CAMBRIDGE SYSTEMATICS

Permian Basin Rail Connection Economic and Financial Feasibility Study Update

final report

prepared for

La Entrada al Pacifico Rural Rail Transportation District

prepared by

Cambridge Systematics, Inc.

June 2013

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1.0 Background

The La Entrada al Pacifico (LEAP) Rural Rail District in West Texas is situated at the center of a region experiencing significant growth in freight transportation demand. The recent surge in demand is largely associated with growth in oil extraction in the region made possible by technological advances in hydraulic fracturing drilling techniques. The fracturing process requires large quantities of pipe, sand, mud, cement, water, and other chemicals – much of which is imported to the region from other parts of the United States. In addition to the boom in oil exploration, the region is experiencing growth in other energy industry activities – including a new coal-fired power plant near Penwell, Texas and waste storage in Andrews County. Agricultural production of cotton, cottonseed, peanuts, and other products north of the LEAP Rural Rail District also sustain demand for freight shipments by rail and truck. Because population is increasing in the region in support of industrial growth, demand for consumer items and construction materials has also grown.

Currently many of the industrial and consumer materials transported in the region are moved by truck. Trucking provides flexible service and is especially effective at local deliveries and last-mile service, but the region's shippers are in need of greater freight transportation options offering lower long-distance shipping cost. Freight rail service has the ability to provide lower unit shipment costs, but the region's freight rail service and access to the national Class I network is currently limited to one railroad – Union Pacific (UP) – with a line that is capacity constrained. Granted, UP has been able to accommodate greater quantities of local freight over its TP Line, but, much of its mainline capacity is consumed by long-distance intermodal movements (e.g., Port of Los Angeles to Dallas). Because intermodal traffic hauled long distances typically produces higher revenues and profit margins, there is little incentive to allocate scarce main line capacity to handle lower revenue traffic associated with energy development. However, with the significant resurgence in energy development and production in the Permian Basin Region, the demand for transportation of development commodities (e.g., frac sand) and crude oil has been increasing.

Given the broad and growing demand for freight transportation options and service in the region, the LEAP Board has been assessing the feasibility of developing a new freight rail connection from the West Texas Lubbock Central (WTLC) approximately 80 miles to the north at Seagraves. A connection to the WTLC would provide access to BNSF Railway at Lubbock, thereby improving connectivity, access to the national Class I network, and competitive options. The new connection would also provide additional opportunities to develop transloading terminals for energy development inputs and outflows of crude oil.

The Texas Department of Transportation, in cooperation with LEAP, first explored the feasibility of connecting the Midland-Odessa market to the WTLC in a 2008 study entitled Permian Basin Rail Connection: Economic and Financial Feasibility Study. That first study also examined a southern connection between Midland-Odessa and the Texas al Pacifico railroad in McCamey. The study assumed that the project would be financed with revenue bonds secured by rail carload fees assessed on a ton-mile basis. The study concluded that projected rail demand would not produce sufficient carload revenue to cover capital construction and continued operating expenses of the new line. The southern connection to McCamey was deemed less viable than the northern connection to Seagraves. The first study proposed strategies for closing the financing gap, including attracting a railroad partner and/or attracting a "mega-shipper." Due to a series of events – including the boom in hydraulic fracturing activity, the attraction of a potential mega-shipper (i.e., Summit Energy to Penwell), and the associated population and economic growth of the region, the LEAP Board initiated this study to reexamine feasibility of the north-south connection between Midland-Odessa and Seagraves. In addition, this study updates the demand estimates between McCamey and Midland-Odessa, which was analyzed in the original study.

In the original study, the following three segments were evaluated for demand, cost, and revenue: A.1 – Seagraves to Seminole, A.2 – Seminole to Odessa, and B – Odessa to McCamey. The segments evaluated in this update include:

- **Segment A –** Seagraves to Odessa (combines A.1 and A.2 from prior study); and
- **Segment B –** Odessa to McCamey.

2.0 Approach

2.1 Overall Approach

To update the 2008 study, interviews were conducted with regional freight stakeholders, construction costs were updated, and freight demand data were updated to reflect the changing conditions. The freight demand data update utilizes a combination of publicly available data and interview findings to develop a new base year (2010) for the report and a revised forecast year (2040). The remainder of this report summarizes the approach and findings of the study update.

2.2 Interviews

Interviews were conducted with freight stakeholders in the region including railroads and major shippers. The interviews were structured to shed light on the growth dynamics of industries affecting rail demand within the study area, including power generation (Summit) and oil services industries to determine if: a) the cost structure for constructing the rail had changed since 2008; and b) if the demand for rail commodities or potential diversion had changed. The interviews confirmed changes in both the demand and cost assumptions for constructing the railroad between Seagraves and McCamey.

Table 2.1 lists the organizations interviewed as part of the outreach effort.

Table 2.1 Interview Participants

Organization Name
BNSF Railway
Flint Hills
Halliburton, Midland/Odessa
J Steel Building
JNL Steel Components
Midland Chamber of Commerce
Odessa Chamber of Commerce
Permian Basin Petroleum Association
Permian Resources
Seminole/Gaines County Economic Development
Summit Power Plant, Penwell
Texas Feed Grain Association
Texas Wheat Association
Union Pacific Railroad
Waste Control Specialists, Andrews
West Texas and Lubbock and Texas-New Mexico Railway

3.0 Rail Demand Update

Using a combination of information from the interviews and public sources of freight transportation data, the consulting team updated the rail demand data to reflect current conditions. To update the rail demand from the 2008 study the consulting team undertook two steps: 1) updating the baseline rail demand, and 2) updating the forecast rail demand.

