



MEMORANDUM

TO: CLIENT

FROM: Felsburg Holt & Ullevig

DATE: December 22, 2021

SUBJECT: West Elizabeth Street Enhanced Travel Corridor—Noise Analysis Documentation

The City of Fort Collins has begun the West Elizabeth Enhanced Travel Corridor (ETC) Plan project. The ETC Plan addresses inadequate transit service, incomplete bicycle and pedestrian networks and higher than expected numbers of crashes at certain locations. The ETC Plan and the City's Transit Master Plan envision bus rapid transit (BRT) on W. Elizabeth Street connecting to the Mason Street Corridor.

This project is being undertaken in cooperation with and funding from the Federal Transit Administration (FTA). The process for evaluating noise for projects administered by FTA is provided in *Transit Noise and Vibration Impact Assessment Manual* (Manual; September, 2018). This noise analysis was conducted in accordance with the Manual and was primarily directed from material in Section 4.

Project Description

The ETC project consists of design services between Overland Trail and Mason Street (Figure 1). The ETC is approximately three miles long and involves increasing transit use and streamlining transit operations by establishing a new BRT system from Colorado State University's (CSU's) Foothills Campus (Overland Trail) to the existing MAX BRT system (Mason Street). Safety improvements to pedestrian and bicycle infrastructure will feature better Americans with Disabilities Act facilities, high-comfort bike facilities, traffic calming measures as well as enhanced parkways and planted medians. The preliminary design will establish the project footprint and determine right-of-way, drainage, utility, and traffic requirements such that the City of Fort Collins will seek grant funding through the FTA to complete final design and construction.

Noise Impact Criteria Selection

The focus of the proposed project is to add BRT service to W. Elizabeth. BRT stations will be constructed and associated general street improvements will be built. General purpose travel lanes will not be added so neither the overall capacity nor expected traffic volumes on W. Elizabeth will change substantively because of the project.

The only identified changes to the noise environment are BRT related. Consequently, FHU concluded this is a Manual Section 4.1 Step 1 Option A (transit only) project. Therefore, FTA noise criteria were selected as the basis for the noise analysis.

The project corridor contains a mix of Land Use Category 2 and 3 properties (Manual Table 4-3). The majority of the noise sensitive land uses in the project corridor are Category 2 (residential). Some of the CSU campus and a few other properties are Category 3 (institutional). Therefore, the noise metrics that will be used for the analysis are L_{dn} for Category 2 properties and $L_{eq(1hr)}$ for Category 3 properties from Manual Section 4.1 Step 2.

The project will make changes to a corridor with existing traffic and transit noise already in the community. Therefore, this is a Manual Section 4.1 Step 3 Option B project so the FTA cumulative noise process was selected for the analysis.

FTA Noise Screening Procedure

The analysis began with an FTA Noise Screening Procedure to conclude whether a more detailed analysis was needed anywhere within the ETC. Two types of noise-producing activities associated with the project were identified: additional BRT vehicles traveling on the streets, and activities at the BRT stations. These activities were evaluated through the BRT roadway and Transit Center entries from Manual Table 4-7, which were the FTA-listed activities most similar to the proposed ETC operations.

Manual Table 4-7 provides default screening distances to sensitive land uses. However, the activity levels assumed for the Manual Table 4-7 distances are substantively greater than the ETC BRT activity proposed for this project. For example, Manual Table 4-8 explains that a BRT roadway is assumed to have 30 diesel buses per hour and a transit center has 20 buses per hour. This would dramatically overstate the anticipated ETC operations of eight or fewer additional buses anywhere in the corridor, all of which will be electric. Simply using the Manual Table 4-7 screening distances could lead to numerous unnecessary General Noise Assessment evaluations. Therefore, the Manual Table 4-7 screening distances were adjusted in accordance with Manual Section 4.4 to minimize extraneous noise analyses, as described below.

The project corridor was divided into five zones to reflect the anticipated operational changes to the BRT (Figure 2). That is, the change in numbers of BRT buses will not be consistent throughout the ETC corridor. From zero to 11 more buses per hour total may be added to any of the BRT corridor segments. These vehicles may add road noise and noise from BRT station activities. Because the majority of the adjacent properties are residential (Figure 2), the screening distances were adjusted with the L_{dn} in mind, where the changes in BRT services reflected daytime and nighttime hours. The speed limits on project streets are 20, 25 or 30 miles per hour.

The resulting adjusted project screening distances for the BRT stations and BRT traffic on W. Elizabeth are listed in Table 1 and illustrated in Figure 2. Any noise sensitive land uses farther from the ETC than these distances do not require further noise analysis; those within these distances were evaluated with a General Noise Assessment.

Table 1. Adjusted Noise Screening Distances for ETC Project

Corridor Zone	BRT Station Screening Distance (ft)	BRT Road Screening Distance (ft)
1	115	22
2	55	6
3	100	22
4	55	5
5	140	23

A review of buildings and properties within the project corridor indicated that 22 residential buildings grouped into 12 areas were within the ETC screening distances (Figure 3). Consequently, a General Noise Assessment was necessary and performed for the affected properties.

FTA General Noise Assessment

The General Noise Assessment was completed for the 22 residential land uses within the screening distances described above. The FTA spreadsheet analysis tool was used for each location

(www.transit.dot.gov/regulations-and-guidance/environmental-programs/noise-impact-assessment-spreadsheet).

The 22 buildings were in 12 groups (Figure 3). For example, Group Z1N1 is the first group in Zone 1 north of W. Elizabeth Street. Multiple nearby buildings in comparable settings were evaluated together where appropriate. In those instances, a single spreadsheet was prepared for the building nearest the relevant noise source (usually a BRT station) and the result represents findings for all the buildings in that group. The spreadsheets included noise sources from stationary “transit centers” for the BRT stations and/or highway noise for the electric BRT buses driving past. A printout of the 12 spreadsheets is provided in Appendix A.

