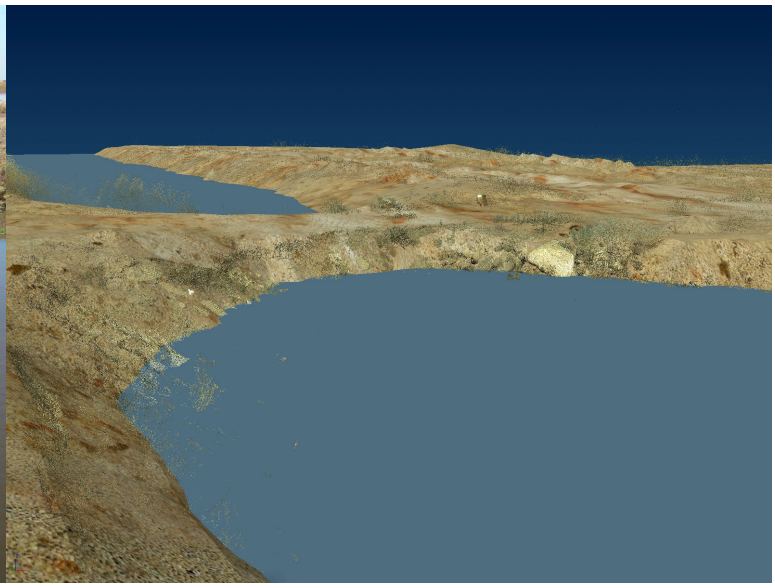
115 S. Church Street • Grass Valley, CA 95945 • (877) 339-7378 • info@precisionsim.com • precisionsim.com

# Complex Reconstruction of Single Vehicle Accident

3D Laser Scanning is PSI's go-to tool for accurately documenting large and complex accident and crime scenes for many reasons. As illustrated in previous posts, often the primary benefit is the ability to preserve a complex scene and all of its physical evidence in perpetuity, allowing in-depth analysis at a later date within the computer.

Sometimes, the benefit of creating a virtual 3D Working Model lies in the ability to perform analyses within the computer that simply cannot be performed within the real world scene. The following case study illustrates just such a scenario.

*Accident Scene Photo at the Time of Incident*



*3D Model of Accident Scene with Waterline*

*Accident Scene Photo at the Time of Analysis*

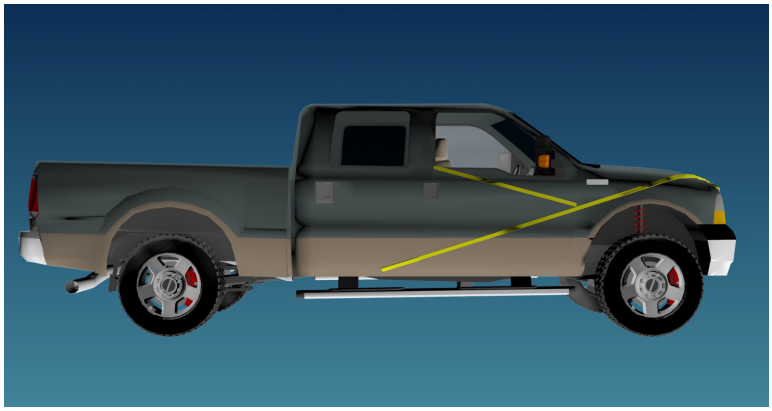
*Laser Scan of Accident Scene*

# The Scenario

The driver of a Ford F-250 extended cab pickup truck is driving down a rural dirt road adjacent to an irrigation ditch. The driver is heading towards his own home with a companion in the passenger seat whom he has recently met at a local bar. Both occupants had been drinking prior to getting into the truck. On the way home, the driver misjudges a turn in the road, entering the turn early and dropping the pickup truck down into the irrigation ditch, lodging it against the embankment and a drainage pipe. As the irrigation ditch is full of water at that time of year, the front and portions of the passenger side of the truck are submerged. The driver exits the truck and walks to his house to get help.

The passenger of the truck is found drowned in the ditch approximately 100 yards downstream a few days later after she was reported missing.

