APPENDIX G: TRANSPORTATION & PUBLIC SAFETY REPORT

Port Bienville Railroad

Hancock and Pearl River Counties, Mississippi

Project Number FRA-0023-00(003)/105494 101000-102000

DRAFT TRANSPORTATION AND SAFETY REPORT

Prepared for:

Mississippi Department of Transportation
Federal Railroad Administration

Prepared by:

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Acronyms and Abbreviations

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
CEA	critical emphasis areas
CFR	Code of Federal Regulations
CSXT	CSX Transportation
DOT	Department of Transportation
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
HCM	Highway Capacity Manual
HCPHC	Hancock County Port and Harbor Commission
KCS	Kansas City Southern
LOS	Level of Service
MDA	Mississippi Development Authority
MDOT	Mississippi Department of Transportation
MFN	Mississippi Freight Network
MTIF	Multimodal Transportation Improvement Fund
NASA	National Aeronautics and Space Administration
NS	Norfolk Southern
NTSB	National Transportation Safety Board
OSHA	Occupational Safety and Health Administration
PBVR	Port Bienville Railroad
PTC	Positive Train Control
RSIA	Rail Safety Improvement Act
SSC	Stennis Space Center
SHSP	Strategic Highway Safety Plan
TIP	Transportation Improvement Program
TRB	Transportation Research Board
USEPA	U.S. Environmental Protection Agency

CHAPTER 1. EXISTING CONDITIONS

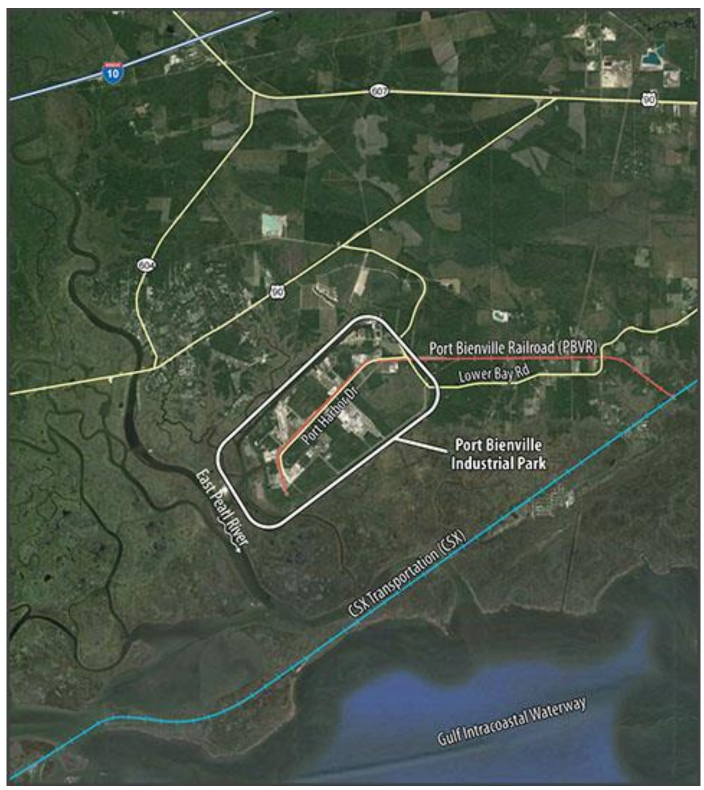
This chapter discusses the affected environment associated with the proposed Project as it relates to the existing transportation infrastructure including port and airport facilities, railroads, and roadway network. Gulf Coast region transportation facilities are also described.

1.1 EXISTING PORT AND AIRPORT FACILITIES

1.1.1 Port Bienville/Port Bienville Industrial Park

Port Bienville is owned and operated by the Hancock County Port and Harbor Development Commission. Port Bienville is a multi-modal, shallow draft barge port with a 12-foot channel located off the Gulf Intracoastal Waterway near mile marker 24 on Mulatto Bayou in Hancock County (**Figure 1**). Port Bienville is a container, bulk and break-bulk seaport with trans-load capabilities. Existing port infrastructure within Port Bienville includes 600 feet of dock space, three primary berths, and an additional 300-foot berth and turning basin. The Port is located on the south end of the study area, with primary highway access provided by way of Interstate 10 (I-10), I-59 and US Highway 90 (US 90).

Figure 1: Port Bienville Industrial Park and Port Bienville Railroad



Source: MDOT Website (MDOT 2016a)

Port Bienville is also home to the Port Bienville Industrial Park which encompasses approximately 3,600 acres. Gulf Coast Foreign Trade Zone #92 is located within the industrial park. Currently, 13 tenants are located within the industrial park, with a workforce of approximately 1,200 employees.

Approximately 1,220 acres of port-owned property on 17 sites is currently available for lease at the Port (HCPHC 2016a). In addition to port-owned property, five parcels of land are privately owned within the industrial park.

In 2001, the Multimodal Transportation Improvement Program was established by the Mississippi Legislature which created a special fund, known as the Multimodal

Transportation Improvement Fund (MTIF) (MDOT 2013a). The MTIF allows the Mississippi Department of Transportation (MDOT) to appropriate funds for multimodal capital improvement projects at ports, airports, railroads, and public transit systems throughout the State. Annual funding for the program is currently $10 million. MDOT's Multimodal Transportation Improvement Program plays a key role in keeping Mississippi's non-highway transportation infrastructure maintained and in a state of good repair. Funds for the program have also contributed to significant upgrades and improvements to the intermodal system through advancements and expansions that otherwise would not have been completed, thus keeping the state competitive in goods movement nationally and internationally. In 2013, the distribution of multimodal funding for each mode of transportation consisted of: ports (38%), rail (12%), public transit (16%), and airports (34%) (MDOT 2011a).

According to the Multimodal Investment Report (MDOT 2013a), ports have experienced an increase in rail infrastructure projects allowing them to better handle and move freight, which in turn makes ports safer, improves the flow of goods, and provides faster service. These benefits have positioned ports to remain more competitive in the goods movement industry. In 2013, Port Bienville was the recipient of a port multimodal grant in the amount of $275,000 for repairs and upgrades to an internal roadway, and for pre-construction survey work for future Port expansion projects. In August 2016, Port Bienville Industrial Park was awarded a $375,500 grant for the construction of bulkhead and dolphin upgrades to support tenant product movements (HCPHC 2016b).

Figure 2: Regional Transportation Infrastructure

Source: HCPHC Website (HCPHC 2016c)

Port Bienville is one of three ports serving Mississippi's Gulf Coast. Two deep draft ports also serve the Gulf Coast including the Port of Gulfport in Gulfport, Mississippi and the Port of Pascagoula in Pascagoula, Mississippi (**Figure 2**).

1.1.2 Stennis International Airport

Stennis International Airport, also owned by the Hancock County Port and Harbor Commission (HCPHC), is located on the eastern perimeter of the study area in Kiln, Mississippi. The airport is a general aviation airport with a 5,500-foot runway. Stennis recorded a total of 29,010 takeoffs and landings in fiscal year 2015, up from 22,008 the previous year (HCPHC 2015).

The first phase of a Terminal Hangar project opened at the airport in 2014 which included the expansion of an existing tenants operation to accommodate maintenance, repair and overhaul operations, in addition to an increase of rentable tenant space including a café. Apron and parking facilities were also constructed (HCPHC 2015). Other recent landside and airside construction projects at the airport include: expansion of an apron at the northern area, rehabilitation of an existing apron, new taxiways makings and airport perimeter fencing. The Stennis Airport property also includes a business park.

In 2013, Stennis Airport was awarded an MDOT Airport multimodal grant in the amount of $23,750 for matching funds for the construction of an apron expansion project (MDOT 2011a). In August 2016, the same multimodal grant funding source provided approximately $252,500 to Stennis Airport for a parking/containment area for fuel trucks and ground support equipment (HCPHC 2016b).

1.2 EXISTING RAIL NETWORK

1.2.1 CSX Transportation

CSX Transportation (CSXT), a subsidiary of CSX Corporation, is one of seven Class 1 railroads serving the United States rail and intermodal markets. The CSXT rail network encompasses 21,000 route miles of tract in 23 states and the District of Columbia (CSX 2016a), which are primarily located in the eastern U.S., specifically east of the Mississippi River.

CSXT's NO&M Subdivision is located between New Orleans and Mobile and is approximately 138.5 miles. Within Mississippi, the single-track mainline extends 74 miles between the Louisiana border and Alabama border. Within Mississippi CSXT owns 74 miles of track, with another 20 miles operated via trackage rights (MDOT 2011a).

Currently, the CSXT mainline carries an average of 18 to 19 freight trains daily (MDOT 2011b)[1], in addition to serving local in-line industries. This daily train volume is consistent with prior train activity reported within the Statewide Freight Plan. Train speeds along the CSXT corridor vary from Class 3 freight train speeds of less than 39 miles per hour (mph) on some short segments to Class 4 freight train speeds of up to 60 mph (MDOT 2015a). There are 72 public highway-rail at-grade crossings along the CSXT mainline; 35 of these crossings do not have Active 2 warning devices (see section 2.4.3 regarding at-grade crossing traffic control devices).

[1] Larry Ratcliffe (CSX), phone call with Kevin Keller (HDR), November 16, 2016.

Existing freight rail service to Port Bienville and the industrial park is provided by CSXT. The Port Bienville Railroad connects to CSXT's mainline approximately 5 miles east of the Port near Ansley, Mississippi. The Port of Gulfport and the Port of Pascagoula are also served by CSXT. In 2011, annual freight flow on the CSXT was 16.4 million tons, with an estimated value of $27.6 billion. By 2040, annual freight flow is projected to be 24.1 million tons, with an estimated value of $50.7 billion (MDOT 2015a).

1.2.2 Norfolk Southern Railway Company

Norfolk Southern Railway Company (NS) operates 20,000 route miles in 22 states and the District of Columbia (NS 2016), which are primarily located in the eastern U.S. with principal gateways at Chicago, St. Louis, Kansas City, Memphis and New Orleans. Within Mississippi, the NS operates 211 route miles which includes ownership of 209 route miles and trackage rights over 2 route miles over two principal routes (MDOT 2011a).

The NS mainline route bisects a small portion of the study area in Nicholson and generally parallels US Highway 11 northward to Picayune. The NS rail line continues farther north to Hattiesburg and Meridian; generally parallel to I-59.

Currently, the NS mainline carries an average of 22 trains a day through Nicholson, and averages about 115 trains per week[2]. Train speeds along the NS corridor generally allow freight speeds of up to 60 mph. There are 30 public highway-rail at-grade crossing along the NS mainline; 7 of these crossings do not have Active 2 warning devices (MDOT 2015a). Passenger rail service is provided on the NS mainline; Amtrak currently operates daily service between New Orleans and New York.

In 2011, annual freight flow on the NS was 28.8 million tons, with an estimated value of $36.4 billion. By 2040, annual freight flow is projected to be 41.8 million tons, with an estimated value of $64.5 billion (MDOT 2015a).

Figure 3: Existing Norfolk Southern Right of Way and Abandoned Railroad Track

Rail service to Stennis Space Center (SSC) was previously provided by way of a former rail spur that connects to the NS lead track in Nicholson, just east of US Highway 11. The right of way and track associated with the former rail line is owned by NS (**Figure 3**). The existing rail

[2] Alan Sisk (NS), email to Kevin Keller (HDR), October 20, 2016.

right of way varies in width but is generally 200 feet wide. Rail service to SSC ceased over 10 years ago; subsequently, maintenance of the existing track has not been undertaken.

