

From: [Glen Garfunkel](#)
To: [Council, City](#); [Lait, Jonathan](#); [French, Amy](#)
Cc: [Abendschein, Jonathan](#); [Eggleston, Brad](#); [Adam Sweeney](#); [Gary Latshaw](#); [Veenker, Vicki](#); [Burt, Patrick](#)
Subject: Electrification (Noise) Ordinance & Heat Pumps - letter for City Council, for Nov 6th mtg (related to Consent Calendar item #8 (Electrification Equipment Ordinance))
Date: Friday, November 3, 2023 5:31:43 PM

Some people who received this message don't often get email from glen100@gmail.com. [Learn why this is important](#)

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Members of the City Council of Palo Alto, and Staff,

We would like to clarify some issues and restate our ordinance proposal, concerning heatpump placement in sideyards.

All arguments given in our 9/25 letter below to council below still stand, including our suggestion to set the property boundary Noise Level limit to 60dBA, especially for inverter heatpumps. Our proposal to set the property boundary Noise Level limits at 60dBA is supported for these reasons:

- 60dBA is the noise level of normal conversation. An electric tooth brush at 3feet measured 65dBA. Cabin noise in a quiet car at highway speeds will measure 65dBA, or more. The point is, 60dBA is not loud. [Noise example link 1](#). [Noise example link 2](#).
- Inverter heatpumps as explained in our 9/25 letter below, rarely operate at the full speed noise levels. Reported spec'd noise level('sound pressure') is full speed (worst case). We can expect inverter heatpump noise levels to typically be several dB below the spec'd value. Our [own measurement of noise vs fan speed is given here](#) showing a strong noise dependence vs fan rpm (and compressor speed). A fan speed reduction of each 10% gives an additional 4 dB noise drop (these fan speed reductions seem to be common in inverter heatpumps).
- As distance from a noise source doubles, it's noise level drops by 6 dBA. As heatpump noise levels are spec'd at 3 feet, then at 6feet the noise will be 6 dB down (and at 12 feet(=6 doubled) it will be down 6 dB doubled = 12 dB). So eg for a 60 dBA heatpump placed 3 feet from a property line, then at *only three feet* into the neighbors property, the noise is already down to 54 dB. The point is, the noise levels drop rapidly with distance, and so impact to neighbors is small and very localized.
- We feel it is also helpful to understand that if a heatpump installation for some reason does result in noise exceeding some target limit, there are low cost measures that can be taken to help suppress the noise; reduction up to several dB or more may be expected, depending on situation details. For example, sound blankets for compressors (installed inside the heatpump) seem to be available for some manufactures/models. Exterior grade sound suppression blankets to be hung on nearby walls or fences are an additional option. From our own measurements we find a clear 3dB noise reduction from a simple standard solid wood fence. Stone or masonry walls are well known to be noise barriers (eg on highways near residential areas) and many dB reduction can be expected for this case (of course wall or fence height of 5-6 feet is preferred). For some

heatpumps, fan (and compressor) speed can be directly controlled and limited, and numerous models allow a 'night' mode which reduces usage at night; in addition, simple thermostat nighttime settings(lower temp settings) can be used to minimize usage(noise) at night.

- [Data by Bret Andersen & Bruce Hodge](#) of Carbon Free Palo Alto has shown that the commonly available heatpump selection would still be quite restricted by the current(Nov 3) 55 dBA limits.

For these reasons, along with the importance of facilitating electrification to reach our climate goals, we strongly encourage Palo Alto to establish property boundary noise targets of 60 dBA, for heatpump sideyard installations for inverter heatpumps and especially for properties with restricted sideyards of 8 feet or less.

Thank you for your consideration.

Glen Garfunkel
Climate Reality Project - Silicon Valley Chapter (Co-Chair)
<https://www.climate reality silicon valley.org/>

Begin forwarded message:

From: Glen Garfunkel <glen100@gmail.com>
Subject: Noise Ordinance and Heat Pumps - letter for City Council
Date: September 25, 2023 at 11:58:30 AM PDT
To: City.Council@cityofpaloalto.org
Cc: Adam Sweeney <adamsweeney1@gmail.com>, Debbie Mytels <debbie.mytels@gmail.com>, "Lait, Jonathan" <Jonathan.Lait@CityofPaloAlto.org>, "French, Amy" <Amy.French@CityofPaloAlto.org>, Jon.Abendschein@cityofpaloalto.org

Sept 25, 2023

Re: Proposed Amendments to Municipal Code Concerning Noise Ordinances and Heat Pump Setbacks

Honorable Members of the City Council of Palo Alto,

There needs to be a suitable balance between important electrification goals and worst case noise concerns. Sideyard placement for heat pumps (suitcase footprint style) is preferable for many home owners with common lot sizes, and accommodating this placement will facilitate adoption of heat pumps. But noise ordinances which are overly conservative will unnecessarily impede the adoption of heat pumps. We believe the proposed noise ordinance is too conservative in two respects.

