Is there evidence to support BWRR's claim that the proposed Baltimore-Washington maglev would not generate a noise nuisance?

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February 11, 2018

Abstract–An independent examination of Federal Railroad Administration (FRA) guidelines suggests that the proposed Baltimore-Washington Superconducting Maglev (SCMAGLEV) would be louder than the estimates that Baltimore Washington Rapid Rail (BWRR) provided the Maryland House of Delegates on February 1, 2018. BWRR's estimates require the use of a noise barrier along the aboveground maglev track. At a 50-foot distance from the track, the BWRR noise estimate appears to be approximately 15 dBA lower than what would be estimated from FRA general-assessment guidelines in the absence of a noise barrier. Based on publically available information, the BWRR-specified noise-barrier cannot explain this 15-dBA discrepancy.

Based in BWRR's noise-level estimates, BWRR asserts that the maglev will remain below FRA noise-impact thresholds as close as 50-feet from the maglev track. In contrast, FRA general-assessment guidelines suggest that a noise nuisance might extend from the track to a distance well in excess of 500 feet from the track, with or without the use of a noise barrier. According to the FRA, it is difficult for a noise barrier to attenuate even 5 dBA of the noise that a maglev train generates at high speed, let alone 15 dBA. For the public to have confidence in BWRR's statement that "noise isn't an issue for the maglev," it would be necessary for BWRR to explain how they arrived at their seemly low estimates.

Outline

Disclaimer: *The information, calculations, and opinions in the present document are informed by material available online. The author is a private citizen interested in the impacts of a proposed rail project in Maryland. The numerical estimates herein are intended merely to encourage reflection.*

1. Introduction

On February 1, 2018, Wayne Rogers claimed both that "noise isn't an issue" for the proposed Baltimore-Washington maglev and that the maglev would produce less noise than the existing Baltimore-Washington Parkway. Mr. Rogers, the Chief Executive Officer of Baltimore Washington Rapid Rail (BWRR), was speaking at a public briefing in Annapolis, Maryland, at the Environment and Transportation Committee of the Maryland House of Delegates. One would expect that BWRR would have access to accurate information about the noise that this project would generate because BWRR is the company seeking to build and operate the proposed maglev rail line and BWRR is providing the engineering specifications to the federally-funded environmental impact study for this project.

The State of Maryland provided a webcast of the February 1 meeting that includes both Mr. Rogers' oral testimony and the slides that he presented to the committee. Fig. 1 of present document shows Mr. Rogers' one slide about maglev noise and a later section of the present document provides a transcript of Mr. Rogers' statements while he showed this slide.

Mr. Rogers' February 1 statements and the associated slide may be the most detailed information presented to the public to date about the noise that may be generated by the proposed Baltimore-Washington maglev. For this reason, it is worth the effort to examine these statements and to try to determine if they are consistent with the maglev noise-estimation guidelines published by the Federal Railroad Administration.

To support his claims about the maglev noise level, Mr. Rogers showed a graph of maglev noise as a function of distance from the track. An independent analysis of this graph, given in the present document, comes to the conclusion that Mr. Rogers' graph underestimates the maglev noise level by 10 to 15 dBA relative to what can be easily be supported by the FRA (2012) general-assessment methodology. A 10 to 15 dBA difference is a significant difference, as a 10 to 15 dBA difference in a transportation project's sound level can result in a significantly different community reaction (FRA 2012, Fig. A-4): merely sporadic complaints about the new noise levels vs. widespread complaints and threats of legal action.

In theory, this 15-dBA discrepancy might be resolved by (1) BWRR presenting engineering data specific to their version of maglev technology that demonstrates that it will produce much less noise than FRA's guidelines for maglev trains, (2) BWRR presenting engineering data for their specific noise-barrier technology that demonstrate how it can greatly exceed FRA estimates of noise-barrier effectiveness against maglev noise, (3) BWRR showing how the implementation of FRA guidelines in the present document is in error, or (4) BWRR revising upward their maglev noise estimate.

Based on maglev information that is publically available at this time, a plausible interpretation of FRA guidelines suggests that the geographic extent of the general-assessment noise nuisance would be approximately a 1,900-foot on either side of the track where the elevated track carries the maglev traveling at 311 mph in the absence of effective noise shielding. Effective noise shielding would reduce the maglev noise level by 5 dBA according to the FRA. With the maglev noise dropping 4.5 dBA for a doubling of distance from the track (FRA 2012, pg. 4-9), the 5-dBA noise barrier would reduce the extent of the noise-nuisance to 880 feet from the track, rather than the 1,900 feet in the absence of a noise buffer ($880 \text{ ft} \approx 1{,}900 \text{ ft} \div 2^{5 \div 4.5}$). FRA (2012) lists a number of difficulties, however, with achieving effective shielding of high-speed maglev noise. Mr. Rogers has not presented evidence of how BWRR would overcome any of these difficulties.