1.2.3 Port Bienville Railroad

The Port Bienville Railroad (PBVR) is a Class III, short line railroad that provides rail service to several businesses within the Port Bienville Industrial Park and connects these rail users to CSXT's east-west mainline along the Gulf Coast. From Port Bienville, the PBVR extends east approximately 5 miles to Ansley, Mississippi and connects to CXST's mainline. Total mileage owned and operated by PBVR is 9 miles (MDOT 2011a). Similar to Class 1 railroads, the single-tract PBVR has the ability to transport 286,000 pound carloads.

The PBVR currently operates 6-day service with 2 trains per day (1 train inbound and 1 train outbound). Each train averages 22 cars per train each way. This daily average is based on the actual number of total cars serviced (49,013 cars) from January 2013 to present. Annually, PBVR handles approximately 6,200 train cars. PBVR train speeds are generally 20 to 30 mph. There are 2 public highway-rail at-grade crossing along the PBVR; each crossing Lower Bay Road with the eastern crossing located at the Port entrance. Active warning devices were recently install at this grade crossing.

The PBVR maintenance yard is located immediately east of Lower Bay Road, and includes a 3,000 foot siding and six storage tracks of varying length, ranging from approximately 2,000 feet to 3,000 feet. Storage capacity is estimated at 429 cars (MDOT 2011a). The Port Bienville Railroad serves the diverse manufacturing and technology industries located within the Port and industrial park.

As part of MDOT's Multimodal Transportation Improvement Program, in 2013 Port Bienville Railroad was awarded a Rail multimodal grant in the amount of $260,000 for rail improvements to a dry bulk terminal. In August 2016, PBVR was the recipient of a $398,000 grant for the construction of a 1,270-foot rail spur (HCPHC 2016b). Other recent PBVR construction projects include expansion of the rail car wash and adjacent rail line, storm drainage improvements consisting of the replacement of culverts, and the installation of lights and gates at two at-grade rail crossings on Lower Bay Road.

1.2.4 Passenger Rail

Amtrak, also known as the National Railroad Passenger Corporation, currently operates intercity passenger rail service within Mississippi. Daily passenger rail service between New Orleans and Chicago is provided along Kansas City Southern (KCS) track which passes through Meridian. Passenger rail service is also provided between New Orleans and New York via the *Crescent*. The *Crescent* route runs along NS mainline track within the study area.

Prior to Hurricane Katrina (August 2005), Amtrak operated intercity passenger rail service between New Orleans and Florida via the *Sunset Limited*. The route followed CSXT's single-track mainline through Mississippi. Since then, Amtrak has completed several studies (including ridership projections, revenue forecasts and infrastructure improvements) to explore options to resume passenger rail service.

The restoration of passenger rail service along the Gulf Coast is a key initiative among several states including Louisiana, Mississippi, Alabama, and Florida. On February 18, 2016, representatives from the FRA, Amtrak, state Departments of Transportation, elected officials, and the Southern Rail Commission embarked on a two-day Gulf Coast Passenger Rail Train Trip—the first passenger rail service since 2005 (Southern Rail Commission 2016). Starting at the Union Passenger Terminal in New Orleans and terminating in Jacksonville, Florida, thousands of enthusiastic residents and community groups greeted the train at each of the 14 stations along its journey, further demonstrating support for passenger rail service for both mobility and economic reasons. Indications are that passenger rail service may be viable if CSXT's mainline route is double-tracked in the future.

CSXT's route through Mississippi also comprises a portion of the Gulf Coast Corridor that was federally designated as a high-speed rail corridor in 1998 and further extended in 2000. Between Houston and Atlanta, total mileage for this designated corridor is 1,025 miles. High-speed (110 miles per hour service) passenger rail service would only be viable if CSXT's mainline route is double-tracked in the future.

1.3 EXISTING ROADWAY NETWORK

1.3.1 Study Area Roadway Network

The study area encompasses a portion of Hancock and Pearl River Counties and is generally bounded by Nicholson and Kiln to the north, Port Bienville to the south, the Pearl River to the west and Stennis International Airport and SR 603/SR 43 to the east. The study area roadways are comprised of a mix of roadway types ranging from interstate highways to local roadways. The study area is bisected by Interstate 10, while Interstate 59 passes through a small portion of the northern portion of the study area in Pearl River County. Interstate 59 (I-59) and Interstate 10 (I-10) are both 4-lane divided facilities and are classified as interstate highways (**Table 1**).

US Highway 11 (US 11) is located in the northern portion of the study area within Nicholson. US 11 is a 2-lane roadway west of I-59 and is classified as a minor arterial. US 11 ends on the west side of I-59 and becomes State Route 607 (SR 607) on the east side of I-59. Within Nicholson and extending north to Picayune, US 11 parallels the NS Railroad. North of Picayune, the NS Railroad and US 11 corridors diverge.

US Highway 90 (US 90) is located in the southern portion of the study area in Pearlington and extends northeast to SR 607. Within these limits, US 90 is classified as a principal arterial north of I-10 and is classified as a major collectors north of I-10.

From I-59 southward to I-10, SR 607 is classified as a major collector. South of I-10, SR 607 is classified as a principal arterial. The portion of SR 607 that traverses through SSC is known as Shuttle Parkway. **Table 1** summarizes the hierarchy of study area roadways and their existing roadway typical sections.

Table 1: Existing Roadway Functional Classification

Route	Functional Classification	Limits	Roadway Typical Section
Interstate 59	Interstate Highway	Throughout Pearl River County	4-lane divided with shoulders
Interstate 10	Interstate Highway	Throughout Hancock County	4-lane divided with shoulders
US Highway 11	Minor Arterial	SR 43 to SR 607/I-59	2-lane
SR 607	Major Collector	I-59 to Texas Flat Road	2-lane with narrow shoulders
SR 607 / Shuttle Parkway	Major Collector	Texas Flat Road to I-10	4-lane divided, no shoulders
SR 607	Principal Arterial	I-10 to US 90	4-lane divided with narrow shoulders
US Highway 90	Minor Arterial	LA/MS state line to Lower Bay Road	2-lane with shoulders
US Highway 90	Principal Arterial	Lower Bay Road to SR 607/US 90	2-lane with shoulders
US Highway 90	Principal Arterial	SR 607 to Rifle Range Road	4-lane divided with shoulders
Texas Flat Road	Major Collector	SR 607 to SR 603	2-lane unimproved
Flat Top Road	Rural Minor Collector	SSC to Old Kiln Road	2-lane unimproved
Lower Bay Road	Local Roadway	US 90 to SR 603	2-lane
Old Lower Bay Road	Local Roadway	Lower Bay Road to SR 603	2-lane
Port and Harbor Drive	Local Roadway	Internal Port Road west of Lower Bay Road	2-lane

Sources:
Functional Classification System map, Pearl River County, MS, MDOT Planning Division, 2015 (MDOT 2015b).
Functional Classification System map, Hancock County, MS, MDOT Planning Division, 2014 (MDOT 2014a).
Functional Classification System map, Picayune Urban Area, Pearl River County, MS, MDOT Planning Division, 2013 (MDOT 2013b).

1.3.2 Traffic Data

Traffic Volume Data

Existing traffic conditions associated with the study area roadways were obtained from MDOT. These data were reviewed to determine the overall volume of traffic on the study area roadway network. Due to the rural nature of the study area, the majority of study area roadways can generally be considered low-volume roadways as shown in **Table 2**.

Table 2: Annual Average Daily Traffic (2008-2014)

Traffic Count Station Site ID	Street - Limits	2008	2009	2010	2011	2012	2013	2014
230039	Interstate 10 – MS/LA State line to SR 607	38,000	38,000	**39,000**	39,000	39,000	**39,000**	39,000
230040	Interstate 10 - SR 607 to Gulfport	**34,000**	**35,000**	**34,000**	**34,000**	**35,000**	**35,000**	36,000
550020	US 11 - Shorty Burgess Road to I-59	**7,400**	7,300	7,400	**7,200**	7,200	7,200	**8,400**
230030	US 90/Chef Menteur Highway - SR 607 to Lower Bay Road	4,100	**2,200**	2,200	2,200	**2,600**	2,600	2,600
230020	US 90/Chef Menteur Highway - SR 604 to MS/LA State line	3,100	3,000	**4,100**	4,000	4,000	**3,000**	4,100
550010	SR 607 – Interstate 59 to Asa McQueen Road	3,200	**5,500**	5,500	5,500	**5,900**	5,900	6,000
230010	SR 607 - Asa McQueen Road to Texas Flat Road	4,600	4,600	4,600	4,600	**5,100**	5,100	5,200
230151	SR 607 - Texas Flat Road to Kellar Road	3,600	3,600	**3,100**	3,000	3,000	**3,400**	3,400
230148	SR 607 - Interstate 10 to US 90/Chef Menteur Highway	4,600	**8,200**	8,400	8,400	**6,700**	6,700	6,900

Source: MDOT, Planning Division, MDOT Count Station Data, http://mdot.ms.gov/applications/trafficcounters

Notes:

1. Traffic counts shown are Annual Average Daily Traffic (AADT) which are computed from adjustment factors.
2. AADT counts shown in Black Text indicate that the count was not counted in the selected year and the AADT was estimated using factors for day-of-week, season, and average percent trucks.
3. AADT counts shown in Red Text indicate that the count was counted in the selected year and the AADT is based on that count.

Supplemental traffic data were obtained from the Gulf Regional Planning Commission for additional study area roadways that are not included in MDOT's traffic count program (**Table 3**). The data continues to reflect the low-volume of daily traffic on key study area roadways.

Table 3: Annual Average Daily Traffic – Local Roadways

Street - Location and/or Limits	Volume	Year of Count
Flat Top Road - North of Texas Flat Road	110	2011
Texas Flat Road - Catahoula Road to Crown Road	2,064	2012
Lower Bay Road - East of US 90/Chef Menteur Highway	1,684	2013
Lower Bay Road - South of Port and Harbor Drive	1,876	2012
Port and Harbor Drive - West of Lower Bay Road	2,135	2012

Source: Gulf Regional Planning Commission; http://mdot.ms.gov/applications/trafficcounters

Vehicle Classification / Percent of Heavy Vehicles

In addition to volume data, traffic count data and other planning documents were reviewed to determine the overall vehicle composition of traffic on study area roadways. Of particular interest was the volume of truck traffic compared to the overall volume of traffic which is depicted by the percentage of truck traffic (T). Truck factors are derived from vehicle classification counts. The percentage of truck traffic compared to overall traffic for various study area roadways are listed in **Table 4**.

Table 4: Truck Factors on Select Study Area Roadways

Location / Limits	T Factor (source)
Interstate 59	16% (3)
Interstate 10	14% (3)
US 11 – south of Orvisburg Road	14% (2)
SR 607 - north of Interstate 10	5% (1)
SR 607 - south of Interstate 10	9% (1); 8% (2)
US 90 - SR 607 to Old Bay Road	14% (1)
Flat Top Road - North of Texas Flat Road	9% (1)
Texas Flat Road	9% (1)

Source 1. Truck factor derived from traffic count data; count date varies
Source 2. Truck factor derived from Mississippi Public Roads, Selected Statistics Extent, Travel and Designation (MDOT 2014b)
Source 3. Truck factor derived from Mississippi Statewide Freight Plan based on 2011 data (MDOT 2015a)

1.3.3 Existing Highway-Railroad At-Grade Crossings

The information described below is extracted from FRA's website under their "Rail Safety" page (FRA 2016a) and "Grade Crossings" page (FRA 2016b).

