Planning for Congestion Mitigation: Methods for Reducing Travel Time and Increasing Roadway Efficiency

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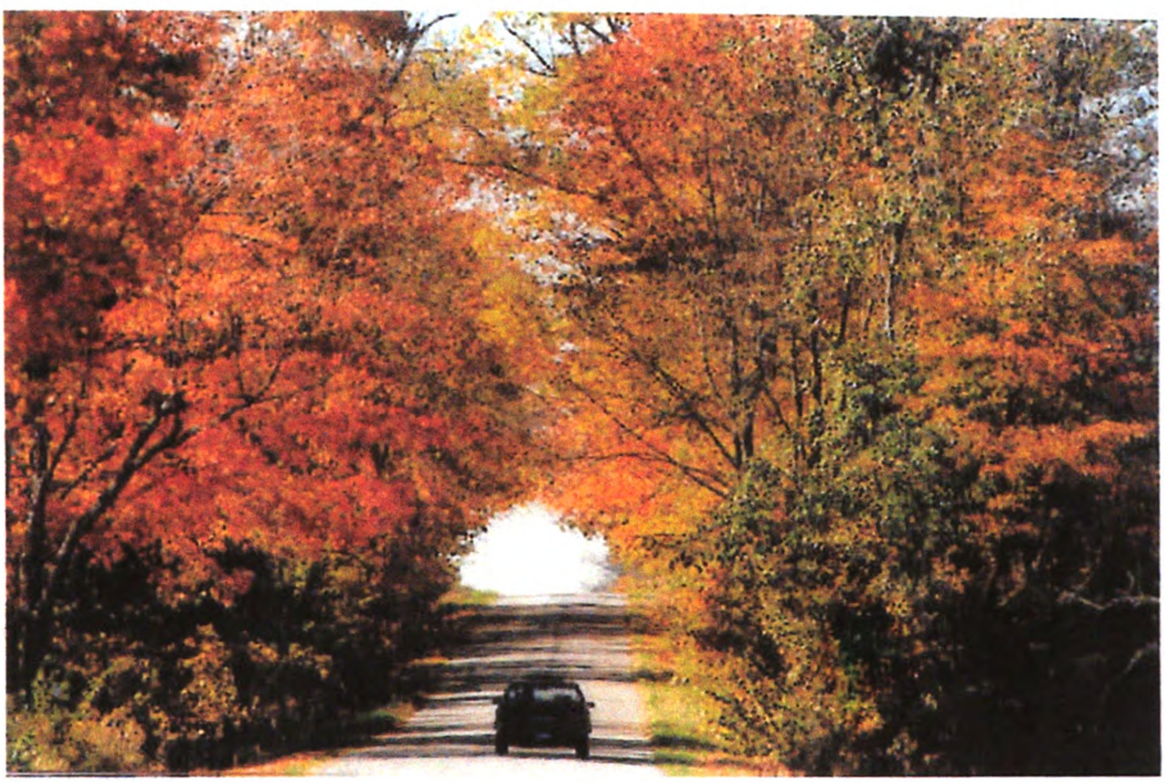
August 2007



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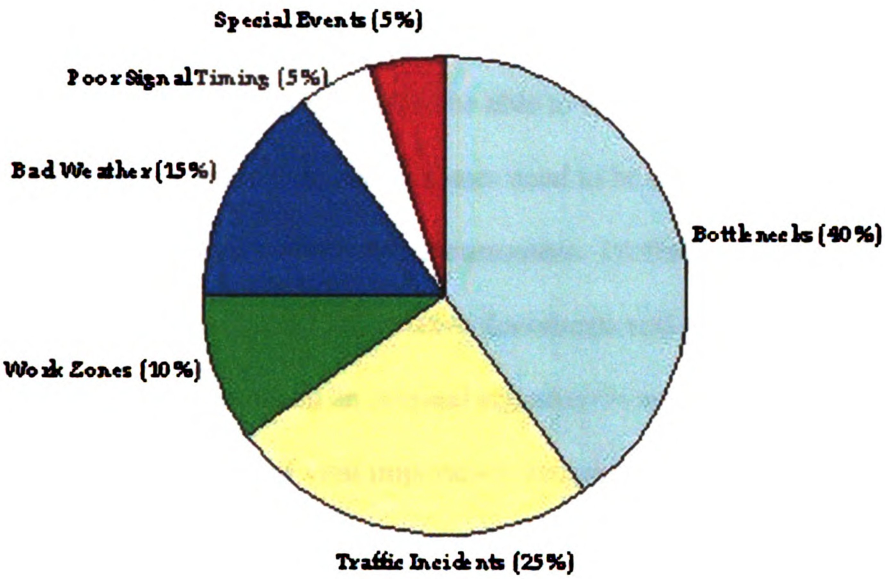
Introduction

Most of the roads in America today are crowded and congested, and the number of new vehicles being added to public roadways continues to increase. With automobiles being the primary source of transportation in this country, the need to get motorists and goods safely and efficiently from one place to another is of paramount importance. According to the Texas Transportation Institute, during the past 20 years traffic has increased by 200 percent. The average commuter now spends approximately 46 hours per year stuck on slow moving overly crowded roadways.[1] There are a number of methods currently in use to reduce congestion. There are also innovative techniques in various stages of development to help reduce congestion in the future.

Roadway congestion occurs when the flow of traffic is obstructed. This can happen for a variety of reasons and is categorized into two types, recurring and non-recurring. Simply put, recurring congestion occurs when the number of users of a particular roadway approaches or exceeds the amount of capacity that is currently available. Although some roadways may indeed always be marked by congestion, that is not the case for all. Roadways that experience recurring congestion may still see periods when traffic demands vary, slightly too significantly, depending on the time of day, day of the week, or time of year. Roughly half of the congestion experienced by motorists is recurring.

Non-recurring congestion, however, occurs due to a decrease or disruption in roadway capacity that is usually temporary and often unforeseen. The four major categories of this type of congestion include: traffic accidents and stalled or broken down vehicles, road construction or work zones, weather and special events. Non-recurring congestion not only reduces the amount of available capacity, but can also have an impact on the entire transportation network. People and businesses that run on tight schedules can be especially affected by this type of congestion. Drivers can run into traffic entering or exiting a special event they were unaware of or come upon an accident they did not know had occurred and then are stuck, along with everyone else, with no available alternatives.[2]

Causes of Congestion[3]



Context

Everyone's lives are affected by transportation in some way or another. Everyday people leave their homes to go to jobs, schools, recreational activities, stores, restaurants, a friend's house, etc., and they need a way to get there. Whether it is by private car, bus or rail, people are always on the move and a congested, inefficient transportation system will do nothing more than slow them down. The costs society pays for congestion are numerous and those costs are paid by individuals and businesses alike. The most obvious and easy to calculate are wasted time spent in traffic, wasted fuel from idling cars, and money lost from missed appointments.

Significance

"A competitive, growing economy requires a transportation system that can move people, goods, and services quickly and efficiently. To meet this challenge, each transport sector must work effectively both by itself and as part of a larger, interconnected whole."[4] Having an efficient transportation network is vital not only for moving people, but also for moving the economy. Everyday American businesses rely on some form of transportation to help keep their operation moving. Manufacturers need to be able to receive raw material and ship their finished products. Distribution centers and warehouses need to be able to ship and receive durable goods. Service providers need to be able to reach customers. Professional firms, financial and legal for example, need to be able to send and receive documents and reports in a timely fashion. For a number of reasons, such as when an original signature is required, it is not always possible to do this electronically. It is also of vital importance that emergency services to be able to reach those who need it.

> "The extra time spent in congestion causes service providers to make fewer calls per day, leading to higher prices for consumers; this is particularly important for emergency medical, fire, and police services which may be unnecessarily delayed from attending to medical, crime, and disaster situations. Companies with production schedules timed to take advantage of trucks delivering components to an assembly line as they are needed must instead plan for items to arrive early. This consumes space and inventory, expending resources that could otherwise be spent on productive activity."[5]

There are a number of companies, Federal Express and Airborne for example, that stay in business by promising to get packages to people quickly. They promise delivery by specific times each day. This is known as just in time delivery and it is becoming more and more popular. An efficient transportation system makes just in time delivery is possible. This reduces the need for businesses to carry large quantities of inventory, thereby saving revenue. Reducing congestion on roadways means that freight hauling trucks can reach their destination more quickly and service providers can make more calls per day which can, in turn, keep prices down.

Relevance

Congestion mitigation is one important aspect of transportation planning. Transportation planning, in turn, is an important aspect of urban planning, since an efficient, flowing, multi-modal transportation system is necessary to keep people and the economy moving. Transportation planning is handled by various government agencies, at the national, state and local levels. Land use planning is primarily a local function and can be done by public agencies or private firms. Municipalities function better when transportation and land planners work together. When developing land it is necessary to keep in mind how people and freight will move in and out of the area. At the same time, when planning transportation systems or system improvements it is necessary to take into account the surrounding land uses and what the effect will be.

Nature of the Problem

In 2002, commuters in the 85 largest urban areas, those with a population of 500,000 or more, experienced 3.5 billion hours of delays due to traffic congestion. Fifty-four percent of highways in these areas are classified as heavily, severely, or extremely congested. In addition, drivers sitting on congested roads waste 5.7 billion gallons of fuel.[6] In 1982, a 20-minute, midday (non-peak hour) trip would take 23 minutes during the peak commuting times. By 2001, the amount of time that same 20-minute, midday trip would take during peak commuting time had risen to 28 minutes. The amount of time that use to be considered "rush hour", i.e. AM and PM travel to and from work, lasted three to four hours per day. Over the last 20 years, that has increased to 6 to 8 hours per day.[7] Large urban areas, such as Los Angeles, CA, see little let up in daytime traffic. Traffic congestion exists virtually from morning until evening.[8] It is also expected that population and employment in America's largest cities will continue to grow approximately 2 percent each year.[9] This will cause even greater delays on all ready overloaded urban highways.

Congestion is a problem for society as a whole because the costs of congestion are numerous and it is not just drivers who "pay the price". Slow moving vehicles consume more fuel and release more emissions causing increases in air and water pollution. Time spent sitting in congestion is simply time lost, which could be better spent on almost anything else, family, work or in recreational pursuits, just to name a few.

What Can Be Done

There are a variety of techniques which can be implemented to help reduce traffic congestion. These methods differ depending on whether the congestion problem is recurring or non-recurring in nature. A discussion of each of the various methods will follow. For recurring congestion, they include:

- Arterial Management, which includes Access Management and Traffic Signal Timing
- Freeway Management and Traffic Operations
- Travel Demand Management

Mitigation techniques that will be discussed for non-recurring congestion include:

- Traffic Incident Management
- Work Zone Management
- Road Weather Management
- Planned Special Event Management

Access Management

Arterials are major roadways that are generally heavily traveled but not part of the interstate system. With an ever increasing number of vehicles clogging American roadways, the need to manage how cars will enter and exit those roads has become a critical issue. When a driver turns off of a street with fast moving traffic the possibility for an accident exists. The car turning must slow down to complete the turn, thereby causing the driver behind to also have to slow down. This process continues with all of the cars that are in the affected lane needing to slow down until the existing driver has completed the turn. If even one driver in the chain is not paying enough attention or is too slow in reacting, a rear-end collision is possible. The chances for collision increase even more when a driver is entering a busy street. They have to go from standing still to whatever speed traffic is flowing in a very short time. Again the cars already in the traffic lane may need to slow down or change lanes quickly to avoid hitting the entering vehicle. This can be especially problematic if the entering vehicle is slow getting up to traffic flow speed or the driver simply chooses to continue at a slower speed. Often times multiple vehicles are entering or exiting a street at once. This slows down traffic, increasing congestion and travel time. One way to deal with this problem is access management. One definition of access management is "a set of proven techniques that can help reduce traffic congestion, preserve the flow of traffic, improve traffic safety, prevent crashes, preserve existing road capacity and preserve investment in roads by managing the location, design and type of access to property."[10] Access management plans are formal and structured ways to coordinate and maintain safe and efficient uses of roadways, while at the same time providing access to the adjoining lands. This applies primarily to major arterials and includes both access from intersecting streets and private driveways. Access management utilizes long-range, system-wide approaches instead of piecemeal or case-by-case plans.[11] Another benefit of implementing access management techniques is that they can make roadways safer as well.

Failing to implement proper access management plans can not only increase traffic congestion, but also have adverse effects on the economy and the environment. The following are common impacts felt when access management issues are ignored:[12]

- More motor vehicle accidents, not just car to car, but also involving pedestrians and bicyclists.
- Roadways becoming less and less efficient.
- More cars will cut-through residential neighborhoods in an attempt to avoid congested arterial roads.
- Home and business owners are adversely affected by the continuous widening of streets in order to reduce congestion.
- Commute times, fuel consumption, and motor vehicle emissions are increased due to the rising number of driveways and traffic signals, which delay vehicle movement along roadways.

Businesses can be affected because when roads become overly congested, and turning into and out of their parking lots is difficult, patrons will tend to find a place with easier access. Also entrances and exits to businesses can be blocked by traffic, especially when they are located to close to an intersection. Drivers often have tunnel vision, in that they are paying primary attention to where they need to go and what may be going on inside their own vehicle, especially when they are traveling with other people, talking on a cell phone, or listening to the radio. They often do not notice, or even do not care that a car is sitting in an adjacent lane waiting to make a turn into a business and pull up in front of the driveway entrance. This can be especially frustrating when they are just sitting at a red light and traffic is stopped. If traffic builds up behind the vehicle blocking the business entrance and enough time to complete the turn is not allowed when the light is green and it turns red again, the whole process could start over. Added problems would exist if the car waiting to make the turn is causing a traffic backup by blocking through traffic because no left turn lane exists or oncoming traffic is unable to use the existing left turn lane because the person waiting to turn off of the street is unable to move. If driver frustration builds enough at not being able to turn into a particular business easily, they are more likely to patronize a competing business with easier accessibility, if it is at all possible. The opposite can also happen when attempting to exit a business and get back onto a street, especially if the driveway is located close to an intersection, which also increases the likelihood of a vehicle crash occurring.

The goals of access management include limiting and consolidating access points along major roadways, making them safer for motorists and pedestrians by promoting unified access points, supporting street and circulation systems for the surrounding land development, and reducing traffic congestion. One of the important principles to remember regarding access management is to acknowledge that a roadway hierarchy must exist. Freeways and expressways are the fastest moving of all roadways, with direct access being fully controlled. Below them exists a grid of arterials, collectors and local roads, with either some or no access control systems in place. Each roadway has a specific purpose, arterials are busier and often carry high volumes of motor vehicles at once, and their function is primarily to move traffic at higher speeds. It is the job of collector and local roads, which typically carry less traffic and move at slower speeds, to provide access to the adjoining land uses. Expecting every road to fulfill every need will not work.[13] Following are some principles that, if followed, can help government officials and transportation policy makers to accomplish access management goals:[14]

- Limit Direct Access to Major Roadways – by limiting direct access to major arterials, especially roads that drivers often use as through streets when traveling in a large metropolitan region, the flow of traffic will be preserved and travel times increased.
- Promote Intersection Hierarchy – provide an appropriate transition from one type of roadway to another. For example, when a driver exits a freeway, they typically go through an interchange that is designed for the transition from high speed freeway to slower speed arterial. This same principle could be applied to other road classifications as well.
- Use Nontraversable Medians to Manage Left-Turn Movements – research has shown that left turns account for the majority of crashes related to access management. By using nontraversable medians and other measures that

minimize that ability of drivers to make left turns, roadway safety is improved.

- Remove Turning Vehicles from through Traffic Lanes – providing right and left turn lanes will allow a car to get out of the through traffic lane and make their slow deceleration in preparation for turning in a more protected area where they are less likely to be rear-ended by through traffic. This also allows through lanes to keep moving at higher speeds and reduces delays and congestion.

Poorly planned and designed roadway and access systems lead to crashes, congestion, economic losses, and loss of life. Insurance companies pay millions of dollars each year in claims for property damage and medical costs. They, in turn, raise premiums on policies for all customers, even those who have never filed a claim. In order for roadways to be safe and efficient, road officials, local bureaucrats, and land developers must work together, and access management techniques must be implemented. All too often stakeholders end up working against each other. Development plans are submitted to local planning agencies and after approval has been obtained, they go to state road authorities for access permits. The problem is that commercial developers generally want a large number of driveways and road officials want to restrict that number. This is where access management principles and techniques come into play. Roads are controlled by state Departments of Transportation (DOTs), local governments, and county road commissions. Land use planning is controlled by different departments within various cities, counties, townships, and municipalities, each with the power to create zoning ordinances. The same agencies do not control both, which is why conflicts often occur. In Michigan there are over 1800 individual local government units. Zoning ordinances are not uniform through out the state, meaning that a land use that is permissible in one town may not be allowed in the neighboring town. Land uses have a direct impact on the roads that pass by them. The bigger the land use (attraction), the more vehicle trips it will produce, leading to road congestion. All relevant parties need to be a part of the process from the beginning. A local road commissioner or qualified transportation planner should be involved in land development planning so that proper access management techniques can be applied from the beginning. This is the only way that existing road capacity will be maintained and able to handle new and expanding development at the same time. Stakeholders must work together if access management techniques are to be implemented successful, injuries avoided, lives saved, traffic congestion decreased and economic development increased.

Case Study: Okemos Road

An example of using access management principles to mitigate congestion and increase safety is found in the Okemos Road project.

Okemos road is a north-south arterial road that runs from the city of Mason to Meridian Township in south-central Michigan. A two mile section of that road, lying between Jolly road to the south and Mt. Hope road to the north, was the subject of a great deal of controversy in 2005. That particular section of Okemos road is home to both commercial and residential real estate was well as a middle school, elementary school and a church. There is a rail road track that runs across the road, as well as seventeen separate intersections that traverse Okemos the road as well. The speed limit is 45 miles per hour on this section of the road. At the time, Okemos road was two lanes in each direction, with no middle turn lane existing. Just south of the Jolly road intersection, there is a freeway exit off of Interstate 96, a busy east-west freeway. This freeway off ramp, exit 110, is used by Okemos residents, as well as for people heading to Michigan State University, the Meridian Mall shopping area and smaller surrounding communities. This stretch of road carries approximately 27,000 vehicles per day. That number is expected to increase to approximately 40,000 per day by 2025.[15] Having such a high volume of traffic also means that accidents are bound to occur.

