

Biological Assessment
for the Proposed US 221 Widening and Bypass Around
Rutherfordton, Rutherford County, NC



T.I.P. Nos. R-2233A and R-2233B
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INTRODUCTION

The purpose of this biological assessment is to review the proposed project, Transportation Improvement Program (TIP) Project # R-2233, in sufficient detail to determine whether the proposed action may affect any of the threatened, endangered or proposed species listed below. This biological assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)). Two separate TIP projects have been combined for purposes of this report; R-2233A and R-2233B.

Threatened, Endangered, Proposed Threatened or Proposed Endangered Species

Common Name	Scientific Name	Federal Status
Dwarf-flowered heartleaf	(<i>Hexastylis naniflora</i>)	Endangered
Indiana bat	(<i>Myotis sodalis</i>)	Endangered
Small whorled pogonia	(<i>Isotria medeoloides</i>)	Endangered
Rock gnome lichen	(<i>Gymnoderma lineare</i>)	Endangered
White Irisette	(<i>Sisyrinchium dichotomum</i>)	Endangered

The federally threatened dwarf-flowered heartleaf (*Hexastylis naniflora*), protected under the Endangered Species Act (ESA) of 1973, as amended, has been documented to occur within the project study area of the proposed US 221 Bypass (or Rutherfordton Bypass) around the Town of Rutherfordton in Rutherford County, NC (Appendix A).

PROJECT DESCRIPTION – R-2233

Details of each project section and subsection are provided below; however, references primarily will be made to the main section of each project (A and B) and not to project subsections (aa, ab, ba, bb), unless necessary. Appendix Figures A-1 and B-1 provide an overview of project right-of-way (ROW) limits for each major section. As of this writing, let dates for the project are as follows:

R-2233A(aa) = 15 December 2009
R-2233A(ab) = 15 December 2009

R-2233B(ba) = 15 December 2013
R-2233B(bb) = 20 October 2015

R-2233A

The proposed project involves the construction of the proposed improvements to US 221 from the North Carolina/South Carolina state line northward, and the proposed US 221 Bypass around the Town of Rutherfordton in Rutherford County, North Carolina. The “A-section” is subdivided into two parts; R-2233A(aa) and R-2233A(ab). The study area for R-2233A(aa) extends from the North Carolina/South Carolina state line to just

south of Floyd's Creek. R-2233A(ab) extends from Floyd's Creek to the US 74 Bypass. The project is approximately 10 miles in length, and encompasses a 400-foot wide corridor centered along the existing centerline of US 221. The project ROW limits are approximately 250-ft wide throughout most of the project length; however, some areas vary in width (Figures A-1 and B-1).

R-2233B

R-2233B extends from just north of US 74 Bypass / US 221 interchange in the vicinity of SR 2171 (Birch Hutchins Road), south of Rutherfordton, to US 74 Business / US 221 Alternate, and continues north along US 221 to SR 1366 (Roper Loop Road). The project is listed in the Transportation Improvement Program (TIP) as project R-2233B. The project is approximately 10 miles in length with ROW limits approximately 300-ft wide throughout most of the project length; however, some areas vary in width (Figures A-1 and B-1).

As shown in Appendix Figure A-1, four alternatives approximately 8 miles long are proposed for this project. The four alternatives include Alternatives 3, 4, and 6 and the US 74A Bypass Alternative. Alternatives 3, 4, and 6 were divided into two sections, R-2233B (ba and bb) to provide additional alternative combinations for review and evaluation. The US 74A Bypass Alternative was not divided.

The dividing point for Alternatives 3, 4, and 6 is located in the vicinity of US 74 Business/US 221A. Each of the three A Sections is compatible with each of the adjacent three B Sections. For example, Alternative A3 may be paired with Alternative B3, B4, or B6 in order to complete the proposed bypass. A total of ten different alternative combinations are possible: nine different alternative combinations and the US 74A Bypass Alternative. Currently, the "A" alternative is matched with its corresponding "B" alternative. Descriptions of Sections A and B for Alternatives 3, 4, and 6 and a description of the US 74A Bypass Alternative follows.

R-2233B(ba)

Alternative A3

Alternative A3 begins just north of US 74 Bypass / US 221 interchange in the vicinity of SR 2171 (Birch Hutchins Road) south of Rutherfordton. It continues on new location east of US 221 from SR 2194 (Poors Ford Road) crossing SR 2201 (Thunder Road), and ending at US 74 Business/US 221A.

Alternative A4

Alternative A4 begins just north of US 74 Bypass / US 221 interchange in the vicinity of SR 2171 (Birch Hutchins Road) south of Rutherfordton. It continues along existing US 221 to SR 2271 (Industrial Park Road) crossing SR 2201 (Thunder Road) and ends on new location at US 74 Business / US 221A.

Alternative A6

Alternative A6 begins just north of US 74 Bypass / US 221 interchange in the vicinity of SR 2171 (Birch Hutchins Road) south of Rutherfordton. It continues on new location east of US 221 from SR 2194 (Poors Ford Road) crossing SR 2201 (Thunder Road) and ends on new location at US 74 Business / US 221A.

R-2233B(bb)

Alternative B3

Alternative B3 begins at US 74 Business / US 221A on new location tying in to existing SR 1536 (Old US 221), and ending at SR 1366 (Roper Loop Road) along US 221.

Alternative B4

Alternative B4 begins at US 74 Business / US 221A on new location and continues north tying into existing US 221 at US 64, ending along US 221 at SR1366 (Roper Loop Road).

Alternative B6

Alternative B6 begins on new location between US 74 Business / US 221A. Alternative B6 continues on new location east of the Town of Rutherfordton crossing US 64 and SR 1520 (Rock Road), ending along US 221 at SR1366 (Roper Loop Road).

US 74A Bypass Alternative

One additional alternative corridor extends the full length of the proposed bypass and is not compatible with the other alternatives. The US 74A Bypass Alternative begins just north of US 74 Bypass / US 221 interchange in the vicinity of SR 2171 (Birch Hutchins Road) south of Rutherfordton. It continues on new location west of US 221 crossing US 221 and continues north on new location from SR 2194 (Poors Ford Road) crossing SR 2201 (Thunder Road) tying into US 74A bypass, crossing the intersection of 74 business, continuing along 74A, merging into SR 1536 (Old US 221) eventually tying into US 221 north of Rutherfordton and ending at SR 1366 (Roper Loop Road).

Purpose and Need Statement

The purpose and need of R-2233A is to improve travel time, safety and system linkage along existing US 221 intrastate corridor between the South Carolina state line and the US 74 Bypass in Rutherford County. Based on NCDOT traffic analysis, estimated traffic volumes are expected to nearly double by 2030; without these proposed improvements the portions of US 221 would operate at a reduced level of service. Currently the fatal accident rate within the project limits (3.62 acc/100mvm) is higher than the statewide

rate for two lane rural US routes (2.01 acc/100mvm). Similarly, the purpose and need of R-2233B is to reduce traffic congestion and improve safety along existing US 221. Further data regarding current and projected traffic volumes or accidents rates are unavailable.

Defined Action Area

The project action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR §402.02]. For this project, the limits of potential effects are generally considered to be 100 ft beyond project ROW limits for R-2233A and 400 ft beyond project ROW limits for R-2233B (an explanation of these distances is provided below in the section, “Project Effects on Species”). As well, the action area is to include land under consideration for acquisition as a conservation area (Appendix D; Figure D-1). It should be noted that both projects are state (not federally) funded; however, because of the need to obtain US Army Corps of Engineer permits for impacts to aquatic systems, a federal nexus is achieved.

Species Description

Dwarf-flowered heartleaf (*Hexastylis naniflora*) was described as a new species in 1957, and was placed in the *virginica* subgroup of this genus (Blomquist 1957). Leaves are cordate to orbicular-cordate (heart-shaped), supported by long thin petioles that grow from a subsurface rhizome. The leaves are variegated, dark green in color, evergreen, and leathery. The inconspicuous flowers are found near the base of the petioles. The calyx tube is cylindrical 6.0 - 13.0 mm long and 4.0 - 7.0 mm wide. Flower color is usually beige to dark brown in color. Flowering occurs from late March to early June, with fruits maturing from mid-May to early July (Blomquist 1957, Gaddy 1981, Gaddy 1987). The narrow opening (4.0 - 7.0 mm) of the calyx is the most definitive characteristic distinguishing *naniflora* from other members of the *virginica* subgroup (Gaddy 1981). Ongoing research funded by NCDOT (Zack Murrell ASU) has found pollen surfaces to be the most reliable indicator.

Dwarf-flowered heartleaf is endemic to the western Piedmont and foothills of North and South Carolina. This herbaceous evergreen is found in moist to rather dry forests along bluffs; boggy areas next to streams and creek heads; and adjacent hillsides, slopes, and ravines. Requiring acidic, sandy loam soils, the species is found in soil series such as Pacolet, Madison, and Musella, among others. Occurrences are generally found on a north facing slope. Undisturbed natural communities such as Piedmont/Coastal Plain Heath Bluff, Dry-Mesic Oak Hickory Forest, and Mesic Mixed Hardwood Forest hold the most viable populations; however, less viable remnant populations are found in disturbed habitats, including logged, grazed, mown, and residential/commercial developed lands; areas converted to pasture, orchards, and tree plantations; roadside rights-of-way; and on upland slopes surrounding man-made ponds or lakes.

Documented Occurrences of DFHL

The NCNHP database of Rare Species and Unique Habitats assists in providing an environmental baseline for DFHL. A review of NCNHP's databases (utilizing the 13 February 2008 NHP database) revealed 182 element occurrence records of DFHL in North Carolina. In South Carolina, 57 elements of occurrence have been documented with an approximate total of 14,500 plants (pers. comm. Julie Holling, Data Manager, SC Dept. of Natural Resources, May 2008). A detailed listing of NHP-recognized occurrences of DFHL in North Carolina can be obtained directly from NC NHP (http://nhpweb.enr.state.nc.us/nhis/partner/gmap75_main.phtml).

Threats to Species

Site conversion from woodlands to pasture, residential/industrial development, reservoir construction, small pond construction, forest clear cutting, and livestock grazing have been recognized as the major past and present threats to this species.

Population Descriptions

Sites within the corridor of the proposed Rutherfordton Bypass containing heartleaf species (*Hexastylis* sp.) were documented, compiled, and identified during a 2003 H.W. Lochner, Inc. survey. Initial Lochner surveys were conducted within the original corridors in both A- and B-sections. As a result of this effort, eight previously undocumented DFHL sites were identified within or adjacent to the project corridor; seven of which were within the R-2233A study area. The 2003 surveys were conducted in April and May and were performed by H.W. Lochner biologists Heather Renninger, Emily Fentress, Ken Roeder, and Susan Smith within areas identified in Figure B-1 for both R2233A and R2233B. DFHL population sizes were estimated at that time. In Fall of 2004, Lochner biologists surveyed a larger area around the B-section—approximately 0.5 – 1 mile beyond project ROW limits for *Hexastylis* sp.. This was performed to better understand the distribution of DFHL and potential impact scenarios in the event that NCDOT was required to develop an “Avoidance alternative” for the B-section. H.W. Lochner biologists Heather Renninger, Emily Fentress, Tim Bassette, and Brian Dustin performed these surveys.

In Spring of 2005, additional surveys were conducted leading to the discovery of another small population; as well, one DFHL population was found within the R-2233B study area. An area 200 ft beyond ROW limits in the A-section and 0.5 to 1 mile beyond ROW limits in the B-section were included in these surveys. Confirmation of the species identity was conducted in March and April of 2005. Also during March and April of 2005 H.W. Lochner Biologists Heather Renninger, Emily Rackley, Tim Bassette, Eric Galamb, and Brian Dustin, and North Carolina Natural Heritage Program Inventory Specialist James Padgett conducted plant counts on all the sites containing DFHL. In order to observe and count DFHL plants, all sites were walked in their entirety along 10 – 25 foot transects, depending on the size of the site and understory density. The H.W.

Lochner staff considered a cluster of DFHL stems as one individual plant. Many of these sites contained little-brown-jug (*Hexastylis arifolia*) also. One site contained little-brown-jug and little heartleaf (*Hexastylis minor*), while another site contained little-brown-jug and variableleaf heartleaf (*Hexastylis heterophylla*). Additionally, numerous stands of little-brown-jug exclusively were found throughout the study area. During this season, sites that contained DFHL were located by Global Positional System (GPS), and a NCNHP Endangered and Rare Plant Field Survey Form was completed for each population. Sites were defined as a group of plants growing in close proximity to each other, generally associated with the same stream system. Figures A-1 and B-1 depict these sites.

During February, March, and April of 2008, NCDOT biologists Lance P. Fontaine, Heather Renninger, Tim Bassette, Mary Frazer, Michael Sanderson, Dennis Herman, and Steve Mitchell conducted re-surveys for DFHL within the proposed corridors associated with R2233B. No new populations of DFHL were observed at this time. Individual plants at sites 1, 210a, and 8 were recounted using similar methodology as previously described. The spring 2008 re-counts at sites 1 and 210a were conducted because it was observed during another field visit that DFHL were spreading between these two sites. Subsequently, these two sites have been combined into one by NCNHP (EO # 106) and for the purposes of this BA. The site 8 re-count was performed to confirm the number of DFHL present in the updated ROW of the B-section of the project. As well, this count helped to ensure an account inventory of plants in the B-section would be considered in a joint BA for projects R-2233A and R-2233B.

Environmental Baseline

The USFWS defines environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in an action area. This environmental baseline also includes: the anticipated impacts of all proposed federal projects in an action area that have already undergone formal or early ESA §7 consultation; and the impacts of State or private actions that are contemporaneous with the consultation in process (USFWS and NMFS March 1998).

NCDOT Projects

Several NCDOT projects have impacted, or are situated near populations of DFHL. A few of these projects have undergone, or are in the process of undergoing, ESA §7 consultation (formal and informal) for DFHL.

U-2307C – East-side thoroughfare from US 70-321 to I-40;

Hickory, Catawba Co.

Let date: September 1995

Summary and Update:

Construction was completed in December 1997. The permits authorized impacts to the entire DFHL population (NCNHP EO record PDARI03060*031*NC). An October 2001 field review revealed that a portion of the population situated outside of project right-of-way limits was impacted by clearing activities (of unknown cause or origin), but the

entire population was not destroyed. Sections of DFHL are present on a steep hill beyond project limits and along the ROW. These sections are unlikely to be impacted from future development because of their location.

B-2816 – Replace bridge No. 230 on SR 1908 over Buffalo Creek;
Shelby, Cleveland Co.

Let date: August 1999

Summary and Update:

Construction was completed in December 2000. On 18 May 1998, Mr. Tim Savidge, NCDOT biologist, counted over 1,000 densely spaced DFHL plants in a 2.5 ac site located on the east side of Buffalo Creek, approximately 0.1 mi north of SR 1908 (NCNHP EO PDARI03060*046*NC). This site was noted as a very high quality DFHL community with little disturbance. The environmental permits associated with this project do not authorize any impacts to DFHL near the bridge. An alternative that avoided direct impact to the DFHL population was chosen. An October 2001 field review revealed that no direct impacts or indirect or cumulative effects have occurred on the DFHL population located near the project.

B-2937 – Replace bridge No. 84 on SR 1108 over Little Gunpowder Creek;
Caldwell County Co.

Let date: November 2000

Summary and Update:

Construction was completed in April of 2003. USFWS rendered a Biological Conclusion of May Adversely Affect for DFHL (NCNHP EO record PDARI03060*044*NC). Project permits authorized NCDOT to impact 0.57 ac of a DFHL population containing approximately 324 DFHL plants. This impact area comprises a portion of a 2.97 ac DFHL site between US 321 and Bridge No. 84. In order to offset the DFHL impacts on this project, NCDOT obtained 2.68 ac of additional right-of-way to preserve the most significant intact portion of DFHL plants situated in the 2.97 ac site. Based on species density with the impact area, the purchase of this perpetual conservation easement protects approximately 1,522 DFHL plants. NCDOT successfully transplanted a number of the plants expected to incur direct impacts to the conservation easement. No additional impacts associated with DFHL observed during an October 2001 field review.

B-3122 – Replace bridge No. 24 on SR 1628 over Ut; Burke Co.

Let date: February 2001

Summary and Update:

Construction was completed in August 2001. As of June 2008, this population has not received an EO record number from NCNHP. Project permits do not authorize impacts to DFHL. The October 2001 field review indicated that no direct impacts or indirect and cumulative effects to DFHL have occurred since project construction.

U-2528AA – Interchange project along I-40 and SR 1124 (33rd Street);
Longview, Catawba Co.

Let date: August 2001

Summary and Update:

Construction completed June 2003. The USFWS rendered a Biological Opinion of Not Likely to Adversely Affect for the anticipated 619 DFHL plants that would be affected by project construction (NCNHP EO PDARI03060*032*NC). Results of the October 2001 survey indicate that the only DFHL impacts on this project occurred as a result of direct construction activities. Even though indirect effects to existing DFHL were not observed, it is anticipated that such effects could eventually occur from development along the interchange. Based on an October 24, 2002 conversation with Trish Simon, the plants in Quad D (SE quadrant) are still present and a protective fence has been placed around them. NCDOT did not disturb Quad A (NE quadrant) in accordance with project permits and plans, but the property owner has since cleared the area for future development. The plants in Quadrant A (NE quad) are no longer present. Quad B (NW quadrant) was already stressed prior to construction due to logging; these plants are no longer present. The population on the other side of the original on-ramp has been cleared by the landowner for future development.

B-3828 – Replace Bridge No. 233 on SR 1906 over Buffalo Creek;
Beam Mill, Cleveland County

Let Date: May 2005

Summary and Update:

Construction of this bridge was completed in April 2006. DFHL (NCNHP EO record PDARI03060*085*NC) were found approximately 50 - 75 feet beyond project limits.

Through informal consultation a biological conclusion of May Effect Not Likely To Adversely Affect was rendered.

U-2414A – Tate Boulevard Extension from SR 1468 to I-40;
Hickory-Conover,

Catawba County

Let date: March 2006

Summary and Update:

Project length is approximately 10 miles in length, but DFHL occur do not occur along the entire project length. This project may affect all or portions of NCNHP EO record PDARI03060*030*NC. The USFWS rendered a Biological Opinion of Not Likely to Adversely Affect for DFHL under the stipulation that the plant population shown in the project construction plans will not be disturbed during road construction. Results of NCDOT's October 2001 field review revealed that the DFHL population along the south side of Tate Boulevard are intact and may have expanded outside of the originally delineated boundaries. DFHL populations along the north side of Tate Boulevard appeared to have been slightly impacted along the parking lot of a newly constructed Home Builders Association building. Note that few DFHL existed along the north side of Tate Boulevard before the building was constructed.

