Metropolitan Airports
Commission and
HNTB Corporation

Annual Noise Contour Analysis

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1 Background

The issue of noise at Minneapolis-St. Paul International Airport (MSP) includes a long history of local efforts to quantify and mitigate noise impacts in a manner responsive to concerns raised by the communities around the airport and consistent with federal policy. These efforts have resulted in the conceptualization and implementation of many initiatives to reduce noise impacts around MSP. One of the most notable of these initiatives has been the sound insulation program originally implemented under 14 Code of Federal Regulations (C.F.R.) Part 150.

Part 150 provides a framework for airport operators to develop a comprehensive noise plan for an airport in the form of a Noise Compatibility Program (NCP). A Part 150 NCP is comprised of two fundamental approaches to addressing noise impacts around an airport: (1) Land Use Measures, and (2) Noise Abatement Measures (operational measures to reduce noise). A key component of Part 150 program planning is the development of a base case Noise Exposure Map (NEM) and a five-year forecast NEM without (unmitigated forecast scenario) and with (forecast mitigated scenario) the recommended operational noise abatement measures. Including operational noise abatement measures is important because the manner in which an airport is operated and how aircraft procedures are executed have a direct effect on an airport's noise impact. NEMs are commonly referred to as noise contours. Forecast mitigated noise contours depict the areas that may be eligible for Land Use Measures (compatible land use plans, property acquisition, residential relocation, and sound mitigation) around an airport.

Recognizing the need for increased infrastructure and the emerging importance of noise issues as operations at MSP increased, the Metropolitan Airports Commission (MAC) submitted its first MSP Part 150 Study to the Federal Aviation Administration (FAA) in October 1987. NEMs were accepted by the FAA in October 1989, and portions of the NCP were approved in April 1990. The NCP included Corrective Land Use Measures which called for the soundproofing of residences, schools and other public buildings. A 1992 update to the NCP and NEM marked the beginning of corrective mitigation measures in the forecast 1996 NEM 65 and greater Day-Night Average Sound Level (DNL) noise contours.

1.1 Corrective Land Use Efforts at MSP to Address Airport Noise

From 1992 to 2006, the residential noise mitigation program was a large and visible part of the Part 150 program at MSP. The MAC designed the MSP residential noise mitigation program using FAA structural Noise Level Reduction (NLR) documentation to establish product-specific Sound Transmission Class (STC) ratings and associated NLR goals, creative bidding practices, and cooperative prioritization and funding efforts. Through innovative approaches to enhancing the program as new information and technologies became available, the MSP residential noise mitigation program quickly became a national model.

Because testing and evaluation of single-family homes near MSP indicated that the majority of such homes provided an average 30 decibels (dB) of outside-to-inside sound attenuation, the MAC developed a "5 dB package" for single-family homes within the 65 DNL and greater noise contours. This package provided an average exterior-to-interior noise reduction level of 5 dB, ensuring a noticeable level of reduction designed to meet the FAA's target of a 45 DNL interior noise level in

each home.[1] The 5 dB package offered a menu of mitigation measures that the MAC might install to achieve an average 5 dB noise reduction and meet the 45 DNL interior noise level in an individual home. The menu of mitigation measures included: windows; prime doors; attic insulation; baffling of attic vents, mail slots and chimneys; and the addition of central air-conditioning. The MAC determined which specific mitigation measures were necessary for a particular home after assessing the home's existing condition.

As a result of detailed and extensive project management and quality control, the program achieved an excellent record of homeowner satisfaction. Throughout the duration of the program, when homeowners were asked if the improvements were effective at reducing aircraft noise, at least 95 percent responded yes. When asked if the modifications improved interior home comfort, at least 95 percent responded yes.

In 2004, the MAC awarded the final bids for the remaining unmitigated homes in the 1996 65 DNL noise contour. In early 2006, the MAC completed the mitigation of an additional 165 single-family homes in the 2007 forecast mitigated 65 DNL noise contour. With the completion of the 165 single-family homes, all eligible and participating homes within the 2007 forecast mitigated 65 DNL contour have been mitigated. This represented a significant accomplishment for an industry-leading airport noise mitigation program. The program resulted in the mitigation of over 7,800 single-family homes in communities around MSP.

The financial investment in the MSP Residential Sound Insulation Program was among the largest in the nation for such programs. Throughout the 14-year project (1992-2006) several variables had an impact on the project's annual financial profile. Year-to-year variations in housing stock and material costs caused fluctuations in the unit, or per-house, costs. This, combined with variations in annual budgets as a result of challenges such as the terrorist attacks of September 11, 2001, resulted in a fluctuating rate of annual home completions.

Annual average mitigation costs per single-family home ranged from a low of $17,300 in 1994 to a high of $45,000 in 2001. The MAC spent a total of approximately $229.5 million on the single-family home mitigation program during its 14-year lifespan.

In addition to the single-family mitigation program, the MAC also mitigated multi-family units and schools, and engaged in property acquisition and relocation. The multi-family component of the residential noise mitigation program started in 2001, and was significantly smaller in both the number of structures mitigated and the associated costs. With completion of multi-family structures in the 1996 65 DNL noise contour, the MAC mitigated approximately 1,327 multi-family units at a total cost of approximately $11.1 million. There were no additional multi-family structures inside the 2007 forecast mitigated 65 DNL noise contour, as such, all eligible and participating multi-family structures within the 2007 forecast mitigated 65 DNL noise contour have been mitigated.

Also, since 1981, the MAC has mitigated 18 schools located around MSP. This total represents all of the schools located within the 1996 65 DNL noise contour. In response to the Minnesota State legislature's directives, the MAC also provided mitigation to certain schools located outside the 1996 65 DNL noise contour. The costs of insulating individual schools varied from $850,000 to $8 million. A total of approximately $52 million was spent on the school sound insulation program.

In addition to the residential and school noise mitigation programs, the MAC implemented a residential property acquisition program that facilitated the relocation of sensitive land uses, such as residential buildings, in noise impact areas. The intent of the residential acquisition program was to address impacted properties in the 1996 65 DNL noise contour, with the property owners and

[1] FAA, *"Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations,"* October 1992, pg. 3-18.

the city in which the respective property resided agreeing that acquisition was the desirable means of mitigating the homes. As a result, the MAC acquired approximately 437 residential properties. In total, the MAC expended approximately $93.0 million on the residential property acquisition program.

1.2 2007 Forecast Mitigated Noise Contour

In late 1998, the MAC authorized an update to the Part 150 program at MSP. The update process began in 1999 with the development of noise contours and noise abatement and land use measures. The MAC published a draft Part 150 Update document in October 2000 and submitted the study, including a 2005 forecast NEM and revised NCP, to the FAA for review. In May 2002, after further consideration of the events of 9/11, the MAC withdrew the study to update the forecast and associated noise contours.

The forecast update process began in February 2003. This effort focused on updating the base case year from a 2000 scenario to a 2002 base case, and updating the forecast year from 2005 to 2007. The purpose of the forecast update was to ensure that the noise contours considered the impacts of the events of September 11, 2001 and ongoing changes in the MSP aircraft fleet. In addition to updating the forecast, the MAC and the MSP Noise Oversight Committee (NOC) conducted a review of the Integrated Noise Model (INM) input methodology and data to ensure continued consensus with the previous contour (i.e., November 2001) development process.

On November 17, 2003, the MAC approved the revised forecast and fleet mix numbers and INM input methodology and data for use in developing the 2002 and 2007 NEMs. In March 2004, the MAC revised the forecast to incorporate certain corrections in general aviation numbers and to reflect Northwest Airline's announcement that it would resume service of five RJ85 aircraft that had previously been taken out of service.

The 2004 Part 150 Update resulted in a comprehensive Noise Compatibility Program (NCP) recommendation. In addition to several land use measures around MSP, the NCP included provisions for a number of operational Noise Abatement (NA) Measures. The aircraft and airport operational noise abatement initiatives in the 2004 Part 150 Update focused on aircraft operation procedures, runway use, departure and arrival flight tracks, voluntary operational agreements with the airlines, and provisions for further evaluation of technology.

The MAC has implemented the operational NA Measures outlined in the November 2004 Part 150 Update NCP that are reflected in the 2007 forecast mitigated noise contour.

Based on the estimate of 582,366 total operations in the 2007 forecast mitigated scenario, approximately 7,234.4 acres are in the 65 DNL noise contour and approximately 15,708.3 acres are in the 60 DNL noise contour. Table 1.1 contains the count of single-family (one to three units per structure) and multi-family (more than three units per structure) dwelling units within the 2007 forecast mitigated noise contours. The counts are based on the block intersect methodology, where all structures on a block that is within or touched by the noise contour are counted. The count of completed units reflects all units that have received mitigation prior to February 2014.

Table 1.1
MINNEAPOLIS-ST.PAUL INTERNATIONAL AIRPORT
Summary of 2007 Forecast Mitigated DNL Noise Contour Single Family and Multi-Family Unit Counts
(Block Intersect Implementation Method, Completed Reflect All Units Completed Prior to February 2014)

City	Count	Dwelling Units Within DNL (dB) Interval									
		Single-Family					Multi-Family				
		60-64	65-69	70-74	75+	Total	60-64	65-69	70-74	75+	Total
Minneapolis	Completed	7260	3078	504	-	10842	851	27	466	-	1344
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	7260	3078	504	-	10842	851	27	466	-	1344
Bloomington	Completed	131	109	40	-	280	256	447	618	-	1321
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	131	109	40	-	280	256	447	618	-	1321
Richfield	Completed	1053	296	-	-	1349	359	14	-	-	373
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	1053	296	-	-	1349	359	14	-	-	373
Eagan	Completed	561	22	-	-	583	-	-	-	-	-
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	561	22	-	-	583	-	-	-	-	-
Mendota Heights	Completed	93	4	-	-	97	-	-	-	-	-
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	93	4	-	-	97	-	-	-	-	-
All Cities	Completed	9098	3509	544	-	13151	1466	488	1084	-	3038
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	9098	3509	544	-	13151	1466	488	1084	-	3038

**Units that declined mitigation or were determined to be ineligible for participation in the current program are not included in the table.*

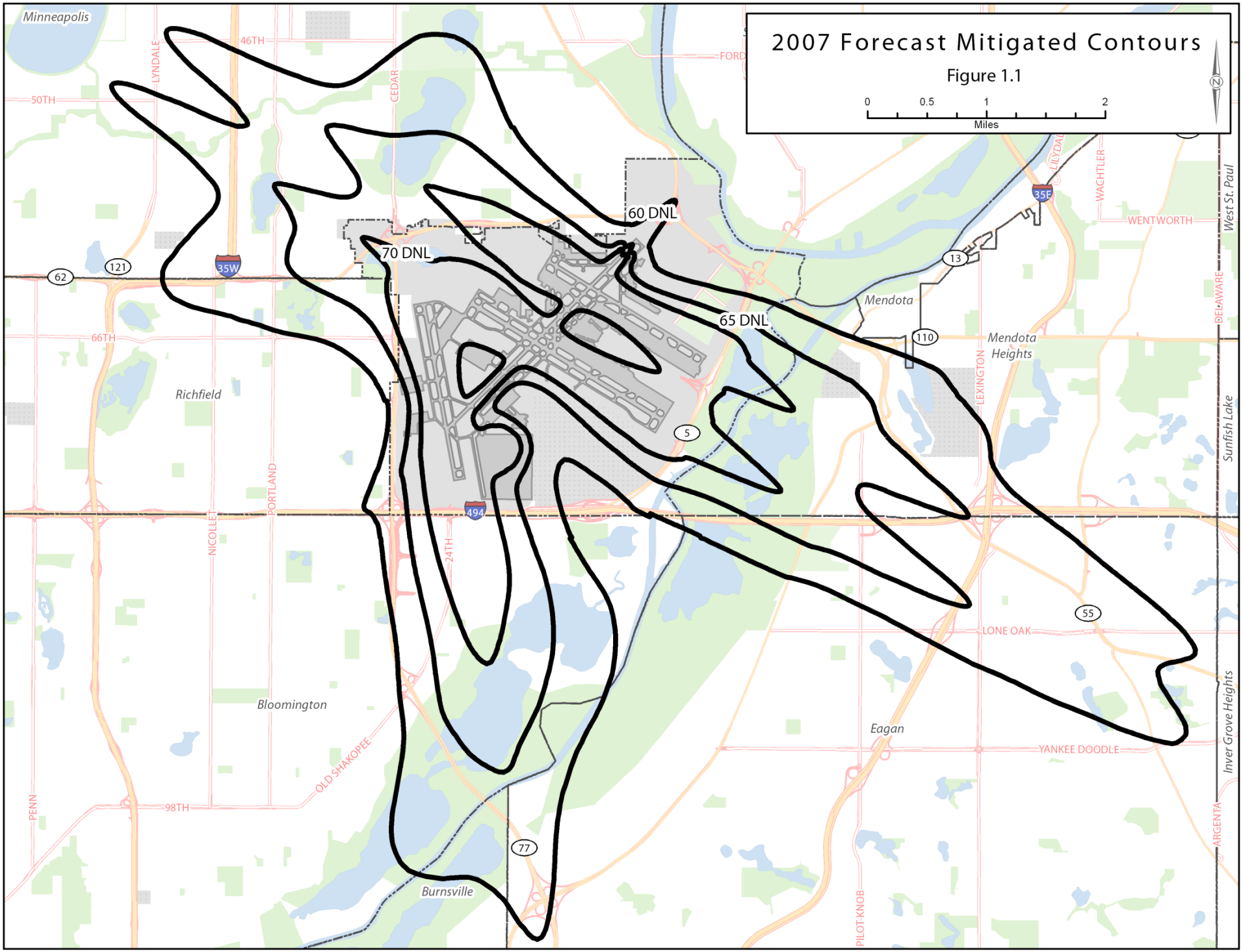
Source: MAC analysis, 2014

All eligible and participating homes within the 2007 forecast mitigated 60 DNL noise contour have been mitigated. As a result of updated parcel information that the MAC obtained from Metro GIS in January 2014, the unit counts in Table 1.1 differ from previous figures published for the 2007 forecast mitigated noise contours in the November 2004 Part 150 Update document. In 2012, the home mitigation phases within the 2007 60 DNL contour were completed. Approximately 1,222 units (310 single-family and 912 multi-family units) did not receive mitigation because either the homeowner declined or they were determined to be ineligible. A depiction of the 2007 forecast mitigated noise contours are provided in Figure 1.1.

1.3 Airport Noise Litigation

One of the largest discussion items in the Part 150 Update process that began in 1999 focused on the mitigation program that the MAC would offer in the 64 to 60 DNL noise contour area. The FAA recognizes sensitive land uses, such as residential land uses eligible for noise mitigation under Part 150, only within the 65 and greater DNL noise contours. However, as part of the Dual-Track Airport Planning Process, the MAC made a policy decision to provide some level of noise mitigation out to the 60 DNL noise contour at MSP. During the Dual-Track Airport Planning Process, an MSP Noise Mitigation Committee was developed and tasked with proposing a noise mitigation plan to be considered in conjunction with the expansion of MSP at its present location.

Throughout the entire Part 150 Update process, the intent of the MSP Noise Mitigation Committee's recommendation regarding mitigation outside the 65 DNL contour was a topic of detailed discussion and debate. During the course of the Part 150 Update process the MAC formulated a number of mitigation proposals, culminating in a final MAC position on mitigation outside the 65 DNL contour. In the November 2004 Part 150 Update, the MAC's recommendation for mitigation in the 64 to 60 DNL contours called for providing central air-conditioning to single-family homes that did not have it, with a homeowner co-pay based on the degree of noise impact.


2007 Forecast Mitigated Contours
Figure 1.1
0
0.5
1
2
Miles
60 DNL
70 DNL
65 DNL
Minneapolis
Richfield
Bloomington
Eagan
Burnsville
Mendota
Mendota Heights
West St. Paul
Sunfish Lake
Inver Grove Heights
46TH
50TH
66TH
98TH
LYNDALE
CEDAR
NICOLLET
PORTLAND
24TH
OLD SHAKOPEE
PENN
FORD
LILYDALE
WACHTLER
WENTWORTH
DELAWARE
LEXINGTON
LONE OAK
YANKEE DOODLE
ARGENTA
PILOT KNOB
35W
35E
494
62
121
13
110
5
55
77

The MAC based eligibility for the mitigation proposal on the 2007 forecast mitigated noise contour using the block intersect methodology. The cities located around MSP expressed dissatisfaction with the MAC proposal, asserting that the MSP Noise Mitigation Committee recommended that the 5 dB package was to be expanded to all properties in the 64 to 60 DNL noise contours. The MAC countered that the MSP Noise Mitigation Committee recommendations did not specify the mitigation package elements to be offered in the 64 to 60 DNL noise contour area and that, because homes in Minnesota have higher than the national average pre-existing noise attenuation characteristics, the full 5 dB package was not necessary outside the 65 DNL contour.

In early 2005, the Cities of Minneapolis, Eagan, and Richfield filed suit in Hennepin County District Court claiming, among other things, the MAC violated environmental quality standards and the Minnesota Environmental Rights Act (MERA) by failing to provide a 5 dB package to single-family homes in the 64 to 60 DNL contours. In September 2005, plaintiffs seeking class action certification filed a separate action against the MAC alleging breach of contract claims associated with mitigation in the 64 to 60 DNL contours. In January 2007, Hennepin County District Judge Stephen Aldrich granted the cities partial summary judgment. The court found, among other things, that the MAC, by virtue of implementing the 5 dB package, created an environmental standard that the MAC violated by recommending different mitigation in the 64 to 60 DNL noise contour area. In February 2007, the court held a trial on the cities' MERA and mandamus claims. Before the court entered final judgment post-trial, however, the parties negotiated a global settlement resolving the cities' case and the class action suit.

1.4 Noise Mitigation Settlement and Annual Noise Contour Analysis

On October 19, 2007, Judge Stephen Aldrich approved a Consent Decree entered into by the MAC and the Cities of Minneapolis, Eagan, and Richfield and the Minneapolis Public Housing Authority that settled the cities' litigation. The Consent Decree provided that it became effective only if: (1) the FAA advised the MAC in writing by November 15, 2007 that the Decree was an appropriate use of airport revenue and was consistent with the MAC's federal grant obligations; and (2) that the court approved a settlement in the class action case by January 17, 2008. Both of these conditions were satisfied, and the MAC began implementing single-family and multi-family mitigation out to the 2007 60 DNL noise contours and mitigation reimbursement funds out to the 2005 60 DNL noise contours, as the Consent Decree requires. Under the Decree, mitigation activities will vary based on noise contour. Homes in the most noise-impacted contours are eligible for more extensive mitigation than those in less-impacted areas.

The 2007 Consent Decree provides that approximately 457 homes in the 2007 64 to 63 DNL forecast noise contours were eligible to receive the same level of noise mitigation that the MAC provided in the 1996 65 DNL and greater contours. The 2007 64 to 63 DNL noise contour mitigation program was designed to achieve 5 dB of noise reduction on average, with mitigation measures that may include the following, depending upon the home's existing condition: central air-conditioning; exterior and storm window repair or replacement; prime door and storm door repair or replacement; wall and attic insulation; baffling of roof vents and chimney treatment. The Decree requires that the MAC complete construction of mitigation in the 2007 64 and 63 DNL noise contours by December 31, 2009. The MAC has completed this task.

In addition, under the Decree, owners of the approximately 5,428 single-family homes in the 2007 62 to 60 DNL noise contours would be eligible for one of two mitigation packages: 1) homes that did not have central air-conditioning as of September 1, 2007 would receive it and up to $4,000 (including installation costs) in other noise mitigation products and services they could choose from a menu provided by the MAC; or 2) owners of homes that already had central air-conditioning

installed as of September 1, 2007 or who chose *not* to receive central air-conditioning would be eligible for up to $14,000 (including installation costs) in noise mitigation products and services they could choose from a menu provided by the MAC. The mitigation menu included upgrades such as: exterior and storm window repair or replacement; prime door and storm door repair or replacement; wall and attic insulation; and baffling of roof vents and chimney treatment. The Decree requires that the MAC complete construction of mitigation in the 2007 62 to 60 DNL contours by December 1, 2012. The MAC has completed this task.

According to the provisions in the Consent Decree, single-family homes in the 2007 64 and 63 DNL contours and in the 2007 62 to 60 DNL contours whose earlier owners opted out of the previously-completed MAC noise mitigation program for the 1996 65 and greater DNL contours, but that had new owners on September 1, 2007, are eligible to "opt in" and receive noise mitigation. If the total cost to the MAC of the opt-in mitigation is less than $7 million, any remaining funds will be used to reimburse owners of single-family homes between the 2005 mitigated 60 DNL contour and the 2007 forecast mitigated 60 DNL contour for purchase and installation of products included on a menu provided by the MAC. The amount each homeowner receives will be determined by subtracting dollars spent for the opt-in program from the total $7 million budget, and then dividing the remainder among the total number of single-family homes within the 2005 60 DNL and 2007 60 DNL contours. The MAC has begun to issue reimbursements and will complete them by July 31, 2014. The total cost of the "opt-in" mitigation and the 2005 mitigated 60 DNL contour reimbursement mitigation program is capped at $7 million.

The MAC began implementing the Noise Mitigation Program in October 2007 following the terms and conditions of the Consent Decree that settled the noise mitigation lawsuit.

As of December 2012, the MAC completed the 5 dB reduction noise mitigation program for all of the single-family homes in the 2007 63-64 DNL contours. (404 homes participated in the program.) In addition, the MAC completed all of the single-family homes in the 2007 60-62 DNL contours in December 2012. (5,055 homes participated in the program.) As of February 2014, a total of 1,363 single-family homes between the 2005 mitigated 60 DNL contour and the 2007 forecast mitigated 60 DNL contour have been provided reimbursements for approved noise mitigation enhancements. With regard to the multi-family noise mitigation program, the MAC has installed acoustical covers on the air-conditioners or completed the installation of new air-conditioning units in 1,646 living units marking completion of that program in 2010.

The total cost to implement mitigation under the Consent Decree is uncertain until the program is complete, but it could cost as much as $95 million, which is inclusive of the $7 million for opt-in mitigation and single-family mitigation reimbursement.

In addition to the MAC's mitigation obligations, the Consent Decree releases legal claims that the cities and homeowners have against the MAC in exchange for the actions that the MAC will perform under the Decree. (Consent Decree Section 8.1, p. 38). The releases cease to be effective for a certain location if the average annual aircraft noise level in DNL at that location is at or above DNL 60 and is at least 2 dB in DNL higher than the DNL level for that location in the 2007 mitigated noise contours. The MAC determines future DNL values by using the FAA's INM and actual MSP operations data to generate a noise contour reflecting noise conditions at MSP for the prior calendar year. (Consent Decree Section 8.1(d), pp. 38-39.) The MAC must develop a noise contour reflecting noise conditions for the prior calendar year by March 1 of each year. The MAC has prepared this report to satisfy Section 8.1(d) of the Consent Decree. The actual contour that the MAC must develop under Section 8.1(d) of the Consent Decree is relevant to the release provisions in Section 8.1 as well as the determination of mitigation eligibility as defined by an amendment to the Consent Decree, described in Chapter 4 of this report. MAC staff and

representatives from the Cities of Minneapolis, Eagan, and Richfield met on February 11 and 20, 2008 to discuss and finalize the annual report format.

1.5 Final MSP 2020 Improvements Environmental Assessment/Environmental Assessment Work Sheet (EA/EAW)

In January 2013, the MAC published the Final MSP 2020 Improvements Environmental Assessment/Environmental Assessment Worksheet (EA/EAW), which reviewed the potential and cumulative environmental impacts of MSP terminal and landside developments needed through the year 2020. Of the several development alternatives examined, Alternative 2 – Airlines Relocate was determined to be the Preferred Alternative. This alternative outlined improvements needed to 2020, presuming that the non-SkyTeam airlines currently located in Terminal 1-Lindbergh are relocated to Terminal 2-Humphrey. SkyTeam is an alliance of 19 member airlines, including Delta Air Lines. This development was supported in recognition of the fact that the two-terminal system could be utilized more efficiently by relocating all airlines other than the SkyTeam airlines to Terminal 2-Humphrey and developing terminal and land side infrastructure accordingly to accommodate future forecasted demand. This would relieve capacity constraints at Terminal 1-Lindbergh while better balancing the mix of passengers and landside capacity at the two terminals.

As is detailed in the EA/EAW, the FAA Finding of No Significant Impact/Record of Decision (FONSI/ROD) and summarized in the MAC's related Findings of Fact, Conclusions of Law, and Order, the Preferred Alternative scenario does not have the potential for significant environmental effects. The forecasted noise contours around MSP are driven by natural traffic growth that is anticipated to occur with or without implementation of the 2020 Improvements.

However, given past noise mitigation activities surrounding MSP, the terms of the 2007 Consent Decree in *City of Minneapolis, et. al. v. Metropolitan Airports Commission*, and local land use compatibility guidelines defined by the Metropolitan Council, many of the public comments on the EA/EAW focused on future noise mitigation efforts. Additionally, the anticipated completion of the Consent Decree noise mitigation program in 2014, and the possible implementation of Performance-Based Navigation (PBN) procedures by the Federal Aviation Administration (FAA) at MSP contemplated at the time of the EA/EAW comment period, raised community interest regarding future of noise mitigation at MSP.

In response, MAC staff, in consultation with the MSP Noise Oversight Committee (NOC), began the process of developing a noise mitigation plan to be included in the EA/EAW. The resulting recommended noise mitigation program established that noise mitigation program eligibility be based upon actual noise contours that the MAC would prepare for MSP on an annual basis. To be eligible for noise mitigation, a home would need to be located for three consecutive years in a higher noise mitigation impact level when compared to the home's status under the terms of the 2007 Consent Decree.

The Final MSP 2020 Improvements EA/EAW detailed the following mitigation program elements:

- Mitigation eligibility would be assessed annually based on the actual noise contours for the previous year.
- The annual mitigation assessment would begin with the actual noise contour for the year in which the FAA FONSI/ROD for the EA/EAW was issued.
- For a home to be considered eligible for mitigation it must be located in the actual 60+ DNL noise contour, within a higher noise impact mitigation area when compared to its

status relative to the Consent Decree noise mitigation program, for a total of three consecutive years, with the first of the three years beginning no later than 2020.
- The noise contour boundary would be based on the block intersect methodology.
- Homes would be mitigated in the year following their eligibility determination.

On January 7, 2013, the FAA published the Final MSP 2020 Improvements EA/EAW and the Draft Finding of No Significant Impact/Record of Decision (FONSI/ROD), which included the following position regarding the proposed noise mitigation program:

> "*The FAA is reviewing MAC's proposal for noise mitigation of homes for consistency with the 1999 FAA Policy and Procedures concerning the use of airport revenue and other applicable policy guidance."*

During the public comment period on the FAA's Draft FONSI/ROD many communities submitted comments urging the FAA to approve the MAC's revised noise mitigation proposal.

On March 5, 2013, the FAA approved the FONSI/ROD for the Final MSP 2020 Improvements EA/EAW. Specifically, in the approved FONSI/ROD (pg. 15), the FAA stated that noise mitigation would not be a condition of FAA approval of the MSP 2020 Improvements project because "[n]o areas of sensitive land uses would experience a 1.5 dB or greater increase in the 65 DNL noise contour when comparing the No Action Alternative for 2020 and 2025 with the Proposed Action [Preferred Alternative – Airlines Relocate scenario] for the respective years." However, the FAA included a letter dated March 5, 2013, as Attachment D to the FONSI/ROD that addresses the conditions under which airport revenue may be used for off-airport noise mitigation. In that letter, the FAA stated:

> *"As a matter of general principle mitigation measures imposed by a state court as part of a consent decree are eligible for use of airport revenue. Conceptually MAC could use airport revenues if it were to amend the 2007 consent decree to include the proposed mitigation."*

Based on the FAA guidance, the MAC initiated discussions with the other parties to the Consent Decree (City of Minneapolis, Minneapolis Public Housing Authority, City of Richfield and City of Eagan) to begin the amendment process. Additionally, at the March 20, 2013, NOC meeting, the Committee was updated on the progress of this issue and voted unanimously, supporting the following position:

> *"NOC supports the noise mitigation program as detailed in the final EA/EAW in principal and supports follow-up negotiations between the parties to the Consent Decree to establish mutually agreeable terms for the modification of the Consent Decree consistent with the March 5th FAA letter in Appendix D of the FONSI ROD, for consideration by the Court."*

This report was updated to provide maps analyzing changes that occur in noise mitigation eligibility as compared to the 2007 Consent Decree, and associated trends relative to consecutive yearly impacts. This information is detailed in Chapter 4.

Chapter

2 2013 Actual Noise Contour

As discussed previously, Section 8.1(d) of the Consent Decree requires the MAC to prepare, by March 1 of each year, an actual noise contour reflecting the noise conditions around MSP for the prior calendar year. This chapter provides detailed information on the 2013 actual noise contour at MSP.

2.1 2013 Actual Noise Contour Development

2.1.1 Integrated Noise Model

The FAA-established mechanism for quantifying airport noise impacts is the Integrated Noise Model (INM). The availability of federal or airport-generated funds for the purpose of noise mitigation efforts is contingent upon the development of a Noise Exposure Map (DNL noise contours) in a manner that is consistent with the federal criteria (i.e., INM and DNL). The INM is used to assess the noise impact of aircraft operations. The INM uses input files consisting of information relative to runway use, flight track use, aircraft fleet mix, aircraft performance and thrust settings, topography information, and atmospheric conditions to generate a Noise Exposure Map. The DNL metric adds a 10-decibel penalty to aircraft operations that occur between the hours of 10 p.m. and 7 a.m. to account for relatively low nighttime ambient noise levels and the fact that most people are asleep during this time. The computer model generates contours that depict an annualized average day of aircraft noise impacts. The DNL contours generated are the focal point of any noise mitigation measure proposed in a Part 150 program.

Quantifying aircraft-specific noise characteristics in INM is accomplished through the use of a comprehensive noise database that has been developed under the auspices of Federal Aviation Regulation (FAR) Part 36. As part of the airworthiness certification process, aircraft manufacturers are required to subject aircraft to a battery of noise tests. Through the use of federally adopted and endorsed algorithms, this aircraft-specific noise information is used in the generation of INM DNL contours. Justification for such an approach is rooted in national standardization of noise quantification at airports. The FAA Office of Environment and Energy developed the INM. Since 1978, the INM has been the FAA's standard tool for determining the predicted noise impact in the vicinity of airports. The INM is designed to estimate long-term average effects using average annual input conditions. The current version of INM, 7.0d, was released in May 2013, and was used to develop the 2013 actual noise contour. The 2012 actual noise contour was calculated using INM version 7.0c. The 7.0d version update includes software and modeling corrections and a number of database updates. Particularly applicable to MSP is the addition of four new Embraer aircraft to INM 7.0d. The MAC contracted with an aviation consulting group, HNTB Corporation, to provide INM data processing used in the preparation of the 2013 actual noise contour.

