



CITY OF

PORTLAND, OREGON

OFFICE OF NEIGHBORHOOD INVOLVEMENT

CHARLIE HALES, MAYOR

Amalia Alarcón de Morris, Bureau Director

Noise Control Program

1221 SW 4th Avenue, Room 110

Portland, Oregon 97204

Promoting a culture of civic engagement

Noise Review Board Meeting

5-14-14

Minutes

Present: Carole Gossett, David Sweet, Paul van Orden, Melissa Stewart, Julie Greb,

Absent: Elki Lahav

Minutes: Kathy Couch

Call to Order: 6:00 pm

Updates/Discussion Sellwood Bridge existing multi-year variance

Mike Pullen and Michael Minor from Multnomah County presented the update.

Most retaining wall work and pile driving is done, on schedule. Bridge opening is scheduled for Sept 2015. Construction is to be completed in 2016. They will build the last piece after opening the new bridge. The noisiest work is completed. Excavation on the Westside is done. Due to rock conditions, there was minimal need to blast. They did receive complaints while installing soldier piles. Types of complaints were mainly due to:

1. Back up beepers during evening hours while pouring concrete. The type of beeper receiving complaints was the warning feature used when the pump is up high. They will share complaints with the contractor.
2. Expansion joint at the east end of the bridge, which consists of loud clicks when vehicles drive over. They are trying to fix it. Now that the bridge is closer to neighbors, they are able to hear more.

With regard to the back up beepers, it was explained that the alarm during concrete pumping can't be silenced because it is a required safety device.

A 3rd sound monitoring device has now been installed. There are now 2 on the west side, along with 1 on the east side. They also have 2 vibration monitoring systems. Noise levels are randomly sampled. They have been in compliance except for one time, according to the monitoring devices.

There previously was an issue of the Noise Control office receiving complaint logs from the bridge project. Currently, tracking of complaints has been adjusting. Paul now receives copies of complaints right away.

Public Testimony

A group of citizens who reside at areas severely impacted by ongoing bridge construction testified. Names and a brief summary of concerns are listed:

Stephanie Wild; Riverpark resident, Pati Gallagher; Riverpark resident, Steve Atkins (via letter read by Pati Gallagher); Riverpark resident and HOA representative, Marsha Lattig; Sellwood Harbor resident, Jim Lartinger; south end of project, and Steve Beis; Riverpark resident

- Joint noise on deck from tires
- Better communication between contractor and subcontractors
- Back up beepers
- Impacts to wildlife (eagles and salmon)
- No notice of vibration testing

In response to the joint noise on the bridge deck, Michael Minor believes the problem is related to temperature and is hoping to fix the issue this week. Paul van Orden suggests that he and Mr. Minor meet at the site to see if it's an adequate location for a meter.

Commission will look for report next month about progress.

Mike Dowd, SW Miles –Now the Water Bureau is doing work on Miles. (Mr. Dowd thought this was part of the Sellwood Bridge variance) Paul van Orden says that the Noise Control office is seeing an increase of city bureaus working at night. We need information from them and they need a variance. Chair Sweet would like Mr. Dowd to keep a log of nighttime noise complaints and let Officer van Orden know.

Public Testimony

A group of citizens who reside at the Sitka Apartments in the Pearl District testified on construction noise related to pile driving in the Block 17 project. Names and a brief summary of concerns are listed:

Patrice Hanson, Maura Jess, Lisbeth Applefield, John Jeserski, Mary Sipe, Barbara Sementa, Grace Forrester, Jamie Rich, Nancy McCay and Sheila Campion

- Health concerns due to noise, exacerbating pre-existing conditions
- Impact on hearing for children
- Inability to escape ongoing pile driving noise between 7 am and 6 pm
- The perspective that there are alternative methods to driven piles that aren't being used.
- Pile driving noise to be held to 80 dBA or less.
- Anxiety about other upcoming construction projects
- Restrict hours that pile driving may occur
- Lack of understanding as to who to go to that can change City Code for pile driving

Reply by NRB –Chair Sweet explains that City has no noise limits on pile driving construction noise during regular hours. He would like the Noise Review Board to look at regulations but it won't be instantaneous. We are now in the busy season. We now have 2 people in the field. There is no extra staffing time to commence the public process to change code until fall.

Paul van Orden says City Council is the ultimate decision-making body. It will be helpful to be agreement with what to bring forward before Council. Citizens need a united voice for what they want. There is no magic way to immediately stop the loud noise of pile driving.. As you make plans, think about a strategy. David Sweet adds that realistically that's not the way council does things. Changing code involves bringing together all who have interest in it – including the chance to review cost, available technology, research on geo-technical restrictions, and input of various people that are part of the process. City is not in a position to impose a short -term solution. The contractor is working within the code we enforce. David tells the citizens that they can certainly approach the contractor and make a proposal.

Justin Calloway

Truck noise problem is the reason he is here. He lives in East Columbia.

Paul van Orden explains that he has set up a meter at Mr. Calloway's residence but we need an accompanying log from the complainant delineating times and sounds in order for the Noise Control Office to disseminate the information. Even though the meter was set up, there were no logs kept. It takes many hours of listening to days of data and without any log there is no way to have potential penalties stick. A judge would simply toss a case against the trucking companies without accompanying citizen logs.

Adjourn- 8:22 pm

Date: May 14, 2014
To: Portland Noise Review Board
From: Michael Dowd, 0753 SW Miles St., Portland OR 97219
Re: Sellwood Bridge Project noise

My reason for being here:

--noise in my neighborhood has certainly been nothing compared to what closer neighborhoods face, but the attitude, knowledge and responsiveness of the project team have been so bad that I'm requesting that the Board help the project team to understand that it must improve its performance, for the protection of all the projects' neighbors

Background/timeline:

--if you look at the noise variance, you'll wonder why someone so far from the construction activity described by the project is here. The reason is that the variance completely misrepresents the scope and location of the project's work:

- the Miles neighborhood is entirely left out of the application
- work on the rail r.o.w., or of using it for access and staging for bridge work, including variance-related work, is not mentioned or shown on maps
- it states nearest residence to noise is a houseboat 400' from the bridge, versus houses on Miles that are within literally 10' of the work

--because the work in our neighborhood was excluded from the application, the NRB was not given accurate information on which to judge the variance, and I and my neighbors were cheated out of the opportunity to testify

--additionally, since the project has always considered work in our neighborhood as being unrelated to the variance (their application proves that) the project has never bothered with meeting any of its conditions/responsibilities in our neighborhood, even though many construction activities there relate directly to the variance

--work in our neighborhood started last summer, with creating the access road and staging area

--noise was an issue from early on, as well as other illegal impacts related to street use, blocking the street and driveways for hours without notice, etc.

--my first noise complaints to Noise Control was in regard to Sunday, August 18 (using the whole street from my house to Macadam from 10 to 10:30 PM to deliver and unload several pieces of heavy equipment)

--project dismissed that with saying it was a subcontractor, and didn't acknowledge violated the noise code, or that the code applied

--project followed that up 2 days later with Tuesday, August 20th loading and moving a huge crane directly in front of my house from 4:45 AM to about 5:30 AM

--I complained to project that it was violating City's noise and street use regulations, and spent the next several WEEKS trying to get them to understand that the noise regulations applied to them. They first cited irrelevant cited irrelevant code sections, and when I persisted they cut off communication with me (without telling me there were). When I wrote more emails because I was getting no responses, they replied I was writing too many emails.

--Finally, we had a meeting on September 21 to which they invited Paul Van Orden without telling me. Fortunately, Paul Van Orden explained to them with crystal clarity:

--no, they were not exempt from construction noise regulations

--yes, the incidents I reported were all violations

--yes, the terms of the variance did require them to report noise complaints to him (which they had denied, so had not done)

--project's response to that meeting was to write meeting minutes to the County so cryptic that I had to write my own minutes to the Commissioner to explain what had happened

--the next morning, the project started up equipment outside my house well before 7 AM!

--Overall, I'd spent dozens of hours over several weeks simply trying to get the project simply to comply with the noise regulations, and during that time, they apparently never once contacted Paul Van Orden for clarification

Situation since then--project has learned nothing:

--when I brought up the problems with noise (and safety issues) at the project's April 14 pre-construction meeting with my neighborhood Mike Pullen dismissed those concerns with "That's your version (of what happened)" and would not respond further

--the result? Last Tuesday, only the second day of digging on Miles Place, the project worked loudly with two excavators and dump trucks in front of my neighbors' houses until about 8 PM

--when I told Mike Pullen, he said to call the Water Bureau if I had a concern--this work was not the County's nor the County's contractor's responsibility

--the Water Bureau told me they were unaware of noise regulations, and worked that late to be sure to be on schedule for a job the following week in another neighborhood (although they only worked part-time here the rest of that week). The late work was intentional, with no emergency, so was not exempt.

