

Manhattan
Regional
Airport

Manhattan Regional Airport

Airport Noise and Land Use Compatibility Planning Study

Prepared for:
City of Manhattan, Kansas

Prepared by:
HNTB Corporation

July 2010

HNTB



**Manhattan Regional Airport Noise and Land Use Compatibility Study:
Rationale for Redesignation of Draft Part 150 Study**

In 2007, the City of Manhattan, Kansas received a FAR Part 150 Noise Compatibility Study Grant from the Federal Aviation Administration (FAA) to undertake a Part 150 Study at Manhattan Regional Airport. The Part 150 grant money was requested to help ensure maintenance of compatible land use and promote protection of compatible land use in the future. The Part 150 Study continued through 2009 when a draft Part 150 was submitted to the FAA in accordance with Title 14 CFR Part 150. The draft included Noise Exposure Maps (NEMs) and a Noise Compatibility Program (NCP) with recommended noise abatement, land use, and continuing program measures. NEMs were developed for the baseline condition/year of submission (2009), the future condition (2014), and were supplemented by a future scenario (2027) to promote the protection of compatible land uses due to significant growth and changes underway or anticipated in Manhattan and nearby communities.

Following the submittal of the draft Part 150 Study to the FAA in November 2009 and receipt of comments in June 2010, the FAA and the Airport Sponsor determined that it would not be cost beneficial to complete the Part 150 Study and obtain a Record of Approval (ROA) from the FAA for the following reasons:

- There are no incompatible land uses within the current (2009) or future (2014) 65 DNL noise contours, and therefore are no recommended *Corrective* measures that would be eligible for consideration of future Airport Improvement Program (AIP) funding.
- Due to the unexpected acceleration of projects to extend Runway 13-31 by 1,200 feet and shift Runway 3-21 by 400 feet, the noise and land use analysis conducted at MHK for the Part 150 would not account for this change in runway length and configuration that would exist at the time of the completed Part 150 Record of Approval.

The NEMs were updated in July 2010 to reflect the updated runway configuration (to be complete in late Summer 2010). Although the NEM graphics have been updated to reflect the current length of Runway 13-31 and the shifting of Runway 3-21, the document text still reflects the findings of the previous analysis. To update the text and reinitiate the review process and approval with the FAA would not have been cost beneficial given that the recommended noise and land use measures would not be eligible for FAA funding or grant assistance. Therefore, the document still refers to the Part 150 Study although the type of the document has changed.

Therefore, the FAA and the Airport Sponsor agreed to amend the FAR Part 150 Noise Compatibility Study Grant. In accordance with Special Condition 12 of AIP Grant No. 3-20-0052-32-2007 for the Manhattan Regional Airport Part 150, the FAA recommended that the grant agreement originally executed on June 5, 2007, be amended as follows:

The Grant description and scope is changed from “Conduct FAR Part 150 Noise Compatibility Study” to “Airport Noise and Land Use Compatibility Planning Study.”

Due to the modification from a Part 150 Study to an *Airport Noise and Land Use Compatibility Study*, the opportunity for a public hearing will no longer be provided and no additional FAA-sponsored opportunities for public input regarding this study will occur.

Although the final *Airport Noise and Land Use Compatibility Study* is not acceptable for the purposes of 14 CFR Part 150, the data and analysis in the document remain applicable to future noise and land use planning in and around Manhattan Regional Airport. The recommended noise abatement measures may be implemented by the airport sponsor on a voluntary basis or as “good neighbor” procedures with the pilots after coordination and agreement with the local air traffic control personnel. The study also recommends beneficial land use measures that may be implemented by local jurisdictions to help prevent compatibility issues with noise and land use in the future. Finally, recommended program measures may be implemented by the airport sponsor in terms of community involvement.

The FAA letter with agreement to amend the grant from a Part 150 Study to an *Airport Noise and Land Use Compatibility Planning Study* follows.



U.S. Department
of Transportation

**Federal Aviation
Administration**

Central Region
Iowa, Kansas,
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Kansas City, Missouri 64106
(816) 329-2600

July 2, 2010

Mr. Peter VanKuren
Airport Manager
City of Manhattan
5500 Fort Riley Blvd.
Suite 120
Manhattan, KS 66502

Dear Mr. VanKuren:

Manhattan Regional Airport
Manhattan, Kansas
AIP Grant No. 3-20-0052-32-2007
Letter Amendment No. 1 – Description and Scope Change

As we discussed in our phone conversation with your consultant, HNTB, on the afternoon of June 17, 2010, and as we discussed on July 1, 2010, we have agreed to amend the grant. In accordance with Special Condition 12 of the above-captioned project grant agreement, the Federal Aviation Administration (FAA), acting for and on behalf of the United States, has determined it to be in the best interest of the United States of America and the City of Manhattan that the grant agreement executed June 5, 2007, be amended as follows:

- 1) The Grant description and scope is changed from “Conduct FAR Part 150 Noise Compatibility Study” to “Airport Noise and Land Use Compatibility Planning Study”.
- 2) The opportunity for a public hearing is deleted from the scope.
- 3) A copy of the revised final study will be submitted to the FAA, and the final study will include maps with a useable scale, i.e., 1”=2,000’.
- 4) Upon receipt of the final study, the FAA will issue an acceptance letter.

As we agreed, the description and scope is changed without any additional financial obligation of the United States under the provisions of Title 49, United States Code. The FAA obligates \$0, resulting in an unchanged financial obligation for the original agreement of \$219,181. Under the terms of the grant agreement, this document is incorporated into, and constitutes Amendment No. 1 of the above-referenced grant agreement.

As we discussed, the study recommends beneficial noise abatement measures that the airport sponsor may implement on a voluntary basis after coordination and agreement with the local air traffic control personnel. The study also recommends beneficial land use measures that may be

implemented by the local authorities having jurisdiction over those matters. Lastly, the study recommends program measures that the airport sponsor may implement in regards to its community involvement, as well as the consideration of future updates to airport noise and compatible land use planning.

There are not any recommended measures that require the FAA to issue a Record of Approval in accordance with 14 CFR Part 150, which would make the proposed measures eligible for consideration of future Airport Improvement Program (AIP) funding. All of the recommended measures may be implemented at the discretion of the airport sponsor and the local authorities having jurisdiction. While most of the study process was conducted in accordance with 14 CFR Part 150, the final "Airport Noise and Land Use Compatibility Planning Study" will not meet the requirements of 14 CFR Part 150, nor be acceptable for the purposes of 14 CFR Part 150.

That is not to say that the study is without merit. On the contrary, the final study provides the airport sponsor with many beneficial measures that the airport sponsor and the local authorities having jurisdiction may implement for airport noise and compatible land use planning in the airport environs.

If you have any questions, or wish to discuss further, please contact me at 816-329-2640, or send me an email message at todd.madison@faa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd M. Madison". The signature is written in a cursive, flowing style with a large initial "T".

Todd M. Madison, P.E.
Airport Capacity Program Manager

cc: Ms. Gayle Townsend, FAA Central Region Attorney, ACE-7
Ms. Kim Hughes, HNTB
Mr. Brian Tompkins, HNTB
Mr. Jeff Deitering, ACE-611D

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Chapter One

INTRODUCTION

Title 14 of the Code of Federal Regulations (CFR) Part 150, “Airport Noise Compatibility Planning,” sets forth standards for airport operators to use in documenting noise exposure in airport environs and establishing programs to minimize aircraft noise and land use non-compatibilities. FAA Advisory Circular 150/5020-1, “Noise Control and Compatibility Planning,” establishes the framework for conducting Part 150 studies, and notes that the goal of the study process is “to develop a balanced and cost-effective program to minimize and/or mitigate the airport’s noise impact on local communities.”

This chapter provides an introduction to the 14 CFR Part 150 regulations in Section 1.1. Section 1.2 describes the organization of the report. Section 1.3 discusses the organizations that had major roles and responsibilities in the study update process. Study goals are discussed in Section 1.4.

1.1 14 CFR PART 150

14 CFR Part 150 (typically referred to as Part 150 within this Study) prescribes specific standards for the following:

- measuring aircraft noise,
- estimating cumulative aircraft noise exposure using computer models,
- describing aircraft noise exposure (including instantaneous, single event and cumulative levels),
- coordinating Noise Compatibility Program (NCP) development with local land use officials and other interested parties,
- documenting the analytical process and development of the compatibility program,
- submitting documentation to FAA,
- FAA and public review processes, and
- FAA approval or disapproval of the submission.

A full Part 150 submission to FAA consists of two elements: Noise Exposure Maps (NEM) and a NCP.

1.1.1 Noise Exposure Maps

NEMs describe the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs, and the resulting aircraft noise and land use compatibility status. NEMs must address two time frames: the year of submission (the “existing condition”) and a year a minimum of five years following the year of submission (the “forecast condition”). NEMs include graphic depictions of existing and forecast (i.e, future) noise exposure levels resulting from aircraft operations and land uses in the airport environs. The NEM documentation must describe the data collection and analyses undertaken in its development.

Forecasts developed for the Airport Master Plan were used for this Part 150 Study (referred to as the “Study” in this document). Forecasts were developed with the existing condition as 2009 and the forecast condition as 2014. Additionally this Study includes forecast conditions for 2027 as an extended potential future look at the noise environment, so as to enable the local planners to protect the land uses that can be affected due to expected growth at the Airport.

1.1.2 Noise Compatibility Program

The NCP is essentially a list of the actions the airport proprietor, airport users, local governments, and FAA propose to undertake to minimize existing and future aircraft noise and land use incompatibility. The NCP documentation must recount the development of the program, including a description of all measures considered, the reasons that individual measures were accepted or rejected, how measures will be implemented and funded, and the predicted effectiveness of individual measures and the overall program.

The development of an NCP begins with an evaluation of all reasonable, feasible actions that could reduce potential land use incompatibilities identified in the NEMs. Part 150 specifies the range of alternatives that must be considered, including land acquisition, sound barriers, soundproofing of public buildings, preferential runway use, flight procedures, restrictions on the type/class of aircraft, and other actions or FAA recommendations that may provide benefits. Although Part 150 requires that these types of measures must be evaluated, it does not mandate adoption or implementation of the measures.

There are three categories of NCP measures, as described in the following paragraphs:

Noise abatement measures seek changes to operational flight procedures to reduce the size or change the shape of the noise contours so as to minimize incompatibilities. Noise abatement alternatives consider changes to runway use, flight track use, and other operational procedures that determine where aircraft fly in the immediate vicinity of the Airport.

Land use measures address areas of existing and future land use incompatibility that remain after the implementation of the noise abatement measures. The land use measures are intended to correct existing incompatible land uses and prevent future incompatibilities.

Continuing program measures serve to enhance community and airport dialogue regarding aviation noise, improve public understanding of aviation noise, and provide for ongoing evaluation of noise generated from aircraft flight operations

The measures described in the NCP presented in this document reflect the airport operator's recommendations for the NCP. The proposed NCP measures are presented prior to FAA's review for approval or disapproval and as such do not represent the opinions or decisions of FAA.

Official FAA acceptance of the Part 150 Study submission and approval of the NCP does not eliminate requirements for the submittal of environmental documentation of any proposed actions pursuant to requirements of the National Environmental Policy Act (NEPA). However, acceptance of the submission is a prerequisite to apply for Federal funding for implementation of any proposed measures.

1.2 REPORT ORGANIZATION

Chapter Two discusses noise metrics used in the evaluation of aircraft noise exposure and the effects of aircraft noise exposure on people. Chapter Three presents the fleet mix, existing and forecast airport operations used in the evaluation of the noise environment around Manhattan Regional Airport (MHK). Chapter Four describes the land use surrounding MHK. Chapter Five presents the NEMs and discusses land use compatibility. Chapter Six provides the evaluation of potential noise abatement measures. Chapter Seven presents the evaluation of land use measures. Chapter Eight presents the continuing program measures. Chapter Nine describes the recommended NCP. Chapter Ten includes the record of public consultation. The appendices provide supporting information, as outlined in the Table of Contents.

1.3 PROJECT ROLES AND RESPONSIBILITIES

The City of Manhattan and the Federal Aviation Administration (FAA) both play important roles in the development and acceptance of the Part 150 Study. A more detailed description of the consultation process is provided in Chapter Ten.

1.3.1 City of Manhattan

As the "airport operator," the City has responsibility over the entire Part 150 Study, including ultimate responsibility for determining what elements will be included in the NCP when it is submitted to FAA for review. The City is also responsible for pursuing implementation of adopted measures.

1.3.2 Consultant

The City retained HNTB Corporation (HNTB) to conduct the technical work required to fulfill Part 150 analysis and documentation requirements. HNTB is responsible for technical analysis

necessary to carrying out the study, conducting the noise analysis and the development of NCP measures.

1.3.3 Federal Aviation Administration (FAA)

FAA has ultimate review authority over the NEMs submitted under Part 150. FAA review includes an assessment of both the adequacy of the technical documentation and the broader issues related to satisfying the Part 150 process requirements.

FAA involvement includes participation by staff from the local, regional, and national levels of the agency, as follows:

- MHK's Air Traffic Control Tower (ATCT) provides significant input into existing and future operational procedures and trends.
- FAA's Central Region has several roles. The Airports Division, in Kansas City, Missouri advises on preparation of the Study and assists with coordination with other FAA offices. The Air Traffic Division staff will support the ATCT role, with final review and decision authority over changes in flight procedures. When the Airport Authority submits the Study documentation to FAA for review, the Kansas City Airports Division will determine whether or not it satisfies all NEM and NCP requirements, and will conduct the initial FAA review of the NCP submission.
- FAA's Central Region Airports Division coordinates their review with the Central Services Flight Procedures Office (FPO) in Fort Worth, Texas.
- FAA's Washington, D.C. Headquarters will receive a copy of the NEM documentation.
- FAA will issue a Record of Approval noting its approval or disapproval of the actions recommended in the NCP.

1.4 STUDY GOALS

In keeping with the Master Plan Objectives three goals have been identified to guide the development of the Part 150 document for MHK. These goals are:

Goal 1: Maintain existing compatible land use while promoting protection of an envelope of compatible land use consistent with planned development at MHK including that of becoming the Aerial Port of Embarkation (APOE) for Fort Riley.

Goal 2: Develop an understanding of probable future noise contours, including an extended future beyond that required by Part 150.

Goal 3: Develop realistic mitigation plans within the context of Federal regulations and eligibility criteria, financial feasibility, and fairness to aviation and non-aviation interests.

Chapter Two

NOISE AND ITS EFFECT ON PEOPLE

Description of aircraft noise exposure in environmental documents is primarily based on using the Day-Night Average Sound Level (DNL) metric. This study also involves the use of supplemental noise metrics in addition to DNL to provide comprehensive analysis for quantifying a specific situation. To assist reviewers in interpreting these complex noise metrics, this chapter presents an introduction to the relevant fundamentals of acoustics and noise terminology (Section 2.1) and the effects of noise on human activity (Section 2.2).

2.1 NOISE METRICS

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where interstate and local roadway traffic, rail, industrial, and neighborhood sources may also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

A “metric” is defined as something “of, involving, or used in measurement.” As used in environmental noise analyses, a metric refers to the unit or quantity that quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics used by individual researchers who have attempted to understand and represent the effects of noise. As a result, literature describing environmental noise or environmental noise abatement has included many different metrics.

Recently, however, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents. Furthermore, the FAA has specified which metrics, such as DNL, should be used for federal aviation noise assessments.

This chapter discusses the following acoustic terms and metrics:

- Decibel, dB
- A-Weighted Decibel, dBA
- Maximum Sound Level, L_{max}
- Sound Exposure Level, SEL

- Equivalent Sound Level, Leq
- Day-Night Average Sound Level, DNL

2.1.1 The Decibel, dB

All sounds come from a sound source—a musical instrument, a speaking voice, and an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in sound waves—tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear.

Our ears are sensitive to a wide range of sound pressures. The loudest sound that we hear without pain has about one trillion times more energy than the quietest sounds we hear. As this range, on a linear scale, is unwieldy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level (SPL) and its logarithmic unit of decibel (dB).

SPL is a measure of the sound pressure of a given noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect). Decibels are logarithmic quantities —logarithms of the ratio of the two pressures, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (the quietest sound we can hear).

The logarithmic conversion of sound pressure to SPL means that the quietest sound we can hear (the reference pressure) has a SPL of about zero decibels, while the loudest sounds we hear without pain have SPLs less than or equal to about 120 dB. Most sounds in our day-to-day environment have SPLs from 30 to 100 dB.

Because decibels are logarithmic quantities, they require logarithmic math and not simple (linear) addition and subtraction. For example, if two sound sources each produce 100 dB and are operated together, they produce only 103 dB—not 200 dB as might be expected. Four equal sources operating simultaneously result in a total SPL of 106 dB. In fact, for every doubling of the number of equal sources, the SPL (of all of the sources combined) increases another three decibels. A ten-fold increase in the number of sources makes the SPL increase by 10 dB. A hundredfold increase makes the level increase by 20 dB, and it takes a thousand equal sources to increase the level by 30 dB.

If one source is much louder than another, the two sources together will produce the same SPL (and sound to our ears) as if the louder source were operating alone. For example, a 100 dB source plus an 80 dB source produce 100 dB when operating together. The louder source “masks” the quieter one. But if the quieter source gets louder, it will have an increasing effect on

the total SPL. When the two sources are equal, as described above, they produce a level 3 decibels above the sound level of either one by itself.

From these basic concepts, note that one hundred 80 dB sources will produce a combined level of 100 dB; if a single 100 dB source is added, the group will produce a total SPL of 103 dB. Clearly, the loudest source has the greatest effect on the total.

There are two useful rules of thumb to remember when comparing SPLs: (1) most of us perceive a 6 to 10 dB increase in the SPL to be an approximate doubling of loudness, and (2) changes in SPL of less than about 3 dB are not readily detectable outside of a laboratory environment.

2.1.2 A-Weighted Decibel, dBA

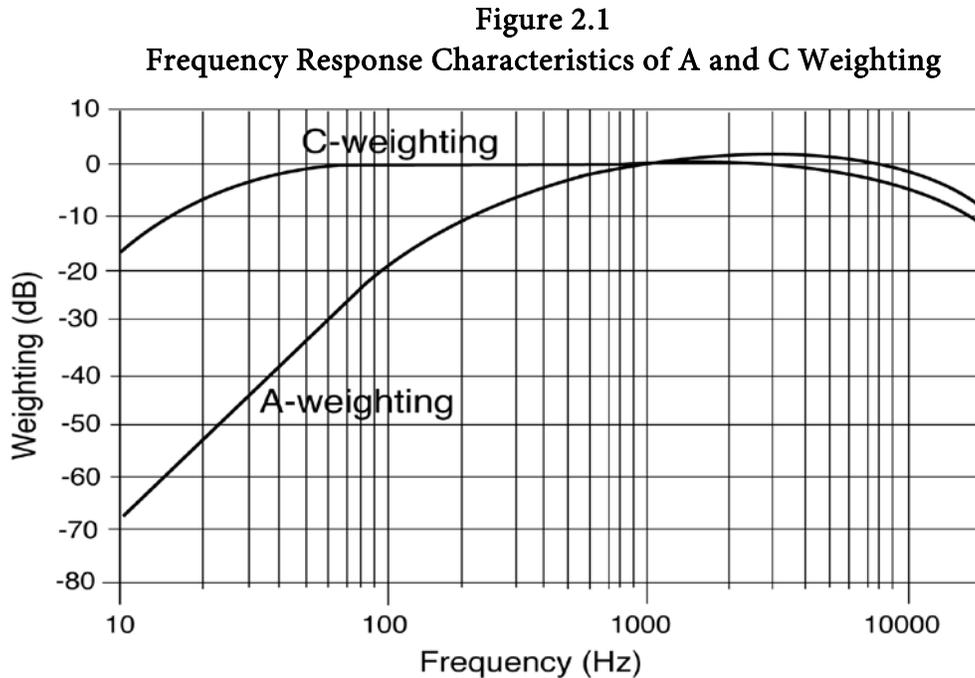
Another important characteristic of sound is its frequency, or “pitch.” This is the rate of repetition of the sound pressure oscillations as they reach our ear. Frequency can be expressed in units of cycles per second (cps) or Hertz (Hz). Although cps and Hz are equivalent, Hz is the preferred scientific unit and terminology.

A very good ear can hear sounds with frequencies from 16 Hz to 20,000 Hz. However, most people hear from approximately 20 Hz to approximately 10,000-15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, around 1,000 to 4,000 Hz. Acousticians have developed and applied “filters” or “weightings” to SPLs to match our ears’ sensitivity to the pitch of sounds and to help us judge the relative loudness of sounds made up of different frequencies. Two such filters, “A” and “C,” are most applicable to environmental noises.

A-weighting significantly de-emphasizes noise at low and high frequencies (below approximately 500 Hz and above approximately 10,000 Hz) where we do not hear as well. The filter has little or no effect at intervening frequencies where our hearing is most efficient. **Figure 2.1** shows a graph of the A-weighting as a function of frequency and its aforementioned characteristics. Because this filter generally matches our ears’ sensitivity, sounds having higher A-weighted sound levels are usually judged to be louder than those with lower A-weighted sound levels, a relationship which does not always hold true for unweighted levels. Therefore, A-weighted sound levels are normally used to evaluate environmental noise. SPLs measured through this filter are referred to as A-weighted decibels (dBA).

As shown in Figure 2.1, C-weighting is nearly flat throughout the audible frequency range, hardly de-emphasizing the low frequency noise. C-weighted levels are not used as frequently as A-weighted levels, but they may be preferable in evaluating sounds whose low-frequency components are responsible for secondary effects such as the shaking of a building, window rattle, perceptible vibrations, or other factors that can cause annoyance and complaints. Uses include the evaluation of blasting noise, artillery fire, sonic boom, and, in some cases, aircraft

noise inside buildings. SPLs measured through this filter are referred to as C-weighted decibels (dBC).



Source: ANSI S1.4-1983 “Specification of Sound Level Meters”

Other weighting networks have been developed to correspond to the sensitivity and perception of other types of sounds, such as the “B” and “D” filters. However, A-weighting has been adopted as the basic measure of community environmental noise by the U.S. Environmental Protection Agency (EPA) and nearly every other agency concerned with aircraft noise throughout the United States.

Figure 2.2 presents typical A-weighted sound levels of several common environmental sources. Sound levels measured (or computed) using A-weighting are most properly called “A-weighted sound levels” while sound levels measured without any frequency weighting are most properly called “sound levels.” However, since this document deals only with A-weighted sound levels, the adjective “A-weighted” will be hereafter omitted, with A-weighted sound levels referred to simply as sound levels. As long as the use of A-weighting is understood, there is no difference implied by the terms “sound level” and “A-weighted sound level” or by the dB or dBA units.

An additional dimension to environmental noise is that sound levels vary with time and typically have a limited duration, as shown in **Figure 2.3**. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (although even the background varies as birds chirp, the wind blows, or a vehicle passes

by). Sounds can be classified by their duration as continuous like a waterfall, impulsive like a firecracker or sonic boom or intermittent like an aircraft overflight or vehicle passby.

2.1.3 Maximum Sound Level, L_{max}

The variation in sound level over time often makes it convenient to describe a particular noise “event” by its maximum sound level, abbreviated as L_{max} . For the aircraft over-flight event in Figure 2.3, the L_{max} is approximately 67 dBA.

Figure 2.4 shows L_{max} values for a variety of common aircraft from the FAA’s Integrated Noise Model database. These L_{max} values for each aircraft type are for aircraft performing a maximum stage (trip) length departure on a day with standard atmospheric conditions at a reference distance of 3.5 nautical miles from their brake release point. Of the dozen aircraft types listed on the figure, the Concorde has the highest L_{max} and the Saab 340 (SF340) has the lowest L_{max} .

The maximum level describes only one dimension of an event; it provides no information on the cumulative noise exposure generated by a sound source. In fact, two events with identical maxima may produce very different total exposures. One may be of short duration, while the other may continue for an extended period. This metric discussed in Section 2.1.4 corrects for this deficiency.

2.1.4 Sound Exposure Level, SEL

A frequently used metric of noise exposure for a single aircraft flyover (and the metric that Part 150 specifies) is the Sound Exposure Level, or SEL. SEL may be considered an accumulation of the sound energy over the duration of an event. The shaded area in **Figure 2.5** illustrates that portion of the sound energy (or “dose”) included in an SEL computation. The dose is then normalized (standardized) to a duration of one second. This “revised” dose is the SEL, shown as the shaded rectangular area in Figure 2.5. Mathematically, the SEL represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as the actual time-varying noise event. For events that last more than one second, SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event.

Note that, because the SEL is normalized to one second, it will always be larger in magnitude than the maximum A-weighted level for an event that lasts longer than one second. In fact, for most aircraft overflights, the SEL is on the order of 7 to 12 dBA higher than the L_{max} . The fact that it is a cumulative measure means that not only do louder flyovers have higher SELs than quieter ones (of the same duration), but longer flyovers also have greater SELs than shorter ones (of the same L_{max}).

It is the SEL’s inclusion of both the intensity and duration of a sound source that makes SEL the metric of choice for comparing the single-event levels of varying duration and maximum sound

level. This metric provides a comprehensive basis for modeling a noise event in determining overall noise exposure.

2.1.5 Equivalent Sound Level, L_{eq}

Maximum A-weighted level, SEL, and LFSL are used to measure the noise associated with individual events. The remaining metrics in this section and in Section 2.1.6 apply to longer-term cumulative noise exposure that often includes many events.

The first cumulative noise metric, the Equivalent Sound Level (abbreviated L_{eq}), is a measure of the exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest (e.g., an hour, an 8-hour school day, nighttime, or a full 24-hour day). However, because the length of the period can be different depending on the time frame of interest, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(8)}$ or $L_{eq(24)}$.

Figure 2.2
Sound Levels of Typical Noise Sources (dBA)

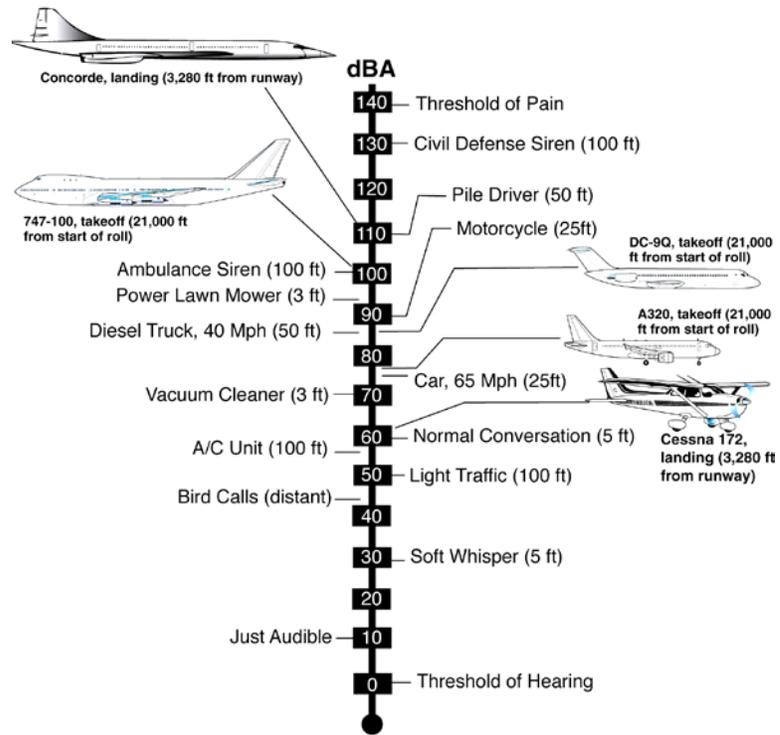
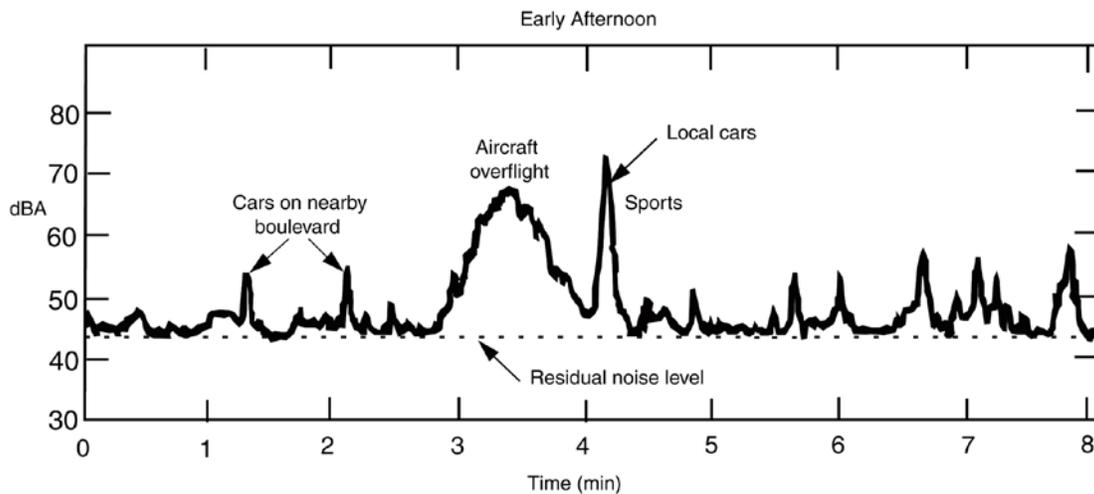


Figure 2.3
Variation of Community Noise in a Suburban Neighborhood



Source: "Community Noise," NTID 300.3 EPA, December 1971.

Figure 2.4
Common Aircraft Departure Noise Levels

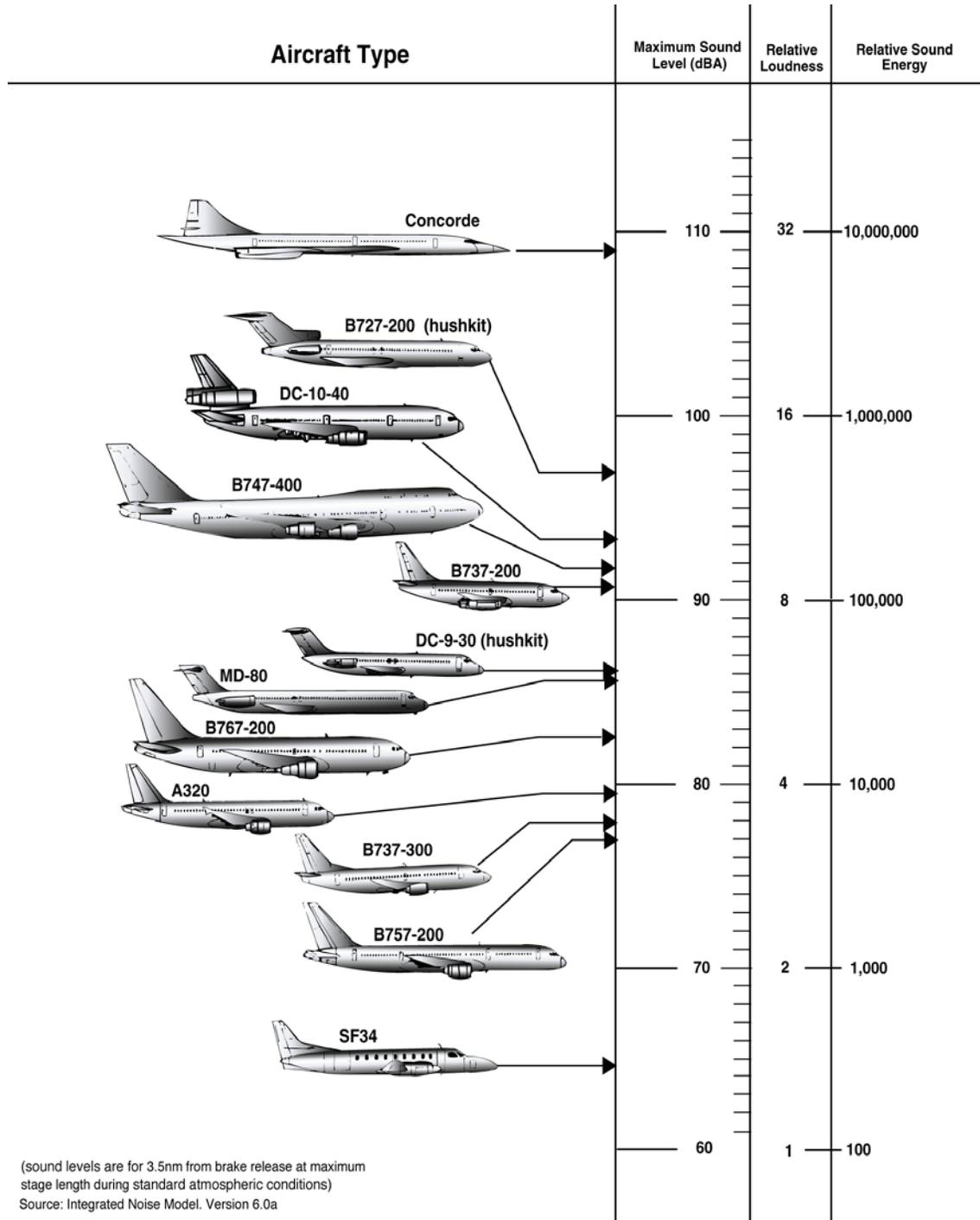
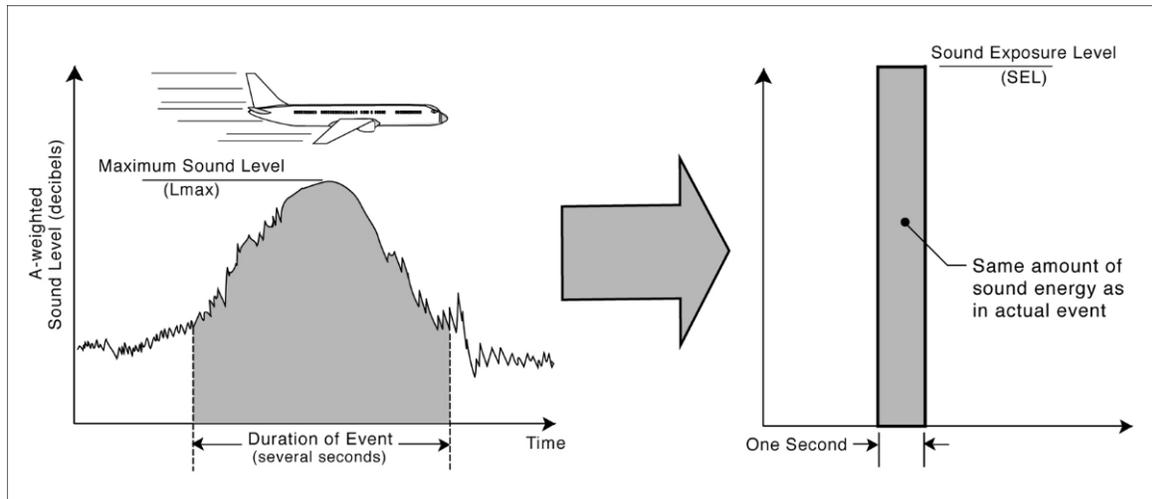


Figure 2.5
Relationship between Single Event Noise Metrics



Conceptually, L_{eq} may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual time-varying sound level with its normal “peaks” and “valleys,” as illustrated in Figure 2.3. In the context of noise from typical aircraft flight events and as noted earlier for SEL, L_{eq} does not represent the sound level heard at any particular time, but rather represents the total sound exposure for the period of interest. Also, it should be noted that the “average” sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or “energy-averaged,” sound level. Thus, loud events tend to dominate the noise environment described by the L_{eq} metric.

As for its application to airport noise issues, L_{eq} is often presented for consecutive 1-hour periods to illustrate how the hourly noise dose rises and falls throughout a 24-hour period, as well as how certain hours are significantly affected by a few loud aircraft.

2.1.6 Day-Night Average Sound Level (DNL)

DNL is the same as L_{eq} (an energy-average noise level over a 24-hour period) except that 10 dB is added to those noise events occurring at night (between 10 p.m. and 7 a.m.). This weighting reflects the added intrusiveness of nighttime noise events attributable to the fact that community back-ground noise levels typically decrease by about 10 dB during those nighttime hours. DNL does not represent the sound level heard at any particular time, but rather represents the total (and partially weighted) sound exposure.

Typical DNL values for a variety of noise environments are shown in **Figure 2.6** to indicate the range of noise exposure levels usually encountered.

Due to the DNL metric's excellent correlation with the degree of community annoyance from aircraft noise (the subject of Section 2.2), DNL has been formally adopted by most federal agencies for measuring and evaluating aircraft noise for land use planning and noise impact assessment. Federal interagency committees such as the Federal Interagency on Urban Noise (FICUN) and the Federal Interagency on Noise (FICON) which include the EPA, FAA, Department of Defense, Department of Housing and Urban Development (HUD), and Veterans Administration, found DNL to be the best metric for land use planning. They also found no new cumulative sound descriptors or metrics of sufficient scientific standing to substitute for DNL. Other cumulative metrics could be used only to supplement, not replace DNL. Furthermore, FAA Orders 1050.1D and 5050.4A for environmental studies, requires that DNL be used in describing cumulative noise exposure and in identifying aircraft noise/land use compatibility issues.^{1 2 3 4 5 6}

Measurements of DNL are practical only for obtaining values for a relatively limited number of points. Instead, many noise studies, including this document, are based on estimates of DNL using a FAA-approved computer-based noise model.

2.2 THE EFFECTS OF AIRCRAFT NOISE ON PEOPLE

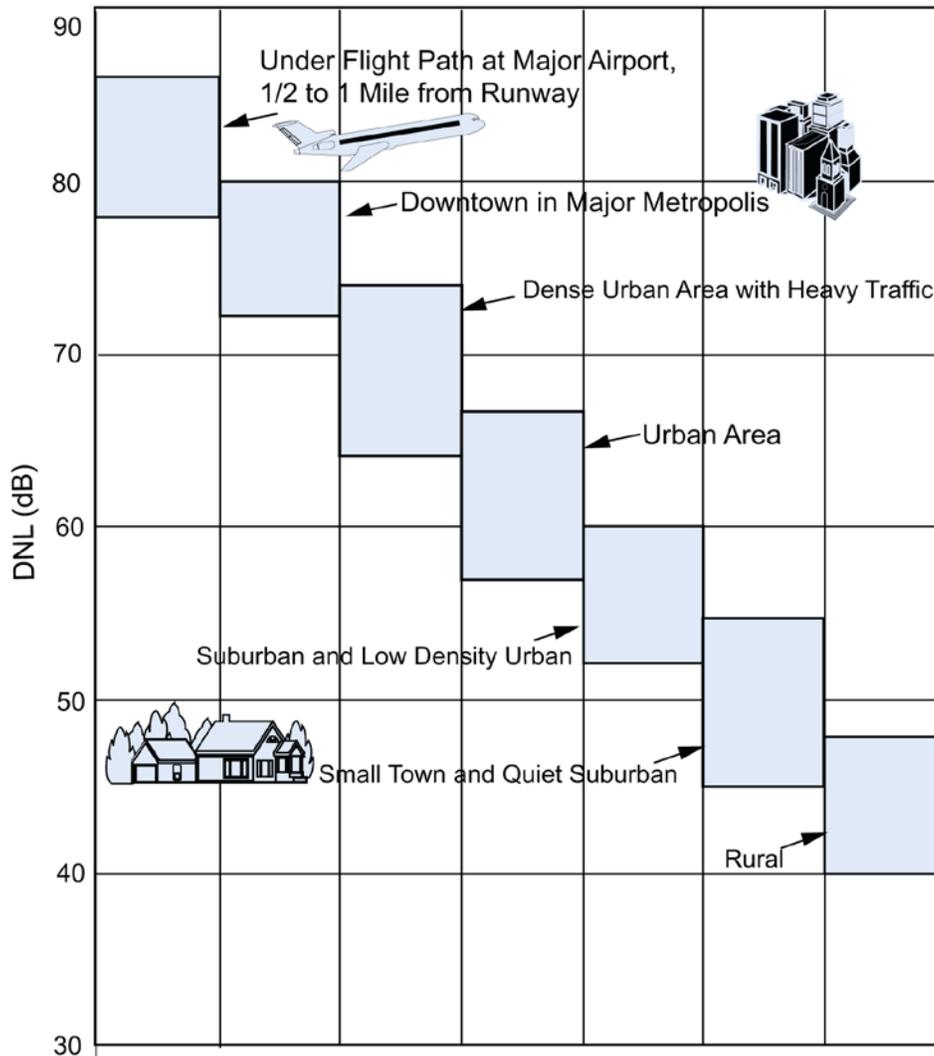
To many people, aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, disrupt classroom activities in schools, and disrupt sleep. Relating these effects to specific noise metrics aids in the understanding of how and why people react to their environment. This section addresses three ways we are potentially affected by aircraft noise: annoyance, interference of speech, and disturbance of sleep.

2.2.1 Community Annoyance

The primary potential effect of aircraft noise on exposed communities is one of annoyance. The U.S. EPA defines noise annoyance as any negative subjective re-action on the part of an individual or group.¹

Scientific studies^{1 2 3 7 8} and a large number of social/attitudinal surveys^{9 10} have been conducted to appraise U.S. and inter-national community annoyance due to all types of environmental noise, especially aircraft events. These studies and surveys have found the DNL to be the best measure of that annoyance.

Figure 2.6
 Typical Range of Outdoor Community Day-Night Average Sound Levels



Source: U.S. Department of Defense. Departments of the Air Force, the Army, and the Navy, 1978. *Planning in the Noise Environment*. AFM 19-10. TM 5-803-2, and NAVFAC P-970. Washington, D.C.: U.S. DoD.

This relation between community annoyance and time-average sound level has been confirmed, even for infrequent aircraft noise events.¹¹ For helicopter overflights occurring at a rate of 1 to 52 per day, the stated reactions of community individuals correlated with the daily time-average sound levels of the helicopter overflights.

The relationship between annoyance and DNL that has been determined by the scientific community and endorsed by many federal agencies, including the FAA, is shown in **Figure 2.7**. Two lines in Figure 2.7 represent two large sets of social/ attitudinal surveys: one for a curve fit of 161 data points compiled by an individual researcher, Ted Schultz, in 1978⁹ and one for a curve fit of 400 data points (which include Schultz's 161 points) compiled in 1992 by the U.S. Air

Force.¹⁰ The agreement of these two curves simply means that when one combines the more recent studies with the early landmark surveys in 1978, the results of the early surveys (i.e., the quantified effect of noise on annoyance) are confirmed.

Figure 2.7 shows the percentage of people “highly annoyed” by a given DNL. For example, the two curves in the figure yield a value of about 13% for the percentage of the people that would be highly annoyed by a DNL exposure of 65 dB. The figure also shows that at very low values of DNL, such as 45 dB or less, 1% or less of the exposed population would be highly annoyed. Furthermore, at very high values of DNL, such as 90 dB, more than 80% of the exposed population would be highly annoyed.

Recently, the use of DNL has been criticized as not accurately representing community annoyance and land-use compatibility with aircraft noise. One frequent criticism is based on the inherent feeling that people react more to single noise events and not as much to “meaningless” time-average sound levels. In fact, a time-average noise metric, such as DNL, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

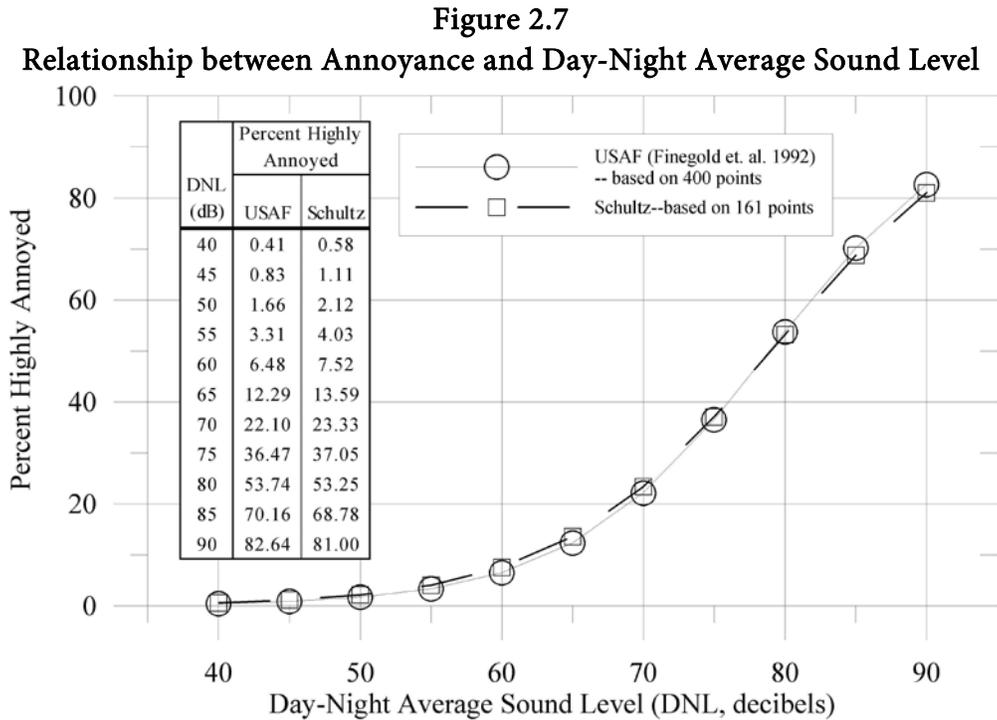
As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime hours during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours 59 minutes and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.5 dB.

As a second example, assume that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and, specifically, the DNL. It is often suggested that a lower DNL, such as 60 or 55 dB, be adopted as the threshold of community noise annoyance for airport environmental analysis documents.

