TRAFFIC SEPARATION STUDY

NORTH CAROLINA RAILROAD/NORFOLK SOUTHERN

HIGH POINT, NC

Prepared For

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
RAIL DIVISION
ENGINEERING & SAFETY BRANCH
Project No. 9.9085004 (P-3309)

Prepared By

Gannett Fleming, Inc.
Charlotte, NC
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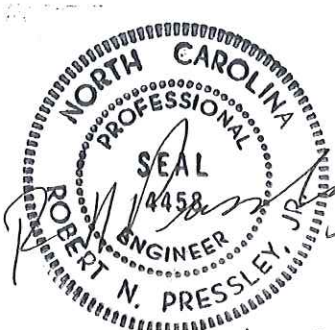
Nancy M. Horne, PE
Project Engineer
NCDOT Rail Division
Engineering & Safety Branch

Paul Worley, CPM
Assistant Director for Engineering & Safety
NCDOT Rail Division
Engineering & Safety Branch

Robert N. Pressley, PE
Senior Project Manager
Gannett Fleming, Inc.



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TRAFFIC SEPARATION STUDY
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I. FINDINGS:

- Rail freight traffic within the North Carolina Railroad/Norfolk Southern (NCRR/NS) corridor from Charlotte to Greensboro is projected to increase by as many as 5 to possibly 10 trains per day over the next several years.
- Vehicular traffic volumes at the four (4) crossings evaluated in this report are modest when compared to other grade crossings within the corridor.
- Emergency responders, especially the High Point Fire Department, are concerned about the condition of the crossings at West Grimes Avenue and Prospect Street and request improvements.
- None of the crossings studied have a significant accident history.
- The substandard vertical clearance at the Ward Avenue overpass, which was studied as part of this report, is a concern to many of the industry officials in the area.
- Active and inactive sidings within street right-of-way hamper access by emergency responders due to the differing elevations between the mainline tracks and the sidings.

II. SUMMARY RECOMMENDATIONS & ESTIMATED COSTS:

<u>Near-term</u> (Implementation within 2 years)

1. **West Grimes Avenue** - Remove inactive rail sidings.....$2,500.00
   Install new gates and flashers.....$125,000.00
   Reprofile roadway approaches.....$25,000.00
   Total Estimated Cost $152,500.00

2. **Taylor Avenue** – Close the crossing.....$12,000.00
Remove pavement.....$4,000.00
Total Estimated Cost $16,000.00

3. **Prospect Street** – Remove inactive rail sidings.....$2,500.00
Reprofile siding.....$12,000.00
Replace asphalt & flange crossing.....$15,000.00
Relocate gates & flashers.....$60,000.00
Reprofile roadway approach.....$30,000.00
Total Estimated Cost $119,500.00

Long-term Recommendations (Implementation within 5+ years)

4. **Taylor Avenue** - Demolish overpass/connect to Green Drive.....$288,000.00
Modify traffic signal at W. Green Drive.....$7,500.00
Total Estimated Cost $295,500.00

5. **Ward Avenue** – Raise grade beams..... $80,000.00
Reprofile siding.....$12,000.00
Lower Ward Avenue.....$173,000.00
Total Estimated Cost $265,000.00

6. **West Point Avenue** – Close the crossing.....$8,000.00
Remove pavement.....$4,000.00
Total Estimated Cost $12,000.00

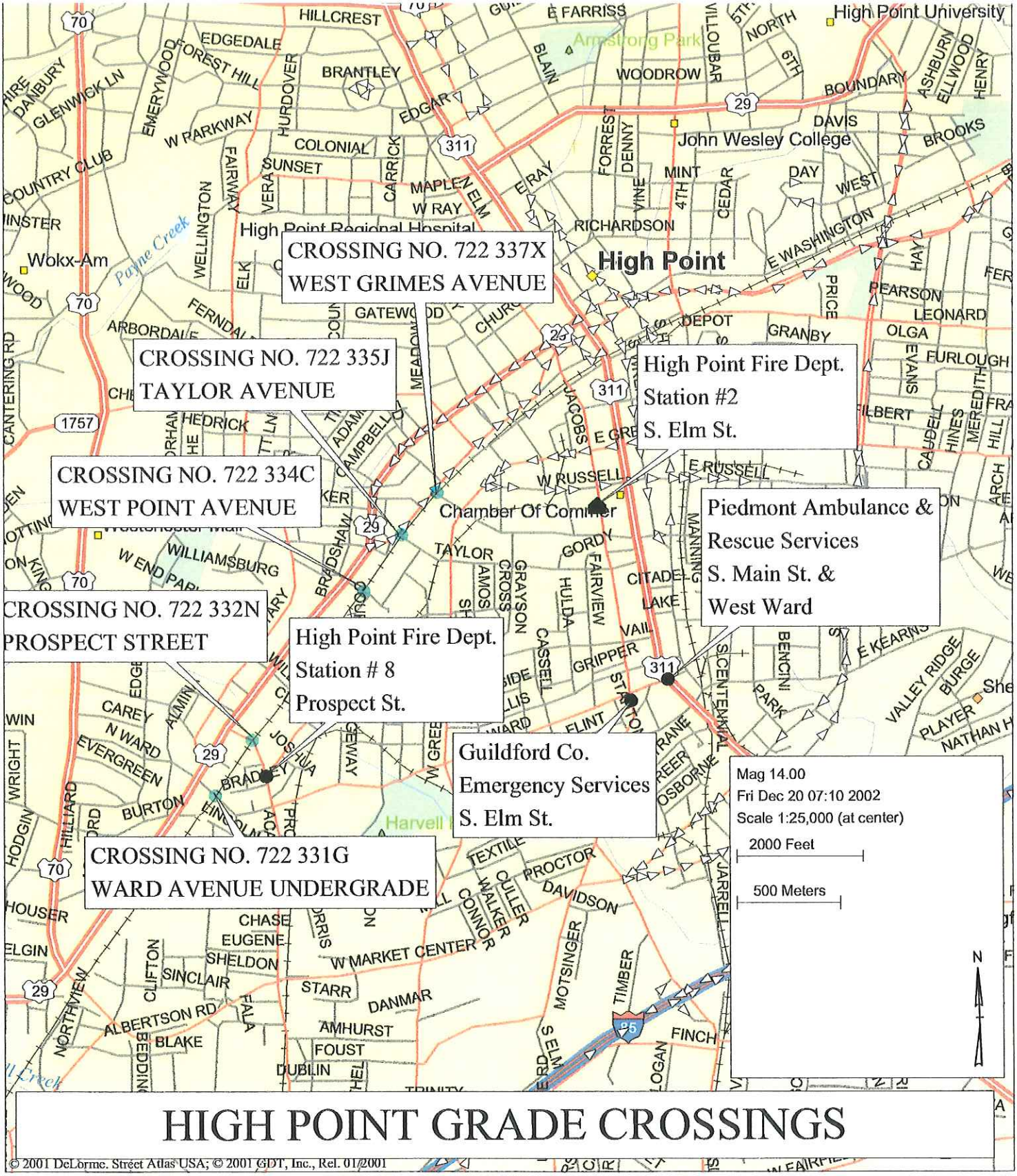
Total Estimated Cost all Recommendations.....$860,500.00

SAY.....$860,000.00

III. PURPOSE OF THE STUDY

The **City of High Point** and the **North Carolina Department of Transportation (NCDOT)** entered into a Municipal Agreement in October of 2000, to evaluate certain local street at-grade crossings of the **North Carolina Railroad/Norfolk Southern Railway (NCRR/NS)** southwest of the Central Business District in High Point. The purpose of the evaluation was to determine if any of the crossings were candidates for closure, consolidation or grade separation. If not, could improvements be made to the local street and crossing network that would enhance public safety. The study included the four (4) remaining public grade crossings of the railroad southwest of downtown High Point which are West Grimes Avenue, Taylor Avenue, West Point Avenue and Prospect Street **(See Figure 1 – VICINITY MAP)**. Ward Avenue, which underpasses the NCRR/NS southwest of Prospect Street, was also included in this study due to its substandard vertical clearance.

For purposes of this study, the railroad will be referred to as the Norfolk Southern or NS and is considered to run north and south. The corridor upon which the NS operates is owned by the State of North Carolina and has been known as the **North Carolina Railroad or NCRR,** since the 1850's. The NCRR corridor extends from Charlotte through Greensboro and on to Raleigh terminating at Morehead City. While NS continues to operate over the NCRR from Greensboro to Morehead City, the main freight traffic movement extends north from Greensboro over NS owned rails to Danville and Roanoke, VA.



HIGH POINT GRADE CROSSINGS

Figure 1 – VICINITY MAP

IV. PREAMBLE

Highway/railway at-grade crossing collisions are the number one cause of death in the railroad industry. In 2000, there were 3,502 train-vehicle collisions with 425 fatalities nationwide. North Carolina had 113 collisions with14 fatalities and 25 injuries as a result of those collisions. There were also 10 trespasser (pedestrians on railroad right-of-way without permission) fatalities in 2000.

Deaths and injuries at grade crossings have steadily declined in this country since 1978 due to an aggressive safety program by the United States Department of Transportation, the various state Departments of Transportation and the railroad companies. These efforts have included improved automatic warning devices, roadway improvements, elimination of sight obstructions, construction of crossing separation structures, and closure of some crossings.

The **NCDOT**, through its **Rail Division,** has a substantial program in place to improve rail-crossing safety. The program is endorsed and supported by the **USDOT**, **Federal Railroad Administration (FRA)** and **Federal Highway Administration (FHWA)**, and the various railroad-operating companies. To be successful, however, requires the support of local government and the citizens of North Carolina. This study, undertaken through a cooperative agreement between state and local government, is part of a continuing effort to enhance the safety of motorists, rail passengers and train crews in North Carolina.

V. THE HIGH POINT STUDY

The City of High Point is a major industrial manufacturing and distribution center located along the NCRR/NS southwest of Greensboro. There are many furniture manufacturing and related plants located adjacent to the tracks as well as the main plants for Thomas Built Buses, which is a national supplier of school buses. Daily train movements over the four (4) crossings included in this study, average 30 to 32 per day including the six (6) passenger trains operated by AMTRAK. Vehicular traffic over the crossings runs from a low of 135 vehicles per day at Taylor Avenue to 2660 at Prospect Street.

Accidents are not a significant problem at any of the crossings in that only six (6) reported train/vehicle collisions have occurred at the four (4) crossings addressed by this study in the last 10 years. The low number of accidents can probably be attributed to the low volume of vehicles crossings the tracks, relatively good sight distance, especially for train crews, and relatively low train operating speeds (currently 40 MPH maximum).

The initial evaluation of the High Point crossings included the following:

- 24-hour automatic traffic counts were taken at each crossing by City of High Point staff. These counts were acquired in May of 2001.
- Each crossing was inventoried utilizing the inventory format required by the Federal Railroad Administration/USDOT.
- All approaches to the crossings, both roadway and railway, were photographed.
- City of High Point transportation staff was interviewed and data and information pertinent to each crossing as well as the overall study was obtained.
- Electronic mapping covering the project study area was obtained from the City.
- Survey data was provided by the City to assist in the assessment of the crossings at West Grimes Avenue, Prospect Street and Ward Avenue.
- NCDOT accident records for each crossing were obtained and incorporated into the evaluation. FRA accident data was also obtained for comparison purposes.
- NS track charts were utilized to establish railroad mileposts, track grade and conformity to field observations.
- The NS District Office in Greenville, SC was contacted for information pertaining to the number of daily trains within the study area.

VI. EXISTING TRANSPORTATION SETTING

The City of High Point is located in the Piedmont Triad (Greensboro and Winston Salem are the other two major cities in the Triad) with a population that approaches 86,000 according to the 2000 census data. The Piedmont Triad has a population of over 1,250,000 according to the same data. Traffic volumes on the High Point roadway network grow at an annual rate of 1.5 to 2%.

Railroad traffic volume along this segment of the NCRR/NS averages 30 to 32 trains every 24 hours including six (6) passenger trains operated by AMTRAK. Approximately 35%, (10 or 11) train movements are at night including the New York to New Orleans "Crescent" passenger train.

All four (4) of the crossings are located in the heart of High Point's major industrial area and serve primarily industrial traffic as well as those who work in the plants.

The City of High Point has a fire station in the southeast quadrant of the crossing at Prospect Street. The station also has access to its service area via West Ward Avenue which underpasses the railroad approximately 1000 feet southwest of the Prospect crossing. Utilizing West Ward Avenue adds less than ½ mile to the travel time for fire equipment to access English Road. With the exception of the Taylor Avenue crossing, all of the crossings are used by emergency responders from time to time. Access to the area on both sides of the railroad is available via the Ward Avenue underpass.

