# Safety Factors in the Jenifer at Ingersoll Bus Stop Relocation

**Phil Gadke**
**General Operations Supervisor**
**Safety and Security**

**March 2016**

# Table of Contents

## Section A

### Introduction

Madison Metro has proposed, as part of the Jenifer St. reconstruction project, to relocate the bus stop at Jenifer and Ingersoll streets from its current "near side" location to a new "far side" location. This simply means currently, as the bus is traveling on Jenifer St, it stops at the Ingersoll St. intersection before it crosses Ingersoll. The proposed change would allow the bus to travel through the intersection of Jenifer and Ingersoll and then service the bus stop.

Currently, the stop located on Jenifer at Ingersoll is a "timed" stop. This means that drivers may not pass this designated stop before the scheduled time. If a driver arrives a minute or two early, they are required to wait until the scheduled departure time. True arrival times can vary due to passenger volume, time of day, weather, traffic volume, signal timing, etc.

This location is also a designated "relief point" for Metro Operators. Metro switches Bus Operators a total of 91 times per regular weekday. This is also another causative factor for the stop relocation proposal.

The National Highway Traffic Safety Administration has also published studies of intersection crashes and causative factors. These studies aid States, Municipalities, and Transit Agencies in identifying hazardous areas and mitigating possible dangers.

The change would have several advantages to creating a safer environment for all users of Jenifer and Ingersoll streets.

## Section B

### The Nature of Jenifer St.

The Jenifer St. Corridor is one of the busiest transit corridors outside of the downtown area within the Madison Metro System. From the intersection of Jenifer and Ingersoll, passengers can literally travel anywhere within Metro's service area with minimal transfer need. This design makes for a quick, easy ride to any of the 4 transfer points on the system traversing the downtown/campus area along with west/southbound routes.

Here is a quick breakdown of the routes and the service they provide:

**3 – Connects the East and West Transfer Points serving Downtown and Campus**

**7 – Provides a similar connection as the 3 route but operates in place of the 3 on the weekends**

**4 – Connects the North and South Transfer Points also serving Downtown and Campus**

**10 – A direct connection for East side neighborhoods to Campus/UW Hospital and University Ave. Corridor. This route travels both Johnson St. and Jenifer St. vias**

**38 – AM and PM peak hour route connecting the Far East side through Jenifer St to Downtown/Campus/UW Hospital**

This service essentially is, at minimum, a bus on Jenifer every 30 mins (within Metro's service hours) 7 days per week, 365 days per year. During peak hour times, you would likely see a bus every few minutes depending on the time of year. During UW recess periods Metro suspends its "extra" bus service due to less student and staff demand from UW.

The Jenifer St. corridor also has a significant amount of neighborhood traffic. It is a chosen route for many commuter bicyclists heading to the Rutledge/Division/Spaight St. areas. This route is a safer, more convenient route for cyclists wishing to head toward the southeast section of the neighborhood but wanting to avoid the Williamson St. and the Cap

City Trail that heads more directly east. Jenifer St. provides a relatively safe alternative than having to pedal out of your way just to stay on the trail.

Jenifer St. is also exclusively residential. With Williamson St. not a viable alternative to transit and the E. Washington corridor just a few too many blocks away, Jenifer is the most likely and appropriate street available to properly serve the neighborhood and the commercial district on Williamson.

Historically, the nature of residential streets can pose different hazards than we typically encounter on higher volume non-residential streets. Residential streets with lower traffic volumes relax street users more than if they were using a higher volume non-residential street for something other than operating a motor vehicle. People have a tendency to not watch traffic movements as closely on residential streets and feel more comfortable with the quiet nature of their surroundings.

Residential streets also do not have as many traffic control devices in place as higher volume streets. Jenifer between Baldwin and Williamson St., for example, does not have any traffic control devices or marked crosswalks. This increases the likelihood of an interaction with a motorist that could be caught off guard by a pedestrian or bicyclist trying to maintain their legal right of way.

Transit can be safely operated on a residential street such as Jenifer, but proper precautions and a proactive approach to safety must be taken into consideration to maintain a high level of safety for all users of the street.

**Field Observations**

In March of 2016 Metro staff observed buses during relief times at approx. 2:30p during standard service on a Wednesday.