In early 2005 plans were put in place to widen the road and add a left turn lane to help alleviate congestion and reduce traffic accidents. In 2003, there were 59 vehicle crashes on this two mile section of road. Eight of those crashes involved injuries to drivers or passengers. The number of crashes increased significantly in 2004, to 121, with 39 injuries. That number dropped in 2005 to 71 total crashes with, 8 injuries occurring, the same number as in 2003. The majority of the 2005 crashes were in the first 7 months of the year, before construction began. There were 20 crashes, with 2 injuries, during the 4 months construction was taking place, when lanes were reduced. Eight accidents occurred during December of 2005. No injuries were reported in any of those crashes.[16] (See Appendix A for Complete Crash Report).

The project, which should have been a straight-forward lane addition, beneficial not only local residents, but also commuters, was controversial from the beginning. Local residents objected to the Ingham County Road Commission's decision to take the needed land for the road widening from the east side of the road, which has far more residential units than the west side, which is largely commercial. The Road Commission argued that that would cost more money, as commercial property is generally more expensive. Residents than went on to argue that the Road Commission was ignoring their concerns and the case ended up in court. An Ingham county circuit judge ruled that the Road Commission violated the State of Michigan Open Meetings Act by not allowing the residents to voice their ideas and concerns before the final decision was made. A thirty day moratorium was put on the project and two public meetings were scheduled for residents to meet with Road Commission members to express their concerns and share their ideas.

After the court ordered delay and public meetings, the project went forward as originally planned. Construction began on July 28, 2005 and was concluded on November 30 that same year. The road was widened and a left turn lane was added to the entire two mile section of the road.

What is the outcome of the lane addition? Removing drivers who are turning from through lanes helps to reduce back-ups and decrease travel times. The second perceived benefit of adding a dedicated left turn lane is to reduce vehicle accidents. In the first year after the lane addition, 2006, the number of vehicle crashes went down by only three from 2005 numbers. But a comparison to 2004 statistics shows 53 fewer accidents. There were 68 total vehicle crashes; nineteen of which included injuries. Thirty-six of those crashes were the result of one vehicle rear-ending another. That number is down from 47 rear-end collisions in 2005. Twenty-five crashes were the result of icy, wet or snowy pavement; that is up by 1 from last year.

One year later it would seem that the addition of the new lane did not do much to reduce the number of vehicle crashes. One year is probably not long enough to determine whether or not the lane addition was successful in reducing vehicle crashes. Other factors, such as vehicles driving too fast for traffic and road conditions, or drivers who are not paying attention to the road, could also be the cause of crashes. No amount of road improvements can compensate for careless or inept drivers. There was a large spike in vehicle crashes in 2004, even though the road, speed limit or number of lanes had not changed from the year before. Time will tell whether the addition of the turn lane will aid in reducing vehicle crashes.

Traffic Signal Timing

There are over 330,000 traffic signals operational throughout the United States today. Of that number, it is estimated that more than 75 percent of these are operating at less than peak efficiency.[17] Traffic signals that are poorly timed cause not only driver frustration, but also add to traffic congestion. Travel times are increased, more fuel is wasted, and more emissions are released into the air. It is frustrating for drivers, moving at a constant rate of speed, to suddenly have to stop because of a red traffic light. That frustration is increased when the driver is stopped at an empty intersection, with no vehicles crossing the intersection. Frustration elevates to greater heights when the red light lasts, or feels to the driver as if it lasts, for a long time. If one roadway has consistently more traffic than the street that intersects it, the light may favor one road over another. The green light for street A (which carries more traffic) is longer than the green light for street B. Thus the driver sitting at a red light on street B will have to wait longer. This may help to alleviate congestion and reduce travel times during heavy or peak usage times, but may cause the opposite when road demand has decreased. The person sitting at the long red light on street B is now seeing an increase to their travel time when there is no need for it. In addition to having the driver setting needlessly at the red light, fuel is being wasted and vehicle emissions are adding to air pollution.

Poorly timed traffic signals are estimated to cause approximately 300 million vehicle-hours of delay on major roadways. This is approximately 5 to 10 percent of all traffic congestion.[18] Currently, only 30 percent of all roadways are arterials and collectors, yet they carry 56 percent of the total vehicle miles driven.[19] Having poorly timed traffic signals only serves to make things worse. In August of 2004 a national assessment of traffic signal operations was conducted to develop the National Traffic Signal Report Card, a first of its kind report designed to gauge how traffic signals are performing. The voluntary Traffic Signal Operation Self Assessment was completed by 378 agencies in 49 states and represents about one-third of all traffic signals in the United States. The assessment included 5 sections: Proactive Management, Signal Operation in Coordinated Systems, Signal Operation at Individual

Intersections, Detection Systems and Maintenance. The overall score was a D-. This means that traffic signals are not functioning any where near as efficiently as they should be. This only serves to add to the amount of delay traveler's experience on arterial and collector roads.[20]

There are a number of aspects that contribute to poor signal timing. They include things such as malfunctioning equipment, out-of-date traffic analysis, and not enough or poorly trained personnel. Bigger factors however, consist of such things as a lack of funding and not enough attention being paid to traffic signals by officials. Most traffic signals in operation prior to the 1950's were preprogrammed electromechanical devices that were configured manually and could have up to three timing phases each day. They were usually programmed with a morning peak travel time, off peak time and afternoon peak travel time. Given that these signals have to be programmed by hand, they are not easily controlled. They cannot respond easily to increasing or changing traffic patterns. Some of these traffic signals are still in use today. This is a testament to the durability of the equipment, but is a major cause of inefficiency and adds to congestion. Even many of the more modern traffic signals used at intersections today operate in a pre-set mode that does not detect the presence or absence of vehicles. Lights may turn red and stop traffic even when there are no cars on the intersecting roadway.[21] Drivers who become frustrated by these types of delays may then engage in unsafe driving behaviors such as, accelerating at yellow lights to get through before the light turns red, cutting through residential neighborhoods or a business parking lot or driveway to avoid a red light or simply run the red light. This can be dangerous to not only other vehicles, but also to parked cars and pedestrians.

There are a number of things that can be done to help reduce congestion because of inefficient traffic signals. Signals need to be retimed regularly, based on changes in travel patterns and levels of traffic. Technological advances have also provided solutions to assist traffic planners in making signals more efficient. There are a number of software packages that exist today, available from both the public and private sectors that have been developed to analyze and optimize traffic signal timing. Using models, computers examine simulated traffic scenarios and then evaluate signal operations.[22] One such software is called ACS Lite. This program is designed to operate in a closed loop arterial traffic signal system; which is what approximately 90 percent of traffic signal systems in the United States are. ACS Lite software works together with an intersection controller to identify traffic flow patterns and signal timing parameters. It can then provide updated information regarding traffic to signals.[23]

Locating signals to favor through traffic is another solution. It is much easier to coordinate the timing of traffic lights on major roadways, there by ensuring the continuous flow of traffic at posted speeds, if the intersections and signals are placed uniformly and with long distances between them. Poor placement of traffic signals and failure to take into account the placement of connectors or median openings, which as traffic increases may become signalized in the future, can lead to delays that computerized signal timing systems are not able to overcome. The result will be more congestion. In addition, one national study on street grids with poorly timed and inadequately spaced signals concluded that 40 percent of all motor fuel consumption was attributed to time spent idling at red lights.[24]

The cost of retiming traffic signals varies from between $500 and $3000 per intersection. The benefit-to-cost ratio however, is approximately 40 to 1. This means that the benefits to drivers and municipalities greatly out way the costs. Benefits such as reduced congestion, less time and fuel wasted, less emissions released into the air, and fewer vehicle crashes results in greater road efficiency and also time, money and lives saved.[25]

Freeway Management and Operations

Freeways located in urban areas account for less than 2.4 percent of all highway mileage but they carry approximately 20 percent of all traffic nationwide. Demand for access to highways only continues to grow. There are three basic component parts involved in providing efficient highway based transportation. They are: 1) building the necessary infrastructure; 2) preserving existing infrastructure; 3) preserving its operating capacity by managing operations on a day-to-day basis.[26]

The era of major highway building is largely over. The emphasis today is on preserving existing roadways and making them as efficient as possible for the ever increasing number of vehicles that operate on them each day. To accomplish this, it is important to properly manage freeways.

Implementing policies, strategies and technologies to improve freeway performance is what freeway management is about. "The over riding objectives of freeway management programs are to minimize congestion, and its side effects, improve safety, enhance overall mobility, and provide support to other agencies during emergencies. The Transportation Research Board's (TRB) Freeway Operations Committee's Millennium Paper states: 'Freeway operations, in its broadest context, entails a program to combat congestion and its damaging effects: user delay, inconvenience and frustration, reduced safety, and deteriorated air quality.' Moreover, this "context" includes a vast array of freeway uses – the daily commute, commercial vehicle operations, personal and recreational trips, emergency service response, and evacuations during emergencies."[27] These objectives need to be put into practice in order to help reduce congestion and increase safety.

When freeways become congested people are inclined to think that the way to solve the problem is simply to increase capacity, i.e., build more freeways or add lanes to existing freeways. Construction is often the number one choice for congestion reduction because it provides a visible increase in roadway capacity. It can also be politically popular because people can see that something is being done about the problem. There are a number of drawbacks to this option. First is cost, there is typically not enough money to finance all the road improvement projects that need doing. This means there is a need to stretch resources as far as possible. Another problem is that in many urban areas there is no room for freeway expansion because of development. This causes land prices to be higher, increasing the cost of the overall project. There are also environmental mitigation requirements that have to be followed.[28] This will usually only solve the congestion temporarily. Once the supply or road capacity has been increased, demand also increases.[29] That is, once capacity is augmented, people who have been using alternate routes, or other forms of transportation will begin to drive on the newly expanded roadway. Eventually the congestion problem will return. Therefore other solutions are needed to help solve the problem of congestion.

Managed Lanes

The use of managed lanes is one way to help reduce to help reduce freeway congestion. Managed lanes include high occupancy vehicle (HOV) lanes, also known as carpool lanes. These are dedicated lanes to be used only my vehicles with multiple occupants. The exact number of occupants varies by freeway.

Another type of managed lane is the high occupancy toll (HOT) lane. A HOT lane allows single drivers access to HOV lanes, for a price. When HOV lanes are being underutilized then single drivers can take advantage of the available capacity. An electronic devise is attached to a vehicle; a toll is prepaid and then deducted electronically when the vehicle enters the HOV/HOT lane. The price of the toll may vary depending on time of day and the amount of traffic on the freeway at the time. This is one example of congestion or value pricing. Revenue collected from these tolls can then be used to pay for road improvements. What is congestion or value pricing? "Value pricing, also known as congestion pricing and peak-period pricing is a way of harnessing the power of the market and reducing the waste associated with congestion. It entails fees or tolls for road use that vary with the level of congestion. Fees are typically assessed electronically to eliminate delays associated with toll collection facilities."[30] What are some benefits to be gained from utilizing congestion or value pricing? "Value pricing makes it easier for drivers to make efficient choices about when and where they travel and it helps more people commute during peak periods. In short, the public saves time and money by avoiding congestion. This helps boost productivity in the economy, reduces accidents, and lessens smog. It also improves traffic flow on the highways and gives valuable information about demand and costs to those in charge of maintaining and expanding the highways."[31]

A third option is reversible and contra-flow lanes. These types of lanes allow for the use of under utilized lanes when traffic flow is much greater in one direction than the other. This allows for some lanes on the underutilized size to switch direction and help alleviate congestion on the opposite side. This allows more lanes to be used during peak travel times without having to construct more lanes, which is sometimes impossible. Each day thousands of people in the San Francisco bay area drive over the Golden Gate Bridge as they travel between the city of San Francisco and Marin County. "Reversible lanes were inaugurated on the roadway on October 29, 1963. Their use greatly aids the flow of traffic during the heavy morning and evening commute hours and during weekend tourist periods. At any given time, the number of lanes northbound or southbound may be adjusted. The Bridge has six roadway lanes and during the morning commute, there are typically four lanes of traffic southbound to San Francisco and two lanes northbound to Marin County. During the afternoon commute, there are typically three lanes northbound to Marin and three lanes southbound to San Francisco."[32]

A fourth strategy for managing traffic lanes is to create truck-only or truck by-pass lanes. These allow for the separation of large freight trucks and passenger cars. Limiting interaction between large trucks and other vehicles will help to increase traffic flow and increase safety, saving time, money and lives.[33]

Ramp Management

Access to the nation's interstate highway system is strictly controlled. Entry can only be gained through the use of access ramps. Proper management of these ramps can help improve the quality and safety of highways. "Ramp management involves processes that control the amount of traffic that can enter or exit the freeway in an effort to maintain or enhance operational efficiency."[34] There are four basic strategies that have been implemented to help control and manage traffic on freeway ramps. Ramp management control devices include such things as traffic signals, signs and gates.

Traffic signals or ramp meters are used to control the number of cars attempting to enter a freeway at a given time. They also control the speed vehicles are traveling and smooth the flow of traffic as it enters a freeway. Ramp meters can be programmed to release one or more vehicles at a time, depending on freeway volumes. Meters at various ramps along stretches of the same freeway can be coordinated in order to smooth the flow of traffic at entry points. Ramp meters can help to optimize congestion and some of its effects, such as collisions and delays, because freeway entry traffic is controlled and orderly.

Another ramp management technique is closing a ramp, either temporarily or permanently, thereby preventing vehicles from using it to enter or exit a freeway. Ramp closures are a good option when traffic needs to be controlled due to a constructions work zone or special event. Ramps can be closed to all or certain types of traffic on a temporary or permanent basis or intermittently, as needed. Long established traffic patterns can be changed when ramps are closed, so this should not be used is come other ramp management technique can be used successfully. If it is necessary to close a ramp, then consideration needs to be given to how traffic will be rerouted.[35] This could serve to increase traffic congestion, if it is not done properly. Consideration needs to be given to traffic patterns and volumes.

A third element of ramp management is special use treatments of freeway ramps. Special use treatments involve, as the name implies, give some classes or types of vehicles preferential treatment. This can apply to the entire ramp or to a special lane, such as one for emergency or high occupancy vehicles.

The fourth element of ramp management is called ramp terminal treatments (RTT). Ramp terminal treatments employ such strategies as signal timing, turn lanes, the widening of ramps, additional storage on adjoining arterials, signs and pavement markings. "Ramp terminal treatments are geared to improving localized problems at either entrance or exit ramp terminals. Treatments focus on providing solutions to problems at the ramp/arterial intersection."[36]

At exit ramp intersections, the strategies can be used to help keep exiting cars from backing up onto the freeway. At entrance ramps, the strategies are generally used to advance the synchronization between ramp meters and traffic signals, not enough space on the ramp for vehicles waiting to enter or exit and notifying drivers and advising alternatives.

Ramp management strategies and programs are designed to address problems relating to safety and mobility. Proper implementation of ramp management techniques can save money and lives by reducing collisions that occur on or around freeway entrance or exit ramps, which helps improve conditions and avoid delays.[37]

In order to know if freeway management strategies are working they need to be continuously monitored and evaluated. Performance measures are a way to do that. "Performance measures provide the basis for evaluating the effectiveness of implemented freeway management strategies, as well as for identifying the location and severity of problems, such as congestion and high accident rates."[38] The information collected from system monitoring can be used to track changes in performance over periods of time. This can be used to identify systems or area with poor performance, and potential causes. Furthermore, specific areas of a freeway management program that need improving can be identified. Once problems or system failures have been identified, appropriate remedies can be put in place. Performance measures are needed to gauge how a transportation system performs with regards to the goals and objectives set forth, for not only the current and on going management and operation of a system, but also for the evaluation of future options.[39]

The use of ramp management techniques is best in high density traffic areas. In Michigan, as with so many other congestion mitigation techniques, they would be most cost effective in the larger metropolitan regions of Detroit and Grand Rapids where traffic congestion is the greatest.

Travel Demand Management

While supply side management deals with capacity issues, such as roadway, bridge and transit infrastructure, demand side strategies are designed to make existing facilities work better.

"Demand side strategies are designed to better balance people's need to travel a particular route at a particular time with the capacity of available facilities to efficiently handle this demand." Demand side strategies focus on providing people with greater travel choices, from mode, i.e., driving or using transit, to route and departure-time. Demand side strategies also provide incentives and information to travelers so they can make educated choices.[40]

General Strategies

Travel demand strategies are divided into two categories, general and targeted. General strategies are more broad-based strategies that included mode, route and departure time choices. They also include infrastructure and travel program investments. General strategies are divided into four categories: 1) technology accelerators, 2) financial incentives, 3) travel time incentives, and 4) marketing and education.

Technology Accelerators

Technology advances, which are discussed in various place throughout this paper, are helping to accelerate the implementation of demand side strategies by transportation agencies. Intelligent transportation systems are one example of how technological advances are affecting travel choices.

Financial Incentives

The average American household spends approximately 18 percent of total household expenses on transportation costs.[41] There are a number of financial incentives that can help drivers think about alternatives to driving alone. These are especially useful for people who commute to work.

Under section 132(f) of the Internal Revenue Service code, employers can offer employees tax-free vanpool, parking and transit benefits. Employers can offer up to $100 per month, tax-free, to employees who take advantage of vanpool and transit services. Employees can also offer up to $195 per month for qualified parking expenses, again tax-free (2004 tax year figures, subject to annual change). Employers also get a tax benefit, in that they can receive a deduction on their payroll related taxes for offering this benefit.[42]

Employees can also set aside up to $100 per month (subject to annual change) to pay for transit or vanpooling expenses. The advantage in this is that the money is pre-tax. This reduces the amount of an employees pay that is subject to tax. Employers also benefit because again, this set aside money is not subject to payroll tax.[43]

There are other types of financial incentives that can be offered by individual companies to meet the unique needs of their employees. The use of financial incentives will only work if there are alternate transportation methods available.

Travel Time Incentives

Travel time incentives are designed to help reduce travel time. Some methods used to accomplish this, such as high occupancy vehicle lanes and access ramps, are discussed in separate sections. Another method is to provide priority parking for car and vanpools. Preferred or priority parking can include such things as covered parking or assigned spaces close to the building entrance. If employees must pay for parking, then employers could offer free parking for cars and vanpools.

