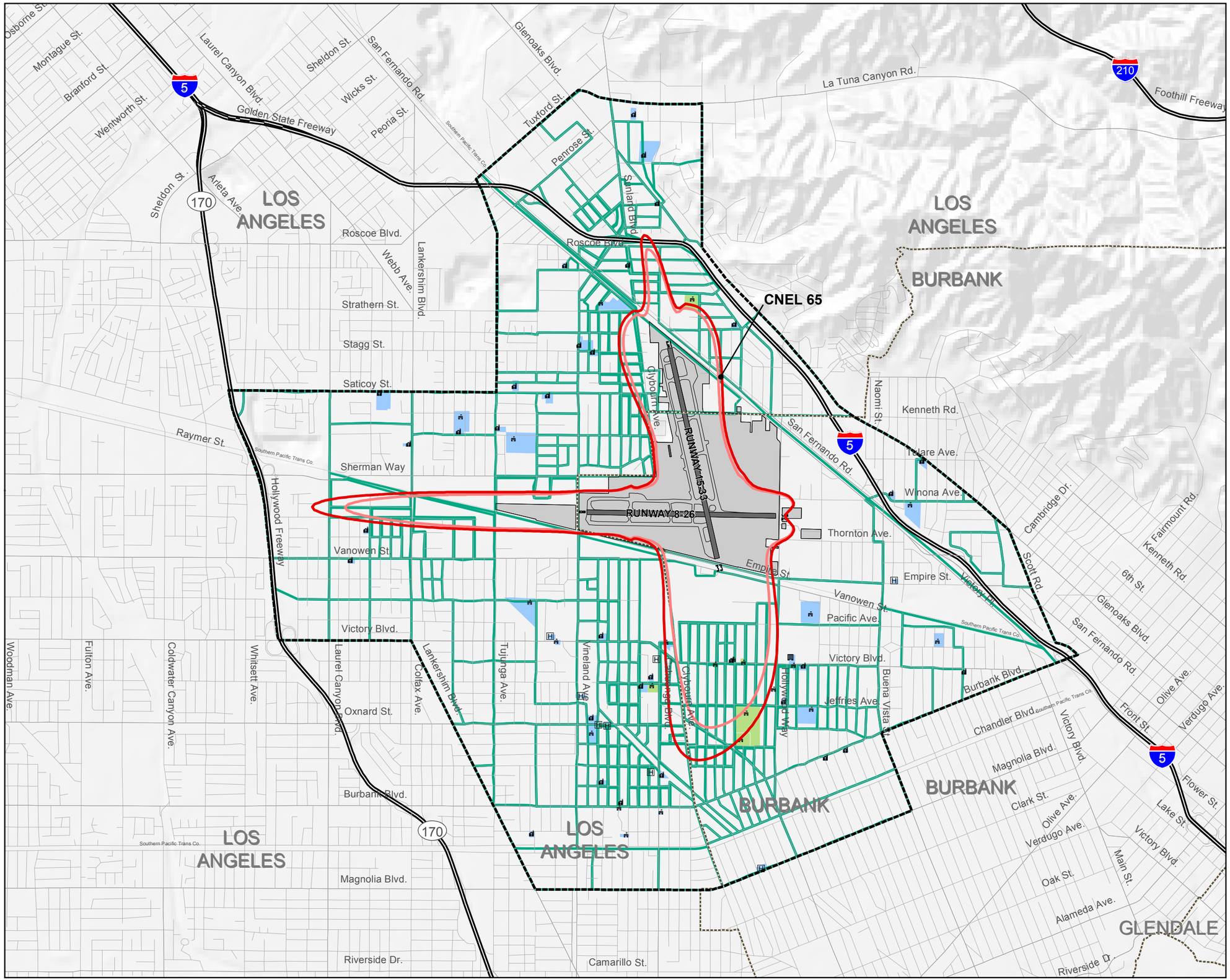
- Meta-analysis based on large amount of data.
- Has credibility in scientific establishment. Essentially the same dataset was used by Fidell. American National Standards Institute is proposing an awakenings dose-response curve that is based on essentially the same data.
- Based on behavioral awakenings, which may understate awakenings overall, since it ignores awakenings indicated by changes in sleep stage.
- Does not account for the effect of multiple events and temporal variations in a series of events over an extended period of time.

Basner Curve

- Based on most thorough polysomnographic study of awakenings ever done. Accounts for the full-range of awakenings indicators.
- Developed from a single study, rather than a meta-analysis.
- Does not account for the effect of multiple events and temporal variations in a series of events over an extended period of time.
- Basner's curve is valid over a range of noise levels between LAmax of 32.7 to 73.2 dBA (roughly equivalent to SELs between 50.4 dBA and 83.2 dBA).

C.2.2 Study Area

The awakenings analysis was conducted in the area corresponding to the 65 CNEL contours for the 2008 and 2015 baseline, unrestricted cases. The study area is shown in Figure C-2. The figure also shows the 2000 Census blocks and block group boundaries in the study area.



LEGEND

- 2008 Baseline CNEL 65 Contour
- 2015 Baseline CNEL 65 Contour
- Primary Study Area
- Census Blocks, Block-Groups
- Municipal Boundary
- Airport Property
- Noise-Sensitive Institutions
- Sound-Insulated School
- Schools, Preschools
- Places of Worship
- Library
- Hospital
- Freeways
- Roads

Noise Analysis by Jacobs Consultancy, 2007

NORTH

0 750 1,500 3,000 Feet

Figure C-2
STUDY AREA FOR
ANALYSIS OF POTENTIAL AWAKENINGS
FAR Part 161 Study for Bob Hope Airport
January 2009

BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY

JACOBS
CONSULTANCY
Airport Management Consulting

C.2.3 Noise Modeling

Points near the center of each census block and block group (centroids) were defined. The detailed grid analysis feature of the Integrated Noise Model (INM) was used to compute SELs at each centroid for every aircraft nighttime event for all eight scenarios (2008 and 2015 baseline conditions and the three curfew alternatives). The noise level at each centroid was taken to be representative of the noise level throughout the corresponding census block or block group.

C.2.4 Outdoor-to-Indoor Noise Attenuation Factors

Since both the Finegold-Elias and the Basner dose-response curves are based on interior noise levels, it was necessary to estimate the outdoor-to-indoor noise level reduction for homes in the study area. The exterior SELs computed by the INM could then be adjusted to represent interior SELs.

As part of its ongoing acoustical treatment program, the Airport Authority has compiled a large database of outdoor/indoor noise measurement data. The data provide a valuable source of information about the outdoor-to-indoor noise level reduction afforded by typical homes in the Airport vicinity. The consultant used this data to calculate the average noise level reductions shown in Table C-2. These averages were used in estimating interior noise levels.

Table C-2

AVERAGE OUTDOOR-TO-INDOOR ATTENUATION FACTORS
Bob Hope Airport FAR Part 161 Study

Treatment Status	Outdoor-to-Indoor Noise Reduction1
Untreated, windows closed	29.3 dBA
Acoustically Treated, windows closed	38.2 dBA

Noise measurement data provided by Bob Hope Airport. Analysis by Jacobs Consultancy, 2007.

Note that the noise level reduction values are based on windows being closed. It is assumed that local residents who are sensitive to being awakened by nighttime aircraft noise will tend to sleep with windows closed to reduce the exterior noise levels as much as possible.

These noise attenuation factors were applied to the homes within the 65 CNEL contour based on the general proportion of treated homes versus untreated homes as of June 2007. Conservative assumptions were made about the pace of the treatment program in the future.

C.3 ANALYSIS

Tables C-3 and C-4 show the results of the awakenings analysis based on the Finegold-Elias and the Basner dose-response curves, respectively. Figures C-3, C-4, C-5, and C-6 show the geographic pattern of awakenings for the baseline case and the three alternative curfews.

Based on the Finegold-Elias equation, Table C-3 shows that the number of annual awakenings in the baseline case would decrease slightly within the 65 CNEL contour from 2008 to 2015. Although the number of nighttime operations is projected to increase from an average of 48 per night to 54 per night during the period, the number of awakenings is projected to decrease slightly because of the forecast retirement of older, louder aircraft, such as the MD-80s and the B-737-300s.

The number of awakenings estimated with the curfews is far lower than in the baseline case, with the number for the full curfew, of course, being the lowest. The departure curfew and the noise-based curfew produce similar numbers of awakenings within the 65 CNEL contour.

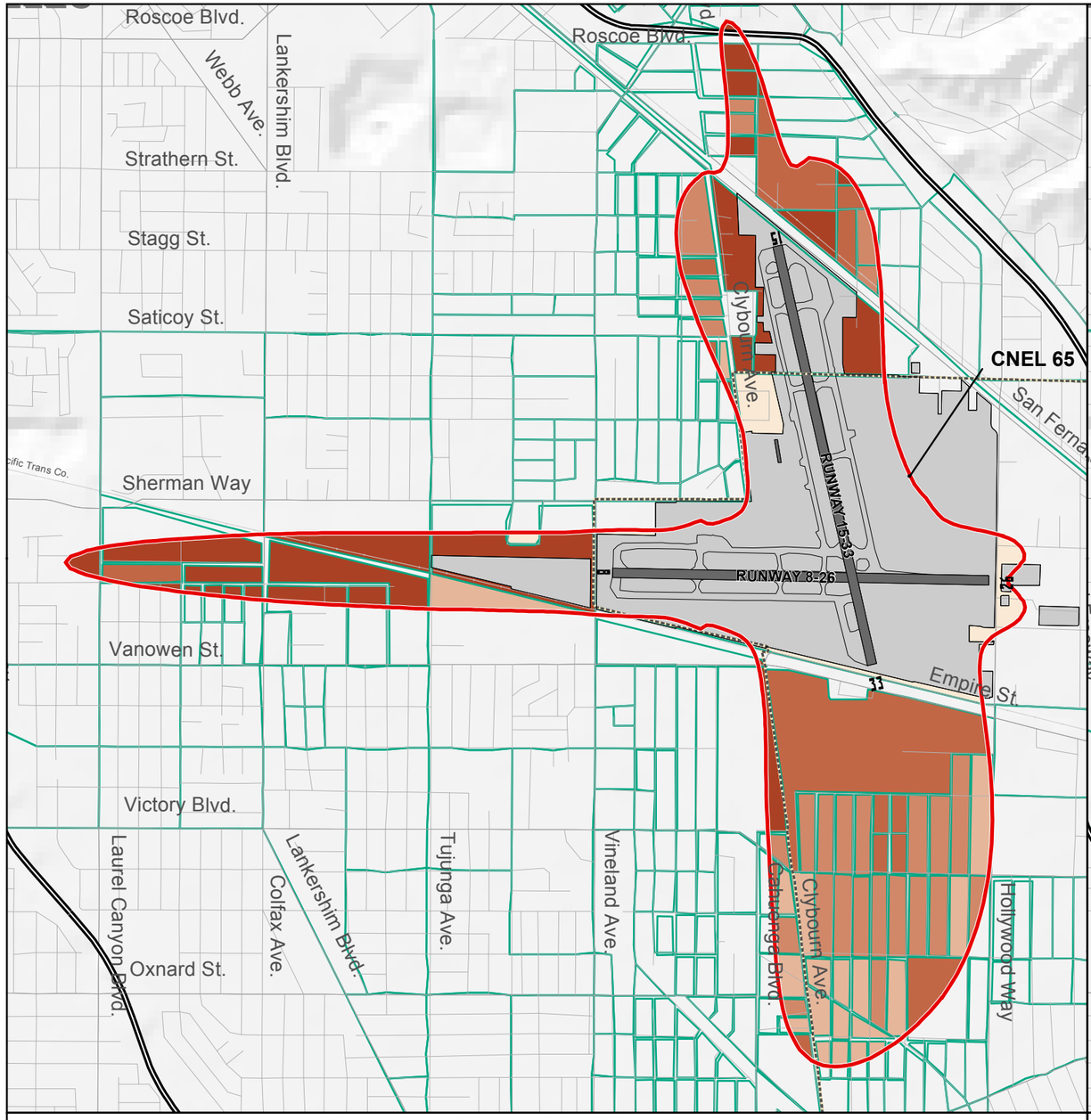
Table C-3

ESTIMATED ANNUAL NIGHTTIME AWAKENINGS—FINEGOLD-ELIAS EQUATION
Bob Hope Airport FAR Part 161 Study

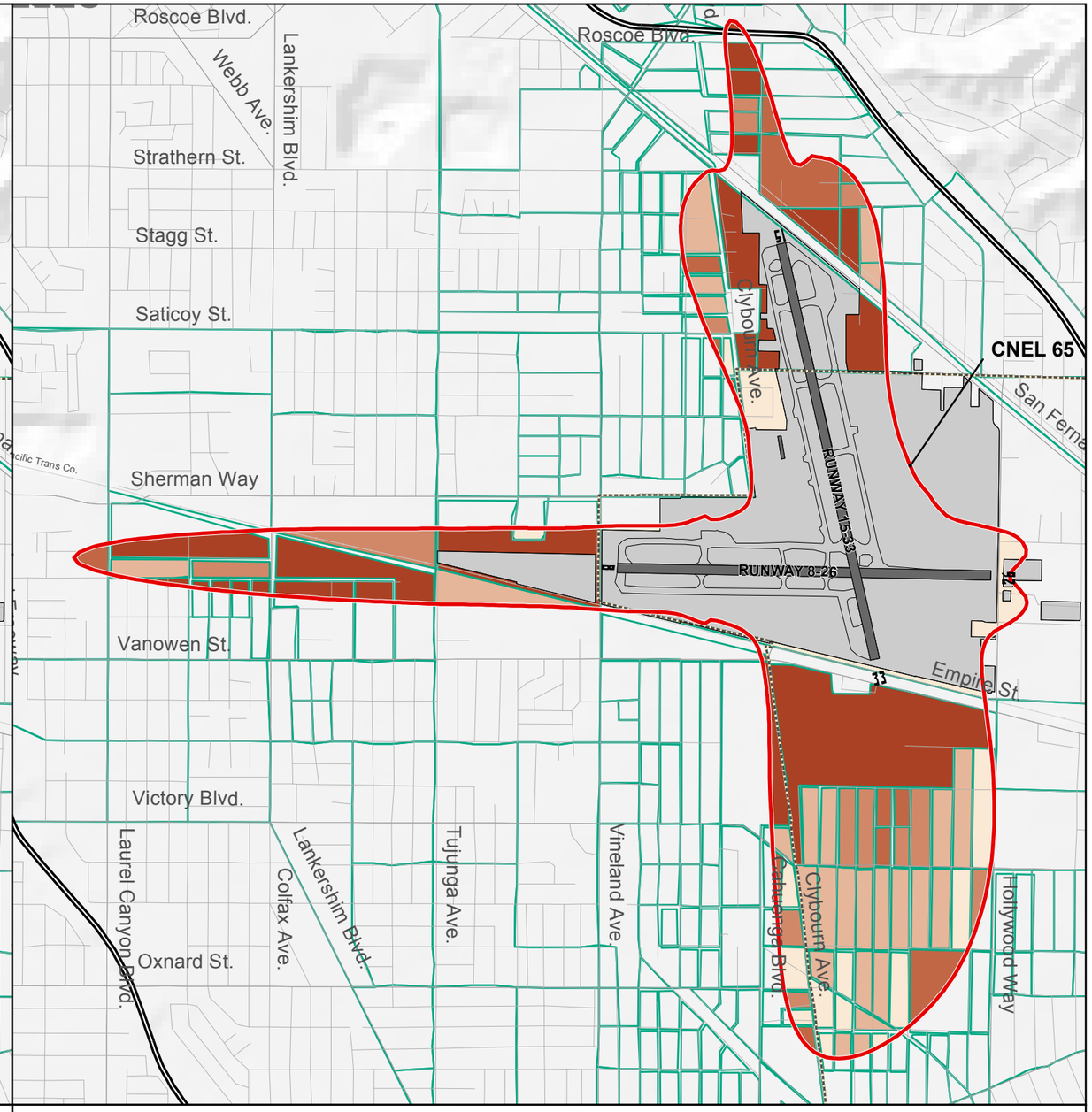
Scenario	2008 Awakenings 65 CNEL Contour *(a)*	2015 Awakenings 65 CNEL Contour *(a)*
Baseline (no curfew)	262,450	260,715
Full Curfew	17,614	32,492
Departure Curfew	93,739	128,156
Noise-Based Curfew	93,484	130,207

(a) Represents the area within the 65 CNEL contour for the baseline (no curfew) case in each forecast year.

Table C-4 shows the annual number of awakenings estimated based on the Basner dose-response curve. Except for the noise-based curfew, it shows somewhat greater numbers of awakenings inside the 65 CNEL contour in the 2008 case than the Finegold-Elias analysis. This is because the Basner curve shows a higher proportion of awakenings at high noise levels. (See Figure C-1.) The noise-based curfew produces approximately the same level of awakenings as with the Finegold-Elias curve because that alternative specifically restricts loud aircraft at night. (The departure curfew would continue to permit arrivals by some relatively loud aircraft.)



Based on Finegold - Elias Curve



Based on Basner Curve

LEGEND

Awakenings Index

- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- 61 - 233

- 65 CNEL Contour
- Airport Boundary
- Municipal Boundary
- Census Block or Block Group
- Freeways
- Roads

Source:
Noise analysis by Jacobs Consultancy, 2007.

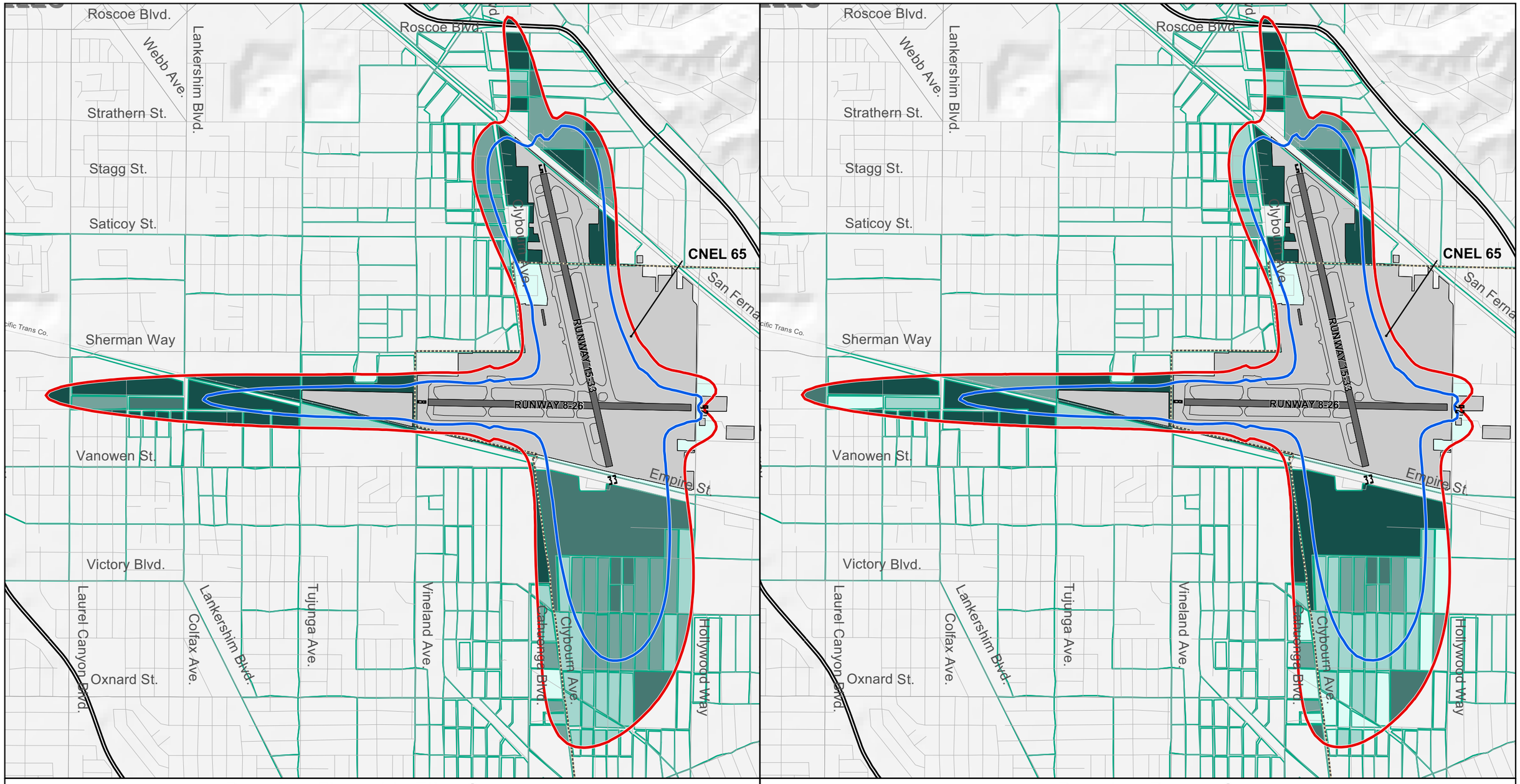
Note:
The awakenings index represents the number of annual awakenings per person. It is computed by dividing the estimated number of awakenings in each year, for each census block or block group, by the 2000 population in each block or block group.

NORTH

0 550 1,100 2,200 Feet

Figure C-3
AWAKENINGS BY CENSUS BLOCK OR BLOCK GROUP - 2015 BASELINE CONDITIONS
FAR Part 161 Study for Bob Hope Airport
January 2009

JACOBS CONSULTANCY
Airport Management Consulting



LEGEND

Reduction in Awakenings Index

- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- > 61

- 65 CNEL Contour - Baseline
- 65 CNEL Contour - Full Curfew
- Airport Boundary
- Municipal Boundary
- Census Block or Block Group
- Freeways
- Roads

Source:
Noise analysis by Jacobs Consultancy, 2007.

Note:
The awakenings index represents the number of annual awakenings per person. It is computed by dividing the estimated number of awakenings in each year, for each census block or block group, by the 2000 population in each block or block group.

NORTH

0 550 1,100 2,200 Feet

Figure C-4

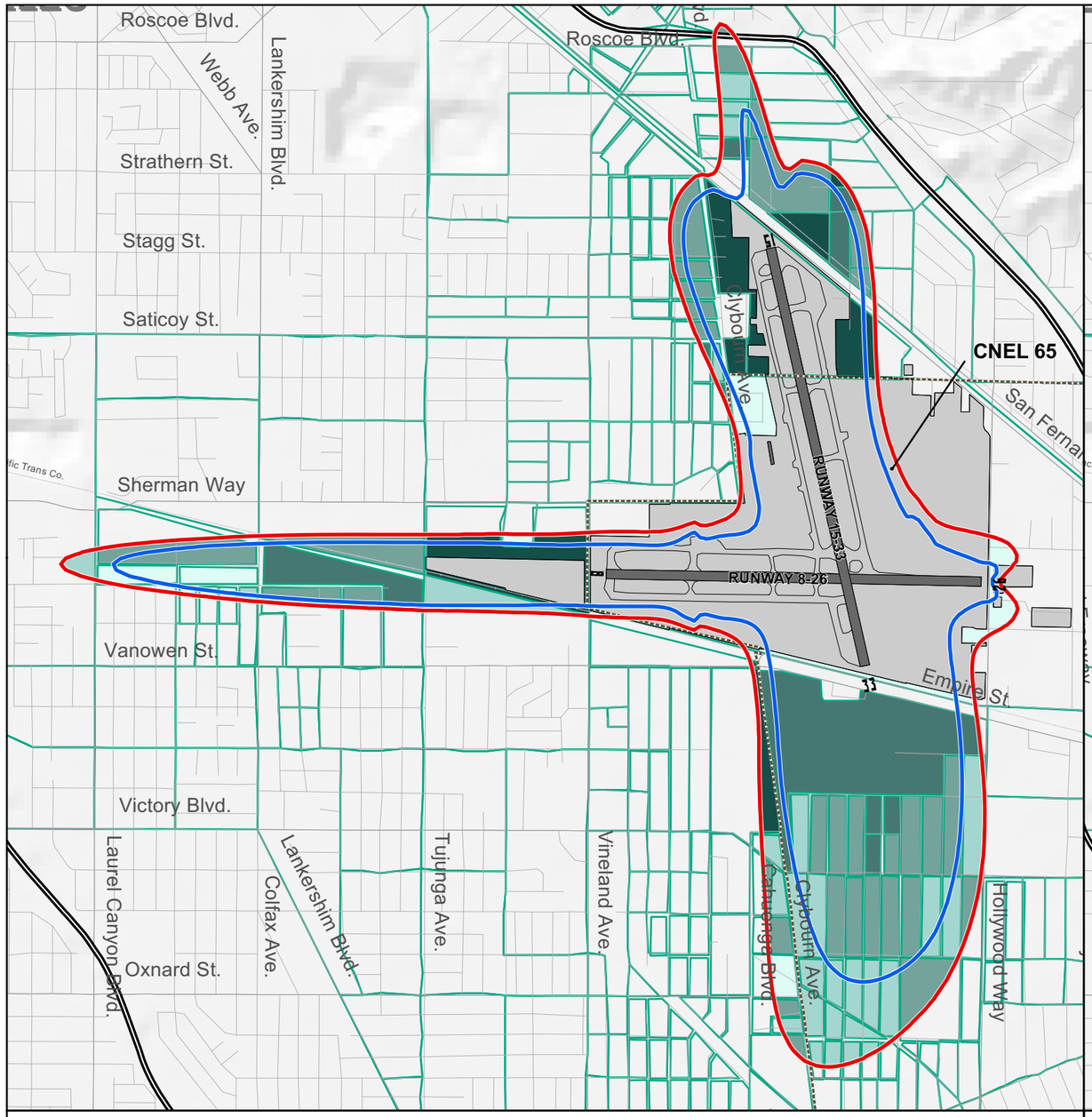
DECREASE IN AWAKENINGS BY CENSUS BLOCK OR BLOCK GROUP - 2015 FULL CURFEW CONDITIONS

FAR Part 161 Study for Bob Hope Airport

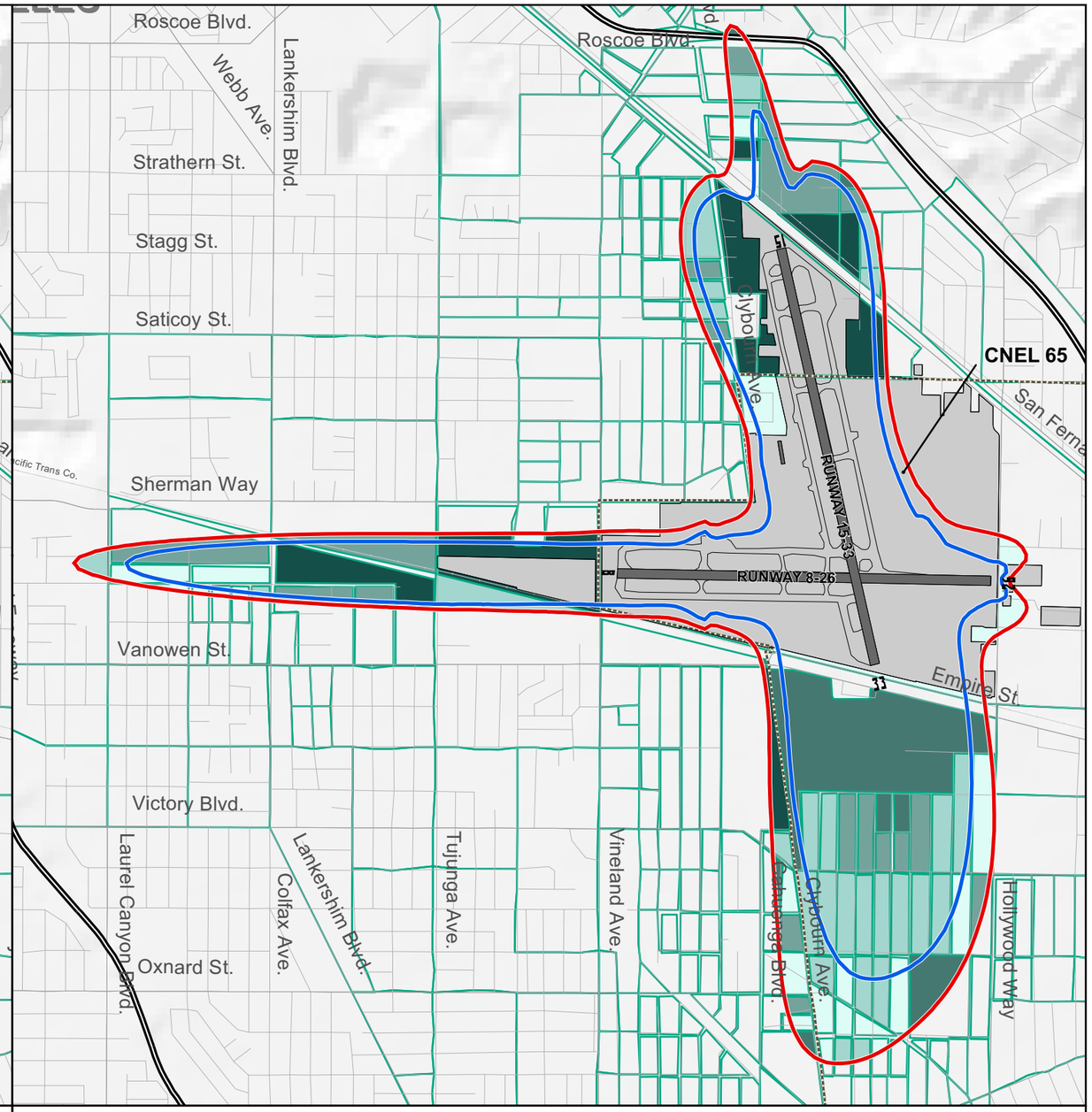
January 2009

JACOBS CONSULTANCY

Airport Management Consulting



Based on Finegold - Elias Curve



Based on Basner Curve

LEGEND

Reduction in Awakenings Index

- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- > 61

- 65 CNEL Contour - Baseline
- 65 CNEL Contour - Departure Curfew
- Airport Boundary
- Municipal Boundary
- Census Block or Block Group
- Freeways
- Roads

Source:
Noise analysis by Jacobs Consultancy, 2007.

