NORTH CAROLINA
Turnpike Authority

Maintenance Rating Program

Triangle Expressway

2015 Second Quarter Report

1 S. Wilmington Street
Raleigh, NC 27601

Last Updated:
August 5, 2015

CONSULTANT CERTIFICATION OF COMPLETION

July 22, 2015

Mr. Andy Lelewski, PE
NCTA Director of Toll Road Operations
1 South Wilmington Street
Raleigh, NC 27601

NCTA Triangle Expressway Roadway and Facility Maintenance Performance Rating Program

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company Asset Management Associates, PLLC, 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,

Ken M. McEntire, PE

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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 2015 Second Quarter Assessment of the Triangle Expressway.

The overall 2015 second quarter maintenance rating of the Triangle Expressway is 94.7, which is above the NCTA target rating of 90. As shown in **Table 1**, all elements assessed achieved a rating greater than the target rating of 85.

TABLE 1: MRP ELEMENT RESULTS FOR THE 2015 SECOND QUARTER ASSESSMENT

ELEMENT	MRP Rating	Target Rating
Road Surface	97.6	85
Unpaved Shoulders	96.6	85
Drainage	93.4	85
Roadside	86.6	85
Traffic Control Devices	96.8	85
Overall MRP Performance Rating	**94.7**	**90**

As part of the NCTA MRP, this report provides a rolling rating of the latest four quarterly inspections of the Triangle Expressway. The current rolling maintenance rating of the Triangle Expressway is 90.9.

TABLE 2: MRP ROLLING ELEMENT RESULTS

ELEMENT	Q3 2014 RATING	Q4 2014 RATING	Q1 2015 RATING	Q2 2015 RATING	ROLLING RATING
Road Surface	89.9	93.3	98.8	97.6	95.9
Unpaved Shoulders	92.9	94.6	100.0	96.6	96.7
Drainage	91.3	82.5	93.0	93.4	90.1
Roadside	87.6	83.2	88.1	86.6	86.5
Traffic Control Devices	85.0	82.1	84.4	96.8	87.2
Overall MRP Performance Rating	**88.6**	**86.8**	**92.0**	**94.7**	**90.9**

This report also provides the results from the quarterly facility maintenance services verification process. Currently all maintenance services are meeting contract expectations.

In addition, the report provides findings of the Green Level Historic District signs inspections. This quarter, all Green Level Historic District signs were found to be in good physical condition, and the landscaped areas around the signs were well maintained.

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 through the use of 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.

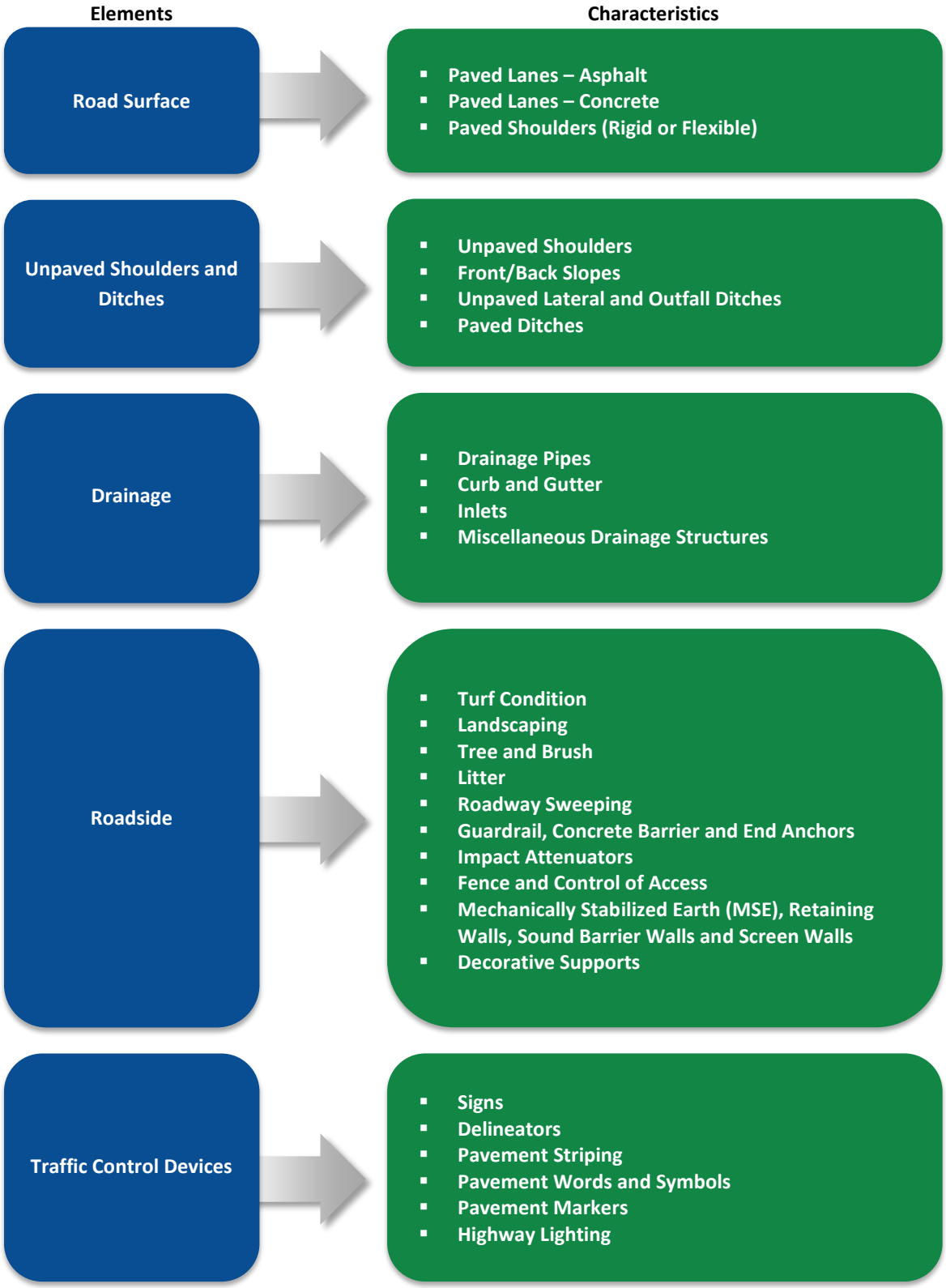
The NCTA performance standards, threshold criteria and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

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 V4*, 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



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 through the use of 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 V4*. 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 sample 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, a MRP rating of 83 signifies that 83 percent of the inspected elements/characteristics met the standard.

The overall MRP rating is determined by summing the elements MRP rating multiplied by the following weighted factors:

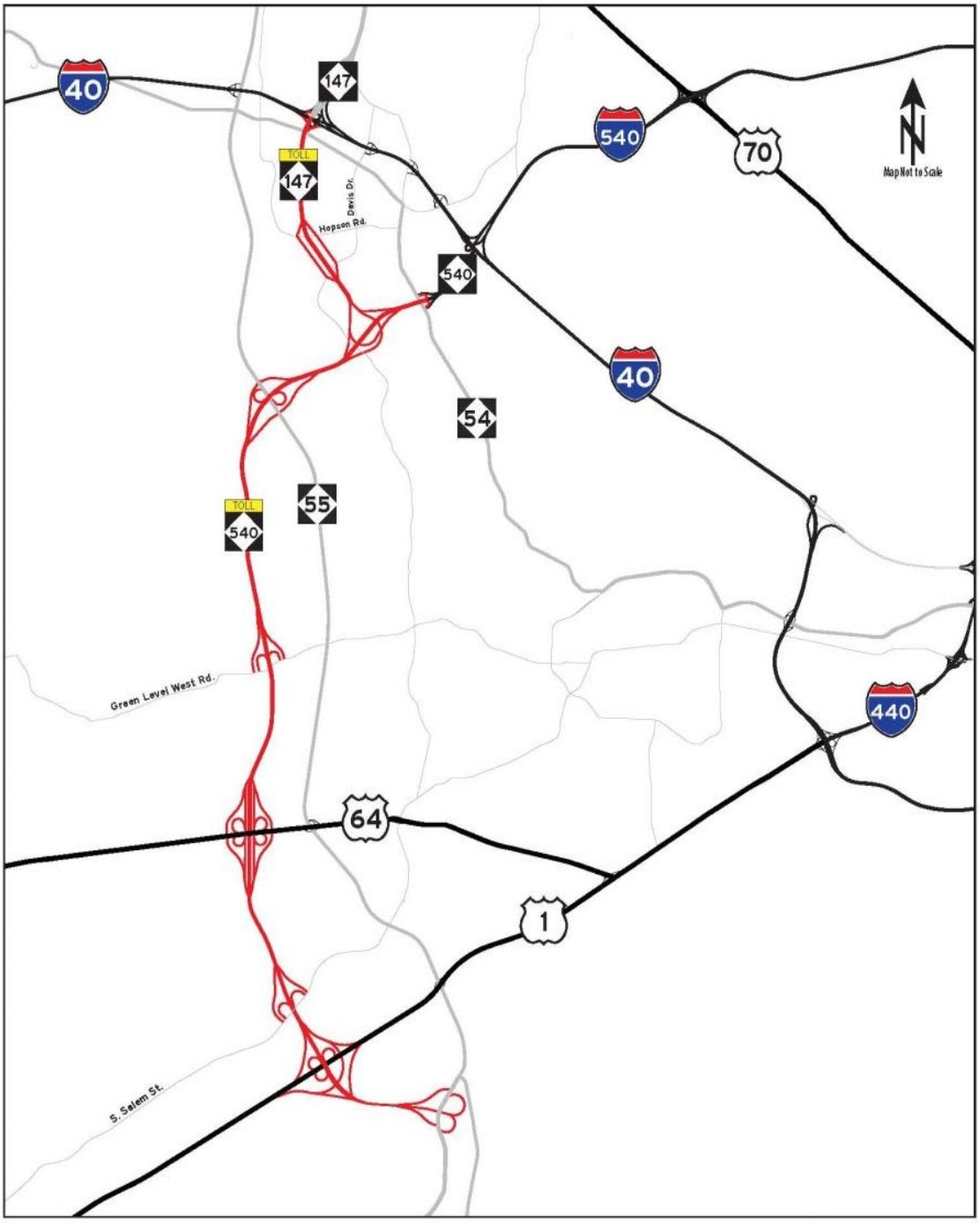
Road Surface =	**25%**
Unpaved Shoulders =	**13%**
Drainage =	**15%**
Roadside =	**17%**
Traffic Control Devices =	**30%**
Total	**100%**

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.

4.0 TRIANGLE EXPRESSWAY DESCRIPTION

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

Figure 2: Triangle Expressway Map



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 Maintenance and conducts routine field visits to maintain an accurate asset inventory and ensure the validity of the MRP.

Prior to the 2015 Second Quarter assessment, the inventory of delineators was updated based on existing delineators along barriers.

6.0 MRP ASSESSMENT

6.1 Quarterly Results

The overall 2015 second quarter maintenance rating of the Triangle Expressway is 94.7, and is above the overall target rating of 90. All element ratings are above the target rating of 85. Turf (50) is the only characteristic that scored below the target rating of 80. It is important to note that these results are only representative of the second quarter sample, one of the four surveys done throughout the year to provide an intermediate snapshot of seasonal conditions. Therefore, they are not a statistically valid representation of the assets; only the total of all 4 quarterly inspections reported at the end of each calendar year, will provide a 95% confidence level in statistical sampling. The MRP Performance characteristic rating for the 2015 second quarter assessments are found in ***Table 3.***

Additionally, ***Appendix A*** shows maps of all the assets that were assessed during the second quarter. ***Appendix B*** shows a list of the individual assets that failed the MRP.

TABLE 3: MRP CHARACTERISTIC RESULTS FOR Q2 2015						
ROAD SURFACE	**SAMPLE PASSED**	**SAMPLE TOTAL**	**WEIGHTED VALUES**	**ACTUAL PTS**	**AVAILABLE PTS**	**Q2 2015 MRP RATING**
Paved Lanes Asphalt	29	29	9	261	261	100
Paved Lanes Concrete	30	30	9	270	270	100
Paved Shoulder	55	59	5	275	295	93
Element Total				**806**	**826**	**97.6**
UNPAVED SHOULDERS AND DITCHES	**SAMPLE PASSED**	**SAMPLE TOTAL**	**WEIGHTED VALUES**	**ACTUAL PTS**	**AVAILABLE PTS**	**Q2 2015 MRP RATING**
Unpaved Shoulder	57	59	9	513	531	97
Front/Back Slopes	56	59	6	336	354	95
Lateral and Outfall	58	59	6	348	354	98
Ditches, Paved	2	2	5	10	10	100
Element Total				**1207**	**1249**	**96.6**
DRAINAGE	**SAMPLE PASSED**	**SAMPLE TOTAL**	**WEIGHTED VALUES**	**ACTUAL PTS**	**AVAILABLE PTS**	**Q2 2015 MRP RATING**
Drainage Pipes	30	34	7	210	238	88
Curb and Gutter	23	24	6	138	144	96
Inlets	32	33	7	224	231	97
Misc. Drainage Structure	30	32	4	120	128	94
Element Total				**692**	**741**	**93.4**
ROADSIDE	**SAMPLE PASSED**	**SAMPLE TOTAL**	**WEIGHTED VALUES**	**ACTUAL PTS**	**AVAILABLE PTS**	**Q2 2015 MRP RATING**
Turf Condition	37	74	7	259	518	50
Landscaping	29	32	4	116	128	91
Trees and Brush	31	31	4	124	124	100
Litter	59	59	4	236	236	100
Roadway Sweeping	58	59	5	290	295	98
Guardrail, Concrete	30	31	9	270	279	97
Impact Attenuators	9	9	9	81	81	100
Fence, Control Access	26	29	7	182	203	90
Retaining, Sound, Screen	18	19	5	90	95	95
Decorative Supports	25	25	5	125	125	100
Graffiti and Stain	59	59	4	236	236	100
Element Total				**2009**	**2320**	**86.6**
TRAFFIC CONTROL DEVICES	**SAMPLE PASSED**	**SAMPLE TOTAL**	**WEIGHTED VALUES**	**ACTUAL PTS**	**AVAILABLE PTS**	**Q2 2015 MRP RATING**
Signs	33	34	7	231	238	97
Delineators	41	41	3	123	123	100
Pavement Striping	57	59	8	456	472	97
Words and Symbols	30	30	7	210	210	100
Pavement Markers	56	59	9	504	531	95
Highway Lighting	26	27	6	156	162	96
Element Total				**1680**	**1736**	**96.8**

The overall MRP Performance element rating results for the second quarter is shown in ***Table 4:***

TABLE 4: MRP ELEMENT RESULTS FOR Q2 2015	
ELEMENT	**Q2 2015 MRP Rating**
Road Surface	97.6
Unpaved Shoulders	96.6
Drainage	93.4
Roadside	86.6
Traffic Control Devices	96.8
Overall MRP Performance Rating	**94.7**

6.2 Analysis and Recommendations

Elements

During the second quarter all elements exceeded NCTA's target threshold criteria of 85. This quarter Traffic Control Devices experienced a significant rating improvement from the first quarter; its rating increased 12.3 points (from 84.4 to 96.8). The increase in rating is attributed to pavement marker replacement activities that took place during the month of May along NC 147 and NC 540 (from I-40 to NC 55). This rating is expected to continue to improve as pavement markers replacement activities continue throughout the summer in Phases II and III of the Triangle Expressway. The pavement marker asset characteristic has an expected life-cycle of approximately three years before reflectivity deteriorates. Therefore replacements should continue to be scheduled on or near a three-year cycle.

Characteristics

This quarter all characteristics satisfied the NCTA target threshold criteria of 80 with the exception of Turf Condition, which obtained a rating of 50. Therefore, this section focuses on Turf Conditions and future emphasis in the work plan to raise the characteristic's rating. Pictures of the turf failures are included in ***Appendix B***.

Turf Condition (50 rating – 37 of the 74 assets failed). Out of the 37 turf areas inspected, 36 failed due to bare ground and one failed due to turf height. Two of the failing turf areas can be seen in the ***Figure 3***.

Figure 3: Turf Failures

Bare ground areas continue to plague much of the turf along various sections of the Triangle Expressway. The strategy proposed by NCDOT Division 5 Landscape Unit is to add nourishment to the soil through an aggressive fertilizing campaign along with selective hydro-seeding of bare ground areas with warm season grasses beginning in the summer of 2015. As of this report, nourishment and re-seeding activities have not begun and the ratings remain low. Results from this effort may not be immediately recognized as it may take several years for the turf to be fully established. Future MRP assessments will track the progress of the program and continue to report its effectiveness.

7.0 ROLLING MRP RATING

The current rolling maintenance rating of the Triangle Expressway is 90.9, exceeding NCTA's target overall rating of 90**.** Additionally, all element ratings are above the target rating of 85. All but three characteristics obtained a rating that meets or exceeds the target rating of 80. Ratings for Miscellaneous Drainage Structures, Turf Condition and Pavement Markers were 70, 53 and 69, respectively.

The cumulative rolling results are presented in ***Tables 5 and 6***. These results are a collection of the four latest quarterly inspections.

TABLE 5: MRP ROLLING CHARACTERISTIC RESULTS					
ROAD SURFACE	**Q3 2014 RATING**	**Q4 2014 RATING**	**Q1 2015 RATING**	**Q2 2015 RATING**	**ROLLING RATING**
Paved Lanes Asphalt	94	100	100	100	99
Paved Lanes Concrete	100	94	100	100	99
Paved Shoulder	77	87	97	93	91
Element Total	**89.9**	**93.3**	**98.8**	**97.6**	**95.9**
UNPAVED SHOULDERS AND DITCHES	**Q3 2014 RATING**	**Q4 2014 RATING**	**Q1 2015 RATING**	**Q2 2015 RATING**	**ROLLING RATING**
Unpaved Shoulder	94	94	100	97	97
Front/Back Slopes	87	97	100	95	96
Lateral and Outfall Ditches, Unpaved	100	94	100	98	98
Ditches, Paved	50	100	100	100	88
Element Total	**92.9**	**94.6**	**100.0**	**96.6**	**96.7**
DRAINAGE	**Q3 2014 RATING**	**Q4 2014 RATING**	**Q1 2015 RATING**	**Q2 2015 RATING**	**ROLLING RATING**
Drainage Pipes	97	97	94	88	94
Curb and Gutter	100	84	100	96	95
Inlets	88	88	97	97	93
Misc. Drainage Structure	72	32	75	94	70
Element Total	**91.3**	**82.5**	**93.0**	**93.4**	**90.1**
ROADSIDE	**Q3 2014 RATING**	**Q4 2014 RATING**	**Q1 2015 RATING**	**Q2 2015 RATING**	**ROLLING RATING**
Turf Condition	61	46	54	50	53
Landscaping	81	81	97	91	88
Trees and Brush	100	100	100	100	100
Litter	100	100	98	100	99
Roadway Sweeping	100	81	98	98	96
Guardrail, Concrete Barrier and End	97	100	100	97	98
Impact Attenuators	78	100	100	100	94
Fence, Control Access	97	97	100	90	96
Retaining Walls and Sound Barrier Walls	94	88	79	95	89
Decorative Supports	100	96	96	100	98
Graffiti and Stain Removal	100	97	100	100	99
Element Total	**87.6**	**83.2**	**88.1**	**86.6**	**86.5**
TRAFFIC CONTROL DEVICES	**Q3 2014 RATING**	**Q4 2014 RATING**	**Q1 2015 RATING**	**Q2 2015 RATING**	**ROLLING RATING**
Signs	94	94	100	97	95
Delineators	N/A	N/A	91	100	91
Pavement Striping/Marking	97	68	86	97	88
Words and Symbols	100	97	100	100	99
Pavement Markers	45	55	64	95	69
Highway Lighting	91	97	96	96	95
Element Total	**85.0**	**82.1**	**84.4**	**96.8**	**87.2**

N/A - As discussed in the 2015 Q1 MRP Report, delineators were omitted from previous assessments and were added back in during the first quarter.

TABLE 6: MRP ROLLING ELEMENT RESULTS					
ELEMENT	Q3 2014 RATING	Q4 2014 RATING	Q1 2015 RATING	Q2 2015 RATING	ROLLING RATING
Road Surface	89.9	93.3	98.8	97.6	95.9
Unpaved Shoulders	92.9	94.6	100.0	96.6	96.7
Drainage	91.3	82.5	93.0	93.4	90.1
Roadside	87.6	83.2	88.1	86.6	86.5
Traffic Control Devices	85.0	82.1	84.4	96.8	87.2
Overall MRP Performance Rating	**88.6**	**86.8**	**92.0**	**94.7**	**90.9**

8.0 TRIANGLE EXPRESSWAY TOLL FACILITY MAINTENANCE

As part of the Roadside Toll Collection System contract, XEROX provides toll facility maintenance for all toll zones along the Triangle Expressway. Facility maintenance includes all labor, equipment, materials and incidentals for the maintenance items under contract.

The equipment and services covered by the facilities maintenance agreement include:

- Air Conditioning Equipment
- Electrical Components
- Fire and Carbon Monoxide Alarms and Fire Extinguishers
- Standby Generators
- Security Components
- Toll Facility Vaults
- Pressure Cleaning
- Pest Control
- Grounding and Ground System Testing

Upon completion of any and all services performed on the equipment identified above, XEROX provides a maintenance log file with the following detailed information:

- date of Service Request
- date of Service Completion
- date of Regularly Scheduled Maintenance Activities
- detail of Tasks Performed
- list of Any Issues Found
- list of Any Replacement Parts Required
- notification to NCTA for Replacement Part Approval

All maintenance logs are stored in the CMMS (Computerized Maintenance Management System) database and submitted to NCTA through Constructware for review. As part of each quarterly

inspection, HNTB reviews the facility maintenance logs to identify any problems reported and ensure XEROX is meeting maintenance contract expectations. Equipment services meet maintenance contract expectations only if the maintenance logs provided prove that the service has been completed.

8.1 Quarterly Results

Air Conditioning Unit Service Requirements	Status
Monthly Service (Scheduled for April, May and June 2015)	
• Replace filters (pleated high efficiency filters shall be used)	Completed
Semi-Annual Service (Scheduled for May 2015)	
• Perform inspection and maintenance checks/cleaning (preventative maintenance) on all air conditioning equipment units. All items in the preventive maintenance inspection shall be checked along with any other item necessary to ensure that each unit is operating properly. ○ Clean condenser and evaporator coils on air conditioning units, with industry approved chemicals and methods and per recommendations by the manufacturer. ○ Clean oil air handling units of the air conditioning equipment (per manufacture recommendations) ○ Clean drain pans and condensate lines of the air conditioning equipment. ○ Lubricate all motors required for the air conditioning equipment. ○ Clean inlet and outlet registers for the air conditioning equipment. ○ Check controls and thermostats for proper operation for the air conditioning equipment. ○ Check for leaks and adjust amounts of refrigerant as needed for the air conditioning equipment. ○ Record refrigerant pressures for the air conditioning equipment. ○ Check electrical connections for the air conditioning equipment. ○ Check for vibrations and noises stemming from the air conditioning equipment. ○ Check all belts and belt pulleys and replace worn belts for the air conditioning equipment.	Completed

Electrical Components Service Requirements	Status
Monthly Service (Scheduled for April, May and June 2015)	
• Electrical Distribution Equipment o Inspect electrical distribution equipment for warning signs, wear, or malfunction. o Inspect enclosures in electrical distribution equipment for damage, unauthorized openings, and corrosion of metallic objects. Repair and paint to match as required. Inspect air passages and remove any blockage. o Inspect, investigate, and solve conditions in which the electrical distribution equipment produces unusual odors. o As electrical distribution equipment is operated and tested, listen, investigate, and mitigate conditions for unusual noises. o Inspect electrical distribution equipment grounding components such as conductors and connections. Inspect insulators for damage. o Inspect liquid immersed electrical distribution equipment for leaks and damage. o Inspect indicating lights on electrical distribution equipment for correct illumination. o Remove debris, dirt, insect nests, and other foreign objects from all components, housings, cabinets, panels, etc. of the electrical distribution equipment. o Verify operation of space heaters and control thermostat of electrical distribution equipment. Check thermostat set point for proper setting.	Completed
Annual Service (Scheduled for November 2015)	
• Electrical Distribution System o Inspect electrical connections in the electrical distribution system for degradation. o Torque all electrical connections in the electrical distribution system to design value. o Verify the grounding of the equipment and associated neutral where applicable for the electrical distribution system. o Conduct infrared test on all main current carrying equipment in the electrical distribution system for hot spots that may indicate overheat conditions or loose connections. o Using calibrated test instruments, calibrate ammeters, voltmeters, etc. Verify continuity of metering selector switch contacts with ohmmeter. o Change filters on Main Distribution Panel in the electrical distribution system at site 6-1 and 7-2. o Inspect electronic power meter on Main Distribution Panels in the electrical distribution system for proper operation. • Low Voltage Panel Boards o Inspect electrical insulation of low voltage panel boards for discoloration and degradation. o Service low voltage panel board circuit breakers per manufacturers' recommendations. o Inspect low voltage panel board breakers' current carrying components for discoloration that may indicate overheating. o Perform insulation resistance test on each phase-to-phase and phase-to-ground for the low voltage panel boards using a megohmmeter. o Prove low voltage panel board circuit breaker operation by actuation of each associated protective device. o Verify low voltage panel board Surge Protection Device (SPD) is functioning (lights). o Measure and record neutral currents for low voltage panel boards. • Automatic Transfer Switches o Inspect, operate, adjust, and lubricate mechanical linkages for the automatic transfer switches. o Verify operation of mechanical interlocks of automatic transfer switches. o Inspect and dress current carrying contacts in accordance with manufacturer's recommendations for the automatic transfer switches. o Test automatic transfer switches. Perform insulation resistance test on each phase-to-phase and phase-to-ground using a megohmmeter. o Perform contact resistance test for automatic transfer switches. o Prove correct operation of the transfer switches by manually initiating transfers in	N/A

Electrical Components Service Requirements	Status
both directions. o Simulate the automatic conditions requiring automatic transfer switches to transfer in both directions. o Verify generator start on transfer for automatic transfer switches. o Verify correct indicating light operation for automatic transfer switches. o Verify equipment alarms – critical monitoring system for automatic transfer switches. • Safety Switches (Disconnects) o Inspect, operate, adjust, and lubricate mechanical linkages for safety switches. o Verify operation of mechanical interlocks for safety switches. o Inspect and dress current carrying contacts for safety switches in accordance with manufacturer's recommendations. o Test safety switches. Perform insulation resistance test on each phase-to-phase and phase-to-ground using a megohmmeter on each critical load switch. o Perform contact resistance test on each critical load switch.	N/A

Fire and Carbon Monoxide Alarms and Fire Extinguishers Service Requirements	Status
Monthly Service (Scheduled for April, May and June 2015)	
• Test smoke detector per manufacture's specification. • Test carbon monoxide detector per manufacture's specification. • Visual inspection of all for fire and carbon monoxide alarms and fire extinguishers. • Clean smoke detectors using a vacuum cleaner attachment to remove dust and cobwebs. If possible, carefully vacuum inside the unit as well. • Clean carbon monoxide detectors using a vacuum cleaner attachment to remove dust and cobwebs. If possible, carefully vacuum inside the unit as well. Retest test/silence button after each cleaning.	Completed
Annual Service (Scheduled for February 2016)	
• Fire and carbon monoxide alarm detector maintenance check. • Check charge on fire extinguisher. • Replace batteries for fire and carbon monoxide alarms.	N/A
Every Two (2) Year Service (Phase III Scheduled for January 2015)	
• Replace carbon monoxide detectors.	N/A
Every Five (5) Year Service (Phases I & II Scheduled for August 2017, Phase III Scheduled for January 2018)	
• Re-fill and conduct a hydrostatic test on fire extinguishers.	N/A

Standby Generators Service Requirements	Status
Weekly Service	
• Exercise cycle run for standby generators for twenty (20) minutes. • Visual inspection of standby generators for obvious issues. • Verify the exercise cycle for standby generators has run.	Completed
Monthly Service (Scheduled for April, May and June 2015)	
• Visual inspection of all devices for standby generators. • Perform standby generator inspections. • Check all standby generator systems for leaks. • Engine o Test low oil pressure (LOP) safety – record seconds to shut down. o Test high engine temperature (HET) safety – record seconds to shut down. o Test over speed (O/S) safety – record seconds to shut down. o Check pre-alarms if applicable. o Check over crank (O/C) item – record seconds to shut down. o Check cycle cranker time. o Check noises or leaks. • Oil System o Check oil filter and gaskets. • Cooling system o Check general condition. o Sample and test anti-freeze and add if needed. o Check coolant level. o Pressure test system. o Check and replace belts and hoses if needed. • Exhaust System o Visually check for leaks, corrosion and check condensation trap and muffler condition. o Drain condensation if possible. • Fuel System o Check for leaks; check all visible connections and flexible hoses. Replace flexible hoses if needed. o Adjust carburetor as needed. o Service air filters as needed. o Clear debris from around engine from grass or other foreign sources. o Check tanks to ensure they meet EPA requirements for standby generators. o Keep monthly log of fuel tank inspect reports. • Generators o Visually inspect generator condition, check slip rings and commutator for wear, check lubrication of rear generator bearing. o Check diode heat sinks. • Battery o Check specific gravity and load test. o Check water level. o Clean terminals and posts and coat with inhibitor. o Check battery charge. o Replace all batteries at the end of the contract. • Ignition System o Check all wires. o Inspect plugs and electronic ignition. o Lubricate upper and lower bearing. o Set timing as needed. • Accessories o Lubricate all hinges, door locks and cover snaps. Test locks and replace or repair as needed. o Inspect annunciator. o Inspect battery charger.	Completed

Standby Generators Service Requirements	**Status**
○ Adjust battery charger – AMP-MA ○ Adjust annunciator battery lights. ○ Inspect tanks for rust and corrosion; prepare and paint all areas showing signs of rust or corrosion. ○ Prepare and paint any areas on the generator enclosure showing signs of rust or corrosion.	Completed
Quarterly Service (Scheduled for May 2015)	
• Testing ○ Check unit under actual or full load as approved by the NCTA. This check should be performed after hours or during weekends. ○ Adjust voltage and frequency under actual load. ○ Adjust clock exerciser, day, time, load, no load. ○ Test delay start, pick up, transfer, cool down, transition and preheat. ○ Calibrate Under Voltage (UV) sensors, generator sensor, and Over Voltage (OV) sensors. ○ Record load per leg, voltage, hertz, oil pressure, and water temperature. ○ Check battery charging system. ○ Test transfer switch relays for proper operation including loss of single phase power. ○ Provide certification of proper operation. ○ Load test the Generator as recommended by the equipment manufacturer. ○ Annual 2 hour Load Bank test per manufacturer recommendation. ○ Provide load test reports. ○ Visually check for leaks.	Completed
Semi-Annual Service (Scheduled for May 2015)	
• Oil System ○ Change engine oil. ○ Change oil filter and gaskets. ○ Visually check for leaks.	Completed
Annual Service (Scheduled for November 2015)	
• Annual 2 hour Load Bank test per manufacturer recommendation. ○ Provide load test reports. ○ Visually check for leaks. • Replace batteries. • Replace filters annually.	N/A