Marketing and Education

Marketing and education involves making sure that people are well informed about (1) available transportation choices, (2) encourage travelers to try new or more efficient travel methods and (3) maintain and increase the incidence with which people use more efficient travel modes, routes or times.[44]

Targeted Strategies

Targeted strategies, as the name implies, are demand-side strategies that are targeted to specific traveler preferences. There are four primary categories of targeted strategies including: 1) mode strategies, 2) departure time strategies, 3) route strategies, and 4) trip reduction strategies.

Mode Strategies

The first category is mode strategies, which have to do with choosing from different methods of travel. In order to get people to try alternative transit options, instead of their cars, then they need to see transit as a convenient and cost effective option. One problem with taking transit is that is an emergency arises, they may not have a way home. Guaranteed Ride Home programs provide rides to people who do not drive to work, but then have some type of unexpected urgent situation arise. Guaranteed Ride Home promises that the person can get home, with no additional cost. The rides home may be provided by taxi, rental cars, company owned vehicles, or some other alternative mode. This method allows for people to use transit while eliminating the inconvenience of having to find a ride home in an emergency.

Providing free or subsidized transit passes to travelers on local or regional bus, rail, ferry or shuttle services is another way to perhaps get people to try transit. Passes can be provided by employers or municipalities to help alleviate traffic on overly congested highways and streets.

Shared vehicles are another mode strategy. Shared vehicles are an option for people who do not own cars but occasionally need one for special trips, such as big shopping trips or a weekend get-a-way. Car sharing, which began in Switzerland in 1987, now has over 100,000 members in the United States, utilizing 2,558 vehicles of all types.[45] "Car sharing is a system where a fleet of cars (or other vehicles) is owned and operated/overseen by a company, public agency, cooperative, *ad hoc* grouping, or even a single individual, and made available for use by members of the car share group in a wide variety of ways. The costs and troubles of vehicle purchase, ownership and maintenance are transferred to a central organizer (the Car share Operator or more familiarly CSO)."[46] A person who would like to utilize car sharing simply needs to locate a company in their area, become a member and away they go. Members can then enjoy the benefits of having access to vehicles when needed without the cost of ownership. Unlike conventional car rental companies, these types of vehicles may be rented by the hour or the day. Car sharing companies and programs now exist in 39 cities and counties throughout the United States. They are principally located in large metropolitan areas, where traffic congestion and smog are usually the worst.

Departure time strategies specifically target the time people leave their current location, i.e., home or work, for a different location. People traveling for leisure or personal activities don't normally have to leave at a set time. They can alter their travel times to depart at non-peak moments. It is different for people commuting to work.

The "typical" work day in this country is 8:00am to 5:00pm. So many people work this schedule that freeways are routinely and predictably congested around those times each day. In order to reduce congestion during these "peak" travel times, employers need to be willing to help. One way to do this is to offer employees flexible work schedules. Altering work schedules so employees arrival and departure times are staggered can aid in reducing demand on roadways and/or transit systems during peak times and make the commute a bit easier for all.

Unfortunately in the state of Michigan, public transportation is limited. Many local municipalities, such as Detroit, Lansing, and Grand Rapids, have bus services available. Tax and company incentives given to employees may make this a viable option for some employees, if they live within walking distance of a transit stop. Of course adverse weather conditions may impact mode choice, since it is not fun to stand at a bus stop in rain or snow, high heat or bitter cold. Furthermore, bus service tends to be closed looped, they only run with a specific metropolitan region. This makes it is more difficult for commuters, people who live in one area, but work in another, to use public transit as an alternative to driving. One alternative that does exist for them, depending on where they live, is Amtrak.

Amtrak train service connects 22 cities in the lower half of Michigan's Lower Peninsula. There are two east-west routes, that run from the cities of Detroit and Port Huron (on Michigan's east side), to the city of Battle Creek (on Michigan's west side). There the lines join and continue on as one to the city of Chicago, Illinois. Two smaller north-south lines also exist, one connecting the cities of Port Huron and Detroit and the other connecting Grand Rapids to the Chicago line.[47] This may be an option for commuters provided they live and work in cities along the Amtrak route. This also leaves the question of how someone gets to their place of employment from the train station. Bus service is one possibility, if it exists. Employees meeting at the train station and traveling together from there is another possibility. Employers could also assist by allowing a company owned vehicle to take employees to and from the train station at a regularly scheduled times each work day.

Route Strategies

Everyday travelers need to make choices on what route to take in order to get to their destination. People typically use a combination of information resources to establish the quickest and most reliable course to get where they need to go. TV and radio news casts typically include traffic reports, especially in larger metropolitan areas. Real time travel information is available through some intelligent transportation systems. Some people just head to their destination using the same old route and only think about alternatives if that route is heavily congested. Demand side route strategies are designed to get timely and accurate information on road conditions to travelers before they find themselves trapped on congested roadways. They can thus choose less congested routes at the beginning of their trip. This is where systems that provide real time travel information and in-vehicle navigation systems come into play.[48]

Trip Reduction Strategies

Trip reduction strategies are designed to lessen the need for some trips. People can reduce the number of trips they make by combining what could be many trips into one. This is also another area in which employers and technology can play important roles.

Programs such as telecommuting and compressed work week can help. Telecommuting is basically using telecommunications technology such as computers, fax machines, e-mail and the internet to allow employees to set-up work stations at home. Employees can stay in touch with work centers and even access company files and directories by using current and ever evolving technologies. By working at home employees save time that would have been spent on roadways and aid in reducing congestion.

Compressed work weeks involve working more than a standard eight hours per day. By working ten hours per day, the standard forty hour work week can be achieved in four days instead of the usual five. This leaves one work day each week when employees don't have to be in the office and there are fewer cars on the road that day. Working longer hours also means some employees will be arriving at work early and leaving later. This will help ease congestion during peak travel times.[49]

Traffic Incident Management

Traffic incident management involves the bringing together the resources of various public agencies and private companies to identify, respond to, and help clear roadway obstructions.[50] Roadway obstructions or traffic incidents can include things such as vehicle crashes, stalled vehicles, spilled loads of cargo and any other debris that ends up in the roadway causing traffic delays.[51]

When a traffic incident occurs, depending on what specifically happened, any number of agencies may be involved. For an vehicle accident, police, fire, emergency medical services, also known as first responders, are usually called in. First responders would then call in second responders, if it were necessary. Second responders include transportation agencies, towing & recovery services and hazardous materials removal.[52]

It is crucial that a traffic incident management plan be worked out before a problem occurs. If first and even second responders are going to be ready when an incident occurs, they need to plan and even practice a head of time. Many hours of time and gallons of fuel will be wasted by travelers sitting in idling vehicles on a blocked roadway.

Incidents in which some or all the lanes of a roadway are blocked affects the flow of traffic far out of proportion to the number of lanes that are actually blocked. Blocking one lane of a three lane freeway will reduce that freeway's capacity by 50 percent. Blocking a second of the three lanes will further reduce capacity by an additional 30 percent, meaning that blocking two-thirds of a three lane freeway will reduce capacity by a total of 80 percent. The amount of time it takes for traffic to return to normal is increased the longer the roadway is blocked. If the incident occurs during a peak travel period, then the traffic that accumulates behind the blockage will not fully dissipate until the amount of traffic decreases. This means that traffic will not return to normal until the peak travel time has ended. Even after lane blockage has been cleared, depending on when the incident occurred, how many lanes were blocked and for how long, it could take several hours for traffic to return to normal.[53]

Another problem that can happen during a traffic incident is the probability of a secondary incident. That is, some type of incident transpires in the traffic that backs up because of a primary event. This could be cars running out of gas or overheating as a result of idling. There is also the danger of vehicle accidents. If traffic comes to a halt suddenly and a driver is traveling at a high rate of speed or not paying enough attention to the road, they may not stop in time and can rear-end a stopped or slow moving car. Approximately 20 percent of all incidents are secondary in nature.[54] This serves to add to congestion by prolonging the original incident.

Incidents that occur on a freeway, forcing lane closures, affect more than just vehicles traveling on that freeway. Freeway lane closures can have a cascading effect on arterials and collector roads. Congestion occurring both on and off the freeway can limit the ability of emergency services to respond to accidents that may or may not be related to the original incident.[55]

Some of the primary goals of an effective traffic incident management plan include:

- Protecting both emergency responders and travelers;
- Reduce delays and associated impacts on travelers;
- Ensure that response resources tied up at incidents are put back into service quickly.[56]

The most important part is to have cooperation between responders and be prepared. A plan must be made up ahead of time and then executed when necessary.

Delays can be mitigated by implementing a previously prepared plan. It is also necessary to communicate to the public that a traffic incident has happened. Letting people know as quickly as possible about freeway incidents allows them to take an alternate route. It is also necessary to clear incidents as quickly as possible.

Quick clearance is the process by which traffic obstructions and accidents are removed safely and quickly from a roadway. "Such obstructions include disabled or wrecked vehicles, debris, and spilled cargo. According to the stated definition, quick clearance practices increase the safety of incident responders and victims by minimizing their exposure to adjacent passing traffic. Also, a reduced probability of secondary incidents accompanies lower congestion levels resulting from fast removal of lane-blocking obstructions."[57]

In order to implement quick clearance practices laws, policies, procedures, and infrastructure intended to ensure that traffic incidents are removed in a safe and timely manner. Quick clearance is designed to remove such frequent barriers to incident removal as:

- ❖ A delay in or improperly responding to a traffic incident;
- ❖ Continuing to block traffic lanes with a prolonged site investigation;
- ❖ Unclear policies, procedures or concerns over liability leading to on site indecision as to how things should be handled.

One unique aspect of quick clearance is that it goes beyond the scope of conventional incident management procedures by possible involving drivers to assist in vehicle removal.

Adopting quick clearance procedures could have a number of potential benefits for road users and the communities in which incidents occur. These benefits include decreases in the amount of congestions resulting from a traffic incident; secondary incidents; the amount of motor vehicle fuel that is wasted; emissions being released into the air by idling vehicles; response time to emergencies; driver stress levels; and aggressive driving behaviors. Quick clearance techniques also reduce the effects that traffic incidents have on freight haulers, tourism and future land use.[58]

The most important element in traffic incident management is proper planning before an incident occurs. It is important to know who will do what during an incident. All responders need to be "on the same page," to be sure that traffic begins flowing again as quickly as possible.

Road Weather Management

Approximately 1.5 million traffic accidents that occur each year are the result of bad or adverse weather conditions. This results in about 800,000 injuries and 7000 fatalities. Snow, rain, ice and fog are examples of inclement weather. Each can cause roads to become hazardous and frustrate drivers by causing more than 500 million hours of delay on freeways. Not only does this cause problems for commuters and others on the road, but also effects economic productivity.[59] While there is nothing that can be done to change or stop weather, there are things that can be done to mitigate the adverse effects of weather on roads and travelers. Technology is a key factor in mitigating weather's effects on roads.

Understanding weathers impacts on roads is a first step to formulating techniques to help mitigate its effects. Weathers impacts on roadways can be divided into five categories: 1) ice, snow and rain cause a loss of pavement friction; 2) rain, fog and the spray from other vehicles restrict visibility; 3) standing water or snow; 4) snow blowing across road lanes; and 5) roads and bridges damaged by storms and flooding.[60] The first three of these fall into the category of operation and maintenance. Snow can be removed (plowed) and standing water pumped away. Electronic signs warning of fog ahead can help drivers to know what they are getting into before preceding. Signs can also advise of alternate routes.

Having visibility reduced, lanes blocked and a loss of friction can affect traffic flow in a number of ways. They can cause speeds to be reduced, greater variation in driver speeds, and a decrease in roadway capacity. These impacts then go on to affect other areas aspects of the overall road system. Drivers behavior may change, not just speed, but some may delay or cancel trips. People who normally use mass transit may, if they have access to vehicles, drive to avoid waiting at bus stops or walking to a train station, in the rain or cold. Snow can also have the opposite effect, causing people to want to take trains, where an available option, to avoid delays and possible accidents on slippery, snow covered or icy roads. Bad weather can also cause traffic signals and other traffic control devices to malfunction, causing further delays and increasing the likelihood of crashes. "When expressed in terms of statistics, the magnitude of the impact of weather on traffic flow becomes apparent: speeds may drop by 10 percent for light rain and 16 to 40 percent for heavy rain or snow; capacity can decrease by 11 to 19 percent; and delays can increase by 11 to 50 percent. Clearly these impacts are large enough to warrant action and solutions exist to manage or reduce the impact of these factors."[61] It is important that roadway managers learn to manage the transportation system under all conditions, including adverse weather. Following are examples of success stories from North Carolina and Minnesota on what can be done to mitigate the effects of weather on travel.

The Charlotte, North Carolina Department of Transportation uses a computerized control system to manage 615 traffic signals within the city. One hundred forty nine of those signals are located within the city's central business district. One those signals, the city uses a weather-related signal timing system to reduce traffic speeds during severe weather. Special signal timing can also be employed at over 350 intersections within the closed-loop system. The system employs 25 plus closed –circuit television cameras (CCTV), connected by twisted pair cables and linked by a fiber-optic cable communications system that is linked to the traffic signal computer control in the traffic operations center. After reviewing weather forecasts and current conditions and then observing traffic patterns and speeds by viewing images from the CCTV cameras, system operators can manually implement weather-related timing plans when necessary. If vehicles are traveling to fast, then signal length, normally 90 seconds, can be increased, while offsets and splits remain the same, in order to slow down traffic. If bad weather strikes during non-peak period times, then peak period signal timing may be employed, which are designed to lower traffic speeds. System operators continually monitor road conditions and traffic flow, when the bad weather subsides, then traffic signals can be returned to normal time-of-day and day-of-week timing patterns. By employing weather-related signal timing traffic speeds can be reduced by an average of 5 to 10 miles per hour, roadway safety is increased and this, in turn, minimizes the likelihood and severity of crashes.[62]

Another method of helping to improve roadway safety during bad weather is the anti-icing system used by the Minnesota Department of Transportation on curved and super-elevated bridges whose pavement is known to become extremely slippery in the winter. One example of this is on a 1,950 foot, eight-lane bridge along Interstate 35 near downtown Minneapolis. The deck of the bridge crossed the Mississippi River and would easily freeze because of the moisture that rose up from the water. There was an average of 25 vehicle crashes on that bridge each winter, which increased congestion and decreased safety. An enclosure was built to house a large chemical storage tank containing 3,100 gallon of liquid potassium acetate, a second tank holding 100 gallons of water, the pump and control mechanisms. The system works when "liquid potassium acetate is pumped through the delivery system to 38 valve bodies installed in the median barrier. The valves direct the anti-icing chemical to 76 spray nozzles. Sixty-eight nozzles are embedded in the bridge decks of both northbound and southbound lanes. The nozzles are installed in the center of travel lanes at a spacing of [55 feet]. Eight barrier-mounted nozzles are located at the north end of the bridge to spray approach and exit panels."[63] Two types of environmental sensor stations were installed on the bridge. The first is designed to monitor air, pavement and subsurface temperatures as well as detect pavement conditions, precipitation type and intensity. The second sensor station is only for the monitoring of pavement temperature and conditions. Environmental sensors determine whether or not the pavement wet or dry, in addition to whether or not the pavement temperature is cold enough for moisture on the roads surface to freeze.

The system is controlled by a computer that constantly gathers data from the environmental sensors which are used to predict the possibility of and detect the presence of snow or ice. When preset threshold conditions are detected a computer sends out a signal, activating flashing beacons located on the bridges entrance ramps to warn motorists of slippery conditions. The same computer also checks the chemical delivery system for leaks and then commences of the 13 preprogrammed spray patterns. A typical spray cycle dispenses roughly 34 gallons of potassium acetate or 12 gallons per lane mile over a 10 minute period. This aids in melting ice and snow and makes the bridge safer to travel on in the winter. Conventional ice and snow removal techniques, like plowing, salting and laying down sand are used to supplement the automated system during heavy storms or when snow accumulates on the bridge.

A sixty-eight percent decline in winter accidents was achieved in the first year after the anti-icing system was installed. Fewer accidents mean an increase in mobility and a reduction in congestion. A third benefit was also improved productivity due to lower material costs and enhanced winter maintenance operations throughout the area.[64]

While there is no way to hold back the weather, there are technologies, both existing and developing, that can help reduce the impacts on roadways, reducing congestion and increasing safety.

Michigan has a climate similar to that of Minnesota. Winter in both states means ice, snow and slippery pavement on roads. Highway bridges and overpasses here in Michigan carry signs warning of the possibility of ice on pavement due to moisture and precipitation that has frozen because of drops in temperature. An anti-icing system like the one employed by the Minnesota Department of Transportation should work here in Michigan as well. Areas such as Detroit and Grand Rapids, which are the largest population centers in the state, would seem to be the best and most cost effective places to implement such a system. Keeping heavily traveled bridges and freeway overpasses free of ice and snow would aid in reducing accidents, saving money for both drivers and the state in the form of lower insurance rates and less money spent on emergency services. It would be up to the Michigan Department of Transportation to identify the locations that would give the state the greatest return on their investment. Identifying factors such as the number and types of vehicles using a particular stretch of highway, the number and severity of vehicle accidents, and the cost to the state for emergency services to aid accident victims could be used. While no two roadways are exactly the same, conditions can be similar. There is no reason not to believe that the technology used in Minnesota would not also work well here in Michigan.

Special Events Traffic Management

Special events add to congestion because they increase demand for access to specific roads, i.e., people traveling to a sporting events, concert or county fair, leading to the venue hosting the event. They can also cause some roads to be closed completely, i.e., a street fair or parade.

Unlike most other types of congestion, special events are not unexpected. They are usually planned weeks, if not months, in advance. They are also typically well publicized. If drivers know that a particular road will have increased traffic due to a planned event, they can plan in advance to take an alternate route. The same holds true for roads that are closed. Drivers may choose to avoid a particular area altogether during the time the event is occurring, plus a period of time before and after that avoid the increased traffic. As a result of drivers using alternate routes, traffic will increase on those roads. This could have a cascade effect on large areas of a transportation network, as people look for alternate routes to avoid event traffic.