While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, a DNL of 65 dB:

- (1) Provides a valid basis for comparing and assessing community noise effects.
- (2) Represents a noise exposure level that is normally dominated by aircraft noise and not other community or nearby highway noise sources.
- (3) Reflects the FAA’s threshold for grant-in-aid funding of airport noise mitigation projects.

(4) HUD also established a DNL standard of 65 dB for eligibility for federally guaranteed home loans.



Source: Federal Interagency Committee on Noise (FICON),
 "Federal Agency Review of Selected Airport Noise Analysis Issues",
 August 1992, p. 3-6, Figure 3.1

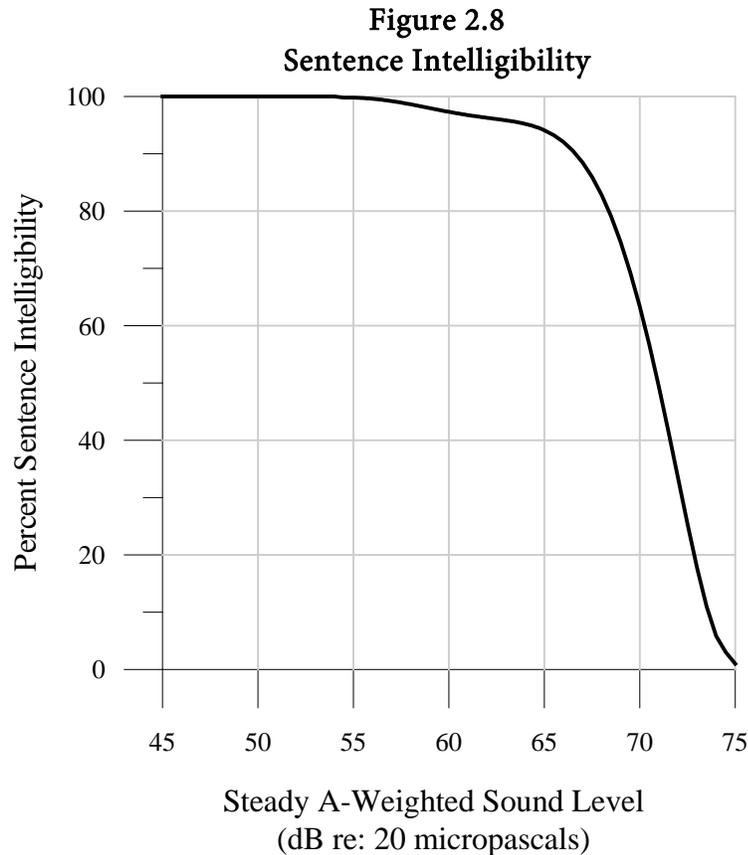
2.2.2 Speech Interference

A primary effect of aircraft noise is its tendency to drown out or “mask” speech, making it difficult to carry on a normal conversation.

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities, such as radio or television listening, telephone use, or family conversation, causes frustration and aggravation. Research has shown that “whenever intrusive noise exceeds approximately 60 dB indoors, there will be interference with speech communication.”¹

Indoor speech interference can be expressed as a percentage of sentence intelligibility among two people speaking in relaxed conversation approximately one meter apart in a typical living room or bedroom.¹ The percentage of sentence intelligibility is a non-linear function of the (steady) indoor background sound level, as shown in **Figure 2.8**. This curve was digitized and curve-fitted for the purposes of this document. Such a curve-fit yields 100 percent sentence intelligibility for background levels below 57 dB and yields less than 10 percent intelligibility for

background levels above 73 dB. Note that the function is especially sensitive to changes in sound level between 65 dB and 75 dB. As an example of the sensitivity, a 1 dB increase in background sound level from 70 dB to 71 dB yields a 14 percent decrease in sentence intelligibility.



Source: EPA, 1974

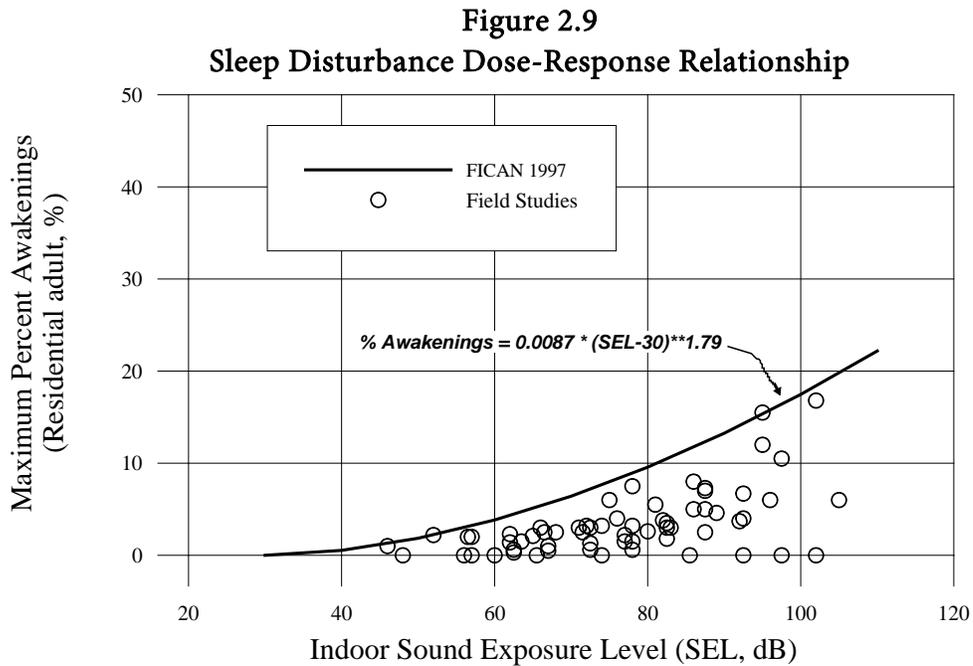
In the same document from which Figure 2.8 was taken, the EPA established an indoor criterion of 45 dB DNL as requisite to protect against speech interference indoors Sleep Disturbance

Sleep disturbance is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep disturbance can be measured in one of two ways. “Arousal” represents awakening from sleep, while a change in “sleep stage” represents a shift from one of four sleep stages to another stage of lighter sleep without awakening. In general, arousal requires a higher noise level than does a change in sleep stage.

In terms of average daily noise levels, some guidance is available to judge sleep disturbance. The EPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference.¹

In June 1997, the Federal Interagency Committee on Aviation Noise (FICAN) reviewed the sleep disturbance issue and presented a sleep disturbance dose-response prediction curve.¹² FICAN based their curve on data from field studies^{13 14 15 16} and recommends the curve as the tool for analysis of potential sleep disturbance for residential areas. **Figure 2.9** shows this curve which, for an indoor SEL of 60 dB, predicts that a maximum of approximately 5 percent of the residential population exposed are expected to be behaviorally awakened. FICAN cautions that this curve should only be applied to long-term adult residents.



Source: FICAN, 1997

NOTES

- ¹ U.S. Environmental Protection Agency, “Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety,” Report 550/9-74-004, March 1974.
- ² “Guidelines for Considering Noise in Land Use Planning and Control,” Federal Interagency Committee on Urban Noise, June 1980.
- ³ Federal Interagency Committee on Noise, “Federal Agency Review of Selected Airport Noise Analysis Issues,” August 1992.
- ⁴ 14 CFR Part 150, Amendment 150-3 December 8, 1995.
- ⁵ FAA Order 1050.1D, Policies and Procedures for Considering Environmental Impacts, Department of Transportation, Federal Aviation Administration, December 5, 1986.
- ⁶ FAA Order 5050.4A, Airport Environmental Handbook, October 8, 1985, Department of Transportation, Federal Aviation Administration, paragraph 47 (e)(1).
- ⁷ “Sound Level Descriptors for Determination of Compatible Land Use,” American National Standards Institute Standard ANSI S3.23-1980.”
- ⁸ “Quantities and Procedures for Description and Measurement of Environmental Sound, Part I,” American National Standards Institute Standard ANSI S21.9-1988.
- ⁹ Schultz, T.J., “Synthesis of Social Surveys on Noise Annoyance,” *J. Acoust. Soc. Am.*, 64, 377-405, August 1978.
- ¹⁰ Fidell, S., Barger, D.S., Schultz, T.J., “Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise.” *J. Acoust. Soc. Am.*, 89, 221-233, January 1991
- ¹¹ “Community Reactions to Helicopter Noise: Results from an Experimental Study,” *J. Acoust. Soc. Am.*, 479-492, August 1987.
- ¹² Federal Interagency Committee on Aviation Noise (FICAN), “Effects of Aviation Noise on Awakenings from Sleep,” June 1997.
- ¹³ Pearson, K.S., Barber, D.S., Tabachnick, B.G., “Analyses of the Predictability of Noise-Induced Sleep Disturbance,” USAF Report HSD-TR-89-029, October 1989.
- ¹⁴ Ollerhead, J.B., Jones, C.J., Cadous, R.E., Woodley, A., Atkinson, B.J., Horne, J.A., Pankhurst, F., Reyner, L, Hume, K.I., Van, F., Watson, A., Diamond, I.D., Egger, P., Holmes, D., McKean, J., “Report of a Field Study of Aircraft Noise and Sleep Disturbance.” London Department of Safety, Environment, and Engineering, 1992.
- ¹⁵ Fidell, S., Pearsons, K., Howe, R., Tabachnick, B., Silvati, L., Barber, D.S. “Noise-Induced Sleep Disturbance in Residential Settings,” AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational and Environmental Health Division, 1994.
- ¹⁶ Fidell, S., Howe, R., Tabachnick, B., Pearsons, K., Sneddon, M., “Noise-Induced Sleep Disturbance in Residences Near Two Civil Airports,” Langley Research Center, 1995.

Chapter Three

FLEET MIX, FLIGHT OPERATIONS AND PROCEDURES

This chapter describes the fleet mix, existing and future aircraft flight operations and procedures at MHK and the related inputs and assumptions needed to generate Day-Night Average Sound Level (DNL) noise contours for the 2009 and 2014 NEMs. Additionally, DNL noise contours were developed for 2027, which is beyond the formal Part 150 requirements. The 2027 DNL noise contours are included because, as stated in Chapter One, MHK desires to maintain existing compatible land use while promoting protection of an envelope of compatible land use consistent with planned development at MHK, including that of becoming the Aerial Port of Embarkation (APOE) for Fort Riley. This goal requires that noise contours be considered further into the future than five years.

The FAA requires the analyses of subsonic aircraft noise exposure around airports to be accomplished using the Integrated Noise Model (INM), a computer program distributed by the FAA. The most recent version of INM available when the study was first modeled (version 7.0a) was used for this study.

INM uses Annual Average Daily (AAD) operations to compute the existing and forecast noise environments at airports. AAD operations are representative of all aircraft operations that occur over the course of a year. The total annual operations are divided by 365 days to determine the AAD operations. Runway and flight track use is also averaged over one year.

Annual average daily operations consist of departures and arrivals by acoustical daytime and nighttime. For the purposes of noise modeling, acoustical daytime is defined as 7:00 a.m. to 9:59 p.m., and nighttime is defined as 10:00 p.m. to 6:59 a.m. The DNL metric applies a 10-dB penalty to nighttime flights due to the added intrusiveness of these operations. Runway use, flight track location and use, and aircraft profiles define the paths that aircraft use as they fly to and from the Airport.

The Aviation Safety and Noise Abatement Act of 1979 required the FAA to establish a consistent measurement of airport noise exposure. In developing the Part 150 study process, the FAA adopted the use of the Day-Night Average Level as the primary measurement of aircraft noise exposure, and in cooperation with other federal agencies, identified land use compatibility guidelines using the DNL metric. Therefore, the INM computes the overall annual average daily noise exposure (e.g., DNL) at points on the ground around the Airport. Then equal daily values of the sound levels are joined together to form a contour for overlay onto land use maps.

The use of INM and computer-based noise modeling allows for the projection of future, forecast noise exposure. When the calculations are made in a consistent manner, INM is most accurate for comparing “before-and-after” noise effects resulting from forecast changes or potential alternatives. The INM allows noise predictions for such forecast change actions without the need for noise monitoring over an extended period of time, or actual implementation of any forecast changes.

This chapter describes the fleet mix used for developing the DNL noise contours as well as the flight operations and procedures modeled for MHK. Section 3.1 describes the Airport and its location, Section 3.2 provides the fleet mix and operational factors used to model the noise at MHK, and Section 3.3 summarizes the input data used for the INM.

3.1 AIRPORT LOCATION AND LAYOUT

MHK is located approximately 4 miles southwest of the business district of the City of Manhattan in Riley County, Kansas. MHK has two active runways: Runway 03/21 is the primary runway at 7,000-foot length, and Runway 13/31 is the cross wind runway. At the time the Part 150 Study was initiated, Runway 13/31 was 3,800 feet long.¹

MHK is a public-use airport owned and operated by the City of Manhattan. MHK’s property limits lie wholly within Riley County.

The elevation of MHK is 1,057 feet above Mean Sea Level (MSL) and the magnetic declination (the difference between magnetic north and true geographic north) is 5 degrees and 8 minutes east as of 2005. Air traffic controllers and pilots use magnetic north to direct and fly aircraft.

The immediate vicinity of MHK consists of the Kansas River to the south with Fort Riley (U.S. Army Post) to the west and northwest of the Airport. The Airport is bordered by Wildcat Creek Road to the west, Eureka Drive to the north, and Fort Riley Boulevard which runs southwest and northeast of MHK.

3.1.1 Weather and Climate

Weather has a significant impact on noise exposure and propagation. Runway use and the operational characteristics of aircraft are heavily influenced by weather. The following subsections detail modeled weather conditions and related impact on aircraft operations.

Temperature

Temperature is an important factor in aircraft performance. As temperature increases, air density decreases, reducing wing lift and engine thrust which results in increased takeoff distance and a lower climb rate; departing aircraft are thus at a lower altitude and noise exposure thereby generally increases. Conversely, noise exposure is decreased on cold days when aircraft have

improved performance capabilities. An annual average daily temperature of 55.5°F was used in the noise model.²

Humidity

Humidity alone does not have a significant impact on aircraft performance, but in conjunction with temperature, however, it does impact the propagation of noise through the air. In general, sound travels farther in more humid conditions. Relative humidity is highest at night and gradually drops during the day. It is generally at its lowest point in the afternoon. An annual average daily humidity of 67.4 percent was used in the noise model.³

Wind

Wind speed and direction primarily determine runway selection and operational flow. Aircraft generally take off and land into the wind (known as a headwind) whenever possible. Headwinds reduce an aircraft's takeoff and landing distance and increase climb rate. Aircraft can operate with considerable crosswinds (a wind blowing at the side of the aircraft)—up to about 20 knots for a typical air carrier jet aircraft. Aircraft can operate with limited tailwinds (a wind blowing on the rear of the aircraft)—up to five to seven knots for a typical air carrier aircraft. Tailwinds increase takeoff and landing distance. Winds in excess of crosswind and tailwind limits generally force aircraft to use a different runway. The winds at MHK are generally out of the southwest and northeast and favor operations on the existing runways, which are aligned accordingly.⁴

3.2 MODELED AIRCRAFT OPERATIONS

This section describes noise model operational inputs, including flight operations, aircraft database, flight profiles, runway use, and flight track location and use. INM uses these inputs to compute noise exposure on the ground. The data in this section provides an overview of the aircraft operations included in the noise model.

3.2.1 Flight Operations and Fleet Mix

The annual average daily flight operations forecast for MHK in 2009, 2014, and 2027 are summarized in **Tables 3-1, 3-2, and 3-3**, respectively. The fleet mix used in the Study was developed separately under the MHK Master Plan Update. The forecast for the Master Plan Update was formally approved by the FAA on April 8, 2008. The forecast of flight operations serves as input into the noise model as an annual average daily fleet mix, with distributions by aircraft type, time of day, arrival or departure, and stage length. For the purposes of developing DNL contours, the aircraft types are grouped into operational categories for the purpose of incorporating runway and flight track use trends into the noise model. **Table 3-4** describes the operational categories into which aircraft types are grouped. **Table 3-5** defines the aircraft identifiers shown in Tables 3-1, 3-2, and 3-3, along with the respective INM modeled aircraft types and operational categories. The use of operational categories is described in Sections 3.2.4 and 3.2.5.

Table 3-1
2009 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures		
			Stage 1	Stage 2	Stage 3
1900D	1,872	936	936	0	0
727EM2	14	7	0	3	3
737300	25	12	0	10	2
737700	34	17	0	10	7
737800	68	34	0	17	17
737N17	2	1	0	1	0
757PW	13	6	0	3	3
A10A	44	22	22	0	0
A319-131	13	6	2	2	2
A320-232	15	7	0	4	3
A4C	30	15	15	0	0
B206L	481	241	241	0	0
B212	51	25	25	0	0
BEC58P	3,490	1745	1745	0	0
C12	1,342	671	671	0	0
C130AD	342	171	171	0	0
C17	14	7	7	0	0
C21A	30	15	15	0	0
CH47D	752	376	376	0	0
CIT3	146	73	73	0	0
CL601	50	25	25	0	0
CNA172	6,100	3050	3050	0	0
CNA206	3,051	1525	1525	0	0
CNA441	2,863	1431	1431	0	0
CNA500	366	183	183	0	0
DC93LW	25	12	5	5	2
EC130	11	6	6	0	0
EMB120	6	3	3	0	0
EMB145	80	40	18	17	5
GASEPF	3,153	1576	1576	0	0
GASEPV	2,606	1303	1303	0	0
GIV	98	49	49	0	0
GV	128	64	64	0	0
H500D	11	6	6	0	0
LEAR35	1,242	621	621	0	0
MD11GE	1	0	0	0	0

Table 3-1
2009 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures		
			Stage 1	Stage 2	Stage 3
MU3001	757	378	378	0	0
PA31	108	54	54	0	0
R22	11	6	6	0	0
S70	3,413	1707	1707	0	0
SA350D	11	6	6	0	0
T-38A	30	15	15	0	0
Total Annual Operations	32,900	16,450	16,330	73	46

Sources: Fleet Mix Forecast and HNTB.

Table 3-2
2014 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures		
			Stage 1	Stage 2	Stage 3
1900D	3052	1526	1526	0	0
727EM2	14	7	0	7	0
737300	25	12	0	10	2
737700	34	17	0	10	7
737800	68	34	0	17	17
737N17	2	1	0	1	0
757300	0	0	0	0	0
757PW	13	6	0	3	3
767400	0	0	0	0	0
A10A	25	12	12	0	0
A319-131	13	6	2	2	2
A320-232	15	7	0	4	3
A4C	17	8	8	0	0
B206L	599	299	299	0	0
B212	50	25	25	0	0
BEC58P	3424	1712	1712	0	0
C12	754	377	377	0	0
C130AD	192	96	96	0	0
C137	0	0	0	0	0
C17	8	4	4	0	0
C21A	17	8	8	0	0
C5A	0	0	0	0	0
CH47D	900	450	450	0	0
CIT3	144	72	72	0	0
CL601	50	25	25	0	0
CNA172	6729	3364	3364	0	0
CNA206	3440	1720	1720	0	0
CNA441	2884	1442	1442	0	0
CNA500	360	180	180	0	0
DC93LW	25	12	5	5	2
EC130	11	5	5	0	0
EMB120	6	3	3	0	0
EMB145	80	40	22	13	5
GASEPF	3127	1563	1563	0	0
GASEPV	2916	1458	1458	0	0
GIV	96	48	48	0	0

Table 3-2
2014 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures		
			Stage 1	Stage 2	Stage 3
GV	113	56	56	0	0
H500D	11	5	5	0	0
KC10A	0	0	0	0	0
LEAR35	1330	665	665	0	0
MD11GE	1	0	0	0	0
MU3001	751	375	375	0	0
PA31	106	53	53	0	0
R22	11	5	5	0	0
S70	4160	2080	2080	0	0
SA350D	11	5	5	0	0
T-38A	17	8	8	0	0
Total Annual Operations	35,600	17,800	17,684	73	43

Sources: Fleet Mix Forecast and HNTB.

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Table 3-3
2027 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures						
			Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
A-10	34	17	17						
A319	5	3	3						
A320-200	5	3	3						
Ae350	11	6	6						
AH-64	450	225	225						
B1900	3,744	1,872	1,872						
B205	50	25	25						
B206	59	30	30						
B-35	750	375	320	55					
B55	770	385	289	77	19				
B727-200	0	0	0						
B737-200	0	0	0						
B737-300	10	5	3	3					
B737-700	136	68	22	24	22				
B737-800	240	120	40	40	40				
B757-200	252	126	0	30	38	49	10	0	
B757-300	184	92	0	18	28	35	11		
B767-400 ER	8	4	0			0	2	1	1
BK-117	11	6	6						
C-12	900	450	180	148	122				
C-130	662	331	0	165	166				
C-17	136	68	0	18	50				
C172	7,137	3,569	3,033	536					
C182	3,600	1,800	1,530	270					
C208	460	230	115	115					
C-21	20	10	0	10					
C310	320	160	120	32	8				
C340	1,819	910	682	182	46				
C-37A	20	10	0		10				
C414	460	230	170	46	14				
C421	900	450	335	115	0				
C-425	360	180	45	90	45				
C-5	60	30	0	10	20				
C525	470	235	59	117	59				
C550	455	228	57	114	57				
C560	455	228	57	114	57				
CH-47	900	450	450						
Cit. X	180	90	30	30	30				
CRJ-200	50	25	13	10	3				
DC-9-15	0	0	0						

MANHATTAN REGIONAL AIRPORT – AIRPORT NOISE AND LAND USE COMPATIBILITY STUDY

Table 3-3
2027 MHK Fleet Mix

Aircraft Type (INM)	Total Annual Operations	Arrivals	Departures						
			Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
EMB-120	6	3	0	3					
EMB-145	72	36	18	13	5				
FD-328	8	4	0	4					
G-IV	130	65	12	27	26				
G-V	130	65	12	27	26				
KC-10	6	3	0		3				
King Air-90	2,600	1,300	325	650	325				
Lear 31	455	228	57	114	57				
Lear 45	780	390	100	190	100				
Lear 55	400	200	65	70	65				
M-20	740	370	278	92					
MD-11	24	12	0		6	6			
MD500	11	6	6						
OH-58	540	270	270						
PA-28	2,000	1,000	850	150					
PA-31	140	70	52	14	4				
PA-31T	1,050	525	131	263	131				
PA-32	2,000	1,000	850	150					
PA-34	134	67	50	14	3				
PC-12	450	225	56	113	56				
R-22	11	6	6						
R-BJ	220	110	36	36	38				
T-45	30	15	15						
T-A4	30	15	15						
UC-35A	200	100	17	34	49				
UH-60	3,710	1,855	1,855						
Total Annual Operations	41,960	20,980	14,809	4,331	1,727	90	23	1	1

Sources: Fleet Mix Forecast and HNTB.

Table 3-4
Aircraft Operational Categories

Operational Category	Description
GJ	General Aviation Jet
GP	General Aviation Propeller
MH	Military Helicopter
CH	Civilian Helicopter
MJ	Military Jet
MP	Military Propeller
PJ	Passenger Jet
RJ	Regional Jet

Source: HNTB.

Table 3-5
Aircraft Identifiers and Modeled Aircraft Types

Aircraft Type	INM Aircraft Type	Description	Aircraft Group	Operational Category
A-10	A10A	Fairchild-Republic A-10A Thunderbolt	Military	MJ
A319	A319-131	Airbus A319	Charter	PJ
A320-200	A320-232	Airbus A320-200	Charter	PJ
Ae350	SA350D	Ecureuil (Squirrel) AS350	Helo - Civil	CH
AH-64	S70	AH-64 Apache	Helo - Mil	MH
B1900	BEC190	Raytheon Beechcraft 1900D	Commuter	GP
B205	B212	Bell 205	Helo - Civil	CH
B206	B206L	Bell 206	Helo - Civil	CH
B-35	BEC33	Beechcraft Bonanza	GA	GP
B55	BEC55	Raytheon Beechcraft Baron 55	GA	GP
B727-200	7272EM2	Boeing 727-200	Charter	PJ
B737-200	737N17	Boeing 737-200	Charter	PJ
B737-300	737300	Boeing 737-300	Charter	PJ
B737-700	737700	Boeing 737-700	Charter	PJ
B737-800	737800	Boeing 737-800	Charter	PJ
B757-200	757PW	Boeing 757-200	Charter	PJ
B757-300	757300	Boeing 757-300	Charter	PJ
B767-400 ER	767400	Boeing 767-400 ER	Charter	PJ
BK-117	EC130	Eurocopter BK117	Helo - Civil	CH
C-12	C12	King Air 200, painted military	Military	MP

Table 3-5
Aircraft Identifiers and Modeled Aircraft Types

Aircraft Type	INM Aircraft Type	Description	Aircraft Group	Operational Category
C-130	C130	C-130 Hercules	Military	MP
C-17	C17	C-17 Globemaster	Military	MJ
C172	CNA170	Cessna 172	GA	GP
C182	CNA182	Cessna 182 Skylane	GA	GP
C208	CNA208	Cessna 208 Caravan	GA	GP
C-21	C21A	C-21 Lear Jet 35-A	Military	MJ
C310	CNA310	Cessna 310	GA	GP
C340	CNA340	Cessna 340	GA	GP
C-37A	GV	C-37A Gulfstream V	Military	MJ
C414	CNA414	Cessna 414	GA	GP
C421	CNA421	Cessna 421	GA	GP
C-425	CNA425	Cessna 425 Corsair (Conquest I)	GA	GP
C-5	C5A	Lockheed C-5 Galaxy	Military	MJ
C525	CNA525	Citation CJI	GA	GJ
C550	CNA550	Citation II or S/II	GA	GJ
C560	CNA560	Citation V	GA	GJ
CH-47	CH47D	CH-47 Chinook	Helo - Mil	MH
Cit. X	CIT3	Citation X	GA	GJ
CRJ-200	CLREGJ	Bombardier CRJ200 LR	Charter	RJ
DC-9-15	DC93LW	McDonnell Douglas DC-9	Charter	PJ
EMB-120	EMB120	Embraer 120	Charter	RJ
EMB-145	EMB145	Embraer 145	Charter	RJ
FD-328	EMB135	Fairchild-Dornier 328 Jet	Charter	RJ
G-IV	GIV	Gulfstream 450	GA	GJ
G-V	GV	Gulfstream V	GA	GJ
KC-10	KC10A	KC-10 Extender	Military	MJ
King Air-90	CNA441	Beechcraft King Air	GA	GP
Lear 31	LEAR31	LearJet 31-A	GA	GJ
Lear 45	LEAR45	LearJet 45	GA	GJ
Lear 55	LEAR55	LearJet 55	GA	GJ
M-20	GASEPF	Mooney M20	GA	GP
MD-11	MD11GE	McDonnell Douglas MD-11	Charter	PJ
MD500	H500D	Hughes MD500	Helo - Civil	CH
OH-58	B206L	OH-58D Kiowa Warrior	Helo - Mil	MH
PA-28	PA28AR	Piper Cherokee	GA	GP
PA-31	PA31	Piper PA-31 Navajo	GA	GP

Table 3-5
Aircraft Identifiers and Modeled Aircraft Types

Aircraft Type	INM Aircraft Type	Description	Aircraft Group	Operational Category
PA-31T	PA31T	Piper PA-31T Cheyenne	GA	GP
PA-32	PA32LA	Piper Cherokee Six	GA	GP
PA-34	PA34	Piper PA-34 Seneca	GA	GP
PC-12	GASEPV	Pilatus PC-12	GA	GP
R-22	R22	Robinson R-22	Helo - Civil	CH
R-BJ	LEAR35	Raytheon Hawker 800	GA	GJ
T-45	T-38A	T-45A Goshawk Trainer	Military	MJ
T-A4	A4C	TA4 Skyhawk	Military	MJ
UC-35A	MU3001	Citation 560 Ultra V	Military	MJ
UH-60	S70	UH-60 Black Hawk	Helo - Mil	MH

Sources: INM 7.0A, Fleet Mix Forecast for MHK and HNTB.

3.2.2 INM Aircraft Database

The INM contains reference noise and performance data on nearly all aircraft types that operate at MHK, including hush kitted aircraft. Aircraft manufacturers such as Boeing and Airbus provide this data to the FAA. This data is then used to model an aircraft's departure and arrival flight profiles, and resultant noise exposure. Aircraft that are not specifically included in the database (such as those with unique engine combinations) are modeled using appropriate substitution aircraft and criteria per the FAA's pre-approved substitution list.

3.2.3 Aircraft Flight Profiles

Flight profiles model the vertical paths of aircraft during departure and arrival to determine the altitude, speed, and engine thrust of an aircraft at any point along a flight track. INM uses this information to calculate noise exposure on the ground.

Profiles are unique to each aircraft type and are based on airline operating procedures, temperature and aircraft operating weight. Detailed information on aircraft flight profiles, under varying conditions, is stored in the INM aircraft database.

The climb rate and flight profile of departing aircraft can vary considerably. New, modern aircraft have higher thrust engines and improved wing designs which results in an increased climb rate as compared to older aircraft. Modern jet engines are also much quieter than their predecessors, even though they can produce more thrust. Temperature, takeoff weight and airline operating procedures are also important factors that affect climb rate.

Pilots use their respective airline's operating procedures to maneuver an aircraft during takeoff. The procedures are unique to each aircraft type. Airlines develop their own operating procedures in conjunction with the aircraft manufacturer and they are approved by the FAA. As a result, operating procedures among most airlines are essentially similar. Standard INM departure profiles, which approximate Distant Noise Abatement Departure Profile (NADP) /ICAO-B profiles as published in FAA Advisory Circular (AC) 91-53A, were used in this study.

The INM aircraft database groups aircraft-specific profiles by stage length which refers to the length of the trip to be made by the aircraft type. INM assumes aircraft weight increases with stage, or trip length, due to the need for more fuel and that each aircraft type's takeoff distance and climb performance is different for each stage length. High-weight (long trip, high stage length) aircraft have increased takeoff distances and lower climb rates than lighter (short trip) aircraft for a given aircraft type. The distribution of operations by stage length is shown in Tables 3-1, 3-2, and 3-3.

Arriving aircraft do not use stage lengths, as they are modeled using a standard three-degree approach path. INM has a database of standard arrival flight profiles for each modeled aircraft type.

3.2.4 Runway Use

Runway use is determined by several factors, including safety, wind, weather, traffic demand, runway capacity, direction of flight, and prescribed runway use procedures. ATC assigns runway use with consideration to all of these factors.

The flow of operations at MHK can essentially be defined by the layout of the two runways. The predominantly used runway is Runway 03/21, where approximately 40 percent of the operations on that runway occur on Runway 03, and 60 percent occur on Runway 21. Runway 13/31 is primarily used by general aviation propeller aircraft and accounts for about 8 percent of the overall runway use at MHK. Runway 13/31 will be extended by 1200' to the northwest in 2010 for a total length of 5,000 feet, and Runway 03/21 (7,000 feet long) will be shifted to the southwest by 400 feet in 2010 to allow for the requisite 1,000-foot RPZ.

Runway use data for input to the INM was derived primarily from FAA ATCT input indicating direction of traffic flow by time of day, combined with validation of previously modeled data for the Manhattan Regional Airport Environmental Assessment (EA) for Runway Safety Area Improvements/Runway Extension as approved by the FAA in March of 2007. This data furnished the necessary runway use information for arrivals and departures, and for daytime and nighttime periods. Airport staff and ATCT staff reviewed the resulting flight tracks and runway utilization rates prior to the modeling of the noise environment at MHK.

Table 3-6 shows average daily runway use for the 2009, 2014, and 2027 NEMs. The identical aircraft runway use was used to develop the NEMs for the above mentioned years, as the existing trends in runway use are not expected to change substantially. This is because large aircraft in the fleet mix for the forecast years would continue to use the primary runway, Runway 03/21, consistent with the current use. As with aircraft flight operations, the INM runway use input is average daily runway use based on typical operations over the course of the entire year. Runway use is the proportion of aircraft that use a runway for departure, arrival, or touch-and-go's, expressed as a percentage. Note that the absence of projected aircraft operations on a runway does not preclude future use of that runway for such operations.

Runway use is modeled by aircraft operational category. Aircraft types are grouped into operational categories by operator (passenger jet, military jet, general aviation propeller, etc.) in order to incorporate operational trends into the NEMs. Average runway use of air carrier operations, such as passenger and cargo carriers, can differ from general aviation operators due to the different locations on the airfield from which these aircraft operate. General aviation and air carrier aircraft also tend to use different arrival and departure routes, and this can affect their respective runway use. Operational categories allow these unique trends to be incorporated into the noise model.

Table 3-6
 Modeled Annual Average Airfield Runway Use for 2009, 2014 & 2027

Operational Category	Operation Type	Runway/Pad	Percent Use Day	Percent Use Night
CH	Arrivals	PAD1	9%	9%
		PAD2	9%	9%
		PAD3	2%	2%
		PAD4	28%	28%
		PAD5	1%	1%
	Departure	PAD1	18%	18%
		PAD3	2%	2%
		PAD4	28%	28%
PAD5		1%	1%	
CH Total			100%	100%
GJ	Arrivals	03	20%	20%
		21	30%	30%
	Departure	03	20%	20%
		21	30%	30%
	Touch and Go	03	0%	0%
		21	0%	0%
GJ Total			100%	100%
GP	Arrivals	03	16%	16%
		13	1%	1%
		21	24%	25%
		31	1%	1%
	Departure	03	16%	16%
		13	1%	1%
		21	24%	25%
		31	1%	1%
	Touch and Go	03	6%	5%
		13	1%	1%
		21	9%	8%
		31	0%	0%
GP Total			100%	100%

Table 3-6

Modeled Annual Average Airfield Runway Use for 2009, 2014 & 2027

Operational Category	Operation Type	Runway/Pad	Percent Use Day	Percent Use Night
MH	Arrivals	PAD1	9%	9%
		PAD2	9%	9%
		PAD3	2%	2%
		PAD4	28%	28%
		PAD5	1%	1%
	Departure	PAD1	18%	18%
		PAD3	2%	2%
		PAD4	28%	28%
		PAD5	1%	1%
	MH Total			100%
MJ	Arrivals	03	20%	20%
		21	30%	30%
	Departure	03	20%	20%
		21	30%	30%
	Touch and Go	03	0%	0%
		21	0%	0%
MJ Total			100%	100%
MP	Arrivals	03	20%	20%
		21	30%	30%
	Departure	03	20%	20%
		21	30%	30%
MP Total			100%	100%
PJ	Arrivals	03	20%	20%
		21	30%	30%
	Departure	03	20%	20%
		21	30%	30%
	Touch and Go	03	0%	0%
		21	0%	0%
PJ Total			100%	100%
RJ	Arrivals	03	20%	20%
		21	30%	30%
	Departure	03	20%	20%
		21	30%	30%
	Touch and Go	03	0%	0%
		21	0%	0%
RJ Total			100%	100%

Source: HNTB.

Note: Differences may exist due to rounding.

3.2.5 Flight Track Layout and Use

Modeled flight tracks depict the approximate paths, or ground tracks, that aircraft use as they travel to and from the airport. Flight tracks are intended to be representative of typical aircraft operations at MHK. As with runway use, flight track use reflects the percentage of annual operations that use a specific flight route, grouped by arrival or departure and daytime or nighttime.

Figure 3.1 shows the modeled departure, arrival, and touch-and-go flight tracks for Runways 03/21 and 13/31. The modeled flight track names shown in Figure 3.1 indicate the general route that aircraft take when arriving or departing from the Airport. For example, 03A1 is an arrival track to Runway 03. **Table 3-7** shows annual average daily flight track use by operational category, time of day, and operation type. As existing trends in flight track layout and use are expected to remain constant for the foreseeable future, the identical aircraft flight track layout and use were used to develop the 2009, 2014, and 2027 NEMs.⁵

Flight track location and use was derived from FAA ATCT input indicating direction of traffic flow by time of day. Flight track location and use for military and helicopter use was developed through discussions with the ATCT at MHK and the airfield manager at Marshall Airfield, Fort Riley.

Due to the complex and increased dispersion of aircraft flight tracks as they leave the immediate vicinity of MHK, modeled flight tracks are only intended to represent actual operations up to the 60 DNL contour. Deviation from typical flight tracks would occur due to safety requirements, emergencies, weather, traffic demand, capacity, and aircraft performance.

Table 3-7
Modeled Annual Average Airfield Flight Track Use

Operational Category	Operation Type	Track ID	Percent Use Day	Percent Use Night
CH	Arrivals	03HA1	9%	9%
		03HA2	9%	9%
		13HA1	28%	28%
		21HA1	2%	2%
		31HA1	1%	1%
	Departure	03HD1	18%	18%
		13HD1	28%	28%
		21HD1	2%	2%
31HD1		1%	1%	
CH Total			100%	100%
GJ	Arrivals	03A1	20%	20%
		21A1	15%	15%
		21A2	15%	15%
	Departure	03D1	10%	10%
		03D2	10%	10%
		21D1	30%	30%
	Touch and Go	03T1	0%	0%
		21T1	0%	0%
GJ Total			100%	100%
GP	Arrivals	03A1	16%	16%
		13A1	1%	1%
		21A1	12%	12%
		21A2	12%	12%
		31A1	1%	1%
	Departure	03D1	8%	8%
		03D2	8%	8%
		13D1	1%	1%
		21D1	24%	25%
		31D1	1%	1%
	Touch and Go	03T1	0%	0%
		03T2	6%	5%
		13T2	1%	1%
		21T1	0%	0%
21T2		9%	8%	
31T2	0%	0%		
GP Total			100%	100%

Table 3-7
Modeled Annual Average Airfield Flight Track Use

Operational Category	Operation Type	Track ID	Percent Use Day	Percent Use Night	
MH	Arrivals	03HA1	9%	9%	
		03HA2	9%	9%	
		13HA1	28%	28%	
		21HA1	2%	2%	
		31HA1	1%	1%	
	Departure	03HD1	18%	18%	
		13HD1	28%	28%	
		21HD1	2%	2%	
		31HD1	1%	1%	
	MH Total			100%	100%
MJ	Arrivals	03A1	20%	20%	
		21A1	15%	15%	
		21A2	15%	15%	
	Departure	03D1	10%	10%	
		03D2	10%	10%	
		21D1	30%	30%	
	Touch and Go	03T1	0%	0%	
		21T1	0%	0%	
	MJ Total			100%	100%
	MP	Arrivals	03A1	20%	20%
21A1			15%	15%	
21A2			15%	15%	
Departure		03D1	10%	10%	
		03D2	10%	10%	
		21D1	30%	30%	
MP Total			100%	100%	
PJ	Arrivals	03A1	20%	20%	
		21A1	15%	15%	
		21A2	15%	15%	
	Departure	03D1	10%	10%	
		03D2	10%	10%	
		21D1	30%	30%	
	Touch and Go	03T1	0%	0%	
		21T1	0%	0%	
PJ Total			100%	100%	

Table 3-7
Modeled Annual Average Airfield Flight Track Use

Operational Category	Operation Type	Track ID	Percent Use Day	Percent Use Night
RJ	Arrivals	03A1	20%	20%
		21A1	15%	15%
		21A2	15%	15%
	Departure	03D1	10%	10%
		03D2	10%	10%
		21D1	30%	30%
	Touch and Go	03T1	0%	0%
		21T1	0%	0%
RJ Total			100%	100%

Source: HNTB.

Note: Differences may exist due to rounding.

3.3 SUMMARY OF NOISE MODEL INPUTS

The annual average daily number of aircraft modeled on any given flight track can be derived by multiplying the average daily flight operations by the runway use percentages, and then by the flight track use percentages. Note that this is representative of an average annual day only; in reality, the actual number of operations that use a specific flight track can vary significantly due to wind and operational factors. The total number of modeled AAD operations for the three scenarios were 75, 97 and 115, respectively.

The data discussed in this chapter is compiled and input into the INM to generate the DNL contours shown on the 2009, 2014, and 2027 NEMs, as presented in Chapter Five.

NOTES

¹ In the summer of 2010, Runway 13/31(crosswind runway) is to be extended by 1,200 feet to a length of 5,000 feet. Runway 03/21 (primary runway) will shift 400 feet to the southwest.

² Historic weather data and NOAA National Geophysical Data Center.

³ Ibid.

⁴ Manhattan Regional Airport Environmental Assessment, 2006; MHK Data Validation Package – February 2008.

⁵ The flight tracks were updated when the noise analysis was conducted for the NEMs in this 2010 Airport Noise and Land Use Compatibility Study to account for the Runway 13/31 extension and Runway 03/21 shift in the summer of 2010.

Chapter Four

LAND USE MAPPING AND COMPATIBILITY GUIDELINES

This chapter reviews the Federal and local land use guidelines related to compatibility with aircraft noise exposure and aeronautical uses, and the development of land use data needed for the analyses required in Part 150.

4.1 FEDERAL GUIDELINES

The degree of annoyance that people experience from aircraft noise varies, depending on their activities at any given time. For example, people are usually less disturbed by aircraft noise when they are shopping, working, or driving than when they are at home. Transient hotel and motel residents seldom express as much concern with aircraft noise as do permanent residents of an area. The concept of “land use compatibility” has arisen from this systematic variation in community reaction to noise.

In a Part 150 Study, DNL noise values have the following two principal uses:

- Provide a basis for comparing existing noise conditions to the effects of noise abatement procedures and/or forecast changes in airport activity; and
- Provide a quantitative basis for identifying potential noise impacts.

Both of these functions require the application of objective criteria for evaluating noise impacts. Part 150 provides the FAA’s recommended guidelines for noise-land use compatibility evaluation. **Table 4-1** reproduces these guidelines. As explained in Chapter 3, the Aviation Safety and Noise Abatement Act of 1979 required the FAA to select a single measure for evaluating airport noise. FAA, through the Part 150 Study process, adopted the DNL metric and guidelines for compatibility of various land uses with various intensities of DNL, as shown in the table.

The FAA’s guidelines represent a compilation of the results of scientific research into noise-related activity interference and attitudinal response. However, reviewers of DNL contours should recognize the highly subjective nature of an individual’s response to noise, and that special circumstances can affect individual tolerances. For example, a high, non-aircraft background noise level can reduce the significance of aircraft noise, such as in areas constantly exposed to relatively high levels of vehicular traffic noise. Alternatively, residents of areas with unusually low background noise levels may find relatively low levels of aircraft noise annoying.

Table 4-1
14 CFR Part 150 Noise/Land Use Compatibility Guidelines

Land Use	Yearly Day-Night Average Sound Level, DNL, in Decibels					
	<65	65- 70	70- 75	75- 80	80- 85	>85
<i>Residential Use</i>						
Residential, other than mobile homes and transient lodgings	Y	N(a)	N(a)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(a)	N(a)	N(a)	N	N
<i>Public Use</i>						
Schools	Y	N(a)	N(a)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(b)	Y(c)	Y(d)	Y(d)
Parking	Y	Y	Y(b)	Y(c)	Y(d)	N
<i>Commercial Use</i>						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail--building materials, hardware and farm equipment	Y	Y	Y(b)	Y(c)	Y(d)	N
Retail trade--general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(b)	Y(c)	Y(d)	N
Communication	Y	Y	25	30	N	N
<i>Manufacturing and Production</i>						
Manufacturing, general	Y	Y	Y(b)	Y(c)	Y(d)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(f)	Y(g)	Y(h)	Y(h)	Y(h)
Livestock farming and breeding	Y	Y(f)	Y(g)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
<i>Recreational</i>						
Outdoor sports arenas and spectator sports	Y	Y(e)	Y(e)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N
SLCUM	Standard Land Use Coding Manual					
Y(Yes)	Land use and related structures compatible without restrictions.					
N(No)	Land use and related structures are not compatible and should be prohibited.					
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.					
25, 30, or 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.					

See following page for Table Notes.

Table 4-1
14 CFR Part 150 Noise/Land Use Compatibility Guidelines

Notes for Table 4-1

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute Federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

- (a) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
 - (b) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
 - (c) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
 - (d) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
 - (e) Land use compatible provided special sound reinforcement systems are installed.
 - (f) Residential buildings require an NLR of 25.
 - (g) Residential buildings require an NLR of 30.
 - (h) Residential buildings not permitted.
-
-

Source: Table 1 of 14 CFR Part 150

Response may also be affected by expectation and experience. People may become accustomed to a level of exposure that guidelines typically indicate may be unacceptable. Conversely, minor changes in exposure may generate a response that is far greater than that which the guidelines suggest.

The cumulative nature of DNL means that the same level of noise exposure can be achieved in an infinite number of ways. For example, a reduction in a small number of relatively noisy operations may be counterbalanced by an increase in relatively quiet flights, with no net change in DNL. Residents of the area may be highly annoyed by the increased frequency of operations, despite the seeming maintenance of the noise status quo.

With these cautions in mind, the Part 150 land use compatibility guidelines can be applied to the DNL contours to identify the potential types, degrees, and locations of incompatibility. Measurement of the land areas involved can provide a quantitative measure of impact that allows a comparison of at least the gross effects of existing and future aircraft operations.

As listed in Table 4-1, Part 150 guidelines specify that all uses are normally compatible with aircraft noise exposure levels at or below 65 DNL. This limit is supported formally by standards adopted by the Department of Housing and Urban Development (HUD). HUD standards address whether sites are eligible for Federal funding support. These standards, set forth in 24 CFR Part 51, define areas with DNL exposure not exceeding 65 dB as acceptable for funding. Areas exposed to noise levels between 65 and 75 DNL are “normally unacceptable,” and require special abatement measures and review. Those areas at 75 DNL and above are “unacceptable” unless special approval is received.¹

In addition to the required 2014 forecast period, this Part 150 considers the noise environment likely to exist at MHK in the long-term. While not required under 14 CFR Part 150, the noise contours for the future year 2027 were also considered in evaluating land use measures due to significant growth and changes underway in Manhattan and nearby communities. See Chapter Seven for additional reasoning for inclusion of 2027 analysis.

