*Right Sizing Study*

# DAYTON BOULEVARD

## SIGNAL MOUNTAIN ROAD
## TO GADD ROAD
## RED BANK, TENNESSEE

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# NOTICE

This document and its contents have been prepared and are intended solely as information for the City of Red Bank and their use in relation to proposed roadway improvements along Dayton Boulevard.

## Document History

| Revision | Purpose | Originated | Reviewed | Authorized | Date |
|---|---|---|---|---|---|
| *1.0* | Draft Report | MM | JDM | GCD | 1/17/2025 |
| *2.0* | Final Report | JDM | JB | GCD | 3/7/2025 |

## Project Information

| | |
|---|---|
| ***Client*** | **City of Red Bank** |
| *Project* | Dayton Boulevard Right Sizing Study |
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| *Project Funding* | State of Tennessee Department of Health Grant |

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# 1. INTRODUCTION

The City of Red Bank is interested in the roadway reconfiguration of Dayton Boulevard, from Signal Mountain Road to Gadd Road located in Red Bank, Tennessee. This report will assess the feasibility of a right sizing analysis along the corridor as well as what, if any, geometric improvements are needed to best facilitate vehicle, pedestrian, and bicycle users.

The Tennessee Department of Transportation (TDOT) *Road Diet Guidance Manual* was utilized to determine the road diet criteria of the study corridor. Crash data was gathered and analyzed to determine safety concerns on the corridor. Traffic counts were collected, and an analysis was prepared to evaluate different roadway geometries. The findings of these analyses are provided in the recommendations along Dayton Boulevard to improve overall safety for all modes along the corridor.

# 2. EXISTING CONDITIONS

## 2.1. Existing Roadway Inventory

***Dayton Boulevard***, between Signal Mountain Road and Gadd Road, is approximately 5 miles and primarily operates as a 5-lane roadway with a two-way center turn lane (TWLTL) along the roadway. Dayton Boulevard is classified as an urban minor arterial road according to the City of Red Bank's Mobility Plan and an urban minor collector according to TDOT's functional roadway classification with an Annual Average Daily Traffic (AADT) volume of 10,360 (2023). The corridor currently operates to serve a variety of commercial and residential neighborhoods adjacent to the roadway and operates as the City of Red Bank's main thoroughfare. Exit ramps from US Highway 27 merges into Dayton Boulevard near the Signal Mountain Road intersection. The posted speed limit along Dayton Boulevard is 40 mph through the study area.

Dayton Boulevard, between Signal Mountain Road and Gadd Road, has 12-foot travel lanes with 12-foot left turn lanes at Signal Mountain Road, Hedgewood Drive, Memorial Drive, Martin Road, Newberry Street, Leawood Avenue, Morrison Springs Road, Ashland Terrace, and Browntown Road. Existing 2-foot shoulder and curb and gutter span along both sides of Dayton Boulevard. Sidewalks are present continuously along the west side of Dayton Boulevard from Signal Mountain Road to Memorial Drive and resume on the west side of Dayton Boulevard from Newberry Street to Wickley Road. Sidewalks are present along the east side of the roadway from Memorial Drive to Newburry Street and resume on the east side of Dayton Boulevard from Greenleaf Street to Browntown Road. Streetlighting is present along both sides of Dayton Boulevard through the study area.

### *Intersection Inventory*

***Dayton Boulevard at Signal Mountain Road / Spring Road*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard consists of one left turn lane with approximately 150 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The southbound approach of Dayton Boulevard consists of one left turn lane with approximately 100 feet of storage and permissive-only signal phasing, two through lanes, and a channelized, free-flow right turn lane with a turning radius of approximately 100 feet and no storage. The eastbound approach of Signal Mountain Road consists of two left turn lanes with full storage and a channelized, yield controlled right turn lane with a turning radius of approximately 250 feet and no storage. The westbound approach of Spring Road is offset from Signal Mountain Road by approximately 85 feet and includes a shared left / through / right turn lane. The eastbound and westbound approaches operate in split signal phasing. No pedestrian infrastructure is present at the intersection.

***Dayton Boulevard at Hedgewood Drive / Commercial Driveway*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard consists of a center turn lane that operates as a left turn lane with protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The southbound approach of Dayton Boulevard consists of one left turn lane with approximately 75 feet of storage and operates with protective / permissive signal phasing, a through lane, and a shared through / right turn lane. The eastbound approach of Hedgewood Drive includes a shared left / through / right turn lane. Similarly, the westbound approach of the commercial driveway includes a shared left / through / right turn lane. The eastbound and westbound approaches operate in split signal phasing. Sidewalk and pedestrian curb ramps are present in the northwest, southwest, and southeast corners of the intersection. A marked crosswalk is present along the south leg of Dayton Boulevard with pedestrian signal heads and pushbuttons included.

***Dayton Boulevard at Memorial Drive / Commercial Driveway*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard includes a center turn lane that operates as a left turn lane with protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The southbound approach of Dayton Boulevard includes a left turn lane with approximately 120 feet of storage and operates in protected / permissive phasing, a through lane, and a shared through / right turn lane. The eastbound approach of the commercial driveway includes a left turn lane with full storage and a shared through / right turn lane. The westbound approach of Memorial Drive includes a left turn lane with approximately 100 feet of storage and a shared left / through / right turn lane. The eastbound and westbound approaches operate in split signal phasing. Sidewalk and pedestrian curb ramps are included in the northeast, northwest, and southwest corners of the intersection. A marked crosswalk is provided across the south leg of Dayton Boulevard, but does not provide a clear, straight path for the pedestrian. The crosswalk runs at approximately a 45-degree angle from the north edge of the left turn lane to the west side of the road. The crosswalk includes pedestrian signal heads and pushbuttons.

***Dayton Boulevard at Martin Road*** is an existing 3-legged signalized intersection. The northbound approach of Dayton Boulevard includes a left turn lane with approximately 260 feet of storage and protected / permissive signal phasing and two through lanes. The southbound approach of Dayton Boulevard includes a through lane and a shared through / right turn lane. The eastbound approach of Martin Road includes a shared left / right turn lane. Sidewalk and curb ramps are present at the northeast and northwest corners of the intersection. A marked crosswalk is present across the western leg of Martin Road and includes pedestrian signal heads and pushbuttons.

***Dayton Boulevard at Newberry Street*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard consists of one left turn lane with approximately 200 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. Similarly, the southbound approach of Dayton Boulevard consists of one left turn lane with approximately 200 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The eastbound approach of Newberry Street includes a shared left / through / right turn lane. The westbound approach of Newberry Street includes a shared left / through / right turn lane and is offset from the eastbound approach by approximately 50 feet to the north. The eastbound and westbound approaches operate in split signal phasing. Pedestrian curb ramps and sidewalk is included at the northeast, northwest, and southwest corners of the intersection. A marked crosswalk is present across the northern leg of Dayton Boulevard with pedestrian signal heads and pushbuttons. Pedestrian signal heads and pushbuttons are also present across the western leg of Newberry Street, but no marked crosswalk is included.

***Dayton Boulevard at Leawood Avenue*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard includes one left turn lane with approximately 75 feet of storage and permissive only signal phasing, one through lane, and one shared through / right turn lane. Similarly, the southbound approach of Dayton Boulevard includes one left turn lane with approximately 65 feet of storage and permissive only signal phasing, one through lane, and one shared through / right turn lane. The eastbound approach of West Leawood Avenue includes a left turn lane with approximately 50 feet of storage and a shared through / right turn lane. The westbound approach of East Leawood Avenue includes a shared left / through / right turn lane and is offset from the eastbound approach by approximately 30 feet to the south. The eastbound and westbound approaches operate in split signal phasing. Marked crosswalks are present across the north and south legs of Dayton Boulevard and across the eastern leg of East Leawood Avenue, but the eastern crosswalk is almost not visible due to wearing. Sidewalk, pedestrian curb ramps, signal heads, and pushbuttons are included at each corner of the intersection.

***Dayton Boulevard at Morrison Springs Road*** is an existing 3-legged signalized intersection. The northbound approach of Dayton Boulevard includes a left turn lane with approximately 60 feet of storage and protected / permissive signal phasing, two through lanes, and on-street parking. The southbound approach of Dayton Boulevard includes two through lanes and a channelized free flow right turn lane with a turning radius of approximately 100 feet and approximately 210 feet of storage. The eastbound approach of Morrison Springs Road includes a left turn lane with approximately 250 feet of storage, a left turn lane with full storage, and a right turn lane with full storage. Marked crosswalks are present across the southern leg of Dayton Boulevard and western leg of Morrison Springs Road. Sidewalk is present along all approaches of the intersection. Pedestrian curb ramps, signal heads, and pushbuttons are included in the northwest, southwest, and southeast corners of the intersection.

***Dayton Boulevard at Ashland Terrace / Commercial Driveway*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard includes a center turn lane that operates left turn lane with permissive only signal phasing, two through lanes, and a signalized right turn lane with approximately 500 feet of storage and right turn overlap signal phasing. The southbound approach of Dayton Boulevard includes a left turn lane with approximately 100 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The eastbound approach of the commercial driveway includes a left turn lane with full storage and a shared through / right turn lane. The westbound approach of Ashland Terrace includes a left turn lane with approximately 310 feet of storage, a shared left / through lane with full storage, and a right turn lane with full storage. The eastbound and westbound approaches operate in split signal phasing. A marked crosswalk is provided across the northern leg of Dayton Boulevard. Sidewalk and pedestrian curb ramps are present in all corners of the intersection, but no pedestrian signal heads or pushbuttons are provided.

