ACKNOWLEDGEMENTS
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EXPERIENCE | Transportation

Kansas Department of Transportation

Highway Patrol

AD ASTRA PER ASPERA
EXECUTIVE SUMMARY

WICHway is KDOT’s Intelligent Transportation System (ITS) in the Wichita Metro Area, and is currently focused on the area highways I-135, I-235, US-54 and K-96. The WICHway system implementation began in 2009 and today includes 21 Dynamic Message Signs (DMS) which are used to communicate with the traveling public, 35 Closed Circuit Television Cameras (CCTV) which are used to monitor traffic and incidents, 43 sensors which alert to traffic congestion and the newly updated WICHway website available at www.WICHway.org.

KDOT has contracted with Sedgwick County 911 to staff and actively monitor the Traffic Management Center (TMC) Monday through Friday, 6 a.m. to 7 p.m., and during special events from the Sedgwick County 911 center.
911 operators and staff may also post messages during non-contract hours, including weekends. Being co-located with Sedgwick County 911 allows key communication between 911 personnel, first responders, WICHway personnel and the traveling public. It also allows faster incident recognition and response; thereby saving time, money and lives. WICHway’s focus is to provide:

- Safety for the traveling public and first responders
- Real-time reliable information to decision makers regarding improvements to Wichita’s transportation system
- Improved travel time reliability and reduced congestion delays of the traveling public

Contained herein are various indices and metrics that have been compiled to allow users and decision makers to make informed decisions regarding the highways in Wichita. Specifically included are metrics and indices such as incidents by time of day, average incident duration, “heat” maps illustrating incident locations, motorist assistance program metrics and congestion indices such as Travel Time Index, Buffer Time Index and Planning Time Index.

Although all of the presented data provides interesting details about transportation in the city, perhaps the most intriguing metrics presented regard accident duration on pages nine, ten and eleven. Specifically, the average clearance time for an accident is two hours and fifty seven minutes. For comparative purposes Kansas City and Houston have accident clearance times of thirty nine minutes and thirty four minutes respectively. This is one area that is marked for improvement in the Wichita area.

WICHway continues to improve its coverage area and is currently in the middle of its 3rd expansion project which will add an additional 6 cameras and two dynamic message signs. In the coming years there are also planned expansions to occur with the East Kellogg (US-54) project being completed by the City of Wichita, the I-235 and Kellogg project, as well as a planned fiber optic infrastructure expansion which will be used for future projects.

WICHway’s first annual report summarizes incident and congestion metrics from July 1, 2013 to December 31, 2013 and is the culmination of months of hard work by individuals from the Kansas Department of Transportation (KDOT), Kansas Highway Patrol (KHP), Sedgwick County, the City of Wichita, Wichita Area Metropolitan Planning Organization and TranSystems Corporation. KDOT would like to thank all of the transportation partners, first responders and individuals that have been involved in making Wichita’s highways a safer and less congested place over the last year. We are very excited to share this information with all of you, and hope you share our enthusiasm for the future of the WICHway system!
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INCIDENT SUMMARY

Introduction

What is an incident? For our purposes, it’s an event that occurs on the highway that affects the safety or capacity of the highway. This may be an accident, stalled vehicle, grass or vehicle fire, construction, pedestrians on the highway, debris, etc. Quick detection and response is essential to minimizing the incident duration, preventing secondary accidents and lessening the effects of the initial incident. Detecting incidents and organizing appropriate responses is a primary focus of the WICHway system.