Security Components Service Requirements	Status
Quarterly Service (Scheduled for June 2015)	
• Check all locks on security components are in working order. • Lubricate all security component locks per manufacturer's recommendations. • Verify keys for all security component locks can be located. • Note and report any lock tampering.	Completed

Toll Facility Vaults Service Requirements	Status
Weekly Service	
• Clear and remove all debris, litter, etc. inside toll facility vaults and out. • Remove cobwebs and insect nests from walls, corners and ceilings of all toll facility vaults. • Clean exterior door jambs, frames and transoms in all entrances.	Completed
Quarterly Service (Scheduled for April 2015)	
• Inspect the toll facility vaults for cracks in panels at sharp angles near doors and openings and at panel connection joints. • Inspect coatings for peeling on doors where concrete was cracking. • Inspect the floor coatings for chipping and wear. • Inspect for rust stains found around cracks, or exposed reinforcing steel, or other causes for concern. • Look at door and vault seals, caulking, exposed backer bar, or door jamb seals missing or damaged.	Completed
Annual Service (Scheduled for October 2015)	
• Inspection by and report on condition from a qualified structural engineer.	N/A

Pressure Cleaning Service Requirements	Status
Semi-Annual Service (Scheduled for June 2015)	
• Provide all labor, materials, tools, equipment and incidentals (including water if not available at the facility) necessary to perform the work as specified. Use cleaners, degreasing agents and other approved means to remove all dirt, oil, tar, exhaust residue, spider webs and egg sacs, mud dauber nests, wasp and bee nests and any other deposit or film which may be present on the exterior of the vaults. Streaking of surfaces will not be allowed and manual scrubbing may be required in order to attain the desired results. • Materials Safety Data Sheets (MSDS) for all chemicals used shall be submitted by ACS. All chemical agents and additives must be approved by NCTA prior to beginning any work. • Protect all NCTA equipment during the time that cleaning is in progress. ACS shall be responsible for any and all damages caused by their Contractor's operations to either NCTA property or to the public moving through the facilities. No equipment, vehicles or materials may be stored at any NCTA facility. • Upon completion of each day's work, ACS shall ensure that the toll zone or facility being cleaned is free from debris caused by the work and remove and dispose of such debris off NCTA right-of-way. • The cleaning equipment shall be independently powered and capable of attaining adequate pressure and temperature to perform a job that meets the desired cleaning results. The equipment must also be designed to apply approved cleaning agents to surfaces to be cleaned in a volume sufficient to attain the desired cleaning results. Chemical cleaners that are used on surfaces in areas of plants and grass shall not be harmful to vegetation. Care shall also be taken to avoid any damage to existing grass, plants, shrubs and trees by equipment or personnel. Any plants or foliage damaged shall be replaced with equal or better plantings at no cost to the NCTA.	Completed

Pest Control Service Requirements	Status
Quarterly Service (Scheduled for June 2015)	
• Insect control includes those measures which are necessary to suppress general household insects within and around the facilities by using properly registered and labeled pesticide products and approved devices. • Rodent control includes those measures necessary to suppress populations of rats and mice that become a nuisance within or around the NCTA premises and equipment. There shall be no signs of infestations. • The program for the control of general pests shall be continually in effect. There shall be no signs of infestations. • Treat all areas of the facility to eliminate those pests mentioned above. These areas include, but are not limited to, vaults (interior and exterior perimeter which extends for a distance of fifteen feet (15') around the vaults), toll cabinets, emergency generators, and storage facilities. • Protect NCTA equipment during the time the work is underway. All materials for pest control shall conform to federal, state and local ordinances and precautions shall be used to avoid accident or injury to the employees and prevent damage to the facilities.	Completed

Grounding and Ground System Testing Service Requirements	Status
Semi-Annual Service (Scheduled for August 2015)	
• Testing o Perform testing of ground rods at each toll zone and facility as directed by the NCTA to determine the resistance of each ground rod. Document, certify, correct and provide a report of Ground Resistance Test for the results of all tests performed. o For all ground rods exceeding 25 ohms (unless otherwise specified), furnish and install 5/8" x 10' copper clad ground rods or ground rod segments as necessary to achieve the grounding requirements until ground resistance of 25 ohms (unless otherwise specified) or less is achieved. o Furnish and install exothermic weld connections, Cadweld by ERICO approved equal as necessary to achieve the testing requirements. o Perform testing and provide and certify a report of Ground Resistance Test at each toll zone grounding system upon completion of installation of new ground rod(s).	N/A

8.2 Analysis and Recommendations

As part of the second quarter inspection, HNTB reviewed the April, May and June maintenance logs provided by XEROX. According to these logs all scheduled maintenance services were completed and are therefore meeting all maintenance contract expectations.

While no non-working items were reported during the quarterly toll-facility vaults services, all 13 vaults were reported to have cracks in the wall panel, roof panel, floor, or sidewalk and the vault in Toll Zone 5 was reported to have water leakage. Additionally, vaults in Toll Zones 22, 26, 29, and 30 were reported to have unsealed expansion joints. NCTA has been notified of all referenced vault deficiencies reported during this quarter. A corrective action plan is being developed in collaboration with the maintenance provider, the installer and the NCTA.

During the monthly and semi-annual air conditioning unit services, five units were reported to have problems. The units in Toll Zones 33 and 17 were reported to have leaks in the refrigerant lines; these leaks have been repaired. The compressor of the unit in Toll Zone 26 was locking up intermittently which caused temperature variations in the vault. This issue was resolved after installing a hard start on the compressor. Also, the units in Toll Zones 13 and 14 were reported to have pitted contactors that need replacement. The contactors will be replaced in November during the next semi-annual service.

During the month of June, the standby generator unit in Toll Zone 1 was reported to have a low battery, and due to high gas pressure it failed to start during a weekly service. These issues were resolved by replacing the battery charger and the inline pressure regulator. Also, the standby generator unit in Toll Zone 2 was reported to have a low voltage. The voltage level went back to normal after replacing the battery charger.

9.0 GREEN LEVEL HISTORIC DISTRICT SIGNS

The four Green Level Historic District signs and surrounding landscaped areas were installed as part of the Triangle Expressway construction projects. 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.

9.1 Analysis and Recommendations

As part of each quarterly inspection, assessors visit the four Green Level Historic District signs to conduct a visual inspection of each sign to ensure they are in good standing. During this quarterly inspection, all signs were found to be in good condition, with the landscaped areas being well maintained. ***Figure 4*** shows two of these signs.

Figure 4: Green Level West Historic District Signs

10.0 CONCLUSION

This report presents the 2015 second quarter and the current cumulative rolling annual assessment of the Triangle Expressway. The NCTA's target ratings are 90 overall, 85 for elements and 80 for characteristics. The second quarter 2015 overall rating is **94.7** and the cumulative rolling rating is **90.9.** The quarterly and cumulative rolling ratings for this quarter have increased from previous assessments by 2.7 and 1.3 points, respectively, and are currently above the target rating of 90.

This quarter all element ratings were above the target rating for both the quarterly and rolling annual scores. Traffic Control Devices experienced a significant rating increase due to replacement work. All characteristics' quarterly ratings exceeded the target rating of 80 with the exception of Turf Conditions (50). Also, based on the cumulative rolling assessment ratings, only Miscellaneous Drainage Structures (70), Turf Condition (53), and Pavement Markers (69) fell below the threshold.

In order to improve this quarter's ratings of the failing characteristics, it is recommended that the maintenance provider continue to plan to remove any ditch debris on a consistent basis, and continue to check pavement markers after the seasons of inclement weather.

Turf Condition is continuing to fail for both the quarterly and the cumulative rolling ratings, and needs the most attention. It is recommended that soil nourishment through an aggressive fertilizing campaign and selective hydro-seeding of bare ground areas with warm season grasses continue throughout the summer of 2015.

Additionally, routine attention and planning should be given to the nighttime visibility program. A continued replacement program for pavement markers should be scheduled at or near a three-year cycle in order to maintain their nighttime effectiveness and reflectivity. While the rating for Pavement Striping exceeded the target rating for both the 2015 second quarter and the rolling rating, the lifespan of epoxy paint and pavement markers is 3 to 5 years. Pavement striping was installed along sections of the Triangle Expressway approximately 3 years ago and therefore, preparations should be made in the budget and work schedule for maintenance.

In the toll facility maintenance annual verification process, all maintenance services were completed and therefore met contract obligations.

All Green Level Historic District signs inspected during the first quarter were found to be in good condition. Also, the landscaped areas surrounding the signs are being well maintained; preserving sign visibility and aesthetic appearance.

Appendix A

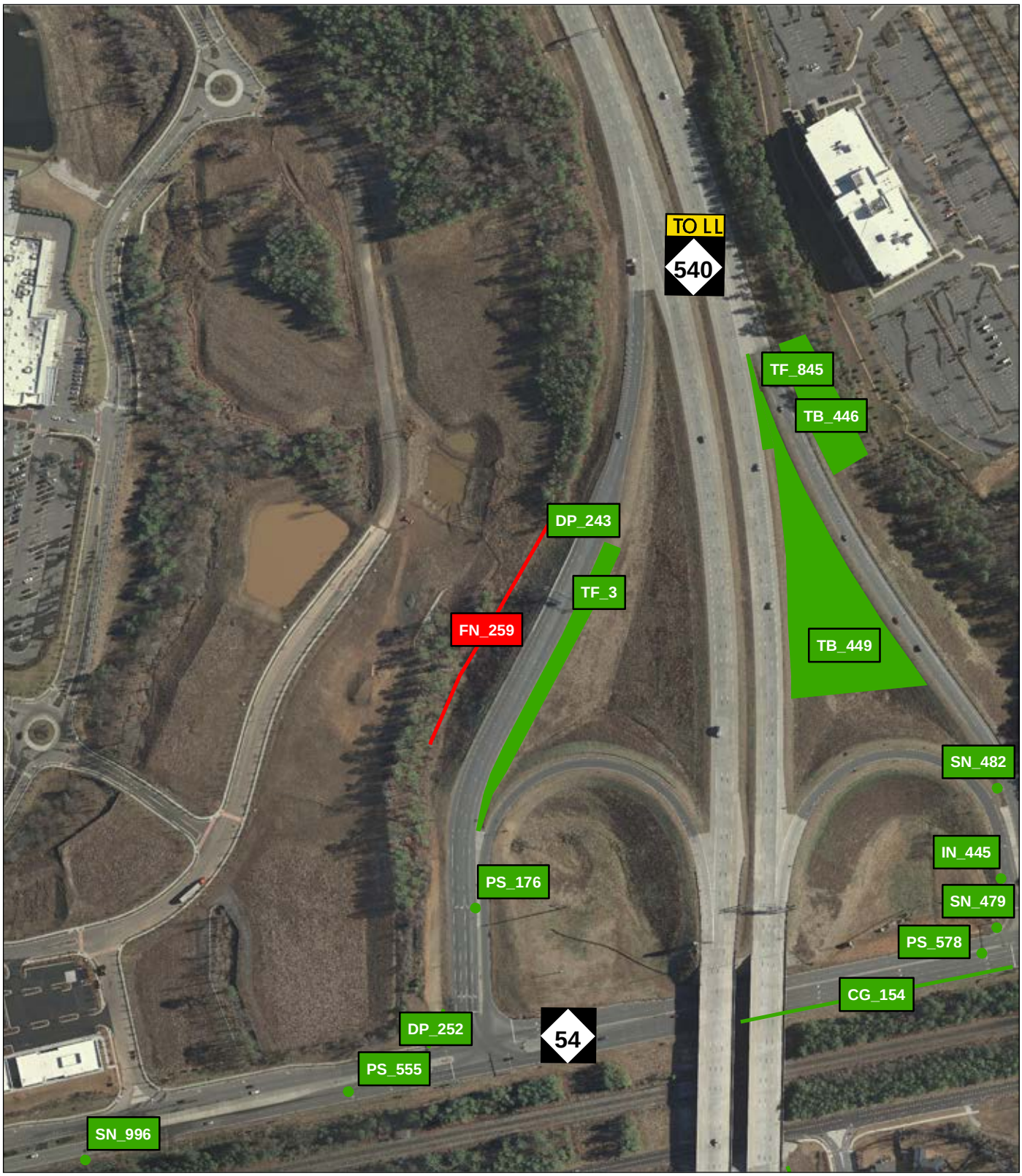
Triangle Expressway 2015 Second Quarter Asset Assessment Locations

Appendix A: Triangle Expressway 2015 Second 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 Attenutators – 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 2015 Second Quarter Asset Assessment Locations



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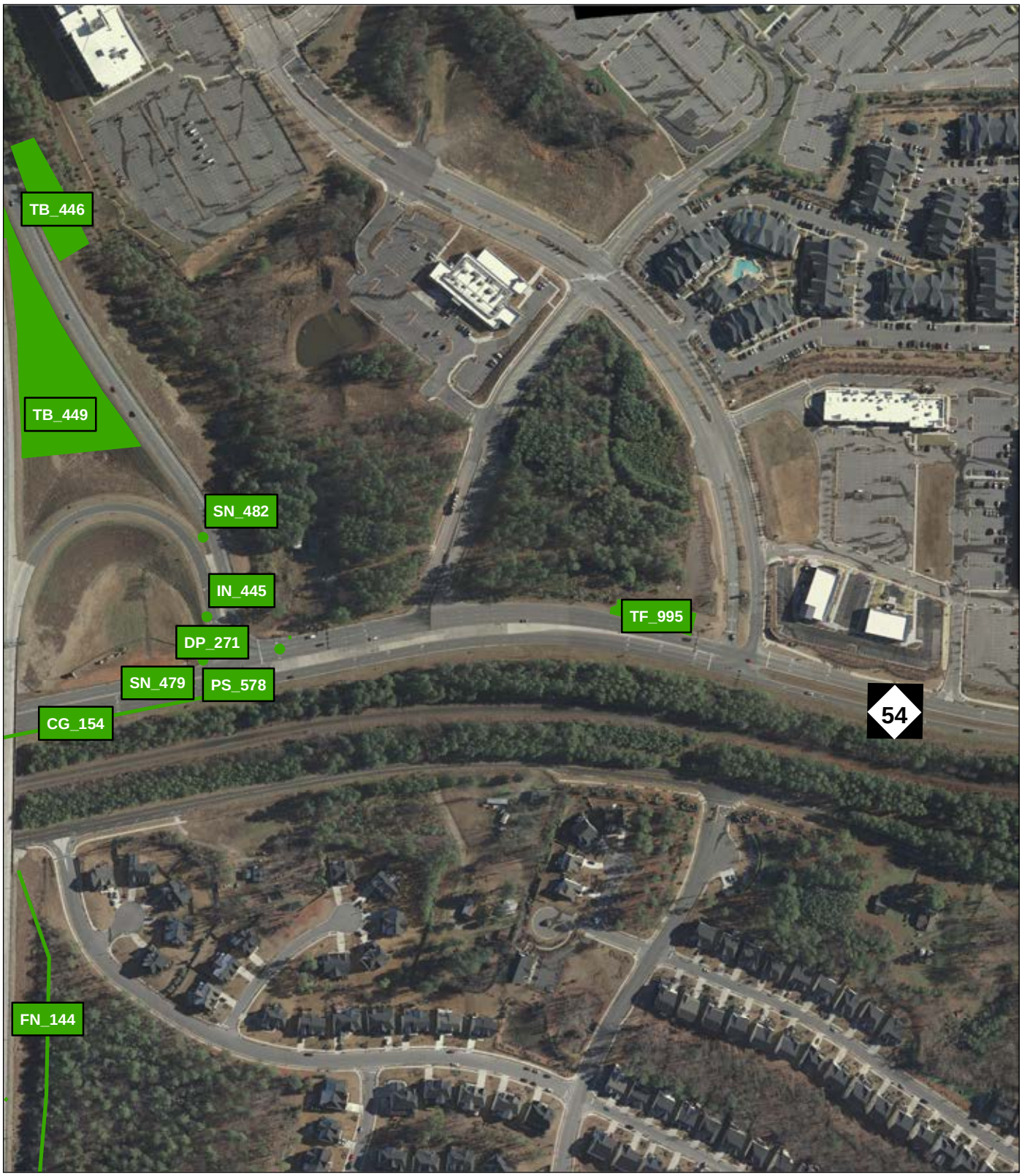
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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NORTH CAROLINA Turnpike Authority

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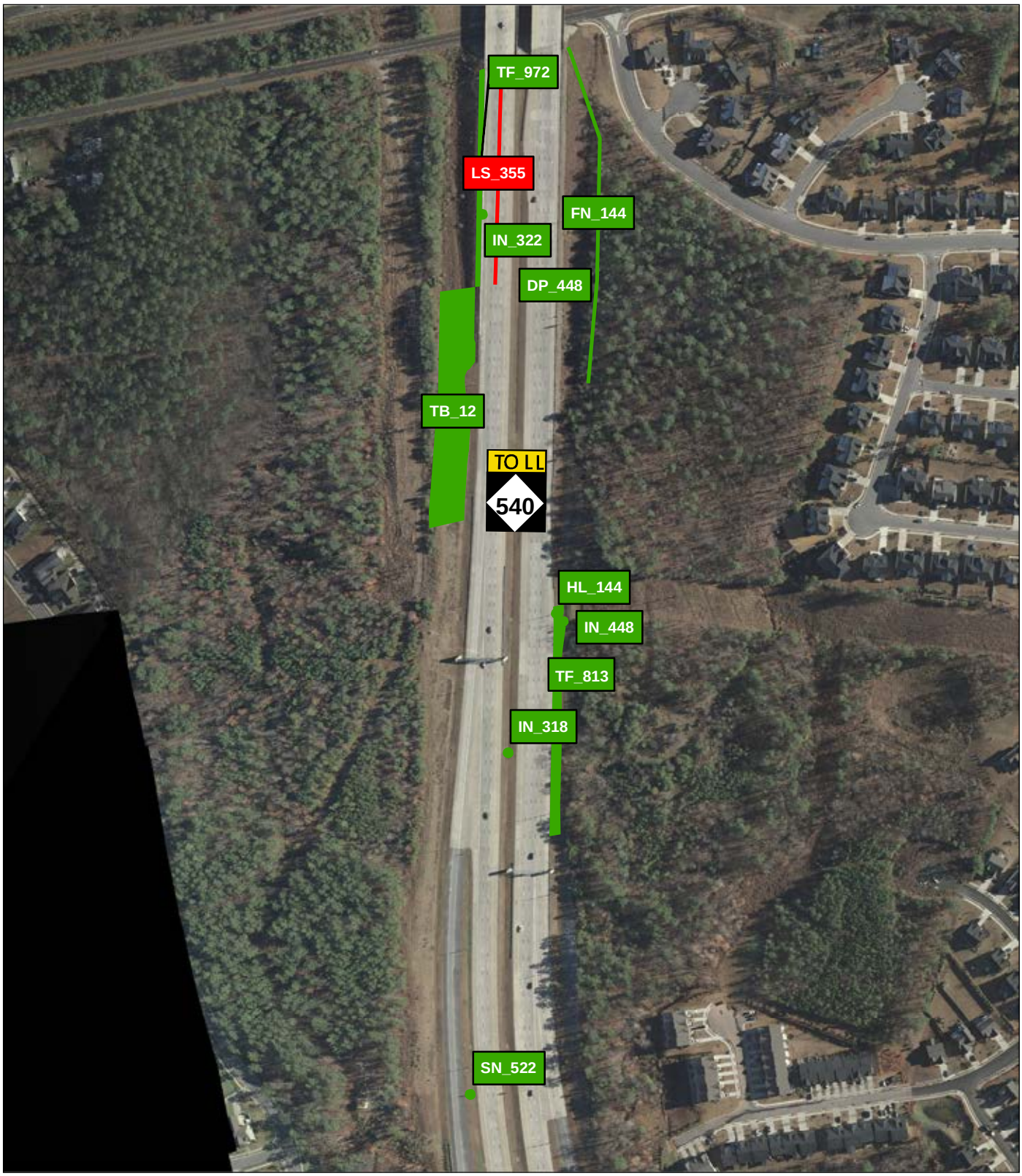
Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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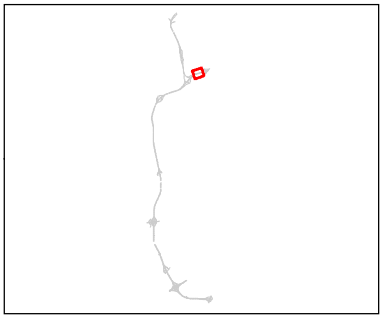

NORTH CAROLINA Turnpike Authority

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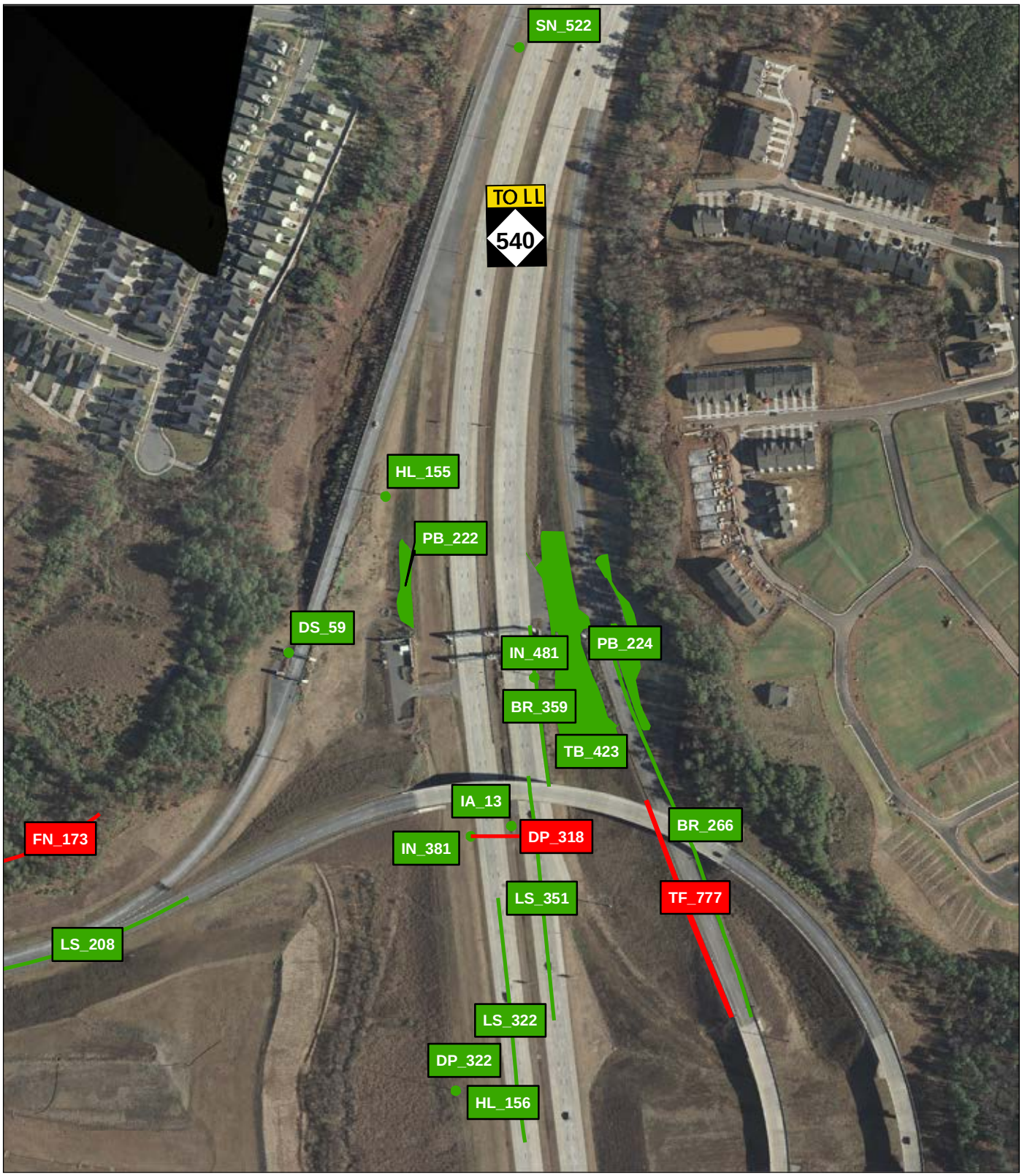
Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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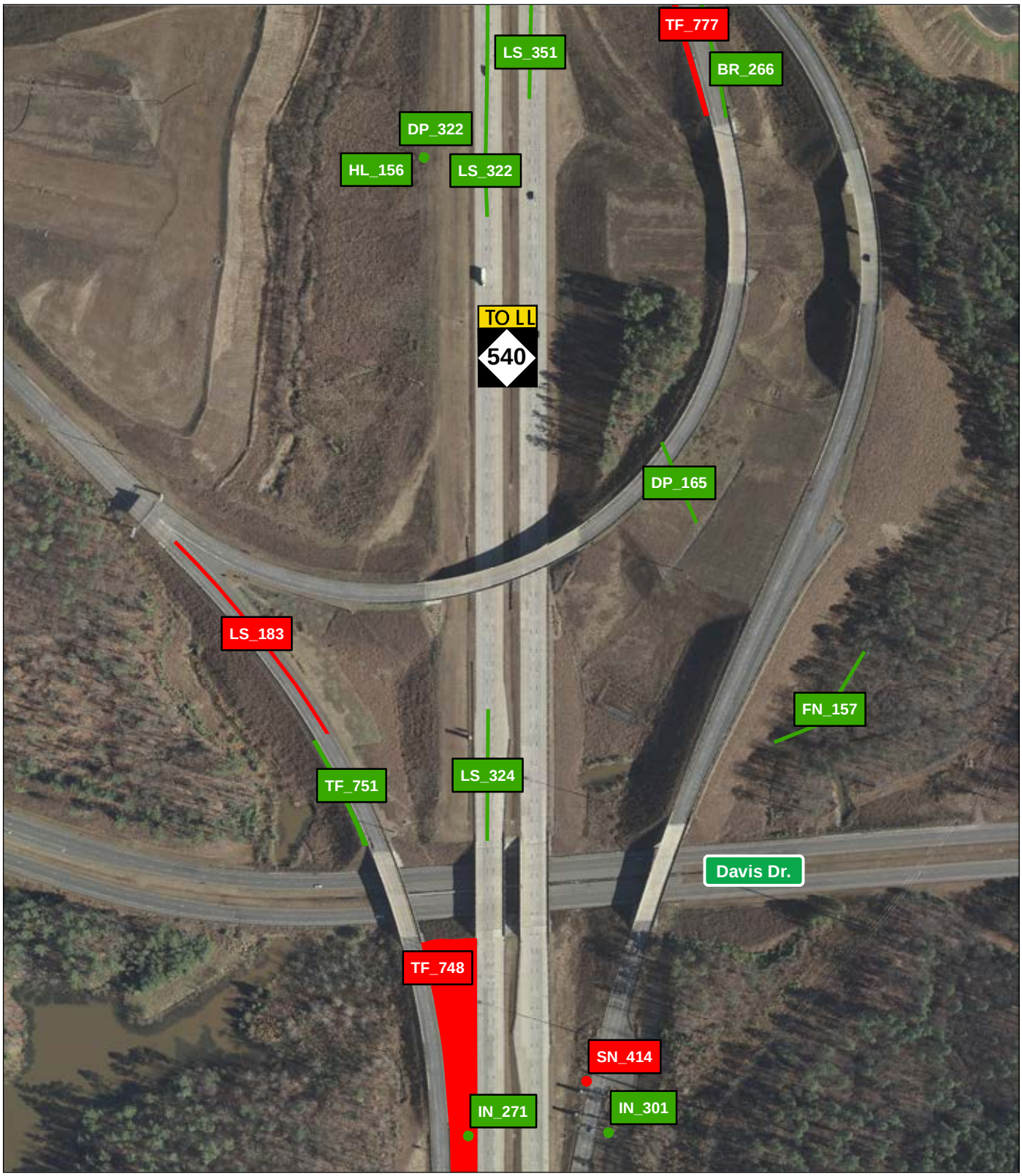
NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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NORTH CAROLINA Turnpike Authority

