Bennett College Redevelopment Project
Noise Assessment

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General Information on Noise

Noise is defined as unwanted sound resulting from vibrations in the air. The range of pressures that cause the vibrations that create noise is large. Noise is therefore measured on a logarithmic scale, expressed in decibels (dB). The frequency of a sound is the "pitch" (high or low). The unit for frequency is hertz (Hz). Most sounds are composed of a composite of frequencies. The normal human ear can usually distinguish frequencies from 20 Hz (low frequency) to about 20,000 Hz (high frequency), although people are most sensitive to frequencies between 500 Hz and 4000 Hz. The individual frequency bands can be combined into one overall dB level.

Noise is typically measured on the A-weighted scale (dBA). The A-weighting scale was developed and has been shown to provide a good correlation with the human response to sound and is the most widely used descriptor for community noise assessments. (Harris, 1991). The faintest sound that can be heard by a healthy ear is about 0 dBA, while an uncomfortably loud sound is about 120 dBA. In order to provide a frame of reference, some common sound levels are listed below.

- Chainsaw at 30 feet 90 dBA
- Truck at 100 feet 85 dBA
- Noisy Urban Environment 75 dBA
- Lawn Mower at 100 feet 65 dBA
- Average Speech 60 dBA
- Typical Suburban Daytime 50 dBA
- Quiet Office 40 dBA
- Quiet Suburban nighttime 35 dBA
- Soft Whisper at 15 feet 30 dBA

Common terms used in this noise analysis are defined below.

L_{eq}—The equivalent noise level over a specified period of time (i.e., 1-hour). It is a single value of noise that includes all of the varying noise energy in a given duration.

Statistical Sound Levels—The A-weighted noise level exceeded a certain percentage of the time. The L_{90} is the noise level exceeded 90 percent of the time and is often considered the background or residual noise level. It is representative of the lower range of noise levels without the contribution of intrusive noises, such as passing trains, cars, aircraft, etc. The L_{10} is the noise level exceeded 10 percent of the time and is a measurement of intrusive noises, such as aircraft overflight.

2.0 Standards

Village of Millbrook

The Village of Millbrook has an enforceable noise ordinance (Chapter 230 of the Zoning Code). The ordinance contains a numerical, or performance standard. The performance standard limits noise from any source to no greater than 60 dBA during the day (7 a.m. to 8 p.m.) and 50 dBA at night (8 p.m. to 7 a.m.), when measured at the property line of the generating source.

Construction activities are exempted from the standard, but are only permitted between the hours of 7 a.m. and 8 p.m.

New York State Department of Environmental Conservation (NYSDEC)

The NYSDEC issued a program guidance document entitled "Assessing and Mitigating Noise Impacts" on October 6, 2000. The guidance discusses various aspects of noise and suggested steps for performing noise assessments. Further, it provides suggestions on evaluating significant increases in noise levels.

The guidance notes that an increase in ambient noise of 10 dBA is perceived by the majority of people to be a doubling of the loudness of a sound. For example, if the ambient sound level is 50 dBA, and is then increased to 60 dBA, most people would perceive the new noise level as twice as loud. The guidance recommends that for non-industrial settings, the SPL (Sound Pressure Level) should probably not exceed ambient noise levels by more than 6 dBA at a given receptor. The addition of any noise source, in a non-industrial setting, should not raise the total future ambient noise level above a maximum of 65 dBA. This would be considered the "upper end" limit since 65dBA allows for undisturbed speech at a distance of approximately three feet. Noise levels in industrial or commercial areas should not exceed 79 dBA.

The NYSDEC guidance explicitly states that the 6 dBA increase is to be used as a general guideline. There are other factors which should also be considered. For example, in settings with very low ambient sound levels, a greater increase may be acceptable since sound levels are so low.

There are no known Federal noise standards applicable to this project

3.0 Existing Noise Levels

3.1 Methodology

An ambient noise monitoring program that included short-term (15 minutes per location) measurements was conducted at six residential locations in the vicinity of the proposed project. Four of the locations were at or near the intersections evaluated in the traffic analysis. Measurements at the traffic intersections were conducted during an AM peak (8 a.m. to 9 a.m.) and PM peak (4:15 to 5:15) weekday period on March 28, 2007. Measurements at the remaining two locations were conducted outside of the peak traffic hours on the same day, in order to obtain ambient conditions during time periods when construction will occur.