B-3621 – Replace Bridge No. 148 on SR 1547 over Micol Creek;
Valdese, Burke Co

Let Date: April 2007

Summary and Update:

Construction of this project was completed in December 2007. The biological conclusion of May Affect, Not Likely to Adversely Affect DFHL was rendered via informal consultation with USFWS. This population (NCNHP EO record PDARI03060*159*NC) was successfully avoided through a modification of construction design. This included installation of a reinforced slope on the south side of the road. This alteration of design allowed for the avoidance of Ut to Micol Creek thus avoiding impacts to DFHL on the south of the creek. Those DFHL on the north side of the road were beyond the project slope stake limits and were not impacted by construction.

B-3126 – Replace bridge No. 90 on SR 1718 over Gunpowder Creek;
Granite Falls, Caldwell Co.

Let date: July 2007

Summary and Update:

The bridge is being replaced on new alignment to the north west of the existing bridge. This project may affect all of or portions of (NCNHP EO PDARI03060*077*NC). Consequently, USFWS rendered a Biological Conclusion of May Effect is likely to Adversely Affect for this project. An October 2001 field review of the proposed project area revealed no changes in land use. Furthermore, indirect or cumulative effects to DFHL as a result of other development were not observed.

R-2824 -Widening of Lovelady Rd (SR 1546);
Rutherford College, Burke Co.

Let Date: January 2009

Summary and Update:

This project is approximately 2 miles in length, however DFHL do not occur along the entire project length. This project will be an upgrade of existing roadway. Initially, this project was issued the biological conclusion of May Affect, Not Likely to Adversely Affect dwarf-flowered heartleaf as rendered through informal consultation with USFWS because the DFHL population (NCNHP EO record PDARI03060*160*NC) is located immediately outside of project construction limits. As an avoidance and minimization measure, NCDOT committed to install protective fencing and signage around the perimeter of the population to prevent construction-related impacts. Very recently additional DFHL were discovered within project ROW limits. As of this writing, NCDOT biologist Tim Bassette is working with USFWS to resolve the issue and minimize impacts.

R-2707 – US 74 bypass;
Shelby, Cleveland County

Let Date: 2011

Summary and Update:

This project is approximately 20 miles in length, however DFHL do not occur along the entire project length. This four lane divided freeway will involve widening existing roadway and new location has not been Let as of this writing. NCDOT biologists located the species at 48 sites within or adjacent to the proposed project area. These sites were previously undocumented, and were collectively estimated to contain 16,405 individual plant clusters (USFWS 2007 DRAFT Five Year Review for DFHL). According to the

2004 BA/BO performed in association with this project, six of 12 EO's are expected to be directly impacted by the road project. Of these six, one (which consists of three plants) is expected to be completely destroyed. Five other EO's are expected to be partially impacted. A total of approximately 3,334 individual plants are anticipated to be destroyed in association with this project. NCDOT has committed to protect all remaining portions of five EO's that are adjacent to existing project right-of-way--approximately 4,798 individual plants. NCDOT will protect these sites through the acquisition of additional ROW, and through the management of invasive exotic species within these areas. NCDOT has stated that an additional 6,984 rosettes may be lost through indirect or cumulative impacts (such as development induced by the road construction project). NCDOT will attempt to minimize the scope of indirect impacts by obtaining conservation easements for other sites. This information is based on the BA/BO and the 5-year report, however, because construction of this project has not begun, actual impact numbers are unavailable at this time. Furthermore, as additional mitigation for impacts associated with this project, NCDOT purchased a ~1,000 acre tract to provide perpetual protection for approximately 10,796 dwarf-flowered heartleaf plants. More information on this site is provided below (see Broad River tract).

Broad River Tract: Located in southwestern Cleveland County, this ~1,000 ac tract is about 2.5 mi southwest of the town of Boiling Springs, NC. The site is situated west of NC 150, along the north side of the Broad River. Sandy Run Creek forms the eastern boundary of the subject property. This heavily forested property contains an estimated >10,796 confirmed DFHL plants spread over 4 sites; EO #'s 14,49,50, 51, 73,74,149,233,236,237,238,239,240,241,246. This property was acquired to offset adverse effects resulting from R-2707 and potentially other projects; because R-2707 has not been completed, specific details regarding final direct effects of the Shelby project and subsequent offsets of the Broad River tract are unavailable. For further information refer to the Shelby bypass BA/BO.

SR 1115 (Camp Creek Road);
Near Burke Co. line, Catawba Co.
Let date: ???

Summary and Update:

This non-TIP NCDOT Division 12 road construction project realigns Camp Creek Road to the east of existing alignment onto new location. This project has been put on hold indefinitely (pers. comm. Ruben Chandler NCDOT – Div. 12 – Division Maintenance Engineer, May 2008) This project may affect all of or portions of NCNHP EO record PDARI03060*058*NC. On 7 May 2001, NCDOT environmental biologists Jill Holmes, Matt Haney, and Tim Bassette conducted a count of DFHL plants in a population situated in a mixed pine-hardwood forest along the east and west sides of Camp Creek Road. Approximately 357 DFHL plants were counted in an area measuring 0.41 ac along the east side of Camp Creek Road. Along the west side of the road, biologists tallied 189 DFHL plants in an area measuring 0.19 ac. Per a 22 September 2002 conversation with Trish Simon, NCDOT Division 12 Environmental Officer, the project is estimated to directly impact approximately 20-30 DFHL plants.

PROJECT EFFECTS ON SPECIES

Project-related threats to the DFHL can be separated into direct, indirect, and cumulative effects. Direct effects refer to consequences that are directly attributed to the construction of the project, such as fill, excavation, draining, or mechanized clearing. Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR §402.02]. Potential direct, indirect, and cumulative effects to the DFHL which may result from project R-2233 are discussed here.

As previously mentioned, there are currently 4 alternatives under consideration for R-2233B. The following assessments of direct, indirect, and cumulative effects are based on current population data and the design plans available as of this analysis.

Direct Effects

Provided below are an arbitrarily determined site identification numbers, the corresponding NCNHP element occurrence number(s) (EO#), and the approximate coordinates of the geographic center of the site (in the convention of latitude/longitude degrees, minutes, seconds). A brief description of each site along with qualitative and quantitative accounts of anticipated impacts are provided as well. The information in this section is intended to complement the data in Appendices B and C.

Current design plans indicate that portions of 7 of the 8 DFHL sites located within the project ROW fall within the proposed project's construction limits. Construction activities may lead to the loss of plants and habitat. In the 8 sites within or immediately outside the project ROW, there are ~4,478 DFHL plants over 13.6 ac with an average density of ~330 plants per acre. Approximately 0.98 ac and ~333 DFHL plants fall within the project's construction limits (slope stake limits). In the A-section ~206 DFHL plants, and in the B-section ~127 DFHL plants, are expected to incur adverse direct, indirect, and cumulative effects. Table 1 depicts DFHL plant numbers, acreage, species density, and total direct impacts for each site. The following highlights each DFHL site that falls within the project's construction limits only. Without translocation, these ~330 plants will be destroyed.

Table 1: DFHL Site and Survey Information

Site	Corresponding EO # *	Number of DFHL	Area [ac]	DFHL Density [#/ac]	Comments	Soil Series
1 (& 210a)	106	2326	4.34	535.94	High quality; few invasives	Pacolet
2	174	119	0.26	457.69	Medium quality; few invasives	Pacolet
3	114	133	0.05	2660.00	Low quality; mowing and trampling	Chewacla and Pacolet
4	173	102	0.42	242.86	Former cow pasture; many invasives; low quality	Pacolet
5	113 (west of Hwy 221) 175 (east of Hwy 221)	1175	7.11	165.26	Medium quality; some invasives; evidence of past cattle impacts	Pacolet
6	76	135	0.53	254.72	Population is a Registered Heritage Area on east side of US221	Pacolet
7	172	126	0.23	547.83	Medium quality; some invasives	Pacolet
8	107 (west of Hwy 221) 122 (east of Hwy 221)	362	0.65	556.92	Medium quality; invasives thick in some areas; referred to as "TimKen site"	Pacolet
Total		4,478	13.6	329.5		

* = NHP records differentiate these sites as distinct populations relative to Hwy 221.

Site 1 (& 210a) – EO# 106 – Lat/Long DMS 81°52'25"W/35°15'10"N – APPROXIMATE* NCDOT Station number (-L- Sta. 310+50 Rt.; -L- Sta. 318+00 Rt.; -Y2- Sta. 12+50 Rt.)

This site represents one of the highest quality sites within the project with few invasive plant species present. DFHL occur along the unnamed tributary to Floyd's Creek from CSX railroad tracks to Jayne's Road (SR 2287) and along an ephemeral drainage feeding into this tributary. The proposed project ROW encompasses approximately 0.29 ac and 50 plants of the 4.34 ac and 2326 site total.

Site 2 – EO# 174 – Lat/Long DMS 81°51'54"W/35°14'43"N – APPROXIMATE* NCDOT Station number (-L- Sta. 275+00 Lt.)

This site represents a medium quality site with few invasive plant species present. The proposed project ROW encompasses approximately 0.08 ac and 37 plants of the 0.26 ac and 119 site total.

Site 3 – EO# 114 – Lat/Long DMS 81°51'54"W/35°14'43"N – APPROXIMATE* NCDOT Station number (-L- Sta. 272+00 Rt.)

This site represents a low quality site with some evidence of mowing and trampling. The proposed project ROW encompasses approximately 0.02 ac and 52 plants of the 0.05 ac and 133 site total.

Site 4 – EO# 173 – Lat/Long DMS 81°51'12"W/35°14'25 "N – APPROXIMATE* NCDOT Station number (-L- Sta. 234+00 Rt.)

This site represents a low quality site within a former cow pasture and numerous invasive plant species. The proposed project ROW does not contain a measureable amount of this DFHL EO.

Site 5 – EO# 113 & 175 – Lat/Long DMS 81°50'25"W/35°13'9"N – APPROXIMATE* NCDOT Station number (-L- Sta. 145+00 Rt. & Lt.)

Element occurrence 113 is west of US 221, EO 175 is east of US 221. These sites represent medium quality sites with some invasive plant species and evidence of past cattle impacts. The proposed project ROW encompasses approximately 0.37 ac and 62 plants of the 7.11 ac and 1175 site total.

Site 6 – EO# 76 – Lat/Long DMS 81°50'30"W/35°11'28"N – APPROXIMATE* NCDOT Station number (-L- Sta. 41+00 Rt. & Lt.)

This site represents a medium quality site with some invasive plant species. This site (on the east side of US 221) is a Registered Heritage Area with NHP. The proposed project ROW encompasses approximately 0.01 ac and 3 plants of the 0.53 ac and 135 site total.

***STATION NUMBER IS A GROSS APPROXIMATION OF DFHL POPULATION LOCATION.**

Site 7 – EO# 172 – Lat/Long DMS 81°50'30"W/35°11'20"N – APPROXIMATE* NCDOT Station number (-L- Sta. 31+50 Rt.)

This site represents a medium quality site with some invasive plant species. The proposed project ROW does not contain a measureable amount of this DFHL EO.

Site 8 – EO# 107 & 122 – Lat/Long DMS 81° 55'53"W/35°19'9"N – APPROXIMATE* NCDOT Station number (unavailable until preliminary plans developed)

Element occurrence 107 occurs west of NC 221, EO 122 occurs east of 221. Sometimes referred to as “TimKen” site. These sites represent medium-high quality sites with dense invasive plant species in some areas. These are the only sites expected to be directly impacted by R-2233B (subsections ba and bb). As previously mentioned, 4 current alternatives exist for this section. Alternates 3, 6, & 74a assume a ‘worst-case’ scenario of impacts (Table 2) while alternate 4 would impact 0.09 acres/58 DFHL plants. To provide a conservative estimate of impacts—and because of uncertainty regarding alternate selection—the ‘worst-case’ scenario has been chosen for the purpose of this report. Thus, under Alternates 3, 6, and 74a: the proposed ROW encompasses approximately 0.37 ac and 127 plants of the 0.372 ac and 646 site total. None of the current proposed alternatives will directly impact EO 122.

***STATION NUMBER IS A GROSS APPROXIMATION OF DFHL POPULATION LOCATION.**

Indirect Effects

Economic development is often used as a criterion in highway funding (Eagle and Stephanedes 1987). Historically, transportation has been viewed as a necessary precursor to economic development (Anderson *et al.* 1992), and transportation infrastructure is “one attractiveness to business investors” (Forckenbrock 1990). Other types of indirect effects may include biological pollution (*e.g.*, invasive species) and changes in hydrological regime. The distance a planted roadside species could invade into the woods has been estimated to range from 33 ft to 400 ft (Forman and Deblinger 1998). Given the steep, hilly topography of the habitat in the area surrounding the project, the maintained/disturbed (landscaped) nature of the habitat in the area, and the project’s partial controlled access design and proposed grade-separations, it is reasonable—and somewhat conservative—to consider that an area ~100 ft from ROW lines for the widening project (R-2233A) may be *indirectly* influenced by the proposed action later in time. The bypass project (R-2233B), however, will provide access to more areas that have been previously inaccessible (NCDOT 2003b); thus, an area of ~400 ft from project ROW lines will be used to estimate indirect effects. Greater distances than 100 ft for the A-section and 400 ft for the B-section may encompass

ecosystems that are beyond the range of direct or indirect project influence as well as undevelopable slopes; these may include other topographic/geographic features, soil-types, hills, ravines, streams, residential/industrial developments, etc. Through management of invasive species and conservation of DFHL the indirect effects of the proposed project can be minimized. Sites proposed for on-site preservation will receive management to control non-native invasive species, but sites that are not proposed for on-site preservation may incur indirect effects due to invasive species. These conservation and management measures are discussed below.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered under these effects because they require separate consultation pursuant to ESA §7. This biological assessment considers future land use patterns and development as part of cumulative effects associated with the proposed project.

Overall, limited indirect and cumulative impacts are expected to occur as a result of R-2233A and R-2233B. In the case of the widening project (R-2233A), new access to property will not be created because the project only widens an existing roadway. This proposed widening may create opportunities for industrial development along the US 221 corridor in Rutherford County; however, the magnitude of induced growth as a result of the project is expected to be low to moderate (NCDOT 2005). Any anticipated development is not expected to be limited to interchanges due to roadway design (HNTB 2003a). Rutherford County's absence of growth controls and their encouragement of development provide the largest likelihood for induced development. Nevertheless, with no new access, limited water and sewer lines, and the county's recent loss of 3,000 textile and furniture jobs, there is not an abundance of opportunities for premium access-induced growth (HNTB 2003a).

Project R-2233B proposes a bypass of US 221 and downtown Rutherfordton with likely indirect and cumulative impacts. The project would provide access to previously inaccessible land, and would also provide a more efficient route for through traffic—in particular, trucks (HNTB 2003b). Both of these impacts would create opportunities for economic development in the Rutherfordton-surrounding area. When the improved access and mobility provided by TIP R-2233B and R-2233A is combined with the proximity to major urban markets and interstates, as well as the low cost of land compared to more urban counties, industrial development (specifically distribution-related) should be attracted to the US 221 corridor in Rutherford County (HNTB 2003b).

Table 2: Direct, Indirect, and Cumulative Effects to DFHL Sites

Site	Area of Site (ac)	# of DFHL	DFHL Density (#/ac)	DIRECT		INDIRECT		CUMULATIVE		TOTAL	
				Area of Direct Effects (ac)*	# DFHL Subject to Direct Effects (ac)**	Area of Indirect Effects (ac)	# DFHL Subject to Indirect Effects**	Area of Cumulative Effects (ac)	# DFHL Subject to Cumulative Effects**	SUM AREA of Direct, Indirect, Cumulative Effects (ac)	TOTAL # of DFHL Subject to Direct, Indirect, Cumulative Effects
1 (& 210a)	4.34	2326	536	0.293	50	0.475	255	0	0	0.768	305
2	0.26	119	458	0.080	37	0.217	99	0	0	0.297	136
3	0.05	133	2,660	0.020	52	0.040	106	0	0	0.060	159
4	0.42	102	243	0.000	0	0.085	21	0	0	0.085	21
5	7.11	1175	165	0.374	62	0.744	123	0	0	1.118	185
6	0.53	135	255	0.010	3	0.126	32	0	0	0.136	35
7	0.23	126	548	0.006	3	0.077	42	0	0	0.083	45
TimKen West (alts 3, 6, 74a)#	0.37	239	646	0.196	127	0.095	61	0	0	0.291	188
TimKen East	0.29	123	424	0.000	0	0.000	0	0	0	0.000	0
Total***	13.6	4,478	329	1.0	333	1.9	740	0.0	0	2.8	1,073

* Direct impacts are construction impacts associated with construction fill, excavation, mechanized clearing, and drainage.

** Based upon site's DFHL density.

*** Acreage totals have been rounded to nearest 0.1 ac.

◀ All or a portion of the site not directly impacted or indirectly or cumulatively effected by the road project is proposed for on-site conservation.

Alternates 3, 6, & 74a assume worst-case scenario of impacts; Alternate 4 would impact 0.09 acres/58 DFHL.

Based on the NCDOT's 2003 Community Impact Assessment, the magnitude of induced growth as a result of R-2233B remains low to moderate. This is because the project design is not expected to create an abundance of opportunities for premium access-induced growth. Project design plans call for two to three intersections/interchanges for a 10-mile bypass in an area that is predominately urban/suburban. This would not concentrate anticipated growth-centers to intersections, but instead allow growth along the entire project corridor (HNTB 2003b). Numerous proposed grade separations—which limit development—are being considered in the alternatives.

The four alternatives being considered for R-2233B do not differ significantly with respect to their indirect and cumulative effects on DFHL. The enhanced connectivity of Rutherfordton, Spindale, and Forest City and the emphasis on spatially-diffused industrial-/distribution-type growth is less detrimental for DFHL because the densities of DFHL are higher in the southern portion of the county and lower within these northerly municipalities. Based on this assessment, the type and degree of anticipated impacts, as well as current and projected land use and economic development, it is assumed that cumulative effects will be captured and represented within the area considered in the analysis of indirect effects—i.e. 100 ft from ROW in R-2233A and 400 ft from ROW in R-2233B; see Indirect Effects above for rationale.