Existing Noise Exposure Levels

Existing noise exposure was estimated using a simplified procedure from Manual Section 4.4. Manual Table 4-17 does not have an entry that matches the project corridor but it was used as the basis. The project is not an “Other Roadway” (closest match from Manual Table 4-17) but is on a minor arterial street that would see a lesser level of traffic. The population density of Fort Collins is estimated to be 3,000 persons/square mile. A midday, 15-minute-long noise measurement gathered along W. Elizabeth Street gave an $L_{eq(1hr)}$ of 64 decibels. From this information, the estimated noise exposure was set at 60 decibels (for both L_{dn} and $L_{eq(1hr)}$) for Zones 1 through 4. Zone 5 is near the Burlington Northern Santa Fe Railway (BNSF), so the estimated noise exposure was set at 65 decibels to account for that noise source. Note that the project will not affect the BNSF and it was not included as a noise source in the FTA analysis.

Frequency of BRT Operations

The proposed ETC BRT schedule was reviewed to assess the proposed changes in operations that inform this noise analysis. There is already bus service within the study corridor but the proposed project may increase some of the operations. The calculated differences in hourly numbers of buses for each zone is summarized in Table 2. These data were used in the spreadsheets (Appendix A).

Table 2. Proposed Average Numbers of Additional BRT Buses per Hour

Corridor Zone	Westbound 7AM-10PM	Westbound 10PM-7AM	Eastbound 7AM-10PM	Eastbound 10PM-7AM
1	3.9	0.3	3.7	0.3
2	0.5	0	0.1	0
3	2.5	0.6	3.9	0.2
4	0.5	0	0.1	0
5	Not applicable	Not applicable	5.9	0.8

Results

None of the sensitive land uses examined through the General Assessment were found to be impacted by noise from the ETC project (Appendix A). Consequently, no noise abatement actions are needed for the proposed project.

Summary

A noise analysis was completed for the proposed ETC BRT project following the FTA noise procedure. A Noise Screening was followed by a General Assessment. No noise impacts were identified from the project; no noise abatement actions were needed.