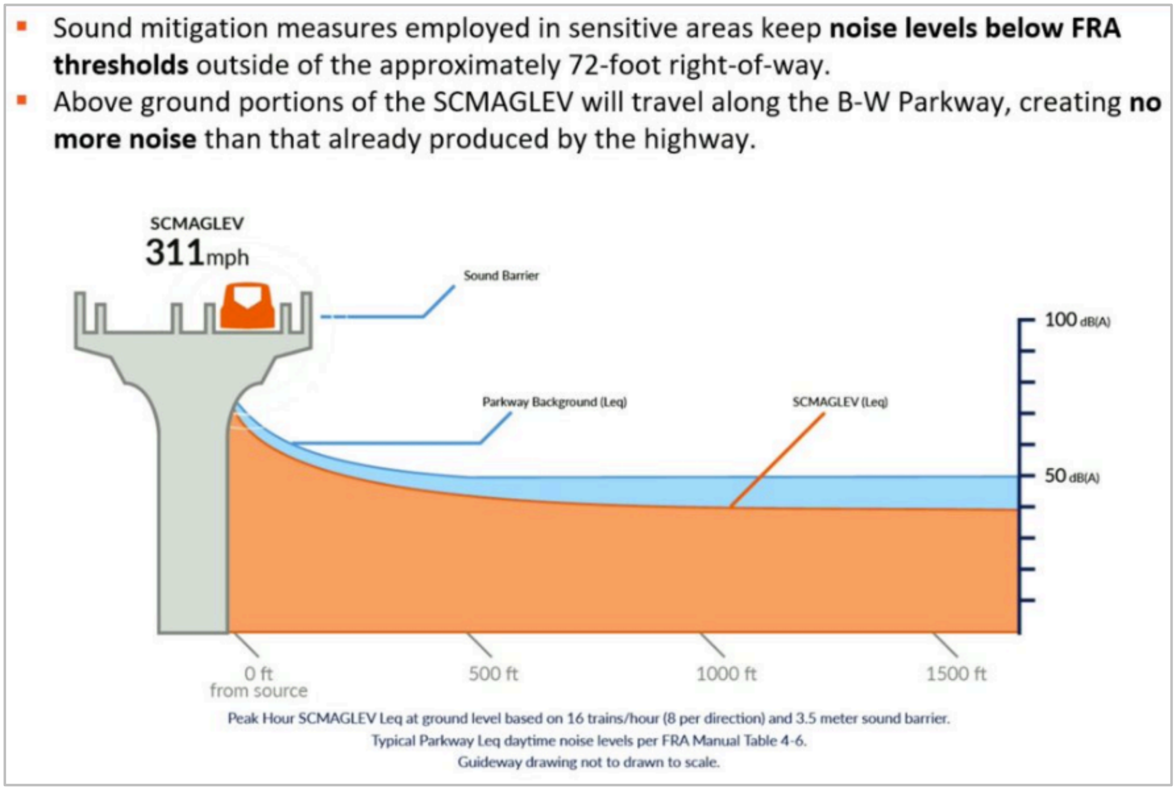


Figure 1: Maglev noise estimates on slide 16 of the presentation that BWRR CEO Wayne Rogers gave at the February 1, 2018, briefing of the Environment and Transportation Committee of the Maryland House of Delegates. This image was obtained via a screen-capture of the State Government's webcast of this public meeting.

2. Pre-existing background noise and noise-impact thresholds

In order to choose the threshold at which a transportation project's noise would impact a community, one must first estimate the pre-existing background noise level. As of February 1, 2018, the currently proposed alignments for the Baltimore-Washington maglev (alternatives J and J1) are within a few hundred feet of the National Park Service's Baltimore-Washington Parkway, and it is uncontroversial that the background-noise level is, to a first approximation, currently determined by the Parkway in that immediate vicinity.

The text on Mr. Rogers' slide states that his graph shows "Typical Parkway Leq daytime noise levels per FRA Manual Table 4-6." Presumably, this means that the blue line on Mr. Rogers' graph for the Baltimore-Washington Parkway is an implementation of the background-sound estimation procedure in FRA (2012) section 4.2.4 that makes use of Table 4-6 of that same document. Mr. Rogers appears to be estimating Baltimore-Washington Parkway noise using the "other road" category of the FRA's Table 4-6. To improve the accuracy of the values read from Mr. Rogers' slide, a grid was first overlain on top of the screen-capture of his slide. The values read were entered into row 1 of Table 1 of the present document.

When applying FRA (2012) Table 4-6, one must decide how to categorize the Baltimore-Washington Parkway. The Parkway does seem to fit Table 4-6's "other roads" category, which FRA defines as including "parkways without trucks." In common usage, the term "parkway" refers to highways built with a park-like buffer of trees on either side of the roadway and often have a prohibitions on trucks. The Baltimore-Washington Parkway does indeed have a buffer of trees on either side, and trucks are prohibited on the Parkway south of Maryland route 175, i.e., along the portion of the Parkway owned by the National Park Service (NPS). All of the aboveground portion of maglev alternatives J and J1 would lie within a few hundred feet of the NPS portion of the Parkway. Essentially all of the nearby land is either protected green space considered priority conservation land by the State of Maryland or contains noise-sensitive features including educational facilities, law enforcement facilities, intelligence or military facilities, and residential neighborhoods.

It appears that whoever prepared the graph of Parkway noise for Mr. Rogers' slide made a minor error that slightly underestimates the Parkway's noise level relative to the intended noise level published in FRA (2012) for parkways. The text of FRA (2012) states that the noise level in each row of Table 4-6 is intended to apply at the outer limit of the range of distances stated in that row. Instead, it appears that Mr. Rogers plots the noise estimate from Table 4-6 in the middle of the range of distances stated in Table 4-6. The values from a more literal interpretation of FRA (2012) Table 4-6 are entered as row 2 of Table 1 of the present document.

Once one determines the pre-existing noise level, then one can read FRA (2012) Figure 3-1 to obtain the noise threshold from the new transportation project (in this case the maglev) that would trigger an impact. For residential areas and national monuments, use the vertical scale on the left side of FRA (2012) Figure 3-1. Using this FRA information and the background-noise level stated in row 2 of Table 1 of the present document, one obtains the noise thresholds stated in row 3 of Table 1 of the present document.

