

Technical Report Documentation Page

1. Report No. FHWA/TX-06/0-5068-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Planning for Container Growth Along the Houston Ship Channel and Other Texas Seaports: An Analysis of Corridor Improvement Initiatives for Intermodal Cargo				5. Report Date November 2005	
				6. Performing Organization Code	
7. Author(s) Robert Harrison, Nathan Hutson, Randy Resor, Jim Blaze				8. Performing Organization Report No. 0-5068-1	
9. Performing Organization Name and Address Center for Transportation Research The University of Texas at Austin 3208 Red River, Suite 200 Austin, TX 78705-2650				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 0-5068	
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Implementation Office P.O. Box 5080 Austin, TX 78763-5080				13. Type of Report and Period Covered Technical Report 9/1/03-8/31/05	
				14. Sponsoring Agency Code	
15. Supplementary Notes Project performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.					
16. Abstract This is a study of Texas port and rail infrastructure and its suitability for handling increased volumes of containers in the near future. The report is the latest in a series of studies performed by of the Center for Transportation Research for the Texas Department of Transportation. Four ports and their corresponding rail corridors are covered within the report. They are the Ports of Beaumont, Houston, Corpus Christi and Brownville. The report reviews recent actions taken by each of these ports in order to improve the efficiencies of container handling and/or the efficiencies of inland intermodal corridors. The researchers conclude that demographic and economic changes in Texas may lead to an intrastate diversification of container flows with more cargo ports handling inbound container shipments. Increasing energy prices and constraints on the trucking industry will create incentives for greater reliance on rail for intermodal movements, especially for out of state destinations.					
17. Key Words Container growth, Port of Houston, Texas seaports, La Quinta			18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161; www.ntis.gov.		
19. Security Classif. (of report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of pages 94	
				22. Price	



Planning for Container Growth Along the Houston Ship Channel and Other Texas Seaports: An Analysis of Corridor Improvement Initiatives for Intermodal Cargo

Robert Harrison
Nathan Hutson
Randy Resor
Jim Blaze

CTR Research Report:	0-5068-1
Report Date:	November 2005
Research Project:	0-5068
Research Project Title:	Planning for Container Growth Along the Houston Ship Channel and Other Texas Seaports
Sponsoring Agency:	Texas Department of Transportation
Performing Agency:	Center for Transportation Research at The University of Texas at Austin

Project performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.

Center for Transportation Research
The University of Texas at Austin
3208 Red River
Austin, Texas 78705

www.utexas.edu/research/ctr

Copyright © 2006
Center for Transportation Research
The University of Texas at Austin

All rights reserved
Printed in the United States of America

Disclaimers

Authors' Disclaimer: The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation.

Patent Disclaimer: There was no invention or discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine manufacture, design or composition of matter, or any new useful improvement thereof, or any variety of plant, which is or may be patentable under the patent laws of the United States of America or any foreign country.

Notice: The United States Government and the State of Texas do not endorse products or manufacturers. If trade or manufacturers' names appear herein, it is solely because they are considered essential to the object of this report.

Engineering Disclaimer

NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

Research Supervisor: Rob Harrison

Acknowledgments

The authors wish to acknowledge the involvement and direction of the Texas Department of Transportation (TxDOT) project monitoring committee—specifically,

PD Delvin Dennis, P.E.

PC Lonnie Gregorcyk, P.E.

PA Raul Cantu, P.E.

PA Anthony Cochran

PA Mario Medina, P.E.

Table of Contents

Chapter 1. Introduction and Background.....	1
1.1 Project Purpose	1
1.2 Project Background.....	2
1.3 Organization of Report	4
Chapter 2. The Port of Beaumont Rail System.....	5
2.1 Overview.....	5
2.2 Regional Landside Access	6
2.3 Rail Access to the Port of Beaumont	7
2.4 Impacts of Rail Congestion around the Port of Beaumont	8
2.5 Port-Related Train Delays.....	9
2.6 Other Causes of Train Delays	11
2.7 Impacts of Train Delays on Local Streets.....	11
2.8 Proposed Rail Access Improvements to the Port of Beaumont	12
2.9 Improvement to the Beaumont Rail System: A New Neches Bridge.....	14
2.10 Justifying the Cost.....	15
2.11 Strategic Summary—Port of Beaumont	16
Chapter 3. Rail Access at the Port of Houston.....	19
3.2 Origins of the current Houston Rail Network.....	20
Chapter 4. Future Container Handling Capacity and Intermodal Corridors for the Port of Corpus Christi	37
4.1 Port of Corpus Christi—Overview	37
4.2 La Quinta Development.....	37
4.3 Corpus Rail Corridors	39
4.4 Other Developments Affecting Intermodal Business at Corpus Christi	44
4.5 Closing of the Ingleside Naval Station	45
4.6 Conclusion	46
Chapter 5. The Feasibility of Containerization at the Port of Brownsville	47
5.1 Port Overview	47
5.2 Mexico’s Northernmost Port.....	50
5.3 The Role of Short-Sea Shipping in Brownsville.....	50
5.4 Rail Issues Related to Brownsville	51
5.5 Conclusion	54
Chapter 6. Conclusions and Next Steps	57
REFERENCES	61
APPENDIX 1. Method for Calculating Train Delay Costs	65
APPENDIX 2: Major Rail Corridors in and Around Houston—Ownership and Trackage Rights	71
End Notes.....	79

List of Tables

Table 2.1. Rail Cars Handled at the Port of Beaumont by Carrier, 2003	6
Table 2.2. Estimated Cost per Hour of Train Delay, Equipment and Lading Delay Cost Only.....	9
Table 2.3. Estimated Cost of Train Delays Incurred by Use of the Port of Beaumont’s Existing Interchange Yard	11
Table 2.4. Estimation of Annual Train Delay Costs, Beaumont	11
Table 2.5. Annual Emissions and Driver Delay Impacts as a Result of Train Delay	12
Table 2.6. Comparative Assessment: Proposed Rail Improvements to the Entrance of the Port of Beaumont	13
Table 2.7. Recent Railroad Single-Track Lift Bridge Replacements	15
Table 3.1. Vessel Size for CMA-CGM PEX2 and PEX3 Lines	19
Table 3.2. UP Major Commodity Flows, Houston Area	20
Table 3.3. Corporate Lineage of Houston Freight Railroad Companies in 2005	21
Table 3.4. The Texas Chemical Coast and Related Rail Service.....	22
Table 3.5. Profile of BNSF and UP Main Line Trains Passing Rosenberg Junction	24
Table 3.6. Railway Market segmentation—INTERMODAL.....	26
Table 3.7. Long Distance Rail-Truck Intermodal Corridors to and from Texas	27
Table 3.8. Potential Short Haul Rail Intermodal Corridors for Houston Shippers	27
Table 3.9. Houston Rail Network Characteristics Limiting Growth and Efficiencies	29
Table 3.10. Greater Houston Grand Plan for Long Range Railway Network Redevelopment	32
Table 3.11. Potential Incremental Cost Improvements for the Houston Rail Corridors.....	34
Table 4.1. 20-Year Forecast of La Quinta’s Market Potential (TEUs).....	38
Table 4.2. Profile of Houston–Corpus Christi–Brownsville Rail/Port Corridor	40
Table 4.3. 2003 Corpus Christi Port Study Conclusion.....	41
Table 4.4. Mercator Study Results.....	42
Table 5.1. TEUs Handled by Brownsville 1998-2004.....	51
Table 6.1. High Growth Rail Corridors in Texas.....	57
Table A-1: Assumed Train Sizes	67

List of Figures

Figure 1.1. Chart of 2004 TEU Volumes for Southern-Atlantic and Gulf Coast Ports Data. Source: AAPA	3
Figure 2.1. Transportation Facilities Serving the City of Beaumont.....	7
Figure 2.2. Schematic of the Port of Beaumont’s Rail Access.....	10
Figure 3.2. Map of Comparative BNSF Intermodal Densities	25
Figure 3.3. Map of Greater Houston Grand Plan for Long Range Railway Network Redevelopment	36
Figure 4.1. Photo of Corpus Christi Cold Storage Facility.....	45
Figure 5.1. Photo of Container Crane at the Port of Brownsville.....	49
Figure 5.2. Imports from Mexico via Brownsville destined for Texas.....	54
Figure A-1: Beaumont Mainline Track Diagram (not to scale).....	66

Chapter 1. Introduction and Background

1.1 Project Purpose

In the past decade, movement of a wide variety of non-bulk commodities in containers has been a major factor in international trade growth. Intermodal containers, which permit cargos to be seamlessly transferred from ships to trains, trucks or barges, have become widely accepted as the method of choice when moving non-bulk items on most trade routes. The Texas Department of Transportation (TxDOT) recognized the importance of containerization on the state transportation network over a decade ago. Project 0-5068 is the third in a series of projects undertaken at the Center for Transportation Research (CTR) at The University of Texas at Austin examining the impacts of container movements on the state economy and transportation system.

The first project, entitled “Infrastructure Impacts of Containerships (including Megacontainerships) on the Texas Transportation System,” 0-1833, produced three reports: an evaluation of the potential impacts of megacontainerships of Gulf container port operations an identification process and evaluation framework for Texas Gulf containerships, and a mode split model. The second, 0-4410, entitled “Containerized Freight Movement in Texas,” examined containerized flows within in the state after the containers leave the primary intermodal terminal point. This report also explored options for diverting containerized freight from highways to other modes. Containerized freight moves into Texas on a variety of modes and is not concentrated at maritime ports as it is in California. In addition, to date, most containers landing at Texas marine terminals are destined for Texas customers. Nevertheless, consistent growth in container volumes at Texas marine terminals raises the issue of whether such volumes can continue to be assimilated into normal traffic flows around the terminals without adverse impacts. At some point in the future, the volumes may necessitate a dedicated corridor to service the demand. This corridor could be either highway or rail, depending on volumes and destinations, and could be funded by fees placed on each container move, as with the Alameda corridor in Southern California.

These studies formed the basis for the third project, 0-5068, entitled “Planning for Container Growth Along the Houston Ship Channel and Other Texas Seaports,” of which this is the first report. A primary purpose of this research is to assess the readiness of the state of Texas to accommodate increasing volumes of intermodal containers entering the state through its own maritime ports. Texas now finds itself in the midst of a global supply chain that is evolving rapidly. No sector of the economy has felt these changes more keenly than the maritime industry. While imports from Asia are growing at the sharpest rate—a fact that would seem to overwhelmingly benefit Pacific ports—several ports on the Atlantic and Gulf coasts have actually had annual volume increases that met or exceeded those of some ports on the Pacific Coast.¹ TEU volumes at Houston have been robust for more than a decade and have expanded from 1.1 to 1.5 million TEUs since 2001. Accommodating such a high rate of growth of containers has been challenging for a state whose port complex was designed primarily around petroleum and other bulk commodities. Two container terminals at the Port of Houston—Barbours Cut and Bayport—together with Galveston and Freeport, have been the main facilities handling containers, with terminals planned at Texas City and Corpus Christi likely to offer

service in the medium term. In addition, a number of other ports, some shallow draft, may provide service through barges or smaller vessels, thereby enhancing the capacity of Texas ports to handle container growth in a variety of ways. Project 0-5068 will examine intermodal access to those ports handling, or likely to handle, containers and establish needs for corridor type connectivity, particularly as it impacts TxDOT's planning and programming.

Rail plays a substantial role in intermodal trips over 650 miles, based on articulated three and five double stack cars. The CTR team used a well-known rail consultant—ZETA-TECH, based in Philadelphia—to provide both the strategic and operational analysis of port rail access and corridor issues. In this report, ZETA-TECH undertook operational analysis of train data to analyze both Beaumont access and the KCS bridge on the Neches River. In the Houston area, rail issues were concentrated on the corridors serving the Port of Houston facilities, since another consultant has been hired to undertake a thorough review of the Houston rail network. Strategic reviews of both Corpus Christi and Brownsville were also conducted and reported in this document.

1.2 Project Background

Driven by the emergence of new markets and centers of manufacture and advances in the efficiency of moving inputs and products between distant countries, international trade volumes have continued to increase. The twin engines of Texas' growing demand for container handling are population growth and increasing GDP per capita. Coupled with these local drivers is a global trend of containerizing a greater proportion of commodities that had traditionally traveled as bulk or break-bulk. This trend has made disaggregated approaches to container forecasting, in which growth in total volume is estimated by growth in demand for specific commodities, comparatively more difficult. Another factor complicating efforts to scientifically predict container demand has been a breakdown in the conventional pattern of commerce in which Asian commodities bound for Texas landed exclusively on the West Coast. Containerized shipments from Asia are now arriving at Houston directly from China via the Panama Canal, a development that accelerated the state's previous growth rate assumptions.

The trend of landing cargo closer to its ultimate destination has so far benefited Houston. Will the same trend now lead to an intrastate diversification of container flows with smaller ports taking on containers destined for their own local population centers as opposed to depending on shipments from either the West Coast or Houston? One likely reason why this development has yet to occur within Texas has to do with the population distribution around the state. Along the Texas coast, there are few significant population centers south of Houston. This pattern of settlement is quite different, for example, from a state like Florida where the entire coastline is heavily urbanized. While Texas has only one port with annual volumes of over 100,000 TEUs, Florida has three container ports with volumes of over 500,000 TEUs that serve different areas of the state.² Figure 1.1 illustrates the TEU volumes for Southern-Atlantic and Gulf Coast ports.

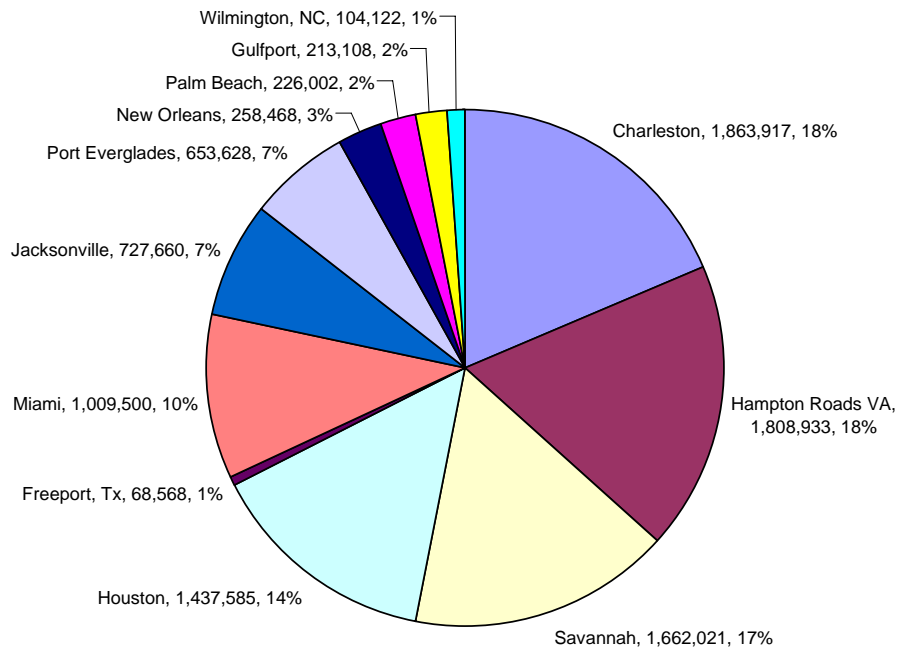


Figure 1.1. Chart of 2004 TEU Volumes for Southern-Atlantic and Gulf Coast Ports Data. Source: AAPA

Texas population patterns are changing. The inland I-35 corridor is growing rapidly. In addition, the border region between Texas and the Mexican states of Tamaulipas and Nuevo Leon is emerging as a second major population center along the Texas coast. This becomes especially evident when national borders are ignored.³ If energy prices and the other aforementioned constraints on the trucking industry continue to increase, the cost of transporting containers from Houston to South Texas may curtail economic growth in that region. Two deep draft ports actively pursuing containerization, the Port of Brownsville and the Port of Corpus Christi, could theoretically serve South Texas more efficiently than the port of Houston given the right combination of economic conditions.

It is possible that in the near future Brownsville or Corpus Christi could become a second port of call for a liner service that also services Houston. Alternatively, if Houston remains the only major port regularly receiving deep draft container ships, containers could be transloaded and delivered on smaller vessels or barges. A combination of these two scenarios is also possible. The port of call option would likely result in greater overall market-share for burgeoning container ports than a short sea or barge option because it would mean that ports could more easily facilitate deliveries to population centers beyond their immediate hinterland. Dependable large volume deliveries are especially critical for establishing rail service.

The role of rail corridors in intrastate and interstate deliveries for Texas ports is a primary focus of this project. There are several reasons for focusing on rail in the initial year. One reason is that some of the ports within the project do not have substantial truck congestion problems. Furthermore, without efficient rail corridors suitable for doublestack container trains, it is unlikely that Houston or any other Texas port will serve as a land bridge hub for cargo whose ultimate destination is outside of the state. Since continually increasing container demand within the state is a certainty, an underutilization of rail corridors would also mean an increase in congestion-related externalities on the state's highway system.

1.3 Organization of Report

This report covers four ports and their corresponding rail corridors. They are the Port of Beaumont, the Port of Houston, the Port of Corpus Christi, and the Port of Brownsville. Each of these ports serves a unique economic niche within the state; therefore each chapter is tailored to the specific needs and features of the port.

Chapter 2 is an analysis of port and rail issues at the Port of Beaumont. Although Beaumont is pursuing possible container-on-barge service to Houston, its primary role in the research is as a critical link in the Sunset Limited rail corridor. CTR, along with rail consultant ZETA-TECH, performed an analysis of delay patterns within the port areas. The cumulative economic costs of rail delays were calculated along with an analysis of proposed improvements.

The Port of Houston is by far the largest container port in the Gulf Coast, handling approximately two-thirds of the Gulf's total containerized cargo.⁴ The opening of the Bayport facility in 2006 is expected to temporarily give the Houston port complex surplus dockside capacity. Therefore Chapter 3 focuses more on landside constraints and Houston's plans to retool its rail corridors in order to move containerized and bulk cargo through the city more efficiently and with less effect on traffic and air quality. Harris County, in coordination with the Port, has performed a comprehensive analysis of 752 rail crossings within the city in order to guide planners in prioritizing grade separation investments and potentially consolidating rail corridors. The researchers, after reviewing this report and speaking at length with port officials, offer strategic guidelines for the port.

Chapter 4 charts the Port of Corpus Christi's progress toward opening its long-planned La Quinta container terminal; a discussion of the future terminal's economic niche is included. The chapter also analyzes the rail corridors Corpus would use to deliver containers to inland population centers and details how the projected traffic generated from La Quinta would affect these lines.

Chapter 5 is an analysis of the feasibility of establishing container handling operations at the Port of Brownsville. The port has made substantial investments in recent years in order to attract a container business including the purchase of a new crane suitable for containers. Given that Brownsville is 350 miles from the Port of Houston, port officials have pursued more efficient ways to move containers to and from Houston including container-on-barge and short sea shipping. The analysis of the Brownsville rail corridor includes the northbound Union Pacific (UP) corridor connecting the port to central Texas and the southbound corridor connecting the port to Monterrey. The city of Brownsville has already completed a substantial rail relocation project aimed at increasing efficiency and safety.

Chapter 2. The Port of Beaumont Rail System

2.1 Overview

The city of Beaumont lies 84 miles east of Houston in Jefferson County, near the Gulf of Mexico and the state's boundary with Louisiana. The Port of Beaumont, located approximately 20 miles inland along the Neches River near Sabine Lake, is a major crossroads for industrial commodities moving between Texas and Louisiana and other states. The port evolved because of its proximity to major petroleum and lumber producing areas in east Texas. Given that Beaumont is only 75 miles from Barbours Cut container terminal, its development as a potential container handling facility will be closely tied to Houston. Approximately 20,000 containers per year are generated by industries in the Beaumont region and travel from Beaumont to Houston by truck or rail. Given that the primary commodities in these containers are resins and refined petroleum products, most of these containers will weight-out, which means that they can not be filled to capacity because they will then be too heavy to move over the road. For this reason, Beaumont is actively pursuing a container-on-barge operation. With barges, Beaumont can repackage overweight containers so that they are on average 20% heavier than would be permitted on trucks and send them directly to the Barbours Cut terminal.⁵

The evolution of the Beaumont port and rail network followed a similar pattern to the Port of Houston complex. The port's channel was incrementally deepened throughout the twentieth century in response to increasing demand, and the port became a point of convergence for all three rail operators within the state. The current maximum depth of the channel leading to the port is 40 ft—deep enough to accommodate most container ships. As is the case with all channel ports, the maximum allowable depth at any one time is affected by silt accumulation. In addition to the ship traffic generated by the port, a significant volume of maritime trade is produced by the many petrochemical facilities located along the Neches River. In 2003 the port ranked fourth in the United States in terms of total tonnage with 87.5 million tons of trade.⁶

The majority of the district's trade involved petroleum and chemical products that were refined or produced at private facilities, but the Port of Beaumont handled a significant volume of non-petroleum bulk cargo. A large component of the port's tonnage continues to be wood products, potash, grain, and similar bulk commodities, which are cross-docked from ship to rail car or from rail car to ship. Military and project (large and bulky) shipments constitute an important source of business for the port. Most of the port's military cargo enters the port by rail and includes a substantial number of roll on/roll off (RO/RO) shipments of military vehicles (e.g., tanks, armored vehicles, and heavy trucks).

The port currently handles containers intermittently and personnel indicate an interest in developing a container-on-barge service to expand this capability.⁷ The port has acquired territory on the opposite side of the Neches River on which it hopes to build an intermodal facility suitable for processing containers; the facility should be completed by late 2006.⁸ At present, severe track layout impediments exist within the port boundaries. The port is also

hindered by congestion along the railroad mainline. Without question, efficient rail service is critical to current operations and prospects for future growth. However, these existing issues prevent the port from operating at its maximum efficiency and create unwanted impacts to the community, such as traffic congestion and increased vehicular emissions within a nonattainment airshed.

2.2 Regional Landside Access

Unlike many Texas ports, a very large share of the tonnage that enters and leaves the Port of Beaumont does so by rail rather than by truck. According to statistics provided by the Port of Beaumont, the port handled almost 48,000 rail cars in 2003. Burlington Northern Santa Fe (BNSF), UP, and Kansas City Southern (KCS) moved approximately 55, 40, and 5 percent of these rail cars, respectively (Table 2.1).

