

# ROAD SAFETY AUDIT

Dresser Hill Road  
Town of Dudley  
June 2015

Prepared For:  
MassDOT



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## Background

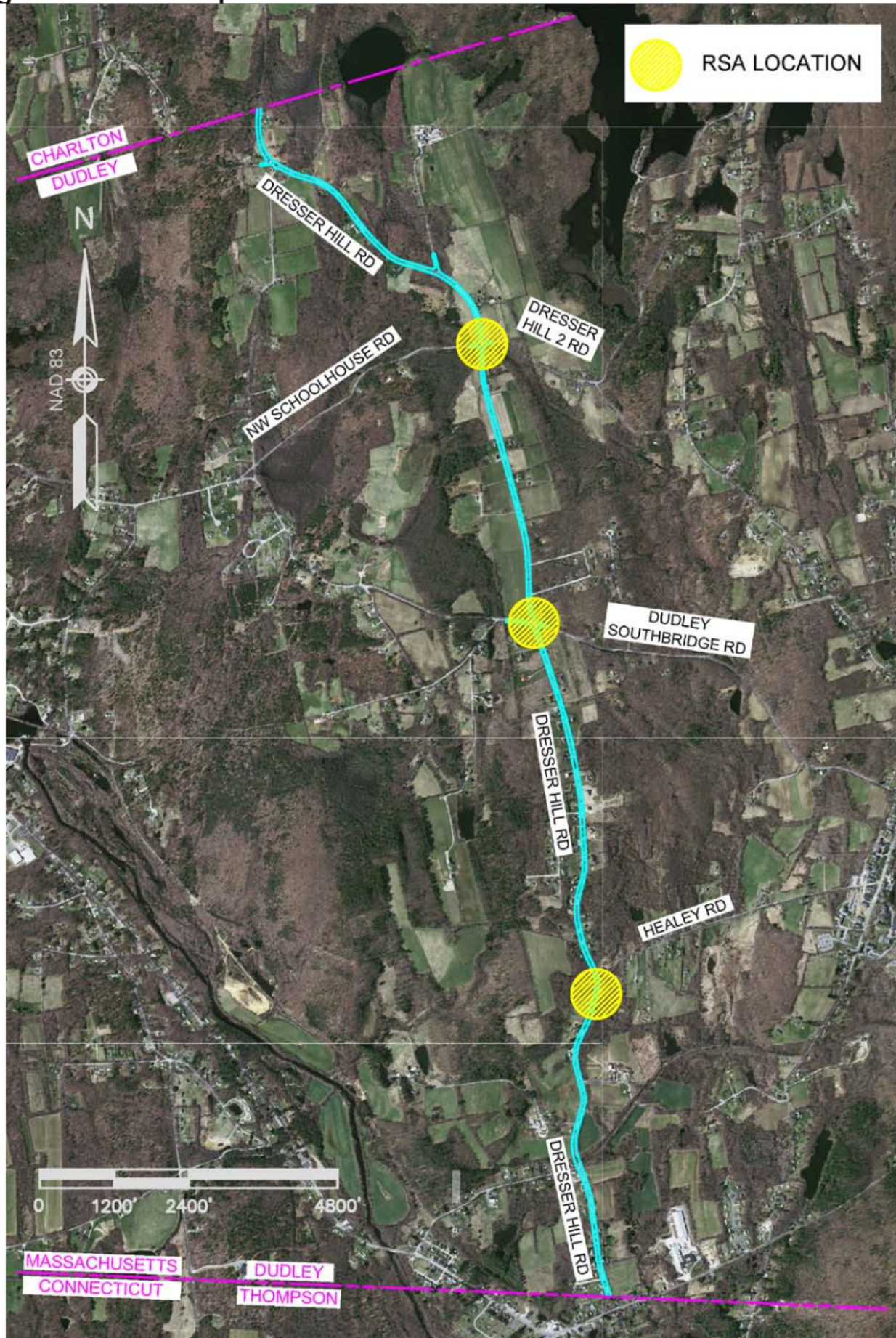
The Federal Highway Administration (FHWA) defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users.

The four mile stretch of Route 31 in Dudley between the Charlton Town Line and the Connecticut State Line has been identified as a High Risk Rural Roadway (HRRR) under the FHWA safety improvement program. The segment of Route 31 experienced 44 crashes in 2010-2013, including one fatal crash. Under the Federal Highway Commission, funding has been allocated for a safety improvement project, planned for advertisement in 2016. The Massachusetts Department of Transportation (MassDOT) Highway Division Traffic and Safety Engineering Section has required that an RSA be performed in order to identify specific locations on Route 31 considered to be the most dangerous, as well as evaluate potential solutions to the problematic locations within the study area. The RSA study area is illustrated in **Figure 1**.

Solutions contained within this RSA represent both short and long term improvements that can be implemented by multiple agencies with the common goal of improving roadway safety for all modes of transportation.



Figure 1. Locus Map





## Project Data

The audit team conducted an RSA for the Route 31 Corridor in Dudley, Massachusetts, on Wednesday, May 20, 2015. The RSA Meeting Agenda is provided in **Appendix A**. Participating audit team members and their affiliations are listed in **Table 1**; team member contact information is provided in **Appendix B**. It was recommended that audit team members visit the location before the RSA. During the preliminary meeting portion of the audit, team members were presented with aerial images of the four mile roadway segment, along with video footage of the roadway, which was taken in both the northern and southern travel directions. Video footage also included travel onto the roadway from intersecting roads, along with photos of both left and right turns, from all directions onto Route 31 so as to provide an overview of the area layout and to identify the areas of focus. The team was also provided with detailed crash information of the roadway, collected between January of 2010 and December of 2013. During the meeting, relevant community members and town officials also provided input and opinions as they were the most acquainted with the area. Afterward, the field visit portion of the RSA was conducted followed by the team reconvening to review the information gathered and discussed potential solutions.

The crash reports provided by the Dudley Police Department detailed 44 total crashes over the data collection period. Of the reported crashes, there were 25 crashes (56.81%) in which there were no reported injuries, 12 crashes (27.27%) in which there was one or more injuries reported as “non-incapacitating”, 6 crashes (13.63%) in which there was one or more injuries reported as “incapacitating”, and one crash (2.27%) in which the injuries sustained led to a fatality. About 66% of the crashes were single vehicle crashes, and 25% were angled collisions. Also noteworthy was the large percentage of crashes, 61.36% (27 of 44), in which one or more drivers lost control of their respective vehicles. Analysis revealed that of the 27 crashes, 20 (74.07%) occurred in either snow (11, 40.74%), rain (5, 14.51%), or ice (4, 14.81%) on the roadway. 13 of the 27 crashes (48.14%) occurred in daylight, 7 crashes (25.92%) occurred in the dark on roads lit by streetlights, and 7 (25.92%) occurred on unlit, dark roads.

Table 1. Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Greg Balukonis	Town Administrator
Dan Gion	Dudley Highway Department
Peter Fox	Selectmen
Nancy Runkle	Town Planner
Steve Wojnar	Police Chief
Keith Lincoln	Chappell Engineering
Karen Fung	Chappell Engineering
Wesley Foster	Chappell Engineering
Lola Campbell	MassDOT District 3
John Mastera	MassDOT Highway Safety
William Ullom	MassDOT Highway safety
Dan Daniska	Central Massachusetts Regional Planning Commission

## Project Location and Description

The RSA focused on Route 31 (Dresser Hill Road) from the Charlton Town Line to the Connecticut State Line. Within the area, Route 31 is under the jurisdiction of the Town of Dudley and is classified as a rural major collector. Route 31 runs north-south from the Connecticut State Line through Dudley and continues north into Charlton. Within the study area, Route 31 consists of one travel lane in each direction, and runs continuously without any traffic signals or stop signs. The roadway contains a variety of horizontal and vertical curvature, and has little to no shoulder throughout the corridor. No sidewalks are provided in the study area, and no bicycle accommodations are provided along the corridor. Passing is not permitted along the corridor and public safety officials stated that vehicles often travel faster along the corridor than is reasonable. There are no speed, intersection, or curve postings.

The RSA Team also identified three intersections along Route 31 that had unique safety issues compared to the rest of the corridor.

**Route 31 (Dresser Hill Road) at Healy Road** is an unsignalized intersection with three approaches. The Healy Road stop-controlled southwest approach consists of one travel lane in each direction. Healy Road is classified as a local road under the Town of Dudley's jurisdiction. The Route 31 northbound and southbound approaches each consist of one travel lane in each direction. Healy Road intersects Route 31 from the northeast, creating an acute intersection angle. There is limited sight distance to vehicles traveling southbound on Route 31; and because of the angle of the intersection, vehicles turning north from Healy Road must cross into opposing traffic when turning onto Route 31. The profile of Healy Road is low to Route 31, thus restricting sight distance and awareness of an intersecting street for drivers traveling on Route 31. A utility pole located on the northeast corner also blocks sight into and out from the intersection. An aerial image of the intersection is shown in **Figure 2**.

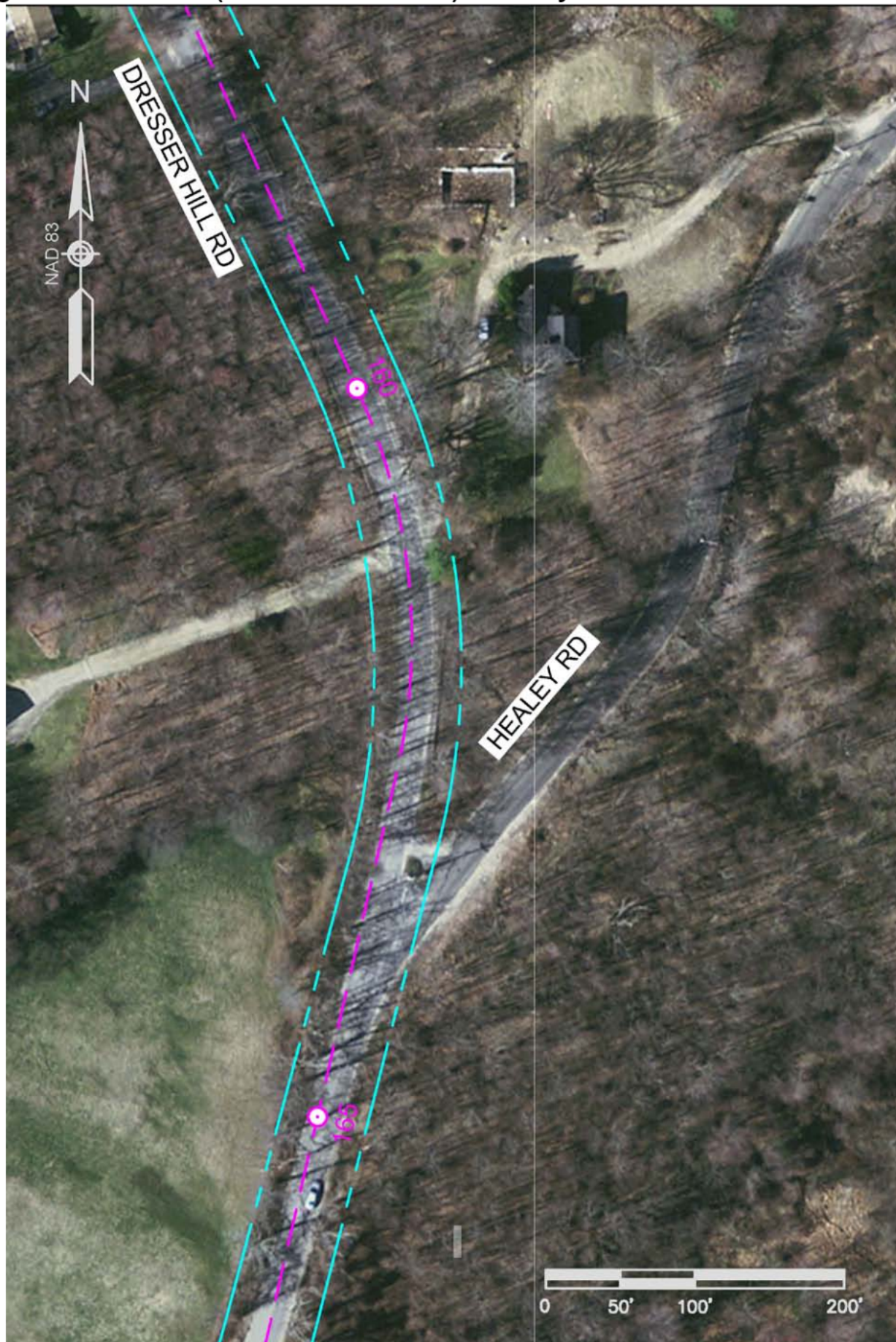
**Route 31 (Dresser Hill Road) at Dudley Southbridge Road** is an unsignalized intersection with four approaches. Dudley Southbridge Road is classified as a local road under the jurisdiction of the Town of Dudley. The Dudley Southbridge Road east and westbound approaches are stop controlled and consist of one travel lane in each direction. The intersection is surrounded by trees which border fields on the southeast, southwest, and northwest corners. The intersection is also impeded by two utility poles, one on the southwest corner and one about 50 yards from the edge of the northwest corner, both of which block sightlines. A large house is located on the Northeast corner, set back from the road. In the front yard of this house, two large trees block sightlines to the north. To the south is a segment of straight road in Route 31. An aerial image of the intersection is shown in **Figure 3**.

