Final Report for
Collision Diagramming Tools Evaluation
November 2008

Prepared for
Oregon Department of Transportation

Prepared by
DKS Associates
TRANSPORTATION SOLUTIONS
December 10, 2008

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Subject: Collision Diagramming Tools Evaluation Final Report

Dear Tim:

Enclosed is the Collision Diagramming Tools Evaluation Final Report. The report incorporates all comments received from ODOT staff as well as Dr. Monsere. Please feel free to call if you have any questions. It has been a pleasure working with you on this project.

Sincerely,

DKS Associates
Transportation Solutions

Brian K. Copeland, P.E.
Senior Transportation Engineer
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1 OBJECTIVE

The purpose of this report is to identify current practices and challenges with collision diagramming at ODOT’s Crash Analysis and Reporting (CAR) Unit, research available tools, and to recommend a collision diagramming tool for implementation.

2 EXECUTIVE SUMMARY

The CAR Unit currently processes thousands of data requests per year and creates collision diagrams by manually drafting them using MicroStation. The most challenging of these are a significant number of collision diagram requests from region traffic investigators that require a quick turnaround. The CAR Unit has been unable to complete these in the desired timeframe because the current process of drafting collision diagrams in MicroStation is so time-consuming. A collision diagramming program developed internally at ODOT called CrashViewer is able to create diagrams quickly, but has many shortcomings and is no longer compatible with ODOT crash data format.

Interviews of public agencies in Oregon and an online survey of state safety professionals throughout the nation were used to determine the current state of practice for collision diagramming. A list of available collision diagramming tools was assembled and several vendors were contacted for a preliminary evaluation of these tools. Four alternatives were selected for further evaluation. These were: 1) continue using MicroStation to manually draft the collision diagrams, 2) update CrashViewer, 3) develop a custom plug-in for MicroStation to automate some of the diagramming tasks, or 4) use Crash Magic. Each alternative was given a score based on its user interface, output quality, data integration, speed and cost. The category scores were averaged to rank the alternatives.

Based on this evaluation, Crash Magic was identified as the alternative which best meets the needs of the CAR Unit and the ODOT regions.

3 CURRENT PRACTICES

3.1 ODOT Crash Analysis and Reporting Unit

The CAR Unit currently uses MicroStation to manually plot each collision diagram. The data used to create collision diagrams are PRC reports which are a query of the Crash Data System (CDS). PRC reports provide a limited summary of crashes for a specified zone and can be accessed through TransViewer on the ODOT website. Since the diagrams are created in CAD, there is no direct link to the data source and all of the crash icons must be individually created and placed by hand for each collision. In addition, the information for each collision must be verified against the PRC report since the location coding or roadway/intersection geometry may vary during the time span of interest. This is a time consuming process but allows for customization and creates the most representative collision diagrams with a high level of
Many ODOT employees are familiar with MicroStation and feel comfortable with its interface.

CrashViewer was developed by ODOT as a way to quickly create collision diagrams. This program was designed to read an alternatively formatted PRC report and assigns symbols for a collision diagram using Microsoft Visio 2002. Users must still use the same verification process for each crash as if they had created the collision diagram in MicroStation. The current version of CrashViewer is not compatible with the alternatively formatted PRC reports available online. This is due to a recent modification of the data format in the PRC reports.

3.1.1 Collision Diagram Needs

The CAR Unit receives approximately 8,000 data requests annually. Of the data requests, creating collision diagrams is the most time intensive. Collision diagrams are requested by various cities and counties, for safety corridors and work zones and by internal ODOT customers such as traffic investigators in each ODOT region. The most demanding requests are from the traffic investigators that are responding to federal requirements to produce a report on the top five percent most hazardous locations in each state.

The collision diagrams are used by region traffic investigators to aid in the analysis of high-risk crash locations. All crashes for the past five years of whole-year data are shown for each location. Not-to-scale schematics of the roadway are acceptable and even preferred due to the ability to plot more crash icons in the lanes than would be provided if scale layouts were used. Since other evaluation tools are used in addition to collision diagrams, an exact plan of the intersection is not needed. There are no specific requirements for the output format of collision diagrams.

3.1.2 Collision Diagram Challenges

ODOT staff identified several challenges with collision diagrams (see Table 1). The number one issue is that the CAR Unit is unable to satisfy the demand for collision diagram requests. There are multiple reasons for this involving the type of requests, collision diagramming methods, tools and data source.

Each year, ODOT creates a Safety Priority Index System (SPIS) list, which identifies and prioritizes locations for potential safety improvements based on crash rates and severity. After this SPIS list is generated, the top 5% locations are further investigated and evaluated by the five Region Traffic manager's offices. Traffic investigators only have six to eight weeks to analyze the locations and incorporate the results into the Highway Safety Improvement Program’s (HSIP) 5 percent report for the Federal Highway Administration (FHWA). Regions 1 and 2 alone may request collision diagrams for several hundred locations, with a desired turnaround of only two to three weeks. The CAR Unit is unable to fulfill all of the requests for collision diagrams at these sites in such a short period of time. This has led many regional traffic investigators to simply not request collision diagrams and to find alternate tools to supplement their analysis.
## Table 1: ODOT Collision Diagramming Challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Likely Cause</th>
</tr>
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</table>
| **Sudden demand from SPIS reports overwhelms CAR Unit** | ✦ Short deadline for Federal Five Percent Reports causes a spike in demand from region traffic investigators and requires fast turnaround.  
✦ Meticulous methods take a long time to produce collision diagrams.  
✦ Lack of experienced personnel who can quickly create collision diagrams.  |
| **CrashViewer currently unusable**                  | ✦ PRC report changed format; CrashViewer cannot read the new format.  
✦ CrashViewer is not currently used and has not been updated to be compatible with source data changes.  
✦ The primary programmer, Chuck Jenkins is too busy to update CrashViewer; maintenance has not been made a priority. |
| **User feedback and perceptions of CrashViewer**    | ✦ Users lack experience working in Visio and are not comfortable using it.  
✦ The CrashViewer user interface is not user friendly.  
✦ Results drawn in Visio are sometimes incorrect or confusing.  
✦ Visio does not easily allow for a high level of customization in its drawings the way MicroStation does. |
| **Due to potential errors users must verify all crash data on every diagram** | ✦ The limited data in PRC reports may not be adequate to describe all incidents.  
✦ Coding errors in the Crash Data System are commonplace.  
✦ There are three different location methods: geospatial, mile point and node/offset; these are not conducive to automatic identification of crash location. Some crashes may be missing in the investigation of an intersection or corridor because of this.  
✦ Mileage type prefixes, such as Y, Z or T, may be overlooked during coding or evaluation of crash data resulting in incorrect crash locations. |
| **Commercial off the shelf software cannot easily use CDS data** | ✦ The CDS is not 100% MMUCC (Model Minimum Uniform Crash Criteria) compliant.  
✦ Oregon crash data is highly complex and includes many more fields than most commercial applications are designed to handle. |

Many people in ODOT have attempted to use CrashViewer to create quick collision diagrams. However, several problems exist with this program and it is not currently in active use. Presently, the first major issue is that the format of the PRC reports changed and CrashViewer is not able to process this new format. The program will require a minor rewrite to adapt it to the new format. Since there has been little interest from the users for CrashViewer, updating the program has not been made a priority.
There are mixed opinions as to the effectiveness of CrashViewer. The program does do an effective job of quickly placing crash icons on collision diagrams from PRC reports. However, there are often instances where the program cannot automatically determine all of the details. When there are multiple collisions at the same location, CrashViewer will offset the icons in an attempt to display all of them but this sometimes results in icons overlapping or being located in odd places. It is possible to modify the collision diagrams after they are created but it is not a user-friendly process. Also, CrashViewer creates the collision diagrams in Microsoft Visio; it appears that many people are not familiar or comfortable working in Visio. Finally, all of the crashes and the intersection or corridor layout in each of the collision diagrams must still be manually verified against the PRC report to identify potential errors.

The most time consuming step, whether using MicroStation or CrashViewer, is that each collision must be studied to confirm that all of the details are correct on the diagram. Often it is not entirely clear from the coding where the crash was located. Sometimes there is conflicting information that must be resolved, such as a crash coded on a curve with a milepoint that is in a straight section of roadway. Also, there are three different location methods: geospatial, mile point and node/offset. The node and offset system is commonly used on city streets to identify the distance and direction from intersections, this system is not used to describe crashes on state highways. Geospatial coordinates are recorded for crashes in 2007 and later data where the incident is located on a state highway with a mile point. Mileage prefixes on state highways are sometimes miscoded during crash coding or overlooked when evaluating the crash location. This can result in inaccurate placement of the crash icons in a collision diagram.

Commercial off the shelf programs, such as Intersection Magic or Highway Safety Analysis, cannot directly use the CDS to create collision diagrams. Some region traffic investigators have expressed interest in using a commercial application to quickly create collision diagrams to aid in the analysis of SPIS locations. One major factor preventing this is lack of consistent geospatial data for crash locations. In addition, the CDS contains significantly more information than commercial applications need to produce collision diagrams resulting in a loss in data fidelity. MMUCC was developed to standardize data fields in crash databases. Because the CDS is not entirely MMUCC compliant, there is a potential for challenges when mapping fields in the CDS to required fields in the commercial software. Having a fully MMUCC compliant database could make it easier for commercial applications to use the CDS. At least one agency (Washington County) has been successful in using Intersection Magic with a conversion script written for the decode database from ODOT. However, with each change in the decode database they must update the conversion script.

### 3.1.3 Desired Features

The most commonly requested feature is a method of automatically reading the crash data and putting that into a basic collision diagram. For ODOT, this should reduce the time needed to create each diagram and allow for a faster turnaround within the CAR Unit.