Analysis of Indirect and Cumulative Effects

In the eight sites located within the project action area, under a worst-case scenario, approximately 2.84 ac and 1,073 DFHL plants are projected to incur indirect and cumulative effects from R-2233A and B. Tables 1 and 2 summarize the DFHL plant numbers, acreage, species density, indirect effects, and cumulative effects for each site. The following section provides a site-specific assessment of indirect and cumulative effects (ICE) associated with these projects.

Site 1 (& 210a) – EO# 106 – Lat/Long DMS 81°52'25"W/35°15'10"N – APPROXIMATE* NCDOT Station number (-L- Sta. 310+50 Rt.; -L- Sta. 318+00 Rt.; -Y2- Sta. 12+50 Rt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.48 ac and 255 plants of the 4.34 ac and 2326 site total. Areas of Site 1 not impacted by direct construction activities will be protected through an on-site conservation actions (additional ROW acquisition in the form of a conservation easement). Right-of-way could not be obtained on properties not contiguous to project boundaries. The NCDOT proposes to protect the DFHL on this parcel through a conservation easement. More details regarding this conservation easement are provided below (Mitigative Measures).

Site 2 – EO# 174 – Lat/Long DMS 81°51'54"W/35°14'43"N – APPROXIMATE* NCDOT Station number (-L- Sta. 275+00 Lt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.22 ac and 99 plants of the 0.26 ac and 119 site total.

Site 3 – EO# 114 – Lat/Long DMS 81°51'54"W/35°14'43"N – APPROXIMATE* NCDOT Station number (-L- Sta. 272+00 Rt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.04 ac and 106 plants of the 0.05 ac and 133 site total.

Site 4 – EO# 173 – Lat/Long DMS 81°51'12"W/35°14'25 "N – APPROXIMATE* NCDOT Station number (-L- Sta. 234+00 Rt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.09 ac and 21 of the 0.42 ac and 102 site total.

Site 5 – EO# 113 & 175 – Lat/Long DMS 81°50'25"W/35°13'9"N – APPROXIMATE* NCDOT Station number (-L- Sta. 145+00 Rt. & Lt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.74 ac and 123 plants of the 7.11 ac and 1,175 site total.

Site 6 – EO# 76 – Lat/Long DMS 81°50'30"W/35°11'28"N – APPROXIMATE* NCDOT Station number (-L- Sta. 41+00 Rt. & Lt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.13 ac and 32 plants of the 0.53 ac and 135 site total.

Site 7 – EO# 172 – Lat/Long DMS 81°50'30"W/35°11'20"N – APPROXIMATE* NCDOT Station number (-L- Sta. 31+50 Rt.)

This site lies within the action area of R-2233A. A 100-ft beyond ROW ICE buffer encompasses approximately 0.08 ac and 42 plants of the 0.23 and 126 site total.

Site 8 – EO# 107 & 122 – Lat/Long DMS 81° 55'53"W/35°19'9"N – APPROXIMATE* NCDOT Station number (unavailable until preliminary plans developed)

This site lies within the action area of R-2233B. A 400-ft beyond ROW ICE buffer encompasses approximately 0.01 ac and 61 plants of the 0.372 ac and 646 site total. If a "worse-case" scenario is assumed for direct impacts (see above) then this assessment must be assumed for ICE.

***STATION NUMBER IS A GROSS APPROXIMATION OF DFHL POPULATION LOCATION.**

MITIGATIVE MEASURES

The NCDOT is required by Section 7 of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 *et seq.*) to sequentially evaluate mitigative measures that avoid, minimize and offset impacts to DFHL as a result of project construction. These measures address impacts that fall within the construction limits.

Avoidance and Minimization

The NCDOT evaluated and implemented several avoidance and minimization measures during the design of R-2233 in order to reduce the adverse affects to DFHL. The benefits to the DFHL population from these measures were considered along with safety concerns, community impacts, and engineering and construction costs. These measures include the following:

- Implemented 2:1 and 1.5:1 slope stake limits at sites adjacent to DFHL (sites 1, 2, 3, 5, 6, and 7). Rock plating will be used where relevant to further stabilize slopes. The revised slope (from the conventional 3:1 - 4:1 slope) decreases the amount of area being impacted by fill and construction activities.
- “Wing walls” will be used at sites 5, 6, and 7. These features reduce the footprint/impact of pipes and culverts and associated fill that would destroy adjacent DFHL.
- ROW and slope stake limits adjusted at sites 2 and 6 to avoid direct impacts and reduce spread of invasive species on DFHL populations.
- Property owners adjacent to Site 1 were approached about establishment of conservation easement for DFHL; one property owner responded positively, the others did not respond.
- Typical mechanized-clearing limits are 10-ft, limits will be adjusted at site 2 and 1 (210a).
- Usage of NCDOT’s Native Seed Mix where feasible.
- Prior to Let of R-2233B, appropriate habitat within the finalized ROW corridor will be re-surveyed for DFHL and other Federally-listed Threatened and Endangered species.
- Where feasible, DFHL within project ROW limits that would otherwise be destroyed, will be transplanted to a special area within a conservation easement; details of transplantation are below.

Measures to Offset DFHL Impacts

On-Site Measures to Offset DFHL Impacts

The NCDOT is conducting on-site conservation measures to offset the project’s impacts to DFHL by obtaining, via monetary settlements, additional ROW adjacent to DFHL Site 1 in the form of a conservation easement. The property owner (Robert Tate) retains ownership of the parcel but NCDOT acquires development rights. It is relevant

to make the distinction that in some cases—namely, the purchase of a “conservation *area*”—NCDOT obtains ownership of a property thus must identify a third-party organization whom to transfer ownership and management once NCDOT’s obligations have been met. In this case—again, the purchase of a “conservation *easement*”—NCDOT is not obligated to transfer ownership.

The Tate conservation easement, if obtained, would preserve in perpetuity the majority of the habitat and plants at this site; ~ 8 acre of DFHL habitat containing an estimated 2,350 plants (Figure D-1). The NCDOT can only obtain additional ROW for on-site preservation sites on those properties where ROW is already being taken for the construction of the road project itself. In order for a DFHL site to be considered as on-site preservation, it must adjoin (be contiguous to) the proposed ROW. A ROW property with DFHL that does not cross proposed ROW cannot be obtained via ROW settlements or condemnation.

Dwarf-flowered heartleaf sites that are not contained within existing ROW or future proposed ROW are eligible to be purchased and preserved as conservation easements. Property owners on the north side of the creek adjacent to Site 1 were contacted by NCDOT about establishment of a conservation easement, however, no response was received. Consequently, ROW on the north-eastern portion of Site 1 cannot be obtained through settlements or condemnation. Nevertheless, the ~ 8 ac Tate conservation easement at Site 1 encompasses the highest density of DFHL at this site, and, what is considered the highest quality DFHL habitat within the project corridor. Furthermore, the property owner has expressed great interest in the development of this conservation easement and is working with NCDOT to this end. It must be mentioned, however, as with any conservation easement, there is never a guarantee that the plans will be executed as desired.

If able to acquire the Tate easement, NCDOT will not only eliminate potential development at this site, but preserve the DFHL and habitat located here in perpetuity. As a result of the rapid progress being made with acquisition of the Tate easement, a conservation and monitoring plan has not been finalized. It will be based on the plan developed for the Broad River Tract which is currently pending approval from the NC Attorney General’s Office. Briefly, the Broad River Tract in Cleveland County, NC is a ~1000 acre conservation area for DFHL. Because the Broad River Tract is a conservation *area*, the Tate conservation *easement* plan will appropriately reflect differences in conservation and monitoring methodologies and timelines. Management of the Tate conservation easement will be performed by NCDOT and/or NCDOT representatives. A conservation committee composed of individuals from relevant agencies and/or organizations will be established to ensure consistent and continued monitoring of the easement. The details of the conservation plan will be included in a separate document approved by USFWS, NCDOT, and any other relevant parties.

As an additional conservation measure, those DFHL within project ROW limits will be transplanted to the Tate easement in a manner similar to that performed for B-2937 (Little Gunpowder Creek; LGC). Briefly, in November 2000, 175 individuals of

DFHL were relocated from the ROW of a NCDOT bridge construction site at LGC to an adjacent conservation easement. Results from the LGC transplant are encouraging with 68% of the transplanted individuals surviving as of April 2002, despite drought conditions (Murrell et al. 2007). Potentially, this action would further preserve an additional ~330 individual plants, provide additional data to support feasibility and efficacy of *Hexastylis* transplantation efforts, and enhance our understanding of DFHL biology and habitat requirements. Transplantation methodology will be based on that developed by Newberry (1996) and Murrell et al. (2007) including efforts to minimize contamination and post-transplant monitoring. Monitoring methodology and reporting requirements will be incorporated into the conservation plan currently being developed. Care will be taken to identify and keep separated those plants from other sites, such that clusters of transplanted individuals will be planted within appropriate habitat but some distance from those individuals considered residents of the Tate easement.

As part of Avoidance and Minimization measures, NCDOT agrees to re-survey the finalized ROW corridor of R-2233B prior to Let to obtain a final number of expected DFHL impacts of this section of the project. Also, NCDOT will re-evaluate and re-survey the finalized R-2233B ROW corridor for the presence of other Federally-listed Threatened & Endangered species and habitat. This measure will help ensure that no populations of DFHL, or other T&E species, have been discovered or spread within the ROW chosen for the project.

An evaluation of any additional DFHL, or other T&E species, anticipated to incur direct, indirect, and cumulative effects as a result of R-2233B will be performed. NCDOT will provide a memorandum to USFWS and the lead federal agency (US Army Corps of Engineers) with the updated values and analysis. If more DFHL are found within the R-2233B ROW limits, an assessment will be made as to the implications of the discovery. The Tate conservation easement may accommodate additional DFHL found within the "B-section" of the project; however, the assessment will be based on the final number of DFHL impacted in R-2233A, the number and habitat quality of DFHL at the Tate conservation easement, current species status, and any other available relevant information. NCDOT and USFWS will re-initiate consultation as necessary if a significant number of additional DFHL, or other T&E species, are discovered within the finalized ROW corridor limits.

Conclusion

The NCDOT acknowledges that the proposed Rutherfordton Bypass will incur direct, indirect, and cumulative effects to DFHL. Eight previously undocumented DFHL sites were identified within the project area as a result of the surveys performed for this BA. In total, eight DFHL sites were identified within or adjacent to the project action area. The eight sites contain approximately 4,478 DFHL plants over approximately 13.6 ac of DFHL habitat with an average density of 329 plants per acre. Approximately 0.98 ac of DFHL habitat and 333 DFHL plants (7.2 % of the population within the action area) fall within the project's direct construction limits (*i.e.*, directly affected). Another 1.86 ac of DFHL habitat and 740 plants (16.5 % of the population within the action area) may

incur indirect and cumulative effects associated with the proposed projects. Direct effects combined with indirect and cumulative effects are estimated to be 2.84 ac of habitat and 1,073 plants (23.9 % of the population within the action area).

In order to offset impacts to DFHL habitat and plants, NCDOT will attempt to conserve/manage a large section of the highest quality site (Site 1) through an on-site conservation easement. This conservation easement is adjacent to the proposed road project and, if obtained, will preserve in perpetuity approximately 8 ac of DFHL habitat containing an estimated 2,350 DFHL plants (52.5 % of the population within the action area). This would provide an additional 2017 DFHL unaffected by direct effects of this proposed project. Plants within NCDOT ROW that are expected to incur adverse impacts will be transplanted to the Tate conservation easement. Potentially, this would preserve an additional ~330 plants. As the exact number of transplanted individuals is not known, they are not being considered in the provided calculations. Prior to Let of R-2233B, NCDOT will re-survey the finalized ROW corridor limits for known locations of, and appropriate habitat for, DFHL and other Federally-listed Threatened and Endangered (T&E) species for Rutherford County. The Tate conservation easement may accommodate additional DFHL associated with the "B-section" of this project; however, if a significant number of DFHL, or other T&E species, are discovered, NCDOT and USFWS will re-initiate ESA consultation, as necessary.

BIOLOGICAL CONCLUSION: MAY AFFECT, LIKELY TO ADVERSLY AFFECT

ADDITIONAL SPECIES

Indiana bat (Myotis sodalis)

Survey window: May-15 through August 15; January 15-February 15 (winter)

The range of the Indiana bat centers on cavernous limestone regions in the eastern United States. The Indiana bat has different summer and winter habitat requirements. Winter habitat is in caves and abandoned mines that usually have standing water on the floor. The bats migrate to the winter habitat between September and November and stay there with occasional periods of activity until they emerge in mid-March to early May. Hibernation only occurs in regions where winter temperatures are stable and are around 40 degrees Fahrenheit.

Little is known of the summer habitat of the Indiana bat, although it is thought that they disperse throughout their range and spend the summer foraging alone over streams or along forest margins. They have been found under loose bark on dead and living trees along small to medium-sized streams. Optimum foraging is over streams with mature riparian vegetation overhanging the water by more than nine feet. Streams that have been stripped of their riparian vegetation do not appear to offer suitable foraging habitat. Rivers as foraging areas and as migration routes are extremely important to this species.

According to the USFWS recovery plan, the most significant threats to this species include 1) the present or threatened destruction, modification, or curtailment of its habitat or range, including hibernation, roosting, and foraging habitat, 2) overutilization for commercial, recreational, scientific, or educational purposes, 3) disease or predation, 4) the inadequacy of existing regulatory mechanisms, and 5) other natural or manmade factors affecting its continued existence, such as climate change, collision with man-made objects, and environmental contaminants.

BIOLOGICAL CONCLUSION: May Affect, Not Likely to Adversely Affect

Analyses of the potential presence of, and impacts to, Indiana Bat were conducted as an evaluation of existing information, assessment by the primary investigators of the habitat requirements, and occurrence of this species in North Carolina. The NC Natural Heritage Program (NCNHP) elemental occurrence database records (30 June 2008) were consulted. The closest non-historical record of a hibernacula is a small colony (28 individuals) discovered in 1999 in the Cheoah Ranger District of the Nantahala National Forest in Graham County (EO ID 15740 EO# - 5; USFWS 1999). This location is more than 100 miles (162 km) northwest of the study area. No hibernacula for Indiana bat are present within the project study area, however appropriate roosting habitat is present. No known occurrence (roosting or hibernacula) of Indiana bat has been reported in the vicinity of the project (>100 miles).

Approximately 20 person-hours were spent searching for habitat and/or individuals of this species in 2008. NCDOT biologists located and assessed area mines and bridges for potential bat activity; surveys for bat-viable trees were conducted, as well. Of these potential habitat locations, two bridges proposed for replacement were observed to be heavily used by bats. Both of these bridges occur within the R-2233A(ab) project area; one bridge is US 221 over CSX railroad track, the other US 221 over Floyd's Creek. Initial visual inspections of both bridge understructures revealed evidence of bat usage. A bat detector equipped with ANABAT software (Titley electronics, Australia) was deployed (28 May 2008) by NCDOT biologists to capture and record nocturnal activity (i.e. vocalizations/calls) at the CSX railroad bridge. Heavy rain and subsequent high flow conditions made survey at the bridge over Floyd's creek not feasible. Numerous bats were observed to be foraging/roosting in and around this structure. Post-analysis of the bat calls using ANALOOK (AnaLookW version 3.3q 2006) software was performed to identify the particular species at this bridge. The data were analyzed independently by NCDOT biologists and Chris Corben; a leading authority on bat biology and co-developer of ANABAT/ANALOOK (personal communication 02 June 2008). Both analyses concluded that several species were present at the bridges on the night of the survey. They were identified as *Myotis* species (*Myotis sp.*), Big brown bats (*Eptesicus fuscus*), Red bats (*Lasiurus borealis*) and Eastern pipistrelles (*Pipistrellus subflavus*). *Myotis sp.* and Big brown bats are known to utilize bridges for day, night, and/or resting roosts between foraging periods. Within the *Myotis* genus, the Indiana bat (*Myotis sodalis*) and the Eastern small-footed bat (*Myotis leibii*; Federal Species of Concern) are known to utilize bridges in this manner and both species are known to occur in Rutherford County. Positive identification of the recorded calls, however, cannot be performed without confirmation via netting.

Due to the presence of appropriate roosting habitat but the absence of hibernacula, the proposed project may affect but is not likely to adversely affect the Indiana bat.

Small whorled pogonia (*Isotria medeoloides*)

USFWS optimal survey window: mid May-early July

Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. It does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods classified as Montane Oak-Hickory Forest, Acidic Cove Forest, Rich Cove Forest, or Mesic Mixed Hardwood Forest (Piedmont Subtype), and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The understory structure and composition of

occupied sites varies from dense rhododendron thickets, to open/sparse/moderate shrub and herbaceous cover in the orchid's microhabitat, to dense stands of New York fern. Other common characteristics shared by small whorled pogonia sites include historic agricultural use of existing habitat; a proximity to logging roads, streams, or other features that create long persisting breaks in the forest canopy; and a prevalence of leaf litter and decaying vegetation.

BIOLOGICAL CONCLUSION: May Affect, Not Likely to Adversely Affect

Analyses of the potential presence of, and impacts to, small whorled pogonia were conducted as an evaluation of existing information, assessment by the primary investigators of the habitat requirements, and occurrence of this species in North Carolina. The NC Natural Heritage Program (NCNHP) elemental occurrence database records (30 June 2008) were consulted. The closest known occurrence (EO # 15; EO ID: 4327) is in western Rutherford Co. approximately 16.5 miles from the project study area. Approximately 16 person-hours were spent searching for this species and its habitat in 2008. Field surveys were conducted during late April through mid May 2003 and April through May 2008, which covered a portion of the appropriate flowering time for this species. Appropriate habitat for this species was found in several areas within the study area; however no individuals of this species were located. No known recent occurrence of small whorled pogonia has been reported by the NCNHP in the project vicinity. Due to the presence of appropriate habitat, but no occurrence of the species within the project area, it is unlikely that the proposed project will affect this federally threatened species.