A RION NA-27 precision integrating sound level meter with integral data logger was utilized for the measurements. The meter meets ANSI S1.4-1983 requirements for precision Type 1 sound level meters. The meter was calibrated before and after the survey period using a Bruel & Kjaer Model 4231 sound level calibrator. The microphone was fitted with a windscreen to reduce wind generated noise and mounted on a tripod at a height of approximately five feet above ground level. The meter was programmed to measure the existing sound levels for a continuous period of 15 minutes at each location. The statistical parameters of L_{eq}, L_{90} and L_{10} were calculated by the meter.

In addition to noise level measurements, the contributing noise sources were identified and recorded, along with the prevailing meteorological conditions. Wind speed and direction were obtained via a Dwyer hand held wind meter and a compass and/or by examining a topographic map of the area, respectively. Sky conditions were observed and recorded at each location.

3.2 Monitoring Locations

The proposed project is divided into essentially two halves, with an existing residential development in between. For the purposes of this analysis, all distances are provided from the approximate center of the nearest project half.

Noise monitoring locations were selected at the following locations, which are also depicted on Figure 1. The approximate distance and direction of each location to the center of the project site is also presented.

Traffic Intersection/Residential Locations

- NYS Route 82 / NYS Route 343 (750 feet, SW)
- NYS Route 343 / Halcyon Road (700 feet, South)
- NYS Route 343 – Bennett Common Way (1,000 feet, SE)
- US 44 / East Farm Drive (700 feet, North)

Other Residential Locations

- Bennett Common Way (500 feet, center of site)
- Manor Drive (1,700 feet, NE)

3.3 Monitoring Results

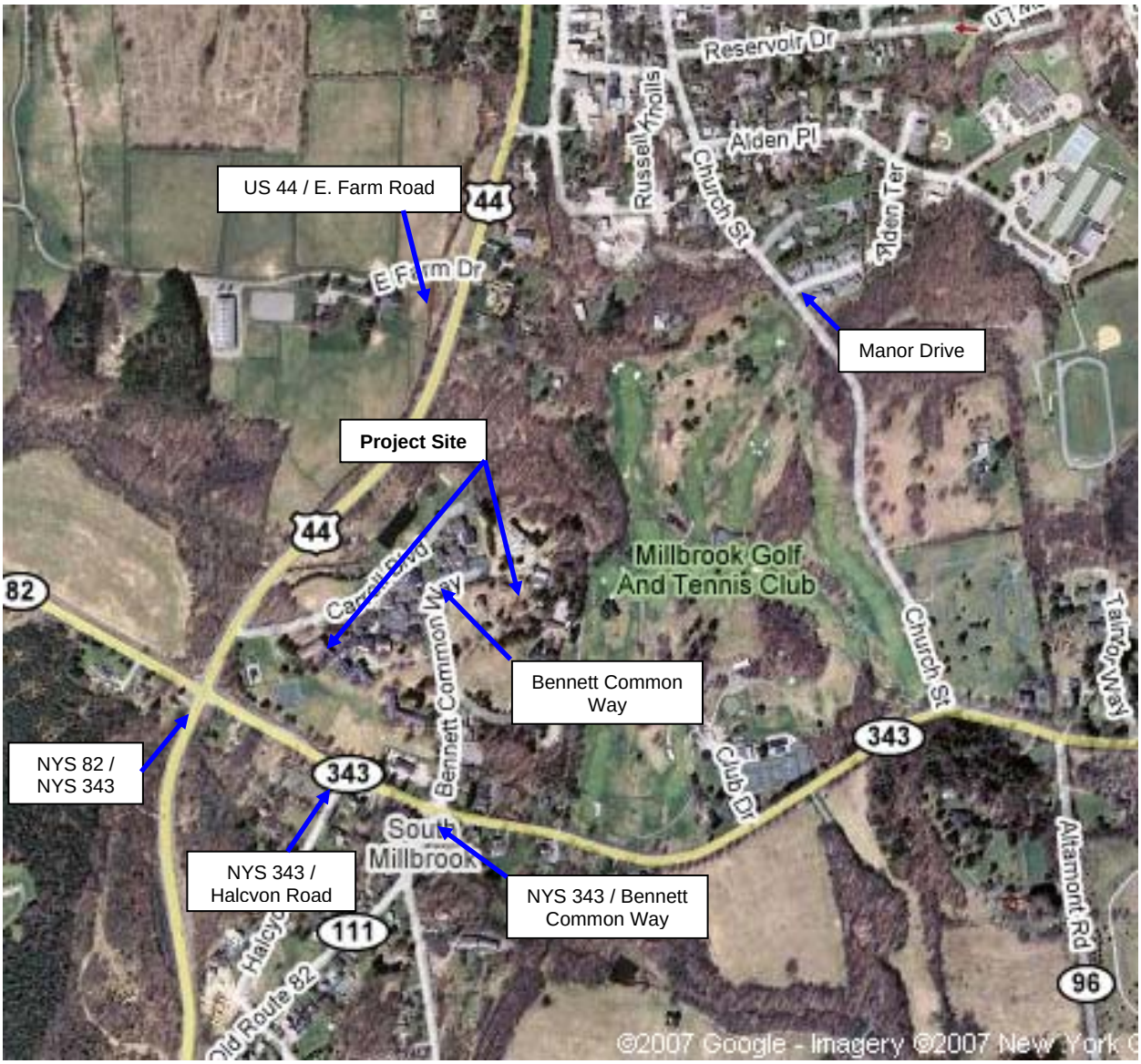
Monitoring was conducted for 15 minutes at each location. Meteorological conditions consisted of north winds at 5 to 10 mph, with some gusts later in the day, partly sunny skies, and temperatures that ranged from approximately 47 degrees F during the AM peak period, to 55 degrees F during the PM peak period. The existing noise environment in the area was dominated mostly by vehicular traffic noise from Route 343, Route 84, Route 44, and other local roads. Bus traffic was noted entering and exiting from the bus depot on Halcyon Road. Natural sounds (birds and wind noises) were also noted. A summary of the measured L_{eq}, L_{10} and L_{90} noise levels from the monitoring program is presented in Table 1 below.