4.2 LAND USE MAPPING

This section describes the development of land use and population data for the areas within MHK’s noise contours. Noise impact analysis on land use for the Study was conducted using Geographic Information Systems (GIS), which facilitated a detailed analysis of land use compatibility and noise impact to communities near MHK. To produce the land use and noise exposure maps (NEMs) for this study, HNTB collected parcel, land use, and city limit GIS data from the Riley County Community GIS Website. The data is available to the public via the Internet through a collaboration involving Riley County, the City of Manhattan, Community Resource Exchange (CORE), and Project Impact. The GIS Website is maintained by the Riley County and City of Manhattan GIS departments.²

The land use, parcel, and city limit information used for this Part 150 Study was updated in 2009. Due to the large number of land use categories identified in the GIS land use data, HNTB reclassified the land use codes into fourteen general categories to be displayed and analyzed.³ In July of 2007, both the City of Manhattan and Riley County received requests to provide concurrence with the land use reclassification on the maps and graphics developed for this study. HNTB applied the same reclassification to the 2009 land use data to simplify land use categories, and again requested and received concurrence with the updated land use from the City of Manhattan and Riley County. See **Appendix B** for land use code reclassification information and city and county land use concurrence correspondence.

Figure 4.1 depicts existing land uses in the vicinity of MHK. Land use categories include the following:

- Residential
- Commercial
- Agriculture
- Communication
- Government/Public/Institution
- Cultural/Entertainment/Recreation
- Industrial
- Vacant
- Vacant Residential
- Church
- School
- Transportation
- Unknown
- Utility

DNL noise contours, when superimposed on the land use base maps, allow assessment of land use compatibility for existing and forecast noise exposure conditions at MHK. Existing incompatible land uses (i.e. Residential, Church, School) within the noise contours were then identified. The aerial photography images shown underneath the land use information are from 2006.

To estimate population counts within the DNL contours, demographic data from the U.S. Census Bureau (2000) and Census TIGER[®] (Topologically Integrated Geographic Encoding and Referencing System) information was used.⁴ Using GIS analysis, the land area of the 2009, 2014, and 2027 NEM contours was intersected with the 2000 Census data to calculate the population and housing units within each of the noise contours (60, 65 and 70 DNL for each).

The Manhattan Urban Area Comprehensive Plan (2003) and the City of Manhattan and Riley County zoning maps were all consulted as part of the land use analysis for this Part 150. The Zoning Ordinances and corresponding Zoning Maps are accessible through the Manhattan and Riley County websites. The Comprehensive Plan contains existing and future land use information in the Manhattan Urban Area. A summary of each of these documents and their applicability to the Part 150 land use analysis is provided in Chapter Seven, Land Use Measures.

NOTES

¹ Office of the Secretary, HUD. 24 CFR, Part 51– Environmental Criteria and Standards. 4-1-07 Edition.

² Riley County Community GIS Website, <http://gis.rileycountyks.gov/> (Last accessed April 2009).

³ Riley County Community GIS Website, <http://gis.rileycountyks.gov/> (Last accessed April 2009).

⁴ TIGER/Line Data®, U.S. Census Bureau, <http://www.census.gov/geo/www/tiger/> (Last accessed April 2009).

Chapter Five

NOISE EXPOSURE MAPS

This chapter presents the Noise Exposure Maps (NEMs) for the years 2009, 2014, and 2027. The NEMs were developed with the information discussed in Chapters Three and Four, and represent existing and forecast noise exposure at MHK.

5.1 NOISE EXPOSURE MAPS

This section presents the MHK NEMs for the Existing Condition in 2009, the Forecast Condition in 2014 and the Forecast Condition (2014) with the implementation of the proposed Noise Compatibility Program (NCP) which includes noise abatement measures discussed in Chapter 6. These NEMs were developed in accordance with the provisions of 14 CFR Part 150, Airport Noise Compatibility Planning. The NEMs for 2027 with and without the implementation of the NCP are also included as a potential future scenario to promote the protection of compatible land uses which are a part of the planned development of the Airport. The certification page at the front of this document and on the NEMs addresses Part 150 requirements regarding the accuracy of the maps and the opportunities provided for public review and input.

5.1.1 Year 2009 Existing Condition Noise Exposure Map

Figure 5.1 presents the NEM for existing conditions for the year of submission (2009), developed with existing land use, operational procedures, airport layout, flight operations and fleet mix, and other noise modeling considerations described in Chapters Three and Four. Figure 5.1 is referred to as the 2009 NEM.

As shown in **Table 5-1**, there are no residents or housing units within the 65 DNL contour of the 2009 NEM. Within the 60-64 dB DNL contours, there are approximately 23 people, nine (9) housing units and one (1) “school” land use (Flint Hills Job Corporation). As the 65 DNL is the Federal threshold for impact to residential areas, the counts within the 60 to 64 DNL contour are provided for informational purposes only. There are also no noise sensitive non-residential locations (schools, hospitals, places of worship, etc) within the 65 DNL contours of the 2009 NEM.

Table 5-1

Summary of Residential Land Use with the Noise Contours:

2009 NEM Residential Land Use				
DNL	Population	Housing Units	Schools	Acreage
60-64	23	9	1	323
65-69	0	0	0	130
70 +	0	0	0	102
Total	23	9	1	555

Notes: Population/Acreage data rounded to the nearest whole number.
 Data corresponds to previous noise analysis completed prior to change in runway configuration. Refer to Appendix C for corresponding NEMs.

Source: HNTB Analysis

5.1.2 Year 2014 Forecast Condition Noise Exposure Map

Figure 5.2 presents the NEM for forecast conditions for the fifth year following the year of submission (2014). The NEM was developed assuming that the existing land use, the existing operational procedures, airport layout¹, flight operations and fleet mix, and other noise modeling considerations described in Chapters Three and Four would remain the same as those defined for 2009. Figure 5.2 is referred to as the 2014 NEM.

As shown in **Table 5-2**, there are no residents or housing units within the 65 DNL contour of the 2014 NEM relative to the existing land use. Within the 60-64 DNL contour there are approximately 18 people and 7 housing units.

The 2014 noise contours are slightly smaller than the 2009 contours off the ends of Runway 03/21 due to the reduction in daily operations conducted by fixed wing military aircraft. The reduction is from approximately 5 daily operations in 2009 to 3 operations in 2014. Annually this amounts to a difference of about 730 operations. The overall shape of the contours is comparable since there is no change in the fleet and the use of the airfield. The 2014 contours are slightly smaller than the 2009 contours on the north end of Runway 13/31 due to the decrease in operations using this runway in 2014. There are no non-residential noise sensitive locations (schools, hospitals, places of worship, etc) within the 65 DNL contours of the 2014 NEM.

Table 5-2

Summary of Residential Land Use within the Noise Contours

2014 NEM Residential Land Use			
DNL	Population	Housing Units	Acreage
60-64	18	7	308
65-69	0	0	126
70 +	0	0	100
Total	18	7	534

Note: Population/Acreage data rounded to the nearest whole number.
 Data corresponds to previous noise analysis completed prior to change in runway configuration. Refer to Appendix C for corresponding NEMs.
 Source: HNTB Analysis

5.1.3 Year 2027 Forecast Condition Noise Exposure Map

Figure 5.3 presents the NEM for a potential future scenario (year 2027) to protect compatible land uses that are currently part of future development planned for MHK. The contours were developed based on the assumption that existing land use, existing operational procedures, airport layout, flight operations and fleet mix, and other noise modeling considerations described in Chapters Three and Four would remain the same as those defined for 2009 and 2014. Figure 5.3 is referred to as the 2027 NEM.

The 65 DNL contour of the 2027 NEM contains approximately 14 people and 5 housing units relative to the existing land use. As shown in Table 5-3, within the 60-64 dB DNL contour, there are approximately 198 people, 84 housing units and one (1) school.

The 2027 noise contours are much larger than the 2014 off the ends of Runway 03/21, but are about the same off the ends of Runway 13/31. There is also an increase in the overall width of the noise contours. The increase in size in both directions is due to the increased activity of fixed wing aircraft on Runway 03/21. While the overall number of AAD operations has increased by only 18 AAD operations, the increase in jet aircraft operations is the major contributor to the increase in the noise contours to the northeast and southwest of the airfield. Approximately 12 of the 18 additional operations are general aviation propeller and military propeller aircraft. The remaining six operations are the much louder passenger aircraft (B-737/700 & 800, B-757, B-767) and military aircraft (C5-A & KC-10A).

Considering the 2009 existing land uses, there are no non-residential noise sensitive locations (schools, hospitals, places of worship, etc) within the 65 DNL contours of the 2027 NEM.

Table 5-3

Summary of Residential Land Use within the Noise Contour

2027 NEM Residential Land Use				
DNL	Population	Housing Units	Schools	Acreage
60-64	198	84	1	817
65-69	14	5	0	289
70 +	0	0	0	159
Total	212	89	1	1265

Note: Population/Acreage data rounded to the nearest whole number.
 Data corresponds to previous noise analysis completed prior to change in runway configuration. Refer to Appendix C for corresponding NEMs.

Source: HNTB Analysis

5.1.4 Year 2014 Forecast Condition Noise Exposure Map with the Implementation of the Noise Compatibility Program

Figure 5.4 shows the 2014 NEM with the implementation of the proposed noise abatement measures, which require the shifting of arrival/departure flight tracks to Runway 03/21. The measures included an adjustment to the current arrival/departure flight track to the southeast and the addition of a new arrival flight track to Runway 21. The aircraft operations to and from this runway were distributed on these flight tracks by aircraft type. These noise abatement measures are discussed in detail and illustrated in Chapter 6.

The implementation of these noise abatement measures does not change the noise impacts to the communities surrounding the Airport and as such does not change the number of sensitive land uses within the 65 DNL contour. While there is no change in the noise exposure due to the implementation of these measures, the NEM is included in this Study in keeping with the requirements necessary to fulfill the Part 150 Study Process.

5.1.5 Year 2027 Forecast Condition Noise Exposure Map with the Implementation of the Noise Compatibility Program

Figure 5.5 shows the 2027 NEM with the implementation of the same noise abatement measures implemented in the 2014 Forecast Condition. These measures result in a slight change in the 60 DNL noise contours to the northeast of the Airport but do not result in change to the 65 DNL contour.

The implementation of the noise abatement measures in 2027 does not change the number of sensitive land uses within the 60 or 65 DNL contours.

5.1.6 Sensitivity Analysis for the Introduction of the Embraer 145

A sensitivity analysis was conducted to determine the impact of introducing scheduled service to and from MHK, utilizing the Embraer 145 (EMB-145) aircraft. This analysis was necessary to ensure that the noise contours used in this Part 150 are representative of the current conditions and those forecast in consideration of the additional EMB-145 operations initiated in spring of 2009. The NEMs for 2009 and 2014 were developed using the FAA-approved forecast from the MHK Master Plan and therefore did not include operational changes that have occurred since the forecast was approved in April 2008.

In coordination with the Airport, several assumptions were made based on the information available to determine the number of operations to be modeled for this sensitivity analysis. HNTB determined that since the Part 150 Study was completed using the forecast, the total number of operations modeled for the Existing Condition (2009) and Forecast Condition (2014) for this analysis should also remain the same. The assumptions made are as follows:

- The expected number of EMB-145 operations by the new carrier is four flights per day, which amounts to 1,456 annual operations. The number of operations conducted by this carrier is not expected to increase in 2014, therefore the number of EMB-145 operations modeled in 2014 remain the same.
- In 2009, the increase in EMB-145 results in the decrease in Beech 1900 operations at MHK. The total number of forecasted Beech 1900 operations for 2009 is 1,872 (See Table 3-1). Hence, the number of Beech 1900 operations modeled for this analysis is 416 (1,872 less 1,456).
- In 2014, the number of EMB-145 operations modeled is 1,456. No Beech 1900 operations were modeled.
- The total number of Beech 1900 operations forecasted in 2014 is 3,052 (See Table 3-2). For the purposes of this analysis, it is anticipated that there will be no Beech 1900 aircraft operating at MHK in 2014. Therefore, in addition to the 1,456 EMB-145 operations, the Cessna King Air was substituted for the remaining 1,596 operations to total of 3,052 annual operations.

The resulting noise impacts due to the increase in operations of the EMB-145 and reduction in the Beech 1900 operations did not yield a noticeable change to the noise exposure in 2009 or 2014. Therefore the NEMs develop for 2009 and 2014 using the approved forecast are still representative of the Existing Conditions and Forecast Condition at MHK.

NOTES

¹ 2010 *Airport Noise and Land Use Compatibility Study* note: The airport layout is being modified between 2009 and 2014 due to the shifting of Runway 03/21 to the southwest and the extension of Runway 13/31, both anticipated to be complete during the summer of 2010. The discussion in the chapter text refers to the NEMs completed for the draft Part 150, prior to modeling the noise with the new runway layout. See Cover Letter for additional detail.

Chapter Six

NOISE ABATEMENT MEASURES

This chapter discusses the proposed Noise Abatement (NA) measures that may offer benefits to the Airport and the surrounding community at the present time and in the future. If approved these measures would be a part of the Noise Compatibility Program (NCP) for MHK. Currently there are no existing noise abatement measures at MHK. Typically, noise abatement measures consider changes to how the runways are utilized, the flight (ground) tracks that the aircraft use to fly to and from the airport, and operational procedures that are used to determine how and where aircraft fly within proximity to an airport.

With the current levels of activity at MHK, the airport operator has not dealt with any major noise complaints from the community. Anticipating the expected growth in civilian and military air traffic at MHK in the coming years, the noise abatement measures included for consideration in this Part 150 Study seek to alleviate potential impacts that may be experienced by the population within the 65 DNL contour. While the five-year 65 DNL contour is the primary noise level to be considered per Part 150 guidelines, the 2027 65 DNL contour was also considered in this Part 150 Study due to the desire to protect for future growth in operations. Based on the noise contours produced for the Part 150, currently there are no housing units within the projected 2014 65 DNL contour. This number is forecasted to increase to 5 housing units and 14 people within the 2027 65 DNL contour. The 2027 noise contours were examined so as to promote the protection of compatible land uses that are part of the planned development of MHK. This includes development that is anticipated when MHK becomes an Aerial Port of Embarkation (APOE) for Fort Riley.

The sections in this chapter summarize the proposed noise abatement measures at MHK, the development of the noise abatement procedures in the NCP, and a summary of the noise abatement measures recommended for inclusion in the NCP.

6.1 EVALUATION OF NOISE ABATEMENT MEASURES

Noise abatement measures are analyzed and evaluated for their potential to mitigate noise impacted areas within the 65 DNL contour. Each measure must be feasible from an operational stand point, follow FAA regulations, and not compromise the safety of pilots/passengers and the work load of air traffic controllers. The proposed measures should also be analyzed for their impact on the capacity and delay constraints at the airport. The proposed measures for MHK were analyzed for their effectiveness in reducing noise impacts, feasibility, cost and safety, while keeping with Part 150 guidelines. Airport and Air Traffic Control Tower (ACTC) staff, Fort Riley personnel, and airport users input were taken into consideration when developing these measures.

The criteria used to evaluate the abatement measures are shown in **Table 6-1**. Each of the measures is presented in this section in tabular format.

Table 6-1

Evaluation Criteria for Noise Abatement Measures

Description	Brief description of proposed measure.
Changes in Noise Exposure	Estimate potential population changes within the 65+ DNL contours for 2009, 2014, and 2027. This needs to be in reference to existing land use, which could result from a proposed measure. The evaluation of this criterion is conducted in consultation with ATC, Airport Personnel and the city/county within proximity of MHK.
Effects on Airport Operations and ATCT Work Load	Assess ATCT and operation feasibility of a proposed measure, in reference to safety, ATC and airline guidelines, aircraft performance, navigation technology, aeronautical users as appropriate, etc.
Impact on Airport Users	Quantitative cost of measures to aeronautical users, including airlines, resulting from increased delay, taxi distance or flight distance.
Regional Economic Impacts	Qualitative assessment of regional impacts stemming from the measure; for example, airport access restrictions that would cause reduced airline service.
Quality of Service Impacts	Qualitative assessment of potential impacts to service for passengers, for example, airport access restrictions that would cause reduced airline including reduced airline schedules and competition, increased delays, etc.
Associated Cost	Quantitative costs of a measure, including infrastructure improvements, equipment acquisition, etc.
Ease of Implementation and Enforcement	Assessment of probability of successful and effective implementation and any environmental documentation required for FAA approval. To the extent possible, this criterion will also identify the parties responsible for enforcement of the measure.
Legal Factors	Legal constraints to implementation of a measure, including, but not limited to Part 161, federal grant assurances, airline lease agreements with airport, etc.
Conclusion	Positive or negative recommendation on inclusion of measure in NCP.

6.2 POTENTIAL NOISE ABATEMENT MEASURES FOR MHK

Part 150 requires that certain measures be evaluated for inclusion in the NCP. Some of these measures may not be feasible for implementation due to the cost and/or benefit for the airport or due to the fact that the current level of operations at the Airport have not resulted in noise complaints from the surrounding communities. MHK is such an airport, where the current levels of operations have not been of concern to the community. This can be seen by the noise contours for 2009 and 2014, where the 65 DNL contours are entirely on airport property. The potential future 65 DNL contour for 2027 extends beyond airport property to the northeast and southwest.

Since there have been no abatement measures previously considered, the primary purpose of this Part 150 Study is to identify abatement measures that may provide a benefit to the Airport based upon the current level of operations (2009) or the expected changes in the future year (2014). The proposed measures were also examined in relation to the potential future 2027 contours for consistency with land use measures, see Chapter Seven. These noise abatement measures were considered based upon guidance provided by 14 CFR Part 150 Process, Noise Control and Compatibility Planning for Airports (AC-150/5020-1) and 14 CFR Part 161 Notice and Approval of Airport Noise and Access Restrictions.

The potential abatement measures that should be considered for implementation per Part 150 are:

- The construction of shielding and/or noise barriers that would protect the surrounding areas from arrivals, departures and run-up operations.
- Preferential runway use that would enable the use of specific runways to direct the flow of aircraft operations over compatible land uses.
- A change to departure and/or arrival procedures to mitigate the impacts from these operations over sensitive land uses.
- A change to flight tracks/paths to direct the flow of aircraft over non-sensitive land.
- The use of restrictions on aircraft operations by the airport. These could be either imposed upon FAA approval or a voluntary effort on the part of the operators that use the airport.

Construction of shielding and/or noise barriers were not considered viable based upon the level of daily operations and the lack of run-up operations. Preferential runway use is also not a viable option as the airfield has only one primary runway, which is used approximately 92 percent of the time due to the length and alignment with wind conditions.

6.3 OPERATIONS TO BE EVALUATED FOR NOISE ABATEMENT MEASURES

The following operations were evaluated to provide abatement measures that were reasonable based on the cost and benefits associated with the implementation of these noise abatement measures.

- *Aircraft Departure Operations* – Defining departure procedures for turbojet aircraft.
- *Aircraft Arrival Operations* – Shifting the flight path of arrival operation from the southeast to Runway 21.
- *Touch and Go Operations* – Propose conditions for the safe operation of aircraft in the flight pattern while over flying residential areas.
- *Nighttime Arrival and Departure Operations* – The use of a curfew or voluntary limitation of operations during the hours of 2200 to 0700.
- *Run-up Operations* – Proposed locations for any maintenance run-ups that may be carried out on the air field.
- *Helicopter Operations* – Procedures for helicopter operations by civilian and military aircraft.
- *Military Operations* – Procedures for military aircraft utilizing MHK for transit to and from Fort Riley and training operations initiated at Fort Riley.

These operations were evaluated against potential measures that would mitigate noise issues that may be present currently and against potential noise issues that may arise in the future due to an increase in operations and the collective growth of the airport and region.

Since a majority of the helicopter operations at MHK are conducted by the military, these two categories were evaluated as one. Run-up operations that are currently conducted at the Airport occur prior to departure at the runway thresholds and have not resulted in noise complaints from the surrounding community. Therefore, they were not evaluated for an abatement measure at this time.

6.3.1 Potential Measure NA – 1: Departure Procedures for Turbojets

The departure procedures for turbojets were evaluated because while operationally they account for only approximately 10 percent of the total operations that occurred in 2009, less than 10 percent of the operations projected to occur in 2014 and more than 12 percent of the operations projected for 2027, the noise contribution by these aircraft to the overall noise environment is much greater than the general aviation aircraft and helicopters that utilize MHK. Therefore the proposed abatement measure recommends that turbojet aircraft departing Runway 03 and 21 should maintain runway heading until reaching 2,000 feet Above Ground Level (AGL) unless

otherwise directed by Air Traffic Control Tower (ATCT). This would enable the aircraft to reach a high enough altitude before making turns over noise sensitive land uses. **Table 6-2** shows the evaluation of this measure.

The potential benefit from implementing this measure would be the reduction of single-event noise close-in to the airport. This is due to the aircraft climbing to a higher altitude before making a turn towards their ultimate destination.

Table 6-2

NA-1: Departure Procedures for Turbojets

Description	Turbojets departing Runway 03/21 would maintain runway heading until reaching 2,000 feet AGL unless otherwise directed by ATC.
Changes in Noise Exposure	The changes in the overall noise exposure would be minimal, but the single-event noise due to turns made at lower altitudes would decrease. There would be no change in noise exposure to the population within the 65 DNL contours.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	None.
Regional Economic Impacts	None.
Quality of Service Impacts	None.
Associated Cost	There is no expected cost associated with this measure to the airport or the user.
Ease of Implementation and Enforcement	This measure would be requested of the users by the Airport and implemented by ATCT.
Legal Factors	None.
Conclusion	Recommended to be included in the NCP.

6.3.2 Potential Measure NA – 2: Relocating the Arrival/Departure Flight Track to/from Runway 03/21 with a Short-Final Approach Segment

The current flight track that is used for arrivals to Runway 21 and departures from Runway 03 to the southeast of the Airport fly over residential communities close to the Miller Parkway corridor. Relocating the flight track closer to the Kansas River prior to turning to the final approach segment would make sure that aircraft do not fly over the residential communities in

that area. See [Figure 6.1](#) for a comparison of the current flight track and the proposed flight track for the abatement measure. **Table 6-3** shows the evaluation of this measure.

The benefit of this measure would be the reduction in over flights that potentially affect the residential community to the northeast of the Airport. The drawback of the new location of the abatement flight track would be the shortening of the final approach segment to Runway 21 to less than 2 miles. Larger aircraft that require a longer final approach segment would not be able to use this track. The workload of the pilot may also increase with a relatively smaller turn radius to final approach segment. Therefore, this measure should be enforced at the discretion of ATCT.

Table 6-3

NA-2: Relocating the Arrival Flight Track to Runway 03/21

Description	Relocating the arrival flight track currently overflying the residential community on the bluff, so that the aircraft is closer to the Kansas River, before turning final to Runway 21 approximately 2 miles from the runway threshold.
Changes in Noise Exposure	There would be no change in noise exposure to the population within the 65 DNL contours.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	Possible increase in pilot workload due to the turn to final approach having a smaller turn radius.
Regional Economic Impacts	None.
Quality of Service Impacts	None.
Associated Cost	None.
Ease of Implementation and Enforcement	Measure would require coordination with ATCT to educate pilots on new procedure. Implementation and enforcement would be at the discretion of ATCT based on safety.
Legal Factors	None.
Conclusion	Recommended to be included in the NCP.

6.3.3 Potential Measure NA-3: Relocating the Arrival Flight Track to Runway 21 with a Five Nautical Mile Final Approach Segment

This measure would require the flight track that currently routes arriving aircraft over the residential community near Miller Parkway corridor to be moved north of the City of Manhattan, intercepting the final approach segment approximately five (5) nautical miles (NM). **Table 6-4** shows the evaluation of this measure.

The benefit from this measure is that arriving aircraft would avoid the communities that it currently over flies and not affect the communities in the City of Manhattan due to the increased altitude five NM from the airport. **Figure 6.2** shows the location of the current flight track and the proposed abatement flight track.

Table 6-4

NA-3: Relocating the Arrival Flight Track to Runway 21

Description	Relocating the arrival flight track currently overflying the residential community on the bluff to the north so that the aircraft intercept final approach approximately five (5) NM from the threshold of Runway 21.
Changes in Noise Exposure	There would be no change in noise exposure to the population within the 65 DNL contours.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	Increase in fuel cost due to longer final approach segment.
Regional Economic Impacts	None.
Quality of Service Impacts	None.
Associated Cost	None.
Ease of Implementation and Enforcement	Measure would require coordination with ATCT to educate pilots on new procedure. Implementation and enforcement would be at the discretion of ATCT based on safety.
Legal Factors	None.
Conclusion	Recommended to be included in the NCP.

6.3.4 Potential Measure NA-4: Limitations on Nighttime Operations

This measure would reduce over flight noise due to nighttime aircraft operations. These operations tend to be more intrusive than day time operations due to the lower levels of ambient noise and to account for this intrusiveness a 10 dB penalty is applied to night operations. There are approximately 10 operations per night modeled for 2009, 13 operations in 2014 and

approximately 16 operations per night expected in 2027. **Table 6-5** shows the evaluation of this measure.

Nighttime use restrictions are generally voluntary and airports that wish to reduce the number of nighttime flights look to the users to cooperate with them to maintain and/or improve their relationship with the surrounding community. Currently the operational levels at night time are low and the benefits gained would be minimal, but as the number of night time flights increase in the future, this abatement procedure should be reevaluated. For the purposes of this Study, restricting flights to and from MHK during these hours is not recommended at this time.

Table 6-5

NA-4: Voluntary Limitations on Nighttime Operations

Description	This is a voluntary limitation of nighttime operations (2200 to 0700).
Changes in Noise Exposure	Compliance would reduce the single event noise during these hours. The change in overall noise exposure cannot be measured, since this is a voluntary measure. Currently the number of operations that occur during these hours is minimal and therefore the noise benefits would be minimal. But any reduction in the number of nighttime operations would potentially reduce the overall size of the 65 DNL contours.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	Only users and operators that will not be significantly impacted will be expected to participate in this measure. Military, Coast Guard, and Police aircraft will not be expected to participate due to the constraints based upon their operations.
Regional Economic Impacts	None.
Quality of Service Impacts	None.
Associated Cost	None.
Ease of Implementation and Enforcement	MHK staff would request operators to limit nighttime activity and advise ATCT to advise pilots of the nighttime noise abatement policy. MHK would be required to work with users and the FBO to educate the flying community of how to implement this policy when ATCT is closed.
Legal Factors	None as it is a voluntary measure.
Conclusion	This measure would produce limited benefits to MHK based upon the current level of nighttime operations. Therefore it is not recommended. If the number of nighttime operations increases at any time in the future, this measure could be reevaluated in the next NCP update.

6.3.5 Potential Measure NA-5: Modifications to Touch and Go Operations

Touch and go operations at the Airport are mainly carried out by local general aviation pilots based at MHK and military pilots from Fort Riley. Three individual elements are considered for this abatement measure specific to touch and go operations. For Element 1, the aircraft should climb to the Traffic Pattern Altitude (TPA) on the upwind leg before turning, unless otherwise advised by ATC. The pattern altitude is 843 feet AGL for general aviation aircraft and 1,443 feet for turbine powered aircraft. **Table 6-6** shows the evaluation of this measure.

Element 2 requires the limiting of touch and go operations at the Airport. Since touch and go operations are repetitive and conducted at a relatively lower altitude they can be a source of noise and annoyance to the community. Based on the number of flights per day in 2009 and 2014, it is unlikely that these operations would be a source of concern from a noise perspective. The touch and go operations are not expected to change in the potential future scenario (2027). Element 3 requires a limitation on the number of successive touch and go operations. If these operations were to go up in number, limiting the days and times that they are conducted along with the number of touch and go's completed in succession by an aircraft in the flight pattern would help alleviate any noise issues arising from these operations.

It is recommended that the Airport implement Element 1, which is the climb-out to TPA as advised by ATCT, but due to the low level of touch and go operations, Elements 2 and 3 are not recommended at this time.

Table 6-6

NA-5: Modifications to Touch and Go Operations

Description	Element 1 - Aircraft should climb to TPA on the upwind leg before turning, unless otherwise advised by ATCT. Element 2 - Limit Touch and Go operations to certain days and times. Element 3 - Limit the number of Touch and Go operations completed successively.
Changes in Noise Exposure	There would be no change in noise exposure to the population within the 65 DNL contours.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	Training schedules of flight students could be affected by restricting activity to certain days and time and operations per flight. Climbing to TPA should not impact the users.
Regional Economic Impacts	None.

Table 6-6

NA-5: Modifications to Touch and Go Operations

Quality of Service Impacts	None.
Associated Cost	Airport may experience a decrease in new flight training if touch and go operations are restricted.
Ease of Implementation and Enforcement	Measure would require coordination with ATCT to educate pilots and would be enforced by ATCT at their discretion based on the level of activity at the airfield.
Legal Factors	None related to climbing to TPA. Any requirement to limit operations would require a Part 161 Study.
Conclusion	Element 1 (Climbing to TPA for touch and go operations) is recommended to be included in the NCP.

6.3.6 Potential Measure NA-6: Modifications to Military Helicopter Operations

Military operations accounted for about seven percent of the overall operations in 2009, are expected to increase to almost 20 percent in the future year of 2014 and are expected to remain at about that level in the potential future (2027) scenario. A large percentage of the operations in 2014 and 2027 are helicopter operations conducted out of Fort Riley. **Table 6-7** shows the evaluation of this measure.

Helicopters operate at much lower altitudes than fixed wing aircraft and therefore can have a higher annoyance factor associated with their operations due to the noise being closer to the receptor (human) and/or based on the frequency of the flights.

Since a majority of the helicopter operations are being flown for training purposes, the following voluntary measure, defined by four individual elements can be taken by the pilots to reduce the noise exposure to noise sensitive land uses between Fort Riley, MHK, and the surrounding areas:

- Element 1 - Conduct operations in the pattern at the designated altitude for general aviation aircraft – Military operations require aircraft and the pilots to practice and simulate operational maneuvers that may require the aircraft to be at less than the TPA at MHK. By requesting that the aircraft remain at the designated altitude the noise impact will be reduced on the community surrounding the Airport.
- Element 2 - When conducting instrument approaches from Fort Riley fly at 1,000 feet AGL – Helicopters use the Category I Instrument Landing System (ILS) at MHK to practice approach procedures. Like operations conducted in the pattern at MHK, the noise impacts to the communities that are under the flight path will be reduced if the aircraft remain at 1,000 feet AGL until a descent to a lower altitude is required by the procedure.

- Element 3 - Maintain a 1,000 feet AGL above residential area en-route to MHK – Maintaining the aircraft altitude at or above 1,000 feet while en-route to MHK will reduce the noise impacts to the communities that lie under the flight path of these aircraft.
- Element 4 - Maintain a cruise speed of approximately 120 knots or less – Since the speed of the aircraft is a contributor to the noise produced by the aircraft, maintaining a cruise speed of 120 knots while en-route will also assist in keeping the noise levels experienced by the communities to a minimum.

Table 6-7

NA-6: Military Helicopter Operations

Description	<p>Element 1 - Conduct operations at no lower than TPA at MHK.</p> <p>Element 2 - Maintain 1,000 feet AGL when practicing instrument approaches until descent is necessary.</p> <p>Element 3 - Maintain 1,000 AGL above residential areas.</p> <p>Element 4 - Maintain a cruise speed of no more than 120 knots.</p>
Changes in Noise Exposure	There would be no change in overall noise exposure to the population within the 65 DNL contours. But this measure could potentially result in a reduction in the level of noise/annoyance experienced by residents under the flight path on a single event/operation basis due to the increased altitude.
Effects on Airport Operations and ATCT Work Load	None.
Impact on Airport Users	None.
Regional Economic Impacts	None.
Quality of Service Impacts	None.
Associated Cost	None.
Ease of Implementation and Enforcement	A voluntary measure carried out by Fort Riley Personnel and enforced by Fort Riley/MHK ATCT at the request of the Airport.
Legal Factors	None as it is a voluntary measure.
Conclusion	All elements are recommended to be included in the NCP as voluntary measures.

6.4 Summary of Recommended Noise Abatement Measures

Table 6-8 is a summary of the noise abatement measures proposed for the NCP per Part 150 guidelines. The proposed noise abatement measures are all voluntary and would be promoted and controlled by the Airport and ATCT to ensure the safety of the users and to maximize the

efficiency of the air traffic flow at MHK within the overall operating conditions of the National Airspace System (NAS). The recommended measures would not change the DNL contours for 2014 or 2027 and should be included in the NCP upon approval by the FAA.

Table 6-8

Summary of Recommended Noise Abatement Measures

Noise Abatement (NA) Measure	Recommendation
<p>NA-1: Departure Procedures for Turbojets Turbojets departing Runway 03/21 would maintain runway heading until reaching 2,000 feet AGL unless otherwise directed by ATC.</p>	<p>Recommended for inclusion in the NCP</p>
<p>NA-2: Arrival/Departure Flight Track to Runway 03/21 Relocating the arrival flight track currently overflying the residential community on the bluff, so that the aircraft is closer to the Kansas River, before turning final to Runway 21 approximately 2 miles from the runway threshold.</p>	<p>Recommended for inclusion in the NCP</p>
<p>NA-3: Arrival Flight Track to Runway 21 Relocating the arrival flight track currently overflying the residential community on the bluff to the north so that the aircraft intercept final approach is approximately 5 NM from the threshold of Runway 21.</p>	<p>Recommended for inclusion in the NCP</p>
<p>NA-4: Nighttime Operations This is a voluntary limitation of nighttime operations (2200 to 0700).</p>	<p>Not recommended for inclusion in the NCP</p>
<p>NA5: Touch and Go Operations Element 1 - Aircraft should climb to TPA on the upwind leg before turning, unless otherwise advised by ATCT. Element 2 - Limit Touch and Go operations to certain days and times. Element 3 - Limit the number of Touch and Go operations per flight.</p>	<p>Element 1 is recommended for inclusion in the NCP</p>
<p>NA-6: Military Helicopter Operations Element 1 - Conduct operations at no lower than TPA at MHK. Element 2 - Maintain 1,000 feet AGL when practicing instrument approaches until descent is necessary. Element 3 - Maintain 1,000 AGL above residential areas. Element 4 - Maintain a cruise speed of no more than 120 knots.</p>	<p>All Elements are Recommended for inclusion in the NCP as a voluntary measure</p>

Chapter Seven

LAND USE MEASURES

This chapter presents the evaluation conducted of existing and potential new land use measures for the MHK Noise Compatibility Program (NCP). The NCP components that focus on land use initiatives usually include measures associated with the following:¹

Corrective land use measures seek to mitigate or correct existing incompatible land uses. There are currently no housing units or incompatible land uses located within the 65 DNL contour of the existing condition (2009) or the forecast condition (2014) Noise Exposure Maps (NEM).

The number of residences within the 2014 60 DNL was also calculated due to anticipated future growth. Given existing population and housing numbers, the 2014 60 DNL contains an estimated 7 housing units without the benefit of noise abatement measures (See Table 5-2).

MHK thus has relatively few instances of incompatible land uses due to aircraft noise per the Federal guidelines at the present time.

Preventive land use measures seek to prevent the introduction of new incompatible land uses around the Airport. These measures would help protect the Airport from encroachment by incompatible development. In addition to the required 2014 forecast period, this Part 150 considers the noise environment likely to exist at MHK in the long-term. While not required under 14 CFR Part 150, the noise contours for the extended future year (2027) were also considered in evaluating land use measures due to significant growth and changes underway in the City of Manhattan and nearby communities. This would enable Airport management and the community to plan for compatible growth at and around MHK. Given existing population in the study area, the 2027 NEM shows that there are 5 housing units in the 65+ DNL contour and 84 housing units within the 60+ DNL contour.

Key issues anticipated to have a notable impact on MHK include the following:

- 1) The projected increase of the Fort Riley troop population by 2011 which would consequently increase MHK's charter aircraft operations and passenger enplanements in support of Fort Riley;
- 2) Plans to expand the capacity of the Kansas Highway 18 (K-18) corridor to accommodate the projected growth of the City of Manhattan and the traffic demands at Fort Riley; and
- 3) Continued urban development in the Eureka Valley.

Section 7.1 describes existing land use regulations and authority applicable to the State of Kansas, the City of Manhattan, Riley County, and MHK. Evaluation criteria for land use measures in this NCP are outlined in Section 7.1. Sections 7.2 and 7.3 evaluate potential preventive and corrective land use measures. Section 7.4 summarizes the land use measures recommended for this NCP.

The potential noise abatement measures described in Chapter Six and the potential land use measures described in this chapter reflect the Airport operator's recommendations for the NCP. The proposed NCP measures are presented prior to the FAA's review for approval or disapproval and as such do not represent the opinions or decisions of the FAA.

Land use data obtained through the Riley County Community GIS website was updated and confirmed by the City of Manhattan and Riley County to generate the land use information for the NEMs, as shown in **Figures 5.1** through **5.5**. Airport property encompasses approximately 710 acres and consists of Transportation and Vacant land uses. The runways and airport facilities are Transportation, while the land beyond the ends of Runways 3, 13, and 21 is identified as vacant.

Land uses surrounding MHK primarily consist of agricultural uses, with a combination of vacant, industrial, residential, and commercial areas making up the other nearby land uses. Commercial and industrial properties along Highway K-18/Riley Boulevard are the primary land uses to the east of MHK. There are several small residential areas to the east and northeast of the Airport, near the end of Runway 21. Random Woods, a small residential area, is located to the southwest of the Airport, along with offices and vacant land. The City of Ogden, with a population of 1,700, is located approximately one mile southwest of the Airport.² The town consists mainly of residential land uses.

Fort Riley Military Reservation is adjacent to the western edge of MHK property. The area's land use plan designates the base (approximately 100,650 acres) as Government / Public / Institutional land use. Fort Riley provides support for live-fire exercises, maneuver training for mechanized/armored vehicles, attack helicopter gunnery, small arms firing, mortar, artillery and tank firing exercises, and maneuver training.³

7.1 LAND USE REGULATION AND APPLICATION

Land use and development controls based upon a comprehensive compatible land use plan are among the most effective compatibility strategies, particularly in developing areas. The exercise of these land use and development controls is usually within the authority of local or county governments rather than the Airport operator. Land use regulations provide the primary means of preventing incompatible new development. A number of different controls are normally available to local governments to prevent incompatible development.

7.1.1 Local Land Use Guidelines

Land use planning for the region is identified in the *Manhattan Urban Area Comprehensive Plan* (2003). In addition to evaluating current land uses in the City of Manhattan, Riley County, and the planning area, the plan also sets forth a vision for land use and growth management in the future. The overarching land use goal for the Manhattan Urban Area states the following:

...the City and County seek to promote an urban development pattern that represents the sustainable use of land, energy and other resources by encouraging orderly, contiguous growth and minimizing single-use or low-density, dispersed development.⁴

Existing land use surrounding MHK includes a combination of agriculture, low- and medium-density residential, general commercial, light industrial, and vacant land. MHK is located approximately three miles southwest of the City of Manhattan, and is bordered to the west by Fort Riley Military Reservation, which is classified as Government/Public/Institutional land use. The majority of land between MHK and the City of Manhattan is agriculture.

The City of Ogden is approximately one mile southwest of MHK and mainly consists of low- to medium-density residential land uses. Fort Riley Boulevard runs along the eastern edge of airport property, adjacent to railroad tracks. The Kansas River is approximately one mile southeast of the Airport.

7.1.2 2003 Manhattan Urban Area Comprehensive Plan

The *2003 Manhattan Urban Area Comprehensive Plan* (Comprehensive Plan) boundary encompasses a 65- to 70-square mile area, and includes the City of Manhattan, the northeast part of the City of Ogden, as well as parts of Riley and Pottawatomie counties. Each jurisdiction is responsible for its own land use planning. However, the joint Comprehensive Plan emphasizes the importance of growth management, focuses on the sustainable use of resources, and the efficient use of land with minimal “leapfrog” development.

The Comprehensive Plan identifies MHK as a Public land use, and discusses the Airport’s effects on surrounding land use and development. The Comprehensive Plan’s Future Land Use Map recommends changes to land uses surrounding the Airport to be more consistent with airport operations. Similarly, the City of Manhattan and Riley County each have airport-related zoning districts in place to ensure that land uses in the MHK vicinity are compatible with airport operations.

The Comprehensive Plan incorporates the land use information for the City of Manhattan and Riley County into two comprehensive maps: Existing Land Use and Future Land Use. The plan identifies land use goals, objectives and development policies for the Manhattan Urban Area. The Comprehensive Plan identifies Special Planning Area policies for potential “areas of change” in

the Manhattan Urban Area. As one of the identified areas, the Eureka Valley (EV) specifically states the following policy:

EV 1: Manhattan Regional Airport – The location and design of future development should be compatible and consistent with the goals and policies of the Airport Master Plan.

Miller Ranch (MR), also identified as a Special Planning Area, identifies the following airport-related policy:

MR 7: Airport Airspace Regulations – Development shall be consistent with established airspace regulations for the Manhattan Regional Airport and the Airport Master Plan.⁵

The City and County have both implemented measures to ensure compatibility between the Airport and surrounding land uses. This Part 150 Study would further support and promote these efforts as these jurisdictions continue to plan for land use development and constraints in the Airport vicinity. The Study is intended to help minimize the effect of aircraft operations, including noise, on people and operations in the vicinity of MHK.

2009 Noise Contour

The 65 and 70 DNL contours are completely contained within Airport property and have no residences or population within them. Refer to **Figure 5.1**.

The existing 60 DNL contour (2009 NEM) closely matches MHK property boundaries, with the exception of the extension past airport property approximately ½-mile to the northeast and ½-mile to the southwest of airport property. Residential land uses, generally considered incompatible with airport operations, are within the 60 DNL just northeast of Runway 21. The residential properties are zoned under Riley County’s jurisdiction as Single Family Residential (A-1 to A-4).⁶ There are approximately 555 acres, 9 housing units, and a population of 23 within the 60 DNL noise contour. The 60 DNL contour also slightly intersects the property of the Flint Hills Job Corps, which is considered a School land use.

Refer to **Table 7-1** for a summary of noise-sensitive land uses within MHK noise contours.

2014 Noise Contour

The 65 DNL and 70 DNL noise contours are within Airport property. Refer to **Figure 5.2**.

The 2014 60 DNL contour closely reflects MHK property boundaries and the 2009 NEM, but is actually slightly smaller in land area than the 2009 NEM contours. Similar to the 2009 60 DNL contour, the 2014 60 DNL contour contains residential properties to the northeast of Runway 21, which are incompatible with airport operations. This residential area is within the Runway 21 Runway Protection Zone (RPZ). The 60 DNL closely borders the Airport periphery on the

northwest, but does intersect residential property in between MHK and the Kansas Veterans' Cemetery, as well as a residential parcel under Riley County jurisdiction just east of the Airport. All of the residential properties within the 60 DNL are zoned Single Family Residential. The southwest end of the 60 DNL contour ends just south of Fort Riley Boulevard, and contains only vacant and agricultural land uses. In 2009, construction is planned to shift Runway 3/21 to the southwest by 400 feet to allow for the requisite 1,000-foot RPZ. There are approximately 534 acres, 7 housing units, and a population of 18 in the 2014 60 DNL.

Refer to Table 7-1 for a summary of noise-sensitive land uses within MHK noise contours.

2027 Noise Contour

Although assessing noise impacts on land uses in the vicinity of MHK beyond 2014 is not required by the Part 150, due to the anticipated nearby development and growth at MHK, land use compatibility within the 2027 noise contours was considered.

The 65 DNL contour contains approximately 5 housing units, a population of 14, and intersects the Flint Hills Job Corps, which is considered a School land use. The 70 DNL contour is contained within Airport property boundaries. Refer to **Figure 5.3**.

The 60 DNL noise contour generated by the future (2027) scenario assumes all land uses would remain the same. The contour extends significantly further to the northeast of Runway 21 and southwest of Runway 3 than the 2009 and 2014 scenarios. Both the 60 DNL and 65 DNL contours include some residential property northeast of Runway 21, and the 60 DNL contour continues approximately 2 miles to the northeast and 1.5 miles southwest of Airport property. The northeast contour extension includes agricultural land, as well as several residential areas, including a new residential subdivision just east of Scenic Drive that was recently annexed by the City. The southwest extension of the 60 DNL contour passes over a section of the City of Ogden that contains residential and cultural/entertainment/recreational land uses. There are approximately 1,265 acres, 89 housing units, one school (Flint Hills Job Corps), and a population of 212 within the 2027 60 DNL contour using 2000 U.S. Census estimates.

Refer to Table 7-1 for a summary of noise-sensitive land uses within MHK noise contours.

Table 7-1

Summary of Noise-Sensitive Land Uses within MHK Noise Contours

2009 NEM	Population	Housing Units	Schools	Churches	Hospitals
60-64 dB	23	9	1	0	0
65-69 dB	0	0	0	0	0
70-74 dB	0	0	0	0	0
75+ dB	0	0	0	0	0
<i>Total within 60 dB</i>	23	9	1	0	0

2014 NEM	Population	Housing Units	Schools	Churches	Hospitals
60-64 dB	18	7	0	0	0
65-69 dB	0	0	0	0	0
70-74 dB	0	0	0	0	0
75+ dB	0	0	0	0	0
<i>Total within 60 dB</i>	18	7	0	0	0

2027 NEM	Population	Housing Units	Schools	Churches	Hospitals
60-64 dB	198	84	1	0	0
65-69 dB	14	5	0	0	0
70-74 dB	0	0	0	0	0
75+ dB	0	0	0	0	0
<i>Total within 60 dB</i>	212	89	1	0	0

7.1.3 Legislative Grants of Zoning Law Powers

The legal basis for all local governmental planning and development regulations is provided by the police power of the State, which has been delegated to local governments through the State’s enabling laws. Police powers are those which regulate private property and behavior to protect the public health, safety, morals, and general welfare of the community.