Table 2.1. Rail Cars Handled at the Port of Beaumont by Carrier, 2003

Railroad	Number of Cars Handled	Percent of Total
Burlington Northern Santa Fe	26,398	55.1
Union Pacific	19,138	40.0
Kansas City Southern	2,344	4.9
Total	47,880	100.0

Source: Port of Beaumont, 2004.

Two rail routes lie between the cities of Beaumont and Houston: the former Southern Pacific (SP) route; and a route formerly owned by the Missouri Pacific (MP) railroad. Both of these railroads were acquired by UP in 1984 and 1997, respectively. UP now operates the two lines as a virtual double track (although they follow slightly different routes between Beaumont and Houston). Eastbound trains operate primarily on the former MP line and the westbound trains move on the former SP line. The two routes come together just west of Beaumont at a point that railroad operators call Langham Road and continue through downtown Beaumont as a double track railroad. See Figure 2.1 for an annotated map of the area.

At its intersection with Wall Street (located within the city of Beaumont), the track ownership changes to the KCS railroad. Trains of the UP and tenant BNSF (which has trackage rights east of Houston) operate over a section of track that is owned and dispatched by KCS for a distance of six-tenths of a mile. While the mainline is double tracked at the location of the turnout to the Port of Beaumont's interchange yard, it narrows to a single track just east of this point, and then crosses the Neches River over a lift bridge with a 20 mph speed limit. This bridge opens about 100 times per year for river traffic, closing the railroad for at least 20 minutes each time it opens. This segment is the only stretch of single track on the Sunset Route between New Orleans and Houston.



Figure 2.1. Transportation Facilities Serving the City of Beaumont

East of Beaumont, UP's two mainlines are not exclusively directional. Most intermodal and automobile trains (high priority traffic) use the former SP Lafayette Subdivision, which diverges from KCS trackage east of the Neches River. Trains headed to the new rail yard in Livonia (carrying chemicals, grain, and other bulk commodities) use KCS rights for about 45 miles to DeQuincy and then move across the former MP track to Livonia and points eastward, including New Orleans.

Given the number of tracks that must funnel into a single line of KCS track at the Neches River in Beaumont, it quickly becomes apparent that this segment of single track restricts rail capacity between New Orleans, Houston, and the west coast of the United States. In addition, this capacity constraint complicates rail access to the Port of Beaumont because, to enter the port from the mainline, trains must block it while interchanging cars to and from the port.

2.3 Rail Access to the Port of Beaumont

Approximately 800 trains per year, averaging roughly two per day, travel into and out of the port. Traffic volume on the Sunset Route is heavy and appears to be about 40 to 50 trains per day with only three or four of them being KCS trains. The remaining trains that traverse this section of track are operated by UP and BNSF. ZETA-TECH's review of daily rail traffic data provided by UP for this segment of the Sunset Route (during a 4.5 month period) indicated that about 30 of the trains were road freight trains, while the remaining trains were local freights, yard switchers, and light engine movements.

Almost all trains enter the port via its interchange yard (See Figure 2). Before rail cars can enter or leave the port using the north entrance, they must be marshaled in the port's interchange yard, which lies north of the Sunset Route mainline and along the Neches River. The interchange yard consists of four short tracks that have a total capacity of about 120 cars (approximately 30 rail cars apiece), which require the BNSF, UP, and KCS to split up inbound trains so that a single train can be made to fit. When a train is being delivered to the port, the train operator must approach the port turnout from the west and then "run around" their cars to shove them into the interchange yard, which briefly blocks *both* main tracks. Trains coming from the east pull past the turnout and reverse into the yard. In either case, one of the two main tracks is blocked for an extended period, effectively lengthening the single-track portion of the route.

Two routes exist for rail cars to travel between the port's interchange yard and the port proper, neither of which is wholly satisfactory. One track runs beneath the Sunset Route's approach to the Neches River Bridge. This route has vertically and laterally restricted clearance where it passes underneath the bridge approach. The second track crosses the mainline at grade, requiring KCS train dispatchers to clear signals for the port's contract switcher to reach the interchange yard and return to the port. There are occasions when the port's contract switcher must wait for extended periods of time while the KCS dispatchers run mainline trains before signaling that it is clear for a crossing move. All UP trains must deliver to the port's interchange yard from the mainline. The BNSF also delivers via the mainline but can access the port's interchange yard via a mile of street trackage embedded within Long Avenue. However, rail operations along Long Avenue result in conflicts with vehicular traffic and noise complaints by residents who live along the street. Additionally, the trains must operate at low speeds and the track is in poor condition.

2.4 Impacts of Rail Congestion around the Port of Beaumont

The heavy traffic volume on the Sunset Route (at around 100 million gross annual tons) means that rail movements to and from the Port of Beaumont's interchange yards and switching movements from the yard to the port have the potential to produce significant delays to unrelated trains using the mainline. Pushing a train into the Port of Beaumont's interchange yard at a speed of 10 mph or less with a tight curvature and hand-throw turnouts means that the delivery of a large train (100 cars or more) typically blocks one of the two tracks on the mainline for an hour or more. To estimate the cost of train delay on the main track, ZETA-TECH produced some standard estimates for a Class I railroad (see Table 2.2). These costs include equipment ownership and maintenance, as well as the value of delay to cargo. However, the estimates do not include train crew costs, since train crews are paid by the mile and not by the hour. Additional labor costs are incurred only if a crew reaches its 12-hour limit of on-duty time and another crew must be called in to replace it. The addition of crew costs to Table 2.2 would increase total hourly costs shown below by approximately 10 to 15 percent.

Table 2.2. Estimated Cost per Hour of Train Delay, Equipment and Lading Delay Cost Only

Cost Category	----- Train Type -----		
	Unit Train	Manifest	Intermodal
Locomotives	\$163.14	\$163.14	\$163.14
Cars	\$78.83	\$42.55	\$25.11
Lading	\$15.14	\$46.66	\$223.42
Total	\$257.11	\$252.35	\$411.67

2.5 Port-Related Train Delays

The Port of Beaumont reports that about 400 trains per year enter the port, so there are about 800 total train movements into and out of the port via the interchange yard—approximately two per day. Figure 2.2 illustrates the Port of Beaumont’s rail access. Not all trains should take as long to deliver as the one observed by ZETA-TECH, but port employees indicated that a more typical period is about an hour and a half. For two trains per day, that is three hours of delay per day or 1,095 hours per year (see Table 2.3). Multiplied by the various types of trains that use the mainline, which were recorded in a database of more than 140,000 records provided by the UP/BNSF joint dispatch facility, the estimated annual cost of delay is \$276,323. At the request of ZETA-TECH, the Trans-Global Solutions operators were asked by Port of Beaumont staff to keep a record of delays experienced by switchers during a one-week period. Records kept by Trans-Global Solutions for the week of August 16, 2004, gave a cumulative total of two hours of delay to their switcher at the mainline diamond. Using a cost of \$252.35 per hour for a manifest train, this totals about \$26,000 in delay cost per year. The total annual cost of delay to trains operating on the mainline and the port’s contract switcher, caused by the current port layout, was estimated to be \$302,567.

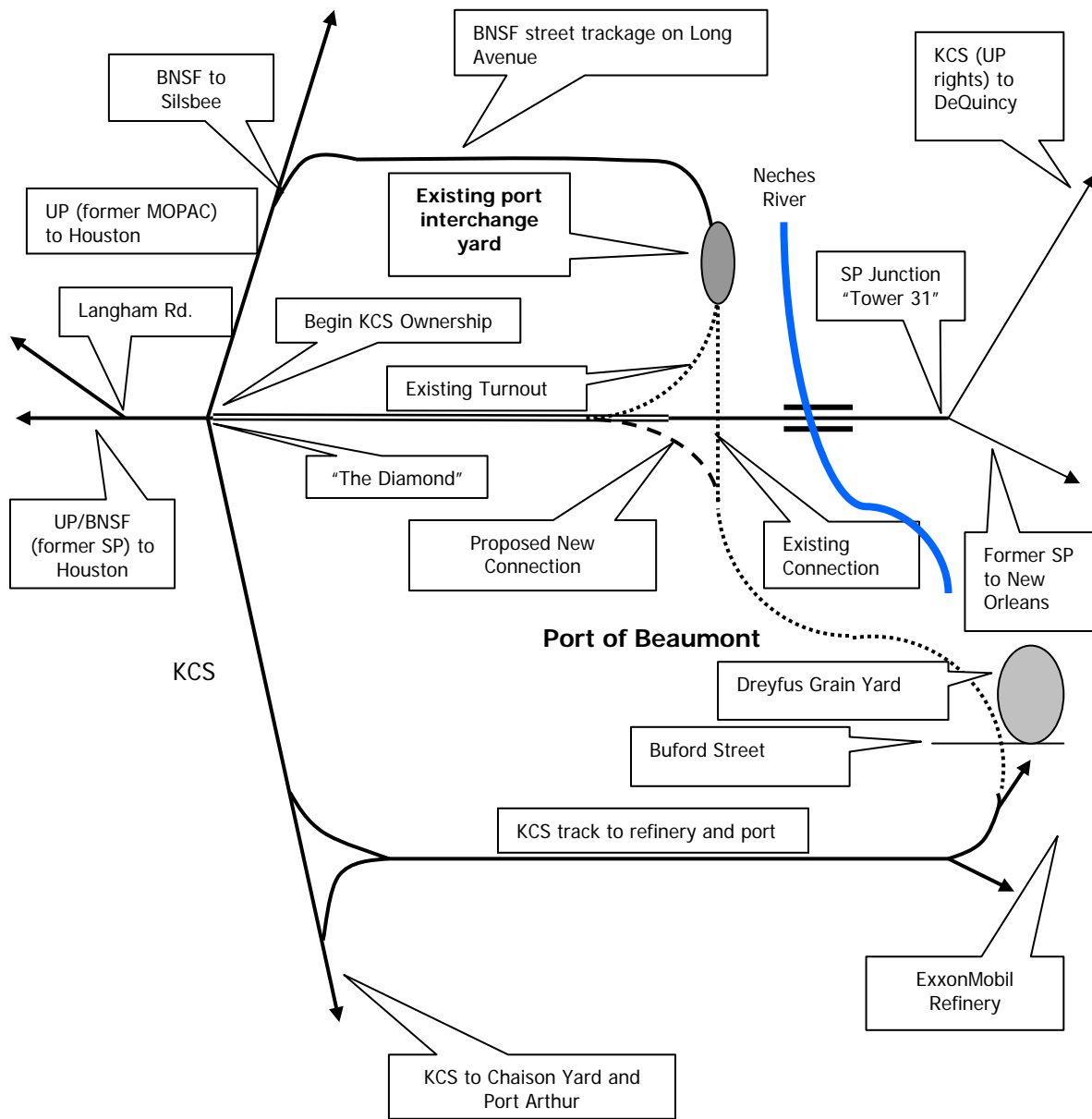


Figure 2.2. Schematic of the Port of Beaumont's Rail Access

Table 2.3. Estimated Cost of Train Delays Incurred by Use of the Port of Beaumont’s Existing Interchange Yard

Type of Delay	Hours per Year	Total Cost †
Interchange yard moves	104	\$26,244
Deliveries to port	1,095	\$276,323
Total	1,199	\$302,567

See Table 2.1 for a description of the estimated hourly train operating costs.

2.6 Other Causes of Train Delays

It is important for the readers of this report to understand that the Port of Beaumont’s access difficulties cannot be considered independent of the congestion on the Sunset Route, which is caused by the funneling of multiple lines of rail traffic onto a single line of track and worsened by the low operating speeds on the lift bridge. Blockages resulting from traffic into and out of the Port of Beaumont add to the problem, but correcting the port’s rail access difficulties would only partially address regional rail congestion. In addition to calculating the cost of delay caused by the Port of Beaumont’s activities, ZETA-TECH also estimated the cost of rail congestion on the mainline due to the single track and lift bridge, again using the data provided by the UP-BNSF joint dispatch facility. These delay costs were ten times greater than those created by the current layout of the port’s interchange yard. Table 2.4 shows ZETA-TECH’s estimate of the cost delay due to congested infrastructure on the Sunset Route, which is at least \$3.0 million per year.

Table 2.4. Estimation of Annual Train Delay Costs, Beaumont

Train Type	Train Delay Cost		Avg. Delay	Number of	Total Cost
	Per Hour	Per Minute	Mins./Train	Trains	
Intermodal	\$411.67	\$6.85	109	1,806	\$1,350,648
Manifest	\$252.35	\$4.21	48	7,228	\$1,459,189
Unit	\$257.11	\$4.29	42	1,340	\$239,437
Total				10,374	\$3,049,274

2.7 Impacts of Train Delays on Local Streets

As trains are taken into and out of the Port of Beaumont, the rail cars can block streets in the Beaumont Central Business District, causing delay to the automobile users in the area. In an attempt to measure the impacts of these delays—and therefore the benefits from improving port access—data were obtained from the local Metropolitan Planning Organization (MPO) on the effects of port-related train delays on automobile emissions. The Texas Transportation Institute (TTI) had previously completed a study of the two most critically affected city streets in downtown Beaumont—Main and Pearl—estimating the amount of volatile organic compounds and nitrous oxides attributable to rail activities generated by the port. CTR staff used the same data—suitably modified, as described in Appendix B—to estimate driver time delay. The results of this analysis are provided in Table 2.5. They show that improving the port’s rail access would result in modest reductions of emissions and would be accompanied by eliminating more than \$1,000,000 of driver time delays.

Table 2.5. Annual Emissions and Driver Delay Impacts as a Result of Train Delay

Criteria	Savings
Reduction in volatile organic compounds	148 kg
Reduction in nitrous oxide	179 kg
Savings in automobile driver delays	\$1,281,150

2.8 Proposed Rail Access Improvements to the Port of Beaumont

Table 2.6 provides a summary of the three alternatives that have been or are currently under consideration for improving rail access to the Port of Beaumont. The Port of Beaumont’s plan is the only one that has secured funding.

Changes to the trackage that provides access to the Port of Beaumont will reduce train delays on the Sunset Route but, as discussed earlier, other improvements could lead to significantly improved efficiency. Replacement of the Neches River Bridge with a two-track draw span or construction of a second parallel span is the most obvious strategy. The fill east of the bridge could be widened to carry two tracks to the site of Tower 31, where the SP Lafayette Sub leaves the KCS trackage. If the Neches River Bridge were to be entirely replaced, it might be possible to raise its elevation, thus reducing the need for openings. The tracks would have to be raised through downtown Beaumont as well, possibly eliminating one or more railroad crossings. A higher bridge elevation would also increase the clearance along the “low line” track connecting the port to the street trackage embedded within Long Avenue. With an increase in the clearance on the low line, the track across the diamond could be eliminated altogether, reducing maintenance costs and train delays. A new, single-track span parallel to the existing bridge would leave the existing track level through Beaumont unchanged and would probably be less costly than a new double-track lift bridge. If this option is selected, however, the timber-trestle approaches to the existing bridge should be replaced with concrete pile and ballast-deck trestles. Another desirable improvement might be the construction of a third main track from “the Diamond” to the proposed port turnout. There is space on the existing right-of-way for a third track if the single-lane roadways on either side of the existing double track can be taken for railroad use. This third track could be configured so that BNSF trains to the Port of Beaumont would not need to use the UP main tracks. It could also create a bypass route for idling trains that must wait for permission from KCS to enter the port, as well as provide a place for Amtrak trains to stop at the Beaumont station without occupying mainline tracks.

Table 2.6. Comparative Assessment: Proposed Rail Improvements to the Entrance of the Port of Beaumont

Assessment Criteria	Port Plan	Alternative Proposal 1	Alternative Proposal 2
Allocated funding	Yes. Federal CMAQ grant with matching funds from the Port of Beaumont and TxDOT for the turnout and improvements in the port.	Primarily uses existing trackage. No funding identified for any improvements or purchases.	Federal CMAQ grant with local matching funds for turnout and improvements within the port. No funding identified for interchange yard in Vidor or an overpass at the ExxonMobil refinery entrance.
Relocated mainline turnout	Yes (inbound and outbound traffic)	No	Yes (outbound traffic only)
Blocks the mainlines of the Sunset Route	Yes, only as inbound and outbound trains enter or leave the port. No switching would be necessary.	No	Yes, only outbound trains leaving the port. No switching would be necessary.
Increased “headroom”	Yes	N/A	N/A
Bypass of Dreyfus yard	Yes	Yes	Yes
Use of Chaison Yard for switching	No	Yes, must be purchased by the Port of Beaumont.	No
Additional usage fees	None	Trackage rights	Joint facility payments
Construction of new setout tracks in Vidor, TX	No	No	Yes. Would cost approximately \$2.5 million. No funding source identified.
Storage for rail cars within the existing port perimeter	Yes	No	Yes
Increases the frequency of trains blocking the ExxonMobil refinery entrance	No	Yes (all trains entering and leaving the port would block the entrance while in transit). No funding source identified for an overpass.	Yes (all trains entering the port and eastbound departing trains would block the entrance while in transit). No funding source identified for an overpass.
Reduces idling vehicular emissions in downtown Beaumont	Yes	Yes	Yes

At the time of this report’s publication, the port had still not received permission from KCS to construct a turnout. For this reason, the port is now examining a new option that would follow the basic port plan but not include the turnout. Port officials admit that the new plan is not their ideal solution. However, they believe that approximately 80% of the benefits that would have been achieved with the turnout plan, including air quality improvements that are critical for securing CMAQ funding, can still be achieved under the new scaled-down plan. Furthermore, the port is not abandoning the turnout option entirely and could add it later. The port received

significant allocations in summer 2005 from the federal transportation bill that should allow it to proceed with rail improvements; \$5.19 million dollars was received for “Southside Intermodal Improvements,” which will include the improvements in rail capacity previously described.

2.9 Improvement to the Beaumont Rail System: A New Neches Bridge

Changes to trackage providing access to the Port of Beaumont will reduce train delays only modestly, as discussed in the previous section considering rail facility access at the port. Additional investment is required to fully correct the capacity constraint on the local system, as represented by the single track and the speed restriction in Beaumont. Replacement of the Neches River Bridge with a two-track draw span or construction of a second parallel span is the most obvious strategy. The fill east of the bridge could be widened to carry two tracks to the site of Tower 31, where the SP Lafayette Sub leaves the KCS trackage. If the Neches River bridge were to be entirely replaced, it might be possible to raise its level somewhat, reducing the need to open the bridge for marine traffic, thus allowing replacement of the lift bridge with a fixed span. This would necessitate raising the track level through downtown Beaumont as well as possibly eliminating one or more rail highway crossings.

A higher-level bridge would also increase clearance on the “low line” track connecting the port to the street trackage in Long Avenue. BNSF has asked that this connection be retained; with an increase in clearance on the low line, the track across the diamond could be eliminated altogether in favor of the low line, reducing maintenance costs and train delays. A new, single-track span parallel to the existing bridge would leave the existing track level through Beaumont unchanged and would probably be less costly than a new double-track lift bridge. It would also permit construction of the new bridge without hindering traffic over the existing bridge. Once complete, the new bridge could be put in service by a “cut and throw” of track that would then allow for rehabilitation of the old bridge. If this option is selected, the timber-trestle approaches to the existing bridge should be replaced with concrete pile, ballast-deck trestles.

Another desirable improvement might be construction of a third main track from “The Diamond” to the proposed port turnout. There is space on the existing right-of-way for a third track if the single-lane roadways on either side of the existing double track can be taken for railroad use. This third track could be configured so that BNSF trains to and from the Port of Beaumont would not need to use UP main tracks. It could also provide a place for Amtrak trains to stop at the Beaumont station without occupying main line tracks. Construction of the third track might then allow complete abandonment of BNSF’s street trackage and the connection to the port along the river.

2.9.1 Neches bridge improvement costs

The major improvement lies in a new bridge and the construction of a second single-track bridge across the Neches River would be easier than replacing the existing bridge with a double-track structure. This is because the retention of the existing bridge would enable (a) rail service to continue at its current level while the new bridge is constructed, and (b) construction of the new bridge could proceed without the need for a “shoo-fly” or other temporary construction to accommodate rail traffic. A critical question centers on how much a new bridge would cost. The bridge and its approaches are approximately 500 feet long. The main span of the bridge itself is 150 feet between towers, with another 50 feet being the width of the two towers together. This

leaves 150 feet of approaches on each side. The cost for a similar bridge adjacent to the existing bridge can be initially estimated using some standard unit costs. The Association of American Railroads surveyed Class I railroads in August 2003 and produced some standard unit costs for railroad bridges of various types, ranging from \$2,800 to \$6,000 per linear foot. However, these unit costs were for fixed bridges of more-or-less standard design and did not account for the cost and complexity of lifting machinery, towers, and approaches. A new bridge over the Neches River would most likely consist of a 150 foot steel lift span and 300 feet of concrete ballast deck pile trestle approaches. The AAR costs suggest that the cost of a Neches bridge would be at least \$900,000 for the main span and \$990,000 for the approaches, plus the cost of the towers and lifting machinery, which might be expected to increase costs considerably.

Another method for estimating the cost of a new bridge over the Neches River is to look at recent similar railroad bridge replacements. A Web search uncovered the four projects in Table 2.7, all similar to the proposed Neches River bridge.

Table 2.7. Recent Railroad Single-Track Lift Bridge Replacements

Bridge Location	Main Span Length	Total Cost	Date Completed	Notes
Hannibal, MOMo.	400	\$8,000,000	1994	Main span only
Wilmington, DEDel.	252	\$13,200,000	2004	Includes 486 feet of single-track approach trestle
Alexandria, LA	306	\$12,000,000	2002	Main span and lift towers only
La Crosse, WI	147	\$16,000,000	2004	Includes new approaches

The project most similar to a new Neches River Bridge is the Shellpot Bridge in Wilmington, DE. This bridge has a 252-foot main span and a total of 284 feet of approaches. However, the Shellpot Bridge renewal involved (for historic reasons) the refurbishment of a historic swing span rather than construction of a new span (which may in fact have cost less) and the refurbishment of an existing pier at mid-river for the swing span. Given this, the cost may therefore be closer to the \$16 million spent by Canadian Pacific Railway to completely renew the swing span over the Black River at La Crosse, WI. The \$16 million cost included a new pier for the rolling-lift bascule bridge, as well as new approaches.

This cursory evaluation of bridge costs shows that it is difficult to estimate the cost of a new bridge over the Neches without preliminary planning and current access to construction costs data. It is necessary, however, to select a reasonable value for the construction costs if a sense of the feasibility of the proposal is to be gained. Accordingly, the conservative value of \$16 million was selected for this purpose

2.10 Justifying the Cost

ZETA-TECH estimated \$3 million in annual train delay costs on the main line through Beaumont, along with about \$300,000 in delay costs occurring within the port and during

movement of rail traffic to and from the port. These delays are incurred for the most part by the three Class I railroads serving Beaumont. Are they sufficient to justify the construction of a \$16 million bridge?