--obviously I'm sure my complaint was never reported by the County to Noise Control, since the County takes no responsibility for the current work

--I know several neighbors who've said they've complained about noise and other construction problems, and been given the impression they're the only ones who complained

--the communication of the County's "project manager" was so bad that the Commissioner's office told me to stop bothering to try to communicate with them

--there has yet to have been a single email or other communication to my knowledge from the County to the neighborhood that mentions noise regulations, the noise variance, or that the project has ever once violated any regulation

THREE DAYS WITH THE PEARL PILE DRIVER

Day One (May 8):	Day Two (May 9):	Day Three (May 12)
7:45 - 8:10	8:18 - 8:31	8:30 - 8:59
8:25 - 8:45	8:58 - 9:04	9:12 - 9:28
9:00 - 9:18	9:20 - 9:25	9:52 - 10:06
9:30 - 9:34	9:42 - 9:48	10:24 - 10:39
9:55 - 10:17	10:06 - 10:12	11:02 - 11:28
10:30 - 10:54	10:31 - 10:47	11:41 - 11:48
10:58 - 11:30	11:07 - 11:21	Lunch Break
Lunch Break	11:41 - 11:52	12:41 - 12:56
12:19 - 12:30	Lunch Break	1:26 - 1:41
12:35 - 1:05	1:04 - 1:17	1:47 - 2:11
1:20 - 1:35	1:30 - 1:47	2:22 - 2:40
1:52 - 1:58	2:11 - 2:26	3:03 - 3:22
2:12 - 2:16		3:35 - 3:53
2:29 - 2:39		

Day One:

Total Episodes: 13

Total: 221m (3.6hr)

Mean Length: 17m

Day Two:

Total Episodes: 11

Total: 121M (2hr)

Mean Length: 11m

Day Three:

Total Episodes: 12

Time: 178m (3hr)

Mean Length: 15m

Total Intervals: 11

Total: 143m (2.4hr)

Mean Length: 13m

Total Intervals: 9

Total: 145m (2.4hr)

Mean Length: 16.1m

Total Intervals: 11

Total: 155m (2.6hr)

Mean Length: 14m

THREE DAYS:

Total Episodes: 36

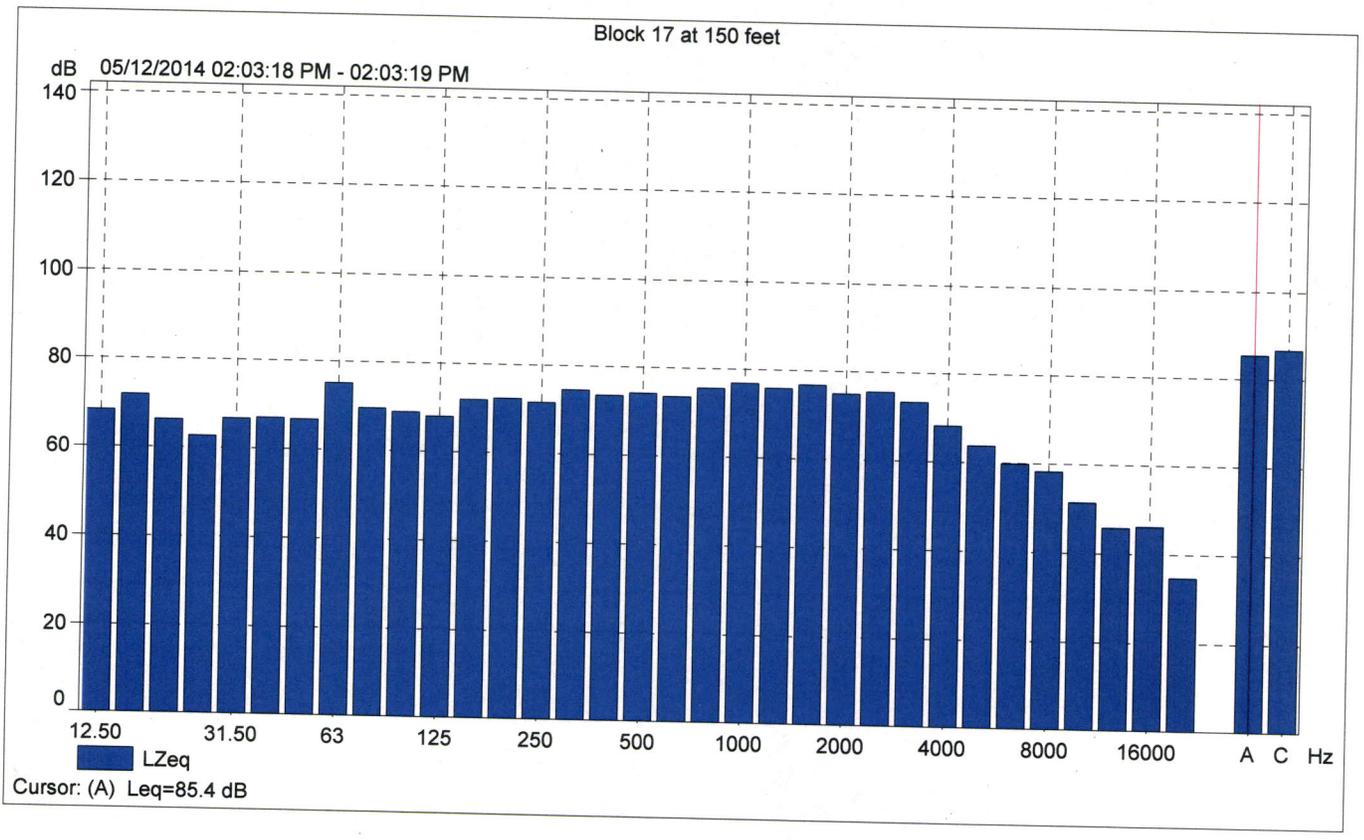
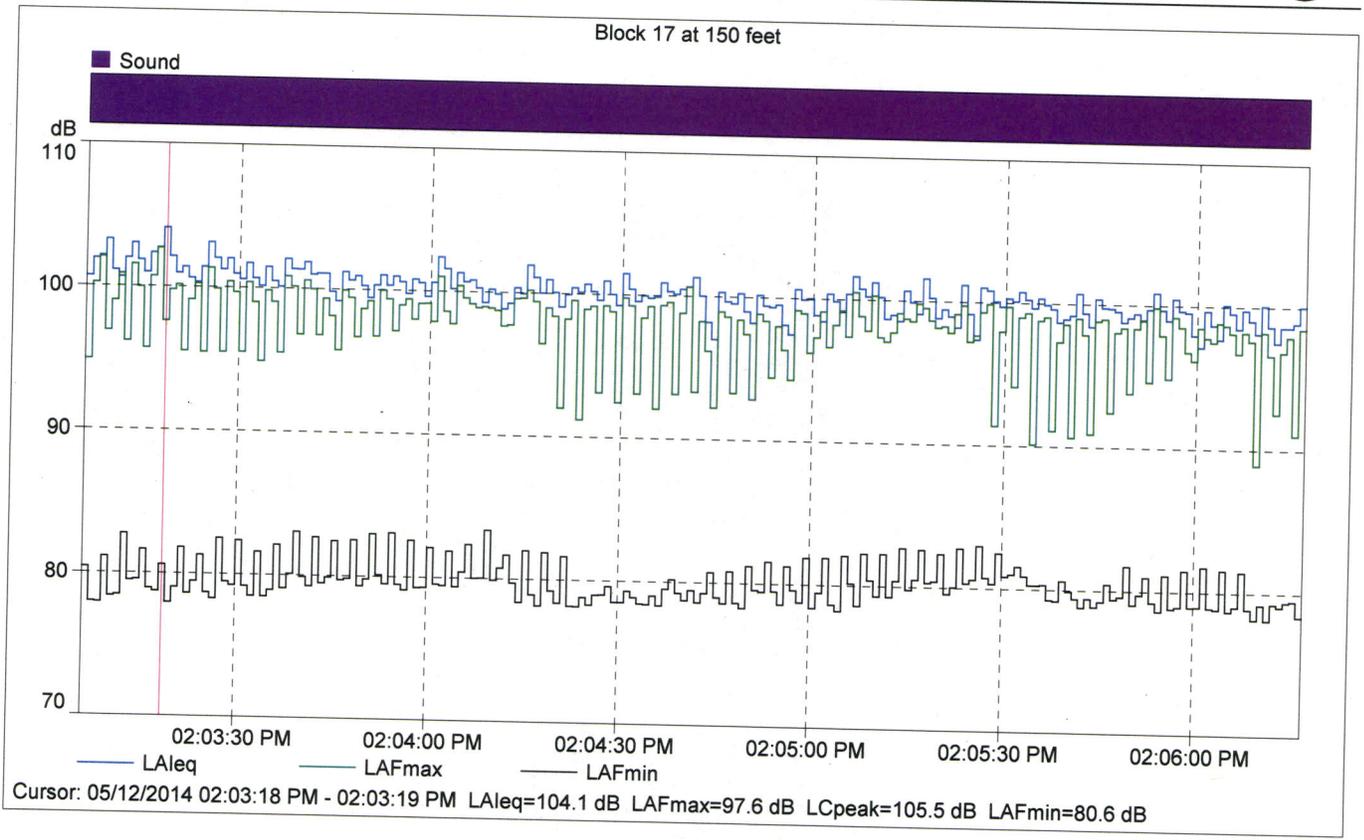
Total Time: 520min (8.7hrs)