English Road and West Kivett Drive parallel the railroad on the west side of the tracks and provide connectivity between downtown High Point and Business 85 southwest of town. On the

east side of the tracks, a defined parallel route is not in place; however, West Green Drive and West Ward Avenue provide connectivity between downtown and southwest High Point.

Traffic signals are currently in place at West Point Avenue and English Road and Prospect Street and English Road.

Norfolk Southern (NS) operates two mainline tracks throughout the study area. In addition, there are industrial sidings, either active or inactive, that parallel the main tracks at all of the crossings. The maximum allowable speed for all trains throughout the study area is currently 40 MPH.

VII. EVALUATION CRITERIA

All crossings were evaluated using the NCDOT Rail Division approved criteria which consists of the following:

- Crossing Inventory – All crossings were inventoried using the USDOT/FRA approved standard form for railroad grade crossings.
- Accident History – Train/vehicle crashes are one factor in evaluating grade crossings. This report utilizes the accident classification system developed and adopted by the Federal Highway Administration and in general use around the country. Under this system, accidents are classified as follows:
    1. K – Killed
    2. Class A – Injured and transported to hospital
    3. Class B – Injured and treated on-scene
    4. Class C – Complains of injury or pain but not treated
    5. PDO - Property Damage Only (damage to vehicle or personal property)
- Automobile traffic – existing and projected (where available).
- Train traffic – existing and projected (where available).
- Truck traffic or designated truck route – do large trucks routinely use the crossing? Is the roadway a designated truck route?
- Sight obstructions – do buildings, foliage or other obstructions restrict either the motorist's or the train crew's ability to observe approaching traffic at the crossing?
- Humped crossing – is the crossing roadway humped to the point of causing vehicles to either drag or become hung on the crossing?
- Queue distance – is there sufficient distance between the track and a paralleling roadway to allow vehicles to safely queue between the track and the road?
- Hazardous materials crossing – do vehicles delivering hazardous materials to nearby industries use the crossing?
- Roadway classification – federal or state route, thoroughfare, collector, local access, etc.
- Adjacent land use – industrial, commercial, residential, etc.
- School bus route – is the crossing routinely used by school buses?
- Emergency responder's route – do fire and medic crews routinely use the crossing?

- Crossing protection safety devices – none, crossbucks, gates and flashers, etc.
- Redundant crossing – does another nearby crossing serve the same function?
- Feasibility of grade separation – does the surrounding topography and land uses accommodate grade separating the roadway from the railroad?
- Roadway improvements – will roadway improvements at or near the crossing improve grade crossing safety? Is it feasible to implement roadway improvements?
- Economic impact if crossing is closed – will closing the crossing have a measurable economic impact on nearby land uses?

Some of the more significant evaluation criteria are discussed in detail below.

A. Accident History

Of the four (4) crossings evaluated, Prospect Street has had three reported accidents over the last 10 years while Taylor Avenue has had none. One of the three at Prospect occurred since the installation of the 4-quadrant gate system when a vehicle was apparently trapped inside the gates and abandoned. The accidents are more fully described as follows:

- 722 337X/W.Grimes Avenue – 12/1996 – Class C injury.
- 722 337X/W. Grimes Avenue – 6/1997 – Class B injury.
- 722 334C/West Point Avenue – 10/1997 – Property Damage Only.
- 722 332N/Prospect Street – 10/1993 – Property Damage Only.
- 722 332N/Prospect Street – 5/1995 – Property Damage Only.
- 722 332N/Prospect Street – 1/2000 – Property Damage Only.

The accident data summarized herein was supplied by the NCDOT Rail Division, Engineering and Safety Branch.

B. Truck Traffic

With the heavy industrial operations nearby and based upon field observations, there is truck traffic at all of the crossings with Prospect Street, W. Point Avenue and West Grimes Avenue handling most of the truck movements. It is reasonable to assume, given the furniture and school bus manufacturing in the area, that many of the trucks are carrying hazardous and flammable materials such as paints and varnishes. At the Prospect Street crossing, there is a large storage tank complex located in the northeast quadrant that is part of Thomas Built Buses operations.

C. Sight Obstructions

As depicted in the crossing photographs at the end of this report, all crossings have good sight distance for the train crews, both north and southbound. From the motorist's

perspective, with the exception of Taylor Avenue, all roadway approaches have poor sight distance in either the north or southbound direction or both. The sight distance is mitigated by the active warning devices in place at all crossings. **See Figure 2.**

Figure 2 – SIGHT OBSTRUCTION-BUILDING AT W. POINT AVENUE

D. Crossing Protection Devices

All four (4) crossings are protected by automatic warning devices (gates, flashing signals and bells). The Prospect Street crossing was enhanced in December 1999 by the installation of 4-quadrant gates, which provides a gate and flasher assembly on both sides of the roadway approach and is one of the most effective means available to control roadway traffic at a grade crossing. Only one of the accidents described above **(VII. A. Accidents)** has occurred (01/23/00) at the Prospect crossing since the installation of the 4-quad system. The accident resulted in property damage only.

Taylor Avenue is a one-way street and has a gate and flasher assembly on the westbound approach only. **Figure 3** shows the gate and cantilever flasher assembly at West Point Avenue.

Figure 3 – CANTILEVERED FLASHERS AT W. POINT AVENUE

E. Roadway Traffic Volume

Traffic volume at the crossings, both current and projected, is shown in the following table:

Table 1 – Roadway Traffic Volume

CROSSING	2001 ADT	2010 PROJECTED ADT	2025 PROJECTED ADT
W. Grimes Avenue	1958	2350	3150
Taylor Avenue	135	160	220
West Point Avenue	1615	1950	2600
Prospect Street	2660	3200	4300

The 2010 and 2025 traffic volumes were derived by projecting the 2001 traffic volumes to grow at an annual rate of 2% per year given the current roadway configuration.

F. Railroad Traffic

Traffic on the railroad currently averages 30 to 32 trains per day including the six (6) AMTRAK operated passenger trains. Maximum speed for all trains is currently 40 MPH within the study area. While firm projections of increased rail traffic are not available, indications are that NS will increase the number of daily trains between Charlotte and Greensboro, which will impact that segment of the railroad involved with this report. The NCDOT Rail Division also projects that the total number of passenger trains could double over the next several years.

Another factor to be considered is that the NCDOT, the NCRR and the NS are in the design stage on several projects on the railroad from Charlotte to Raleigh. These projects will add a second mainline track in some areas, add passing sidings in other areas, improve railroad curvature in some areas and make other safety improvements including the closure of crossings. These improvements are designed to improve passenger train speeds and reduce travel time between Raleigh and Charlotte. An added benefit is that it will also improve operations for NS allowing the movement of more freight trains over the same track segment.

G. Humped Crossings

"Humped" crossings are those crossings where the railroad track(s) is typically higher than the surrounding landscape, especially the roadway approaches. This means that crossing vehicles have to ascend on one side of the crossing and descend on the other. Sometimes when the hump is severe enough, low-hanging vehicles, such as large trucks and buses, may hang up on the crossing resulting in train/vehicle collisions or an interruption in railroad operations.

The humped condition that occurs at railroad grade crossings is usually the result of maintenance activities along the railroad. Mainline railroads typically receive track resurfacing, crosstie replacement and ballast replenishment about every three (3) years. In order to install ballast (the large stones that the crossties rest upon), track maintenance equipment will lift both the rail and the crossties underneath in order to insert new ballast. This activity results in the roadbed rising about 3 inches each time this activity occurs. Over the course of about 10 years, a railroad track may rise a foot.

All four of the High Point crossings are humped to some degree although none meet the AASHTO requirements for "moderately" or "severely" humped. Field observations show

that recent maintenance on the track has occurred in that new asphalt has been added on all roadway approaches including the areas between the tracks. Because of the new asphalt surface, it could not be determined if significant numbers of vehicles were dragging as they crossed the tracks. However, accident data shows that vehicles had been stuck on the track at the Taylor Avenue crossing on two separate occasions in 1987 and 1990. There have been no reports of vehicles stuck on the tracks in the last 10 years.

H. Queue Distance

Queue distance is defined as the distance between the railroad track and a paralleling roadway where vehicles can safely stack up while waiting to cross the track or enter into the flow of traffic on the paralleling roadway. In situations where there is heavy traffic on the crossing as well as on the parallel roadway, vehicles may back up over the track creating an unsafe condition. By the same token, heavy traffic on the railroad may cause traffic to back out into the roadway creating the potential for rear-end collisions.

Nearby traffic signals on the parallel roadway can also exacerbate the queuing problem if the signal timing/phasing patterns are such that adequate green time is not provided to the crossing traffic. The backup from the signal can then cause vehicles to queue over the track(s).

Queue distance information is as follows:

Table 2 – Queue Distance

CROSSING	QUEUE DISTANCE (+/-)	PARALLEL ROADWAY	TRAFFIC SIGNAL
W. Grimes Avenue	40 feet	W. Kivett Drive	No
Taylor Avenue	50 feet	W. Kivett Drive	No
West Point Avenue	280 feet	English Road	Yes
Prospect Street	440 feet	English Road	Yes

Field observations did not reveal a queuing problem at any of the crossings. High Point DOT staff was not aware of any such problems and discussions with adjacent business operators did not reveal a queuing problem at any of the crossings including West Grimes Avenue and Taylor Avenue.

I. Hazardous Materials Crossing

Thomas Built Buses, a major manufacturer of buses, operates a school bus manufacturing operation along the east side of the NCRR/NS from Prospect Street to near West Point

Avenue. Representatives of the company confirmed that they do receive shipments of hazardous and flammable materials. These shipments include cleaning solvents, lubricants, paints and varnishes and gasoline. Some of these shipments enter the plant site via the Prospect Street crossing. However, some shipments enter the plant site from the east using Ward Avenue to underpass the railroad. Plant officials did confirm that they were aware of the low clearance at Ward Avenue and would like to see it improved.

None of the local or plant officials interviewed could recall an incident (train/vehicle collision) involving hazardous materials at any of the crossings that are a part of this study.

J. School Bus Operations

The Guilford County Schools Transportation Department reports that the Prospect Street crossing is the only one used by school buses. Four (4) passes are made over the crossing during school days but only one carries students. The Department further reports that closing all crossings would not have an adverse impact on system operations.

K. Emergency Responders

In addition to the High Point Police Department, there are three (3) emergency services/responders serving the City of High Point. These are the High Point Fire Department, Guilford County Emergency Services (medic) and Piedmont Ambulance & Rescue Services. Their utilization of the grade crossings is more fully described below.

1. High Point Fire Department

The High Point Fire Department responds to emergencies within the area from three locations: Station #2, the Headquarters Station located at 434 S. Elm Street (**See Figure 1**); Station #3 located at 300 N. Rotary Drive; and Station #8 shown in **Figure 4**, located at 208 Prospect Street. The Fire Department's web page states that Station #8 was located in this particular area because of the Department's close working relationship with the railroads (The Winston-Salem Southbound RR was operating at the time). Station #8 is also located directly across Prospect Street from Thomas Built Buses and houses a hazardous materials decontamination team.

The Fire Department reports that they frequently use West Grimes Avenue, West Point Avenue and Prospect Street in responding to emergencies in the area. Taylor Avenue is seldom used. When asked to rank the crossings from 1 to 4 in importance with 1 being the most important, the Department ranked Grimes, West Point and Prospect all as a '1' and Taylor as a '3'. The Department went on to state that they frequently use the three (3) crossings ranked most important to

respond to other emergencies in the area and that closing any of the three would have a negative impact on response times.

When asked if there are other safety or roadway concerns in the area that need to be addressed, the Department responded that they would like to see the crossings at Grimes and Prospect, due to their alignment and uneven track condition (the mainline tracks are higher than the sidings), improved.

Figure 4 – FIRE STATION NO. 8

2. Guilford County Emergency Services

This service dispatches medic crews from two stations in the area, one based at 201 Montlieu Avenue and the other at 900 S. Elm Street (**See Figure 1**). During calendar year 2001, EMS crews responded to approximately 50 calls within the area served by the four grade crossings. However, only about one-half of the responses required a crew to cross the railroad. EMS requests that the grade crossings at Prospect and Grimes be improved. Furthermore, they advise that closing West Point Avenue and Taylor Avenue would have minimal impact on response times.

3. Piedmont Ambulance & Rescue Services

This service has a station located at the corner of S. Main Street and West Ward Avenue (**See Figure 1**), which houses three (3) emergency vehicles. Mr. Rick Crotts, the weekday dispatcher, reports that they make frequent use of the crossing

at Prospect Street but avoid the other crossings. Mr. Crotts could not provide statistics on the actual number of times vehicles are dispatched or the route taken. Mr. Crotts did state that if a train blocks the crossing at Prospect, then the crew remains on Ward Avenue to access English Road. He did report frequent responses to Thomas Built Buses.