3.1 Update Baseline Rail Demand

Segment A – Seagraves to Midland-Odessa

Using data provided by the Texas Department of Transportation (TxDOT), the baseline carload demand was updated to reflect transportation and goods movement trends since the study was completed in 2008 and better predict baseline conditions upon the recovery from the 2009 recession. The consulting team analyzed TxDOT Truck Counts for 2003 and 2010 to estimate the change in total freight traffic on the rail study corridor (highway and potential rail traffic). The analysis focused on north-south traffic, primarily on U.S. 385. The original study predicted that traffic on the corridor would grow by about 14 percent between 2003 and 2010 but observed truck counts by TxDOT indicated that truck traffic grew faster than predicted – by 50 percent. Accordingly the consulting team developed revised 2010 baseline freight volumes reflecting the growth on the segment between Seagraves and Odessa. This revision added approximately 3,000 annual carloads in 2010 (the difference between 50 percent growth and the original growth of 14 percent), for a new 2010 baseline of 8,760 rail carloads.

The consulting team also examined truck counts on other regional highway facilities to provide context to the examination of the U.S. 385 corridor. The analysis shows wide variation in the counts, including significant growth on some corridors, declining volumes on others, but exhibiting an overall trend of increased volume on major corridors serving Midland-Odessa. This recent growth was substantiated by the interviews.[1] Table 3.1 shows the change in truck volumes at specific regional locations.

[1] The Midland and Odessa Chambers of Commerce indicated that there has been at least a 10-20 percent annual growth the last several years in truck traffic on the region's roadways.

Table 3.1 Observed Truck Growth on Key Permian Basin Routes

Route	Location	Percent Growth 2003 to 2010
U.S. 62	Parallel to Rail Line (Ropesville)	50%
U.S. 385	Between Andrews and Seminole	49%
U.S. 385	Between Andrews and Odessa	63%
U.S. 385	In Gaines County (North of Seminole at Seagraves)	50%
U.S. 385	South of Odessa (Crane County)	13%
U.S. 385	Just north of McCamey	-31%
TX 349	Between La Mesa and Midland (Martin County)	1%
TX 349	South of Midland (Upton County)	194%
TX 349/U.S. 87 Corridor	Between O'Donnell and Tahoka (Lynn County)	-24%
TX 349/U.S. 87 Corridor	Near Lubbock	-22%
U.S. 84 Corridor	Between Dallas and Lubbock (Scurry County)	-22%
U.S. 180	Between Seminole and New Mexico	16%
TX 302	Between Kermit and Odessa	38%
U.S. 380	West of Brownfield	-15%
I-20	In Ector County	-21%
I-20	I-20 in Howard County (Big Spring)	18%
I-20	I-20 between Midland and Odessa (Odessa)	40%

Source: 2003 and 2010 Texas DOT Texas Truck Flowband Maps.

Note: No truck count locations on FM roads.

3.2 Update the Forecast Rail Volumes

Segment B – Midland-Odessa to McCamey

For the segment between Odessa and McCamey, there were mixed results from the truck counts. The number of trucks traveling on the U.S. 385 route south of Odessa (in Crane County) in 2010 increased slightly from 2003 but trucks traveling on the same corridor had shown declines just north of McCamey (Upton County). The TX 349 corridor south of Midland in Upton County experienced growth indicating increases in activity more focused in the eastern part of Upton County. Based on these findings, and due to the fact that some sections of the highways parallel to the proposed rail route did experience marginal growth, this study update maintains the demand estimate of 5 percent compound annual growth between 2003 and 2010 established in the original study. As a result, the 2010 baseline for this section was left unchanged at 5,600 rail carloads. For both

Segments A and B, truck counts were collected and compared at different locations.[2]

The major source of potential rail demand in the 2008 study was truck-to-rail diversion from parallel corridors, especially U.S. 385. To update the demand numbers from the previous study, the consulting team relied on observed truck counts obtained from TxDOT. The counts span the years 2003 to 2010 and allow the consulting team to update the new baseline numbers to 2010 reflecting the robust growth in truck volumes on the corridor. In contrast, the long-term growth forecasts reflect the more conservative longer-term trends of the forecast developed for the 2008 study instead of extrapolating a long-term growth rate from the recent truck volume growth. This approach helps temper the forecast over the long term instead of relying on the annual growth rates of the last few years which reflect the current boom cycle of the petroleum industry. Thus, for the period from 2010 to 2040, the long-term growth rate from the original study (1-3 percent) was utilized due to the general consistency in long-term forecasts in the original dataset. The adjusted baseline should account for shifts in freight traffic in the region as a result of the run up to record fuel prices in 2008, the subsequent recession in 2009, and beginning of the recovery in 2010.

Augmenting Baseline Truck Diversion with New Potential Sources of Rail Demand

Because the baseline and forecast data used in the original study does not fully account for special generators of freight and the recent boom in petroleum, the rail demand data were supplemented with information from interviews with the oil services industry and with data on well starts and the freight requirements of oil wells. To update the previous rail forecast, the data were supplemented with estimates representing increased potential rail demand and truck diversion as a result of the substantial growth in natural resource extraction through hydraulic fracturing in the Permian Basin (fracking).

The team also investigated the possibility of additional rail demand resulting from a major new shipper: the coal-fired Summit Energy plant in Penwell, Texas. While the facility will require frequent unit train shipments of inbound coal and will produce byproducts that will also require rail service. However, use of the new north south connection would depend on whether UP or BNSF would handle the inbound coal and outbound byproducts. The connection would only be used if the BNSF handles some or all of this traffic. Given this uncertainty, potential rail demand of the Summit energy facility is estimated in this study but not included with the total.