Using a discount rate of 7% and a 25-year payback period for the investment, the \$16,000,000 investment can be recovered, with interest, with a payment of less than \$1.4 million per year. As noted earlier, this discount rate and payback schedule can support almost \$40 million in potential total capital spending. This leaves considerable scope for additional improvements, including perhaps the proposed KCS setout tracks at Vidor, Texas, (\$2.5 million) and possibly a third track from the port turnout to BNSF Junction (about a half mile, with an estimated cost \$1,000,000 plus \$15,000 for signaling).

Thus this project is easily justified on the basis of avoided railroad delay costs, even before such public costs as rail and highway crossing delays are considered.

2.11 Strategic Summary—Port of Beaumont

Container movements are not yet a critical element in the strategic planning of the port of Beaumont. Two important corridor issues, however, were identified during the first year of 0-5068 that could impact the future growth of containerized traffic, whether comprising international merchandise, military cargo or container-on-barge operations. The first relates to rail access to the port, the second to delays on the Neches River lift bridge and, in both cases, the strategic challenge is the same. The Port of Beaumont rail freight access plan would have helped the port itself, shippers using the port, local city traffic, shippers whose freight travels through Beaumont, and finally the railways whose main lines serve the port. Additionally, the proposed port access improvements might encourage additional diversion of long distance trucking to the rail intermodal services along the Houston to New Orleans corridor by increasing the velocity of through train movements along the railway transcontinental route that parallels I 10.

However, although the plan would have conferred benefits to all parties, as with so many intermodal programs, some win more than others. The best two alternatives to improve port rail access would have primarily benefited the two high-density major railroads, the port and its switching operating efficiency and finally local city traffic congestion and air quality. To date, although the discussions have been professional and serious, a united agreement on how best to improve rail access has failed to emerge. It is clearly difficult to frame a partnership when the parties have different stakes in, and shares of, the benefit stream.

This suggests a need to pursue possible avenues of resolution to be examined in the second year of the study. At this time possible approaches have been identified and others may evolve. One involves a new approach toward sharing project benefits with minor participants that are equity players because of their prior ownership rights. The second avenue is to consider eminent domain procedures that could result in a partial project implementation without harm to the minor party. This issue is of interest because it goes beyond the Beaumont example. Similar benefit sharing issues (and difficulties in seeking improvements through partnering) will arise in the Houston rail relocation planning and their resolution will require a detailed economic solution.

2.11.1 Strategic Summary—Sunset Limited Corridor and the Neches River Lift Bridge.

The Port of Beaumont access analysis permitted pre-feasibility calculations to be estimated on an important constraint on the northeast Texas section of the UP Sunset Limited route, the Neches River lift bridge owned and operated by the KCS railroad. The bridge is close to the port of Beaumont but not part (directly, at least) of the various access improvement strategies. Initial figures reported in this chapter suggest that there is a strong likelihood that an acceptable cost-benefit ratio would be achieved from improved average speeds on this part of the route and add capacity on the bridge itself. At the moment, the line carries a small percentage—around 10 percent—of intermodal traffic and that even less is destined to Texas ports. But two developments need to be recognized that heighten the significance of the traffic crossing the bridge and Texas port operations.

First, there are two traffic categories that are highly relevant to Texas port operations. Inefficiencies in these categories can negatively impact port growth. The first category comprises grains, much of which are en route for export through Texas gulf ports. The second category is the wide variety of chemicals produced at sites within or adjacent to gulf port property. In both cases, improvements to transit times will help maintain primary economic competitiveness that translates to secondary benefits at Texas ports. Second, the growth of rail intermodal traffic has been so great that it will, within a decade, become a major traffic element on the corridor. Intermodal long-lane traffic is growing nationally at two to four times the rate of other railway train traffic. So while only 3 to 4 intermodal trains a day may currently use this bridge (in each direction), that growth could make the bridge the key passage for 13 to 15 intermodal trains a day by 2009, which would raise the intermodal traffic share from 10 percent to anywhere from 16 to 22 percent.

Some benefits from an improved bridge facility across the Neches River would accrue to shippers and railroad companies using the Houston rail network. Trains are sometimes held within the Houston area while trains are crossed into the port of Beaumont or wait to cross the bridge, thereby causing system congestion. The Houston rail network, which is the most critical sector in the Texas Gulf port network, impacting the port of Houston and rail operations to other Texas ports, is the subject of the next chapter.

Chapter 3. Rail Access at the Port of Houston

This chapter, based on published reports, secondary data, and field interviews with transportation specialists in the Houston region, reviews the opportunities for improved railway planning for both the Port of Houston and Houston region. The chapter provides a strategic review of the role of the railways serving both the ports and the industrial complexes such as petrochemical terminals along the Houston ship channel. Finally, the chapter explores potential technical improvements to the Houston area railway network that might be accomplished faster and at lower cost than some larger projects to expedite container traffic flows at Houston ship channel terminals currently being considered.

As a container port, Houston saw a dramatic 15.6% increase in total twenty foot equivalent (TEU) container volume from 1.2 to 1.4 million TEUs in 2004. The Barbour's Cut container terminal has already outstripped the design capacity and is employing various techniques to maintain acceptable service levels until the opening of the first phase of the Bayport complex in mid-2006. Steps taken recently by the port to increase throughput per acre include curtailing the number of free days inbound containers can stay in the yard and not allowing truckers to drop off boxes for export until the receiving vessel's arrival is pending.

Deliveries of Asian cargo through the Panama Canal are a large part of the reason that the terminal's growth has accelerated so dramatically. At present the CMA-CGM shipping line is running two weekly services to Houston called Pacific Express (PEX) 2 and 3. The eight vessels that make up the service originate in Shanghai and have TEU capacities ranging between 2,450 and 4,250 TEU (see Table 3.1). The average size of the PEX 3 vessels is smaller; however, according to CMA-CMG officials a larger percentage of the cargo on the PEX 3 line terminates in Houston.⁹

Table 3.1. Vessel Size for CMA-CGM PEX2 and PEX3 Lines

PEX2	TEUs	PEX 3	TEUs
Vega	4,132	Cielo D'America	2,452
Yantian	4,250	Carolina	2,838
Ville D'Aquarius	3,961	Northern Reliance	3,538
Vernet	3,588	Trade Zale	2,526

The PEX services already make up a significant share of total throughput. As of 11/11/05, NYK Lines had also moved 14,050 containers in and out of the Port of Houston through the Panama Canal. This equates to 22,480 TEUs.

With the completion of Bayport, the total Houston container handling capacity will approach two million TEUs, placing the port in an elite class of U.S. seaports.¹⁰ For railway traffic strategic planning considerations, it is somewhat difficult to isolate the port's fortunes from the other business of the railways. As noted, the rail corridors that approach and exit Houston are used for many major commodity moves and the major lanes are shown in Table 3.2 for the UP. A similar breakdown list would apply to the BNSF market segments that use the Houston rail network.¹¹

Table 3.2. UP Major Commodity Flows, Houston Area

Railroad	Commodity/Service	Lane
UP Corridor Service	Intermodal	West Coast–Houston Port
		West Coast–Houston Domestic
		West Coast–New Orleans & East
	Coal	Powder River–Texas Utilities
	Grain	North Central States–Export
	Rocks/Minerals	West Texas–Houston
	Chemicals	Movement to all US Points
	Plastics	Movement to all US Points
	All Other	Movement to all US Points
	POTENTIAL	Intermodal short haul lanes
BNSF Corridor Service	Similar to UP	(See above, as most would apply to BNSF corridors)

3.2 Origins of the current Houston Rail Network

The railway network that serves the port complex and the industries around greater Houston is often described as a rail system. However, the current network arose without a focused development strategy or a long-term plan to provide an optimum service pattern to its customers. Rather, it is the result of a series of railway mergers and acquisitions that took place as opportunities presented themselves between strong and weak railroad competitors. Furthermore, some company mergers could be regarded as suboptimal in terms of operating efficiencies—as with the Santa Fe and the Burlington Northern merger, which took place after the failed (and potentially better) merger attempt between the Santa Fe and Southern Pacific¹². The last round of mergers left the Houston area primarily served by the Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) railroads, with UP controlling much of the area rail network.

Kansas City Southern is the third class one railroad company¹³ serving the Houston market. It does so through its controlling interest in the Texas Mexican Railway Company¹⁴ (the Tex-Mex or TM). The Tex-Mex received the right to operate over certain sections of the Houston network (termed trackage rights) as part of the conditions set in the UP-SP merger conditions. Finally, rail connections with the Port of Houston (POH) terminals like Barbours Cut are not handled by class one railroads but by the Port Terminal Railroad Association (PTRA), which builds the trains and so permits the class one companies to use locomotive power more effectively. The PTRA and other switching companies are not discussed in this chapter but play an important role in improving rail container movements into and out of the port terminals.

Table 3.3 illustrates the lineage of today’s Houston area railroads. This is the legacy of the various corporate predecessors who, on an incremental basis, built or improved the track structure that provides the infrastructure of current rail freight services.

Table 3.3. Corporate Lineage of Houston Freight Railroad Companies in 2005

2005 Company	Predecessor Company Serving Houston	Control or Merger Date
Union Pacific	Southern Pacific	1996
	Missouri Pacific	1980
	Katy	1988
BNSF	Atchison, Topeka, and Santa Fe	1995
	Burlington Northern	Fort Worth & Denver: 1970
Kansas City Southern Industries	Texas-Mexico	2005

These comments are not meant to be critical of the corporate process underlying the development of the current class one railroads. They simply represent an acceptance that tracks in the Houston area might be different if rail planners had the luxury of designing a Houston network that would better connect the far-flung network of today’s railway companies and their key customers. And this includes the various ports and terminals along the Houston ship channel that would benefit from better rail service. The result is that Houston’s rail network often does not mesh well with the directional movement of trains with the rest of the United States track network. Addressing these concerns is not simply a case of adding capacity to well established rail segments or corridors. There is, however, an opportunity to redevelop the network over time so that overall performance is enhanced to the point where it functions better as an integrated system.

3.2.2 Private Railway Incremental Investment Strategy Approach

There are significant, well-known differences between the railways and competing modes of transport like trucks and barges in terms of their infrastructure investment processes. Succinctly, railroads pay for all aspects of their business, from power to the maintenance and rehabilitation of the entire rail infrastructure. This should be recognized when considering the ability of railroad companies providing service to Houston terminals to upgrade their regional Houston and coastal Texas infrastructure. Railroads have to bear the cost of network improvements out of operating margins that have, as noted in the introduction, been rather thin over the last twenty years. This argues that rail investment should be sharply focused on projects with the highest economic return.

The dilemma facing companies such as BNSF and UP is that they have numerous competing projects spread across their networks that may lie within twenty or more U.S states. A private company’s ability to invest is a function of both its total annual income and its rate of return on invested capital. At 2004 business levels, a railroad the size of BNSF or UP is realistically limited to around \$2 billion of new investment each year. That has to include both fixed plant (track, structures, yards, and terminals) and rolling stock (locomotives and freight cars). Financial data from 2005 indicate substantial improvements in U.S railroad profitability and rate

of return, which may enhance their investment capability but not to the point where all infrastructure needs can be adequately addressed.

Given these financial constraints, is it feasible that the major class one railroads could finance an enhanced corridor system in the Houston region that would also benefit the terminals along the Houston Ship Channel? That question is strategic and will be addressed in the rest of this chapter.

3.2.3 The Port as One of Several Houston Area Rail Customers

The concept of a “rail corridor” when linked to port container flows tends to suggest investment schemes on the scale of the Alameda corridor at Los Angeles/Long Beach, the Oregon improvements to the port of Seattle and the inland port corridor project at New York/New Jersey. All of these projects were driven—and in the case of Alameda, paid for—by substantial container volumes moving from the ports to inland transcontinental terminal hubs serving their customers.¹⁵ Although container movements are growing strongly at the Port of Houston, the numbers do not justify a dedicated corridor built primarily to handle container traffic. Volumes at the Port of Houston are not on the scale of a major transcontinental load center, defined by absolute volumes of 4 to 5 million TEU and a substantial volume of transshipments. Rather, the majority of inbound cargo is destined for Texas. The port is a major economic entity within the Texas economy because of its diversity of cargo, with container traffic as only one component of the port’s portfolio. Although the POH is a key source of cargo generation for Houston railways, non port-related industrial companies also play a large role. In terms of railroad revenue and profitability, chemicals still make up the most important sector in this category. Rail is often in demand for the movement of hazardous materials. Seven percent of cargo handled at the POH is labeled dangerous and hazardous (D&H), a ratio that is many times the average for U.S. ports.¹⁶

The greater Houston and Beaumont to Corpus Christi region is home to about 25 percent of U.S. petroleum refining capacity. Petroleum related by-products, chemicals, and plastics require access to heavy railway cars for efficient shipment to inland markets. Within this coastal corridor, the freight railways compete with the other freight modes for a share of the business generated by approximately 250 chemical plants, 74 natural gas facilities and 30 oil refineries.¹⁷

The corridor is split into three geographic segments as shown in Table 3.4.

Table 3.4. The Texas Chemical Coast and Related Rail Service

Texas Chemical Coast	Rail Served Corridor	Railroads Serving
Golden Triangle	Beaumont, Port Arthur	UP, BNSF, KCS
Near South Shore	Beaumont–Houston–Bloomington	UP, BNSF
Far South Shore	Bloomington–Corpus Christi–Kingsville	UP, BNSF, TM

Note: TM (Tex-Mex portion of the KCS railroad company) has very limited rights to serve Houston and some rights and direct access of its own along portions of the Far South Corridor.

One way to gauge the importance of chemical business to the railways is to recognize that Union Pacific defines its entire railway in eight geographic market segments, one of which is the “Gulf Chemical Market.” Furthermore, it devotes considerable managerial time to investing resources

to expanding services along seven different company-wide “Corridor Initiatives.”¹⁸ Focusing on Union Pacific for the moment, about 37% of its revenue comes from serving energy and chemical related customers. UP managers expect that those two commodity groups will see future business growth at levels that typically exceed the average national US growth in GDP. In 2003, they forecast 3% to 5% annual growth in their energy traffic. Clearly, container business is not the same magnitude in terms of UP business strategy, nor is it likely to become in the next decade.

Grains complement chemicals as an important business group for rail business and railroads were initially constructed along the Gulf of Mexico to serve port grain traffic. Deep water harbors such as that at Galveston provided a natural outlet for the export of U.S. grains to the rest of the world. The deeper the allowed vessel draft, the lower the per bushel total export cost. Today BNSF is a major grain hauler, and in the Houston area serves not only POH export silos but also participates as a trade partner with the Texas Mexican Railway in the movement of 100 car trains of grain hoppers into Mexico via the Union Pacific tracks running between southern Houston and Corpus Christi and then on to Laredo via a junction with the Tex-Mex near Corpus Christi Bay at Robstown in Nueces County.

The commodity groups of energy, chemicals, containers, and grains suggest that this southeastern Texas coastal rail corridor could become one of the fastest growing U.S. rail freight corridors in the next decade. The places served along this route include: Houston, Alcoa, Angleton, Brazoria, Bay City, Bloomington, Inari, Sinton, Corpus Christi, and Robstown. The key growth factor is the range of commodity types and the ability of the rail network to offer different service levels needed by each commodity. Improvements to the rail network are not going to be dominated by a single commodity group and certainly not by POH container flows which are rather small at this time. Rather, it suggests a systemic approach is needed, perhaps separating through traffic, which could potentially be diverted away from critical metropolitan bottlenecks from traffic generated from the various ship channel terminals including those at Barbours Cut, Bayport, and other potential container handling facilities along the ship channel.

3.2.4 Rail Traffic in the Houston Regional Hinterland

On some railroads, general cargo that is non-port, non-intermodal, and non-bulk can amount to about half of the railway business. This business competes with port-related traffic for track access and contributes to the demand that at times results in congestion. This can have a number of undesirable consequences, ranging from excessive idling (impacting air quality) to delays at at-grade highway crossings (impacting road traffic).

One way to illustrate railway corridor use is to examine the traffic types that pass a major corridor junction. Table 3.5 provides an insight for the Houston area, based on a recent 24-hour survey that identified BNSF and UP train types at the Rosenberg junction in the southwestern approaches to Houston.

Table 3.5. Profile of BNSF and UP Main Line Trains Passing Rosenberg Junction

Train Type	BNSF	Union Pacific	Tex-Mex
Mixed Freight	10	11	1
Grain	6	0	0
Coal	4	0	0
Intermodal	2	7	0
Port Intermodal	2	0	0
Rock	6	9	0

Source: January 2004 survey by Stephen Foyt, Railway search tree.

Two and a half trains an hour, on average, can be expected to pass this important Houston location. During this sample period, the trains were roughly half UP and half BNSF but this ratio will vary. One to three Tex-Mex trains and an Amtrak train may also pass this location. The table also shows that on a typical business day, traffic includes trains bound to or from the Ports of Houston, Beaumont, and Corpus Christi. In addition, traffic to and from the Houston general rail market and California passes this point—some bound for the ports along the Pacific and others bound for intermodal customers in the southeast U.S., indicative of the long reach of current class one railroad operations. That is important to note since even today the highest density container train routes typically serve as an extension of this Pacific trade to U.S. inland points. As a consequence, much containerized rail movements originating on the west coast passes east-west and bypasses the Texas rail network to the north, as shown in the map in Appendix B.

The focus of this study is on container movements, so it is important to recognize that a wide variety of important traffic types passes across the Houston system and competes for the same slots that any increase in rail-based port container traffic would seek.

3.2.5 Intermodal Freight

A major growth area for western railroad freight in the past decade has been the movement of containerized international freight. The rail intermodal business began with systems that took highway semi-trailers and secured them on flat cars after being lifted by special yard cranes at inland rail terminals. They then competed with tractor hauled semi-trailers over the longer domestic freight lanes. This had the disadvantage of carrying heavy suspension and tires along with the trailer body and taking up space so that only one trailer could be carried per car, so restricting its truck-competitiveness. The system, known as trailer on flat car (TOFC), was rendered obsolete (in terms of pure cost) when an articulated well car system that would accept double-stacked ISO international containers was devised. This offered huge cost savings that meant railroads could more effectively compete with trucks for trips over 500 miles and was adopted by railroads from the mid-1980s. In 2005, the number of containers hauled by rail now far exceeds the number of trailers hauled by rail.¹⁹ When double-stack technology was introduced, it was sponsored by one of the major ocean carriers²⁰ as an extension of their business and this set the scene for the port gateway container routes seen today, particularly west coast to northeast inland hub destinations. Figure 3.1 illustrates the intermodal density for one mail rail line, BNSF.

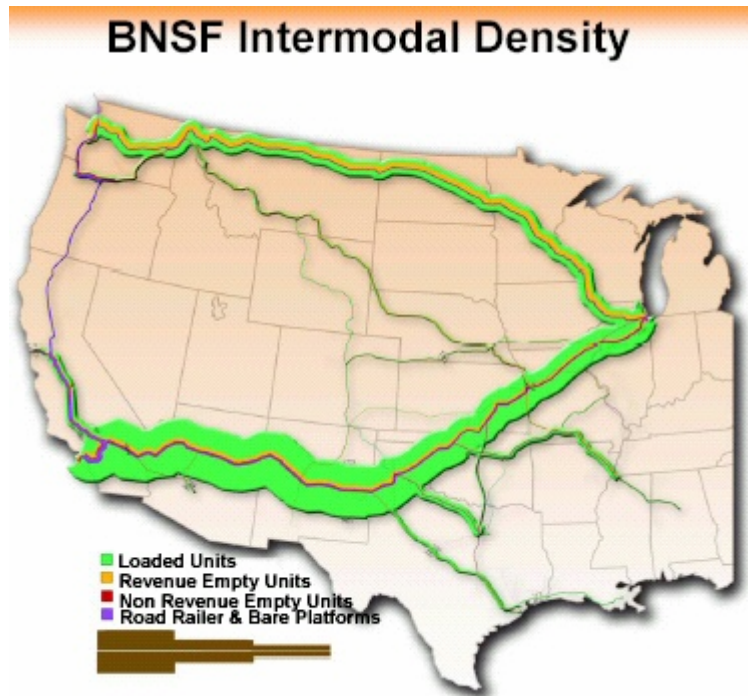


Figure 3.2. Map of Comparative BNSF Intermodal Densities

Therefore the heaviest concentration of BNSF containerized unit trains moves via Kansas City to Chicago, which currently carries 3.5 million TEUs per year.²¹ This pattern may change over time, but in 2005 it means that the Houston coastal region is a much smaller intermodal service area for the BNSF railroad than are the urban regions to the north.

3.2.6 Potential New Role of the Railways

In examining the Houston potential for additional rail intermodal growth, the team started with an examination of the markets. Table 3.6 illustrates the typical way that railroad companies offer and price container service. Growth in service levels are related to demand for the specific market segments and constraints on track and yard capacity serving the segments, including the cost of their mitigation.

One item of note in Table 3.6 is that some services are not called intermodal by railway managers. Transloading services and tri-level rail car movement of light motor vehicles are not typically located in a railroad company's intermodal marketing group. Railways generally relate these multimodal transfer movements to a specific railway sales account such as automotive or chemical customers. As a result, the railway market group that sells intermodal services does not usually deal directly with automotive or chemical customers seeking an intermodal train service. Planners, however, tend to categorize such services as intermodal. Thus, when looking at potential rail corridor growth, this report assumes that these services are part of rail intermodal operations.

Table 3.6. Railway Market segmentation—INTERMODAL

MARKET SEGMENT	PRIME CUSTOMERS	ROUTE PROFILES	PRICING PROFILE
Hinterland Movement of Import/Export Containers	Ocean Carriers & Third Party Operators	Long land bridge 1,000 or more miles inland Multiple trains per week	Doublestack containers Often repacked from TEU to 53 ft Boxes < \$.075 per mile rail charge
Premium Parcels	United Parcel Service	700 mile plus route Fastest & guaranteed train operating schedules	Private train contract Priced higher than other intermodal trains
Premium TL	J B Hunt- & Schneider-type trucking companies	Major urban market to major urban market 800 miles or longer	Confidential Likely lower than UPS but higher than others
TOFC Plans	Customers still using trailers	900 miles or longer Some North American routes now exclude trailers	Price per equivalent length box is higher for a trailer than a stacked container
Misc. Low Price other	Empties and lower service requirement customers		Available on a few routes where excess capacity exists & with a low cost terminal location
Other International	Port Contracted Train	Port to Inland Port Hub like NYC to Albany NY	Subsidized Norfolk VA or proposed Albany NY –Inland Hub Not a typical service in the US
TRANSLOADING	Chemicals & other easy to transfer commodities	350 plus rail miles combined with short truck drays	Combines low rail line haul rates with short truck delivery to off –rail customer locations
Finished Automobiles	Automotive Distributors	450 mile plus hauls	Combines low rail line haul rates with short truck delivery to off –rail customer locations

Note: some of the pricing and service profile descriptions reflect an across-the-board assessment of the various railway intermodal services that are offered, rather than a specific UP or BNSF or KCS profile. For a specific Texas railway company profile, log onto that railroad’s web site.