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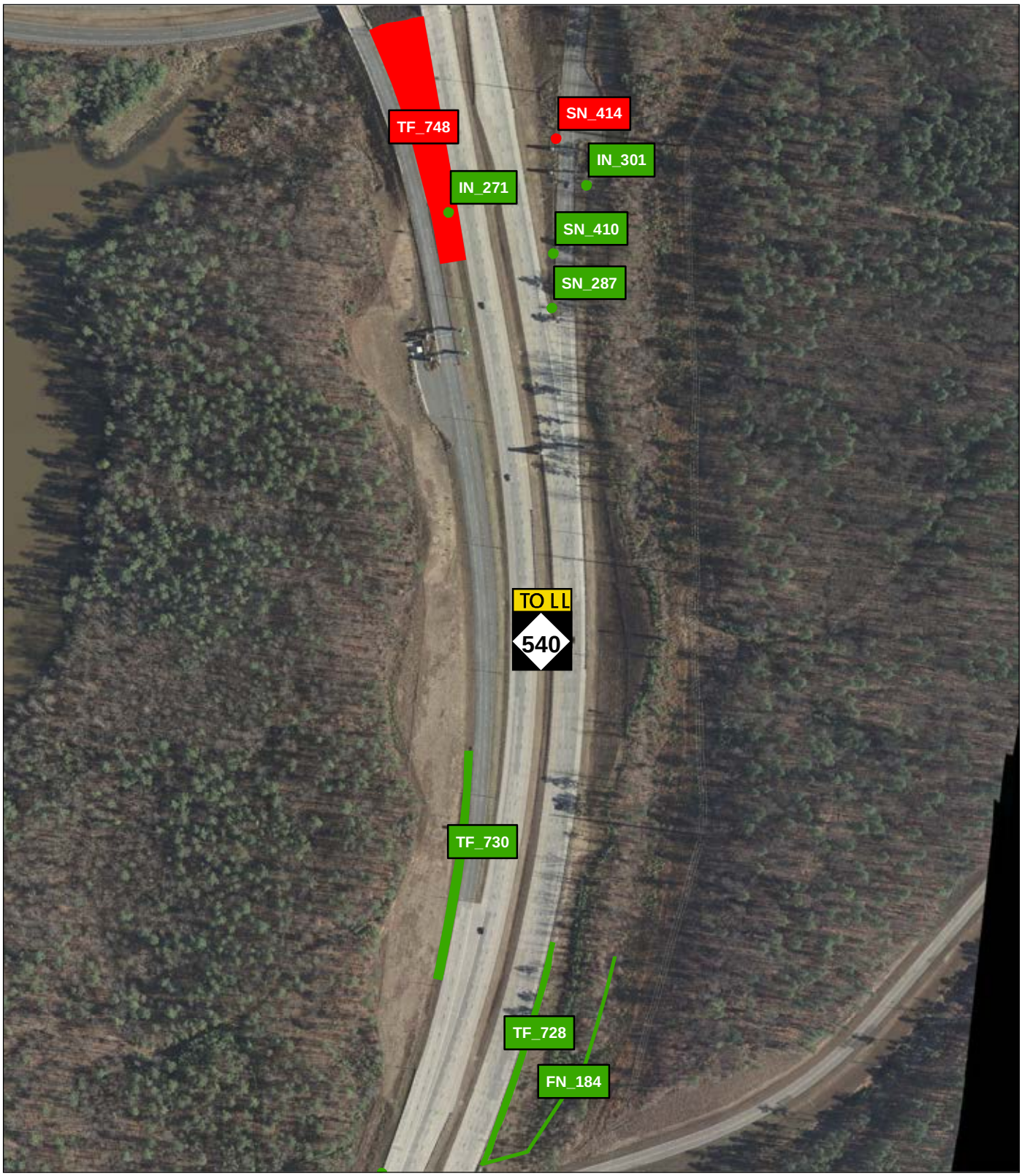

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NORTH CAROLINA Turnpike Authority

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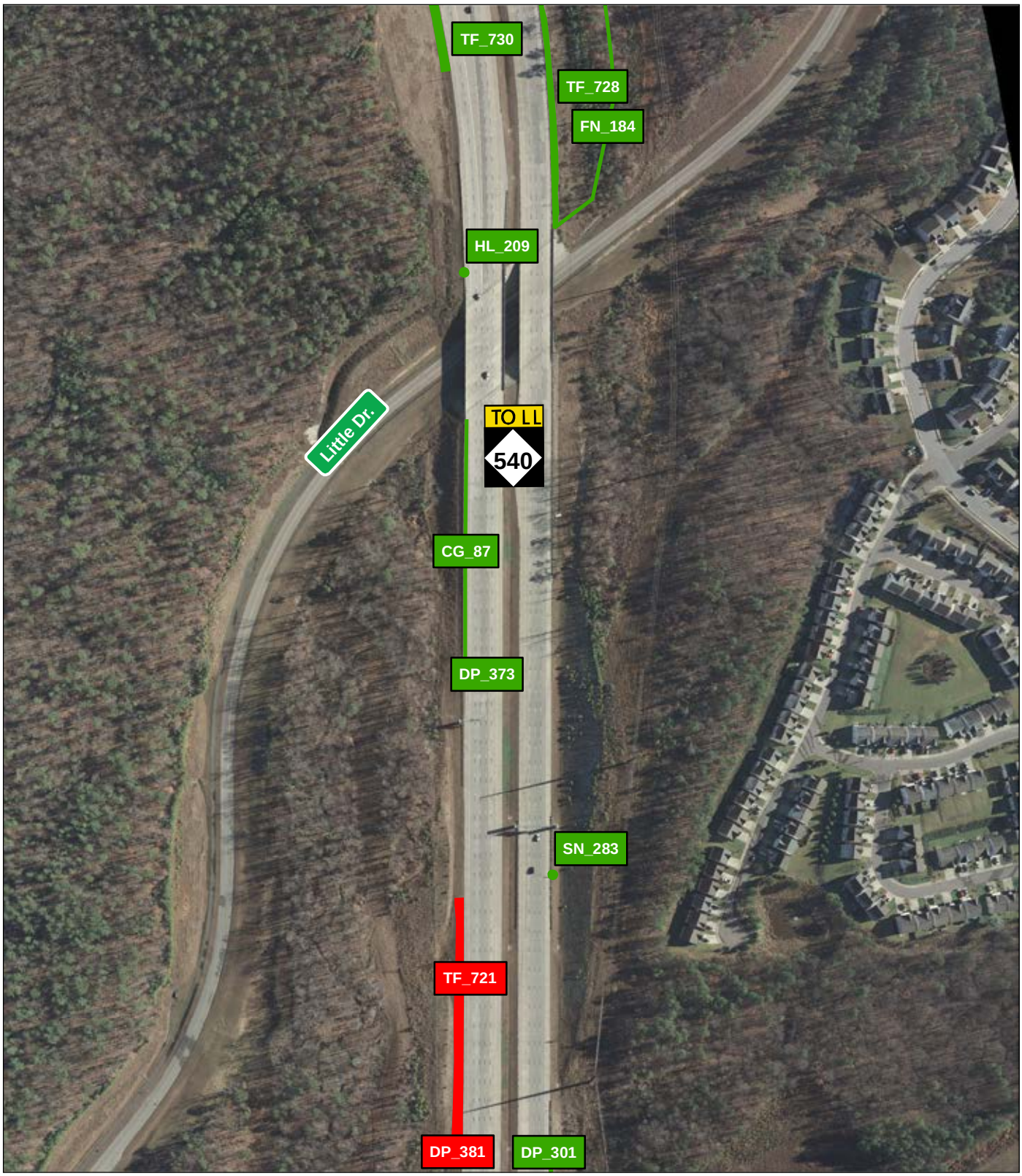

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NORTH CAROLINA Turnpike Authority

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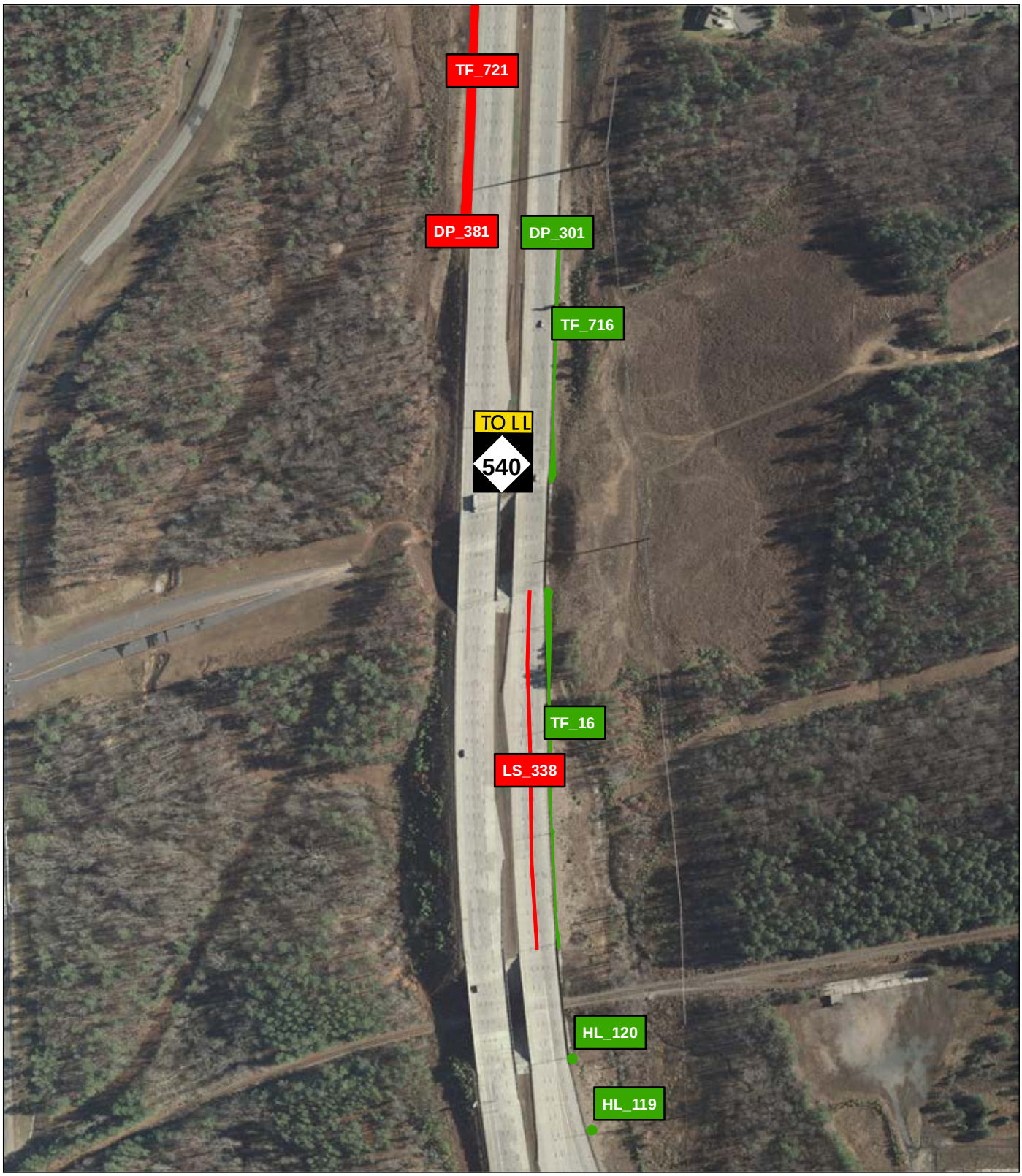

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NORTH CAROLINA Turnpike Authority

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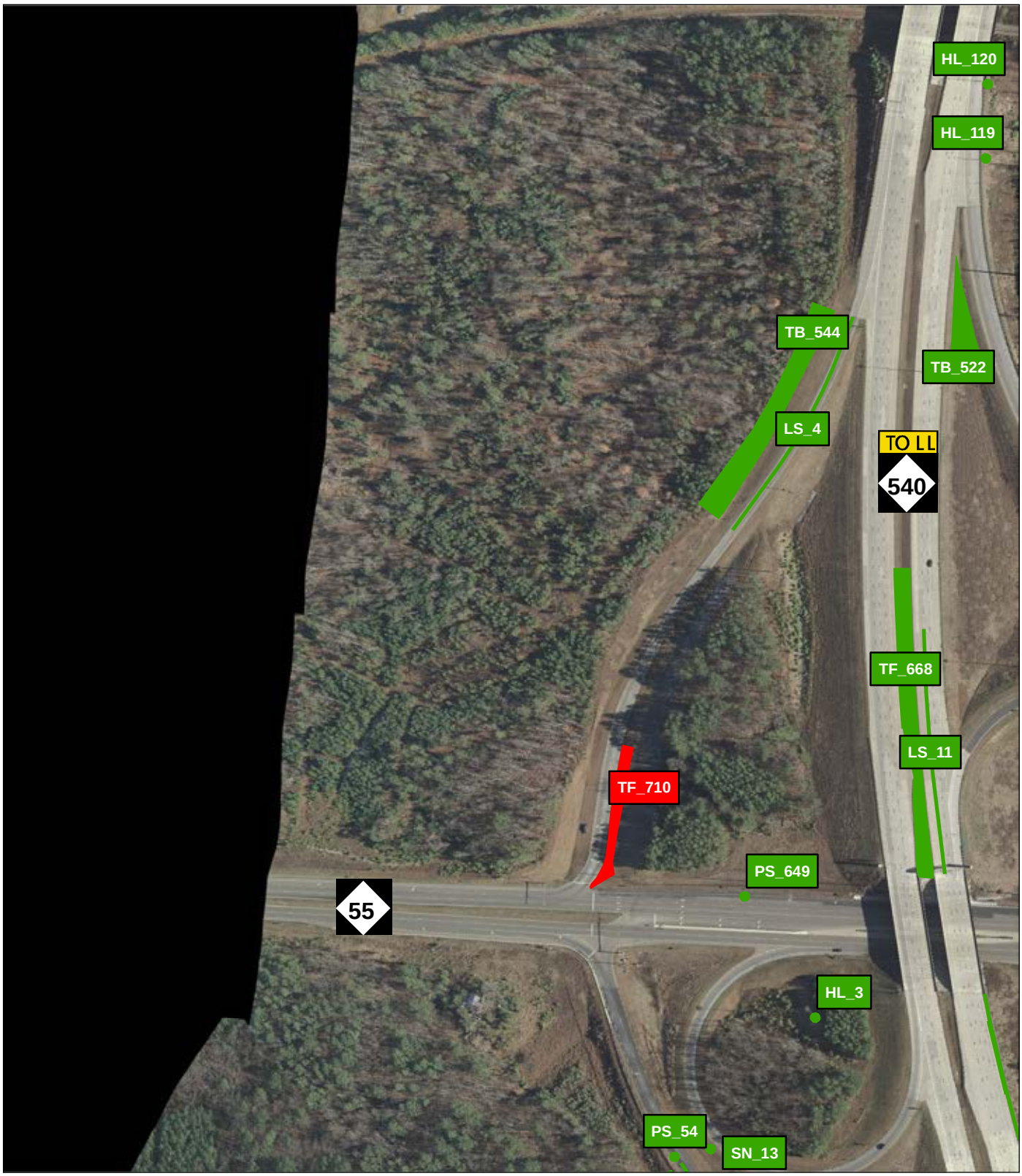
Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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NORTH CAROLINA Turnpike Authority

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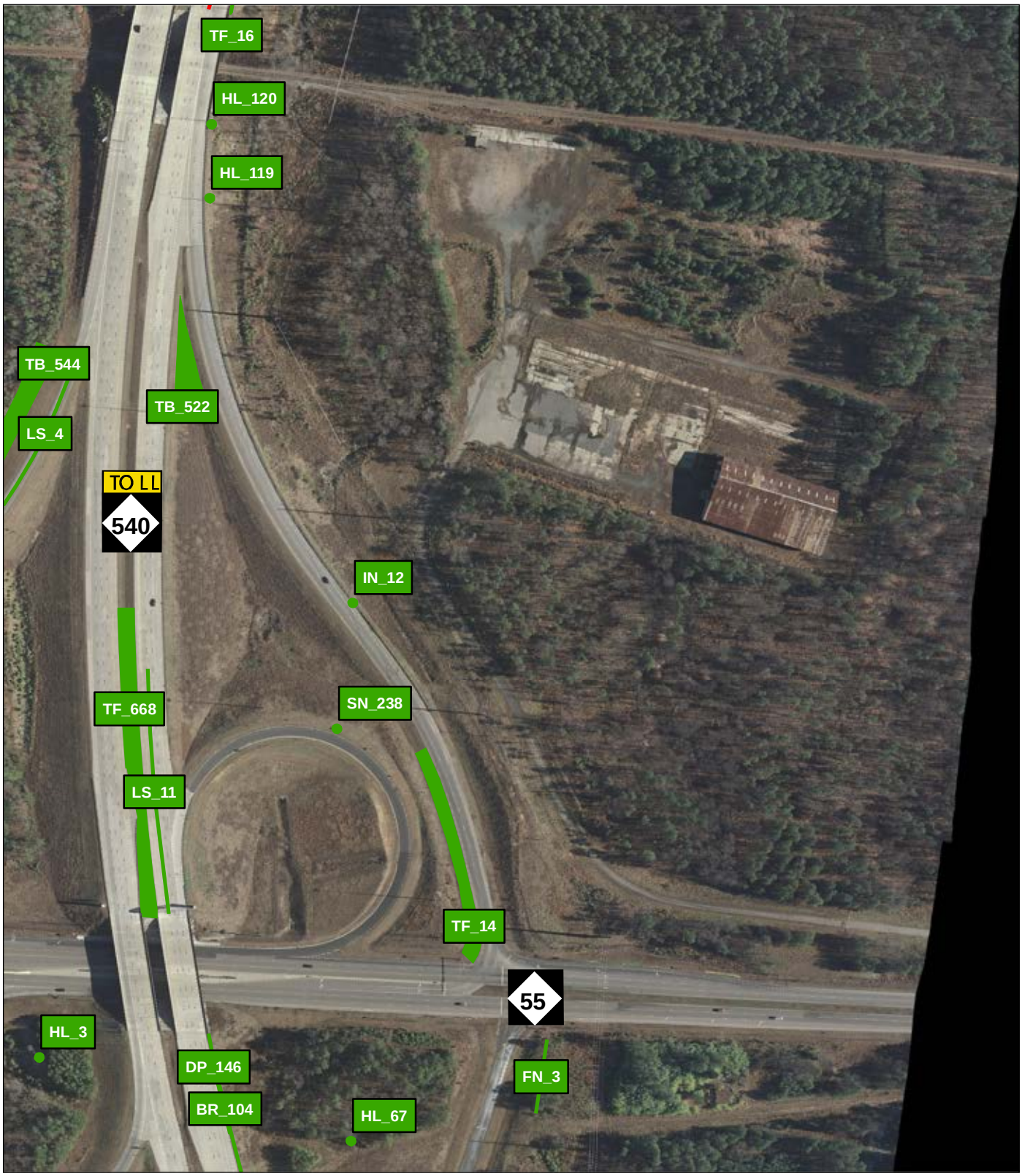

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NORTH CAROLINA Turnpike Authority

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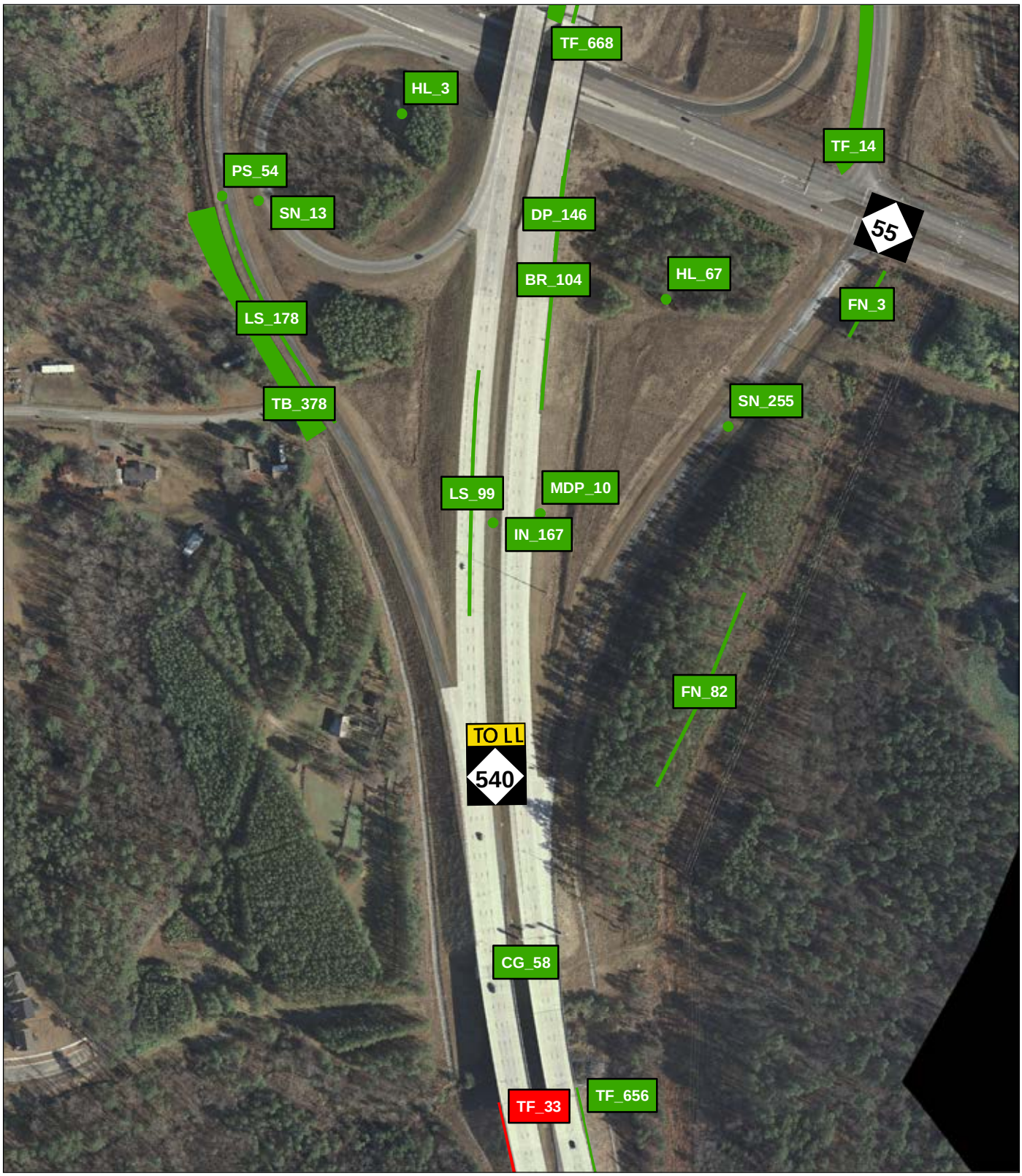

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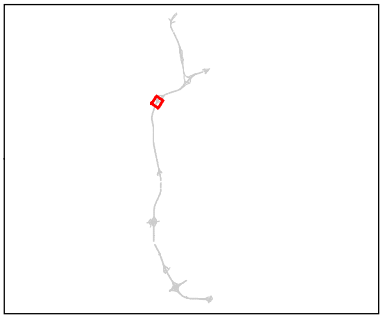

NORTH CAROLINA Turnpike Authority

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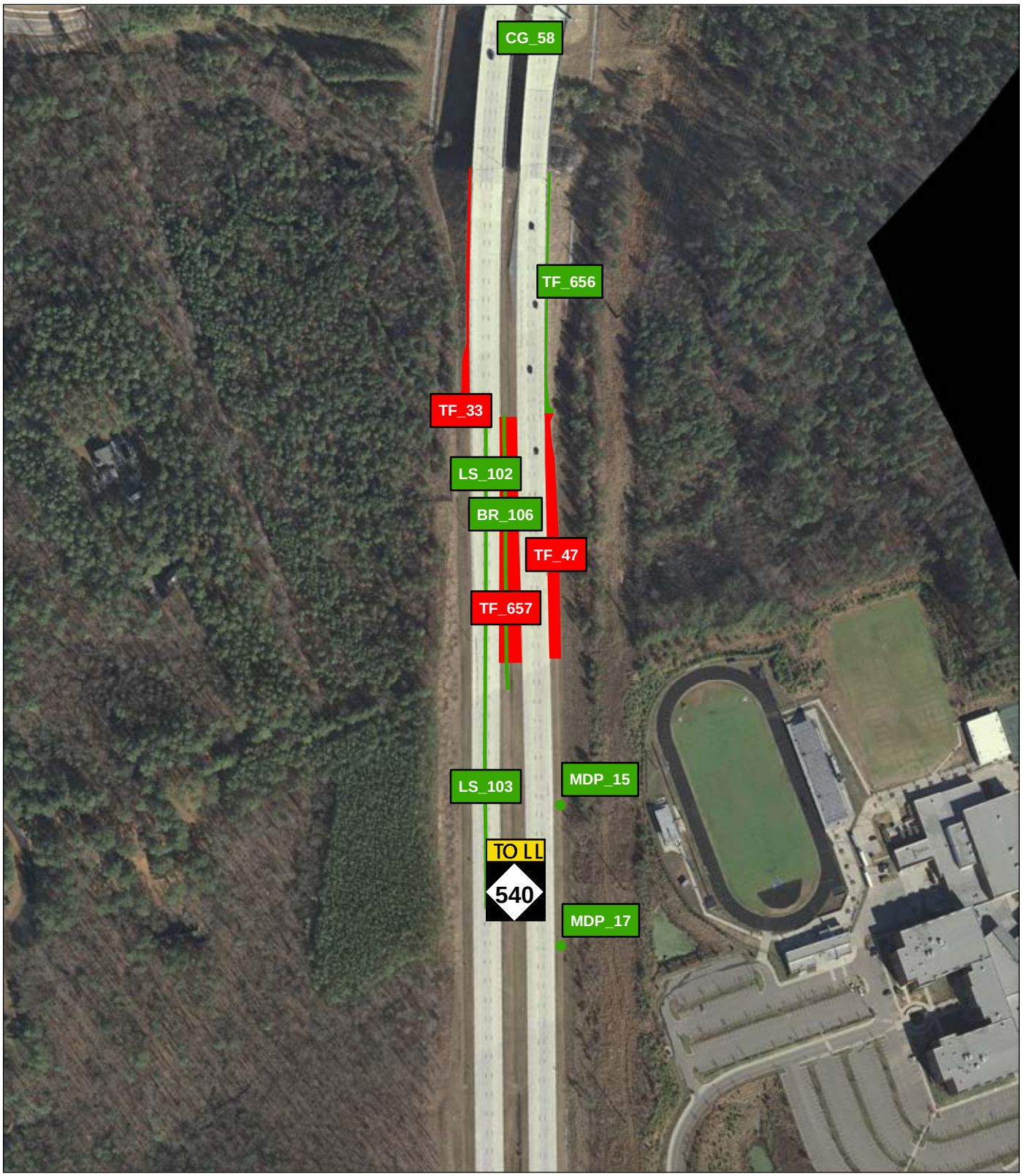

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NORTH CAROLINA Turnpike Authority

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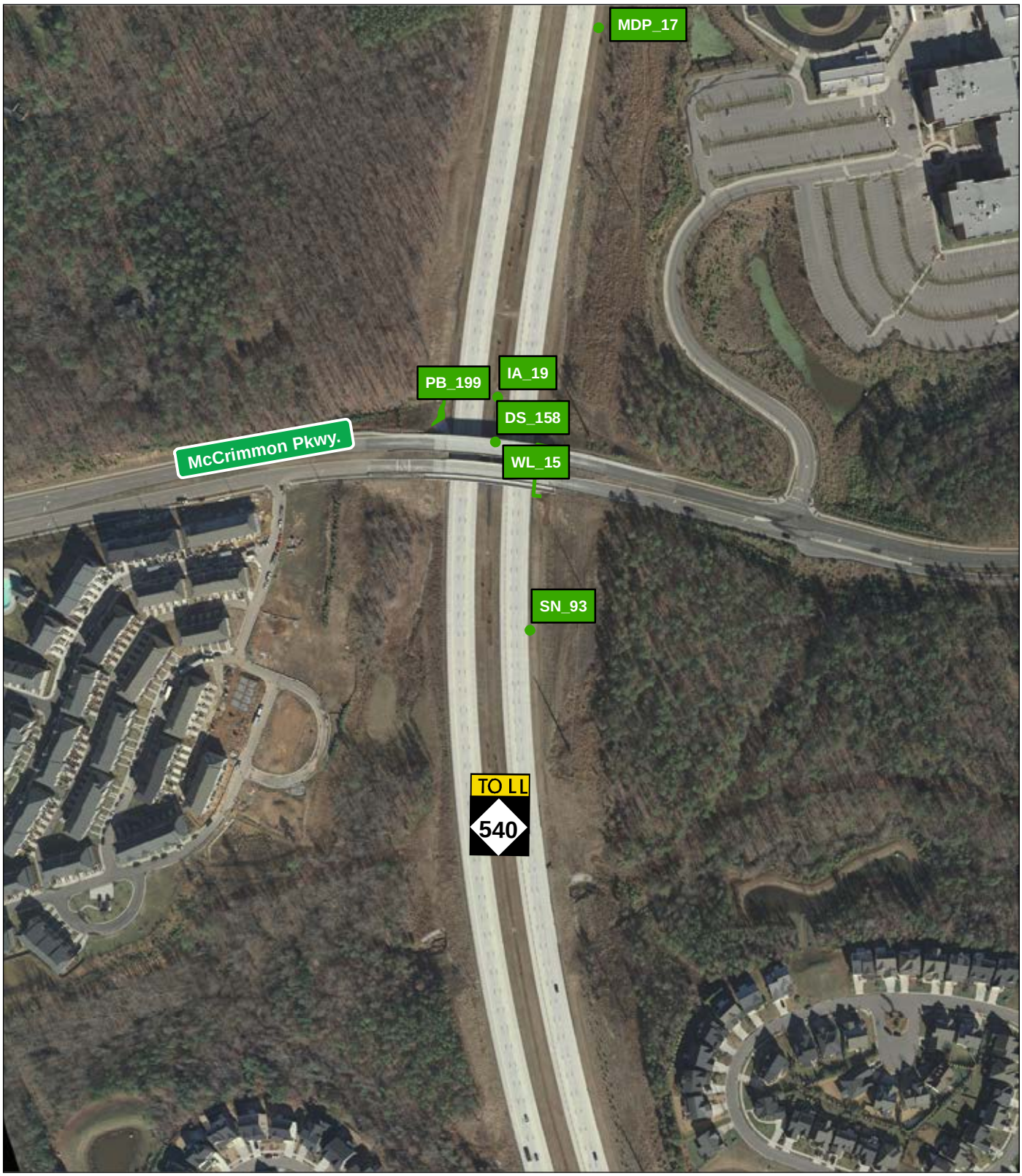

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NORTH CAROLINA Turnpike Authority