2.1.2 2013 Aircraft Operations and Fleet Mix

The past 13 years have presented many challenges to the aviation industry. From a local perspective, operational levels and the aircraft fleet mix at MSP have been subject to effects from the events of September 11, 2001, high fuel prices, a flurry of bankruptcy filings by several legacy

airlines including Northwest Airlines, and an economic recession. Additionally, overall market forces appear to be favoring consolidation, as indicated by major airline acquisitions and mergers, beginning with Delta Air Lines' acquisition of Northwest Airlines in 2008, followed by United Airlines' acquisition of Continental Airlines in 2012 and the merger of American Airlines and US Airways in 2013. These developments have had profound effects on airline and airport operations. For example, the actual 2013 operational level at MSP is below the operational level documented at the airport over 20 years ago.

The MAC derived MSP operations numbers for this study from the MAC's Noise and Operations Monitoring System (MACNOMS) data. The MACNOMS total operations number was 0.3 percent lower than the FAA Air Traffic Activity Data System (ATADS) number. To rectify the numbers, the MAC adjusted the MACNOMS data upward to equal the total 2013 FAA ATADS number. Table 2.1 provides the total number of 2013 aircraft operations at MSP by operational category. The 2013 total operations number of 431,573 is up from the 2012 number of 424,928 (1.6 percent increase).

Considering the multi-faceted nature of the variables that are presently impacting the operational level at MSP, forecasting long-term operational implications is complex. All signs, however, in the near-term seem to point to a fundamental change in the nature of airline operations at MSP, especially in the type of aircraft flown by all airlines and in particular by Delta Air Lines. Specifically, Modified Stage 3 hushkit operations dropped to a low of four total monthly operations in October 2013. By January 2014 scheduled DC9 hushkit operations by the air carriers at MSP had ceased.

Table 2.1
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Total Operations

Operations Category	2013 Operations
Scheduled Passenger Air Carrier (a)	396,481
Cargo	11,701
Charter	95
GA	20,752
Military	2,544
TOTAL	**431,573**

(a) Includes both air carrier and regional carrier operations

Source: Actual year-to-date 2013 MACNOMS data adjusted to match FAA ATADS data (to account for unavailable MACNOMS operations data).

The use of newer and quieter manufactured Stage 3 aircraft is on the rise. Some examples at MSP of these newer aircraft are the Airbus A320/319, Regional Jets (CRJ-200/900 and EMB-170), Boeing B757-200/300, Boeing B737-700/800, and MD90.

When comparing the DC9 hushkitted aircraft to the CRJ-200 regional jet, 43 CRJ operations would be required to generate the same noise impact as one DC9 operation. The CRJ-200 aircraft represents newer technology engine noise emission levels.

Table 2.2 provides a breakdown of the 2013 aircraft fleet mix at MSP. The average daily number of hushkitted aircraft operations was down in 2013 to 0.2 from 2.4 in 2012. In 2013, the average daily number of total nighttime operations was 95.0, down from the 98.4 average daily nighttime operations in 2012. Overall, the 2013 total average daily operations number of 1182.4 is up slightly by 1.8 percent from the 1161.0 average daily operations in 2012[2].

[2] 2012 was a leap year, therefore MAC analysis used 366 days to develop the annual average daily operations.

Table 2.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Aircraft Fleet Mix Average Daily Operations

Group	INM Aircraft Type	Day	Night	Total
Manufactured/Re-engined Stage 3 Jet	717200	6.9	2.2	9.0
	737300	11.1	1.1	12.2
	737400	0.3	0.1	0.4
	737500	0.1	0.0	0.1
	737700	40.1	8.6	48.7
	737800	39.2	10.6	49.8
	737900	1.3	0.2	1.4
	747400	0.1	0.0	0.1
	747R21	0.0	-	0.0
	757300	16.8	1.2	18.0
	757PW	47.9	7.2	55.1
	757RR	1.0	1.5	2.5
	767300	4.9	1.1	6.0
	767400	1.6	0.5	2.1
	767CF6	0.0	0.0	0.0
	767JT9	1.2	0.1	1.3
	777200	0.3	-	0.3
	7773ER	1.7	-	1.7
	A300-622R	0.2	0.1	0.3
	A310-304	0.1	0.1	0.2
	A319-131	60.3	5.3	65.5
	A320-232	83.6	8.1	91.7
	A321-232	3.1	2.0	5.2
	A330-343	7.8	0.5	8.2
	A340-642	0.0	-	0.0
	AN124	0.0	0.0	0.0
	BD100	3.7	0.3	4.0
	BD700	0.1	0.0	0.1
	BEC400	0.8	0.0	0.9
	CL600	0.0	0.0	0.0
	CL601	0.9	0.1	1.0
	CLREGJ	269.5	9.6	279.1
	CNA500	0.1	0.0	0.1
	CNA501	0.0	0.0	0.0
	CNA525C	0.3	0.0	0.3
	CNA550	0.0	-	0.0
	CNA551	0.1	0.0	0.2
	CNA55B	0.2	0.0	0.3
	CNA560E	0.8	0.0	0.8
	CNA560U	0.3	0.0	0.4
	CNA560XL	3.1	0.2	3.3
	CNA650	0.3	0.0	0.3
	CNA680	1.6	0.1	1.7
	CNA750	4.2	0.4	4.6
	CRJ701	41.3	3.7	45.1
	CRJ900	82.9	3.7	86.6
	D328J	0.3	0.0	0.3
	DC1010	1.7	0.5	2.2
	DC1030	0.0	-	0.0
	EMB120	0.0	0.0	0.0
	EMB135	12.7	1.3	14.0
	EMB140	0.0	0.0	0.0
	EMB145	2.9	0.2	3.1
	EMB14L	3.7	0.5	4.2
	EMB170	136.8	8.5	145.3

Table 2.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Aircraft Fleet Mix Average Daily Operations

Group	INM Aircraft Type	Day	Night	Total
Manufactured/Re-engined Stage 3 Jet	EMB190	5.0	0.0	5.0
	FAL10	0.0	0.0	0.0
	FAL20A	0.8	0.1	0.8
	FAL50	0.7	0.1	0.8
	FAL900	0.8	0.1	0.9
	G150	0.2	0.0	0.2
	G200	2.1	0.2	2.4
	GIV	1.2	0.1	1.3
	GV	1.0	0.1	1.0
	HK4000	0.0	-	0.0
	HS125	0.0	-	0.0
	HS1258	1.9	0.2	2.0
	IA1124	0.0	-	0.0
	IA1125	0.1	-	0.1
	IL76	0.0	0.0	0.0
	JST2TF	0.0	-	0.0
	LEAR31	0.1	0.0	0.1
	LEAR35	0.7	0.1	0.8
	LEAR45	0.9	0.0	1.0
	LEAR55	0.1	-	0.1
	LEAR60	0.5	0.0	0.6
	MD11GE	1.5	1.2	2.7
	MD11PW	1.5	1.5	2.9
	MD80	5.7	0.6	6.3
	MD81	0.0	-	0.0
	MD82	1.6	0.2	1.8
	MD83	6.2	0.8	7.0
	MD88	27.4	1.7	29.1
	MD9025	36.0	2.5	38.5
	MD9028	45.3	2.0	47.2
	R390	0.1	0.0	0.1
	Total	1,039.6	91.4	1,130.9
Hushkit Stage 3 Jet	727EM2	0.0	0.0	0.1
	737N17	0.0	-	0.0
	DC93LW	0.0	0.0	0.0
	DC95HW	0.1	0.0	0.1
	DC9Q7	0.0	-	0.0
	Total	0.2	0.0	0.2
Microjet	CNA510	0.2	0.0	0.2
	ECLIPSE500	0.1	0.0	0.1
	Total	0.3	0.0	0.3
Stage 2 Less than 75,000 lb. MTOW	FAL20	0.3	0.6	0.8
	GII	0.0	-	0.0
	GULF3	0.0	0.0	0.0
	LEAR24	0.0	-	0.0
	Total	0.3	0.6	0.9
Propeller	1900D	38.8	1.9	40.7
	AC50	-	0.0	0.0
	ATR42	1.2	0.3	1.5
	ATR72	0.0	0.0	0.0
	BEC200	0.9	0.1	1.0
	BEC300	0.5	0.1	0.5
	BEC30B	0.1	0.0	0.1
	BEC33	0.0	-	0.0

Table 2.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Aircraft Fleet Mix Average Daily Operations

Group	INM Aircraft Type	Day	Night	Total
Propeller	BEC55	0.0	-	0.0
	BEC58	0.0	0.0	0.0
	BEC65	1.1	0.2	1.3
	BEC80	0.4	0.0	0.5
	BEC90	0.2	0.0	0.2
	BEC95	0.0	-	0.0
	BEC99	0.8	0.1	0.9
	BEC9F	0.0	-	0.0
	BECM35	0.0	-	0.0
	CNA172	0.0	-	0.0
	CNA182	0.0	-	0.0
	CNA206	0.0	-	0.0
	CNA207	0.0	0.0	0.0
	CNA208	0.1	0.0	0.1
	CNA210	0.0	-	0.0
	CNA303	0.0	-	0.0
	CNA310	0.0	0.0	0.0
	CNA337	0.0	0.0	0.0
	CNA340	0.1	0.0	0.1
	CNA402	0.0	-	0.0
	CNA414	0.1	0.0	0.1
	CNA421	0.2	-	0.2
	CNA425	0.0	-	0.0
	CNA441	0.1	0.0	0.1
	CNV240	-	0.0	0.0
	DA42	0.0	-	0.0
	EMB110	0.0	-	0.0
	GASEPV	0.0	-	0.0
	M20J	0.1	0.0	0.1
	P180	0.1	0.0	0.2
	PA23AZ	0.0	-	0.0
	PA28	0.0	-	0.0
	PA28AR	0.0	-	0.0
	PA28DK	0.0	-	0.0
	PA31	0.1	0.0	0.1
	PA31T	0.0	0.0	0.0
	PA32LA	0.0	-	0.0
	PA32SG	0.0	-	0.0
	PA34	0.0	-	0.0
	PA42	0.0	-	0.0
	PA46	0.0	0.0	0.0
	PC12	0.2	0.0	0.3
	RWCM69	0.0	-	0.0
	SA227	0.0	-	0.0
	SAMER3	0.0	-	0.0
	SAMER4	0.7	0.1	0.8
	SD360	0.0	0.0	0.0
	SF340	0.0	-	0.0
	SR22	0.2	0.0	0.2
	STBM7	0.0	0.0	0.0
	TED600	0.0	0.0	0.0
	Total	46.6	2.9	49.6

Table 2.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Aircraft Fleet Mix Average Daily Operations

Group	INM Aircraft Type	Day	Night	Total
Helicopter	A109	-	0.0	0.0
	B206L	0.0	-	0.0
	B407	0.0	-	0.0
	R44	0.0	-	0.0
	SA350D	0.0	-	0.0
	Total	0.1	0.0	0.1
Military	C-130E	0.4	0.0	0.4
	T34	0.0	-	0.0
	T6	0.0	-	0.0
	Total	0.4	0.0	0.4
Grand Total		**1,087.4**	**95.0**	**1,182.4**

Note: Totals may differ due to rounding.

Source: MAC-provided INM Input Data, HNTB 2014

2.1.3 2013 Runway Use

FAA control of runway use throughout the year for arrival and departure operations at MSP has a notable effect on the noise impact around the airport. The number of people and dwellings impacted by noise is a direct result of the number of operations on a given runway and the land uses off the end of the runway.

Historically, prior to the opening of Runway 17/35, arrival and departure operations occurred on the parallel runways at MSP (12L/30R and 12R/30L) in a manner that resulted in approximately 50 percent of the arrival and departure operations occurring to the northwest over South Minneapolis and 50 percent to the southeast over Mendota Heights and Eagan. As a result of the dense residential land uses to the northwest and the predominantly industrial/commercial land uses to the southeast of MSP, focusing departure operations to the southeast has long been the preferred operational configuration from a noise reduction perspective.

Since the introduction of Runway 17/35 at MSP in 2005, another opportunity exists to route aircraft over an unpopulated area – the Minnesota River Valley. With use of the Runway 17 Departure Procedure, westbound departure operations are routed such that they avoid close-in residential areas southwest of Runway 17. Thus, use of Runway 17 for departure operations is the second preferred operational configuration (after Runways 12L and 12R) for noise reduction purposes.

Table 2.3 provides the runway use percentages for 2013. From 2012 to 2013 arrival operation percentages decreased on Runways 12L, 12R and 35 and increased on Runways 30L and 30R. There were no changes in the arrival operation percentages on Runways 4, 17 and 22. The most notable change in total arrival runway use from 2012 to 2013 was a one percent increase (from 19.2 percent to 20.2 percent) in Runway 30L arrival operations. The most notable change in arrival runway use during the nighttime hours was on Runway 12R, where operations decreased from 29.5 percent in 2012 to 26.0 percent in 2013. Departure operations decreased on Runways 12R, 17 and 30R and increased on Runways 12L and 30L from 2012 to 2013. There were no changes in departure operation percentages on Runways 4, 22 and 35. The most notable change in total departure runway use from 2012 to 2013 was a 2.2 percent increase (from 29.5 percent to 31.7 percent) in Runway 30L departure operations. The most notable change in departure runway use during the nighttime hours was also on Runway 30L, where operations increased from 18.4 percent in 2012 to 23.1 percent in 2013.

Table 2.3
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Runway Use

Operation	Runway	Day	Night	Total
Arrivals	4	0.0%	0.0%	0.0%
	12L	19.1%	14.6%	18.7%
	12R	18.8%	26.0%	19.4%
	17	0.0%	0.1%	0.0%
	22	0.0%	0.0%	0.0%
	30L	18.7%	36.1%	20.2%
	30R	23.6%	20.7%	23.3%
	35	19.7%	2.5%	18.2%
	Total	100.0%	100.0%	100.0%
Departures	4	0.0%	0.0%	0.0%
	12L	12.1%	19.9%	12.7%
	12R	4.7%	26.3%	6.3%
	17	23.8%	16.3%	23.3%
	22	0.0%	0.0%	0.0%
	30L	32.4%	23.1%	31.7%
	30R	27.0%	14.3%	26.0%
	35	0.0%	0.0%	0.0%
	Total	100.0%	100.0%	100.0%
Overall	4	0.0%	0.0%	0.0%
	12L	15.6%	17.1%	15.7%
	12R	11.7%	26.1%	12.8%
	17	12.0%	7.6%	11.6%
	22	0.0%	0.0%	0.0%
	30L	25.6%	30.1%	26.0%
	30R	25.3%	17.7%	24.7%
	35	9.8%	1.3%	9.1%
	Total	100.0%	100.0%	100.0%

Note: Totals may not add up to 100% due to rounding.
Source: MAC-provided INM Input Data, HNTB 2014

2.1.4 2013 Flight Tracks

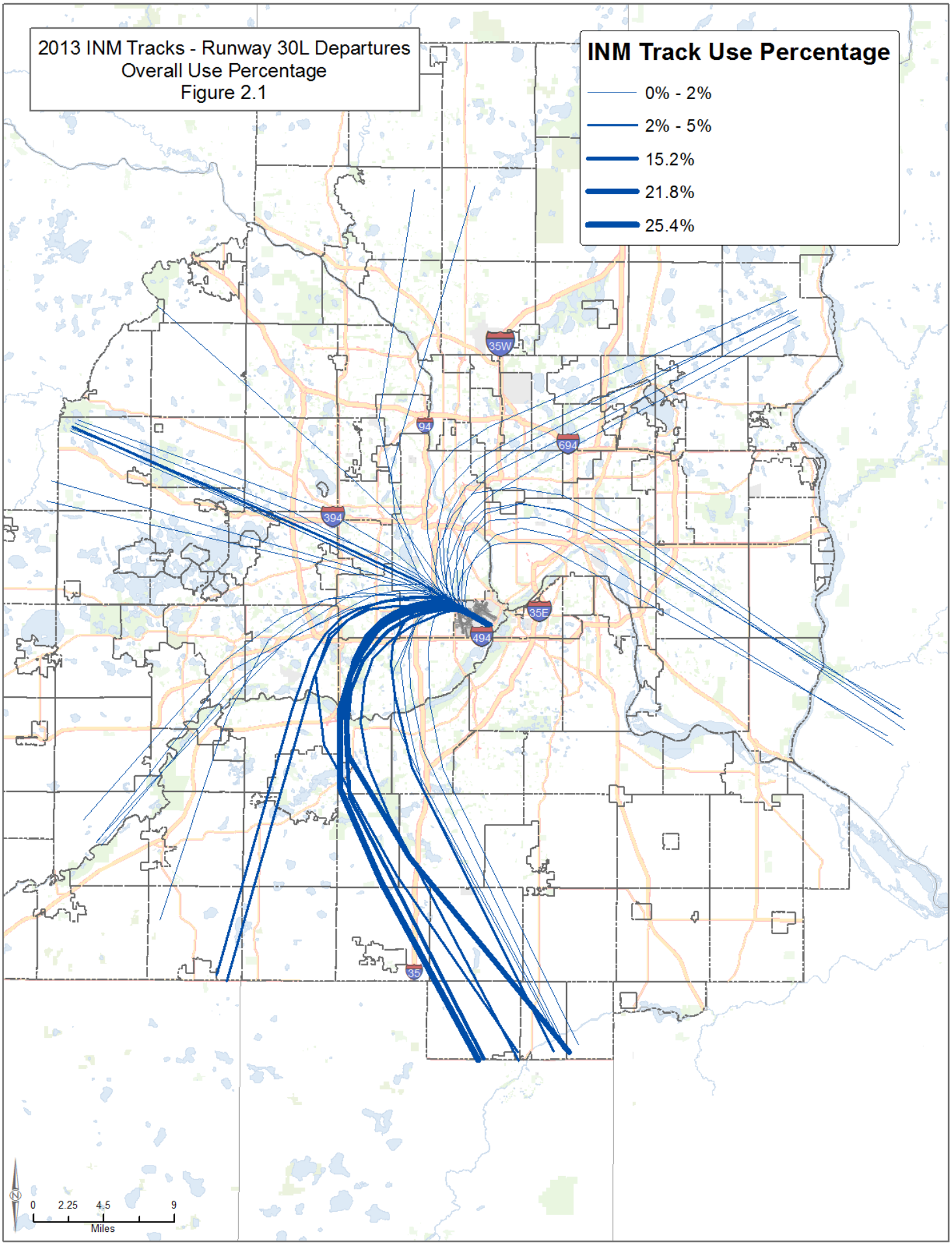
Due to enhanced analysis methodologies and technologies, the INM departure flight track locations used to develop the 2013 actual noise contour have been modified from those used for the 2012 actual noise contour. The tracks also differ from those used to develop the 2007 forecast mitigated noise contour. Subtracks were also added to each of the backbone tracks. The INM's standard distribution was used in distributing the flights to the subtracks. No changes to departure INM tracks on Runways 4, 22 or 35 or INM arrivals tracks were made. Changes were focused within the vicinity of previous MSP noise contours.

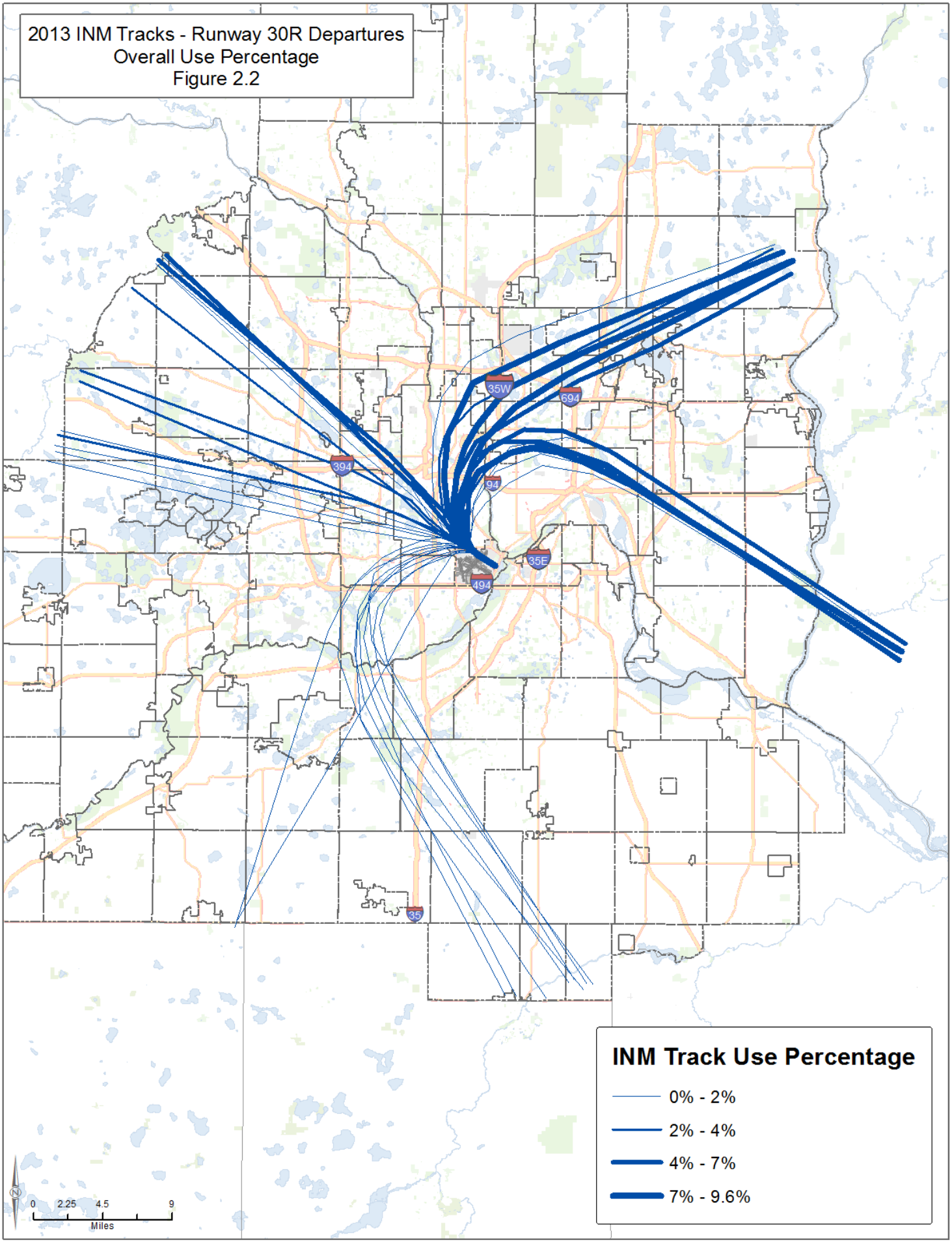
The same methodology as in previous annual reports was used to assign 2013 radar data with the INM flight tracks. The radar-to-INM flight track correlation process employs a best-fit analysis of the radar flight track data based on linear trends. This approach provides the ability to match each radar flight track directly to the appropriate INM track.

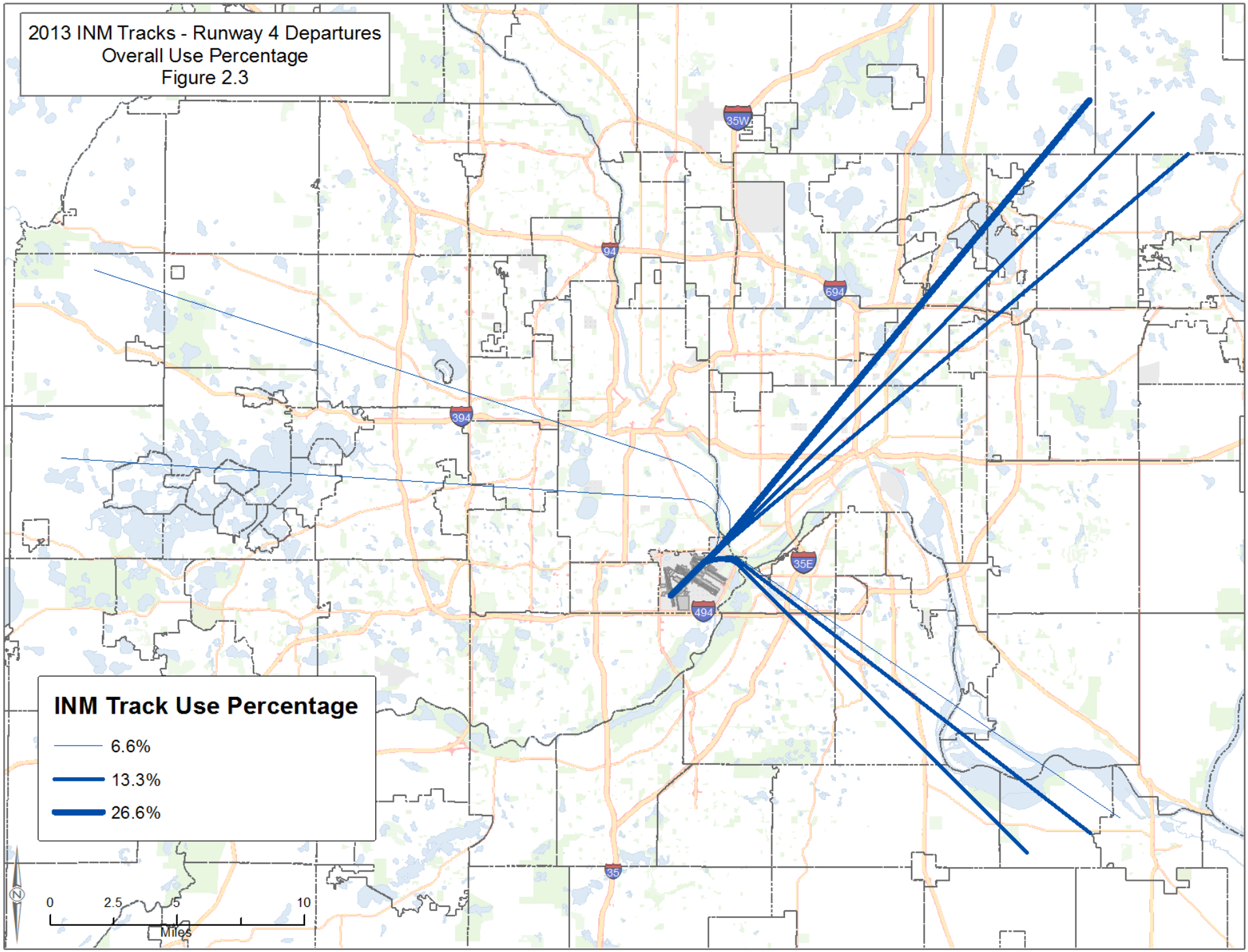
Figures 2.1 to 2.16 provide the updated backbone INM departure and arrival flight track and the use information used to develop the 2013 actual noise contour.

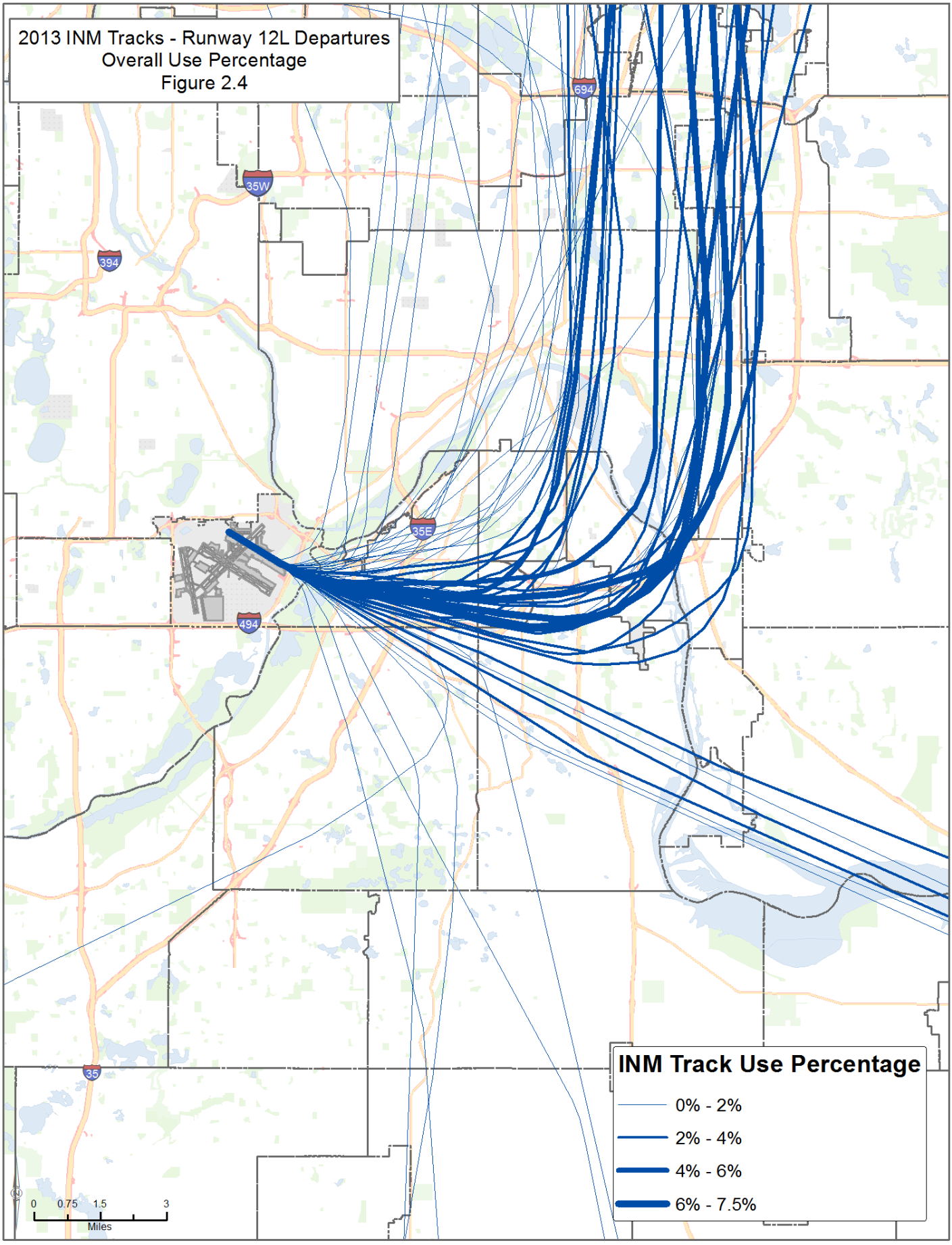
2.1.5 2013 Atmospheric Conditions

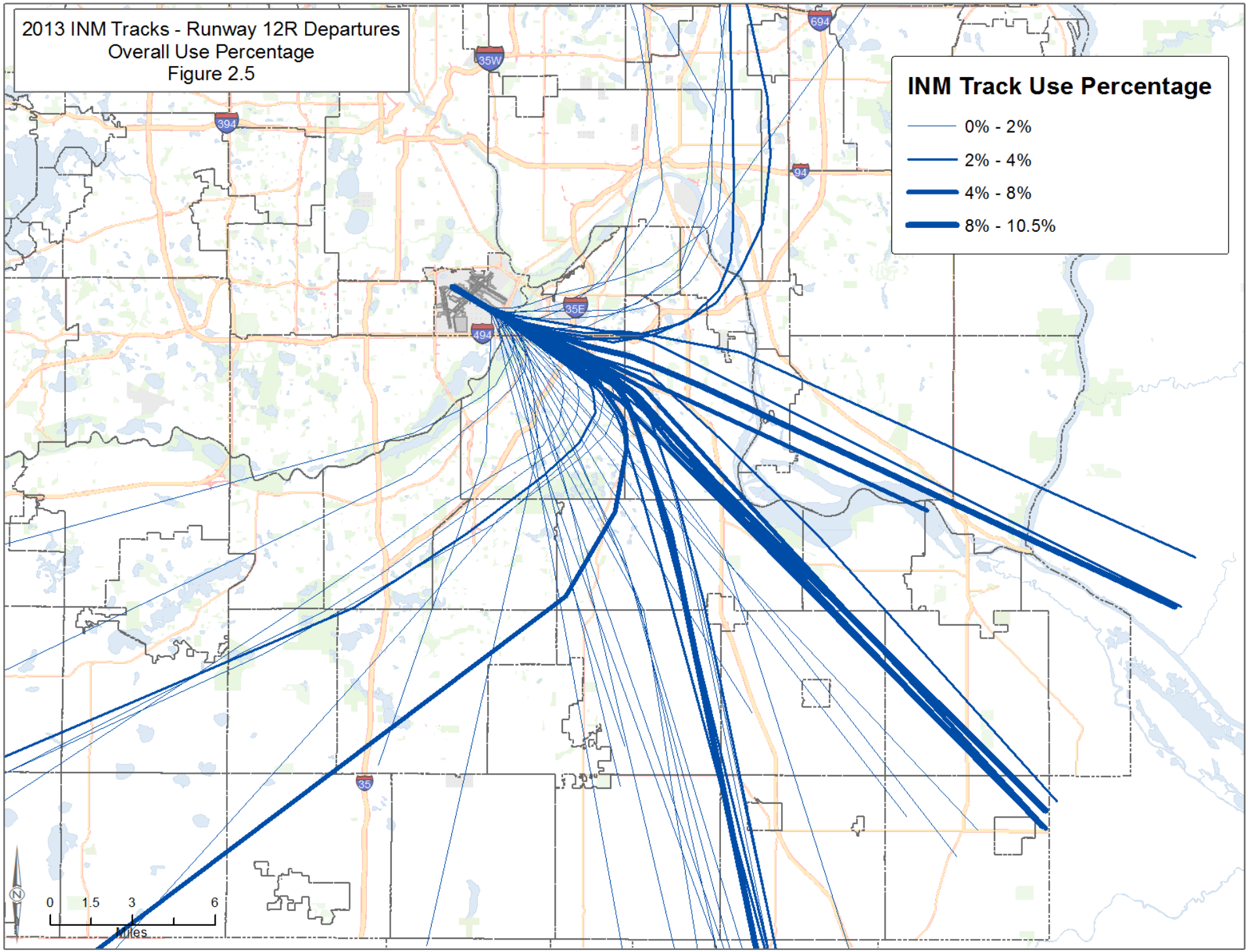
The MAC gathered atmospheric data for the 2013 actual noise contour from the Minnesota State Climatology Office. The 2013 annual average temperature of 45.3 degrees Fahrenheit and 2013 average annual wind speed of 7.6 knots were used in the INM modeling process. The 2013 average annual pressure of 29.93 inches of Mercury and a 2013 annual average relative humidity of 66.2 percent were also used.