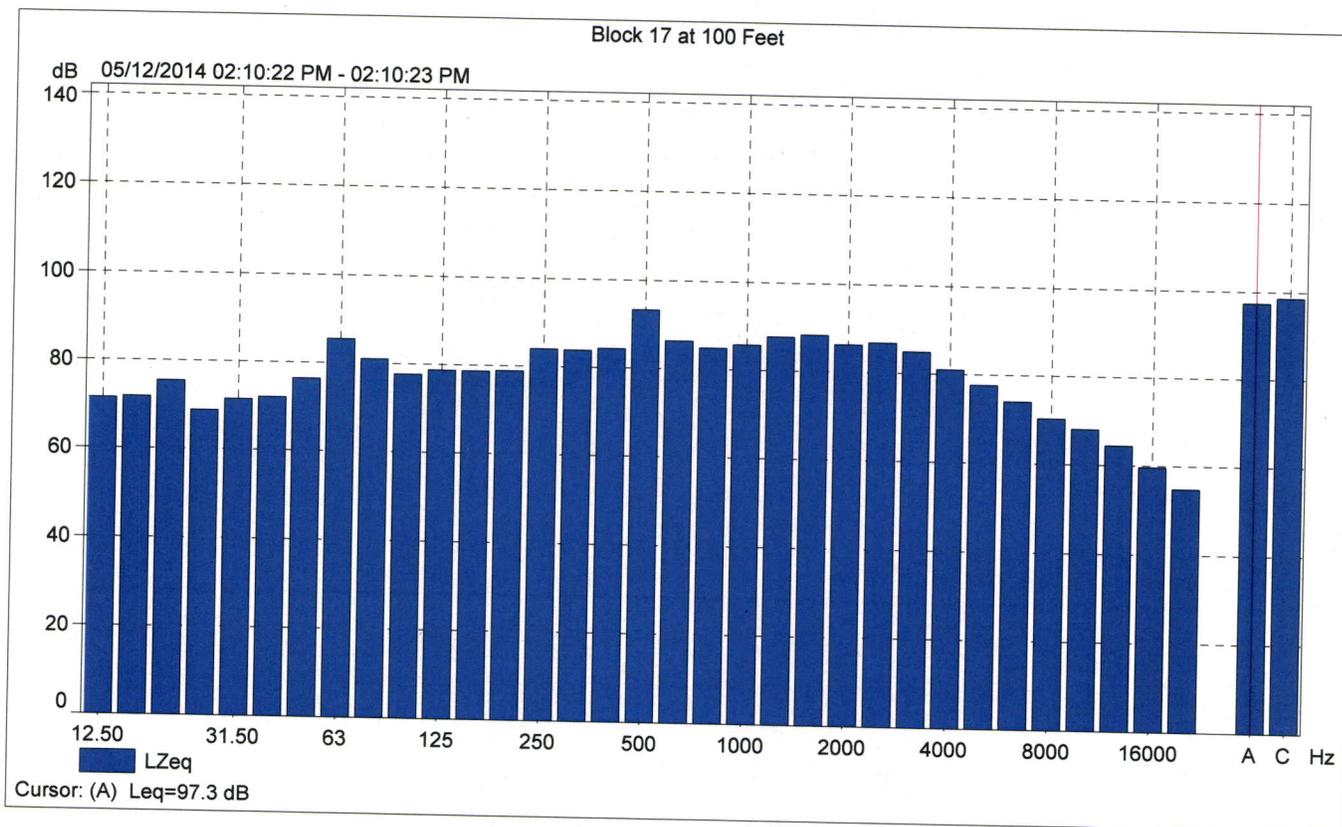
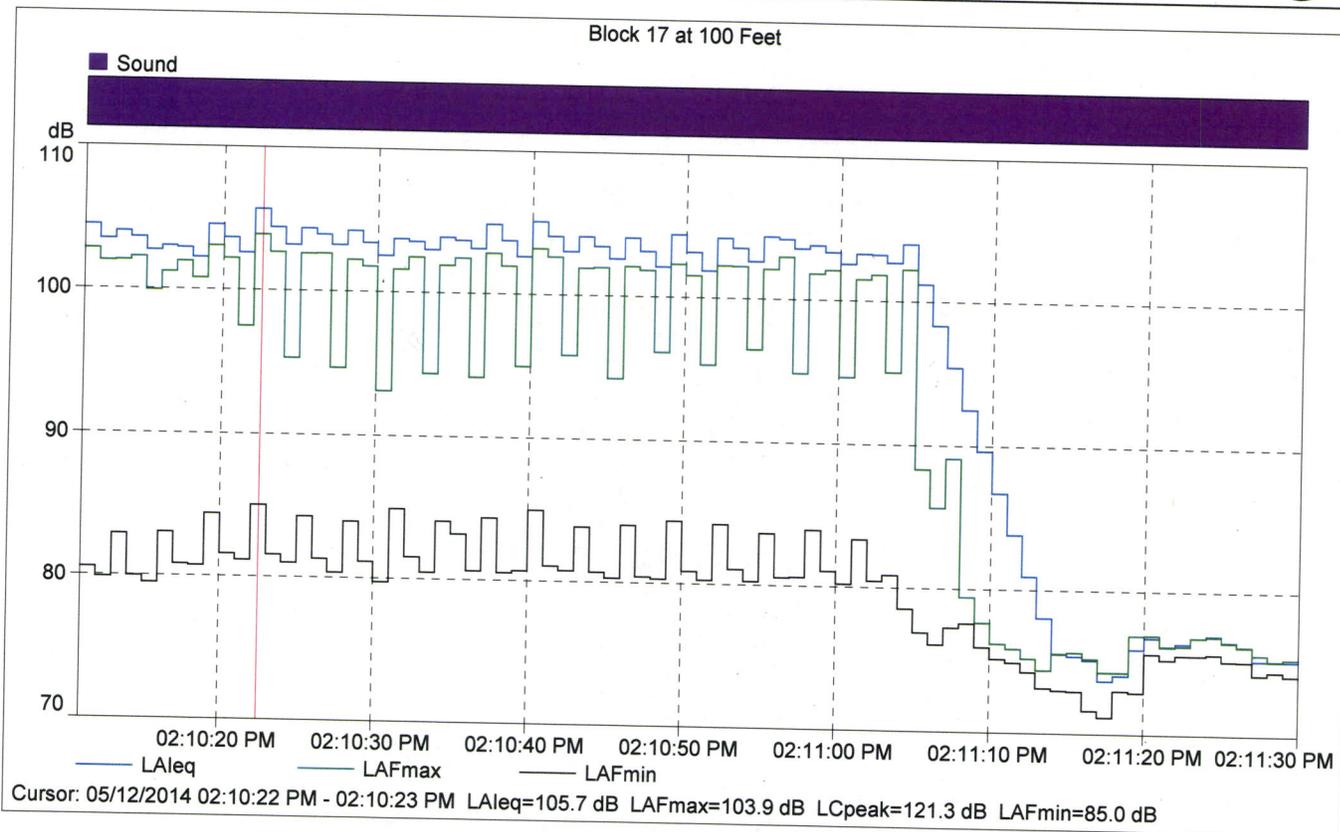
Mean Length: 14.4min

Total Intervals: 31

Total Time: 443min (7.4hrs)

Mean Length: 14.3min





Pile Driving: It's Impact on Community Health,
Well-being and Productivity
by Patrice Hanson

Noise Pollution: A Modern Plague

Lisa Goines, RN, Louis Hagler, MD
South Med J. 2007;100(3):287-294.