***Dayton Boulevard at Wickley Road / Browntown Road*** is an existing 4-legged signalized intersection. The northbound approach of Dayton Boulevard includes a left turn lane with approximately 150 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. Similarly, the southbound approach of Dayton Boulevard includes a left turn lane with approximately 75 feet of storage and protected / permissive signal phasing, a through lane, and a shared through / right turn lane. The eastbound approach of Browntown Road includes a left turn lane with approximately 50 feet of storage and a shared through / right turn lane. The westbound approach of Wickley Road includes a shared left / through / right turn lane. The eastbound and westbound approaches operate in split signal phasing. Sidewalk and a pedestrian curb ramp is provided in the southwest corner of the intersection but no other pedestrian infrastructure is present.

## 2.2. Background Projects

The projects detailed below are currently planned or are in the design phase in or adjacent to the study area. Those projects include:

- City of Red Bank Community Mobility Plan
  - Per the City of Red Bank's Community Mobility Plan, proposed sidewalk and pedestrian crossings are recommended at the intersection of Dayton Boulevard at Signal Mountain Road. Similarly, a pedestrian crossing is recommended across the eastbound approach of Newberry Street at Dayton Boulevard, with the addition of a pedestrian bridge parallel to Dayton Boulevard to connect sidewalk across Stringers Branch. The Plan also recommends installing sidewalk and pedestrian crossings across Lawton Street and Ashland Terrace as well as installing a pedestrian hybrid beacon (PHB) across Morrison Springs Road (west of Dayton Boulevard) to allow pedestrians more access to the existing Food City grocery store. Additional sidewalk and pedestrian crossings are outlined as recommendations along Dayton Boulevard from Browntown Road / Wickley Road to Gadd Road at the City Limits.
- 'Connecting Chattanooga Neighborhoods by Rail-Trail' Study
  - The City's Rail Trail Study notes the existing Norfolk Southern railroad corridor parallel to Dayton Boulevard could serve as a priority corridor for a rails to trails system, however no plans have been determined for this greenway.
- Northshore Greenway Feasibility Study
  - The City of Chattanooga's Northshore Greenway Feasibility Study gives reference to a right sizing study along Dayton Boulevard as a recommendation to utilize parts of Dayton Boulevard to establish connection points for the Northshore Greenway. The study lists Dayton Boulevard as a critical connection for citizens to access the growing commercial and residential corridor.
- Red Bank Plan: 2035
  - The City of Chattanooga's 2035 Plan notes citizen concerns for a desire to have safer ways to cross Dayton Boulevard as well as improved intersection infrastructure. This plan also details the desire to keep Dayton Boulevard a central business district within Red Bank and to strategically grow the corridor with desirable businesses that support the community's new and diverse goal for development.
  - The Plan also notes a goal to realign Ashland Terrace at Dayton Boulevard to better facilitate congestion through the Morrison Springs Road area. Additionally, installing pedestrian crosswalks at every intersection along Dayton Boulevard was recommended to better enhance pedestrian safety and right-of-way.
  - Another set of goals in the plan list bicycle lanes along Dayton Boulevard as well as enhanced streetscape and lighting along the corridor as ways to create a more welcoming connected environment for its citizens.
- Bicycle Boulevard
  - This TDOT Local Programs project is funded partially by Federal CMAQ dollars to provide a multi-use path for bicyclists and pedestrians along local neighborhood streets, parallel to Dayton Boulevard. This project is currently in the design phase.
- Dayton Boulevard Resurfacing
  - This project is planned to resurface Dayton Boulevard from Browntown Road to Gadd Road (TIP ID: 130155.00). This project is currently in the design phase.

- Tennessee Department of Transportation Resurfacing
    - This project is planned to resurface SR 8 from Frazier Avenue to Dayton Boulevard. This resurfacing project is scheduled for letting in 2025.
- Signal Mountain Intersection Restriping
    - The City of Red Bank plans to update the striping at the intersection of Dayton Boulevard and Signal Mountain Road in correlation with the TDOT resurfacing project mentioned above.

## 2.3. Road Diet Criteria

TDOT has developed the *Road Diet Guidance Manual* to assist local municipalities with criteria for evaluating alternating roadways within the existing right-of-way limits. These alterations could include road reconfiguration and/or road diets. Criteria for evaluation level of the study corridor is defined from 10-year traffic projections as well as existing and proposed laneage. The analysis level criteria is detailed below in Table 2.1.

**Table 2.1 – TDOT Road Diet Analysis Level Criteria**

| Analysis Level | Proposed Lanes | AADT* | Initial Screening | Capacity/LOS** Analysis | Traffic Study |
|---|---|---|---|---|---|
| *1* | to 3<br>to 5 | <12,000<br><18,000 | **Required** | **Optional** | **Optional** |
| *2* | to 3<br>to 5 | >12,000 – <20,000<br>>18,000 – <30,000 | **Required** | **Required** | **Optional** |
| *3* | to 3<br>to 5 | >20,000<br>>30,000 | **Required** | **Required** | **Required** |

*: Average Annual Daily Traffic
**: Level of Service

TDOT outlines the following process for forecasting 10-year AADT projections:

1. Access the TN-TIMES website and find the nearest count location to the project location. If there are multiple count stations along the project corridor, use the count station with the highest AADT. Document the recorded AADT for the previous 5 years.
2. Calculate the growth rate between the most current year and the fifth previous year using the following equation:

$$5\ Year\ Growth\ Rate = \frac{Current\ Year\ AADT - AADT\ from\ 5\ Years\ Prior}{AADT\ from\ 5\ Years\ Prior}$$

3. Multiply the Current Year AADT by 1 plus the Growth Rate calculated in Step 2 to get the 5-year traffic projection. If the Growth Rate calculated in Step 2 was negative, assume zero to be conservative instead of forecasting a lower AADT volume in the future.
4. Assume an annual growth rate of 1% for the last 5 years. Multiply the value from Step 3 by 1.05 to calculate the 10-year traffic projection.

Count station 33000511 along Dayton Boulevard is located south of Newberry Street within the proposed road diet limits and recorded an AADT of 13,418 vehicles per day (vph) and 14,249 vph for the years of 2019 and 2023, respectively. This count station was the most representative of the daily traffic along Dayton Boulevard and showed the most aggressive level of growth within the most recent 5-year period. The following equations detail the calculated historic growth rate and projected future AADT:

1. $6.2\%\ Growth\ Rate = \frac{14{,}249\ (2023\ AADT) - 13{,}418\ (2019\ AADT)}{13{,}418\ (2019\ AADT)}$

2. $15{,}133\ (2028\ AADT) = 14{,}249\ (2023\ AADT) * (1 + 0.062)$

3. $15{,}890\ (2033\ AADT) = 15{,}133\ (2028\ AADT) * (1 + 0.05)$

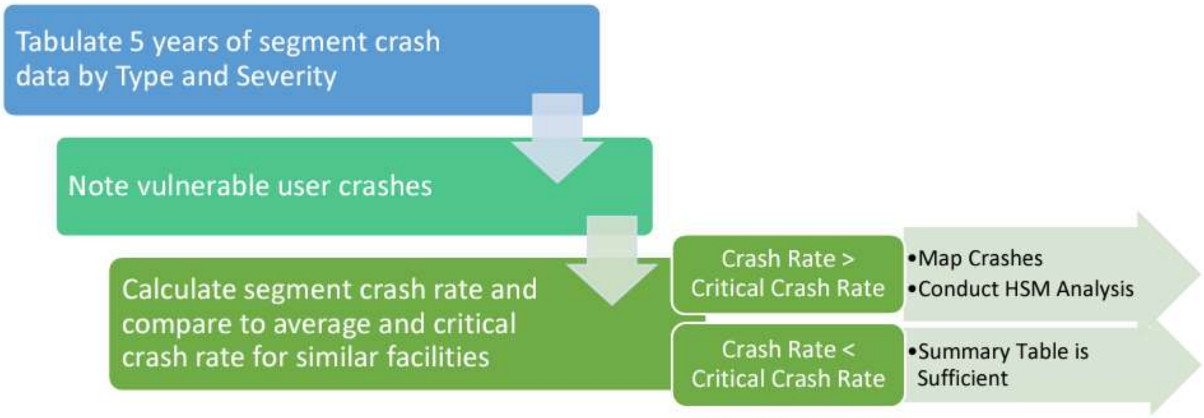
The calculated five-year growth rate of 6.2% was applied to the 2023 AADT for a projected 2028 AADT of 15,133. A five-year projected growth rate of 5% was then applied to the 2028 projected AADT for a 2033 projected AADT of 15,890. The 10-year projected AADT of Dayton Boulevard along with its proposed 3-lane section configuration results in a Level 2 analysis per TDOT's *Road Diet Guidance Manual*. Therefore, this study will incorporate a safety analysis, initial screening criteria, and capacity/LOS analysis for the proposed study area.

Tube count data can be found in detail in Appendix A.

## 2.4. Safety Analysis

Regardless of the study level determined by TDOT's *Road Diet Guidance Manual*, a safety analysis is a critical component for any road diet study. TDOT outlines the safety analysis process below in Figure 2.1.

**Figure 2.1 – Safety Analysis Flow Chart**




TDOT recommends the latest 5-year period of crash data to be obtained from the Enhanced Tennessee Roadway Information Management System (ETRIMS). Crash rate should then be calculated using either the crash rate by vehicle miles traveled or crash rate by segment length. The crash rate should then be compared to the critical crash rate provided by TDOT.

The crash per million vehicle miles traveled and crash rate per segment length can be calculated using Equation 1 and Equation 2, respectively. The segment exposure and critical crash rate can be calculated using Equation 3.

**Equation 1 – Segment Crash Rate per Million Vehicle Miles Traveled**

$$R = \frac{C * 1{,}000{,}000}{V * 365 * N * L}$$

Where R is the segment crash rate expressed in crashes per million vehicles miles traveled, C is the total number of crashes that have occurred within the study period, V is the segment AADT, N is the number of years within the study period, and L is the segment length expressed in miles.