There are many different ways to look at incident breakdowns and over the next few pages you’ll find summaries that:

- Group the number of incidents by type (e.g. percentage of stalled vehicles) which gives you an idea of how prevalent each incident is as a whole.
- Group incidents by time of day, day of week, and month of the year which allow you to examine when an incident is likely to occur.
- Group incidents by location or give you a “heat” map which illustrates high incident locations.
- Group average clearance times by month, week and incident type which allows review of any patterns by the same factors.
- Group crashes by severity as well as crash rates per route which allows a further examination of the accident data by time of crash as well as the ability to prioritize possible safety improvements.
**WICHway System Framework**

WICHway currently utilizes 35 closed circuit television cameras (CCTV) to observe and locate incidents and 21 dynamic message signs (DMS) used to communicate with roadway users. The devices are securely connected to the Traffic Management Center (TMC), located in the Sedgwick County Emergency Management building, through a combination of radio, cell and fiber connections. KDOT does not routinely record video from traffic cameras, but live images may be viewed 24/7 by visiting the website at [www.WICHway.org](http://www.WICHway.org).

Operators view live video and can control all traffic cameras and message signs from consoles at the TMC. The TMC is staffed Monday through Friday, 6 a.m. to 7 p.m. and during special events. Emergency personnel may also post messages and view cameras during off hours, including weekends.

The data used in the report summarizes incident types, totals and locations of confirmed incidents actively logged during operational hours from July 1, 2013 to December 31, 2013.
Incident Types
By identifying incident types as well as their effects on the traveling public, efforts can be made to reduce their impact to motorists. The total number of logged incidents during the analysis period was 958. The chart below summarizes incidents by category and percentage of incidents as a whole. The top three types of incidents are Stalled Vehicles, Accidents and Debris which account for 95.8% of the logged events. Stalled Vehicles and Roadway Debris often sound innocuous in nature, but can lead to reduced capacities and congestion during heavy traffic and sometimes result in secondary accidents. Accidents are the worst of the tracked incident types, not only because of the implications to the motorists involved, but also the safety of the first responders and other traveling public. Secondary accidents are often more severe than the initial wreck and require additional first responders as well as introducing additional delays. Tow, Congestion, Construction, Fire and Pedestrian incidents make up the remaining 4.2% of the total incidents.
**Total Incidents**

Identifying trends in incidents is the first step in targeting countermeasures to reduce the number of incidents. The graphs below show the number of logged incidents versus different groups of time. Allowing incident trends by month, day of the week and time of day. When looking at the incident data by month, the summer months tend to have a higher number of incidents. When looking at the number of incidents by day of week, Monday and Friday have an increased number of incidents with Wednesday being the lowest incident day. Incident numbers also increase during peak driving times. When comparing the data to National Highway Traffic Safety Administration (NHTSA) crash data, the general trends appear to match the national crash data.
Detail Incidents by Month

Monthly data illustrates the relationship of incident types to the time of the year. Weather, such as snow and rain, or seasonal temperatures, such as hot summers and cold winters, may contribute to incident trends. Months when school is in session affects travel and incidents differently than when students are out of school. The graph to the right depicts incident types broken down by month. Due to the somewhat random nature and the number of events, stalled vehicles, construction, congestion and vehicles logged to be towed are not shown for clarity. Also, months with zero incidents in that grouping are not shown for clarity (e.g. there were no fires in July). The data trends for Debris, Pedestrian and Fire would appear to be typical of what you would expect (e.g. pedestrian activity is higher during warmer months). Generally the summer months have a higher number of accidents, so the month of October having the most accidents is somewhat surprising.
Incidents by Day of Week

Similar to above, by illustrating the relationship of incidents to the day of the week, patterns may be spotted. Due to the somewhat random nature and the number of events, stalled vehicles, construction, congestion and vehicles logged to be towed are not shown for clarity. The data is somewhat interesting; generally the national trend is that more accidents will occur on Monday and Friday than the other weekdays. The other incidents appear somewhat random in nature when comparing to the day of week.
Incident Location Map

Identifying high incident rate areas is important when determining the need for safety improvements. The map below illustrates the locations of the logged incidents. Areas with low incident rates are blank or green. As the number of incidents in a location increase, the thematic map changes in color from green to yellow to red. From the data below, the interchange areas of: I-135 and US-54; I-235 and US-54; and K-96/K-254/I-235 and I-135 have the highest number of incidents. Highway interchange locations typically have higher incident rates than that of open roadways due to more complex driving maneuvers associated with interchange areas, such as lane changes, merging and traffic traveling at different speeds.
Incident Clearance Times

Incident clearance time is an important factor to consider with traffic management. The longer an incident remains on the roadway, the larger the effect on traffic including heavy congestion and secondary collisions. Safely and quickly reducing traffic exposure to incidents is essential to an effective transportation system.