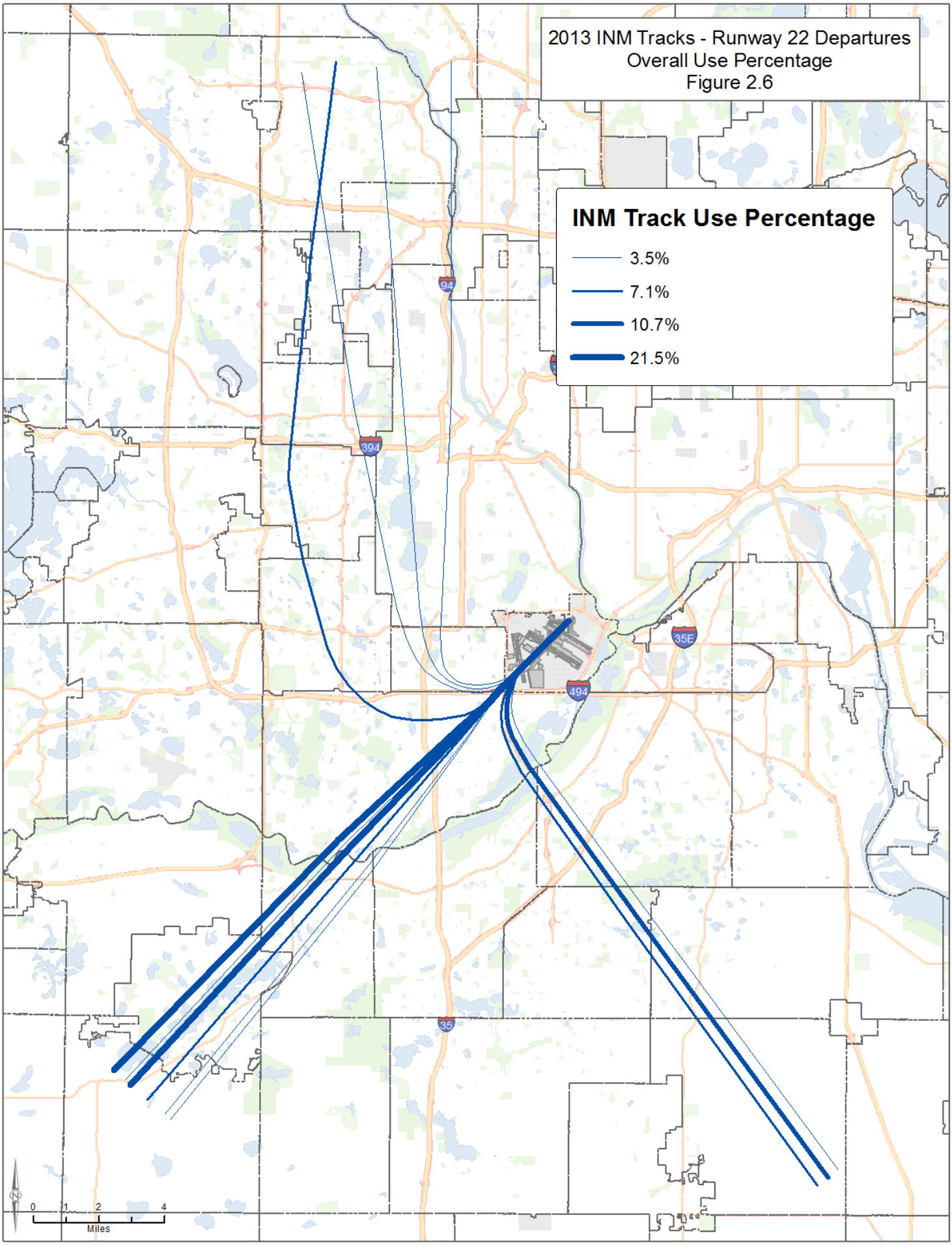

2013 INM Tracks - Runway 30L Departures
Overall Use Percentage
Figure 2.1
INM Track Use Percentage
0% - 2%
2% - 5%
15.2%
21.8%
25.4%
35W
94
694
394
35E
494
35
N
0
2.25
4.5
9
Miles

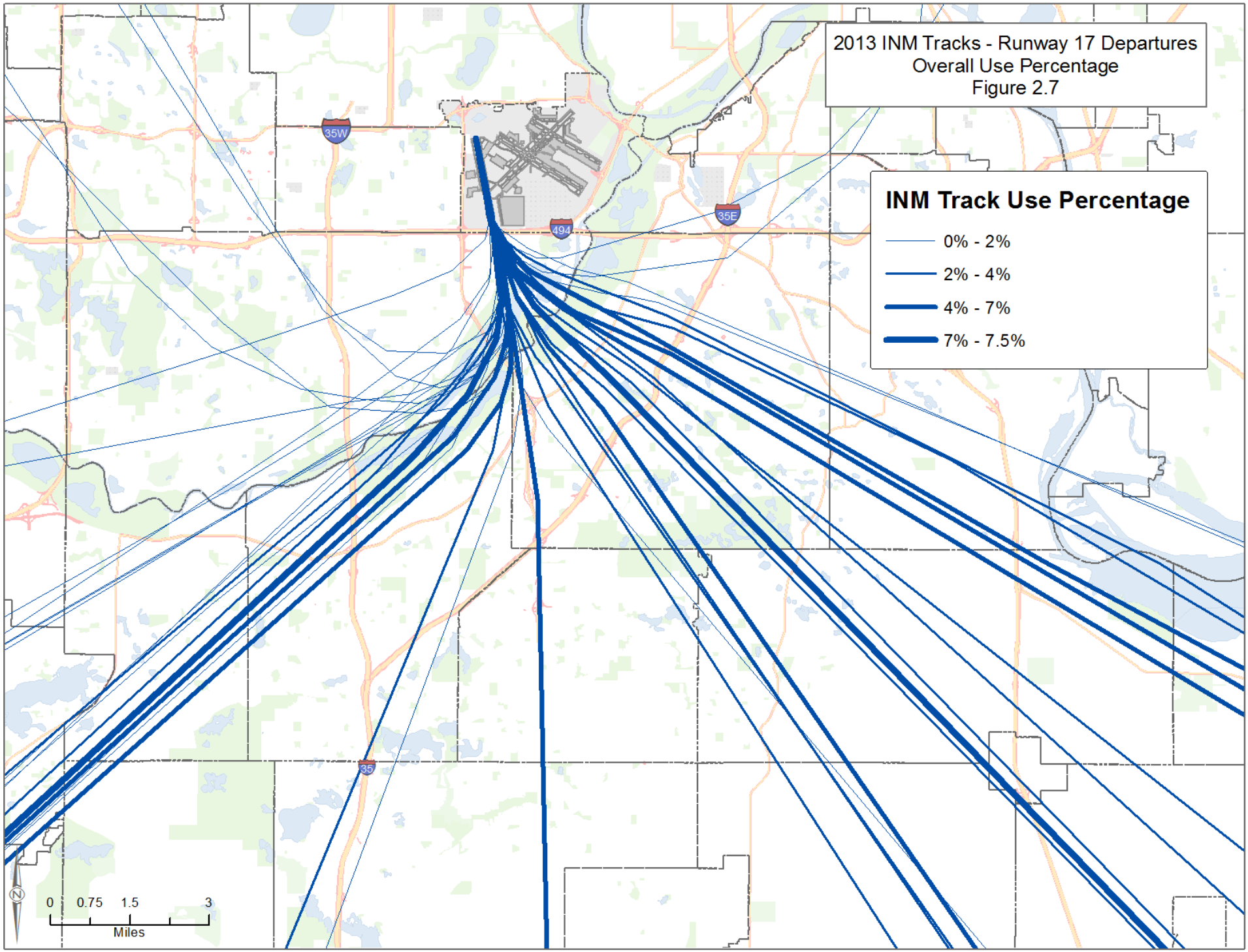

2013 INM Tracks - Runway 30R Departures
Overall Use Percentage
Figure 2.2
35W
694
394
94
35E
494
35
INM Track Use Percentage
0% - 2%
2% - 4%
4% - 7%
7% - 9.6%
0
2.25
4.5
9
Miles

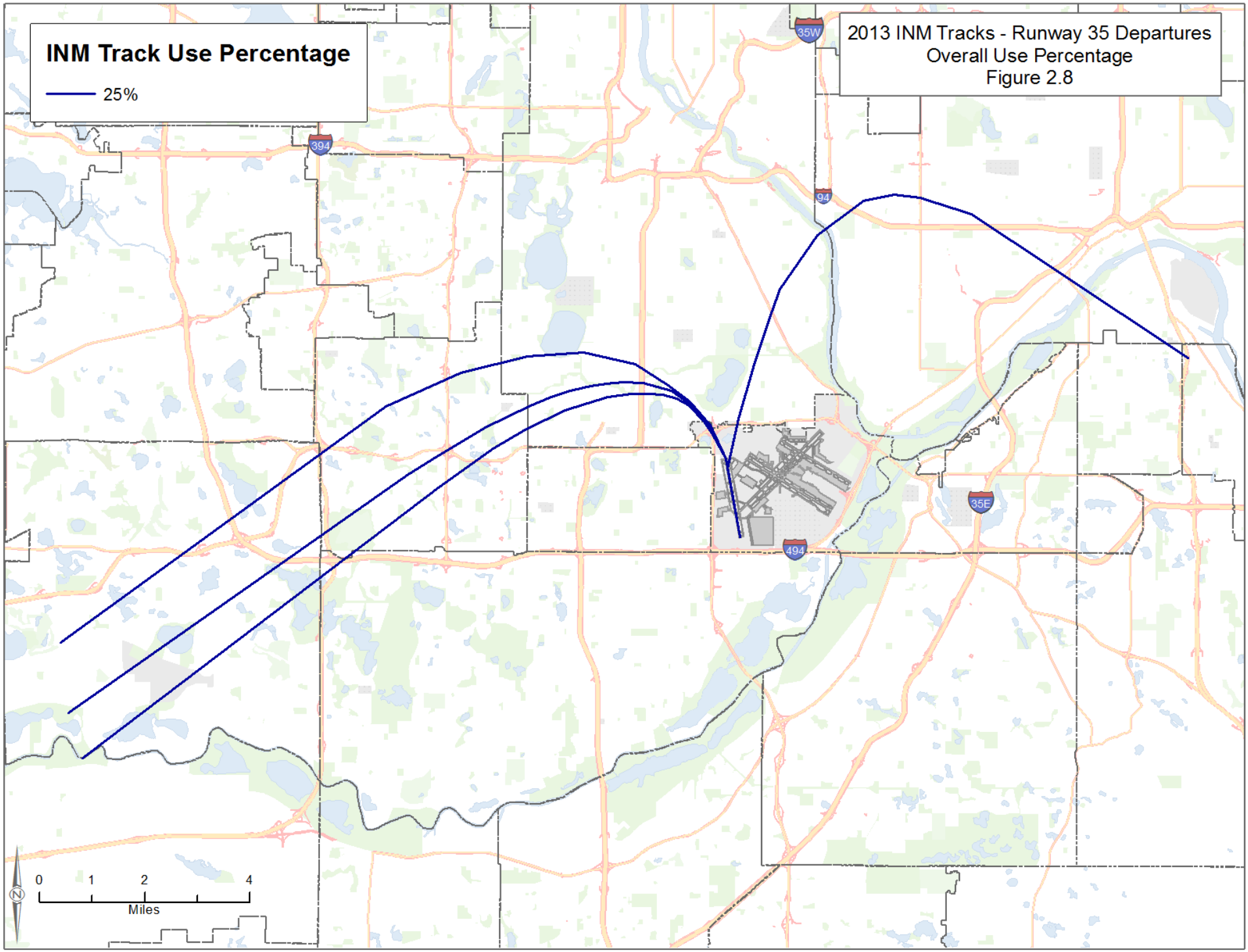

2013 INM Tracks - Runway 4 Departures
Overall Use Percentage
Figure 2.3
35W
94
694
394
35E
494
35
INM Track Use Percentage
6.6%
13.3%
26.6%
N
0
2.5
5
10
Miles

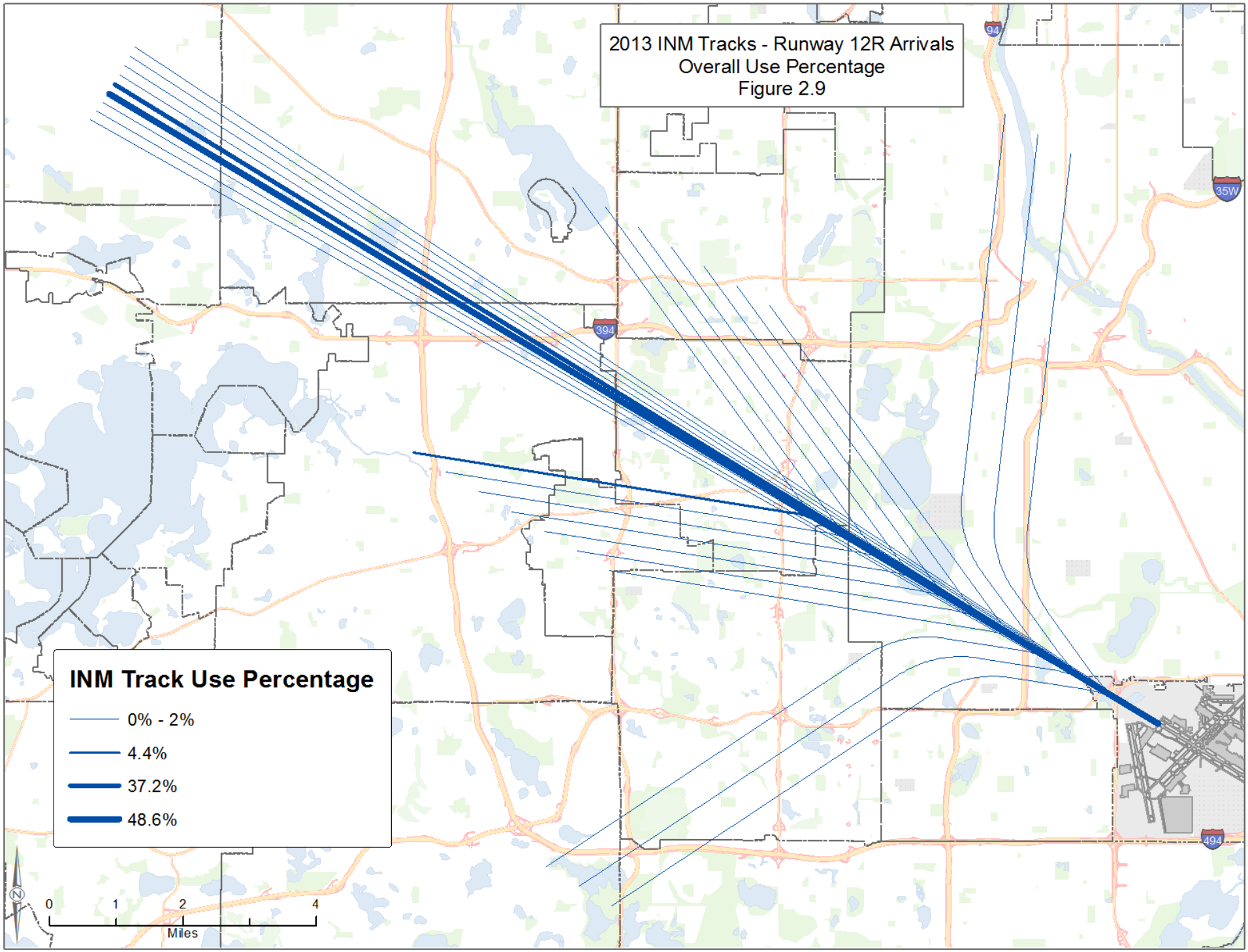

2013 INM Tracks - Runway 12L Departures
Overall Use Percentage
Figure 2.4
694
35W
394
35E
494
35
INM Track Use Percentage
0% - 2%
2% - 4%
4% - 6%
6% - 7.5%
0 0.75 1.5 3
Miles

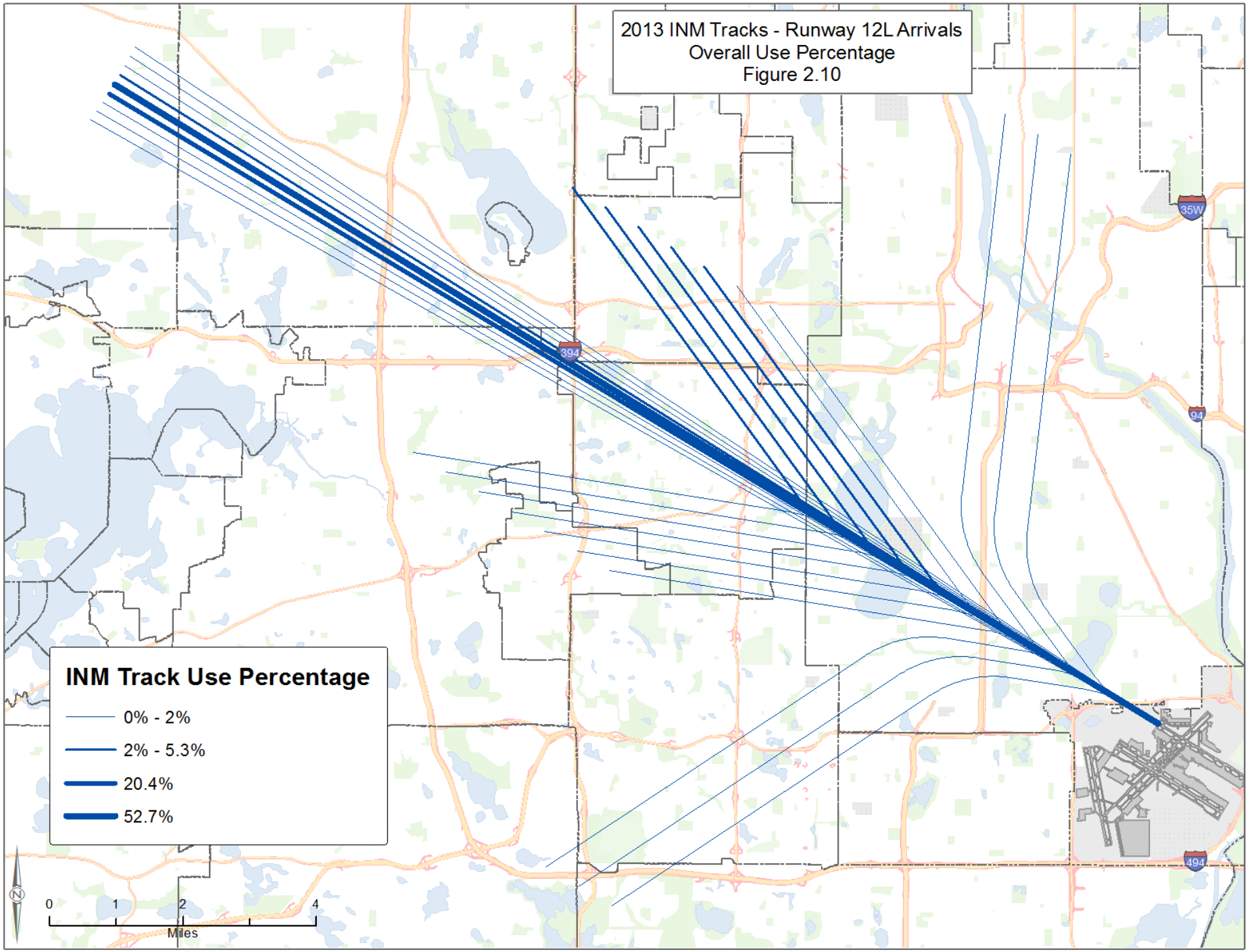

2013 INM Tracks - Runway 12R Departures
Overall Use Percentage
Figure 2.5
INM Track Use Percentage
0% - 2%
2% - 4%
4% - 8%
8% - 10.5%
35W
394
694
94
35E
494
35
N
0
1.5
3
6
Miles

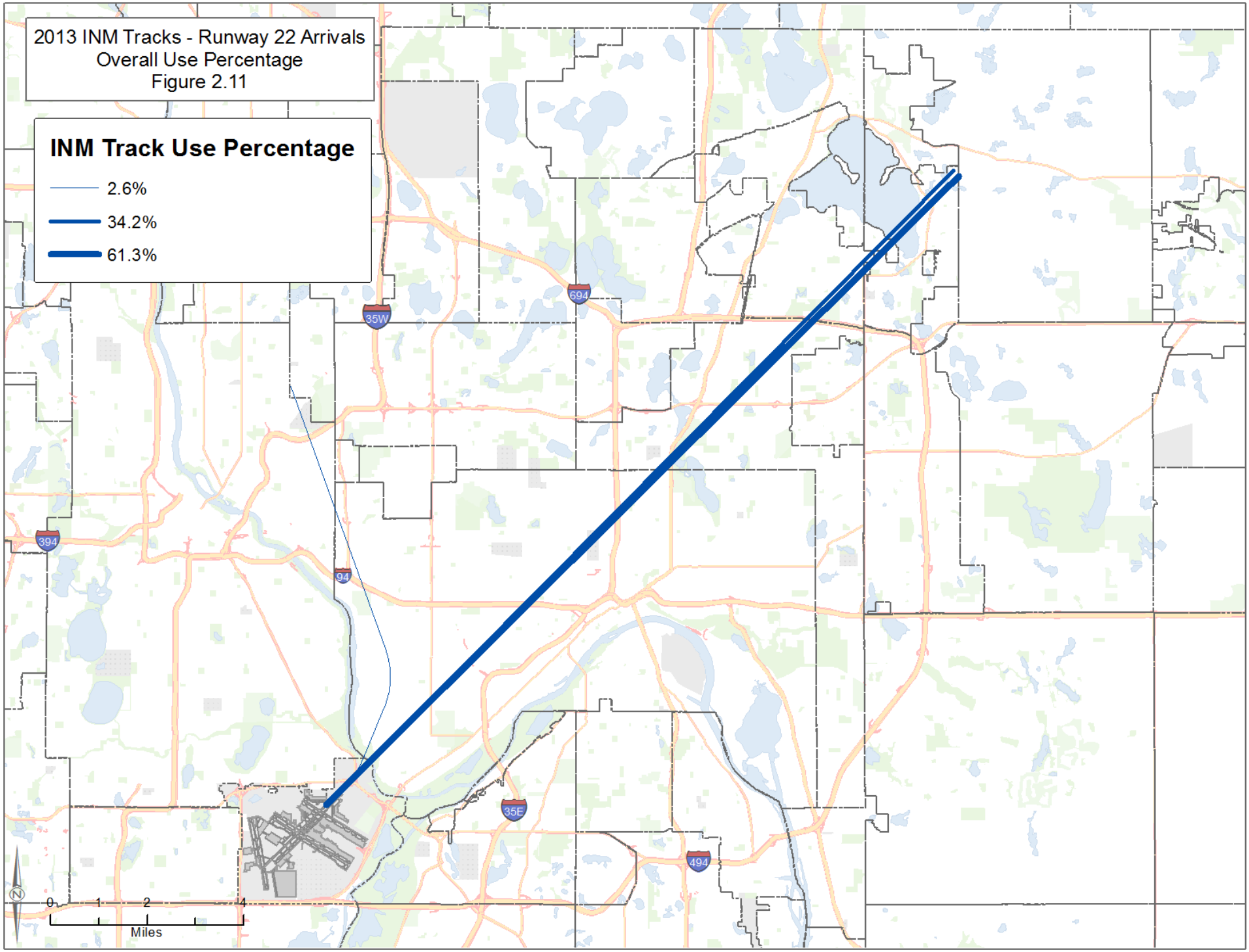

2013 INM Tracks - Runway 22 Departures
Overall Use Percentage
Figure 2.6
INM Track Use Percentage
3.5%
7.1%
10.7%
21.5%
94
394
35E
494
35
0
1
2
4
Miles

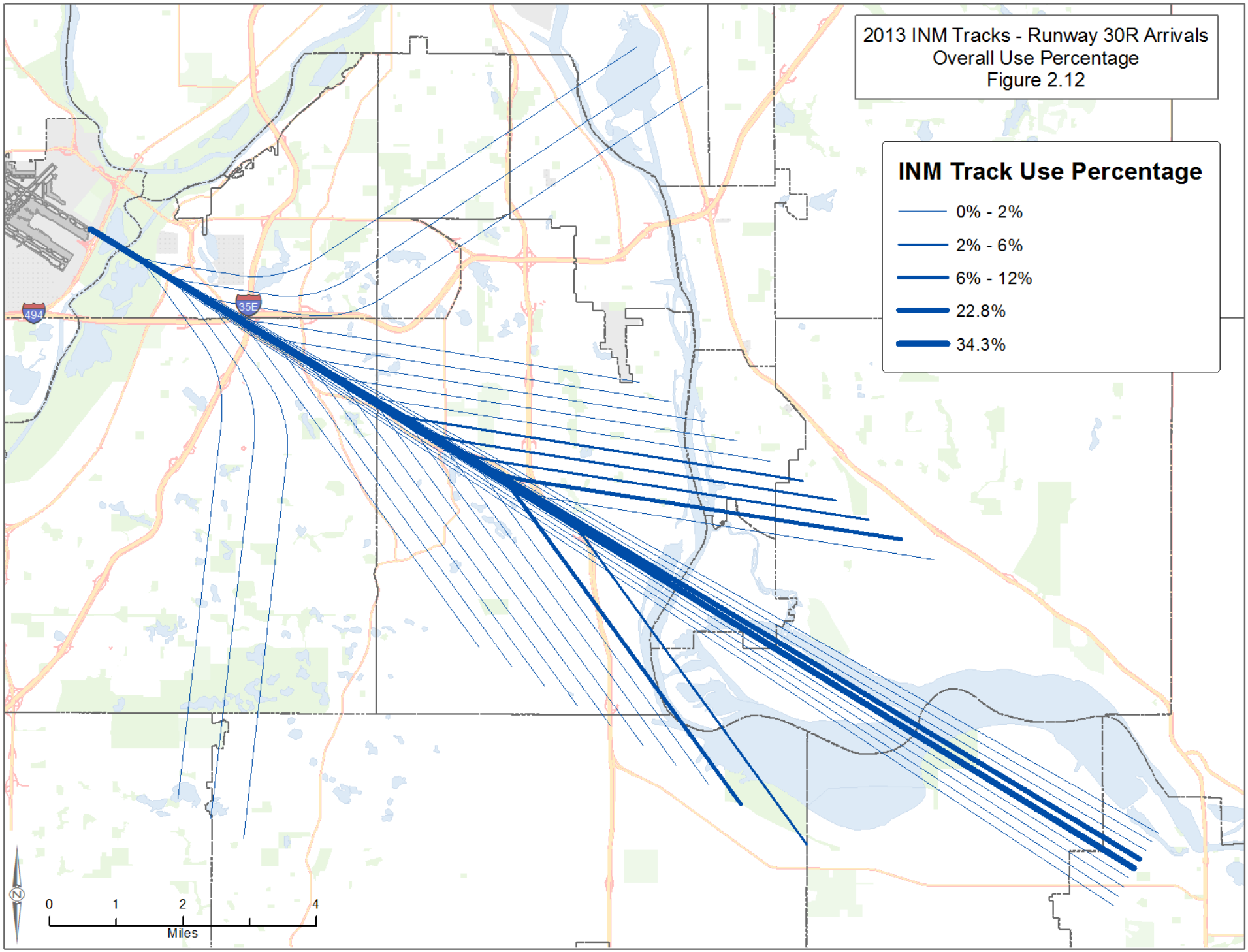

2013 INM Tracks - Runway 17 Departures
Overall Use Percentage
Figure 2.7
INM Track Use Percentage
0% - 2%
2% - 4%
4% - 7%
7% - 7.5%
35W
494
35E
35
N
0
0.75
1.5
3
Miles