3. How loud would the proposed maglev be?

As described in the previous section, Mr. Rogers' noise estimate for the Baltimore-Washington Parkway noise appears broadly consistent with the table in FRA (2012) that he cites. In contrast, Mr. Rogers' noise estimate for the proposed Baltimore-Washington maglev does not appear consistent with the general-assessment methodology of FRA (2012). The maglev values read from Mr. Rogers' graph from February 1, 2018, are printed in row 4 of Table 1 of the present document.

To evaluate Mr. Rogers' estimates, the present document independently estimates maglev noise using the FRA (2012) general-assessment methodology. The FRA intended this methodology to be easily to implement when only basic information is available about a proposed high-speed rail project. As shown in the following paragraph, this methodology can be expressed as a single equation.

The present document use all of the input parameters that Mr. Rogers provides on his February 1 slide: 16 trains per hour (8 in each direction) during the peak hour of the day (n_{train} = 16), a 311-mph train speed (v = 311), an elevated track, and an 10-foot-tall (3 meter) noise barrier fixed to the outer edge of the concrete structure that holds up the track. Combining the first two equations in FRA (2012) Table 4-5 results in Equation 1 for the maglev noise level at a 50-foot distance from the track, L_{eq} (50 ft):

(Eq. 1)

$$L_{eq}\,(50\text{ ft}) = 78\text{ dBA} + 50\log_{10}(\,v / 120\text{ mph}\,) + 10\log_{10}(\,n_{train}\,) + C_{elevated} + C_{barrier} - 35.6$$

Because the track is elevated, the noise level is greater by a constant $C_{elevated}$ = +2 dBA. Mr. Rogers' slide does not provide a value for the noise reduction $C_{barrier}$ that he assumes is achieved by the 10-foot noise barrier that he proposes. For this reason, the calculations in the present document use two values for $C_{barrier}$. Rows 4 and 5 of Table 1 of the present document are calculated with either $C_{barrier}$ = 0 (no noise barrier) or $C_{barrier}$ = 5 dBA (an extremely effective maglev noise barrier against maglev noise, according to FRA (2012)).

To propagate sound to distances beyond 50 feet from the track, the FRA (2012) general-assessment methodology is used, which stipulates a 4.5 dBA drop in noise level per doubling of the observer's distance from the track. FRA (2012) advises that, later in the design process, the 4.5 dBA value may be refined.

Comparing rows 4 and 5 of Table 1 of the present document, it is clear that, at all distances between 50 and 1,600 feet from the track, Mr. Rogers' estimate of the maglev noise is 15 dBA less than the present document estimates with no noise-barrier based on the FRA (2012) general-assessment methodology. Mr. Roger's estimates exceed by 10 dBA those of the present document when an effective noise barrier of 5 dBA is used, again, following the FRA (2012) general-assessment methodology. The next section of the present document explores possible resolutions for this apparent discrepancy between Mr. Rogers' estimates and FRA methodology.

While it is true that Mr. Rogers' maglev noise estimates stay below the pre-existing Parkway noise and the associated FRA impact thresholds for new projects, the same is not true of the independent estimates calculated in the present document based on FRA guidelines. Comparing rows 3 and 5, one sees that for the noise estimates generated directly from FRA guidelines, the maglev-generated noise exceeds FRA thresholds for noise impact at all distances from 50 to 1,600 feet with no noise barrier. Although Table 1 does not extend that far, the FRA impact thresholds are no longer exceeded once one reaches approximately 1,900 feet from the track with no noise barrier. With a 5-dBA noise barrier and 4.5-dB fall off of noise with distance doubling, the FRA impact threshold would be exceeded up to 880 feet from the track (880 ft $\approx$ 1,900 ft $\div\, 2^{5 \div 4.5}$).

Table 1. Peak daytime hourly equivalent sound level, L_{eq} (dBA), estimated for the existing Baltimore-Washington Parkway and the proposed Baltimore-Washington maglev.

	Observer's distance from road or track (feet)						dBA drop per distance doubling [a]
	50	100	200	400	800	1,600	
Baltimore-Washington Parkway: a pre-existing noise source							
1. parkway, according to BWRR (dBA)	67	62	56	51	50	50	5.3
2. parkway, according to FRA Table 4-6 (dBA)	70	65	60	55	50	50	5.0 [b]
The new noise level threshold that would cause an impact							
3. threshold from FRA (dBA)	64	61	58	55	53	53	--
Proposed Baltimore-Washington maglev: new noise source							
4. maglev, according to BWRR (dBA)	62	57	52	46	41	40	5.3
5. maglev, based on FRA, no noise barrier, FRA (dBA) [c]	**77.1**	**72.6**	**68.1**	**63.6**	**59.1**	**54.6**	4.5 [d]
6. maglev, based on FRA, 5 dBA noise barrier (dBA) [c]	**72.1**	**67.6**	**63.1**	**58.6**	**54.1**	49.6	4.5 [d]

[a] The amount that the peak daytime hourly equivalent sound level L_{eq} drops for each doubling of the distance from the track, calculated between 50 and 400 feet.

[b] For parkways and other roads, FRA (2012) Table 4-6 specifies a drop of 5 dBA per distance doubling.

[c] Bold-faced values exceed the FRA threshold at that distance from the road or track.

[d] For high-speed trains, FRA (2012, pg. 4-9) implies a drop of 4.5 dBA per distance doubling because FRA explicitly specifies a distance-related drop-off of 15 $\log_{10}$ (d/50ft) prior to considering attenuation from dense vegetation or rows of buildings.