Region traffic investigators do not want to be forced to reconcile each plotted crash with the PRC report in order to verify the crash details. The CAR Unit does not believe it is reasonable
that all crash icons can be properly oriented and located using software alone. Therefore, it may not be realistic to avoid back checking collision diagrams for potential errors. A useful feature would be a connection between each crash icon and the detailed crash coding; this could make it easier to verify that the information shown on the diagrams are correct.

Since crash locations are identified by multiple methods and roadways often have several different names, geospatial coordinates should be included in all crash data. This would decrease the time required to locate each crash in an area of interest and reduce the number of crashes overlooked.

### 3.1.4 Operating Environment

The standard computer workstation in ODOT runs Microsoft Windows XP SP2. The standard database platform is SQL Server 2005 and Information Services typically avoids MS Access based applications. A single sign-on policy is in place using Windows Authentication to access all applications and databases. Internet Explorer 6 is the standard browser.

Chuck Jenkins is responsible all maintenance and support of CrashViewer, which is no longer compatible with current PRC reports. CrashViewer requires Visual Basic 6 runtime files and Microsoft Visio 2002. For a commercial off-the-shelf product, the vendor is expected to support all code changes and may need to develop the interface to allow connectivity to the CDS.

### 3.2 Oregon Public Agencies

Aside from ODOT, the five agencies contacted and interviewed by phone were Washington County, Clackamas County, the City of Gresham, City of Medford and the Oregon State Police. These agencies use a variety of methods and source data to fulfill their collision diagraming requirements (see Table 2).

<table>
<thead>
<tr>
<th>Table 2: Current Practices for Local Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington County</td>
</tr>
<tr>
<td>Software</td>
</tr>
<tr>
<td>Data Source(s)</td>
</tr>
<tr>
<td>Diagram Type(s)</td>
</tr>
</tbody>
</table>

There are several different tools used by public agencies in Oregon. Washington County and the City of Medford both use Intersection Magic from Pd’ Programming. Clackamas County and the City of Gresham use custom in-house tools to analyze crash data and produce collision....
diagrams. The Oregon State Police use Crash Zone to investigate individual incidents. Most agencies use the ODOT data as the primary source of crash data.

### 3.2.1 Collision Diagram Needs

Local agencies in Oregon use collision diagrams for a few general purposes. City and county agencies all use collision diagrams to some extent to diagnose or analyze high rate crash locations. Washington County, the City of Medford and the Oregon State Police also use collision diagrams as a way to convey crash data to the public.

Each agency relies on collision diagrams for analysis to varying degrees. Washington County creates collision diagrams to diagnose hazardous intersections, while the City of Gresham uses collision diagrams to visually confirm their interpretation of crash lists. The Oregon State Police only create crash diagrams for individual crashes for investigative purposes; they do not track crash data over multiple incidents.

### 3.2.2 Level of Success / Desires

All of the agencies contacted feel their current system for analyzing collision diagrams is sufficient for their needs. Washington County stated that Intersection Magic required a significant level of effort to use with the crash decode database from ODOT. However, once the data has been imported into Intersection Magic they are able to easily create collision diagrams. The City of Gresham and Clackamas County use custom tools and have no problems with the ODOT crash data. However, both of these agencies do not create collision diagrams as often and spend a significant amount of time cleaning up the diagrams after they have been created.

All of the agencies that rely on the ODOT crash data have difficulty locating the exact location of incidents. While most agencies only used intersection collision diagrams, many expressed an interest in corridor diagrams or pin maps if better crash data were available or easier to interface with. Since the official ODOT crash data is not released until all the previous year’s records are entered and validated (typically in May or June the following calendar year), many agencies supplement this data with recent local police accident reports.

### 3.3 State Safety Professionals Nationwide

An online survey of state highway safety officials regarding their current collision diagramming tools was conducted through Dr. Christopher Monsere of Portland State University. The survey results consisted of 29 responses from 28 states (there were two responses from Wisconsin). Based on the responses, six professionals were contacted with follow-up questions; five responded with additional information about their tools and practices. The survey form and results summary are shown in the appendix.

The state safety professionals’ use of collision diagramming tools can be broken down into the following four general groups: Intersection Magic or Crash Magic from Pd’ Programming, custom or in-house tools, drafting diagrams in CAD, or other applications. Professionals were asked to rate their collision diagramming tools from poor to excellent. Of respondents using the
same tools, results were relatively consistent. However, custom or in-house tools had a much higher variance in the responses; some users reported great experiences and others were very dissatisfied.

The results from this survey were used to determine the current practices and overall satisfaction of collision diagramming tools at state DOTs. The comments and rankings for each application were taken into consideration when evaluating each alternative tool.

4 ALTERNATIVES REQUIREMENTS

A primary requirement is for the system to be able to produce many collision diagrams in a short period of time. The CAR Unit receives approximately 8,000 data requests a year, and satisfying this demand in a timely manner has been a significant challenge. Collision diagrams are the most time-intensive of these requests. Therefore, minimizing the time the CAR Unit spends creating each collision diagram can improve their ability to keep up with data requests. Of collision diagram requests, the most demanding are those by the region traffic investigators for the annual report on high-risk locations.

ODOT has been using MicroStation to create collision diagrams for many years, and ODOT staff appears to be experienced and comfortable with it. Switching to any new system of collision diagramming with a different interface will be a challenge. User-friendliness is critical to the acceptance and use of any application. Therefore, the system must be something staff can easily learn and become comfortable using.

ODOT staff spends a significant amount of time reconciling the collision diagram with the crash data. When using MicroStation and CrashViewer, this involves a tedious process of comparing each crash icon to its corresponding data row in a TransViewer PRC report of comprehensive crash details. The ability to quickly bring up the source crash data and compare it to each crash icon within the collision diagramming tool should speed up this process considerably.

In order to use the collision diagramming tools to their full extent, users must be able to process the crash location information from all of the different formats in the CDS. This includes locating collisions by route/milepoint, intersection/offset, latitude/longitude and by a list of crash identifiers.

In addition, there are several desired features that should be explored for each application. While there is no specific format requirement for collision diagrams, the ability to edit and update existing collision diagrams is required. If errors are found in a diagram or if the same location is requested again, it could be quicker to update an existing diagram rather than building a new one. A direct link to the CDS or another data source could provide for a higher level of automation in the collision diagramming process. Also, compatibility with GIS platforms will allow for better integration of crash data into other ODOT applications.
5 ALTERNATIVES ASSESSMENT

Collision diagramming tools were assessed in two stages. All possible candidate applications were first screened to determine if they could create customizable collision diagrams meeting the basic needs of the CAR Unit. Programs that met this requirement were further evaluated and ranked by how well they would suit the needs of ODOT. Applications that included “fatal flaws” were discarded and were not further evaluated.

5.1 Preliminary Screening

The initial evaluation of 13 possible tools was first used to determine if the application could suit the basic needs of the CAR Unit and create a highly customizable collision diagram. Table 3 shows the collision diagramming tools examined and the selection criteria used for screening. Many tools were examined only to the point it became obvious that they would not adequately meet ODOT’s collision diagramming needs. In these cases, many of the criteria are labeled as “unknown” since it was not investigated.

An important criterion used for preliminary evaluation was the level of possible customization. ODOT has indicated a high level of customization is one of their basic needs for an effective collision diagramming tool. For example, some applications allow for modification of roadway geometry and movement of each crash icon while others have a fixed layout. Also, there are a few collision diagramming applications that allow for a high level of customization but only display single incidents and cannot group collisions for use in trend analysis.

Since a significant number of collisions of interest to the CAR Unit do not occur specifically at intersections, candidate applications must be able to create collision diagrams at midblock or along a corridor. Collision diagramming tools that were unable to produce diagrams along a corridor were eliminated from further evaluation.

Oregon crash data has several formats for crash location identification: by roadway/milepoint, intersection/offset and geospatial coordinates. It is important that the collision diagramming software be able to interpret crash data in all of these formats. In addition, the application must be able to read or import crash data directly from the CDS, from a decode database or from a TransViewer PRC report. Tools which were incompatible with the CDS were excluded from further evaluation.

Not all vendors allowed for a demonstration, either using example data or a custom demonstration with actual crash data. In addition, some products are not currently being used in Oregon where they could be evaluated in-person during an office visit. Without the ability to view a demonstration of the application, there was no way to validate the claims of the vendor. This became an important factor in deciding whether to continue a further evaluation of their product.
### Table 3: Requirements Matrix of Collision Diagramming Tool

<table>
<thead>
<tr>
<th>Application:</th>
<th>Criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroStation</td>
<td>Yes</td>
</tr>
<tr>
<td>CrashViewer</td>
<td>Yes</td>
</tr>
<tr>
<td>MicroStation Semi-Automation</td>
<td>Yes</td>
</tr>
<tr>
<td>Intersection Magic</td>
<td>Yes</td>
</tr>
<tr>
<td>Crash Magic</td>
<td>Yes</td>
</tr>
<tr>
<td>Accident Information Management System</td>
<td>Yes</td>
</tr>
<tr>
<td>Traffic Collision Database</td>
<td>No</td>
</tr>
<tr>
<td>Highway Safety Analysis</td>
<td>No</td>
</tr>
<tr>
<td>RoadSoft GIS</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Engineering Software</td>
<td>No</td>
</tr>
<tr>
<td>SafetyAnalyst</td>
<td>Unknown</td>
</tr>
<tr>
<td>Crash Zone</td>
<td>Single Inc. Only</td>
</tr>
<tr>
<td>Vista FX</td>
<td>Single Inc. Only</td>
</tr>
</tbody>
</table>

A description of each alternative is provided below. Based on this preliminary evaluation, interviews with local agencies and comments from state highway safety officials nationwide, a wide range of alternatives were reduced to four potential solutions. The options available are: 1) continue the current practice of using MicroStation to draft collision diagrams, 2) upgrade/update CrashViewer, 3) create a custom plug-in for MicroStation to automate a portion of the diagram process, or 4) utilize Crash Magic.

