



NORTH CAROLINA  
**Turnpike Authority**

## Maintenance Rating Program

Triangle Expressway

### 2020 First Quarter Report

1 S. Wilmington Street  
Raleigh, NC 27601



Last Updated:  
May 5, 2020

## CONSULTANT CERTIFICATION OF COMPLETION

May 1, 2020

Dennis Jernigan, P.E.  
Director of Highway Operations, NCTA  
1 South Wilmington Street  
Raleigh, NC 27601

### NCTA Triangle Expressway Roadway Maintenance Performance Rating Program; Q1, FY 2020 Rating

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company The Kercher Group, Inc., which is a subconsultant to HNTB North Carolina, P.C. Collaboratively; we are working as the Triangle Expressway Roadway and Facility Maintenance Performance Rating Program Consultants.

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been independently performed in accordance with, and in conformity to, the *NCTA Roadway and Facility Maintenance Performance Standards*.

Sincerely,

The Kercher Group, Inc.

A handwritten signature in blue ink that reads "Ken M. McEntire". The signature is written in a cursive style with a large initial "K" and "M".

Ken M. McEntire, PE  
Principal

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## Maintenance Rating Program for the Triangle Expressway

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### 1.0 EXECUTIVE SUMMARY

The North Carolina Turnpike Authority (NCTA) Maintenance Rating Program (MRP) is a maintenance evaluation program for roadway features and toll facilities on the NCTA system. This report presents results from the 2020 first quarter assessment of the Triangle Expressway.

The overall 2020 first quarter maintenance rating of the Triangle Expressway was 93.6, meeting the NCTA target rating of 90. As shown in **Table 1**, all five elements assessed achieved a rating greater than the target rating of 85.

Table 1: MRP Element Results for the 2020 First Quarter Assessment		
Element	MRP Rating	Target Rating
Road Surface	94.9	85.0
Unpaved Shoulders and Ditches	98.7	85.0
Drainage	91.9	85.0
Roadside	94.7	85.0
Traffic Control Devices	90.4	85.0
<b>Overall MRP Performance Rating</b>	<b>93.6</b>	<b>90.0</b>

This report also provides a rolling rating of the latest four quarterly inspections of the Triangle Expressway. As presented in **Table 2**, the rolling maintenance rating of the Triangle Expressway was 92.9.

Table 2: MRP Rolling Element Results					
Element	Q2 2019 Rating	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Rolling Rating
Road Surface	92.6	96.9	89.5	94.9	93.5
Unpaved Shoulders and Ditches	97.8	94.7	99.1	98.7	97.6
Drainage	94.0	92.3	98.1	91.9	94.1
Roadside	92.8	94.7	96.2	94.7	94.6
Traffic Control Devices	87.9	86.6	90.9	90.4	89.0
<b>Overall MRP Performance Rating</b>	<b>92.1</b>	<b>92.5</b>	<b>93.6</b>	<b>93.6</b>	<b>92.9</b>

In addition, the report provides findings of the Green Level Historic District signs inspection. This quarter, two of three signs were inspected. One sign has been temporarily removed due to a nearby redevelopment project. Both signs were found to be in good physical condition, and the landscaped areas around the signs were maintained in accordance with NCTA MRP standards.

## 2.0 INTRODUCTION

The NCTA MRP is a comprehensive planning, measuring, and managing process that provides a means for communicating to managers, stakeholders and customers the impacts of policy and budget decisions on program service delivery.

Using outcome-based performance measures and the service level scale (0 through 100), the inspection results are rated against established thresholds criteria. The program analysis is accomplished using sampling procedures that capture the level of service being provided for individual assets. The evaluation procedure is based on the establishment of threshold conditions that quantify the maximum defect allowed on assets. Over time, the results can be charted to identify work needs and subsequent necessary actions.

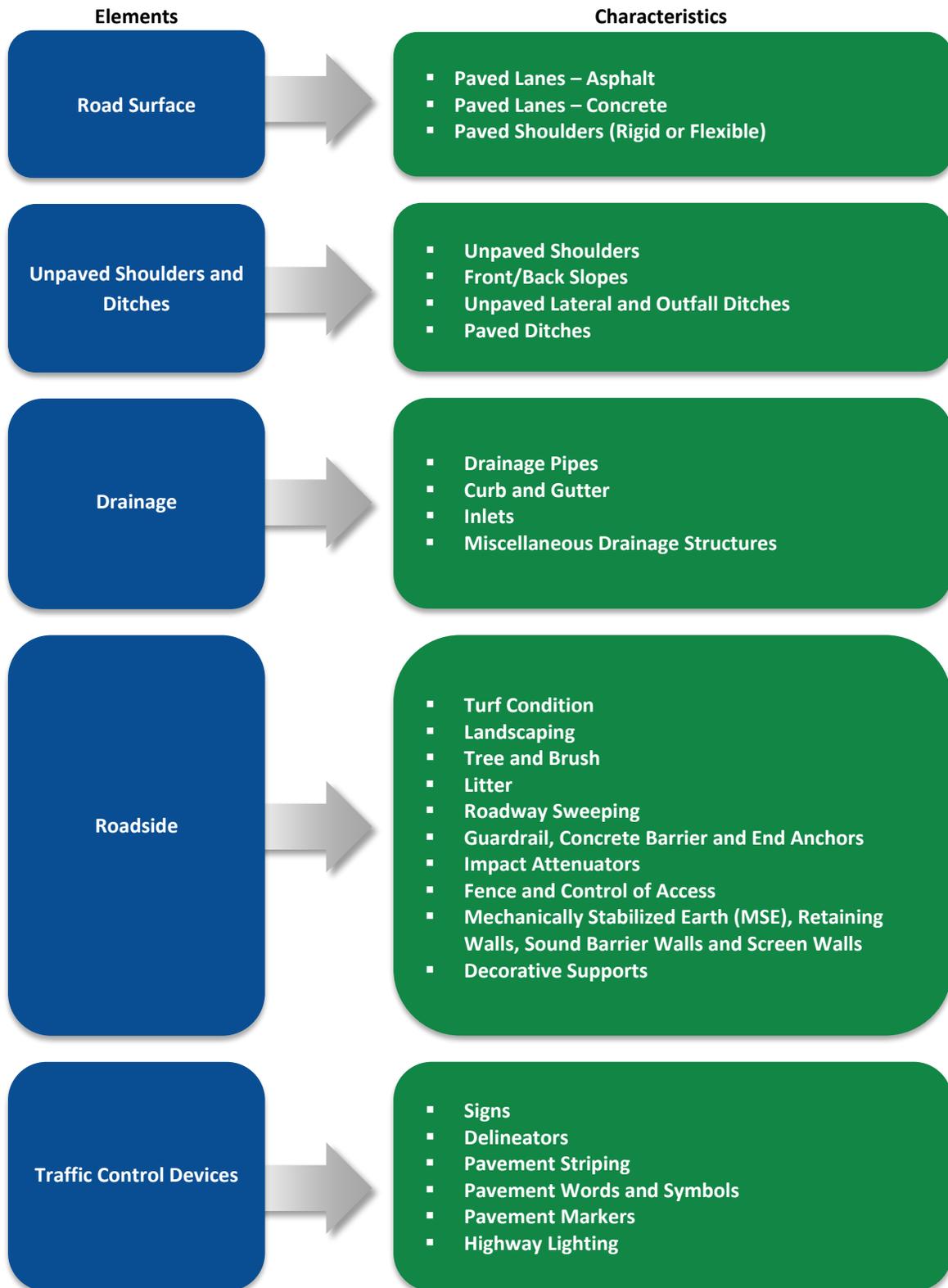
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

Using field survey information, a maintenance matrix can be developed to show the ties between maintenance activities and the characteristics of various roadway features. The purpose of this evaluation is to provide information that can be used to schedule and prioritize routine maintenance activities and provide uniform maintenance conditions that meet established objectives.

## 3.0 MRP PROCEDURE

Per the *NCTA Roadway and Facility Maintenance Performance Standards V6*, roadway assets or characteristics on NCTA facilities have been grouped into elements. These elements and corresponding characteristics can be seen in **Figure 1**:

Figure 1: Maintenance Elements and Characteristics



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A weighting system has been established to identify the importance of each element and characteristic. This system consists of two weighting factors: one that accounts for the importance of individual characteristics within a given maintenance element (1-9), and one that accounts for the importance of the maintenance elements to the total rating (by % of score). This two-factor system reveals deficiencies among characteristics and elements.

The program analysis is accomplished using statistically valid, random sampling procedures that capture the level of service for individual characteristics with a 95% confidence level in sampling. The sample characteristics selected are evaluated during quarterly inspections, which are performed during the months of February, May, August, and November to account for dynamic changes in assets during the various seasons. The evaluation process is completed using electronic data collection tablets and is based on established threshold conditions described in the *NCTA Roadway and Facility Maintenance Standards V6*. Those characteristics that meet or exceed the threshold are coded as PASSING; those that do not meet the threshold are coded as NOT PASSING.

When the evaluation process is completed, the number of PASSING samples and total samples are multiplied by the weighted values (1-9) to determine the actual and possible rating points for characteristics and elements. MRP ratings for elements and characteristics are then calculated as the ratio of the actual rating points to possible rating points. The MRP ratings represent the maintenance level of service currently being provided, as they define the percent of characteristics and elements that meet the maintenance condition standard. For instance, an MRP rating of 83 signifies that 83 percent of the inspected elements/characteristics met the standard.

The overall MRP rating is determined by calculating the sum of the elements ratings multiplied by the following weighted factors:

<b>Road Surface =</b>	<b>25%</b>
<b>Unpaved Shoulders =</b>	<b>13%</b>
<b>Drainage =</b>	<b>15%</b>
<b>Roadside =</b>	<b>17%</b>
<b>Traffic Control Devices =</b>	<b>30%</b>
<hr/>	
<b>Total</b>	<b>100%</b>

The NCTA's overall target rating is 90, with elements scoring 85 or higher, and characteristics 80 or higher. In addition to quarterly ratings, the cumulative rolling annual rating is calculated each quarter. This rating is obtained by adding the ratings of the latest four quarterly inspections to compensate for the likelihood of uneven sample sizes.

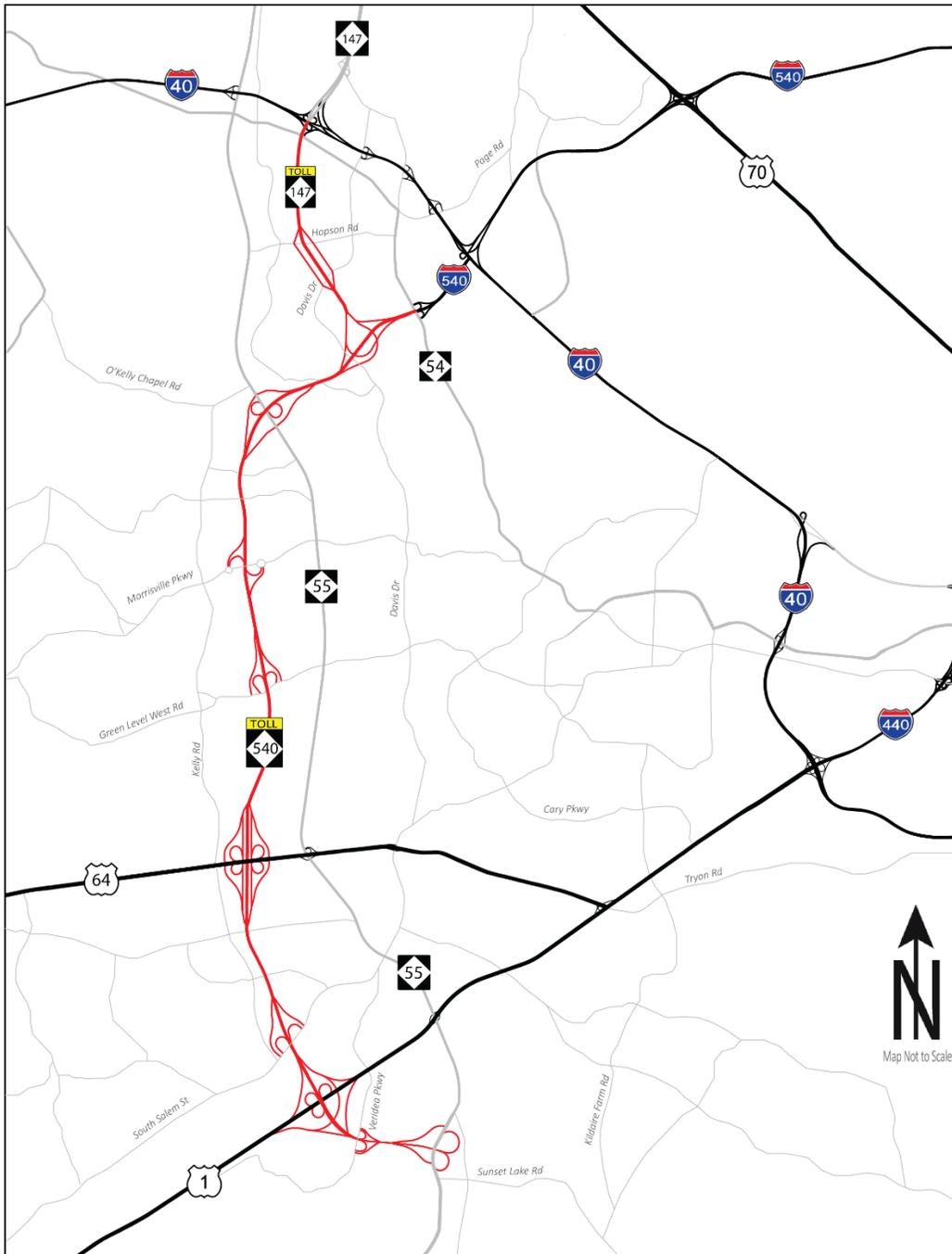
## Maintenance Rating Program for the Triangle Expressway

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### 4.0 TRIANGLE EXPRESSWAY DESCRIPTION

The Triangle Expressway extends for approximately 18.8 miles from the interchange of I-40 and Toll NC-147 in Durham to the NC-55 Bypass near Holly Springs (**Figure 2**). It includes a one-mile segment on Toll NC-540 extending north from the Toll NC-540 / Toll NC-147 interchange to the NC-54 interchange. The Triangle Expressway consists of twelve interchanges and twenty all-electronic toll collection zones.

Figure 2: Triangle Expressway Map



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5.0 TRIANGLE EXPRESSWAY ASSET INVENTORY UPDATE

Through normal day-to-day maintenance activities and the construction of special projects, roadside assets are continuously being added or modified on the roadway. NCTA coordinates closely with NCDOT Division 5 Maintenance and conducts routine field visits to maintain an accurate asset inventory and ensure the validity of the MRP survey.

During this quarter assets on Toll NC 540 North from Green Level West Road to Carpenter Fire Station Road were removed from the inventory due to the Morrisville Parkway Interchange construction project. Once these assets are evaluated in a baseline assessment they will be integrated into the quarterly inspections. **Table 3** presents the updated number of assets that are currently available for inspections.

Table 3: Asset Inventory		
Assets	Total Inventory	2020 Eligible Inventory
Barriers	801	743
Curb and Gutter	428	393
Decorative Supports	297	279
Drainage	1180	1105
Misc. Drainage	221	221
Fences	508	472
Highway Lighting	435	398
Impact Attenuators	47	45
Inlets	1126	1080
Linear Segments	795	767
Plant Beds	266	262
Paved Ditches	2	2
Pavement Symbols	638	602
Signs	1215	1096
Tree and Brush	603	539
Turf	1074	1039
Walls	88	85

## 6.0 MRP FIRST QUARTER ASSESSMENT

### 6.1 Quarterly Results

The overall 2020 first quarter maintenance rating of the Triangle Expressway was 93.6, meeting NCTA’s target overall rating of 90. All elements assessed achieved ratings above the target rating of 85 established for element groups.

During the first quarter, NCTA led a paint removal and rehabilitation project to improve the condition of concrete barrier, decorative support columns, and retaining walls throughout Triangle Expressway. Due to this ongoing project, the scaling criteria of the Decorative Supports and Retaining Walls and Sound Barrier Walls characteristics was evaluated but did not affect the characteristics rating. Once this project is completed, the scaling criteria for Decorative Supports and Retaining Walls and Sound Barrier Walls characteristics rating will resume and will be included in the Roadside element and overall scoring.

It is important to note that these results are only representative of the first quarter sample, one of the four surveys to provide an intermediate snapshot of seasonal conditions. Therefore, they are not a statistically valid representation of the assets; only the total of all four quarterly inspections, reported at the end of each calendar year, provides a 95% confidence level in statistical sampling. The first quarter MRP performance ratings for elements and characteristics are presented in **Table 4** and **Table 5**, respectively.