**Route 31 (Dresser Hill Road) at Dresser Hill Road #2/ NW Schoolhouse Road** is an unsignalized intersection with four approaches. The Dresser Hill Road #2 stop-controlled eastern approach and the NW Schoolhouse Road stop-controlled western approach each consist of one travel lane in each direction, and is classified as a local road under the jurisdiction of the Town of Dudley. Both Dresser Hill Road #2 and NW Schoolhouse Road are classified as local roads and fall under the jurisdiction of the Town of Dudley. The Route 31 northbound and southbound approaches also consist of one travel lane in each direction. The profiles of the side streets are low to Route 31, restricting sight distance and awareness of the intersecting roads for drivers traveling on Route 31. An aerial image of the intersection is shown in **Figure 4**.



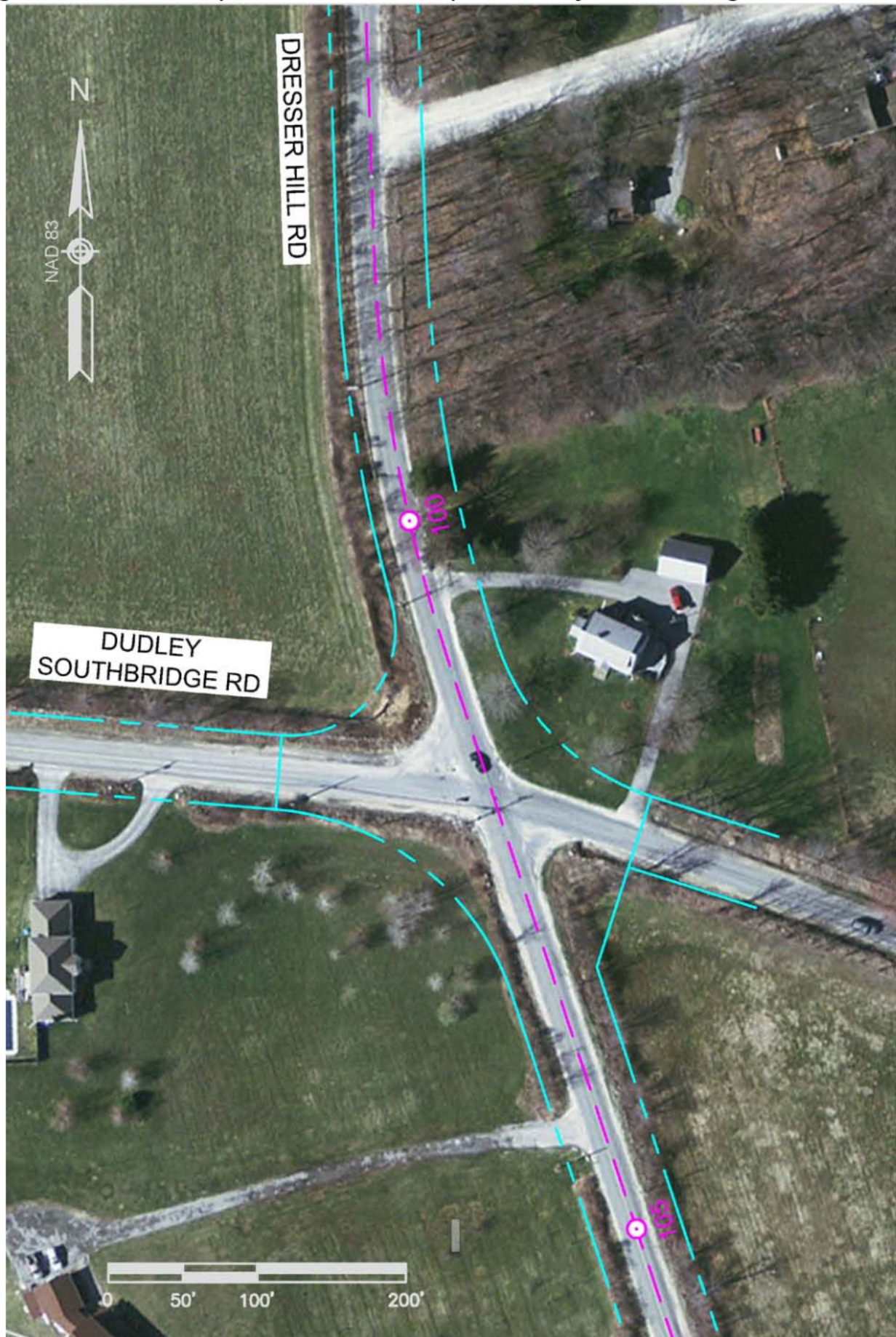
Route 31 (Dresser Hill Road) Corridor, Dudley

**Figure 2. Route 31 (Dresser Hill Road) at Healy Road**



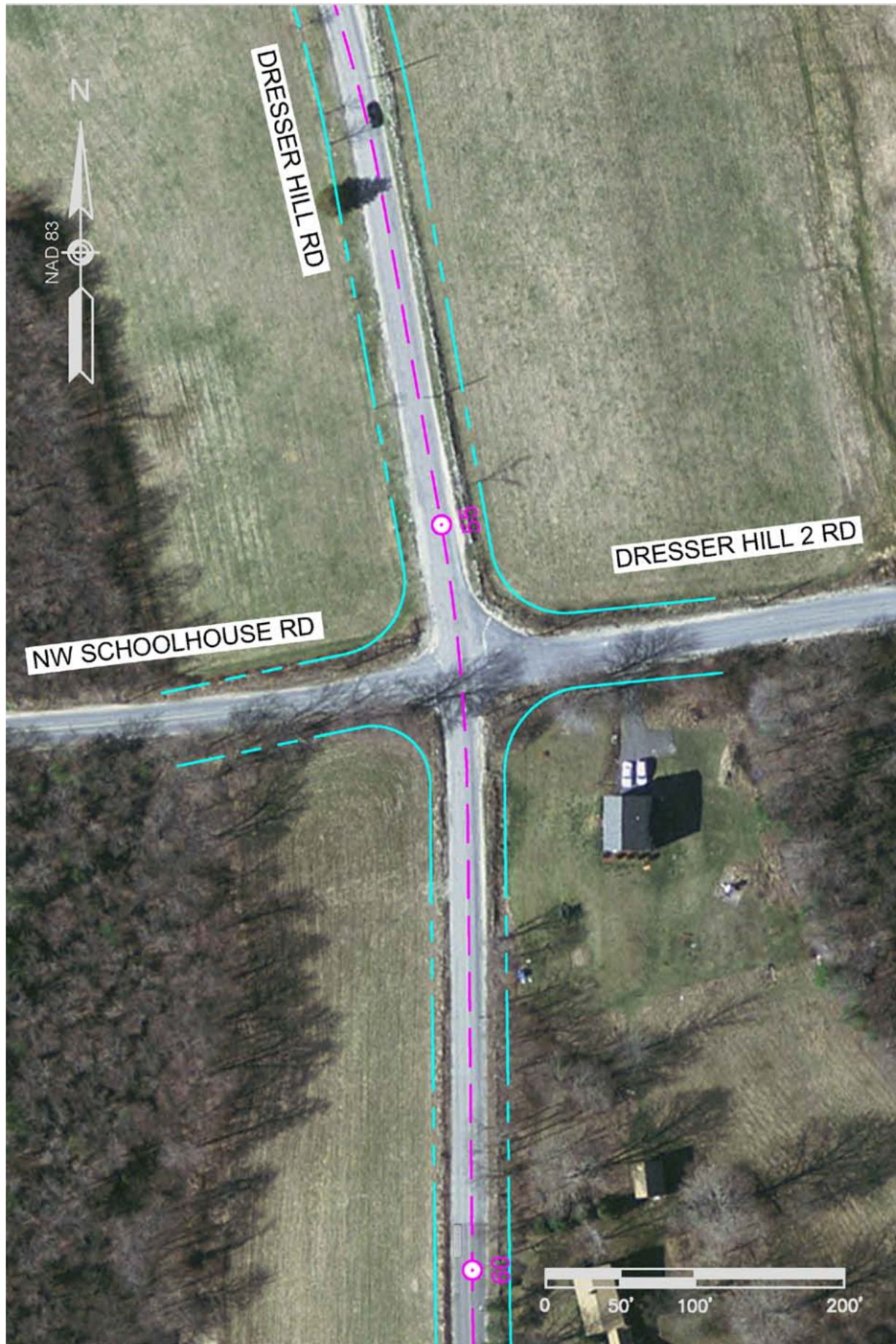


**Figure 3. Route 31 (Dresser Hill Road) at Dudley Southbridge Road**





**Figure 4. Route 31 (Dresser Hill Road) at Dresser Hill Road #2 and NW Schoolhouse Road**





## Road Safety Audit Observations

Based on field observations on Wednesday May 20, 2015, the RSA team determined that the segment of Route 31 (Dresser Hill Road) between the Charlton Town Line and the Connecticut State Line in Dudley has the following issues that affect safety:

- Travel Speeds
- Roadway Geometry
- Signage
- Lighting
- Pedestrian and Bicycle Accommodations
- Intersection Geometry
- Sight Lines
- Snow Removal
- Vegetation
- Wildlife Hazards

The following sections describe in more detail the safety issues and potential enhancements determined during the RSA. Several of these issues require further study and engineering judgment to determine the feasibility of implementing the improvements to address them.

## Corridor Wide Observations

### *Travel Speeds*

Members of the team noted that speed signage had been in place at 40 miles per hour (mph) before a road repaving project in 2009, during which all speed postings were removed and never replaced. The Police Chief, Steve Wojnar, reported that drivers have been known to use excessive speeds on the roadway, often exceeding 50-65 mph, though with some reports as high as 70 mph on straighter segments of the road. MassDOT representative John Mastera reported later that a speed study had not been conducted and was not on file for this area of Route 31.

High travel speeds may lead to severe crashes and out-of-control crashes along the corridor. Of the 44 crashes reported along the corridor, 27 crashes (61.36%) occurred when the motorist lost control of the vehicle, hitting a fixed object on the side of the roadway or another vehicle. It was noted that the combination of long stretches of straight roadway often precede sharp curvature where vehicles traveling at excessive speeds do not have enough time or space to slow to a safer speed prior to entering the curved portion of the road.

Chief Wojnar reported that speed enforcement does occur when possible, however, under staffing and underfunding have been detrimental recently to speed enforcement.

### *Roadway Geometry*

Between the Charlton Town Line and Koebeke Road, and Leo Ave and the Connecticut State Line, Route 31 contains a series of horizontal and vertical curves. These curves obscure sight lines between motorists on the roadway and vehicles entering or exiting driveways or side streets. Vertical downgrades may also contribute to travel speeds on downgrades.

In locations with no guardrails, there are often trees, utility poles or other objects located very close to the edge of the roadway. These objects may present safety issues, as many vehicles that depart the roadway hit these objects because they do not have sufficient recovery time before striking a fixed object. 22 of the 44 crashes (50%) involved vehicles hitting fixed objects on the side of the roadway.



***The horizontal and vertical geometry restrict sight distance and may result in excessive travel speeds***

The vertical geometry of the roadway may also contribute to some of the crashes in the study area. In addition to excessive speeds on downgrades, vertical curves restrict sight distance to what is likely less than required values for existing travel speeds. Furthermore, the vertical geometry of the intersecting roadway approaches is, in almost all cases, lower relative to the Route 31 roadway.

### ***Signage & Speed Postings***

Along the entire stretch of road, there was a notable lack of signage and speed postings. There were no speed limit postings on the entire four mile roadway corridor, and the existing signage was very minimal, as well as outdated.

Stop signs are located at the intersecting streets to Route 31, with no advance warning of the intersection and the paint was non-reflective and faded, making them harder to see at night. The stop signs also lack proper marking as one or two way stops and can be mistaken for four way stops, having the potential to cause serious crashes if drivers expect all vehicles to stop at the intersection. These signs should be replaced with current highly reflectorized signage. Team members also noted lacking signage including advanced curve warnings, chevron markings, animal crossings, and dangerous roadway condition warnings.



***The stop signs also lack proper marking as two way stops***

Team members reported difficulty locating street signs, discovering that they were located on utility poles at a higher than standard elevation as an anti-vandalism measure. This contributes to a lack of awareness for motorists on Route 31 of the presence of an intersection.



***A lack of delineation was observed throughout the corridor as seen in this photo where the double yellow center line has worn away.***

### ***Delineation***

A lack of delineation was observed throughout the corridor. Delineation devices such as retro reflective pavement markings, recessed pavement markers, roadway edge reflectors, and guardrail reflectors are not provided or are in need of upgrading. The lack of delineation makes it difficult for drivers to locate the edge of the roadway, and makes it difficult for motorists to navigate the winding roadway, especially at night and during inclement weather. The lack of delineation likely contributes to the single vehicle departure crashes.

### ***Lighting***

The lighting on the Route 31 corridor is inconsistent, and may be inadequate in some locations. During daylight hours, the roadway is shadowed by overhead foliage. While only 18% of the 44 reported crashes occurred on dark and unlit segments of road, team members noted that additional lighting at intersections may increase awareness of the intersections including on signage. This was particularly noticeable in the northern area of the road between the Charlton Town Line and Koebeke Road, where the majority of the nighttime crashes occurred. 61% of crashes occurred in daylight hours, and the other 18% of crashes occurred during nighttime hours on lit sections of road, suggesting that some existing streetlights may be in need of replacement. Additionally, some streetlights observed during the RSA were on during daytime hours, suggesting an issue with their timing.



### ***Pedestrian & Bike Traffic, Shoulder Width***

RSA participants observed that there are no bicycle and pedestrian facilities on the corridor. Dudley residents have made Town Representatives aware of safety concerns for cyclists and pedestrians on Route 31, particularly given the high vehicle travel speeds along the corridor and the history of speed related crashes where drivers lost control of the vehicle. Although no pedestrian and only one bicycle crash was reported in the crash data, the concern of missing pedestrian and bicycle accommodations was still raised during the RSA. Route 31 can be considered a regional connector for bicycle travel between Dudley and Charlton, as it connects the two town centers as well as functioning as a recreational route.



