Item # BS2008-18

SEMINOLE COUNTY GOVERNMENT
BOARD OF ADJUSTMENT
AGENDA MEMORANDUM

SUBJECT: **5700 S. Sylvan Lake Drive** – Primrose School – Sanford; Steve Merrick, Interplan, LLC, applicant; Request for a Special Exception to establish a child care center in A-1 (Agriculture) district.

DEPARTMENT: Planning & Development **DIVISION:** Planning

AUTHORIZED BY: Kathy Fall **CONTACT:** Denny Gibbs **EXT:** 7387

Agenda Date 5/18/09 **Regular** ☐ **Consent** ☐ **Public Hearing – 6:00** ☒
Continued from 4/27/09

MOTION/RECOMMENDATION:

1. **Approve** the request for special exception to establish a child care center in A-1 (Agriculture) district; or
2. **Deny** the request for special exception to establish a child care center in A-1 (Agriculture) district; or
3. **Continue** The request to a time and date certain.

GENERAL INFORMATION	Applicant: Location: Zoning:	Steve Merrick, Interplan, Primrose School - Sanford 5700 S. Sylvan Lake Drive A-1 (Agriculture)
BACKGROUND / REQUEST	• After hearing this item at the 4/27/09 meeting, the Board continued this until 5/18/09 in order for the applicant to propose alternate site design. • The applicant proposes to construct a 10,723 square foot child care center on 2.31 acres in the A-1 (Agriculture) district. • The property is located at the intersection of Orange Blvd. and South Sylvan Lake Drive. Orange Blvd. is classified as a Collector roadway. • The property is located within the Wekiva River Protection Area (WRPA). • The hours of operation are from 6:30 am to 6:30 pm. • There will be 184 students and 20 employees.	

Reviewed by:
Co Atty: ______
Pln Mgr: ______

STANDARDS FOR GRANTING A SPECIAL EXCEPTION; LDC SECTION 30.43(b)(2)	The Board of Adjustment (BOA) shall have the power to hear and decide special exceptions it is specifically authorized to pass under the terms of the Land Development Code upon determination the use requested: ***<u>IS NOT DETRIMENTAL TO THE CHARACTER OF THE AREA OR NEIGHBORHOOD OR INCONSISTENT WITH TRENDS OF DEVELOPMENT IN THE AREA</u>:*** The subject property is located within the Wekiva River Protection Area and East Lake Sylvan Transitional Area and is required by Section 369.305(1)(b)3, Florida Statutes, to demonstrate that the new use is low-density residential in nature and has less impacts on natural resources than low-density residential development. Seminole County Comprehensive Plan Policy FLU 1.9 Wekiva and Econlockhatchee River Protection also requires the County to implement Protection Zone policies and regulations regarding maintaining rural density and character in the aggregate within the Wekiva River Protection Area (WRPA). The term "rural density and character" would equate to a general pattern of one (1) dwelling unit per net buildable acre, or less (Policy FLU 12.3). Based upon the attached Primrose School Development Impact Report dated April 6, 2009, staff finds they have demonstrated consistency with Section 369.305(1)(b)3, Florida Statutes and Policy FLU 12.3 for the Wekiva River Protection Area (WRPA). A child care center is consistent with the trend of development in this area. Across Orange Blvd from the subject property is Wilson Elementary and the Gathering Place Church and just south is the water treatment plant. Further, child care centers serve the needs of adjacent residential developments. ***<u>DOES NOT HAVE AN UNDULY ADVERSE EFFECT ON EXISTING TRAFFIC PATTERNS, MOVEMENTS AND VOLUMES</u>:*** The subject property is located at the corner of S. Sylvan Lake Drive and Orange Blvd, which is a collector roadway. The traffic study provided shows that most affected road segments will operate within their adopted level of service and intersection improvements, once completed, will bring the intersection at Orange Blvd and CR46A up to a

	satisfactory level of service. Prior to obtaining permits, the site must pass concurrency. ***<u>IS CONSISTENT WITH THE SEMINOLE COUNTY COMPREHENSIVE PLAN:</u>*** The Seminole County Comprehensive Plan designates the property Suburban Estates (SE) future land use. The property is also located within the Wekiva River Protection Area and East Lake Sylvan Transitional Area and the subject use has demonstrated consistency with the requirements of Section 369.305(1)(b)3, Florida Statutes, states, regarding development within the Wekiva River Protection Area: "Prohibition of development that is not low-density residential in nature, unless that development has less impacts on natural resources than low-density residential development." Further, in 1999, Seminole County and the Florida Department of Community Affairs entered into a Stipulated Compliance Agreement to ensure that land uses within the WRPA comply with the provisions of the Act. Seminole County adopted Objectives and Policies within its Comprehensive Plan to respond to the requirements of Compliance Agreement. All development proposals within the WRPA must be consistent with those unique provisions of the Seminole County Comprehensive Plan. By meeting LEED standards for site development and construction as noted in the attached Development Impact Report, the Primrose School has demonstrated consistency with Wekiva River Protection Area (WRPA) Objectives and Policies. ***<u>MEETS ANY ADDITIONAL REQUIREMENTS SPECIFIED IN THE CODE SECTION AUTHORIZING THE USE IN A PARTICULAR ZONING DISTRICT OR CLASSIFICATION:</u>*** Based on the submitted site plan, the proposed use and proposed building meets the minimum area and dimensional requirements of the A-1 district. To minimize impacts, where the subject property is adjacent to R-1AAA, at the northwest corner of the property, a landscape buffer is required per the Active passive buffer requirements SCLDC 30.1232. The retention pond at the west side of the subject property provides additional distance from adjacent

	homes. Staff additionally recommends as a condition of approval a 6-foot fence be required at the north and west property line to lessen impacts to adjacent residential properties. Staff also recommends canopy and understory trees be planted along eastern portion of the north property line - active buffer requirements provide landscaping along the western portion of the north property line. This landscaping shall consist of a canopy tree every 40 feet with 3 understory trees between starting at the east end of lot 3 of Barrington Club and going eastward to Orange Blvd. ***<u>WILL NOT ADVERSELY AFFECT THE PUBLIC INTEREST:</u>*** Within the A-1 district child care centers are allowed as a conditional use.
STANDARDS FOR GRANTING A SPECIAL EXCEPTION IN THE A-1 (AGRICULTURE) DISTRICT; LDC SECTION 30.124(a)	The BOA may permit any use allowed by special exception in the A-1 (Agriculture) district upon making findings of fact, in addition to those required by section 30.43(b)(2) of the Land Development Code, that the use: ***<u>IS CONSISTENT WITH THE GENERAL ZONING PLAN OF THE A-1 (AGRICULTURE DISTRICT):</u>*** Agriculture zoning permits uses that have an agriculture purpose and non-agriculture uses with conditions to protect the character of the area. Within the urban area Agricultural zoning is considered a transitional zoning. ***<u>IS NOT HIGHLY INTENSIVE IN NATURE:</u>*** Consistency with the Wekiva River Protection Area has been demonstrated in the attached Development Impact Report. Section 369.305(1)(b)3 of the Wekiva River Protection Act prohibits development "that is not low-density residential in nature, unless that development has less impacts on natural resources than low-density residential development." In the case of Seminole County, the term "low-density residential" equates to a general pattern of one (1) dwelling unit per net buildable acre in the aggregate within the WRPA. ***<u>HAS ACCESS TO AN ADEQUATE LEVEL OF URBAN SERVICES SUCH AS SEWER, WATER, POLICE, SCHOOLS AND RELATED SERVICES:</u>*** The property is located in the Northwest Service Area in which

	water and sewer will be provided by Seminole County utilities. Capacity availability for the proposed improvements will be determined at concurrency. Other county services, including emergency services and garbage disposal, are also available to the site.
STAFF FINDINGS	Staff believes the proposed use would be compatible with the trend of development in the area for the following reasons: • The property is located on Orange Blvd, a collector roadway. • Day care centers serve adjacent residential areas. • Other similar uses have been established along Orange Blvd. • Impacts will be minimized by establishing landscape and fence buffers and limiting the numbers of students and hours of operation. • Based on the submitted site plan, the proposed use would conform to the minimum dimensional standards of the A-1 district.
STAFF RECOMMENDATION	Staff recommends approval of the subject request. If the Board should decide to grant a special exception, staff recommends the following conditions of approval: 1. The general layout of the proposed uses as depicted on the attached master plan shall not change. 2. No building shall increase more than 10% without Board of Adjustment approval. 3. The hours of operation shall be Monday through Friday, 6:30 am to 6:30 pm. 4. Maximum number of students shall be limited to 184. 5. A 6-foot stockade fence is required along the north and west property lines except at the point where the active buffer components are required adjacent to Lot 3 and Lot 4. 6. Landscaping consisting of one canopy tree every 40 feet with three (3) understory trees between shall be installed starting at the east end of lot 3 of Barrington Club and going eastward to Orange Blvd. 7. In order to meet the consistency requirements Seminole County Comprehensive Plan Policy FLU 12.3 for the Wekiva River Protection Area (WRPA) the following are required: a) The project shall be certified by the U.S. Green Building Council (USGBC). The project must meet the minimum requirements for the Certified level of LEED for New Construction or LEED for Schools. The

	following credits shall be met regardless of certification level: 1. SS Credit 4.4: Alternative Transportation: parking Capacity (NC) 2. SS Credit 5.1: Site Development: Protect of Restore Habitat **Applicant shall make a substantial attempt to meet this credit and submit for credit approval to USGBC; if USGBC denies credit for SS Credit 5.1 then this requirement will not apply.* 3. SS Credit 5.2: Site Development: Maximize Open Space 4. SS Credit 6.1: Stormwater Design: Quantity Control 5. SS Credit 6.2: Stormwater Design: Quality Control 6. SS Credit 7.1: Heat Island Effect: Non-Roof 7. SS Credit 8: Light Pollution Reduction 8. WE Credit 1: Water Efficient Landscaping: Reduce by 50% 9. WE Credit 2: innovative Wastewater Technologies The credits listed above are based upon LEED New Construction v3. In the event that a newer version of LEED NC is established the credits most resembling the above mentioned credits shall be adhered to. The Seminole County Planning Manager shall make the determination if the new credit language is consistent with LEED NC v3. 8. Prior to the issuance of development permits, a site plan that meets the requirements of other applicable code requirements including Chapter 40 of the Land Development Code shall be reviewed and approved by the Development Review Committee.

INTERPLAN LLC

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ORLANDO, FL 32810
PH 407.645.5008
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May 8, 2009

Seminole County Development Review Division
Attn: Denny Gibbs
1101 East Fifth Street
Sanford, FL 32771

Reference: **Board of Adjustments Playground Options**
IP # 2008.0110
Proposed Primrose School at Sanford

Dear Ms. Gibbs:

Per the Board of Adjustment meeting on April 27th, 2009, three playground options have been designed in an effort to alleviate the Board of Adjustment's concerns about the playground near the northern property boundary. We would like to first note that the hours of operation for the daycare will be limited to 6:30 am – 6:30 pm Monday thru Friday. No noise or activity will be coming from the daycare in the evenings or weekends when residents are most likely to be home. For more information on the playground usage, please refer to the attached email from Sabrina Boesch, a Primrose Schools Franchise Owner. Also, all three options exceed the code required buffer of 15 feet. At other locations such as the existing Primrose School at Hunter's Creek there is no buffer separating the playground from the adjacent residential properties and there have been no noise complaints from these residents. This is because playgrounds typically do not have a noise impact on abutting properties. Please refer to the attached aerial exhibits showing this property. Per the attached, *"Development of Noise Assessment Method for School Playground Noise"* by Wexiong Wu of AKRF Inc., the maximum playground boundary noise levels for an early childhood school is 71.5 dBA. This is approximately equivalent to the noise level of driving 30 mph in a car with the windows up (typically 68-73 dBA). Taking into account a 25 foot buffer (5.8 dBA reduction) and a 6 foot high stockade fence (15 dBA reduction) further reduces the noise level to 50.7 dBA. This noise level is slightly higher than that of a typical neighborhood (40-50 dBA). The difference is barely perceptible to the human ear. A 128' masonry wall is proposed from the northwest property corner east along the residentially zoned properties. To preserve a large tree patch including a 52" oak tree, a 6' blockade fence will connect the end of the masonry wall to northeast property corner. Please reference the attached Development of Noise Assessment Method for School Playground Noise, the All Tech Insulation Noise Levels, and the FHWA Physical Techniques to Reduce Noise Impacts for more information. Please see below for a breakdown of all three site plan options:

Option A proposes a 25 foot buffer between the northern property line and the proposed playground as discussed during our recent public hearing. The playground equipment has also been rotated and re-arranged in order to limit the equipments proximity to the northern property boundary. In addition, Option A is the most operationally efficient layout for Primrose due to the location of the playground with respect to the hall doorway (located 40' east of the northwest corner of the building). With this option, all classrooms will be able to enter and exit the playground directly from the hall doorway. The other two layouts could potentially create confusion and possible safety concerns by requiring teachers to transport students to the playground through a non-direct route. Please refer to Exhibit A.

Option B proposes to relocate the northern playground behind the rear of the building. The proposed dry retention pond has been modified to create a buffer between the north residential properties and the playground. This proposed option will provide an 83.5 foot buffer with the residential zoned properties to the north and a 94.6 foot buffer with the agricultural zoned residential properties to the west. This option will provide the best buffer for all residential properties. The drawback to Option B is the hall doorway does not lead directly to the relocated playground and therefore has average operational efficiency. Please refer to Exhibit B.

Option C proposes to relocate the northern playground to the southwest corner of the property. A 5 foot sidewalk will connect the playground to the proposed building. This option would include a 15 foot buffer between the western residential property line and the proposed playground. This proposed option will have the same impact on the west residential property as the original design had on the north residential properties since the buffers separating the property line from the playground are 15 feet for both scenarios. As the case for Option B, the hall doorway does not lead directly to the relocated playground. When you take into account the large distance from the playground to the building, Option C has the least operational efficiency. Please refer to Exhibit C.

In conclusion, Option A and B provide sufficient buffers from all residential properties. Option C provides a substantial buffer from the northern properties, however this layout only allows for a 15 foot buffer on the west residential property line. For the day to day operations of a Primrose School, Option A provides the best operational location of the playground due to the location of the hall doorway. Please see the table below summarizing the three options:

Option	North Buffer	West Buffer	Operational Efficiency
A	25.0'	124.6'	Best
B	83.5'	94.6'	Average
C	177.1'	15.0'	Poor

If you have any questions or concerns, please call me at (407) 645-5008.

Respectfully,
INTERPLAN, LLC

Bob Ziegenfuss, PE
Director of Civil Engineering

cc: File

From: Chris Boesch [mailto:broker32817@yahoo.com]
Sent: Friday, May 08, 2009 10:20 AM
To: Mike Thedieck
Cc: MMcCabe@PrimroseSchools.com
Subject: Re: Primrose School - Sanford

Mike,

This is response to item #2, addressing the concerns of noise associated with those playgrounds closest to the northern site line.

Although the school has a capacity of 184 there is never that many children outside at one time. There are two outside play times each day: once in the morning and once in the afternoon. The morning session starts at 9:30 and for the playgrounds in question runs about 2 hours. The afternoon session starts at 3:30 and also runs about 2 hours. An important point to remember is that the classes are rotated within that 2 hour time block. Each class is only outside for about 30 minutes each session. This means there is never more than 24 children outside on those northern playgrounds at any one time.

Sabrina Boesch
Primrose Schools Franchise Owner

LEED (Leadership in Energy and Environmental Design)

The USGBC (US Green Building Council) created LEED (Leadership in Energy and Environmental Design) Version 1.0 in 1998 as a national and holistic green building rating system; LEED has evolved over the past 11 years to become the premier international green building rating system. The LEED rating systems are voluntary, consensus-based, and market-driven. The LEED rating system is under constant revision to adapt and proactively encourage innovative green design and practices. LEED supports proven programs and strategies for increasing and measuring the performance of buildings and communities.

LEED is a credit-based certifying program that assigns points based upon the completion of particular credits. The credits are broken up into the following categories for New Construction:

- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy and Atmosphere (EA)
- Materials and Resources (MR)
- Indoor Environmental Quality (IEQ)
- Innovation in Design (ID)
- Regional Priority (RP)

Most credit categories have required prerequisites, such as an overall improvement of base energy consumption before any credits issued. The LEED New Construction certifications are awarded according to the following scale:

- Certified: 40-49 points
- Silver 50-59 points
- Gold 60-79 points
- Platinum 80 points and above
- Total possible points are 85

The LEED credits are based upon the potential environmental impacts and human benefits of each credit. The various credit categories seek to create and maintain a healthy and eco-friendly environment for the building inhabitants, environment, and wildlife. LEED credits have the common theme of Reduce, Reuse, and Recycle throughout to create positive impacts on communities, such as reduced carbon emissions, water consumption, or stormwater runoff.