Kansas delegates its local government planning powers through the State Constitutional Home Rule provisions of 1960, as stated in Article 12 of the *Constitution of Kansas*. All cities and counties in Kansas have self-executing powers that allow them to engage in planning, zoning and subdivision regulation.⁷

MHK is located within Riley County boundaries, but is incorporated by the City of Manhattan and therefore falls within City jurisdiction for land use planning and zoning. Because of the Airport’s proximity to unincorporated Riley County, however, land use decisions in the County impact the Airport, and vice versa.

In 1976, the City of Manhattan and Riley County created the Manhattan Urban Area Planning Board (MUAPB) through an inter-local agreement, formed in order to coordinate planning in the Manhattan Urban Area, which consists of the city limits of Manhattan and the surrounding urbanizing area. The MUAPB is responsible for the formation of Subdivision and Zoning Regulations, as well as the development, adoption, and update of the Comprehensive Plan. The MUAPB has the power and authority to review and recommend approval or disapproval of plats for the subdivision of land within the Manhattan Urban Area. Recommendations for annexations and rezonings are forwarded to the respective city and county governing bodies for final approval. The governing body of the City of Manhattan makes determinations for land located within city limits, and the governing body of Riley County makes determinations for land located within the MUA outside the City.⁸

7.1.4 Municipal and County Zoning Laws

Short of acquisition, zoning provides the most direct means of regulating incompatible development in the airport environs. Since many land uses are not adversely affected by aircraft noise levels, an obvious land use compatibility technique is to zone areas of significant levels of aircraft noise for land uses such as industrial and commercial development which are less disturbed by noise and airport operations. Such compatible use zoning is subject to practical constraints on changes to future land use. In addition, the zoning ordinance provides a means of attaching conditions to development that might make the permitted uses less sensitive to aircraft noise. Zoning provides the localities with the power to restrict the development of incompatible land uses as described in this document. Although the City of Manhattan and Riley County each enact and enforce zoning regulations, each jurisdiction does not coordinate or synchronize their specific requirements with the other.

7.1.4.1 Airport Zoning Laws

Both the City of Manhattan and Riley County include airport-related zoning districts. The Airport Zoning Act provides the foundation for airport zoning districts in Kansas. The following statement in Kansas Statute 3-701 provides the basis for permitting Airport Hazard Zoning:

- (a) That the creation or establishment of an airport hazard is a public nuisance and an injury to the community served by the airport in question; (b) that it is therefore necessary in the interest of the public health, public safety, and general welfare that the creation or establishment of airport hazards be prevented. It is further declared that both the prevention of the creation or establishment of airport hazards and the elimination, removal, alteration, mitigation, or marking and lighting of existing airport hazards are public purposes for which political subdivisions may raise and expend public funds and acquire land or property interests therein.⁹

By instituting Airport Zoning Districts, land use limitations and regulations for both the City and the County properties were established where the zoning is applied. These zoning districts

acknowledge the unique land use impacts of airports due to the high levels of incompatible development and limited vacant land in areas surrounding the Airport. Airport Zoning Districts help to protect the Airport and the surrounding community from incompatible uses.

Riley County has a stand-alone Airport Noise Hazard District zoning category (See Section 7.1.6.3, *Riley County Zoning*), while the City of Manhattan has established an Airport Overlay District (See Section 7.1.6.2, *City of Manhattan Zoning*).¹⁰

7.1.4.2 City of Manhattan Zoning

Because MHK is surrounded by property in several jurisdictions, this section identifies zoning within the City of Manhattan jurisdiction. MHK and the incorporated city “islands” near MHK are primarily zoned industrial and commercial. City property to the west of the Airport and just east of the Kansas Veterans’ Cemetery and Fort Riley is zoned Light Industrial and Business Park. The Light Industrial district is intended to allow for manufacturing, processing, assembly, and non-retail service activities. Business Park uses include areas intended for administrative, research, and assembly activities, and are designed to be compatible with nearby residential districts.

City property to the northeast of the Airport includes Light Industrial, Industrial Park, Heavy Commercial, and University zoning districts. Industrial Park is intended to allow for a variety of manufacturing and research activities in a large-lot industrial park setting. Heavy Commercial is designed to provide for commercial uses that allow for the sale and/or service of heavy equipment or products. The University Zoning District is designed to allow for a flexible environment for the establishment of University or education-related uses and activities with intentional buffers from adjacent zoning districts and public streets.

The City’s Zoning Ordinance includes an Airport Overlay (AO) District, which is in place “to promote the use and development of land in a manner that is compatible with the continued operation and utility of the Manhattan Municipal Airport so as to protect the public investment in, and benefit provided by the facility to the region.”¹¹ The zoning overlay category is applied as an overlay district to lands in the vicinity of MHK, in combination with appropriate underlying zoning districts. The district allows the City to protect the Airport and surrounding community by regulating land uses on and near the Airport. As such, the overlay district is applied to all annexed lands that are located beneath the Part 77 Airspace. The AO District is also used as an independent zoning category for the purpose of zoning the Airport property.

The AO District, based on the FAA’s Part 77 Airspace Obstruction Analysis guidance, was adopted by the City Commission in 1996, but was not applicable to MHK until the City annexed the Airport in January of 2000. The Airport land was rezoned from Riley County’s zoning designation to the City’s AO District at that time.

The AO District creates multiple zones with various height limitations. The zones are only applied to incorporated properties and are visually represented on the City’s Official Manhattan

Municipal Airport Zoning Map. No uses in the AO District are allowed to create electrical interference with navigational signals or radio communication between the Airport and aircraft; impair visibility; create bird strike hazards; or otherwise endanger or interfere with the landing, takeoff, or maneuvering of aircraft. The district, applied as an overlay district, permits the uses allowed by the underlying zoning district, subject to the height and use restrictions of the overlay district zoning article. The overlay district, as applied to the Airport property, is a stand-alone district without an underlying use, and only permits uses that are compatible with the Airport.¹²

The City of Manhattan's AO Zoning District coverage includes the majority of the 2014 60 DNL contour. However, the City's overlay zone does not apply to Riley County properties bordering the Airport, some of which are within the 2014 60 DNL contour as well.

7.1.4.3 Riley County Zoning

The Airport is located southwest of Manhattan city limits proper and is bordered by other incorporated city property and unincorporated Riley County. MHK is therefore affected by adjacent land use and zoning decisions that are within Riley County's control.

Land uses adjacent to MHK within Riley County jurisdiction are classified by a combination of residential, agricultural, commercial, industrial, and airport noise hazard zoning districts. The majority of property abutting the Airport is zoned Airport Noise Hazard, with several pockets of residential, industrial and commercially zoned property nearby.

The Airport Noise Hazard zoning district is independent of the City's Airport Overlay District. The City of Manhattan's Airport Zoning Map shows that the City's overlay district does not apply to properties in the unincorporated county. Permitted uses in Riley County's Airport Noise Hazard District include Municipal Airport and related accessory facilities, agricultural uses, various commercial uses, and industrial uses that do not interfere with electronics and communications systems. The district does not permit residential uses, and it places restrictions on exterior lighting, emissions, noise, odor, and vibration, to not be detectable beyond the property line. The district also establishes height restrictions as prescribed by FAA Regulations Part 77, as well as minimum setback and lot size requirements.¹³

There are several county properties adjacent to the Airport that are zoned for residential use. Properties located directly to the east and west of the Airport, as well as to the immediate northeast within the Runway 21 Runway Protection Zone (RPZ), are all zoned for residential use. The residential zoning of these properties ranges from A-1 to A-4, which denotes Single Family Residential and permits single family homes and other limited uses, with A-1 providing the least flexibility and A-4 providing the most flexibility for other permitted uses (e.g., places of worship, day care centers, public parks and recreation buildings, mobile homes). In the summer of 2010, Runway 13/31 (crosswind runway) will be extended by 1,200 feet to the northwest to a length of 5,000 feet (previously 3,800 feet), and Runway 03/21 will be shifted to the southwest by 400 feet to allow for the requisite 1,000-foot RPZ.

County land to the east and west of MHK is zoned for agriculture, which is intended to preserve and protect agricultural areas from incompatible development and urban sprawl. In addition to general agricultural uses, this classification permits single-family homes if minimum 20-acre lot size is met, parks and recreation, educational institutions, public service and utility-type uses, among several others.

Highway Business Commercial zoning is also applied to several properties just east of MHK and north of Fort Riley Boulevard. This is the least restrictive commercial zoning category. Most commercial uses are allowed, provided that density requirements and use limitations are met. Several properties to the east of the Airport under county jurisdiction are zoned Light Industrial, which allows for many types of manufacturing uses.¹⁴ Both of these zoning categories are considered to be compatible with airport operations; however, the C-4 (Highway Business Commercial) Zoning District also allows the “owner or operator of a principal use [business]” to have a residence on the premises. Therefore, this commercial district permits residences under certain circumstances, which is not compatible with Airport operations.¹⁵

7.1.4.4 Zoning and Future Land Use Map Compatibility

The Manhattan Urban Area’s Future Land Use Map indicates a transition to more compatible land uses in the Airport vicinity, including office-research park, community commercial, agriculture, and industrial uses. The Future Land Use Map identifies the area to the east of MHK as Community Commercial and Industrial, and the area to the west of the Airport as Office-Research Park, both of which would be compatible with airport operations. None of the current residential zoning districts near MHK are consistent with future land use plans. The property to the west of MHK zoned A-4 Residential is identified as Office-Research Park in the future and the current A-2 Residential properties to the east of MHK are identified as Agriculture or Industrial in the Future Land Use Map.

The properties zoned Highway Business Commercial are consistent with the Future Land Use Map, which designates this area as Community Commercial, intended to provide one-stop-shopping convenience and intended to have a regional draw. This future land use category typically requires between 10 and 30 acres of land, and is to be located along, or at the intersection of, major arterial roads. This zoning is consistent with future land use plans in the Comprehensive Plan, which designates this area to the east of the Airport as Industrial.¹⁶

7.1.5 Subdivision Regulations

Subdivision regulations have traditionally played several roles in noise compatibility planning. They may require dedication of aviation or noise easements which specifically authorize aircraft overflights. Subdivision regulations may also require official notification or disclosure of aircraft noise levels as part of the property deed (note that disclosure may not occur until closing on the sale of the property). Finally, subdivision regulations may require the developer to provide specified sound attenuation or noise insulation.

7.1.5.1 Manhattan Urban Area Subdivision Regulations

The Kansas Statute (Chapter 12-749) grants municipalities the power to establish subdivision regulations governing land located within city limits following the adoption of a comprehensive plan. The same article grants a county planning commission the right to establish subdivision regulations for all or for parts of the unincorporated areas of the county. Chapter 12-750 of the Kansas Statute provides for joint subdivision authority between the city and property outside the city within unincorporated areas of the county. Therefore, the Manhattan Urban Area Subdivision Regulations apply to the City of Manhattan and the portion of the Manhattan Urban Area located in Riley County. The regulations were adopted by the MUAPB, the City of Manhattan (Ordinance Number 6357), and Riley County (by resolution), pursuant to the Inter-local Agreement between the City and the County, dated July 7, 1981, and pursuant to KSA 12-741, et. seq. (Resolution Number 110200-56).

The Manhattan Urban Area Subdivision Regulations contain standards for aviation easements, which grant the right to fly airplanes over private property. The City's Subdivision Layout Standards require land located within the vicinity of flight paths and noise impact areas of publicly-owned or controlled airports to grant a permanent aviation easement to the public to allow aircraft to operate within "navigable airspace."¹⁷ The portions of Riley County outside of Manhattan Urban Area boundaries and the City of Ogden do not have subdivision regulations that contain aviation easements.

7.1.6 Fort Riley Land Use

Fort Riley Military installation, located just west of MHK, supports military training and operations. Major facilities on Fort Riley include a 6,900-acre range, a 16,200-acre Artillery and Mortar Impact Area, a 3,000-acre Amphibious training area, Marshall Army Airfield, the post's onsite airfield, and three drop zones.¹⁸

Just to the southeast of Fort Riley is the Kansas Veterans' Cemetery, which is bordered to the east by MHK. The Part 77 surfaces of MHK passes over the Cemetery property as well as the southeast corner of the Fort Riley post.

The *Flint Hills Joint Land Use Study* (JLUS) was completed in 2005 in a collaborative planning effort among local governments and Fort Riley representatives to help ensure that military operations are compatible with surrounding land uses and that urban encroachment does not impact Fort Riley's operations. As part of this Study, noise and land use impacts were assessed and compatibility tools were proposed.

7.1.7 Summary of Land Use Regulation

Several jurisdictions regulate the land area encompassed by the noise contours. The City of Manhattan and Riley County both have zoning authority over their respective properties on and around the Airport. The MUAPB has subdivision oversight authority and is charged with

ensuring that the area’s development is consistent with the Comprehensive Plan. As part of this, the MUAPB also reviews development applications and planning and zoning proposals and makes recommendations to the City and County for final action. The 2027 NEM shows that the City of Ogden and the Kansas Veterans’ Cemetery are also within the MHK noise contours. The City of Ogden’s existing and future land use maps, zoning ordinance, and Comprehensive Plan are outdated. It was anticipated that the land use maps and zoning ordinance would be updated in 2009.¹⁹

7.2 EXISTING LAND USE MEASURES

This section includes the land use measures currently in place in the vicinity of MHK. The measures have been implemented outside of the FAA’s Part 150 process but are considered existing land use measures for this Study. The majority of land bordering the Airport is in unincorporated Riley County, but falls within the jurisdiction of the Manhattan Urban Area (MUA). The MUA has several land use measures in place that address airport operations. A small area to the southwest of the Airport is in Riley County and not within the MUA boundaries. The County has limited local government policy to accommodate airport nuisances, largely because the majority of the Airport’s impacts are within MUA jurisdiction. Fort Riley Military Installation borders the Airport to the west, and has a variety of tools in place to address their own operational impacts to on-post and off-post lands. The developed part of the City of Ogden lies approximately one mile southwest of the Airport, and has no measures in place to address Airport impacts. **Table 7-2** summarizes the existing land use measures in each of the jurisdictions.

Table 7-2
Existing Land Use Measures

Manhattan Urban Area (includes City of Manhattan)		
Land Use Measure	Definition	Purpose
Airport Overlay Zoning District	Zoning overlay district applied to lands in the vicinity of MHK (under Part 77 airspace) in combination with the underlying zoning district. Intended to prevent the creation or establishment of obstructions or incompatible land uses that are hazardous to the Airport’s operation or the public welfare. (MUA Zoning Ordinance, Article X)	To ensure that land is developed in a manner that is compatible with the continued and future operations at MHK. Although there is no current noise disclosure mandate in Manhattan, the AO District also serves to notify buyers of the relative proximity to the Airport.
Airport Overlay Zoning as a standalone district	Same intention as Airport Overlay Zoning district, but applies as a stand-alone zoning	To ensure that land is developed in a manner that is compatible with the continued and future

Table 7-2
Existing Land Use Measures

	classification to Airport property only.	operations at MHK. To prohibit noise sensitive land uses.
Avigation Easement ²⁰	The airport owner or government acquires the right to conduct noise over a property. Avigation easements are established in the area of flight paths and noise areas.	To protect navigable airspace at public airports. The easement also serves as notification that the property is subject to potentially significant aircraft noise. Currently functions as main tool guiding new development.
Comprehensive Plan	Policy document with maps, written policy statements, and goals and objectives, intended to provide long range guidance on land use issues, such as where residential, commercial, and industrial development should occur in the future (City of Manhattan website).	Discourages new residential development in Eureka Valley and encourages development that is consistent with established airspace regulations for MHK and the Airport Master Plan.
Future Land Use Map (from Manhattan Urban Area Comprehensive Plan)	A land use map that designates future land uses in an area, consistent with the community’s development goals and objectives. The map is typically accompanied by narrative that defines the range of size or density, primary and secondary uses, and defining characteristics for each land use identified. ²¹	To provide a plan for future land uses that is consistent with the Manhattan Urban Area’s development goals and objectives. All of the future land uses within the City’s jurisdiction near MHK are compatible with Airport operations. However, current land use and zoning is not consistent with future land use map objectives.
Riley County (unincorporated)		
Land Use Measure	Definition	Purpose
Airport Noise Hazard District	Zoning district that prohibits any uses that are incompatible with airport operations (e.g. residential). Also sets height and use limitations.	Prevents obstruction of air navigation around MHK and encourages compatible land uses in areas surrounding the Airport.
Future Land Use Map (from Manhattan Urban Area Comprehensive Plan)	A land use map that designates future land uses in an area, consistent with the community’s development goals and	To provide a plan for future land uses that is consistent with the Manhattan Urban Area’s development goals and

Table 7-2
Existing Land Use Measures

	objectives. The map is typically accompanied by narrative that defines the range of size or density, primary and secondary uses, and defining characteristics for each land use identified.	objectives. Land uses in Riley County that are currently incompatible with airport operations are designated on the MUA’s Future Land Use Map as Office-Research Park (in the area currently zoned A-4/ SF Residential), and Agriculture or Industrial zoning (in the area currently zoned A-2/ SF Residential), which are both compatible with airport operations.
City of Ogden		
Land Use Measure	Definition	Purpose
The City of Ogden does not currently have any land use measures to ensure compatibility with operations at MHK. (Comprehensive Plan and land use planning documents are outdated [c.1993] and currently being updated)	None	None

7.3 POTENTIAL LAND USE MEASURES

This section identifies and evaluates potential Part 150 land use measures to minimize airport-related noise impacts on communities within the vicinity of MHK. There are three corrective and six preventive land use measures being considered in this Part 150 Study. A brief explanation of each of the land use measures is described, and then each measure is evaluated using each of the criteria presented in **Table 7-3**.

Table 7-3
Evaluation of Potential Land Use Measures

Criteria	Description
Area to which measure would be applied	This factor defines the DNL contour intervals within which the measure would be applied and/or the types of land uses within the applicable contour intervals which would be addressed.
Compatibility Benefits	This factor describes the potential benefits of the measure. Potential benefits could be of a direct nature (restricting additional residential

Table 7-3
Evaluation of Potential Land Use Measures

	development in areas impacted by airport noise), indirect (permitting informed decisions by potential buyers) or remedial (provide acceptable interior noise levels).
Effect on Property Values and Tax Base	Qualitative assessment of measure’s potential impact on affected real property values and tax base.
Costs	This factor identifies public and private sector costs associated with implementing the measure and potential eligibility for federal funds.
Legal Factors	Legal constraints to implementation of a measure.
Political Acceptability	This factor describes the interests which may be adversely affected by the potential measure. Such interests could include existing land owners concerned about potential impacts on property values, neighbors concerned about the potential character change of the neighborhood, or developers opposed to limitations or conditions that might be placed on development of land.
Implementation Factors and Responsible Parties	This factor summarizes the administrative and other actions necessary to implement the measure. The factor also identifies the public agency responsible for implementing the proposed measure.
Conclusion	This factor summarizes the reasons for recommending or not recommending measures for addition to the land use program.

Of the nine land use measures considered for the MHK Part 150, three (3) of the measures are corrective:

- Land acquisition
- Property Purchase Assurance Program
- Sound Insulation Program (residential, schools, and other public buildings)

Six (6) of the measures are preventative:

- Compatible use zoning
- Real Estate Noise Disclosure
- Building code provisions / amendments
- Purchase of Development Rights / Transfer of Development Rights
- Coordination among neighboring jurisdictions
- Dedication of Avigation Easements with Building Permits

7.3.1 Corrective Land Use Measures

The following provides a brief summary of each of the potential corrective land use measures considered in this Part 150, and is followed by a summary table that evaluates the measure. The following proposed land use measures are intended to correct existing land uses that are not compatible with airport operations. In keeping with FAA Land Use Compatibility Guidelines (See Table 4-1), the corrective measures would apply to incompatible land uses within the 2014 65 DNL. Currently the 2014 65 DNL is within Airport property and no incompatible land uses exist within the 2014 65 DNL.

7.3.1.1 Potential Measure: Land Acquisition (Corrective)

With this measure, the City of Manhattan would seek to purchase existing incompatible development within the 2014 65 DNL. The land could be acquired through voluntary sale by the owner at fair market value. After purchase of the land, the City of Manhattan could use the property for Airport or other public purposes, lease it for compatible use, or sell the land with attached deeds or easements that would permit only compatible development of the property. This potential measure would only apply to incompatible land uses within the 2014 65 DNL contour, however none currently exist. **Table 7-4** provides an evaluation of this corrective land use measure.

Table 7-4

LU-1: Land Acquisition (Corrective)

Description	Acquire parcels of land that are currently (or have the potential to be) impacted by Airport noise. The land would be maintained as: <ul style="list-style-type: none"> • Vacant land; • Sold for development into compatible uses; or • Developed for a compatible public use. This measure allows for acquisition of property only at the initiative and with the approval of the local jurisdictions, and where it has been established that there is reasonable consensus among residents to vacate the area.
Area(s) to which measure would be applied	Incompatible parcels located within the 2014 65 DNL, as mutually agreed to by the City of Manhattan/MHK and respective communities. Currently, the 2014 65 DNL is within Airport property.
Compatibility Benefits	Removes and/or prevents the development of incompatible use.
Effect on Property Values and Tax Base	No effect on property values. (The purchase price would equal the fair market appraisal price). Acquired lands would be removed from the tax base, and properties resold for compatible use would be returned to the tax base.
Costs	Current federal and local guidelines would determine the fair market value of all properties identified for acquisition. City of Manhattan property acquisition and administrative costs.
Legal Factors	None anticipated, as this would be a voluntary program.
Political Acceptability	Local jurisdictions may not be in favor of this measure due to the

Table 7-4

LU-1: Land Acquisition (Corrective)

	uncertainty of sources of funding for this program and because it could potentially reduce available land for residential development.
Implementation Factors and Responsible Parties	City of Manhattan (airport sponsor) would identify eligible areas in consultation with local governments. The designated entity (this is sometimes the Department of Transportation) or a local land bank, coordinating with local jurisdictions would determine what undeveloped land is available for acquisition. The process of determining what lands are available and the actual purchasing procedures may be a lengthy and time-consuming process.
Conclusion	There are no residences within the 2014 65+ DNL, and therefore this measure is not required and would not be carried forward unless local regulations identify incompatible land uses below the 65 DNL.

7.3.1.2 Potential Measure: Property Purchase Assurance Program (Corrective)

The intention of this measure is to guarantee the purchase of existing homes within the 2014 65 DNL after the seller has made a “bona fide effort” to sell the property and has been unable to do so at its fair market value. In effect, the City would act as the “buyer of last resort.” The City could then have the residence sound-insulated and re-sell it with easements attached or redevelop the property as a compatible land use. Fair market value would be determined based on local and Federal guidelines.

The specific houses eligible for the Purchase Assurance Program would be determined by each local jurisdiction. Stipulations such as how long the owners have resided in the house, eligibility, the length of time that the property could be listed for sale before the owner receives reimbursement of fair market value, and the type of sound insulation package modification the house would receive based on its location within the 65+ DNL contour, would be pre-determined. As one facet of this program, jurisdictions could coordinate to develop an education program that realtors would be required to attend in order to become “certified” by the local area as having a working knowledge of the purchase guarantee and sound insulation programs to participate in this program.

Based on the Uniform Relocation and Real Property Acquisition Policies Act for voluntary programs, the Property Purchase Assurance Program would not include payment or reimbursement of moving/relocation expenses. In addition, any adjustment of the mitigated 2014 65 DNL contour boundary to determine eligibility would be subject to FAA overall approval.

Each local jurisdiction would be responsible for determining their defined length of time for either acceptance or refusal of program participation once a homeowner becomes eligible. In the event of refusal, each jurisdiction would be responsible for determining how long a participant

must wait before becoming eligible again for another Part 150 program. Currently the 2014 65 DNL is within Airport property and no incompatible land uses exist within the 2014 65 DNL. **Table 7-5** summarizes the evaluation of this measure.

Table 7-5
LU-2: Property Purchase Assurance Program (Corrective)

<p>Description</p>	<p>This measure would guarantee the purchase of existing homes within the 2014 65 DNL contour, assuming the seller has made a bona fide effort to sell the property and has been unable to do so for a set amount of time at its fair market value. This program would not be intended nor designed to acquire all, or a substantial portion, of a designated area, but rather to provide the homeowner the opportunity to sell his/her home at a guaranteed fair market value on a house-by-house basis prior to participating in the sound insulation program.</p> <p>Property Purchase Assurance Program eligibility is limited to homeowners residing within the 2014 65 DNL contour in neighborhoods identified by each individual jurisdiction.</p> <p>This program would be developed in coordination with other mitigation measures, such as a Sound Insulation Program.</p>
<p>Area(s) to which measure would be applied</p>	<p>Homeowners within the 2014 65 DNL contour. Currently, the 2014 65 DNL is within Airport property limits.</p> <p>Some communities may request acquisition potential extend to the 2027 60 DNL. Given the projected growth around MHK and anticipated increase in future noise contours, the Property Purchase Assurance Program could be considered for the 2027 65 DNL contour if requested by local jurisdictions. This measure is particularly important in residential areas where neighborhood stability may be at risk.</p>
<p>Compatibility Benefits</p>	<ul style="list-style-type: none"> • Enable residents who desire to relocate due to noise impacts to do so. Reassure residents weary of purchasing homes near the Airport that their property would not lose value due to increased noise. • Sound insulation and avigation easements are typically applied to acquire properties.
<p>Effect on Property Values and Tax Base</p>	<p>An increase in the cost of new construction due to the higher standards of sound insulating the properties for resale.</p> <p>Minimal effect on tax base.</p>

Table 7-5

LU-2: Property Purchase Assurance Program (Corrective)

Costs	<p>City of Manhattan would fund the initial cost, which would eventually be offset by resale. The City would also fund the cost for administering the program, with the assistance of available grants.</p> <p>The City may be eligible for federal funding if part of an approved Part 150 Noise Compatibility Program (NCP). Some costs may be eligible for 80% federal funding if part of an approved Part 150 NCP, although actual levels may be less depending upon availability of funds.</p> <p>Temporary reductions in area property taxes while properties are under state ownership.</p>
Legal Factors	None.
Political Acceptability	<p>If other factors contribute to the inability to sell properties, the availability of this measure could lead to rapid residential turnover, causing neighborhood instability. However, this measure would provide assurance that residents could receive fair market value for their properties.</p>
Implementation Factors and Responsible Parties	<p>The upfront and start-up costs of the program may be high.</p> <p>City of Manhattan in consultation with other local jurisdictions.</p>
Conclusion	<p>There are no residential properties or other noise-sensitive land uses within the 2014 65+ DNL, and therefore this measure is not required and would not be carried forward unless local regulations identify incompatible land uses below the 65 DNL.</p>

7.3.1.3 Potential Measure: Sound Insulation Program (Corrective)

Sound Insulation Programs are intended to alleviate the impact of aircraft noise in noise-sensitive indoor environments (e.g. residential, schools) by way of building modifications to reduce the amount of noise entering these properties from the outside. Program eligibility would be at the discretion of the FAA as it relates to federal funding. Development of the program, however, would be completed in partnership with the City of Manhattan (airport sponsor). The City would work with other local jurisdictions to determine the boundary for the sound insulation program. The program may be applied to residential properties and any other noise sensitive locations within the 2014 65 DNL. Currently the 2014 65 DNL is within Airport property and no residential properties or noise sensitive land uses exist within the 2014 65 DNL.

The program would seek to reduce interior noise levels by utilizing a combination of structural modifications including replacement of exterior windows and doors, additional insulation, baffles, and other measures. An evaluation of this corrective measure is included in **Table 7-6**.

Table 7-6
LU-3: Sound Insulation Program (Corrective)

Description	This measure would provide for sound insulation to residential properties within the 2014 65 DNL. In addition, per Part 150 Guidelines, noise sensitive uses (i.e., schools) might be included as part of the Sound Insulation Program. Those properties participating in the Sound Insulation Program would typically provide an avigation easement and a waiver of claim in exchange for the sound insulation to the property.
Area(s) to which measure would be applied	Existing residential property and noise sensitive locations within the 2014 65 DNL would eligible. ²²
Compatibility Benefits	<ul style="list-style-type: none"> • Reduce the impact of aircraft noise by providing indoor locations where normal activities can be enjoyed without interruption per EPA and Part 150 Guidelines. • Energy conservation benefits may result from sound insulation. • Treated residents may have an increase in value.
Effect on Property Values and Tax Base	Potential increase in property value due to insulation and miscellaneous improvements, but probably less than the cost of acquisition. No measurable effect on local tax base.
Costs	<ul style="list-style-type: none"> • City of Manhattan would fund the soundproofing construction. This program may be eligible for 80% federal funds if part of an approved Part 150 NCP, although actual levels may be less depending upon availability of funds. • City of Manhattan would fund administrative and program administration costs.
Legal Factors	None.
Political Acceptability	No anticipated opposition due to affected property owners or other interests.
Implementation Factors and Responsible Parties	Local jurisdictions where this program applies. A pilot program may first be established to determine program parameters, requirements, and costs.
Conclusion	There are no residential properties or other noise sensitive land uses within the 2014 65 DNL. Therefore, this measure is not required and would not be carried forward unless local regulations identify incompatible land uses below the 65 DNL.

7.3.2 Preventive Land Use Measures

This section evaluates potential land use measures that seek to prevent new incompatible land uses. While the boundary of corrective strategies maintain the FAA threshold of noise impact as defined in Table 4.1 (2014 65 DNL contour), the preventive land use measures in this section

would extend to the 2027 60 DNL as a buffer against future expansion of noise exposure levels. Compatibility criteria would be developed for each contour interval.

Each preventive measure discussed is followed by a summary table that evaluates the measure.

7.3.2.1 Potential Measure: Airport Overlay Zoning District (Preventive)

This measure is intended to prevent any new incompatible land uses from being developed adjacent to the Airport. This measure may be implemented by amending local zoning ordinances and zoning maps. All of the properties within City of Manhattan jurisdiction adjacent to MHK have land uses that are compatible with Airport operations; parcels are zoned for Industrial and Commercial. This is due partly to the inclusion of an Airport Overlay Zoning District applied to City land within Part 77 airspace, which prevents land uses that are incompatible with airport operations.

While the City of Manhattan currently has an Airport Overlay Zoning District that applies to City property in the Airport vicinity and a Noise Hazard Zoning District is applied to some of the Riley County land uses near the Airport, there are areas in Riley County and the City of Ogden that are within the 2027 60 DNL contour that are currently incompatible with Airport operations. The 2027 60 DNL contour also includes the southwest corner of the City of Manhattan proper (northeast of MHK) that is zoned for residential and vacant residential land uses. Implementing an overlay zoning district in these parts of Riley County and the cities of Ogden and Manhattan would prevent new incompatible land uses from being developed.

An airport overlay district provides an effective alternative to rezoning each incompatible land use near the Airport in Riley County and the City of Ogden to another zoning category. The overlay zoning regulations are supplemental to the requirements of the underlying general zoning district, and support land use compatibility through either prohibiting noise-sensitive land uses or requiring dedication of aviation easements and/or covenants. An airport overlay zoning district would help to protect both the Airport and the surrounding properties from allowing development of new incompatible uses. Existing land uses that were in effect prior to the zoning ordinance amendment would be allowed to remain as nonconforming uses until or unless the building is altered to change the use, or under other provisions cited in K.S.A. 12-758.²³ **Table 7-7** summarizes the evaluation of this measure.

Expanding the area where the airport overlay zoning district is applied to include all areas within the 2027 60 DNL contour would be largely consistent with the Comprehensive Plan's Future Land Use Map (2003), which designates all lands adjacent to the Airport as industrial, office-research park, agricultural, or commercial. The Future Land Use Map designates the area to the northeast of the airport at the far tip of the 2027 60 DNL contour as Environmentally Sensitive Area and Low/Medium Residential. The airport overlay zoning district would be applied as an additional layer of protection to the current underlying zoning category. Therefore, the Environmentally Sensitive Area would still be protected with existing or future appropriate underlying zoning, and any residentially-zoned areas would likely have restrictions in place that

would prevent the areas within the airport overlay zoning district from being developed for residential purposes.

Table 7-7
LU-4: Airport Overlay Zoning District (Preventive)

Description	This would amend the Riley County Zoning Map and associated Zoning Ordinance for the areas of the County within the 2027 60+ DNL contour. The amendments would prevent new incompatible residential development and other noise sensitive structures from being constructed within the 2027 60 DNL contour unless they comply with the Noise Level Reduction (NLR) requirements of the Part 150 Guidelines. This measure could be applied with change of ownership.
Area(s) to which measure would be applied	Land within the 2027 60 DNL contour of MHK that is zoned for Residential use (or other uses not compatible with airport operations). The 2027 60 DNL could be considered as the threshold for noise impact to plan for compatible growth at and around MHK as a preventive buffer. This would apply as an additional layer of zoning for all properties within the 2027 60 DNL in Riley County that are zoned single-family residential (A-2 and A-4). ²⁴
Compatibility Benefits	<ul style="list-style-type: none"> • Prevention of incompatible uses (e.g. Residential) • A mechanism for implementation of noise level reduction construction and aviation easement requirements for new construction. • There would be no change in the character of the existing environment.
Effect on Property Values and Tax Base	Zoning would affect the type of development permitted on a property, and therefore its value as well. Property owners could experience decreased property values if the most marketable use for noise impacted property is precluded by zoning. On the other hand, zoning could increase property values by providing assurances that future development would be compatible with existing or proposed development.
Costs	Staff or consultant costs for document development and changes, and time costs to county officials for review and adoption of amendments. The administrative costs associated with amending zoning ordinances and zoning maps would be borne by the local jurisdictions.
Legal Factors	None. Zoning authority is granted to local jurisdictions by the State of Kansas and changes to the zoning ordinance would be consistent with the Manhattan Urban Area Comprehensive Plan.
Political Acceptability	Developers and/or property owners may oppose the measure because of its potential to reduce areas of available residential development. However, there are only a few residential parcels and this measure would not greatly impact availability of residential development in the

Table 7-7
LU-4: Airport Overlay Zoning District (Preventive)

	county. Otherwise, the local jurisdictions may be in favor of this measure if commercial or industrial property generates a higher tax base than residential property in the same area.
Implementation Factors and Responsible Parties	Riley County Planning and Development Department would be responsible for updating the existing zoning guidelines and zoning map to designate those areas compatible with airport-related activity.
Conclusion	This measure is recommended for application wherever possible as a preventive measure within the 2027 60 DNL noise contour in planning for compatible growth at and around MHK.

7.3.2.2 Potential Measure: Real Estate Noise Disclosure (Preventive)

With this potential measure, local governments would seek to ensure that prospective buyers of residential property are informed of the aircraft noise exposure levels expected at a particular location. Fair disclosure of this information can be required directly through an ordinance or in the subdivision regulations covering the sale or transfer of property. A completed form outlining conditions that the property may be subject to can be included as a standard part of escrow and closing proceedings. For example, the U.S. Veterans Administration uses this approach by requiring a “Statement of Awareness” from veterans purchasing housing in areas near airports where noise levels exceed 65 DNL. Alternatively, the airport sponsor (City of Manhattan) could encourage local realtors and title companies to establish noise disclosure programs that inform prospective buyers of noise exposure levels *prior* to financial closing negotiations. This preventive measure is evaluated in **Table 7-8**.

Table 7-8
LU-5: Real Estate Noise Disclosure (Preventive)

Description	This measure would provide for disclosure of noise exposure levels to prospective homebuyers. MHK would encourage all neighboring jurisdictions to require disclosure of noise exposure levels by ordinance or via amended subdivision regulations/covenants that would require disclosure upon sale/transfer of the property. MHK could also encourage local realtors and title companies to establish a noise disclosure program.
Area(s) to which measure would be applied	The measure would apply to the 2014 65 DNL. However, there are no incompatible uses within the 2014 DNL contour. As a preventive buffer, the 2027 60 DNL should be considered as the area to protect for compatible growth at and around MHK.
Compatibility Benefits	<ul style="list-style-type: none"> • Notification to potential buyers of noise exposure levels. • Protection for the residential property seller and their agents from litigation due to airport noise.

Effect on Property Values and Tax Base	There is potential for reduction in property values due to disclosure of noise impacts. This may have little effect given that most buyers are likely aware of proximity to airport, as the residential areas impacted are relatively small.
Costs	Administrative costs to establish the program.
Legal Factors	The disclosure policy would not relinquish any of the buyer’s legal rights. It would only serve as a means to ensure that buyers are aware of potential aircraft noise exposure levels before purchasing or leasing the property.
Political Acceptability	Developers and individual homeowners may oppose the measure due to potential negative effect on marketing of residential properties.
Implementation Factors and Responsible Parties	Responsible parties would include the City of Manhattan and Riley County. The jurisdictions would adopt subdivision regulations, covenants, or ordinances requiring disclosure of noise levels as published in MHK noise exposure maps. Disclosure notice would preferably be provided prior to financial closing. MHK may also coordinate with local real estate interests to establish a noise disclosure program.
Conclusion	This measure is recommended for application as a preventive buffer within the 60 DNL noise contour for 2027 conditions, and is therefore recommended for inclusion in the NCP. Planned residential development to the northeast of MHK in the Scenic Meadows and Miller Parkway Corridor Area warrants the use of this preventive measure if enacted by the respective local jurisdictions.

7.3.2.3 Potential Measure: Revise Building Codes/Housing Codes for Noise Level Reduction Construction (Preventive)

Building codes and housing codes typically establish standards for construction with primary emphasis on functional and structural aspects of structures. Housing codes usually include standards based on safety and health, in addition to structural standards. Local building codes are often based on national or regional standard codes modified as necessary to suit local conditions. The City of Manhattan has adopted the International Building Code²⁵ and Riley County and the City of Ogden both do not have building codes, but do require a building permit for construction.²⁶ As part of the International Building Code, the International Residential Code, 2006 Edition, was adopted in the City of Manhattan in 2007, with City-modified code amendments.²⁷

Although the City’s building code is intended for purposes of establishing rules and regulations for construction, alteration, addition, demolition, equipment, use and occupancy, location and maintenance of buildings and structures, building codes and housing codes can be also be used to provide noise mitigation. Many home construction measures well known for increasing energy efficiency, such as wall insulation and the reduction of air infiltration, can also greatly decrease interior noise levels. Other noise attenuation measures that could be implemented using building

codes may include the use of absorptive materials used in building construction for noise sensitive areas.

The City's building code could also be modified to include the purpose of advancing aircraft noise and land use compatibility as follows:

- Acoustical treatment standards for new structures can be established to ensure the use of sound attenuating construction techniques in areas exposed to moderately high levels of noise. When incorporated in building codes and housing codes, such standards can provide a relatively satisfactory method of achieving land use compatibility without restricting development through zoning.
- Sound attenuating treatment to reduce interior noise levels resulting from outside noise would be recommended as a condition of building permit approval by the local jurisdictions for all new residential and other noise-sensitive land uses (e.g., schools, churches, medical facilities, etc.) in areas exposed to noise above 65 DNL. Sound attenuation provisions to achieve the appropriate noise level reduction (NLR) corresponding to the land use compatibility guidelines should be included in the city and county building codes (See Table 4-1). Compliance could be insured by existing building inspection personnel with some additional training as needed.
- Additions to the building codes to include NLR guidelines would not repeal, abrogate, or in any way impair or interfere with existing provisions of other codes, laws or ordinances, or with private restrictions placed upon property by covenant, deed, easement, or other agreement.

The EPA recommends a maximum interior noise level of 45 dBA. In areas that experience 65 DNL a residential structure would be required to attenuate 20 dB. Because there are no existing residences or non-residential buildings within the 2014 65 DNL contour, no additional sound attenuation building or housing code measures would be required. However, this measure would apply with issuance of a building permit for new construction, including substantial additions (greater than 1,000 square feet) to existing development, and also development on already zoned property that has not yet been developed.

As a preventative measure, if the 2027 60 DNL contour is applied as a buffer against future expansion of noise exposure levels, building code revisions would apply to structures and houses. It is normally sufficient to provide positive ventilation or central air conditioning, good seals and weather-stripping for windows and doors, using solid-core doors and elimination of direct sound paths such as mail slots or through-the-wall ventilating fans. Acoustical testing of structures built using the current building code would be necessary in order to determine the amount of additional sound attenuation needed.

To implement this preventive measure to the 2027 60 DNL contour, Riley County and the City of Ogden would need to develop and implement building codes, and the City of Manhattan would need to amend its existing building code/housing code. Adoption of appropriate NLR guidelines for construction around the Airport could alleviate noise in residential and other noise-sensitive structures.

As described in **Table 7-9**, this preventive measure would recommend that building codes for areas within the 2027 60 DNL be amended to require noise-sensitive buildings to be constructed to achieve a maximum interior noise level of 45 dBA. This interior noise level would meet the EPA guideline for avoiding sleep and speech interference due to aircraft noise.

As this measure would address the building codes, it could be applied to any new development of existing land. The measure would thus apply to all new construction and substantial additions within the 2027 60 DNL contour, and ensure that new development would be constructed to reduce the effects of aircraft noise.

Table 7-9

LU-6: Revise Building Codes for Noise Level Reduction Construction (Preventive)

Description	MHK would recommend that all neighboring jurisdictions revise and/or adopt a building code/housing code to ensure land-use compatibility within the limits of the 2027 60 DNL contour. Specifically, the building code should ensure a noise level reduction (NLR) that is sufficient to achieve an interior noise level of 45 dBA. In addition, subdivision regulations could be amended to help guide development in noise impacted areas by reducing building exposure (e.g. providing buffer areas, requiring open space).
Area(s) to which measure would be applied	As a long term land use management tool, the measure would apply to the 2027 60 DNL.
Compatibility Benefits	<ul style="list-style-type: none"> • Interior noise levels for newly constructed structures would be reduced. • Interior noise levels of newly constructed noise-sensitive buildings would be reduced.
Effect on Property Values and Tax Base	Potential for increase in property values.
Costs	The city and county governments would incur the administrative costs associated with amending local zoning and building codes. Developers and property buyers would incur the increased costs needed to achieve noise level reductions goals. However the increased costs may not be substantially more than provided for with current construction techniques, and any additional cost would likely be offset over the long-term by reduced energy costs.
Legal Factors	See Implementation Factors and Responsible Parties. Inclusion of this tool/measure in the MUA Comprehensive Plan to confirm the need for

	modifications to City of Manhattan building code and development of Riley County and Ogden building code would support the use of this measure.
Political Acceptability	Developers and those who purchase newly developed properties may oppose the measure due to increased construction costs.
Implementation Factors and Responsible Parties	The City of Manhattan and Riley County would adopt modifications to the building code/residential code and subdivision regulations. The MUAPB could be engaged to suggest specific revisions to ordinances regarding building codes and subdivision regulations and to recommend the City Commission or County Commission to adopt them. MHK would coordinate with all participating jurisdictions on the measure.
Conclusion	Due to the compatibility benefits of reducing interior noise levels and the relatively low cost in lieu of property acquisition, this measure is recommended for inclusion in the NCP.

7.3.2.4 Potential Measure: Purchase of Development Rights or Transfer of Development Rights (Preventive)

Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) are voluntary programs in which landowners are paid fair market value for the development rights of their property. These programs provide for the separation of development rights from land ownership. In this case, the City of Manhattan (airport sponsor) would seek to purchase and extinguish development rights in order to prevent new incompatible development within the 2027 60 DNL.

With a PDR, the City of Manhattan could purchase development rights from an agricultural property that is under pressure for residential development. The landowner would receive compensation for the development rights while the City of Manhattan would be able to extinguish the right to develop the property and/or place a permanent conservation easement on the property, and prevent new incompatible development. PDR programs are usually funded by the sale of bonds or property tax revenues. An evaluation of the measure is contained in **Table 7-10**.

The use of a TDR program would help to preserve land in its existing state and avoid unwanted development in the 2027 60 DNL by transferring the right to develop a property from a sending area to a receiving area where development is more desirable.

The State of Kansas has enabling legislation that supports the development of PDR and TDR programs in the State, however the Manhattan Urban Area Comprehensive Plan does not address the PDR and TDR land use compatibility tools, which makes this land use measure less feasible at this time.