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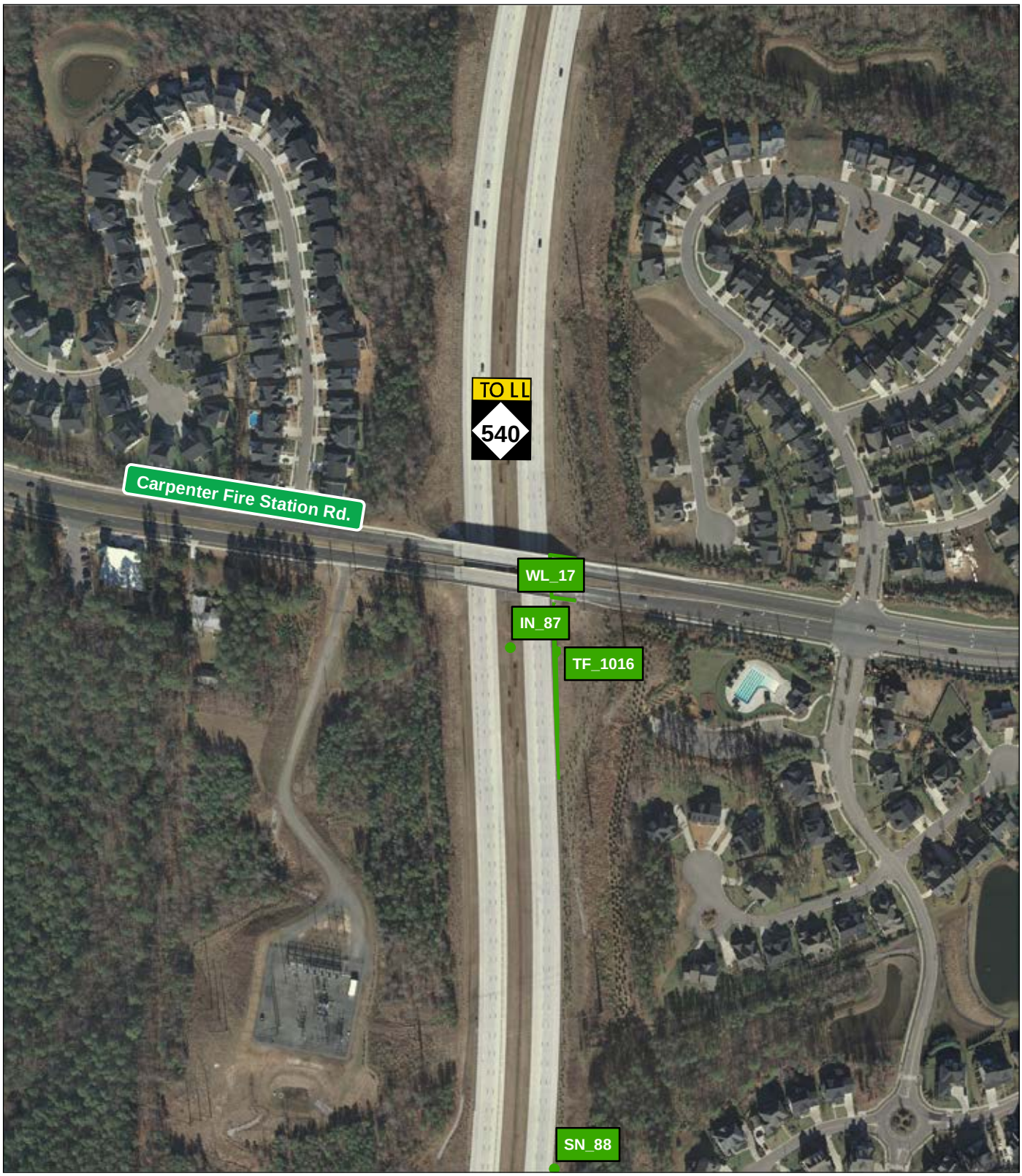

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NORTH CAROLINA Turnpike Authority

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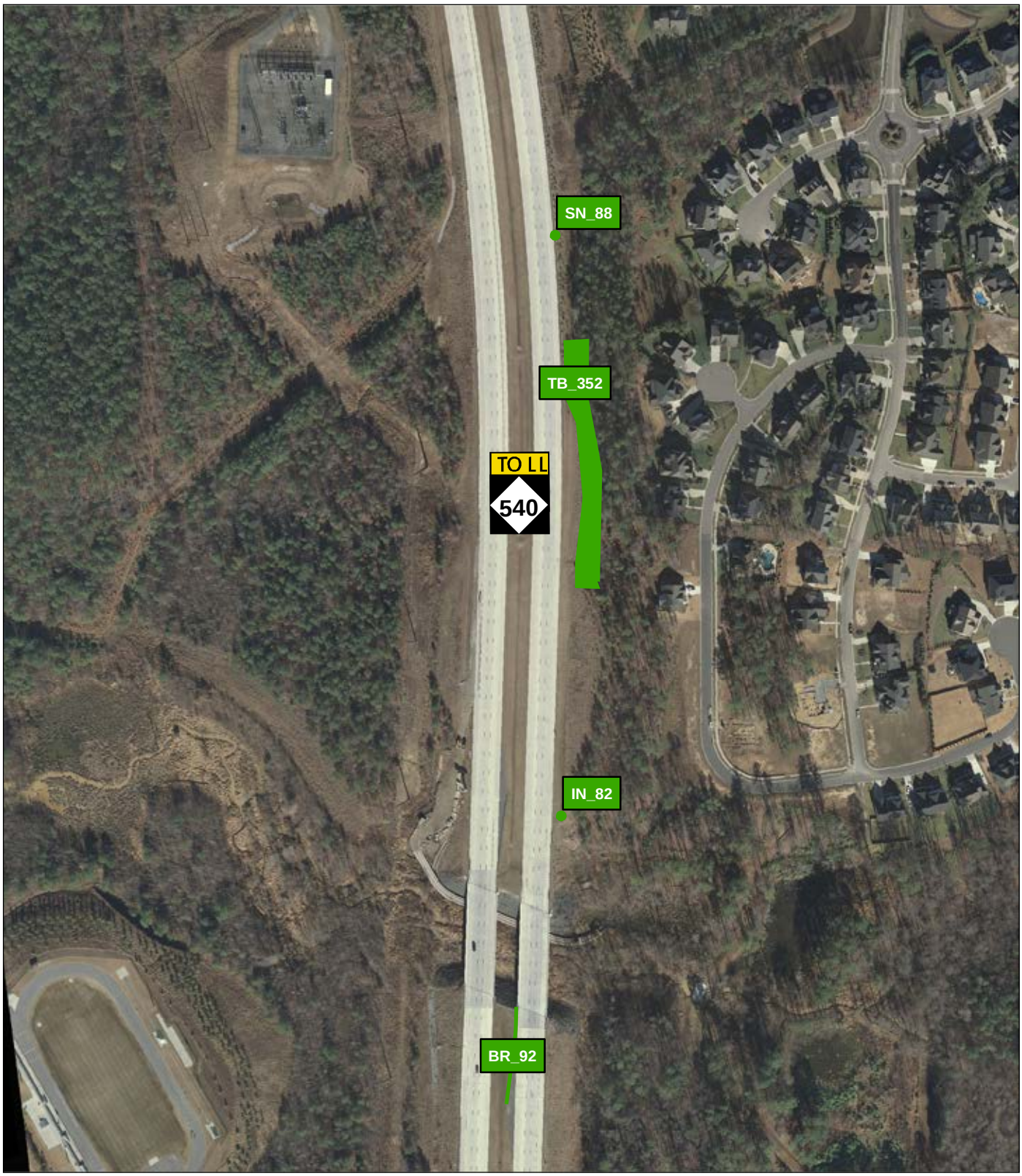

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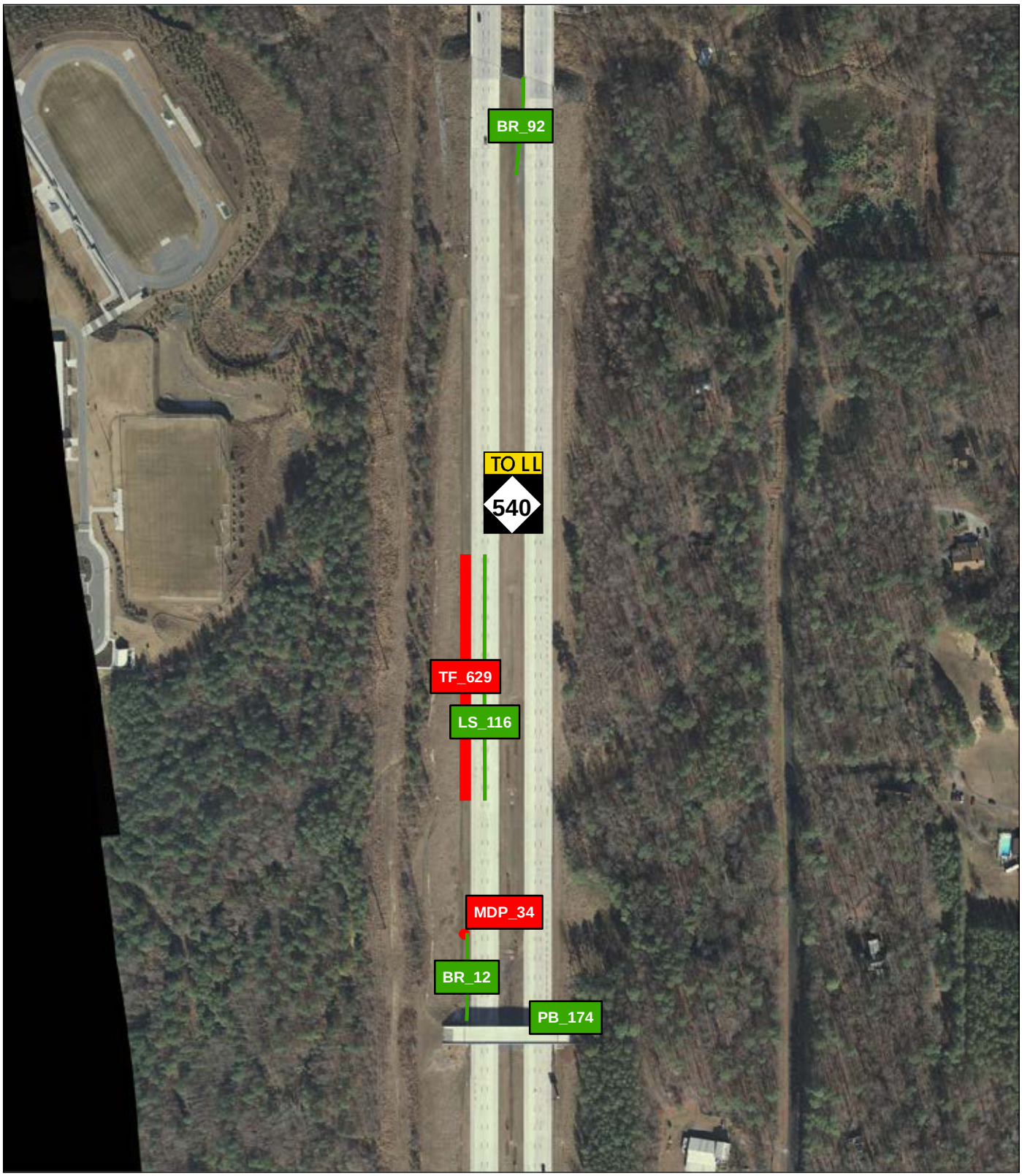

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NORTH CAROLINA Turnpike Authority

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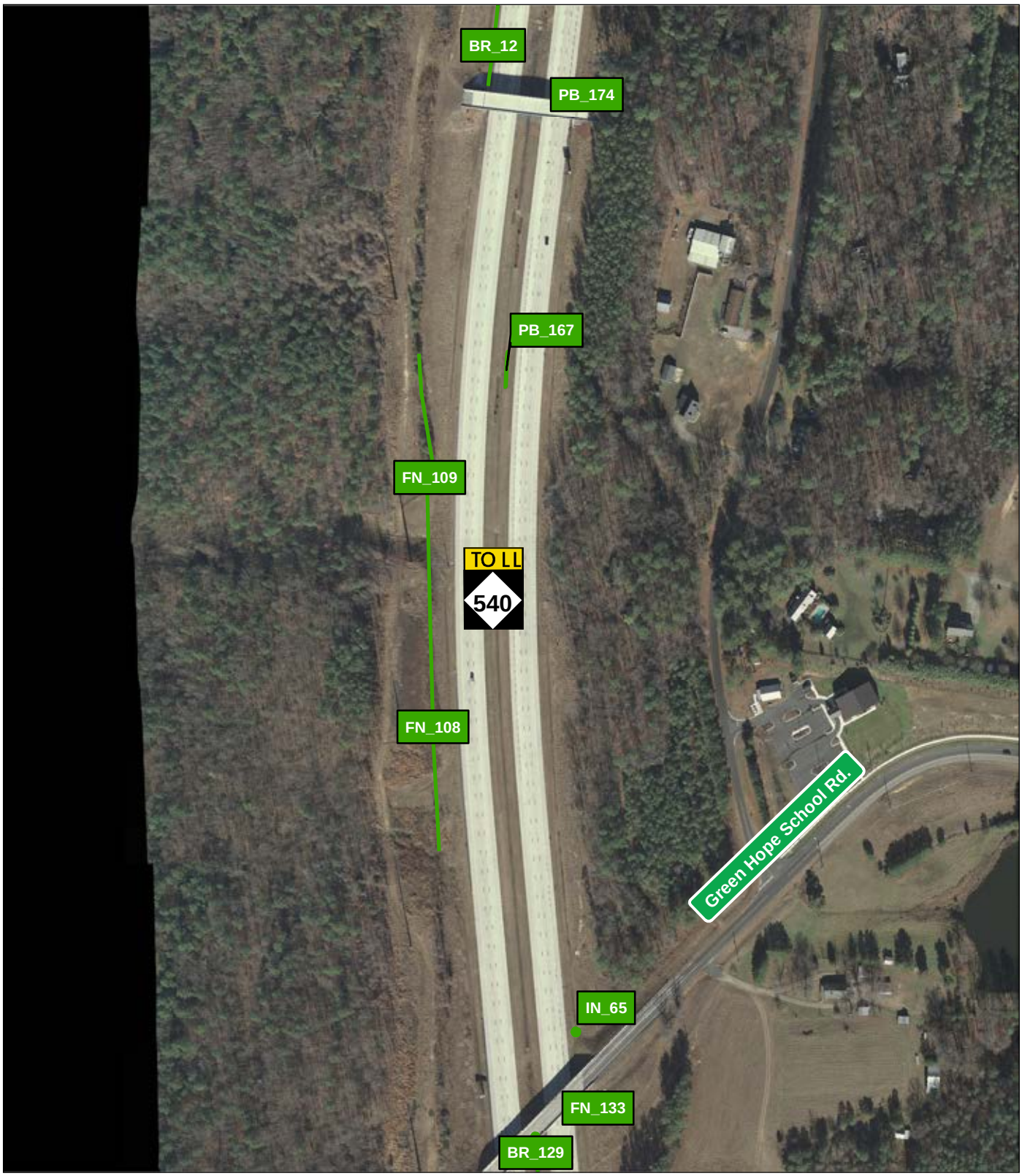

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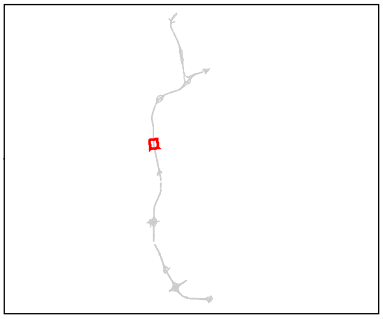

NORTH CAROLINA Turnpike Authority

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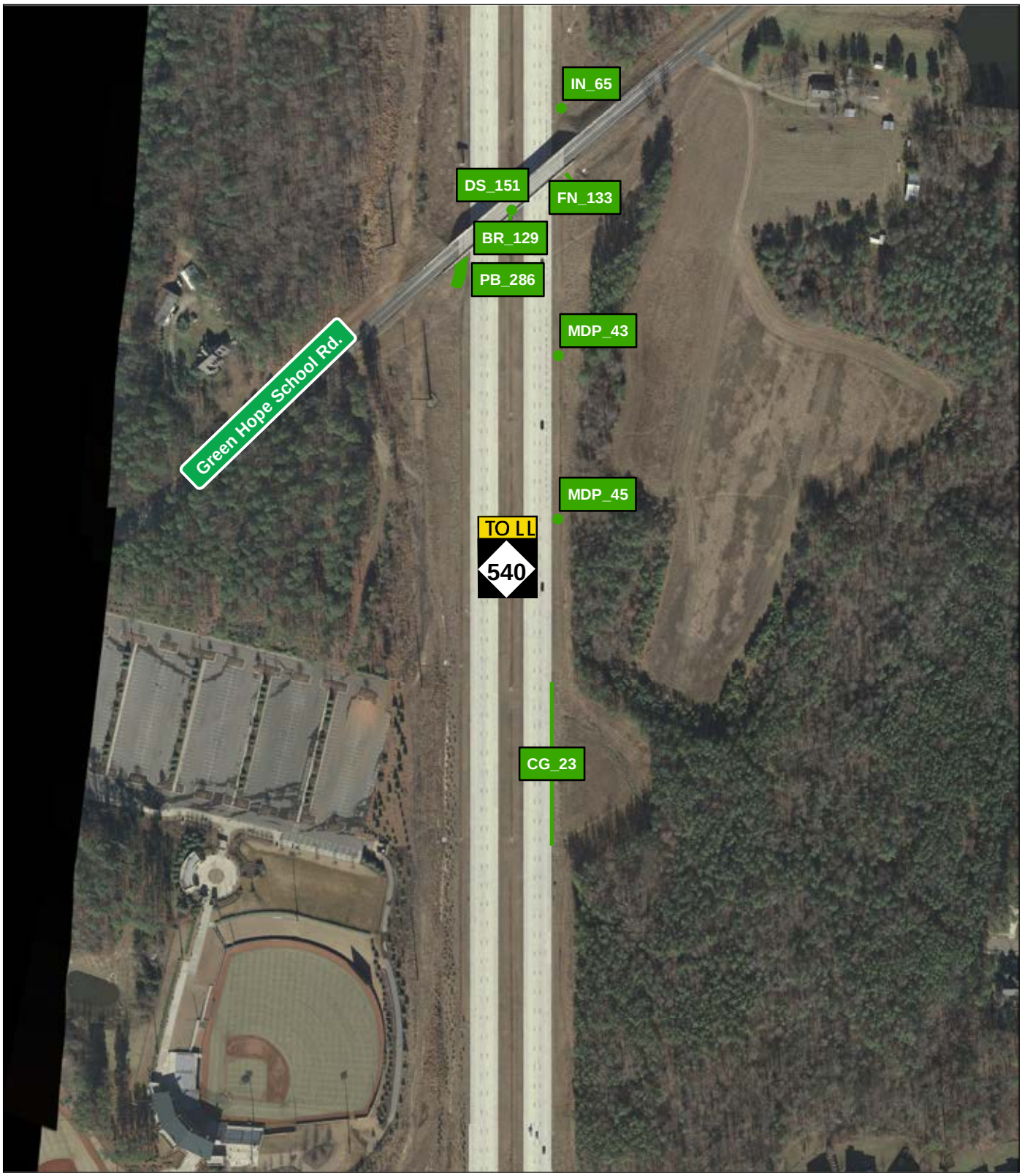

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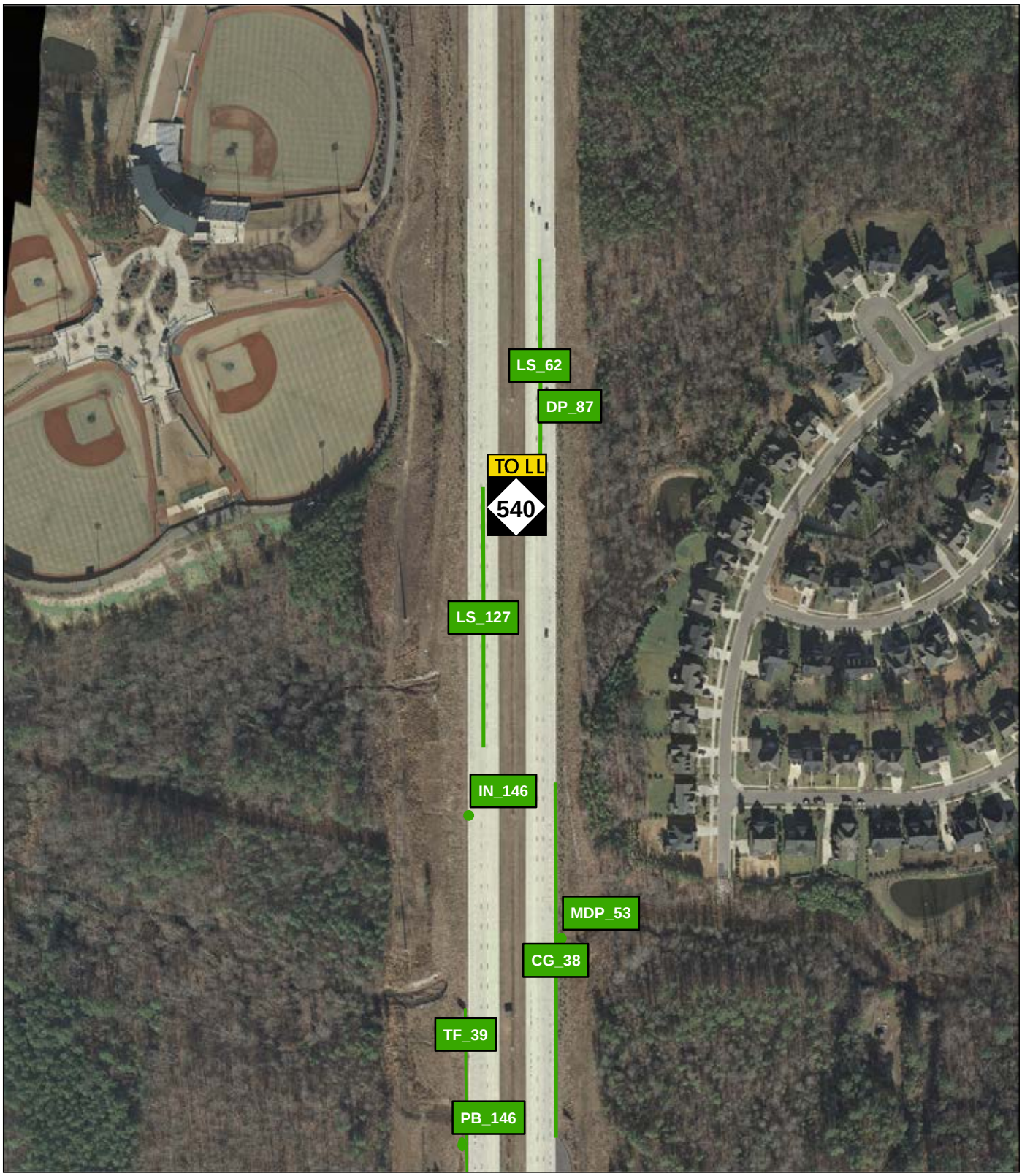

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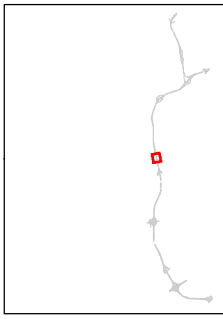

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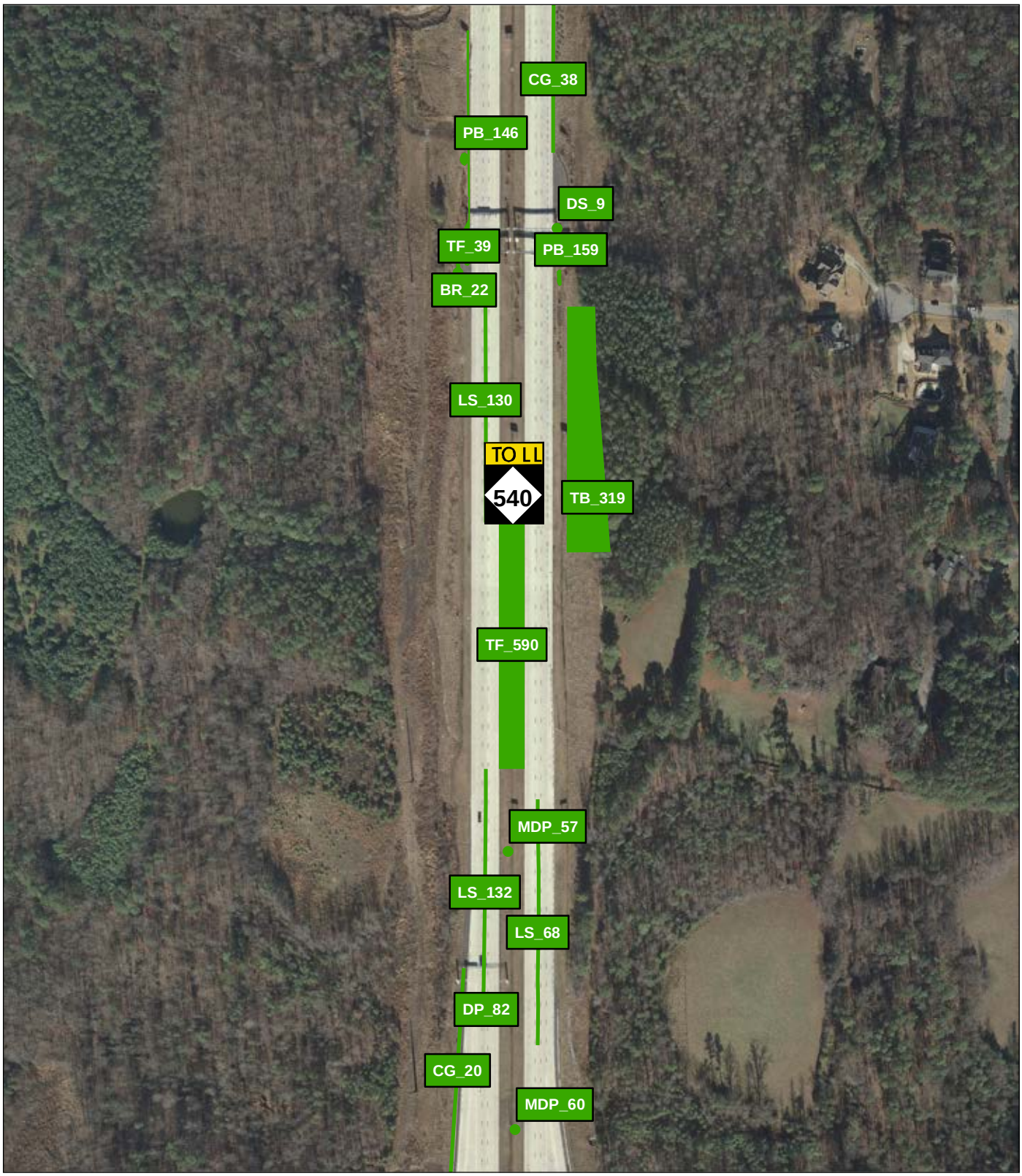

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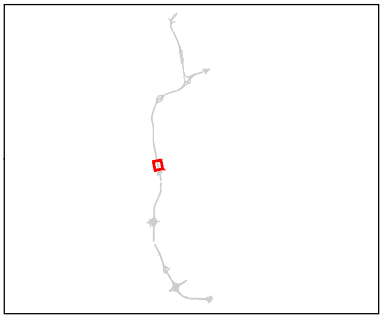

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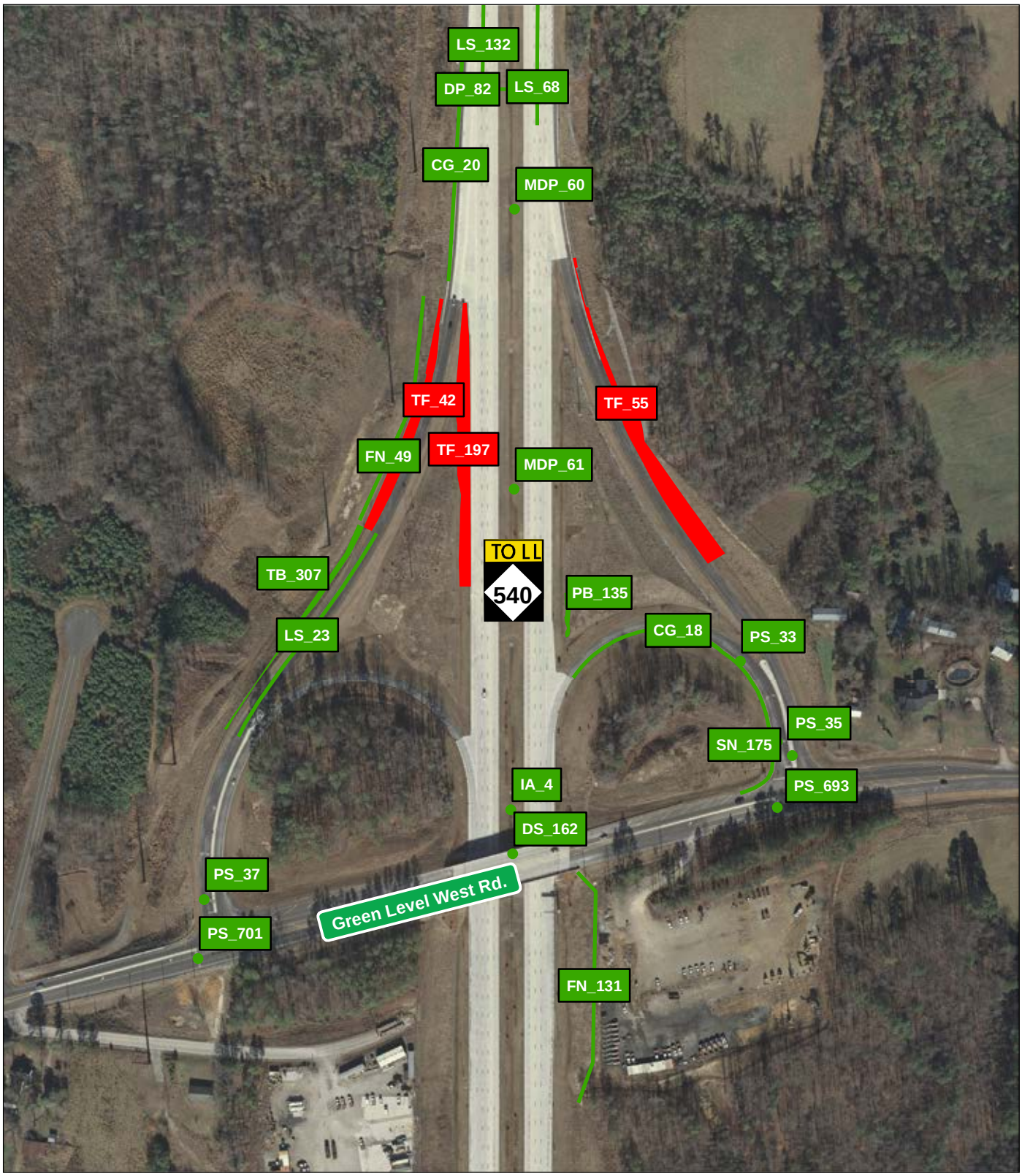

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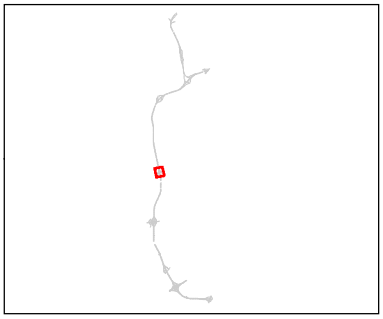

NORTH CAROLINA Turnpike Authority

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Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