**Equation 2 – Segment Crash Rate per Mile**

$$R = \frac{C}{N * L}$$

Where R is the segment crash rate expressed in crashes per mile, C is the total number of crashes that have occurred within the study period, N is the number of years within the study period, and L is the segment length expressed in miles.

**Equation 3 – Section Exposure**

$$E = \frac{V * L * N * 365}{1{,}000{,}000}$$

Where E is the section exposure, V is the segment AADT, L is the length of the segment expressed in miles, and N is the number of years within the study period.

The study corridor along Dayton Boulevard was analyzed for its segment crash rates per million vehicle miles traveled for the purposes of this report. Segments were divided between study intersections along the corridor and are as follows:

- Dayton Blvd (from Signal Mountain Road / Spring Road to Hedgewood Drive)
- Dayton Blvd (from Hedgewood Drive to Memorial Drive)
- Dayton Blvd (from Memorial Drive to Martin Road)
- Dayton Blvd (from Martin Road to Newberry Street)
- Dayton Blvd (from Newberry Street to Leawood Avenue)
- Dayton Blvd (Leawood Avenue to Morrison Springs Road)
- Dayton Blvd (from Morrison Springs Road to Ashland Terrace)
- Dayton Blvd (from Ashland Terrace to Wickley Road / Browntown Road)
- Dayton Blvd (from Wickley Road / Browntown Road to Gadd Road)

The crash rates along segments of the study corridor were compared to historical TDOT statewide average crash rates to similar 4-lane roadways with a two-way left-turn lane and urban minor arterial functional classification as well as the critical crash rate for each segment. The details of these crash rates comparison can be found in Table 2.2.

**Table 2.2 – Crash Rate Analysis – Dayton Boulevard**

| Roadway Segment | Crash Rate (per Million Vehicle Miles Traveled) | Statewide Average Crash Rate | Critical Crash Rate | Is Crash Rate > Critical Crash Rate? |
|---|---|---|---|---|
| *Dayton Blvd (from Signal Mountain Rd / Spring Rd to Hedgewood Dr)* | 9.406 | 3.633 | 5.590 | **YES** |
| *Dayton Blvd (from Hedgewood Dr to Memorial Dr)* | 3.163 | 3.633 | 4.492 | **NO** |
| *Dayton Blvd (from Memorial Dr to Martin Rd)* | 3.083 | 3.633 | 4.937 | **NO** |
| *Dayton Blvd (from Martin Rd to Newberry St)* | 1.033 | 3.633 | 4.574 | **NO** |
| *Dayton Blvd (from Newberry St to Leawood Ave)* | 2.268 | 3.633 | 4.642 | **NO** |
| *Dayton Blvd (Leawood Ave to Morrison Springs Rd)* | 3.296 | 3.633 | 5.623 | **NO** |
| *Dayton Blvd (from Morrison Springs Rd to Ashland Terrace)* | 20.359 | 3.633 | 5.856 | **YES** |
| *Dayton Blvd (from Ashland Terrace to Wickley Rd / Browntown Rd)* | 3.083 | 3.633 | 4.457 | **NO** |
| *Dayton Blvd (from Wickley Rd / Browntown Rd to Gadd Rd)* | 1.757 | 3.633 | 4.776 | **NO** |

Throughout the study corridor, two of the nine segments have crash rates that exceed the critical crash rate for that segment of roadway, Dayton Boulevard from Signal Mountain Road / Spring Road to Hedgewood Drive and Dayton Boulevard from Morrison Springs Road to Ashland Terrace. Crash modification factors were analyzed to determine what, if any, safety improvements could be anticipated along these segments from the installation of a road diet.

A summary table of the historic crashes along the entire corridor can be found in Table 2.3.

**Table 2.3 – Dayton Boulevard Total Crashes (August 30, 2019 – August 30, 2024)**

| Description | Number of Crashes | % of Crashes |
|---|---|---|
| *Fatal (K)* | 0 | 0% |
| *Serious Injury (A)* | 11 | 2% |
| *Minor Injury (B)* | 38 | 8% |
| *Possible Injury (C)* | 32 | 7% |
| *Property-Damage Only (O)* | 397 | 83% |
| *Pedestrian* | 2 | < 1% |
| *Pedalcycle* | 1 | < 1% |
| *Intersection* | 184 | 38% |
| *Segment* | 294 | 62% |
| *Daylight* | 310 | 65% |
| *Dark-Lighted* | 88 | 18% |
| *Dark-Not Lighted* | 8 | 2% |
| *Dawn* | 6 | 1% |
| *Dusk* | 5 | 1% |
| *Other/Unknown* | 61 | 13% |
| *Clear* | 309 | 64% |
| *Cloudy* | 70 | 15% |
| *Rain* | 32 | 7% |
| *Other/Unknown* | 67 | 14% |
| *Angle* | 155 | 32% |
| *Head-On* | 13 | 3% |
| *Rear-End* | 114 | 24% |
| *Side-Swipe* | 61 | 13% |
| *No Collision W/ Vehicle* | 59 | 12% |
| *Other/Unknown* | 76 | 16% |
| ***Total*** | **478** | **100%** |

Based on AASHTOWare Safety crash data (August 30, 2019 – August 30, 2024), a total of 478 crashes have occurred along Dayton Boulevard between Signal Mountain Road / Spring Road and Gadd Drive. Zero crashes resulted in a fatality, 11 crashes (2%) resulted in a suspected serious injury, and 70 crashes (15%) resulted in a minor or possible injury. One hundred and fifty-five crashes (32%) were angle crashes, either from vehicles striking each other in the study intersections or crossing the center line along the corridor. Fifty-nine collisions (12%) were single-vehicle crashes, two of which were the result of a vehicle striking a pedestrian and one with a vehicle striking a bicyclist.

Of all the crashes, 38% occurred at an intersection while 62% occurred along segments of Dayton Boulevard. 22% occurred during non-daylight conditions. Cloudy or rainy weather conditions accounted for 22% of the total crashes.

Crash reports for the collisions involving a suspected serious injury, pedestrian, or bicyclist were obtained from the TITAN database. Analysis of these crash reports revealed that one crash, which had coordinates along the study segment of Dayton Boulevard, had occurred along Highway 27; therefore, it was excluded from the crash analysis. Additionally, some of the crashes that were reported as suspected serious injury did not result in life-altering injuries but were still included in the analysis as the reported injury type.

AASHTOWare Safety crash data along the corridor can be found in Appendix A.

### *2.4.1. Crash Modification Factors (CMFs) Clearinghouse*

CMF Clearinghouse was utilized to determine what, if any, proven safety benefit exists with the installation of road diet features along the study corridor. The CMF Clearinghouse is composed of a comprehensive listing of available CMFs and includes all the CMFs included in the Highway Safety Manual (HSM). A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. A CMF reflects the safety effect of a countermeasure, whether it will result in a decrease in crashes (CMF below 1.0), increase in crashes (CMF over 1.0), or no change in crashes (CMF of 1.0). A countermeasure is a strategy intended to reduce crash frequency or severity on the road, and in the case of this study, the reduction of travel lanes from 5-lanes to 3-lanes along the roadway.

A CMF is graded on its star quality rating, which indicates the quality or confidence in the results of the study producing the CMF. The star rating is based on a scale (1 to 5), where a 5 indicates the highest or best rating. The review process to determine the star rating judges the accuracy and precision as well as the general applicability of the study results. Reviewers considered various factors for each study (depending on the study type used to develop the CMFs) — study design, sample size, statistical methodology, statistical significance, etc. — and judged each CMF according to its performance in the various factors (including multiple subcategories within each factor).

This study assessed CMFs from the Clearinghouse database to determine the safety impacts of a lane reduction along Dayton Boulevard's cross section, particularly with focus along the two segments of roadway that have crash rates that exceed the critical crash rates for the study corridor.

The National Association of City Transportation Officials (NACTO)'s report, *An Evaluation of "Road Diet" Projects on Five Lane and Larger Roadways,* cites multiple countermeasures that can be applied to a 5-lane road diet based on the geometric improvements of the project. These improvements include the slowing of overall traffic speeds along the corridor, the potential reduction of sideswipe incidents along the roadway, the installation of bicycle lanes, shortened pedestrian crossings, reduction in conflict points along the roadway, decreased side street crossing length along the main corridor, and improved sight distance for left turning vehicles along the roadway.

From these potential improvements, CMFs were quantified for the most appropriate countermeasures applied to this project. The results of the Clearinghouse data are summarized below in Table 5.

**Table 5 – Crash Modification Factors**

| CMF ID | Countermeasure | CMF Factor | CRF Factor | Star Quality Rating |
|---|---|---|---|---|
| **10737** | **Install Bicycle Lanes** | 0.435 | 0.565 | 4/5 |
| **9120** | **Median Treatment for Ped/Bike Safety** | 0.86 | 0.14 | 3/5 |
| **9024** | **Install Rectangular Rapid Flashing Beacon (RRFB)** | 0.526 | 0.474 | 3/5 |

As shown in Table 5, the installation of bicycle lanes along the roadway has shown to provide an estimated 56% reduction in crashes at 372 locations that were studied with this improvement. The installation of a median treatment for pedestrians that are proposed with this project has shown a 14% reduction of crashes at locations that were studied with this improvement. Similarly, sites that installed RRFBs along the roadway at mid-block crossings reflected a crash reduction of 47% with this improvement.

## 3.1. Road Diet Analysis

### *3.1.1. Road Diet Consideration*

Road diets refer to a redistribution of vehicle travel lanes that typically results in a reduction of through lanes and installation of a center Two-Way Left Turn Lane (TWLTL). The additional roadway space also can be used to provide facilities for other users such as bicyclists, transit, and pedestrians. They are often considered on 4-lane undivided roadways and 5-lane roadways to improve safety and mobility for all users.