“Domestic tranquility is one of the six guarantees in the United States Constitution, a guarantee that is echoed in some form or other in every state Constitution. In 1972, the Noise Control Act was passed by Congress, declaring, ... it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes health and welfare.”

“In residential populations, combined sources of noise pollution will lead to a combination of adverse effects such as impaired hearing; sleep disturbances; cardiovascular disturbances; interference at work, school, and home; and annoyance, among others. These effects are the result of stress from noise, stress that has been increasingly linked to illness.

Vulnerable groups, generally underrepresented in study populations, include patients with various diseases, patients in hospitals or those who are rehabilitating from injury or disease, the blind, the hearing impaired, fetuses, infants and young children, and the elderly. Because children are particularly vulnerable to noise induced abnormalities, they need special protection.”

Noise pollution: non-auditory effects on health
Stephen A Stansfeld and Mark P Matheson

“It is likely that children represent a group which is particularly vulnerable to the non-auditory health effects of noise. They have less cognitive capacity to understand and anticipate stressors and lack well-developed coping strategies^{54,55}. Moreover, in view of the fact that children are still developing both physically and cognitively, there is a possible risk that exposure to an environmental stressor such as noise may have irreversible negative consequences for this group.”

Dangerous Decibel Level for Babies

by Renee Miller,

"A general rule you can follow is that if a noise makes it difficult to hear conversation at a normal volume, then it could damage your child's hearing. To understand how loud this is, keep in mind that a normal conversation is about 60 decibels. If you have to raise your voice to be heard, or the sound is loud enough to make hearing difficult for you, then it is likely too loud for your baby."

Fact Sheet: Noise-Induced Hearing Loss in Children
American Academy of Otolaryngology

Above 85 decibels	Can cause permanent hearing loss
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More from: Noise Pollution: A Modern Plague:

"Average outdoor residential day-night sound levels below 55 dB were defined as acceptable by the EPA; acceptable average indoor levels were less than 45 dBA. Sound levels above this produce annoyance in significant numbers of people."

The results of annoyance are privately felt dissatisfaction, publicly expressed complaints to authorities (although underreporting is probably significant), and the adverse health effects already noted. Given that annoyance can connote more than slight irritation, it describes a significant degradation in the quality of life, which corresponds to degradation in health and well-being."

"Noise levels above 80 dB are associated with both an increase in aggressive behavior and a decrease in behavior helpful to others"

"Annoyance increases significantly when noise is accompanied by vibration or by low frequency components."

"The term annoyance does not begin to cover the wide range of negative reactions associated with noise pollution; these include anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion. Lack of perceived control over the noise intensifies these effects."

"Noise makers and the businesses that support them are as reluctant as smokers to give up their bad habits. Legislators at all levels should protect us from noise pollution the same way they protected us from tobacco smoke and other forms of pollution. It is clear that laws can change behaviors in ways that benefit society as a whole."

Dealing with Vibration and Noise from Pile Driving by W. Allen Marr, P.E.

“Studies by the World Health Organization have shown that the majority of people become moderately annoyed by steady, continuous sound levels above 50dB(A) and seriously annoyed at continuous sound levels above 55dB(A).

In today’s urban world, people demand a secure environment free from annoyance. Contractors must develop means to manage the vibration and noise problems produced by pile driving: (they offer two of the following suggestions in addition to others)

- 1) Education-People that may be impacted by pile driving need to be informed in advance of the planned activities and what the impact to them may be.
- 2) Abatement-Try to reduce the time required by pile driving.
Use noise shrouds or curtains to reduce noise levels by 15-30 decibels”

Reduction of decibels is important as the effect on the listener increases exponentially as decibels increase. Even a 10 decibel decrease can make a significant difference.

Pile Driving Noise by Weiland Acoustics

“Considering that the human ear perceives a 10 dB reduction of noise as half as loud, this will give you some idea of the relief provided by a 20 dB decrease. That’s the good news.”

PILEDRIVERS.org

The Official Publication Of The Pile Driving Contractors Association - Winter 2001 - Volume 2, Number 1

Steady Growth, Satisfied Customers

Waters And Sons
Takes Care Of Business
Page 6

Protecting Our Waters

Replacing A Bridge
Without Making
Dangerous Waves
Page 11

Dealing With The Vibration And Noise Of Pile Driving

by W. Allen Marr, P.E.

Pile driving produces vibrations and noise that might extend thousands of feet away from the driving activity, and people have become increasingly intolerant of these effects. They complain to government agencies and oppose developments that use pile elements, and their opposition is beginning to seriously affect the pile driving industry in the developed countries.

Governmental agencies and owners are choosing alternatives to pile driving to avoid the vibrations and noise. This is an unfortunate and uninformed reaction for three reasons: the alternatives might be considerably more expensive than driving piles; the alternatives might produce comparable levels of noise and vibrations; and the perceptions of people about the possible damage from vibrations and noise are generally wrong. This paper addresses the third issue.

The pile driving hammer produces vibrations and noise with each blow delivered to the pile. The vibrations of consequence are caused by waves of energy

traveling away from the pile. Each blow to the pile transfers energy from the pile to the surrounding soil. As much as 70 percent of the energy transferred to the soil by pile driving travels away from the pile in the form of surface waves (Woods, 1997). The particle velocity of the ground surface caused by these traveling waves of energy decreases with distance from the source due to geometric effects, much like the height of a ripple created by dropping a stone into a pond decreases with distance away from the drop point.

The oscillating ground can induce stresses that can damage a structure. Plaster and weak mortar are among the first elements to experience damage. The repeated stressing from the hundreds of blows necessary to drive a single pile potentially exacerbates damage due to fatigue effects.

Figure 1 shows a typical plot of the levels of particle velocity required to produce structural damage at a frequency of 10 Hz. Also shown are the measured peak vibration levels from various con-

struction activities as a function of distance away from the vibration source. The measured data show how the particle velocity decreases rapidly with distance from the source.

Figure 1 shows that if one is more than 15 feet away from the vibration source for typical pile driving, the vibration level is below

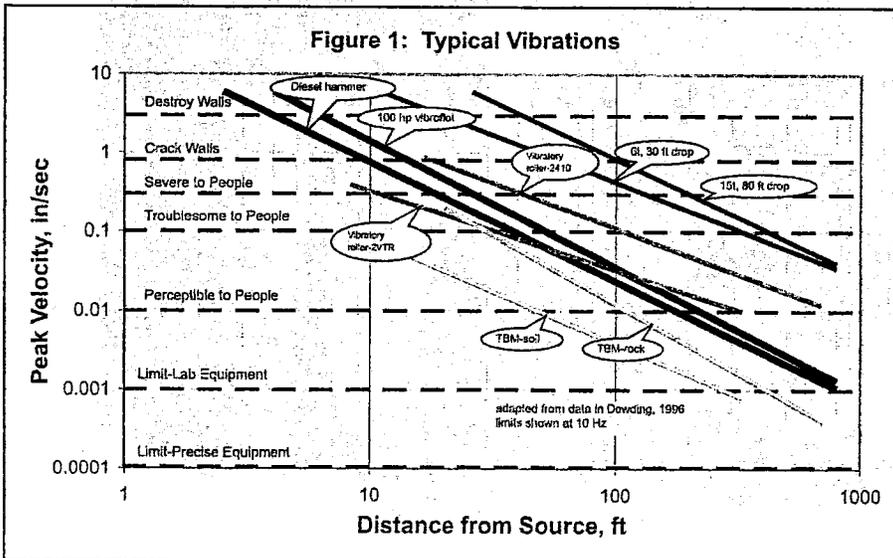
that which might damage a structure. The available data and experience show that unless pile driving is occurring within a few feet of a structure, it does not cause damage to the structure from vibrations. (There may be other undesirable effects, such as vibration induced ground settlement or disruptions to very sensitive equipment, but these are special cases.)

The contents of Figure 1 are well known to the geotechnical engineering profession and many pile driving contractors.

So why do people complain about pile driving and resist its use? Figure 1 holds a significant part of the answer. It also shows criteria on the sensitivity of people to vibrations. People can typically perceive vibrations above 0.01 in/sec – one-hundredth the level at which structural damage might occur. Vibrations above 0.1 in/sec can become troublesome to people. They can feel and become concerned about vibrations that are only 1/100th of those that might begin to cause damage

“People complain about pile driving effects because they are much more sensitive to vibrations than are buildings. They tend to extrapolate their personal sensitivity to vibrations to a concern about the safety of their building.”