Highway-railroad grade crossings are intersections where a highway crosses a railroad at-grade. To avoid collisions, warning/control devices are required at grade crossings just like intersecting roads need stop signs or traffic signals. Active Grade Crossings have active warning and control devices such as bells, flashing lights, and gates, in addition to passive warning devices such as crossbucks (the familiar x-shaped signs that mean yield to the train), yield or stop signs and pavement markings. Passive Grade Crossings have only passive warning devices. These warning/control devices are specified in the Manual of Uniform Traffic Control Devices (MUTCD); (also see Section 2.4.3 - Proposed Traffic Control Measures at Highway-Rail At-Grade Crossings for further discussion).

Grade crossings may be public or private. Public grade crossings are roadways that are under the jurisdiction of, and maintained by, a public authority. Private grade crossings are on privately owned roadways, such as on a farm or industrial area, and are intended for use by the owner or by the owner's licensees and invitees. A private crossing is not intended for public use and is not maintained by a public highway authority.

Table 5 provides a summary of the existing highway-rail at-grade crossings that are located in the northern portion of the study area along the existing NS right of way (ROW).

Table 5: Existing Highway-Rail At-Grade Crossings along NS Rail Alignment

Roadway Crossing Location	NS Alignment Approximate Centerline Station (1)	Crossing Type and Disposition		
		At-Grade		Grade-Separated; Public Crossing
		Public	Private	
US Highway 11	Sta 7+91	Existing	-	-
Interstate 59	Sta 38+30	-	-	Existing; Rail over
Asa McQueen Road	Sta 84+93	Existing	-	-
Unknown Roadway	Sta 128+80	Existing	-	-
Unknown Roadway	Sta 155+29	Existing	-	-
Ridge Road	Sta 199+45	Existing	-	-
Texas Flat Road	Sta 229+74	Existing	-	-

Source 1: HDR Engineering, Inc. Conceptual Engineering Map Set

Figure 4 and **Figure 5** depict the northbound and southbound approaches to the existing at-grade crossing at US Highway 11, respectively, while **Figure 6** depicts the existing at-grade crossing at Texas Flat Road.

Figure 4: US Highway 11 At-Grade Crossing (view looking northbound)

Figure 5: US Highway 11 At-Grade Crossing (view looking southbound)

Figure 6: Texas Flat Road At-Grade Crossing (view looking westbound)

1.3.4 Existing Highway-Railroad At-Grade Crossings

Crash Data Overview – Number of Incidents by Year

The most recent years of crash data for study area roadways were obtained from MDOT. These data were reviewed to determine the overall location of crashes in relationship to the proposed Project alignment. **Table 6** simply presents an overall summary of the number of crashes that occurred between 2010 and 2015.

Table 6. Annual Crash Summary (2010-2015)

Crash Location Street - Limits	2010	2011	2012	2013	2014	2015	Total
US 11 - Shorty Burgess Road to I-59	5	9	7	8	8	11 (1)	48
US 90 - SR 607 to Lower Bay Road	6	1	6	9	1	7	30
SR 607 – I-59 to Asa McQueen Road	4	2	6	7	2	7	28
SR 607 - Asa McQueen Road to Texas Flat Road	3	4	1	2	1	4	15
SR 607 - Texas Flat Road to Kellar Road	1	3	1	1	2	6	14
SR 607 – I-10 to US 90	13	14	11	15	17	21	91
Texas Flat Road – SR 607 to SR 603	7	7	10	6	7	9	46
Lower Bay Road – US 90 to Old Lower Bay Road	2	1	-	-	1	1	5

Source: MDOT, Planning Division, District 6 Crash Data, XL GL and MUCR GL Reports (January 2010 – December 2015) for Locations Shown.
Note 1: one crash eliminated from the data set as it occurred on Interstate 59.

Crash Data Summary Relative to Proposed Project Alignment

Crash locations within immediate proximity to, or crossing the proposed Project alignment were evaluated. Further review of this crash data was undertaken to determine the location and number of crashes on US 11 north of I-59 and on Texas Flat Road east of SR 607 as they relate to the project alignment. **Table 7** summarizes crash data key features for these specific locations.

Table 7. Location Crash Summary Relative to Proposed Project

Crash Location Street - Limits	Total Crashes (2010 – 2015)	Crash Data Key Features
US 11 - Shorty Burgess Road to I-59	48	• The proposed project would cross US 11 generally between Shorty Burgess Road and Jackson Landing Road. • One crash occurred on US 11 at the abandoned NS tracks. • Eleven crashes took place on US 11 between Nicholson Elementary School just north of Shorty Burgess Road, southward to River Road. Although it is not identified as a contributing factor, the roadway geometry in this portion of US 11 includes a horizontal curve that could potentially affect driver sight distance. • One of the eleven crashes noted above took place in front of Nicholson Elementary School in March 2011 at 3 A.M. and involved an intoxicated driver running off the road. • The need for a School Zone pedestrian crossing should be considered as part of project design. • Ten of the 49 crashes took place at the I-59 interchange; although not within proximity to the proposed project. Twenty (20) additional crashes occurred at the interchange and were recorded in crash date for SR 607 - I-59 to Asa McQueen Road.
Texas Flat Road – SR 607 to SR 603	46	• The proposed project would cross Texas Flat Road just east of SR 607. The proposed project would then run parallel to, and south of Texas Flat Road for approximately 7.5 miles. • Eight out of 46 crashes occurred near, or at the intersection of SR 607 and Texas Flat Road. The proposed project crosses Texas Flat Road just east of SR 607. • An additional 8 out of 46 crashes occurred on Texas Flat Road at Flat Top Road, Mainline Road or Bombing Range Road. The proposed project parallels Texas Flat Road to the south of these locations. • Although not within proximity to the proposed project; almost half of the crashes (24) within theses limits took place on the east side of Texas Flat Road at SR 603/MS 43.

Source: Review of MDOT, Planning Division, District 6 Crash Data, XL GL and MUCR GL Reports (January 2010 – December 2015) for Locations Shown

1.4 MULTIMODAL CORRIDORS

A key element of the Mississippi Statewide Freight Plan was the identification of primary freight corridors in the state. Several multimodal freight corridors comprise the Mississippi Freight Network (MFN). The MFN is intended to define these critical corridors and is comprised of primary multimodal freight corridors, major intermodal facilities (marine ports, river ports, and commercial airports) served by these corridors, and the connecting roadway and rail links serving those intermodal facilities and the state's major freight generators. Included among those are Tier I Corridors which include the I-10/CSXT (Gulf Coast) Corridor and the I-59/NS Corridor. Both of these Tier I Corridors is aligned to a major interstate and Class 1 railroad main line. Each corridor features a combination of intermodal facilities (ports, airport, or rail) that are served by both a highway and rail connector.

1.5 RAILROAD SAFETY

FRA's Office of Railroad Safety promotes and regulates safety throughout the Nation's railroad industry through a diverse staff of railroad safety experts. Five of the safety disciplines focus on compliance and enforcement in: hazardous materials; motive power and equipment; operating practices; signal and train control; and track (FRA 2016a).

1.5.1 Railroad Safety Laws, Regulations and Programs

Rail Safety Improvement Act of 2008

In response to several fatal rail accidents that occurred between 2002 and 2008, Congress passed the Rail Safety Improvement Act (RSIA) of 2008, the first authorization of FRA's safety programs since 1994 (Public Law No. 110-432, Division A, enacted October 16, 2008, 122 Statute 4848-4906) (FRA 2009). The RSIA directs FRA to, among other things, promulgate new safety regulations. These new regulations govern different areas related to railroad safety, such as hours of service requirements for railroad workers, positive train control implementation, standards for track inspections, certification of locomotive conductors, and safety at highway-rail grade crossings.

Section 130

Section 130 refers to the Federal Aid Crossing Improvement Program; Section 130, Title 23 U.S. Code, Highway-Rail. This program requires each state to conduct and systematically maintain a survey of all public crossings, identifying those needing attention and provides funds for highway-rail grade crossing safety improvements. The improvements could be for separation, relocation, warnings signs and devices, and surfaces. Section 130 also requires that each state establish and implement a schedule of projects for this purpose, minimally requiring it to provide signs for all highway-rail grade crossings.

Accident Data and Reporting Investigations

To keep the railroads safe, FRA collects and analyzes data from the railroads and converts this information into meaningful statistical tables, charts, and reports. In addition to Railroad reported accidents and incidents, FRA continuously monitors the occurrence of train accidents and incidents and investigates serious events to determine their cause and compliance with existing safety laws and regulations. These activities are implemented under CFR Title 49 Part 225 – Railroad Accidents/Incidents: Reports Classification and Investigations.

The purpose of Part 225 is to provide the Federal Railroad Administration with accurate information concerning the hazards and risks that exist on the Nation's railroads. FRA needs this information to effectively carry out its regulatory responsibilities under 49 U.S. Code chapters 201-213. FRA also uses this information for determining comparative trends of railroad safety and to develop hazard elimination and risk reduction programs that focus on preventing railroad injuries and accidents. Any State may require railroads to submit to it copies of accident/ incident and injury/illness reports filed with FRA under this part, for accidents/incidents and injuries/illnesses which occur in that State.

Railroad Bridge Safety Standards

The structural integrity of bridges that carry railroad tracks is important to the safety of railroad employees and to the public. The responsibility for the safety of railroad bridges rests with the owner of the track carried by the bridge, together with any other party to whom that responsibility has been assigned by the track owner. The severity of a train accident is usually compounded when a bridge is involved, regardless of the cause of the accident.

Under 49 CFR Parts 213 and 237, FRA has established Federal safety requirements for railroad bridges (FRA 2010). This final rule requires track owners to implement bridge management programs, which include annual inspections of railroad bridges, and to audit the programs. This final rule also requires track owners to know the safe load capacity of bridges and to conduct special inspections if the weather or other conditions warrant such inspections.

Positive Train Control

Positive Train Control (PTC) systems are integrated command, control, communications, and information systems designed to prevent train accidents by controlling train movements with safety, security, precision, and efficiency. PTC systems will improve railroad safety by significantly reducing the probability of collisions between trains, casualties to roadway workers and damage to their equipment, and over speed accidents. The National Transportation Safety Board (NTSB) has named PTC as one of its "most-wanted" initiatives for national transportation safety.

In 2008, Congress required Class I Railroad mainlines handling poisonous-inhalation-hazard materials and any railroad main lines with regularly scheduled intercity and commuter rail passenger service to fully implement PTC by December 31, 2015. In late 2015, Congress extended the deadline by at least three years to December 31, 2018, with the possibility for two additional years if certain requirements are met. The new legislation, the PTC Enforcement and Implementation Act, required that railroads submit a revised PTC Implementation Plan by January 26, 2016, outlining when and how the railroad would have a system fully installed and activated.

PTC may be voluntarily developed and implemented by a railroad following the requirements of 49 Code of Federal Regulations (CFR) Part 236, Subpart H – Standards for Processor-Based Signal and Train Control Systems; or, may be as mandated by the Rail Safety Improvement Act of 2008 developed and implemented by a railroad following the requirements of 49 CFR Part 236, Subpart I – Positive Train Control Systems (FRA 2016c).

AASHTO Strategic Highway Safety Plan

The American Association of State Highway and Transportation Officials (AASHTO) published a nationally focused Strategic Highway Safety Plan (SHSP) in 1997, which was updated in 2004. This national SHSP focused on 22 specific highway safety challenges, or emphasis areas, that are divided into the following six parts or categories (MDOT 2014c):

- Part 1: Drivers
- Part 2: Special Users
- Part 3: Vehicles
- Part 4: Highways
- Part 5: Emergency Services
- Part 6: Management

Within the Part 4 Highways category, one of the AASHTO's critical emphasis areas is reducing vehicle-train collisions.