The graphs below illustrate total incident clearance times logged by TMC operators during normal monitoring hours, Monday-Friday, 6 a.m. to 7 p.m. Data excludes stalled vehicles, tow and construction incidents for clarity since these events often last multiple days, and would be difficult to show in relationship to the other incidents.
Incident Clearance Times

Clearance Time by Incident (Hour:Min)

- ACCIDENT: 2:57
- FIRE: 0:46
- DEBRIS: 0:22
- CONGESTION: 0:19
- PEDESTRIAN: 0:09
Crashes by Severity

The duration of incidents is used as a performance measure of how an accident affects the roadway. Duration of accident is an appropriate metric for severity because the duration affects the number and type of responders that respond to crashes, the amount of congestion that occurs because of the accident, including increased delay to travelers, and the amount of traffic control needed to provide a safe crash scene. According to the Manual on Uniform Traffic Control Devices (MUTCD), a federal document for minimum traffic standards, crashes can be separated into three levels of duration:

- Minor - duration under 30 minutes
- Intermediate - duration of 30 minutes to 2 hours
- Major – duration greater than 2 hours

Crashes sorted by severity level are shown to the right. Major crashes typically involve injuries or fatalities while minor crashes include fender-benders or little property damage and no injuries. The crashes shown include confirmed injury and non-injury collisions logged by TMC operators on highways only.
Crash Rates

Crash rates are a traffic safety performance measure that can be effective in prioritizing safety improvements. Since more people traveling in an area at a time increases the chances of a crash happening, looking at the crash rate per number of vehicles in the area allows you to identify locations that may have geometric problems or other contributing factors. Crash rates are measured in crashes per 10 million vehicle miles driven for roadway segments in order to relate crash frequency to traffic volumes or vehicle miles traveled. Crash rates are generally calculated by the following equation and are shown in the chart to the right for the different roadway segments.

\[
\text{Crash Rate} = \frac{C \times 10,000,000}{V \times L \times 365 \times N}
\]

Where the variables in the equation are:

- \(C\) = Total number of roadway crashes in the study period
- \(V\) = Traffic ADT volumes
- \(N\) = Number of years of data
- \(L\) = Length of the roadway segment in miles

<table>
<thead>
<tr>
<th>Location</th>
<th>Crashes (C)</th>
<th>VMT (V*L)</th>
<th>Number of Years</th>
<th>Crashes per 10 million vehicle miles driven</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-135</td>
<td>98</td>
<td>5,832,458</td>
<td>0.5</td>
<td>0.921</td>
</tr>
<tr>
<td>K-96</td>
<td>25</td>
<td>1,823,297</td>
<td>0.5</td>
<td>0.751</td>
</tr>
<tr>
<td>US-54</td>
<td>122</td>
<td>12,511,800</td>
<td>0.5</td>
<td>0.534</td>
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</table>
As a reference, for a Kansas urban freeway the crash statistics are 0.66 per 10 million vehicle miles driven for 6-lane urban freeways, and 1.23 per 10 million vehicle miles driven for 4-lane urban freeways. The above graphic illustrates in a heat map fashion the areas with the highest crash rates. I-235 and US-54 (Kellogg) and US-54 (Kellogg) just west of the downtown exit have the highest crash rates. US-54 and I-135 as well as I-135/I-235/K-254 are some of the other “hot spots” in the coverage area. Crash rates are calculated using confirmed injury and non-injury crashes along Wichita’s highways and logged by TMC operators during normal monitoring hours, Monday through Friday, 6 a.m. to 7 p.m.
MOTORIST ASSISTANCE PROGRAM