In order to mitigate the congestion caused by special events, it is important that public agencies, such as police and emergency services, work together with event planning and venue officials. Currently, "advanced planning, proactive management and control of traffic in support of planned special events are not yet commonly accepted or consistently applied practices."[65] To do this, event operators, public agencies and service providers, which don't normally work together, need to start. They should work together to plan and coordinate events before they begin, during the actual event and after it is over. It also requires that the appropriate resources be allocated to support such activities and practices. Current practices are usually not performed for all events within a metropolitan area, but are typically event specific. To improve current practices, new local initiatives may be needed. They should focus on facilitating "advanced planning, coordination, proactive management, and control of traffic for all planned special events within a region or for specific events."[66] Preparations for increased traffic need to be put into place as an event is being planned. Traffic routes need to be mapped out in advance, marked with clear, easy to read signs placed along the entrance route so that arriving attendees know which direction to go and where to park. If normal traffic direction patterns are to be temporarily changed, i.e., turning what is normally a two-way road into a one-way road, for traffic entering or exiting a venue, this also needs to be clearly posted and alternatives provided for thru traffic.

Each fall, East Lansing, Michigan residents can count on two things happening, approximately 45,000 students will return to the Michigan State University campus and football season will begin. Six to seven home football games are played at Spartan Stadium each season. They attract approximately 75,000 ticket holders, who watch the game from inside the stadium and hundreds more who get together on the campus with friends to be near the action. All this attracts thousands of vehicles of all sizes to the campus each game day.

While this may be good for local businesses, such as restaurants who serve hungry game goers and stores mobbed with people loading up on game and tailgating supplies, it is a major inconvenience for those not attending the game. Increased congestion on surrounding roads that non-game attendees have to deal with makes getting where they need to go all the more difficult.

Since the public knows well in advance when home games are played, the best option for people not attending the game is to just stay clear of the area on those days. Congestion would be much worse were it not for the special events traffic plan that the University has and uses each game day. The Michigan State University police department even includes a special events unit.

A few elements of the plan, according to Inspector Kelly Beck of the special events unit, include coordinating with the East Lansing police department to help control traffic on public roads which border the campus. The campus has several large outlying parking lots which are always filled to capacity on game day. After parking, attendees are shuttled to the stadium. This helps to cut down the number of cars which need to enter the actual campus. On campus road use is restricted. Some roads are closed to all traffic and others can only be used by parking lot shuttles buses dropping off and picking up attendees. Some attendees have special parking passes which entitle them to on campus parking. They may also use the same roads as shuttle buses. When the game is over and people are leaving campus, those roads open up to help facilitate departure. Some two-way roads become one-way roads for a brief time, again to help attendees exit campus quickly. If there was not traffic plan and attendees were allowed to drive and park where ever they wanted, with no control, people would spend much more time sitting in traffic coming and going on game days.

Construction and Work Zones

In the United States, as of the year 2000, there were 3,936,232 miles of public roads.[67] This includes interstate highways, other freeway and expressways, arterials, collectors, and local roads. Many of today's interstate highways are well over 30 years old, having been built in the 1950's, 1960's and 1970's. Today few new freeways are being built and the focus is on maintaining the infrastructure that currently exists.

During the summer of 2001, there were approximately 3110 road construction work zones on United States highways. This meant that about 13 percent of the National Highway System was under construction, reducing capacity by over 20,000 miles of roadway. What did not decrease, however, was demand. In fact, over the past 20 years freeway lane miles have increased by only 5 percent, while vehicle miles of travel grew by approximately 79 percent.[68] The demand for access to interstate highways far exceeds capacity.

Reducing this capacity during road repairs only makes this worse. Road repair however, must be done. Concrete and steel were not made to last forever and need maintenance. It is important to make the time roads are under repair as easy as possible for travelers.

The first and most obvious step is to make sure that travelers know the road work is going on. The information needs to be accurate and issued for enough in advance so people can make informed choices about travel times and routes.[69]

Some current methods for providing information on road construction are via web sites, traffic reports on radio and articles in local newspapers. Road signs are also usually posted well in advance of a construction project, letting travelers know when a project will begin.

An emerging technology to help travelers learn about the location of construction projects and other types of congestion causing problems is the 511 traveler information phone number. "On March 8, 1999, The U.S. Department of Transportation (USDOT) petitioned the Federal Communications Commission (FCC) to designate a nationwide three-digit telephone number for traveler information. This petition was formally supported by 17 State DOTs, 32 transit operators, and 23 Metropolitan Planning Organizations and local agencies. On July 21, 2000 the Federal Communications Commission designated "511" as the single traffic information telephone number to be made available to states and local jurisdictions across the country."[70] As of August 1, 2005, the service was available in 23 states and Northern California. It was accessible to approximately 32 percent of the United States population, with plans for 7 more states to launch the service by the end of 2006. This would bring the percentage of the population with access to 511 services to 54 percent.[71] "As the 511 traveler information telephone service is implemented and becomes more available across the country, detailed information will be accessible for anyone with a phone, enabling motorists to plan for the inconvenience of delays and remain in control of their own schedules. Increasingly, the 511 service is providing the real-time information necessary to choose alternate routes, and times of day for travel."[72] Since this service will eventually be nation wide, it will be of great benefit not only to local drivers, but also to long distance travelers. Interstate travel will be more convenient because people will know in advance if lanes are reduced or roads are closed altogether.

Alternate routes can be planned in advance, if necessary, saving driver's time, inconvenience, and frustration.

Other elements to consider when dealing with road construction include deciding whether to do the construction during the day or at night. One advantage to nighttime construction is that there is much less traffic on the road. It is usually more convenient for drivers because road lanes, depending on what exactly is being done, can remain open. This means less congestion for drivers. Currently over one-quarter of road work is done at night.[73] If road work is being done at night then issues need to be taken into account that do not exist during the day. One of the primary issues is visibility. At night, when visibility is greatly reduced people tend to drive at a higher rate of speed, because there is usually less traffic on the road. Drivers can come upon a traffic work zone quickly, especially if the work has not been publicized. This can cause greater harm for drivers and workers. Nighttime work zones must be well lit and greater traffic control measures need to be taken. Illuminated signs warning of the upcoming work zones need to be posted, speeds reduced and drivers given plenty of notice about upcoming work zones.

If road work is to be done during the day then a decision must be made on whether to keep the roadway open, with reduced lanes in use, or to close the road completely. There are advantages and issues with each. "Full road closure alleviates the potential for long-term traffic congestion and improves safety by reducing crashed and other incidents. In the full-closure strategy, the roadway is closed, traffic rerouted, and the contractor given full access to the roadway. Full closure strategies are used to help reduce the construction period, improve quality, increase safety by reducing traveler exposure to complex work zones and separate the road worker from the hazard of freeway traffic."[74] Although it may seem a drastic step and of greater inconvenience to travelers, the advantages of being able to work on the entire road at once and getting the project completed faster may be worth whatever temporary inconvenience it causes drivers; the added benefit to road workers is they are in a much safer environment without drivers going by. Full closure can be used for some, but not all of the duration of a project. In addition full closure could occur at night or on weekends when there is less traffic.

Full lane closures are best used when there are clear and easy alternatives for rerouting traffic, such as where there are several freeways or major arterials close together and running in the same direction, east-west or north-south. This allows the rerouted traffic to be spread out among multiple roadways and may help to reduce the congestion caused by the construction project. In the state of Michigan, this may work best in larger metropolitan areas, such as Detroit and Grand Rapids, where more road lanes, freeway and arterial, exist. In less populated regions, such as small suburbs or rural areas, there are typically fewer alternatives. Full closure of a highway or major roadway may necessitate a very long detour. In addition, if it is the only alternate route heading in a particular direction, north-south or east-west, and all traffic must use it, congestion will increase significantly.

Partial road closure exists when only some of the lanes on a road are closed during construction or repair projects. This has the advantage of keeping at least part of the road open for use. This could lead to more congestion than completely closing the road because of bottlenecks that can occur because of closed lanes. Road workers can also be put at greater risk working in such close proximity to moving vehicles. It may also take longer to complete the project if only part of the road is closed at a time. Whether a full or partial road closure is warranted should be decided on a case by case basis.

Quick construction strategies are designed to speed road work projects. They include such things as using precise sections of pavement that will easily fit together on site.

Additionally, concrete that cures quickly and machines that guarantee pavement is smooth before it dries can help to further ensure shorter construction periods.[75]

Another method for reducing congestion due to road work is to give contractors an incentive to complete the work quickly. One such method is an innovative contracting technique known as A + B bidding. It is a cost-plus-time bidding process that decides on a contractors bid based on the cost of the bid (A) and time needed to complete the project (B) or at least the critical portion of it. "The intent of this kind of bidding is to provide an incentive for the contractor to minimize delivery time for high-priority and congested roadways by offering incentives for early completion and disincentives for late completion."[76] This strategy works especially well for road work that needs to be done on heavily traveled roads.

Another innovative technique used to give contractors an incentive to complete projects as quickly as possible is called lane rental. Lane rental involves charging the contractor a fee for occupying non-work lanes or the shoulder to do contract work.[77]

In Michigan, summer not only means hot weather, but also the beginning of what is called "pothole or road construction season." Potholes and cracked or broken pavement are created by cold weather, which cause cement to expand and contract causing cracks to form. Water from rain or snow gets inside the cracks and freezes when temperatures drop. This causes the cracks to get bigger and with the added weight of heavy vehicles, the cement will break apart and holes can form. The use of ice melts, usually salt, to help keep roads free of ice and snow, and therefore safer for vehicles, only exacerbates the problem. Each summer the Michigan Department of Transportation and many local road commissions, begin repairs on hundreds of miles of roads within the state. This causes a real headache for drivers who have to endure lane closures, traffic tie-ups, and slow going through construction zones. Road repairs, however, have to be made. It is simply best to get them done as swiftly as possible.

According to Larry Doyle at the Michigan Department of Transportation, MDOT uses financial incentives and disincentives to help get road repairs completed more quickly. For one thing, they do, in some cases, charge companies contracted to do repair work lane rental fees for the use of any lane or lanes not under construction. In addition bonuses are given for early completion of a project. By the same token, a penalty is charged if the work is not completed on time (as per the contract) or simply drags on with no solid reason for a delay, i.e. long periods of bad weather, when work cannot be done.

Conclusion

There are more vehicles on the road today than at any other time. More vehicles mean more congestion, increased travel time and a decrease in safety. Congestion costs are high, not only in terms of money, time and resources wasted, but also the number of lives lost each year due to vehicle crashes. Advances in technology will help to alleviate congestion and increase safety.

The cost of implementing new technologies can be expensive, sometimes to the point of being prohibitive. When it comes to allocating the limited funds state & local governments and transportation agencies get, the first thought is generally to put the money into the repair and upgrading of roadways. People can see and feel potholes, cracks and broken pavement. They are typically the easiest to fix. The problem is that with more and more vehicles being added to roadways, congestion is only going to get worse. The need to invest money in the technologies that will help to ease that congestion is essential. Starting with smaller, simpler projects, such as improvements in traffic signal timing, is one way to begin. As technologies evolve, costs usually decrease. This may make implementation easier for cash strapped governments and transportation agencies.

Drivers must also do their part by being willing to explore and use alternative transportation methods, when they exist. Further, it is essential to understand that there are costs to congestion that have to be paid. Changing driver's attitudes about driving alone in their cars, increasing the use of things such as carpools and public transportation, and helping educate the public of the costs of congestion are some key ways to help reduce road congestion.

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Appendix A

Okemos Road Crash Report Summary

			Reason for Collision				Pavement Conditions	
Year	Total Crashes	Crashes that Include Injuries	Rear-End Collisions	Animal Collisions	Side Swipe	Other	Icy/Wet Snowy	Dry
2003	59	8	32	4	10	13	15	44
2004	121	39	83	5	11	22	43	78
2005	71	8	47	5	5	14	24	47
2006	68	19	36	3	9	20	25	43

Standard Crash Report - Milepoints

Ingham County

Report Module: Safety Management Analysis
Today's Date: Thursday, November 30, 2006
Dates: 7/1/2003 to 7/1/2005
PR/RoadName: 362602: Okemos Rd
Milepoints: From 7.108 To 9.116
Sort Order: Road Name, Milepoint, Date of Crash

Milepoint	Intersection Name	Milepoint	Intersection Name	Milepoint	Intersection Name
0.000	Okemos Rd & E Columbia St & N Jefferson	0.157	Randolph St & Okemos Rd	0.237	Ann St & Okemos Rd
0.267	Okemos Rd & N Rogers St	0.405	Valley Ct & Okemos Rd	0.484	Mason Hills Dr & Okemos Rd
0.558	Mason Hills Dr & Okemos Rd & Coppersmit	1.143	Okemos Rd & W Howell Rd	2.145	Okemos Rd & Harper Rd
3.152	Lamb Rd & Okemos Rd	4.156	Holt Rd & Okemos Rd	4.910	Willoughby Rd & Okemos Rd
5.163	Okemos Rd & Willoughby Rd	6.168	Sandhill Rd & Okemos Rd	6.682	E I 96/Okemos RAMP & Okemos Rd & Oke
6.693	Okemos Rd & Okemos/E I 96 RAMP	6.896	Okemos Rd & Okemos/W I 96 RAMP	6.906	W I 96/Okemos RAMP & Okemos Rd & Oke
7.008	Okemos Rd & University Park Dr & Woodlak	7.108	Jolly Rd & Okemos Rd	7.210	Hampton Pl & Okemos Rd
7.267	Jolly Oak Rd & Okemos Rd	7.313	Association Dr & Okemos Rd	7.428	Coyote Creek Dr & Okemos Rd
7.573	Okemos Rd & Fox Hollow Dr	7.646	Okemos Rd & Knob Hill Dr	7.658	Okemos Rd & Tamarack Dr
7.812	Okemos Rd & Club Meridian Dr	7.945	Okemos Rd & Heritage Ave	8.063	Okemos Rd & Bennett Rd & Kinawa Dr
8.470	Okemos Rd & Sower Blvd	8.662	Okemos Rd & Woodfield Rd	8.759	Science Pkwy & Okemos Rd
8.842	Riverwood Dr & Okemos Rd	8.856	Hulett Rd & Okemos Rd	8.935	Kewanee Way & Okemos Rd
9.010	Okemos Rd & Shawnee Trl	9.116	Okemos Rd & E Mount Hope Rd	9.234	Okemos Rd & Wonch Dr
9.405	Clinton St & Okemos Rd	9.484	Hamilton Rd & Okemos Rd	9.562	Methodist St & Okemos Rd
9.658	Kent St & Okemos Rd	9.861	Okemos Rd & W Grand River Ave	10.112	Hillcrest Ave & Okemos Rd
10.203	Okemos Rd & Central Park Dr	10.663	Gaylord C Smith Ct & Okemos Rd	10.874	Banyon Trl & Okemos Rd
11.000	Okemos Rd & Quarry Rd	11.258	Okemos Rd & Songbird Pointe	11.407	Okemos Rd & Raby Rd
11.584	Haslett Rd & Okemos Rd	11.664	Blue Lac Dr & Okemos Rd	11.735	La Mer Ln & Okemos Rd
12.019	Okemos Rd & Village Dr	12.160	Lake Lansing Rd & Okemos Rd		