#### 5.1.1 MicroStation

ODOT is currently using MicroStation to create all collision diagrams. Manually drafting collision diagrams in CAD is still a popular solution with many state DOTs. MicroStation excels at especially complicated collision diagrams, allowing for a high level of customization to every...
aspect of the diagram. It is possible to create a collision diagram for any type of roadway, including nonstandard intersection configurations and display major roadway realignments. However, all of the collisions must be placed manually on the diagram by referencing a crash list.

**Conclusion:** Evaluate as possible solution.

### 5.1.2 CrashViewer

CrashViewer has not been well received and it is not currently in use at ODOT. The application quickly creates collision diagrams in Microsoft Visio using an alternatively formatted PRC report. CrashViewer creates diagrams at most standard intersection configurations and along corridors. As with most collision diagramming software, manual manipulation of the icons is often required. An update to the crash data processing of CrashViewer is required to make the program compatible with the current PRC report format. A copy of CrashViewer 1.4 with example data was provided to DKS for evaluation.

**Conclusion:** Evaluate as possible solution.

### 5.1.3 MicroStation Semi-Automation

A possible solution is a custom tool that allows for limited automation within MicroStation. In the past, ODOT crash data was stored on a mainframe and it was possible to import crash information into a MicroStation template to be edited. The CAR Unit expressed much interest in having a similar capability with the CDS that would allow them to create collision diagrams much faster. This would provide the same high level of customization the CAR Unit is used to while improving data integration and decreasing the time spent creating each diagram.

**Conclusion:** Evaluate as possible solution.

### 5.1.4 Intersection Magic

Intersection Magic from Pd’ Programming is the de facto standard in commercial-off-the-shelf collision diagramming. Intersection Magic is currently used by Washington County and several cities in Oregon. Figure 1 shows a typical collision diagram created in Intersection Magic by Washington County. The program can create diagrams for most intersection configurations but does not have the ability to create diagrams midblock or along a corridor. Intersection Magic uses a proprietary database, but it is possible to copy CDS data to this database using a conversion script. However, only 40 fields are allowed per crash so there is significant loss in data fidelity for analysis. A demonstration of Intersection Magic using example crash data was provided by Pd’ Programming.
DKS was able to pursue an on-site demonstration of Intersection Magic at Washington County with actual ODOT crash data. It was easy to produce collision diagrams once the data had been converted and cleaned. However, the process of cleaning up the data required significant time and effort. According to Washington County, it takes a few months from when they receive the decode database until they are able to use the data effectively.

Conclusion: Rejected due to lack of corridor diagrams and data compatibility challenges.

5.1.5 Crash Magic

Crash Magic is the successor of Intersection Magic. Figure 2 shows an example collision diagram created using Crash Magic. This application is unique in that it is server-based and accessed using a web browser. The server portion of Crash Magic uses a SQL database and can read directly from the CDS. It has full support for all data fields in the CDS and can use calculated fields. Crash Magic can create collision diagrams at all standard intersection configurations and along corridors. Pd’ Programming has provided DKS with a custom demonstration of Crash Magic using a copy of the CDS database provided by ODOT.

Conclusion: Evaluate as possible solution.

5.1.6 Accident Information Management System (AIMS)

AIMS is produced by JMW Engineering. Figure 3 shows a collision diagram using the AIMS Google Earth module. The program can be made to read nearly any data format and should be compatible with the CDS. AIMS is module-based and users can purchase individual components to customize the application to their specific needs. The program creates collision diagrams that can be modified using a graphics editor. Using the editor, it can create diagrams at any intersection configuration and along corridors. However, it is not possible to edit a diagram after it has been created; users must rebuild the diagram each time to incorporate changes.

Some agencies interviewed expressed frustration with their implementation of AIMS. JMW Engineering was not able to adequately deliverer on promised features which resulted in a limited tool that could not be updated. In addition, the vendor was not willing to provide a demonstration of AIMS using either provided crash data or a generic data set without the purchase of a license.

Conclusion: Rejected due to no re-editing capabilities and lack of demonstration.
5.1.7 Traffic Collision Database (TCD)

Traffic Collision Database is produced by Crossroads Software. The program is designed to handle all aspects of safety analysis including data management, queries and reports, analysis of collisions, citations and DUIs. The collision diagram function within TCD is part of the reporting tool and is based on street name intersections. It can create collision diagrams at intersections and midblock. Figure 4 shows a typical collision diagram using TCD.

While none of the state DOTs surveyed and no public agencies in Oregon use TCD for creating collision diagrams, the City of Vancouver does. They have found the application easy to use and very productive. The city manually enters crash data from local police reports with all collisions coded by intersection and an estimated offset distance. However, TCD does not work perfectly for the city: adding new streets and commercial driveways has been difficult and adding crash data at interchanges with multiple connection points is confusing.

TCD requires a GIS street layer to create a network of intersections. Streets with the same name in different cities will create conflicts. TCD does not include an interface to differentiate jurisdictions so another field, such as collision date, will need to be used for a unique area identifier. There was no demonstration available and the vendor was unresponsive in pursuing a statewide implementation.

Conclusion: Rejected due to significant challenges using a statewide data source and lack of demonstration.

5.1.8 Highway Safety Analysis (HSA)

Highway Safety Analysis is produced by X32 Group. The program is based within Microsoft Access and uses queries to create reports and summaries. The collision diagram editor allows users to create diagrams using a background graphic and a drawing sequence. This allows the program to create collision diagrams at intersections and midblock. Figure 5 shows a collision diagram created using HSA. A demonstration of Highway Safety Analysis 3.0 with a small set of example data was provided by X32 Group. HSA only uses crash data located by intersection and does not support a linear referencing system for crash locations. Since the majority of collisions of interest to ODOT are along state highways located by milepoint this eliminates HSA from further consideration.

Conclusion: Rejected due to incompatibility with CDS.
5.1.9 RoadSoft GIS

RoadSoft GIS is produced by Technology Design Group and is an integrated solution for roadway asset management and safety analysis. A collision diagram tool, shown in Figure 6, is included as part of network screening. However, the diagrams produced by RoadSoft GIS do not allow for the high level of customization required by ODOT. **Conclusion: Rejected due to limits of basic collision diagramming function.**

5.1.10 Traffic Engineering Software (TES)

Traffic Engineering Software is produced by TES Information Technology and is an all-in-one solution for all traffic engineering data. This program is designed to manage all roadway transportation data including infrastructure, sign inventory, GIS information, traffic studies, & counts, and collision & safety data. It is possible to create basic collision diagrams within the collision analysis module. However, as shown in Figure 7, the collision diagrams are simple and do not support a high level of customization. **Conclusion: Rejected due to limits of basic collision diagramming function.**

5.1.11 SafetyAnalyst

SafetyAnalyst is a set of tools currently in development through a cooperative effort of the Federal Highway Administration with 27 state transportation departments and public agencies. The program is designed to analyze the physical portion of a road system and identify accident patterns. The diagnosis tool within SafetyAnalyst can create collision diagrams at specified locations. Select commercial collision diagramming packages, including Crash Magic, will be able to interact with and modify these diagrams. SafetyAnalyst will not be available for distribution until July 2009. **Conclusion: Rejected, not yet available.**

5.1.12 Crash Zone

Crash Zone is used by law enforcement agencies, including the Oregon State Police. The program is primarily used by Accident Reconstructionists and is
designed to create 3-d models and time-position diagrams of individual collisions like in Figure 8. Crash Zone cannot be used to analyze collision trends from a crash database.

Conclusion: Rejected, will only plot individual crashes.

5.1.13 Vista FX

Vista FX is produced by Visual Statement, and like Crash Zone, is primarily used by law enforcement agencies to diagram individual collisions. Figure 9 shows a typical collision diagram in Vista FX. The program does not support the type of collision diagrams that would be used to summarize the history of crashes at an intersection.

Conclusion: Rejected, will only plot individual crashes.

5.2 In-depth Evaluation

Four of the 13 collision diagramming tools investigated were selected for further evaluation. These are: 1) continue using MicroStation to manually draft the collision diagrams, 2) update CrashViewer, 3) develop a custom plug-in for MicroStation to automate some of the diagramming tasks, or 4) use Crash Magic.

Each alternative was given a score of 1 to 5 (poor to excellent) in the categories of user interface, output quality, data integration, speed and cost. User interface includes the program user-friendliness and how easy it will be for people to learn. Output quality covers how accurately the diagrams represent the actual crash data, how easy it is to understand the collision diagram and the features available for updating or editing saved diagrams. Data integration describes the link between the source data and the collision diagram, as well as how easily these are reconciled. The speed ranking is based on how long it should take to create a collision diagram for any given location. Cost includes the total operating expenses expected to implement and maintain the system. The score of each collision diagramming tool is based on the average performance in each of these five categories.

5.2.1 MicroStation

This is the existing program used by the CAR Unit to create collision diagrams. There are several advantages to continuing to use MicroStation. Users are familiar with the application and diagramming process. Drafting collision diagrams allows for a high level of customization to the roadway layout and placement of crash icons. It is also the least expensive option because all of the licensing is already in place for the CAR Unit and requires no additional end-user training.

However, the CAR Unit is having difficulty fulfilling the large number of data requests in a timely manner using this method. There is no direct link between the crash data and the collision
diagram so each crash icon must be verified against the crash data. This requires a significant amount of time to be spent on each diagram. Using MicroStation as the primary collision diagramming tool will result in a continuation of the existing problems facing ODOT.

For MicroStation to be used effectively as the primary collision diagramming tool for the CAR Unit, changes in procedures or staff allocation must be made. Since a large spike in demand for collision diagrams is created by regional traffic investigator’s annual report of SPIS locations, one possible solution is to temporarily increase the number of staff creating collision diagrams during these high-demand periods. The overall scores for MicroStation are shown in Table 4 below.