L. Adjacent Land Uses

All land uses adjacent the four crossings in this study are industrial. The entire land segment along the railroad has at one time been a thriving industrial area. Today, however, there are many vacant and deteriorating buildings that housed furniture manufacturing plants and related industries. Significant industries still in operation in the area include:

- Thomas Built Buses (manufacturer of school buses)
- Burks, Inc. (distributor of paint materials)
- Hayworth Roll and Panel, Co. (plywood manufacturer)
- L & M Frame Co. (manufacturer of furniture frames)
- Fiber Dynamics Co. (textile manufacturing)
- Valspar, Inc. (manufacturer of paints and varnishes)
- Haas Saw and Supply, Co. (distributor of saw blades and related equipment)
- Creative Works, Inc. (manufacturer of furniture accessories)
- Woodworkers Supply Co. (distributor of woodworking tools and supplies)

A questionnaire was developed to assist in the conduct of interviews with operators of adjacent industries.

The Valspar operations parallel the railroad on the west side of the track from West Point Avenue to almost Prospect Street. The company has significant shipping and receiving operations, however, access to company docks is via English Road and not over the tracks.

VIII. MENU OF AVAILABLE TRANSPORTATION SYSTEM ENHANCEMENTS

Over the years, Traffic, Roadway and Railway engineers have developed more sophisticated methods for treating safety issues at grade crossings over and above those traditionally used for most of the 20th Century. A listing and description of these methods follows:

A. Grade Separation Structures

Separating railroad traffic from vehicular traffic offers the greatest degree of public safety but it is also the costliest. Important factors used in determining the feasibility of

constructing a separation structure are discussed below. This method is also discussed in **Section IX. SAFETY AND MOBILITY ISSUES** that follows this Section.

- **Traffic Volumes** in the 15,000 to 20,000 vehicles per day (VPD) range and above are generally considered to be the threshold for consideration of a grade separation structure for local streets. Volumes of 30,000 VPD and more can be accommodated without significant delay provided train traffic is low.
  The **NCDOT** uses an **"exposure index"** to determine whether or not a grade separation structure is warranted at either an existing or proposed railway/highway crossing. The exposure index is determined by multiplying the number of trains per day over the railroad by the number of vehicles per day in the design year on the roadway. In other words, if a roadway project were being designed to handle traffic volumes forecast for the year 2020, the 2020 traffic volumes for both trains and automobiles would be used to calculate the exposure index. For a railroad with 5 trains per day and a roadway with 2,000 vehicles per day, the exposure index would be 10,000. The threshold for consideration for construction of either an overpass or an underpass is an exposure index of 15,000 in rural areas and 30,000 in urban areas. An exposure calculation for the High Point crossings is shown in the table below. While the index calculations exceed NCDOT threshold criteria for three of the crossings, when compared to indices for crossings on a statewide basis with higher traffic volumes, they would rank low on a priority listing. For example, a grade crossing recently evaluated in Charlotte carries 45 trains per day and approximately 30,000 vehicles per day yielding a current exposure index of 1,350,000. (The number of trains per day/TPD shown below has not been provided by either the Norfolk Southern or the North Carolina Railroad. The number has been derived by Gannett Fleming based upon NCDOT projected rail passenger service and an increase of approximately one freight train per year).

Table 3 – Projected Traffic/Train Volumes

CROSSING	2025 PROJECTED TRAFFIC	2025 PROJECTED TRAIN TRAFFIC	EXPOSURE INDEX
W. Grimes Avenue	3150 VPD	55 TPD	173,250
Taylor Avenue	220 VPD	55 TPD	12,100
West Point Avenue	2600 VPD	55 TPD	143,000
Prospect Street	4300 VPD	55 TPD	236,500

- **Accident History** is a major factor used when considering grade separation structures. Even though traffic volumes for vehicles and trains may be low, if frequent collisions between railroad and highway traffic is occurring, then a

separation structure may be warranted.

- **Topography**, or the lay of the land, is another important consideration. Where the street, railroad and surrounding land are near the same elevation, the construction of grade separation structures is made considerably more difficult. By the same token, if the railroad is in a deep cut, for example, and the approaching roadway has to dip down to cross the track, then the construction of an overpass is made considerably easier and less expensive.

- **Construction Impacts** are of considerable importance in that they may be of such a magnitude as to do greater harm to the community than if the present conditions remain. Construction impacts can include acquisition and the subsequent relocation of families and businesses; destruction of the natural environment such as woodlands and wetlands; and disruption of historical and archaeological sites. While the effects of some of the impacts may only be temporary, some can forever alter the character of a neighborhood or community. The visual and noise impacts of an overpass, for example, may be something that a community is unwilling to tolerate.

- **Costs** for grade separation structures can easily exceed several million dollars and transportation agencies must, therefore, give them careful consideration before recommending funding and construction.

B. Crossing Protection Devices Upgrade

One way to deal with safety issues at an at-grade railroad crossing is to upgrade the crossing protection devices.

Crossing protection devices include signs, gates, bells and flashing signals (flashers) used to warn motorists of the pending crossing and, in the case of bells, flashers and gates, alert the motorist to the train approaching the crossing. Passive devices, which include advance-warning signs, railroad crossbucks and standard stop signs, are generally used on low volume crossings with good site distance. Active devices, which include flashers, bells and gates, are used on higher volume crossings with greater accident potential or where existing conditions warrant more positive control. Traffic signals located along parallel roadways that are within 200 feet of the crossing must be interconnected to the automatic warning devices. The interconnection allows the approaching train to preempt the traffic signal such that vehicles can clear the crossing and traffic on the parallel roadway is prohibited from turning onto the crossing. In some cases, traffic signals are installed adjacent the crossing to provide greater traffic control. Passive and active devices are listed below:

1. No signs or markings present
2. Railroad crossbucks
3. Standard stop signs (limited sight distance) & crossbucks
4. Flashing signals and bells
5. Cantilevers (flashing signals mounted over the tracks)
6. Flashing signals, bells & gates
7. Gates and cantilevers
8. Traffic Signal Preemption
9. Traffic Signal

C. Enhanced Crossing Protection Devices

The use of four-quadrant gates/flashers and a median separator is an alternative used on high volume rail corridors where more positive control of the grade crossing is warranted. The use of this type system is very effective where significant numbers of motorists ignore the existing devices. The installation consists of dual gates which, when activated, block the entire roadway approach width (inbound and outbound lanes), and a median separator on each approach to prevent motorists from crossing the roadway centerline in an attempt to get around the gates. The NCDOT Rail Division has recently begun testing a new separator design that consists of a 4-foot wide by 5-inch high concrete median with reflective tubular markers mounted on the median. This design should require less maintenance than the all-plastic devices previously used on some crossings.

In tests completed at Sugar Creek Road in Charlotte, in 1996, by the NCDOT in cooperation with Norfolk Southern (NS), violations dropped from almost 45 per week with standard gates and signals, to less than two (2) per week with 4-quadrant gates and a median separator.

Other advanced crossing protection devices available for installation include:

- Long-gate arms, (covers 2/3 of the approach roadway versus 1/2 for standard gates).
- Warning device revisions (upgrade flashers from 8" to 12" lenses, add gates)
- Pavement marking revisions (supplemental R X R symbol)
- Special signage ("Low Vehicles May Drag", "Do Not Stop On Track")

Video enforcement is another technique that is being used to improve crossing safety. Under this program, video cameras are set up at certain crossings to record events as well as the type vehicle and license plate of those who violate the warning devices. This information is then provided to law enforcement officials for enforcement purposes.

In **Figure 5**, note that the gates on the entrances to the crossing are already down while those on the exits are just coming down. The gates are timed to allow motorists to clear the crossing before all gates are fully in the down position.

Figure 5 – 4-QUAD GATES AT PROSPECT STREET

D. Crossing Closure/Crossing Consolidation

The most cost-effective way to deal with railroad/highway crossing safety issues is to close low-volume redundant crossings. Crossings that connect to the same street network and are within a quarter mile (+/- 1300 feet) of each other are considered to be redundant. Crossing consolidation is another way to treat crossings that may be relatively close to each other. Consolidation of two or more crossings into one can be accomplished by utilizing or building roads that parallel the tracks or by replacing several crossings with a grade separation structure or by constructing a new at-grade public crossing with automatic warning devices. Consolidation is a particularly effective method where several crossings, either public or private, are relatively close together and sufficient right-of-way exists to construct a frontage or parallel road.

E. Street Improvements

Street improvements are an effective way to treat capacity and safety problems associated with a particular section of roadway, an intersection or a railroad crossing. These improvements can range from simply remarking the existing pavement to obtain a turn

lane to total reconstruction of the roadway. In many cases, the more minor the improvement, the greater the benefits.

F. Traffic Signals

As traffic volumes increase within a roadway network or at a particular intersection, the addition of a traffic signal(s) to the system may be warranted. Traffic signals are not a "cure-all" for traffic problems. Signals have distinct advantages and disadvantages. They are:

Advantages

1. They can provide for the orderly movement of traffic.
2. Where proper physical layouts and control measures are used, they can increase the traffic-handling capacity of the intersection.
3. They can reduce the frequency of certain types of accidents, especially the right-angle type.
4. Given favorable conditions, they can be coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route.
5. They can be used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Disadvantages

1. Excessive delay may be caused.
2. Disobedience of the signal indications is encouraged.
3. The use of less adequate routes may be induced in an attempt to avoid such signals.
4. Accident frequency (especially the rear-end type) can be significantly increased.

Because of these advantages/disadvantages, it became necessary to develop a series of "warrants" for signal installation. The warrants are prescribed in the Manual on Uniform Traffic Control Devices (MUTCD) and are:

Warrant 1 - Minimum vehicular volume
Warrant 2 - Interruption of continuous traffic
Warrant 3 - Minimum pedestrian volume
Warrant 4 - School crossings
Warrant 5 - Progressive movement
Warrant 6 - Accident experience
Warrant 7 - Systems
Warrant 8 - Combination of warrants
Warrant 9 - Four-hour volumes

Warrant 10 - Peak hour delay
Warrant 11 - Peak hour volume

Minimum criteria are established for each of the warrants and one or more must be met before installation of a new traffic signal can be considered.

IX. SAFETY AND MOBILITY ISSUES

A. Vehicles Queuing Across Railroad Tracks

Queuing of vehicles across the tracks usually occurs due to the nearby presence of traffic signals, intersections or roadways parallel to the track. This can be a significant problem, especially in areas of high congestion where motorists on a parallel roadway may not even be aware that vehicles are queued over the track. In areas of high-volume/high-speed rail traffic, at-grade crossings must be monitored to assure that queuing problems do not develop.

Although both West Grimes Avenue and Taylor Avenue have minimal queue distances (less than the length of a tractor/trailer truck), field observations did not reveal a problem with vehicles queuing over the track at either crossing.

B. Traffic Signal Preemption

Traffic signal preemption is a technique used by Traffic Engineers to prevent automobile traffic from turning onto a crossing or to clear traffic from the crossing when a train is approaching. Under this technique, the approaching train activates signs and signals. These activated signs and signals warn motorists of the approaching train and prohibit turns until the train has cleared the crossing. The signals can also be programmed to give priority to the traffic on the crossing and allow it to clear before the automatic warning devices are activated.

The Manual on Uniform Traffic Control Devices requires that preemption of traffic signals occur when a traffic signal is within 200 feet or less of the crossing. The signals at English Road and West Point Avenue and English Road and Prospect Street are more than 200 feet from the crossings and are not preempted.

C. Humped Crossings

A "humped" crossing is one at which the elevation of the railroad is generally higher than that of the approaching roadway. This humped effect may cause cars and trucks to ascend on one approach to cross the track and descend on the other side. When the humping is severe enough, vehicles, especially low-hanging trucks, tend to drag over the crossing and can become hung such that the vehicle can go neither forward nor backward. Maintenance of the railroad tends to exacerbate the hump over time in that work on the track ballast generally raises the roadbed about three inches per occurrence. Over a ten-

year period, the railroad will rise about one foot (1'). In cases where a vehicle becomes hung on the crossing, significant disruption can occur to railroad operations while the hung vehicle is cleared from the tracks.

Trailer dollies on tractor/trailer trucks and lowboy trailers (those used to carry heavy construction equipment) are particularly susceptible to hanging or dragging at humped crossings. Such crossings typically receive supplemental signing warning of the humped condition and the potential for dragging.