4. Why is BWRR's estimate of maglev noise so low?

The previous section of the present document describes an apparent discrepancy between BWRR noise estimates presented on February 1, 2018, and FRA general-assessment methodology. A possible resolution to this apparent discrepancy might include the following: (1) BWRR might present engineering data specific to their version of maglev technology that demonstrates that it will produce much less noise than one would expect from FRA's guidelines for maglev trains, (2) BWRR might present engineering data for their specific noise-barrier technology that demonstrate how their noise barrier can greatly exceed the FRA estimate of noise-barrier effectiveness against maglev noise, or (3) BWRR might revise upward their maglev noise estimate.

At this time, there is much less information available to the public about the noise characteristics of the SCMAGLEV than was available during the 2003 environmental impact study of the Baltimore-Washington Transrapid maglev, a rail line that was never built. Specifically, the FRA published a three-hundred-page evaluation of the Transrapid maglev noise characteristics in 2002. It appears that no such study, even one briefer than FRA (2002), has been published for the L0 series superconducting maglev, i.e., the currently proposed maglev for the Baltimore-Washington project.

As a thought experiment, one can list some issues that BWRR would have to address if BWRR attempted to use explanation #2 to justify its currently low maglev-noise estimates. Specifically, here are some of the reasons that FRA (2012) states for why it would be difficult for a noise barrier to reduce by 5 dBA the noise of a maglev traveling at high speed. In this context, FRA defines high speed as anything over 180 mph, i.e. speed regime III. The following three factors are described on page 2-16 of FRA (2012):

(1) A significant portion of maglev noise is generated by turbulence along and just above the upper edge of the first and last cars, and for this reason, noise barriers need to be considerably taller than the maglev train to be effective. The SCMAGLEV train is likely to be approximately 11-feet tall.

(2) The peak frequency of high-speed maglev noise occurs at lower frequencies than the noise generated by steel-wheeled trains. Lower frequencies are better able to go around noise barriers, so for this reason, noise barriers need to be considerably taller to be effective against maglev noise than is typically required for steel-wheel trains.

(3) A noise barrier built close to the train track has reduced effectiveness because noise can reverberate in the space between the train and the barrier, ultimately escaping over the top of the barrier. On February 1, 2018, Mr. Rogers proposed building the noise barrier a few feet from the train, along the outer edge of the concrete structure that holds up the elevated track.

Factors #1 and #2 lead FRA (2012, pg. 2-16) to assert that a minimum height of 15 feet is necessary for a noise barrier to reduce high-speed maglev noise by 5 dBA. BWRR's February 1, 2018, noise estimates indicated the use of merely an 10-foot-tall barrier (3 meters). FRA (2012, pg. 2-16) suggests that Factor #3 can be addressed by further increasing the height of the noise barrier or by adding sound-absorptive material to the barrier, presumably increasing the construction cost of the sound barrier.

If BWRR were able to revise upward the specifications, expense, and effectiveness of their noise barrier, that would not solve the problem of noise because BWRR has stated that it would build the sound barrier only in "sensitive areas," i.e., not everywhere along the aboveground portion of the maglev track. It is possible that members of the public, elected officials, or local, county, state, or federal agencies would be concerned about noise in areas that BWRR does not classify as noise sensitive. For this reason, organizations that provide independent estimates of the maglev impact to Maryland communities should continue to provide maglev-noise estimates excluding noise barriers, while also estimating the impact with noise barriers present.

5. Maglev noise could be an issue even if the maglev were quieter than the Parkway

On February 1, 2018, Mr. Rogers asserted that the noise from the proposed maglev would be quieter than noise from the existing Baltimore-Washington Parkway and that the noise from the maglev was "not an issue". As discussed above, it appears that the FRA (2012) general-assessment guidelines indicate that the maglev is likely to be louder than the Parkway for an observer standing an equal distance away from each noise source even with the inclusion of an effective noise barrier for the maglev. Suppose for a minute that the opposite is true, i.e., that Mr. Rogers is correct in saying that the maglev would be quieter than the Parkway for an observer standing an equal distance away from either noise source.

Maglev noise could be an issue even if the maglev were quieter than the Parkway because of one crucial fact that Mr. Rogers leaves out of his argument. Specifically, Mr. Rogers' comparison treats the aboveground maglev track as being exactly on top of the Parkway, whereas in actual fact, the two alternatives for the maglev track are up to ~600 feet east or west of the Baltimore-Washington Parkway at various locations along the aboveground portion of the track (i.e., between Greenbelt and Fort Meade).

When the maglev is closer to the observer than the Parkway, then the maglev noise could be louder for that observer even if the maglev were quieter than the Parkway at a 50-foot distance away from each of the two noise sources. This configuration is illustrated by Fig. 2.

This thought experiment is based on a common-sense idea, not complicated math. A jet plane would louder than a vacuum cleaner if you were standing 50 feet away from each, but when you are vacuuming in your house, the vacuum's volume is louder for you because the vacuum is closer to you than the plane flying a few miles away. In light of this concept, Mr. Rogers' appeal to the relative loudness of the Parkway and the maglev sounds seems more like a marketing pitch rather than being valid, scientific reasoning. Furthermore, it may be a marketing pitch that relies on a false premise if the maglev is actually louder than the Parkway at an equal distance from each of them, as FRA guideline seem to suggest (see the discussion in an earlier section of the present document).