Table 7-10

LU-7: Purchase of Development Rights and Transfer of Development Rights (Preventive)

Description	With PDR/TDR, the City of Manhattan would seek to purchase the development rights for properties within the 2027 60 DNL contour that could be developed into incompatible uses. With TDR, the development rights would be sent to a “receiving” area that is more compatible with development and the “sending” area owner would receive compensation for the sale of these rights. This prohibits any and all uses of the land that could be adversely impacted by aircraft noise.
Area(s) to which measure would be applied	As a long term land use management tool, this would apply to jurisdictions with land within the 2027 60 DNL as a preventive buffer for compatible growth at and around MHK.
Compatibility Benefits	<ul style="list-style-type: none"> • Landowners would have a means to be compensated for their development interests. • MHK/City of Manhattan would be able to prevent new incompatible use.
Effect on Property Values and Tax Base	The new allowable use may have less taxable value than the original development, which would affect the value and/or tax base.
Costs	The City of Manhattan would be responsible for administrative costs and funding for purchase of the development rights and coordination, as well as costs to develop and implement these measures. The City could seek federal funding for the program if the local jurisdictions implement a noise threshold standard using the 2027 60 DNL contour.
Legal Factors	Since the programs would be voluntary and property owners would receive fair market value for development rights, little opposition would be anticipated. If the program results in the development of non-residential uses in residential areas, some residents could oppose the measure. Currently, there are no provisions for sale/purchase of development rights in place in the City or County, nor is it included in the current Comprehensive Plan. However, local governments have the authority to amend zoning regulations which may include PDRs and TDRs. The State of Kansas has enabling legislation that allows for the development of a PDR/TDR system.
Political Acceptability	See Legal Factors.
Implementation Factors and Responsible Parties	<ul style="list-style-type: none"> • City of Manhattan would identify parcels with the potential for new incompatible development and seek to purchase or transfer development rights from those parcels. • Landowners may not be compelled to sell their development rights.
Conclusion	This measure is not recommended for inclusion in the NCP at this time. The development rights system would have to be adopted by the local governments and the comprehensive plan would need to be updated to recognize this measure for development rights and land designation. This measure may be reconsidered in future Part 150 studies for MHK.

7.3.2.5 Dedication of Avigation Easements with Building Permits (Preventive)

An avigation easement is the right to the use of real property for the purpose of aircraft overflights and related noise, vibrations, and other effects caused by aircraft operations. An avigation easement is a permanent encumbrance on the land. Although the use of navigable airspace by aircraft is a federal prerogative, an avigation easement provides an additional mechanism of right-of-way and disclosure.

The City of Manhattan’s Subdivision Layout Standards include the requirement that avigation easements be granted to the public for land located within the vicinity of established flight paths and noise impact areas of public-owned or controlled airports to allow aircraft to operate within the “Navigable Airspace” as defined by the Federal Aviation Act of 1958, as amended.²⁸ However, the avigation easements are not currently tied to any issuance of building permits in the City. As a preventive land use measure, the City of Manhattan (airport sponsor) would encourage Riley County and the City of Ogden to also mandate that avigation easements be required with subdivision plats and with the issuance of building permits in all three jurisdictions for new noise-sensitive development within the 2027 60 DNL.

As a condition of subdivision approval in Riley County and Ogden, and as a condition of issuance for building permits in all three jurisdictions, the owner of property within the 2027 60 DNL contour would be required to dedicate to the airport sponsor a noise and avigation easement. This transfer is similar to the arrangement for the dedication of street rights-of-way or utility easements. Additionally, ownership of the easement serves as notification that the property is subject to aircraft noise.²⁹

An evaluation of the measure is included in **Table 7-11**.

Table 7-11

LU-8: Dedication of Avigation Easements with Building Permits (Preventive)

Description	The City of Manhattan would encourage jurisdictions with land within the 2027 60 DNL contour to require that avigation easements be required with subdivision plats/covenants and the issuance of building permits for new noise-sensitive development.
Area(s) to which measure would be applied	As a long term land use management tool, this would apply to jurisdictions with land within the 2027 60 DNL as a preventive buffer to improve compatibility of future development (City of Manhattan, Riley County, City of Ogden).
Compatibility Benefits	<ul style="list-style-type: none"> • Easements would notify developers and property owners of the aircraft noise exposure levels and the right of aircraft overflight. • Improves compatibility of future development. • Releases local jurisdictions, aircraft operators, and the airport owner and operator from the effects of aircraft operations on noise-sensitive properties. Properties with an avigation easement would be considered compatible.

Table 7-11

LU-8: Dedication of Avigation Easements with Building Permits (Preventive)

Effect on Property Values and Tax Base	Potential for slight reduction in property value.
Costs	The city and county governments would incur the administrative costs associated with amending procedures or issuance of building permits. As the easements would be issued with building permits or as part of subdivision regulations, rather than purchased, there is no purchase cost.
Legal Factors	Avigation easements legally protect the airport operator from litigation.
Political Acceptability	Homeowners and developers may oppose the measure due to the potential for reduced marketability.
Implementation Factors and Responsible Parties	City of Manhattan, Riley County, and the City of Ogden would each be responsible for the implementation of this measure for properties within their own jurisdiction within the 2027 60 DNL contour.
Conclusion	This measure would provide a viable mechanism for granting of avigation easements for new construction within the 2027 60 DNL contour. The measure would promote improved aircraft noise and land use compatibility. Therefore, the measure is recommended for inclusion in the NCP.

7.4 SUMMARY OF LAND USE STRATEGIES

The recommended land use measures are intended to prevent the introduction of new incompatible development within noise impacted areas. **Table 7-12** summarizes the evaluation of land use measures.

None of the potential corrective land use measures are being recommended for inclusion in the NCP because the corrective measures only apply to the 2014 65 DNL noise contour which does not extend beyond MHK property boundaries. The corrective measures are applied to the 2014 65 DNL as recommended in 14 CFR Part 150 per the FAA’s guidelines (See Table 4.1).

As a preventative measure, use of the 2027 60 DNL could be considered if local regulations identified this contour for purposes of maintaining noise compatibility, intended as a buffer against future expansion of noise exposure levels.

Of the preventive land use measures, the legal authority exists in the City of Manhattan and in Riley County to implement the recommended land use measures. For example, Real Estate Noise Disclosure requirements (LU-5) could be implemented in new subdivision covenants, and Airport Overlay Zoning (LU-4) could be implemented by amending the existing Riley County and City of Ogden zoning regulations. Dedication of avigation easements (LU-8) would require granting of the easements with issuance of building permits, which builders and developers are

already required to obtain in each of the impacted jurisdictions. Although the City of Manhattan currently has a building code and a residential code in place that could be amended to include the revision of building codes for noise level reduction (LU-6), this measure may take more time to implement for Riley County and the City of Ogden given that there are currently no building codes. The Purchase of Development Rights or Transfer of Development Rights measure (LU-7) is not recommended for inclusion in the NCP at this time due to the fact that the framework has not yet been established. This measure may be a viable option in the future if local Comprehensive Plans are updated to include this program as a recommended land use tool and if local governments adopted the development rights system.

Table 7-12
Summary of Land Use Measure Evaluation

Land Use Measure	Type of Measure	Recommendation
LU-1: Land Acquisition Acquire parcels of land that are currently impacted by Airport noise.	Corrective	Not recommended for inclusion in the NCP.
LU-2: Property Purchase Assurance Program Guarantees the purchase of existing homes within areas impacted by airport noise after seller makes a bona fide effort to sell.	Corrective	Not recommended for inclusion in the NCP.
LU-3: Sound Insulation Program Provides for sound insulation to residential properties within noise-impacted area.	Corrective	Not recommended for inclusion in the NCP.
LU-4: Compatible Use Zoning Prevents new incompatible residential development and other noise sensitive structures from being constructed within noise-impacted area.	Preventive	Recommended for inclusion in the NCP.
LU-5: Real Estate Noise Disclosure Ensures noise exposure levels be provided to prospective homebuyers.	Preventive	Recommended for inclusion in the NCP.
LU-6: Revise Building Codes for Noise Level Reduction Revise building codes to ensure land use compatibility within noise-impacted areas.	Preventive	Recommended for inclusion in the NCP.
LU-7: Purchase of Development Rights or Transfer of Development Rights Development rights within noise-impacted area could be sent to a receiving area that is more compatible with development.	Preventive	Not recommended for inclusion in the NCP.
LU-8: Dedication of Avigation Easements with Building Permits Encourages jurisdictions to require avigation easements with subdivision plats and the issuance of building permits within noise-impacted area.	Preventive	Recommended for inclusion in the NCP.

NOTES

¹ The land use measures discussed in this chapter and the rest of this Study are associated with the NEMs that were developed in 2008-2009 for the draft Part 150, and are contained in Appendix C. The NEMs contained in this *Airport Noise and Land Use Compatibility Study* were updated in 2010 to reflect the 1,200-foot extension to Runway 13/31 and the 400-foot shift of Runway 03/21, as explained in the cover letter of this Study.

² U.S. Census Bureau, 2000.

³ *Flint Hills Joint Land Use Study*, June 2005.

⁴ *Manhattan Urban Area Comprehensive Plan*, April 2003. Accessed at <<http://www.ci.manhattan.ks.us/documentcenterii.aspx>>, last accessed August 2009.

⁵ Ibid.

⁶ The residential zoning of these properties ranges from A-1 to A-4, which are all Single Family Residential that permit single family homes and other limited uses, with A-1 providing the least flexibility and A-4 providing the most flexibility for other permitted uses (e.g., places of worship, day care centers, public parks and recreation buildings, mobile homes, etc.).

⁷ *Constitution of the State of Kansas*, Article 12--Corporations, Section 5. Amendment effective July 1, 1961.

⁸ City of Manhattan, Kansas website, "Manhattan Urban Area Planning Board," <<http://www.ci.manhattan.ks.us>>, accessed February 14, 2008.

⁹ Chapter 3, Article 7 (3-701) of Kansas Statutes, "Aircraft and Airfields."

¹⁰ *Riley County Zoning Regulations*, 1973. Airport Noise Hazard District, Section 9A. *Manhattan Zoning Regulations*, as amended and reestablished, Ordinance No. 6575. Article XI: Airport Overlay District, October 3, 2006.

¹¹ *Manhattan Zoning Regulations*, as amended and reestablished, Ordinance No. 6575. Article XI: Airport Overlay District, October 3, 2006.

¹² The zones include (A) the Airport Noise Exposure Zone (includes the area contained within the boundaries of the 65 DNL noise contour); (B) Conical Zone; (C) Horizontal Zone; (D) Precision Instrument Runway Approach Zone; (E) Runway Larger Than Utility Visual Approach Zone; (F) Runway Larger Than Utility With a Visibility Minimum Greater Than ¾ Mile Nonprecision Instrument Approach Zone; (G) Transitional Zones; (H) Utility Runway Nonprecision Instrument Approach Zone; and (I) Utility Runway Visual Approach Zone.

¹³ Official Riley County Zoning Map of the *Riley County Zoning Regulations*, adopted and in accordance with Kansas Statutes Annotated, 1973 Supplement, Sections 19-2914 through 19-2926b, Sections 12-725 through 12-733, and Kansas Statutes Annotated, 1973 Supplement, Sections 12-734 and 12-735.

¹⁴ Single family residential (A-2, A-4) to the west and scattered in other areas; and Agricultural (G-1), Highway Business District Commercial (C-4), and Light Industrial (D-2) to the east. (Official Riley County Zoning Map of the *Riley County Zoning Regulations*, adopted and in accordance with Kansas Statutes Annotated, 1973 Supplement, Sections 19-2914 through 19-2926b, Sections 12-725 through 12-733, and Kansas Statutes Annotated, 1973 Supplement, Sections 12-734 and 12-735.)

¹⁵ Official Riley County Zoning Map of the *Riley County Zoning Regulations*, adopted and in accordance with Kansas Statutes Annotated, 1973 Supplement (Section 6).

¹⁶ Ibid.

¹⁷ Manhattan Subdivision Layout Standards, Article X, Part 6, 10-601, Section J. "Navigable Airspace" as defined by the Federal Aviation Act of 1958, as amended. Consistent with FAA Regulations, the MUAPB may disapprove a plat

or portion thereof, which could create a hazardous situation for air traffic and the general public resulting from development and construction of a project.

¹⁸ *Flint Hills Joint Land Use Study*, June 2005.

¹⁹ Phone interview with Vincent Cramer, Ogden City Clerk, June 23, 2008.

²⁰ City of Manhattan Subdivision Layout Standards (Article X), p.X-16.

²¹ *Manhattan Urban Area Comprehensive Plan*, April 2003, p. 4-1.

²² Change in FAA's Noise Mitigation Policy for procedures for Part 150: "Beginning October 1, 1998, the FAA will approve under part 150 only remedial noise mitigation measures for existing noncompatible development and only preventive noise mitigation measures in areas of potential new noncompatible development. As of the same date, the ability to use AIP grants to carry out such measures will be affected to the extent that such remedial measures may not be approved under Part 150."

²³ K.S.A. 12-758. *Same; existing uses; alterations; agricultural land exempted, exception.*

(a) Except as otherwise provided by this section and K.S.A. 12-770 and 12-771, and amendments thereto, regulations adopted under authority of this act shall not apply to the existing use of any building or land, but shall apply to any alteration of a building to provide for a change in use or a change in the use of any building or land after the effective date of any regulations adopted under this act. If a building is damaged by more than 50% of its fair market value such building shall not be restored if the use of such building is not in conformance with the regulations adopted under this act.

(b) Except for flood plain regulations in areas designated as a flood plain, regulations adopted by a city pursuant to K.S.A. 12-715b, and amendments thereto, or a county pursuant to this act shall not apply to the use of land for agricultural purposes, nor for the erection or maintenance of buildings thereon for such purposes so long as such land and buildings are used for agricultural purposes and not otherwise. History: L. 1991, ch. 56, § 18; L. 1997, ch. 147, § 9; May 1.

²⁴ Official Riley County Zoning Map of the Riley County Zoning Regulations, adopted and in accordance with Kansas Statutes Annotated, 1973 Supplement, Sections 19-2914 through 19-2926b, Sections 12-725 through 12-733, and Kansas Statutes Annotated, 1973 Supplement, Sections 12-734 and 12-735.

²⁵ City of Manhattan Code of Ordinances, Section 8-31, *Building Code*.

²⁶ Riley County website, <http://www.rileycountyks.gov/FAQ.asp?QID=437>. (Accessed 6/30/08).

²⁷ City of Manhattan Code of Ordinances, Section 8-31, *Building Code*.

²⁸ City of Manhattan Subdivision Layout Standards (Article X), p.X-16.

²⁹ FAA, Land Use Compatibility and Airports, 2006.
http://www.faa.gov/about/office_org/headquarters_offices/aep/planning_toolkit/ (Last accessed 9/2/09).

Chapter Eight

CONTINUING PROGRAM MEASURES

This chapter presents measures that are related to the ongoing implementation, monitoring, and review of the Noise Compatibility Program (NCP). Two Continuing Program Measures were considered and recommended for this Part 150.

As stated previously, the City of Manhattan (Airport Sponsor) has overall responsibility for conducting the Part 150 Study, including ultimate responsibility for the recommendation of measures for inclusion in the NCP. *All of the final NCP measures that this document proposes for implementation are recommendations of the City of Manhattan.*

The methodology used to evaluate the Continuing Program Measures is similar to the evaluation of land use measures in Chapter Seven. A brief explanation of the measure is described, and each measure is then evaluated using the criteria presented in Table 7-3 in Chapter Seven.

8.1 COORDINATION AMONG NEIGHBORING JURISDICTIONS; PUBLIC EDUCATION AND AWARENESS PROGRAM

A high degree of coordination and cooperation among neighboring jurisdictions and local governments is necessary to ensure that the existing and proposed land use compatibility techniques are carefully considered and potentially implemented. The City of Manhattan and Riley County would continue to foster coordination as they have with the establishment of the Manhattan Urban Area and established Urban Service Area.

To ensure that each affected jurisdiction is involved in airport and land use compatibility decision-making, a joint committee or board would be established to include the Airport, the City of Manhattan, Riley County, Fort Riley, and the City of Ogden. As part of this coordination, initiatives for public education and awareness programs concerning airport actions and land use compatibility would be emphasized.

The involvement of airport officials would be an important component of this effort. The set interaction between land use planners and Airport staff would help ensure that both groups are involved with and aware of decisions being made by the Airport and neighboring jurisdictions. An evaluation of the measure is included in **Table 8-1**.

Table 8-1

CPM-1: Emphasis on Coordination Among Neighboring Jurisdictions

Description	Establish a coordinated committee that includes jurisdictions within the area impacted by airport noise in order to coordinate planning efforts with each other and with the Airport. This would also provide a means to ensure sufficient public education and awareness programs for dissemination and sharing of public feedback and concerns. Engagement of airport officials would be essential.
Area(s) to which measure would be applied	Those areas in any jurisdiction with lands within the 2027 60 DNL contour. (Manhattan, Riley County, Fort Riley, Ogden)
Compatibility Benefits	Coordination of land use measures and sharing of information among jurisdictions and MHK.
Effect on Property Values and Tax Base	None.
Costs	No monetary cost anticipated if committee members are volunteers. Time spent to search for appropriate committee members and to establish an action plan for implementing this plan.
Legal Factors	None.
Political Acceptability	Highly acceptable, as it would facilitate communication between neighboring jurisdictions and the public. No anticipated opposition to this coordination effort.
Implementation Factors and Responsible Parties	Time dedicated to this effort could be substantial during the initial creation of a committee/board. Responsible parties would likely begin with MHK and the City of Manhattan (airport sponsor), and eventually extend to Riley County, Ogden, and Fort Riley to maintain this effort.
Conclusion	This measure is recommended for implementation. It would facilitate communication between jurisdictions and MHK, and would establish a medium for the dissemination and exchange of information with the public.

8.2 PERIODIC EVALUATION AND UPDATES OF NOISE EXPOSURE

The Noise Exposure Maps (NEMs) prepared for this Part 150 Study will need to be updated periodically.¹ It is expected that new NEMs will need to be produced to reflect changes in the nature of aircraft noise and land use surrounding the airport to ensure that the NEMs account for any physical changes that occur at the airport, changes in fleet mix, as well as any updates to noise modeling software. As the NEMs are updated in the future, if revisions are necessary, the City may also need to update the Noise Compatibility Program (NCP) to ensure that it still adequately addresses noise and land use compatibility at and around the airport.

The FAA typically requests new NEMs and formal assessment and reporting on the implementation of the NCP at five year intervals, however this timeframe may be extended if the forecast NEMs remain representative of actual conditions at MHK. The map and program review interval would be shortened if conditions at the airport change in a manner that would cause a

significant change in noise exposure (i.e., runway realignments or significant modifications to ground facilities being planned). This is in accordance with Part 150, Section 150.21(d), which states that the airport operator shall promptly prepare and submit a revised NEM under specified circumstances, including when it is likely that a change has taken place at the airport that would cause a significant increase or decrease in the DNL noise contour of 1.5 dB or greater over incompatible land uses.

Table 8-2
CPM-2: Periodic Evaluation of Noise Exposure

Description	Update the airport’s Noise Exposure Maps (NEMs) at five-year intervals, or when changes to the airport would result in a significant change to noise exposure. The Airport operator shall prepare and submit a revised NEM in accordance with §150.21(d), if after submission any of the stated provisions should occur, i.e. when it is likely a change has taken place that will cause a significant increase or decrease in the DNL noise contour of 1.5 dB or greater over incompatible land uses. The City of Manhattan may determine that an update to the Noise Compatibility Program (NCP) is also necessary as part of the periodic evaluation.
Area(s) to which measure would be applied	Those areas in any jurisdiction with lands within the contours of the existing or future NEMs. (Manhattan, Riley County, Fort Riley, Ogden)
Compatibility Benefits	This measure would ensure that efforts to maintain noise and land use compatibility are updated regularly and also helps to proactively address potential noise issues.
Effect on Property Values and Tax Base	None.
Costs	City of Manhattan for periodic evaluations, City and FAA to fund NEM/NCP revisions.
Legal Factors	None.
Political Acceptability	Highly acceptable, as it would ensure that noise and land use compatibility issues are consistently being addressed. No anticipated opposition to periodic evaluations.
Implementation Factors and Responsible Parties	City of Manhattan (Airport Sponsor) would be responsible for periodic evaluation and review.
Conclusion	This measure is recommended for implementation. Periodic review of noise exposure is recommended by CFR Part 150 Regulations.

8.3 SUMMARY OF RECOMMENDED CONTINUING PROGRAM MEASURES

The continuing program measures to coordinate among neighboring jurisdictions (CPM-1) and periodic evaluation of noise exposure (CPM-2) would not require any amendments to existing ordinances or new covenants, but would require collaborative planning between MHK, the City of Manhattan, Riley County, City of Ogden, and Fort Riley.

Table 8-3 summarizes the continuing program measures that the City proposes and recommends for inclusion in the NCP.

Table 8-3
Summary of Continuing Program Measures

Continuing Program Measure	Type of Measure	Recommendation
<p>CPM-1: Coordination Among Neighboring Jurisdictions; Public Education and Awareness Program Coordinate jurisdictions within the area impacted by airport operations; ensure sufficient public education and awareness programs.</p>	Continuing	Recommended for inclusion in the NCP.
<p>CPM-2: Periodic Evaluation of Noise Exposure Re-evaluate and update NEMs at five-year intervals and revise NCP as necessary.</p>	Continuing	Recommended for inclusion in the NCP.

NOTES

¹ The continuing program measures discussed in this chapter and the rest of this Study are associated with the NEMs that were developed in 2008-2009 for the draft Part 150, and are contained in Appendix C. The NEMs contained in this *Airport Noise and Land Use Compatibility Study* were updated in 2010 to reflect the 1,200-foot extension to Runway 13/31 and the 400-foot shift of Runway 03/21, as explained in the cover letter of this Study.

Chapter Nine

NOISE COMPATIBILITY PROGRAM

This chapter summarizes the measures recommended for inclusion in the Noise Compatibility Program (NCP). Section 9.1 presents the recommended noise abatement and land use measures, as well as the continuing program measures that could serve to enhance the recommended noise abatement and land use measures. Section 9.2 reviews the recommended NCP and implementation procedures.

9.1 RECOMMENDED NOISE COMPATIBILITY PROGRAM

The City of Manhattan (Airport Sponsor) has overall responsibility for conducting the Part 150 Study, including ultimate responsibility for the recommendation of measures for inclusion in the NCP. *All of the final NCP measures that this document proposes for implementation are recommendations of the City of Manhattan.*

9.1.1 Recommended Measures

The recommended noise abatement measures would be based on making modifications to existing operational procedures at MHK so as to provide benefits to neighboring communities and maintain that no residents are impacted by 65+ DNL contours. No corrective land use measures are proposed as there are no incompatible land uses within the 2009 or 2014 65+ DNL contour. The preventive measures proposed are intended to help prevent future incompatible land use issues. The NCP for MHK includes eleven measures: five noise abatement measures, four land use measures, and two continuing program measures. Chapter Six presents the analyses that led to the selection of the noise abatement, Chapter Seven presents the analyses that led to the selection of land use measures, and Chapter Eight presents the continuing program measures, intended to support ongoing land use and noise compatibility between MHK and neighboring jurisdictions.

9.1.2 Recommended Noise Abatement Measures

NA-1: Departure Procedures for Turbojets. Turbojets departing from Runway 03/21 would maintain runway heading until reaching 2,000 feet above ground level (AGL) unless otherwise directed by Air Traffic Control (ATC).

NA-2: Relocating the Arrival/Departure Flight Track to/from Runway 03/21 with a Short-Final Approach Segment. The arrival flight track currently overflying the residential community on the bluff would be relocated so that the aircraft is closer to the Kansas River, before turning final to Runway 21 approximately 2 miles from the runway threshold.

NA-3: Relocating the Arrival Flight Track to Runway 21 with a Five Nautical Mile Final Approach Segment. The arrival flight track currently overflying the residential community on the bluff would be relocated to the north so that the aircraft intercept final approach is approximately 5 NM from the threshold of Runway 21.

NA-5: Touch and Go Operations. Aircraft would climb to the traffic pattern altitude (TPA) on the upwind leg before turning, unless otherwise advised by ATC. The pattern altitude is 843 feet AGL for general aviation aircraft and 1,443 feet for turbine powered aircraft.

NA-6: Military Helicopter Operations. Aircraft would climb to the TPA on the upwind leg before turning, unless otherwise advised by ATC; Touch and Go operations would be limited to certain days and times; Number of Touch and Go operations per flight would be limited.

9.1.3 Recommended Land Use Measures

LU-4: Airport Overlay District Zoning. Prevent new incompatible residential development and other noise sensitive structures from being constructed within the noise-impacted area.

LU-5: Real Estate Noise Disclosure. Ensure that disclosure of noise exposure levels was provided to prospective homebuyers.

LU-6: Revise Building Codes for Noise Level Reduction. City of Manhattan would recommend that Manhattan revise its building code and Riley County develop a building code that would ensure land use compatibility in the vicinity of MHK. Specifically, a noise level reduction (NLR) would apply as a long term land use management tool to the 2027 60 DNL.

LU-8: Dedication of Avigation Easements with Building Permits. City of Manhattan would encourage jurisdictions with land within the 2027 60 DNL contour to require that avigation easements be required with subdivision plats/covenants and the issuance of building permits for new noise-sensitive development.

9.1.4 Recommended Continuing Program Measures

CPM-1: Coordination Among Neighboring Jurisdictions; Public Education and Awareness Program. This measure would coordinate jurisdictions within the area impacted by airport operations and establish a program to enhance public awareness of aircraft noise issues and the NCP.

CPM-2: Periodic Evaluation of Noise Exposure. This measure would include the ongoing monitoring of noise and operations in the vicinity of MHK to ensure the continued validity of the NEMs and the effectiveness of the NCP.

9.2 NCP IMPLEMENTATION

Part 150 details extensive requirements related to NCP implementation, including:

- Identification of the time period covered by the program.
- Identification of parties responsible for implementation of each program element.
- Indication that responsible parties have agreed to implement the measure.
- Schedule for implementation of the program.
- Essential government actions.
- Anticipated funding sources.

Table 9-1 summarizes implementation details for each proposed element of the NCP.

9.2.1 Time Period Covered by the Noise Exposure Maps

In the absence of unanticipated changes in forecast conditions, the NEMs would typically cover a period of five years from the date of submission. The NCP would remain valid until revised in a subsequent NCP update. In the case of MHK, the existing condition (2009) and future condition (2014) NEMs are supplemented by a potential future scenario (2027) to promote the protection of compatible land uses due to significant growth and changes underway in Manhattan and nearby communities. The 2027 NEM is intended for planning purposes. This will enable Airport management and the community to plan for compatible growth at and around MHK. See Chapter 5 for further explanation of the 2027 noise contour.

9.2.2 Implementation Responsibility

Part 150 requires that the NCP clearly identify the agency(-ies) responsible for implementing each recommended element.

According to the FAA’s definition of implementation responsibility¹, the City of Manhattan, as airport operator, must initiate the implementation of all noise abatement measures. Clearly, however, the FAA and ATC have key roles in the implementation of aircraft operational measures. Since the FAA is responsible for air traffic control, it must develop and provide instructions to pilots related to preferred runway use and noise abatement flight tracks. Both air carriers and pilots have supporting roles in the implementation of aircraft operational measures, as they must support and comply with noise abatement procedures, consistent with the safe operation of aircraft.

The City of Manhattan, Riley County, and the City of Ogden are all responsible for implementation of land use measures in their respective jurisdictions. The City of Manhattan, as Airport Sponsor, will seek assistance from local governments in the publicity of land use measures. Local jurisdictions are responsible for the implementation and enforcement of land use controls. FAA is involved in the implementation of land use measures through program approval and funding assistance.

9.2.3 Indication of Agreement to Implement

As the lead agency in the implementation of all measures, the City of Manhattan agrees to its responsibilities. Through airport staff, the consulting team members have discussed the proposed NCP elements with the FAA and local government representatives.

9.2.4 Further Environmental Review

Federal or local regulations may require environmental review prior to the implementation of some NCP measures. MHK will not initiate the implementation of any measure until it, the FAA, or other responsible agency has satisfied any such requirements.

In particular, the FAA may approve some noise abatement measures “subject to environmental review” per the National Environmental Policy Act, as described in FAA Order 1050.1E, Policies and Procedures for Considering Environmental Impacts. The FAA will determine environmental review requirements when an official FAA “action” is contemplated. In the case of the MHK NCP, the triggering FAA action would likely be the modification of flight tracks.

**Table 9-1
Implementation Summary for NCP**

Proposed Measure	Implementation Actions and Responsible Parties	Anticipated Costs and Funding Sources	Anticipated Schedule
Noise Abatement Measures			
NA-1: Departure Procedures for Turbojets	ATC is responsible for implementing this action. The Airport will be responsible for taking the necessary actions to educate the users about this procedure. Should be published as a NOTAM.	The Airport will potentially incur some cost based on the method of disseminating this information to the users. FAA administrative cost to publish a NOTAM	[Initiate following NCP approval]
NA-2: Arrival/Departure Track to Runway 03/21	ATC is responsible for implementing this action. The Airport and ATC will be responsible for taking the necessary actions to educate the users about the change in the location of the flight track. Should be published as a NOTAM.	Airport and FAA administrative cost to publish literature and NOTAM.	[Initiate following NCP approval]
NA-3: Arrival Flight Track to Runway 21	ATC is responsible for implementing this action. The Airport and ATC will be responsible for taking the necessary actions to educate users about the change in the location of the flight track. Should be published as a NOTAM.	Airport and FAA administrative cost to publish literature and NOTAM.	[Initiate following NCP approval]

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NA-5: Touch and Go Operations – Aircraft should climb to TPA on upwind leg before turning, unless otherwise advised by ATCT	ATC will be responsible for implementing this measure. The general aviation community and flight school/s will need to be notified about this measure.	None	[Initiate following NCP approval]
NA-6: Military Helicopter Operations	Fort Riley ATC and Management will be responsible for implementing this procedure. Should be stated as a standard operating procedure for operations conducted at MHK.	None	[Initiate following NCP approval]
Land Use Measures			
LU-4: Airport Overlay District Zoning	Rezone Riley County properties in the 2027 65 DNL to Noise Hazard district or amend Riley County Zoning Ordinance to include an Airport Overlay District that would apply to properties in 2027 65 DNL. Riley County Commission would be responsible for amendment to the zoning ordinance and rezoning of property.	Riley County administrative costs.	TBD. Would likely follow an update or amendment to the Manhattan Urban Area Comprehensive Plan.
LU-5: Real Estate Noise Disclosure	City of Manhattan (as Airport Sponsor) would coordinate with Riley County and City of Ogden.	Administrative costs to jurisdictions within the 2027 60+ DNL.	[Initiate following NCP approval]
LU-6: Revise Building Codes for Noise Level Reduction	City of Manhattan (as Airport Sponsor) would coordinate with Riley County and City of Ogden. Building Officials could assist in the development of additions/revisions to building/residential code.	Administrative costs to jurisdictions within the 2027 60+ DNL.	[Initiate following NCP approval; Upon local approval]
LU-8: Dedication of Avigation Easements with Building Permits	City of Manhattan, Riley County, City of Ogden would each be responsible for implementing this measure within their respective jurisdictions.	Administrative costs associated with amending procedures to jurisdictions within the 2027 60+ DNL.	[Initiate following NCP approval; Upon local approval and initiation of each jurisdiction]
Continuing Program Measures			
CPM-1: Coordination Among Neighboring Jurisdictions; Public Education and Awareness	City of Manhattan, Riley County, City of Ogden, MHK would work together to implement measure.	Administrative costs to coordinating jurisdictions; MHK administrative costs for	[Initiate following NCP approval]

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Program		public awareness program.	
CPM-2: Periodic Evaluation of Noise Exposure	City of Manhattan (Airport Sponsor) would be responsible for periodic evaluation and review. FAA for review of NEM/NCP revisions.	City of Manhattan (Airport Sponsor) and FAA to fund NEM/NCP revisions.	[Initiate following NCP approval; ongoing]

NOTES

¹ As set forth in FAA Advisory Circular (AC) 150/5020-1, “Noise Control and Compatibility Planning for Airports,” August 5, 1982.

Chapter Ten

RECORD OF CONSULTATION

The public consultation program for the MHK Part 150 Study was completed in accordance with the public consultation requirements contained in 14 CFR Part 150 Subpart B – Development of Noise Exposure Maps (NEMs) and Noise Compatibility Program (NCP).¹

For this Study, the opportunity to comment on the NEMs was afforded to the City of Manhattan, the FAA, Fort Riley and MHK personnel.

10.1 COORDINATION

The Part 150 Study for MHK involved the coordination of a variety of parties whose input was essential in developing the NEMs and NCP. The public involvement in the first phase of the Part 150 was minimal due to the fact that Airport operations have minimal impact on the surrounding communities.

Input was sought and received from the following entities:

Agency/Organization	Name	Title
City of Manhattan/Manhattan Regional Airport	Mr. Peter VanKuren	Airport Manager, Manhattan Regional Airport
City of Manhattan/Manhattan Regional Airport	Mr. Don Williams	MHK Air Traffic Control Tower
Federal Aviation Administration	Mr. Todd Madison, P.E.	Environmental Specialist
Federal Aviation Administration, Airports Division Central Region	Mr. Jeffrey Deitering, P.E.	Airport Planning Engineer - Kansas
City of Manhattan/Manhattan Regional Airport	Mr. Don Williams	Air Traffic Control Tower
Kansas Air Center	Mr. Ron Nordt	Fixed Base Operator (FBO)
Marshall Army Airfield, Fort Riley, Kansas	Mr. Troy Mattingly	Airfield Manager

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Agency/Organization	Name	Title
Marshall Army Airfield, Fort Riley, Kansas	Mr. Ralph Millard	Chief, Air Traffic Control
City of Manhattan	Mr. Eric Cattell, AICP	Assistant Director of Planning
City of Manhattan	Ms. Karen Davis, AICP	Director of Community Development
Riley County	Mr. Monty Wedel, AICP	Director, Planning and Special Projects
Riley County	Mr. John Cowan	GIS Coordinator
Riley County	Bob Isaac	Planner
City of Ogden	Mr. Vincent Cramer	City Clerk
BG Consultants, Inc.	Mr. Pat Cox	Consultant to City of Ogden

Each of the stakeholders were consulted in the data collection and validation process required for the development of noise contours, NEM’s noise abatement measures, land use measures and the NCP. The following section will summarize the coordination conducted with each of the mentioned parties. Related materials and records of correspondence are included in Appendix B.

10.1.1 Data Collection and Validation for the Development of Noise Contours

MHK and its consultant HNTB kicked off the data collection process for the Part 150 with a meeting at the FAA offices in Kansas City. This meeting was attended by FAA personnel, MHK personnel and HNTB staff. The topics of discussion included the current Master Plan being prepared for MHK by HNTB, the schedule and data collection process for the Part 150 and in particular the noise analysis.

A data collection package was prepared by HNTB to assist the relevant stakeholders in providing the most accurate and up to date information required for the modeling of the noise environment at MHK. This package was discussed in detail with the MHK personnel, Air Traffic Control Tower (ATCT) staff, and the Fort Riley airfield manager. Upon collection of all the necessary data, HNTB consolidated this information into a final validation package and requested all stakeholders to validate the data prior to developing the noise contours. The package was transmitted and validated on February 6, 2008. This package applied to the development of 2009, 2014 and 2027 noise contours. The final data validation package is included in Appendix B.

10.1.2 Data Collection and Validation for the development of NEMs, Noise Abatement Measures, and Land Use Measures

The data collection related to the development of the NEM's, noise abatement measures and land use compatibility measures was completed in coordination with the Air Traffic Control Tower at MHK, City of Manhattan and Riley County. The proposed noise abatement measures were reviewed by the MHK Tower manager and approved on August 31, 2009. (See Appendix B).

Geographic Information Systems (GIS) facilitated a detailed analysis of land use compatibility and noise impact to communities near MHK. Land use GIS data and parcel information for the Manhattan Urban Area for this Study was updated in 2009. The GIS Website is maintained by the Riley County and City of Manhattan GIS departments. The land use data and city limits available at the beginning of this study were from 2003. Because of the large number of land use categories identified in the GIS land use data at that time (212), HNTB reclassified the land use codes into fourteen (14) general categories to be displayed and analyzed.² The planning departments were asked to review and confirm or correct the simplified reclassification of land use information in July of 2007. The City of Manhattan and Riley County also received requests to provide concurrence with land use on the base maps developed for this study in July of 2007 and again in 2009. The City of Manhattan Community Development Department requested several changes to the land use base maps in late 2008 during coordination regarding land use data. (See Appendix B).

Due to the timeframe between the initial Part 150 data collection and the submission of the draft Part 150 Study in 2009, verification requests were submitted again to the City of Manhattan Community Development Department and the Riley County Planning and Special Projects Department for approval in May of 2009. (See Appendix B).

The City of Manhattan, Riley County, and the City of Ogden were all contacted in the fall of 2008 or early 2009 to ensure that the most up-to-date planning documents were being consulted for the analysis of existing and potential land use measures. Through correspondence with the city planners and consultants to the jurisdictions, HNTB verified that they were using the most recent comprehensive plans, zoning ordinances, and other land use planning documents available for the analysis. The City of Manhattan was consulted regarding the draft Land Use Measures Chapter (Chapter 7) to confirm accuracy of information prior to the submission of the draft Part 150.

10.1.3 Joint Planning Board Meeting

A joint planning board meeting was held on August 24, 2009. The public was encouraged to attend the meeting via an ad placed in the *Manhattan Mercury* on August 19, 2009. This special meeting was called to allow the planning boards of the City of Manhattan and Riley County to hear a presentation of the preliminary land use measures considered and recommended by the Part 150 consultant. The PowerPoint presentation along with the meeting announcement and agenda are included in Appendix B, *Draft Part 150 Consultation*. After the presentation was

provided, the planning boards provided preliminary comments on the measures presented. The general consensus from those in attendance was that protecting public and the investment made by the City at MHK was the ultimate goal. To that end, the preliminary measures defined in the PowerPoint presentation have been modified to reflect the use of the 2027 60 DNL instead of the 2027 65 DNL for preventive measures. The meeting was a work session and therefore no formal motions could be entertained however informal guidance to the Part 150 consultant was provided.

10.2 PUBLIC HEARING

Note: Because the Study no longer constitutes an official FAA Part 150 Study, the opportunity to request a public hearing was not provided to the public and no public hearing was held.

NOTES

¹ Because the Airport Noise and Land Use Compatibility Study is not seeking official FAA Part 150 approval, meeting public consultation requirements in accordance with 14 CFR Part 150 Subpart B is no longer applicable.

² Riley County Community GIS Website, <http://gis.rileycountyks.gov/> (Last accessed March 2009).

Appendix A
NOISE EXPOSURE MAP & NOISE
COMPATIBILITY PROGRAM
CHECKLISTS

For Informational Purposes Only

NOISE EXPOSURE MAP CHECKLIST

Informational Purposes Only

MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
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I. Submitting And Identifying The NEM

A. Submission is properly identified:	Yes	
1. 14 C.F.R. Part 150 NEM?		
2. NEM and NCP together?	Yes	
3. Revision to NEMs FAA previously determined to be in compliance with Part 150?	No	
B. Airport and Airport Operator's name are identified?	Yes	Cover Page
C. NCP is transmitted by airport operator's dated cover letter, describing it as a Part 150 submittal and requesting appropriate FAA determination?	No	A dated cover letter will be provided with the Final DRAFT Part 150 Study.

II. Consultation: [150.21(b), A150.105(a)]

A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	Yes	Chapter 10
B. Identification of consulted parties:	Yes	Chapter 10, Section 10.1, Page 10-1
1. Are the consulted parties identified?	Yes	Same
2. Do they include all those required by 150.21(b) and A150.105(a)?	Yes	Chapter 10, Appendix B
3. Agencies in 2., above, correspond to those indicated on the NEM?		Chapter 10, Appendix B
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views, data, and comments during map development and in accordance with 150.21(b)?	NA	The certification will be included once the DRAFT Part 150 Study is approved.
D. Does the document indicate whether written comments were received during consultation and, if there were comments, that they are on file with the FAA regional airports division manager?	TBD	Chapter 10, Appendix B

III. General Requirements: [150.21]

A. Are there two maps, each clearly labeled on the face with year (existing condition year and one that is at least 5 years	Yes	Chapter 5, Figures 5-1 and 5-2
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MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
into the future)?		
B. Map currency:		
1. Does the year on the face of the existing condition map graphic match the year on the airport operator's NEM submittal letter?	No	Existing Condition of 2009 is representative of 2010, which is the year of submission.
2. Is the forecast year map based on reasonable forecasts and other planning assumptions and is it for at least the fifth calendar year after the year of submission?	Yes	Chapter 3, Page 3-3, FAA approved forecast from the MHK Master Plan. The Forecast Condition of 2014 is representative of 2015, which is 5 into the future from the year of submission.
3. If the answer to 1 and 2 above is no, the airport operator must verify in writing that data in the documentation are representative of existing condition and at least 5 years' forecast conditions as of the date of submission?		See cover letter included with the submission of the Draft Part 150
C. If the NEM and NCP are submitted together:		
1. Has the airport operator indicated whether the forecast year map is based on either forecast conditions without the program or forecast conditions if the program is implemented?	Yes	Chapter 5, Sections 5.1.4 and 5.1.5
2. If the forecast year map is based on program implementation:	Yes	
a. Are the specific program measures that are reflected on the map identified?	Yes	Chapter 6 Section 6.3.2 and 6.3.3
b. Does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	Yes	Chapter 6 Section 6.3.2 and 6.3.3
3. If the forecast year NEM does not model program implementation, the airport operator must either submit a revised forecast NEM showing program implementation conditions [B150.3(b), 150.35(f)] or the sponsor must demonstrate the adopted forecast year NEM with approved NCP measures would not change by plus/minus 1.5 DNL? (150.21(d))		Forecast year NEM does include an NEM with program implementation. See Chapter 5.

MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
IV. Map Scale, Graphics, And Data Requirements: [A150.101, A150.103, A150.105, 150.21(a)]		
A. Are the maps of sufficient scale to be clear and readable (they must not be less than 1" to 2,000'), and is the scale indicated on the maps?	Yes	Chapter 5, Figures 5-1 through 5-5
(Note (1) if the submittal uses separate graphics to depict flight tracks and/or noise monitoring sites, these must be of the same scale, because they are part of the documentation required for NEMs.)	NA	
(Note (2) supplemental graphics that are not required by the regulation do not need to be at the 1" to 2,000' scale)	NA	
B. Is the quality of the graphics such that required information is clear and readable? (Refer to C. through G., below, for specific graphic depictions that must be clear and readable)	Yes	Chapter 5, Figures 5-1 through 5-5
C. Depiction of the airport and its environs:		
1. Is the following graphically depicted to scale on both the existing condition and forecast year maps?	Yes	
a. Airport boundaries	Yes	Chapter 5, Figures 5-1 through 5-5
b. Runway configurations with runway end numbers	Yes	Chapter 5, Figures 5-1 through 5-5
2. Does the depiction of the off-airport data include?		
a. A land use base map depicting streets and other identifiable geographic features	Yes	Chapter 5, Figures 5-1 through 5-5
b. The area within the DNL 65 dB (or beyond, at local discretion)	Yes	Chapter 5, Figures 5-1 through 5-5. The 60 DNL contour is included for informational purposes and use in considering preventive land use measures.
c. Clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the DNL 65 dB (or beyond, at local discretion)	Yes	Chapter 5, Figures 5-1 through 5-5. Airport is located within the boundaries of Riley County.
D. 1. Continuous contours for at least the DNL 65, 70, and 75 dB?	Yes	Chapter 5, Figures 5-1 through 5-5
2. Has the local land use jurisdiction(s) adopted a lower local standard and if so, has the sponsor depicted this on	Yes	Chapter 5, Figure 5-3 and 5-5. The 60 DNL was included

MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
the NEMs?		in the 2027 Conditions for preventive land use planning purposes, corrective measures are based on the Federal standard.
3. Based on current airport and operational data for the existing condition year NEM, and forecast data representative of the selected year for the forecast NEM?	Yes	Chapters 3 and 5
E. Flight tracks for the existing condition and forecast year timeframes (these may be on supplemental graphics which must use the same land use base map and scale as the existing condition and forecast year NEM), which are numbered to correspond to accompanying narrative?	Yes	See Appendix B - Data Validation Package
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map and scale as the official NEMs)	NA	
G. Non-compatible land use identification:	NA	Currently there are not non-compatible land uses within the 2014 65 DNL contours.
1. Are non-compatible land uses within at least the DNL 65 dB noise contour depicted on the map graphics?	Yes	Chapter 5, Figures 5-4 and 5-5, on by 2027 are non-compatible land uses within the 65 DNL.
2. Are noise sensitive public buildings and historic properties identified? (Note: If none are within the depicted NEM noise contours, this should be stated in the accompanying narrative text.)	Yes	Chapter 5, Figures 5-1 through 5-5, there are no non-compatible land uses within the 2014 65 DNL contours, by the year 2027 there are non-compatible land uses within the 65 DNL.
3. Are the non-compatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?	Yes	Chapter 5, Figures 5-1 through 5-5
4. Are compatible land uses, which would normally be considered non-compatible, explained in the accompanying narrative?	NA	

V. Narrative Support Of Map Data: [150.21(a), A150.1, A150.101, A150.103]

MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
A. 1. Are the technical data and data sources on which the NEMs are based adequately described in the narrative?	Yes	Chapter 3, 5 and 6
2. Are the underlying technical data and planning assumptions reasonable?	Yes	Chapter 3, 5 and 6
B. Calculation of Noise Contours:		
1. Is the methodology indicated?	Yes	Chapter 3
a. Is it FAA approved?	Yes	Chapter 3, INM Version 7.0a
b. Was the same model used for both maps? (Note: The same model also must be used for NCP submittals associated with NEM determinations already issued by FAA where the NCP is submitted later, unless the airport sponsor submits a combined NEM/NCP submittal as a replacement, in which case the model used must be the most recent version at the time the update was started.)	Yes	
c. Has AEE approval been obtained for use of a model other than those that have previous blanket FAA approval?	NA	
2. Correct use of noise models:		
a. Does the documentation indicate, or is there evidence, the airport operator (or its consultant) has adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another that was not included on the FAA's pre-approved list of aircraft substitutions?	Yes	Chapter 3 and Appendix B
b. If so, does this have written approval from AEE, and is that written approval included in the submitted document?	Yes	Appendix B
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?	NA	
4. For noise contours below DNL 65 dB, does the supporting documentation include an explanation of local reasons? (Note: A narrative explanation, including evidence the local jurisdiction(s) have adopted a noise level less than DNL 65 dB as sensitive for the local community(ies), and including a table or other depiction of the differences from the Federal table, is highly desirable but not specifically required by the rule. However, if the airport sponsor submits NCP measures within the locally significant noise contour, an explanation must be included if it wants the FAA to consider the measure(s) for approval for purposes of eligibility for Federal aid.)	Yes	Preventive measures utilize the 2027 60 DNL contour, Chapter 7, pp. 7-20-7-29. For information on decision to utilize 2027 60 DNL contour for preventive measures, see Chapter 10, 10.1.3 (p.10-3).
C. Non-compatible Land Use Information:		

MHK Part 150 Study - Noise Exposure Map Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
1. Does the narrative (or map graphics) give estimates of the number of people residing in each of the contours (DNL 65, 70 and 75, at a minimum) for both the existing condition and forecast year maps?	Yes	Chapter 5, Pages 5-2 through 5-4
2. Does the documentation indicate whether the airport operator used Table 1 of Part 150?	Yes	Chapter 4, Page 4-2
a. If a local variation to table 1 was used:		
(1) Does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	NA	
(2) Does the narrative include the airport operator's complete substitution for table 1?	NA	
3. Does the narrative include information on self-generated or ambient noise where compatible or non-compatible land use identifications consider non-airport and non-aircraft noise sources?	NA	
4. Where normally non-compatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	NA	
5. Does the narrative describe how forecast aircraft operations, forecast airport layout changes, and forecast land use changes will affect land use compatibility in the future?	Yes	Chapter 7

VI. Map Certifications: [150.21(b), 150.21(e)]

A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	NA	To be included on the Certification Page upon formal submission of the Draft Part 150 study for FAA review.
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete under penalty of 18 U.S.C. § 1001?	NA	To be included on the Certification Page upon formal submission of the Draft Part 150 study for FAA review.