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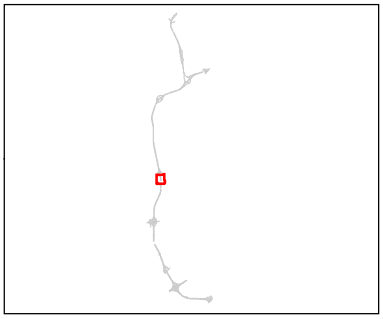

NORTH CAROLINA Turnpike Authority

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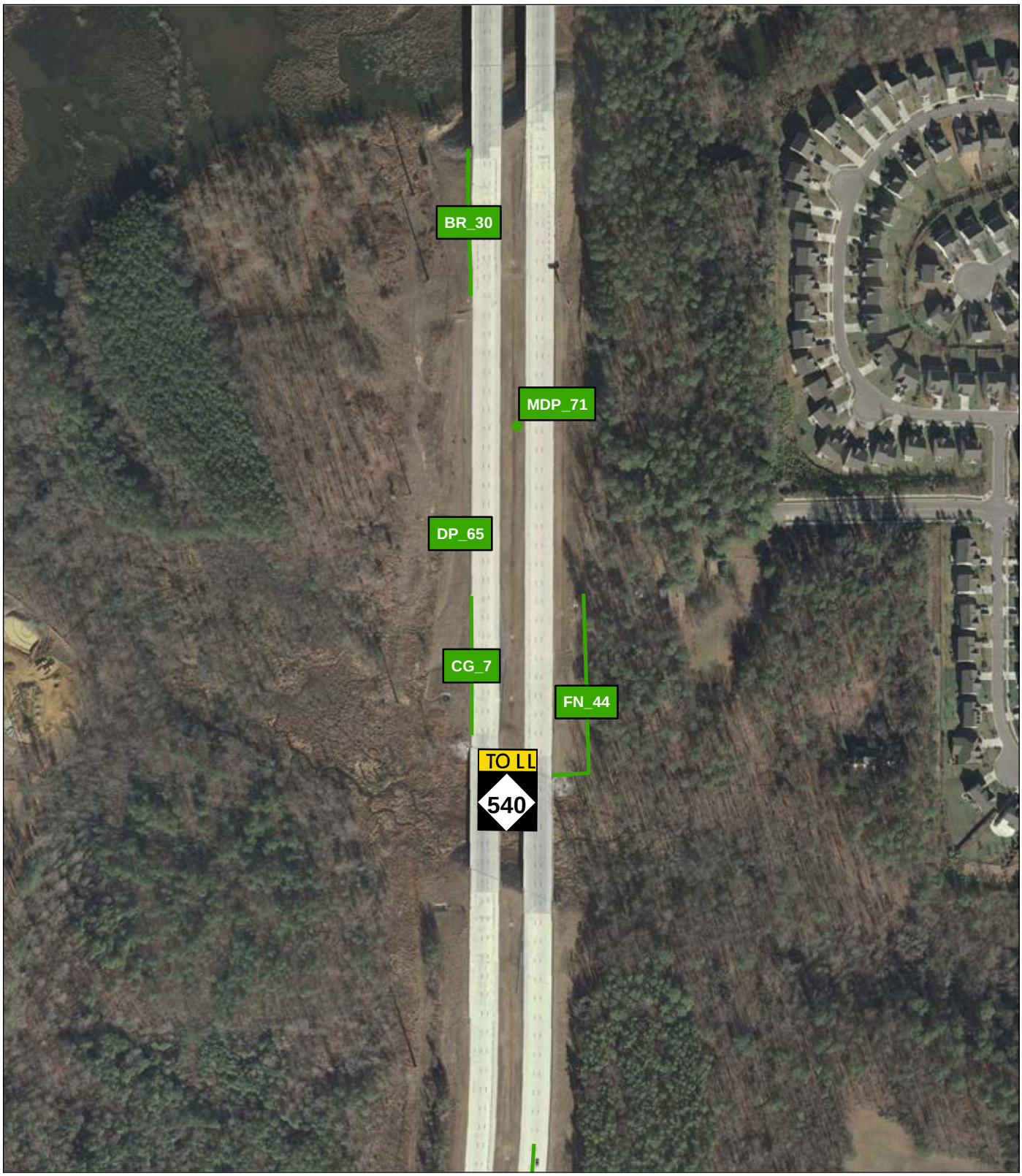

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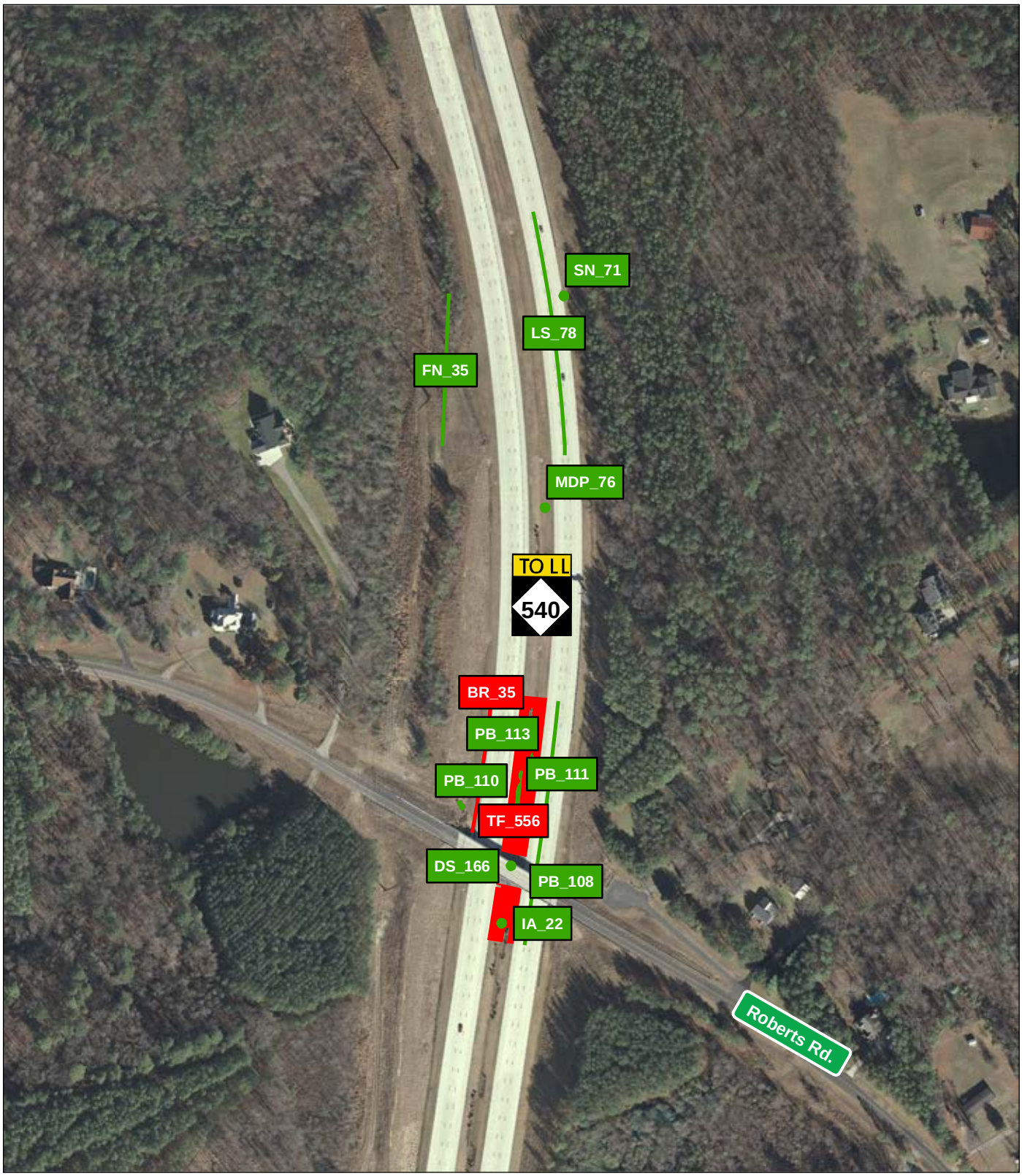
NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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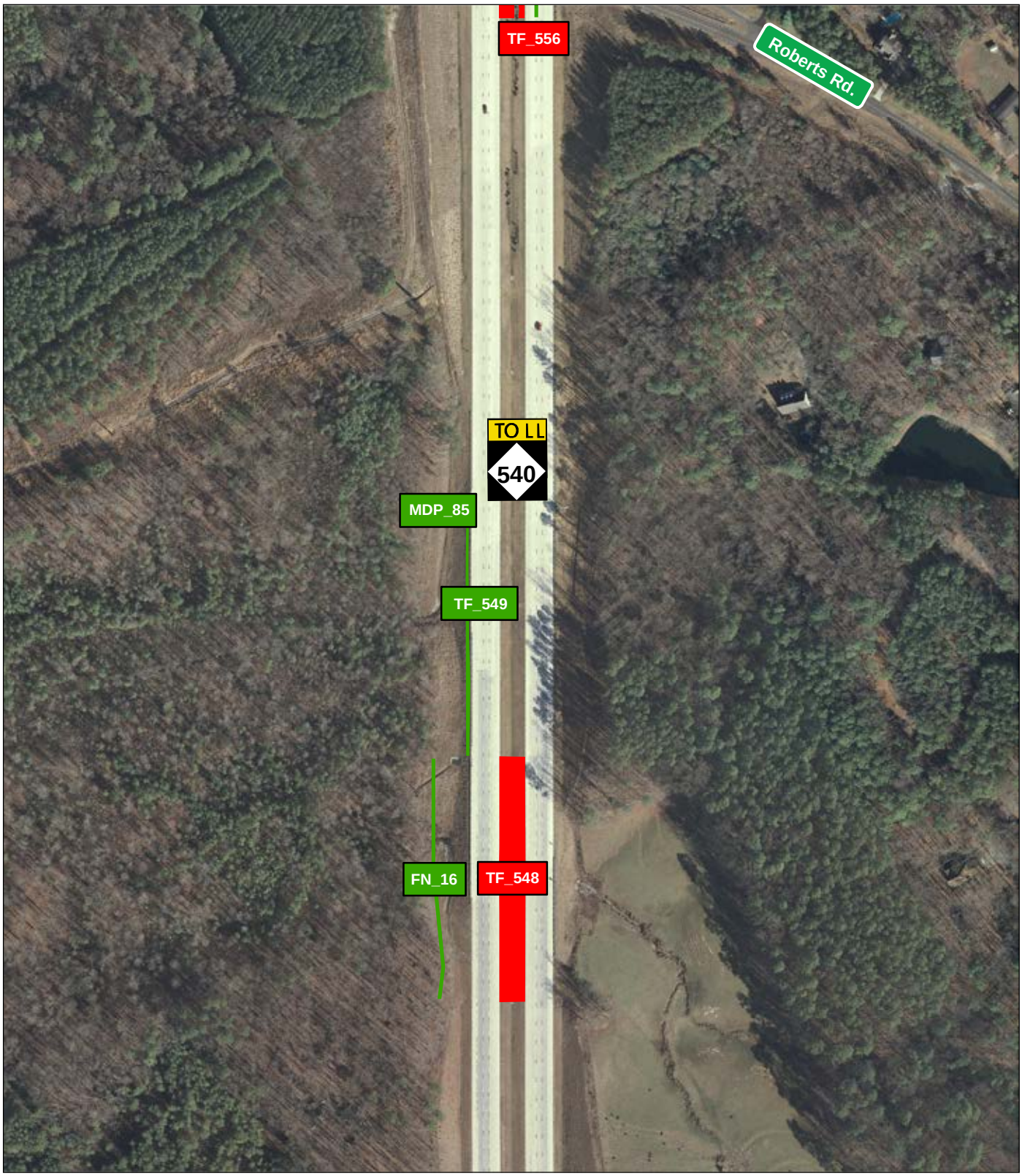
NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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NORTH CAROLINA Turnpike Authority

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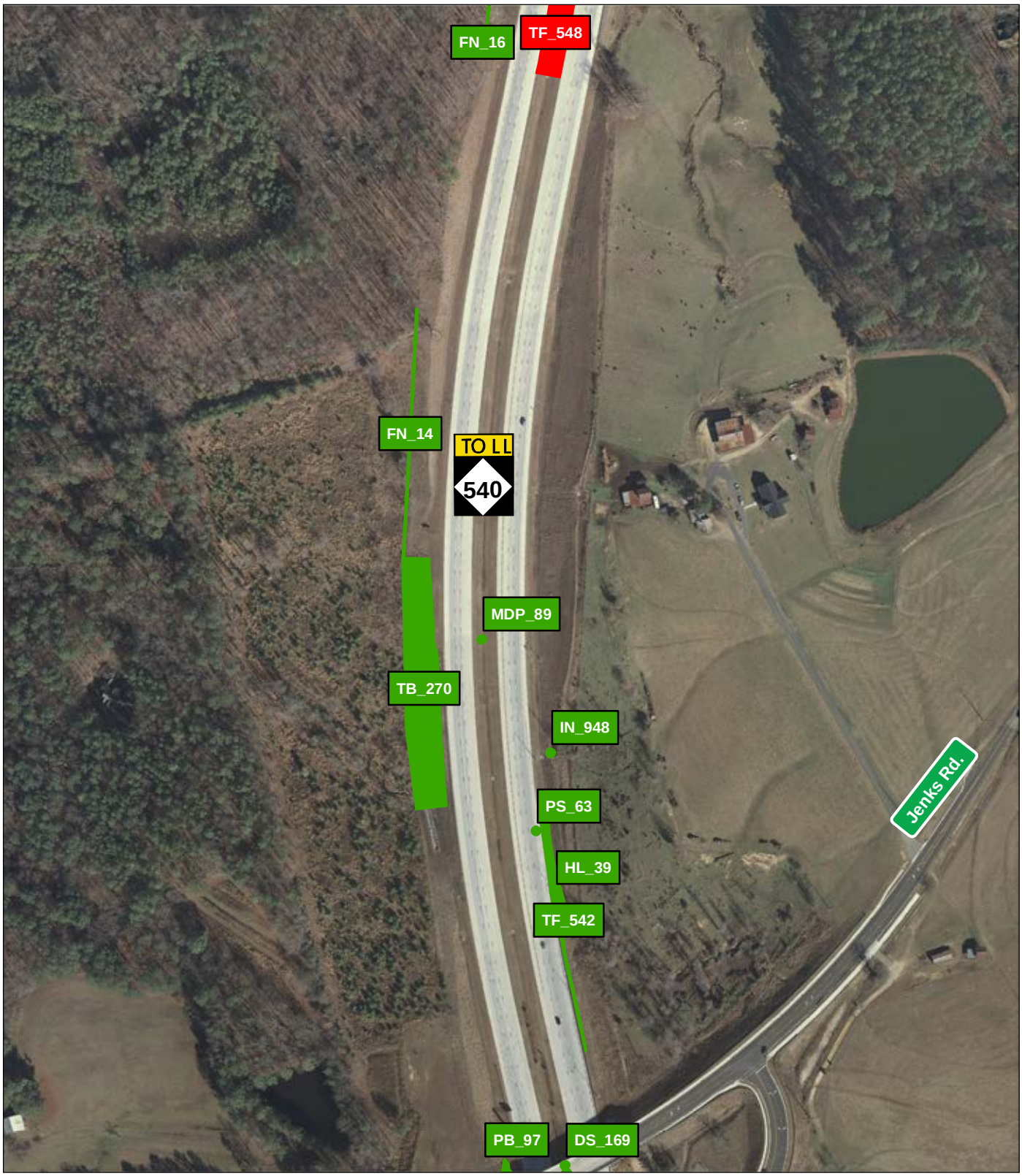

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NORTH CAROLINA Turnpike Authority

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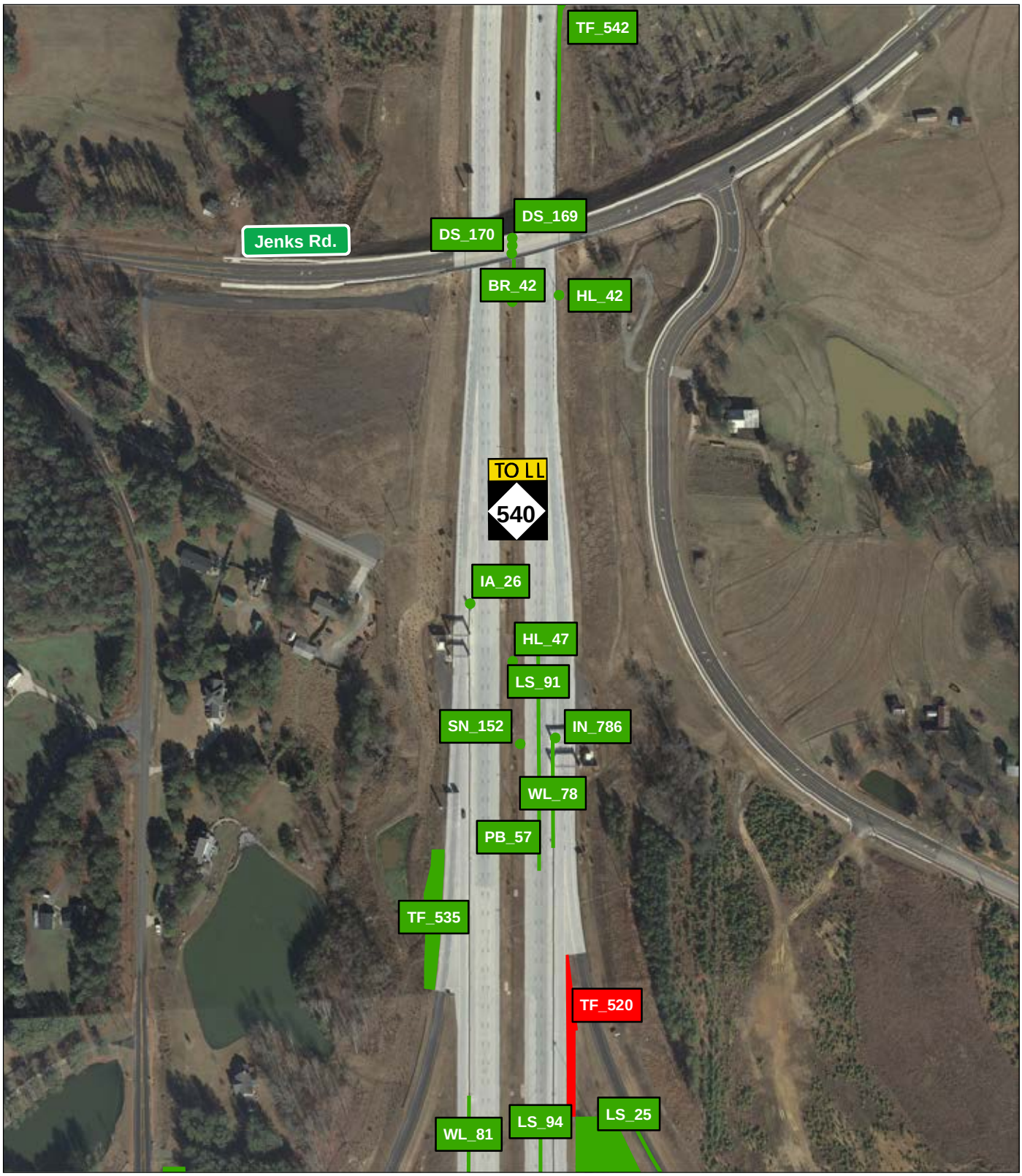

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NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

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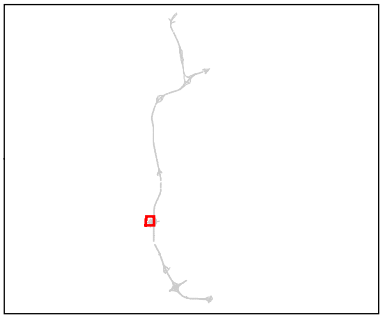

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

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Passing Asset

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NORTH CAROLINA Turnpike Authority

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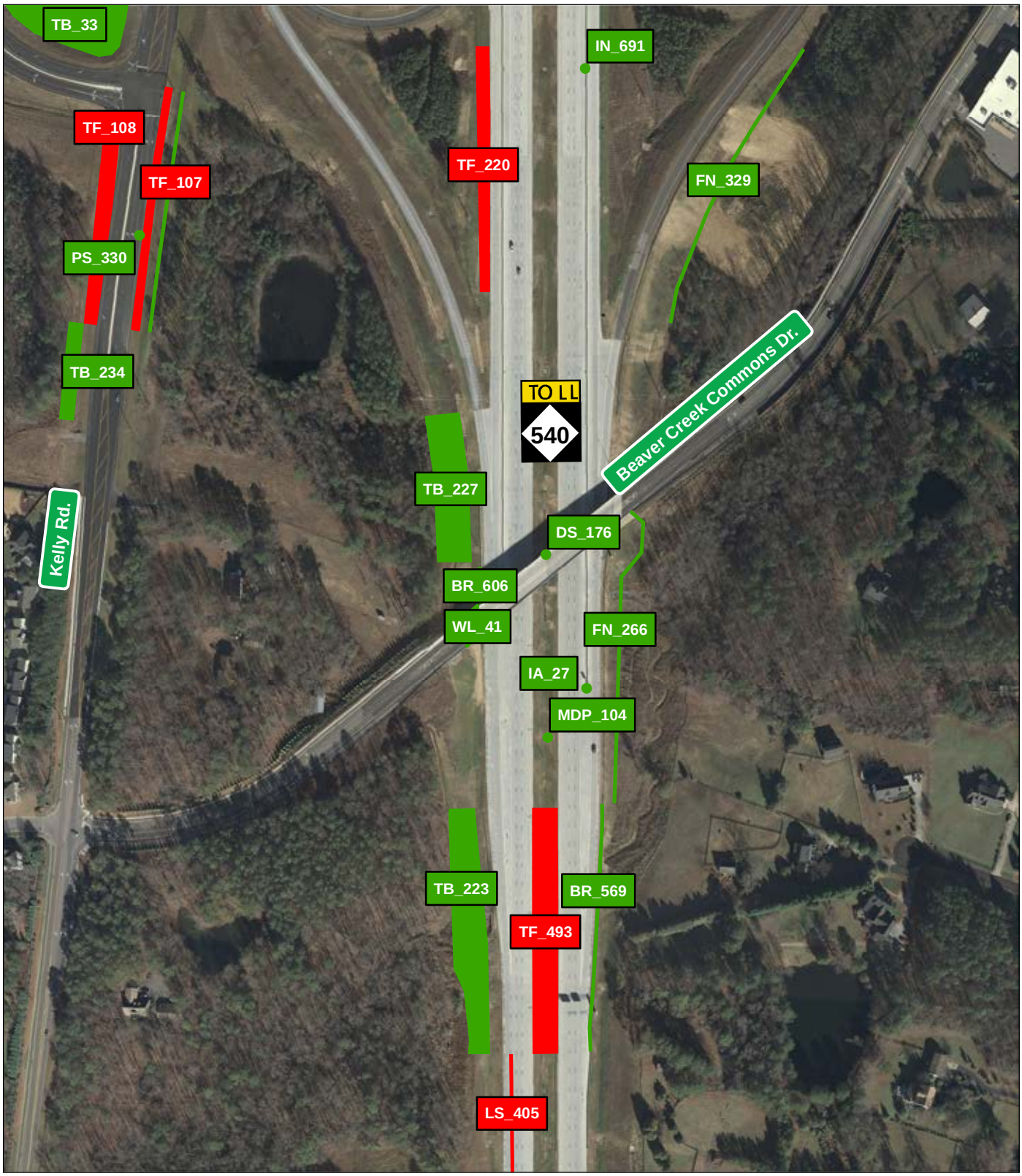
Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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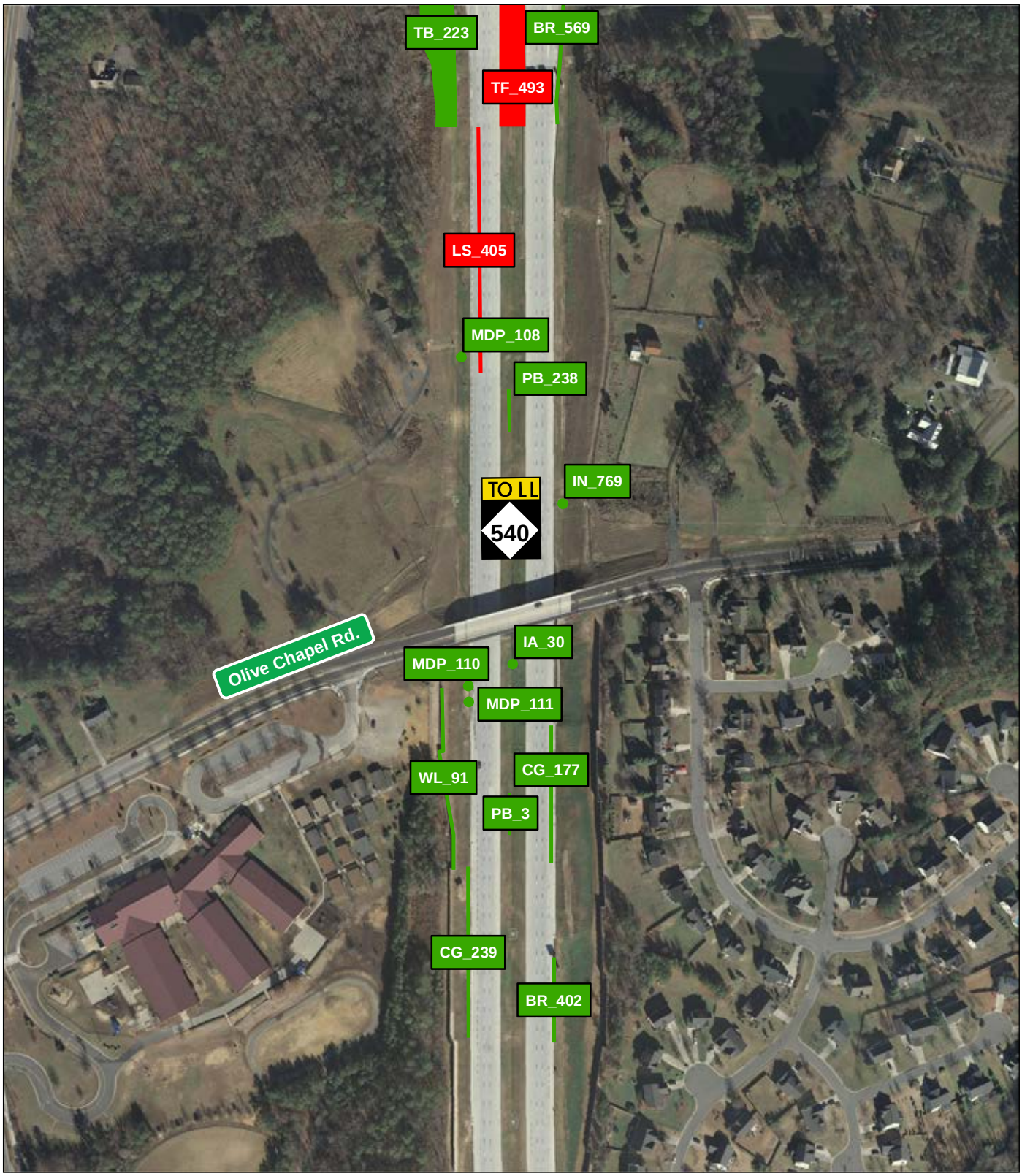
NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