White Irisette (*Sisyrinchium dichotomum*)

USFWS optimal survey window: late May-July

White irisette, endemic to the upper Piedmont of North and South Carolina, is generally found on the southeast to southwest aspect of mid-elevation mountain slopes in thin-canopied, dry-mesic Basic Oak Hickory Forests that are mature, successional, or recently logged. Occurrences are also found in open, disturbed sites such as clearings, woodland edges, roadside embankments/rights-of-way, and power line rights-of-way. Known populations occur at elevations between 1,312 and 3,280 feet above mean sea level on gentle to very steep slopes. The perennial herb prefers rich, basic soils, probably weathered from amphibolite, which are intermittently saturated with rain but well drained. The species occurs in a variety of soils, including the Ashe-Cleveland association; the Evard-Cowee complex; and Brevard, Cowee, Fannin, Greenlee, and Hayesville series. It may grow on sites where down slope runoff has removed the usual deep litter, humus, or mineral soil layers. Partial shade to direct sun is preferred, and some form of disturbance (e.g., mowing, clearing, grazing, periodic fire) is necessary to maintain its relatively open habitat.

BIOLOGICAL CONCLUSION: No Effect

Analyses of the potential presence of, and impacts to, white irisette were conducted as an evaluation of existing information, assessment by the primary investigators of the habitat requirements, and occurrence of this species in North Carolina. The NC Natural Heritage Program (NCNHP) elemental occurrence database records (30 June 2008) were consulted. The closest known occurrence (EO ID – 20552; EO # 30) is approximately six miles away from the northern-most edge of the B-section of the project. Other occurrences within Rutherford County are in the South Mountains area in the northern portion of the state. No habitat for this species is located within the study area as no basic soils are present. No known recent occurrence of white irisette has been reported by the NCNHP in the project vicinity. The proposed project will have no effect on this federally endangered species.

Rock gnome lichen (*Gymnoderma lineare*)

USFWS optimal survey window: year round

Rock gnome lichen, recorded in High Elevation Rocky Summit, High Elevation Granitic Dome, and Spray Cliff natural communities, occurs in high elevation coniferous forests (particularly those dominated by red spruce and Fraser fir) usually on rocky outcrop or cliff habitats. This squamulose lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet mean sea level where there is often fog, or on boulders and large outcrops in deep river gorges at lower elevations. Habitat is primarily limited to vertical rock faces where seepage water from forest soils above flows only at very wet times. The species requires a moderate amount of sunlight, but cannot tolerate high-intensity solar radiation. The lichen does well on moist, generally open sites with northern exposures, but requires at least partial canopy coverage on southern or western aspects because of its intolerance to high solar radiation. The rock mosses *Andreaea* and *Grimmia* are common associate species in the vertical intermittent seeps.

BIOLOGICAL CONCLUSION: No Effect

Analyses of the potential presence of, and impacts to, rock-gnome lichen were conducted as an evaluation of existing information, assessment by the primary investigators of the habitat requirements, and occurrence of this species in North Carolina. The NC Natural Heritage Program (NCNHP) elemental occurrence database records (30 June 2008) were consulted. Suitable habitat is not present within the study area for the rock-gnome lichen. Elevations within the study area only reach a maximum of 1,100 feet (330 m), which does not provide suitable environmental conditions for this species. No known occurrence of rock-gnome lichen has been reported by the NCNHP within the project vicinity. The proposed project will have No Effect on this federally endangered species.

REFERENCES

- Anderson, S.J., R. Harrison, M.A. Euritt, H.S. Mahmassani, C.M. Walton and R. Helaakoski. 1992. Economic Impacts of Highway Bypasses. Research report 1247-3F conducted for the Texas Department of Transportation in cooperation with the U.S. Department of Transportation, FHWA.
- Blomquist, H.L. 1957. A revision of *Hexastylis* of North America. *Brittonia* 8:255-281.
- Eagle, D. and Y.J. Stephanedes. 1987. Dynamic Highway Impacts on Economic Development. In *Transportation Research Record 1116: Transportation Economics: Issues and Impacts*. TRB National Research Council. Washington, DC.
- Forkenbrock, D.J. 1990. Putting Transportation and Economic Development into Perspective. In *Transportation Research Record 1274: Transportation and Economic Development 1990*. TRB National Research Council. Washington, DC.
- Forman, R.T.T. and R.D. Deblinger, 1998. The ecological road-effect zone for transportation planning and a Massachusetts highway example. In Evink G.L., P. Garrett, D. Zeigler and J. Berry, Eds. 1998. *Proceedings of the International Conference on Wildlife Ecology and Transportation*. FL-ER-69-98, Florida Department of Transportation, Tallahassee, Florida. 263 pp.
- Gaddy, L.L. 1987. A Review of the Taxonomy and Biogeography of *Hexastylis* (Arisolochiaceae). *Castanea* 52(3):186-196.
- Gaddy, L.L. 1981. The Status of *Hexastylis naniflora* Blomquist in North Carolina. Report prepared for U.S. Fish and Wildlife Service, Contract No. 14-16-0004-79-103. 34pp.
- HNTB. 2003a. Draft Community Impact Assessment, Widening of US 221 From the South Carolina State Line to US 74; TIP R-2233A, Rutherford County, NC.
- HNTB. 2003b. Community Impact Assessment, US 221 Bypass From US 74 to SR 1367; TIP R-2233B, Rutherford County, NC.
- Murrell, Z. E., J. E. Padgett, E. L. Gillespie, and F. Williams. 2007. Ecological, morphological, micromorphological and molecular analyses of the species in the *Hexastylis heterophylla* Complex. NCDOT & CTE, Report No. FHWA/NC2004-01. Raleigh, NC.
- Newberry, G. 1996. Technical and Agency Draft Recovery Plan for Dwarf-flowered Heartleaf (*Hexastylis naniflora*) Blomquist. U. S. Fish and Wildlife Service, Region 8, Atlanta, GA.

- North Carolina Department of Transportation (NCDOT). 2003. Final Natural Resources Technical Report. (R-2233A).
- North Carolina Department of Transportation (NCDOT). 2004. Final Natural Resources Technical Report. (R-2233B).
- North Carolina Department of Transportation (NCDOT). 2005. State Environmental Assessment (R-2233A).
- North Carolina Department of Transportation (NCDOT). 2006. State Finding of No Significant Impact (R-2233A FONSI).
- North Carolina Natural Heritage Program (NCNHP). 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.
- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: 18 February 2008).
- Padgett, James Edward. 2004. Biogeographical, Ecological, Morphological, and Micromorphological Analyses of the Species in the *Hexastylis heterophylla* Complex. Master's Thesis. Appalachian State University, Boone, NC. 124 pp.
- Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh (DENR), NC. 325 pp.
- United States Fish and Wildlife Service (USFWS). Indiana bat in North Carolina. <http://www.fws.gov/nc-es/mammal/indianabat.html>. (Accessed: 18 February 2008).
- United States Fish and Wildlife Service (USFWS). Rock Gnome Lichen in North Carolina. <http://www.fws.gov/nc-es/plant/rglichen.html> (Accessed: 17 January 2008).
- United States Fish and Wildlife Service (USFWS). Small Whorled Pogonia in North Carolina. <http://www.fws.gov/nc-es/plant/swpogonia.html> (Accessed: 17 January 2008).
- United States Fish and Wildlife Service (USFWS). White Irisette in North Carolina. <http://www.fws.gov/nc-es/plant/whiteiris.html> (Accessed: 18 January 2008).
- United States Fish and Wildlife Service (USFWS). 1989. Endangered and Threatened Wildlife and Plants; Threatened Status of *Hexastylis naniflora* (Dwarf-flowered heartleaf). 54 FR 14964-14967.

- United States Fish and Wildlife Service (USFWS). 14 April 1989. Endangered and Threatened wildlife and plants; Threatened Status of *Hexastylis naniflora* (Dwarf-flowered Heartleaf). Final Rule. Presented in the Federal Register, Volume 54, Number 71.
- United States Fish and Wildlife Service (USFWS). 1992. Small Whorled Pogonia (*Isotria Medeoloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75 pp.
- United States Fish and Wildlife Service (USFWS). 1995. White Irisette Recovery Plan. Atlanta, GA. 22 pp.
- United States Fish and Wildlife Service (USFWS). 7 March 1997. Notification of Status Review for *Hexastylis naniflora* (dwarf-flowered heartleaf). 3 pp.
- United States Fish and Wildlife Service (USFWS). 1997. Recovery Plan for Rock Gnome Lichen (*Gymnoderma lineare*) (Evans) Yoshimura and Sharp. Atlanta, GA. 30 pp.
- United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). March 1998. Final Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences. US Government Printing Office, Washington, D.C.
- United States Fish and Wildlife Service (USFWS). 2005. The Indiana Bat in Western North Carolina: A Status Summary Update-April 2005. <http://www.fws.gov/nc-es/mammal/Aprilbat.pdf>. (Accessed: 18 February 2008).
- United States Fish and Wildlife Service (USFWS). 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html (Accessed: 18 February 2008).
- United States Fish and Wildlife Service (USFWS). 2007. Dwarf-flowered heartleaf (*Hexastylis Naniflora*) 5-Year Review: Summary and Evaluation, DRAFT. Asheville, NC. 51 pp.

APPENDIX A: Project Vicinity Map

Figure A-1: Project vicinity map

APPENDIX B: DFHL Site Information and Locations

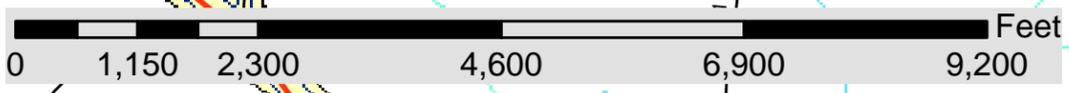
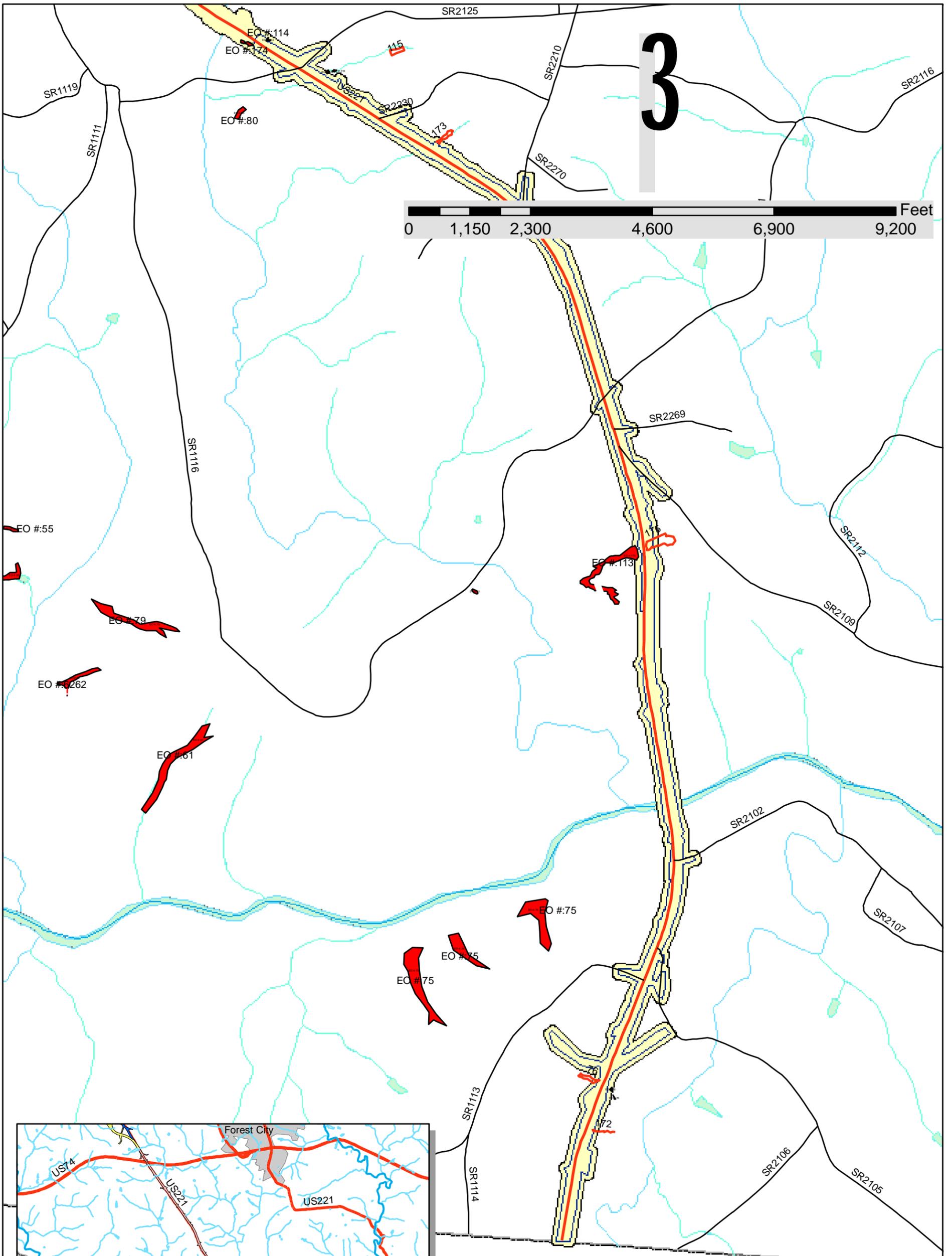
Figure B-1aa – Section A (aa) – Project with 100 ft buffer

Figure B-1ab – Section A (ab) – Project with 100 ft buffer

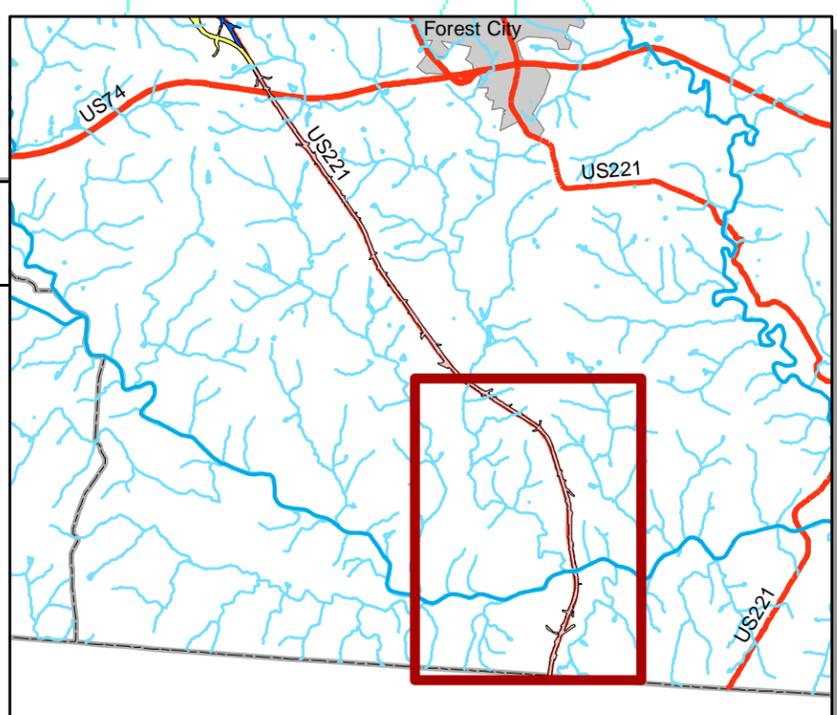
Figure B-1ba – Section B (ba) – Project Alternates with 400 ft buffer

Figure B-1bb – Section B (bb) – Project Alternates with 400 ft buffer

Figure B-2; Section B: DFHL – Site 8

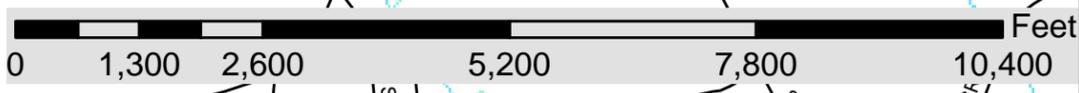
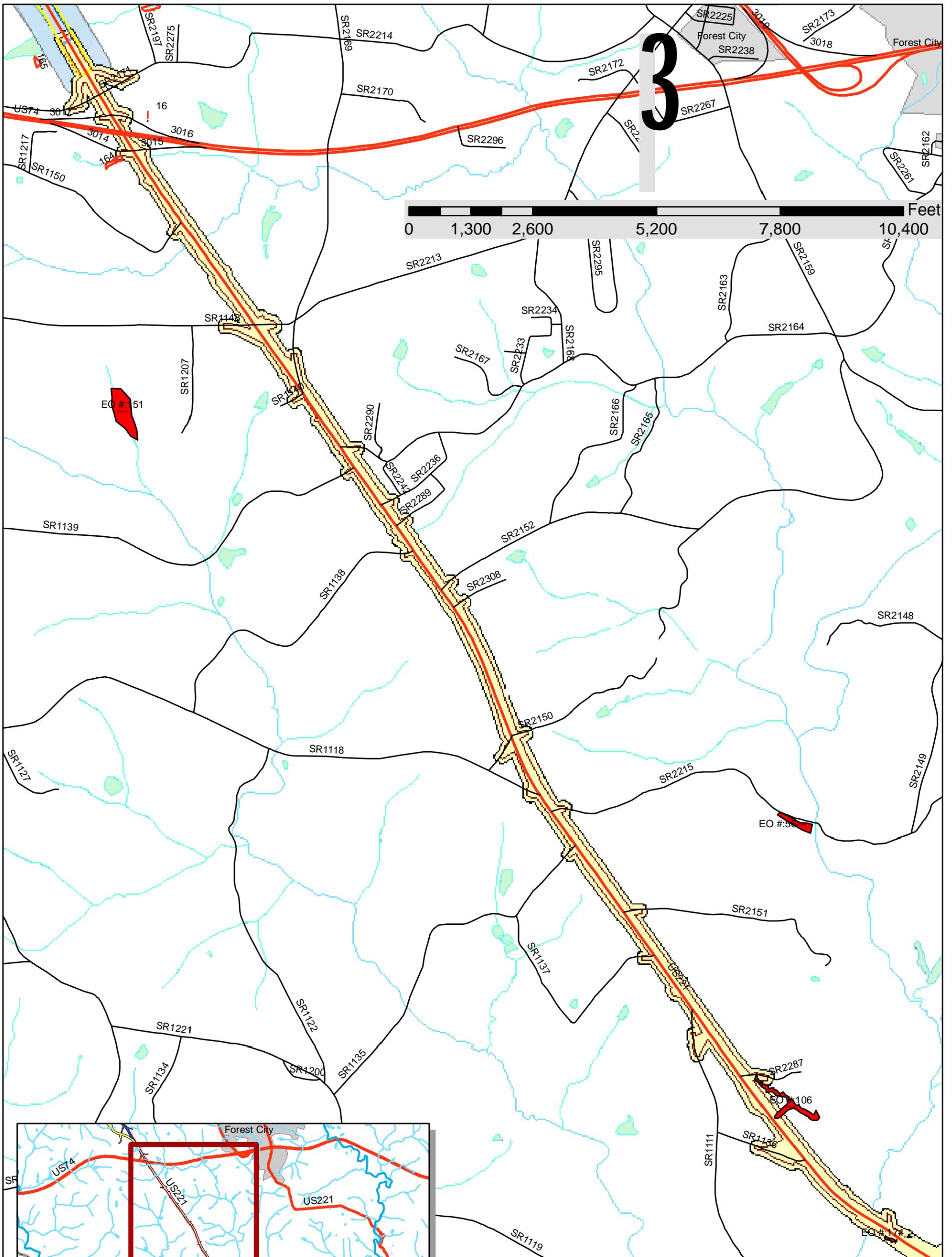


