Review of Baltimore-Washington Superconducting MAGLEV Project Draft Environmental Impact Statement and Section 4(f) Evaluation

Prepared by Norman Marshall, President, Smart Mobility, Inc., for the City of Greenbelt, Maryland

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smart mobility

Qualifications

I received a B.S. in Mathematics from Worcester Polytechnic Institute (1977) and an M.S. in Engineering Sciences from Dartmouth College (1982). My studies at Dartmouth College included graduate courses in transportation modeling.

I have 33 years of professional experience in transportation modeling and transportation planning including 14 years at RSG Inc. (1987-2001) and 19 years at Smart Mobility Inc. (2001-now).

My primary professional focus is regional travel demand modeling and related transportation planning. I am a nationally known expert in this field and have completed projects in over 30 states including work for the U.S. government, state Departments of Transportation, Metropolitan Planning Organizations, cities, and non-profit organizations. One of my particularly notable projects is a $250,000 project with the California Air Resources Board where I led a team including the University of California in reviewing the state's regional travel demand models.

I have many peer-reviewed publications and conference presentations, including presentations at national Transportation Research Board conferences in 2017, 2018 and 2019.

I am an Associate Member of the Transportation Research Board.

My resume is attached as Appendix A.

Executive Summary

I have reviewed the Draft Environmental Impact Statement and Section 4(f) Evaluation (DEIS) for the Baltimore-Washington Superconducting MAGLEV Project. Specifically, I have reviewed the transportation and economic analyses and find:

1) The DEIS fails to completely disclose the ridership modeling reports developed for the Project. The Federal Railway Administration falsely claims that they are "confidential business information that was not relied on to prepare the Draft Environmental Impact Statement (DEIS)." These reports are the foundation for much of the information in the DEIS. The FRA's failure to review these reports is a failure to take the required "hard look" at Project impacts.

2) The DEIS hides and does not address who will pay for the huge cost of constructing the SCMAGLEV.

3) The DEIS does not demonstrate that operating and maintenance (O&M) costs will be offset by revenues. This leads to huge unanswered questions regarding the financial viability of the project and the possible need for subsidies should revenues fail to offset O&M costs.

4) The DEIS inflates ridership by a) failing to screen out unrealistic zone-to-zone trips, and b) applying unrealistically high SCMAGLEV mode shares to overly large catchment areas.

5) The DEIS fails to disclose critical information about the stated preference survey that one of the redated reports states "forms the basis of the ridership forecasts."

6) The DEIS overestimates travel time savings and reliability benefits by a factor of five or more.

7) The DEIS overestimates auto mode parking and toll costs and ignores SCMAGLEV parking costs.

8) SCMAGLEV would undermine MARC, Amtrak and bus service and have negative impacts on minority and low-income populations. Very few would be able or willing to pay the $70-79 peak and $59-$69 off-peak proposed one-way ticket prices to use the SCMAGLEV.

9) The DEIS overestimates induced travel.

10) The DEIS fails to present a ridership range that reflects the great uncertainty in the Project. In a more realistic range of ridership outcomes, the median estimate is only a third of the DEIS forecast.

11) The Project Sponsor is mispresenting construction and permanent SCMAGLEV jobs including using a permanent jobs number of 14,600 vs. the DEIS estimate of 390 to 440. The DEIS ignores the jobs that will be lost from cuts to other public transit options and all the estimated job benefits from the SCMAGLEV would also occur from investment in the more affordable other transit options.

12) Three quarters of the purported economic benefits of SCMAGLEV are travel time and reliability benefits and these are overestimated by a factor of 15 or more. Even with the inflated travel time and reliability benefits assumed, the DEIS shows that these benefits are not large enough to cover additional out-of-pocket costs. When more realistic travel time and reliability benefits are assumed, riders would pay an average of $30 more than the value of the benefits received.

13) The other two significant benefits claimed in the DEIS – safety and congestion – rest on inflated ridership numbers and rely on simplistic and unreliable vehicle miles traveled (VMT) multipliers.

14) I conclude that the supposed congestion relief for non-SCMAGLEV travelers will not materialize. Instead, construction of the SCMAGLEV will create a two-tier system with a fast ride for the affluent and negative consequences for everyone else.

15) The DEIS documents significant negative construction impacts. These impacts are not fully analyzed in the DEIS but include hundreds of trucks per day at multiple locations for seven years. For example, it is expected that construction of the Train Maintenance Facility (TMF) will require 100 trucks a day or more over the seven-year construction period. This is of particular concern to the City of Greenbelt, as two of the three TMF options are proximal to Greenbelt on the Beltsville Agricultural Research Center. There are also significant traffic impacts in and around the City from construction of the southern portal and southern viaduct. Construction trucks will not be permitted on the BW Parkway and instead will be routed on local roads – some of which already are severely congested. There also will be many temporary road closures in the area. More information about these impacts and mitigation should have been included in the DEIS.

Critical DEIS Documents Have Not Been Provided to the Public

The DEIS refers to Baltimore Washington Rapid Rail, LLC (BWRR) as the "Project Sponsor." The DEIS extensively references ridership and revenue studies done for the Project Sponsor but fails to provide public access to these studies despite specific requests for them. Only on April 9, almost three months after the release of the DEIS, were two heavily redacted reports from a larger set of requested documents released. A Federal Railway Administration (FRA) email claims that the redactions are to "protect sensitive business information from disclosure."[1] This is a mischaracterization of most of the redactions, and many critical questions are left unanswered. One of the two redacted documents, Ridership Supplement 2018-12-10 Rev0_Redacted.pdf, is useless because it only includes summary numbers that are in the DEIS, and the DEIS numbers are different and appear to be more recent. The other document includes some information that is not in the DEIS but is heavily redacted as shown in this example.

Figure 1: Redaction Example from the Executive Summary of the Final Ridership Report[2]

- An intercity passenger forecasting model for the corridor was developed. (b) (4) [redacted]

In the example copied above, the Project Sponsor is unwilling to provide even the most basic information about the model. There is no possibility that the missing text is "sensitive business information." This problem is present throughout the redacted document.

Models are very complicated and unavoidably rest on assumptions and have limitations. No one should blindly accept the outputs of a "model" without knowing how the model was constructed and validated. The FRA email describes the missing reports as "confidential business information that was not relied on to prepare the Draft Environmental Impact Statement (DEIS)."[3] The DEIS <u>does</u> rely on these documents because they are the foundation for many of the critical numbers in the DEIS. The FRA should have taken a hard look at these documents and made them available to the public.

Three other heavily redacted documents were released on April 23. Again, very little new information was provided. A redacted Louis Berger memorandum concerning "SCMAGLEV Ridership Report Revenue and Operations Estimates Addendum" provides no unredacted revenue or operations estimates. The other two documents, scmaglev-ridership-data_request_part 1.pdf and scmaglev-ridership-data_request_part 2.pdf, include numbers provided elsewhere and many redactions.

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[1] Email from Faris Mohammed, Federal Rail Administration to Ian Fisher, Jill Grant and Associates LLC dated March 26, 2021.

[2] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, p. 2.

[3] Mohammed, March 26, 2021.

There are Huge Unanswered Questions About Possible Subsidies

The BWRR website, under the heading "Clearing Up Misconceptions," states:

> Independent ridership and revenue studies validate the financial feasibility of the project, which substantiated that operating and maintenance costs are projected to be completely offset by revenues. These assumptions will be validated in the Environmental Impact Statement (EIS) process.[4]

Questions about the financial viability of SCMAGLEV are not "misconceptions" and they have not been "cleared up." The DEIS is silent about who would pay for the huge capital cost of the project including the cost of utility relocations. The DEIS doesn't even present or attempt to verify the Project Sponsor's estimated capital cost, $13.8 to $16.8 billion, but forces the reader to calculate the cost using a table presenting purported job benefits.[5]. And that cost apparently doesn't include the cost of the SCMAGLEV vehicles, which will be manufactured outside the Washington-Baltimore-Arlington CSA, and other capital costs.[6] The actual capital cost of the Project is important and must be presented for the FRA and the public to meaningfully evaluate the Project. The source of that significant capital costs is also important, particularly where, as is the case here, the Project Sponsor has indicated it intends to rely on government support, and the FRA and the public must evaluate the use of funds for this Project versus numerous other rail or public transit options.

The DEIS does not validate the assumption that "operating and maintenance costs are projected to be completely offset by revenues." Estimated Annual O&M Costs of $60 to $67 million per year in 2018 dollars are buried in an Appendix.[7] The text accompanying these numbers states:

> This analysis assumes that funding for O&M would be provided through private funds and a mix of government funds and project-generated funds, such as fares and potentially advertising revenues.[8]

This statement lists "project-generated funds" as only one of three sources of O&M funding and explicitly lists "government funds" as an O&M funding source – contradicting the statement that the costs "are projected to be completely offset by revenues." Similarly, it does not demonstrate that the project will be "revenue-producing" as specified in the Project Purpose and Need. Most critically, it has no discussion about what would happen if SCMAGLEV revenues fail to cover O&M costs. Would the SCMAGLEV cease operation? If not, how would the revenue gap be closed?

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[4] https://bwrapidrail.com/facts/ accessed 3-23-21.
[5] DEIS at 4.6-16
[6] DEIS App. D-4 at D-20
[7] DEIS App. D.4 at D-32
[8] DEIS App. D.4 at D-32

The DEIS Overestimates SCMAGLEV Mode Share

The ridership estimates are fundamental to demonstrating that the proposed SCMAGLEV will meet the Project Purpose and Need and will not burden the public with endless subsidies. However, the ridership reports produced by BWRR's consultant were not provided with the DEIS and then were withheld as proprietary and confidential. The lack of this essential information has hindered my review and forced me to try to ascertain what was done based on the limited and sometimes contradictory information provided. Nevertheless, I have concluded that there are significant problems in the ridership forecasts.

At multiple points in this process, unjustifiable modeling choices have been made that push the SCMAGLEV ridership higher, as described below. These unjustifiable choices inflate ridership in a compounding way. This raises questions about whether the modeling is biased to achieve a high ridership estimate, i.e. to satisfy the Project Sponsor, and whether the FRA independently verified the modeling. Whatever the reasons, this inflated modeling does not satisfy NEPA's requirement to take a hard look at the Project's impacts.

There is a standard ridership estimation process. It is a bottom-up process that includes several steps:

1) estimate total travel in the corridor in a detailed trip table between small area zones – segmented by business vs. non-business,
2) estimate door-to-door travel times for every zone-to-zone trip for every mode including different possible access modes to stations (walk, transit, auto),
3) estimate costs for every zone-to-zone trip for every mode including fares, parking costs, and auto operating costs and tolls when appropriate,
4) screen out implausible zone-to-zone trips where there would be a large generalized cost penalty (cost difference + monetarized time difference),
5) estimate mode shares for every zone-to-zone trip (business and non-business) including access mode based on the comparative times and costs, and
6) sum up the trips by mode to get aggregate totals.

This bottom-up process generally appears to have followed in the DEIS although some choices were made that make the model less accurate. Rather than using the small Transportation Analysis Zones from the Baltimore and Washington, D.C. regional models, much larger zones were used with a total of 207 zones across 27 counties as summarized in Table 1.

Table 1: SCMAGLEV Zones vs. Baltimore Metropolitan Council (BMC) and Metropolitan Washington Council of Governments (MWCOG) Zones[9]

TABLE 2-1 ZONAL SYSTEM COMPARISON

	Maglev Studies		MPO	
County	SCMAGLEV	2003 DEIS	BMC	MWCOG
Alexandria, VA	2	0	0	65
Anne Arundel, MD	15	16	256	98
Arlington + Alexandria	7	29	0	206
Arlington, VA	5	0	0	141
Baltimore City, MD	20	22	300	0
Baltimore, MD	25	19	410	0
Calvert, MD	2	2	0	47
Carroll, MD	5	5	99	58
Charles, MD	8	3	0	113
Clarke + Jefferson	2	2	0	22
Clarke, VA	1	0	0	9
District of Columbia, DC	16	31	35	393
Fairfax, VA	17	24	0	540
Falls Church, VA	1	0	0	9
Fauquier, VA	3	2	0	50
Frederick, MD	7	5	35	130
Fredericksburg, VA	1	0	0	14
Harford, MD	6	3	155	0
Howard, MD	9	13	167	68
Jefferson, WV	1	0	0	13
King George, VA	1	1	0	25
Loudoun, VA	5	9	0	282
Manassas, VA	1	0	0	13
Montgomery, MD	20	23	115	376
Prince George's, MD	23	25	195	635
Prince William, VA	4	6	0	363
Spotsylvania, VA	3	1	0	62
St. Mary's, MD	2	2	0	75
Stafford, VA	4	2	0	90
TOTAL	**207**	**245**	**1,767**	**3,669**

As shown in Table 1, The MWCOG model has 393 TAZs in the District of Columbia, and the MWCOG model could have been used to calculate accurate travel times by auto and transit to the Washington, D.C. SCMAGLEV station. In the SCMAGLEV model, there are only 16 zones for the District of Columbia and these travel times will necessarily be less accurate – especially for transit where transit access time varies considerably over a distance as small as a single block. With the computer capability available today, there is no significant advantage to having a smaller number of zones, so this is a poor choice.

[9] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, Table 2-1, p. 14.

The DEIS Uses Overly Large Catchment Areas

The DEIS defines 25-mile catchment areas around each SCMAGLEV station. It states:

> To establish reasonable limits for the market area for intercity travel to be served by the SCMAGLEV stations, a 25-mile catchment area was established around each of the three stations.[10]

As shown in Figure 2, these "catchment areas" are unrealistic. The most obvious problem with the 25-mile catchment areas is that there are areas that are less than 25 miles from both the Washington D.C. and Baltimore stations as shown in the darker shaded area. This area is highlighted in Figure 3. Most of the City of Greenbelt is in the overlap catchment area, i.e. within 25 miles of both stations in both the Cherry Hill and Camden Yard alternatives. BWI Marshall Airport is as well. Clearly, no one would use SCMAGLEV to travel to and from this overlap area.