Figure I. Overview of ETC BRT Project Corridor

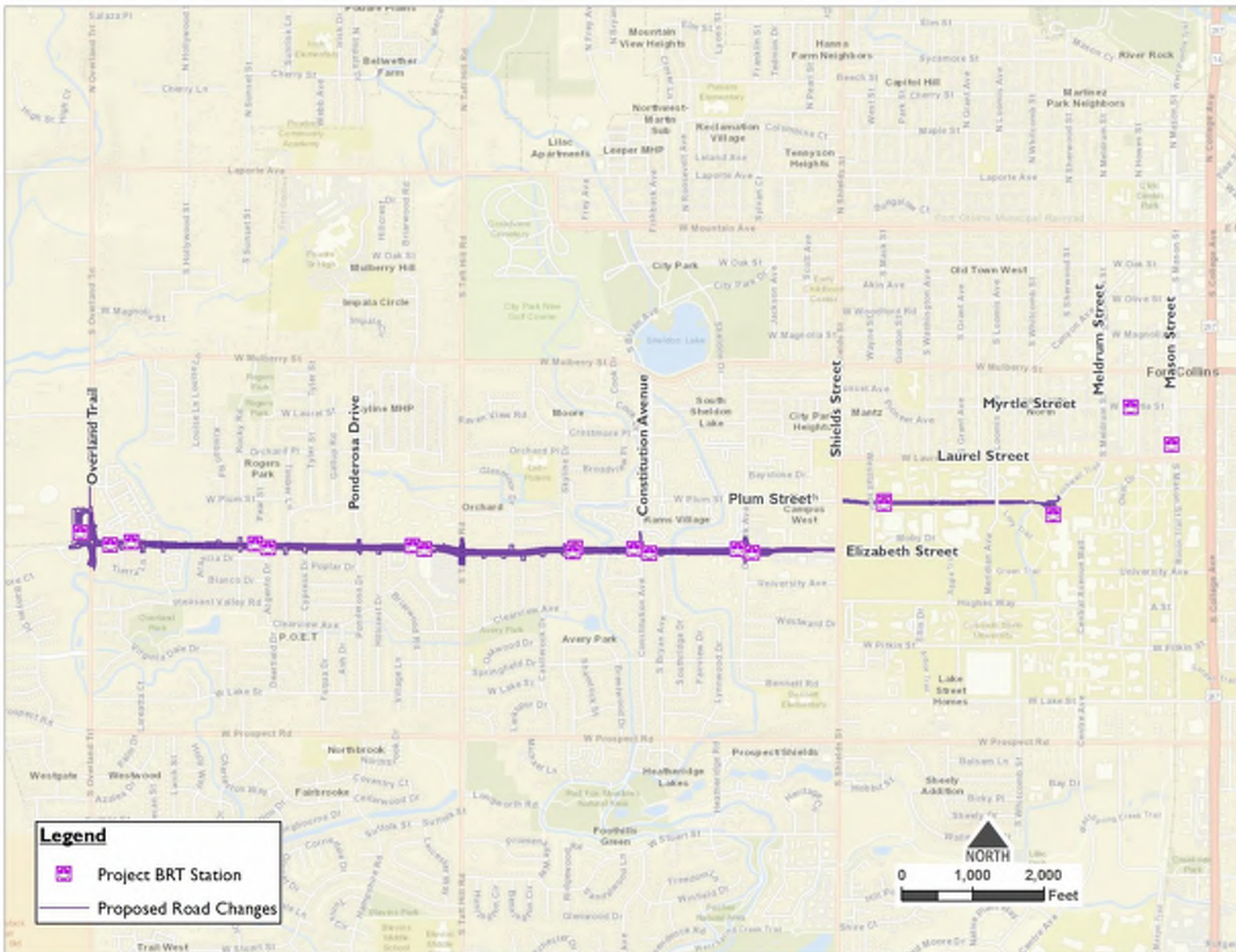


Figure 2. Project Noise Screening Areas and Nearby Noise-Sensitive Properties

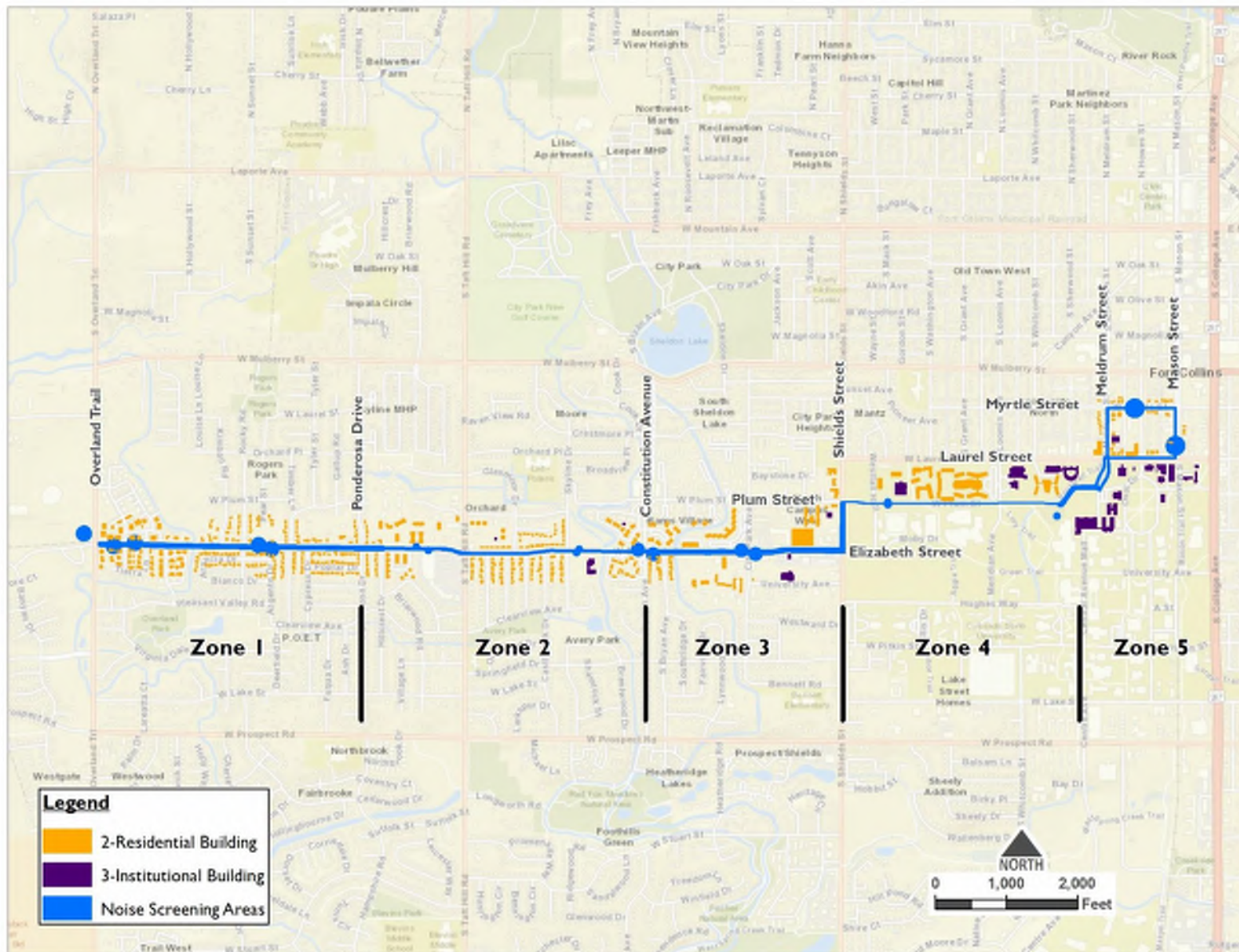
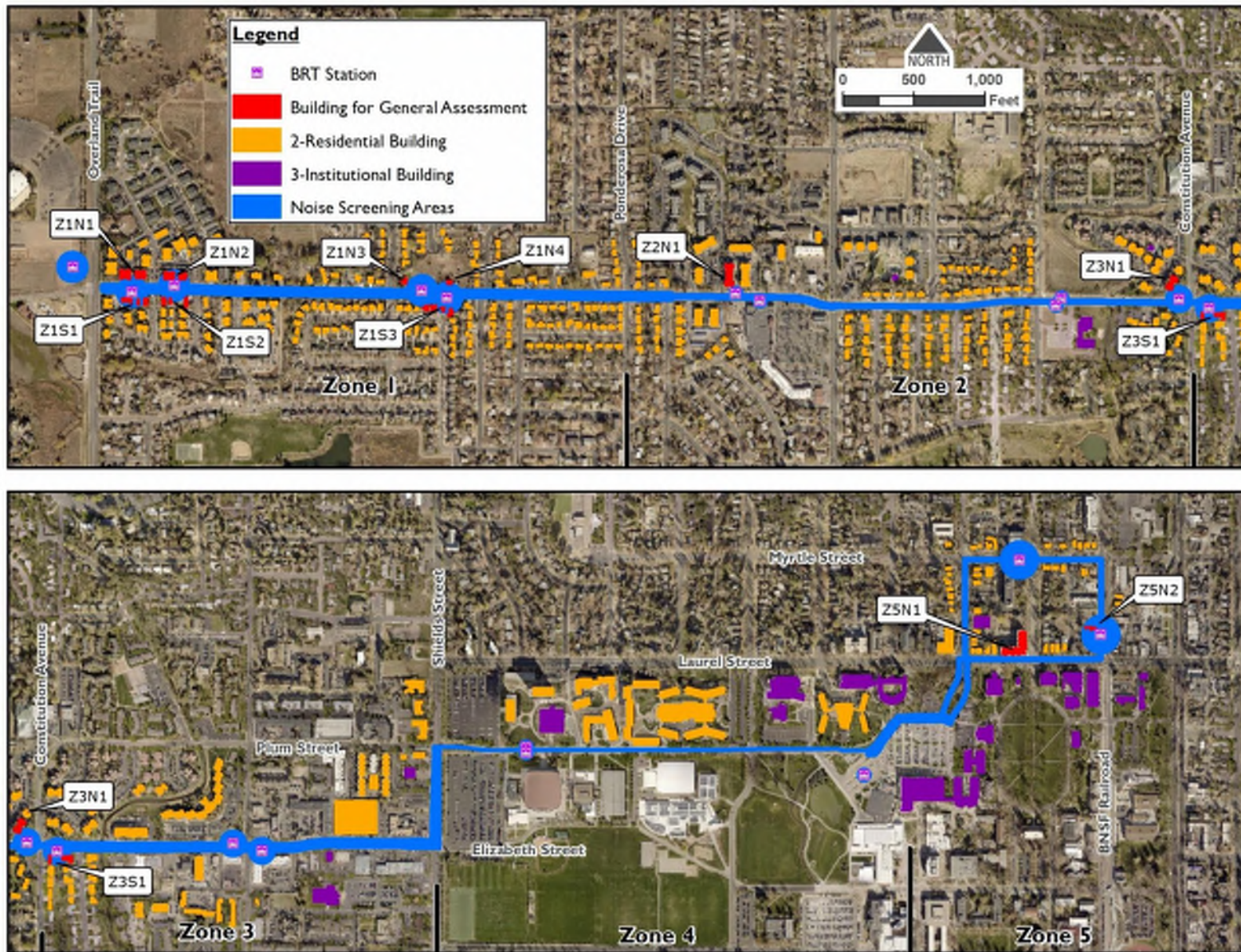