Table 4: MRP Element Results for Q1 2020	
Element	Q1 2020 MRP Rating
Road Surface	94.9
Unpaved Shoulders and Ditches	98.7
Drainage	91.9
Roadside	94.7
Traffic Control Devices	90.4
<b>Overall MRP Performance Rating</b>	<b>93.6</b>

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**Table 5: MRP Characteristic Results for Q1 2020**

<b>Road Surface</b>	<b>Sample Passed</b>	<b>Sample Total</b>	<b>Weighted Values</b>	<b>Actual Pts</b>	<b>Available Pts</b>	<b>Q1 Rating</b>
Paved Lanes Asphalt	10	12	9	90	108	83
Paved Lanes Concrete	20	20	9	180	180	100
Paved Shoulder	31	32	5	155	160	97
<b>Element Total</b>				<b>425</b>	<b>448</b>	<b>94.9</b>
<b>Unpaved Shoulders and Ditches</b>	<b>Sample Passed</b>	<b>Sample Total</b>	<b>Weighted Values</b>	<b>Actual Pts</b>	<b>Available Pts</b>	<b>Q1 Rating</b>
Unpaved Shoulder	31	32	9	279	288	97
Front/Back Slopes	32	32	6	192	192	100
Lateral and Outfall Ditches, Unpaved	32	32	6	192	192	100
Ditches, Paved	2	2	5	10	10	100
<b>Element Total</b>				<b>673</b>	<b>682</b>	<b>98.7</b>
<b>Drainage</b>	<b>Sample Passed</b>	<b>Sample Total</b>	<b>Weighted Values</b>	<b>Actual Pts</b>	<b>Available Pts</b>	<b>Q1 Rating</b>
Drainage Pipes	31	34	7	217	238	91
Curb and Gutter	28	28	6	168	168	100
Inlets	31	34	7	217	238	91
Misc. Drainage Structure	25	30	4	100	120	83
<b>Element Total</b>				<b>702</b>	<b>764</b>	<b>91.9</b>
<b>Roadside</b>	<b>Sample Passed</b>	<b>Sample Total</b>	<b>Weighted Values</b>	<b>Actual Pts</b>	<b>Available Pts</b>	<b>Q1 Rating</b>
Turf Condition	45	51	7	315	357	88
Landscaping	25	25	4	100	100	100
Trees and Brush	30	30	4	120	120	100
Litter	27	32	4	108	128	84
Roadway Sweeping	32	32	5	160	160	100
Guardrail, Concrete Barrier and End Anchors	31	32	9	279	288	97
Impact Attenuators	10	10	9	90	90	100
Fence, Control Access	26	29	7	182	203	90
Retaining Walls and Sound Barrier Walls	14	15	5	70	75	93*
Decorative Supports	30	30	5	150	150	100*
Graffiti and Stain Removal	44	44	4	176	176	100
<b>Element Total</b>				<b>1750</b>	<b>1847</b>	<b>94.7</b>
<b>Traffic Control Devices</b>	<b>Sample Passed</b>	<b>Sample Total</b>	<b>Weighted Values</b>	<b>Actual Pts</b>	<b>Available Pts</b>	<b>Q1 Rating</b>
Signs	31	33	7	217	231	94
Delineators	32	32	3	96	96	100
Pavement Striping/Marking	28	32	8	224	256	88
Words and Symbols	35	39	7	245	273	90
Pavement Markers	30	32	9	270	288	94
Highway Lighting	26	32	6	156	192	81
<b>Element Total</b>				<b>1208</b>	<b>1336</b>	<b>90.4</b>

\*Scaling criteria not included in the quarter rating for this characteristic while the paint removal contract is ongoing.

## Maintenance Rating Program for the Triangle Expressway

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Additionally, **Appendix A** includes maps that present the location of all assets assessed during the first quarter. **Appendix B** includes a list of the individual assets that did not achieve their target ratings.

### 6.2 Analysis and Recommendations

#### Elements

During the first quarter, all elements exceeded NCTA's quarter score threshold criteria of 85. Furthermore, all elements exceeded a quarter score higher than 90.

Road Surface (94.9) experienced a decrease in rolling rating compared to the previous quarter's rolling rating. The rolling rating for this element was 0.3 points lower than 2019 annual ratings. The decrease in rolling rating can be attributed to the characteristic, Paved Lanes Asphalt (83), obtaining quarter scores less than 90 for the last two quarters. Traffic Control Devices (90.4) also experienced a 0.3 decrease in rolling rating from the 2019 annual rating. Pavement Striping/Marking (88) as well as Words and Symbols (90) maintained scores above 85 for the last two quarters; however, both characteristic rolling ratings experienced decreases. Repaving and subsequent striping of all asphalt lanes is scheduled to begin later this year.

Unpaved Shoulders and Ditches (98.7) experienced an increase in rolling rating. The rating for this element was 0.3 points higher than the 2019 annual rolling rating. The increase was predominately due to Unpaved Shoulders (97) obtaining a score greater than 95 in the last two quarters.

Drainage (91.9) experienced an increase in rolling rating of 0.2 points. Misc. Drainage Structures (83) continued to score above the characteristic threshold score of 80 for four consecutive quarters. Both Drainage Pipes (91) and Inlets (91) received lower ratings from last quarter, reducing the characteristic rolling ratings by 1.4 points.

Roadside (94.7) experienced a rolling rating increased 0.5 points from the previous quarter. Turf Condition (88) continued receiving a score greater than 85 for the last three quarters. Retaining Walls and Sound Barrier Walls (93) as well as Decorative Supports (100) increased in ratings from the previous quarter.

#### Characteristics

This quarter, all characteristic met the NCTA target threshold criteria of 80. Pictures of all characteristic failures are included in **Appendix B**.

## Maintenance Rating Program for the Triangle Expressway

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### 7.0 CURRENT ROLLING MRP RATING

The rolling maintenance rating of the Triangle Expressway was 92.9, exceeding NCTA's target overall rating of 90. All elements exceeded NCTA's rolling rating threshold criteria of 85. Also, all characteristic ratings met or exceeded the target rating of 80.

The 2019/2020 results are presented in **Tables 6 and 7**. These results are a collection of the four quarterly inspections conducted in the last year.

<b>Table 6: MRP Element Results for 2020</b>					
<b>Element</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Road Surface	92.6	96.9	89.5	94.9	93.5
Unpaved Shoulders and Ditches	97.8	94.7	99.1	98.7	97.6
Drainage	94.0	92.3	98.1	91.9	94.1
Roadside	92.8	94.7	96.2	94.7	94.6
Traffic Control Devices	87.9	86.6	90.9	90.4	89.0
<b>Overall MRP Performance Rating</b>	<b>92.1</b>	<b>92.5</b>	<b>93.6</b>	<b>93.6</b>	<b>92.9</b>

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<b>Table 7: MRP Rolling Element Results</b>					
<b>Road Surface</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Paved Lanes Asphalt	93	93	75	83	87
Paved Lanes Concrete	94	100	100	100	99
Paved Shoulder	91	97	88	97	93
<b>Element Total</b>	<b>92.6</b>	<b>96.9</b>	<b>89.5</b>	<b>94.9</b>	<b>93.5</b>
<b>Unpaved Shoulders and Ditches</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Unpaved Shoulder	97	88	100	97	95
Front/Back Slopes	100	100	97	100	99
Lateral and Outfall Ditches, Unpaved	97	100	100	100	99
Ditches, Paved	100	100	100	100	100
<b>Element Total</b>	<b>97.8</b>	<b>94.7</b>	<b>99.1</b>	<b>98.7</b>	<b>97.6</b>
<b>Drainage</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Drainage Pipes	100	97	100	91	97
Curb and Gutter	86	93	100	100	95
Inlets	97	94	97	91	95
Misc. Drainage Structure	89	81	95	83	87
<b>Element Total</b>	<b>94.0</b>	<b>92.3</b>	<b>98.1</b>	<b>91.9</b>	<b>94.1</b>
<b>Roadside</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Turf Condition	73	91	91	88	86
Landscaping	96	100	100	100	99
Trees and Brush	97	97	100	100	98
Litter	100	94	100	84	95
Roadway Sweeping	100	100	100	100	100
Guardrail, Concrete Barrier and End Anchors	100	94	97	97	97
Impact Attenuators	100	100	100	100	100
Fence, Control Access	93	97	93	90	93
Retaining Walls and Sound Barrier Walls	86	86	86	93*	88
Decorative Supports	80	84	92	100*	90
Graffiti and Stain Removal	100	100	100	100	100
<b>Element Total</b>	<b>92.8</b>	<b>94.7</b>	<b>96.2</b>	<b>94.7</b>	<b>94.6</b>
<b>Traffic Control Devices</b>	<b>Q2 2019 Rating</b>	<b>Q3 2019 Rating</b>	<b>Q4 2019 Rating</b>	<b>Q1 2020 Rating</b>	<b>Rolling Rating</b>
Signs	91	94	100	94	95
Delineators	85	100	88	100	93
Pavement Striping/Marking	88	78	88	88	85
Words and Symbols	84	84	90	90	87
Pavement Markers	84	84	91	94	88
Highway Lighting	96	89	86	81	88
<b>Element Total</b>	<b>87.9</b>	<b>86.6</b>	<b>90.9</b>	<b>90.4</b>	<b>89.0</b>

\*Scaling criteria not included in the quarter rating for this characteristic while the paint removal contract is ongoing.

## 8.0 GREEN LEVEL HISTORIC DISTRICT SIGNS

Green Level Historic District signs and surrounding landscaped areas were installed as part of the Triangle Expressway construction project. Currently, NCDOT is maintaining the Green Level Historic District Signs and the Town of Cary is providing maintenance to the landscaped areas surrounding these signs.

### 8.1 Analysis and Recommendations

As part of each quarterly inspection, an assessment team visits the three Green Level Historic District signs to conduct a visual inspection of each sign and ensure they are in good standing. Two of the three signs included in the inspection inventory were found to be in good condition, with the landscaped areas being well maintained. The third sign had been temporarily removed due to nearby construction activities.

**Figure 3** shows the two signs assessed and the area of the third sign.

**Figure 3: Green Level West Historic District Signs, Landscape Areas**



## 9.0 CONCLUSION

This report presents the 2020 first quarter assessment of the Triangle Expressway. The NCTA's target ratings are 90 for the rolling rating, 90 for the overall quarter rating, 85 for elements, and 80 for characteristics. The first quarter 2020 overall rating was 93.6 and the rolling rating was 92.9, both ratings met the target rating of 90.

All element ratings were above the target ratings for the quarter and rolling assessment. During the first quarter assessment, all characteristics met or exceeded the target rating of 80.

The characteristics that have rolling ratings less than 90 and have received quarter scores less than 80 in the last four quarters include Paved Lanes Asphalt, Pavement Striping/Marking, and Turf Condition. To maintain/improve the condition ratings, it is recommended the pavement striping/marketing replacement cycles are completed as planned in the capital budget. Also, bare areas seeding/fertilization program efforts should continue during the spring and summer seasons to promote new turf growth.

This quarter, the two Green Level Historic District signs inspected were found to be in good condition while the third sign was identified to have been removed for a Town of Cary development project near Green Level West Road. Additionally, the landscaped areas surrounding the signs were found to be well maintained.

# **Appendix A**

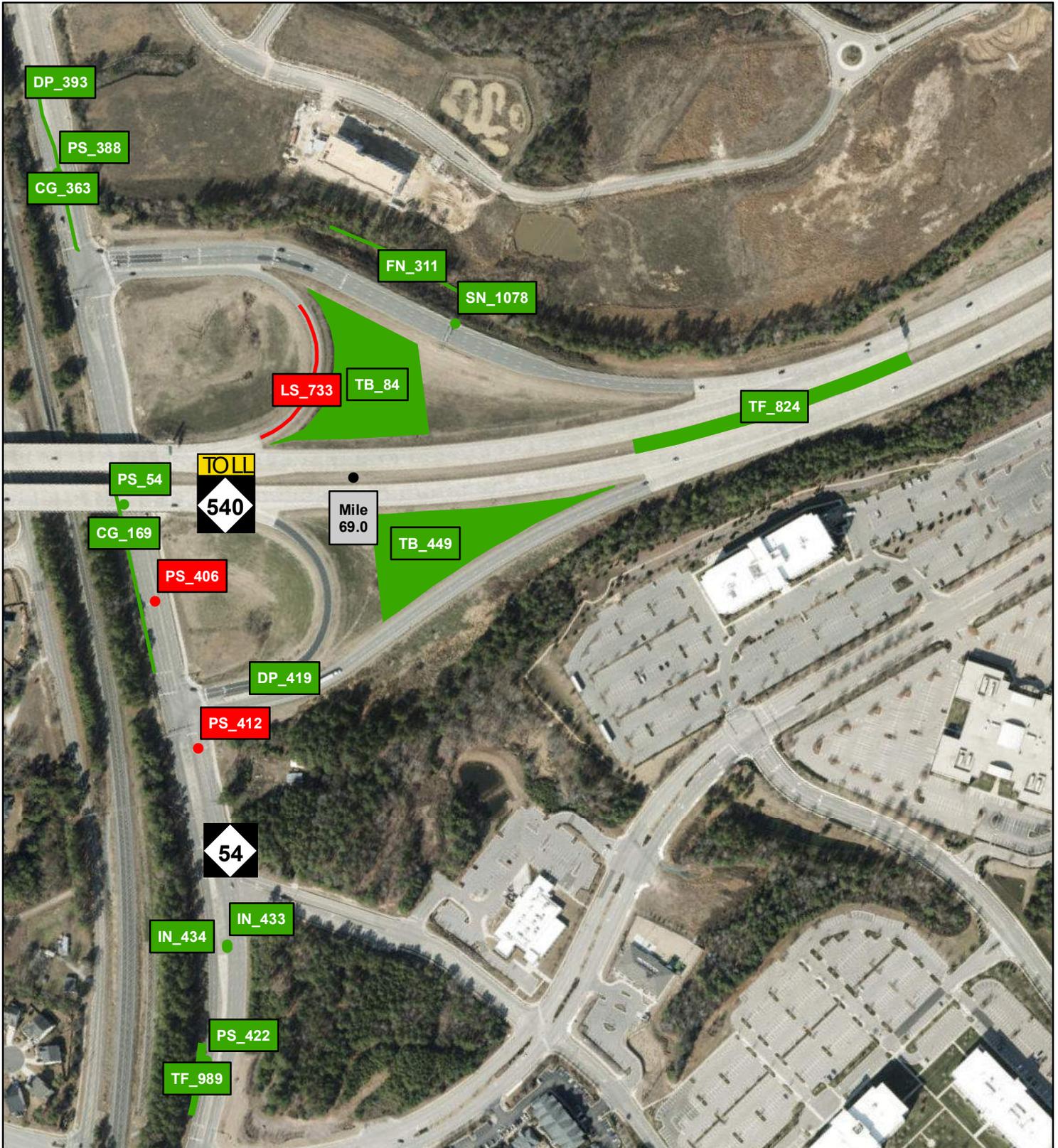
**Triangle Expressway 2020 First Quarter Asset Assessment Locations**

## Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

Provided below are a series of maps outlining the assets that were a part of this quarter's sample and their corresponding result. Assets are defined by an Inventory ID, which is a unique identifier given to each individual asset. The components that make up the Inventory ID are an asset specific prefix along with a number, such as LS\_1. All assets and their respective prefixes are listed below:

- Guardrail, Concrete Barrier and End Anchors – BR
- Curb and Gutter – CG
- Decorative Supports – DS
- Drainage Pipes – DP
- Misc. Drainage Structures – MDP
- Fence and Control of Access – FN
- Graffiti - GF
- Highway Lighting – HL
- Impact Attenuators – IA
- Inlets – IN
- Landscaping – PB
- Linear Samples – LS
  - Paved Lanes – Asphalt
  - Paved Lanes – Concrete
  - Paved Shoulders
  - Unpaved Shoulders
  - Front/Back Slopes
  - Unpaved Lateral and Outfall Ditches
  - Litter
  - Roadway Sweeping
  - Pavement Striping/Markings
  - Pavement Markers
  - Delineators
- Paved Ditches – PD
- Pavement Words and Symbols – PS
- Signs – SN
- Tree and Brush – TB
- Turf Condition – TF
- MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls – WL

# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

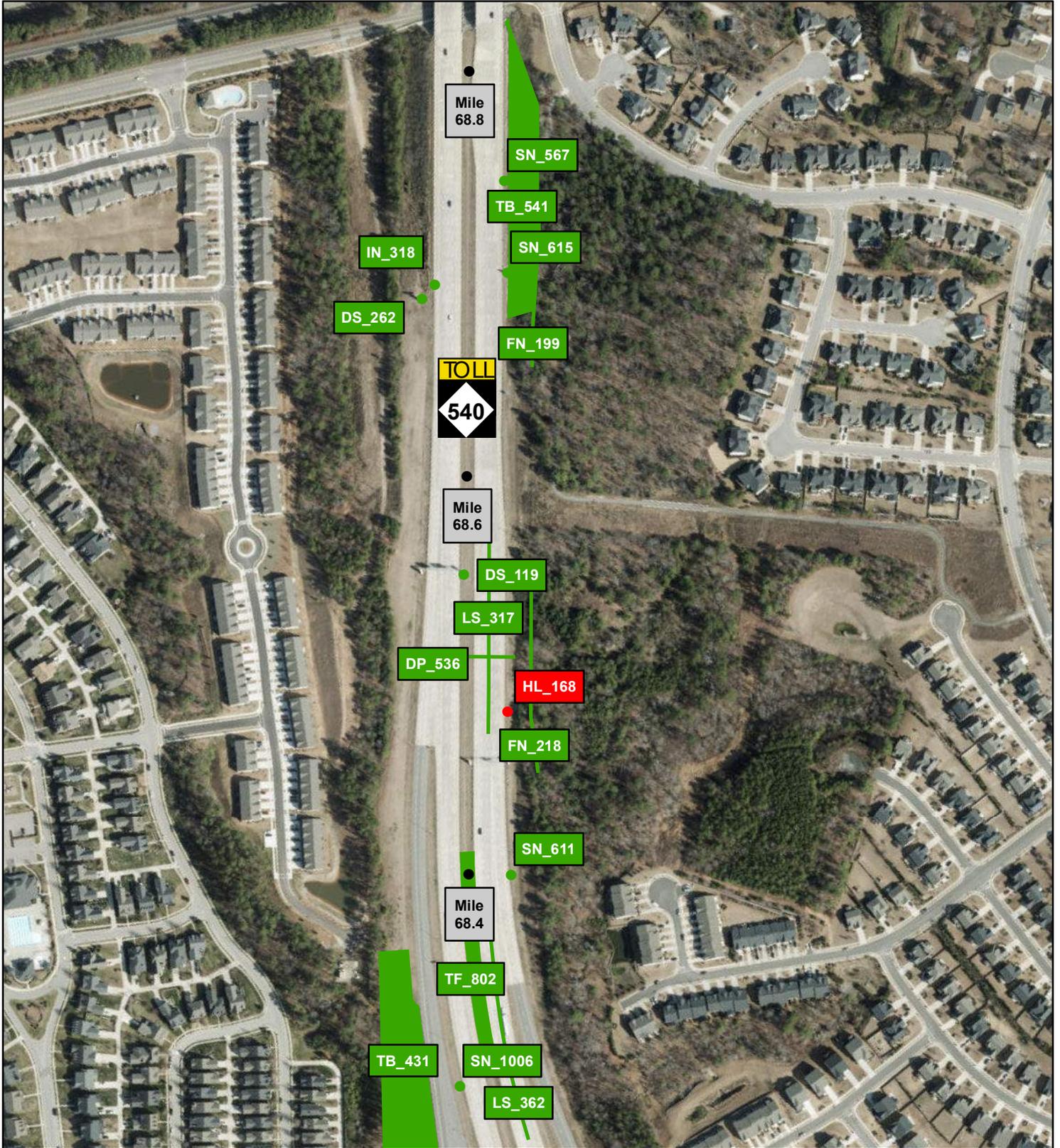


## Legend

- Failing Asset
- Passing Asset

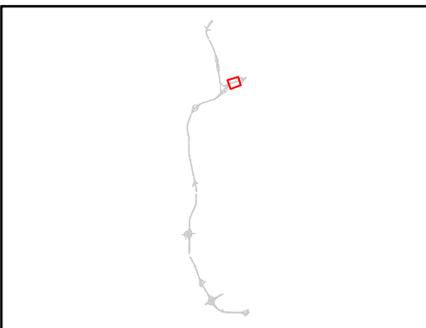


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset

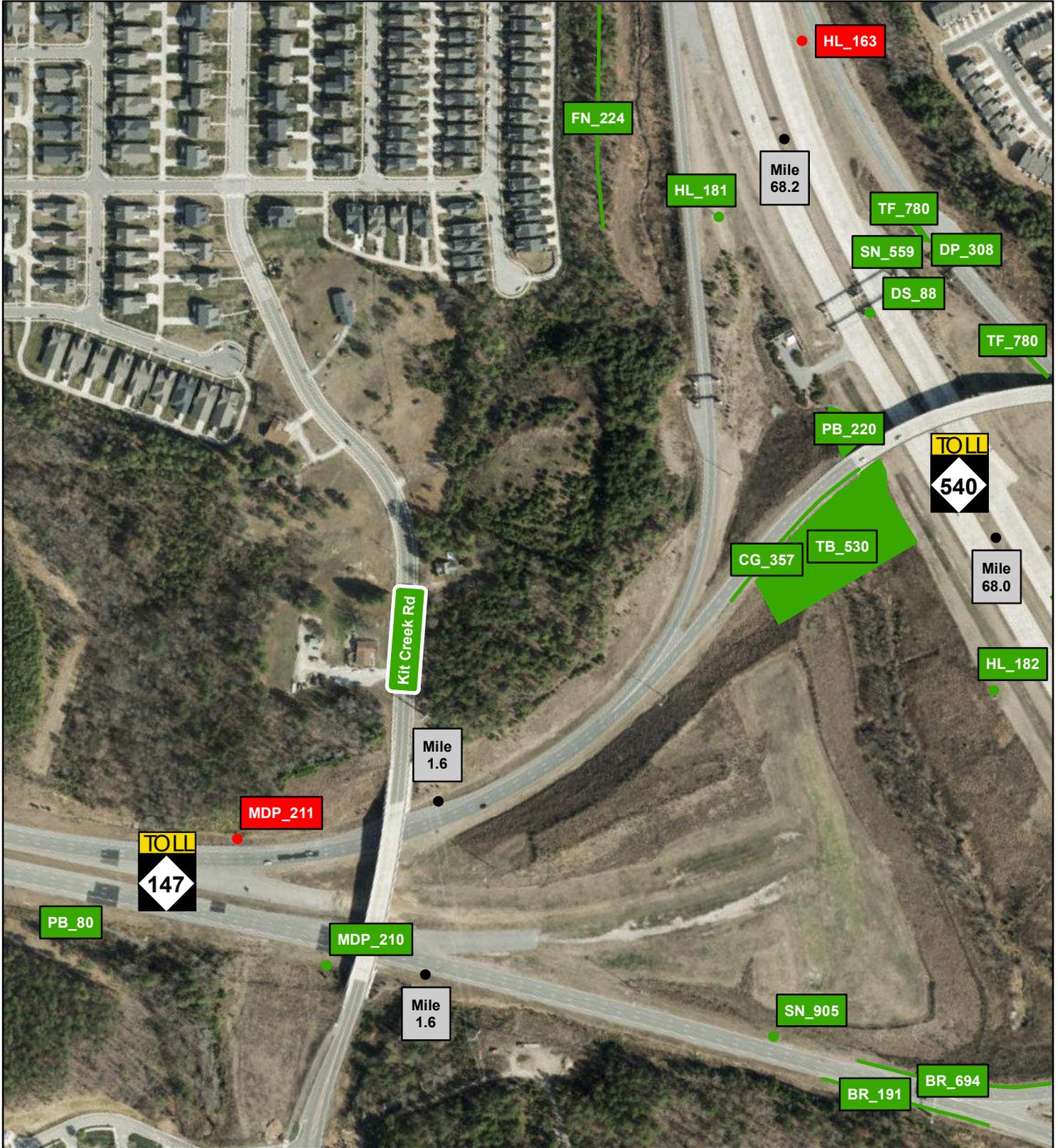






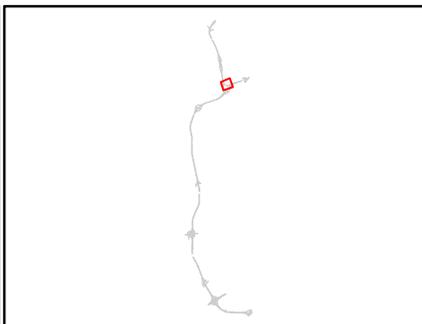
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# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