The study does not account for a more recent phenomenon – which is the growing shipment of crude oil by rail from the region. The Permian Basin has

[2] http://www.dot.state.tx.us/travel/traffic_maps/default.htm.

traditionally been well served by the pipeline infrastructure that connects it with major refining centers, including those on the Texas Gulf Coast. However, recent growth in production (estimated at 1.3 million barrels per day), has outpaced the capacity of the pipelines serving the region (925,000 barrels per day).[3] An additional 280,000 barrels per day are refined locally, leaving approximately 100,000 barrels per day of excess oil which cannot be refined locally but which cannot be transported by pipeline due to capacity constraints. In response to this situation pipeline companies have proposed infrastructure expansions.[4] However, in the short term – as pipelines are readied – rail is already serving an important role in moving crude to market. With 100,000 excess daily barrels of oil, rail shipments in the region could presently be as high as 142 daily carloads – or about 2 unit trains.

The future role of rail in hauling crude is uncertain given future pipeline potential; some industry analysts believe the region is well served and planned expansions will accommodate future demand. The transportation costs also favor pipelines as rail shipment costs of crude are 50 to 100 percent higher than pipeline.[5] However, with growth of 33 percent in crude oil production from the region from 2012 to 2016 (and potentially much more in the longer term), rail may yet play an important role in providing a flexible transport option if pipeline capacity falls short of peak output.[6]

3.3 Oil Services Industry Volumes

Interview Results

The perception of this particular "boom" is that it may have staying power due to the new hydraulic fracturing technologies that are revitalizing oil wells in the region. Annual well starts alone have increased by about 60 percent since 2010.[7] Interviews with the Permian Basin Petroleum Association, Halliburton, and others all indicated that a new rail service in the region would greatly benefit regional shippers. To reflect this in the estimates, the consulting team assumed a supplemental demand for rail serving the oil services industry in addition to the baseline for several of the scenarios. Although, there may be some risk in double counting assumed carloads, the increases were based on existing data for new well starts and increases were conservative based on these data.

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[3] BMO Capital Markets. *Transportation – Rails, Energy Opportunities: More Than Just Crude.* January 2013.

[4] Platts. *New Crudes, New Markets*. March 2013.

[5] PLG Consulting. Oil & Natural Gas: The Evolving Freight Transportation Impacts. 2013.

[6] Ibid 4.

[7] Texas Railroad Commission District 8. Data from Rigdata.com.

Because most of the oil services growth is very new, (substantial increases in oil production from fracking over the last two to three years) it was not reflected in truck diversion data utilized for the baseline estimates. To estimate changes in rail demand, industry reports and data were consulted and interviews were conducted with several sources including the Chambers of Commerce from Midland and Odessa, the Seminole/Gaines County Economic Development Department, and several shippers associated with the industry such as Halliburton, Permian Resources, steel shippers, and sand shippers. The interviewees reported significant demand for freight rail transport of petroleum products, sand, drilling pipe, and steel products for drilling rigs.[8] These products are currently carried by both rail (either on another railroad and transferred to truck) or by truck. Although interviews were conducted with several major industry representatives (i.e., steel shippers, large oil service providers, Chamber of Commerce representatives), it is likely that this only reflects a small proportion of the total potential rail demand in the region and consequently represents a conservative estimate of demand.[9]

Demand Estimates from Well Development

To substantiate oil services industry demand from the industry interviews, data on oil well starts in the Permian Basin were collected and analyzed. The well starts data were collected for 2010 and 2011 and through April of 2012 from Rigdata.com which collects and publishes information for industry on permitting, drilling rig locations and activity, well starts, and oil and gas industry operations. Within the Permian Basin, there are three Oil and Gas Division District Boundaries identified by the Railroad Commission of Texas: 7C, 8, and 8A. The region as a whole (especially District 8) has seen substantial growth in new oil well starts over the past three years as shown in Figure 3.1.

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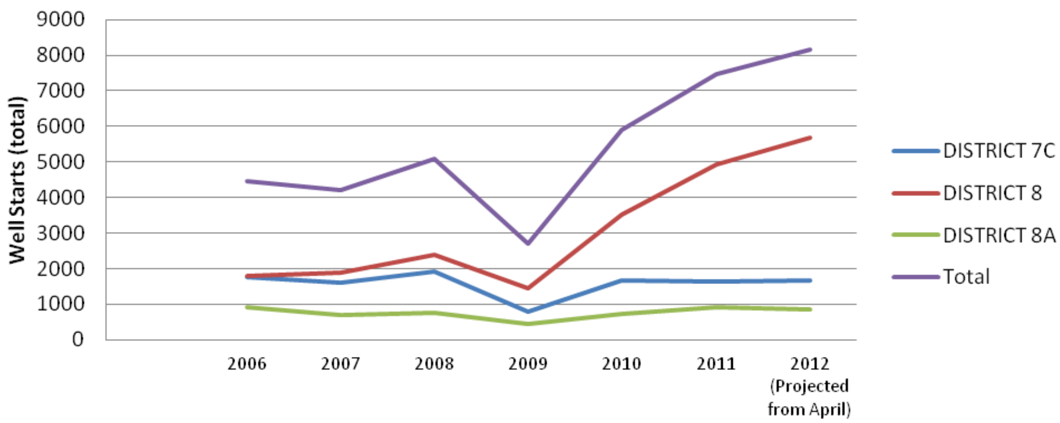
[8] Demand estimates do not include potential demand for outbound crude oil tankers, rail being a key mode for shipping crude when pipeline capacity is limited. The total volume of rail shipments of crude oil from the study area is unknown, however, Flint Hills (one of the larger facilities in the region) reported the equivalent of about 50 rail cars per day of crude oil currently being shipped to Houston (one unit train, every other day). Other companies have recently begun operations as well, such as Atlas Oil's facility in Odessa which has a maximum capacity of 50-150 carloads per month (i.e., a 100-car unit train every couple of weeks). http://bulktransporter.com/management/shippers/transportation_atlas_oil_opens/.