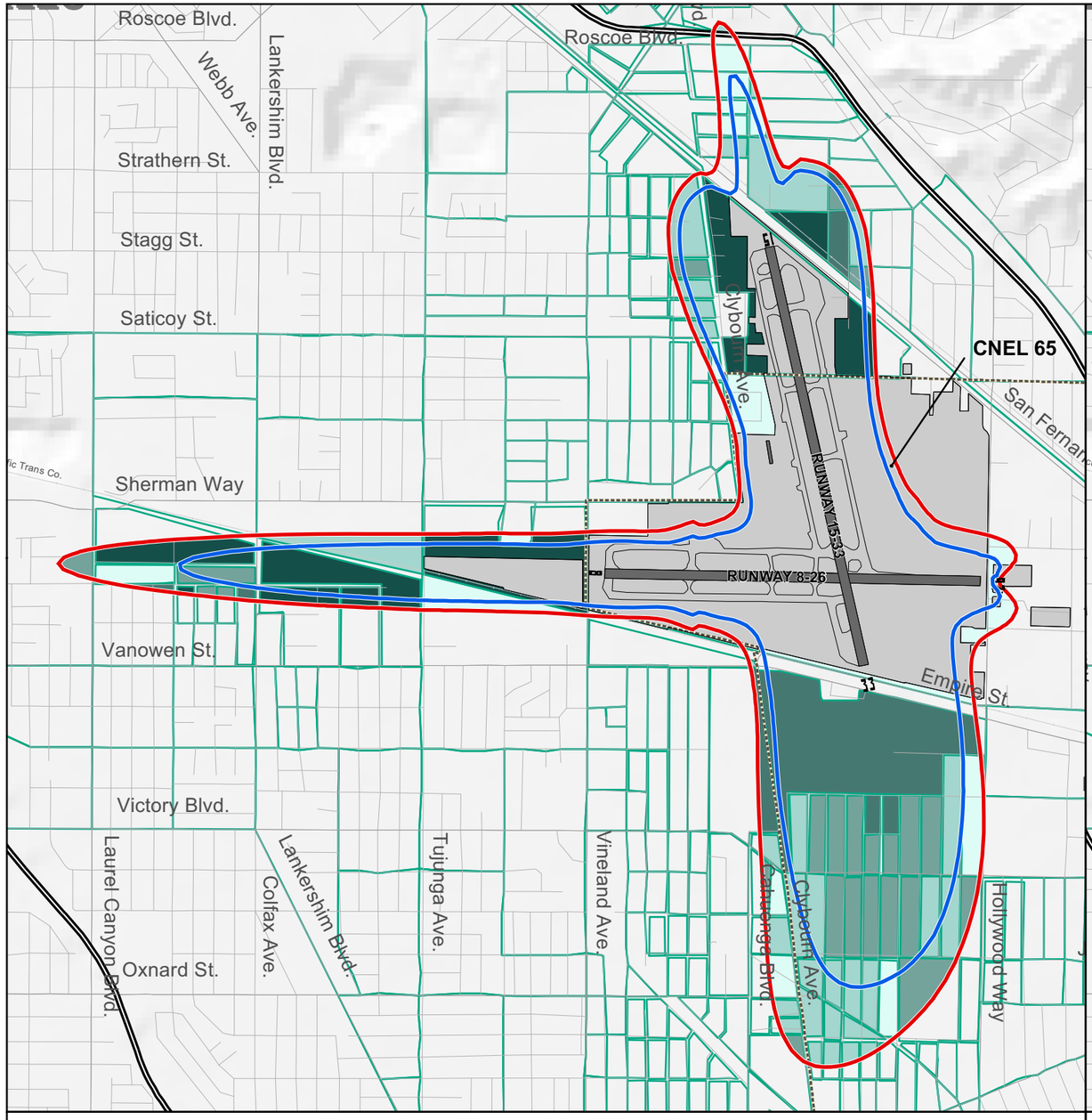
Note:
The awakenings index represents the number of annual awakenings per person. It is computed by dividing the estimated number of awakenings in each year, for each census block or block group, by the 2000 population in each block or block group.

NORTH

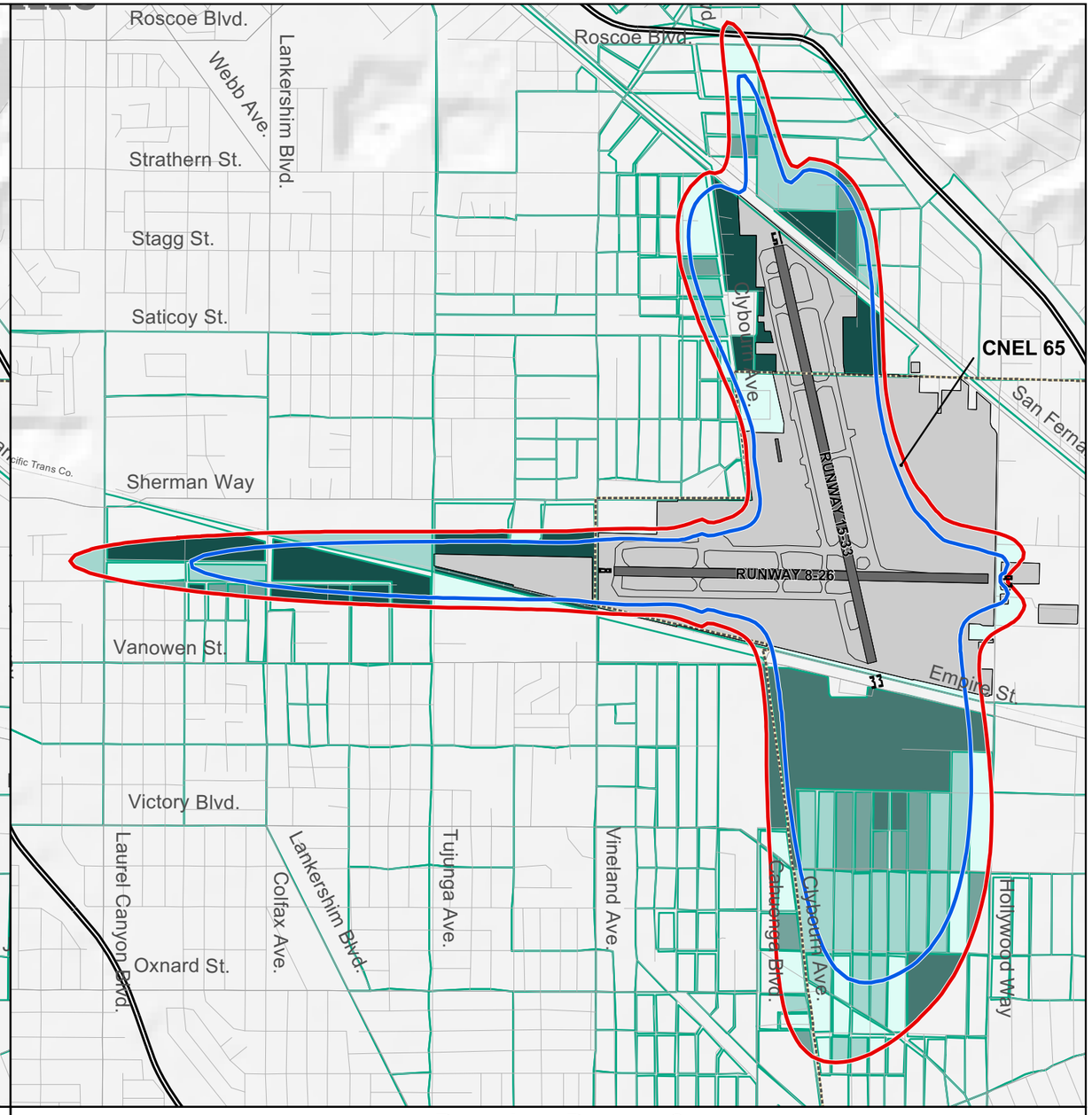
0 550 1,100 2,200 Feet

Figure C-5
DECREASE IN AWAKENINGS BY CENSUS BLOCK OR BLOCK GROUP - 2015 DEPARTURE CURFEW CONDITIONS
FAR Part 161 Study for Bob Hope Airport
January 2009

JACOBS CONSULTANCY
Airport Management Consulting



Based on Finegold - Elias Curve



Based on Basner Curve

LEGEND

Reduction in Awakenings Index

- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- > 61

- 65 CNEL Contour - Baseline
- 65 CNEL Contour - Noise-Based Curfew
- Airport Boundary
- Municipal Boundary
- Census Block or Block Group
- Freeways
- Roads

Source:
Noise analysis by Jacobs Consultancy, 2007.

Note:
The awakenings index represents the number of annual awakenings per person. It is computed by dividing the estimated number of awakenings in each year, for each census block or block group, by the 2000 population in each block or block group.

NORTH

0 550 1,100 2,200 Feet

Figure C-6
DECREASE IN AWAKENINGS BY CENSUS BLOCK OR BLOCK GROUP - NOISE-BASED CURFEW CONDITIONS IN 2015
FAR Part 161 Study for Bob Hope Airport
January 2009

JACOBS CONSULTANCY
Airport Management Consulting

The 2015 results predicted by the Basner curve are quite different than the results of the Finegold-Elias analysis. The number of awakenings inside the 65 CNEL contour is projected to decrease for the baseline and departure curfew cases from 2008. The reason is the forecast retirement of the loudest aircraft over the next several years. (Given the slope of the Basner curve, this fleet transition has a greater effect on its predictions of awakenings that on the estimates produced by the Finegold-Elias curve.)

Table C-4

ESTIMATED ANNUAL NIGHTTIME AWAKENINGS—BASNER EQUATION
Bob Hope Airport FAR Part 161 Study

Scenario	2008 Awakenings 65 CNEL Contour *(a)*	2015 Awakenings 65 CNEL Contour *(a)*
Baseline (no curfew)	285,659	182,143
Full Curfew	20,888	36,291
Departure Curfew	115,571	106,176
Noise-Based Curfew	93,170	123,610

(a) Represents the area within the 65 CNEL contour for the baseline (no curfew) case in each forecast year.

Table C-5 shows the range of reduction in potential awakenings on an average night for the baseline case and each alternative curfew. The range is based on the varying predictions of the two alternative dose-response curves. On an average night in 2008, the full curfew would result in 671 to 725 fewer awakenings within the 65 CNEL contour. In 2015, the number would range from 400 to 625. The number of awakenings with the other curfew alternatives would be somewhat lower, based on the relationships discussed for Tables C-3 and C-4.

Table C-5

ESTIMATED RANGE OF REDUCTION IN NIGHTTIME AWAKENINGS PER NIGHT
Bob Hope Airport FAR Part 161 Study

Scenario	2008 Awakenings 65 CNEL Contour *(a)*	2015 Awakenings 65 CNEL Contour *(a)*
Full Curfew	671 - 725	400 – 625
Departure Curfew	462 - 466	208 – 363
Noise-Based Curfew	463 - 527	160 – 358

(a) Represents the area within the 65 CNEL contour for the baseline (no curfew) case in each forecast year.

C.4 FINAL CONSIDERATIONS AND LIMITATIONS OF ANALYSIS

As noted previously, the scientific understanding of the impact of aircraft noise on sleep, and methods for assessing and predicting that impact, are not fully developed. Thus, the analysis presented in this Appendix must be interpreted as a very general assessment of relative impact of alternative operating scenarios on the sleep of airport-vicinity residents. Although the absolute numbers of awakenings predicted in this analysis is uncertain, the relative differences among the various curfew alternatives are valid estimates.

One of the complications in estimating the effect of aircraft noise on sleep is the impact of multiple events closely spaced in time. This phenomenon has the following effects:

- A series of closely spaced events increases the chance of awakening with each successive event, as it causes changes to lighter sleep stages. (Thus, for example, the third event in a series will have the same chance of awakening a subject as a louder isolated event.)

- Closely spaced events can increase the period of awakening by making it more difficult to fall back to sleep.

- Thus, closely spaced events do not necessarily always cause discrete awakenings, but may make the awakening caused by the first event more problematic for the sleeper.

Given the state of scientific understanding, there is no clear way to control for these effects in a predictive awakenings analysis.

To determine how serious this complication might be in the Bob Hope Airport area, an analysis was undertaken to determine the average distribution of operations throughout the night – between 10:00 p.m. and 7:00 a.m. – by 5-minute epochs for the 2005 calendar year. The results are shown in Table C-6.

An average of 41 arrivals and departures occurred at night in 2005. These were distributed throughout the night, with the 6:00 a.m. hour having the most operations – 8.2 – and the 4:00 a.m. hour the least – 1.34. Only two five-minute epochs had more than one average operation – the 10:00 to 10:05 period with 1.01 and the 6:55 to 7:00 period with 1.21. Twenty-four epochs had more than 0.50 operations, 11 of which occurred between 6:00 a.m. and 7:00 a.m.

This distributional pattern has two implications:

- The likelihood of multiple events spaced closely enough in time to complicate the single event-induced awakenings estimate is relatively small.

- The relatively high number of operations in the early morning (between 6:00 a.m. and 7:00 a.m.) may be responsible for a relatively higher proportion of awakenings than would be estimated using the Finegold-Elias and Basner dose-response curves. (The awakenings research shows a distinct tendency for noise-induced awakenings to increase later during the sleep period – which is early in the morning for most people.)

Table C-6

AVERAGE DAILY OPERATIONS BY 5-MINUTE EPOCH IN 2005 -- 10:00 P.M. TO 7:00 A.M.
Bob Hope Airport FAR Part 161 Study

Time		Number of Operations by Type		
Hour	Minute Group	Arrival	Departure	Total
10	00	0.60	0.41	1.01
	05	0.45	0.41	0.86
	10	0.41	0.22	0.63
	15	0.30	0.16	0.46
	20	0.32	0.18	0.50
	25	0.31	0.17	0.48
	30	0.32	0.16	0.47
	35	0.33	0.12	0.45
	40	0.36	0.10	0.46
	45	0.41	0.10	0.50
	50	0.31	0.08	0.40
	55	0.21	0.10	0.31
10:00 Total		4.32	2.21	6.53
11	00	0.19	0.07	0.26
	05	0.14	0.14	0.28
	10	0.18	0.19	0.37
	15	0.21	0.24	0.46
	20	0.30	0.16	0.47
	25	0.28	0.12	0.40
	30	0.24	0.07	0.32
	35	0.20	0.08	0.28
	40	0.19	0.09	0.29
	45	0.28	0.10	0.38
	50	0.35	0.16	0.50
	55	0.48	0.22	0.70
11:00 Total		3.05	1.65	4.70
12	00	0.29	0.30	0.59
	05	0.31	0.15	0.46
	10	0.32	0.18	0.50
	15	0.33	0.22	0.55
	20	0.30	0.19	0.49
	25	0.22	0.11	0.33
	30	0.15	0.08	0.23
	35	0.15	0.07	0.21
	40	0.11	0.15	0.26
	45	0.19	0.25	0.44
	50	0.22	0.30	0.53
	55	0.33	0.12	0.45
12:00 Total		2.92	2.12	5.04

Time		Number of Operations by Type		
Hour	Minute Group	Arrival	Departure	Total
01	00	0.21	0.18	0.40
	05	0.25	0.04	0.29
	10	0.22	0.06	0.28
	15	0.19	0.06	0.25
	20	0.12	0.04	0.16
	25	0.07	0.05	0.12
	30	0.08	0.04	0.12
	35	0.05	0.06	0.11
	40	0.09	0.05	0.15
	45	0.08	0.12	0.20
	50	0.12	0.31	0.43
	55	0.15	0.21	0.37
01:00 Total		1.65	1.23	2.88
02	00	0.19	0.11	0.30
	05	0.17	0.12	0.29
	10	0.17	0.12	0.29
	15	0.16	0.14	0.30
	20	0.17	0.15	0.31
	25	0.18	0.13	0.31
	30	0.24	0.18	0.41
	35	0.30	0.15	0.45
	40	0.31	0.19	0.50
	45	0.30	0.27	0.57
	50	0.18	0.26	0.44
	55	0.09	0.21	0.30
02:00 Total		2.46	2.01	4.48
03	00	0.07	0.19	0.27
	05	0.08	0.14	0.22
	10	0.12	0.21	0.33
	15	0.15	0.68	0.84
	20	0.11	0.53	0.64
	25	0.10	0.27	0.37
	30	0.08	0.13	0.22
	35	0.04	0.24	0.28
	40	0.03	0.24	0.27
	45	0.03	0.28	0.31
	50	0.03	0.20	0.23
	55	0.03	0.19	0.22
03:00 Total		0.88	3.32	4.20

Time		Number of Operations by Type		
Hour	Minute Group	Arrival	Departure	Total
4	00	0.02	0.07	0.09
	05	0.01	0.04	0.05
	10	0.02	0.03	0.05
	15	0.04	0.02	0.06
	20	0.02	0.03	0.05
	25	0.01	0.04	0.05
	30	0.04	0.08	0.12
	35	0.05	0.05	0.10
	40	0.04	0.04	0.08
	45	0.06	0.07	0.13
	50	0.11	0.14	0.24
	55	0.16	0.15	0.31
04:00 Total		0.56	0.78	1.34
05	00	0.22	0.12	0.35
	05	0.19	0.18	0.37
	10	0.24	0.21	0.45
	15	0.27	0.15	0.42
	20	0.17	0.09	0.26
	25	0.15	0.12	0.27
	30	0.13	0.16	0.28
	35	0.10	0.24	0.33
	40	0.10	0.22	0.32
	45	0.07	0.19	0.26
	50	0.10	0.17	0.27
	55	0.16	0.24	0.40
05:00 Total		1.91	2.08	3.99
06	00	0.22	0.38	0.59
	05	0.21	0.33	0.54
	10	0.22	0.26	0.48
	15	0.21	0.31	0.52
	20	0.17	0.34	0.50
	25	0.20	0.40	0.59
	30	0.21	0.54	0.75
	35	0.21	0.67	0.88
	40	0.24	0.55	0.80
	45	0.18	0.42	0.59
	50	0.18	0.56	0.74
	55	0.16	1.05	1.21
06:00 Total		2.40	5.81	8.21
Grand Total		20.15	21.20	41.35

Source: Burbank-Glendale-Pasadena Airport, log of TAMIS data for 2005 calendar year.

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Appendix D

ESTIMATED EFFECT OF NOISE REDUCTIONS ON RESIDENTIAL PROPERTY VALUES

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Appendix D

ESTIMATED EFFECT OF NOISE REDUCTION ON RESIDENTIAL PROPERTY VALUES

This appendix documents the methodology used to compute the property value increase attributable to the potential adoption of the alternative curfews. In concept, the process involved the following steps:

1. Using INM grid analysis, compute CNEL values for all scenarios at each residential building within the 2008 baseline 65 CNEL contour.

2. Estimate the average current value of each residential building type within the Airport vicinity.

3. Compute the noise-related diminution of property value for each scenario by multiplying the average value of each residential building by the noise discount coefficient corresponding to the CNEL level to which it is exposed.

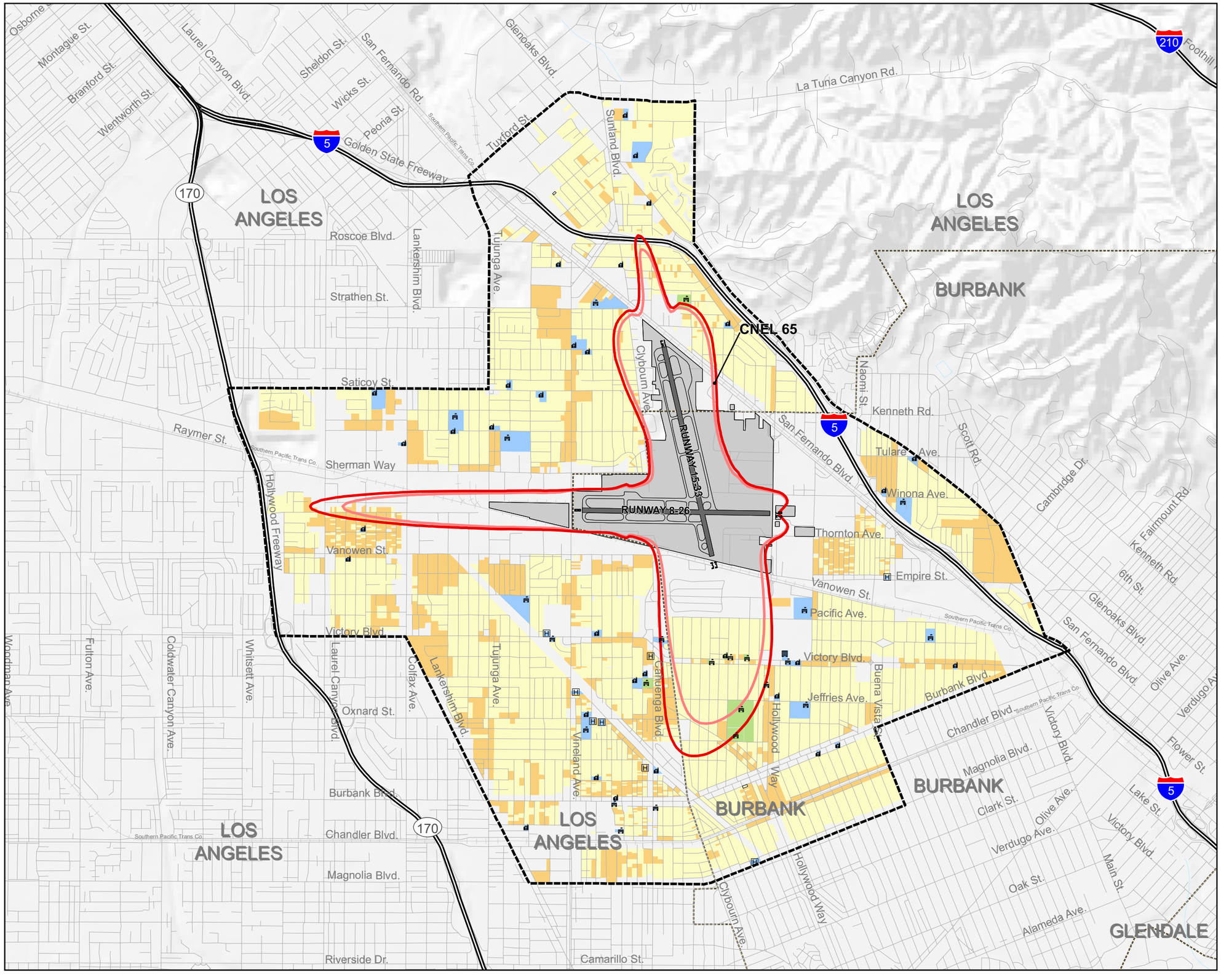
4. Calculate the difference in property value discount for each curfew alternative compared to the baseline case for each residential building.

