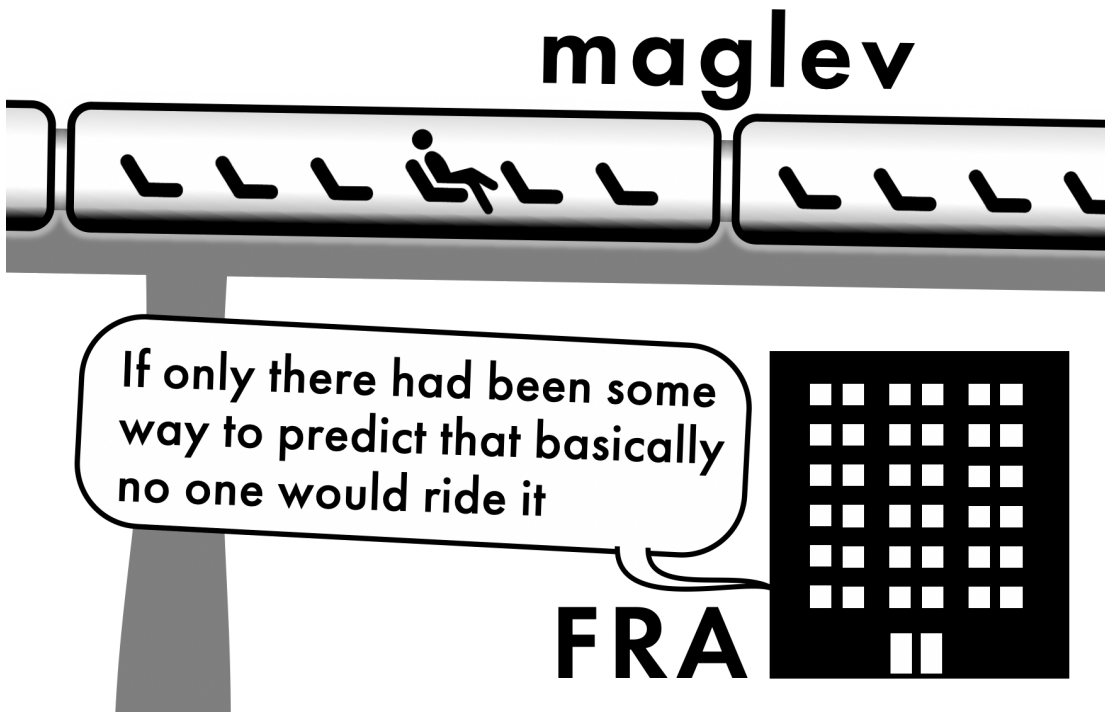# The Federal Railroad Administration falls for an excessively high forecast of how many trips would be made on the maglev

21
MAY 2021

👤 by Owen A Kelley | 🏷 posted in: Greenbelt News, Transportation |

Reference data suggest that the official ridership forecast is more than a factor of ten too high for the proposed Baltimore–Washington maglev

A cartoon depicting the question: Is the maglev's official ridership forecast accurate?

With the maglev public-comment period drawing to a close, many residents in the area are rushing to submit their comments in time. Greenbelt Online offers this last blog post about the maglev before the comment period ends. Instructions for submitting your comments are available here. This blog post discusses the official forecast of the maglev's ridership. Prior articles in this series covered what fraction of Washington-area residents would find the maglev ticket price worth the travel time saved and the climate-change impact of building and operating the maglev. The entire analysis is contained in the following PDF file: kelley202108.magRider.

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It would be a scandal to spend 17 billion dollars to build a new rail line if one could predict that the train would run mostly empty. There are hints that this disaster might unfold if a magnetic-levitation rail line were built between Baltimore and Washington, DC. Most people call this train, the "maglev." [1]

The official ridership forecast for the Baltimore-Washington maglev is stated in the project's draft environmental impact statement. The draft impact statement, however, merely copies its ridership forecast from a contractor's report, a report that the public is not allowed to read. This secrecy makes it more difficult to double-check the official ridership forecast but it does not make it impossible. If an approximate answer is sufficient, then only a few mathematical steps are needed to derive a ridership forecast that is independent of the official forecast.

