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# Traffic Analysis Memo

| | | | |
|---|---|---|---|
| To: | Oklahoma Department of Transportation | Date: | November 2021 |
| From: | Garver | | |
| RE: | ODOT CI-2262 – US-70 Roosevelt Bridge | | |

## 1. Introduction

As part of the Oklahoma Department of Transportation (ODOT) CI-2262 contract, Garver is studying the at-risk Roosevelt Memorial Bridge structure along United States Highway 70 (US-70) between Kingston and Durant, Oklahoma. This memo summarizes the traffic and safety analysis related to the potential bridge widening/replacement options and considers the two adjacent intersections on either end of the project study area.

## 2. Existing Conditions

The study area, shown in Figure 1, extends approximately 4 miles along US-70 from State Park Road to Willow Springs Road/Johnson Creek Road. US-70 is an east-west roadway through this area with a varying speed limit of 55 to 65 MPH. The study area includes the US-70 bridge (Roosevelt Memorial Bridge) over Lake Texoma and adjacent causeway to the east. The US-70 intersections at State Park Road to the west and Willow Springs Road/Johnson Creek Road to the east bound the study area. Both intersections have two-way stop control on the side streets.

US-70 is an undivided, two-lane facility over Lake Texoma and along the causeway but transitions to a five-lane facility at the boundary intersections. The bridge itself stretches approximately one-mile across Lake Texoma and has two 12' lanes, no shoulders, a flat grade, and a 55 MPH speed limit. The speed limit increases to 60 mph west of the Roosevelt Memorial Bridge and 65 mph over the causeway to the east.

The three-legged State Park Road intersection on the west side serves residential and recreational trips with access to Catfish Bay and Lake Texoma State Park. Access to marinas/boat launches onto Lake Texoma is provided at this intersection, and a gas station with open frontage located in the southwest quadrant. The intersection lane configuration includes a right turn only lane drop for eastbound traffic, a second westbound through lane added just east of the intersection, and a flared northbound approach that can accommodate right turning traffic to move around a single left turning vehicle.

To the east, the four-legged Willow Springs Road/Johnson Creek Road intersection serves residential development on the south side of US-70 and Johnson Creek Campground on the north side of US-70. Similar to State Park Road, a five-lane to two-lane transition at the intersection creates a westbound right and left turn lane drop for traffic heading over Lake Texoma. The eastbound approach does not have a left turn lane.


**US-70 Roosevelt Bridge**

*Study Area*

**Figure 1**

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## 2.1. Traffic Volumes

Data was collected in May 2021, to reflect warm-weather and school traffic volumes, and was processed/summarized into the design traffic volumes shown in Figures A-1 and A-2 in Appendix A – Traffic Volumes. 24-hour turning movement counts were collected at the two study intersections on a Tuesday, along with 7-day counts on US-70, to confirm the Tuesday values were representative of the entire week given the fluctuation in traffic common to recreational areas during warmer weather periods.

An analysis of the 7-day information on US-70 indicated Thursday data was approximately 15% higher than Tuesday data, so the 24-hour turning movements were adjusted accordingly. With the adjustment factor, US-70 carries approximately 8,500 vehicles per day across the Roosevelt Memorial Bridge with trucks accounting for 9% of the total volume. State Park Road carries approximately 1,750 vehicles per day, and Willow Springs Road/Johnson Creek Road carries approximately 1,200 vehicles per day.

## 2.2. Field Observations

Field observations were conducted in March 2021 to determine travel speeds, areas of limited sight distance, and potential safety/operational concerns within the study area. Inventory was also collected for any pertinent roadway features such as traffic control devices, sign locations, lane widths, and intersection configurations.

During the field observations, no significant intersection delay was observed in the AM or PM peak periods. A slight reduction in speed was observed on the bridge as vehicles entered or exited the bridge to the west and while traveling along the narrow bridge. Additional findings from the field observations were noted in the field and summarized in further detail in Appendix B – Safety Analysis Memo.

### 2.2.1 Roosevelt Memorial Bridge and Causeway

The Roosevelt Memorial Bridge extends approximately one-mile in length over Lake Texoma and includes a 250' truss section. The truss creates a vertical confinement on the already narrow two-lane route, as depicted in Figure 2. The bridge does not currently have a median to protect drivers from crossing into the opposing lane or any shoulders to offer emergency refuge. Passing opportunities are not provided on the Roosevelt Memorial Bridge; however, the causeway section and segment east towards the intersection of US-70 at Willow Springs Road/Johnson Creek Road do provide passing zones to allow road users the ability to pass using the opposing lane. The Roosevelt Memorial Bridge is the only portion of the study area with roadway lighting as luminaires are located on power poles at approximately 440-foot intervals.

Figure 2: Truss Structure on Bridge

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### 2.2.2 Sight Distance Restrictions

Intersection sight distance at State Park Road and at Willow Springs Road/Johnson Creek Road was observed in the field. The presence of trees, power poles, signage, and guardrails contribute to less visibility, as shown in Figure 3 and Figure 4.

Figure 3: Visibility, looking West – from Stop Bar at Willow Springs Road

Figure 4: Visibility, looking West – from Stop Bar at State Park Road

The sight distance needed to safely complete a right turn, a left turn, or a crossing maneuver can be calculated using guidance in the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*. Table 1 below depicts the intersection sight distance required for vehicles to conduct the maneuver from a stop condition on a minor street to a major street, along with the current sight distances that were field measured. As shown below, single-unit and combination trucks do not have enough sight distance to safely conduct any of the three maneuvers due to slower acceleration characteristics associated with trucks. Passenger cars cannot make a safe left turn from Willow Springs Road/Johnson Creek Road onto US-70. Due to the adjacent State Park and opportunities to get to Lake Texoma from this route, cars with boat trailers are common and subject to the sight distance conditions.

Table 1 – Required Sight Distances

| Location | Design Speed | Design Vehicle | Required Sight Distances (feet) | | | Existing Conditions Sight Distances (feet) | |
|---|---|---|---|---|---|---|---|
| | | | Right-Turn Distance | Left-Turn Distance | Crossing Distance | US-70 EB Vehicles | US-70 WB Vehicles |
| Willow Springs Road (NB) | 65 mph | Passenger Cars | 621 | 717 | 621 | 650 | 1,500 |
| | | Single-Unit Trucks | 812 | 908 | 812 | | |
| | | Combination Trucks | 1,003 | 1,099 | 1,003 | | |
| Johnson Creek Rd (SB) | 65 mph | Passenger Cars | 621 | 717 | 621 | 650 | 1,500 |
| | | Single-Unit Trucks | 812 | 908 | 812 | | |
| | | Combination Trucks | 1,003 | 1,099 | 1,003 | | |
| State Park Road (NB) | 60 mph | Passenger Cars | 573 | 662 | - | 700 | > 2,000 |
| | | Single-Unit Trucks | 750 | 838 | | | |
| | | Combination Trucks | 926 | 1,014 | | | |

*Source: AASHTO Policy of Geometric Design of Highways and Streets, equation* $ISD = 1.47V_{major}t_g$ *($t_g$ from tables 9-6, 9-8, and 9-10).*

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## 3. Crash Data

Crash Data was collected using ODOT's Safe-T Database for a five-year period from 2015 to 2019. Figure B-4 in Appendix B – Safety Analysis Memo depicts overall crash data along US-70, including a crash frequency heat map and statistics by occurrence, severity, and road condition/location. Over the five-year period, a total of 52 crashes occurred within the corridor limits with 18 crashes (35%) classified as intersection-related. Figures B-5 and B-6 in Appendix B – Safety Analysis Memo include collision diagrams along the project route. The most common crash types included 12 rear-ends, 11 angle-turning, nine fixed-object, eight sideswipe-opposite direction, and six head-on collisions. Four fatal crashes occurred on the route, along with two incapacitating injuries and nine non-incapacitating injuries.

The corridor crash rate (78 crashes per 100 million vehicle miles traveled (MVMT)) was comparable to the statewide crash rate (76 per 100 MVMT). However, the fatal crash rate for the corridor was almost 2.5 times larger at 6.0 per 100 MVMT than the statewide fatal crash rate at 2.6 per 100 MVMT.

Intersection-related collisions accounted for over one-third of the total collisions experienced within the study area – which can be contributed to limited sight distance and high travel speeds along US-70. The nine fixed-object collisions are important to note as these collisions were involving elements located closely alongside the roadway of the study area. Guardrails or barrier rails accounted for six of the collisions, one collision with a tree, another with a traffic sign, and one with a curb.

Additional information regarding the crash data can be found in Appendix B – Safety Analysis Memo.

## 4. Crash Modification Factors

A crash modification factor (CMF) is used to compute the expected number of crashes after implementing a countermeasure on a road or intersection. Several countermeasures with beneficial CMFs are described below that could be implemented to reduce the number of collisions that occur on the route.

Possible solutions to improve safety along the bridge and/or causeway section of the project route could include:

- Installation of any type of median barrier = 43% reduction (CMF ID: 42)
- Convert 2-lane roadway to a 4-lane divided roadway = 66% reduction (CMF ID: 7566)
- Upgrade facility to allow passing = 32% reduction (CMF ID: 9108)
- Installation of street lighting (along the entire route) = 37% reduction of night-time collisions (CMF ID: 7774)

As mentioned in the previous section, intersection-related and fixed object collisions accounted for a significant number of crashes within the study area. According to the *CMF Clearinghouse* online database, removing or relocating fixed objects outside of a clear zone could result in a 38% reduction of crashes (CMF ID: 1024). The potential addition of an outside shoulder width would also allow additional clearance from objects located on the route (such as guardrails, trees, and signs as previously mentioned). Adding rumble strips on the outside shoulders of the non-bridge segments could also assist in reducing the number of fixed-object collisions by alerting drivers prior to vehicles departing the travel lane, which would result in a 16% crash reduction (CMF ID: 3442).

Additional safety countermeasures and design elements are discussed in Section 9 of this study regarding the bridge cross-section safety analysis.

## 5. Capacity Analysis (Existing Conditions)

Level of Service (LOS) analysis was conducted for the study intersections. LOS is a concept defined by the *Highway Capacity Manual, 6th Edition* (HCM) to define the quality of operations and is divided into six categories: LOS A through LOS F. LOS A indicates low delay, free flow conditions while LOS F indicates that demand exceeds capacity and results in high delay and low travel speeds. Movement delay (seconds per vehicle) is typically used to define LOS for intersections.

Synchro 11 analysis software was used to evaluate traffic operations at the study intersections. This software was applied to determine the expected LOS at intersections using a procedure consistent with the equation based HCM methodology. In addition, micro-simulation was used to analyze intersection operations via SimTraffic, the companion software to Synchro, to supplement some of the shortcomings of the HCM procedure.

All movements, at both study intersections, resulted in LOS B or better for the existing 2021 design volumes. The results of the analysis are tabulated in Table C-1 in Appendix C – Existing and No Build Analysis Results.

Using the *Highway Capacity Software 7* (HCS7), analysis was also completed for the existing two-lane bridge facility to determine the segment LOS (as compared to the Synchro results producing intersection LOS), which uses density as the measure of evaluation. Segment LOS is a level of service parameter quantifying the proximity of other vehicles and is directly related to the freedom to maneuver within the traffic stream, measured in vehicles per mile per lane.

The existing one-mile bridge segment operates at LOS C for both the AM and PM peak periods. The highest directional volume (vehicles/hour) was used for each peak period to reflect the worst-case scenario results with the density LOS. The reports of the analysis are included in Appendix C – Existing and No Build Analysis Results.

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# 6. No Build Conditions

Existing traffic volumes were grown and analyzed to predict operational conditions in the proposed design year of 2050.

## 6.1. Growth Trend

Historic growth trends were analyzed at ODOT count stations west of State Park Road in Marshall County on US-70 and east of Willow Springs Road/Johnson Creek Road in Bryan County on US-70, which were the closest stations to the project site. The most recent Average Annual Daily Traffic (AADT) volumes available were from 2019, so a trend function was used to estimate the AADT for 2021 and 2050. These historic volumes can be seen below in Table 2. Since the two count locations were not in close proximity and the volumes varied, an average growth rate of 1.5% was determined and used for the purposes of this study.

Table 2 - Historic Growth Trends

| Road | Site ID | Year | AADT Volume |
|---|---|---|---|
| US-70 (West of State Park Road) | 480031 | 2010 | 7,111 |
| | | 2011 | 7,142 |
| | | 2012 | 6,449 |
| | | 2013 | 6,443 |
| | | 2014 | 6,577 |
| | | 2015 | 6,900 |
| | | 2016 | 7,200 |
| | | 2017 | 7,500 |
| | | 2018 | 6,700 |
| | | 2019 | 6,600 |
| | | 2021 | **6,868** |
| | | 2050 | **6,896** |
| | | Growth Rate | 0.014% |
| US-70 (East of Willow Springs Road/Johnson Creek Road) | 070016 | 2010 | 8,705 |
| | | 2011 | 8,636 |
| | | 2012 | 8,580 |
| | | 2013 | 8,749 |
| | | 2014 | 8,930 |
| | | 2015 | 9,100 |
| | | 2016 | 10,200 |
| | | 2017 | 10,600 |
| | | 2018 | 11,000 |
| | | 2019 | 10,800 |
| | | 2021 | **11,566** |
| | | 2050 | **20,587** |
| | | Growth Rate | 2.689% |

### 6.2. Future Traffic Volumes (Background Growth Only)

Using the 1.5% growth rate, US-70 will carry approximately 13,200 and 11,400 vehicles per day east and west of the study area, respectively, by 2050. The bridge is estimated to carry roughly 12,200 vehicles per day. Additionally, State Park Road will carry 2,500 vehicles per day and Willow Springs Road/Johnson Creek Road will carry approximately 1,700 vehicles per day. The 2050 (background growth only) volumes for the study intersections are displayed in Figure A-3 in Appendix A – Traffic Volumes.

### 6.3. Proposed Development Scenario

An expansive development is planned west of the Roosevelt Memorial Bridge near the intersection of US-70 and State Park Road. This property, referred to as PointeVista Development, features approximately 2,700 acres of mixed-use development and includes the following features:

- 2,100 homes
- Three 4-star resort hotels
- Convention/conference center
- Championship golf course
- Caribbean Lagoon
- Chickasaw Nation Casino
- Full-service marina
- Waterfront town center
- Entertainment venues
- Aquatic center
- 25,000 SF of restaurants (assumed)
- 100,000 SF retail shops (assumed)

Conceptual analysis of this development property was considered as a worst-case scenario for the purpose of this study. Volumes were projected for the year 2050 using a trip generation procedure consistent with *ITE's Trip Generation Manual*. A 20% mixed-use reduction was also applied to the initial trip-generated volumes under the assumption that vehicles will enter the property and visit multiple elements within the same trip.

According to the proposed site plan, the main access to this development would be a new entrance from US-70 opposite Chickasaw Pointe Road, which is approximately 1,000' west of State Park Road. On the south side, Texoma Park Road would be realigned to Chickasaw Pointe Road rather than the current alignment towards State Park Road. Due to this re-alignment, State Park Road would not handle the same traffic demand as today and most new trips using PointeVista would be directed towards the Chickasaw Pointe Road/Texoma Park Road main entrance. When developing the volumes for 2050 with Development, it was assumed that this new roadway configuration will divert 90% of the existing trips from State Park Road to the Chickasaw Pointe Road/Texoma Park Road intersection, though the proposed Casino would be accessed from State Park Road.

With the assumed land use plan at full build out, the PointeVista Development would generate approximately 30,000 trips per day with 10% assumed to be traveling north/south between the development. Of the remaining trips, it was assumed that 45% of the vehicles would be oriented to the west (I-35) and 55% would travel from the east (US-75).

The additional demand brought forth by this development would significantly increase traffic volumes on US-70 within the study area. Projected 2050 traffic volumes inclusive of the development were estimated at approximately 28,200 and 26,700 vehicles per day east and west of the bridge, respectively. The bridge itself is projected to carry approximately 27,300 vehicles per day. The 2050 with Development volumes for the study intersections are displayed in Figure A-4 in Appendix A – Traffic Volumes.

### 6.4. 2050 No Build Capacity Analysis (Background Growth Only)

As shown in Table C-2 in Appendix C – Existing and No Build Analysis Results, intersection conditions worsen by 2050, but all movements will operate at LOS C conditions or better.

Results for the No Build facility indicated LOS D results for both the AM and PM peak periods for the 2050 design volumes. As with the 2021 existing volumes, the highest directional volume (vehicles/hour) was used for each peak period. The reports for these analyses are included in Appendix C – Existing and No Build Analysis Results.

### 6.5. 2050 No Build Capacity Analysis (Development Scenario)

Analysis was completed with the PointeVista Development, under the assumption that no changes were made to the existing configuration of the roadway. As expected, the results (shown in Table C-3 in Appendix C – Existing and No Build Analysis Results) show significant delay with LOS E and F results on the side street movements at each intersection.

With the development added, the segment LOS also worsens on the Roosevelt Memorial Bridge with LOS E conditions on US-70 during both peak periods. The two-lane bridge would be a bottleneck under this scenario. The reports for each of these analyses are included in Appendix C – Existing and No Build Analysis Results.

## 7. Traffic Signal Warrant

Traffic signal warrants were analyzed at the study intersections using the existing year and future design year volumes. All signal warrant analysis reports can be found in Appendix D – Signal Warrants. The following sections detail the process used for the warrant evaluation and the corresponding results.

### 7.1. Criteria

The signal warrants were performed using the *Manual on Uniform Traffic Control Devices* (MUTCD) Signal Warrants tool within HCS7. The warrant software considered the speed on the major street, the lane configuration, and the traffic volume over a consecutive 12-hour period. While satisfaction of any of the criteria alone does not mandate signalization, the MUTCD requires that at least one of the following warrants be met:

- Warrant 1 – Eight-hour vehicular volume
- Warrant 2 – Four-hour vehicular volume
- Warrant 3 – Peak hour
- Warrant 4 – Pedestrian volume
- Warrant 5 – School crossing
- Warrant 6 – Coordinated Signal System
- Warrant 7 – Crash Experience
- Warrant 8 – Roadway Network
- Warrant 9 – Intersection Near a Grade Crossing

Warrants 1 through 3 were determined to be applicable for this project and are described in additional detail below.

- Warrant 1 typically applies where the volume of intersecting traffic throughout the average day is significant or the intersecting traffic causes excessive delay to the minor street traffic. It is made up of two conditions. Condition A considers the volume of traffic crossing the intersection while Condition B considers the delay and number of conflicts for the minor street traffic. Conditions A and B are independent of one another in determining whether the warrant is satisfied. However, if neither condition is satisfied for 8 hours of an average day, a combination of the warrants may be considered at 80% of the required vehicles per hour (vph). Volume criteria is determined graphically with separate charts for high-speed routes/isolated communities with populations less than 10,000.

- Warrant 2 applies where the volume of intersecting traffic, usually during peak times, is the primary reason for considering a traffic signal. If it is found for any four hours of an average day that the side street traffic suffers undue delay which would be remedied by a traffic signal, then a signal may be justified. Volume criteria is determined graphically with separate charts for high-speed routes/isolated communities with populations less than 10,000.

- Warrant 3 typically applies to facilities that attract or discharge large numbers of vehicles over a short time. It is made up of two conditions. For Condition A, three criteria must occur for this warrant to be met. First, the total stopped time delay for one side street approach must equal or exceed four vehicle-hours for a single lane approach or five vehicle-hours for a two-lane approach. Second, the volume for this side street approach must exceed 100 vph for a single lane approach or 150 vph for a two-lane approach. Finally, the total volume entering the intersection must exceed 650 vph for three-leg intersections and 800 vph for four-leg intersections during the same hour as the first two criteria. For Condition B, the warrant is determined graphically. Like Warrants 1 and 2, reduced criteria is applied for high-speed routes or communities less than 10,000 population.

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If the intersection met any criteria for the warrants listed above with initial volumes, a right turn reduction factor was applied to the right turn movements from the side streets to determine if a signal would still be warranted due to those vehicles being able to turn right on red at a proposed signal and thus would not count towards the warrant. The right-turn movements were reduced using Pagones Theorem, which is used by several state DOTs and considers the side street lane configuration and the volumes on the side street and mainline approaches. The right-turn reduction was treated as a separate scenario and is a more conservative approach that is recommended for consideration in the MUTCD. In addition, scenarios were considered that completely removed minor turn lanes and corresponding volumes or tested a heavy mainline left turn versus through movement.

## 7.2. Warrant Analysis Results

Several scenarios were tested while performing the signal warrant analysis at the two intersections on US-70 within the study area. The existing configuration (No Build) was examined for 2021, 2050 (background growth only), and 2050 with Development volumes. The proposed configuration (Build), which is discussed in further detail in Section 7 of this report, also examines the volumes for the years 2021, 2050 (background growth only), and 2050 with Development. The process and results are discussed below for the various scenarios.

### 7.2.1. 2021 Existing Results

The following scenarios were completed to determine if a signal would be warranted at the intersections using the current lane configuration and 2021 traffic demand.

- 2021 Raw volumes do not meet warrant criteria at either intersection.
- 2021 Design volumes do not meet warrant criteria at either intersection.

As neither of those scenarios warranted a signal, an additional scenario was examined due to the unique configuration of lane drops/additions occurring near or at these intersections:

- A scenario was tested that included just a single lane through movement in both directions of US-70 to test the warrants against the single approach lane criteria with left turn and right turn traffic on US-70 removed. This situation still did not warrant a signal with the 2021 Design volumes at either intersection.

### 7.2.2. 2050 No Build Results (Background Growth Only)

The following scenarios were completed to determine if a signal would be warranted at the intersections using the current lane configuration and 2050 traffic demand.

- At the State Park Road intersection, 2050 Design volumes meet Warrants 1 and 2.
    - With right turn volumes reduced, Warrant 1 was still met in 2050 at State Park Road.

- Using the lane reduction scenario mentioned above, Warrants 1, 2, and 3 were met in 2050 with side street right turn volumes maintained at State Park Road
    - Warrants 1 and 3 were met under this scenario if side street right turn volumes were reduced at the intersection.
- No traffic signal warrants are met at the Willow Springs Road/Johnson Creek Road intersection under any scenario using 2050 Design volumes.

### 7.2.3. 2050 No Build Results (Development Scenario)

The following scenarios were completed to determine if a signal would be warranted at the intersections using the current lane configuration and 2050 with Development demand.

- With the increased volumes, the State Park Road intersection would warrant signalization in 2050 by Warrants 1, 2, and 3 with and without right turn reductions.
- At Willow Springs Road/Johnson Creek Road, Warrant 2 was met when full volumes were considered but no warrant criteria were met after side street right turns were reduced.