*Photo of Truck Involved in Accident*



*3D Model of Truck Involved in Accident*

The district attorney's office is interested in determining how much of the truck was in the water at the time the driver decided to leave the truck with his passenger inside, who was intoxicated and potentially injured from the impact into the ditch. Although the truck was removed by the driver with the assistance of friends, physical evidence remains that may help shed light on the question of the condition of the truck and its occupant at the time the driver abandoned his vehicle.

As the truck was in the water for a number of hours prior to extraction, there are water marks on the exterior and interior of the truck indicating the level of the waterline relative to the truck at rest. In fact, there are two sets of waterlines – one depicting the level relative to the truck with both doors closed, as the truck was initially at point of rest, and a second waterline on the passenger door depicting the angle of the door when it was opened at a later point. In addition to the waterline evidence, there is damage to the front of the truck near the front license plate that appears to correspond to an impact strike on the underwater pipe struck by the truck, arresting its forward momentum at the point of rest.

# The Analysis

PSI visited the scene months after the crash when the ditch was empty of water, and utilized our 3D laser scanner to create an accurate 3D model of the surface of the embankment, the floor level under the water and the pipe that was struck by the truck.

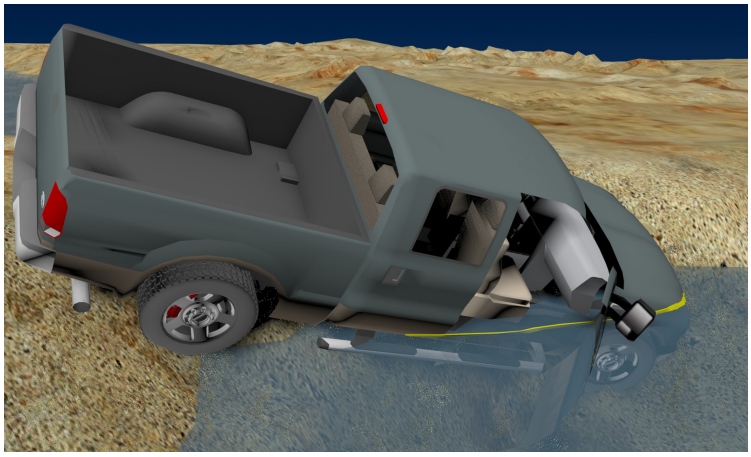
Using reference photography from the search and rescue efforts deployed to find the missing woman, PSI was able to use photogrammetry to recreate the water depth level within the 3D model of the drainage ditch.

For those of you who enjoy puzzles, the next step is right up your alley. It's a 3-dimensional puzzle. Using the accurate terrain model, an accurate 3D model of an F-250 with the water stains and the physical evidence, PSI's engineers translated and rotated the F-250 in all three axes to accurately align the water marks with the derived water level at the time of the accident. This process would be essentially impossible to do at the scene, requiring the flexibility and accuracy of the computer driven 3D working model to perform. The ability to manipulate the 3D model of the F-250 relative to the waterline, while receiving real-time feedback as to the match, allowed PSI to quickly derive a 3D perspective of the orientation and location of the F-250 relative to the irrigation ditch at the time the driver abandoned the vehicle and his passenger.

*Waterline with Door Closed*

*Waterline with Door Open*

*Waterline with Door Closed*



*Waterline with Door Open*

## The Conclusion

As previously mentioned, this puzzle had a daunting wrinkle – a second waterline created when the passenger door was opened after a sufficient time to have left an initial waterline on the door in the closed position. As there was no evidence that the F-250 moved between the door open and door closed configurations, a single solution to both puzzles was necessary. Although this proved an extra challenge, it also provided a very stringent double-check as only a solution that solved both configurations would be deemed valid, and yet once derived, it was likely to prove to be a unique solution.

*Waterline with Door Open*

The resulting position of the F-250 and the graphics automatically generated as part of the solution process – an additional benefit to the 3D Working Model – provided the District Attorney with sufficient evidence to quickly resolve the case and seek justice for the family of the victim.