Table 3.7 illustrates the typical lengths of haul that the railways and their current intermodal customers consider profitable. At these distances total costs—comprising fuel and competitive wages, the cost of two truck drays, the lift on and off of the rail cars, and the trains’ costs for line haul transport—cover the direct long-term variable costs of the movement, plus the appropriate company overhead cost and profit margin.

Table 3.7. Long Distance Rail-Truck Intermodal Corridors to and from Texas

Origin/Destination	Highway Miles	UP service	BNSF Service
Los Angeles Region & Ports	1,550	Via El Paso	Via Temple
SFO Bay Area	1,935	Via El Paso	Via Temple
Portland	2,290	Via El Paso	
Seattle	2365	Via El Paso	
Detroit	1,390	Via ESL	Via KC
Atlanta	795	Via New Orleans	Via New Orleans
Mexico City	> 900	Via Laredo or via Eagle Pass	Via Tex-Mex or via Eagle Pass

3.2.7 Short Haul Intermodal Market Corridors

In the next two decades, changes in costs of fuel and the costs of long distance highway driving may combine with other factors such as lower cost public intermodal terminals and even social benefit transfers to make short distances profitable for railway intermodal traffic. Table 3.8 identifies the most likely short haul corridors for containerized and intermodal freight originating from Houston.

Table 3.8. Potential Short Haul Rail Intermodal Corridors for Houston Shippers

Origin/Destination	Highway Miles	Factor for Sustainable Operation
Dallas	240	High congestion cost or congestion pricing on I-45; Port of Houston capital to support inland lift-on/lift-off terminal; Domestic container replaces trailers
New Orleans	345	High congestion cost or congestion pricing on I-10; Public capital for lift-on/lift-off terminal; domestic container replaces trailers
Little Rock	440	High congestion on I-10; Public Capital for lift-on/lift-off terminal; domestic container replaces trailers
Break Point for Medium Haul Distance		
Memphis	575	Public capital for lift-on/lift-off terminal; domestic container replaces trailers
Lubbock	585	Public capital for lift-on/lift-off terminal; domestic container replaces trailers
El Paso	750	Domestic container replaces trailers

This potential raises the question regarding whether the rail corridors into Houston and the other Texas ports can handle the additional short haul demand on their networks. The short haul intermodal rail break point in early 2004 was about 475 miles. At distances less than 475 miles, the drayage and terminal costs in 2004 simply offset any economic advantage from railway line haul economics, even with doublestack technology. This figure is an average and does not reflect all conditions. Factors such as a shortage of truckers or trucks, higher than average congestion, or high fuel costs could impact the route length.

In this regard, the break-even point is quite dynamic. For example, if fuel costs remain high and the time-value of traffic congestion on the interstate networks continues to increase, a change in the break point distance would occur. Without much difficulty, it is possible to calculate a shift to less than 400 miles as drayage penalties are reduced by line haul increases in diesel fuel above \$2.50 a gallon and driver wages up by 25 percent. But that still requires other factors to overcome the higher terminal costs, which have a capital investment recovery component and an operating cost. As these costs shift, a potential reduction in the long distance threshold can also be calculated. As seen in Table 3.7, Memphis and Lubbock are economically more attractive (without subsidies) as middle distance range inland port hubs for Port of Houston originating containerized traffic.

3.2.8 Railway Traffic in the Houston Region

Capacity shortages on railroad networks have been cited recently in transportation journals and by public officials, particularly on the routes used by doublestack west coast originating container shipments. This is simply a function of the private ownership of railways in which investment into redundant capacity is not profitable. By finding ways to squeeze the most out of existing capacity, the railroads can maximize their profit margin, even though this strategy entails risk given the close competition with trucks for short to medium haul markets. If railroads delay capital improvements for too long, they experience declines in service quality and reliability that could lead shippers to abandon rail over these routes. Furthermore, a growth in demand may occur at a faster rate than timing of the infrastructural improvements needed to correct track and operational deficiencies. For this reason, the long term profitability of railroads in the competitive but lucrative container hauling market will depend on their ability to think strategically and anticipate growth. There are two reasons for this need. First, container demand can be more variable than growth rates of traditional bulk commodities like coal, grain or aggregate because shippers can change routes and ports. Secondly, a rail company transitioning from a bulk carrier to a container merchandise carrier has to meet stricter on-time delivery schedules. Robert Noorigian, VP of CN railways, described the changing culture of railway operators transitioning from a bulk-centric to a merchandise-centric operation in the following way:

“In the past...we would hold the train until all the cars were delivered... It’s analogous to taking a flight to Toronto where the plane won’t take off until they fill up all the seats. It isn’t good customer service and it isn’t good asset utilization.”²²

Railroads in North America have thus far managed to capitalize on the surge of intermodal container demand placed on their business in 2004 and 2005. Rail demand for containers

originating at the port of Houston has been modest and has not unduly stretched either the railroad operations or the Houston network. However, that could change in the next decade as container volumes are driven higher by local population growth, new distribution systems and the development of long range services favoring doublestack economies.

Rail capacity is fluid and can be adjusted in different ways. One way is through the price mechanism—raising fees when congestion levels are reached. However, the more conventional approach is through engineering (like adding tracks and sidings) or operations (like signals and longer trains). Frequently, railway freight capacity at one location is often determined by an upstream network effect remote from the Houston area. If the remote problem is fixed, congestion in Houston can be mitigated.

An example would be a BNSF train delayed in southern Houston because of a cross traffic movement miles to the north or a lack of passing siding capacity to hold trains coming south as it waits to go north. These network effects might be resolved by making capital improvements in the Houston region, or they might better be addressed—in terms of both cost and time—remotely if the root cause of the problem lies outside Houston.

In the first year of this study, the team attempted to develop a basic strategic evaluation of the network effect in Houston. The characteristics in Table 3.9 have been established through conducting a number of interviews and field inspections within the first year research activities. These conditions limit both the capacity for growth on the Houston network (including port intermodal traffic) and the ability to recover from those network problems that cannot be foreseen.

Table 3.9. Houston Rail Network Characteristics Limiting Growth and Efficiencies

The Houston rail approaches are made up of a collection of single track networks.
Typically, there is a relatively long distance between passing sidings along most of single track lines.
The track speeds on these routes are often in the 30 to 50 mph range.
Siding lengths vary and are not consistent on each route. The shortest siding is often less than 6,500 feet.
A few of the lines with the highest future potential for growth lack modern signal systems.
Yards to receive and dispatch trains are often located on the opposite side of the urban area from the rail approaches, meaning that trains have to traverse low-speed urban segments to serve them.

Collectively, the limitations on the rail corridors mean that the network cannot easily recover when unplanned events create congestion either within the region or along the more remote track approaches. The corridor infrastructure conditions also mean that the railroads collectively have a problem with system velocity, which simply means that they have difficulty in maintaining

both average train speeds and reliability of their scheduled networks when operations are subject to a high occurrence of random track delays.

Interviews with railway staff also confirmed that managers in each railway company operating in Texas are aware of the fundamental design issues and the need to find affordable solutions so that growth in this financially important market can be accommodated. There are multiple ways to improve these network conditions. One is to implement a large restructuring plan that would essentially reroute much of the track infrastructure and add capacity while decreasing network crossing delays from other trains and with other non-railway vehicles. The latter is important as the Houston metropolitan area grows (some estimates suggest that the population will double in twenty years) and inner city densities of inhabitants increases. An alternative approach is to improve growth and network fluidness by making incremental infrastructure improvements. This chapter considers both and first reviews the large restructuring option.

The Current Houston Area Strategic Plans for Possible Railway Network Redevelopment

The favored railway reroute options currently being considered publicly for the Houston area can be classified around one or more of the following perceptions of the need for either: (a) grade crossing elimination;²³ (b) commuter trains in the corridor being studied; (c) light rail extension into the corridor being studied; or (d) a conceptual assessment of freight route consolidation.

The current Houston rail relocation projects identified in the field visits comprise the following strategic elements:

1. The Port of Houston and Harris County *Conceptual Rail Corridor Consolidation Plan*—an idea to build a northern freight rail by-pass along the old ATSF Silsbee subdivision, and reroute north and south long distance freight trains onto the UP (old MP Palestine line) corridor that passed the BNSF/UP joint dispatch center at the Spring, TX suburban location.
2. A high clearance bridge that would take freight trains to the south of Houston east and west across the Houston Ship Channel.
3. An east-west rail freight tunnel under the Houston Ship Channel.²⁴
4. A Sugar Land and Rosenberg rail relocation project with an option for commuter rail service.
5. Trans-Texas Corridor (TTC-69) could provide a full by-pass of the central Houston rail network if fully implemented. The contract for the TTC-69 master plan has not been awarded, however, and is long term in scale.

Each of the above plans appears to have different local and sometimes federal champions. The TxDOT role is not yet defined—except for TTC-69—although it will clearly have either an oversight or a planning role, or possibly both, before any of these alternative strategies are implemented. The project costs have not yet been fully estimated. Sources suggest a cost range for full implementation could be in the \$3 to \$5 billion range. A large, but yet unknown, percentage of this cost will have to come from public sources, since many of the direct project benefits will not go to the railways or their customers.

Another strategic plan that is large in scope would change the locations of major classification yards within the Houston network to reduce rail and highway congestion while raising service levels. There are two major UP rail freight classification yards in the Houston area. Both of these yards²⁵ are located in northeast central Houston near the ship channel and east of downtown. They are part of a network that stretches from Los Angeles to New Orleans and from the Mexican border to Chicago and points north of Texas. Thus the UP Houston yards are important train building locations for the company.

Houston does not play the same strategic role in the BNSF network. The former BN and the former ATSF networks never had a major classification yard where they interchanged and switched railcars between road trains in Houston. After the BNSF and the UP megamergers, the Houston network did offer BNSF the opportunity to run trains through from southern California to New Orleans. However, they seem to do so without the need for a major Houston classification yard. This need may change in the near future, but at present BNSF operates with a different local yard function-operating scenario than Union Pacific. Furthermore, it does operate an intermodal terminal that seems to be capable of meeting all current demand for containerized services from the port of Houston and other customers.

In theory, the opportunity exists for UP to build a new ex-urban classification yard away from the central Houston area and provide benefits to both its operations and the total network. If the operating hypothesis is correct, then a different set of local train operating statistics might be simulated and change the cost benefit approach toward a better Houston region mobility solution than the three options now on the table.

A suburban (or remote) joint classification yard facility might be considered by the two major railroad companies if it would reduce the asset base they currently carry on their balance sheets. The option would also have to be structured so that it gave them an assured higher efficiency level than the current arrangement at a reasonable shared unit operational cost. A complex equation²⁶ would have to run in the operational test planning (simulation) and then be used to calculate private and public benefits.

Table 3.10 illustrates another extensive approach aimed at modernizing Houston's rail network and the approaching rail corridors. This long-range strategic plan for Houston, which uses a June 2005 working proposal, involves the following:

1. Substantial new rail right-of-way construction,
2. Significant consolidation of approach routes into fewer routes into Houston, but each with more daily trains,
3. Significant highway/railway grade crossing construction,
4. A new tunnel by-pass across the Houston Ship Channel, and
5. A new railway by-pass to the extreme north, northeast, and east of the Houston traffic area.

Table 3.10. Greater Houston Grand Plan for Long Range Railway Network Redevelopment

20-25 Year Horizon	Corridor	Area	Capital In Millions
Short Run 5-Year Phase	A) East Belt Railway Improvements	East-West Main south to port interchange yard	\$150
	B) East-West Houston–Beaumont Mains	Englewood Yard & Settegest Yard east to Dayton	\$500
Mid-Range Phase	C) North Hardy Consolidation	Dobbin Jct to just north of Houston Central City & the West & East Belt Line Junctions	\$300
	D) Port /West Belt–East Port Intermodal Facilities	Main Jct. between West Belt main line and the eastern port complex of yards Track to the bay intermodal yards	\$400
Long Run Phase	E) South Houston Sugar Land Rural By-Pass	Abandon the Rosenberg 610 West By-Pass Build a “greenfield” rail line to the far south that reconnects near T&NO Jct near Hobby Airport	\$1,000
	F) Ship Channel Tunnel & Eastern Houston By-Pass	A tunnel or high bridge to take traffic entirely out of the north and middle sections of the East Belt rail line north of Tower 24	\$1,000
	G) Ship Channel Tunnel & Eastern Houston By-Pass	A tunnel or high bridge to take traffic entirely out of the north and middle sections of the East Belt rail line north of Tower 24	\$1,400 +
TOTAL LONG RUN CAPITAL INVESTMENT	ALL		Almost \$5,000

Note: Cost estimates are rounded up

All the conceptual plans for rail redevelopment in Houston described in this section contain objectives that are legitimate and probably show positive net total benefits, comprising private plus social elements. The critical issue that remains is whether the Houston network could make a case to justify federal support that could match the Alameda corridor. The answer, especially given the failure of the Chicago CREATE project to garner sufficient support in the recent transportation reauthorization bill, is probably negative. Similar plans to those in Table 3.10 exist at other rail bottlenecks across the United States, which means that total U.S. rail system investment needs far exceed the capacity of the railroads to meet these needs financially. Examining the projects in Table 3.9 raises the question of how many will the class one railroads serving Houston take up and what percentage of the expected individual project costs can they reasonably service? An alternative strategy for network improvement could be an incremental approach, which is now discussed.

3.2.9 Potential Incremental Project Improvements

A second way not yet fully considered is to use the railway industry incremental approach toward making risk-based investment in markets but adding public benefit funding of a more limited nature than the projects described in the previous section. A list of strategic priorities for incremental rail and rail-port redevelopment focused on rail capacity include:

1. Rail operational velocity improvements
2. Holding tracks for clear route dispatch
3. Suburban and remote rail shipper support yards
4. Heavy axle benefits and route standardization

To implement these, a full cost-benefit calculation and cost sharing approach would first have to be examined. Table 3.11 suggests the types of projects that could be incrementally implemented for the Houston urban rail terminal and terminal approach corridor area. They have several characteristics of interest to rail planners seeking network efficiencies. The projects are labeled incremental because they add marginal capacity and service functionality upon the existing infrastructure and are selected because they would not normally require substantial design and lead time for construction, except (perhaps) where environmental issues arise. The project costs and the private as well as public benefits would have to be measured before commitments from the various beneficiaries can be expected. They can accommodate a market based projection of increased traffic demand based upon corridor related traffic analysis between the railways and their major customer commodity groups. They could increase train flows within the busiest sections where congestion is observed by using the “network effects” tactic of holding trains until a free-flow downstream condition exists. Finally, in aggregate they appeal to the way that class one US railroads currently do business.

Table 3.11. Potential Incremental Cost Improvements for the Houston Rail Corridors

Corridor	Corridor's Usage	Improvements	Reason for Improvements
Rosenberg–East Belt & Port Approach Along US 90	Western market approach to Port of Houston	Double track or added sidings Approach hold sidings Key highway crossing grade separations	Faster train velocity to lower delays Keep trains out of Eastern Houston track during congested periods Decrease highway vehicle crossing delays
East Belt & West Belt Inner City Rail Corridor	North-South freight routes for most trains to reach key customers or the port area	Added train hold sidings along West Belt and East Belt Signal and turnout improvements	Hold trains until routes are cleared ahead Increase speed of moving trains to lower delay times
North-South Hardy Road Rail Corridor	Main route from N. Texas and Midwest markets	Added main track and holding sidings Connections to BNSF E/W by-pass line in northern Harris County area	Hold trains until routes are cleared ahead Increase speed of moving trains to lower delay times
East-West Corridor Rail Lines towards Beaumont	Main route from New Orleans and points east of the Mississippi River	Added main track between central Houston and Dayton Double track the Neches River Bridge at Beaumont Added track siding between Dayton and Beaumont, possibly on the two parallel rail lines to Beaumont	Increase speed of trains moving to lower delay times Added track to by-pass the busy Englewood Yard at Houston Hold trains outside of the busy Houston terminal until routes are cleared ahead
Western I-610 Corridor and the Northern I-10 Corridor around the City Center	Main route by-pass for transcontinental traffic that transits through Houston	Add main tracks and upgrade train capacity at key junctions and sections along this natural by-pass route	By-pass trains away from the busy Port and Eastern Corridor West Line routes By-pass through trains away from T&NO Jct and North-South corridor at that location

These near-term improvements in capacity should be analyzed in terms of their commercial return by determining:

1. The capital cost of the projects,
2. The current versus projected traffic congestion,
3. The market growth in expected train volume,
4. The train delay today and expected future savings from avoided train delays,
5. The projected private industry rate of return on the private capital investment, and
6. The public benefits for a share of the investment costs.

Further study would determine the investment cost range of the suggestions identified broadly in Table 3.11. However, initial estimates put the total costs for the projects outlined in that table at a strategic \$150 to \$200 million range, not including public road grade crossing capital.

The public benefits still need to be measured in terms of:

1. The average delay today and the delay in the future as train and highway traffic volumes grow,
2. The value of time per unit of delay and the dollar value of that delay,
3. The pollution caused delay values from vehicle idling, and
4. The accident delay value as incidents between trains and highway vehicles are estimated both in terms of today's risk level and the risk when accounting for market growth of traffic over time.

These public benefits can then be used to help determine the role of public funding; previous studies demonstrate the magnitude of public benefits associated with rail urban projects.

Importantly, moving forward with short run incremental changes that might be jointly funded with private and public capital dollars still allows the longer range and more expensive strategic options to be considered. The list of suggestions in Table 3.11 does not prohibit the ultimate execution of a more aggressive plan for urban rail congestion relief.

3.2.10 Chapter Summary and Next Steps

Sharp increases in container volumes at the Port of Houston are changing the port's role in the national economy. While the port has long been the national leader in petrochemicals, it is now moving closer to the status of a regional load center for intermodal containers. Ports in this category tend to rely far more strongly on rail for intermodal deliveries to destinations beyond their immediate hinterland. For this reason, it is critical that improvements in the Houston rail network occur in tandem with improvements in dockside capacity. There are many options currently under consideration for improving train speeds through the Houston network while at the same time mitigating the impact of trains moving through neighborhoods.

The Port of Houston's planning process will be discussed again in the second year report due to be published in late 2006. Houston related topics to be addressed in the second year report include: (1) a mathematical forecast of container growth volumes in the Houston region through

2020 (2) an analysis of truck container movements in the Houston region (3) issues related to the opening of the Bayport container terminal (4) a discussion of environmental justice implications of intermodal movements under the current situation and following planned improvements.

Figure 3.2 identifies the seven major Houston corridors associated with the proposed improvements and investments in Table 3.11.

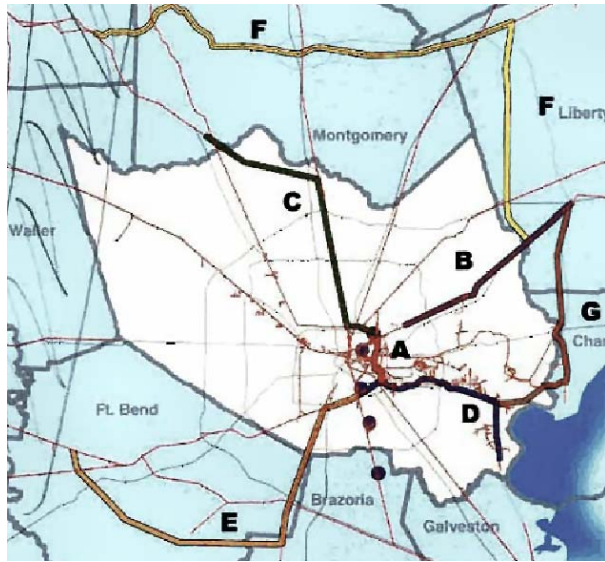


Figure 3.3. Map of Greater Houston Grand Plan for Long Range Railway Network Redevelopment

Chapter 4. Corridors for the Port of Corpus Christi

4.1 Port of Corpus Christi—Overview

The Port of Corpus Christi emerged as a major gateway for petroleum and agricultural products for Texas in the 1930s. In 2003, the port ranked seventh in the nation's total tonnage and is a critical conduit for liquid bulk, dry bulk, and breakbulk cargo. Between 2003 and 2004, the port saw a substantial surge in its break bulk volume from 360,000 to over 500,000 tons. At the time this report was published there were several initiatives being planned and built at the Port of Corpus Christi in order to expand and diversify the port's cargo handling portfolio. Most frequently mentioned is the proposed La Quinta container terminal. The terminal itself, however, is only one component in a broader system intended to allow the port to accommodate larger ships and transfer cargo more efficiently to inland terminals. The port's capacity as a priority military port has also contributed to its overall development pattern. In 2005, the Office of the Governor, through TxDOT, provided a grant of \$5.2 million for improvements of rail connections to the port and cargo handling during military deployments.²⁷

Perhaps the most compelling argument advanced in support of the Port of Corpus Christi's efforts to develop a major container handling center is the need for redundancy in the state's container handling network. An alternative center for importing and exporting containers within Texas would be a strong asset to the state in the case of a rapid surge in container growth that temporarily overwhelms Houston. Such a facility would also be useful or responding to an event such as a major hurricane that would sideline the Barbours Cut terminal for a matter of weeks or months. The challenge for the port is in convincing potential investors in the \$400 million dollar project that La Quinta will be profitable not only in times of emergency but also when its key potential competitors such as Barbour's Cut, Brownsville, and Bayport are operating smoothly. While Corpus Christi itself is not a major source of container demand, its location allows it to equally serve the two most critical economic areas of the state—the greater Houston area and the I-35 corridor. It is also well positioned to serve South Texas and the border region. Eventually, the Port hopes to provide three distinct advantages over Houston: a deeper channel, less congested landside access, and more convenient access to south Texas and Mexico.²⁸

4.2 La Quinta Development

The La Quinta project was initiated in January of 1998 when the port purchased a thousand acre tract of land near the Ingleside Naval Station. The land parcel is on the opposite side of the bay from the main city of Corpus Christi and is close to the entrance to the Gulf of Mexico. As such, ships accessing this terminal would not need to cross under the harbor bridge and could be expected to interfere less with the day-to-day workings of the city.