[9] For example, the demand for steel products based on three firms interviewed was reported to be over 400 carloads per year in the Permian Basin. Seminole County reported that this could be as much as half of the steel market in the area.

Figure 3.1 Growth in Well Starts 2006-2012



Source: Rigdata, Inc., 2012.

To determine the number of new wells (based on the Rigdata data and location of well information from the Railroad Commission of Texas) that might serve the Counties identified above, two data sources were collected 1) locations of new permits within each district, by County and 2) total wells within each County. The Counties proximate to the study area within each of these districts include:

- Ector, Midland, Martin, and Andrews (8);
- Upton (7C);[10] and
- Dawson and Gaines County (8A).

Within each district, the proportion of new exploratory permits (again, reported by Rigdata)[11] for each of the Counties is used as a proxy for the proportion of new well starts within the "study area" counties.

The Counties were divided into tiers (north and south of Midland) to correspond with segments on the potential rail.[12] As a check for overall oil services activity within each County, the number of regular producing wells in February 2012 (the most currently data available from the Texas Railroad Commission) in each

[10] Note: although well starts in District 7C as a whole have remained relatively static for the last 5-6 years (indicating consistent operations and not a fracking "boom," based on data from the Texas Railroad Commission, it appears that activity in Upton County has increased substantially.

[11] Data on new permits was collected for April 13, May 4, and May 18, 2012 to get a rough sampling. As a check for overall activity, the proportion of wells in September of 2011 was also checked for validation of oil services activities for that district within "study area" counties.

[12] Crane and Upton Counties were used to calculate the approximate wells associated with those Counties within each district for the Southern segment.

County was confirmed to validate the proportion of oil services activities for that district within "study area" counties.

Seagraves to Odessa

Within District 8, Ector, Midland, Martin, and Andrews Counties account for over 50 percent of the new permits and 50 percent of the existing wells. For 8A, also north of Midland, Gaines and Dawson County account for close to 20 percent of the new permits and 22 percent of the existing wells.

Odessa to McCamey

For 7C, Upton County accounts for between 25 percent and 45 percent of the new permits and about 30 percent of the existing wells and for District 8 south of Odessa, Crane County accounts for between 3-6 percent of the new permits and 10 percent of the existing wells.

The proportions of well starts within each district were multiplied by the totals in 2010 (the baseline year) to determine the number of well starts within study area Counties. For the Seagraves to Odessa segment, this equaled 1,980 wells and for the Odessa to McCamey segment, 674 wells. According to the interviewees, nearly every well is being developed using hydraulic fracturing methods.[13]

Recent industry estimates indicate that for each new drilling rig/well site, there is demand for between 23 and 47 railcars of inbound product per well to supply the necessary inputs for hydraulic fracturing: sand, drilling mud, acid, cement, pipe, and other chemicals.[14] It is highly unlikely that each well, or even a majority of the wells would utilize rail for all of these inputs, given the developed and mature supply chain for truck, and existing rail service from the UP, BNSF, and short lines in the region. Additionally, many of the products used in well inputs are collected via local sources (such as existing sand mines in West Texas or local chemical plants). Several interviewees however, reported acquiring frac sand and other products (such as steel for drilling pipe) from regions as far away as the Upper Midwest and East Coast.[15] Based on the truck diversion share diversion within the study area from the 2008 study, there is a diversion potential

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[13] One interviewee noted that the success rate for production in new wells used to be about 10 percent; now, with the fracking process, success rates are between 80-90 percent. The estimates in this report are for all well starts; the actual number of carloads could be slightly lower depending on the success rate of well starts., which may require additional research to quantify.

[14] BNSF Railway;, Gennessee & Wyoming (http://www.gwrr.com/customers/utica__marcellus_shale), PLG Consulting. Oil & Natural Gas: The Evolving Freight Transportation Impacts (Presentation). 2013.

[15] http://www.mywesttexas.com/business/oil/top_stories/article_1aa6a950-95c2-56ec-84cf-d5cffabbd937.html.

for rail of between 2-8 percent of the total oil services commodities with a slightly higher share for chemicals.[16] Many of these commodities (i.e., nonmetallic minerals – sand, chemicals and allied products, and primary metals) typically have a higher rail mode share in other parts of Texas but a low mode share in this region indicating a greater potential for diversion. In addition to well development inputs, long-term well maintenance requires a modest number of annual shipments – the equivalent of between 1 to 3 carloads per year.[17] This estimate is included in the long-term forecast shown in Table 3.5.

Based on these assumptions, the new rail connection could potentially expect a 5 percent long-term diversion of the well inputs. With aggressive marketing and pricing (such as a reduced carload fee for certain commodities), as much as 10 percent diversion may be possible. Assuming that the interviews only described a small but important portion of the overall oil production and extraction industry in the Permian Basin, there is relative consistency between the data and interview results. The baseline supplement calculation was based on oil well information for 2010 for uniformity with the overall baseline estimates. Table 3.2 shows the a) Seagraves to Odessa and the b) Odessa to McCamey rail segments and the potential supplement in carload demand in 2010.