5. Sum the results of all residential buildings for each scenario and the result is the property value benefit attributable to each alternative.

The next section describes the process used to estimate the average value of residential property in the Airport environs.

D.1 ESTIMATING CURRENT PROPERTY VALUES

Detailed residential property data in the Airport environs were obtained from the Los Angeles County Assessor's database. Data of interest included building type, sale prices, and the dates of the most recent three sales of each property. The data also included the number of dwelling units in each residential building with one to four units. Multi-family buildings with five or more units are grouped into one category. For this inquiry, the "Airport environs" were considered to be the following zip codes: 91352, 91505, 91601, 91605 and 91606. Due the low number of recent sales of multi-family buildings in those zip codes, additional data for multi-family buildings were obtained from five other zip codes: 91506, 91602, 91604 and 91607. In total, data for 16,870 residential properties were collected. Figure D-1 shows the area within which data were collected. Table D-1 shows the distribution of residential properties by property type.



LEGEND

- 2008 Baseline CNEL 65 Contour
- 2015 Baseline CNEL 65 Contour
- Detailed Land Use Study Area
- Municipal Boundary
- Airport Boundary
- Single-Family Noise-Sensitive Residential Land Use
- Multi-Family Noise-Sensitive Residential Land Use
- Noise-Sensitive Institutions
- Sound-Insulated School
- Schools, Preschools
- Places of Worship
- Library
- Hospital
- Freeways
- Roads

Figure D-1
STUDY AREA FOR EFFECTS OF NOISE ON RESIDENTIAL PROPERTY VALUES
FAR Part 161 Study for Bob Hope Airport
January 2009

JACOBS CONSULTANCY
Airport Management Consulting

Table D-1

DISTRIBUTION OF RESIDENTIAL PROPERTY TYPES IN ASSESSOR'S DATA SAMPLE

Bob Hope Airport FAR Part 161 Study

Residential Property Type	Number Units in Building	Proportion
Single-Family (conventional)	1	77.8%
Single-Family Condominium	1	13.1%
Multi-Family	2	2.6%
Multi-Family	3	1.7%
Multi-Family	4	1.7%
Multi-Family	5	0.4%
Multi-Family	>5	2.8%

The next step was to identify properties that were sold recently enough for the prices to be representative of current prices. This was taken as the thirteen-month period from January 2006 through January 2007. The sales data were grouped by residential building type. The recent sales data included numerous multi-family properties with 5 or more dwelling units. To determine the number of units in these larger buildings, site visits and queries of the County Assessor's on-line website were used. The price data are shown in Table D-2.

For single-family homes and condominiums, the median prices indicated in Table D-2 were taken as representative of the "average" value of those housing types in the Airport study area. The median, rather than the mean, is a superior indicator of central tendency when the data includes extreme outliers, as does the property sales data. (Note the $4.9 million single-family home sale.) Further, the number of cases for the single-family homes and condominiums was large enough for the median to be a reliable indicator of value throughout the study area.

The small number of cases for each multi-family building type, ranging from only one to no more than 25 cases, made it inadvisable to use the raw data as representative of the value of those building types throughout the study area. Thus, it was decided to pool the data for all multi-family buildings and compute an average price per dwelling unit. It was hypothesized that the average price per dwelling unit would decrease as the number of units in the multi-family building increased. This would make sense given the obvious economies of scale that attend the increase in dwelling unit density (for example, the spreading of the cost of land among several dwelling units.) The raw sales data in Table D-2 provided some evidence to support the hypothesis.

Table D-2

RECENT PROPERTY SALES DATA IN AIRPORT VICINITY

Bob Hope Airport FAR Part 161 Study

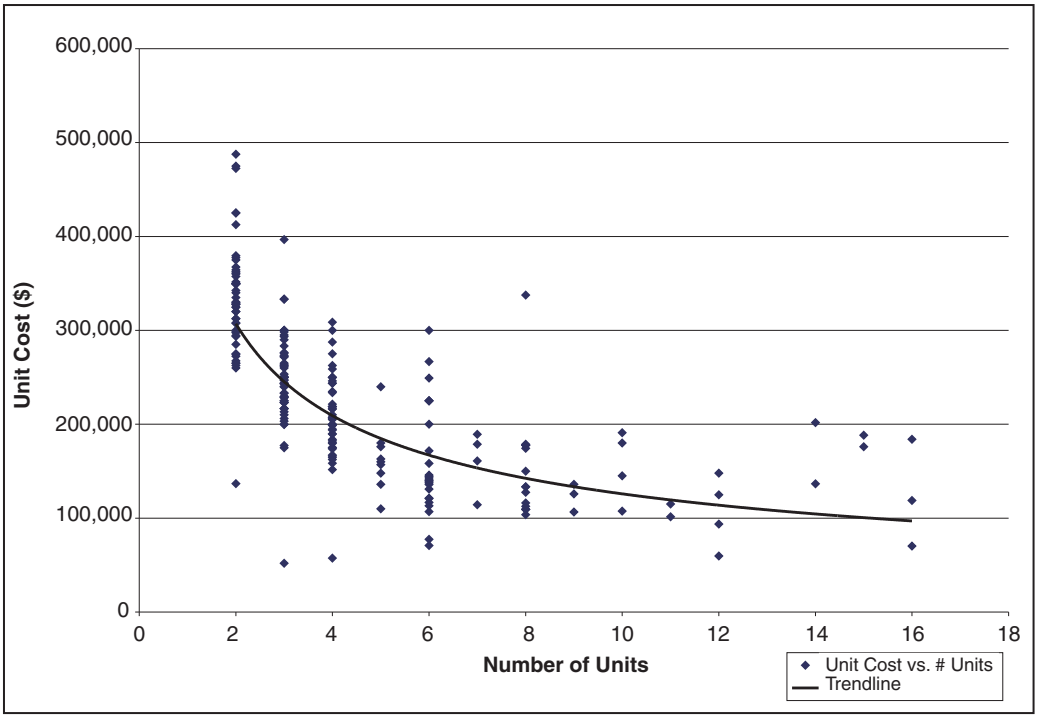
Residential Property Type	# Units in Building	Minimum ($)	Maximum ($)	Mean ($)	Standard Deviation ($)	Median ($)	No. of Sales
Single-Family (conventional)	1	50,000	4,900,049	605,178	210,943	575,005	1,213
Single-Family Condominium	1	20,500	810,008	398,161	112,079	395,003	286
Multi-Family	2	520,005	2,700,027	747,752	329,719	657,006	53
Multi-Family	3	156,001	1,190,011	724,138	141,613	729,007	51
Multi-Family	4	230,002	23,300,233	2,609,051	6,088,532	799,007	39
Multi-Family	5	550,005	1,200,012	816,674	178,485	800,008	9
Multi-Family	6	425,504	1,800,018	961,129	350,549	845,008	25
Multi-Family	7	800,008	23,300,233	5,560,555	9,918,815	1,250,512	5
Multi-Family	8	829,008	23,300,233	2,513,495	5,375,086	1,067,010	17
Multi-Family	9	959,509	23,300,233	6,654,441	11,097,740	1,179,012	4
Multi-Family	10	1,075,010	1,910,019	1,558,765	377,460	1,625,016	4
Multi-Family	11	1,115,011	1,265,012	1,190,012	106,067	1,190,012	2
Multi-Family	12	112,501	7,742,077	2,161,521	2,796,153	1,311,263	6
Multi-Family	14	1,912,019	2,825,028	2,368,524	645,595	2,368,524	2
Multi-Family	15	2,640,026	2,825,028	2,732,527	130,816	2,732,527	2
Multi-Family	16	1,125,011	2,944,029	2,167,272	825,613	2,300,023	4
Multi-Family	20	14,000,140	14,000,140	14,000,140	---	14,000,140	1
Multi-Family	21	517,505	517,505	517,505	---	517,505	1
Multi-Family	23	3,100,031	3,100,031	3,100,031	---	3,100,031	1
Multi-Family	24	2,670,026	2,670,026	2,670,026	---	2,670,026	1
Multi-Family	26	10,573,605	10,573,605	10,573,605	---	10,573,605	1
Multi-Family	27	2,500,025	3,025,030	2,762,528	371,235	2,762,528	2
Multi-Family	28	3,300,033	10,573,605	6,936,819	5,143,192	6,936,819	2
Multi-Family	30	3,925,039	4,525,045	4,225,042	424,268	4,225,042	2
Multi-Family	35	3,550,035	3,550,035	3,550,035	---	3,550,035	1
Multi-Family	36	3,875,038	14,000,140	8,937,589	7,159,528	8,937,589	2
Multi-Family	43	14,000,140	14,000,140	14,000,140	---	14,000,140	1
Multi-Family	46	5,850,058	5,850,058	5,850,058	---	5,850,058	1
Multi-Family	48	4,800,048	4,800,048	4,800,048	---	4,800,048	1
Multi-Family	50	7,929,579	7,929,579	7,929,579	---	7,929,579	1
Multi-Family	60	8,600,086	8,600,086	8,600,086	---	8,600,086	1
Multi-Family	61	5,900,059	5,900,059	5,900,059	---	5,900,059	1
Multi-Family	82	22,275,222	22,275,222	22,275,222	---	22,275,222	1
Multi-Family	88	11,500,115	11,500,115	11,500,115	---	11,500,115	1
Multi-Family	141	38,690,386	38,690,386	38,690,386	---	38,690,386	1
Multi-Family	144	15,000,150	15,000,150	15,000,150	---	15,000,150	1
Multi-Family	248	27,855,778	27,855,778	27,855,778	---	27,855,778	1

Figure D-2, below, plots the relationship between the average sales price per unit and the number of units in the multi-family building. (Note that data for buildings with more than 16 units are not included since sales data for such buildings were very few in number.) The scatter diagram indicates a distinct relationship between the variables. A regression analysis was undertaken to quantify the relationship in the form of a least squares equation. The regression curve (the black line in the figure) fits the data reasonably well (R^2= 0.55). The relationship it describes, that the average price per unit declines at a lessening rate as the number of units in the building increases, also seems reasonable.

Figure D-2

SALES PRICES PER UNIT FOR MULTI-FAMILY PROPERTIES

Bob Hope Airport FAR Part 161 Study



Source: Jacobs Consultancy analysis of Los Angeles County Assessor's property sales data.

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The regression is quantified by the following equation:

Equation 1: Unit Price = 450,963 x (No of Units)$^{-0.5542}$

The average dwelling unit prices by residential property type, computed from the regression equation, are shown in Table D-3. The estimated average total price of each type of multi-family property, computed from the average price per dwelling unit, is also shown.

Table D-3

ESTIMATED AVERAGE PROPERTY VALUES IN STUDY AREA
Bob Hope Airport FAR Part 161 Study

Residential Property Type	Number Units in Building	Per Unit Price *(a)*	Total Price of Property
Single-Family (conventional)	1	$575,005	$575,005
Single-Family Condominium	1	$395,003	$395,003
Multi-Family	2	$307,121	$614,242
Multi-Family	3	$245,313	$614,243
Multi-Family	4	$209,160	$735,939
Multi-Family	5	$184,830	$836,641
Multi-Family	6	$167,067	$924,148
Multi-Family	7	$153,387	$1,002,399
Multi-Family	8	$142,445	$1,073,707
Multi-Family	9	$133,444	$1,139,563
Multi-Family	10	$125,875	$1,200,998
Multi-Family	11	$119,399	$1,258,754
Multi-Family	12	$113,778	$1,313,390
Multi-Family	13	$108,841	$1,365,337
Multi-Family	14	$104,462	$1,414,936
Multi-Family	15	$100,543	$1,462,463
Multi-Family	16	$97,010	$1,552,164
Multi-Family	>16	$97,010	>$1,552,164

(a) Prices of single-family properties are the medians shown in Table D-2. Per unit prices for multi-family properties were computed from Equation 1.

D.2 RELATIONSHIP BETWEEN AIRCRAFT NOISE AND HOUSING PRICE

The impact of aircraft noise on housing prices in the Airport environs was analyzed using a statistical technique known as "hedonic modeling." That analysis is documented in Technical Report 2.

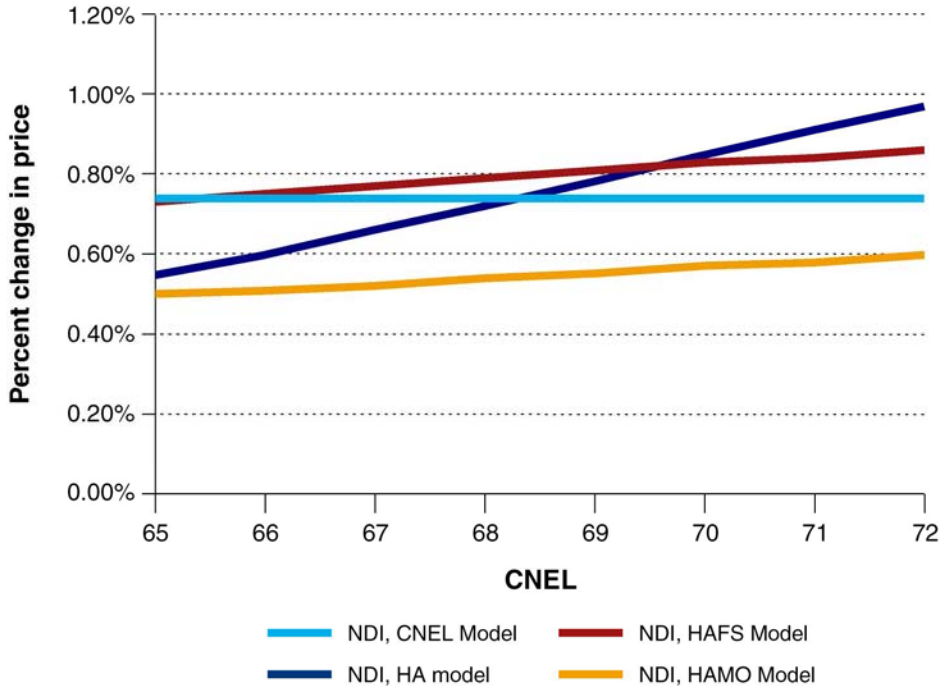
Alternative specifications of the hedonic model were evaluated to explore the most statistically valid relationships between aircraft noise and property values. Four alternative versions of the model produced equally compelling results.

The results of the statistical analyses were used to compute Noise Discount Indices (NDI) for each specification of the hedonic model. The NDI represents the percentage discount in property value per decibel increase in noise. A graph of the NDIs for the four models is shown in Figure D-3.

Figure D-3

COMPARISON OF NDIs FROM ALTERNATIVE MODELS

Bob Hope Airport FAR Part 161 Study



Source: Jacobs Consultancy analysis, 2006-2007.

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Note that each NDI increases as the noise level increases. Table D-4 shows the NDIs for each model at noise levels from 65 to 72 CNEL.

D.3 COMPUTATION OF INCREASE IN PROPERTY VALUE

Any incremental increase in property value caused by a reduction in noise would be capitalized into the overall value of the properties soon after implementation of the curfew. Thus, the computations of property value recovery were done on the basis of noise levels projected for 2008 – taken as the nominal implementation year for the curfew.

Detailed noise modeling using the INM was done to obtain CNEL values for all scenarios at each residential property address within the 2008 baseline 65 CNEL contour. (Refer to Appendix B, Aircraft Noise Analysis, for details on the noise modeling methodology.) For the purposes of calculating the benefit for the restricted cases, the differences in the property value discounts for the restricted cases as compared to the baseline case were calculated.

Table D-4

NOISE DISCOUNT INDICES
Bob Hope Airport FAR Part 161 Study

CNEL	Alternative Specifications of Hedonic Model			
	CNEL Model	HA Model	HA_{FS} Model	HA_{MO} Model
65	0.74%	0.55%	0.73%	0.50%
66	0.74%	0.60%	0.75%	0.51%
67	0.74%	0.66%	0.77%	0.52%
68	0.74%	0.72%	0.79%	0.54%
69	0.74%	0.78%	0.81%	0.55%
70	0.74%	0.85%	0.83%	0.57%
71	0.74%	0.91%	0.84%	0.58%
72	0.74%	0.97%	0.86%	0.60%
Average NDI	**0.74%**	**0.78%**	**0.80%**	**0.55%**

NOTES: The noise discount index (NDI) is the estimated discount in residential property value per decibel increase in aircraft CNEL. The NDIs were computed from the regression coefficients for the noise variables developed in the hedonic modeling study (Technical Report 2, The Impact of Aircraft noise on Residential Property Values in the Bob Hope Airport Environs).

Source: Jacobs Consultancy analysis, 2007 – 2008.

The following steps were used in the calculation process:

1. The INM was used to compute CNEL values for the 2008 baseline and restricted scenarios at the location of each residential property within the baseline 65 CNEL contour.

2. Where required, HA values (HA, HA_{MO} and HA_{FS}), for all scenarios, were then computed from the CNEL values at each location.

3. The difference in HA values (or CNEL levels) between the baseline and each restricted scenario was calculated.

4. The difference in HA values (or CNEL levels) for each case was multiplied by the corresponding noise discount coefficient (b_T) and then by the average property price for that type/size of property, as shown in Table D-3. The computation equation is shown below:

$$\Delta\text{Property Value Increase (\$)} = (HA_{baseline} - HA_{curfew}) * b_T * \text{Average Housing Price (\$)}$$

D.4 ESTIMATED INCREASE IN PROPERTY VALUE

The estimated property value increase for each alternative curfew, based on the NDIs for all four property value impact models, is shown in Table D-5. The results should be interpreted as estimates of the range of residential property value increase for each curfew alternative. For example, for the full curfew, the property value increase is estimated to range from $6.427 million to $8.888 million.

Table D-5

ESTIMATES OF INCREASED PROPERTY VALUE WITH ALTERNATIVE CURFEWS
Bob Hope Airport FAR Part 161 Study

	Property Value Increase (NPV - 2006 $)				
	CNEL Model	HA Model	HA_{FS} Model	HA_{MO} Model	Average
Full Curfew	$8,517,799	$7,692,072	$8,887,581	$6,426,522	$7,880,993
Departure Curfew	$6,906,396	$6,221,432	$7,206,629	$5,137,426	$6,367,971
253 EPNdB Curfew	$6,260,779	$5,574,946	$6,512,820	$4,610,224	$5,739,692

NPV -- net present value, 2006 $, using 7% discount rate.

Increases in property value computed for residences within 65 CNEL contour based on 2008 forecast noise exposure.

Source: Jacobs Consultancy analysis, 2007-2008.

Appendix E

DOCUMENTATION AND ANALYSIS OF CONTINGENT VALUATION SURVEYS IN THE BOB HOPE AND VAN NUYS AIRPORT AREAS

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DOCUMENTATION AND ANALYSIS OF CONTINGENT VALUATION SURVEYS IN THE BOB HOPE AND VAN NUYS AIRPORT AREAS

Contingent valuation (CV) surveys were undertaken in the Bob Hope Airport and Van Nuys Airport areas in support of the Part 161 Study. The surveys were intended to elicit information about:

(1) the value to residents in the Bob Hope Airport area of a curfew reducing nighttime noise, and

(2) the cost to residents in the Van Nuys area of additional nighttime flights at Van Nuys Airport due to adoption of a curfew at Bob Hope Airport.

Since one of the benefits of the proposed curfew would be the reduction in aircraft noise-induced awakenings, the Airport Authority's consultants were interested in finding a method through which the monetary value of the reduction could be computed. They determined that a contingent valuation survey was the most promising methodology.

In designing and administering the contingent valuation surveys, the Airport Authority retained the services of Arnold Steinberg and Associates, a professional polling firm, together with its Part 161 Study consultants. The study design and survey questions were developed by the entire team. Steinberg and Associates administered the surveys and tabulated the data. Jacobs Consultancy performed the post-survey statistical analyses.

The findings of the Bob Hope area survey were used to compute an estimate of the overall willingness of residents inside the 65 CNEL contour to pay for a mandatory curfew. The results indicated that, over the period from 2008 to 2015, residents would be willing to pay between $4.4 and $7.2 million for a curfew (the net present value in 2006 dollars). This was similar to the projected increase in property values attributable to the full curfew that was computed using the hedonic property value model, documented in Appendix D, (a range of $4.6 to $8.9 million). Thus, the results of the CV survey validate the findings of the hedonic property value model and vice versa.

The CV survey also found that homeowners who reported being awakened by nighttime aircraft noise were willing to pay substantially more for a curfew than residents who were not awakened – approximately $87 per month versus $57. This difference was also reflected in the willingness of renters to pay for a curfew -- $39 per month versus $30. The difference between the willingness-to-pay of those awakened versus those not awakened was taken as the value to the residents of not being awakened by aircraft noise. When this incremental value was applied to all

potentially sensitive sleepers residing inside the 65 CNEL contour, it produced a total value of $562,000 (net present value, 2006 dollars).

E.1 THE CONTINGENT VALUATION METHOD

The observation of markets is the typical way that economists determine the value of goods and services. Purchasing decisions are straightforward indicators of the value of a good or service to the buyer. When the objective is to estimate the value of a public good not traded in the marketplace, however, the economist is forced to consider indirect methods of inferring the value of the good.

In a residential setting, aircraft noise reduction can be considered a public good. It is evident that aircraft noise can be a nuisance that can motivate complaints and even political action. For those who are noise-sensitive, the reduction of noise is certainly something of value. The question is: how is that value to be estimated?

Economists have developed survey methods to elicit information about the value that people place on public goods. These are generally known as "stated preference" surveys or "contingent valuation" surveys. Contingent valuation (CV) surveys have been used for many years, primarily to develop estimates of people's willingness-to-pay for changes in the quantity or quality of public goods such as outdoor recreation opportunities, wilderness preservation, water quality, the value of archeological artifacts, and noise reduction.*

The CV method involves four steps: (1) selecting a sample of respondents from the relevant population (e.g., the population that will benefit from the public good); (2) questioning the respondents about their valuations of the public good; (3) analyzing the responses to develop an estimate of willingness-to-pay for the good; (4) applying the results of the study to the affected population at large.**

E.2 CONTINGENT VALUATION SURVEY IN BOB HOPE AIRPORT VICINITY

E.2.1 Selection of Sample in Bob Hope Airport Vicinity

It was determined that a sample should be drawn from residents of the Part 161 Study Area. This area, shown in Figure E-1, is the study area that was used in the Part 150 Study Update in the late 1990s and is a reasonable approximation of an area

*See, for example, Barreiro, et al. 2005. How much are people willing to pay for silence? A contingent valuation study, *Applied Economics*, Vol 37, pp. 1233-1246. Bjorner, et al. 2003. Valuation of Noise Reduction – Comparing Results from Hedonic Pricing and Contingent Valuation. AKF Forlaget. Wardman, et al. Applying stated preference methods to the valuation of noise: some lessons to date, in *Proceedings of Inter-Noise 2005,* the 2005 Congress and Exposition on Noise Control Engineering, Rio de Janeiro, Brazil, August 7-10, 2005.

**For information about the CV method, see Boardman, Anthony, et al., *Cost-Benefit Analysis: Concepts and Practice*, 3rd Edition; Chapter 14, "Contingent Valuation: Using Surveys to Elicit Information about Costs and Benefits." Prentice Hall, 2006.

within which people concerned about airport noise can be found. The sample was selected from an area larger than the 65 CNEL boundary to provide a wide enough range of noise exposures to reveal any dose-response relationships in the responses to the questions (i.e., to see if increasing levels of awakenings and willingness-to-pay were correlated with increased CNEL levels).

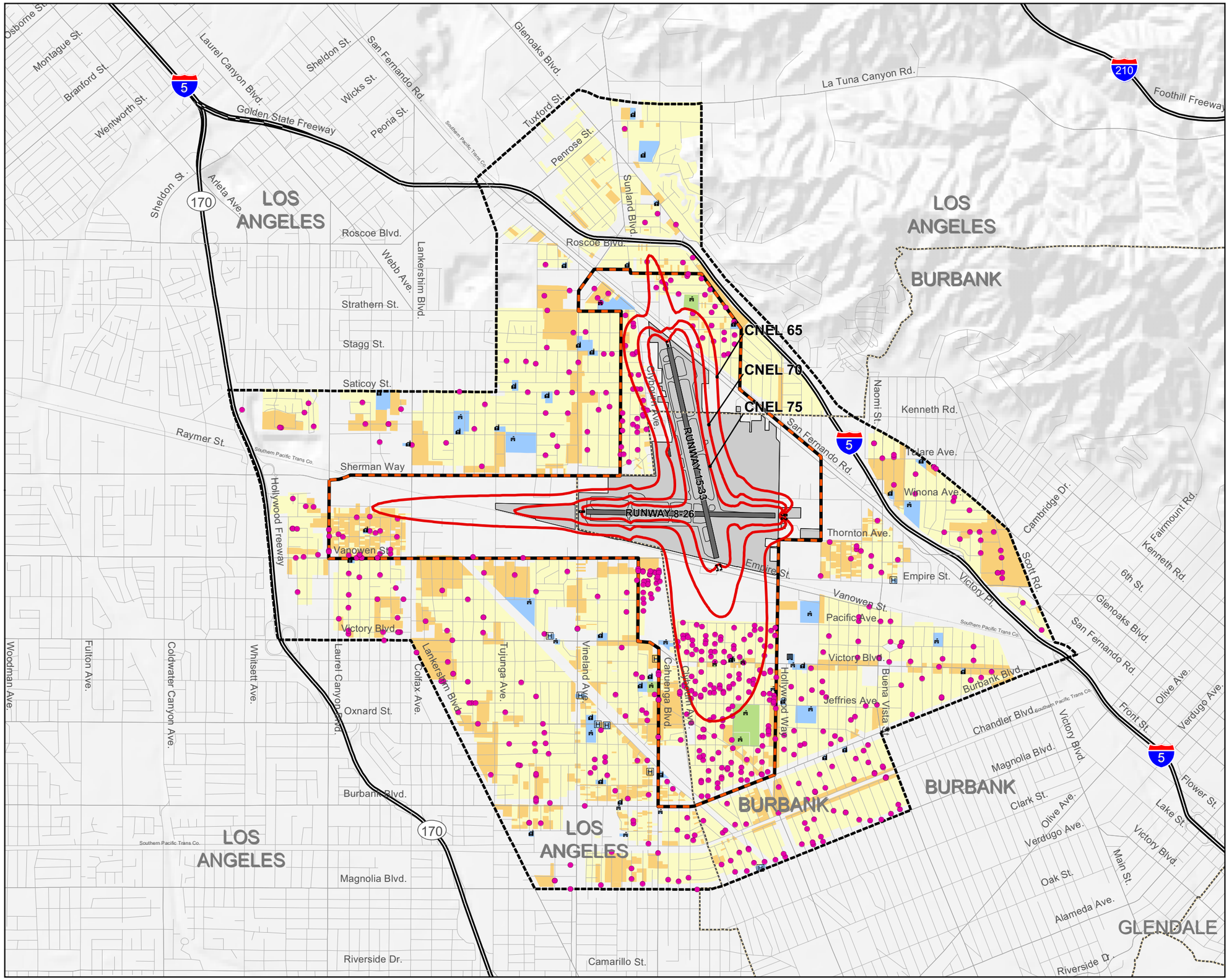
To ensure that a sample of reasonable size was selected from inside the 65 CNEL contour, the overall sample area was divided into two areas, one roughly corresponding to the 2005 65 CNEL contour and the other corresponding to the outer study area boundary. Random samples of respondents were selected within each subarea, "Sampling Area 1" and "Sampling Area 2," from the County's roll of registered voters. Registered voters were considered to be representative of residents who had lived in the area long enough to have become familiar with it and to have a strong enough stake in the community to have well developed opinions about their neighborhoods and the local area.