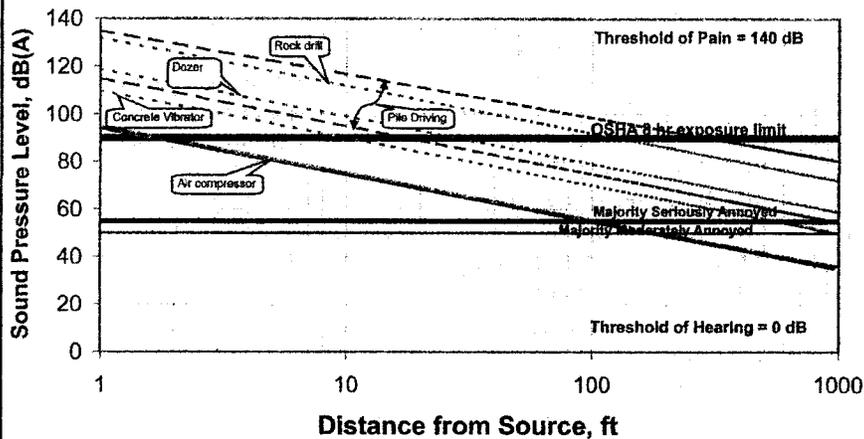
Figure 1: Typical Vibrations



(Continued On Page 18)

Vibration (Continued From Page 17)

Figure 2: Sound levels



to structures. They can feel and become concerned about vibrations that are 1/10th of the levels that become troublesome to most people. People complain about pile driving effects because they are much more sensitive to vibrations than are buildings. They tend to extrapolate their personal sensitivity to vibrations to a concern about the safety of their building.

Noise from pile driving rarely if ever produces structural damage, but it causes annoyance that may reach a long distance. Figure 2 summarizes some typical data on noise levels for various construction activities. It also shows some of the criteria used to limit noise. The measurement of sound level used in Figure 2 is dB(A).

Humans perceive a 10 dB increase in sound level as a doubling of loudness. Sound level decreases approximately 6 dB(A) for every doubling of the distance from the source. Noise below 80 dB(A) is considered not to cause hearing loss.

OSHA set the eight-hour exposure limit to noise at 90 dB(A). Studies by the World

Health Organization have shown that the majority of people become moderately annoyed by steady, continuous sound levels above 50 dB(A) and seriously annoyed at continuous sound levels above 55 dB(A).

Pile driving is one of the noisiest construction operations. Figure 2 shows a range of sound levels reported for pile driving for a variety of hammer types and sizes. For the noisiest hammer, one would have to go approximately 300 feet away from the hammer to get below the OSHA eight-hour exposure limit. One would have to get several miles from the noisiest hammer for the sound level to drop below that causing moderate annoyance to most people.

Clearly, pile driving in urban areas has the potential to annoy a lot of people. When people become annoyed, they also become concerned. They start looking for evidence of damage to their property from the construction work and complaining to their elected officials. Some engage lawyers to pursue compensation for their

grief. When people look for evidence to confirm their suspicions, they will usually find something. Politicians don't like receiving complaints. Lawyers love opportunity. Noise may be the

most serious threat to the pile driving industry today – not because it is causing damage but because it creates a perceived problem to those impacted.

Vibration and noise from pile driving have some common elements. The intensity of both decreases with the log

of distance away from the source. Both are unlikely to cause structural damage as long as the structure is several feet from the driving activity. For both, the real problem is the annoyance to people caused by the vibrations and the noise and not physical damage.

In today's urban world, people demand a secure environment, free from annoyance. Contractors must develop ways to manage the vibration and noise problems produced by pile driving. The following approaches are recommended for every project that involves pile driving:

✓ **Education** - People who might be impacted by pile driving need to be informed in advance of the planned activities and what the impact to them might be. Informed (Continued On Page 20)

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Vibration (Continued From Page 18)

people are less likely to suspect that the vibrations and noise are causing physical harm to themselves or their

cause harm. Actual measurements can become invaluable if you face legal action over vibration or noise complaints.

"People potentially impacted should be provided with educational materials on the project schedule, the nature of the work, the importance of the work to the community and the potential impacts of the work on them."

Should the measurements show unacceptable performance, adjust your work processes to correct the problem before someone else complains.

property. People potentially impacted should be provided with educational materials on the project schedule, the nature of the work, the importance of the work to the community and the potential impacts of the work on them. A special effort should be made to assure them that feeling vibrations and hearing noise does not equate to physical harm or damage. Be considerate and respectful of their expected right to a peaceful environment.

Measurements should begin before pile driving starts to establish background levels of vibration and noise. Pre-construction damage surveys may be worthwhile where buildings are located within a few hundred feet of pile driving activities.

✓ **Abatement** - Take steps to reduce vibration and noise levels to the extent that they are economically possible. Limit the time of driving to daylight hours when people are less affected by these nuisances. Try to reduce the time required for pile driving. Use noise shrouds or curtains to reduce noise levels by 15 to 30 dB(A). Figure 2 shows that a 30 dB(A) reduction to the noisiest hammer can limit the area within which most people are moderately annoyed to within 500 feet of the work.

✓ **Involvement** - Keep the affected parties engaged in the project and informed of progress. Use community representatives, community meetings, newsletters or a project web page to keep people informed of the work progress. Use the measurements from your monitoring program to show how well you are keeping vibrations and noise at safe levels.

✓ **Proactive** - Stay proactive to manage vibrations and noise and minimize misinformation. After all, vibrations and noise from pile driving are more perceived problems than they are reality. But as the modern world acts, perception is reality, so you have to work to manage the perception.

✓ **Monitoring** - Measure the vibration and noise levels at key locations. Use the measured data with the information in this paper to demonstrate that your work is well below the levels that

We have been working on some technology to help contractors carry out these approaches. It involves the use of vibration and sound monitoring equipment connected to the Internet. We provide special seismographs to a con-

tractor, who places them at sensitive locations. The seismographs are coupled to the Internet by a cell phone. The system is programmed to call our server whenever a preset threshold of vibration or sound is recorded. Our server downloads the specific data from the seismograph and places it onto a web site. Our server might also send an e-mail or a coded message by phone or pager to contractors to alert them that threshold levels for vibration or noise are being exceeded. All of this happens automatically, within a few minutes.

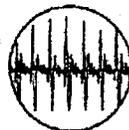
This technology helps educate the community on the real effects of pile driving, rather than perceived effects; gives the contractor measurements with which to establish and control abatement programs; provides a database of

real facts to counter inflated claims; keeps significant parties involved by giving them access to the real facts on the project through the web site; and provides a proactive way for contractors to work with the community by keeping its members informed. We look forward to using it to help contractors more effectively deal with vibrations and noise produced by pile driving.

References

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Woods, R.D. "Dynamic Effects of Pile Installations on Adjacent Structures," Synthesis of Highway Practice 253, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C., 1997.



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Stories of the Effects of Pile Driving

Since the construction began I've been mildly irritated..... I try to be zen and I've been making the most of a poor situation by going to bed earlier and getting up earlier, but I have been in disbelief since the pile driving began - especially on the weekends when so many people are at home! It drives me batty and there's no escape from it. Even with my efforts to change my sleep schedule to accommodate construction last week was so busy I couldn't keep their hours and I was so sleep deprived, I came home from work Thursday at about 6, fell asleep immediately and slept straight through until they began pile driving the next morning - that was about 14 hours of sleep.

Now that I know there are other options they could be using I'm just shy of infuriated. Thinking about this construction going into the summer, and over the next few *years*, as well, being unable to open my windows.... Portland is about doing better, and I think that means we don't have to totally sacrifice our quality of life because a developer is out to make millions across the street. -Lea

My apartment has been rocked and my cable service has been disrupted 3 times in two weeks.

I know this is going to continue, and even though we are so happy to see the neighborhood grow, but this way it feels worse than anything imagined.