The accuracy of the official ridership forecast matters because the maglev's draft impact statement relies on the ridership forecast in order to quantify the various benefits of operating the maglev. The number of people riding the maglev determines the revenue from ticket sales, the financial solvency of the maglev operator, the amount of road-congestion prevented, the reduction in car-generated air pollution, and the number of jobs created because of maglev operations.[2]

It is unclear how low ridership would have to be to make the maglev worthless. The draft impact statement ignores this question. Would this threshold be crossed if the official ridership forecast were, say, twice as high as would be reasonable? The analysis below suggests that the official ridership forecast is more than ten times greater than can be supported by several datasets that describe the region's travel patterns.[3]

Background

In January 2021, the Federal Railroad Administration published the maglev's draft environmental impact statement. The document describes ridership as a "key metric" for determining impacts of operating the proposed maglev. Bizarrely, the document uses only 6 out of its 3,000 pages to describe its ridership forecasting method. Such a brief discussion of such an important topic is odd. The draft impact statement provides so little detail that the official ridership forecast is not reproducible.[4]

Worse yet, it appears that the Federal Railroad Administration merely copied its ridership numbers from a contractor's report. The contracting company is named Louis Berger.

In the draft impact statement, there is no evidence that the Federal Railroad Administration commissioned an independent review of the Louis Berger ridership report or had its own staff perform an internal review of it. The draft impact statement does mention one review of the Louis Berger ridership report, but that review suffers from at least the appearance of a conflict of interest. That review was conducted by the company that wants to built the maglev, i.e., Baltimore Washington Rapid Rail (BWRR). [5]

By republishing Louis Berger's numbers in the draft impact statement, the Federal Railroad Administration has transformed Louis Berger's numbers into the project's official ridership forecast.

During most of the public-comment period for the maglev's draft impact statement, the Louis Berger ridership report was completely hidden from the public. The company that wants to build the maglev, BWRR, was allowed to see the Louis Berger report, but not the public or elected officials. Toward the end of the comment period, the Federal Railroad Administration made public a heavily redacted copy of the Louis Berger report. The information relevant to the present article, for example, was completed blanked out in this redacted copy.[6]
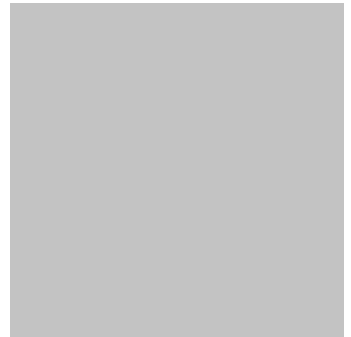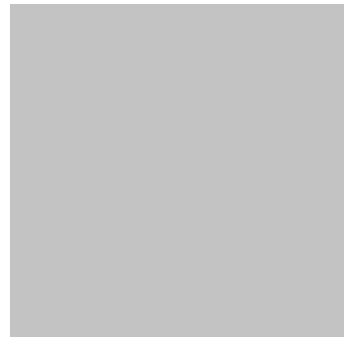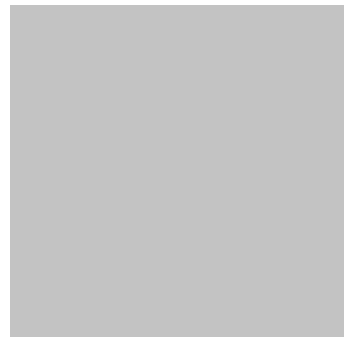
The proposed maglev would have only three stops: downtown Washington, downtown Baltimore, and the Baltimore/Washington International (BWI) airport. The present paper examines travel between the two urban centers first and subsequently examines travel from urban center to BWI airport.

The maglev's draft impact statement says that most of the maglev's ridership would be people traveling between the two cities rather than people who are flying out of or in to BWI airport.

In addition, the draft impact statement says that most maglev trips would be "diverted" not "induced." A diverted maglev trip is a maglev trip that the customer would make by another form of transportation if the maglev were not built. In contrast, an induced maglev trip is a trip that would only occur if the maglev were built. As a practice, transportation planners divide total ridership into diverted and induced travel. The present article examines only diverted trips because they are easier to estimate than induced trips.

