INDIANA UNIVERSITY
TRANSPORTATION RESEARCH CENTER
School of Public and Environmental Affairs
222 West Second Street
Bloomington, Indiana 47403-1501
(812) 855-3908 Fax: (812) 855-3537

ON-SITE POTENTIAL SAFETY RELATED DEFECT INVESTIGATION

CASE NUMBER - IN-04-022
LOCATION - Mississippi
VEHICLE - 2003 SATURN VUE
CRASH DATE - April 2004

Submitted:

August 26, 2005
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Prepared for:

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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15. *Supplementary Notes* On-site potential safety-related defect investigation involving a 2003 Saturn Vue with manual safety belts and depowered front air bag system.			
16. *Abstract* This report covers an on-site investigation of a potential safety-related defect involving the left rear suspension of a 2003 Saturn Vue (case vehicle). This crash is of special interest because the case vehicle's driver contacted the Auto Safety Hotline and reported that the left rear wheel bent underneath the case vehicle during a roadway recovery steering maneuver after the vehicle reentered the roadway causing the case vehicle to roll over, and the driver (29-year-old female) sustained numerous injuries as a result of the crash. The case vehicle was traveling southeast in a straight, level section of a two lane, undivided state highway at a driver estimated speed of approximately 72 km.p.h. (45 m.p.h.). The case vehicle's driver was distracted by her cat, and the vehicle drifted off the right side of the road. The driver steered left and reentered the roadway. The driver then steered right, and the case vehicle began to rotate clockwise and traveled back across the roadway in a rapidly increasing clockwise yaw. The case vehicle departed the south edge of the roadway, and the left front and left rear tires loaded into the ground and tripped the case vehicle causing it to roll over driver side leading. The case vehicle rolled over one time (i.e., four quarter turns) and came to rest on its wheels facing northwest. The driver was restrained by her manual lap-and-shoulder safety belt system and remained in her seat throughout the rollover. She sustained numerous injuries during the rollover including a neck and lower back strain and a sprained right ankle. She was transported from the scene to a local hospital and treated and released. The evidence at the scene and on the vehicle indicated that the damage to the left rear suspension most likely occurred during the rollover sequence as the left rear wheel loaded into the ground as the case vehicle departed the edge of the roadway. The evidence did not support this damage occurring on the roadway during the case vehicle's steering maneuver and subsequent yaw.			
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This investigation was brought to NHTSA's attention on April 14, 2004 by a call to the Auto Safety Hotline in Washington, D.C. This crash involved a 2003 Saturn Vue (case vehicle), which ran-off-road and rolled over. The crash occurred in April, 2004, at 6:51 p.m., in Mississippi and was investigated by the Mississippi Highway Patrol. This crash is of special interest because it is alleged that components of the case vehicle's left rear suspension collapsed during a roadway recovery steering maneuver after the vehicle reentered the roadway causing the case vehicle to roll over, and the case vehicle's driver [29-year-old, White (non-Hispanic) female] sustained numerous injuries as a result of the crash. This contractor and representatives of the agency's Office of Defects Investigation (ODI) in Washington, D.C. and General Motors inspected the case vehicle and scene, and this contractor downloaded the case vehicle's Event Data Recorder (EDR) on July 23, 2004. In addition, this contractor interviewed a witness and conducted a preliminary inspection of the scene on July 22, 2004; and interviewed the case vehicle's driver on October 7, 2004. This report is based on the police crash report, scene and vehicle inspections, insurance photographs, statements by the tow truck driver, interviews with the case vehicle's driver and a witness; the Auto Safety Hotline, Vehicle Owner's Questionnaire; occupant kinematic principles and this contractor's evaluation of the evidence.

SUMMARY

The case vehicle was traveling southeast in a straight, level section of a two lane, undivided state highway at a driver estimated speed of approximately 72 km.p.h. (45 m.p.h.). The case vehicle's driver was distracted by her cat, and the vehicle drifted off the right side of the road. The driver steered left and reentered the roadway. The driver then steered right, and the case vehicle began to rotate clockwise and traveled back across the roadway in a rapidly increasing clockwise yaw. The case vehicle departed the south edge of the roadway, and the left front and left rear tires loaded into the ground and tripped the case vehicle causing it to roll over driver side leading. The case vehicle rolled over one time (i.e., four quarter turns) and came to rest on its wheels facing northwest. The weather at the time of the crash was clear, the roadway was dry and traffic density was light.