[10] DEIS App. D.2 at. C-106

Figure 2: DEIS “Catchment Area” for the Washington, D.C. and Baltimore Stationss Mapped for Camden Yards Alternative

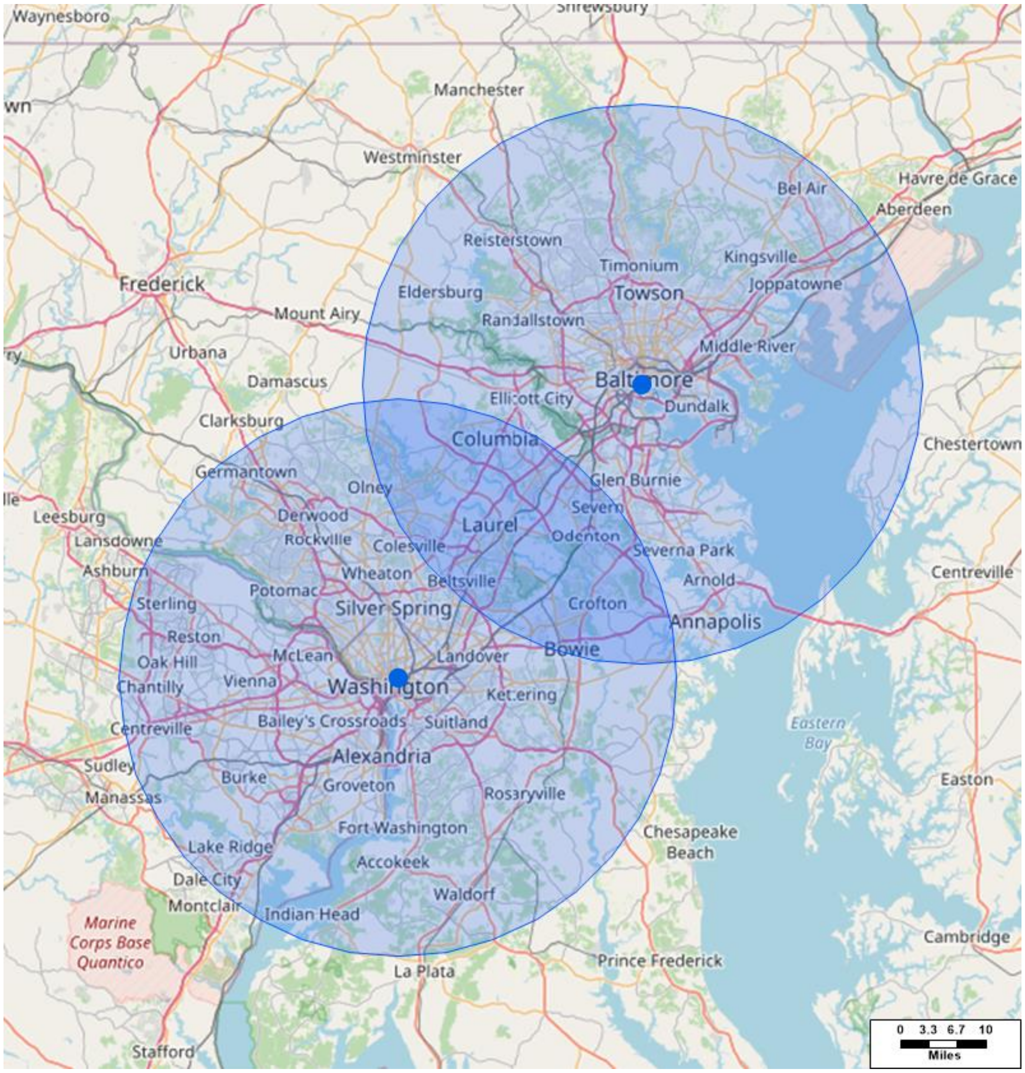
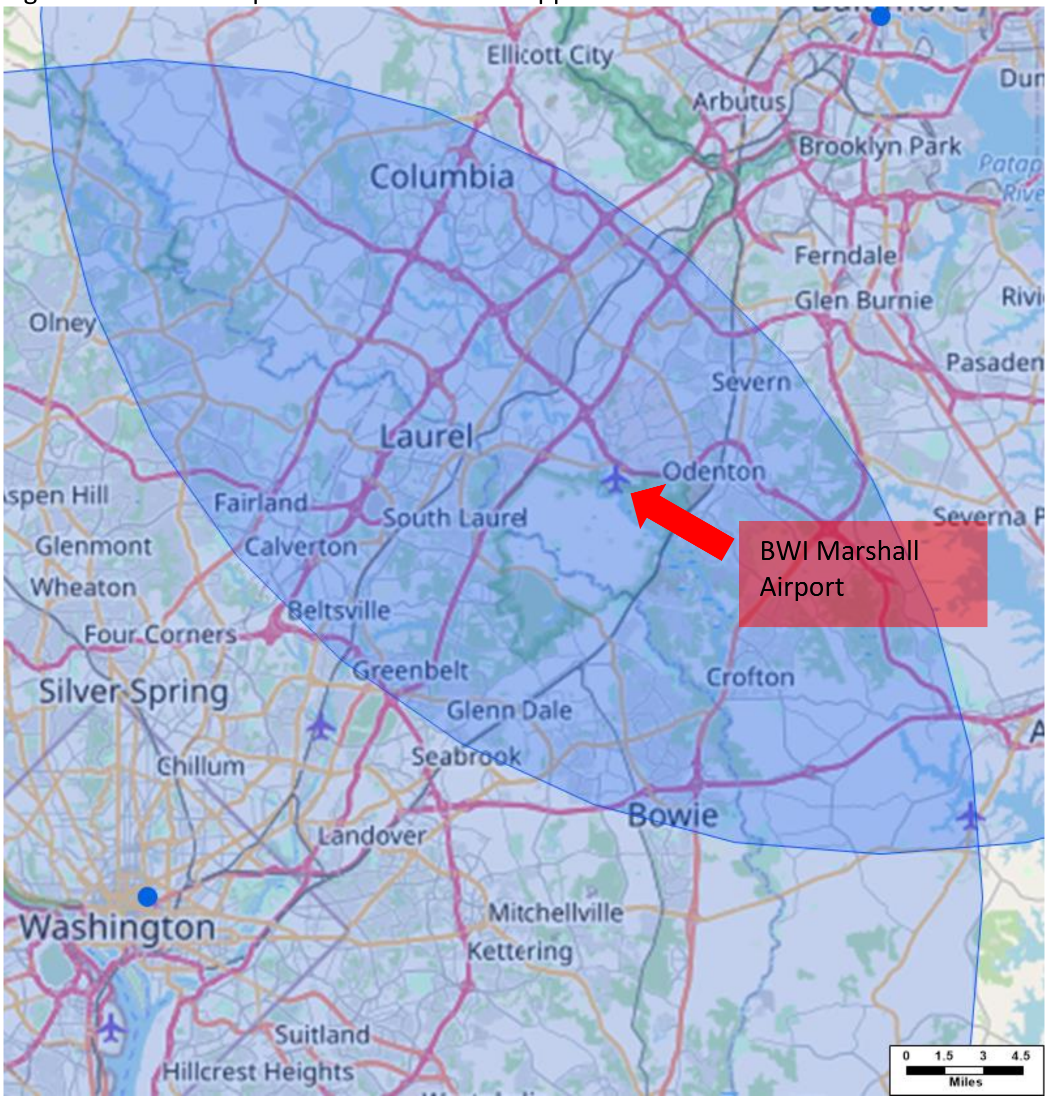


Figure 3: DEIS Overlap "Catchment Area" Mapped for Camden Yards Alternative



The DEIS Failed to Screen Out Unrealistic Trips

It is necessary to screen out unrealistic origin-destination pairs because even a small share of many unrealistic potential trips can add up to a large number. The DEIS applied some screening. It states:

> Within the Baltimore/Washington region, the 25-mile zone was further refined to reflect what was considered a reasonable catchment area for short distance trips within those respective larger areas.[11]

One of the redacted reports provides additional information about this screening process:

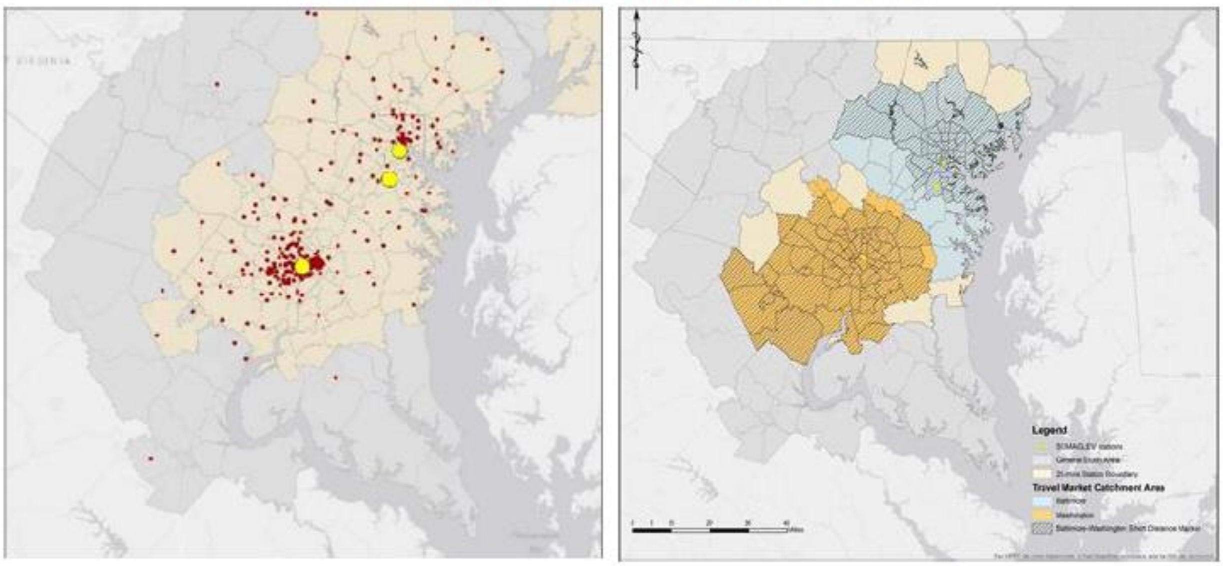
> The 25-mile zone was further refined to reflect what was considered a reasonable catchment area for short distance trips. The first part of the refinement was defining zones with centroids that were within a 30-40 minute drive of the proposed SCMAGLEV

[11] DEIS App. D.2 at C-106

stations (the blue and orange shaded regions in the right portion of Figure 3-11 that demarcate the Baltimore and Washington regions respectively). These delineated areas were further revised to exclude short cross-jurisdictional movements between the Baltimore and Washington regions, and are depicted by the cross-hatched area in right portion of Figure 3-11.[12]

Figure 4: DEIS Preliminary SCMAGLEV Market Areas[13]

FIGURE 3-11 PRELIMINARY SCMAGLEV MARKET AREAS



The figure on the left shows that limiting the catchment area to a 30-40-minute drive is little different than the 25-mile catchment area, so this step accomplishes very little. The figure on the right is barely legible in the redacted pdf document, but it appears that this screen is removing potential trips within the Washington, D.C. area (orange) and within the Baltimore area (darker blue). These trips certainly should be screened out, but this screen does not remove many other implausible trips. In the model, residents of Greenbelt still could travel to either Washington, D.C. or to Baltimore, and then take SCMAGLEV to the other city or to BWI Marshall Airport. The model also would allow trips perpendicular to the SCMAGLEV route, e.g. between Rockville and Annapolis. Screening should be done based on door-to-door generalized cost (cost plus monetarized value of time). A threshold should be set for a maximum additional cost that could be paid for SCMAGLEV and all origin-destination pairs that exceed this penalty should be screened out. It does not appear that this was done in the DEIS modeling.

Geographic Markets with Significant SCMAGLEV Time Savings Are Very Limited

Both the screening process and the subsequent mode share calculations require accurate auto travel times. One of the redacted reports states:

> Auto travel time and distance data feeding the model was obtained through Google Maps Directions API. This is a service that calculates directions and travel times, by mode of travel, between specified locations based on actual travel times experienced in the real-

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[12] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, Table 2-1, p. 35.

[13] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, Table 2-1, p. 35.

world under conditions. Google API data was collected for a typical Tuesday in April for the four time of day periods included in the model.[14]

This is an appropriate way to calculate auto travel times. Owen Kelley used a very similar method to calculate auto travel times using the Bing Maps Route API.[15] He found that very few origin-to-destination travel times would have significant time savings with SCMAGLEV. The DEIS states:

> These two urban areas (Baltimore and DC) are approximately 40 miles apart. The anticipated SCMAGLEV services are estimated to reduce travel times by 8 to 27 minutes of travel time savings depending on the trip purpose and length under each of the Build Alternatives.[16]

Kelley used these time thresholds to map plausible SCMAGLEV trips. In these maps, Kelley makes an important point that it is unrealistic to have long access time on both ends of a SCMAGLEV trip. In his Figure 2 (reproduced as Figure 5) he shows that for trips to large portion of Washington D.C., there is a relatively small area in Baltimore City and Baltimore County from which there would be significant time savings. In his Figure 3 (reproduced as Figure 6), he shows that for trips to a very small area in Washington, D.C. around the station, there is a larger catchment area. In neither of these maps do the travel sheds extend to the 25-mile catchment areas used in the DEIS.

Figure 5: Owen Kelley Maps Realistic SCMAGLEV Catchment Area for Trips to Washington, D.C.

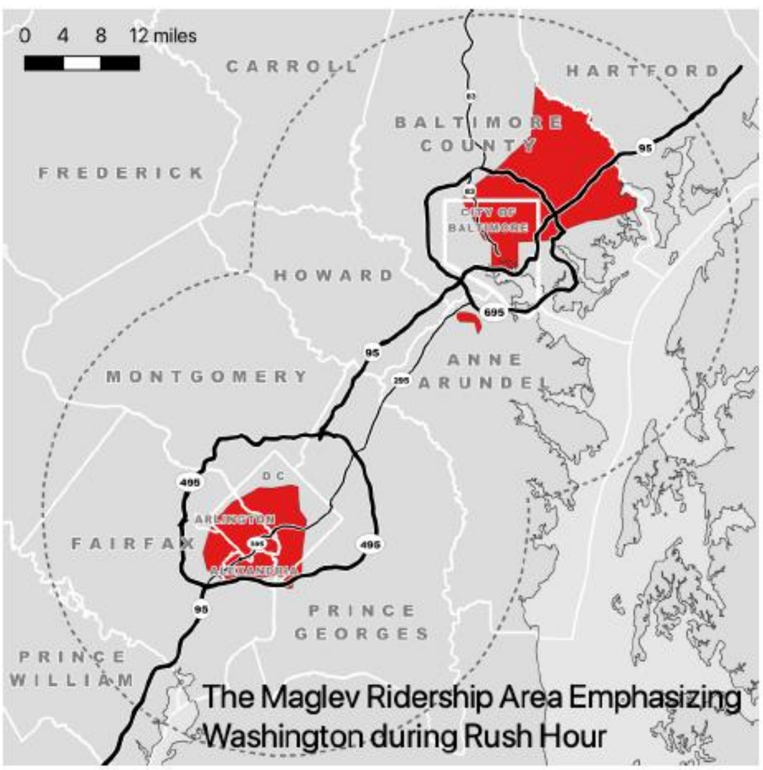


Figure 2. During rush hour, the maglev ridership area (shown in red). This area is optimized to reach many locations at the Washington end of the trip. The ridership area is reduced at the Baltimore end of the trip so that the goal can still be realized of the maglev trip saving the traveler at least 8 to 27 minutes of travel-time relative to the time that would otherwise be spent driving directly to the destination.

[14] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, p. 60.

[15] Kelley, Owen. The proposed Baltimore-Washington maglev would serve a small geographic area, March 25, 2021. https://www.greenbeltonline.org/wp-content/uploads/2021/03/maglevRegion.pdf.

[16] DEIS Appendix D.4 at C-6.

Figure 6: Owen Kelley Maps Realistic SCMAGLEV Catchment Area for Trips to Immediate Station Area in Washington, D.C.

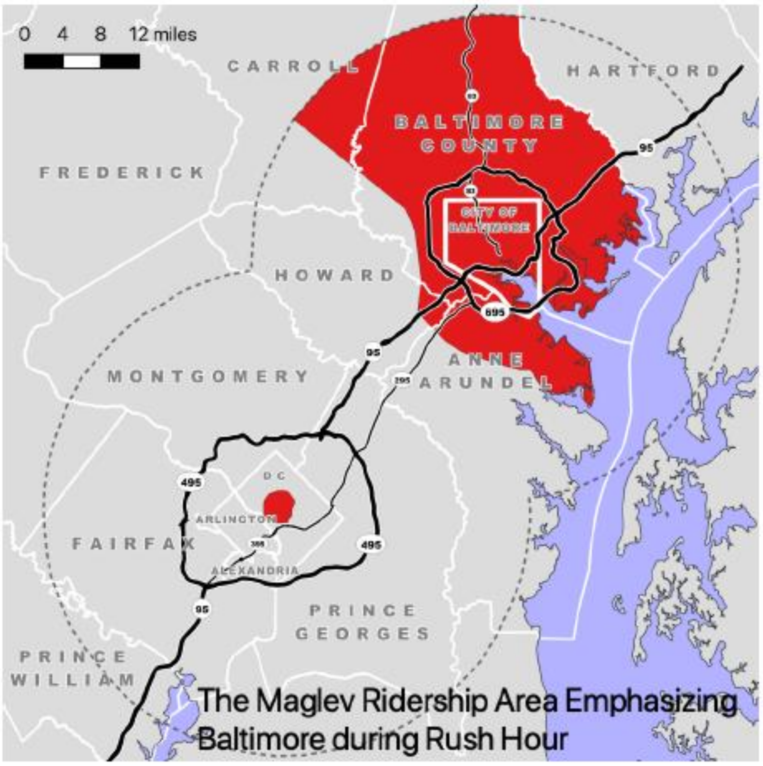


Figure 3. The same as Figure 2 except that the maglev ridership area (shown in red) is optimized to reach more locations at the Baltimore end of the trip during rush hour. Simultaneously, locations reachable at the Washington end of the trip are reduced so that the goal can still be realized of the maglev trip saving the traveler least 8 to 27 minutes of travel time relative to the time to drive directly to the destination. Few people would make use of the maglev under these circumstances because few locations can be reached in Washington.