3

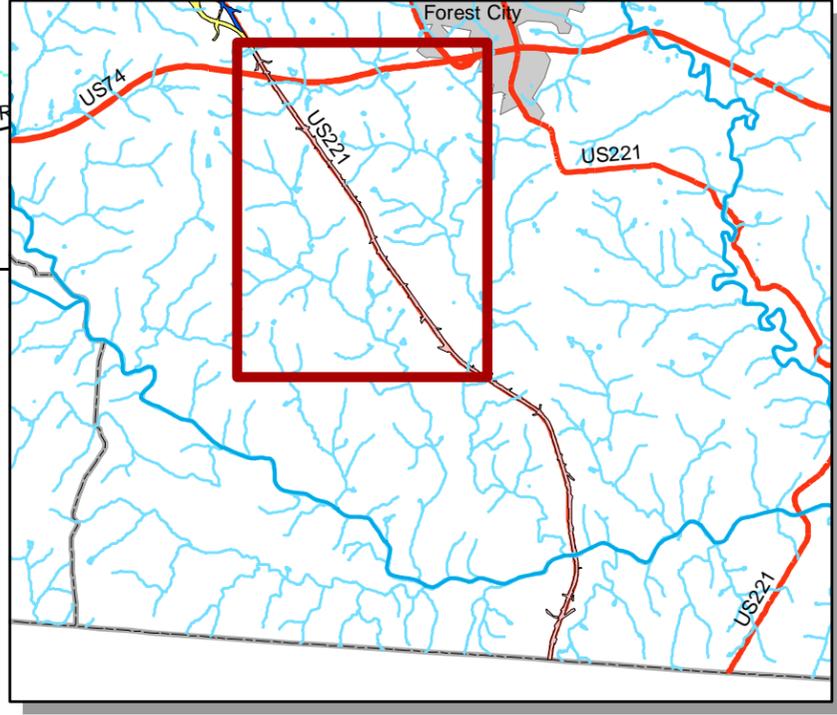


	<p>North Carolina Department of Transportation</p>
	<p>T.I.P. No. R-2233 A & B US 221 Widening & Rutherfordton Bypass</p>
	<p>Section A (aa): Project with 100 ft Buffer</p>

- Legend**
- DFHL
 - ROW_aa
 - R2233A_ROW_Buffer100ft

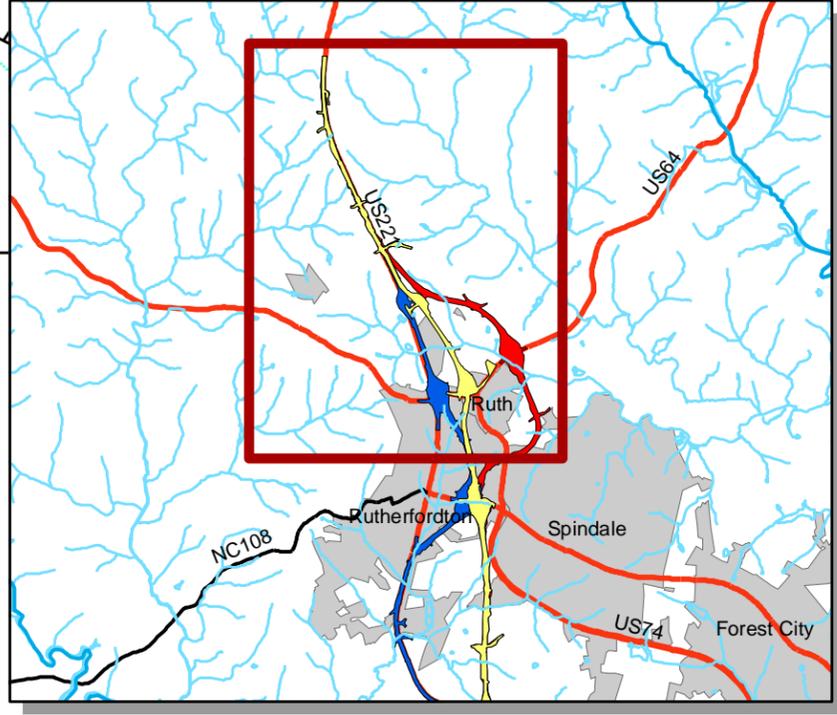
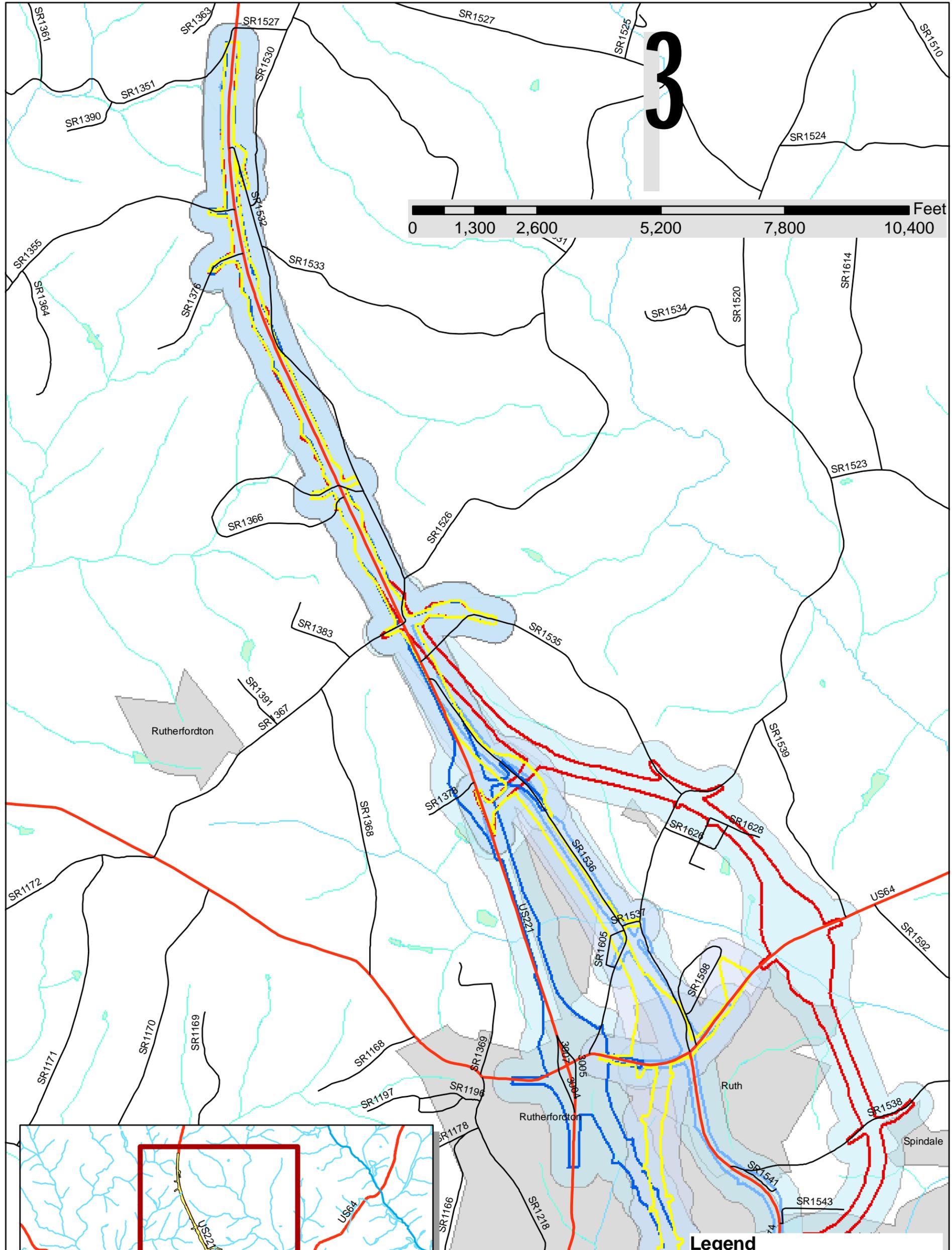
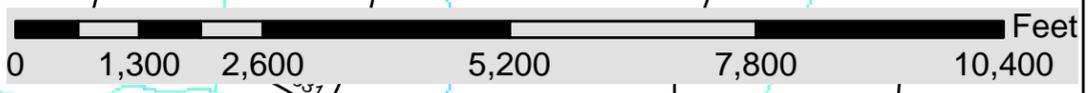


3




 North Carolina Department of Transportation
 T.I.P. No. R-2233 A & B
 US 221 Widening & Rutherfordton Bypass
Section A (ab):
Project with 100 ft Buffer

Legend
 DFHL
 ROW_ab
 R2233A_ROW_Buffer100ft



 North Carolina Department of Transportation

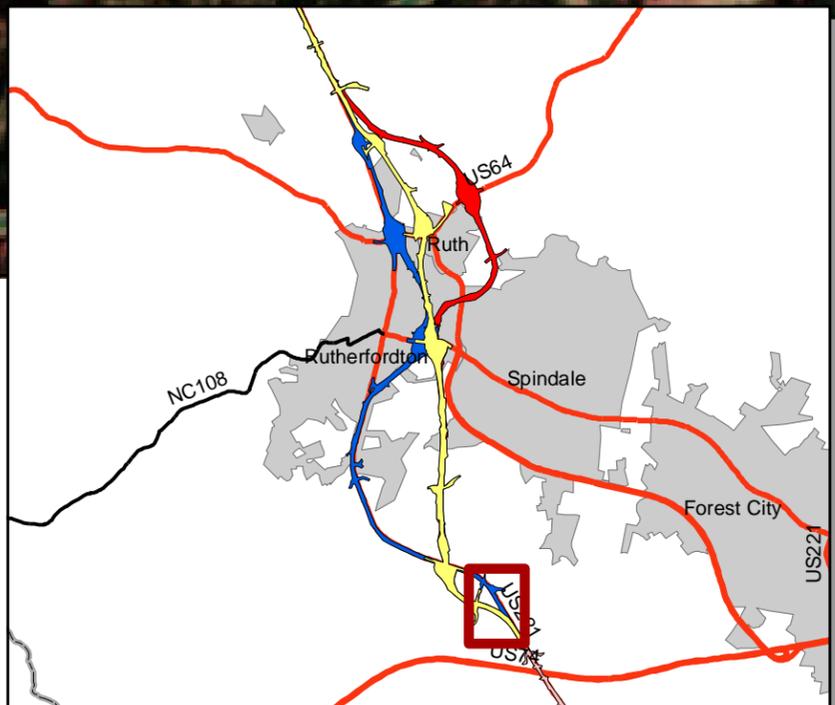
T.I.P. No. R-2233 A & B
US 221 Widening & Rutherfordon Bypass

**Section B (bb):
Project Alts w/ 400 ft Buffer**

Legend	
	DFHL
	R2233B_ROW_Alt74a
	R2233B_ROW_Alt6
	R2233B_ROW_Alt4
	R2233B_ROW_Alt3
	R2233B_ROW_Alt74a_Buffer400ft
	R2233B_ROW_Alt6_Buffer400ft
	R2233B_ROW_Alt4_Buffer400ft
	R2233B_ROW_Alt3y_Buffer400ft



EO #:122
DFHL - SITE 8
EO #:107



 North Carolina Department of Transportation

T.I.P. No. R-2233 A & B
US 221 Widening & Rutherfordton Bypass

Section B:
DFHL - Site 8

- Legend**
- DFHL
 - R2233B_ROW_Alt3
 - R2233B_ROW_Alt4
 - R2233B_ROW_Alt6
 - R2233B_ROW_Alt74a

APPENDIX C: Project Effects on DFHL

Project design plans (as scanned) in areas adjacent to DFHL:

Figure C-1: DFHL – Site 1

Figure C-2: DFHL – Site 1

Figure C-3: DFHL – Site 2 and 3

Figure C-4: DFHL – Site 3

Figure C-5: DFHL – Site 4

Figure C-6: DFHL – Site 5

Figure C-7: DFHL – Site 6

Figure C-8: DFHL – Site 6

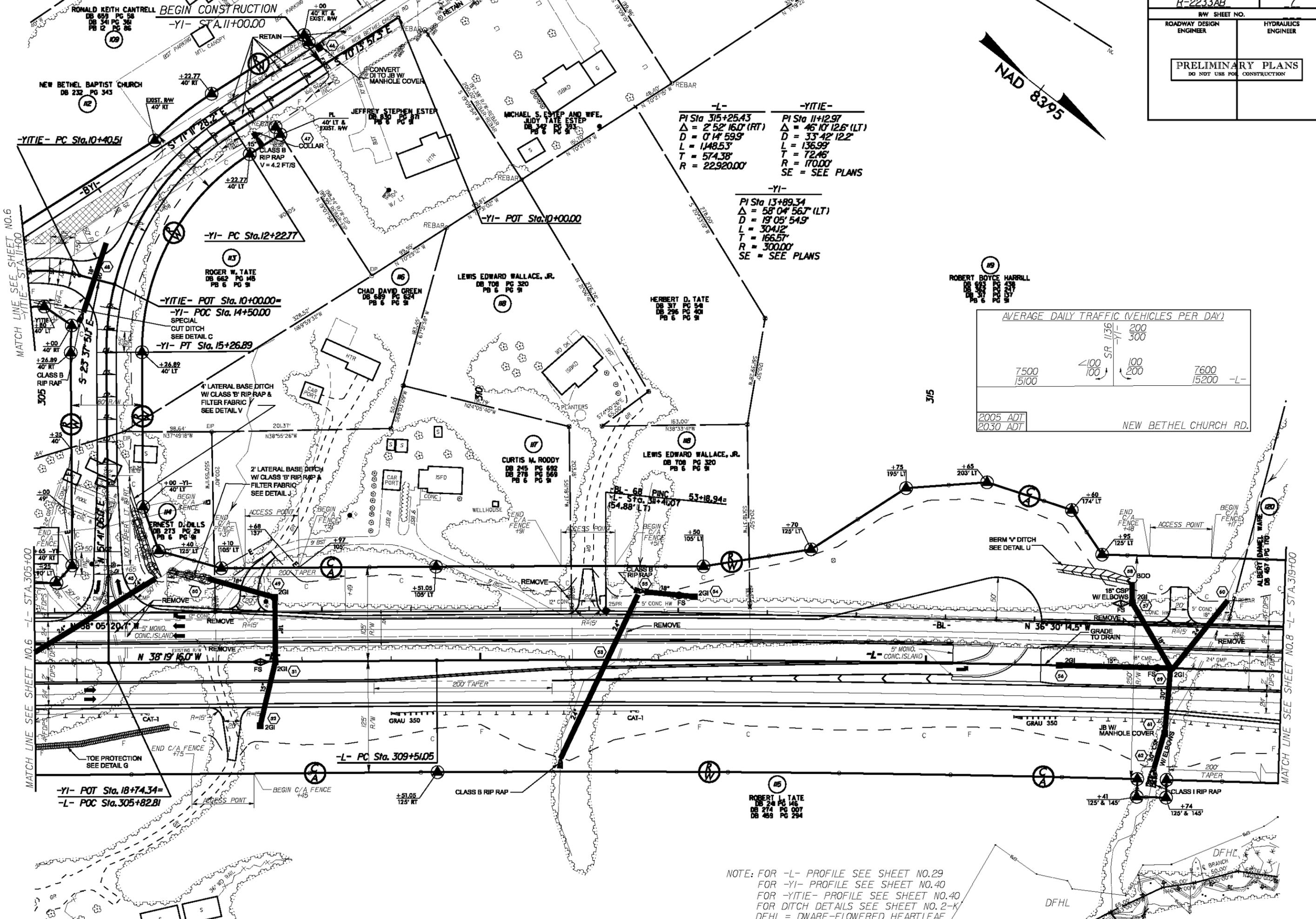
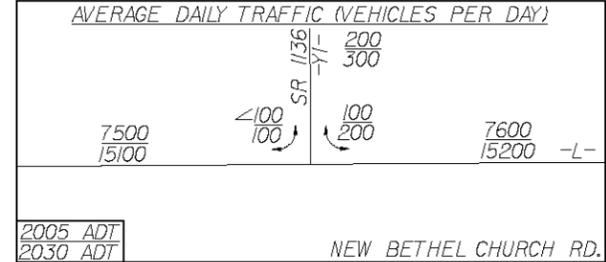
Figure C-9: DFHL – Site 7



-L-
 PI Sta 315+25.43
 $\Delta = 2^\circ 52' 16.0''$ (RT)
 $D = 0' 14' 59.9''$
 $L = 148.53'$
 $T = 574.38'$
 $R = 22920.00'$

-YITIE-
 PI Sta 11+12.97
 $\Delta = 46^\circ 10' 12.6''$ (LT)
 $D = 33^\circ 42' 12.2''$
 $L = 136.99'$
 $T = 72.46'$
 $R = 170.00'$
 SE = SEE PLANS

-YI-
 PI Sta 13+89.34
 $\Delta = 58^\circ 04' 56.7''$ (LT)
 $D = 19^\circ 05' 54.9''$
 $L = 304.12'$
 $T = 166.57'$
 $R = 300.00'$
 SE = SEE PLANS