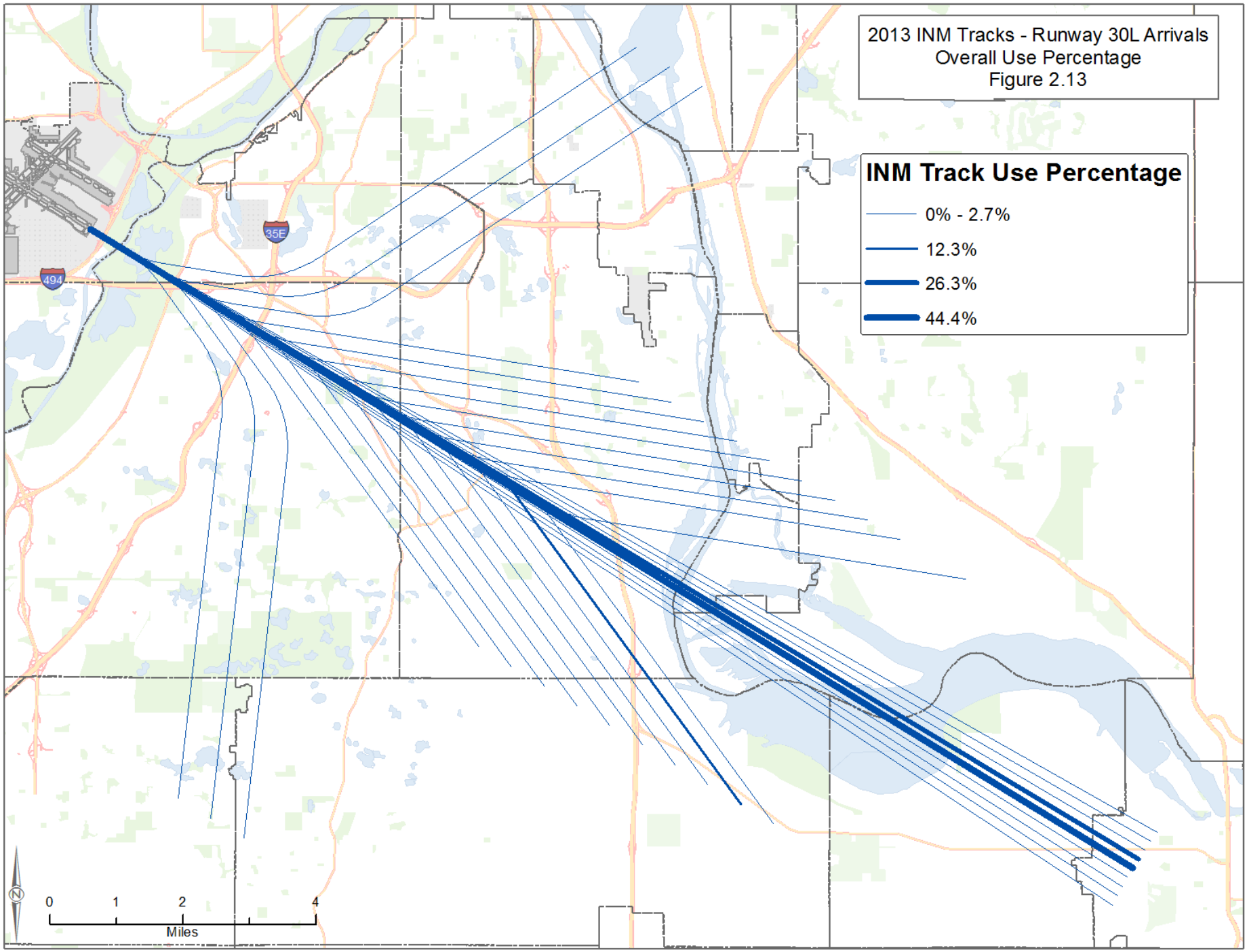

INM Track Use Percentage
25%
2013 INM Tracks - Runway 35 Departures
Overall Use Percentage
Figure 2.8
35W
394
94
35E
494
0
1
2
4
Miles

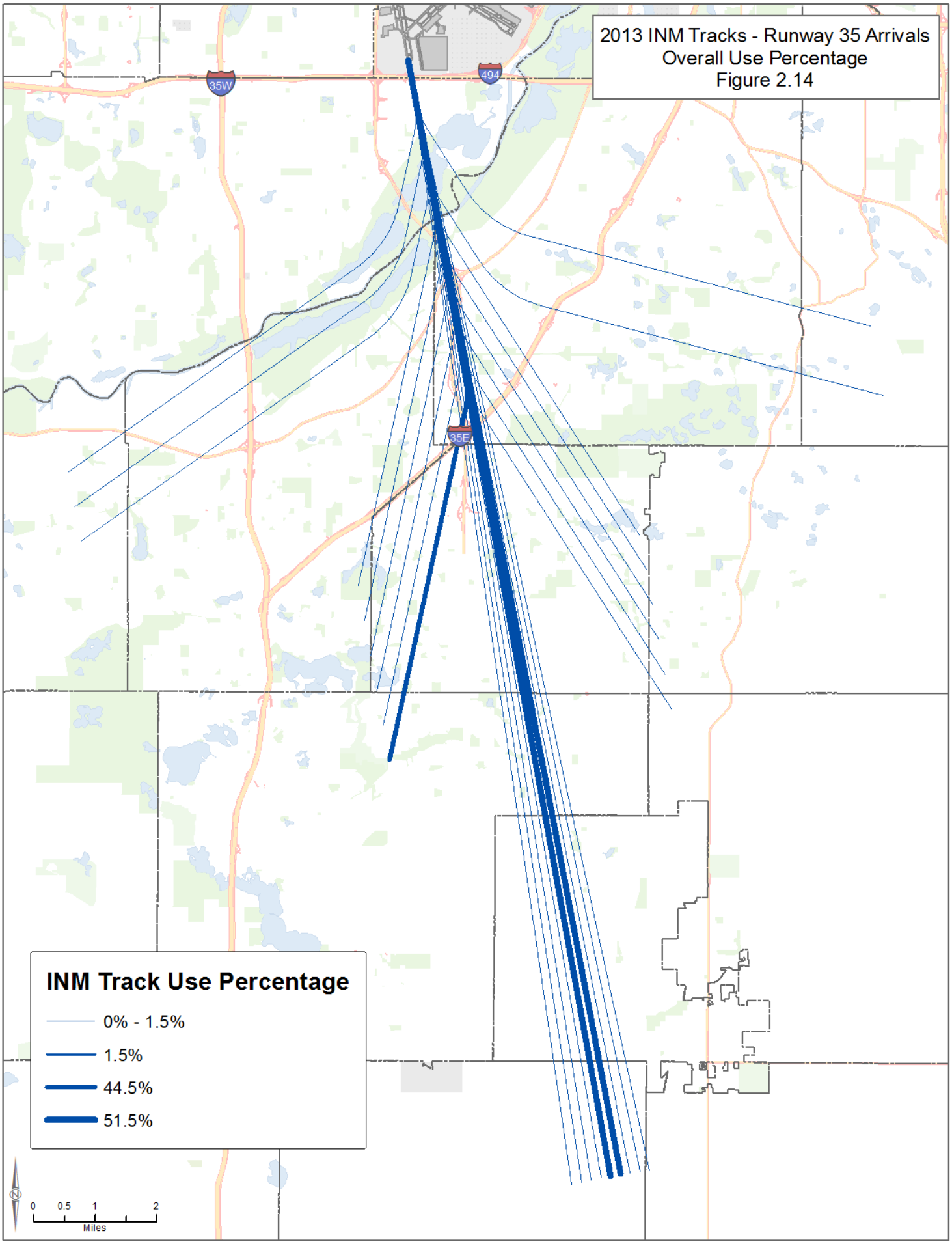

2013 INM Tracks - Runway 12R Arrivals
Overall Use Percentage
Figure 2.9
INM Track Use Percentage
0% - 2%
4.4%
37.2%
48.6%
0
1
2
4
Miles
94
35W
394
494

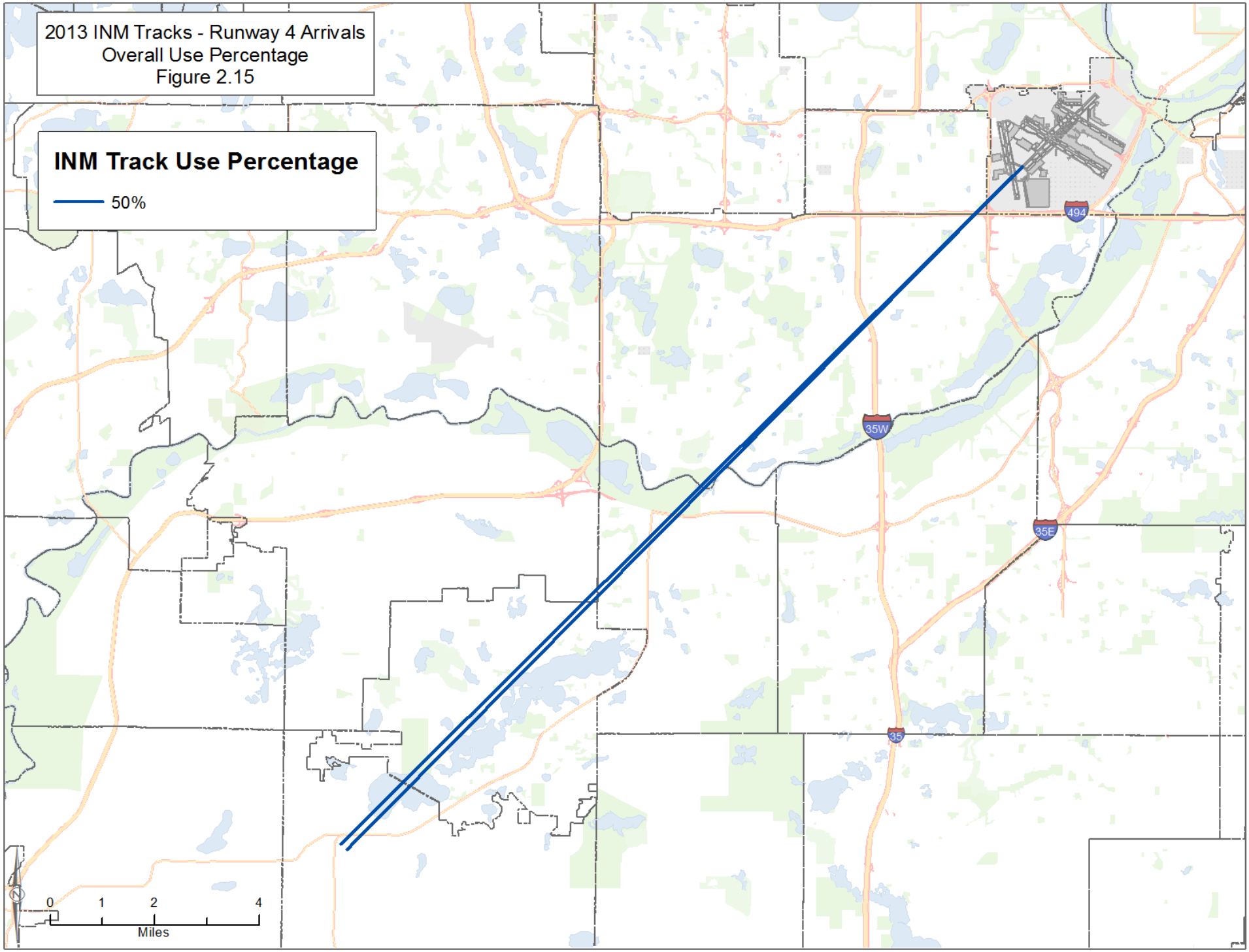

2013 INM Tracks - Runway 12L Arrivals
Overall Use Percentage
Figure 2.10
INM Track Use Percentage
0% - 2%
2% - 5.3%
20.4%
52.7%
394
35W
94
494
0
1
2
4
Miles

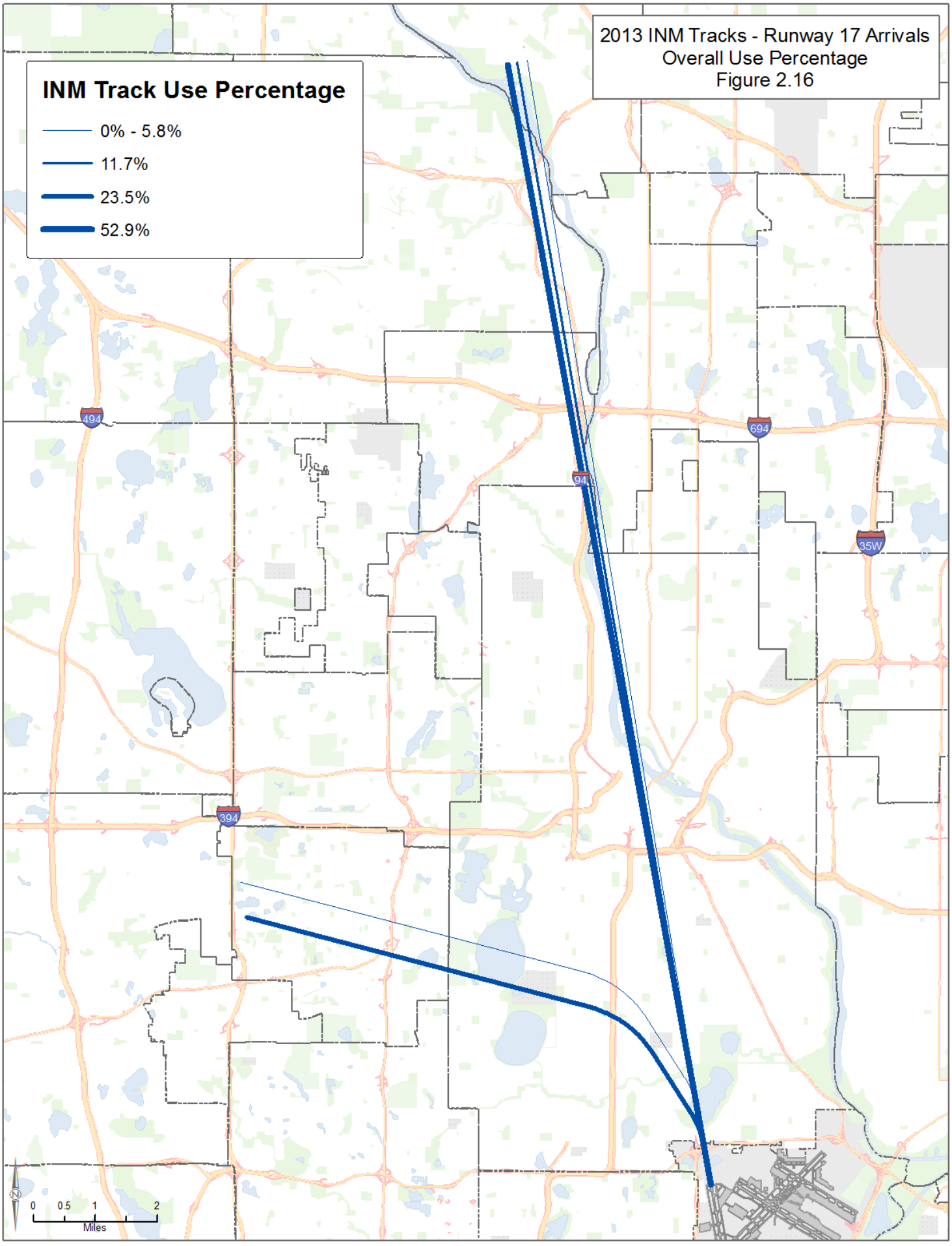

2013 INM Tracks - Runway 22 Arrivals
Overall Use Percentage
Figure 2.11
INM Track Use Percentage
2.6%
34.2%
61.3%
694
35W
394
94
35E
494
0
1
2
4
Miles


2013 INM Tracks - Runway 30R Arrivals
Overall Use Percentage
Figure 2.12
INM Track Use Percentage
0% - 2%
2% - 6%
6% - 12%
22.8%
34.3%
494
35E
N
0
1
2
4
Miles


2013 INM Tracks - Runway 30L Arrivals
Overall Use Percentage
Figure 2.13
INM Track Use Percentage
0% - 2.7%
12.3%
26.3%
44.4%
494
35E
0
1
2
4
Miles


2013 INM Tracks - Runway 35 Arrivals
Overall Use Percentage
Figure 2.14
35W
494
35E
INM Track Use Percentage
0% - 1.5%
1.5%
44.5%
51.5%
N
0 0.5 1 2
Miles


2013 INM Tracks - Runway 4 Arrivals
Overall Use Percentage
Figure 2.15
INM Track Use Percentage
50%
494
35W
35E
35
0
1
2
4
Miles


2013 INM Tracks - Runway 17 Arrivals
Overall Use Percentage
Figure 2.16
INM Track Use Percentage
0% - 5.8%
11.7%
23.5%
52.9%
494
694
94
35W
394
0 0.5 1 2
Miles

2.2 2013 Modeled Versus Measured DNL Levels

As part of the 2013 actual noise contour development process, an analysis was conducted to compare the INM-developed 2013 DNL noise contours to actual measured aircraft noise levels at the 39 MAC Noise and Operations Monitoring System (MACNOMS) Remote Monitoring Towers (RMTs) around MSP. An INM grid point analysis determined the model's predicted 2013 DNL noise levels at each of the RMT locations (determined in the INM by the latitude and longitude coordinates of each RMT).

Table 2.4 provides a comparison of the INM grid point analysis at each MACNOMS RMT site, based on the 2013 actual noise contour as produced with the INM, and the actual MACNOMS monitored aircraft DNLs at those locations in 2013.

The average absolute difference between the modeled and measured DNLs was 2.3 dB (the 2012 average absolute difference was 2.1 dB). The median difference was 1.7 dB (the 2012 median difference was 1.5 dB). There were 18 MACNOMS RMTs that reported slightly higher DNL levels than the INM model generated. The MAC believes that this is due in part to the inclusive approach MAC staff has taken in tuning MACNOMS noise-to-track matching parameters. This conservative approach, along with the increasing number of quieter jets operating at the airport, results in increased instances of community-driven noise events being attributed to quieter aircraft operating at further distances from the monitoring location. The use of absolute values provides a perspective of total difference between the INM modeled values and the measured DNL values provided by MACNOMS in 2013. The median is considered the most reliable indicator of correlation when considering the data variability across modeled and monitored data.

Table 2.4
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
2013 Measured vs. Modeled INM DNL Values at RMT Locations

RMT Site	2013 Annual Measured DNL (a)	2013 Modeled DNL	Difference (Modeled minus Measured)	
			Sign	Absolute
1	55.1	55.2	0.1	0.1
2	57.8	56.5	-1.3	1.3
3	62.6	61.9	-0.7	0.7
4	59.4	59.4	0.0	0.0
5	67.5	67.3	-0.2	0.2
6	67.7	64.8	-2.9	2.9
7	59.7	57.5	-2.2	2.2
8	56.6	55.1	-1.5	1.5
9	37.5	41.0	3.5	3.5
10	39.6	46.9	7.3	7.3
11	36.6	43.2	6.6	6.6
12	37.5	45.6	8.1	8.1
13	53.3	53.0	-0.3	0.3
14	59.6	59.4	-0.2	0.2
15	55.6	53.9	-1.7	1.7
16	63.8	62.0	-1.8	1.8
17	40.6	46.8	6.2	6.2
18	53.6	57.8	4.2	4.2
19	49.5	52.3	2.8	2.8
20	42.7	49.1	6.4	6.4
21	45.5	47.7	2.2	2.2
22	54.2	55.7	1.5	1.5
23	60.1	58.2	-1.9	1.9
24	58.2	58.5	0.3	0.3
25	50.6	52.8	2.2	2.2
26	52.3	50.7	-1.6	1.6
27	55.1	55.0	-0.1	0.1
28	57.8	59.5	1.7	1.7
29	52.7	52.1	-0.6	0.6
30	60.3	59.1	-1.2	1.2
31	45.5	48.7	3.2	3.2
32	41.0	46.1	5.1	5.1
33	45.7	48.5	2.8	2.8
34	43.7	47.5	3.8	3.8
35	52.9	53.5	0.6	0.6
36	52.9	51.8	-1.1	1.1
37	46.6	47.7	1.1	1.1
38	49.7	49.5	-0.2	0.2
39	50.4	50.1	-0.3	0.3
			Average	**2.3**
			Median	**1.7**

All units in dB DNL
(a) Computed from daily DNLs

SOURCE: MAC RMT data and HNTB INM analysis, 2014

Overall, the small variation between the actual MACNOMS monitored aircraft noise levels and the INM modeled noise levels provides additional external system verification that the INM is providing an accurate assessment of the actual aircraft noise impacts around MSP.

2.3 2013 Noise Contour Impacts

Based on the 431,573 total operations in 2013, approximately 3,503.9 acres are in the 65 DNL noise contour (an increase of 10.7 acres from the 2012 actual noise contour) and approximately 8,744.1 acres are in the 60 DNL noise contour (a reduction of 162.0 acres from the 2012 actual noise contour). Table 2.5 contains the count of single-family (one to three units per structure) and multi-family (more than three units per structure) dwelling units in the 2013 actual noise contours. The MAC based the counts on the block intersect methodology where all structures on a block that are within or touched by the noise contour are counted.

Table 2.5
MINNEAPOLIS-ST.PAUL INTERNATIONAL AIRPORT
Summary of 2013 Actual DNL Noise Contour Single Family and Multi-Family Unit Counts
(Block Intersect Implementation Method, Completed Reflect All Units Completed Prior to 2/4/2014)

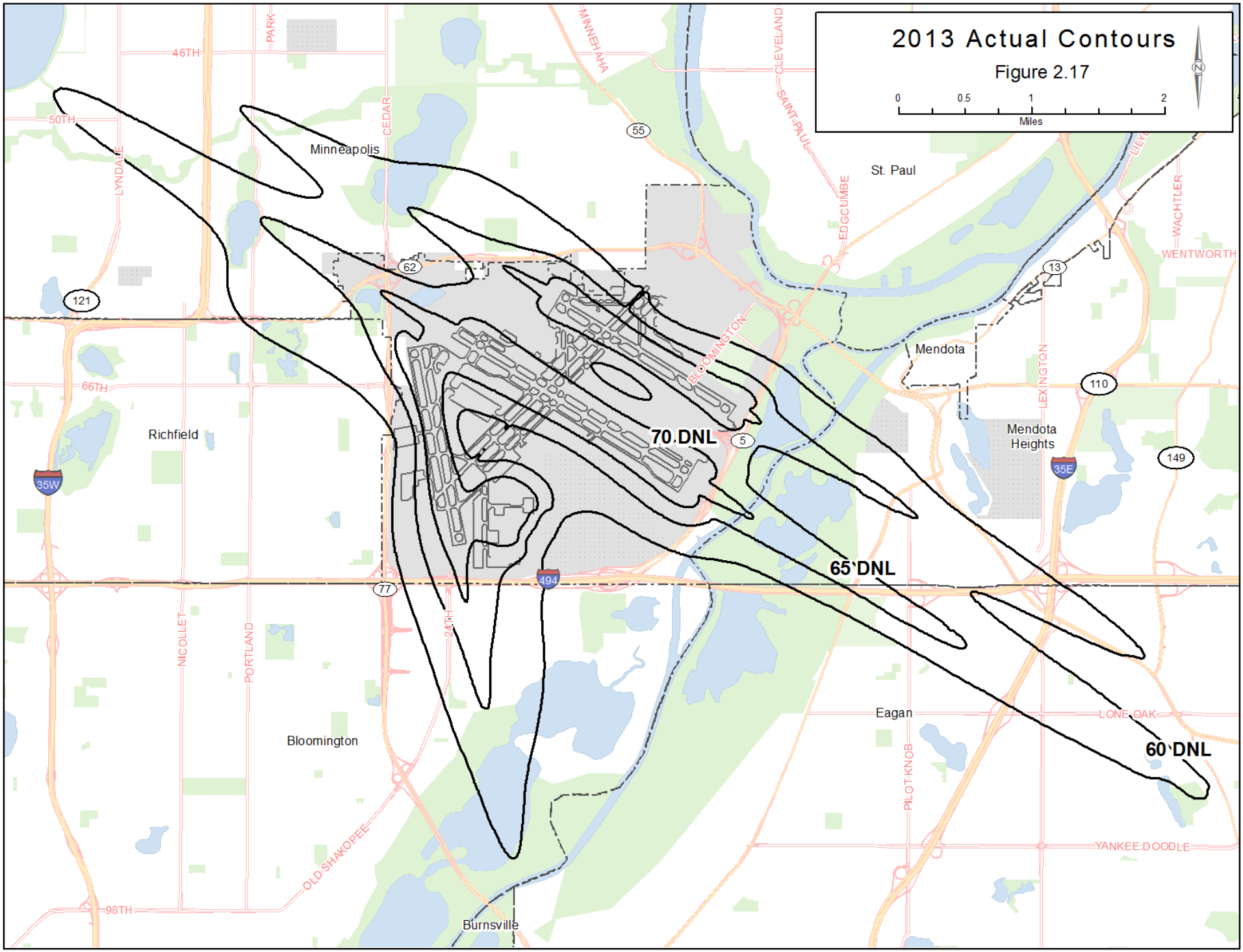
City	Count	Dwelling Units Within DNL (dB) Interval									
		Single-Family					Multi-Family				
		60-64	65-69	70-74	75+	Total	60-64	65-69	70-74	75+	Total
Minneapolis	Completed	5688	975	-	-	6663	373	460	-	-	833
	Additional	137	-	-	-	137	89	-	-	-	89
	Total	5825	975	-	-	6800	462	460	-	-	922
Bloomington	Completed	16	1	-	-	17	504	-	-	-	504
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	16	1	-	-	17	504	-	-	-	504
Richfield	Completed	540	-	-	-	540	66	-	-	-	66
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	540	-	-	-	540	66	-	-	-	66
Eagan	Completed	166	-	-	-	166	-	-	-	-	-
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	166	-	-	-	166	-	-	-	-	-
Mendota Heights	Completed	2	1	-	-	3	-	-	-	-	-
	Additional	-	-	-	-	-	-	-	-	-	-
	Total	2	1	-	-	3	-	-	-	-	-
All Cities	Completed	6412	977	-	-	7389	943	460	-	-	1403
	Additional	137	-	-	-	137	89	-	-	-	89
	Total	6549	977	-	-	7526	1032	460	-	-	1492

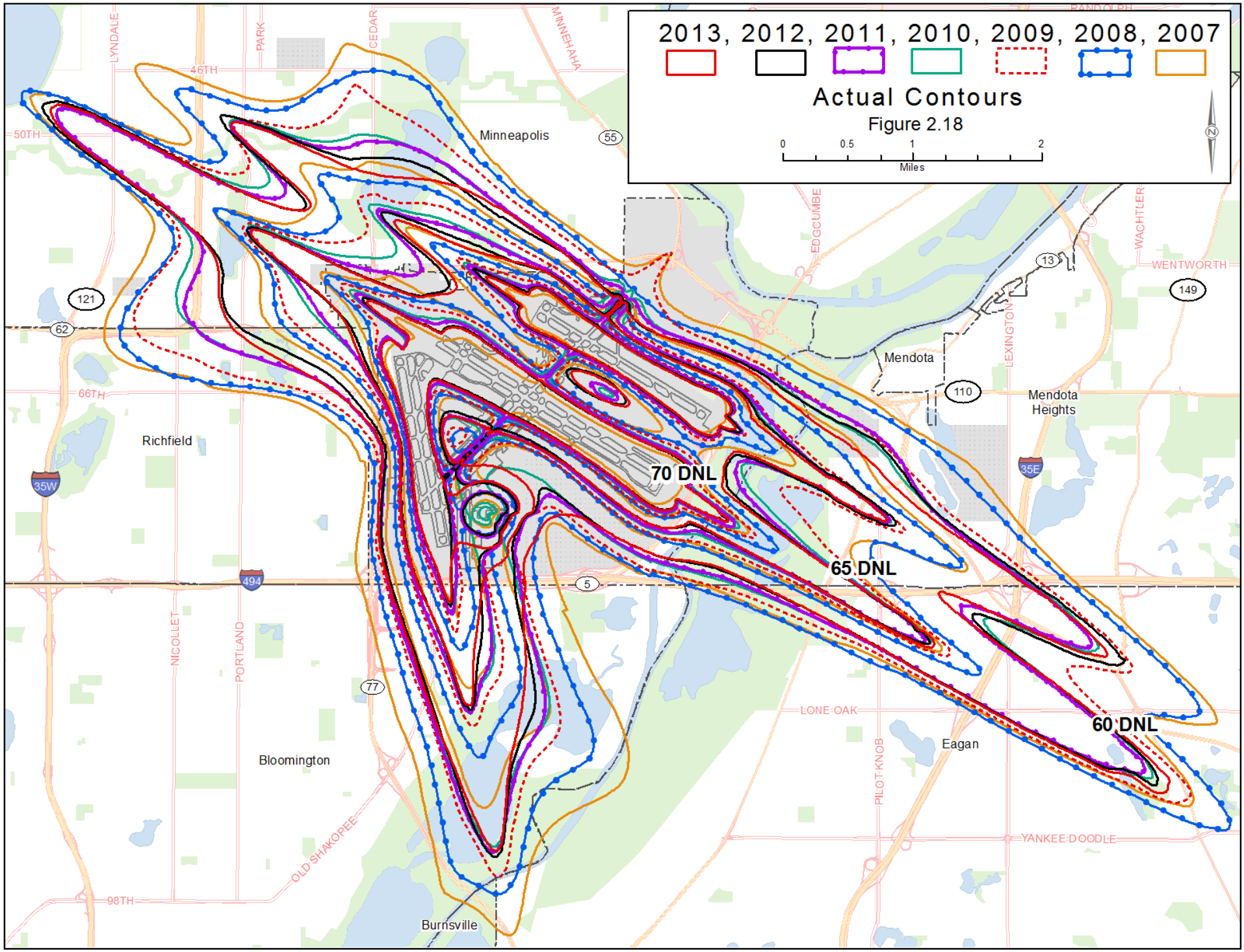
**Units that declined mitigation or were determined to be ineligible for participation in the current program are not included in the table.*

Source: HNTB provided INM contours, MAC analysis, 2014

The 2013 count of residential units within the actual 60 DNL noise contour that have not received noise mitigation around MSP is 226, an increase of 53.7 percent from the total of 147 based on the 2012 actual noise contours. This increase is due in large part to an overall increase in operations from 2012 to 2013. All homes within the 2013 actual 65 DNL contour have received the 5 dB noise reduction mitigation package.

A depiction of the 2013 actual noise contour is provided in Figure 2.17. The 2007, 2008, 2009, 2010, 2011, 2012, and 2013 actual noise contours are provided in Figure 2.18. The 2013 actual 65 DNL noise contour is 0.3 percent larger than the 2012 actual 65 DNL noise contour and the 2013 actual 60 DNL noise contour is 1.8 percent smaller than the 2012 actual 60 DNL noise contour.