Even for the limited set of origin-destination pairs where SCMAGLEV could be competitive in travel time, many travelers will require the special convenience of auto mode. The 2017 National Household Travel Survey estimates total travel in the U.S. The survey included 1254 households in the Baltimore and Washington regions. The survey data are organized in several ways including as “tours.” A home-to-work tour could be a direct trip with no stops, but it also could have one or more stops. These intermediate stops often preclude transit being a viable alternative for a particular tour. For example, if there is a day care stop, auto mode likely is required.

5.7% of the Baltimore and Washington tours are 35 miles in length or greater. A tour between the SCMAGLEV stations would fall into this group, as Google Maps shows the shortest driving distance from Camden Yards to the Mount Vernon Square is 37 miles. Of tours exceeding 35 miles in length, almost half (47%) included one or more stops. Therefore, only 3.0% of all tours are 35 miles or greater in length and have no intermediate stops.

In addition to trips with intermediate stops, SCMAGLEV also would compete poorly with auto in multiple other trip categories including:

- trips including bulky shopping purchases,
- trips where door-to-door service is highly preferable including many medical trips, and
- family trips where paying multiple SCMAGLEV fares would be prohibitive.

The Claimed DEIS SCMAGLEV Mode Shares Are Ridiculously High

The DEIS states:

> The ridership report assumes that about 70.0 percent of business travelers in the defined catchment area and 67.0 percent of non-business travelers, which includes those making personal trips as well as commuters, between Baltimore and Washington, D.C., would choose the SCMAGLEV service if it were available.[17]

This is clearly not a realistic assumption. The 70.0 percent and 67.0 percent numbers are likely too high even for travel limited to walking distance of both the Washington, D.C. and Baltimore stations because many people will want access to their cars for one or more of the reasons mentioned above, and/or because they will be unable or unwilling to pay the additional cost. Applying these inflated "assumed" SCMAGLEV mode shares to these large catchment areas – as is implied in the excerpt - is ridiculous. It also is contrary to the bottom-up modeling procedure described above where every zone-to-zone market has different SCMAGLEV mode shares. It is unclear how these numbers were applied, or even if they really were applied.

The DEIS continues its misleading "catchment area" framing when it presents commute flows between the Washington, D.C. Metropolitan Statistical Area (MSA), and the Baltimore MSA:

- Baltimore MSA to Washington, D.C. MSA: 192,270.
- Washington, D.C. MSA to Baltimore MSA: 168,995.[18]

While the DEIS suggests the SCMAGLEV would increase these numbers, these numbers are already much larger than the commute market for SCMAGLEV. For example, the Washington, D.C. MSA to Baltimore MSA number includes commutes by Montgomery County, Maryland residents to Baltimore and these commuters would not use SCMAGLEV because it would require opposite direction travel into congested Washington, D.C. Focusing on commutes to Baltimore City and Baltimore County from the Washington, D.C. MSA, there are 20,000 from Montgomery County, Maryland and 10,000 from Prince George's County, Maryland vs. 13,000 from the District of Columbia and all of Virginia combined.

[17] DEIS, p. 4.6-3.
[18] DEIS App. D.4 Figures D.4-9 and D.4-10 at D-80.

Stated Preference Survey Issues

The source of the "70.0 percent and 67.0 percent" numbers is a stated preference survey where travelers are asked whether they would choose SCMAGLEV when presented with hypothetical times and costs for different modes. This is a standard method. Figure 7 shows an example from Great Britain.

Figure 7: High-Speed Rail Stated Preference Survey Example from Great Britain[19]

If the following options were available, which would you choose for your journey between Stockport and Paddington?

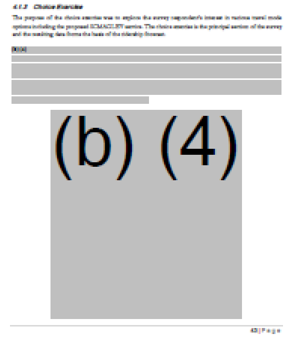
	Car	Air	Existing rail	High speed rail
Expected travel times:				
Time to get to train station / airport		15 mins	5 mins	15 mins
Waiting time at airport		1 hour		
Time spent in car / train / airplane	3 hours 30 mins	1 hour	2 hours 30 mins	1 hour 10 mins
Time to get from train station / airport		30 mins	5 mins	10 mins
Total Travel time	**3 hours 30 mins**	**2 hours 45 mins**	**2 hours 40 mins**	**1 hour 35 mins**
Percentage of trips "on time" (arrive within 10 mins of expected arrival time)	**90% on time**	**90% on time**	**85% on time**	**99% on time**
Service frequency		**One flight every 2 hours**	**One train every 20 mins**	**One train every 30 mins**
Interchanges			**Need to make 1 interchange**	**Need to make 2 interchanges**
Total travel cost and crowding	**£37 return**	**£113 return** **All seats will be taken**	*Standard class:* **£88 return** **You will have a seat, but others will be standing around you** *First class:* **£154 return** **3 in every 6 seats will be taken**	*Standard class:* **£130 return** **4 in every 6 seats will be taken** *First class:* **£227 return** **4 in every 6 seats will be taken**
Which would you use for your journey?	☐	☐	☐ *Standard* ☐ *First*	☐ *Standard* ☐ *First*
Or do not make journey	☐			

As shown in Figure 7, stated preference survey questions are a lot of information for respondents to process. Typically, each respondent is shown a series of these experiments with different service characteristics to estimate how the respondents trade off travel time and cost and other service factors. The exact framing of the questions and the sequence of experiments can have a significant impact on the survey results. In addition, there is a large research literature about how people often overstate how much they would be willing to pay in these surveys.[20] Given the well-known potential pitfalls in stated preference surveys, it particularly important to take a hard look at how the survey was conducted. However, this information has been almost completely redacted as shown in Figure 8.

[19] Burge, Peter, Chong Woo Kim and Charlene Roh. Modelling Demand for Long-Distance Travel in Great Britain: Stated preference surveys to support the modelling of demand for high-speed rail, p. xv. Rand Europe, 2014.

[20] Loomis, John B. 2013 WAEA Keynote Address: Strategies for Overcoming Hypothetical Bias is Stated Preference Surveys: *Journal of Agricultural and Resource Economics* 39(1): 34-36, p. 2014.

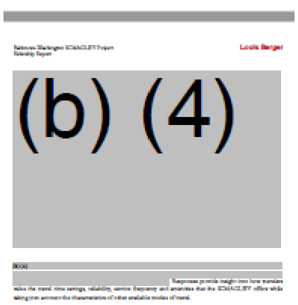
Figure 8: Redacted Material on Stated Preference Survey (three pages of redacted report shown on left in reduced form and unredacted material on those pages shown on right)[21]



4.1.3 Choice Exercise

The purpose of the choice exercise was to explore the survey respondent's interest in various travel mode options including the proposed SCMAGLEV service. The choice exercise is the principal section of the survey and the resulting data forms the basis of the ridership forecast.

Everything in between on these three pages has been redacted.



(b) (4) Responses provide insight into how travelers value the travel time savings, reliability, service frequency and amenities that the SCMAGLEV offers while taking into account the characteristics of other available modes of travel.

The unredacted text states:

> The choice exercise is the principal section of the survey and the resulting data forms the basis of the ridership forecast.

[21] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, Table 2-1, p. 43-45.

As stated in the documents: "the stated preference data forms the basis of the ridership forecasts." Not only is this data not shared, but even the way the questions were asked has been hidden. It is impossible to take a hard look at the ridership forecasts without this information.[22]

The DEIS Overestimates Travel Time Savings and Reliability Benefits

The primary SCMAGLEV case is that a 15-minute onboard travel time between Washington, D.C. and Baltimore will result in very large aggregate travel savings. In the standard ridership estimation process outlined above, time savings are aggregated from the estimated time savings for each TAZ-to-TAZ trip. This does not appear to have been done in the DEIS modeling. It is unknown what was done, but whatever was done resulted in large overestimates of travel time savings.

For any transit trip, including SCMAGLEV, door-to-door travel time includes access time to the station, wait time at the station, the in-vehicle time, and egress time to the final destination which can include one or more additional transit segments including access time, wait time and egress time. The DEIS states that the travel time savings:

> … reflects the "door-to-door" time, and therefore includes transfer and wait times out-of-vehicle as well as in-vehicle time. [23]

Except for the Google Maps API auto travel times mentioned in the redacted report and discussed above, the DEIS fails to explain how door-to-door travel times for each mode (auto, bus, MARC, Amtrak and SCMAGLEV) were computed, and does not present any summaries of these times by mode. Instead, it jumps all the way to aggregate time savings, and provides no information about how these numbers were calculated. DEIS Table D.4-18 shows purported annual travel time savings (in hours) from riding SCMAGLEV.

Table 2: Annual Travel Time Savings by Year (in hours)[24]

Table D.4-18: Annual Travel Time Savings by Year (in hours)

Commute Pair	Cherry Hill		Camden Yards	
	2030	2045	2030	2045
Washington, D.C.-Baltimore	21,003,586	27,606,825	23,613,732	31,133,083
Washington, D.C.-BWI Marshall Airport	1,758,358	2,741,589	1,976,872	3,091,776
Baltimore-BWI Marshall Airport	2,707,478	3,589,649	3,043,940	4,048,160
Total	**25,469,422**	**33,938,062**	**28,634,545**	**38,273,018**

Source: SCMAGLEV Ridership Data Request, July 27, 2020; Table 7, SCMAGLEV Ridership Supplement, December 10, 2018

The DEIS presents no information about the average time savings per rider. I calculated these averages by dividing annual time savings by annual diverted ridership (excluding induced trips where travel time savings are not applicable). DEIS Table D.4-25 shows annual diverted ridership by station pair.

[22] Incredibly, the FRA even redacted the 70.0 percent and 67.0 percent results on page 48 of the ridership report, which is the source cited for this assumption, It is clearly impossible for the FRA to know the ridership report made this assumption without reviewing that information in unredacted form in the ridership report.

[23] DEIS App. D.4 at D-36.

[24] DEIS App. D.4 at D-35.

Table 3: Annual Diversions to SCMAGLEV by Mode[25]

Table D.4-25: Annual Diversions to SCMAGLEV by Mode

Segment	Auto	Rail	Bus	Taxi/TNC
Cherry Hill Station				
2030				
Washington, D.C. – Baltimore	10,486,098	1,879,084	182,355	0
BWI Marshall Airport – Baltimore	444,677	99,752	16,356	394,013
Washington, D.C. – BWI Marshal Airport	449,692	143,915	54,395	188,204
2045				
Washington, D.C. – Baltimore	13,621,026	2,268,291	209,921	0
BWI Marshall Airport – Baltimore	575,457	126,581	19,957	547,496
Washington, D.C. – BWI Marshal Airport	680,798	215,333	79,855	313,055
Camden Yards Station				
2030				
Washington, D.C. – Baltimore	11,618,545	2,001,528	189,648	0
BWI Marshall Airport – Baltimore	492,700	106,252	17,010	461,525
Washington, D.C. – BWI Marshal Airport	498,256	153,292	56,571	220,451
2045				
Washington, D.C. – Baltimore	15,088,769	2,406,176	216,883	0
BWI Marshall Airport – Baltimore	637,465	134,275	20,619	642,121
Washington, D.C. – BWI Marshal Airport	754,158	228,422	82,503	367,161

Sources: SCMAGLEV Ridership Data Request, July 27, 2020; Tables 8 and 9, SCMAGLEV Ridership Supplement, December 10, 2018.

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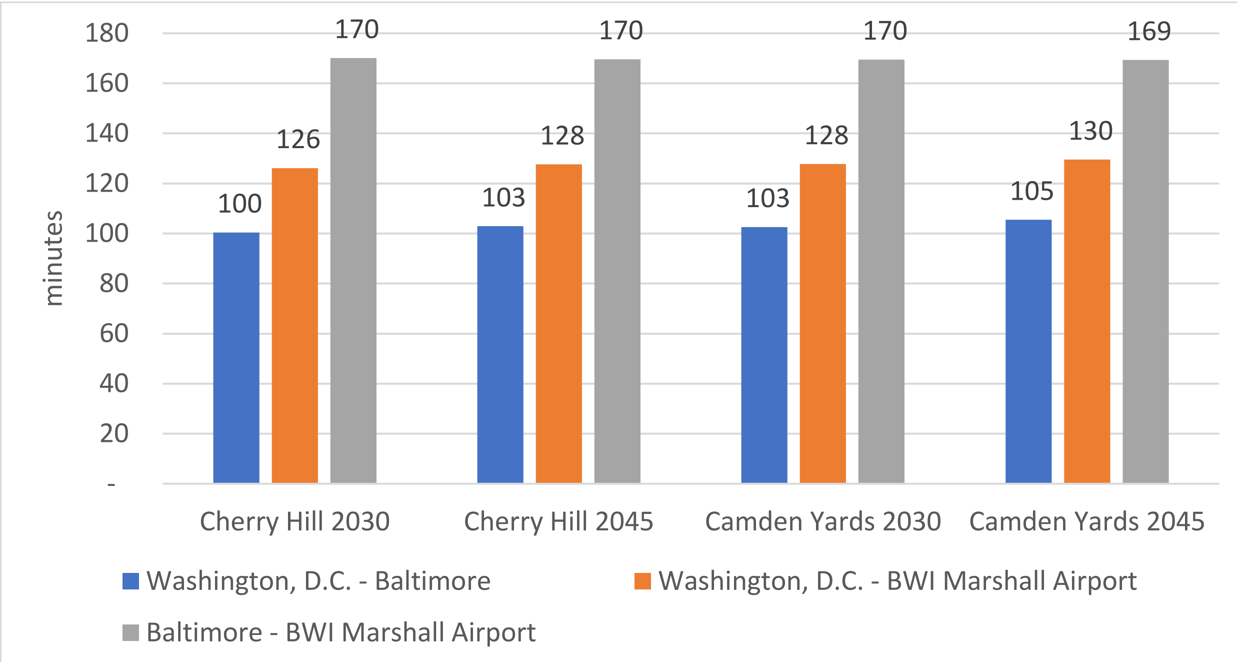
[25] DEIS App. D.4 at D-42.

Dividing annual time savings by annual diverted ridership results in an average time savings per one-way trip. These averages are shown in Figure 9.

Figure 9: Average SCMAGLEV Time Savings Per One-Way Trip (Minutes) Calculated by Dividing DEIS Annual Travel Time Savings by DEIS Annual Ridership



The travel time savings shown in Figure 9 are impossible. The almost 3-hour average time savings for trips between BWI and Baltimore is particularly ridiculous given that the light rail from Camden Station to the BWI Terminal takes 26 minutes. However, none of the numbers make sense.