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
PR Number: 0362602			**Road Name: Okemos Rd**													
7.108	5233502	Meridian Twp	0'	JOLLY	Dual Left-Turn	PDO	1/23/2004	06PM-07PM	2	2	0	Friday	Snow	Dark,Lighted	Snowy	On Road
7.110	5666152	Meridian Twp	10' N	JOLLY	Side-Swipe Same	PDO	11/12/2003	05PM-06PM	2	2	0	Wednesday	Cloudy	Dark,Lighted	Dry	On Road
7.112	6809694	Meridian Twp	20' N	JOLLY	Angle Turn	PDO	1/6/2005	05PM-06PM	2	3	0	Thursday	Cloudy	Daylight	Snowy	On Road
7.114	6809150	Meridian Twp	30' N	JOLLY	Rear-End Straight	PDO	2/5/2005	03PM-04PM	2	2	0	Saturday	Clear	Daylight	Dry	On Road
7.115	6809655	Meridian Twp	35' NW	JOLLY	Rear-End Straight	Injury	12/11/2004	09AM-10AM	2	4	1	Saturday	Wind	Daylight	Slushy	On Road
7.116	5666116	Meridian Twp	40' N	JOLLY	Rear-End Straight	PDO	10/18/2003	01PM-02PM	2	5	0	Saturday	Clear	Daylight	Dry	On Road
7.117	5666096	Meridian Twp	50' N	JOLLY	Rear-End Drive	PDO	12/3/2003	07AM-08AM	2	4	0	Wednesday	Cloudy	Dawn	Dry	On Road
7.117	6985231	Meridian Twp	50' N	JOLLY	Rear-End Straight	PDO	7/13/2004	06AM-07AM	2	2	0	Tuesday	Clear	Dawn	Dry	On Road
7.117	6809292	Meridian Twp	50' N	JOLLY	Rear-End Straight	PDO	10/13/2004	07AM-08AM	2	3	0	Wednesday	Cloudy	Dawn	Dry	On Road
7.117	7549577	Meridian Twp	50' N	JOLLY	Side-Swipe Same	PDO	1/22/2005	08AM-09AM	2	4	0	Saturday	Snow	Daylight	Snowy	On Road
7.121	6809746	Meridian Twp	70' N	JOLLY	Rear-End Straight	Injury	1/18/2005	09AM-10AM	2	3	1	Tuesday	Clear	Daylight	Dry	On Road
7.122	5958946	Meridian Twp	75' N	JOLLY	Side-Swipe Same	PDO	5/5/2004	11AM-NOON	2	2	0	Wednesday	Clear	Daylight	Dry	On Road
7.127	6809114	Meridian Twp	100' N	JOLLY	Rear-End Straight	PDO	9/12/2004	02PM-03PM	2	4	0	Sunday	Cloudy	Daylight	Dry	On Road
7.127	6809507	Meridian Twp	100' N	JOLLY	Rear End Left Turn	Injury	10/25/2004	03PM-04PM	2	3	1	Monday	Clear	Daylight	Dry	On Road
7.136	7549788	Meridian Twp	150' N	JOLLY	Other Drive	PDO	1/29/2005	07PM-08PM	2	3	0	Saturday	Clear	Dark,Lighted	Dry	On Road
7.136	6809900	Meridian Twp	150' N	JOLLY	Rear-End Drive	PDO	5/1/2005	11AM-NOON	2	5	0	Sunday	Cloudy	Daylight	Dry	On Road
7.146	6808737	Meridian Twp	200' N	JOLLY	Rear-End Straight	PDO	7/27/2004	02PM-03PM	2	3	0	Tuesday	Rain	Daylight	Wet	Uncoded
7.146	6808917	Meridian Twp	200' N	JOLLY	Rear-End Straight	PDO	10/16/2004	03PM-04PM	2	2	0	Saturday	Rain	Daylight	Wet	On Road
7.146	6808915	Meridian Twp	200' N	JOLLY	Rear-End Straight	Injury	10/16/2004	NOON-01PM	3	4	2	Saturday	Rain	Daylight	Wet	On Road
7.155	5958571	Meridian Twp	250' N	JOLLY	Rear-End Straight	PDO	3/13/2004	03PM-04PM	3	5	0	Saturday	Cloudy	Daylight	Dry	On Road
7.155	6808634	Meridian Twp	250' N	JOLLY	Side-Swipe Same	PDO	6/30/2004	NOON-01PM	2	5	0	Wednesday	Clear	Daylight	Dry	On Road
7.184	5666625	Meridian Twp	400' NW	JOLLY	Rear-End Straight	PDO	12/7/2003	03PM-04PM	2	2	0	Sunday	Clear	Daylight	Dry	On Road
7.184	4169523	Meridian Twp	400' N	JOLLY	Rear-End Straight	Injury	1/26/2004	05PM-06PM	3	4	1	Monday	Snow	Dusk	Slushy	On Road
7.190	4271458	Meridian Twp	391' S	JOLLYOAK	Misc. Multiple Vehicle	PDO	8/20/2003	05PM-06PM	2	2	0	Wednesday	Clear	Daylight	Dry	On Road
7.208	4390086	Meridian Twp	530' N	JOLLY	Rear-End Straight	Injury	7/31/2003	02PM-03PM	2	2	1	Thursday	Cloudy	Daylight	Dry	On Road
7.208	5233377	Meridian Twp	528' N	JOLLY	Rear-End Straight	Injury	4/30/2004	06PM-07PM	2	3	1	Friday	Rain	Daylight	Wet	On Road
7.229	4211964	Meridian Twp	200' S	JOLLYOAK	Rear-End Straight	PDO	8/17/2003	02PM-03PM	2	5	0	Sunday	Clear	Daylight	Dry	On Road
7.229	4389998	Meridian Twp	200' S	JOLLY OAK	Side-Swipe Same	PDO	1/4/2004	04PM-05PM	2	4	0	Sunday	Snow	Daylight	Icy	On Road
7.239	6809328	Meridian Twp	150' S	JOLLY OAK	Misc. Multiple Vehicle	Injury	10/8/2004	03PM-04PM	2	2	2	Friday	Clear	Daylight	Dry	On Road
7.248	4212169	Meridian Twp	100' S	JOLLY	Rear-End Straight	PDO	1/11/2004	06PM-07PM	2	2	0	Sunday	Rain	Dark,Lighted	Wet	On Road
7.248	6809143	Meridian Twp	100' S	JOLLY OAK	Side-Swipe Same	PDO	11/23/2004	05PM-06PM	2	3	0	Tuesday	Cloudy	Dusk	Dry	On Road
7.258	7549890	Meridian Twp	50' S	JOLLY OAK	Rear-End Straight	PDO	3/11/2005	NOON-01PM	2	3	0	Friday	Clear	Daylight	Dry	On Road
7.258	7296808	Meridian Twp	50' SE	JOLLY	Rear-End Straight	PDO	5/14/2005	02PM-03PM	2	4	0	Saturday	Cloudy	Daylight	Wet	On Road
7.262	5666350	Meridian Twp	25' S	OAK	Rear-End Straight	PDO	9/23/2003	08AM-09AM	2	2	0	Tuesday	Clear	Daylight	Dry	On Road

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
7.263	4568304	Meridian Twp	20' S	JOLLY OAK	Rear-End Straight	PDO	9/26/2003	06PM-07PM	2	2	0	Friday	Cloudy	Daylight	Dry	On Road
7.264	4169427	Meridian Twp	5' S	JOLLYOAK	Fixed Object	PDO	7/8/2003	08AM-09AM	1	1	0	Tuesday	Cloudy	Daylight	Dry	On Road
7.267	5666125	Meridian Twp	30' E	JOLLY OAK	Angle Straight	PDO	11/3/2003	01PM-02PM	2	2	0	Monday	Rain	Daylight	Wet	On Road
7.267	4390006	Meridian Twp	0'	JOLLY OAK	Angle Turn	PDO	1/15/2004	NOON-01PM	2	5	0	Thursday	Cloudy	Daylight	Icy	On Road
7.267	5958439	Meridian Twp	30' E	JOLLY OAK	Angle Straight	PDO	3/26/2004	04PM-05PM	2	2	0	Friday	Rain	Daylight	Wet	On Road
7.267	5958970	Meridian Twp	30' E	JOLLY OAK	Angle Straight	PDO	4/16/2004	05PM-06PM	2	2	0	Friday	Cloudy	Daylight	Dry	On Road
7.267	6808780	Meridian Twp	15' W	JOLLY OAK	Angle Straight	PDO	6/17/2004	02PM-03PM	2	3	0	Thursday	Cloudy	Daylight	Wet	Uncoded
7.267	6808980	Meridian Twp	10' E	JOLLY OAK	Head-On Left-Turn	PDO	6/21/2004	03PM-04PM	2	3	0	Monday	Cloudy	Daylight	Dry	On Road
7.267	6808689	Meridian Twp	5' W	JOLLY OAK	Angle Turn	PDO	6/25/2004	08PM-09PM	2	2	0	Friday	Clear	Daylight	Dry	On Road
7.267	6809291	Meridian Twp	10' E	JOLLY OAK	Rear-End Straight	PDO	10/11/2004	07AM-08AM	2	2	0	Monday	Clear	Daylight	Dry	On Road
7.268	5233416	Meridian Twp	5' N	JOLLY OAK	Head-On Left-Turn	PDO	5/6/2004	11AM-NOON	2	2	0	Thursday	Clear	Daylight	Dry	On Road
7.276	6808843	Meridian Twp	50' N	JOLLYOAK	Rear-End Straight	PDO	8/27/2004	07AM-08AM	2	2	0	Friday	Rain	Daylight	Wet	On Road
7.281	5666332	Meridian Twp	75' N	JOLLY OAK	Rear-End Straight	Injury	11/14/2003	05PM-06PM	3	5	2	Friday	Cloudy	Dusk	Dry	On Road
7.286	7549917	Meridian Twp	100' N	JOLLY OAK	Rear-End Straight	PDO	3/10/2005	05PM-06PM	2	3	0	Thursday	Snow	Daylight	Snowy	On Road
7.313	5666052	Meridian Twp	10' E	ASSOCIATION	Angle Turn	PDO	10/17/2003	10AM-11AM	2	2	0	Friday	Clear	Daylight	Dry	On Road
7.387	6809165	Meridian Twp	634' N	JOLLY OAK	Rear-End Straight	PDO	3/10/2005	05PM-06PM	2	2	0	Thursday	Snow	Dawn	Snowy	On Road
7.390	4169399	Meridian Twp	200' S	COYOTE CREEK	Rear-End Straight	Injury	12/22/2003	Unknown	2	2	1	Monday	Cloudy	Dark	Dry	On Road
7.400	5233369	Meridian Twp	150' S	COYOTE CREEK	Rear-End Straight	Injury	4/8/2004	09PM-10PM	2	2	1	Thursday	Cloudy	Dark	Wet	On Road
7.400	4390375	Meridian Twp	150' S	COYOTE CREEK	Animal	PDO	4/8/2004	09PM-10PM	1	1	0	Thursday	Clear	Dark	Dry	On Road
7.419	7549662	Meridian Twp	50' S	COYOTE CREEK	Rear-End Drive	PDO	3/22/2005	03PM-04PM	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
7.426	6809208	Meridian Twp	10' S	COYOTE CREEK	Rear End Left Turn	Injury	9/8/2004	07PM-08PM	2	2	1	Wednesday	Cloudy	Daylight	Dry	On Road
7.427	6808985	Meridian Twp	7' SE	COYOTE CREEK	Rear-End Straight	PDO	7/13/2004	08AM-09AM	2	2	0	Tuesday	Clear	Daylight	Dry	On Road
7.447	6808686	Meridian Twp	100' N	COYOTE CREEK	Rear-End Straight	PDO	6/21/2004	06PM-07PM	3	3	0	Monday	Rain	Daylight	Wet	On Road
7.528	5958544	Meridian Twp	686' S	TAMARACK	Side-Swipe Same	PDO	3/30/2004	05PM-06PM	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
7.545	6809178	Meridian Twp	150' S	FOX HOLLOW	Rear-End Straight	PDO	4/18/2005	02PM-03PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
7.574	6808692	Meridian Twp	5' N	FOX HOLLOW	Head-On Left-Turn	PDO	6/29/2004	04PM-05PM	2	1	0	Tuesday	Clear	Daylight	Dry	On Road
7.577	6808608	Meridian Twp	20' N	FOXHOLLOW	Rear-End Straight	PDO	8/23/2004	02PM-03PM	3	3	0	Monday	Cloudy	Daylight	Dry	On Road
7.579	5666048	Meridian Twp	30' N	FOX HOLLOW	Side-Swipe Same	PDO	10/6/2003	05PM-06PM	2	3	0	Monday	Clear	Daylight	Dry	On Road
7.582	5666493	Meridian Twp	50' N	FOX HOLLOW	Rear-End Straight	PDO	12/9/2003	05PM-06PM	2	2	0	Tuesday	Rain	Dark,Lighted	Wet	On Road
7.639	6808817	Meridian Twp	100' S	TAMARAK	Rear-End Straight	PDO	8/5/2004	03PM-04PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
7.639	6808619	Meridian Twp	100' S	TAMARACK	Rear-End Straight	PDO	10/7/2004	06PM-07PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
7.639	7549725	Meridian Twp	100' S	TAMARAK	Rear-End Straight	PDO	11/24/2004	06PM-07PM	2	3	0	Wednesday	Wind	Dark,Lighted	Snowy	On Road
7.646	5666316	Meridian Twp	0' X	KNOBHILL	Rear-End Straight	PDO	9/3/2003	05PM-06PM	3	3	0	Wednesday	Clear	Daylight	Dry	On Road
7.648	6810100	Meridian Twp	10' N	KNOBHILL	Rear-End Straight	PDO	6/21/2005	06PM-07PM	2	3	0	Tuesday	Clear	Daylight	Dry	On Road
7.649	6809532	Meridian Twp	50' S	TAMARACK	Overturn	PDO	10/27/2004	05PM-06PM	1	2	0	Wednesday	Cloudy	Daylight	Dry	On Road

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
7.651	4390345	Meridian Twp	37' S	TAMARACK	Rear-End Straight	PDO	10/19/2003	03PM-04PM	2	2	0	Sunday	Clear	Daylight	Dry	On Road
7.651	6809205	Meridian Twp	35' S	TAMARACK	Rear End Left Turn	PDO	9/2/2004	06PM-07PM	3	1	0	Thursday	Clear	Daylight	Dry	On Road
7.652	6808978	Meridian Twp	30' S	TAMARACK	Rear-End Straight	Injury	6/19/2004	05PM-06PM	2	0	3	Saturday	Clear	Daylight	Dry	On Road
7.654	6809508	Meridian Twp	20' S	TAMARACK	Rear-End Straight	Injury	10/29/2004	NOON-01PM	2	2	1	Friday	Cloudy	Daylight	Dry	On Road
7.658	4211930	Meridian Twp	0' X	TAMARACK	Rear-End Straight	PDO	7/11/2003	NOON-01PM	3	3	0	Friday	Cloudy	Daylight	Dry	On Road
7.662	4212006	Meridian Twp	20' NW	TAMARACK	Rear-End Straight	PDO	1/6/2004	07AM-08AM	2	3	0	Tuesday	Cloudy	Dawn	Icy	On Road
7.665	5958981	Meridian Twp	35' NW	TAMARACK	Rear End Left Turn	Injury	5/8/2004	04PM-05PM	2	2	1	Saturday	Clear	Daylight	Dry	On Road
7.665	7549693	Meridian Twp	100' N	KNOB HILL	Rear-End Drive	Injury	12/17/2004	03PM-04PM	2	3	1	Friday	Clear	Daylight	Dry	On Road
7.672	5958437	Meridian Twp	75' N	TAMARAK	Side-Swipe Same	Injury	3/24/2004	01PM-02PM	2	3	1	Wednesday	Cloudy	Daylight	Wet	On Road
7.686	4212012	Meridian Twp	150' N	TAMARAK	Rear-End Drive	PDO	1/15/2004	04PM-05PM	2	3	0	Thursday	Clear	Daylight	Icy	On Road
7.686	5958866	Meridian Twp	150' N	TAMARACK	Rear-End Straight	Injury	5/6/2004	03PM-04PM	2	2	1	Thursday	Cloudy	Daylight	Dry	On Road
7.722	6809547	Meridian Twp	400' N	KNOBHILL	Misc. Multiple Vehicle	PDO	1/19/2005	11AM-NOON	3	4	0	Wednesday	Snow	Daylight	Snowy	On Road
7.774	6808677	Meridian Twp	200' S	CLUB MERIDIAN	Rear-End Drive	Injury	6/8/2004	11AM-NOON	2	1	1	Tuesday	Clear	Daylight	Dry	On Road
7.806	5666018	Meridian Twp	30' S	CLUB MERIDIAN	Rear-End Straight	PDO	8/22/2003	05PM-06PM	2	4	0	Friday	Clear	Daylight	Dry	On Road
7.807	5666037	Meridian Twp	25' S	CLUB MERIDIAN	Rear-End Drive	PDO	9/10/2003	03PM-04PM	2	3	0	Wednesday	Clear	Daylight	Dry	On Road
7.807	5666305	Meridian Twp	25' S	CLUB MERIDIAN	Rear-End Straight	PDO	11/3/2003	05PM-06PM	2	4	0	Monday	Rain	Dark	Wet	On Road
7.807	8165257	Meridian Twp	25' S	CLUB MERIDIAN	Rear-End Straight	Injury	6/22/2005	02PM-03PM	2	2	2	Wednesday	Clear	Daylight	Dry	On Road
7.812	5666632	Meridian Twp	0' X	CLUBMERIDIAN	Angle Drive	PDO	12/17/2003	NOON-01PM	2	2	0	Wednesday	Cloudy	Daylight	Icy	On Road
7.812	6809472	Meridian Twp	10' E	CLUB MERIDIAN	Rear-End Straight	PDO	11/18/2004	08AM-09AM	2	3	0	Thursday	Cloudy	Daylight	Wet	On Road
7.812	6809473	Meridian Twp	10' E	CLUB MERIDIAN	Rear-End Straight	PDO	11/18/2004	08AM-09AM	2	3	0	Thursday	Cloudy	Daylight	Wet	On Road
7.813	7549503	Meridian Twp	1320' S	BENNETT	Animal	PDO	1/4/2005	06PM-07PM	1	1	0	Tuesday	Clear	Dark	Wet	On Road
7.845	4568306	Meridian Twp	530' S	HERITAGE	Rear-End Straight	PDO	10/2/2003	07AM-08AM	2	3	0	Thursday	Clear	Daylight	Dry	On Road
7.850	5666013	Meridian Twp	500' S	HERITAGE	Rear-End Drive	PDO	8/12/2003	11AM-NOON	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
7.869	6808706	Meridian Twp	400' S	HERITAGE	Rear-End Straight	Injury	9/2/2004	03PM-04PM	2	4	1	Thursday	Clear	Daylight	Dry	On Road
7.888	6808872	Meridian Twp	300' S	HERITAGE	Rear-End Straight	Injury	8/27/2004	04PM-05PM	2	2	1	Friday	Uncoded	Uncoded	Uncoded	On Road
7.888	6809339	Meridian Twp	300' S	HERITAGE	Rear-End Straight	Injury	12/13/2004	05PM-06PM	2	6	1	Monday	Wind	Dusk	Snowy	On Road
7.888	6809450	Meridian Twp	300' S	HERITAGE	Side-Swipe Same	PDO	12/13/2004	04PM-05PM	2	3	0	Monday	Wind	Dusk	Snowy	On Road
7.907	5666541	Meridian Twp	200' S	HERITAGE	Rear-End Drive	Injury	12/9/2003	07AM-08AM	2	3	2	Tuesday	Rain	Daylight	Wet	On Road
7.907	6808626	Meridian Twp	200' S	HERITAGE	Animal	Injury	6/7/2004	11AM-NOON	1	1	1	Monday	Clear	Daylight	Dry	On Road
7.907	6809244	Meridian Twp	200' S	HERITAGE	Animal	PDO	10/27/2004	08PM-09PM	1	4	0	Wednesday	Cloudy	Dark	Dry	On Road
7.926	7549653	Meridian Twp	100' S	HERITAGE	Animal	PDO	2/25/2005	07AM-08AM	1	1	0	Friday	Snow	Dawn	Snowy	On Road
7.936	8165484	Meridian Twp	50' S	HERITAGE	Rear-End Straight	PDO	6/28/2005	NOON-01PM	2	2	0	Tuesday	Clear	Daylight	Dry	On Road
7.941	5666158	Meridian Twp	20' S	HERITAGE	Side-Swipe Same	PDO	11/19/2003	06PM-07PM	2	4	0	Wednesday	Clear	Dark,Lighted	Dry	On Road
7.950	7549708	Meridian Twp	25' N	HERITAGE	Rear-End Straight	PDO	12/4/2004	02PM-03PM	2	4	0	Saturday	Cloudy	Daylight	Dry	On Road
7.963	4212157	Meridian Twp	530' S	BENVETT	Animal	PDO	12/22/2003	06AM-07AM	1	1	0	Monday	Cloudy	Dark,Lighted	Dry	On Road