***RSA participants observed that there are no bicycle and pedestrian facilities on the corridor.***

Team members noted that children often have no place to stand at their bus stops and no shoulder to walk to and from the bus stops, particularly in winter months, when the height of snowbanks and darkness impact visibility.

Bike traffic is most prevalent between Dresser Hill Road #2 and the Connecticut State Line. This route is an established bike route, despite the distinct lack of bike space. The road has only a one foot shoulder and only 11 foot lanes, so the roadway is already very narrow before accounting for bike and pedestrian traffic. One selectman, who was not able to attend, expressed in writing a suggestion that bicycle and pedestrian facilities be provided from Dresser Hill Road #2 to the Connecticut State Line.

The narrow roadway also makes it difficult to keep snow off the road in the winter months. The local audit team members noted that the plows had difficulty keeping snow off the road because there was nowhere to push the snow since the road was flanked by trees, telephone poles and stone walls.



***Dense vegetation restricts sight distance at various points throughout the corridor.***

### ***Vegetation & Road Visibility***

The visibility along Route 31 is very limited, both to curves and to intersections ahead of the driver. This is mostly caused by dense vegetation along the side of the roadway. Dense forest is most prevalent on the northern segment of the road between the Charlton Town Line and the Koebke Road intersection, as well as on the southern segment beginning at the Leo Ave intersection and ending at the Connecticut State Line. In these areas, trees grow very close to the edge of the roadway, blocking the sightline of drivers as they approach the many dangerous curves in the roadway. The drivers have little to no advanced sight of what lies around the corner until they are in a place where it is too late for the situation to be mitigated.

It was noted that the close proximity of trees prohibits sunlight from melting the snow and ice on the roadway which leads to unsafe conditions, greater maintenance and the need for de-icing chemicals to be applied. Additionally, trees and dense vegetation have grown around the intersections throughout the roadway, not just on the segments listed above. Particularly at the intersections of Healy, Dudley Southbridge, and Koebe Roads, vegetation has encroached into the desirable clear space along the roadway, blocking almost all sight in one or more directions for drivers approaching Route 31. The trees have grown in on Healy and Koebe such that it is difficult for drivers traveling on Route 31 to see drivers approaching from the side roads while at the same time, drivers approaching from side roads have almost no ability to see oncoming traffic on Route 31. A right hand sightline at both intersections is filled with trees, and leaving the driver blind to oncoming traffic. During the months of June and July, uncut grass in adjacent fields grows tall enough to obstruct the sightline across roadway curves.

#### ***Other Miscellaneous Factors***

Various other factors were noted as well. Among these factors was the prevalence of snowdrift along sections of the corridor that are adjacent to fields, particularly in the north and central parts of the roadway. These fields generate strong cross-winds, which can push snow from the fields into the roadway, leading to hazardous driving conditions and visibility deficiencies.

Also mentioned was the prevalence of animals, mostly during the non-winter months. Animal presence on the roadway was reported to be most common on the northern sections of the roadway, particularly between Dresser Hill Road #2 and the Water Tower and on the fields mentioned above relating to snowdrift.

It was also noted that fog and low-lying clouds may contribute to poor visibility, though it was not specified where this was most prevalent or what solutions would specifically apply to this issue.

## Intersection Observations

### Location 1: Route 31 at Healy Road

#### *Intersection Geometry*

While no crashes had been reported at Healy Road during the study period, this location has the potential for serious accidents. Healy Road approaches Route 31 from the northeast, intersecting at approximately 35°. Healy also approaches at a very steep grade from below Route 31, making the intersection angle very sharp and awkward. Drivers have to turn their vehicles sharply to see the incoming traffic; however, this view is blocked by trees, vegetation, and a utility pole on the right hand side.

Because of the sharp horizontal angle of the intersection, drivers on Healy Road attempting to turn northbound on to Route 31 generally are forced into the opposing lane in order to complete the turn. The surrounding horizontal curves, particularly to the north on Route 31 are often traversed at speeds higher than safe or reasonable. As Route 31 drivers come around these curves, they cannot see the intersection or the side street drivers in the intersection, leaving the potential for very serious crashes, especially when mainline drivers use excessive speeds.

#### *Vegetation & Sight lines*

To the right, Healy Road drivers are forced to look through utility poles, trees, and shrubbery in order to see the roadway ahead. It is difficult to see through these factors, effectively blinding the driver to oncoming traffic. To the left, the Healy Road driver has better visibility, though low lying branches and foliage overhanging the road intrudes into the sightline.

The combination of all these factors makes it so that Healy Road drivers making a right hand turn are completely blind to the oncoming mainline traffic traveling southbound. They must make a sharp right hand turn that usually requires entering the opposing lane so they can make the turn completely.

In addition, Healy Road intersects directly south of a major curve in Route 31. This curve has limited horizontal sight distance, and is preceded to the north by a long straight segment of road on which drivers are known to drive at excessive speeds.

A utility pole blocks the right hand sight line from being viewable. The pole is mildly fragmented, possibly from being struck, though there was no report of such an accident in the data.



***To the right, drivers are forced to look through a utility pole, trees, and shrubbery in order to see the roadway ahead***



## Location 2: Route 31 at Dudley Southbridge Road

### *Intersection Visibility & Geometry*

Dudley Southbridge Road is statistically the most dangerous of all the intersections analyzed. It contains 6 crashes, one of which was fatal. Five of the crashes were caused by a collision between a driver on Route 31 and a driver on Dudley Southbridge Road. At the intersection, trees are present as they border the fields surround the intersection on the southern and northwestern corners. Many of the trees are afflicted by leafy vines and other invasive vegetation that compounds the effects of the already dense foliage hanging off the trees.

A house with a level, open lawn at the northeastern corner leaves the drivers visible, though two large trees have dense foliage hanging low making the drivers still difficult to detect. The foliage and plant life give the eastern side of the intersection the appearance that it is simply a driveway and not an important local road.

The western side has more trees and vines blocking drivers, making this side of the intersection less visible to mainline traffic from the south until the side street driver has entered the intersection. A stone wall and telephone pole on the northwest corner block the view towards the curve north of the intersection on Route 31.

A horizontal curve on Route 31 to the north and a straight corridor segment to the south are often driven very fast by north and southbound mainline drivers, limiting the reaction time of drivers, decreasing the amount of time before the intersection in which drivers are visible to each other. Additionally, the profile of the side street is low to Route 31, further increasing the danger at the intersection.

### *Signage, Lighting, & Traffic Control*

The intersection is currently a two-way stop, stopping drivers on both approaches of Dudley Southbridge Road (east and westbound). The approaches to this intersection are inclined, making it more difficult to see traffic on Route 31. Although it is a two-way stop, drivers often assume it is a four-way stop due to the way the intersection appears in its physical surroundings. Both mainline and side street drivers appear equal in a side street driver's right of way. The stop signs do not designate it as a two-way. There are no warning signs or speed postings though drivers are reported to drive at excessive speeds approaching the intersection from both the north and south on Route 31. The existing signage is faded and non reflective.

Lighting in the form of streetlights is present, though could be in better placement and potentially upgraded. The RSA team also reported difficulty locating street name signs, particularly at this intersection, finding that street name signs had been placed high up on utility poles, at a higher than standard elevation following a local problem with recurrent vandalism.



***At the intersection, trees are present as they border the fields surround the intersection on the southern and northwestern corners.***

## Location 3: Route 31 at Dresser Hill Road #2 and NW Schoolhouse Road

### *Intersection & Roadway Geometry*



***There is a hill to the north, off which Route 31 approaches the intersection at a downgrade.***

Route 31 intersects Dresser Hill Road #2 and NW Schoolhouse Road on a steep southerly downgrade. Dresser Hill Road #2 and NW Schoolhouse crest at Route 31. The upgrade of the intersecting roadways makes cars difficult to see from Route 31, leaving potential for dangerous crashes when drivers are unable to see each other and vehicles must travel up an incline from a stopped position when entering Route 31.

### *Vegetation & Visibility*

Foliage from trees to the northwest and southeast restrict sight distance and can block sightlines to cars on the crest of the hill to the north. These trees are primarily located on the northwestern side of Route 31. To the south, there are a handful of trees along the roadway on the Eastern side of the roadway.

### *Signage & Intersection Control*

The intersection consists of a two way stop for both Dresser Hill Road #2 traffic and NW Schoolhouse Road traffic, while Route 31 traffic is uninterrupted down the hill. Stop signs are present on the intersecting roadways, though no warning signs or speed postings are present. Drivers have been reported to use excessive speed on Route 31, especially in the southbound direction as vehicles travel downhill approaching the intersection.

# Safety Enhancements

## 1. Corridor Wide Enhancements:

- a. A speed study should be conducted for the entirety of the roadway. Following the study, the road should be zoned with regulatory speeds and posted accordingly. Also consider collecting traffic counts and additional data both on the entire roadway and the specified intersections.
- b. Consider adding radar speed signs in areas where speeding is especially prominent. Radar speed signage should display the posted speed limit and the vehicle speed. If the vehicle speed exceeds the posted speed limit, the display should read “SLOW DOWN” to reinforce to motorists that they are exceeding the posted speed limit.
- c. Consider the use of advanced curve warning signs with advisory speed signage in advance of horizontal curves. While not enforceable, advisory speed signage may alert motorists to a change in the roadway, causing them to drive more cautiously, while the advanced curve warning sign gives the motorist advanced notice on what to expect of the roadway ahead.
- d. Advanced animal crossing signs should be considered between Dresser Hill Road #2 and the Water tower.
- e. Identify and provide locations where police can park and conduct traffic enforcement, including speed and passing violations, to help reduce the occurrence of speeding and reckless driving on the corridor.
  - i. The Dudley Police Department should examine the possibility of receiving additional funding for enforcement through programs such as the Massachusetts Executive Office of Public Safety and Security (EOPSS).
- f. Consider horizontal and vertical alignment revisions at intersecting side streets to make a more conventional “T” intersection with approach grades that blend with Route 31. See **Figures 6 & 7**.
- g. Provide intersection warning signage on Route 31 with supplemental street name signs and “Stop Ahead” signage on stop-controlled intersecting roadways to alert motorists to the presence of the intersection. Provide advance stop sign and route marker assemblies on side street approaches to Route 31. Consider adding reflectorized strips to sign posts.
- h. Consider providing a paved shoulder to provide motorists with a recovery zone in case they depart the roadway. Mark the shoulder with a solid white edge line (SWEL) to guide motorists along the roadway and to help keep vehicles away from the guardrails. Consider using a 30-degree shoulder slope, or *Safety Edge*, as outlined by the Federal Highway Administration (FHWA) to reduce the occurrence of tire scrubbing, which can cause motorists to lose control of their vehicles. According to the FHWA, the *Safety Edge* may reduce the occurrence of crashes on two-lane highways by 6%.

- i. Clear the edge of the roadway as much as possible of vegetation, trees, and utility poles to increase sight distance, limit the hazard of fixed object crashes and to give motorists additional recovery room.
- j. Provide delineation throughout the corridor. Thermoplastic and retro reflective pavement markings should be used in addition to recessed pavement markers along the DYCL. Rumble strips may help decrease crashes with vehicles leaving the roadway. More delineation techniques may also be explored, including guardrail reflectors and yellow and white object markers (depending on which side of the road they are used). Object markers may be used according to Section 2C.65 of the MUTCD along stretches of roadway where it is particularly undesirable to leave the roadway edge. Chevron signs may also be used to better delineate sharp horizontal curvature.
- k. Provide larger street name signage at intersections and provide street name placards on intersection warning signage so that motorists may prepare to make their turns in advance of the intersection. Also consider advanced guide signs reading “Healy Road Ahead”.
- l. Identify locations where additional lighting is needed and provide it as part of long-term reconstruction efforts.
- m. Consider the safety benefits of providing additional lighting at intersections to draw motorist attention to the intersections.
- n. Consider providing a sidewalk on at least one side of the roadway to provide pedestrians with a safe location to walk along Route 31.
- o. Consider providing a shoulder of at least 5 feet on each side of the roadway to provide bicyclists with a safe location to ride their bicycles along the corridor and to provide motorists with a recovery zone. This would also reduce future vegetation growth and snow removal complications.
- p. Removal of vegetation and overhead foliage to aid in natural means of snow removal.

## **2. Healy Road Enhancements:**

- a. Consider altering the geometry of the Healy Road southwest-bound approach to Route 31 to create a right-angle intersection, which would improve motorists’ sight lines to the north and force motorists entering or exiting Healy Road to do so at slower speeds. Considered alterations should review both horizontal and vertical alterations to the approach so as to reduce both the horizontal intersection angle and the approach grade of Healy Road as illustrated in **Figures 6 & 7**.
- b. Consider implementation of signage around the intersection on both Healy Road and Route 31 to warn of the intersection ahead. Signage on Healy Road should include route marker assemblies. Route 31 signage should include both dangerous curve/intersection warnings. Curve warnings can also include Chevron signs around the curves. Suggested speed warnings and poor weather signs should also be considered. All implemented signage should also be considered for lighting (energy efficient, flashing or blinking).



- c. Consider movement/replacement of the utility pole currently located to the north of the intersection.
- d. Consider removal of vegetation around the intersection as well as pushing back of the tree line both in the immediate surroundings and the surrounding horizontal curves on Route 31. This will aid in both snow removal and sightline increase.
- e. Place advisory speed signage if applicable based upon a study.

