BEFORE THE
SURFACE TRANSPORTATION BOARD

Finance Docket No. 36025

TEXAS CENTRAL RAILROAD AND INFRASTRUCTURE, INC. &
TEXAS CENTRAL RAILROAD, LLC
-AUTHORITY TO CONSTRUCT AND OPERATE-
PASSENGER RAIL LINE BETWEEN DALLAS, TX AND HOUSTON, TX

Verified Statement of John T. Harding
In Support of Reply to Petition for Exemption

1. My name is John T. Harding. As Chief Maglev[1] Scientist for the U.S. Department of Transportation, Federal Railroad Administration ("FRA") from 1976-2004, I participated in and contributed to several High Speed Rail ("HSR") and Maglev deployment studies commissioned by Congress.

2. I am a consultant in transportation technology and economics. In addition to my experience at the FRA, I obtained a Ph.D. in Physics from California Institute of Technology in 1958, and a MA equivalency in Economics from University of California at Berkeley in 1978.

3. In preparation for this statement, I have reviewed:

   a. The Petition for Exemption ("Petition") filed by Texas Central Railroad and Infrastructure, Inc. and Texas Central Railroad, LLC ("TCR");

   b. Redacted portions of the Texas Central High Speed Rail Feasibility Study by the Louis Berger Group dated February 2013;[2]

[1] Maglev (derived from magnetic levitation) is a transport method that uses magnetic levitation to move trains with magnets and electricity without touching the ground.
[2] TCR has not provided the full version.

c. the Statewide Ridership Analysis Report authored by the Texas Department of Transportation (the "TxDOT Report")[3] dated December 2013;

d. TxDOT District Traffic Maps 2014, District Base Sheet Supplemental;

e. the TxDOT Statewide Planning Map application;[4]

f. Numerous online studies and articles regarding high-speed rail; and

g. Various other materials that pertain to TCR's proposed construction of the 240-mile-long rail corridor, including materials on TCR's website.

4. I have come to the following conclusions regarding the inadvisability of exempting TCR's proposed high-speed rail line from the prior approval requirements of 49 U.S.C. § 10901.

COST OF PROJECT

5. The issue as I see it is whether TCR can meet operating expenses and repay lenders and investors for the $10-$18.3B estimated cost of the high-speed rail line from Dallas to Houston ("Dallas-Houston HSR"). Initially, I would note that $10B for construction (TCR's estimate in its Petition), or even $12B (TCR's most recent estimate), appears to be artificially low based on TCR's estimates of $16.8B[5] to $18.3B[6] contained in the TxDOT report, and my general experience with railroads underestimating construction costs while seeking regulatory approval.

PASSENGERS PER YEAR (RIDERSHIP PROJECTIONS)

6. The TxDOT Report, dated December 2013, was written by TxDOT with input from TCR. Based on TCR's input, TxDOT estimated the upfront capital cost of the Dallas-Houston HSR at $18.3B.[7] I believe this number is much more accurate than the lowball figure of $10B

[3] See Exhibit 2 to TAHSR's Reply to Petition for Exemption.
[4] http://www.txdot.gov/inside-txdot/division/transportation-planning/maps/statewide-planning.html.
[5] TxDOT Report at 74, Table 35.
[6] *Id*. at 71, Table 32.
[7] *Id*.

advanced by TCR in its Petition, or the $12B figure TCR company officials recently quoted to reporters. Further, TxDOT estimates the 2035 annual ridership between "0.7M to 2.7M passengers," a range critically below the four million projected by TCR in its Petition. The low-end projection of 700,000 annual passengers should give the Board grave concern. The TxDOT Report also notes that "…the Dallas Fort Worth to Houston corridor has air service within the corridor at a level of competitiveness far above the other corridors as compared to the assumed passenger rail service."[8] This is a *negative* indication for the viability of the Dallas-Houston HSR, and may spell doom for such an expensive project.

7. It is clear from the initial ridership projections from TxDOT, and using TxDOT's highest initial projection of 2.7M,[9] the Dallas-Houston HSR will not be a viable undertaking. TxDOT goes on to say that TCR's numbers would need to be "modified" for the Dallas-Houston HSR to be more competitive with air service.[10] In my years of experience, I have seen many consultants and agencies "modify" numbers, but even "modifying" these numbers will not make the Dallas-Houston HSR viable.