The damage to the left rear suspension most likely occurred during the rollover sequence as the left rear wheel loaded into the ground as the case vehicle departed the edge of the roadway. The evidence does not support this damage occurring on the roadway during the case vehicle's steering maneuver and subsequent yaw.

Based on the vehicle inspection, the CDC for the case vehicle was determined to be: **00-TZDO-3.** Based on the crush to the case vehicle's roof, the severity of the rollover was estimated to be moderate.

Immediately prior to the crash, the case vehicle's driver was seated in an upright posture with her back against the seat back and both hands on the steering wheel. Her seat track was located in its middle position, the seat back was upright and the tilt steering column was adjusted to its center position. The driver was restrained by her manual, three-point, lap-and-shoulder safety belt system. The driver stated she took her foot off the accelerator after the case vehicle

departed the right side of the roadway and did not apply the brakes during the entire event, which is supported by the EDR data. As the case vehicle rotated clockwise across the roadway, the driver moved to the left and her seat belt retractor most likely locked. The driver moved left into her door as the case vehicle departed the south edge of the roadway and began to roll over. During the rollover, the driver most likely impacted the left B-pillar causing a bruise to her left upper arm. In addition, she most likely impacted her right knee on the steering column and her right foot on the foot controls causing a bruise and cartilage damage to her knee and a sprained ankle. As the case vehicle sustained a hard ground impact to the right roof side rail, the driver loaded her safety belt causing a bruise to her left shoulder and chest. The force of this impact was also the likely source of a strain to the driver's neck and lower back. The driver remained restrained in her seat throughout the rollover and was able to exit the vehicle under her own power through the driver's door following the crash. The driver's use of her manual three-point, lap-and-shoulder safety belt mitigated her interaction with the case vehicle's interior components during the roll over.

The police crash report indicated the case vehicle's driver sustained a "C" (possible) injury as a result of the crash, and was transported from the scene by ambulance to a local hospital. The driver was treated in the emergency room and released. The driver stated she lost five work days as a result of the crash, has visited her doctor five times and is in chiropractic therapy for her injuries.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the case vehicle was traveling was a two lane, undivided, state highway, traversing in a northwest and southeast direction. The northwest bound travel lane was 3.0 meters (9.8 feet) wide and the southeast bound travel lane was 3.3 meters wide (10.8 feet). The estimated roadway coefficient of friction was 0.72. Each travel lane was bordered by a grass shoulder approximately 1.8 meters (5.9 feet) wide and a shallow ditch. Pavement markings consisted of a solid yellow no-passing line for northwest bound traffic, broken yellow center line for southeast bound traffic and solid white edge lines. The case vehicle's approach to the crash location was uncontrolled and the speed limit was 88 km.p.h. (55 m.p.h.). At the time of the crash the light condition was dusk, the atmospheric condition was clear, and the roadway pavement was dry, level bituminous. Traffic density was light and the site of the crash was rural. See the Crash Diagram at the end of this report.

Figure 1: Approach of case vehicle in southeast bound lane, arrow shows area of rollover

Pre-Crash: The case vehicle was traveling southeast in a straight, level section of roadway (**Figure 1**) at a driver estimated speed of approximately 72 km.p.h. (45 m.p.h.). The case vehicle driver stated that she and her husband were in the process of moving, and she was following him to their destination. The case vehicle was loaded with a number of boxes and,

