

#E1-26194

Appendix A: Alternatives Analysis Maps

CAMP HALL RAIL PROJECT



**540 East Bay Street
Charleston, South Carolina**

25 July 2017



Figure 1. Site Location Map

Camp Hall Railroad Build-in
Alternatives Analysis
Berkeley County, South Carolina

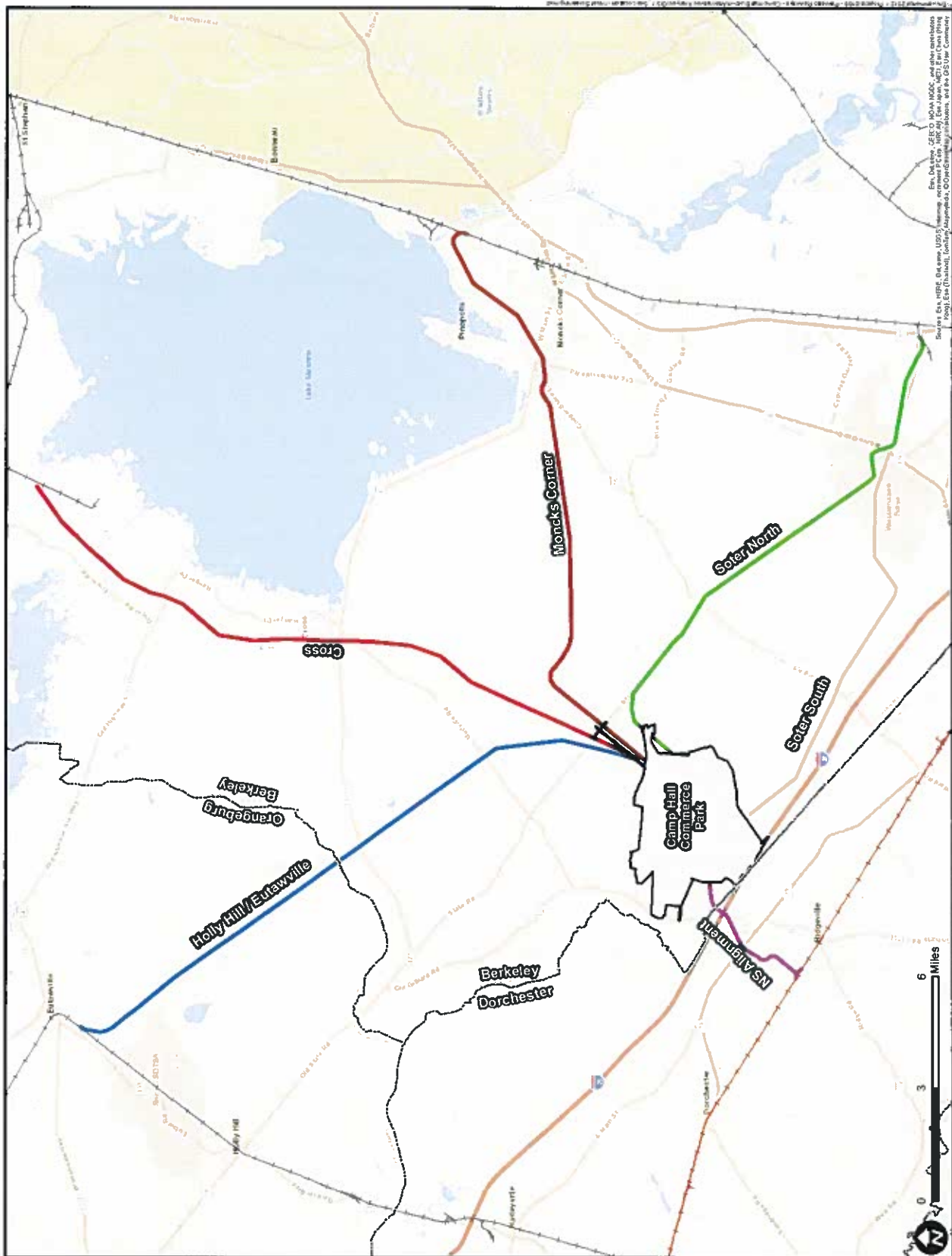
Legend

- County Boundary
- Camp Hall Commerce Park
- Existing Nearby Rail
- CSXT
- Norfolk Southern
- Initial Rail Corridor Screenings
- Cross
- Holly Hill / Eutawville
- Monks Corner
- NS Alignment
- Soler North
- Soler South



US 101	6240.15.0105
Drawn By	RWS
Reviewed By	AWC
Date	03/25/2015

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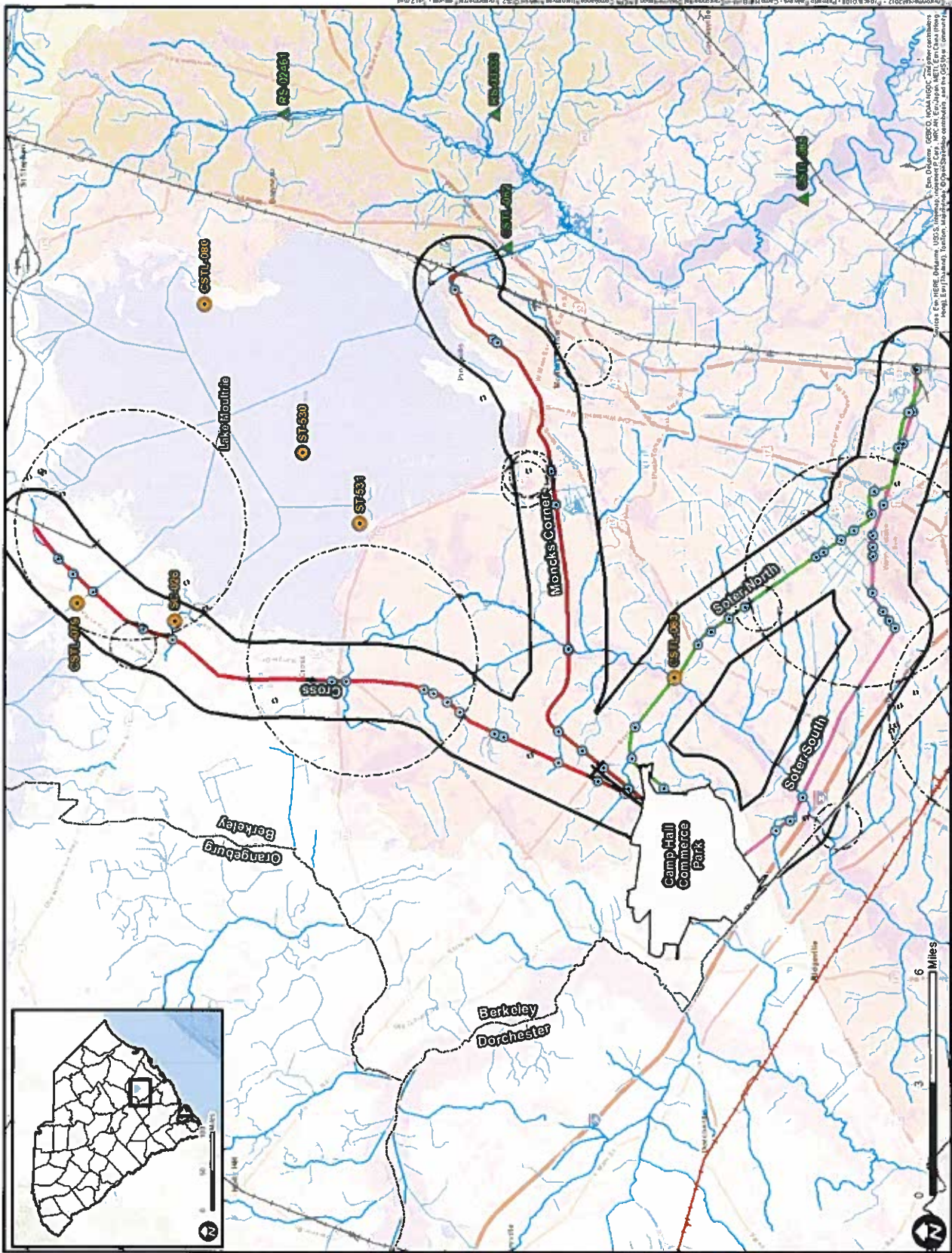
Figure 2. Environmental Features Map
Camp Hall Railroad Build-in Alternatives Analysis
Berkeley County, South Carolina

- Legend**
- County Boundary
 - Camp Hall Commerce Park
 - Tier 2 Study Area
 - Impaired 303D Station
 - TMDL Station
 - TMDL Watershed
 - Stream Crossings
 - Named Stream
 - Minor Tributary
 - National Wetland Inventory
 - Known
 - Threatened/Endangered Species Habitat
 - Existing Nearby Rail
 - CSXT
 - Norfolk Southern
 - Tier 2 Rail Alternative Alignments
 - Cross
 - Moncks Corner
 - Soter North
 - Soter South



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 Date: 08/15/2018
 By: [Signature]
 Title: [Signature]
 Project: [Signature]



**Camp Hall Railroad Build-in
Alternatives Analysis
Berkeley County, South Carolina**

County Boundary
Camp Hall Commerce Park
Tier 2 Study Area
SCDOT Traffic Station

 Potential Relocation EJ Community

Municipalities: _____

Urbanized Area

1x3
Norfolk Southern

Tier 2 Rail Alternative Alignments

— Moncks Corner

Soter South

Author	By	BMWS
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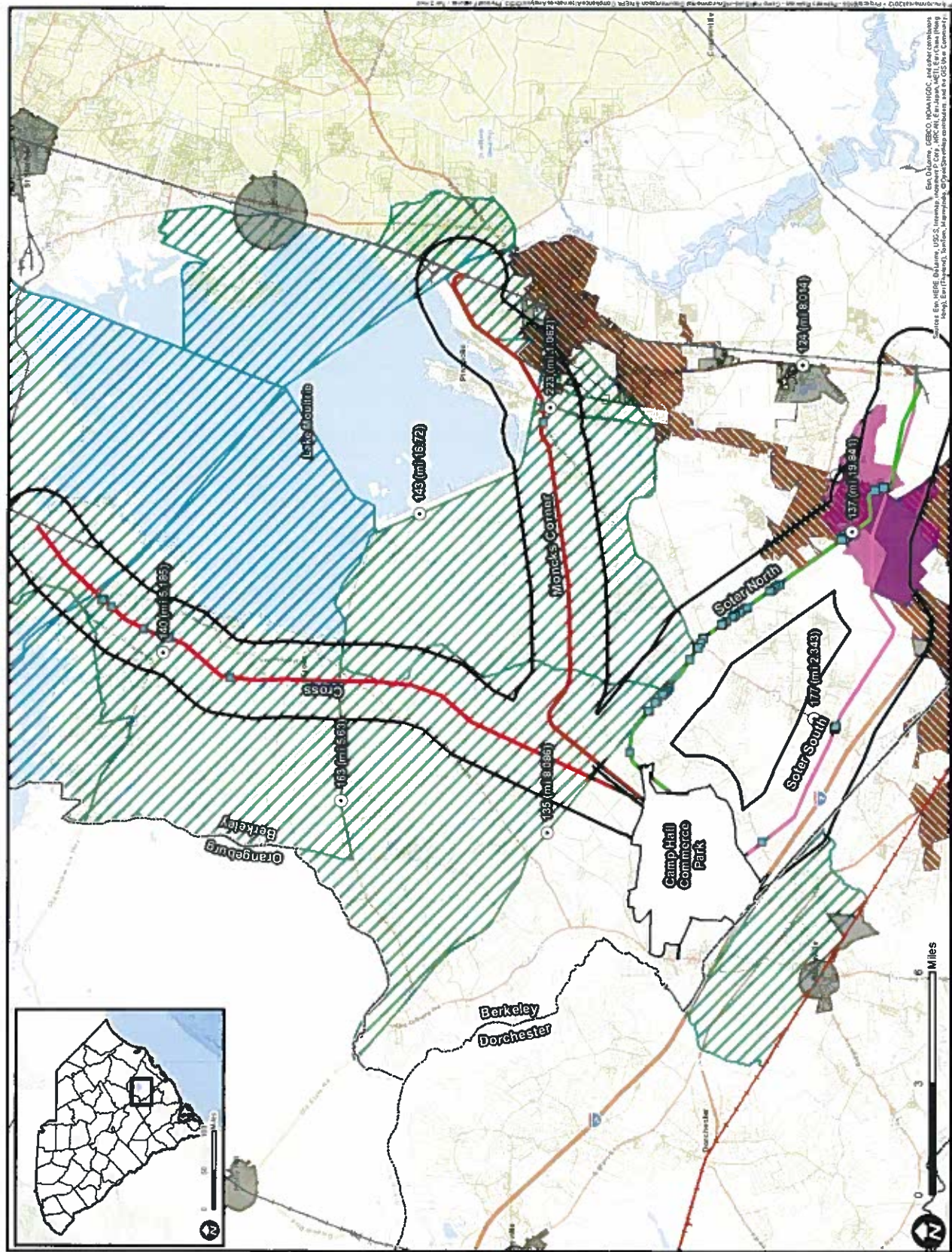


Figure 4. Historic and Archaeological Resources Map

Camp Hall Railroad Build-in Alternatives Analysis
Berkeley County, South Carolina

Legend

-  County Boundary
-  Camp Hall Commerce Park
-  Tier 2 Study
-  Historic Structure
-  Known Archaeological
-  Historic Area
-  NRHP Site
- Existing Nearby Rail**
-  CSXT
-  Norfolk Southern
- Tier 2 Rail Alternative Alignments**
-  Cross
-  Moncks Corner
-  Soter North
-  Soter South



NO. 101	8/26/14	01/10/15
Drawn By	RMV	
Reviewed By	AMS	
Date	08/22/15	

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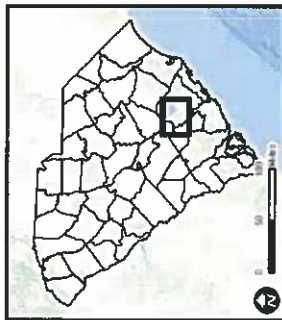
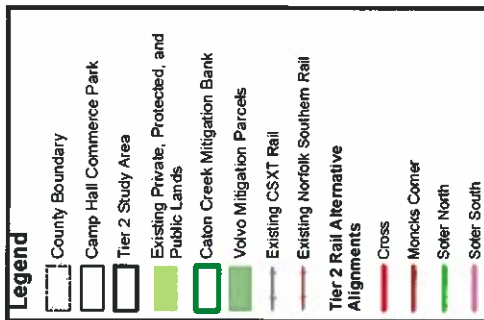
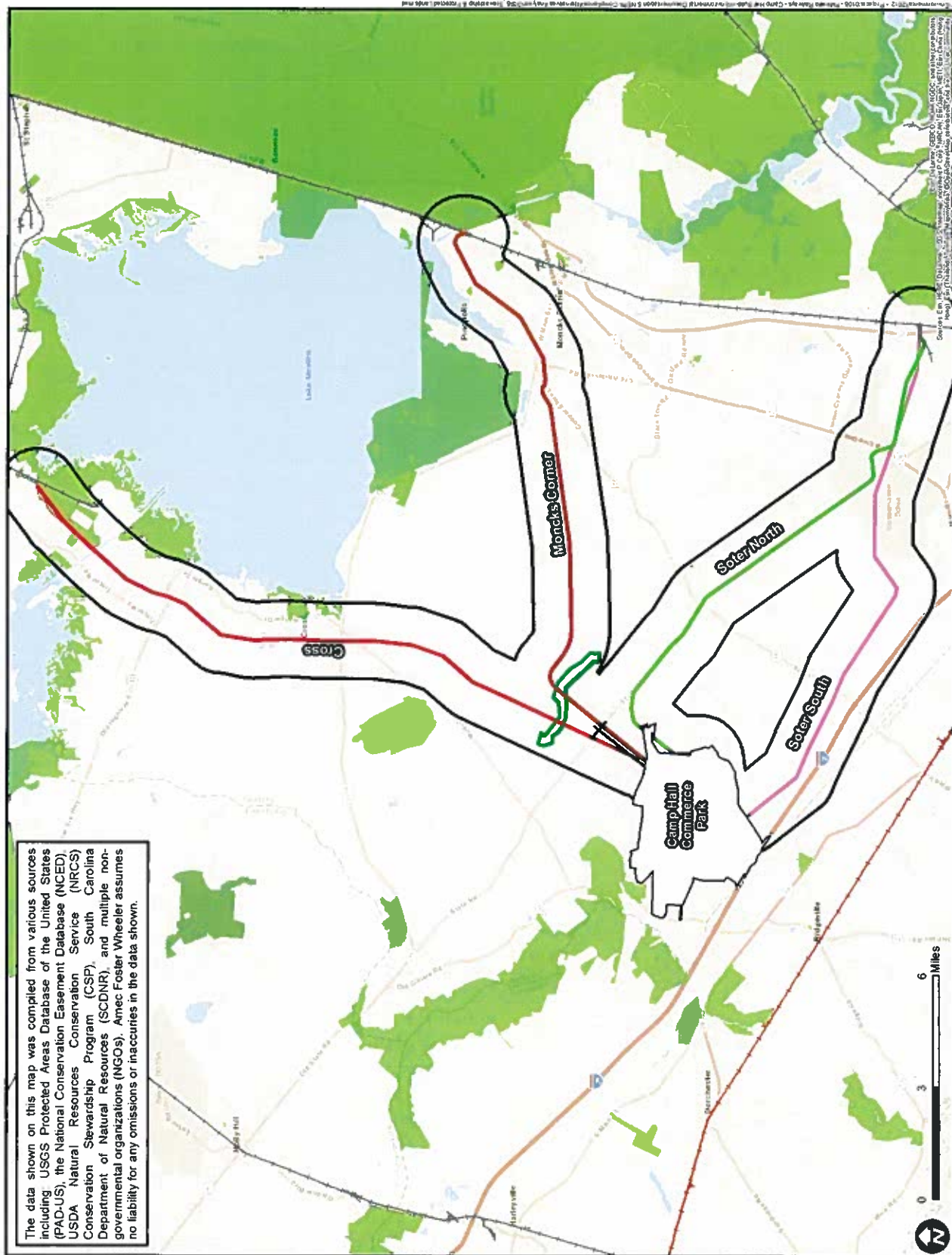


Figure 5. Stewardship and Protected Lands Map
Camp Hall Railroad Build-in Alternatives Analysis
Berkeley County, South Carolina



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Map Date: 02/26/13
Drawn By: BWS
Reviewed By: AWS
Date: 09/22/06



The data shown on this map was compiled from various sources including USGS Protected Areas Database of the United States (PAD-US), the National Conservation Easement Database (NCED), USDA Natural Resources Conservation Service (NRCS) Conservation Stewardship Program (CSP), South Carolina Department of Natural Resources (SCDNR), and multiple non-governmental organizations (NGOs). Amec Foster Wheeler assumes no liability for any omissions or inaccuracies in the data shown.