The port does not directly tax the local population base. It is partly for this reason that the Port Authority has had significant freedom in determining its own development path and choosing its strategic direction. While the port's traditional cargoes continue to grow in volume, the attraction of containerization is the possibility of receiving diversions from existing cargo flows. In this case, the port's container business could grow even in a period when the overall economy is retracting.²⁹

The successful completion of the La Quinta project depends on the ability of the port to find an operator that would be responsible for dock construction, crane acquisition, and general operations. In December 2004, the port entered into a preliminary agreement with Phillipine-based International Container Terminal Services Inc. Following the disintegration of this agreement, the port issued a general RFP in June 2005 to “Develop and Operate a Major Container Terminal in the Western Gulf of Mexico.” The RFP specified that the port was flexible to different potential business strategies and divisions of responsibility between the terminal operator and the port authority. However, the RFP also makes it clear that the terminal operator, not the Port of Corpus Christi, will be responsible for the “daily management, marketing, and operation of the ocean and intermodal terminals.”³⁰ The deadline for submission of applications was in October, 2005. On November 22, 2005 the Port announced that it had entered into an agreement with Dragados-S.P.L of Madrid, Spain for development of the La Quinta Trade gateway. Port commissioners voted unanimously to allow six months of exclusive negotiations with Dragados during which time the two partners will attempt to work out the details of the development agreement.³¹ Dragados is a subsidiary of Grupo ACS—the largest port operator within Spain and one of the largest within Europe. The first phase of the project is expected to cost \$111 million.

The potential market that could be served by the La Quinta facility was analyzed in a port-sponsored report by Mercator Transport Group, published in March of 2005. Mercator examined the potential market share that Corpus Christi could hope to gain in different areas of Texas, Mexico and the inland markets of the United States dubbed “intermodal areas.” The conclusion was that, in 2009, imports of roughly 200,000 TEU’s would be twice as high as exports (see Table 4.1) Furthermore, the largest share of imports and exports would be destined for the intermodal areas—well beyond the port’s immediate hinterland. The assumed volume of intermodal transshipments that La Quinta would be able to capture from Houston is based the continuation of congested conditions on the Houston rail network. If substantial improvements in the Houston rail corridors are realized, the estimations of intermodal growth at Corpus Christi would be undercut somewhat. In that case, La Quinta would likely focus on developing its Mexico market where it has a significant advantage in distance over Houston.

Table 4.1. 20-Year Forecast of La Quinta’s Market Potential (TEUs)

20 Year Forecast of La Quinta's Market Potential (TEUS)

US Geographic Area	To/From Latin			2004E				2009				2014			
	EURO	AMR	ASIA	Exports	Imports	Empties	Total	Exports	Imports	Empties	Total	Exports	Imports	Empties	Total
Central & South Texas	X	X		12,139	11,688	0	23,827	17,426	15,528	0	32,954	24,088	20,231	0	44,319
Houston	X	X		8,393	797	0	9,190	12,534	1,083	0	13,617	17,730	1,419	0	19,149
North Texas & Southern Plains	X	X		7,489	4,448	0	11,937	11,159	5,754	0	16,913	15,711	7,260	0	22,971
Intermodal Areas	X	X		43,693	44,189	0	87,882	64,008	57,592	0	121,600	89,199	73,563	0	162,761
Northern Mexico	X	X	X	0	54,552	0	54,552	0	71,746	0	71,746	0	91,707	0	91,707
Central & South Texas			X	3,107	20,472	0	23,579	4,072	31,498	0	35,570	5,830	46,280	0	52,110
North Texas & Southern Plains			X	1,256	1,253	0	2,509	1,647	1,928	0	3,575	2,359	2,833	0	5,192
^A Transloads to Texas			X	0	20,800	0	20,800	0	32,002	0	32,002	0	47,021	0	47,021
Empties				0	0	75,640	75,640	0	0	98,233	98,233	0	0	139,081	139,081
Total				76,077	158,199	75,640	309,916	110,845	217,131	98,233	426,210	154,916	290,314	139,081	584,312

^A 1 Retail import operation in 2004

Source: Mercator Transport Group

4.3 Corpus Rail Corridors

The presence of efficient rail connections for the port of Corpus Christi is in some ways even more important for the economic success of La Quinta than for container handling ports along the Houston ship channel since a majority of the cargo coming into the La Quinta would need to move significantly inland and could therefore be captured by rail. The small but growing transit business operated by Tex-Mex carries traffic along the rail corridor on its way to or from shippers located in Mexico. Tex-Mex operates two to three trains a day over the UP-owned tracks between Robstown, Tex., and the Houston area. The BNSF operates one to three trains a day over the same UP tracks to reach the Tex-Mex rail interchange at Robstown so that it can serve the growing Mexican trade via the Tex-Mex Laredo gateway located some 150 miles to the west of Corpus Christi.

Presently, there is not a large demand for rail through-traffic on the UP-owned line south of Corpus Christi. Market demand for rail freight service to and from the city of Brownsville also is not very high, resulting in just a train a day at maximum in each direction south of the Corpus Christi Bay area.

Table 4.2 illustrates the profile of the rail corridor from Houston to Corpus to Brownsville in the year 2005. The rail line distance between south suburban Houston and Brownsville is about 345 miles³². The line is single track for the most part, with maximum permitted freight train speed of 50 miles per hour. The northern part of the line has a centralized traffic control system, whereas the southern most part of the line uses a track warrant control system. Train weights are restricted to a gross car weight of just 263,000 pounds and therefore the more modern cars of 286,000 lb capacity are not allowed into Corpus Christi via this line³³.

According to Fred Babin, the Port's Transportation Manager in charge of rail developments, the first priority for the port in enhancing its rail corridors would be the improvement of the Corpus Christi-Houston line so that it could accommodate car weights of 286,000 lbs. The current weight restriction constrains the port's grain operation. However, Mr. Babin believed that, from the perspective of future containerized operations, the weight restriction to Houston would not be a major problem for two reasons. The first is that relatively few containers coming into La Quinta would be expected to move through Houston by rail. Secondly, container trains are expected to rarely, if ever, exceed the current 264,000 lb weight limit.

Table 4.2. Profile of Houston–Corpus Christi–Brownsville Rail/Port Corridor

Major Corridor Markets	Miles from Brownsville	Line	Passing Siding ³⁴	Joint RR User
Algoa Angleton Subdivision	343	Jct with BNSF Galveston sub		BNSF has Trackage rights to Brownsville
Brownie	341		10,000	
Liverpool	332		7,600	
Glenn	323		8,300	
Angleton	318	UP Yard		
Brazoria	307		7,600	
Sweeny		UP Yard		
Allenhurst	292		7,700	
Bay City	282		5,600	
Buckeye	274		8,200	
Blessing	263		7,800	
Laward	248		7,760	
Vanderbilt	239		6,680	
Keeran	229		5,600	
<i>Pacedo</i>	224	UP Line from Flatonia		Tex-Mex Beaumont– Houston trains enter/exit here
<i>Bloomington</i>	221	UP Yard		UP subdivision point
Inari	204	Southern end of CTC	7,600	
Greta	193		7,200	
Woodsboro	181		6,300	
<i>Sinton Jct</i>	162	UP 29 mile industrial branch to north bay port complex	UP Yard on Branch	UP sole provider for Aransas Pass & La Quinta area of northern Corpus Christi Bay
Sinton	161		11,000	
Odem	155		UP Yard	
San Antonia Jct	154	UP line crossing		
<i>Robstown</i>	142	Tex-Mex Interchange & Junction	7,100	Tex-Mex & some BNSF trains exit and enter UP line
Kingsville	118		UP Yard	
Sarita	98		5,100	
Armstrong	77		7,400	
Norias	68		5,000	
Raymondville	48		5,700	
Harlingen	26		Yard	
Brownsville	1		Yard	BNSF Haulage Used

The Corpus Christi Bay area also has ample room for new industrial development and additional ship loading areas. The development of the Joe Fulton trade corridor is expected to make rail

movements within the port area more efficient. All of these factors make the bay an attractive area for port-related development.

Given the small size of its immediate hinterland, Corpus Christi planners have been examining the prospects for moving shipper-generated cargo to inland US markets such as Little Rock, Memphis, Kansas City, Minneapolis-St Paul, and Chicago. Table 4.3 summarizes some of those plans.

Table 4.3. 2003 Corpus Christi Port Study Conclusion

Market Forecast	Strategic Assumptions	Implication	Most Likely Assumed Inland Rail Route Options
La Quinta Intermodal Facility will add 2 to 4 trains per day	<p>Congestion will increase at southern California ports</p> <p>Poor rail service LA area to upper Midwest markets</p> <p>Continued growth in China-US container imports</p>	<p>Market to serve the US Midwest states</p> <p>A successful La Quinta intermodal terminal facility would significantly expand the Port's rail traffic base</p>	<p>Corpus Christi-Houston-DFW or Arkansas rail corridors</p> <p>Possible San Antonio-Austin route to by-pass Houston</p>
Other nonintermodal traffic will expand greatly and continually over the next five to ten years	Ingleside area in North Bay section will have the greatest growth	Strong diversified port growth	<p>Likely increase of freight car axle loadings</p> <p>Possible attempt to gain second rail carrier service in North Bay area</p>
Continued goods output along the historical South Bay	Expansion projects and rail relocation & modernization underway	Positive strong growth in the South Bay area	Rail access into South Bay by all three majors—BNSF, Tex-Mex, and UP

October 2003

In terms of access to the Midwest, an assumption that must be examined by either port officials or by potential investors is whether congestion on the already dominant low cost transcontinental Pacific-Landbridge routes to the north will not be corrected by investments. Potential investors should also not overlook the capability of the great circle short route ports in the Pacific Northwest, as far as Vancouver and Prince Rupert to the north to divert cargo flows bound for the U.S. Midwest.

A 2004 Mercator report, entitled “La Quinta Intermodal Service Evaluation Summary,” showed a table comparing La Quinta’s projected advantage to the Midwest Markets from Los Angeles/Long Beach (LA/LB). The results of that 2004 Mercator study showed, among other things, what the Corpus Christi advantage would look like (see Table 4.4).

Table 4.4. Mercator Study Results³⁵

Line Haul Route	Original Study Projected Transit Hrs	Actual Operating Hrs Range
San Pedro LA–Chicago	83	45 to 76
La Quinta–Chicago	70	Not Yet Operating

The fast track BNSF (old Santa Fe rail route) running LA/LB-Barstow-Kingman-Abilene-Kansas City-Chicago) continues to offer throughout 2005 the fastest and most delivery reliable intermodal service in the western United States.

It is possible, therefore, that the initial Mercator service was comparing two different service levels for the two corridors. The fact that some intermodal trains may use a scheduled running time of more than 80 hours is a direct reflection of the market whereby some shippers of containers want to buy the service with the lowest possible cost per TEU or FEU. In other words, some shippers willingly purchase slower train service that gives them the lowest possible cost based on high density of train operation. High density of train movements on rail lines ironically can often mean lower production costs provided the lines still remain operationally fluid. As of spring 2005, the average intermodal train moving on the BNSF between LA/LB and Chicago did not require an 83-hour transit.

The Corpus Christi intermodal project also concluded that the “Union Pacific’s Brownsville subdivision is a major source of train delay—and that this will become a bigger problem in the future as UP’s and the port’s traffic expands.” Since Corpus Christi hopes to attract new liner services that would serve markets beyond Texas, La Quinta intermodal trains may exacerbate the existing congestion along this line.

If the Corpus hinterland trends toward the southwest and the growing Mexican markets, Corpus Christi may gain a share of Mexican intermodal rail trade from Mexico’s northeastern states. Here, the definition of intermodal needs should include not only containers but also autos and other forms of “transloadable” break bulk commodities.

The UP privately owned rail line in the corridor that parallels US 59-77 and Texas route 35 is a functioning single-track network that was built for freight service and still performs that role relatively well.

Bloomington to Houston

With a single track configuration and CTC plus siding spacing of 11 to 23 miles range, the northern part of the corridor can accommodate about 18 to 22 average trains of about 7,000 ft length. The northern route does accommodate heavy axle load equipment in the 286,000-lb range. Some estimates place traffic growth along this corridor at 50 percent over the next five years.

Bloomington to Corpus Christi

This section of the corridor has two capacity-related issues that should probably be addressed either privately by the railroads that share the track or with TxDOT planners. The track has a weight restriction of just 263,000 lbs per car. That means the total net potential benefits of lower car costs and fewer theoretical train starts for the same volume are not yet being obtained. The main reason for these restrictions seems to be related to bridges along the route rather than the track as a whole. The BNSF, which has trackage rights over the line, has estimated the cost of fixing the problem and thereby increasing weight capacity at less than \$12 million dollars.³⁶ A focused cost-benefit calculation should be able to identify the added cost liability of bridge and track structural needs and wear and tear (degradation) against the benefit stream of lower car costs per commodity unit and lower train operating costs per trailing ton. That calculation typically takes less than a few months to complete and the resulting negotiations usually can be concluded among the contracting parties in just another few months. Construction to correct the physical problems could take less than a year. When capital improvements occur on shared track, the owning railroad and its tenant track users generally by contract terms pay their share on a prorated use basis.

Train capacity measured in terms of trains per day may be the most pressing short-term issue for all parties. Railway owners in charge of train dispatching usually try to accommodate the tenant trains in the same rules of priority as their own trains. But with the current siding spacing and the current combination of train dispatching signals and warrants, the likely maximum number of trains per day between Bloomington (mile post 219) and Sinton (mile post 162) is probably around 17 to 18 with trains limited to 6,300 to 7,200 ft. The short-term solution is to add one or two sidings and to standardize at a longer siding length.

A market forecast should drive the short-term capital investment. Part of that forecast will be port-oriented traffic; however, an even larger portion will likely be driven by a combination of market forecasts for both domestic chemical traffic along this coastal rail corridor and NAFTA-related cargo forecast along this corridor. Neither of those forecasts yet exists in the public domain, but a nominal growth rate for those two market segments would likely lead to the potential for another 6 to 8 daily trains along this sixty mile or so track section.

Over the next decade, the entire 180 plus route miles between 1) the industrial approaches toward the North Bay and South Bay areas of Corpus Christi and 2) the southern approaches into the Houston proper corridors are a strong candidate for a double track CTC business investment. This hypothesis would have to be verified with railway marketing experts at UP, BNSF, and KCS. Given the observations made during the project inspection this August, this hypothesis is logically advanced³⁷ to TxDOT at this time.

Capacity toward the border port of Laredo

The 150 plus miles of Tex-Mex railway between the Corpus Christi port area and the border crossing at Laredo is like the corridor north toward Houston—a prime market development corridor. This market corridor has its basis in the differential of product costs in two different nations; therefore the market forecast is also subject to dampening by nonmarket forces like customs and border-processing issues. If the institutional boundaries are removed, the logic for natural growth is clear.

This corridor has a logical haul of about 250 miles into the Monterrey market, which means it is a natural port to inland hinterland, with conventional rail carload traffic playing a transloading role as an economically viable mode. Whereas intermodal short haul typically requires a distance threshold that exceeds 500 miles, the conventional rail car has a much lower distance threshold. Because this project was not supported by a marketing component, only the hypothesis is advanced at this time for further study.

To make the Tex-Mex route³⁸ more economically robust, track and dispatching might have to be upgraded beyond the levels currently anticipated by Tex-Mex with its recent special funding agreement.

4.4 Other Developments Affecting Intermodal Business at Corpus Christi

Although true containerization will not begin at the Port of Corpus Christi until the opening of the La Quinta terminal, the port has recently increased its role share of noncontainerized break bulk consumer goods. The establishment of a large cold storage facility has allowed the port to gain experience handling perishables and has recently been one of the port's most rapid areas of growth. The 100,000 sq ft facility, completed in 2000, allows perishable products to be transferred from ship to storage within 60 seconds. Since 2001 the facility has collaborated with Australia and New Zealand for both imports and exports. The facility has also served as storage for the local shrimp industry. It has, however, rarely had enough volume to run at or near capacity until this year.³⁹

Having previously received certification by the USDA for poultry exports, in 2005 the port established a new relationship with Ozark Mountain Poultry to ship frozen chicken leg quarters to the Port of St. Petersburg in Russia. The shipment of over 4 metric tons per month is considered by the port to be a major development. In recent years, Russia has been the largest importer of U.S. poultry.⁴⁰ Ozark Mountain exported 50,000 metric tons of poultry from the U.S. last year.

The supply chain for the poultry shipments is as follows. Cargo arrives from OMP's Arkansas headquarters via refrigerated rail cars on pallets. It is then transferred on forklifts directly to the cold storage facility. Once a month, a Panamanian flag ship with a Ukrainian crew arrives at Corpus Christi. The chicken (9.4 million lb) is again transferred in bulk on forklifts. The ship then departs for St. Petersburg. The OMP poultry shipment alone takes up approximately one third of the port's cold storage space. These deliveries from nearby Arkansas are an example of a successful medium range rail operation of cargo that, while not containerized at present, could theoretically be containerized in the future. Across the country, cold storage facilities are shifting their operations from simple warehousing to value-added services and significantly shortening turnaround times.⁴¹ (Figure 4.1 depicts the cold storage facility at the Port of Corpus Christi.) After the La Quinta terminal is constructed, poultry and other perishables could be shipped by bulk in refrigerated rail cars, then consolidated into reefer containers within the cold storage unit and drayed to La Quinta. Containerizing perishables would increase the choice of available ships that could make deliveries, allow the port to use its cold storage space more efficiently, and decrease the possibility of spoilage once the cargo arrives.

Given the time sensitive nature of the product, the success of an operation such as this one would require highly efficient and reliable rail connections. In 2001 rail boxcars made up only seven percent of the total movement of perishables in the U.S.⁴² Since 2001, a new generation of refrigerated rail cars that has a far larger capacity (maximum 180,000 lb per car) and are more energy efficient has come on the market. BNSF was the first Class 1 carrier to update its inventory followed by a UP order for 1,500 new cars in 2003.⁴³



Figure 4.1. Photo of Corpus Christi Cold Storage Facility

4.5 Closing of the Ingleside Naval Station

A key determinant of the port's capital resources in the near future will be tied to the future of the Ingleside Naval Station. It now appears almost certain that the station will close as recommended by the Pentagon on May 13, 2005, and approved by the President on September 15, 2005. The City of Corpus Christi stands to lose thousands of jobs both directly and indirectly connected to base operations. The port will, however, have the option to acquire the naval improvements and use them either to supplement activities at La Quinta or potentially develop the site for an entirely different purpose such as a cruise terminal. A recent port-sponsored study named the Ingleside area as the most favorable area for development of cruise operations and estimated that such a facility would cost between \$10.6 and \$37.9 million to develop.⁴⁴ The demand for an additional cruise terminal within the state at present is uncertain, given that Bayport will also be opening a cruise terminal in the near future. With regard to cruise operations, the port has also recently examined the possibility of starting a less vacation-oriented passenger service to the Port of Veracruz in Mexico, which would allow travelers to ferry their vehicles with them.⁴⁵

If the federal government requires the port to pay the market price for Ingleside, it would likely mean an expenditure of over \$200 million as estimated by the BRAC commission's assessment.⁴⁶

4.6 Conclusion

Port personnel at Corpus Christi are currently working on several fronts to modernize and streamline operations at their port. While a substantial amount of news about the port has focused on the development of the La Quinta container terminal, the La Quinta project itself is only one element of the port's master plan.

With regard to the port's future as a container handling center, there is no question that Corpus faces a huge challenge in attempting to win market share from Houston. The efforts of Corpus Christi are most likely to be successful if it can offer shippers marginal advantages at each stage of the process. The provision of greater efficiencies for landside movements is one area in which Corpus Christi believes it can offer a sustained advantage over Houston.

There is a strong temptation among planners analyzing the viability of a particular route to focus overwhelmingly on distances and capacities while paying insufficient attention to the less quantifiable aspects of transportation efficiencies. Factors such as proactive customer service, reliable interagency communication, and support from the local community can not be observed on a map but are often central to the ultimate success of a logistics operation. From the perspective of a shipper, delays that derive from congestion are far more tolerable than delays that derive from carelessness.

The Center for Transportation Research team analysis of the Port of Corpus Christi's rail corridors did indicate certain strong competitive rail corridor possibilities. One of the port's competitive strengths is directly related to the service potential of the KCS-controlled Tex-Mex route between the Port of Corpus Christi and the US-Mexican customs Port of Laredo. If the Corpus Christi hinterland trends toward the southwest and the growing Mexican markets, Corpus Christi may gain a share of Mexican intermodal rail trade from Mexico's northeastern states. The Corpus Christi to Houston corridor has weight restrictions that inhibit growth in certain markets but are unlikely to curtail intermodal growth. Northbound shipments on the UP line to the Midwest are also a potential growth area. Ensuring access through trackage rights to the La Quinta site by KCS and BNSF has been recognized by the port as a critical first priority. A review by ZETA-TECH found no legal reason by which UP could be compelled to allow access by a second railway carrier to the proposed North Bay location of La Quinta. Therefore the matter would have to be resolved by some type of negotiated agreement. Negotiation naturally assumes that both UP and the second rail carrier have some financial reason to come to terms based on the 1) the potential business revenues, 2) the projected train operating costs from the proposed service, and 3) projected track-related infrastructure maintenance costs from added second carrier operations.

Chapter 5. The Feasibility of Containerization at the Port of Brownsville

5.1 Port Overview

The Port of Brownsville serves a unique niche as the only major cargo handling maritime port along the Texas-Mexican border. With the dissolution of trade barriers between the U.S. and Mexico, the port is well suited to enhancing the maritime dimension of NAFTA trade, which has so far been dominated by short truck movements over land ports of entry. Recently, several actions within Mexico have shown that the country is seeking to diversify its freight portfolio, heightening the potential role of intermodal containers in cross border trade.⁴⁷

The port enjoys the use of a tremendous swath of largely underdeveloped land, 48,000 acres in total to the east of the city of Brownsville. It is also close to two airports and is served by the Union Pacific and Transportation Ferroviaria Mexicana (TFM) Railway.