Table 3.2 Supplemental Base Year Carloads for Oil Services Industry "Fracking" Products Potentially Carried by Rail

Description of Inputs	A – Seagraves to Odessa	B – Odessa to McCamey
Proportion of successful well starts within each district in study area counties[a]	1,584	539
Potential carload equivalents of materials for well development (per fracked well[b]		
Low	23	23
High	47	47
Total potential carloads associated with oil well production[c]		
Low (23 potential carload equivalents)	45,540	15,502
High (47 potential carload equivalents)	93,060	31,678
Supplemental annual carloads (2010) – 5% Diversion		
Low (5% diversion)	2,277	775
High (10% diversion)	9,306	3,168

[a] Multiplied by 0.8 to reflect the proportion of successful fracked well starts.

[b] Ibid 14.

[c] Proportion of well starts with the three districts multiplied by approximate number of annual carload inputs per fracked well.

[16] Based on the interviews, currently chemicals are predominantly carried by truck within the study area.

[17] Ibid 13.

The total potential carload demand based on the adjusted baseline for 2010 and the supplemental demand from the oil services fracking "boom" are shown in Table 3.3.

Table 3.3 Railcar Demand Summary of Scenarios
Total Carloads, 2010

Carload Demand Scenarios (2010)	A – Seagraves to Odessa	B – Odessa to McCamey
Baseline Demand – Updates 2008 study, no supplemental oil demand	8,760	5,600
Low Estimate – Baseline plus capture 5% market diversion for fracking inputs (assumes 23 carloads of material per fracked well)	11,037	6,375
High Estimate – Baseline plus capture 5% market diversion for fracking inputs (assumes 47 carloads of material per fracked well)	18,066	8,768

The assumptions for growth in the baseline commodities are consistent with the previous study. For the potential supplemental carloads associated with the oil services industry, however, the assumptions have been adjusted to account for the current "boom" in regional oil field development. From the 2010 baseline, 10 percent growth was assumed in 2011 and 2016, with a 4 percent growth from 2017-2020, and 1 percent growth from 2020-2040. This is a conservative estimate based on information reported in the interviews and data trends in well development estimated from Rigdata. Some in the industry expect the current annual increases in well starts (of greater than 10 percent annually) to last until the end of the decade; this study assumes a leveling off of the increases will help protect against overly aggressive targets for what has been a very cyclical industry. The total carloads over the next 30 years based on these assumptions are described in Table 3.4.

Table 3.4 Railcar Demand Summary of Scenarios
Total Carloads, 2010-2040

Carload Demand Scenarios (2010-2040)	A – Seagraves to Odessa	B – Odessa to McCamey
Baseline Demand – Updates 2008 study, no supplemental oil demand	411,857	216,610
Low Estimate – Baseline plus capture 5% market diversion for oil services industry (assumes 23 carloads of material per fracked well)	694,411	312,793
High Estimate – Baseline plus capture 10% market diversion for oil services industry (assumes 47 carloads of material per fracked well)	1,278,248	511,533

Summit Energy

Based on interviews, the Summit Coal Energy facility could potentially provide an additional three unit trains per week (19,500 annual carloads) of inbound coal and one unit train per week (6,500 annual carloads) of outbound slag and urea. This accounts for about 26,000 annual carloads of bulk cargo for a short line. Developing a short line rail connection from Seagraves to the Midland-Odessa area could provide Summit Power (for coal deliveries) and other customers in the region with an alternative to using Union Pacific. Coal demand (and potential carload fees) from the Penwell plant would likely influence the potential revenue for the Seagraves to Odessa segment but may require additional branch extensions to serve the Penwell facility, incurring additional costs which are not included in this study. Table 3.5 is provided for information purposes only to indicate supplemental demand potential from Summit. The figures are not part of the total demand estimate because the plant will initially utilize Union Pacific which is adjacent to its site. This may change in the future depending on the location and level of service of potential new rail alignments.

Table 3.5 Railcar Demand Summary, Summit Power Plant, 2010

Description of Input	Year of First Operation (Summit) Estimates
Annual Carloads inbound (Coal)	19,500
Annual Carloads inbound (Slag/Urea)	6,500
Supplemental annual carloads (2010)	26,000

Note: Estimates are illustrative only and are not included in the demand estimates.

Source: Cambridge Systematics, Inc., Interviews, 2011.

4.0 Cost Update

This section summarizes the methods and results of updating construction costs and rail operating costs for the scenarios, including a discussion of how costs are validated.

4.1 CONSTRUCTION COST UPDATES

Approach

Another major component of this study is the validation and updating of rail construction costs from the first study. The cost updates are based on interviews with the railroads on general assumptions about topography, local availability of materials and labor, and current standards for operations and maintenance costs. This revised study includes a second construction cost tier reflecting estimated costs for constructing a lower operating speed short line class railroad at about $1 million per mile. This study also considers a building a more expensive railroad at $2.65 million per mile; to the standards of active Class I railroad[18] branch lines. Please note that this study is intended to *begin* the conversation with local partners and potential investors to identify implementation strategies to construct the new rail. It should be noted that this is a feasibility study, not intended for investment purposes.