Advantages:
User Interface:
• Users are already comfortable with program
Output Quality:
• Produces the most representative collision diagrams
• Can design any roadway layout and vehicle directions
Cost:
• No additional training, no change in procedures
• Existing licensing for CAR Unit

Disadvantages:
Data Integration:
• No link between collision diagram and crash data
• Must reconcile crash icons against a crash summary such as a PRC report
• Not GIS compatible
Speed:
• Difficulty meeting collision diagramming requests within the desired time frame
Cost:
• Not licensed in all regions
• May require an increase in staff to keep up with demand

Table 4: Ranking for MicroStation

<table>
<thead>
<tr>
<th>User Interface</th>
<th>Output Quality</th>
<th>Data Integration</th>
<th>Speed</th>
<th>Cost</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3.4</td>
</tr>
</tbody>
</table>

5.2.2 CrashViewer

CrashViewer has many challenges that would need to be addressed before it could be used as an effective collision diagramming application at ODOT. The two most significant problems are that the program cannot process the data format in the current PRC reports and there has been a history of reported problems with the application. Even if all of the data processing issues are addressed, the user interface is awkward and difficult to learn. In addition, CrashViewer can only interpret collision data that is coded by milepoint and that is available in a PRC report format. The program cannot plot crashes coded by intersection offset or geospatial coordinates. A major redesign would be required to address these issues. The overall scores for CrashViewer are shown in Table 5.
Advantages:
  Speed:
  • Quickly plots crash icons into the general locations

Disadvantages:
  User Interface:
  • Major editing functions are non-intuitive, difficult to learn
  • History of user dislike at ODOT
  Output Quality:
  • Intersection types are assumed based on crash data, no ability to handle less common designs such as 5-ways or roundabouts
  • Will only plot vehicle directions on a north-south-east-west grid
  Data Integration:
  • Cannot process data format from current PRC reports
  • Will only plots crashes coded by mile point from PRC reports
  • No link between collision diagram and crash data
  • Not GIS compatible
  Speed:
  • Some diagram cleanup/post-processing must be done in the editor
  Cost:
  • Requires an update to use PRC reports
  • Unknown development costs
  • Will require additional training, change in procedures
  • ODOT is responsible for all maintenance & support

Table 5: Rankings for CrashViewer

<table>
<thead>
<tr>
<th>User Interface</th>
<th>Output Quality</th>
<th>Data Integration</th>
<th>Speed</th>
<th>Cost</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

5.2.3 MicroStation Semi-Automation

It is not possible to fully evaluate how effective a semi-automation tool for MicroStation would be for ODOT because it does not exist and would require development. However, it is the only alternative that integrates current practices with a link to the database and crash data/diagram reconciliation. The North Carolina Department of Transportation (NCDOT) is using a custom system to increase diagramming speed and accuracy. Figure 10 shows the interface for MicroStation that NCDOT uses. Within MicroStation, the plug-in allows users to query the
crash database and generate a list of unique crash identifiers. A dialog box displays information for each individual collision in the list. The user can check the validity of the crash data, modify it as needed, and then place the crash icon on a roadway template in the proper location. An integrated process of data retrieval, verification and diagramming should be significantly faster than the current method used by ODOT.

The system used by NCDOT is not without its faults, however. Even though the system has been in development and active use, it does not yet have a fully integrated data query tool. A list of crash identifiers must still be gathered and processed outside of MicroStation. This list is then imported and used to query the crash database. In addition to the development of the plug-in application itself, NCDOT assembled a series of roadway templates to be used with this system. When building a new diagram, a roadway template must be selected manually and the location of crash icons must still be determined by the user. This allows for more freedom when assembling a new collision diagram, but also requires more time than a fully automated system.

Developing an in-house application to work within MicroStation carries a large risk. The end product could be easy to use and successful or it could be a difficult burden that achieves less than the desired results. In addition, the costs of custom applications are difficult to estimate. NCDOT developed their program entirely in-house; they were not able to produce an estimate of how many man-hours have gone into the project. The overall scores for MicroStation Semi-Automation are shown in Table 6.
Advantages:

User Interface:
- CAR Unit expressed strong interest in this solution during interview
- ODOT will be able to design the plug-in to own requirements

Output Quality:
- Can produce same high quality diagrams as current process
- Can design any roadway layout and vehicle directions

Data Integration:
- Incorporates crash data reconciliation into diagramming process

Speed:
- Should be faster than using MicroStation and PRC reports

Disadvantages:

User Interface:
- User must select the proper template and determine where to place crash icons
- Program will only be as good as it is designed & implemented

Speed:
- May not increase production speed enough to satisfy demand

Cost:
- Unknown development costs
- Will need to program the custom plug-in and create roadway templates
- Will require additional training, change in procedures
- MicroStation not licensed in all regions
- ODOT is responsible for all maintenance & support

Table 6: Rankings for MicroStation Semi-Automation

<table>
<thead>
<tr>
<th>User Interface</th>
<th>Output Quality</th>
<th>Data Integration</th>
<th>Speed</th>
<th>Cost</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3.4</td>
</tr>
</tbody>
</table>

5.2.4 Crash Magic

Crash Magic is the only commercial-off-the-shelf application that appears to meet the basic needs of ODOT. This is a proven program that is in use by several state departments of transportation, providing a low risk solution.

Like most commercial tools, Crash Magic will draw vehicle directions on a north-south-east-west grid. However, Pd’ Programming has stated that they will, upon license with ODOT, implement support for eight directions (including northwest, northeast, southwest and southeast). They will also create an interface to allow users to rotate crash icons within the collision diagram editor. The ability to create custom roadway templates will allow for a high level of customization and accuracy in collision diagrams.

Crash Magic supports a GIS interface through ArcGIS and a plug-in. However, it is only able to plot crashes that have geospatial data and only a small portion of the crashes in the CDS are geocoded. In order to utilize a GIS interface to its full extent, latitude and longitude data would need to be added to as much crash data as possible. Since many collisions of interest to ODOT
are currently coded by route/milepoint on state highways, it should not be difficult to define the location in geospatial coordinates as well.

For data values that are divided into separate fields, such as the latitude and longitude fields, Crash Magic can logically combine these together into a single entity. Calculated fields can work with two separate identifiers which could be used to isolate roadway names by jurisdiction and milepoint range.

Since Crash Magic is a web-based application instead of desktop program, the interface speed is a concern. The DOT survey received one comment that the program could sometimes be slow. This issue was discussed with Pd’ Programming and the crash database server and network speed were found to be common bottlenecks. The demonstration server had little speed optimizations for ODOT data and was accessed over an internet connection. With the database server on the local network and optimization for common data requests, Crash Magic should have significantly less delay.

Crash Magic is compatible with many of the systems already in place at ODOT. The program queries crash data directly from the CDS. If coding errors are found, diagrams read the new information and are immediately updated. The web interface can be configured to work with Windows Authentication; no additional login credentials are required. Pd’ Programming has designed Crash Magic completely compatible with SafetyAnalyst when it is released. While the final code for SafetyAnalyst code has not been released, Crash Magic already has the software hooks in place. This includes support for Simple Object Access Protocol (SOAP) which will allow Crash Magic to be called directly from SafetyAnalyst. Once the code is released Pd’ Programming will be able to finalize their integration code.

The standard licensing fee calculation from Pd’ Programming for a state DOT is $12,000 per region. This would be a $60,000 one-time fee for agency-wide use. One year of software updates and single-contact technical support is included in the initial license fee. All application and end-user technical support must flow a designated single point of contact at ODOT. The person selected as the contact effectively serves as the first level of technical support for Crash Magic within ODOT. After the first year it is $12,000 a year if ODOT wishes to continue with second-tier support and software upgrade services. There is also a one-time $3,000 configuration cost to adapt Crash Magic to the ODOT crash data format. Significant changes in the CDS structure may require a new configuration of Crash Magic. On-site training can be provided by Pd’ Programming at an additional cost. ODOT would be responsible for the database server maintenance and administration.

Public agencies in Oregon can purchase a license for Crash Magic at $12,000 each plus $3,000 configuration if they want to run their own server and use the annual decode database from ODOT. Users outside of ODOT may be able to use ODOT’s Crash Magic server, possibly through a Virtual Private Network (VPN) over the internet, but it will be slower than a local network system. The overall scores for Crash Magic are shown in Table 7.
Advantages:

User Interface:
- Can easily modify existing collision diagrams to assist in identifying trends (DUI, night/day, weather, etc)
- Region Traffic Investigators can create their own collision diagrams

Output Quality:
- Can create custom templates to match any roadway
- Supports eight vehicle directions
- Can save export collision diagrams in Portable Document Format (PDF) to email

Data Integration:
- Queries directly from Crash Data System
- Can verify crash data within the diagram editor at any time, even at a later time
- GIS compatible when using geocoded crash data

Speed:
- Can quickly produce collision diagrams

Cost:
- Proven system used by many DOTs; lower risk solution
- Tech support provided by vendor

Disadvantages:

Data Integration:
- Requires geospatial data for all crashes to use GIS interface

Speed:
- Web interface is slower than a desktop application

Cost:
- $60,000 one-time licensing fee, $3,000 initial configuration, $12,000/year after first year for updates and second-tier technical support
- Will require additional training due to new program and new procedures
- CDS database server will need to be further optimized to handle Crash Magic requests efficiently

Table 7: Rankings for Crash Magic

<table>
<thead>
<tr>
<th>User Interface</th>
<th>Output Quality</th>
<th>Data Integration</th>
<th>Speed</th>
<th>Cost</th>
<th>Overall Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4.0</td>
</tr>
</tbody>
</table>

5.3 Evaluation Conclusion

The alternatives were ranked by the overall scores in the categories of user interface, output quality, data integration, speed and cost; this is shown in Table 8. Based on these rankings, Crash Magic best meets the needs of the CAR Unit. Creating a custom application to automate many of the tasks in MicroStation could also be a good solution, but carries a significant risk as the application would need to be developed and the costs are unknown.
Table 8: Ranking of Final Alternatives

<table>
<thead>
<tr>
<th>Application</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash Magic</td>
<td>4.0</td>
</tr>
<tr>
<td>MicroStation</td>
<td>3.4</td>
</tr>
<tr>
<td>Semi-Automation</td>
<td>3.4</td>
</tr>
<tr>
<td>MicroStation</td>
<td>3.4</td>
</tr>
<tr>
<td>CrashViewer</td>
<td>2.0</td>
</tr>
</tbody>
</table>

6 RECOMMENDED NEXT STEPS

Based on the detailed evaluation of each alternative and considering the collision diagramming challenges facing the CAR Unit and the regions, we recommend that ODOT pursue an implementation of Crash Magic from Pd’ Programming as the preferred alternative. One person from the CAR Unit should be identified to coordinate the initial installation of Crash Magic and to serve as the common contact point for all technical support. ODOT should request on-site training from Pd’ Programming to familiarize CAR Unit personnel with Crash Magic. Since many public agencies in Oregon rely on ODOT collision data, they should be invited to consider adopting Crash Magic. This will reduce the level of effort required at each agency to convert the crash data into a usable format.