Mississippi Strategic Highway Safety Plan

Mississippi's initial Strategic Highway Safety Plan (SHSP) set a goal of reducing traffic-related fatalities to 700 traffic fatalities by 2011. At the time, this was considered a stretch goal because during the prior study period (2000 to 2007), Mississippi averaged almost 900 traffic fatalities per year and the trend line was flat. The 2013 SHSP builds on the original SHSP that was completed by MDOT and Mississippi Department of Public Safety in 2007. The new goal includes reducing annual traffic fatalities by 25 percent by 2017; this translates into 525 or fewer traffic fatalities by 2017 (MDOT 2014c).

As part of the 2013 SHSP update, Mississippi's crash data for severe crashes that occurred between 2005 and 2009 was analyzed and then disaggregated into AASHTO's critical emphasis areas (CEA). The analysis identified the number of severe crashes in each CEA, along with the percentage represented of the total number of crashes. It was concluded that a focus on the top CEA's represent the greatest potential to significantly reduce the number of severe crashes throughout Mississippi. The top CEAs are listed as follows (MDOT 2014c):

- Unbelted Drivers
- Intersection Crashes
- Impaired Drivers
- Unlicensed Drivers
- Road Departure Crashes

Accident data for vehicle-train collisions was also evaluated as part of the 2013 SHSP update. Within the Part 4 Highways category, one of the AASHTO's critical emphasis areas is reducing vehicle-train collisions.

Rail Safety Public Awareness Programs

Operation Lifesaver, Inc. is just one of many organizations dedicated to advocating rail safety and educating the public on rail safety programs. They are a nonprofit public safety organization committed to reducing collisions, fatalities and injuries at highway-rail crossings and trespassing on or near railroad tracks. Throughout the United States, they work with rail safety advocates, and local and state governments to educate people about rail safety and develop educational materials and create public awareness campaigns (OLI 2016).

1.5.2 Highway-Rail Grade Crossing Safety

The rail safety area most visible to the general public, and for which the public is most exposed to potential harm from rail operations, is the interface between the rail and highway systems at grade crossings. There are over 4,200 highway-rail crossings in Mississippi, with almost 2,300 located on public roadways. Over the past decade, MDOT has completed improvements to over 400 at-grade crossing locations (MDOT 2011a).

1.5.3 Hazardous Materials

The following information is excerpted from FRA website, Hazardous Material Transport (FRA 2016d) and CSX website under safety/hazardous materials (CSX 2016b).

Rail transportation of hazardous materials in the United States is recognized to be the safest method of moving large quantities of chemicals over long distances. Recent statistics show that the rail industry's safety performance, as a whole, is improving. In particular, the vast majority of hazardous materials shipped by rail tank car every year arrive safely and without incident, and railroads generally have an outstanding record in moving shipments of hazardous materials safely.

Freight railroads have established recommended operating practices for the transportation of hazardous materials pursuant to Association of American Railroads (AAR) *Recommended Railroad Operating Practices for Transportation of Hazardous Materials,* Circular No. OT-55-I (CPC-1174, Supplement No. 1) (AAR 2006). Continuous sponsored industry and government improvements in rail equipment, tank car and container design and construction, and inspection and maintenance methods have resulted in reducing derailments, spills, leaks and casualties while the volume of traffic increases (FRA 2016d). Railroads that transport hazardous materials have highly trained experts that manage hazardous material movements and respond to hazardous material incidents. The transport of hazardous materials is regulated by the U.S. Department of Transportation (DOT), the U.S. Department of Homeland Security, the U.S. Transportation Security Administration, the U.S. Environmental Protection Agency (USEPA), and the Occupational Safety and Health Administration (OSHA). These regulations mandate that the transport of hazardous materials be conducted with the highest level of care and security.

Freight railroads are considered "common carriers" under U.S. interstate commerce laws and are legally required to move any freight including hazardous materials, provided that they are contained within a government approved rail car or container. Rail cars that transport hazardous materials must meet strict Federal regulations.

The majority of hazardous materials are chemicals that are essential to the economy of the U.S. and are used to manufacture every day products. Hazardous commodities, by U.S. DOT hazard class, are listed below.

- Class 1 – Explosives
- Class 2 – Gases
- Class 3 – Flammable Liquids
- Class 4 – Other Flammable Substances
- Class 5 – Oxidizing Substances and Organic Peroxides
- Class 6 – Toxic (Poisonous) and Infectious Substances
- Class 7 – Radioactive Material
- Class 8 – Corrosives
- Class 9 – Miscellaneous Hazardous Materials

1.5.4 Emergency Response

USEPA regulations address spill prevention and cleanup. Most USEPA regulations address fixed facilities rather than transport activities. However, USEPA regulations in 40 CFR Part 263, are applicable to transporters of hazardous waste, and specify immediate response actions, discharge cleanup, and other requirements for transporters of hazardous waste. Finally, OSHA regulations in 29 CFR § 1910.120, address hazardous waste operations and emergency response, and specify emergency response and cleanup operations for releases of hazardous substances and substantial threats of such releases.

1.5.5 FRA Accident Data

Accident data for Hancock County and Pearl River County were obtained from FRA's Office of Safety Analysis. **Table 8** presents 20 years of accident data (1996-2015) for each of the railroads that operate within the study area.

According to the Highway Rail Incident records, PBVR had 2 rail incidents over the past 20-year period.

Table 8: Accident Data

Year	Hancock County				Pearl River County		
	Port Bienville	CSXT	Amtrak	Total	NS	Amtrak	Total
2015	-	1	-	1	-	-	0
2014	-	1	-	1	-	-	0
2013	-	1	-	1	-	-	0
2012	-	2	-	2	-	-	0
2011	1	2	-	3	-	-	0
2010	-	1	-	1	1	-	1
2009	-	1	-	1	-	1	1
2008	-	1	-	1	3	-	3
2007	-	3	-	3	-	-	0
2006	-	3	-	3	3	-	3
2005	-	-	-	-	-	-	0
2004	-	1	-	1	-	-	0
2003	-	1	1	2	-	-	0
2002	-	2	-	2	1	1	2
2001	-	-	-	0	1	1	2
2000	-	1	1	2	1	-	1
1999	-	-	-	-	-	3	3
1998	1	1	-	2	1	1	2
1997		2	1	3	1	1	2
1996		1	1	2	-	-	0
20-year Total	**2**	**25**	**4**	**31**	**12**	**8**	**20**

Source: FRA's Office of Safety Analysis (FRA 2016e)
Note: Highway Rail Incidents Only; Severity of Incidents not included

CHAPTER 2. FUTURE CONDITIONS

This chapter discusses the proposed Project as it relates to future year transportation infrastructure including port and airport facilities, railroads, and roadway network. A summary of projected future year traffic conditions, operations, and safety within the study area is presented. Future year traffic operations consists of a traffic and grade crossing analysis which focuses on future year train volumes and associated highway traffic impacts that are projected as part of the proposed Project.

2.1 PORT AND AIRPORT FACILITIES

2.1.1 Port Bienville/Port Bienville Industrial Park

Major development initiatives have recently been undertaken or are proposed at Port Bienville Industrial Park. These projects, which would benefit from the expansion of regional transportation facilities within the study area, are briefly described below (HCPHC 2015).

Jindal Tubular USA LLC, one of the largest manufacturers of large diameter steel pipe, invested $10 million in their plant expansion for a production line to manufacture mortar-lined pipe for drinking water. Since beginning operations in August 2015, Jindal has increased employment at its Port Bienville Industrial Park plant from less than 50 to 200 personnel.

DAK Americas, which is one of the largest plastic-resin manufacturers in the U.S., has announced plans for a new manufacturing plant at their existing site at the industrial park. The plant would include $40 million of direct investment while adding 87 new full time jobs.

In December 2015, it was announced that the Port Bienville Industrial Park will receive $8 million in RESTORE Act funding (Deepwater Horizon Oil Spill) for the construction of a trans-load dock and ancillary infrastructure improvements including rail line expansion. The project will improve Port users' ability to move product between modes of transportation and will increase Port throughput in support of industry onsite and offsite.

Each of these planned projects will place a greater demand on the study area transportation network. New and expanding manufacturing facilities will require additional employees and services, thus generating additional vehicular traffic and placing a greater demand on the existing roadway network.

2.1.2 Stennis International Airport

In December 2015, it was announced that the airport will receive $2 million in RESTORE Act funding (Deepwater Horizon Oil Spill) for Phase II of the Terminal Hangar project to construct a new 24,000 square foot hangar. The new hangar will also accommodate maintenance, repair and overhaul operations (HCPHC 2015).

2.2 FUTURE RAIL NETWORK

2.2.1 Multimodal Corridors

Future conditions associated with the Tier I Corridors defined in the Mississippi Statewide Freight Plan were assessed using a comprehensive approach. The comprehensive approach considered a combination of all the intermodal facilities for assessing the corridor needs, as well as corridor infrastructure requirements. Each of the short-range and long-range recommended improvements to the Tier I Corridors would provide a benefit to the proposed Project. Key features associated with each of these multimodal Tier I Corridors include:

<u>I-10/CSXT – Short-Range and Long-Range Recommended Improvements</u>

- Upgrade all public at-grade crossings to full active crossing warning devices to improve safety (35 out of 72).
- Widen I-10 along the entire corridor to enhance reliability.
- Enhance rail access between CSXT and the Port of Gulfport to improve operational efficiency.
- Raise 7 of 48 bridges along I-59 to meet 16-foot vertical clearance requirement.
- Double track CSXT mainline to accommodate passenger rail.

<u>I-59/NS – Short-Range and Long-Range Recommended Improvements</u>

- Upgrade all public at-grade crossings to full active crossing warning devices to improve safety (7 out of 30).
- Construct track improvements along NS rail corridor in Picayune and Laurel to raise operating speed and enhance reliability.
- Upgrade I-59 to improve safety—21 miles out of 171 miles along I-59 have high crash segments.
- Raise 1 of 9 bridges along I-10 to meet 16-foot vertical clearance requirement.
- Double track NS mainline to accommodate high-speed passenger rail.

2.3 FUTURE ROADWAY NETWORK

2.3.1 Study Area Roadway Network

Future improvements to study area roadways are included within MDOT's 5-year Transportation Improvement Program (TIP). The only project included within the TIP that is located within the study area is the proposed US 90 bridge replacement over the Pearl River near the Louisiana/Mississippi state line (Project 106663/301000). Initial funding in the amount of $30 million has bee identified for the construction of this project, which is scheduled to begin in 2020 (MDOT 2016b).

2.4 PROPOSED PROJECT

2.4.1 Mainline Alignment

The proposed Project is identified as a near-term priority within the Mississippi State Rail Plan (MDOT 2011a). The proposed Project would provide a direct connection between Port Bienville and the NS rail line near I-59, near Picayune/Nicholson. The proposed rail connection to the NS would also provide access to the Canadian National Railroad further north in Hattiesburg. Overall, the proposed Project would link to both the CSXT and NS main lines in Hancock County providing Port Bienville with the access to dual Class I rail service.

The proposed Project would repair and upgrade a 5.33 mile portion of the inactive NS rail line between US Highway 11 and Texas Flat Road. This segment of existing rail previously served SSC. The existing track within this segment consists of 136 pound (136#) continuously welded rail with wood ties. Within this segment of the overall rail corridor, a setout track is proposed within the existing NS right of way. A setout track is a short side track with access roads on both sides used to set out a defective car, allowing the rest of the train to proceed while the defective car remains behind to be repaired at a later time. They can also be used to store maintenance or inspection equipment for a short period of time.