### 7.2.4. Build Scenario Results

The Build scenario was analyzed for signal warrant criteria at each of the intersections for the years 2021, 2050 (background growth only), and 2050 with Development assuming that the Roosevelt Memorial Bridge and causeway sections are widened to two through lanes in each direction to match the cross-section of the approaches.

- No warrants were met at either study intersection in 2021.
- Using 2050 Design volumes (background growth only),
    - Traffic signal warrants are met at State Park Road with full volumes (Warrants 1 and 2) and with right turn volumes reduced (Warrant 1).
    - No warrant criteria is met at Willow Springs Road/Johnson Creek Road.
- Using 2050 Design volumes with Development,
    - State Park Road meets Warrants 1, 2 and 3 with full volumes and right turns reduced.
    - Willow Springs Road/Johnson Creek Road meets Warrant 3 with full volumes but no warrant criteria with right turn volumes reduced.
    - In addition, it is anticipated that the main development entrance into PointeVista (located approximately 1,000’ west of State Park Road) would meet Warrants 1, 2, and 3.

## 8. Build Analysis

A potential Build scenario assumed an increased capacity from the existing two-lane configuration bridge/causeway to a four-lane configuration with the addition of 10’ wide shoulders.

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Analysis was completed for the Build scenario at the study intersections using Synchro 11 software, and along the US-70 mainline utilizing the multi-lane analysis within the HCS7 software. Results of those findings are described in the following sections and included in Appendix E – Build Analysis Results

### 8.1. Intersection Analysis

The potential expansion of the bridge to four-lanes will modify the configuration of the two intersections within the study area. State Park Road eastbound vehicles currently must merge left before entering the bridge – whereas the Build condition will allow both lanes to continue onto the bridge.

#### 8.1.1. Build Condition – Intersection Configuration

Utilizing the requirements set forth in ODOT's *Roadway Design Manual* for exclusive right-turn lanes, volumes were analyzed to determine if a right-turn lane would be warranted at either intersection with the projected volumes. 2050 (background growth only) volumes did not warrant a right-turn lane at either intersection for mainline or side street movements. 2050 with Development volumes did warrant a right-turn lane for vehicles traveling eastbound on US-70 making a right-turn onto State Park Road. Volumes did not meet a right-turn lane warrant at the intersection of Willow Springs Road/Johnson Creek Road for the 2050 with Development scenario.

Figure 5 depicts the proposed lane configuration at the US-70 at State Park Road intersection. The northbound leg of this intersection remains the existing configuration with the flared channelized right turn movement. At the east end of the study area approaching the intersection of Willow Springs Road/Johnson Creek Road, US-70 currently has a westbound lane drop that would be modified to include two continuous through lanes and an eastbound left turn lane in the Build scenario. The potential lane configuration at US-70 and Willow Springs Road/Johnson Creek Road is depicted in Figure 6 on the following page.


Figure 5: Build Conditions – US-70 at State Park Road

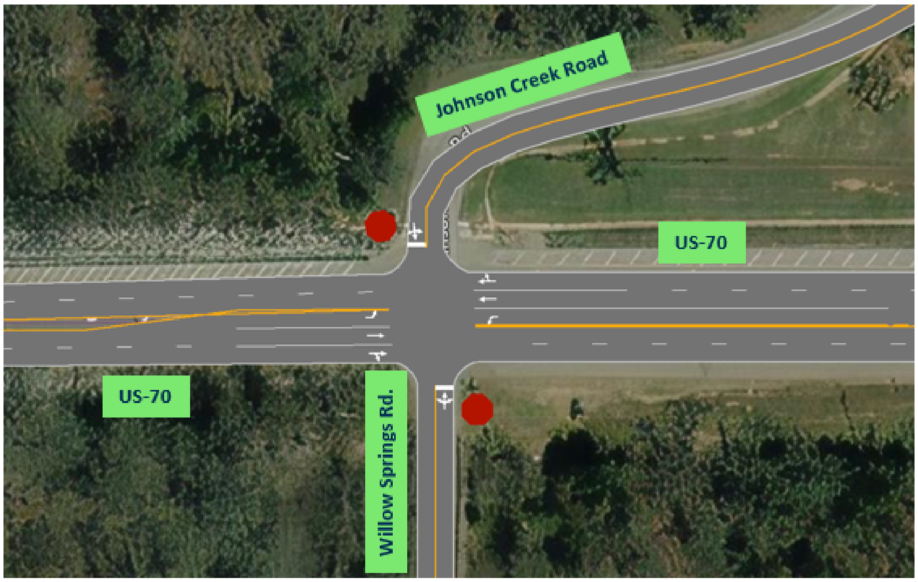


Figure 6: Build Conditions – US-70 at Willow Springs Road/Johnson Creek Road

### 8.1.2. 2021 Results

Analysis of the Build scenario at the two study intersections with 2021 design volumes resulted in LOS A conditions for all movements. The results of the analysis are tabulated in Table E-1 in Appendix E – Build Analysis Results.

2021 design volumes resulted in LOS A conditions for each direction of travel along the US-70 bridge segment for the Build scenario in both the AM and PM peak period conditions. The reports for these analyses are included in Appendix E – Build Analysis Results.

### 8.1.3. 2050 Results (Background Growth Only)

For the 2050 (background growth only) design volumes, the State Park Road northbound movement improves to LOS A in the AM period and delay is also reduced in the PM peak period. The northbound and southbound movements at the Willow Springs Road/Johnson Creek Road intersection both improve delay from the No Build scenario, with the PM peak improving to LOS B results. The results of the analysis are tabulated in Table E-2 in Appendix E – Build Analysis Results.

2050 design volumes resulted in LOS A conditions for each direction of travel along the bridge segment for both AM and PM peak period conditions when analyzing the bridge using multi-lane criteria. The reports for these analyses are included in Appendix E – Build Analysis Results.

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### 8.1.4. 2050 with Development Results

Preliminary analysis was completed for the Build scenario including the PointeVista Development property, which is projected to drastically boost 2050 traffic volumes. Figure 7 depicts the assumed configuration at the main entrance (turn lanes on all approaches), with State Park Road still providing access to the Chickasaw Nation Casino. State Park Road would warrant a signal with these projected volumes but was assumed to remain unsignalized due to spacing and to gauge LOS.

LOS results for the 2050 with Development volumes produced LOS C for all movements at the signalized intersection location. The analysis indicated LOS E and F movements at both study intersections during the AM and PM peak periods. The results of the analysis are tabulated in Table E-3 in Appendix E – Build Analysis Results.

For multi-lane analysis using 2050 with Development volumes, LOS B results are expected for the eastbound direction of travel and LOS A conditions for the westbound direction of travel during the AM peak period. The PM peak period indicated LOS B results for each direction of travel. The reports for these analyses are included in Appendix E – Build Analysis Results.

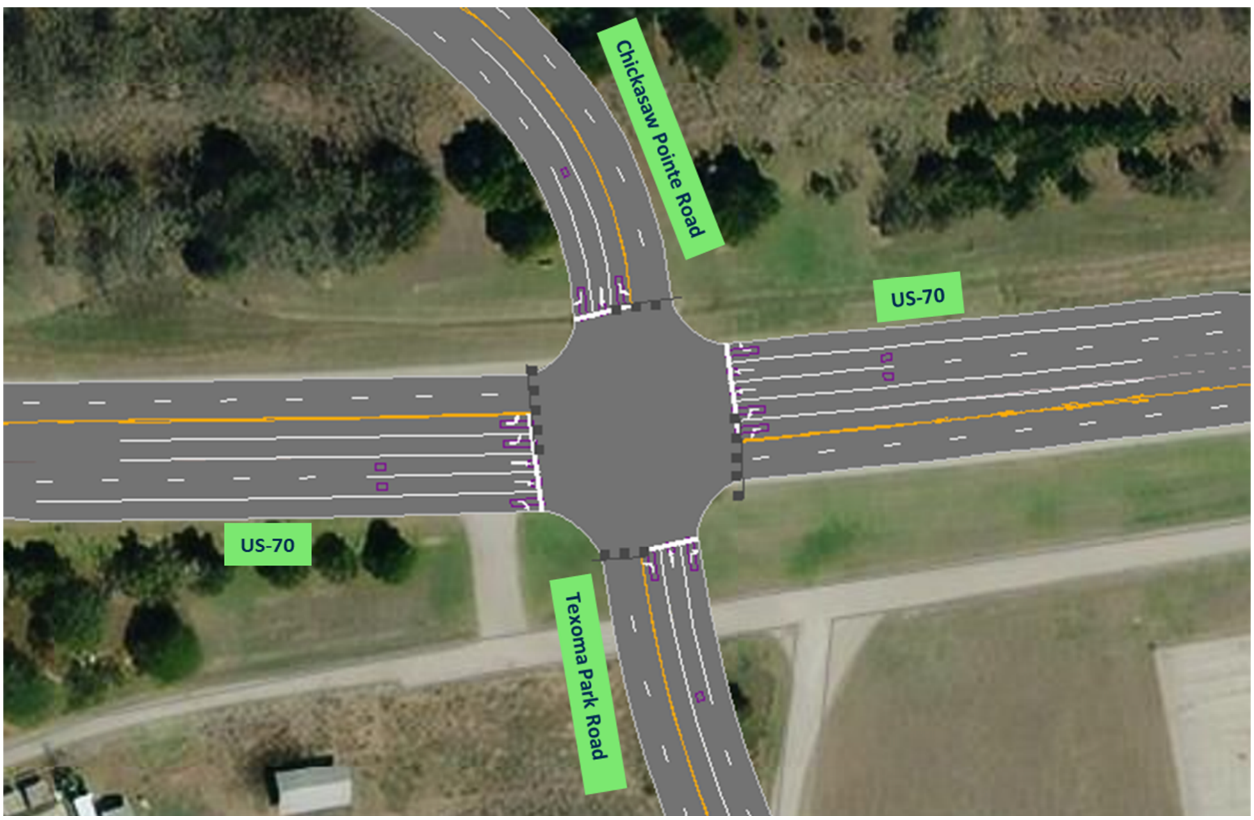


Figure 7: Build Conditions – US-70 at New Signalized Intersection (~1,000' west of State Park Road)

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## 9. Bridge Cross-Section Safety Analysis

The potential safety benefits of additional cross-section elements were considered along the one-mile bridge segment, such as providing a median, lighting, or wider shoulders. *Highway Safety Software* (HSS) was utilized to deploy the *Highway Safety Manual* (HSM) methodology to estimate the predicted crashes between potential cross-section configurations. HSS considers Safety Performance Functions (SPFs) for rural two-lane and multi-lane highways to predict the number of expected crashes, then adjusts this total based on CMFs from the presence of a limited number of cross-sectional elements (lane width, shoulder type and width, presence of horizontal curve and superelevation, number of driveways, rumble strips, grade and lighting presence) using data published in the original HSM.

Inside the HSS, segment analysis was completed for the following scenarios:

- Scenario 1: Existing Conditions (2-12' lanes, no shoulders, no median, no barrier separation, some lighting)
- Scenario 2: Build Conditions (4-12' lanes, 2-10' shoulders, no median, no barrier separation, no lighting)
- Scenario 3A: Scenario 2 + the addition of a Median
- Scenario 3B: Scenario 2 + Median, the addition of a Median Barrier
- Scenario 4A: Scenario 2 + Median, the addition of lighting
- Scenario 4B: Scenario 2 + Median, Median Barrier, the addition of lighting

Scenario 1 was completed using HSS Two-Lane Analysis (rural), and Scenarios 2 through 4B were completed using HSS Multi-Lane Analysis (rural).

The HSS analysis is intended to provide a high-level predictive safety analysis. HSS does have limitations within the software due to sensitivity of the measures and the simplicity of the functions used. More detailed analysis using more recent CMFs published in the online clearinghouse can be performed to differentiate between similar sub-options. Below describes the constraints within the software and the effect on the predicted crash results:

- *Addition of Shoulders:* HSS yielded the same results for an 8' to a 12' right shoulder width. For the purpose of this study, 10' shoulders were used.
- *Addition of a Median:* Once present, the impact of a median on safety does not change from smaller widths up to 15'. 12' was used for the purpose of this study.
- *Addition of a Median Barrier:* Presence of a median barrier will result in the same predicted crash frequency (per AADT) regardless of the size of median width; HSS also does not provide an opportunity to specify the type of median barrier installed. A 12' median width was used for the purpose of this study, to stay consistent with the other scenarios.
- *Lighting:* This is a pass/fail option within HSS without judgment of coverage area or gaps.

Given these assumptions, Table 3 below depicts the predicted annual crashes associated with each bridge scenario for 2021, 2050 (background growth only), and 2050 with Development design volumes. Scenario 1 for 2050 with Development was not included in this report due to the high AADT value associated with the proposed development property. According to Chapter 10 of the *Highway Safety Manual*, application to two-lane rural segments with AADT substantially outside the range of 0 to 17,800 vehicles per day may not provide reliable results. The 2050 with Development volumes are projected to be approximately 27,300 vehicles per day, and therefore were not included in the two-lane analysis for Scenario 1.

Table 3 – Highway Safety Software Results (Bridge)

| | Predicted Annual Crashes | | |
|---|---|---|---|
| | 2021 | 2050 (Background Growth Only) | 2050 with Development |
| Scenario 1 | 3.3 | 4.7 | - |
| Scenario 2 | 3.1 | 4.7 | 12.1 |
| Scenario 3A | 1.7 | 2.4 | 5.6 |
| Scenario 3B | 1.6 | 2.3 | 5.4 |
| Scenario 4A | 1.5 | 2.2 | 5.1 |
| Scenario 4B | 1.5 | 2.1 | 4.9 |

As more design elements are incorporated into the bridge, the anticipated number of collisions per year is reduced with Scenarios 3A through 4B reducing bridge crashes by more than 50%. Note these reductions apply only to the one-mile bridge; improvements to the causeway would further reduce crashes.

Projecting through the design year, Scenario 3A through 4B would have 57 to 64 fewer total bridge crashes than Scenario 1 (No Build) through 2050 if considered the background growth only design volumes, which includes an estimated savings of 7 to 10 fatal or injury collisions. Due to the restrictions of HSS for Scenario 1 regarding the development property volumes, predicted crash saving calculations were not attained for 2050 with Development scenarios.

Results for each of the various scenarios from the HSS can be found in Appendix F – Bridge Cross-Section Safety Analysis Results.

#### 9.1.1. Crash Modification Factors to support HSS Limitations

Additional CMFs were identified to differentiate between limitations of the HSS, including:

- Increasing median width (CMF ID: 5416) from 10 feet to 15 feet would reduce crashes by an additional 4%
- Increasing median shoulder width (CMF ID: 7203) on a divided facility does not help to reduce crashes (increases by 3%)
- Increasing outside shoulder width (CMF ID: 917/919) from 6 feet to 8 feet reduces crashes by 4% and from 6 feet to 10 feet or more reduces crashes by 18%
- Installing cable median barrier (CMF ID: 47) reduces crashes 29%; steel median barriers (CMF ID: 46) reduce crashes by 35%

## 10. Conclusion

The potential improvements to the US-70 corridor will increase the safety and improve operations across the bridge and at the two adjacent intersections within the study area. The current configuration of the bridge (2-12' lanes with no shoulders) is narrow and provides no opportunity for passing or safe refuge for vehicles. Lane configuration updates (such as removing the lane drops) and increasing sight distances would assist in improving the existing safety issues that occur within the project limits.

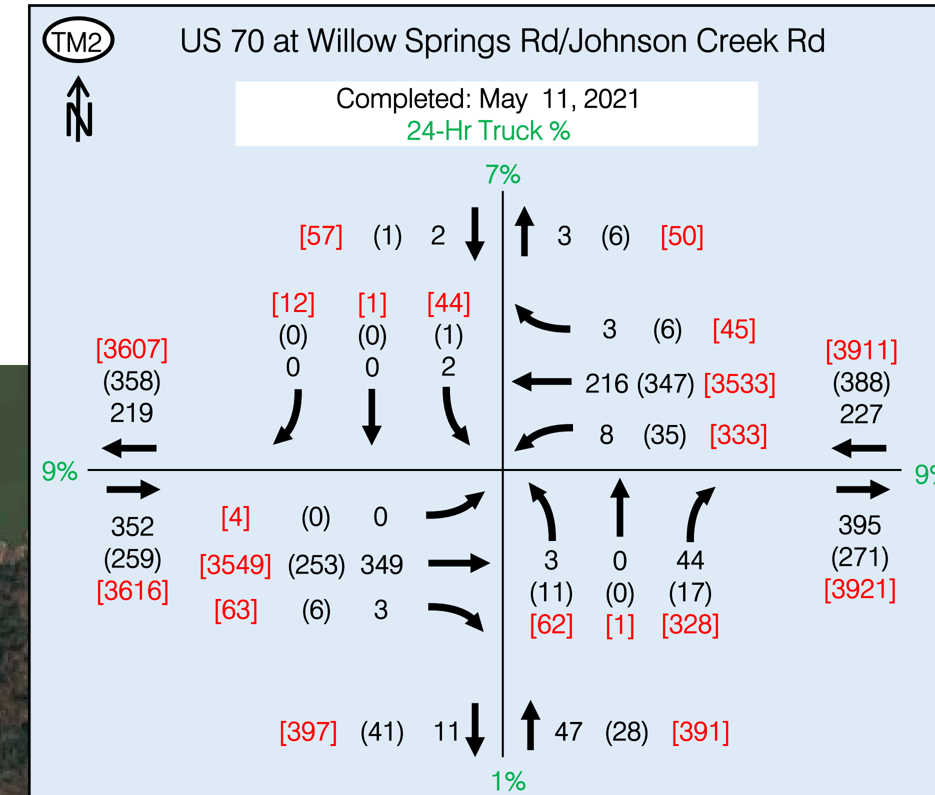
Projected traffic volumes are expected to increase by approximately 50% by 2050. If the PointeVista Development property is built out completely, the projected volumes will drastically increase the traffic throughout the study area (roughly double the projected 2050 design volumes). The high development-influenced volumes would create LOS E or worse results on the bridge and major delay at the two intersections.

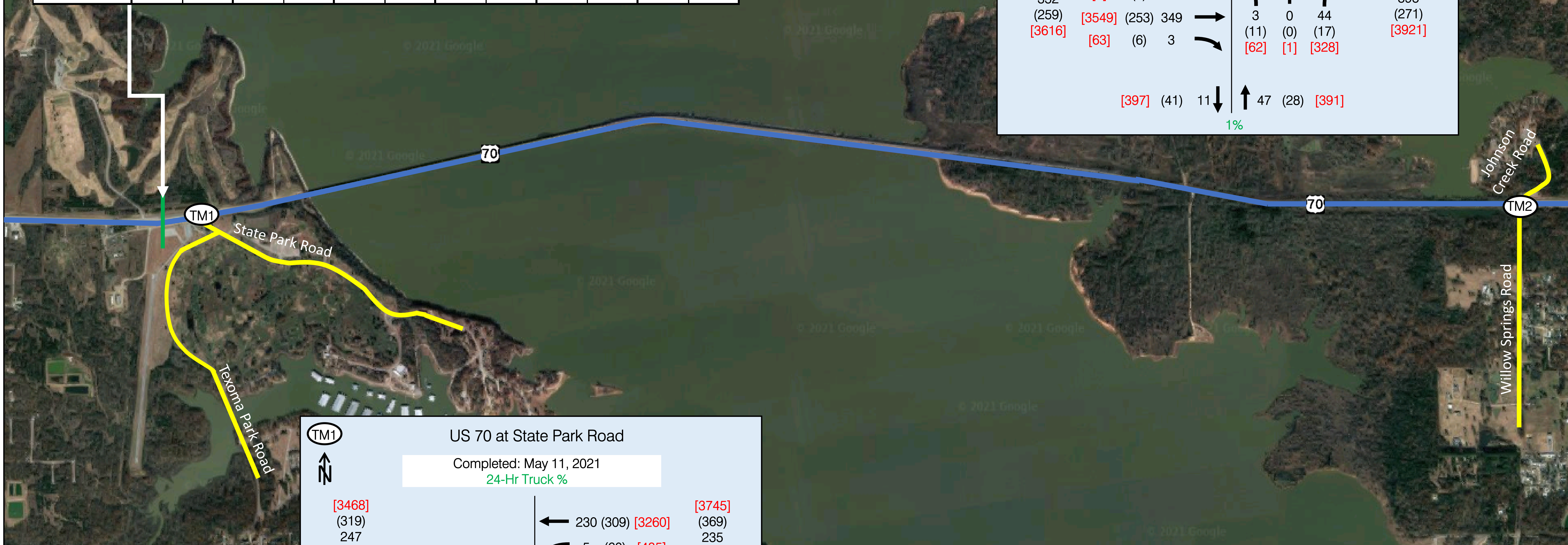
The potential widening and increased capacity of the bridge would improve the intersection LOS for each of the study intersections. Converting the route from one-lane to two-lane operations will provide additional passing opportunities and a safer route for the projected traffic volumes associated along US-70. With the provision of lighting and median space/barrier, predictive crash analysis showed more than a 50% crash reduction from the existing condition along the bridge.