The CAR Unit must be allowed enough time to become familiar with the new procedures before the annual requests of collision diagram of SPIS sites from region traffic investigators. MicroStation as the primary collision diagramming tool should be phased out as CAR Unit personnel become familiar with Crash Magic. The MicroStation templates and cell files currently in use should be maintained until they are no longer needed.

The staffing at the CAR Unit may need to allocate more personnel for creating collision diagrams during peak data requests from region traffic investigators. If possible, region traffic investigators should consider becoming familiar with Crash Magic and produce their own collision diagrams as needed.
**APPENDIX A: LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIMS</td>
<td>Accident Information Management System</td>
</tr>
<tr>
<td>CAR</td>
<td>Crash Analysis and Reporting</td>
</tr>
<tr>
<td>CDS</td>
<td>Crash Data System</td>
</tr>
<tr>
<td>COTS</td>
<td>Commercial off The Shelf</td>
</tr>
<tr>
<td>DUI</td>
<td>Driving Under the Influence</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>HSA</td>
<td>Highway Safety Analysis</td>
</tr>
<tr>
<td>HSIP</td>
<td>Highway Safety Improvement Program</td>
</tr>
<tr>
<td>NCDOT</td>
<td>North Carolina Department of Transportation</td>
</tr>
<tr>
<td>ODOT</td>
<td>Oregon Department of Transportation</td>
</tr>
<tr>
<td>PDF</td>
<td>Portable Document Format</td>
</tr>
<tr>
<td>SDC</td>
<td>State Data Center</td>
</tr>
<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
</tr>
<tr>
<td>SPIS</td>
<td>Safety Priority Index System</td>
</tr>
<tr>
<td>TCD</td>
<td>Traffic Collision Database</td>
</tr>
<tr>
<td>TES</td>
<td>Traffic Engineering Software</td>
</tr>
<tr>
<td>VPN</td>
<td>Virtual Private Network</td>
</tr>
</tbody>
</table>
APPENDIX B: CONTACT INFORMATION FOR VENDORS

**Pd' Programming**

Pete d'Oronzio  
pete@pdmagic.com  
(303) 666-7896

**JMW Engineering**

Shui-Ying ("Ying") Wong  
wong@jmwengineering.com  
(703) 503-3219

**Crossroads Software**

Jeff Cullen  
jcullen@crossroadssoftware.com  
(714) 990-6433

**North Carolina Department of Transportation**

Brian Murphy  
bgmurphy@ncdot.gov  
(919) 773-2898
APPENDIX C: SURVEY OF STATE SAFETY PROFESSIONALS

Online Survey Form

A Survey of Collision Diagramming Practices

1) Please provide your contact information. This will only be used for follow-up questions and to categorize responses by state or agency. We will not disclose individual names in any printed material.

2) Which state do you work in?

3) What type of organization do you work for?

4) How often do you use or create collision diagrams?
   - Weekly
   - Monthly
   - A few times a year

5) How are the collision diagrams that you use prepared?
   - I prepare them myself
   - They are prepared for me

6) Which software is used to prepare the collision diagrams?
   - Accident Information Management System (AIMS) by JMW Engineering
   - Highway Safety Analysis by X32 Group
   - Intersection Magic (Crash Magic) by Pd’ Programming
   - Intersection Magic with Map Magic by Pd’ Programming
   - Safety Analyst by FHWA (still in beta testing)
   - Traffic Collision Database by Crossroads Software
   - Custom-built in-house tools
   - Drafting in CAD (AutoCAD/MicroStation/etc)
   - Not sure
   - Other (please specify)

7) If you answered "in-house" tool, may we contact you for a user manual or other documentation?
   - Yes
   - No

8) We would like to ask you for additional feedback about the software package or tool that was indicated in the previous question. Would you like to respond to these questions? We will not associate your name with these evaluations in any printed summary of the results.
   - Yes
   - No
9) How long have you been using this program?
   - < 1 year
   - 1 to 5 years
   - Longer than 5 years

10) How would you rate the software's ease of use/user friendliness?
   - Excellent
   - Very Good
   - Good
   - Fair
   - Poor

11) How would you rate your level of success using this software?
   - Excellent
   - Very Good
   - Good
   - Fair
   - Poor

12) What are some of the problems you encounter using it?

13) What do you like about this software package?

14) How well would you rate this software in terms of meeting all of your needs?
   - Excellent
   - Very Good
   - Good
   - Fair
   - Poor
   - No Experience

16) Do you know if your state has purchased a statewide license for software or tools to create collision diagrams?
   - Yes
   - No
   - Not Sure

17) Has your state or local agency conducted an evaluation or review of collision diagramming software?
   - Yes
   - No
   - Not Sure
18) If you have conducted your own evaluation, may we contact you for more information? Alternatively, email the report or memo to monsere@pdx.edu.
   ○ Yes
   ○ No

**Summarized Survey Results**

In order to allow these professionals to comment freely, without regard for repercussions from vendors or colleagues, all identifying information was removed from the survey results. In cases where there is only one or two responses on a specific tool the ratings of the tool are not displayed but are included in the average. Individual comments have been modified to fix spelling mistakes and to remove identifying references.

<table>
<thead>
<tr>
<th>Collision Diagramming Tool Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number Used</strong></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Intersection Magic/ Crash Magic</td>
</tr>
<tr>
<td>Custom or In-House Program</td>
</tr>
<tr>
<td>Draft in CAD</td>
</tr>
<tr>
<td>AIMS</td>
</tr>
<tr>
<td>HSA</td>
</tr>
<tr>
<td>RoadSoft GIS</td>
</tr>
<tr>
<td>Vista FX</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total/Average</td>
</tr>
</tbody>
</table>

6.1.1 **Survey Comments for Intersection Magic and Crash Magic**

*What do you like about this software package?*
- “Ability to use an aerial background image.”
- “Saves time, shows crash identification number and can save the diagram electronically.”
- “It concentrates on collision diagramming and does that well, better than the others last I checked. Our other tools handle the non-collision diagram related portions of analysis.”
- “The software itself is excellent and worked well as a COTS solution.”
- “It creates diagrams fast and shows extra symbols for severe crashes and DUI crashes.”
- “The diagrams are clear and usually error free. The filtering and other customization tools are very useful.”
What are some of the problems you encounter using it?

• “There are limitations on how many crash fields we can import from our crash database. This has been addressed in a future version. The program requires some expertise each year when the latest year’s crash data is loaded into it to make all the reporting features work properly. Currently, only one person at here has the knowledge to troubleshoot the program when necessary. However, Pd’ Programming is usually able to help.”

• “We are only able to print the collision diagrams, and are not able to email them. With Crash Magic we should be able to email the diagrams.”

• “Not always the best response time for questions or potential upgrades but, overall, the tool is excellent and works well with our mainline analysis tools.”

• “It is a web access application and sometimes is slow.”

• “The company is somewhat unresponsive at times.”

• “The software would randomly change individual crash types. For example, it would diagram a rear-end collision as a right-angle collision and it wouldn't do it consistently. Maybe that was just a glitch and has now been corrected.”

• “It will pull a crash into an intersection if the crash occurred within a certain radius of the intersection. This could be problematic in urban areas with a lot of access points and give an inaccurate picture of what is actually happening at the intersection.”

6.1.2 Survey Comments for Custom/In-House Tools

What do you like about this software package?

• “Nothing”

• “It is all automatic”

• “Free”

• “Intuitive, easy to use, specific to state crash data.”

• “Uncluttered format, link access to scanned reports, ability to quickly edit crash type by clicking on collision diagram template.”

• “The diagramming software (Visio) supports customized variations in the templates (intersections, sections) and allows users to move individual accident icons as necessary after the diagram is created.”

What are some of the problems you encounter using it?

• “If there are more than several hundred accidents in a small roadway section the diagram density makes it harder to display the accident data. Any corrections to errors found in the accident data cannot be saved back to the main database.”

• “Currently limited to intersection collision diagrams. Working to develop GIS-based corridor collision diagrams.”

• “Miscoded crash report data, internal program issues with plotting certain types of crashes.”

• “Conveying information graphically for existing crashes. Time required developing.”

• “Some crash diagrams need to be checked, but limited.”

• “Mainframe based; out-of-date”

• “Corrections cannot be sent back to the main database.”
APPENDIX D: ODOT INTERVIEW NOTES

Robin Ness, Sylvia Vogel & Chuck Jenkins

Considerations for Collision Diagrams:

1. Multiple request at same time of year (SPIS & other annual reports)
2. 100+ sites/some requests
3. Multi-year data in one diagram
4. Roadway alignment or configuration change
5. Crash data complexity/coding methodology
6. Roadway jurisdiction locations

Who requests/receives collision diagrams?