D. Grade Crossing Condition

The condition of the grade crossing surface can affect both safety and mobility (**See Figure 6**). A poorly maintained crossing surface can contribute to accidents that may or may not involve a train. Also, a crossing in poor condition may cause automobile operating speeds over the crossing to be lowered, thereby, impacting roadway capacity. Another issue that must be considered is the width of the crossing. A narrow crossing can cause problems if a motorist attempts to pass a stopped or stalled vehicle and runs off the crossing surface onto the track. Many times a vehicle in this situation has to be towed off the track. This type of situation generally leads to at least a disruption in railroad operations.

Figure 6 – CROSSING AT WEST GRIMES AVENUE

The four (4) crossings contained in this study are, for the most part, in good condition and wide enough to accommodate the crossing traffic. However, the presence of adjacent

siding tracks creates an uneven profile in that the siding tracks are lower than the mainline tracks.

E. Vehicles Driving Around Automatic Gates

This event typically occurs when motorists perceive that the automatic gates have lowered but a train is not approaching the crossing; when the motorist perceives that the train is far enough away from the crossing to allow for a safe crossing; when the gates fail in the lowered position (Fail Safe); or when impatience causes a driver or pedestrian to maneuver around the gates even when an approaching train is in sight.

Field tests have determined that one of the hardest things for a motorist to judge while stopped at a crossing is the speed of an approaching train. Because of its size and the motorist's perspective, an approaching train may appear to be moving relatively slow when it is, in fact, approaching at a relatively high rate of speed.

Installation of 4-quad gates (with or without median separators) has proved to be very effective in treating this safety issue. Occurrences of this type have been virtually eliminated along the NS mainline from Charlotte to Raleigh where such gate/signal systems have been installed as part of the Sealed Corridor Initiative. Of the crossings included in this report, only Prospect Street has 4-quad gates **(See Figure 5)**. In conducting fieldwork for this report, there were no observed instances where a motorist drove around a lowered gate at any of the studied crossings.

F. Improved Signs and Markings

Installation and maintenance of required traffic control signs and markings is constantly an issue with state and municipal street and highway departments. And, to some extent, maintenance of the railroad signs, signals, and gates at crossings can be an issue with the railroad company.

Signs and markings are in place and well-maintained at all four (4) crossings.

G. Roadway Improvements

In order to make grade crossings safer, roadway improvements are frequently recommended. In many cases, not only does the crossing roadway require improvement, but a nearby paralleling roadway or intersection can be involved as well as the relocation of overhead wire lines.

Later in this report, proposed roadway improvements are discussed.

H. Roadway Grade Separation

Providing a roadway/railway grade separation can eliminate safety, queuing and delay problems at a railroad grade crossing. Highway grade separations can either be on a bridge over the railway or the roadway can pass beneath the rail line.

Highway overpasses require greater length for the same design speed. The total elevation difference is greater because the standard rail vertical clearance of 23 feet exceeds the typical highway clearance of 16 or 16.5 feet (even though the structure depth is usually greater for the rail bridge typically provided at an underpass). More importantly, the vertical curve in the middle of the facility, the "crest" curve on an overpass, is longer for a given design speed than the "sag" curve at an underpass, due to stopping sight distance requirements.

The visual and noise impacts associated with overpasses can make them undesirable for use in residential zones, downtown zones, or near historic structures.

The design, and ultimately the feasibility, of a highway/railway grade separation is heavily influenced by property access considerations and the location and connectivity of roadways which parallel the tracks and connect to the cross street. Where an existing frontage road is immediately adjacent to the railroad, this facility must be bridged as well as the railroad adding to the overall project cost. If necessary, a connection to the frontage road can be provided by directional ramps similar to freeway on-and-off ramps. These ramps provide access to the frontage road for traffic to-and-from points on the same side of the railway line as the frontage roadway.

No grade separation projects are recommended in this report, however, improvements to existing Ward Avenue and the NS overpass are proposed later in this report.

I. Other Mobility Factors

Use of these crossings is not a factor with the Guilford County School System. Only one school bus crosses per day carrying students and the System reports that closing all four would not negatively impact school transportation.

Access for police vehicles to the area is not impeded by either railroad operations or the condition of the crossings in that the number of officers on duty at any given time allows police response from both sides of the tracks.

In discussions with High Point Department of Transportation staff, it was determined that there are no planned capital improvement projects in the area, either City or NCDOT sponsored, which would impact any of the crossings studied in this report.

X. RECOMMENDATIONS AND ESTIMATED COSTS

For purposes of this report, implementation schedules for recommendations are classified as follows:

Near-term (0-2 years)
Long-term (5+ years)

A. West Grimes Avenue

There are two inactive siding tracks east of the mainline tracks at West Grimes Avenue. The first siding is almost 0.6 of a foot lower than the adjacent mainline track and the second siding is approximately one foot lower than the nearest mainline track. These elevation differences contribute greatly to the uneven roadway profile. The roadway approaches to the crossing can be greatly improved by removing the inactive tracks and reprofiling the street. West Grimes Avenue carries two-way traffic of less than 2000 vehicles a day between W. Kivett Drive and W. Greene Dr. The roadway width is approximately 22 feet. See Figure 10 in the Appendix following Tab 1.

The Hawthorn Roll and Panel Company loading dock is located in the northeast quadrant of the street/railroad intersection. The West Grimes Avenue pavement is lower than the ramp for the loading dock, so modest grade changes to the street profile should not impact access to the dock. However, care must be taken in construction to assure that storm water runoff does not leave the street and flow onto the dock ramp.

Near-term Recommendations are as follows:

1. Remove the inactive siding tracks within the street right-of-way.
2. Install new gates and flashers.
3. Reprofile both roadway approaches to the crossing. This will involve approximately 60 feet of roadway on each approach.

Estimated cost:

1. Remove inactive rail sidings (NS or City) $2,500.00
2. Install new gates and flashers (includes longer gate arms) $125,000.00
3. Reprofile both roadway approaches $25,000.00

Total Estimated Cost $152,500.00

B. Taylor Avenue

Taylor Avenue is a one-way westbound street carrying a traffic volume of less than 200 vehicles per day. The street dead ends at an abandoned overpass of the Winston-Salem Southbound Railroad (WSSB) approximately 500 feet east of the grade crossing. See Figure 7 below and Figures 11 & 12 in the Appendix following Tab 2.

Figure 7 – CLOSED OVERPASS OF ABANDONED WSSB RAILROAD

The recommendations concerning this crossing fall into both near and long-term categories.

Near-term, it is recommended that the grade crossing be closed. The volume of traffic on Taylor Avenue at the crossing is less than 200 vehicles per day, so closing the crossing will not have a measurable impact on the other streets involved in this study. However, long-term benefits for emergency responders to the area can accrue if Taylor Avenue is opened into West Green Drive. These benefits would allow fire companies from Station #1 as well as emergency responders from both Guilford County and the Piedmont Ambulance and Rescue Service to access the industrial plants along Mills Street and Courtesy Road quicker. Access via a connection into West Green Drive would allow those vehicles responding from the east to also enter the area without crossing the railroad. This long-term improvement would also provide better access to the area for

general traffic to/from the east in that access can be obtained without crossing the railroad.

Near-term Recommendations are as follows:

1. Close and remove the crossing of the NCRR/NS.
2. Remove the pavement from Kivett Drive easterly to the driveways of the adjacent parking lots.

Estimated cost:

1. Close and remove crossing $12,000.00
2. Remove pavement.....$4,000.00

Total estimated cost $16,000.00

Long-term Recommendations are as follows:

1. Demolish the abandoned WSSB overpass, backfill the cut and open Taylor Avenue into W. Green Drive.
2. Modify the existing traffic signal at W. Green Drive to include the new Taylor Avenue approach.

Estimated cost:

1. Demolish overpass and connect to W. Green Drive $288,000.00
2. Modify traffic signal at W. Green Drive (City) $7,500.00

Total estimated cost $295,500.00

C. West Point Avenue

The High Point Fire Department ranks the West Point Avenue crossing as a number "1" along with both West Grimes Avenue and Prospect Street. However, access to the area is available from the Prospect Street end along Courtesy Road and to the Taylor Avenue end via Mills Street. The distance between the West Point Avenue crossing and Prospect Street is less than 0.6 miles and between West Point Avenue and West Grimes Avenue is less than 0.4 miles. Both the Taylor Avenue crossing and the West Point Avenue crossing are serving the same function as Prospect, Grimes and Ward and, therefore, are redundant and should be closed.

Traffic volume at the crossing is modest, just over 1600 vehicles per day, and there are

sight obstructions on both roadway approaches caused by existing buildings.

Improvements recommended in this report for Taylor Avenue and Ward Avenue, if implemented, will improve overall access to the area both for the general purpose vehicles and emergency responders. Access to the businesses and properties on the east side of the tracks from the Fire Department's headquarters station will be enhanced as well as for other emergency responders if Taylor Avenue is opened into Green Drive. See Figure 13 in the Appendix following Tab 3.

Long-term Recommendation:

Following the completion of the recommended connection of Taylor Avenue into West Green Drive, it is recommended that the crossing at West Point Avenue be closed.

Estimated Cost:

1. Close crossing (NS) $8,000.00
2. Pavement removal..... $4,000.00

Total estimated cost $12,000.00

D. Prospect Street

Prospect Street (See Figure 8) carries traffic volumes approaching 3000 vehicles per day and serves a major industry as well as a High Point Fire Station. The roadway alignment, both horizontal and vertical, is substandard.

The condition at the grade crossing is exacerbated by the existence of one active rail siding as well as two inactive sidings, one on each side of the crossing. Over the years as maintenance has occurred on the main line tracks, they gained elevation while the siding tracks remained unchanged. Currently, the top-of-rail of the active siding track is 0.7-foot lower than the top-of-rail on the adjacent mainline track. The elevations of the inactive tracks that remain in place are lower still. See Figure 14 in the Appendix following Tab 4.

Figure 8 – CROSSING AT PROSPECT STREET

Near-term Recommendations are as follows:

1. Remove the inactive siding tracks within the street right-of-way.
2. Reprofile approximately 600 linear feet (300 feet each side of the crossing) of the active siding track and raise the top of rail elevation to match that of the nearest main line track.
3. Replace the active siding track at the crossing with 132# rail and replace all crossties.
4. Relocate the east side gates and flashers to within 15 feet of the centerline of the active siding track.
5. Reprofile approximately 150 feet of the eastbound approach of Prospect to the crossing.

Estimated Cost:

1. Remove inactive rail sidings (NS or City) $2,500.00
2. Reprofile siding (NS) $12,000.00
3. Replace asphalt & flange crossing (NS) $15,000.00
4. Relocate gates and flashers (NS) $60,000.00
5. Reprofile eastbound approach $30,000.00

Total Estimated Cost $119,500.00

E. Ward Avenue

The railroad overpasses Ward Avenue on a bridge (See Figure 9) constructed in 1931 according to plans supplied by the NS. At the time of the initial construction, the clearance from the pavement surface at the centerline of the road to the bottom of the bridge steel was 13 feet. Over time, as the roadway has been maintained and resurfaced, the vertical clearance has decreased to 12'-9". AASHTO recommends a minimum of 14 feet of vertical clearance for local streets with an allowance for future resurfacing.

The bridge was originally constructed to carry four (4) tracks, two mainline and two siding tracks, one siding on each side of the mainlines. Today, the siding on the west side of the bridge has been removed but the beams that carried the tracks and ties are still in place. In 1951, Southern Railway, NS's predecessor, raised the beams for the mainline tracks so that they rest on the abutments approximately 9 inches higher than the beams for the siding tracks. It is possible that Southern left the siding beams at their original elevations to protect the mainline beams from being struck by an over-height vehicle.

The reinforced concrete abutments for the bridge extend below the roadway surface several feet and rest on timber piles. The bridge plans show the abutments actually extending approximately 3 feet below the street surface to the top of a shelf that extends out beneath the pavement about 3 feet on each side of the road. From the shelf, the abutments extend several more feet down to the piles.

Figure 9 – WARD AVENUE OVERPASS

In order to achieve the 14-foot vertical clearance desired, the overhead bridge beams for the siding tracks should be raised to the same elevation as the beams for the mainline tracks (approximately 9 inches) and the roadway should be lowered approximately 7 inches. As an alternative, the beams for the inactive siding could be removed. The four (4) 36" x 260# beams that provide the support for each set of tracks are connected together to form a rigid structure requiring that all four beams be lifted or jacked as a single unit. Raising the beams on the active siding will require that the track be reprofiled on each side of the overpass to accommodate the new elevation. See Figure 15 in the Appendix following Tab 5.