As part of this study, a road diet was analyzed as a potential operational and safety improvement for pedestrians and bicyclists along the corridor. A road diet would redistribute the amount of space allocated to different road users, reducing the amount of space dedicated primarily to vehicles and providing more space to other modes of travel. In this case, the space would be reallocated to provide dedicated paths for pedestrians and bicyclists. The redistributed road space would not only provide more comfortable paths for vulnerable road users, but it would also reduce the number of vehicle lanes required to cross the roadway, eliminating some of the existing conflict points. The road diet considered for Dayton Boulevard would reduce the roadway's cross section from 5-lane with a center turn lane to a 3-lane cross section, with the center of those lanes operating as a TWLTL.

According to TDOT's *Road Diet Guidance Manual*, Dayton Boulevard falls under a Level 2 study threshold for analysis of road diet feasibility. This determination was made based on the roadway's existing AADT and roadway configuration. Furthermore, historical crash data indicates a below average crash rate and an A/C crash rate of less than 1 for the entire corridor, except for two segments that have an above average crash rate and an A/C crash rate greater than 1. Under a Level 2 threshold study, a capacity / LOS analysis is required of the study corridor.

In addition to TDOT's *Road Diet Guidance Manual*, Federal Highway Administration (FHWA) provides guidance for when to consider a road diet. According to FHWA's Road Diet Informational Guide, FHWA recommends good candidates for road diet corridors to have an AADT of 20,000 or less vehicles per day (vpd). A peak-hour volume of above 875 vehicles per hour per direction (vphpd) is regarded as less feasible for road diet criteria with expected reduced arterial LOS during the peak period. Additionally, Kentucky Transportation Center (KTC) Guidelines for Road Diet Conversions recommends road diets are feasible for corridors with AADT as high as 23,000 vpd. The City of Seattle, which assesses road diet candidates with AADT as high as 25,000 vpd, has determined their own criteria for feasibility. When determining feasibility for roadways with AADT greater than 16,000 vpd, a corridor is deemed feasible if analysis shows less than a 30% travel time increase and LOS change of less than 2+.

Dayton Boulevard was assessed encompassing the above criteria to determine if a road diet is feasible between Signal Mountain Road / Spring Road to Gadd Road. The projected 2033 AADT according to TDOT's Road Diet guidance criteria is anticipated to be 15,890 vpd, meeting the industry standard for acceptable AADT along the corridor for a lane reduction. The projected peak hour directional volumes stemming from the collected turning movement counts show a projected high of 1,126 vehicles per hour per direction (vphpd) (AM) and 1,295 vphpd (PM). Although this exceeds the FHWA general guidance for peak hour directional counts, these peak volumes only occur towards the southern end of the corridor close to Signal Mountain Road and do not necessarily correlate with the majority of Dayton Boulevard's traffic volumes. A capacity and LOS assessment was completed along the entire study corridor to determine the operational impacts of a potential road diet reconfiguration.

### 3.1.2. Capacity / LOS Analysis

According to TDOT's *Road Diet Guidance Manual*, Dayton Boulevard falls under a Level 2 study threshold for analysis of road diet feasibility which warrants a capacity / LOS analysis to be performed for the study corridor. The primary intent of the existing capacity / LOS analysis is to determine a baseline of how key intersections perform now and in the future without the road diet. This baseline analysis is then compared to how the key intersections will perform with fewer lanes now and in the future, assuming 10 years of traffic growth. All signalized intersections within the limits of the road diet should be analyzed, however, judgment is required in determining which unsignalized intersections need to be included in the capacity / LOS analysis. None of the unsignalized intersections showed high crash occurrences; therefore, engineering judgement concluded that none of the unsignalized intersections needed to be included in the analysis.

The guidelines for existing and proposed capacity / LOS analysis based on TDOT's *Road Diet Guidance Manual* are shown in Figure 3.1.

**Figure 3.1 – Capacity / LOS Analysis**

**Existing Year Existing Geometry Capacity/LOS Analysis**

- Use the existing lane configuration
- Collect or use recent intersection turning movement counts at key intersections
- Conduct peak hour capacity/LOS analysis at key intersections

**Future Year Existing Geometry Capacity/LOS Analysis**

- Use the existing lane configuration
- Project the turning movement volumes using growth rates established in Section 4.0
- Conduct peak hour capacity/LOS analysis at key intersections
- Optimize signal timing and phasing

**Existing Year Proposed Geometry Capacity/LOS Analysis**

- Use the proposed lane configuration
- Collect or use recent intersection turning movement counts at key intersections
- Assume no traffic diversion or mode shift
- Conduct peak hour capacity/LOS analysis at key intersections

**Future Year Proposed Geometry Capacity/LOS Analysis**

- Use the proposed lane configuration
- Project the turning movement volumes using growth rates established in Section 4.0
- Conduct peak hour capacity/LOS analysis at key intersections
- Optimize signal timing and phasing

Additionally, TDOT has established standards for acceptable traffic signal operations across different areas. In Urban and Urban Core areas, a traffic signal is considered acceptable if it maintains a Level of Service (LOS) up to F, with a volume-to-capacity (v/c) ratio of less than 1.0 and can accommodate queues. For Suburban and Rural areas, the requirements are more stringent, necessitating a LOS of E or better, a v/c ratio of less than 0.9, and the ability to accommodate queues.

## 3.2. Operational Analysis

### 3.2.1. Methodology

The *Highway Capacity Manual, 7th Edition* (HCM) outlines the methodology used for conducting operational analysis of the study intersections. The performance measures used in this methodology are based on the average delay, in seconds, experienced per vehicle at the intersection. Delay is further summarized in terms of Level of Service (LOS), a letter grade based on the calculated delay that ranges from A, the best, to F, the worst. The relationship between control delay and LOS for signalized and unsignalized intersections is summarized in Table 3.1.

**Table 3.1 – Level of Service Criteria**

| Level of Service | Description | Average Control Delay (seconds per vehicle) | |
|---|---|---|---|
| | | Signalized | Unsignalized |
| ***A*** | *Free flow* | ≤ 10 | ≤ 10 |
| ***B*** | *Stable flow, slight delay* | > 10 - 20 | > 10 - 15 |
| ***C*** | *Stable flow, acceptable delay* | > 20 - 35 | > 15 - 25 |
| ***D*** | *Near-unstable flow, tolerable delay* | > 35 - 55 | > 25 - 35 |
| ***E*** | *Unstable flow, intolerable delay* | > 55 - 80 | > 35 - 50 |
| ***F*** | *Forced flow, failure* | > 80 | > 50 |

*Source: Highway Capacity Manual (HCM 7th Edition)*

### 3.2.2. Background Projects

Separate from this study, TDOT and the City of Red Bank are working together to resurface and restripe a portion of Dayton Boulevard, from approximately just north of Spring Street to south of Signal Mountain Road where US 27 turns into Dayton Boulevard. These restriping plans include the conversion of some vehicle traffic lanes to establish buffered bicycle lanes through and south of the intersection of Signal Mountain Road. The proposed lane configuration at Dayton Boulevard at Signal Mountain Road consists of the following changes to the existing geometry:

- Conversion of southbound shared through/right turn lane along Dayton Boulevard to be right turn only lane operating under signal control
- Installation of buffered bicycle lanes along northbound and southbound approaches of Dayton Boulevard

Additionally, the City of Red Bank is working to resurface and restripe another portion of Dayton Boulevard from Browntown Road / Wickley Road to Gadd Road. The proposed lane configuration at Dayton Boulevard at Browntown Road / Wickley Road consists of the following changes to the existing geometry:

- Removal of northbound and southbound outside through lane along Dayton Boulevard
- With the removal of the southbound shared through/right turn lane along Dayton Boulevard, install right turn only lane with 75 feet of storage.

Both of the above referenced projects are completed through the design phase and are anticipated to complete construction before the proposed Road Diet project would be implemented. For purposes of this analysis, these background projects are incorporated into the No Build 2034, Build 2024, and Build 2034 scenarios.

### *3.2.3. Analysis Conditions*

The results of the Existing 2024, No Build 2034, Build 2024, and Build 2034 scenarios are summarized in Table 3.2 and Table 3.3 for the AM and PM peak hours, respectively. Full capacity analysis results are included in Appendix A.

*Existing 2024*

The existing roadway geometry and traffic control, along with the existing traffic counts, were used in the analysis. As shown in Table 3.2 and Table 3.3, all approaches operate at LOS D or better.

*No Build 2034*

The No Build 2034 analysis was conducted with the same roadway geometry as the Existing 2024 analysis. Due to the historic annual growth anticipated for the study area, some intersection approaches will experience an increase in delay. The LOS along the southbound approach of Dayton Boulevard at Signal Mountain Road increased during the PM peak hours to a LOS E. The eastbound approach of Ashland Terrace is anticipated to operate at LOS E during the PM peak hour. The remaining approaches operate at a LOS D or better within the study area. Queue lengths along the southbound approach of Dayton Boulevard at Signal Mountain Road / Spring Road experiences an increase during both peak hours.

*Build 2024*

The Build 2024 implements the road diet improvements and optimizes signal timings to the existing roadway network. Multiple approaches operate below a LOS D during both peak hours. The eastbound and westbound approaches of Dayton Boulevard at Signal Mountain Road / Spring Road, Hedgewood Drive, Memorial Drive, Newberry Street and Browntown Road / Wickley Road operate at an LOS E or LOS F during both peak hours. Additionally, the Eastbound approach of Dayton Boulevard at Ashland Terrace operates at an LOS E and LOS F during the AM and PM peak hours, respectively. Queue lengths along Dayton Boulevard increase at multiple locations.

*Build 2034*

The Build 2034 implements the same road diet improvements and signal timings adjustments added to the Build 2024 network. Minor changes are observed to the delay in both peak hours. All approaches operating below a LOS D in the Build 2024 scenario continue to do so here, with the addition of westbound approach of Dayton Boulevard at Ashland Terrace in both peak hours. Queue lengths remain relatively the same from observations made with the Build 2024 conditions.