Figure 3. General Noise Assessment Locations



APPENDIX A
FTA NOISE SPREADSHEET PRINTOUTS

Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z1N1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	100
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	50
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	74
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	52 dBA
Total Noise Exposure:	61 dBA
Increase:	1 dB
Impact?:	None

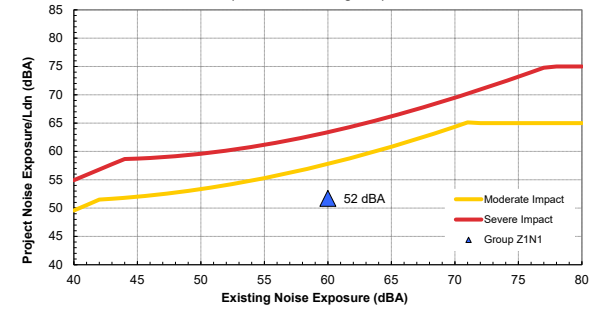
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	50.9 dBA
Leq(night):	39.6 dBA
Ldn:	50.5 dBA

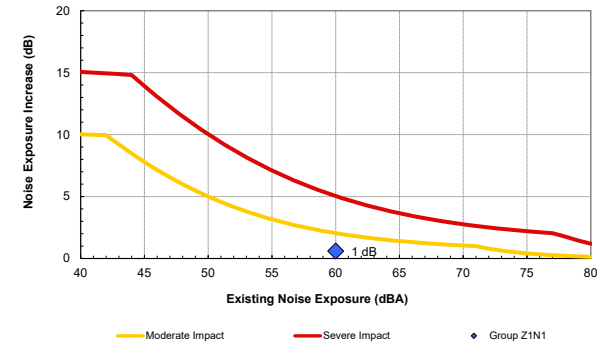
Source 2 Results	
Leq(day):	44.2 dBA
Leq(night):	33.0 dBA
Ldn:	43.8 dBA
Incremental Ldn (Src 1-2):	51.3 dBA

Source 3 Results	
Leq(day):	41.7 dBA
Leq(night):	30.4 dBA
Ldn:	41.2 dBA
Incremental Ldn (Src 1-3):	51.7 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z1N2
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	53
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	52
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	76
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	58 dBA
Total Noise Exposure:	62 dBA
Increase:	2 dB
Impact?:	None

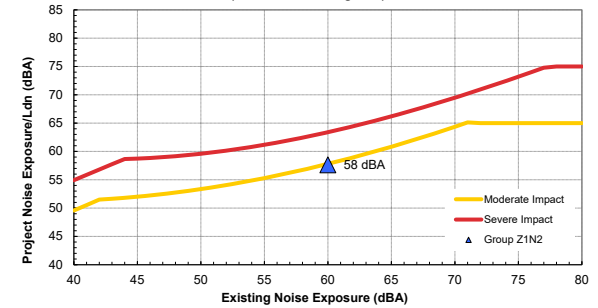
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	57.8 dBA
Leq(night):	46.5 dBA
Ldn:	57.4 dBA

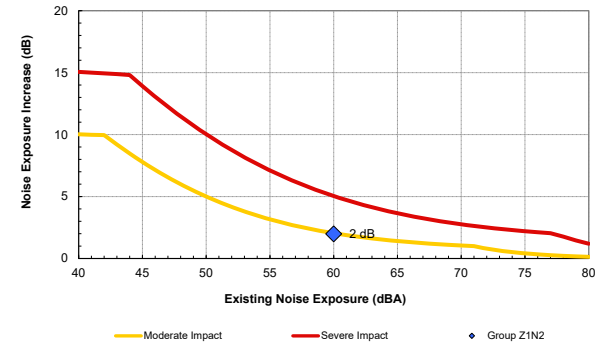
Source 2 Results	
Leq(day):	44.0 dBA
Leq(night):	32.7 dBA
Ldn:	43.5 dBA
Incremental Ldn (Src 1-2):	57.5 dBA