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Revised June 2005 to reflect legislative changes. Reviewed for currency 12/2007.

NOISE COMPATIBILITY PROGRAM CHECKLIST

Informational Purposes Only

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
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I. Submitting And Identifying The NCP

A. Submission is properly identified:		
1. 14 C.F.R. Part 150 NCP?	Yes	
2. NEM and NCP together?	Yes	
3. Program revision? (To what extent has it been revised?)	No	
B. Airport and Airport sponsor's name are identified?	Yes	Cover Page and Chapter 1
C. NCP is transmitted by airport sponsor's cover letter?		To be included upon formal submission to the FAA.

II. Consultation (including public participation): [150.23]

A. Documentation includes narrative of public participation and consultation process?	Yes	Chapter 10
B. Identification of consulted parties:	Yes	Chapter 10, Section 10.1, Appendix B
1. All parties in 150.23(c) consulted?	Yes	Chapter 10
2. Public and planning agencies identified?	Yes	Chapter 10
3. Agencies in 2., above, correspond to those affected by the NEM noise contours?	Yes	Chapter 10
C. Satisfies 150.23(d) requirements by:		
1. Documentation shows active and direct participation of parties in B., above?	Yes	Chapter 10 and Appendix B
2. Active and direct participation of general public and opportunity to submit their views, data, and comments on the formulation and adequacy of the NCP?		Chapter 10 and Appendix B
3. Participation was prior to and during development of NCP and prior to submittal to FAA?	Yes	Chapter 10 and Appendix B
4. Indicates adequate opportunity afforded to all consulted parties to submit views, data, etc.?	Yes	Chapter 10 and Appendix B
D. Evidence is included there was notice and opportunity for a public hearing on the final NCP?	TBD	Advertisement for request for public hearing will be provided upon formal submission of the Draft Part 150 Study. If requested, a hearing will be held and comments addressed prior to formal submission of NCP.

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
E. Documentation of comments:		
1. Includes summary of public hearing comments, if hearing was held?		This will be supplied if a public hearing is requested and held.
2. Includes copy of all written material submitted to operator?		This will be supplied if a public hearing is requested and held.
3. Includes operator's responses/disposition of written and verbal comments?		This will be supplied if a public hearing is requested and held.
F. Is there written evidence from the appropriate office within the FAA that the sponsor received informal agreement to carry out proposed flight procedures?	Yes	Appendix B

III. NOISE EXPOSURE MAPS: [150.23, B150.3; 150.35(f)] (This section of the checklist is not a substitute for the Noise Exposure Map checklist. It deals with maps in the context of the Noise Compatibility Program submission.)

A. Inclusion of NEMs and supporting documentation:		
1. Map documentation either included or incorporated by reference?	Yes	Chapter 5, Figures 5-1 through 5-5
2. Maps previously found in compliance by FAA?	NA	Formal review has not been initiated, NEM and NCP will be submitted at the same time.
3. FAA's compliance determination still valid?	NA	
(a) Existing condition NEM represents conditions at the airport at the time of submittal of the NCP for FAA approval?	Yes	Existing Condition of 2009 is representative of 2010, which is the year of submission.
(b) Forecast condition NEM represents conditions at the airport at least 5 years into the future from the date of submittal of the NCP to the FAA for approval?	Yes	The Forecast Condition of 2014 is representative of 2015, which is 5 years into the future from the year of submission.
(c) Sponsor letter confirming elements (a) and (b), above, if date of submission is either different than the year of submittal of the previously approved NEMs or over 12 months from the date shown on the face of the NEM?	Yes	See Letter of Certification

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
(d) If (a) through (c) cannot be validated, the NEMs must be redone and resubmitted as per 150.21.	NA	
4. Does 180-day period have to wait for map compliance finding?	Yes	
B. Revised NEMs submitted with program: (Review using NEM checklist if map revisions included in NCP submittal. Report the applicable findings in the spaces below after a full review using the NEM checklist and narrative.)	NA	
1. Revised NEMs included with program?	NA	
2. Has airport sponsor requested in writing that FAA make a determination on the NEM(s), showing NCP measures in place, when NCP approval is made?	NA	
C. If program analysis uses noise modeling:		
1. INM, HNM, or FAA-approved equivalent?	Yes	INM version 7.0a
2. Monitoring in accordance with A150.5?	NA	
D. One existing condition and one forecast-year map clearly identified as the official NEMs?	Yes	Chapter 5, Figures 5-1 and 5-2 until the NCP measures are approved at which point Figures 5-3 will be the official NEM. For planning purposes the Cities of Manhattan and Ogden and Riley County may chose to use Figure 5-5 as the official NEM for land use planning purposes.

IV. CONSIDERATION OF ALTERNATIVES: [B150.7, 150.23(e)(2)]

A. At a minimum, were the alternatives below considered, or if they were rejected was the reason for rejection reasonable and based on accurate technical information and local circumstances?		
1. Land acquisition and interests therein, including air rights, easements, and development rights?	Yes	Chapter 7, Pages7-15 through 7-31
2. Barriers, acoustical shielding, public building soundproofing	Yes	Chapter 6, Page 6-3 and Chapter 7, Page 7-18 through 7-20

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
3. Preferential runway system	Yes	Chapter 6, page 6-3
4. Voluntary flight procedures	Yes	Chapter 6, Noise Abatement Measures 1, 2 and 3, Pages 6-4 through 6-7
5. Restrictions described in B150.7 (taking into account Part 161 requirements)	Yes	Chapter 6, Table 6-1 and 6-6
6. Other actions with beneficial impact not listed in the regulation	No	
7. Other FAA recommendations (see D, below)	NA	
B. Responsible implementing authority identified for each considered alternative?	Yes	
C. Analysis of alternative measures:		
1. Measures clearly described? 2. Measures adequately analyzed? 3. Adequate reasoning for rejecting alternatives?	Yes	Chapters 6 and 7
D. Other actions recommended by the FAA: As the FAA staff person familiar with the local airport circumstances, determine whether other actions should be added? (List separately, or on back, actions and describe discussions with airport sponsor to have them included prior to the start of the 180-day cycle. New measures recommended by the airport sponsor must meet applicable public participation and consultation with officials before they can be submitted to the FAA for action. See E., below.)	NA	

V. ALTERNATIVES RECOMMENDED FOR IMPLEMENTATION: [150.23(e), B150.7(c); 150.35(b), B150.5]

A. Document clearly indicates:		
1. Alternatives that are recommended for implementation?	Yes	Chapter 6, Table 6-8 and Chapter 7, Table 7-12
2. Final recommendations are airport sponsor's, not those of consultant or third party?	Yes	
B. Do all program recommendations:		

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
1. Relate directly or indirectly to reduction of noise and non-compatible land uses? (Note: All program recommendations, regardless of whether previously approved by the FAA in an earlier Part 150 study, must demonstrate a noise benefit if the airport sponsor wants FAA to consider the measure for approval in a program update. See E., below.)	Yes	Chapters 6 and 7
2. Contain description of each measure’s relative contribution to overall effectiveness of program?	Yes	Chapters 6 and 7
3. Noise/land use benefits quantified to extent possible to be quantified? (Note: some program management measures cannot be readily quantified and should be described in other terms to show their implementation contributes to overall effectiveness of the program.)	Yes	Chapters 6 and 7
4. Does each alternative include actual/anticipated effect on reducing noise exposure within non-compatible area shown on NEM?	Yes	Chapters 6 and 7
5. Effects based on relevant and reasonable expressed assumptions?	Yes	Chapters 6 and 7
6. Does the document have adequate supporting data that the measure contributes to noise/land use compatibility?	Yes	Chapters 6 and 7
C. Analysis appears to support program standards set forth in 150.35(b) and B150.5?	Yes	
D. When use restrictions are recommended for approval by the FAA:		
1. Does (or could) the restriction affect Stage 2 or Stage 3 aircraft operations (regardless of whether they presently operate at the airport)? (If the restriction affects Stage 2 helicopters, Part 161 also applies.)	NA	Chapter 6, all restrictive actions were considered to be voluntary measures.
2. If the answer to D.1 is yes, has the airport sponsor completed the Part 161 process and received FAA Part 161 approval for a restriction affecting Stage 3 aircraft? Is the FAA’s approval documented? For restrictions affecting only Stage 2 aircraft, has the airport sponsor successfully completed the Stage 2 analysis and consultation process required by Part 161 and met the regulatory requirements, and is there evidenced by letter from FAA stating this fact?	NA	

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
3. Are non-restrictive alternatives with potentially significant noise/compatible land use benefits thoroughly analyzed so that appropriate comparisons and conclusions among all alternatives can be made?	NA	
4. Did the FAA regional or ADO reviewer coordinate the use restriction with APP-400 prior to making determination on start of 180-days?	NA	
E. Do the following also meet Part 150 analytical standards?		
1. Recommendations that continue existing practices and that are submitted for FAA re-approval? (Note: An airport sponsor does not have to request FAA re-approval if noise compatibility measures are in place from previously approved Part 150 studies. If the airport has implemented the measures as approved in the previous NCP, the measures may be reported and modeled as baseline conditions at the airport.)	NA	
2. New recommendations or changes proposed at the end of the Part 150 process?	No	This is MHK's first Part 150 Study..
F. Documentation indicates how recommendations may change previously adopted noise compatibility plans, programs, or measures?	No	This is MHK's first Part 150. Study.
G. Documentation also:		
1. Identifies agencies that are responsible for implementing each recommendation?	Yes	Chapters 6 and 7
2. Indicates whether those agencies have agreed to implement?	Yes	Work Session with local planning boards on 8/24/09 indicates that there is agreement to implement.
3. Indicates essential government actions necessary to implement recommendations?	Yes	Chapters 6 and 7
H. Timeframe:		
1. Includes agreed-upon schedule to implement alternatives?	NA	Implementation timeframe will be determined by local planning staffs land use measures and FAA for noise abatement measures.

MHK Part 150 Study - Noise Compatibility Program Checklist

PROGRAM REQUIREMENT	Yes/No	SUPPORTING PAGES/REVIEW COMMENTS
2. Indicates period covered by the program?	Yes	Chapter 8, Continuing Program Measures.
I. Funding/Costs:		
1. Includes costs to implement alternatives?	Yes	Typically, costs are associated with Planning Staff for City of Manhattan, Riley County, and City of Ogden. Noise abatement measures are procedural and would require FAA air traffic and charting staff. No direct costs are necessary.
2. Includes anticipated funding sources?	Yes	Local municipalities and FAA staff for procedural changes.
VI. PROGRAM REVISION: [150.23(e)(9)] Supporting documentation includes provision for revision? (Note: Revision should occur when it is likely a change has taken place at the airport that will cause a significant increase or decrease in the DNL noise contour of 1.5 dB or greater over non-compatible land uses. See §150.21(d))	NA	

Issued in Washington, D.C. -- APP-600, March 1989

Updated 2/2008

Appendix B

DRAFT PART 150 CONSULTATION

For Informational Purposes Only

Data Validation Package

Approval of Noise Abatement Measures

Land Use Verification

Joint Planning Board Meeting

DATA VALIDATION PACKAGE

February 2008

Informational Purposes Only

Final Data Validation Package for Existing Conditions Part 150 Airport Noise Compatibility Study



*Prepared by
Chrishanth Fernando
Caroline Ellis*

*HNTB Corporation
2900 S. Quincy Street
Suite 200
Arlington, VA 22206*



Noise Study Data for Manhattan Regional Airport

Introduction

The purpose of this data package is to collect the required data for the development of noise contours for Manhattan Regional Airport. These contours will be part of the Part 150.

The analysis will include an Existing Condition, which will be based on the operations of 2008 and Future Conditions for the year 2013. **The airfield configuration along with the flight track and runway use are not expected to change for the future condition.**

The following are the sections/tabs included in this package for your validation.

Airfield Information - Includes information about aspects of the airfield that will be used to design flight tracks and the runway/helipad configuration at MHK.

Flight Tracks - These flight tracks and representative ground tracks for operations conducted at the airport. They are presented by operation type (Arrival, Departure and Touch & Go) and by aircraft type (Jet, Propeller, Helicopter, Military Jet, Turbo Prop, and Passenger Jet).

Runway Use - The use of the runways at MHK by the different operators, based on weather conditions, safety and other criteria that affect the operational environment at the airport.

The average temperature, pressure and headwind will be used for modeling purposes. This will be calculated using historical data.

This data was collected through multiple sources and they are as follows:

1. Airfield Info was collected through the ALP, AFD and www.airnav.com
2. Flight track information was collected through interviews with ATC, Instrument Approach Procedures available and previous HNTB study/analysis
3. Runway Use and Aircraft operations information was collected through interviews with ATC and the Chapter 3 Forecast of Aviation Demand for MHK and previous HNTB study/analysis

This data has been reviewed by all parties concerned and has been validated. If you have any questions, please do not hesitate to contact Chris Fernando at 703-253-5929 or via email at cfernando@hntb.com.

Thank you for your assistance and cooperation.



**Manhattan Regional Airport (MHK)
Runways and Proposed Helipad Placement**



Source: Google Earth and HNTB, 2008.

Airfield Information

Data requested herein forms the geographic basis on which noise modeling is based. Geographic information must be accurate because it directly affects the locational accuracy of the computed noise contours.

Please review and correct the data below as required.

Airfield Name	Manhattan Regional Airport
FAA Identifier	MHK
Tower Operation (Local Times):	7:00 AM to 9:00 PM (CST)
Station Elevation:	1,057 Feet
Magnetic Declination (DATE):	5° 8' (annual change of 6 minutes W) (2005)

NAVAID	Type	Latitude - Decimal Degrees (WGS 84)	Longitude - Decimal Degrees (WGS 84)
FORT RILEY (FRI)	VOR	38.9701667°N	96.8610000°W
CAVALRY (CVY)	NDB	39.0260000°N	96.7945000°W
CLAY CENTER (CYW)	NDB	39.3807458°N	97.1612444°W
MCDOWELL CREEK (MQD)	NDB	39.1174419°N	96.6293372°W
MANHATTAN (MHK)	VOR/DME	39.1454411°N	96.6687231°W
RWY 03 ILS (I-MHK)	LOC	39.148508°N	96.661992°W
HERINGTON (HRU)	NDB	38.6927847°N	96.8111214°W

Runway/ Pad*	Elevation (Feet MSL)	Traffic Pattern	Latitude - Decimal Degrees (WGS 84)	Longitude - Decimal Degrees (WGS 84)	Length (Feet)	Width (Feet)	Displaced Threshold (Feet)	Glide Slope (degree)
Runway 03	1,054	Right	39.132396°N	96.679300°W	7,000	150	None	3.0
Runway 21	1,042	Left	39.147141°N	96.663472°W	7,000	150	None	3.0
Runway 13	1,057	Left	39.147298°N	96.673918°W	3,800	100	None	3.5
Runway 31	1,044	Right	39.139052°N	96.665707°W	3,800	100	None	3.0
Pad 1	1,054	Right	39.136039°N	96.675211°W	150	150	None	
Pad 2	1,054	Right	39.139239°N	96.671908°W	150	150	None	
Pad 3	1,043	Left	39.142678°N	96.668219°W	150	150	None	
Pad 4	1,057	Left	39.144469°N	96.671067°W	150	150	None	
Pad 5	1,057	Right	39.141208°N	96.667864°W	150	150	None	

Notes:

*Helipad placement is approximate, based on ATC interview.

VOR = Very high frequency omni-directional range

DME = Distance measuring equipment

NDB = Non-directional beacon

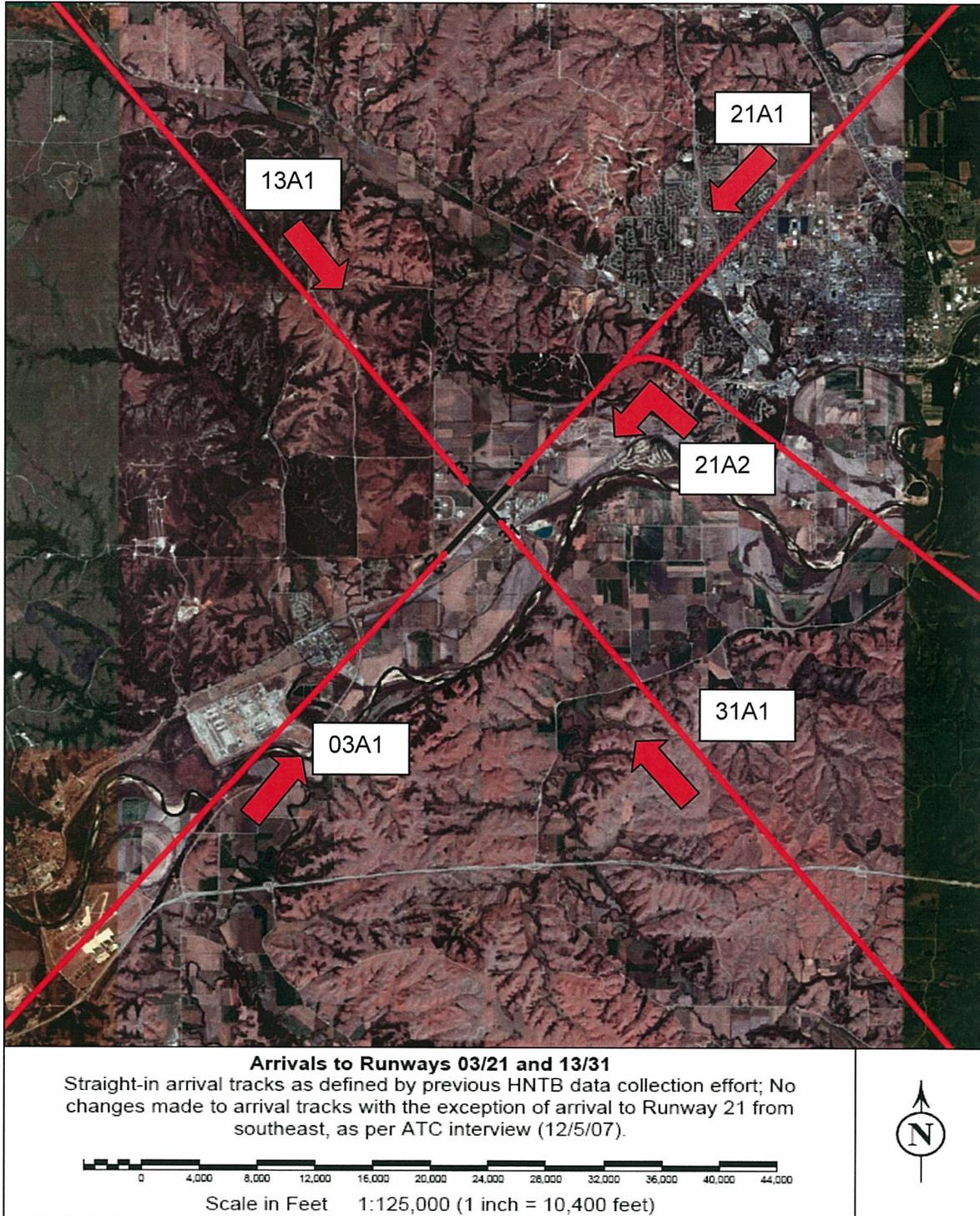


Sensitive Receptors

Please list any known sensitive receptors at and around the airfield. These can include, hospitals, churches, schools, communities etc. Please provide either the latitude/longitude or the street address.

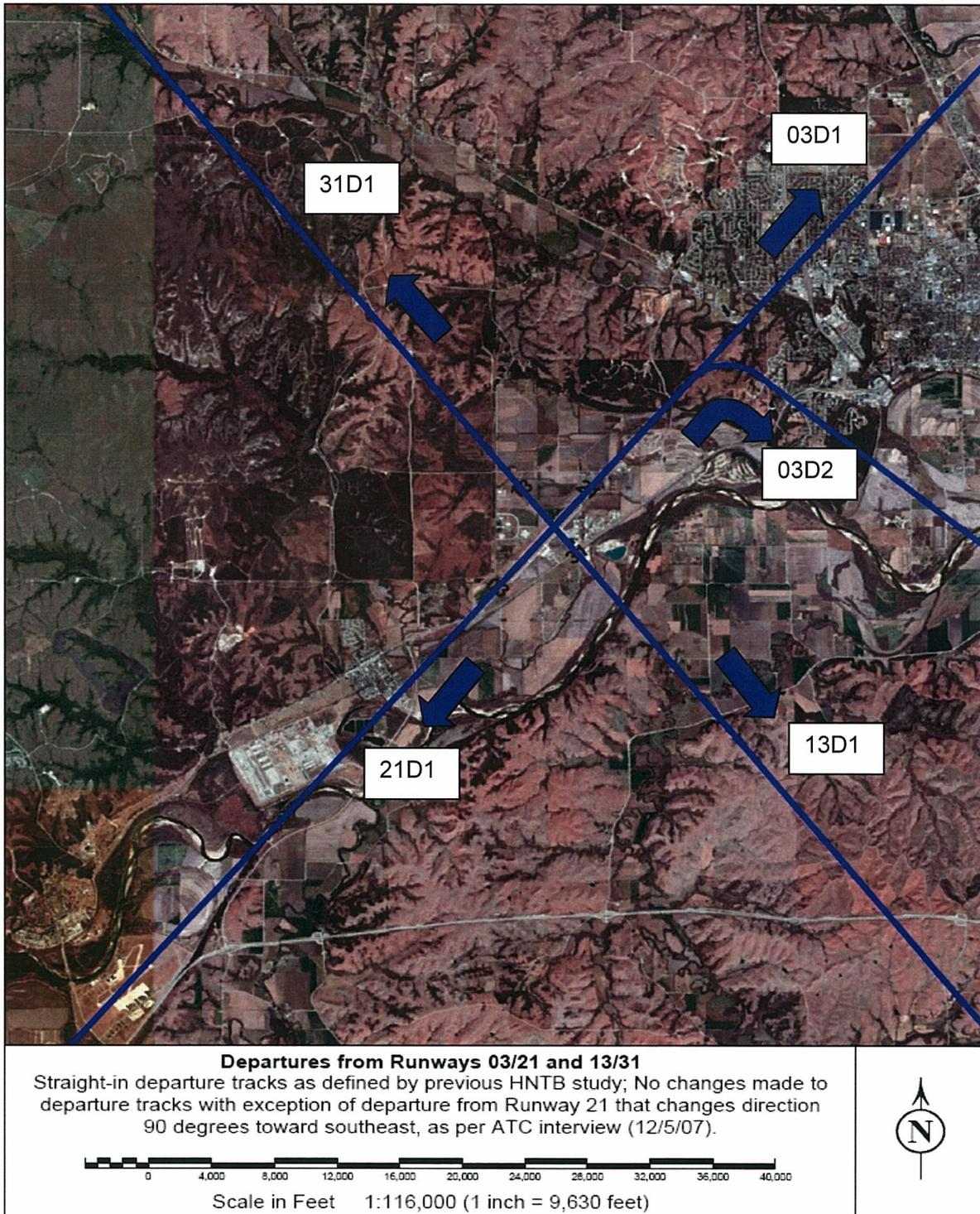
Location ID	Latitude (WGS 84)	Longitude (WGS 84)	Street Address
NONE SPECIFIED			





Source: HNTB, 2007

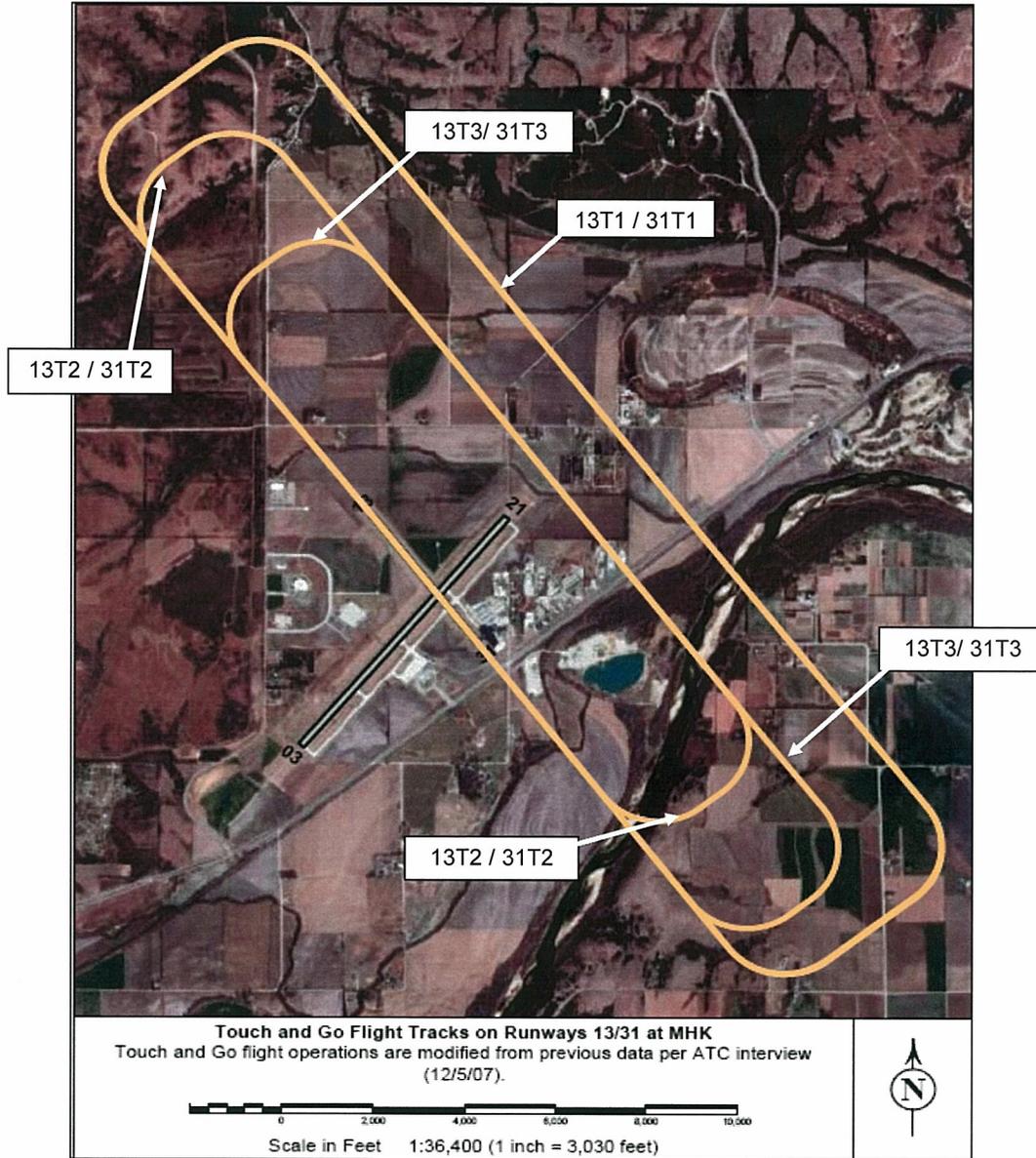




Source: HNTB, 2007.



Touch and Go Flight Tracks - Runway 13/31

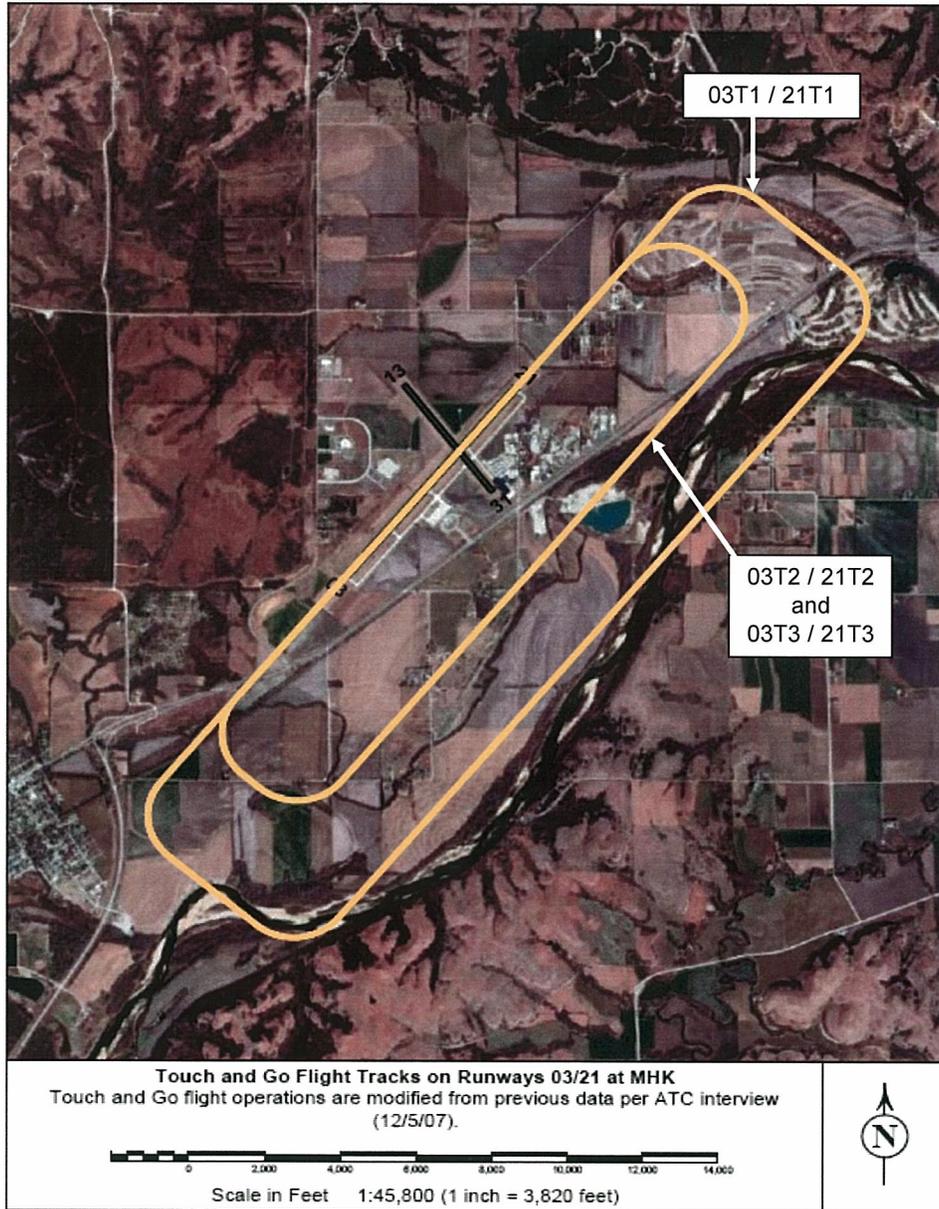


Source: HNTB, 2007.

There are three (3) Touch-and-Go flight tracks for Runway 13/31. Flight tracks T2 and T3 are the same size and overlap, as shown. The flight tracks correspond with the following aircraft:

- | | |
|-------------|-----------------------------------|
| 13T1 / 31T1 | General Aviation Jets, Turboprops |
| 13T2 / 31T2 | General Aviation Propellor |
| 13T3 / 31T3 | Helicopter (HELO) |

Touch and Go Flight Tracks - Runway 03/21



Source: HNTB, 2007.

There are three (3) Touch-and-Go flight tracks for Runway 03/21. Flight tracks T2 and T3 are the same size and overlap completely, as shown. The flight tracks correspond with the following aircraft:

- | | |
|-------------|-----------------------------------|
| 03T1 / 21T1 | General Aviation Jets, Turboprops |
| 03T2 / 21T2 | General Aviation Propellor |
| 03T3 / 21T3 | Helicopter (HELO) |



Existing Runway and Track Use at MHK

The runway and flight track usage at MHK is shown in the table below. Please note that the percent use of each runway is based on flow of traffic. Runway and Helpad usage identifies the frequency with which each aircraft type uses each of the runways/helpads.

As an example, 40% of General Aviation (GA) jet aircraft arrivals occur on Runway 03, 60% occur on Runway 21, and 0% of GA jet arrivals occur on Runways 13 and 31. Forty percent (40%) of GA jet aircraft depart from Runway 03, 60% depart from Runway 21, and 0% of GA jet aircraft depart from Runways 13 and 31. Where runways have multiple flight tracks, the percent of operations that each track is used is also displayed. For example, 50% of GA jet aircraft arriving into Runway 21 use flight track identifier (Track ID) 21A1, and 50% of GA jet aircraft arriving into Runway 21 use Track ID 21A2. For an illustration of flight tracks and Track ID's, see pages 5-8.

AIRCRAFT	OPS TYPE	Runway/Pad Utilization		Tracks Utilization Percentage		
		ID	Percent Use	Track ID	Description	Percent Use
General Aviation Jet Aircraft	Arrival	03	40%	03A1		100%
		13	--	13A1		--
		21	60%	21A1		50%
		21	60%	21A2		50%
	Departure	31	--	31A1		--
		03	40%	03D1		50%
		03	40%	03D2		50%
		13	--	13D1		--
	Touch&Go	21	60%	21D1		100%
		31	--	31D1		--
		03	40%	03T1		100%
		13	--	13T1		--
General Aviation Propeller	Arrival	21	60%	21T1		100%
		31	--	31T1		--
		03	36%	03A1		100%
		13	5%	13A1		100%
	Departure	21	56%	21A1		50%
		21	56%	21A2		50%
		31	3%	31A1		100%
		03	36%	03D1		50%
	Touch&Go	03	36%	03D2		50%
		13	5%	13D1		100%
		21	56%	21D1		100%
		31	3%	31D1		100%
Helicopter	Arrival	03	36%	03T2		100%
		13	5%	13T2		100%
		21	56%	21T2		100%
		31	3%	31T2		100%
		PAD1	18%	03A1		50%
	Departure	PAD2	18%	03A2		50%
		PAD3	5%	21A1		100%
		PAD4	56%	13A1		100%
		PAD5	3%	31A1		100%
		PAD1	36%	03D1		100%
	Touch&Go/Auto Rotation	PAD2	--	03D2		--
		PAD3	5%	21D1		100%
PAD4		56%	13D1		100%	
PAD5		3%	31D1		100%	
PAD1		--	03T3		--	
	PAD2	--	03T3		--	
	PAD3	--	21T3		--	
	PAD4	--	13T3		--	
	PAD5	--	31T3		--	

Source: HNTB, 2007.



Existing Runway and Track Use at MHK (continued)

The runway and flight track usage at MHK is shown in the table below. Please note that the percent use of each runway is based on flow of traffic. Runway and Helipad usage identifies the frequency with which each aircraft type uses each of the runways/helipads.

As an example, 40% of Passenger Jet arrivals occur on Runway 03, 60% occur on Runway 21, and 0% of arrivals occur on Runway 13 and 31. Forty percent (40%) of Passenger Jets depart from Runway 03, 60% depart from Runway 21, and 0% of Passenger Jets depart from Runways 13 and 31. Where runways have multiple flight tracks, the percent of operations that each track is used is also displayed. For example, 50% of Passenger Jets arriving into Runway 21 use flight track identifier (Track ID) 21A1, and 50% of Passenger Jets arriving into Runway 21 use Track ID 21A2. For an illustration of flight tracks and Track ID's, see pages 5-8.

AIRCRAFT	OPS TYPE	Runway Utilization		Tracks Utilization Percentage		
		ID	Percent Use	Track ID	Description	Percent Use
Military	Arrival	03	40%	03A1		100%
		13	--	13A1		--
		21	60%	21A1		50%
		21	60%	21A2		50%
		31	--	31A1		--
	Departure	03	40%	03D1		50%
		03	40%	03D2		50%
		13	--	13D1		--
		21	60%	21D1		100%
		31	--	31D1		--
	Touch&Go*	03	--	03T1		--
		13	--	13T1		--
21		--	21T1		--	
31		--	31T1		--	
Passenger Jet	Arrival	03	40%	03A1		100%
		13	--	13A1		--
		21	60%	21A1		50%
		21	60%	21A2		50%
		31	--	31A1		--
	Departure	03	40%	03D1		50%
		03	40%	03D2		50%
		13	--	13D1		--
		21	60%	21D1		100%
		31	--	31D1		--
	Touch&Go*	03	38%	03T1		100%
		13	--	13T1		--
21		62%	21T1		100%	
31		--	31T1		--	
Turbo Prop Aircraft	Arrival	03	40%	03A1		100%
		13	--	13A1		--
		21	60%	21A1		50%
		21	60%	21A2		50%
		31	--	31A1		--
	Departure	03	40%	03D1		50%
		03	40%	03D2		50%
		13	--	13D1		--
		21	60%	21D1		100%
		31	--	31D1		--
	Touch&Go	03	40%	03T1		100%
		13	--	13T1		--
21		60%	21T1		100%	
31		--	31T1		--	

Source: HNTB, 2007.

*Note: Military Jets and Passenger Jets do not typically use Touch-and-Go flight tracks/patterns. The fleet mix used shows Passenger Jets with Touch-and-Go's.



APPROVAL OF NOISE ABATEMENT MEASURES

2008 through 2009

Informational Purposes Only

Subject: FW: Fw: MHK EA - INM substitution

-----Original Message-----

From: jon.pietrak@faa.gov [mailto:jon.pietrak@faa.gov]
Sent: Wednesday, June 14, 2006 10:43 AM
To: Barbara Kulvelis
Cc: sandy.liu@faa.gov; Kim Hughes
Subject: Re: Fw: MHK EA - INM substitution

The recommended INM "profile" substitution for the T-45 is the T-38A based on "thrust to weight" ratio.

Regards,

Jon F. Pietrak
Office of Environment and Energy
Noise Division, AEE-100
(202) 267-3493
jon.pietrak@faa.gov

Sandy Liu/AWA/FAA
AEE-100, Noise
Division

06/13/2006 12:01
PM

Jon Pietrak/AWA/FAA@FAA To
Joseph DiPardo/AWA/FAA@FAA cc
Fw: MHK EA - INM substitution Subject

Jon,
Can you offer and/or approve a sufficient substitution for their request? If needed, consult with Eric at VOLPE. Thanks!

- Sandy

----- Forwarded by Sandy Liu/AWA/FAA on 06/13/2006 11:59 AM -----

"Barbara

Kulvelis"
<BKulvelis@HNTB.com>
om> To
Sandy Liu/AWA/FAA@FAA
cc
06/09/2006 09:45 AM "Kim Hughes" <KHUGHES@HNTB.com>
Subject
MHK EA - INM substitution

Mr. Liu,
HNTB Corporation is working with the City of Manhattan, Kansas, on an environmental assessment for runway improvements at Manhattan Regional Airport (MHK).

For each year of analysis, approximately 0.05 average daily operations of transient T-45 Goshawk navy trainers are forecast to use MHK. Note that the T45 operations are forecast both with and without the proposed project.

While the HAWK aircraft type in INM is the closest substitution (as the T45 is a derivative of the HAWK), the HAWK does not have profile data. Since this is a transient operation and a low number of operations are forecast, it is not practical to obtain profile data from the operator. We are coordinating with AEE-100 per the requirements of FAA Order 1050.1E to identify an appropriate substitution. Based upon general operating weights/size, number of engines, and operating characteristics, the A4C seems to be an appropriate substitution for the T45 . However, if AEE-100 has identified another aircraft type in INM that would be a better substitution, please let me know.

In order to maintain the schedule for this project, we would appreciate your response via email by June 23, 2006. Thanks for your help!

Please let me know if you have any questions .

Regards,

Barbara A. Kulvelis
Senior Environmental Aviation Planner

HNTB Corporation
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Arlington, VA 22201

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Fax (703) 671-6210
www.hntb.com

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From: Hua.He@faa.gov
To: Chrisanth.Fernando
Subject: Re: MHK - Part 150 INM Substitution
Date: Tuesday, February 19, 2008 11:14:14 AM

Chris,

I am fine with your substitution proposal for this study.

Bill

Hua (Bill) He, Ph.D.
Office of Environment and Energy (AEE)
Federal Aviation Administration
800 Independence Ave., SW, Room 900W
Washington, D.C. 20591 USA
(202) 267-3565 office
(202) 267-5594 fax
hua.he@faa.gov

"Chrisanth Fernando" <cfernando@HNTB.com>

02/08/2008 04:02 PM

To Hua He/AWA/FAA@FAA

cc

Subject MHK - Part 150 INM Substitution

Bill,

We met at the AEDT DRG meeting a few weeks ago and I am hoping you can help me out with an INM substitution.

HNTB is working with the City of Manhattan, Kansas, on a Part 150 study at Manhattan Regional Airport. The base year of 2008 and the future year 2013, include the AH-64 Apache helicopter that requires an appropriate INM substitution. Based on the engine characteristics and size of the helicopter, it seems that the S-70 (UH-60) would be an appropriate substitution. However, if there is another helicopter that would be a better substitution, please let me know.

Let me know if you have any questions.

Kind Regards,

Chris

Chrisanth Fernando

Aviation Environmental Planner

HNTB Corporation

2900 S. Quincy Street

Suite 200

Arlington, VA 22206

Tel: (703) 824-5100

Direct: (703) 253-5929

Fax: (703) 671-6210

Email: cfernando@hntb.com

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From: [Manhattan Tower](#)
To: [Chrishanth Fernando](#);
Subject: RE: Part 150 Study - Noise Abatement Measures - Email 1
Date: Monday, August 31, 2009 11:49:49 AM

Chris:

I reviewed the Part 150 Study and it looks fine to me. I don't see anything that will cause any problems from an air traffic point of view.

Don Williams
ATM, MHK

From: Chrishanth Fernando [mailto:cfernando@HNTB.com]
Sent: Wednesday, August 26, 2009 3:36 PM
To: 'mhk@midwestatc.com'
Cc: 'Peter VanKuren'; Kim Hughes
Subject: Part 150 Study - Noise Abatement Measures - Email 1

Don,

As part of the Part 150 Study that is currently being conducted by the Airport, HNTB has proposed the implementation of a number of Noise Abatement Measures to minimize the noise impacts to the communities surrounding the Airport. Currently the Study is in the draft stage and before the Airport submits the Draft Part 150 Study to the FAA for review, we would like you to review and comment on the proposed abatement measures.

The FAA would like to receive the Draft Part 150 prior to the Labor Day weekend. Therefore, I would greatly appreciate it, if you could send me your comments at your earliest convenience.

The chapter containing the proposed abatement measures is attached to this email along with the associated figures. Since the figures are 5MB each, they will be transmitted in two emails. Please feel free to contact me with any questions.

Kind regards,

Chris

Chrishanth Fernando
Aviation Environmental Planner

HNTB Corporation
2900 S. Quincy Street

Suite 200
Arlington, VA 22206

Tel: (703) 824-5100

Direct: (703) 253-5929

Fax: (703) 671-6210

Email: cfernando@hntb.com

www.hntb.com

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RECORD OF TELEPHONE CALL



Job #	<u>37889 (MHK Part 150)</u>	Date	<u>February 2, 2009</u>
Call From	<u>Chrisanth Fernando</u>	Of	<u>HNTB</u>
Call To	<u>Troy Mattingly</u>	Of	<u>Fort Riley</u>
By	_____		

Subject Discussed

Action Taken

Helicopter Operations from Fort Riley to MHK and possible noise abatement measures

Left two messages on January 30, 2009

Topics of discussion were how to best come up with noise abatement measures for helicopter operation originating from Fort Riley Airfield.

Types of operations being conducted:

1. Pattern work – approximately 700-800 feet AGL
2. Instrument approaches – OM is on Fort Riley airfield, which is 6.7 miles form MHK.

Residential units being built in southeast (Ogden).

Based on current ops, the helo's will be approx. 1000 feet AGL above the units.

Cruise speed is approx. 120 knots, which is the same speed flown in the traffic patter, unless instructed otherwise by ATC. Normal cruise speed is 155/160 knots.