8. TxDOT "modified" the numbers based on publicized assumptions being used by TCR.[11] TxDOT assumed two highly significant conditions: (1) removal of the highly touted Brazos Valley stop, and (2) reducing the rail fare to $108.[12] TxDOT then performs undisclosed mathematical gyrations to *double* the ridership estimates. No federal regulatory agency could possibly accept a doubling of the most significant number—ridership—without supporting documentation. Again, TxDOT's annual ridership projections ranged from 0.7M to 2.7M. Using

[8] *Id*. at 73.
[9] *Id*. at 71, Table 32.
[10] *Id*. at 73.
[11] *Id*.
[12] *Id*.

its gyrations, TxDOT shows TCR's projections of annual ridership doubling to 1.5M to 5.7M.[13] Although I question the doubling of these projections, for purposes of the Income Statements below, I will give TCR the benefit of the doubt and use the highest annual ridership estimate of 5.7M. Even using this figure, the numbers prove that the Dallas-Houston HSR will be a financial disaster.

9. Even though I am using TCR's number, it is important to thoroughly examine the current ridership disinformation circulated by TCR to gain public and political support. TCR is currently reporting to the politicians and the public that *90,000 vehicles per day currently travel between Dallas and Houston* .[14] Based on TxDOT's own traffic counts, there is no support whatsoever for TCR's report of daily vehicular traffic moving between Houston and Dallas.

10. TxDOT conducts 24-hour traffic counts 365 days a year along the I-45 highway between Dallas and Houston.[15] These traffic counts can be accessed using TxDOT's Statewide Planning Map application. Logically, the number of vehicles traveling between Dallas and Houston daily *must be less* than the minimum traffic point along the route. Even TCR could not debate this point.

11. The minimum traffic point occurs near Streetman, TX, and in 2014 amounted to an average annual daily traffic of 26,256 vehicles (9.58M/y), of which 40.4% are trucks.[16] Of course, commercial trucks cannot be used to estimate potential for high-speed rail. Reducing 26,256

[13] *Id*. at 74, Table 35.
[14] See Exhibit 13 to TAHSR's Reply to Petition for Exemption. Online link: https://youtu.be/k6igUibrfwc?t=49s.
[15] http://www.txdot.gov/inside-txdot/division/transportation-planning/maps.html.
[16] See Exhibit 14 to TAHSR's Reply to Petition for Exemption, from TxDOT's Statewide Planning Map application.

vehicles by 40.4% trucks leaves 15,648 passenger vehicles. In addition, it should be noted that TxDOT only projects 39,015 vehicles/day moving between Houston and Dallas by 2034.[17]

12. All of these traffic counts include two types of traffic: specific Dallas to Houston traffic, and other traffic.

13. Other traffic includes two components: (1) local traffic traveling short of Dallas to Houston, for example from Corsicana to Buffalo, and (2) any long-haul traffic traveling beyond Dallas or Houston on either end. Other Traffic will likely be much greater than specific point-to-point traffic, such as Dallas to Houston. Further, I would expect a significant amount of local traffic based on my experience. TCR's consultant, the Louis Berger Group, has estimated that the specific Dallas to Houston traffic percentage would be 55%, a seemingly high figure for which no supporting data has been provided. Nonetheless, to cast TCR's project in the most favorable light, I will use TCR's consultant's 55% figure in my calculations on TxDOT traffic counts.

14. Based on my experience and background, and the available studies on HSR projects similar to TCR's, it would appear that a realistic estimate of diversion rates (or induced ridership) for Dallas to Houston vehicular traffic is below 10% of eligible passenger vehicles. Indeed, induced ridership should be constrained to less than 10% in light of fatally flawed overestimates typically used in connection with other HSR projects.

15. I would note, however, that the Berger Group uses a diversion rate (15%) which is at least 50% higher than I would opine. To give TCR the benefit of the doubt, I have used the Berger Group's 15% diversion rate in the following Traffic Study Chart, which is based on TCR's most favorable assumptions, along with TxDOT's numbers.

[17] *Id*.