unknown to the driver, her cat had gotten in the vehicle as it was being loaded. The driver stated that she was startled when the cat suddenly jumped up on a box behind her, cried loudly and began to vomit. As a result of this distraction, the case vehicle's right side tires drifted off the roadway to the right onto the grass shoulder (**Figure 2**). The driver steered the case vehicle left, reentered the roadway and then steered back to the right (**Figure 3**). The right steer maneuver put the case vehicle into a clockwise rotation and the left front, left rear and right rear tires made striated tire marks on the roadway. The tire mark striations indicate a tire that is rotating and slipping sideways, the signature of a yaw mark. The yaw marks had been worn off the traveled portion of the roadway due to traffic and the passage of time between the crash and this contractor's scene inspection, but remnants of the yaw marks were still visible on the center line, no passing line and the south edge line of the roadway (**Figures 4** and **5**). The yaw path show that the vehicle's clockwise rotation increased rapidly as it traveled partially into the northwest bound lane and then across the southeast bound lane. The case vehicle had rotated clockwise approximately 160 degrees from its original travel heading when it departed the south roadway edge, driver side leading. The evidence at the scene and on the case vehicle show that the rollover event occurred on the south side of the roadway.

Figure 2: View southeast, case vehicle departed right side of roadway between driveway and utility pole, arrow shows case vehicle's area of final rest

Figure 3: Area where case vehicle reentered the roadway, arrow shows location of yaw marks at center of roadway (marked with orange paint)

Figure 4: View southeast to case vehicle's yaw path, paint marks on center of roadway show yaw marks, arrow shows left rear yaw mark on centerline and no passing line

Figure 5: Case vehicle's left front yaw mark in foreground between paint dots, right rear yaw mark in background between paint marks, arrow shows area of case vehicle's final rest

Crash: The case vehicle departed the south edge of the roadway and the left rear and left front tires loaded into the ground and tripped the vehicle causing it to roll over driver side leading. The interaction of the tires with the ground created divots in the ground beginning at the edge of the pavement, broke the beads on both tires and jammed grass in the bead of the left front tire (**Figures 6** and **7**). The passage of time since the crash combined with heavy rains and mowing of the roadway shoulder had caused the ground divots to dissipate; however, remnants of the divots still remained at the edge of the pavement (**Figures 8** and **9**).

Figure 6: Insurance photo of case vehicle in tow lot showing condition of left rear wheel, spare tire mounted on left front

Figure 7: Insurance photo showing left front wheel in case vehicle's spare tire compartment, arrow shows grass jammed in bead

Figure 8: Remains of divot from case vehicle's left front wheel, tape measure at bottom of divot

Figure 9: Remains of divot from case vehicle's left rear wheel, tape measure at bottom of divot

Figure 10: Top view of the crush to case vehicle's roof, roof side rails and right windshield header

Figure 11: Overview of right roof side rail crush, vertical scale increments in tenths of foot

As the case vehicle rolled over, the left roof side rail sustained a minor ground impact during the first quarter roll, and the right roof side rail sustained a hard ground impact during the second quarter roll (**Figures 10** and **11** above). The impact to the right roof side rail was the most severe and caused the most damage to the vehicle. As the case vehicle continued over into its third quarter roll, the right side sustained a minor ground impact that broke off the right side view mirror and scratched the right C-pillar. As the case vehicle was completing its third quarter roll, the sidewalls of the right side tires impacted the ground and grass was jammed in the beads of both tires (**Figures 12** and **13**). The case vehicle then landed on its wheels completing one full rollover.

Figure 12: Grass jammed in bead of case vehicle's right front tire

Figure 13: Grass jammed in bead of case vehicle's right rear tire

Post-Crash: The case vehicle came to rest on its wheels on the south side of the roadway facing northwest (**Figure 14**). The driver stated she exited the case vehicle under her own power through the driver's door. The witness stated she went to the case vehicle immediately after the crash and found the case vehicle driver out of the vehicle looking for her cat.

Figure 14: View back to roadway from area of case vehicle's final rest

CASE VEHICLE

The 2003 Saturn Vue was a four-door, all wheel drive, sport utility vehicle (VIN: 5GZCZ43DX3S------) equipped with 2.2 L, four cylinder engine and three-speed automatic transmission. Braking was achieved by power assisted front disc and rear drum brakes. The front seat was equipped with de-powered driver and front right passenger air bags, bucket seats with adjustable head restrains and three-point, manual, lap-and-shoulder safety belts. The back seat was equipped with a split bench seat with folding backs, adjustable head restraints in the outboard seat position and manual, three-point, lap-and-shoulder safety belts in all three seat positions. In addition, the case vehicle was equipped with an EDR housed within the air bag system's Sensing and Diagnostic Module (SDM) and a LATCH system for securing child safety seats. Four wheel, anti-lock brakes; traction control and side curtain air bags were an option on the case vehicle, but

it was not so equipped. The case vehicle's wheelbase was 271 centimeters (106.7 inches) and the odometer reading at the time of the inspection was 38,704 kilometers (24,050 miles).