### **3. Dudley Southbridge Enhancements:**

- a. Consider implementation of warning signage, both on Route 31 and Dudley Southbridge Road. Route 31 signs should include dangerous intersection warnings and Dudley Southbridge signage should include route markers along with guide signs to alert drivers that they are approaching a higher speed roadway. The green guide sign should specify the direction of Route 31 south and northbound. All signage currently in place should be replaced with retro reflective signage. All new signage should be considered for energy-efficient lighting options.
- b. Consider implementing a four-way stop or other traffic control measures to reduce speed and raise intersection awareness. If a four way stop is considered impractical, alternatives could include lighted signage, overhead flashing or strobe lights (yellow towards Route 31 traffic and red toward Dudley Southbridge traffic).
- c. Consider removal of trees and vegetation surrounding the intersection. Care should be taken to avoid removing all vegetation as this could cause problems with snowdrift from the fields. If done properly, the intersection will be more visible and snow removal will be easier with more roadside space. See **Figure 5**.
- d. Consider movement of utility poles located around the intersection to increase visibility around the intersection.
- e. Consider speed postings including postings with radar-feedback for drivers. This would be most effective with radar, as it would ease the stress on the already understaffed Dudley Police Force; however, increased police presence in the area should still be considered.
- f. If possible, consider removing/resetting stone walls so as to improve sightlines and aid in snow removal.

### **4. Dresser Hill Road #2 & NW Schoolhouse Road Enhancements:**

- a. Consider implementation of warning signage on Route 31, Dresser Hill Road #2 and NW Schoolhouse. Route 31 signage should include dangerous intersection warnings. Dresser Hill Road #2/NW Schoolhouse Road should include route marker assemblies. Current signage should be replaced with retroreflective signage. New signage should be considered for energy efficient lighting options to highlight to drivers that they are approaching a dangerous intersection. This is particularly relevant to stop and warning signs.
- b. Consider removal of trees and vegetation surrounding the intersection.
- c. Consider altering roadway and intersection geometry to create a more level intersection and to reduce the steep upgrading of intersecting roadways.

## Potential Safety Enhancements

*Short-term enhancements* include:

- Provide intersection warning signage and “Stop Ahead” signage
- Provide animal warning signage
- Increase speed enforcement
- Improve street name signage
- Remove trees and other obstructions, including relocation of utility poles (See **Figure 5**)
- Conducting a speed study and implementing speed limit postings

*Long-term enhancements* include:

- Realignment of intersections and reduction of steep grade at intersections (See **Figures 6 & 7**)
  - Healy Road
  - Koebke Road
  - Dresser Hill Road #2 & NW Schoolhouse Road
- Improve roadway lighting
- Provide pedestrian walkways and bike lanes from Dresser Hill Road #2 to the Connecticut State Line

**Table 2** summarizes these safety issues, possible enhancements, estimated safety payoff, time frame, cost, and responsibility. Safety payoff estimates are based on engineering judgment and are categorized as low, medium, and high. The time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). The costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001). It is the responsibility of MassDOT to ensure that the designer incorporates the relevant safety enhancements identified as part of this RSA

Table 2. Potential Safety Enhancements Summary

Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Corridor-wide Observations	A speed study should be conducted for the entirety of the roadway. Following the study, the road should be zoned with regulatory speeds and posted accordingly. Dudley Police should explore potential funding from EOPSS and other programs.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Consider using a speed display sign in areas where speeding is especially prominent. Radar speed signage should display the posted speed limit and the vehicle speed. If the vehicle speed exceeds the posted speed limit, the display should read "SLOW DOWN" to reinforce to motorists that they are exceeding the posted speed limit.	Medium	Mid-term	Low	Town of Dudley
	Consider the use of advanced curve warning signs with advisory speed signage in advance of horizontal curves.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Advanced animal crossing signs should be considered between Dresser Hill Road #2 and the Water tower.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Identify and provide locations where police can park and conduct traffic enforcement, including speed and passing violations.	Medium	Short-term	Medium	Town of Dudley

Time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). Costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001).

Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Corridor-wide Observations	Consider horizontal and vertical alignment revisions at intersecting side streets to make a more conventional "T" intersection with approach grades that blend with Route 31. See <b>Figures 6 &amp; 7</b> .	High	Mid-term	High	MassDOT/Town of Dudley
	Provide intersection warning signage on Route 31 with supplemental street name signs and "Stop Ahead" signage on stop-controlled intersecting roadways. Provide advance stop sign and route marker assemblies on side street approaches to Route 31.	High	Mid-term	Medium	MassDOT/Town of Dudley
	Consider providing a paved shoulder to provide motorists with a recovery zone in case they depart the roadway. Mark the shoulder with a solid white edge line (SWEL) to guide motorists along the roadway and to help keep vehicles away from the guardrails. Consider using a 30-degree shoulder slope, or <i>Safety Edge</i> , as outlined by the Federal Highway Administration (FHWA) to reduce the occurrence of tire scrubbing, which often causes motorists to lose control of their vehicle. According to the FHWA, the <i>Safety Edge</i> may reduce the occurrence of crashes on two-lane highways by 6%.	High	Mid-term	High	MassDOT/Town of Dudley
	Clear the edge of the roadway as much as possible of vegetation, trees, and utility poles.	High	Mid-term	Medium	MassDOT/Town of Dudley

Time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). Costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001).



Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Corridor-wide Observations	Provide delineation throughout the corridor. Thermoplastic and retro reflective pavement markings should be used in addition to recessed pavement markers along the DYCL. Rumble strips may decrease the number of crashes in which drivers leave the roadway. More delineation techniques may also be explored, including guardrail reflectors and yellow and white object markers (depending on which side of the road they are used). Chevron signs may also be used to better delineate sharp horizontal curvature.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Provide larger street name signage at intersections and provide street name placards on intersection warning signage.	Low	Mid-term	Low	MassDOT/Town of Dudley
	Identify locations where additional lighting is needed and provide it as part of long-term reconstruction efforts.	Medium	Mid-term	Medium	Town of Dudley
	Consider the safety benefits of providing additional lighting at intersections to draw motorist attention to the intersections.	Medium	Mid-term	Medium	Town of Dudley
	Consider providing a sidewalk on at least one side of the roadway to provide pedestrians with a safe location to walk along Route 31.	High	Mid-term	High	MassDOT/Town of Dudley

Time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). Costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001).

Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Corridor-wide Observations	Consider providing a shoulder of at least 5 feet on each side of the roadway to provide bicyclists with a safe location to ride their bicycle along the corridor and to provide motorists with a recovery zone in the event that they depart the roadway.	High	Mid-term	High	MassDOT/Town of Dudley
	Removal of vegetation and overhead foliage to aid in natural means of snow removal.	High	Mid-term	Medium	MassDOT/Town of Dudley
Location 1: Route 31 at Healy Road	Consider altering the geometry of the Healy Road southwest-bound approach to Route 31 to create a right-angle intersection. Considered alterations should review both horizontal and vertical alterations to the approach so as to reduce both the horizontal intersection angle and the approach grade of Healy Road as illustrated in <b>Figures 6 &amp; 7</b> .	High	Mid-term	High	MassDOT/Town of Dudley
	Consider implementation of signage around the intersection on both Healy Road and Route 31 to warn of the intersection ahead. Signage on Healy Road should include route marker assemblies. Route 31 signage should include both dangerous curve and dangerous intersection warnings. Curve warnings can also include Chevron signs around the curves. Suggested speed warnings and poor weather signs should also be considered.	Medium	Mid-term	Medium	MassDOT/Town of Dudley
	Consider movement and replacement of utility pole currently located at the north of the intersection.	Medium	Mid-term	Medium	Town of Dudley

Time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). Costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001).

Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Location 1: Route 31 at Healy Road	Consider removal of vegetation around the intersection as well as pushing back of the tree line both in the immediate surroundings and the surrounding horizontal curves on Route 31.	Medium	Mid-term	Medium	MassDOT/Town of Dudley
	Place advisory speed signage if applicable based upon a study.	Medium	Short-term	Low	Town of Dudley
Location 2: Route 31 at Dudley Southbridge Road	Consider implementation of warning signage, both on Route 31 and Dudley Southbridge Road. Route 31 signage should include dangerous intersection warnings and Dudley Southbridge warnings should include route marker signage.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Consider implementing a four-way stop or other traffic control measures to reduce speed and raise intersection awareness, such as lighted signage overhead flashing lights (yellow towards Route 31 traffic and red toward Dudley Southbridge traffic).	Medium	Mid-term	High	MassDOT/Town of Dudley
	Consider removal of trees and vegetation surrounding the intersection. Care should be taken to avoid removing all vegetation as this could cause problems with snowdrift from the fields. See <b>Figure 5</b> .	High	Mid-term	Medium	MassDOT/Town of Dudley
	Consider movement of utility poles located around the intersection to increase visibility around the intersection.	High	Mid-term	Medium	Town of Dudley

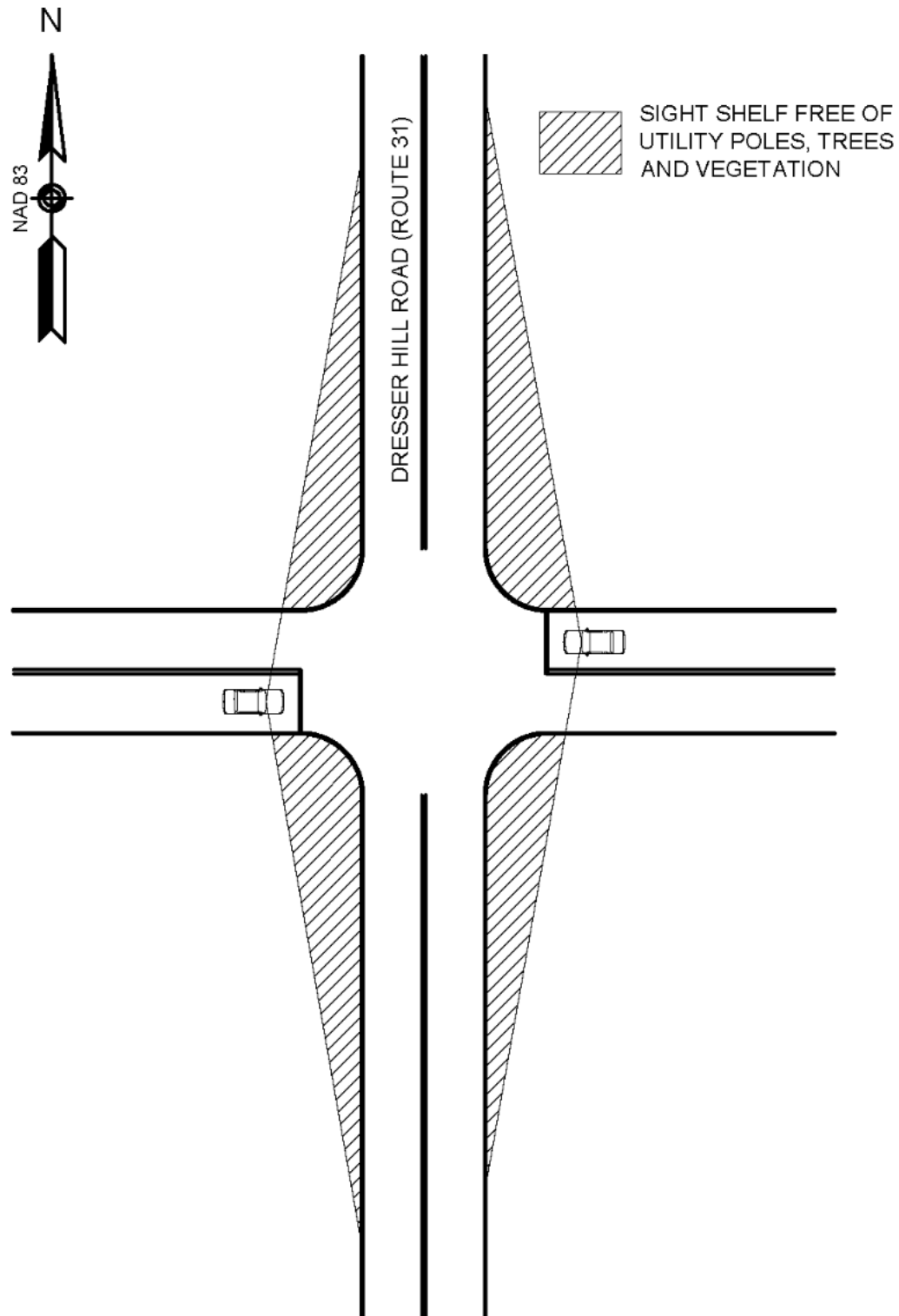
Time frame is categorized as short-term (<1 year), mid-term (1 to 3 years), or long-term (typically >3 years). Costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,001).