In 2004 the Port of Brownsville had 168 vessel calls and moved 2,026,168 metric tons of cargo, down from 2,363,384 metric tons in 2003. This figure does not include barges, which make up the majority (70%) of total vessel calls. The commodities that suffered the sharpest declines in 2004 were ores, which declined from 484,634 to 118,065 mt, and grain, which declined from 49,517 to 27,914 mt. Petroleum coke rose to 31,159 mt in 2004 compared with 11,431 mt in 2003. The majority of solid cargo is handled by dock 15 (54 percent in 2004). The vast majority of the ships that dock at Brownsville have a draft of 20 to 30 ft (65 percent in 2003 and 59 percent in 2004). Ships with draft of over 35 feet made up 8 percent and 12 percent of vessel calls for 2003 and 2004, respectively. In terms of total volume, these ships made up a more significant share of the total—25 percent in 2003 and 26 percent in 2004. Each year, a few ships are turned away by the port because of excessive draft. These ships are almost always carrying petroleum bulk or minerals.

Through July 2005, the port had received 101 cargo vessels, 28 tankers, and more than 500 barges. The cargo mix also included larger amounts of imported refined petroleum products including 174,839 mt of gasoline and 954 mt of diesel. At the same point last year, no such products had been imported.

The current operational depth of the port of Brownsville is 39 ft on average. The depth along dock 15 is 42 feet whereas most of the other docks are at 36 ft. The port is expected to begin a new routine dredging operation in November 2005 that will restore a 42 ft permitted depth to the entire channel. Dredging typically occurs once every three years. The cost of this year's dredging operation is expected to be 3.6 million dollars. A feasibility study has been proposed in coordination with the Army Corps of Engineers on the options of deepening the channel to, alternatively, 45, 50, and 55 feet and the associated costs and benefits. The initial estimate for dredging to 55 ft is \$280,000,000, according to Marketing Director German Rico. In addition to the study regarding depth, ongoing research on the possibility of widening the channel by 100 ft is also being conducted. This additional width would be necessary for the port to handle imports and exports simultaneously.

Brownsville's need for additional depth is especially critical given its desire to be the first U.S. call for northbound ships; the port would process ships that are fully laden and require maximum draft.⁴⁸ If widening were to occur, it would facilitate new pier construction.

According to Hector Lopez, Director of Engineering Services for the port, \$6.2 million will be necessary for feasibility studies of various deepening and widening scenarios. Of this figure, the port will be responsible for covering half of the money and the Corps of Engineers will be responsible for the other half. If the port receives all of the necessary clearances, construction could begin in 2010 and finish in 2015. Ultimately, in order to receive a go ahead for construction, the port must demonstrate that such a project is in the national interest—meaning it will lead to a net gain for the U.S. in its cargo-handling ability, not simply a diversion from one port to another.

Even with its current draft limitation, the Brownsville infrastructure would be sufficient for a wide range of container ships with capacities in the range of 3,000-4,000 TEU. The port has also recently experimented with short-sea shipping lines such as Osprey, which have a draft of less than 20 ft and a short turning radius. An optimal route for employing short-sea shipping from the port's perspective would include the delivery of containerized exports from Mexico via Monterrey that could be efficiently transferred to a shallow draft ship and delivered to a facility such as Bayport, Barbour's Cut, Baton Rouge, or New Orleans. In 2002, the Port invested \$2.5 million in a multi-purpose Gottwald rubber-tired container crane (see Figure 5.1), which can unload between 25 and 28 forty-foot boxes per hour from Brownsville's lone dock suitable for containerized cargo: Dock 15.⁴⁹ Given the mobility of the Gottwald crane, there is currently no need to acquire yard gantries. The crane's radius of 78 ft makes it too small to handle Panamax ships that require an outreach of over 100 ft. A crane capable of serving the largest post-Panamax ships would have an outreach of over 200 ft and cost between 8 and 10 million dollars. If channel deepening were to occur, docks closer to the mouth of the ship channel could theoretically be used for containers. At present, dock 15 can serve containers but is more often used for steel and other bulk cargo.



Figure 5.1. Photo of Container Crane at the Port of Brownsville

CTR made a field visit to the Port of Brownsville on June 1, 2005, meeting with Interim Port Director Donna Eymard, Marketing Director German Rico, and Director of Engineering Services Hector Lopez. The port is still making the transition from the recent death of its longtime director, Raul A Besteiro, Jr. At the time of the CTR visit, the Brownsville Navigation District board was in the process of whittling down a long list of potential long-term replacements for Mr. Besteiro.⁵⁰ In August, the Port selected Bernard List, former deputy director of the Port of Miami as its new director.

Mr. Besteiro had assigned a high priority to bringing containerized cargo to the port and charged marketing director German Rico upon his hiring to “get containers.” To this end Mr. Rico has employed myriad strategies to guide the port on a path to containerization. For example, Mr. Rico has established relationships with shipping lines such as Osprey, P&O Nedlloyd, and China Shipping, and has worked to establish “sister port” status with ports in Mexico, including Manzanillo and Lazaro Cardenas.⁵¹ He has also meticulously studied the Mexican rail system and issues related to border crossings for truck and rail that would potentially help the viability of Brownsville in transshipping Mexican cargo bound for the U.S. One potential problem for the port in bringing increased Mexican imports from Monterrey is the TFM-KCS business model, which has prioritized the Monterrey to Laredo corridor over the Monterrey to Brownsville

corridor. According to a recent presentation by a Monterrey representative of TFM, the railway has received instructions from KCS to minimize investment in track that is not priority and focus efforts on the priority corridors from Lazaro Cardenas to Laredo and from Mexico City to Laredo.⁵² Because TFM-KCS controls a border crossing at Laredo through the Tex-Mex railway but has no such connection at Brownsville, TFM/KCS has an incentive to prioritize access to the Laredo crossing.

The acquisition of a crane suitable for container lifts, the completion of a warehouse for Dock 15, and the addition of new rail infrastructure are among the many improvements the port has made in recent years to increase its attractiveness for container operations. The port does not yet have a dedicated container yard, but there is no shortage of available land to construct such a facility. So far in 2005, the port's business focus has been steel handling, which has been particularly lucrative in recent months. As of October 2005, steel accounted for over 50 percent of the total metric tons moved by port during the year. Raw imports are unloaded at the port and moved by the port's short line railway to the TFM terminal. The TFM railway then transports the slab to industrial centers in Monterrey and other northeast Mexican locations. It is sometimes then re-exported through the Port of Brownsville. The construction of dock 16, with its convenient access to rail, will initially be dedicated to increasing the port's steel-handling capacity but could later be converted to container operations. However, the port is wary of the trap of placing all of its eggs in one commodity basket.⁵³

5.2 Mexico's Northernmost Port

The Port of Brownsville is often referred to as "Mexico's Northernmost Port"—a phrase that conveys how vital the port is to the Mexican economy. Almost all of the port's functions relate directly or indirectly to Mexico. A substantial amount of steel arrives at the port; it is then sent to industrial centers like Monterrey and Guanajuato via rail. In addition, Mexican steel is processed at the Port of Brownsville for export to a third country such as China. In this sense, the Port of Brownsville serves a niche for Mexico that is strongly needed—the provision of a deepwater port that can facilitate seaborne exports from Mexico's thriving industrial regions near the U.S. border, especially the states of Tamaulipas and Nuevo Leon. The closest competitors to Brownsville on the Mexican side are the twin ports of Altamira and Tampico some 250 miles to the south.

5.3 The Role of Short-Sea Shipping in Brownsville

Short-sea shipping, which the GAO has defined as the waterborne transportation of commercial freight between domestic ports through the use of inland and coastal waterways, is an alternative means of moving containers to large coastal markets such as Houston.¹ Given Texas's unique shape, a small ship could efficiently access the Bayport or Barbours Cut facilities from Brownsville more directly (260 nautical miles or 300 miles) than either truck (375 miles) or train. In addition, short-sea shipping has tended to operate in corridors where rail service frequency or reliability has declined.⁵⁴ Osprey ran weekly service to Brownsville during 2004 but discontinued the service in 2005 because of insufficient demand and a shortage of available

¹ The generally acceptable definition of Short Sea shipping is currently widening in scope to include international cross gulf services.

vessels.⁵⁵ Table 5.1 shows the TEUs handled by Brownsville. Another concern on the part of short-sea advocates has been the rehandling costs necessary to transfer cargo from truck to ship and then back to truck again. When Osprey ran its experimental service to Brownsville in 2004, it was able to negotiate stevedore costs so that these costs were not prohibitive.⁵⁶ However, there is a question of whether these special rates would continue should the service become more regular.

Table 5.1. TEUs Handled by Brownsville 1998-2004

1998	1999	2000	2001	2002	2003	2004
109	100	152	78	104	10	1055

(Source: MARAD)

The Osprey Sea Trader vessel has a capacity of 240 TEU and an average speed of 12-14 knots (15 mph). Therefore it can easily make the journey from the Port of Brownsville to Barbours Cut within one 24-hour period. There are several potential impediments that could prevent short-sea shipping (SSS) from gaining greater market share vis a vis truck and rail in transporting containers. First and foremost, the investment decisions of short-sea shippers are limited by the Jones Act, which requires all ships used in operations traveling from one domestic port to another to be made in the U.S. or be U.S.-flagged. The president of Osprey stated that he could buy three Sea Trader equivalent ships in Europe for the price one in the U.S..⁵⁷ The differential in production costs in the U.S. and abroad of self-propelled ships such as the one used by Osprey is far higher than the comparative costs of tug and barge operations.⁵⁸ Still, the Osprey Sea Trader rate of approximately \$500 per TEU for deliveries from Brownsville was quite competitive with rail.⁵⁹ Short sea-shippers are currently too small to pose much of a threat to rail carriers.

Brownsville sits at the headwaters of the Texas inland waterway system that could be used for extensive container-on-barge (COB) operations. The feasibility and limitations of COB operations have been discussed in several recent CTR reports including TRR 1782 “Feasibility of a Container-on-Barge Network Along the Texas Gulf Coast” by Bomba and Harrison (2002). German Rico has also examined the role of ocean going barges for returning empty containers from the port of Houston.

5.4 Rail Issues Related to Brownsville

5.4.1 Rail Relocation

Rail relocation was one of the most prominent and at times controversial transportation issues discussed during the 79th legislative session. As envisioned, relocating rail away from cities can increase safety for city residents while simultaneously increasing the speed of freight trains and providing new right of way for new highway construction or commuter rail. The City of Brownsville, in conjunction with Cameron County, recently completed a thirty-year rail relocation effort. The project, which began in 1973 and officially concluded on May 26, 2005, led to the deactivation of seventy-nine of Brownsville's ninety-three railroad crossings.⁶⁰ The remaining fourteen at-grade crossings are scheduled to be removed in the new “West Rail Relocation Project.” According to Mark Lund at the Brownsville MPO, although the city of

Brownsville usually follows larger Texas cities in its transportation improvements, when it comes to rail relocation, “We’re the leader.”⁶¹ The West Rail proposal is currently in the engineering stages. Mr. Lund estimated the engineering was 60 percent complete in June 2005 and the total project cost would be \$20 million. One factor that has sped the Brownsville rail projects is the interest and active participation of Mexico. At-grade crossings in the city of Matamoros are responsible for the deaths of several children every year and removing the rail from city streets is an important political goal for the Tamaulipas government. The Mexican contribution to West Rail would be roughly three times that of the U.S. Funding for the project was secured in the 2005 federal transportation reauthorization. Given the passage of the Texas Rail Relocation Fund (Proposition 1) in November of 2005, it seems likely that the project will eventually come to fruition. If completed, the West Rail is expected to shave 2.5 hours in transit time from Monterrey to the Olmito yard.⁶² Senator Kay Bailey Hutchinson has been active in securing funding and authorization for the project. In early October a presidential permit was issued that would allow Cameron County to proceed with engineering and construction.⁶³

5.4.2 BND Bridge

For several years, the Port of Brownsville proposed the construction of a truck and rail bridge that would link the Port of Brownsville directly to Matamoros. From the perspective of the port, a rail bridge would bypass the current monopoly held by UP on rail shipments through Cameron County and would also increase the viability of transshipments through Mexico, perhaps originating in Asia, that could be processed by the port of Brownsville. A rail bridge may also be valuable to TFM-KCS for analogous reasons.

Funding for the BND Bridge was originally earmarked in an October 1991 election that authorized the sale of \$21 million in bonds. Some of these funds were spent in an inefficient manner owing in part to political stops and starts that led to obsolescence in the initial engineering work performed.⁶⁴ It is now highly unlikely, if the bridge is in fact constructed that it will include rail. According to Mark Lund at the Brownsville Metropolitan Planning Organization, the Tamaulipas government has long indicated that it would not support a rail bridge to the port, in part because such a bridge would undermine the city of Matamoros’s efforts to remove rail from its downtown area. Another reason the Mexican side may be unenthusiastic may have to do with economic forces internal to Mexico. Maquiladora factories in the state of Tamaulipas, which borders South Texas, have a strategic advantage in transportation costs vis a vis states in the Mexican interior provided that trucking remains the only viable option for moving Mexican-assembled consumer goods to the U.S. If a direct rail linkage was established with Brownsville, transportation costs would be lowered and states within the Mexican interior (south of Mexico City) would become more attractive for the establishment of new maquilas. Therefore, from the perspective of Tamaulipas, a truck bridge would overwhelmingly benefit their state, whereas a rail bridge is more likely to service states like Oaxaca, Michoacan, and Guerrero where labor rates are low but transportation costs are prohibitive.

The engineering effort for the bridge was completed for a combined truck and rail bridge. Consequently, the plans would need to be modified in order to remove rail. Hector Lopez, director of engineering for the port, stated that rail is still a possibility but would now be designated as “phase two” while a truck bridge would be designated “phase one.” A final

complication for the port is that Mexico still has not acquired the right of way for the proposed route and settlements on the Matamoros side have occurred since the plan was completed.

The final issue related to rail and the port involves Brownsville's connectivity with the rest of the state. The rail line leading from Brownsville to Corpus Christi is owned by UP, but BNSF was given unlimited trackage rights ten years ago to serve this Brownsville market.

A recent report authored by the Texas Transportation Institute speculated that the current trackage rights agreement will work to the disadvantage of market development in and around Brownsville:

Because the UP maintains the line and the other railroad companies pay fees in proportion to their usage, many of the competitive forces that would have previously encouraged UP to make large investments in improving the Angleton and Brownsville Subdivisions are gone.⁶⁵

The report suggests that the Port of Brownsville will obtain inferior rail service options to support its future growth. However, CTR and ZETA-TECH believes that the trackage rights agreement in place at Brownsville, which is analogous to many such arrangements throughout the U.S. and Canada, need not be a serious impediment to the Brownsville corridor's future development. Most track-sharing agreements allow for capital to increase capacity to be a directly shared expense.⁶⁶ Therefore, while it may be true that insufficient siding length could eventually inhibit growth on the corridor, the reasons why the corridor has not yet received significant capital improvements probably has more to do with a lack of overall demand and is not an endemic feature of UP track ownership.

According to the Texas Transportation Institute project, rail crossings at Brownsville will grow from 25,981 in 2001 to 56,597 in 2010.⁶⁷ That prediction works out to about 225 freight cars per working day. The CTR-ZETA-TECH researchers calculate that such an increase in border crossing is well within the daily UP line capacity on the route to Corpus Christi. If indeed the rail freight traffic at Brownsville increases at this predicted rate, BNSF might convert from its current haulage by UP operation to a BNSF-manned trackage rights service between Corpus Christi and Brownsville, as permitted under the terms of the agreement with UP. The growth in rail traffic will also depend to some extent on the continued ability of Brownsville to maintain the specially legislated overweight exemption for trucks along its main corridor. This exemption is unique in the nation and has likely prevented the shifting of certain types of cargo from trucks to rail.

Preliminary data from 2005 show that a relatively low percentage of rail containers coming into Brownsville from Mexico are loaded. For the first three months of the year, 2046 loaded rail containers crossed at Brownsville compared with 44,959 at Laredo, a 22:1 ratio. The only area in which volumes at Brownsville are comparable to volumes at Laredo is in the handling of empty containers. In 2005 Brownsville has handled 23,968 empty containers compared with 31,934 at Laredo. The general pattern is for Brownsville to ship raw or unfinished commodities to Monterrey by truck or rail; these commodities are then processed in Mexico for re-export to the United States through a different port of entry, most often Laredo. In effect, a very low value of goods whose ultimate destination lies within Texas is shipped through Brownsville by rail as can be seen in the following graph. Rather, truck imports so dominate the relationship that truck

imports and total imports are almost one in the same, as illustrated in Figure 5.2. The rail linkage from inland processing centers such as San Luis Potosi and Monterrey is almost equidistant to Laredo and Brownsville. Laredo, however, is closer than Brownsville, to major Texas population centers.

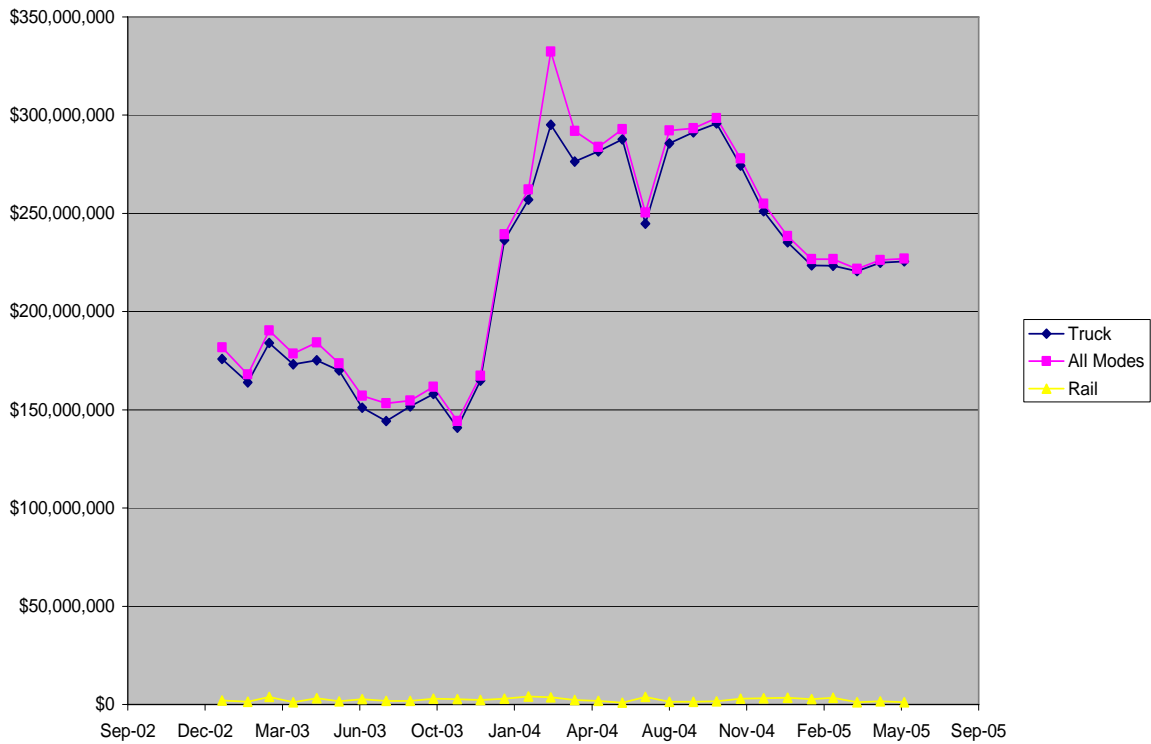


Figure 5.2. Imports from Mexico via Brownsville destined for Texas

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the Department of Homeland Security, U.S. Customs and Border Protection, Office of Management Reporting, as of August 11, 2005.

5.5 Conclusion

An examination of the Port of Brownsville’s likely emergence as a container handling center reveals several advantages that may aid the transition. The port’s large territory will give it the ability to develop whatever container handling facilities are economically justified. There is also the possibility of transitioning the port into a more diverse cargo processing scenario similar to an inland port. Given current trends in international trade, Brownsville’s convenient access to the Mexican border will continue to grow as a strategic asset.

Container shipping lines tend to gravitate toward ports with a substantial local consumer base. The city of Brownsville had a 2003 census population of 156,000, representing an increase of 12 percent since 2000. The urbanized area, however, also includes Matamoros with a population of

430,000 and could also include Harlingen (28 miles from the port) with a population of 60,000. The immediate hinterland includes McAllen-Reynosa (combined population 850,000) and Monterrey (1,100,000). Thus the port would be viable as a destination and not only as a transshipment point.

In terms of physical infrastructure, the depth of the ship channel can be deemed sufficient for a viable container business. Although the emergence of 8000 TEU megacontainerships requiring a depth of 50 feet has created substantial media attention, the chances of such ships needing to call at *any* Gulf Coast seaport in the near future is minimal. In addition, Brownsville's limited crane capacity is only suitable at present for small to medium sized container ships.

Rail issues may prove important for Brownsville if it hopes to expand its hinterland north of Texas or further into the interior of Mexico. The current prioritization by KCS-FM into the Monterrey-Laredo corridor probably has more to do with the capital constraints on the railway, which acquired new track at a rapid rate from 1992 to 1998 in the United States, Mexico, and Canada and is currently working to modernize and consolidate these gains. The rail relocation project that is currently in the advanced stages of implementation would likely boost the efficiency of increased rail cargo traffic.

Chapter 6. Conclusions and Next Steps

The first year of research focused on rail access needs at the Ports of Beaumont, Corpus Christi, and Brownsville together with a preliminary assessment of that for the Port of Houston. Rail movements of containerized international goods are limited to few Texas ports and even at the largest—the Port of Houston—other commodities such as grains and chemicals dominate rail traffic volumes. The two major Class 1 companies serving Texas, UP and BNSF, presently do not have sufficient intermodal demand at Texas Gulf ports to warrant substantial investments to improve intermodal access and service to their facilities. The companies are currently focusing their intermodal investments on the trans-continental routes where densities of over 100 trains a day are reached on certain sections. BNSF, for example, has only seven percent of its route between Southern California and Chicago remaining in a single track format and is planning to complete double tracking the route by the end of 2006. Single track, with suitable track and siding design, may accommodate 60 trains per day. Double tracks, with universal double cross-over every 10 to 12 miles raise the ceiling to around 85 trains per day. Triple tracking sections can then raise this to between 100 and 115 trains per day. The large and profitable volumes of Asian intermodal traffic moving from California to the Midwest are the primary drivers of rail investment along these corridors, some of which cross Texas. The dominance of rail investment into these intermodal routes makes it challenging for Texas ports to secure investments serving their facilities, even when demonstrable benefits exist for railroad companies, shippers, ports, and the local community. Therefore the best strategy for Texas ports in seeking investments from rail companies is to focus on improvements that will benefit total system performance for all rail commodity moves, not only for containers.