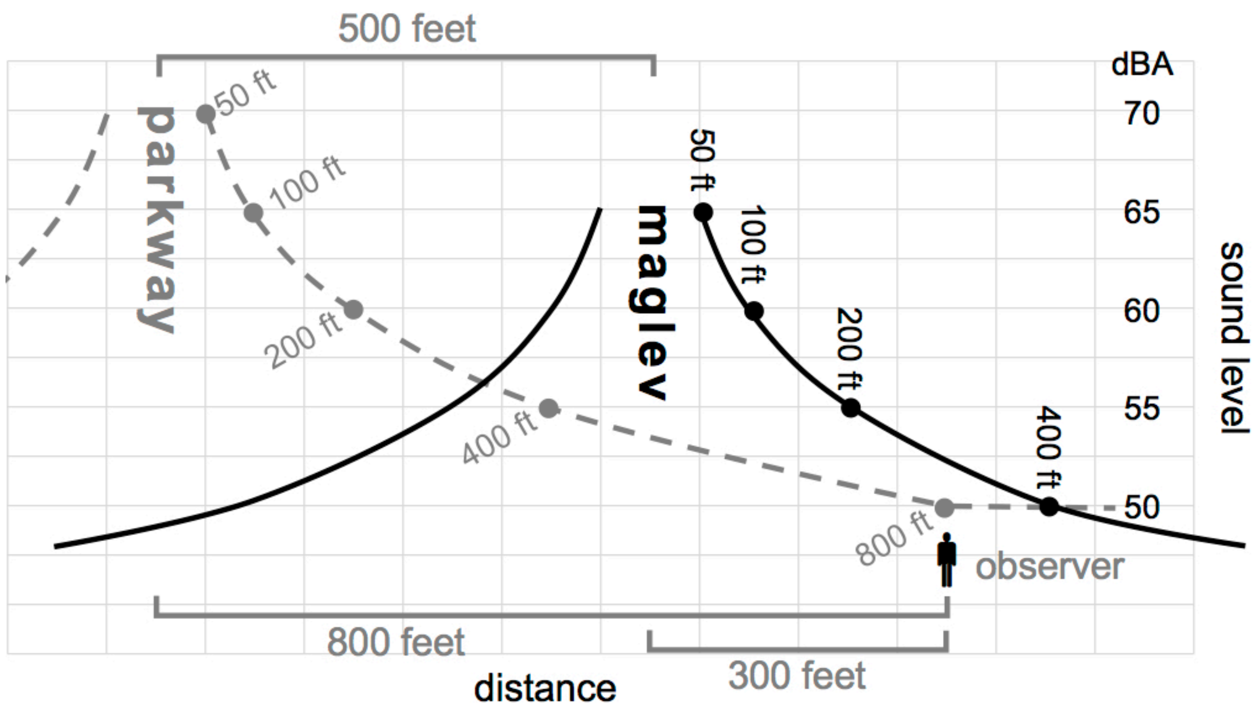


Figure 2. This schematic diagram illustrates that noise can be a regulatory issue even if the maglev is quieter than the Baltimore-Washington Parkway at a 50-foot distance from each noise source. The crucial point is that the maglev may be closer to the observer than the parkway. In this diagram, the maglev is 500 feet away from the Parkway and the observer is a further 300 feet away from the maglev. To simplify the comparison, both noise sources in this diagram are shown decreasing by 5 dBA of intensity for each doubling of the distance. For the sake of argument, this diagram hypothesizes the initial intensity of the maglev sound to be 5 dBA less at a 50-foot distance than is the Parkway sound at a 50-foot distance, i.e., a 65 and 70 dBA sound level, respectively.

6. Comparing two sound variables for estimating impact: L_{eq} vs. L_{dn}

In his Feb 1, 2018, testimony, Mr. Rogers used the hourly equivalent sound level for the peak hour of the day, L_{eq} (dBA), while the January 2018 CATS report used a different variable: the day-night sound level, L_{dn} (dBA). In general terms, the day-night sound level is appropriate for evaluating impacts to residential areas because the calculation of the day-night sound level considers the full-day's total sound exposure using a penalty for noise that occurs during the night when people are more sensitive to noise disturbance. In contrast, the peak-hour sound level is appropriate for evaluating impacts to locations whose intended use during daytime is sensitive to noise, such as schools, national monuments, libraries, churches, etc. As its name implies, the peak-hour sound level, L_{eq}, looks at the noise generated during only loudest hour of the day.

The relationship between L_{eq} and L_{dn} varies depending on the train schedule. As the number of trains between 10 pm and 7 am increases, L_{dn} might increase above L_{eq}. As the number of trains during the peak of rush hour increases, L_{eq} might increase above L_{dn}. Fig. 3 shows three hypothetical train schedules. The inner ring of numbers is the number of trains in each of the 24 hours of a day. The partial, outer ring of numbers is the effective number of trains in that hour after a factor of 10 penalty is applied for trains occurring during the 9-hour FRA night-time period.

For the most realistic schedule (Fig. 3c), the values of L_{eq} and L_{dn} are likely to be within a few dBA of each other by coincidence. This schedule is realistic in that, Mr. Rogers' February 1, 2018, noise slide stated that 16 trains per hour (8 in each direction) were likely during the busiest hour of the weekday commute.

During his testimony, Mr. Rogers also stated that there might be only 4 trains per hour (2 in each direction) during low-demand times such as mid-morning. One might speculate that this level of service is so low that it defeats the purpose of the maglev (rapid transportation). At 4 train passbys an hour (2 in each direction), one may have to wait as long as 30 minutes to start the 15-minute train ride from Washington to Baltimore. After factoring in the time to travel to the starting maglev station and also from the final maglev station to one's destination, the total time could be considerably longer than 45 minutes. Some trips in the DC-Baltimore area might actually take less time if one made the entire trip by car outside of rush hour rather than using maglev for one leg of the trip. For example, one may drive from Bethesda, Maryland, to the Homewood Campus of John Hopkins in about 55 minutes, outside of rush hour.