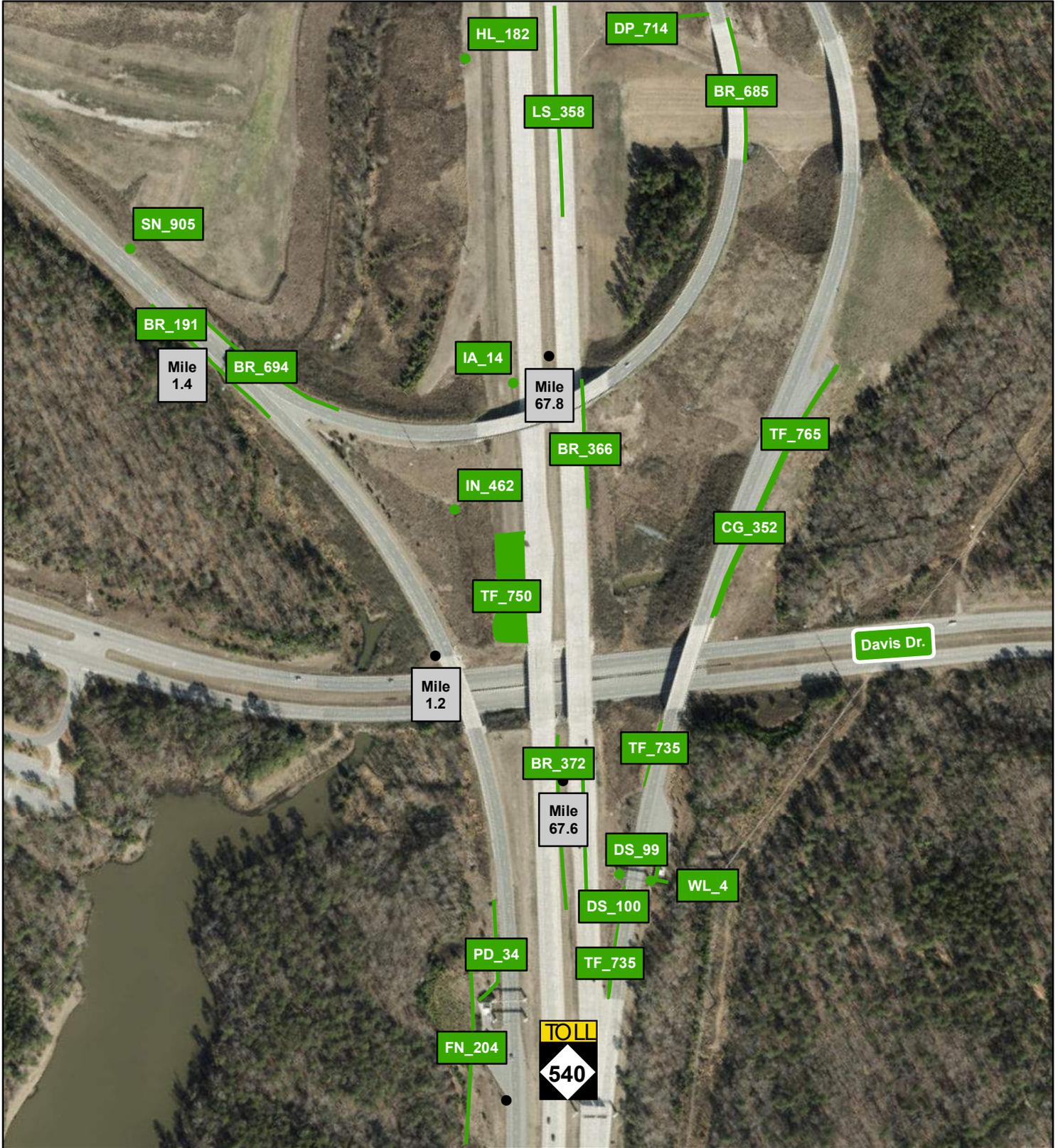


## Legend

- Failing Asset
- Passing Asset

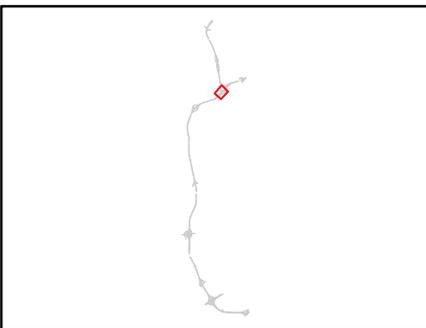


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset

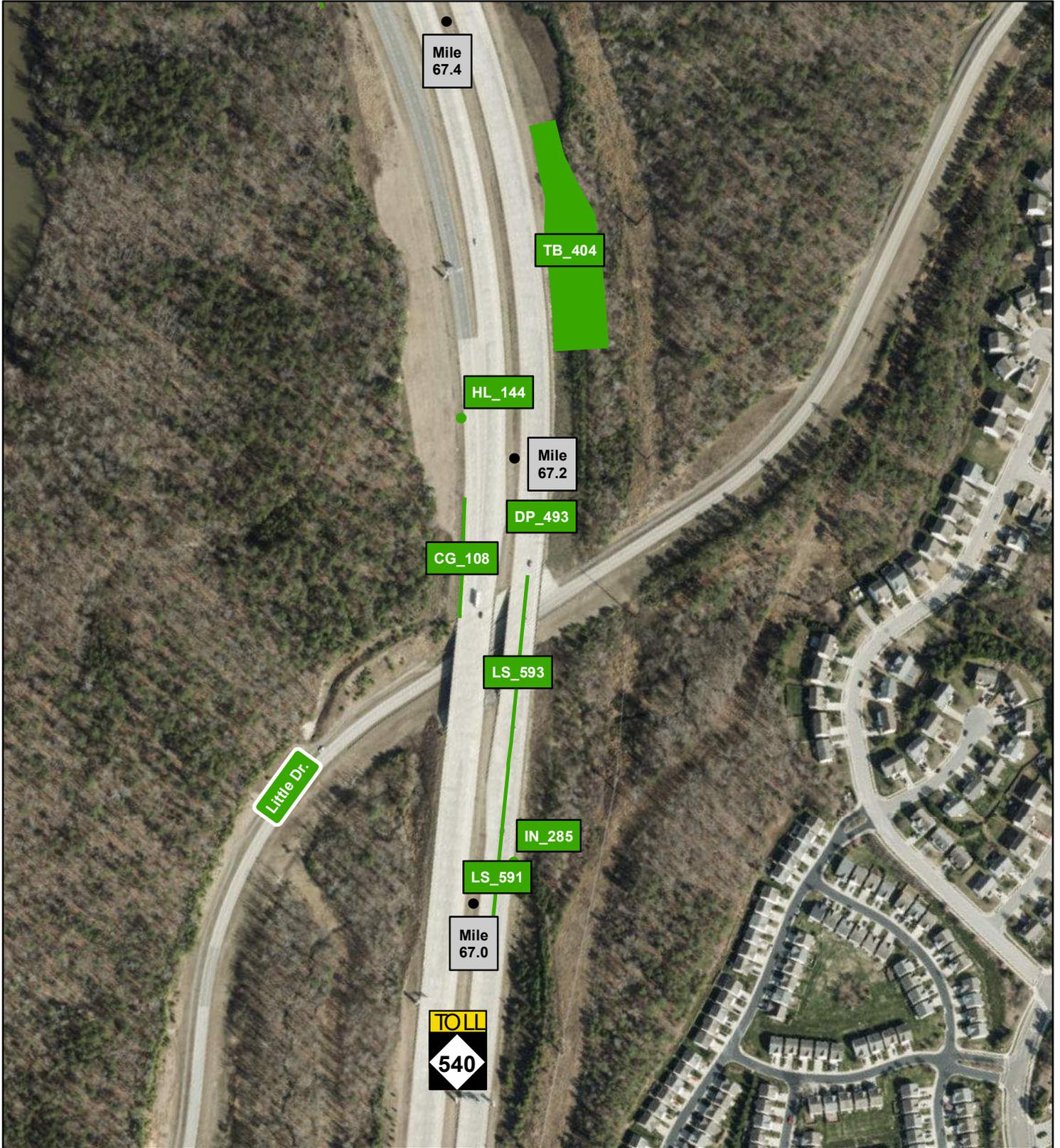






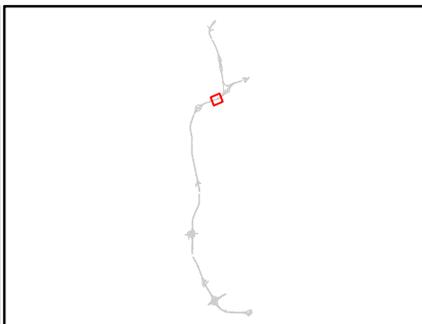
A4

# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

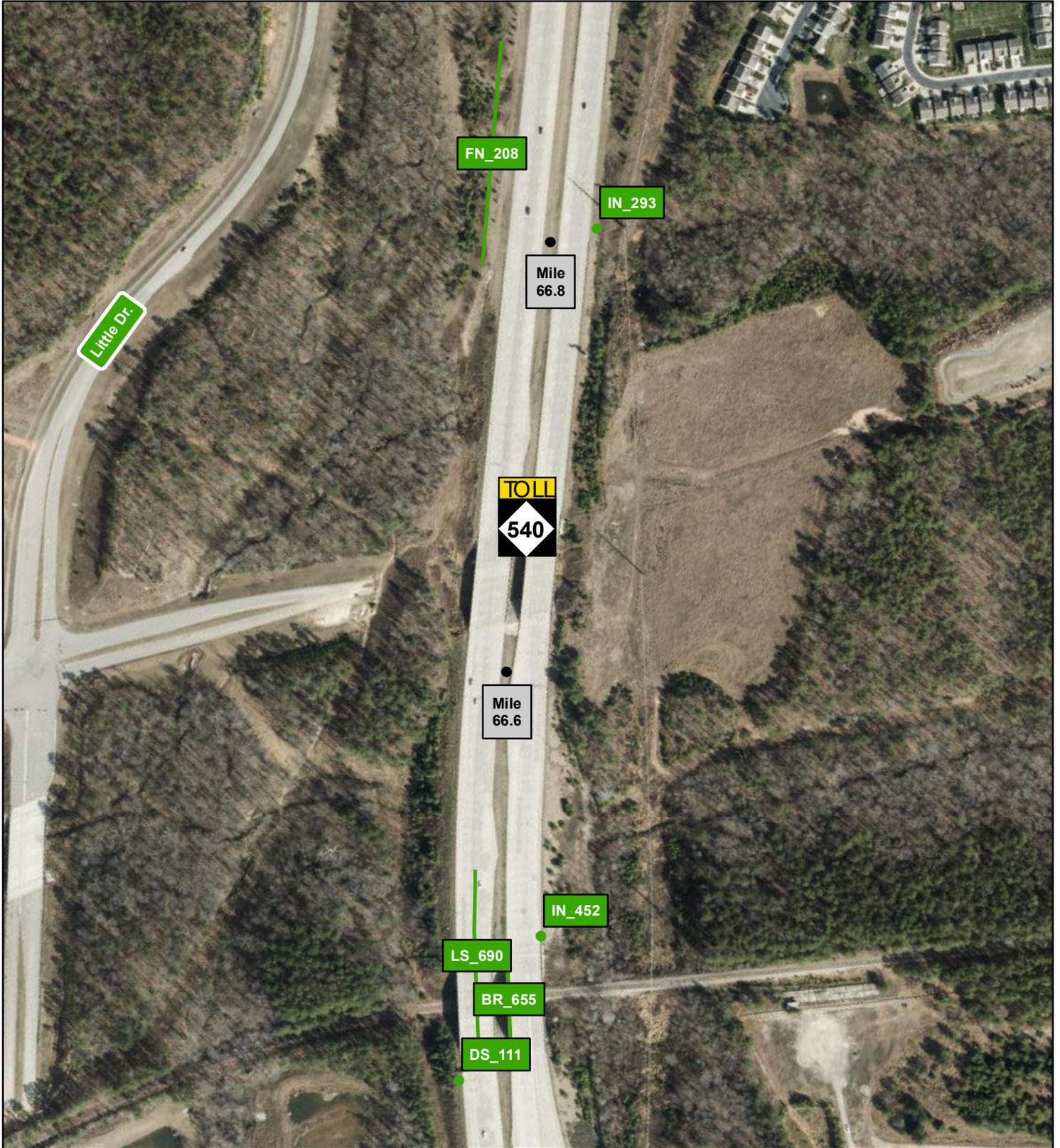


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

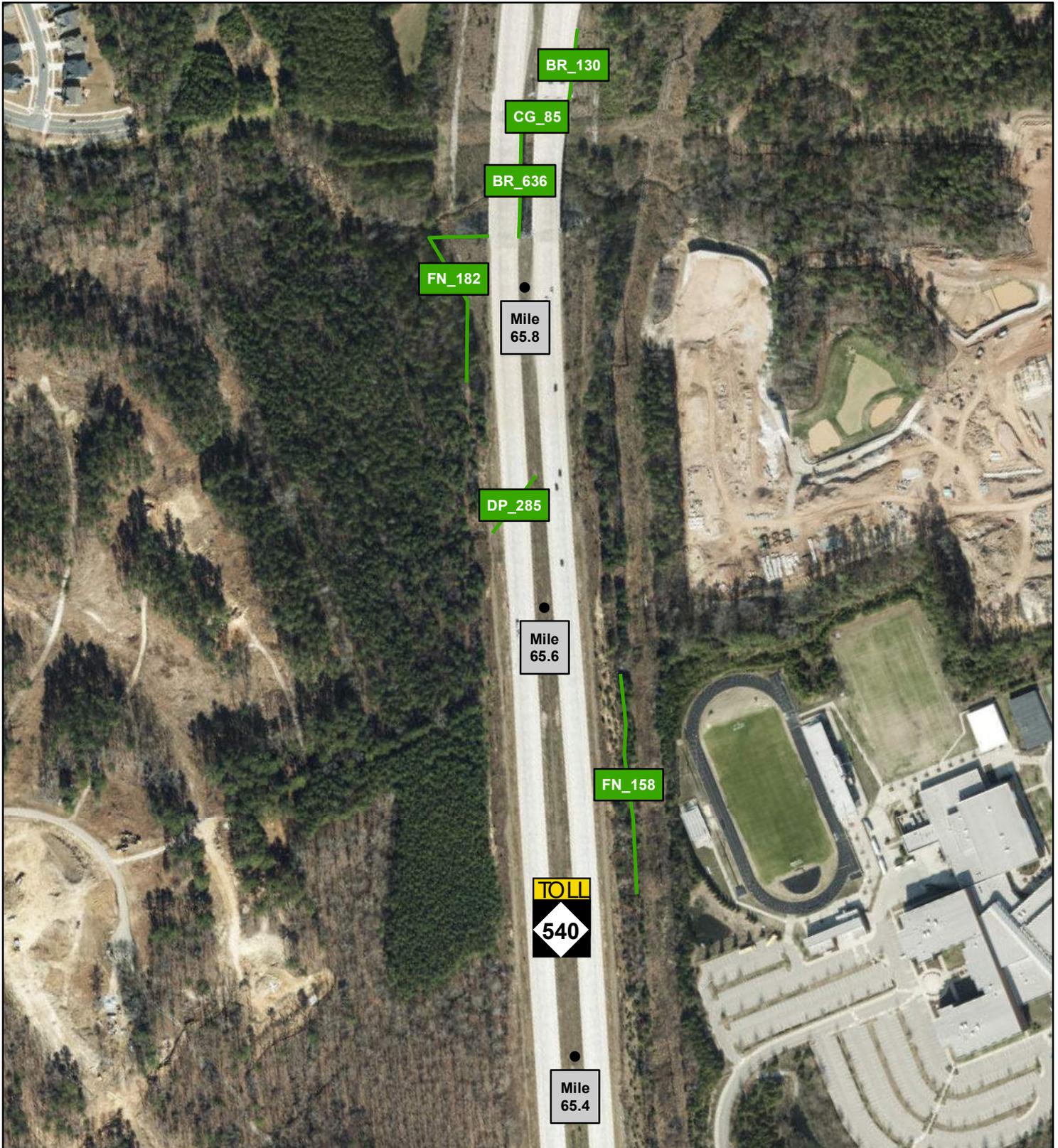


## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

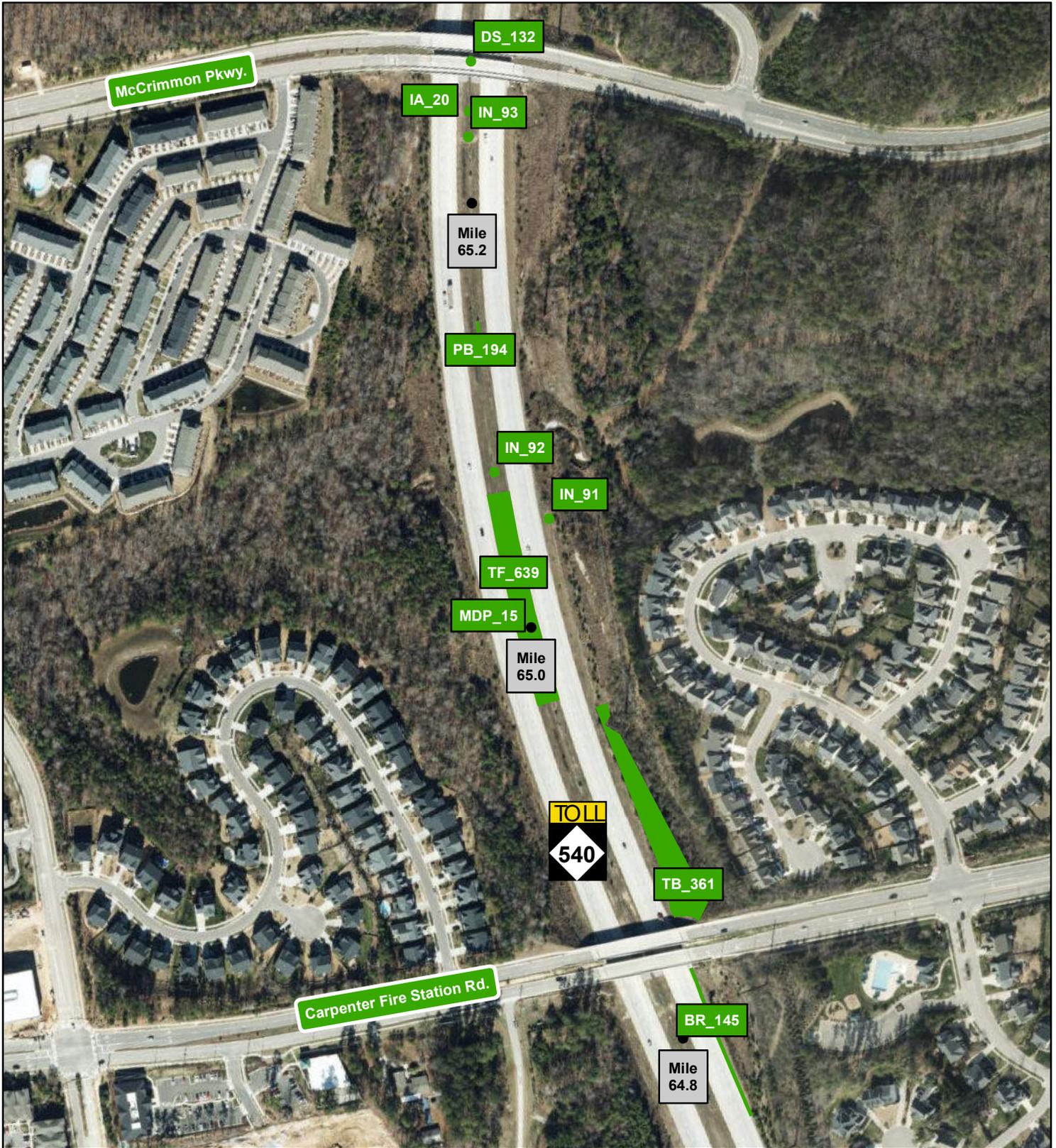


## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

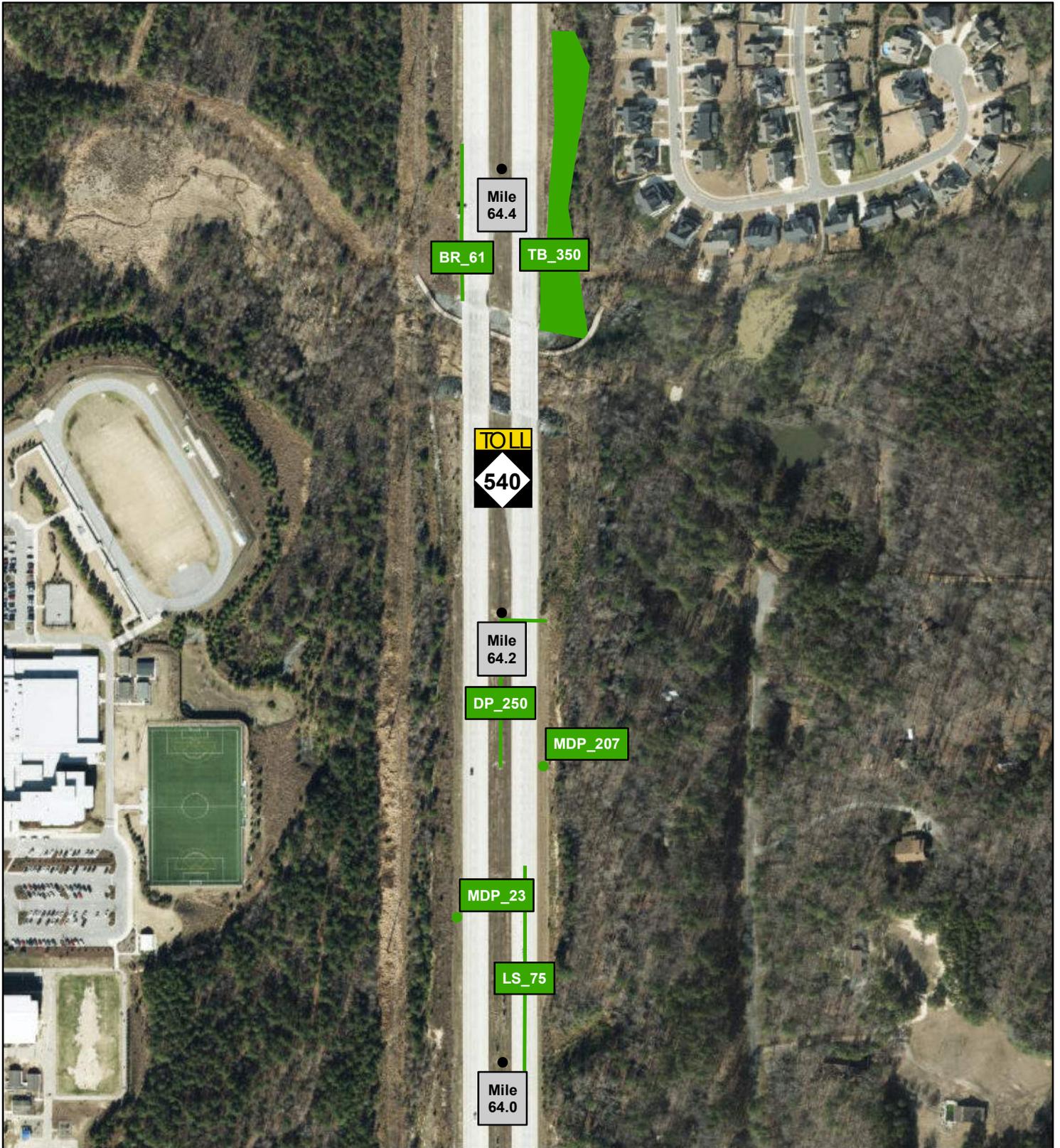


## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

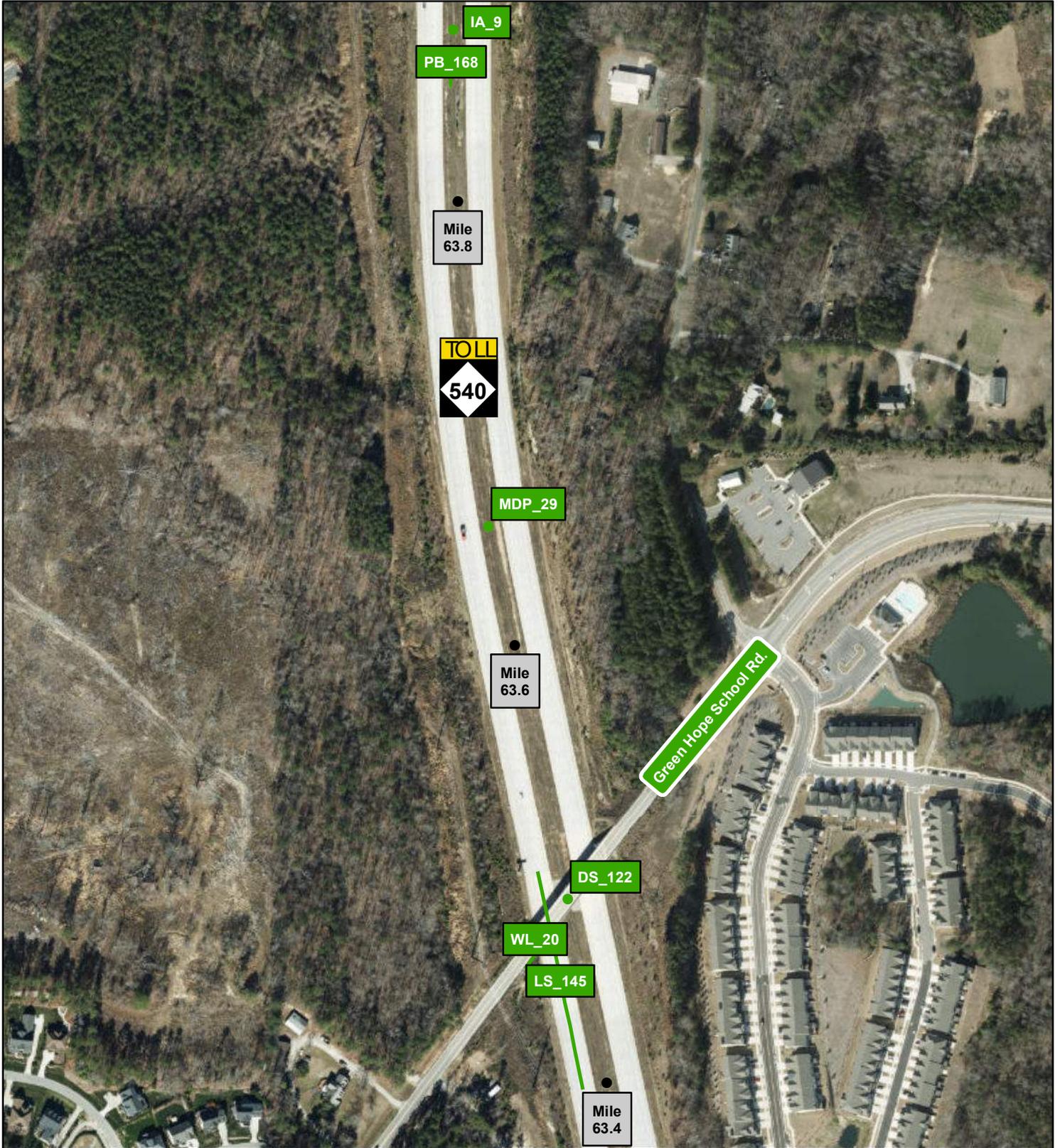


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

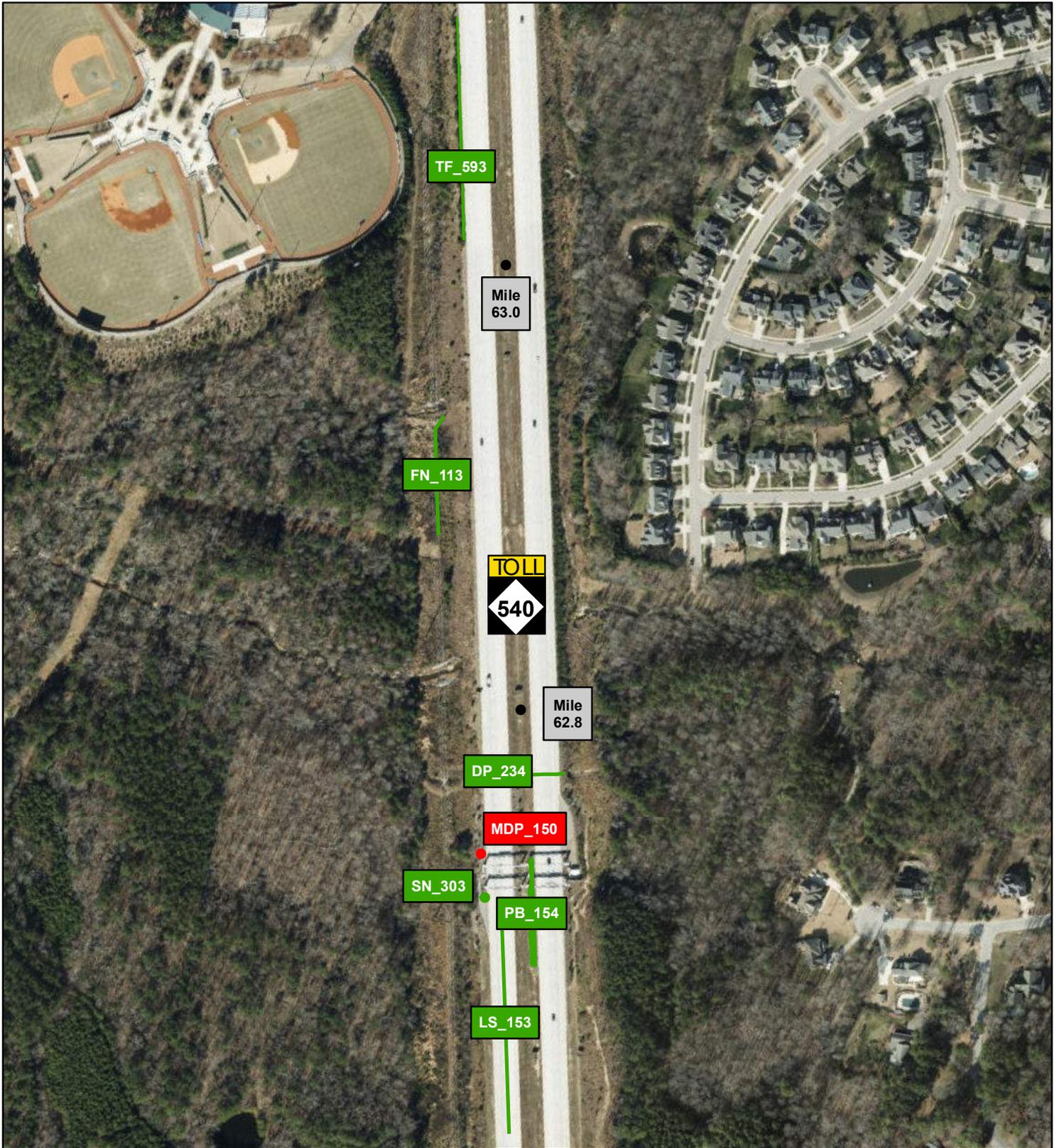


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

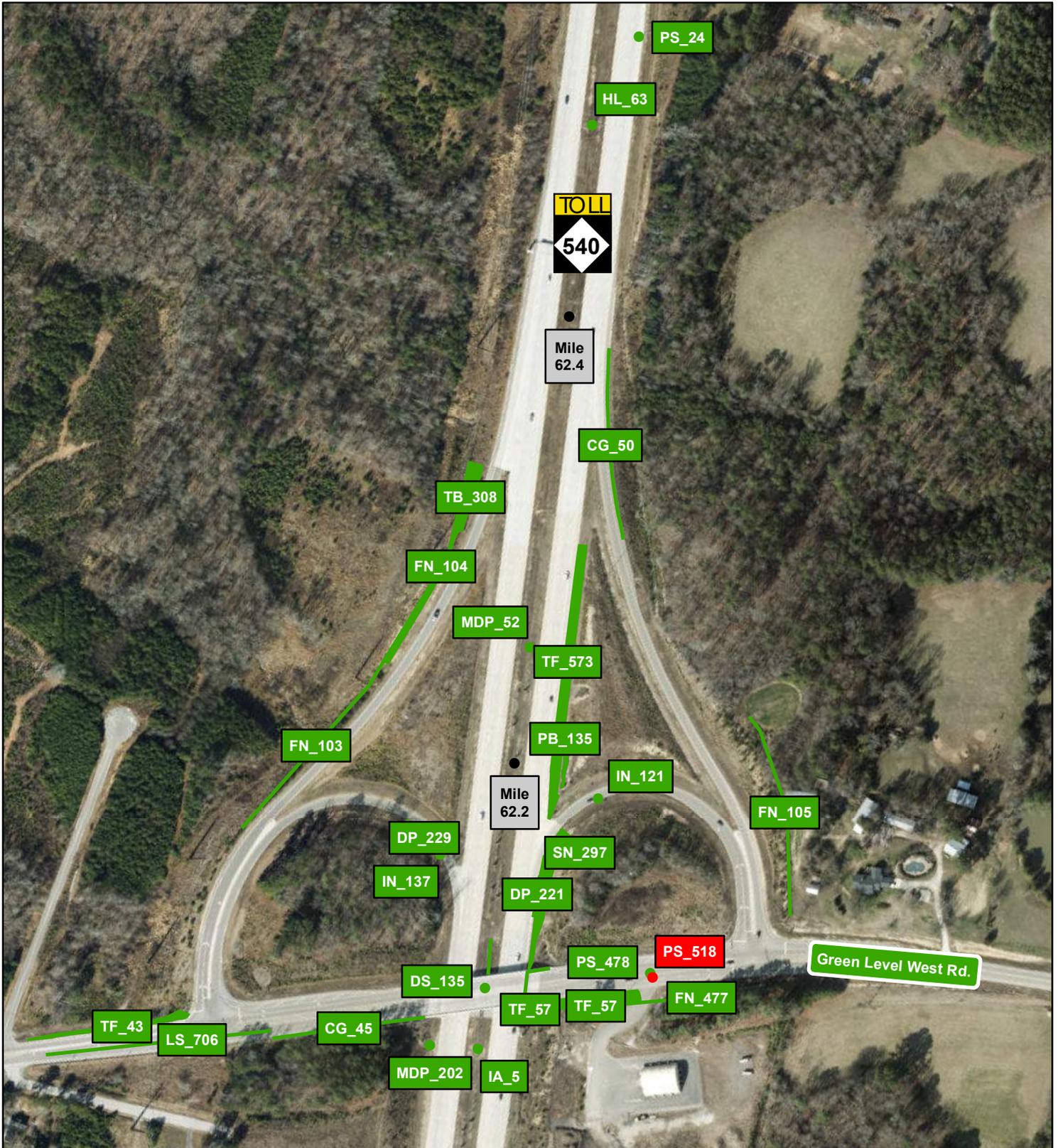


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

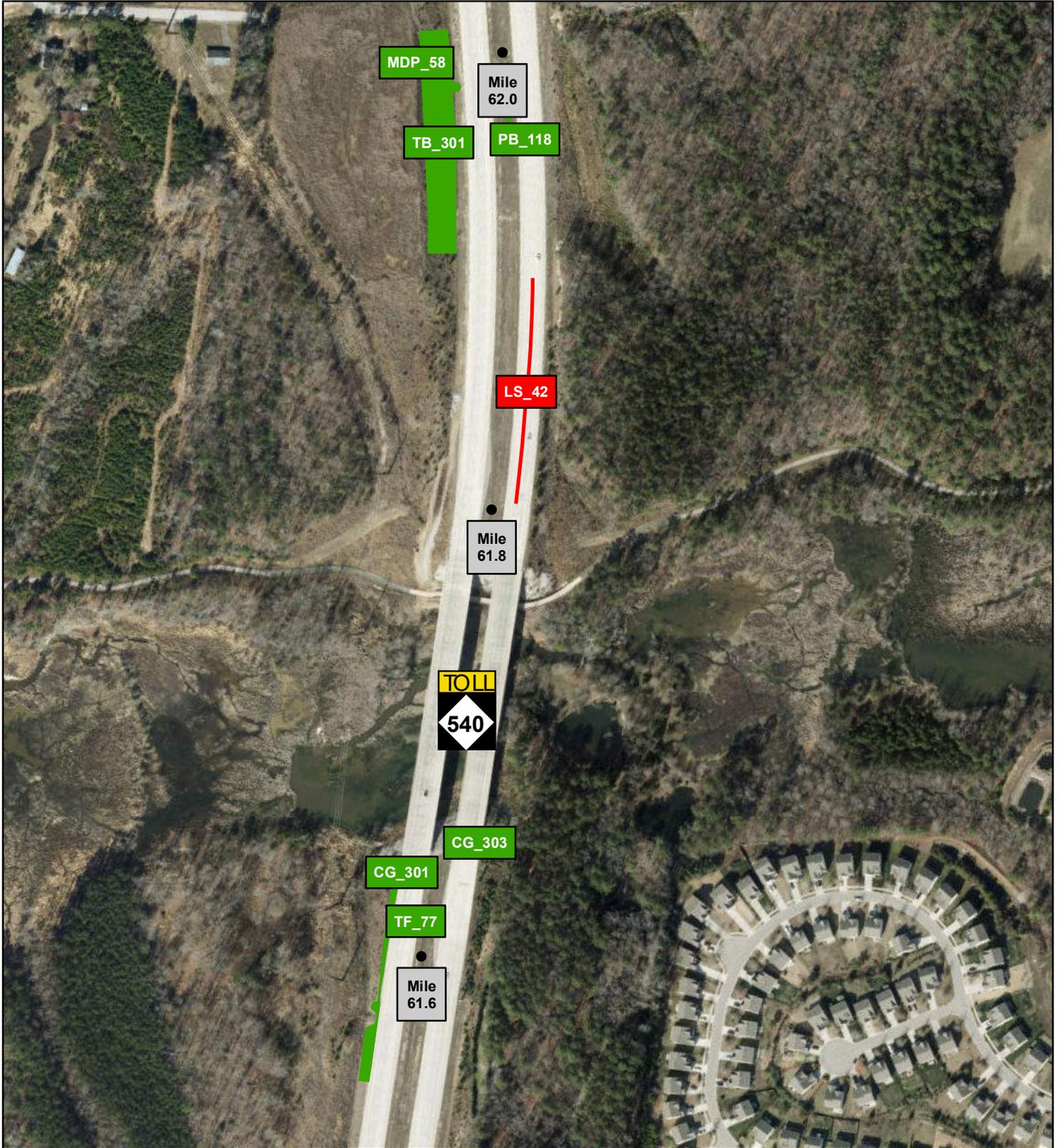


## Legend

- Failing Asset
- Passing Asset

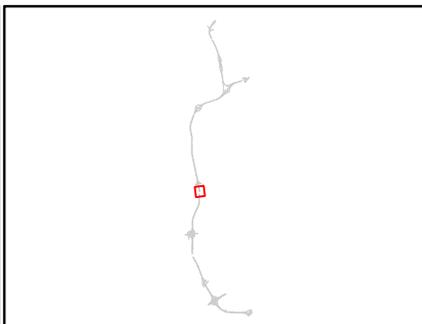


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

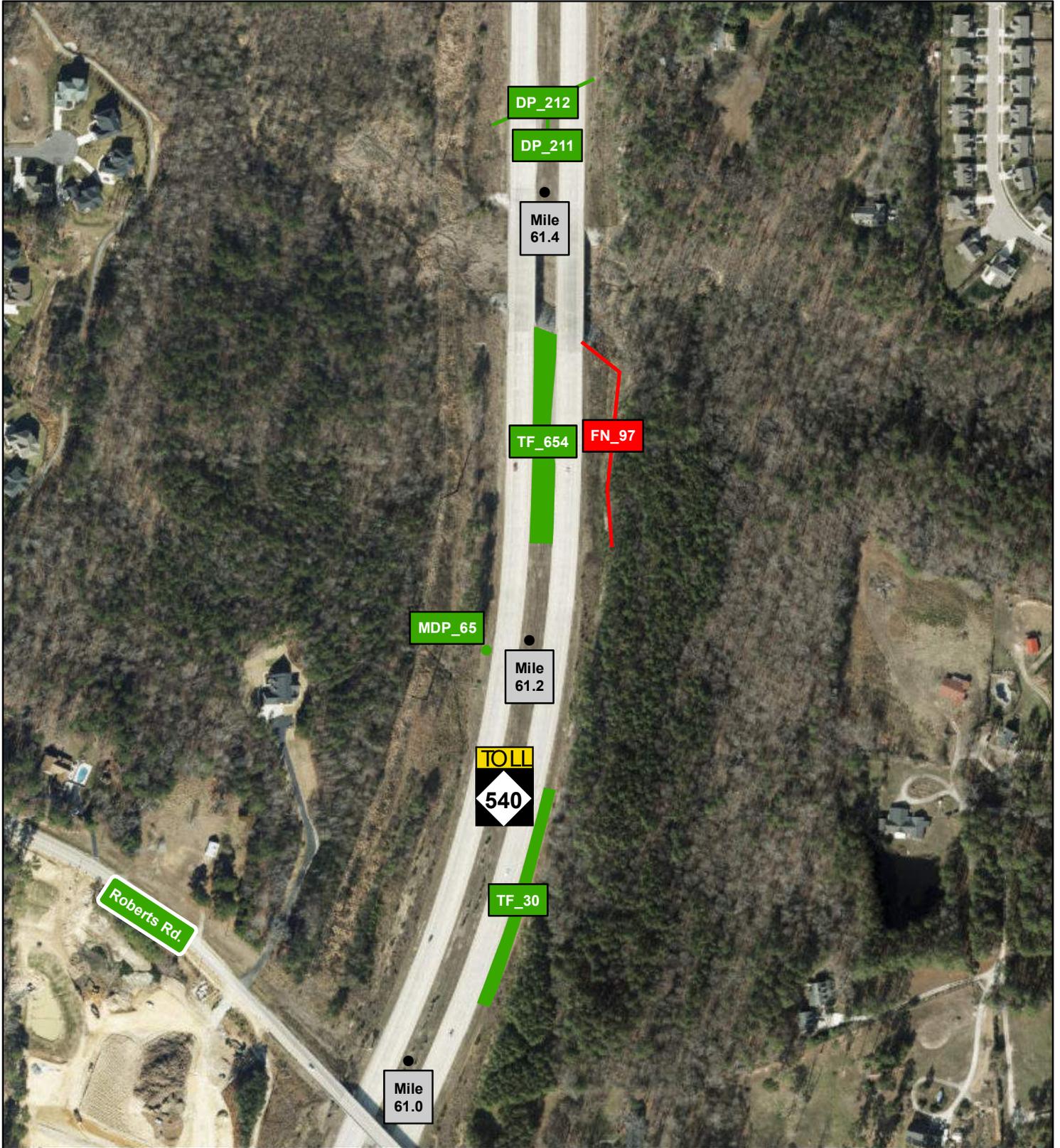


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset

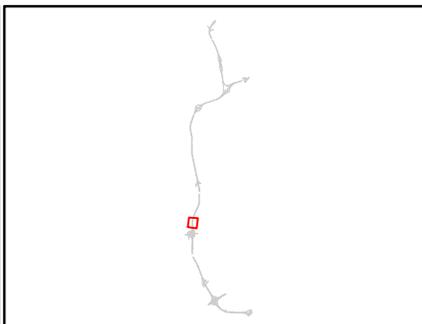


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

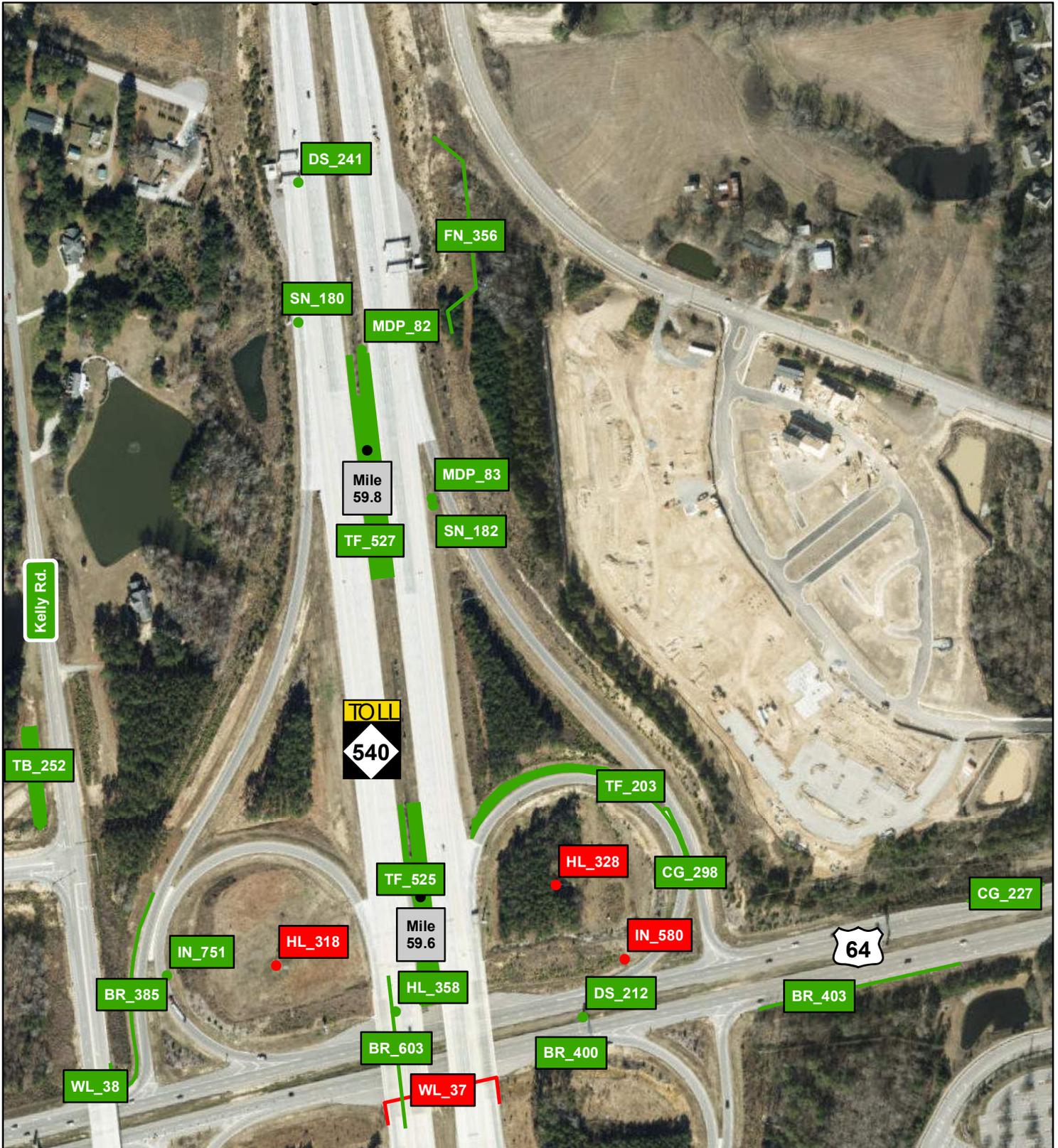


## Legend

-  Failing Asset
-  Passing Asset

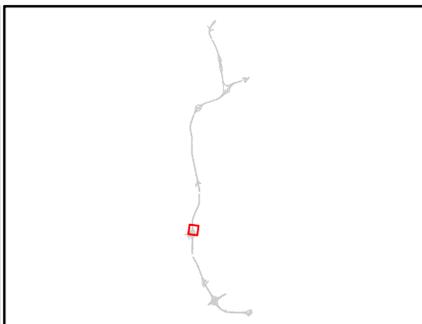


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

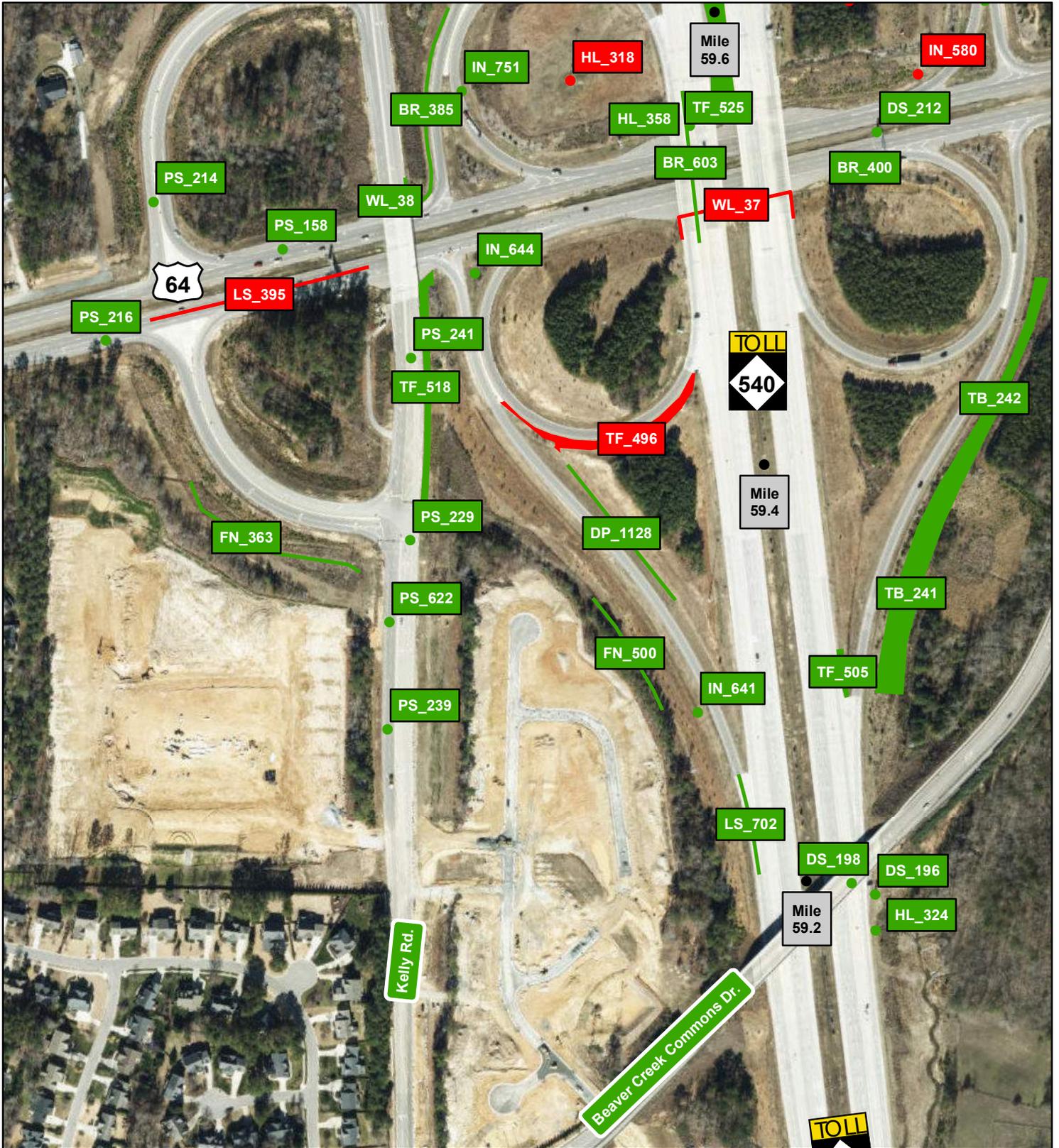


## Legend

- Failing Asset
- Passing Asset

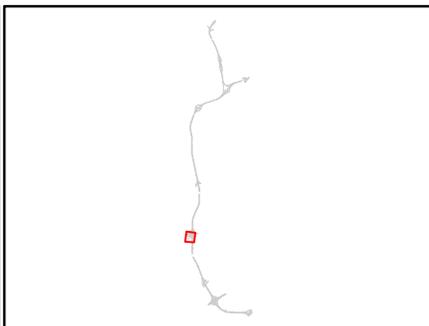


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

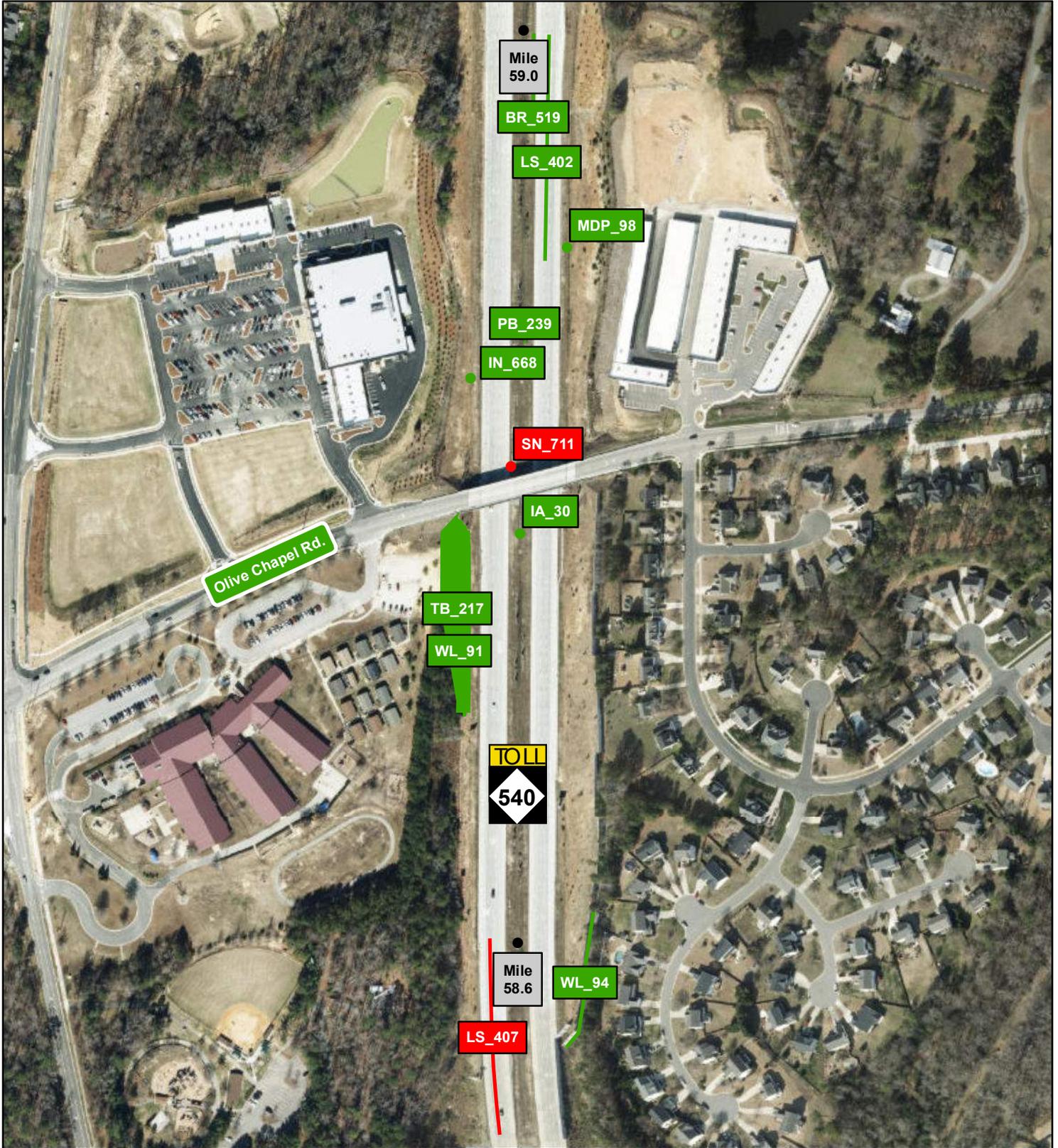


## Legend

- Failing Asset
- Passing Asset

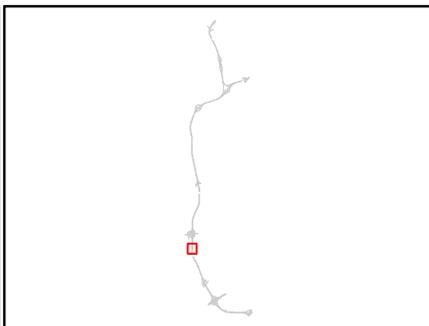