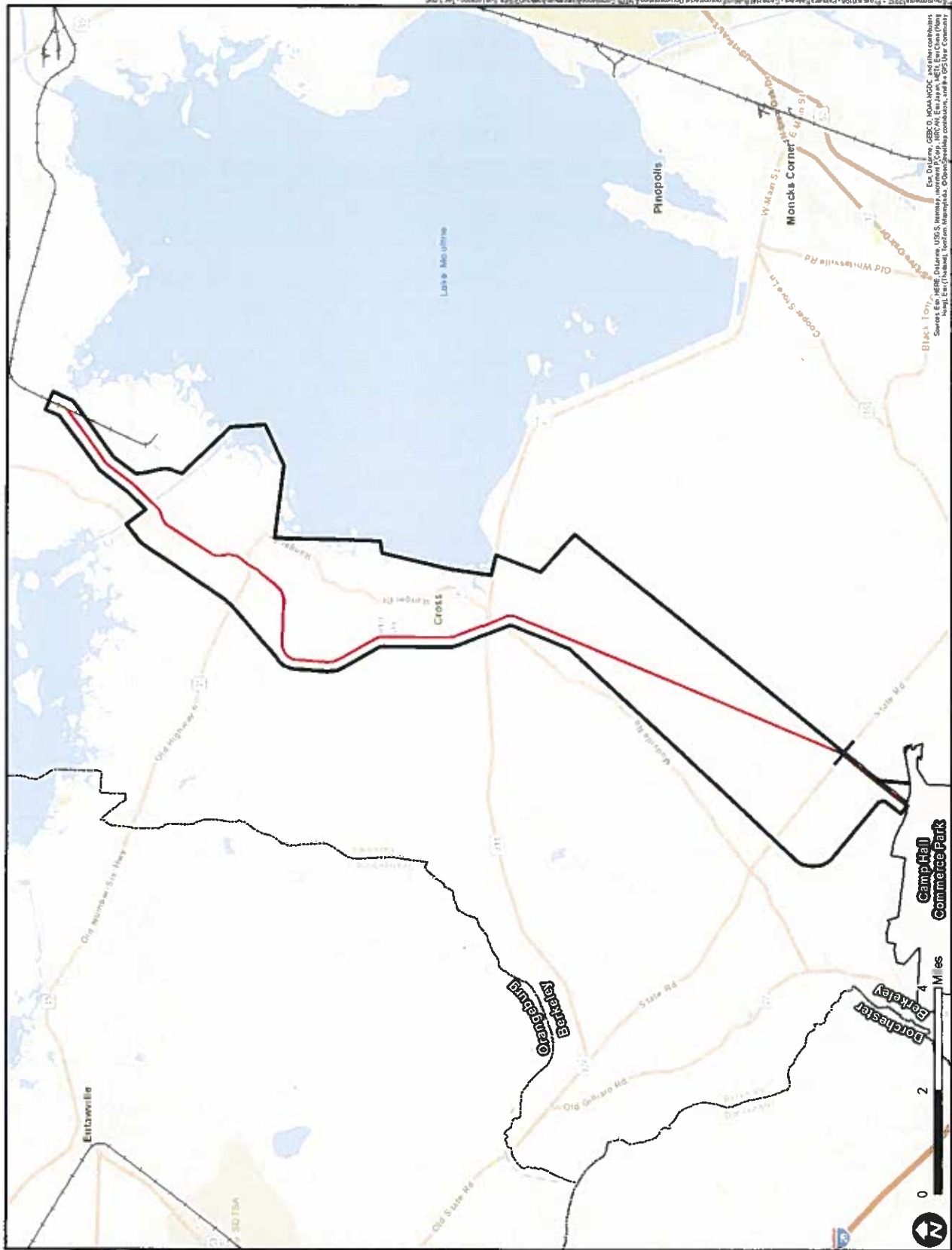
**Figure 6a. Tier 3 Cross Option
1 Alternative Alignment**
Camp Hall Railroad Build-in
Alternatives Analysis
Berkeley County, South Carolina

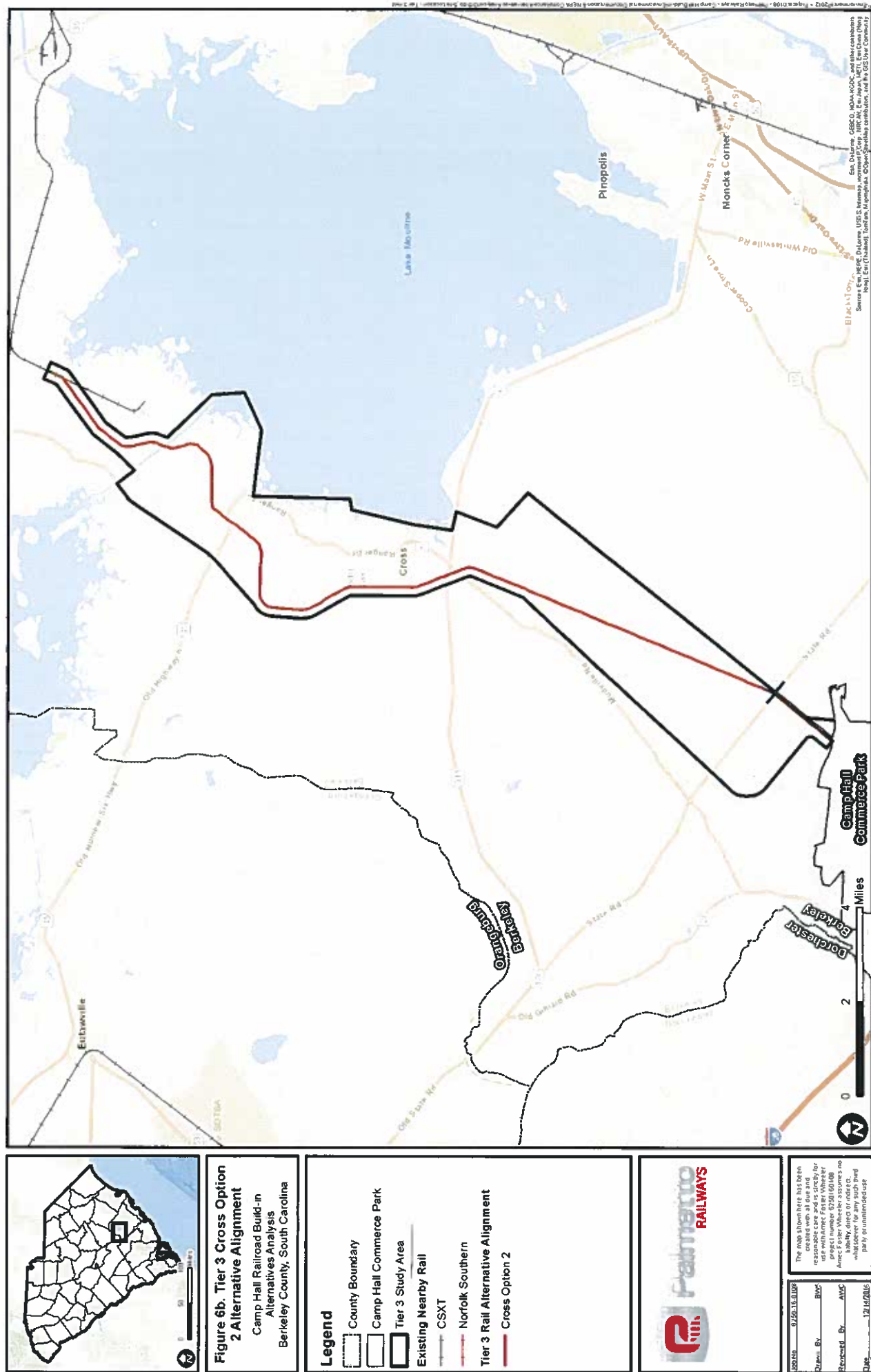
- Legend**
- County Boundary
 - Camp Hall Commerce Park
 - Tier 3 Study Area
 - Existing Nearby Rail
 - CSXT
 - Norfolk Southern
 - Tier 3 Rail Alternative Alignment
 - Cross Option 1

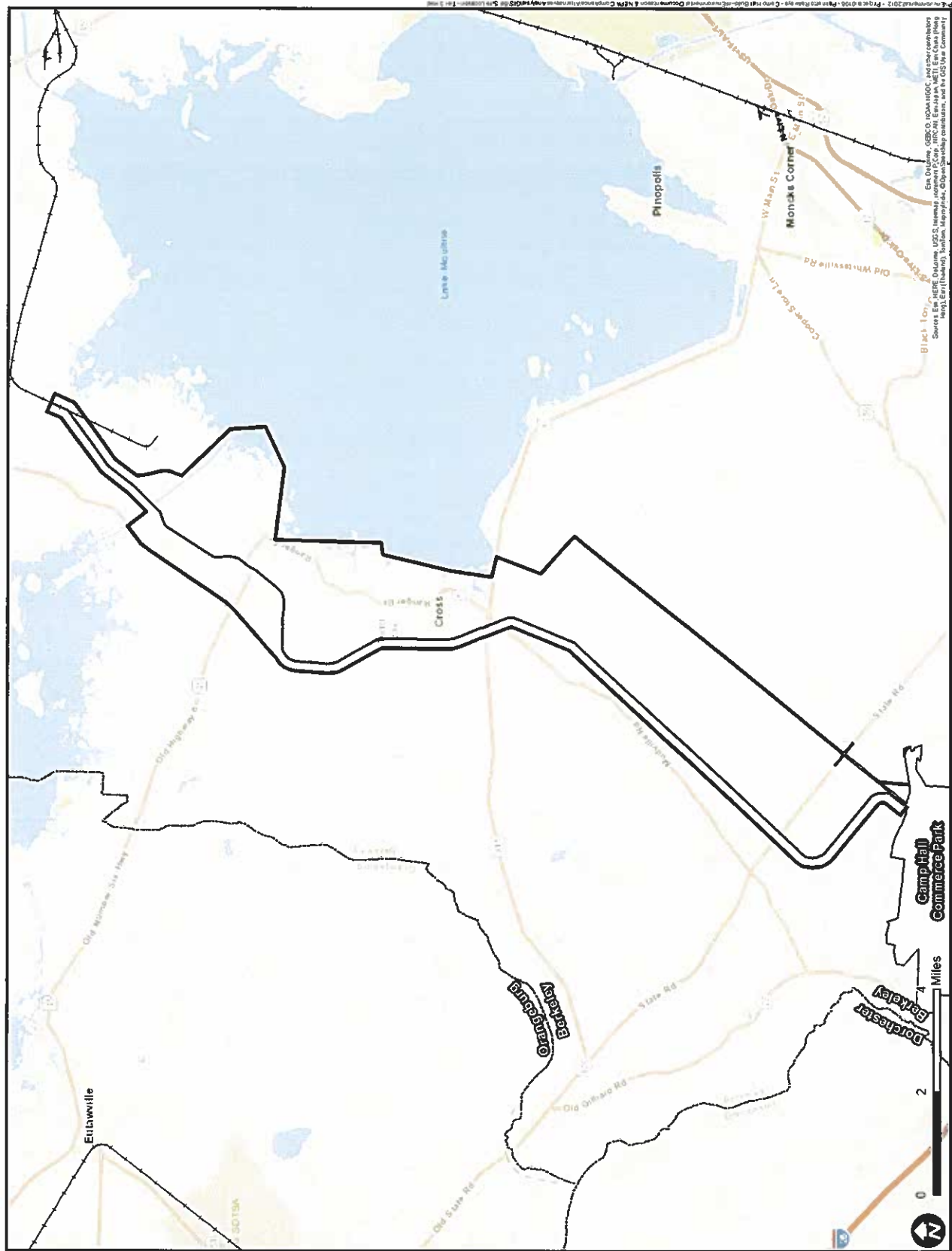


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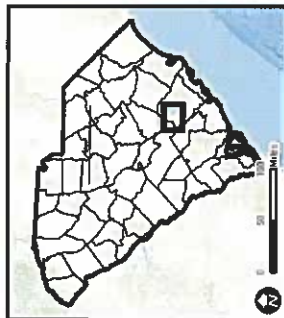
Date: 12/14/2016
 Project No.: 6250-16-010
 Client: BNSF
 Project: BNSF
 Prepared By: AWC







**Figure 6d. Tier 3 Cross Option
4 Alternative Alignment**
Camp Hall Railroad Build-in
Alternatives Analysis
Berkeley County, South Carolina



Legend

-  County Boundary
-  Camp Hall Commerce Park
-  Tier 3 Study Area
-  Existing Nearby Rail
-  CSXT
-  Norfolk Southern
-  Tier 3 Rail Alternative Alignment
-  Cross Option 4



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Appendix B: Habitat and Wetland Descriptions

CAMP HALL RAIL PROJECT



**540 East Bay Street
Charleston, South Carolina**

25 July 2017

HABITAT AND WETLAND DESCRIPTIONS

The proposed 22.7-mile railroad corridor connecting the Camp Hall Commerce Park to the existing rail line at the Cross generating station has been evaluated with respect to habitat and wetland types. The proposed rail line corridor review area is approximately 200 feet wide, plus some expanded areas where minor alternatives to the original alignment may be considered. The entire proposed rail line corridor, including all expanded areas, totals approximately 866 acres. Of the original proposed rail line corridor (623 acres), 368.6 acres have been confirmed as wetlands based on a Preliminary Jurisdictional Determination issued by the U.S. Army Corps of Engineers (USACE) identified by SAC # 2016-01395. The most recent areas added to the potential route have not been verified by the USACE and include approximately 242 acres of which an estimated 157 acres are wetlands. Assuming the USACE confirms the 157 additional acres as wetlands, 526 acres of wetlands occur in the entire proposed project corridor being considered for the proposed rail line.

The evaluation occurred between April 20, 2016 and June 1, 2017. The inspection has identified 11 types of habitat and 14 types of wetlands. These habitat types include: **upland mixed hardwood and pine forests, upland hardwood forests, upland plantation pine forests, wetland plantation pine forests, Carolina bays, plantation pine converted Carolina bays, depressional ponds, bottomland hardwood forested wetlands, open water, agricultural fields, roads and utilities.** The wetland types follow the Cowardin code (National Wetland Index) referenced in Table 1. The habitat types are based on observations in the field. The habitat and wetland types are shown on attached Maps, pages 1-17, and discussed below.

Habitat Types

A description of each habitat type is provided below and is representative of conditions at the time of evaluation. Table 2 provides the approximate acreage of each habitat type in the corridor.

The **upland mixed hardwood and pine forest (U43)** comprised 25.8 acres of the corridor and is characterized by an overstory composed primarily of loblolly pine (*Pinus taeda*) with some interspersed longleaf pine (*Pinus palustris*), southern red oak (*Quercus falcata*), pignut hickory (*Carya glabra*), and some interspersed live oaks (*Quercus virginiana*). Cover ranged from 40-70% in the overstory. The upland pine forest habitat found within and immediately adjacent to the corridor appeared to be approximately 30-50 years old; however, nothing within this habitat type was considered to be old growth. The midstory is composed of loblolly pine, southern red oak, pignut hickory, longleaf pine, and sweetgum (*Liquidambar styraciflua*) with a cover ranging from 10-30%. The shrub layer is sparse, with 10-20% cover consisting of wax myrtle (*Morella cerifera*), farkleberry (*Vaccinium arboreum*), redbay (*Persea borbonia*), and deerberry

(*Vaccinium stamineum*). The herbaceous layer is healthy, at approximately 30-50% cover, and was composed primarily of bracken fern (*Pteridium aquilinum*), broomstraw (*Andropogon virginicus*), longleaf woodoats (*Chasmanthium sessiliflorum*), dogfennel (*Eupatorium capillifolium*), panic grass (*Panicum sp.*), and slender lespedeza (*Lespedeza virginica*). Vine species include muscadine (*Vitis rotundifolia*), greenbriar (*Smilax sp.*), and sawtooth blackberry (*Rubus argutus*) making up approximately 10% of the cover.

The **upland hardwood forest (U43)** is similar to the mixed hardwood and pine forest and comprised 8.5 acres of the corridor; however, it is generally present only within ecotones between upland and wetland areas. The age classes found within this habitat type ranged from new growth to approximately 50 years old. No old growth was found within or adjacent to the corridor. While there is an occasional loblolly or longleaf pine in these areas, the overstory composition is primarily composed of hardwoods including: white oak (*Quercus alba*), post oak (*Quercus stellata*), live oak, southern red oak, and pignut hickory, with water oak (*Quercus nigra*) found on the lower slopes leading to the wetlands. Overstory closure ranges from 40-60%. The midstory (10-25% cover) consists of pignut hickory, sweetgum, red oak, red maple (*Acer rubrum*), American hornbeam (*Carpinus caroliniana*), and American holly (*Ilex opaca*). Shrub layers are sparse (0-10% cover), and consist of redbay and wax myrtle. The herbaceous layer is sparse, approximately 0-10% cover, and is composed primarily of bracken fern, cinnamon fern (*Osmunda cinnamomea*), broomstraw, and longleaf woodoats.

The **upland and wetland plantation pine forests (U42P, PFO4B)** comprised approximately 544.4 acres of the corridor and is characterized by an overstory composed primarily of loblolly pine. Plantation pine forests span both upland and wetland areas, as well as some former Carolina bay features that were converted to pine monoculture. These areas are intensively managed for silviculture with a first thinning typically at ages 12-15 years old, followed by a clear cut at 25-30 years old. Age classes along the corridor spanned from new growth to approximately 30 years old. These areas are bedded and extensively ditched. The planted pine forest habitat covers 61% of the corridor. The corridor spans multiple stands of pines, ranging from open thinned (70-80 Basal Area) stands to dense, pre-merchantable stands (140 Basal Area). As a result of recent clear cuts there are areas with no overstory or midstory. In thinned pine areas (70-80 BA), there is a midstory of sweet gum and red maple with approximately 10-20% cover. In denser pine areas (140 BA) there is no midstory or shrub layer due to 90-100% overstory cover. In open thinned pine stands the shrub layer consists of wax myrtle, redbay, fetterbush (*Lyonia lucida*), and deerberry, with 10-30% cover. The herbaceous layer is also somewhat sparse, approximately 0-10% cover, and is composed primarily of dwarf palmetto (*Sabal minor*), longleaf woodoats, plumegrass (*Saccharum giganteum*), giant cane (*Arundinaria gigantea*), Virginia chain fern (*Woodwardia virginiana*), cinnamon

fern, and netted chain fern (*Woodwardia areolata*). Sphagnum moss (*Sphagnum sp.*) is also present within some of the wetland areas.

Five **Carolina bay (PFO2C, PFO1H)** depressional wetlands are located within the project corridor comprising approximately 10.5 acres. These wetlands are seasonally to perennially inundated based upon their size. The genesis of this depressional habitat has been debated, although Piovan and Hodgeson¹ found nine distinct qualities are common to all Carolina bays: 1) oval shaped; 2) oriented northwest to southeast; 3) parallelism of the long axis; 4) sand rims above general elevation; 5) interior surface below the general elevation; 6) different soils within sand rim and outside of sand rim; 7) shallow; 8) flat sandy bottom; 9) naturally isolated features. Within the corridor there are five Carolina bays, four of which are named, including Bulltown Bay, Skeleton Bay, Todd Bay, and Beech Island Bay shown on Habitat Descriptions map pages 1, 5, 6, 7, 8, & 9, respectively. A large portion of these bays are ditched and either partially or entirely planted in loblolly pine. Within the remnant habitat, red maple, swamp tupelo (*Nyssa biflora*), and pond cypress (*Taxodium ascendens*) dominate the overstory at 30-40% cover with the oldest reaching approximately 50 years old; no areas within the habitat type are considered old growth. The midstory is sparse, consisting of the same species found in the overstory. Within more seasonally wet Carolina bays, a shrub and herbaceous layer is present consisting of redbay, dwarf palmetto (*Sabal minor*), and fetterbush in the shrub layer, with various grasses and sedges making up the herbaceous layer. Perennial flooded bays have no shrub or herbaceous vegetation present.