As shown in DEIS Table D.4-25 reproduced above as Table 3, the DEIS forecasts that most diversion will be from auto. Driving the longest station-to-station distance today, Washington, D.C. to Camden Yards, takes less than an hour during off peak times and about an hour during peak times. The DEIS gives an auto travel time between Washington, D.C. and Baltimore of 55 minutes.[26]

Therefore, with a SCMAGLEV travel time of 15 minutes, the actual average time savings for those diverting from auto could be no more than 45 minutes – even if all travelers were traveling directly to and from the station areas. Most potential SCMAGLEV riders will need to access both the origin and destination station by auto or by transit. Generally, this access and egress time will exceed the 15-minute SCMAGLEV travel time by a wide margin and cut into any potential time savings.

This excerpt from the Economic Impact Analysis Technical Report gives a more accurate indication of SCMAGLEV time savings:

> These two urban areas (Baltimore and DC) are approximately 40 miles apart. The anticipated SCMAGLEV services are estimated to reduce travel times by 8 to 27 minutes

[26] DEIS App. D.4 Table D.4-59 atD-82.

of travel time savings depending on the trip purpose and length under each of the Build Alternatives.[27]

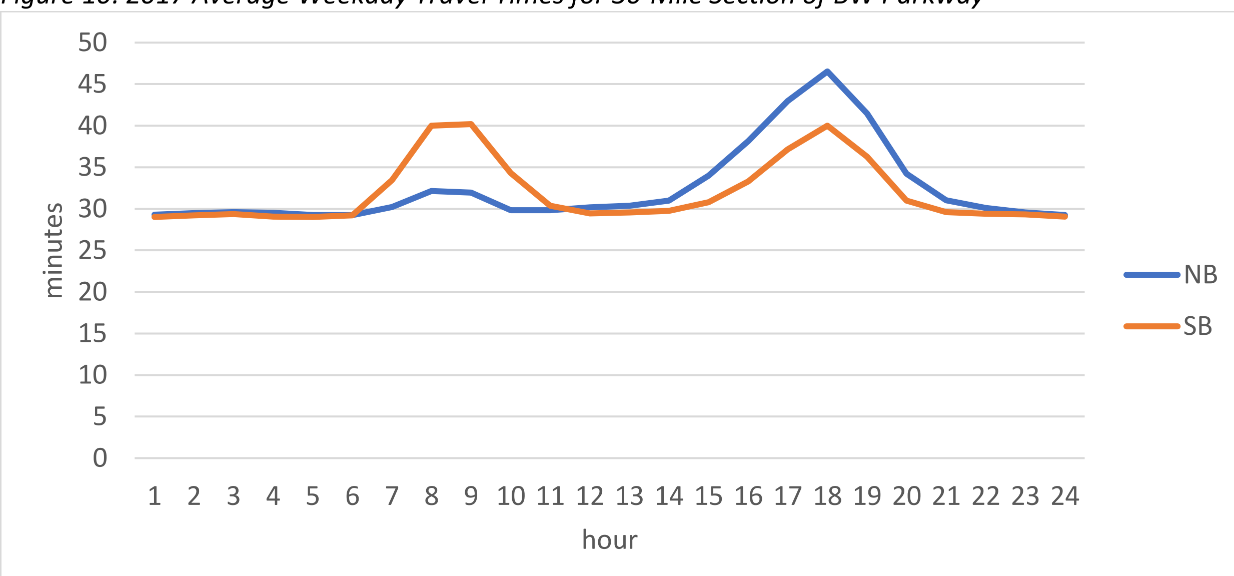
This excerpt suggests that the travel time savings shown in DEIS Table D.4-18, reproduced above as Table 2, are 5 to 10 times as great as the real time savings. As discussed below, these inflated travel times are also converted in the DEIS to inflated economic savings.

There is no justification for such large errors in a critically important metric. I can think of two possible sources of error although even together, they are insufficient to explain the errors:

1) The DEIS may have falsely assumed that peak period road delays are applicable to all SCMAGLEVEL travel.
2) The DEIS may be relying on unrealistic future travel times from the regional travel demand models.

Peak hour travel times affect only a small portion of daily travel. Maryland DOT has published an online map of real-time speed data from cell phones and other electronic devices for 2017 (pre-pandemic) showing average travel time by hour for major roads. Figure 10 summarizes these data for the 30-mile section of the BW Parkway from the District of Columbia line to a point where the data ends in the approach to the City of Baltimore. This 30-mile section includes most of the distance between the two stations, and the diurnal delay pattern is likely to be similar at missing sections in Washington, D.C. and Baltimore. The blue line shows northbound travel and the orange line shows southbound travel.

Figure 10: 2017 Average Weekday Travel Times for 30-Mile Section of BW Parkway



Source: Maryland DOT TravelTimeIndex/ TravelTimeIndex_Maryland_MDOTSHA (MapServer)

As shown in Figure 10 the travel time during much of the day is 30 minutes, i.e. an average speed of 60 m.p.h. There are average southbound delays of about 10 minutes during the morning and afternoon peak periods, a short delay in the northbound morning peak period, and a longer up to an

[27] DEIS App. D.4 at C-6.

approximately 15-minute delay in the northbound afternoon peak period. The peak travel time is only 45 minutes, and this only is present for a single afternoon hour in one direction (northbound).

DEIS Table D.2-1, reproduced below as Table 4, indicates that the SCMAGLEV will operate for 18 hours a day and most service will operate at times when there is little or no delay on the BW Parkway. Because the SCMAGLEV will operate not only during peak hours but also during significant portions of the day when car travel within the corridor experiences little or no delay, it would be incorrect to consistently apply the peak auto delay to estimate time savings enjoyed by those travelling on the SCMAGLEV. It can reasonably be anticipated that travel time savings in these off-peak hours will be much lower than they would be during the peak period. However, it is possible that the DEIS assumes that all car travel within the corridor—even car travel during off-peak hours—is delayed to the maximum extent experienced at any point in the day, and thus overestimates time savings.

Table 4: SCMAGLEV Trains Per Hour and Hourly Capacity by Direction[28]

Table D.2-1: SCMAGLEV Trains Per Hour and Hourly Capacity, by Direction

Hour of Day	Baltimore To Washington		Washington to Baltimore	
	SCMAGLEV Trains per Hour	Total Capacity per Hour (Number of Seats per Hour)	SCMAGLEV Trains per Hour	Total Capacity per Hour (Number of Seats per Hour)
5 AM – 6 AM	4	3,048	4	3,048
6 AM – 7 AM	6	4,572	6	4,572
7 AM – 8 AM	8	6,096	8	6,096
8 AM – 9 AM	8	6,096	8	6,096
9 AM – 10 AM	8	6,096	8	6,096
10 AM – 11 AM	6	4,572	6	4,572
11 AM – 12 PM	4	3,048	4	3,048
12 PM – 1 PM	4	3,048	4	3,048
1 PM – 2 PM	4	3,048	4	3,048
2 PM – 3 PM	4	3,048	4	3,048
3 PM – 4 PM	6	4,572	6	4,572
4 PM – 5 PM	8	6,096	8	6,096
5 PM – 6 PM	8	6,096	8	6,096
6 PM – 7 PM	8	6,096	8	6,096
7 PM – 8 PM	6	4,572	6	4,572
8 PM – 9 PM	4	3,048	4	3,048
9 PM – 10 PM	4	3,048	4	3,048
10 PM – 11 PM	4	3,048	4	3,048

Source: Baltimore-Washington SCMAGLEV Project Operations Plan, BWRR, 5-6-20

The average auto travel time for potential SCMAGLEV riders across the entire day is much closer to free-flow travel times than peak travel times, even when the greater number of travelers during peak periods is factored in. Here is a mathematical illustration where it is assumed that hourly SCMAGLEV ridership is proportional to train capacity (i.e. that the number of riders on each train is consistent throughout the

[28] DEIS App. D.2 at A-2.

day) and that, during peak periods, 75% of travelers in the corridor will be going to Washington, D.C. in the morning and back to Baltimore in the afternoon, while 25% of travelers will traveling in the opposite direction. With this temporal and directional distribution, the average travel time for competing auto mode for this 30-mile section of the BW Parkway is 35 minutes, i.e. an average delay of 5 minutes. The actual temporal and directional distribution could be different, but this illustration shows why it is wrong to apply the peak delay (45-minute travel time) to all travel.

Future auto travel times will not be significantly greater than travel times today. Both the MWCOG and BMC regional models rely on a 40-year old static assignment algorithm that does not constrain traffic volumes to roadway capacity, and instead assumes that traffic will grow beyond capacity and slow to unrealistically low speeds. The models consistently exaggerate future travel times as is documented in my peer-reviewed journal article: *Forecasting the impossible: The status quo of estimating traffic flows with static traffic assignment and the future of dynamic traffic assignment.*[29]

The MWCOG and BMC long-range transportation plans issued every five years always show large increases in future travel time per person. While certain roads may become somewhat more congested during portions of the day, the forecasted systemic travel time increases are never realized. People operate with a “travel time budget” and respond to increasing congestion by changing their behavior including changing departure time, mode, and in some cases, destinations. Figure 11 below shows data from the National Household Travel Survey (NHTS) showing that the “average time spent driving a private vehicle in a typical day” has stayed remarkably constant over time. There was an increase during the 1990s, a time when many women were joining the labor force, but since 2000 there has been little change. Time spent driving also is very similar across differently sized regions. If the DEIS is assuming large increases in travel time, it is wrong.

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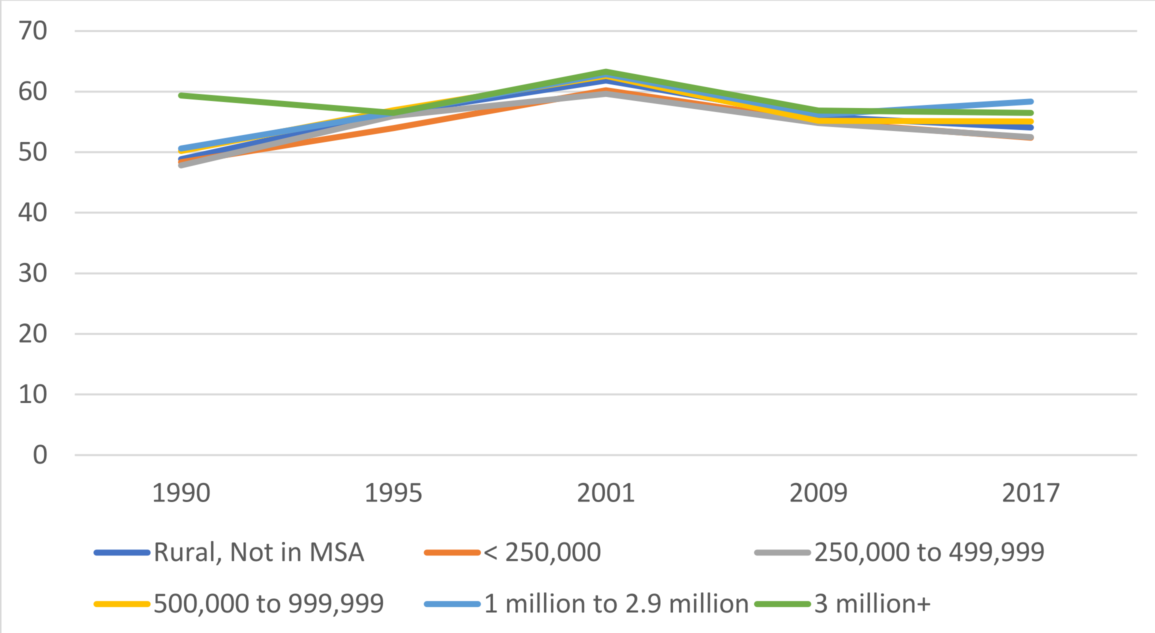
[29] Marshall, Norman. Forecasting the impossible: The status quo of estimating traffic flows with static traffic assignment and the future of dynamic traffic assignment, *Research in Transportation Business & Management*, Volume 29, 2018, 85-92. https://www.sciencedirect.com/science/article/pii/S2210539517301232?via%3Dihub.

Figure 11 Average Time Driving (minutes per day) 1990-2017 by MSA Population (NHTS)



After greatly exaggerating travel time savings, the DEIS adds on an additional 5 minutes of travel time savings per diverted trip under the separate category "reliability" based on a concept called "buffer time." The DEIS states:

> Buffer time is the additional time allocated by travelers during their trip planning to compensate for delays caused by events. For auto and bus travelers the primary events impacting buffer time are traffic jams caused by accidents or congestion, highway maintenance and construction, or difficulty parking. . .. The amount of buffer time travelers allocate is a personal decision dependent upon the perceived reliability of the transportation mode and the importance of reaching the planned destination when scheduled.[30]
>
> . . .
>
> Given the uncertainties, the analysis assumes a corridor wide buffer time reduction of five minutes per trip soon after the SCMAGLEV system starts operating. This is a conservative estimated [sic] of the amount of time SCMAGLEV rider [sic] would reduce their buffer time once the SCMAGLEV system is established as a highly reliable transportation mode.[31]

This assumption is arbitrary and is not conservative. One of the buffer time components, parking, could be more problematic at the SCMAGLEV station than at the final destination. Congestion around the stations could also be more variable than congestion along the direct route.

The DEIS Overestimates Auto Mode Parking and Toll Costs and Ignores SCMAGLEV Parking Costs

The DEIS states:

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[30] DEIS App. D.4 at D-37.

[31] DEIS App. D.4 at D-38.

> Parking fees are assumed to be an average of $30 per round-trip and are applied to all auto trips between Washington, D.C. and Baltimore because the major employment centers have parking garages that require daily payment either by the hour or as a portion of the employee's paycheck.[32]

Focusing on the more prevalent Baltimore to Washington trip, a typical auto commuter would not pay for parking in Baltimore. Therefore, I assume that the DEIS excerpt is not implying that parking is charged on both ends of an auto trip ($15 in D.C. and $15 in Baltimore for a total of $30 round-trip), but instead is charged on only one end of the trip (i.e. $30 in either D.C. or Baltimore), and that this amount has been divided between the two segments of the trip for the purposes of modeling.

The $30 assumed is much higher than what regular commuters to Washington, D.C. are paying. For example, the Department of Energy charges $55.80/month for the Forrestal Building garage located just south of the Smithsonian Castle.[33] If an employee commutes an average of 20 days per month, the cost is only $2.79 per day, i.e. less than one tenth of what is assumed in the DEIS. It is likely that many other Federal employees have similarly low parking rates. The District of Columbia charges some employees $65 a month and other employees $140 a month.[34] The price of private parking lots and garages varies by location and amenities and "can range from $60 to upward of $300."[35] Applying an average of 20 commutes per month, this is a range of $3 to $15 per day, with the top end being only half of what is assumed in the DEIS. In addition, thousands of commuters to Washington, D.C. park at one of the 44 Metro lots with prices of $45-$65 a month or at a day rate of about $5 – much cheaper that assumed in the DEIS.

However, even these lower parking prices overstate the average parking cost that could be avoided with SCMAGLEV because many trips will be to areas with free parking. The DEIS states that: "SCMAGLEV rider origin and destinations by Traffic Analysis Zone [were] based on the two regional models (MWCOG and BMC)."[36] The two regional model areas are overlapping. In the MWCOG model, the BW Parkway extends north to I-895. Figure 12 maps the origins of trips on the northern end of the BW Parkway in the 2040 MWCOG model during the weekday afternoon peak period (3-7 p.m.), i.e. the period when most commuters would be heading home.