TxDOT TRAFFIC STUDY CHART

	2014	2034
Average Daily Minimum Traffic Count (TxDOT)	26,256	39,015
➢ Reduce by TxDOT Truck Percentage	40.4%	40.4%
➢ Total Passenger Vehicles at Minimum Traffic Spot – Streetman, TX	15,648	23,253
Dallas to Houston Factor (from the Berger Group)	55%	55%
Dallas to Houston Only Passenger Vehicles (available to divert to HSR)	8,606	12,789
Diversion Factor to HSR (from the Berger Group)	15%	15%
Maximum New HSR Passengers Per Day Diverted	1,291	1,918

16. If *on day one of operations* TCR captured its target of 20% of the 2,858 airline passengers[18] (571) that on average fly between Dallas and Houston daily, and diverted its target of 15% of available Dallas to Houston passenger vehicles, its daily passenger rate would total only 1,862 passengers (571 + 1,291). This number, which is more than 9,000 passengers short of TCR's 10,958 daily projection (4M annually), would not sustain the Dallas-Houston HSR and would undermine any environmental benefit, as the trains would be running near empty. There appears to be no reasonable likelihood that TCR could repay its investment, much less pay operating costs, with a realistic appraisal of ridership.

[18] See Exhibit 12 to TAHSR's Reply to Petition for Exemption, from U.S. Department of Transportation's Domestic Airline Consumer Airfare Reports.

TICKET PRICE

17. In the TxDOT Report, TCR acknowledges that it must reduce ticket prices to $108 to stimulate demand in order to achieve their "doubled" ridership statistics.[19] I have used the TxDOT $108 price for the ticket in the following financial calculations.

RETURN TO INVESTORS

18. High-speed rail ("HSR") projects are typically regarded as risky investments, and therefore investors usually require a significant rate of return. I am aware that in the case of the Florida HSR project, investors required a 12% rate on bonds of return based on the risky nature of the project. Rather than use 12%, I have used 5% as a blended rate for debt service and investor return in my example, which represents a conservative assumption.

19. I note that the proponent of the Florida HSR issued bonds at a 12% coupon rate. Obviously, equity investors will require some guaranteed return on such a risky investment. Further, any debt to the Japanese must be repaid on an amortized schedule, and bonds will eventually need to be retired. Any traditional debt will also have to be repaid on an amortization schedule with interest and principal. When bonds are utilized in an infrastructure project, there is typically a coupon rate representing interest, and with a mandated sinking fund to retire the principal amount of the bond at maturity. In my calculations, I have used a straight 5% rate as the blended cost of debt, bonds, and investor capital, which I believe is conservative and favoring TCR. To provide context, a fully amortized payment at 2.9% interest on a 30-year amortized loan of $12B is $600,043,438. In comparison, a straight 5% rate on $12B is $600,000,000. In other words, using the straight 5% rate for purposes of my calculations on TxDOT's traffic numbers comparisons, is equivalent to using a 2.9% rate on debt and bonds, and

[19] TxDOT Report at 73.

assuming that equity would want a 5% return due to the risk. Of course, as stated above, in Florida the bond investors required 12% on the HSR project, about 900 basis points over a 2.9% rate. After considering all of these factors, I have used an optimistic and conservative assumption (favoring TCR) of 5% for a weighted cost of capital, bonds, and debt.

OPERATION AND MAINTENANCE

20. Operations and maintenance costs are obviously in addition to debt service and return to investors. In my calculations, the estimated annual operations and maintenance cost (O&M) are taken directly from the TxDOT Report. I believe the O&M numbers are underestimated, based on ridership miles. Again, I have used the high-end ridership projection of 5.7M, which at 240 miles is 1,368,000,000 annual passenger miles. Using the low figure of $266M for O&M costs provided by TCR to TxDOT, TCR's average O&M cost is $0.19 per passenger mile. The international average is approximately $0.30 per passenger mile, and I expect TCR's O&M costs to meet or exceed this average. As a result, using TCR's low estimate of $266M is once again giving TCR the benefit of the doubt, underscoring the extremely conservative nature of my analysis.

INCOME STATEMENT

21. The below Income Statement gives TCR every benefit of the doubt. It applies TCR's most favorable ridership estimate as utilized by TxDOT (5.7M/year). It ignores the $18.3B TxDOT estimate, and instead uses TCR's most recent construction cost estimate ($12B), TCR's O&M estimate ($266M), and the $108 ticket cost. Even after using all of TCR's estimated numbers, its Project will run an annual loss of $250,000,000. To clarify, this *quarter billion-dollar deficit* occurs after 20 years of operation, when the train should be running at optimal levels.