Cities/counties, SPIS are majority, also safety corridors and work zones from the transportation safety division.

SPIS requests may include multiple intersections:
Roadways may change in the 5 years, coding for roadway positions may change.
Example: A highway becomes divided with a median, the lane definitions/codes change.
It requires a human who understands what/when/where this occurred.

How many diagrams are requested?

8000/year for all data; collision diagrams are the most time intensive. Sometimes there are specialized reports for access points/etc.

What is the expected turnaround?

2-3 weeks. Getting this info to regions in time frame they want is a big challenge. The timeline is set by federal reporting requirements.

What happens if you are unable to fulfill the requests?

They take longer than expected.

How are collision diagrams currently created?

MicroStation

Do you have any experience using other collision diagramming tools? What software packages or methods?

No. Sylvia would much prefer the automation of CrashViewer if it could read the current PRC report format.
Do you re-use or update drawings or always create new ones?
   If possible they do reuse old diagrams and update/delete/add as required. However, they
do not often receive multiple requests for the same location. Sylvia has copies of all
diagrams she has created.

Do you have any special needs for the compatibility of the output?
   No, just need something. Visio 2002 was selected for CrashViewer because it can save
in a format compatible with MicroStation.

When creating diagrams do you need to verify each crash at each location?
   Yes

How long does it take to produce a diagram of a single location?
   12+ crashes per hour is the general rule, Sylvia can do many more than that now with her
experience. A complicated location may take 3 hours including review.

How long does it take to create a diagram in CrashViewer compared to MicroStation?
   CrashViewer requires the same data review, that is most of the time.

What do you wish you could do with your program that you can’t?
   What CrashViewer does – the mainframe used to. However, it required a manual prep of
the PRC report.

What is the common name for the live crash database?
   Crash Data System (CDS)

What format is the data?
   The CDS database is in Sequel, highways are milepoint based, cities are node/offset, and
all new crashes include lat/long. Chuck has a conversion tool that calculates lat/long
from the other formats.

Is the database fully MMUCC (Model Minimum Uniform Crash Criteria) compliant?
   Most objects are compliant, not 100% but very high.

Is Information Services involved in any way with the database?
   IS does the server portion, CAR Unit does the QA & reports.

How do users access the data?
   The PRC reports have all of the data needed to create collision diagrams. The decode is
an extract of the database.
Are PRC reports via TransViewer from the live crash database?
Yes

Is this the same data that public agencies receive?
They receive the decode database.

What are the quality control procedures for the crash database?
The problems are often with the interpretation of the data. Z segments are a common problem, as is negative mileage. They are building rules into the database to counter these issues.

How can errors in the database be resolved?
When errors are identified they are corrected.

How does the data process work?
Data comes from the DMV. ODOT codes accident and make sense out of it.

What is needed to run CrashViewer?
CrashViewer requires Visual Basic 6 runtime files and Visio 2002 Pro.

Can it be used with the current PRC reports from TransViewer?
It is not compatible with the PRC reports. The arrangement of the columns and the format of some data types have changed from numerical to alphabetic or the other way around.

How fast can CrashViewer create a collision diagram?
10 miles/minute, very fast to produce the diagrams. However, the diagrams still require the users to review the PRC reports to verify that all of the information is correctly displayed.

What has CrashViewer not been able to do? What problems still exist?
- People not using it.
- Database changes made it incompatible.
- People do not want to check the data & reconcile it. Users do not want to do data review.
- Source data is extremely complex, too complex for most programs.
- CrashViewer only uses mile point; also need to do collision diagrams using other reference systems (non-MP).
- The largest number of descriptions of a location determines how the diagram is laid out. This may not be representative of the actual location.
- No support for Y intersections, roundabouts, and 5 way intersections. These are often in Portland where the street layouts can be very complex.

Can these problems be realistically addressed?
Many minor annoyances can be addressed.

How often does CrashViewer need to be updated to accommodate changes?
Chuck would prefer to rebuild CrashViewer. One module to read source data, another module to produce the collision diagrams. That way if the source data changes there is no need to rebuild the entire program.

How much time is spent maintaining CrashViewer?
Not enough time to work on it, not sure.

How much time would be needed to make CrashViewer compatible with the new PRC reports?
Chuck does not know how long that would take.

**Janet Lundeen, Traffic Investigator**

Do you create collision diagrams?
Yes

What do you use the collision diagrams for? (Public meeting, diagnosis, investigations?)
Currently use collision diagrams to aid traffic investigations of SPIS reports. She may use them for Public meetings if needed.

How many years of data do you typically include in a diagram?
Last 5 whole years that data is available.

What type of drawing views do you use? (Intersections, corridors, strip maps, pin maps?)
Usually intersection views but sometimes corridors if the intersections are close together.

What types of filters do you use in diagrams? (Severity, collision type, age or weather?)
No filters – all crashes are displayed.

How important is an exact representation of the intersection to your analysis? (Google maps or GIS versus traditional pictorial representation of crashes)
It is often not possible to use exact representations of intersections due to the large number of collision icons. Often diagrams are created with a aspect ratio other than 1-1. She makes sure the North arrow has the correct alignment.

How do you create collision diagrams? (Special software/hand drawn/GIS/CAD/from other group)

She uses MicroStation to create all of her collision diagrams.

CrashViewer users initial questions:

Have Visio installed to use CrashViewer but have never used it

How would your rate the software’s ease of use/user friendliness?

It is easy for her to use because she has a lot of experience with it.

What do you like about this software package?

She likes the familiarity of the program.

How would you rate your level of success using this software? Does the software meet all of your needs?

What do you wish you could do with the program that you can’t?

No – she can do everything she wants with MicroStation. She can be very detailed with the way she displays the intersections and crashes.

What about the ability to view original crash reports instead of crash code only?

Sometimes she has questions about a particular crash and how it was coded. If she were able to interpret the original report it might save time in clarifying the situation instead of waiting for an email back from Sylvia.

Ability to analyze crash data such as queried crash lists, top crash locations, etc?

She only uses collision diagrams to investigate intersections and uses the SPIS list to decide which intersections need attention. She does not require this feature to be built in.

How do obtain crash data? (Paper or PDFs of crash list, database file, live database connection, online via TransViewer from Intranet?)

She get her data from the crash database using TransViewer on the ODOT website.

Do you augment the ODOT crash data with police reports or other data?
If she has problems interpreting a specific crash she may look to the OSP website and find more details. She does not add in additional collisions – only uses it to clarify the one she is already plotting.

**Do you have any problems with the crash location coding? (lat/long, milepost, node/offset?)**

The coding of continuous left turn lanes is an ongoing problem. Also occasional problems with incorrect coding of the quadrant the crash occurred in. She is able to locate the general location without any problems.

**May I contact you again in the future to discuss collision diagrams?**

We may contact her again in the future if we have any more questions.

**KC Humphrey, Traffic Safety Advocate, Region 1**

**Do you create collision diagrams?**

No

**What do you use the collision diagrams for? (Public meeting, diagnosis, investigations?)**

He uses collision diagrams for assisting in the investigation of top 5% crash locations (from SPIS list). In recent years he has only received a small portion of the collision diagrams that he has requested from the ODOT crash unit; he does not have the time himself to create the collision diagrams. He relies on other tools in place of collision diagrams for much of his analysis.

**Do you know the name of the software used to create the diagrams?**

He does not know what they use to produce the collision diagram.

**Are there any shortcomings with the collision diagrams given to you?**

He only receives a small fraction of the diagrams he requests.

**Do you have any experience using collision diagramming tools? What software packages or methods?**

No.

**What about the ability to view original crash reports instead of crash code only?**

He does not have time to read through all of the 50,000 crash reports at 250 locations.

**Do you have any problems with the crash location coding? (lat/long, milepost, node/offset?)**
There are many problems with the crash coding. Crash locations are systematically miscoded, often mixing up mile post location and z-location. The location codes make it difficult to interpret where in the roadway crashes are occurring. It is difficult to understand car-bike crashes, why is the bike not considered “vehicle 2?”

*Additional comments:*

- When the crash unit is creating collision diagrams he does not understand why they do not create collision diagrams with a layer for each year of data. For repeat locations they could easily add the next year of data and remove the 6th year of data instead of creating an entirely new collision diagram.

- One of his supplemental tools is a summary chart created in Excel by a macro that connects to the crash data. It shows both graphically and in tables the statistics for a specified location. It also includes a diagram of the direction of crashes. He sent a few examples to us to look at.

- They only have 6 weeks from the release of the SPIS data to when the federal report is due. For Region 1 that includes 50,000 incidents at 250 locations. He needs a way to quickly summarize the problems at each location and move on. He does not have time to create collision diagrams for each location but if he were given the collision diagrams they would help him analyze the location.

**Kathi McConnell, Traffic Investigator, Region 2**

*Do you create collision diagrams?*

Yes. The crash unit can’t make them fast enough.

*What do you use the collision diagrams for? (Public meeting, diagnosis, investigations?)*

To aid in the investigation of the top SPIS sites in her region. Sometimes she will make a simplified diagram using colored dots instead of hieroglyphs to take to public meetings.

*How many years of data do you typically include in a diagram?*

The diagrams have 5 years of data in them in an attempt to identify crash patterns; the SPIS only looks at the past 3 years.

*What type of drawing views do you use? (Intersections, corridors, strip maps, pin maps?)*
Depends on the site, sometimes intersections, sometimes corridors, sometimes a section of a curve (displayed as a straight roadway).

*What types of filters do you use in diagrams? (Severity, collision type, age or weather?)*

No filters – shows all crashes.

*How important is an exact representation of the intersection to your analysis? (Google maps or GIS versus traditional pictorial representation of crashes)*

No need for an exact representation. A skewed roadway diagram is fine as long as the north arrow points north and she can determine where the crashes occurred when she takes the diagram into the field.