Table 1
Measured Ambient Noise Levels

Receptor Location	Measured Sound Levels (dBA)						
	AM Peak				PM Peak		
	L_{eq}	L_{10}	L_{90}		L_{eq}	L_{10}	L_{90}
NYS Route 82 / NYS Route 343	63	66	57		63	66	56
NYS Route 343 / Halcyon Road	61	63	52		61	60	48
NYS Route 343 – Bennett Common Way	60	63	53		59	62	50
US 44 / East Farm Drive	62	65	50		58	62	45
Bennett Common Way	48	48	40		50	53	44
Manor Drive	60	65	41		63	68	43

A review of the data in Table 1 reveals that measured ambient L_{eq} levels at the traffic intersection locations were relatively high, but typical for areas with moderate vehicular traffic, ranging from 58 to 63 dBA. Similar noise levels were found during the AM and PM peak periods. Much lower noise levels were found within the campus site near the existing residences (Bennett Common Way), due to the distance from the main roadways and the shielding effects of existing buildings.

Figure 1
NOISE ANALYSIS LOCATIONS



4.0 Future Condition Without the Project

Without the project, the noise levels around the project site would likely remain essentially unchanged, with no additional traffic or other additional noise coming from the site.

5.0 Potential Impacts

Potential noise impacts from the proposed project could be caused by increases in noise levels associated with increases in vehicular traffic, and, for the short-term, increases in noise during project construction.

This noise assessment consisted of both a background noise monitoring program and a noise impact evaluation. Background noise monitoring was conducted in order to quantify the existing noise environment during peak traffic hours and at other hours of the day when construction activities are expected to occur. The noise impact evaluation was performed by calculating expected increases in noise associated with the "Build" condition over the "No-Build" condition traffic volumes, and by estimating project construction noise levels. The expected increases in vehicular noise levels were then compared to the project impact criterion.

Noise Impact Criteria

The NYSDEC guidance recommends that for non-industrial settings, the SPL (Sound Pressure Level) due to a permanent source should probably not exceed ambient noise levels by more than 6 dBA at a given receptor in order to avoid noise impacts. The addition of any noise source, in a non-industrial setting, should not raise the total future ambient noise level above a maximum of 65 dBA.