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7.964	5958426	Meridian Twp	100' N	HRITAGE	Animal	PDO	3/9/2004	08AM-09AM	1	1	0	Tuesday	Cloudy	Daylight	Dry	On Road
8.035	6809157	Meridian Twp	150' S	KINAWA	Rear-End Straight	Injury	12/10/2004	04PM-05PM	3	6	2	Friday	Rain	Daylight	Wet	On Road
8.035	7549919	Meridian Twp	150' S	BENNETT	Rear-End Drive	Injury	3/11/2005	07AM-08AM	4	3	1	Friday	Cloudy	Daylight	Icy	On Road
8.044	4389999	Meridian Twp	100' S	BENNETT	Rear-End Straight	PDO	1/5/2004	09AM-10AM	2	2	0	Monday	Snow	Daylight	Icy	On Road
8.054	4568297	Meridian Twp	50' S	BENNETT	Side-Swipe Opposite	PDO	8/20/2003	05PM-06PM	2	4	0	Wednesday	Clear	Daylight	Dry	On Road
8.054	6809119	Meridian Twp	50' S	KINAWA	Rear-End Straight	Injury	10/4/2004	05PM-06PM	2	2	1	Monday	Clear	Daylight	Dry	On Road
8.055	5285269	Meridian Twp	40' S	KINAWA	Angle Straight	Injury	4/21/2004	07AM-08AM	2	3	3	Wednesday	Cloudy	Daylight	Dry	On Road
8.055	5958721	Meridian Twp	40' S	KINAWA	Rear-End Straight	PDO	6/1/2004	09PM-10PM	2	1	0	Tuesday	Cloudy	Dusk	Dry	On Road
8.056	4169325	Meridian Twp	30' S	KINRWA	Rear-End Straight	PDO	7/11/2003	02PM-03PM	2	2	0	Friday	Cloudy	Daylight	Dry	On Road
8.063	4169348	Meridian Twp	5' E	KINAWA	Rear End Left Turn	PDO	7/24/2003	07AM-08AM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.063	6810095	Meridian Twp	5' E	BENNETT	Angle Straight	Injury	6/16/2005	09AM-10AM	2	3	1	Thursday	Clear	Daylight	Dry	On Road
8.065	4212350	Meridian Twp	10' N	BENNETT	Rear-End Straight	PDO	2/10/2004	08AM-09AM	3	3	0	Tuesday	Snow	Daylight	Snowy	On Road
8.067	6809007	Meridian Twp	20' N	BENNETT	Rear-End Straight	PDO	1/14/2005	07PM-08PM	2	2	0	Friday	Clear	Dark,Lighted	Dry	On Road
8.072	5233504	Meridian Twp	50' N	BENNETT	Rear-End Straight	Injury	1/24/2004	NOON-01PM	2	2	1	Saturday	Cloudy	Daylight	Wet	On Road
8.072	6808840	Meridian Twp	50' N	KINAWA	Side-Swipe Same	PDO	8/11/2004	04PM-05PM	2	2	0	Wednesday	Cloudy	Daylight	Dry	On Road
8.074	5666083	Meridian Twp	60' N	KINAWA	Side-Swipe Same	PDO	11/7/2003	09PM-10PM	2	3	0	Friday	Clear	Dark,Lighted	Dry	On Road
8.101	7549882	Meridian Twp	200' N	BENNETT	Side-Swipe Same	PDO	3/2/2005	07AM-08AM	2	2	0	Wednesday	Cloudy	Daylight	Snowy	On Road
8.110	4212369	Meridian Twp	250' N	KINAWA	Rear-End Straight	PDO	6/3/2004	04PM-05PM	2	3	0	Thursday	Cloudy	Daylight	Dry	On Road
8.120	5666057	Meridian Twp	300' N	BENNETT	Side-Swipe Same	PDO	11/3/2003	10AM-11AM	2	2	0	Monday	Rain	Daylight	Wet	On Road
8.120	6808841	Meridian Twp	300' N	KINAWA	Rear-End Straight	PDO	8/19/2004	02PM-03PM	2	2	0	Thursday	Cloudy	Daylight	Dry	On Road
8.120	6808646	Meridian Twp	300' N	BENNETT	Rear-End Straight	PDO	5/5/2005	03PM-04PM	2	4	0	Thursday	Clear	Daylight	Dry	On Road
8.139	5233365	Meridian Twp	400' N	BENNETT	Rear-End Straight	PDO	2/26/2004	03PM-04PM	3	3	0	Thursday	Clear	Daylight	Dry	On Road
8.163	4389993	Meridian Twp	530' NW	BENNETT	Animal	PDO	12/29/2003	07AM-08AM	1	1	0	Monday	Rain	Dark	Wet	On Road
8.253	6808988	Meridian Twp	1003' N	KINAWA	Animal	PDO	7/27/2004	02PM-03PM	1	2	0	Tuesday	Rain	Daylight	Wet	On Road
8.264	5233309	Meridian Twp	1060' N	BENNETT	Rear-End Drive	PDO	1/22/2004	NOON-01PM	3	3	0	Thursday	Clear	Daylight	Snowy	On Road
8.313	6809226	Meridian Twp	1320' N	KINAWA	Rear-End Straight	PDO	8/10/2004	04PM-05PM	2	1	0	Tuesday	Clear	Daylight	Dry	On Road
8.313	6809505	Meridian Twp	1320' N	KINAWA	Rear-End Straight	PDO	10/21/2004	05PM-06PM	2	3	0	Thursday	Cloudy	Daylight	Dry	On Road
8.313	7549922	Meridian Twp	1320' N	BENNETT	Rear-End Straight	PDO	4/14/2005	07AM-08AM	4	4	0	Thursday	Clear	Daylight	Dry	On Road
8.314	5666192	Meridian Twp	1325' N	BENNETT	Rear-End Straight	PDO	9/5/2003	05PM-06PM	2	2	0	Friday	Clear	Daylight	Dry	On Road
8.394	4390176	Meridian Twp	400' S	SOWER	Rear-End Straight	Injury	5/19/2004	05PM-06PM	3	3	1	Wednesday	Clear	Daylight	Dry	On Road
8.394	6808848	Meridian Twp	400' S	SOWER	Rear-End Straight	Injury	9/2/2004	03PM-04PM	2	2	1	Thursday	Clear	Daylight	Other	On Road
8.394	6809438	Meridian Twp	400' S	SOWER	Rear-End Straight	Injury	12/4/2004	10PM-11PM	2	4	1	Saturday	Clear	Dark	Dry	On Road
8.413	6808629	Meridian Twp	300' S	SOWER	Rear End Left Turn	Injury	6/14/2004	09AM-10AM	3	7	1	Monday	Clear	Daylight	Dry	On Road
8.413	6809712	Meridian Twp	300' S	SOWER	Animal	PDO	1/27/2005	07PM-08PM	1	1	0	Thursday	Clear	Dark,Lighted	Dry	On Road
8.423	5666326	Meridian Twp	250' S	SEWER	Animal	PDO	10/28/2003	06AM-07AM	1	1	0	Tuesday	Rain	Dawn	Wet	On Road

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8.432	4212021	Meridian Twp	200' S	SOWAR	Rear-End Straight	PDO	1/22/2004	NOON-01PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.442	4212129	Meridian Twp	150' S	SOWAR	Rear-End Straight	PDO	11/28/2003	NOON-01PM	3	6	0	Friday	Cloudy	Daylight	Wet	On Road
8.447	5958872	Meridian Twp	120' S	SOWER	Rear-End Straight	Injury	5/1/2004	03PM-04PM	3	6	1	Saturday	Rain	Daylight	Wet	On Road
8.456	6809426	Meridian Twp	75' S	SOWER	Rear-End Drive	PDO	7/19/2004	05PM-06PM	2	2	0	Monday	Cloudy	Daylight	Dry	On Road
8.456	8165412	Meridian Twp	75' S	SOWER	Rear-End Straight	PDO	6/29/2005	NOON-01PM	2	0	0	Wednesday	Clear	Daylight	Dry	On Road
8.461	5233397	Meridian Twp	50' S	SOWAR	Other Object	PDO	2/20/2004	11PM-MDNT	1	1	0	Friday	Snow	Dark,Lighted	Snowy	On Road
8.461	7549501	Meridian Twp	50' S	SOWER	Side-Swipe Same	PDO	1/12/2005	06PM-07PM	2	5	0	Wednesday	Other	Other	Other	On Road
8.462	5666178	Meridian Twp	40' S	SOWER	Rear-End Straight	PDO	12/10/2003	05PM-06PM	2	2	0	Wednesday	Rain	Dark	Wet	On Road
8.462	6808743	Meridian Twp	40' S	SOWER	Side-Swipe Same	PDO	8/11/2004	04PM-05PM	5	5	0	Wednesday	Clear	Daylight	Dry	On Road
8.466	8165485	Meridian Twp	20' S	SOWER	Rear-End Straight	PDO	6/28/2005	NOON-01PM	2	3	0	Tuesday	Clear	Daylight	Dry	On Road
8.467	5666239	Meridian Twp	15' S	SOWER	Rear-End Drive	PDO	8/15/2003	03PM-04PM	2	3	0	Friday	Clear	Daylight	Dry	On Road
8.468	5666062	Meridian Twp	10' S	SOWER	Rear End Left Turn	Injury	11/16/2003	05PM-06PM	3	6	2	Sunday	Rain	Dark,Lighted	Wet	On Road
8.469	4568343	Meridian Twp	5' S	SOWER	Misc. Multiple Vehicle	PDO	7/28/2003	11AM-NOON	2	3	0	Monday	Cloudy	Daylight	Dry	On Road
8.469	6808837	Meridian Twp	5' S	SOWER	Rear-End Straight	Injury	8/9/2004	10AM-11AM	2	4	1	Monday	Cloudy	Daylight	Dry	On Road
8.469	6809398	Meridian Twp	5' S	SOWER	Rear-End Drive	Injury	11/18/2004	08AM-09AM	3	3	1	Thursday	Cloudy	Daylight	Dry	On Road
8.470	5666392	Meridian Twp	40' X	SOWER	Other Object	PDO	10/9/2003	08PM-09PM	1	3	0	Thursday	Cloudy	Dark	Dry	On Road
8.470	5958926	Meridian Twp	15' E	SOWER	Rear End Left Turn	PDO	5/12/2004	08PM-09PM	2	3	0	Wednesday	Clear	Daylight	Dry	On Road
8.470	6808863	Meridian Twp	5' E	SOWER	Rear End Left Turn	PDO	8/3/2004	05PM-06PM	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
8.474	6808684	Meridian Twp	20' N	SOWER	Rear-End Straight	Injury	6/21/2004	01PM-02PM	3	3	1	Monday	Rain	Daylight	Wet	On Road
8.475	5958907	Meridian Twp	25' N	SOWER	Head-on	Injury	5/15/2004	05PM-06PM	2	3	1	Saturday	Cloudy	Daylight	Dry	On Road
8.475	7549835	Meridian Twp	25' N	SOWER	Rear End Right Turn	PDO	2/28/2005	07PM-08PM	2	4	0	Monday	Snow	Dark,Lighted	Snowy	On Road
8.489	7549626	Meridian Twp	100' N	SOWER	Animal	PDO	2/2/2005	07PM-08PM	1	1	0	Wednesday	Clear	Dark	Dry	On Road
8.527	6808931	Meridian Twp	300' N	SOWER	Rear-End Straight	Injury	6/18/2004	NOON-01PM	3	7	1	Friday	Clear	Daylight	Dry	On Road
8.648	5666155	Meridian Twp	75' S	WOODFIELD	Animal	PDO	11/18/2003	05PM-06PM	1	2	0	Tuesday	Rain	Dark	Wet	On Road
8.651	7549481	Meridian Twp	60' S	WOODFIELD	Fixed Object	PDO	1/12/2005	05PM-06PM	1	0	0	Wednesday	Rain	Dark,Lighted	Wet	On Road
8.653	7549862	Meridian Twp	50' S	WOODFIELD	Misc. Multiple Vehicle	PDO	3/11/2005	08AM-09AM	2	2	0	Friday	Cloudy	Daylight	Icy	On Road
8.656	6809784	Meridian Twp	30' S	WOODFIELD	Rear-End Straight	PDO	2/9/2005	05PM-06PM	2	3	0	Wednesday	Sleet,Hail	Dusk	Icy	On Road
8.661	5666270	Meridian Twp	5' S	WOOD FIELD	Fixed Object	PDO	1/28/2004	02PM-03PM	1	1	0	Wednesday	Clear	Daylight	Slushy	Out Shou/Curb
8.661	5958974	Meridian Twp	5' S	WOODFIELD	Angle Straight	PDO	4/29/2004	07PM-08PM	2	3	0	Thursday	Clear	Daylight	Dry	On Road
8.662	6808865	Meridian Twp	15' E	WOODFIELD	Rear End Right Turn	PDO	8/3/2004	07PM-08PM	2	2	0	Tuesday	Clear	Daylight	Dry	On Road
8.665	6809049	Meridian Twp	15' N	WOODFIELD	Rear End Left Turn	Injury	11/15/2004	03PM-04PM	2	2	2	Monday	Cloudy	Daylight	Dry	On Road
8.671	6809416	Meridian Twp	50' N	WOODFIELD	Rear-End Straight	PDO	12/21/2004	03PM-04PM	2	3	0	Tuesday	Clear	Daylight	Wet	On Road
8.681	6808740	Meridian Twp	100' N	WOODFIELD	Rear-End Straight	PDO	8/10/2004	05PM-06PM	3	4	0	Tuesday	Rain	Daylight	Wet	On Road
8.681	7549908	Meridian Twp	100' N	WOODFIELD	Rear-End Straight	Injury	2/23/2005	02PM-03PM	2	3	1	Wednesday	Cloudy	Daylight	Dry	On Road
8.721	6808903	Meridian Twp	200' S	SCIENCE	Rear-End Straight	PDO	8/12/2004	02PM-03PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road

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8.721	6809976	Meridian Twp	200' S	SCIENCE	Rear-End Straight	PDO	4/28/2005	03PM-04PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.721	6810097	Meridian Twp	200' S	SCIENCE	Rear-End Straight	PDO	6/20/2005	02PM-03PM	2	2	0	Monday	Cloudy	Daylight	Dry	On Road
8.731	4390002	Meridian Twp	150' S	SCIENCE PARKWAY	Fixed Object	PDO	1/8/2004	11AM-NOON	1	1	0	Thursday	Cloudy	Daylight	Dry	On Road
8.731	6809792	Meridian Twp	150' S	SCIENCE	Rear End Left Turn	PDO	3/3/2005	11AM-NOON	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.740	6809213	Meridian Twp	100' S	SCIENCE	Rear-End Drive	PDO	9/24/2004	09AM-10AM	2	3	0	Friday	Cloudy	Daylight	Dry	On Road
8.745	5958947	Meridian Twp	75' S	SCIENCE	Rear-End Straight	PDO	5/11/2004	06PM-07PM	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
8.748	6808555	Meridian Twp	60' S	SCIENCE	Rear-End Straight	PDO	7/19/2004	08AM-09AM	2	3	0	Monday	Clear	Daylight	Dry	On Road
8.748	7549489	Meridian Twp	60' S	SCIENCE	Rear-End Straight	PDO	2/9/2005	05PM-06PM	2	2	0	Wednesday	Snow	Dusk	Slushy	On Road
8.755	7549695	Meridian Twp	20' S	SCIENCE	Bicycle	Injury	12/20/2004	03PM-04PM	2	2	1	Monday	Wind	Daylight	Snowy	On Road
8.756	5666172	Meridian Twp	15' S	SCIENCE PKWY	Rear End Left Turn	PDO	10/13/2003	NOON-01PM	2	3	0	Monday	Clear	Daylight	Dry	On Road
8.757	5666124	Meridian Twp	10' S	SCIENCE PARKWAY	Angle Straight	PDO	11/2/2003	03PM-04PM	2	4	0	Sunday	Rain	Daylight	Wet	On Road
8.758	6809124	Meridian Twp	5' S	SCIENCE	Angle Straight	PDO	10/14/2004	06PM-07PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.758	7549506	Meridian Twp	5' S	SCIENCE	Rear-End Straight	Injury	6/14/2005	NOON-01PM	2	5	2	Tuesday	Clear	Daylight	Dry	On Road
8.759	5666355	Meridian Twp	15' W	SCENCE	Head-On Left-Turn	PDO	10/3/2003	01PM-02PM	2	2	0	Friday	Cloudy	Daylight	Dry	On Road
8.759	7549681	Meridian Twp	5' W	SCIENCE	Head-On Left-Turn	Injury	12/7/2004	08AM-09AM	2	2	1	Tuesday	Rain	Daylight	Wet	On Road
8.763	5666647	Meridian Twp	20' N	SCIENCE PARKWAY	Side-Swipe Same	PDO	12/9/2003	02PM-03PM	2	2	0	Tuesday	Rain	Daylight	Wet	On Road
8.763	8165414	Meridian Twp	20' N	SCIENCE	Rear-End Straight	PDO	6/29/2005	01PM-02PM	2	1	0	Wednesday	Clear	Daylight	Dry	On Road
8.764	6808981	Meridian Twp	25' N	SCIENCE	Rear-End Straight	Injury	6/21/2004	04PM-05PM	2	3	2	Monday	Rain	Daylight	Wet	On Road
8.764	6808561	Meridian Twp	25' N	SCIENCE	Rear-End Straight	PDO	9/9/2004	05PM-06PM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
8.765	7549762	Meridian Twp	30' NW	SCIENCE	Rear-End Straight	Injury	12/18/2004	02PM-03PM	2	2	1	Saturday	Cloudy	Daylight	Wet	Uncoded
8.765	7549535	Meridian Twp	30' N	SCIENCE	Rear-End Straight	PDO	2/8/2005	05PM-06PM	2	3	0	Tuesday	Cloudy	Dusk	Dry	On Road
8.773	5233506	Meridian Twp	75' N	SCIENCE	Rear-End Straight	PDO	1/24/2004	06PM-07PM	2	4	0	Saturday	Clear	Dark	Dry	On Road
8.778	5666362	Meridian Twp	100' N	SCIENCE PARKWAY	Rear-End Straight	PDO	10/6/2003	05PM-06PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
8.797	5666544	Meridian Twp	200' N	SCIENCE PKWY	Fixed Object	PDO	12/17/2003	07AM-08AM	1	1	0	Wednesday	Snow	Dark	Snowy	On Road
8.842	5666139	Meridian Twp	0' X	RIVERWOOD	Rear-End Straight	Injury	8/1/2003	NOON-01PM	3	7	1	Friday	Cloudy	Daylight	Dry	On Road
8.842	6809138	Meridian Twp	10' W	RIVERWOOD	Rear-End Straight	PDO	9/28/2004	03PM-04PM	2	3	0	Tuesday	Rain	Daylight	Wet	On Road
8.848	6808869	Meridian Twp	40' S	HULETT	Rear-End Straight	PDO	8/21/2004	02PM-03PM	2	2	0	Saturday	Clear	Daylight	Dry	On Road
8.856	4568298	Meridian Twp	10' E	HULETT	Angle Turn	PDO	8/20/2003	03PM-04PM	2	2	0	Wednesday	Clear	Daylight	Dry	On Road
8.856	6808970	Meridian Twp	50' E	HULETT	Rear-End Straight	PDO	9/6/2004	04PM-05PM	2	2	0	Monday	Cloudy	Daylight	Dry	On Road
8.865	5666042	Meridian Twp	50' N	HULETT	Side-Swipe Same	PDO	9/9/2003	05PM-06PM	2	3	0	Tuesday	Clear	Daylight	Dry	On Road
8.875	5666481	Meridian Twp	100' N	HOLETT	Side-Swipe Same	PDO	11/26/2003	Unknown	2	2	0	Wednesday	Clear	Dark	Dry	On Road
8.910	4169521	Meridian Twp	530' S	SHAWNEE	Rear-End Straight	PDO	1/26/2004	11AM-NOON	2	3	0	Monday	Snow	Daylight	Snowy	On Road
8.916	5958520	Meridian Twp	100' S	KEWANEE	Rear-End Straight	PDO	2/15/2004	01PM-02PM	2	4	0	Sunday	Clear	Daylight	Dry	On Road
8.929	6809862	Meridian Twp	30' S	KEWANEE	Rear-End Straight	PDO	2/25/2005	08PM-09PM	4	10	0	Friday	Cloudy	Dark,Lighted	Wet	On Road
8.934	5958889	Meridian Twp	5' S	KEWANEE	Side-Swipe Same	PDO	5/14/2004	07PM-08PM	2	3	0	Friday	Rain	Daylight	Wet	On Road