Here is another case where developers will cut the cost for profits at the expense of the public. -Charles

The construction in our neighborhood has had a huge impact on my life and well being. My apartment is **MAYBE** the minimum of 50' from and facing the construction. When they are driving I cannot be in my home, even with ear plugs. My apartment is jolted with such force that it rattles the glasses in the hutch.- Maura

I live in the Sitka Apartments, overlooking 11th Street, between Overton and Northrup. I am on the 2nd floor. As a freelance writer, I spend most of my days at home. Since Andersen Construction started pile driving on Block 17, this means many of my work hours are spent finding ways to drown out the noise, and many times, finding somewhere else to get my work done, when the constant pounding and shaking becomes too much. My work includes movie reviews, and watching films at home, that I

can barely hear. Now that the weather is warm, I can't open my windows to get air lest the hammering fill the whole room. The construction has affected my sleep patterns, waking me up every morning in a most unpleasant manner, making it hard to transition out of sleep and into my day. Depending on where the pile driver is positioned, the sound travels up Overton to the buildings just past 10th, and then echoes back, creating a doubling effect and an inescapable cacophony. Escapes to the public park are impossible, as the noise there is unbearable. When I go on my jog, I can hear the noise all the way up to Thurman and 17th and down to the waterfront. These people have taken over life for blocks upon blocks. There's little escape. It's hard to sleep, it's hard to think, I go between feeling trapped in their bubble and being run out of my own apartment. It's the very definition of "unsettling." - Jamie S. Rich

The pile driving is quite disruptive to my concentration. I work from home using a computer and the phone all day. And now into the night. My wife and I live in the West building. Sixth floor facing Northrup. The pounding and shaking begin around 8 am each morning and go throughout most of the day...every 20 minutes or so a 10-15 minute pounding and shaking cycle begins as another steel pole is driven into the ground. Impressive sight to watch. But very disruptive to my work efforts. I cannot concentrate during a pile driving cycle. Work productivity slows during the day and I have to work into the night to catch up. During client calls I have been asked what the rhythmic hammering sound is. They are amazed I accomplish any of their project objectives. And my calls are done with the window tightly closed. I would like to keep the window open all day...but shut it at the beginning of each cycle. Now as the weather warms up I live with my office being hot and stuffy at times throughout the day!
-Brad Dong

Personal statement:

The pile driving that takes place six days per week across the street from my residence is extremely disruptive to my daily life. I notice that I, and my neighbors, are more emotionally on edge and more agitated in general. Urban living can already be stressful for many community members, and the increased, un-regulated noise resulting from the pile driving exacerbates that stress.

Philosophical statement:

The raising of voices regarding extreme construction noise in the Pearl District is about community values. A community is an interdependent group of people based on mutual respect. This is not an "us (residents) vs. them (developers)" situation – this is an opportunity to address how all community members (workers, children, elderly, developers, investors, pet owners, city officials, et al) may be best served.

-Mark Woodlief

I for one am suffering from headaches and spastic nerves and muscle spasms from the endless impossible pounding. I am a pretty calm person and already at 8:40 am I can feel the tension and my muscles tightening. I was at the chiropractor yesterday and twice last week, it helps for a while then I return to this. Personally as a heart patient I try so to remain calm this so doesn't help.-anonymous

My name is Isabella Giordano, I am 23 years old and currently live at the Sitka. Every morning I am rudely awakened by my apartment shaking. Once this awful sound starts I am no longer able to sleep and lie in bed listening to the repeated pounding until I have to get up for work. I think it goes without saying that my work performance is being affected because I'm so incredibly tired and aggravated. The Sitka is the perfect building for me because I can only afford low income housing and it is close to my job that I have been at for four years. If the ludicrous and absolutely unnecessary construction begins of the 28 story building in the lot across from me, and the already existing construction behind me continues I will be forced to leave. No person can live in such unbearable conditions. The noise would be abusive. I feel that it is mentally and physically affecting me, my neighbors, children, pets, and the community. Please help.

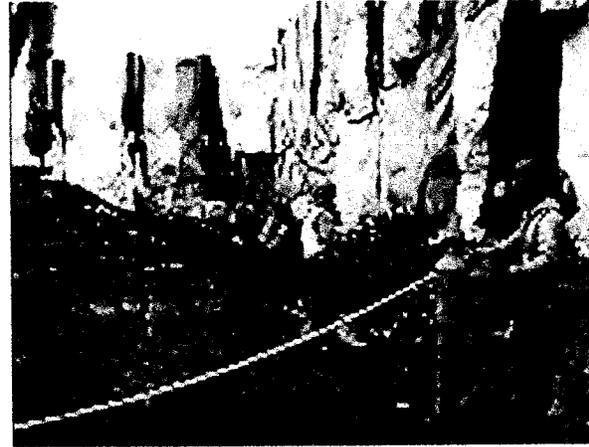
Six weeks ago I was a different person. I was calm and reasoned well, I was making future plans. Within the last six weeks that has changed on mentally and physically to where I have difficulty maintaining my patience, my sleep has radically changed from deep to a few hours at a time, my low-blood pressure is now 15-20 points higher than normal, and my hands sweat every time the pile driver booms into the ground.

My neighbor's dog whines and yaps all day to it out of frustration; my cat hates me because it can't nap during the day and my mind is foggy all the time too. There are days when I'm out somewhere and I feel oddly dizzy and fatigued and it frightens me a bit. And some days indoors when the pounding (physically visceral -- vibrating) is literally endless I feel like screaming back. We have two more weeks and I'm worried that it will have more than a side effect on my health. The continuous vibration during the day makes it impossible to nap and that is not good.
-Jen Elliott

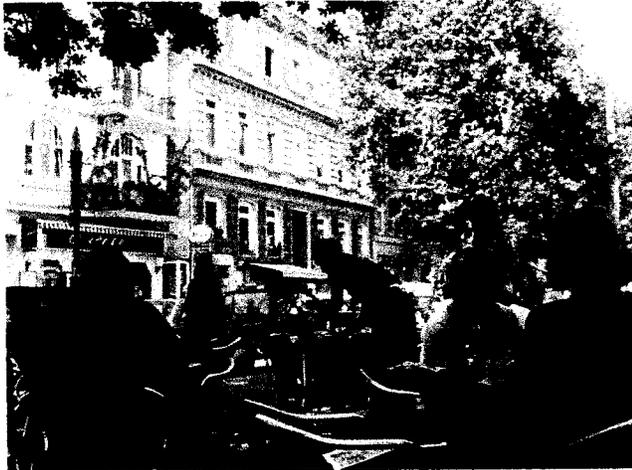
PRO



Development



PRO



Livability



Accounting the True Costs

Options & Opportunities

Compiled by Maura Jess May 14, 2014

SECTION 1:

Current available technology and practices that could be employed **TODAY**

From the NYC construction noise control products and vendor guideline sheet:
http://www.nyc.gov/html/dep/pdf/construction_guidance.pdf

NOISE BARRIERS

Carsonite AcoustaShield
www.carsonite.com

Sound Fighter
LSE Sound Barrier
www.soundfighter.com

Kinetics
Noise Block
www.kineticsnoise.com

NOISE CURTAINS

Sound Seal
BBC-13-2
www.soundseal.com

Illbruck Acoustic
SONEX Curtain
www.illbruck-acoustic.com

McGill AirSilence
Fibersorb Curtains
www.mcgillairsilence.com

SILENCERS & MUFFLERS

Universal Silencers
Silencers
www.universal-silencer.com

Burgess Manning
Silencers
www.burgessmanning.com

SECTION 2:

Current available alternative technology and practices for all FUTURE CONSTRUCTION

According to Garth Ullakko (Estimating and Superintendent at DeWitt Construction) DeWitt's choice to use the Driven Grout Pile machinery is based on the particular geological conditions at Block 17 where there is high risk of potentially contaminated soil. He explained that the need to get into the gravel level, which is quite deep, precludes the use an auger type drilling method which would bring up contaminated soil and would not reach the necessary depth.

Recent technologies employed by Foundation Piledriving Contractors appear to offer a number of alternative equipment choices which would address these special challenges and are "ideal for contaminated sites to avoid spoils, in low overhead conditions, in restricted site conditions, and on sites where noise and vibration are not tolerated".
(see following article)



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ALTERNATIVE PROCESSES SPECIALTY SOLUTIONS

At Foundation Constructors, we have a unique perspective on specialty piles. Specialty piles are generally considered "problem solver" deep foundation systems. Many projects are faced with extensive construction constraints. In urban environments, vibration or noise may be an issue. Pile driving hours may be strictly limited. Construction is often planned adjacent to sensitive unreinforced masonry buildings, high tech equipment buildings, hospitals, or entertainment studios, where vibration is an issue. The site may be low overhead. The site may be found to be contaminated, making off haul and spoil disposal costly. When you factor in the indirect cost of these outside factors, a specialty pile often proves to be the most economical solution on a total project cost basis. At Foundation we offer augercast piles and our FDP-EX series (Foundation Displacement Pile Series). Our FDP-EX Series consists of the following:

1. FUNDEX Pile (Cast in place Displacement Pile)
2. TUBEX GI (Grout Injection) Pile (A torqued in displacement pile with an outer grout/soil coverage)
3. TUBEX Pile (A torqued in displacement Pile with an oversized tip.)
4. EDTTEX Pile (A torqued in displacement Pile without an oversized tip)

Because we install various types of conventional piles, we can easily compare the costs and advantages of using alternate metho

Whether your project is in the design development stage or is already fully designed, our estimating and engineering team can wc with you to select the appropriate pile for your project. We can help determine the right pile type for your project with limited inform however the more information that is provided the more accurate we can be with piling and pricing options. Information we would have if available is site conditions, the column load and/or pile capacity required, and the geotechnical investigation. We work to understand your project's particular constraints to find the right system for the job.