**Table 3.2 – Capacity Analysis Results – AM Peak Hour**

| | | Existing 2024 | | | No Build 2034 | | | Build 2024 | | | Build 2034 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue |
| **AM Peak Hour** | | | | | | | | | | | | | |
| 1. Dayton Boulevard at Signal Mountain Road / Spring Road | Overall | 17.0 | B | --- | 25.2 | C | --- | 21.2 | C | --- | 23.3 | C | --- |
| | Eastbound | 27.3 | C | 171’ | 34.3 | C | 192’ | 70.0 | E | 226’ | 76.3 | E | 260’ |
| | Westbound | 37.4 | D | 15’ | 40.7 | D | 25’ | 81.7 | F | 19’ | 77.5 | E | 31’ |
| | Northbound | 8.9 | A | 135’ | 12.1 | B | 236’ | 11.7 | B | 183’ | 12.5 | B | 148’ |
| | Southbound | 19.1 | B | 297’ | 34.1 | C | 857’ | 12.5 | B | 961’ | 13.6 | B | 846’ |
| 2. Dayton Boulevard at Hedgewood Drive | Overall | 16.4 | B | --- | 16.9 | B | --- | 13.6 | B | --- | 11.4 | B | --- |
| | Eastbound | 31.6 | C | 64’ | 29.6 | C | 57’ | 71.0 | E | 96’ | 71.6 | E | 81’ |
| | Westbound | 40.6 | D | 0’ | 36.6 | D | 0’ | 63.1 | E | 0’ | 65.1 | E | 0’ |
| | Northbound | 12.6 | B | 156’ | 14.2 | B | 185’ | 1.6 | A | 399’ | 1.6 | A | 416’ |
| | Southbound | 16.8 | B | 301’ | 17.1 | B | 261’ | 14.2 | B | 1046’ | 11.2 | B | 894’ |
| 3. Dayton Boulevard at Memorial Drive | Overall | 19.4 | B | --- | 19.1 | B | --- | 17.3 | B | --- | 16.3 | B | --- |
| | Eastbound | 38.3 | D | 18’ | 38.1 | D | 17’ | 71.0 | E | 23’ | 71.3 | E | 23’ |
| | Westbound | 30.9 | C | 157’ | 31.8 | C | 147’ | 57.8 | E | 265’ | 58.4 | E | 217’ |
| | Northbound | 18.8 | B | 191’ | 19.4 | B | 200’ | 14.4 | B | 270’ | 13.4 | B | 273’ |
| | Southbound | 14.9 | B | 230’ | 14.0 | B | 201’ | 3.5 | A | 688’ | 3.4 | A | 623’ |
| 4. Dayton Boulevard at Martin Road | Overall | 6.1 | A | --- | 5.6 | A | --- | 7.6 | A | --- | 6.8 | A | --- |
| | Eastbound | 24.6 | C | 38’ | 24.4 | C | 33’ | 41.6 | D | 51’ | 39.9 | D | 44’ |
| | Northbound | 2.1 | A | 35’ | 2.0 | A | 36’ | 2.3 | A | 236’ | 2.3 | A | 224’ |
| | Southbound | 7.2 | A | 109’ | 7.0 | A | 103’ | 8.1 | A | 331’ | 7.7 | A | 327’ |
| 5. Dayton Boulevard at Newberry St | Overall | 17.4 | B | --- | 18.3 | B | --- | 26.3 | C | --- | 26.0 | C | --- |
| | Eastbound | 29.9 | C | 21’ | 30.0 | C | 29’ | 74.9 | E | 34’ | 74.1 | E | 42’ |
| | Westbound | 26.3 | C | 118’ | 27.1 | C | 203’ | 81.4 | F | 294’ | 77.6 | E | 274’ |
| | Northbound | 16.3 | B | 127’ | 17.6 | B | 173’ | 14.6 | B | 637’ | 15.1 | B | 666’ |
| | Southbound | 14.1 | B | 151’ | 14.5 | B | 171’ | 11.9 | B | 431’ | 11.8 | B | 482’ |
| 6. Dayton Boulevard at Leawood Ave | Overall | 5.6 | A | --- | 5.8 | A | --- | 4.3 | A | --- | 4.5 | A | --- |
| | Eastbound | 11.9 | B | 10’ | 11.8 | B | 12’ | 31.6 | C | 21’ | 31.4 | C | 25’ |
| | Westbound | 12.2 | B | 23’ | 12.1 | B | 20’ | 32.7 | C | 46’ | 32.5 | C | 41’ |
| | Northbound | 4.9 | A | 39’ | 5.2 | A | 42’ | 3.3 | A | 272’ | 3.6 | A | 291’ |
| | Southbound | 5.1 | A | 45’ | 5.3 | A | 48’ | 0.6 | A | 77’ | 0.7 | A | 80’ |
| 7. Dayton Boulevard at Morrison Springs Road | Overall | 27.2 | C | --- | 28.4 | C | --- | 33.9 | C | --- | 33.3 | C | --- |
| | Eastbound | 34.9 | C | 323’ | 36.9 | D | 369’ | 52.7 | D | 393’ | 50.7 | D | 427’ |
| | Northbound | 11.7 | B | 105’ | 11.9 | B | 117’ | 4.9 | A | 225’ | 5.8 | A | 295’ |
| | Southbound | 21.9 | C | 92’ | 22.1 | C | 101’ | 6.0 | A | 210’ | 8.3 | A | 234’ |

| | | Existing 2024 | | | No Build 2034 | | | Build 2024 | | | Build 2034 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue |
| **AM Peak Hour** | | | | | | | | | | | | | |
| **8. Dayton Boulevard at Ashland Terrace** | **Overall** | **25.9** | **C** | --- | **26.0** | **C** | --- | **27.7** | **C** | --- | **30.1** | **C** | --- |
| | Eastbound | 47.0 | D | 26' | 50.5 | D | 17' | **67.7** | **E** | **31'** | **67.3** | **E** | **20'** |
| | Westbound | 34.2 | C | 316' | 34.1 | C | 349' | **59.8** | **E** | 335' | **59.3** | **E** | **372'** |
| | Northbound | 26.6 | C | 162' | 27.3 | C | 232' | 9.9 | A | 489' | 14.5 | B | 540' |
| | Southbound | 16.5 | B | 254' | 16.3 | B | 265' | 22.8 | C | 790' | 24.7 | C | 839' |
| **9. Dayton Boulevard at Browntown Road / Wickley Road** | **Overall** | **11.9** | **B** | --- | **13.3** | **B** | --- | **14.2** | **B** | --- | **14.1** | **B** | --- |
| | Eastbound | 23.4 | C | 44' | 23.4 | C | 52' | **59.1** | **E** | **68'** | **59.2** | **E** | **67'** |
| | Westbound | 27.0 | C | 36' | 27.2 | C | 43' | **69.9** | **E** | **67'** | **69.9** | **E** | **66'** |
| | Northbound | 9.0 | A | 64' | 8.9 | A | 65' | 5.8 | A | 24' | 5.6 | A | 26' |
| | Southbound | 10.5 | B | 142' | 13.1 | B | 353' | 7.4 | A | 316' | 7.6 | A | 341' |