Plantation Pine Converted Carolina Bays were once Carolina bays but have been completely harvested, ditched, and planted in plantation pine for future harvest. This comprised 32.3 acres within the project corridor, and the timber within this habitat type was approximately 10 to 30 years of age. This habitat type mirrors the wetland plantation pine habitat type.

Several **depressional pond (PFO1C)** wetlands are interspersed along the corridor, covering approximately 17 acres. These wetlands are seasonally inundated and characterized by age classes ranging from new growth to approximately 30 years old. No old growth was found within this habitat type. The overstory is composed of black gum, sweet gum, red maple, and in larger gum ponds that are semi-permanently flooded, pond cypress is present. The overstory cover ranges from 20-40% in the overstory. The

¹ Piovan, S. & Hodgeson, M. 2016. How many Carolina bays? An analysis of Carolina bays from USGS topographic maps at different scales. Journal of Cartography and Geographic Information Science. Pgs 1-17.

midstory is sparse, approximately 10% cover, consists of black gum, sweet gum, and red maple. The shrub stratum is composed of fetterbush and redbay. The understory cover is variable, ranging from open water to 100% cover. Species in this stratum include smartweed (*Polygonum* spp.), arrowhead (*Sagittaria lancifolia*), soft rush (*Juncus effusus*), giant cane, netted chain fern, and various other grasses and sedges.

The **bottomland hardwood forested wetland (PFO1C, PFO2C, PFO1B)** habitat comprised 174.8 acres and is characterized by an overstory composed of bald cypress (*Taxodium distichum*), water oak, black gum, swamp tupelo and swamp chestnut oak (*Quercus michauxii*). Overstory closure ranged from 30-50% characterized by an age class from 10 to 50 years old. No old growth was found within or immediately adjacent to the proposed project corridor. The midstory is composed of bald cypress, black gum, sweetgum, and swamp tupelo characterized by a cover ranging from 10-20%. The shrub and herbaceous layer ranges from sparse to heavy, approximately 10-60% cover, and is composed primarily of dwarf palmetto, giant cane, sphagnum moss, Virginia chain fern and cinnamon fern based on the hydrologic regimen of the wetland. Areas that are seasonally flooded are characterized by a sparse understory due to flooding. Areas that are characterized as temporarily flooded or saturated contain a well-developed understory. Defined stream channels occur within a few of the bottomland hardwood forests within the proposed project corridor.

The project corridor crosses **open water (L1UBHh)** at the Diversion Canal between the Santee-Cooper lakes. This area comprised 2.4 acres of the corridor. The canal was excavated in 1941. It is 7.5 miles long, approximately 500 feet wide and approximately 12 feet deep. The bottom consists of sand and clay, with some sediments washed downstream from the Santee River. There is very little organic material or vegetation in this part of the canal and it was last dredged in 2014 to remove accumulated silt and sediments on the Lake Moultrie side of the canal. The Diversion Canal was once an important access for inland maritime trade, but today is used primarily for recreational access between the lakes.

Several small **agricultural fields (U21)** exist within the project corridor (1.3 acres), primarily as wildlife food plots. Commonly planted vegetation included chufa, wheat, peas and soybeans. In areas that are not planted, a variety of native grasses dominate, including: broomstraw, chalky bluestem (*Andropogon capillipes*), dog fennel, switchgrass (*Panicum virgatum*), and tapered rosette grass (*Dichanthelium acuminatum*). These areas are routinely disked and cultivated.

Various **Roads and Utilities** cross the corridor, comprising approximately 6% of the proposed project corridor (48.9 acres). The roads are filled, either paved or gravel, and

are culverted over wetland crossings. Utility right of ways are maintained throughout the proposed project corridor, from large transmission lines to smaller distribution lines.

Wetland Types and Condition

There are multiple wetland types within the project corridor. These wetlands have been classified by type and further by their existing condition as defined in Appendix C of the US Army Corps of Engineers' "Guidelines for Preparing a Compensatory Mitigation Plan"² (see Appendix A attached). Various wetland types share habitat types with differences lying in hydrologic periods, genesis of the wetland, and landscape position. Table 3 provides the approximate amount of each wetland type and its condition(s) in the corridor.

The majority ~62% (323.9 acres) of wetlands identified within the project corridor are within bedded **plantation pine forests**. Plantation pine forests span both upland and wetland areas and comprised approximately 66% of the corridor (576.7 Acres). These areas have been routinely logged with heavy equipment for decades. Bedding is the practice of using a plow to build up a raised "bed" on which the trees are planted to keep them elevated from surface water. As the trees grow, they use a substantial amount of water, lowering the water table in the area. These areas are ditched on the stand boundaries to remove excess surface water. Ditches are routed to larger canals that move water off site or into adjacent wetland features. Some Carolina bay wetland features have been converted to pine monoculture, and the plantation pine forest spans both upland and wetlands. These wetland areas are considered *Impaired* and have experienced heavy soil disturbance and compaction. In some areas, beds are constructed against the native topography, trapping water between beds.

The project corridor spans five **Carolina bays** identified as Bulltown Bay, Skeleton Bay, Todd Bay, Beech Island Bay, and an un-named bay. These areas comprise approximately 2% of the wetland acreage of the corridor (10.5 acres), and this habitat type covers approximately 1% of the total corridor. A part of Bulltown Bay that is impacted by the existing rail line is considered *Very Impaired* due to the fill material and lack of hydrologic connections through the railroad grade. Skeleton Bay, Todd Bay, and Beech Island Bay are all *Impaired* wetlands. They have been harvested and re-planted in loblolly pine. Within Beech Island Bay a utility easement is maintained, creating an emergent wetland habitat. Skeleton Bay and Todd Bay have been completely converted to plantation pine, thus these areas were counted as such.

The un-named Carolina bay is *Partially Impaired* due to timber harvesting up to the edges of the bay. This Carolina bay makes up over 1% of the wetlands identified within the corridor (8.4 acres). The outer ring of cypress has been removed, and loblolly has been planted in beds adjacent to the Carolina bay. On one border of the bay, the planted

pine has been recently clear-cut, and a ditch outfalls under the road to a culvert to maintain water below flood level within the Carolina bay.

The proposed project corridor contains multiple **depressional wetlands**. These comprised 3% (16.9 acres) of the total wetland acreage of the corridor and approximately 2% of the total corridor. The depressional wetlands along the corridor within industrial forestlands are considered *Impaired* due to the conversion of the landscape to pine monoculture. Minor ditching has altered the hydrology within these areas as well. The depression wetlands within the South Carolina Department of Natural Resources' (SCDNR) Hall Wildlife Management Area (WMA) are considered *Fully Functional* as they retain their natural hydrology. Although minor logging has taken place within these wetlands, they remain pristine wetlands.

Bottomland Hardwood forests compose 33% (174.8 acres) of the total wetland acreage of the corridor, and approximately 20% of the entire corridor. These areas exhibit evidence of past logging and are often bisected by roads with adequately sized culverts to allow unimpeded flow of water through the wetland. There are no old growth stands along the corridor; all stands are considered second or third growth based on species composition and tree size. Early successional wetland species such as river birch (*Betula nigra*), sweet gum, black willow (*Salix nigra*), water oak, and red maple dominate recently harvested bottomland hardwood areas. In older regeneration, bald cypress, swamp white oak, and swamp tupelo dominate. These areas mostly lack a defined tributary, but rather are seasonally saturated and flooded, to semi-permanently flooded wetlands. For those few bottomland hardwood forests with a defined watercourse, it often has been channelized and crossed by forestry roads. Hydrology is altered in the industrial forest lands through the extensive ditching to remove surface water. These ditches are routed into wetland areas for eventual downstream discharge into a larger named watercourse. The bottomland hardwood forests within the South Carolina Department of Natural Resources' (SCDNR) Hall Wildlife Management Area (WMA) are *Partially Impaired*. The hydrology of this area is partially altered with the construction of the Bulltown Ditch. There is also slight fragmentation with the construction of the CSX rail line crossing through wetlands shown on habitat type map, page 1, as well as ruts and soil compaction due to past logging activity within the wetland areas. The remainder of the corridor's bottomland hardwood wetlands are considered *Impaired* due to the extensive ditches altering the hydrology within these forest areas and fragmentation of the bottomlands with interspersed planting of loblolly pine.

The corridor crosses the Diversion Canal between Lakes Moultrie and Marion. This navigable **Open Water** wetland comprises <1% (2.4 acres) of the total wetlands within the corridor and < 1% of the total corridor. The open water is used for commercial and recreational purposes. The Diversion Canal was constructed in the 1980s by the US Army

Corps of Engineers. It provides aquatic habitat for a variety of species; however, there is no vegetation associated with the open water wetland. This area is considered *Very Impaired* due to the excavated nature of the canal and the periodic dredging to remove accumulated sediment. Also, spoil has been placed adjacent to the canal on either side, filling wetlands and altering the natural hydrology of these adjacent areas.

Linear Conveyances occur throughout the project corridor. These features are used to drain and direct water from one area to another. Some of these features hold water long enough to allow for wetland vegetation growth in the base and along the banks, while others do not. The larger linear conveyances on industrial timberland properties contain some water flow or evidence of recent flow in the form of drift deposits and scouring. Smaller linear conveyances are often dry or contain standing water. Some of these features have been dug in uplands, while others have been excavated in wetlands. All linear conveyances within the industrial timber properties are routinely maintained with a tracked excavator to promote unimpeded water flow during large storms. Often, spoil is placed adjacent to the linear conveyance or incorporated into an adjacent road. All linear conveyances within the project corridor are considered *Very Impaired* due to their excavated nature and purpose of altering or removing hydrology in the adjacent areas.

There are two areas within the corridor that exhibit characteristics of a perennial, relatively permanent water (PRPW) tributary, identified by the USACE as “Non-Wetland Waters.” Of the two (see Habitat Descriptions maps, pages 1 & 8) identified PRPW Tributaries, one is considered a naturally occurring feature with a sinuous channel and well-defined bed and bank. The channel is approximately 6-8 feet wide and the water level typically occurs approximately 5 feet below top of bank. This wetland feature crosses under various forestry roads via large concrete and metal culverts that are large enough not to impede the natural flow. There is no channelization of the water course. This wetland is considered a *Partially Impaired* wetland. Due to streamside management best management practices, the adjacent forest is buffered to protect water quality. Outside of the approximately 50’ buffer, loblolly pine is planted in rows for future harvest. This buffer consists of a mixed hardwood and pine forest with a sandy soil.

The second PRPW Tributary feature consists of a channelized run named “Bulltown Ditch” and is shown on Habitat Description maps page 1 & 2. The Bulltown Ditch extends over 18,000 feet from the Santee Canal off of Lake Moultrie to the Diversion Canal, bisecting Bulltown Bay. This feature is approximately 6 feet wide and 4 feet deep. The canal is crossed by various public and forestry roads as well as the CSX rail line serving the Cross Generating Station through large concrete and metal culverts. The Bulltown Ditch dates from sometime after the Santee Canal (circa 1793) and is a maintained watercourse. This wetland system is highly impacted and is considered a *Very Impaired* wetland feature. It removes hydrology from some areas and is an excavated

feature with an adjacent spoil berm that alters hydrology in the immediate area of the ditch. In some areas, the Bulltown Ditch flows through uplands before draining back into wetlands.

PALMETTO RAILWAYS – CROSS ROUTE WETLAND CLASSIFICATIONS	
Cowardin Code (NWI)	Description
PFO1B	Palustrine forested with broad-leaved deciduous vegetation, saturated soils
PFO1C	Palustrine forested with broad-leaved deciduous vegetation, seasonally flooded
PFO1H	Palustrine forested with broad-leaved deciduous vegetation, permanently flooded
PFO2C	Palustrine forested with needle-leaved deciduous vegetation, seasonally flooded
PFO4B	Palustrine forested with needle-leaved evergreen vegetation, saturated soils
PFO4C	Palustrine forested with needle-leaved evergreen vegetation, seasonally flooded
PSS1B	Palustrine scrub shrub with broad-leaved deciduous vegetation, saturated soils
PSS1E	Palustrine scrub shrub with broad-leaved deciduous vegetation, seasonally flooded/saturated
PSS1H	Palustrine scrub shrub with broad-leaved deciduous vegetation, permanently flooded
U14	Upland transportation and utilities
U21	Upland agriculture
U42P	Upland evergreen forest (pine)
U43	Upland mixed forest
L1UBHh	Lacustrine limnetic with unconsolidated bottom, permanently flooded due to diking

Table 1- Description of Cowardin Code (National Wetland Index) used to classify wetland types.

PALMETTO RAILWAYS - CROSS ROUTE HABITAT DESCRIPTIONS	
HABITAT DESCRIPTION	ACREAGE
AGRICULTURAL FIELDS	1.3
BOTTOMLAND HARDWOOD FORESTED WETLANDS	174.8
CAROLINA BAYS	10.5
DEPRESSIONAL PONDS	16.9
OPEN WATER	2.4
PLANTATION PINE CONVERTED CAROLINA BAYS	32.3
ROADS AND UTILITIES	48.9
UPLAND HARDWOOD FORESTS	8.5
UPLAND MIXED HARDWOOD AND PINE FORESTS	25.8
UPLAND PLANTATION PINE	252.8
WETLAND PLANTATION PINE	291.6
Total	865.8 Acres

Table 2- Acreage of different habitat types along the 22.7-mile Project Corridor

PALMETTO RAILWAYS - CROSS ROUTE WETLAND HABITAT INFORMATION		
HABITAT DESCRIPTION	CONDITION	ACREAGE
BOTTOMLAND HARDWOOD FORESTED WETLANDS	PARTIALLY IMPAIRED	94.2
BOTTOMLAND HARDWOOD FORESTED WETLANDS	IMPAIRED	71.2
BOTTOMLAND HARDWOOD FORESTED WETLANDS	VERY IMPAIRED	9.5
CAROLINA BAYS	PARTIALLY IMPAIRED	5.3
CAROLINA BAYS	IMPAIRED	5.2
DEPRESSIONAL PONDS	FULLY FUNCTIONAL	4.9
DEPRESSIONAL PONDS	PARTIALLY IMPAIRED	1.2
DEPRESSIONAL PONDS	IMPAIRED	9.8
DEPRESSIONAL PONDS	VERY IMPAIRED	1.0
PLANTATION PINE CONVERTED CAROLINA BAYS	IMPAIRED	32.3
WETLAND PLANTATION PINE	IMPAIRED	291.6
Total		526.2 Acres

Table 3 – Acreage and Condition of Wetland Habitat Types within Project Corridor

Appendix A

From the USACE's "Guidelines for Preparing a Compensatory Mitigation Plan"²

Existing Condition- the degree of disturbance relative to the ability of a site to perform its physical, chemical, and biological functions. This factor evaluates site disturbances relative to the existing functional state of the system.

Fully Functional- The typical suite of functions attributed to the aquatic resource type are functioning naturally. Existing disturbances do not substantially alter important functions. Examples include: Pristine (undisturbed) wetlands, aquatic resources with non-functional ditches or old logging ruts with no effective drainage, or minor selective cutting.

Partially Impaired- Site disturbances have resulted in partial or full loss of one or more functions typically attributed to the aquatic resource type but functional recovery is expected to occur through natural processes. Examples include: clear-cut wetlands, aquatic areas with ditches that impair but do not eliminate wetland hydrology, or temporarily cleared utility corridors.

Impaired- Site disturbances have resulting in the loss of one or more functions typically attributed to the aquatic resource type and functional recovery is unlikely to occur through natural processes. Restoration activities are required to facilitate recovery. Examples include: areas that have been impacted by surface drainage and converted to pine monoculture or agriculture, areas that are severely fragmented, or wetlands within maintained utility corridors.

Very Impaired- Site disturbances have resulted in the loss of most functions typically attributed to the aquatic resource type and functional recovery would require a significant restoration effort. Examples include: filled areas, excavated areas, or effectively drained wetlands (hydrology removed or significantly altered)

² USACE, Guidelines for Preparing a Compensatory Mitigation Plan. 2010. Pgs 1-114.

Appendix C: Noise and Vibration Assessment

CAMP HALL RAIL PROJECT

Submitted to:



**Palmetto Railways
540 East Bay Street
Charleston, South Carolina**

25 July 2017

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1.0 INTRODUCTION

1.1 Project Overview

Palmetto Railways (PR) is planning for the development of an industrial rail line to serve the Camp Hall Commerce Park in Berkeley County, South Carolina. The new rail line will connect Camp Hall Commerce Park to existing railroad right-of-way, near the Santee Cooper Cross Generating Station in Berkeley County.

The proposed rail corridor extends approximately 23 miles west to east between a point northeast out of Camp Hall Commerce Park to the existing railroad right-of-way near the Santee Cooper Cross Generating Station.

1.2 Noise and Vibration Overview

The purpose of this Report is to comply with NEPA requirements for the Proposed Action, on account of which PR proposes to operate 5 roundtrip freight trains per week from Camp Hall Commerce Park to existing railroad right-of-way, near the Santee Cooper Cross Generating Station in Berkeley County. Maximum operating speeds are projected to be 25 miles per hour (mph).

Figure 1-1 shows the project area for this Proposed Action. Along the project area, there is one ***Build Alternative*** that will be evaluated. For this Proposed Action, construction impacts will be assessed.