LAND USE VERIFICATION

July 2007 through May 2009

Informational Purposes Only

The following is a list of the land use categories and code consolidation used for mapping of land uses in the vicinity of Manhattan Regional Airport using Geographic Information Systems (GIS):

Agriculture = 811, 812

Church = 670, 671, 673

Commercial = 170, 171, 511, 512, 513, 514, 515, 516, 518, 521, 522, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 544, 551, 552, 553, 556, 581, 582, 583, 584, 585, 611, 612, 613, 624, 631, 632, 635, 636, 638, 639, 640, 643, 644, 645, 649

Communication = 471, 473, 474, 476

Cultural/Entertainment/Recreational = 708, 709, 710, 711, 712, 714, 715, 721, 725, 728, 732, 733, 735, 736, 738, 799

Government/Public/Institutional = 651, 652, 653, 654, 656, 657, 658, 659, 660, 680, 682, 683, 699

Industrial = 211, 243, 259, 271, 272, 274, 282, 292, 323, 326, 327, 333, 341, 399, 915

Residential = 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 199

School = 661, 662, 663, 664, 665, 667, 668

Transportation = 411, 422, 424, 431, 460, 650

Unknown = Any Blank Record, 000, 499, 999

Utility = 481, 482, 483, 484, 485, 486

Vacant Residential = 100

Vacant = 200, 400, 500, 650, 700, 800

July 31, 2007

Ms. Karen Davis, AICP
Director of Community Development
City of Manhattan
1101 Poyntz Avenue
Manhattan, Kansas 66502

Dear Ms. Davis,

HNTB Corporation is conducting a 14 Code of Federal Regulations (CFR) PART 150 Noise Compatibility Study for the Manhattan Regional Airport (MHK). The general purpose of a 14 CFR Part 150 Study is to recommend a program of airport operations and land use controls that will help to reduce aircraft noise and prevent future development which would be incompatible with airport noise.

In order for HNTB Corporation to adequately evaluate demographic and land use impacts, as mandated by the 14 CFR Part 150 Study process, we have collected existing land use in Geographic Information System (GIS) format from The Riley County Community GIS Website. As you are likely aware, the data is available via the internet through a collaboration involving Riley County, The City of Manhattan, Community Online Resource Exchange (CORE), and Project Impact. The land use designations in the parcel database are extremely detailed, with a total of 212 separate land use categories. For the purpose of simplification, I have re-classified the land use codes into fourteen general categories to be displayed and analyzed. In this transmittal, I have attached a graphic which illustrates the re-classification of land use in the area around the airport.

We are requesting that the Planning Division at the City of Manhattan review the attached land use re-classification to determine if the changes are accurate and satisfactory by the city's standards. Any comments or information that is provided will be corrected, and they will directly affect the overall quality and accuracy of the 14 CFR Part 150 Study.

I look forward to working with you or your designated representative in this matter. If you have any questions or require any additional information, please do not hesitate to contact me.

Thank you for your cooperation in expediting this request.

Sincerely,

Bryan Bielinski
GIS Analyst
HNTB Corporation

July 31, 2007

Mr. Monty Wedel
Director of Planning
Riley County
110 Courthouse Plaza
Manhattan, Kansas 66502

Dear Mr. Wedel,

HNTB Corporation is conducting a 14 Code of Federal Regulations (CFR) PART 150 Noise Compatibility Study for the Manhattan Regional Airport (MHK). The general purpose of a 14 CFR Part 150 Study is to recommend a program of airport operations and land use controls that will help to reduce aircraft noise and prevent future development which would be incompatible with airport noise.

In order for HNTB Corporation to adequately evaluate demographic and land use impacts, as mandated by the 14 CFR Part 150 Study process, we have collected existing land use in Geographic Information System (GIS) format from The Riley County Community GIS Website. As you are likely aware, the data is available via the internet through a collaboration involving Riley County, The City of Manhattan, Community Online Resource Exchange (CORE), and Project Impact. The land use designations in the parcel database are extremely detailed, with a total of 212 separate land use categories. For the purpose of simplification, I have re-classified the land use codes into fourteen general categories to be displayed and analyzed. In this transmittal, I have attached a graphic which illustrates the re-classification of land use in the area around the airport.

We are requesting that the Planning and Development Department at Riley County review the attached land use re-classification to determine if the changes are accurate and satisfactory by the county's standards. Any comments or information that is provided will be corrected, and they will directly affect the overall quality and accuracy of the 14 CFR Part 150 Study.

I look forward to working with you or your designated representative in this matter. If you have any questions or require any additional information, please do not hesitate to contact me.

Thank you for your cooperation in expediting this request.

Sincerely,

Bryan Bielinski
GIS Analyst
HNTB Corporation

RECORD OF TELEPHONE CALL



Job # 37889 (MHK Part 150)
Call From Caroline Ellis
Call To Vincent Cramer, City Clerk
By _____

Date June 23, 2008 (4:30 PM EST)
Of HNTB
Of City of Ogden

Subject Discussed

MHK Part 150 and land use plans or zoning in the City of Ogden.

Existing and Future Land Use Maps, Zoning Ordinance, and Comprehensive Plan are all very outdated. The Comprehensive Plan is from around 1993. There are plans to update it later this year. There are no official city maps that include the recent expansions/annexations.

BG Consultants are currently working on a Zoning Ordinance Update and current zoning map. He said to give them a call if we'd like to.

Call Pat Cox or Thaniel Monaco at BG Consultants.

Action Taken

Called BG Consultants.

RECORD OF TELEPHONE CALL



Job # 37889 (MHK Part 150)
Call From Caroline Ellis
Call To Pat Cox
By _____

Date June 23, 2008 (5:00 PM EST)
Of HNTB
Of BG Consultants

Subject Discussed

MHK Part 150 and land use plans or zoning in the City of Ogden.

BG Consultants are currently working on a Zoning Ordinance Update and current zoning map. I was referred to them by the Ogden City Clerk (Vincent Cramer).

According to Mr. Cox, the zoning ordinance and map update is still in the beginning stages and there is nothing to show or share yet. He says that the map was previously hand-drawn and they're putting it into AutoCAD. He says the northern part of the city where the noise contour touches is very rural and largely undeveloped. He has heard of someone that wants to put in a strip of storage units, but there is no application for it yet. (This would be commercial anyhow, and would not affect compatible land use).

Action Taken

RECORD OF TELEPHONE CALL



Job # 37889 (MHK Part 150)
Call From Caroline Ellis
Call To Eric Cattell, Asst. Director of Planning
By _____

Date Nov 12, 2008 (11:30 AM EST)
Of HNTB
Of City of Manhattan Planning Dept.

Subject Discussed

MHK Part 150.

Called to check to see if there were any updates to Existing or Future Land Use Maps that HNTB should be aware of in developing Part 150 land use analysis. Mr. Cattell suggested that we request the most recent land use and zoning GIS data from the GIS coordinator at Manhattan.

May need to speak with Dan Oldehoeft (Public Works)

There are no updates to the Future Land Use Map in the 2003 Manhattan Urban Area Comprehensive Plan, and that should still be used as a reference for the Part 150 analysis.

Mr. Cattell also mentioned that he had some concern over the 60 DNL contours in 2027 going over the Miller Parkway Corridor Area.

Action Taken

Ms. Karen Davis, AICP
Director of Community Development
City of Manhattan
1101 Poyntz Avenue
Manhattan, Kansas 66502

May 1, 2009

Dear Ms. Davis,

HNTB Corporation is assisting the City of Manhattan in conducting a 14 Code of Federal Regulations (CFR) PART 150 Noise Compatibility Study for the Manhattan Regional Airport (MHK). The general purpose of a 14 CFR Part 150 Study is to recommend a program of airport operations and land use controls that will help to reduce aircraft noise and prevent future development which would be incompatible with airport noise.

In order for HNTB Corporation to adequately evaluate demographic and land use impacts, as mandated by the 14 CFR Part 150 Study process, we have collected Geographic Information System (GIS) data for land use, parcels, and the city boundaries through the Riley County Community GIS Website. The data is available via the Internet through a collaboration involving Riley County, the City of Manhattan, Community Online Resource Exchange (CORE), and Project Impact.

HNTB Corporation previously submitted a request for verification of land use when the project began in June of 2007. However, given the timeframe of the project, we have updated the land use used in 2007 to the latest available 2009 GIS information. The land use designations in the parcel database are extremely detailed, with a total of 212 separate land use categories. For the purpose of simplification, the land use codes have been re-classified into fourteen general categories to be displayed and analyzed. This is the same re-classification that was used and verified by the City of Manhattan and Riley County in 2007. HNTB Corporation has also coordinated with Eric Cattell for verification of land use information on multiple occasions in the past several months.

Please find attached a graphic which illustrates the re-classification of land use in the area around the airport. We are requesting that the Community Development Department at the City of Manhattan please review the attached land use map to confirm the land use information is accurate and satisfactory to the City's standards. Any comments or

information that is provided will be corrected, and will be pertinent to the overall quality and accuracy of the 14 CFR Part 150 Study.

HNTB is submitting the Draft Part 150 Noise Study for review to the City of Manhattan (Airport Sponsor) in early May. Given that this is a draft submittal, any comments or changes the Community Development Department submits to HNTB Corporation by June 5th will be considered prior to the final submission of the Part 150 Study. If you are in agreement with the land uses shown on this graphic, please sign below and return to HNTB Corporation, 2900 S. Quincy Street, Suite 200, Arlington, VA 22206 or scan and send to cellis@hntb.com. If you have any questions or require any additional information, please do not hesitate to contact me at 703-253-5843 or by email at the address above.

Sincerely,

Caroline H. Ellis, AICP
Environmental Planner
HNTB Corporation

On behalf of the City of Manhattan Community Development Department, I verify that the land use information shown on the 2009 Land Use Map provided by HNTB Corporation, is accurate.

Ms. Karen Davis, AICP
Director of Community Development
City of Manhattan

Date

Mr. Monty Wedel, AICP
Planning and Special Projects Director
Riley County
110 Courthouse Plaza
Manhattan, Kansas 66502

May 1, 2009

Dear Mr. Wedel,

HNTB Corporation is assisting the City of Manhattan in conducting a 14 Code of Federal Regulations (CFR) PART 150 Noise Compatibility Study for the Manhattan Regional Airport (MHK). The general purpose of a 14 CFR Part 150 Study is to recommend a program of airport operations and land use controls that will help to reduce aircraft noise and prevent future development which would be incompatible with airport noise.

In order for HNTB Corporation to adequately evaluate demographic and land use impacts, as mandated by the 14 CFR Part 150 Study process, we have collected Geographic Information System (GIS) data for land use, parcels, and the city boundaries through the Riley County Community GIS Website. The data is available via the Internet through a collaboration involving Riley County, the City of Manhattan, Community Online Resource Exchange (CORE), and Project Impact.

HNTB Corporation previously submitted a request for verification of land use when the project began in June of 2007. However, given the timeframe of the project, we have updated the land use used in 2007 to the latest available 2009 GIS information. The land use designations in the parcel database are extremely detailed, with a total of 212 separate land use categories. For the purpose of simplification, the land use codes have been re-classified into fourteen general categories to be displayed and analyzed. This is the same re-classification that was used and verified by the City of Manhattan and Riley County in 2007.

Please find attached a graphic which illustrates the re-classification of land use in the area around the airport. We are requesting that the Planning and Development Department at Riley County review the attached land use map to confirm the land use information is accurate and satisfactory to the County's standards. Any comments or information that

is provided will be corrected, and will be pertinent to the overall quality and accuracy of the 14 CFR Part 150 Study.

HNTB is submitting the Draft Part 150 Noise Study for review to the City of Manhattan (Airport Sponsor) in early May. Given that this is a draft submittal, any comments or changes Riley County submits to HNTB Corporation by June 5th will be considered prior to the final submission of the Part 150 Study. If you are in agreement with the land uses shown on this graphic, please sign below and return to HNTB Corporation, 2900 S. Quincy Street, Suite 200, Arlington, VA 22206 or scan and send to cellis@hntb.com. If you have any questions or require any additional information, please do not hesitate to contact me at 703-253-5843 or by email at the address above.

Sincerely,

Caroline H. Ellis, AICP
Environmental Planner
HNTB Corporation

On behalf of the Riley County Planning and Development Department, I verify that the land use information shown on the 2009 Land Use Map provided by HNTB Corporation, is accurate to the best of my knowledge.

Monty Wedel, AICP (or designee)
Planning and Special Projects Director
Riley County

Date

Caroline Ellis

From: ERIC CATTELL [CATTELL@ci.manhattan.ks.us]
Sent: Monday, May 18, 2009 2:55 PM
To: Caroline Ellis
Cc: KAREN DAVIS
Subject: RE: MHK Existing Land Use Revised

Caroline: Looks good.

Thanks

From: Caroline Ellis [mailto:cellis@HNTB.com]
Sent: Monday, May 18, 2009 10:05 AM
To: ERIC CATTELL
Cc: KAREN DAVIS
Subject: MHK Existing Land Use Revised

Eric,

Changes have been made to the existing land use map for the draft Part 150 based on your edits, as well as Riley County edits. Please take a look at the attached map and let me know if it this looks good to you or if any other changes need to be made.

Thank you again for taking the time to go over this last week. It is greatly appreciated!

Thanks,
Caroline

Caroline H. Ellis, AICP
Environmental Planner

HNTB Corporation
2900 South Quincy St., Ste. 200
Arlington, Virginia 22206

Tel (703) 824-5100
Fax (703) 671-6210
Direct (703) 253-5843
www.hntb.com

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Caroline Ellis

From: Steve Higgins [shiggins@rileycountyks.gov]
Sent: Wednesday, May 20, 2009 12:32 PM
To: Caroline Ellis
Subject: DOC (4).PDF
Attachments: DOC (4).PDF

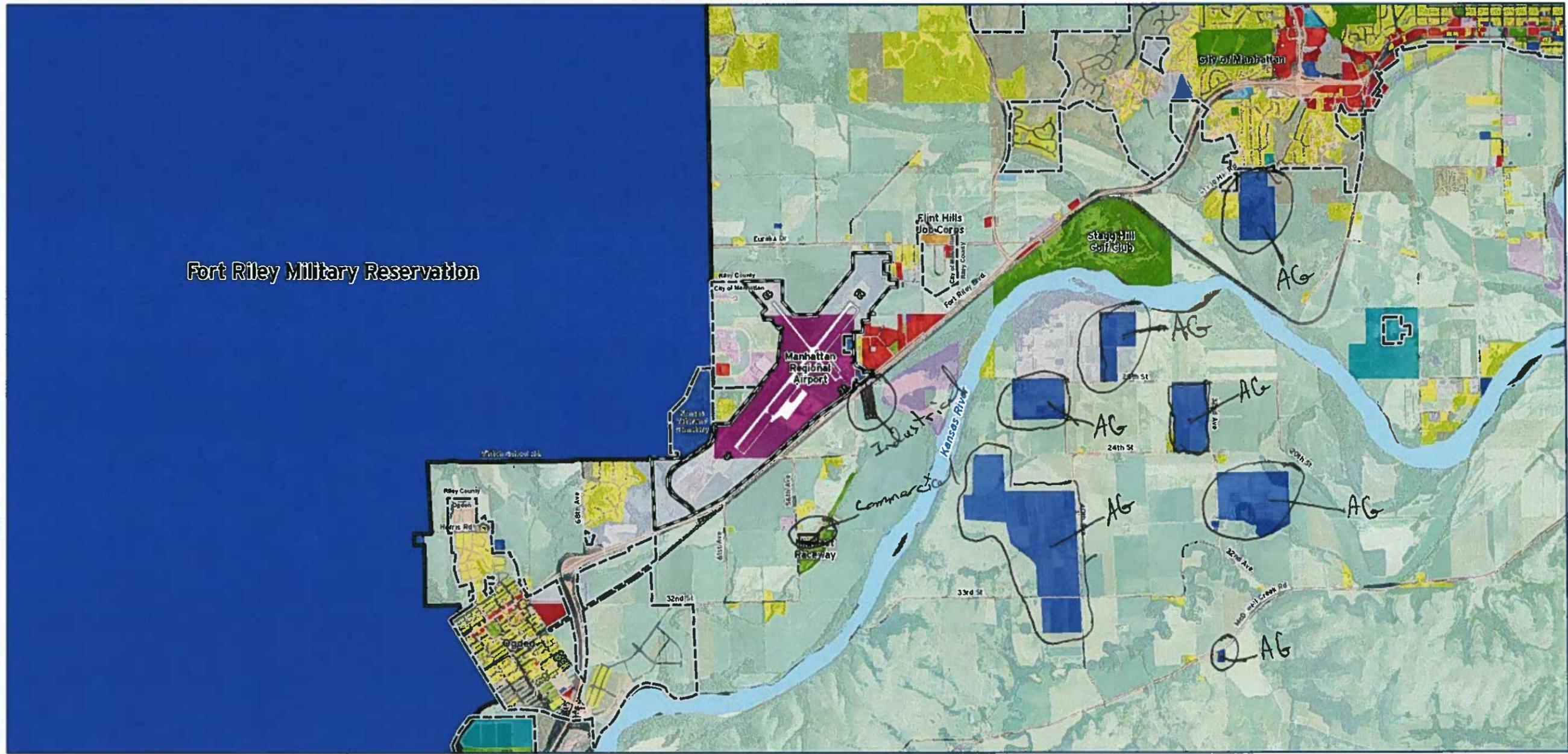
<<DOC (4).PDF>> Caroline,
Will this work?



Existing Land Use

FIGURE 4.1

MANHATTAN REGIONAL AIRPORT PART 150



Fort Riley Military Reservation

LEGEND

- Agriculture
- Cultural / Entertainment / Recreational
- School
- Vacant
- City Boundary
- Church
- Government / Public / Institutional
- Transportation
- Vacant Residential
- Airport Property
- Commercial
- Industrial
- Unknown
- Ft. Riley Boundary
- Communication
- Residential
- Utility



From: [Steve Higgins](#)
To: [Caroline Ellis](#)
Subject: RE: DOC (4).PDF
Date: Wednesday, May 20, 2009 3:59:48 PM

Caroline,
It would be accurate to take the bare dirt at the NW corner of the parcel and list it as industrial.

Steve Higgins, CFM

-----Original Message-----

From: Caroline Ellis [<mailto:cellis@HNTB.com>]
Sent: Wednesday, May 20, 2009 2:34 PM
To: Steve Higgins
Subject: FW: DOC (4).PDF

Steve,

One of the changes that you made to the land use map was from Ag to Industrial on a parcel just south of the Airport. As you can see from the attachment, the land use data shows this as one larger parcel. Could you take a look at the attached and let me know if we should manually divide this parcel and show it part Industrial/part Ag (as Kent mentions below), or if we should just change the whole parcel to Industrial land use? Looking at the aerial, it also looks like the lower left corner of the parcel may be something other than Ag too. (or possibly could be buildings used for Ag purposes).

Thanks,
Caroline

Caroline H. Ellis, AICP
HNTB Corporation

-----Original Message-----

From: Kent Miller
Sent: Wednesday, May 20, 2009 2:21 PM
To: Caroline Ellis
Subject: RE: DOC (4).PDF

Caroline,

The most current Riley County land use data shows this area as a single parcel identified as Agriculture. Should we manually split this parcel to reflect the Industrial area? There is also an area in the lower left portion of the parcel that may be in question.

Thanks, Kent

Kent Miller
GIS Analyst

HNTB Corporation
2900 S. Quincy Street, Suite 200
Arlington, VA 22201

Tel (703) 253-5879
Fax (703) 671-6210
www.hntb.com

-----Original Message-----

From: Caroline Ellis

Sent: Wednesday, May 20, 2009 12:38 PM

To: Kent Miller

Subject: FW: DOC (4).PDF

Kent,

Let me know if you can decipher Riley County's suggested changes, and I'll let Riley County know that we got it and can make it out okay.

Caroline

-----Original Message-----

From: Steve Higgins [<mailto:shiggins@rileycountyks.gov>]

Sent: Wednesday, May 20, 2009 12:32 PM

To: Caroline Ellis

Subject: DOC (4).PDF

<<DOC (4).PDF>> Caroline,
Will this work?

This e-mail and any files transmitted with it are confidential and are intended solely for the use of the individual or entity to whom they are addressed. If you are NOT the intended recipient or the person responsible for delivering the e-mail to the intended recipient, be advised that you have received this e-mail in error and that any use, dissemination, forwarding, printing or copying this e-mail is strictly prohibited.

Caroline Ellis

From: Caroline Ellis
Sent: Thursday, May 21, 2009 2:27 PM
To: VanKuren@ci.manhattan.ks.us
Cc: 'ERIC CATTELL'; 'mwedel@rileycountyks.gov'; 'Steve Higgins'; Brian Tompkins; Kim Hughes
Subject: Draft Part 150 - revised land use map
Attachments: fig_4_1_land_use_052109.pdf

Peter,

Based on input that we received from the City of Manhattan and Riley County after sending them each our existing land use maps use in the draft Part 150, we received suggested comments and changes, which we have incorporated into the land use maps. These changes will be applied to all of the maps showing land use in the Part 150. As a brief background, we initially created our land use maps with January 2009 GIS land use data that we pulled from the Riley County Community GIS ftp site. However, the City and County both had several changes to the land uses being shown. The changes do not effect the land use and noise measures recommended in the draft Part 150.

Consulted parties:

City of Manhattan: Eric Cattell, Karen Davis
Riley County: Monty Wedel, Steve Higgins

Let me know if you have any questions or comments about this.

Caroline H. Ellis, AICP
Environmental Planner

HNTB Corporation
2900 South Quincy St., Ste. 200
Arlington, Virginia 22206

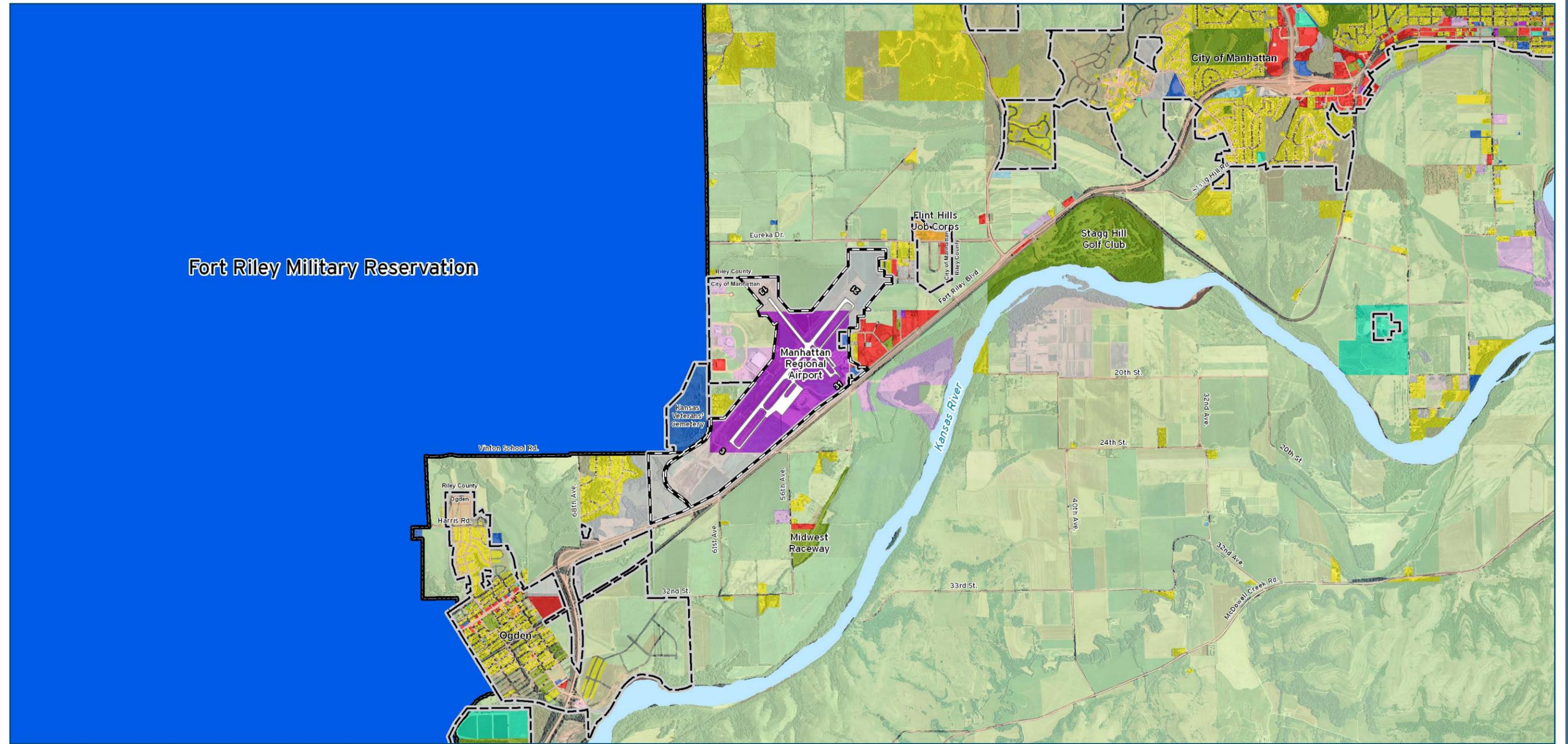
Tel (703) 824-5100
Fax (703) 671-6210
Direct (703) 253-5843
www.hntb.com



Existing Land Use

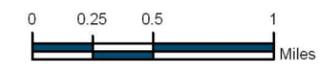
FIGURE 4.1

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | Airport Property |
| Commercial | Industrial | Unknown | Ft. Riley Boundary | |
| Communication | Residential | Utility | | |



JOINT PLANNING BOARD MEETING

August 24, 2009

Informational Purposes Only

■ TRAVEL DEALS

All-you-can fly pass; Mexico's highlands

The Washington Post

The week's best travel bargains around the globe:

- If September brings big travel plans, you might want to consider JetBlue's new All-You-Can-Jet Pass, with unlimited flights on any of the airline's more than 600 daily flights to 57 destinations between Sept. 8 and Oct. 8. The cost is \$599; taxes and fees are included for all domestic flights but not to Puerto Rico or international destinations. Buy the pass by Aug. 21 or while supplies last.

For more information, go to www.jetblue.com/deals/all-you-can-jet.

- Natural Habitat Adventures is taking \$500 off two of its Kingdom of the Monarchs

trips in Mexico's highlands. After the discount, the five-night expedition, which observes millions of migrating butterflies in their wintering grounds, costs \$2,395 per person double.

Trip includes accommodations at the Camino Real in Mexico City, Posada Don Bruno or Las Margaritas in the mountain village of Anganguo and the Hotel Avandaro Golf & Spa Resort in the Sierra Madre Mountains; most meals, including soda and beer; bottled water; park entrance fees; naturalist guides; horseback riding in Chincua and Piedra Herrada; and taxes and service charges. Airfare additional. Discount applies to the Jan. 10 and Jan. 18 departures.

Availability is limited due to the small group size (about 14), so book as soon as possible. Info: 800-543-8917, www.nathab.com.

- Virgin America has extended its sale to the West Coast, with one-way fares from Washington Dulles to Los Angeles or San Francisco for \$119, or \$259 round trip including taxes and fees. Regular one-way fares start at \$254. Travel between Aug. 18 and Nov. 18. Book by Aug. 17 at www.virginamerica.com, or call 877-359-8474 and pay a \$15 booking fee.

All offers were verified and available on Thursday afternoon, but deals sell out quickly and may be subject to change.

Daylily Sale

SATURDAY, AUGUST 22 FROM 8 A.M. - NOON

FARMERS' MARKET

5TH AND HUMBOLDT

Many varieties – great prices

Sponsored annually by the Flint Hills Daylily Society



Public Meeting

Manhattan Regional Airport Draft Part 150 Noise Study

The Manhattan Urban Area Planning Board and the Riley County Planning Board will hold a joint work session on Monday, August 24, 2009 at 7 p.m. in the City Commission Room, City Hall, 1101 Poyntz Avenue, to receive a presentation from the project consultant on the preliminary noise and land use measures to be included in the forthcoming Part 150 Noise Study, associated with the Manhattan Regional Airport. **The public is encouraged to attend and provide comment.**

For additional information, please contact the Community Development Department at 785-587-2412.

It is our policy to provide individuals with disabilities an equal opportunity to participate in, and enjoy the benefits of our services, programs, and activities. This meeting is being held in the City Commission Room at the City Hall, 1101 Poyntz Avenue. In accordance with provisions of the ADA, every attempt will be made to accommodate persons with disabilities. Please contact the human Resources Department (587-2440) for assistance.



It is our policy to provide individuals with disabilities an equal opportunity to participate in, and enjoy the benefits of our services, programs, and activities. This meeting is being held in the City Commission Room at City Hall, 1101 Poyntz Avenue. In accordance with provisions of the ADA, every attempt will be made to accommodate the needs of persons with disabilities. Please contact the Human Resources Department (587-2440) for assistance.

JOINT WORK SESSION
MANHATTAN URBAN AREA PLANNING BOARD
And
RILEY COUNTY PLANNING BOARD

City Commission Room, City Hall
1101 Poyntz Avenue
Monday, August 24, 2009
7:00 P.M.

BOARD MEMBERS PLEASE NOTIFY THE PLANNING OFFICE IF YOU CANNOT ATTEND THIS MEETING.

I. WORK SESSION

1. Presentation of the **PRELIMINARY DRAFT PART 150 AIRPORT NOISE STUDY** for the Manhattan Regional Airport. HNTB, the project consultant, will provide an overview of the preliminary noise and land use measures identified in the study.

Action Needed: Provide input on the preliminary draft to the project consultant.

**Manhattan Regional Airport
14 CFR Part 150 Study**

August 24, 2009

By Kim Hughes, P.E.
Manager, Environmental Services
HNTB Corporation



1

Presentation Topics

- Introduction to the Part 150 Study Process
 - What is a Part 150 Study?
 - Aviation Noise 101
- Noise Exposure Maps
- Noise Abatement Measures Considered
- Land Use Measures Considered
- Next Steps



2

What is a Part 150 Study?

14 CFR Part 150 Airport Noise Compatibility Planning Program

- Part 150 was created in 1984 in compliance with the Aviation Safety and Noise Abatement Act of 1979 (ASNA).
- Primary Federal Regulation for Guiding and Controlling Noise Compatibility
- Part 150 establishes Procedures, Standards and Methodologies for Airport Operators
 - Mitigation
 - Protecting Airport Growth
- 14 CFR Part 161
- A Strictly **VOLUNTARY** effort by the Airport Operator




3

What is a Part 150 Study?

The Part 150 Process Provides

<ul style="list-style-type: none"> ➤ Establishes the Noise Threshold (65 DNL) ➤ INM as the Noise Modeling Software ➤ Defines Land Uses that are Compatible/ Non Compatible ➤ Voluntary Development of NEM/NCP 	<ul style="list-style-type: none"> ➤ Review of NEMs to ensure Compliance with FAA Guidelines ➤ Provides for Approval/Disapproval of Part 150 NCPs ➤ Procedures and Criteria for Funding through the AIP ➤ Considers Existing Conditions and Typically 5-years into the Future
---	---




4

MHK as the APOE

MHK as the Aerial Port Of Embarkment

In 2017 MHK is expected to become an APOE



C5A - Galaxy

This Part 150 considers 2027 to include the impact of MHK becoming an APOE.



5

What is a Part 150 Study?

Part 150 Requires Consideration of Noise and Land Use Actions

NCPS must consider a wide range of potential noise compatibility actions, based on 2 categories.

- **Noise Abatement Actions:** Reduce non-compatible land use by decreasing aircraft noise through aircraft procedural changes.
- **Land Use Actions:** Reduce non-compatible land uses by preventing future non-compatible development, changing land uses, or reducing the effect of noise through corrective means.



6

What is a Part 150 Study?

Evaluation of Potential Measures

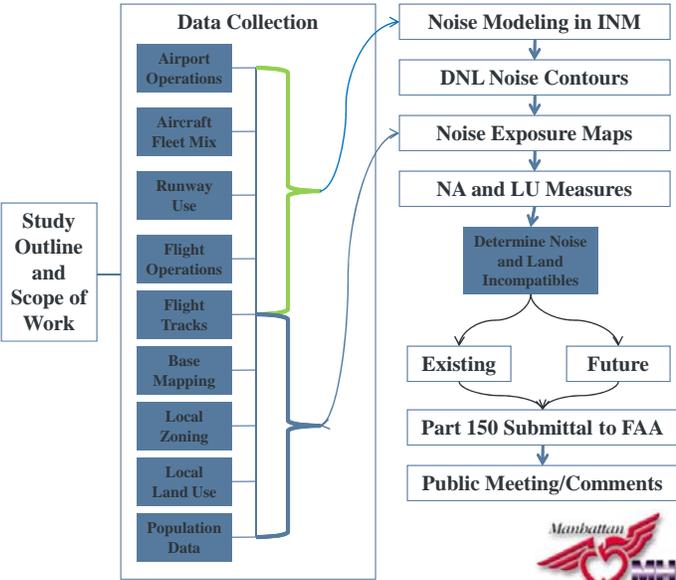
Noise and Land Use Measures may be further defined as Preventive or Corrective:

- Corrective measures are intended to reduce population in the 65+ DNL and alleviate and/or eliminate non-compatible land uses in existing developed areas.
- Preventive measures are designed place operations over areas that will be compatible with aviation activities and to restrict new development not compatible with aircraft noise.




7

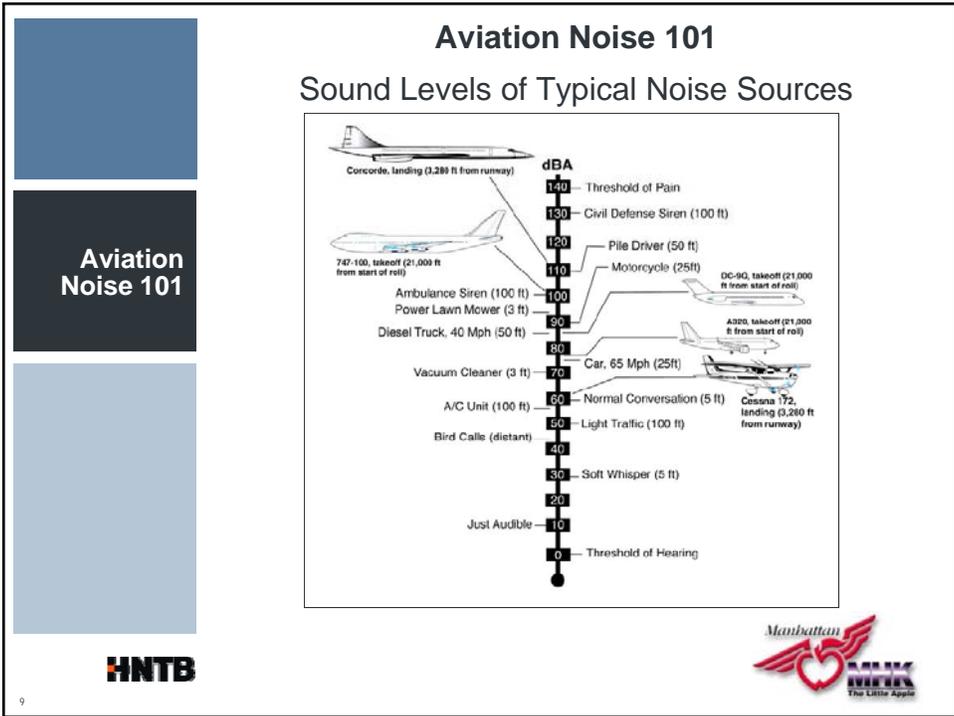
What is a Part 150 Study?



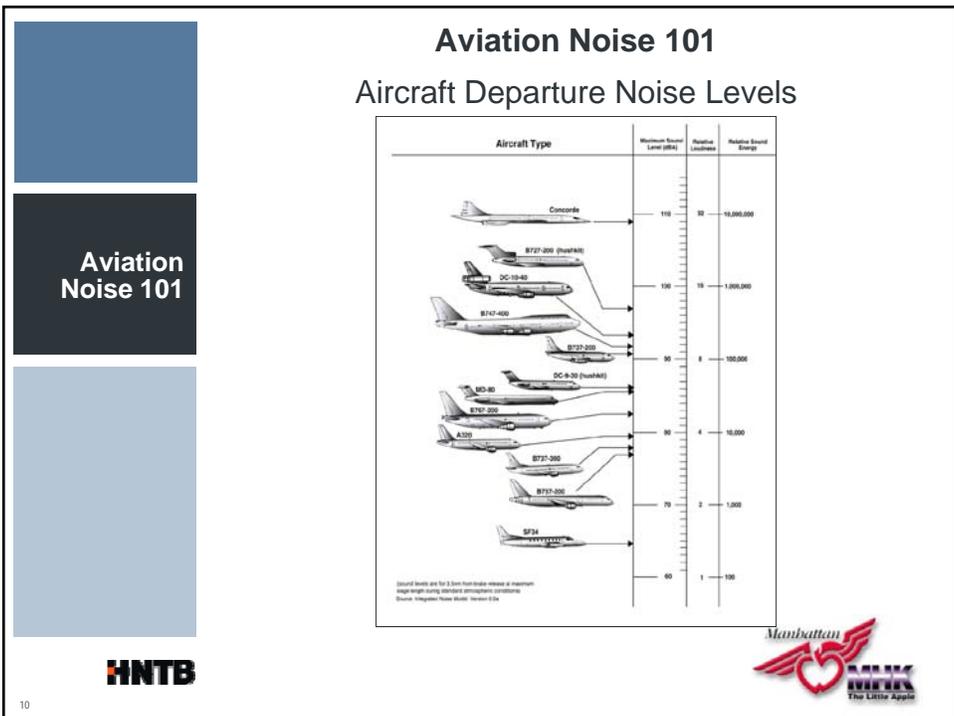
The flowchart illustrates the process of a Part 150 study. It begins with 'Study Outline and Scope of Work', which leads to 'Data Collection'. This stage includes: Airport Operations, Aircraft Fleet Mix, Runway Use, Flight Operations, Flight Tracks, Base Mapping, Local Zoning, Local Land Use, and Population Data. The data collection feeds into 'Noise Modeling in INM', which produces 'DNL Noise Contours', 'Noise Exposure Maps', and 'NA and LU Measures'. These measures lead to 'Determine Noise and Land Incompatibles', which is split into 'Existing' and 'Future' scenarios. The final steps are 'Part 150 Submittal to FAA' and 'Public Meeting/Comments'.



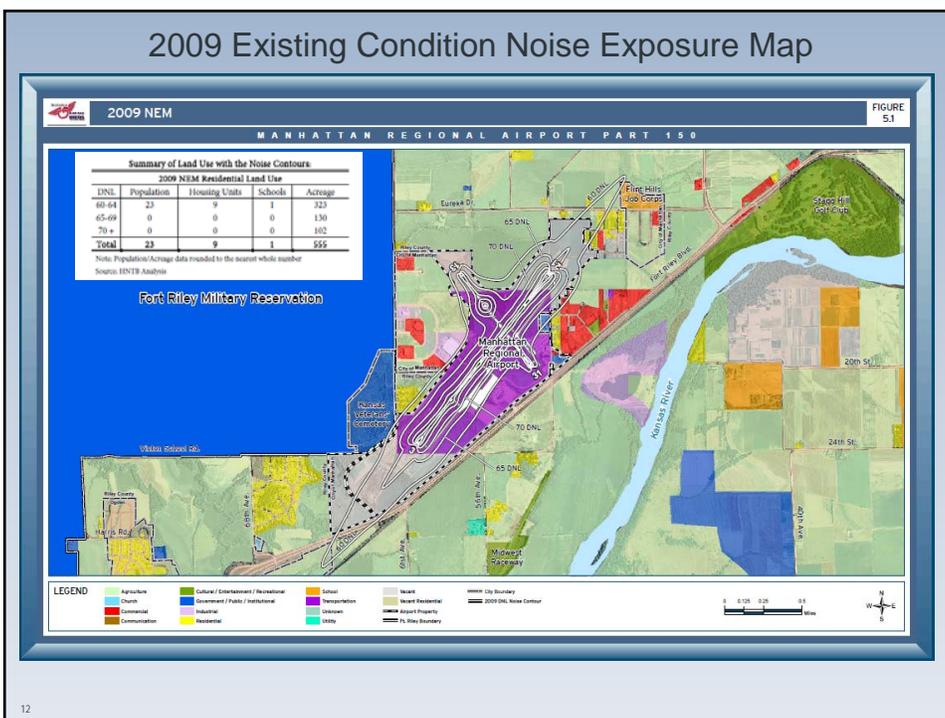
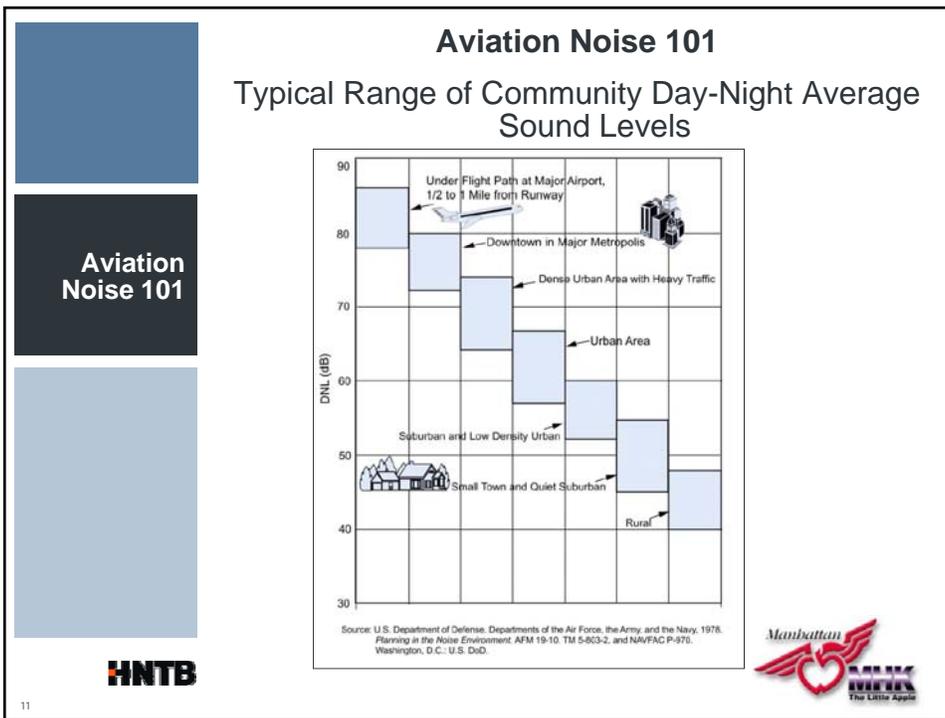

8



9



10



**Noise
Abatement
Measures**

Noise Abatement Measure Evaluation Criteria

- Changes in Noise Exposure
- Effects on Airport Operations and ATCT Workload
- Impact on Airport Users
- Regional Economic Impacts
- Quality of Service Impacts
- Associated Cost
- Ease of Implementation and Enforcement
- Legal Factors




15

**Noise
Abatement
Measures**

Potential Noise Abatement Measures Considered

- The construction of shielding and/or noise barriers





- Preferential runway use
- Changes to departure and/or arrival procedures
- A change to flight tracks/paths
- Restrictions on aircraft operations




16

Noise Abatement Measures

Aircraft Operations Evaluated for MHK

- Aircraft Departure Operations
- Aircraft Arrival Operations
- Touch and Go Operations
- Nighttime Arrival and Departure Operations
- Run-up Operations
- Helicopter Operations
- Military Operations

HNTB



17

Noise Abatement Measures

Noise Abatement (NA) Measures

NA – 1 Departure Procedures for Turbojets
NA – 2 Arrival/Departure Flight Track to Runway 03/21



HNTB



18

Noise Abatement Measures

Noise Abatement (NA) Measures

NA – 3 Arrival Flight Track to Runway 21

NA – 4 Limit Nighttime Operations – **NOT RECOMMENDED**

NA – 5 Touch and Go (T&G) Operations

- Climb to TPA on Upwind before Turning Crosswind

TPA – 843' AGL for GA Aircraft and 1,443' AGL for Turbine Aircraft

Source: Aeronautical Knowledge Handbook

19

Noise Abatement Measures

Noise Abatement (NA) Measures

NA – 6 Military Helicopter Operations (Voluntary)

- Aircraft Operations Originating from Fort Riley CAB
- Climb to TPA on the upwind leg before turning

The Fighting Sixth

6

1

Dei Amor Patriae

AH-64-Apache Longbow

1ST INFANTRY DIVISION

Source: Aeronautical Knowledge Handbook

20

Noise Abatement Measures

Noise Abatement (NA) Measures

NA – 6 Military Helicopter Operations (Voluntary)

- Aircraft Operations Originating from Fort Riley CAB
 - Limit T&G ops to certain days/times
 - Limit T&G ops per flight





Blackhawk





CH-47 - Chinook







21

Land Use Regulations

Land Use Regulations Considered

- Existing Land Use
- 2003 Comprehensive Plan (includes Future Land Use)
- Zoning
 - Manhattan
 - Riley County
 - Airport-related Zoning Districts
- Subdivision Regulations
- Fort Riley Joint Land Use Study (JLUS)





22

Existing
Land Use
Measures

City of Manhattan: Existing Land Use Measures

- Airport Overlay Zoning District
 - Applies to the lands in the vicinity of MHK.
 - To ensure that land is developed in conjunction with existing and future operations at the Airport.
- Airport Overlay Zoning as a Standalone District
 - Applies as a stand-alone zoning classification for Airport property ONLY.
 - To prohibit noise sensitive land uses.
- Avigation Easement
 - Airport owner acquires the right to conduct “noise” over a property.
 - To protect navigable airspace at public airports.
- Comprehensive Plan
- Future Land Use Map




23

Existing
Land Use
Measures

Riley County: Existing Land Use Measures

- Airport Noise Hazard District
 - Zoning district that prohibits uses that are incompatible with airport operations.
 - Prevents obstruction of air space around MHK.
- Future Land Use Map




24

Land Use Measure Evaluation Criteria

Land Use Measure Evaluation Criteria

- Geographical Area of the Land Use Measure
- Compatibility Benefits
- Effect on Property Values and Tax Base
- Legal Factors
- Political Acceptability
- Implementation Factors and Responsible Parties




25

Potential Land Use Measures

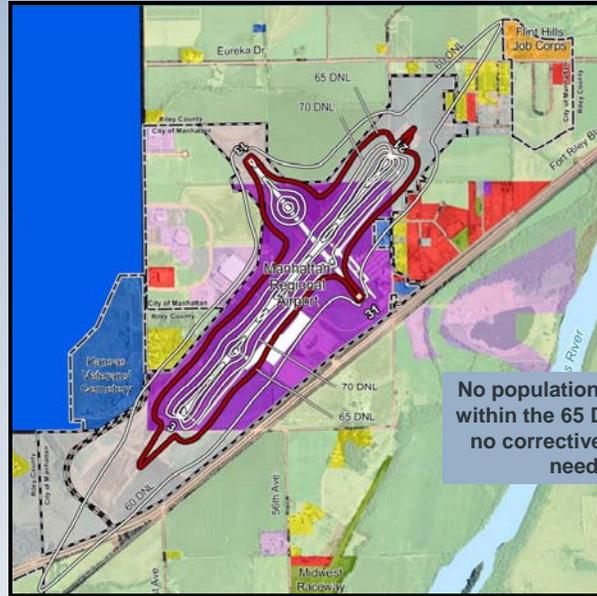
Potential Land Use Measures

- **Corrective Land Use Measures** (2014 65 DNL)
 - Land Acquisition
 - Property Purchase Assurance Program
 - Sound Insulation Program
- **Preventive Land Use Measures** (2027 65 DNL)
 - Compatible Land Use Zoning
 - Real Estate Noise Disclosure
 - Building Code Provisions/Amendments
 - Purchase and Transfer of Development Rights
 - Coordination among Neighboring Jurisdictions




26

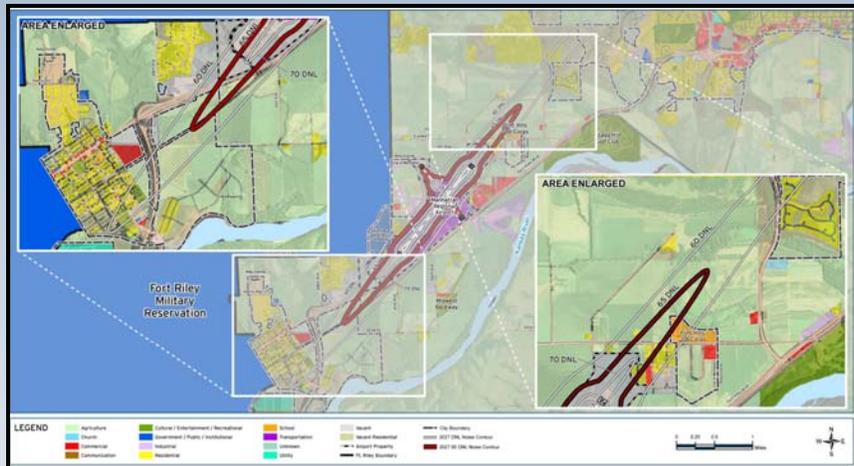
Corrective Land Use Measures (2014 65 DNL)



No population is expected within the 65 DNL by 2014, no corrective measures needed.