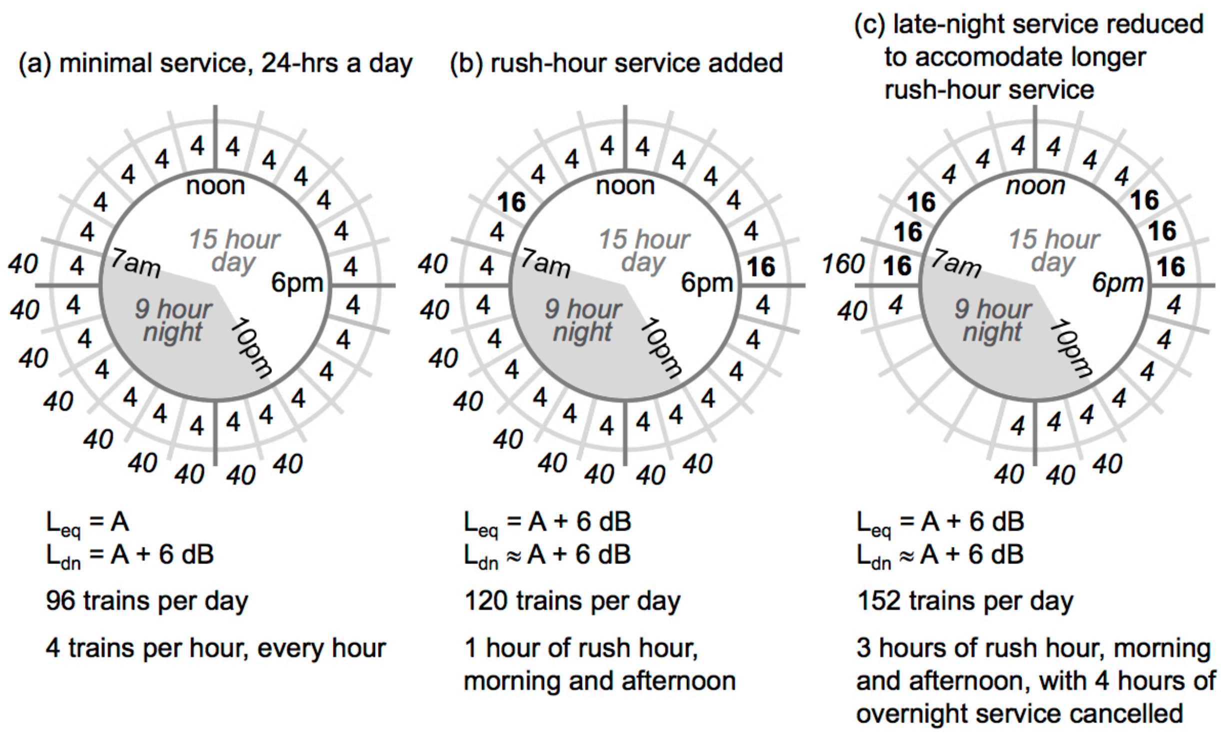


Figure 3. A schematic representation of three hypothetical, maglev schedules showing how the number of train passbys per hour affects the L_{eq} and L_{dn} sound levels. FRA (2012) specifies that nighttime covers 10 pm to 7 am, during which time the L_{dn} calculation penalizes noise sources. L_{eq}, in contrast, is only sensitive to the number of trains during the busiest hour, and it is unaffected by whether this hour occurs during day

or night. **(a)** Given a minimal and equal level of service during each hour of the day (4 passbys an hour), L_{dn} is 6 dBA greater than L_{eq} because of the nighttime penalty. **(b)** Same as panel *a*, except that the schedule now includes a one-hour-long rush hour between 8–9 am and 5–6 pm, which increases L_{eq} but has negligible effect on L_{dn}. **(c)** In order provide better service during rush hour, this schedule has a 3-hour-long rush hour in the morning and afternoon while curtailing late-night service to avoid increasing L_{dn} between schedules *b* and *c*. Since the peak number of trains per hour are the same in *b* and *c*, L_{eq} is the same in schedules *b* and *c*.