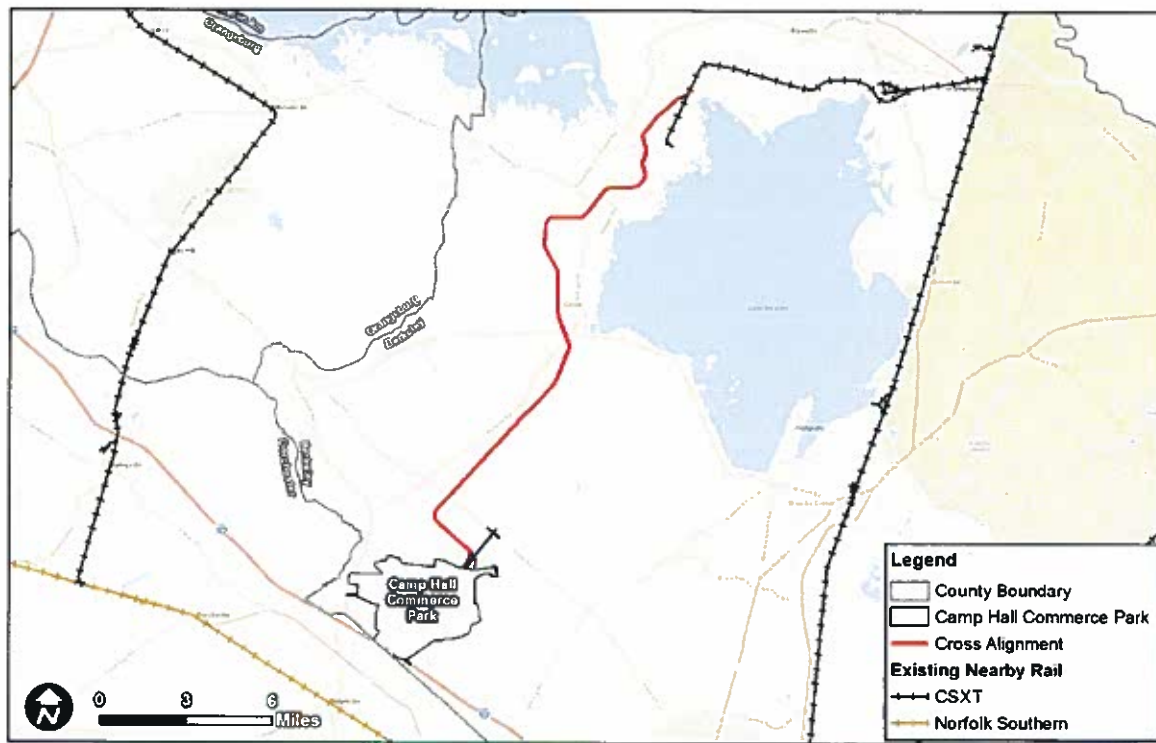


Figure 1-1: Project Alignment

Guidance has been developed by the Federal Transit Administration (FTA) published in "Transit Noise and Vibration Impact Assessment" [1] for conventional rail noise and vibration impact assessments, and FRA has developed complementary guidance for high-speed rail [2].

FTA transit noise and vibration impact assessment procedures are relied on by FRA in evaluating improvements to conventional passenger rail lines and stationary rail facilities and for assessments of horn noise. Since there are no existing federal guidance documents or methods specifically applicable for the evaluation of freight train traffic noise a supplemental freight rail analysis guideline was developed for the Chicago Rail Efficiency And Transportation Efficiency (CREATE) program [3] using the FTA procedures with certain modifications to allow for the evaluation of freight traffic.

The Project team performed a Screening Noise Assessment using aspects of the General Noise Assessment and General Vibration Assessment in accordance with FTA guidelines as well the CREATE Program guidelines. Future anticipated rail traffic volumes were evaluated in order to assess the Project-related effects of airborne noise.

1.3 Regulatory Setting

The jurisdictional authorities and corresponding regulations, statutes, and guidelines for determining potential impacts related to noise and vibration are summarized in Table 1-1.

Table 1-1: Regulations, Statutes and Guidelines for Noise and Vibration

Regulation, Statute, Guideline	Description
Federal	
National Environmental Policy Act (42 USC 4321 et seq.) [4]	Requires the consideration of potential environmental effects. NEPA implementation procedures are set forth in the President's Council on Environmental Quality's Regulations for Implementing NEPA (49 CFR 1105).
U.S. Army Corps of Engineers NEPA Environmental Regulations (33 CFR 230) [5]	Provides guidance for implementing the procedural provisions of NEPA for the Corps. It supplements CEQ regulations 40 CFR 1500–1508.
Noise Control Act of 1972 (42 USC Chapter 65) [6]	Protects the health and welfare of U.S. citizens from the growing risk of noise pollution, primarily from transportation vehicles, machinery, and other commerce products. Increased coordination between federal researchers and noise control activities; established noise emission standards; and presented noise emission and reduction information to the public.
U.S. Environmental Protection Agency Railroad Noise Emission Standards (40 CFR 201) [7]	Established final noise emission standards for surface carriers engaged in interstate commerce by railroad. This rulemaking is pursuant to Section 17 of the Noise Control Act of 1972.
FRA Railroad Noise Emission Compliance Regulations (49 CFR 210) [8]	These regulations indicate the minimum compliance regulations necessary to enforce EPA's Railroad Noise Emission Standards.
FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR 222) [9] and (49 CFR 229) [10]	Requires the sounding of locomotive horns at public highway rail grade crossings. Considers the allowance of quiet zones when the increase risk is mitigated with supplementary grade crossing safety measures.
Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006) [1]	Provides procedures and guidance for analyzing the level of noise and vibration, assessing the resulting impacts, and determining possible mitigation for most federally funded transit projects.
FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment (DOT/FRA/ORD-12/15) [2]	Provides guidance and methods for "the assessment of potential noise and vibration impacts resulting from proposed high-speed ground transportation projects."
CREATE Program, "CREATE Noise and Vibration Assessment Methodology (CREATE) [3]	Provides guidance and methods for "the assessment of potential noise impacts resulting from proposed freight rail transportation projects."
Local	
Berkeley County Noise Control Ordinances (Ordinance No. 05-08-56 [11] amended by Ordinance No. 09-04-21 [12])	Regulates excessive noise that interfere with the use, value and enjoyment of property and which pose a hazard to the public health, safety and welfare.

Notes:

USC = United States Code;

NEPA = National Environmental Policy Act;

Regulation, Statute, Guideline	Description
--------------------------------	-------------

CFR = Code of Federal Regulations;
FTA = Federal Transit Administration;
FRA = Federal Railroad Administration;

1.4 Methodology

The evaluation of potential noise and vibration impacts includes two parts: screening procedure and general assessment. The screening procedure is somewhat qualitative and uses basic information about a project and the area of proposed operation to develop an inventory of sensitive sites and/or receivers. Following the screening procedure, a general assessment was completed to develop more quantitative estimates of Project-related noise levels. By calculating Project-related train noise and existing noise at each receiver, the two types of noise can be compared with specific impact criteria, based on the type of land use that best describes the receiver. The impact criteria are used to designate each receiver as being severely impacted, moderately impacted, or not impacted (see discussion on Section **Error! Reference source not found.**). An inventory of impacts was then tabulated and used to make decisions regarding the potential need for noise mitigation.

The general noise assessment steps are described below. These steps are described in further detail in Section 3.0. The main items to consider are:

- **Source Levels** – Determine the Source Reference Level based on the type of project being assessed. For moving sources, the noise descriptor Sound Exposure Level (SEL) is used to describe a vehicle pass-by under reference operating conditions. For stationary sources, the SEL pertains to a typical operation for one hour.
- **Project Operating Conditions** – Convert the noise source reference level to noise exposure in terms of “hourly equivalent sound level” or $L_{eq}(h)$ or “day-night sound level” or L_{dn} under approximate operating characteristics. Noise exposure is first calculated at a reference distance of 50 feet from the track or corridor centerline.
- **Propagation Characteristics** – Generate noise exposure versus distance curves for each source that will allow for calculation of noise exposure at any distance from the corridor. Apply estimates of shielding attenuation from rows of buildings so that estimates of noise impact are not unrealistically high.
- **Study Area Characteristics** – Estimate the existing noise exposure at surrounding areas prior to any project construction or implementation.
- **Noise Impact Estimation** – Using impact criteria provided in the FRA guidelines, locate the distance from source at which project noise exposure related to existing noise exposure results in impact. Calculate distance to moderate impact and severe impact along the corridor, and generate impact contours, signifying the outer limits of impact.
- **Noise Impact Inventory** – Tabulate impacted receivers within moderate and severe impact contours, making sure to account for shielding attenuation from buildings.
- **Noise Mitigation** – In areas where impacts have been identified, estimate the noise reduction that would result from mitigation measures and repeat the tabulation of noise impacts after mitigation.

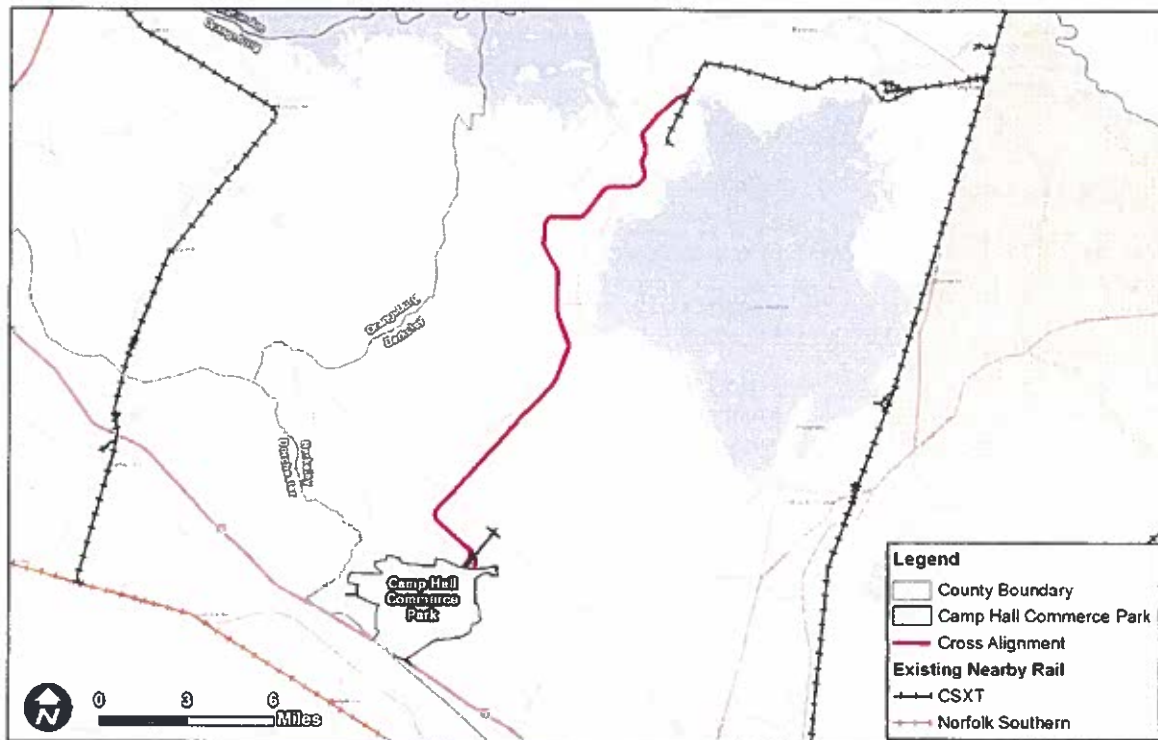


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- **Noise Impact Inventory** – Tabulate impacted receivers within moderate and severe impact contours, making sure to account for shielding attenuation from buildings.
- **Noise Mitigation** – In areas where impacts have been identified, estimate the noise reduction that would result from mitigation measures and repeat the tabulation of noise impacts after mitigation.

The FTA model has been adopted by the FRA, however the FTA model – which can be found on the FTA Noise Impact Assessment Spreadsheet (FTA Spreadsheet [13] ¹), is directly applicable to conventional rail noise. A supplemental freight rail analysis spreadsheet (CREATE Spreadsheet [14] [15]²) tool was developed for the Chicago Rail Efficiency And Transportation Efficiency (CREATE) program using the FTA Manual model procedures [3]. This tool was used for the purposes of the general assessment undertaken for this project.

1.5 Project Traffic Description

The Proposed Project will be used solely for freight traffic. The current traffic scenario is identified in Table 1-2 which reflects the basic assumptions for the impact assessment.

Table 1-2: General Assumptions for Project Traffic

<i>Line</i>	Assumption	Value	Notes
1	Total Traffic Per Day	$\frac{5}{7}$ (0.71)	Corresponds to a total of 5 trains per week
1.a	Average Hourly Daytime Traffic (7AM – 10PM)	$\frac{2.5}{7} \times \frac{1}{15}$ (0.024)	From Line 1, considered that half of the traffic will occur during day-time
1.b	Average Hourly Nighttime Traffic (10PM – 7AM)	$\frac{2.5}{7} \times \frac{1}{9}$ (0.040)	From Line 1, considered that half of the traffic will occur during night-time
2	Typical Train make-up		
2.a	Number of Locomotives	2	Per Train
2.b	Number of Cars	30	Per Train
2.c	Length of Car	76 ft	-
2.d	Speed	25 mph	-

2.0 INVENTORY OF SENSITIVE SITES

2.1 Study Area

The study area for direct impacts is within 1 mile of the project centerline. Figure 2-1 illustrates the study area.

¹ Federal Transit Administration Noise Impact Assessment Spreadsheet.

<https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/noise-impact-assessment-spreadsheet>

² CREATE Freight Noise and Vibration Model Spreadsheet. <https://www.fra.dot.gov/eLib/Details/L03727>

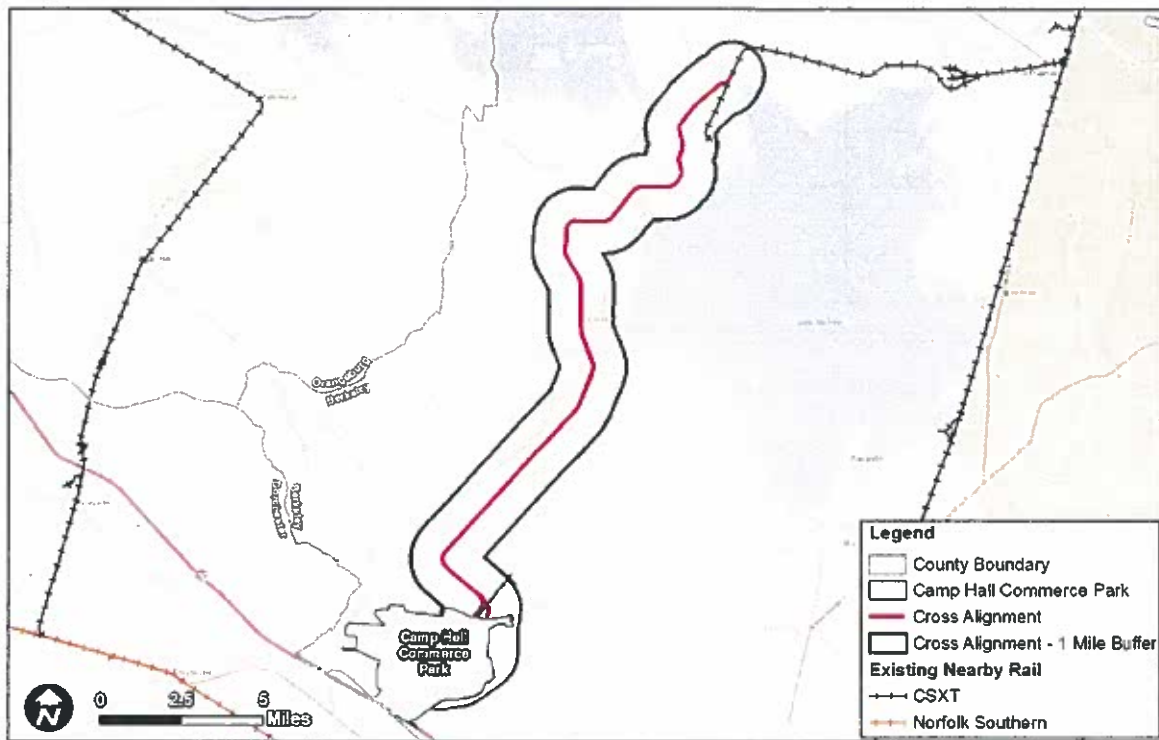


Figure 2-1: Study Area

2.2 Screening Areas

Screening distances were developed to identify the potential limits of noise impact from freight and passenger activity. The screening distances were based on the FTA Manual³. It must be noted that the FTA Manual does not provide a direct recommendation for the screening distance for a project with similar traffic as the Project under assessment.

As per FTA manual the screening distances are:

- For the project alignment: 750 ft
- In proximity of a crossing where train mounted horns will be used: 1,600 ft

The definition of proximity to a crossing is found in the FRA regulations⁴. The locomotive horn shall begin to be sounded at least 15 seconds, but no more than 20 seconds, before the locomotive enters the crossing. With a project speed of 25 mph, this results in a distance of 733 ft from all public crossings. The screening distances is presented in Figure 2-2.

³ FTA Manual Table 4-1 and 4-2.

⁴ 49 CFR 222, § 222.21 (2)

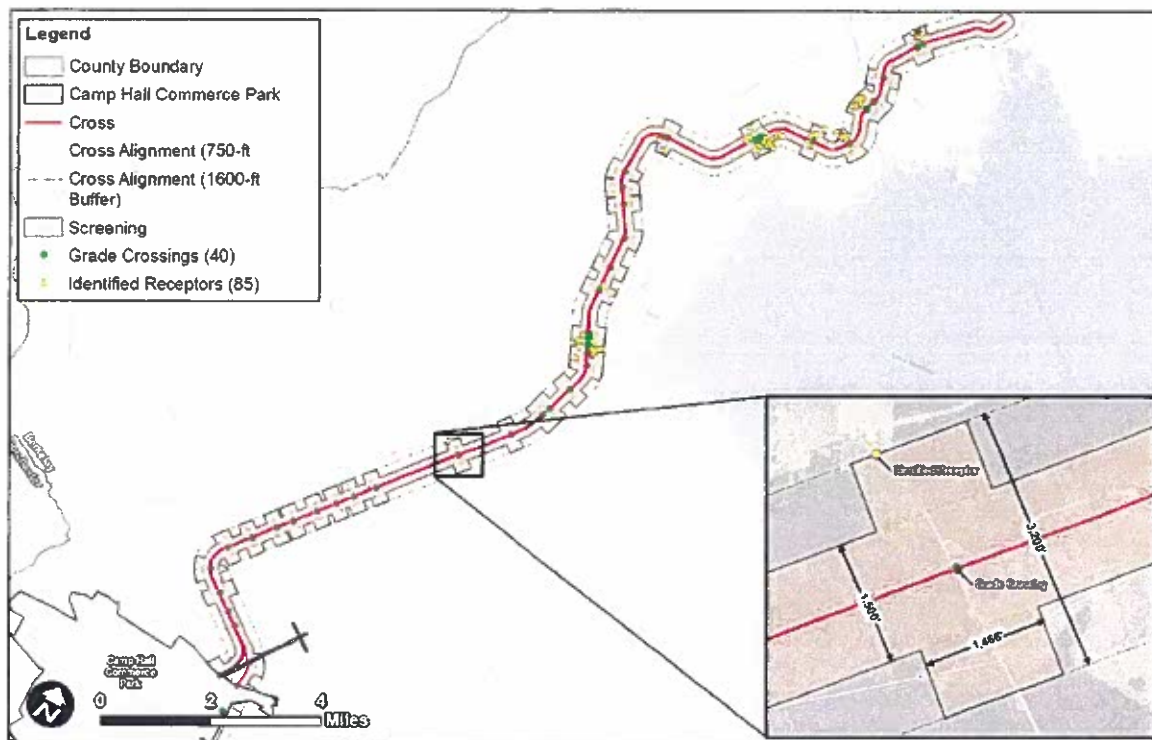


Figure 2-2: Screening Distances

2.3 Zoning Review

A review of the Berkeley County and Municipal Zoning Classifications was completed. Figure 2-3 shows the Berkeley County Zoning Map⁵.