The calculation of diverted trips starts with a recent travel survey. The travel survey states how many trips are made between Washington and Baltimore, and the survey was published in 2020 by the Metropolitan Washington Council of Governments.[7]

The relevant number to extract from the travel survey is the number of trips within the maglev service area: 18,956 one-way trips per day. As discussed in the Appendix of the present article, this number depends on which jurisdictions are determined to be within the maglev's ridership area. These jurisdictions are listed in an article that the present author wrote titled "The Maglev would serve a small geographic area." In these jurisdictions, most residents could save time by riding the maglev rather than driving between Baltimore and Washington. In this way, the maglev would serve three jurisdictions at the southern end of the maglev line: the District of Columbia, the City of Alexandria, and Arlington County. The maglev would serve two jurisdictions at northern end of the line: the City of Baltimore and Baltimore County.[8]

The 18,956-trip estimate is based on data collected in 2018, but this number can be extrapolated to 2045, the year for which the maglev's official ridership forecast is intended to apply. To extrapolate from 2018 to 2045 one may use a 0.93% increase in travel per year between Baltimore and Washington as proposed in the maglev's draft impact statement.[9]

The next step is to multiply by the fraction of the population that makes enough money that the travel time saved on the maglev would seem worth the maglev ticket price. In an earlier article titled "Maglev riders would come from the wealthiest 2% of the Baltimore-Washington population," the author showed that about 2% of the population earns this much.[10]

The schematic diagram below shows how these factors are combined to arrive at an unofficial forecast that 178,000 one-way trips would be diverted to the maglev in 2045. The diagram also shows the official forecast for this portion of the maglev ridership: 17.6 million one-way maglev trips. To be clear, both the official forecast and the just-derived unofficial forecast are both forecasts for diverted maglev trips in 2045, excluding BWI airport customers. The official forecast is approximately one hundred times greater than the independent, unofficial forecast (100 ≈ 17.6 ÷ 0.178).[11]

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A schematic diagram showing how the unofficial forecast is calculated for the number of diverted travelers is calculated.

Downtown to Airport

The preceding section considered non-airport travel and this section considers airport travel. In both cases, the official ridership forecast in the draft impact statement is much higher than the unofficial forecast derived in the present article.

At the Baltimore/Washington International (BWI) airport, a maglev station is proposed immediately adjacent to the airport's main terminal where the hourly parking garage now stands. The Maryland Aviation Administration reported that BWI airport had 26.933 million arrivals and departures in 2019.[12]

The first task is to determine what portion of BWI customers would save time if they used the maglev to travel to or from the airport. Those Washington area residents who would save time riding the maglev to or from BWI are those who live in DC, Arlington, or Alexandra. Most City of Baltimore residents, but not most Baltimore County residents, could save time by riding the maglev to BWI. Approximately 21% of the region's population lives in the four above-mentioned jurisdictions.[13]

airport trips. The first factor extrapolates the 2019 measured trips to 2045, the year of the official maglev ridership forecast. The second factor is 0.02, the portion of the population that is wealthy enough to find the maglev travel-time savings worth the maglev ticket price.

After combining these factors, the result is an unofficial forecast of 143,000 one-way maglev trips in 2045 by BWI customers traveling to or from the airport on the proposed maglev. Add these 143,000 airport trips to the 178,000 non-airport trips derived in the previous section to arrive at the total number of maglev trips that represent travel diverted from other forms of transportation in 2045. The sum of these two numbers is 321,000 trips, which is far less than the official forecast of 20.6 million trips.

To be clear, the official and unofficial forecasts are both estimates of the number of diverted maglev trips that would be made in 2045. The official forecast is a factor of 64 times greater than the independent, unofficial forecast that the present article derives (64 ≈ 20.6 ÷ 0.321).[14]

Commuters

The official ridership forecast is far too high based on the analysis presented so far that uses publicly available reference datasets. Because it is a serious charge to claim that the Federal Railroad Administration has been fooled into republishing a grossly implausible ridership forecast, this section examines yet another reference dataset. This third dataset confirms the pattern seen so far, as explained below.