E.2.2 Design and Administration of Survey in Bob Hope Airport Vicinity

Experience with the administration and analysis of CV surveys over the years has led to refinements in the technique and general guidance as to best practices. In addition to the typical considerations that apply to any social survey, such as the minimization of sampling bias and the need for careful design of questions, two issues are unique to CV surveys: (1) the method of eliciting willingness-to-pay, and (2) the payment vehicle which respondents would use.

E.2.2.1 Payment Vehicle

Economists and survey researchers have determined that it is good practice in CV surveys to link a specific, albeit hypothetical, method of paying for public goods which respondents are asked to value. In surveys dealing with the preservation of wilderness areas or the provision of park and recreation areas, for example, respondents may be asked if they would be willing to pay a given amount in additional taxes for those goods. The idea is to ensure that the respondents will see the issue as an economic choice. This is considered more likely if the respondent is asked their willingness-to-pay for the good through an appropriate and familiar means.



LEGEND

- Location of Survey Respondent
- 2005 Baseline CNEL Contours
- Sampling Area 1
- Sampling Area 2
- Municipal Boundary
- Airport Property
- Single-Family Residential
- Multi-Family Residential
- Noise-Sensitive Institutions
- Sound-Insulated School
- Schools, Preschools
- Places of Worship
- Library
- Hospital
- Freeways
- Roads

Sources:
BGPAA Geographic Information System, 2007;
Field checking by Jacobs Consultancy, July 2007;
Noise Analysis by Jacobs Consultancy, 2007;
Arnold Steinberg and Associates, Inc., May 2007.

NORTH

0 750 1,500 3,000 Feet

Figure E-1
SAMPLING AREAS FOR CONTINGENT VALUATION SURVEY
FAR Part 161 Study for Bob Hope Airport
January 2009

JACOBS CONSULTANCY
Airport Management Consulting

In the case of the CV survey in the Bob Hope Airport area, the price of housing was chosen as the payment vehicle. Increased taxes or some form of direct payment to aircraft operators as a means of paying for noise reduction were considered but discarded. Both options were considered too complicated to explain satisfactorily (just how would increased taxes translate into reduced noise?) and potentially inflammatory ("why should I have to suffer a tax increase to get relief from this annoyance?").

The price of housing was considered an appropriate payment vehicle for the following reasons:

- The hedonic modeling study, summarized in Appendix D, found that airport noise influences the price of housing in the local area.
- People are familiar with the idea that the price of housing reflects neighborhood ambience and local environmental qualities or nuisances.
- People are familiar with housing prices and monthly rent or mortgage payments.

E.2.2.2 Elicitation of Willingness-to-Pay

Two sets of questions were posed to respondents to ask their willingness-to-pay for a curfew. The first set were open-ended questions, where people were simply asked what they would be willing to pay for their home, or a similar home, if a curfew was in effect at Bob Hope Airport. This is an example of one of the open-ended questions:

> Suppose today you were buying your home – or a similar home – within or near this airport flight pattern. If your preferred, strictly enforced curfew went into effect today, how much more would you then be willing to pay in your monthly mortgage payment?

A similar form of the question was asked of renters.

Another set of questions was based on the "double dichotomous choice" or "double-bounded referendum" approach that has been developed by CV researchers. Respondents were asked whether they would be willing to pay a given monthly amount in increased housing payments if their preferred curfew was in effect. If they answered affirmatively, they were then asked if they would be willing to pay a given higher amount. If they answered negatively, the questioning stopped. If they answered "yes," they were asked if they would be willing to pay an even higher amount.

For those who initially said "no" to the opening price, they were asked if they would be willing to pay a lower amount. If they again replied "no," they were asked an even lower amount.

In order to reduce the risk that the opening price would bias the answers, the sample was divided into three groups. Each was asked a different starting price. The range of starting prices – from $50 to $150 per month – was based roughly on the findings of the hedonic modeling study. (This was computed by taking the difference in value of a median priced house insider the 65 CNEL contour and a similar house that was not exposed to noise. The difference in price was then amortized over a 30-year period to get a rough estimate of the monthly difference in housing payment.)

An example of the sequence of "double-bounded referendum" questions follows:

> Suppose your preferred curfew were in effect today and you were buying (or renting) your current home (or apartment) today. Would you be willing to pay an additional $50 per month for a house payment (or rent)?
>
> *For those answering "yes:"*
>
> Would you be willing to pay an additional $75 per month?
>
> *For those answering "yes" again:*
>
> Would you be willing to pay an additional $100 per month?
>
> *For those answering "no" to the opening question:*
>
> Would you be willing to pay an additional $25 per month?
>
> *For those answering "no" again:*
>
> Would you be willing to pay and additional $15 per month?

E.2.2.3 Other Aspects of Survey Design and Administration

The survey included several introductory questions to reveal whether the respondent had any concerns about the airport generally or airport noise, specifically. Additional questions were designed to reveal the respondent's familiarity with airport noise and overflights and to provide them with some baseline information on airport activity, including nighttime activity. The essential features of each curfew alternative were also described.

The survey was administered by telephone over 10 consecutive days in April 2007. Those administering the survey were fluent in both English and Spanish. A total of 601 surveys were completed, 540 in English and 61 in Spanish.

E.2.3 Overview of Survey Results

The collected data included demographic information for the respondent and household, the location of the respondent's residence, whether the respondent was awakened by aircraft noise and how often, preferences with respect to the three curfew alternatives, and several responses to capture the amount they would be willing to pay if their preferred curfew was enforced. In addition, CNEL noise levels, based on the 2005 baseline case, were computed for each respondent's address and added to the data set. The Airport Authority's residential acoustical treatment records were also linked to the addresses of the respondents to add acoustical treatment status to the data set.

The raw results of the survey are presented in Attachment 1, together with the survey questions. Table E-1 summarizes some of the key responses to the survey.

The sample included a mix of renters (26%) and homeowners (71%). (The remaining 3% did not indicate their housing tenure status.) Noise levels at the residences ranged from CNEL 47.1 to 71.3 dB, and 18.3% of them had noise levels of 65 CNEL or higher.

Forty percent of the respondents reported that noise was a problem for someone in the household. Noise in the day and evening, from 7:00 a.m. to 10:00 p.m. was a problem for 48.5% of those reporting that noise was a problem. Nighttime noise was a problem for 31.1% of those bothered by noise. Just over 26% of the respondents reported being awakened at some time by noise at night. Just over 10% reported being awakened more than once per week, and 19% reported being awakened more than once per month.

Two-thirds of the respondents thought that the Airport should prohibit flights at night. The same proportion also believed that the current voluntary "curfew" was generally observed. Sizeable pluralities of the respondents favored each of the three curfew alternatives, although the alternative favored by most was the curfew on "noisy aircraft" (the noise-based curfew). It was the first choice of 33.4% of the respondents. The full curfew was next in order of preference, with 29.3% favoring it. The departure curfew was favored by 20.3% of respondents.

The final questions summarized in Table E-1 address the willingness of the respondents to pay a higher price for housing if a curfew was in place. The open-ended questions resulted in high numbers of "zero" and "unsure" responses, with about 75% of respondents in those two categories.

Table E-1

CONTINGENT VALUATION SURVEY OF BOB HOPE AIRPORT AREA RESIDENTS—SELECTED RESULTS

Bob Hope Airport FAR Part 161 Study

	Number	Percent
Housing tenure of respondents		
Own	427	71.0%
Rent	154	25.6%
Refuse to answer	20	3.3%
	601	
2005 Baseline CNEL at residence of respondents. (Range from CNEL 47.1 to 71.3 dB.)		
CNEL less than 50 dB	33	5.5%
CNEL 50 to 54.9 dB	143	23.8%
CNEL 55 to 59.9 dB	144	24.0%
CNEL 60 to 64.9 dB	171	28.5%
CNEL 65 to 69.9 dB	108	18.0%
CNEL 70 dB and more	2	0.3%
	601	
Acoustical treatment status		
Sound-insulated	144	24.0%
Not Sound-insulated	457	76.0%
	601	
Is aircraft noise a problem for anyone in household?		
Yes	243	40.4%
No	341	56.7%
Unsure or refused to answer	17	2.8%
	601	
At what times is noise a problem? (Some respondents gave more than one time, so total exceeds the number of "yes" responses in previous question.)		
Between 7 a.m. and 10 p.m.	131	48.5%
Between 10 p.m. and 7 a.m.	84	31.1%
All times	25	9.3%
Unsure of time	30	11.1%
	270	
Are you ever awakened by aircraft noise at night?		
Yes	159	26.5%
No	206	34.3%
Unsure or refused to answer	11	1.8%
No - do not hear nighttime noise	225	37.4%
	601	

	Number	Percent
How often are you awakened by aircraft noise at night? (Asked only of those answering "yes" to previous question.)		
2 to 3 times per night	4	0.7%
Every night	15	2.5%
2 to 3 times per week	43	7.2%
Weekly	19	3.2%
A few times per month	33	5.5%
Monthly	8	1.3%
Rarely	34	5.7%
Unsure or do not know	3	0.5%
Total awakened	159	26.5%
Not awakened	442	73.5%
	601	
Should airport prohibit or not prohibit flights between 10 p.m. and 7 a.m.?		
Yes, should	400	66.6%
No, should not	152	25.3%
Unsure	49	8.2%
	601	
Is the current voluntary curfew generally observed or not?		
Yes	407	67.7%
No	120	20.0%
Unsure	74	12.3%
	601	
Would home or rental unit be worth more if it was not within airport flight pattern?		
Yes, worth more	313	52.1%
No, not worth more	166	27.6%
Unsure	122	20.3%
	601	
Would home or rental unit be worth less if the voluntary curfew were not in effect?		
Yes, worth less	336	55.9%
No, not worth less	149	24.8%
Unsure	116	19.3%
	601	

	Number	Percent
Would you favor a nighttime curfew on noisy aircraft, so that only quiet aircraft could takeoff or land?		
Favor	377	62.7%
Oppose	153	25.5%
Unsure	71	11.8%
	601	
Would you favor a nighttime curfew that prohibits takeoffs but allows landings?		
Favor	264	43.9%
Oppose	222	36.9%
Unsure	115	19.1%
	601	
Would you favor a nighttime curfew that prohibits both takeoffs and landings?		
Favor	331	55.1%
Oppose	189	31.4%
Unsure	81	13.5%
	601	
Which curfew would you most favor?		
Curfew on noisy aircraft	201	33.4%
Curfew on takeoffs	124	20.6%
Full curfew	176	29.3%
All	12	2.0%
None	35	5.8%
Unsure	53	8.8%
	601	
Suppose today you were about to buy your home or a similar home within or near this airport flight pattern. If your preferred curfew just went into effect, how much more would you be willing to pay for your monthly mortgage? (Asked only of homeowners.)		
Zero	150	33.6%
Under $50	17	3.8%
$50 to $99	12	2.7%
$100 to $174	19	4.3%
$175 or more	60	13.4%
Unsure	189	42.3%
Total renters	447	
Suppose today you were renting your rental unit or a similar unit within or near this airport flight pattern. If your preferred curfew just went into effect, how much more would you be willing to pay in monthly rent? (Asked only of renters.)		
Zero	76	49.4%
Under $50	13	8.4%
$50 to $99	10	6.5%
$100 to $174	9	5.8%
$175 or more	8	5.2%
Unsure	38	24.7%
Total renters	154	

	Number	Percent
Combination of owner and renter results of previous two questions.		
Zero	226	37.6%
Under $50	30	5.0%
$50 to $99	22	3.7%
$100 to $174	28	4.7%
$175 or more	68	11.3%
Unsure	227	37.8%
Total renters	601	
Suppose your preferred curfew were in effect today and you were buying or renting your current home/rental unit today. Would you be willing to pay an additional [*amount*] per month for your house payment/rent?		
$15	8	1.3%
$25	7	1.2%
$50	42	7.0%
$75	23	3.8%
$100	87	14.5%
$125	22	3.7%
$150	49	8.2%
$175	9	1.5%
$200	19	3.2%
No	259	43.1%
Unsure	76	12.6%
	601	
Weighted Mean	$43.74	
Why do you feel that the value of noise reduction from the proposed curfew alternatives is zero to you as a homeowner/renter? (Asked of those who replied to all questions that they would be unwilling to pay anything for a curfew.)		
Noise not a problem	38	40.9%
Airport should resolve problem	11	11.8%
Just will not pay more	14	15.1%
Noise is just a problem you live with	9	9.7%
Airport is resolving	6	6.5%
Noise reduction will not affect price	5	5.4%
Personal reasons	5	5.4%
House payment not relevant to problem	5	5.4%
	93	

The double-bounded referendum questions, however, resulted in a substantial reduction in the number of "unsure" responses (down to 12.6%) and yielded reasonable data. The greatest number of willingness-to-pay responses clustered at $100 per month (14.5%). Nevertheless, 43.1% of the respondents said they would be unwilling to pay more for housing if a curfew was in effect. The weighted mean of all responses, including the "zero" responses, was $43.74. (The double-bounded referendum data on willingness-to-pay were used for all subsequent analysis.)

A total of 93 respondents consistently responded with "zero" to all willingness-to-pay questions. The final question reported in Table E-1 explored the reasons that people expressed an unwillingness to pay more for housing if a curfew was in effect. As indicated in Table E-1, over 40% of them explained that they did not consider noise to be a problem. Fifteen percent indicated that they would simply not pay more for housing (possibly indicating income constraints). Just fewer than 12% believed that noise was a problem the Airport should resolve and that their payments for housing should not be involved in the issue. Just fewer than 10% explained that noise is simply a problem they were prepared to live with. A variety of other reasons were offered by the others.

E.2.4 Data Analysis

Exploratory analysis was conducted to understand the responses and gain insights into peoples' willingness to pay. Several cross-tabulation tables and graphs were developed to visualize data trends. The following relationships were investigated:

- Willingness to pay versus CNEL noise level
- Willingness to pay versus curfew preference
- Willingness to pay versus awakenings

After the initial exploration of the data, a variety of models were developed and tested for their statistical significance. The analysis concluded with the definition of a model that explains the variance in willingness-to-pay for a curfew based on housing tenure (owner or renter) and awakenings more than once a month.

E.2.4.1 Willingness to Pay versus Noise Level

Table E-2 shows the additional monthly amount that respondents, both renters and homeowners, are willing to pay for their preferred curfews. Note the large number of respondents, across all CNEL levels, who reported that that they not willing to pay anything. Among respondents indicating a willingness to pay for a curfew, the amounts tend to cluster between $50 and $150.

Table E-2

WILLINGNESS TO PAY FOR CURFEW VERSUS NOISE LEVEL
Bob Hope Airport FAR Part 161 Study

Monthly Willingness-to-Pay	CNEL Levels 45-50	50-55	55-60	60-65	65-70	70-75	Row Totals
Zero	20	61	62	68	48	0	259
$15	1	0	1	6	0	0	8
$25	0	3	3	1	0	0	7
$50	1	10	11	15	5	0	42
$75	2	8	5	4	4	0	23
$100	1	20	21	24	20	1	87
$125	2	5	4	4	7	0	22
$150	4	10	11	15	9	0	49
$175	1	2	2	2	2	0	9
$200	1	7	3	6	2	0	19
Column Totals	33	126	123	145	97	1	525

Note: Table excludes data for respondents who indicated that they were "unsure" whether they would be willing to pay for a curfew.

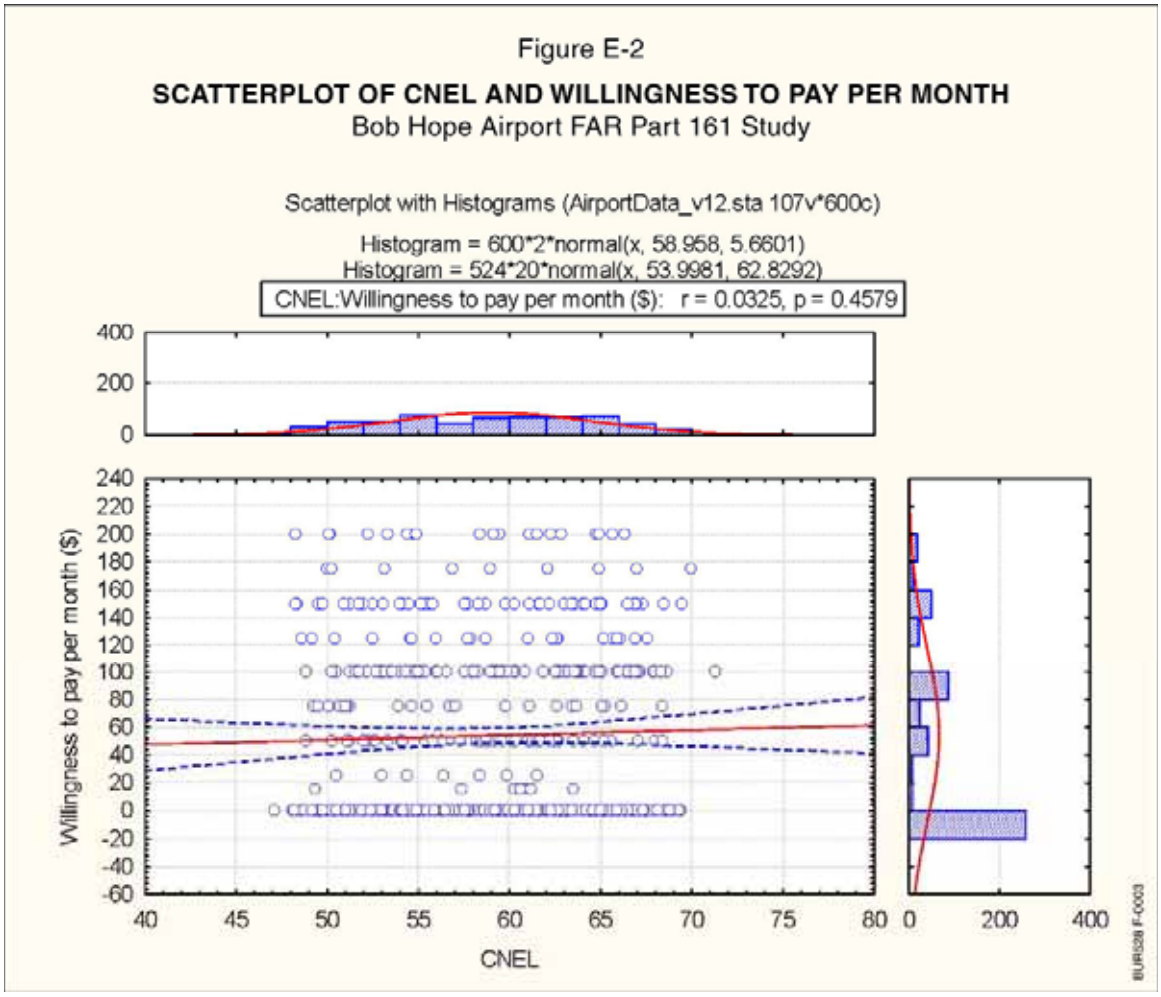
Source: Jacobs Consultancy analysis, 2007.

Figure E-2 depicts a scatterplot of the willingness-to-pay data by CNEL level. The data points are almost randomly distributed across CNEL levels, and there does not appear to be any specific trend. The histograms for individual variables are also shown in the graph.

Figure E-2

SCATTERPLOT OF CNEL AND WILLINGNESS TO PAY PER MONTH

Bob Hope Airport FAR Part 161 Study



E.2.4.2 Willingness to Pay versus Curfew Preference

Table E-3 breaks down monthly willingness-to-pay based on the curfew preferences of the respondents. Here again, a substantial number of respondents indicated an unwillingness to pay for a curfew. About 40% of those favoring the full curfew and the departure curfew said they would be unwilling to pay anything. About 45% of those favoring the noise-based curfew would be unwilling to pay. Interestingly, on the other hand, 14 of those who indicated that they were opposed to any curfew indicated a willingness to pay more for housing if a mandatory curfew was in effect.

The weighted means indicate that the supporters of a full curfew would be willing to make higher average monthly payments than the supporters of the other two curfew alternatives -- $60.48 compared with just under $49.00 for the other alternatives. The overall average among all people willing to pay for a curfew, at $47.08, is slightly less than the amount that the supporters of the departure curfew and the noise-based curfew are willing to pay.

Table E-3

WILLINGNESS TO PAY FOR CURFEW BY CURFEW PREFERENCE
Bob Hope Airport FAR Part 161 Study

Monthly Willingness-to-Pay	Preference: Full Curfew	Departure Curfew	Noise-based Curfew	All Curfews	Opposed to Curfew	Unsure	Total
Zero	69	49	92	4	21	24	259
$15	3	1	3	0	0	1	8
$25	1	1	5	0	0	0	7
$50	11	11	15	1	2	2	42
$75	4	7	12	0	0	0	23
$100	41	16	27	0	2	1	87
$125	7	3	10	1	1	0	22
$150	16	16	13	1	2	1	49
$175	2	1	5	1	0	0	9
$200	10	2	6	0	0	1	19
Unsure	12	17	13	4	7	23	76
Total	176	124	201	12	35	53	601
Weighted Mean	$60.48	$48.91	$48.73	$41.67	$20.71	$10.66	$47.08

Source: Jacobs Consultancy analysis, 2007.

E.2.4.3 Willingness to Pay versus Awakenings

Figure E-3 presents a scatterplot of willingness-to-pay (for renters and owners) versus awakenings. For purposes of this graph, an awakenings scale was created, corresponding to the responses to the survey. This was coded as shown below:

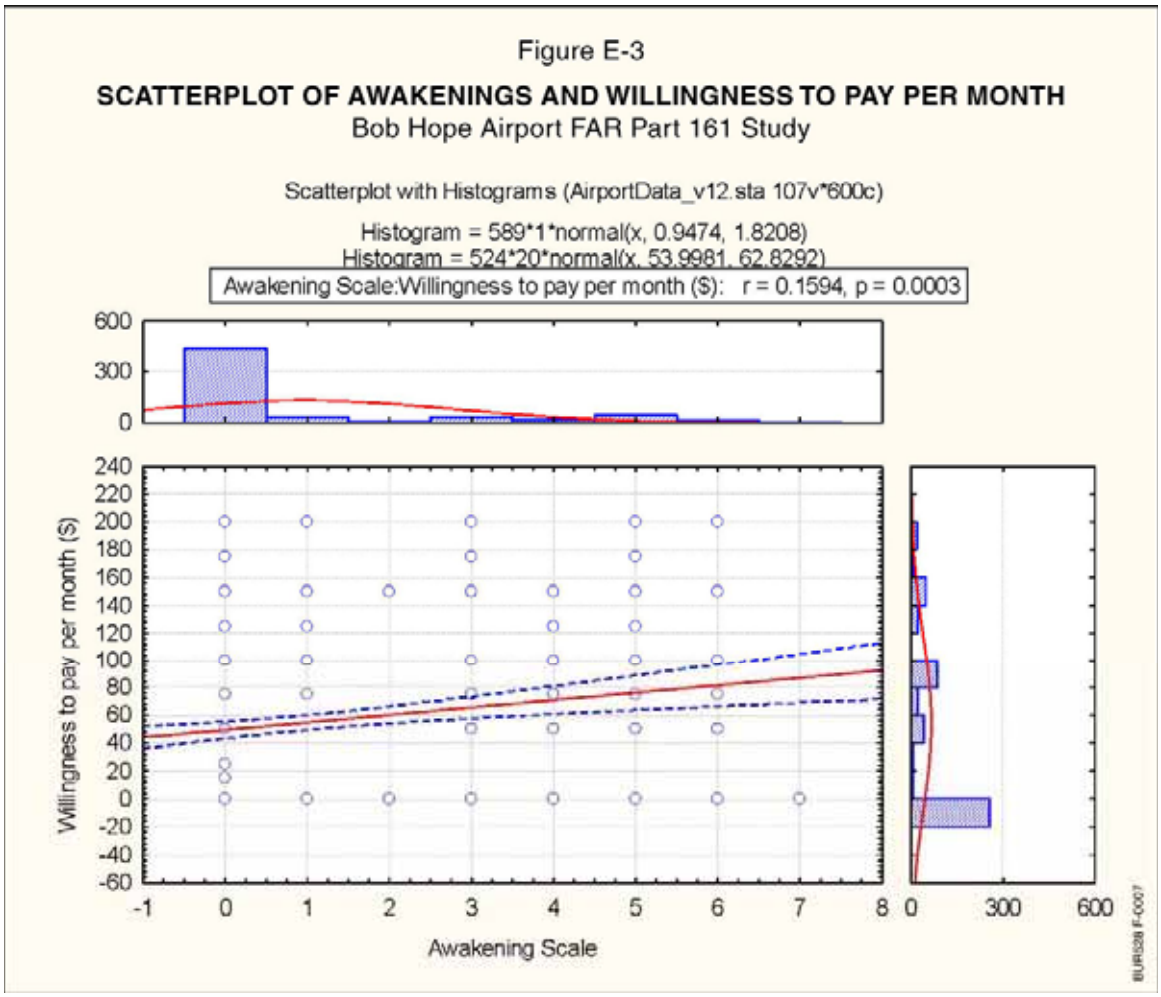
Awakening Scale	Description
0	Not awakened
1	Rarely
2	Monthly
3	Few times a month
4	Weekly
5	Two or three times a week
6	Every night
7	More than once a night

The graph indicates a slight trend, with willingness-to-pay increasing as the awakenings scale increases.