⁵ Berkeley County Zoning Map, updated on February 14, 2014, as retrieved from http://gis.berkeleycountysc.gov/PDF/ZONING_OVERALL.pdf

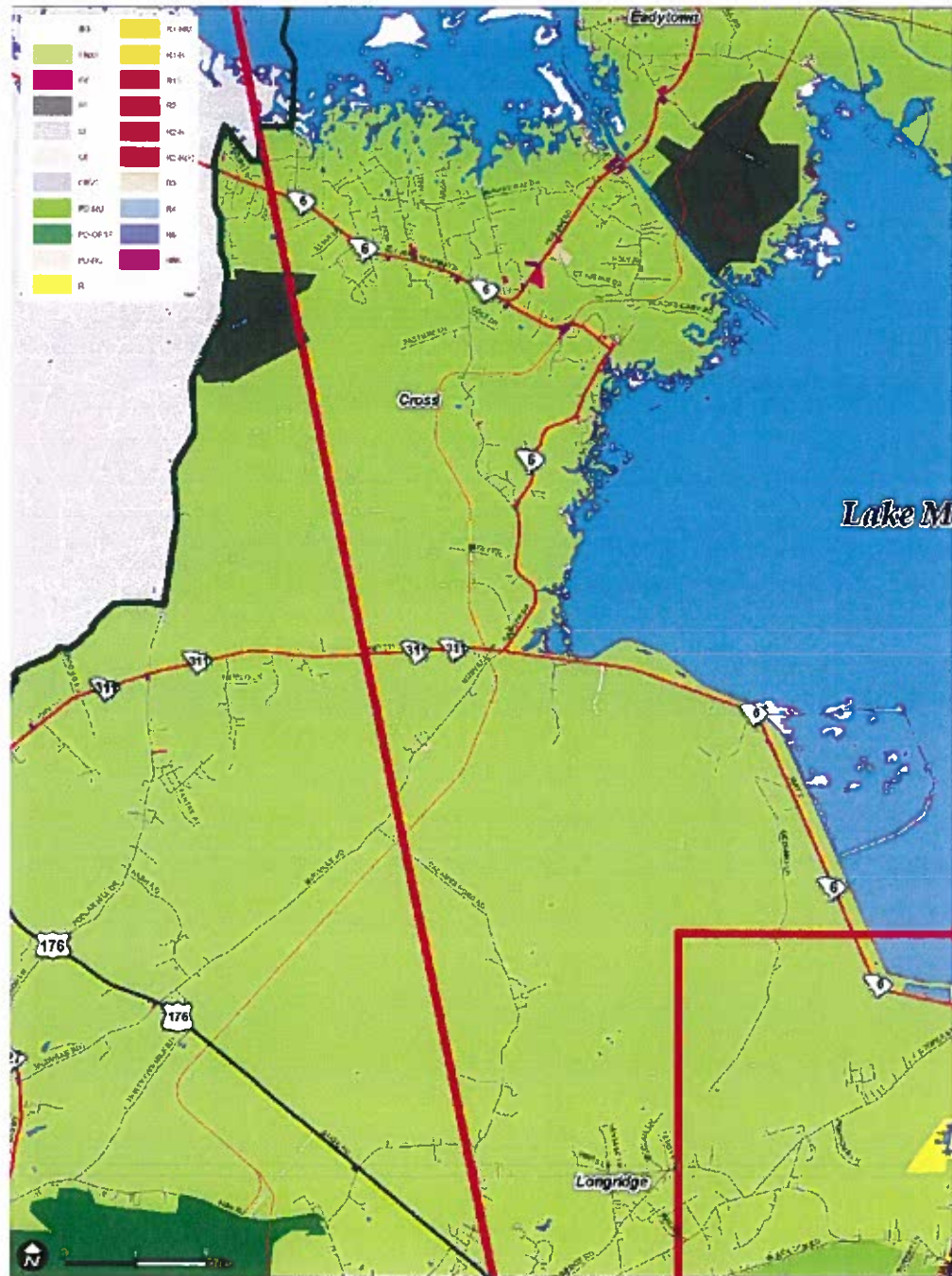


Figure 2-3: Berkeley County (SC) Zoning Map

The Project alignment passes through an area mainly designated as FLEX1. As per the Code of Ordinances, Berkeley County, South Carolina (Berkeley County Code) [16], FLEX1 is an Agricultural District. One of the permitted uses of this zone is for Residential Uses and therefore individual or clusters of residential buildings may be found. Near the intersection of the Project alignment and Highway 6, the alignment will cross a zoning classified as RNC. As per Berkeley

County Code, this zone is for Rural and neighborhood commercial district. Within a RNC zone permitted uses include residential, commercial, recreational and institutional uses. On the portion of the Project alignment north of the Diversion Canal, the alignment will cross a zone classified as HI. As per Berkeley County Code, this zone is for Heavy Industrial. Within a HI zone permitted uses include agricultural, commercial, industrial, recreational and institutional uses.

2.4 Noise Evaluation Areas

The screening distance is variable within the study area, so the study area was subdivided into noise evaluation areas (NEA's) assumed to have similar background noise conditions. Each NEA was evaluated in terms of unique noise receptors for analysis. A list of all the NEA's for the project and receptors is presented in Table 2-1.

Table 2-1: Receptors Identified During Screening

(A)	(B)	(C)	(D)		(E)		(F)	(G)	(H)
NEA	Receptor	Address	Coordinates		Existing Land Use	Type of Structure	Distance to Alignment [ft]		
			Longitude	Latitude					
NEA_01	PR_01	2341 Mudville Road	-80.20154756	33.24418234	FLEX1	Residential	1600		
NEA_02	PR_02	2924 Mudville Road	-80.17602582	33.27767545	FLEX1	Residential	1200		
NEA_03	PR_03a	2991 Mudville Road	-80.17219556	33.28018193	FLEX1	Residential	450		
	PR_03b	n/a	-80.17193846	33.28002533	FLEX1	Residential	660		
NEA_04	PR_04a	n/a	-80.17286622	33.28034991	FLEX1	Residential	100		
	PR_04b	2982 Mudville Road	-80.17286622	33.28034991	FLEX1	Residential	180		
	PR_04c	n/a	-80.17286622	33.28034991	FLEX1	Residential	310		
NEA_05	PR_05a	n/a	-80.17203945	33.28165162	FLEX1	Residential	523		
	PR_05b	n/a	-80.17203945	33.28165162	FLEX1	Residential	690		
	PR_05c	n/a	-80.17203945	33.28165162	FLEX1	Residential	915		
NEA_06	PR_06a	1030 Highway 311	-80.17038301	33.28232898	FLEX1	Residential	1000		
	PR_06b	n/a	-80.17038301	33.28232898	FLEX1	Residential	1215		
	PR_06c	1015 Ranger Drive	-80.17038301	33.28232898	FLEX1	Residential	1415		
NEA_07	PR_07	n/a	-80.17240948	33.28309182	FLEX1	Residential	415		
NEA_08	PR_08a	Red Ash Lane	-80.17657933	33.28122901	FLEX1	Residential	790		
	PR_08b	1119 Highway 311	-80.17657933	33.28122901	FLEX1	Residential	915		
	PR_08c	J.L. Williams House	-80.1777997	33.28113809	FLEX1	Historical	1390		
NEA_09	PR_09	1126 Highway 311	-80.1769639	33.28415208	FLEX1	Residential	460		
NEA_10	PR_10	276 George Wigfall Road	-80.17321196	33.29620146	FLEX1	Residential	1450		
NEA_11	PR_11	Dora Way	-80.17697782	33.29772158	FLEX1	Residential	250		
NEA_12	PR_12a	n/a	-80.1797322	33.33891432	FLEX1	Residential	430		

(A)	(B)	(C)	(D)		(E)		(F)	(G)	(H)
NEA	Receptor	Address	Coordinates		Existing Land Use	Type of Structure	Distance to Alignment [ft]		
			Longitude	Latitude					
NEA_13	PR_12b	n/a	-80.1797322	33.33891432	FLEX1	Residential	590		
	PR_13	n/a	-80.17750646	33.33684509	FLEX1	Residential	1285		
NEA_14	PR_14a	n/a	-80.15531755	33.34896562	FLEX1	Residential	260		
	PR_14b	n/a	-80.15531755	33.34896562	FLEX1	Residential	450		
	PR_14c	n/a	-80.15531755	33.34896562	RNC	Residential	295		
	PR_14d	n/a	-80.15491699	33.34986539	FLEX1	Residential	485		
NEA_15	PR_15	Abraham Lane	-80.15585582	33.35062424	FLEX1	Residential	1220		
NEA_16	PR_16a	Cherokee Path Lane	-80.15166305	33.34746302	FLEX1	Residential	630		
	PR_16b	Cherokee Path Lane	-80.15166305	33.34746302	FLEX1	Residential	800		
	PR_16c	Cherokee Path Lane	-80.15166305	33.34746302	FLEX1	Residential	1060		
NEA_17	PR_17a	n/a	-80.15135013	33.34973389	FLEX1	Residential	310		
	PR_17b	1138 Old Highway 6	-80.15135013	33.34973389	RNC	Residential	245		
	PR_17c	n/a	-80.15135013	33.34973389	FLEX1	Residential	605		
NEA_18	PR_18a	n/a	-80.14971915	33.34898574	FLEX1	Residential	930		
	PR_18b	n/a	-80.14971915	33.34898574	FLEX1	Residential	867		
	PR_18c	n/a	-80.14971915	33.34898574	FLEX1	Residential	1045		
NEA_19	PR_19a	n/a	-80.14853795	33.34930919	FLEX1	Residential	885		
	PR_19b	245 Harley Circle	-80.14853795	33.34930919	FLEX1	Residential	845		
	PR_19c	n/a	-80.14853795	33.34930919	FLEX1	Residential	1015		
	PR_19d	Jerusalem Church	-80.14853795	33.34930919	FLEX1	Institutional	1240		
NEA_20	PR_19e	n/a	-80.14853795	33.34930919	FLEX1	Residential	1550		
	PR_20	n/a	-80.1517578	33.35206979	FLEX1	Residential	135		
NEA_21	PR_21a	n/a	-80.1476464	33.35198334	FLEX1	Residential	745		

(A)	(B)	(C)	(D)		(E)	(F)	(G)	(H)
NEA	Receptor	Address	Coordinates		Latitude	Existing Land Use	Type of Structure	Distance to Alignment [ft]
			Longitude					
	PR_21b	n/a	-80.1476464		33.35198334	FLEX1	Residential	755
	PR_21c	n/a	-80.1476464		33.35198334	FLEX1	Residential	735
	PR_21d	n/a	-80.147611		33.35210629	FLEX1	Residential	625
	PR_21e	n/a	-80.14750468		33.35210527	FLEX1	Residential	475
	PR_21f	n/a	-80.14750468		33.35210527	FLEX1	Residential	640
	PR_21g	n/a	-80.14683957		33.35251171	FLEX1	Residential	735
NEA_22	PR_22	n/a	-80.14564716		33.35576468	FLEX1	Residential	388
NEA_23	PR_23a	n/a	-80.1384932		33.35667831	FLEX1	Residential	530
	PR_23b	n/a	-80.13716901		33.3569272	FLEX1	Residential	725
NEA_24	PR_24a	2249 Ranger Drive	-80.13711175		33.35401177	FLEX1	Residential	195
	PR_24b	2243 Ranger Drive	-80.13711175		33.35401177	FLEX1	Residential	360
NEA_25	PR_25a	n/a	-80.13554441		33.35889405	FLEX1	Residential	1507
	PR_25b	n/a	-80.13554441		33.35889405	FLEX1	Residential	1570
NEA_26	PR_26a	n/a	-80.13058773		33.35935441	FLEX1	Residential	1404
	PR_26b	n/a	-80.13058773		33.35935441	FLEX1	Residential	1130
	PR_26c	n/a	-80.13058773		33.35935441	FLEX1	Residential	1055
	PR_26d	n/a	-80.12868491		33.35913038	FLEX1	Residential	802
	PR_26e	n/a	-80.12868491		33.35913038	FLEX1	Residential	790
	PR_26f	n/a	-80.12669654		33.35881665	FLEX1	Residential	266
NEA_27	PR_27a	n/a	-80.12884593		33.36820866	FLEX1	Residential	1260
	PR_27b	n/a	-80.12918121		33.36803004	FLEX1	Residential	905
	PR_27c	n/a	-80.12922861		33.36863191	FLEX1	Residential	876
	PR_27d	n/a	-80.12922861		33.36863191	FLEX1	Residential	915

(A)	(B)	(C)	(D)	(E)		(F)	(G)	(H)
				Longitude	Latitude			
NEA	Receptor	Address						
	PR_27e	n/a	-80.12859147	33.36933671		FLEX1	Residential	679
	PR_27f	n/a	-80.12859147	33.36933671		FLEX1	Residential	561
	PR_27g	n/a	-80.12859147	33.36933671		FLEX1	Residential	815
	PR_27h	n/a	-80.12859147	33.36933671		FLEX1	Residential	1288
	PR_27i	n/a	-80.12828963	33.37024506		FLEX1	Residential	950
NEA_28	PR_27j	n/a	-80.12828963	33.37024506		FLEX1	Residential	1028
	PR_28a	n/a	-80.12118024	33.39158984		FLEX1	Residential	1454
	PR_28b	n/a	-80.12146512	33.39216728		FLEX1	Residential	1234
	PR_28c	n/a	-80.12146512	33.39216728		FLEX1	Residential	1260
	PR_28d	n/a	-80.12146512	33.39216728		FLEX1	Residential	1260
	PR_28e	n/a	-80.12146512	33.39216728		FLEX1	Residential	1170
	PR_28f	n/a	-80.12133495	33.39206548		FLEX1	Residential	1130
	PR_28g	n/a	-80.121268	33.39189461		FLEX1	Residential	1005
	PR_28h	n/a	-80.121268	33.39189461		FLEX1	Residential	995
	PR_28i	n/a	-80.121268	33.39189461		FLEX1	Residential	965
	PR_28j	n/a	-80.121268	33.39189461		FLEX1	Residential	1050
	PR_28k	n/a	-80.121268	33.39189461		FLEX1	Residential	900
	PR_28l	n/a	-80.12082629	33.3914237		FLEX1	Residential	751

Table Notes:

- (A) NEA – Noise Evaluation Area
- (B) Receptor – Receptor labeling used in Figure 3a to 3e
- (C) Address – Receptor address (if available)
- (D) Longitude – Receptor longitude
- (E) Latitude – Receptor latitude
- (F) Existing Land Use – Land use as identified in Local Planning

- (G) **Type of Structure** – Type of structure identified as part of the screening
- (H) **Distance to Track Alignment [ft]** – Measured distance from receptor location to track alignment.

2.5 Noise Evaluation Criteria

The FTA and FRA established similar procedures and guidelines for assessing train noise. Train noise is generally expressed in terms of A-weighted sound pressure level as a function of time. The time descriptor used in this train noise assessment is the day-night noise level (L_{dn}). The L_{dn} can be thought of as a 24-hour average noise level that penalizes noise events that happen at night (10pm to 07am) because most people are more annoyed by noise at nighttime than during the daytime.

This noise assessment assessed Project-related noise at land uses where overnight sleep occurs (primarily residences); this is consistent with FRA guidance. Residences were identified by visual inspection of digital aerial photographs; no site surveys were performed. The impact assessment, discussed later in this document, uses the term receptors to refer to land uses where overnight sleep occurs; each noise impact identified later in this report represents a single receptor, or land use where overnight sleep occurs.

The FTA noise impact criteria⁶ are defined by two curves, representing severe and moderate noise impacts, which are defined as:

- **Severe Impact.** A significant percentage of people are highly annoyed by noise in this range. Noise mitigation would normally be specified for severe impact areas unless it is not feasible or reasonable (unless there is no practical method of mitigating the impact).
- **Moderate Impact.** In this range, other project-specific factors are considered to determine the magnitude of the impact and the need for mitigation. Other factors include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

Each of these curves are expressed for the three following land use categories defined in the FTA Manual⁷:

- **Category 1:** Tracts of land where quiet is an essential element for their intended purpose. This category includes tracts of land set aside for serenity and quiet and such land uses as outdoor concert pavilions, as well as National Historical Landmarks with significant outdoor use.
- **Category 2: Residential** – This category covers all residential land uses and any buildings where people sleep, such as hotels and hospitals.
- **Category 3: Institutional** – This category includes schools, parks, libraries, cemeteries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading.

Figure 2-4 illustrates the FTA noise impact criteria, these are based on existing noise exposure and project-related noise exposure. FTA noise impact thresholds vary with existing noise levels and with the land time use.

⁶ Noise impact criteria is identified in **Figure 3-1** from the FTA Manual

⁷ Land use categories are identified in **Table 3-2** from the FTA Manual

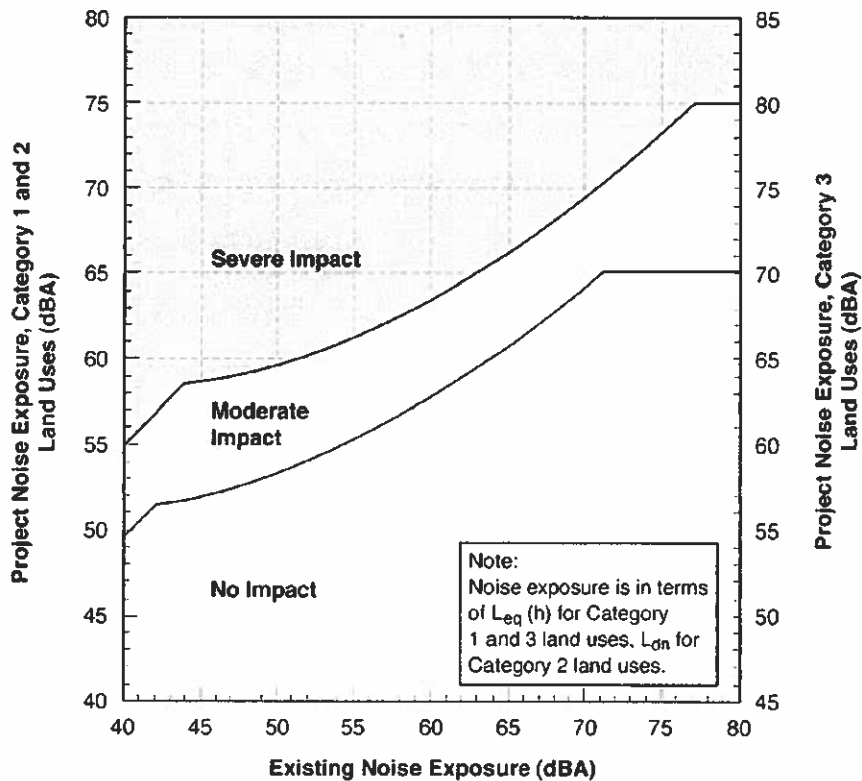


Figure 2-4: FTA Noise Impact Criteria

2.6 Existing Noise Levels

The existing noise levels were estimated based on **Section 5.4** of the FTA Manual. In proximity of major roadways, the estimate existing noise level was determined based on noise level estimation with distance to the roadway (**Table 5-7** of the FTA Manual). When there are no major roadways and the noise characteristics that surround a receptor are far enough from major roadways and is dominated by local streets and local community activity the existing noise levels were estimated based on population density (**Table 5-7** of the FTA Manual).