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
8.940	6809132	Mendian Twp	25' N	KEWANEEWAY	Angle Drive	PDO	8/20/2004	NOON-01PM	2	3	0	Fnday	Clear	Daylight	Dry	On Road
8.941	5666211	Mendian Twp	30' N	KEWANEE	Side-Swipe Same	PDO	10/20/2003	02PM-03PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
8.963	6808782	Mendian Twp	150' N	KEWANEEW	Rear-End Straight	PDO	6/19/2004	NOON-01PM	2	3	0	Saturday	Cloudy	Daylight	Dry	On Road
8.973	6809905	Meridian Twp	200' N	KEWANEE	Rear-End Drive	PDO	3/27/2005	02PM-03PM	2	3	0	Sunday	Cloudy	Daylight	Dry	On Road
9.005	5666489	Meridian Twp	25' S	SHAWNEE	Rear End Left Turn	Injury	12/15/2003	06PM-07PM	2	2	1	Monday	Cloudy	Dark	Dry	On Road
9.029	5958956	Mendian Twp	100' N	SHAWNEE	Side-Swipe Same	PDO	6/3/2004	11AM-NOON	2	3	0	Thursday	Clear	Daylight	Dry	On Road
9.048	6808641	Mendian Twp	200' NE	SHAWNEE	Rear-End Straight	Injury	9/18/2004	04PM-05PM	3	7	1	Saturday	Clear	Daylight	Dry	Uncoded
9.097	4390087	Mendian Twp	100' S	MT HOPE	Rear-End Straight	PDO	8/6/2003	01PM-02PM	2	3	0	Wednesday	Clear	Daylight	Dry	On Road
9.102	5666318	Mendian Twp	75' S	MT HOPE	Rear-End Straight	PDO	9/15/2003	08AM-09AM	2	2	0	Monday	Rain	Daylight	Wet	On Road
9.107	6808622	Meridian Twp	50' S	MT HOPE	Rear-End Drive	PDO	10/16/2004	NOON-01PM	2	2	0	Saturday	Rain	Daylight	Wet	On Road
9.110	5958470	Meridian Twp	30' S	MT HOPE	Fixed Object	PDO	2/12/2004	08PM-09PM	1	1	0	Thursday	Cloudy	Dark,Lighted	Dry	On Road
9.115	5958678	Mendian Twp	5' S	MT HOPE	Rear-End Straight	PDO	5/28/2004	11AM-NOON	2	3	0	Friday	Cloudy	Daylight	Dry	On Road
9.116	4390140	Meridian Twp	20' W	MT HOPE	Angle Straight	PDO	7/30/2003	10PM-11PM	2	5	0	Wednesday	Clear	Dark,Lighted	Dry	On Road
9.116	4211944	Meridian Twp	20' E	MT HOPE	Angle Straight	Injury	9/12/2003	01PM-02PM	2	3	1	Fnday	Clear	Daylight	Dry	On Road

Total crashes for PR 0362602: 223

Total Fatal Crashes: 0 Total Injury Crashes: 53 Total PDO Crashes: 170

Standard Crash Report - Milepoints

Ingham County

Report Module: Safety Management Analysis
Today's Date: Wednesday, November 08, 2006
Dates: 7/28/2005 to 11/30/2005
PR/RoadName: 362602: Okemos Rd
Milepoints: From 7.108 To 9.116
Sort Order: Road Name, Milepoint, Date of Crash

Milepoint	Intersection Name
0.000	Okemos Rd & E Columbia St & N Jefferson
0.267	Okemos Rd & N Rogers St
0.558	Mason Hills Dr & Okemos Rd & Coppersmit
3.152	Lamb Rd & Okemos Rd
5.163	Okemos Rd & Willoughby Rd
6.693	Okemos Rd & Okemos/E I 96 RAMP
7.008	Okemos Rd & University Park Dr & Woodlak
7.267	Jolly Oak Rd & Okemos Rd
7.573	Okemos Rd & Fox Hollow Dr
7.812	Okemos Rd & Club Meridian Dr
8.470	Okemos Rd & Sower Blvd
8.842	Riverwood Dr & Okemos Rd
9.010	Okemos Rd & Shawnee Trl
9.405	Clinton St & Okemos Rd
9.658	Kent St & Okemos Rd
10.203	Okemos Rd & Central Park Dr
11.000	Okemos Rd & Quarry Rd
11.584	Haslett Rd & Okemos Rd
12.019	Okemos Rd & Village Dr

Milepoint	Intersection Name
0.157	Randolph St & Okemos Rd
0.405	Valley Ct & Okemos Rd
1.143	Okemos Rd & W Howell Rd
4.156	Holt Rd & Okemos Rd
6.168	Sandhill Rd & Okemos Rd
6.896	Okemos Rd & Okemos/W I 96 RAMP
7.108	Jolly Rd & Okemos Rd
7.313	Association Dr & Okemos Rd
7.646	Okemos Rd & Knob Hill Dr
7.945	Okemos Rd & Heritage Ave
8.662	Okemos Rd & Woodfield Rd
8.856	Hulett Rd & Okemos Rd
9.116	Okemos Rd & E Mount Hope Rd
9.484	Hamilton Rd & Okemos Rd
9.861	Okemos Rd & W Grand River Ave
10.663	Gaylord C Smith Ct & Okemos Rd
11.258	Okemos Rd & Songbird Pointe
11.664	Blue Lac Dr & Okemos Rd
12.160	Lake Lansing Rd & Okemos Rd

Milepoint	Intersection Name
0.237	Ann St & Okemos Rd
0.484	Mason Hills Dr & Okemos Rd
2.145	Okemos Rd & Harper Rd
4.910	Willoughby Rd & Okemos Rd
6.682	E I 96/Okemos RAMP & Okemos Rd & Oke
6.906	W I 96/Okemos RAMP & Okemos Rd & Oke
7.210	Hampton Pl & Okemos Rd
7.428	Coyote Creek Dr & Okemos Rd
7.658	Okemos Rd & Tamarack Dr
8.063	Okemos Rd & Bennett Rd & Kinawa Dr
8.759	Science Pkwy & Okemos Rd
8.935	Kewanee Way & Okemos Rd
9.234	Okemos Rd & Wonch Dr
9.562	Methodist St & Okemos Rd
10.112	Hillcrest Ave & Okemos Rd
10.874	Banyon Trl & Okemos Rd
11.407	Okemos Rd & Raby Rd
11.735	La Mer Ln & Okemos Rd

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
PR Number: 0362602			**Road Name: Okemos Rd**													
7.110	7549811	Meridian Twp	10' NW	JOLLY	Angle Turn	PDO	9/17/2005	06PM-07PM	2	3	0	Saturday	Clear	Daylight	Dry	Uncoded
7.117	8165683	Meridian Twp	50' N	JOLLY	Rear-End Straight	PDO	8/20/2005	02PM-03PM	2	3	0	Saturday	Cloudy	Daylight	Dry	On Road
7.117	7549956	Meridian Twp	50' N	JOLLY	Rear-End Straight	PDO	11/22/2005	06PM-07PM	2	2	0	Tuesday	Cloudy	Dark	Dry	On Road
7.122	6614856	Meridian Twp	75' N	JOLLY	Rear-End Straight	Injury	8/28/2005	03PM-04PM	2	6	2	Sunday	Clear	Daylight	Dry	On Road
7.239	7549519	Meridian Twp	150' S	JOLLY	Rear-End Straight	PDO	9/21/2005	05PM-06PM	2	2	0	Wednesday	Clear	Daylight	Dry	On Road
7.276	8165309	Meridian Twp	50' N	JOLLY OAK	Rear-End Straight	PDO	8/12/2005	01PM-02PM	2	3	0	Friday	Cloudy	Daylight	Dry	On Road
7.281	7549949	Meridian Twp	75' N	JOLLY OAK	Animal	PDO	11/7/2005	04PM-05PM	1	1	0	Monday	Clear	Daylight	Dry	On Road
7.286	8165656	Meridian Twp	100' N	JOLLY OAK	Rear-End Straight	PDO	8/9/2005	NOON-01PM	2	1	0	Tuesday	Clear	Daylight	Dry	On Road
7.569	8165886	Meridian Twp	20' SW	FOX HOLLOW	Angle Turn	PDO	11/21/2005	08AM-09AM	2	2	0	Monday	Cloudy	Daylight	Dry	On Road
7.657	8165865	Meridian Twp	5' S	TAMARACK	Angle Straight	PDO	10/25/2005	04PM-05PM	2	2	0	Tuesday	Cloudy	Daylight	Dry	On Road
7.658	6809258	Meridian Twp	20' W	TAMMARACK	Head-On Left-Turn	PDO	10/5/2005	07AM-08AM	2	2	0	Wednesday	Cloudy	Dusk	Dry	On Road
7.803	8165513	Meridian Twp	50' S	CLUB MERIDIAN	Rear-End Straight	PDO	8/29/2005	01PM-02PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
7.898	8165500	Meridian Twp	250' S	HERITAGE	Side-Swipe Same	PDO	8/22/2005	04PM-05PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
7.959	7549620	Meridian Twp	75' N	HERITAGE	Rear-End Straight	PDO	9/2/2005	01PM-02PM	2	1	0	Friday	Cloudy	Daylight	Dry	On Road
8.006	8165516	Meridian Twp	300' S	KINAWA	Rear-End Straight	PDO	8/29/2005	07PM-08PM	2	2	0	Monday	Cloudy	Daylight	Dry	On Road
8.065	8165508	Meridian Twp	10' N	BENNETT	Rear-End Straight	PDO	8/8/2005	06AM-07AM	2	2	0	Monday	Clear	Dawn	Dry	On Road
8.069	7549562	Meridian Twp	30' N	BENNETT	Rear-End Straight	PDO	8/20/2005	10PM-11PM	2	3	0	Saturday	Clear	Dark,Lighted	Dry	On Road
8.562	8165868	Meridian Twp	528' S	WOODFIELD	Hit Train	Injury	10/25/2005	11PM-MDNT	2	3	1	Tuesday	Cloudy	Dark	Debris	On Road
8.662	8165941	Meridian Twp	25' W	WOODFIELD	Fixed Object	PDO	10/18/2005	NOON-01PM	1	1	0	Tuesday	Clear	Daylight	Dry	On Road
8.664	6809200	Meridian Twp	10' N	WOODFIELD	Rear-End Straight	PDO	8/4/2005	04PM-05PM	2	4	0	Thursday	Cloudy	Daylight	Dry	On Road
9.107	8165741	Meridian Twp	45' S	MT HOPE	Angle Turn	PDO	10/17/2005	06PM-07PM	2	3	0	Monday	Cloudy	Dusk	Wet	On Road
9.116	8165620	Meridian Twp	10' E	MOUNT HOPE	Angle Turn	PDO	11/16/2005	09AM-10AM	2	3	0	Wednesday	Rain	Daylight	Wet	On Road

Total crashes for PR 0362602: 22

Total Fatal Crashes: 0 Total Injury Crashes: 2 Total PDO Crashes: 20

Standard Crash Report - Milepoints

Ingham County

Report Module: Safety Management Analysis
Today's Date: Thursday, November 30, 2006
Dates: 12/1/2005 to 11/30/2006
PR/RoadName: 362602: Okemos Rd
Milepoints: From 7.108 To 9.116
Sort Order: Road Name, Milepoint, Date of Crash

Milepoint	Intersection Name
0.000	Okemos Rd & E Columbia St & N Jefferson
0.267	Okemos Rd & N Rogers St
0.558	Mason Hills Dr & Okemos Rd & Coppersmit
3.152	Lamb Rd & Okemos Rd
5.163	Okemos Rd & Willoughby Rd
6.693	Okemos Rd & Okemos/E I 96 RAMP
7.008	Okemos Rd & University Park Dr & Woodlak
7.267	Jolly Oak Rd & Okemos Rd
7.573	Okemos Rd & Fox Hollow Dr
7.812	Okemos Rd & Club Meridian Dr
8.470	Okemos Rd & Sower Blvd
8.842	Riverwood Dr & Okemos Rd
9.010	Okemos Rd & Shawnee Trl
9.405	Clinton St & Okemos Rd
9.658	Kent St & Okemos Rd
10.203	Okemos Rd & Central Park Dr
11.000	Okemos Rd & Quarry Rd
11.584	Haslett Rd & Okemos Rd
12.019	Okemos Rd & Village Dr

Milepoint	Intersection Name
0.157	Randolph St & Okemos Rd
0.405	Valley Ct & Okemos Rd
1.143	Okemos Rd & W Howell Rd
4.156	Holt Rd & Okemos Rd
6.168	Sandhill Rd & Okemos Rd
6.896	Okemos Rd & Okemos/W I 96 RAMP
7.108	Jolly Rd & Okemos Rd
7.313	Association Dr & Okemos Rd
7.646	Okemos Rd & Knob Hill Dr
7.945	Okemos Rd & Heritage Ave
8.662	Okemos Rd & Woodfield Rd
8.856	Hulett Rd & Okemos Rd
9.116	Okemos Rd & E Mount Hope Rd
9.484	Hamilton Rd & Okemos Rd
9.861	Okemos Rd & W Grand River Ave
10.663	Gaylord C Smith Ct & Okemos Rd
11.258	Okemos Rd & Songbird Pointe
11.664	Blue Lac Dr & Okemos Rd
12.160	Lake Lansing Rd & Okemos Rd

Milepoint	Intersection Name
0.237	Ann St & Okemos Rd
0.484	Mason Hills Dr & Okemos Rd
2.145	Okemos Rd & Harper Rd
4.910	Willoughby Rd & Okemos Rd
6.682	E I 96/Okemos RAMP & Okemos Rd & Oke
6.906	W I 96/Okemos RAMP & Okemos Rd & Oke
7.210	Hampton Pl & Okemos Rd
7.428	Coyote Creek Dr & Okemos Rd
7.658	Okemos Rd & Tamarack Dr
8.063	Okemos Rd & Bennett Rd & Kinawa Dr
8.759	Science Pkwy & Okemos Rd
8.935	Kewanee Way & Okemos Rd
9.234	Okemos Rd & Wonch Dr
9.562	Methodist St & Okemos Rd
10.112	Hillcrest Ave & Okemos Rd
10.874	Banyon Trl & Okemos Rd
11.407	Okemos Rd & Raby Rd
11.735	La Mer Ln & Okemos Rd

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
PR Number: 0362602			**Road Name: Okemos Rd**													
7.155	8166836	Meridian Twp	250' NW	JOLLY	Rear-End Straight	PDO	12/29/2005	06PM-07PM	2	3	0	Thursday	Cloudy	Dark	Dry	On Road
7.611	8165294	Meridian Twp	200' N	FOX HOLLOW	Rear-End Straight	PDO	12/7/2005	04PM-05PM	2	2	0	Wednesday	Clear	Daylight	Dry	On Road
7.639	8166806	Meridian Twp	100' S	TAMARACK	Angle Straight	PDO	12/16/2005	08AM-09AM	2	3	0	Friday	Cloudy	Daylight	Icy	On Road
7.705	8166685	Meridian Twp	250' N	TAMARAK	Rear-End Straight	PDO	12/22/2005	03PM-04PM	2	3	0	Thursday	Rain	Daylight	Wet	On Road
8.057	6809973	Meridian Twp	30' S	KINANA	Rear-End Drive	PDO	12/16/2005	07AM-08AM	2	2	0	Friday	Snow	Daylight	Icy	On Road
8.740	8166683	Meridian Twp	100' S	SCIENCE	Side-Swipe Same	PDO	12/16/2005	08AM-09AM	2	2	0	Friday	Cloudy	Daylight	Icy	On Road
8.842	8166609	Meridian Twp	25' E	RIVERWOOD	Angle Straight	PDO	12/21/2005	03PM-04PM	2	2	0	Wednesday	Snow	Daylight	Icy	On Road
9.105	8165801	Meridian Twp	60' S	MT HOPE	Rear-End Straight	PDO	12/4/2005	03PM-04PM	2	5	0	Sunday	Cloudy	Daylight	Slushy	On Road

