1. Introduction

One common concern regarding the implementation of a light rail line is the increased noise generated by the passing trains. This document seeks to outline the impacts of light-rail on noise around the area the line is implemented and courses of action lawmakers can take to mitigate noise without sacrificing the efficiency of the rail. This document also serves to educate the public about the impact light rail will have on the sound in our cities and towns.

Long-term exposure to loud noise can cause hearing damage. According to the World Health Organization, "... noise is a non-specific stressor that has been shown to adversely affect human health, especially following long-term exposure. ... Sleep disturbance and annoyance, mostly related to road traffic noise, comprise the main health-related burden of environmental noise"[1] Therefore it is important to minimize railway noise to protect human health. Any new rail implementation should align with the WHO's 55db interim night noise guideline value and explore solutions to reach 40db."

2. Causes and Mitigation Methods

It is difficult to predict/to measure the average environmental noise a railway causes because it depends on many factors, such as speed, track type, vehicle shape, horns, curve radius, breaks, weather, wheelbase, and wheel diameter. The best way to determine the noise level of a light rail line is to use projections published by the transit authority backing the project. Specific project parameters and noise mitigation mitigation methods however can be explored.

Quiet zones are sections of the rail line in which trains are not permitted to use their horn during crossings unless during an emergency or to comply with other federal regulations.[2] Since horns are required to be significantly louder than the train itself in order to be perceivable, implementation of quiet zones can significantly reduce the noise impact of a light rail line, especially in a location with many road crossings. Safety concerns are present with the implementation of quiet zones, however modern technology has reduced the danger associated with quiet zones.

A study conducted on the light rail lines in Porto, Portugal found that one of the most impactful variables to rail noise was the curvature of the track. "The presence of the curve leads to a substantial increase in noise levels in the whole frequency range. [...] The wheel is restricted in its movement by the presence of the rail, generating an increase in noise levels."[3] However, these curved sections can be made quieter by introducing methods to reduce vibrations and thus the noise they cause.

1. *WHO housing and health guidelines*. Geneva, Switzerland: World Health Organization, 2018.
2. "Train Horns and Quiet Zones," Train Horns and Quiet Zones | FRA, accessed July 26, 2025, https://railroads.dot.gov/railroad-safety/divisions/crossing-safety-and-trespass-prevention/train-horn-rulequiet-zones.
3. *Lázaro, João, Pedro Alves Costa, and Luís Godinho. 2024. "Experimental Light Rail Traffic Noise Assessment in a Metropolitan Area" Applied Sciences 14, no. 3: 969. https://doi.org/10.3390/app14030969*

Two mitigation methods explored by Transport Infrastructure Ireland were absorbing rubber mats and rail dampers. Sound exposure levels with absorbing rubber mats at different locations varied with reductions of 2.2-4.0db while rail dampers measured reductions of 2.6-3.5db[3] on their light rail lines. Although this is a relatively small change, the authors note, "A difference of 3dBA between the levels of two sounds separated by a time interval is generally considered to be the minimum perceptible difference. The results from the two systems above may therefore be considered to be perceptible to the human ear."[3]