South of Texas Flat Road, the proposed Project consists of new rail that would be constructed with a proposed 200-foot right of way. The new alignment segment is approximately 18.3 miles in length. Approximately 96,624 track feet of rail would be constructed as part of the Project. The proposed track would consist of 136 pound (136#) continuously welded rail with wood ties. Manual and electric turnouts would be installed.

2.4.2 Proposed Highway-Rail At-Grade Crossings

As part of the conceptual engineering that was undertaken for the proposed rail alignment, proposed highway-rail grade crossings along the 23-mile rail corridor are depicted in **Figure 1**. Depending on highway functional classification and existing traffic volume, the proposed grade crossings consist of grade-separated crossings and at-grade crossings. **Table 9** summarizes the grade crossing locations along the Project alignment, which are further described below.

Grade-Separated Crossings

Four grade-separated crossings would occur along the entire project corridor. These locations include the existing rail bridge over I-59 in Nicolson and three new grade-separated structures at I-10, SR 607 and US 90. For the new grade-separations, the rail would be elevated over the roadway with a bridge structure, and embankment sections would be constructed on each approach to the bridge. Bridge lengths would be determined based on existing topography, existing cross street right of way and proposed vertical geometry.

Public At-Grade Crossings

Thirteen public at-grade crossings would occur along the entire limits on project corridor. Six of the public at-grade crossings would be located on the north end of the corridor where the existing rail crosses US 11, Asa McQueen Road, Ridge Road, Texas Flat Road, and two unknown roads. Seven additional public at-grade crossings would occur at Flat Top Road, Mainline Road, Catahoula Road, Old Lower Bay Road, and three unknown roads.

In addition to the public at-grade crossings that are associated with the proposed Project, an existing highway-rail at-grade crossing occurs where the CSX Railroad crosses Lower Bay Road, just east of the entrance to Port Bienville. This grade crossing is proposed to be upgraded with flashing gates as described in the Mississippi State Rail Plan (MDOT 2011a).

Private At-Grade Crossings

Along the main line alignment from Texas Flat Road to US 90, there would be approximately nine private at-grade crossings. All of these crossings would occur at existing local access roadways, many of which are unpaved or unimproved asphalt roadways and do not have designated street names. These existing roadways provide access to undeveloped parcels of land owned by private landholders. In addition, several of the at-grade crossings are located within the SSC buffer zone.

Figure 7: Proposed Grade Crossings along Project Alignment

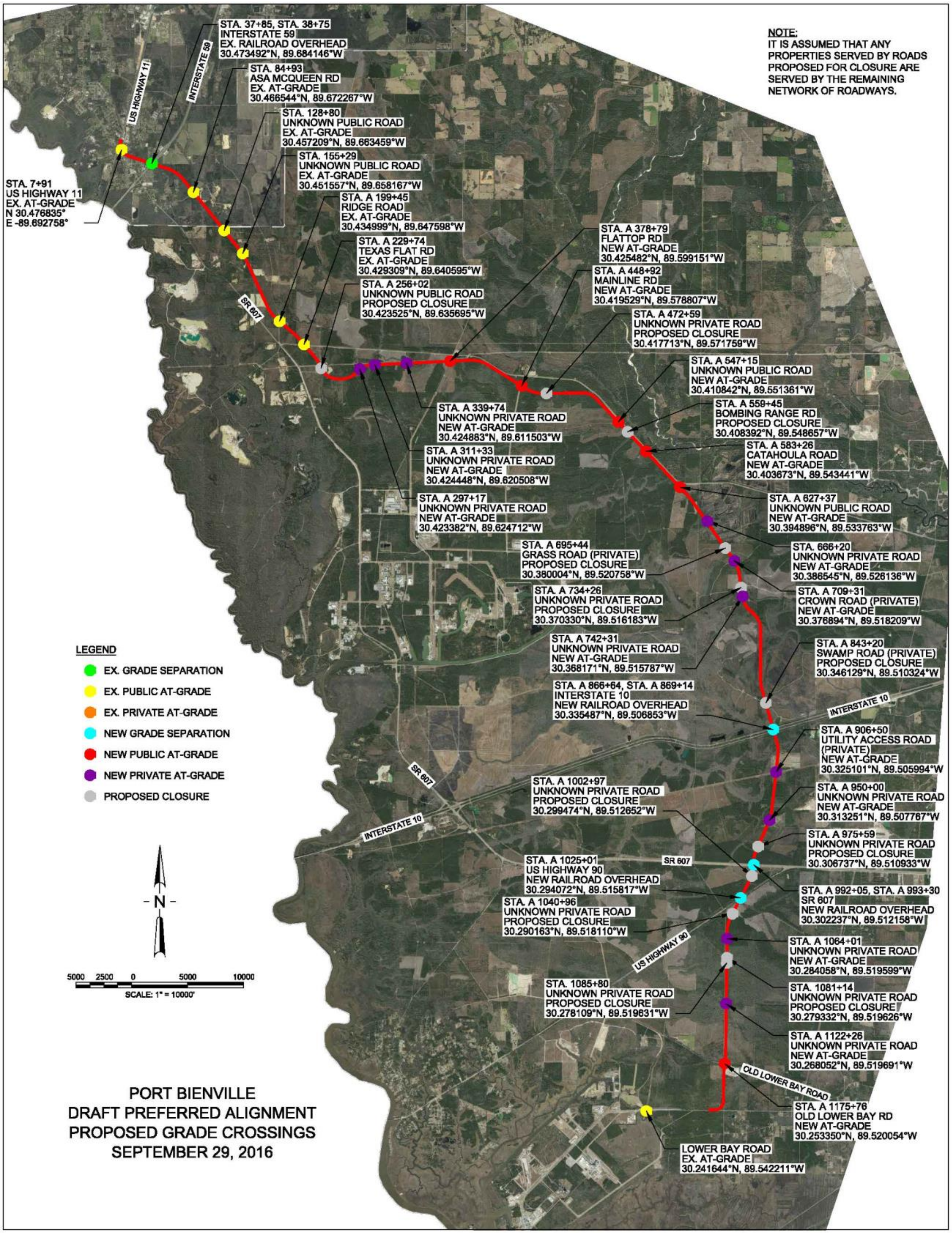


Table 9: Proposed Grade Crossings along Project Alignment

Roadway Crossing Location	Alignment Centerline Station (1)	Crossing Type and Disposition		
		At-Grade		Grade-Separated; Public Crossing
		Public	Private	
Proposed Rail on Existing Alignment within Existing NS Railroad Right-of-way				
US Highway 11	Sta 7+91	Existing		
Interstate 59	Sta 38+30			Existing; Rail over
Asa McQueen Road	Sta 84+93	Existing		
Unknown Roadway	Sta 128+80	Existing		
Unknown Roadway	Sta 155+29	Existing		
Ridge Road	Sta 199+45	Existing		
Texas Flat Road	Sta 229+74	Existing		
Proposed Rail on New Alignment within Required Right-of-way				
Unknown Roadway	Sta 256+02	Proposed		
Unknown Roadway	Sta 297+17		Proposed	
Unknown Roadway	Sta 311+33		Proposed	
Unknown Roadway	Sta 339+74		Proposed	
Flat Top Road	Sta 378+79	Proposed		
Mainline Road	Sta 448+92	Proposed		
Unknown Roadway	Sta 547+15	Proposed		
Catahoula Road	Sta 583+26	Proposed		
Unknown Roadway	Sta 627+37	Proposed		
Unknown Roadway	Sta 666+20		Proposed	
Crown Road	Sta 709+31		Proposed	
Unknown Roadway	Sta 742+31		Proposed	
Interstate 10	Sta 867+50			Proposed; Rail over
Utility Access Road	Sta 906+50		Proposed	
Unknown Roadway	Sta 950+00		Proposed	
SR Route 607	Sta 992+70			Proposed; Rail over
US Highway 90	Sta 1025+01			Proposed; Rail over
Unknown Roadway	Sta 1122+26		Proposed	
Old Lower Bay Road	Sta 1175+76	Proposed		
Total No. of Crossings by Type		**13**	**9**	**4**

Note 1: Station locations are based on conceptual rail alignment maps prepared by HDR.

Proposed Road Closures

Due to the close proximity of existing private roadways in relationship to the three proposed grade separations, a few adjacent private roadways would need to be closed to accommodate the embankment sections associated with the bridge approaches. Proposed private roads recommended for closure are depicted in Figure 7 and would occur at the following locations:

- one private road closure north of I-10,
- two private road closures immediately north and south of SR 607; and
- one private road closure south of US 90.

2.4.3 Proposed Traffic Control Measures at Highway-Rail At-Grade Crossings

In accordance with the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD), traffic control for grade crossings includes all signs, signals, markings, other warning devices, and their supports along highways approaching and at grade crossings. The function of this type of traffic control is to promote safety and provide effective operation of rail and highway traffic at grade crossings. Before any new highway-rail grade crossing traffic control system is installed, or before modifications are made to an existing system, approval shall be obtained from the highway agency with the jurisdictional and/or statutory authority, and from the railroad company (FHWA 2009).

Highway-rail grade crossing traffic control measures would be implemented in accordance with the MUTCD standards as part of the Project. Recommended traffic control for highway-rail at-grade crossings would include, at a minimum, one grade crossing (crossbuck) sign on each highway approach to every highway-rail grade crossing, alone or in combination with other traffic control devices. The crossbuck sign is a warning to on-coming traffic of a highway-rail grade crossing and of a driver's responsibility to yield to rail traffic if a train is approaching the crossings. In addition, a Grade Crossing Advance Warning sign shall be used on each highway in advance of every public highway-rail grade crossing (with exceptions). Several other advance warning signs can be used to alert drivers of highway-rail crossing conditions (**Figure 8**).

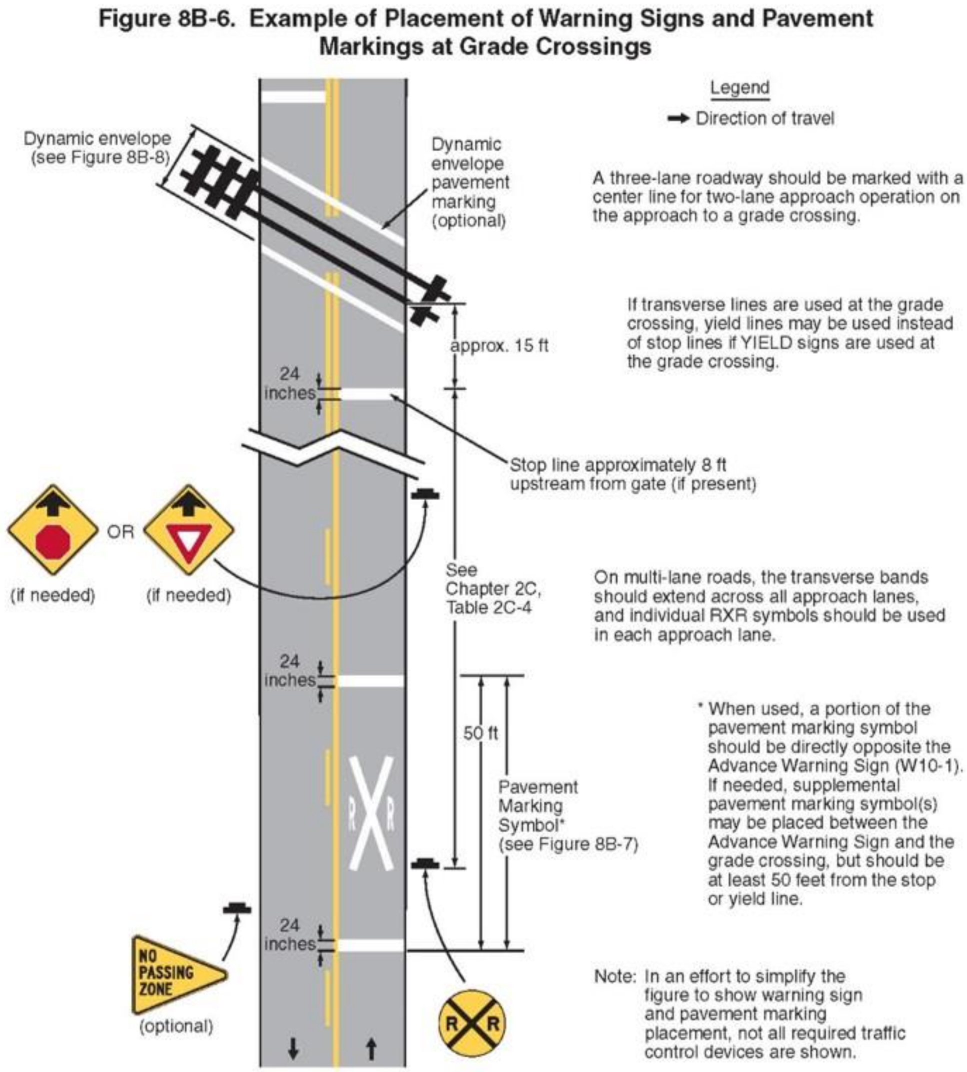
Figure 8: Highway-Rail At-Grade Crossing Signage