Existing noise exposure levels are presented on Table 2-2: Existing Noise Exposure Levels are based on the methodology described above.

Table 2-2: Existing Noise Exposure Levels

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	Near Major Roadway	Roadway	Distance [ft]	Census		Based on...	Leq,D	Leq,E	Leq,N	Ldn
				County	Population Density [pp/sq-mi]					
				Existing Noise Exposure (FTA Tbl 5-7)						
PR_01	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_02	No	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_03a	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_03b	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_04a	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_04b	Yes	Old Hwy 6	535	Berkeley	122	Population Density	40	35	30	40
PR_04c	Yes	Old Hwy 6	215	Berkeley	122	Population Density	40	35	30	40
PR_05a	Yes	Old Hwy 6	190	Berkeley	122	Other Roadway	60	55	50	60
PR_05b	Yes	Old Hwy 6	215	Berkeley	122	Other Roadway	60	55	50	60
PR_05c	Yes	Old Hwy 6	750	Berkeley	122	Other Roadway	60	55	50	60
PR_06a	Yes	State Hwy 6	680	Berkeley	122	Other Roadway	60	55	50	60
PR_06b	Yes	State Hwy 6	770	Berkeley	122	Population Density	40	35	30	40
PR_06c	No	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_07	Yes	State Hwy 6	95	Berkeley	122	Other Roadway	55	50	45	55
PR_08a	Yes	State Hwy 6	105	Berkeley	122	Other Roadway	50	45	40	50
PR_08b	Yes	State Hwy 6	160	Berkeley	122	Other Roadway	60	55	50	60
PR_08c	Yes	State Hwy 6	318	Berkeley	122	Other Roadway	50	45	40	50
PR_09	Yes	State Hwy 6	140	Berkeley	122	Other Roadway	50	45	40	50
PR_10	Yes	State Hwy 6	195	Berkeley	122	Population Density	40	35	30	40
PR_11	Yes	State Hwy 6	145	Berkeley	122	Population Density	40	35	30	40

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	Near Major Roadway	Roadway	Distance [ft]	Census		Based on...	Leq,D	Leq,E	Leq,N	Ldn
				County	Population Density [ppl/sq-mi]					
PR_12a	Yes	State Hwy 6	270	Berkeley	122	Population Density	40	35	30	40
PR_12b	Yes	State Hwy 6	100	Berkeley	122	Population Density	40	35	30	40
PR_13	Yes	State Hwy 6	110	Berkeley	122	Population Density	40	35	30	40
PR_14a	Yes	State Hwy 6	215	Berkeley	122	Other Roadway	50	45	40	50
PR_14b	Yes	State Hwy 6	645	Berkeley	122	Other Roadway	55	50	45	55
PR_14c	No	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_14d	No	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_15	No	n/a	n/a	Berkeley	122	Other Roadway	50	45	40	50
PR_16a	No	n/a	n/a	Berkeley	122	Other Roadway	50	45	40	50
PR_16b	No	n/a	n/a	Berkeley	122	Other Roadway	50	45	40	50
PR_16c	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_17a	No	n/a	n/a	Berkeley	122	Other Roadway	65	60	55	65
PR_17b	No	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_17c	Yes	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_18a	Yes	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_18b	Yes	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_18c	Yes	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_19a	Yes	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_19b	Yes	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_19c	No	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_19d	No	n/a	n/a	Berkeley	122	Other Roadway	60	55	50	60
PR_19e	No	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55

(A)	(B)	(C)	(D)	(E)	(F)	(G)	Existing Noise Exposure (FTA Tbl 5-7)				
Receptor	Near Major Roadway	Roadway	Distance [ft]	Census		Based on...	Leq,D	Leq,E	Leq,N	L _{dn}	
				County	Population Density [ppl/sq-mi]						
PR_20	No	n/a	n/a	Berkeley	122	Other Roadway	50	45	40	50	
PR_21a	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21b	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21c	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21d	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21e	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21f	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_21g	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_22	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_23a	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_23b	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_24a	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_24b	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40	
PR_25a	Yes	State Rd S-8-708	155	Berkeley	122	Population Density	40	35	30	40	
PR_25b	Yes	State Rd S-8-708	150	Berkeley	122	Population Density	40	35	30	40	
PR_26a	Yes	State Rd S-8-708	250	Berkeley	122	Population Density	40	35	30	40	
PR_26b	Yes	State Rd S-8-708	355	Berkeley	122	Population Density	40	35	30	40	
PR_26c	Yes	State Rd S-8-708	405	Berkeley	122	Population Density	40	35	30	40	
PR_26d	Yes	State Rd S-8-708	322	Berkeley	122	Population Density	40	35	30	40	
PR_26e	Yes	State Rd S-8-708	373	Berkeley	122	Population Density	40	35	30	40	
PR_26f	Yes	State Rd S-8-708	317	Berkeley	122	Population Density	40	35	30	40	
PR_27a	Yes	State Rd S-8-708	320	Berkeley	122	Population Density	40	35	30	40	

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	Near Major Roadway	Roadway	Distance [ft]	Census		Based on...	Leq,D	Leq,E	Leq,N	Ldn
				County	Population Density [ppl/sq-mi]					
PR_27b	Yes	State Rd S-8-708	195	Berkeley	122	Population Density	40	35	30	40
PR_27c	Yes	State Rd S-8-708	140	Berkeley	122	Population Density	40	35	30	40
PR_27d	Yes	State Rd S-8-708	155	Berkeley	122	Population Density	40	35	30	40
PR_27e	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_27f	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_27g	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_27h	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_27i	No	n/a	n/a	Berkeley	122	Population Density	40	35	30	40
PR_27j	Yes	Old Hwy 6	535	Berkeley	122	Population Density	40	35	30	40
PR_28a	Yes	Old Hwy 6	215	Berkeley	122	Other Roadway	60	55	50	60
PR_28b	Yes	Old Hwy 6	190	Berkeley	122	Other Roadway	60	55	50	60
PR_28c	Yes	Old Hwy 6	215	Berkeley	122	Other Roadway	55	50	45	55
PR_28d	Yes	Old Hwy 6	750	Berkeley	122	Other Roadway	55	50	45	55
PR_28e	Yes	State Hwy 6	680	Berkeley	122	Other Roadway	50	45	40	50
PR_28f	Yes	State Hwy 6	770	Berkeley	122	Other Roadway	55	50	45	55
PR_28g	No	n/a	n/a	Berkeley	122	Other Roadway	55	50	45	55
PR_28h	Yes	State Hwy 6	95	Berkeley	122	Other Roadway	55	50	45	55
PR_28i	Yes	State Hwy 6	105	Berkeley	122	Other Roadway	55	50	45	55
PR_28j	Yes	State Hwy 6	160	Berkeley	122	Other Roadway	60	55	50	60
PR_28k	Yes	State Hwy 6	318	Berkeley	122	Other Roadway	60	55	50	60
PR_28l	Yes	State Hwy 6	140	Berkeley	122	Other Roadway	60	55	50	60

Table Notes:

(I) **Receptor** – Receptor labeling used in Figure 3a to 3e.

- (J) **Near Major Roadway** – Identifies if the receptor is in proximity of a major roadway.
- (K) **Roadway** – Identifies the major roadway in proximity of the receptor
- (L) **Distance [ft]** – Measured distance from receptor location to major roadway.
- (M) **County** – County that the receptor is located within.
- (N) **Population Density** – County population density in number of people per square mile.
- (O) **Existing Noise Exposure – Base on...** – Defines the columns used for estimation of noise levels based on **Table 5-7** from the FTA Manual.
- (P) $L_{eq,D}$ – Day-time L_{eq} .
- (Q) $L_{eq,E}$ – Evening L_{eq} .
- (R) $L_{eq,E}$ – Night-Time L_{eq} .
- (S) L_{DN} – Day-Night sound pressure level.

2.7 Vibration Evaluation Criteria

The FTA Manual provides a calculation method for predicting vibration levels for a generalized assessment. The criteria for ground borne vibration is established based on frequency of operation and specific land uses. The three identified land uses⁸ for vibration assessment are:

- **Vibration Category 1 – High Sensitivity:** Included in Category 1 are buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.
- **Vibration Category 2 – Residential:** This category covers all residential land uses and any buildings where people sleep, such as hotels and hospitals. No differentiation is made between different types of residential areas.
- **Vibration Category 3 – Institutional:** Vibration Category 3 includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

There are also some buildings that can be very sensitive to vibration and noise but do not fit into any of the three categories previously listed. Examples include concert halls, TV and recording studios, and theaters. These buildings have their own impact criteria and are treated separately from the aforementioned categories.

The limits are presented in Table 2-3 which represent the FTA Manual⁹ limits for both ground borne vibration (GBV) and ground borne noise (GBN).

Table 2-3: Ground Borne Vibrations (GBV) Impact and Ground-Borne Noise (GBN) Impact Criteria for General Assessment

Land Use Category	GBV Impact Levels (VdB re 1 µin/sec)			GBN Impact Levels (dB re 20 micro Pascals)		
	Frequent Events ¹	Occasional Events ²	Infrequent Events ³	Frequent Events ¹	Occasional Events ²	Infrequent Events ³
Category 1: Buildings where vibration would interfere with interior operations	65 VdB ⁴	65 VdB ⁴	65 VdB ⁴	N/A ⁵	N/A ⁵	N/A ⁵
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

⁸ Land use categories are identified in **Section 8.1.1** from the FTA Manual

⁹ Impact limits for operational vibrations are identified in **Table 8-1** from the FTA Manual

Land Use Category	GBV Impact Levels (VdB re 1 µin/sec)			GBN Impact Levels (dB re 20 micro Pascals)		
	Frequent Events ¹	Occasional Events ²	Infrequent Events ³	Frequent Events ¹	Occasional Events ²	Infrequent Events ³

Notes:

1. *Frequent Events* is defined as more than 70 vibration events of the same kind per day.
2. *Occasional Events* is defined as between 30 and 70 vibration events of the same kind per day.
3. *Infrequent Events* is defined as fewer than 30 vibration events of the same kind per day.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
5. Vibration-sensitive equipment is not sensitive to ground-borne noise.

3.0 OPERATIONAL NOISE

3.1 No Build Alternative

Under the No-Build Alternative no freight train will be introduced and the noise levels at the receptors will remain unchanged.

3.2 Project Alternative

3.2.1 Estimated Noise Levels and Impact Assessment

The estimated noise levels from the Proposed Project were calculated based on two distinct models:

- For receptors in proximity of a public crossing the model used was the FRA Horn Model [17]. It should be noted that this model is provided by the FRA¹⁰ in a closed (secured) excel format. This model does not provide as an output specific exterior noise level, rather only the impact assessment based on distance between the receptor and the alignment and distance to crossing.
- For receptors not in proximity of a public crossing the CREATE model was used [18]. It should be noted that this model is provided by the FRA¹¹ in a closed (secured) excel format. This model does provide an estimated exterior sound level based on the distance between the receptor and the alignment.

For each receptor identified in Section 2.4 an assessment of impact was conducted and the results presented in Table 3-1.

¹⁰ Horn Noise MS Excel spreadsheet model [15], in Excel spreadsheet format as provided by the FRA can be found at <https://www.fra.dot.gov/eLib/Details/L04091>

¹¹ CREATE Freight Noise and Vibration Model MS Excel Spreadsheet Model [13], in Excel spreadsheet format as provided by the FRA can be found at <https://www.fra.dot.gov/eLib/Details/L03727>

Table 3-1: General Noise Assessment

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	FTA Land Use / Noise Metric	Distance to Track Alignment [ft]	Near Crossing / Longitudinal distance to Crossing [ft]	Existing Land Use	Existing Noise Level [dBA]	Predicted Exterior Noise Levels [dBA]	Increase in Overall Noise Exposure -- Build over Existing [dBA]	Scenario Impacts		
									FTA	
										Allowable Increase [dBA]
PR_01	2 / Ldn	1600	Yes / 295	FLEX1	40	n/a	n/a	10	15	No Impact
PR_02	2 / Ldn	1200	Yes / 160	FLEX1	55	n/a	n/a	4	7	No Impact
PR_03a	2 / Ldn	450	Yes / 60	FLEX1	40	n/a	n/a	10	15	Moderate Impact
PR_03b	2 / Ldn	660	Yes / 60	FLEX1	40	n/a	n/a	10	15	No Impact
PR_04a	2 / Ldn	100	Yes / 113	FLEX1	40	n/a	n/a	10	15	No Impact
PR_04b	2 / Ldn	180	Yes / 155	FLEX1	40	n/a	n/a	10	15	No Impact
PR_04c	2 / Ldn	310	Yes / 135	FLEX1	40	n/a	n/a	10	15	Moderate Impact
PR_05a	2 / Ldn	523	Yes / 397	FLEX1	60	n/a	n/a	2	5	No Impact
PR_05b	2 / Ldn	690	Yes / 396	FLEX1	60	n/a	n/a	2	5	No Impact
PR_05c	2 / Ldn	915	Yes / 300	FLEX1	60	n/a	n/a	2	5	No Impact
PR_06a	2 / Ldn	1000	Yes / 419	FLEX1	60	n/a	n/a	2	5	No Impact
PR_06b	2 / Ldn	1215	Yes / 410	FLEX1	40	n/a	n/a	10	15	No Impact
PR_06c	2 / Ldn	1415	Yes / 330	FLEX1	55	n/a	n/a	4	7	No Impact
PR_07	2 / Ldn	415	Yes / 253	FLEX1	55	n/a	n/a	4	7	No Impact
PR_08a	2 / Ldn	790	Yes / 245	FLEX1	50	n/a	n/a	5	10	No Impact
PR_08b	2 / Ldn	915	Yes / 264	FLEX1	60	n/a	n/a	2	5	No Impact
PR_08c	1 / Leq(h)	1390	Yes / 0	FLEX1	50	n/a	n/a	5	10	No Impact
PR_09	2 / Ldn	460	Yes / 111	FLEX1	50	n/a	n/a	5	10	No Impact
PR_10	2 / Ldn	1450	Yes / 259	FLEX1	40	n/a	n/a	10	15	No Impact

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	
Receptor	FTA Land Use / Noise Metric	Distance to Track Alignment [ft]	Near Crossing / Longitudinal distance to Crossing [ft]	Existing Land Use	Existing Noise Level [dBA]	Predicted Exterior Noise Levels [dBA]	Increase in Overall Noise Exposure – Build over Existing [dBA]	Scenario Impacts			
								Increase in Overall Noise Exposure – Build over Existing [dBA]	FTA Allowable Increase [dBA]		Impact Under FTA Criteria
									MI	SI	
PR_11	2 / Ldn	250	Yes / 569	FLEX1	40	n/a	n/a	10	15	Moderate Impact	
PR_12a	2 / Ldn	430	Yes / 558	FLEX1	40	n/a	n/a	10	15	No Impact	
PR_12b	2 / Ldn	590	Yes / 560	FLEX1	40	n/a	n/a	10	15	No Impact	
PR_13	2 / Ldn	1285	Yes / 140	FLEX1	40	n/a	n/a	10	15	No Impact	
PR_14a	2 / Ldn	260	Yes / 645	FLEX1	50	n/a	n/a	5	10	Moderate Impact	
PR_14b	2 / Ldn	450	Yes / 391	FLEX1	55	n/a	n/a	4	7	No Impact	
PR_14c	2 / Ldn	295	Yes / 166	RNC	60	n/a	n/a	2	5	No Impact	
PR_14d	2 / Ldn	485	Yes / 266	FLEX1	55	n/a	n/a	4	7	No Impact	
PR_15	2 / Ldn	1220	Yes / 191	FLEX1	50	n/a	n/a	5	10	No Impact	
PR_16a	2 / Ldn	630	Yes / 189	FLEX1	50	n/a	n/a	5	10	No Impact	
PR_16b	2 / Ldn	800	Yes / 177	FLEX1	50	n/a	n/a	5	10	No Impact	
PR_16c	2 / Ldn	1060	Yes / 104	FLEX1	40	n/a	n/a	10	15	No Impact	
PR_17a	2 / Ldn	310	Yes / 102	FLEX1	65	n/a	n/a	1	4	No Impact	
PR_17b	2 / Ldn	245	Yes / 288	RNC	60	n/a	n/a	2	5	No Impact	
PR_17c	2 / Ldn	605	Yes / 179	FLEX1	60	n/a	n/a	2	5	No Impact	
PR_18a	2 / Ldn	930	Yes / 145	FLEX1	55	n/a	n/a	4	7	No Impact	
PR_18b	2 / Ldn	867	Yes / 309	FLEX1	60	n/a	n/a	2	5	No Impact	
PR_18c	2 / Ldn	1045	Yes / 282	FLEX1	60	n/a	n/a	2	5	No Impact	
PR_19a	2 / Ldn	885	Yes / 597	FLEX1	60	n/a	n/a	2	5	No Impact	
PR_19b	2 / Ldn	845	Yes / 728	FLEX1	55	n/a	n/a	4	7	No Impact	
PR_19c	2 / Ldn	1015	Yes / 573	FLEX1	60	n/a	n/a	2	5	No Impact	

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	FTA Land Use / Noise Metric	Distance to Track Alignment [ft]	Near Crossing / Longitudinal distance to Crossing [ft]	Existing Land Use	Existing Noise Level [dBA]	Predicted Exterior Noise Levels [dBA]	Increase in Overall Noise Exposure -- Build over Existing [dBA]	Scenario Impacts		
									FTA	
									Allowable Increase [dBA]	SI
PR_19d	3 / Leq(h)	1240	Yes / 635	FLEX1	60	n/a	n/a	2	5	No Impact
PR_19e	2 / Ldn	1550	Yes / 675	FLEX1	55	n/a	n/a	4	7	No Impact
PR_20	2 / Ldn	135	Yes / 684	FLEX1	50	n/a	n/a	5	10	Moderate Impact
PR_21a	2 / Ldn	745	No / n/a	FLEX1	40	46	7	10	15	No Impact
PR_21b	2 / Ldn	755	No / n/a	FLEX1	40	46	7	10	15	No Impact
PR_21c	2 / Ldn	735	No / n/a	FLEX1	40	46	7	10	15	No Impact
PR_21d	2 / Ldn	625	No / n/a	FLEX1	40	47	8	10	15	No Impact
PR_21e	2 / Ldn	475	No / n/a	FLEX1	40	49	10	10	15	No Impact
PR_21f	2 / Ldn	640	No / n/a	FLEX1	40	47	8	10	15	No Impact
PR_21g	2 / Ldn	735	No / n/a	FLEX1	40	46	7	10	15	No Impact
PR_22	2 / Ldn	388	No / n/a	FLEX1	40	50	10	10	15	No Impact
PR_23a	2 / Ldn	530	Yes / 314	FLEX1	40	n/a	n/a	10	15	No Impact
PR_23b	2 / Ldn	725	Yes / 33	FLEX1	40	n/a	n/a	10	15	No Impact
PR_24a	2 / Ldn	195	Yes / 146	FLEX1	40	n/a	n/a	10	15	No Impact
PR_24b	2 / Ldn	360	Yes / 69	FLEX1	40	n/a	n/a	10	15	Moderate Impact
PR_25a	2 / Ldn	1507	Yes / 529	FLEX1	40	n/a	n/a	10	15	No Impact
PR_25b	2 / Ldn	1570	Yes / 747	FLEX1	40	n/a	n/a	10	15	No Impact
PR_26a	2 / Ldn	1404	Yes / 597	FLEX1	40	n/a	n/a	10	15	No Impact
PR_26b	2 / Ldn	1130	Yes / 570	FLEX1	40	n/a	n/a	10	15	No Impact
PR_26c	2 / Ldn	1055	Yes / 276	FLEX1	40	n/a	n/a	10	15	No Impact
PR_26d	2 / Ldn	802	Yes / 317	FLEX1	40	n/a	n/a	10	15	No Impact