2013 Actual Contours
Figure 2.17
0
0.5
1
2
Miles
N
70 DNL
65 DNL
60 DNL
Minneapolis
St. Paul
Richfield
Bloomington
Eagan
Mendota
Mendota Heights
Burnsville
46TH
50TH
66TH
98TH
PARK
CEDAR
MINNEHAHA
CLEVELAND
SAINT PAUL
EDGCUMBE
WACHTLER
WENTWORTH
LYNDALE
BLOOMINGTON
LEXINGTON
NICOLLET
PORTLAND
24TH
OLD SHAKOPEE
PILOT KNOB
LONE OAK
YANKEE DOODLE
55
62
121
5
13
110
149
35W
35E
494
77


2013, 2012, 2011, 2010, 2009, 2008, 2007
Actual Contours
Figure 2.18
0
0.5
1
2
Miles
N
70 DNL
65 DNL
60 DNL
Minneapolis
Richfield
Bloomington
Burnsville
Eagan
Mendota
Mendota Heights
Lone Oak
Wentworth
46th
50th
66th
98th
Lyndale
Park
Cedar
Minnehaha
Randolph
Edgcumbe
Wachtler
Lexington
Nicollet
Portland
Old Shakopee
Pilot Knob
Yankee Doodle
55
121
62
13
149
110
35W
35E
494
5
77

Chapter 3 Comparison of the 2013 Actual Noise Contour and the 2007 Forecast Noise Contour

This chapter provides a detailed comparative analysis of the 2013 actual and 2007 forecast mitigated noise contours, focusing on the significant noise modeling variables and noise impacts at MSP.

3.1 Comparison of 2013 Actual and 2007 Forecast Noise Contour Inputs

3.1.1 Integrated Noise Model Considerations

To develop the actual 2013 contour HNTB used Integrated Noise Model (INM) Version 7.0d, which incorporates lateral attenuation capabilities and updates to noise and performance data for commercial aircraft, updates to substitution aircraft data, and corrections to minor software issues. The MAC developed the 2007 forecast mitigated contour using INM Version 6.1.

It is important to note that changes to the model over time can change the size and shape of a noise contour. For example, the improvements to lateral attenuation adjustment algorithms and flight path segmentation in INM 7.0 (versus those used in version 6.1) were found by the FAA to increase the size of a DNL contour for a range of case study airports between 3 and 10 percent over what previous versions of INM would have modeled.

3.1.2 Aircraft Operations and Fleet Mix Comparison

Table 3.1 provides a comparison of total MSP operations by operational category used in the 2007 forecast mitigated noise contour and the 2013 actual noise contour.

As indicated in Table 3.1, the 2013 actual total MSP operations number of 431,573 represents a 25.9 percent reduction from the 2007 forecast mitigated total operations number of 582,366. Scheduled passenger air carrier and cargo operations accounted for the majority of the reduction. However, it is notable that charter operations are 98.4 percent below the 2007 forecast mitigated number.

Table 3.1
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated and 2013 Actual Total Operations

Operations Category	2013 Actual	2007 Forecast
Scheduled Passenger Air Carrier (a)	396,481	523,472
Cargo	11,701	21,158
Charter	95	5,766
GA	20,752	28,846
Military	2,544	3,124
TOTAL	**431,573**	**582,366**

(a) Includes both air carrier and regional carrier operations

Source: Actual 2013 MACNOMS data adjusted to match FAA ATADS data (to account for unavailable MACNOMS operations data).

Table 3.2 provides a comparison of the 2007 forecast mitigated noise contour fleet mix and the 2013 actual noise contour fleet mix[3]. An assessment of average daily operations per aircraft type with daytime and nighttime operation statistics is provided.

Table 3.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated Fleet Mix and 2013 Actual Fleet Mix
Average Daily Operations

		Day		Night		Total		
Group	INM Aircraft Type	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	Difference Forecast and Actual
Manufactured/Re-engined Stage 3 Jet	717200	7.3	6.9	1.0	2.2	8.3	9.0	-0.7
	737300	48.2	11.1	3.5	1.1	51.7	12.2	39.5
	737400	0.1	0.3	0.0	0.1	0.1	0.4	-0.3
	737500	5.7	0.1	0.5	0.0	6.2	0.1	6.1
	737700	7.8	40.1	0.5	8.6	8.3	48.7	-40.4
	737800	65.5	39.2	12.6	10.6	78.1	49.8	28.3
	737900	5.7	1.3	0.5	0.2	6.2	1.4	4.8
	747100	0.0	-	0.0	-	0.0	-	0.0
	747200	0.0	-	0.0	-	0.0	-	0.0
	747400	1.9	0.1	0.2	0.0	2.1	0.1	2.0
	747R21	-	0.0	-	0.0	-	0.0	0.0
	757300	34.1	16.8	1.1	1.2	35.1	18.0	17.1
	757PW	88.4	47.9	8.6	7.2	97.1	55.1	42.0
	757RR	-	1.0	-	1.5	-	2.5	-2.5
	767200	1.2	-	0.5	-	1.7	-	1.7
	767300	-	4.9	-	1.1	-	6.0	-6.0
	767400	-	1.6	-	0.5	-	2.1	-2.1
	767CF6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	767JT9	-	1.2	-	0.1	-	1.3	-1.3
	777200	0.0	0.3	0.0	0.0	0.0	0.3	-0.3
	777ER	-	1.7	-	0.0	-	1.7	-1.7
	A300-622R	4.8	0.2	4.2	0.1	9.1	0.3	8.8
	A310-304	1.4	0.1	1.3	0.1	2.7	0.2	2.5
	A318	5.7	-	0.5	-	6.2	-	6.2
	A319-131	149.1	60.3	3.9	5.3	153.0	65.5	87.5
	A320-211	173.4	-	16.5	-	189.9	-	189.9
	A320-232	-	83.6	-	8.1	-	91.7	-91.7
	A321-232	0.0	3.1	0.0	2.0	0.0	5.2	-5.2
	A330-301	6.2	-	0.0	-	6.2	-	6.2
	A330-343	-	7.8	-	0.5	-	8.2	-8.2
	A340	2.1	-	0.0	-	2.1	-	2.1
	A340-642	-	0.0	-	0.0	-	0.0	0.0
	AN124	-	0.0	-	0.0	-	0.0	0.0
	ASTR	2.3	-	0.2	-	2.5	-	2.5
	BA46	74.3	-	2.2	-	76.5	-	76.5
	BD100	-	3.7	-	0.3	-	4.0	-4.0
	BD700	-	0.1	-	0.0	-	0.1	-0.1
	BEC400	0.0	0.8	0.0	0.0	0.0	0.9	-0.9
	C500	1.4	-	0.1	-	1.4	-	1.4
	C650	4.9	-	0.6	-	5.5	-	5.5
	C750	4.6	-	0.3	-	4.9	-	4.9
	CL600	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CL601	264.1	0.9	14.7	0.1	278.8	1.0	277.8
	CLREGJ	-	269.5	-	9.6	-	279.1	-279.1
	CNA500	-	0.1	-	0.0	-	0.1	-0.1

[3] Some INM aircraft types were not available at the time of the preparation of the 2007 forecast noise contour.

Table 3.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated Fleet Mix and 2013 Actual Fleet Mix
Average Daily Operations

		Day		Night		Total		
Group	INM Aircraft Type	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	Difference Forecast and Actual
Manufactured/Re-engined Stage 3 Jet	CNA501	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA525	0.0	-	0.0	-	0.0	-	0.0
	CNA525C	-	0.3	-	0.0	-	0.3	-0.3
	CNA550	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA551	0.0	0.1	0.0	0.0	0.0	0.2	-0.2
	CNA55B	-	0.2	-	0.0	-	0.3	-0.3
	CNA560	0.0	-	0.0	-	0.0	-	0.0
	CNA560E	-	0.8	-	0.0	-	0.8	-0.8
	CNA560U	-	0.3	-	0.0	-	0.4	-0.4
	CNA560XL	-	3.1	-	0.2	-	3.3	-3.3
	CNA650	-	0.3	-	0.0	-	0.3	-0.3
	CNA680	-	1.6	-	0.1	-	1.7	-1.7
	CNA750	-	4.2	-	0.4	-	4.6	-4.6
	CRJ701	-	41.3	-	3.7	-	45.1	-45.1
	CRJ900	-	82.9	-	3.7	-	86.6	-86.6
	D328J	-	0.3	-	0.0	-	0.3	-0.3
	DC1010	9.6	1.7	3.8	0.5	13.4	2.2	11.2
	DC1030	-	0.0	-	0.0	-	0.0	0.0
	DC820	0.0	-	0.0	-	0.0	-	0.0
	DC860	0.0	-	0.0	-	0.0	-	0.0
	DC870	0.0	-	1.4	-	1.4	-	1.4
	EMB120	-	0.0	-	0.0	-	0.0	0.0
	EMB135	0.0	12.7	0.0	1.3	0.0	14.0	-14.0
	EMB140	-	0.0	-	0.0	-	0.0	0.0
	EMB145	45.3	2.9	0.2	0.2	45.5	3.1	42.4
	EMB14L	-	3.7	-	0.5	-	4.2	-4.2
	EMB170	0.0	136.8	0.0	8.5	0.0	145.3	-145.3
	EMB190	0.0	5.0	0.0	0.0	0.0	5.0	-5.0
	FAL10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	FAL200	0.0	-	0.0	-	0.0	-	0.0
	FAL20A	1.0	0.8	0.7	0.1	1.7	0.8	0.9
	FAL50	-	0.7	-	0.1	-	0.8	-0.8
	FAL900	-	0.8	-	0.1	-	0.9	-0.9
	G150	-	0.2	-	0.0	-	0.2	-0.2
	G200	-	2.1	-	0.2	-	2.4	-2.4
	GIV	2.6	1.2	0.2	0.1	2.8	1.3	1.5
	GV	0.8	1.0	0.1	0.1	0.9	1.0	-0.1
	GULF1	0.0	-	0.0	-	0.0	-	0.0
	HK4000	-	0.0	-	0.0	-	0.0	0.0
	HS125	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	HS1258	-	1.9	-	0.2	-	2.0	-2.0
	IA1124	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	IA1125	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	IL76	-	0.0	-	0.0	-	0.0	0.0
	JST2TF	-	0.0	-	0.0	-	0.0	0.0
	L101	0.6	-	0.2	-	0.8	-	0.8
	LEAR31	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	LEAR35	26.0	0.7	2.3	0.1	28.4	0.8	27.6
	LEAR45	0.0	0.9	0.0	0.0	0.0	1.0	-1.0
	LEAR55	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	LEAR60	0.0	0.5	0.0	0.0	0.0	0.6	-0.6
	MD11GE	0.3	1.5	0.4	1.2	0.7	2.7	-2.0

Table 3.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated Fleet Mix and 2013 Actual Fleet Mix
Average Daily Operations

		Day		Night		Total		
Group	INM Aircraft Type	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	Difference Forecast and Actual
Manufactured/Re-engined Stage 3 Jet	MD11PW	-	1.5	-	1.5	-	2.9	-2.9
	MD80	-	5.7	-	0.6	-	6.3	-6.3
	MD81	0.5	0.0	0.0	0.0	0.6	0.0	0.6
	MD82	-	1.6	-	0.2	-	1.8	-1.8
	MD83	17.0	6.2	1.6	0.8	18.6	7.0	11.6
	MD88	-	27.4	-	1.7	-	29.1	-29.1
	MD9025	0.0	36.0	0.0	2.5	0.0	38.5	-38.5
	MD9028	-	45.3	-	2.0	-	47.2	-47.2
	MU2	0.0	-	0.0	-	0.0	-	0.0
	MU300	7.2	-	0.6	-	7.8	-	7.8
	R390	-	0.1	-	0.0	-	0.1	-0.1
	SABR65	0.0	-	0.0	-	0.0	-	0.0
	SBR2	0.4	-	0.0	-	0.4	-	0.4
	Total	1071.5	1039.6	85.0	91.4	1156.7	1130.9	25.8
Hushkit Stage 3 Jet	727EM2	8.0	0.0	6.4	0.0	14.4	0.1	14.3
	737N17	-	0.0	-	0.0	-	0.0	0.0
	737Q	0.0	-	0.0	-	0.0	-	0.0
	BAC111	0.0	-	0.0	-	0.0	-	0.0
	DC93LW	-	0.0	-	0.0	-	0.0	0.0
	DC95HW	-	0.1	-	0.0	-	0.1	-0.1
	DC9Q	245.3	-	15.3	-	260.5	-	260.5
	DC9Q7	-	0.0	-	0.0	-	0.0	0.0
	Total	253.3	0.2	21.7	0.0	274.9	0.2	274.7
Microjet	CNA510	-	0.2	-	0.0	-	0.2	-0.2
	ECLIPSE500	-	0.1	-	0.0	-	0.1	-0.1
	Total	-	0.3	-	0.0	-	0.3	-0.3
Stage 2 Less than 75,000 lb. MTOW	FAL20	-	0.3	-	0.6	-	0.8	-0.8
	GII	2.1	0.0	0.2	0.0	2.3	0.0	2.3
	GULF3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LEAR24	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	LEAR25	2.1	-	0.4	-	2.5	-	2.5
	SABR75	0.0	-	0.0	-	0.0	-	0.0
	Total	4.2	0.3	0.6	0.6	4.8	0.9	3.9
Propeller	1900D	-	38.8	-	1.9	-	40.7	-40.7
	A748	0.0	-	0.0	-	0.0	-	0.0
	AC50	-	0.0	-	0.0	-	0.0	0.0
	ATR42	-	1.2	-	0.3	-	1.5	-1.5
	ATR72	-	0.0	-	0.0	-	0.0	0.0
	BEC100	0.0	-	0.0	-	0.0	-	0.0
	BEC190	0.0	-	0.0	-	0.0	-	0.0
	BEC200	0.0	0.9	0.0	0.1	0.0	1.0	-1.0
	BEC23	0.0	-	0.0	-	0.0	-	0.0
	BEC300	0.0	0.5	0.0	0.1	0.0	0.5	-0.5
	BEC30B	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	BEC33	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BEC55	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BEC58	14.3	0.0	4.7	0.0	19.0	0.0	19.0
	BEC60	0.0	-	0.0	-	0.0	-	0.0
	BEC65	0.0	1.1	0.0	0.2	0.0	1.3	-1.3
	BEC80	0.0	0.4	0.0	0.0	0.0	0.5	-0.5
	BEC90	0.0	0.2	0.0	0.0	0.0	0.2	-0.2

Table 3.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated Fleet Mix and 2013 Actual Fleet Mix
Average Daily Operations

		Day		Night		Total		
Group	INM Aircraft Type	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	Difference Forecast and Actual
Propeller	BEC95	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BEC99	0.0	0.8	0.0	0.1	0.0	0.9	-0.9
	BEC9F	-	0.0	-	0.0	-	0.0	0.0
	BECM35	-	0.0	-	0.0	-	0.0	0.0
	BL26	0.0	-	0.0	-	0.0	-	0.0
	C130	7.8	-	0.2	-	8.0	-	8.0
	CNA150	0.0	-	0.0	-	0.0	-	0.0
	CNA172	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA177	0.0	-	0.0	-	0.0	-	0.0
	CNA180	0.0	-	0.0	-	0.0	-	0.0
	CNA182	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA185	0.0	-	0.0	-	0.0	-	0.0
	CNA205	0.0	-	0.0	-	0.0	-	0.0
	CNA206	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA207	-	0.0	-	0.0	-	0.0	0.0
	CNA208	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	CNA210	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA303	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA310	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA320	0.0	-	0.0	-	0.0	-	0.0
	CNA337	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA340	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	CNA401	0.0	-	0.0	-	0.0	-	0.0
	CNA402	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA404	0.0	-	0.0	-	0.0	-	0.0
	CNA414	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	CNA421	0.0	0.2	0.0	0.0	0.0	0.2	-0.2
	CNA425	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CNA441	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	CNV240	-	0.0	-	0.0	-	0.0	0.0
	DA42	-	0.0	-	0.0	-	0.0	0.0
	DHC6	22.5	-	4.4	-	26.8	-	26.8
	DHC8	0.0	-	0.0	-	0.0	-	0.0
	DO328	0.0	-	0.0	-	0.0	-	0.0
	EMB110	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	FK27	0.1	-	0.0	-	0.1	-	0.1
	GASEPF	1.3	-	0.3	-	1.6	-	1.6
	GASEPV	3.7	0.0	0.5	0.0	4.3	0.0	4.3
	M20J	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	P180	-	0.1	-	0.0	-	0.2	-0.2
	PA23AZ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA24	0.0	-	0.0	-	0.0	-	0.0
	PA28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA28AR	-	0.0	-	0.0	-	0.0	0.0
	PA28DK	-	0.0	-	0.0	-	0.0	0.0
	PA31	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
	PA31T	-	0.0	-	0.0	-	0.0	0.0
	PA32LA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA32SG	-	0.0	-	0.0	-	0.0	0.0
	PA34	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA42	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA44	0.0	-	0.0	-	0.0	-	0.0

Table 3.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated Fleet Mix and 2013 Actual Fleet Mix
Average Daily Operations

		Day		Night		Total		
Group	INM Aircraft Type	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	2007 Forecast	2013 Actual	Difference Forecast and Actual
Propeller	PA46	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	PA60	0.0	-	0.0	-	0.0	-	0.0
	PC12	-	0.2	-	0.0	-	0.3	-0.3
	RWCM69	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SA227	-	0.0	-	0.0	-	0.0	0.0
	SAMER2	0.0	-	0.0	-	0.0	-	0.0
	SAMER3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SAMER4	0.0	0.7	0.0	0.1	0.0	0.8	-0.8
	SD330	0.0	-	0.0	-	0.0	-	0.0
	SD360	-	0.0	-	0.0	-	0.0	0.0
	SF340	93.3	0.0	5.9	0.0	99.2	0.0	99.2
	SR22	-	0.2	-	0.0	-	0.2	-0.2
	STBM7	-	0.0	-	0.0	-	0.0	0.0
	TED600	-	0.0	-	0.0	-	0.0	0.0
	Total	143.0	46.6	16.0	2.9	159.0	49.6	109.4
Helicopter	A109	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	B206L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	B212	0.0	-	0.0	-	0.0	-	0.0
	B222	0.0	-	0.0	-	0.0	-	0.0
	B407	-	0.0	-	0.0	-	0.0	0.0
	EC130	0.0	-	0.0	-	0.0	-	0.0
	R44	-	0.0	-	0.0	-	0.0	0.0
	S70	0.0	-	0.0	-	0.0	-	0.0
	SA350D	-	0.0	-	0.0	-	0.0	0.0
	Total	0.0	0.1	0.0	0.0	0.0	0.1	-0.1
Military	C130E	-	0.4	-	0.0	-	0.4	-0.4
	C17	0.0	-	0.0	-	0.1	-	0.1
	C5	0.1	-	0.0	-	0.1	-	0.1
	C9A	0.0	-	0.0	-	0.0	-	0.0
	F16GE	0.1	-	0.0	-	0.1	-	0.1
	F-18	0.0	-	0.0	-	0.0	-	0.0
	KC135	0.0	-	0.0	-	0.0	-	0.0
	T1	0.0	-	0.0	-	0.0	-	0.0
	T34	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	T37	0.1	-	0.0	-	0.1	-	0.1
	T38	0.1	-	0.0	-	0.1	-	0.1
	T6	-	0.0	-	0.0	-	0.0	0.0
	U21	0.0	-	0.0	-	0.0	-	0.0
	Total	0.4	0.4	0.0	0.0	0.5	0.4	0.1
Grand Total		**1472.4**	**1087.4**	**123.3**	**95.0**	**1595.9**	**1182.4**	**413.6**

Note: Totals may differ due to rounding.

Source: MAC-provided INM Input Data, HNTB 2014. Average Daily Operations for 2007 forecast were obtained from the November 2004 Part 150 document.

In general, many of the aircraft groups operating at MSP showed a reduction in the number of average daily operations from the 2007 forecast mitigated to the 2013 actual operations statistics. Manufactured or re-engined Stage 3 average daily operations in the 2013 actual statistics were down 2.2 percent from the 2007 forecast mitigated number. The hushkitted Stage 3 average daily

operations in the 2013 actual statistics were down 99.9 percent from the 2007 forecast mitigated number.

In total, the 2013 actual average daily number of operations was 1,182.4, which is a 25.9 percent reduction from the 2007 forecast mitigated of 1,595.9 operations. Nighttime operations decreased by 28.3 average daily operations from the 2007 forecast mitigated to the 2013 actual operations statistics.

3.1.3 Runway Use Comparison

Table 3.3 provides a comparison of the 2007 forecast mitigated noise contour and the 2013 actual noise contour runway use percentages.

Table 3.3
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Comparison of 2007 Forecast Mitigated and 2013 Actual Runway Use

		Day		Night		Total	
Op Type	Runway	2007 Fcst.	2013 Actual	2007 Fcst.	2013 Actual	2007 Fcst.	2013 Actual
Arrivals	4	0.0%	0.0%	3.8%	0.0%	0.3%	0.0%
	12L	21.8%	19.1%	17.2%	14.6%	21.4%	18.7%
	12R	14.7%	18.8%	12.4%	26.0%	14.5%	19.4%
	17	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
	22	0.5%	0.0%	2.4%	0.0%	0.6%	0.0%
	30L	21.1%	18.7%	25.1%	36.1%	21.4%	20.2%
	30R	25.1%	23.6%	26.4%	20.7%	25.2%	23.3%
	35	16.9%	19.7%	12.7%	2.5%	16.5%	18.2%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Departures	4	0.2%	0.0%	0.4%	0.0%	0.2%	0.0%
	12L	8.9%	12.1%	14.1%	19.9%	9.3%	12.7%
	12R	15.9%	4.7%	18.3%	26.3%	16.1%	6.3%
	17	37.2%	23.8%	34.6%	16.3%	37.0%	23.3%
	22	0.1%	0.0%	0.8%	0.0%	0.1%	0.0%
	30L	15.0%	32.4%	12.8%	23.1%	14.8%	31.7%
	30R	22.7%	27.0%	19.2%	14.3%	22.4%	26.0%
	35	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Overall	4	0.1%	0.0%	2.1%	0.0%	0.3%	0.0%
	12L	15.3%	15.6%	15.6%	17.1%	15.4%	15.7%
	12R	15.3%	11.7%	15.3%	26.1%	15.3%	12.8%
	17	18.6%	12.0%	17.1%	7.6%	18.5%	11.6%
	22	0.3%	0.0%	1.6%	0.0%	0.4%	0.0%
	30L	18.0%	25.6%	19.0%	30.1%	18.1%	26.0%
	30R	23.9%	25.3%	22.8%	17.7%	23.8%	24.7%
	35	8.4%	9.8%	6.4%	1.3%	8.3%	9.1%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Runway use for 2007 forecast reflects Part 150 mitigated 2007 runway use. Totals may not add up to 100% due to rounding.

Source: MAC-provided INM Input Data, HNTB 2014. Runway use for 2007 forecast was obtained from the November 2004 Part 150 document.

A general evaluation of the runway use percentages in Table 3.3 indicates that use of Runway 17 and Runway 12R for departure operations is well below the percentage use numbers forecasted in the 2007 mitigated scenario. The departure percentage on Runway 30L is notably higher than what was forecasted in the 2007 forecast mitigated scenario. The nighttime departure percentage

on Runway 17 is significantly lower, and the Runways 30L and 12R nighttime departure percentages are notably higher, than the levels forecasted in the 2007 forecast mitigated scenario. The nighttime arrival percentages on Runways 12R and 30L are notably higher, and significantly lower on Runway 35, than the levels forecasted in the 2007 forecast mitigated scenario.

3.1.4 Flight Track Considerations

As detailed in Section 2.1.4, due to enhanced analysis methodologies and technologies, the INM departure flight track locations used to develop the 2013 actual noise contour have been modified from those used for the 2012 actual noise contour. The tracks also differ from those used to develop the 2007 forecast mitigated noise contour. Subtracks were also added to each of the backbone tracks. The INM's standard distribution was used in distributing the flights to the subtracks. No changes to departure INM tracks on Runways 4, 22 or 35 or INM arrivals tracks were made. Changes were focused within the vicinity of previous MSP noise contours.

The same methodology as in previous annual reports was used to assign 2013 radar data with the INM flight tracks. The radar-to-INM flight track correlation process employs a best-fit analysis of the radar flight track data based on linear trends. This approach provides the ability to match each radar flight track directly to the appropriate INM track.

3.1.5 Atmospheric Conditions Comparison

The MAC used an average annual temperature of 47.7 degrees Fahrenheit and an average annual wind speed of 5.3 knots in the 2007 forecast mitigated INM contour modeling process. The MAC also used an average annual pressure of 29.90 inches and an annual average relative humidity of 64 percent. As stated in Section 2.1.5, the 2013 actual noise contour used a 2013 annual average temperature of 45.3 degrees Fahrenheit and a 2013 average annual wind speed of 7.6 knots in the INM modeling process. In addition, a 2013 average annual pressure of 29.93 inches of Mercury and a 2013 annual average relative humidity of 66.2 percent were used.

3.2 Comparative Integrated Noise Model Grid Point Analysis

The INM was used to conduct a grid point analysis based on the 2007 forecast mitigated noise contour and 2013 actual noise contour INM input files. The MAC used INM Version 6.2a for the 2007 forecast mitigated noise contour grid point analysis because this was the oldest version of INM available to MAC staff to conduct the analysis in early 2008 when the annual noise contour report process began at MSP. When comparing the DNL values generated for the MACNOMS RMT locations with INM 6.1 in the November 2004 Part 150 Update document to the levels generated for those same locations with INM 6.2a, the differences were insignificant.

The INM was used to calculate DNL values for the center points of each city block included in the mitigation programs outlined in the Consent Decree. Figures 3.1 to 3.5 depict the 2013 actual grid point analysis area and the DNL levels calculated for each block by city. Figures 3.6 to 3.10 depict the 2007 forecast mitigated grid point analysis area and the DNL levels calculated for each block by city. Figures 3.11 to 3.15 depict the difference in DNL levels, on a block-by-block basis, between the 2007 forecast mitigated noise contours and the 2013 actual noise contours.

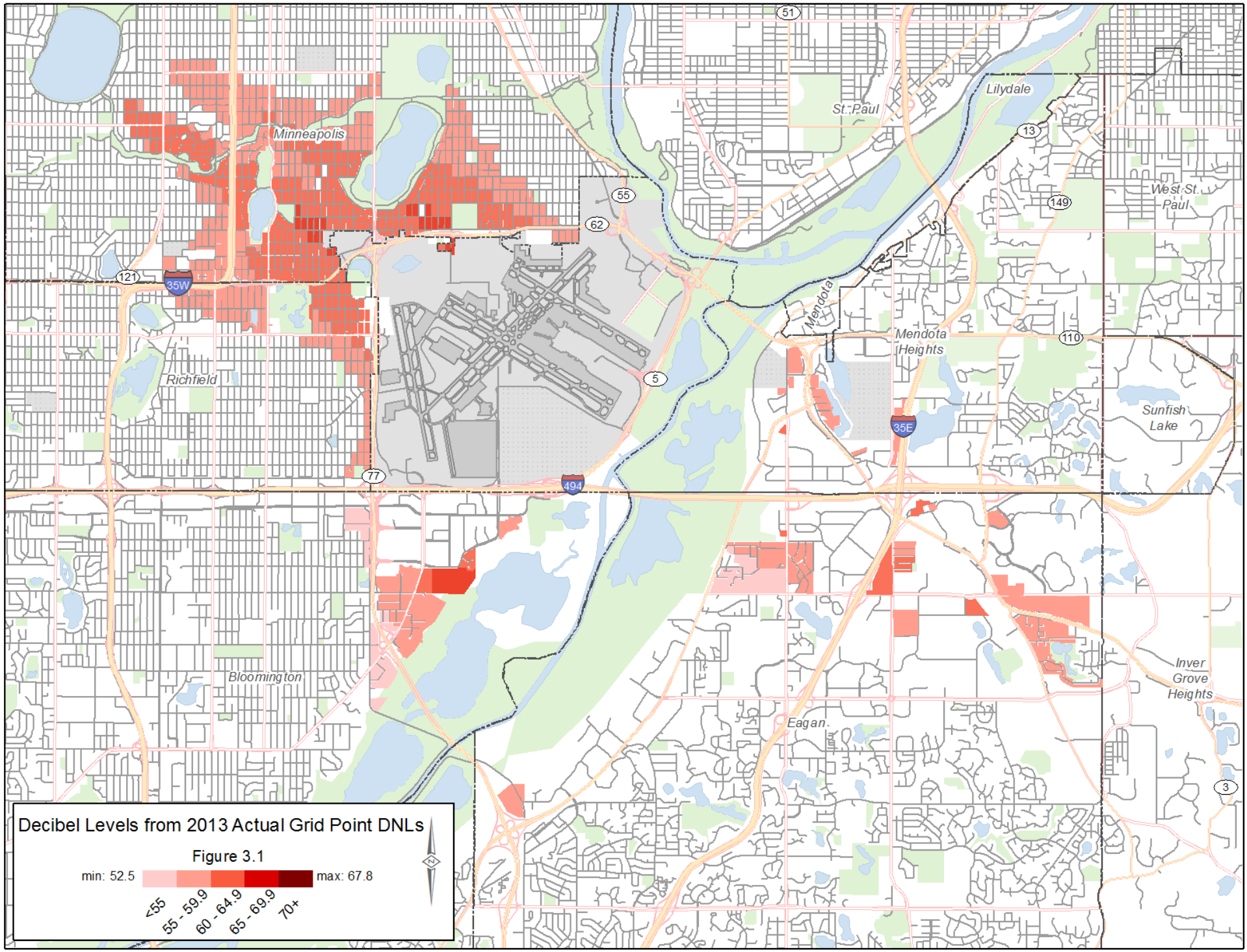
3.3 Contour Comparison Summary

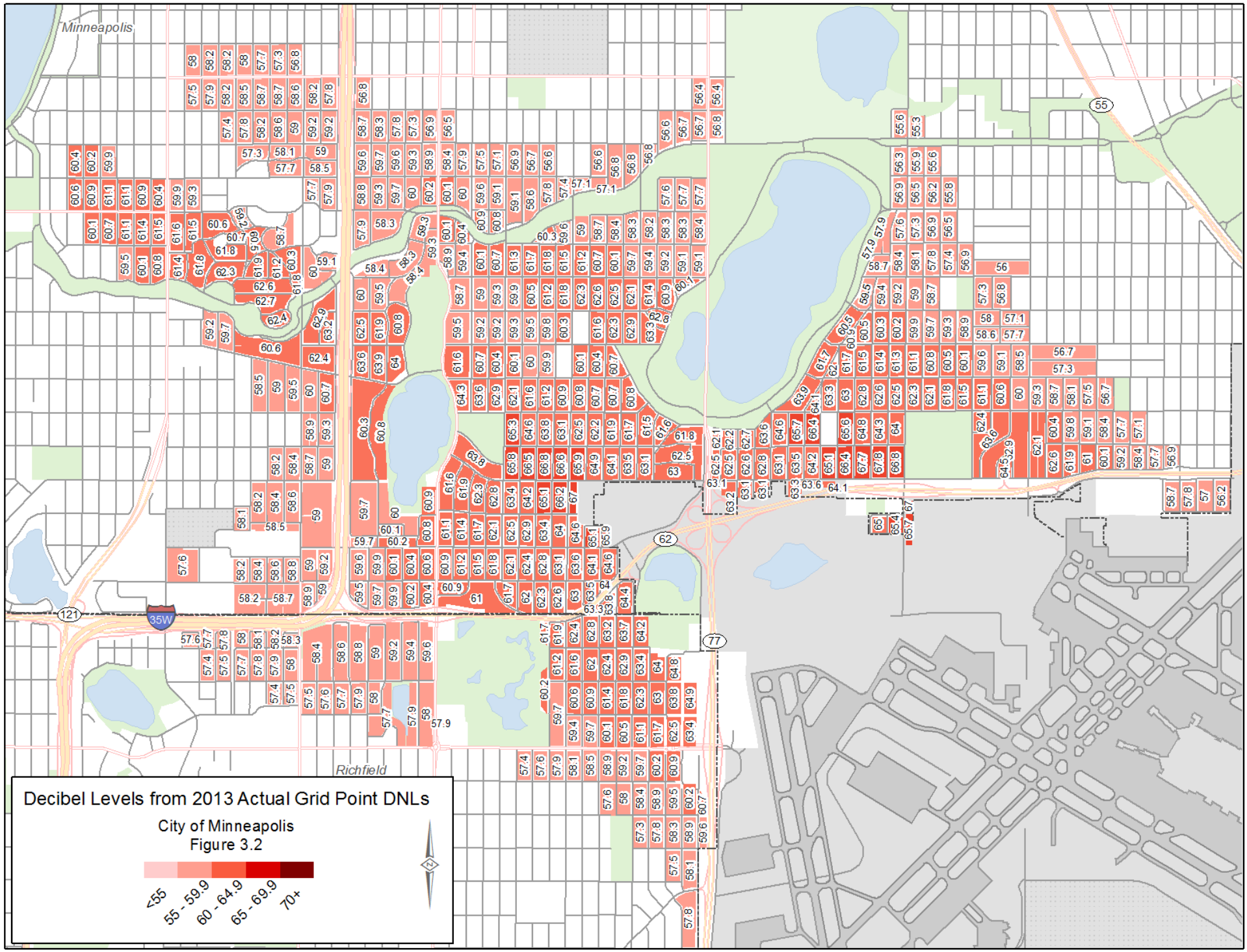
The 2013 actual noise contour is smaller than the 2007 forecast mitigated contour by 6,964.2 acres (44.3 percent reduction) in the 60 DNL contour and by 3,730.5 acres (51.6 percent reduction) in the 65 DNL contour. As depicted in Figures 3.16, there is a small area in South Minneapolis where the 2013 actual noise contours extend beyond the 2007 forecast mitigated noise contours. Chapter 4 provides an analysis of mitigation eligibility relative to the 2013 actual contour consistent with the requirements of the First Amendment to the Consent Decree. There is an overall decrease of 4,188 residential units in the 65 DNL contour and 2,983 residential units in the 60 to 64 DNL noise contours around MSP when comparing the 2007 forecast mitigated contour with the 2013 actual contour that was developed under the requirements of the Consent Decree.