Validating Costs

The original report assumed that new track between Seagraves and McCamey would be constructed single track to standards used by the Class I railroads which would support potentially higher speeds (i.e., maximum allowable speed of 40 mph) and carload weights up to 286,000 pounds. If the track is constructed to short line specifications, which may be appropriate if the line does not ultimately carry coal unit trains or other very heavy cargo, or carries less overall traffic (e.g., less than 30,000-40,000 or so annual carloads), it could likely be constructed for roughly $1 million per mile. This scenario assumes only minor

[18]Note: The less expensive rail construction costs are based on Federal Railroad Administration Class I and II track. The FRA track classes are based on maximum allowable speeds on the railroad and differ from the term "Class I railroad" which is a Surface Transportation Board classification on revenue generated by the Country's largest railroads. For this memorandum, Class I track is referring to railroads under the STB classification for areas with expected higher speeds and greater volumes of traffic. http://www.fra.dot.gov/downloads/PubAffairs/Track%20Standards%20fact%20sheet%20FINAL.pdf.

bridge work and relatively flat terrain, and 115-pound rail, which is the current standard for new construction on lines with moderate traffic.[19] The short line track would support 286,000-pound carloads.

Table 4.1 Average Cost Per Mile for Short Line Track

Component	Cost Per Mile (Average)
Track	$500,000
Grading	$300,000
Right-of-Way	$200,000
Total Cost per Mile	**$1,000,000**

Source: Interviews, 2011.

Constructing the extension to FRA Track Class I standards (i.e., 10 mph) could reduce construction costs further. However, ongoing operational and maintenance costs will be higher with the slower speed due to lower labor productivity, more frequent maintenance needs, and potential additional requirements for locomotives and rolling stock arising from lower equipment utilization.

The greatest opportunity for construction cost savings is in the area of track materials, with ties and rail comprising the largest cost elements. For both materials, it may be possible to acquire used rather than new material, but at the cost of higher maintenance expenditures in the future and somewhat diminished reliability. Such practices were prevalent in years past, particularly during the lengthy period of railroad downsizing when quality used materials were readily available in many regions of the U.S. Even now, it is not uncommon for short lines and industrial rail facilities to utilize a mix of old and new railroad ties, and used rail. However, obtaining the large quantities of suitable used ties and rail that would be necessary for this project will be difficult, and some of the potential savings may be offset by high transportation costs associated with moving the material over long distances to West Texas. In our research we found that there is very little used 115 (or even 112) pound rail available, and what there is, is not much less expensive than new. This weight rail is generally viewed as the minimum standard for 286,000 service, although, any weight rail over 100 pounds per yard can be safely utilized in return for higher ongoing maintenance costs. As a result, the $1 million per mile estimate envisions using used rail in the 100 to 110 pound range.

[19] Currently the WTLC between Seagraves and Lubbock uses 85-pound track, which is inadequate for handling regular volumes of 286,000 traffic in an efficient and safe manner. The railroad recently spent about $10 million dollars upgrading this section (Interviews with WTLC).

4.2 CONSTRUCTION COSTS FOR CLASS I AND SHORT LINE RAIL

The costs for the rail line constructed to Class I standards remain the same as the previous study, although they have been validated based on the recent TxDOT West Texas Rail Feasibility Study (2011) and interviews. That study verified the sources provided in the Permian Basin Rail Connection Economic and Financial Feasibility Study and converted costs from 2007 to 2010 dollars (first quarter) using the Consumer Price Index (CPI). The CPI provides an adjustment for inflation rates through the first quarter of 2010. An increase in costs of 5.98 percent from the previous study was assumed based on CPI.

- Total construction costs – $2.65 million per mile.

In the TxDOT West Texas Rail Feasibility Study, a slightly lower cost of $2.4 million was used for construction. However, interviewees for this study reported a range of Class I railroad construction costs in the Permian Basin region of between $2 and $3.5 million. To provide a more conservative estimate, $2.65 million number was used (consistent with the 2008 Permian Basin Rail Connection Economic and Financial Feasibility Study).

The Table 4.2 displays the construction costs for the two main segments evaluated, including the cost of three roadway grade separations (approximately $25.5 million total). The costs do not include any costs associated with finance, operations, or maintenance. The savings associated with constructing the $1 million per mile short line track is about $131 million for the Seagraves to Odessa segment and $112 million for the Odessa to McCamey segment.

Table 4.2 Construction Costs
Millions of 2011 Dollars

Alignment Segment	Class I Standard	Short Line Standard
Segment A – Seagraves-Odessa	$239.3	$108.0
Segment B – Odessa-McCamey	$254.5	$142.3

Construction Finance Costs

Like the previous study, the construction costs assume a revenue bond or similar financing over a 30-year term (2011-2040), from construction to full retirement of financing.[20] The total costs for this 30-year period for the Seagraves to Odessa segments is nearly $387 million including construction financing costs of about $148 million over the 30-year term. The financing assumes a 3.5 percent interest rate on the financing vehicle, which could be a mix of public and private capital. The next section will compare the total cost to potential revenues to produce a financial feasibility recommendation.

Table 4.3 Construction Costs with Financing
Millions of 2011 Dollars

Alignment Segment	Class I Standard	Financing Costs	Total (Including Financing)	Short Line Standard	Finance Costs	Total (Including Financing)
Segment A – Seagraves-Odessa	$239.3	$147.6	$386.9	$108.0	$66.6	$174.6
Segment B – Odessa-McCamey	$254.5	$156.9	$411.4	$142.3	$87.7	$230.0

Maintenance Costs

Maintenance costs from the original study were updated from 2007 to 2010 dollars based on the CPI and described in the West Texas Rail Feasibility Study. Operations costs were not included given that rail users would bear the cost of operations as part of their service. An annual maintenance cost of $10,600 per mile was used for both scenarios. However, if lower quality or used materials are utilized in construction, the materials may not have as long a life and maintenance costs may be higher over time. These costs were validated by the interviews. Over 30 years, the maintenance costs associated with the Seagraves to Odessa connection is about $26 million for the both types of rail construction. Table 4.4 presents the total cost per scenario including construction and maintenance. The estimate includes the cost of financing.