Data from the Census Bureau show that 13,091 people commuted between Baltimore and Washington in 2015, the most recent year for which these data are available. This number is the sum of the people who live in Baltimore and work in Washington and the people who live in Washington and work in Baltimore. As discussed in Kelley (2021 March 25), these commuters have the District of Columbia, Arlington, or Alexandria at the southern end of their commute and Baltimore County or the City of Baltimore at the northern end of their commute.[15]

The annual number of one-way commuting trips can be estimated by multiplying the number of commuters by two trips per workday and by the average number of workdays in a year.[16]

Multiply this number of trips by the same two factors used in the previous sections of the present article. First, use a 0.93%-per-year increase in travel between the year that the data was collected, 2015, and the maglev forecast year, which is 2045. Second, multiply by 0.02 because only about 2% of the population is wealthy enough that the travel-time saved on the maglev would be worth the maglev ticket price. The result is an unofficial forecast that 147,000 one-way maglev trips would be made in 2045 by diverted commuters, commuters who switched from some other form of transportation to ride the maglev.

In contrast, the official forecast is that diverted commuters would make 5.2 million one-way maglev trips per year. The official forecast is 35 times higher than the unofficial forecast (35 ≈ 5.2 ÷ 0.147).[17]

To review, the present article has examined three reference datasets. All three of them provide evidence that the official ridership forecast for the proposed maglev is implausibly high. The official forecast in the draft impact statement is more than ten times higher than the reference datasets can support.

Prior Studies Suggest Low Ridership

There is nothing surprising about the present article finding that only a few travelers would prefer the proposed Baltimore-Washington maglev over other forms of transportation.

Academies report in 1991 and Federal Railroad Administration reports in 1993 and 2005. This result applies to all types of high-speed rail lines whether or not they use maglev technology. The proposed Baltimore-Washington maglev would be only 36 miles long, which is much shorter than the 100-mile cutoff.[18]

It is surprising that the Federal Railroad Administration chose not to mention the findings of these earlier studies in the January 2021 draft impact statement for the proposed Baltimore-Washington maglev. The regulations that implement the National Environmental Policy Act (NEPA) require that an impact statement evaluate all relevant points of view.[19]

The most natural interpretation of these earlier studies is that a maglev shorter than 100 miles would not be economically viable. For this reason, a short-run maglev line would be an invalid subject for an environmental impact statement. To quote NEPA regulations, the subject of an environmental impact statement must:

have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made [20]

Based on the analysis in the present article, a maglev between Baltimore and Washington would have so few riders that it would lack the "independent utility" that is required in the above-quoted regulation.

Conclusion

The present article has examined the official forecast for the number of trips that would be made on the proposed Baltimore-Washington maglev. The official forecast is stated in the draft environmental impact statement that the Federal Railroad Administration published in January 2021.

The analysis in the present article finds that the official ridership forecast is implausibly high. The official forecast is more than an order of magnitude higher than what reference datasets can support.

The official forecast is 20.6 million one-way maglev trips that would be made each year by travelers diverted from other forms of transportation. In contrast, various reference datasets examined in the present article suggest that a much smaller number of diverted travelers is more likely: 0.32 million one-way maglev trips per year. A diverted traveler is someone who would make the trip by another form of transportation if the maglev were not built. The draft impact statement reports that the great majority of maglev travelers would be diverted from other forms of transportation.

If the official ridership forecast is higher than warranted, then it would prevent the draft impact statement from helping the public and elected officials evaluate the harm and benefits associated with the proposed maglev. The draft impact statement relies on the ridership forecast to derive its estimate for, among other things, the maglev's revenue, the solvency of the maglev operator, the air-pollution reduction, the road-congestion improvement, and the jobs created by maglev operations.

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Notes

[1] $15–17 billion: Appendix D4, Table D4-8, pg. D-21.

[2] Revenue from maglev ticket sales in "SCMAGLEV annual fare cost" row of Appendix D4, Table D4-28, pg. D-44. Road congestion: Kelley 2021 Feb 10. Air pollution: Appendix D4, Table D4-40, pg. D-51, and Kelley 2021 April 11. 390–440 jobs created by maglev operations: Chapter 4.6, pg. 4.6-8.