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[32] DEIS App. D.4 at D-40. The DEIS cites "2050 SCMAGLEV By Market Segment. Baltimore-Washington SCMAGLEV Project Draft Final Ridership Report, June 29, 2018" as the source of this assumption. However, the FRA did not provide this Report with the DEIS, and then refused to produce it after the City requested, claiming "this record was not relied on for the Draft Environmental Impact Statement (DEIS) and was erroneously included in the list of references." This information is also not found in the unredacted portions of the other produced reports. The FRA's claim is clearly false; how does the FRA know what parking fees were assumed and the basis for that assumption? The FRA's withholding of this information hinders meaningful review and violates NEPA.

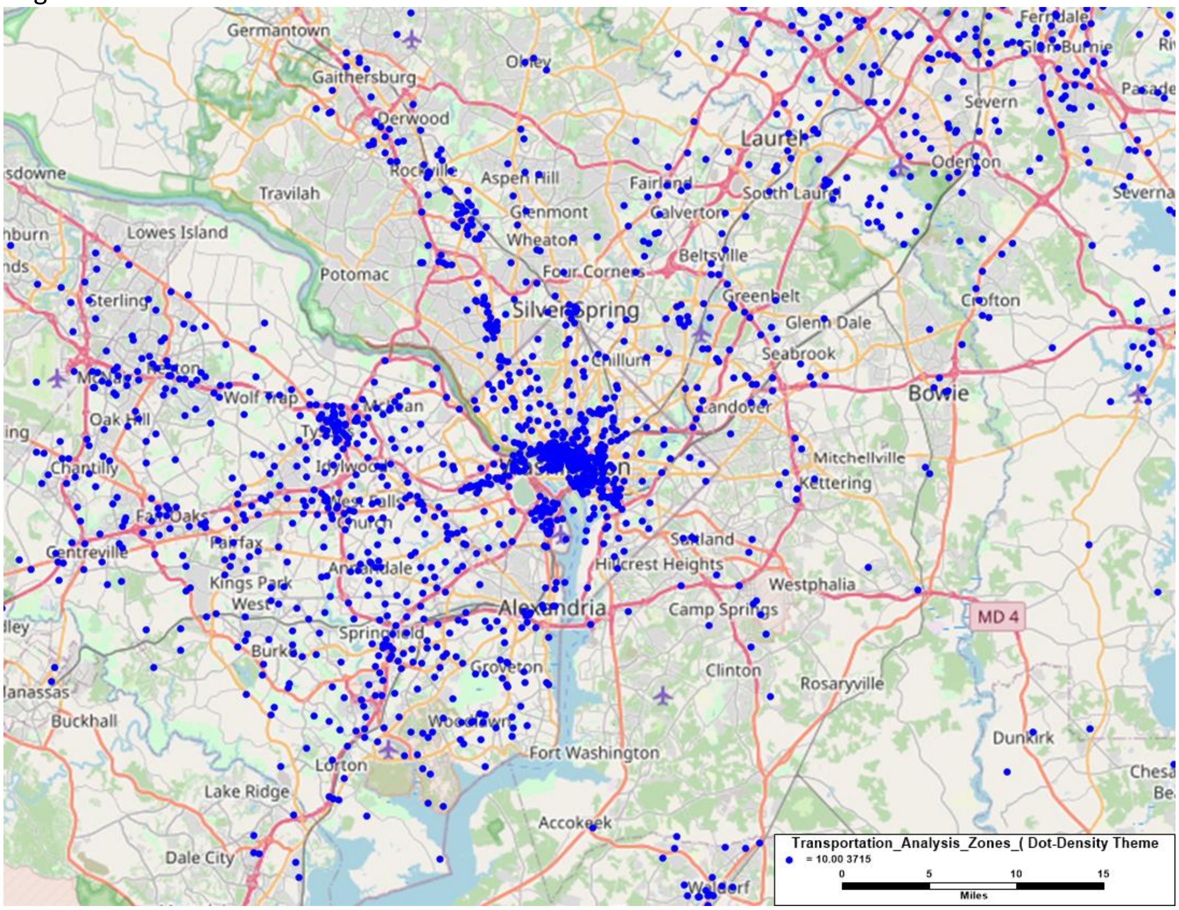
[33] https://www.energy.gov/management/office-management/employee-services/parking-and-garage#Rates accessed March 18, 2021.

[34] Office of the District of Columbia Auditor. The District's Worksite Parking Program treats Employees Inequitably and Could Increase Revenue, August 2, 2018.

[35] https://monthlyparking.org/washington-dc-monthly-parking/ accessed March 18, 2021.

[36] DEIS App D.2 at E-116.

Figure 12 Origins of 2040 p.m. peak period BW Parkway northbound traffic at the MWCOG region edge



Source: MWCOG model files created for 2020 Maryland I-495 & I-270 Managed Lanes Project DEIS (auto person trips)

Figure 12 is focused on the afternoon peak period because it is most congested, and it is focused on northbound travel to Baltimore because that is the predominant pattern during the afternoon peak period. In Figure 12, less than one quarter of all the trips on the northern end of the BW Parkway originate in the District of Columbia, and the other origins are primarily in areas with free parking.

On the other hand, if a SCMAGLEV rider needed to drive to the Baltimore station, they would likely need to pay for parking. The Camden Yards alternative assumes construction of a new seven-story 5,000 space parking garage[37] and the Cherry Hill alternative includes construction of a new four-story parking garage. It will be necessary to charge for parking in these garages. The DEIS does not say that these parking costs are considered. If not, the SCMAGLEV costs to riders are underestimated.

The DEIS also overestimates average auto toll costs stating:

[37] DEIS at 4.2-21.

> Toll fees are assumed to be an average of $8 per trip. The study assumes that 24.0 percent of auto drivers would use toll lanes. [38]

This does not make any sense. The fastest route between the Washington, D.C. and Baltimore stations generally is the BW Parkway which includes no tolls. The current I-95 Express Lanes peak E-Z toll is only $1.54, and the toll is even less outside the peak periods.[39]

SCMAGLEV Would Undermine MARC and Amtrak Service and Have Negative Impacts on Minority and Low-Income Populations

The DEIS gives a rail fare between Baltimore and Washington of $10 as a "weighted average based on 2017 ridership of Amtrak Acela, Amtrak regional rail and MARC commuter rail fares."[40] If average fares are used in the modeling this is problematic because travelers do not pay average fares; they pay specific fares, and the market should be segmented. The DEIS shows 88% of total rail ridership in the corridor today being on MARC.[41] The actual MARC fare between Baltimore and Washington is $8 and a monthly pass is $216. With 20 round trips per month, this brings the fare down to $5.40. In sharp contrast, the DEIS assumes SCMAGLEV fares between Baltimore and Washington of $70-79 peak and $59-$69 off-peak.[42] For commuters this represents a difference of $70 per trip or $140 per day.

The different station locations for MARC, Amtrak and SCMAGLEV would make some options more attractive for certain origins and destinations. In the standard estimation process, these differences would be considered in each TAZ-to-TAZ market. The DEIS modeling does not appear to have considered these differences.

MARC travel time is about an hour vs. 15 minutes for SCMAGLEV, a difference of 45 minutes. In addition, the SCMAGLEV train is planned to run more frequently than the MARC so it would involve less waiting time, bringing the total time savings to about an hour. An hour time savings is certainly valuable but only worth the cost to those with a value of time of $70 an hour or more. If the ridership modeling is done correctly, diversion from MARC to SCMAGLEV should mostly be limited to those with values of time of over $70 per hour.

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[38] DEIS App. D.4 at D-41.
[39] https://mdta.maryland.gov/ETL/Toll_Rate_Schedule.html.
[40] DEIS at D-43.
[41] DEIS App. D.4 Table D.4-45 at D-53.
[42] DEIS App. D.2 Table D.2-35 at D-108.

The DEIS gives a range of numbers for values of time. In the Economic Analysis Impact Technical Report, values of time of $15.20 per hour for personal travel (including commuting) and $27.10 per hour for business travel (2018 $) were used in calculating benefits.[43] This same report also uses a different value of $16.60 for all travel.[44]

The redacted ridership report gives higher values for "intercity travel" including especially high numbers for "air or high speed rail." [45] It is not known if these higher values of time were used in the DEIS modeling but they should not have been. The U.S. Department of Transportation reference cited in this report applies these rail values of time to "connecting large urban areas up to 500 miles apart with 2-3 hour travel time and speeds between 125 and 250 mph."[46] These higher values of time for longer trips are related to the cost of overnight stays and/or avoiding the cost of overnight stays through faster travel. They are not applicable to the proposed SCMAGLEV which will not serve "intercity trips."

The redacted ridership report also states: "The U.S. DOT guidelines on the value-of-time indicate that these estimates should keep pace with the rate of real growth in projected household income." This is a reference to a previous 2014 Guidelines[47], and this approach is not included in the newer 2016 Guidelines. In my experience, this is not standard accepted practice and certainly is not a conservative assumption. The redacted report says that real income is assumed to increase by 1.35 percent per year. Over the period 2018 to 2045, this represents real income growth of 44%. It is not known whether this growth factor was applied in the DEIS modeling. If it was, this inflates ridership.

It appears that the ridership modeling used different values of time for four different income groups, but the values are not provided for evaluation and comment; it's not clear if the FRA reviewed and verified this information.[48]

The U.S. Department of Transportation recommends estimating value of time as 50% of hourly median household income for personal travel including commuting.[49] Following this guidance, a value of time of $70 is only appropriate for those with household incomes of $291,000 or above. This is not typical of MARC riders. The Maryland Transportation Administration reports that 72.7% of MARC riders have household incomes of below $150,000 with 46.6% having household incomes of less than $100,000.[50]

Nevertheless, the DEIS shows that up to 2/3 of all MARC ridership would divert to SCMAGLEV.[51] This is unrealistic.

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[43] DEIS App. D.4 at D-35.
[44] DEIS App. D.4 at D-38.
[45] Travel Demand Final 2018-11-16_Redacted.pdf, Louis Berger, p. 53.
[46] U.S. Department of Transportation. Revised Departmental Guidance on Valuation of travel Time in Economic Analysis, July 9, 2014.
[47] U.S. Department of Transportation. Revised Departmental Guidance on Valuation of travel Time in Economic Analysis, at 7, September 27, 2016.
[48] DEIS App. D.2 at D-107.
[49] U.S. Department of Transportation. Revised Departmental Guidance on Valuation of travel Time in Economic Analysis, at 4, September 27, 2016.
[50] Maryland Transportation Administration. 2020-2023 Title VI Implementation Program, p. 105.May 2020.
[51] DEIS App. D.4 Tables D.4-48 and D.4-49 at D-56 - D.57.

The DEIS states:

> The regional CLRPs [Constrained Long-Range Plans] show nearly $1.5 Billion of funding committed to improvements on MARC service.[52]

DEIS Table 4.2-4 shows planned MARC service improvements.

Table 5: Future MARC Peak Period Service Frequencies[53]

Table 4.2-4: Future MARC No Build Alternative Peak Period Service Frequencies

MARC Line/Direction	Current Peak Period Service Frequency	Future Peak Period Service Frequency
Penn Line – Baltimore to Washington	15-30 Minutes	15 – 20 minutes
Penn Line – Washington to Baltimore	30 minutes	20 minutes
Camden Line – Baltimore to Washington	30 minutes	20 minutes
Camden Line – Washington to Baltimore	30 minutes	20 minutes

Source: MWCOG Regional Forecasting Model – Future Network

The DEIS states:

> [T]hese significant forecasted trip diversions would likely require a lowering of MARC service levels to account for a decline in forecasted ridership demand as well as a likely decline in fare revenue.
>
> Forecasted changes in ridership demand and lower levels of service would also likely require modifications to MARC's long-range expansion plans and other capital investments.[54]

As discussed above, the DEIS greatly overestimates how much MARC ridership would divert to SCMAGLEV. However, any diversion will undermine funding for the planned improvements and instead threaten MARC service cutbacks. The DEIS also projects around a $30 million annual loss to MARC and Amtrak caused by the SCMAGLEV which will necessitate service reductions.[55] Instead of analyzing this impact, the DEIS merely suggests MARC and Amtrak's newfound additional capacity might entice new riders. Elsewhere, the DEIS even projects significant decreases in energy consumption from bus and rail travel in the region, both cut by more than half when compared to the no build projection, presumably requiring significant cuts to route, frequency, and stations served.[56]

The DEIS glosses over the impacts that significantly decreased bus and train public transit services would have on people throughout the region who rely on those modes of travel, including Environmental Justice communities. Based on these projections, if you cannot afford the SCMAGLEV or if the

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[52] DEIS, p. 3-9.
[53] DEIS App. D.2 at 4.2-10.
[54] DEIS, p. 4.2-10.
[55] DEIS, App. D.4 at D-56.
[56] DEIS at 4.19-11.

SCMAGLEV's routes and stations do not get you where you need to go, you will have fewer alternative options and it will take longer to travel throughout the region. Current MARC ridership includes many minority and low-income persons. Almost half of current MARC ridership (45.6%) identify as other than white non-Hispanic. 17.8% of MARC riders are from households with less than $50,000 annual income. These riders would be adversely affected by any MARC cutbacks.

If the SCMAGLEV is constructed and fails to generate sufficient revenue to cover operations, there would be great pressure to shift transit money to subsidize it because it will be a case of "too much invested to quit." There also would be pressure to limit competition by MARC and Amtrak – which could lead to MARC and Amtrak cutbacks and/or fare increases.

A 2002 review of Maglev vs. conventional high-speed rail (HSR), An Evaluation of Maglev Technology and Its Comparison with High Speed Rail, concluded:

> The analysis reaches the following conclusions on the three most important system characteristics. First, recent developments of HSR have reduced the advantage of Maglev in higher speeds, so that the differences in travel times on typical interstation spacings would be small. Second, high speed rail has a huge advantage over Maglev due to HSR's compatibility with existing rail networks. Third, high speed rail involves a lower investment cost, while operating costs on Maglev are still uncertain. Energy consumption is estimated to be lower for high speed rail. All other features, like riding comfort, system image, grade climbing ability, noise, etc., are not significant enough to make one mode superior to the other. Thus the benefits of high speed rail strongly outweigh Maglev's small travel time advantage. Based on this conclusion, the soundness and direction of US federal policy of investing in Maglev systems while neglecting high speed rail and Amtrak is questioned.[57]

This report also highlights a fundamental problem with the proposed Project. The distance traveled is too short to justify such a large investment to increase speed:

> … [T]he optimal domain for high speed ground transportation systems is on long interstation lengths, such as 100 km [62 miles]. On shorter distances, the gains in travel time are so small that it is difficult to justify the high investment. For example, very important and functional lines between center cities and airports (Frankfurt, Zürich, and London-Heathrow are outstanding examples) may not be candidates for HSGT (as proposed for Pittsburgh, Baltimore, Munich, and Shanghai), because they require much higher costs and bring very little additional benefit, regardless of technology.[58]

In 2019, a team at George Mason University did a systems engineering evaluation of possible rail improvements from Washington, D.C. to New York City comparing Maglev, a new conventional high-speed rail system, and a new Acela fleet. The "team has recommended the new Acela fleet for the Northeast Corridor."[59] Based on the results of this study, Professor George Donohue writes:

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[57] Vuchic, Vukan R, and Jeffrey Michael Casello. An Evaluation of Maglev Technology and Its Comparison with High Speed Rail. University of Pennsylvania Scholarly Commons, 2002.
[58] *Id.* at 36.
[59] Coffman, N., Y. Kodjo, J Noble and J. Choi. Northeast Corridor Mass Transportation Systems Analysis, 2019.

> In my opinion, this study [the Baltimore-Washington SCMaglev DEIS] is a red herring study of a loss-leading advertisement for a public-private-sector project (Washington to Baltimore) of a much larger Washington to New York City purchase. As such is could be compared to a Trojan Horse. It will not be a commercial success.[60]

Table 6 shows why Donohue describes the proposed SCMAGLEV between Washington, D.C. and Baltimore as a "Trojan Horse" as a step towards Washington, D.C. to New York City. Washington, D.C. – Baltimore only ranks tenth in revenue.