Table 3.3 – Capacity Analysis Results – PM Peak Hour

| | | Existing 2024 | | | No Build 2034 | | | Build 2024 | | | Build 2034 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue |
| **PM Peak Hour** | | | | | | | | | | | | | |
| **1. Dayton Boulevard at Signal Mountain Road / Spring Road** | **Overall** | **20.5** | **C** | --- | **45.1** | **D** | --- | **32.9** | **C** | --- | **42.1** | **D** | --- |
| | Eastbound | 33.6 | C | 210’ | 51.3 | D | 264’ | **78.2** | **E** | **289’** | **84.0** | **F** | 372’ |
| | Westbound | 36.2 | D | 17’ | 52.8 | D | 71’ | **76.4** | **E** | **70’** | **84.5** | **F** | **93’** |
| | Northbound | 14.6 | B | 503’ | 39.7 | D | 788’ | 25.5 | C | 512’ | 33.2 | C | 752’ |
| | Southbound | 28.3 | C | 251’ | **56.5** | **E** | **632’** | 26.3 | C | 642’ | 38.0 | D | 591’ |
| **2. Dayton Boulevard at Hedgewood Drive** | **Overall** | **18.4** | **B** | --- | **19.8** | **B** | --- | **10.3** | **B** | --- | **13.2** | **B** | --- |
| | Eastbound | 34.0 | C | 68’ | 36.9 | D | 74’ | **72.0** | **E** | **105’** | **71.4** | **E** | **112’** |
| | Westbound | 41.7 | D | 56’ | 44.5 | D | 58’ | **69.0** | **E** | **77’** | **67.7** | **E** | **80’** |
| | Northbound | 17.5 | B | 418’ | 18.9 | B | 474’ | 4.5 | A | 1279’ | 7.4 | A | 1537’ |
| | Southbound | 16.7 | B | 260’ | 18.0 | B | 315’ | 9.4 | A | 882’ | 12.7 | B | 951’ |
| **3. Dayton Boulevard at Memorial Drive** | **Overall** | **23.3** | **C** | --- | **25.9** | **C** | --- | **21.8** | **C** | --- | **24.9** | **C** | --- |
| | Eastbound | 41.3 | D | 49’ | 45.3 | D | 53’ | **74.5** | **E** | **60’** | **74.3** | **E** | **64’** |
| | Westbound | 37.3 | D | 201’ | 40.2 | D | 223’ | **58.2** | **E** | **226’** | **58.7** | **E** | **256’** |
| | Northbound | 22.8 | B | 426’ | 26.2 | C | 502’ | 19.3 | B | 987’ | 24.7 | C | 1181’ |
| | Southbound | 15.8 | B | 220’ | 16.9 | B | 252’ | 3.7 | A | 665’ | 5.2 | A | 498’ |
| **4. Dayton Boulevard at Martin Road** | **Overall** | **7.9** | **A** | --- | **5.3** | **A** | --- | **11.6** | **B** | --- | **7.0** | **A** | --- |
| | Eastbound | 24.4 | C | 88’ | 24.4 | C | 39’ | 34.9 | C | 107’ | 41.1 | D | 52’ |
| | Northbound | 3.9 | A | 103’ | 2.6 | A | 85’ | 6.7 | A | 465’ | 3.8 | A | 895’ |
| | Southbound | 9.1 | A | 123’ | 7.4 | A | 116’ | 12.1 | B | 369’ | 8.5 | A | 52’ |
| **5. Dayton Boulevard at Newberry St** | **Overall** | **23.0** | **C** | --- | **26.0** | **C** | --- | **33.2** | **C** | --- | **42.0** | **D** | --- |
| | Eastbound | 37.3 | D | 36’ | 41.8 | D | 34’ | **73.0** | **E** | **44’** | **73.5** | **E** | **41’** |
| | Westbound | 36.5 | D | 391’ | 45.8 | D | 476’ | **73.0** | **E** | **324’** | **82.2** | **F** | **436’** |
| | Northbound | 22.3 | C | 338’ | 24.4 | C | 387’ | 28.6 | D | 1277’ | 41.0 | D | 1387’ |
| | Southbound | 15.2 | B | 153’ | 16.1 | B | 172’ | 14.5 | B | 550’ | 17.7 | B | 348’ |
| **6. Dayton Boulevard at Leawood Ave** | **Overall** | **6.8** | **A** | --- | **6.9** | **A** | --- | **5.7** | **A** | --- | **5.9** | **A** | --- |
| | Eastbound | 12.4 | B | 19’ | 13.6 | B | 23’ | 30.8 | C | 28’ | 30.9 | C | 31’ |
| | Westbound | 13.0 | B | 38’ | 14.4 | B | 45’ | 32.8 | C | 55’ | 33.1 | C | 59’ |
| | Northbound | 6.5 | A | 78’ | 6.4 | A | 91’ | 5.1 | A | 833’ | 5.3 | A | 381’ |
| | Southbound | 6.1 | A | 53’ | 6.0 | A | 61’ | 1.0 | A | 100’ | 1.6 | A | 386’ |
| **7. Dayton Boulevard at Morrison Springs Road** | **Overall** | **27.0** | **C** | --- | **27.5** | **C** | --- | **28.2** | **C** | --- | **35.6** | **D** | --- |
| | Eastbound | 38.3 | D | 399’ | 38.8 | D | 419’ | 50.7 | D | 465’ | 50.7 | D | 495’ |
| | Northbound | 12.6 | B | 144’ | 13.1 | B | 150’ | 5.3 | A | 447’ | 6.3 | A | 338’ |
| | Southbound | 23.3 | C | 153’ | 24.2 | C | 170’ | 10.4 | B | 402’ | 48.7 | D | 544’ |

| | | Existing 2024 | | | No Build 2034 | | | Build 2024 | | | Build 2034 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue | Delay | LOS | Queue |
| **PM Peak Hour** | | | | | | | | | | | | | |
| **8. Dayton Boulevard at Ashland Terrace** | **Overall** | **30.6** | **C** | --- | **39.2** | **D** | --- | **31.5** | **C** | --- | **49.1** | **D** | --- |
| | Eastbound | 54.7 | D | 65’ | **61.4** | **E** | **71’** | **90.2** | **F** | **75’** | **95.3** | **F** | **81’** |
| | Westbound | 34.7 | C | 326’ | 35.8 | D | 368’ | **63.2** | **E** | 330’ | **62.4** | **E** | **373’** |
| | Northbound | 30.6 | C | 270’ | 46.4 | D | 444’ | 11.0 | B | 716’ | 43.0 | D | 862’ |
| | Southbound | 22.3 | C | 256’ | 25.7 | C | 290’ | 27.5 | C | 728’ | 39.4 | D | 874’ |
| **9. Dayton Boulevard at Browntown Road / Wickley Road** | **Overall** | **13.3** | **B** | --- | **14.3** | **B** | --- | **17.7** | **B** | --- | **18.1** | **B** | --- |
| | Eastbound | 24.8 | C | 82’ | 25.5 | C | 94’ | **59.6** | **E** | **132’** | **59.3** | **E** | **148’** |
| | Westbound | 28.3 | C | 38’ | 28.3 | C | 42’ | **70.0** | **E** | **70’** | **70.4** | **E** | **75’** |
| | Northbound | 9.9 | A | 117’ | 10.4 | B | 131’ | 7.1 | A | 232’ | 7.6 | A | 342’ |
| | Southbound | 11.1 | A | 98’ | 12.9 | B | 236’ | 7.3 | A | 222’ | 7.9 | A | 246’ |

### *3.2.4. Context Elements*

Included in TDOT’s Road Diet Criteria is the ‘Context Elements’ category, which allows agencies to provide contextual evidence for the reasoning behind a proposed road diet. This information helps provide the beneficial implications for what the road diet can provide beyond an operational analysis of just vehicular traffic along the corridor. Local agencies are encouraged to provide contextual evidence that a road diet will be beneficial for their community and why it is desired. Some potential criteria of contextual elements for consideration are shown in Figure 3.2 below.

**Figure 3.2 – Road Diet Context Elements**

The City of Red Bank can identify numerous benefits from a proposed road diet along Dayton Boulevard given the context elements criteria:

- Land Use / Economic Growth Impacts
  - Red Bank has an opportunity to see an increase in downtown economic activity by increased visits from active transportation users. With Dayton Boulevard serving as the 'Main Street' of Red Bank, many local and commercial businesses line the corridor, some of which with wishes to operate like a true urban downtown area with frequent pedestrians as opposed to a high-speed vehicle centric corridor. The installation of bicycle lanes and the right sizing of the vehicle lanes along the corridor allow these businesses to have an opportunity for more frequent walking and cycling customers, as well as more 'window time' for slower vehicles traversing through the area. The proposed cross section of a 3-lane roadway will promote more of a downtown feel for not only existing businesses to benefit from but also shape the potential opportunity for future businesses to open along Dayton Boulevard.
- Fulfillment of a Bike Route / Network Need
  - Red Bank has established goals for building a citywide network of connected bicycle routes, greenways, and recreational parks as listed in the Background Projects highlighted in Section 2.2 of this report. The installation of buffered bicycle lanes along Dayton Boulevard would provide a crucial north-south connection for bicycle infrastructure throughout the City. Not only would this connection stretch the entirety of the City limits from north to south, this network would serve as a main arterial for bicycle traffic and allow other existing and future bicycle connections from the east and west to have a tie in connection to the network.
- Proximity to Parallel or Diversion Routes
  - As noted above, the City plans on building upon the proposed bicycle lanes that will be installed along Dayton Boulevard to have a multitude of bicycle network options throughout the City. One particular connection that will be benefit from the Dayton Boulevard bicycle lanes will be the proposed Bicycle Boulevard project that will serve as a future connection between White Oak Park and Red Bank City Park. This project will provide not only a parallel route to the Dayton Boulevard bicycle lanes but will further add to the residential and commercial business connections throughout the City. Bicycle Boulevard will also rely on Dayton Boulevard to provide a partial connection along the route.
- Bike and Pedestrian Activity
  - The City's presence of bicycle and pedestrian activity is already evident in the foot traffic that currently exists along Dayton Boulevard. The City's desire is to continue to expand their infrastructure to meet the growing demand of more bicycle/pedestrian users along the corridor of different comfort levels. Outlined in their numerous projects highlighted in Section 2.2, the City is working to accommodate the growing number of roadway users that are not just vehicle focused.
- Satisfies Purpose and Need provided by Stakeholders
  - The City of Red Bank received grant funding through the Tennessee Department of Health for the purpose of this study. Outlined in the application, several desired outcomes of the projects were listed including: increased multi-modal facilities, increased physical activity of local residents, improved physical health, and improved mental health of citizens. The essence of this project is committed to installing multi-modal facilities (i.e. buffered bicycle lanes) for citizens of all ages to utilize throughout the City. Providing these facilities will allow users to operate through the community outside of their vehicles, promoting more interaction for physical and mental health opportunities through exercise and community engagement.

- In Harmony with Community Goals
    - Red Bank's Community Mobility Plan outlines the City's vision to "*enhance the City's unique character by safely interconnecting our residents, employees, and visitors to open spaces, neighborhoods, jobs, Red Bank's downtown, and the surrounding region through investments that improve roadway flow, and are walkable, bikeable, transit supportive, and sustainable*". This study's goal is consistent with the City's vision for a more walkable and bikeable connection for all residents of Red Bank. The reallocation of the Dayton Boulevard roadway to incorporate both vehicle and bicycle traffic are critical to the success of this vision and will serve as the backbone to many other projects fulfilling this community goal in the future.

# 4. RECOMMENDATIONS

## 4.1. Corridor Recommendations

Recommendations were noted for segments along Dayton Boulevard as well as specific intersections along the corridor. These recommendations include the installation of buffered bicycle lanes, midblock crossings, installation of Rectangular Rapid Flashing Beacons (RRFB), installation of flexible delineators, pedestrian crossing upgrades, signal head upgrades, and restriping of existing pavement markings. These recommendations are outlined in more detail below.