LEED has the following certified projects in the Orlando area:

- Townpark 400; Silver; Lake Mary
- Four City of Orlando Fire Stations; Certified; Orlando
- Umatilla Health Clinic; Silver; Umatilla
- Wyndham Vacation Ownership; Silver; Orlando
- Orlando Utilities Commission (in progress)
- Daytona Beach Kennel Club; Daytona Beach
- The Conservatory; Celebration

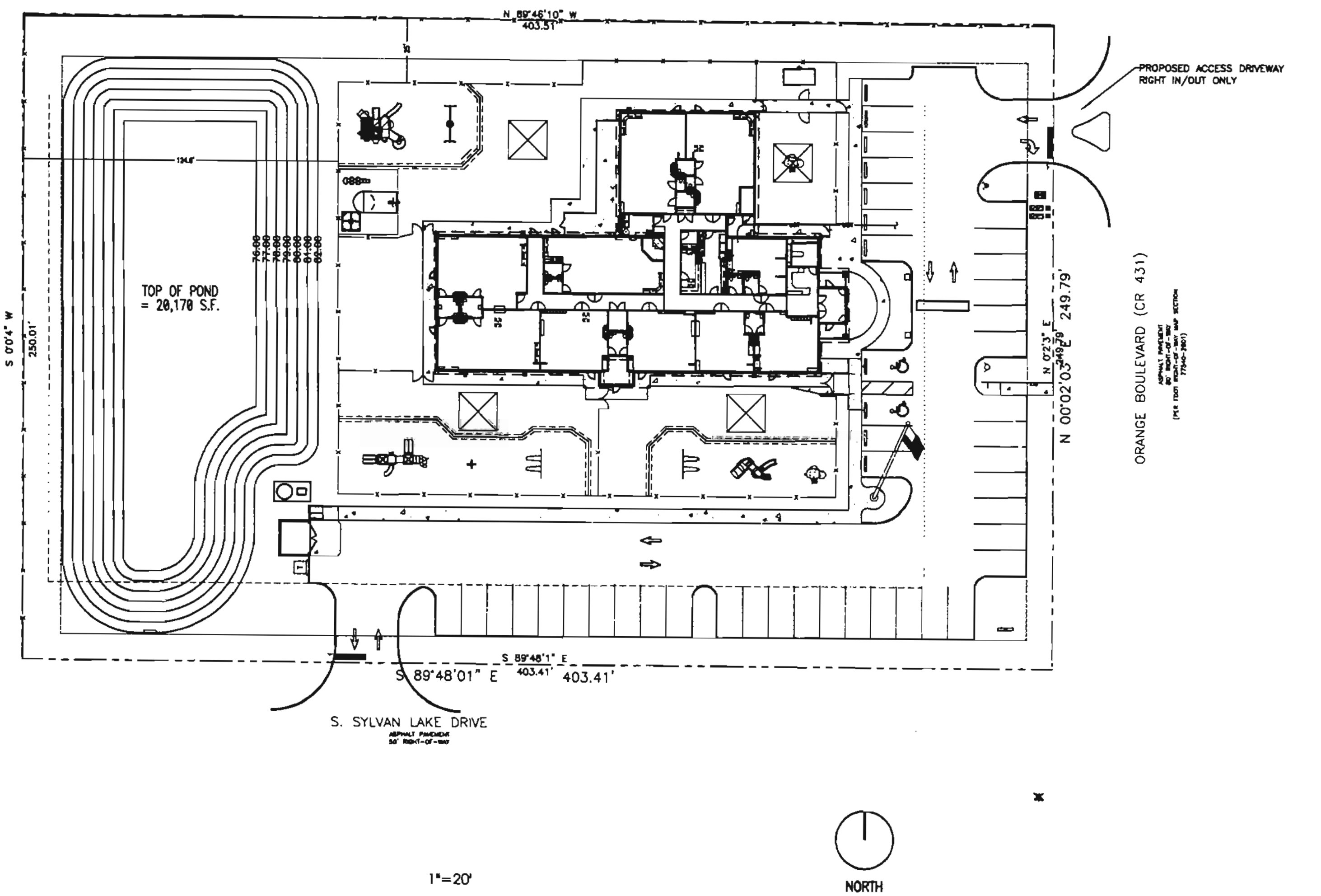
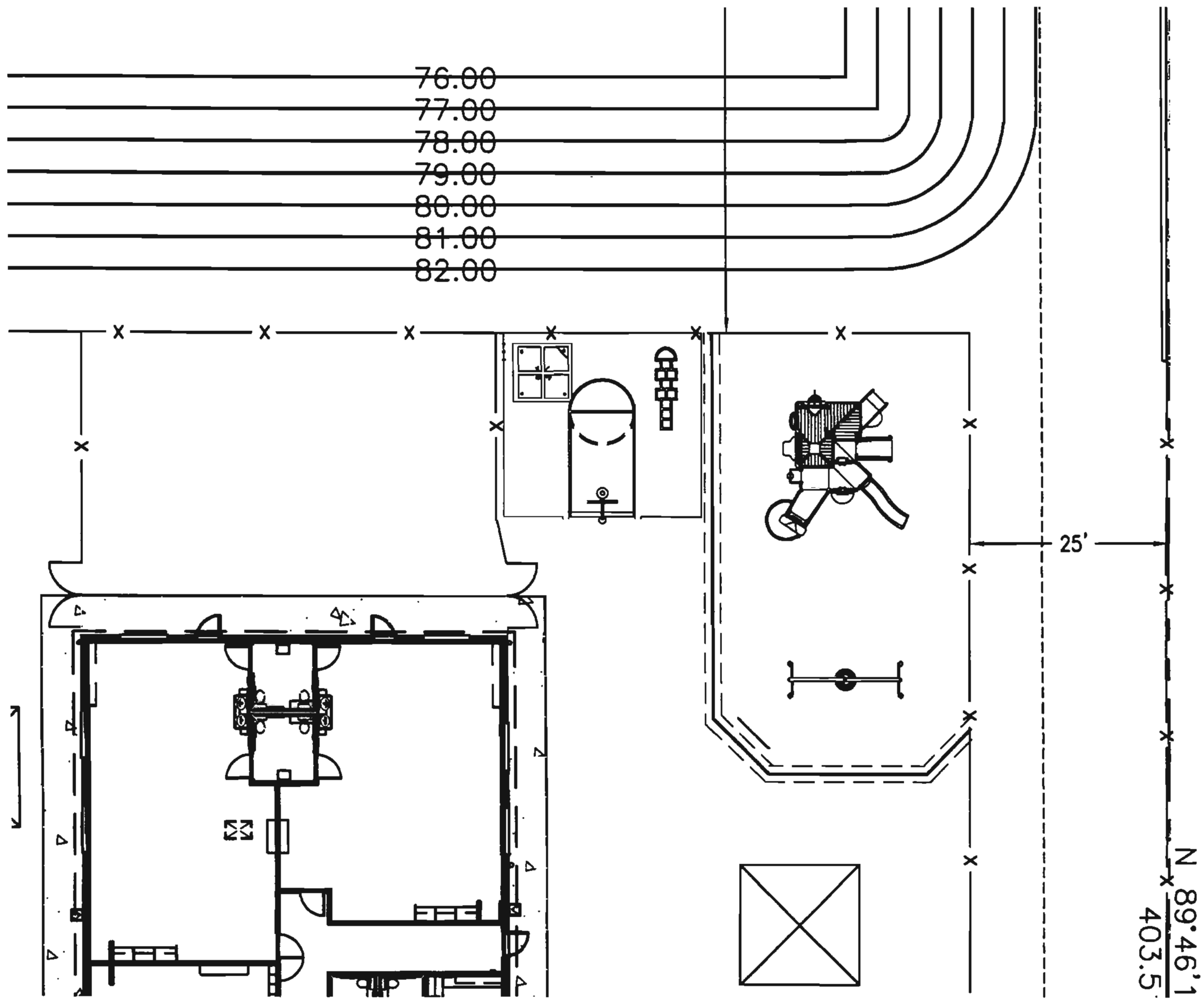


EXHIBIT A

1"=20'



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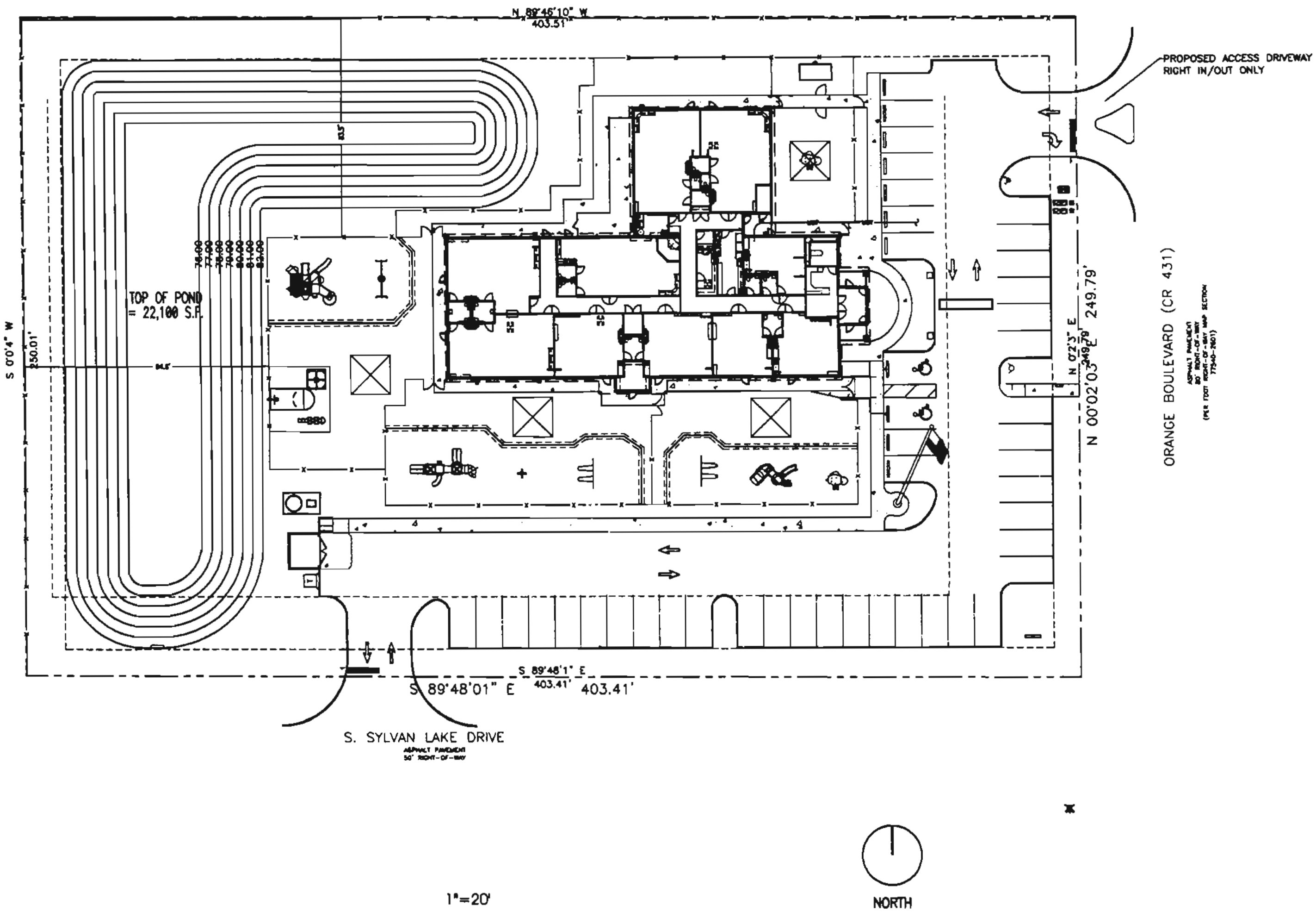
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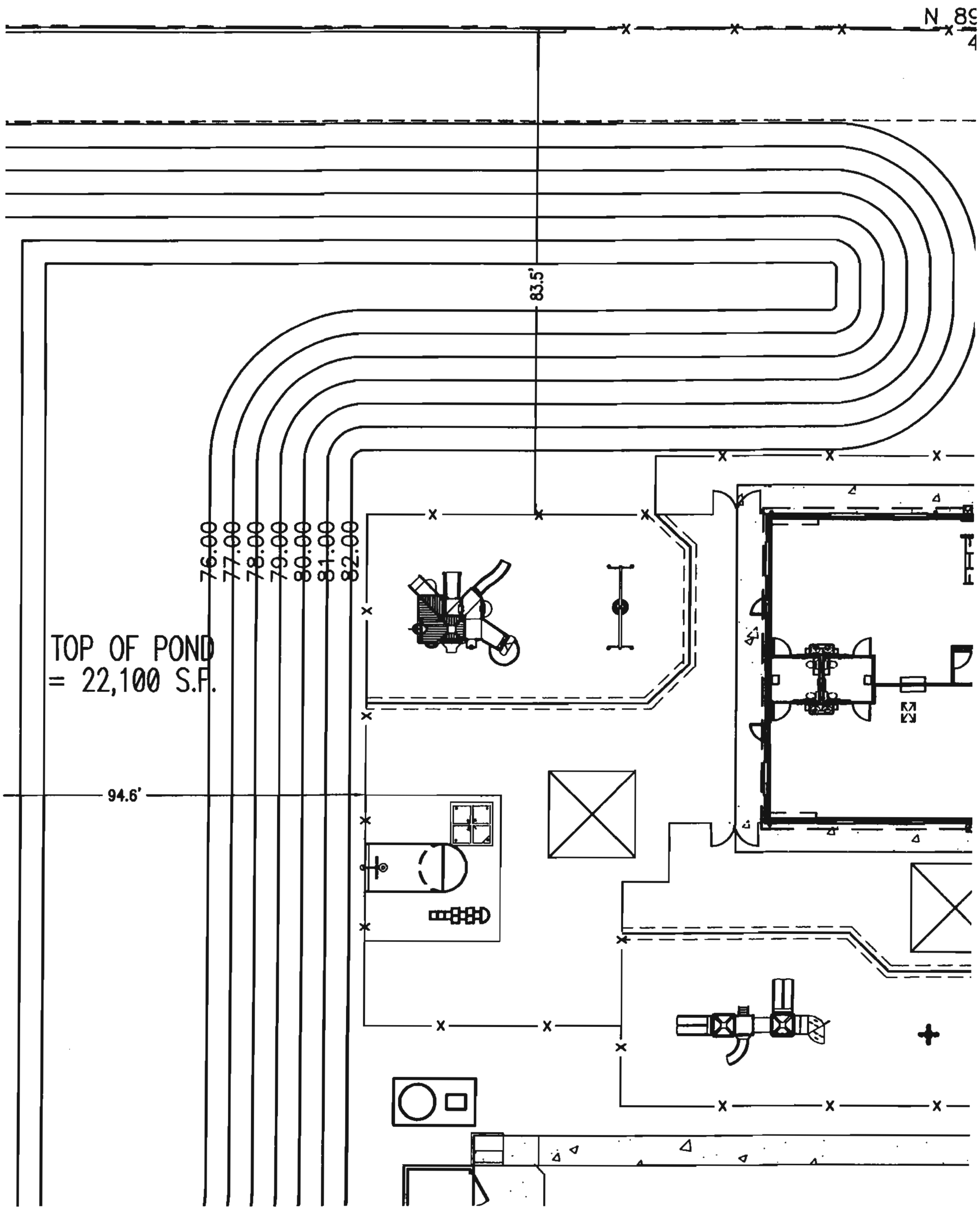
249.79'
N 00°02'03" E 249.79'
S 89°48'1" E
403.41'
S 89°48'01" E 403.41'
S. SYLVAN LAKE DRIVE
1"=20'
NORTH

EXHIBIT B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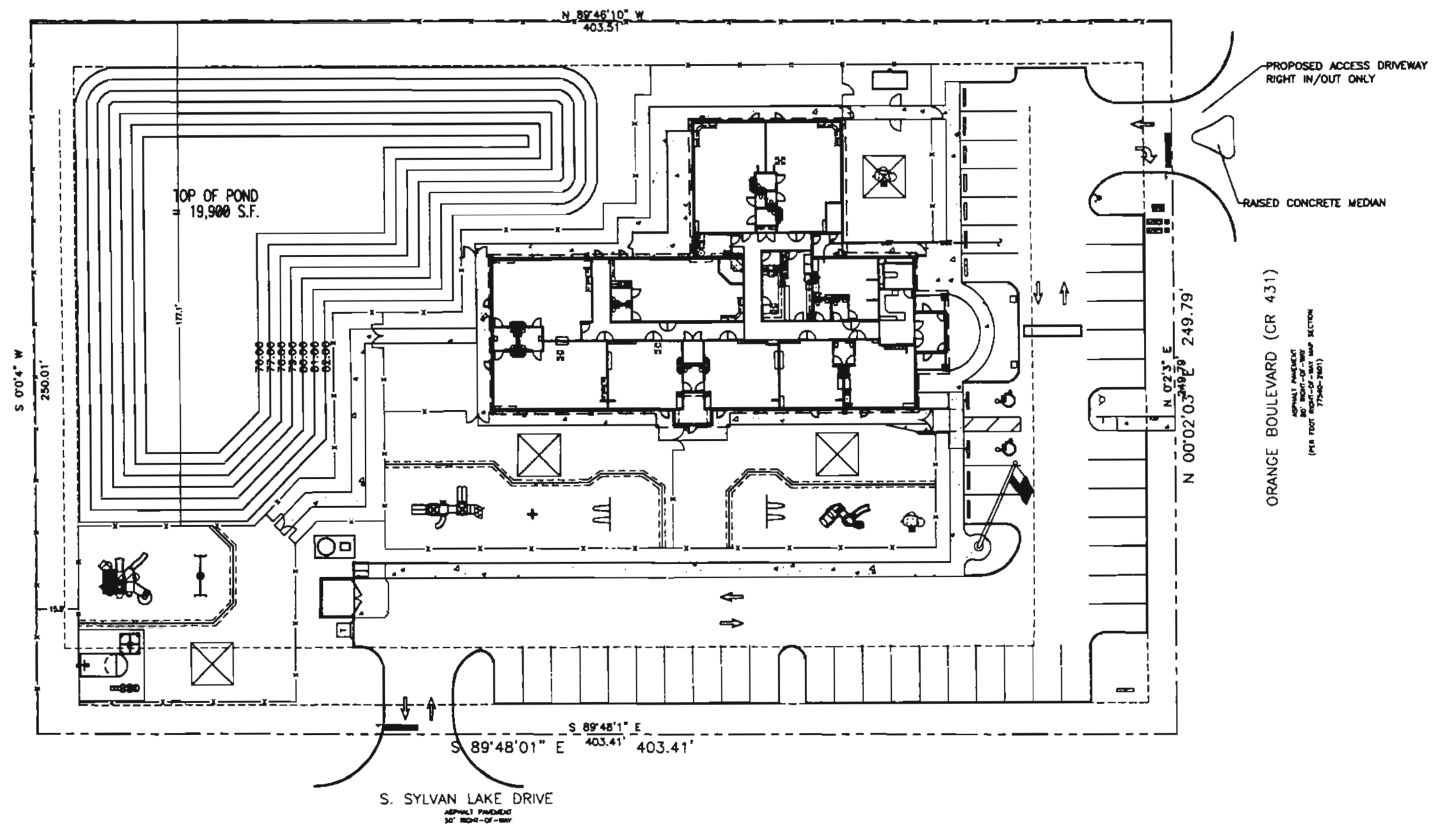
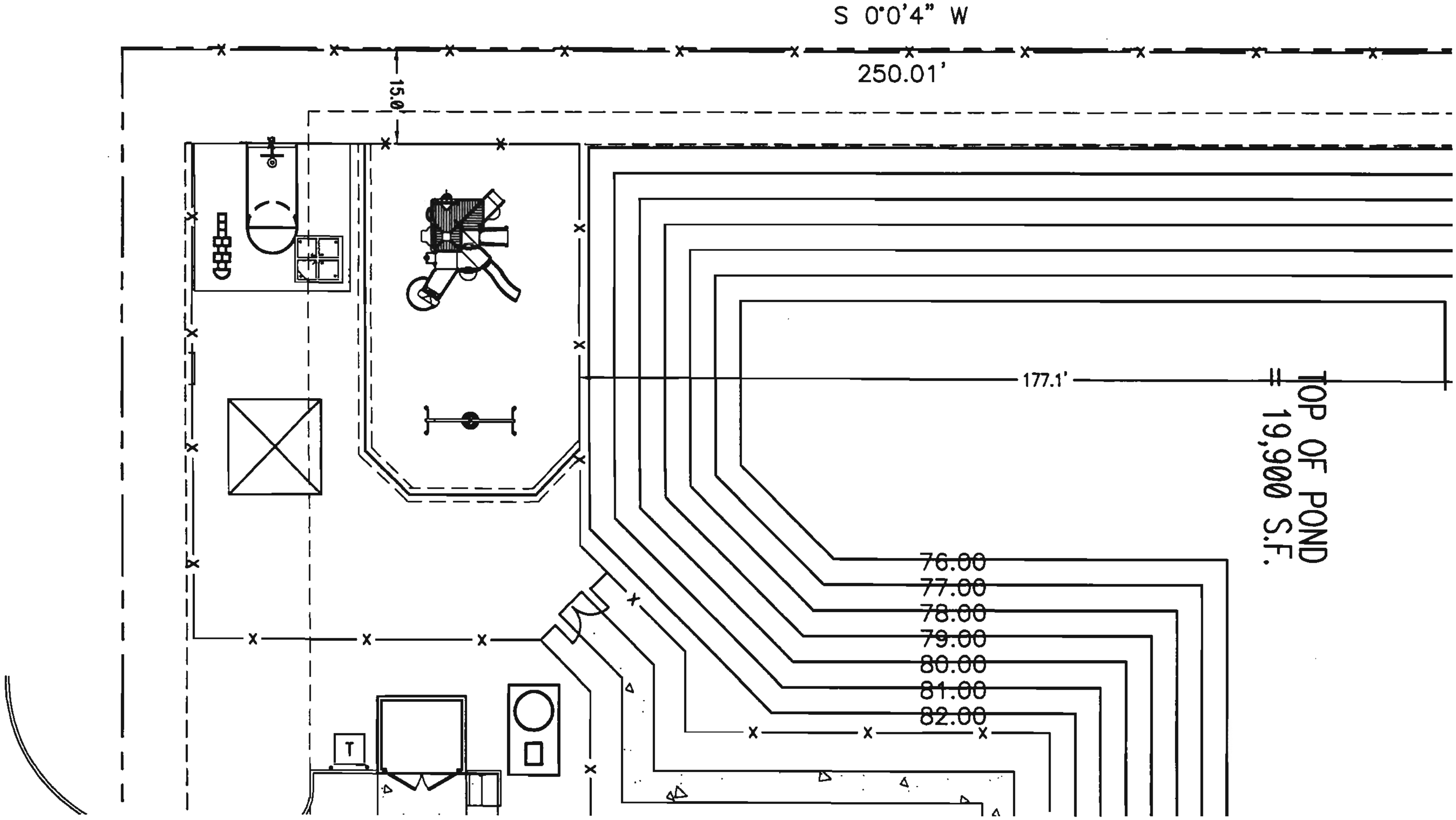