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

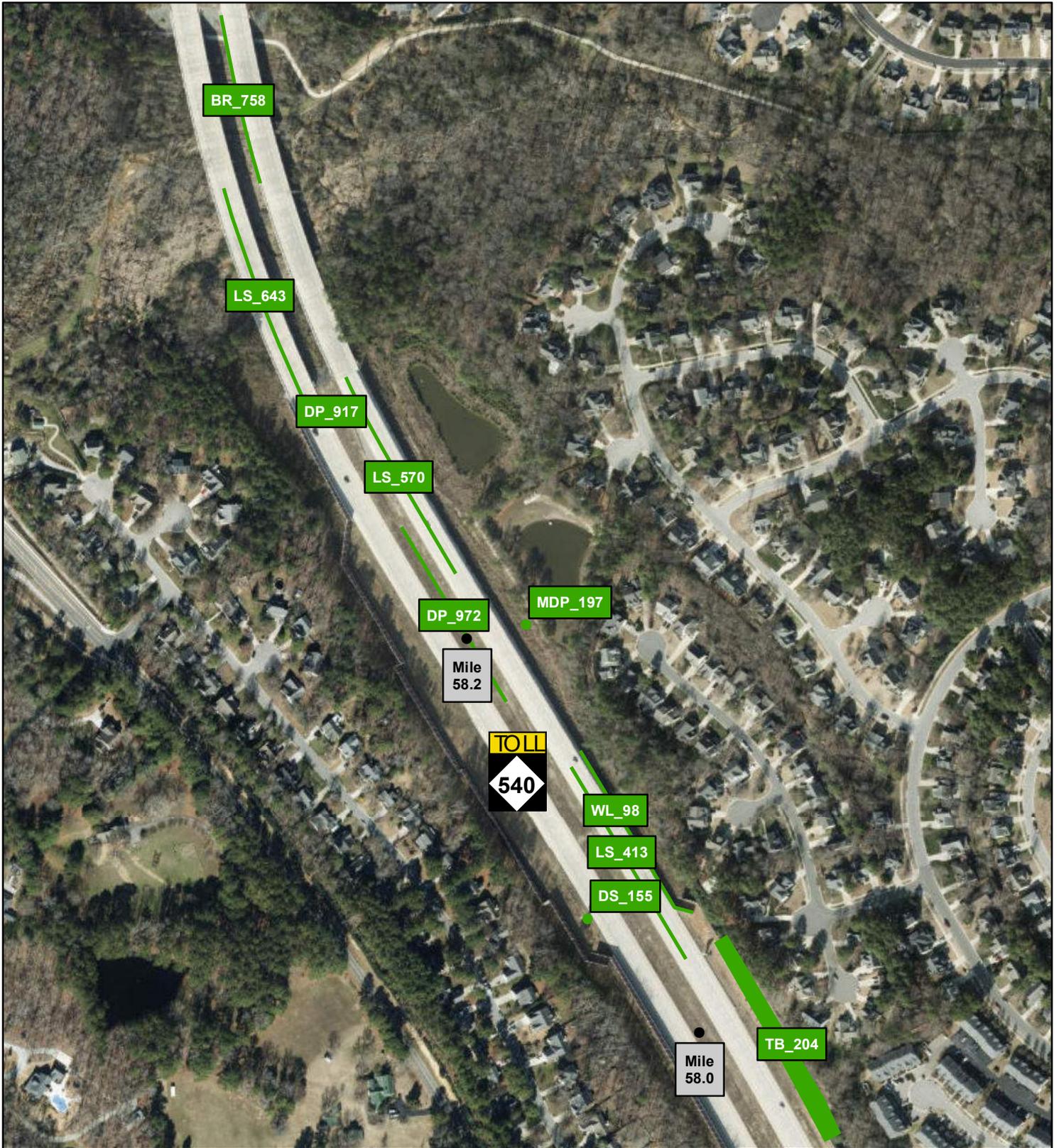


## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

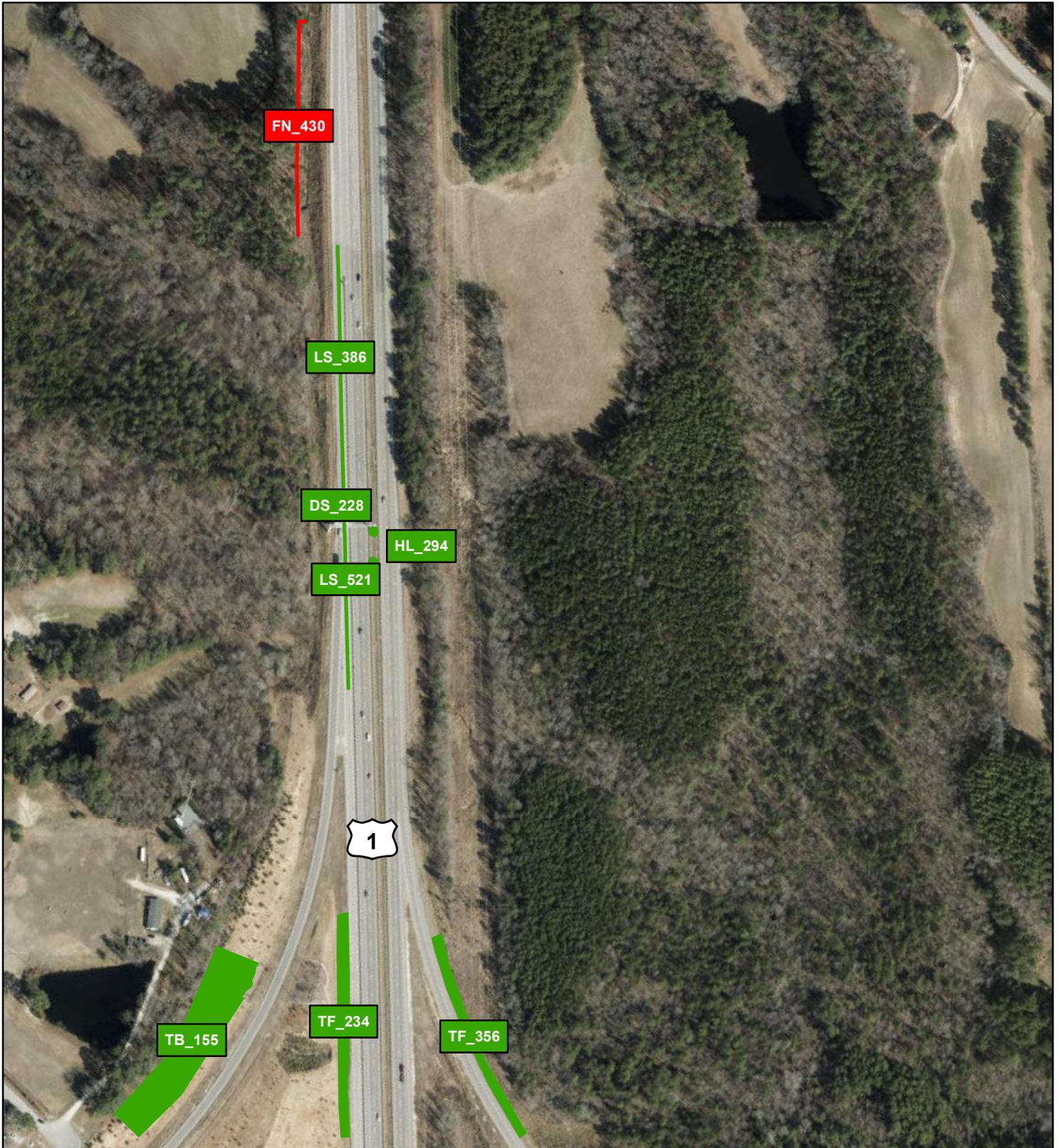


## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

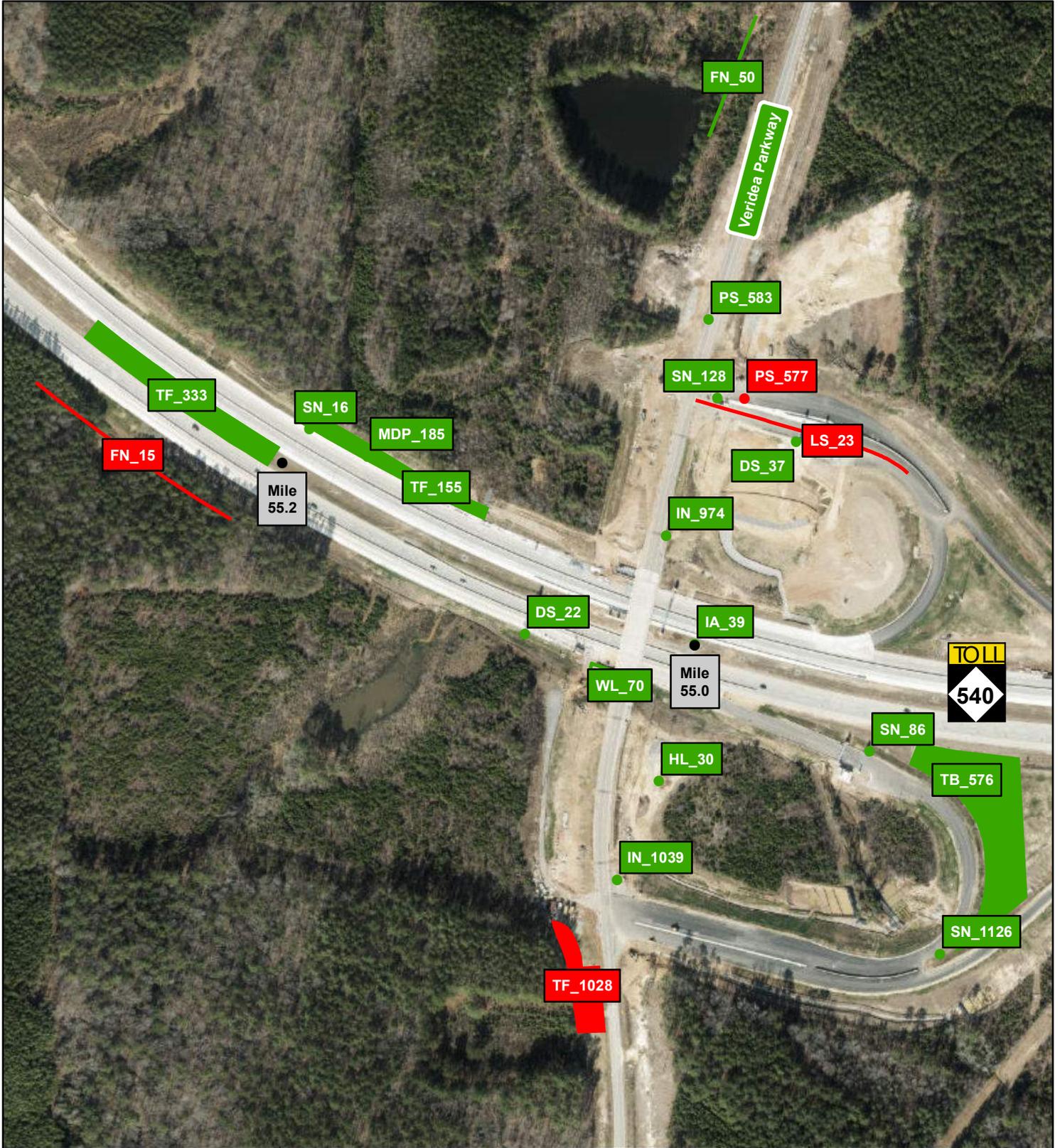


## Legend

-  Failing Asset
-  Passing Asset

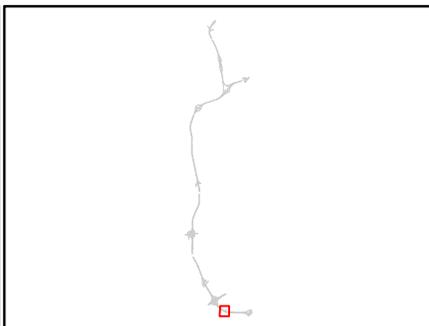


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

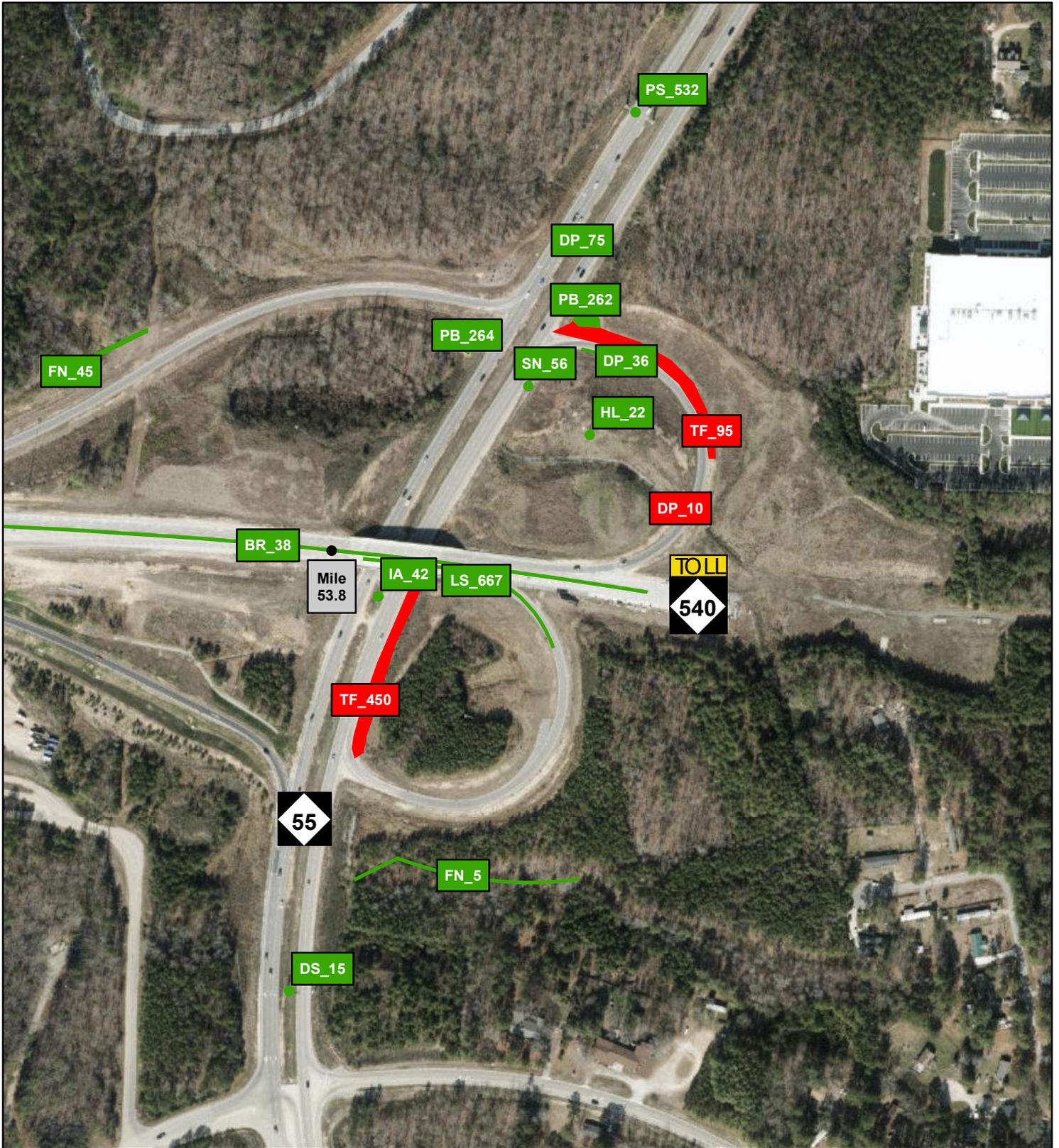


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

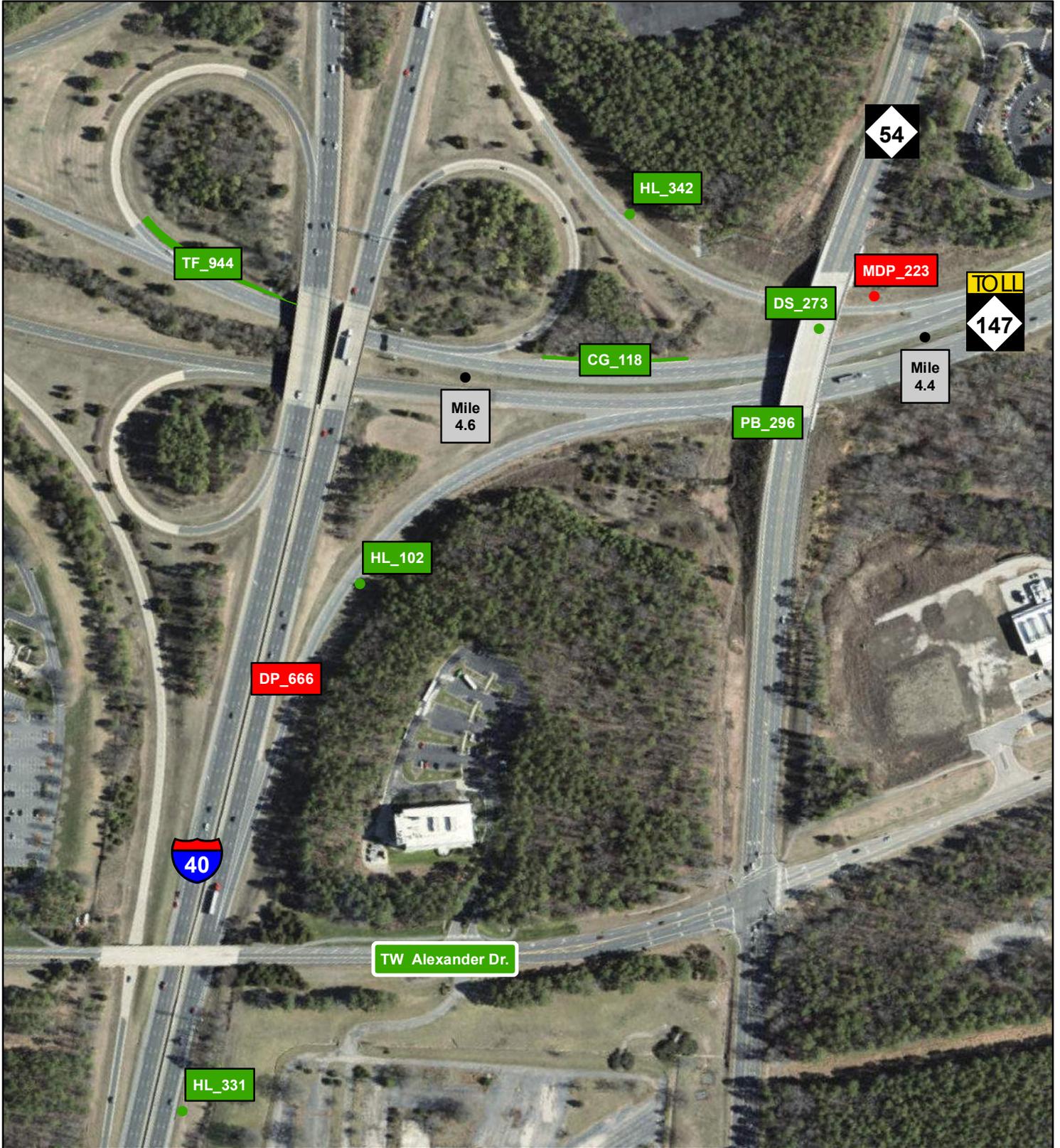


## Legend

- Failing Asset
- Passing Asset

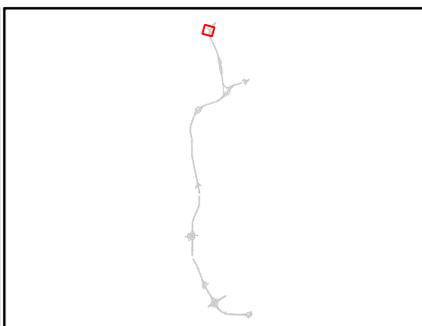


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

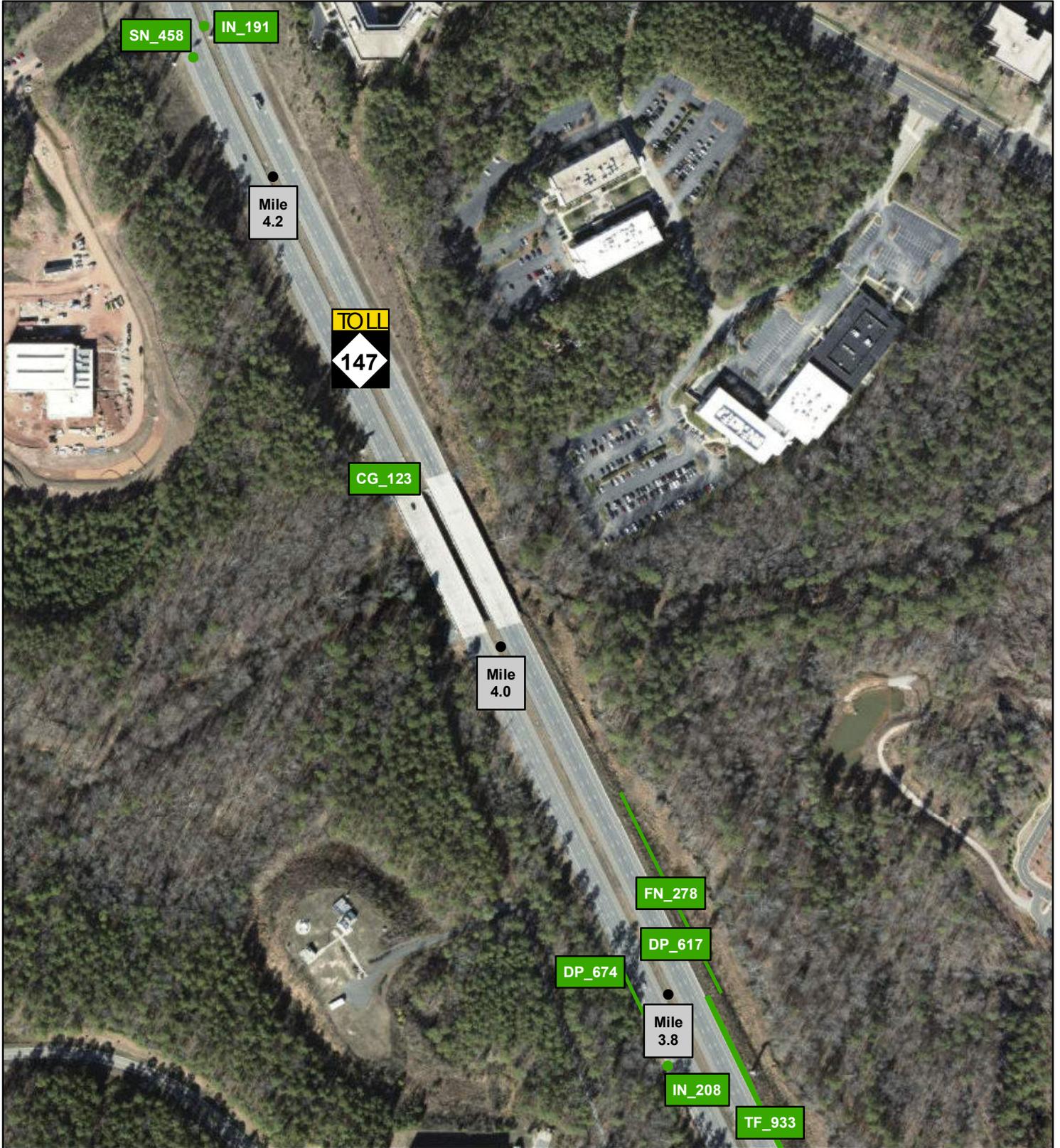


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

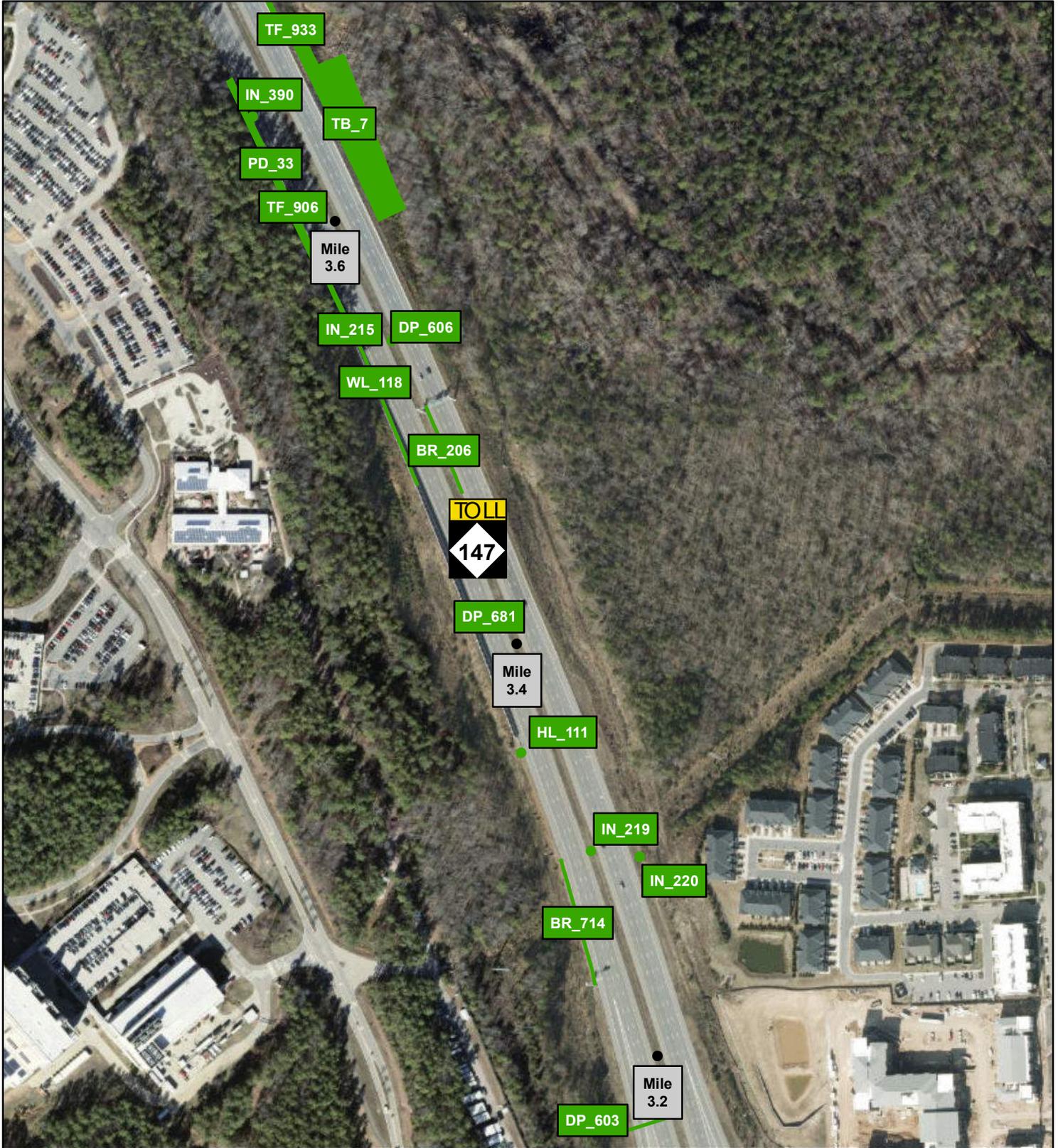


## Legend

-  Failing Asset
-  Passing Asset



# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations

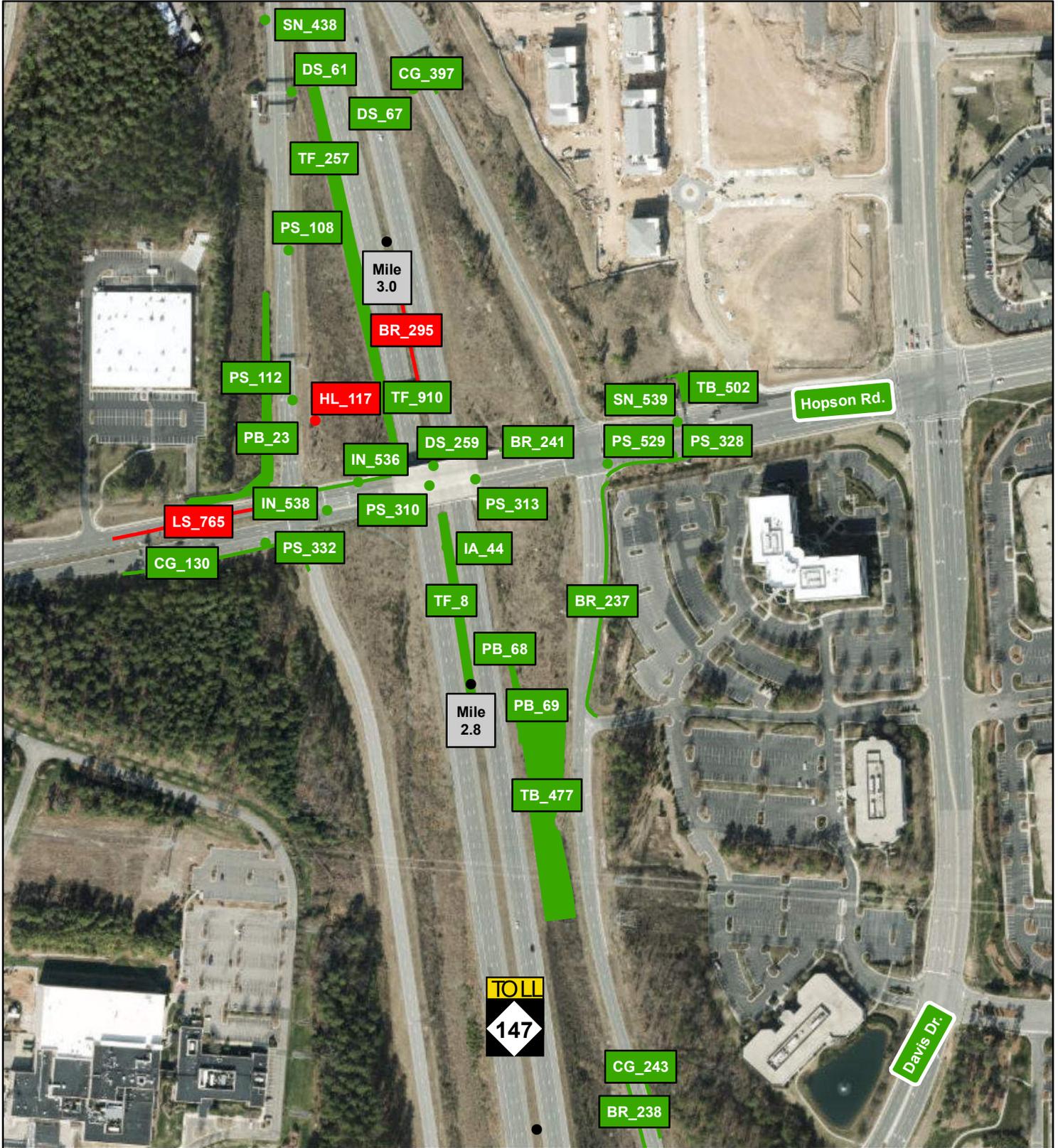


## Legend

- Failing Asset
- Passing Asset

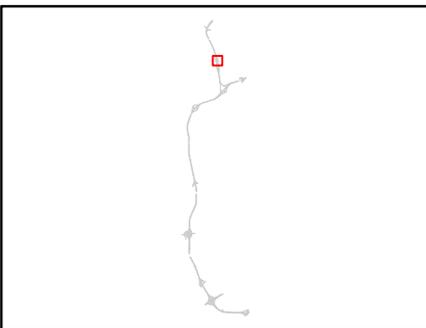


# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

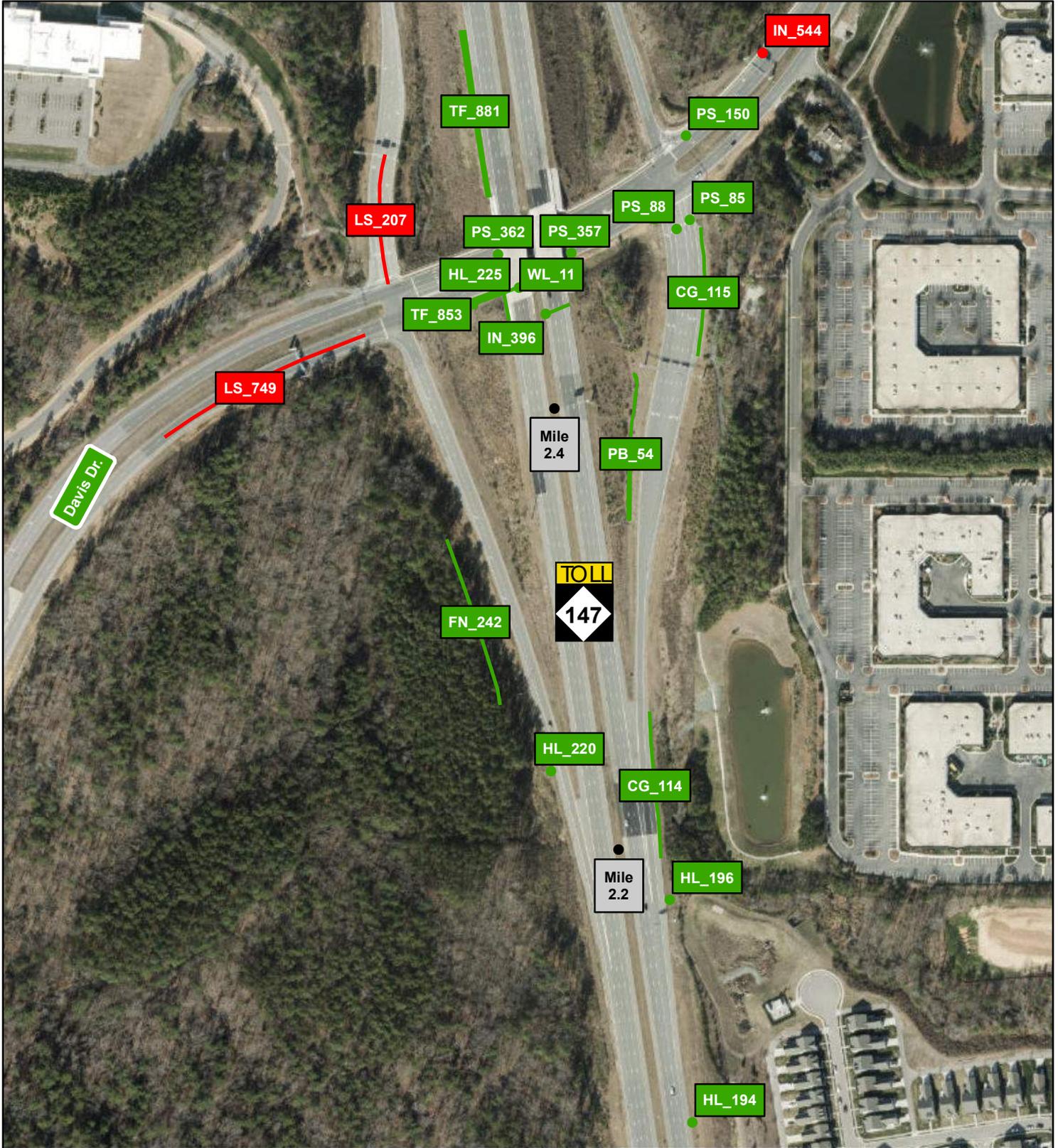
- Failing Asset
- Passing Asset



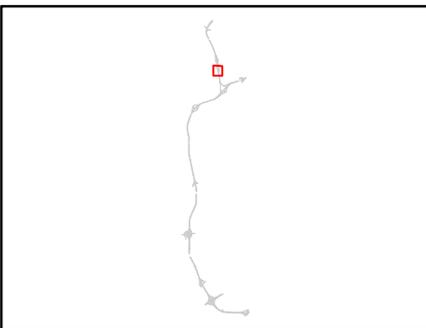

A34

# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

- Failing Asset
- Passing Asset

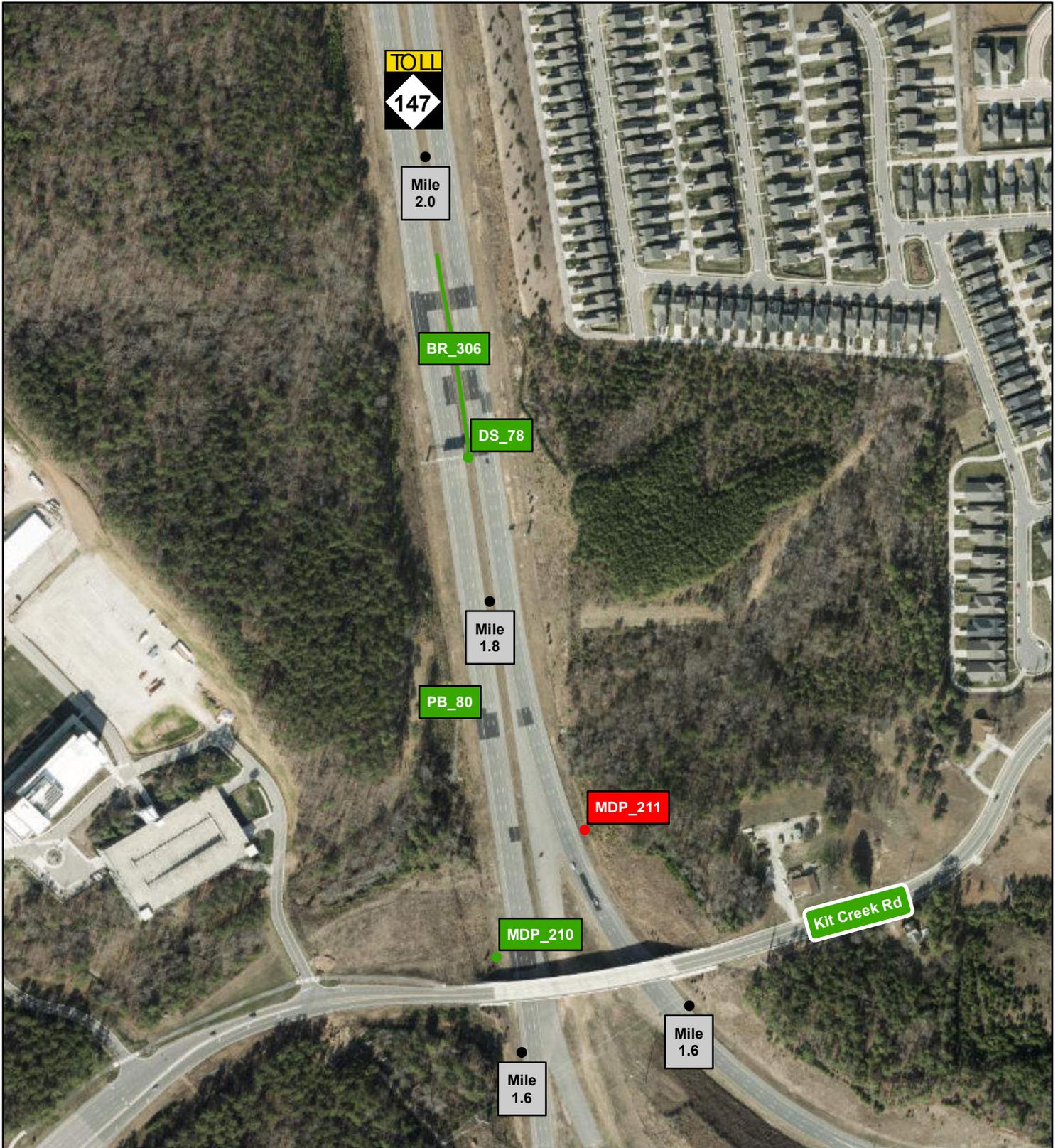



NORTH CAROLINA  
**Turnpike Authority**

A35

# Appendix A: Triangle Expressway 2020 First Quarter Asset Assessment Locations



## Legend

-  Failing Asset
-  Passing Asset



## **Appendix B**

**Triangle Expressway 2020 First Quarter Table Results of Assets Failing MRP**

## Appendix B: Triangle Expressway 2020 First Quarter Table Results of Assets Failing MRP

Provided below are a series of tables outlining the existing failures that occurred throughout the facility. Assets are defined by an Inventory ID, which is a unique identifier