First, it does not make accommodations for 'inverter' type heat pumps, which generally

operate at conditions much quieter than their dBA noise value, which by definition is the worst case noise value. Inverter heat pumps have variable speed fans (and compressors) and rarely operate at 100% speed. Non-inverter heat pumps, on the other-hand, are either 100% on (full speed) or completely off. While non-inverter heat pumps regulate building temperature by toggling on(100%) and off(0%), inverter heat pumps can vary heat (or cooling) delivery continuously, and will modulate down to match the load, and normally operate well under 100% speeds(capacity). At reduced speeds, inverter heat pumps can easily be 5dBA or more quieter than at the full speed(dBA). ('Night mode' and fan speed limits exist in some models explicitly for noise reduction purposes.)

This inverter heat pump issue is referenced briefly in staff introduction to the proposed ordinance, but the ordinance so far does not address this. We strongly encourage Palo Alto to address this and relax the noise requirements for inverter heat pumps to strike a more reasonable balance between rare low occurrence noise issues, and electrification goals.

Our second point of concern is that regardless of heat pump types, the noise requirements appear overly conservative. The ordinance seeks to maintain a noise level of less than 50dBA at the property line nearest the heat pump, and imposes heat pump noise limits of 53dBA for a setback of 5 feet from the property line, and further setback limits for slightly higher noise cases. But normal speech can measure around 60dBA, and cabin noise levels inside a car at normal speeds are typically in the ballpark of 65-70dB(A). We experience these levels everyday.

While Palo Alto here is seeking to keep noise under 50dBA at the property line other communities have different higher noise limits. From a brief search we find Portland OR targets at 55dbA, numerous cities target 60dBA, Houston TX targets 65dBA, and it appears Chicago may have limits over 70dBA (daytime noise limits). We suspect there are very few (if any) appropriate heat pumps that would meet these proposed dbA limits, and the ordinance impact would be to severely limit and delay the installations, force homeowners to install in front or back yards, and frustrate them in the process. In practice heat pumps are installed in various other communities in sideyards with 5-8feet of space, with little known issue.

There are a few other factors too that should be pointed out that support higher noise limits. Noise levels drop 6dB with the doubling of distance, so for example a 56dbA heat pump placed at 6.0feet from property line would just fail the ordinance(50dB at property line), but measured at only another 6 feet into the neighbor's property, it's noise level would be down to 44-45dBA, which is very low. The basic point is that noise levels decay strongly with 'doubling distance', so for heat pump placement in sideyards close to the property line, eg at 5 feet, then the doubling distance is only 10feet, and the *zone of elevated noise* in the neighbor's property is exceedingly small. (This is not true if the noise source is say 50feet *from* property line, and it's noise value reaches 50dBA at the property line: here one need to go 50feet into the neighbors property to reach the additional 6dB drop in noise.). Sideyard placement is important, and we feel this consideration of the short spatial extent of the noise further supports additional relaxation of the ordinance.

There is another detail worth noting. Heat pumps will run strongest when it is very hot or very cold, but that is exactly when people tend to keep their house windows closed. So in practice, at least for indoor noise (from the outdoor unit), on average, this will tend to additionally reduce noise levels that residents are exposed to.

For sideyard installations we propose that the ordinance target to reach 60dBA at the property edge.

Due to the importance of the electrification efforts in addressing our climate goals, we feel every effort should be made to assure that the ordinances facilitate heat pump installations and do not unnecessarily restrict them. We appreciate your review and consideration of these issues.

Sincerely,

Glen Garfunkel, Co-Chair, Climate Reality Project - Silicon Valley Chapter

Adam Sweeney, Co-Chair, Climate Reality Project - Silicon Valley Chapter

Debbie Mytels(Palo Alto Resident), Decarbonization Action Director, Climate Reality Project
- Silicon Valley Chapter.