**Northbound Ingersoll Crossing Jenifer**

**Image 1: Northbound Ingersoll at Jenifer, looking west from a motorist's perspective.**

**Image 2: Northbound Ingersoll looking West with an obstructed view for motorists.**


**Image 3: Northbound Ingersoll looking west obstructed for a pedestrian attempting to cross Jenifer nearside**

**Image 4: Northbound Ingersoll as if a ped were attempting to cross obstructed nearside**

**Image 5: Northbound Ingersoll looking west obstructed ped view far side**

**Image 6: Northbound Ingersoll looking west obstructed ped view crossing far side**

**<u>Southbound Ingersoll Crossing Jenifer</u>**

**Image 7: Southbound Ingersoll looking east unobstructed motorist**

**Image 8: Southbound Ingersoll looking east obstructed motorist**


**Image 9: Southbound Ingersoll looking east obstructed proceeding into the intersection**

**Image 10: Southbound Ingersoll looking east obstructed ped crossing nearside**


**Image 11: Southbound Ingersoll looking east obstructed ped mid crossing nearside**

******The car did not notice the photographer and slammed on the brakes assuming a pedestrian

**Image 12: Southbound Ingersoll looking east obstructed ped crossing nearside**

****Photographer had no idea the bike was there until stepped around the bus

**Image 13: Southbound Ingersoll looking east obstructed ped far side**

**Image 14: Southbound Ingersoll looking east obstructed ped crossing far side**

**Other observations:**

- **3 vehicles turned right in front of bus 978 while operators were changing shifts**
- **Some motorists stopped behind the bus confused as to what it was doing although it had its 4-way signals activated.**
- **Northbound motorist proceeding straight across the intersection was struggling to see around bus 963. The motorist began sounding his horn to alert someone that he may not have seen that he was proceeding through the intersection.**

## Section C

**National Highway Traffic Safety Administration (NTHSA) Study Report**

In September 2010 the US Department of Transportation National Highway Traffic Safety Administration released a report called Crash Factors in Intersection Related Crashes: An On-Scene Perspective. Below is a brief summary of the findings.

NHTSA analyzed data collected by the National Motor Vehicle Crash Causation Survey (NMVCCS). This survey collected data from 2,188,969 crashes from January 2005 to December 2007. Of the 2 million crashes 787,236 were determined to be at intersections. Of the 787,236 crashes at intersections, 96% of them were determined to be caused by some sort of driver error with the remainder to be mechanical failure or environmental. The 1,289,283 non-intersection related crashes had a 92% driver error rate. Below are some of the statistics related to intersection crashes.

- 787,236 intersection crashes accounted for 36% of the total crash data collected by the NMVCCS.
  - 22% Vehicle turning left
  - 12.6% Vehicle crossing over intersection
  - 1.2% Vehicle turning right
- Traffic Control Devices
  - 52.5% Signalized intersection
  - 31.3% Intersection with at least 1 stop sign
  - 15.9% No traffic control device
  - 3.0% Unknown
- Atmospheric Conditions *Over 100% due to multiple conditions coding on some crashes
  - 78.6% Clear
  - 16.0% Cloudy
  - 6.2% Rain
  - 1.2% Fog
  - 0.3% Snow
  - 0.5% Other
- Driver attributed critical error
  - 55.7% Recognition error (inattention, internal and external distraction, inadequate surveillance
  - 29.2% Decision error (aggressive driving, too fast for conditions, misjudgment of gap, turned with obstructed view)
  - 11.2% Performance error (over compensation, failure to maintain control)
- Relative Ratio. Critical reason likelihood compared to non-intersection crashes
  - Turning with "Obstructed View" as the critical reason has the highest relative ratio. **Intersection crashes are 355 times more likely to occur with obstructed view as the reason than non-intersection crashes.**
  - Inadequate Surveillance 6.1 times more likely
  - Illegal maneuver 4.1 times more likely
  - False assumption 3.8 times more likely
  - Misjudgment of gap 3.1 times more likely
- The study also shows that more drivers than expected turning left at intersections controlled by at least 1 stop sign were assigned critical errors such as turning with obstructed view, inadequate surveillance, and misjudgment of gap.
- Obstructed view critical errors are included as a significant factor in **ALL** types of intersection crashes analyzed.

Link to the study: http://www-nrd.nhtsa.dot.gov/Pubs/811366.pdf

This study appears to be a significant analysis of intersection crashes. It demonstrates the need for motorists to have a clear line of sight when proceeding through intersections. It is clear that left turn movements with an obstructed view create a significant safety hazard and a higher risk of crash. As part of driver training, drivers are taught to look left, look right, and look left again before proceeding into an intersection. The reasoning behind checking the left hand side twice is to avoid a possible accident. The extra look to the left allows for error to the right. This allows a driver in error more time to correct the action mid intersection, possibly stopping, before being struck by a vehicle approaching on the right.

If the left hand view is significantly obstructed by an object or vehicle parked too close to the intersection, the risk involved with proceeding increases exponentially. This is applicable to motorists, pedestrians, and bicyclists alike.

Because Jenifer and Ingersoll is a Metro "relief point", buses are staged in the stop for a longer period of time on a regular basis that just the average bus stop that only takes a few seconds to service. This creates a significant **left hand line of sight obstruction** for all users of the street.