Figure E-3

SCATTERPLOT OF AWAKENINGS AND WILLINGNESS TO PAY PER MONTH

Bob Hope Airport FAR Part 161 Study

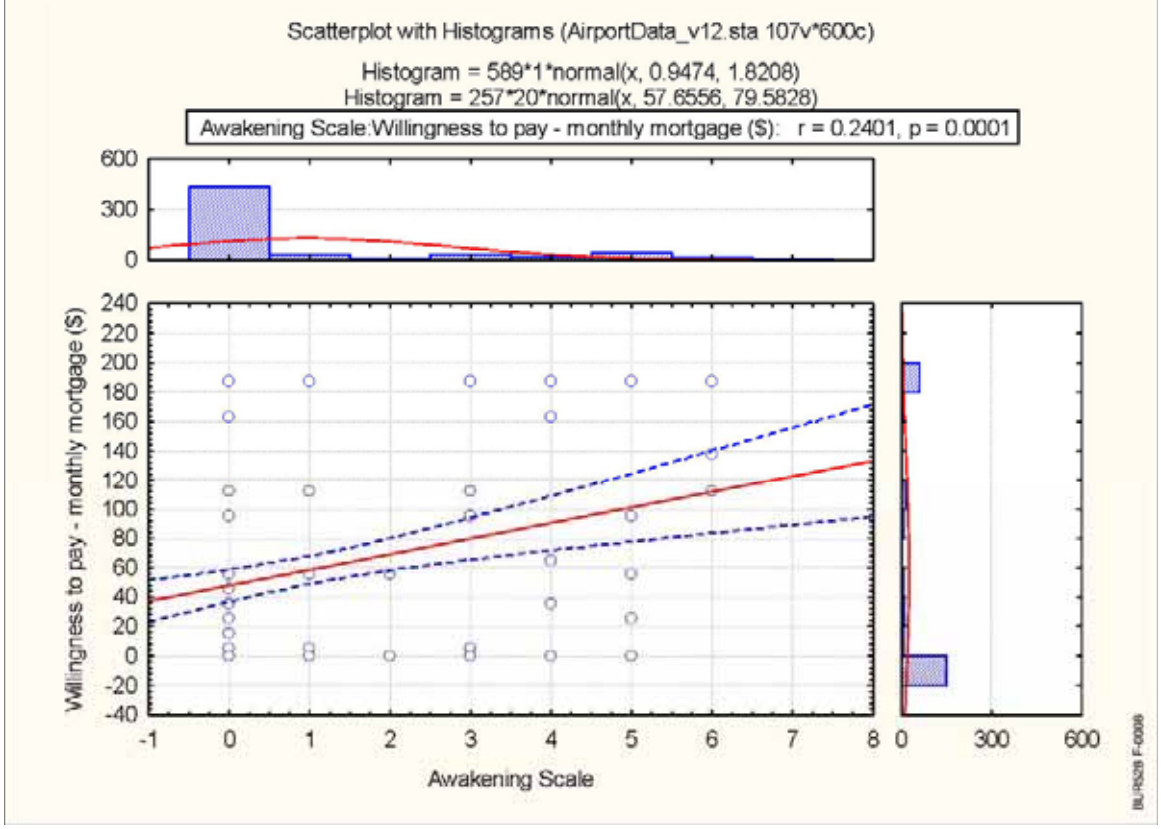


Figures E-4 and E- 5 plot awakenings and willingness-to-pay separately for homeowners and renters. Figure E-4 shows a stronger positive trend between the willingness-to-pay and awakenings for homeowners than for owners and renters combined, as shown in Figure E-3.

Figure E-4

SCATTERPLOT OF AWAKENINGS AND WILLINGNESS OF HOMEOWNERS TO PAY FOR CURFEW

Bob Hope Airport FAR Part 161 Study

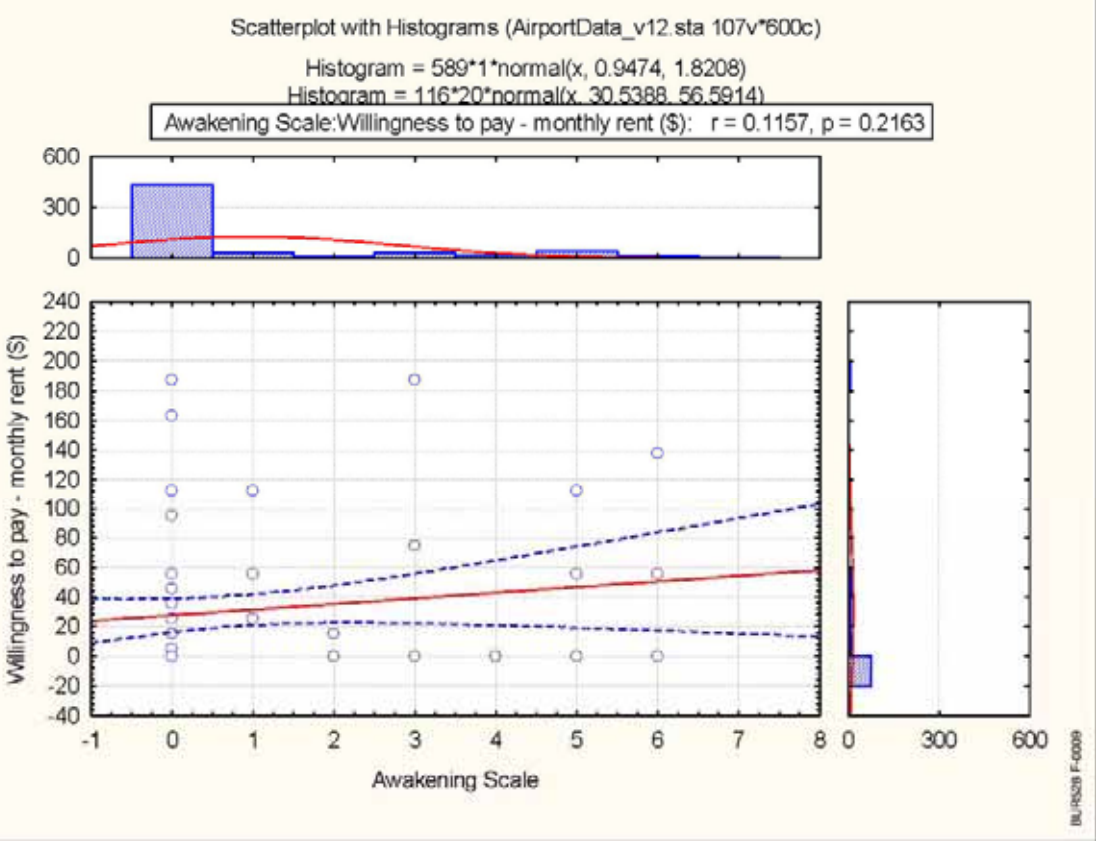


As the trends in the previous two figures would indicate, Figure E-5 shows a weaker relationship between awakenings and the willingness of renters to pay for a curfew than for owners.

Figure E-5

SCATTERPLOT OF AWAKENINGS AND WILLINGNESS OF RENTERS TO PAY FOR CURFEW

Bob Hope Airport FAR Part 161 Study



Given the potential importance of the relationship between awakenings and willingness-to-pay, additional analysis was undertaken to explore how awakenings are related to other variables. Presented below are analyses correlating awakenings with noise levels, and by curfew preference. An analysis of the correlation between awakenings and housing tenure (owner versus renter) was also undertaken, but the results were not statistically significant and are not presented in this Appendix.

E.2.4.4 Awakenings by CNEL Level

Table E-5 shows the number of reported awakenings by noise level. The proportion of people who report being awakened monthly or more than once per month increases markedly at levels above 60 CNEL. The proportions range from 11% to 16% at noise levels below 60 CNEL, but increase to 24% in the 60 to 65 CNEL range and to 27% in the 65 to 70 CNEL range.

Table E-4

AWAKENINGS BY CNEL LEVEL

Bob Hope Airport FAR Part 161 Study

Awakening Scale	CNEL 45-50	CNEL 50-55	CNEL 55-60	CNEL 60-65	CNEL 65-70	CNEL 70-75	Row Totals
0 – Never	28	118	119	116	64	0	445
1 – Rarely	1	6	4	10	13	0	34
2 – Monthly	0	4	1	2	1	0	8
3 – Few Times a Month	2	2	7	13	9	0	33
4 – Weekly	0	3	2	7	7	0	19
5 – 2 to 3 Times a Week	3	7	8	14	10	1	43
6 – Nightly	0	3	5	4	3	0	15
7 – 2 to 3 Times a Night	0	1	1	2	0	0	4
Column Totals	34	144	147	168	107	1	601
% Awakened More than Once a Month	15%	11%	16%	24%	27%	100%	19%

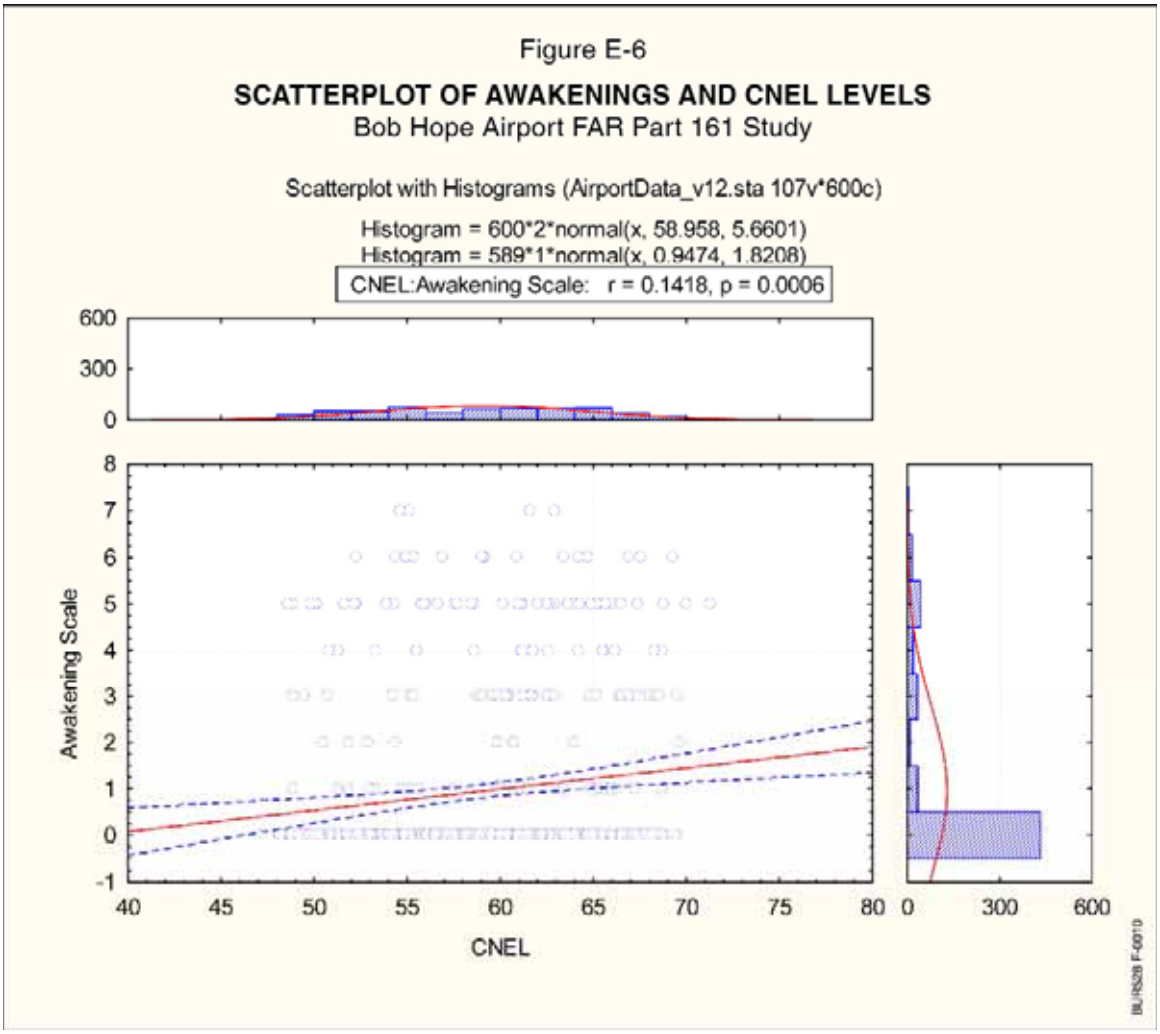
Source: Jacobs Consultancy analysis, 2007.

The scatterplot in Figure E-6 shows the relationship between awakenings and noise levels in graphic form. The plot shows a distinct trend for awakenings to increase as noise level increases. The large number of people who are not awakened, however, causes the overall relationship to be relatively weak.

Figure E-6

SCATTERPLOT OF AWAKENINGS AND CNEL LEVELS

Bob Hope Airport FAR Part 161 Study



E.2.4.5 Awakenings by Curfew Preference

Table E-5 shows the relationship of awakenings to curfew preferences among the respondents. The results indicate that 77% of those preferring the full curfew are awakened more than once a month, compared with 72% supporting the departure curfew, and 69% supporting the noise-based curfew.

Further, the results indicate strong support for a mandatory curfew among those who report being awakened. Of those who are awakened more than once a month, 94% support a mandatory curfew. Of those who report being awakened at any time, 92% support a mandatory curfew.

Table E-5

NUMBER OF AWAKENINGS BY CURFEW PREFERENCE
Bob Hope Airport FAR Part 161 Study

	Preference						
Awakening Scale	Full Curfew	Departure Curfew	Noise-Based Curfew	All Curfews	Opposed to Curfew	Unsure	Row Totals
1 – Rarely	13	7	10	0	2	2	34
2 – Monthly	4	1	1	0	1	1	8
3 – Few Times a Month	16	8	6	1	1	1	33
4 – Weekly	9	3	5	1	0	1	19
5 – 2 to 3 Times a Week	25	7	9	1	0	1	43
6 – Nightly	8	3	2	1	0	1	15
7 – 2 to 3 Times a Night	0	0	2	0	2	0	4
Column Totals	75	29	35	4	6	7	156
Awakened More than Once a Month	58	21	24	4	3	4	114
As percent of total	77%	72%	69%	100%	50%	57%	73%

Source: Jacobs Consultancy analysis, 2007.

E.2.4.6 Analysis of Variance (ANOVA)

To further define and quantify the relationship between the willingness to pay and awakenings, ANOVA models were estimated using as the dependent variable the combined response of willingness-to-pay per month. The analysis of variance tests differences in group means for statistical significance. This is accomplished by analyzing the variance, that is, by partitioning the total variance into the component that is due to true random error (i.e., within-group sum of squares) and the components that are due to differences between means. These latter variance components are then tested for statistical significance, and, if significant, the null hypothesis of "no differences between means" is rejected, and the alternative hypothesis that the means (in the population) are indeed different is accepted.

In this study, ANOVA models were intended to capture any statistically significant differences in the average willingness to pay across different groups by awakening scale, noise levels, owners/renters, age, gender and sound insulation. Several models were estimated with different combinations of factors. The age and gender of respondents, noise levels, and sound insulation factors were all found not to be statistically significant.

The awakening scale factor was also tested. The analysis described above had determined that the relationship between awakenings and willingness to pay appeared to be statistically significant, but the trend was found not to be monotonically increasing. (That is, the willingness-to-pay did not increase at every step along the awakenings scale.) Thus, linear regression was considered an inadequate method for defining a reliable quantitative relationship between the two variables. Alternative ANOVA models were estimated based on three alternative definitions of the awakenings factor – (1) ever awakened (even if only rarely), (2) awakened at least once a month, and (3) awakened more than once a month. All produced similar, statistically significant results. The results of the third model, with the awakenings variable defined as "more than once per month," are presented below.

Table E-6 presents the ANOVA model results based on the awakenings factor and owner/renter classification factor. The effect of the interaction between the two dependent variables (awakenings and owner/renter) was also estimated. The results include the sum of squares and mean squares for the effects. The awakenings factor in the model is statistically significant, and so is the owner/renter factor.

Table E-6

ANOVA MODEL – WILLINGNESS TO PAY FOR CURFEW VERSUS AWAKENINGS AND OWNER/RENTER STATUS

Bob Hope Airport FAR Part 161 Study

	Sum of Squares	Degr. of Freedom	Mean Squares	F	p
Intercept	**718,440**	**1**	**718,439.7**	**195.1260**	**0.000000**
Own/Rent	**88,439**	**1**	**88,438.9**	**24.0197**	**0.000001**
Awakened more than once per month	**24,007**	**1**	**24,007.3**	**6.5203**	**0.010955**
Own/Rent*Awakened more than once per month	6,260	1	6,260.4	1.7003	0.192839
Error	1,874,101	509	3,681.9		
Sum of Squares – Model	159,965.6				
df – Model	3				
Mean Squares – Model	53,321.86				
Sum of Squares – Residuals	1,874,101				
df – Residuals	509				
Mean Squares – Residuals	3,681.927				
F	14.48205				
P	**0.000000**				

Note: The statistics in **bold typeface** were found to be statistically significant.

Source: Jacobs Consultancy analysis, 2007.

The following three figures present the effect of the factors graphically. Figure E-7 shows the estimated willingness of owners and renters to pay for a curfew. It shows that owners would be willing to pay approximately $72 per month and renters approximately $35 per month for their preferred curfews.

Figure E-7

ANOVA MODEL — EFFECT OF OWNER/RENTER FACTOR

Bob Hope Airport FAR Part 161 Study

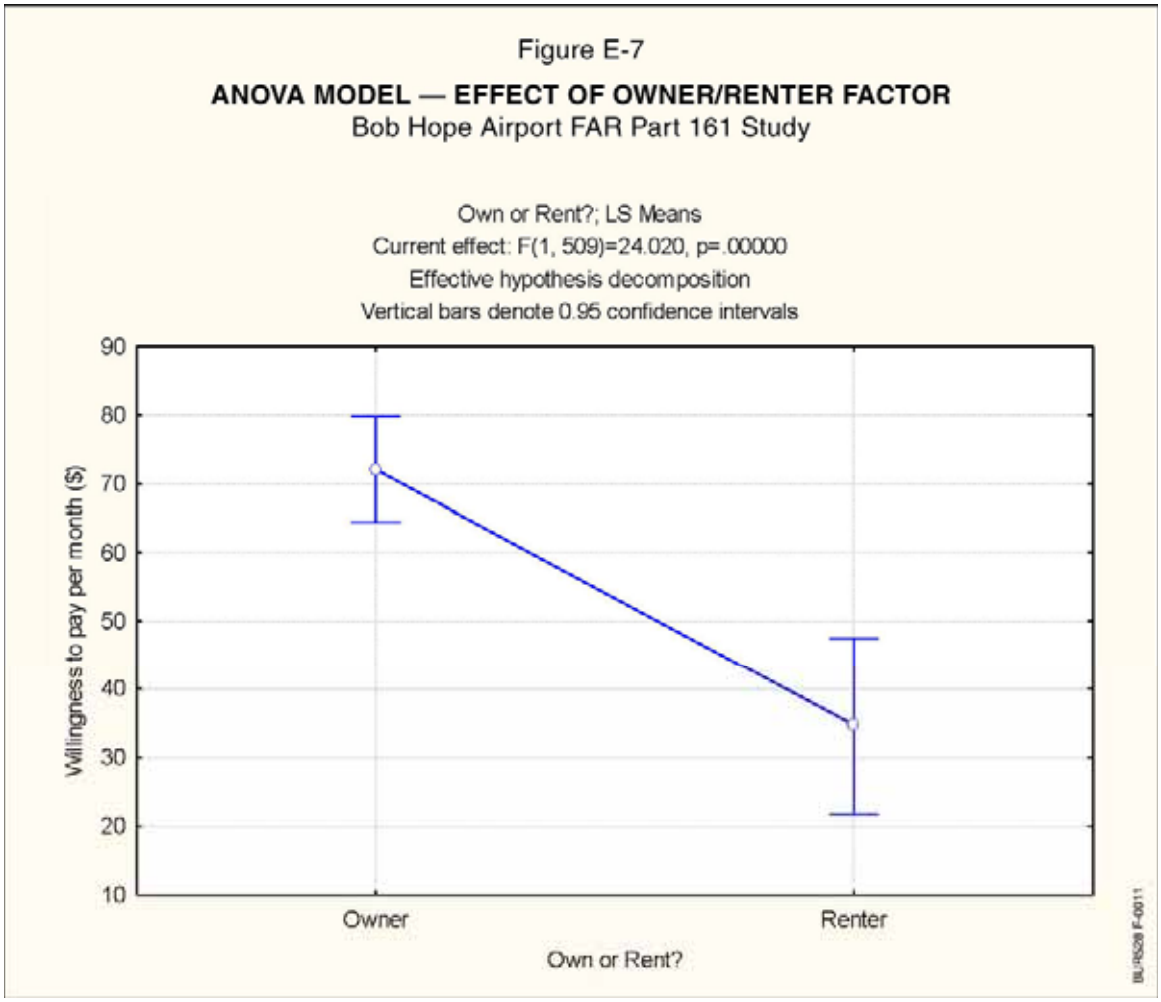


Figure E-8 shows the effect of the awakenings factor. Those who are awakened more than once a month would be willing to pay approximately $67 per month for a curfew. Those who are not awakened as often or not at all would be willing to pay about $44 per month.

Figure E-8

ANOVA MODEL — EFFECT OF AWAKENING FACTOR

Bob Hope Airport FAR Part 161 Study

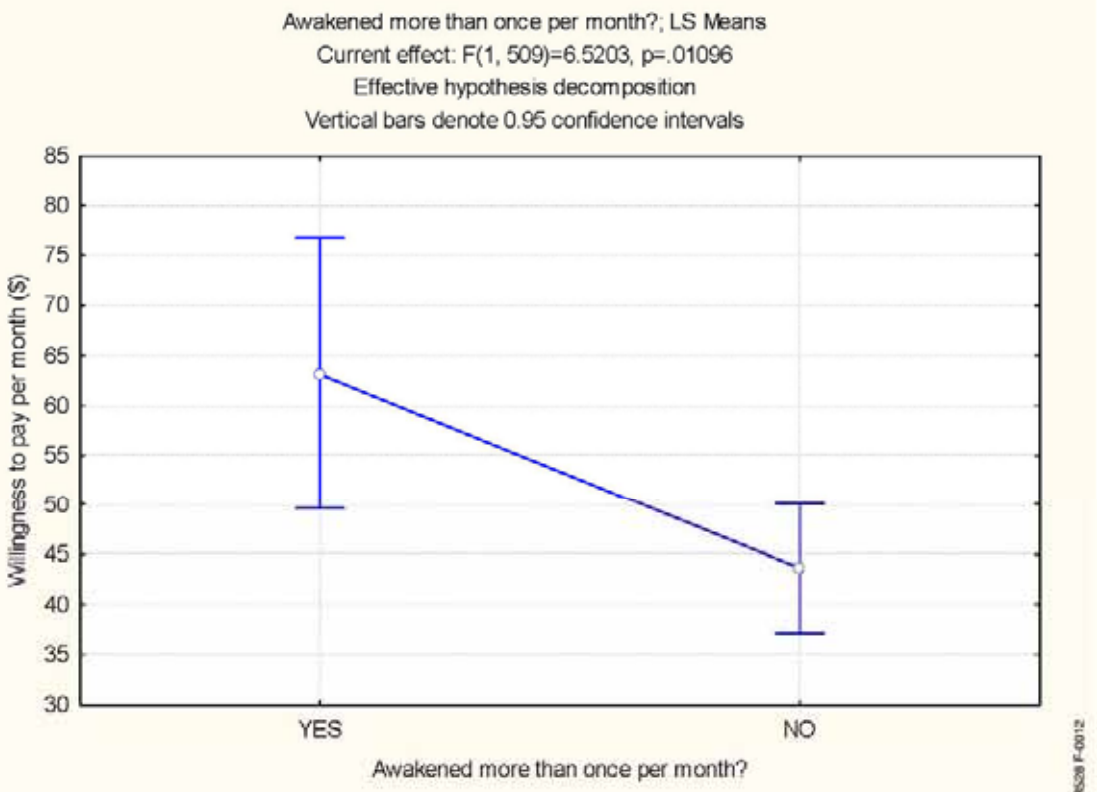


Figure E-9 shows the combined effects of the owner/renter factor and the awakenings factor. Owners who are awakened more than once a month would be willing to pay the most for a curfew – approximately $87 per month. Owners who are not awakened would be willing to pay approximately $57 per month.

Renters would be willing to pay substantially less for a curfew, but the general relationship between those who more sensitive to awakenings and those who are less sensitive is still apparent. Those who are awakened would be willing to pay approximately $46 per month for a curfew. Those who are awakened less often would be willing to pay just less than $30.