NOTE: FOR -L- PROFILE SEE SHEET NO.29
 FOR -YI- PROFILE SEE SHEET NO.40
 FOR -YITIE- PROFILE SEE SHEET NO.40
 FOR DITCH DETAILS SEE SHEET NO.2-K
 DFHL = DWARF-FLOWERED HEARTLEAF

NOTE:
 PROVIDE ROCK PLATING AT THE FOLLOWING STATIONS:
 STA. 321+75 TO 325+75 -L- RT
 STA. 11+25 TO 12+75 -Y2- LT
 STA. 12+75 TO 13+25 -Y2- RT
 SEE DETAIL ON SHEET 2-M

AVERAGE DAILY TRAFFIC (VEHICLES PER DAY)	
7600 15200	7700 15300
<100 100	100 300
SR 2287 -Y2-	100 300

2005 ADT
2030 ADT

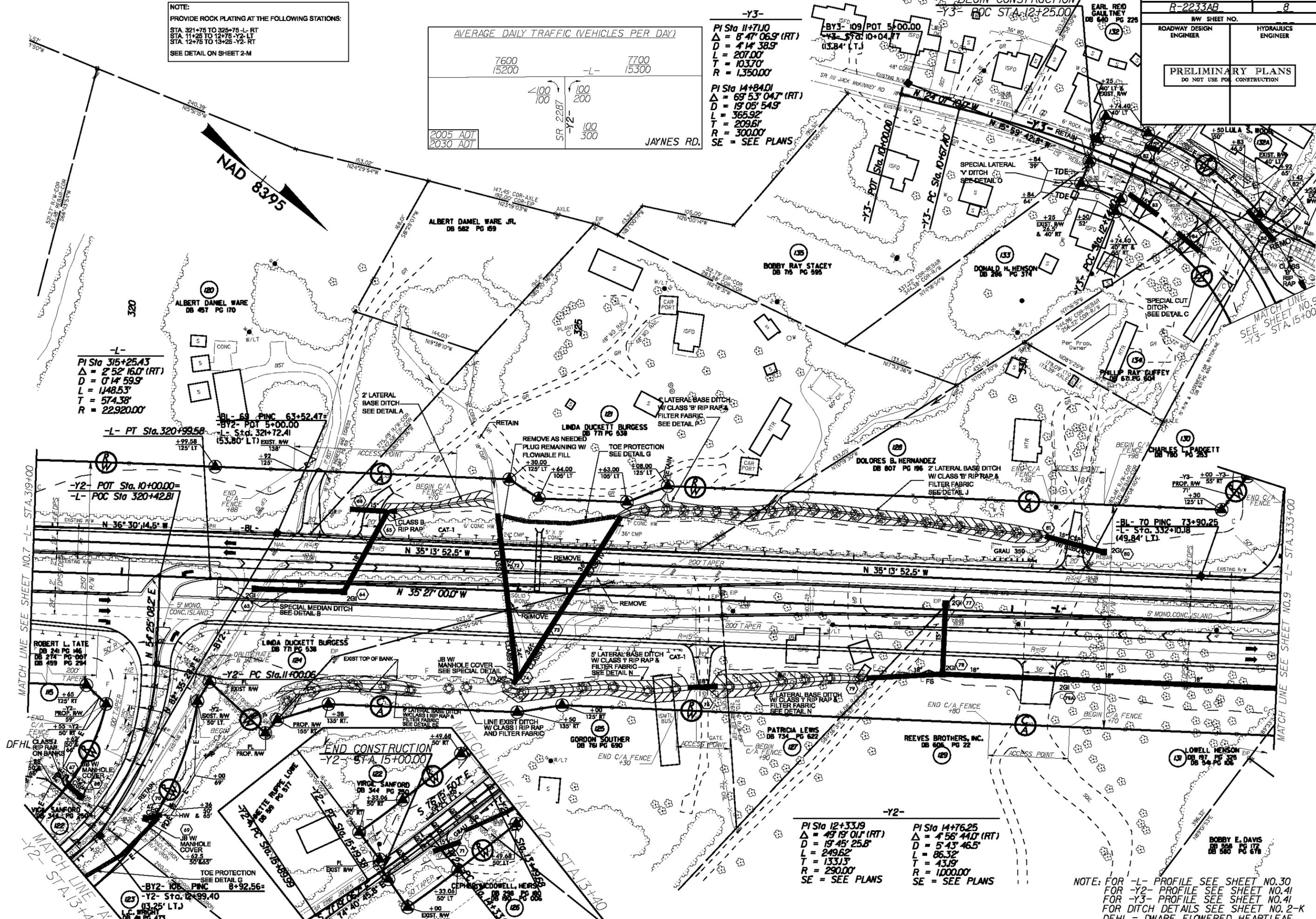
JAYNES RD.

-Y3-
 PI Sta 11+71.0
 $\Delta = 6' 47'' 06.9''$ (RT)
 $D = 4' 14'' 38.9''$
 $L = 207.00'$
 $T = 103.70'$
 $R = 1,350.00'$
 PI Sta 14+84.0
 $\Delta = 69' 53'' 04.7''$ (RT)
 $D = 19' 05'' 54.9''$
 $L = 365.92'$
 $T = 209.61'$
 $R = 300.00'$
 SE = SEE PLANS

BEGIN CONSTRUCTION
 -Y3- POC STA. 12+25.00

PROJECT REFERENCE NO. R-2233AB	SHEET NO. 8
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION



-L-
 PI Sta 315+25.43
 $\Delta = 2' 52'' 16.0''$ (RT)
 $D = 0' 14'' 59.9''$
 $L = 1148.53'$
 $T = 574.38'$
 $R = 22920.00'$

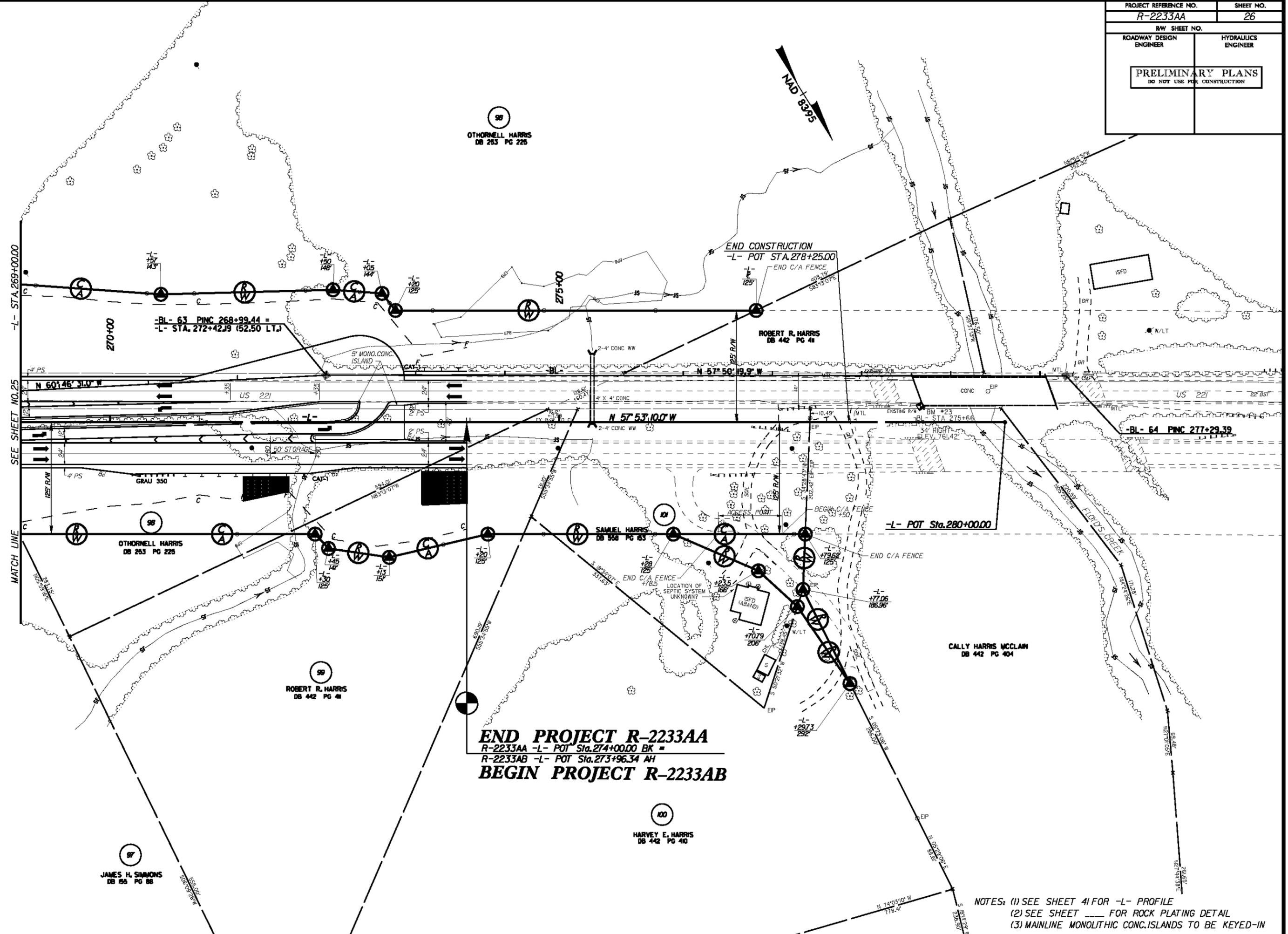
-Y2- POT Sta. 10+00.00=
 -L- POC Sta. 320+42.81

-Y2-
 PI Sta 12+33.9
 $\Delta = 49' 19'' 01.7''$ (RT)
 $D = 19' 45'' 25.8''$
 $L = 249.62'$
 $T = 133.13'$
 $R = 290.00'$
 SE = SEE PLANS

-Y2-
 PI Sta 14+76.25
 $\Delta = 4' 56'' 44.0''$ (RT)
 $D = 5' 43'' 46.5''$
 $L = 86.32'$
 $T = 43.19'$
 $R = 1000.00'$
 SE = SEE PLANS

NOTE: FOR -L- PROFILE SEE SHEET NO.30
 FOR -Y2- PROFILE SEE SHEET NO.41
 FOR -Y3- PROFILE SEE SHEET NO.41
 FOR DITCH DETAILS SEE SHEET NO.2-K
 DFHL = DWARF FLOWERED HEARTLEAF

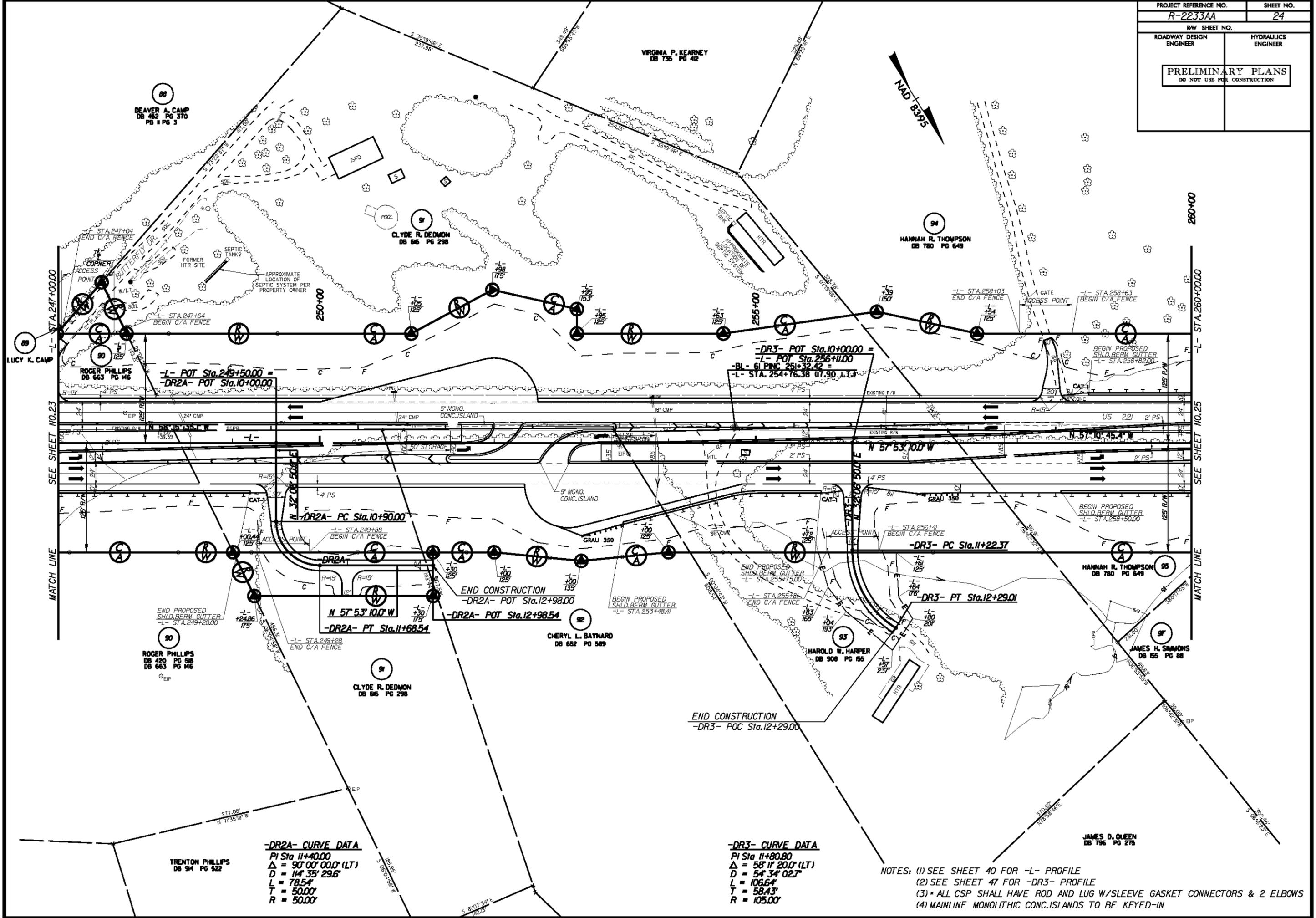
PROJECT REFERENCE NO.	SHEET NO.
R-2233AA	26
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



END PROJECT R-2233AA
 R-2233AA -L- POT Sta. 274+00.00 BK =
 R-2233AB -L- POT Sta. 273+96.34 AH
BEGIN PROJECT R-2233AB

NOTES: (1) SEE SHEET 41 FOR -L- PROFILE
 (2) SEE SHEET ____ FOR ROCK PLATING DETAIL
 (3) MAINLINE MONOLITHIC CONC. ISLANDS TO BE KEYED-IN

VIRGINIA P. KEARNEY
DB 736 PG 42



-L- POT Sta. 249+50.00 =
-DR2A- POT Sta. 10+00.00

-DR3- POT Sta. 10+00.00 =
-L- POT Sta. 256+11.00
-BL- 61 PINC 251+32.42 =
-L- STA. 254+76.38 (7.90 L.T.)

-DR2A- PC Sta. 10+90.00

-DR3- PC Sta. 11+22.37

END CONSTRUCTION
-DR2A- POT Sta. 12+98.00

-DR3- PT Sta. 12+29.01

-DR2A- PT Sta. 11+68.54

END CONSTRUCTION
-DR3- POC Sta. 12+29.00

-DR2A- CURVE DATA
 PI Sta 11+40.00
 $\Delta = 90^{\circ} 00' 00.0''$ (LT)
 D = 114' 35" 29.6"
 L = 78.54'
 T = 50.00'
 R = 50.00'

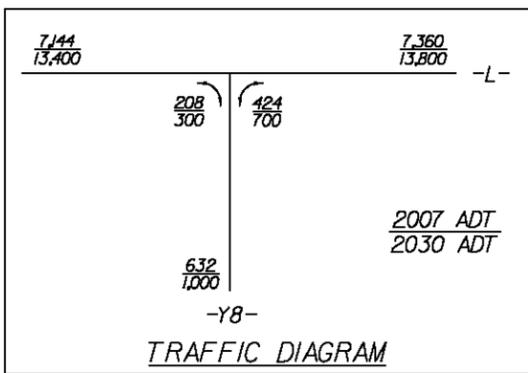
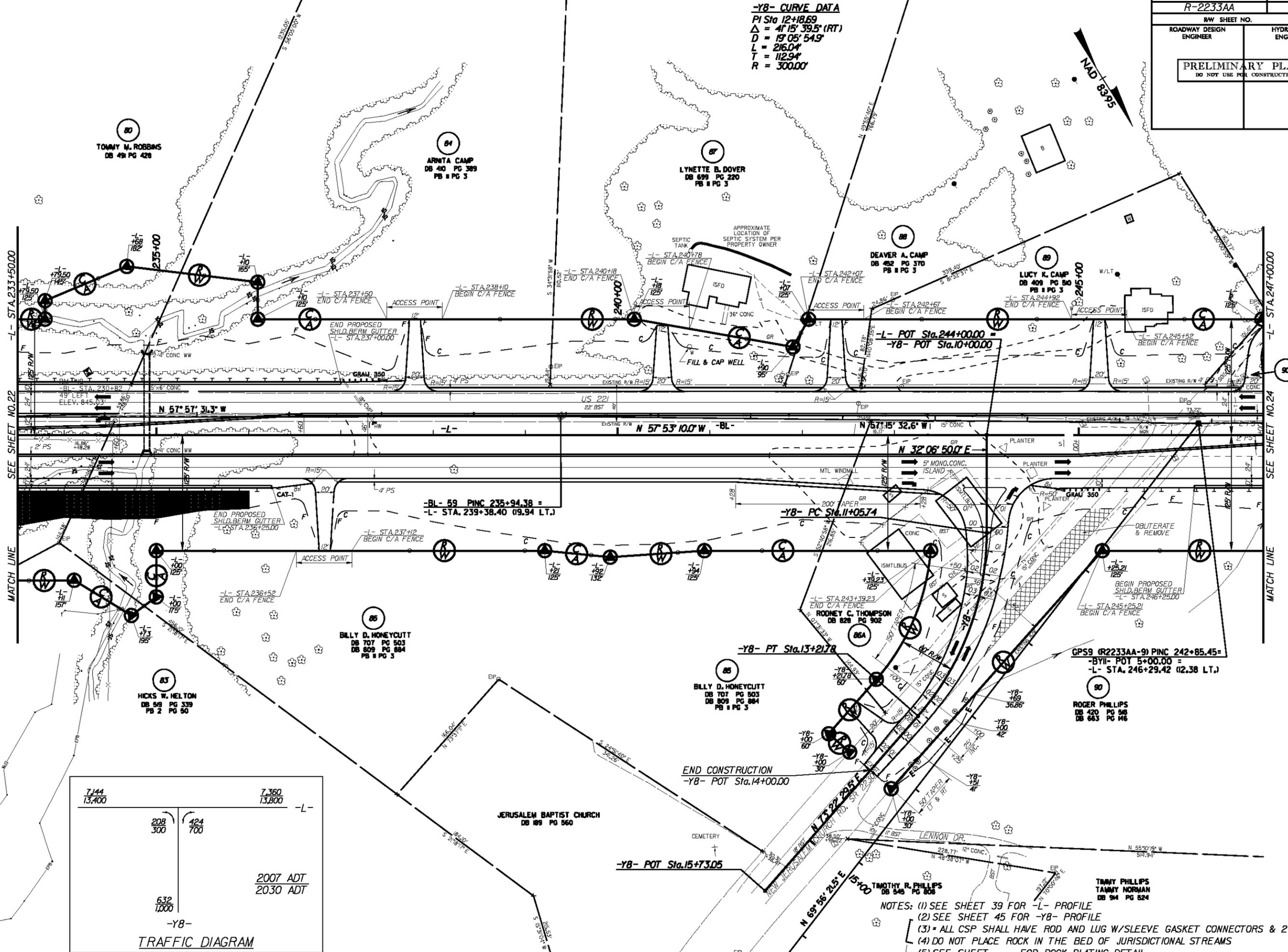
-DR3- CURVE DATA
 PI Sta 11+80.80
 $\Delta = 58^{\circ} 11' 20.0''$ (LT)
 D = 54' 34" 02.7"
 L = 106.64'
 T = 58.43'
 R = 105.00'