EXHIBIT C

1"=20'

NORTH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PRIMROSE SCHOOL AT HUNTERS CREEK

NORTH

1" = 1000'

INTERPLAN LLC
ARCHITECTURE / ENGINEERING
INTERIOR DESIGN
PROJECT MANAGEMENT

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AA C03420 CA 8660

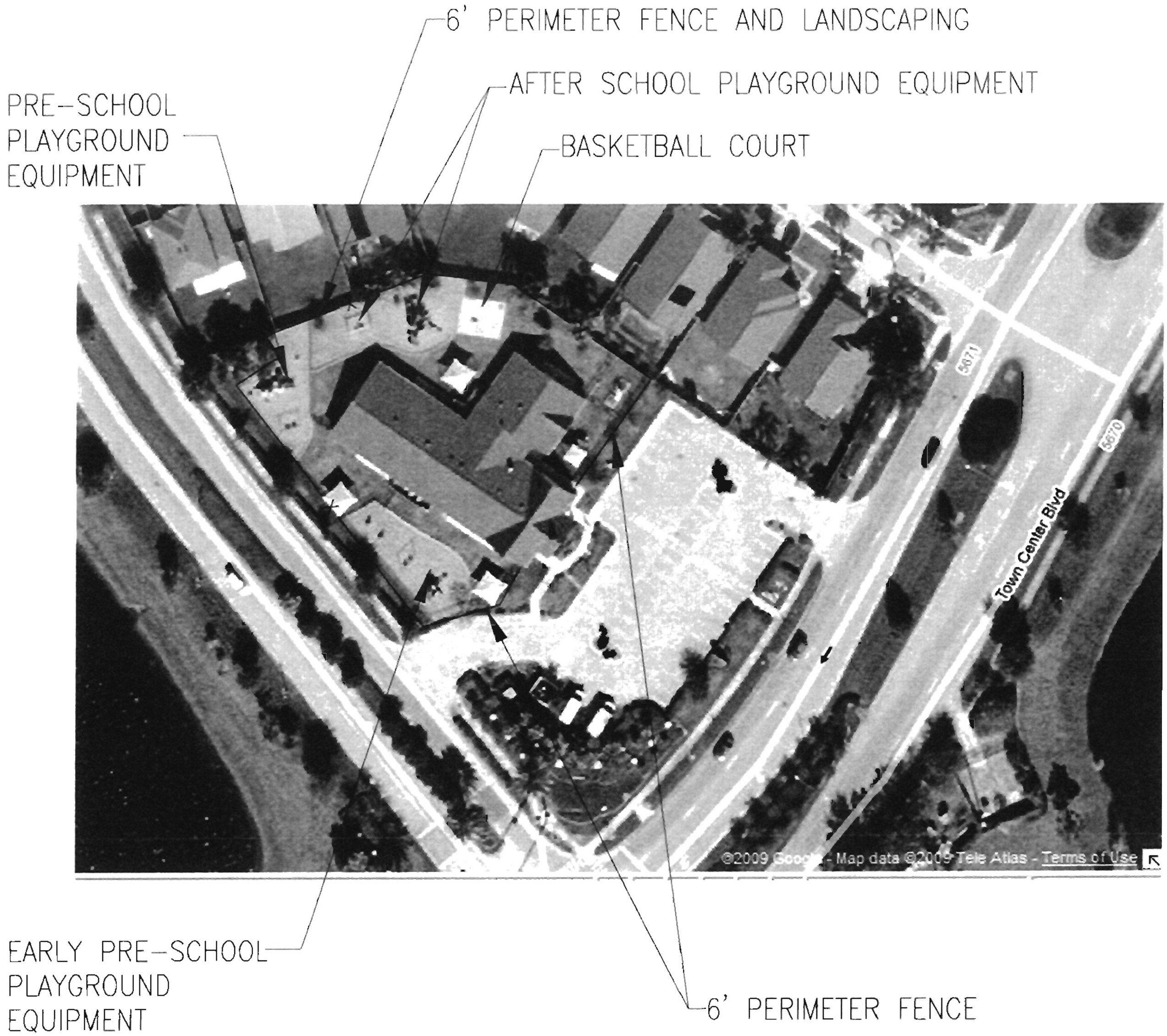
PRIMROSE SCHOOL

HUNTER'S CREEK AERIAL
ORLANDO, FLORIDA

PROJECT NO: 2008.0110
DATE: 5-07-09

EX2

CHECKED:



NORTH

1" = 100'

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AA 003420 CA 8660

PRIMROSE SCHOOL

HUNTER'S CREEK AERIAL
ORLANDO, FLORIDA

PROJECT NO: 2008.0110
DATE: 5-07-09

EX1

CHECKED:

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Noise Levels

Take a look at the noise levels of many common appliances and events around the house. You might be surprised. All sounds are measured at the distance that a person would typically be from the source.

Contact an All Tech Insulation engineer today **(432-897-1533)** for a deeper discussion about your specific acoustic requirements.

Device dBA

Grand Canyon at Night (no roads, birds, wind) 10
A soft whisper in someone's ear 15
Quiet basement w/o mechanical equipment/Rustling leaves 20
A Quiet Library 30
Quiet Room 28-33
Computer 37-45
Refrigerator 40-43
Typical Living Room 40
Forced Hot Air Heating System 42-52
Radio Playing in Background 45-50
Background Music 50
Typical Neighborhood 40-50
Bathroom Exhaust Fan 54-55
Microwave 55-59
Normal conversation (3-5 feet), sewing machine, typewriter 55-65
Clothes Dryer 56-58
Printer 58-65
Window Fan on High 60-66
Alarm Clock 60-80
Dishwasher 63-66
Clothes Washer 65-70
Phone 66-75
Inside Car, Windows Closed, 30 MPH 68-73
Inside Car, Windows Open, 30 MPH 72-76
Handheld Electronic Games 68-76
Kitchen Exhaust Fan, High 69-71
Garbage Disposal 76-83
Air Popcorn Popper 78-85
Hairdryer 80-95
Electric Can Opener 81-83
Vacuum Cleaner 84-89
Coffee Grinder 84-95
Handheld Electric Mixer 86-91
Lawn Mower 88-94
Lawnmower, power drill, shop tools, **8 hours** per day is the **maximum exposure** (protects 90% of people) **90***
Air Compressor 90-93
1/4" Drill 92-95
Food Processor 93-100
Weed Whacker 94-96
Outboard motor, farm tractor, garbage truck, snowmobile; **2 hours** per day is the maximum exposure without protection **100***
Leaf Blower 95-105
Circular Saw 100-104
Maximum Output of Stereo 100-110
Jackhammer, chainsaw, pneumatic drill, loud rock concert; **15 minutes** per day is the maximum exposure without protection **110***
Pain begins 125
Threshold of pain. Noise level during a stock car race 130

Our Company
MediaCenter
Containment Systems
Sealants & Coatings
Thermal
Acoustic
Welcome
Applications
FAQs-Architectural
FAQs-Basic
Acoustic Properties
Decibal (dB) Demo

Decibel (dB) Levels
Insulation * Absorption
Sound Proofing Myths
News
PDF Brochures
Peace-of-Mind

Gun muzzle blast, jet engine; Even **brief exposure injures unprotected ears.** Maximum allowed noise with hearing protector **140***
Death of hearing tissue 180
Loudest sound possible to measure 194

The next time you operate a leaf blower, weed whacker, snowmobile, or any device emitting more than 90 dB, please use proper ear protection.

If you are not sure how many decibels a device is producing. Go to your local Radio Shack and purchase a decibel meter (about 40 dollars). You might be surprised how loud (unsafe) the world is becoming. We were.

Contact an All Tech Insulation engineer today **(432-897-1533)** for a deeper discussion about your specific acoustic requirements.

- The above information was obtained through OSHA.

* Note: exceeding the time limit at decibel level will produce hearing loss. Once hearing loose or damage occurs it almost never returns.

Live Help: Available

INTER-NOISE 2006
3-6 DECEMBER 2006
HONOLULU, HAWAII, USA

Development of Noise Assessment Method for School Playground Noise

Weixiong Wu[a]
AKRF Inc.
440 Park Avenue South
New York, NY 10016
USA

ABSTRACT

AKRF has developed an assessment method for school playground noise. In general, noise from school playground activities may result in significant noise impacts to adjacent residential buildings and other sensitive receptors. Determining noise emission levels from playgrounds and using an appropriate noise criterion to perform environmental impact analyses are difficult because of the unique sound characteristics of playground activities, the lack of published literature on monitoring and assessing them, and the absence of applicable noise regulations. To provide accurate noise emission levels for school playground activities, noise measurements were performed at typical New York City public schools. In addition, a noise study was conducted to determine an appropriate noise impact criterion to apply to the environmental assessment of New York City School Construction Authority (SCA) projects. This paper presents the results, including measured playground noise levels, a proposed noise criterion, and the procedure for noise assessment produced by this developing method. The results demonstrate that this method can be used for SCA projects in environmental impact determinations.

1 INTRODUCTION

Noise from school playground activities can result in serious community complaints in high-density residential areas in New York City. With the lack of published literature on monitoring playground noise and the absence of applicable noise regulations, a critical issue is determining what noise emission levels and noise criterion should be used for noise assessment. Previously, the playground noise levels used in environmental noise assessments were 75 dBA $L_{eq(1)}$ at the playground boundary, 73 dBA $L_{eq(1)}$ 15 feet away from the playground boundary, 70 dBA $L_{eq(1)}$ 30 feet away from the playground boundary, with a 4.5 dBA drop-off rate per doubling of distance for locations farther than 30 feet away. However, these emission levels might only represent noise levels for general playground activities, not for specific school types. In addition, the previous noise criteria, i.e., noise standards contained in the *New York City Environmental Quality Review (CEQR) Technical Manual*[1] were considered to be quite stringent compared to the noise criteria and standards used by Federal and State agencies. Consequently, AKRF conducted a noise study to evaluate the unique sound characteristics of playground activities and develop an applicable noise criterion. The study included noise monitoring at eight New York City public schools (i.e., early childhood, elementary, intermediate, and high school) for noise emissions from playground activities, and a determination of an appropriate noise criterion based on examination of noise impact criteria applied by other government agencies.

The following paper is divided into four sections. The first section presents the procedure and the results of measured playground noise levels. The second section presents an examination of a

[a] weixiong_wu@akrf.com

proposed noise criterion. The third section demonstrates the developing noise assessment method and assessment results. The final section presents a summary.

2 SCHOOL PLAYFROUND NOISE EMMISSION LEVELS

2.1 Noise Monitoring

Between October 1 and 14, 1992, eight New York City public schools consisting of early childhood (P.S. 52R), elementary (P.S. 299, P.S. 52R, P.S. 57, and P.S. 69), intermediate (I.S. 7, I.S. 72, and I.S. 75), and high school (Tottenville High School) were monitored for noise emissions from playground activities.[2]

2.2 Equipment Used during Noise Monitoring

Three sound level meters were used for the measurements. Two of the instruments were Larson Davis Labs Model 700 meters and the third was a Bruel & Kjaer Type 4427 noise level analyzer. All of these instruments meet ANSI Standard S1.4-1983 tolerances for Type 1 specification. The instruments were mounted on tripods at heights of 5 feet above the ground. The instruments were calibrated before and after each measurement session. Windscreens were used for all measurements. The weather conditions were clear to partly cloudy with winds under 10 miles per hour and temperatures in the 45 to 55 degree Fahrenheit range. All monitoring methods conformed to industry-accepted practices for measuring sound pressure levels.

2.3 Measured Noise Results

Table 1 shows the maximum hourly noise levels at the playground boundary for each type of school. There does not seem to be a clear relationship between noise levels measured and the number of students in the playground or the total number of students at any given school. The average difference between L_{eq} and L_{10} measured values was 2.8 dBA. In calculating this average, all measured differences less than 1.5 dBA were not used because they were associated with readings where extraneous peak levels from such sources as sirens, trucks, buses, and children yelling into the microphones contaminated the measurements.

Table 1: Maximum Hourly Playground Boundary Noise Levels for Environmental Assessments

Early Childhood Schools (Grades K-2)		Elementary Schools (Grades 1-5)		Intermediate Schools (Grades 6-8)		High Schools (Grades 9-12)	
Time	$L_{eq(1)}$ (dBA)	Time	$L_{eq(1)}$ (dBA)	Time	$L_{eq(1)}$ (dBA)	Time	$L_{eq(1)}$ (dBA)
7-8 AM	63.8	7-8 AM	63.8	7-8 AM	64.9	7-8 AM	68.2
8-9 AM	69.3	8-9 AM	69.3	8-9 AM	64.9	8-9 AM	68.2
9-0 AM	62.9	9-0 AM	62.9	9-0 AM	64.3	9-0 AM	64.3
10-11 AM	69.3	10-11 AM	69.3	10-11 AM	68.9	10-11 AM	67.6
11-12 PM	71.5	11-12 PM	71.4	11-12 PM	71.0	11-12 PM	67.6
12-1 PM	71.5	12-1 PM	71.4	12-1 PM	71.0	12-1 PM	67.6
1-2 PM	62.9	1-2 PM	62.9	1-2 PM	68.9	1-2 PM	64.3
2-3 PM	62.9	2-3 PM	62.9	2-3 PM	64.3	2-3 PM	64.3

Based on the measured results, the maximum values, shown in Table 2, were recommended to be used as a preliminary estimate of the noise levels generated by students in a New York City school playground. Applying these levels to all operating hours for a new school would result in a conservative analysis to provide worst-case values.

Table 2: Boundary Noise Levels
for Preliminary Environmental Assessments

School Type	$L_{eq(1)}$ (dBA)
Early Childhood Center	71.5
Elementary School	71.4
Intermediate School	71.0
High School	68.2

If a project could potentially cause significant impacts, a detailed analysis may be required. For this type of analysis, noise levels for playground-related noise should be added on an hour-by-hour basis, as shown in Table 1, by school type.

Based on measured values for distance attenuation, it can be summarized that hourly noise levels can be expected to decrease by the following values at the specified distances from the playground boundary: 4.8 dBA at 20 feet, 6.8 dBA at 30 feet, and 9.1 dBA at 40 feet. A 4.5 dBA drop-off per doubling of distance from the playground boundary for all distances between 40 and 300 feet appears to be appropriate for analytical purposes. Atmospheric absorption, terrain, and meteorological conditions would affect noise levels more than 300 feet away from the playground, and should be considered on a case-by-case basis. However, for most areas of New York City, background noise levels and building densities are high enough to make most playgrounds inaudible beyond distances of 300 feet. Figure 1 shows typical noise level attenuation versus distance from the playground boundary with a maximum distance of 300 feet. At any distance greater than 40 feet, the playground noise level $L_{eq(1)}$ can be predicted by using the following formula:

$$L_{p1} = L_{p2} - 15 * \log(d/10) - A_e$$

where:

L_{p1} is the predicted playground equivalent noise level at a specific distance;

L_{p2} is the maximum hourly equivalent noise level at the playground boundary for each type of school;

d is the distance from the source to the receiver in feet; and

A_e is excess attenuation caused by environmental and terrain features (>300 feet).