The NYSDEC guidance explicitly states that the 6 dBA increase is to be used as a general guideline. There are other factors which should also be considered. For example, in settings with very low ambient sound levels, a greater increase may be acceptable since sound levels are so low.

5.1 Operational Noise - Traffic

A noise impact evaluation was performed by calculating expected noise level increases associated with traffic volumes. Traffic noise was evaluated by obtaining traffic count data for the No-Build and Build scenarios. Noise levels associated with vehicular traffic are a function mainly of traffic speed, vehicle mix (automobiles, medium trucks, heavy trucks) and volume.

Posted vehicle traffic speeds will not be affected by the project. Vehicle mixes are also anticipated to be essentially the same. Therefore, any changes in traffic related noise will be a function of the change in volume. For example, a doubling of traffic volume (assuming speeds and vehicle mixes do not change) equates to an increase in noise of 3 dBA.

Traffic volumes for each of the intersections evaluated for the traffic study, for each scenario, were tabulated and are presented in Table 2. The increase in noise over the No-Build scenario for each time period is also presented.

A review of the data in Table 2 reveals that negligible increases over the no-build scenario will be experienced at any of the intersections due to vehicular traffic. The greatest calculated increase is only 0.3 dBA, an essentially imperceptible increase. Using the NYSDEC impact criterion discussed previously, no significant adverse noise impacts would be expected from increased vehicular traffic associated with the project.

5.1.1 Mitigation

No mitigation measures will be required for vehicular traffic noise since no noise impacts are expected as a result of future traffic volumes associated with the project.

Table 2
Traffic Volume Noise Analysis

Bennett College Traffic Noise Analysis				
Intersection		**No-Build**	**Build**	**Increase over No-Build (dBA)**
		Traffic Volumes		
NYS Rte 82 / NYS Route 343				
	AM Peak	1082	1108	**0.1**
	PM Peak	977	1004	**0.1**
NYS Rte 343 / Halcyon Road				
	AM Peak	455	476	**0.2**
	PM Peak	443	466	**0.2**
NYS Route 343 / Bennett Common Way				
	AM Peak	567	607	**0.3**
	PM Peak	560	604	**0.3**
US 44 / Carroll Boulevard				
	AM Peak	622	647	**0.2**
	PM Peak	543	571	**0.2**

5.2 Construction Noise

The construction process for this Project will generally include the following phases:

- Demolition
- Excavation
- Foundations
- Building Construction
- Restoration/Finishing

The construction process for residential projects generally occurs in the following sequences: Ground clearing, excavation (road and infrastructure construction), foundations, building construction, exterior finishing and cleanup. Construction equipment utilized will differ from sequence to sequence. Construction equipment utilized differs in each phase, but in general, heavy equipment (bulldozers, loaders, dump trucks) is used during the excavation phase. Noise is generated during construction primarily from diesel engines that power the equipment. Exhaust noise is usually the predominant source of diesel engine noise, which is the reason that maintaining functional mufflers on all equipment will be a requirement of the Project.

Noise levels of construction equipment likely to be used for the Project are summarized in Table 3 (BBN, 1971; NYSDEC, 1974). Typical site average sound levels for each phase of construction are presented in Tables 4 and 5 (BBN, 1971). Noise levels in the tables are presented for a reference distance of 50 feet and at various greater distances, covering the range of distances to nearby residences at the Project.

Table 3
Noise Levels of Major Construction Equipment

Equipment Type	**Noise Level (dBA)**					
	50 Feet	**500 Feet**	**700 Feet**	**750 Feet**	**1000 Feet**	**1700 Feet**
Cement Trucks	85	63	60	59	56	50
Front Loaders	79	57	54	53	50	44
Graders	85	63	60	59	56	50
Bulldozers	85	63	60	59	56	50
Pickup Trucks	55	33	30	29	26	20
Backhoes	80	58	55	54	51	45
Concrete Mixers	85	63	60	59	56	50
Excavator	85	63	60	59	56	50

Source (BBN, 1971; NYSDEC, 1974; MADEP)