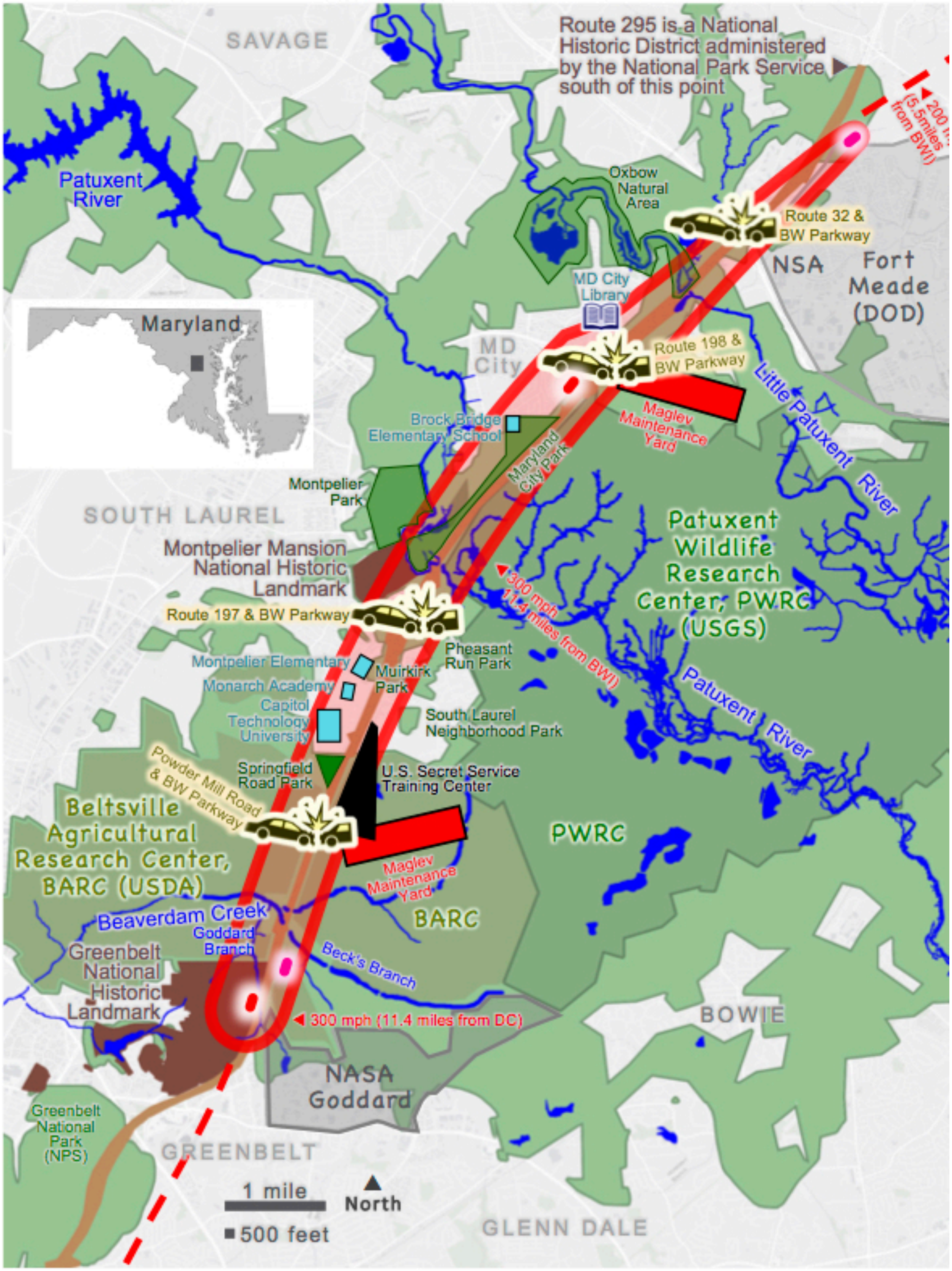
7. What areas along the proposed maglev track are "noise sensitive"?

On February 1, the noise-related slide that Wayne Rogers showed stated that BWRR would erect noise barriers where the maglev track passed through "sensitive areas." It does not appear that these noise-sensitive areas were identified in the poster boards displayed at the April and October 2017 public-comment meetings for the Baltimore-Washington maglev environmental impact study. For this reason, it is possible that the noise-sensitive areas that may be identified in the future by BWRR or by the environmental impact study may not include all of the areas where members of the public, elected officials, or various federal, state, or local agencies are concerned about maglev noise impacts.

A glance at the aboveground portion of proposed maglev track alternatives as of February 1, 2018 (alternatives J and J1), suggests that essentially all of the aboveground track goes through areas that a layperson might naively classify as noise sensitive for one reason or another, i.e., protected green space, libraries, residential areas, primary and higher education facilities, a public library, residential areas, law-enforcement facilities (i.e., U.S. Secret Service), and counter-intelligence facilities (i.e., CIA).

The preliminary alternative screening report that was released on February 1, with a January 2018 publication date, confirms that a number of agencies with affected property are concerned about impacts from the proposed maglev.

Figure 4. (next page) This map shows with a red outline a 1,900-foot buffer on either side of the aboveground portion of maglev alternatives J and J1. The buffer is centered on alternative J1 between Greenbelt and Route 198, and the buffer is centered on alternative J north of Route 198. The small, glowing red and pink ovals represent the anticipated 1000-foot long trenches at the tunnel entrances for alternatives J and J1, respectively. The car-crash symbols indicate locations where roads that intersect with the Baltimore-Washington Parkway have merge lanes within the FRA (2012) startle distance of the proposed maglev track. Various kinds of protected green space are shown in shades of green. Educational facilities and a library are shown in blue. Brown polygons indicate National Historic Landmarks listed in the National Registry of Historic Places. Military, intelligence, and law-enforcement facilities are shown in black or gray. To help identify the east-west distance between alternatives J and J1 (which is typically 160 to 1,200 feet) a length scale at the bottom of this map shows a 500-foot distance. The map was compiled from various online GIS data sources.