3 SCA NOISE CRITERION

A study was conducted to examine noise criteria applied by other government agencies for the purpose of determining an appropriate noise impact criterion to apply to the environmental assessment of school projects. Various state and federal agencies were identified that have adopted noise impact criteria for evaluation of their projects. In general, these criteria include desired absolute noise levels, which are based on land use categories, and relative criteria, which are based on changes in noise levels due to a project. This study focused primarily on relative criteria, concluding with the recommendation of an appropriate relative criterion for SCA to use in its environmental impact determinations.

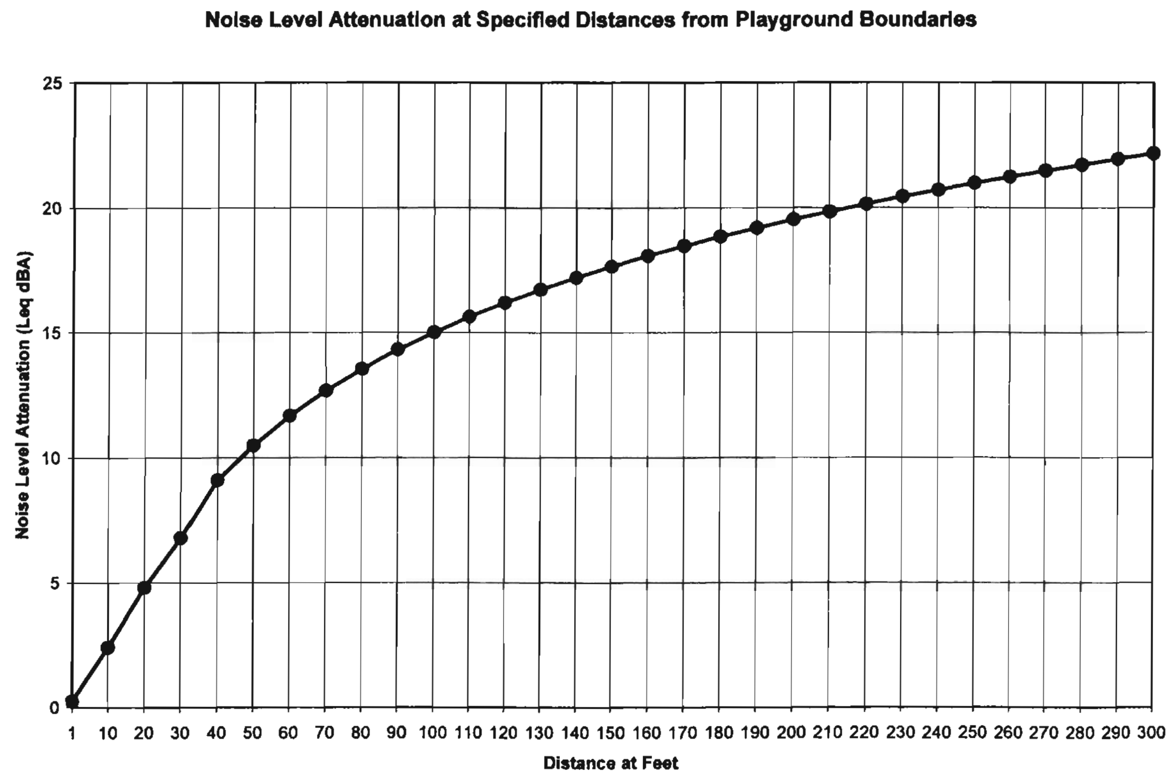


Figure 1. Playground Noise Attenuation Versus Distance

3.1 Human Perception and Community Response to Changes in Noise Levels

The average ability of an individual to perceive changes in noise levels is well documented[3] (see Table 3). Generally, changes in noise levels less than 3 dBA are barely perceptible, changes of 5 dBA are readily noticeable, and changes of 10 dBA are perceived as doubling in loudness. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Table 3: Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Noise affects people in terms of individual reactions to specific effects, such as interference with speech, sleep, and other activities. It is also possible to characterize the effects of noise on people by studying the aggregate response of people in communities. The rating method used for this purpose is based on a statistical analysis of the fluctuations in noise levels in a community, and integrating the fluctuating sound energy over a known period of time, most typically during

1 or 24 hours. Various government and research institutions have proposed criteria that attempt to relate changes in noise levels to community response. One commonly applied criterion for estimating response is incorporated into the community response scale proposed by the International Standards Organization (ISO) of the United Nations[4] (see Table 4). This scale relates changes in noise level to the degree of community response and permits direct estimation of the probable response of a community to a predicted change in noise level.

Table 4: Community Response to Increases in Noise Levels

Change (dBA)	Category	Description
0	None	No observed reaction
5	Little	Sporadic complaints
10	Medium	Widespread complaints
15	Strong	Threats of community action
20	Very strong	Vigorous community action

3.2 Federal and States Noise Impact Regulations and Guidelines

In general, project-generated increases in noise levels over existing noise levels of 6 dBA ($L_{eq(1)}$ or $L_{10(1)}$) or greater are considered significant impacts by Federal and States agencies. The New York State Department of Transportation uses an approximately 6 dBA $L_{eq(1)}$ change, Pennsylvania Department of Transportation uses an approximately 10 to 15 dBA $L_{eq(1)}$ change, New Jersey Department of Transportation uses an approximately 10 dBA $L_{eq(1)}$ change, California Department of Transportation uses an approximately 12 dBA $L_{eq(1)}$ change, and Connecticut Department of Transportation uses an approximately 15 dBA $L_{10(1)}$ change.[5]

3.3 CEQR Noise Standards

The *CEQR Technical Manual* uses the following criteria to determine whether a proposed project would result in a significant adverse noise impact. The impact assessments compare the proposed project's Build condition $L_{eq(1)}$ noise levels to those calculated for the No Build condition, for receptors potentially affected by the project.

If the No Build levels are less than 60 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period, the threshold for a significant impact would be an increase of at least 5 dBA $L_{eq(1)}$. For the 5 dBA threshold to be valid, the resultant Build condition noise level would have to be equal to or less than 65 dBA. If the No Build noise level is equal to or greater than 62 dBA $L_{eq(1)}$, or if the analysis period is a nighttime period (defined in the *CEQR Technical Manual* as being between 10 PM and 7 AM), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$. (If the No Build noise level is 61 dBA $L_{eq(1)}$, the maximum incremental increase would be 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold.)

3.4 A Proposed Noise Impact Criterion

SCA used the impact criteria set forth in the *CEQR Technical Manual* for the environmental review of its projects before the study. These are the most stringent noise impact criteria in the country. A change of 3 dBA represents a barely perceptible change in noise levels, which in terms of community response is not likely to result in a significant reaction. With the exception of New York City, the most stringent state and federal agencies' standards considered $L_{eq(1)}$ or $L_{10(1)}$ increases over existing noise levels of 6.0 dBA or greater, as significant impacts.

As noted above, while some agencies apply their impact criteria to a comparison with existing conditions, for SCA projects, as with other New York City environmental reviews, the comparison is with a No Build condition. This comparison (i.e., Build and No Build values) is appropriate because it avoids penalizing a project for non-project-related noise increases that occur between the evaluation of existing conditions and the time the project is scheduled to begin operating. In any case, given the short time frame for construction (one to three years), and the fact that most SCA projects are undertaken in areas where little new construction is occurring prior to the estimated year of completion of school construction, existing and future No Build noise levels are usually approximately equal. Therefore, agency standards, like those employed under CEQR, that compare Build condition noise levels with No Build condition noise levels in many cases yield similar results to standards that compare Build and existing noise levels.

Based on average response characteristics, changes in noise levels less than 3 dBA are barely perceptible to most listeners, and 5 dBA changes are readily noticeable. One commonly applied criterion for estimating community response to increases in noise levels is incorporated into the community response scale proposed by the United Nations, which relates changes in noise level to the degree of community response. Changes of 5.0 dBA or more yield sporadic community complaints.

Based upon the study results, AKRF recommended that SCA revised its relative noise impact criteria to consider project-related increases in $L_{eq(1)}$ noise levels over future conditions without the project of greater than 5.0 dBA as significant impacts. The proposed 5.0 dBA relative criteria is similar to the NYSDOT criteria and is consistent with increases in noise levels considered noticeable to the public and, therefore, likely to result in complaints. This criterion represents a conservative standard which is more stringent than that used by other state and federal agencies and is reasonable in terms of likely community response to increases in noise levels.

4 NOISE ACCESSMENT MOTHODOLOGY AND RESULTS

Using the updated emission noise levels and the revised noise criterion to determine potential noise impacts from playground noise, the noise assessment method includes the following procedure:

- Determine sensitive receptor locations within the adjacent study area where the maximum playground noise levels would be likely to occur;
- Measure the existing ambient noise levels at the selected receptor locations;
- Determine maximum hourly noise levels at the playground boundary due to the type of school based on the values in Table 1;
- Calculate noise levels at sensitive receptor locations; and
- Compare calculated Build noise levels with the SCA noise criterion and No Build noise levels to determine if any noise impacts would result from the proposed project.

For purposes of impact assessment, project-related increases in $L_{eq(1)}$ noise levels over future conditions without the project of greater than 5.0 dBA were considered significant impacts. Table 5 shows the analysis results for the AM peak hour period obtained by using the developing method for SCA school projects.

Table 5: Noise Assessment Results for School Playground Activities

School Name	Type of School	Distance to the Closest Residence (feet)	Measured Existing $L_{eq(1)}$	No Build $L_{eq(1)}$	Playground $L_{eq(1)}$	Total Build $L_{eq(1)}$	Change

Jerome Avenue School	Elementary	3	65.5	65.6	68.6	70.4	4.8
Regis Drive Inter. School	Intermediate	130	60.4	60.4	48.2	60.7	0.3
Corona School	High	65	63.7	63.9	56.2	64.6	0.7
Glen Oaks	Elementary	0	64.8	64.8	69.3	70.6	5.8

The Jerome Avenue Elementary School will be located in Bronx. The sensitive receptor is located 3 feet away from the proposed playground boundary. The increase in the Build noise level due to the playground noise would be 4.8 dBA compared to the No Build noise level. Changes of this magnitude would not exceed the 5 dBA SCA impact criterion, resulting in no significant impacts during the AM period.

The Regis Drive Intermediate School will be located in Staten Island. The sensitive receptor is located 160 feet away from the proposed playground boundary. The increase in the Build noise level due to the playground noise would be 0.3 dBA compared to the No Build noise level. Changes of this magnitude would not exceed the 5 dBA SCA impact criterion, resulting in no significant impacts during the AM period.

The Corona High School will be located in Queens. The sensitive receptor is located 65 feet away from the proposed playground boundary. The increase in the Build noise level due to the playground noise would be 0.7 dBA compared to the No Build noise level. Changes of this magnitude would not exceed the 5 dBA SCA impact criterion, resulting in no significant impacts during the AM period.

The Glen Oaks Elementary School will be located in Queens. The sensitive receptor is immediately adjacent to the proposed playground boundary. The increase in the Build noise level due to the playground noise would be 5.8 dBA compared to the No Build noise level. Changes of this magnitude would exceed the 5 dBA SCA impact criterion, resulting in significant impacts during the AM period.

5 SUMMARY

The developing noise assessment method has been applied to many school projects since SCA has adopted the playground emission noise levels and the proposed noise criterion. The results of this noise study can be summarized as follows:

- In general, the measured playground noise emission levels are accurate for noise from school playground activities.
- The playground noise levels can be expected to decrease by the following values at the specified distances from the playground boundary: 4.8 dBA at 20 feet, 6.8 dBA at 30 feet, and 9.1 dBA at 40 feet. A 4.5 dBA drop-off per doubling of distance from the playground boundary for all distances between 40 and 300 feet appears to be appropriate for analytical purposes.
- Compared to Federal and State noise criteria, the previous noise impact criteria used by SCA were quite stringent.
- The proposed 5.0 dBA relative criterion represents a conservative standard which is reasonable in terms of likely community response to increases in noise levels.
- The noise assessment method was developed by using the updated playground emission noise levels and the proposed noise criterion.

- The assessment results demonstrate that this method can be used for SCA projects in environmental impact determinations.

6 ACKNOWLEDGEMENTS

The author would like to acknowledge contributions to the noise study from the acoustic engineers and publishing support from the marketing specialists at AKRF, and special thanks to Dr. Stephen Rosen, Mr. Stephen Holley, Mr. James Cowan, and Ms. Jennifer DeMerritt.

7 REFERENCES

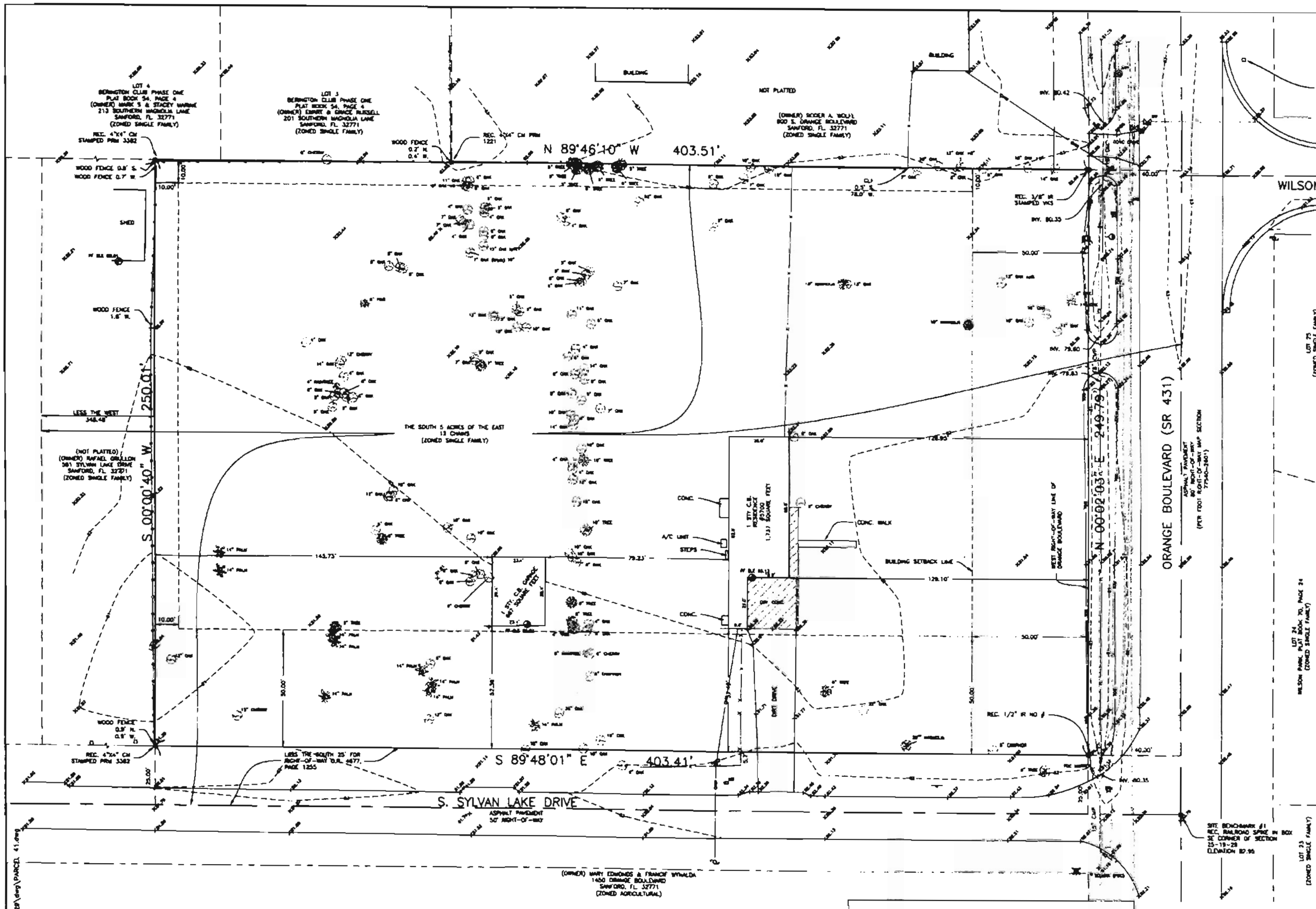
[1] *New York City Environmental Quality Review (CEQR) Technical Manual*, Chapter 3R Noise, New York, 2001. The *CEQR Technical Manual* is the guidance document that assists City agencies, project sponsors, and the public in conducting environmental review of projects in the City.

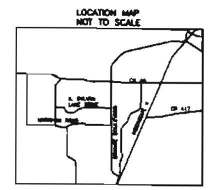
[2] *SCA Playground Noise Study*, Memorandum, AKRF, Inc., October 23, 1992.

[3] *Fundamentals and Abatement of Highway Traffic Noise*, Bolt Beranek and Neuman, Inc., Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.

[4] International Standards Organization, *Noise Assessment with Respect to Community Responses,* ISO/TC 43. (New York: United Nations, November 1969).

[5] *Handbook of Environmental Acoustics,* James P. Cowan, 1994.





DESCRIPTION:

THE SOUTH 5 ACRES OF THE EAST 12 CHAINS OF GOVERNMENT LOT 2, SECTION 25, TOWNSHIP 19 SOUTH, RANGE 29 EAST, SEMINOLE COUNTY, FLORIDA; LESS THE WEST 348.48 FEET THEREOF AND LESS RIGHT-OF-WAY FOR SYLVAN LAKE DRIVE AND ORANGE BOULEVARD.