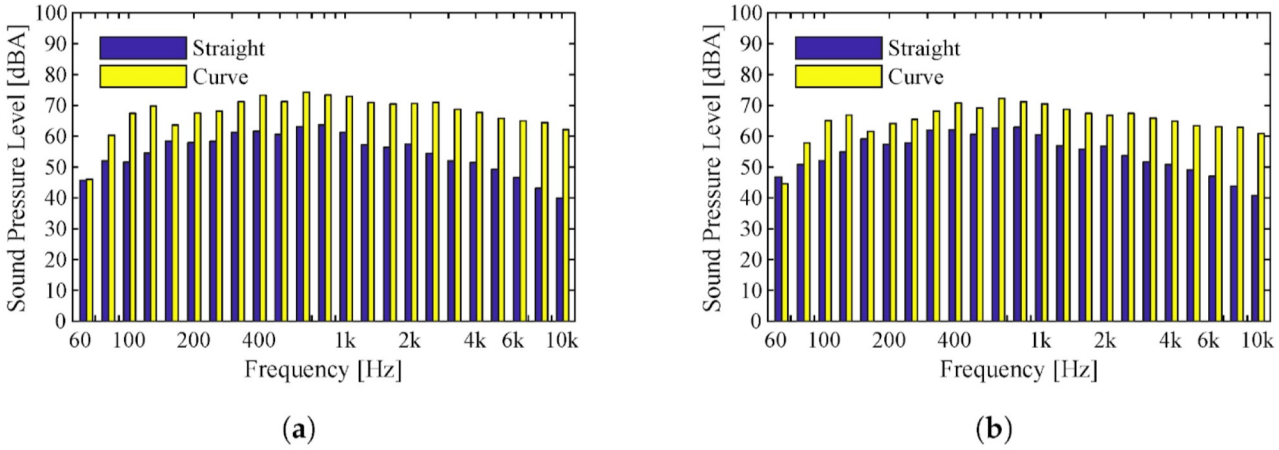

Figure 1. Sound Pressure comparison between straight and curved tracks on the Porto Metro Line.[3]

3. Discussion

Light rail creates a significant amount of noise in quiet environments, however in noisy environments the effect isn't nearly as significant. Nose is measured in decibels which is a logarithmic scale, that means that adding noise values effectively cancels out the quieter noise as it is insignificant compared to the louder noise. Figure 2 provides initial projections for the noise level that the New Jersey's upcoming Glassboro-Camden Line will have near its path. For many of these locations, the existing noise level is already a significantly higher level than the projected noise exposure from the GCL and why the GCL is considered Moderate Impact for most of these locations. For example, if you were to add the 67dBA exposure from the GCL around Cooper Hospital to the existing noise level of 79dBA, that level would increase to 79.3dBA[4] which is not a perceptible difference.[5]

3. Lázaro, João, Pedro Alves Costa, and Luís Godinho. 2024. "Experimental Light Rail Traffic Noise Assessment in a Metropolitan Area" Applied Sciences 14, no. 3: 969. https://doi.org/10.3390/app14030969

4. "Decibel Calculator," Decibel Calculator - dB Calculator - Addition and Subtraction of dB Values, accessed July 26, 2025, https://www.noisemeters.com/apps/db-calculator/.

5. Byrne, Stephen. (2018). An assessment of the effectiveness of noise reduction systems on Dublin's light rail system (Luas).