Recommended Signs	 Grade Crossing sign (R15-1) (Crossbuck)	 Grade Crossing Advance Warning sign (W10-1)		
Optional Traffic Control/Advance Warning Signs	 Diagonal Crossing (W10-12)	 Parallel Crossing (W10-3)	 Stop Sign (if needed)	 Yield Sign (if needed)

Source: *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways* (FHWA 2009).

In addition to MUTCD-compliant grade crossing signage, various on-street pavement markings are recommended for installation at public at-grade crossings. These markings would include stop lines, dynamic envelope pavement markings, and railroad pavement marking symbols. **Figure 9** provides an example layout of safety devices for a public highway-rail grade crossing.

Figure 9: Highway-Rail Crossing Signage and On-street Pavement Marking Example



Source: *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways,* Page 765 (FHWA 2009).

Table 10 summarizes the proposed traffic control measures that are recommended for installation at each of the 22 at-grade crossings. Advance warning signs, on-street pavement markings, signal gates and flashing lights are proposed at all public at-grade crossings. At the remaining private at-grade crossings, which would consist of very low volume roadways, crossbuck signs are recommended. On US 11, pedestrian crossing signs to accommodate Nicholson Elementary School students should be considered, if warranted.

Traffic control and signing and pavement marking plans which illustrate the proposed traffic measures for each of these locations would be developed as part of the Project design. Concurrence and approval from the highway agencies (MDOT, Hancock County and

Pearl River County) with the jurisdictional and/or statutory authority for each roadway would be required.

Table 10: Proposed Traffic Control Measures at Highway-Rail Grade Crossings

Roadway Crossing Location	Alignment Centerline Station (1)	Crossing Type (Public/Private)	Proposed At-Grade Crossing Measures
US Highway 11	Sta 7+91	Public	Gates, flashers, pavement markings and grade crossing signs (crossbucks and grade-crossing advance railroad crossing)
Asa McQueen Road	Sta 84+93	Public	
Unknown Roadway	Sta 128+80	Public	
Unknown Roadway	Sta 155+29	Public	
Ridge Road	Sta 199+45	Public	
Texas Flat Road	Sta 229+74	Public	
Unknown Roadway	Sta 256+02	Public	
Unknown Roadway	**Sta 297+17**	**Private**	**Crossbuck signs**
Unknown Roadway	**Sta 311+33**	**Private**	
Unknown Roadway	**Sta 339+74**	**Private**	
Flat Top Road	Sta 378+79	Public	Gates, flashers, pavement markings and grade crossing signs (crossbucks and grade-crossing advance railroad crossing)
Mainline Road	Sta 448+92	Public	
Unknown Roadway	Sta 547+15	Public	
Catahoula Road	Sta 583+26	Public	
Unknown Roadway	Sta 627+37	Public	
Unknown Roadway	**Sta 666+20**	**Private**	**Crossbuck signs**
Crown Road	**Sta 709+31**	**Private**	
Unknown Roadway	**Sta 742+31**	**Private**	
Utility Access Road	**Sta 906+50**	**Private**	
Unknown Roadway	**Sta 950+00**	**Private**	
Unknown Roadway	**Sta 1122+26**	**Private**	
Old Lower Bay Road	Sta 1175+76	Public	Gates, flashers, pavement markings and grade crossing signs (crossbucks and grade-crossing advance railroad crossing)

Note 1: Station locations are based on conceptual rail alignment maps prepared by HDR.

2.5 TRAFFIC DELAY ANALYSIS

2.5.1 Traffic Delay Analysis Overview

Train crossings interrupt roadway traffic flow for a period of time at highway-rail at-grade crossings. Speed and length of the train are the primary factors that contribute to vehicular delay. A traffic delay analysis was undertaken to estimate the projected vehicular delay in 2020 and 2040. Factors considered in the vehicle delay analysis include:

- The number of trains per day associated with the proposed Project,
- The estimated time it takes for a train to pass the highway-rail at-grade crossing; and
- Existing and projected roadway traffic volumes.

To characterize future conditions along the Project corridor, the analysis estimated future traffic delays due to the train movements at four public highway-rail at-grade crossings. The analysis focused on calculating delays to characterize the future effects on vehicular traffic from projected train movements. Vehicle delay calculations included the following measurements:

- Blocked crossing time per train, minutes (Dc)
- Average delay per delayed vehicle, minutes (Da)
- Vehicle queue length, number of vehicles (Q)
- Average delay for all vehicles, minutes (Dv)
- Total delayed vehicles per day (Td)
- Total vehicle delay for all vehicles in 24-hour period

Table 11 briefly describes the parameters that were used to measure the grade crossing roadway and rail operational delay.

Table 11: Operational Parameters at Highway-Rail Grade Crossings

Parameter	Description
Blocked Crossing Time per Train (Dc)	The time required for a train to cross the intersecting roadway will be estimated. This time is called the blocked crossing time. This value is used to determine the length of time drivers wait when trains pass through a highway/rail at-grade crossing. Average train speed is a major factor in this calculation. This speed is dependent not only on track conditions and train operating characteristics, but also on intersecting commuter and freight rail traffic.
Average Delay per Delayed Vehicle (Da)	The average delay per delayed vehicle is the average amount of time that a driver would be delayed at a highway/rail at-grade crossing as a result of a single train crossing. It assumes a uniform arrival of vehicles. Vehicles arrive at a constant rate. When the blocked crossing period begins, vehicles begin to queue. When the blocked crossing period ends, queued vehicles begin to depart at the constant vehicle departure rate. The departure rate continues until the departure curve intersects the arrival curve, signifying the dissipation of the queue.
Vehicle Queue Length (Q)	The vehicle queue is the estimated number of vehicles in line at the end of the blocked crossing time of a single train event. The vehicle queue is equal to the number of vehicles that arrive during the blocked crossing time (De). The vehicle queue during the peak hour of roadway traffic is estimated. The peak-hour traffic is assumed to be 10 percent of the ADT volume-a typical assumption used by traffic engineers, and consistent with MDOT count data. The vehicle queue at the end of the blocked crossing time is determined.
Average Delay for All Vehicles (Dv)	The average delay per vehicle is the average amount of time that a vehicle is delayed at that intersection.
Average Number of Vehicles Delayed Per Day (Td)	The average number of vehicles delayed per day equals the number of drivers in a 24-hour period that would be stopped for trains at highway-rail at-grade crossings.
Traffic Level of Service (LOS)	The vehicle delay effects at highway-rail at-grade crossings uses the LOS concept at signalized intersections, as documented in the 2010 Highway Capacity Manual (HCM) (TRB 2010). Use of the HCM procedures for signalized intersections is acceptable for the following reasons: the absence of a similar measure of efficiency for highway-rail at-grade crossings, and similarities between signalized intersection operation and highway-rail at-grade crossing operation.
Total Daily Average Vehicle Traffic Delay	The total average vehicle delay for each crossing over a 24-hour period multiplied by the number of vehicles delayed is used to estimate the total daily average vehicle traffic delay.

2.5.2 Traffic Delay Analysis Methodology

The model used for calculation of delay at individual at-grade crossings provides a measure of delay based upon the time spent waiting for trains to clear individual crossings. This analysis provides output within the following general categories.

Maximum Queue Length. The queuing model supplied, based upon the Highway Capacity Manual (HCM) methodology measures the length of traffic queues created when trains crossing through at-grade intersections stop traffic flow. Measurement of the queue length is in the number of vehicles waiting in both directions at the given time the train crosses. As the train schedule limits the number and frequency of trains operating in the corridor, it also limits the likelihood of this queue developing during the peak of traffic.

Total Delay. Delay measurements identify two conditions prevalent along the rail corridors:

- Aggregate Delay, defined as the total delay (in vehicle hours) incurred by all vehicles passing through the rail/road intersection.
- Average Delay, defined as the delay experience (in seconds per vehicle) for each peak hour experienced by vehicles passing through the rail/road intersection.

Level of Service. Level of Service (LOS) represents the evaluation of traffic operations, given a roadway subdivision, intersection or similar unit, combined with its general characteristics using procedures outlined in the *Highway Capacity Manual (HCM) 2000*, developed by the Transportation Research Board of the National Academies (TRB 2000). Procedures outlined in this manual can examine conditions along various types of roadways, given a variety of traffic operational conditions.

In these analyses, the measure of performance, known as the level of service, appear as a letter grade ranging from A to F. Thresholds and general descriptions for these measures, for both signalized and unsignalized intersections appear in **Table 12**. Analysis of level of service for roadways depends on the prevailing conditions of traffic operations found in the corridor, as characterized generally by the following factors:

- Traffic density or number of vehicles found on the corridor by lane;
- Prevailing speed of operation; and
- Ratio of volume to roadway capacity.

Table 12: Level of Service Criteria, Highway Capacity Manual

Signalized Intersections		Unsignalized Intersections	
Level of Service	**Control Delay per Vehicle**	**Level of Service**	**Control Delay per Vehicle (Sec)**
A	≤ 10 seconds/vehicle	A	≤ 10 seconds/vehicle
B	> 10-20 seconds/vehicle	B	> 10-15 seconds/vehicle
C	> 20-35 seconds/vehicle	C	> 15-25 seconds/vehicle
D	> 35-55 seconds/vehicle	D	> 25-35 seconds/vehicle
E	> 55-80 seconds/vehicle	E	> 35-50 seconds/vehicle
F	> 80 seconds/vehicle	F	> 50 seconds/vehicle

Source: Exhibit 16.2, Level of Service Criteria for Signalized Intersections; Exhibit 17.2, Level of Service Criteria Unsignalized Intersections; *Highway Capacity Manual 2000* (TRB 2000).

Analyses which find LOS C or better conditions typically indicate that traffic movements occur close or at the posted speed limit, although some friction might be occurring as a result of vehicles entering from side streets, driveways or from lane changes to avoid congestion or turning vehicles. Typically, this level of operational environment, at-peak, occurs rarely, as this time period often reflects the period during which the maximum number of vehicles per hour can be found in the corridor. LOS D marks the point in traffic operations where the options to maneuver around slower moving vehicles, or vehicles entering/exiting the roadway is severely restricted. Traffic operations characterized by slower moving vehicles, including incidents of stopped vehicles or vehicles remaining platooned at signals through multiple cycles, reflect LOS E or LOS F conditions. LOS F represents that period during which the roadway is at, or over capacity, with a breakdown in traffic flow probable. **Table 13** provides an overview of the LOS Criteria for rural streets, by classification.