CASE VEHICLE DAMAGE

Exterior Damage: The case vehicle sustained minor direct damage to the left portion of the air scoop below the front bumper. The impact dislocated the left corner of the scoop from one of its mounts and deposited grass in the mounting screw (**Figure 15**). This impact most likely occurred during the initial tripping phase of the rollover due to loading of the case vehicle's front suspension from the yaw and the left front wheel loading into the ground. The rollover directly damaged the roof, both roof side rails and the right upper portion of the windshield (**Figures 16** and **17**). The most severe damage during the rollover occurred to the right roof side rail. The maximum crush was approximately 20 centimeters (8 inches) occurring approximately 15 centimeters (6 inches) forward of the B-pillar. In addition, the right side view mirror was broken off, and there were a few scratches to the right C-pillar. Induced damage involved the right side doors; and the right front, right rear and right quarter windows were broken out. The case vehicle's wheelbase was reduced approximately 1 centimeter (0.4 inches) on the right side and 2 centimeters (0.8 inches) on the left side.

Figure 15: Damage to the left portion of case vehicle's front air scoop, blade of grass in mounting screw at center of photo

Figure 16: Overview of damage to case vehicle's roof from the left front corner

The recommended tire size was: P235/65R16 and the vehicle was equipped with tires of this size. The case vehicle's tire data are shown in the table below. Data for the left front and left rear tires are based on observations from the insurance photographs (except tread depth and tire restriction). The tow operator indicated that the left front tire was removed from the case vehicle and the spare tire mounted in its place in order to tow the case vehicle from the scene. He also indicated that they aired-up and remounted the left front wheel on the case vehicle and aired-up the left rear wheel sometime prior to this contractor's vehicle inspection.

Figure 17: Right front view of damage to roof and windshield

Tire	*Measured Pressure*		*Recommend Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kpa	psi	kpa	psi	milli-meters	32nd of an inch			
LF	Flat	Flat	207	30	6	7	Insurance photos show tire debeaded with grass in bead	No	Yes
RF	193	28	207	30	6	7	None, but grass in bead	No	No
LR	Flat	Flat	207	30	8	10	Insurance photos show tire debeaded, see no grass in bead	Rubs trailing arm	Yes
RR	207	30	207	30	8	10	None, but grass in bead	No	No

Vehicle Interior: Inspection of the case vehicle's interior revealed no evidence of occupant contact to any interior surfaces or components. Numerous passenger compartment intrusions were observed and documented involving primarily the front right and back right seat positions. The most severe intrusions into these seat areas involved vertical intrusion of the roof of approximately 19 centimeters (7.5 inches), and approximately 9 centimeters (3.5 inches) of vertical and lateral intrusion of the roof side rail (**Figure 18**). In addition, there was lateral intrusion of the C-pillar and D-pillar of about 4 centimeters (1.6 inches). Lastly, there was no evidence of compression of the energy absorbing steering column, and no deformation of the steering wheel rim was observed (**Figure 19**).

Figure 18: Intrusion of case vehicle's roof, right roof side rail and right B and C pillars

Figure 19: Overview of case vehicle's steering wheel and steering column

Damage Classification: Based on the vehicle inspection, the CDC for the case vehicle was determined to be: **00-TZDO-3.** The WinSMASH reconstruction program could not be used to reconstruct the case vehicle's Delta V because rollovers are out-of-scope for the WinSMASH

program. Based on the crush to the case vehicle's roof, this contractor estimates the severity of the rollover to be moderate.