Table 6: Top Amtrak Washington, D.C. City Pairs by Revenue[61]

Top city pairs by revenue, 2019	
1. New York, NY	226 mi
2. Philadelphia, PA	135 mi
3. Newark, NJ	216 mi
4. Metropark, NJ	202 mi
5. Wilmington, DE	110 mi
6. Stamford, CT	262 mi
7. Trenton, NJ	168 mi
8. Chicago, IL*	921 mi
9. New Haven, CT	301 mi
10. Baltimore, MD	41 mi

As shown in Table 6, the top nine city pairs by revenue are all trips greater than 100 miles. The Washington, D.C. – Baltimore market is not critical to Amtrak but extending SCMAGLEV farther north could cripple it. Donohue describes how the SCMAGLEV would undermine public investments that already are being made in the Acela system:

> Amtrak has already signed with the French company Alstom to receive 28 trainsets of a new design known as the Avelia Liberty. These trains are assembled in the US and the first are already being delivered. This order will replace and expand the current Acela fleet of 20 trainsets. The new trainsets are scheduled for complete delivery by the end of 2022 and will offer increased speed, capacity, and operational frequency along the route.

[60] Donohue, George. Maglev line is a Trajan horse. Just fix the current train system. *Capital Gazette*, February 20, 2021.

[61] Rail Passenger Association, https://www.railpassengers.org/site/assets/files/2607/was.pdf, 2020.

The DEIS Overestimates Induced Travel

The DEIS states:

> [T]he travel demand model estimated that 15-17 percent of the total ridership between the Washington, D.C. and Baltimore market pair, and 34-41 percent of the total ridership between the Washington, D.C. and BWI Marshall Airport market pair are induced riders, or those that would not otherwise take the trip.[62]

It is hard to understand what the large induced travel between Washington, D.C. and BWI Marshall Airport means. Does it mean that people are making air trips they would not otherwise have made? It seems highly unlikely that there would be many such trips. It is more plausible that the SCMAGLEV airport link could lead to changes in airport choice from National Reagan and Dulles Airports – but this likely would also require changes in air service and a full analysis of these complex dynamics does not seem to have been done. Without such an analysis, this claim is invalid.

The DEIS presents contradictory information about BWI ridership. In one place in the DEIS, 45-50% of total SCMAGLEV ridership begins or ends at BWI.[63] Elsewhere in the DEIS, only about 15% of total SCMAGLEV ridership begins or ends at BWI.[64] The DEIS also shows much higher Washington, D.C. – BWI ridership in the Camden Yards alternative vs. the Cherry Hill alternative as illustrated in the table reproduced below for induced travel, but also true for diverted travel.[65] The location of the Baltimore station should have no effect on Washington, D.C. – BWI ridership. The combination of these discrepancies plus the unexplained large BWI induced travel share indicate that much better modeling of BWI travel is needed.

Table 7: DEIS Induced Ridership by Year[66]

Table D.4-29: Induced Ridership by Year

Item	Cherry Hill		Camden Yards	
	2030	2045	2030	2045
Total Induced Ridership	2,718,370	3,709,469	3,144,844	4,360,099
Baltimore – Washington, D.C.	2,156,069	3,036,581	2,494,326	3,569,188
Washington, D.C. – BWI Marshall Airport	562,301	672,888	650,518	790,911

Note: The DEIS forecasts no induced ridership between Baltimore and BWI Marshall Airport.

The 15-17% induced travel share between Washington, D.C. and Baltimore is much smaller but is an overestimate. The combination of high SCMAGLEV fares and only 8 to 27 minutes time savings will attract few additional trips in the corridor.

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62 DEIS Tables D.4-25 (diverted ridership) and D.4-29 (induced ridership) reproduced in this report as Tables 2 and 5 together comprise total forecast SCMAGLEV ridership by station pair.

63 Calculated from DEIS Appendix D.2 Transportation Technical Report, Table D.2-2, p. A-3, assuming that there are the same number of SCMAGLEV trips in each direction for each station pair.

64 Calculated from DEIS Appendix D.4 Economics Impact Analysis Technical Report, Table D.4-25, p. D-42 reproduced in this report as Table 2 (diverted travel) and Table D.4-29, p. D-45 reproduced in this report as Table 5 (induced travel).

65 DEIS App. D.4 Table D.4-25 at D-42 reproduced in this report as Table 2.

66 DEIS App. D.4 Table D.4-29 at D-45.

Ridership is Highly Uncertain

The DEIS presents ridership forecasts as point estimates with many significant digits. Forecasting SCMAGLEV ridership is extremely complex and necessarily rests on a set of assumptions that are highly uncertain. It would be more honest for the DEIS to present ranges of possible SCMAGLEV ridership rather than a single forecast. This has been done for the California High-Speed Rail Authority as shown in Table 8. This is highly relevant because the California project is the only high-speed rail project under construction in the United States today.

Table 8: California High-Speed Rail Ridership and Revenue Forecasting[67]

Table ES.1 Range of Annual Ridership by Implementation Step[a] (Millions)

Confidence Level That Ridership Will Be Less Than Stated Value	Implementation Step—Silicon Valley to Central Valley line 2029	Implementation Step—Phase 1 2033	Implementation Step—Phase 1 2040
Minimum	3.7	8.6	8.9
1%	6.5	14.6	15.2
10%	9.6	21.1	22.2
25%	12.4	27.0	28.3
Median	16.5	35.6	37.4
75%	21.7	46.1	48.5
90%	27.1	56.8	60.6
99%	37.3	76.0	80.9
Maximum	53.4	109.8	118.1
Base Run	**16.2**	**35.6**	**38.6**

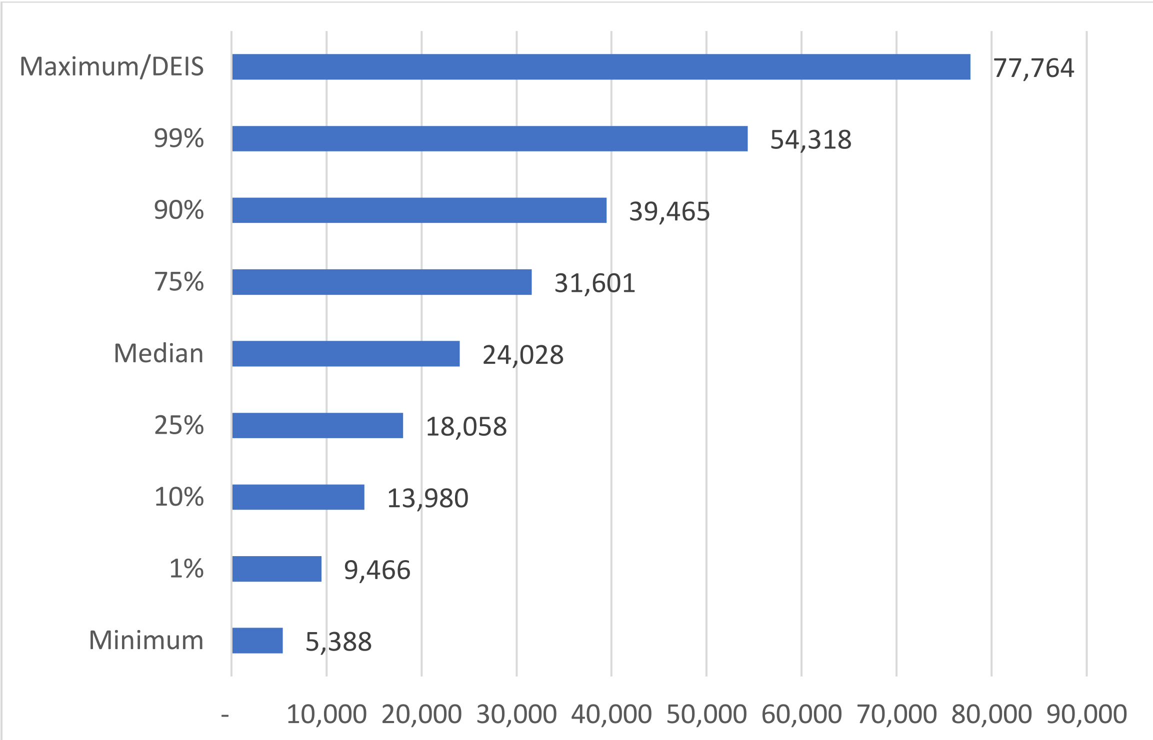
The data for the third column, "Implementation Step – Phase 1 2040," is for a system that runs all the way from San Francisco to Los Angles and Anaheim. This is a more realistic corridor for high-speed rail that better conforms to the station spacing of 100 km (62 miles) and 2-3 hour travel time high-speed rail descriptions in other reports referenced above. The minimum ridership forecast is less than a tenth as high as the maximum forecast. Limiting the range to the 80% most likely outcomes (from 10% to 90%), the 10% forecast is only about a third of the 90% forecast.

The failure of the SCMAGLEV ridership estimates to present a range is not because the uncertainty is low; it is because the uncertainty is so high that presenting a realistic range would call the Project into question. I haven't constructed my own SCMAGLEV model or even been able to examine the DEIS model, as this information has not been made public, despite requests. Nevertheless, I am confident that it is more realistic to treat the DEIS ridership forecast like the maximum in the California modeling example and use the California ridership distribution as estimates for other ridership outcomes. The highest DEIS ridership is for 2045 with the Camden Yards alternative, 77,764 trips per day in Table D.2-2.

[67] Cambridge Systematics. California High-Speed Rail 2020 Business Plan Ridership and Revenue Forecasting Technical Supporting Document, p. ES-2. Prepared for DB Engineering & Consulting USA Inc. for the California High-Speed Rail Authority, January 2020.

In Figure 13, this number is set as the maximum and the other numbers are scaled in proportion to the California numbers.

Figure 13: Realistic Range for SCMAGLEV 2045 Ridership in Camden Yards Alternative (per day)



Even the numbers in Figure 13 may overstate ridership because the DEIS assumes very frequent train service which is essential to achieving high ridership. If ridership is significantly lower, service will need to be cut back. General modeling assumptions include a) wait time is half of the headway between departures, and b) wait time is weighted as twice as onerous as in-vehicle time. Therefore, a shift from departures every 15 minutes to every 30 minutes (off-peak) would increase average wait time from 7 ½ minutes to 15 minutes and this 7 ½ minute increase would be equivalent to 15 minutes of in-vehicle time in the competition with other modes (especially auto). Then lower ridership could require further service cutbacks – a common vicious circle with transit in the U.S.

DEIS Overstates Economic Benefits

The DEIS Executive Summary lists three bullets under "Economic Impacts." The first two bullets relate to 1) construction impacts and 2) operations and maintenance jobs and annual spending. These bullets mostly say that spending a huge amount of money creates jobs. Any other project would result in similar jobs multipliers in the Regional Input-Output Modeling System (RIMS II) model cited in the DEIS.[68] Moreover, the DEIS is assuming 100 percent of funding comes from outside the region and therefore the maximum construction impact, while ignoring the lost jobs and displaced revenue from business interruptions, including permanent closures.[69]

The DEIS estimates that construction would create 166,000 to 191,000 job-years, i.e. 1 job-year = 1 job for one year.[70] With the planned 7-year construction period, this represents an average of 24,000 to 27,000 jobs during the construction period. The Project Sponsor is stating a much higher and incorrect value in website communications: "205,000 jobs nationwide from construction."[71] This is 8 times the actual average value.

The Project Sponsor also misrepresents permanent jobs – using 14,600 in website communications.[72] The DEIS states:

> The annual economic impacts from operation and maintenance of the SCAGLEV Project for the Washington-Baltimore-Arlington CSA would result in between 390 and 440 total jobs annual, and between $24.3 and $27.4 million in earnings (2018) for all Build alternatives.[73]

This is only about 3% of the number the Project Sponsor is using. There is no justification for putting out such misinformation.

A redacted Louis Berger memorandum released on April 23rd concerning "SCMAGLEV Ridership Report Revenue and Operations Estimates Addendum" gives total employment impacts of 1,350 – 2,080. However, most of these jobs are indirect jobs calculated in the IMPLAN model rather than direct jobs associated with the Project. Even with the indirect jobs included, the estimate is only about a tenth of the number used in the Project Sponsor website communications.

The third bullet states:

> The availability of the SCMAGLEV service option would change the travel patterns in the Combined Statistical Area (CSA). These changes include the net change in user benefits, increased reliability relative to other modes, increased safety, induced ridership, avoidance of congestion, pavement savings, reduced emissions as drivers divert to SCMAGLEV, and reduced revenue for publicly provided regional commuter rail service as riders on these modes divert to SCMAGLEV.[74]

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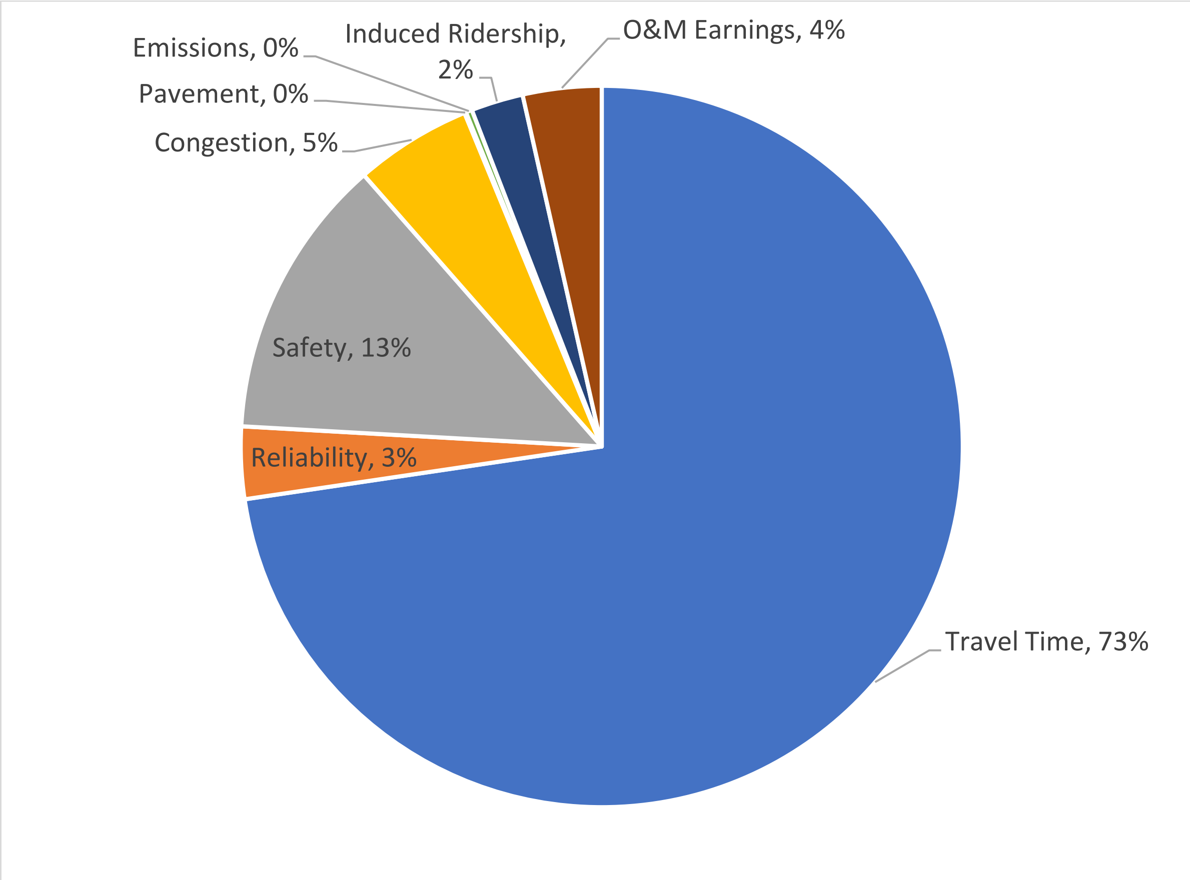
[68] DEIS at 4.6-2.
[69] DEIS App. D.4 at D-20, 30.
[70] DEIS App. D.4 Table D.4-10 at D-25 2.
[71] https://bwrapidrail.com/project/benefits/ and also https://northeastmaglev.com/economic-benefits/.
[72] https://bwrapidrail.com/project/benefits/ and also https://northeastmaglev.com/economic-benefits/.
[73] DEIS at. 4.6-8.
[74] DEIS at ES-15.