ALSO LESS THAT PROPERTY CONVEYED TO SEMINOLE COUNTY IN THAT CERTAIN QUIT CLAIM DEED RECORDED IN OFFICIAL RECORDS BOOK 4677, PAGE 1255, DESCRIBED AS THE SOUTH 25 FEET OF THE FOLLOWING DESCRIBED PROPERTY: THE SOUTH 5 ACRES OF THE EAST 12 CHAINS OF GOVERNMENT LOT 2, SECTION 25, TOWNSHIP 19 SOUTH, RANGE 29 EAST, SEMINOLE COUNTY, FLORIDA; LESS THE WEST 348.48 FEET THEREOF.

CONTAINING 100,825 SQUARE FEET OR 2.315 ACRES, MORE OR LESS.

SURVEY REPORT:

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]

UTILITY COMPANIES:

COMMUNICATION/FIBEROPTIC-ATT	1-800-241-3624
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TELEPHONE-ATT	561-582-5036
WATER, SEWER & RECLAIMED WATER-SEMINOLE COUNTY	407-665-2881

BUILDING SETBACKS

2 FRONT SETBACKS 50'
2 SIDE YARD SETBACKS 10'

FIDELITY NATIONAL TITLE INSURANCE COMPANY TITLE COMMITMENT NUMBER M708-1578 EFFECTIVE MAY 15, 2008.

EXCEPTIONS FROM SCHEDULE "B-II"

ITEM #1. NOT A SURVEY MATTER.
ITEM #2. NOT A SURVEY MATTER.
ITEM #3. NOT A SURVEY MATTER.
ITEM #4. SHOWN HEREON.
ITEM #5. NOT A SURVEY MATTER.
ITEM #6. SHOWN HEREON.

LEGEND & ABBREVIATIONS

(symbol)	MAILBOX	CB	CONCRETE BLOCK
(symbol)	UTILITY POLE	CM	CONCRETE MONUMENT
(symbol)	SIGN	CMP	CORRUGATED METAL PIPE
(symbol)	FIRE HYDRANT	CONC	CONCRETE
(symbol)	FINISH FLOOR ELEVATION	COV	COVERED
(symbol)	SANITARY SEWER VALVE	FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
(symbol)	AIR RELEASE VALVE	FOC	FIBER OPTIC CABLE
(symbol)	WATER VALVE	IR	IRON ROD
(symbol)	TELEPHONE MARKER	REC	RECOVERED
(symbol)	GUY POLE	CLF	CHAIN LINK FENCE

SHEET 1 OF 1

REVISIONS

Rev. ______ Date: ______
Rev. ______ Date: ______
Rev. ______ Date: ______
Rev. ______ Date: ______

THIS SURVEY MAP AND REPORT OR THE COPIES THEREOF ARE NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

Job No.: E6378
Field Date: 6/19/08
Drawn By: SMF
Field By: JT
Scale: 1"=20'
Drawing File: PARCEL 41

Mark E. Luke
Professional Surveyor & Mapper
Florida Registration #5006

ALTA/ACSM LAND TITLE SURVEY

BOUNDARY & TOPOGRAPHIC SURVEY
FOR
INTERPLAN, LLC.

HENRICH-LUKE & SWAGGERTY, LLC

FILE 6665

Gibbs, Denny

From: Mike Thedieck [MThedieck@interplanorlando.com]
Sent: Friday, May 08, 2009 1:55 PM
To: Stuart Anderson; Steven Merrick
Subject: FW: Primrose School - Sanford

From: Chris Boesch [mailto:broker32817@yahoo.com]
Sent: Friday, May 08, 2009 10:20 AM
To: Mike Thedieck
Cc: MMcCabe@PrimroseSchools.com
Subject: Re: Primrose School - Sanford

Mike,

This is response to item #2, addressing the concerns of noise associated with those playgrounds closest to the northern site line.

Although the school has a capacity of 184 there is never that many children outside at one time. There are two outside play times each day: once in the morning and once in the afternoon. The morning session starts at 9:30 and for the playgrounds in question runs about 2 hours. The afternoon session starts at 3:30 and also runs about 2 hours. An important point to remember is that the classes are rotated within that 2 hour time block. Each class is only outside for about 30 minutes each session. This means there is never more than 24 children outside on those northern playgrounds at any one time.

Sabrina Boesch
Primrose Schools Franchise Owner

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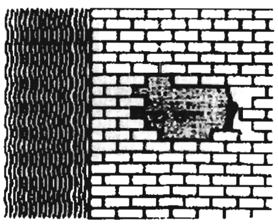
4 Physical Techniques to Reduce Noise Impacts



This section describes some of the physical methods which architects, developers and builders can employ to reduce noise impacts. There are four major actions which can be taken to improve noise compatibility for any type of land use or activity. These are site planning, architectural design, construction methods, and barrier construction.

Acoustical site design uses the arrangement of buildings on a tract of land to minimize noise impacts by capitalizing on the site's natural shape and contours. Open space, nonresidential land uses, and barrier buildings can be arranged to shield residential areas or other noise sensitive activities from noise, and residences can be oriented away from noise.

Acoustical architectural design incorporates noise reducing concepts in the details of individual buildings. The areas of architectural concern include building height, room arrangement, window placement, and balcony and courtyard design.

Acoustical construction involves the use of building materials and techniques to reduce noise transmission through walls, windows, doors, ceilings, and floors. This area includes many of the new and traditional "soundproofing" concepts

Noise barriers can be erected between noise sources and noise-sensitive areas. Barrier types include berms made of sloping mounds of earth, walls and fences constructed of a variety of materials, thick plantings of trees and shrubs, and combinations of these materials.

These physical techniques vary widely in their noise reduction characteristics, their costs, and especially, in their applicability to specific locations and conditions. This section is not designed to provide complete criteria for selecting a solution to particular noise problems and is not intended as a substitute for acoustical design. Rather, its purpose is to illustrate the wide range of possible alternatives which could be considered in the architectural and engineering planning process. Knowledgeable municipal officials can provide valuable assistance to designers, developers, and builders who may not be familiar with sound attenuation techniques that are most applicable locally.

4.1 Acoustical Site Planning

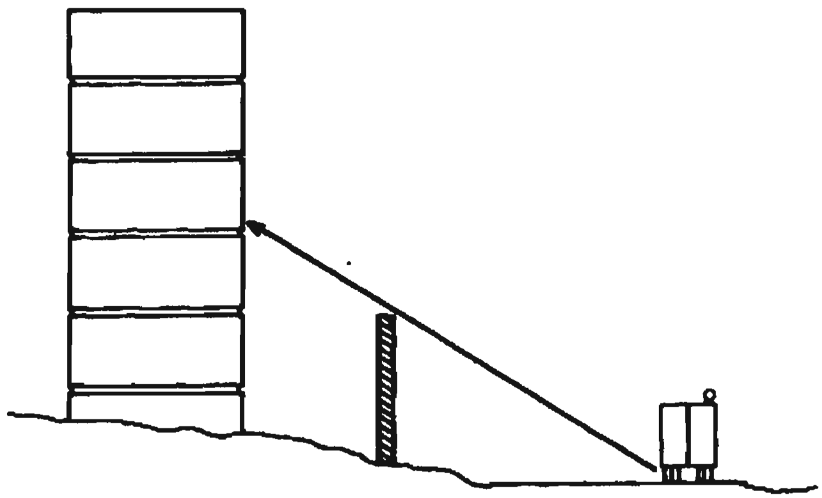
The arrangement of buildings on a site can be used to minimize noise impacts. If incompatible land uses already exist, or if a noise sensitive activity is planned, acoustical site planning often provides a successful technique for noise impact reduction.

Many site planning techniques can be employed to shield a residential development from noise. These can include:

1. increasing the distance between the noise source and the receiver;
2. placing nonresidential land uses such as parking lots, maintenance facilities, and utility areas between the source and the receiver;
3. locating barrier-type buildings parallel to the noise source or the highway; and
4. orienting the residences away from the noise.

The implementation of many of the above site planning techniques can be combined through the use of cluster and planned unit development techniques.

Distance Noise can be effectively reduced by increasing the distance between a residential building and a highway. Distance itself reduces sound: doubling the distance from a noise source can reduce its intensity. Distance itself reduces sound: doubling the distance from a noise source can reduce its intensity by as much as 6 dBA. In the case of high rise buildings, distance may be the only means, besides acoustical design and construction, of reducing noise impacts. This is because it is nearly impossible to provide physical shielding for the higher stories from adjacent noise. (See Figure 4.1.)



4.1 Noise barriers can shield only the lowest floors of a building.

Noise Compatible Land Uses as Buffers Noise protection can be achieved by locating noise-compatible land uses between the highway and residential units. Whenever possible, compatible uses should be nearest the noise source. Figure 4.2 which follows shows a proposed parking garage along two sides of a development in Boston. Both the Fitzgerald Expressway and the entrance to the Callahan Tunnel which are shown on the site plan are major and noisy traffic routes.

4.2 Parking Garage to shield residential area.

In addition to protecting the residential development from the noise and dirt of highway traffic, the parking garage provides needed facilities for the residents

Buildings as Noise Shields Additional noise protection can be achieved by arranging the site plan to use buildings as noise barriers. A long building, or a row of buildings parallel to a highway can shield other more distant structures or open areas from noise. One study shows that a two-story building can reduce noise levels on the side of the building away from the noise source by about 13dBA.[1]

If the use of the barrier building is sensitive to highway noise, the building can be soundproofed. This technique was used in a housing project under construction in England where a 3,900 foot long, 18 foot wide and 45-70 foot high wall (depending on the terrain) serves as both residence and a sound shield.[2]

The wall/building will contain 387 apartments in which the kitchens and bathrooms are placed towards the noise, and the bedrooms and living rooms face away from the highway. The wall facing the highway will be soundproofed and windows, when they exist, are sealed. Substantial noise reductions are expected.

Orientation The orientation of buildings or activities on a site affects the impact of noise, and the building or activity area may be oriented in such a way as to reduce this impact.

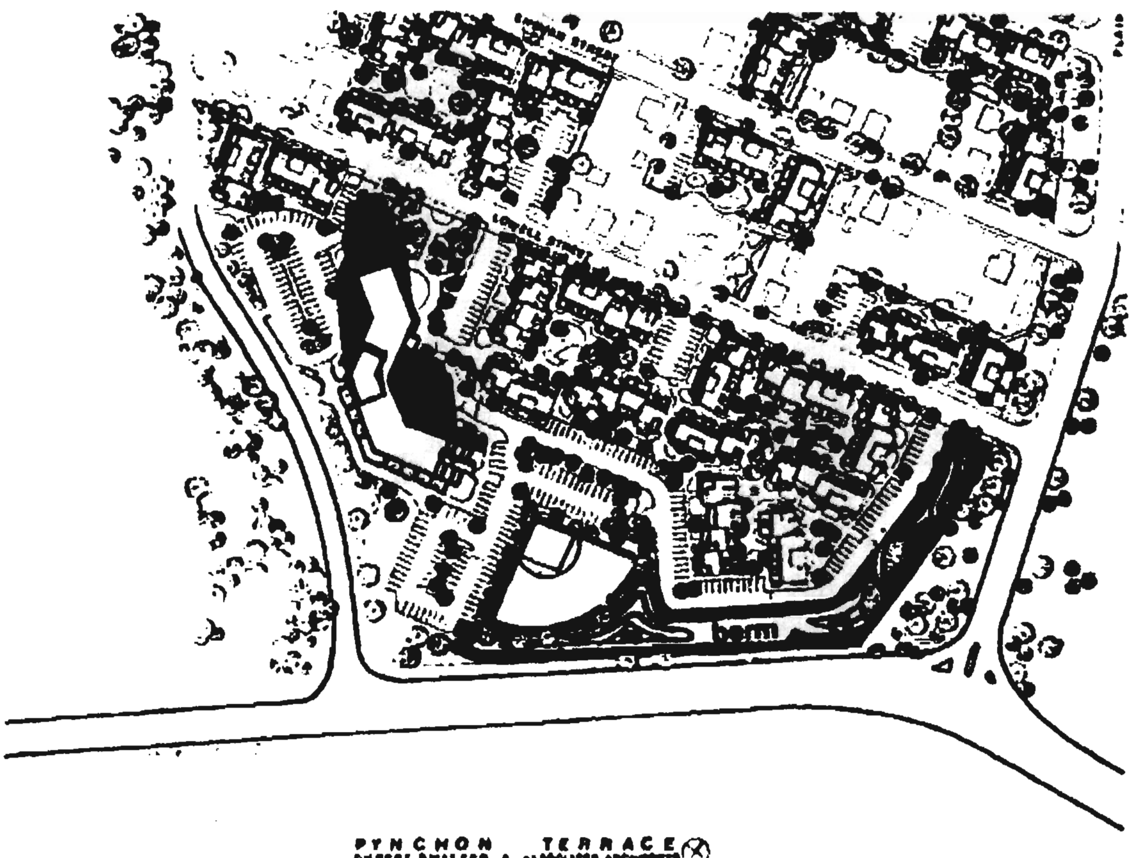
Noise impacts can be severe for rooms facing the roadway since they are closest to the noise source. The noise impact may also be great for rooms perpendicular to the roadway because a) the noise pattern can be more annoying in perpendicular rooms and b) windows on perpendicular walls do not reduce noise as effectively as those on parallel walls because of the angle of the sound. Road noise can be more annoying in perpendicular rooms because it is more extreme when it suddenly comes in and out of earshot as the traffic passes around the side of the building, rather than rising and falling in a continuous sound, as it would if the room were parallel to passing vehicles.

Whether the noise impact is greater on the perpendicular or the parallel wall will depend on the specific individual conditions. Once the most severely impacted wall or walls are determined, noise impacts may be minimized by reducing or eliminating windows from these walls.

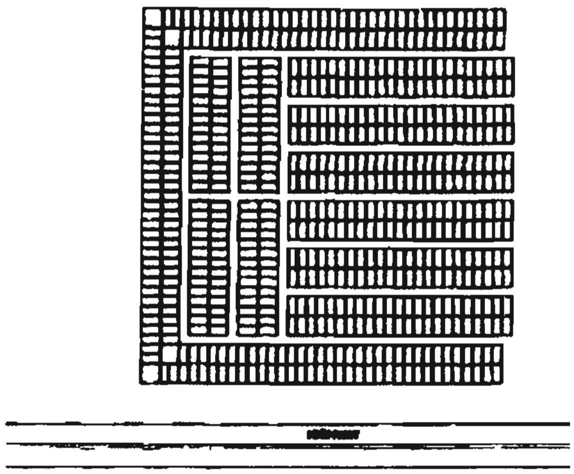
Buildings can also be oriented on a site in such a way as to exploit the site's natural features. With reference to noise, natural topography can be exploited and buildings placed in low noise pockets if they exist. If no natural noise pockets exist, it is possible to create them by excavating pockets for buildings and piling up earth mounds between them and the noise. Such a structure would obstruct the sound paths and reduce the noise impacts on the residences.

Cluster and Planned Unit Development A cluster subdivision is one in which the densities prescribed by the zoning ordinance are adhered to but instead of applying to each individual parcel, they are aggregated over the entire site, and the land is developed as a single entity. A planned unit development, or P.U.D., is similar but changes in land use are included, such as apartments and commercial facilities in what would otherwise be a single-family district. Examples of grid, cluster and P.U.D. subdivisions follow in Figures 4.4, 4.5, and 4.6.

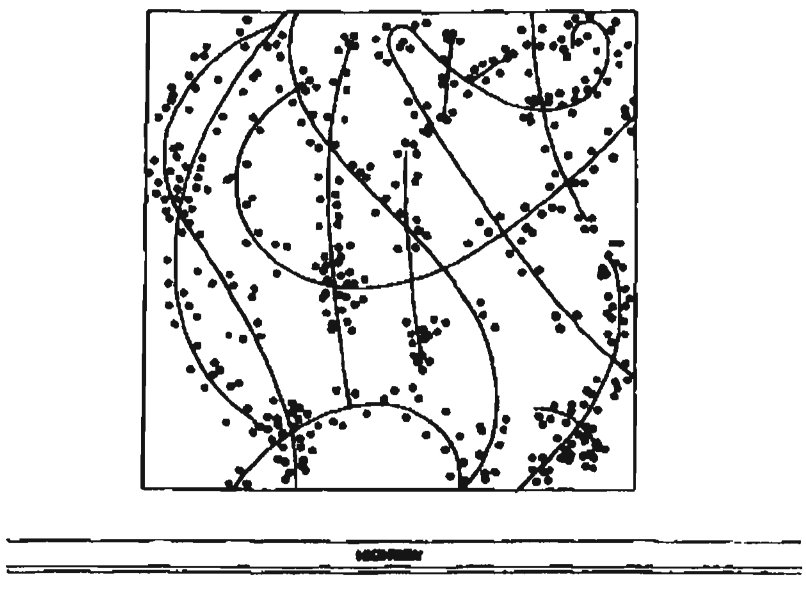
Figure 4.3 provides another example of locating noise-compatible uses near a highway (West Street) in Springfield, Massachusetts. From the plan, one can see that parking spaces, ends of buildings, and a baseball diamond are near the highway.