The Motorist Assistance Program (MAP) is a partnership between the Kansas Department of Transportation and the Kansas Highway Patrol. The map to the right illustrates the coverage area of the program. The MAP has outlined four primary goals:

1. To protect and assist stranded motorists, thereby reducing the safety risk that stranded motorists create for themselves and other drivers.
2. To reduce congestion in the metro areas, particularly during rush hours and on holidays through the removal of disabled vehicles from traffic lanes.
3. To assist the Kansas Department of Transportation and local law enforcement agencies in the prevention of incidents that endangers motorists and disrupts normal traffic flow.
4. To free road patrol troopers to perform duties requiring law enforcement powers through the cost-effective employment of non-sworn Motorist Assistance Technicians.
Wichita’s Motorist Assistance Program (MAP) includes 6 motorist assistance technicians (MATS) and 5 Motorist Assistance Vehicles (MAVS) that operate Monday through Friday, 5 a.m. to Midnight, and 7 a.m. to 11 p.m. during the weekends. The table below displays the activity and totals accumulated from January 1, 2013 to December 31, 2013.

**Activity** | **2013 Totals**
--- | ---
Public Contacts* | 7,375
Service Rendered | 4,918
Unattended Vehicles** | 1,808

**Time**

<table>
<thead>
<tr>
<th>Activity</th>
<th>2013 Totals</th>
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<tbody>
<tr>
<td>Total Miles Driven</td>
<td>213,381</td>
</tr>
<tr>
<td>Regular Patrol Time (Hours)</td>
<td>7,029.75</td>
</tr>
<tr>
<td>Service Rendered Time (Hours)</td>
<td>1,293.75</td>
</tr>
<tr>
<td>Special Assignment Time (Hours)</td>
<td>52.50</td>
</tr>
<tr>
<td>On Scene Accident Time (Hours)</td>
<td></td>
</tr>
<tr>
<td>Fatal</td>
<td>6.75</td>
</tr>
<tr>
<td>Injury</td>
<td>136.75</td>
</tr>
<tr>
<td>Property Damage</td>
<td>116.25</td>
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</tbody>
</table>

*Contact with at least one person. Multiple persons in an encounter are not counted individually

**Red tag placed on the vehicle found abandoned between the fences along a highway. Recovered stolen vehicles are excluded.

**MISSION**
To improve traffic safety through timely, courteous, and cost-effective assistance to motorists whose vehicles are stranded or disabled along the roadway.
TRAFFIC INCIDENT MANAGEMENT TRAINING

Traffic Incident Management (TIM) is a comprehensive initiative focused on improving safety, capacity and reliability of a roadway. TIM consists of planned and coordinated efforts to identify and restore roadway capacity as safely and quickly as possible. Strong traffic management practices help to improve the safety of responders and the public, as well as improve route reliability. In 2013 in the Wichita area, over 450 traffic incident responders from multiple disciplines have been trained. Responders completed a four-hour training course developed by the Federal Highway Administration (FHWA) through the Strategic Highway Research Program (SHRP2). The course develops a common set of practices and advance standards for all emergency responders and those who support traffic incident management (TIM).

<table>
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<th>Responders</th>
<th>Total Trained</th>
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<tr>
<td>Law Enforcement</td>
<td>49</td>
</tr>
<tr>
<td>Fire/Rescue</td>
<td>379</td>
</tr>
<tr>
<td>Towing and Recovery</td>
<td>0</td>
</tr>
<tr>
<td>EMS</td>
<td>3</td>
</tr>
<tr>
<td>DOT/ Transportation</td>
<td>24</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>456</strong></td>
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In 2013, over 450 traffic incident responders from multiple disciplines have completed a 4-hour TIM training course.

Saves Lives
- Faster incident response and clearance times result in fewer secondary crashes.
- Training results in less exposure of responder team to moving traffic during recovery.