Table 13: Rural Street Level of Service Criteria, Highway Capacity Manual

Rural Class	Class I	Class II	Class III	Class IV
Range of Free Flow Speeds (FFS)	55 to 45 mph	45 to 35 mph	35 to 30 mph	35 to 25 mph
Typical FFS	50 mph	40 mph	35 mph	30 mph
LOS	**Average Travel Speed (mph)**			
A	> 42	> 35	> 30	> 25
B	> 34-42	> 28-35	> 24-30	> 19-25
C	> 27-34	> 22-28	> 18-24	> 13-19
D	> 21-27	> 17-22	> 14-18	> 9-13
E	> 16-21	> 13-17	> 10-14	> 7-9
F	≤ 16	≤ 13	≤ 10	≤ 7

Source: Exhibit 15.2, Rural Street Level of Service by Class; *Highway Capacity Manual 2000* (TRB 2000).

2.5.3 Traffic Delay Analysis Locations

At-grade crossings along the proposed Project were analyzed for delay under future year conditions in 2020 and 2040. The analysis focused on public at-grade crossings that would most likely be impacted by the proposed Project. The overall transportation network and rural nature of the study area were also considered. Along the proposed rail alignment, three future highway-rail grade crossings were evaluated including US Highway 11, Texas Flat Road, and Flat Top Road. The existing at-grade crossing on Lower Bay Road at the Port entrance was also evaluated. The delay analysis on Lower Bay Road consisted of two scenarios: 1) with proposed Project rail traffic from the NS line only and 2) with proposed Project rail traffic from the NS line in combination with PBVR traffic on the existing spur that connects to CSXT. Due to the CSXT's current common carrier obligation with Port Bienville, it is assumed that the existing and projected rail volumes for Port Bienville Industrial Park Tenants would continue to be served by CSXT. For purposes of the delay analysis, projected one-way rail volumes on the existing PBVR are estimated to be 22 cars in 2020, increasing to 33 cars by 2040.

2.5.4 Highway Data for Traffic Delay Analysis

In order to analyze future year traffic delay at proposed at-grade crossings, data was compiled from several sources. The delay analysis was conducted based on proposed values for the number of trains (N), average train speed (V), length of trains (L), number of traffic lanes (NL), and traffic count data. Traffic data for the delay analysis was provided by the Mississippi Department of Transportation (MDOT) and the Gulf Regional Planning Commission. No additional traffic counts were obtained to supplement the existing data.

Average daily traffic (ADT) traffic count data by MDOT documents total volume found at key locations in the study area. Historical ADT for the study area (two-way traffic) provides for changes in overall traffic. The purpose of this data, and the trend it provides, is to establish growth in traffic patterns as a means of creating a common baseline within stations of different years within the study area.

Each data point collected in the study area also came from a variety of count years. The analysis of future rail operations requires that all traffic volumes use a common year to establish a base for future operations. To define this base within a dataset containing points collected over a variety of years, the analysis used a trend line to document changes in traffic volume in the area. This trend is an annualized rate of change calculated following a review of data from several years for established count stations in the study area. Generally, the trend for changes in traffic found through this method was a 1 percent annual change. This rate of change allowed for its annualized growth between date of collection and the established baseline year (2020) and future year (2040). **Table 14** provides a summary of the ADT data used in the analysis of future conditions for each location evaluated. This data demonstrates the low volume nature of the majority of roads which cross the proposed Project.

Table 14: Grade Crossing Projected Traffic Volume Data (2020 and 2040)

At-Grade Crossing Location	Existing Volume (year)	2020 Estimated Volume (1)	2040 Estimated Volume (1)
US Highway 11	8,400 (2014)	8,917	10,880
Texas Flat Road	2,064 (2012)	2,235	2,727
Flat Top Road	110 (2011)	-	-
	See Note 1	500	610
Lower Bay Road	1,876 (2012)	2,031	2,479

Note 1. The 2011 traffic count for Texas Flat Road is located to the north of Flat Top Road. The proposed at grade crossing is located on the south side of Flat Top Road where there is no traffic count data. Based on the existing roadway network, it is assumed that the volume of traffic on Flat Top Road, south of Texas Flat Road, would be higher due to the proximity of access to SSC. Therefore the 2020 volume on Texas Flat Road south of Flat Top Road is estimated at 500 vehicles per day.

2.5.5 Rail Data for Traffic Delay Analysis

Estimates of existing and future rail car volumes were developed as part of the delay analysis. The PBVR is currently operating 6-day service with 2 trains per day (1 train inbound and 1 train outbound). Each train averages 22 cars per train each way. This daily average is based on the actual number of total cars serviced (49,013 cars) from January 2013 to present. Annually, PBVR handles approximately 6,200 train cars. These existing trains access Port Bienville by way of the CSXT mainline near Ansley, Mississippi.

Based on previous interviews that were conducted with existing companies and information from the Mississippi Development Authority (MDA), future rail car usage on the Port Bienville Railroad could increase significantly given access to dual Class I railroads. The largest projected rail car user, Shale Support Services, is currently trucking fracking sands from Hancock County to its drying facility in Picayune. Additional product lines are planned for this facility in the near future if dual rail access is available, and the Phase II expansion would move 168,000 tons (1,680 rail cars) of material monthly (20,160 rail cars annually) from the Hancock County facility (MDOT 2013c).

Table 15 depicts the total projected volume of rail traffic with dual Class I rail service into Port Bienville.

Table 15: Projected Rail Car Volumes with Dual Class I Rail Service

Existing and Projected Rail User	Existing and/or Projected Annual Rail Car Volume	Existing and/or Projected Daily Rail Car Volume (one-way only)
Existing Rail Car Volume for Existing Port Bienville Industrial Park Tenants (1)	6,200 rail cars	22 rail cars
Future Additional Rail Car Volume for Existing Port Bienville Industrial Park Tenants (2)	3,530 rail cars	11 rail cars (3)
Projected Rail Car Volumes for Phase II Shale Support Services Facility in Hancock County (2)	20,160 rail cars	65 rail cars (3)
Total Projected Rail Car Volumes for Existing Industries and MDA Industrial Prospect	**29,890 rail cars**	**98 rail cars**

Source 1: Hancock County Port and Harbor Commission, email correspondence dated June 2, 2016 and August 25, 2016.
Source 2: Port Bienville Rail Feasibility Study, CDM Smith, September 2013.
Source 3: Projected Daily Volume Based on 6-day Service Weekly per Year.

As part of the grade crossing analysis, projected rail car volumes were distributed among the Class I railroads as shown in **Table 16**. Due to the CSXT's current common carrier obligation with Port Bienville, it is assumed that the existing and projected rail volumes for Port Bienville Industrial Park Tenants would continue to be served by CSXT. For purposes of the delay analysis, projected one-way rail volumes on the existing PBVR are estimated to be 22 cars in 2020, increasing to 33 cars by 2040.

The remainder of the projected rail traffic would utilize the proposed rail line. Based on the distribution of projected daily rail car volumes, it is estimated that the proposed rail line would move 65 rail cars (one-way only) on a daily basis by 2040. In the interim, the projected one-way rail volume on the proposed rail line is estimated to be 30 cars in 2020.

Table 16: Distribution of Projected Daily Rail Car Volumes by Class I Railroad (one-way only)

Existing and Projected Rail User	Total Projected Daily Rail Car Volumes (one-way only)	Projected Daily Rail Car Volumes - Existing CSXT		Projected Daily Rail Car Volumes - NS/Proposed Project	
	Full Build - 2040	2020	2040	2020	2040
Existing Rail Car Volume for Existing Port Bienville Industrial Park Tenants	22 rail cars	22	22	-	-
Future Projected Additional Rail Car Volume for Existing Port Bienville Industrial Park Tenants	11 rail cars	-	11	-	-
Projected Rail Car Volumes for Phase II Shale Support Services Facility in Hancock County	65 rail cars	-	-	30	65
Total Projected Rail Car Volumes for Existing Industries and Future Industrial Prospects	**136 rail cars**	**22**	**33**	**30**	**65**

Train Lengths (L). The numbers of existing and projected cars per train is projected to vary from 22 to 65 cars. With each car having an average length of 60 feet including the coupling, plus an 80 foot locomotive, train lengths could range from 1,400 feet to 4,060 feet. Trains over 50 cars would require two locomotives, which is accounted for within the 65 car - 4,060 feet train set.

Train Speed (V). The average train operating speed provided by the PBVR Railway is 39 miles per hour (mph). For the delay analysis, it was assumed that the average train speed for the proposed Project would be 30 mph at proposed public highway-rail grade crossings. At the Port entrance, a 20 mph speed was assumed for the train to cross Lower Bay Road.

2.5.6 Traffic Delay Analysis Results

As part of the proposed Project, the number of trains crossing Lower Bay Road immediately east of the Port entrance is anticipated to increase to 4 trains per day. This includes 2 trains per day (inbound and outbound) on the proposed rail line plus 2 trains per day (inbound and outbound) on the existing PBVR that connects to CSXT.

Appendix A presents the results of the traffic delay analysis. Vehicle operations at each of the crossings evaluated are not projected to experience any level of delay in 2020 and 2040, as indicated by the level of service A. Blockage of public at-grade intersections is not anticipated and motorist delay is not projected. Queue lengths are minimal, as is total vehicle delay.

CHAPTER 3. PROJECT COMMITMENTS

Rail Safety Public Awareness Program

During construction and prior to operation of the proposed Project, a rail safety public awareness program should be implemented. Since rail service has not been in operation within the study area for over a decade, this type of program will benefit residents and motorists alike.

The public awareness program should include efforts with community officials to identify elementary, middle, and high schools within the study area and provide, upon request, informational materials concerning railroad safety to such identified schools. Nicholson Elementary School located on US 11 near the northern-most at-grade crossing would benefit significantly from this type of safety program.

Highway-Rail At-Grade Crossings

The proposed Project would result in 13 public at-grade crossings and 9 private at-grade crossings. Traffic control measures are recommended for installation at each of the 22 at-grade crossings. Advance warning signs, on-street pavement markings, signal gates and flashing lights are proposed at all public at-grade crossings. At the remaining private at-grade crossings, grade crossing signs (crossbucks) are recommended. On US 11, pedestrian crossing signs to accommodate Nicholson Elementary School students should be considered, if warranted. Traffic control and signing and pavement marking plans which illustrate the proposed traffic measures for each of these locations would be developed as part of the Project design. Concurrence and approval from the highway agencies (MDOT, Hancock County, and Pearl River County) with the jurisdictional and/or statutory authority for each roadway would be required.

At each of the public at-grade crossings, permanent signs prominently displaying both a toll-free telephone number and a unique grade-crossing identification number in compliance with Federal Highway Regulations (23 CFR Part 655) should be installed. The toll-free number would enable drivers to report accidents, malfunctioning warning devices, stalled vehicles, or other dangerous conditions and would be answered 24 hours per day.

Emergency Response

Emergency service providers include police, fire departments, and emergency medical services. Vehicle responders could potentially be delayed if a train is present when emergency vehicles arrive at the crossing. The delay time would depend on the emergency vehicle arrival time relative to the train arrival time, as well as the length and speed of the train. Although trains have the potential to affect emergency access for police and fire vehicles, the communities within the study area maintain mutual aid agreements and other forms of intergovernmental agreements to contact each other in the event of a blocked at-grade crossing. If an at-grade crossing is blocked by a train, alternate routes would be taken by emergency response vehicles.