Source 3 Results	
Leq(day):	41.5 dBA
Leq(night):	30.2 dBA
Ldn:	41.1 dBA
Incremental Ldn (Src 1-3):	57.6 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: **W Elizabeth ETC**

Receiver Parameters	
Receiver:	Group Z1N3
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	115
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	48
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	72
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary

Existing Ldn:	60 dBA
Total Project Ldn:	51 dBA
Total Noise Exposure:	60 dBA
Increase:	0 dB
Impact?:	None

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results

Leq(day):	49.4 dBA
Leq(night):	38.1 dBA
Ldn:	48.9 dBA

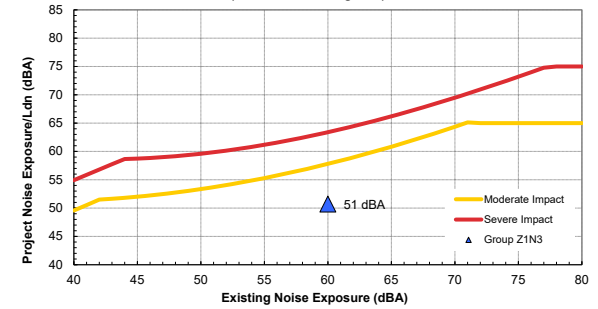
Source 2 Results

Leq(day):	44.5 dBA
Leq(night):	33.2 dBA
Ldn:	44.0 dBA
Incremental Ldn (Src 1-2):	50.2 dBA

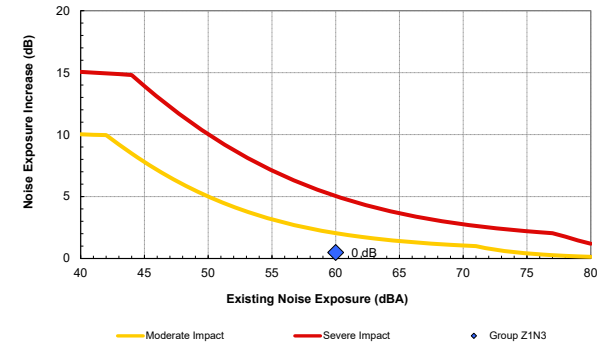
Source 3 Results

Leq(day):	41.8 dBA
Leq(night):	30.6 dBA
Ldn:	41.4 dBA
Incremental Ldn (Src 1-3):	50.7 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: **W Elizabeth ETC**

Receiver Parameters	
Receiver:	Group Z1N4
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	89
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	46
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	70
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary

Existing Ldn:	60 dBA
Total Project Ldn:	53 dBA
Total Noise Exposure:	61 dBA
Increase:	1 dB
Impact?:	None

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results

Leq(day):	52.1 dBA
Leq(night):	40.9 dBA
Ldn:	51.7 dBA

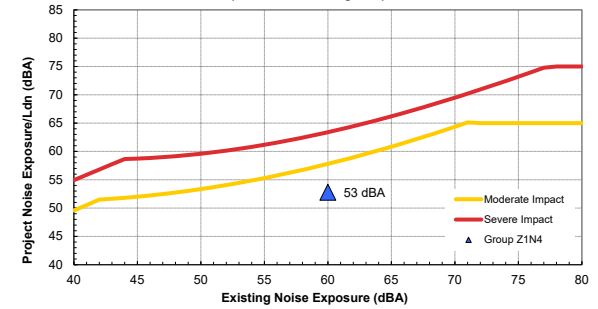
Source 2 Results

Leq(day):	44.8 dBA
Leq(night):	33.5 dBA
Ldn:	44.3 dBA
Incremental Ldn (Src 1-2):	52.5 dBA

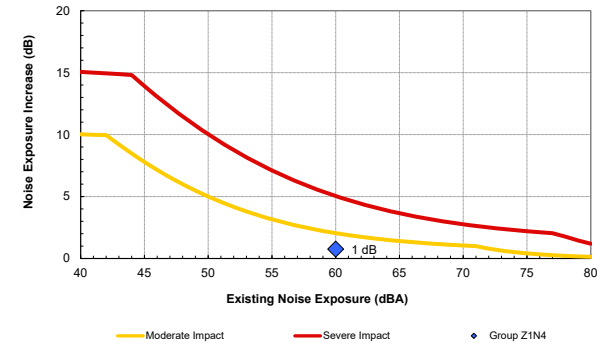
Source 3 Results

Leq(day):	42.0 dBA
Leq(night):	30.8 dBA
Ldn:	41.6 dBA
Incremental Ldn (Src 1-3):	52.8 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z1S1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	3.9
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	52
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	3.7
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	75
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	52
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	58 dBA
Total Noise Exposure:	62 dBA
Increase:	2 dB
Impact?:	None

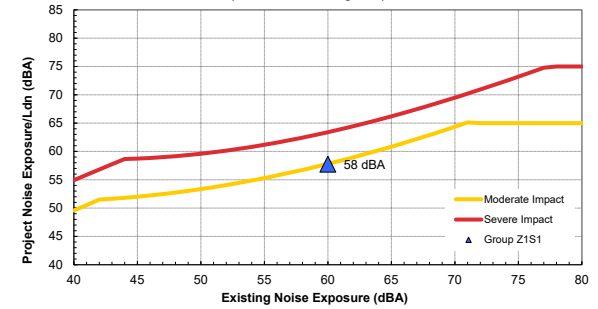
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	57.9 dBA
Leq(night):	46.7 dBA
Ldn:	57.5 dBA