Saves Money
- Less congestion leads to few freight and traveler delays and backups.
- Fewer secondary crashes saves on insurance claims.
- Faster cleanups lead to cost savings for incident personnel.

Saves Time
- Smarter response techniques cut congestion clearance time and decrease delays.
CONGESTION INDEX REPORTS

Introduction

Traffic congestion affects our daily lives as we travel along the roadways. Morning and evening commuters generally have a similar schedule day to day, which causes peak periods of congestion. Commuters are familiar with regular congestion on their routes and will plan accordingly. Irregular congestion from incidents and other factors are things that frustrate drivers. Roadway users want travel time reliability with consistent and reliable travel times day to day on their route.

The purpose of the congestion index report is to inform commuters of travel time reliability for Wichita. Although Wichita does not currently have bad congestion compared to other larger cities, congestion continues to increase as the city grows. Travel time reliability is measured by comparing travel times during little or no congestion to peak hour travel times. The Federal Highway Administration (FHWA) has outlined three effective methods on measuring travel time reliability:

- travel time index (TTI),
- planning time index (PTI),
- buffer time index (BTI).

The data contained within this report is based on unprocessed or “raw” data collected from traffic sensors within WICHway’s intelligent transportation system. No attempts were made to alter data or interpolate missing data in any way. Prior to analyzing the data found in this report, erroneous data from possible malfunctioning detectors or other erroneous data was eliminated.

The results outlined in this report are intended to help inform travelers of current congestion areas and help stakeholders make informed decisions on areas of the highway system that need improvement. As data continues to be developed, historic and current traffic trends can be used to derive comparisons; thereby helping make informed decisions on areas of improvement to Wichita’s transportation system.
**WICHway Sensor Framework**

Wichita’s Intelligent Transportation System (ITS) currently has 43 traffic sensors throughout the network. Traffic sensors detect traffic conditions 24/7 including vehicle speeds, volume, lane occupancy and direction in 15-minute intervals, all of which is stored on secure servers.

The data used in this report is from July 1, 2013 to December 31, 2013. When a peak period is referenced, the peak periods correspond to 7:15 to 8:15 morning and 4:30 to 5:30 in the afternoon; the peak periods in this report were determined using data collected over the 6-month time period.

The congestion indices used in this report are:

- Travel Time Index (TTI),
- Planning Time Index (PTI),
- Buffer Time Index (BTI).

All three travel time reliability indices are calculated standards used by the Federal Highway Administration (FHWA). For comparison purposes the FHWA publishes an Urban Congestion report located at:


The FHWA report has the above indices for many other cities in the US.

The indices averages shown in this report are weighted by the vehicle miles traveled (VMT) for several roadway segments and time periods. The travel time index equations (TTI, PTI and BTI) can be found in the appendix.
Average Daily Traffic (ADT) by Route

ADT is a measure of the average number of vehicles that cross a point (in both directions) on a roadway segment during a day. Based on typical peaking characteristics, the capacity of a freeway lane is 20,000 vehicles per day per lane.

K-96 ADT

K-96 is a bypass route connecting East US-54 (Kellogg) with North I-135 and then continues to Hutchinson, Kansas.
I-135 runs north and south through Wichita and is a major interstate route for travelers and commuter traffic.
US-54 has the highest Average Daily Traffic (ADT) in Wichita.
Average Travel Speed by Segment

The average travel speed chart below shows actual average speeds by highway segment compared to the posted speed limits. The green segment represents the posted speed limit +/- 5 m.p.h. Areas where the line extends below the lower green area threshold signifies the average flow of traffic is below the posted speed limit and is an indication of where congestion is routinely present.

The posted speed limit is generally 60 m.p.h on I-135 and US-54 and 65 m.p.h. on K-96
Travel Time Index (TTI)

The Travel Time Index (TTI) represents the \textit{average additional} time required during peak times compared to time with no congestion.

If it typically takes a driver 1 minute to drive between two points with no congestion, a TTI of 1.5 means on average, it will take the same driver 1 minute 30 seconds (1 minute x 1.5 = 1.5 minutes) to travel between the same two points during the peak periods.