From: bretande@pacbell.net
To: [Lait, Jonathan](#); [French, Amy](#); [Council, City](#)
Cc: [Abendschein, Jonathan](#); [Eggleston, Brad](#); [Eggleston, Brad](#); [Hodge, Bruce](#)
Subject: Heat Pumps and the Electrification Equipment Ordinance - Consent item 8, Nov. 6th, 2023 meeting
Date: Tuesday, October 31, 2023 8:00:53 PM
Attachments: [PastedGraphic-1.png](#)
[image002.png](#)

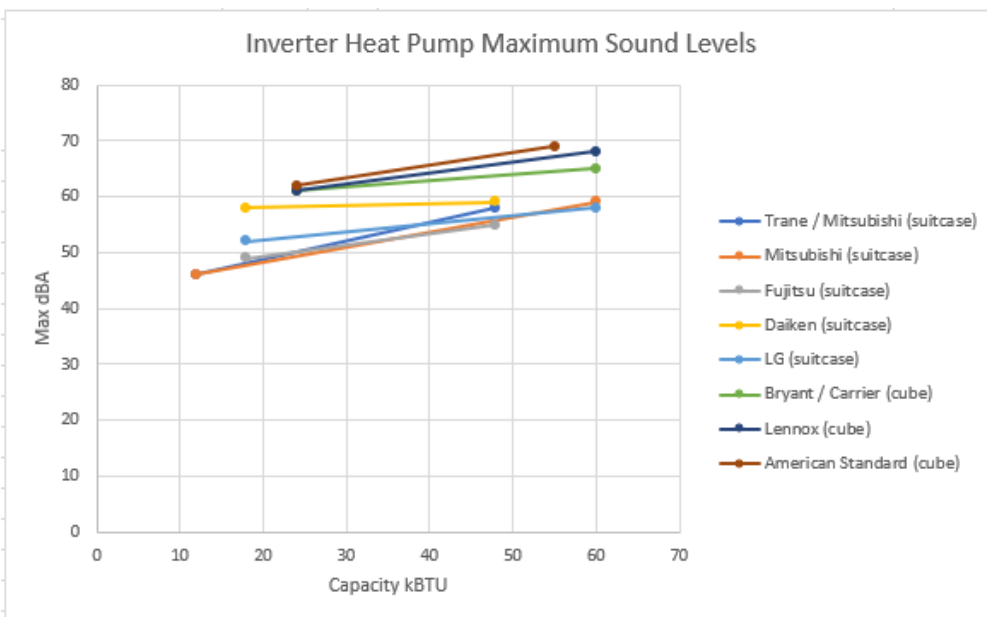
CAUTION: This email originated from outside of the organization. Be cautious of opening attachments and clicking on links.

Hello Council and Staff Members,

Thanks for the continuing work on the proposed noise ordinance changes.

We would like to re-emphasize the need for continued discussion and clarification of the current proposal. The most important concern is the allowable noise limit for inverter heat pumps. We continue to believe the levels in Table 1 of Attachment A should be raised by 5dBA (to a maximum of 60dB at a 3 foot setback).

We are strengthening our argument (laid out in our prior letter, attached) with results from some additional analysis of [Heat Pump HVAC Noise Levels](#) for popular inverter models. The latest chart below adds more product lines and highlights the two types of units, the low profile, "suitcase", style units and the familiar "cube" shaped units typical of central AC systems. You can see that the suitcase modes have significantly lower maximum sound levels as a group. Most single family homes in Palo Alto will likely need units on the high end of the capacity range, 36kBTU or above which means the quietest units available for them will fall in the 55 - 60dB maximum sound level range.



Aside from the substantive change needed above, the proposed Table 1 of Attachment is in need of correction and clarification. We understand the purpose of the Table 1 is to define exceptions to the established noise ordinance maximum sound levels only for standard heat pumps and inverter heat pumps as specific subcategories of Electrification Equipment. In that case the first two columns would apply to standard heat pumps (currently "Equipment") and the 3rd and 4th columns to inverter heat pumps (currently "inverter pumps"). These terms should be clearly defined and table labeled accordingly.

Thanks for your consideration. We are happy to discuss the topics in more detail any time.