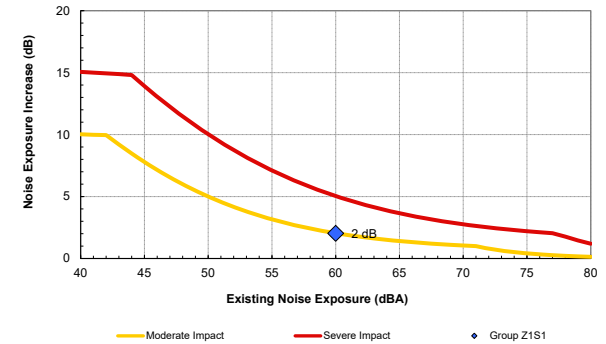
Source 2 Results	
Leq(day):	41.2 dBA
Leq(night):	30.3 dBA
Ldn:	40.9 dBA
Incremental Ldn (Src 1-2):	57.6 dBA

Source 3 Results	
Leq(day):	44.0 dBA
Leq(night):	32.7 dBA
Ldn:	43.5 dBA
Incremental Ldn (Src 1-3):	57.7 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z1S2
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	88
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	71
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	48
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	53 dBA
Total Noise Exposure:	61 dBA
Increase:	1 dB
Impact?:	None

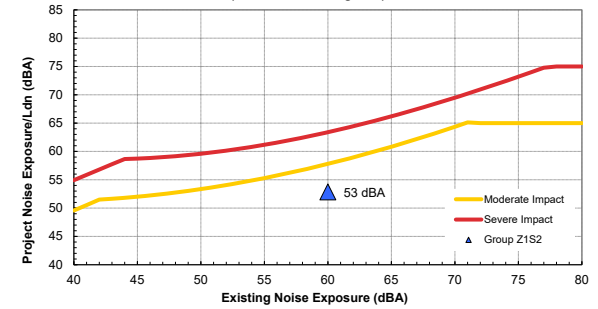
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	52.3 dBA
Leq(night):	41.0 dBA
Ldn:	51.8 dBA

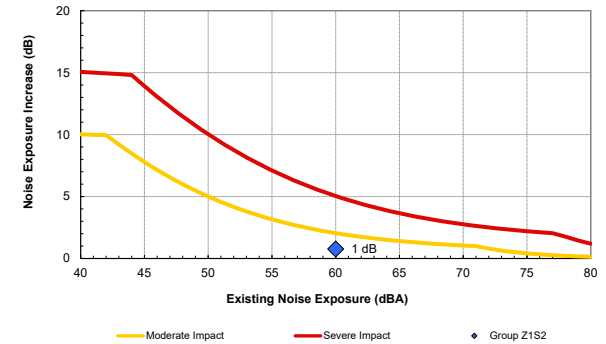
Source 2 Results	
Leq(day):	41.9 dBA
Leq(night):	30.7 dBA
Ldn:	41.5 dBA
Incremental Ldn (Src 1-2):	52.2 dBA

Source 3 Results	
Leq(day):	44.5 dBA
Leq(night):	33.2 dBA
Ldn:	44.0 dBA
Incremental Ldn (Src 1-3):	52.8 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



version: 1/29/2019

Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z1S3
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.3
Distance	Distance from Source to Receiver (ft)	65
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	100
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.3
Distance	Distance from Source to Receiver (ft)	76
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	55 dBA
Total Noise Exposure:	61 dBA
Increase:	1 dB
Impact?:	None

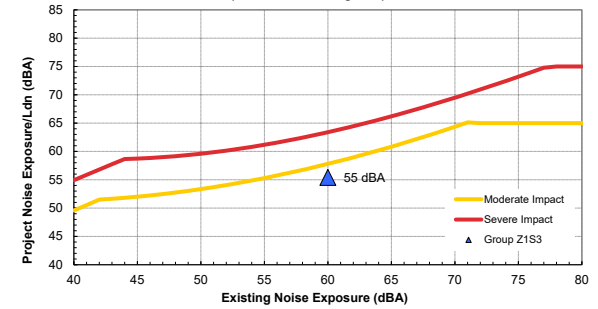
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	55.6 dBA
Leq(night):	44.3 dBA
Ldn:	55.1 dBA

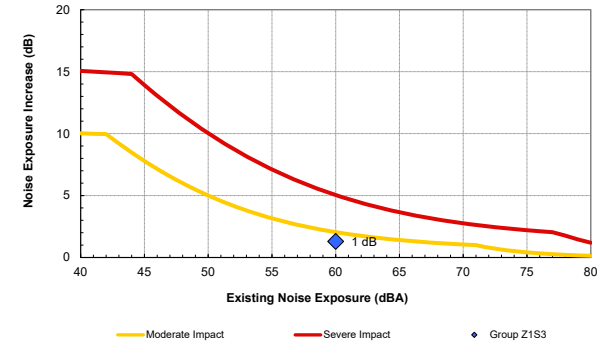
Source 2 Results	
Leq(day):	39.7 dBA
Leq(night):	28.4 dBA
Ldn:	39.3 dBA
Incremental Ldn (Src 1-2):	55.2 dBA

Source 3 Results	
Leq(day):	41.5 dBA
Leq(night):	30.2 dBA
Ldn:	41.1 dBA
Incremental Ldn (Src 1-3):	55.4 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z2N1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	0.5
Nighttime hrs	Avg. Number of Buses/hr	0.1
Distance	Distance from Source to Receiver (ft)	69
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.5
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.1
Distance	Distance from Source to Receiver (ft)	59
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0
Distance	Distance from Source to Receiver (ft)	82
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	48 dBA
Total Noise Exposure:	60 dBA
Increase:	0 dB
Impact?:	None