Table 6.1. High Growth Rail Corridors in Texas

1. The BNSF Los Angeles to Chicago corridor that passes through Amarillo
2. The Union Pacific NAFTA corridor that goes from Laredo, through San Antonio and north to Midwest trade lanes.
3. Two separate Texas Union Pacific southern transcontinental corridors entering at El Paso and then traversing the state via (a) Midland, Fort Worth and Longview, and (b) San Antonio, Houston and Beaumont (Sunset Limited route).

Table 6.1 identifies the main rail through-corridors in the state. These serve as segments on national transportation supply chains and primarily enhance the market share of west coast port operations rather than Texas ports. A fourth corridor, relevant to Texas port activities, is the UP and BNSF network around Houston carrying container traffic, including military containerized equipment to Beaumont and Corpus Christi, as well as dedicated international trade container trains running to and from the Port of Houston. This is a different type of corridor to those in Table 6.1, since its focus is regional and is based on the activities around the Houston Ship Channel. It is likely that TxDOT will see efforts to develop some type of partnering in this region to address rail access improvements, particularly at the Port of Houston, which would include

containerized traffic first at Barbours Cut and then Bayport. These corridor proposals will be examined in greater detail in the second year. As envisioned, the Houston corridor is likely to be a multibillion dollar venture, yet still modest when compared with the scale of the Alameda corridor, which currently carries more than 45 trains a day.

The team found that the Port of Beaumont has an important rail access problem which impacts both port operations and the capacity of the UP Sunset Limited route. All parties—the Port, City, TxDOT and all railroads serving the port—agree that a solution should be sought but a lack of agreement between the railroads on the precise remedy has prevented progress to resolve the issue. On a longer planning horizon, the reconstruction of the KCS bridge over the Neches River is critical to the ability of the Sunset Limited to grow in volume.

In Houston, the challenge lies in streamlining the complex track system serving the various customers in the region. Train numbers and increased dimensions have created a number of at-grade crossing traffic problems, which have grown as the Metroplex continues to expand and take in more rail-highway crossings. TxDOT has selected a consultant to evaluate the system and make recommendations on rail improvements, including priority crossings for grade separation. Project 0-5068 is limited to the Houston Ship Channel rail services and in the first year this was constrained to the Port of Houston. The Port Authority's priority rail freight improvement projects focus on tracks with port access. This meets the terms of reference for this project. These would include: (1) the additional main line from UP's Strang Subdivision (at Highway 225 and Strang Yard) to the new Bayport Container Terminal on UP's right-of-way, and (2) an additional main line between Pasadena Junction and Deer Park Junction on the Port Authority's right-of-way. For broader Port of Houston rail system improvements, increased capacity on routes into and out of Houston is important and a prime candidate would be UP's Glidden Subdivision between Rosenberg and Manchester Junction.

The report also described the aspirations of the Ports of Corpus Christi and Brownsville to accommodate containers in the near future. These ports are served by rail systems that do not currently have capacity limitations and that can be relatively easily improved when needed by additional passing sidings. Multicarrier access in the Port of Corpus Christi will become an issue when La Quinta is operational. However, at this time the team believes that trackage rights with UP to the La Quinta facility can be negotiated successfully. Rail service is important at Corpus Christi and Brownsville if intermodal containerized liner services are operated because the main markets for containerized commodities from these ports are sufficiently far from the ports to favor rail, rather than truck, movements.

In 2004, the Southern California ports encountered a series of problems that resulted in severe congestion on both the sea and landside parts of the port operations. Shippers reacted in a variety of ways, including evaluating other transportation routes from Asia to U.S. markets. These included (a) other west coast ports of entry (Oakland, Seattle and Vancouver), (b) using Mexican Pacific ports and then double-stack rail service to border ports of entry like Laredo, (c) using Asia-Europe-East Coast services (fast and competitive service to Europe on megacontainer ships but requiring transshipment in Europe to a U.S. east coast service), and finally (d) using an all-water Asia Gulf service through the Panama Canal. To date, the regional Gulf Coast markets have favored the latter option and a number of ports on the eastern Atlantic seaboard, including

Houston in the Texas Gulf, have benefited from the growth in these services, which have now grown to the point where Houston can support a 3,000 TEU Asian vessel liner service.

Caution is advised for planners relying on continued congestion at the ports of Los Angeles and Long Beach to justify port investments given that in 2005 Southern California ports have managed to grow at around 8 percent *without* any congestion at the sea side of the operations. The strategic message is that shippers will balance their routes based on commodity types, port costs, and transportation costs and service. Economies of scale and comparative advantage at Los Angeles and Long Beach will permit these ports to remain the generally preferred entry points for Asia-U.S. trade in the next five to ten years. However, the forecasts performed by Southern California ports in 2001-2003, which projected a rapid rate of container growth at these ports, are likely to be tempered, given that a percentage of this growth will spread over competing routes—including those through Texas Gulf ports.

In the second year of Project 0-5068, several tasks will be undertaken. Emphasis will remain in the Houston Ship Channel and on the Port of Houston operations, particularly the rail links to Barbours Cut and Bayport. The team will work within the confines of the TxDOT rail consultant and cooperate when developing any proposals for port rail corridors along the Houston Ship Channel. The containerized facility planned by Texas City will be evaluated, together with a number of shallow draft ports declaring an interest in supporting container-on-barge operations. An exercise will also be undertaken to forecast Texas Gulf Coast container growth using all available secondary data. Finally, Asian all water services need passage through the Panama Canal and there is increasing concern both over its current capacity and the plans to enlarge the century-old locks to allow larger vessels to use the canal. The team has begun to collect data on this subject and will continue this inquiry in the second year.

REFERENCES

Beshur, Alison “Chicken, melons to fill warehouse deal could make refrigerated port facility profitable,” *Corpus Christi Caller-Times* (Texas), September 8, 2005, Thursday, Business; Pg. D1, 382 words, Caller-Times.

Beshur, Alison. “Study: Ingleside best spot for cruise ships; consultant adds that opportunity is negligible now,” *Corpus Christi Caller-Times*, October 12, 2005.

David H. Bierling, Curtis A. Morgan, Arthur P. James, Jeffery E. Warner, Gretchen A. Chabot, and Tim A. Sain, TTI, *Current And Future Rail Access Needs Of Western Gulf- Texas Ports*, November 2003.

Bomba, Michael; Harrison, Robert. An Identification Process and Evaluation Framework for Texas Gulf Containerships. The University of Texas at Austin. Center for Transportation Research (CTR), 2000.

Bomba, Michael et al., “Landside Access at Texas Seaports,” Center for Transportation Research, October 2005.

Bomba, Michael; Harrison, Robert, *An Identification Process and Evaluation Framework for Texas Gulf Containerships*, The University of Texas at Austin. Center for Transportation Research (CTR) 2000.

BNSF Representative Presentation, September 29, 2004.

“BNSF Buys First New Reefer Cars in 35 Years,” May 2001,
http://refrigeratedtrans.com/mag/transportation_bnsf_buys_first/index.html.

Eaton, David, presentation at “Inland Ports Across America Conference,” San Antonio, Texas, October 3, 2005.

“Governor Perry announces \$5.2 million funding to extend rail capacity at the Port of Corpus Christi, Military operations to be enhanced by infrastructure improvements,” February 28, 2005,
<http://www.portofcorpuschristi.com/news/PortNews2-28-05.html>.

“Gulf Ports in Expansion Mode: Mobile, Manatee, Beaumont adding major facilities,” Laura Myers and Janet Plume, *Gulfshipper* March 16, 2004,
<http://www.gulfshipper.com/news/article.asp?1type=trade&sid=634>.

Harrison, Robert; Figliozzi, Miguel A.; Walton, C. Michael. University of Texas at Austin., *Mega-Containerships and Mega-Containerports in the Gulf of Mexico: A Literature Review and Annotated Bibliography*. Center for Transportation Research (CTR) 2000.
http://www.utexas.edu/research/ctr/pdf_reports/1833_1.pdf .

Hartnett, Dwayne “New \$2.5 Million Crane to Boost Business at Port of Brownsville, Texas,” *The Brownsville Herald*, May 30, 2002.

Hendricks, David “Corpus cruise ferry not ready to dock yet,” San Antonio Express-News, January 20, 2005.

Interview with John Roby, Director of Logistics at Port of Beaumont, October 28, 2005.

Lund, Mark interview by CTR, Director of Cameron County MPO, June 1, 2005.

“Market concentration: Double-digit growth in container volumes has become the norm,” *Journal of Commerce*, May 23, 2005.

Martinez, Laura “BND sifts through port director applications,”
http://www.brownsvilleherald.com/ts_more.php?id=65405_0_10_0_C.

Nall, Stephanie. “Cold front; More cold-storage companies are offering value-added logistics services,” *Journal of Commerce*, May 23, 2005.

Plume, Janet “Boom time in Brownsville; South Texas port handles imports of semi finished steel, exports of finished product,” *Journal of Commerce*, June 13, 2005.

“Presidential Permit Issued For West Rail Project: Gives Construction of the International Bridge a Green Light”, October 1, 2004, <http://hutchison.senate.gov/pr1545.htm>.

Prozzi, Jolanda; Spurgeon, Kellie; Harrison, Robert; Roop, Stephen S., *What We Know About Containerized Freight Movement in Texas*, University of Texas at Austin. Center for Transportation Research (CTR), 2003. (CTR 4410-1)
http://www.utexas.edu/research/ctr/pdf_reports/0_4410_1.pdf.

“Russia's US Chicken Ban in Force”, Sunday, 10 March, 2002,
<http://news.bbc.co.uk/1/hi/world/europe/1864844.stm>.

“Short-sea shipping: A Work in Progress” *Journal of Commerce*, R.G. Edmonson, September 08, 2003, <http://www.joc.com/conferences/sss/SSSAWorkInProgress-080803.pdf>.

Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions, GAO Report to the Senate Committee on Commerce, Science, and Transportation and the House Committee on Transportation and Infrastructure, July 2005,
<http://www.gao.gov/new.items/d05768.pdf>.

Spencer, Curtis Presentation to “Inland Ports Across North America:” IMS Worldwide, San Antonio, Texas, October 3, 2005.

Torteya and Torteya Law Firm, *Final Report Regarding Status, in Mexico, of Brownsville Navigation & Canal District's Proposed Port Bridge Project*," October 29, 2004,
<http://www.portofbrownsville.com/documents/FINAL.BND.REPORT.102904.pdf>.

"Union Pacific orders 1,500 reefer boxcars," August 2003,
http://refrigeratedtrans.com/mag/transportation_union_pacific_orders_2/index.html.

"U.S. Container Terminal Throughput Density," Mark Sisson, PE, February 12, 2003. Available only online: www.portofhouston.com/pdf/genifo/POHA-BayportCapacity.pdf, accessed August 15, 2005.

"U.S. Port Cargo Rankings by Trade,"
http://www.aapa-ports.org/pdf/2003_US_PORT_CARGO_TONNAGE_RANKINGS.xls,
accessed October 10, 2005.

APPENDIX 1. Method for Calculating Train Delay Costs

Data Characteristics and Preparation

Most of the data used for the analysis of train delay on the Sunset Route was provided by personnel at the UP-BNSF joint dispatch facility in Spring, Texas, which maintains a database of train movements. The dataset it provided to ZETA-TECH covered a period of approximately 4.5 months and included 141,262 separate records. The number of records in the dataset is much larger than the actual number of trains, since a single train can produce multiple records (and most do). Each record in the database shows an “O/S” (on station) time for a specific train at a particular point, which frequently results in multiple O/S times recorded for the same train, on the same date, at the same point. This redundancy is most likely an artifact of the signal system, which was not designed to track train movements, but rather to control them. As a result, the dataset required substantial editing before it could be used in the analysis. Each of the 141,000 plus records showed a train I.D. (usually six-character alphanumeric), followed by “train day” (the date the train departed from its initial terminal), “date” (the date of the O/S), time (time of the O/S), and location (a code, usually one or two letters followed by a number; e.g., Langham Road is LF282).

Figure A-1 shows the track configuration through Beaumont and to points beyond. The map shows locations where the O/S times are given by the signal system, as well as several O/S points on each of the four single-track segments east and west of Beaumont that were found in the UP dataset. East of Tower 31 on SP, points were Frances (east and west ends siding) and Connell (east and west ends). East of Tower 31 on the Livonia Sub, KCS ownership extends to DeQuincy, LA. The first UP control point is “GCL Junction,” followed by “CS Junction” and “DeQuincy” (west and east ends siding). West of Langham Road, on the former SP Lafayette Sub, there is a “hold signal” at Amelia, followed by a siding (east and west China). On the Beaumont sub, the first siding is Elizabeth (east and west), followed by a yard at Amelia, and then followed by Grayburg (east and west). Trains can be “staged” (held) at any of these points or on the double track between Langham Road and Wall Street eastbound. The data supplied by the UP-BNSF joint dispatch facility included dates and times for trains passing each of these locations.

The number of trains was counted using an Access database feature that permits the accumulation of unique occurrences of a particular combination. In this case, a combination of train ID, train date (the day of the month on which the train originated), and CTC event date were used. Each unique combination of these three items was counted as a train. Use of the train date was necessary, paradoxically, because a number of the CTC records (mostly for local freights and switchers) did not report an origination date, simply an alphanumeric ID. Use of only the CTC event date would have excluded these records. In a few cases, trains that arrived in Beaumont just before midnight and departed after midnight were counted twice (two different CTC event dates, same train ID and day). However, a review of the data indicated that this was not a common occurrence. In any event, the use of only the CTC event dates would have led to the same problem.

During the time period sampled, UP was phasing out the former SP Digicon dispatching system and combining its functions with the Union Switch & Signal system with which the Harriman Dispatch Center was originally equipped. Incompatibilities between the data retained by the two systems caused delays and difficulties in obtaining a single unified sample for analysis. The first data set supplied to ZETA-TECH included complete data for Langham Road to Tower 31, and data for the former MP lines beyond those points, but no data for the Lafayette Sub. A second data sample contained Lafayette Sub data (from the Digicon system) but little information from the former MP Beaumont and Livonia subdivisions. Since these two samples covered different periods, there was no way to reconcile any missing elements, so the second data sample, covering the period from September 1, 2004, to January 18, 2005, was used in the analysis.

The data are believed to be reasonably complete but may be missing delays to eastbound trains held west of Beaumont on the Beaumont sub (typically either at Elizabeth or Grayburg) and to west bounds off the Lafayette Sub held at either Francis or Connell. DeQuincy, La., is some 40 miles east of Beaumont, so it is doubtful that westbound trains off the Livonia Sub are held there. KCS reports no delays, so there are no data on trains delayed between DeQuincy and Langham Road.

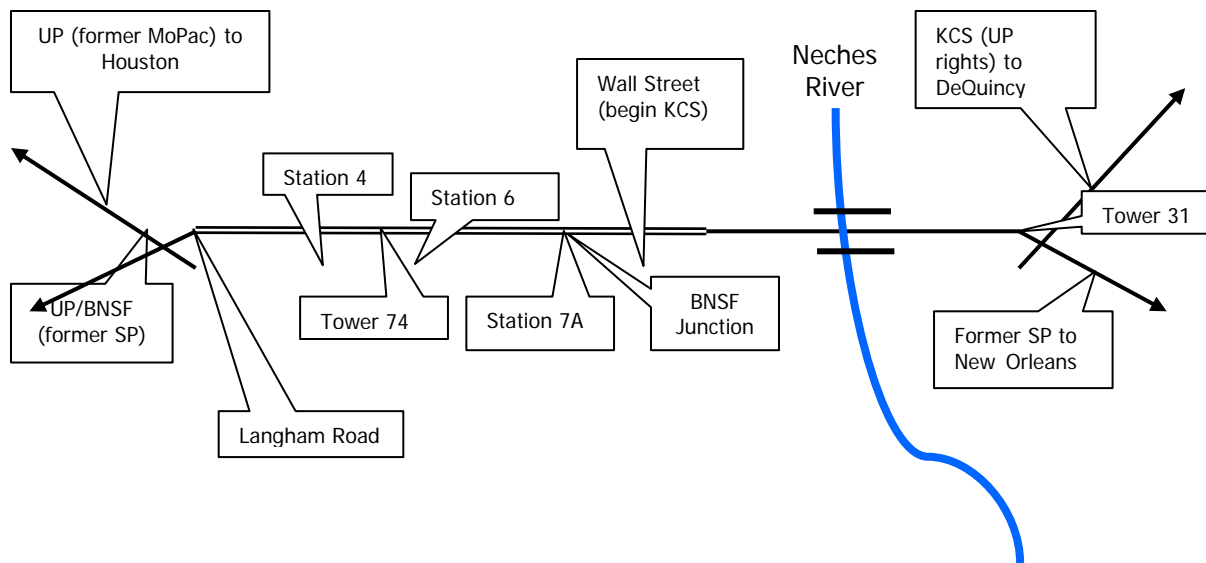


Figure A-1: Beaumont Mainline Track Diagram (not to scale)

Distances between the O/S points are as follows:

- ❑ Wall Street to Tower 31: 0.6 mile
- ❑ Wall Street to BNSF Junction: 0.1 mile
- ❑ BNSF Jct. to Sta. 7A: 0.0 mile
- ❑ Station 7A to Station 6: 1.0 mile
- ❑ Station 6 to Tower 74: 0.1 mile
- ❑ Tower 74 to Station 4: 0.3 mile
- ❑ Station 4 to Langham Road: 1.5 mile

Calculating the Cost of Train Delay

For the purposes of calculating train delay, samples were taken from each group of trains (trains were grouped by train I.D., with a first letter ranging from “A” for automotive to “Z” for TOFC). For each of these samples, the minimum observed running time was calculated between two points (usually Langham Road and Tower 31, due to inconsistencies in the data), then an average running time for all trains in each sample was calculated. The difference between average running time and minimum running time was the average delay (in minutes) per train for that class of train.

The cost of delay per hour for each type of train was calculated and appears in Table 2 of this report. The methodology employed by ZETA-TECH has been used in their previous studies and considers the following costs:

- ❑ The ownership cost of the railroad equipment (locomotives and cars) delayed
- ❑ A value per pound for the shipper-owned products (“lading”) being carried (available from the Association of American Railroads)
- ❑ A “holding cost” composed of the imputed interest cost of money used to purchase the lading, plus a “perish ability” factor

Summing these three costs for each of three train types (unit train, manifest, and intermodal) provides an estimation of the “direct” train delay cost. This does not include the cost of crews (since crews are compensated on a hybrid time/mileage basis), nor the cost of locomotive fuel used by idling diesel locomotives (units are almost never shut down when in service and on a train). It also excludes any administrative overhead, such as the cost of contacting shippers to inform them of delays to their products, the cost of moving new crews out to the delayed trains if necessary, and other management costs.

The average train size was calculated using the assumptions shown in Table A-1.

Table A-1: Assumed Train Sizes

Train Type	Locomotives	Cars
Unit (coal, grain, mineral)	3	113
Manifest	3	61
Intermodal	3	36

Using data on average train length and motive power assignments, ZETA-TECH determined the cost of delay to rail equipment as follows:

- ❑ An average ownership cost per hour for road locomotives
- ❑ An ownership cost for each freight car, based on a \$60,000 purchase price, a 20-year service life, and an 8 percent cost of money

ZETA-TECH’s methodology requires information on the mix of commodities by two-digit Standard Transportation Commodity Code, or STCC. For this analysis, a commodity distribution

for Burlington Northern Santa Fe Railway (BNSF) was used and commodities were assigned to one of three train types, as follows:

- ❑ Unit trains (coal, grain, and minerals)
- ❑ Intermodal trains (shipper and forwarder traffic, “freight all kinds”)
- ❑ Manifest trains (all other)

For each train type, a percentage mix of traffic categories was calculated. A weighted average of these categories was used to determine an average price per pound for commodities carried on each type of train. For each of these three categories, a weighted average delay in minutes per train was calculated. This was then multiplied by all trains in that category in the sample.

The ownership cost of locomotives and cars, and the value of lading, were then added together to produce a total calculated delay cost per hour, using the figures shown in Table 2.2 of the report. Total train delay cost was then calculated by annualizing the 4.5 months of data and applying the appropriate cost per hour, as shown in Tables 2.3 and 2.4 of the report. Given the missing data and the conservative assumptions used to develop these estimates, ZETA-TECH believes the delay cost calculations probably understate the true value of train delays in Beaumont.

Methodology for Calculating Automobile Emissions and Delay Costs.

These notes were supplied by a staff member (Paul Tiley) at the South East Transportation Regional Planning Commission (SETRPC)—the metropolitan planning organization (MPO) responsible for Beaumont. They are taken from a project undertaken by the Texas Transportation Institute (TTI) on the impacts on air quality caused by train delay in downtown Beaumont. This work was completed as Project ID: F Strategy: Southside Intermodal Project.

Description: A rail interchange yard forces traffic to be blocked on Main and Pearl streets in downtown Beaumont for extended periods of time, six times a day for up to an hour at a time according to the project description. Alterations to the interchange yard will reduce vehicle idling at the rail crossings.

Analysis: MOSERs Guide, 7.5

Variables: *EF_I*: Idling emission factor (NO_x, VOC) (grams/hour)

tc: Average amount of time rail crossing is closed due to train crossing (hours/crossing)

t_H: Duration of analysis period (hours)

t_{H,C}: Hours per analysis period roadway is closed due to train crossing

V: Bi-directional arterial volume for analysis period

Main St. 3,200 vehicles daily

Pearl St. 1,300 vehicles daily

Data Sources: SETRPC, TTI

Method and Equation

Daily Emission Reduction = A * B

$$A = t_{H,C} / t_H * V$$

The number of vehicles affected by rail crossing delays

$$B = t_C / 2 * EF_I$$

The average idling emissions resulting from affected traffic idling at the closed crossing (assumed to be half of the average time the roadway is closed per train crossing)

Discussion

Idling rate for LDGV is 1.382 g/hr for VOC and 1.685 g/hr for NOx.

$$A = 6 \text{ hr}/24 \text{ hr} * 3200 \text{ ADT} = 832 \text{ (Main St.)}$$

APPENDIX 2: Major Rail Corridors in and Around Houston— Ownership and Trackage Rights

The following appendix describes the pattern of rail ownership for existing rail corridors running through and around the City of Houston. The appendix also covers which companies have user rights to run their trains over the tracks in these corridors and a general description of activities along these corridors.