Figure E-9

ANOVA MODEL — EFFECT OF AWAKENING FACTOR

Bob Hope Airport FAR Part 161 Study

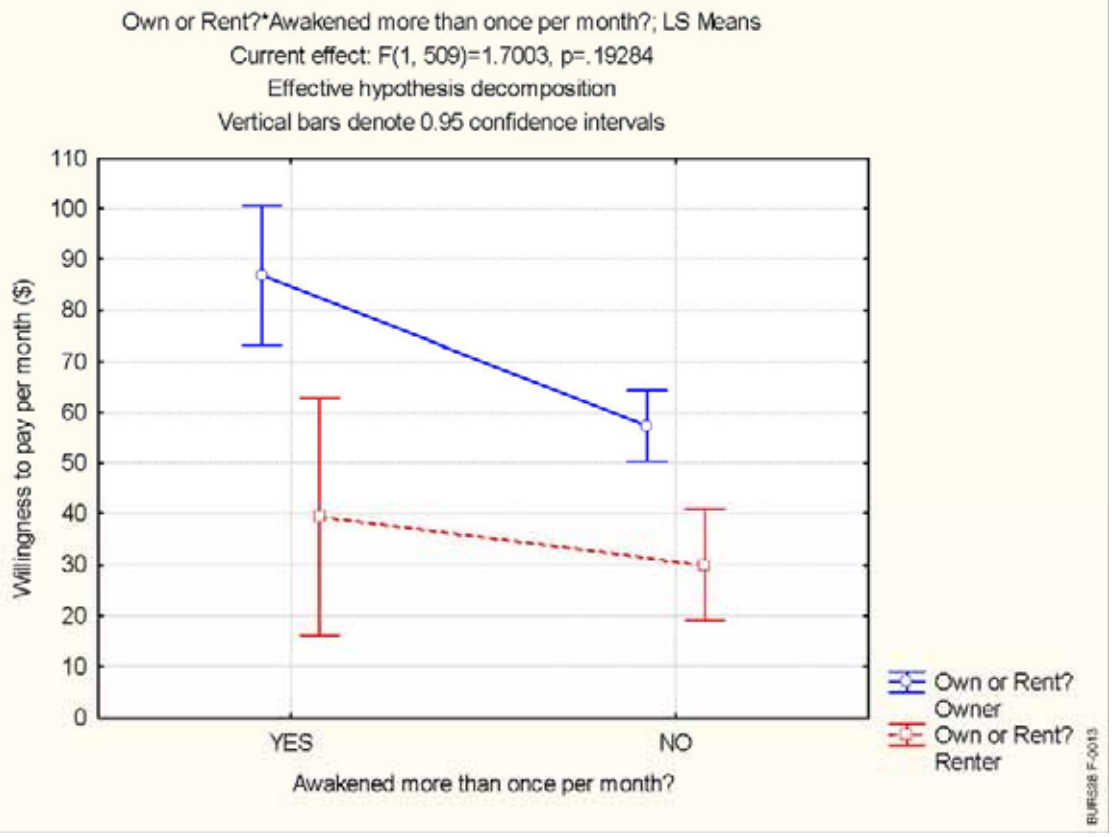


Figure E-9 shows the combined effects of the owner/renter factor and the awakenings factor. Owners who are awakened more than once a month would be willing to pay the most for a curfew – approximately $87 per month. Owners who are not awakened would be willing to pay approximately $57 per month. Renters would be willing to pay substantially less for a curfew, but the relationship between those who are more sensitive to awakenings and those who are less sensitive is still apparent. Those who are awakened would be willing to pay approximately $39 for a curfew and those who are not awakened would be willing to pay about $30 per month.

The least squares means from the ANOVA model, graphed in Figure E-9, are shown in Table E-7. The 95% confidence intervals are also shown.

In considering the 95% confidence interval, homeowners who are awakened more than once a month would be willing to pay from $73.17 to $100.52 per month for a curfew. Owners who are not awakened would be willing to pay between $50.39 and $64.34 per month.

Table E-7

WILLINGNESS-TO-PAY BY OWNER/RENTER AND AWAKENINGS FACTOR
Bob Hope Airport FAR Part 161 Study

Own or Rent?	Awakened More than Once a Month?	Willingness-to-pay per Month – Mean	Willingness-to-pay per Month --Std. Error	Willingness-to-pay per Month -- Lower Bound 95%	Willingness-to-pay per Month -- Upper Bound 95%
Owner	YES	$86.84	$6.96	$73.17	$100.52
Owner	NO	$57.36	$3.55	$50.39	$64.34
Renter	YES	$39.42	$11.90	$16.04	$62.80
Renter	NO	$29.87	$5.56	$18.95	$40.80

Source: Jacobs Consultancy analysis, 2007.

Renters who are awakened more than once a month would be willing to pay between $16.04 and $62.80. Renters who are not awakened would be willing to pay between $18.95 and $40.80 per month. The wider range for renters than for property owners reflects the greater spread observed in the data, which was caused, in part, by the smaller sample of renters among the respondents.

E.2.5 Application of CV Survey Findings in the Bob Hope Airport Area

The findings of the contingent value survey in the Bob Hope Airport area indicate that local residents would be willing to pay for a mandatory curfew at the Airport. One particularly important finding is that those who report themselves to be awakened by nighttime aircraft noise are willing to pay more than others for a curfew.

The results of the ANOVA model, shown in Table E-7, were used to develop an estimate of the total willingness of residents inside the 65 CNEL contour to pay for a curfew, shown in Table E-8. By computing the monthly "payments" that would be made by residents inside the 65 CNEL contour from 2008 through 2015 and then discounting the stream of payments to net present value (2006 dollars), the estimated value of the curfew alternatives to these residents would be over $5.8 million. This can be considered an estimate of the value – or benefit -- of the curfew to local residents.

Using the 95% confidence intervals from Table E-9, high and low ranges for the estimated value of the curfew to local residents can be developed. Shown in Table E-9, the benefit would range from a low of $4.4 million to $7.2 million.

Table E-8

ESTIMATED WILLINGNESS OF RESIDENTS INSIDE 65 CNEL TO PAY FOR CURFEW – BASED ON CV SURVEY

Bob Hope Airport FAR Part 161 Study

Owner/Renter by Awakenings Sensitivity	Monthly WTP	Dwellings Inside 65 CNEL		Total WTP Actual $		Net Present Value
		2008	2015	2008	2015	2008 - 2015
Sensitive Sleepers						
Owners	$86.84	129	213	$134,263	$222,407	
Renters	$39.42	145	240	$68,620	$113,670	
Subtotals		274	454	$202,883	$336,078	$1,466,343
Non-sensitive Sleepers						
Owners	$57.36	550	912	$378,851	$627,570	
Renters	$29.87	620	1,027	$222,124	$367,951	
Subtotals		1,170	1,938	$600,975	$995,521	$4,343,567
Column Totals		1,444	2,392	$803,858	$1,331,599	$5,809,910

Note: The proportion of owners versus renters was estimated based on the count of single-family and multifamily units inside the projected 2008 and 2015 baseline 65 CNEL contours. The proportion of "sensitive sleepers" was based on the proportion of respondents in the CV survey who reported being awakened more than once a month (19.0%).

Source: Jacobs Consultancy analysis, 2007.

Table E-9

RANGE OF NET PRESENT VALUES OF WILLINGNESS TO PAY FOR CURFEW

Bob Hope Airport FAR Part 161 Study

	Middle Range	Low Range	High Range
Net Present Value (2006 $)	$5,809,910	$4,443,370	$7,177,577

Note: low and high range estimate developed from the 95% confidence intervals shown in Table E-8.

Source: Jacobs Consultancy analysis, December 2007.

These findings are similar to the estimates of increased property values within the 65 CNEL contour based on the findings of the hedonic housing price model discussed in Appendix D, that analysis predicted a range of increased residential property values from $5.3 million to $10.2 million.* Thus, the results of the analysis of the CV survey results can be taken as confirmation of the estimated increase in property values developed from the hedonic modeling study. The benefits computed in the CV survey as presented in Tables E-8 and E-9, however, cannot simply be added to the estimated increase in residential property values documented in Appendix D. To a large degree, the estimated benefits developed through the CV survey and the hedonic model are measuring the same thing – the effect of the alternative curfews on the residential housing market.

Nevertheless, the CV survey provides evidence of an important detail that could not have been discovered through the hedonic modeling study – that people who report being regularly awakened by aircraft noise are "willing to pay" more for nighttime noise reduction than those who are rarely awakened.

The hedonic model discussed in Appendix D, which provides the basis for estimating the potential property value increase attributable to the reduction in noise with the alternative curfews, is explicitly based on housing market data. The price of housing is set by the market, where the interaction of demand and supply establish prices. Aircraft noise is responsible for many disturbances which can annoy people at their residences. While disruption of sleep is one of those disturbances, the research into noise-induced awakenings in residential settings has found that only a small proportion of people are highly sensitive to nighttime awakenings from aircraft noise. According to several studies, indoor sound exposure levels (SELs) from aircraft overflights as loud as 90 dBA awaken only about 5 to 6% of the people exposed to the noise.** In the Bob Hope Airport area, the CV survey produced similar findings (although they are not directly comparable with the results of scientific sleep disturbance studies.) The CV survey found that only 19% of respondents reported being awakened more than once per month by aircraft noise.

Given the small proportion of people who are highly sensitive to nighttime awakenings from aircraft noise, it is unlikely that they have sufficient force in the market to affect the price of housing in the Airport area. This means that the estimated property value recovery developed from the hedonic modeling study does not fully account for the value of the curfew alternatives to sensitive sleepers.

*The range of property value increase predicted with the hedonic housing price model varies with the specific curfew alternative and the specific NDI (noise discount index) used for the prediction. See page D-12 in Appendix D.

**See Appendix C for a summary of the research into noise-induced awakenings, in particular Figure C-1 on page C-15.

The additional amount that sensitive sleepers are willing to pay for a curfew may be characterized as a premium that households with sensitive sleepers would be willing to pay for a curfew. This premium represents an estimate of the value of the reduction in awakenings that would result from the alternative curfews. These premiums can be computed from the monthly willingness-to-pay estimates for owners and renters presented in Table E-7, above.

Table E-10 presents the estimated value of the reduction in awakenings. It was computed by taking the willingness-to-pay premiums from Table E-7 and applying them to the estimated number of households inside the baseline 65 CNEL contours forecast for 2008 and 2015. The annual willingness-to-pay was then converted to net present value to develop the estimate shown in Table E-10 – a total of $450,000. This represents a net additional benefit of the alternative curfews.

Table E-10

ESTIMATED WILLINGNESS OF SENSITIVE SLEEPERS TO PAY FOR NIGHTTIME CURFEW
Bob Hope Airport FAR Part 161 Study

Households with Sensitive Sleepers	Monthly WTP Premium	Households inside 65 CNEL Contour	
		2008 Baseline	2015 Baseline
Owner Households	$29.48	129	213
Renter Households	$ 9.55	145	240
Annual Willingness to Pay		$62,203	$103,040
Net Present Value (2006 $)		$450,000	

Notes: Estimates of annual willingness to pay for each year between 2008 and 2015 were estimated through interpolation.

Source: Jacobs Consultancy analysis, 2007.

Thus far, the application of the findings of the CV survey to the Part 161 Study have not considered the possibility that airport area residents may be willing to pay different amounts for the different curfews. In fact, Table E-4 showed that those favoring a full curfew would be willing to pay approximately 24% more than those favoring the departure curfew or the noise-based curfew. They would be willing to pay about 28% more than the average of all respondents who indicated a willingness to pay for a curfew (which included those explicitly favoring one of the curfew alternatives and those who were unsure of their preference).

While the number of data cases is too small for a rigorous statistical analysis using the ANOVA model discussed in Section E.2.4.6, the finding that people favoring a full curfew are willing to pay more for it than those favoring less restrictive

alternatives makes sense. The finding of a substantially higher willingness-to-pay reported by those supporting the full curfew deserves to be reflected in the benefit-cost analysis for the Part 161 Study. As a rough estimate of the value of the full curfew to local residents sensitive to being awakened, the value of the curfew to sensitive sleepers, shown in Table E-10, is increased by 25%.

Table E-11 presents the final estimates of the value of the alternative curfews to sensitive sleepers. The value of the full curfew to sensitive sleepers is estimated at $562,000. The other two alternatives are valued at $450,000 – the overall average presented in Table E-10.

Table E-11

ESTIMATED WILLINGNESS OF SENSITIVE SLEEPERS TO PAY FOR ALTERNATIVE CURFEWS
Bob Hope Airport FAR Part 161 Study

Net Present Value (2006 $)		
Full Curfew	Departure Curfew	Noise-Based Curfew
$562,000	$450,000	$450,000

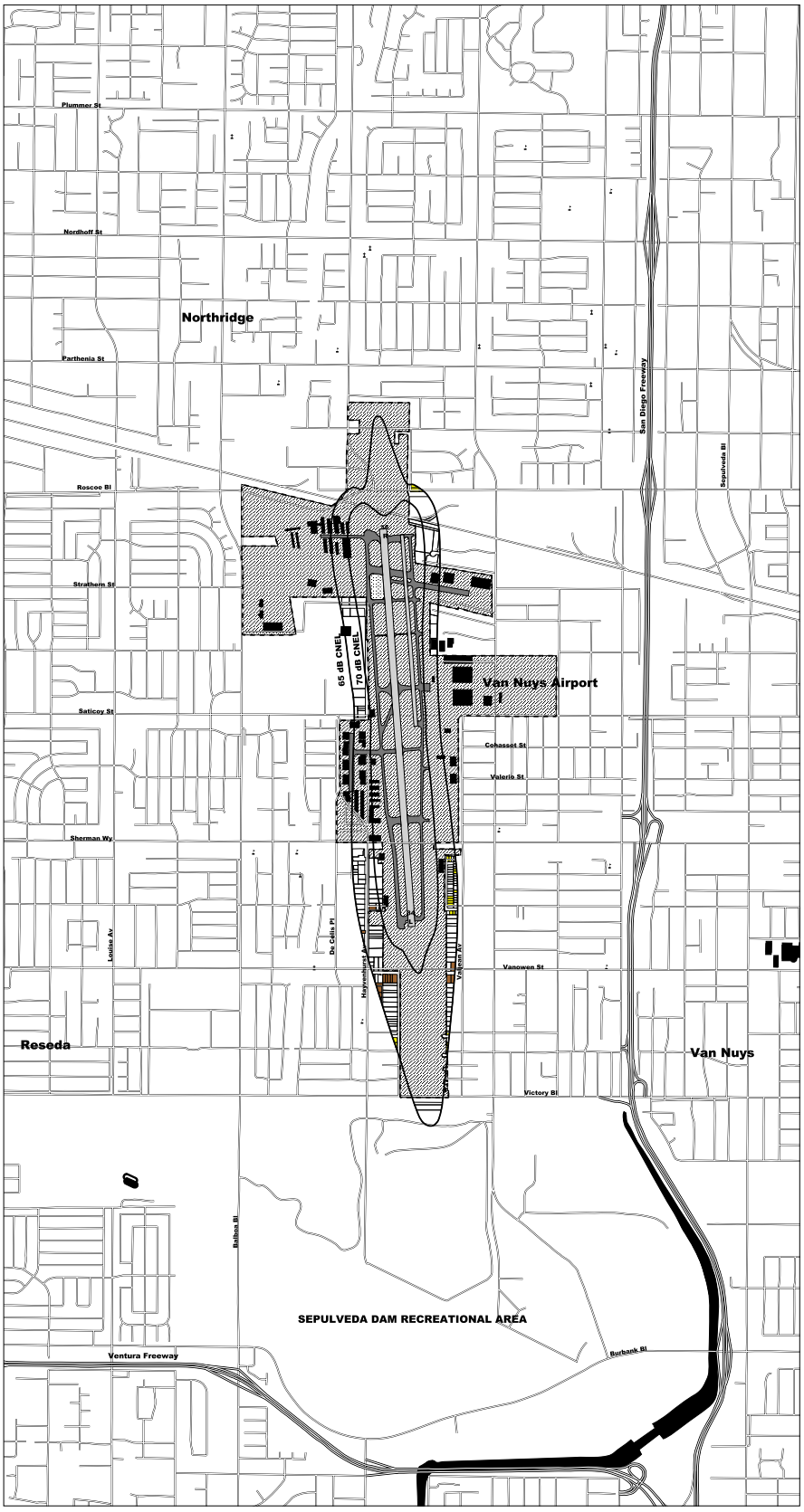
Source: Jacobs Consultancy analysis, 2007.

E.3 SURVEY IN VAN NUYS AIRPORT AREA

A contingent valuation survey was also undertaken in the Van Nuys Airport vicinity. The purpose of that survey was to determine whether the local residents would be willing to pay anything to avoid a given increase in nighttime aircraft activity. Implementation of a curfew at Bob Hope Airport would cause nighttime takeoffs and landings to shift to other airports in the Los Angeles area. Van Nuys is projected to receive an average of 8 to 13 shifted operations per night in 2008 and 10 to 16 in 2015. Most of these would be business jets.

E.3.1 Selection of Sample in Van Nuys Airport Vicinity

For the Van Nuys survey, it was determined that all dwellings within the 65 CNEL contour would comprise the "sample." In fact, a 100% canvas of all households within the 65 CNEL contour was attempted. Based on the first quarter noise contour for Van Nuys, published by Los Angeles World Airports, an estimated 54 dwellings were inside the 65 CNEL contour. See Figure E-10.



Van Nuys
Los Angeles World Airports

1Q07

Airport Impact Area: CNEL 65, 70, and 75 dB Contours

LEGEND

- Residential - Single Family within Contour
- Residential - Multi-Family within Contour
- Airport Property
- Noise Contour
- Airport Boundary
- Freeways
- Streets
- Landmarks
- Churches
- Hospitals
- Schools

N
W E
S

0.5 0 0.5 1 Miles

NOTES

Noise Contours are generated using the Federal Aviation Administration's Integrated Noise Model (INM) version 6.1. The INM contour data file is based on annualized operational information gathered for the 12 month period ending December 31, 2006. The INM program is run after the fourth quarter of the previous year, and the resultant contour is adjusted to the current quarter's Noise Monitoring Station (NMS) annual average aircraft CNEL.

Sources of information include: Runway Utilization Reports, FAA's Automated Radar Terminal System (ARTS) Data, FAA Tower Traffic Records, and the Passive Secondary Surveillance Radar (PASSUR) Data.

Dwelling unit calculations are based on estimates made using June 198? assessor information, supplemented with land use surveys. Population estimates reflect the increases from the 1990 census data for persons per dwelling unit. The land use database used to generate this report reflects all progress made through LAWA's Land Use Mitigation Program through December 31, 2005.

Map projection is in State Plane Feet based on North American Datum of 1983 (NAD83), and is located in Zone 5 of the California Coordinate System of 1983.

BUR528 Figure E-10.pdf

Source: Noise Management Division, Los Angeles World Airports.

Figure E-10

VAN NUYS AIRPORT—NOISE EXPOSURE FIRST QUARTER 2007

FAR Part 161 Study for Bob Hope Airport

February 2008

BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY

JACOBS CONSULTANCY

E.3.2 Design and Administration of Survey in Van Nuys Airport Vicinity

The Van Nuys area survey was adapted from the Bob Hope Airport survey, discussed above in Section E.2.2. The willingness-to-pay questions were revised to ask whether the respondents would be willing, if buying their homes today, to pay more for the home if they knew that the current number of nighttime operations at Van Nuys (about 90) would not increase.

The Van Nuys survey also included the same kinds of demographic and orientation questions as the Bob Hope Airport survey. The survey was administered by Arnold Steinberg and Associates by telephone over 19 consecutive days in November 2007. A copy of the Van Nuys survey, including the responses, is in Attachment 2 to this Appendix.

E.3.3 Analysis of Van Nuys Airport Area Survey Data

Despite the efforts of the survey administrators, including repeated call backs at different times of the day to those who did not answer their telephones and the extension of the survey period, only 17 surveys were completed. These are too few to enable reliable statistical analysis. Nevertheless, the responses were reviewed to see if information of potential value could be gleaned from the data.

Table E-12 shows the number of respondents who reported being awakened by nighttime aircraft noise by the amount they said they would be willing to pay to avoid an increase in 10 nighttime flights. Four respondents, 23.5% of the respondents, reported that they were awakened more than once per month. This is similar to the proportion reported among Bob Hope Airport area survey respondents – 19%. The proportions of Van Nuys survey respondents reporting less frequent awakenings, however, was considerably higher than the results of the Bob Hope Airport area survey (those awakened monthly, 35% versus 20%; those ever awakened, 47% versus 26%). These differences suggest that the small group of respondents may have over-represented those who were particularly sensitive to being awakened by aircraft noise.

Using the data in Table E-12, the average monthly willingness-to-pay, among the residents who reported being awakened at night, was $46.88. The average willingness-to-pay for those who were not awakened was $11.11. These values are plausible in light of the willingness-to-pay data developed through the contingent value survey in the Bob Hope Airport area. (See Table E-8.) The willingness-to-pay among Van Nuys area residents is somewhat less than among Bob Hope Airport area residents. This is reasonable since the noise reduction that the Van Nuys area residents were asked to value (a cap on the increase of nighttime operations) would be substantially less than the curfews that the Bob Hope Airport area residents were asked about (curfew alternatives that would significantly reduce the nighttime operations and noise at the Airport).

Table E-12

NUMBER OF AWAKENINGS BY WILLINGNESS-TO-PAY – VAN NUYS AREA
Bob Hope Airport FAR Part 161 Study

	Willingness-to-Pay to Avoid Increase in Flights						Row
Awakened	Zero	$50	$75	$100	$125	$150	Totals
Never	8			1			9
Rarely	1		1				2
Monthly	2						2
Few Times a Month							0
Weekly	1					1	2
2 to 3 Times a Week	1					1	2
Nightly							0
2 to 3 Times a Night							0
Column Totals	13	0	1	1	0	2	17

Source: Jacobs Consultancy analysis, 2007.

E.3.4 Application of Van Nuys CV Survey Findings

The willingness-to-pay estimates developed from the data in Table E-12 were used as the basis for estimating the cost to Van Nuys area residents of implementing a curfew at Bob Hope Airport. The CV study undertaken in the Van Nuys area is not sufficiently detailed to discern precisely how these costs would be incurred. The point is that the findings of the Van Nuys CV survey provide evidence that local residents would be giving up something of value if additional nighttime flights were increased at Van Nuys Airport as a result of the implementation of a curfew at Bob Hope Airport.

The following steps were used to estimate the willingness of Van Nuys area residents to pay to avoid an increase in nighttime aircraft operations:

1. Estimate the number of dwelling units likely to be within the 65 CNEL contour in 2008 and 2015 with a curfew in force at Bob Hope Airport. This was done by comparing the FAA's forecast of itinerant operations at Van Nuys for 2008 and 2015 (taken from the 2007 Terminal Area Forecast -- TAF) with the number of itinerant operations at VNY over the past five years. (This is explained in greater detail in Chapter 4, Benefit-Cost Analysis, Section 4.6.5.)

2. Estimate the number of households likely to have a member awakened by noise more than once per month. Because of the evidence of bias in the

limited sample of Van Nuys area residents, the findings of the Bob Hope Airport area survey, where 19% of respondents indicated that they were awakened more than once per month, were used to make this estimate.

3. Compute the willingness of those sensitive to awakenings to pay to avoid an increase in nighttime operations based on a monthly payment of $46.88.

4. Compute the willingness of non-sensitive people to pay to avoid an increase in nighttime operations based on a monthly payment of $11.11.

Table E-13 shows the results of the analysis. The net present value of the total willingness-to-pay from 2008 through 2015, would be $232,243.

Table E-13

ESTIMATED WILLINGNESS OF RESIDENTS INSIDE 65 CNEL TO PAY TO AVOID INCREASE IN NIGHTTIME OPERATIONS AT VAN NUYS AIRPORT

Bob Hope Airport FAR Part 161 Study

Households by Awakenings Sensitivity	Monthly WTP	Dwellings Inside 65 CNEL		Total Willingness-to-Pay Actual $		Net Present Value (2006 $)
		2008	2015	2008	2015	2008 - 2015
Sensitive Sleepers	$45.88	10	69	$ 5,762	$38,944	
Non-sensitive Sleepers	$11.11	44	296	$ 5,834	$39,435	
Column Totals		54	365	$11,596	$78,389	$232,243

Note: The proportion of "sensitive sleepers" was based on the proportion of respondents reporting that they were awakened more than once per month by nighttime aircraft noise (23.5%).

Source: Jacobs Consultancy analysis, 2007.

ATTACHMENT 1

Results of Contingent Value Survey in Bob Hope Airport Area
April – May 2007

1: Days of Week

	#	%
Monday WK1	99	16.5
Tuesday WK1	89	14.8
Wednesday WK1	84	14.0
Thursday WK1	115	19.1
Friday WK1	53	8.8
Saturday WK1	22	3.7
Sunday WK1	39	6.5
Monday WK2	68	11.3
Tuesday WK2	21	3.5
Wednesday WK2	11	1.8
COLUMN TOTALS	601	601

2: Sample/Oversample

	#	%
Sample	601	100.0
Oversample [None]	-	-
COLUMN TOTALS	601	601

2: Samples

	#	%
Subsample 1	200	33.3
Subsample 2	199	33.1
Subsample 3	202	33.6
	-	-
COLUMN TOTALS	601	601

7: Zipcode

	#	%
91352	97	16.1
91406	-	-
91504	39	6.5
91505	237	39.4
91506	19	3.2
91601	57	9.5
91605	52	8.7
91606	100	16.6
ALL OTHER	-	-
COLUMN TOTALS	601	601

9: Area/Cities
[City Code]

	#	%
Burbank	295	49.1
Los Angeles	306	50.9
	-	-
COLUMN TOTALS	601	601

11: Los Angeles City Council District

	#	%
District 2	139	45.4
District 4	58	19.0
District 6	109	35.6
COLUMN TOTALS	306	306

12: Area:

	#	%
Area 1/[CNEL Area]	274	45.6
Area 2/[Beyond CNEL]	327	54.4
COLUMN TOTALS	601	601

13: Language Version

	#	%
English Version	540	89.9
Spanish Version	61	10.1
COLUMN TOTALS	601	601

14: Insulation Data
[Data Programmed after project.]

	#	%
Sound Insulated	110	39.7
Sound Ins. (Area 2)	3	1.1
NOT Sound Insulated	164	59.2
Unsure/DK	-	-
COLUMN TOTALS	277	277

14X: Insulation Data
[Data Programmed after project.]

	#	%
Sound Insulated	113	40.8
NOT Sound Insulated	164	59.2
Unsure/DK	-	-
COLUMN TOTALS	277	277

15: Household -- Single versus Multiple

	#	%
Single Voter	113	40.8
Multiple Voter	164	59.2
COLUMN TOTALS	277	277

20: AGE/BIRTHYEAR
[20X = <50; 50+>]

	#	%
1. Age 18-34	71	11.8
2. Age 35-49	187	31.1
3. Age 50-64	202	33.6
4. Age 65+	141	23.5
Age <50	258	42.9
Age 50+	343	57.1
COLUMN TOTALS	601	601
MEAN	601	2.7

22: Sex

	#	%
Male	252	41.9
Female	349	58.1

23: In just TWO or THREE words, what's the main issue facing your local community?
[NOISE/PROBE:] What kind of noise? <Code 1/2>
[AIRPORT NOISE:] <Must code 2.>
[AIRPORT/AIRPLANES/AIRPORT-RELATED:]
Can you be more specific? <Must code 2/3>

	#	%
NOISE-NOT Airport	30	5.0
AIRPORT NOISE	53	8.8

AIRPORT-RELATED	21	3.5
TOTAL AIRPORT	74	12.3
Other mentions	343	57.1
No problems	54	9.0
Don't know/Refuse	100	16.6
COLUMN TOTALS	601	601

The closest airport is Bob Hope Airport, previously called Burbank-Glendale-Pasadena Airport or Burbank Airport.
24: A flight pattern means the airspace that is used by aircraft to take off from, or to land at, an airport. Thinking about this airport -- do you know -- do you live:
INTERVIEWER: Read Statement
ROTATE 1-2, READ 3 LAST.

