**Date: August 26th, 2024**

**Project: NCDOT RP 2023-20 (Three-phase Intersections)**

**Title: Validation of the results for the SSI**

**Validation of the results for the SSI**

The SSI for new alternatives tool is a spreadsheet that was developed solely based on the processes, formulas, and steps provided in the FHWA’s “A Safe System-Based Framework and Analytical Methodology for Assessing Intersections” (Report No. FHWA-SA-21-008). The validation was done based on the examples provided in the FHWA report for four of the intersections that were relevant to our research. The examples utilized for the validation focused on the signalized intersections. As a result of this, the validation was done for scenarios 1 and 3. The intersection in scenario 2 is an unsignalized intersection. These intersections included two-phase MUT (MUT), signalized conventional intersection (signalized traditional (existing)), signalized RCI (signalized RCUT), and signalized partial CFI (PDLT). It is important to note that, in the calculations of the average complexity adjustment, the examples in the report focused on a permissive/protected left turn signal. In contrast, this tool assumed a protected left turn phase only, and as such the results could not be validated. The results obtained also did not take into consideration the non-motorized traffic.

Table 1 and Table 2 present the results of the relative exposures and the average severity index P (FSI) for scenario 1 and scenario 3, respectively, from the FHWA report and our SSI for new alternatives spreadsheet. The highlighted sections of the tables represent the results from the spreadsheet. The validation performed for the severity calculations showed similar results to those in the FHWA report.

**Table 1. Relative exposure, and average severity P (FSI) from the FHWA report and the SSI for new alternatives tool for Scenario 1.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Intersection Type** | **Relative Exposure**  **(Scenario 1)** | | | | **Relative Exposure**  **(SSI tool)** | | | **Average Severity**  **(Scenario 1)** | | | **Average Severity**  **(SSI tool)** | | |
|
| **Cross** | **Merge** | **Diverge** | **Cross** | | **Merge** | **Diverge** | **Cross** | **Merge** | **Diverge** | **Cross** | **Merge** | **Diverge** |
| Signalized Traditional (existing) | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |
| PDLT/Partial CFI | 0.96 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |
| Signalized RCUT/RCI | 0.19 | 3.31 | 3.25 | 0.19 | | 2.63 | 2.60 | 0.09 | 0.01 | 0.00 | 0.09 | 0.01 | 0.00 |
| MUT | 0.84 | 2.58 | 2.88 | 0.74 | | 2.19 | 2.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |

**Table 2. Relative exposure, and average severity P (FSI) results from the FHWA report and the SSI for new alternatives tool for Scenario 3.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Intersection Type** | **Relative Exposure**  **(Scenario 3)** | | | **Relative Exposure**  **(SSI tool)** | | | **Average Severity**  **(Scenario 3)** | | | **Average Severity**  **(SSI tool)** | | | |
|
| **Cross** | **Merge** | **Diverge** | **Cross** | **Merge** | **Diverge** | **Cross** | **Merge** | **Diverge** | **Cross** | **Merge** | **Diverge** |
| Signalized Traditional (existing) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |
| PDLT/Partial CFI | 0.97 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |
| Signalized RCUT/RCI | 0.26 | 3.25 | 2.82 | 0.26 | 2.48 | 2.25 | 0.09 | 0.01 | 0.00 | 0.09 | 0.01 | 0.00 |
| MUT | 0.84 | 2.58 | 2.88 | 0.74 | 2.19 | 2.00 | 0.04 | 0.01 | 0.00 | 0.04 | 0.01 | 0.00 |