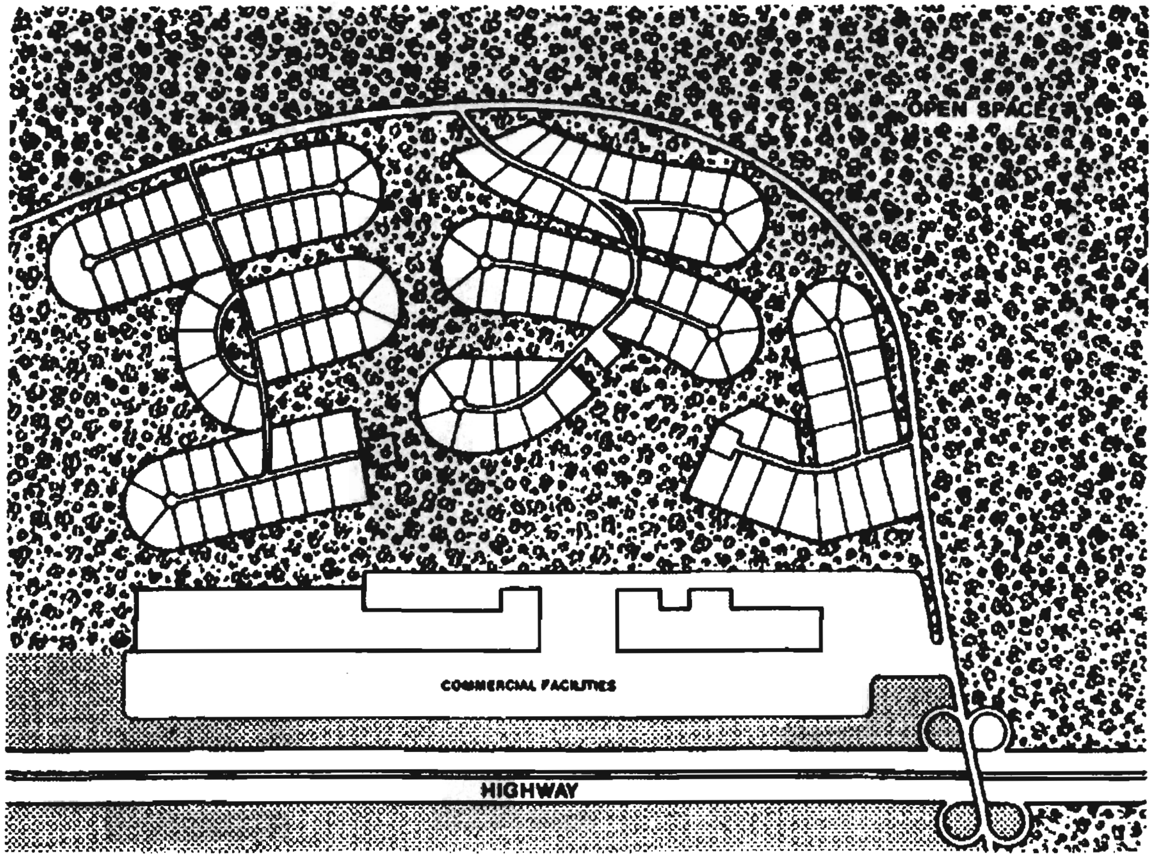
4.3 Parking spaces, end of buildings, and a baseball diamond are placed near the highway. A berm is constructed and trees are planted to shield residences from traffic noise.



4.4 Conventional Grid Subdivision

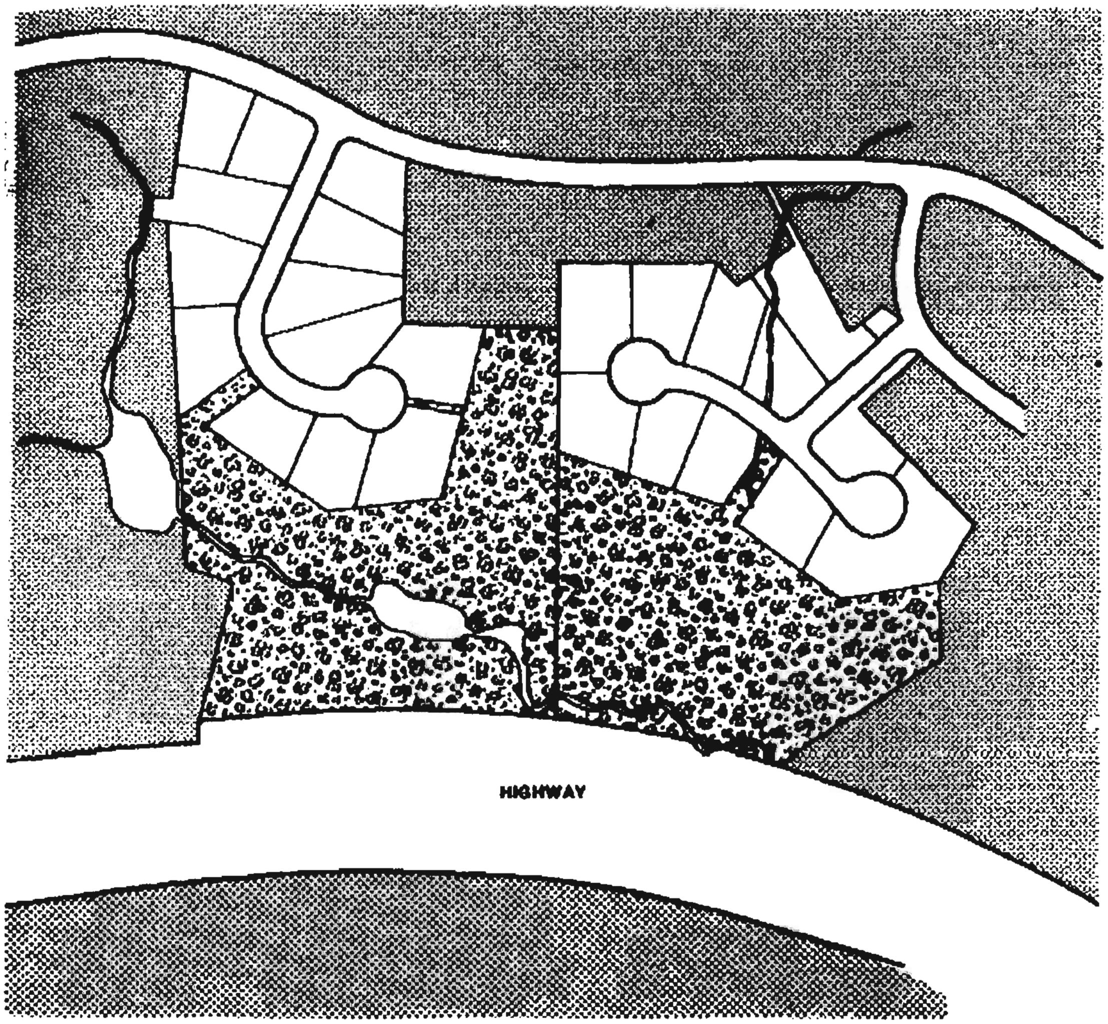


4.5 Cluster Subdivision



4.6 Placement of noise compatible land uses near highway in Planned Unit Development

From Figure 4.4 it can be seen how the conventional grid subdivision affords no noise protection from the adjacent highway. The first row of houses bears the full impact of the noise. In contrast, the cluster and P.U.D. techniques enable commercial uses and open space respectively to serve as noise buffers. Examples of this are shown in Figures 4.6 and 4.7.



4.7 In cluster development, open space can be placed near the highway to reduce noise impacts on residences

A word of caution is necessary: in a cluster development, the required open space can be located near the highway to minimize noise to the residences. However, many recreation uses are noise sensitive, and when one takes advantage of the flexibility of cluster development to minimize noise, care must be taken not to use all of the available open space in buffer strips, thus depriving the development of a significant open space area. Where high noise levels exist, a combination of buffer strips and other techniques (such as berms and acoustical sound proofing) can be employed.

The flexibility of the cluster and planned unit development techniques allows many of the above site planning techniques to be realized and effective noise reduction achieved.

[1] Hans Bernard Reichow, "Town Planning and Noise Abatement," Architect's Journal, 137-7 (February 13, 1963) pp. 357-360.

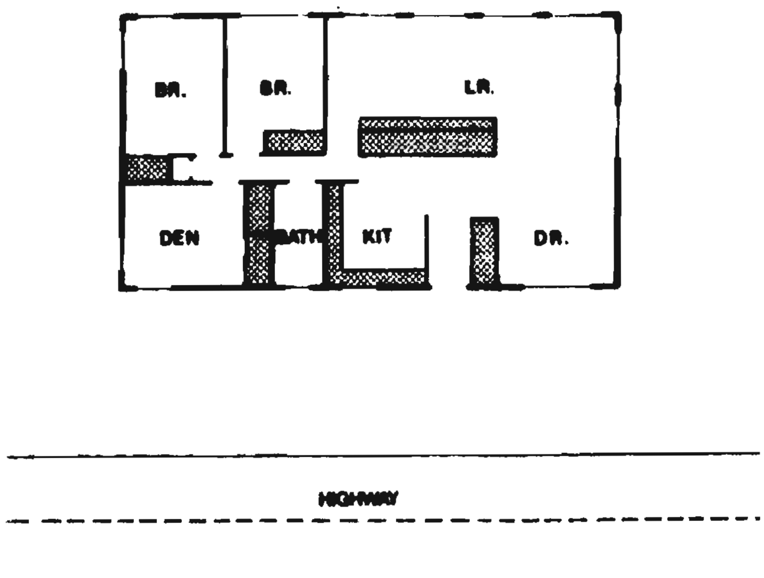
[2]"Live-in Wall, 3,900 Feet Long, is Also a Sound Shield," Engineering Record, (September 6,1973).

4.2 Acoustical Architectural Design

Noise can be controlled in a building with proper architectural design. By giving attention to acoustical considerations in the planning of room arrangement, placement of windows, building height, balconies, and courtyards, the architect may achieve significant noise impact reduction, without the need for costly acoustical construction.

Room Arrangement Noise impacts can be substantially reduced by separating more noise sensitive rooms from less noise sensitive rooms; and placing the former in the part of the building which is furthest away from the noise source. The less sensitive rooms should then be placed closest to the noise source where they can act as noise buffers for the more sensitive rooms.

Whether or not a room is noise sensitive depends on its use. Bedrooms, livingrooms, and dining rooms are usually noise sensitive, while kitchens, bathrooms, and playrooms are less so. Figure 4.8 shows a layout designed to reduce the impact of highway noise. This technique was used extensively in England in a 100 acre residential development adjacent to a planned expressway.[1] Kitchens and bathrooms were placed on the expressway side of the building, and bedrooms and living rooms were placed on the shielded side. In addition, the wall facing the expressway is sound insulated.

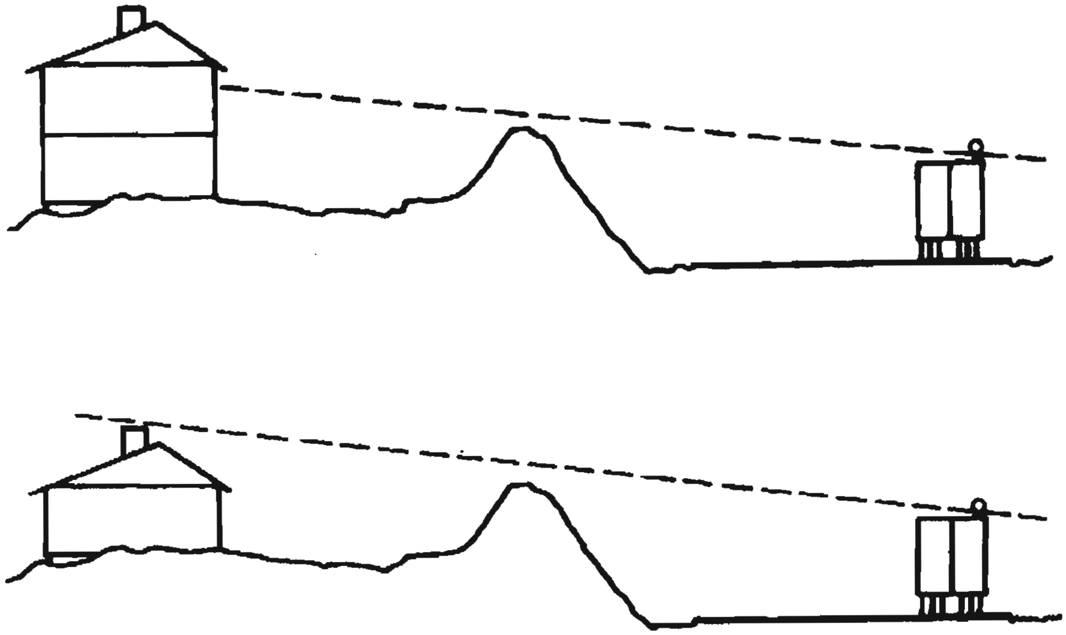


4.8 Use of acoustical architectural design to reduce noise impacts on more noise sensitive living spaces

[1]"Live-In Wall is Also Sound Shield", Engineering News-Record, September 6,1973.

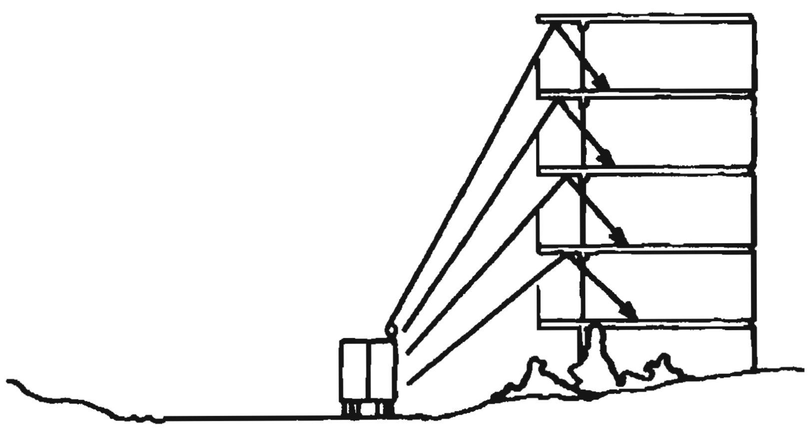
Solid Walls Noise can be reduced by eliminating windows and other openings from the walls of a building close to noise sources. The solid wall can then have the effect of a sound barrier for the rest of the building. As previously discussed in Figure 4.1, walls directly adjacent, and those perpendicular to the noise source can be the most severely impacted. When a solid wall is impractical, illegal, or highly undesirable; the same effect can be achieved by reducing window size and sealing windows airtight. This technique is used in the housing project described above.[1]

One Story Houses In cases where either the house or the highway is slightly recessed or a barrier has been placed in the sound path, the noise impact may be further reduced if the house has only one story[2] (See Figure 4.9). If the single story design is inefficient, the split level design may be effective. In any case the path of the sound waves should be assessed before the building design is drawn.



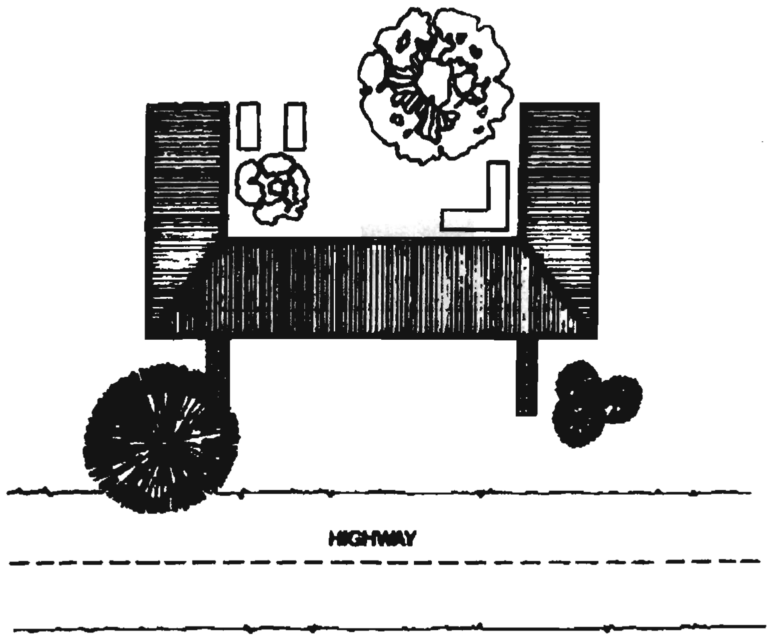
4.9 Noise impacts can be reduced by use of single story houses.

Balconies If balconies are desired they should be given acoustical consideration. The standard jutting balcony, facing the road, may reflect traffic noise directly into the interior of the building in the manner illustrated in Figure 4.10. In addition to reflecting noise into the building, the balcony may be rendered unusable due to the high noise levels. This problem is particularly applicable to high rise apartment buildings where balconies are common. If balconies are desired, the architect may avoid unpleasant noise impacts by placing them on the shielded side of the buildings.



4.10 The standard jutting balcony facing the road may reflect traffic noise directly into the interior of the building.

Courtyards Proper architectural design may also provide for noise reduction in an area outside of the building. The court garden and patio houses can provide outdoor acoustical privacy. (See Figure 4.11). Schools, rest homes, hotels, and multi-family apartment dwellings can also have exterior spaces with reduced noise by means of court yards.



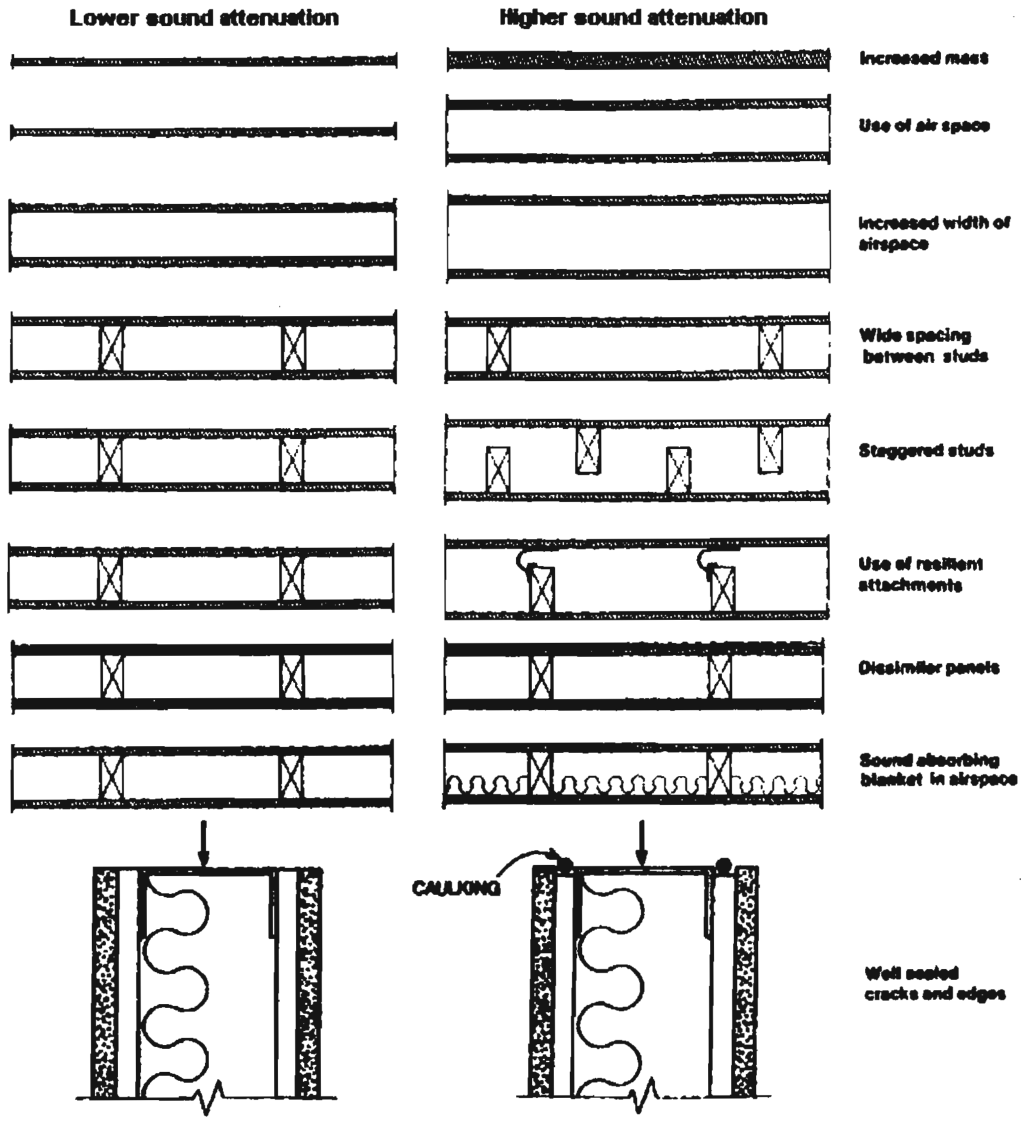
4.11 Use of courtyard house to obtain quite outdoor environment

4.3 Acoustical Construction

Noise can be intercepted as it passes through the walls, floors, windows, ceilings, and doors of a building. Examples of noise reducing materials and construction techniques are described in the pages that follow.