Route 295 is a National Historic District administered by the National Park Service south of this point
SAVAGE
Patuxent River
Oxbow Natural Area
Route 32 & BW Parkway
NSA
Fort Meade (DOD)
MD City Library
Maryland
MD City
Route 198 & BW Parkway
Maglev Maintenance Yard
Little Patuxent River
Brock Bridge Elementary School
Maryland City Park
Montpelier Park
SOUTH LAUREL
Patuxent Wildlife Research Center, PWRC (USGS)
Montpelier Mansion National Historic Landmark
300 mph (11.4 miles from BWI)
Route 197 & BW Parkway
Pheasant Run Park
Montpelier Elementary
Muirkirk Park
Monarch Academy
Capitol Technology University
South Laurel Neighborhood Park
Patuxent River
Powder Mill Road & BW Parkway
Springfield Road Park
U.S. Secret Service Training Center
Beltsville Agricultural Research Center, BARC (USDA)
PWRC
Maglev Maintenance Yard
Beaverdam Creek
Goddard Branch
BARC
Greenbelt National Historic Landmark
Beck's Branch
300 mph (11.4 miles from DC)
BOWIE
NASA Goddard
Greenbelt National Park (NPS)
GREENBELT
1 mile
500 feet
North
GLENN DALE

8. Transcript of noise-related statements by BWRR's Wayne Rogers, February 1, 2018

Below is a transcript of Wayne Rogers' testimony on February 1, 2018, at the Environment and Transportation Committee of the Maryland House of Delegates held in room 250 of the House Office Building in Annapolis, Maryland. The committee's schedule[1] listed this meeting as "Briefing: Maryland Department of Transportation, 2018 Departmental Legislation, MAGLEV and Hyperloop Projects, Highway Expansion/Baltimore and Washington D.C. Regions" and other agenda items. This briefing was webcast by the State of Maryland. Mr. Rogers' slide presentation begins 14 minutes into the webcast and the statements transcribed below begin approximately 40 minutes into the webcast. During this portion of his presentation, Mr. Rogers has an exchange with Delegate Kumar P. Barve, the committee chair.

> **Mr. Rogers:** You are going to hear people say, "Oh my gosh, this is going to be really noisy, and it is going to hurt everyone all round." We already talked about it not affecting residences, and 75% of it being underground. But if we look at the real world of noise, on the BW Parkway east [alternative J], the noise levels of this train, floating on air, is well below FRA thresholds. And even if you look at the aboveground section that would travel along the Parkway, it has less noise than is already being produced on the BW Parkway. The FRA has measurements of the BW Parkway itself, and you look where the train is going to be, and you can see from this graph, it is well below the standard from the State of Maryland. At the same time, it is well below the ambient noise that you already hear on the Parkway where it is located.
>
> **Delegate Barve:** Okay, go back to that chart. What is the orange? The orange represents the noise from the maglev, and the blue represents what?
>
> **Mr. Rogers:** The orange represents noise from the maglev. The blue represents the background noise of the cars on the BW Parkway, and that noise is greater than the noise of the maglev, and that makes sense because you have something traveling 300 mph floating on air. The only noise you are hearing from it is the air sound as it goes by. There's not like a steel wheel train where there's wheels on steel or a catenary. That is the thing on the top of the train that connects to the electrical lines that causes a lot of sound. Noise is not an issue for this train.

One phrase that seems odd in Mr. Roger's testimony is that he twice invokes the fact that the maglev is "floating on air."

Contrary to what Mr. Rogers seemed to imply on February, 1, 2018, the fact that the maglev is floating on air in no way proves that the maglev is quiet. No one would describe as "quiet" the thunderous sound of a commercial airliner coming in for a landing, yet the airplane is

[1] The committee schedule was found online at: http://mgaleg.maryland.gov/webmga/frmMain.aspx?pid=cmtepage&stab=03&id=env&tab=subject7&ys=2018RS

floating on air—nothing else is holding it up. In the case of the airplane, much of the low-frequency noise during its landing approach is generated by air turbulence (Zaporozhets et al 2011, pp. 7–12), not the airplane's engines, which are throttled down as the plane approaches the runway. Similarly, most of the noise generated by a maglev is due to air turbulence at its peak speed of 311 mph, which is almost half the speed of sound. By some estimates, billions of dollars have been spent on noise-reduction measures within newly designed airplanes or on sound-mitigation measures near airports, so objects that "float on air" can be a major noise nuisance. Perhaps, Mr. Rogers was counting on his audience of state lawmakers to fail to make this association between trains or planes floating on air and airport noise.

9. Conclusion

Based on information that is currently available to the public, the 15 dBA difference cannot be explained between the noise estimates presented by BWRR CEO Wayne Rogers on February 1, 2018, and the noise estimates that one can calculate using the general-assessment methodology of FRA (2012) in the absence of a noise barrier.

The noise barrier mentioned in Mr. Rogers' testimony is inadequate to explain 5 dBA of difference, let alone the full 15 dBA difference. Even if BWRR revised upward the specifications, cost, and effectiveness of its noise barrier, the noise problem would likely remain because BWRR has stated that it would build the noise barrier only in "sensitive areas," i.e., not everywhere along the aboveground portion of the maglev track. Members of the public, elected officials, or local, county, state, or federal agencies may be concerned about maglev-generated noise in areas that BWRR does not classify as noise sensitive. For this reason, organizations that provide independent estimates of the potential maglev impact to Maryland communities should continue to use maglev noise estimates that excludes any noise barrier while also providing a separate estimate that includes a noise barrier that is consistent with FRA guidelines (i.e. a barrier that attenuates no more than 5 dBA of high-speed maglev noise). For example, FRA guidelines suggest that the noise nuisance would extend 1,900 or 880 feet from an elevated maglev track for a reasonable number of trains per day traveling at 311 mph, depending on whether or not a 5-dBA noise barrier is in place along the track.

BWRR or other parties to the Baltimore-Washington maglev environmental impact statement should provide information that clarifies the noise nuisance that the proposed Baltimore-Washington maglev may generate. Such information should include the noise-level 50 feet from the track in the absence of a noise barrier, details about the noise barrier that BWRR proposes for noise-sensitive areas, a list of which portions of the aboveground track are considered noise sensitive, and details of how BWRR noise estimates are consistent with FRA guidelines, assuming that they are consistent.

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