[Specialty Pile Job List](#)

TUBEX GI PILES (GROUT INJECTION)

The TUBEX GI piles (Grout Injection) are steel and concrete pipe composite piles that are screwed into the ground under very high torque and down-pressure. As the piles are installed, a high pressure grouting system is used to pump grout through the pile tip to create a soil-cement grouted zone around the outside of the pipe. TUBEX GI piles are true soil displacement piles. Unlike conventional drilling methods TUBEX GI piles do not produce drill spoil, which creates off haul costs, and reduces skin friction capacity. Tubex are soil displacement, and the grouting actually increases the pile's effective diameter. **TUBEX GI piles are ideal for contaminated sites to avoid spoils, in low overhead conditions, in restricted site conditions, and on sites where noise and vibration aren't tolerated.**

[Download Tubex GI piles spec](#)

TUBEX PILES

The TUBEX piles are steel and concrete pipe composite piles that are screwed into the ground under very high torque and down-pressure. TUBEX piles are true soil displacement piles. Unlike conventional drilling methods TUBEX piles do not produce drill spoil, which creates off haul costs, and reduces skin friction capacity. Tubex are soil displacement, and the over sized tips increases the pile's surface are to allow for higher compression and tension capacities. **TUBEX piles are ideal for contaminated sites to avoid spoils, in low overhead conditions, in restricted site conditions, and on sites where noise and vibration are not tolerated.**

EDTTEX PILES

The EDTTEX piles are steel and concrete pipe composite piles that are screwed into the ground under very high torque and down-pressure. EDTTEX piles are true soil displacement piles. Unlike conventional drilling methods EDTTEX piles do not produce drill spoil, which creates off haul costs, and reduces skin friction capacity. EDTTEX are soil displacement with the same size diameter tips as the outside diameter of pipe. EDTTEX piles are ideal for contaminated sites to avoid spoils, in low overhead conditions, in restricted site conditions, and on sites where noise and vibration aren't tolerated.

Learn more about our [Edttex Pile Process](#)

FUNDEX PILES

Sometimes referred to as Full Section Soil Displacement concrete piles, Fundex piles differ from augercast piles in that structural concrete and full length reinforcing of any configuration are used to construct the pile that is fully inspectable. A high torque Fundex rotary table forces a mandrel into the ground to the bearing layer. A sacrificial boring tip fitted to the mandrel base prevents soil and water from entering the mandrel. Upon reaching the required depth, a reinforcing cage is placed up to full length of the pile, and structural concrete with aggregate sizes up to 1"--not grout-- is placed in the pile. The mandrel is then extracted leaving the tip, cage and concrete in place. There is no possibility of soil intrusion into the structural concrete, and the cage is fully inspectable for placement and code-required concrete coverage prior to placing the concrete. Installation produces no vibration, noise or spoils.

[Fundex piles](#) are true cast-in-place soil displacement concrete piles.

[Fundex Job List](#)

[Download Fundex Specs](#)

AUGERCAST PILES

An augercast pile is formed by drilling into the ground with a hollow stemmed continuous flight auger to the required depth or degree of resistance. A fine aggregate (fine to course sand) is then pumped into the hollow stemmed auger under pressure. Auger cast piles have specific advantages for some installations with difficult excavation requirements, in environmentally sensitive areas and the right soil conditions. These piles, however, are not suited for contaminated or rocky soils.

SECTION 3:

5 myths of Construction Noise (2012)

<http://www.sandv.com/downloads/1212thal.pdf> (see attached)

What Japan is doing (2007)

<http://www.piling-technologies.com/piling/3.html>

Japan is one of the most advanced countries of "anti-pollution" technologies and regulations. Several groups of Japanese innovative engineers challenged to invent the epoch-making piling machine which could drive and extract sheet piles virtually without noise & vibration. It was the Hydraulic Static Load Pile Pressing/Extracting Machine, which hydraulically pressed in and pulled out the sheet pile virtually without any noise or vibration.

After birth of this revolutionarily **environmentally-friendly** piling equipments, the Japanese Government strengthened the legal regulations for "noise & vibration" at the construction job site. As a result, all the contractors were obliged to use this kind of piling equipment especially when the job site was located in urban districts and other environmentally-restricted areas. In only several years most of the old-fashioned conventional types of piling equipments were replaced with these new high-tech **environmentally-friendly** piling equipments. "Noise & vibration" are now the problems of the past in Japan.

Five Myths of Construction Noise

Paul L. Burgé, URS Corporation, La Jolla, California

Erich Thalheimer, Parsons Brinckerhoff, Boston, Massachusetts

The requirements, techniques and tools for assessing and controlling construction noise are frequently misunderstood or conveniently ignored by those responsible for doing so. The failure to properly identify, plan for, and control noise and vibration at the construction site can result in a wide range of unintended consequences, up to and including work stoppages, public resentment, unwanted political and media attention, fines and threats of legal action. This article identifies and corrects several of the most common myths and misconceptions about construction noise assessment and control and helps to identify the correct regulations, tools and technical approaches for correctly addressing construction noise on federal, state and local projects.

Virtually any type of modern construction project includes some type of noise generation. For some types of projects, the temporary nature of the construction noise may be of only minor importance compared to the long-term operational noise, such as an airport runway. For other types of construction projects, such as the erection of a large office building, the construction process is largely the beginning and end of potential noise concerns.

While analysis or control of construction noise is typically required as part of a project from a regulatory aspect, this requirement is often ignored, misunderstood, or forgotten about, resulting in negative unintended consequences. This apparent lack of proper understanding or intent of construction noise policy and practice is often replaced with persistent myths and misconceptions about construction noise, such as how it can't or shouldn't be bothered with as part of the planning process or actual construction activities. We have collected some of the most persistent, and false, rumors, myths, and misconceptions regarding construction noise (typically perpetuated by folks other than noise control professionals) and attempt to provide some legitimate and compelling information to refute or correct them.

Please also note that the term "construction noise" as presented in this article can generally be taken to include both construction noise and vibration, especially when the devices, equipment or processes that produce one can often produce both.

Myth 1—Construction Noise is Just a Temporary Nuisance. Define temporary. This may be true for some smaller projects that will only produce a limited amount of noise and involve a few days of construction work with few nearby sensitive receivers. However, many large-scale projects will require months or even years of noisy construction activity, and suggesting to angry neighbors that it is "only temporary" may result in negative and unexpected consequences, including a loss of credibility. As a result, demonstrating a short duration for noisy construction activities (such as a few days or weeks) may serve to lessen or limit some noise impacts, but in general "temporary" is no free pass for properly identifying construction noise impacts or appropriate noise abatement options.

This is particularly true for projects that require construction work at night. Often control of noise takes a back seat to traffic mitigation. Consequently, construction work that requires taking (closing) a traffic lane will be scheduled for nighttime hours to avoid commuter disruptions. Unfortunately this invariably leads to sleeping disturbance for nearby residents. Experience has shown that people can tolerate one night of disruption; however, they will become much more upset after two nights of excessive noise. And after three nights they are increasingly likely to band together, complain to the police, contact their local elected representatives and the newspapers, and demand that the work be stopped.

Myth 2—Construction Projects Don't Need to Follow Restrictions for Noise. While some local jurisdictions may have noise



Noise-control curtains being used to reduce noise emissions from a rock-drilling operation to the surrounding community.

ordinances or other laws or standards that specifically exempt construction noise, these exemptions often have strings attached, such as limits on nighttime or weekend construction activity, which may or may not be consistent with project construction schedules. In addition, if a project falls under the policy or guidance of a state or federal agency that requires construction noise analyses and abatement, a local construction noise ordinance exemption will typically not relieve that obligation. Indeed, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), the Federal Energy Regulatory Commission (FERC) and many other federal, state and local agencies specifically require construction noise and vibration analyses during the environmental phase of their projects (regardless of local exemptions).

Myth 3—There Aren't Enough Tools or Resources to Adequately Evaluate Construction Noise. Actually, there is a significant amount of guidance manuals and other tools to assist in developing defensible construction noise and vibration analyses, including free resources from many federal and state agencies. The following offers some of our favorites:

- FHWA Highway Construction Noise Handbook (http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/)
- FHWA Roadway Construction Noise Model (RCNM) (http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/)
- FTA Transit Noise and Vibration Impact Assessment Manual, Chapter 12 (http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf)
- FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment Manual, Chapter 10 (<http://www.fra.dot.gov/eLib/Details/L04090>)
- Caltrans Manual for Highway Construction Vibration (vibration only) (http://www.dot.ca.gov/hq/env/noise/pub/Vibration_Guidance_Manual_Jun04.pdf)
- Power Plant Construction Noise Guide (out of print, but still a helpful reference), Empire State Electric Energy Research Corporation, New York

It is important to realize that even though all of these references were developed for use on particular project types (highway, rail, power plants), the information that they reference and the methods that they outline are general in nature and lend themselves for use on a wide variety of project types. For example, a large bulldozer or pile driver generally creates the same amount of noise and vibration

Based on a paper presented at Inter-Noise 2012, the 41st International Congress and Exposition on Noise Control Engineering, August 2012.

regardless of the project type.

Myth 4 Construction Noise Cannot be Effectively Controlled. Construction noise is just sound that happens to come from construction activities; there is no reason it cannot be predicted, measured, controlled and managed just like any other type of noise. Some construction equipment or processes will be particularly noisy. These include impact and vibratory pile drivers, hoe rams, jackhammers, rock drills, vacuum excavator trucks, and blasting events (if needed). Therefore, use of this equipment should be carefully scrutinized for potential noise impacts prior to their use, and mitigation measures should be required on a *proactive* basis. Control measures could include avoidance of these devices at night, required use of low-noise equipment models, required use of alternative quieter methods, or required use of noise barriers. The bottom line is that the best form of noise control is to *avoid* making noise in the first place.

If noise complaints are being received, then project managers must have the ability to effectively react in a timely manner. This usually means having a trained noise technician on hand and ready to respond to investigate the circumstances and evaluate conditions in the field that led to the complaints. Noise measurements should be performed, or recorded noise data should be reviewed, to see if the contractor was exceeding noise limits. If exceedances are found, then project managers can feel confident directing the contractor to immediately implement effective mitigation measures, or cease work, without fear of being charged by the contractor with expensive claims for lost productivity and inefficiencies.

All reasonable and feasible construction noise mitigation measures should be considered for potential noise-reducing effectiveness, cost, and burden on the contractor to maintain. In general, mitigation measures can be applied at the noise *source*, along the *pathway*, and/or directly affecting the *receiver*. Examples include:

Source Controls

- Time constraints – prohibiting work during sensitive nighttime hours
- Scheduling – performing noisy work during less sensitive time periods
- Equipment restrictions – restricting the type of equipment that can be used
- Specialty products – special-purpose pads, liners and enclosures
- Noise emission limits – specifying equipment noise limits (i.e., L_{max} at 50 feet)
- Substitute methods – using quieter methods or equipment when possible
- Engine exhaust mufflers – ensuring equipment have quality mufflers installed
- Lubrication and maintenance – well maintained equipment will be quieter
- Reduced-power operation – use equipment of only necessary size and power
- Limit equipment on site – only have necessary equipment at work site
- Noise compliance monitoring – have a technician on site to monitor compliance
- Quieter backup alarms – manually adjustable, ambient-sensitive, or broadband alarms, or prohibition, providing an observer directs the vehicles' rearward motion

Pathway Controls

- Noise barriers – permanent or portable, wooden, metal, plastic or concrete barriers
- Noise curtains – flexible vinyl curtains hung from supports or draped over equipment
- Enclosures – encasing/enclosing localized and stationary noise sources
- Increased distance – perform noisy activities farther away from receptors or off-site

Receiver Controls

- Window soundproofing – installing double- or triple-pane windows or storm windows
- Air conditioners – allow windows to remain closed and provides background noise
- Receptor noise limits – cumulative noise limits at receptor loca-

tions (i.e., L_{eq} or L_{10})

- Community meetings – open dialog to involve affected public and share information
- Noise complaint process – ability to log and respond to noise complaints
- Temporary relocation to hotels – only in extreme, otherwise unmitigatable cases

Myth 5 Contractors can be Trusted to Control their Own Noise. Experience has shown that it is a rare contractor who can be trusted to self-monitor and self-regulate its own construction noise. Unfortunately, doing so would most often be counterproductive to work schedule and efficiency. And like they say, "time is money!" When projects have allowed contractors to monitor their own noise, the results seem to invariably conclude that the contractor is working in full compliance with all regulations and limits, even when that's obviously not the case. Consequently, it is a far better arrangement to have the construction management team or an independent entity be responsible for monitoring contractor compliance in the field. But monitoring alone is useless unless it is done to evaluate compliance with a comprehensive construction noise specification upon which mitigation actions can be justified.

A well written construction noise specification is essential for being able to manage construction noise and to manage the contractor in the field once work begins. It must be fair and balanced, meaning that it allows for the necessary work to be performed while also protecting the public from unreasonably excessive noise. The specification should clearly state, for the benefit of the contractor and the affected public alike:

- Exactly what equipment or activity restrictions will be in effect
- The noise criteria limits that will be enforced
- The requirements for developing noise control plans
- Expected capability of noise mitigation measures
- The means and methods by which the contractor will be evaluated for compliance, including payment or punishment.

This way the contractor knows what to expect going into the project and can account for it in the competitive bid price. Once a contractor wins the job, they then "own" the responsibility to comply with the noise specification.

Construction noise specifications should be "performance-based" specifications, meaning that the contractor is free to perform the work as they see fit and to find their own solutions so long as they comply with the noise limits and restrictions in the specification. Project officials should not be directing the contractor on how to mitigate excessive noise, otherwise the contractor can be excused from blame if the methods don't work as hoped. The bottom line is that the contractor is responsible for complying with their noise specification limits, and if they fail to do so, they can be financially punished or work can be temporarily halted.

Construction noise criteria should combine limits for both steady (continuous) noise as well as short-term (transient) noise. For example, the L_{eq} or L_{10} noise metrics, expressed in A-weighted decibels (dBA), have been shown to work well at regulating continuous construction noise when evaluated (averaged) over a period of an hour or less. This time duration allows for a timely response to noise complaints yet is not overly sensitive to occasional short-term loud noises the contractor may produce. To address impulsive noises, a short-duration metric such as the L_{max} should be specified as well. These limits should be evaluated at community receptor exterior locations for ease of monitoring.

Absolute noise limits or relative increase noise limits (e.g., background plus 5 dBA) can be specified providing they allow for the necessary work to advance while also providing the community with the protection required. It is also suggested that separate noise limits be established for daytime and nighttime periods, because background noise conditions can vary dramatically throughout a 24-hour period. Finally, noise limits can be tailored somewhat to the sensitivity of the receptors, meaning that less stringent limits can be applied to industrial or commercial receptors, while more restrictive limits can be applied to residential receptors.

Bonus Myth There is no Way to Mitigate Noise From Pile Driving. Pile drivers, when present, are typically the loudest noise source on a construction site, but they do not necessarily have to

operate without effective noise control measures. Reducing noise from pile driving benefits not only the community but also laborers on the job site as well. Options to consider for controlling pile driver noise and related noise reduction benefits could include the following:

- Pre-auger or pre-trench the pile holes to loosen the ground (-5 to 10 dB).
- Use a nylon or rubber pile cap cushion on top of the piles (-5 to 10 dB).
- Use a bellows system around the pile as a noise enclosure (-15 to 20 dB).
- Use temporary noise barriers mounted close to the pile driver -5 to 10 dB).
- Use a vibratory pile driver instead of an impact pile driver (varies depending on pile and soil types).
- Use a hydraulic pile driver instead of an old diesel pile driver (-5 to 10 dB).

- Use a different system altogether such as slurry walls or a hydraulic pile pusher.
- Restrict the time of day when pile driving operations can occur.

References

1. *Construction Noise Handbook*, U.S. Department of Transportation, Federal Highway Administration, DOT-VNTSC-FHWA-06-02, August 2006.
2. *FTA Transit Noise and Vibration Impact Assessment*, U.S. Department of Transportation, Federal Transit Administration, FTA-VA-90-1003-06, May 2006.
3. *Transportation- and Construction-Induced Vibration Guidance Manual*, Jones & Stokes, J&S 02-039, Prepared for California Department of Transportation, Noise, Vibration, and Hazardous Waste Management Office, Sacramento, CA, June 2004.
4. *Power Plant Construction Noise Guide*, Empire State Electric Energy Research Corp., New York, May 1977.
5. E. Thalheimer, "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project," *Noise Control Eng. J.* Vol 48, No 5, pp. 157-165, September-October 2000. 

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