To compare the insulation performance of alternative constructions, the sound transmission class (STC) is used as a measure of a material's ability to reduce sound. Sound Transmission Class is equal to the number of decibels a sound is reduced as it passes through a material. Thus, a high STC rating indicates a good insulating material. It takes into account the influence of different frequencies on sound transmission, but essentially it is the difference between the sound levels on the side of the partition where the noise originates and the side where it is received. For example, if the external noise level is 85 dB and the desired internal level is 45 dB, a partition of 40 STC is required. The Sound Transmission Class rating is the official rating endorsed by the American Society of Testing and Measurement. It can be used as a guide in determining what type of construction is needed to reduce noise.

A. Walls provide building occupants with the most protection from exterior noise. Different wall materials and designs vary greatly in their sound insulating properties. Figure 4.12 provides a visual summary of some ways in which the acoustical properties can be improved:



4.12 Factors which influence sound attenuation of walls

B.

- Increase the mass and stiffness of the wall.
- In general, the denser the wall material, the more it will reduce noise. Thus, concrete walls are better insulators than wood walls of equal thickness. Increasing the thickness of a wall is another way to increase mass and improve sound insulation. Doubling the thickness of a partition can result in as much as a 6 dB reduction in sound.[3] However, the costs of construction tend to limit the feasibility of large increases in wall mass. The relative stiffness of the wall material can influence its sound attenuation value. Care must be taken to avoid wall constructions that can vibrate at audible frequencies and transmit exterior sounds.

- Use cavity partitions
- A cavity wall is composed of two or more layers separated by an airspace. The airspace makes a more effective sound insulator than a single wall of equal weight, leading to cost savings.

- Increase the width of the airspace.
- A three inch airspace provides significant noise reduction, but increasing the spacing to six inches can reduce noise levels by an additional 5 dBA. Extremely wide air spaces are difficult to design.

- Increase the spacing between studs.

- In a single stud wall, 24 inch stud spacing gives a 2-5 dB increase in STC over the common 16 inch spacing.[4]

- Use staggered studs.
- Sound transmission can be reduced by attaching each stud to only one panel and alternating between the two panels.

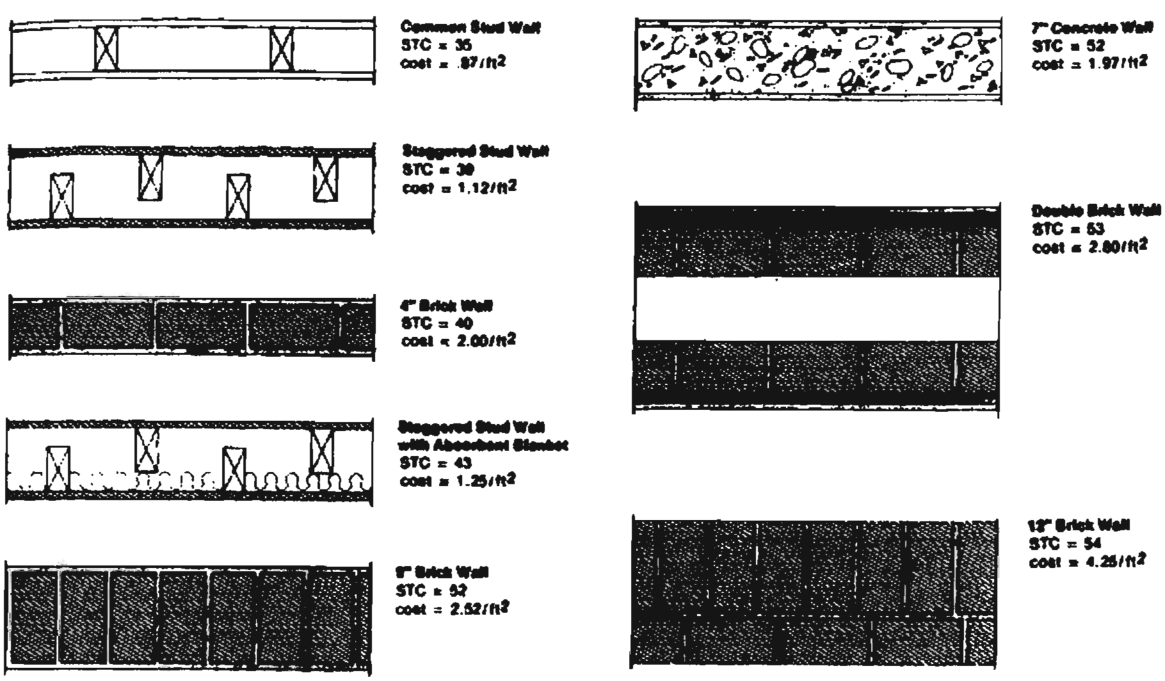
- Use resilient materials to hold the studs and panels together.
- Nails severely reduce the wall's ability to reduce noise. Resilient layers such as fiber board and glass fiber board, resilient clips, and semi-resilient attachments are relatively inexpensive, simple to insert, and can raise the STC rating from 2-5 dB.1

- Use dissimilar leaves.
- If the leaves are made of different materials and/or thickness, the sound reduction qualities of the wall are improved.[2]

- Add acoustical blankets.
- Also known as isolation blankets, these can increase sound attenuation when placed in the airspace. Made from sound absorbing materials such as mineral or rock wool, fiberglass, hair felt or wood fibers, these can attenuate noise as much as 10 dB.[3]They are mainly effective in relatively lightweight construction.

- Seal cracks and edges.
- If the sound insulation of a high performance wall is ever to be realized, the wall must be well sealed at the perimeter. Small holes and cracks can be devastating to the insulation of a wall. A one-inch square hole or a 1/16 inch crack 16 inches long will reduce a 50 STC wall to 40.[4]

Figure 4.13 shows a sample of wall types ranging from the lowest to the highest sound insulation values. The cost of these walls in dollars per square foot is given for comparison of cost effectiveness.[5]



4.13 Wall Types with STC Rating and Approximate Cost.

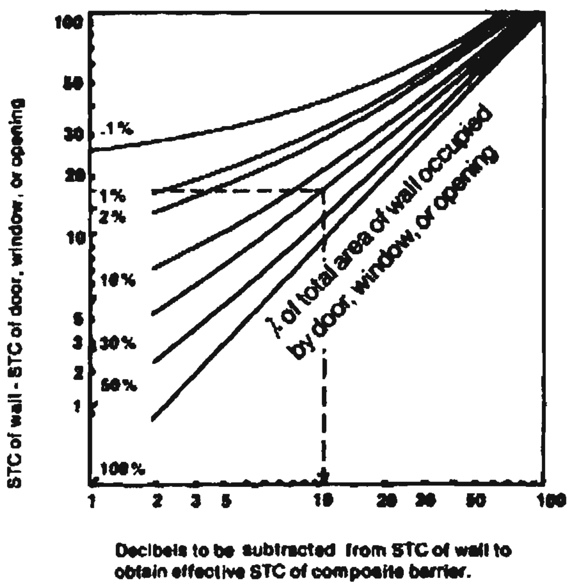
1 "Live-in Wall. . ."

[2]This technique is used extensively in Cerritos, California.

[3]R.K. Cook and P. Chrzanowski, "Transmission of Noise Through Walls and Floors," Cyril Harris, ed., Handbook of Noise Control, McGraw-Hill Book Company, Inc. (New York, 1957).

[4]T. Doelle, Environmental Acoustics, (New York, McGraw-Hill Book Company, 1972), pp. 232-233.

C. Windows Sound enters a building through its acoustically weakest points, and windows are one of the weakest parts of a wall. An open or weak window will severely negate the effect of a very strong wall. Whenever windows are going to be a part of the building design, they should be given acoustical consideration. Figure 4.14 illustrates the effects of windows on the sound transmission of walls. For example, if a wall with an STC rating of 45 contains a window with an STC rating of 26 covering only 20% of its area, the overall STC of the composite partition will be 33, a reduction of 12 dB.



4.14 Graph for calculating STC of composite barriers.

The following is a discussion of techniques that can be used to reduce noise in a building by means of its windows. These techniques range from a blocking of the principal paths of noise entry to a blocking of the most indirect paths.

- **Close windows** The first step in reducing unwanted sound is to close and seal the windows. The greatest amount of sound insulation can be achieved if windows are permanently sealed. However, openable acoustical windows have been developed which are fairly effective in reducing sound.6 Whether or not the sealing is permanent, keeping windows closed necessitates the installation of an air-conditioning system. The air conditioning system may in addition provide some masking of noise. (Masking is discussed below). If windows must be openable, special seals are available which allow windows to be opened.[7]
- **Reduce window size**The smaller the windows, the greater the transmission loss of the total partition of which the window is a part. Reducing the window size is a technique that is used because (a) it precludes the cost of expensive acoustical windows, and (b) it saves money by cutting down the use of glass. The problems with this technique are (a) it is not every effective in reducing noise; e.g., reducing the proportion of window to wall size from 50% to 20% reduces noise by only 3 decibels; and (b) many building codes require a minimum window to wall size ratio.
- **Increase glass thickness**If ordinary windows are insufficient in reducing noise impacts in spite of sealing techniques, then thicker glass can be in stalled. In addition, this glass can be laminated with a tough transparent plastic which is both noise and shatter resistant. Glass reduces noise by the mass principle; that is, the thicker the glass, the more noise resistant it will be. A 1/2-inch thick glass has a maximum STC rating of 35 dB compared to a 25 dB rating for ordinary 3/16 inch glass.

However, glass thickness are only practical up to a certain point, when STC increases become too insignificant to justify the cost. For example, a 1/2 inch thick glass can have an STC of 35; increasing the thickness to 3/4 inch only raises the STC to 37. However, a double glass acoustical window consisting of two 3/16 inch thick panes separated by an airspace will have an STC of 51 and can cost less than either solid window

In addition to thickness, proper sealing is crucial to the success of the window. To prevent sound leaks, single windows can be mounted in resilient material such as rubber, cork, or felt.

Install Double-Glazed Windows Double-glazed windows are paired panes separated by an airspace or hung in a special frame. Generally, the performance of the double-glazed window may be increased with:

a. increased airspace width
b. increased glass thickness
c. proper use of sealing
d. slightly dissimilar thickness of the panes
e. slightly non-parallel panes

In general the airspace between the panes should not be less than 2-4 inches if an STC above 40 is desired. If this is not possible, a heavy single-glazed window can be used. The use of slightly non-parallel panes is a technique employed when extremely high sound insulation is required, such as in control rooms of television studios.

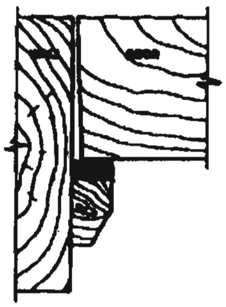
The thickness of double-glazed panes may vary from 1 /8 to 1 /4 inch or more per pane. Although thickness is important, the factors which most determine the noise resistance of the window is the use of sealant and the width of the airspace.

As in the case of all windows, proper sealing is extremely important. To achieve an STC above 43, double-glazed windows should be sealed permanently. If the windows must be openable, there are available special frames and sealers for openable windows which allow a maximum STC of 43.1

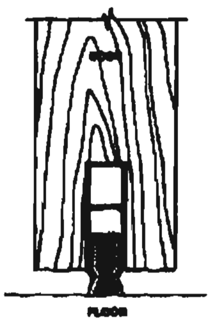
Permanently sealed double-glazed windows often require an air pressure control system to maintain a constant air pressure and minimal moisture in the airspace. Without this system, the panes may deflect, and, in extremely severe cases, pop out of the frames.

To further insure isolation of noise between double-glazed panes, the panes could be of different thicknesses, different weights, and slightly non-parallel to each other. This prevents acoustical coupling and resonance of sound waves.

D. Doors Acoustically,doors are even weaker than windows, and more difficult to treat. Any door will reduce the insulation value of the surrounding wall. The common, hollow core door has an STC rating of 17 dB. Taking up about 20% of the wall, this door will reduce a 48 STC wall to 24 STC. To strengthen a door against noise, the hollow core door can be replaced by a heavier solid core door that is well sealed[2] and is relatively inexpensive. A solid core door with vinyl seal around the edges and carpeting on the floor will reduce the same 48 STC wall to only 33dB[3]. An increased sound insulation value can be achieved if gasketed stops or drop bar threshold closers are installed at the bottom edge of the door. (See Figure 4.15) The alternative solution to doors is to eliminate them whenever possible from the severely impacted walls and place them in more shielded walls.



Gasketed door stop



Drop bar threshold closer

4.15 Increased sound insulation can be achieved with gasketed door stops or drop bar threshold closers.

E. Ceilings Acoustical treatment of ceilings is not usually necessary unless the noise is extremely severe or the noise source is passing over the building. The ordinary plaster ceiling should provide adequate sound insulation except in extremely severe cases. An acoustically weak ceiling which is likely to require treatment is the beamed ceiling.4 Beamed ceilings may be modified by the addition of a layer of fiberglass or some other noise resistant material. Suspended ceilings are the most effective noise reducers but they are also the most expensive.

F. Floors In the case of highway noise, floors would only require acoustical treatment if the highway were passing under the building. In this case, flooring would have to provide protection against structural vibrations as well as airborne sound.

G. Two ways to insulate a floor from noise are to install a solid concrete slab at least 6 inches thick or install a floating floor. In general, the floating floor gives the greatest amount of sound and vibration insulation; however, it is extremely expensive. Basically, a floating floor consists of a wood or concrete slab placed over the structural slab, but separated by a resilient material. The resilient material isolates the surface slab from the structural slab and the surrounding walls.

H. Interior Design Overall interior noise levels can be reduced by the extensive use of thick, heavy carpeting, drapes, wall hangings, and acoustical ceiling tiles. These materials absorb sound. They cannot prevent noise from coming through the walls, but they can reduce overall sound levels by reducing sound reverberations.

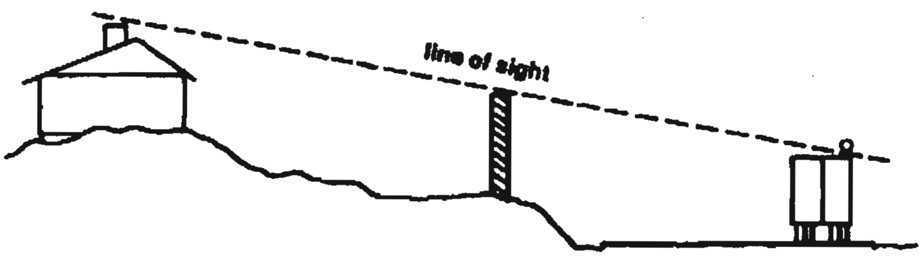
I. Masking Another way of coping with noise is to drown it out with background noise. This technique is known as masking. It can be very effective in reducing noise fluctuations which are often the most annoying aspects of noise. Masking can be produced by air conditioning and heating systems, soft music, or electronic devices.

4.4 Barriers

A noise barrier is an obstacle placed between a noise source and a receiver which interrupts the path of the noise. They can be made out of many different substances:

a. sloping mounds of earth, called berms
b. walls and fences made of various materials including concrete, wood, metal,plastic, and stucco
c. regions of dense plantings of shrubs and trees
d. combinations of the above techniques

The choice of a particular alternative depends upon considerations of space, cost, safety and aesthetics, as well as the desired level of sound reduction. The effectiveness of the barrier is dependent on the mass and height of the barrier, and its distance from the noise source and the receiver. To be effective a barrier must block the "line of sight" between the highest point of a noise source, such as a truck's exhaust stack, and the highest part of the receiver. This is illustrated in Figure 4.16.

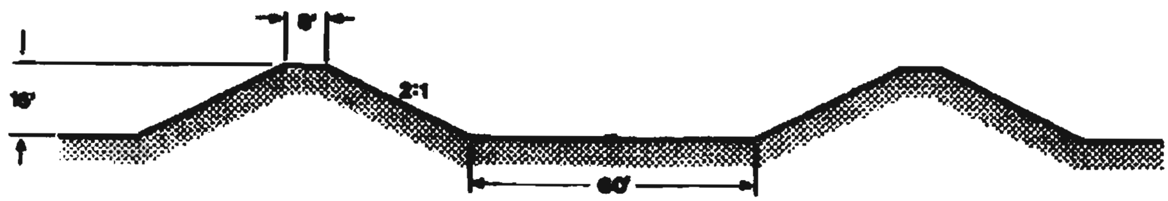


4.16 To be effective, a barrier must block the "line of sight" between the highest point of a noise source and the highest part of a receiver.