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	Scenario Impacts				(K)
Receptor	FTA Land Use / Noise Metric	Distance to Track Alignment [ft]	Near Crossing / Longitudinal distance to Crossing [ft]	Existing Land Use	Existing Noise Level [dBA]	Predicted Exterior Noise Levels [dBA]	Increase in Overall Noise Exposure – Build over Existing [dBA]	FTA		Impact Under FTA Criteria		
								Allowable Increase [dBA]	SI			
											MI	SI
PR_26e	2 / Ldn	790	Yes / 82	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_26f	2 / Ldn	266	Yes / 49	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27a	2 / Ldn	1260	Yes / 833	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27b	2 / Ldn	905	Yes / 595	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27c	2 / Ldn	876	Yes / 388	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27d	2 / Ldn	915	Yes / 157	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27e	2 / Ldn	679	Yes / 104	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27f	2 / Ldn	561	Yes / 49	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27g	2 / Ldn	815	Yes / 52	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27h	2 / Ldn	1288	Yes / 45	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27i	2 / Ldn	950	Yes / 220	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_27j	2 / Ldn	1028	Yes / 370	FLEX1	40	n/a	n/a	10	15	No Impact		
PR_28a	2 / Ldn	1454	Yes / 225	FLEX1	60	n/a	n/a	2	5	No Impact		
PR_28b	2 / Ldn	1234	Yes / 37	FLEX1	60	n/a	n/a	2	5	No Impact		
PR_28c	2 / Ldn	1260	Yes / 147	FLEX1	55	n/a	n/a	4	7	No Impact		
PR_28d	2 / Ldn	1260	Yes / 228	FLEX1	55	n/a	n/a	4	7	No Impact		
PR_28e	2 / Ldn	1170	Yes / 275	FLEX1	50	n/a	n/a	5	10	No Impact		
PR_28f	2 / Ldn	1130	Yes / 188	FLEX1	55	n/a	n/a	4	7	No Impact		
PR_28g	2 / Ldn	1005	Yes / 232	FLEX1	55	n/a	n/a	4	7	No Impact		
PR_28h	2 / Ldn	995	Yes / 175	FLEX1	55	n/a	n/a	4	7	No Impact		
PR_28i	2 / Ldn	965	Yes / 30	FLEX1	55	n/a	n/a	4	7	No Impact		

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Receptor	FTA Land Use / Noise Metric	Distance to Track Alignment [ft]	Near Crossing / Longitudinal distance to Crossing [ft]	Existing Land Use	Existing Noise Level [dBA]	Predicted Exterior Noise Levels [dBA]	Increase in Overall Noise Exposure – Build over Existing [dBA]	Scenario Impacts		Impact Under FTA Criteria
								FTA Allowable Increase [dBA]	MI	SI
PR_28j	2 / Ldn	1050	Yes / 50	FLEX1	60	n/a	n/a	2	2	No Impact
PR_28k	2 / Ldn	900	Yes / 40	FLEX1	60	n/a	n/a	2	2	No Impact
PR_28l	2 / Ldn	751	Yes / 25	FLEX1	60	n/a	n/a	2	2	No Impact

Table Notes:

- (A) **Receptor** – Receptor labeling used in Figure 3a to 3e.
- (B) **FTA Land Use / Noise Metric** – Type of land use for a receptor based on land use categories identified in **Table 3-2** from the FTA Manual. Metric used for assessment as per **Table 3-2** from the FTA Manual.
- (C) **Distance to Track Alignment [ft]** – Measured distance from receptor location to track alignment.
- (D) **Near Crossing / Longitudinal Distance to Crossing [ft]** – Measured distance along track alignment to nearest public crossing.
- (E) **Existing Land Use** – Land use as identified in Local Planning.
- (F) **Existing Noise Level** – Existing noise level defined for the receptor.
- (G) **Predicted Exterior Noise Levels** – Predicted exterior noise levels. For receptors in proximity of a public crossing the model used was the FRA Horn Model (Column D indicates “Yes”) [17] – this method does not provide a specific exterior noise level, rather only the impact assessment. For receptors not in proximity of a public crossing the CREATE model was used [14].
- (H) **Increase in Overall Noise Exposure – Build over Existing** – Estimated Increase of noise levels from existing noise levels.
- (I) **MI** – Moderate Impact threshold based on existing noise levels and land use as per **Table 3-1** from the FTA Manual.
- (J) **SI** – Severe Impact threshold based on existing noise levels and land use as per **Table 3-1** from the FTA Manual.
- (K) **Impact under FTA Criteria** – This is based on the result from FRA Horn Model [17] for receptors in proximity of public crossings or based on the result in Column H for all other receptors.

3.2.2 Impacts and Mitigations

Based on the results presented in Table 3-1, only six (6) of the eighty-five (85) identified receptors would be classified as having Moderate Impacts – PR_03a, PR_04c, PR_11, PR_14a, PR_20, and PR_24b. Locomotive horn use at public-at grade crossings is the primary cause of the predicted noise impacts at these locations. Therefore, minimizing locomotive horn use in the Proposed Project area represents the greatest opportunity to mitigate potential Project-related noise impacts.

No Severe Impacts were identified for the Proposed Project.

4.0 OPERATIONAL VIBRATION

4.1 Project Specific Criteria

Taking into consideration the traffic for the Project as identified in Section 1.5, the Proposed Project falls under the Infrequent Event Category – fewer than 30 vibration events of the same kind per day. Based on that assumption, the project specific limits are identified in Table 4-1.

Table 4-1: Project Specific GBV Impact and GBN Impact Criteria

Metric for Assessment	Land Use Category		
	Category 1	Category 2	Category 3
GBV Impact Levels (VdB re 1 μ in/sec)	65 VdB	80 VdB	83 VdB
GBN Impact Levels (dB re 20 micro Pascals)	N/A	43 dBA	48 dBA

Notes:

Category 1: Buildings where vibration would interfere with interior operations

Category 2: Residences and buildings where people normally sleep

Category 3: Institutional land uses with primarily daytime use

4.2 Estimated Vibration Levels and Impact Assessment

Based on the FTA Manual (**Chapter 10**) a noise assessment of the possible impacts was generated to determine the distances from the alignment necessary to comply with the Project specific ground-borne vibrations and ground-borne noise identified in Table 4-1. Figure 4-1 shows the Project specific estimated¹² ground surface vibrations, adjusted to the Project speed of 25 mph (see Section 1.5).

¹² Based on the FTA Manual Generalized Ground Surface Vibration Curves (**Figure 10-1** of the FTA Manual)

Based on the Receptor location review presented in Section 2.4, all receptors can be classified as Vibration Category 2 – Residential or Vibration Category 3 – Institutional. No Vibration Category 1 – High Sensitivity receptors were identified as part of the Screening.

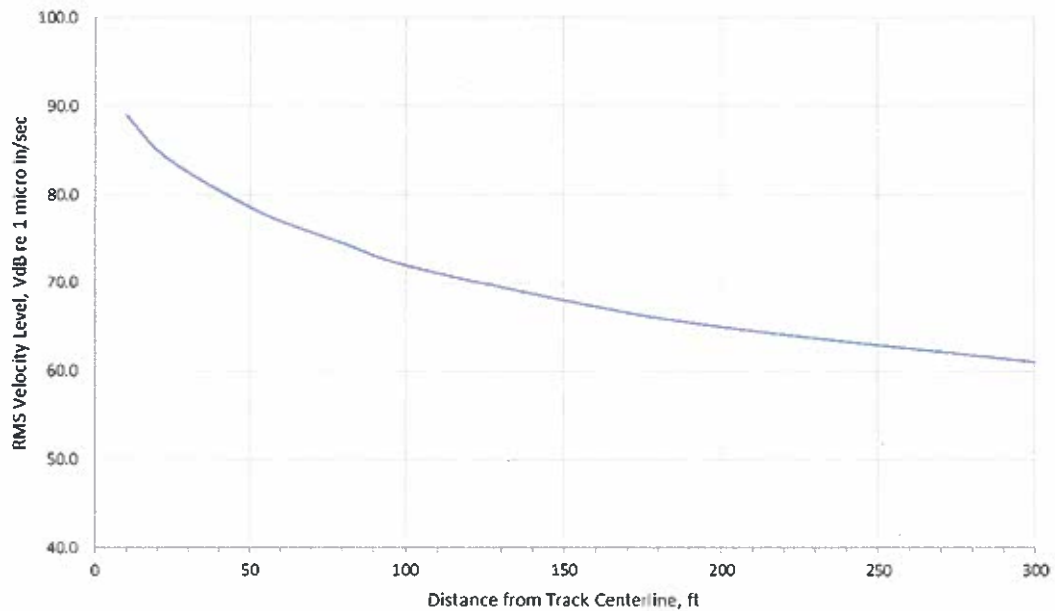


Figure 4-1: Project Specific Generalized Ground Surface Vibrations

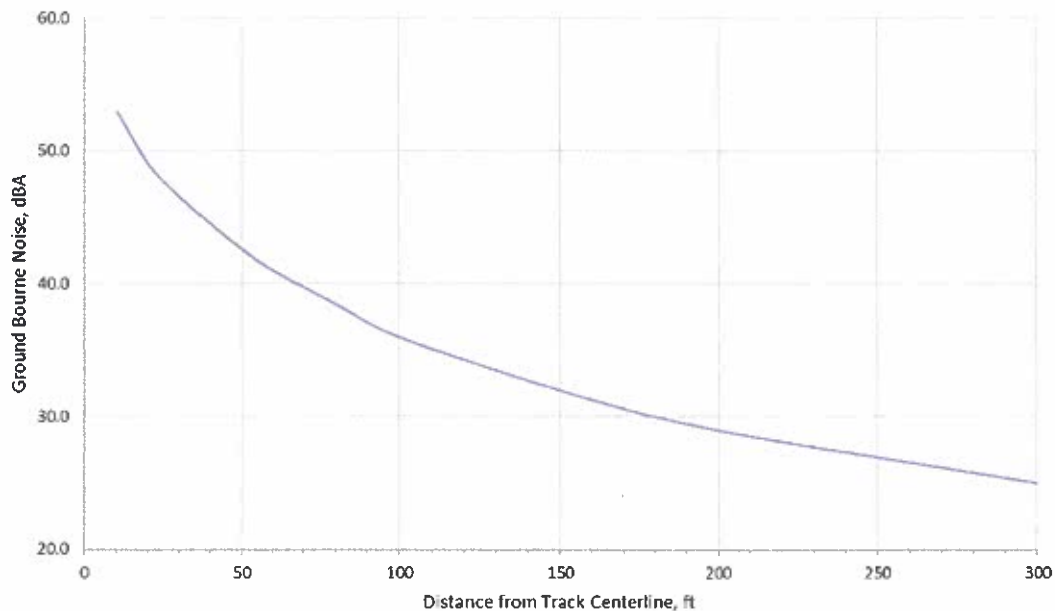


Figure 4-2: Project Specific Generalized Ground Bourne Noise

Based on Figure 4-1 and Figure 4-2 the following distances are identified for compliance with the limits:

Table 4-2: Project Specific GBV and GBN Impact Distances

Metric for Assessment	Land Use Category (Vibration) ^(A)			
	Category 2		Category 3	
	Limit	Distance [ft]	Limit	Distance [ft]
GBV Impact Levels (VdB re 1 µin/sec)	80 VdB	40	83 VdB	30
GBN Impact Levels (dB re 20 micro Pascals)	43 dBA	60	48 dBA	30

Notes:

(A) – No Vibration Category 1 land uses were identified in the Project Screening.

Based on the distance to the track centerline identified in Table 3-1, none of the identified receptors identified during the screening is within the impact distances identified in Table 4-2. Therefore, the projected vibration from the project is below the impact threshold. Significant vibration impacts are therefore not anticipated with this project.

5.0 CONSTRUCTION ASSESSMENT

5.1 Introduction

During project track construction, noise levels will be produced by the operation of heavy-duty equipment and various other construction activities. Noise levels generated by construction activities depend on a series of variables. Such variables include the number and type of pieces of equipment, their general condition of operation, the amount of time each piece operates per day, the presence of any noise attenuating features (e.g. walls, berms) and the location of the construction activities relative to the receptors. The majority of these variables are traditionally left to the discretion of the contractor which makes it difficult to accurately estimate levels of construction noise. As such for purposes of this assessment, a professional judgment of the likely means and methods that would be used by the contractor is used. Some construction activities and use of some equipment may result in perceptible vibrations levels, depending on the distance from the construction activity to the receptor. Activities such as pile driving, pavement breaking and the use of tracked vehicles (e.g., bulldozers) can generate higher ground-borne vibration levels.

5.2 Noise Assessment

The Berkeley County has an ordinance for noise control in unincorporated areas (Ordinance No. 05-08-56 [11] amended by Ordinance No. 09-04-21 [12]). These ordinances specify sound level limits for continuous operation of equipment in proximity of residential and non-residential areas. The amendment of the noise control ordinance (by Ordinance No. 09-04-21 [12]) stipulates on Sec. 38-1. §§c. an exception for "Noises from construction or demolition activities occurring between 6:00 a.m. and 10:00 p.m.".

The FTA Guidelines¹³ define a two-step approach to assessment of noise impact from construction activities. The first step is a screening process based on the combined noise levels, from the two noisiest pieces of equipment, under the assumption that they operate at the same time and locations. The criteria for this screening assessment are identified in Table 5-1 which represent noise levels which are not to be exceeded.

Table 5-1: Construction Noise General Assessment Criteria

Land Use	One-hour L _{eq} [dBA]	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

The equipment anticipated to be part of the construction stage for this project is identified in Table 5-2. Two areas of project are identified as likely to have the largest impacts due to proximity to the construction zones. One area is composed of at-grade track construction and another is the bridge construction over the Diversion Canal. The noise characteristics for the different types of equipment's anticipated to be used on site are identified in Table 5-2. The values presented are the same as the values presented in the FTA Manual or the FHWA Highway Construction Handbook [19].

Table 5-2: Expected Equipment to be used During Construction (Noise Assessment)

Equipment	Noise Emissions Characteristics		Project Areas	
	E.L. [dBA] ^(A)	U.F. ^(B)	At-grade Track Construction	Bridge Construction
Air Compressor	81	40%	77	77
Backhoe	80	40%	76	76
Crane, Mobile	83	16%	75	75
Dozer	85	40%	81	n.e.u. ^(C)
Generator	81	50%	78	78
Loader	85	40%	81	81
Dump Truck	84	40%	80	80
Pile-driver	95	20%	n.e.u. ^(C)	88
Concrete Mixer	85	40%	n.e.u. ^(C)	81
Concrete Pump	82	20%	n.e.u. ^(C)	75
Roller	74	20%	67	n.e.u. ^(C)

¹³ See Section 12.1.3 of the FTA Manual.

Equipment	Noise Emissions Characteristics		Project Areas	
	E.L. [dBA] ^(A)	U.F. ^(B)	At-grade Track Construction	Bridge Construction
Spike Driver	77	2%	60	60
Tie Cutter	84	2%	67	67
Tie Handler	80	2%	63	63
Tie Inserter	85	2%	68	68
Truck	88	2%	71	71

Notes:

^(A) – E.L. is the noise emission level of the particular piece of equipment at the reference distance of 50 feet.

^(B) – U.F. is the usage factor that accounts for the fraction of time that the equipment is in use over the specified time period.

^(C) – n.e.u. indicates that the particular piece of equipment is not expected to be used for the identified Project Areas.

From the data presented in Table 3-1, the closest receptor to the at-grade construction area is PR_04a with a distance to the alignment of 100 ft. For the area of the bridge construction the closest receptor is PR_27f with a distance to the alignment of 561 ft. Both locations are residential, therefore will have the strictest noise criteria limits as identified in Table 5-1.

An assessment was done for the 2 noisiest sound sources, and the results are presented in Table 5-3.

Table 5-3: General Assessment of Construction Noise

Reception Location	One-hour L _{eq} [dBA]	
	At-grade Track Construction	Bridge Construction
At 50 ft distance	84	89
PR-04a (100 ft)	78	n/a
PR-27f (561 ft)	n/a	68

The values presented in Table 5-3 are below the limits identified in in Table 5-1 for residential locations located within the project screening area. Therefore based on this assessment no additional study or consideration of mitigation is considered necessary.

5.3 Vibration Assessment

During construction activities vibrations from construction equipment are expected. These vibrations may be perceptible at some receptor locations. However since perceptible vibrations from construction are typically short-term and reversible the focus of assessment is typically constrained to potential damage, resulting from vibration levels which are greater than the limits

of human perception, to structures which in most cases is of greater concern. The FTA Guidelines¹⁴ defines the limits for potential damages in structures due to construction vibrations. These limits are identified in Table 5-4.

Table 5-4: Vibration Limits for Damage due to Construction Activities

Building Category	PPV [in/sec] ^(A)
I. Reinforced concrete, steel or timber (no plaster)	0.50
II. Engineered concrete and masonry (no plaster)	0.30
III. Non-engineered timber and masonry buildings	0.20
IV. Buildings extremely susceptible to vibrations damages	0.12

Notes:

(A) – PPV = Peak Particle Velocity

The significant vibration generating equipment anticipated to be part of the construction stage for this project are identified in Table 5-5. Two areas of project are identified as likely to have the largest impacts due to proximity to the construction zones. One refers to at-grade track construction and another refers to the bridge construction over the diversion canal. The vibration characteristics identified in Table 5-5 are taken from the FTA Manual.

Table 5-5: Expected Equipment to be used During Construction (Vibration Assessment)

Equipment	PPV at 25 ft [in/sec]	Project Areas	
		At-grade Track Construction ^(A)	Bridge Construction ^(B)
Pile Driver (Impact)	0.644	n.e.u. ^(C)	0.006
Vibratory Roller	0.210	0.026	0.002
Large bulldozer	0.089	0.011	0.001
Loaded Trucks	0.076	0.010	0.001

Notes:

(A) – for at-grade track construction the receptor PR-04a at a distance of 100 ft distance – closest receptor to construction site.

(B) – for at-grade track construction the receptor PR-27f at a distance of 561 ft distance – closest receptor to construction site.

(C) – n.e.u. indicates that the particular piece of equipment is not expected to be used for the identified Project Areas.

Based on the values presented in Table 5-5, no vibration impacts are expected to any of the identified receptors due to vibrations from construction activities. Therefore based on this assessment no additional study or consideration of mitigation is considered necessary.

¹⁴ See Section 12.2.2 of the FTA Manual.