Site #	Receptor Site Description	FTA Land Use Category	Average Centerline Receptor to Track Distance	Existing Noise Level	FTA Impact Threshold Levels		Horn Soundings	Projected Noise Exposure from GCL Operations	Number of Equivalent Residential Units Impacted	FTA Impact Determination
					Moderate	Severe				
			Feet	Ldn (dBA)	Ldn (dBA)	Ldn (dBA)	Ldn (dBA)	Ldn (dBA)		
M01	Cooper Hospital and 501A Haddon Avenue, Camden	2	100	79	66–75	>75	N/A	67[1]	30	Moderate Impact
M02	911 South 9th Street, Camden	2	115	71	66–70	>70	N/A	66	51	Moderate Impact
M03	56 S. Railroad Ave, Gloucester City	2	65	76	66–74	>74	70	71	34	Moderate Impact
M04	5 ½ Railroad Lane, Westville	2	75	65	61–65	>65	N/A	64	75	Moderate Impact
M05	800 Gateway Boulevard, Westville	2	140	79	66–75	>75	61	64	0	No Impact
M06	926 Washington Avenue, Woodbury	2	75	77	66–74	>74	64	67	68	Moderate Impact
M07	93 Wallace Street, Woodbury	2	155	70	65–69	>69	N/A	61	0	No Impact
M08	348 East-West Jersey Avenue, Woodbury Heights	2	85	58	57–62	>62	N/A	63	65	Severe Impact
M09	1 Cedar Street, Wenonah	2	140	62	59–64	>64	N/A	61	64	Moderate Impact
M10	870 East Atlantic Avenue, Sewell	2	70	69	64–69	>69	N/A	64	92	Moderate Impact
M11	304 Montgomery Avenue, Pitman	2	85	67	63–67	>67	61	65	50	Moderate Impact
M12	827 West Jersey Avenue, Pitman	2	110	69	64–69	>69	N/A	62	0	No Impact
M13	43 Zane Street, Glassboro	2	90	69	64–69	>69	68	79[1]	40	Severe Impact
M14	11 Church Street, Glassboro	2	490	65	61–66	>66	64	65[1]	45	Moderate Impact
M15	Girard House #14, Rowan University, Glassboro	2	45	69	64–69	>69	66	69	83	Severe Impact
M16	Stewart Park, Measurement collected at nearby residences at 168 Laurel Street, Woodbury	2	105	65	61–66	>66	N/A	62	26	Moderate Impact
M17	816 Essex Street, Gloucester City	2	150	65	61–66	>66	N/A	61	42	Moderate Impact
Y01	560 Chestnut St. near East-West Jersey Ave, Woodbury Heights.	2	310	60	58–63	>63	N/A	60	8	Moderate Impact
Y02	601 Park Avenue, Woodbury Heights	2	210	54	55–61	>61	N/A	55	17	Moderate Impact
Y03	39 Sewell Street near Highland Ave, Glassboro	2	280	63	60–65	>65	60	65[1]	14	Moderate Impact
Y04	530 Ellis Street, Glassboro	2	450	65	61–65	>65	59	61[1]	11	Moderate Impact
PK01	Gloucester City Public Library, Gloucester	3	54	64[1]	66–70[1]	>70[1]	N/A	63[2]	NA	No Impact
PK02	Thompson St and Lane Ave Park, Gloucester	3	40	59[1]	63–68[1]	>68[1]	N/A	65[2]	NA	Moderate Impact
PK03	Green Street Playground, Woodbury	3	56	60[1]	63–68[1]	>68[1]	N/A	65[2]	NA	Moderate Impact
PK04	Veterans' Park, Woodbury Heights	3	45	57[1]	62–67[1]	>67[1]	N/A	66[2]	NA	Moderate Impact
PK05	Ballard Park, Pitman	3	107	59[1]	63–68[1]	>68[1]	N/A	62[2]	NA	No Impact
PK06	Bowe Park, Glassboro	3	92	67[1]	68–72[1]	>72[1]	N/A	61[2]	NA	No Impact

[1]Calculation includes noise exposure from wheel squeal at receptor sites M1, M13, M14 and Y3 and Y4 where tight curved tracks are proposed.
[2] Peak-hour Leq (1hr) dBA noise levels.
Source: GCL Project Team, January 2018.

Figure 2. Comparison of Projected Transit Noise Exposure Levels and FTE Impact Criteria, for Proposed GCL Transit Service Operations.[6]

6. Tech. Glassboro-Camden Line EIS Noise and Vibration Technical Report , 2018.

4. Conclusion

Rail noise is a very real issue with serious concerns, however there are design characteristics and solutions that can remedy the issue of noise with light rail. Figure 2 shows the projected noise levels as well as the Federal Transit Administration's determination of the impact that noise will have on the surrounding area. Woodbury Heights and Glassboro municipalities have sections that reach into the severe impact category and as a result the Glassboro-Camden line will explore whether mitigation measures are necessary while the sections with moderate impact will also be considered for mitigation methods.[4] The Glassboro-Camden line also allows municipalities to apply for quiet-zones at no cost; quiet zones replace the honking of train horns with additional safety infrastructure to reduce noise levels. For areas that cannot reach an appropriate noise level with mitigation measures, a quiet zone should be considered.

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Lázaro, João, Pedro Alves Costa, and Luís Godinho. 2024. "Experimental Light Rail Traffic Noise Assessment in a Metropolitan Area" Applied Sciences 14, no. 3: 969. https://doi.org/10.3390/app14030969

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