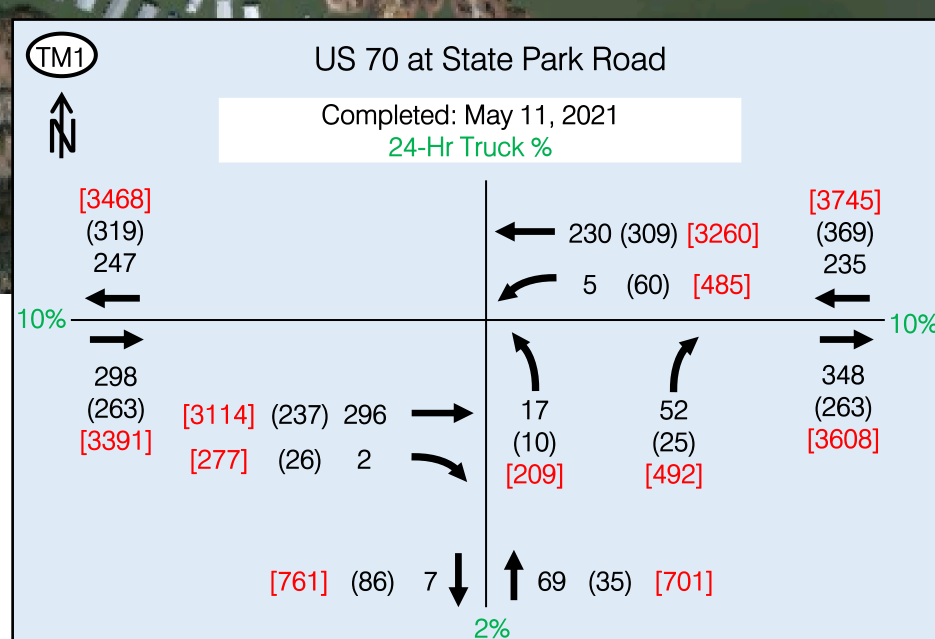
# Appendix A – Traffic Volumes

| 7-Day Total Counts | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Mon, 5/17*** | ***Tues, 5/11*** | ***Wed, 5/12*** | ***Thurs, 5/13*** | ***Fri, 5/14*** | ***Sat, 5/15*** | ***Sun, 5/16*** | ***AVG DAILY*** |
| ***Eastbound*** | 3761 | 3389 | 3889 | 4375 | 4853 | 4137 | 2781 | 3884 |
| ***Westbound*** | 3794 | 3378 | 3862 | 4248 | 4836 | 4237 | 2948 | 3900 |
| ***2-way Truck %*** | 10% | 10% | 10% | 10% | 8% | 4% | 4% | 8% |

| Peak Hour Volume | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Mon, 5/17*** | | ***Tues, 5/11*** | | ***Wed, 5/12*** | | ***Thurs, 5/13*** | | ***Fri, 5/14*** | | ***AVG DAILY*** | |
| | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB | EB | WB |
| ***AM Peak Vol.*** | 287 | 241 | 300 | 234 | 317 | 251 | 303 | 252 | 255 | 267 | 242 | 205 |
| ***PM Peak Vol.*** | 273 | 324 | 268 | 320 | 298 | 323 | 313 | 391 | 376 | 376 | 275 | 321 |




**Legend**

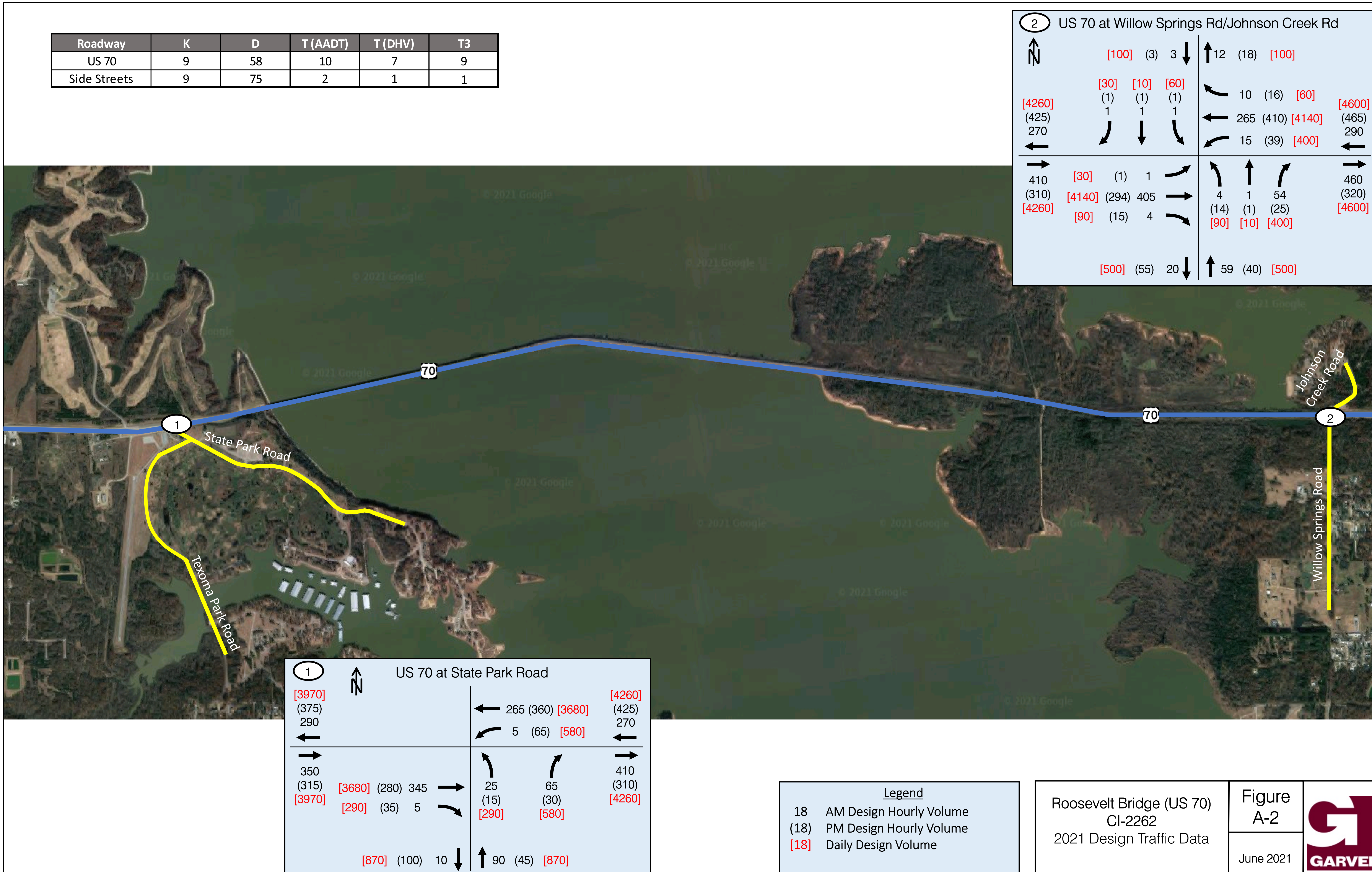
- 18 AM Design Hourly Volume
- (18) PM Design Hourly Volume
- [18] Daily Design Volume
- TM# 24-Hour Turning Movement Count

Roosevelt Bridge (US 70)
CI-2262
2021 Raw Counts

Figure A-1

June 2021

| Roadway | K | D | T (AADT) | T (DHV) | T3 |
|---|---|---|---|---|---|
| US 70 | 9 | 58 | 10 | 7 | 9 |
| Side Streets | 9 | 75 | 2 | 1 | 1 |




Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Daily Design Volume

Roosevelt Bridge (US 70)
CI-2262
2021 Design Traffic Data

Figure A-2

June 2021

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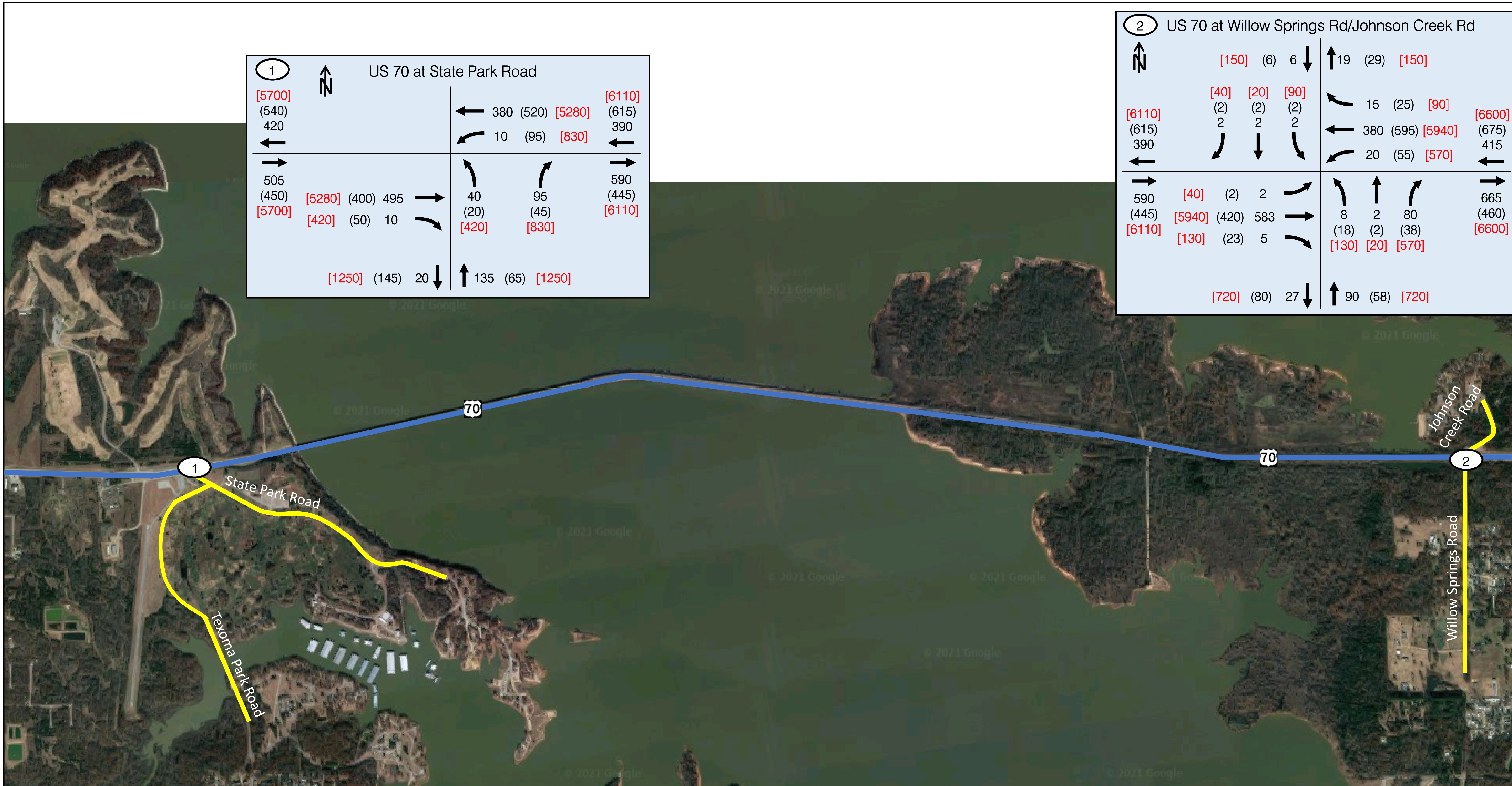


| Roadway | K | D | T (AADT) | T (DHV) | T3 |
|---|---|---|---|---|---|
| US 70 | 9 | 58 | 10 | 7 | 9 |
| Side Streets | 9 | 75 | 2 | 1 | 1 |

**Legend**

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Daily Design Volume

Roosevelt Bridge (US 70)
CI-2262
2050 Design Traffic Data

Figure A-3

July 2021

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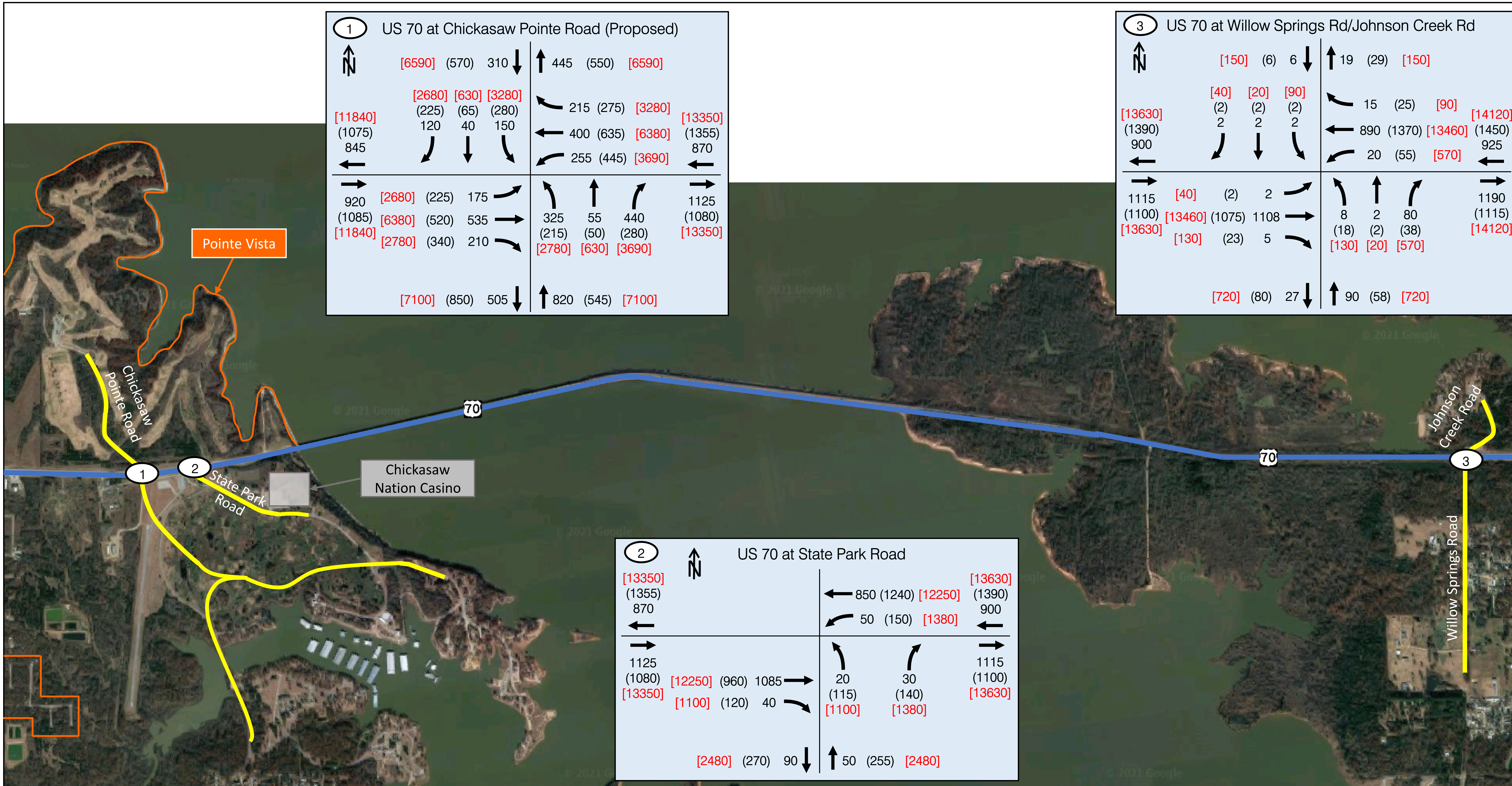


| Roadway | K | D | T (AADT) | T (DHV) | T3 |
|---|---|---|---|---|---|
| US 70 | 9 | 56 | 10 | 7 | 9 |
| Side Streets | 10 | 60 | 2 | 1 | 1 |

<u>Legend</u>

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Daily Design Volume

Roosevelt Bridge (US 70)
CI-2262
2050 Design Traffic Data
w/ Development

Figure A-4

July 2021

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# Appendix B – Safety Analysis Memo

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# DRAFT Safety Analysis Memo

| | | | |
|---|---|---|---|
| To: | Oklahoma Department of Transportation | Date: | March 2021 |
| From: | Garver | | |
| RE: | ODOT CI-2262 – US-70 Roosevelt Bridge | | |

## 1. Project Description

The Roosevelt Memorial Bridge currently stretches across Lake Texoma between Kingston and Mead, Oklahoma along United States Highway 70 (US-70). The Oklahoma Department of Transportation (ODOT) plans to correct the at-risk existing bridge structure, with the limits of the project beginning at the intersection of US-70 and State Park Road (west of Lake Texoma) and extending east for approximately four miles inclusive of the span structure.

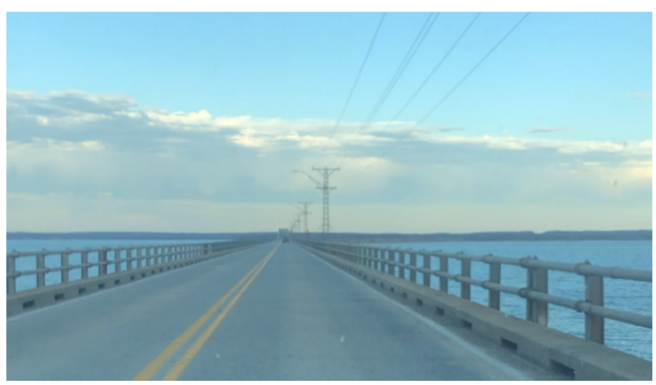
Figure B-1 depicts the corridor split into three segments (west of the bridge, the bridge, and east of the bridge), and shows the defining features within each segment including posted speed limits, lighting, passing opportunities, shoulder width, and grade information.

### 1.1. Segment 1: West of the Roosevelt Memorial Bridge

Segment 1 stretches 0.3 miles from the intersection of US-70 at State Park Road to the beginning of Roosevelt Memorial Bridge. In Segment 1, US-70 experiences a lane configuration transition depicted in Figure B-2. West of the intersection, US-70 transitions from a two-lane route to a five-lane section with two lanes in each direction and a center two-way left turn lane (TWLTL). At the State Park Road intersection, the outer eastbound lane terminates as a right turn lane with additional pavement on the departure side that serves as de facto acceleration lane for right turning traffic from State Park Road. On the westbound approach to the State Park Road intersection, a second through lane develops just beyond the western terminus of the Roosevelt Memorial Bridge and the center TWLWL develops approximately 250' in advance of the intersection. Rumble strips along the 10' shoulders are provided on each side of the highway.

### 1.2. Segment 2: Roosevelt Memorial Bridge

Segment 2 includes the Roosevelt Memorial Bridge section, stretching approximately one mile across Lake Texoma. The Roosevelt Memorial Bridge is a two-lane highway with 12' lanes, no shoulders, and a flat grade, as shown in the picture to the right. The bridge has a barrier rail on either side. A middle section



**Roosevelt Memorial Bridge – Barrier Railing**

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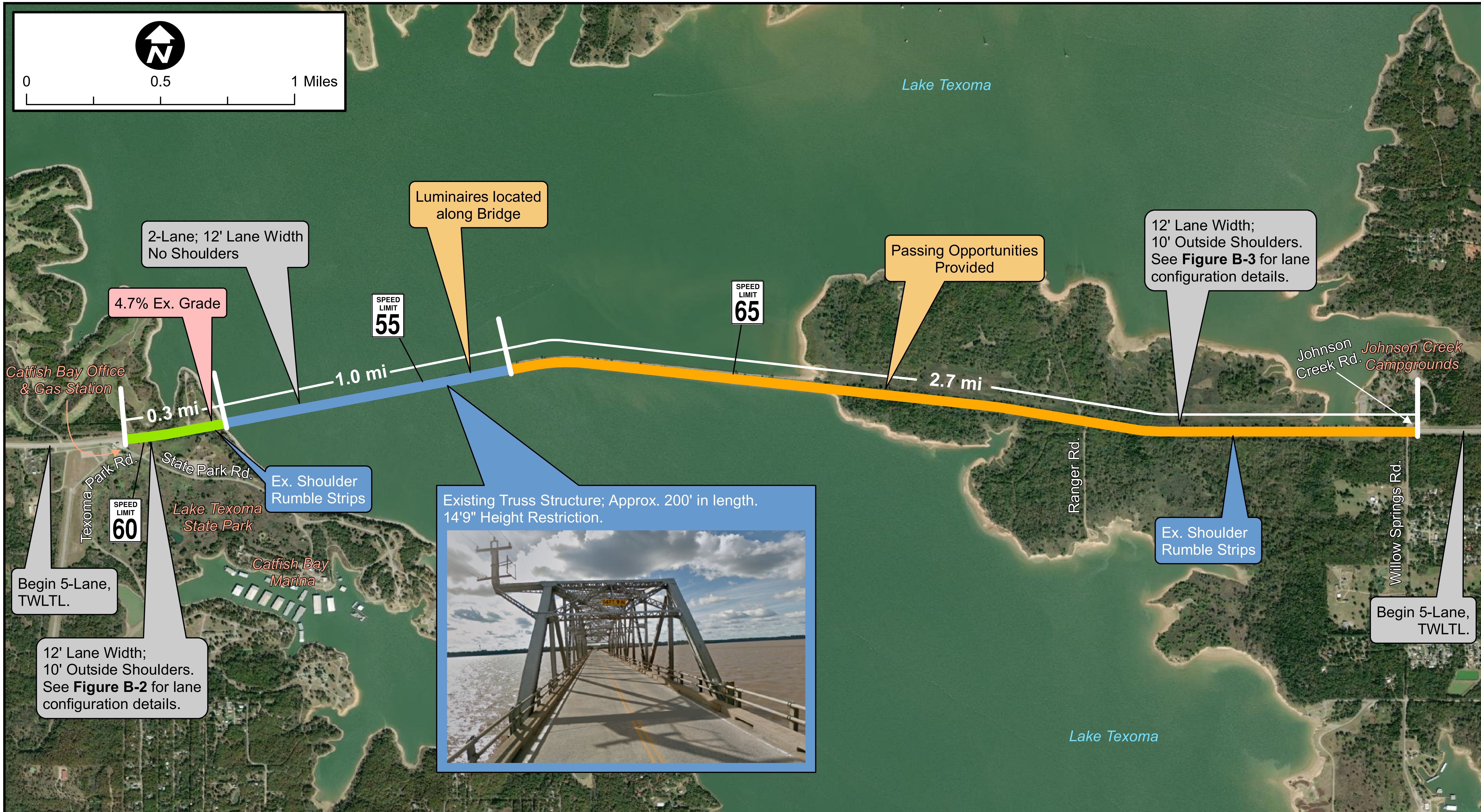
of the bridge is comprised of a truss (depicted in Figure B-1) with a clearance of only 14’-9”. Overhead electric runs across the south side of the bridge with light poles mounted on the bridge.

### 1.3. Segment 3: East of the Roosevelt Memorial Bridge

East of the bridge, US-70 remains a two-lane roadway over a causeway before transitioning to a five-lane road with a TWLTL at the intersection of Willow Springs Road/Johnson Creek Road. The lane transition is accomplished via a lane addition on the departure side of the intersection and a right turn lane drop for the westbound right turn lane. Throughout Segment 3, the grade is relatively flat. Figure B-3 depicts the lane configuration changes near the intersection.