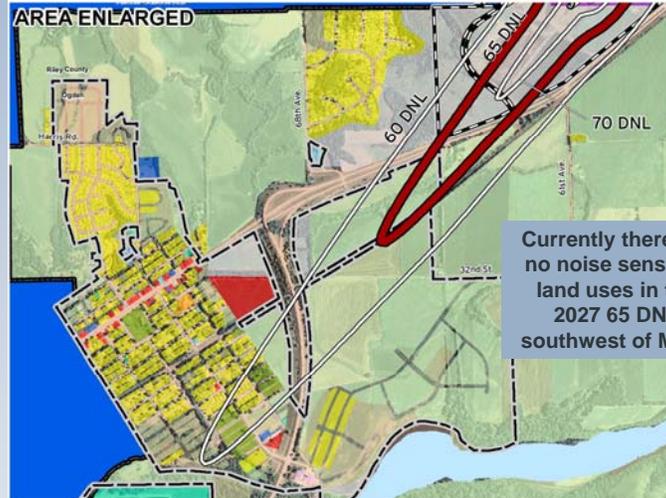
27

Preventive Land Use Measures (2027 65 DNL)



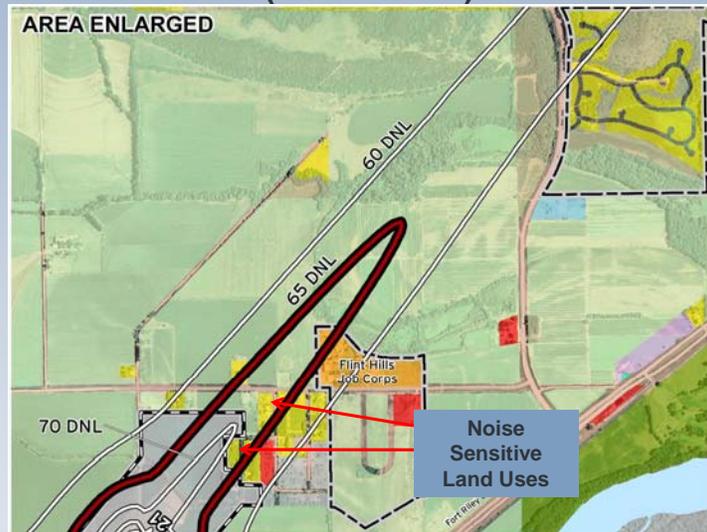
28

Preventive Land Use Measures (2027 65 DNL)



29

Preventive Land Use Measures (2027 65 DNL)



30

Land Use Measures Evaluated

Compatible Land Use Zoning

- Amend the Riley County Zoning Map and associated Zoning Ordinance for the areas of the County within the 2027 65+ DNL contour. This measure could be applied with change of ownership.

- Recommended for application wherever possible as a preventive measure within the 2027 DNL 65 in planning for compatible growth at and around MHK




31

Land Use Measures Evaluated

Real Estate Noise Disclosure

- Provide for disclosure of noise exposure levels to prospective homebuyers. MHK would encourage all neighboring jurisdictions to require disclosure of noise exposure levels by ordinance or via amended subdivision regulations/covenants that would require disclosure upon sale/transfer of the property. MHK could also encourage local realtors and title companies to establish a noise disclosure program.

- Recommended for application as a preventive buffer within the 2027 65 DNL. Planned residential development to the northeast of MHK in the Scenic Meadows and Miller Parkway Corridor Area warrants the use of this preventive measure if enacted by the respective local jurisdictions.




32

Land Use Measures Evaluated

Building Code Provisions/Amendments

- MHK would recommend that all neighboring jurisdictions revise and/or adopt a building code/housing code to ensure land-use compatibility within the limits of the 2027 65 DNL contour. Specifically, the building code should ensure a noise level reduction (NLR) of approximately 20 dB as needed to achieve an interior noise level of 45 dBA. In addition, subdivision regulations could be amended to help guide development in noise impacted areas by reducing building exposure (e.g. providing buffer areas, requiring open space).
- Due to the compatibility benefits of reducing interior noise levels and the relatively low cost in lieu of property acquisition, this measure is recommended for inclusion in the NCP.




33

Land Use Measures Evaluated

Purchase and Transfer of Development Rights

- With PDR/TDR, the City of Manhattan would seek to purchase the development rights for properties within the 2027 65 DNL contour that could be developed into incompatible uses.
- This measure is not recommended for inclusion in the NCP at this time. The development rights system would have to be adopted by the local governments and the comprehensive plan would need to be updated to recognize this measure for development rights and land designation.




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Land Use Measures Evaluated

Coordination among Neighboring Jurisdictions

- Establish a coordinated committee that includes jurisdictions within the area impacted by airport noise in order to coordinate planning efforts with each other and with the Airport.
- Recommended for implementation. It would facilitate communication between jurisdictions and MHK, and would establish a medium for the dissemination and exchange of information with the public.




25

Land Use Measures Evaluated

Land Use Measures Summary

- No Corrective Measures needed for MHK
- Preventive Measures consider the extended future of MHK as an APOE
- Measures would be implemented locally




26

	<h2>Next Steps</h2>
Next Steps	<ul style="list-style-type: none">➤ Comments from City Planners/Public Incorporated
	<ul style="list-style-type: none">➤ Draft Part 150 Submitted to the FAA for Comments➤ Comments from FAA Incorporated➤ Draft Part 150 Published for Public Comments<ul style="list-style-type: none">➤ IF Requested – Public Meeting➤ Final Part 150 submitted to FAA➤ FAA Review
	

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Appendix C

DRAFT 2009, 2014, and 2027 NEMs

**(NOISE ANALYSIS CONDUCTED PRIOR TO RUNWAY
CONFIGURATION CHANGE)**

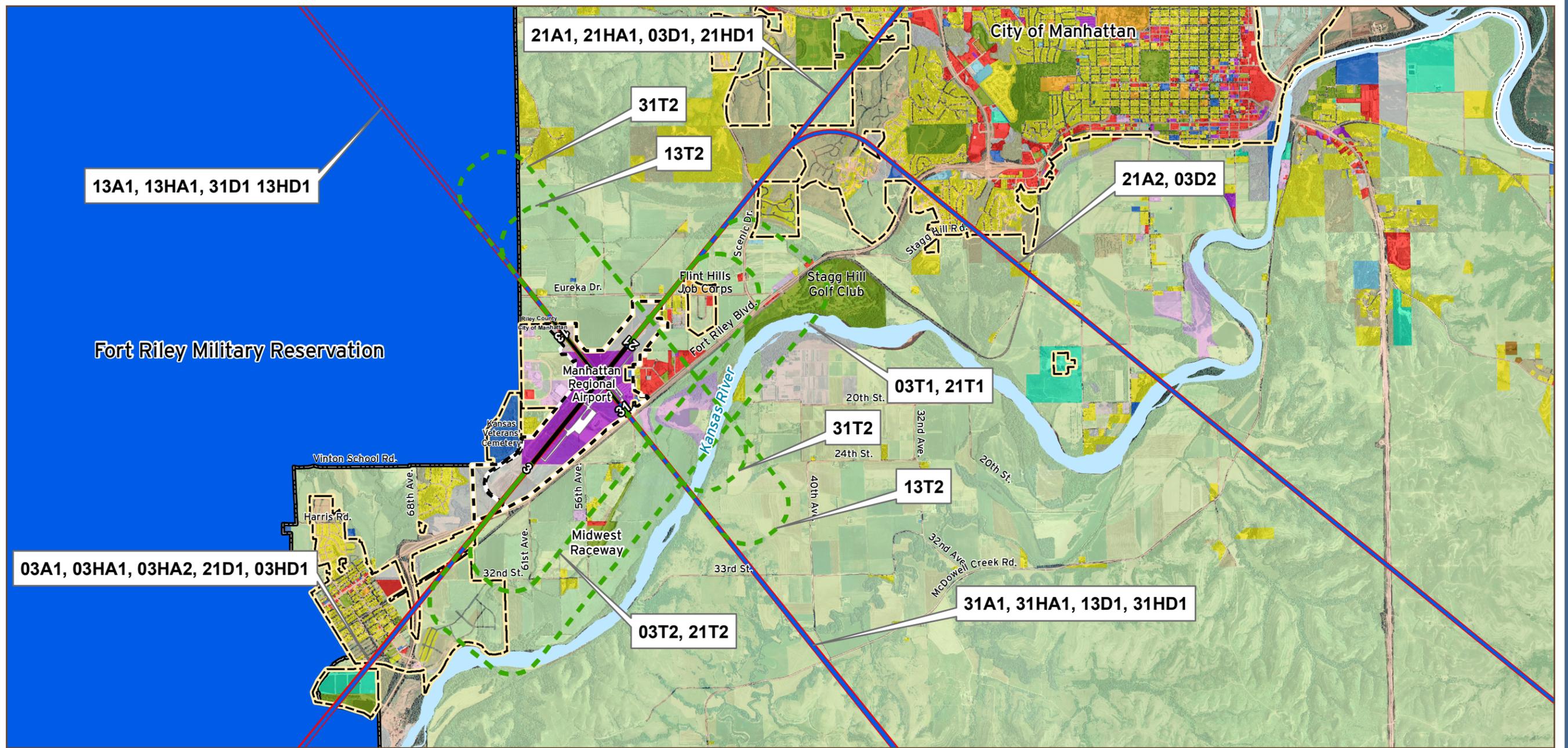
For Informational Purposes Only



Arrival, Departure and Touch and Go Flight Tracks

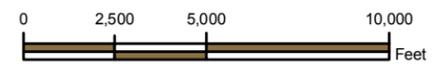
FIGURE 3.1

M H K A I R P O R T N O I S E A N D L A N D U S E C O M P A T I B I L T Y S T U D Y



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|---------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | Arrival Flight Track |
| Commercial | Industrial | Unknown | Airport Property | Departure Flight Track |
| Communication | Residential | Utility | Ft. Riley Boundary | Touch and Go Flight Track |

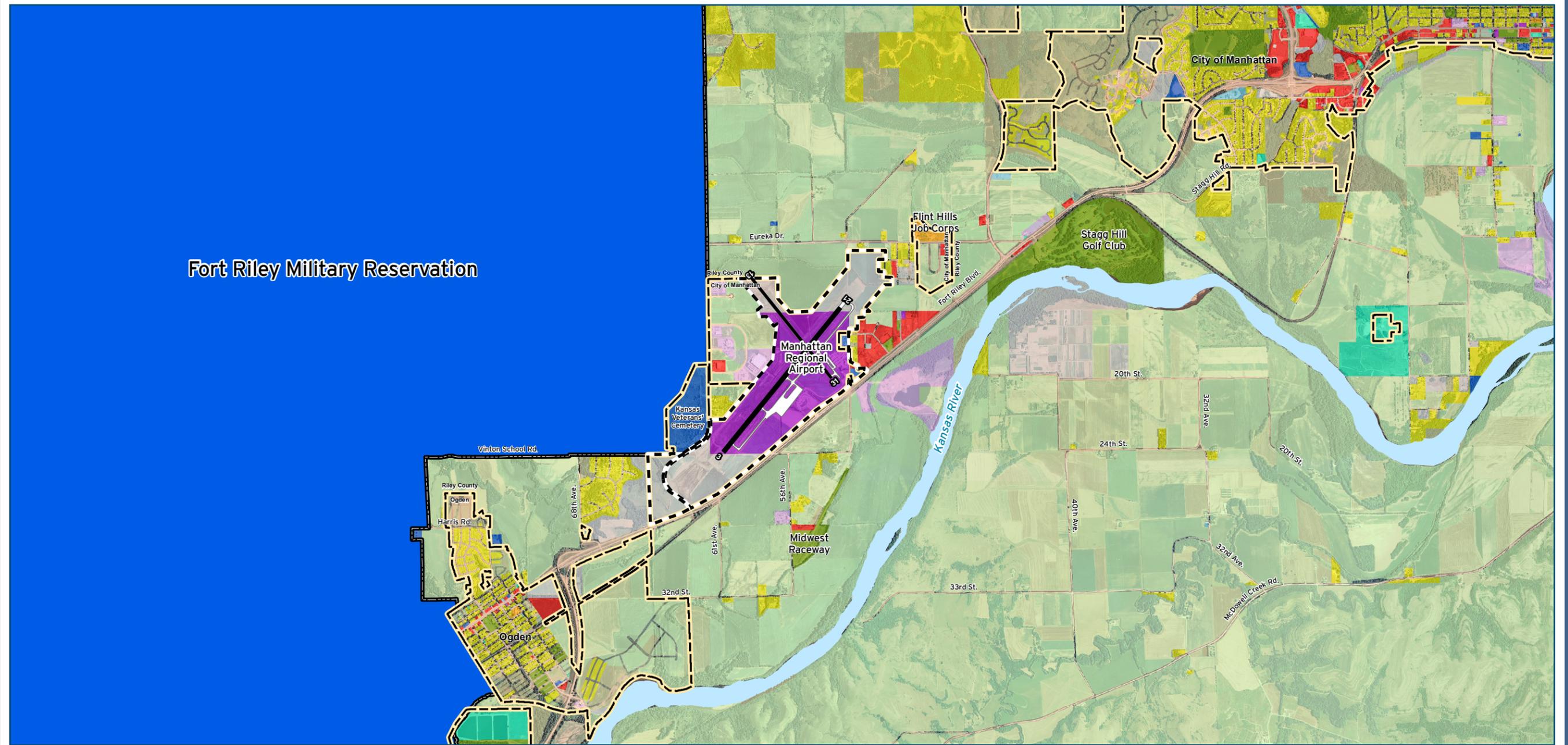




Existing Land Use

FIGURE 4.1

M H K A I R P O R T N O I S E A N D L A N D U S E C O M P A T I B I L T Y S T U D Y



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | Airport Property |
| Commercial | Industrial | Unknown | Ft. Riley Boundary | |
| Communication | Residential | Utility | | |

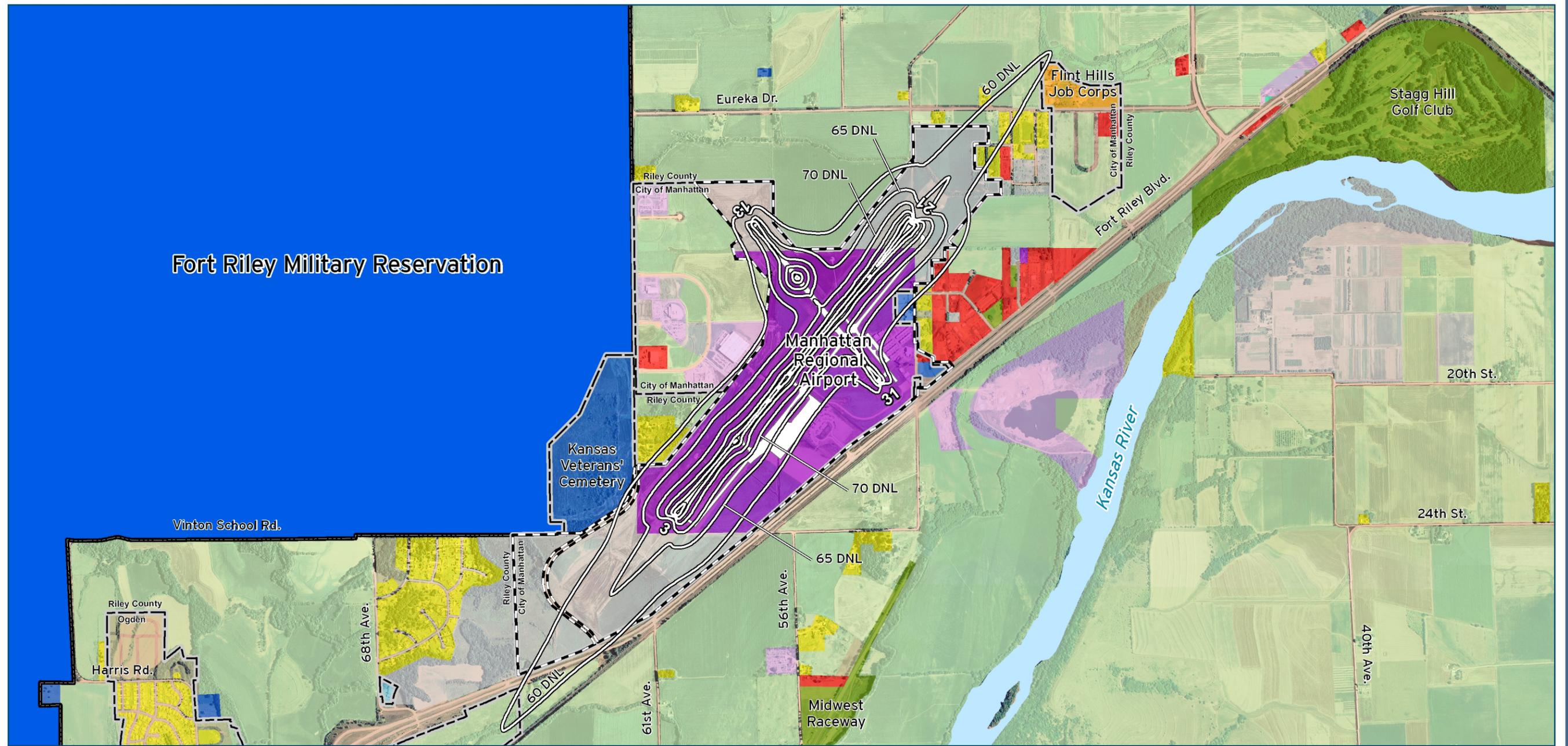




2009 Existing Conditions Noise Exposure Map

FIGURE 5.1

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | 2009 DNL Noise Contour |
| Commercial | Industrial | Unknown | Airport Property | |
| Communication | Residential | Utility | Ft. Riley Boundary | |

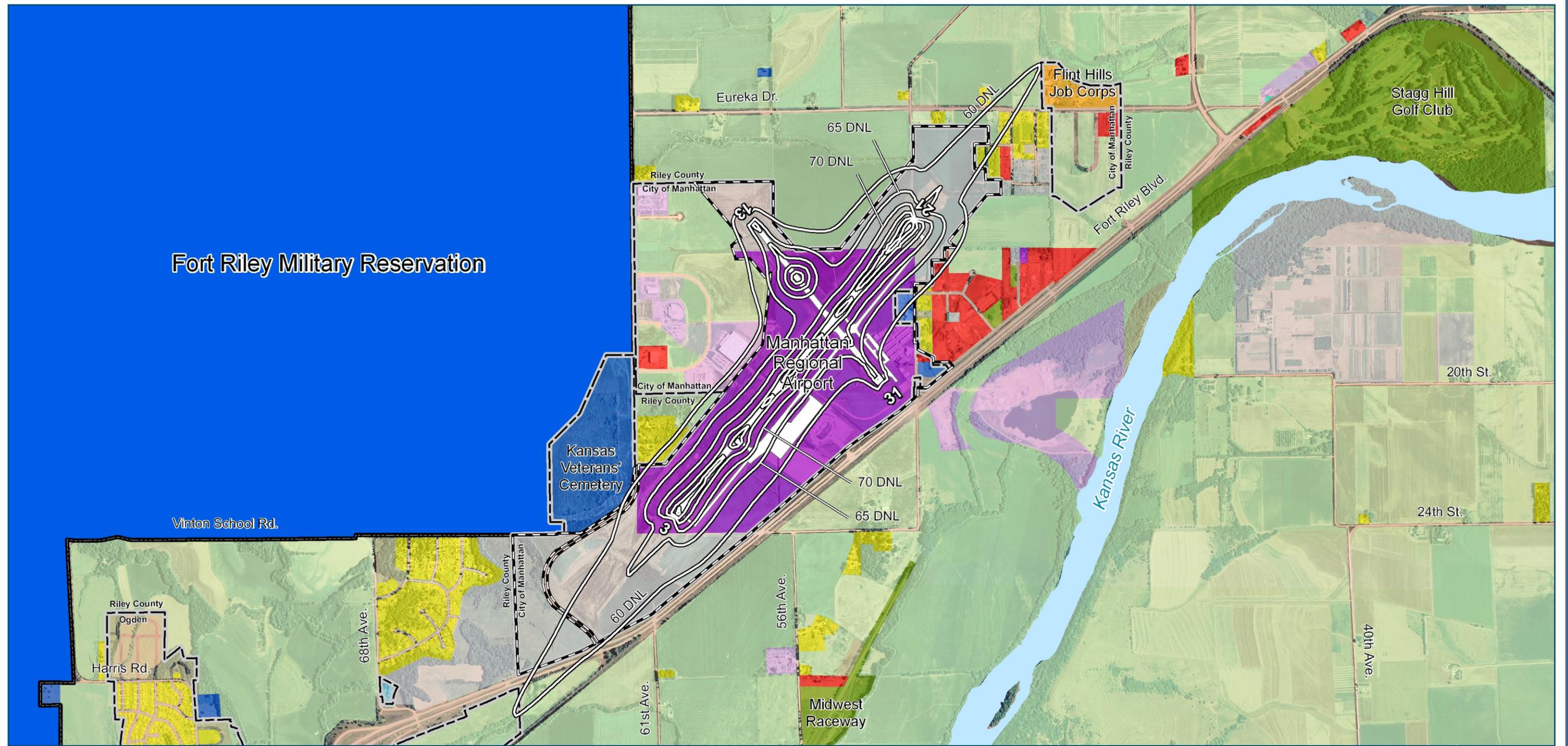




2014 Five-Year Forecast Conditions Noise Exposure Map

FIGURE 5.2

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | 2014 DNL Noise Contour |
| Commercial | Industrial | Unknown | Airport Property | |
| Communication | Residential | Utility | Ft. Riley Boundary | |

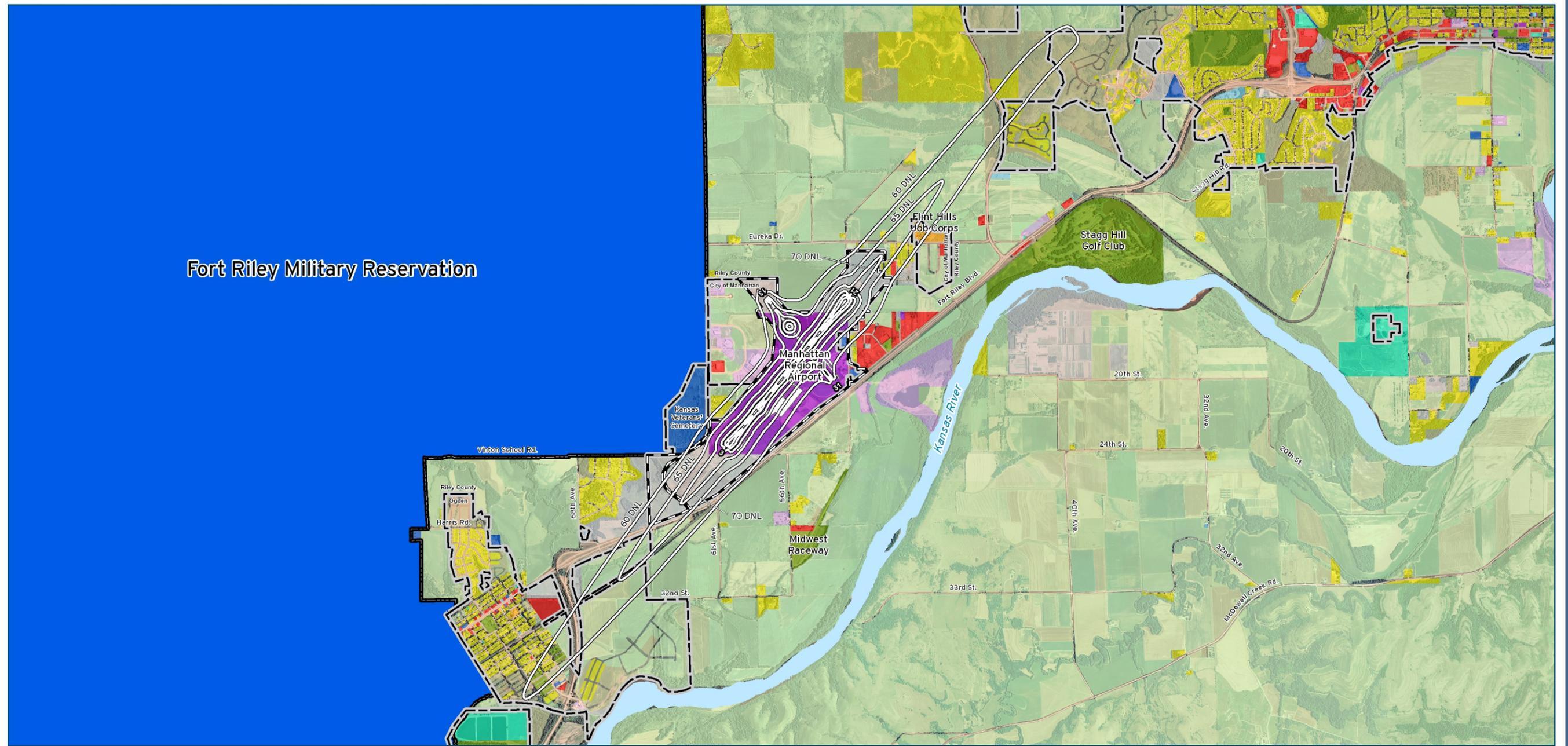




2027 Noise Exposure Map

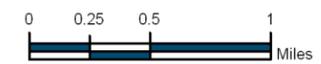
FIGURE 5.3

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | 2027 DNL Noise Contour |
| Commercial | Industrial | Unknown | Airport Property | |
| Communication | Residential | Utility | Ft. Riley Boundary | |

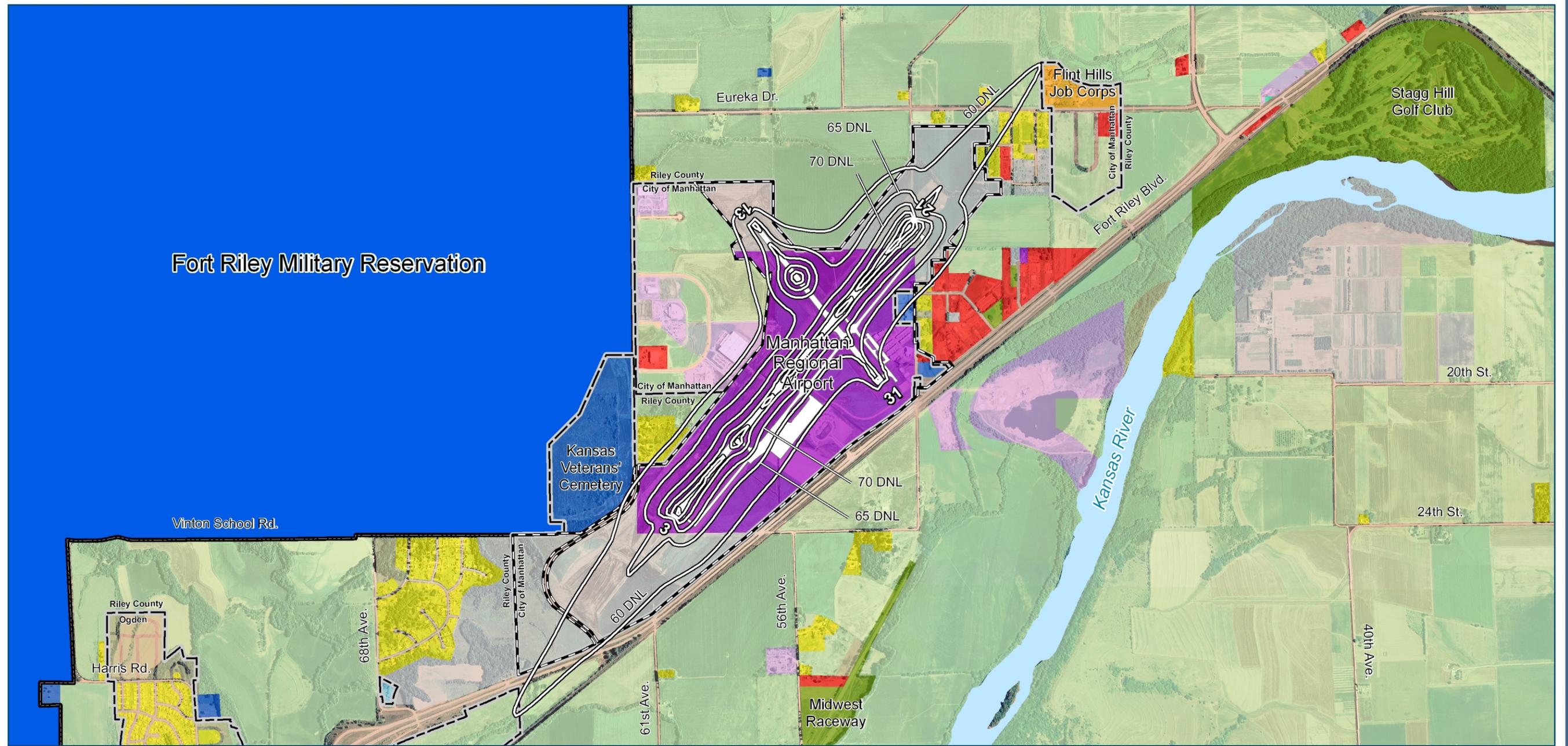




2014 Five-Year Noise Exposure Map with Noise Compatability Program

FIGURE 5.4

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | 2014 DNL Noise Contour |
| Commercial | Industrial | Unknown | Airport Property | |
| Communication | Residential | Utility | Ft. Riley Boundary | |

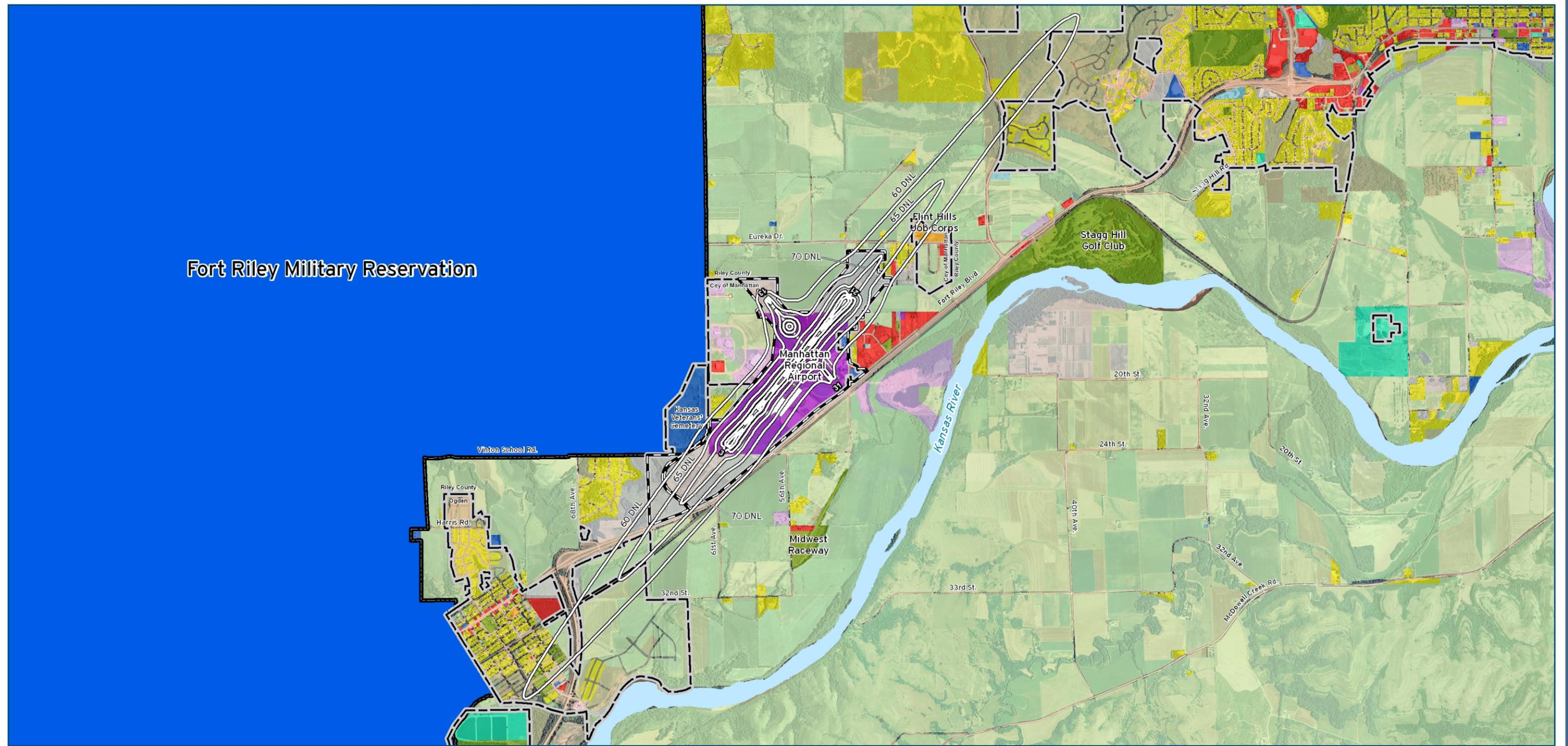




2027 Noise Exposure Map with Noise Compatability Program

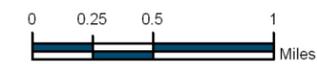
FIGURE 5.5

MANHATTAN REGIONAL AIRPORT PART 150



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | 2027 DNL Noise Contour |
| Commercial | Industrial | Unknown | Airport Property | |
| Communication | Residential | Utility | Ft. Riley Boundary | |

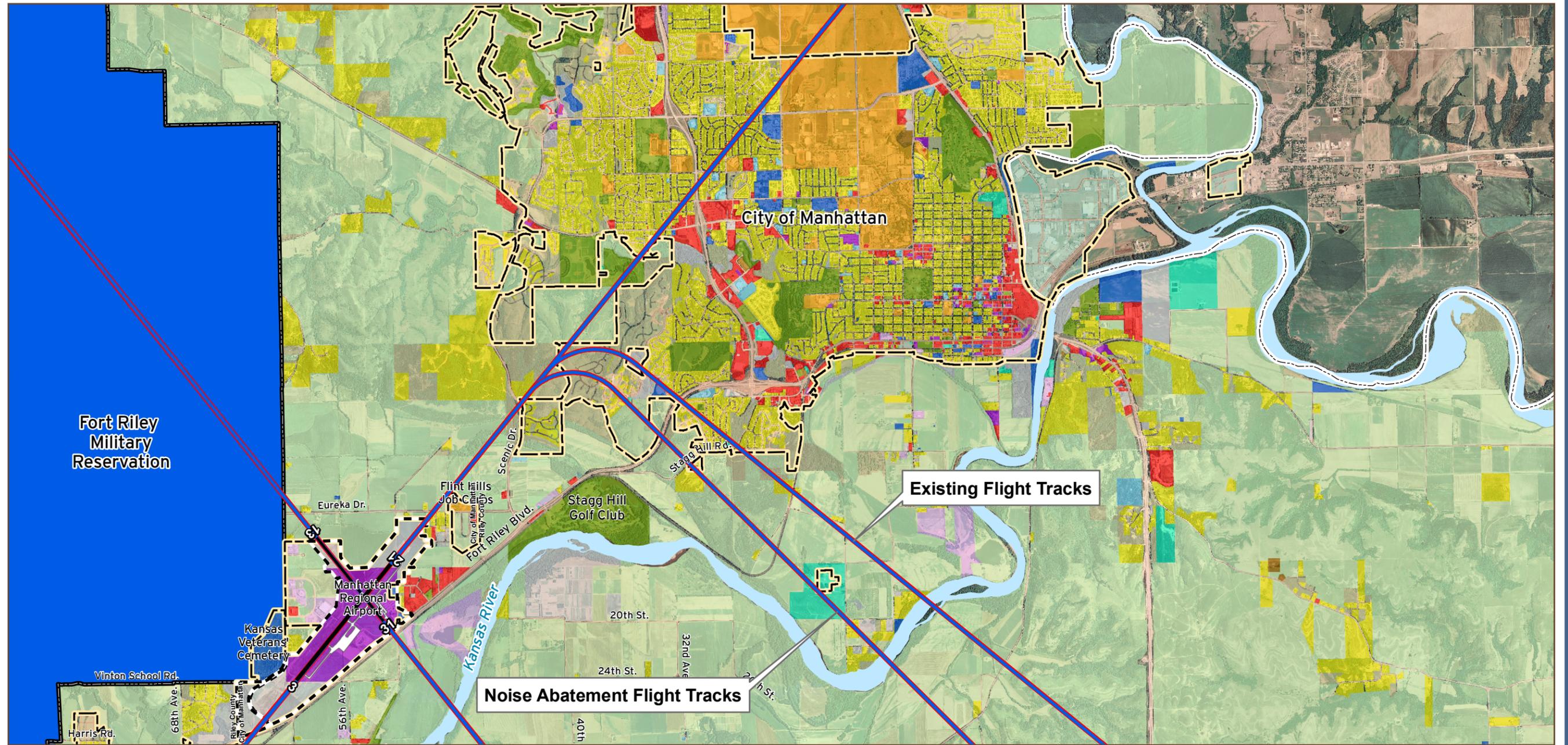




Arrival/Departure Flight Tracks to/from Runway 03/21 with Short Final Approach Segment

FIGURE 6.1

M H K A I R P O R T N O I S E A N D L A N D U S E C O M P A T I B I L T Y S T U D Y

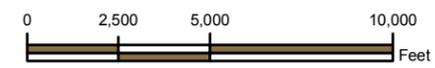


Existing Flight Tracks

Noise Abatement Flight Tracks

LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | Arrival Flight Track |
| Commercial | Industrial | Unknown | Airport Property | Departure Flight Track |
| Communication | Residential | Utility | Ft. Riley Boundary | |

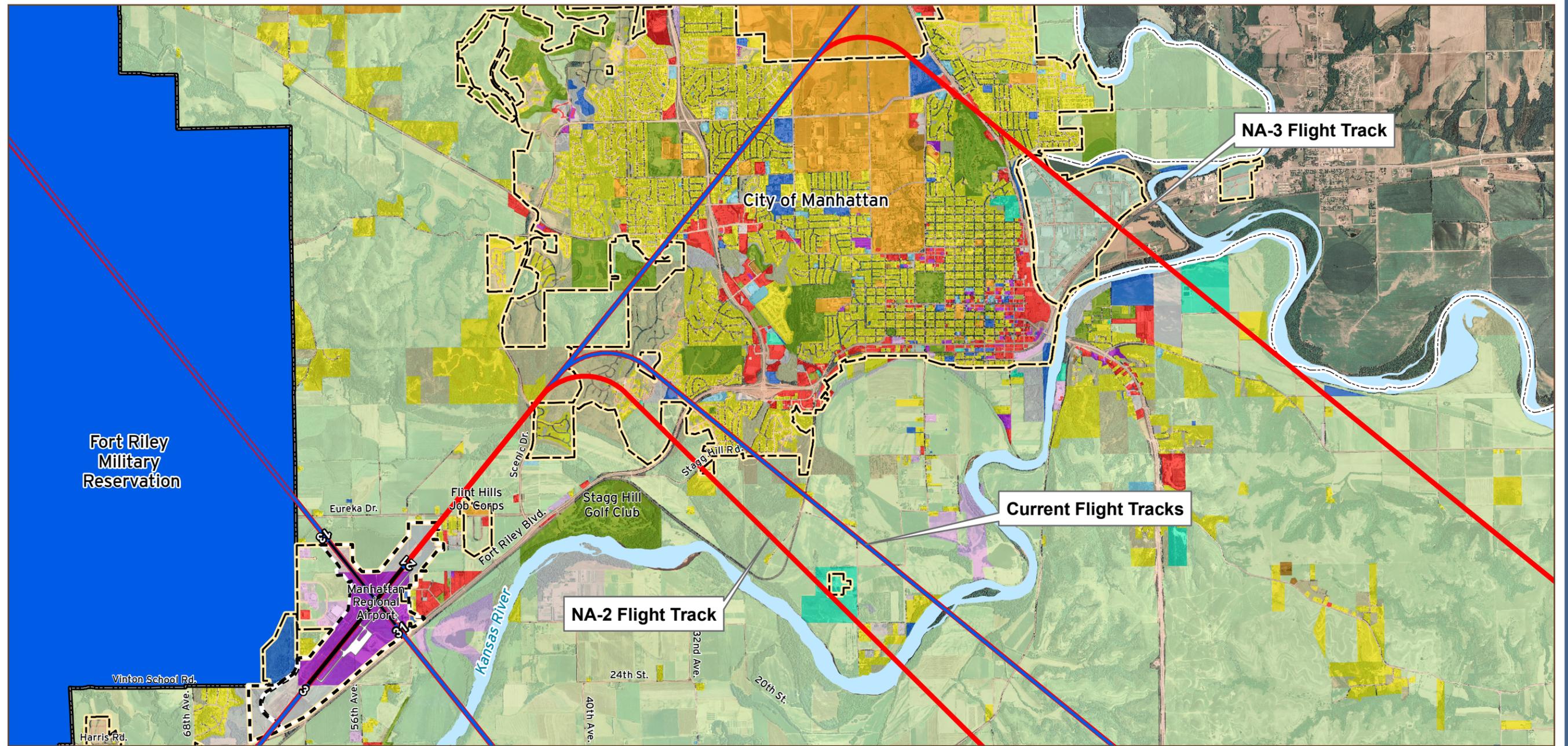




Arrival/Departure Flight Tracks to Runway 21 with Extended Final Approach Segment

FIGURE 6.2

M H K A I R P O R T N O I S E A N D L A N D U S E C O M P A T I B I L T Y S T U D Y



LEGEND

- | | | | | |
|---------------|---|----------------|--------------------|------------------------|
| Agriculture | Cultural / Entertainment / Recreational | School | Vacant | City Boundary |
| Church | Government / Public / Institutional | Transportation | Vacant Residential | Arrival Flight Track |
| Commercial | Industrial | Unknown | Airport Property | Departure Flight Track |
| Communication | Residential | Utility | Ft. Riley Boundary | |