## Section D

1. **Proactive Approach to Safety**

How does this all apply to the Jenifer and Ingersoll St. bus stop proposal? Metro has been aiming for a proactive approach to safety. Identifying and mitigating possible safety hazards before accidents happen are the key to the success of system wide safety improvements. Agencies should be able to take every safety precaution when upgrading or designing streets or roadways. When infrastructure was designed 50 years ago, there weren't nationwide studies and analysis of design to work with. Engineers simply had to design what they knew was best. These studies have provided data on a national level to assist in creating the safest environment possible and take every step necessary to prevent injury and save lives. The need for local data is no longer necessary. This is a good thing. This eliminates having to react when a situation becomes a problem. Minimizing the "How did we not recognize this problem before?" question.

2. **System Safety Goals**

Metro Transit has always considered safety to be number 1. In comparison to other transit agencies that are similar in size, Metro is one of the top performers nationally as far as service to the community and ridership. Metro also earned the most improved system with safety amongst 18 other transit agencies in Wisconsin in 2014. The accident claim rates dropped and with a proactive approach to safety, development of a positive safety culture with employees, and community involvement with safety, the accident rates will continue to fall. The ultimate goal is to be one of the safest transit agencies to utilize, drive next to, bike along side, and cross paths with as a pedestrian. Communication and working with the community will only make that goal easier to achieve.

3. **Safety Management System**

Safety Management Systems are proven to be one of the most effective tools in organizational safety. Transportation groups nationwide use safety management as a way to improve employee morale, communication, save lives, and lower cost associated with accidents. Airlines, trucking companies, rail transportation are all examples of big industries that have implemented safety management systems and have noticed significant improvements in accident reduction.

Metro is currently building a Safety Management System. There are a few key components to safety management that need to be in place for success. Data. Hazard identification and mitigation is one of the biggest parts to SMS. Communication and community involvement is another.

Where is Metro in the process? Collecting data and analyzing. Metro has identified that some of the biggest collectors of data for hazard identification are Bus Operators. There are 315 Bus Operators that observe and work through the daily tasks that Metro asks of them.

As part of annual refresher training that takes place for all operators, Metro conducted the “Safety Roundabout”. It is a mediated roundtable discussion asking operators for input on hazards that they feel might create dangerous situations. It was explained that the input would only be accepted if it was a physical location or something that could be photographed.

As operators talked and shared their concerns with the safety supervisor, Metro training staff noted the hazards they mentioned. All 315 drivers participated (groups of 3-5 per day until finished). They produced 50 legal pages of concerns and hazards. Some of the hazards could be easily mitigated with simple awareness. Some hazards involved requests to planning to change dangerous turns on routes, some involved working with inner city bus companies, traffic engineering, etc.

The data analysis is not yet complete. Upon preliminary analysis, one of the most redundant hazards identified by operators so far was fear of pedestrian getting hit by a passing vehicle. Operators mentioned the close calls they observe with near side stops, yelling out their windows, honking horns, anything to prevent what they could see was about to happen, some were noticeably upset just thinking about it. Jenifer and Ingersoll was mentioned. Because an accident has not happened yet, Metro does not have footage or accident data supporting, but are all the operators wrong? As part of the analysis, redundant concerns mentioned by operators stand out. It brings the observations and incidents operators face on a daily basis out of the shadows and into the spotlight. It isn’t just one overly sensitive operator. It is operator after operator voicing the concern about the inability to see around the large bus.

Because Jenifer and Ingersoll is not controlled by a traffic signal or, has pedestrian safety devices in place, a far side bus stop location is the best choice in accident prevention of all kinds.

## Summary

As many transit agencies nationwide upgrade their bus stops and take a harder look at bus stop safety, decisions to relocate or redesign bus stops are not taken lightly. There have been significant studies completed by the Transportation Cooperative Research Program (TCRP) regarding bus stop safety and placement. According to TCRP Report 19 and TCRP Synthesis 117, bus stop placement has many variables. In some instances near side stops are conducive to a safer bus stop location. In most cases near side stop locations are desirable at signalized intersections.

Link to TCRP Report 19 http://nacto.org/docs/usdg/tcrp_report_19.pdf

Link to TCRP Synthesis 117 http://www.tcrponline.org/PDFDocuments/tcrp_syn_117.pdf

Essentially, TCRP recommends that all transit agencies develop an individual procedure for bus stop placement. Metro has followed this recommendation and as streets are reconstructed and bus stops are improved, Metro completes a safety analysis and determines the best stop locations.

This procedure, along with significant crash data and national trends, leads Metro to tend to far side stops at intersections similar to Jenifer and Ingersoll.

Metro has the safety of everyone in the community in mind. Approaching hazards with accident prevention in mind will not only protect our community members, it serves as an example of what should be done rather than what could have been done.