ANALYSIS OF ALLEGED LEFT REAR SUSPENSION COLLAPSE

The case vehicle's driver stated in the Auto Safety Hotline, Vehicle Owner's Questionnaire and in her interview that after she steered the case vehicle back onto the roadway, the rear end fish-tailed slightly and the left rear wheel bent underneath the case vehicle causing it to rollover on the roadway passenger side first. This contractor's inspection of the case vehicle revealed that the left rear toe control link was badly bent; the upper control arm was bent, but to a lesser degree, the tire had contacted the trailing arm (**Figure 20**) and also contacted the front of its wheel house (**Figure 21**). In addition, the left rear wheel was observed to be angled in at the bottom about 10 degrees (**Figure 22**) and angled to the right, also about 10 degrees (**Figure 23** below). The evidence on the vehicle and at the crash site does not support this damage occurring while the case vehicle was on the roadway during its clockwise yaw. The damage to these components most likely occurred as the left rear wheel departed the pavement and loaded into the ground. The remains of a divot with mounded-up soil was found at the edge of the pavement where the left rear wheel departed (**Figure 9** above). In addition, no rim gouges were found in the roadway pavement and no abrasions were found on the left rear rim or tire sidewall. The surface of the outer treads of the left rear tire were also abraded (**Figure 23** below) consistent with the yaw tire marks that were observed on the roadway centerline, no-passing line and southwest edge line, indicating the tire was rotating and not debeaded while the case vehicle was on the roadway. Based on the evidence, this contractor concludes the following: This crash was a soil-tripped, driver side leading rollover that occurred as the case vehicle departed the south edge of the pavement. The damage to the left rear suspension most likely occurred during the rollover sequence

Figure 20: Left rear wheel contacting trailing arm, toe link bent in V-shape, arrow points to bent upper control arm

Figure 21: Scuff at front of left rear wheel house from contact by left rear tire

Figure 22: Insurance photo of case vehicle in tow lot showing condition of left rear wheel

as the left rear wheel loaded into the ground as the case vehicle departed the edge of the roadway. The evidence does not support this damage occurring on the roadway during the case vehicle's steering maneuver and subsequent yaw.

Figure 23: Top view of case vehicle's left rear wheel showing it angled to the right, outer treads abraded

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with de-powered air bags in the driver and front right passenger positions. The driver's air bag was located in the steering wheel hub (**Figure 24**) and the front right passenger's air bag was located in the middle instrument panel above the glove box (**Figure 25**). The driver and front right air bags did not deploy because no frontal impact occurred during the crash sequence.

Figure 24: Overview on steering wheel and instrument panel

Figure 25: Overview of case vehicle's instrument panel, front right air bag located above glove box door

CRASH DATA RECORDING

The download of the case vehicle's EDR was done during the vehicle inspection via connection to the case vehicle's diagnostic link connector. The EDR recorded a non-deployment event. The case vehicle's system status report and pre-crash data graph are presented at the end of this report (**Figures 26** and **27**). It is this contractor's opinion that the crash sensing algorithm was activated during the rollover event. It appears the vehicle sustained a longitudinal acceleration just severe enough to wake up the crash sensing algorithm as indicated by the maximum SDM recorded velocity change of 0.00 km.p.h. (0.00 m.p.h) shown on the system status report. The system status report also recorded the SIR warning lamp as off and the driver's seat belt switch circuit as buckled.

The pre-crash data shows the brake switch circuit was off for the five, one-second sample periods prior to algorithm enable (AE). It also reports the case vehicle traveling 76 km.p.h. (47 m.p.h.) at 23% throttle five seconds prior to AE. This is consistent with the case vehicle driver's reported travel speed of approximately 72 km.p.h. (45 m.p.h.). The speed then begins to decrease and at three seconds prior to algorithm enable, the percent throttle is recorded as zero and remains at zero for the remaining two, one-second sample periods prior to AE. It is this contractor's opinion that the clockwise yaw preceding the rollover most likely began between three and four seconds prior to AE.