Table 4
Typical Site Average Noise Levels
By Construction Activity (dBA) - Maximum Required Equipment in Operation

Construction Phase	Noise Level (dBA)					
	50 Feet	500 Feet	700 Feet	750 Feet	1000 Feet	1700 Feet
Excavation	88	66	63	62	59	53
Foundations	81	59	56	55	52	46
Building Construction	81	59	56	55	52	46
Restoration/Finishing	88	66	63	62	59	53

Sources (BBN, 1971)

Table 5
Typical Site Average Noise Levels
By Construction Activity (dBA) - Minimum Required Equipment in Operation

Construction Phase	**Noise Level (dBA)**					
	50 Feet	**500 Feet**	**700 Feet**	**750 Feet**	**1000 Feet**	**1700 Feet**
Excavation	75	53	50	49	46	40
Foundations	81	59	56	55	52	46
Building Construction	65	43	40	39	36	30
Restoration/Finishing	72	50	47	46	43	37

Sources (BBN, 1971)

The nearest residences to the edge of the Project property are no less than 50 feet away. These most proximate residences could experience the maximum sound levels presented in Tables 5 through 7 above, but only for brief periods when the equipment are operating at the edge of the project property. Most residences are located at various distances, up to 1,700 feet and more from the project.

The project site covers a fairly large area. The actual sound levels which will be experienced by existing off-site residential uses surrounding the site will be a function of distance. As such, no one existing residential use will be exposed to the same sound levels over an extended period of time, as construction progresses through the site. For the purposes of this analysis, the project site was treated as two sites for calculating distances to nearby residences. The approximate center of each site was used as a baseline in order to obtain average construction noise levels.

The calculated levels above were arrived at by considering the reduction in noise with distance (e.g., 6 dBA reduction with doubling of distance) and the effects of sound absorption by the air. The noise levels above do not account for any vegetation or intervening structures, both on and off the property site, that will act as effective noise barriers, further reducing offsite noise levels.

The data presented in Table 4 reflect the average sound level occurring when the maximum amount of construction equipment is operating at the site, a conservative estimate. The data in Table 5 reflect the average sound level when only the minimum equipment required is in operation. Construction noise levels are never steady in nature, but rather fluctuate depending on which equipment pieces and how many are in use at any given time. Demolition noise sources associated with removing the existing structures are anticipated to be similar to those associated with Project construction.

The construction sound levels presented above indicate that construction noise will be audible at the most proximate receptors, but likely only when the maximum equipment is in operation. Some construction phases will generate noise levels that will be below ambient levels, especially when the minimum amount of equipment is in operation (Table 4).

Construction noise and equipment will not be unusual, as they will be typical of those associated with any residential development. It is important to note that the equipment presented is not used in each phase of construction. Further, equipment used is not generally operated continuously, nor is all of the equipment always operated simultaneously. There will therefore be times when no equipment is operating and noise will be at ambient levels. Construction activities are also scheduled to occur during daytime hours, when many people are at work and away from home.

The construction noise levels presented above are those that would be experienced for people outdoors. A building (house) will provide significant attenuation for those who are indoors. Sound levels can be expected to be up to 27 dBA lower indoors with the windows closed. Even in homes with the windows open, indoor sound levels can be reduced by up to 17 dBA (USEPA, 1978). Construction noise will also be temporary in nature.

5.2.1 Mitigation

The Village of Millbrook noise ordinance is designed to minimize potential noise impacts due to construction by limiting construction activities to between the hours of 7:00 a.m. and 8:00 p.m.

It is therefore considered to be a practical mitigation measure, and project construction hours will be in compliance with the ordinance.

The short-term nature of construction activities does not warrant any mitigation measures. However, as a general good construction practice to reduce construction noise to the greatest extent possible and practical, functional mufflers will be maintained on all construction equipment. Accordingly, no long term or permanent noise impacts are anticipated due to Project construction activities.

6.0 Compliance with Standards and Guidelines

The Village of Millbrook noise ordinance does not address vehicular traffic noise directly, and as such, is not applicable. No noise generating sources, other than those associated with residential developments, are proposed for the project. The ordinance limits construction activities to the hours of 7:00 a.m. and 8:00 p.m. The Project construction schedule will be in compliance with the Village noise ordinance.