	#	%
WITHIN Flight Ptrn	295	49.1
NEAR Flight Pattern	254	42.3
Neither	35	5.8
Unsure/dk	17	2.8
COLUMN TOTALS	601	601
WITHIN - NEAR	41	6.8

25: When you think about AIRCRAFT NOISE noise related to this airport, has this situation, over the last few years, generally:
INTERVIEWER: Read Statement, ROTATE 1-2

	#	%
Become BETTER	155	25.8
Become WORSE	191	31.8
Stayed The Same	199	33.1
Unsure/dk	56	9.3
COLUMN TOTALS	601	601
BETTER - WORSE	-36	-6.0

26: When it comes to you -- or to ANYONE living in your household, is aircraft noise related to this airport a problem?
[YES, ask:] At any particular time?...
[PROBE:] Any other time?
(OK TO CODE MORE THAN ONE: 1-6]
[Yes, all the time = Code 7]
[Yes, but can't say what time = Code 8]
[NO: Code 13.]
[UNSURE if problem: Code 99.]
[NO: Code 13.]
OKAY TO CODE MORE THAN ONE.
INITIAL "YES" RESPONSE, THEN CANNOT CODE 13 OR 99.
INITIAL "NO" RESPONSE=CODE 13.
CODE 7 MEANS CANNOT CODE 1-6.

	#	%
Yes/Before 7AM	49	8.2
Yes/7AM-to-12:00	36	6.0
Yes/12:00-to-5PM	26	4.3
Yes/5PM-to-10PM	69	11.5
Yes/10PM-To12PM	22	3.7
Yes/Mdnght And Ltr	13	2.2
Yes/ALL THE TIME	25	4.2
Yes/BUT DK What Time	30	5.0
TOTAL YES	243	40.4
NO/NOT A Problem	341	56.7
Refuse/Unsure/dk	17	2.8
COLUMN TOTALS	601	601
MEAN	-	?

26X: When it comes to you -- or to ANYONE living in your household, is aircraft noise related to this airport a problem?

	#	%
Yes/7AM-to-10PM	122	20.3
Yes/10PM-to-7AM	80	13.3
Other Yes	55	9.2
NO/NOT A Problem	341	56.7
Refuse/Unsure/dk	17	2.8
COLUMN TOTALS	601	601

27: Do you personally ever hear AIRCRAFT noise between the hours of 10PM at night and 7AM in the morning? "[NO=code 2.]"

	#	%
Yes/Hear Noise	358	59.6
No/Do NOT Hear Noise	225	37.4
Refuse/Unsure/dk	18	3.0
COLUMN TOTALS	601	601
YES - NO	133	22.1

THIS QUESTION ONLY FOR "YES" AND "99"

RESPONDENTS IN PRIOR QUESTION/Q27.
28: Between these hours of 10PM at night and 7AM in the morning, are you ever actually awakened from your sleep by this aircraft noise?

	#	%
Yes/Awakened	159	42.3
No/NOT Awakened	206	54.8
Refuse/Unsure/dk	11	2.9
COLUMN TOTALS	376	376
YES - NO	-47	-12.5

28X: Between these hours of 10PM at night and 7AM in the morning, are you ever actually awakened from your sleep by this aircraft noise?

	#	%
Yes/Awakened	159	26.5
No/NOT Awakened	206	34.3
Refuse/Unsure/dk	11	1.8
No/Do NOT Hear Noise	225	37.4
COLUMN TOTALS	601	601

THIS QUESTION ONLY FOR "YES" RESPONDENTS IN PRIOR QUESTION/Q28.
29: How often are you actually awakened by this aircraft noise?
[DO NOT PROMPT!: IF RESPONSES ARE NOT 1-7, THEN CODE PRINT RESPONSE, "UNSURE" RESPNSE = CODE "99" ...THEN ASK Q30.]

	#	%
2/3 Times A Night	3	1.9
Every Night	15	9.4
2/3 Times A Week	43	27.0
Weekly	17	10.7
Few Times A Month	33	20.8
Monthly	8	5.0
Rarely	33	20.8
Other Response	-	-
Unsure/dk	7	4.4
COLUMN TOTALS	159	159
MEAN	152	3.6

29X: How often are you actually awakened by this aircraft noise?

	#	%

More than Weekly	61	38.4
More than Monthly	50	31.4
Monthly/Rarely	41	25.8
Other/Unsure	7	4.4
COLUMN TOTALS	159	159

30: Are you awakened by such aircraft noise...: more than once every night, every night, two or three times a week, weekly, a few times a month, monthly, or rarely?
THIS QUESTION ONLY FOR PRIOR QUESTION/Q29 RESPONDENTS WHO ARE "UNSURE" ("99").

	#	%
Mre Thn Once A Nght	1	14.3
Every Night	-	-
2 Or 3 Times A Week	-	-
Weekly	2	28.6
Few Times A Month	-	-
Monthly	-	-
Rarely	1	14.3
Other Response	-	-
Still Unsure/dk	3	42.9
COLUMN TOTALS	7	7
MEAN	4	4.0

29+30: How often are you actually awakened by this aircraft noise?

	#	%
2/3 Times A Night	4	2.5
Every Night	15	9.4
2/3 Times A Week	43	27.0
Weekly	19	11.9
Few Times A Month	33	20.8
Monthly	8	5.0
Rarely	34	21.4
Other Response	-	-
Unsure/dk	3	1.9
COLUMN TOTALS	159	159
MEAN	156	3.6

31: Do you believe this airport should PROHIBIT, or should NOT prohibit, flights between the hours of 10PM at night and 7AM in the morning?

	#	%
YES/SHOULD	400	66.6
NO/Should NOT	152	25.3
Unsure/dk	49	8.2
COLUMN TOTALS	601	601
YES - NO	248	41.3

32: From what you've heard or read, does this airport have a VOLUNTARY curfew, or not?

	#	%
YES Voluntary Curfew	294	48.9
NO Voluntary Curfew	118	19.6
Unsure/dk	189	31.4
COLUMN TOTALS	601	601
YES - NO	176	29.3

33: This airport DOES have a voluntary curfew. Between the hours of 10PM at night and 7AM in the morning, passenger airlines are asked NOT to schedule landings and takeoffs....
Quieter business aircraft are permitted, but the loudest business aircraft are PROHIBITED....
Do you feel this voluntary curfew is generally observed, or not?

	#	%
Yes/Observed	407	67.7
No/NOT Observed	120	20.0
Unsure/dk	74	12.3
COLUMN TOTALS	601	601
YES - NO	287	47.8

34: This VOLUNTARY curfew IS generally observed, with some exceptions. Do you APPROVE or DISAPPROVE of this VOLUNTARY curfew?

	#	%
Approve	456	75.9
Disapprove	79	13.1
Unsure/dk	66	11.0
COLUMN TOTALS	601	601
APPROVE - DISAPPROVE	377	62.7

35: Typically, during these curfew hours: TWO passenger flights and TWENTY small cargo and business aircraft take off. For you...are these aircraft departures:
INTERVIEWER: Read Statement

	#	%
NOT A Problem	334	55.6
SOMEWHAT A Problem	180	30.0
A BIG Problem	67	11.1
Unsure/dk	20	3.3
COLUMN TOTALS	601	601
MEAN	581	1.5

RESULTS MEAN HOMEOWNERS THEN ASKED 37A, 38A, 45, 46A, 47A, 55A; POSSIBLY 53A&54A; 55A; RENTERS THEN ASKED 37B, 38B, 46B, 47B, 55B, POSSIBLY 53B&54B; NOT: "99" FOR Q36 WILL BE TREATED AS HOMEOWNERS.
36: For statistical purposes: do you own your home or do you rent?

	#	%
Own/[HME OR CNDO]	427	71.0
Rent/[APRTMNT/HME]	154	25.6
Refuse/dk	20	3.3
COLUMN TOTALS	601	601

THIS QUESTION ONLY FOR HOMEOWNERS.
37A: Where you live is within, or near, the airport flight pattern. If your home were NOT within, or near, the flight pattern, do you believe your home would be worth more?

	#	%
YES/Worth MORE	250	55.9
NO/NOT Worth More	112	25.1
Unsure/dk	85	19.0
COLUMN TOTALS	447	447
YES - NO	138	30.9

THIS QUESTION ONLY FOR RENTERS.
37B: Where you live is within, or near, the airport flight pattern. If your rental unit were NOT within, or near, the flight pattern, do you believe your rental unit would be worth MORE to its owner?

	#	%
YES/Worth MORE	63	40.9
NO/NOT Worth More	54	35.1
Unsure/dk	37	24.0
COLUMN TOTALS	154	154
YES - NO	9	5.8

37X: Where you live is within, or near, the

airport flight pattern. If your home/rental unit were NOT within, or near, the flight pattern, do you believe your home would be worth more? (37A + 37B)

	#	%
YES/Worth MORE	313	52.1
NO/NOT Worth More	166	27.6
Unsure/dk	122	20.3
COLUMN TOTALS	601	601
YES - NO	147	24.5

THIS QUESTION ONLY FOR HOMEOWNERS.
38A: The voluntary curfew has been in effect for more than 25 years. If this voluntary curfew were NOT in effect, do you believe your home would be worth LESS?

	#	%
YES/Worth LESS	265	59.3
NO/Not Worth Less	102	22.8
Unsure/dk	80	17.9
COLUMN TOTALS	447	447
YES - NO	163	36.5

THIS QUESTION ONLY FOR RENTERS.
38B: The voluntary curfew has been in effect for more than 25 years. If this voluntary curfew were NOT in effect, do you believe your rental unit would be worth LESS to its owner?

	#	%
YES/Worth LESS	71	46.1
NO/Not Worth Less	47	30.5
Unsure/dk	36	23.4
COLUMN TOTALS	154	154
YES - NO	24	15.6

38X: The voluntary curfew has been in effect for more than 25 years. If this voluntary curfew were NOT in effect, do you believe your home/rental unit would be worth LESS? (38A+38B)

	#	%
YES/Worth LESS	336	55.9
NO/Not Worth Less	149	24.8
Unsure/dk	116	19.3
COLUMN TOTALS	601	601
YES - NO	187	31.1

39: We've been talking about a VOLUNTARY curfew. How important would it be to you, personally, to have a MANDATORY curfew that would be STRICTLY-ENFORCED:
INTERVIEWER: Read Statement, ROTATE 1-3.

	#	%
1-NOT Important	156	26.0
2-SOMEWHAT Important	175	29.1
3-VERY Important	234	38.9
Unsure/dk	36	6.0
COLUMN TOTALS	601	601
MEAN	565	2.1

40: Some aircraft are noisier than others. Would you FAVOR or OPPOSE a mandatory curfew that prohibits NOISY aircraft, so that only quiet aircraft could land or take-off?
SAMPLE 1: Q40, Q41, Q42
SAMPLE 2: Q41, Q42, Q40
SAMPLE 3: Q42, Q40, Q41

	#	%
Favor	377	62.7
Oppose	153	25.5
Unsure/dk	71	11.8
COLUMN TOTALS	601	601
FAVOR - OPPOSE	224	37.3

41: Take-offs are louder than landings. Would you FAVOR or OPPOSE a mandatory curfew that PROHIBITS take-offs, but ALLOWS landings?

	#	%
Favor	264	43.9
Oppose	222	36.9
Unsure/dk	115	19.1
COLUMN TOTALS	601	601
FAVOR - OPPOSE	42	7.0

42: Landings are noisy. Would you FAVOR or OPPOSE a mandatory curfew that PROHIBITS both landings...AND...take-offs?

	#	%
Favor	331	55.1
Oppose	189	31.4
Unsure/dk	81	13.5
COLUMN TOTALS	601	601
FAVOR - OPPOSE	142	23.6

43: A curfew could produce more quiet time, but it also could limit air service. Of these THREE curfews, which curfew would you MOST favor:
INTERVIEWER: Read Statement, ROTATE 1-3.

	#	%
1-NOISE CURFEW	201	33.4
2-PARTIAL CURFEW	124	20.6
3-FULL CURFEW	176	29.3
All	12	2.0
NONE/Opposed	35	5.8
Unsure/dk	53	8.8

THIS QUESTION FOR RESPONDENTS WHO IN Q43 CHOSE NOISE/CURFEW /1.
44A: Why would you most favor a NOISE CURFEW prohibiting noisy aircraft, and allowing quiet aircraft?

	#	%
NOISE/GENERAL/ANTI	28	13.9
NOISE/LESS	24	11.9
AIRPORT HERE	24	11.9
QUIETER POSSIBLE	18	9.0
LESS DISTURBING	17	8.5
NEED TO SLEEP	12	6.0
ANTI BIG PLANES	10	5.0
NOISE NOT PROBLEM	9	4.5
WHERE I LIVE	8	4.0
CURFEW NEEDED	7	3.5
NIGHT QUIET	7	3.5
ECONOMY/BUSINESS	5	2.5
ANTI PRIVATE PLANES	3	1.5
SAFETY/EMERGENCY	3	1.5
PASS. AIRCRAFT OK	2	1.0
TAKE-OFFS NOISIER	2	1.0
INSULATION WORKS	1	0.5
LANDINGS WORSE	1	0.5
COMPROMISE	1	0.5
POLLUTION	1	0.5
HOUSE/WINDOWS SHAKE	1	0.5
TV	1	0.5
FLIGHT DELAYS	-	-
STRICT NO NOISE	-	-
HOME WORTH MORE	-	-
NO LOOPHOLES	-	-

QUALITY OF LIFE	-	-
TOO MANY FLIGHTS	-	-
DK/RF/NA	16	8.0
COLUMN TOTALS	201	201

THIS QUESTION FOR RESPONDENTS WHO IN Q43 CHOSE PARTIAL CURFEW /2.
44B: Why would you most favor a PARTIAL CURFEW that would prohibit take-offs and allow landings?

	#	%
TAKE-OFFS NOISIER	23	18.5
NOISE NOT PROBLEM	10	8.1
NOISE/LESS	9	7.3
ECONOMY/BUSINESS	8	6.5
AIRPORT HERE	7	5.6
NOISE/GENERAL/ANTI	6	4.8
SAFETY/EMERGENCY	6	4.8
QUIETER POSSIBLE	5	4.0
FLIGHT DELAYS	5	4.0
LANDINGS WORSE	5	4.0
WHERE I LIVE	5	4.0
COMPROMISE	4	3.2
ANTI BIG PLANES	2	1.6
LESS DISTURBING	2	1.6
STRICT NO NOISE	2	1.6
NEED TO SLEEP	2	1.6
CURFEW NEEDED	1	0.8
QUALITY OF LIFE	1	0.8
PASS. AIRCRAFT OK	-	-
ANTI PRIVATE PLANES	-	-
INSULATION WORKS	-	-
HOME WORTH MORE	-	-
POLLUTION	-	-
NIGHT QUIET	-	-
NO LOOPHOLES	-	-
HOUSE/WINDOWS SHAKE	-	-
TOO MANY FLIGHTS	-	-
TV	-	-
DK/RF/NA	21	16.9
COLUMN TOTALS	124	124

44A-C: Why would you most favor a NOISE CURFEW prohibiting noisy aircraft, and allowing quiet aircraft?

	#	%
NOISE/GENERAL/ANTI	52	10.4
NOISE/LESS	46	9.2
NEED TO SLEEP	39	7.8
AIRPORT HERE	31	6.2
TAKE-OFFS NOISIER	27	5.4
QUIETER POSSIBLE	25	5.0
NIGHT QUIET	24	4.8
LESS DISTURBING	23	4.6
NOISE NOT PROBLEM	23	4.6
STRICT NO NOISE	22	4.4
WHERE I LIVE	20	4.0
ECONOMY/BUSINESS	14	2.8
CURFEW NEEDED	13	2.6
QUALITY OF LIFE	13	2.6
ANTI BIG PLANES	12	2.4
SAFETY/EMERGENCY	12	2.4
COMPROMISE	7	1.4
HOME WORTH MORE	7	1.4
POLLUTION	7	1.4
TV	7	1.4
ANTI PRIVATE PLANES	6	1.2
LANDINGS WORSE	6	1.2
FLIGHT DELAYS	5	1.0
NO LOOPHOLES	4	0.8
HOUSE/WINDOWS SHAKE	4	0.8
TOO MANY FLIGHTS	4	0.8
PASS. AIRCRAFT OK	2	0.4
INSULATION WORKS	1	0.2
DK/RF/NA	45	9.0
COLUMN TOTALS	501	501

44A-C: Why would you most favor a NOISE CURFEW prohibiting noisy aircraft, and allowing quiet aircraft?

	#	%
NOISE/GENERAL/ANTI	52	10.4
NOISE/LESS	46	9.2
NEED TO SLEEP	39	7.8
AIRPORT HERE	31	6.2
TAKE-OFFS NOISIER	27	5.4
QUIETER POSSIBLE	25	5.0
NIGHT QUIET	24	4.8
LESS DISTURBING	23	4.6
NOISE NOT PROBLEM	23	4.6
STRICT NO NOISE	22	4.4
WHERE I LIVE	20	4.0
ECONOMY/BUSINESS	14	2.8
CURFEW NEEDED	13	2.6
QUALITY OF LIFE	13	2.6
ANTI BIG PLANES	12	2.4
SAFETY/EMERGENCY	12	2.4
COMPROMISE	7	1.4
HOME WORTH MORE	7	1.4
POLLUTION	7	1.4
TV	7	1.4
ANTI PRIVATE PLANES	6	1.2
LANDINGS WORSE	6	1.2
FLIGHT DELAYS	5	1.0
NO LOOPHOLES	4	0.8
HOUSE/WINDOWS SHAKE	4	0.8
TOO MANY FLIGHTS	4	0.8
PASS. AIRCRAFT OK	2	0.4
INSULATION WORKS	1	0.2
DK/RF/NA	45	9.0
COLUMN TOTALS	501	501

THIS QUESTION ONLY FOR HOMEOWNERS.
45: Suppose TODAY you were about to buy your home -- or a similar home -- within, or near, this airport flight pattern. If your preferred, strictly enforced curfew JUST went into effect TODAY, how much MORE would you THEN be willing to pay to buy your home or a similar home?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
1)Zero	118	26.4
2)Under $5000	15	3.4
3)$5000-$9999	14	3.1
4)$10,000-$14,999	14	3.1
5)$15,999-$19,999	5	1.1
6)$20,000-$24,999	14	3.1
7)$25,000-$29,999	7	1.6
8)$30,000-$34,999	2	0.4
9)$35,000-$39,999	1	0.2
10)$40,000-$44,999	4	0.9
11)$45,000-$49,999	1	0.2
12)$50,000-$54,999	18	4.0
13)$55,000-$59,999	1	0.2
14)$60,000-$64,999	3	0.7
15)$65,000-$69,999	-	-
16)$70,000-$74,999	1	0.2
17)$75,000 Or MORE	15	3.4
Unsure/dk	214	47.9
COLUMN TOTALS	447	447
MEAN	233	4.4

45X: Suppose TODAY you were about to buy your home -- or a similar home -- within, or near, this airport flight pattern. If your preferred, strictly enforced curfew JUST went into effect TODAY, how much MORE would you THEN be willing to pay to buy your home or a similar home?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero	118	26.4
Under $10000	29	6.5
$10,000-$24,999	33	7.4
$25,000-$49,999	15	3.4
$50,000-$74,999	23	5.1
$75,000 Or MORE	15	3.4
Unsure/dk	214	47.9
COLUMN TOTALS	447	447

THIS QUESTION ONLY FOR HOMEOWNERS.
46A: A HIGHER sales price for your home probably means a HIGHER mortgage for whoever buys it. Do you understand this could mean a HIGHER monthly mortgage payment for whoever would be paying the mortgage?

	#	%
Yes	378	84.6
No	22	4.9
Unsure/dk	47	10.5
COLUMN TOTALS	447	447

THIS QUESTION ONLY FOR RENTERS.
46B: A reduction in airport noise could be reflected in a higher property value for the unit you rent. Do you understand that could mean a higher rent for whoever would be paying the rent?

	#	%
Yes	109	70.8
No	19	12.3
Unsure/dk	26	16.9
COLUMN TOTALS	154	154

THIS QUESTION ONLY FOR HOMEOWNERS.
47A: Suppose TODAY you were buying your home -- or a similar home -- within, or near, this airport flight pattern. If your preferred, strictly enforced curfew went into effect today, how much more you would you then be willing to pay in your monthly mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
1)Zero/None	150	33.6
2)Under $10 A Month	3	0.7
3)$10-$19 A Month	3	0.7
4)$20-$29 A Month	7	1.6
5)$30-$39 A Month	3	0.7
6)$40-$49 A Month	1	0.2
7)$50-$59 A Month	6	1.3
8)$60-$69 A Month	1	0.2
9)$70-$79 A Month	-	-
10)$80-$89 A Month	-	-
11)$90-$99 A Month	5	1.1
12)$100-$124 A Month	15	3.4
13)$125-$149 A Month	1	0.2
14)$150-$174 A Month	3	0.7
15)$175 A Month +	60	13.4
Unsure/dk	189	42.3
COLUMN TOTALS	447	447
MEAN	258	5.6

47AX: Suppose TODAY you were buying your home -- or a similar home -- within, or near, this airport flight pattern. If your preferred, strictly enforced curfew went into effect today, how much more you would you then be willing to pay in your monthly mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero/None	150	33.6
Under $50 A Month	17	3.8
$50-$99 A Month	12	2.7
$100-$174 A Month	19	4.3
$175 A Month +	60	13.4
Unsure/dk	189	42.3
COLUMN TOTALS	447	447

THIS QUESTION ONLY FOR RENTERS.
47B: Suppose TODAY you were renting your unit -- or a similar rental unit -- within, or near, this airport flight pattern. If your referred, strictly enforced curfew went into effect today, how much more would you then be willing to pay in rent?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
1)Zero/None	76	49.4
2)Under $10 A Month	2	1.3
3)$10-$19 A Month	4	2.6
4)$20-$29 A Month	4	2.6
5)$30-$39 A Month	1	0.6
6)$40-$49 A Month	2	1.3
7)$50-$59 A Month	8	5.2
8)$60-$69 A Month	-	-
9)$70-$79 A Month	1	0.6
10)$80-$89 A Month	-	-
11)$90-$99 A Month	1	0.6
12)$100-$124 A Month	6	3.9
13)$125-$149 A Month	1	0.6
14)$150-$174 A Month	2	1.3
15)$175 A Month +	8	5.2
Unsure/dk	38	24.7
COLUMN TOTALS	154	154
MEAN	116	3.7

47BX: Suppose TODAY you were renting your unit -- or a similar rental unit -- within, or near, this airport flight pattern. If your referred, strictly enforced curfew went into effect today, how much more would you then be willing to pay in rent?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero/None	76	49.4
Under $30 A Month	10	6.5
$30-$99 A Month	13	8.4
$100+ A Month	17	11.0
Unsure/dk	38	24.7
COLUMN TOTALS	154	154

47X: Suppose TODAY you were buying your home -- or a similar home -- within, or near, this airport flight pattern. If your preferred,

strictly enforced curfew went into effect today, how much more you would you then be willing to pay in your monthly mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
1)Zero/None	226	37.6
2)Under $10 A Month	5	0.8
3)$10-$19 A Month	7	1.2
4)$20-$29 A Month	11	1.8
5)$30-$39 A Month	4	0.7
6)$40-$49 A Month	3	0.5
7)$50-$59 A Month	14	2.3
8)$60-$69 A Month	1	0.2
9)$70-$79 A Month	1	0.2
10)$80-$89 A Month	-	-
11)$90-$99 A Month	6	1.0
12)$100-$124 A Month	21	3.5
13)$125-$149 A Month	2	0.3
14)$150-$174 A Month	5	0.8
15)$175 A Month +	68	11.3
Unsure/dk	227	37.8
COLUMN TOTALS	601	601
MEAN	374	5.0

THIS QUESTION ONLY FOR SAMPLE 1.
48A: For example, suppose your preferred curfew were in effect today and you were buying/renting your current home/apartment today. Would you be willing to pay an ADDITIONAL 50-dollars per month for a house payment/rent?

	#	%
Yes	88	44.0
No	85	42.5
Unsure/dk	27	13.5
COLUMN TOTALS	200	200
YES - NO	3	1.5

THIS QUESTION ONLY FOR SAMPLE 2.
48B: For example, suppose your preferred curfew were in effect today and you were buying/renting your current home/apartment today. Would you be willing to pay an ADDITIONAL 100-dollars per month for a house payment/rent?

	#	%
Yes	76	38.2
No	103	51.8
Unsure/dk	20	10.1
COLUMN TOTALS	199	199
BETTER - WORSE	-27	-13.6

THIS QUESTION ONLY FOR SAMPLE 3.
48C: For example, suppose your preferred curfew were in effect today and you were buying/renting your current home/apartment today. Would you be willing to pay an ADDITIONAL 150-dollars per month for a house payment/rent?

	#	%
Yes	52	25.7
No	116	57.4
Unsure/dk	34	16.8
COLUMN TOTALS	202	202
YES - NO	-64	-31.7

48X: For example, suppose your preferred curfew were in effect today and you were buying/renting your current home/apartment today. Would you be willing to pay an ADDITIONAL 50/100/150-dollars per month for a house payment/rent? 48A + 48B + 48C

	#	%
Yes	216	35.9
No	304	50.6
Unsure/dk	81	13.5
COLUMN TOTALS	601	601
YES - NO	-88	-14.6

THIS QUESTION ONLY FOR "YES" VOTERS IN Q48A.
49A: How about an additional $75 per month?

	#	%
Yes	56	63.6
No	28	31.8
Unsure/dk	4	4.5
COLUMN TOTALS	88	88
YES - NO	28	31.8

THIS QUESTION ONLY FOR "YES" VOTERS IN Q48B.
49B: How about an additional $125 per month?

	#	%
Yes	45	59.2
No	25	32.9
Unsure/dk	6	7.9
COLUMN TOTALS	76	76
YES - NO	20	26.3

THIS QUESTION ONLY FOR "YES" VOTERS IN Q48C.
49C: How about an additional $175 per month?

	#	%
Yes	28	53.8
No	20	38.5
Unsure/dk	4	7.7
COLUMN TOTALS	52	52
YES - NO	8	15.4

THIS QUESTION ONLY FOR "YES" VOTERS IN Q49A.
50A: How about an additional $100 per month?

	#	%
Yes	47	83.9
No	9	16.1
Unsure/dk	-	-
COLUMN TOTALS	56	56
YES - NO	38	67.9

THIS QUESTION ONLY FOR "YES" VOTERS IN Q49B.
50B: How about an additional $150 per month?