# US-70 Roosevelt Bridge

*Project Limits Map: Segment Details*

**Figure B-1**

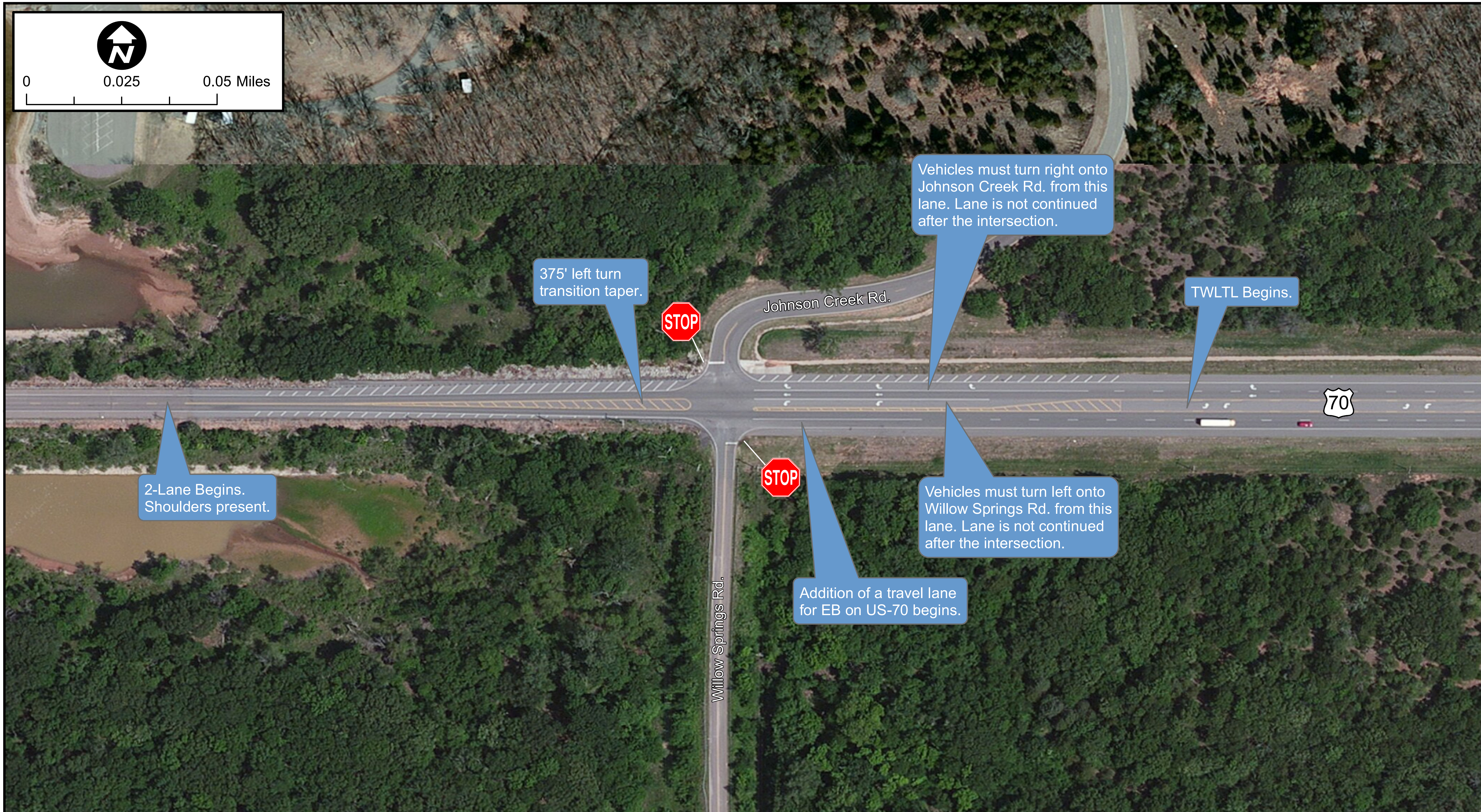
**Legend**

- Segment 1: West of Bridge to State Park Rd (0.3 mi)
- Segment 2: Roosevelt Memorial Bridge (1 mi)
- Segment 3: East of Bridge to Willow Springs Rd/Johnson Creek Rd (2.7 mi)


# US-70 Roosevelt Bridge

*Lane Configuration Details: Segment 1*

**Figure B-2**




# US-70 Roosevelt Bridge

*Lane Configuration Details: Segment 3*

**Figure B-3**

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## 2. Crash History

Crash Data was collected using ODOT's Safe-T Database for a five-year period from 2015 to 2019. Figure B-4 depicts overall crash data along US-70, including a crash frequency heat map and statistics by occurrence, severity, and road condition/location. Over the five-year period, a total of 52 crashes occurred within the corridor limits, with 18 crashes (35%) classified as intersection-related. The most common crash types included 12 rear-ends, 11 angle-turning, nine fixed-object, eight sideswipe-opposite direction, and six head-on collisions.

Four fatal crashes occurred on the route, along with two incapacitating injuries and nine non-incapacitating injuries. Each fatal crash is described in additional detail below:

1) November 22, 2016: Head-On collision 0.2 miles west of the intersection of Willow Springs Road/Johnson Creek on US-70. A vehicle traveling westbound crossed over the centerline and struck a vehicle traveling eastbound. This crash involved a four-door passenger vehicle and a pickup truck. The collision occurred around 4pm on a Tuesday afternoon in daylight conditions with cloud presence. This collision resulted in one fatality and one non-incapacitating injury occurring within Segment 3.
2) March 27, 2018: Sideswipe Same Direction collision 1.5 miles west of the intersection at US-70 and Willow Spring Road/Johnson Creek. This three-vehicle crash involved a pickup truck, a Single-Unit Truck (two axles) and a Sport Utility Vehicle (SUV) near 4pm on a Saturday afternoon in daylight with dry roadway conditions and clouds present. All vehicles were traveling eastbound, and one took a maneuver to pass another vehicle causing the collision. The crash occurred within Segment 3 and resulted in one fatality and three non-incapacitating injuries.
3) June 21, 2018: Head-On collision on the Roosevelt Memorial Bridge, approximately 0.8 miles east of the bridge approach. A vehicle traveling eastbound crossed over the centerline and struck a vehicle traveling westbound on the bridge. The collision occurred between a four-door passenger vehicle and a Truck-Tractor/Semi-Trailer around 1pm on a Thursday. The weather was clear in daylight with dry roadway conditions. This collision resulted in two fatalities and occurred within Segment 2.
4) March 22, 2019: Rear-End collision occurring one mile west of the US-70 and Willow Springs Road/Johnson Creek Road intersection. This collision involved a pickup truck and four-door passenger vehicle around 3pm on a Friday afternoon in daylight with dry roadway conditions and clear weather. The collision was caused by a DWI, resulting in one fatality and one possible injury. This collision occurred within Segment 3.

From the Crash Analysis Summary (Figure B-4), a few key items should be noted.

- *Crash Severity:* 61% of crashes were property damage only, 27% injury-related, and 12% fatality or serious injury.

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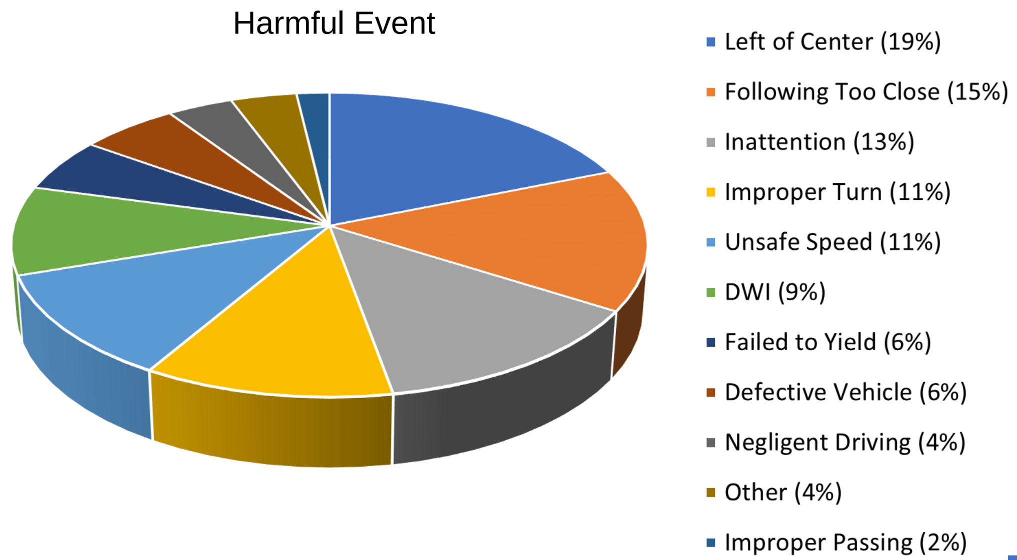
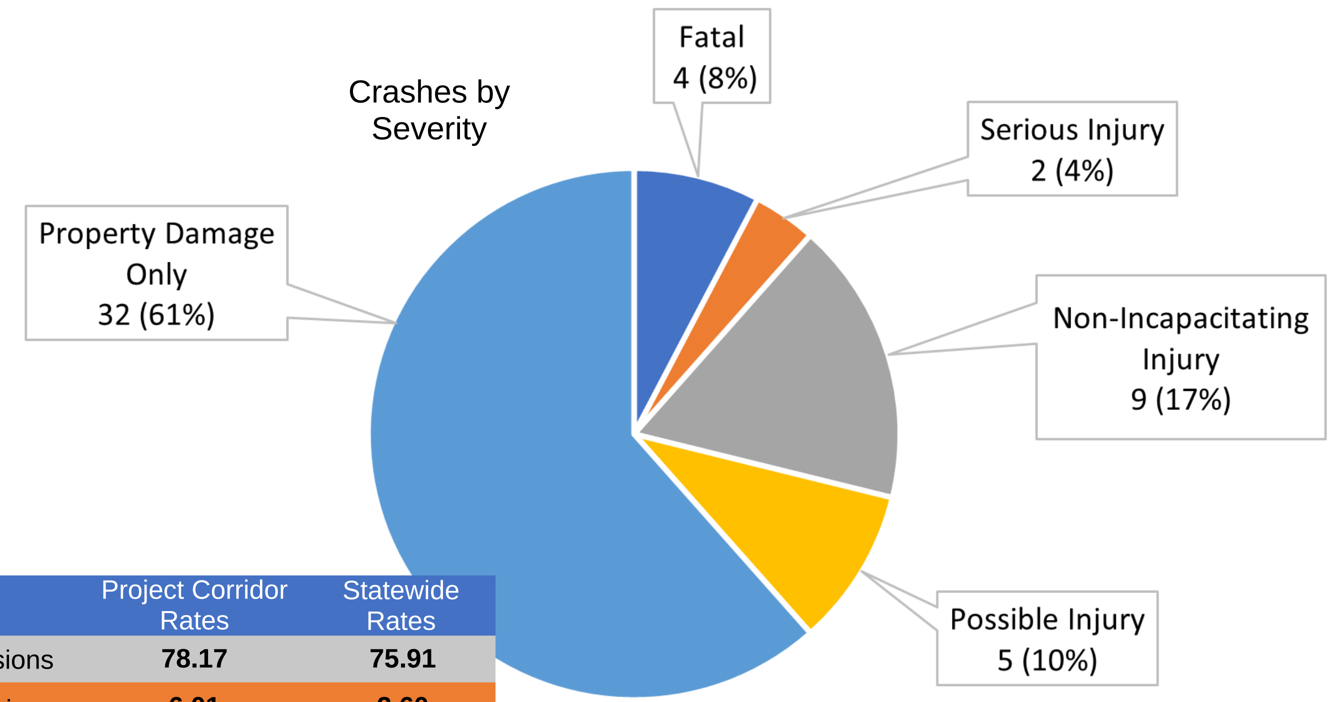
- *Collision Type:* Left of Center (crossing the roadway centerline) collisions occurred most often, accounting for 19% of the total crashes. Vehicles following too close and not paying attention accounted for 15% and 13% of the crashes, respectively.
- *Weather Conditions:* Trends indicated that collisions typically occurred in clear weather conditions during daylight with dry roadway conditions, but an estimated 10% of the total collisions did occur in wet conditions or at night.
- *Day and Time:* The most common day and time that collisions occurred over the five-year period was on Wednesday between 10am and 1pm, with four collisions total. 17% of crashes occurred during twilight or darkness hours.
- *Crash Rates:* The corridor crash rate (78 crashes per 100 Million Vehicle Miles Traveled (MVMT)) was comparable to the statewide crash rate (76 per 100 MVMT), however, the fatal crash rate for the corridor was almost 2.5x larger at 6.0 per 100 MVMT than the statewide fatal crash rate at 2.6 per 100 MVMT.
- *Location Frequency:* The heat map shows hot spot crash locations at the intersections of US-70 at State Park Road and US-70 at Willow Springs Road/Johnson Creek Road, and along the Roosevelt Memorial Bridge near the western bridge end and in the center of the bridge near the truss.

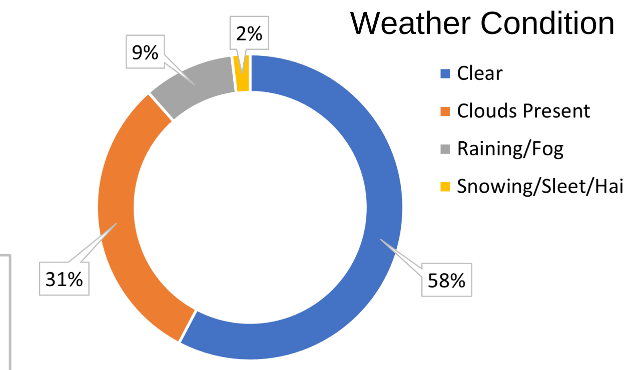
Figure B-5 shows crash diagrams for the West side of the project corridor. Inset A displays the collisions at the intersection of State Park Road. As shown, there were seven angle turning collisions, a rear end, an animal collision, and two fixed-object crashes. Inset B displays the collisions at the West terminus of the bridge where the shoulders narrow and guardrail is provided to prevent departures leading to the constricted bridge structure (as shown to the right). Near this location, six sideswipes, two rear-ends, a head on collision, and a fixed-object crash occurred over the five-year period.

West Terminus of Bridge

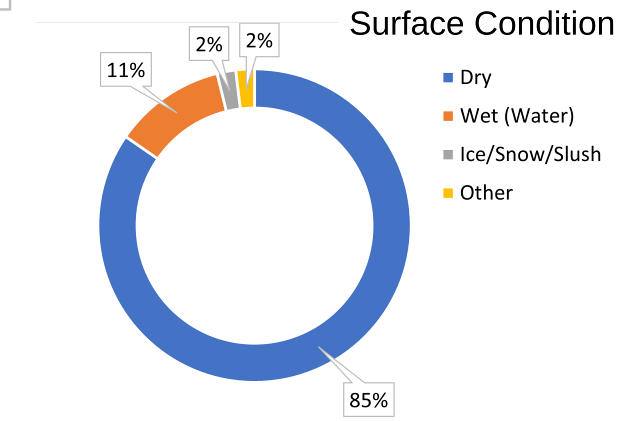
Figure B-6 depicts the crashes that occurred on the East side of the project route, with a focus in Inset C at the intersection of US-70 at Willow Springs Road/Johnson Creek Road. These crash types consist of four angle-turning collisions, three rear ends, a head-on collision, and two fixed-object crashes (one hitting a tree, and another hitting a sign).

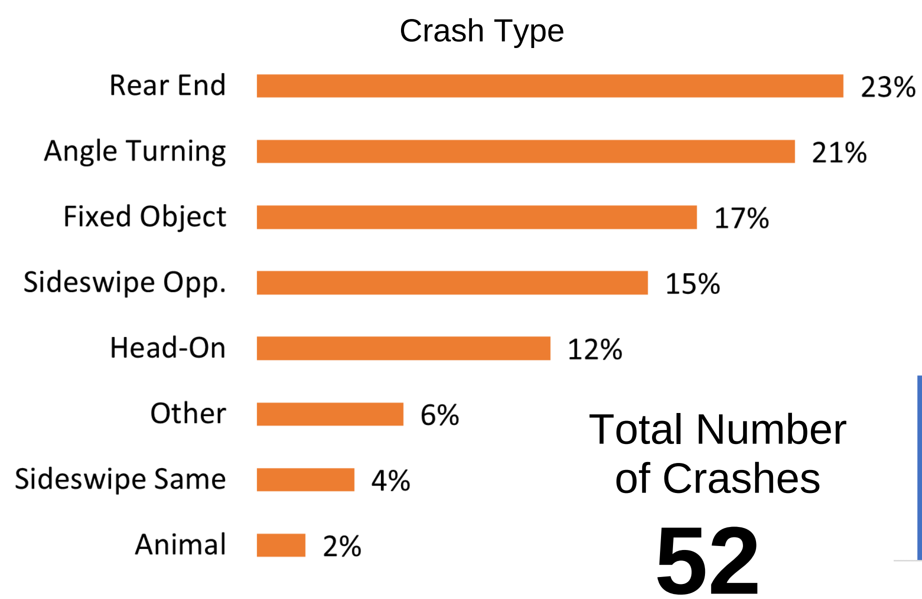


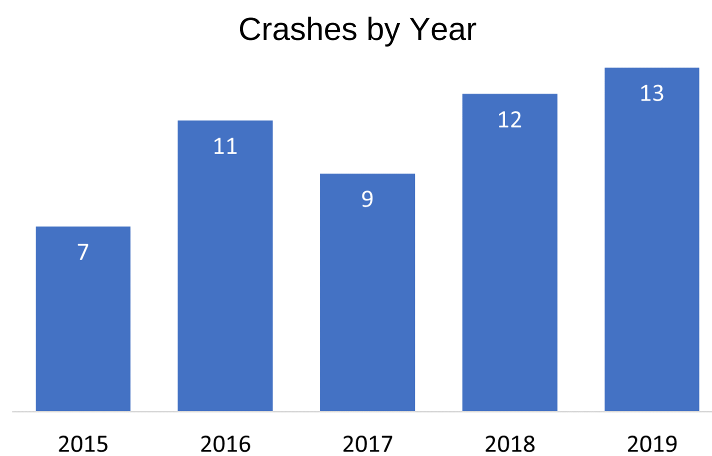

| | Project Corridor Rates | Statewide Rates |
|---|---|---|
| Total Collisions | 78.17 | 75.91 |
| Fatal Collisions | 6.01 | 2.60 |



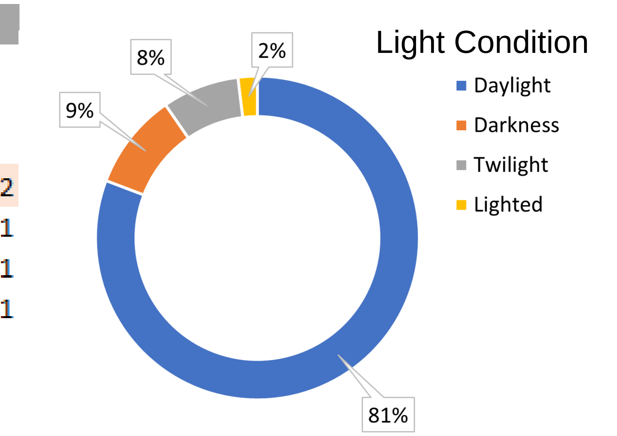

Total Number of Crashes

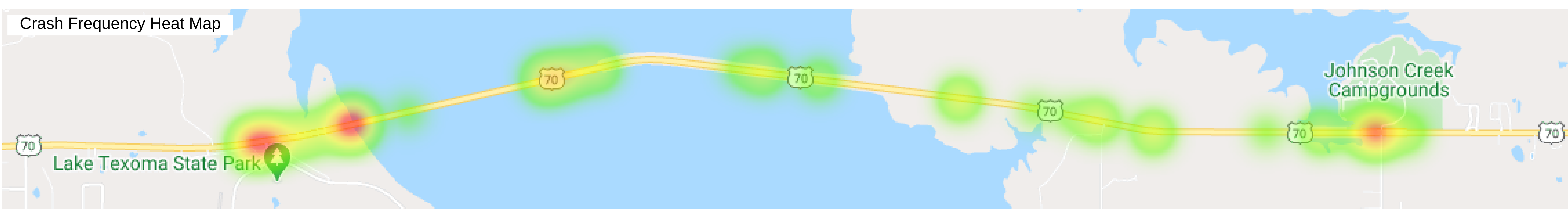
**52**




Crash Distribution by Date and Time

| Hours / Days | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| 0:00 - 4:00 | | | | 2 | | | |
| 4:00 - 7:00 | | 1 | | | | | |
| 7:00 - 10:00 | | 2 | 2 | 3 | 2 | | |
| 10:00 - 13:00 | 2 | | 4 | 2 | | 2 | 2 |
| 13:00 - 16:00 | 1 | 2 | | 2 | 2 | | 1 |
| 16:00 - 19:00 | 1 | 3 | 2 | | 3 | 1 | 1 |
| 19:00 - 22:00 | | 1 | | | 3 | 2 | 1 |
| 22:00 - 24:00 | | | | 1 | | 1 | |