Location	Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Party
Location 2: Route 31 at Dudley Southbridge Road	Consider speed postings including postings with radar-feedback for drivers.	Medium	Short-term	Low	Town of Dudley
	If possible, consider removing/resetting stone walls so as to improve sightlines and aid in snow removal.	Low	Mid-term	Medium	MassDOT/Town of Dudley
Location 3: Route 31 at Dresser Hill Road #2/NW Schoolhouse Road	Consider implementation of warning signage, on Route 31, Dresser Hill Road #2 and NW Schoolhouse. Route 31 signage should include dangerous intersection warnings and Dresser Hill Road #2/NW Schoolhouse Road should include route assembly markers.	Medium	Mid-term	Low	MassDOT/Town of Dudley
	Consider removal of trees and vegetation surrounding the intersection.	Medium	Mid-term	Medium	MassDOT/Town of Dudley
	Consider altering roadway and intersection geometry to create a more level intersection and to reduce the steep upgrading of intersecting roadways.	High	Mid-term	High	MassDOT/Town of Dudley

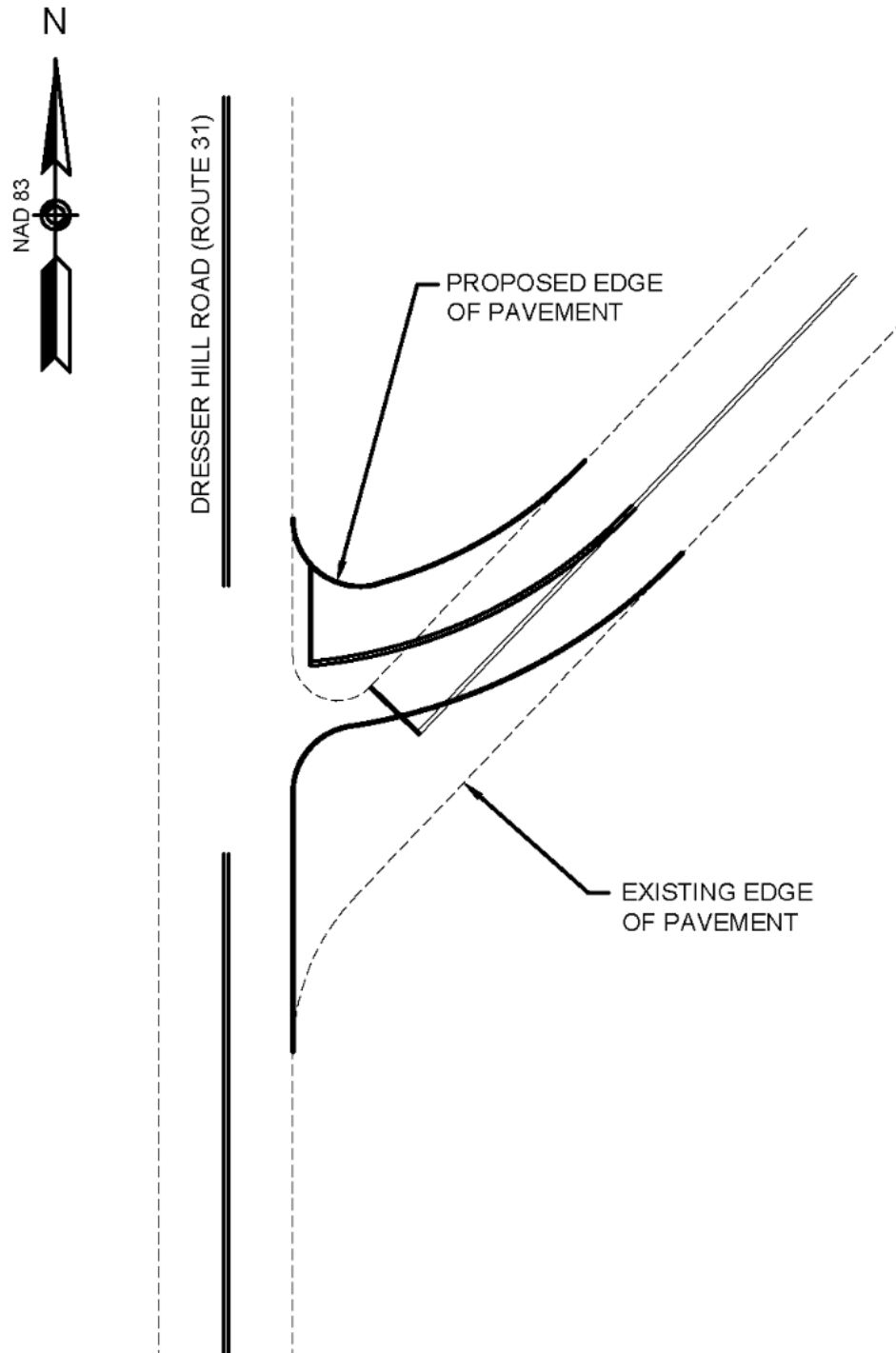
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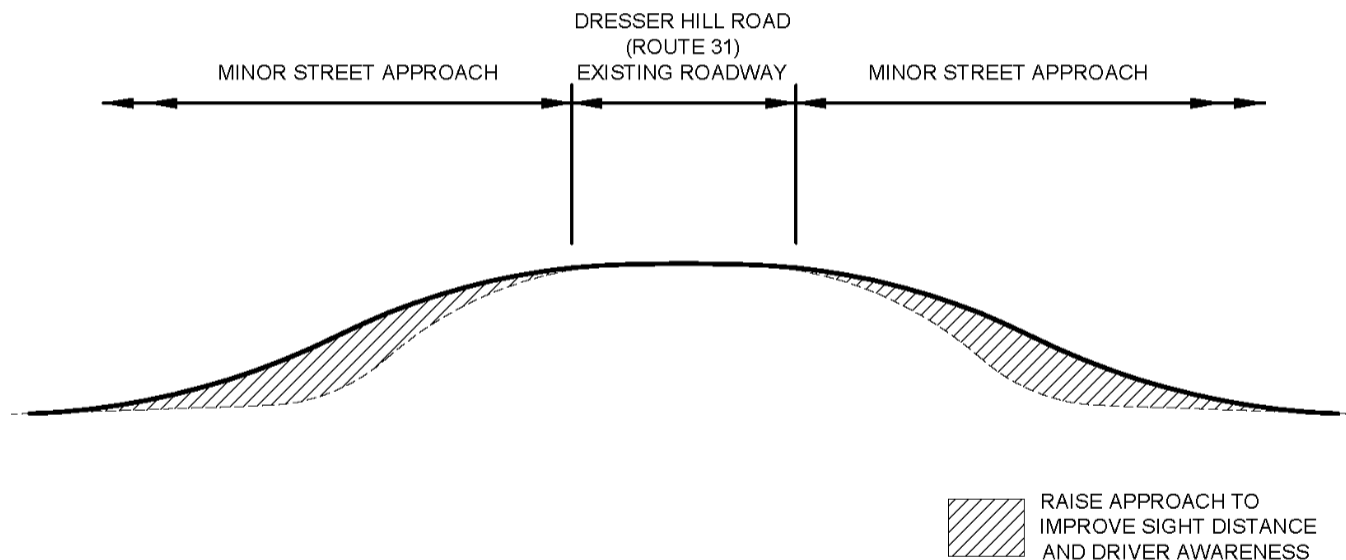
**Figure 5. Typical Clearing at Intersections**



**Figure 6. Typical Re-Alignment at Acute Angle Intersections**



**Figure 7. Typical Profile Adjustments at Side Street Approaches**



## **Appendix A. RSA Meeting Agenda**



# Agenda

## Road Safety Audit Dudley Dresser Hill Road (Route 31) Meeting Location: Dudley Town Hall 71 West Main Street 3rd Floor May 20, 2015 9:00 AM -12:00 noon

**Type of meeting:** High Crash Location - Road Safety Audit  
**Attendees:** Invited Participants to Comprise a Multidisciplinary Team  
**Please bring:** Thoughts and Enthusiasm!!

**9:00 AM** **Welcome and Introductions**  
**9:15 AM** **Review of Site Specific Material**  

- Crash, Speed and Volume Summaries-provided in advance
- Existing Geometries and Conditions

**10:00 AM** **Visit the Site**  

- Drive to Dresser Hill Road at Connecticut State Line
- As a group, identify areas for improvement

**11:30 AM** **Post Visit Discussion/Completion of RSA**  

- Discuss observations and finalize findings
- Discuss potential improvements and finalize recommendations

**12:00 noon** **Adjourn for the Day - but the RSA has not ended**

### Instructions for Participants:

- Before attending the RSA on May 20, 2015, participants are encouraged to drive through the intersection and complete/consider elements on the RSA Prompt List with a focus on safety.
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

## **Appendix B. RSA Audit Team Contact List**



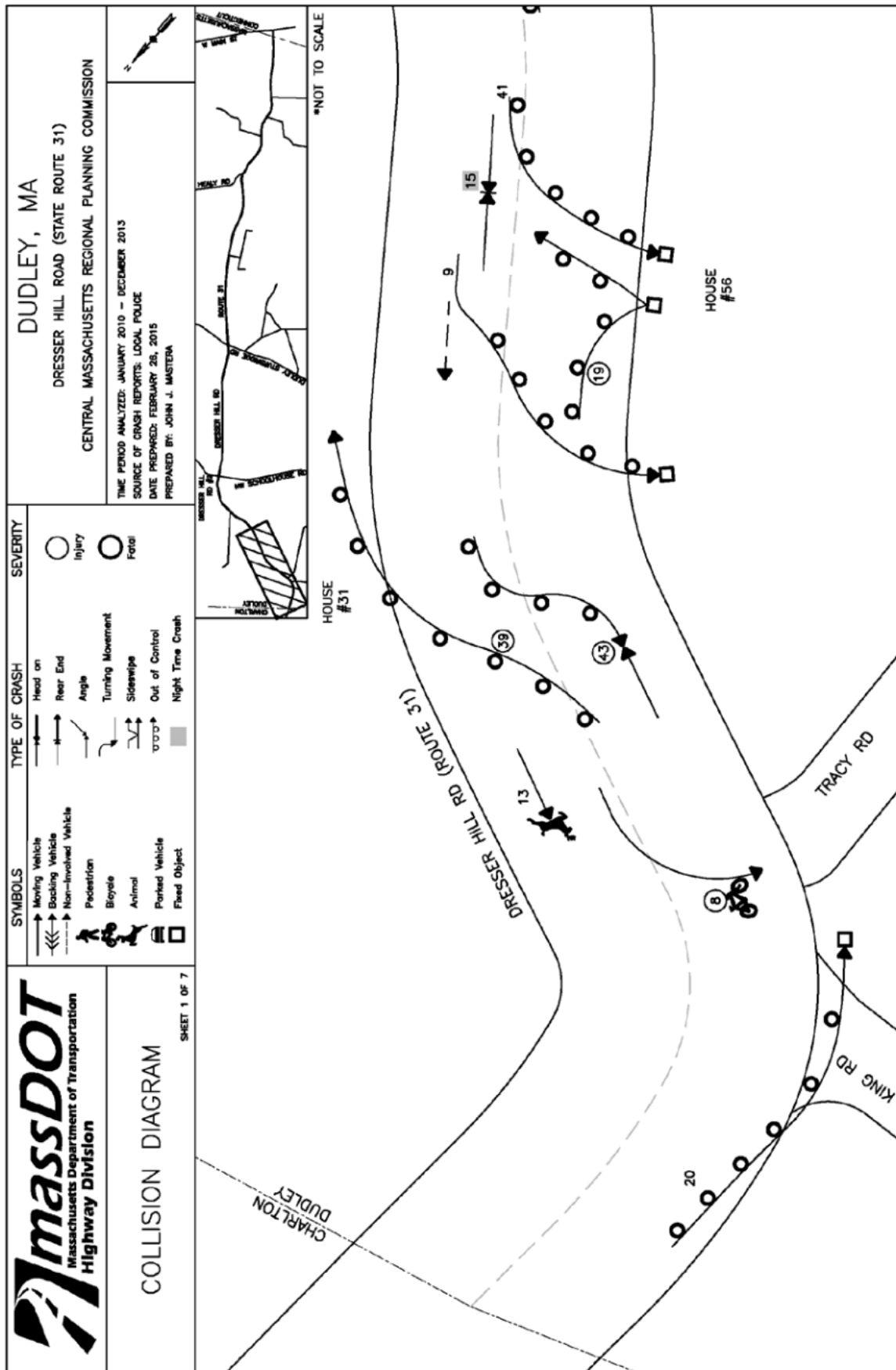
SIGN IN SHEET  
DUDLEY - Dresser Hill Road (Route 31)  
from Charlton Town Line to Connecticut State Line