The Travel Time Index (TTI) represents the \textit{average} additional time needed during peak hours. The TTI is the average travel times divided by the free-flow travel time.

\[ TTI = \frac{\text{Average Travel Time}}{\text{Freeflow Travel Time}} \]

The TTI for Wichita is computed for specific highway segments with the average travel time computed during peak morning and afternoon periods (7:15am to 8:15am, 4:30pm to 5:30pm). A peak period TTI was chosen because for the Wichita area, this is generally the time that is associated with congestion in the Wichita area. The TTI ratio can be explained by considering the values as percentages. A TTI of 1 means the average travel time is equal to the free-flow speed, indicating no delay or congestion during peak periods. If the value is greater than 1, such as 1.3, the average peak travel time is 30\% longer than if no congestion was present. For example, if it typically takes a driver 1 minute to drive between two points with no congestion, a TTI of 1.3 means it will take the same driver 1 minute 18 seconds to travel between the same two points during the peak period. If the value is less than 1, then the speed of vehicles during the peak time is greater than off-peak times.
Travel Time Index (TTI) PM Peak Hour
K-96 Travel Time Index (TTI)

**Westbound K-96 Travel Time Index (TTI)**

- EB Hillside
- EB Chisholm Creek
- EB Woodlawn
- EB Rock
- EB Webb
- EB Greenwich

**Eastbound K-96 Travel Time Index (TTI)**

- EB Hillside
- EB Chisholm Creek
- EB Woodlawn
- EB Rock
- EB Webb
- EB Greenwich
I-135 Travel Time Index (TTI)

Southbound I-135 Travel Time Index (TTI)

<table>
<thead>
<tr>
<th>Location</th>
<th>Travel Time Index (TTI)</th>
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<tr>
<td>SB 37th-West</td>
<td>11.3</td>
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<tr>
<td>SB K-96</td>
<td>10.6</td>
</tr>
<tr>
<td>SB Hydraulic-North</td>
<td>10.2</td>
</tr>
<tr>
<td>SB Hydraulic-South</td>
<td>9.6</td>
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<tr>
<td>SB 21st</td>
<td>9</td>
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<tr>
<td>SB 17th-West</td>
<td>8.6</td>
</tr>
<tr>
<td>SB 13th</td>
<td>8</td>
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<tr>
<td>SB 9th</td>
<td>7.6</td>
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<td>SB Central-North</td>
<td>7.2</td>
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<td>SB Central-South</td>
<td>6.8</td>
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<td>SB Douglas</td>
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Northbound I-135 Travel Time Index (TTI)

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<thead>
<tr>
<th>Location</th>
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<tbody>
<tr>
<td>NB Douglas</td>
<td>1.10</td>
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<tr>
<td>NB Central-South</td>
<td>1.05</td>
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US-54 Travel Time Index (TTI)

Westbound US-54 Travel Time Index (TTI)

Eastbound US-54 Travel Time Index (TTI)
Planning Time Index (PTI)

Planning Time Index (PTI) represents the total travel time required to maintain arrival time 95% of the time. 95% arrival is similar to saying 19 days out of 20 work days you would arrive on time.

The Planning Time Index (PTI) represents total travel time a commuter should plan for in order to maintain arrival time 95% of the time. The higher the PTI, the more likely the driver is to experience travel delay for the road segment. The PTI is the 95th percentile travel time divided by the free-flow travel time.

\[
PTI = \frac{95th\ Percentile\ Travel\ Time}{Freeflow\ Travel\ Time}
\]

The PTI for Wichita is computed for specific highway segments with the average travel time computed during peak morning and afternoon periods (7:15am to 8:15am, 4:30pm to 5:30pm). The PTI ratio can be explained by considering the values as percentages. A PTI of 1 means no additional planning time is needed 95% of the time. A value greater than 1, such as 2.0, indicates the driver should plan the travel time to take 200% longer, or twice as long, than times with no congestion. For example, if it typically takes a driver 1 minute to drive between two points with no congestion, a PTI of 2.0 means it will take the same driver 2 minutes to travel between the same two points during a peak period. If the value is less than 1, then the speed of vehicles during the peak time is greater than off-peak times.