given to each individual asset. The components that make up the Inventory ID are an asset specific prefix along with a number, such as LS\_1. The Inventory ID and GIS Reference Page number correspond to the provided map packets and allow for quick location of particular asset failures. Photos of failures were provided when applicable.

All assets and their respective prefixes are listed below:

• Guardrail, Concrete Barrier and End Anchors (BR) .....	1
• Curb and Gutter (CG).....	2
• Decorative Supports (DS) .....	3
• Drainage Pipes (DP) .....	4
• Misc. Drainage Structure (MDP).....	5
• Fence and Control of Access (FN).....	7
• Graffiti (GR).....	8
• Highway Lighting (HL).....	9
• Impact Attenuators (IA).....	11
• Inlets (IN) .....	12
• Landscaping (PB).....	13
• Linear Sample (LS) .....	14
○ Paved Lanes – Asphalt (LS).....	14
○ Paved Lanes – Concrete (LS) .....	14
○ Paved Shoulders (LS).....	15
○ Unpaved Shoulders (LS) .....	15
○ Front/Back Slopes (LS).....	15
○ Unpaved Lateral and Outfall Ditches (LS) .....	15
○ Litter (LS) .....	16
○ Litter (LS) .....	17
○ Roadway Sweeping (LS) .....	17
○ Pavement Striping (LS) .....	18
○ Pavement Markers (LS).....	19
○ Delineators (LS) .....	19
• Paved Ditches (PD) .....	20
• Pavement Words and Symbols (PS) .....	21
• Signs (SN) .....	22
• Tree and Brush (TB).....	23
• Turf Condition (TF).....	24
• MSE/Retaining Walls, Sound Barrier Walls and Screen Walls (WL) .....	26

## Guardrail, Concrete Barrier and End Anchors (BR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Cable Guardrail	BR_295	Functional Damage		A34

**Curb and Gutter (CG)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Decorative Supports (DS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Drainage Pipes (DP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Drainage Pipe	DP_10	Obstruction		A30
2	Drainage Pipe	DP_666	Erosion		A31
3	Drainage Pipe	DP_758	Obstruction		A25

### Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_150	Obstruction		A12
2	Shoulder Drain	MDP_165	End Damage – Build Up		A29
3	Shoulder Drain	MDP_189	Rodent Screen		A25
4	Shoulder Drain	MDP_211	Rodent Screen		A3, A36

### Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Shoulder Drain	MDP_223	End Damage – Build Up		A31

## Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_15	Fence Height		A27
2	Woven	FN_97	Fence Height		A15
3	Woven	FN_430	Fence Height		A26

**Graffiti (GR)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Highway Lighting (HL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	High Mast	HL_14	Part Damage, Missing Part		A25
2	Double Roadway	HL_117	Rodent Screen		A34
3	Single Roadway	HL_163	Pole Damage		A3
4	Double Roadway	HL_168	Part Damage, Missing Parts		A2

**Highway Lighting (HL)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	High Mast	HL_318	Part Damage		A18, A19
6	High Mast	HL_328	Part Damage		A18

**Impact Attenuators (IA)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Inlets (IN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Inlet	IN_544	Obstruction		A35
2	Inlet	IN_580	Obstruction / Eroded Area		A18, A19
3	Inlet	IN_914	Eroded Area		A29

**Landscaping (PB)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Linear Sample (LS)

### Paved Lanes – Asphalt (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_207	Unsealed Cracks		A35
2	Asphalt	LS_765	Unsealed Cracks		A34

### Paved Lanes – Concrete (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

### Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_489	Unsealed Cracks		A23

### Unpaved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_472	Elevation Deviation		A28

### Front/Back Slopes (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

### Unpaved Lateral and Outfall Ditches (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

**Litter (LS)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_42	Litter		A14
2	Asphalt	LS_395	Litter		A19