Figure 14 shows the relative magnitude of these annual benefits as reported in the DEIS.

Figure 14: Percentage of Total Annual SCMAGLEV Economic Benefits Reported in DEIS (Average of the Two Alternatives and Two Years)[75]



The ridership estimate errors discussed above all translate directly to errors in calculations of economic benefits because they all are proportional to ridership. However, in some cases the errors in economic benefit calculations are even greater. For example, the economic benefits of travel time savings are the product of SCMAGLEV ridership multiplied by average time savings per rider. If ridership is overestimated by a factor of three as suggested in Figure 13 and travel time savings are overestimated by a factor of five or more as discussed above, then the economic benefits of the travel time savings are overestimated by a factor of fifteen or more. DEIS Table D.4-20 shows annual travel time savings of $696.6 million in 2045 for the Camden Yards alternative.[76] A fifteenth of that is only $46.4 million.

As shown in Figure 15, three quarters of the benefits claimed in the DEIS are direct benefits to the riders – travel time savings and reliability. Even with the inflated travel costs savings, the DEIS numbers show that SCMAGLEV is a bad deal. The DEIS estimates of the value of travel time savings plus reliability are less than the additional out-of-pocket cost to the riders (SCMAGLEV trip cost minus avoided cost from another mode). Figure 9 shows these numbers on an average cost per rider basis.

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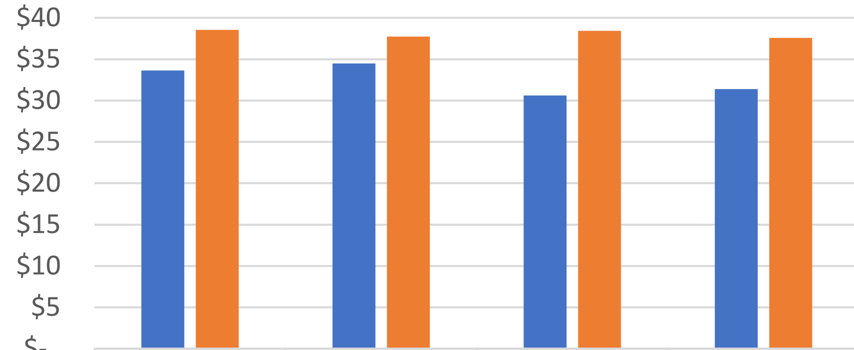
[75] Calculated from values in DEIS App. D.4 Table D.4-7 at D-19.
[76] DEIS App. D.4 Table D.4-20 at D-36.

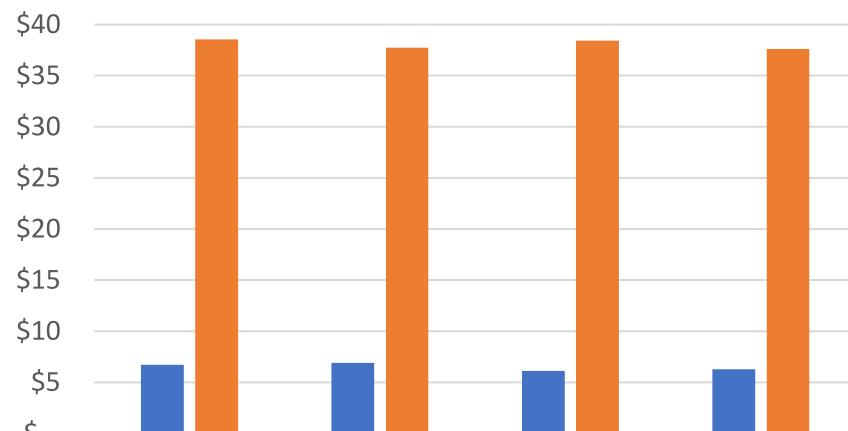
Figure 15: Average Purported Travel Time and Reliability Per Rider Compared to Average Purported Additional Cost Per Rider Computed from DEIS Tables[77]



	Cherry Hill 2030	Cherry Hill 2045	Camden Yards 2030	Camden Yards 2045
Travel time + reliability savings	$34	$34	$31	$31
Extra travel cost	$39	$38	$38	$38

As documented above, both the travel time savings and reliability estimates are likely inflated by at least a factor of five. Figure 16 shows the additional out-of-pocket cost per SCMAGLEV rider compared to more user benefits where the DEIS estimates are divided by five.

Figure 16: More Realistic Travel Time and Reliability Per Rider Compared to Average Purported Additional Cost Per Rider [78]



	Cherry Hill 2030	Cherry Hill 2045	Camden Yards 2030	Camden Yards 2045
Travel time + reliability savings	$7	$7	$6	$6
Extra travel cost	$39	$38	$38	$38

[77] Travel cost savings and reliability from DEIS App. D.4 Table D.4-7 at p. D-19 divided by total diverted trips from Table D.4.2-3, p. 4.2-7.

[78] Same as Figure 15 except travel time and reliability savings divided by a factor of five.

With more realistic cost and reliability savings, the average rider would be paying about $30 more than they would be getting back in benefits.

The other economic benefits claimed in the DEIS are similarly unreasonable. The next largest benefit is safety – ranging from $75 million to $115 million per year depending on the alternative and year.[79] As with all the economic benefits number, these estimates are inflated due to inflated ridership estimates. However, the analysis also is overly simplistic as it assumes that reductions in vehicle miles traveled (VMT) translate proportionally into accident reductions. This has not happened during the pandemic. The *Washington Post* wrote:

> Traffic fatalities increased nationally and in the Washington region last year despite a significant drop in traffic because of the coronavirus pandemic. . .
>
> Excessive speeding was cited as a leading contributor to the carnage. . .
>
> Traffic deaths last year were up from 2019, when 249 people were killed in the District and its closer suburbs. . .
>
> The Washington region's numbers mirror a national trend. . .
>
> While Americans drove less because of stay-at-home orders and increased telecommuting, the fatality rate per mile driven rose 24 percent last year, according to the [National Safety] Council's analysis. Meanwhile, the number of miles driven nationwide decreased by 15 percent.[80]

In the DEIS accident benefits calculations, an estimated reduction in fatalities from 3 to 5 per year (depending on alternative and year) represents about 40% of the total benefits because each life saved is valued at about $10 million. As shown in the pandemic experience, these calculations are unreasonable because there is no direct connection between VMT and fatalities. There also is no certainty that the SCMAGLEV will be as safe as assumed in the DEIS as the SCMAGLEV technology is significantly different that the reference technology discussed in the DEIS.[81] One significant SCMAGLEV accident could offset many years of the purported fatality reductions.

The other accident benefit calculations (injuries and property damage) are similarly unrealistic.

The next largest benefits category in the DEIS is congestion. Again, the estimates are arbitrary. First, since it is based on the inflated diverted ridership estimates, this number starts out as unrealistically inflated. Then, like with the safety calculations, the congestion calculations assume that there is a direct relationship between VMT reduction and travel time savings for others. It relies on a congestion cost per VMT multiplier from an obscure outdated 2000 report.[82]

It is likely that this report has not been updated because the underlying premise is wrong. In 1992 Anthony Downs coined the term *triple convergence* to describe how peak period traffic congestion is inevitable because drivers will compensate for capacity increases by (a) shifting routes, (b) shifting time

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[79] DEIS App. D.4 Table D.4-7 at D-19.

[80] Lazo, Luz. Transportation counts fell during the cononavirus pandemic, but road fatalities still increased. *Washington Pos*t, February 12, 2021.

[81] DEIS App. D.4 at D-47.

[82] DEIS App. D.4 at D-45.

of travel, and (c) shifting travel mode.[83] After capacity expansion, the new equilibrium will be just as congested as the old equilibrium.

The term *induced travel* has been used to include the three triple convergence effects plus other shifts in destinations, and longer-term shifts in land use. A review of the induced travel research by Handy and Boarnet concluded that induced travel is real and that the magnitude is sufficient to prevent capacity expansion from reducing congestion: "Thus, the best estimate for the long-run effect of highway capacity on VMT [vehicle miles traveled] is an elasticity close to 1.0, implying that in congested metropolitan areas, adding new capacity to the existing system of limited-access highways is unlikely to reduce congestion or associated GHG [greenhouse gas] in the long-run."[84]

Just as adding freeway capacity has no significant impact on peak period freeway congestion, adding parallel transit capacity has no significant impact on peak period freeway congestion.

SCMAGLEV Would Serve a Small Affluent Portion of the Population and Have Little or No Benefit to the Rest

As documented above, the high SCMAGLEV fares would only be attractive for those MARC travelers with household incomes exceeding $291,000. This also generally would be true for those that use autos, given that the DEIS states that the time savings from Baltimore to Washington would be 8 to 27 minutes.[85] Following U.S. Department of Transportation Guidance, the value of time for a traveler with $200,000 household income is $48/hour or 80 cents a minute. They would be willing to pay an extra $6.40 to save 8 minutes (much less than the additional SCMAGLEV cost) or $21.60 to save 27 minutes (also less than the additional cost of SCMAGLEV in most cases).

As discussed above, the supposed congestion relief for non-SCMAGLEV travelers will not materialize. Instead, construction of the SCMAGLEV will create a two-tier system with a fast ride for the affluent and likely negative consequences for everyone else.

Negative Impacts Are Much More Certain Than the Benefits

The DEIS documents significant negative construction impacts that are certain. These impacts are not fully analyzed in the DEIS. Regarding mitigation of construction impacts, the Transportation Technical Report repeats this text 20 times:

> Completion of a detailed traffic impact study by the Project Sponsor in order to fully understand the implications of truck arrivals and departures on traffic operations during each phase of construction and during different times of the day. Data used to complete the analysis presented in the DEIS is not yet at this level of detail.[86]

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[83] Downs, A. *Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*. Washington DC: Brookings Institution, 1992.
[84] Handy, S. and M. G. Boarnet. Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief prepared for California Air Resources Board, September 30, 2014 (emphasis added).
[85] DEIS App. D.4 at C-6.
[86] *E.g.*, DEIS App. D.2 at A-63, A-64, A-66, A-67,

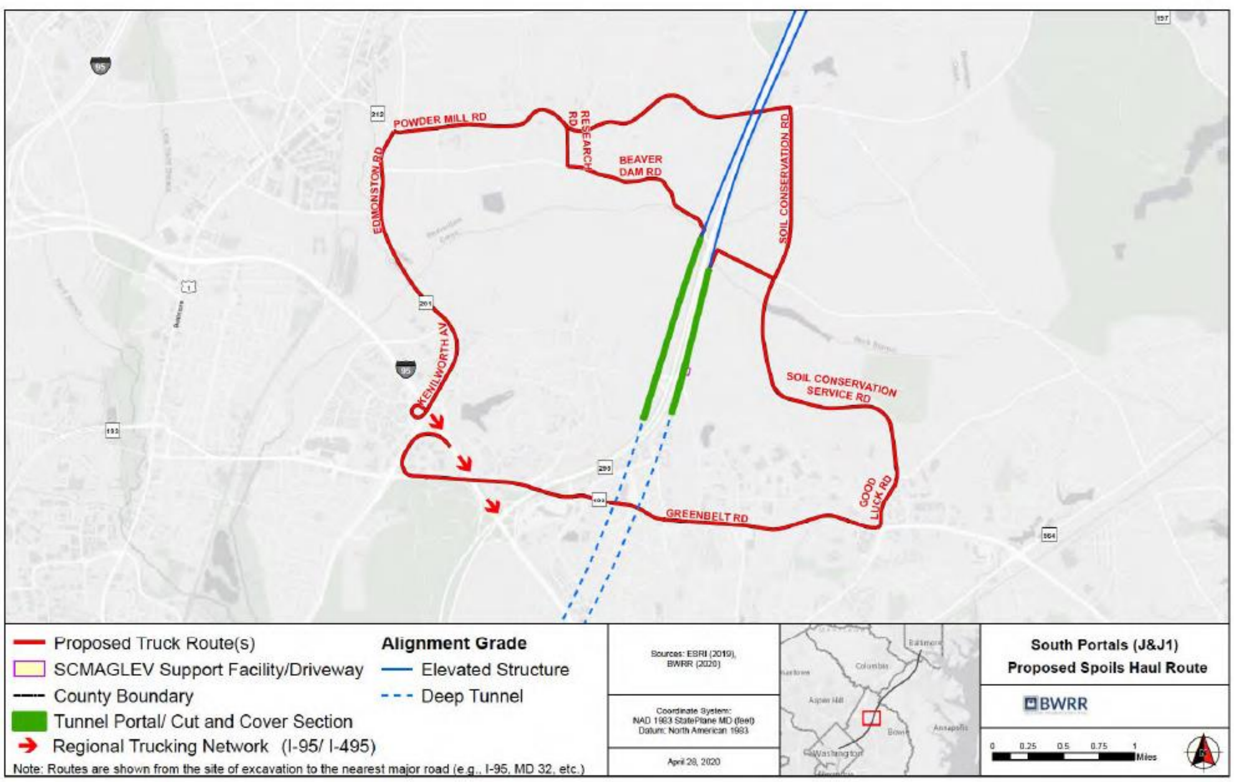
This information, along with mitigation plans, is information that the public needs to evaluate this Project and should have been part of the DEIS for public comments.

The DEIS does contain enough information to demonstrate that the magnitude of the impacts is very great and extends over a 7-year construction period. The Transportation Technical Appendix Table D.2-33 presents estimated truck and auto trips by work site. One of the eight pages in this table is reproduced below. As shown in the table, it is expected that whichever of the three Train Maintenance Facility (TMF) alternatives is ultimately selected will require 100 trucks a day or more for seven years.

These truck trips will have a major impact on local roads in and around the City of Greenbelt because as the DEIS states: “No commercial or construction vehicles/trucks will be allowed on the BW Parkway.”[87] Circuitous routing required for construction of the southern poral is shown in Figure 17.