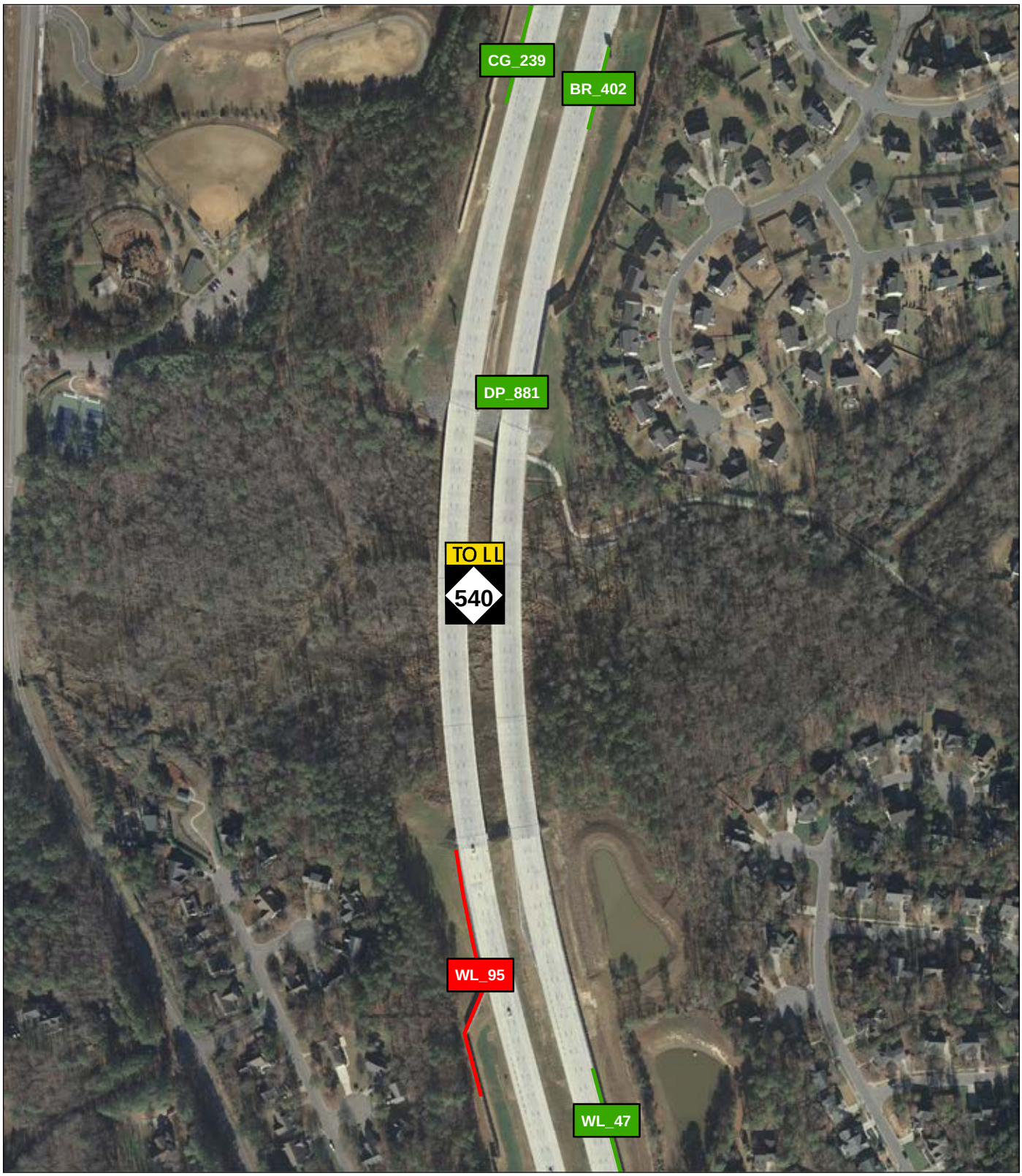
Legend

Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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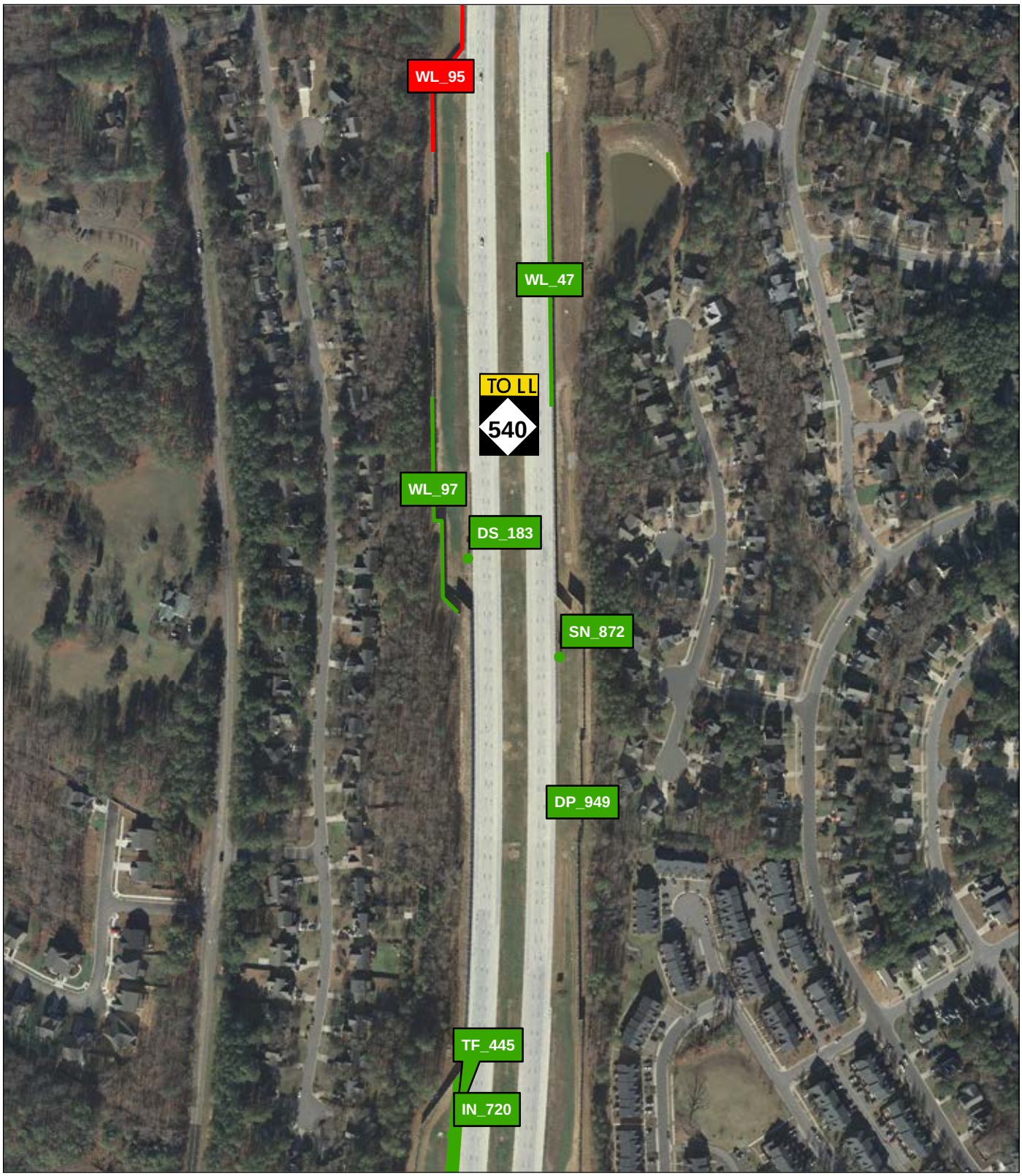
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

A33

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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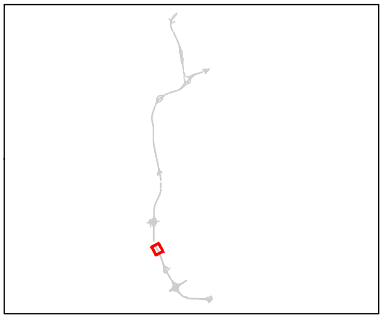
Failing Asset



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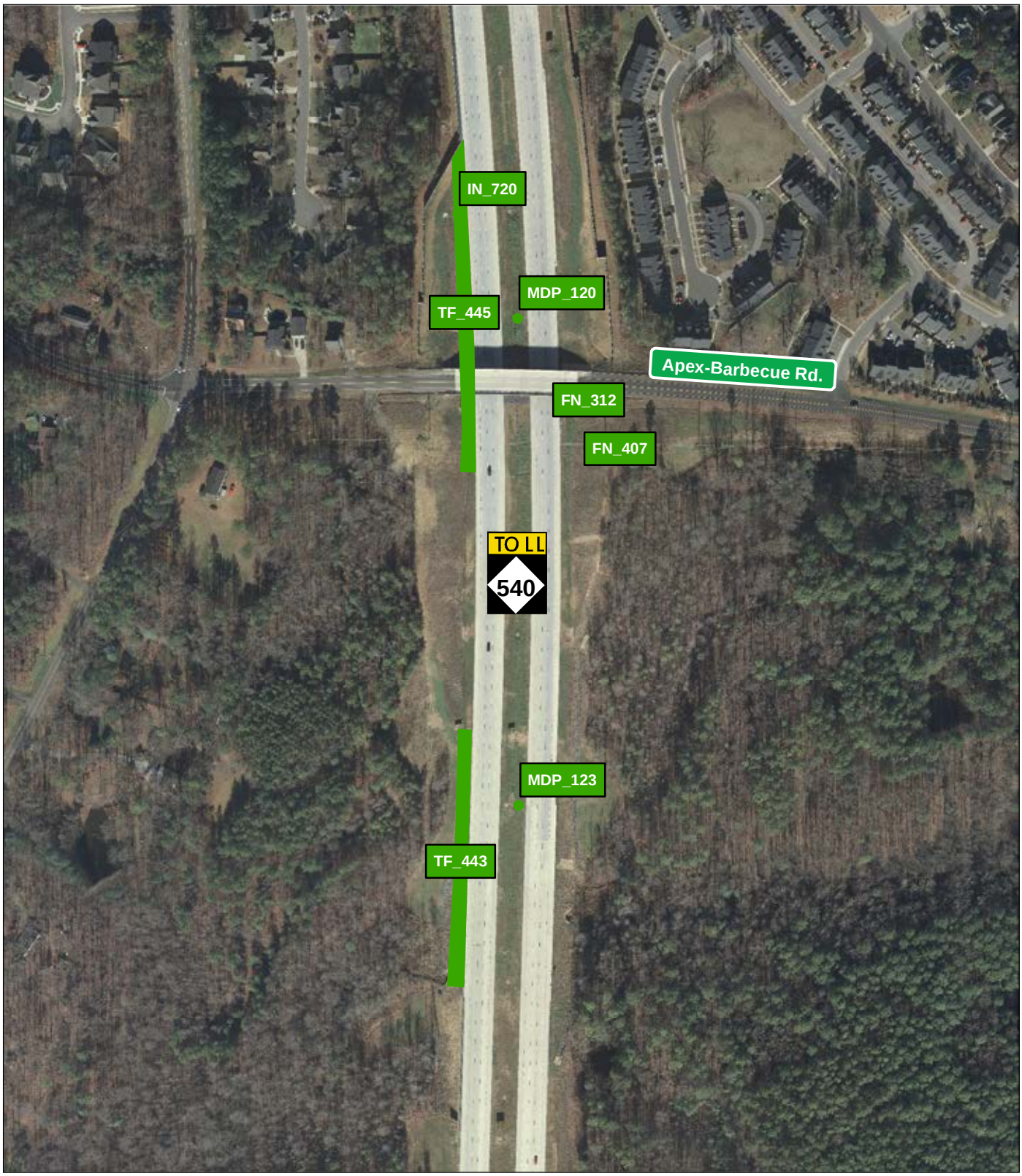

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Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

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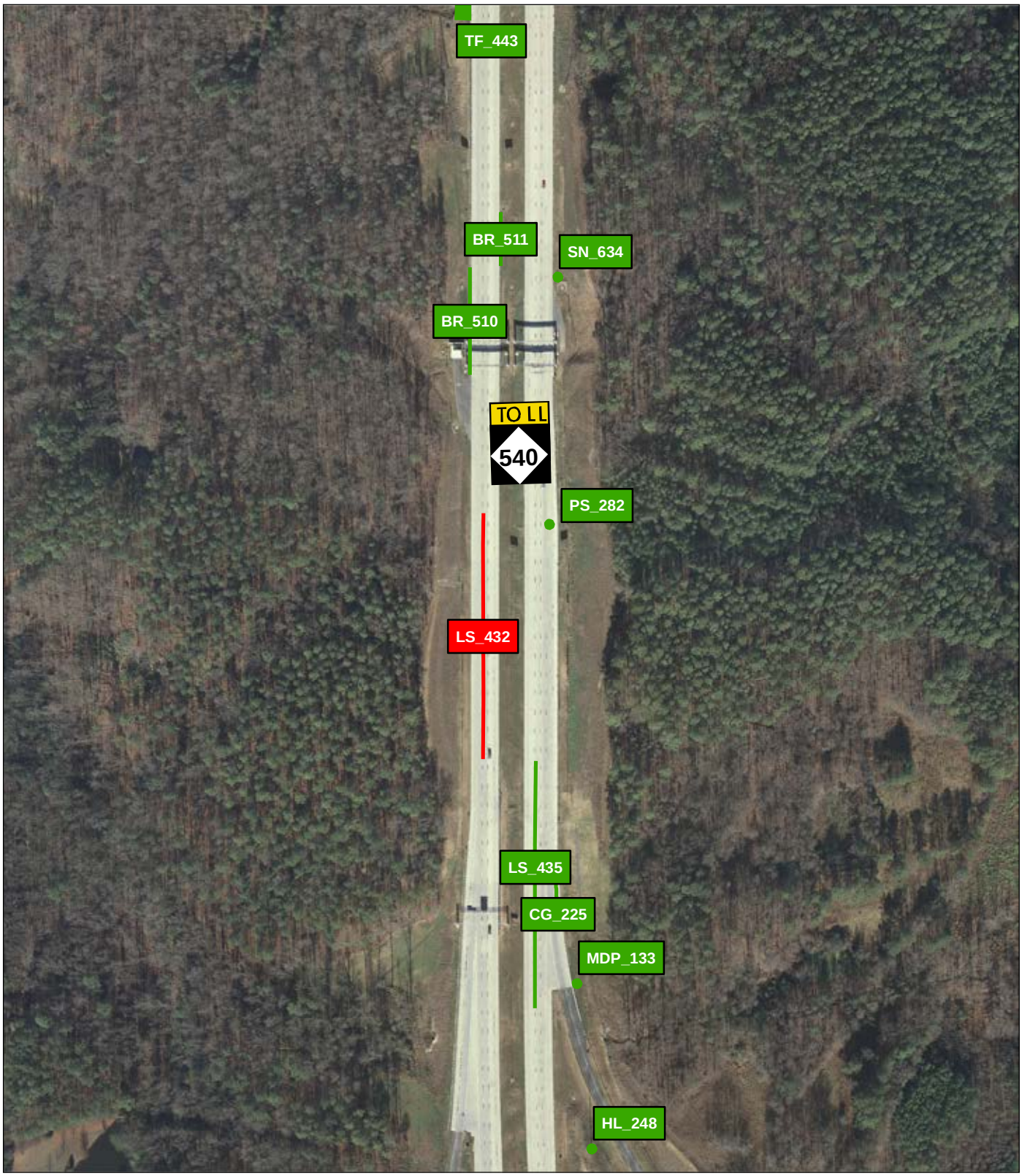

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Passing Asset

Failing Asset

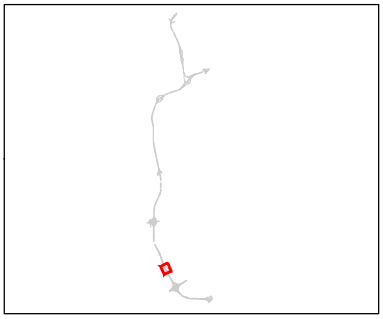
NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

Legend

Passing Asset

Failing Asset



NORTH CAROLINA Turnpike Authority

A37

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

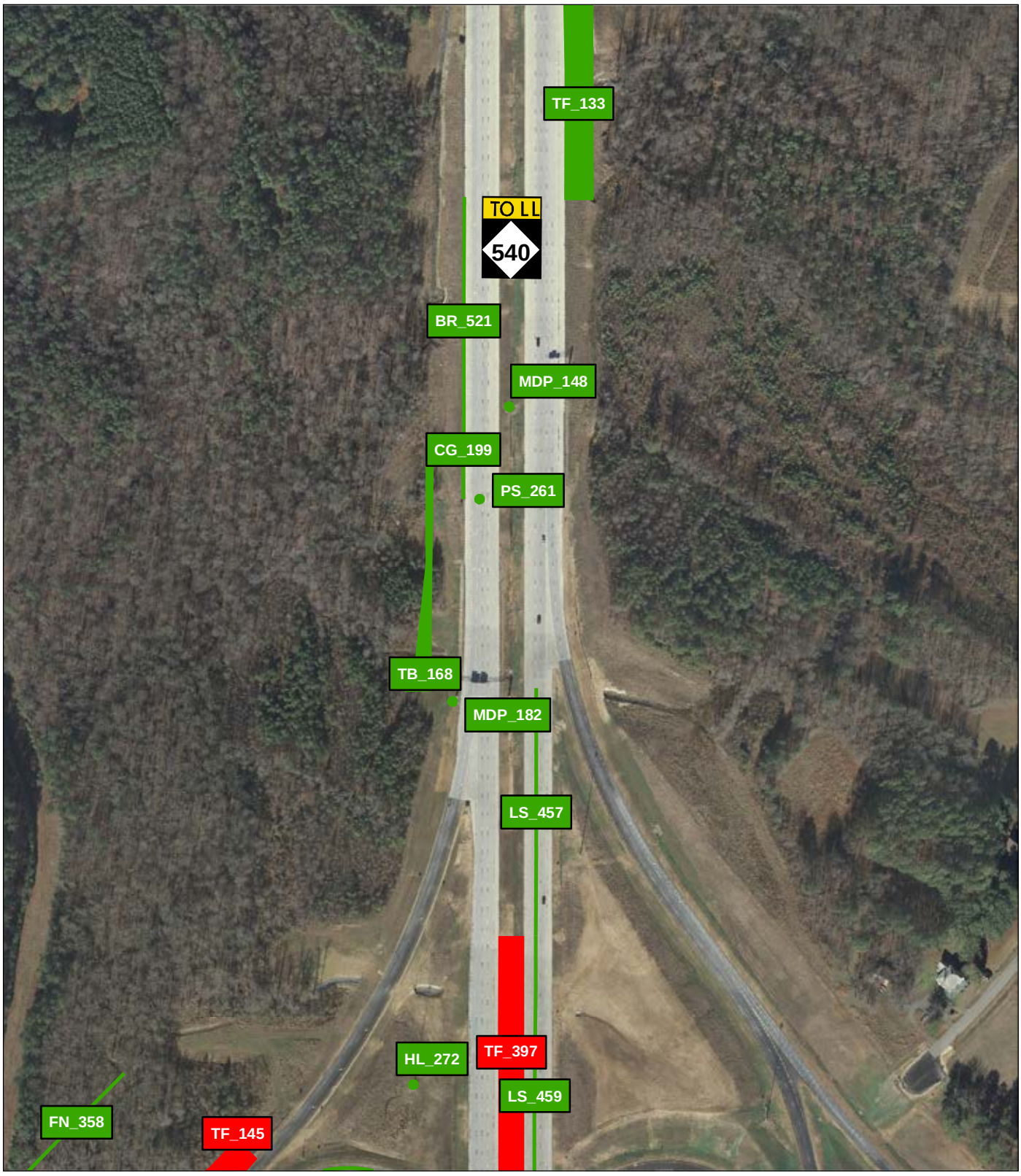
Legend

Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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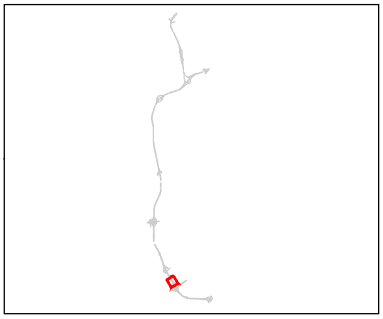
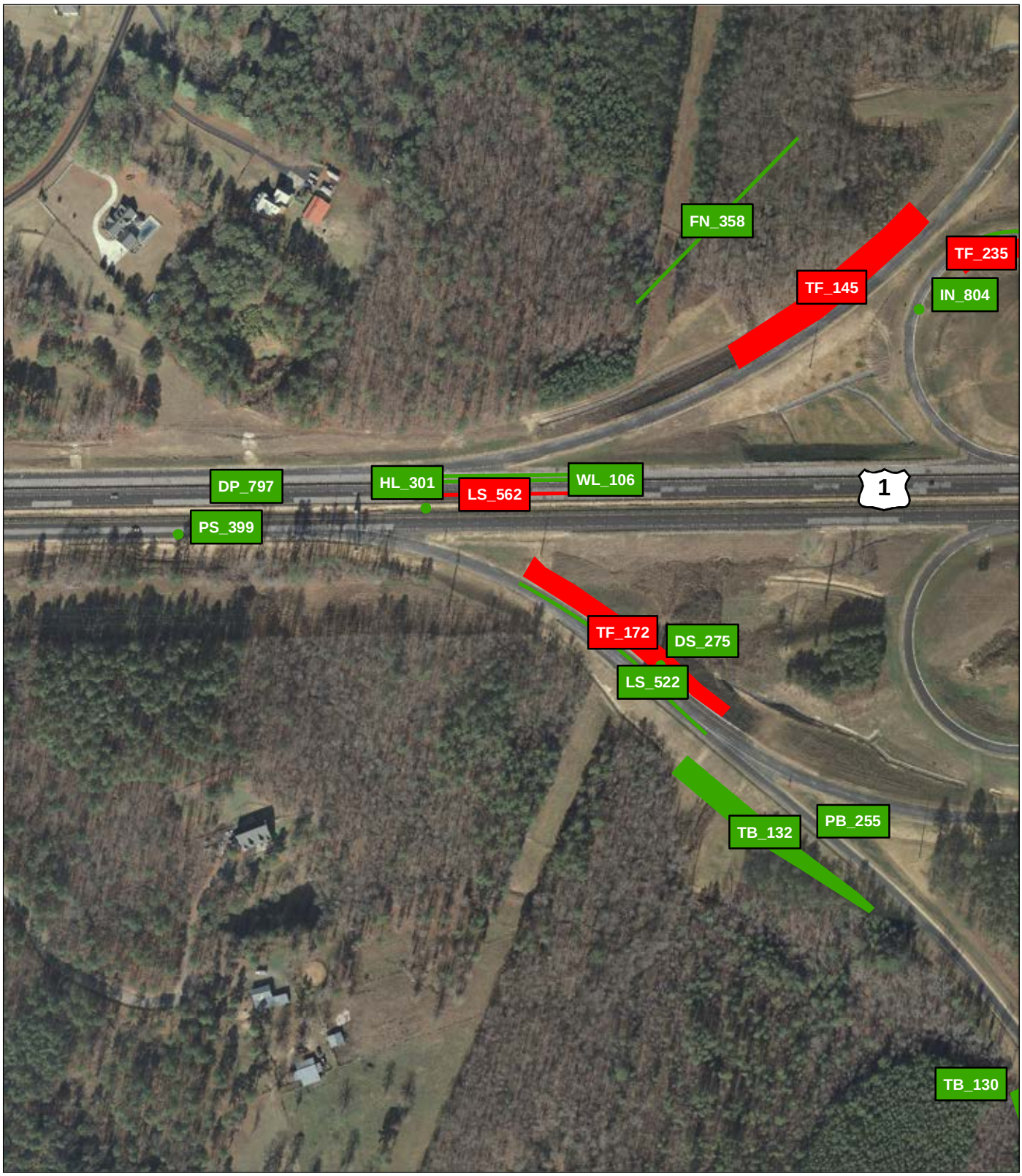
Failing Asset



NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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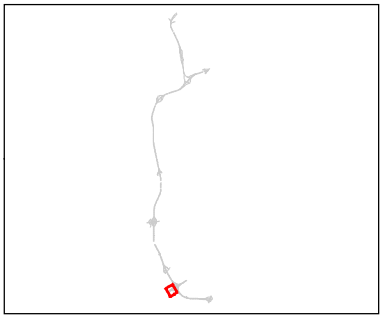
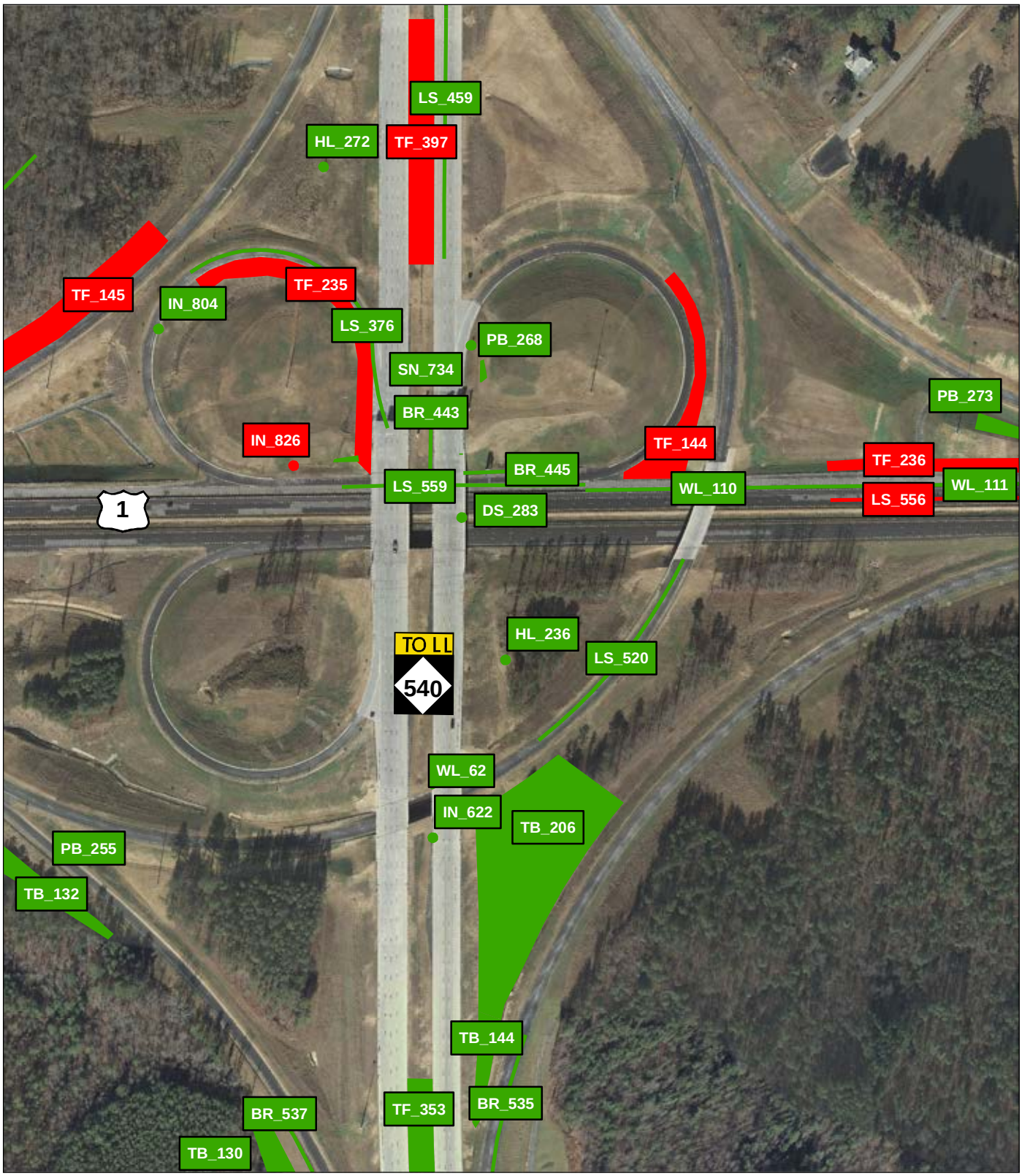
Failing Asset



NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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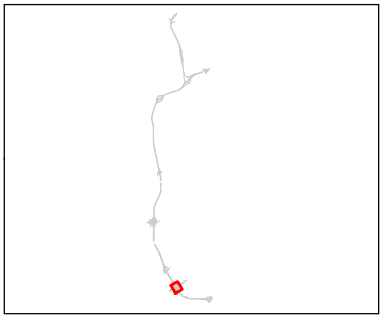

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations

Legend

Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

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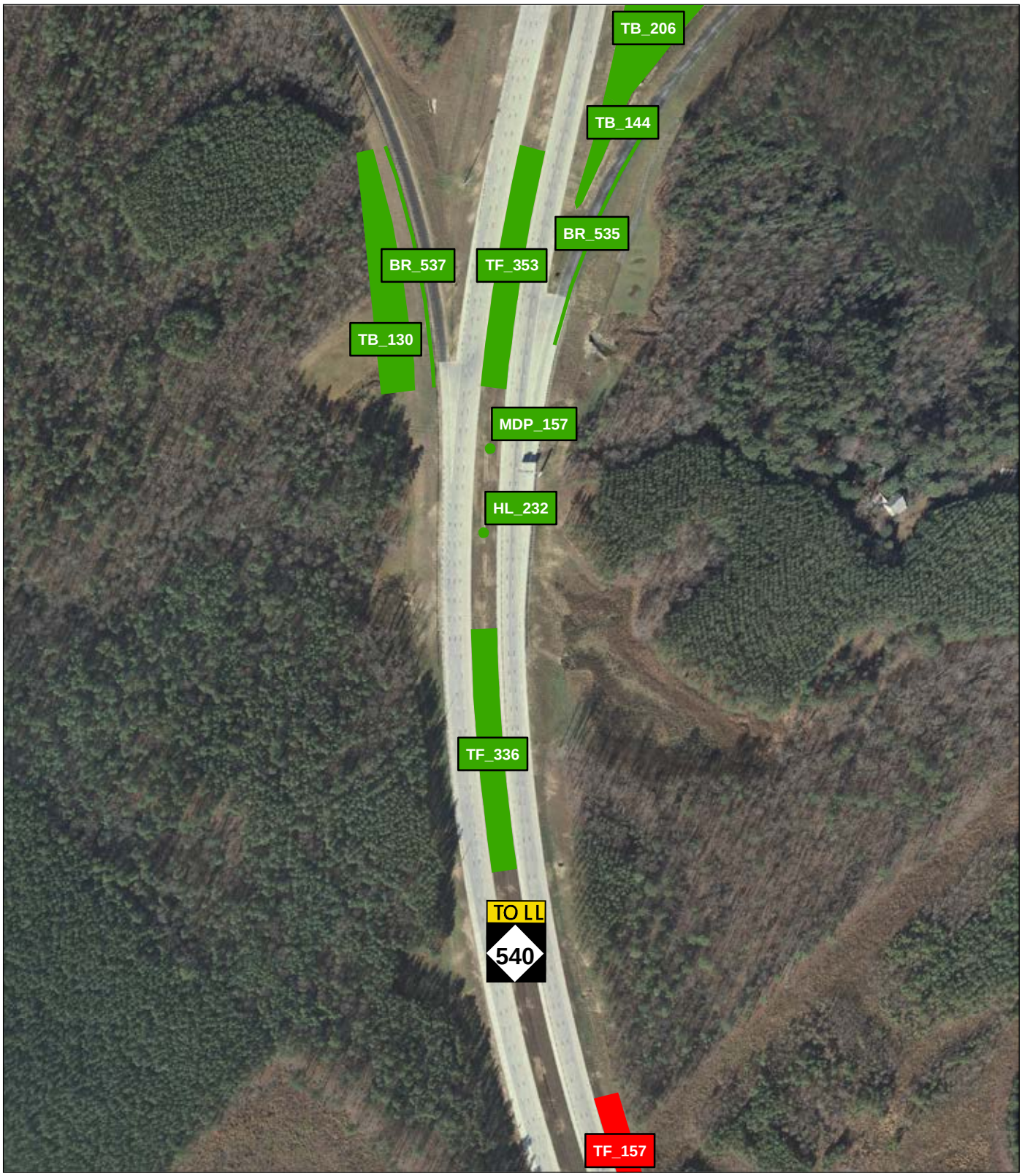