[20] Note: There are very few examples of public agencies assessing a ton-mile fee to secure long-term construction bonds. The Shellpot Bridge in Delaware assesses a sliding carload fee (depending on traffic demand). The Alameda Corridor in Los Angeles uses a carload fee, which is similar. Additionally, due to the cyclical nature of natural resource extraction (i.e., oil services) in the region assumed to be driving much of the rail demand, shorter term bonds (i.e., 20-25 years) might be more attractive to potential investors.

Table 4.4 Construction and Maintenance Costs
Millions of 2011 Dollars

Alignment Segment	Class I Standard	Maintenance Costs	Total (Including Financing)	Short Line Standard	Maintenance Costs	Total (Including Financing)
Segment A – Seagraves-Odessa	$386.9	$26.2	$413.1	$174.6	$26.2	$200.8
Segment B – Odessa-McCamey	$411,.4	$22.3	$433.7	$230.0	$22.3	$252.3

5.0 Financial Feasibility

5.1 Revenue Estimate Methodology

The methodology from the original study for assessing carload fees remains similar with this update for the baseline rail demand; however the rail fee rate of $0.10 was reduced to $0.04 for the baseline carload demand. This rate was reduced to assume greater cost competitiveness with trucks, build market share for the rail service, and still generate a small profit from the trip to help retire revenue bonds. Currently, a Class I railroad average revenue for carloads across all commodities is about $0.033 per ton-mile.[21] This rate is considerably lower than the $0.20 to $0.30 per ton-mile rate charged by the trucking industry in the region and also allows shippers to access the national rail network and spread costs out over a longer trip. For the supplemental demand, $0.04 cents per ton-mile was applied as potential revenue for oil services inputs in the low estimate.[22] For the high estimate, a ton-mile charge of $0.06 was assumed. If at a future time coal becomes a major shipment over the line, the facility would expect to collect a $0.02 cents per ton-mile carload fee is assumed for coal shipments (consistent with average Class I rates).[23]

The estimate assumes an average carload weight of 111 tons with the assumption that the average distance traveled on the new route would be about 60 miles, consistent with the original study. The results of the revenue estimates are described below.

[21] Source: AAR Class I Railroad Statistics, 2011.

[22] Note: Based on research from BNSF/UP and the interviews on frac sand and chemical shipments, carried by rail from outside the region (such as the Upper Midwest) to the Permian Basin via the Dallas Metroplex. Certain commodities may warrant a slightly higher fee (6-7 cents per ton/mile based on transportation distance and product demand), however the $0.04 conservative estimate leaves some room for marketing rail in this area.

[23] Source: AAR 2010 Railroads and Coal, 2010.

5.2 REVENUE ESTIMATES

The assumptions were applied to the forecast demand data to produce the following carload revenue estimates for each scenario (Table 5.1).

Table 5.1 Potential Revenue, 2010-2040
Millions of 2011 Dollars

Alignment Segment	Baseline	Low Estimate[a]	High Estimate[b]
Segment A – Seagraves-Odessa	$109.7	$185.0	$510.8
Segment B – Odessa-McCamey	$57.7	$83.3	$204.4

[a] Low estimate assumes 5 percent market capture of the well development and maintenance traffic. Revenue is $0.04 per ton-mile. Assumes that each well generates 23 carload equivalents for well development and 2 annual carload equivalents for maintenance.

[b] High estimate assumes 10 percent market capture of the well development and maintenance traffic. Revenue is $0.06 per ton-mile. Assumes that each well generates 47 carload equivalents for well development and 2 annual carload equivalents for maintenance.

The next section describes either the funding gap or expected profit associated with each segment under each scenario.

Baseline Demand Scenario

Table 5.2 shows the funding gap and expected revenue for each segment under the baseline demand scenario. Assuming the costs associated with Class I railroad standard construction of $2.65 million per mile, the costs are greater than the revenue for the Seagraves to Odessa segment and the Odessa to McCamey segment.

Table 5.2 Baseline Scenario Potential Feasibility
Millions of 2011 Dollars

Class I Standard ($2.65 Million per Mile)				Short Line Standard ($1 Million per Mile)		
Alignment Segment	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)
Segment A – Seagraves-Odessa	$413.1	$109.7	($303.4)	$200.8	$109.7	($91.1)
Segment B – Odessa-McCamey	$433.7	$57.7	($376.0)	$252.3	$57.7	($194.6)

As described in the previous section, a review of truck traffic on several highways south of the Midland-Odessa area towards McCamey indicated a lower (or negative) growth rate for trucks between 2003 and 2010, indicating that much of the activity in the oil services industry (and support industries) is happening in fields north of Midland-Odessa. The northern portion of the rail corridor (Segment A) better serves those areas and the potential rail demand is reflective of this activity.

Assuming updated baseline demand and a less expensive standard of rail construction ($1 million per mile), the Seagraves to Odessa segment has a funding gap about $91 million.