	#	%
Yes	25	55.6
No	17	37.8
Unsure/dk	3	6.7
COLUMN TOTALS	45	45
YES - NO	8	17.8

THIS QUESTION ONLY FOR "YES" VOTERS IN Q49C.
50C: How about an additional $200 per month?

	#	%
Yes	19	67.9
No	9	32.1
Unsure/dk	-	-
COLUMN TOTALS	28	28
YES - NO	10	35.7

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q48A.
51A: How about an additional $25 per month?

	#	%
Yes	7	6.3
No	77	68.8
Unsure/dk	28	25.0
COLUMN TOTALS	112	112
YES - NO	-70	-62.5

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q48B.
51B: How about an additional $75 per month?

	#	%
Yes	14	11.4
No	91	74.0
Unsure/dk	18	14.6
COLUMN TOTALS	123	123
YES - NO	-77	-62.6

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q48C.
51C: How about an additional $125 per month?

	#	%
Yes	2	1.3
No	119	79.3
Unsure/dk	29	19.3
COLUMN TOTALS	150	150
YES - NO	-117	-78.0

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q51A.
52A: How about an additional $15 per month?

	#	%
Yes	8	7.6
No	68	64.8
Unsure/dk	29	27.6
COLUMN TOTALS	105	105
YES - NO	-60	-57.1

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q51B.
52B: How about an additional $50 per month?

	#	%
Yes	10	9.2
No	80	73.4
Unsure/dk	19	17.4
COLUMN TOTALS	109	109
YES - NO	-70	-64.2

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q51C.
52C: How about an additional $100 per month?

	#	%
Yes	9	6.1
No	111	75.0
Unsure/dk	28	18.9
COLUMN TOTALS	148	148
YES - NO	-102	-68.9

52X: Combines all three samples and all payment questions. What is the highest amount you would be willing to pay?

	#	%
1 $15	8	1.3
2 $25	7	1.2
3 $50	42	7.0
4 $75	23	3.8
5 $100	87	14.5
6 $125	22	3.7
7 $150	49	8.2
8 $175	9	1.5
9 $200	19	3.2
10 No	259	43.1
11 Unsure	76	12.6
COLUMN TOTALS	601	601

THIS QUESTION ASKED ONLY OF HOMEOWNERS WHO ANSWERED "ZERO" IN Q47A AND ALSO DID NOT ANSWER "YES" TO A SINGLE QUESTION IN 48-52 SERIES.
53A: We talked about a curfew that would significantly reduce noise between the hours of 10PM at night and 7AM in the morning. Why do you feel that the value of this noise reduction is ZERO for you, as a homeowner? [ANYTHING SAID: ENTER 1 AND RECORD ON NEXT SCREEN!]

	#	%
NOISE NOT PROBLEM	25	41.0
AIRP. SHLD RESLVE	8	13.1
WON'T PAY MORE	7	11.5
NOISE IS PROBLEM	6	9.8
AIRPORT RESOLVING	5	8.2
WON'T AFF. PRICE	3	4.9
PERSONAL REASONS	3	4.9
Won't Pay More	-	-
NOT RELEVANT	4	6.6
REFUSE	-	-
COLUMN TOTALS	61	61

THIS QUESTION ASKED ONLY OF RENTERS WHO ANSWERED "ZERO" IN Q47B AND ALSO DID NOT ANSWER "YES" TO A SINGLE QUESTION IN 48-52 SERIES.
53B: We talked about a curfew that would significantly reduce noise between the hours of 10PM at night and 7AM in the morning. Why do you feel that the value of this noise reduction is ZERO for you, as a renter? [ANYTHING SAID: ENTER 10 AND RECORD ON NEXT SCREEN!]

	#	%
NOISE NOT PROBLEM	13	40.6
WON'T PAY MORE	7	21.9
NOISE IS PROBLEM	3	9.4
AIRP. SHLD RESLVE	3	9.4
WON'T AFF. PRICE	2	6.3
PERSONAL REASONS	2	6.3
AIRPORT RESOLVING	1	3.1
Won't Pay More	-	-
NOT RELEVANT	1	3.1
REFUSE	-	-
COLUMN TOTALS	32	32

THIS QUESTION ONLY FOR HOMEOWNERS WHO WERE ASKED Q53A.
54A: Suppose someone were buying your home TODAY. If an enforced curfew were in effect, how much MORE per month do you believe someone would pay in a mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero [DNR]	35	32.4
Under $10 A Month	1	0.9
$10-$19.99 A Month	2	1.9

$20-$29.99 A Month	-	-
$30-$39.99 A Month	-	-
$40-$49.99 A Month	-	-
$50-$59.99 A Month	2	1.9
$60-$69.99 A Month	-	-
$70-$79.99 A Month	-	-
$80-$89.99 A Month	-	-
$90-$99.99 A Month	2	1.9
$100-$124 A Month	3	2.8
$125-$149 A Month	-	-
$150-$174.99 A Month	-	-
$175 A Month Or More	5	4.6
Unsure/dk	58	53.7
COLUMN TOTALS	108	108
MEAN	50	3.8

THIS QUESTION ONLY FOR RENTERS WHO WERE ASKED Q53B.
54B: Suppose someone were renting your apartment TODAY. If an enforced curfew were in effect, how much MORE per month do you believe someone would pay in rent?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero [DNR]	20	29.9
Under $10 A Month	1	1.5
$10-$19.99 A Month	-	-
$20-$29.99 A Month	-	-
$30-$39.99 A Month	-	-
$40-$49.99 A Month	1	1.5
$50-$59.99 A Month	2	3.0
$60-$69.99 A Month	-	-
$70-$79.99 A Month	1	1.5
$80-$89.99 A Month	1	1.5
$90-$99.99 A Month	-	-
$100-$124 A Month	5	7.5
$125-$149 A Month	-	-
$150-$174 A Month	2	3.0
$175 A Month Or More	3	4.5
Unsure/dk	31	46.3
COLUMN TOTALS	67	67
MEAN	36	5.4

THIS QUESTION ONLY FOR HOMEOWNERS.
55A: Has your home been acoustically treated, or sound-insulated, under the Airport Authority's residential acoustical treatment program?

	#	%
Yes	127	28.4
No	286	64.0
Unsure/dk	34	7.6
COLUMN TOTALS	447	447
YES - NO	-159	-35.6

THIS QUESTION ONLY FOR RENTERS.
55B: Has your apartment been acoustically treated, or sound-insulated, under the Airport Authority's residential acoustical treatment program?

	#	%
Yes	16	10.4
No	113	73.4
Unsure/dk	25	16.2
COLUMN TOTALS	154	154
YES - NO	-97	-63.0

57: How many people, including yourself, currently live in your household?

	#	%
One-Two	256	42.6
Three-Four	221	36.8
Five-Six	77	12.8
Seven+	17	2.8
COLUMN TOTALS	601	601
One-Four	477	79.4
Five +	94	15.6
Refuse/Unsure/dk	30	5.0

58: Does your household include children 18 or under?

	#	%
Yes	223	37.1
No	356	59.2
Refuse	22	3.7
COLUMN TOTALS	601	601

59: Was this study completed in ENGLISH or SPANISH?

	#	%
ENGLISH	540	89.9
SPANISH	61	10.1
COLUMN TOTALS	601	601

*** Proprietary computer programming capability supports interviewers to assure that, where appropriate and programmed, question sequences are rotated and categories within questions are rotated. This means, regardless of the sequence shown in this printout, that if a series of questions is programmed for rotation, they are asked in rotated order. Similarly, within a question, even if an interviewer instruction shows read list, the items in the list are programmed to be rotated. ***

ATTACHMENT 2

Results of Contingent Value Survey in Van Nuys Airport Area
November 2007

1: Days of Week

	#	%
Thursday 11-8	2	11.8
Friday 11-9	--	--
Saturday 11-10	--	--
Sunday 11-11	3	17.6
Monday 11-12	2	1.8
Tuesday 11-13	--	--
Wednesday 11-14	--	--
Thursday 11-15	--	--
Friday 11-16	--	--
Saturday 11-17	--	--
Sunday 11-18	1	5.9
Monday 11-19	3	17.6
Tuesday 11-20	--	--
Wednesday 11-21	--	--
Friday 11-23	--	--
Saturday 11-24	1	5.9
Sunday 11-25	1	5.9
Monday 11-26	3	17.6
Tuesday 11-27	1	5.9
COLUMN TOTALS	17	17

13: Language Version

	#	%
English Version	12	70.6
Spanish Version	5	29.4
COLUMN TOTALS	17	17

15: Household -- Single versus Multiple

	#	%
Single Voter	3	17.6
Multiple Voter	14	82.4
COLUMN TOTALS	17	17

20: AGE/BIRTHYEAR
[20X = <50; 50+>]

	#	%
1. Age 18-34	1	5.9
2. Age 35-49	4	23.5
3. Age 50-64	6	35.3
4. Age 65+	6	35.3
Age <50	5	29.4
Age 50+	12	70.6
COLUMN TOTALS	17	17
MEAN	17	3.0

22: Sex

	#	%
Male	9	52.9
Female	8	47.1
COLUMN TOTALS	17	17

23: In just TWO or THREE words, what's the main issue facing your local community?
[NOISE/PROBE:] What kind of noise? <Code 1/2>
[AIRPORT NOISE:] <Must code 2.>
[AIRPORT/AIRPLANES/AIRPORT-RELATED:]
Can you be more specific? <Must code 2/3>

	#	%
NOISE-NOT Airport	--	--
AIRPORT NOISE	--	--
AIRPORT-RELATED	--	--
TOTAL AIRPORT	--	--
Other mentions	13	76.5
No problems	2	11.8
Don't know/Refuse	2	11.8
COLUMN TOTALS	17	17

The closest airport is Van Nuys Airport.
24: A flight pattern means the airspace that is used by aircraft to take off from, or to land at, an airport. Thinking about this airport -- do you know -- do you live:
INTERVIEWER: Read Statement
ROTATE 1-2, READ 3 LAST.

	#	%
WITHIN Flight Ptrn	6	35.3
NEAR Flight Pattern	11	64.7
Neither	--	--
Unsure/dk	--	--
COLUMN TOTALS	17	17
WITHIN - NEAR	-5	-29.4

25: When you think about AIRCRAFT NOISE noise related to this airport, has this situation, over the last few years, generally:
INTERVIEWER: Read Statement
ROTATE 1-2

	#	%
Become BETTER	3	17.6
Become WORSE	7	41.2
Stayed The Same	6	35.3
Unsure/dk	1	5.9
COLUMN TOTALS	17	17
BETTER - WORSE	-4	-23.5

26: When it comes to you -- or to ANYONE living in your household, is aircraft noise related to this airport a problem?
[YES, ask:] At any particular time?
[PROBE:] Any other time?
(OK TO CODE MORE THAN ONE: 1-6]
[Yes, all the time = Code 7]
[Yes, but can't say what time = Code 8]
[NO: Code 13.]
[UNSURE if problem: Code 99.]
[NO: Code 13.]
OKAY TO CODE MORE THAN ONE.
INITIAL "YES" RESPONSE, THEN CANNOT CODE 13 OR 99.
INITIAL "NO" RESPONSE = CODE 13.
CODE 7 MEANS CANNOT CODE 1-6.

	#	%
Yes/Before 7AM	2	11.8

Yes/7AM-to-12:00	3	17.6
Yes/12:00-to-5PM	3	17.6
Yes/5PM-to-10PM	4	23.5
Yes/10PM-To12PM	--	--
Yes/Mdnght And Ltr	--	--
Yes/ALL THE TIME	3	17.6
Yes/BUT DK What Time	2	11.8
TOTAL YES	14	82.4
NO/NOT A Problem	3	17.6
Refuse/Unsure/dk	--	--
COLUMN TOTALS	17	17

26X: When it comes to you -- or to ANYONE living in your household, is aircraft noise related to this airport a problem?

	#	%
Yes/7AM-to-10PM	8	47.1
Yes/10PM-to-7AM	2	11.8
Other Yes	5	29.4
NO/NOT A Problem	3	17.6
Refuse/Unsure/dk	--	--
COLUMN TOTALS	17	17

27: Do you personally ever hear AIRCRAFT noise between the hours of 10PM at night and 7AM in the morning? "[NO=code 2.]"

	#	%
Yes/Hear Noise	9	52.9
No/Do NOT Hear Noise	7	41.2
Refuse/Unsure/dk	1	5.9
COLUMN TOTALS	17	17
YES - NO	2	11.8

THIS QUESTION ONLY FOR "YES" AND "99" RESPONDENTS IN PRIOR QUESTION/Q27.
28: Between these hours of 10PM at night and 7AM in the morning, are you ever actually awakened from your sleep by this aircraft noise?

	#	%
Yes/Awakened	8	80.0
No/NOT Awakened	2	20.0
Refuse/Unsure/dk	--	--
COLUMN TOTALS	10	10
YES - NO	6	60.0

28X: Between these hours of 10PM at night and 7AM in the morning, are you ever actually awakened from your sleep by this aircraft noise?

	#	%
Yes/Awakened	8	47.1
No/NOT Awakened	2	11.8
Refuse/Unsure/dk	--	--
No/Do NOT Hear Noise	7	41.2
COLUMN TOTALS	17	17

THIS QUESTION ONLY FOR "YES" RESPONDENTS IN PRIOR QUESTION/Q28.
29: How often are you actually awakened by this aircraft noise?
[DO NOT PROMPT!: IF RESPONSES ARE NOT 1-7, THEN CODE PRINT RESPONSE, "UNSURE" RESPNSE = CODE "99" ...THEN ASKED Q30.]

	#	%
7. Mre Thn Once/Nght	--	--
6. Every Night	--	--
5. 2/3 Times A Week	1	12.5
4. Weekly	2	25.0
3. Few Times A Month	--	--
2. Monthly	2	25.0
1. Rarely	2	25.0
Other Response	--	--
Unsure/dk	1	12.5
COLUMN TOTALS	8	8
MEAN	7	2.7

29X: How often are you actually awakened by this aircraft noise?

	#	%
More than Weekly	1	12.5
More than Monthly	2	25.0
Monthly/Rarely	4	50.0
Other/Unsure	1	12.5
COLUMN TOTALS	8	8

30: Are you awakened by such aircraft noise...: more than once every night, every night, two or three times a week, weekly, a few times a month, monthly, or rarely?
THIS QUESTION ONLY FOR PRIOR QUESTION/Q29 RESPONDENTS WHO ARE "UNSURE" ("99").

	#	%
7. Mre Thn Once/Nght	--	--
6. Every Night	--	--
5. 2/3 Times A Week	1	100.0
4. Weekly	--	--
3. Few Times A Month	--	--
2. Monthly	--	--
1. Rarely	--	--
Other Response	--	--
Still Unsure/dk	--	--
COLUMN TOTALS	1	1
MEAN	1	5.0

29+30: How often are you actually awakened by this aircraft noise?

	#	%
7. Mre Thn Once/Nght	--	--
6. Every Night	--	--
5. 2/3 Times A Week	2	25.0
4. Weekly	2	25.0
3. Few Times A Month	--	--
2. Monthly	2	25.0
1. Rarely	2	25.0
Other Response	--	--
Unsure/dk	--	--
COLUMN TOTALS	8	8
MEAN	8	3.0

31: Do you believe Van Nuys Airport should PROHIBIT, or should NOT prohibit, flights between the hours of 10PM at night and 7AM in the morning?

	#	%
YES/SHOULD	13	76.5
NO/Should NOT	3	17.6
Unsure/dk	1	5.9
COLUMN TOTALS	17	17
YES - NO	10	58.8

36: For statistical purposes: Do you own your home or do you rent?

	#	%
Own/[HME OR CNDO]	15	88.2
Rent/[APRTMNT/HME]	2	11.8
Refuse/dk	--	--
COLUMN TOTALS	17	17

THIS QUESTION ONLY FOR HOMEOWNERS.
37A: Where you live is within, or near, the airport flight pattern. If your home were NOT within, or near, the flight pattern, do you believe your home would be worth more?

	#	%
YES/Worth MORE	9	60.0
NO/NOT Worth More	3	20.0
Unsure/dk	3	20.0
COLUMN TOTALS	15	15
YES - NO	6	40.0

THIS QUESTION ONLY FOR RENTERS.
37B: Where you live is within, or near, the airport flight pattern. If your rental unit were NOT within, or near, the flight pattern, do you believe your rental unit would be worth MORE to its owner?

	#	%
YES/Worth MORE	1	50.0
NO/NOT Worth More	1	50.0
Unsure/dk	--	--
COLUMN TOTALS	2	2
YES - NO	--	--

37X: Where you live is within, or near, the airport flight pattern. If your home/rental unit were NOT within, or near, the flight pattern, do you believe your home/rental unit would be worth more? (37A + 37B)

	#	%
YES/Worth MORE	10	58.8
NO/NOT Worth More	4	23.5
Unsure/dk	3	17.6
COLUMN TOTALS	17	17
YES - NO	6	35.3

38: In the overnight hours, that is, between 10 PM at night and 7 AM the next morning: approximately 90 flights currently go in, or out of, Van Nuys Airport. How aware are you about this information?

	#	%
NOT Aware	10	58.8
SOMEWHAT Aware	3	17.6
VERY Aware	4	23.5
Unsure/Don't Know	--	--
COLUMN TOTALS	17	17

THIS QUESTION ONLY FOR HOMEOWNERS.
39: Suppose TODAY you were about to buy your home—or a similar home—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much MORE would you THEN be willing to pay to buy your home or a similar home? INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

		#	%
1)	Zero	4	26.7
2)	Under $5000	--	--
3)	$5000-$9999	--	--
4)	$10,000-$14,999	--	--
5)	$15,999-$19,999	--	--
6)	$20,000-$24,999	--	--
7)	$25,000-$29,999	--	--
8)	$30,000-$34,999	1	6.7
9)	$35,000-$39,999	--	--
10)	$40,000-$44,999	--	--
11)	$45,000-$49,999	--	--
12)	$50,000-$54,999	--	--
13)	$55,000-$59,999	--	--
14)	$60,000-$64,999	--	--
15)	$65,000-$69,999	--	--
16)	$70,000-$74,999	--	--
17)	$75,000 Or MORE	1	6.7
Unsure/dk		9	60.0
COLUMN TOTALS		15	15
MEAN		6	4.8

THIS QUESTION ONLY FOR HOMEOWNERS.
39X: Suppose TODAY you were about to buy your home—or a similar home—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much MORE would you THEN be willing to pay to buy your home or a similar home? INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

	#	%
Zero	4	26.7
Under $10000	--	--
$10,000-$24,999	--	--
$25,000-$49,999	1	6.7
$50,000-$74,999	--	--
$75,000 Or MORE	1	6.7
Unsure/dk	9	0.0
COLUMN TOTALS	15	15

THIS QUESTION ONLY FOR HOMEOWNERS.
40A: A HIGHER sales price for your home probably means a HIGHER mortgage for whoever buys it. Do you understand this could mean a HIGHER monthly mortgage payment for whoever would be paying the mortgage?

	#	%
Yes	13	86.7
No	1	6.7
Unsure/dk	1	6.7
COLUMN TOTALS	15	15

THIS QUESTION ONLY FOR RENTERS.
40B: A reduction in airport noise could be reflected in a higher property value for the unit you rent. Do you understand this could mean a higher rent for whoever would be paying the rent?

	#	%

Yes	1	50.0
No	--	--
Unsure/dk	1	50.0
COLUMN TOTALS	2	2

41A: Suppose TODAY you were buying your home—or a similar home—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much more would you then be willing to pay in your monthly mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

		#	%
1)	Zero/None	10	66.7
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	--	--
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	--	--
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	2	13.3
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	1	6.7
Unsure/dk		2	13.3
COLUMN TOTALS		15	15
MEAN		13	3.8

41AX: Suppose TODAY you were buying your home—or a similar home—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much more would you then be willing to pay in your monthly mortgage payment?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

	#	%
Zero/None	10	66.7
Under $50 A Month	--	--
$50-$99 A Month	--	--
$100-$174 A Month	2	13.3
$175 A Month +	1	6.7
Unsure/dk	2	13.3
COLUMN TOTALS	15	15

41B: Suppose TODAY you were renting your unit—or a similar rental unit—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much more would you then be willing to pay in rent?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

		#	%
1)	Zero/None	1	50.0
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	--	--
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	1	50.0
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	--	--
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	--	--
Unsure/dk		--	--
COLUMN TOTALS		2	2
MEAN		2	3.5

41BX: Suppose TODAY you were renting your unit—or a similar rental unit—within, or near, this airport flight pattern. If you could LIMIT flights between 10PM and 7AM to the current 90-flight average, that is, avoid ADDITIONAL flights each overnight, how much more would you then be willing to pay in rent?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

	#	%
Zero/None	1	50.0
Under $50 A Month	1	50.0
$50-$99 A Month	--	--
$100-$174 A Month	--	--
$175 A Month +	--	--
Unsure/dk	--	--
COLUMN TOTALS	2	2

41X: 41A+41B

		#	%
1)	Zero/None	11	64.7
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	--	--
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	1	5.9
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	2	11.8
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	1	5.9
Unsure/dk		2	11.8
COLUMN TOTALS		17	17
MEAN		15	3.7

42: To AVOID.FIVE more flights that would make 95 in total each overnight?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

		#	%
1)	Zero/None	13	76.5
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	--	--
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	1	5.9
7)	$50-$59 A Month	--	--

8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	--	--
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	1	5.9
Unsure/dk		2	11.8
	COLUMN TOTALS	17	17
MEAN		15	2.3

43: To AVOID.TEN more flights that would make 100 in total each overnight?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS.

		#	%
1)	Zero/None	13	76.5
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	1	5.9
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	--	--
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	--	--
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	2	11.8
Unsure/dk		1	5.9
	COLUMN TOTALS	17	17
MEAN		16	2.9

44: To AVOID.FIFTEEN more flights that would make 105 in total each overnight?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

		#	%
1)	Zero/None	13	76.5
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	1	5.9
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	--	--
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	--	--
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	2	11.8
Unsure/dk		1	5.9
	COLUMN TOTALS	17	17
MEAN		16	2.9

45: To AVOID.TWENTY more flights that would make 110 in total each overnight?
INTERVIEWER: DO NOT PROMPT WITH DOLLAR AMOUNTS

		#	%
1)	Zero/None	12	70.6
2)	Under $10 A Month	--	--
3)	$10-$19 A Month	--	--
4)	$20-$29 A Month	1	5.9
5)	$30-$39 A Month	--	--
6)	$40-$49 A Month	--	--
7)	$50-$59 A Month	--	--
8)	$60-$69 A Month	--	--
9)	$70-$79 A Month	--	--
10)	$80-$89 A Month	--	--
11)	$90-$99 A Month	--	--
12)	$100-$124 A Month	1	5.9
13)	$125-$149 A Month	--	--
14)	$150-$174 A Month	--	--
15)	$175 A Month +	1	5.9
Unsure/dk		2	11.8
	COLUMN TOTALS	17	17
MEAN		15	2.9

46: Let's talk about a SPECIFIC dollar amount to AVOID more flights added to the current 90 each overnight. If you were BUYING your current home/RENTING your current apartment today… would you be willing to pay an ADDITIONAL 100 dollars per month for a house payment/in rent to avoid TEN more flights each overnight?

	#	%
Yes	3	17.6
No	14	82.4
Unsure/dk	--	--
COLUMN TOTALS	17	17
YES - NO	-11	-64.7

THIS QUESTION ONLY FOR "YES" VOTERS IN Q46.
47: How about an additional $125 per month?

	#	%
Yes	2	66.7
No	1	33.3
Unsure/dk	--	--
COLUMN TOTALS	3	3
YES - NO	1	33.3

THIS QUESTION ONLY FOR "YES" VOTERS IN Q47.
48: How about an additional $150 per month?

	#	%
Yes	2	100.0
No	--	--
Unsure/dk	--	--
COLUMN TOTALS	2	2
YES - NO	2	100.0

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q46.
49: How about an additional $75 per month?

	#	%
Yes	1	7.1
No	13	92.9
Unsure/dk	--	--
COLUMN TOTALS	14	14
YES - NO	-12	-85.7

THIS QUESTION ONLY FOR "NO" OR "UNSURE" VOTERS IN Q49.
50: How about an additional $50 per month?

	#	%
Yes	--	--

No	13	100.0
Unsure/dk	--	--
COLUMN TOTALS	13	13
YES - NO	-13	100.0

50x: 46-50 Combined Let's talk about a SPECIFIC $ amount to AVOID more flights added to the current 90 each overnight. If you were BUYING your current home/RENTING your current apartment today… would you be willing to pay an ADDITIONAL ???-dollars per month for a house payment/in rent to avoid TEN more flights each overnight?

	#	%
No	13	76.5
$50	--	--
$75	1	5.9
$100	1	5.9
$125	--	--
$150	2	11.8
COLUMN TOTALS	17	17

51: How long have you lived at your present address?

	#	%
5 Years Or Less	3	17.6
6-9 Years	2	11.8
10-14 Years	2	11.8
15-19 Years	--	--
20-24 Years	4	23.5
25+ Years	6	35.3
Refuse/dk	--	--
COLUMN TOTALS	17	17
MEAN	17	4.1

51X: How long have you lived at your present address?

	#	%
9 Years Or Less	5	29.4
10-19 Years	2	11.8
20+ Years	10	58.8
Refuse/dk	--	--
COLUMN TOTALS	17	17

52: Does your household include children 18 or under?

	#	%
Yes	5	29.4
No	12	70.6
Refuse	--	--
COLUMN TOTALS	17	17

53: How many people, including yourself, current household?

	#	%
One	4	23.5
Two	5	29.4
Three	2	11.8
Four	4	23.5
Five	--	--
Six	1	5.9
Seven	1	5.9
Eight Or More	--	--
One-Two	9	52.9
Three-Four	6	35.3
Five-Six	1	5.9
Seven+	1	5.9
One-Four	15	88.2
Five +	2	11.8
Refuse/Unsure/dk	--	--
COLUMN TOTALS	17	17
MEAN	17	2.9

*** Proprietary computer programming capability supports interviewers to assure that, where appropriate and programmed, question sequences are rotated and categories within questions are rotated. This means, regardless of the sequence shown in this printout, that if a series of questions is programmed for rotation, they are asked in rotated order. Similarly, within a question, even if an interviewer instruction shows read list, the items in the list are programmed to be rotated. Although respondents may be read a set of rotated full-length categories, the rotated categories shown here are in abbreviated text. ***