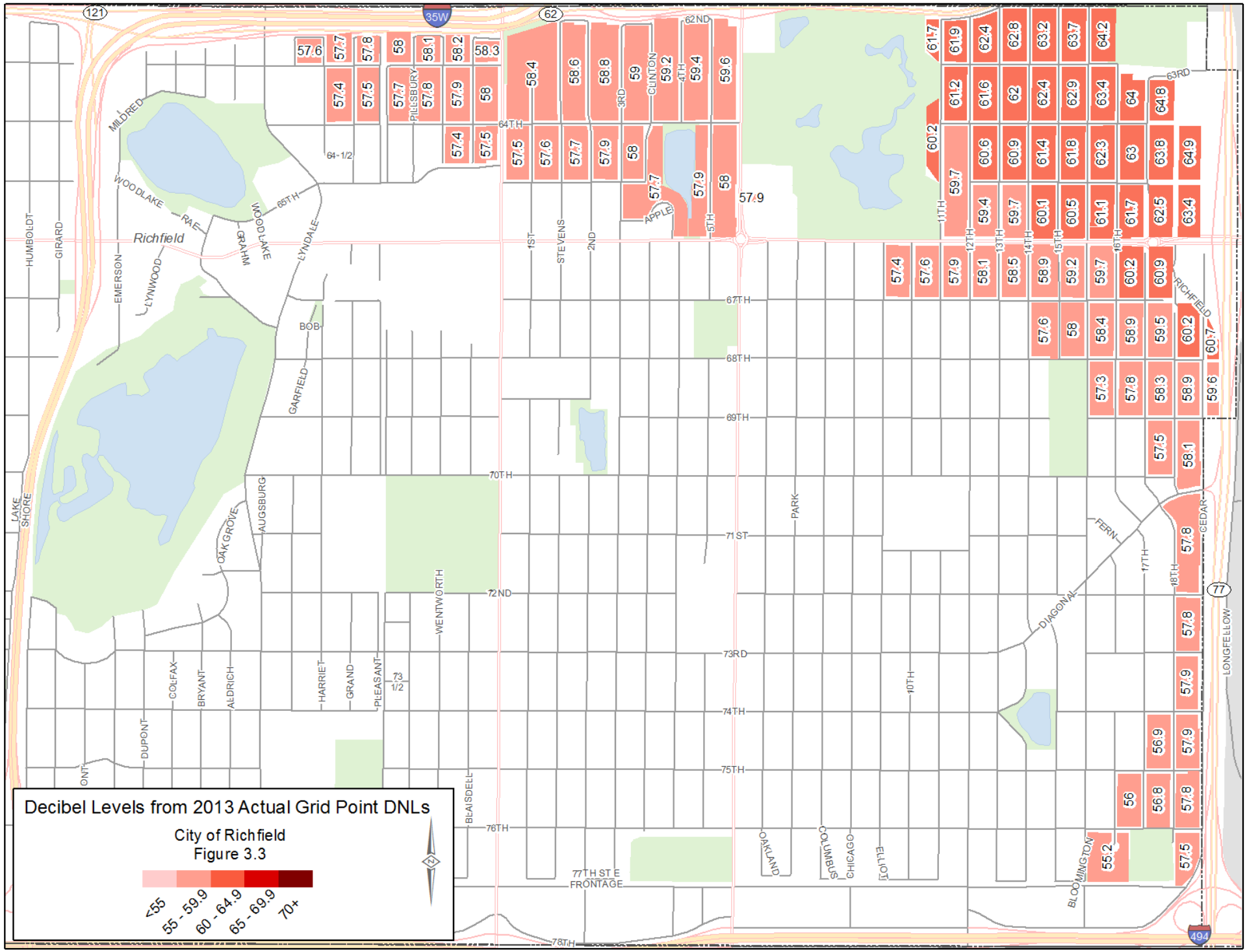
The small extension of the 2013 actual noise contour beyond the 2007 forecast mitigated noise contour can largely be attributed to nighttime runway use variances between what was forecasted and what was occurring in 2013.

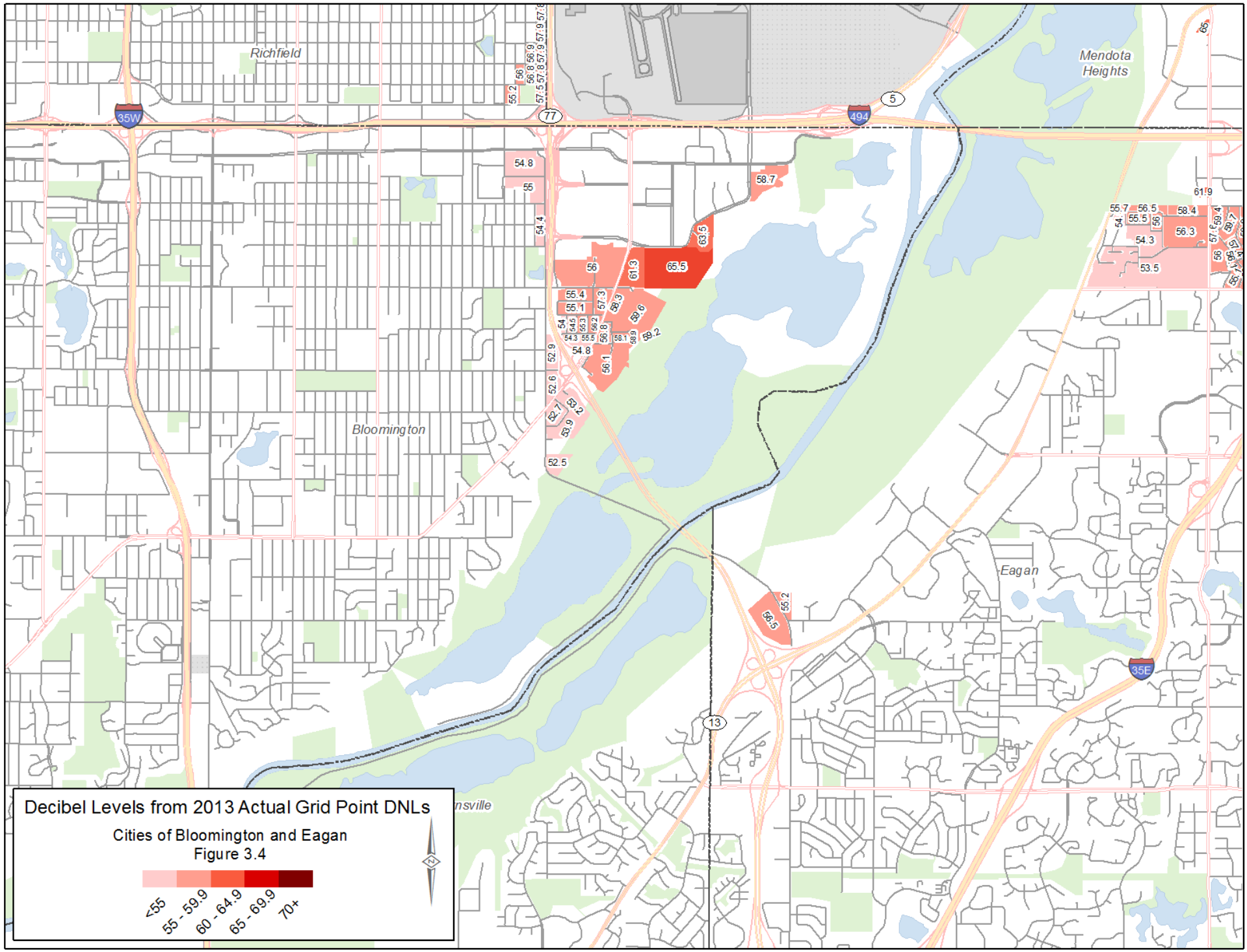
The predominant contraction in the contours from the 2007 forecast mitigated to the 2013 actual noise contour scenarios is driven largely by fleet mix changes (including a significant reduction in hushkitted aircraft operations), and a significant reduction of total annual operations, including a 23 percent reduction in the nighttime operations. The larger arrival lobe on Runway 12R is largely a function of higher nighttime arrival operations on that runway.

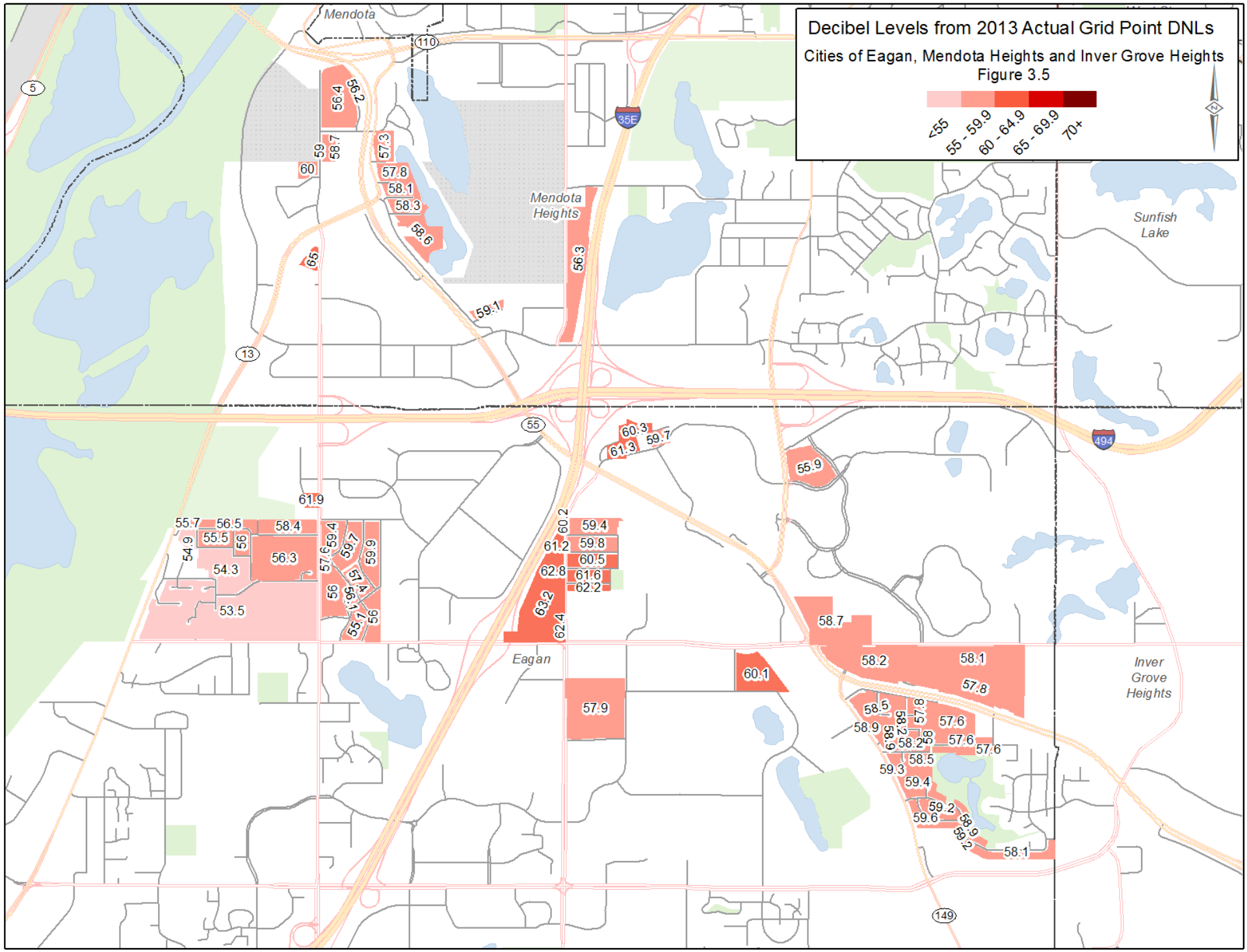
In summary, in addition to INM modeling enhancements, the primary factors to consider when comparing the 2007 forecast mitigated noise contours to the 2013 actual noise contours are total operation numbers, fleet mix, nighttime operations, and runway use.

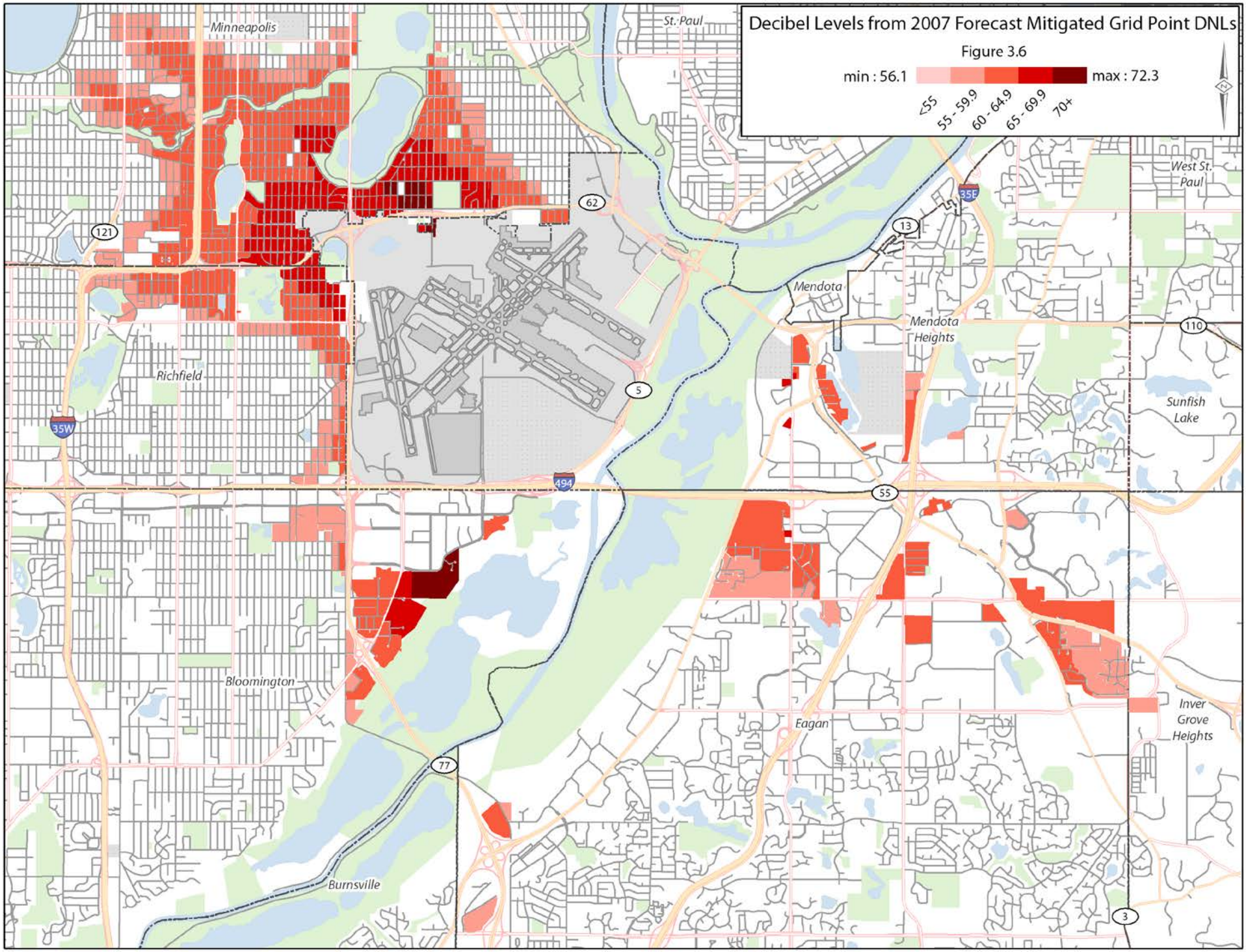

Minneapolis
St. Paul
Lilydale
West St. Paul
Richfield
Mendota
Mendota Heights
Sunfish Lake
Bloomington
Eagan
Inver Grove Heights
35W
35E
494
5
55
62
51
13
149
110
121
77
3
Decibel Levels from 2013 Actual Grid Point DNLs
Figure 3.1
min: 52.5
max: 67.8
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+

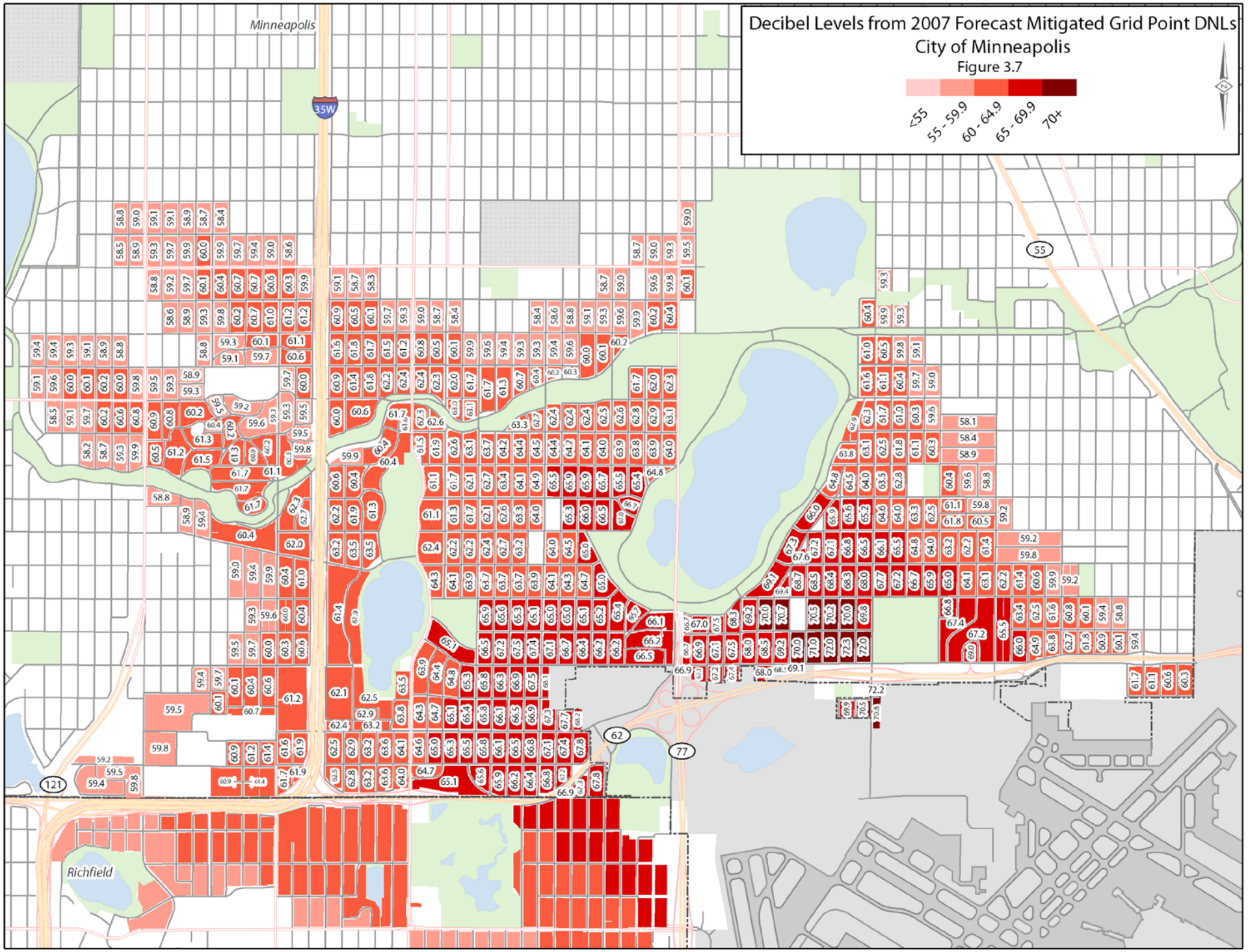

Minneapolis
Richfield
35W
121
62
77
55
Decibel Levels from 2013 Actual Grid Point DNLs
City of Minneapolis
Figure 3.2
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+

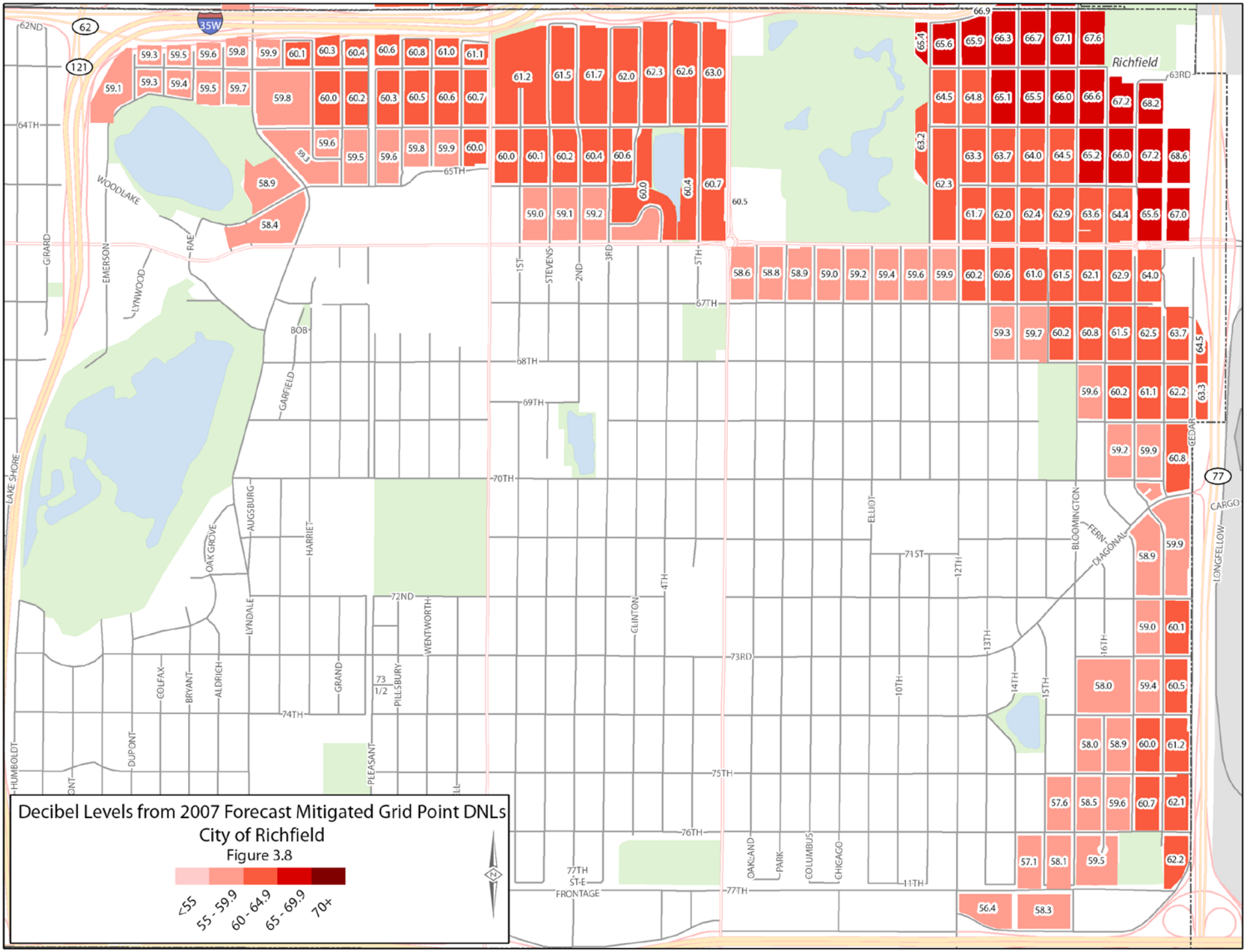

Decibel Levels from 2013 Actual Grid Point DNLs
City of Richfield
Figure 3.3
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Richfield
121
35W
62
494
77
64TH
64 - 1/2
66TH
67TH
68TH
69TH
70TH
71 ST
72ND
73RD
73 1/2
74TH
75TH
76TH
77TH ST E FRONTAGE
78TH
62ND
63RD
1ST
2ND
3RD
4TH
5TH
10TH
11TH
12TH
13TH
14TH
15TH
16TH
17TH
18TH
HUMBOLDT
GIRARD
EMERSON
LYNWOOD
MILDRED
WOODLAKE RAE
WOODLAKE DRIVE
LYNDALE
BOB
GARFIELD
AUGSBURG
OAK GROVE
LAKE SHORE
DUPONT
COLFAX
BRYANT
ALDRICH
HARRIET
GRAND
PLEASANT
WENTWORTH
BLAISDELL
PILLSBURY
STEVENS
CLINTON
APPLE
PARK
OAKLAND
COLUMBUS
CHICAGO
ELLIOT
FERN
DIAGONAL
CEDAR
RICHFIELD
LONGFELLOW
BLOOMINGTON

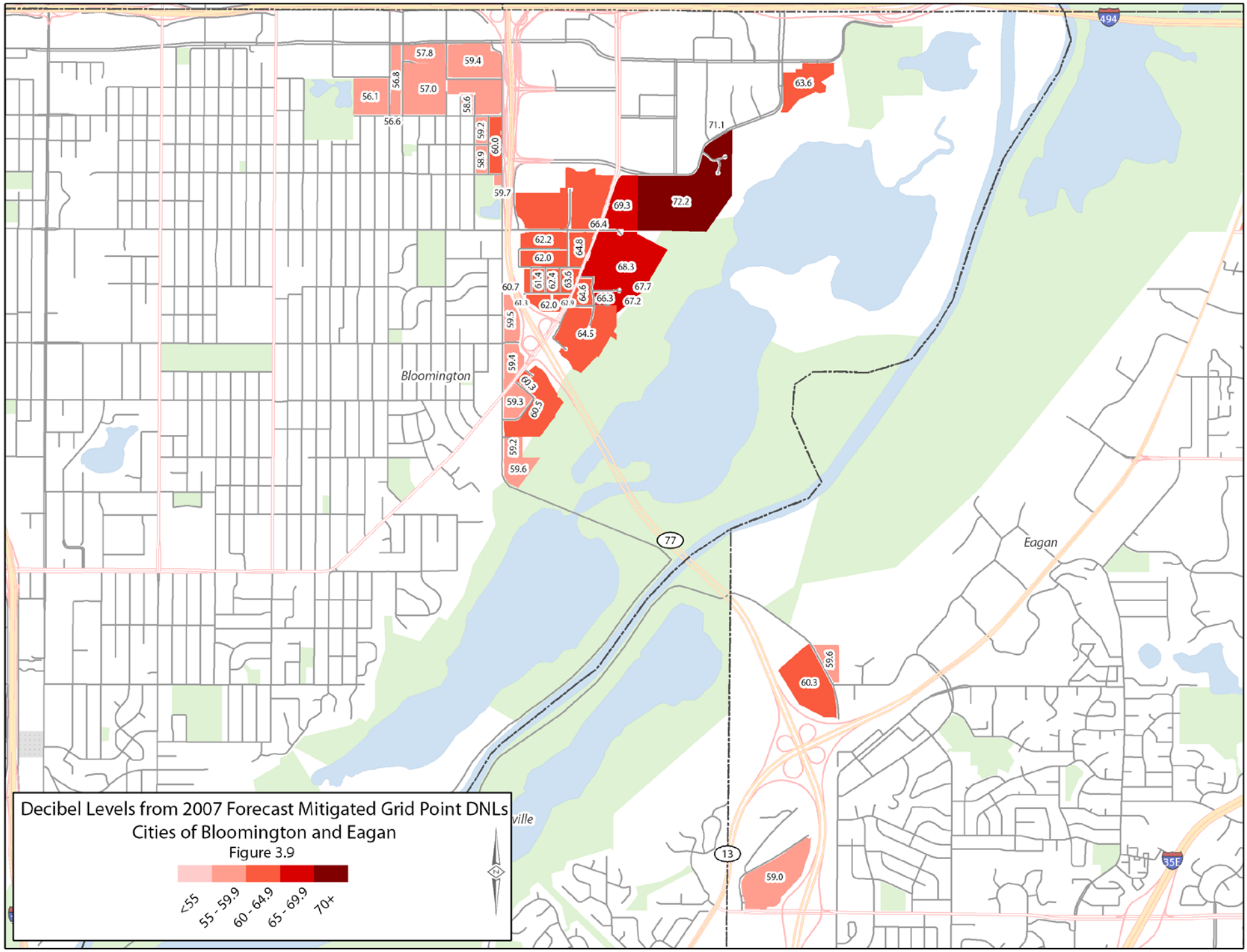

Richfield
Bloomington
Mendota Heights
Eagan
35W
494
77
5
13
35E
Decibel Levels from 2013 Actual Grid Point DNLs
Cities of Bloomington and Eagan
Figure 3.4
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+