CASE VEHICLE DRIVER KINEMATICS

Immediately prior to the crash, the case vehicle's driver [29-year-old, White (non-Hispanic) female; 168 centimeters and 59 kilograms (66 inches, 130 pounds)] was seated in an upright posture with her back against the seat back and both hands on the steering wheel. Her seat track was located in its middle position, the seat back was upright and the tilt steering column was adjusted to its center position. The driver stated she took her foot off the accelerator after the case vehicle departed the right side of the roadway, but did not apply the brakes. She stated she remained in an upright position with both hands on the steering wheel as she steered the case vehicle back onto the roadway and then steered to the right. The driver stated she did not apply the brakes during the entire event, which is supported by the EDR data.

Based on the driver interview and supported by the EDR data, the case vehicle's driver was using her manual, three-point lap-and-shoulder safety belt system. In addition, the driver reported a belt pattern bruise to her left shoulder and chest.

Following the case vehicle driver's right steer maneuver, the driver most likely moved to the left and her seat belt retractor most likely locked as the case vehicle yawed clockwise on the roadway. The driver moved left into her door as the case vehicle departed the south edge of the roadway, the left side tires loaded into the ground and the vehicle began to roll over. The driver most likely impacted the left B-pillar bruising her left upper arm as the left roof side rail impacted the ground at the beginning of the second quarter roll. In addition, she most likely impacted her right knee on the steering column and her right foot on the foot controls bruising her knee, injuring her right knee cartilage and spraining her ankle. The driver then moved to the right and toward the roof as the case vehicle sustained a hard ground impact to the right roof side rail at the end of the second quarter roll. The driver loaded her safety belt causing a bruise to her left shoulder and chest. The force of this impact was also probably the source of the driver's neck and lower back strain. The driver then most likely moved down into the seat and to the right as the right side tires impacted the ground at the end of the third quarter roll. The driver moved back to the left and likely contacted her door as the case vehicle completed the fourth quarter roll and came to rest on its wheels. The driver remained restrained in her seat throughout the rollover and was able to exit the vehicle under her own power through the driver's door following the crash. The driver's use of her manual, three-point, lap-and-shoulder safety belt mitigated her interaction with the case vehicle's interior components during the roll over.

The police crash report indicated the case vehicle's driver sustained a C (possible) injury as a result of the crash, and was transported from the scene by ambulance to a medical treatment facility. The driver was treated in the emergency room and released. The driver stated she lost five work days as a result of the crash, has visited her doctor five times and is in chiropractic therapy for her injuries. The table below shows the driver's injuries and injury mechanisms.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Strain, acute cervical, not further specified	minor 640278.1,6	Noncontact injury: impact forces	Probable	Emergency room records
2	Injury right knee cartilage, not further specified	moderate 850802.1,1	Steering column, right side	Probable	Interviewee (same person)
3	Strain, acute, lumbar {lower} area of back, not further specified	minor 640678.1,8	Noncontact injury: impact forces	Probable	Emergency room records
4	Sprain right ankle, not further specified	minor 850206.1,1	Floor, foot controls	Probable	Emergency room records
5	Contusion {bruise} central chest area	minor 490402.1,4	Torso portion of safety belt system	Probable	Interviewee (same person)
6	Contusion {bruise} left shoulder	minor 790402.1,2	Torso portion of safety belt system	Probable	Interviewee (same person)
7	Contusion {bruise} left upper arm, not further specified	minor 790402.1,2	"B"-pillar, left	Probable	Interviewee (same person)
8	Contusion right knee, not further specified	minor 890402.1,1	Steering column, right side	Probable	Interviewee (same person)

5GZCZ43DX3Sxxxxxx System Status At Non-Deployment	
SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Ignition Cycles At Non-Deployment	1753
Ignition Cycles At Investigation	1781
Maximum SDM Recorded Velocity Change (MPH)	0.00

PRE-CRASH DATA				
Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	47	1984	23	OFF
-4	42	1600	12	OFF
-3	38	1408	0	OFF
-2	22	1088	0	OFF
-1	11	1088	0	OFF