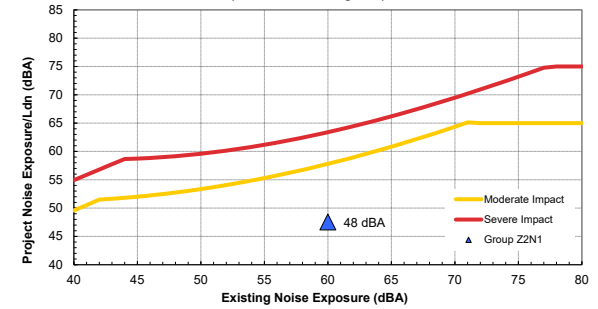
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	45.9 dBA
Leq(night):	38.9 dBA
Ldn:	47.3 dBA

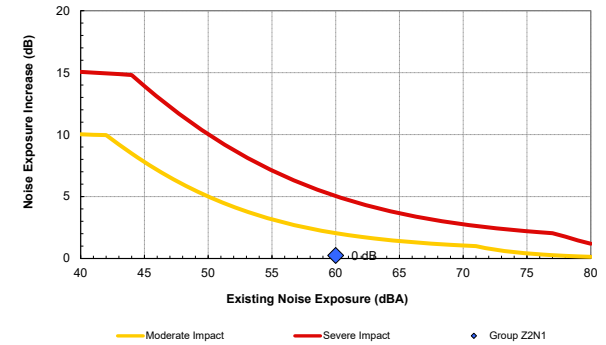
Source 2 Results	
Leq(day):	34.1 dBA
Leq(night):	27.1 dBA
Ldn:	35.5 dBA
Incremental Ldn (Src 1-2):	47.5 dBA

Source 3 Results	
Leq(day):	0.0 dBA
Leq(night):	0.0 dBA
Ldn:	6.4 dBA
Incremental Ldn (Src 1-3):	47.5 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



version: 1/29/2019

Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z3N1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	2.5
Nighttime hrs	Avg. Number of Buses/hr	0.6
Distance	Distance from Source to Receiver (ft)	82
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	2.5
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.6
Distance	Distance from Source to Receiver (ft)	84
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.2
Distance	Distance from Source to Receiver (ft)	108
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary	
Existing Ldn:	60 dBA
Total Project Ldn:	53 dBA
Total Noise Exposure:	61 dBA
Increase:	1 dB
Impact?:	None

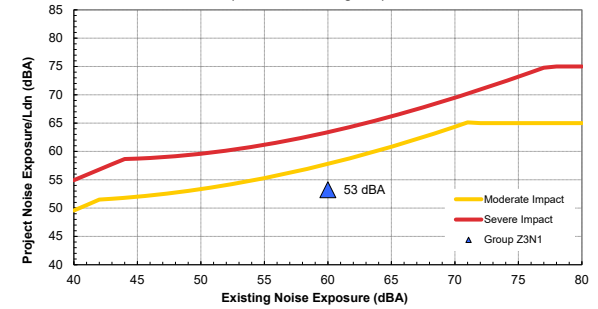
Distance to Impact Contours	
Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results	
Leq(day):	51.0 dBA
Leq(night):	44.8 dBA
Ldn:	52.8 dBA

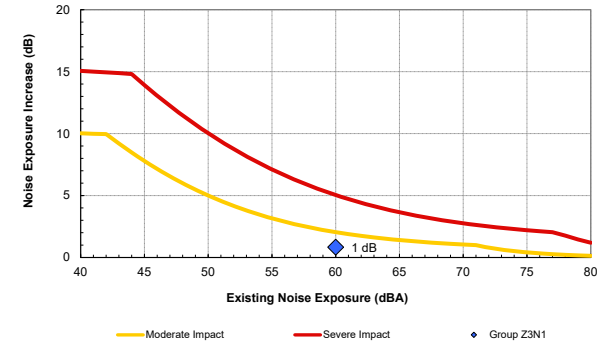
Source 2 Results	
Leq(day):	38.8 dBA
Leq(night):	32.6 dBA
Ldn:	40.6 dBA
Incremental Ldn (Src 1-2):	53.1 dBA

Source 3 Results	
Leq(day):	39.2 dBA
Leq(night):	26.2 dBA
Ldn:	38.3 dBA
Incremental Ldn (Src 1-3):	53.2 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z3S1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	60 dBA

Noise Source Parameters	
Number of Noise Sources:	3

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	4
Nighttime hrs	Avg. Number of Buses/hr	0.2
Distance	Distance from Source to Receiver (ft)	54
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	2.5
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.6
Distance	Distance from Source to Receiver (ft)	72
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 3
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	4
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	0.2
Distance	Distance from Source to Receiver (ft)	50
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Project Results Summary

Existing Ldn:	60 dBA
Total Project Ldn:	57 dBA
Total Noise Exposure:	62 dBA
Increase:	2 dB
Impact?:	None

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Source 1 Results

Leq(day):	57.6 dBA
Leq(night):	44.6 dBA
Ldn:	56.7 dBA

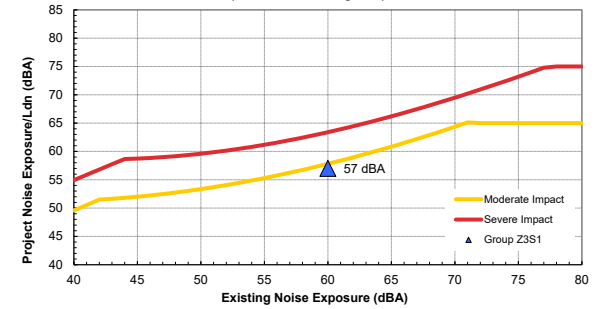
Source 2 Results

Leq(day):	39.8 dBA
Leq(night):	33.6 dBA
Ldn:	41.6 dBA
Incremental Ldn (Src 1-2):	56.8 dBA