Total crashes for PR 0362602: 8

Total Fatal Crashes: 0 Total Injury Crashes: 0 Total PDO Crashes: 8

Standard Crash Report - Milepoints

Ingham County

Report Module: Safety Management Analysis

Today's Date: Tuesday, April 17, 2007

Dates: 1/1/2006 to 12/31/2006

PR/RoadName: 362602: Okemos Rd

Milepoints: From 7.100 To 9.200

Sort Order: Road Name, Milepoint, Date of Crash

Milepoint	Intersection Name
0.000	W Columbia St & Okemos Rd & S Jefferson
0.267	Okemos Rd & N Rogers St
0.558	Coppersmith Dr & Okemos Rd & Mason Hill
3.152	Lamb Rd & Okemos Rd
5.163	Willoughby Rd & Okemos Rd
6.693	Okemos/E I 96 RAMP & Okemos Rd
7.008	University Park Dr & Okemos Rd & Woodlak
7.267	Okemos Rd & Jolly Oak Rd
7.573	Okemos Rd & Fox Hollow Dr
7.812	Club Meridian Dr & Okemos Rd
8.470	Okemos Rd & Sower Blvd
8.759	Okemos Rd & Science Pkwy
8.935	Okemos Rd & Kewanee Way
9.234	Wonch Dr & Okemos Rd
9.562	Methodist St & Okemos Rd
10.112	Okemos Rd & Hillcrest Ave
10.727	Canadian National Railway & Okemos Rd
11.258	Okemos Rd & Songbird Pointe
11.664	Okemos Rd & Blue Lac Dr
12.160	Lake Lansing Rd & Okemos Rd

Milepoint	Intersection Name
0.157	Okemos Rd & Randolph St
0.405	Okemos Rd & Valley Ct
1.143	W Howell Rd & Okemos Rd
4.156	Holt Rd & Okemos Rd
6.168	Sandhill Rd & Okemos Rd
6.896	Okemos Rd & Okemos/W I 96 RAMP
7.108	Jolly Rd & Okemos Rd
7.313	Association Dr & Okemos Rd
7.646	Knob Hill Dr & Okemos Rd
7.945	Heritage Ave & Okemos Rd
8.581	Okemos Rd & CSX Transportation
8.842	Riverwood Dr & Okemos Rd
9.010	Shawnee Trl & Okemos Rd
9.405	Okemos Rd & Clinton St
9.658	Kent St & Okemos Rd
10.203	Okemos Rd & Central Park Dr
10.874	Banyon Trl & Okemos Rd
11.407	Raby Rd & Okemos Rd
11.735	Okemos Rd & La Mer Ln

Milepoint	Intersection Name
0.237	Ann St & Okemos Rd
0.484	Okemos Rd & Mason Hills Dr
2.145	Okemos Rd & Harper Rd
4.910	Okemos Rd & Willoughby Rd
6.682	E I 96/Okemos RAMP & Okemos Rd & Oke
6.906	W I 96/Okemos RAMP & Okemos/W I 96 R
7.210	Okemos Rd & Hampton Pl
7.428	Coyote Creek Dr & Okemos Rd
7.658	Tamarack Dr & Okemos Rd
8.063	Kinawa Dr & Bennett Rd & Okemos Rd
8.662	Okemos Rd & Woodfield Rd
8.856	Hulett Rd & Okemos Rd
9.116	E Mount Hope Rd & Okemos Rd
9.484	Hamilton Rd & Okemos Rd
9.861	Okemos Rd & W Grand River Ave
10.663	Okemos Rd & Gaylord C Smith Ct
11.000	Okemos Rd & Quarry Rd
11.584	Okemos Rd & Haslett Rd
12.019	Okemos Rd & Village Dr

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
PR Number: 0362602			**Road Name: Okemos Rd**													
7.102	7298327	Alaiedon Twp	30' S	JOLLY	Angle Straight	PDO	1/21/2006	07PM-08PM	2	2	0	Saturday	Cloudy	Dark,Lighted	Dry	On Road
7.104	7298678	Alaiedon Twp	20' S	JOLLY	Rear-End Straight	PDO	6/24/2006	10AM-11AM	2	2	0	Saturday	Clear	Daylight	Dry	On Road
7.104	7299049	Alaiedon Twp	20' S	JOLLY	Rear-End Straight	Injury	10/27/2006	11AM-NOON	2	2	2	Friday	Rain	Daylight	Wet	On Road
7.106	7291716	Alaiedon Twp	0' X	JOLLY	Rear-End Straight	PDO	3/1/2006	03PM-04PM	2	2	0	Wednesday	Cloudy	Daylight	Dry	On Road
7.116	8566398	Meridian Twp	40' N	JOLLY	Rear-End Drive	PDO	7/20/2006	09AM-10AM	2	2	0	Thursday	Cloudy	Daylight	Uncoded	On Road
7.117	8566550	Meridian Twp	50' N	JOLLY	Rear-End Straight	PDO	5/30/2006	07AM-08AM	2	2	0	Tuesday	Clear	Daylight	Dry	On Road
7.121	8566086	Meridian Twp	70' N	JOLLY	Rear-End Drive	Injury	11/7/2006	01PM-02PM	2	2	1	Tuesday	Rain	Daylight	Wet	On Road
7.127	8566958	Meridian Twp	100' N	JOLLY	Rear-End Straight	PDO	2/16/2006	05PM-06PM	2	3	0	Thursday	Rain	Daylight	Wet	On Road
7.127	6810050	Meridian Twp	100' N	JOLLY	Rear-End Straight	Injury	10/26/2006	06PM-07PM	3	4	1	Thursday	Cloudy	Dusk	Dry	On Road
7.165	8566868	Meridian Twp	300' N	JOLLY	Rear-End Straight	PDO	5/17/2006	04PM-05PM	2	4	0	Wednesday	Cloudy	Daylight	Dry	On Road
7.208	8566233	Meridian Twp	528' N	JOLLY	Rear-End Straight	PDO	12/13/2006	05PM-06PM	2	2	0	Wednesday	Cloudy	Dark,Lighted	Dry	On Road
7.259	8166249	Meridian Twp	40' S	JOLLY	Backing	PDO	10/17/2006	07PM-08PM	2	3	0	Tuesday	Cloudy	Dark,Lighted	Wet	On Road
7.262	8566800	Meridian Twp	25' S	JOLLY OAK	Rear-End Straight	PDO	5/25/2006	04PM-05PM	2	2	0	Thursday	Cloudy	Daylight	Wet	On Road
7.272	8166060	Meridian Twp	25' NE	JOLLY OAK	Angle Turn	PDO	7/30/2006	11PM-MDNT	2	2	0	Sunday	Clear	Dark	Dry	On Road
7.286	8566519	Meridian Twp	100' N	JOLLY OAK	Animal	PDO	5/4/2006	09PM-10PM	1	1	0	Thursday	Clear	Dark	Dry	On Road
7.556	8566170	Meridian Twp	90' S	FOX HOLLOW	Side-Swipe Opposite	PDO	12/7/2006	03PM-04PM	2	2	0	Thursday	Snow	Daylight	Wet	On Road
7.573	8166038	Meridian Twp	30' E	FOX HOLLOW	Rear End Right Turn	PDO	2/8/2006	05PM-06PM	3	3	0	Wednesday	Snow	Daylight	Icy	On Road
7.649	8166363	Meridian Twp	50' S	TAMARACK	Rear-End Straight	PDO	10/9/2006	05PM-06PM	2	6	0	Monday	Clear	Daylight	Dry	On Road
7.652	8166293	Meridian Twp	30' S	TAMARACK	Rear-End Straight	PDO	10/5/2006	10AM-11AM	2	2	0	Thursday	Clear	Daylight	Dry	On Road
7.655	8566268	Meridian Twp	15' S	TAMARACK	Rear-End Straight	Injury	12/19/2006	04PM-05PM	2	2	2	Tuesday	Clear	Daylight	Dry	On Road
7.656	7549972	Meridian Twp	10' S	TAMARACK	Misc. Multiple Vehicle	PDO	1/16/2006	01PM-02PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
7.658	8166358	Meridian Twp	0' X	TAMARACK	Angle Straight	Injury	9/28/2006	10AM-11AM	2	2	2	Thursday	Clear	Daylight	Dry	On Road
7.661	7549932	Meridian Twp	15' N	TAMARACK	Head-On Left-Turn	Injury	8/3/2006	04PM-05PM	2	2	1	Thursday	Cloudy	Daylight	Wet	On Road
7.662	8166124	Meridian Twp	20' N	TAMARACK	Side-Swipe Same	PDO	7/16/2006	06PM-07PM	2	3	0	Sunday	Clear	Daylight	Dry	On Road
7.677	8165723	Meridian Twp	100' N	TAMARACK	Rear-End Straight	PDO	4/12/2006	04PM-05PM	2	6	0	Wednesday	Rain	Daylight	Wet	On Road
7.807	8566354	Meridian Twp	25' S	CLUB MERIDIAN	Rear-End Drive	PDO	5/10/2006	03PM-04PM	2	3	0	Wednesday	Rain	Daylight	Dry	On Road
7.926	8166626	Meridian Twp	100' S	HERITAGE	Rear-End Straight	PDO	2/8/2006	05PM-06PM	2	3	0	Wednesday	Cloudy	Dark	Icy	On Road
7.937	8166861	Meridian Twp	40' S	HERITAGE	Side-Swipe Opposite	Injury	2/8/2006	06PM-07PM	2	2	1	Wednesday	Snow	Dusk	Icy	On Road
7.945	8166860	Meridian Twp	0' X	HERITAGE	Fixed Object	PDO	2/8/2006	05PM-06PM	1	1	0	Wednesday	Snow	Dusk	Icy	On Road
7.950	8166859	Meridian Twp	25' N	HERITAGE	Rear-End Straight	PDO	2/8/2006	05PM-06PM	2	2	0	Wednesday	Snow	Dusk	Icy	On Road
8.035	6810141	Meridian Twp	150' S	KINOAA	Rear-End Drive	Injury	8/24/2006	10AM-11AM	2	3	1	Thursday	Rain	Daylight	Wet	On Road
8.049	8566506	Meridian Twp	75' S	KINAWA	Side-Swipe Same	PDO	2/27/2006	03PM-04PM	2	2	0	Monday	Snow	Daylight	Wet	On Road
8.055	8566396	Meridian Twp	40' S	KINAWA	Rear-End Drive	Injury	7/20/2006	08AM-09AM	3	3	1	Thursday	Cloudy	Daylight	Dry	On Road
8.057	8166252	Meridian Twp	30' S	KINAWA	Rear-End Straight	Injury	11/2/2006	11AM-NOON	2	4	1	Thursday	Cloudy	Daylight	Wet	On Road

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road
8.059	8566121	Meridian Twp	20' S	KINAWA	Rear-End Straight	PDO	12/8/2006	01PM-02PM	2	2	0	Friday	Clear	Daylight	Dry	On Road
8.063	8166130	Meridian Twp	20' E	BENNETT	Angle Turn	Injury	8/2/2006	NOON-01PM	2	2	1	Wednesday	Clear	Daylight	Dry	On Road
8.065	7550021	Meridian Twp	10' N	KINAWA	Side-Swipe Opposite	PDO	8/2/2006	11PM-MDNT	2	2	0	Wednesday	Rain	Dark,Lighted	Wet	On Road
8.068	8566535	Meridian Twp	25' N	BENNERT	Rear-End Drive	PDO	3/6/2006	08AM-09AM	2	3	0	Monday	Snow	Daylight	Wet	On Road
8.069	8566419	Meridian Twp	30' N	KINAWA	Head-On Left-Turn	PDO	9/18/2006	03PM-04PM	2	2	0	Monday	Cloudy	Daylight	Uncoded	On Road
8.101	8165726	Meridian Twp	200' N	KINANA	Side-Swipe Same	PDO	4/22/2006	02PM-03PM	2	4	0	Saturday	Cloudy	Daylight	Dry	On Road
8.110	8566077	Meridian Twp	250' N	KINAWA	Side-Swipe Opposite	Injury	9/27/2006	08AM-09AM	2	3	1	Wednesday	Cloudy	Daylight	Dry	On Road
8.110	8166397	Meridian Twp	250' N	KINANA	Rear-End Straight	Injury	10/24/2006	09AM-10AM	2	2	1	Tuesday	Cloudy	Daylight	Dry	On Road
8.120	8166099	Meridian Twp	300' N	BENNETT	Rear-End Straight	PDO	8/8/2006	05PM-06PM	2	3	0	Tuesday	Clear	Daylight	Dry	Uncoded
8.461	7550022	Meridian Twp	50' S	SOWER	Fixed Object	PDO	8/10/2006	09PM-10PM	1	3	0	Thursday	Cloudy	Dark,Lighted	Dry	On Road
8.498	8566895	Meridian Twp	150' N	SOWER	Angle Straight	PDO	2/5/2006	03AM-04AM	2	3	0	Sunday	Snow	Dark	Snowy	On Road
8.570	8566973	Meridian Twp	528' N	SOWER	Rear-End Straight	PDO	7/17/2006	05PM-06PM	2	3	0	Monday	Clear	Daylight	Dry	On Road
8.659	7550020	Meridian Twp	15' S	WOODFIELD	Misc. Single Vehicle	Injury	7/20/2006	08AM-09AM	1	1	1	Thursday	Cloudy	Daylight	Dry	Out Shou/Curb
8.740	8566906	Meridian Twp	100' S	SCIENCE	Rear-End Straight	PDO	5/18/2006	01PM-02PM	2	2	0	Thursday	Rain	Daylight	Wet	On Road
8.755	8566416	Meridian Twp	20' S	SCIENCE	Side-Swipe Same	PDO	8/31/2006	11AM-NOON	2	4	0	Thursday	Clear	Daylight	Dry	Uncoded
8.755	7549946	Meridian Twp	20' S	SCIENCE	Rear-End Straight	Injury	11/22/2006	06PM-07PM	2	2	1	Wednesday	Clear	Dark,Lighted	Dry	On Road
8.757	8566101	Meridian Twp	10' S	SCIENCE	Pedestrian	Injury	9/28/2006	07PM-08PM	2	0	1	Thursday	Clear	Dusk	Dry	On Road
8.759	8566971	Meridian Twp	10' W	SCIENCE	Angle Turn	PDO	7/17/2006	03PM-04PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
8.761	8566575	Meridian Twp	10' N	SCIENCE	Rear-End Straight	PDO	4/17/2006	04PM-05PM	2	2	0	Monday	Clear	Daylight	Dry	On Road
8.766	7549938	Meridian Twp	35' NW	SCLENCE	Rear-End Straight	Injury	8/31/2006	05PM-06PM	2	2	2	Thursday	Clear	Daylight	Dry	On Road
8.768	6808599	Meridian Twp	45' NW	SCIENCE	Rear-End Straight	PDO	9/12/2006	05PM-06PM	2	3	0	Tuesday	Rain	Daylight	Wet	On Road
8.778	8166376	Meridian Twp	100' N	SCIENCE	Side-Swipe Same	PDO	12/22/2006	01PM-02PM	2	3	0	Friday	Rain	Daylight	Wet	On Road
8.838	8566900	Meridian Twp	20' S	RIVERWOOD	Fixed Object	PDO	2/8/2006	04PM-05PM	1	1	0	Wednesday	Snow	Daylight	Icy	On Road
8.856	8166386	Meridian Twp	30' W	HULETT	Angle Straight	PDO	10/6/2006	01PM-02PM	2	2	0	Friday	Clear	Daylight	Dry	On Road
8.865	8166136	Meridian Twp	50' N	HULUTT	Rear-End Straight	PDO	7/20/2006	02PM-03PM	2	1	0	Thursday	Clear	Daylight	Dry	On Road
8.870	8566480	Meridian Twp	150' N	RIVERWOOD	Rear-End Straight	PDO	2/9/2006	07PM-08PM	2	2	0	Thursday	Cloudy	Dark,Lighted	Dry	On Road
8.907	8566516	Meridian Twp	150' S	KEWANEE	Rear-End Straight	Injury	4/25/2006	11AM-NOON	2	2	1	Tuesday	Cloudy	Daylight	Dry	On Road
8.949	8166624	Meridian Twp	75' N	KEWANNE WAY	Angle Straight	PDO	1/18/2006	06PM-07PM	2	2	0	Wednesday	Cloudy	Dark,Lighted	Snowy	On Road
9.001	8165827	Meridian Twp	50' S	SHAWNEE	Rear-End Straight	Injury	2/3/2006	05PM-06PM	2	2	1	Friday	Cloudy	Dusk	Wet	On Road
9.097	7549927	Meridian Twp	100' S	MT HOPE	Angle Straight	PDO	7/21/2006	09AM-10AM	3	1	0	Friday	Clear	Daylight	Dry	Out Shou/Curb
9.116	8165716	Meridian Twp	15' W	MOUNT HOPE	Angle Turn	PDO	3/11/2006	04PM-05PM	2	2	0	Saturday	Clear	Daylight	Dry	On Road
9.135	8166348	Meridian Twp	100' N	MT HOPE	Animal	PDO	11/15/2006	04PM-05PM	1	1	0	Wednesday	Clear	Daylight	Dry	On Road
9.144	8166142	Meridian Twp	150' N	MOUNT HOPE	Animal	PDO	11/18/2006	02AM-03AM	1	1	0	Saturday	Cloudy	Dark	Dry	On Road
9.155	6810033	Meridian Twp	1320' S	CLINTON	Rear-End Straight	PDO	9/28/2006	04PM-05PM	3	5	0	Thursday	Clear	Daylight	Dry	On Road

Standard Crash Report - Milepoints

MilePoint	UD10 #	UD10 City/Township	UD-10 Crash Location	UD-10 Crossroad Reference	Crash Type	Crash Severity	Date	Hour of Occurence	Number of: Veh.	Occup.	Inj.	Weekday	Environmental Condition: Weather	Lighting	Surface	Relationship On Road

Total crashes for PR 0362602: 68

Total Fatal Crashes: 0 Total Injury Crashes: 19 Total PDO Crashes: 49