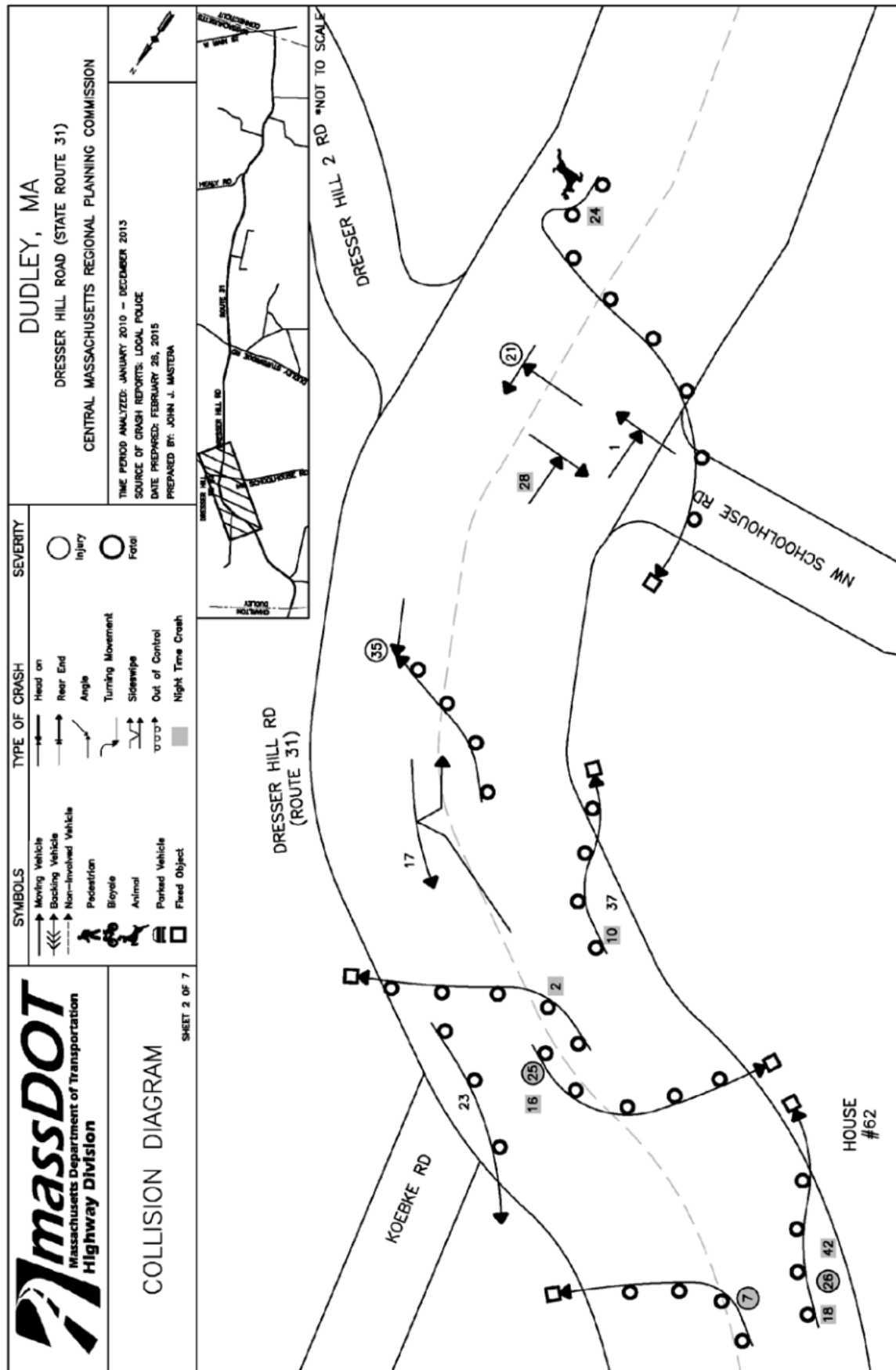
DATE: 5/25/2015  
SUBJECT: Road Safety Audit

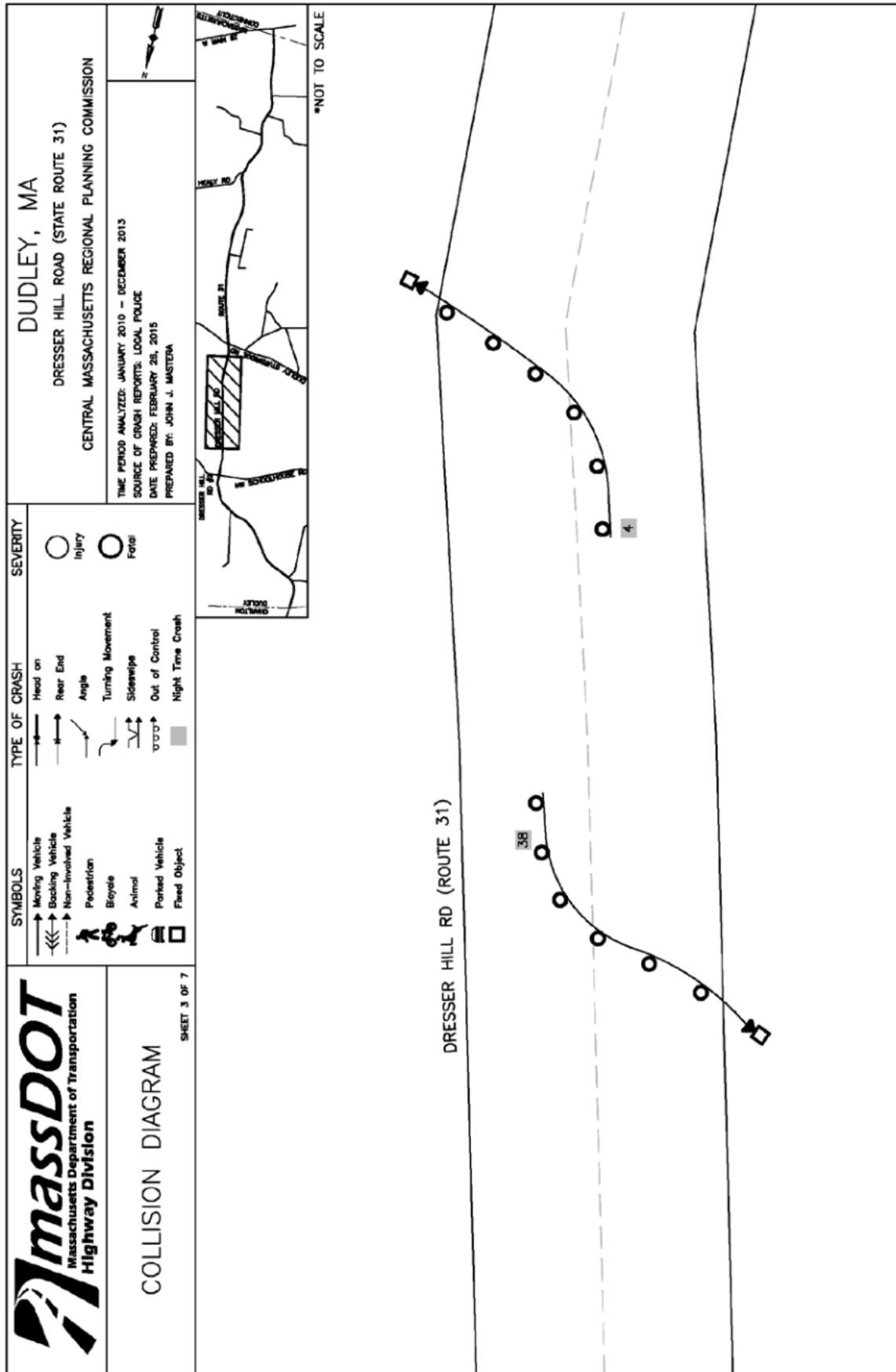
NAME (PLEASE PRINT)	DEPT./ORG.	TEL. # (INCLUDE EXT.)	EMAIL
Gregg Bannion	Town Administrator	508-949-8001	ADMINISTRATOR@DUDLEYMA.GOV
KAREN S FONG	CHAPPELL ENG	508 481 7400	kfong@chappellengineering.com
Wesley Foster	Chappell Eng	508-566-0097	WFoster2968@gmail.com
PETER E FOX	SELECTMEN	508-949-1482	FOXPEI@YAHOO.COM
DAN GROW	Highway	508-949-8020	Dalleyhighway1@CHARTER.NET
NANCY RUNKLE	Town Planner	508-949-8014x1	nrunkleplanner@aol.com
KERNA LINCOLN	CHAPPELL ENG	857-998-2577	Kline@chappellengineering.com
STEVE WOTNAR	Dudley Police Dept	508-949-8023	Swojan@dudleypolice.com
Lola Campbell	MassDOT District 3	508-929-3887	Alotade.Campbell@state.ma.us
DAN DAVISKA	CHAPPL	508-459-3331	ddaviska@cmare.com
JOHN MASTERA	MassDOT Highway Safety	857-368-9648	JOHN.MASTERA@STATE.MA.US
William Ullman	MassDOT Highway Safety	857 368 9622	WilliamUllman@state.ma.us