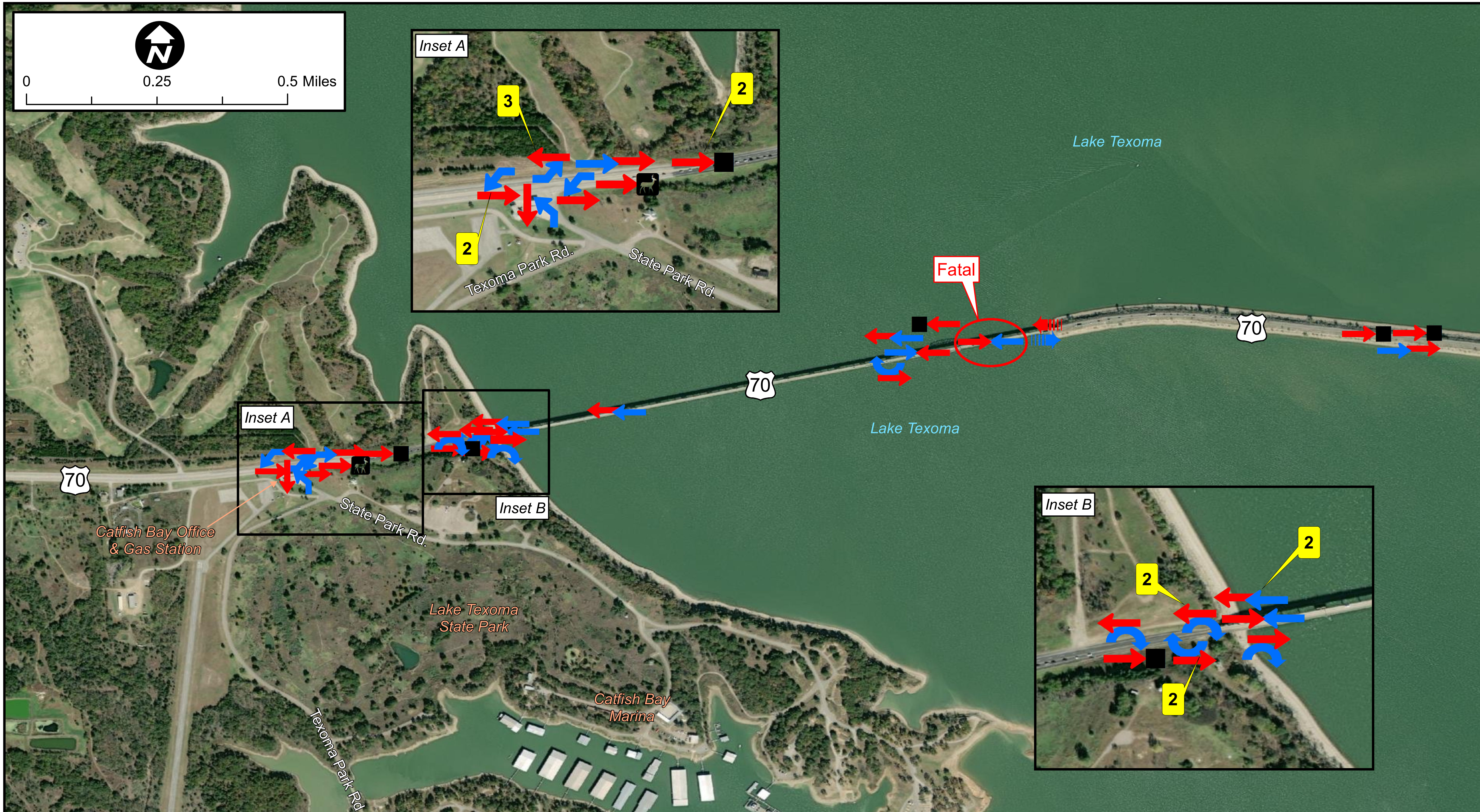




# US-70 Roosevelt Bridge

*Crash Analysis Summary (2015-2019)*

**Figure B-4**

*Source: ODOT Safe-T Database.*




# US-70 Roosevelt Bridge

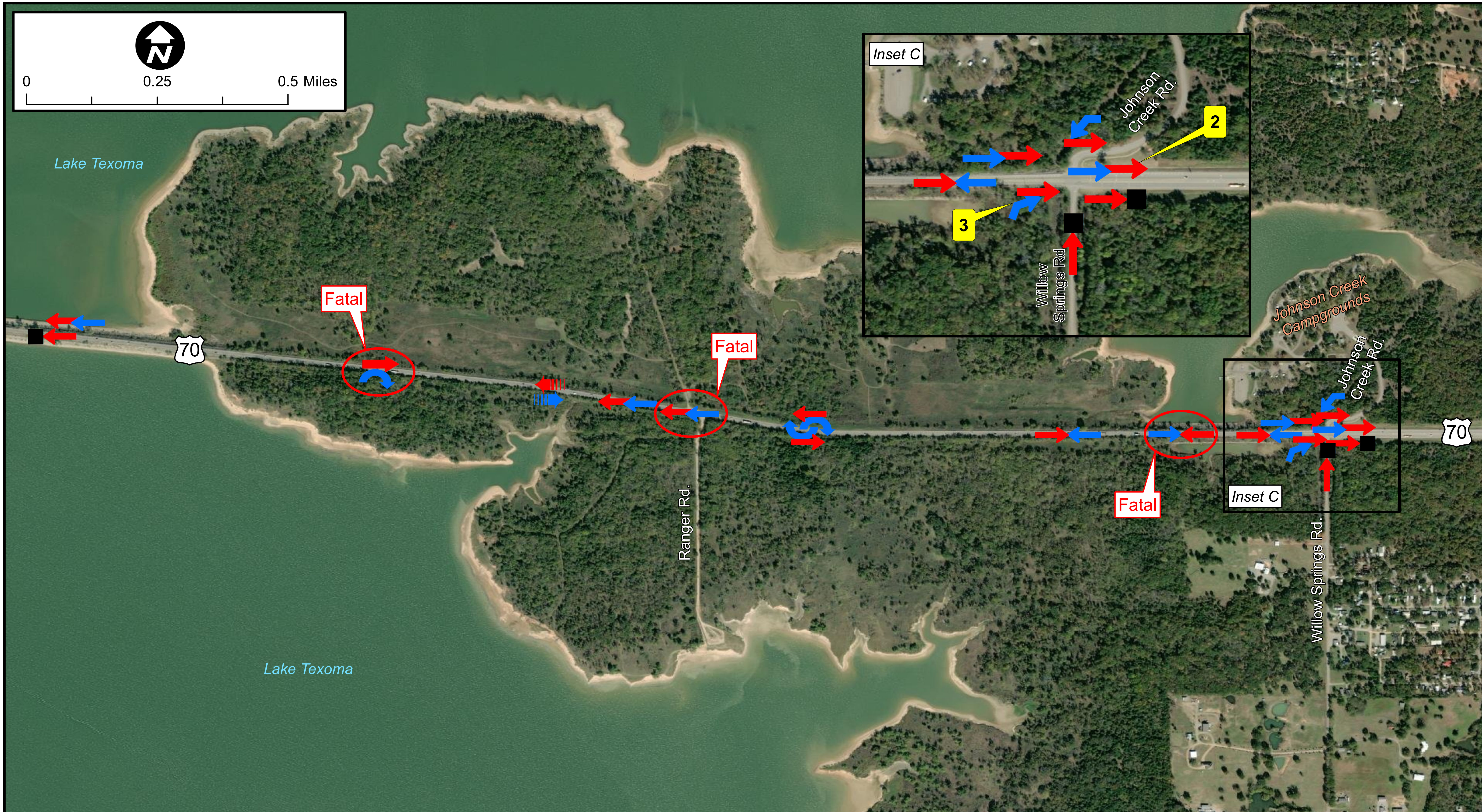
*Crash Data Map (2015-2019)*

**Figure B-5**

**Legend**

- Vehicle #1 Travel Direction
- Vehicle #2 Travel Direction
- Angle Turning
- Animal
- Fixed Object
- Head On
- Other
- Rear End
- Sideswipe Opposite
- Sideswipe Same
- # Number of Crashes (of particular type & location)

*Source: ODOT Safe-T Database.*




# US-70 Roosevelt Bridge

*Crash Data Map (2015-2019)*

**Figure B-6**

**Legend**

Vehicle #1 Travel Direction
Vehicle #2 Travel Direction
Angle Turning
Animal
Fixed Object
Head On
Other
Rear End
Sideswipe Opposite
Sideswipe Same
Number of Crashes (of particular type & location)

*Source: ODOT Safe-T Database.*

## 3. Field Observation of Road Configuration/Crash Causes

Field observations were conducted to verify contributing factors to crashes and identify additional safety issues. Photographs, sight distance measurements, and traffic observations assisted in the safety analysis of the project route.

### 3.1. Roosevelt Memorial Bridge and Causeway

The 250’ truss section of US-70 experienced five crashes over the five-year period. These crashes resulted in one fatal collision, two non-incapacitating injury collisions, and two property damage only collisions. One of the collisions occurred around 7pm at night, with the rest occurring between the hours of 9am and 4pm. Driving the route, the truss creates a vertical confinement on the narrow two-lane route, which could cause drivers to move towards the centerline and potentially cross over resulting in a collision. Solutions to increase safety along any proposed new or updated bridge include:

Truss Structure on Bridge

- Provision of a median
- Widen to two-lanes in each direction
- Rumble strips (centerline and outside shoulder)
- Shoulder provision

A mile-long causeway is located within Segment 3 directly east of the Roosevelt Memorial Bridge. This section does not have a median to protect drivers from crossing into the opposite lane. As noted previously, the most common crash type along this route was left of center, accounting for 19% of the 52 total crashes. Installation of any type of median barrier, according to the CMF Clearinghouse, would result in a 43% reduction of fatal crashes (CMF ID: 42). The addition of a median would allow an opportunity to connect the far east and west ends of the project to the TWLTL configuration that presently exists at both State Park Road and Willow Springs Road/Johnson Creek Road.

No passing opportunities are provided on the Roosevelt Memorial Bridge, however Segment 3 (including the causeway) does provide passing zones to use the opposing lane along an unlit portion. The installation of passing lanes can be used to improve safety on two-lane highways and still allow faster traffic to overtake slower vehicles, which could result in a reduction of 32% (CMF ID: 9108) over the current configuration. Providing passing opportunities could also be accomplished by providing two lanes in each direction along the bridge and causeway. As with the median addition, widening US-70 on the bridge and east of Lake Texoma would aid in connecting

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the bridge and causeway sections to the existing five-lane cross section at either end of the project.

The lack of shoulders along the bridge do not provide safe refuge for disabled vehicles traveling across Lake Texoma. Adding shoulders would increase safety by providing a recovery area for drivers who leave the travel lane. Shoulders also provide an area for drivers to maneuver to avoid crashes and offer space for maintenance activities which the bridge currently does not provide.

Crashes occurring in darkness or twilight hours made up 17% of the total crashes. The Roosevelt Memorial Bridge is the only portion of the route with lighting where luminaires are located on the existing power-poles. Providing street lighting throughout the entire route could result in a 37% reduction for night-time, injury related collisions according to CMF Clearinghouse (CMF ID: 7774).

Luminaires on Bridge

### 3.2. Fixed-Object Related Collisions

Nine fixed-object collisions (17%) occurred along the project route. At the intersection of Willow Springs Road and US-70, one collision occurred with a traffic sign and another with a tree. Throughout the corridor there were six collisions involving a guardrail or barrier rail, and one collision with a curb. According to the CMF Clearinghouse, removing or relocating fixed objects outside of a clear zone could result in a 38% reduction of crashes (CMF ID: 1024). An increase in the outside shoulder width would allow additional clearance from objects located on the route, such as guardrails, signs, and curbs, with anticipation of reducing the number of fixed-object related collisions. The addition of rumble strips on the outside shoulders would also assist in preventing fixed-object collisions by alerting drivers prior to vehicles departing the travel lane. Addition of outside shoulder rumble strips would result in a 16% crash reduction (CMF ID: 3442).

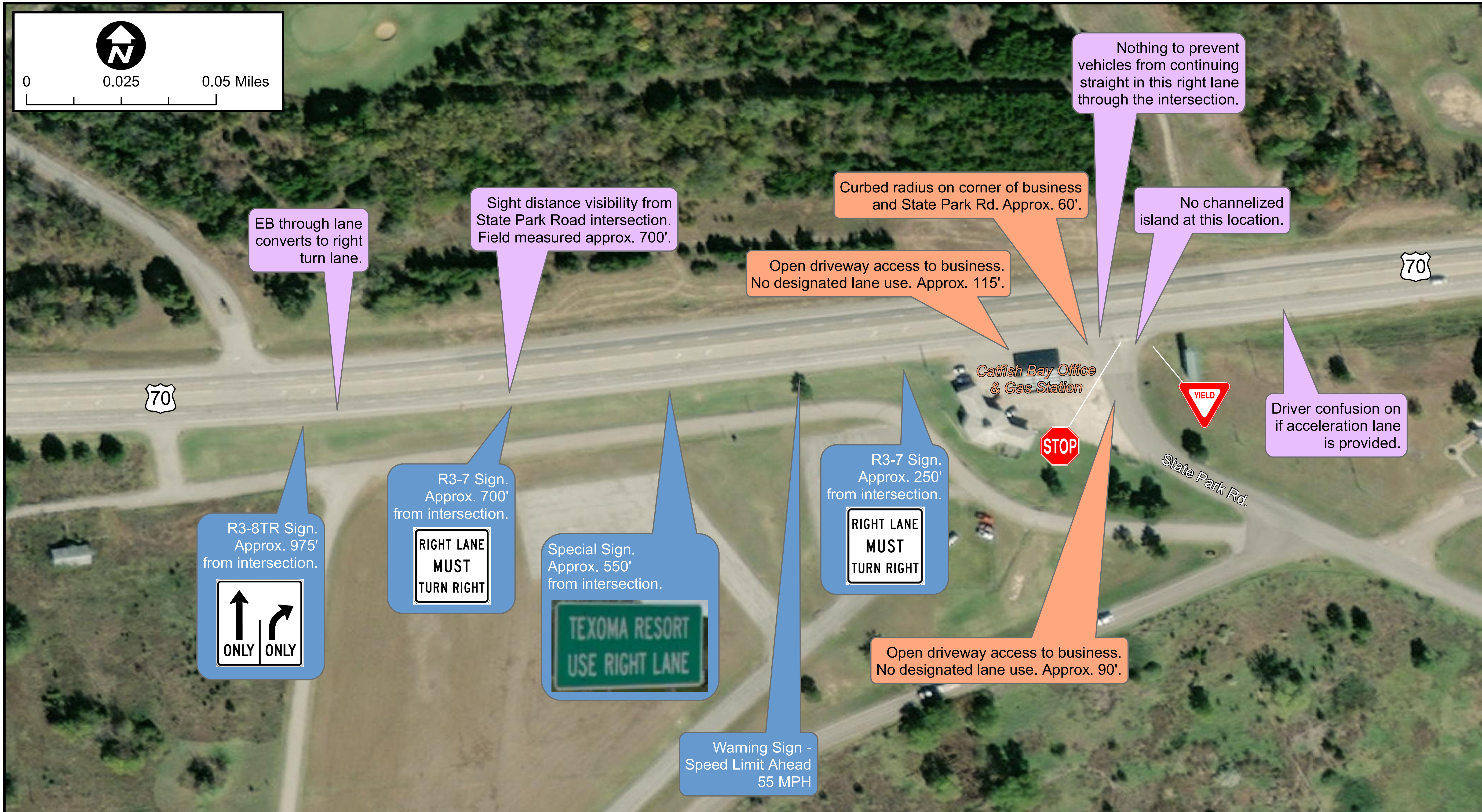
### 3.3. Intersection-Related Collisions

Out of the 52 total crashes, 18 (35%) were intersection-related crashes occurring at both State Park Road and Willow Springs Road/Johnson Creek Road – most of which involved angle-turning maneuvers. Limited intersection sight-distance and high travel speeds on US-70 could play a role in the intersection specific crashes.

Figure B-7 depicts the current challenges with the right-lane configuration for eastbound travelers on US-70, along with the present signage on US-70. Drivers are alerted almost 1000’ in advance of the right turn lane drop. As shown, channelization is not provided at the intersection to restrict vehicles from continuing through the intersection along US-70, other than the provided signage notifying the road-users. As pavement is provided on the departure side of the intersection for the continuation of the through movement, this leads to confusion for drivers making turns to/from State Park Road. Providing striping to hatch out the area (similar to the intersection at US-70 and

Willow Springs Road/Johnson Creek Road) or provision of painted or raised channelization would improve driver expectation.

Another option for reducing intersection-related collisions would be to install an Intersection Conflict Warning System (ICWS) for intersections with limited sight distance. According to the CMF Clearinghouse database, implementation of an ICWS could result in a 31% reduction (CMF ID: 8471) by alerting and notifying road-users ahead of an intersection. Refer to Section 3.4/3.5 for a discussion of intersection sight distance.




# US-70 Roosevelt Bridge

*State Park Road Intersection*
*Safety Issues*

**Figure B-7**

GARVER
6450 South Lewis Ave.
Suite 300
Tulsa, OK 74136
TEL 918.250.5922
FAX 918.858.0107
**www.GarverUSA.com**

## 3.4. Sight Distance Evaluation

Sight distance from the side streets (State Park Road and Willow Springs Road/Johnson Creek Road) could be improved to increase visibility of vehicles traveling along US-70. The presence of trees, power poles, signage, and guardrails contribute to less visibility. The suggested sight distance to safely complete a right turn, a left turn, or a crossing maneuver can be calculated using guidance in the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets.*


Visibility, looking West – from Stop Bar at State Park Rd.

Table 1 on the following page depicts the intersection sight distances required for vehicles to conduct the maneuver from a stop condition on a minor street to a major street. The table also lists the current sight distances that were field measured, representing the distance from the crossing street stop bar to the point where a driver's eye could begin locating the vehicle traveling on US-70. This analysis revealed that the intersection sight distances are adequate for passenger car vehicles making right turns or crossing, but do not provide enough sight distance for a left turn maneuver from Willow Springs Road/Johnson Creek Road. Trucks do not have enough sight distance available for right turns, left turns, or crossing US-70. Per ODOT's Traffic Data, US-70 carries approximately 5% single unit trucks and 7% combination trucks. Sight distance improvements can be achieved through grade corrections, widening, trimming vegetation, and shoulder provisions.

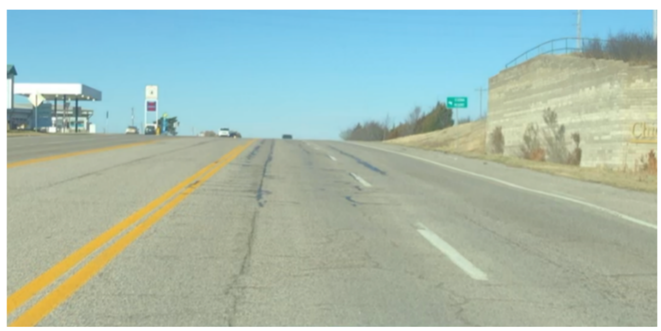

Visibility, looking West – from Stop Bar at Willow Springs Rd.

Table 1 – Required Sight Distances

| Location | Design Speed | Design Vehicle | Required Sight Distances (feet) | | | Existing Conditions Sight Distances (feet) | |
|---|---|---|---|---|---|---|---|
| | | | Right Turn Distance | Left Turn Distance | Crossing Distance | US-70 EB Vehicles | US-70 WB Vehicles |
| Willow Springs Road (NB) | 65 mph | Passenger Cars | 621 | 717 | 621 | 650 | 1500 |
| | | Single-Unit Trucks | 812 | 908 | 812 | | |
| | | Combination Trucks | 1,003 | 1,099 | 1,003 | | |
| Johnson Creek Road (SB) | 65 mph | Passenger Cars | 621 | 717 | 621 | 650 | 1500 |
| | | Single-Unit Trucks | 812 | 908 | 812 | | |
| | | Combination Trucks | 1,003 | 1,099 | 1,003 | | |
| State Park Road (NB) | 60 mph | Passenger Cars | 573 | 662 | - | 700 | > 2000 |
| | | Single-Unit Trucks | 750 | 838 | | | |
| | | Combination Trucks | 926 | 1,014 | | | |

*Source: AASHTO Policy of Geometric Design of Highways and Streets, equation* $ISD = 1.47V_{major}t_g$ *(*$t_g$ *from tables 9-6, 9-8, and 9-10).*

### 3.5. Additional Segment 1 Issues


Uphill traveling WB on US-70

A steep grade (estimated at 4.7%) exists west of the Roosevelt Memorial Bridge causing potential visibility concerns. For vehicles traveling westbound from the bridge on US-70, it is difficult to see vehicles traveling eastbound from the top of the curve and creates hesitation for vehicles needing to get into the center left turn lane leading to State Park Road or into the gas station. The new bridge would provide an opportunity to reduce the existing grade, by potentially raising the profile of the bridge approaches, which could increase visibility.

A site visit revealed faded striping at the Stop/Yield condition at State Park Road, which could be a factor into the collisions occurring. Restriping the pavement markings would increase driver awareness of the stop/yield condition at the intersection.

In addition, the gas station on the Southwest corner of the US-70 at State Park Road intersection currently has no defined access management for vehicles entering or exiting the business. Vehicles can access the property through the large driveway off US-70, as well as through the large driveway opening from State Park Road (these distances are highlighted in Figure B-7). Providing access management for this business would allow vehicles to have guided lanes to enter and exit the property safely and reduce high-speed conflict on US-70.