Long-term Recommendations are as follows:

1. Raise grade beams for both siding tracks on NS overpass.
2. Reprofile approximately 600 linear feet (300 feet each side of overpass) of the active siding track to accommodate the rise in deck elevation.
3. Lower approximately 400 feet of Ward Avenue to achieve the desired clearance *(The estimate below does not consider any costs for relocation or removal of underground utility lines. The City of High Point reports that they typically require utility companies to relocate their facilities at their own expense).*

Estimated Cost

1. Raise grade beams (NS) $80,000.00
2. Reprofile siding (NS) $12,000.00
3. Lower Ward Avenue $173,000.00

Total Estimated Cost $265,000.00

This Report Prepared by:

Robert N. Pressley, PE
Senior Project Manager
Principal Author, Photographer and Investigator

Travis C. Pollack, AICP
Transportation Planner
Investigations and Technical Review

Brian K. Caldwell
CADD Technician
Graphics and Technical Support

Stuart W. Williams, PE
Senior Project Engineer
Quality Assurance/Quality Control

w\projects\39904.180\Hi Point

APPENDIX

Location: HIGH POINT **Crossing: 722 337 X**
Street Name: WEST GRIMES AVENUE **Milepost: 299.79**

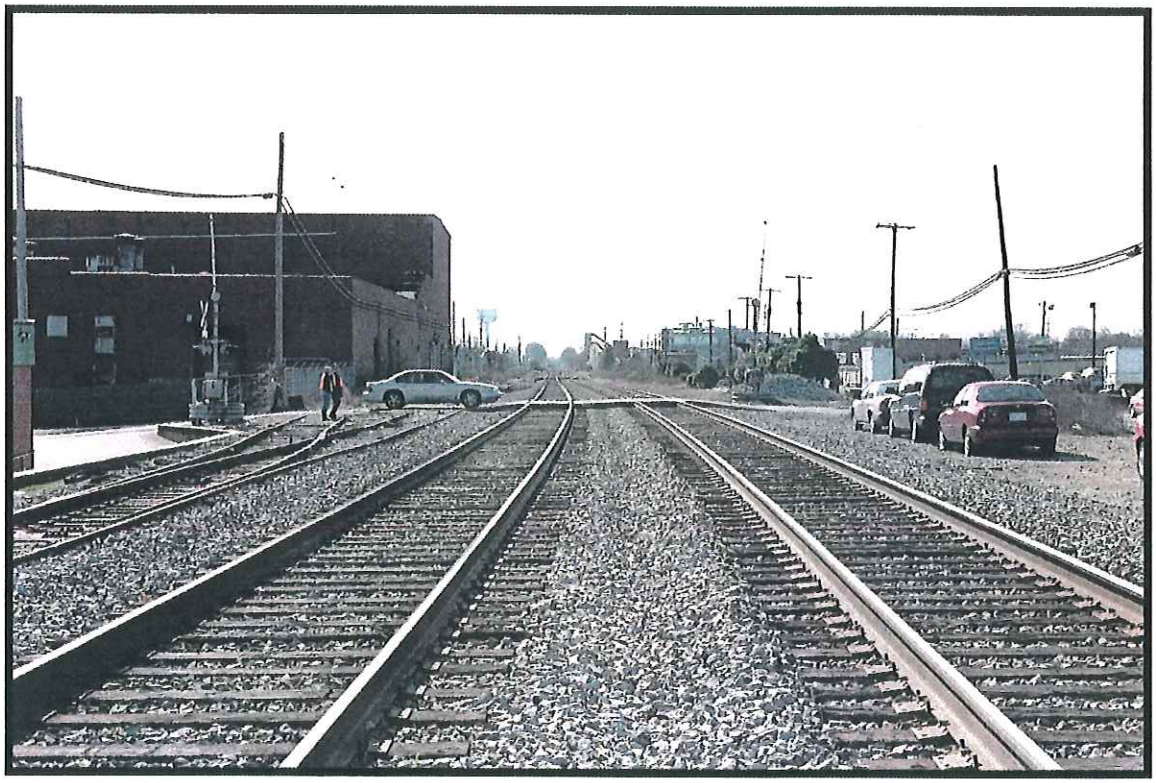
EASTBOUND APPROACH

WESTBOUND APPROACH

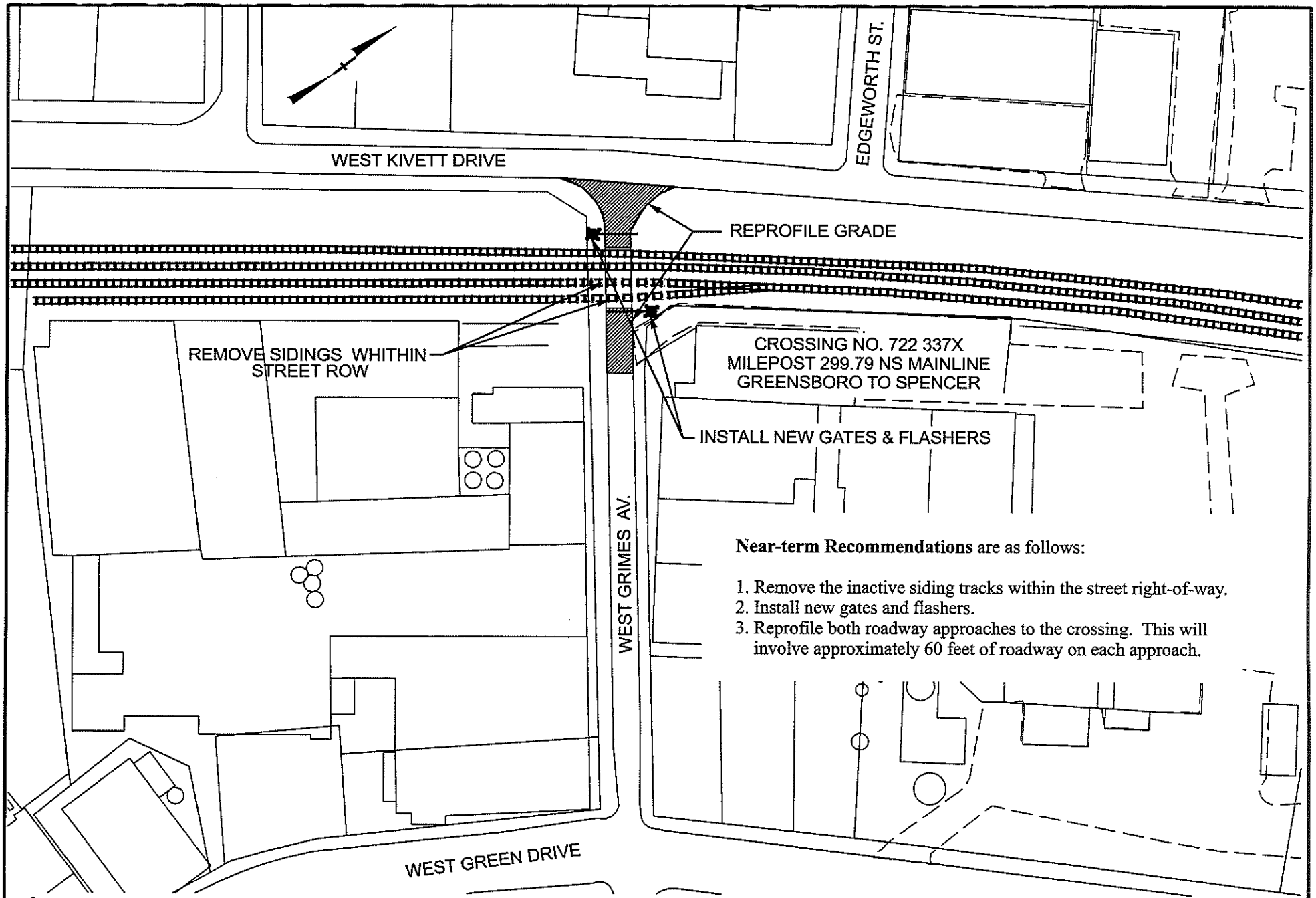
Location: HIGH POINT
Street Name: WEST GRIMES AVENUE

Crossing: 722 337 X
Milepost: 299.79

NORTHBOUND APPROACH



SOUTHBOUND APPROACH



Near-term Recommendations are as follows:

1. Remove the inactive siding tracks within the street right-of-way.
2. Install new gates and flashers.
3. Reprofile both roadway approaches to the crossing. This will involve approximately 60 feet of roadway on each approach.

Gannett Fleming
ENGINEERS AND PLANNERS
301 South McDowell St. Ste 914
Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 337X
LOCAL STREET - GRIMES AVENUE
RECOMMENDED IMPROVEMENTS
NEAR TERM - DECEMBER 2002

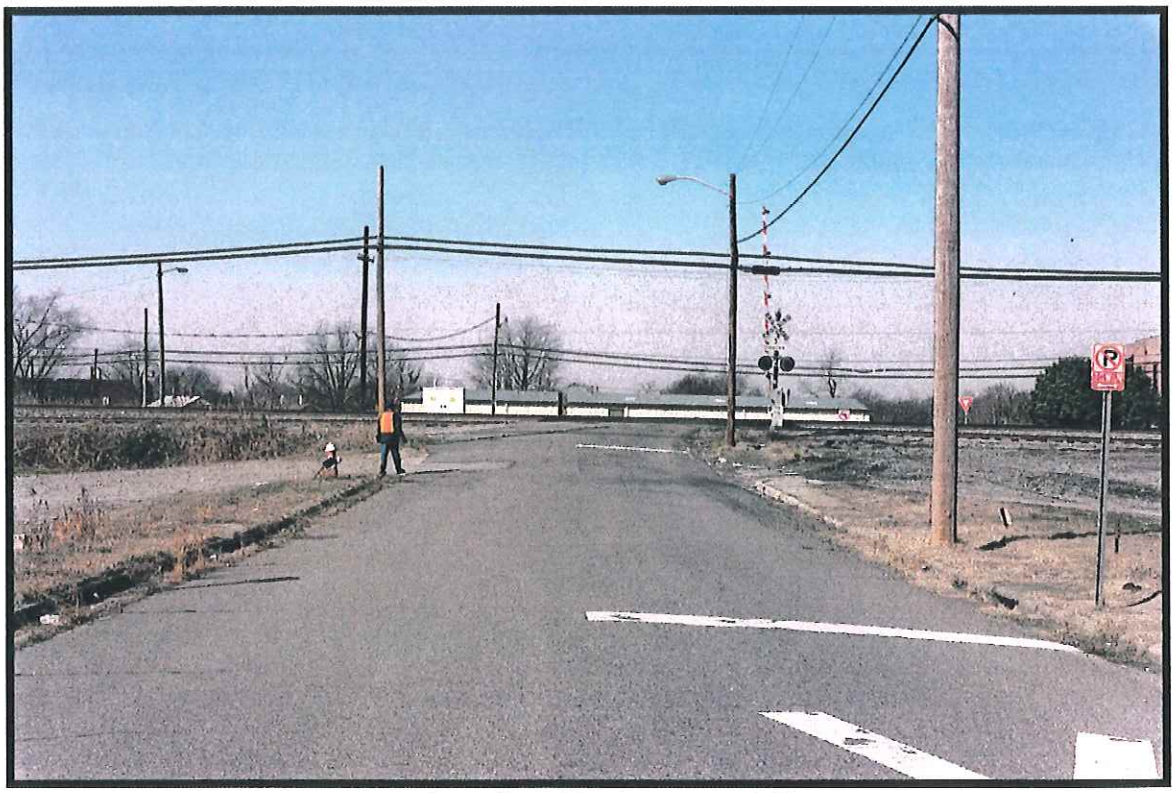
BAR SCALE 1"=100'
0 50 100 200

FIGURE 10

Location: HIGH POINT
Street Name: TAYLOR AVENUE

Crossing: 722 335 J
Milepost: 299.96

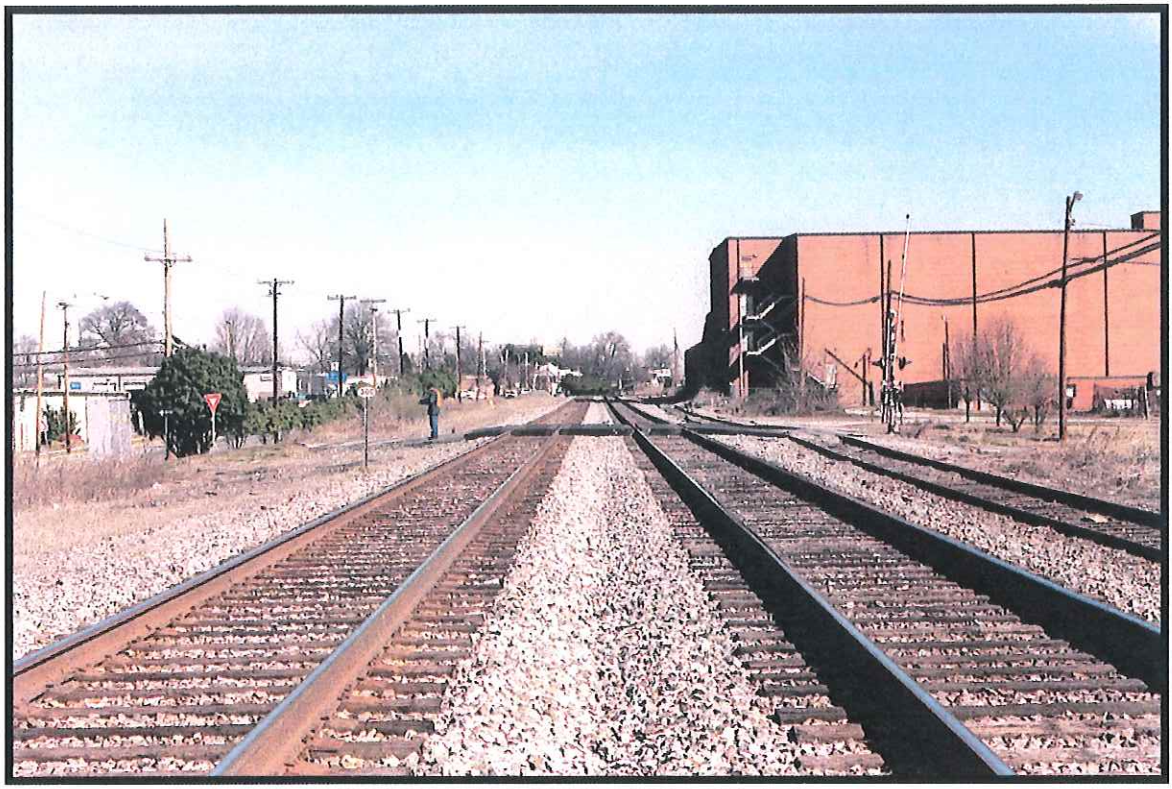
EASTBOUND APPROACH
(NOTE: One-Way Westbound Only)