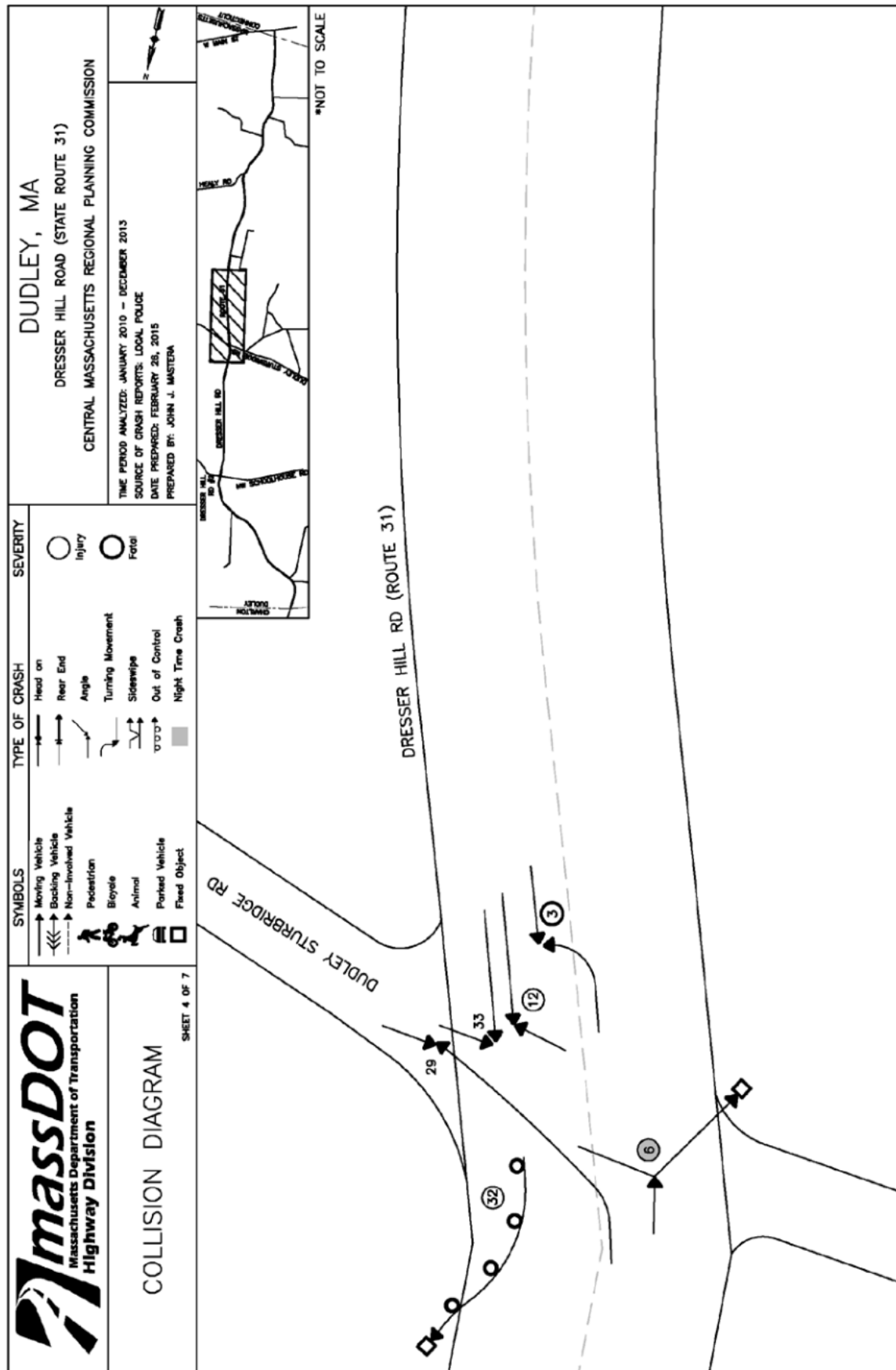
## **Appendix C. Detailed Crash Data**



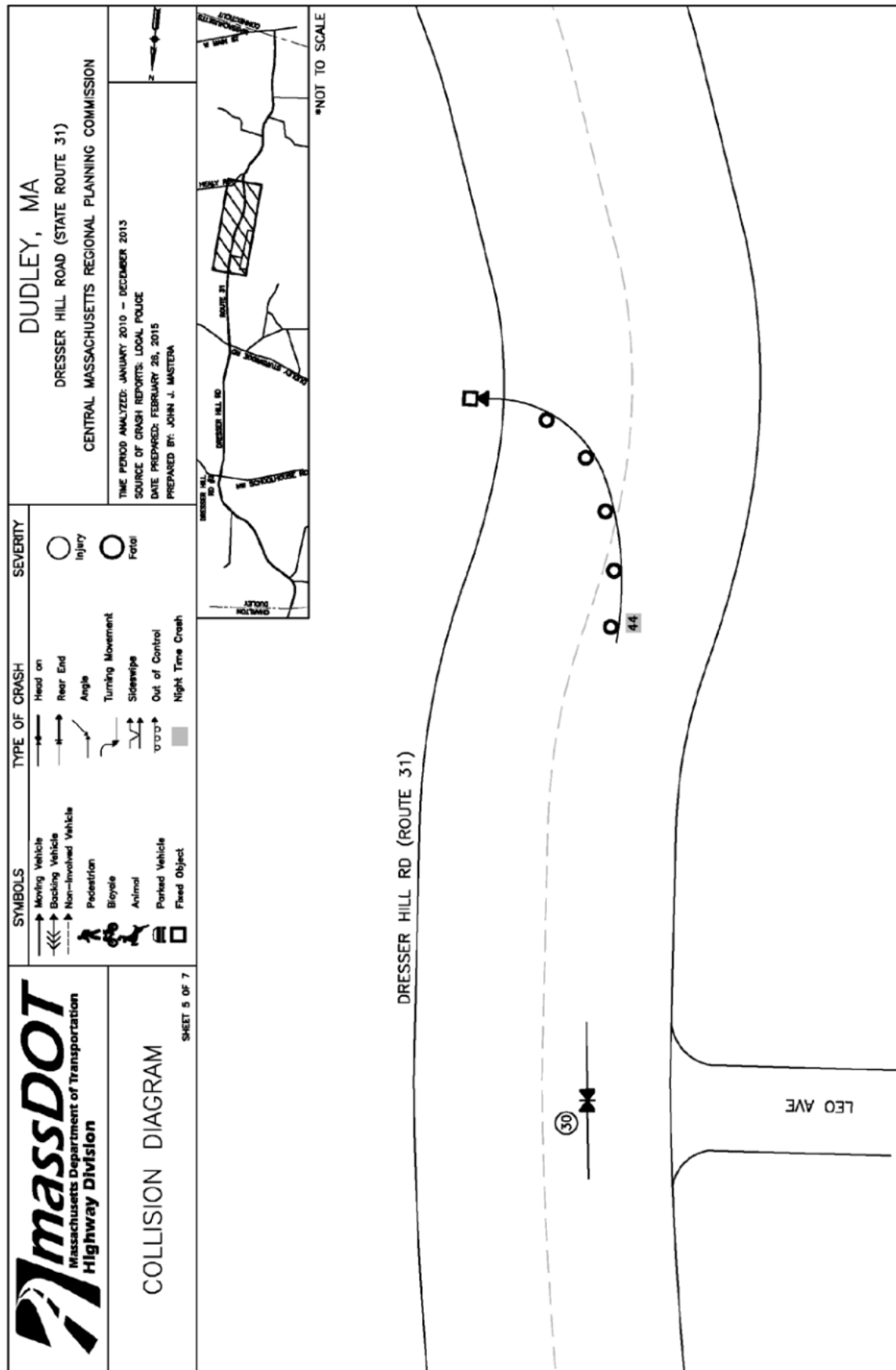


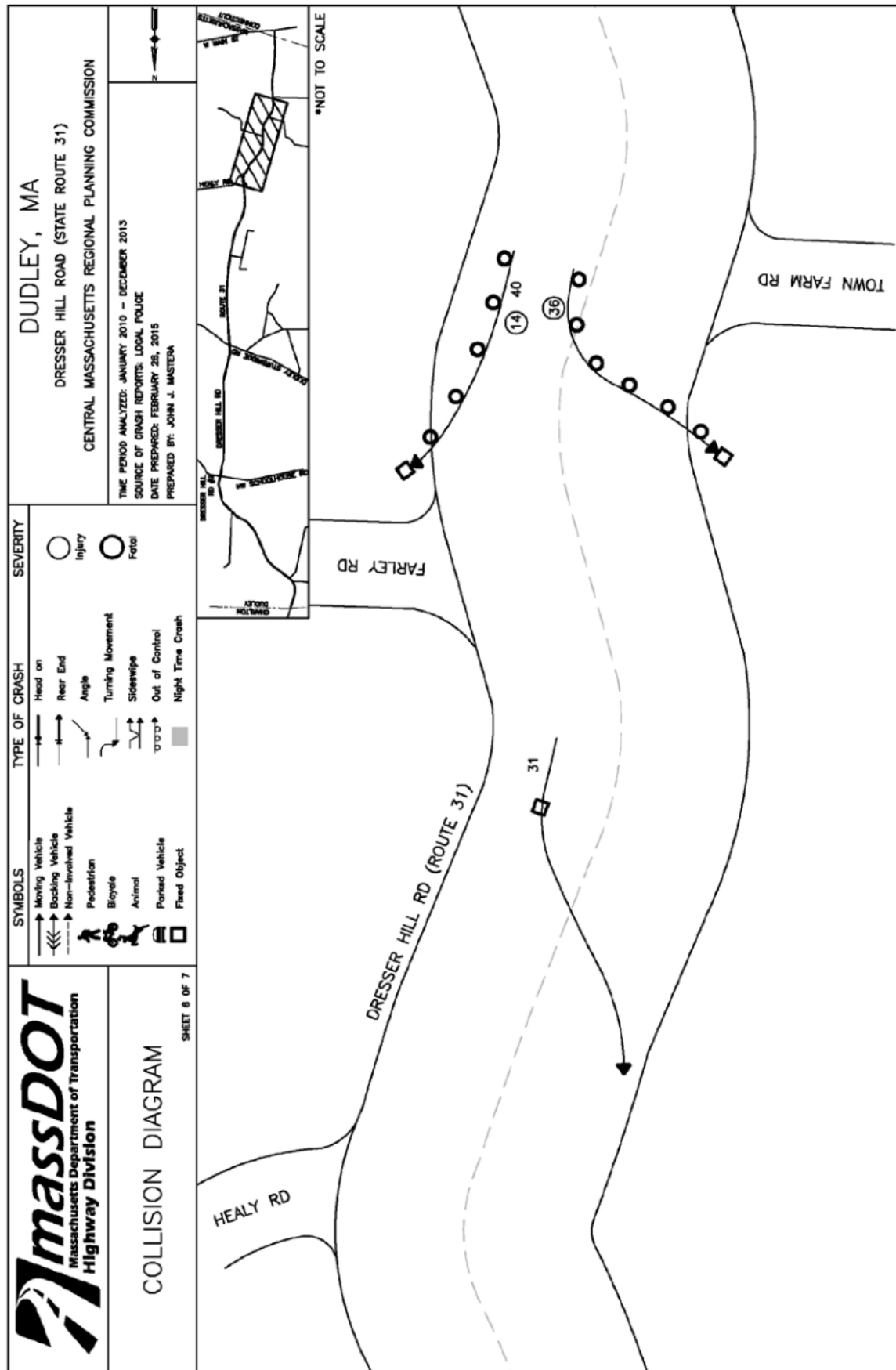












<p><b>Massachusetts Department of Transportation</b> <b>Highway Division</b></p>		<p><b>DUDLEY, MA</b> DRESSER HILL ROAD (STATE ROUTE 31) CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION</p>		<p>TIME PERIOD ANALYZED: JANUARY 2010 - DECEMBER 2013 SOURCE OF CRASH REPORTS: LOCAL POLICE DATE PREPARED: FEBRUARY 28, 2015 PREPARED BY: JOHN J. MASTERA</p>																												
<p>SHEET 7 OF 7</p> <p style="font-size: 2em; font-weight: bold; text-align: center;">COLLISION DIAGRAM</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">SYMBOLS</th> <th style="width: 30%;">TYPE OF CRASH</th> <th style="width: 40%;">SEVERITY</th> </tr> </thead> <tbody> <tr> <td>→ Moving Vehicle</td> <td>Head on →←</td> <td>○ Injury</td> </tr> <tr> <td>↔ Backing Vehicle</td> <td>Rear End → ←</td> <td>○ Fatal</td> </tr> <tr> <td>- - - Non-involved Vehicle</td> <td>Angle ↘↙</td> <td></td> </tr> <tr> <td>🚶 Pedestrian</td> <td>Turning Movement ↻</td> <td></td> </tr> <tr> <td>🏍 Motorcycle</td> <td>Sideswipe ↔↗↘</td> <td></td> </tr> <tr> <td>🐾 Animal</td> <td>Out of Control 🌀</td> <td></td> </tr> <tr> <td>🚗 Parked Vehicle</td> <td>Night Time Crash 🌃</td> <td></td> </tr> <tr> <td>📦 Fixed Object</td> <td></td> <td></td> </tr> </tbody> </table>				SYMBOLS	TYPE OF CRASH	SEVERITY	→ Moving Vehicle	Head on →←	○ Injury	↔ Backing Vehicle	Rear End → ←	○ Fatal	- - - Non-involved Vehicle	Angle ↘↙		🚶 Pedestrian	Turning Movement ↻		🏍 Motorcycle	Sideswipe ↔↗↘		🐾 Animal	Out of Control 🌀		🚗 Parked Vehicle	Night Time Crash 🌃		📦 Fixed Object		
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**Crash Data Summary Table**  
Dresser Hill Road (Route 32) ; Dudley, MA  
January 2010 - December 2013

Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Agas	Comments
1	01/03/10	Friday	3:26 PM	Angle	Daylight	Cloudy	Other	Failed to yield right of way	21	No injury - Vehicle entered from NW Schoolhouse Rd and failed to clear and was struck by vehicle travelling south on Dresser Hill Rd
2	01/03/10	Friday	11:36 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Snow	Unknown	18	No injury - Vehicle lost control crossing roadway and striking a tree
3	01/24/10	Sunday	11:30 AM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	17	Fatal injury - Vehicle attempting to turn left into Dudley Southbridge Rd stating that the vehicle driving on Dresser Hill Rd had a signal to turn right and was struck by the vehicle
4	01/30/10	Saturday	9:42 PM	Single Vehicle Crash	Dark - lighted	Cloudy	Snow	No Improper Driving	19	No injury - Vehicle lost control crossing roadway and striking a tree
5	02/10/10	Wednesday	4:28 PM	Single Vehicle Crash	Daylight	Snow	Snow	No Improper Driving	22	NOT LOCATED
6	03/21/10	Sunday	2:44 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	Incapacitating injury - Vehicle failed to clear a right of way striking vehicle travelling south. Entering vehicle then rectified and struck utility pole
7	03/22/10	Monday	8:11 PM	Single Vehicle Crash	Dark - roadway not lighted	Rain	Wet	Operating defective equipment	22	Incapacitating injury - Vehicle lost control due to low tire pressure striking tree and struck left turning vehicle at Tracy Rd
8	04/15/10	Thursday	4:11 PM	Angle	Daylight	Clear	Dry	No Improper Driving	75	No injury - Vehicle attempted to pass illegally and lost control striking Utility Pole #149
9	05/20/10	Sunday	3:03 PM	Single Vehicle Crash	Daylight	Clear	Dry	Exceeded authorized speed limit	23	No injury - Vehicle lost control leaving roadway and striking a tree
10	05/27/10	Sunday	2:53 AM	Single Vehicle Crash	Dark - roadway not lighted	Clear	Dry	Unknown	26	NOT LOCATED
11	09/09/10	Thursday	6:43 PM	Single Vehicle Crash	Dusk	Cloudy	Dry	No Improper Driving	55	No injury - Vehicle travelling north going around utility work was caught in low hanging utility lines crossing roadway causing the wires to fall and the utility pole to break. Also causing damage to commercial vehicles at the work zone
12	11/17/10	Wednesday	1:18 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	20	Non-incapacitating injury - Vehicle entered from Dudley Southbridge Rd failed to clear the right of way striking vehicle heading north. Vehicle on Dresser Hill Road was rectified off roadway
13	12/04/10	Saturday	2:39 PM	Single Vehicle Crash	Daylight	Clear	Dry	No Improper Driving	37	No injury - Vehicle struck deer crossing roadway
14	01/23/11	Saturday	10:46 AM	Single Vehicle Crash	Daylight	Clear	Snow	Over-correcting/over-steering	38	Non-incapacitating injury - Vehicle lost control leaving roadway and striking tree
15	02/26/11	Friday	7:43 PM	Head on	Dark - lighted roadway	Sleet, Hail, Freezing Rain	Snow	No Improper Driving	68	Non-incapacitating injury - Vehicle travelling south lost control crossing centerline and crashing with head-on vehicle
16	04/01/11	Friday	3:48 AM	Single Vehicle Crash	Dark - roadway not lighted	Sleet, Hail, Freezing Rain	Ice	Unknown	44	No injury - Vehicle lost control leaving roadway and striking small tree
17	05/01/11	Wednesday	5:17 PM	Sideways opposite direction	Daylight	Rain	Wet	No Improper Driving	27	No injury - Vehicle crossed center line sideswiping oncoming vehicle. Cause unknown due to hit and run
18	05/05/11	Sunday	12:22 AM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	No Improper Driving	64	No injury - Vehicle attempted to avoid deer crossing roadway causing the vehicle to leave the roadway striking a utility pole
19	05/18/11	Saturday	2:55 PM	Single Vehicle Crash	Daylight	Clear	Dry	Unknown	40	Non-incapacitating injury - Vehicle lost control leaving roadway and striking tree, then being redirected back into the roadway
20	07/18/11	Monday	4:37 PM	Single Vehicle Crash	Daylight	Cloudy	Dry	Illness	51	No injury - Vehicle lost control leaving roadway across King Rd striking alone wall
21	08/19/12	Thursday	8:27 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	37	Non-incapacitating injury - Vehicle entered from NW Schoolhouse Rd and failed to clear and was struck by vehicle travelling north on Dresser Hill Rd
22	02/11/12	Saturday	7:53 AM	Single Vehicle Crash	Daylight	Snow	Ice	No Improper Driving	17	NOT LOCATED
23	03/03/12	Saturday	6:44 AM	Single Vehicle Crash	Daylight	Cloudy	Ice	No Improper Driving	21	No injury - Vehicle lost control leaving roadway into a snowbank and rolled over landing on all four tires in wooded area
24	03/07/12	Wednesday	8:36 PM	Single Vehicle Crash	Dark - lighted roadway	Cloudy	Dry	No Improper Driving	45	No injury - Vehicle lost control attempting to avoid deer crossing roadway crossing the road. Vehicle rolled sideways across NW Schoolhouse Rd ending in embankment
25	03/16/12	Friday	3:11 AM	Single Vehicle Crash	Dark - roadway not lighted	Clear	Dry	Failure to keep in proper lane or running off road	29	Incapacitating injury - Vehicle lost control leaving roadway and striking a tree before burning in flames
26	05/13/12	Sunday	12:26 AM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	Unknown	25	Incapacitating injury - Vehicle lost control leaving roadway and striking a tree. Operator stated he was attempting to avoid an opposing vehicle
27	05/16/12	Wednesday	5:15 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	42	No injury - Vehicle entered from Dudley Southbridge Rd failed to clear the right-of-way striking vehicle north on Dresser Hill Rd
28	05/18/12	Friday	8:51 PM	Angle	Dark - lighted roadway	Snow	Dry	Failed to yield right of way	22	No injury - Vehicle entered from Dresser Hill #2 and failed to clear and was struck by vehicle travelling south on Dresser Hill Rd
29	07/08/12	Sunday	11:27 AM	Angle	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	54	No injury - Vehicle turning left onto Dudley Southbridge Rd crossed the centerline striking vehicle stopped on Dudley Southbridge Rd