*How do you create collision diagrams? (Special software/hand drawn/GIS/CAD/from other group)*

MicroStation

*CrashViewer users initial questions*

Does not use CrashViewer – previous investigator tried it and it was a big mess that required nearly as much work. At least with MicroStation there is more customization.

*How would your rate the software’s ease of use/user friendliness?*

Using MicroStation is very time consuming.

*What are some of the problems you encounter using it?*

Have to manually read coding details for each incident.

*What do you like about this software package?*

Familiarity and experience with MicroStation. She can copy/paste from other collision diagrams.

*How would you rate your level of success using this software? Does the software meet all of your needs?*

*What do you wish you could do with the program that you can’t?*

Any features in other programs that you have used that you wish you had?

She would prefer that the program would read the data directly and create the collision diagrams for her.

*What about the ability to view original crash reports instead of crash code only?*
More information is better. She often requests the original reports for fatal crashes anyway.

*Ability to analyze crash data such as queried crash lists, top crash locations, etc?*

She uses SPIS to determine which sites to investigate.

*How do obtain crash data? (Paper or PDFs of crash list, database file, live database connection, online via TransViewer from Intranet?)*

She uses TransViewer to access ODOT crash data.

*Do you augment the ODOT crash data with police reports or other data?*

Not to add to the collisions but to find more details about specific incidents.

*Do you have any problems with the crash location coding? (lat/long, milepost, node/offset?)*

The coding has lots of errors in it with travel direction, lane, etc. Clarification is often needed because the original coding simply does not make sense.

*Does your source data require any cleanup before you can use it to create diagrams?*

We may contact her in the future if we have more questions about collision diagrams.

**Doug Bish, Traffic Eng. Supervising Manager**

*Do you create collision diagrams?*

He doesn’t make full collision diagrams.

*How do you create collision diagrams? (Special software/hand drawn/GIS/CAD/from other group)*

He will sketch out a quick diagram in the corner of the PRC reports to get a visual idea of what is going on. He knows it takes too long to request collision diagrams from the crash unit so he does not bother to ask. He would like to make his own collision diagrams if it were fast and easy.

*Have you used CrashViewer?*

He tried to load CrashViewer to try it out and could not get it to work. He asked Tim Burks if he could get it to work and Tim was unable to get CrashViewer to function properly.
Do you have any experience using collision diagramming tools? What software packages or methods?

He does not have any experience with commercial tools such as Intersection Magic or Crossroads.

**Information Services**

**6.1.3 Dan Wells, Manager of Maintenance and Support, Transportation and Development**

*Summary of call:*

The department he manages only supports custom applications that they have written. They do not do end user support. Chuck Jenkins handles all of the support for CrashViewer; it requires continual updates since changes in Microsoft applications often breaks it.

For new programs: the application first goes through the “I-Care process” which evaluates the programs compatibility with existing ODOT applications. The I-Care process gets passed around and he does not know who the current contact is for that program. The Help Desk handles the end user support for common applications such as Microsoft Office.

**6.1.4 Shawn Freilinger, Client/Server Resource Team Lead**

*From email:*

The requirements would depend some on whether ODOT was supporting the actual code or if it was a vendor supplied and supported application. It sounds like you are evaluating vendor applications so I am going to go on that assumption.

Here is some basic desktop and database requirements:

1. Operating System: Windows XP SP2
2. Standard Database platform: SQL Server 2005
3. We typically avoid MS Access based applications
4. Security: We have a single sign-on policy so it should use Windows Authentication to access the database

5. Standard Browser: IE6 but Firefox is used by some.

Server Requirements: The server group or State Data Center (SDC) could answer this better but the following is what I understand (I have CC’d the team lead for the server group)

2. Web Server: IIS 6
3. There may be more that Dan Hande or the SDC can provide?

Vendor support:

1. If it is a COTS (Commercial Off The Shelf) product, the vendor would support code changes.
2. We have on site DBAs but they typically do very little to the COTS applications
3. We may be interested in installation support (Dan Hande question)
4. We may need an interface developed to allow connectivity of our crash data system to the vendor system. It could be an option for them to provide that connectivity.
5. Training: Typically the business would seek training from the vendor if it is needed.

Potential Issues:

1. There may be an issue if a server is required. A server request would go through the SDC and this has caused some delays in the past.

6.1.5 Dan Hande

From email:

From a server perspective I'll just add the following:

ODOT server hardware and O/S are now managed by the Oregon Dept of Admin Services' State Data Center. Their strategy is to deploy virtual servers on VMWare ESX platform running on IBM server hardware. Storage is maintained on a Hitachi SAN, attached via HBAs to the VM host server. If conditions warrant something other than a
virtual server, IBM blade servers or traditional IBM servers are options. Resource allocation (CPUs, RAM) is dependant upon the application requirements.
APPENDIX E: LOCAL AGENCY INTERVIEW NOTES

Washington County

Stacy Shetler, Traffic Analyst:

**Do you create or use collision diagrams?**

Washington County creates and uses collision diagrams.

**What is the primary use of the collision diagrams? (Public meeting, diagnosis, investigations)**

All of the above. They use them for conveying crash histories to the public, investigating complaints, capital and maintenance project development, development review, safety warrant analysis. They use a SPIS list to summarize the highest crash rate intersections and to classify those as existing hazardous intersections. When developers or consultants work on a project they will look at the SPIS list & collisions diagrams to see if it involves one of the identified intersections and propose safety improvements.

**How often do you create collision diagrams?**

Daily

**How many years do you typically include in a diagram?**

Diagrams are usually 3 years of data to match the 3 year SPIS period. By the time they receive the crash data from ODOT it is 12 to 18 months out of date. They have about 6 years of quality data and older data sets going back to the 80s.

**Is it more common to create intersection or corridor (strip maps) diagrams?**

They exclusively create intersection diagrams. A street order hasn’t been established to utilize the corridor diagramming tools provided in the software. Crashes off the state hwy system are coded by street, cross street, distance from intersection. Crashes on the state hwy system are coded by highway number, mile point. Street names are not included for these records. They would like to create corridor diagrams if the data was in one referencing system and conducive for this application.

**What types of filters would you like to see for the diagrams? (Severity, collision type, age or weather)**

Their current diagramming software can filter on any of the fields imported from the ODOT data. That includes collision type, age, weather, or whatever. They often use a distance filter at 265 ft for SPIS qualification. One problem currently is that the diagramming software is limited in the number of fields it can import. Therefore not all the ODOT data fields can be imported.

**How important is an exact representation of the intersection to your analysis? (Google maps or traditional pictorial representation of crashes)**

It is very dependant on what they are using the collision diagram for. Crash diagrams are used in conjunction with aerial photos to determine if the crashes were at the intersection or a driveway/access nearby. In general it is not critical to be exact, but enough information to the analysis to be useful.
How do you create or obtain collision diagrams? (Special software/hand drawn/GIS/CAD/from other group)

They use Intersection Magic Software 6.7.2.5 for the data that comes from ODOT, then hand draw any supplemental crashes that they find in their files that come from the sheriff’s office and local police departments.

How long have you been using this program?

The county has been using it for about 10 years. Stacy has been using it for about 3 years.

How would your rate the software’s ease of use/user friendliness?

The interface and basic functions are easy to use. It is a 3 on a 1-10 (easy-hard) scale. Making sure the user captures all the crashes for the intersection can be tricky because the ODOT street names sometimes have the prefix and or extra spaces between the prefix and street name. Also any data coded by hwy, mile point is inaccessible unless the case id number is known. The software itself can be as difficult as you want once you get into the more advanced features such as scripting.

What are some of the problems you encounter using it?

Intersection Magic truncates to ordinal directions: NW becomes N, etc. It is not possible to show an intersection that is not on the north/south-east/west layout. The input fields are limited – the crash data supplied by ODOT has more fields than Intersection Magic can handle so they must leave information out. The pictorial representation of the crashes can be moved but not rotated or changed. Because of this they cannot fix the direction of a crash if it is not correct. The program is currently undergoing a rewrite and they hope that it will address some of these issues.

Where do you obtain your crash data? (ODOT, in-house, police data?)

Use the crash data from ODOT. Some hardcopy police records are used to supplement. They will create the diagrams using the ODOT data then look at the police records to see if any of those are relevant. Not all of the police agencies send the county copies of their crash reports, however.

How do obtain crash data? (Web based? ODOT Decode Access database? In-house database or tool? Paper or PDF copies of ODOT crash forms?)

The data from ODOT comes yearly in the Decode Access database. Intersection Magic programmers created, for a fee, a data preparation program that enables the ODOT data to be imported. ODOT stopped sending the large paper crash data books.

Do you have any problems with the crash location information? (lat/long, milepost, node/offset?)

They have many problems with location data. Washington County uses a numbering system for crash locations. Cities use node/offset in feet. Counties use MP offset in 1/100th of a mile. Crashes off the state hwy system, beginning in 2007 are being coded by latitude & longitude to identity crash locations which will help with this problem. Crash data in Oregon is reported from citizens involved in the collision and sometimes they do not know exactly where they were so they get it wrong.
Due to the field limitations of Intersection Magic connection number is not imported from the ODOT data. Connection number is needed to know what ramp the crash data is referring to.

ODOT’s street numbers can be different depending on what political jurisdiction the crash occurred. If the ODOT coder selects the wrong jurisdiction, then the wrong street name is loaded into the record. The causes records to have streets and cross streets locations that don’t exist.

**Does your source data require any cleanup?**

Yes, the data set requires an immense amount of cleanup to be usable. They go through all the data coded to highway and mile point and assign street and cross streets. They go through all the records that are at locations that don’t exist and change them. The street names are not normalized as some years the prefixes were used and sometimes not. The distance from intersection field is changed to feet from 100ths of a mile.