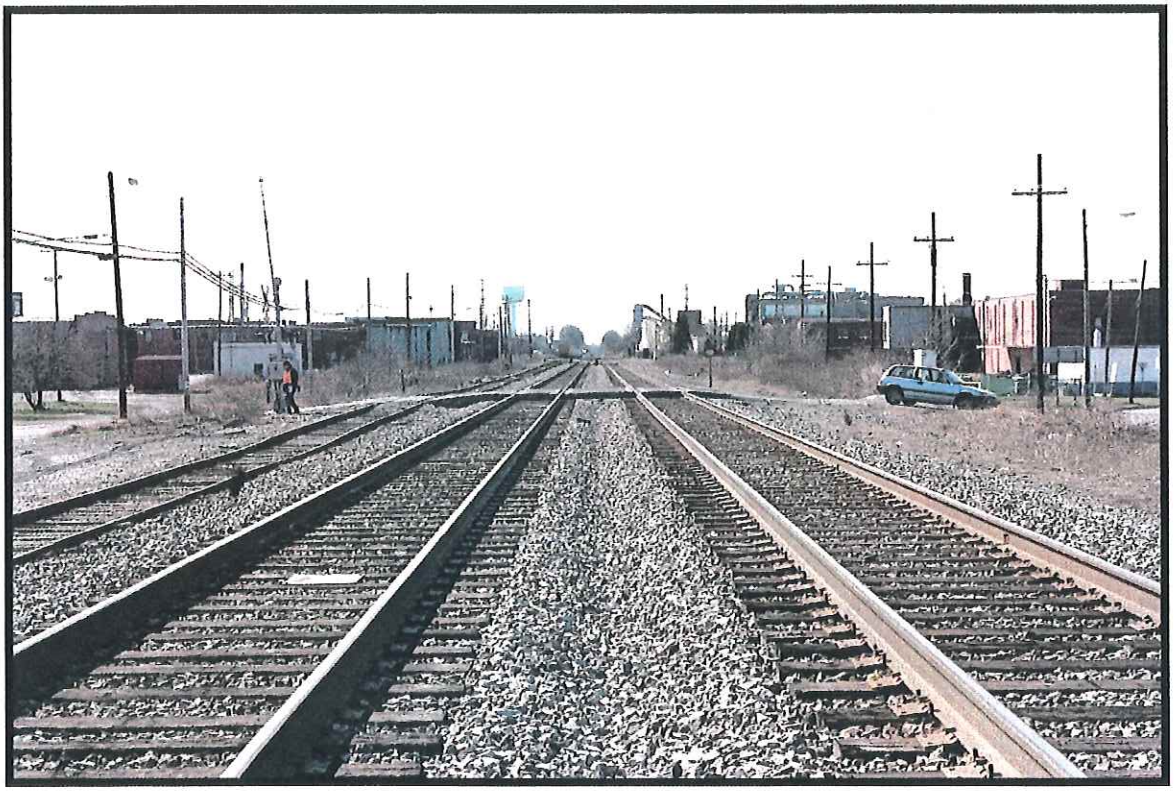
WESTBOUND APPROACH

Location: HIGH POINT
Street Name: TAYLOR AVENUE

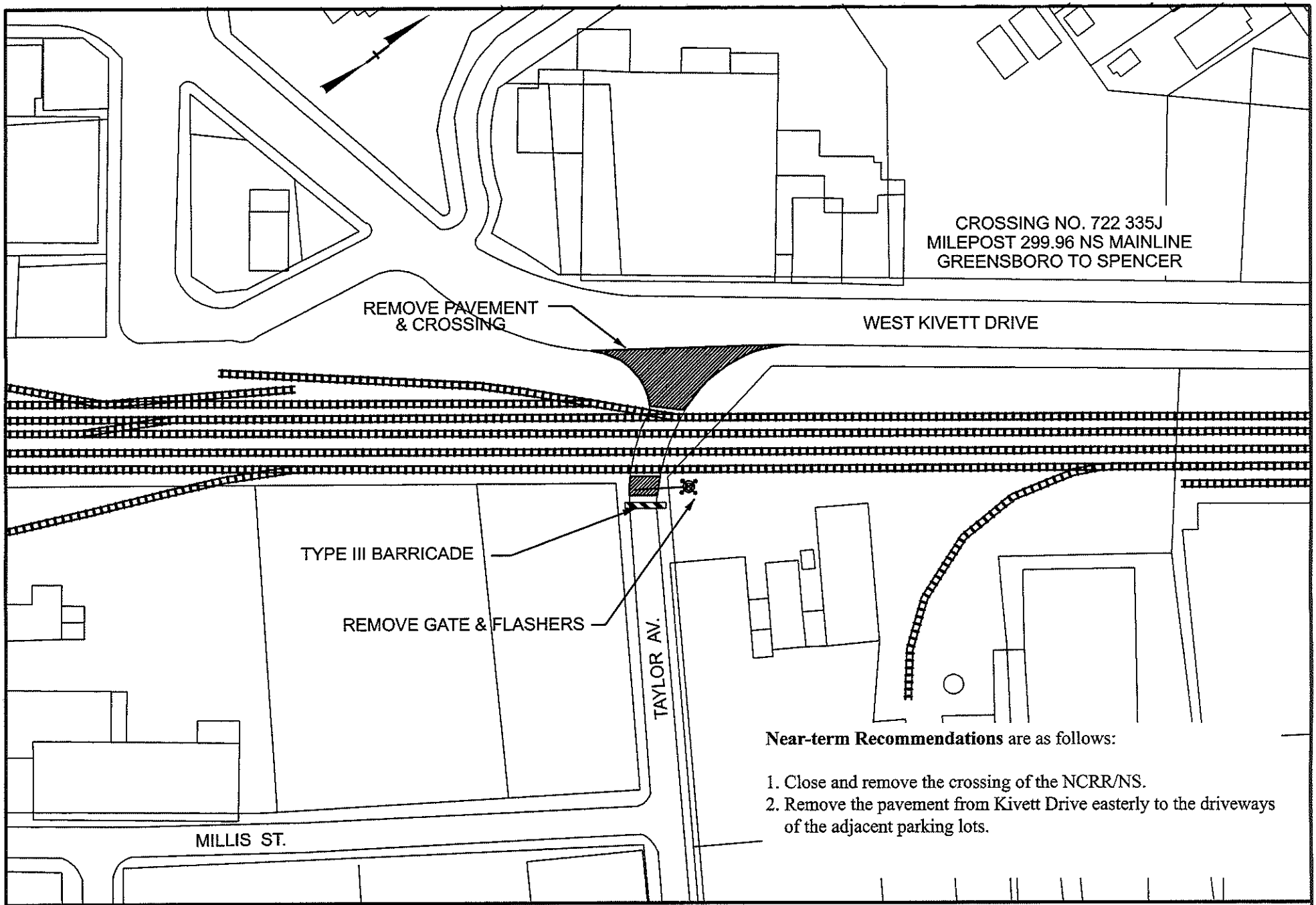
Crossing: 722 335 J
Milepost: 299.96



NORTHBOUND APPROACH



SOUTHBOUND APPROACH



Gannett Fleming
ENGINEERS AND PLANNERS
301 South McDowell St. Ste 914
Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 335J
LOCAL STREET - TAYLOR AVENUE
RECOMMENDED IMPROVEMENTS
NEAR TERM - DECEMBER 2002

BAR SCALE 1"=100'
0 50 100 200

(FIGURE 1 OF 2) FIGURE 11

ENNIS ST.

TAYLOR AV.

EXTEND ROADWAY

REMOVE OVERPASS & FILL

MODIFY SIGNAL

W GREEN DR.

Long-term Recommendations are as follows:

1. Demolish the abandoned WSSB overpass, backfill the cut and open Taylor Avenue into W. Green Drive.

2. Modify the existing traffic signal at W. Green Drive to include the new Taylor Avenue approach.

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ENGINEERS AND PLANNERS
301 South McDowell St. Ste 914
Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 335J
LOCAL STREET - TAYLOR AVENUE
RECOMMENDED IMPROVEMENTS
LONG TERM - DECEMBER 2002

BAR SCALE 1"=100'
0 50 100 200

(SHEET 2 OF 2) FIGURE 12

GANNETT FLEMING, INC.
ROADWAY, DRAINAGE AND SITE IMPROVEMENT PROJECTS
ENGINEER'S ESTIMATE

301 S. McDOWELL STREET
SUITE 914
CHARLOTTE, NORTH CAROLINA 28204
(704) 375-2438 FAX (704) 332-9361

PROJECT: Taylor Avenue Grade Crossing No.: 722 335J/ High Point
NUMBER: NCDOT Project No.: 9.908500P (P-3309) GF Project No.: 39904.180