[3] Many ridership forecasts off ±30%: Hartgen (2013). A factor of 10 error would be unusually large.

[4] Six-page-long ridership-model description citing zero references: Appendix D2, pg. B-104 to D-109. Key metric: Chapter 4.2, pg. 4.2-6. 654 pages in main text and 2399 pages in the appendices, so the total page count is 3,053. To count pages, use the mdls command in the MacOS terminal: mdls -n kMDItemNumberOfPages *.pdf | awk '{print $3; sum += $3} END {print sum}'.

[5] The maglev DEIS cites the 2018 Louis Berger "Baltimore-Washington SCMAGLEV Project Final Ridership Report" in Appendix D4 (footnote to Table D4-19, pg. D-36) and in Chapter 4.6 (pg. 4.6-3, footnotes 9). The DEIS describes 3 steps that the "project sponsor" took to check the ridership forecast (Appendix D2, pg. B-104), but no steps that the Federal Railroad Administration took. The Federal Railroad Administration is a regulatory agency, so one of its essential functions is to double-check statements made by project sponsors, i.e., by the industry that the agency is supposed to be regulating. From the page following the title page of the draft impact statement: "The Project Sponsor, Baltimore Washington Rapid Rail, LLC proposes to construct and operate an SCMAGLEV system between Baltimore, MD and Washington, D.C." See the discussion in Voulgaris (2019) on how a forecast can be affected by the biases of the forecaster.

Administration (MTA) 17 March 2021, press release, https://www.mta.maryland.gov/articles/304. Redacted copy of the 2018 Louis Berger ridership report released on April 23, 2021, at https://bwmaglev.info/index.php/project-documents/deis#ridership-studies.

[7] See the Appendix of the present article for details about the Regional Travel Survey.

[8] Ridership area article: 25 March 2021: https://www.greenbeltonline.org/the-maglev-would-serve-a-small-geographic-area/.

[9] 0.93% annual growth: Appendix D2, pg. C-106.

[10] 2% article: 2 May 2021: https://www.greenbeltonline.org/maglev-wealth/.

[11] Official ridership forecast for diverted non-airport travelers calculated as diverted travelers contributing 20.579 million trips (Chapter 4.2, Table 4.2-3, pg. 4.2-7) multiplied by 85.5% of maglev trips would be by people other than BWI airport customers (Appendix D4, Table D4-19, pg. D-35). 17.6 million = 20.579 million · 0.855.

[12] MD Aviation Administration December 2020.

[13] 21%: see the Census Bureau data described in the Appendix of the present article.

[14] Official forecast of 20.579 million trips by diverted travelers: Chapter 4.2, Table 4.2-3, pg. 4.2-7.

[15] 13,091 commuters: See the American Commuter Survey data in the Appendix of the present article.

[16] How many trips the average commuter would make in a year: Appendix of present article.

[17] Official forecast for diverted commuters calculated as 20.579 million trips by diverted travelers (Chapter 4.2, Table 4.2-3, pg. 4.2-7) multiplied by 25.4% of maglev trips being made by commuters (Appendix D4, Table D4-19, pg. D-35). 5.2 million = 20.579 million · 0.254.

[18] 33–36-mile length stated in maglev DEIS: FRA 2021, Chapter 3, pg. 3-18 and 3-19. National Academies (1991), Figure ES-1, pg. 7. Car's advantages over rail: FRA 1997, pg. 7-4; FRA 2008, pg. 6-7; and FRA 2005, pg. ES-3.

[19] Eccleston 2014, pg. 258–259. NEPA regulation 2005 Section 1502.9(a) states, "the [lead author] agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts."

[20] 23 CFR § 771.111, https://www.law.cornell.edu/cfr/text/23/771.111.

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Disclaimer: *Kelley is writing in his capacity as a individual citizen examining a non-partisan issue of interest to the public. If errors are suspected, please contact him at okelley@gmu.edu.*

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Owen Kelley is an atmospheric scientist who has lived in Greenbelt for 25 years. He writes occasionally for the Greenbelt Online blog and Greenbelt News Review.

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