**Do you have to fix (modify) the drawing things after the collision diagrams are created?**

The individual crashes can be moved around once the diagram is created. When there are a lot of crashes, the data overlaps on the page and it is manually adjusted. Intersection Magic interprets the data as in the database. If there are problems with the data, then there will be problems with the diagrams.

**Do you have any experience using other collision diagramming tools? What software packages or methods?**

No. The vendor for Crossroads demonstrated the software but they have not used it. Washington County does not use Map Magic with Intersection Magic for GIS.

**May I contact you again in the future to discuss collision diagrams?**

They offered DKS the option to drop by sometime and take a look at how they use Intersection Magic. DKS went to the county and spend a few hours looking at the program and discussing it with Stacy.

**Clackamas County**

Rick Nys, Traffic Engineer

**Do you create or use collision diagrams?**

A technician creates collision diagrams as needed.

**What is the primary use of the collision diagrams? (Public meeting, diagnosis, investigations)**

Clackamas County will often only create collision diagrams at intersections that have enough incidents to warrant further study. They will not create collision diagrams for areas that have a low level of crashes. Collision diagrams are commonly used as an aid in explaining concepts to the public and are sent out to the public if requested.

**How often do you create collision diagrams?**

Only when warranted.
How many years do you typically include in a diagram?

3-5 years worth of data.

Is it more common to create intersection or corridor (strip maps) diagrams?

They will create either intersection or corridor diagrams depending on what they are investigating.

What types of filters would you like to see for the diagrams? Such as severity, collision type, age or weather?

They put a summary table by crash severity at the bottom of the diagrams.

How important is an exact representation of the intersection to your analysis? (Google maps or traditional pictorial representation of crashes)

They use a traditional pictorial view of intersections. They cannot precisely locate crashes from their data so that is good enough.

How do you create or obtain collision diagrams? (special software/hand drawn/GIS/CAD/from other group) How long have you been using this program?

Sometimes they create diagrams by hand, most of the time they use an in-house Excel macro tool to create the diagrams.

Where do you obtain your crash data? (ODOT, in-house, police data?)

They use the ODOT crash data and supplement that with sheriff crash records.

How do obtain crash data? (Web based? ODOT Decode Access database? In-house database or tool? Paper or PDF copies of ODOT crash forms?)

They receive the printouts and an Access file from ODOT. From the Sherriff they get their data in PDFs if it is an open investigation, paper printouts if the investigation is closed.

Do you have any problems with the crash location information? (lat/long, milepost, node/offset?)

Their roads are coded by milepost so they do not have problems with the ODOT crash data. The location problems they have are due to people reporting crashes incorrectly – where the description of the location does not match the milepost in the report.

Does your source data require any cleanup?

They do not need to do any cleanup or modifications to the ODOT data to make it usable.

Do you have to fix (modify) the drawing things after the collision diagrams are created?

Sometimes the output from the Excel macro will bunch things into a corner and those need to be moved to make the diagram readable.

Do you have any experience using other collision diagramming tools? What software packages or methods?

They have used Intersection Magic in the past. They felt it was not worth it.
City of Gresham

Jay McCoy, Traffic Engineer:

By voicemail:

Gresham does not do a lot of collision diagrams due to the fact that there are not many accidents at specific locations in Gresham. They do review the ODOT crash data but not plot the data. If a tool were available that would automatically create collision diagrams from the ODOT database they would use it. Please contact Jim Gelhar who may have a different perspective.

Jim Gelhar, Civil Engineer:

Do you use or create collision diagrams?

Yes, the city creates collision diagrams.

What is the primary use of the collision diagrams? (Public meeting, diagnosis, investigations)

They use it for in-house analysis and visual confirmation of crash lists.

How often do you create collision diagrams?

They normally create a collision diagram about once a month; interns create collision diagrams for the top 20 intersections once a year.

How many years do you typically include in a diagram?

3 years

Is it more common to create intersection or corridor (strip maps) diagrams?

They only create the intersection diagrams. They do not have any automatic tools to create corridor diagrams.

What types of filters would you like to see for the diagrams? (Severity, collision type, age or weather)

No filters, they show all crashes

How important is an exact representation of the intersection to your analysis? (Google maps or traditional pictorial representation of crashes)

For their use it is not very important. Currently all crashes within 50 feet are grouped together graphically.

How do you create or obtain collision diagrams? (special software/hand drawn/GIS/CAD/from other group)

They built a custom in-house tool that runs in Excel and links to an Access database. It uses MS Drawing tools to build the collision diagrams.

How long have you been using this program?

About 3 years.

What do you like about this software package?
It is a good time saver and much faster than using CAD to draw the collision diagrams.

Where do you obtain your crash data? (ODOT, in-house, police data?)

They exclusively using the crash data from ODOT and receive updates about a year. No local data is used.

How do obtain crash data? (Web based? ODOT Decode Access database? In-house database or tool? Paper or PDF copies of ODOT crash forms?)

ODOT sends them a database file each year.

Do you have any problems with the crash location information? (lat/long, milepost, node/offset?)

The problem with locations is due to the general imprecision of the initial recording.

Does your source data require any cleanup?

Very little cleanup data required since their tool was designed to work specifically with the ODOT data. If a crash cannot be automatically located then it is omitted.

Do you have to fix (modify) the drawing things after the collision diagrams are created?

The output from their tool requires quite a bit of manual modification once the diagrams are created. It usually requires rearranging icons and text so it does not overlap and it is easy to read.

Do you have any experience using other collision diagramming tools? What software packages or methods?

Jim used Intersection Magic about 7 years ago at King County and felt it left a lot to be desired; in general it had many problems.

City of Medford

Peter Mackprang, Associate Traffic Engineer:

Do you create or use collision diagrams?

Yes, they create their own collision diagrams.

What is the primary use of the collision diagrams? (Public meeting, diagnosis, investigations)

Their use is 50/50; to convey crash data to the public and to include in traffic impact reports and lists.

How often do you create collision diagrams?

2-3 times per week on average; currently 12 or more a day while they are doing signalized intersection reviews.

How many years do you typically include in a diagram?

Usually 5 years in the diagrams. They have data for 11 years; they will often references the old data to look for trends but do not include it in the diagrams.

Is it more common to create intersection or corridor (strip maps) diagrams?
They usually only create intersections views and sometimes midblock as well. They do not produce collision diagrams of corridors.

**What types of filters would you like to see for the diagrams? (Severity, collision type, age or weather)**

They do not use any filters.

**How important is an exact representation of the intersection to your analysis? (Google maps or traditional pictorial representation of crashes)**

They prefer a precise location but they are currently not able to do that to their satisfaction.

**How do you create or obtain collision diagrams? (Special software/hand drawn/GIS/CAD/from other group)**

They create the diagrams using Intersection Magic. They do not have Map Magic which should allow for precise placing of crash locations on diagrams.

**How long have you been using this program?**

They have been using Intersection Magic for 3 years

**How would you rate the software’s ease of use/user friendliness?**

It is easy to learn and fairly intuitive.

**What are some of the problems you encounter using it?**

They cannot pinpoint exact crash locations. It is not easy to print a nicely formatted collision list; they currently copy and paste the lists it to Word for formatting and printing.

**What do you like about this software package?**

They like the electronic retrieval and generic features of this type of tool.

**How would you rate your level of success using this software? Does the software meet all of your needs?**

It does the job.

**Where do you obtain your crash data? (ODOT, in-house, police data?)**

All of their data is from local police records. All crashes are input by hand. They do not use the ODOT crash database.

**Do you have any problems with the crash location information? (lat/long, milepost, node/offset?)**

Occasionally the police reports miscode the crash location.

**Do you have to fix (modify) the drawing things after the collision diagrams are created?**

Intersection Magic has difficulty combining aliases: intersections with two different named side streets. The software handles this with "virtual locations", user defined searches that combine intersection names as needed. Virtual locations searches produce a separate list from intersection searches and these then have to be combined manually.

**Do you have any experience using other collision diagramming tools? What software packages or methods?**

**ODOT – Collision Diagramming Tools Evaluation**

**Final Report**

November 2008
He has used Crossroads in other jurisdictions and it appears to have fewer problems with aliases.

May I contact you again in the future to discuss collision diagrams?

We can contact them again later if we have additional questions.

**Oregon State Police**

Jeff Willis, Accident Reconstructionist:

Do you create or use collision diagrams?

They create incident specific crash diagrams.

What is the primary use of the collision diagrams? (Public meeting, diagnosis, investigations)

Crash diagrams are used for investigative purposes. For a fatal crash they will do scale diagrams, for non-fatal incidents they will do not-to-scale drafts.

How often do you create collision diagrams?

They create collision diagrams quite frequently as part of accident investigations.

How many years do you typically include in a diagram?

All of the crash diagrams are incident specific, not historical or trend-finding.

How important is an exact representation of the intersection to your analysis? (Google maps or traditional pictorial representation of crashes)

The accuracy of the layout is extremely important.

How do you create or obtain collision diagrams? (special software/hand drawn/GIS/CAD/from other group)

They use Crash Zone by CAD Zone in Beaverton.

How long have you been using this program?

They have been using it since at least 2000, likely longer.

How would you rate the software’s ease of use/user friendliness?

It is very easy for them to use. It is not at all like CAD. It is good for safety applications.

What are some of the problems you encounter using it?

It works very well; they do not have problems with it.

Where do you obtain your crash data? (ODOT, in-house, police data?)

All data is from in-house for investigating specific crashes.

Do you have any problems with the crash location information? (lat/long, milepost, node/offset?)

They use their own reference points such as nails in the pavement and reference local permanent fixtures such as utility poles/signs/lights/etc.
Do you have any experience using other collision diagramming tools? What software packages or methods?

They have used CAD in the past to create collision diagrams.

May I contact you again in the future to discuss collision diagrams?

Please contact Mike Stupfel. He may give a better historical perspective. He is best reached on his cell phone 503-931-2727 and state that we previously spoke to Jeff Willis.