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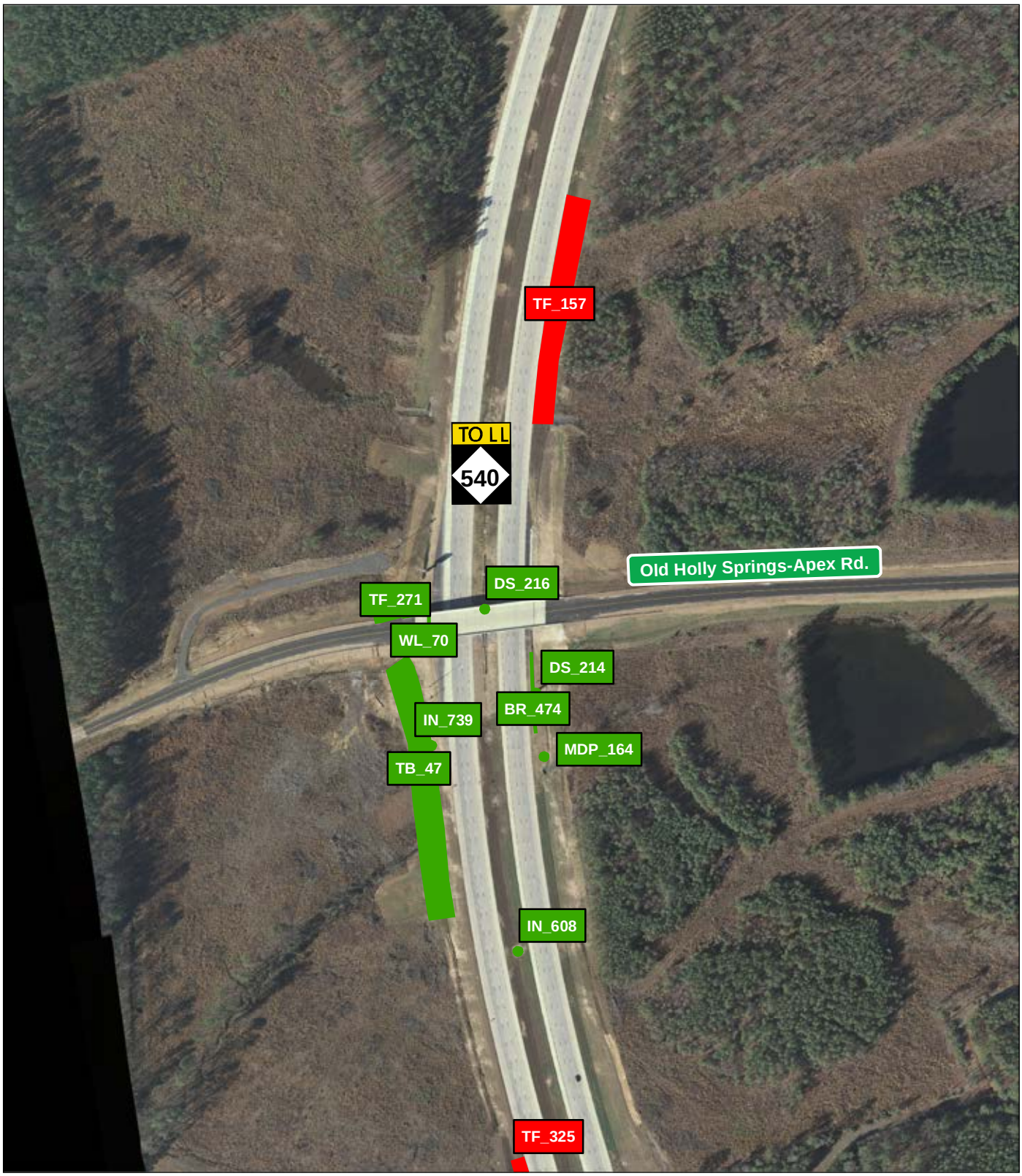
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

A43

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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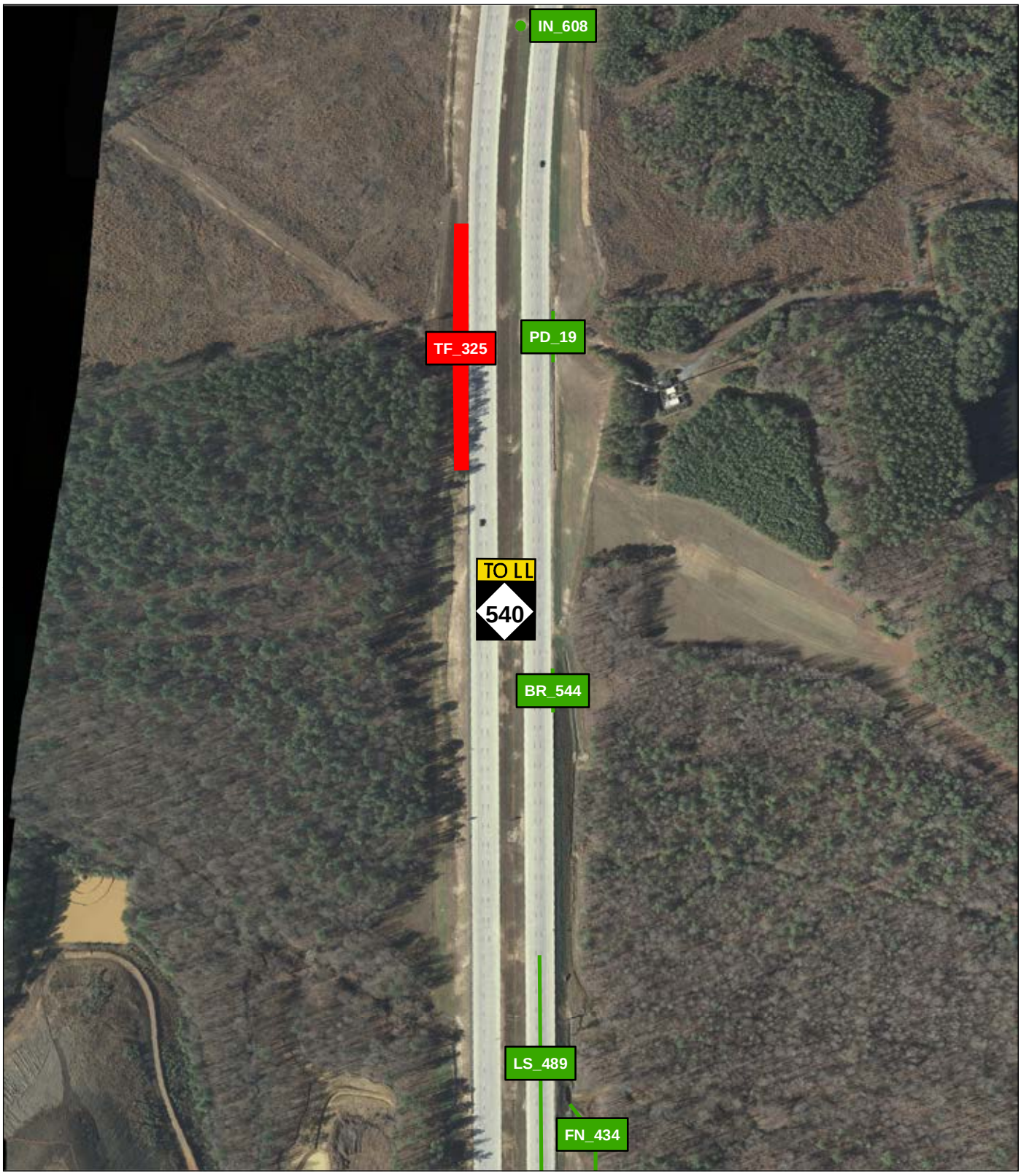
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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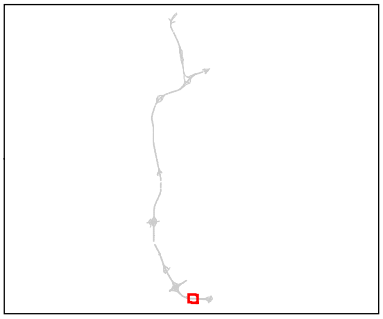
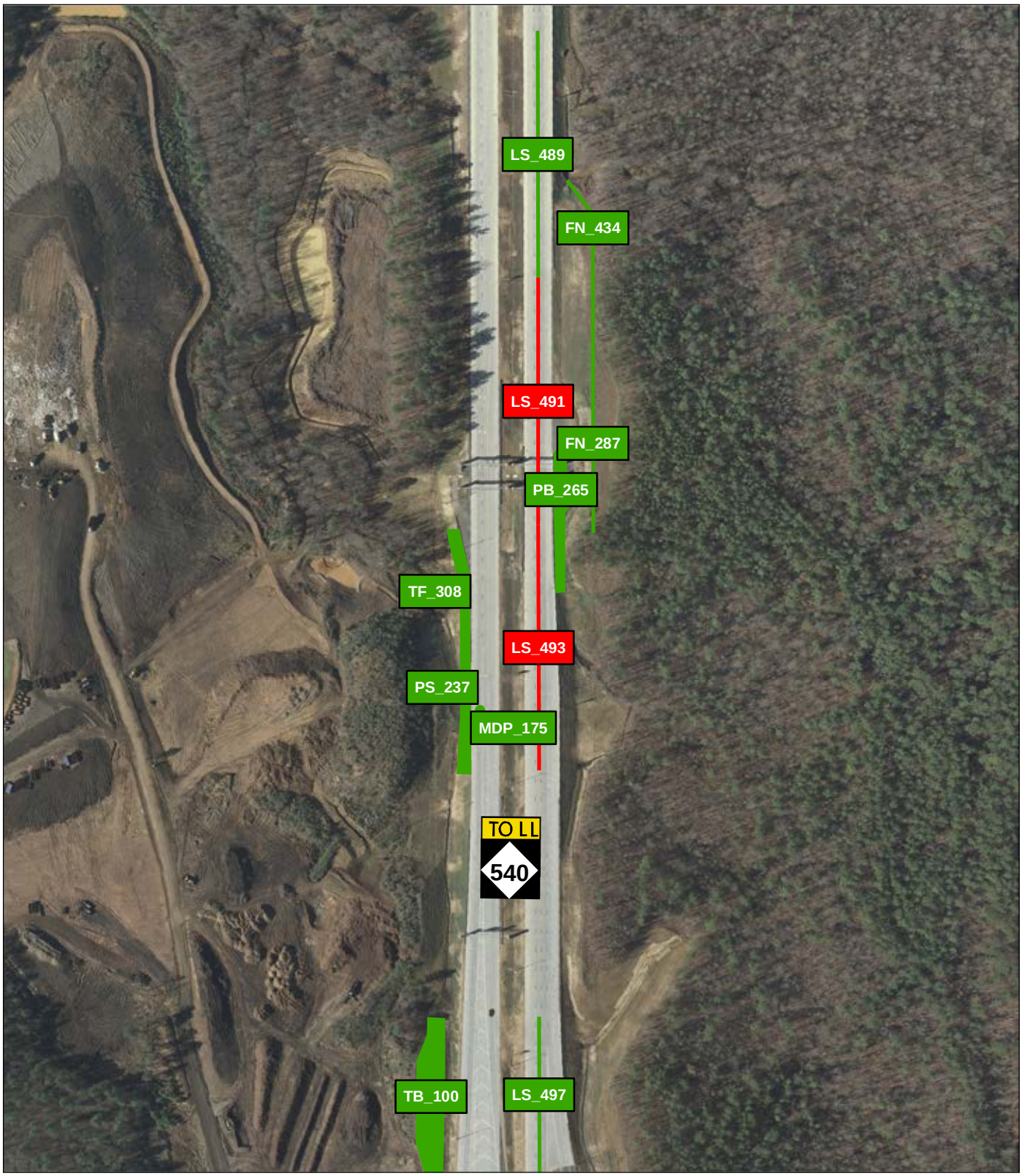
Failing Asset



NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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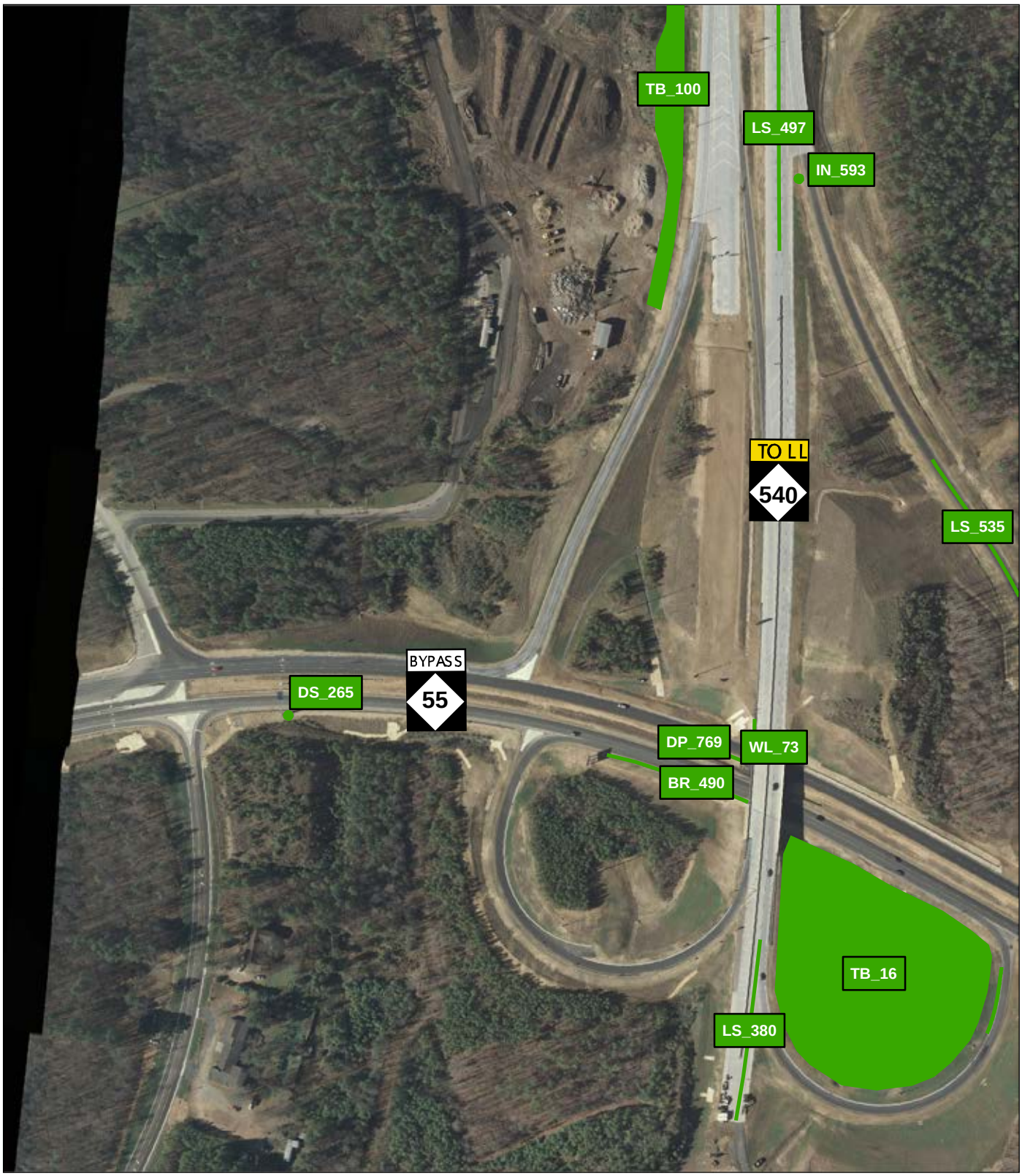
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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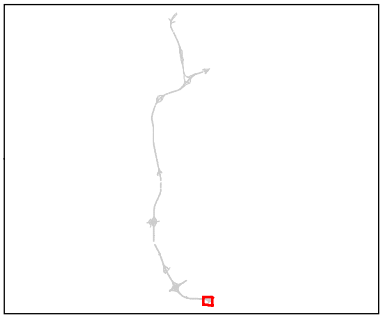
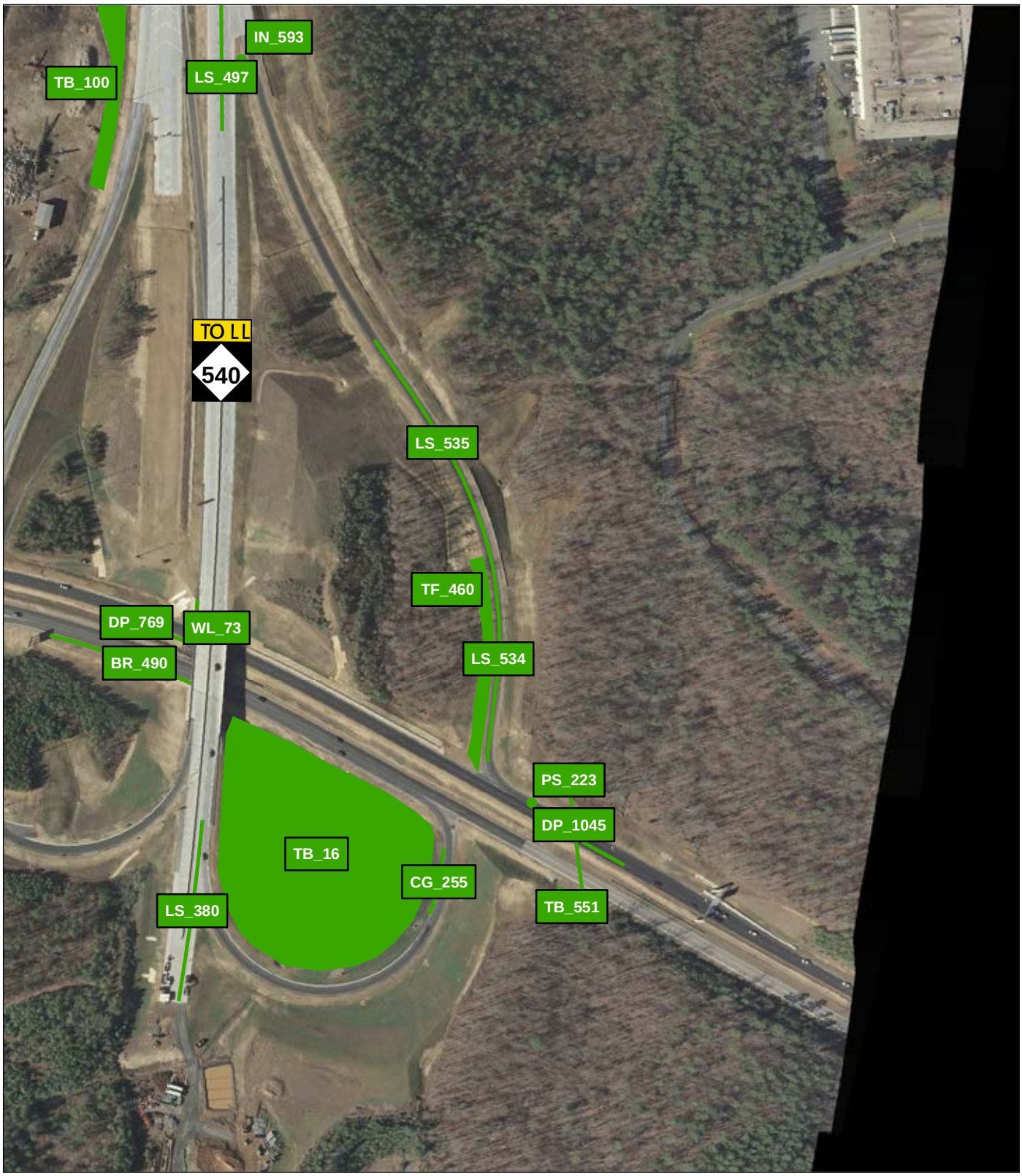


NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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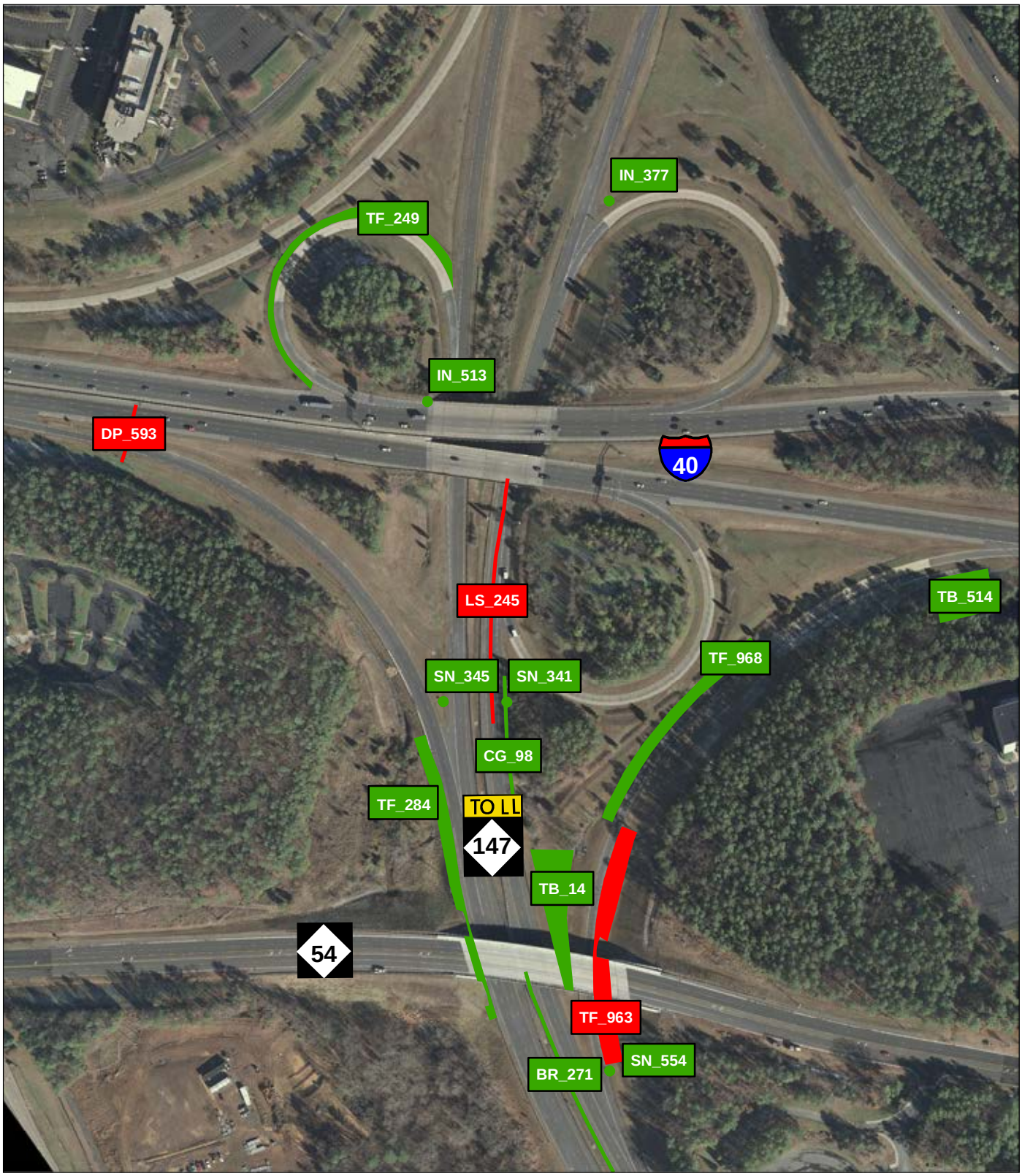
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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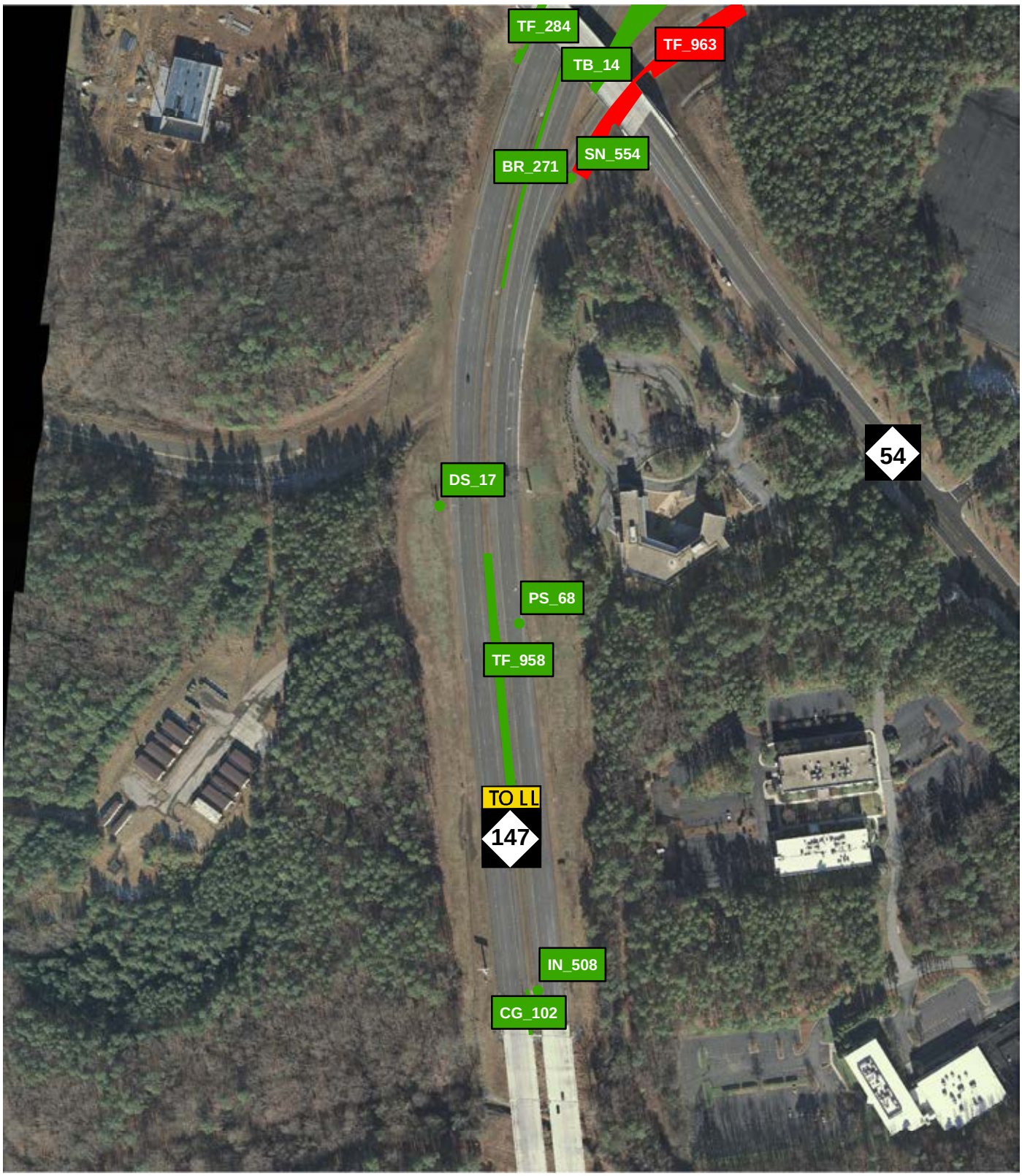
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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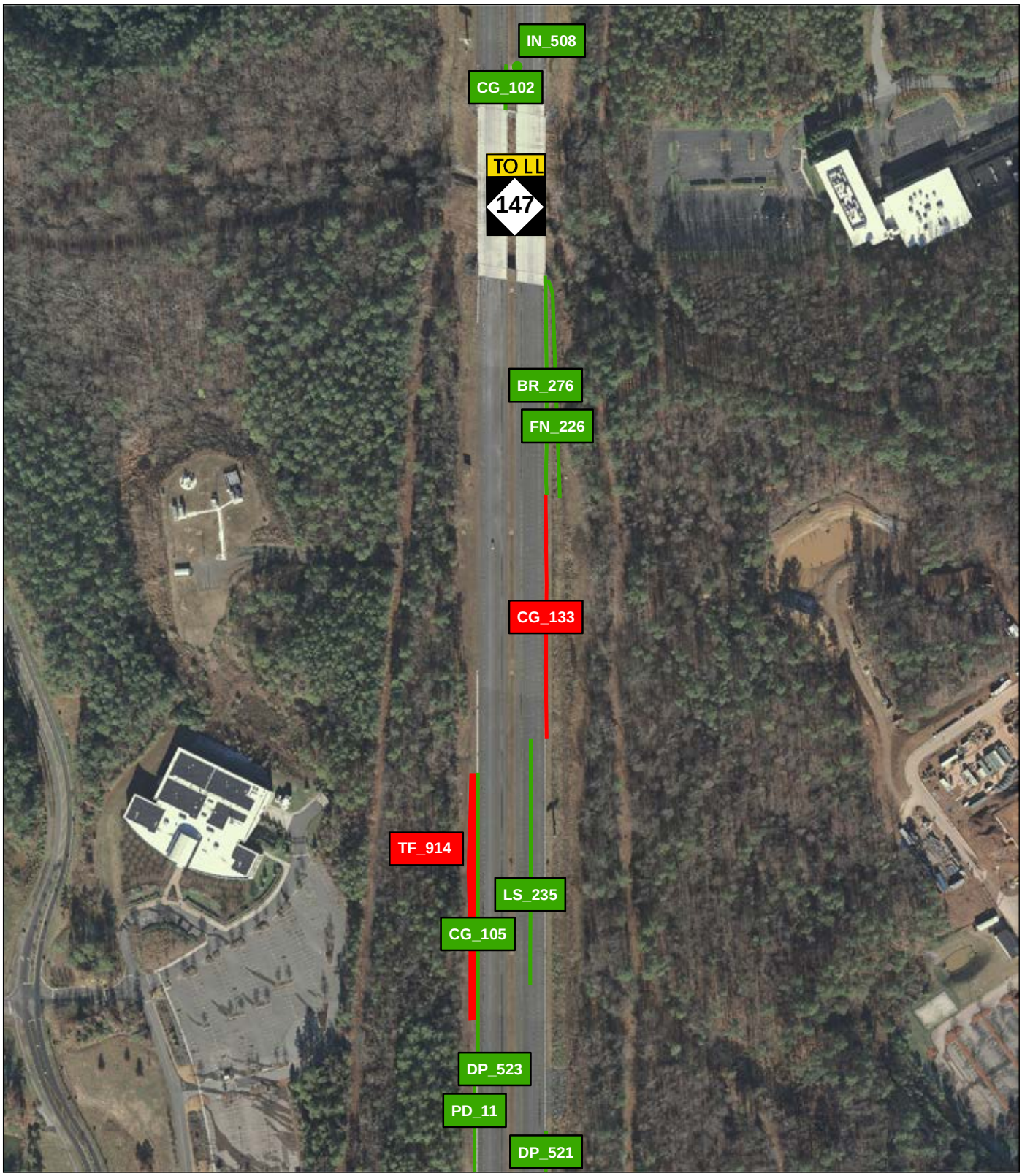
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

A50

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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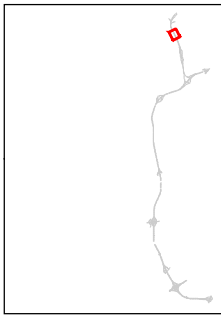
Failing Asset