1. The WESTERN approach rail route in the southwest area of Houston is located along the US Highway 59 Corridor

THE GLIDDEN SUBDIVISION

Usage: 30 to 40 or more trains a day use this corridor west of Rosenberg
60 or more trains a day cross at Rosenberg

Location: Major railroad track facility is called Rosenberg Junction
Track extends between Rosenberg station and West Junction
This is the former Southern Pacific main line

Owner: The Owner-Operator of this rail line is Union Pacific (UP) Railroad

Origin of Trains: UP trains on this route come eastward from San Antonio, Laredo, and points in western Texas or to the west of El Paso, Texas.

Activity-Trackage Rights: BNSF has trackage rights to use this route to run its intermodal trains over this portion of the UP Glidden Subdivision as part of a reciprocal agreement to allow the UP to run its Galveston trains over the BNSF Mykawa Subdivision tracks along Mykawa highway in southern Houston. The privately negotiated contract to exchange these rights allowed the UP to avoid using its own tracks called the GH&H route.

BNSF's intermodal trains destined for Barbours Cut (a Port of Houston terminal) also use this route between Rosenberg Junction and the tracks passing Houston area Tower #30 where the BNSF trains then run on the tracks of the Port of Houston Terminal Association (the PTRA) past Pasadena, Texas, and then into the Barbours Cut yard.

BNSF eastbound trains almost never make the turn to the north at West Junction and therefore do not operate over UP's Terminal Subdivision from West Junction to Eureka Junction (paralleling I-610 on Houston's west side, or east-west between Chaney Yard and Englewood Yard parallel to I-10 in Houston's northern downtown area. UP trains can and do use this Terminal Subdivision rail route as do Amtrak trains running between Los Angeles and New Orleans.

Train routing exceptions are allowed, however, under Surface Transportation Board (STB) regulations whenever the joint center dispatchers see the need to allow maximum free flow in the Houston greater terminal area. The procedural name is called "clear route" dispatching.

2. The NORTHWEST and SOUTHWESTERN approach rail route located in the far northwest and far southwest areas of Houston is located along the State Route 36 and then along the State Route 6 Highway Corridor.

THE GALVESTON SUBDIVISION

Usage: 30 or more trains per day use this corridor

Location: Major railroad track rail stations are Rosenberg Junction and Alvin Junction. Track extends between Rosenberg station and Alvin.

This is part of the former ATSF (Santa Fe) main line into Houston.

The BNSF trains on this route come from the Temple, Texas, area and beyond.

Ownership: The owner-operator of this rail line is BNSF

Activity-Trackage Rights:

Most of the general merchandise BNSF main line trains that enter Houston along the former ATSF route coming from areas to the far northwest of Houston will use this BNSF's Galveston Subdivision to reach Alvin, Tex, in the southern area of Houston.

Some BNSF trains will use the UP's Glidden subdivision east of Rosenberg to reach the T&NO junction with the West Belt.

UP has trackage rights over the BNSF north of Rosenberg Junction

3. The SOUTH approach rail route located in the southern area of Houston is located along Mykawa Road.

THE MYKAWA SUBDIVISION

Usage: 30 to 35 or more trains per day

Location: Major railroad track rail stations include Alvin, Pearland, and New South Yard

Track extends between Alvin and the areas immediately southeast of downtown Houston

This is part of the former ATSF (Santa Fe) main line into Houston

The owner-operator of this rail line is BNSF

Activity-Trackage Rights: At Alvin, BNSF trains will turn north onto BNSF's Mykawa Subdivision to reach the BNSF domestic intermodal yard that NSF calls "Pearland" (located near Hobby Airport). Non-intermodal trains like merchandise trains will continue north past the intermodal yard to reach BNSF's New South Yard.

BNSF freight trains bound for Dayton Texas or beyond that enter Houston along this Alvin and Mykawa route would then normally use the East Belt rail corridor tracks up to Houston Tower #87 and enter onto the tracks of UP's Lafayette subdivision from Tower 87 eastward.

4. The Central Houston Terminal Tracks of the former Houston Belt and Terminal

Owner: The owner-operator use of the former Houston Belt and Terminal is equally divided along east-west HB&T tracks with BNSF having the basic use of the western route tracks.

Trackage Rights: Both the BNSF and UP have full operating rights on all of the HB&T tracks.

Locations: Major HB&T railroad tracks and major station points include:

Along the predominantly UP managed East Belt Main Line Tracks

East Belt Yard

Tower #85 or RR Control Point #283

Basin Yard

North Shore Connection

SP Junction Track–Control point 241

Kirkpatrick Jct.

Settegast Yard

Along the predominantly UP managed East Belt Main Line Tracks

Control point (CP) 169 and the Old South Yard

Control Point #139

Crossover the UP's former SP main line between Hardy Yard and Tower #26

Belt Junction

Connection with BNSF Ft. Worth & Denver subdivision main line

5. The Port Terminal Railroad (The PTRA - Association) Terminal Tracks are located along the Houston Ship Channel

Activity: Both the BNSF and the UP can reach the PTRA shippers by interchanging freight with the PTRA for switching to customer sidings or by delivering whole trains to the PTRA facilities like the two intermodal terminals.

The Tex-Mex Railroad can also deliver or receive freight to and from the PTRA provided the freight is bound to or comes from points on the tracks of the Tex-Mex or to and from Mexico.

Location: The main interchange yard with the PTRA is North Yard, which is located just to the south of I-10 near Market Street on the city's east side and to the west of I-610 near that location.

6. The NORTH-NW approach rail route of BNSF is located along State Highway Corridor 249.

THE HOUSTON SUBDIVISION

Usage: 8 to 12 trains per day

Owner: BNSF

Locations: Major railroad track rail points include a recent connection at Dobbin on the former BNSF Silsbee Branch. The tracks in this corridor extend between the West Belt Connection near the north central Houston area and points to the northwest. This is part of the former D&FW (BN) main line into Houston from Ft. Worth, Texas.

Train Origination:

The BNSF trains on this route can also come from the Temple, Texas, area and beyond. BNSF trains bound for customers or transshipment points along the north side of the Houston Ship Channel, including interchange direct to the PTRA would come over this BNSF route off of the former Silsbee line via a new connection with the old FW&D line at Dobbin.

Activity-Trackage Rights:

Much of the traffic on this line would include grain trains.

This route continues onto the north part of the East Belt and continues on the East Belt to North Yard.

BNSF trains use this route rather than trying to navigate a less reasonable route into North Yard via the New South Yard. BNSF grain trains that need to reach Cargill on the PTRA would also use the Dobbin connection and come down this route to the East Belt.

BNSF trains trying to reach the New Orleans joint line or the facilities and shipper near or to the south of Dayton, Texas, would normally also use this route via the connection at Dobbin. BNSF trains coming off the old ATSF route through Temple, Texas, would do this by taking the Silsbee line to the FW&D line and then down the FW&D line to the East Belt and then over the UP's East Belt to a new connection to the old SP New Orleans line near Houston Tower #87.

As part of a competitive arrangement during the megamergers of 1995-1997, BNSF obtained a negotiated right to interchange with PTRA at Pasadena Yard. To accomplish this train movement to Pasadena Yard, BNSF trains can operate over the UP Glidden Subdivision to Tower #30. This avoids a more tortuous

movement of having BNSF trains routed via the New South Yard and then via the East Belt to the Booth Yard Industrial Lead. This would require an S-shaped complicated train movement through a heavily populated area with many rail-highway grade crossings past Booth Yard and then a turn to reach the vicinity of Tower #30 from the north.

7. The NORTH WEST approach rail route of UNION PACIFIC is located along the US 290 Highway Corridor

THE EUREKA SUBDIVISION

Usage: 4 to 6 trains per day

Owner: UP

Locations: Major railroad track rail points along this route include Tower 13 and Chaney Jct. The tracks in this corridor extend between northwest Houston and Hearne, Texas. This is part of the former SP main line into Houston from Palestine, Texas.

8. The NORTHERN approach rail route of UNION PACIFIC is located along the TOLLWAY Corridor

THE PALESTINE & FORTH WORTH SUDDIVISIONS

Usage: 34 or more trains per day

Locations:

This is part of the former Missouri Pacific (MP) main line into Houston from Palestine and Texarkana

Owner: UP

9. The NORTH-NORTHEAST approach rail route of UNION PACIFIC is located along the US 59 Highway Corridor

THE LUFKIN SUBDIVISION

Usage: 7 to 10 trains per day

Locations: Major railroad track rail points along this route include Rabbit Crossing, Tower 210, and Tower 76

The tracks in this corridor extend between an area to the north-northeast of downtown Houston and Humble, Texas

This is part of the former MP main line into Houston from Shreveport, La., some 230 miles to the NNE. The UP trains on this route typically operate in a southbound direction only on the UP's main line service from Shreveport and both Memphis and St Louis.

Owner-operator: UP

10. The NORTH EAST approach rail route of UNION PACIFIC is located along the US 90 East Highway Corridor

THE BEAUMONT SUBDIVISION

Usage: 21 to 24 trains per day

Locations: Major Railroad Track rail points along this route include:

Entrance into northern Settegest Yard near Settegest Junction

The tracks in this corridor extend between an area to the north of downtown Houston near Gulf Coast Jct. and the crossing with the Lufkin subdivision corridor at a location called Rabbit.

Owner-operator: UP

Activity-Trackage Rights: This is part of the former MP main line into Houston from Beaumont, Texas. The UP trains on this route usually operate in an eastbound direction toward Beaumont and beyond toward New Orleans. BNSF and Tex-Mex trains may also use this route when transiting between Houston and Beaumont.

11. The EAST-NORTHEAST approach rail route of UNION PACIFIC is located to the north of the I-10 Highway Corridor near Englewood Yard

THE LAFAYETTE SUBDIVISION

Usage: 21 to 24 trains per day

Locations: Major railroad track rail points along this route include

Englewood Yard, Tower 87, and the approach tracks between Houston and Dayton The tracks in this corridor extend between northeast downtown Houston, Englewood, Crosby, and Dayton

Activity-Trackage Rights:

This is part of the former SP main line into Houston from Beaumont, Texas.

The UP trains on this route usually operate in a westbound direction only and typically come from the New Orleans gateway

The owner-operator of this rail line is UP.

BNSF trains use this route when moving to and from Dayton and New Orleans via Beaumont. Tex-Mex trains use this route as part of their transit between Houston and Beaumont.

12. The HOUSTON WEST-PASS approach rail route of UNION PACIFIC is located in the city's western area parallel to I-10.

THE TERMINAL SUBDIVISION

Usage: 24 or more trains per day use this corridor

Activity-Trackage Rights: Also sees Amtrak and Tex-Mex trains
No BNSF trackage rights

13. The HOUSTON–GALVESTON CORRIDOR approach in the southeast area has two rail lines

The UP's GH&H subdivision, which parallels Texas Highway 3.

Usage: 8 UP trains or more per day—some as UP grain trains to the port.
The BNSF Galveston subdivision line continues southeast of ALVIN to Galveston. It parallels Texas Highway 6.

Usage: 6 BNSF trains or more per day over the 22 miles south of Algoa Junction
15 to 20 trains per day north of Algoa

Activity: Some UP trains to Corpus Christi or Brownsville will use the Glidden subdivision to move southbound via Flatonia, Texas, and Victoria. UP trains northbound to Houston from that coastal area will use this route over the BNSF.

End Notes

¹ The port of Portland, Oregon, for example, saw a substantial decline in container volumes in 2004. www.pacificshipper.com

² Another large container terminal is currently under development at Tampa. Marketing director Wade Elliot justified the viability of the Tampa terminal by the high cost of intrastate trucking: “A lot of importers and exporters in this area had been forced to truck their business to congested ports on the east coast (of Florida) and pay \$600 to \$700 per container to move it to South Florida.”

http://www.seaportspr.com/viewportnews.cgi?newsletter_id=34&article_id=1471

³ The Mexican state of Tamaulipas that borders Texas has one of the highest rates of poverty within Mexico. Given that demand for consumer goods (besides basic food and housing) is nonlinear, economic changes that half the poverty rate to that of states such as Baja California could be expected to have a tremendous effect on the demand for containerized consumer goods within the state.

⁴ “Market concentration: Double-digit growth in container volumes has become the norm,” *Journal of Commerce*, May 23, 2005

⁵ Interview with John Roby, Director of Logistics at Port of Beaumont. 10-28-2005

⁶ “U.S. Port Cargo Rankings by Trade”

http://www.aapa-ports.org/pdf/2003_US_PORT_CARGO_TONNAGE_RANKINGS.xls

⁷ Bomba, Michael et al. “Landside Access at Texas Seaports.” October 2005. CTR-0-4437.

⁸ “Gulf Ports in Expansion Mode: Mobile, Manatee, Beaumont adding major facilities,” Laura Myers and Janet Plume, *Gulfshipper*, March 16, 2004 <http://www.gulfshipper.com/news/article.asp?1type=trade&sid=634>

⁹ Source: CMA-CMG Houston office. A substantial share of this cargo is destined for the newly opened Wal-Mart distribution center and therefore must be cleared by truck. If CMA were to retain these services but increase the vessel size to Panamax, the volume of weekly deliveries could rise to 8,000 TEU.

¹⁰ In 2004 only four U.S. ports moved more than two million TEUs. <http://www.aapa-ports.org/industryinfo/statistics.htm>.

¹¹ See Appendix A for details about the exact routes of these corridors.

¹² July 24, 1986, ICC denial of merger application.

¹³ The Port Terminal Railroad Association (PTRA) and other local switching companies are not discussed in this report.

¹⁴ January 1, 2005

¹⁵ 5.8 million TEUs a year move inland from LA/LB. Source: Presentation by Curtis Spencer; IMS Worldwide, October 3, 2005.

¹⁶ U.S. Container Terminal Throughput Density, February 12, 2003, Mark Sisson, PE; www.portofhouston.com/pdf/genifo/POHA-BayportCapacity.pdf.

¹⁷ J. Parker Lamb, *Trains Magazine*, Oct 1999.

¹⁸ Union Pacific Corporate Presentation, “Manifest Network Issues and Initiatives,” Sept. 2003.

¹⁹ Short-Haul Intermodal Service: Can Rail Compete with Truck? Transportation Research Board Alternative Freight Capacity Workshop, January 2004

<http://gulliver.trb.org/publications/security/144/Resor.pdf>

²⁰ APL in the early 1980’s led the conversion to inland rail distribution as a means to avoid the replacement of some of their aging vessels that served the US east coast via the Panama Canal.

²¹ Source: Presentation by Curtis Spencer; IMS Worldwide, October 3, 2005.

²² Speech by Robert Noorigian, Industrials and Transportation Conference, May 17, 2005, www.insinc.com

²³ Spring of 2004 study; HARRIS COUNTY FREIGHT RAILROAD CORRIDORS AND URBAN MOBILITY PROGRAM, Joint Project of Harris County and the Port of Houston, a PPT Report. The purpose of the 2005 work is to identify and analyze alternative solutions to reduce the interaction of freight rail operations and urban roads; the 2005 study involves 752 rail and road at-grade crossings identified in the 2004 report.

²⁴ At one time, TxDOT did operate a highway tunnel under the Houston Ship Channel on SH 146 between La Porte and Baytown. The impressive cable-stayed Hartman Bridge replaced it in the early '90s. There is now only one tunnel in Texas—the Washburn Tunnel, which is also under the Houston Ship Channel on Federal Road. It is operated by Harris County.

²⁵ Settegast Yard (a former MP site) and Englewood Yard (a former SP yard)

²⁶ Made complex in part because of changes to be negotiated in crew districts, fueling locations, local train dispatching, and other regional operating details to be worked out. Complex also because of the need to rearrange through blocking at other system yards remote from Houston and to reschedule both trains and the supporting network of locomotives and crews for long distance trains. Detailed analysis may reveal that separate yards for BNSF and UP might be a superior solution.

²⁷ <http://www.portofcorpuschristi.com/news/PortNews2-28-05.html>

²⁸ Corpus Christi hopes to dredge its ship channel to 50 or 55 feet, deeper than the Houston Ship Channel

²⁹ The port fee for petroleum has been fixed at 4 cents per barrel since 1983. Therefore increases in revenue in this area have been tied entirely to increased demand. Recently, the port reached an agreement to increase the rate to 6 cents per barrel, with an additional increase to 8 cents in the next few years.

³⁰ <http://www.portofcorpuschristi.com/bids/RFP0615%20TAG.pdf>

³¹ “Port Begins Negotiating for La Quinta Contract,” Nick Nelson, Corpus Christi Caller Times, November 16, 2005.

³² Algoa and Brownie in the north to Brownsville in the south

³³ The Port area of Corpus Christi is also served by a San Antonio branch of the UP. Car weights on that UP branch can be up to 286,000 lb gross. BNSF and Tex-Mex trains are not allowed on this branch.

³⁴ Figures are rounded down.

³⁵ Direct through intermodal train service is assumed.

³⁶ BNSF presentation, Sept 29, 2004.

³⁷ The operational basis for the hypothesis can be explained in a separate report about railway track capacity criteria and measurement that are well documented in similar corridor studies.

³⁸ BNSF also uses the route on a negotiated partnership basis with Tex-Mex and UP might sometime in the future be open to privately negotiating a similar agreement to by-pass its busy San Antonio to Laredo route. Such “reciprocity” negotiations have a long and rich history in U.S. railroading.

³⁹ “Chicken, melons to fill warehouse deal could make refrigerated port facility profitable,” Corpus Christi *Caller-Times* (Texas), Sept. 8, 2005, Thursday, Business; p. D1, Alison Beshur.

⁴⁰ U.S. poultry exports to Russia have sometimes been threatened by political factors. In 2002, the Russian government launched what politicians referred to as a “chicken war” against U.S. imports, which were accused of undermining domestic production and poisoning the population with antibiotics.

<http://news.bbc.co.uk/1/hi/world/europe/1864844.stm>

⁴¹ “Cold front: More cold-storage companies are offering value-added logistics services,” *Journal of Commerce*, May 23, 2005, Stephanie Nall.

⁴² “BNSF Buys First New Reefer Cars in 35 Years,” May 2001.

http://refrigeratedtrans.com/mag/transportation_bnsf_buys_first/index.html

⁴³ “Union Pacific orders 1,500 reefer boxcars,” Aug. 2003.

http://refrigeratedtrans.com/mag/transportation_union_pacific_orders_2/index.html

⁴⁴ “Study: Ingleside best spot for cruise ships. Consultant adds that opportunity is negligible now,” *Corpus Christi Caller-Times* (Texas), Oct. 12, 2005, Wednesday, A; p. A6, , Alison Beshur.

⁴⁵ “Corpus cruise ferry not ready to dock yet,” *San Antonio Express-News*, Jan. 20, 2005, Thursday, METRO, p. 1E, David Hendricks.

⁴⁶ This “buy back fee” is being protested strongly by Rep. Solomon Ortiz who argues that the job loss related to the base closing is already a blow to the city and that the city spent significant resources in preparing the area to accommodate the naval station when it was first opened in 1988. Representative Ortiz has submitted legislation that would allow the city to renegotiate its deed with the Navy.

⁴⁷ Substantial investments have been made along major Mexican rail corridors to make double-stack container trains feasible. In addition, the Mexican government has recently passed legislation to facilitate inbound container movements. Inland ports such in Guanajuato and San Luis Potosi will also contribute to this purpose

⁴⁸ An Identification Process and Evaluation Framework for Texas Gulf Containerships, Bomba, Michael, Harrison, Robert. Austin : The University of Texas at Austin. Center for Transportation Research (CTR), 2000.

⁴⁹ “New \$ 2.5 Million Crane to Boost Business at Port of Brownsville, Texas,” Dwayne Hartnett, *The Brownsville Herald*, May 30, 2002.

⁵⁰ “BND sifts through port director applications” by Laura B. Martinez.

http://www.brownsvilleherald.com/ts_more.php?id=65405_0_10_0_C.

⁵¹ Brownsville signed a trade pact with the Port of Manzanillo in 2003,

http://www.bedc.com/about/news/newsDetail.asp?news_id=1047, and has developed several trade contacts since that point.

⁵² Presentation by David Eaton at “Inland Ports Across America” Conference, San Antonio, Texas 10/03/2005

⁵³ There is a possibility that the continuation of high energy prices may soon curtail the Mexican steel industry, the Mexican Iron and Steel Chamber recently warned. “Boom time in Brownsville; South Texas port handles imports of semi finished steel, exports of finished product,” Janet Plume, *Journal of Commerce*, June 13, 2005.

⁵⁴ <http://www.gao.gov/new.items/d05768.pdf>

⁵⁵ As of November 2005, Brownsville was still holding semi-regular meetings with officials from Osprey about the possibility of resuming service in 2006.

⁵⁶ “The Gulf Coast operators said that handling costs were not a significant concern because they were able to negotiate special rates with dockworkers.” <http://www.gao.gov/new.items/d05768.pdf>

⁵⁷ “Short-sea shipping: A Work in Progress,” *Journal of Commerce*, Sept. 08, 2003 R.G. Edmonson.

<http://www.joc.com/conferences/sss/SSSAWorkInProgress-080803.pdf>.

⁵⁸ “Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions”

<http://www.gao.gov/new.items/d05768.pdf>

⁵⁹ “Ballpark” average rate quoted by Osprey Houston office, 6/08/05.

⁶⁰ *The Brownsville Herald*, June 2, 2005, by Emma Perez-Trevino.

⁶¹ CTR Interview with Mark Lund, Director of Cameron County MPO, June 1, 2005

⁶² Current And Future Rail Access Needs Of Western Gulf- Texas Ports, TTI November 2003, David H. Bierling, Curtis A. Morgan, Arthur P. James, Jeffery E. Warner, Gretchen A. Chabot, and Tim A. Sain

⁶³ <http://hutchison.senate.gov/prl545.htm>

⁶⁴ In order to clear the record, the Port of Brownsville made the unusual decision to post the investigation’s final report” *Regarding Status, in Mexico, of Brownsville Navigation & Canal District’s Proposed Port Bridge Project*” by the law firm of Torteya and Torteya on its official website.

⁶⁵ Bierling, David H. et al. Current And Future Rail Access Needs Of Western Gulf- Texas Ports. TTI, November 2003.

⁶⁶ The shared use via trackage rights is today actually operated under a haulage contract.

⁶⁷ Bierling, David H. et al. Current and Future Rail Access Needs of Western Gulf Coast Ports. TTI, November 2003.