REFERENCES

Association of American Railroads (AAR). 2006. *Recommended Railroad Operating Practices for Transportation of Hazardous Materials*, Circular No. OT-55-I (CPC-1174, Supplement No. 1).

CSX. 2016a. “Company Overview.” https://www.csx.com/index.cfm/about-us/company-overview/ (accessed November 21, 2016).

CSX 2016b. “Hazardous Materials.” https://www.csx.com/index.cfm/about-us/safety/hazardous-materials1/ (accessed November 22, 2016).

Federal Railroad Administration (FRA). 2009. *Overview, Highlights and Summary of the Rail Safety Improvement Act of 2008 (the Act). (Public Law No. 110-432, Division A, enacted Oct. 16, 2008, 122 Stat. 4848-4906).* Prepared March 10, 2009.

Federal Railroad Administration (FRA). 2010. *49 CFR Parts 213 and 237 Bridge Safety Standards; Final Rule. Federal Register. July 15, 2010.*

Federal Railroad Administration (FRA). 2016a. “Railroad Safety.” https://www.fra.dot.gov/Page/P0010 (accessed July 8, 2016).

Federal Railroad Administration (FRA). 2016b. “Highway-Rail Grade Crossings Overview.” https://www.fra.dot.gov/Page/P0156 (accessed July 8, 2016).

Federal Railroad Administration (FRA). 2016c. “Positive Train Control (PTC) Legislation & Regulations.” https://www.fra.dot/Page/P0564 (accessed July 8, 2016).

Federal Railroad Administration (FRA). 2016d. “Hazardous Materials Transportation.” https://www.fra.dot/Page/P0151 (accessed July 8, 2016).

Federal Railroad Administration (FRA). 2016e. “Ten Year Accident/Incident Overview.” Office of Safety Analysis. http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/TenYearAccidentIncidentOverview.aspx (accessed November 18, 2016). Accident/Incident data current through the end of August 31, 2016.

Federal Highway Administration (FHWA). 2009. *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways.* 2009 Edition. Updated in 2012.

Hancock County Port and Harbor Commission (HCPHC). 2015. *Comprehensive Annual Financial Report For Fiscal Year Ended September 30, 2015*. Prepared by Finance Department, Janet E. Sacks, Chief Financial Officer.

Hancock County Port and Harbor Commission (HCPHC). 2016a. “Port Bienville Industrial Park.” http://portairspace.com/advantages/port_bienville_industrial_park (accessed November 21, 2016).

Hancock County Port and Harbor Commission (HCPHC). 2016b. “Stennis Airport, Port Bienville Receive MDOT Grants.” August 1, 2016. http://portairspace.com/news/article/stennis-airport-port-bienville-receive-mdot-grants (accessed November 21, 2016).

Hancock County Port and Harbor Commission (HCPHC). 2016c. “Maps and Media.” http://portairspace.com/site_selection/maps (accessed November 21, 2016).

Mississippi Department of Transportation (MDOT). 2011a. *Mississippi State Rail Plan*. June 2011.

Mississippi Department of Transportation (MDOT). 2011b. *Mississippi's Unified Long-Range Transportation Infrastructure Plan (MULTIPLAN 2035).* Appendix E: Freight and Passenger Rail Investment Needs. May 2011.

Mississippi Department of Transportation (MDOT). 2013a. *Multimodal Investment Report.*

Mississippi Department of Transportation (MDOT). 2013b. *Functional Classification System, Picayune Urban Area, Pearl River County, Mississippi.* [map]. MDOT Transportation Planning Division in Cooperation with the U.S. Department of Transportation Federal Highway Administration.

Mississippi Department of Transportation (MDOT). 2013b. *Port Bienville Rail Feasibility Study.* Prepared by CDM Smith in association with HDR. September 19, 2013.

Mississippi Department of Transportation (MDOT). 2014a. *Functional Classification System, Hancock County, Mississippi.* [map]. MDOT Transportation Planning Division in Cooperation with the U.S. Department of Transportation Federal Highway Administration.

Mississippi Department of Transportation (MDOT). 2014b. *Mississippi Public Roads Selected Statistics Extent, Travel, and Designation.* Prepared by the MDOT Transportation Planning Division in Cooperation with U.S. Department of Transportation Federal Highway Administration. Information contained in the Planning Division's files as of December 31, 2014.

Mississippi Department of Transportation (MDOT). 2014c. *Mississippi Strategic Highway Safety Plan.* January 2014.

Mississippi Department of Transportation (MDOT). 2015a. *Mississippi Statewide Freight Plan Final Report.* February 2015.

Mississippi Department of Transportation (MDOT). 2015b. *Functional Classification System, Pearl River County, Mississippi*. [map]. MDOT Transportation Planning Division in Cooperation with the U.S. Department of Transportation Federal Highway Administration.

Mississippi Department of Transportation (MDOT). 2016a. http://mdot.ms.gov/ports/bienville.html (accessed November 21, 2016).

Mississippi Department of Transportation (MDOT). 2016b. http://mdot.ms.gov/applications/five_year_plan/Views/Details.aspx?Proj=106663/301000 (accessed August 19, 2016).

Norfolk Southern (NS). 2016. "Our Network" http://www.nscorp.com/content/nscorp/en/shipping-options/intermodal/why-norfolk-southern-intermodal/our-network.html (accessed November 21, 2016).

Operation Lifesaver, Inc. (OLI). 2016. "About Operation Lifesaver." https://oli.org/rail-safety (accessed August 19, 2016).

Southern Rail Commission. 2016. "Gulf Coast Train Tour – Recap." http://www.southernrailcommission.org/rail-story (accessed November 21, 2016).

Transportation Research Board (TRB). 2000. *HCM2000 Highway Capacity Manual*. National Academies of Sciences.

Transportation Research Board (TRB). 2010. *HCM2010 Highway Capacity Manual*. National Academies of Sciences.

APPENDIX A — AT-GRADE CROSSING DELAY ANALYSIS RESULTS

FINAL

APPENDIX A
At-Grade Crossing Delay Analysis - 2020

Table 1 Calculation of Future Crossing Delay, All Locations (2020 Build; 1,880 foot train sets)

									BUILD CONDITION (2020)									LOS	Queue Length	Total Veh Delay (24 hour) min	
City	County	Street	Distance Between Crossings (miles)	Crossing Type	Year	Source	2020 ADT Estimated	2020 ADT Rounded	L	V	D_C	D_a	N	T_D	NL	Q	D_V	Projected (2020)	Projected (2020)	Future Minutes	Future Hours
Nicholson	Pearl River	**US Highway 11**	0.0	at-grade	2020	MDOT Count + 1% growth rate	8,917	9000	1,880	30	1.2	0.79	2	15	2	11	0.003	A	273	11.94	0.20
Not Applicable	Hancock	**Texas Flat Road**	4.20	at-grade	2020	MDOT Count + 1% growth rate	2,235	2300	1,880	30	1.2	0.79	2	4	2	3	0.003	A	70	3.05	0.05
Not Applicable	Hancock	**Flat Top Road**	3.40	at-grade	2020	MDOT Count + 1% growth rate	500	500	1,880	30	1.2	0.79	2	1	2	1	0.003	A	15	0.66	0.01
Port Entrance	Hancock	**Lower Bay Road**	17.0	at-grade	2020	MDOT Count + 1% growth rate	2,031	2100	1,880	20	1.6	1.02	2	5	2	3	0.004	A	82	4.66	0.08
Port Entrance	Hancock	**Lower Bay Road ***	17.0	at-grade	2020	MDOT Count + 1% growth rate	2,031	2100	1,880	20	1.6	1.02	4	9	2	3	0.009	A	82	9.32	0.16
		*** 4 trains per day**																			

Variable Definitions

Input Values
Output Values

D_c =(L/(Vx88))+0.50
=Time required for train to pass, minutes

L — L =Length of train, feet (average)

V — V =Train speed, mph (from schedule or observation)
(x88)=Conversion Factor from mph to fpm
(+0.50) =Time in minutes for gate closing and opening

D_a =0.5*Dc*1.3
=Average delay per delayed vehicle, minutes

T_D =(Dc/1440)*N*ADT
=Number of vehicles delayed per day

1440 =Minutes per day

N =Number of trains per day

Q =ADT*0.1*(0.6/60)*D_c/(NL/2)
=Vehicle queue (number of vehicles)

NL =Number of traffic lanes

D_V =T_d*D_a*2/ADT
=Ave delay for all vehicles, min per vehicle

D =Dc*N/ADT
Ave delay for each vehicle

Notes:
1.) Train speed, mph (V) and number of trains per day (N) based upon data provided by PBVR and Hancock County.
Vehicle traffic data obtained from MDOT.

Template developed by HDR Engineering, Inc.

FINAL

APPENDIX A
At-Grade Crossing Delay Analysis - 2040

Table 2 Calculation of Future Crossing Delay, All Locations (2040 Build; 4,060 foot train sets)

									BUILD CONDITION (2040)									LOS	Queue Length	Total Veh Delay (24 hour) min	
City	County	Street	Distance Between Crossings (miles)	Crossing Type	Year	Source	2040 ADT Estimated	2040 ADT Rounded	L	V	D_C	D_a	N	T_D	NL	Q	D_V	Projected (2040)	Projected (2040)	Future Minutes	Future Hours
Nicholson	Pearl River	**US Highway 11**	0.0	at-grade	2040	MDOT Count + 1% growth rate	10,880	10,900	4,060	30	2.0	1.32	2	31	2	22	0.007	A	555	40.87	0.68
Not Applicable	Hancock	**Texas Flat Road**	4.20	at-grade	2040	MDOT Count + 1% growth rate	2,727	2,800	4,060	30	2.0	1.32	2	8	2	6	0.007	A	143	10.50	0.17
Not Applicable	Hancock	**Flat Top Road**	3.40	at-grade	2040	MDOT Count + 1% growth rate	610	700	4,060	30	2.0	1.32	2	2	2	1	0.007	A	36	2.62	0.04
Port Entrance	Hancock	**Lower Bay Road**	17.0	at-grade	2040	MDOT Count + 1% growth rate	2,479	2,500	4,060	20	2.8	1.82	2	10	2	7	0.014	A	175	17.78	0.30
Port Entrance	Hancock	**Lower Bay Road ***	17.0	at-grade	2040	MDOT Count + 1% growth rate	2,479	2,500	4,060	20	2.8	1.82	4	19	2	7	0.028	A	175	35.56	0.59
		*** 4 trains per day**																			

Variable Definitions

Input Values
Output Values

D_c =(L/(Vx88))+0.50
=Time required for train to pass, minutes

L — L =Length of train, feet (average)

V — V =Train speed, mph (from schedule or observation)
(x88)=Conversion Factor from mph to fpm
(+0.50) =Time in minutes for gate closing and opening

D_a =0.5*Dc*1.3
=Average delay per delayed vehicle, minutes

T_D =(Dc/1440)*N*ADT
=Number of vehicles delayed per day

1440 =Minutes per day

N =Number of trains per day

Q =ADT*0.1*(0.6/60)*D_c/(NL/2)
=Vehicle queue (number of vehicles)

NL =Number of traffic lanes

D_V =T_d*D_a*2/ADT
=Ave delay for all vehicles, min per vehicle

D =Dc*N/ADT
Ave delay for each vehicle

Notes:
1.) Train speed, mph (V) and number of trains per day (N) based upon data provided by PBVR and Hancock County.
Vehicle traffic data obtained from MDOT.

Template developed by HDR Engineering, Inc.