Figure 26: Case vehicle's System Status at Non-Deployment report

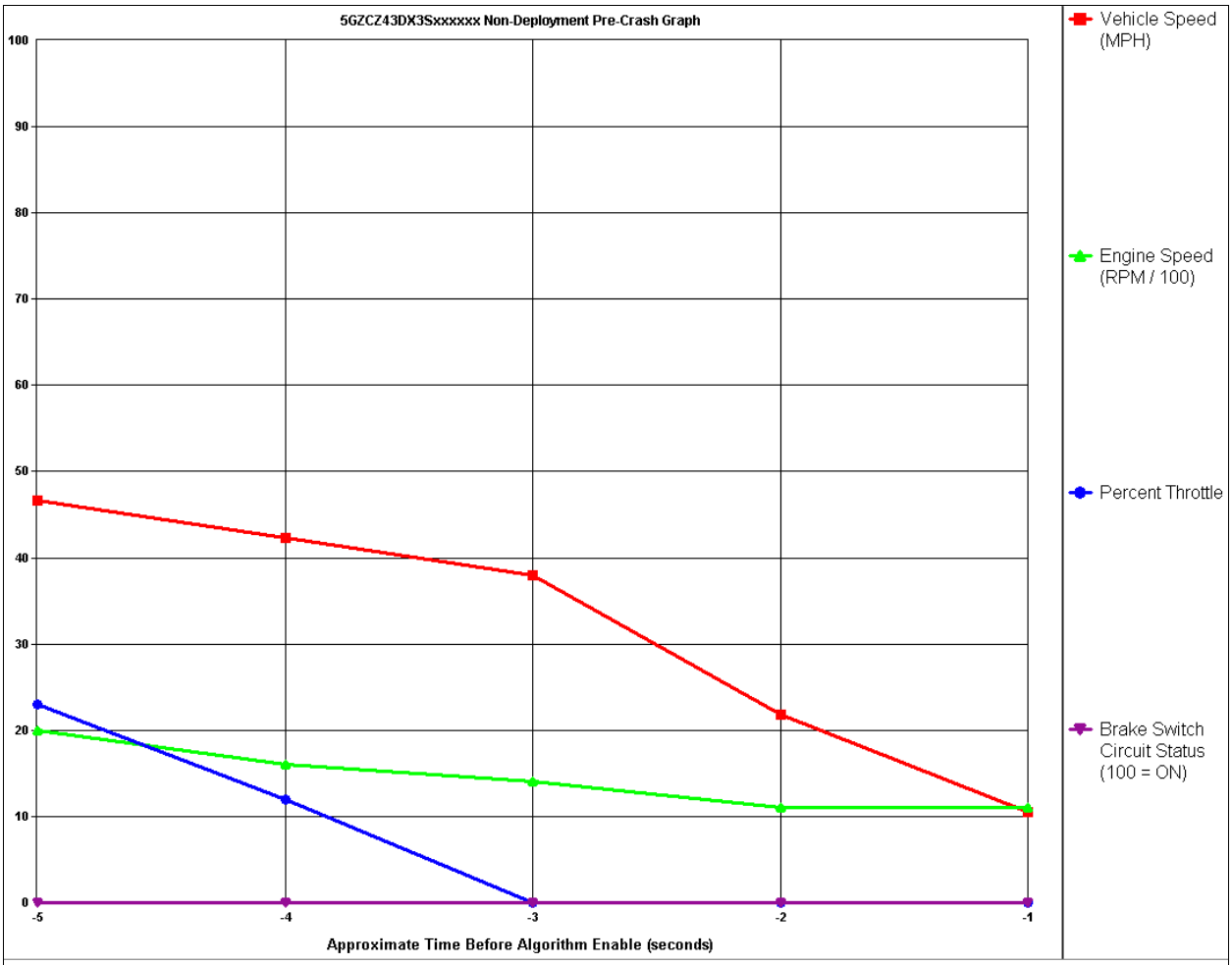
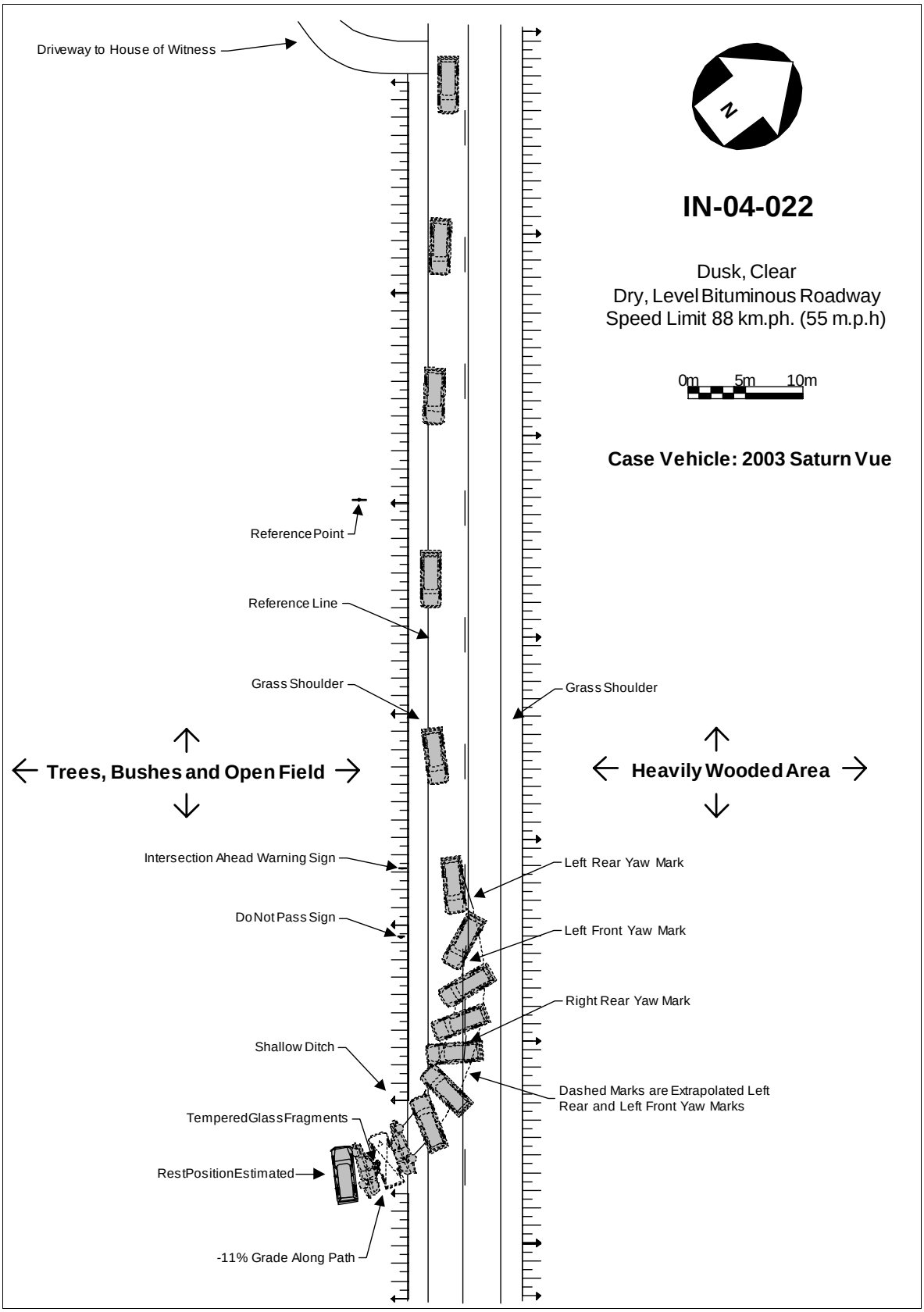


Figure 27: Case vehicle's Non-Deployment Pre-Crash Data Graph


Driveway to House of Witness
N
IN-04-022
Dusk, Clear
Dry, Level Bituminous Roadway
Speed Limit 88 km.ph. (55 m.p.h)
0m 5m 10m
Case Vehicle: 2003 Saturn Vue
Reference Point
Reference Line
Grass Shoulder
Grass Shoulder
Trees, Bushes and Open Field
Heavily Wooded Area
Intersection Ahead Warning Sign
Do Not Pass Sign
Shallow Ditch
Tempered Glass Fragments
Rest Position Estimated
-11% Grade Along Path
Left Rear Yaw Mark
Left Front Yaw Mark
Right Rear Yaw Mark
Dashed Marks are Extrapolated Left Rear and Left Front Yaw Marks