6.0 CLOSURE

Yours truly,

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited

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Signature: _____ Date: July 25, 2017

Reviewed by: Buddy Ledger, M.A.Sc., P.Eng., INCE
Acoustics Group Leader / Senior Acoustic Engineer

Signature: _____ Date: July 25, 2017

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Noise And Vibration Report\6250160108_Camphall_N&V_Report_V00_Blair.Docx

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APPENDIX A
FIGURES



Figure 1. Site Location Map

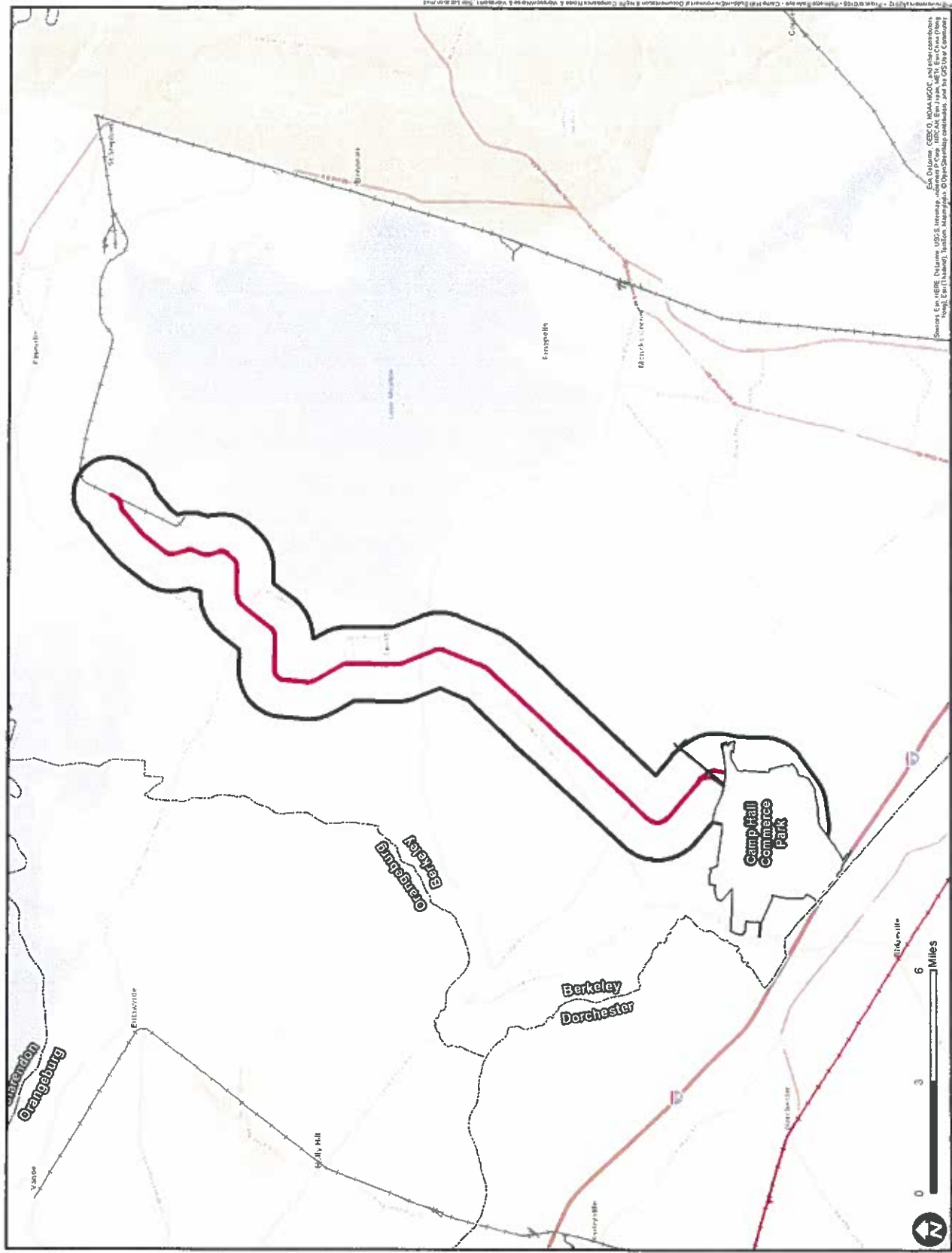
Camp Hall Railroad Build-in
Noise and Vibration Analysis
Berkeley County, South Carolina

- Legend**
- County Boundary
 - Camp Hall Commerce Park
 - Cross Alignment
 - Cross Alignment - 1 Mile Buffer
 - Existing Nearby Rail
 - CSXT
 - Norfolk Southern

FEDMANTO
RAILWAYS

Job No.	6750-15.0109
Drawn By	BWS
Reviewed By	AP
Date	05/11/2017

The analysis shown here has been prepared for the use of the client and is not to be used for any other purpose without the written consent of the client. The client assumes all liability for any such use.



ES&J, Inc. (ES&J) has been selected by the South Carolina Department of Transportation (SCDOT) to prepare the Noise and Vibration Analysis (NVA) for the Camp Hall Railroad Build-in project. ES&J is a subsidiary of the Parsons Corporation. The NVA was prepared under the direction of the SCDOT and is subject to review and approval by the SCDOT. The NVA is not to be used for any other purpose without the written consent of the SCDOT.

Order No. 8750-15-106
 Item By BWS
 Estimated By AP
 Date 05/17/01

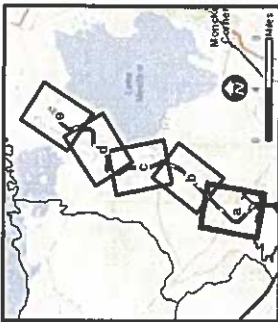


Figure 3a. Identified Receptors Map

Camp Hall Railroad Build-in
Noise and Vibration Analysis
Berkeley County, South Carolina

Legend

- Camp Hall Commerce Park
- Proposed Rail Centerline
- Cross Alignment (750-ft Buffer)
- Cross Alignment (1600-ft Buffer)
- Screening Area
- Named Road
- Grade Crossings (40)
- Receptor Impact Under FTA Criteria
- No Impact
- Moderate Impacts



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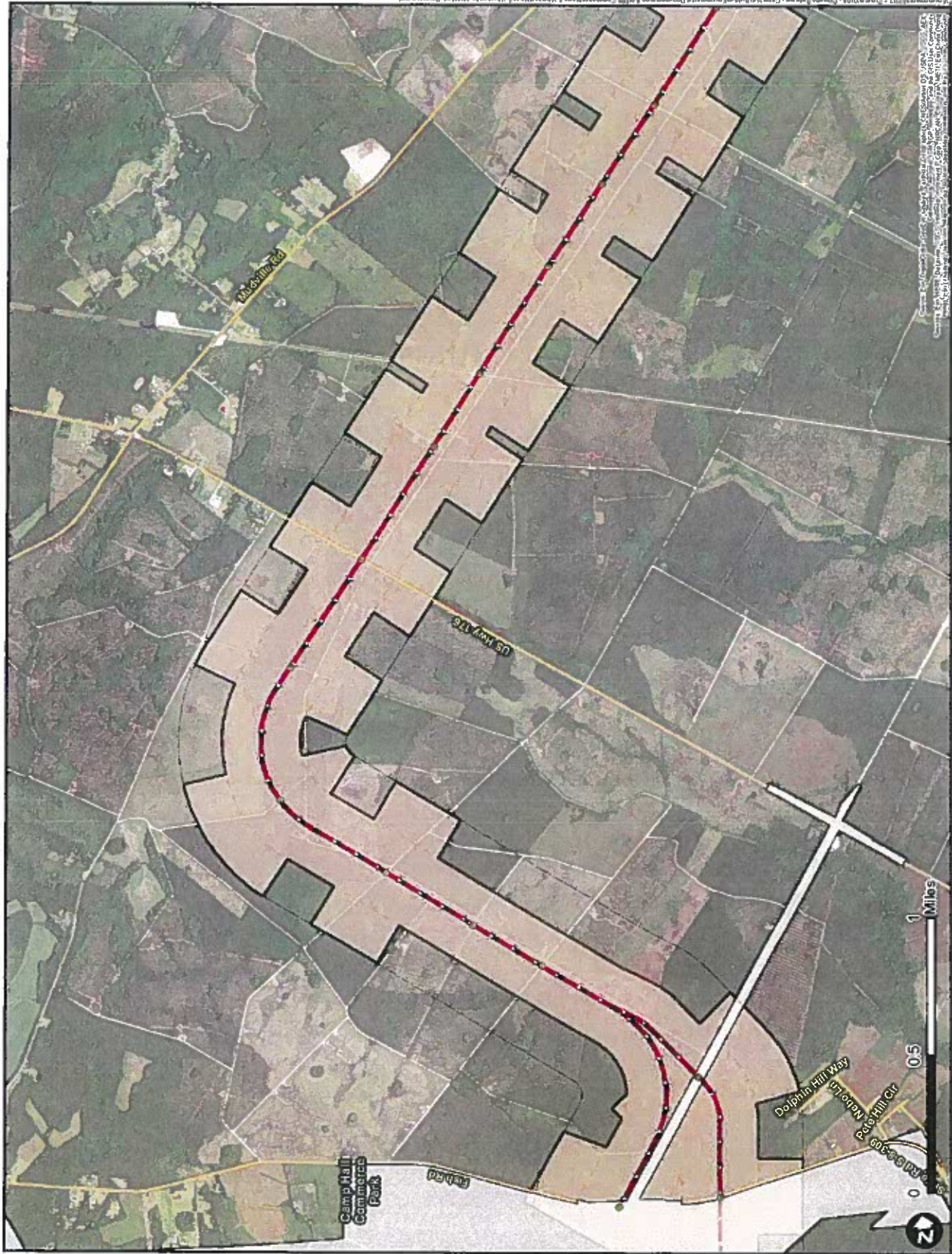




Figure 3b. Identified Receptors Map

Camp Hall Railroad Build-in
Noise and Vibration Analysis
Berkeley County, South Carolina

- Legend**
- Camp Hall Commerce Park
 - Proposed Rail Centerline
 - Cross Alignment (750-ft Buffer)
 - Cross Alignment (1800-ft Buffer)
 - Screening Area
 - Named Road
 - Grade Crossings (40)
 - Receptor Impact Under FTA Criteria
 - No Impact
 - Moderate Impacts



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03/15/2016 01:20:16-2106
 Drawn By: BUS
 Reviewed By: AP
 Date: 11/2/2016

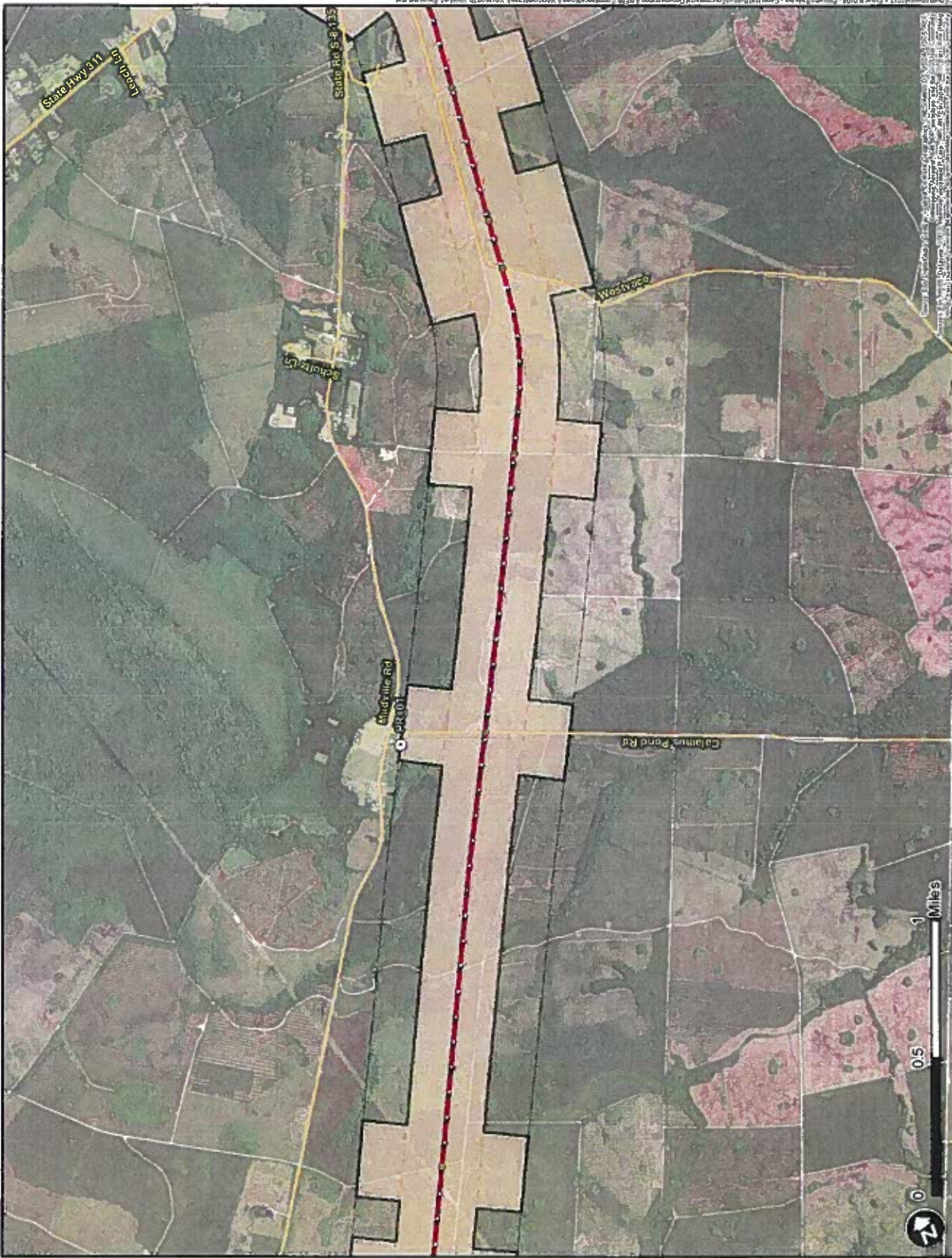




Figure 3d. Identified Receptors Map
Camp Hill Railroad Build-in
Noise and Vibration Analysis
Berkeley County, South Carolina

- Legend**
- Camp Hill Commerce Park
 - Proposed Rail Centerline
 - Cross Alignment (750-ft Buffer)
 - Cross Alignment (1600-ft Buffer)
 - Screening Area
 - Named Road
 - Grade Crossings (40)
 - Receptor Impact Under FTA Criteria
 - No Impact
 - Moderate Impacts

Piedmont
RAILWAYS

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Job No.	6250-18-0109	Drawn By	RMS	Reviewed By	AP
Date	05/10/2017				

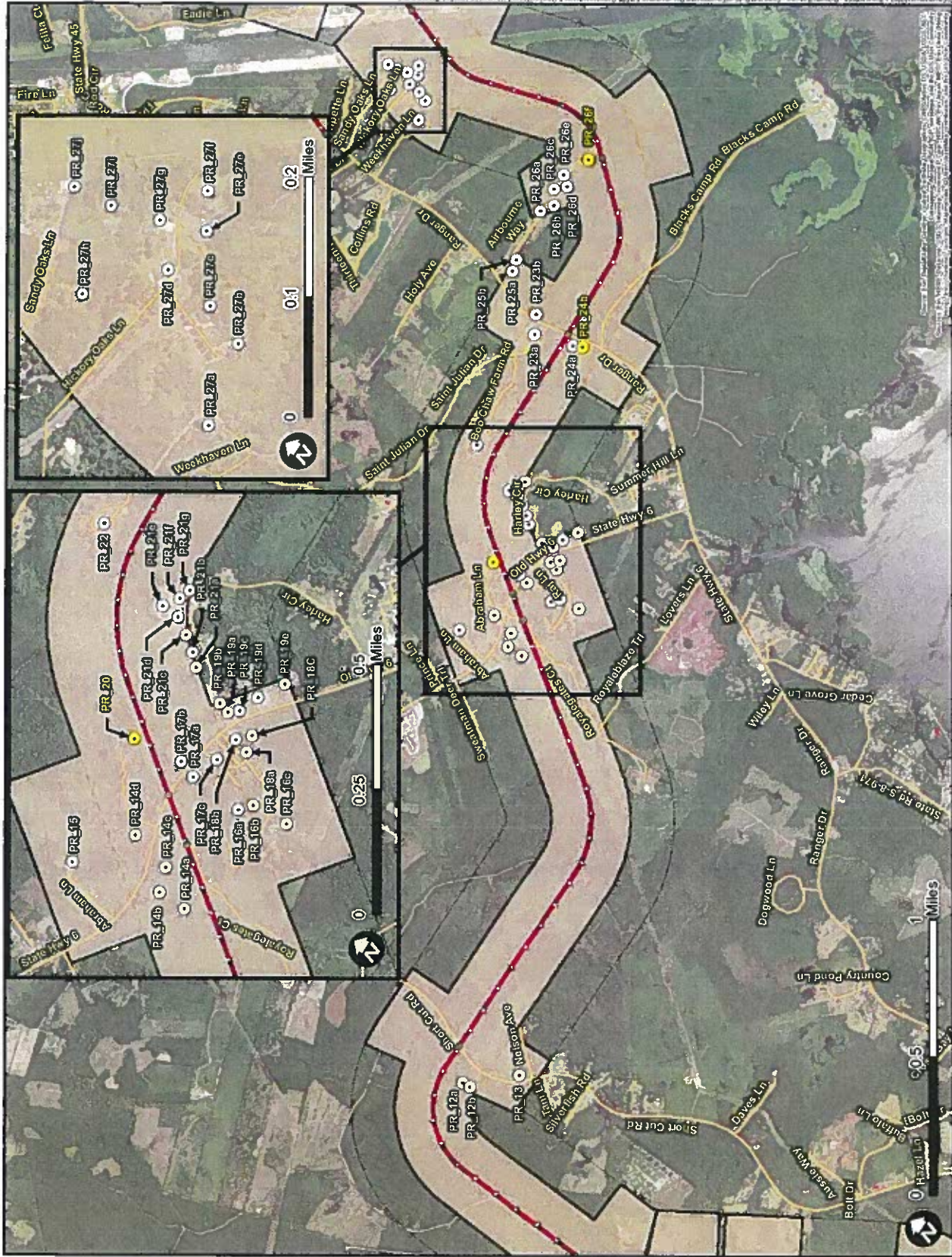




Figure 3e. Identified Receptors Map
Camp Hall Railroad Build-in
Noise and Vibration Analysis
Berkeley County, South Carolina

Legend

- Camp Hall Commerce Park
- Proposed Rail Centerline
- Cross Alignment (750-ft Buffer)
- Cross Alignment (1600-ft Buffer)
- Screening Area
- Named Road
- Grade Crossings (40)
- Receptor Impact Under FTA Criteria
- No Impact
- Moderate Impacts

Note:
No impact receptors are not labeled

Palmetto RAILWAYS

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Job No. 2202-10A-01P
Client: BNSF
Scale: As Shown
Date: 09/11/2017
Page: 2 of 2