NOTES: (1) SEE SHEET 40 FOR -L- PROFILE
 (2) SEE SHEET 47 FOR -DR3- PROFILE
 (3) ALL CSP SHALL HAVE ROD AND LUG W/SLEEVE GASKET CONNECTORS & 2 ELBOWS
 (4) MAINLINE MONOLITHIC CONC. ISLANDS TO BE KEYED-IN

TRENTON PHILLIPS
DB 94 PG 522

JAMES D. QUEEN
DB 796 PG 278

-Y8- CURVE DATA
 PI Sta 12+18.69
 $\Delta = 41^{\circ} 15' 39.5" (RT)$
 $D = 17^{\circ} 05' 54.9"$
 $L = 216.04'$
 $T = 112.94'$
 $R = 300.00'$

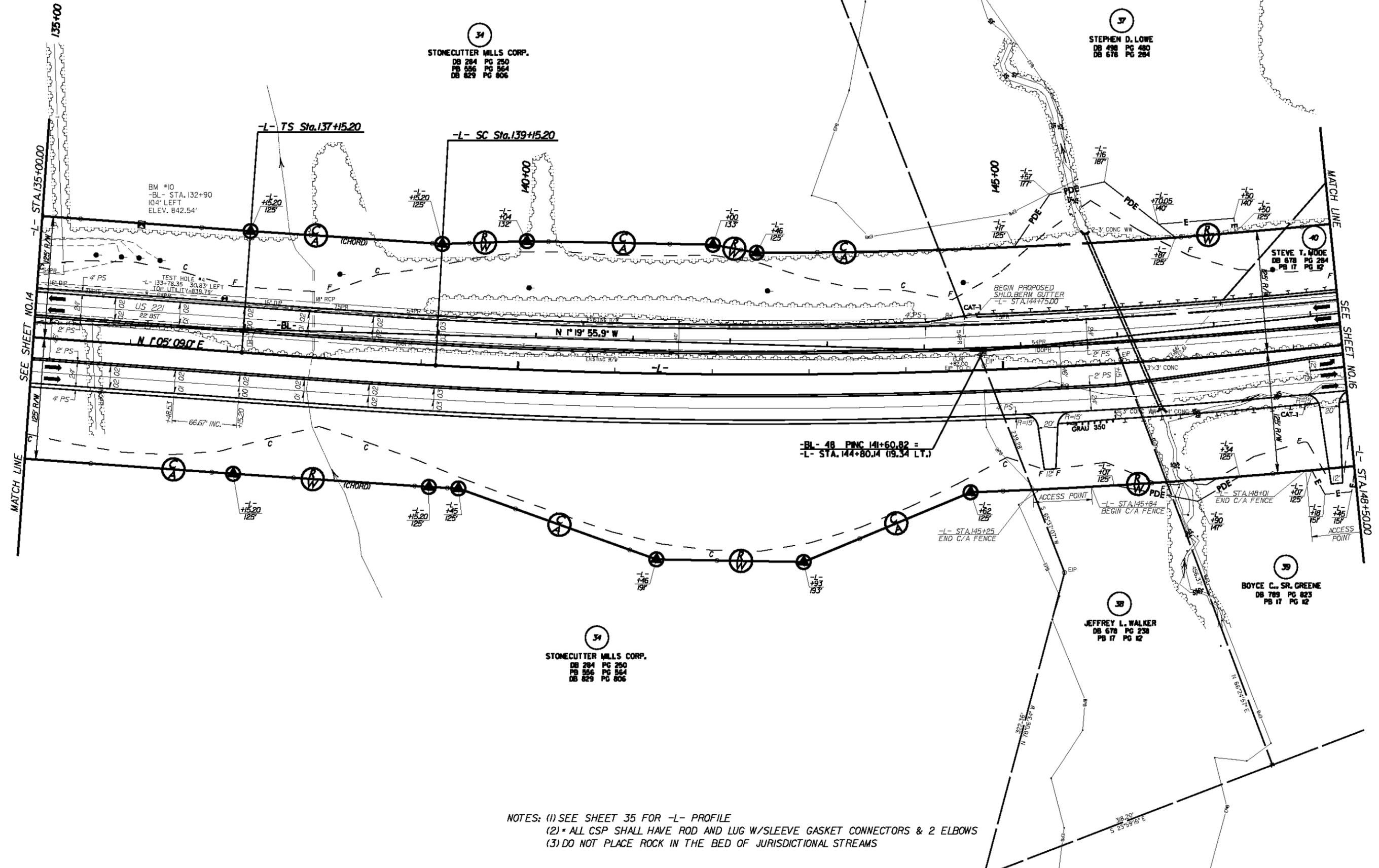


- NOTES: (1) SEE SHEET 39 FOR -L- PROFILE
 (2) SEE SHEET 45 FOR -Y8- PROFILE
 (3) * ALL CSP SHALL HAVE ROD AND LUG W/SLEEVE GASKET CONNECTORS & 2 ELBOWS
 (4) DO NOT PLACE ROCK IN THE BED OF JURISDICTIONAL STREAMS
 (5) SEE SHEET ___ FOR ROCK PLATING DETAIL

PROJECT REFERENCE NO.	SHEET NO.
R-2233AA	15
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

-L- CURVE DATA

PI Sta 138+48.53	PI Sta 147+84.20
Os = 0° 57' 17.7"	Δ = 16° 28' 55.5" (LT)
Ls = 200.00'	D = 0° 57' 17.7"
LT = 133.34'	L = 1726.00'
ST = 66.67'	T = 869.00'
	R = 6,000.00'
	SE = SEE PLANS



34
STONECUTTER MILLS CORP.
DB 284 PG 250
PB 556 PG 564
DB 829 PG 806

37
STEPHEN D. LOWE
DB 498 PG 480
DB 676 PG 284

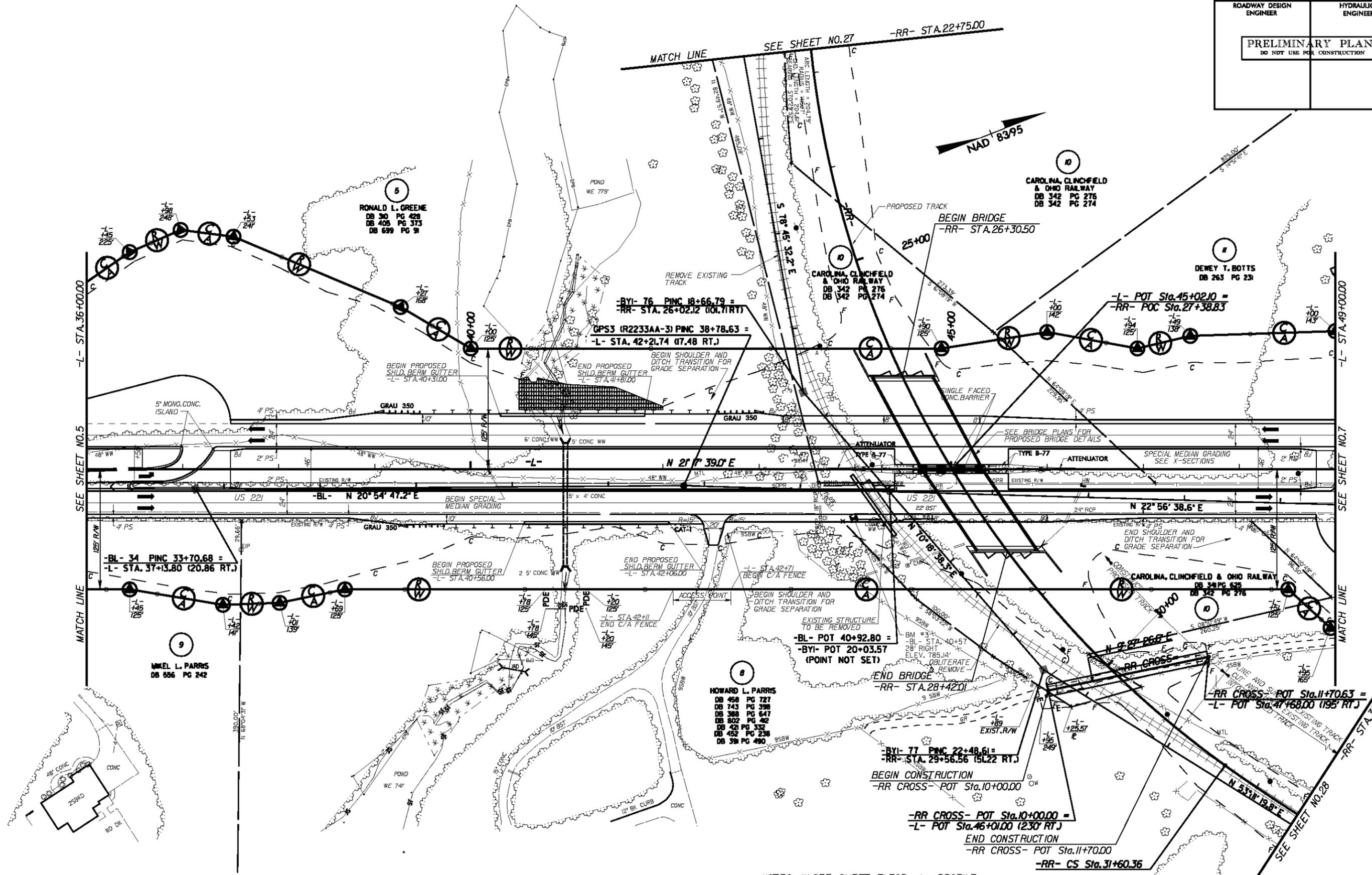
40
STEVE T. MOORE
DB 678 PG 284
PB 17

39
BOYCE C., SR. GREENE
DB 789 PG 823
PB 17 PG 12

38
STONECUTTER MILLS CORP.
DB 284 PG 250
PB 556 PG 564
DB 829 PG 806

38
JEFFREY L. WALKER
DB 678 PG 238
PB 17 PG 12

NOTES: (1) SEE SHEET 35 FOR -L- PROFILE
(2) * ALL CSP SHALL HAVE ROD AND LUG W/SLEEVE GASKET CONNECTORS & 2 ELBOWS
(3) DO NOT PLACE ROCK IN THE BED OF JURISDICTIONAL STREAMS



NOTES: SEE ROADWAY STANDARD DRAWING, STD. NO. 225.09 FOR GUIDE FOR SHOULDER AND DITCH TRANSITION AT GRADE SEPARATIONS
SEE ROADWAY STANDARD DRAWING, STD. NO. 862.01 SHEETS 1 & 2 OF 11 FOR SPECIAL MEDIAN GRADING

-RR- CURVE DATA

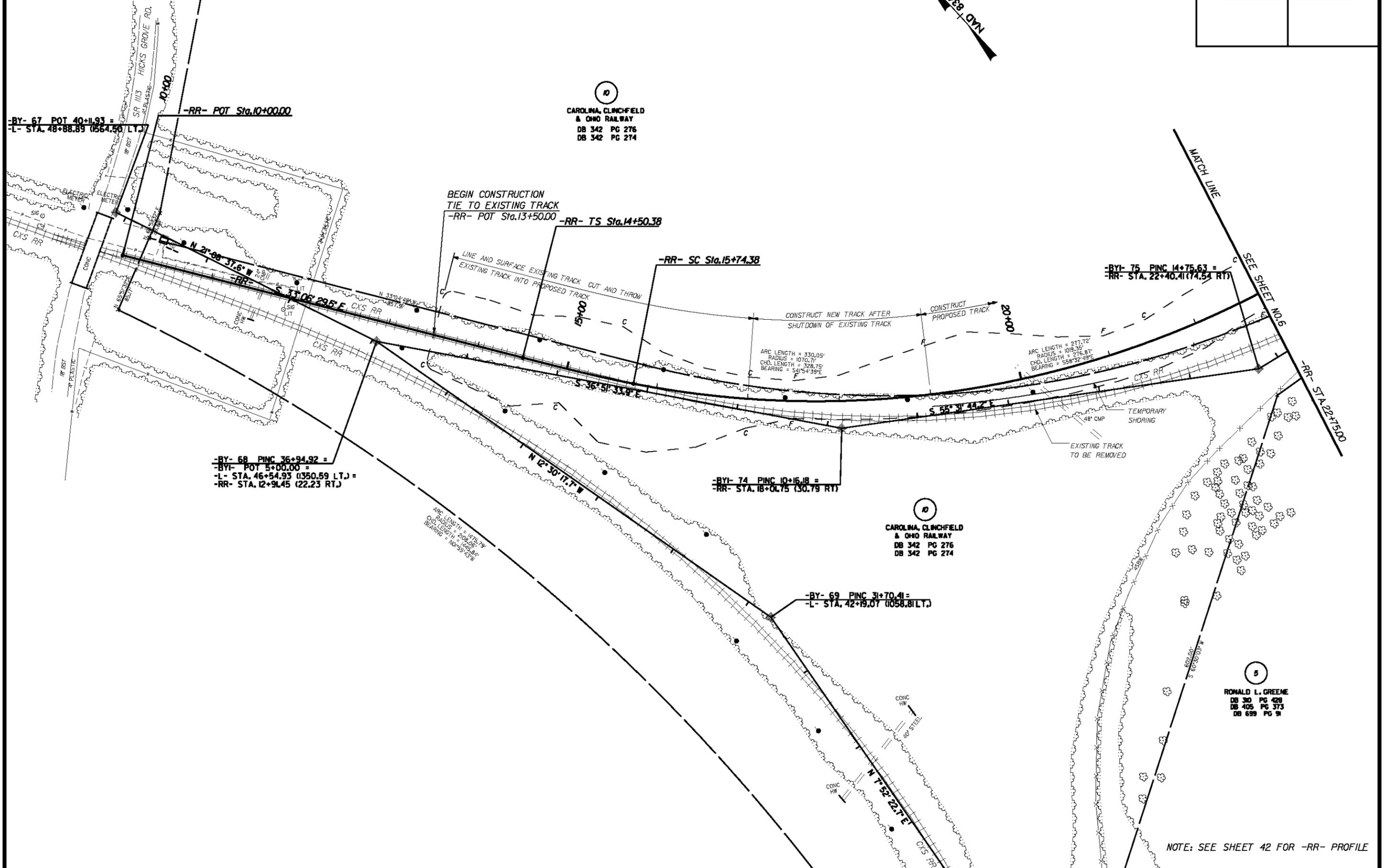
PI Sta 25+62.61	PIs Sta 32+01.71
$\Delta = 86^{\circ} 26' 10.8" (LT)$	$\Theta_s = 3^{\circ} 22' 39.8"$
$D = 5^{\circ} 27' 00.0"$	$L_s = 124.00'$
$L = 1585.99'$	$LT = 82.68'$
$T = 988.24'$	$ST = 41.35'$
$R = 1051.70'$	

- NOTES: (1) SEE SHEET 31 FOR -L- PROFILE
(2) SEE SHEET 42 FOR -RR- PROFILE
(3) * ALL CSP SHALL HAVE ROD AND LUG W/SLEEVE GASKET CONNECTORS & 2 ELBOWS
(4) DO NOT PLACE ROCK IN THE BED OF JURISDICTIONAL STREAMS
(5) MAINLINE MONOLITHIC CONC. ISLANDS TO BE KEED-IN
(6) SEE SHEETS S-1 TO S- FOR STRUCTURE DETAILS
(7) SEE SHEETS C-1 TO C- FOR CULVERT DETAILS
(8) SEE SHEET ____ FOR ROCK PLATING DETAIL

PROJECT REFERENCE NO.	SHEET NO.
R-2233AA	27
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

-RR- CURVE DATA

PI Sta 15+33.06	PI Sta 25+62.61
θs = 3°22'39.8"	Δ = 86°26'10.8" (LT)
Ls = 124.00'	D = 5°27'00.0"
LT = 82.68'	L = 1,585.99'
ST = 41.35'	T = 988.24'
	R = 1,051.70'




 CAROLINA, CLINCHFIELD
 & OHIO RAILWAY
 DB 342 PG 276
 DB 342 PG 274


 CAROLINA, CLINCHFIELD
 & OHIO RAILWAY
 DB 342 PG 276
 DB 342 PG 274


 RONALD L. GREENE
 DB 30 PG 428
 DB 405 PG 373
 DB 699 PG 91

-BY- 67 POT 40+11.93 =
 -L- STA. 48+88.89 (564.58 LT.)