# Appendix C – Existing and No Build Analysis Results

## Table C-1 – 2021 Existing Analysis Results

| Time Period | Analysis Means | MOE | EB Movement Left | EB Movement Thru | EB Movement Right | WB Movement Left | WB Movement Thru | WB Movement Right | NB Movement Left | NB Movement Thru | NB Movement Right | SB Movement Left | SB Movement Thru | SB Movement Right | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.2 | n/a[1] | | 9.5 | | | | | | 1.3 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 2.1 | 1.0 | 1.6 | 0.5 | | 8.0 | | 2.1 | | | | 1.7 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.2 | n/a[1] | | 8.4 | | | | | | 1.2 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 1.7 | 1.1 | 2.1 | 0.5 | | 8.8 | | 1.9 | | | | 1.3 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | B | | | B | | | A |
| | | Delay | 8.0 | n/a[1] | | 8.5 | n/a[1] | | 12.7 | | | 13.2 | | | 1.2 |
| | SimTraffic | LOS | n/a[1] | A | A | A | A | A | A | A | A | n/a[1] | A | A | A |
| | | Delay | n/a[1] | 1.2 | 0.0 | 2.4 | 1.6 | 0.5 | 8.0 | 6.2 | 3.2 | n/a[1] | 7.3 | 2.7 | 1.5 |
| PM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | B | | | B | | | A |
| | | Delay | 8.4 | n/a[1] | | 8.1 | n/a[1] | | 14.1 | | | 13.4 | | | 1.1 |
| | SimTraffic | LOS | n/a[1] | A | A | A | A | A | A | A | A | A | A | A | A |
| | | Delay | n/a[1] | 1.4 | 0.2 | 3.1 | 2.5 | 1.2 | 7.5 | 8.0 | 3.1 | 3.4 | 9.1 | 5.9 | 2.2 |

[1] free movement

## Table C-2 – 2050 No Build Analysis Results

| Time Period | Analysis Means | MOE | EB Movement Left | EB Movement Thru | EB Movement Right | WB Movement Left | WB Movement Thru | WB Movement Right | NB Movement Left | NB Movement Thru | NB Movement Right | SB Movement Left | SB Movement Thru | SB Movement Right | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | B | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.8 | n/a[1] | | 11.0 | | | | | | 1.5 |
| | SimTraffic | LOS | | A | A | A | A | | B | | A | | | | A |
| | | Delay | | 3.0 | 1.2 | 2.9 | 0.5 | | 12.5 | | 2.3 | | | | 2.3 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.8 | n/a[1] | | 9.3 | | | | | | 1.3 |
| | SimTraffic | LOS | | A | A | A | A | | B | | A | | | | A |
| | | Delay | | 2.7 | 1.2 | 3.2 | 0.5 | | 14.2 | | 2.0 | | | | 1.8 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | C | | | C | | | A |
| | | Delay | 8.4 | n/a[1] | | 9.2 | n/a[1] | | 18.6 | | | 16.8 | | | 1.8 |
| | SimTraffic | LOS | A | A | A | A | A | A | B | C | A | A | A | A | A |
| | | Delay | 1.8 | 1.5 | 0.1 | 4.8 | 2.0 | 0.9 | 13.0 | 18.0 | 3.4 | 5.7 | 8.0 | 3.2 | 2.0 |
| PM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | C | | | C | | | A |
| | | Delay | 9.0 | n/a[1] | | 8.6 | n/a[1] | | 21.3 | | | 17.0 | | | 1.5 |
| | SimTraffic | LOS | A | A | A | A | A | A | B | B | A | C | C | A | A |
| | | Delay | 1.9 | 2.1 | 0.2 | 5.2 | 3.8 | 1.3 | 11.3 | 14.8 | 4.1 | 24.6 | 16.8 | 6.2 | 3.4 |

[1] free movement

Table C-3 – 2050 with Development No Build Analysis Results

| Time Period | Analysis Means | MOE | EB Movement | | | WB Movement | | | NB Movement | | | SB Movement | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | |
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | B | n/a[1] | | C | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 12.8 | n/a[1] | | 16.9 | | | | | | 0.7 |
| | SimTraffic | LOS | | A | A | C | A | | F | | A | | | | A |
| | | Delay | | 8.3 | 2.6 | 18.7 | 0.6 | | 114.3 | | 2.6 | | | | 6.2 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | B | n/a[1] | | F | | | | | | B |
| | | Delay | | n/a[1] | n/a[1] | 14.6 | n/a[1] | | 145.4 | | | | | | 14.4 |
| | SimTraffic | LOS | | A | A | C | A | | F | | F | | | | F |
| | | Delay | | 7.1 | 3.0 | 21.8 | 0.7 | | 1191.2 | | 1051.8 | | | | 70.9 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | B | n/a[1] | | B | n/a[1] | | F | | | E | | | A |
| | | Delay | 10.8 | n/a[1] | | 12.5 | n/a[1] | | 181.3 | | | 46.9 | | | 7.9 |
| | SimTraffic | LOS | A | A | A | C | A | A | E | n/a[1] | A | E | C | B | A |
| | | Delay | 2.4 | 2.2 | 0.1 | 16.0 | 5.1 | 1.2 | 36.2 | n/a[1] | 4.4 | 43.6 | 15.8 | 14.0 | 3.7 |
| PM | HCM | LOS | B | n/a[1] | | B | n/a[1] | | F | | | F | | | E |
| | | Delay | 14.7 | n/a[1] | | 13.0 | n/a[1] | | 1833.8 | | | 66.1 | | | 41.1 |
| | SimTraffic | LOS | A | A | A | C | C | A | F | F | F | F | F | F | C |
| | | Delay | 7.9 | 2.7 | 0.3 | 23.9 | 17.8 | 5.9 | 529.0 | 361.9 | 384.2 | 311.5 | 172.5 | 97.1 | 22.7 |

[1] free movement

# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, AM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 488 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.84 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.29 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 4.7 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 55.7 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 55.7 | Percent Followers, % | 53.3 |
| Segment Travel Time, minutes | 1.08 | Follower Density, followers/mi/ln | 4.7 |
| Vehicle LOS | C | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 4.7 | C |

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# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, PM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 483 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.88 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.28 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 4.6 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 55.7 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 55.7 | Percent Followers, % | 53.0 |
| Segment Travel Time, minutes | 1.08 | Follower Density, followers/mi/ln | 4.6 |
| Vehicle LOS | C | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 4.6 | C |

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# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, AM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 702 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.84 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.41 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 8.1 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 55.2 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 55.2 | Percent Followers, % | 63.3 |
| Segment Travel Time, minutes | 1.09 | Follower Density, followers/mi/ln | 8.1 |
| Vehicle LOS | D | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 8.1 | D |

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# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, PM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 699 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.88 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.41 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 8.0 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 55.2 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 55.2 | Percent Followers, % | 63.2 |
| Segment Travel Time, minutes | 1.09 | Follower Density, followers/mi/ln | 8.0 |
| Vehicle LOS | D | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 8.0 | D |

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# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2050 w/ Dev |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, AM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 1327 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.84 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.78 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 19.7 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 54.2 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 54.2 | Percent Followers, % | 80.3 |
| Segment Travel Time, minutes | 1.11 | Follower Density, followers/mi/ln | 19.7 |
| Vehicle LOS | E | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 19.7 | E |

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# HCS7 Two-Lane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/16/2021 |
| Agency | | Analysis Year | 2050 w/ Dev |
| Jurisdiction | | Time Analyzed | |
| Project Description | No-Build, PM | Units | U.S. Customary |

## Segment 1

### Vehicle Inputs

| | | | |
|---|---|---|---|
| Segment Type | Passing Constrained | Length, ft | 5280 |
| Lane Width, ft | 12 | Shoulder Width, ft | 0 |
| Speed Limit, mi/h | 55 | Access Point Density, pts/mi | 0.0 |

### Demand and Capacity

| | | | |
|---|---|---|---|
| Directional Demand Flow Rate, veh/h | 1580 | Opposing Demand Flow Rate, veh/h | - |
| Peak Hour Factor | 0.88 | Total Trucks, % | 9.00 |
| Segment Capacity, veh/h | 1700 | Demand/Capacity (D/C) | 0.93 |

### Intermediate Results

| | | | |
|---|---|---|---|
| Segment Vertical Class | 1 | Free-Flow Speed, mi/h | 58.2 |
| Speed Slope Coefficient | 3.71463 | Speed Power Coefficient | 0.41674 |
| PF Slope Coefficient | -1.31135 | PF Power Coefficient | 0.75701 |
| In Passing Lane Effective Length? | No | Total Segment Density, veh/mi/ln | 24.7 |
| %Improved % Followers | 0.0 | % Improved Avg Speed | 0.0 |

### Subsegment Data

| # | Segment Type | Length, ft | Radius, ft | Superelevation, % | Average Speed, mi/h |
|---|---|---|---|---|---|
| 1 | Tangent | 5280 | - | - | 53.8 |

### Vehicle Results

| | | | |
|---|---|---|---|
| Average Speed, mi/h | 53.8 | Percent Followers, % | 84.3 |
| Segment Travel Time, minutes | 1.11 | Follower Density, followers/mi/ln | 24.7 |
| Vehicle LOS | E | | |

### Facility Results

| T | Follower Density, followers/mi/ln | LOS |
|---|---|---|
| 1 | 24.7 | E |

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# Appendix D – Signal Warrants

# HCS7 Warrants Report

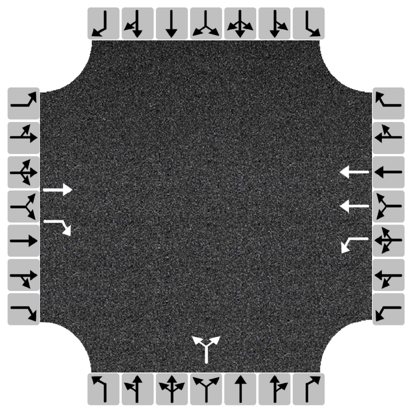
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Raw Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 210 | 17 | 30 | 213 | 0 | 14 | 0 | 31 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 492 | 66 | 558 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 08 - 09 | 460 | 51 | 511 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 409 | 58 | 467 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 428 | 52 | 480 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 396 | 39 | 435 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 431 | 52 | 483 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 445 | 46 | 491 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 447 | 46 | 493 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 519 | 29 | 548 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 540 | 44 | 584 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 17 - 18 | 602 | 36 | 638 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 499 | 31 | 530 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 5668 | 550 | 6218 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

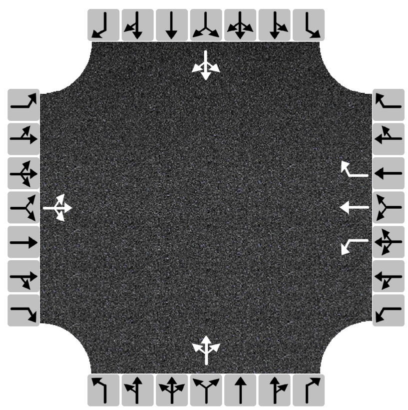
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Raw Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 0 | 238 | 5 | 19 | 228 | 2 | 3 | 0 | 20 | 2 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 543 | 42 | 586 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 08 - 09 | 454 | 21 | 484 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 448 | 21 | 473 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 444 | 16 | 468 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 419 | 18 | 438 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 490 | 26 | 520 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 481 | 21 | 503 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 495 | 13 | 511 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 512 | 19 | 535 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 647 | 28 | 676 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 550 | 27 | 582 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 456 | 41 | 500 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 5939 | 293 | 6276 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

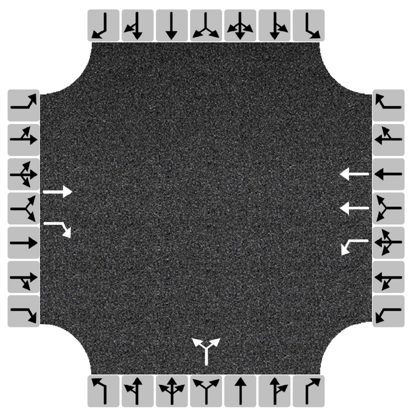
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 246 | 20 | 40 | 240 | 0 | 18 | 0 | 37 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 620 | 90 | 710 | 0 | 0 | No | Yes | No | Yes | No | No | No | No | No |
| 08 - 09 | 514 | 55 | 569 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 449 | 68 | 517 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 501 | 74 | 575 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 463 | 43 | 506 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 503 | 59 | 562 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 488 | 59 | 547 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 528 | 50 | 578 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 15 - 16 | 637 | 43 | 680 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 643 | 51 | 694 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 17 - 18 | 740 | 45 | 785 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 487 | 41 | 528 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 6573 | 678 | 7251 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

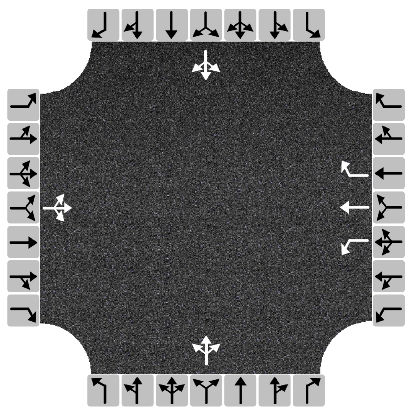
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 1 | 276 | 6 | 26 | 267 | 4 | 6 | 0 | 24 | 3 | 0 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 700 | 59 | 762 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 08 - 09 | 545 | 36 | 593 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 518 | 29 | 556 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 548 | 24 | 585 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 479 | 15 | 497 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 560 | 39 | 604 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 544 | 27 | 574 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 577 | 23 | 603 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 562 | 19 | 584 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 675 | 29 | 711 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 775 | 40 | 818 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 513 | 35 | 561 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 6996 | 375 | 7448 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

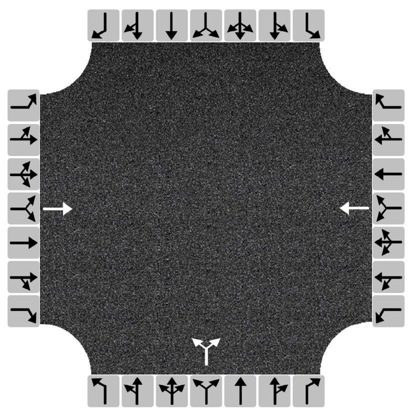
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/26/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Single Thru Lane | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | | | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 246 | 0 | 0 | 240 | 0 | 18 | 0 | 37 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 610 | 90 | 700 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 08 - 09 | 503 | 55 | 558 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 405 | 68 | 473 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 451 | 74 | 525 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 11 - 12 | 416 | 43 | 459 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 452 | 59 | 511 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 13 - 14 | 440 | 59 | 499 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 14 - 15 | 473 | 50 | 523 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 15 - 16 | 523 | 43 | 566 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 529 | 51 | 580 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 17 - 18 | 640 | 45 | 685 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 398 | 41 | 439 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 5840 | 678 | 6518 | 0 | 0 | 0 | 1 | 1 | 9 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

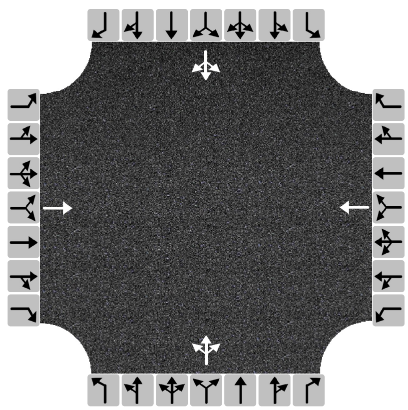
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/24/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Single Thru Lane | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | T | | | T | | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 0 | 276 | 0 | 0 | 267 | 0 | 6 | 0 | 24 | 3 | 0 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 670 | 59 | 732 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 08 - 09 | 524 | 36 | 572 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 488 | 29 | 526 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 516 | 24 | 553 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 447 | 15 | 465 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 525 | 39 | 569 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 512 | 27 | 542 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 539 | 23 | 565 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 516 | 19 | 538 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 619 | 29 | 655 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 704 | 40 | 747 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 470 | 35 | 518 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 6530 | 375 | 6982 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

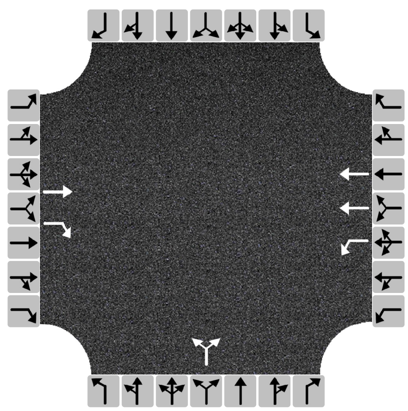
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 29 | 57 | 345 | 0 | 27 | 0 | 54 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 895 | 135 | 1030 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 741 | 79 | 820 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 09 - 10 | 646 | 99 | 745 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 719 | 105 | 824 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
| 11 - 12 | 665 | 61 | 726 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 12 - 13 | 722 | 84 | 806 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 700 | 84 | 784 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 759 | 72 | 831 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 909 | 62 | 971 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 16 - 17 | 919 | 72 | 991 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 17 - 18 | 1065 | 65 | 1130 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 18 - 19 | 694 | 58 | 752 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| Total | 9434 | 976 | 10410 | 0 | 0 | 2 | 5 | 12 | 12 | 5 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

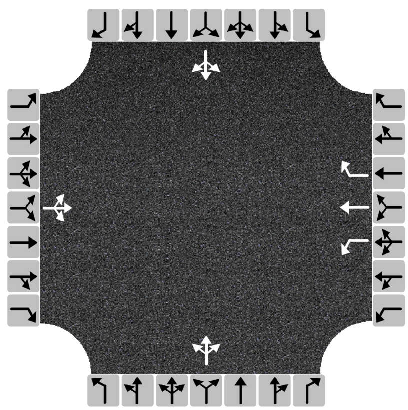
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 396 | 9 | 37 | 384 | 6 | 8 | 1 | 35 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1005 | 90 | 1101 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 781 | 50 | 849 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 743 | 40 | 795 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 787 | 35 | 842 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 687 | 22 | 714 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 802 | 56 | 866 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 778 | 37 | 820 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 828 | 33 | 866 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 806 | 28 | 839 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 966 | 41 | 1017 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 1120 | 58 | 1184 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 18 - 19 | 735 | 51 | 806 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 10038 | 541 | 10699 | 0 | 0 | 0 | 1 | 3 | 5 | 1 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

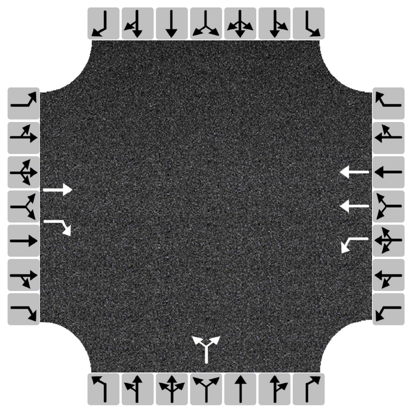
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 29 | 57 | 345 | 0 | 27 | 0 | 33 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 895 | 102 | 997 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 741 | 61 | 802 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 09 - 10 | 646 | 73 | 719 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 719 | 78 | 797 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 11 - 12 | 665 | 45 | 710 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 12 - 13 | 722 | 62 | 784 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 700 | 62 | 762 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 759 | 53 | 812 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 909 | 46 | 955 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 919 | 53 | 972 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 17 - 18 | 1065 | 49 | 1114 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 694 | 43 | 737 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 9434 | 727 | 10161 | 0 | 0 | 0 | 1 | 8 | 12 | 1 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

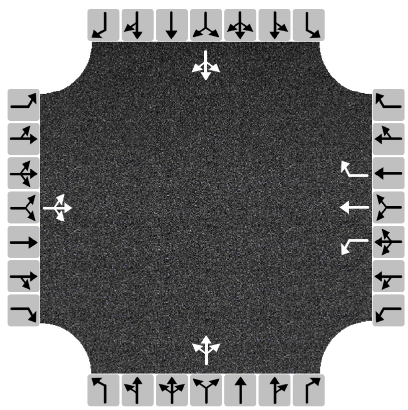
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 396 | 9 | 37 | 384 | 6 | 8 | 1 | 17 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1005 | 50 | 1061 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 08 - 09 | 781 | 25 | 823 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 743 | 22 | 777 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 787 | 19 | 824 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 687 | 12 | 704 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 802 | 29 | 839 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 778 | 21 | 804 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 828 | 17 | 850 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 806 | 20 | 831 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 966 | 31 | 1006 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 1120 | 45 | 1171 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 735 | 37 | 791 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 10038 | 328 | 10481 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

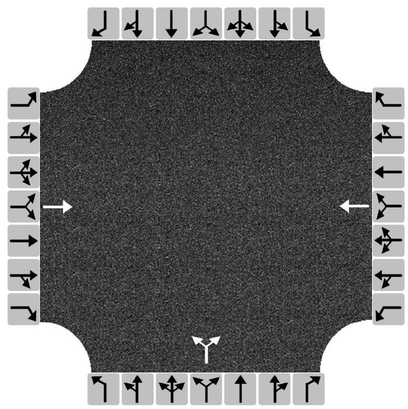
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/26/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Single Thru Lane | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | | | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 0 | 0 | 345 | 0 | 27 | 0 | 54 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 875 | 135 | 1010 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 720 | 79 | 799 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 09 - 10 | 582 | 99 | 681 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 647 | 105 | 752 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
| 11 - 12 | 597 | 61 | 658 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 12 - 13 | 648 | 84 | 732 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | No | No | No |
| 13 - 14 | 631 | 84 | 715 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 679 | 72 | 751 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 752 | 62 | 814 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 16 - 17 | 761 | 72 | 833 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 17 - 18 | 920 | 65 | 985 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 18 - 19 | 571 | 58 | 629 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| Total | 8383 | 976 | 9359 | 0 | 0 | 2 | 5 | 12 | 12 | 7 | 0 | 1 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

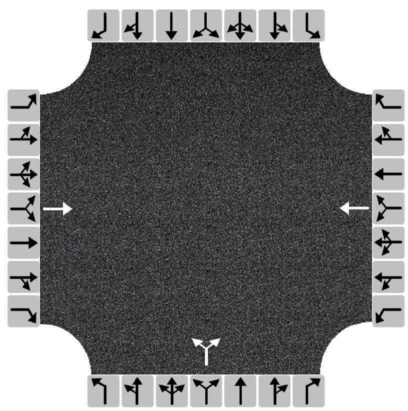
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/26/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Single Thru Lane + Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | | | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 0 | 0 | 345 | 0 | 27 | 0 | 33 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 875 | 102 | 977 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 720 | 61 | 781 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 09 - 10 | 582 | 73 | 655 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 647 | 78 | 725 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 11 - 12 | 597 | 45 | 642 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 12 - 13 | 648 | 62 | 710 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 631 | 62 | 693 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 679 | 53 | 732 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 752 | 46 | 798 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 761 | 53 | 814 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 17 - 18 | 920 | 49 | 969 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 571 | 43 | 614 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 8383 | 727 | 9110 | 0 | 0 | 0 | 1 | 8 | 12 | 1 | 0 | 1 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

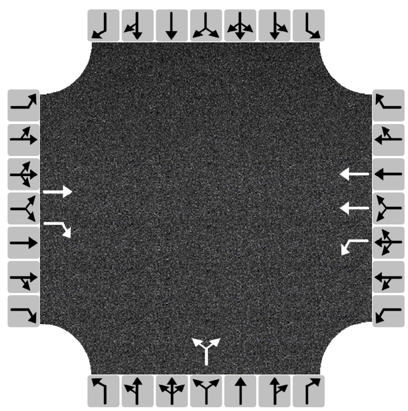
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/17/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 819 | 76 | 93 | 804 | 0 | 71 | 0 | 88 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2025 | 50 | 2075 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 08 - 09 | 1721 | 163 | 1884 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 09 - 10 | 1480 | 205 | 1685 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1646 | 219 | 1865 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1520 | 128 | 1648 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 12 - 13 | 1650 | 175 | 1825 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1606 | 175 | 1781 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1729 | 149 | 1878 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 15 - 16 | 2052 | 128 | 2180 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 16 - 17 | 2073 | 149 | 2222 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 17 - 18 | 2470 | 255 | 2725 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1561 | 121 | 1682 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| Total | 21533 | 1917 | 23450 | 0 | 0 | 11 | 11 | 11 | 12 | 11 | 0 | 11 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

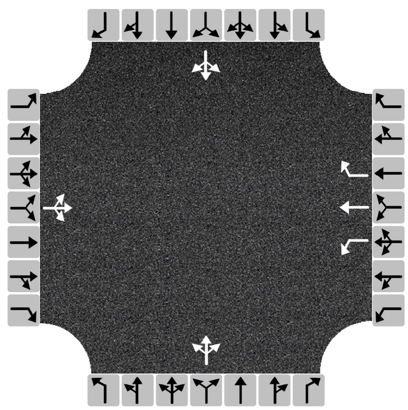
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 897 | 9 | 37 | 872 | 6 | 8 | 1 | 35 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2040 | 90 | 2136 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 1716 | 50 | 1784 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 1631 | 40 | 1683 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 1726 | 35 | 1781 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 1498 | 22 | 1525 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 1755 | 56 | 1819 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 1710 | 37 | 1752 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 1805 | 33 | 1843 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 1762 | 28 | 1795 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 2114 | 41 | 2165 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 2550 | 58 | 2614 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 18 - 19 | 1604 | 51 | 1675 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 21911 | 541 | 22572 | 0 | 0 | 0 | 1 | 3 | 5 | 1 | 0 | 1 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

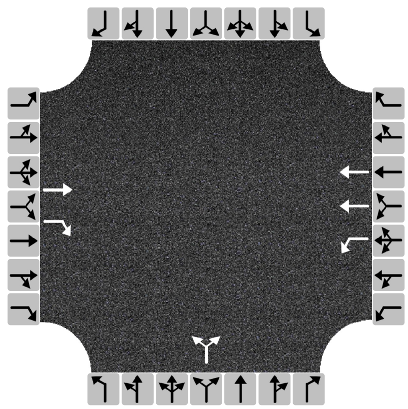
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | No Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | R | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 819 | 76 | 93 | 804 | 0 | 71 | 0 | 73 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2025 | 49 | 2074 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 08 - 09 | 1721 | 154 | 1875 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 09 - 10 | 1480 | 182 | 1662 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1646 | 194 | 1840 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1520 | 110 | 1630 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 12 - 13 | 1650 | 156 | 1806 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1606 | 161 | 1767 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1729 | 132 | 1861 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 15 - 16 | 2052 | 118 | 2170 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 16 - 17 | 2073 | 138 | 2211 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 17 - 18 | 2470 | 241 | 2711 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1561 | 102 | 1663 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| Total | 21533 | 1737 | 23270 | 0 | 0 | 10 | 11 | 11 | 12 | 11 | 0 | 11 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

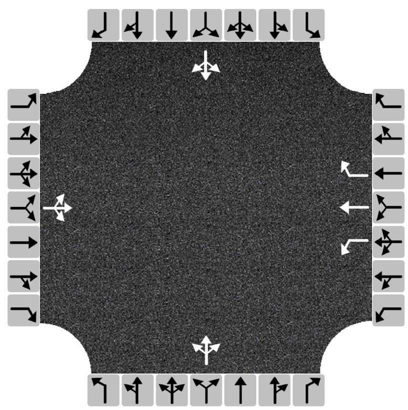
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | No Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | | LTR | | L | T | R | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 897 | 9 | 37 | 872 | 6 | 8 | 1 | 26 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2040 | 74 | 2120 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 1716 | 39 | 1772 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 1631 | 30 | 1673 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 1726 | 26 | 1772 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 1498 | 15 | 1518 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 1755 | 40 | 1803 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 1710 | 28 | 1743 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 1805 | 24 | 1834 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 1762 | 25 | 1792 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 2114 | 39 | 2163 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 2550 | 56 | 2613 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 18 - 19 | 1604 | 44 | 1668 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 21911 | 440 | 22471 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

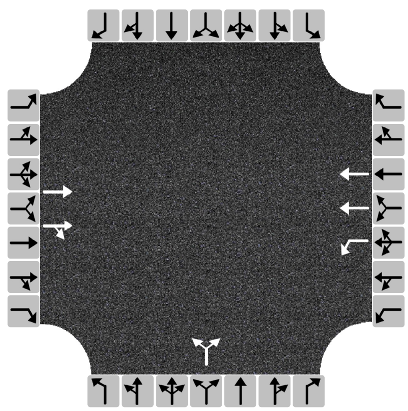
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | TR | | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 246 | 20 | 40 | 240 | 0 | 18 | 0 | 37 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 620 | 90 | 710 | 0 | 0 | No | Yes | No | Yes | No | No | No | No | No |
| 08 - 09 | 514 | 55 | 569 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 449 | 68 | 517 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 501 | 74 | 575 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 463 | 43 | 506 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 503 | 59 | 562 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 488 | 59 | 547 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 528 | 50 | 578 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 15 - 16 | 637 | 43 | 680 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 643 | 51 | 694 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 17 - 18 | 740 | 45 | 785 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 487 | 41 | 528 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 6573 | 678 | 7251 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

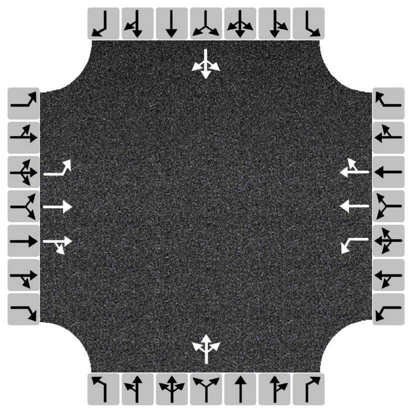
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | Design - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | L | TR | | L | TR | | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 1 | 276 | 6 | 26 | 267 | 4 | 6 | 0 | 24 | 3 | 0 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 700 | 59 | 762 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 08 - 09 | 545 | 36 | 593 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 518 | 29 | 556 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 548 | 24 | 585 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 479 | 15 | 497 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 560 | 39 | 604 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 544 | 27 | 574 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 577 | 23 | 603 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 562 | 19 | 584 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 675 | 29 | 711 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 775 | 40 | 818 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 513 | 35 | 561 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 6996 | 375 | 7448 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

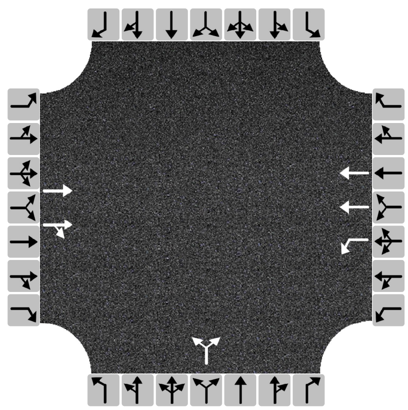
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | TR | | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 29 | 57 | 345 | 0 | 27 | 0 | 54 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 895 | 135 | 1030 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 741 | 79 | 820 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 09 - 10 | 646 | 99 | 745 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 719 | 105 | 824 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
| 11 - 12 | 665 | 61 | 726 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 12 - 13 | 722 | 84 | 806 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 700 | 84 | 784 | 0 | 0 | No | Yes | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 759 | 72 | 831 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 909 | 62 | 971 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 16 - 17 | 919 | 72 | 991 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 17 - 18 | 1065 | 65 | 1130 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 18 - 19 | 694 | 58 | 752 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| Total | 9434 | 976 | 10410 | 0 | 0 | 2 | 5 | 12 | 12 | 5 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

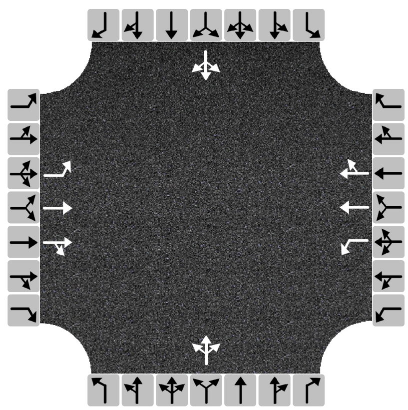
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | L | TR | | L | TR | | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 396 | 9 | 37 | 384 | 6 | 8 | 1 | 35 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1005 | 90 | 1101 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 781 | 50 | 849 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 743 | 40 | 795 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 787 | 35 | 842 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 687 | 22 | 714 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 802 | 56 | 866 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 778 | 37 | 820 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 828 | 33 | 866 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 806 | 28 | 839 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 966 | 41 | 1017 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 1120 | 58 | 1184 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 18 - 19 | 735 | 51 | 806 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 10038 | 541 | 10699 | 0 | 0 | 0 | 1 | 3 | 5 | 1 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

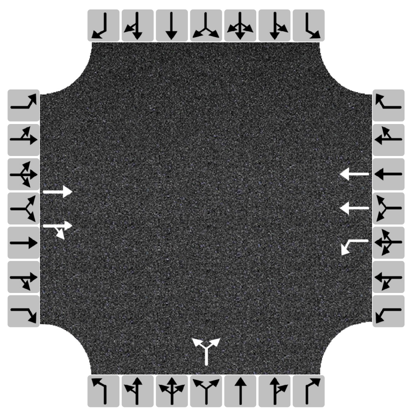
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | TR | | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 353 | 29 | 57 | 345 | 0 | 27 | 0 | 33 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 895 | 102 | 997 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | No | No | No |
| 08 - 09 | 741 | 61 | 802 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 09 - 10 | 646 | 73 | 719 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 10 - 11 | 719 | 78 | 797 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 11 - 12 | 665 | 45 | 710 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 12 - 13 | 722 | 62 | 784 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 700 | 62 | 762 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 14 - 15 | 759 | 53 | 812 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 15 - 16 | 909 | 46 | 955 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 16 - 17 | 919 | 53 | 972 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 17 - 18 | 1065 | 49 | 1114 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 18 - 19 | 694 | 43 | 737 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 9434 | 727 | 10161 | 0 | 0 | 0 | 1 | 8 | 12 | 1 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

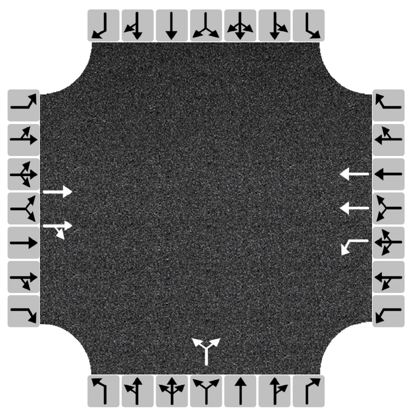
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | TR | | L | T | | | LR | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 819 | 76 | 93 | 804 | 0 | 71 | 0 | 88 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2025 | 50 | 2075 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 08 - 09 | 1721 | 163 | 1884 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 09 - 10 | 1480 | 205 | 1685 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1646 | 219 | 1865 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1520 | 128 | 1648 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 12 - 13 | 1650 | 175 | 1825 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1606 | 175 | 1781 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1729 | 149 | 1878 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 15 - 16 | 2052 | 128 | 2180 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 16 - 17 | 2073 | 149 | 2222 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 17 - 18 | 2470 | 255 | 2725 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1561 | 121 | 1682 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| Total | 21533 | 1917 | 23450 | 0 | 0 | 11 | 11 | 11 | 12 | 11 | 0 | 11 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

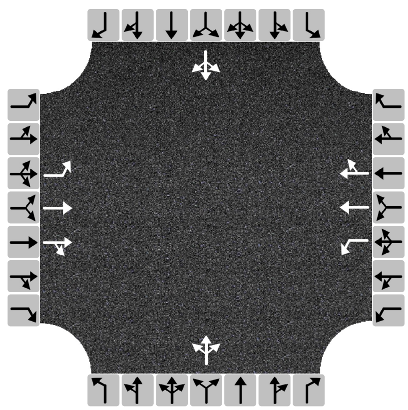
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | L | TR | | L | TR | | | LTR | | | LTR | |
| Vehicle Volumes Averages (veh/h) | 2 | 897 | 9 | 37 | 872 | 6 | 8 | 1 | 35 | 6 | 1 | 2 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2040 | 90 | 2136 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 1716 | 50 | 1784 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| 09 - 10 | 1631 | 40 | 1683 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 1726 | 35 | 1781 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 1498 | 22 | 1525 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 1755 | 56 | 1819 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 13 - 14 | 1710 | 37 | 1752 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 1805 | 33 | 1843 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 1762 | 28 | 1795 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 2114 | 41 | 2165 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 2550 | 58 | 2614 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 18 - 19 | 1604 | 51 | 1675 | 0 | 0 | No | No | No | Yes | No | No | No | No | No |
| Total | 21911 | 541 | 22572 | 0 | 0 | 0 | 1 | 3 | 5 | 1 | 0 | 1 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

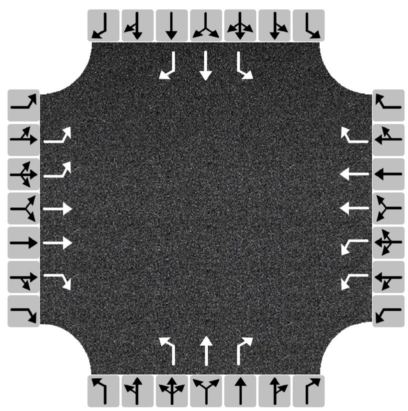
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/2/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | New Intersection | Time Period Analyzed | |
| Project Description | Build - Full Volumes | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Lane Usage | L | T | R | L | T | R | L | T | R | L | T | R |
| Vehicle Volumes Averages (veh/h) | 179 | 424 | 190 | 246 | 419 | 212 | 183 | 41 | 242 | 211 | 40 | 173 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1790 | 820 | 2920 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 1610 | 431 | 2470 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 09 - 10 | 1373 | 538 | 2446 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1533 | 577 | 2684 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1421 | 336 | 2092 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 12 - 13 | 1539 | 461 | 2459 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1488 | 461 | 2408 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1622 | 394 | 2408 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 15 - 16 | 1898 | 337 | 2570 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 16 - 17 | 1913 | 395 | 2701 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 17 - 18 | 2440 | 570 | 3555 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1449 | 319 | 2084 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| Total | 20076 | 5639 | 30797 | 0 | 0 | 12 | 12 | 12 | 12 | 12 | 0 | 12 | 0 | 0 |

## Warrants

| Warrant | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

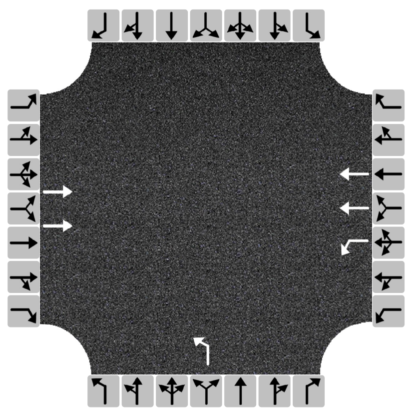
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/27/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | State Park Road | Time Period Analyzed | |
| Project Description | Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 0 | 2 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Lane Usage | | T | | L | T | | L | | | | | |
| Vehicle Volumes Averages (veh/h) | 0 | 819 | 0 | 93 | 804 | 0 | 71 | 0 | 0 | 0 | 0 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1985 | 20 | 2005 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 08 - 09 | 1681 | 68 | 1749 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 09 - 10 | 1414 | 91 | 1505 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1576 | 97 | 1673 | 0 | 0 | No | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1461 | 57 | 1518 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 12 - 13 | 1584 | 78 | 1662 | 0 | 0 | No | No | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1533 | 78 | 1611 | 0 | 0 | No | No | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1666 | 66 | 1732 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 15 - 16 | 1933 | 60 | 1993 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| 16 - 17 | 1949 | 70 | 2019 | 0 | 0 | No | No | Yes | Yes | Yes | No | No | No | No |
| 17 - 18 | 2350 | 115 | 2465 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1478 | 57 | 1535 | 0 | 0 | No | No | Yes | Yes | No | No | No | No | No |
| Total | 20610 | 857 | 21467 | 0 | 0 | 1 | 3 | 11 | 11 | 8 | 0 | 5 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

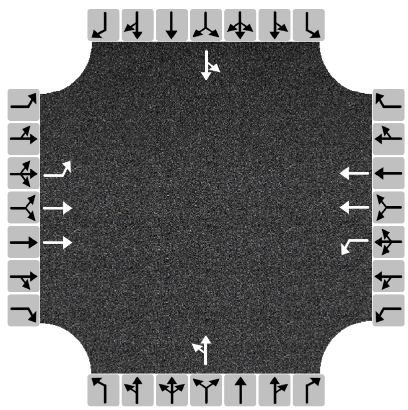
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/27/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | Willow Springs Road/Johnson Creek Road | Time Period Analyzed | |
| Project Description | Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Usage | L | T | | L | T | | | LT | | | LT | |
| Vehicle Volumes Averages (veh/h) | 2 | 897 | 0 | 37 | 872 | 0 | 8 | 1 | 0 | 6 | 1 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 2020 | 10 | 2034 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 08 - 09 | 1710 | 13 | 1728 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 09 - 10 | 1620 | 9 | 1637 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 10 - 11 | 1715 | 15 | 1737 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 11 - 12 | 1488 | 5 | 1497 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 12 - 13 | 1744 | 12 | 1762 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 13 - 14 | 1699 | 8 | 1711 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 14 - 15 | 1794 | 7 | 1805 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 15 - 16 | 1746 | 9 | 1759 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 16 - 17 | 2095 | 13 | 2115 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 17 - 18 | 2502 | 20 | 2526 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| 18 - 19 | 1590 | 16 | 1621 | 0 | 0 | No | No | No | No | No | No | No | No | No |
| Total | 21723 | 137 | 21932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 2: Four-Hour Vehicular Volume*** | |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | |
| ***Warrant 3: Peak Hour*** | |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# HCS7 Warrants Report

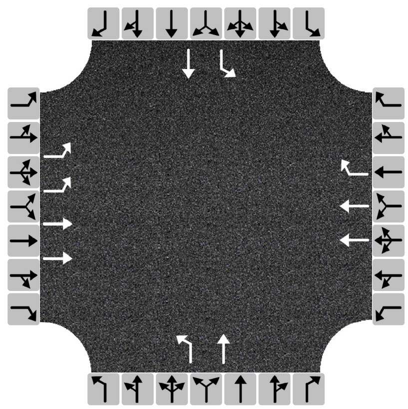
## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 8/26/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | New Intersection | Time Period Analyzed | |
| Project Description | Build - Right Turn Reduction | | |

## General

| | | | |
|---|---|---|---|
| Major Street Direction | East-West | Population < 10,000 | Yes |
| Starting Time Interval | 7 | Coordinated Signal System | No |
| Median Type | Undivided | Crashes (crashes/year) | 0 |
| Major Street Speed (mi/h) | 60 | Adequate Trials of Crash Exp. Alt. | No |
| Nearest Signal (ft) | 0 | | |

## Geometry and Traffic



| Approach | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Number of Lanes, N | 2 | 2 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| Lane Usage | L | T | | | T | R | L | T | | L | T | |
| Vehicle Volumes Averages (veh/h) | 179 | 424 | 0 | 0 | 246 | 419 | 183 | 41 | 0 | 211 | 40 | 0 |
| Pedestrian Averages (peds/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Gap Averages (gaps/h) | 0 | | | 0 | | | 0 | | | 0 | | |
| Delay (s/veh) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |
| Delay (veh-hrs) | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | | |

## School Crossing and Roadway Network

| | | | |
|---|---|---|---|
| Number of Students in Highest Hour | 0 | Two or More Major Routes | No |
| Number of Adequate Gaps in Period | 0 | Weekend Counts | No |
| Number of Minutes in Period | 0 | 5-year Growth Factor (%) | 0 |

## Railroad Crossing

| | | | |
|---|---|---|---|
| Grade Crossing Approach | None | Rail Traffic (trains/day) | 0 |
| Highest Volume Hour with Trains | Unknown | High Occupancy Buses (%) | 0 |
| Distance to Stop Line (ft) | - | Tractor-Trailer Trucks (%) | 9 |

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# HCS7 Warrants Report

## Volume Summary

| Hour | Major Volume | Minor Volume | Total Volume | Peds/h | Gaps/h | 1A ( 70% ) | 1A ( 56% ) | 1B ( 70% ) | 1B ( 56% ) | 2 ( 70% ) | 3A ( 70% ) | 3B ( 56% ) | 4A ( 70% ) | 4B ( 56% ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 - 08 | 1365 | 380 | 1935 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 08 - 09 | 1244 | 255 | 1701 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 09 - 10 | 1046 | 316 | 1621 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 10 - 11 | 1167 | 339 | 1784 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 11 - 12 | 1079 | 198 | 1439 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 12 - 13 | 1170 | 271 | 1663 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 13 - 14 | 1134 | 271 | 1627 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 14 - 15 | 1231 | 232 | 1653 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 15 - 16 | 1435 | 197 | 1799 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 16 - 17 | 1442 | 231 | 1868 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 17 - 18 | 1825 | 345 | 2435 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| 18 - 19 | 1097 | 186 | 1441 | 0 | 0 | Yes | Yes | Yes | Yes | Yes | No | Yes | No | No |
| Total | 15235 | 3221 | 20966 | 0 | 0 | 12 | 12 | 12 | 12 | 12 | 0 | 12 | 0 | 0 |

## Warrants

| | |
|---|---|
| ***Warrant 1: Eight-Hour Vehicular Volume*** | ✔ |
| A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or-- | ✓ |
| 56% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 2: Four-Hour Vehicular Volume*** | ✔ |
| Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 3: Peak Hour*** | ✔ |
| A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or-- | |
| B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach) | ✓ |
| ***Warrant 4: Pedestrian Volume*** | |
| A. Four Hour Volumes --or-- | |
| B. One-Hour Volumes | |
| ***Warrant 5: School Crossing*** | |
| Gaps Same Period --and-- | |
| Student Volumes | |
| Nearest Traffic Control Signal (optional) | |
| ***Warrant 6: Coordinated Signal System*** | |
| Degree of Platooning (Predominant direction or both directions) | |
| ***Warrant 7: Crash Experience*** | |
| A. Adequate trials of alternatives, observance and enforcement failed --and-- | |
| B. Reported crashes susceptible to correction by signal (12-month period) --and-- | |
| C. 56% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied | ✓ |
| ***Warrant 8: Roadway Network*** | |
| A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or-- | |
| B. Weekend Volume (Five hours total) | |
| ***Warrant 9: Grade Crossing*** | |
| A. Grade Crossing within 140 ft --and-- | |
| B. Peak-Hour Vehicular Volumes | |

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# Appendix E – Build Analysis Results

## Table E-1 – 2021 Build Analysis Results

| Time Period | Analysis Means | MOE | EB Movement Left | EB Movement Thru | EB Movement Right | WB Movement Left | WB Movement Thru | WB Movement Right | NB Movement Left | NB Movement Thru | NB Movement Right | SB Movement Left | SB Movement Thru | SB Movement Right | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.2 | n/a[1] | | 8.5 | | | | | | 1.2 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 1.5 | 1.0 | 2.0 | 0.6 | | 8.0 | | 2.2 | | | | 1.4 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.3 | n/a[1] | | 8.0 | | | | | | 1.2 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 1.5 | 1.2 | 1.9 | 0.6 | | 7.6 | | 1.9 | | | | 1.2 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | B | | | B | | | A |
| | | Delay | 8.0 | n/a[1] | | 8.5 | n/a[1] | | 10.9 | | | 12.2 | | | 1.0 |
| | SimTraffic | LOS | n/a[1] | A | A | A | A | A | A | A | A | n/a[1] | A | A | A |
| | | Delay | n/a[1] | 0.7 | 0.0 | 3.0 | 1.2 | 0.9 | 6.6 | 5.4 | 3.9 | n/a[1] | 6.6 | 2.3 | 1.2 |
| PM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | B | | | B | | | A |
| | | Delay | 8.4 | n/a[1] | | 8.2 | n/a[1] | | 12.1 | | | 12.8 | | | 1.0 |
| | SimTraffic | LOS | A | A | A | A | A | A | A | C | A | A | B | A | A |
| | | Delay | 0.0 | 0.8 | 0.1 | 2.5 | 1.7 | 1.5 | 8.0 | 20.5 | 3.7 | 4.4 | 11.8 | 3.1 | 1.6 |

[1] free movement

## Table E-2 – 2050 Build Analysis Results

| Time Period | Analysis Means | MOE | EB Movement Left | EB Movement Thru | EB Movement Right | WB Movement Left | WB Movement Thru | WB Movement Right | NB Movement Left | NB Movement Thru | NB Movement Right | SB Movement Left | SB Movement Thru | SB Movement Right | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.8 | n/a[1] | | 9.2 | | | | | | 1.3 |
| | SimTraffic | LOS | | A | A | A | A | | B | | A | | | | A |
| | | Delay | | 2.0 | 1.3 | 2.0 | 0.7 | | 11.5 | | 2.4 | | | | 1.9 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | A | n/a[1] | | A | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 8.9 | n/a[1] | | 8.5 | | | | | | 1.3 |
| | SimTraffic | LOS | | A | A | A | A | | B | | A | | | | A |
| | | Delay | | 1.4 | 1.2 | 2.9 | 0.7 | | 12.7 | | 2.0 | | | | 1.6 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | B | | | B | | | A |
| | | Delay | 8.4 | n/a[1] | | 9.3 | n/a[1] | | 13.8 | | | 14.5 | | | 1.4 |
| | SimTraffic | LOS | A | A | A | A | A | A | B | B | A | B | B | A | A |
| | | Delay | 0.5 | 1.1 | 0.1 | 3.0 | 1.5 | 1.2 | 10.8 | 10.5 | 5.3 | 11.9 | 11.6 | 2.7 | 1.7 |
| PM | HCM | LOS | A | n/a[1] | | A | n/a[1] | | C | | | C | | | A |
| | | Delay | 9.1 | n/a[1] | | 8.7 | n/a[1] | | 15.8 | | | 15.8 | | | 1.3 |
| | SimTraffic | LOS | A | A | A | A | A | A | A | B | A | B | B | A | A |
| | | Delay | 0.8 | 1.0 | 0.0 | 3.1 | 2.3 | 1.6 | 9.7 | 13.3 | 4.0 | 10.3 | 10.3 | 3.9 | 2.0 |

[1] free movement

Table E-3 – 2050 with Development Build Analysis Results

| Time Period | Analysis Means | MOE | EB Movement | | | WB Movement | | | NB Movement | | | SB Movement | | | Overall |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | |
| **US-70 at Chickasaw Pointe Road (New Intersection)** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | C | | | C | | | C | | | C | | | C |
| | | Delay | 26.2 | | | 24.5 | | | 29.1 | | | 24.1 | | | 26.2 |
| | SimTraffic | LOS | | | | A | A | A | | A | A | A | A | | A |
| | | Delay | | | | 4.6 | 0.2 | 2.1 | | 0.2 | 0.3 | 1.7 | 0.1 | | 1.3 |
| PM | HCM | LOS | C | | | C | | | C | | | C | | | C |
| | | Delay | 28.9 | | | 25.9 | | | 28.0 | | | 25.9 | | | 27.1 |
| | SimTraffic | LOS | | | | A | A | A | | A | A | A | A | | A |
| | | Delay | | | | 4.3 | 0.0 | 2.6 | | 0.4 | 0.2 | 1.7 | 0.3 | | 1.4 |
| **US-70 at State Park Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | | n/a[1] | n/a[1] | B | n/a[1] | | C | | | | | | A |
| | | Delay | | n/a[1] | n/a[1] | 12.9 | n/a[1] | | 15.2 | | | | | | 0.7 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 1.5 | 1.4 | 1.5 | 0.2 | | 7.3 | | 2.2 | | | | 1.4 |
| PM | HCM | LOS | | n/a[1] | n/a[1] | B | n/a[1] | | F | | | | | | B |
| | | Delay | | n/a[1] | n/a[1] | 14.0 | n/a[1] | | 113.7 | | | | | | 11.4 |
| | SimTraffic | LOS | | A | A | A | A | | A | | A | | | | A |
| | | Delay | | 0.0 | 2.6 | 4.3 | 0.0 | | 0.4 | | 0.2 | | | | 1.4 |
| **US-70 at Willow Springs Road/Johnson Creek Road** | | | | | | | | | | | | | | | |
| AM | HCM | LOS | B | n/a[1] | | B | n/a[1] | | E | | | D | | | A |
| | | Delay | 10.9 | n/a[1] | | 12.7 | n/a[1] | | 44.7 | | | 27.8 | | | 2.1 |
| | SimTraffic | LOS | n/a[1] | A | A | A | A | A | A | A | A | n/a[1] | A | A | A |
| | | Delay | n/a[1] | 0.8 | 0.1 | 2.4 | 1.2 | 0.5 | 6.5 | 9.5 | 3.7 | n/a[1] | 5.4 | 3.2 | 1.2 |
| PM | HCM | LOS | B | n/a[1] | | B | n/a[1] | | F | | | E | | | A |
| | | Delay | 13.8 | n/a[1] | | 12.3 | n/a[1] | | 180.2 | | | 39.8 | | | 4.4 |
| | SimTraffic | LOS | n/a[1] | A | A | A | A | A | A | A | A | n/a[1] | A | A | A |
| | | Delay | n/a[1] | 0.4 | 2.6 | 4.3 | 0.4 | 0.4 | 4.8 | 0.0 | 2.9 | n/a[1] | 0.0 | 2.9 | 2.9 |

[1] free movement

# HCS7 Multilane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, AM | Units | U.S. Customary |

## Direction 1 Geometric Data

| | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 1 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 1 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 410 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 266 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.13 |

## Direction 1 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 5.0 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 1 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 244 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.56 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

| Direction 2 Geometric Data | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

| Direction 2 Adjustment Factors | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

| Direction 2 Demand and Capacity | | | |
|---|---|---|---|
| Volume(V) veh/h | 270 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 176 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.09 |

| Direction 2 Speed and Density | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 3.3 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

| Direction 2 Bicycle LOS | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 244 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.56 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

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# HCS7 Multilane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2021 |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, PM | Units | U.S. Customary |

## Direction 1 Geometric Data

| | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 1 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 1 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 310 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 192 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.10 |

## Direction 1 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 3.6 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 1 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 176 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.40 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | D |

| Direction 2 Geometric Data | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

| Direction 2 Adjustment Factors | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

| Direction 2 Demand and Capacity | | | |
|---|---|---|---|
| Volume(V) veh/h | 425 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 264 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.13 |

| Direction 2 Speed and Density | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 4.9 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

| Direction 2 Bicycle LOS | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 176 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.40 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | D |

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# HCS7 Multilane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, AM | Units | U.S. Customary |

## Direction 1 Geometric Data

| | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 1 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 1 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 590 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 383 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.19 |

## Direction 1 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 7.1 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 1 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 351 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.75 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

## Direction 2 Geometric Data

| | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 2 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 2 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 390 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 253 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.13 |

## Direction 2 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 4.7 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 2 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 351 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.75 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

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# HCS7 Multilane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2050 |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, PM | Units | U.S. Customary |

## Direction 1 Geometric Data

| | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 1 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 1 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 445 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 276 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.14 |

## Direction 1 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 5.1 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 1 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 253 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.58 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

| Direction 2 Geometric Data | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

| Direction 2 Adjustment Factors | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

| Direction 2 Demand and Capacity | | | |
|---|---|---|---|
| Volume(V) veh/h | 615 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 381 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.19 |

| Direction 2 Speed and Density | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 7.1 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

| Direction 2 Bicycle LOS | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 253 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 4.58 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

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# HCS7 Multilane Highway Report

| Project Information | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, AM | Units | U.S. Customary |

| Direction 1 Geometric Data | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

| Direction 1 Adjustment Factors | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

| Direction 1 Demand and Capacity | | | |
|---|---|---|---|
| Volume(V) veh/h | 1115 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 724 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.36 |

| Direction 1 Speed and Density | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 13.5 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | B |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

| Direction 1 Bicycle LOS | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 664 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 5.07 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

## Direction 2 Geometric Data

| | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 2 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 2 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 900 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.84 | Flow Rate ($V_p$), pc/h/ln | 584 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.29 |

## Direction 2 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 10.9 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | A |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 2 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 664 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 5.07 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

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# HCS7 Multilane Highway Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/19/2021 |
| Agency | | Analysis Year | 2050 with Development |
| Jurisdiction | | Time Analyzed | |
| Project Description | Build, PM | Units | U.S. Customary |

## Direction 1 Geometric Data

| | | | |
|---|---|---|---|
| Direction 1 | EB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 1 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 1 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 1110 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 688 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.34 |

## Direction 1 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 12.8 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | B |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 1 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 631 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 5.05 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

## Direction 2 Geometric Data

| | | | |
|---|---|---|---|
| Direction 2 | WB | | |
| Number of Lanes (N), ln | 2 | Terrain Type | Level |
| Segment Length (L), ft | - | Percent Grade, % | - |
| Measured or Base Free-Flow Speed | Base | Grade Length, mi | - |
| Base Free-Flow Speed (BFFS), mi/h | 55.0 | Access Point Density, pts/mi | 0.0 |
| Lane Width, ft | 12 | Left-Side Lateral Clearance ($LC_R$), ft | 6 |
| Median Type | Divided | Total Lateral Clearance (TLC), ft | 12 |
| Free-Flow Speed (FFS), mi/h | 55.0 | | |

## Direction 2 Adjustment Factors

| | | | |
|---|---|---|---|
| Driver Population | Mostly Familiar | Final Speed Adjustment Factor (SAF) | 0.975 |
| Driver Population SAF | 0.975 | Final Capacity Adjustment Factor (CAF) | 0.968 |
| Driver Population CAF | 0.968 | | |

## Direction 2 Demand and Capacity

| | | | |
|---|---|---|---|
| Volume(V) veh/h | 1390 | Heavy Vehicle Adjustment Factor ($f_{HV}$) | 0.917 |
| Peak Hour Factor | 0.88 | Flow Rate ($V_p$), pc/h/ln | 862 |
| Total Trucks, % | 9.00 | Capacity (c), pc/h/ln | 2072 |
| Single-Unit Trucks (SUT), % | - | Adjusted Capacity ($c_{adj}$), pc/h/ln | 2006 |
| Tractor-Trailers (TT), % | - | Volume-to-Capacity Ratio (v/c) | 0.43 |

## Direction 2 Speed and Density

| | | | |
|---|---|---|---|
| Lane Width Adjustment ($f_{LW}$) | 0.0 | Average Speed (S), mi/h | 53.6 |
| Total Lateral Clearance Adj. ($f_{LLC}$) | 0.0 | Density (D ), pc/mi/ln | 16.1 |
| Median Type Adjustment ($f_M$) | 0.0 | Level of Service (LOS) | B |
| Access Point Density Adjustment ($f_A$) | 0.0 | | |

## Direction 2 Bicycle LOS

| | | | |
|---|---|---|---|
| Flow Rate in Outside Lane ($v_{OL}$),veh/h | 631 | Effective Speed Factor ($S_t$) | 4.62 |
| Effective Width of Volume ($W_v$), ft | 18 | Bicyle LOS Score (BLOS) | 5.05 |
| Average Effective Width ($W_e$), ft | 24 | Bicycle Level of Service (LOS) | E |

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# Appendix F – Bridge Cross-Section Safety Analysis Results

# Highway Safety Software Rural Two Lane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 1 | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Grade (%) | 0.0 |
| Shoulder Type | Paved | Shoulder Width (ft) | 0 |
| Driveway Density (driveway/mi) | 0 | Roadside Hazard Rating | 6 |
| Centerline Rumble Strips | No | Passing Lanes | No Passing or Climbing Lanes |
| Two-Way Left Turn Lane | No | Segment Lighting | Yes |
| Automated Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Centerline Rumble Strips - CMF7 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.287 | Passing Lanes - CMF8 | 1.000 |
| Horizontal Curve - CMF3 | 1.000 | Two-Way Left Turn Lane - CMF9 | 1.000 |
| Superelevation - CMF4 | 1.000 | Roadside Design - CMF10 | 1.222 |
| Grade - CMF5 | 1.000 | Lighting - CMF11 | 0.922 |
| Driveway Density - CMF6 | 1.000 | Auto Speed Enforcement - CMF12 | 1.000 |
| Combined CMF | 1.449 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 0.729 | 1.056 | 1.056 |
| Property Damage Only (PDO) | - | 1.542 | 2.235 | 2.235 |
| Total | 0.236 | 2.271 | 3.291 | 3.291 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.056 | $167,130.12 |
| Property Damage Only (PDO) | $7,400.00 | 2.235 | $16,536.54 |
| Total | - | 3.291 | $183,666.66 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 2 | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Roadway Type | Undivided |
| Right Shoulder Width/Type (ft) | 10/Paved | Sideslopes | 1 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 0.965 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | - | | |
| Combined CMF | 1.139 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.630 | 1.855 | 1.855 |
| Property Damage Only (PDO) | - | 1.054 | 1.200 | 1.200 |
| Total | 0.187 | 2.684 | 3.056 | 3.056 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.855 | $293,524.27 |
| Property Damage Only (PDO) | $7,400.00 | 1.200 | $8,882.51 |
| Total | - | 3.056 | $302,406.79 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 3A | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 1.040 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 0.844 | 0.878 | 0.878 |
| Property Damage Only (PDO) | - | 0.750 | 0.779 | 0.779 |
| Total | 0.212 | 1.594 | 1.658 | 1.658 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 0.878 | $138,919.37 |
| Property Damage Only (PDO) | $7,400.00 | 0.779 | $5,768.29 |
| Total | - | 1.658 | $144,687.67 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 3B | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 1.000 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 0.844 | 0.844 | 0.844 |
| Property Damage Only (PDO) | - | 0.750 | 0.750 | 0.750 |
| Total | 0.212 | 1.594 | 1.594 | 1.594 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 0.844 | $133,576.32 |
| Property Damage Only (PDO) | $7,400.00 | 0.750 | $5,546.44 |
| Total | - | 1.594 | $139,122.76 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 4A | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 0.949 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 0.844 | 0.801 | 0.801 |
| Property Damage Only (PDO) | - | 0.750 | 0.711 | 0.711 |
| Total | 0.212 | 1.594 | 1.512 | 1.512 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 0.801 | $126,756.18 |
| Property Damage Only (PDO) | $7,400.00 | 0.711 | $5,263.25 |
| Total | - | 1.512 | $132,019.43 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2021 |
| Project Description | Roosevelt Bridge - Scenario 4B | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 8500 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 0.912 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 0.844 | 0.770 | 0.770 |
| Property Damage Only (PDO) | - | 0.750 | 0.684 | 0.684 |
| Total | 0.212 | 1.594 | 1.454 | 1.454 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 0.770 | $121,880.94 |
| Property Damage Only (PDO) | $7,400.00 | 0.684 | $5,060.81 |
| Total | - | 1.454 | $126,941.76 |

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# Highway Safety Software Rural Two Lane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 1 | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Grade (%) | 0.0 |
| Shoulder Type | Paved | Shoulder Width (ft) | 0 |
| Driveway Density (driveway/mi) | 0 | Roadside Hazard Rating | 6 |
| Centerline Rumble Strips | No | Passing Lanes | No Passing or Climbing Lanes |
| Two-Way Left Turn Lane | No | Segment Lighting | Yes |
| Automated Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Centerline Rumble Strips - CMF7 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.287 | Passing Lanes - CMF8 | 1.000 |
| Horizontal Curve - CMF3 | 1.000 | Two-Way Left Turn Lane - CMF9 | 1.000 |
| Superelevation - CMF4 | 1.000 | Roadside Design - CMF10 | 1.222 |
| Grade - CMF5 | 1.000 | Lighting - CMF11 | 0.922 |
| Driveway Density - CMF6 | 1.000 | Auto Speed Enforcement - CMF12 | 1.000 |
| Combined CMF | 1.449 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.046 | 1.516 | 1.516 |
| Property Damage Only (PDO) | - | 2.213 | 3.207 | 3.208 |
| Total | 0.236 | 3.260 | 4.724 | 4.724 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.516 | $239,880.87 |
| Property Damage Only (PDO) | $7,400.00 | 3.207 | $23,734.80 |
| Total | - | 4.724 | $263,615.67 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 2 | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Roadway Type | Undivided |
| Right Shoulder Width/Type (ft) | 10/Paved | Sideslopes | 1 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 0.965 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | - | | |
| Combined CMF | 1.139 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 2.420 | 2.755 | 2.755 |
| Property Damage Only (PDO) | - | 1.685 | 1.919 | 1.919 |
| Total | 0.187 | 4.105 | 4.674 | 4.674 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 2.755 | $435,850.32 |
| Property Damage Only (PDO) | $7,400.00 | 1.919 | $14,199.38 |
| Total | - | 4.674 | $450,049.70 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 3A | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 1.040 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.194 | 1.241 | 1.241 |
| Property Damage Only (PDO) | - | 1.135 | 1.180 | 1.180 |
| Total | 0.212 | 2.329 | 2.422 | 2.422 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.241 | $196,386.76 |
| Property Damage Only (PDO) | $7,400.00 | 1.180 | $8,734.21 |
| Total | - | 2.422 | $205,120.97 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 3B | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 1.000 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.194 | 1.194 | 1.194 |
| Property Damage Only (PDO) | - | 1.135 | 1.135 | 1.135 |
| Total | 0.212 | 2.329 | 2.329 | 2.329 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.194 | $188,833.42 |
| Property Damage Only (PDO) | $7,400.00 | 1.135 | $8,398.28 |
| Total | - | 2.329 | $197,231.70 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 4A | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 0.949 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.194 | 1.133 | 1.133 |
| Property Damage Only (PDO) | - | 1.135 | 1.077 | 1.077 |
| Total | 0.212 | 2.329 | 2.210 | 2.210 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.133 | $179,191.96 |
| Property Damage Only (PDO) | $7,400.00 | 1.077 | $7,969.48 |
| Total | - | 2.210 | $187,161.44 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 4B | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 12200 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 0.912 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 1.194 | 1.089 | 1.089 |
| Property Damage Only (PDO) | - | 1.135 | 1.036 | 1.036 |
| Total | 0.212 | 2.329 | 2.125 | 2.125 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 1.089 | $172,299.96 |
| Property Damage Only (PDO) | $7,400.00 | 1.036 | $7,662.96 |
| Total | - | 2.125 | $179,962.93 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 2 (w/ Dev) | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 27300 |
| Lane Width (ft) | 12.0 | Roadway Type | Undivided |
| Right Shoulder Width/Type (ft) | 10/Paved | Sideslopes | 1 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 0.965 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | - | | |
| Combined CMF | 1.139 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 5.841 | 6.650 | 6.650 |
| Property Damage Only (PDO) | - | 4.744 | 5.402 | 5.402 |
| Total | 0.187 | 10.585 | 12.052 | 12.052 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 6.650 | $1,052,014.33 |
| Property Damage Only (PDO) | $7,400.00 | 5.402 | $39,973.03 |
| Total | - | 12.052 | $1,091,987.36 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 3A (w/ Dev) | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 27300 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 1.040 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 2.582 | 2.685 | 2.685 |
| Property Damage Only (PDO) | - | 2.838 | 2.952 | 2.952 |
| Total | 0.212 | 5.420 | 5.637 | 5.637 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 2.685 | $424,837.94 |
| Property Damage Only (PDO) | $7,400.00 | 2.952 | $21,842.66 |
| Total | - | 5.637 | $446,680.60 |

# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 3B (w/ Dev) | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 27300 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 1.000 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 1.000 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 2.582 | 2.582 | 2.582 |
| Property Damage Only (PDO) | - | 2.838 | 2.838 | 2.838 |
| Total | 0.212 | 5.420 | 5.420 | 5.420 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 2.582 | $408,498.02 |
| Property Damage Only (PDO) | $7,400.00 | 2.838 | $21,002.55 |
| Total | - | 5.420 | $429,500.58 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 4A (w/ Dev) | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 27300 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.040 | | |
| Combined CMF | 0.949 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 2.582 | 2.450 | 2.450 |
| Property Damage Only (PDO) | - | 2.838 | 2.693 | 2.693 |
| Total | 0.212 | 5.420 | 5.144 | 5.144 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 2.450 | $387,640.93 |
| Property Damage Only (PDO) | $7,400.00 | 2.693 | $19,930.20 |
| Total | - | 5.144 | $407,571.13 |

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# Highway Safety Software Rural Multilane Segment Report

## Project Information

| | | | |
|---|---|---|---|
| Analyst | Garver | Date | 9/8/2021 |
| Jurisdiction | | Analysis Year | 2050 |
| Project Description | Roosevelt Bridge - Scenario 4B (w/ Dev) | | |

## Input Data

| | | | |
|---|---|---|---|
| Length of Segment (mi) | 1.000 | AADT (veh/day) | 27300 |
| Lane Width (ft) | 12.0 | Roadway Type | Divided |
| Right Shoulder Width (ft) | 6 | Median Width (ft) | 12 |
| Auto Speed Enforcement | No | Calibration Factor | 1.00 |

## Crash Modification Factors

| | | | |
|---|---|---|---|
| Lane Width - CMF1 | 1.000 | Lighting - CMF4 | 0.912 |
| Shoulder Type/Width - CMF2 | 1.000 | Automated Speed Enforcement - CMF5 | 1.000 |
| Median Width - CMF3 | 1.000 | | |
| Combined CMF | 0.912 | | |

## Predicted Roadway Section Crashes

| Crash Severity | Overdispersion Parameter | $N_{spf,rs}$ by Severity | Predicted Crash Frequency | Crash Rate (crashes/mi/year) |
|---|---|---|---|---|
| Fatal and Injury (FI) | - | 2.582 | 2.356 | 2.356 |
| Property Damage Only (PDO) | - | 2.838 | 2.590 | 2.590 |
| Total | 0.212 | 5.420 | 4.946 | 4.946 |

## Economic Analysis (Predicted Crashes)

| Crash Severity | Per Crash Societal Crash Cost | Predicted Annual Crashes | Total Societal Crash Cost |
|---|---|---|---|
| Fatal and Injury (FI) | $158,200.00 | 2.356 | $372,731.66 |
| Property Damage Only (PDO) | $7,400.00 | 2.590 | $19,163.66 |
| Total | - | 4.946 | $391,895.32 |

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