### *4.1.1. Install Buffered Bicycle Lanes along Dayton Boulevard*

With the proposed reconfiguration of Dayton Boulevard, three 12-foot lanes will be striped along the roadway leaving room for buffered bicycle lanes adjacent to the vehicle travel lanes. 6-foot bicycle lanes are recommended to be installed along both sides of Dayton Boulevard accompanied by a minimum 4-foot buffered zone between the vehicle travel lanes and proposed bicycle lanes. Throughout the corridor, Dayton Boulevard maintains a 5-lane cross section, however the lane widths vary from 10 – 12 feet along the roadway. To remain consistent with the travel lane and bicycle lane widths through the corridor, it is recommended to widen the buffered zone striping along the roadway in this area. The addition of a buffered zone between the bicycle and vehicle lanes creates a vertical separation of space between the users of the roadway and better delineate the separate dedicated facility for cyclists and will provide a connection to future planned bicycle routes parallel to the study corridor. Dayton Boulevard serves as an ideal bicycle route to allow connections to multiple neighborhoods in the vicinity of the study area since it is the main thoroughfare for the City of Red Bank.

### *4.1.2. Proposed New Speed Limit along Dayton Boulevard*

In addition to the proposed 3-lane cross section and installation of bicycle lanes along Dayton Boulevard, a lower speed limit is recommended along the roadway through the length of the City of Red Bank. Currently, Dayton Boulevard has a posted speed limit of 40 mph. A reduced speed limit of 35 mph is recommended along the corridor given the proposed multimodal nature of the overall improvements and the City's goal for improving the operations and safety for all users on the roadway. A lower posted speed limit not only allows vulnerable users to feel more welcome in their facilities along the corridor but also provides vehicle traffic more time to react and see pedestrians / bicycles at potential crossing points.

### *4.1.3. Install Rectangular Rapid Flashing Beacons (RRFB) at Unsignalized Pedestrian Crossings*

It is recommended that RRFBs be installed at the existing unsignalized pedestrian crossing at Greenleaf Street. The RRFBs serve as an enhanced crossing for pedestrians where a traditional signalized intersection is not warranted. In addition to the existing pedestrian crossings along primarily the southern portion of Dayton Boulevard, additional pedestrian crossings with RRFBs are proposed along the study corridor. These are recommended instead of a more robust Pedestrian Hybrid Beacon (PHB) due to the proposed 35 mph speed limit and reduced cross section along Dayton Boulevard.

### *4.1.4. Upgrade Signal Timings along Dayton Boulevard*

Given the proposed new cross section from a 5-lane to 3-lane roadway, it is recommended to optimize the traffic signal timings at each of the signalized intersections along Dayton Boulevard. Optimizing the signal timings can provide various benefits to the corridor, including updating vehicle yellow and red times to the most current safety standards as well as allocating proper green time for each approach of the study intersections to ensure vehicle queueing and delay times remain satisfactory. Additionally, optimizing signal timings can provide an overall enhanced experience to drivers during specific times of day, such as the AM and PM commuting hours. Signal timings can and should be customized during these periods to ensure traffic flow along the corridor is at its most optimal conditions.

The existing and proposed typical sections of Dayton Boulevard are shown in Figure 4.4.1 through 4.4.4.

Figure 4.4.1 – Existing Typical Section – Dayton Boulevard

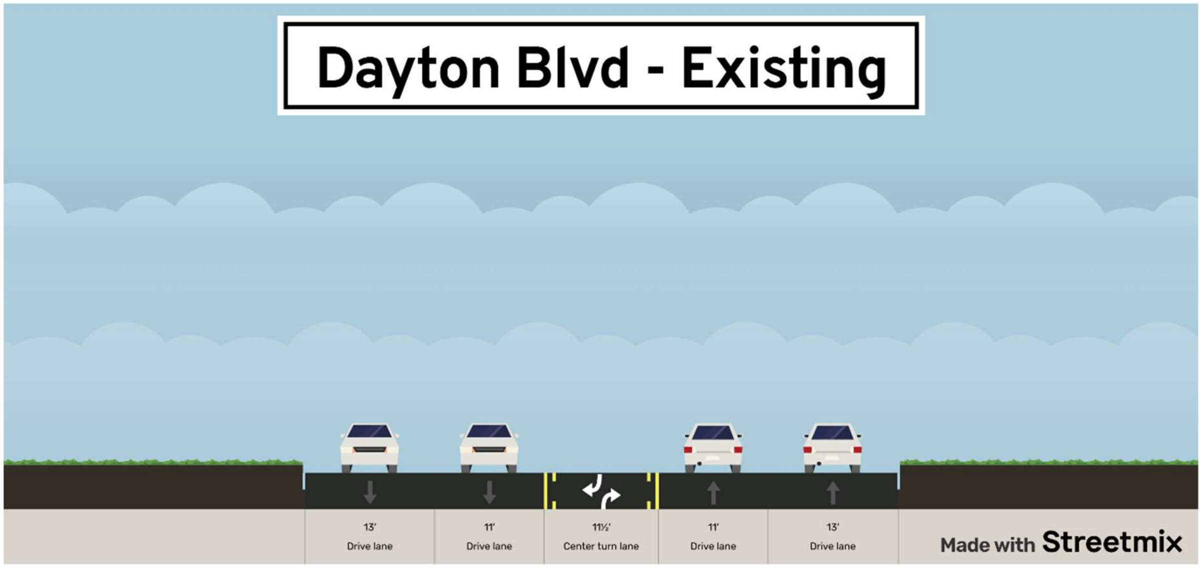



Figure 4.4.2 – Proposed Typical Section – Dayton Boulevard

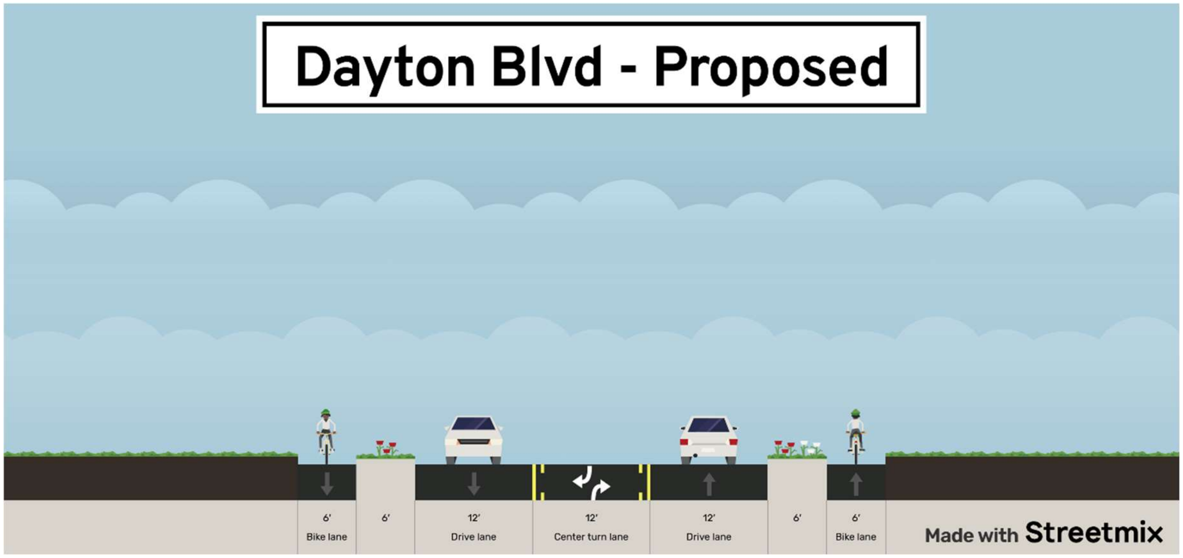


Figure 4.4.3 – Existing Typical Section – Dayton Blvd between Morrison Springs Road and Ashland Terrace

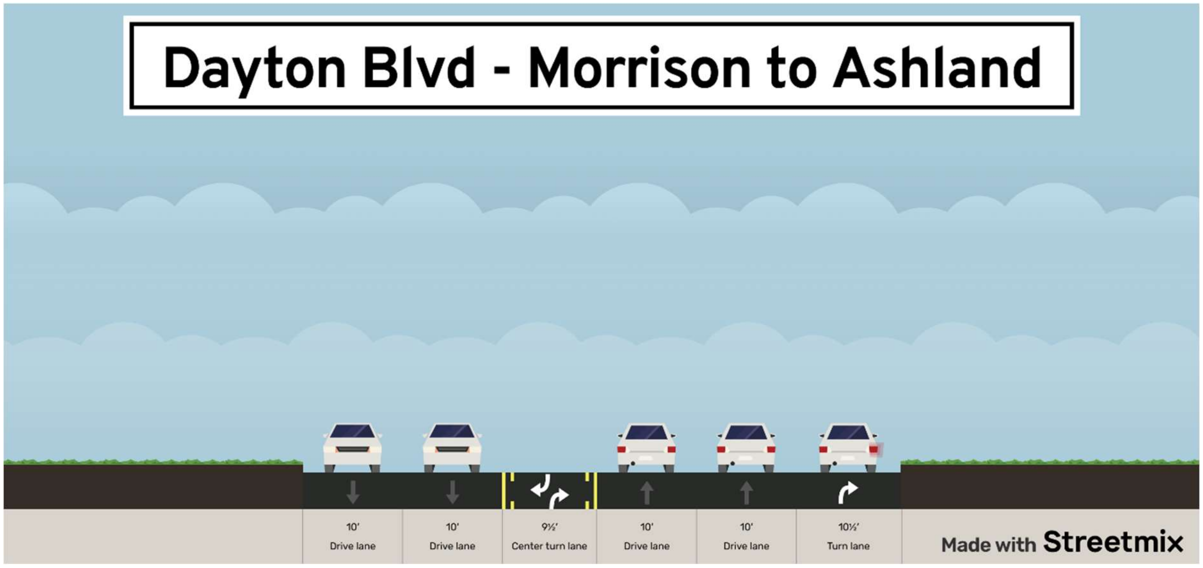
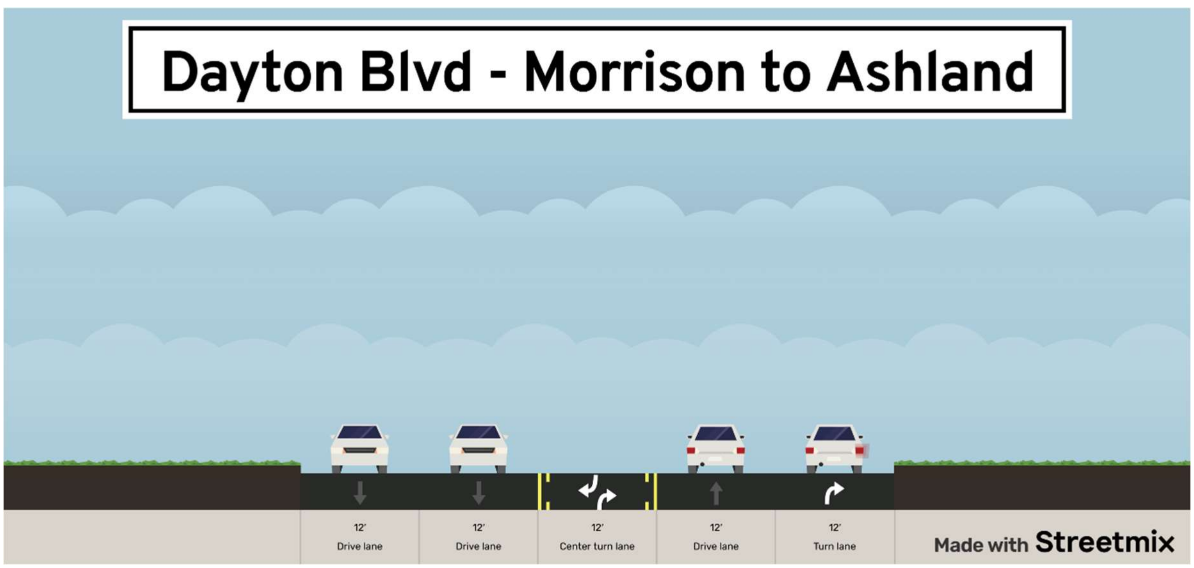