3	Concrete	LS_407	Litter		A20
4	Concrete	LS_472	Litter		A28

### Litter (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Concrete	LS_490	Litter		A23

### Roadway Sweeping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

### Pavement Striping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_23	Nighttime Reflectivity	Not Available for Nighttime Failure	A27
2	Concrete	LS_42	Line Width		A14
3	Asphalt	LS_207	Line Missing		A35
4	Asphalt	LS_733	Line Missing		A1

### Pavement Markers (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_207	Reflective Marker Missing & Nighttime Reflectivity		A35
2	Asphalt	LS_749	Nighttime Reflectivity	Not Available for Nighttime Failure	A35

### Delineators (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

**Paved Ditches (PD)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Pavement Words and Symbols (PS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Left Turn	PS_406	Nighttime Reflectivity	Not Available for Nighttime Failure	A1
2	Thru Arrow	PS_412	Nighttime Reflectivity		A1
3	Thru Arrow	PS_518	Nighttime Reflectivity	Not Available for Nighttime Failure	A13
4	Left Turn	PS_577	Nighttime Reflectivity		A27

## Signs (SN)

#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	NC Route	SN_334	Height Requirement		A7
2	Mile Post	SN_711	Lateral Clearance		A20

**Tree and Brush (TB)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
This asset did not produce any failures.					

## Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Turf	TF_235	Bare Ground		A24
2	Turf	TF_340	Bare Ground		A25
3	Turf	TF_450	Bare Ground		A30
4	Turf	TF_496	Bare Ground		A19

**Turf Condition (TF)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Turf	TF_1028	Bare Ground		A27

**MSE/Retaining Walls, Sound Barrier Walls and Screen Walls (WL)**

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Sound Wall	WL_37	Unsealed Crack		A18, A19