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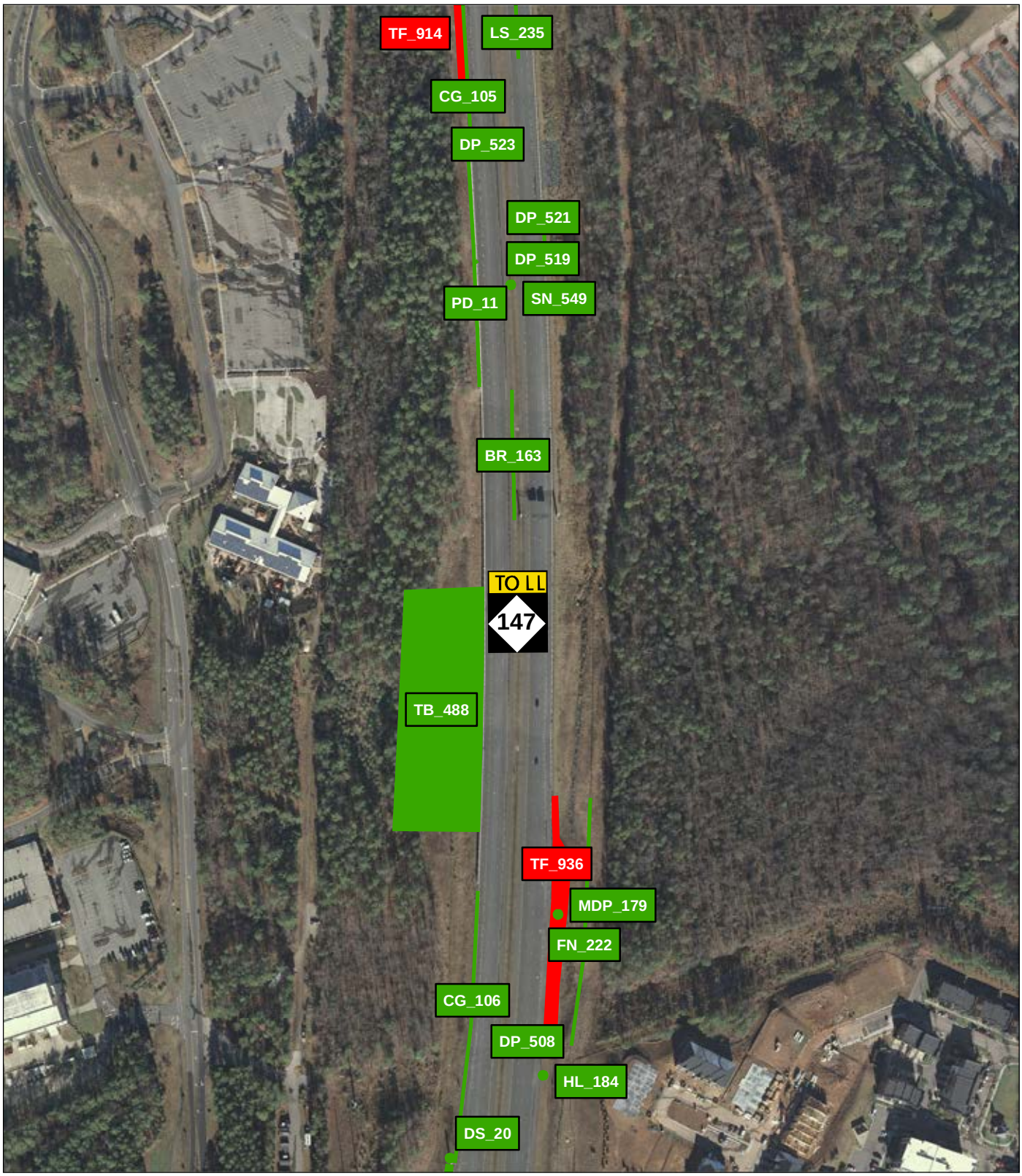

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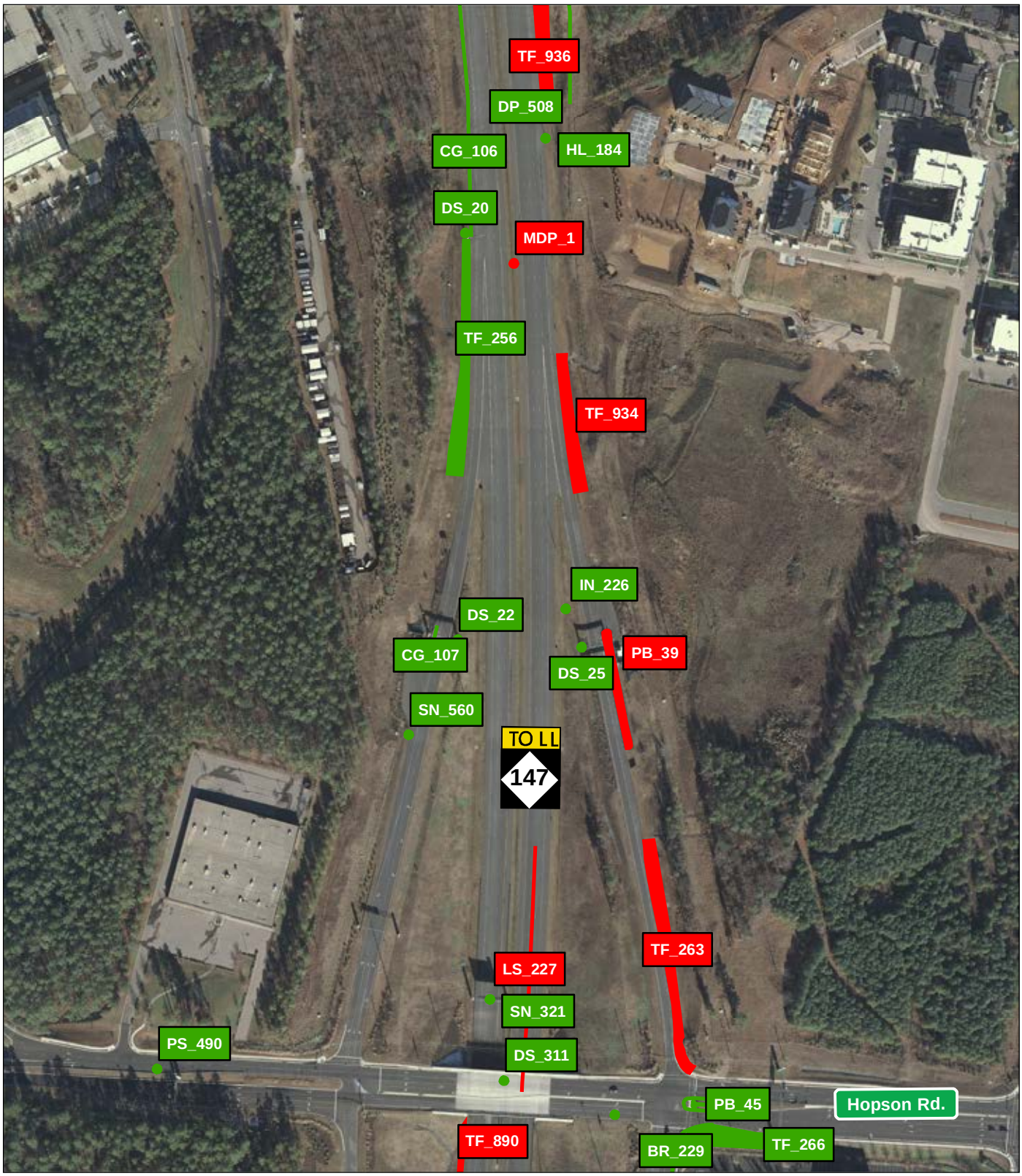
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

A52

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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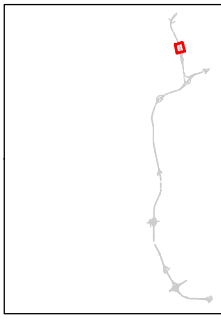
Failing Asset



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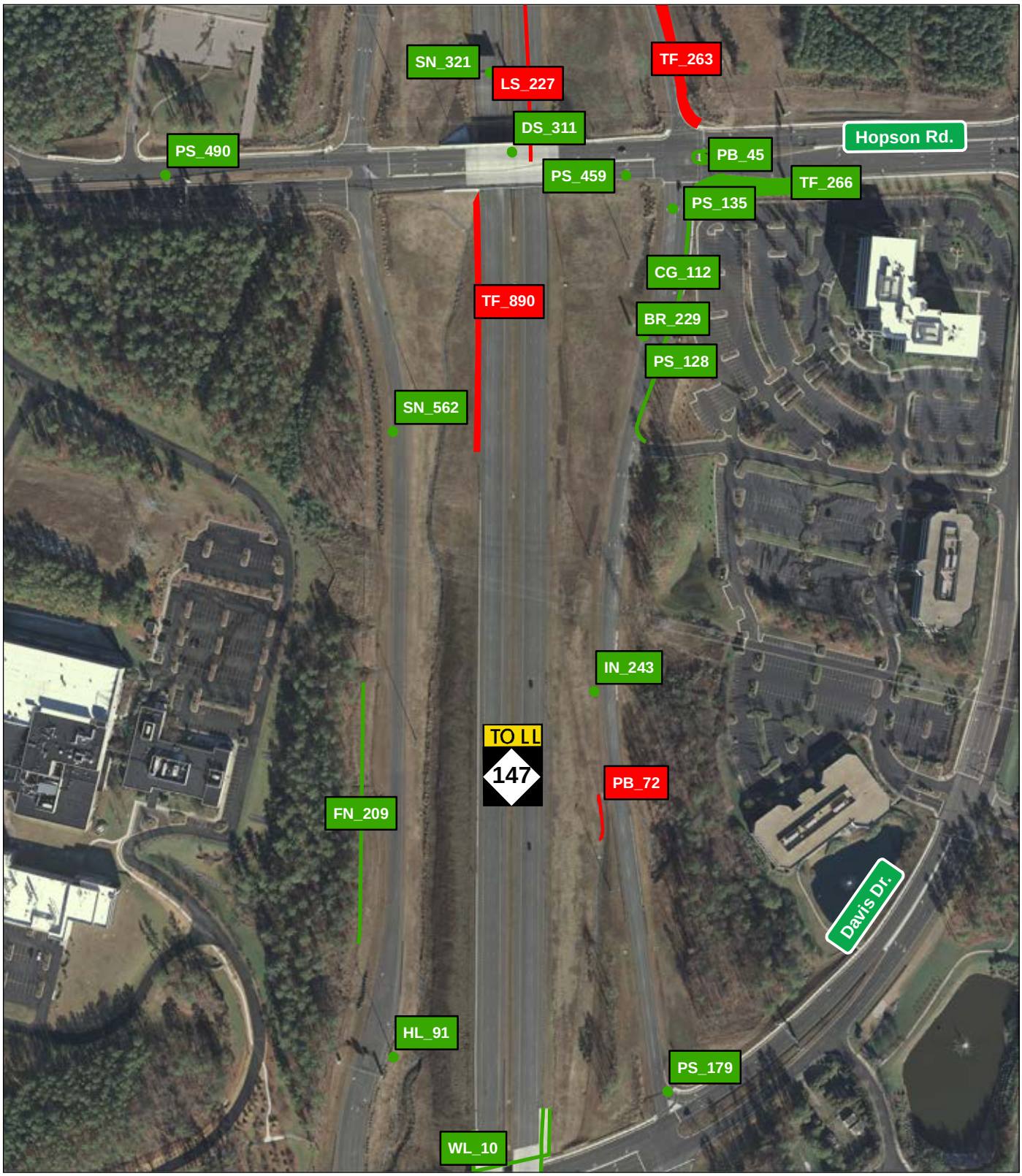
A53

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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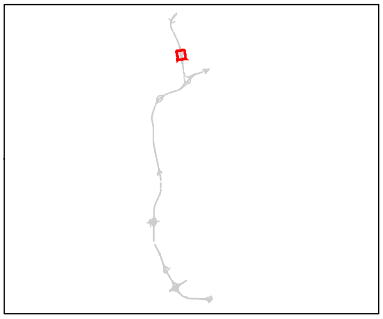
Failing Asset



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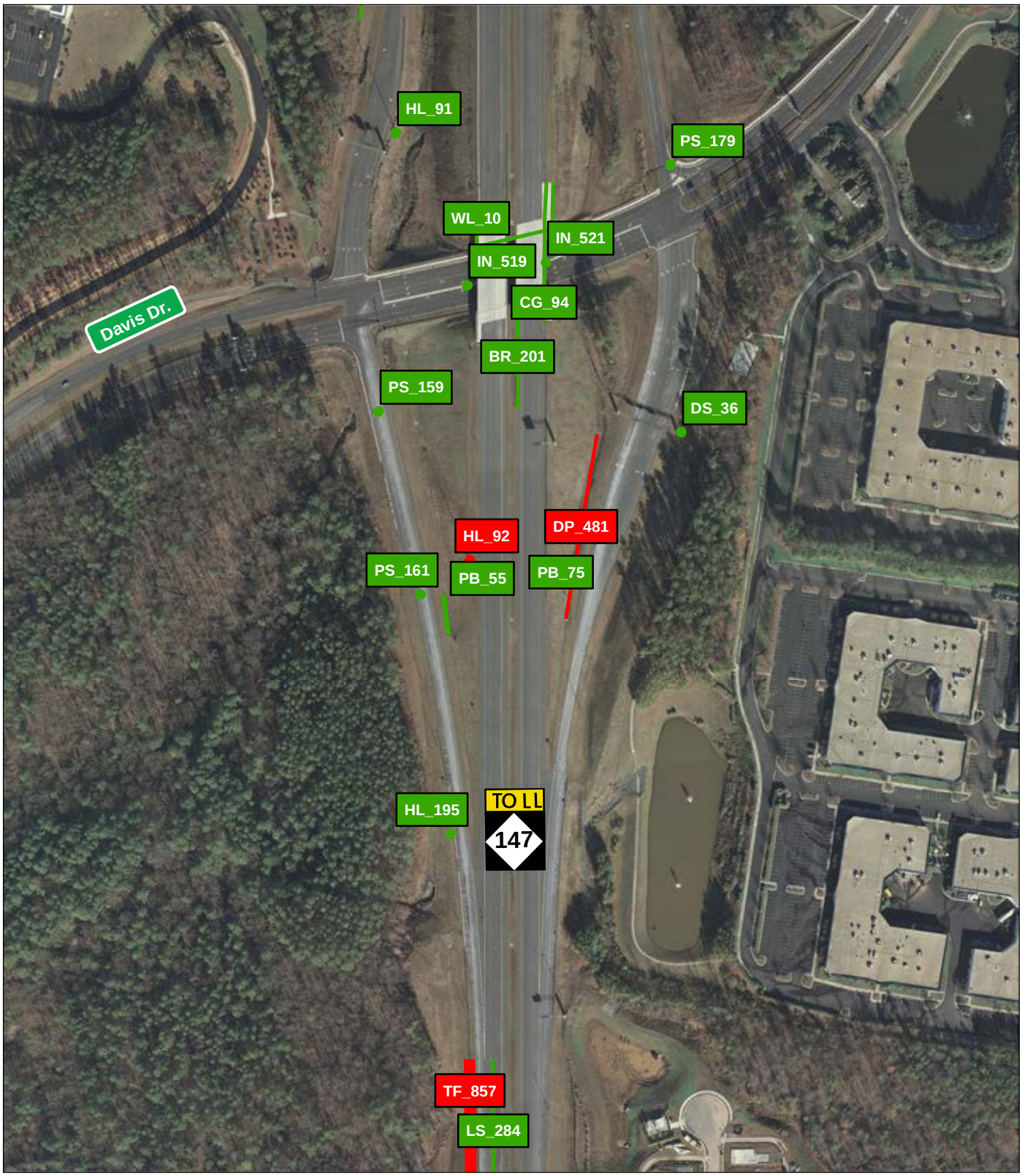

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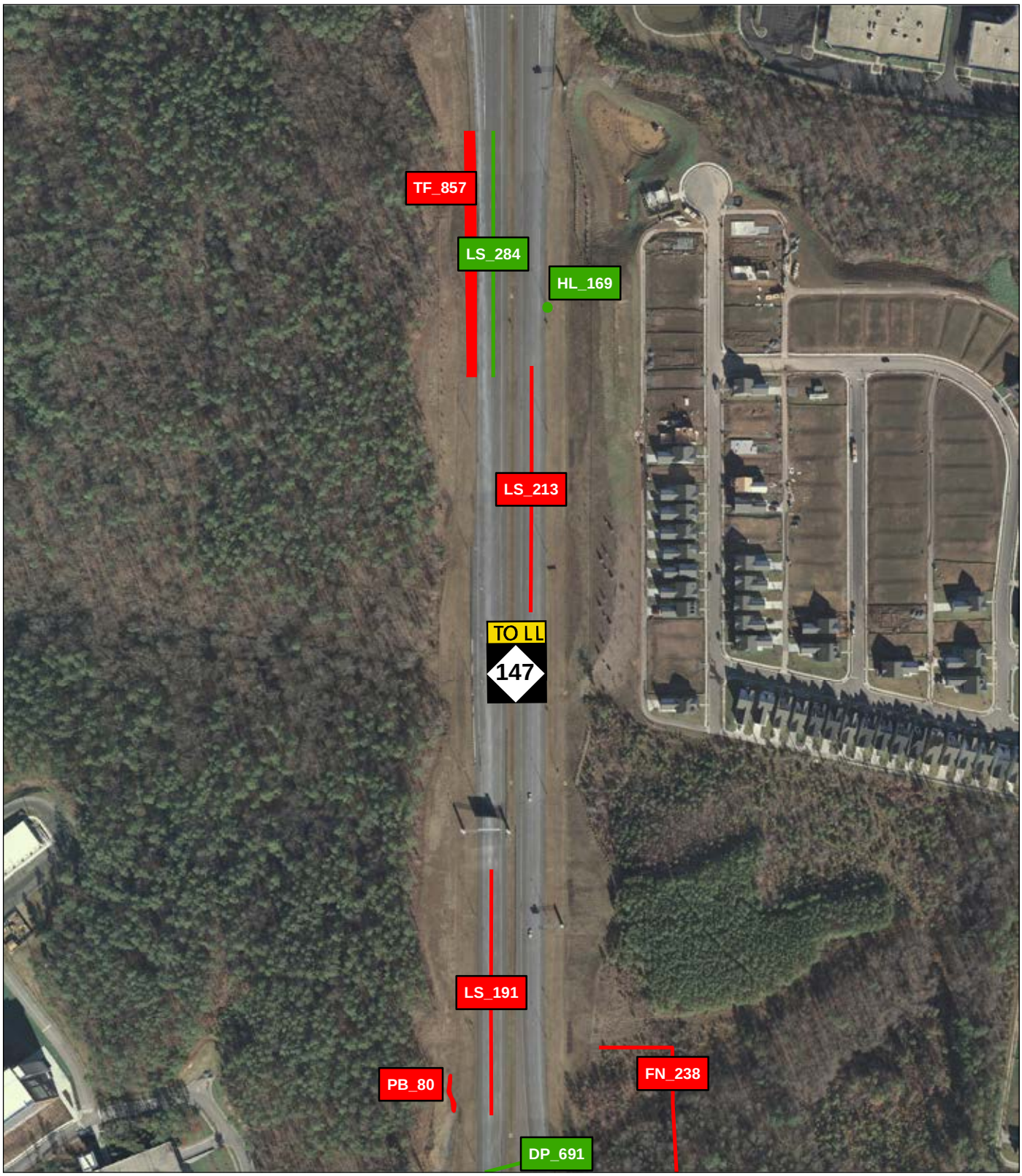
Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

A55

Appendix A: Triangle Expressway 2015 Second Quarter Asset Assessment Locations



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Passing Asset

Failing Asset

NORTH CAROLINA Turnpike Authority

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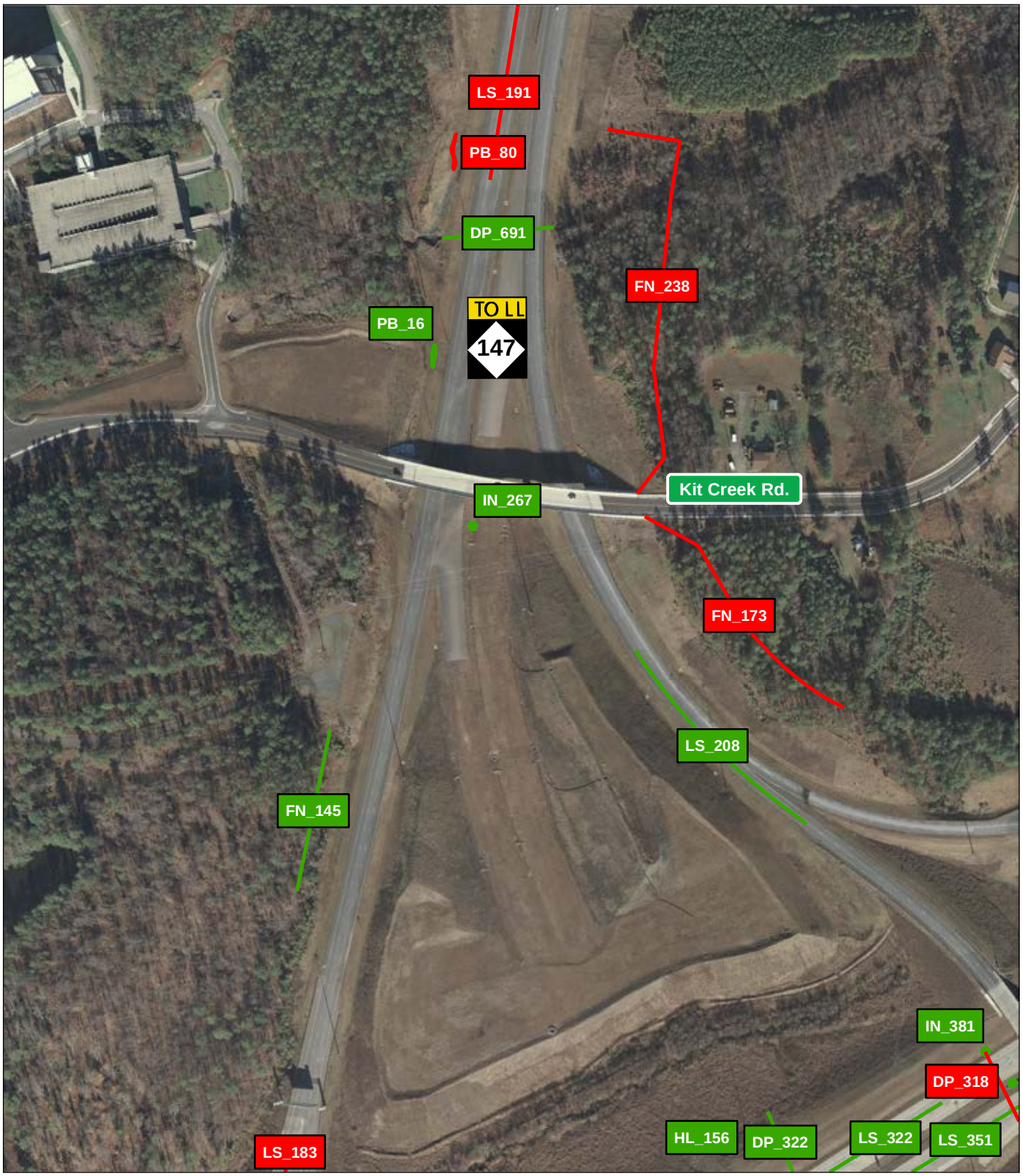

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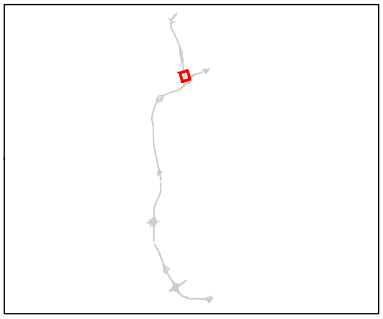
Passing Asset

Failing Asset



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Appendix B

Triangle Expressway 2015 Second Quarter Table Results of Assets Failing MRP

Appendix B: Triangle Expressway 2015 Second 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. All assets and their respective prefixes are listed below:

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.

Guardrail, Concrete Barrier and End Anchors (BR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Guardrail	BR_35	Twisted Block		A25

Curb and Gutter (CG)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Valley	CG_133	Structural Damage		A51

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	Cross Pipe	DP_318	Obstruction		A5, A57
2	Drain	DP_381	Obstruction		A8, A9
3	Lateral Pipe	DP_481	Obstruction		A55
4	Cross Pipe	DP_593	Obstruction		A49

Misc. Drainage Structures (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_1	Obstruction		A53
2	Shoulder Drain	MDP_34	Obstruction		A17

Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_173	Vegetation Compressing Fence		A5, A57
2	Woven	FN_238	Vegetation Compressing Fence		A56, A57
3	Woven	FN_259	Open Gate		A2

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_92	Damaged Parts		A55

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	Inlets	IN_826	Obstruction		A41

Landscaping (PB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Plant Bed	PB_39	Unwanted Weeds		A53
2	Plant Bed	PB_72	Unwanted Weeds		A54
3	Plant Bed	PB_80	Unhealthy Appearance		A56, A57

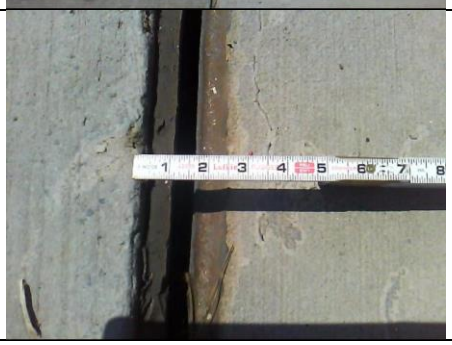
Paved Lanes – Asphalt (LS)

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

Paved Lanes – Concrete (LS)

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

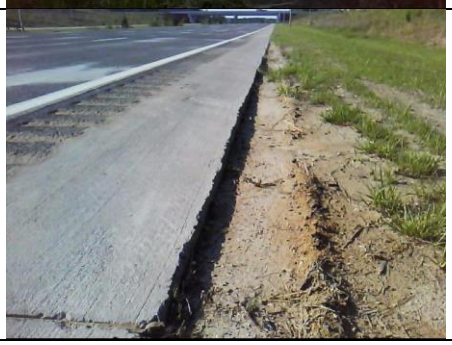
Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_183	Paved Shoulder Joint		A6, A57
2	Concrete	LS_338	Paved Shoulder Joint		A9
3	Concrete	LS_355	Paved Shoulder Joint		A4
4	Concrete	LS_493	Paved Shoulder Joint and Settlement		A46

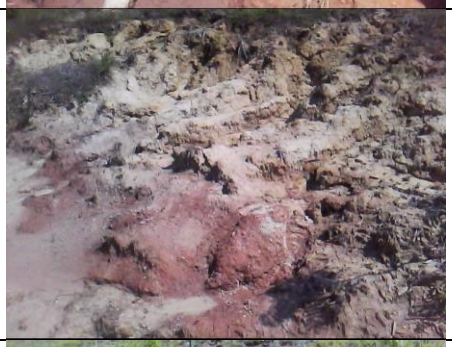
Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
4	Concrete	LS_493	Paved Shoulder Joint and Settlement		A46

Unpaved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_245	Shoulder Dropoff		A49
2	Concrete	LS_405	Shoulder Dropoff		A31, A32

Front/Back Slopes (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_191	Slope Failure		A56, A57
2	Asphalt	LS_213	Slope Failure		A56
3	Asphalt	LS_227	Slope Failure		A53, A54

Unpaved Lateral and Outfall Ditches (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_432	Blocked Ditch		A36

Litter (LS)

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

Roadway Sweeping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_338	Roadway Sweeping		A9

Pavement Striping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_405	Line Missing		A31, A32
2	Concrete	LS_491	Line Missing		A46

Pavement Markers (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_552	Marker Reflectivity	Not Available for Nighttime Failure.	A42
2	Asphalt	LS_556	Marker Reflectivity	Not Available for Nighttime Failure.	A41, A42
3	Asphalt	LS_562	Marker Reflectivity	Not Available for Nighttime Failure.	A40

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
This asset did not produce any failures.					

Signs (SN)

#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Do Not Enter	SN_414	Leaning		A6, A7

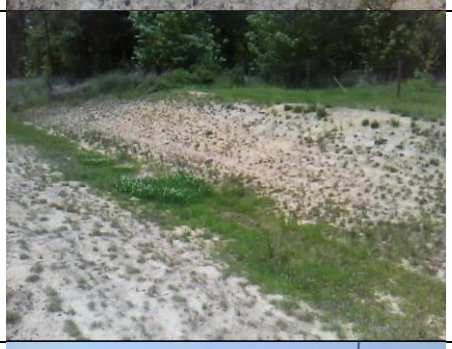
Tree and Brush (TB)

#	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_33	Bareground		A12, A13
2	Turf	TF_42	Bareground		A22
3	Turf	TF_47	Bareground		A13
4	Turf	TF_55	Bareground		A22

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Turf	TF_107	Bareground		A29, A31
6	Turf	TF_108	Bareground		A29, A31
7	Turf	TF_144	Bareground		A41
8	Turf	TF_145	Bareground		A39, A40, A41

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
9	Turf	TF_157	Bareground		A43, A44
10	Turf	TF_172	Bareground		A40
11	Turf	TF_183	Bareground		A37
12	Turf	TF_197	Bareground		A22

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
13	Turf	TF_220	Bareground		A29, A30, A31
14	Turf	TF_224	Bareground		A29
15	Turf	TF_235	Bareground		A40, A41
16	Turf	TF_236	Bareground		A41, A42

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
17	Turf	TF_263	Bareground		A53, A54
18	Turf	TF_325	Bareground		A44, A45
19	Turf	TF_397	Bareground		A39, A41
20	Turf	TF_431	Bareground		A37, A38

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
21	Turf	TF_493	Bareground		A31, A32
22	Turf	TF_520	Bareground		A28, A30
23	Turf	TF_548	Bareground		A26, A27
24	Turf	TF_556	Bareground		A25, A26

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
25	Turf	TF_568	Bareground		A23
26	Turf	TF_629	Bareground		A17
27	Turf	TF_657	Bareground		A13
28	Turf	TF_710	Bareground		A10

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
29	Turf	TF_721	Bareground		A8, A9
30	Turf	TF_748	Bareground		A6, A7
31	Turf	TF_777	Height		A5, A6
32	Turf	TF_857	Bareground		A55, A56

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
33	Turf	TF_890	Bareground		A53, A54
34	Turf	TF_914	Bareground		A51, A52
35	Turf	TF_934	Bareground		A53
36	Turf	TF_936	Bareground		A52, A53

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
37	Turf	TF_963	Bareground		A49, A50

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

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Sound Wall	WL_95	Joint Separation		A33, A34