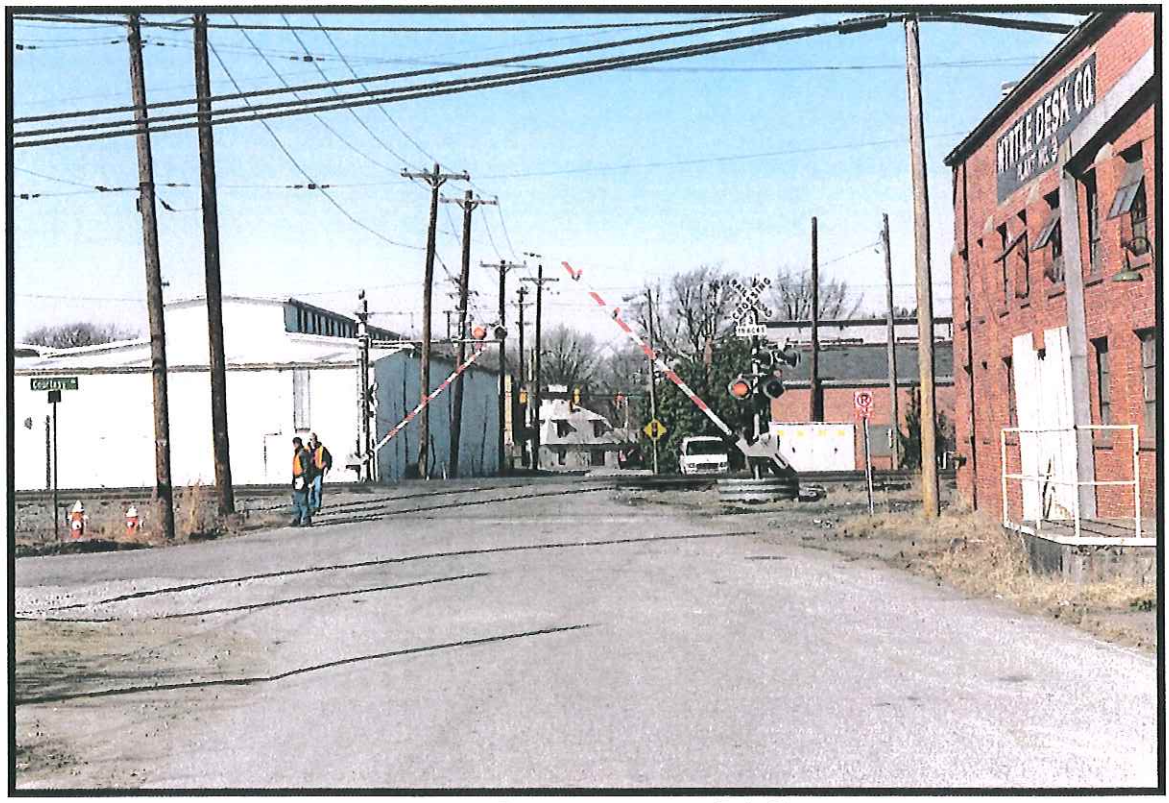
ESTIMATOR: RNP

Item No.	Sect. No.	Item Description	Quanity and Unit	Unit Price	Amount
		ROADWAY ITEMS			
1	800	Mobilization (5%)	1 LS	$0.00	$11,000.00
2	200	Clearing and Grubbing (0.3 Acre)	1 LS	$25,000.00	$25,000.00
3	SP	Demolish Existing Bridge	1 LS	$50,000.00	$50,000.00
4	225	Unclassified Excavation	500 CY	$10.00	$5,000.00
5	230	Borrow	7500 CY	$10.00	$75,000.00
6	250	Removal of Existing Pavement	500 SY	$4.00	$2,000.00
7	310	Storm Drainage Allowance	1 LS	$5,000.00	$5,000.00
8	545	Incidental Stone Base	25 TN	$20.00	$500.00
9	630	Bituminous Concrete Base Course, Type HB	300 TN	$45.00	$13,500.00
10	640	Bituminous Concrete Binder Course, Type H	150 TN	$50.00	$7,500.00
11	645	Bituminous Concrete Surface Course, Type I-2	75 TN	$50.00	$3,750.00
12	654	Base Failure Repair	10 TN	$250.00	$2,500.00
13	846	2'-6" Concrete Curb and Gutter	700 LF	$12.50	$8,750.00
14	848	4" Concrete Sidewalk	280 SY	$24.00	$6,720.00
15	848	6" Concrete Driveways	185 SY	$33.50	$6,197.50
16	848	Concrete Wheelchair Ramps	6 SY	$35.00	$210.00
17	880	Seeding and Mulching	2000 SY	$1.00	$2,000.00
18	893	Erosion Control Measures	1 LS	$2,500.00	$2,500.00
		Traffic Control Items			
19	920	Traffic Control Measures	1 LS	$2,500.00	$2,500.00
20	1205	Pavement Marking and Signing Measures	1 LS	$1,000.00	$1,000.00

Subtotal	$230,627.50
25 % Contingency	$57,656.88
Contract Sum	$288,284.38
SAY	**$288,000**

Location: HIGH POINT **Crossing: 722 334 C**
Street Name: WEST POINT AVENUE **Milepost: 300.17**

EASTBOUND APPROACH

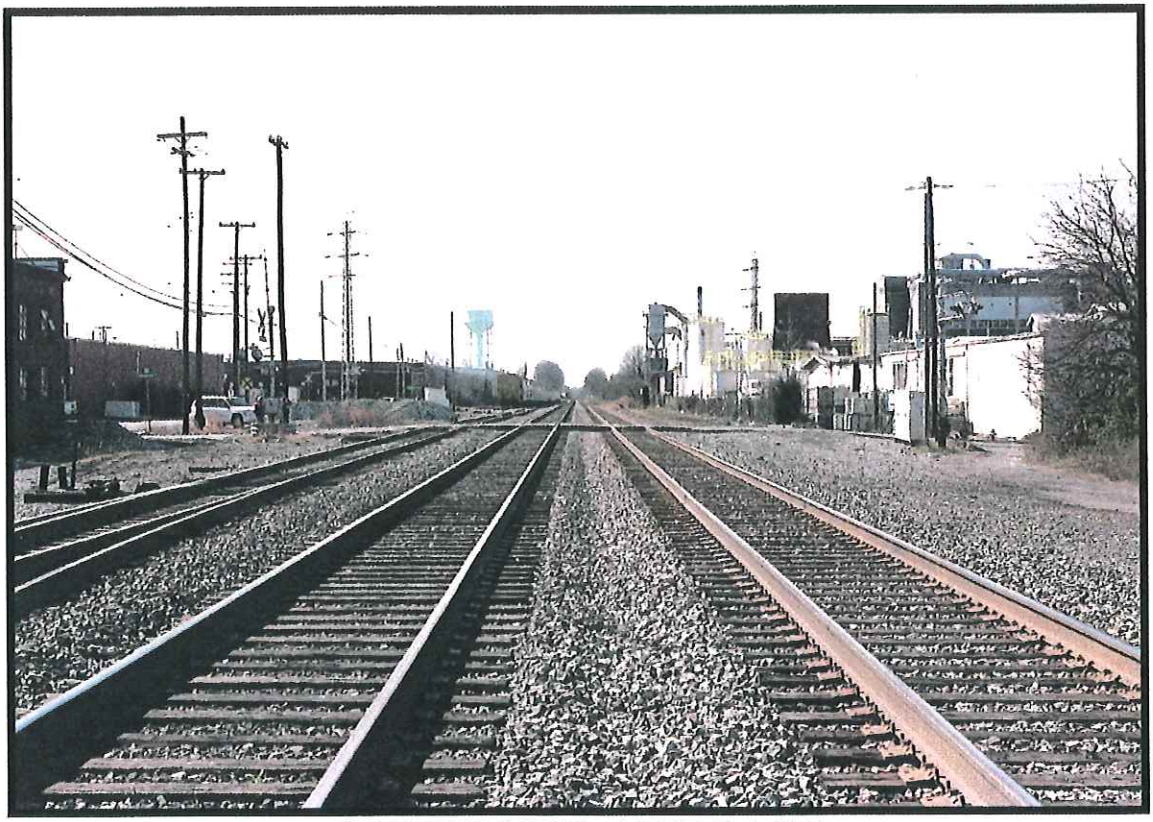


WESTBOUND APPROACH

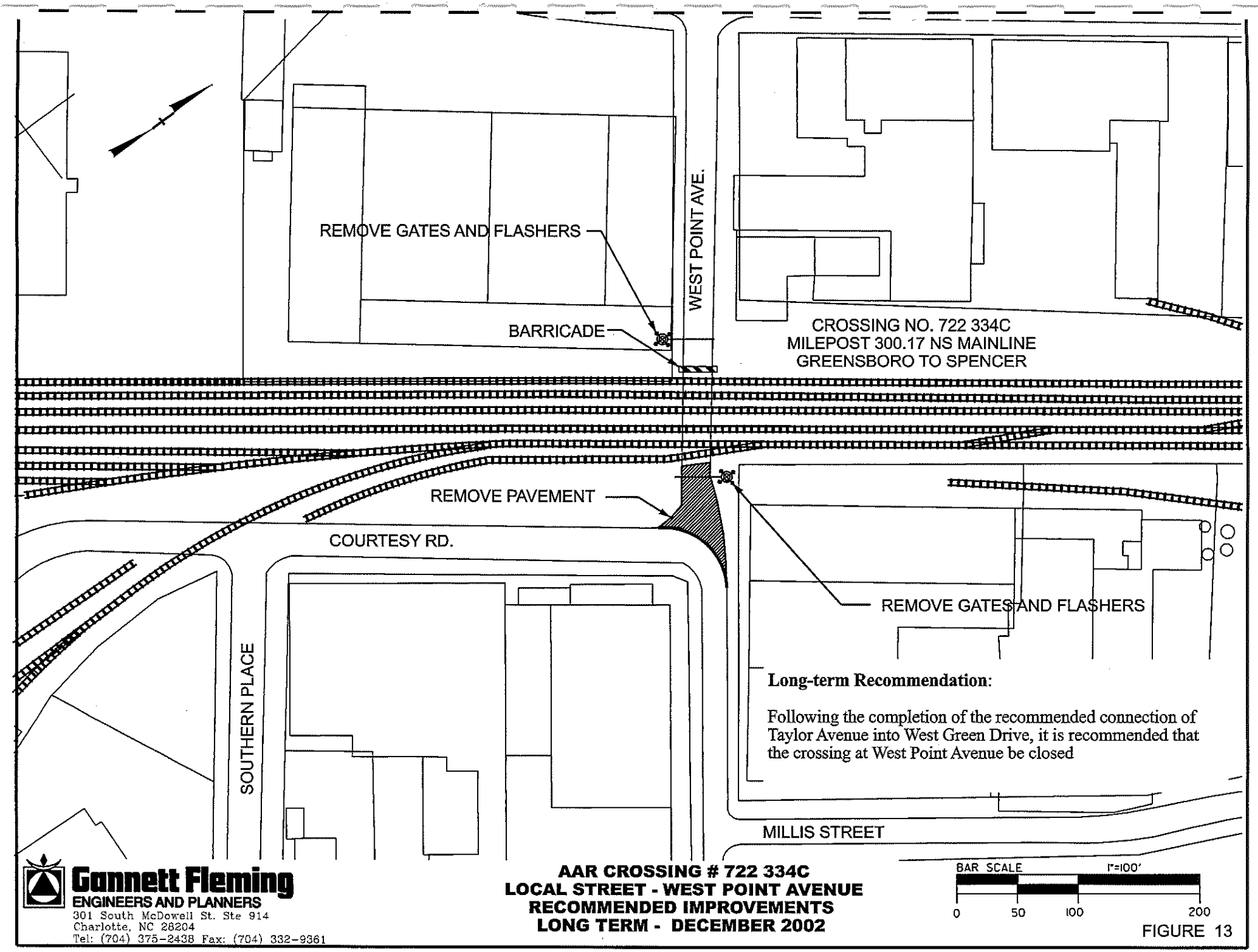
Location: HIGH POINT
Street Name: WEST POINT AVENUE

Crossing: 722 334 C
Milepost: 300.17

NORTHBOUND APPROACH



SOUTHBOUND APPROACH



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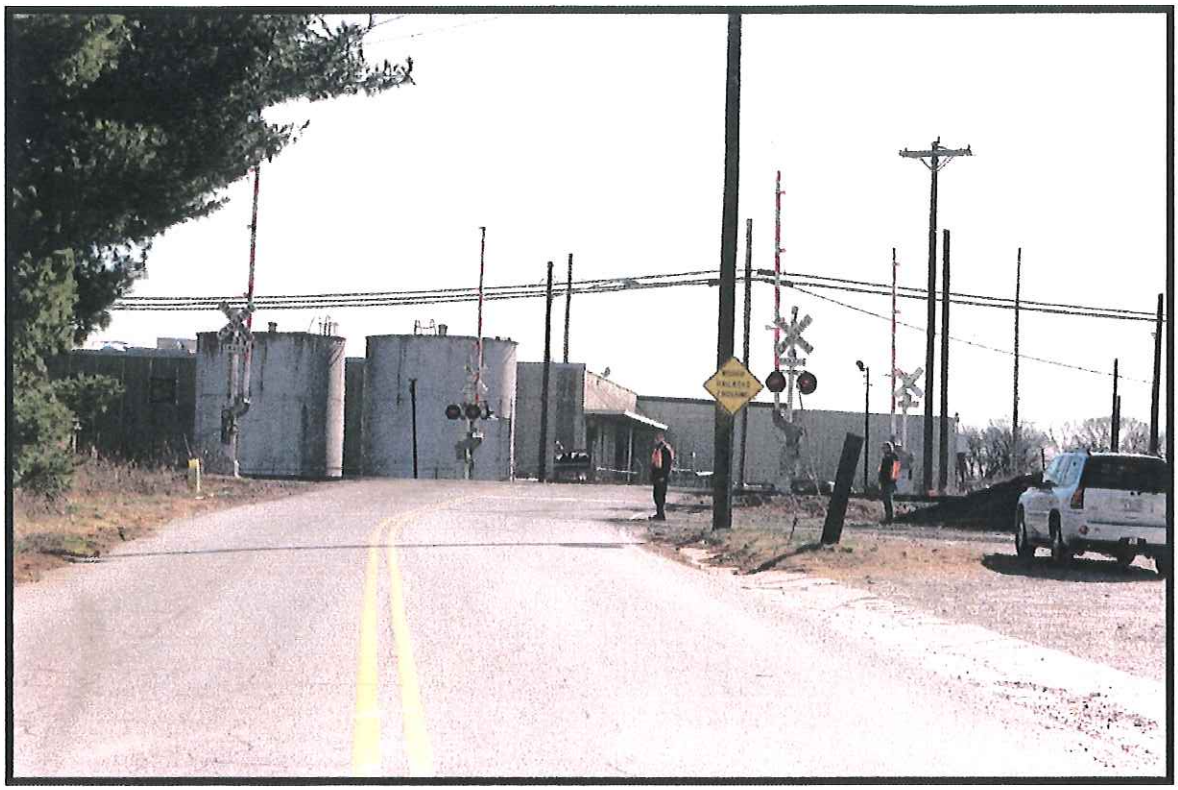
Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 334C
LOCAL STREET - WEST POINT AVENUE
RECOMMENDED IMPROVEMENTS
LONG TERM - DECEMBER 2002