Decibel Levels from 2013 Actual Grid Point DNLs
Cities of Eagan, Mendota Heights and Inver Grove Heights
Figure 3.5
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Mendota
Mendota Heights
Eagan
Inver Grove Heights
Sunfish Lake
35E
494
110
5
13
55
149


Decibel Levels from 2007 Forecast Mitigated Grid Point DNLs
Figure 3.6
min : 56.1
max : 72.3
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Minneapolis
St. Paul
West St. Paul
Mendota
Mendota Heights
Richfield
Sunfish Lake
Bloomington
Eagan
Inver Grove Heights
Burnsville
62
121
13
35E
5
35W
494
55
110
77
3


Decibel Levels from 2007 Forecast Mitigated Grid Point DNLs
City of Minneapolis
Figure 3.7
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Minneapolis
Richfield
35W
55
62
77
121


Decibel Levels from 2007 Forecast Mitigated Grid Point DNLs
City of Richfield
Figure 3.8
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Richfield
62ND
64TH
65TH
66TH
67TH
68TH
69TH
70TH
71ST
72ND
73RD
74TH
75TH
76TH
77TH
63RD
62
121
35W
77
GIRARD
EMERSON
LYNWOOD
RAE
WOODLAKE
LAKE SHORE
BOB
GARFIELD
AUGSBURG
HARRIET
OAK GROVE
LYNDALE
GRAND
PILLSBURY
WENTWORTH
73 1/2
PLEASANT
DUPONT
COLFAX
BRYANT
ALDRICH
HUMBOLDT
1ST
STEVENS
2ND
3RD
4TH
5TH
CLINTON
ELLIOT
10TH
11TH
12TH
13TH
14TH
15TH
16TH
BLOOMINGTON
FERN
DIAGONAL
CEDAR
CARGO
LONGFELLOW
OAKLAND
PARK
COLUMBUS
CHICAGO
77TH ST E FRONTAGE


Decibel Levels from 2007 Forecast Mitigated Grid Point DNLs
Cities of Bloomington and Eagan
Figure 3.9
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Bloomington
Eagan
494
77
13
35E
63.6
71.1
72.2
69.3
66.4
68.3
67.7
67.2
64.5
64.8
62.2
62.0
61.4
62.4
63.6
64.6
66.3
60.7
59.7
59.5
59.4
60.3
60.5
59.3
59.2
59.6
57.8
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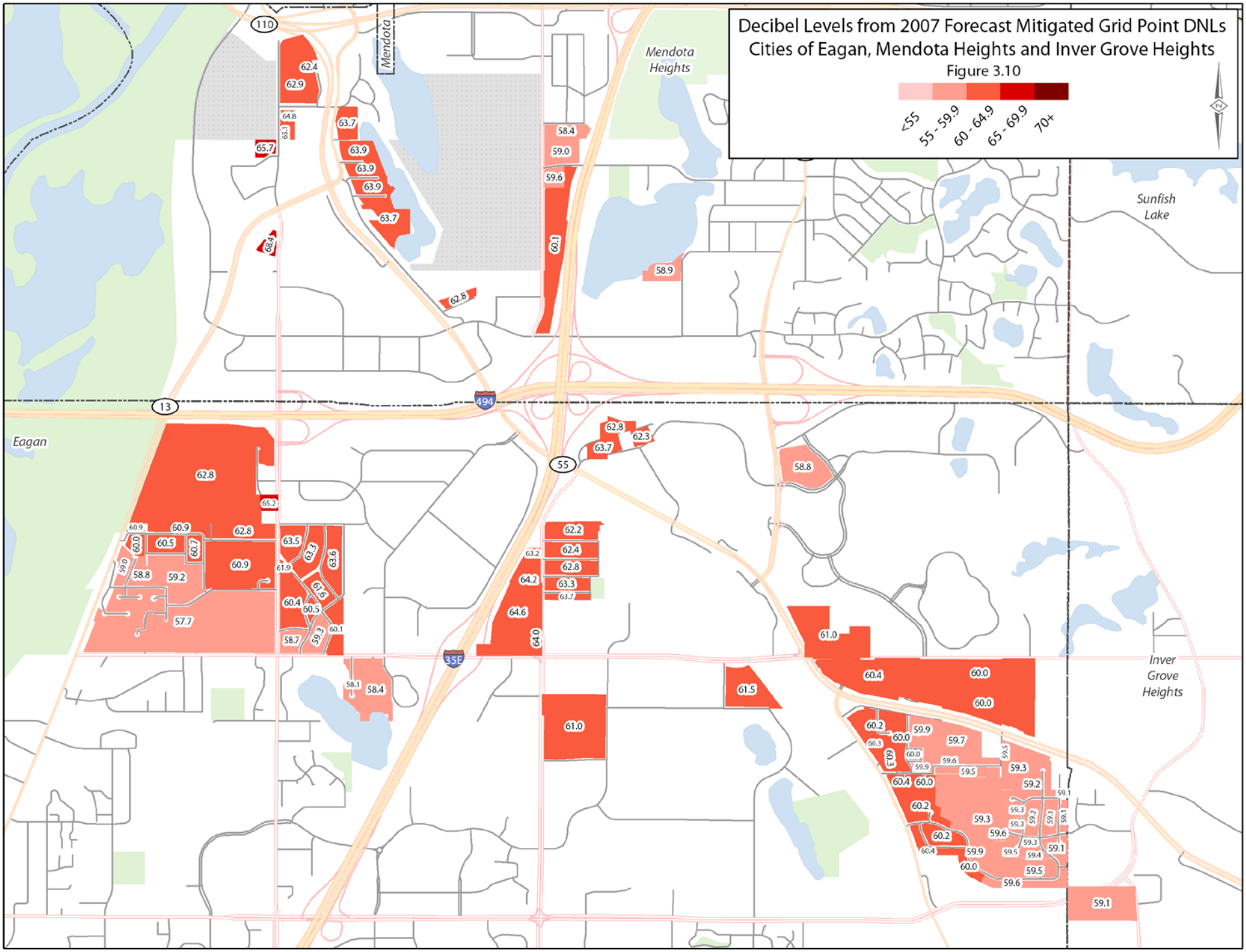
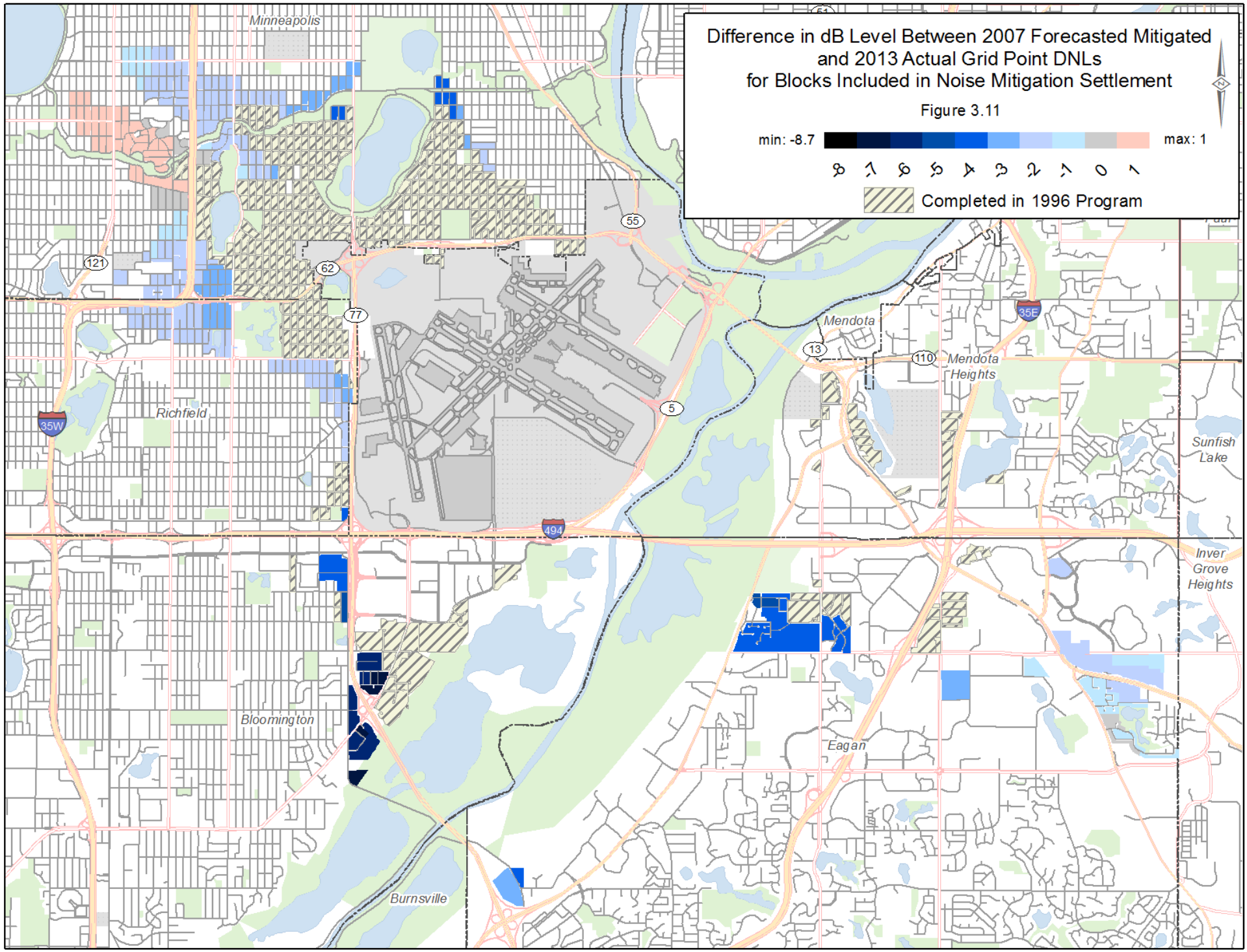
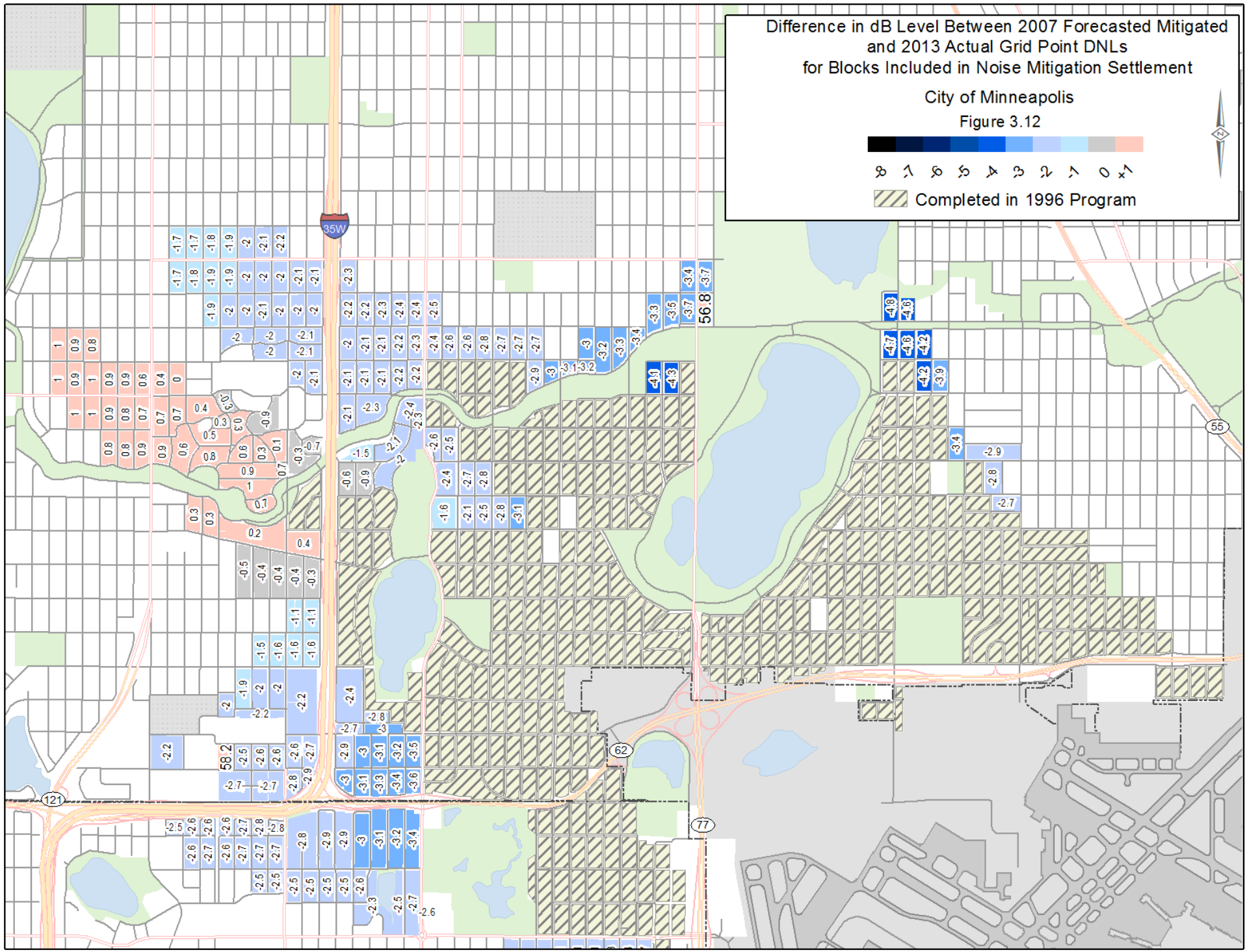
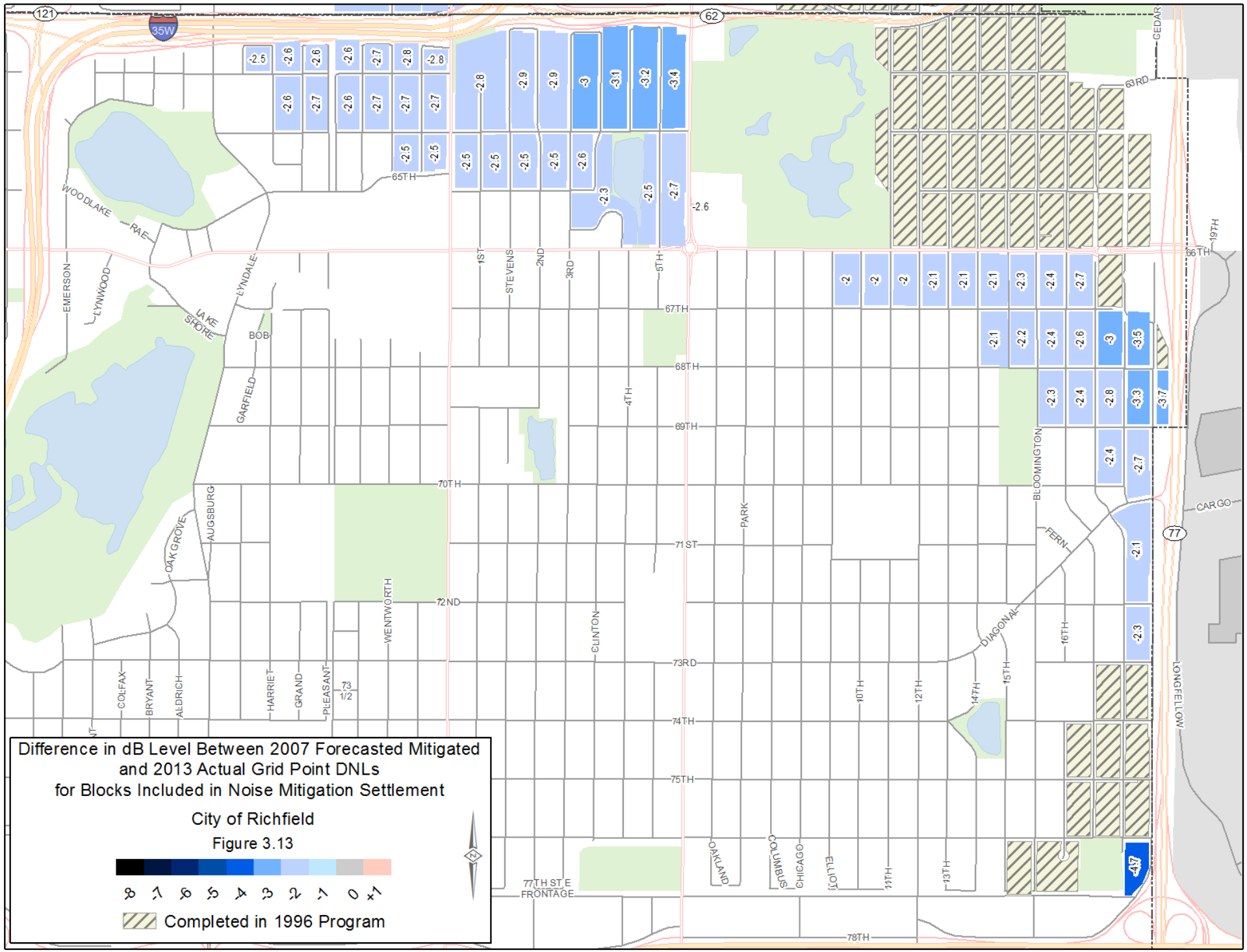
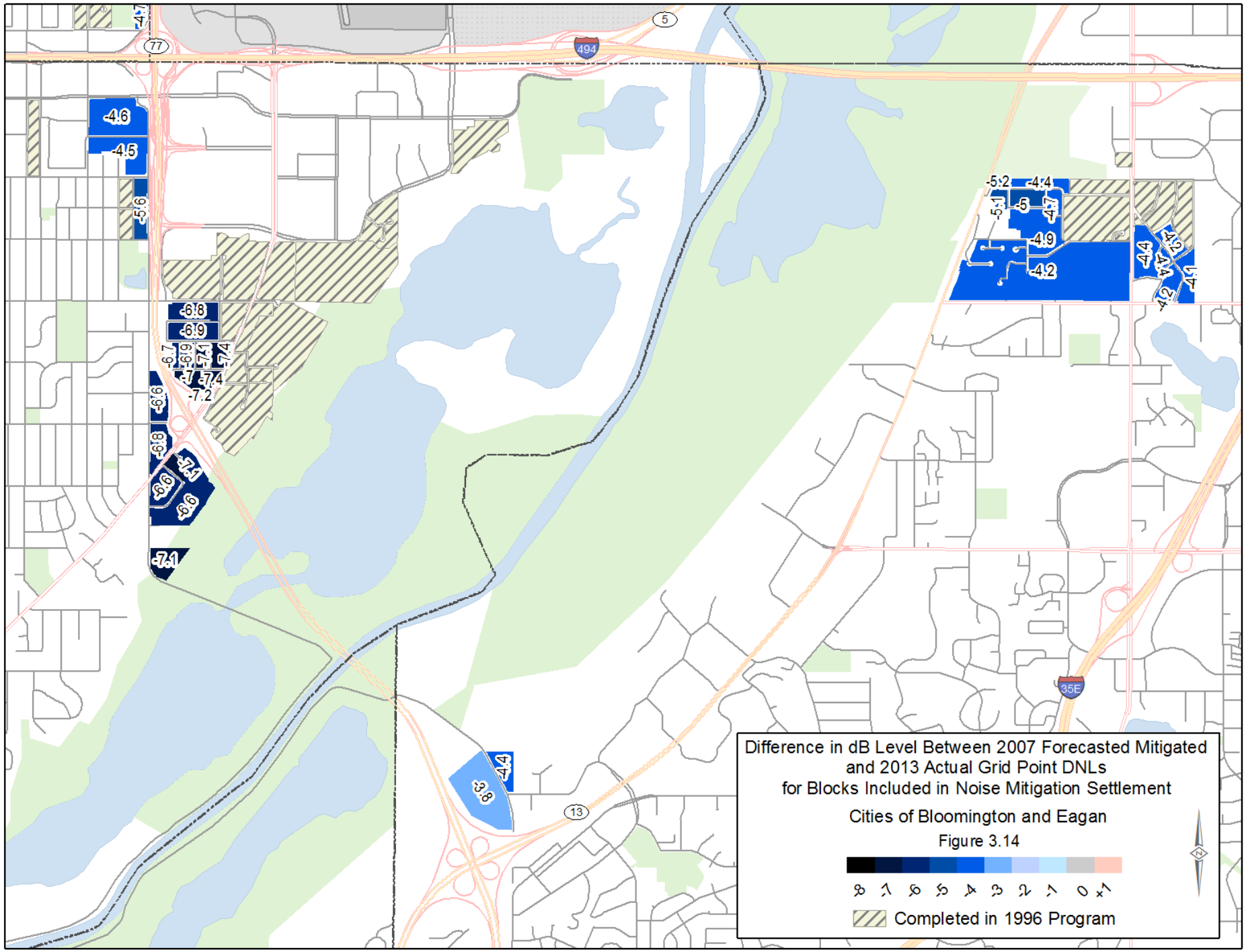
59.2
60.0
58.9
60.3
59.6
59.0

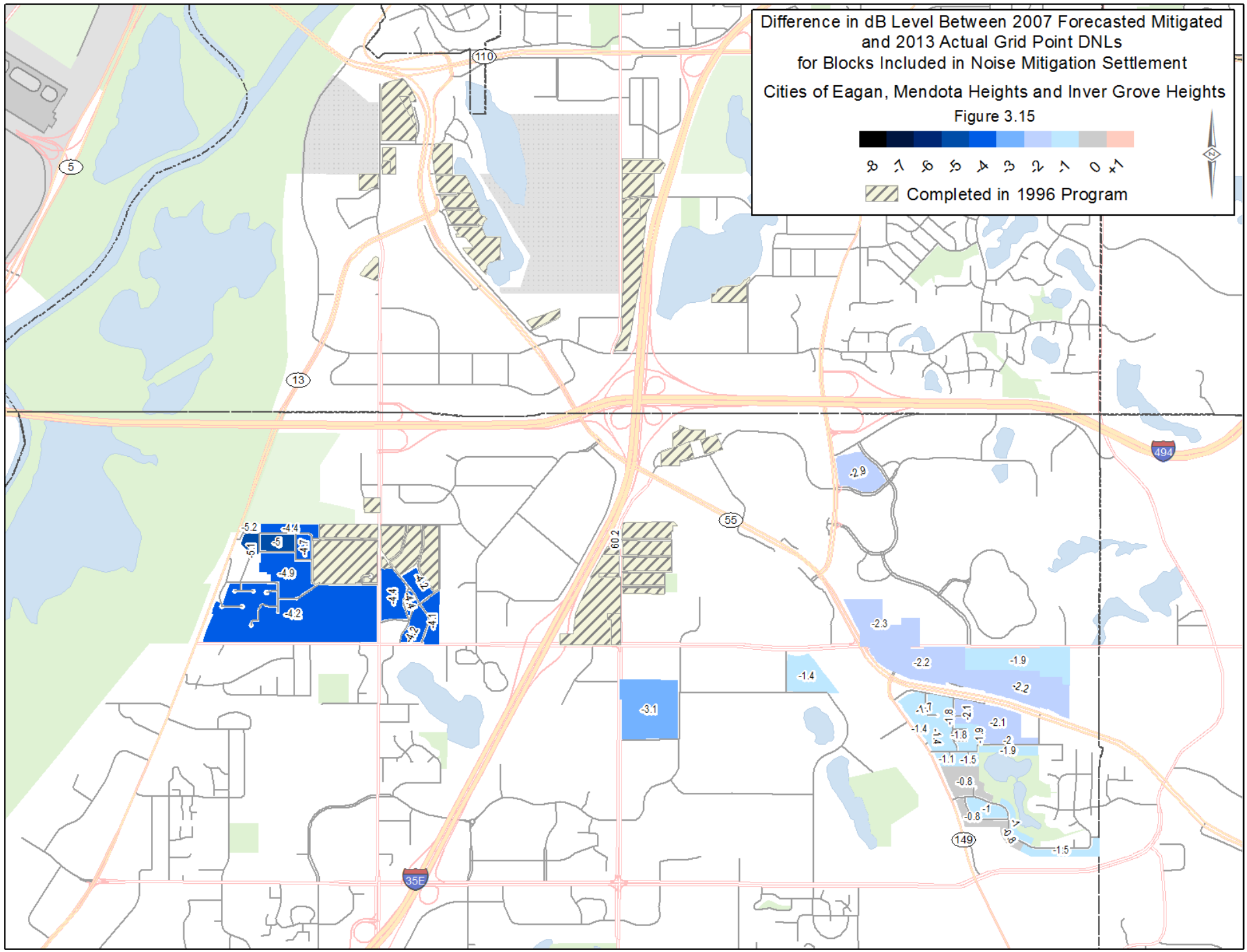

Decibel Levels from 2007 Forecast Mitigated Grid Point DNLs
Cities of Eagan, Mendota Heights and Inver Grove Heights
Figure 3.10
<55
55 - 59.9
60 - 64.9
65 - 69.9
70+
Mendota Heights
Sunfish Lake
Eagan
Inver Grove Heights
Mendota
110
13
494
55
35E

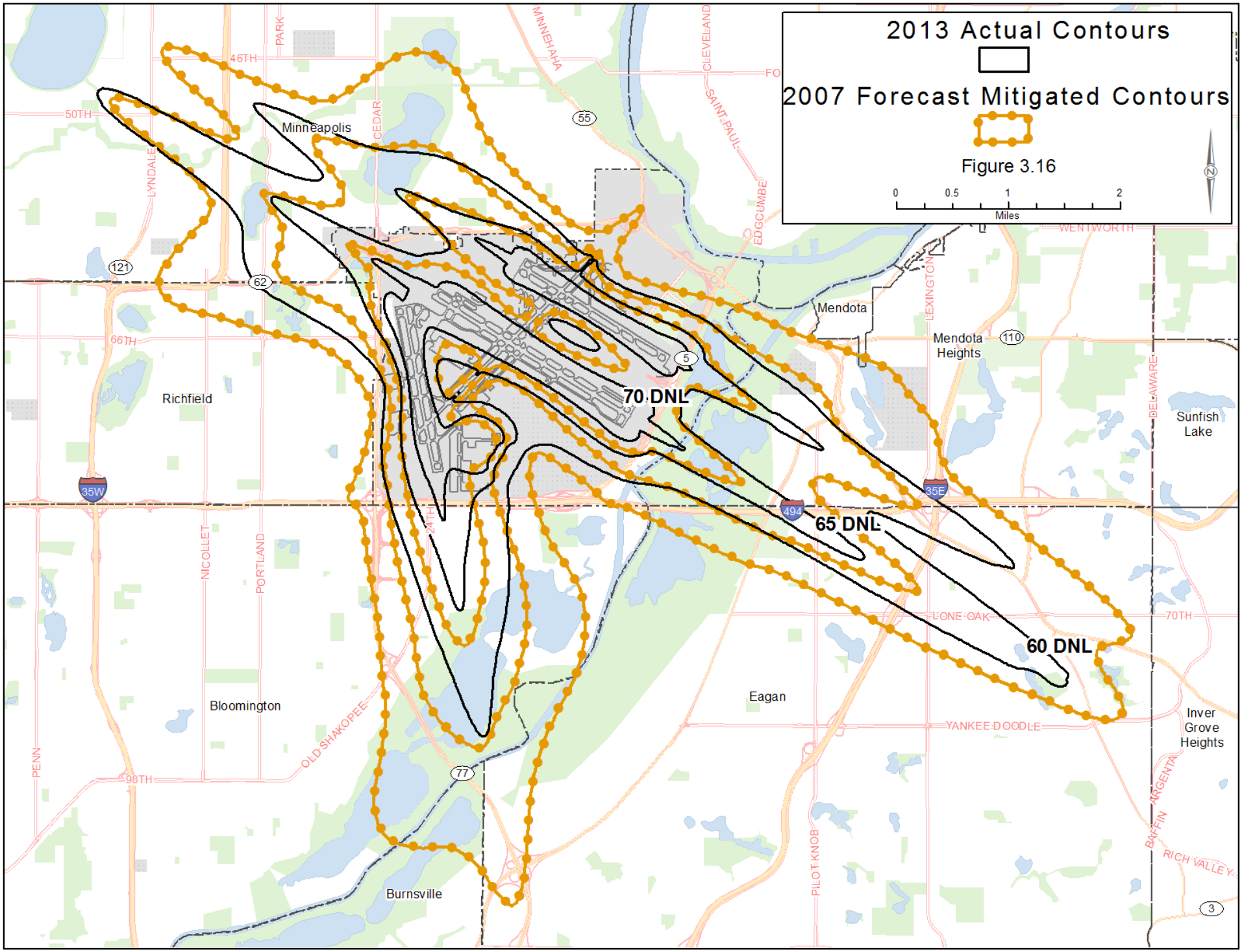

Difference in dB Level Between 2007 Forecasted Mitigated
and 2013 Actual Grid Point DNLs
for Blocks Included in Noise Mitigation Settlement
Figure 3.11
min: -8.7
max: 1
Completed in 1996 Program
Minneapolis
Richfield
Bloomington
Burnsville
Eagan
Mendota
Mendota Heights
Sunfish Lake
Inver Grove Heights
35W
35E
494
55
62
77
5
13
110
121


Difference in dB Level Between 2007 Forecasted Mitigated
and 2013 Actual Grid Point DNLs
for Blocks Included in Noise Mitigation Settlement
City of Minneapolis
Figure 3.12
8 7 6 5 4 3 2 1 0 +1
Completed in 1996 Program
35W
55
62
77
121
56.8
58.2


Difference in dB Level Between 2007 Forecasted Mitigated and 2013 Actual Grid Point DNLs for Blocks Included in Noise Mitigation Settlement
City of Richfield
Figure 3.13
8
7
6
5
4
3
2
1
0
>1
Completed in 1996 Program
121
35W
62
77
65TH
66TH
67TH
68TH
69TH
70TH
71ST
72ND
73RD
74TH
75TH
77TH ST E FRONTAGE
78TH
WOODLAKE
RAE
EMERSON
LYNWOOD
LAKE SHORE
LYNDALE
BOB
GARFIELD
AUGSBURG
OAK GROVE
COLFAX
BRYANT
ALDRICH
HARRIET
GRAND
PLEASANT
73 1/2
WENTWORTH
1ST
STEVENS
2ND
3RD
4TH
5TH
CLINTON
PARK
OAKLAND
COLUMBUS
CHICAGO
ELLIOT
10TH
11TH
12TH
13TH
14TH
15TH
16TH
BLOOMINGTON
DIAGONAL
FERN
CEDAR
63RD
19TH
CARGO
LONGFELLOW


Difference in dB Level Between 2007 Forecasted Mitigated and 2013 Actual Grid Point DNLs
for Blocks Included in Noise Mitigation Settlement
Cities of Bloomington and Eagan
Figure 3.14
Completed in 1996 Program
77
494
5
35E
13


Difference in dB Level Between 2007 Forecasted Mitigated
and 2013 Actual Grid Point DNLs
for Blocks Included in Noise Mitigation Settlement
Cities of Eagan, Mendota Heights and Inver Grove Heights
Figure 3.15
Completed in 1996 Program
N
5
110
13
55
494
35E
149
-5.2
-4.4
-5
-4.7
-5.1
-4.9
-4.2
-4.4
-4.7
-4.1
-4.2
-2.9
-2.3
-2.2
-1.9
-2.2
-1.4
-3.1
-1.7
-1.8
-2.1
-1.4
-1.4
-1.8
-1.9
-2
-2.1
-1.9
-1.1
-1.5
-0.8
-0.8
-1
-0.8
-1.5


2013 Actual Contours
2007 Forecast Mitigated Contours
Figure 3.16
0
0.5
1
2
Miles
70 DNL
65 DNL
60 DNL
Minneapolis
Richfield
Bloomington
Eagan
Burnsville
Mendota
Mendota Heights
Sunfish Lake
Inver Grove Heights
46TH
50TH
66TH
70TH
98TH
LONE OAK
YANKEE DOODLE
WENTWORTH
LYNDALE
PARK
CEDAR
MINNEHAHA
CLEVELAND
SAINT PAUL
EDGCUMBE
LEXINGTON
DELAWARE
NICOLLET
PORTLAND
OLD SHAKOPEE
PENN
PILOT KNOB
ARGENTA
BAFFIN
RICH VALLEY
35W
35E
494
55
62
121
5
110
77
3

Chapter 4 2013 Actual Noise Contour and the First Amendment to the Consent Decree

As discussed previously, the First Amendment to the Consent Decree requires the MAC to determine eligibility for noise mitigation on an annual basis using actual noise contours, developed under Section 8.1(d) of the Consent Decree. This chapter provides detailed information about noise mitigation impacts from the 2013 actual noise contour at MSP.