If travel during times of light traffic with little congestion takes 2 minutes, a PTI of 1.5 means the same trip will take a total of 3 minutes (1.5 minutes x 2 = 3 minutes), or 1.5 times longer.

If travel during times of light traffic with little congestion takes 2 minutes, a PTI of 1.5 means the same trip will take a total of 3 minutes (1.5 minutes x 2 = 3 minutes), or 1.5 times longer.
Planning Time Index (PTI) AM Peak Hour

Planning Time Index Legend

- 1.0 – 1.30
- 1.31-1.60
- 1.61+
Planning Time Index (PTI) PM Peak Hour
K-96 Planning Time Index (PTI)

**Westbound K-96 Planning Time Index (PTI)**

- **Greenwich (WB)**: 297
- **Webb (WB)**: 295.7
- **Rock (WB)**: 295.1
- **Woodlawn (WB)**: 294.2
- **Chisholm Creek (WB)**: 293.4
- **Hillside (WB)**: 291.8

**Eastbound K-96 Planning Time Index (PTI)**

- **Hillside (EB)**: 291.8
- **Chisholm Creek (EB)**: 293.4
- **Woodlawn (EB)**: 294.2
- **Rock (EB)**: 295.1
- **Webb (EB)**: 295.7
- **Greenwich (EB)**: 297
I-135 Planning Time Index (PTI)

Southbound I-135 Planning Time Index (PTI)

Northbound I-135 Planning Time Index (PTI)
US-54 Planning Time Index (PTI)

**Westbound US-54 Planning Time Index (PTI)**

- **US-54 – (AM)**
- **US-54 – (PM)**

**Eastbound US-54 Planning Time Index (PTI)**

- **US-54 – (AM)**
- **US-54 – (PM)**
Buffer Time Index (BTI)

**Buffer Time Index (BTI) represents the additional time or “buffer” necessary above the average peak travel time.**

The Buffer Time Index (BTI) represents the *additional* time, or buffer, commuters need to add above their average travel time in order to maintain their planned arrival time. The higher the BTI, the more time the driver should add to account for unexpected delay. The BTI is given as a percentage and its value increases as congestion worsens. The BTI is the 95th percentile travel time minus the average travel time divided by the average travel time.

\[
BTI (\%) = \frac{95th \text{ Percentile Travel Time} - \text{Average Travel Time}}{\text{Average Travel Time}}
\]

The BTI for Wichita is computed for specific highway segments with the travel times computed during peak morning and afternoon periods (7:15am to 8:15am, 4:30pm to 5:30pm). A BTI of 0% means no extra time is needed during peak-hours verses free-flow traffic. A percentage such as 20% indicates the driver should plan the travel time to be 20% longer than times with no congestion. For example, if travel during times of light traffic with little congestion takes 5 minutes, a BTI of 40% means the traveler should plan the an additional 2 minutes (5 minutes x 40% = 2 minutes) to make their destination on time.
Buffer Time Index (BTI) AM Peak Hour
Buffer Time Index (BTI) PM Peak Hour
K-96 Buffer Time Index (BTI)

**Westbound K-96 Buffer Time Index (BTI)**

- **WB Greenwich**
  - Buffer Time Index (BTI) 297

- **WB Webb**
  - Buffer Time Index (BTI) 295.7

- **WB Rock**
  - Buffer Time Index (BTI) 295.1

- **WB Woodlawn**
  - Buffer Time Index (BTI) 294.2

- **WB Chisholm Creek**
  - Buffer Time Index (BTI) 293.4

- **WB Hillside**
  - Buffer Time Index (BTI) 291.8

**Eastbound K-96 Buffer Time Index (BTI)**

- **EB Hillside**
  - Buffer Time Index (BTI) 291.8

- **EB Chisholm Creek**
  - Buffer Time Index (BTI) 293.4

- **EB Woodlawn**
  - Buffer Time Index (BTI) 294.2

- **EB Rock**
  - Buffer Time Index (BTI) 295.1

- **EB Webb**
  - Buffer Time Index (BTI) 295.7

- **EB Greenwich**
  - Buffer Time Index (BTI) 297
I-135 Buffer Time Index (BTI)