BAR SCALE 1"=100'
0 50 100 200

FIGURE 13

Location: HIGH POINT **Crossing: 722 332 N**
Street Name: PROSPECT STREET **Milepost: 300.73**



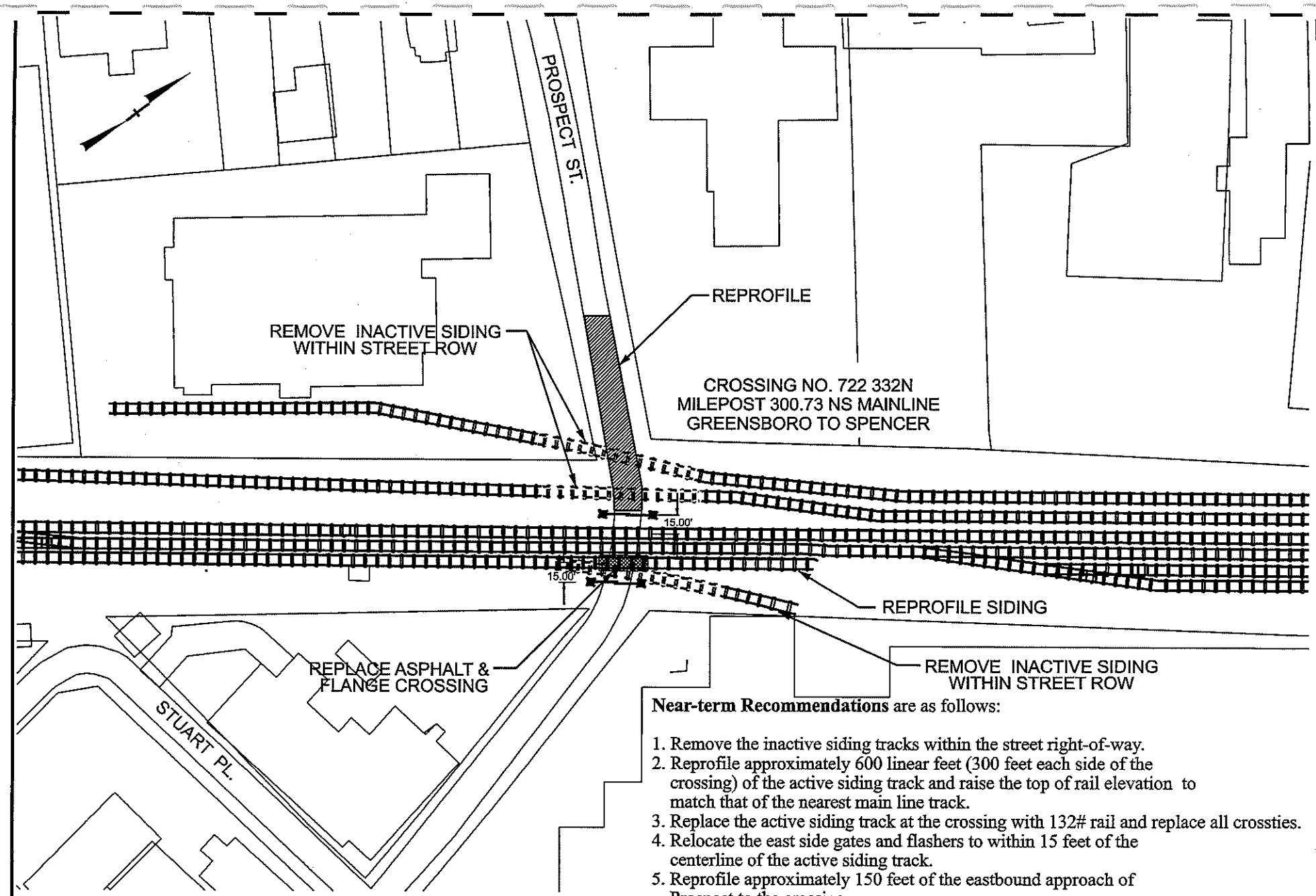
EASTBOUND APPROACH

WESTBOUND APPROACH

Location: HIGH POINT **Crossing: 722 332 N**
Street Name: PROSPECT STREET **Milepost: 300.73**

NORTHBOUND APPROACH

SOUTHBOUND APPROACH



Near-term Recommendations are as follows:

1. Remove the inactive siding tracks within the street right-of-way.
2. Reprofile approximately 600 linear feet (300 feet each side of the crossing) of the active siding track and raise the top of rail elevation to match that of the nearest main line track.
3. Replace the active siding track at the crossing with 132# rail and replace all crossties.
4. Relocate the east side gates and flashers to within 15 feet of the centerline of the active siding track.
5. Reprofile approximately 150 feet of the eastbound approach of Prospect to the crossing.

Gannett Fleming
ENGINEERS AND PLANNERS
301 South McDowell St. Ste 914
Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 332N
LOCAL STREET - PROSPECT STREET
RECOMMENDED IMPROVEMENTS
NEAR TERM - DECEMBER 2002

BAR SCALE 1"=100'
0 50 100 200

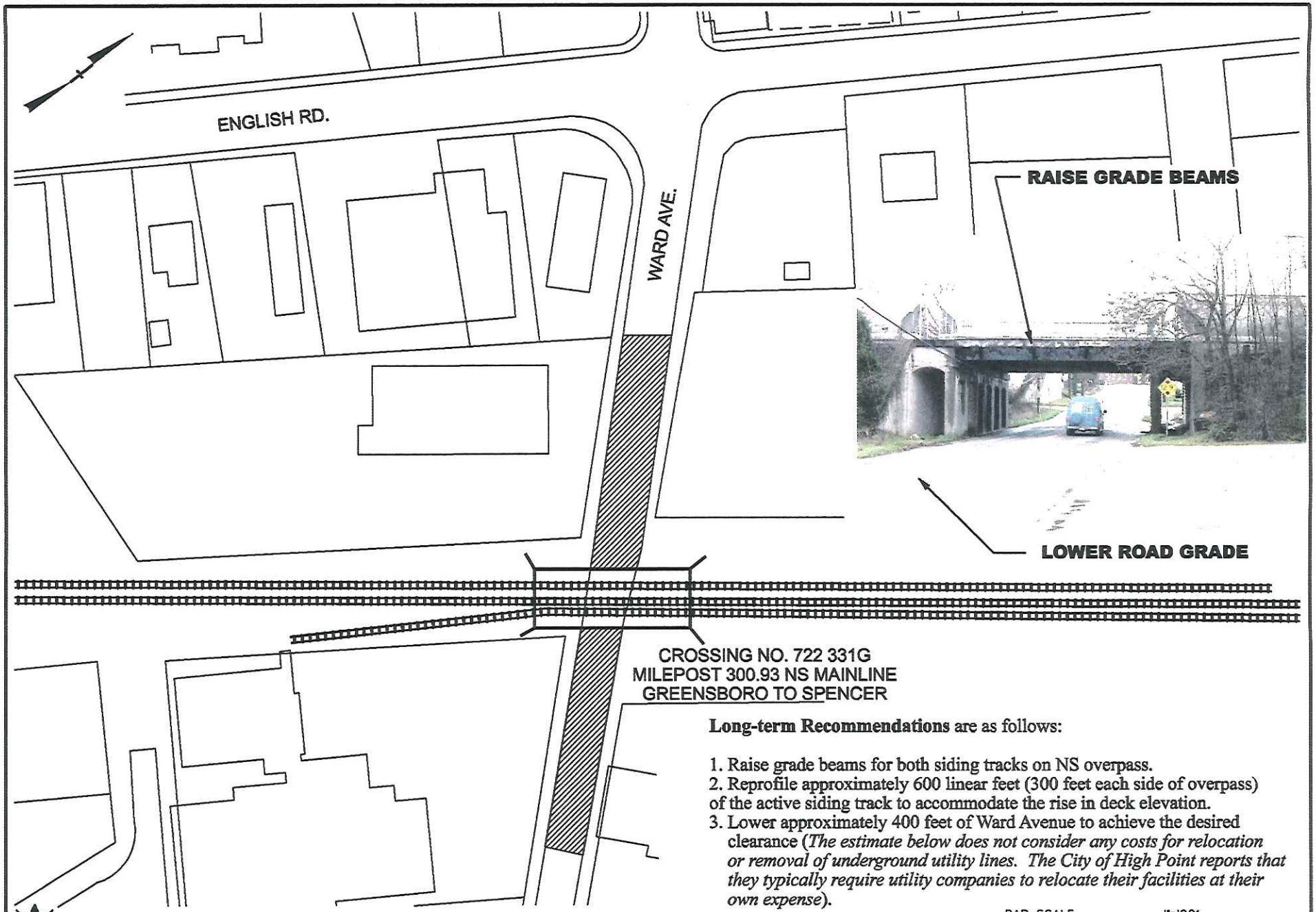
FIGURE 14

Location: HIGH POINT
Street Name: WARD AVENUE

Crossing: 722 331 G
Milepost: 300.93

RAILROAD OVERPASS EASTBOUND

RAILROAD OVERPASS WESTBOUND



Long-term Recommendations are as follows:

1. Raise grade beams for both siding tracks on NS overpass.
2. Reprofile approximately 600 linear feet (300 feet each side of overpass) of the active siding track to accommodate the rise in deck elevation.
3. Lower approximately 400 feet of Ward Avenue to achieve the desired clearance (*The estimate below does not consider any costs for relocation or removal of underground utility lines. The City of High Point reports that they typically require utility companies to relocate their facilities at their own expense*).

BAR SCALE 1"=100'

0 50 100 200

Gannett Fleming
ENGINEERS AND PLANNERS
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Charlotte, NC 28204
Tel: (704) 375-2438 Fax: (704) 332-9361

AAR CROSSING # 722 331G
LOCAL STREET - WARD AVENUE
RECOMMENDED IMPROVEMENTS
LONG TERM - DECEMBER 2002

FIGURE 15

GANNETT FLEMING, INC.
ROADWAY, DRAINAGE AND SITE IMPROVEMENT PROJECTS
ENGINEER'S ESTIMATE

301 S. McDOWELL STREET
SUITE 914
CHARLOTTE, NORTH CAROLINA 28204
(704) 375-2438 FAX (704) 332-9361

PROJECT: Ward Avenue Overpass No.: 722 331G/ High Point
NUMBER: NCDOT Project No.: 9.908500P (P-3309) GF Project No.: 39904.180

ESTIMATOR: RNP

Item No.	Sect. No.	Item Description	Quanity and Unit	Unit Price	Amount
		ROADWAY ITEMS			
1	800	Mobilization (5%)	1 LS	$0.00	$7,000.00
2	200	Clearing and Grubbing	1 LS	$5,000.00	$5,000.00
3	225	Unclassified Excavation	2000 CY	$10.00	$20,000.00
4	310	Storm Drainage Allowance	1 LS	$15,000.00	$15,000.00
5	545	Incidental Stone Base	25 TN	$20.00	$500.00
6	630	Bituminous Concrete Base Course, Type HB - 6"	375 TN	$45.00	$16,875.00
7	640	Bituminous Concrete Binder Course, Type H - 5"	300 TN	$50.00	$15,000.00
8	645	Bituminous Concrete Surface Course, Type I-2 - 2"	175 TN	$50.00	$8,750.00
9	654	Base Failure Repair	10 TN	$250.00	$2,500.00
10	846	2'-6" Concrete Curb and Gutter	400 LF	$12.50	$5,000.00
12	848	4" Concrete Sidewalk	675 SY	$24.00	$16,200.00
13	848	6" Concrete Driveways	400 SY	$33.50	$13,400.00
14	848	Concrete Wheelchair Ramps	6 SY	$35.00	$210.00
15	880	Seeding and Mulching	2000 SY	$1.00	$2,000.00
16	893	Erosion Control Measures	1 LS	$2,500.00	$2,500.00
		Traffic Control Items			
17	920	Traffic Control Measures	1 LS	$7,500.00	$7,500.00
18	1205	Pavement Marking and Signing Measures	1 LS	$1,000.00	$1,000.00

Subtotal	$138,435.00
25 % Contingency	$34,608.75
Contract Sum	$173,043.75
SAY	$173,000