4.1 First Amendment to the Noise Mitigation Consent Decree

On July 31, 2013, the Cities of Minneapolis, Richfield, Eagan, the Minneapolis Public Housing Authority and the MAC jointly filed the First Amendment ("Amendment") to the Consent Decree to Hennepin County Court. The Amendment, provided in Appendix A, contains language that binds the MAC to provide noise mitigation services consistent with the noise mitigation terms described in the Final MSP 2020 Improvements Environmental Assessment/Environmental Assessment Worksheet (EA/EAW).

On September 25, 2013, Hennepin County Court Judge Ivy Bernardson approved the First Amendment to the 2007 Consent Decree.

The Amendment to the Consent Decree incorporates text in the eligibility section and the related mitigation program as defined by the Consent Decree.

In 2014 the Annual Noise Contour Report format was updated in consultation and agreement with the parties to the Consent Decree (including the City of Minneapolis, City of Richfield, and City of Eagan) to address the mitigation program requirements detailed in the First Amendment to the Consent Decree. In addition to the background information provided in Chapter 1, Section 1.5, the report was updated to provide maps analyzing changes that occur in noise mitigation eligibility as compared to the 2007 Consent Decree, and associated trends relative to consecutive yearly impacts.

4.2 2013 Actual Contour Noise Mitigation Impact

Under the provisions of the First Amendment to the Consent Decree, provided in Appendix A, properties must meet certain criteria to be considered eligible for participation in the MAC noise mitigation program.

First, as stated in the First Amendment to the Consent Decree:

> *"The community in which the home is located has adopted local land use controls and building performance standards applicable to the home for which mitigation is sought that prohibit new residential construction, unless the construction materials and practices are*

consistent with the local land use controls and heightened building performance standards for homes within the 60 DNL Contour within the community in which the home is located."

This criterion has been met by all of the communities contiguous to MSP.

Second, as stated in the First Amendment to the Consent Decree:

"The home is located, for a period of three consecutive years, with the first of the three years beginning no later than calendar year 2020 (i) in the actual 60-64 DNL noise contour prepared by the MAC under Section 8.l(d) of this Consent Decree and (ii) within a higher noise impact mitigation area when compared to the Single-Family home's status under the noise mitigation programs for Single-Family homes provided in Sections 5.1 through 5.3 of this Consent Decree or when compared to the Multi- Family home's status under the noise mitigation programs for Multi-Family homes provided in Section 5.4 of this Consent Decree. The noise contour boundary will be based on the block intersect methodology. The MAC will offer noise mitigation under Section IX of this Consent Decree to owners of eligible Single-Family homes and Multi-Family homes in the year following the MAC's determination that a Single-Family or Multi-Family home is eligible for noise mitigation under this Section."

Table 4.1 provides the number of single-family living units and Table 4.2 provides the number of multi-family living units that met the first year eligibility criteria.

Table 4.1
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Summary of 2013 Actual DNL Noise Contours Single-Family Unit Counts by Block with Mitigation Eligibility Status

Year of Eligibility	City	Mitigation	Fig 4.1 and 4.2 Key	DNL Contours 60-62	63-64	65-69	70-74	75+	Total
Year 1 out of 3	Minneapolis	In 2013 Actual Contours previously mitigated *(No mitigation eligibility change)*		4,312	1,421	986	-	-	6,719
	Mitigation Changes After 3 Consecutive Years	In 2013 Actual 60 DNL previously outside 2005 and 2007 60 DNL *(Eligible for mitigation after 3 consecutive years)*		18	-	-	-	-	18
		In 2013 Actual 60 DNL previously between 2005 and 2007 60 DNL *(Eligible for additional mitigation, less previous reimbursements after 3 consecutive years)*		119	-	-	-	-	119
		In 2013 Actual 63 DNL previously in 2007 60-62 DNL *(Eligible for the "five decibel package" after 3 consecutive years)*		-	-	-	-	-	0
		Minneapolis Total		4,449	1,421	986	-	-	6,856
	Bloomington	In 2013 Actual Contours previously mitigated *(No mitigation eligibility change)*		85	33	1	-	-	119
	Richfield	In 2013 Actual Contours previously mitigated *(No mitigation eligibility change)*		379	161	-	-	-	540
	Eagan	In 2013 Actual Contours previously mitigated *(No mitigation eligibility change)*		145	21	-	-	-	166
	Mendota Heights	In 2013 Actual Contours previously mitigated *(No mitigation eligibility change)*		2	-	1	-	-	3
		Grand Total		**5,060**	**1,636**	**988**	**-**	**-**	**7,684**

Note: Block Intersect Methodology; Single-Family=1-3 Units.
Source: HNTB provided INM contours, MAC analysis, 2014

Table 4.2
MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT
Summary of 2013 Actual DNL Noise Contours Multi-Family Unit Counts by Block with Mitigation Eligibility Status

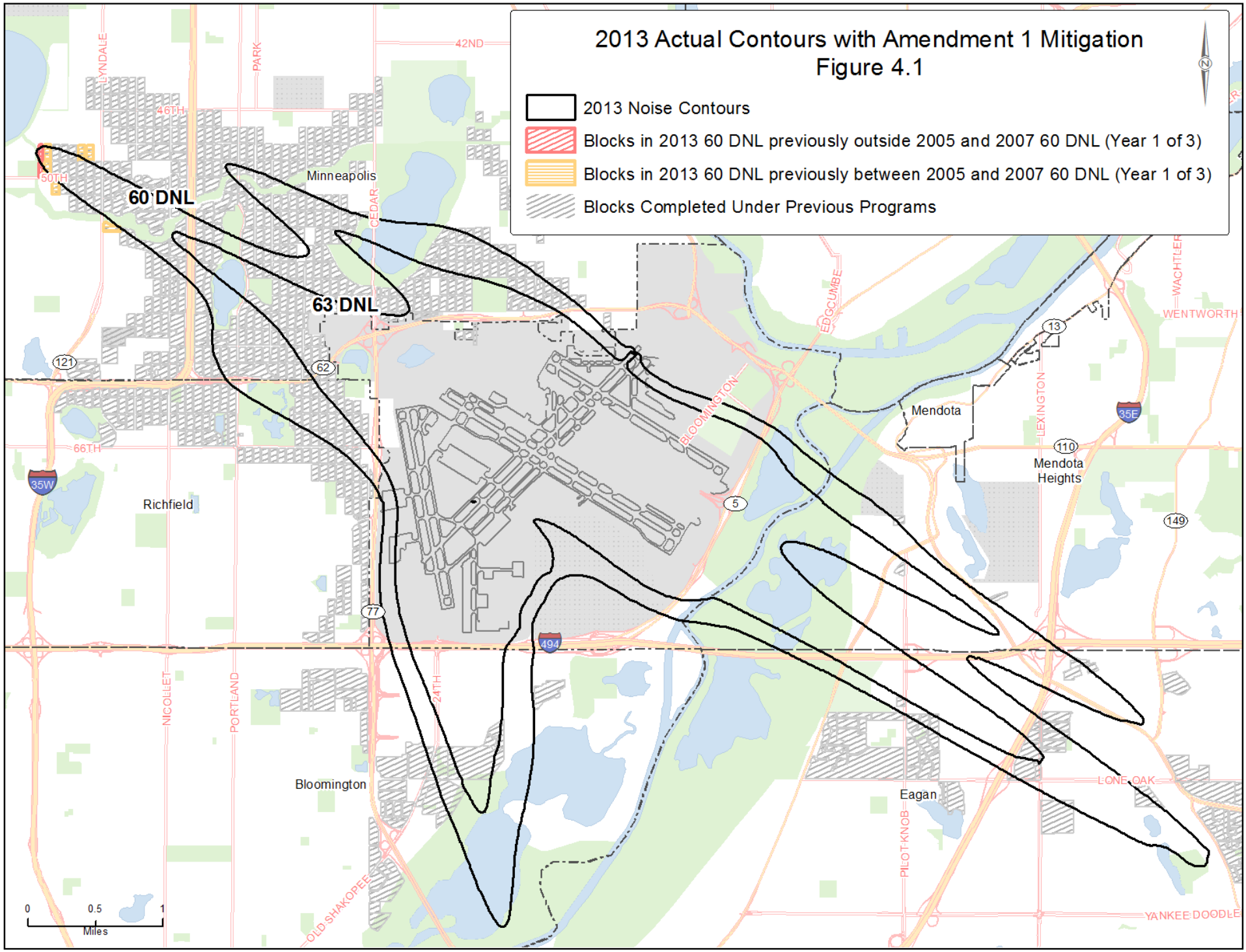
Year of Eligibility	City	Mitigation	Fig 4.1 and 4.2 Key	DNL Contours 60-64	65-69	70-74	75+	Total
Year 1 out of 3	Minneapolis	In 2013 Actual Contours previously mitigated under 2007 Consent Decree *(no mitigation eligibility change)*		328	449	-	-	777
	Mitigation Changes After 3 Consecutive Years	In 2013 Actual 60-64 DNL previously outside 2005 and 2007 60 DNL *(eligible for mitigation after 3 consecutive years)*		89	-	-	-	89
		Minneapolis Total		417	449	-	-	866
	Bloomington	In 2013 Actual Contours previously mitigated under 2007 Consent Decree *(no mitigation eligibility change)*		402	-	-	-	402
	Richfield	In 2013 Actual Contours previously mitigated under 2007 Consent Decree *(no mitigation eligibility change)*		66	-	-	-	66
	Eagan	In 2013 Actual Contours previously mitigated under 2007 Consent Decree *(no mitigation eligibility change)*		-	-	-	-	0
	Mendota Heights	In 2013 Actual Contours previously mitigated under 2007 Consent Decree *(no mitigation eligibility change)*		-	-	-	-	0
		Grand Total		**885**	**449**	**0**	**0**	**1,334**

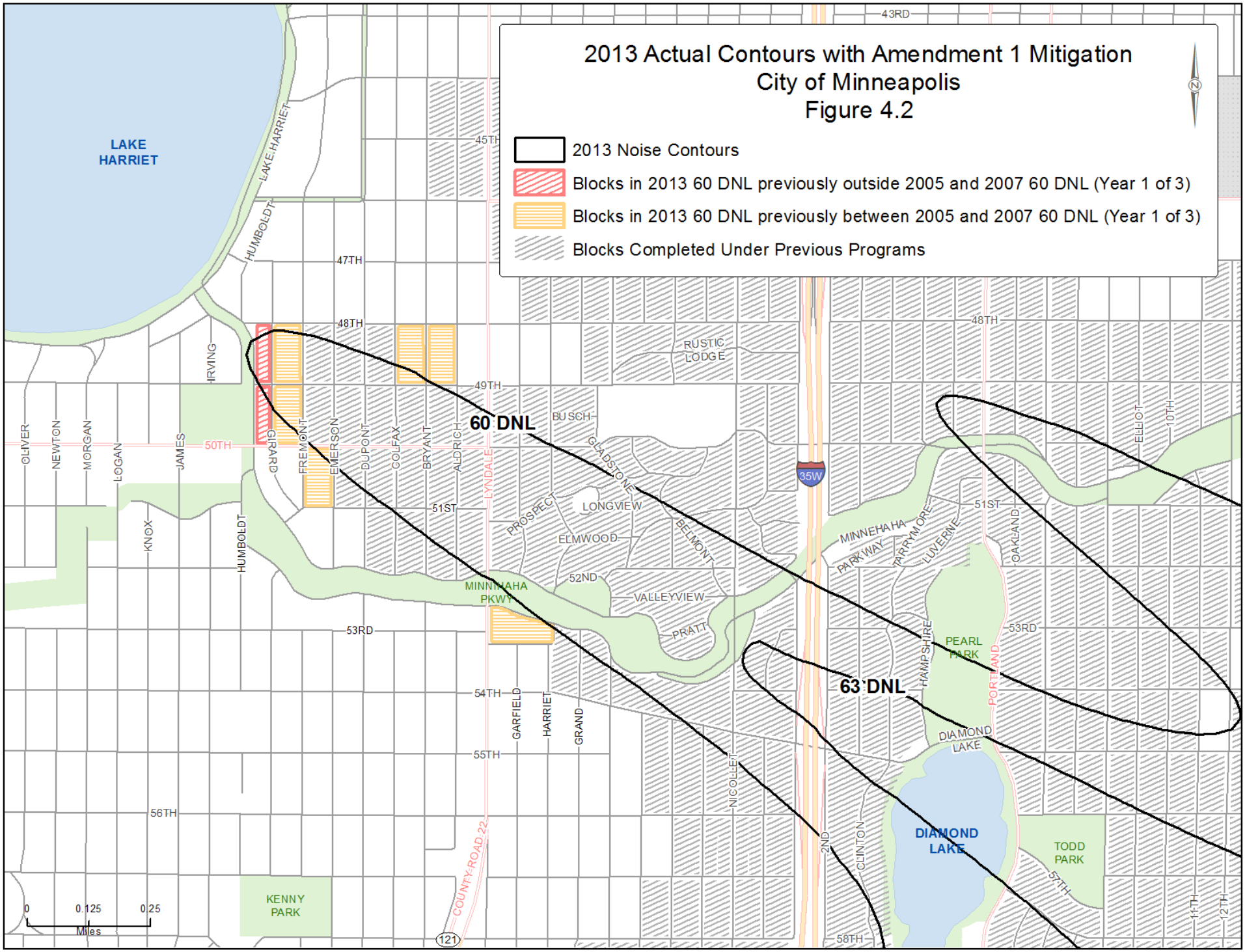
Note: Block Intersect Methodology; Multi-Family>3 Units.

Source: HNTB provided INM contours, MAC analysis, 2014

In this first year (2013) of eligibility established by the terms of the First Amendment to the Consent Decree, the only residential properties that meet the mitigation eligibility criteria are located within the City of Minneapolis. There are 137 single-family units and 89 multi-family units that meet the first year of eligibility for increased noise mitigation from the MAC. Of the 137 single-family units, 18 units were outside the original Consent Decree mitigation area and are now within the 2013 60-62 DNL noise contour. If these single-family homes remain within the 60-62 DNL annual noise contour for three consecutive years, they will be eligible for one of two mitigation options as detailed in Section 9.5(b) in Appendix A. There are 119 single-family units within the 2013 60-62 DNL noise contour that were previously between the 2005 and 2007 60 DNL contours and are eligible to receive approved mitigation reimbursements until July 31, 2014, under the terms of the original Consent Decree. If these single-family homes remain within the 60-62 DNL annual actual noise contour for three consecutive years, they will be eligible for one of two mitigation options as detailed in Section 9.5(b) in Appendix A, less any reimbursements paid under the original Consent Decree mitigation program. The 89 multi-family units were originally outside the original Consent Decree mitigation area and are now within the 2013 60-64 DNL contours. If these multi-family units remain within the 60-64 DNL annual actual noise contour for three consecutive years, they will be eligible for the Multi-Family Home Mitigation Package as defined in Section 9.6 of Appendix A.

The blocks meeting the first year of noise mitigation eligibility are shown in Figures 4.1 and 4.2.


2013 Actual Contours with Amendment 1 Mitigation
Figure 4.1
2013 Noise Contours
Blocks in 2013 60 DNL previously outside 2005 and 2007 60 DNL (Year 1 of 3)
Blocks in 2013 60 DNL previously between 2005 and 2007 60 DNL (Year 1 of 3)
Blocks Completed Under Previous Programs
60 DNL
63 DNL
Minneapolis
Richfield
Bloomington
Eagan
Mendota
Mendota Heights
WENTWORTH
42ND
46TH
50TH
66TH
LYNDALE
PARK
CEDAR
EDGCUMBE
WACHTLER
BLOOMINGTON
LEXINGTON
NICOLLET
PORTLAND
24TH
OLD SHAKOPEE
PILOT KNOB
LONE OAK
YANKEE DOODLE
35W
35E
494
121
62
13
5
110
149
77
0
0.5
1
Miles


2013 Actual Contours with Amendment 1 Mitigation
City of Minneapolis
Figure 4.2
2013 Noise Contours
Blocks in 2013 60 DNL previously outside 2005 and 2007 60 DNL (Year 1 of 3)
Blocks in 2013 60 DNL previously between 2005 and 2007 60 DNL (Year 1 of 3)
Blocks Completed Under Previous Programs
60 DNL
63 DNL
LAKE HARRIET
DIAMOND LAKE
KENNY PARK
PEARL PARK
TODD PARK
MINNEHAHA PKWY
43RD
45TH
47TH
48TH
49TH
50TH
51ST
52ND
53RD
54TH
55TH
56TH
57TH
58TH
LAKE HARRIET
HUMBOLDT
IRVING
OLIVER
NEWTON
MORGAN
LOGAN
JAMES
KNOX
GIRARD
FREMONT
EMERSON
DUPONT
GOLFAX
BRYANT
ALDRICH
LYNDALE
BUSCH
RUSTIC LODGE
GLADSTONE
PROSPECT
LONGVIEW
ELMWOOD
BELMONT
VALLEYVIEW
PRATT
GARFIELD
HARRIET
GRAND
NICOLLET
CLINTON
2ND
PORTLAND
HAMPSHIRE
DIAMOND LAKE
MINNEHAHA PARK WAY
TARRYMORE
LUVERNE
OAKLAND
ELLIOT
10TH
11TH
12TH
35W
COUNTY ROAD 22
121
0
0.125
0.25
Miles

Appendix A

First Amendment to the Consent Decree

Filed in Fourth Judicial District Court
9/25/2013 2:06:29 PM
Hennepin County Civil, MN

STATE OF MINNESOTA | DISTRICT COURT

COUNTY OF HENNEPIN | FOURTH JUDICIAL DISTRICT

STATE OF MINNESOTA BY THE CITY OF MINNEAPOLIS, et al.,

Plaintiffs,

v.

METROPOLITAN AIRPORTS COMMISSION,

Defendant, and

NORTHWEST AIRLINES,

Defendant-Intervenor.

Case No. 27-CV-05-005474

FIRST AMENDMENT TO CONSENT DECREE

WHEREAS, the City of Minneapolis, City of Richfield, City of Eagan, Minneapolis Public Housing Authority (collectively, the "Cities"), and the Metropolitan Airports Commission (the "MAC") are parties to a Consent Decree entered by this Court on October 19, 2007 (the "Consent Decree");

WHEREAS, the MAC will complete all noise mitigation requirements established in the October 19, 2007 Consent Decree no later than September 1, 2014;

WHEREAS, the MAC intends to implement the proposed Minneapolis St.-Paul International Airport (MSP) 2020 Improvements Project to accommodate the expected demand such that the level of service is acceptable throughout MSP's facilities under both existing and 2020 conditions, and that regional roadways provide an acceptable level of service under both existing and 2030 conditions;

WHEREAS, the Cities allege that the Metropolitan Council has formally adopted 60 DNL as a local noise mitigation standard for MSP, whether or not the interior noise level in a residence is below 45 DNL;

WHEREAS, the Cities allege that the final MSP 2020 Improvements Project Environmental Assessment/Environmental Assessment Worksheet is inadequate under the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4370h, and the Minnesota Environmental Policy Act (MEPA), Minn. Stat. §§ 116D.01-116D.10;

WHEREAS, the Cities allege that failure to provide noise mitigation for existing homes that are newly within the 60 DNL for exterior noise surrounding MSP, whether or not the interior noise level in a residence is at or below 45 DNL, violates the Minnesota Environmental Rights Act (MERA), Minn. Stat. §§ 116B.01-116B.13;

WHEREAS, the MAC contends that the MSP 2020 Improvements Environmental Assessment/Environmental Assessment Worksheet is adequate under NEPA and MEPA;

WHEREAS, the MAC contests the Cities' allegations under NEPA, MEPA, and MERA and does not admit any liability to the Cities arising out of the allegations;

WHEREAS, the Cities allege that they have adopted ordinances requiring new residential construction to include specified noise attenuation within the 2007 60 DNL Contour for exterior noise surrounding MSP, whether or not the interior noise level in a residence is at or below 45 DNL;

WHEREAS, the MAC and the Cities desire to resolve the issues arising out of the MSP 2020 Improvements Environmental Assessment/Environmental Assessment Worksheet and the Cities' allegations under NEPA, MEPA, and MERA, and avoid litigation with respect to those issues and allegations; and

WHEREAS, Section 8.1(j) and Section 8.7 of the Consent Decree allow the Cities and the MAC to modify the Consent Decree by mutual agreement and in writing; and

WHEREAS, this Amendment will be submitted to the Federal Aviation Administration Office of Legal Counsel for a legal determination regarding its consistency with federal requirements regarding the use of airport revenue;

NOW THEREFORE, upon (a) receipt of a written legal determination by the Federal Aviation Administration Office of Legal Counsel that use of airport revenue to fund the programs contemplated by this Amendment is permitted and (b) approval of this Amendment by the Court, the Consent Decree shall be amended as follows:

1. The Consent Decree is hereby modified to insert the following language after Section 8.14:

IX. NOISE MITIGATION PROGRAM TO BE IMPLEMENTED FOLLOWING FAA APPROVAL OF THE MSP 2020 IMPROVEMENTS ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL ASSESSMENT WORKSHEET

9.1 Goal of the Program. The MAC's goal in adopting the noise mitigation program in Section IX of this Consent Decree is to minimize the environmental impacts on residents in communities adjacent to MSP, consistent with the unique noise characteristics associated with air carrier aircraft operations.

9.2 Duration of the Program. The noise mitigation program in Section IX of this Consent Decree will commence immediately and terminate on December 31, 2024.

9.3 Noise Contours and Program Eligibility Assessment. The MAC will determine eligibility for the program based upon actual noise contours that MAC develops under Section 8.1(d) of this Consent Decree. The MAC will assess eligibility for noise mitigation under

the program annually based upon the Section 8.1(d) actual noise contours prepared for the previous calendar year.

9.4 Eligibility Criteria. The owners of Single-Family homes and Multi-Family homes, as those terms are defined in Section 4.27 and Section 4.16 of this Consent Decree, shall be eligible for the noise mitigation program in Section IX of this Consent Decree. There is no requirement that the interior noise level in any Single-Family or Multi-Family home receiving mitigation under Section IX of this Consent Decree be above 45 DNL. The owner of a Single-Family or Multi-Family home will be considered eligible for mitigation under the noise mitigation program in Section IX of this Consent Decree if the following criteria are met: (a) the community in which the home is located has adopted local land use controls and building performance standards applicable to the home for which mitigation is sought that prohibit new residential construction, unless the construction materials and practices are consistent with the local land use controls and heightened building performance standards for homes within the 60 DNL Contour within the community in which the home is located, and (b) the home is located, for a period of three consecutive years, with the first of the three years beginning no later than calendar year 2020 (i) in the actual 60-64 DNL noise contour prepared by the MAC under Section 8.1(d) of this Consent Decree and (ii) within a higher noise impact mitigation area when compared to the Single-Family home's status under the noise mitigation programs for Single-Family homes provided in Sections 5.1 through 5.3 of this Consent Decree or when compared to the Multi-Family home's status under the noise mitigation programs for Multi-Family homes provided in Section 5.4 of this Consent Decree. The noise contour boundary will be based on the block intersect methodology. The MAC will offer noise mitigation under Section IX of this Consent Decree to owners of eligible Single-Family homes and Multi-Family homes in the year following

the MAC's determination that a Single-Family or Multi-Family home is eligible for noise mitigation under this Section.

9.5 Single-Family Home Mitigation Package.

(a) If a Single-Family home is in the 63 or higher DNL annual noise contour prepared by the MAC under Section 8.1(d) of this Consent Decree for three consecutive years and meets the Eligibility Criteria in Section 9.4, the Single-Family home will be eligible for the Five-Decibel Reduction Package, as that term is defined in Section 4.11 of this Consent Decree. The Five-Decibel Reduction Package shall be designed to achieve a program average Noise Level Reduction, as that term is defined in Section 4.19 of this Consent Decree, of five decibels and shall be achieved by an application of some or all of the mitigation measures set forth in Section 4.11 of this Consent Decree, depending solely upon the characteristics of each home.

(b) If a Single-Family home is in the 60-62 DNL annual noise contour prepared by the MAC under Section 8.1(d) of this Consent Decree for three consecutive years and meets the Eligibility Criteria of Section 9.4, the Single-Family home will be eligible for one of two mitigation options, to be selected by the owner of the home. The two mitigation options are: (1) if no central air conditioning exists in the home as of April 1, 2013, the MAC will install central air conditioning and provide a total not to exceed $4,000 (in 2007 dollars) of noise mitigation products and services from the Mitigation Menu, as that term is defined in Section 4.14 of this Consent Decree, including reasonable and customary installation costs; or (2) if central air conditioning exists in the home as of April 1, 2013, or if central air conditioning does not exist in the home as of April 1, 2013, but the homeowner chooses not to receive central air conditioning, the MAC will provide a total not to exceed $14,000 (in 2007 dollars) of noise products and services from the Mitigation Menu, including reasonable and customary installation costs. In

providing any reimbursements or mitigation improvements for a particular home under this Section 9.5(b), the MAC shall reduce the reimbursement or mitigation improvements by the amount of reimbursement (if any) actually paid for that particular home under Section 5.3(e) of this Consent Decree.

9.6 Multi-Family Home Mitigation Package. Multi-Family homes in the 60-64 DNL annual noise contours prepared by the MAC under Section 8.1(d) of this Consent Decree that meet the Eligibility Criteria of Section 9.4 will be eligible for the Multi-Family Home Mitigation Package as defined in Section 4.17 of this Consent Decree.

9.7 Opt-Out Eligibility. Single-Family and Multi-Family homes that previously opted out of mitigation under this Consent Decree are not eligible to participate in the mitigation program provided under this Section.

9.8 Releases from Homeowners. The MAC may require owners of Single-Family and Multi-Family homes receiving noise mitigation under Section IX of this Consent Decree to sign a release in the form substantially similar to the release used previously by the MAC in its Part 150 noise mitigation program.

9.9 Release and Waiver. The Cities and any other communities participating in the mitigation program under Section IX of this Consent Decree hereby waive any and all past, present, and future claims regarding the MSP 2020 Improvements Environmental Assessment/Environmental Assessment Worksheet or in any way making a challenge to the adequacy or nature of the environmental review for the MSP 2020 Improvements projects, including but not limited to claims based in whole or in part on the National Environmental Policy Act, and the Minnesota Environmental Policy Act. The Cities and any other communities participating in the noise mitigation program under Section IX of this Consent Decree hereby

waive any claims relating to aircraft noise from MSP under the Minnesota Environmental Rights Act (MERA) or any other legal theory, subject to the exceptions stated in Section 8.1 of this Consent Decree. By adopting the noise mitigation program under Section IX of this Consent Decree, the MAC is not conceding that it has created an environmental quality standard, limitation, rule, order, license, stipulation agreement or permit.

Entered this 25th day of September, 2013

The Honorable Ivy S. Bernhardson, District Court Judge _____

THE UNDERSIGNED PARTY enters into this First Amendment to Consent Decree in the matter of State by City of Minneapolis, et al. v. Metropolitan Airports Commission et al.

FOR THE CITY OF MINNEAPOLIS

By: _____
Susan L. Segal

Its: City Attorney

Dated: 5/20/13

FOR THE CITY OF RICHFIELD

By: _____
Debbie Goettel,

Its: Mayor

Dated: May 14, 2013

By: _____
Steven L. Devich

Its: City Manager

Dated: May 14, 2013

FOR THE CITY OF EAGAN

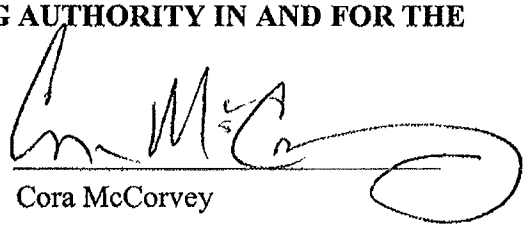
By: _____
Mike Maguire
Its: Mayor

Dated: May 7, 2013

By: _____
Christina M. Scipioni
Its: Clerk

Dated: May 7, 2013

FOR THE MINNEAPOLIS PUBLIC HOUSING AUTHORITY IN AND FOR THE CITY OF MINNEAPOLIS

By: 

Cora McCorvey

Its: Executive Director/CEO

May 14, 2013

FOR THE METROPOLITAN AIRPORTS COMMISSION

By: _____
Jeffrey W. Hamiel

Its: Executive Director/CEO

Dated: May 21, 2013