-RR- POT Sta. 10+00.00

BEGIN CONSTRUCTION
 TIE TO EXISTING TRACK
 -RR- POT Sta. 13+50.00 -RR- TS Sta. 14+50.38

-RR- SC Sta. 15+74.38

-BY- 75 PINC 14+75.63 =
 -RR- STA. 22+40.41 (74.54 RT)

-BY- 68 PINC 36+94.92 =
 -BY- POT 5+00.00 =
 -L- STA. 46+54.93 (1350.59 LT.) =
 -RR- STA. 12+94.45 (22.23 RT.)

-BY- 74 PINC 10+16.18 =
 -RR- STA. 18+06.75 (30.79 RT)

-BY- 69 PINC 31+70.41 =
 -L- STA. 42+19.07 (1058.81 LT.)

NOTE: SEE SHEET 42 FOR -RR- PROFILE

-L- CURVE DATA
 PIs Sta 22+51.74
 $\theta_s = 1'02'30.3''$
 $L_s = 200.00'$
 $LT = 133.34'$
 $ST = 66.67'$

PI Sta 27+93.13
 $\Delta = 9'51'59.2''$ (RT)
 $D = 1'02'30.3''$
 $L = 947.11'$
 $T = 474.73'$
 $R = 5,500.00'$
 SE = SEE PLANS

PIs Sta 33+32.18
 $\theta_s = 1'02'30.3''$
 $L_s = 200.00'$
 $LT = 133.34'$
 $ST = 66.67'$

-LLT- CURVE DATA
 PI Sta 29+71.47
 $\Delta = 4'49'11.4''$ (RT)
 $D = 1'02'30.3''$
 $L = 462.67'$
 $T = 231.47'$
 $R = 5,500.00'$
 SE = SEE PLANS

-LRT- CURVE DATA
 PI Sta 29+68.86
 $\Delta = 4'45'55.8''$ (RT)
 $D = 1'02'30.3''$
 $L = 457.46'$
 $T = 228.86'$
 $R = 5,500.00'$
 SE = SEE PLANS

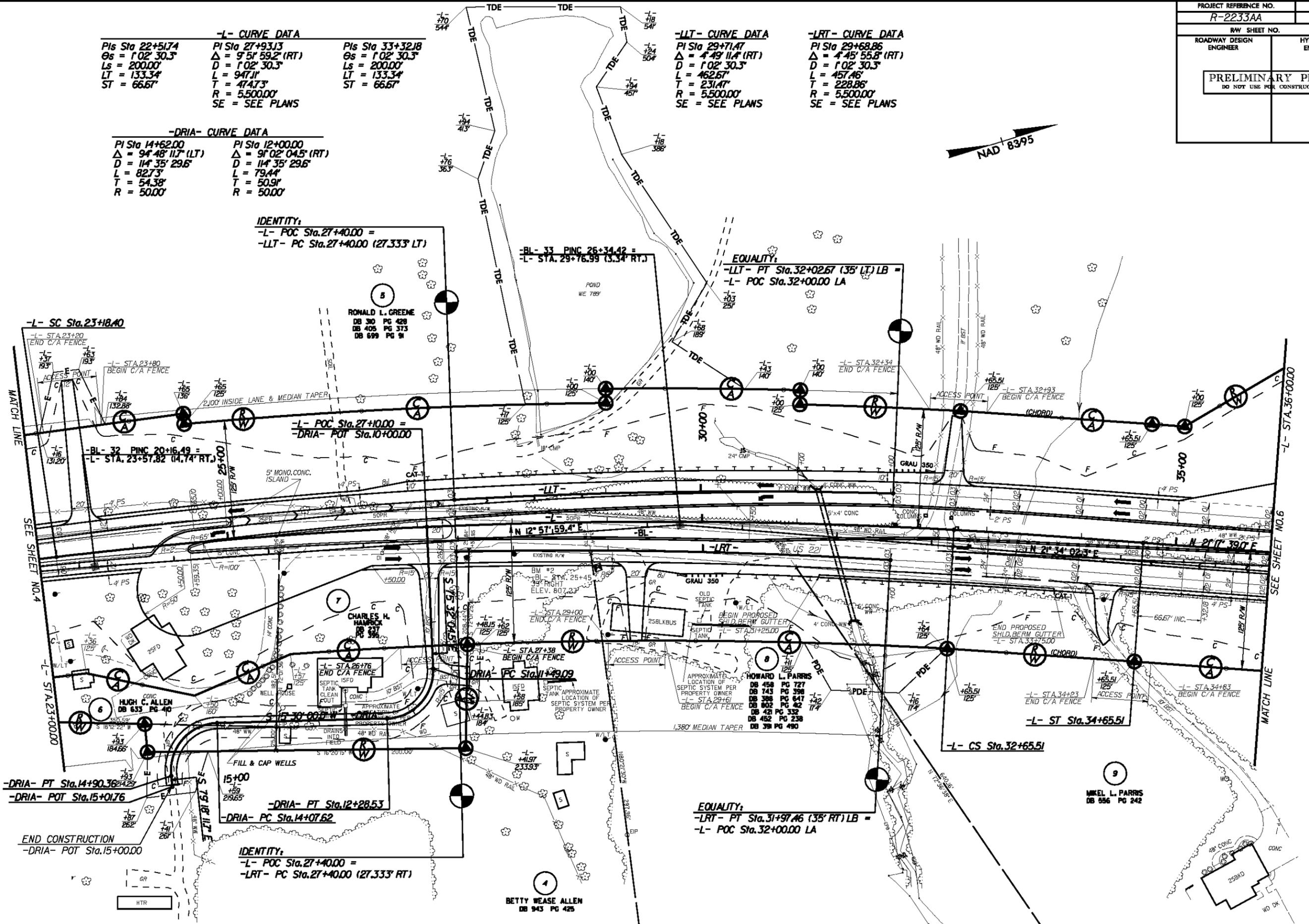
-DRIA- CURVE DATA

PI Sta 14+62.00
 $\Delta = 94'48'11.7''$ (LT)
 $D = 114'35'29.6''$
 $L = 82.73'$
 $T = 54.38'$
 $R = 50.00'$

PI Sta 12+00.00
 $\Delta = 91'02'04.5''$ (RT)
 $D = 114'35'29.6''$
 $L = 79.44'$
 $T = 50.91'$
 $R = 50.00'$

IDENTITY:
 -L- POC Sta.27+40.00 =
 -LLT- PC Sta.27+40.00 (27.333' LT)

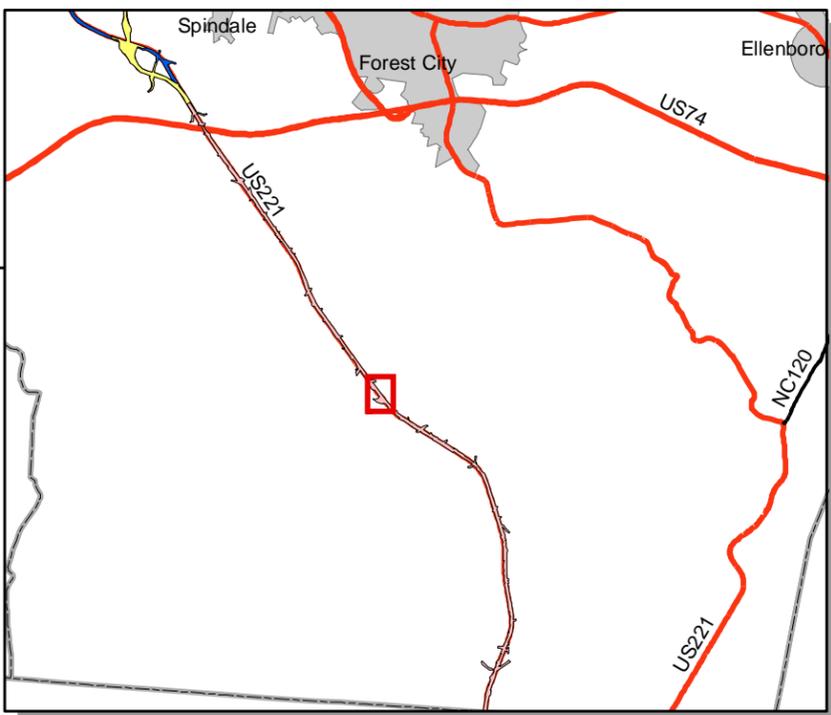
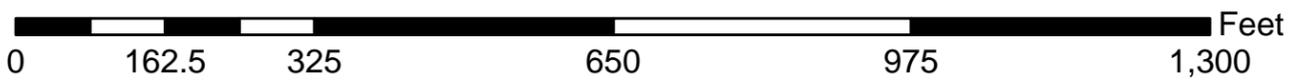
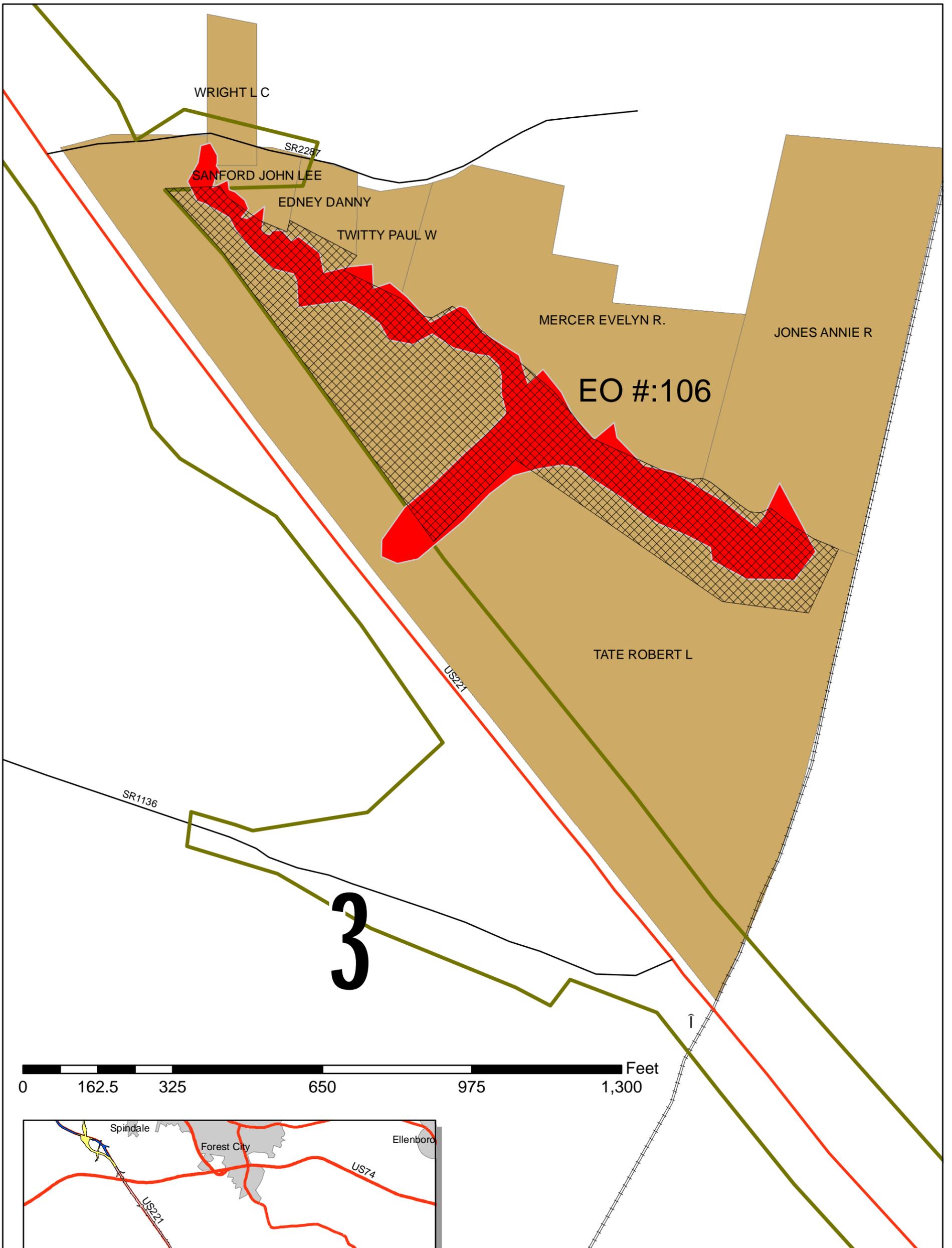
EQUALITY:
 -LLT- PT Sta.32+02.67 (35' LT) LB =
 -L- POC Sta.32+00.00 LA



- NOTES:**
- (1) SEE SHEET 30 FOR -L-, -LLT- & -LRT- PROFILES
 - (2) SEE SHEET 47 FOR -DRIA- PROFILE
 - (3) * ALL CSP SHALL HAVE ROD AND LUG W/SLEEVE GASKET CONNECTORS & 2 ELBOWS
 - (4) DO NOT PLACE ROCK IN THE BED OF JURISDICTIONAL STREAMS
 - (5) MAINLINE MONOLITHIC CONC. ISLANDS TO BE KEYED-IN

APPENDIX D: Measures to Offset DFHL Impacts

Figure D-1: Tate conservation easement



	North Carolina Department of Transportation
	T.I.P. No. R-2233 A & B US 221 Widening & Rutherfordton Bypass
	<i>Approximate</i> Proposed Conservation Area DFHL - Site 1

Legend

-  ROW_ab
-  DFHL
-  Proposed_ConEase
-  LandParcels
-  Railroad Grade Crossing
-  Railroads

APPENDIX E: Credentials of NCDOT Biologists

Qualifications of NCDOT biologists:

Investigator: Tim Bassette

Education: M.S.E.S. Water Resources and Hazardous Materials, Indiana University
B.A. Biology, Alfred University

Experience: Environmental Supervisor/Program Consultant, NCDOT, August 2005-present

Senior Environmental Biologist, H.W. Lochner, Inc., November 2003-July 2005

Environmental Specialist, NCDOT, September 1998-October 2003

Environmental Regulatory Specialist, Booz•Allen & Hamilton, Inc., February 1997-August 1998

Environmental Intern, Environmental Audits, Inc., May 1995-December 1995

Environmental Chemistry Lab Technician, RCRA Environmental, Inc., May 1994-August 1994 and November 1991-August 1993

Expertise: Jurisdictional wetland/stream delineations, federally protected species surveys (terrestrial), flora/fauna inventories (terrestrial/aquatic), Clean Water Act §§404/401 and Coastal Area Management Act permit applications, Natural Resource Technical Reports, Endangered Species Act §7 Biological Assessments, National Environmental Policy Act-Clean Water Act §404 Merger Process coordination/documentation.

Investigator: Dennis W. Herman

Education: B.S. Biology, Western Carolina University

Experience: Environmental Biologist/Supervisor, NCDOT, August 2004-present.

Coordinator of Living Collections, NC Museum of Natural Sciences, June 1996-August 2004.

Assistant Curator of Herpetology, Zoo Atlanta, 1981-1996.

Senior Zoo Keeper of Herpetology & Mammals, Atlanta Zoological Park, 1972-1981.

Expertise: Section 7 investigations, protected species (terrestrial/aquatic) surveys, bog turtle & mountain bog specialist, ecological studies, rare plant identification, benthic macroinvertebrate collection.

Investigator: Lance P. Fontaine, Ph.D.
Education: Ph.D., Wildlife and Fisheries Sciences, Texas A&M University, 2008
M.S. Wildlife and Fisheries Sciences, Texas A&M University, 2002
B.S. Ecological & Evolutionary Biology, Tulane University, 1999
Experience: Environmental Specialist, NCDOT, Raleigh, NC, October 2006 – Present
Lecturer, University of California at Irvine, January 2006 – September 2006
Research Assistant, Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, August 2000 – December 2005
Pond Technician/Technical Consultant, Integrated Lakes Management, Gurnee, IL September 1999 – August 2000
Expertise: Endangered species (terrestrial/aquatic) surveys; section 7 compliance and field investigation; biological assessment preparation; water quality analysis; aquatic and wetland ecology studies; freshwater and marine fish ecology and ecophysiology studies; invasive and exotic species (terrestrial/aquatic) issues; statistical analysis; benthic macroinvertebrate collection; GIS studies; prescribed burns; SCUBA.

Investigator: Mary E. Frazer
Education: B.S. Zoology, University of Wisconsin
M.E.M. (Master of Environmental Management), Resource Ecology, Duke University.
Experience: Natural Systems Specialist, NCDOT, August 2000-present.
Water Regulation Specialist, Wisconsin Department of Natural Resources, 1998-2000.
Wisconsin Coastal Management Program, 1994-1998.
Biologist, Soil and Environmental Consultants, 1992-1994.
Expertise: Section 7 field investigations; NEPA documentation, wetland and aquatic investigations

Investigator: Steven Mitchell
Education: B.S. Biology, East Carolina University, 1973.
Experience: Environmental Supervisor, NCDOT, August 2004-present.
Environmental Scientist NCDENR, RRO, 1991-2002.
Environmental Specialist, NCDENR, DWQ, 1978-1991.
Expertise: Coordinate and conduct Section 7 investigations (aquatic and terrestrial). Identification of aquatic benthic macroinvertebrates. Wetland and Riparian Identification and Mitigation. Ecological studies, NEPA documentation. Scuba diving certified.

Investigator: Heather Renninger

Education: B.S. Ecology/Environmental Biology, Appalachian State University

Experience: Environmental Specialist, NCDOT, February 2007- present
Environmental Biologist, H.W. Lochner, Inc., 2003-2007
Biologist, Earth Tech, Inc., 2000-2003

Expertise: Section 7 field investigations and documentation, benthic macroinvertebrate collection, 401/404 permitting, protected species (terrestrial/aquatic) surveys, NEPA documentation, wetland delineation, stream restoration, invasive species, avian ecology and behavior.

Investigator: Michael Sanderson

Education: B.S. Fisheries and Wildlife Science, North Carolina State University

Experience: Environmental Specialist, NCDOT April 2004- present
Wildlife Research Biologist, Down to Earth Environmental, February – June, 2003
Wildlife Research Technician, NC Cooperative Fish and Wildlife Research unit, 1991- 1999
Biological Science Technician (Wildlife), US Fish and Wildlife Service, 1995- 1997

Expertise: Bird surveys, behavioral analysis, habitat use/evaluation, Section 7 field investigations, protected species (terrestrial/aquatic) surveys, Wetland delineation, Scuba Certified.