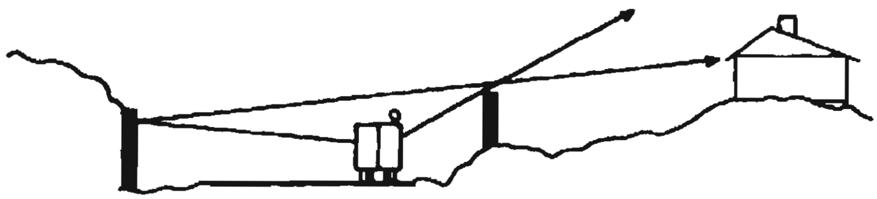
To be most effective, a barrier must be long and continuous to prevent sounds from passing around the ends. It must also be solid, with few, if any, holes, cracks or openings. It must also be strong and flexible enough to withstand wind pressure.

Safety is another important consideration in barrier construction. These may include such requirements as slope, the distance from the roadway, the use of a guard rail, and discontinuation of barriers at intersections. Aesthetic design is also important. A barrier constructed without regard for aesthetic considerations could easily be an eyesore. A well designed berm or fence can aesthetically improve an area from viewpoints of both the motorist and the users of nearby land.

A. **Earth Berms** An earth berm, a long mound of earth running parallel to the highway, is one of the most frequently used barriers. Figure 4.17 shows a cross-section of a berm. Berms can range from five to fifty feet in height. The higher the berm, the more land is required for its construction. Because of the amount of land required, a berm is not always the most practical solution to highway noise. Different techniques must be applied in urban as distinct from rural settings. A berm can provide noise attenuation of up to 15 dBA if it is several feet higher than the "line of sight" between the noise source and the receiver. This is comparable to the noise reduction of various walls and fences which are used as barriers. However, earth berms possess an added advantage: instead of reflecting noise from one side of the highway to another, as walls do,1 and thus increasing the noise heard on the opposite side, they deflect sound upwards. Figure 4.18 illustrates this phenomenon. The cost of building a berm varies with the area of the country and the nature of the project. In California, the statewide average for building a berm is about $1 per cubic yard when the earth is at the site.2 In planning a berm, one must include seeding and planting in figuring cost. Also to be included are land costs and maintenance in relation to erosion, drainage, snowplowing, mowing, and perhaps future seeding. It costs approximately $1,000 per acre per year to maintain a berm which is accessible to maintenance equipment.3



4.17 Cross section of a berm



4.18 Wall barriers may reflect sound from one side of the highway to the other.

B. Walls and Fences as Barriers In addition to the more usual function of keeping people, animals and vehicles from entering the highway right of way at undesired locations, a properly designed fence or wall can also provide visual and acoustical separation between highway noise sources and adjacent land areas. This method can reduce noise as much as 15 dBA.4 The vertical construction and minimal width of walls and fences makes installation possible when space is severely limited. This is especially important when land costs are high, and where buildings are already adjacent to the highway. The advantages and disadvantages of wall and fence barriers are summarized in Figure 4.19. The number of design variations for fence and wall barriers is virtually unlimited. Acoustically, any solid continuous structure will suffice, provided that it is high enough, and provided that the barrier is of adequate mass and density. The cost of a fence or wall type barrier can vary considerably according to the type of construction, the material used, local availability of materials and skills, and the barrier's dimensions. Not all types of barriers are suited for all climates, and local conditions may cause significant differences in the maintenance cost of the various barrier types. The cost questions must be evaluated on a local basis. Some of the frequently used materials for fence and wall construction are masonry, precast concrete, and wood. Masonry noise barriers can be made of concrete blocks, brick or stone. A concrete block barrier might range in cost from $10a linear foot for a 6-ft. high wall, to $75 a linear foot for a 12-ft. high wall. This latter figure includes a safety railing. In general, a concrete block wall would cost $50 to $60 a linear foot.1 To alleviate the monotony of a long run of wall, pilasters can be used: a 20 ft. high concrete wall with pilasters might cost $300 per linear foot.2 Brick and stone are extremely expensive and should only be used for special aesthetic considerations.3 Precast concrete panels offer opportunities for cost reduction. A 13' 4" high wall in Fairfield, California constructed of precast concrete panels cost only $29.50 per linear foot Wood noise barriers are another possibility. They tend to be less expensive than other methods but are not as durable. An estimated cost for a 6' high 5/8" plywood fence is $5.00 per linear foot.[4]

C. Plantings Plants absorb and scatter sound waves. However, the effectiveness of trees, shrubs, and other plantings as noise reducers is the subject of some debate. Some conclusions can, however, be drawn:

- Plantings in a buffer strip, high, dense,and thick enough to be visually opaque, will provide more attenuation than that provided by the mere distance which the buffer strip represents. A reduction of 3-5 dBA per 100 feet can be expected. Shrubs or other ground cover are necessary in this respect to provide the required density near the ground.
- The principal effect of plantings is psychological. By removing the noise source from view, plantings can reduce human annoyance to noise. The fact that people cannot see the highway can reduce their awareness of it, even though the noise remains.
- Time must be allowed for trees and shrubs to attain their desired height.
- Because they lose their leaves, deciduous trees do not provide year-round noise protection.

In general, plantings by themselves do not provide much sound attenuation. It is more effective, therefore, to use plantings in conjunction with other noise reduction techniques and for aesthetic enhancement. The cost of plantings varies with the species selected, the section of the country, the climate, and the width of the buffer strip. For deciduous trees and evergreens, costs range from $10 to $50 a linear foot. The width of such a strip would be approximately 40 feet for deciduous trees and 20 feet for evergreens. Planting shrubs between the trees so as to form a dense ground cover would double the price.

D. Combinations of Various Barrier Designs Often, the most economical, acoustically acceptable, and aesthetically pleasing barrier is some combination of the barrier types previously discussed. For example, the Milwaukee County Expressway and Transportation Commission feels that barriers constructed of precast concrete on top of an earth berm provide maximum benefit for the cost.5 They estimate that such a combination costs $51 per linear foot. In addition to cost advantages, an earth berm with a barrier wall on top of it possesses several other advantages over both a wall or a berm alone: 1) it is more visually pleasing than a wall of equivalent height; 2) the berm portion of this combination is less dangerous for a motorist leaving the roadway; 3) the non-vertical construction of the berm does not reflect noise back to the opposite side of the highway the way a wall does; 4) the combination requires less land than would be required for a berm of equivalent height and slope; and 5) the wall provides a fencing function not provided by a berm. Another combination to be considered is that of plantings in combination with a barrier. Not only do plantings and ground cover provide some additional noise attenuation, but they also increase visual appeal.

[1] Reflection of noise from one side of the highway to another can increase sound levels by 3 dBA. Scholes, Salvidge, and Sargent, "Barriers and Traffic Noise Peaks,"Applied Acoustics, 5:3 (July 1972) p. 217.

[2]This estimate was provided by the California Highway Department.

[3] Ibid.

[4] California Division of Highways, Highway Noise Control, A Value Engineering Study, (October 1972).

4.5 Conclusion

Figure 4.19 provides a summary of the physical techniques which can be used by designers, builders, and developers to reduce highway noise impacts. Some conclusions follow which may be useful in getting them implemented.

Figure 4.19

Physical Technique	Potential Effectiveness	Situations Where Most Effective	Cost	Relevant Administrative Technique	Comments
Acoustical Site Planning	Good-excellent: depends on size of lot and natural terrain.	Before building construction, before subdivision development	Low. only costs are fees of acoustical consultant and site planner.	Building code* Health code	Fairly inexpensive but requires space which may be unavailable. Has limited sound reduction. Positive aesthetic impacts.
Acoustical Architectural Design	Fair	Before building construction.	Low: only cost is that of acoustical consultant	Building code* Health code	Low cost but limited effectiveness.
Acoustical construction.	Excellent for interior, poor for exterior.	During building construction best. Most costly after construction.	Varies with amount of noise reduction desired but generally high especially after construction.	Building code* Health code	Most effective noise reduction for interiors
Barriers	Fair-excellent, depends on height and mass	Varies with type of barrier	Moderate-high: varies with type of barrier, see below.	Zoning, subdivision rules, health code	High noise reduction and potentially low cost. Achieves exterior

					noise reduction. Can have adverse aesthetic impacts.
Earth Berms	Good-excellent	Best during road construction when earth is available. Costly after road construction. Impractical in densely populated areas where land is scarce.	Moderate-high: depends on availability of earth.		Good noise reduction properties and aesthetic appeal, but requires space and requires maintenance.
Walls and Fences	Poor-excellent, depends on height and mass	Any time	Low-high: depends on height and thickness.		Requires little space and no maintenance, but may be aesthetically unappealing and can reflect noise to other side of road.
Plantings	Poor	After road construction. After building construction.	Moderate high: depends on size of buffer strip.		Poor noise reduction but often necessary for aesthetic appeal. Best used in combination with other techniques.
Combinations	Good-excellent.	Depends on particular combination.	Moderate-high: depends on type of barrier used		Potentially high noise reduction and aesthetic appeal.

4.19 Summary of Physical Techniques to Reduce Noise Impacts

As is indicated by the chart below, five factors which must be considered in the selection of noise reduction measures include the following:

1. Noise reduction desired
2. Situation where the physical technique would be most effective
3. Cost
4. Relevant administrative techniques
5. Aesthetics

Noise Reduction The physical techniques discussed vary in their noise reduction capabilities. For example, the effectiveness of the less expensive techniques, such as site planning and acoustical architectural design, is limited to situations where there is some distance between the buildings and the noise source. If the noise source is nearby and significant noise reduction is desired regardless of the expense, then more expensive measures, such as acoustical soundproofing and barrier construction, may be necessary.

Situation where a technique is most applicable The applicability of a technique is determined by the population density of an area and the point in the development process at which the technique is to be used, i.e., its timing. In a densely populated area, site planning (perhaps in conjunction with construction of a berm and a region of plantings) can often solve the noise problem. In a high density area where land is scarce and expensive, a better alternative would be barrier construction and acoustical soundproofing of the buildings.

*Administrative techniques which can achieve any physical technique are health codes, occupancy permit procedures, architectural review boards, and municipal design services.

The timing of a technique also determines whether or not it is applicable. There are three points at which physical noise reduction measures can be used: in the planning phase; during building construction; and after construction. Techniques applicable during the planning phase Include acoustical site planning and acoustical architectural design. During the construction phase, those techniques most applicable for highways are berms and barriers, since building materials are available at the site; and during building construction the most appropriate measure is acoustical soundproofing. It is possible to undertake noise reduction measures after construction, but costs are much higher.

Cost Cost is a very important consideration in the selection of a physical noise reduction technique. Generally, cost is determined by the amount of noise reduction desired and whether the noise measure is a preventative or ameliorative one.

The most effective noise reduction measures are often the most expensive. These include barrier construction and acoustical soundproofing. However, if action is taken as a preventative measure in the planning stage, there is often no need for the more expensive techniques.

Relevant administrative techniques All these physical techniques depend upon administrative actions for implementation. It is possible that physical measures to reduce noise would be taken without local government action, but since they involve extra expense, it is unlikely that they would be adopted on any significant scale. Many administrative means exist to achieve each physical noise reduction technique. For example, a noise impacted area can be zoned to specify details of development design or construction. In such an area, buffer strips (acoustical site planning), acoustical arrangement of living spaces (acoustical architectural design), building insulation (acoustical construction techniques), and barrier construction could be required. Similar requirements could be included in the subdivision laws. Building and health codes, enforced by withholding an occupancy permit, are effective ways to bring about acoustical soundproofing. As explained in the section on Building Codes, particular acoustical construction materials can be required or specific performance standards established.

Aesthetics Aesthetic and quality of life considerations are another important area of concern. They depend largely on local preferences and climate, and opinions of what is aesthetically pleasing will vary among communities.

Whatever the aesthetic judgement, aesthetic considerations must be incorporated into the planning and construction process to insure that the solution which results is not offensive to the community. This can save a great deal of time and money in the long run.

Finally, it should be stressed that no single technique or combination of techniques is best for all situations, and that technique which is best will depend on the nature of the project. The factors which are discussed above (i.e., noise reduction, cost, applicability, and aesthetics) must be balanced against each other to determine which technique or combination of techniques will be most effective in a given situation.

SEMINOLE COUNTY APPROVAL DEVELOPMENT ORDER

On May 18, 2009, Seminole County issued this Development Order relating to and touching and concerning the following described property:

LEG SEC 25 TWP 19S RGE 29E S 5 ACRES OF E 12 CH OF LOT 2 (LESS W 348.48 FT & RD)

(The aforedescribed legal description has been provided to Seminole County by the owner of the aforedescribed property.)

FINDINGS OF FACT

Property Owner: Primrose School - Sanford
3660 Cedarcrest Road
Acworth, GA 30101

Project Name: S. Sylvan Lake Drive (5700)

Special Exception Approval:

Special Exception to establish a child care center for 184 students in A-1 (Agriculture) district.

The Development Approval sought is consistent with the Seminole County Comprehensive Plan and will be developed consistent with and in compliance to applicable land development regulations and all other applicable regulations and ordinances.

The owner of the property has expressly agreed to be bound by and subject to the development conditions and commitments stated below and has covenanted and agreed to have such conditions and commitments run with, follow and perpetually burden the aforedescribed property.

Prepared by: Denny Gibbs, Senior Planner
1101 East First Street
Sanford, Florida 32771

Order

NOW, THEREFORE, IT IS ORDERED AND AGREED THAT:

(1) The aforementioned application for development approval is **GRANTED.**

(2) All development shall fully comply with all of the codes and ordinances in effect in Seminole County at the time of issuance of permits including all impact fee ordinances.

(3) The conditions upon this development approval and the commitments made as to this development approval, all of which have been accepted by and agreed to by the owner of the property are as follows:

1. The general layout of the proposed uses as depicted on the attached master plan shall not change.
2. No building shall increase more than 10% without Board of Adjustment approval.
3. The hours of operation shall be Monday through Friday, 6:30 am to 6:30 pm.
4. Maximum number of student shall be limited to 184.
5. A 6-foot stockade fence is required along the north and west property lines except at the point where the active buffer components are required adjacent to Lot 3 and Lot 4.
6. Landscaping consisting of one canopy tree every 40 feet with three (3) understory trees between shall be installed starting at the east end of lot 3 of Barrington Club and going eastward to Orange Blvd.
7. In order to meet the consistency requirements Seminole County Comprehensive Plan Policy FLU 12.3 for the Wekiva River Protection Area (WRPA) the following are required:
   a) The project shall be certified by the U.S. Green Building Council (USGBC). The project must meet the minimum requirements for the Certified level of LEED for New Construction or LEED for Schools. The following credits shall be meet regardless of certification level:
      1. SS Credit 4.4: Alternative Transportation: parking Capacity (NC)
      2. SS Credit 5.1: Site Development: Protect of Restore Habitat*
         **Applicant shall make a substantial attempt to meet this credit and submit for credit approval to USGBC; if USGBC denies credit for SS Credit 5.1 then this requirement will not apply.*
      3. SS Credit 5.2: Site Development: Maximize Open Space
      4. SS Credit 6.1: Stormwater Design: Quantity Control
      5. SS Credit 6.2: Stormwater Design: Quality Control
      6. SS Credit 7.1: Heat Island Effect: Non-Roof
      7. SS Credit 8: Light Pollution Reduction

8. WE Credit 1: Water Efficient Landscaping: Reduce by 50%
9. WE Credit 2: innovative Wastewater Technologies

The credits listed above are based upon LEED New Construction v3. In the event that a newer version of LEED NC is established the credits most resembling the above mentioned credits shall be adhered to. The Seminole County Planning Manager shall make the determination if the new credit language is consistent with LEED NC v3.

8. Prior to the issuance of development permits, a site plan that meets the requirements of other applicable code requirements including Chapter 40 of the Land Development Code shall be reviewed and approved by the Development Review Committee.

(4) This Development Order touches and concerns the aforedescribed property and the conditions, commitments and provisions of this Development Order shall perpetually burden, run with and follow the said property and be a servitude upon and binding upon said property unless released in whole or part by action of Seminole County by virtue of a document of equal dignity herewith. The owner of the said property has expressly covenanted and agreed to this provision and all other terms and provisions of this Development Order.

(5) The terms and provisions of this Order are not severable and in the event any portion of this Order shall be found to be invalid or illegal then the entire order shall be null and void.

Done and Ordered on the date first written above.

By: ______________________________
Alison C. Stettner
Planning Manager

STATE OF FLORIDA)
COUNTY OF SEMINOLE)

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared _____________________ who is personally known to me or who has produced _________________ as identification and who executed the foregoing instrument.

WITNESS my hand and official seal in the County and State last aforesaid this _______day of ________________, 2009.

____
Notary Public, in and for the County and State Aforementioned

My Commission Expires:

SEMINOLE COUNTY DENIAL DEVELOPMENT ORDER

On May 18, 2009, Seminole County issued this Development Order relating to and touching and concerning the following described property:

LEG SEC 25 TWP 19S RGE 29E S 5 ACRES OF E 12 CH OF LOT 2 (LESS W 348.48 FT & RD)

(The aforedescribed legal description has been provided to Seminole County by the owner of the aforedescribed property.)

FINDINGS OF FACT

Property Owner: Primrose School - Sanford
3660 Cedarcrest Road
Acworth, GA 30101

Project Name: S. Sylvan Lake Drive (5700)

Requested Special Exception:

Special Exception to establish a child care center in A-1 (Agriculture) district.

Approval was sought to establish a child care center within a zoning that permits said use only as a conditional use. The Board of Adjustment finds that the proposed use is inconsistent with development trends in the area and would adversely affect the public interest and should not be permitted.

The requested development approval is hereby denied.

Prepared by: Denny Gibbs, Senior Planner
1101 East First Street
Sanford, Florida 32771

Done and Ordered on the date first written above.

By: ______________________________
Alison C. Stettner
Planning Manager

STATE OF FLORIDA)
COUNTY OF SEMINOLE)

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared ______________________ who is personally known to me or who has produced _________________ as identification and who executed the foregoing instrument.

WITNESS my hand and official seal in the County and State last aforesaid this _______day of _________________, 2008.

____
Notary Public, in and for the County and State Aforementioned

My Commission Expires: