Technical Report
Air Quality

1.0 Introduction

Motorized vehicles affect air quality by emitting airborne pollutants. Changes in traffic volumes, travel patterns, and roadway locations affect air quality by changing the number of vehicles and the congestion levels in a given area. The air quality impacts from the project are analyzed by addressing criteria pollutants, a group of common air pollutants regulated by the U.S. Environmental Protection Agency (EPA) on the basis of criteria (information on health and/or environmental effects of pollution). A qualitative evaluation of Mobile Source Air Toxics (MSATs) has also been performed for this project. The scope and methods of these analyses were developed in collaboration with the Minnesota Pollution Control Agency (MPCA), Hennepin County, the Metropolitan Council, the Minnesota Department of Transportation (MnDOT), and the Federal Highway Administration (FHWA).

1.1 Purpose of Report

This *Air Quality Technical Report* has been prepared in support of the Bottineau Transitway Project Draft Environmental Impact Statement (Draft EIS). The objective of this report is to evaluate the Project's potential air quality impacts within the study area. This includes the following:

- Evaluate the Project's impact on regional air quality levels
- Evaluate whether this Project would cause or contribute to a new localized exceedance of carbon monoxide (CO) ambient air quality standards or increase the frequency or severity of any existing exceedance
- Evaluate the mobile source air toxic (MSAT) impacts of the Project
- Evaluate the construction emissions of the Project

2.0 Technical Analysis

The nature of the air quality analysis is different from other types of environmental impacts. As such, the organization of this report is slightly different from other technical reports. Section 2.4 Environmental Consequences addresses additional methodology for each criteria, where established. It also outlines current status/condition for the criterion being evaluated.

2.1 Regulatory Context/Methodology

2.1.1 Legal and Regulatory Context

The air quality impacts from the project are analyzed by addressing criteria pollutants, a group of common air pollutants regulated by the U.S. Environmental Protection Agency (EPA) on the basis of criteria (information on health and/or environmental effects of pollution). The criteria pollutants identified by the EPA are ozone, particulate matter, carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide. Potential impacts resulting from these pollutants are assessed by comparing projected concentrations to National Ambient Air Quality Standards (NAAQS). In addition to the criteria air pollutants, the EPA also regulates air toxics. There are seven compounds with significant contributions from mobile sources identified by the EPA: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. The The Federal Transit Administration (FTA) does not provide guidance for assessment of Mobile Source Air Toxics (MSAT) effects, but accepts the Federal Highway Administration (FHWA) guidance for the assessment of MSAT effects for transportation projects in the National Environmental Policy Act (NEPA) process.

2.1.2 Study Area

All roadway segments adjacent to and crossing the transitway alignments currently under consideration were included in the evaluation of air quality impacts.

2.2 Affected Environment

Air quality is evaluated based on impacts to humans in theimpacted environment. Humans experience air quality impacts by breathing unsafe concentrations of airborne pollutants. Exposure to air pollutants emitted from motor vehicles can occur in homes, businesses, and recreation facilities located adjacent to affected roadway segments or on pedestrian facilities along project-area roadways.

2.3 Environmental Consequences

2.3.1 Operating Phase Impacts

No-Build Alternative

The No-Build alternative is not expected to result in any effects related to motor vehicle emissions. Changes in air quality effects result from changes in traffic patterns and congestion levels on project area roadways. As no changes to project area roadways are being considered under the No-Build alternative, no meaningful air quality effects are expected. As discussed in the Build Alternatives section, the Metropolitan Council has demonstrated regional conformity for carbon monoxide emissions in the 2030 Transportation Policy Plan, and the EPA predicts that emissions of MSATs would decrease dramatically by the design year of the Project. Therefore no adverse air quality impacts are expected under the No-Build alternative.

Transportation System Management Alternative

The Transportation System Management (TSM) alternative does involve any change to the roadway network compared to the No-Build alternative. Changes in air quality effects result from changes in traffic patterns and congestion levels on project area roadways. As no changes to project area roadways are being considered under the TSM alternative, no meaningful air quality effects are expected. The TSM alternative is expected to result in increased transit ridership in the project area, and no negative air quality effects are expected compared to the No-Build alternative.

Build Alternatives

<u>NAAQS Criteria Pollutants</u>

Ozone

Ground-level ozone is a primary constituent of smog and is a pollution problem throughout many areas of the United States. Exposures to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate preexisting respiratory diseases such as asthma. Ozone is not emitted directly from vehicles, but is formed as volatile organic compounds (VOCs) and nitrogen oxides (NOx) react in the presence of sunlight. Transportation sources emit NOx and VOCs and can therefore affect ozone concentrations. However, due to the phenomenon of atmospheric formation of ozone from chemical precursors, concentrations are not expected to be elevated near a particular roadway.

The MPCA, in cooperation with various other agencies, industries, and groups, has encouraged voluntary control measures for ozone and has begun developing a regional ozone modeling effort. Ozone concentrations in the lower atmosphere are influenced by a complex relationship of precursor concentrations, meteorological conditions, and regional influences on background concentrations. MPCA staff has begun development of ozone modeling for the Twin Cities metropolitan area. The MPCA has recently indicated that the ozone models currently use federal default traffic data and a relatively coarse modeling grid. As such, ozone modeling in Minnesota is in its developmental stage, and there is therefore no available method of determining the contribution of a single roadway to regional ozone concentrations. Ozone levels in the Twin Cities metropolitan area currently meet state and federal standards, and reductions in ozone levels have been observed between 2007 and 2010. Additionally, the State of Minnesota is classified by the EPA as an "ozone attainment area," which means that Minnesota has been identified as a geographic area that meets the national health-based standards for ozone levels. Because of these factors, a quantitative ozone analysis was not conducted for this project.

Particulate Matter

Particulate matter (PM) is the term for particles and liquid droplets suspended in the air. Particles come in a wide variety of sizes and have been historically assessed based on size, typically measured by the diameter of the particle in micrometers. $PM_{2.5}$ or fine particulate matter refers to particles that are 2.5 micrometers or less in diameter. PM_{10} refers to particulate matter that is 10 micrometers or less in diameter.

Motor vehicles (i.e., cars, trucks, and buses) emit direct PM from their tailpipes, as well as from normal brake and tire wear. Vehicle dust from paved and unpaved roads may be re-entrained, or re-suspended, in the atmosphere. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and VOCs. $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- Increased respiratory symptoms (such as irritation of the airways, coughing, or difficulty breathing)
- Decreased lung function
- Aggravated asthma
- Development of chronic bronchitis
- Irregular heartbeat
- Nonfatal heart attacks
- Premature death in people with heart or lung disease

Source: http://www.epa.gov/air/particlepollution/health.html

The EPA issued a final rule on October 17, 2006 that tightened the NAAQSs for $PM_{2.5}$ to include a 24-hour standard of 35 micrograms per cubic meter (μg/m^3) and retained the 1997 annual $PM_{2.5}$ standard of 15.0 μg/m^3. The annual standard is based on a three-year average of annual mean $PM_{2.5}$ concentrations; the 24-hour standard is based on a three-year average of the 98th percentile of 24-hour concentrations. The NAAQS 24-hour standard for PM_{10} is 150 μg/m^3, not to be exceeded more than once per year on average over three years. The following statement was published by the Minnesota Pollution Control Agency in the *Air Quality in Minnesota: 2011 Report to the Legislature*:

> *EPA is reevaluating the particulate standards in response to scientists' better understanding of the serious risks associated with breathing even low levels of fine particles. In light of these potential health effects, EPA's new standards, expected in 2013, will likely be more stringent.*

The Clean Air Act conformity requirements include the assessment of localized air quality impacts of federally funded or federally approved transportation projects that are located withn $PM_{2.5}$ nonattainment and maintenance areas and deemed to be projects of air quality concern. The entire State of Minnesota has been designated as an unclassifiable/attainment area for PM. This means that Minnesota has been identified as a geographic area that meets the national health-based standards for PM levels, and therefore is exempt from performing PM qualitative hot-spot analyses.

Nitrogen Dioxide (Nitrogen Oxides)

Nitrogen oxides, or NO_x, are the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. The MPCA's *Annual Pollution Report to the Legislature: A Summary of Minnesota's Air Emissions and Water Discharges* (April 2011) indicates that:

> *On-road gasoline vehicles and diesel vehicles account for 40% of NO_x emissions in Minnesota. In addition to being a precursor to ozone, NO_x can cause respiratory irritation in sensitive individuals and can contribute to acid rain.*

Nitrogen dioxide (NO_2), which is a form of nitrogen oxide (NO_x), is regularly monitored in the Twin Cities metropolitan area. Currently, NO_2 levels meet state and federal standards. Data presented in the MPCA's 2010 Annual Air Monitoring Network Plan for the State of Minnesota, indicates that

> *The lowest annual average level of NO_2 in the State of Minnesota for the study year (2007) was 0.0054 ppm and the highest was 0.0093 ppm. These two concentrations are approximately 10-20% of the National Ambient Air Quality Standards' annual average standard for NO_2 of 0.053 ppm. Therefore, Minnesota currently meets applicable NAAQS for NO_2; however, continued reductions are sought, in light of the role of NO_2 in forming other pollutants of concern.*

The EPA's regulatory announcement, EPA420-F-99-051 (December 1999), describes the Tier 2 standards for tailpipe emissions, and states:

> *The new tailpipe standards are set at an average standard of 0.07 grams per mile for nitrogen oxides for all classes of passenger vehicles beginning in 2004. This includes all light-duty trucks, as well as the largest SUVs. Vehicles weighing less than 6000 pounds will be phased-in to this standard between 2004 and 2007.*
>
> *As newer, cleaner cars enter the national fleet, the new tailpipe standards will significantly reduce emissions of nitrogen oxides from vehicles by about 74 percent by 2030. The standards also will reduce emissions by more than 2 million tons per year by 2020 and nearly 3 million tons annually by 2030.*

Within the project area, it is unlikely that NO_2 standards would be approached or exceeded based on the relatively low ambient concentrations of NO_2 in Minnesota and on the long-term trend toward reduction of NOx emissions. Because of these factors, a specific analysis of NO_2 was not conducted for this project.

Sulfur Dioxide
Sulfur dioxide (SO_2) and other sulfur oxide gases (SO_x) are formed when fuel containing sulfur, such as coal, oil, and diesel fuel is burned. Sulfur dioxide is a heavy, pungent, colorless gas. Elevated levels can impair breathing, lead to other respiratory symptoms, and at very high levels aggravate heart disease. People with asthma are most at risk when SO_2 levels increase. Once emitted into the atmosphere, SO_2 can be further oxidized to sulfuric acid, a component of acid rain.

The MPCA's *Annual Pollution Report to the Legislature: A Summary of Minnesota's Air Emissions and Water Discharges* (April 2011) indicates that on-road mobile sources account for just 14 percent of SO_2 emissions in Minnesota. Over 53 percent of SO_2 released into the air comes from electric utilities, especially those that burn coal. MPCA monitoring shows that ambient SO_2 concentrations are consistently below federal standards. The MPCA has concluded that long-term trends in both ambient air concentrations and total SO_2 emissions in Minnesota indicate steady improvement.

Emissions of sulfur oxides from transportation sources are a small component of overall emissions and continue to decline due to the desulphurization of fuels. Additionally, the State of Minnesota is classified by the EPA as a "sulfur dioxide attainment area," which means that Minnesota has been identified as a geographic area that meets the national health-based standards for sulfur dioxide levels. Because of these factors, a quantitative analysis for sulfur dioxide was not conducted for this project.

Lead
Due to the phase out of leaded gasoline, lead is no longer a pollutant associated with vehicular emissions, and no analysis is warranted. No localized emissions of lead are associated with light rail transit operations.

Carbon Monoxide
Carbon monoxide (CO) is a traffic-related pollutant that has been of concern in the Twin Cities Metropolitan area. In 1999, the EPA redesignated all of Hennepin, Ramsey, Anoka, and portions of Carver, Scott, Dakota, Washington, and Wright counties as a maintenance area for CO. This means the area was previously classified as a nonattainment, area but was found to be in attainment, and is now classified as a maintenance area. Maintenance areas are required to undertake actions to demonstrate continuing compliance with CO standards. Since the Bottineau Transitway is located in Heepin County, evaluation of CO for assessment of air quality impacts is required for environmental approval in NEPA documents.

Air Quality Conformity
The 1990 Clean Air Act Amendments (CAAA) require that State Implementation Plans (SIPs) must demonstrate how states with nonattainment and maintenance areas will meet federal air quality standards.

The EPA issued final rules on transportation conformity (40 CFR 93, Subpart A), which describe the methods required to demonstrate SIP compliance for transportation projects. It requires that transportation projects must be part of a conforming Long Range Transportation Policy Plan (LRTPP) and four-year Transportation Improvement Program (TIP). The Bottineau Transitway is part of the 2030 Transitway System shown in Metropolitan Council's *2030 Transportation Policy Plan* (TPP)

(Figure 7-43, November 10, 2010). The proposed project is not included in the *2012-2015 Transportation Improvement Program* (September 28, 2011) because it is not scheduled to be constructed until after year 2015. The TPP was found to be in conformity by FHWA on February 23, 2011. (The FHWA acts as the executive agent for the Federal Transit Administration (FTA) for purposes of determining conformity of metropolitan transportation plans.)

In addition to conformity analysis performed as part of the *2030 Transportation Policy Plan*, expansion of transit services is also discussed as a means of improving regional air quality. *Chapter 7: Transit* references changing Federal policies that lead to coordinated investments in housing and transit service that can improve air quality through fewer vehicle miles traveled in private cars. *Appendix F: Clean Air Act Conformance* includes “Public Transit Strategies” in the list of “Timely Implementation of Transportation Control Measures.” In sum, the proposed transitway improvements are consistent with the Metropolitan Council’s goal of improving regional air quality.

On November 8, 2010, the EPA approved arequest for a limited maintenance plan for the Twin Cities maintenance area. Under a limited maintenance plan, the EPA has determined that there is no requirement to estimate projected emissions over the maintenance period and that "an emission budget may be treated as essentially not constraining for the length of the maintenance period. The reason is that it is unreasonable to expect that the maintenance area will experience so much growth within this period that a violation of CO National Ambient Air Quality Standard (NAAQS) would result." (US EPA Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment Areas, October 6, 1995) Therefore, no regional modeling analysis for the LRTPP and TIP is required; however federally funded and state funded projects are still subject to "hot spot" analysis requirements. The limited maintenance plan adopted in 2010 determines that the level of CO emissions and resulting ambient concentrations will continue to demonstrate attainment of the CO NAAQS. In concordance, no regional emissions modeling was completed as part of the evaluation of the current project; however hot spot analysis has been completed, as required.

Conformity Analysis

The effects of the proposed project on air quality were examined through analysis of the predicted impacts on CO concentrations. The following section discusses the CO analysis modeling methods and results.

To assess CO concentration changes, background concentrations were measured and adjusted for future background traffic growth and changes in vehicle emissions. Potential CO impacts on air quality were analyzed with respect to intersection conditions for the proposed project. Forecast year 2030 traffic was used to model future CO concentrations as the worst-case conditions. The analysis methods and procedures and the scope of this analysis were developed in collaboration with MPCA.

Air quality modeling was performed using current versions of EPA CO emission (MOBILE 6.2) and dispersion modeling (CAL3QHC) software. All methods and procedures used in the air quality analyses are generally accepted by the EPA and MPCA as approved for industry-standard analytical methods. The modeling assumptions used in this analysis included the following:

- Speed Class: Arterial, posted speed limits
- Traffic Mix: National Default
- Traffic Age Distribution: MPCA Data
- Wind Speed: 1 meter/second
- Temperature: -8.8 degrees Celsius
- Wind Direction: 36 directions at 10 degree increments

- Surface Roughness: 108 centimeters
- Atmospheric Stability Class: D
- 8-Hour Persistence Factor: 0.7
- Fuel Program: Conventional Gasoline East
- Fuel Reid Vapor Pressure: 9.0 lbs/square inch
- Oxygenated Fuels: Ethanol with 2.7 percent oxygen content

The CO emissions factors were produced by the MOBILE6.2 emission model at varying speeds for year 2030 conditions (see Appendix A).

Intersection Carbon Monoxide Analysis

Carbon monoxide concentrations were calculated for five intersections in the project area: one representing the worst-case condition along each of the alignments under consideration. These locations were identified from the Bottineau Transitway *Traffic Evaluation Technical Report* (Kimley-Horn and Associates, 2012) as the intersections with the highest traffic volumes and poorest levels of service and are expected to result in the worst-case CO concentrations. The rationale for this approach is to evaluate whether any of the proposed alignments might be expected to result in Carbon Monoxide concentrations exceeding NAAQS allowable limits. This methodology was developed based on input from MPCA and Hennepin County. The intersections selected for evaluation include:

- Alignment A: CSAH 81 & CSAH 130 (Brooklyn Boulevard)
- Alignment B: CSAH 103 (Broadway Avenue) & CSAH 130 (Brooklyn Boulevard)
- Alignment C: CSAH 81 & CSAH 10 (Bass Lake Road)
- Alignment D1: TH 55 & CSAH 2 (Penn Ave)
- Alignment D2: CSAH 81 & CSAH 2 (Penn Ave)

Carbon monoxide concentrations near the intersections were estimated using forecast traffic volumes, proposed intersection geometrics, optimized signal timing, emission levels from the EPA MOBILE 6.2 model, and dispersion modeling using the EPA model CAL3QHC. Schematics and peak-hour turning movements for each of the intersection models are provided in Appendix B.

Background Carbon Monoxide Concentrations

Background CO concentrations are needed for air quality analysis purposes to represent conditions without the influence of nearby vehicles. By definition, the background CO concentration in any particular area is that concentration which exists independently of direct contributions from nearby traffic. The background concentrations are added to intersection-scale modeled results to yield predicted CO levels.

Background CO concentrations for the analysis documented in this study were obtained from CO monitoring conducted by MnDOT near Grove Academy in St. Louis Park from February 17 to March 4, 2011 (approximately three miles from the project area). The maximum one-hour and eight-hour concentrations are given in Table 1. The maximum one-hour concentration during this period was 0.56 ppm and the maximum eight-hour concentration was 0.49 ppm, both observed on March 3, 2011. Since March is the beginning of meteorological spring, the Holzworth Correction Factor was applied to estimate the worst-case (winter) concentration. Background concentrations were also adjusted for future year 2030 conditions to account for background traffic growth. The traffic growth at each of the selected intersections was computed. The highest growth factor between 2011 and 2030 is expected at the intersection of CSAH 81 & CSAH 130 (Brooklyn Boulevard), and is 1.3. To represent worst-case conditions, no background reduction factor to account for future emissions-control improvements was used, which likely results in overestimations of ambient background CO concentrations. Results of background CO monitoring and the adjustment calculations are presented in Table 1.

Table 1. Background Carbon Monoxide Concentrations

Grove Academy, St. Louis Park, MN	1-Hour	8-Hour
March 2011 maximum concentrations[1]	0.56	0.49
Holzworth Correction Factor (Spring)	1.53	1.53
2011 background CO concentration (ppm)	0.86	0.75
Background traffic growth – 2011 to 2030	1.3	1.3
Adjusted background CO concentration (ppm) - 2030	1.12	0.98

Evaluation Results

The intersection CO modeling results are shown in Table 2. These results are the worst-case results from the CAL3QHC dispersion model, showing the location of the highest expected concentration, the value of the highest one-hour and eight-hour concentrations, and the wind angle that produced these concentrations. The CO results provided represent background CO concentrations plus modeled intersection CO concentrations. The worst-case was identified at the intersection of CSAH 81 and CSAH 130 (Brooklyn Boulevard).

Table 2. Carbon Monoxide Modeling Results (Listed in parts-per-million (ppm))

Highest CO Receptor Location	1-Hour Average Concentration	8-Hour Average Concentration	Wind Direction
Alignment A: CSAH 81 & CSAH 130 (Brooklyn Boulevard)			
SE Quadrant	2.52	1.96	310°
Alignment B: CSAH 103 (Broadway Avenue) & CSAH 130 (Brooklyn Boulevard)			
SW Quadrant	2.12	1.68	300°
Alignment C: CSAH 81 & CSAH 10 (Bass Lake Road)			
NW Quadrant	2.22	1.75	110°
Alignment D1: TH 55 & CSAH 2 (Penn Ave)			
SW Quadrant	2.42	1.89	70°
Alignment D2: CSAH 81 & CSAH 2 (Penn Ave)			
NW Quadrant	1.52	1.26	170°

Discussion and Conclusions

Intersection-level CO modeling was performed for the worst operating intersection under worst-case conditions. The highest predicted concentrations are expected to occur near the intersection of CSAH 81 & CSAH 130 (Brooklyn Boulevard), with one-hour and eight-hour of concentrations of 2.52 and 1.96 ppm, respectively. Based on these results, concentrations of CO in the project areas would not exceed the federal one-hour standard of 35 ppm, the Minnesota one-hour standard of 30 ppm, and the federal eight-hour standard of 9 ppm.

[1] Source: MnDOT Background Carbon Monoxide Monitoring Report, February 17 through March 4, 2011

These CO modeling results show that the Bottienau Trnasitway Project is not expected to cause CO concentrations exceeding state or federal standards. Based on the qualitative assessment presented at the beginning of this section, the Project would not cause exceedances of the other criteria pollutants.

Mobile Source Air Toxics

FHWA provides guidance on evaluation of MSATs for highway projects as part of the NEPA process. This guidance was used to complete this evaluation. The following section summarizes the key elements of the FHWA guidance, the entirety of which is available online at: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/100109guidmem.cfm According to the FHWA guidance, a qualitative evaluation of MSAT impacts has been completed for the Bottineau Transitway Project.

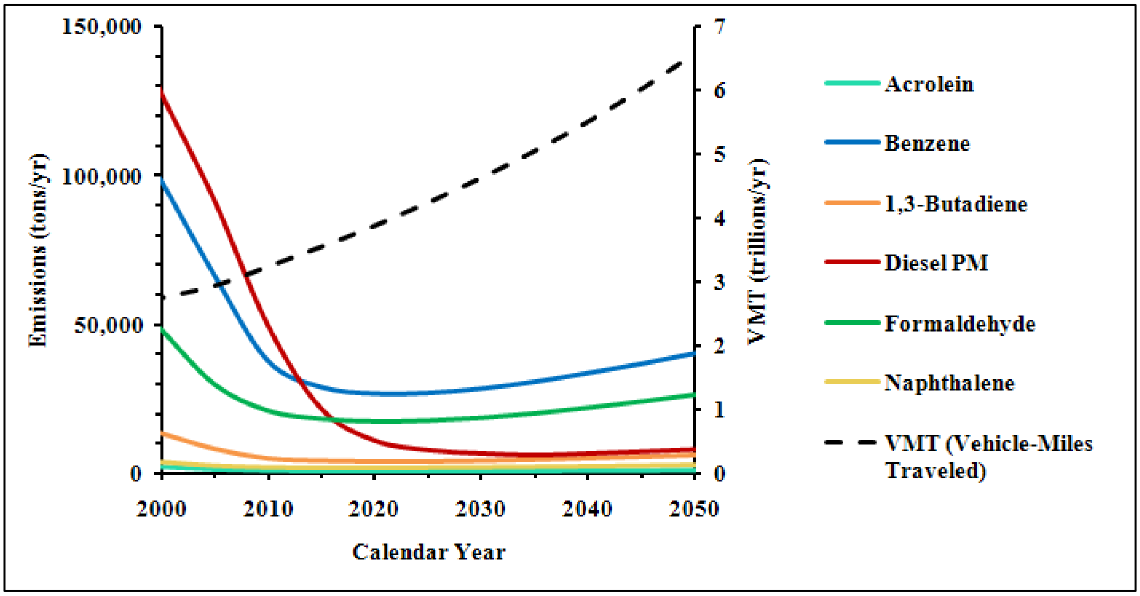
Summary of MSAT Information

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html).

In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule further requires controls that would dramatically decrease Mobile Source Air Toxics (MSAT) emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles traveled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSATs is projected from 1999 to 2050, as shown in Figure 1.

Figure 1: National MSAT Emission Trends 1999 - 2050 for Vehicles Operating On Roadways Using EPA's MOBILE 6.2 Model



Notes:

(1) Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.

(2) Trends for specific locations may be different, depending on locally derived information on vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.
Source: U.S. Environmental Protection Agency. MOBILE6.2 model run 20 August 2009.

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Information is incomplete or unavailable to credibly predict project-specific health impacts due to changes in MSAT emissions associated with a proposed set of transportation alternatives. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with transportation projects. However, available technical tools do not enable us to predict the project-specific health impacts of MSAT emissions.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts – with each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevent a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

There is also a lack of a national consensus on an acceptable level of risk. The process used by the EPA as provided by the Clean Air Act is to determine whether more stringent controls are required to 1) provide an ample margin of safety to protect public health, or, 2) prevent an adverse environmental effect.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

Qualitative MSAT Analysis

For each alternative in this technical report, the amount of MSAT emitted would be proportional to the average daily traffic (ADT), assuming that other variables, such as fleet mix, are the same for each alternative. All of the Build alternatives are expected to serve approximately 26,000 transit trips by year 2030. Current air quality levels are considered acceptable and are expected to remain at acceptable levels under the Build alternatives. Changes in ADT between alternatives differ among the various alignments. Each alignment is evaluated individually and discussed below.

Alignment A

The proposed operations of the Bottineau Transitway along Alignment A is not expected to have a significant impact on vehicular traffic. The transitway would be largely separated from the adjacent roadways of CSAH 81 and CSAH 130 (Elm Creek Boulevard). As a result, the ADT estimated for the A-C-D1 and A-C-D2 Build Alternatives does not differ from that for the No Build Alternative. Since ADT does not differ, no changes in MSAT emissions for the Build Alternatives along the corridor are expected.

The realigned travel lanes contemplated as part of Alignment A would have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under the Build Alternative there may be localized areas where ambient concentrations of MSAT could be higher under the Build Alternative than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built along CSAH 130 (Elm Creek Boulevard) between Northland Drive and CSAH 81. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts.

Alignment B

The ADT estimated for the B-C-D1 and B-C-D2 Build Alternative along Alignment B is not expected to change compared to the No Build Alternative. It is possible that the presence of the transitway along CSAH 103 (Broadway Avenue) would be expected to impact the efficiency of the roadway and result in longer queues at intersections and more idling vehicles. This would lead to higher MSAT emissions for the Build Alternatives along Alignment B because lower speeds are associated with higher MSAT emission rates; according to EPA's MOBILE6.2 model, emissions of all of the priority MSAT except for diesel particulate matter increase as speed decreases. The extent of these speed-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

The realigned travel lanes contemplated as part of Alignment B would have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under the Build Alternatives with a B-Alignment there may be localized areas where ambient concentrations of MSAT could be higher under the Build Alternative than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built along CSAH 103 (Broadway Avenue) between Oak Grove Parkway and 75th Avenue. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts.

Alignment C

The ADT estimated along Alignment C (all Build alternatives) is not expected to change compared to the No Build Alternative. It is possible that the presence of the transitway along CSAH 81 would be expected to impact the efficiency of the roadway and result in longer queues at intersections and more idling vehicles. This would lead to higher MSAT emissions for the Build Alternatives along Alignment C because lower speeds are associated with higher MSAT emission rates; according to EPA's MOBILE6.2 model, emissions of all of the priority MSAT except for diesel particulate matter increase as speed decreases. The extent of these speed-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

Alignment D

Changes in ADT are not a relevant measure for the segments of Alignment D1 passing near Theodore Wirth Park. This is because the Bottineau Transitway would operate on exclusive right of way with little or no impact to vehicular traffic. As a result, no changes in MSAT emissions would be expected for the Build Alternative with a D1 alignment (A or B – C- D1) compared to the No Build Alternative.

Alignment D2

The ADT estimated for the Build Alternatives along Alignment D2 is not expected to change compared to the No Build Alternative. It is possible that the presence of the transitway along 34th Avenue, CSAH 81, and CSAH 2 (Penn Ave) would be expected to impact the efficiency of the roadway and result in longer queues at intersections and more idling vehicles. This would lead to higher MSAT emissions for the Build Alternative along Alignment D2 because lower speeds are associated with higher MSAT emission rates; according to EPA's MOBILE6.2 model, emissions of all of the priority MSAT except for diesel particulate matter increase as speed decreases. The extent of these speed-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

The realigned travel lanes contemplated as part of the project alternatives would have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under the Build Alternative utilizing Alignment D2 there may be localized areas where ambient concentrations of MSAT could be higher than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built along 34th Avenue, CSAH 81, and CSAH 2 (Penn Ave) between the 34th Avenue railroad crossing and TH 55 (Olson Memorial Highway). However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. Also, MSAT would be lower in other locations when traffic shifts away from them.

Alignment D Common Section

The ADT estimated for the Build Alternatives along the alignment D common section is not expected to change compared to the No Build Alternative. It is possible that the presence of the transitway along TH 55 would be expected to impact the efficiency of the roadway and result in longer queues at intersections and more idling vehicles. This would lead to higher MSAT emissions for the Build Alternative along the Alignment D Common Section because lower speeds are associated with higher MSAT emission rates; according to EPA's MOBILE6.2 model, emissions of all of the priority MSAT except for diesel particulate matter increase as speed decreases. The extent of these speed-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

All Alternatives

Under each of the proposed alternatives (No-Build, TSM and Build alternatives) emissions would likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent between 1999 and 2050. On a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today. The magnitude of the EPA-projected reductions is so great (even after accounting for traffic growth) that MSAT emissions in the study area are likely to be lower in the under a wide variety of future conditions.

2.3.2 Construction Phase Impacts

No-Build Alternative

No air quality impacts are associated with construction under the No-Build alternative.

Transportation System Management Alternative

Construction activities under the Transportation System Management Alternative are limited to the development of a transit center at 97th Avenue. Construction activities under the TSM alternative could result in higher concentrations of air pollutants. Construction equipment powered by fossil fuels emit the same air pollutants as highway vehicles. Exposed earthen materials can also produce increased particulate matter when they are moved or disturbed by wind. It is not expected that concentrations of these air pollutants would exceed any state or Federal standards.

Build Alternatives

The construction of each of the alignments under consideration would affect traffic volumes and operations along roadways in and around the project area. During construction, some intersections may need to temporarily operate with reduced capacities, or be be temporarily closed. Under these conditions, traffic would be expected to detour to parallel roadway facilities near the project area. This increased traffic may result in increased emissions and higher concentrations of air pollutants near homes and businesses. These emissions levels would not be expected to result in localized concentrations that would exceed any state or Federal air quality standards.

In addition to traffic-related emissions increases, construction activities can also result in higher concentrations of air pollutants. Construction equipment powered by fossil fuels emit the same air pollutants as highway vehicles. Exposed earthen materials can also produce increased particulate matter when they are moved or disturbed by wind. It is not expected that concentrations of these air pollutants would exceed any state or Federal standards, in part due to the Best Management Practices described in Section 2.5.

2.3.3 Indirect/Secondary Impacts

No indirect or secondary impacts are associated with air quality for the proposed project.

2.4 Avoidance, Minimization, and/or Mitigation Measures

The analysis presented in this document demonstrates there will be no anticipated exceedances of air pollutant concentrations either during the operating phase of the proposed project; therefore, no mitigation measures are necessary. The State of Minnesota does not require permits related to air quality for projects of this type.

This analysis also demonstrates that there will be no anticipated exceedances under the construction phase. However, a series of Best Management Practices (BMPs) would be implemented during construction to control dust. This may include the following preventive and mitigative measures:

- Minimization of land disturbance during site preparation
- Use of watering trucks to minimize dust
- Covering of trucks while hauling soil/debris off-site or transferring materials
- Stabilization of dirt piles if they are not removed immediately
- Use of dust suppressants on unpaved areas
- Minimization of unnecessary vehicle and machinery idling
- Revegetation of any disturbed land post-construction

Traffic control measures would be developed in subsequent stages of the project to address detours and flow of traffic.

3.0 Summary

The following table summarizes the general air quality impacts of the Build alternatives proposed for the Bottineau Transitway project. This table is meant to give a snapshot of the types of impacts that may be anticipated, and will be combined with other impact categories and provided as a full table in the Draft Environmental Impact Statement (Draft EIS). Full analysis by alternative is provided in the body of this report. It is not anticipated that adverse air quality impacts would result from the No-Build or Transportation System Management (TSM) alternatives.

Table S-1. Summary of Impacts and Mitigation Measures

Impact Category	Impacts of Build Alternatives	Avoidance, Minimization, and/or Mitigation Measures
Operating Phase Air Quality – Carbon Monoxide (CO) Hot Spot Analysis	None of the alternatives under consideration would be expected to result in carbon monoxide concentrations exceeding state or Federal Standards.	None required.
Operating Phase Air Quality – Mobile Source Air Toxics (MSAT) Analysis	While there may be localized areas where MSAT emissions would increase, Environmental Protection Agency (EPA) vehicle and fuel regulations, coupled with fleet turnover, would result in substantial reductions that, over time,would result in significantly lower region-wide MSAT than those found today.	None required.

Impact Category	Impacts of Build Alternatives	Avoidance, Minimization, and/or Mitigation Measures
Construction Impacts of Build Alternatives on Air Quality	Construction of the proposed Bottineau Transitway may also cause increased concentrations of dust and air pollutants. When roads are closed or operating with reduced capacity, detoured traffic would result in increased traffic on parallel roadways near the project area. Increased emissions would also be produced by construction equipment and particulate matter can enter the air from exposed earthen materials. However, it is expected that ambient concentrations of increased air pollutants would remain below state and Federal standards.	Best Management Practices (BMPs) would be implemented during construction to control dust and manage equipment. Traffic control measures would be developed in subsequent stages of the project to address detours and flow of traffic.

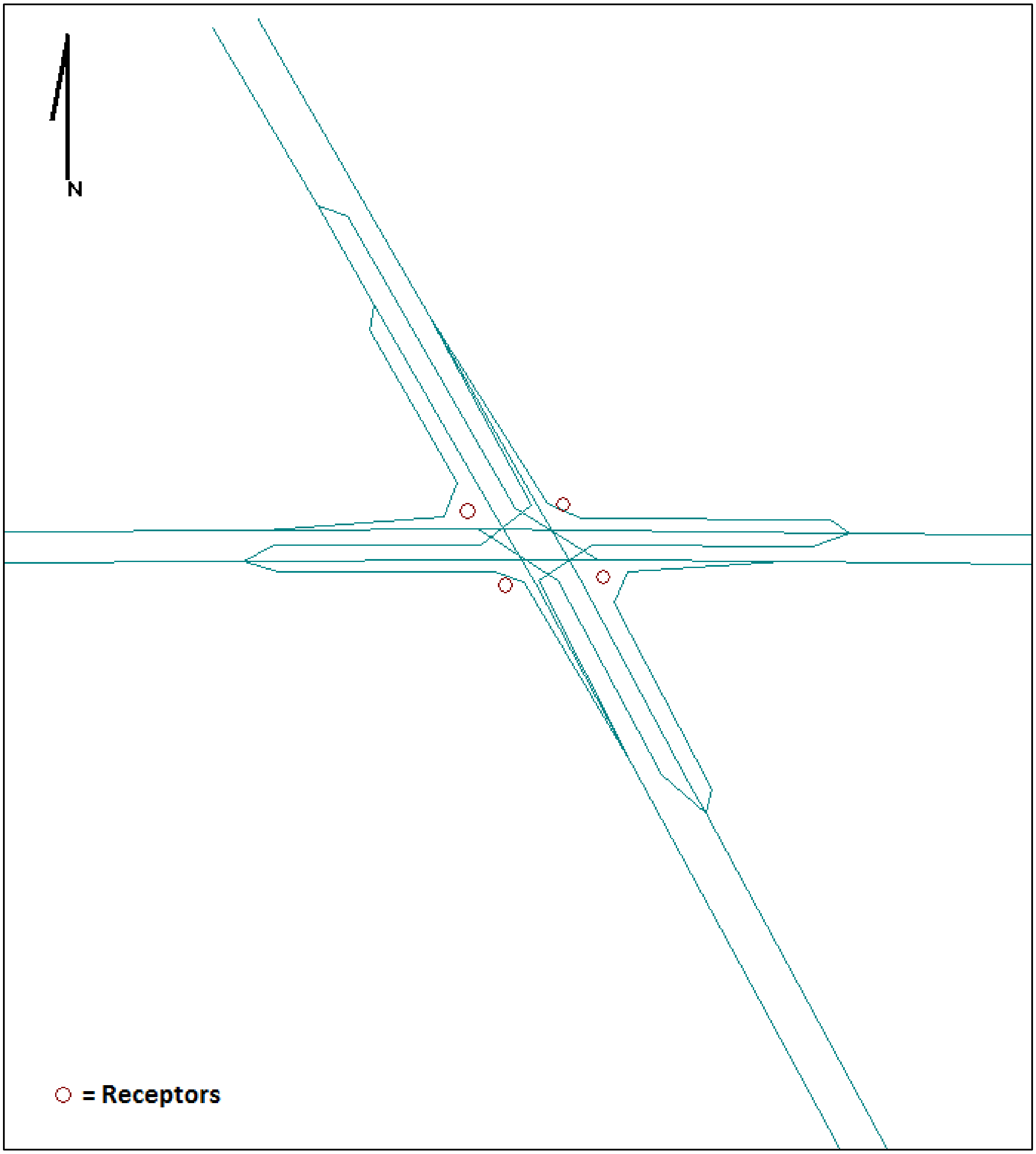
APPENDIX A
CO Emissions Factors

TABLE A-1: MOBILE6.2 Year 2030 Carbon Monoxide Emissions Factors

Speed	Emissions (g/mi)
Idle	80.8
2.5	32.3
3	28.7
4	24.2
5	21.5
10	16.0
15	14.2
20	13.3
25	12.8
30	12.5
35	12.6
40	12.9
45	13.3
50	13.8
55	14.2
60	14.6
65	15.1

APPENDIX B
CAL3QHC Schematics and Traffic Inputs

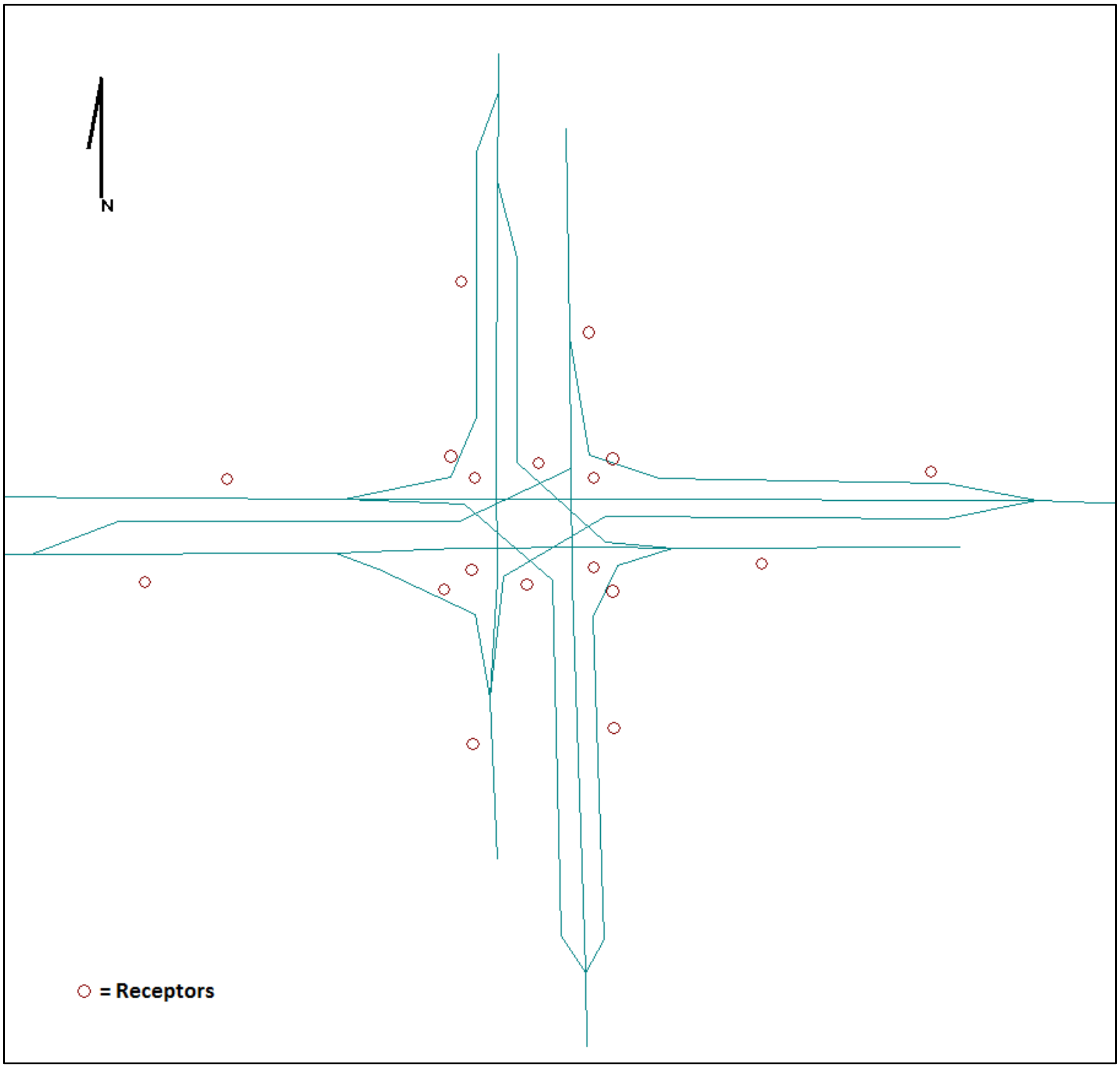
CAL3QHC Schematic for Alignment A
CSAH 81 & CSAH 130 (Brooklyn Boulevard)



Year 2030 PM Peak Hour Turning Movements

NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
240	1,580	270	270	1,200	50	190	1,295	155	210	680	370

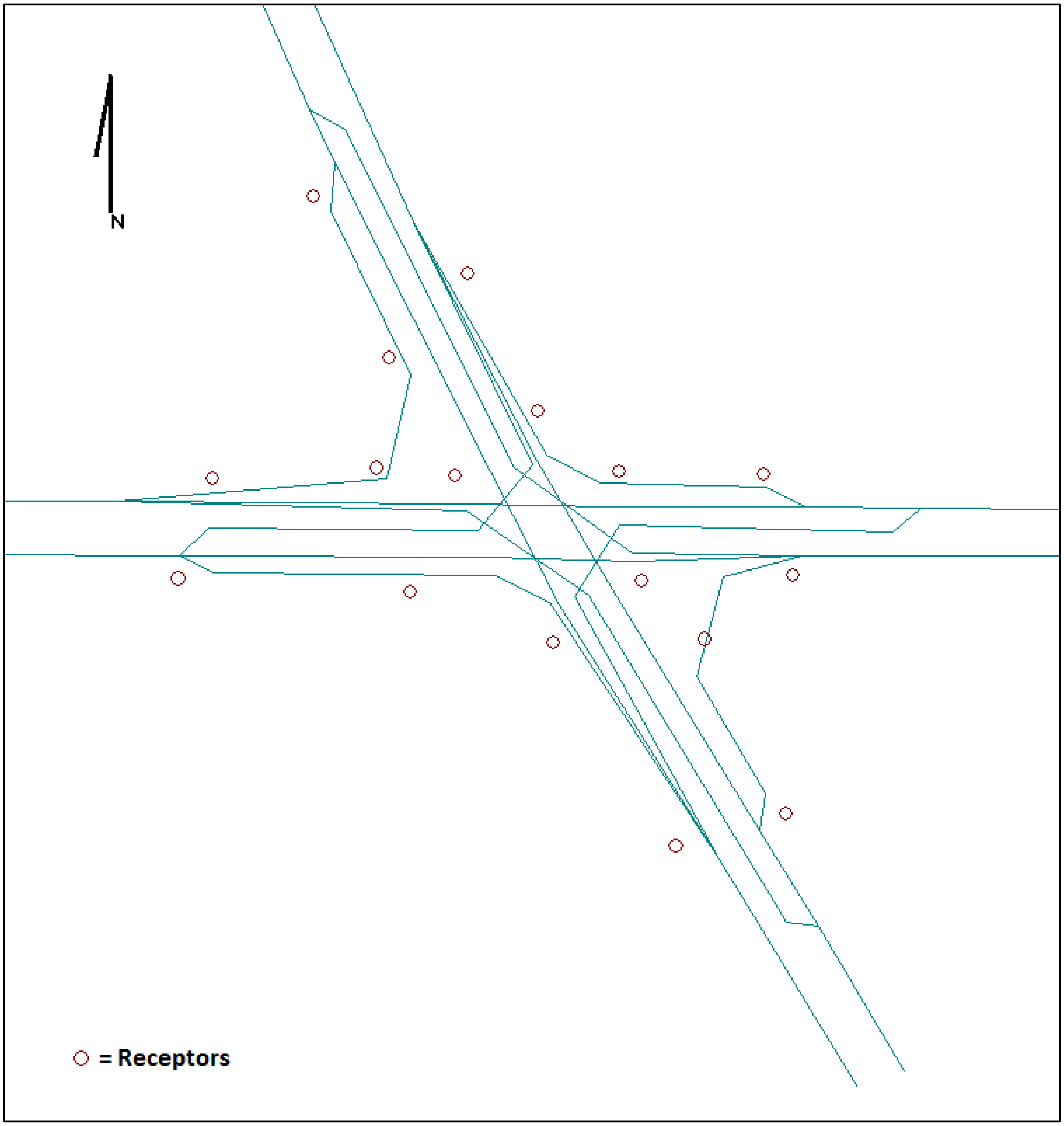
CAL3QHC Schematic for Alignment B
CSAH 103 (Broadway Avenue) & CSAH 130 (Brooklyn Boulevard)



Year 2030 PM Peak Hour Turning Movements

NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
145	505	210	180	400	270	525	750	65	185	725	245

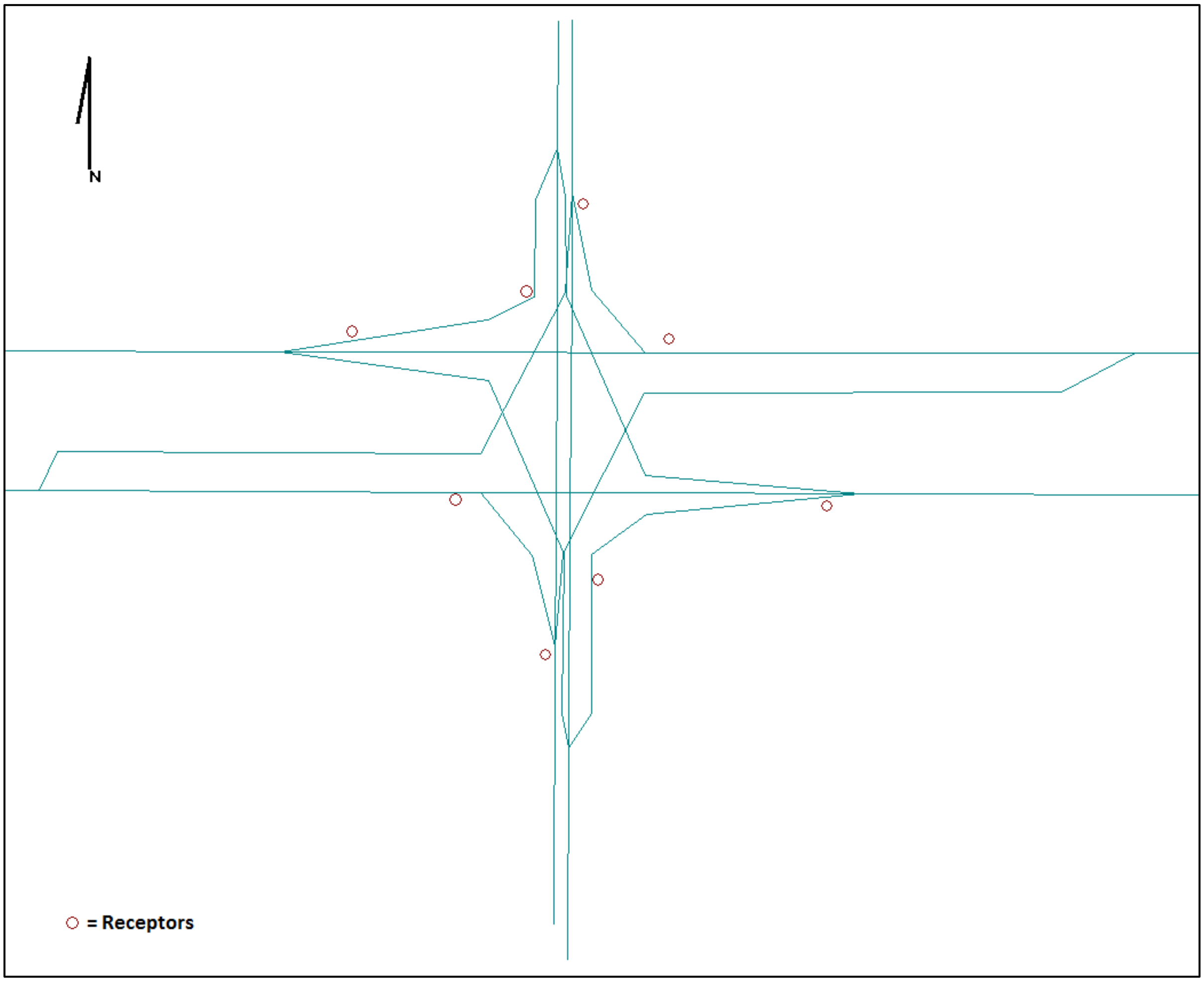
CAL3QHC Schematic for Alignment C
CSAH 81 & CSAH 10 (Bass Lake Road)



Year 2030 PM Peak Hour Turning Movements

NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
351	1146	178	145	661	298	581	981	319	115	789	169

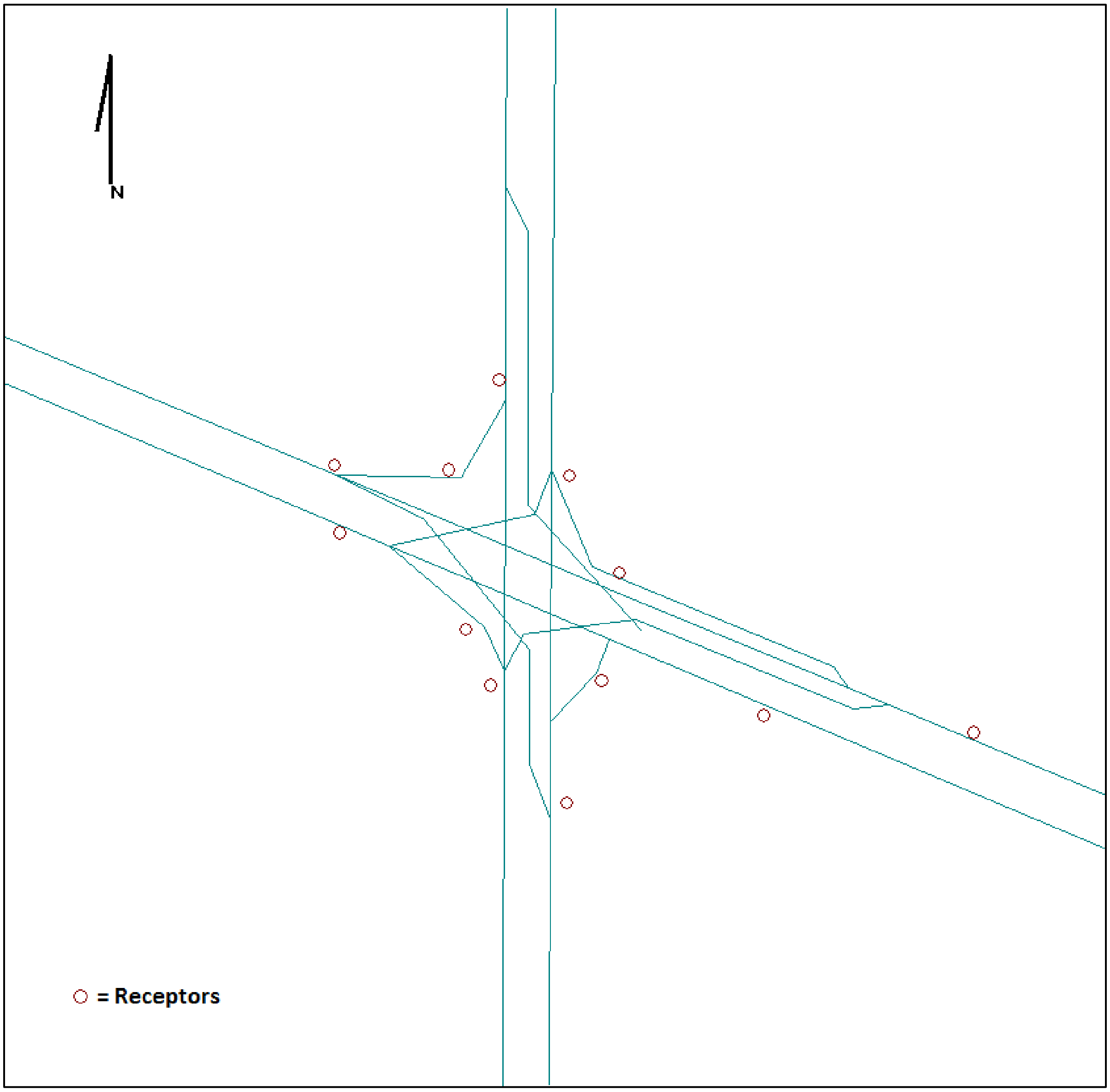
CAL3QHC Schematic for Alignment D1
TH 55 & CSAH 2 (Penn Avenue)



Year 2030 PM Peak Hour Turning Movements

NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
32	409	57	92	216	139	212	1462	71	245	1614	121

CAL3QHC Schematic for Alignment D2
CSAH 81 & CSAH 2 (Penn Ave)



Year 2030 PM Peak Hour Turning Movements

NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
118	420	54	117	272	17	0	390	113	110	552	133