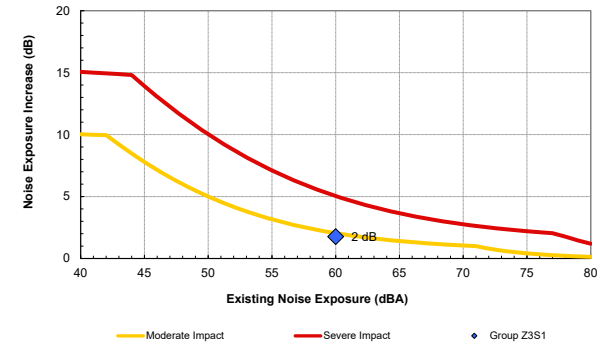
Source 3 Results

Leq(day):	44.2 dBA
Leq(night):	31.2 dBA
Ldn:	43.3 dBA
Incremental Ldn (Src 1-3):	57.0 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



version: 1/29/2019

Project: **W Elizabeth ETC**

Receiver Parameters	
Receiver:	Group Z5N1
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	65 dBA

Noise Source Parameters	
Number of Noise Sources:	1

Noise Source Parameters		Source 1
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	30
	Avg. Number of Events/hr	6
Nighttime hrs	Speed (mph)	30
	Avg. Number of Events/hr	1
Distance	Distance from Source to Receiver (ft)	30
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

	Noise Barrier?	No

Project Results Summary

Existing Ldn:	65 dBA
Total Project Ldn:	50 dBA
Total Noise Exposure:	65 dBA
Increase:	0 dB
Impact?:	None

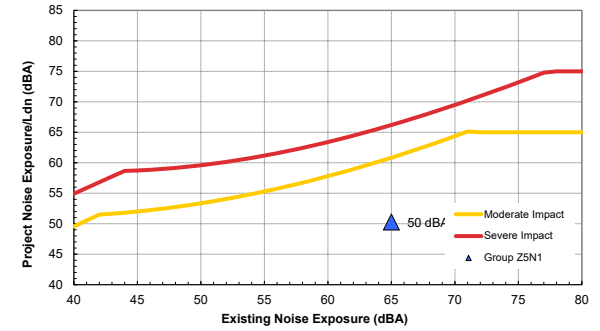
Distance to Impact Contours

Dist to Mod. Impact Contour (Source 1):	6 ft
Dist to Sev. Impact Contour (Source 1):	3 ft

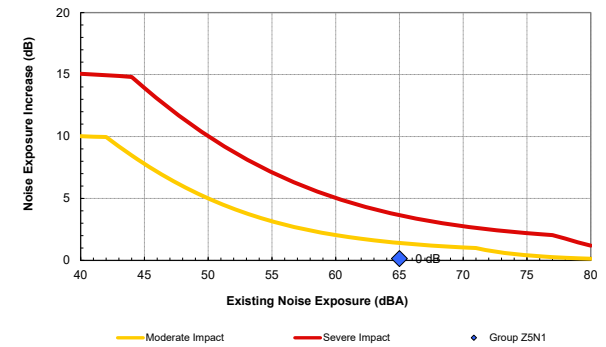
Source 1 Results

Leq(day):	49.3 dBA
Leq(night):	41.5 dBA
Ldn:	50.3 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)



version: 1/29/2019

Project: W Elizabeth ETC

Receiver Parameters	
Receiver:	Group Z5N2
Land Use Category:	2. Residential
Existing Noise (Measured or Generic Value):	65 dBA

Noise Source Parameters	
Number of Noise Sources:	2

Noise Source Parameters		Source 1
	Source Type:	Stationary Source
	Specific Source:	Bus Transit Center
Daytime hrs	Avg. Number of Buses/hr	6
Nighttime hrs	Avg. Number of Buses/hr	1
Distance	Distance from Source to Receiver (ft)	55
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

Noise Source Parameters		Source 2
	Source Type:	Highway/Transit
	Specific Source:	Buses (electric)
Daytime hrs	Speed (mph)	25
	Avg. Number of Events/hr	6
Nighttime hrs	Speed (mph)	25
	Avg. Number of Events/hr	1
Distance	Distance from Source to Receiver (ft)	36
	Number of Intervening Rows of Buildings	0
Adjustments	Noise Barrier?	No

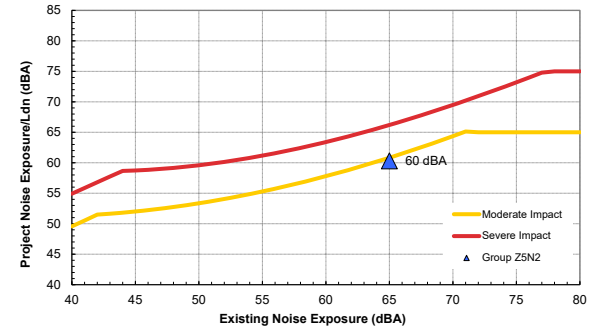
Project Results Summary	
Existing Ldn:	65 dBA
Total Project Ldn:	60 dBA
Total Noise Exposure:	66 dBA
Increase:	1 dB
Impact?:	None

Distance to Impact Contours	
Dist to Mod. Impact Contour (Sources 1+2):	--
Dist to Sev. Impact Contour (Sources 1+2):	--

Source 1 Results	
Leq(day):	59.1 dBA
Leq(night):	51.4 dBA
Ldn:	60.1 dBA

Source 2 Results	
Leq(day):	45.9 dBA
Leq(night):	38.1 dBA
Ldn:	46.9 dBA
Incremental Ldn (Src 1-2):	60.3 dBA

Noise Impact Criteria
(FTA Manual, Fig 4-2)



Increase in Cumulative Noise Levels Allowed
(FTA Manual, Figs 4-3 and 4-4)