Figure 4.4.4 – Proposed Typical Section – Dayton Blvd between Morrison Springs Road and Ashland Terrace




The proposed typical sections outlined in this report differ slightly from those presented in the Red Bank Comprehensive Plan. Recommendations for this study prioritize operational efficiency, safety, and overall user experience by incorporating one-way bike lanes on each side of the roadway, allowing cyclists to travel with the flow of vehicular traffic. The AASHTO Guide for the Development of Bicycle Facilities, 5th Edition states *"Whenever possible, facilities should be designed to operate as one way in the direction of adjacent motor vehicle traffic, to reduce the amount of information motorist need to make decisions about safe movements."* The guide further states *"…on two-way streets, one-way separated bike lanes on each side of the street are typically preferred over a two-way separated bike lane or side path on one side of the street. One-way separated bike lanes in the direction of motorized travel are typically the easiest option to integrate into the existing operation of a roadway. This* *configuration provides intuitive and direct connections with the surrounding transportation network, including simpler transitions to existing bike lanes and shared travel lanes. It is the most consistent with motorist and pedestrian expectations since bicyclist operation is the same direction as motor vehicle operations."*

Another key factor associated with the recommended single lane separated bicycle lanes is the need for right-turn lanes at intersections, which are essential for maintaining smooth traffic operations and reducing congestion. The inclusion of right-turn lanes helps separate turning vehicles from through traffic, providing a safe deceleration area and reducing potential conflicts with cyclists. One-way bike lanes further enhance safety by providing a predictable and organized travel path for bicyclists, aligning their movement with vehicular traffic. This layout also creates a more functional and balanced roadway layout that serves all users, including motorists, cyclists, and pedestrians. Implementing these modifications enables the corridor to achieve safe and efficient multimodal operations while addressing critical intersection challenges.

Additionally, the inclusion of single lane separated bicycle lanes aligns with the City of Red Bank's vision to provide connection for all users along both the east and west sides of Red Bank. Bicycle lanes along both sides of the roadway allow for ease of connection for traveling cyclists regardless of which area of Red Bank they are entering Dayton Boulevard. These connections also allow for improved access to existing and future businesses both directly and indirectly along Dayton Boulevard in either direction. Ultimately, this cross section best supports the growth of Red Bank along both directions of Dayton Boulevard and the overall City equally.

## 4.2. Intersection Recommendations

### *4.2.1. Dayton Boulevard at Signal Mountain Road / Spring Road*

Signal Mountain Road / Spring Road will mark the southern limits of the proposed road diet reconfiguration, and therefore, a transition back to the existing intersection laneage will occur just south of the intersection. The existing conditions include two travel lanes along Dayton Boulevard traveling northbound and southbound along the corridor. The westbound receiving laneage along Signal Mountain Road includes two travel lanes with which the southbound channelized right turn lane utilizes as a dedicated receiving lane. The proposed road diet improvements include reducing the southbound through movement to one lane. Signal improvements should be considered at the intersection, including signal head modifications for the lane changes along the southbound approach. It should also be noted that TDOT resurfacing restriping improvements at the intersection of Signal Mountain Road at Dayton Boulevard have been incorporated into this study's concept plans.

### *4.2.2. Dayton Boulevard at Hedgewood Drive*

Dayton Boulevard at Hedgewood Drive continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The southbound lane along Dayton Boulevard is once again reduced to one travel lane at the intersection. The northbound approach is also reduced to one through lane, and the shared through/right turn lane is changed to a right turn lane. The side streets are changed from split phasing to permissive phasing.

### *4.2.3. Dayton Boulevard at Memorial Drive*

Dayton Boulevard at Memorial Drive continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The southbound lane along Dayton Boulevard is changed to a left turn lane and a shared through/right turn lane. The northbound approach is also reduced to one through lane while the shared through/right turn lane is changed to a right turn lane with permissive-overlap phasing. The side streets will no longer operate in split phasing. The eastbound approach will operate with permissive left turn phasing, and the westbound approach will operate with permitted-protected left turn phasing.

### *4.2.4. Dayton Boulevard at Martin Road*

Dayton Boulevard at Martin Road continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The northbound approach is also reduced to one left turn lane and one through lane.

### *4.2.5. Dayton Boulevard at Newberry Street*

Dayton Boulevard at Newberry Street continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The northbound and southbound lanes along Dayton Boulevard are changed to a left turn lane and a shared through/right turn lane. The westbound approach operates as a single lane in existing conditions. The addition of a left turn lane to change the laneage to a left turn lane and a through/right turning movement at the westbound approach will improve queuing along Newberry Street. The side streets will continue to operate in split phasing due to the intersection offset.

### 4.2.6. Dayton Boulevard at Leawood Avenue

Dayton Boulevard at Leawood Avenue continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The northbound and southbound lanes along Dayton Boulevard are changed to a left turn lane and a shared through/right turn lane.

### 4.2.7. Dayton Boulevard at Morrison Springs Road

Dayton Boulevard at Morrison Springs Road continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The northbound lane along Dayton Boulevard is changed to a left turn lane and a through lane, and the southbound lane is changed to a right turn lane and a through lane. The high demand of eastbound left turning volumes from Morrison Springs Road onto Dayton Boulevard required the need for dual left turn lanes and therefore two northbound receiving lanes along Dayton Boulevard.

### 4.2.8. Dayton Boulevard at Ashland Terrace

Dayton Boulevard at Ashland Terrace continues the proposed road diet improvements. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The northbound laneage along Dayton Boulevard is changed to one left turn lane, one through lane, and one right turn lane, while the southbound laneage is changed to one left turn lane and one shared through/right turn lane. The westbound approach of Ashland Terrace is changed to two left turn lanes and one shared through/right turn lane. Additionally, the side streets were changed from split phasing to protected/permissive phasing. The high demand of westbound left turning volumes from Ashland Terrace onto Dayton Boulevard required the need for dual left turn lanes and therefore two southbound receiving lanes along Dayton Boulevard.

### 4.2.9. Dayton Boulevard at Wickley Road / Browntown Road

Wickley Road / Browntown Road marks the northernmost signalized intersection of the proposed road diet reconfiguration. Existing conditions along Dayton Boulevard include two northbound and southbound travel lanes. The recommended laneage for Dayton Boulevard at the intersection includes one left turn lane and one shared through/right turn lane for the northbound approach. The southbound approach will change to one left turn lane, one through lane, and one right turn lane. The side streets will no longer operate in split phasing. The eastbound approach will operate with protected/permissive left turn phasing, while the westbound approach will operate with permissive left turn phasing.

The recommended traffic signal upgrades along the corridor will require minimal construction effort and are not expected to involve replacing major signal infrastructure. The improvements will include replacing certain signal heads, signal head rewiring, and updating signal timings.

Conceptual layouts of the proposed recommendations along Dayton Boulevard can be found in Appendix B.

## 4.3. Landscape Architectural Recommendations

Dayton Boulevard serves as a vital urban corridor, linking the City of Red Bank with its residents and influencing daily life throughout the community. Findings from this Right Sizing Study have identified an opportunity to enhance the City's quality of life by reducing the number of travel lanes and minimizing paved surfaces. This reclaimed space can be transformed into multi-modal transportation infrastructure and expanded green areas.

The proposed multi-modal features include dedicated pathways for pedestrians and cyclists, designed to be safely separated from vehicular traffic. Meanwhile, the enhanced landscaped areas can be used to accomplish the following:

- **Street Trees:** Provide shade, enhance comfort for pedestrians, and reduce stormwater runoff.
- **Rain Gardens and Bio-Retention Areas:** Improve water quality by filtering pollutants and slow the flow of stormwater runoff.
- **Enhanced Streetscape Aesthetics:** Create a visually appealing environment that fosters community pride and beautifies the entire city.

This approach aims to create a safer, greener, and more inviting corridor that balances transportation needs with environmental sustainability and urban livability.

Appendix C illustrates potential design concepts and opportunities for enhancements along the corridor.