Figure 17: Proposed Haul Route for South Portal[88]

Figure 30. Proposed Haul Route for South Portal (Alignment Alternative J & J1)



As shown in Figure 17, the routing includes running north of the City through BARC, to the east of the City on Soil Conservation Road, and directly through the City on Edmonston/Kenilworth Road and Greenbelt Road. The DEIS estimates that trucks will be moving excavated materials along this route 24 hours a day for 27 months, with 145 estimated truck trip per day for Alternative J and 240 truck trips per day for Alternative J1.[89]

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[87] DEIS, App. G7 at 95 of 226.
[88] DEIS, App. G7 at 136 of 226.
[89] DEIS, App. G7 Tables 22 and 23 at 108 of 226

Table 9 Estimated Truck and Auto Trips by Work Site During SCMAGLEV Construction (1 page of 8)[90]

Work Site Location	Alignment Alternative	Approx. Alignment Stationing	Work Element	Duration (Months)	Construction Time Period	Workday Length	Roadways Impacted (see current conditions)	Truck Trips per Day	Worker Vehicle Arrivals Per Day
Camden Yards Station	J, J1	207+300	Camden Yards Station Civil Construction	48	Years 2 to 7	7AM - 4 PM	Interstate 395, Conway Street, Pratt Street, Howard Street, Lombard Street	200-250	150
			Camden Yards Station Architectural Construction	24	Years 2 to 7	7AM - 4 PM	Interstate 395, Conway Street, Pratt Street, Howard Street, Lombard Street	100	100
BARC West TMF Site (materials delivery from Powder Mill Road in vicinity of Research Road) - Prince George's County	n/a		BARC West TMF Site Construction	78	Years 1 to 7	7AM - 4 PM	Powder Mill Road	100	150
			BARC West TMF Site Substations (2 substations)	24	Years 2 to 6	7AM - 4 PM	Powder Mill Road	6	100
			MOW Facility Construction	24	Years 2 to 6	7AM - 4 PM	Powder Mill Road	6	100
BARC Airstrip TMF Site (materials delivery from Springfield Road) - Prince George's County	n/a		BARC Airstrip TMF Site Construction	78	Years 1 to 7	7AM - 4 PM	Springfield Road	100	150
			BARC Airstrip TMF Site Substations (2 substations)	24	Years 2 to 6	7AM - 4 PM	Springfield Road	6	100
			MOW Facility Construction	24	Years 2 to 6	7AM - 4 PM	Powder Mill Road	6	100
BARC 198 TMF Site (materials delivery from Old Portland Road via MD 198	n/a		MD 198 TMF Site Construction	90	Years 1 to 7	7AM - 4 PM	Old Portland Road Extended	100	150
			BARC Airstrip/MD 198 TMF Site Substations (2 substations)	24	Years 2 to 6	7AM - 4 PM	Old Portland Road Extended	6	100

Source: BWRR Construction Reports

90 DEIS App. D.2 at A-91.

In addition to the construction of the TMF and tunnel portal, these road segments will also be subject to traffic impacts due to southern viaduct construction[91] and possibly BARC TMF ramp construction.[92]

There will be many temporary closures and detours and will inconvenience residents and increase congestion. In the Greenbelt area, DEIS Appendix G Part I shows:

- Traffic from NB MD 295 to Explorer Rd. will be detoured via Greenbelt Rd. and Goddard Rd. (p. 13)
- Traffic from Explorer Rd. to MD 295 will be detoured via Goddard Rd. and Greenbelt Rd. (p. 13)
- Traffic from NB MD 295 will be detoured via the Capitol Beltway MD 201 and Powder Mill Rd. (p. 14-15)
- Traffic from MD 193 will be detoured via MD 201 and Powder Mill Rd. (p 14-15)
- Traffic from SB MD 295 will be detoured via Power Mill Rd., MD 201, and the Capitol Beltway. (Park I, p. 16-17)
- Beaver Dam Rd. closure between Research Rd. and Soil Conservation Rd. Beaver Dam Rd. traffic will be detoured via Research Rd., Power Mill Rd. and Soil Conservation Rd. (p. 18-21)
- Soil Conservation Rd. closure between Power Mill Rd. and Beaver Dam Rd. Soil Conservation Road will be detoured via Power Mill Road, Research Road, and Beaver Dam Rd. (p. 22)
- Springfield Rd. closure between Power Mill Rd. and Beaver Dam Rd. Springfield Rd. traffic will be detoured via Powder Mill Rd., Soil Conservation Rd., and Beaver Dam Rd. (Park I, p. 23)
- Springfield Rd. closure between Powder Mill Rd. and Odell Rd. Springfield Rd. traffic will be detoured via Power Mill Rd., Poultry Rd., and Odell Rd.

These traffic impacts will be in an area that is already experiencing significant traffic congestion as documented in a recent traffic impact statement done for the proposed Bureau of Engraving and Printing facility. Figure 18 shows existing failing level-of-service F intersections in both the weekday morning and afternoon peak period for the intersection of Edmonston Road with Powder Mill Road and for the intersections of Powder Mill Road with the BW Parkway. The DEIS fails to analyze traffic impacts at these failing intersections or to offer any mitigation.

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[91] DEIS, App. G7 Tables 13 and 14 at 93 of 226.
[92] DEIS, App. G7 Tables 15 and 15 at 94-95 of 226.

Figure 18: Existing Intersection Level of Service (HCM)[93]

[93] Alliance Consulting Group. Bureau of Engraving and Printing Transportation Impact Study Full Report with Appendices at 66. June 2020.

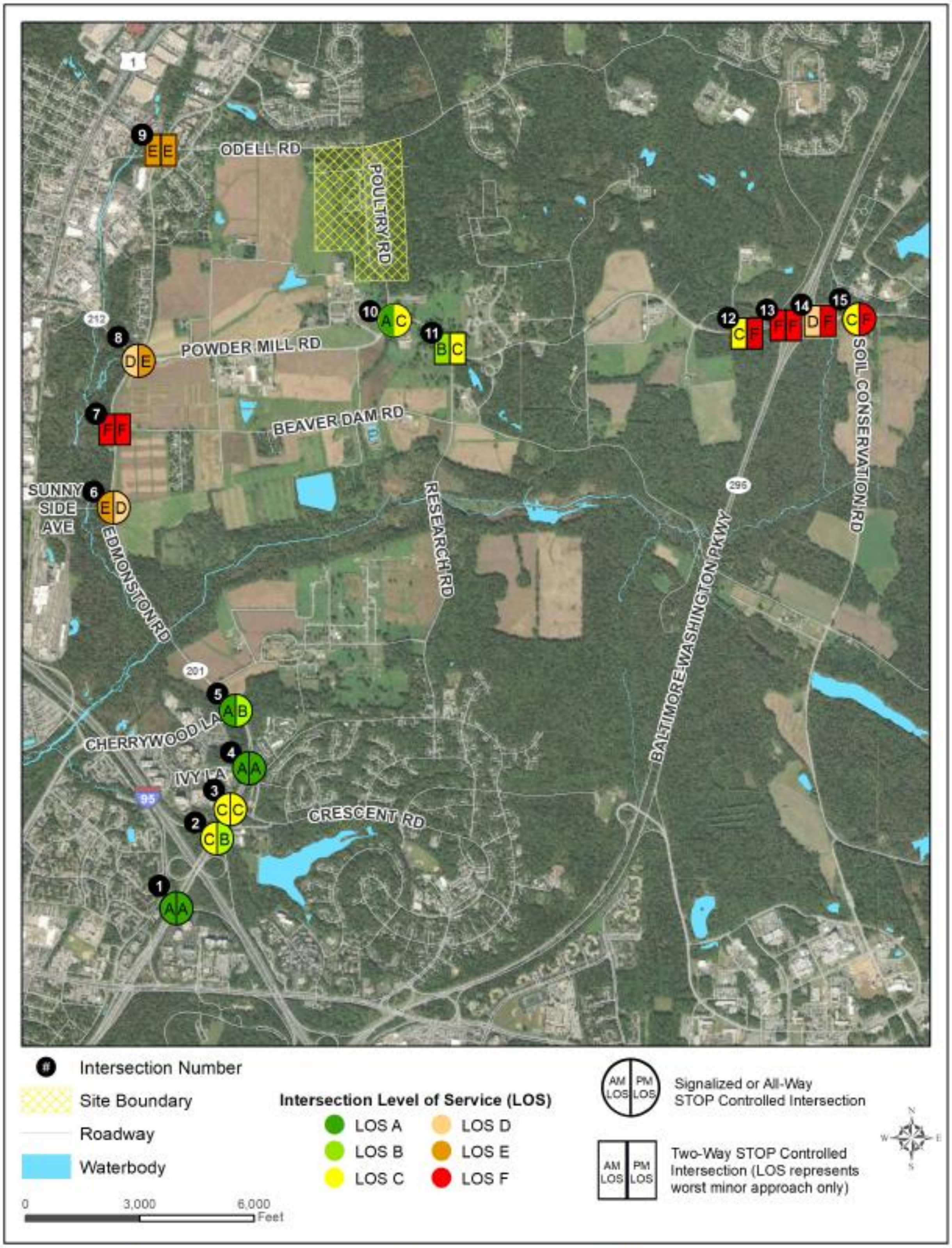

Figure 4-18: Existing Condition: Intersection Level of Service (HCM)

Conclusions

The DEIS inflates ridership by a) failing to screen out unrealistic zone-to-zone trips, and b) applying unrealistically high SCMAGLEV mode shares to overly large catchment areas. The DEIS fails to disclose critical information about the stated preference survey that one of the redacted reports states "forms the basis of the ridership forecasts."

The DEIS overestimates travel time savings and reliability benefits by a factor of five or more. Three quarters of the purported economic benefits of SCMAGLEV are travel time and reliability benefits and these are overestimated by a factor of 15 or more. Even with the inflated travel time and reliability benefits assumed, the DEIS shows that these benefits are not large enough to cover additional out-of-pocket costs. When more realistic travel time and reliability benefits are assumed, riders would pay an average of $30 more than the value of the benefits received.

The other significant economic benefits calculations in the DEIS rest both on inflated ridership and on unreliable vehicle miles traveled (VMT) multipliers.

The DEIS documents significant negative construction impacts. More information about these impacts and mitigation should have been included in the DEIS.

Appendix A: Norman L. Marshall Resume

NORMAN L. MARSHALL, PRESIDENT

nmarshall@smartmobility.com

EDUCATION:

Master of Science in Engineering Sciences, Dartmouth College, Hanover, NH, 1982----------------
Bachelor of Science in Mathematics, Worcester Polytechnic Institute, Worcester, MA, 1977

PROFESSIONAL EXPERIENCE: (31 Years, 17 at Smart Mobility, Inc.)

Norm Marshall helped found Smart Mobility, Inc. in 2001. Prior to this, he was at RSG for 14 years where he developed a national practice in travel demand modeling. He specializes in analyzing the relationships between the built environment and travel behavior and doing planning that coordinates multi-modal transportation with land use and community needs.

Regional Land Use/Transportation Scenario Planning

Portland Area Comprehensive Transportation System (PACTS) – the Portland Maine Metropolitan Planning Organization. Updating regional travel demand model with new data (including AirSage), adding a truck model, and multiclass Dynamic Traffic Assignment (DTA) including differentiation between cash toll and transponder payments.

Loudoun County Virginia Dynamic Traffic Assignment – Enhanced subarea travel demand model to include Dynamic Traffic Assignment (Cube). Model being used to better understand impacts of roadway expansion on induced travel.

Vermont Agency of Transportation-Enhanced statewide travel demand model to evaluate travel impacts of closures and delays resulting from severe storm events. Model uses innovate Monte Carlo simulations process to account for combinations of failures.

California Air Resources Board – Led team including the University of California in $250k project that reviewed the ability of the new generation of regional activity-based models and land use models to accurately account for greenhouse gas emissions from alternative scenarios including more compact walkable land use and roadway pricing. This work included hands-on testing of the most complex travel demand models in use in the U.S. today.

Climate Plan (California statewide) – Assisted large coalition of groups in reviewing and participating in the target setting process required by Senate Bill 375 and administered by the California Air Resources Board to reduce future greenhouse gas emissions through land use measures and other regional initiatives.

Chittenden County (2060 Land use and Transportation Vision Burlington Vermont region) – led extensive public visioning project as part of MPO's long-range transportation plan update.

Flagstaff Metropolitan Planning Organization – Implemented walk, transit and bike models within regional travel demand model. The bike model includes skimming bike networks including on-road and off-road bicycle facilities with a bike level of service established for each segment.

Chicago Metropolis Plan and Chicago Metropolis Freight Plan (6-county region)— developed alternative transportation scenarios, made enhancements in the regional travel demand model, and used the enhanced model to evaluate alternative scenarios including development of alternative regional transit concepts. Developed multi-class assignment model and used it to analyze freight alternatives including congestion pricing and other peak shifting strategies.

Municipal Planning

City of Grand Rapids – Michigan Street Corridor – developed peak period subarea model including non-motorized trips based on urban form. Model is being used to develop traffic volumes for several alternatives that are being additional analyzed using the City's Synchro model

City of Omaha – Modified regional travel demand model to properly account for non-motorized trips, transit trips and shorter auto trips that would result from more compact mixed-use development. Scenarios with different roadway, transit, and land use alternatives were modeled.

City of Dublin (Columbus region) – Modified regional travel demand model to properly account for non-motorized trips and shorter auto trips that would result from more compact mixed-use development. The model was applied in analyses for a new downtown to be constructed in the Bridge Street corridor on both sides of an historic village center.

City of Portland, Maine – Implemented model improvements that better account for non-motorized trips and interactions between land use and transportation and applied the enhanced model to two subarea studies.

City of Honolulu – Kaka'ako Transit Oriented Development (TOD) – applied regional travel demand model in estimating impacts of proposed TOD including estimating internal trip capture.

City of Burlington (Vermont) Transportation Plan – Led team that developing Transportation Plan focused on supporting increased population and employment without increases in traffic by focusing investments and policies on transit, walking, biking and Transportation Demand Management.

Transit Planning

Regional Transportation Authority (Chicago) and Chicago Metropolis 2020 – evaluated alternative 2020 and 2030 system-wide transit scenarios including deterioration and enhance/expand under alternative land use and energy pricing assumptions in support of initiatives for increased public funding.

Capital Metropolitan Transportation Authority (Austin, TX) Transit Vision – analyzed the regional effects of implementing the transit vision in concert with an aggressive transit-oriented development plan developed by Calthorpe Associates. Transit vision includes commuter rail and BRT.

Bus Rapid Transit for Northern Virginia HOT Lanes (Breakthrough Technologies, Inc and Environmental Defense.) – analyzed alternative Bus Rapid Transit (BRT) strategies for proposed privately-developing High Occupancy Toll lanes on I-95 and I-495 (Capital Beltway) including different service alternatives (point-to-point services, trunk lines intersecting connecting routes at in-line stations, and hybrid).

Roadway Corridor Planning

I-30 Little Rock Arkansas – Developed enhanced version of regional travel demand model that integrates TransCAD with open source Dynamic Traffic Assignment (DTA) software, and used to model I-30 alternatives. This model models freeway bottlenecks much more accurately than the base TransCAD model.

South Evacuation Lifeline (SELL) – In work for the South Carolina Coastal Conservation League, used Dynamic Travel Assignment (DTA) to estimate evaluation times with different transportation alternatives in coastal South Caroline including a new proposed freeway.

Hudson River Crossing Study (Capital District Transportation Committee and NYSDOT) – Analyzing long term capacity needs for Hudson River bridges which a special focus on the I-90 Patroon Island Bridge where a microsimulation VISSIM model was developed and applied.

PUBLICATIONS AND PRESENTATIONS (partial list)

DTA Love: Co-leader of workshop on Dynamic Traffic Assignment at the June 2019 Transportation Research Board Planning Applications Conference.

Forecasting the Impossible: The Status Quo of Estimating Traffic Flows with Static Traffic Assignment and the Future of Dynamic Traffic Assignment. *Research in Transportation Business and Management* 2018.

Assessing Freeway Expansion Projects with Regional Dynamic Traffic Assignment. Presented at the August 2018 Transportation Research Board Tools of the Trade Conference on Transportation Planning for Small and Medium Sized Communities.

Vermont Statewide Resilience Modeling. With Joseph Segale, James Sullivan and Roy Schiff. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

Assessing Freeway Expansion Projects with Regional Dynamic Traffic Assignment. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

Pre-Destination Choice Walk Mode Choice Modeling. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

A Statistical Model of Regional Traffic Congestion in the United States. Presented at the 2016 Annual Meeting of the Transportation Research Board.

MEMBERSHIP/AFFILIATIONS

Associate Member, Transportation Research Board (TRB)

Member and Co-Leader Project for Transportation Modeling Reform, Congress for the New Urbanism (CNU)