Passengers Per Year in 2035	5,700,000
Ticket Price	$108
Gross Annual Revenue	$615,600,000
Less Debt Service/Return to Investors (5% interest only on $12,000,000,000 upfront capital)	$600,000,000
Annual Revenue available after Debt Service/Return to Investors	$15,600,000
Less: Annual O&M Costs	$266,000,000
Annual Deficit	($250,400,000)
Deficit over 40 years	($10,016,000,000)

22. In comparison, the below Income Statement uses TCR's ridership estimate from its Petition (4M/year), and TxDOT's more realistic construction cost estimate ($16.8B).

Passengers Per Year in 2035	4,000,000
Ticket Price	$108
Gross Annual Revenue	$432,000,000
Less Debt Service/Return to Investors (5% interest only on $16,800,000,000 upfront capital)	$840,000,000
Annual Loss after Debt Service/Return to Investors	($408,000,000)
Less: Annual O&M Costs	$266,000,000
Annual Deficit	($674,000,000)
Deficit over 40 years	($26,960,000,000)

23. Under either scenario, the deficit over 40 years will exceed $10 billion. Both of these scenarios are analyzing 2035, after 15 years for ridership to ramp up. One can only imagine the deficit TCR will run the first five years of the Project. Using TxDOT's low-end ridership figure

of 700,000 (1,500,000 after the doubling) would result in immediate failure. In short, even using TCR's favorable ridership and construction cost projections, the Dallas-Houston HSR does not appear to be financially viable in either the short or long term.

24. There is another trend that the Board should consider before granting approval to construct this Project. From my review of air-traffic statistics, air ridership between Dallas and Houston has been falling dramatically since 2000. Also, there is evidence that auto travel is starting to show a decline. During economic downturns, many businesses turned to electronic means of communication, such as video conference calls. Initially this was quite expensive, and oftentimes entailed traveling to a video conference center. As the economy has rebounded, many businesses have stayed with electronic conferencing, rather than business travel, both for the cost savings and due to the lost executive time during travel. Now anyone with an Apple smart phone can conduct a video conference via FaceTime. Skype and many other programs are also available for basically cost-free video conferencing. This is a threatening development regarding feasibility of a new and expensive HSR line, constructed primarily for business travelers.

ADVISABILITY OF HIGH SPEED RAIL FOR DALLAS TO HOUSTON CORRIDOR

25. When I was Chief Scientist at the FRA, Congress required that the FRA examine the market for HSR and Maglev. Eight corridors were examined,[20] including the Texas Triangle between Houston, San Antonio and Dallas. Some other corridors looked more favorable, assuming that government investment covered external benefits. The Texas Triangle did not appear to be promising; however, it showed "partnership potential" for "New HSR" using a longer, wishbone-shaped, shared route via Waco. The wishbone shaped corridor presented the best potential for Texas HSR, as it allowed travel between six of Texas' major cities: Houston (4th largest city in US

[20] See Figures 7-8 at http://www.fra.dot.gov/eLib/details/L02519 of which I was a contributing author.

population), San Antonio (7th), Dallas (9th), and Austin (11th), Ft. Worth (16th) and Waco. The wishbone corridor ran north and south from Dallas to Waco. It then split into two paths, southeasterly toward Houston and south towards Austin and San Antonio. This spread the enormous capital expenditure for HSR construction over a ridership base in six significant cities, including five out of the 16 most populous cities in the United States. Notably, under the wishbone-shaped corridor, the first 100 miles south from Dallas was only built once. TCR's Project would require a redundant southbound track built through Waco, if Austin and San Antonio will ever be served.

26. In contrast, TCR's proposed Dallas-Houston HSR does not incorporate the wishbone corridor's economic good sense and economies of scale, and forces the $12B to $18.3B expenditure to be funded by the ridership base exclusively in Houston and Dallas; hence, the certain failure.

VERIFICATION

I, John T. Harding, declare under penalty of perjury that the foregoing statement is true and correct. Further, I certify that I am qualified and authorized to file this statement.

Executed on May 31, 2016

/s/ John T. Harding