**Southbound I-135 Buffer Time Index (BTI)**

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<td>8</td>
<td>7.6</td>
<td>7.2</td>
<td>6.8</td>
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**Northbound I-135 Buffer Time Index (BTI)**

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<td>9.6</td>
<td>10.2</td>
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**2013 Annual Report**
US-54 Buffer Time Index (BTI)

Westbound US-54 Buffer Time Index (BTI)

Eastbound US-54 Buffer Time Index (BTI)
WICHWAY TOOLS AND EQUIPMENT

WICHway utilizes an array of tools to monitor traffic, reduce congestion, assist responders to incidents and improve travel in Wichita. Many of these tools are available through the website, available at WICHway.org.

**WICHway Website**
Alerts and real-time information about traffic conditions and incidents available on desktop, tablets, and mobile devices.

**Traffic Management Center**
Control center for WICHway, Wichita’s Intelligent Transportation System.

**Closed-Circuit Cameras**
View live traffic and monitor incidents.

**Traffic Detectors**
Record live traffic data including speed, volume, lane occupancy and direction

**Dynamic Message Signs (DMS)**
Alerts road users of current traffic conditions.
APPENDICES

Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
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<tr>
<td>BTI</td>
<td>Buffer Time Index</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed-Circuit Television</td>
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<tr>
<td>DMS</td>
<td>Dynamic Message Sign</td>
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<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
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<tr>
<td>ITS</td>
<td>Intelligent Transportation System</td>
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<tr>
<td>KDOT</td>
<td>Kansas Department of Transportation</td>
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<tr>
<td>KHP</td>
<td>Kansas Highway Patrol</td>
</tr>
<tr>
<td>MAP</td>
<td>Motorist Assistance Program</td>
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<tr>
<td>MAV</td>
<td>Motorist Assist Vehicle</td>
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<tr>
<td>MIST</td>
<td>Management Information System for Transportation</td>
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<td>MUTCD</td>
<td>Manual on Uniform Traffic Control Devices</td>
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<td>TIM</td>
<td>Traffic Incident Management</td>
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<td>Traffic Management Center</td>
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<td>TTI</td>
<td>Travel Time Index</td>
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<tr>
<td>VMT</td>
<td>Vehicle Miles Traveled</td>
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Travel Time Index Equations

Travel Time Index (TTI)

\[ TTI = \frac{Average\ Travel\ Time}{Freeflow\ Travel\ Time} \]

Planning Time Index (PTI)

\[ PTI = \frac{95th\ Percentile\ Travel\ Time}{Freeflow\ Travel\ Time} \]

Buffer Time Index (BTI)

\[ BTI\ (% \ = \frac{95th\ Percentile\ Travel\ Time - Average\ Travel\ Time}{Average\ Travel\ Time} \]

Vehicle Miles Traveled (VMT)

\[ VMT = ADT \times Segment\ Length\ (Miles) \]

Average Index Value

To calculate and indices weighted average for several roadway segments and time periods

\[ Average\ Index\ Value = \frac{\sum_{i=1}^{n} (Index\ Value_{n} \times VMT_{n})_{each\ segment\ and\ time\ period}}{\sum_{i=1}^{n} (VMT_{n})_{each\ segment\ and\ time\ period}} \]
Tom Hein, WICHway Manager
316-660-4990
hein@ksdot.org
714 N. Main, Wichita, Kansas 67203
Visit us at: www.WICHway.org