Illegal U-turns are one of the Wrong-Way Driving (WWD) maneuvers that could result in head-on crashes and severe injuries. Even without crashes, these illegal movements still cause disturbance for approaching traffic. Crashes that result from this type of violation on limited access facilities are often severe because of the high speed of the approaching traffic and the unexpected angle of entrance of the illegally turning vehicle into the through traffic stream. Therefore, reviewing this type of violation and understanding the contributing factors that may lead drivers to commit such illegal maneuver would help officials foresee and consequently minimize the potential risks resulting from the resulting WWD crashes. This will improve safety and operations for the network users.

The purpose of this thesis is to review illegal U-turn maneuvers on limited access facilities and find the significant contributing factors that encourage or discourage drivers to commit this type of violation. The study area included the Orlando metropolitan area (Orlando-Kissimmee-Sanford) and the Miami metropolitan area (Miami-Fort Lauderdale-West Palm Beach).

The modeling methodology for this thesis had three goals: predicting the number of illegal U-turn violations across the traversable grass median sections each year, selecting the most effective variables in predicting the illegal U-turn violations, and estimating the probability of the occurrence for an illegal U-turn violation at a paved median opening for official use only per year.

To determine the variables that influence the illegal U-turn violations at limited access facilities, 11 exploratory variables in each model mentioned were analyzed. The variables that were found significant using a Poisson regression model were the number of lanes, the distance to the nearest interchange, the length of the median segment, the number of access points in the segment, the median type, the average distance between the access points, and the speed limit. Afterwards, the previously mentioned variables were evaluated using the least absolute shrinkage and selection operator method to conclude that the most effective variables were the median design type and the distance of the section to the nearest interchange. However, the variables found significant for the median opening modeled by the logistic regression model were the spacing between the median openings and the distance to the nearest interchange.

Along with required design guidelines, the models found in this thesis could be used as effective planning tools to select the appreciate locations for installing new median openings and reevaluating the existing median openings to select the locations with the lowest probability of illegal U-turns and by result the locations with the lowest potential risk.

Other modeling techniques that include additional factors could be tested in future research so that appropriate countermeasures can be installed to reduce or eliminate these illegal U-turns. Furthermore, the methodology could be extended to arterials (or roads with partially controlled access).