Low Carload Estimate

This scenario assumes identical costs to the Baseline scenario as well as an additional 5 percent of the carload traffic associated with drilling of new wells. Under this scenario carload revenue is $0.04 per ton-mile. This estimate is based on the assumption that 23 carload equivalents of material are required for each oil well to be developed. As described in the Demand Update section, there is stronger growth associated with the fracking process and new oil wells in the Counties north of Odessa. Demand estimates suggest that segment alone, using the Class I standard track, could generate revenue of nearly $185 million but still leave a funding gap of $228 million by 2040 (constant 2011 dollars) under the assumptions of the Low Estimate for the Seagraves-Odessa segment. With construction costs of $1 million per mile and the same revenue would still far short of covering costs, with a $15 million shortfall over the 40-year period for the Seagraves-Odessa segment. The gap is greater on the Odessa-McCamey segment, with a $350 million gap with a Class I standard and $169 million with a Short Line Standard.

Table 5.3 Low Carload Estimate Potential Feasibility
Millions of 2011 Dollars

Class I Standard ($2.65 Million per Mile)				Short Line Standard ($1 Million per Mile)		
Alignment Segment	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)
Segment A – Seagraves-Odessa	$413.1	$185.0	($228.10)	$200.8	$185.0	($15.80)
Segment B – Odessa-McCamey	$433.7	$83.3	($350.40)	$252.3	$83.3	($169.00)

High Estimate[24]

This scenario assumes revenue from baseline carloads as well as capturing 10 percent of the potential carloads associated with the oil services industry. Under this scenario carload revenue is $0.06 per ton-mile. All other assumptions are identical to the Low Estimate. Under this scenario the Seagraves-Odessa segment is feasible and produces potentially long-term profitability under both the high and low construction cost scenarios. Under both construction scenarios (Class I and Short Line) the Odessa to McCamey segment does not produce a feasible investment.

Table 5.4 High Carload Estimate Potential Feasibility
Millions of 2011 Dollars

Class I Standard ($2.65 Million per Mile)				Short Line Standard ($1 Million per Mile)		
Alignment Segment	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)	Cost (Construction, O&M)	Potential Revenue	Feasibility (Funding Gap or Profit)
Segment A – Seagraves-Odessa	$413.1	$510.8	$97.7	$200.8	$510.8	$310.0
Segment B – Odessa-McCamey	$433.7	$204.4	($229.3)	$252.3	$204.4	($47.9)

Table 5.5 summarizes feasibility across all three scenarios. It shows that Segment A – Seagraves to Odessa is potentially feasible under the High Estimate scenario at Class I and Short Line construction standards but is not likely to be feasible under the Low Estimate. Segment B remains unfeasible under all scenarios.

[24] As noted above, at this level of carload traffic it is unlikely that a lower standard of track would be constructed since the costs of replacing rail, ballast, and other track components would, over time, more than overcome the cost savings associated with construction of the less expensive rail.

Table 5.5 Summary of Feasibility (Funding Coverage or Gap)
Millions of 2011 Dollars

Class I Standard ($2.65 Million per Mile)				Short Line Standard ($1 Million per Mile)		
Alignment Segment	Baseline	Low Estimate	High Estimate	Baseline	Low Estimate	High Estimate
Segment A – Seagraves-Odessa	($303.4)	($228.10)	$97.7	($91.1)	($15.80)	$310.0
Segment B – Odessa-McCamey	($376.0)	($350.40)	($229.3)	($194.6)	($169.00)	($47.9)

6.0 Conclusions and Recommendations

The major findings from the interviews and updated feasibility analysis are as follows:

1. Updated demand estimates indicate that constructing and operating a new freight rail connection in the Permian Basin, especially between Seagraves and Odessa are feasible based on existing demand and projected growth in certain industries in the region. The updated cost estimates and demand calculations based on the interviews provide opportunities to leverage growing markets in the region. LEAP may choose to issue bonds for the construction with the expectation that they will be paid off within the 30-year time horizon through carload fees. LEAP may also choose to partner directly with either a short line rail operator, outside investor, or major shipper to jointly finance all or part of the projects.
2. Participants in the oil services industry expect 10 years of solid growth, especially as a result of advances in hydraulic fracturing. The demand for transportation of inputs to the fracking process is currently outstripping supply in many areas.
3. Crude oil shipment by rail represents a burgeoning new market, but is not included in the assessment due to its uncertain future. The longer-term potential of rail to carry crude will depend on the degree to which pipeline expansions can keep up with growing demand. At minimum, LEAP should explore the future demand for crude oil shipments on the proposed connection and opportunities to develop transloading facilities for trucks to bring oil to the rail connection.
4. Several of the interviewees (especially those involved in oil services) stressed that the time was *now* to construct the rail line to provide an alternative mode of transporting their cargo beyond the highways, Union Pacific, and the existing short line.
5. LEAP should identify a list of partners to explore and discuss financing and implementation strategies for constructing at least one of the rail alternatives. Because Iowa Pacific Holdings, parent company of the WTLC would likely benefit from the connection to the Midland-Odessa market, LEAP should consider discussing potential partnership opportunities. The LEAP Board should also discuss potential partnerships with oil service companies.
6. The development of the Summit Power plant at Penwell, Texas could contribute significant revenue and feasibility to a Midland-Odessa to Seagraves rail extension. However, due to the presumed utilization of Union Pacific, the

carload estimates for Summit Energy are provided for information purposes only and are not part of the revenue estimate.

7. This memorandum summarizes the advisory findings of this study update and is not a substitute for a detailed investment-grade study. As the LEAP Board and potential partners discuss possible investment scenarios, an investment grade study would be required to secure future financing.