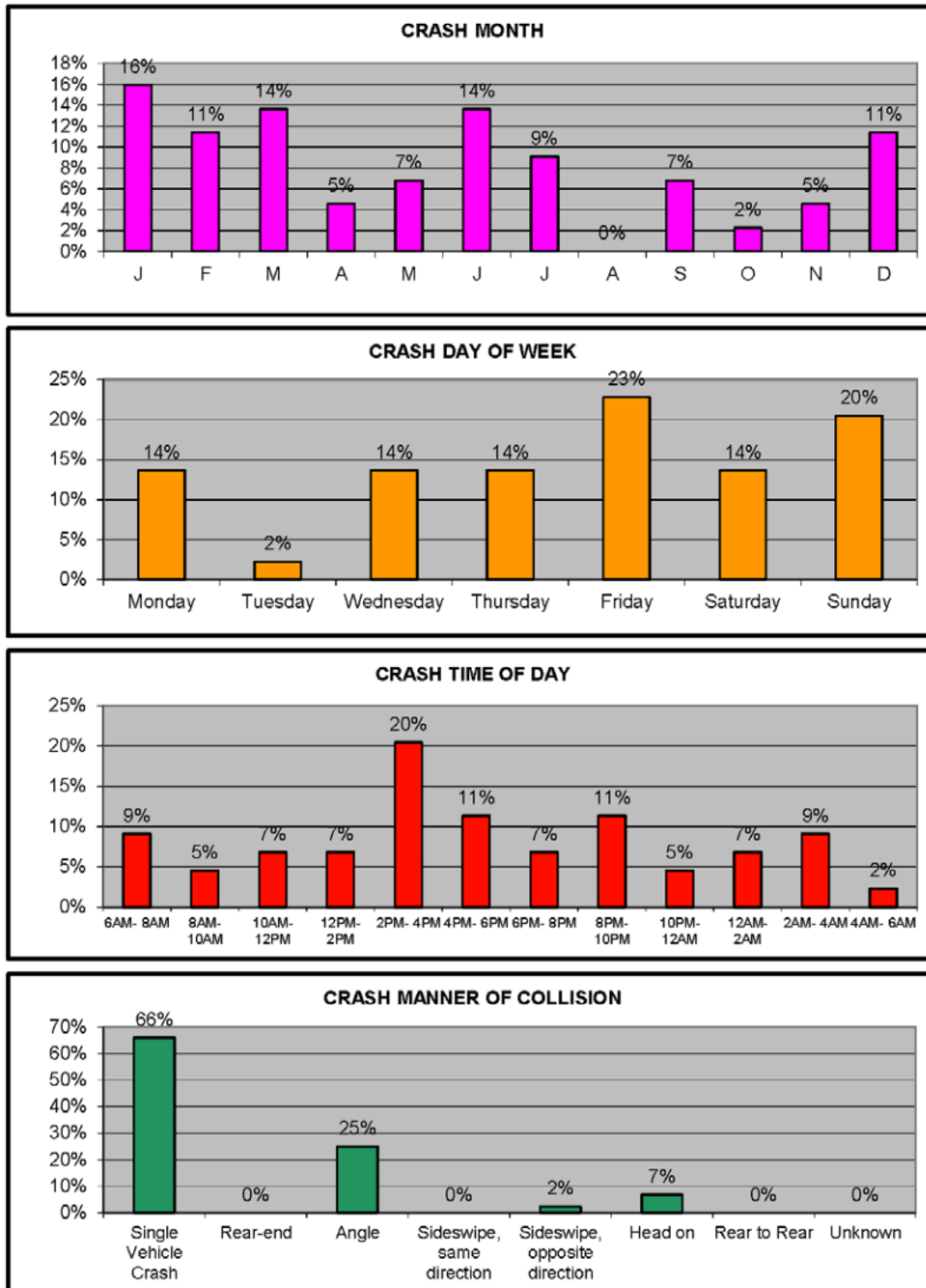
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January 2010 - December 2013

Crash Diagram	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages	Comments
30	09/17/12	Monday	7:36 AM	Head on	Daylight	Clear	Dry	Unknown	17 22	Non-incapacitating Injury - No Narrative Provided. Police photos indicate a 2 car collision with one vehicle striking a utility pole and another vehicle with extensive front end damage on front lawn of residential property
31	09/28/12	Friday	3:36 PM	Single Vehicle Crash	Daylight	Rain	Wet	No motorist Driving	44	No Injury - Vehicle was traveling north when a dead tree fell and struck the top of the vehicle causing the vehicle to lose control and come to rest on opposite shoulder
32	10/19/12	Friday	3:14 PM	Single Vehicle Crash	Daylight	Rain	Wet	Exceeded authorized speed limit	16	incapacitating Injury - vehicle lost control due to excessive speed leaving roadway and striking utility pole then burning in flames
33	11/22/12	Thursday	3:47 PM	Angle	Daylight	Clear	Dry	Glare	27 82	Non-incapacitating Injury - Vehicle released from Dudley Sturbridge Rd failed to clear the right of way striking vehicle heading north. Vehicle on Dresser Hill Road was redirected off roadway
34	12/27/12	Thursday	5:54 AM	Single Vehicle Crash	Dark- roadway not lighted	Sleet, Hail, Freezing Rain	Ice	Unknown	46	NOT LOCATED
35	12/30/12	Sunday	12:23 PM	Angle	Daylight	Blowing Sand, Snow	Snow	Failure to keep in proper lane or running off road	41 51	Non-incapacitating Injury - Vehicle lost control and crossed centerline striking oncoming vehicle
36	01/28/13	Tuesday	7:17 AM	Single Vehicle Crash	Daylight	Cloudy	Snow	No motorist Driving	38	Non-incapacitating Injury - Vehicle lost control and left roadway striking a stone wall
37	02/03/13	Sunday	3:47 AM	Single Vehicle Crash	Dark- lighted roadway	Snow	Snow	No motorist Driving	20	No Injury - Vehicle lost control leaving roadway and striking a stone wall and tree
38	02/18/13	Monday	1:12 AM	Single Vehicle Crash	Dark- roadway not lighted	Blowing Sand, Snow	Snow	Failure to keep in proper lane or running off road	24	No Injury - Vehicle lost control leaving roadway and striking a stone wall and tree
39	03/01/13	Friday	3:37 PM	Single Vehicle Crash	Daylight	Cloudy	Dry	Fatigued/asleep	70	incapacitating Injury - Operator fell asleep causing the vehicle to run off the road and roll over at House #81
40	06/28/13	Friday	12:30 PM	Single Vehicle Crash	Daylight	Cloudy	Dry	Overstayed	19	No Injury - Vehicle hit roadway striking Utility Pole #22
41	07/10/13	Wednesday	7:09 PM	Single Vehicle Crash	Daylight	Rain	Wet	Inattention	22	Non-incapacitating Injury - Vehicle lost control leaving roadway and striking Utility Pole #147
42	07/25/13	Thursday	11:54 PM	Single Vehicle Crash	Dark- lighted roadway	Rain	Wet	Exceeded authorized speed limit	17	No Injury - Vehicle lost control leaving roadway and striking tree and stone wall
43	12/09/13	Monday	8:03 AM	Head on	Daylight	Sleet, Hail, Freezing Rain	Slush	No motorist Driving	19 41	Non-incapacitating Injury - Vehicle lost control due to conditions crossing the center line and striking oncoming vehicle
44	12/18/13	Monday	8:28 PM	Single Vehicle Crash	Dark- roadway not lighted	Clear	Snow	Driving too fast for conditions	19	No Injury - Vehicle entering corner at high speed losing control and crossing roadway striking a tree

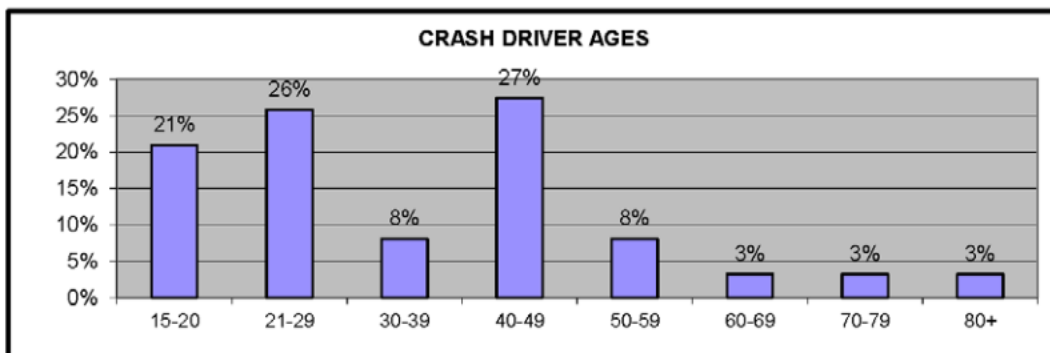
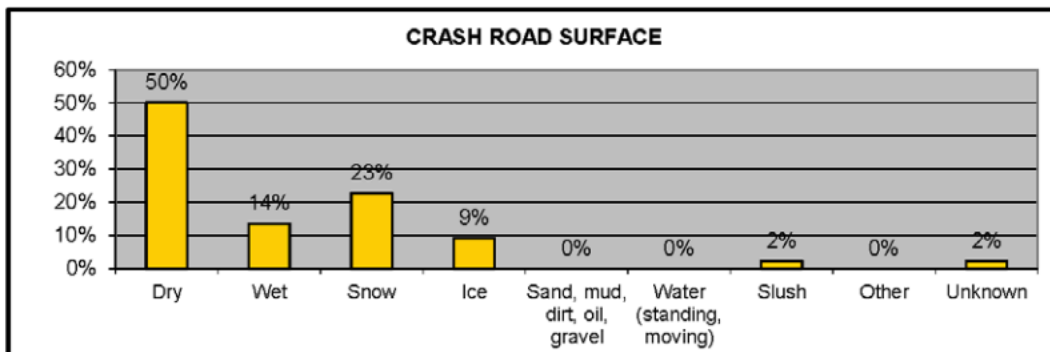
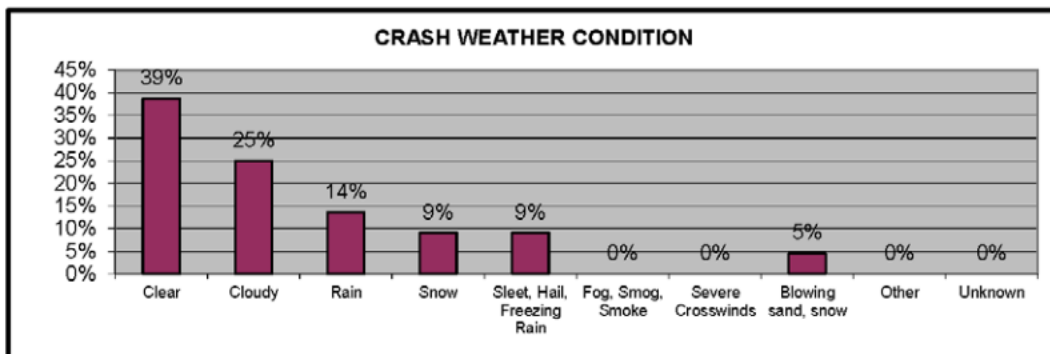
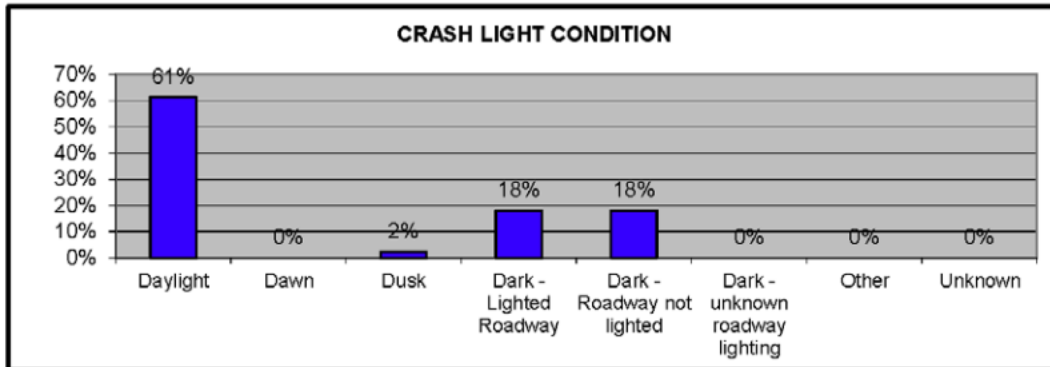
\*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another driver.

Summary based on Crash Reports obtained from the Dudley Police Department

**Crash Data Summary Tables and Charts**  
Dresser Hill Road (Route 32) ; Dudley, MA



**Crash Data Summary Tables and Charts**  
Dresser Hill Road (Route 32) ; Dudley, MA



## **Appendix D. Road Safety Audit References**

## Road Safety Audit References

*Massachusetts Traffic Safety Toolbox*, Massachusetts Highway Department, [www.mhd.state.ma.us/safetytoolbox](http://www.mhd.state.ma.us/safetytoolbox).

*Road Safety Audits, A Synthesis of Highway Practice*. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

*Road Safety Audits*. Institute of Transportation Engineers and U.S. Department of Transportation, Federal Highway Administration, [www.roadwaysafetyaudits.org](http://www.roadwaysafetyaudits.org).

*FHWA Road Safety Audit Guidelines*. U.S. Department of Transportation, Federal Highway Administration, 2006.

*Road Safety Audit*, 2<sup>nd</sup> edition. Austroads, 2000.

*Road Safety Audits*. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.