Best Regards,

Bret Andersen
Bruce Hodge

Carbon Free Palo Alto

From: Bruce Hodge <hodge@tenaya.com>
Sent: Thursday, October 19, 2023 11:14 AM
To: Jonathan Lait <jonathan.lait@cityofpaloalto.org>; Amy French <Amy.French@CityofPaloAlto.org>; City Council <city.council@cityofpaloalto.org>
Cc: Jonathan Abendschein <Jon.Abendschein@CityofPaloAlto.org>; Eggleston, Brad <Brad.Eggleston@CityofPaloAlto.org>; Bret Andersen <bretande@pacbell.net>
Subject: <DRAFT>Palo Alto's Proposed Noise Ordinance: Relevant Data and a Proposal

Hi All,

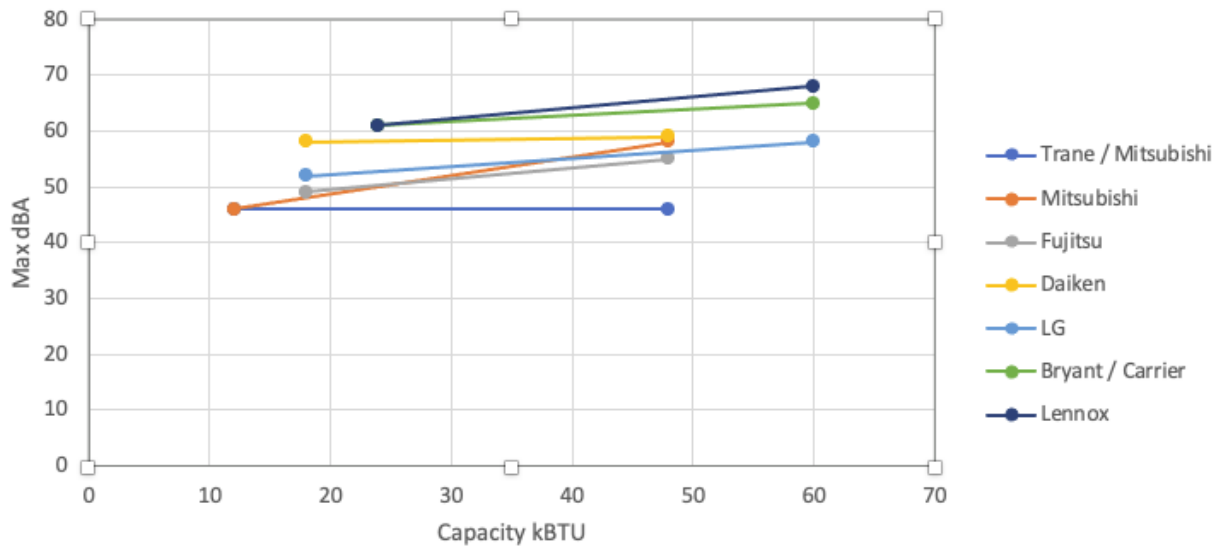
Thanks for your work on this important ordinance which has an outsize impact upon the ability of Palo Alto to electrify and meet its 80/30 climate goals.

First we offer two different spreadsheets, then a proposal.

The document [Sound levels in side yards](#) essentially provides the reverse relationship established by the proposed ordinance - for a given allowed noise level (in dBA) at the property line it lists the maximum sound levels for any device given its distance from the property line. We've listed values in 1 ft increments starting at 3' from the property line and ranging up to 10' away. It's quite easy to extend the table to have a finer granularity of distances or a greater range. This table is populated using the formula referenced by this [resource](#) and assumes that the maximum sound levels provided by the manufacturer are measured at 3' from the device. The table in the proposed ordinance makes the same assumption.

Looking at the lines in the table for 55 dBA as the maximum allowed noise (starting at line 18), one can see that a device located at 3' from the property line would have to be rated at 55 dBA or less. This is essentially the situation for all 6' side yards (we allocate a 3' wide zone for a device sited next to the building wall). If you have a 8' side yard then you can locate the device 5' from the property line and your device can emit up to 59.4 dBA. So 55 dBA for inverter units is better than before, but it's still problematic for 6' side yards. The reason for that is that not many devices have sound levels low enough to qualify.

[HP HVAC Noise Levels](#) shows data from a survey of maximum noise levels of heat pump inverter condensers from various primary manufacturers. The range of maximum noise levels is approximately 48-68 dBA. Based on our limited survey and incorporating some amount of guesswork, we estimate that only about a third of the units we surveyed qualify at the 55dBA property line limit in 6' setback yards. If that limit is raised to 60dBA at the property line, then about half of the units would qualify in 6' setback yards.



We also note that manufacturers vary in the way the measure and disclose levels, some provide a minimum sound level (e.g. Bryant / Carrier) in brochures and maximums only in their data sheets. Some values in the table and graphs are extrapolated in those cases. We did not check every model in every range but we attempted to capture the low and high capacity, which generally corresponds to lower to higher max noise levels for units within a given model range. We would actually be in favor of disallowing devices where the manufacturer does not provide maximum noise levels. It would also be helpful if all manufacturers disclosed their methodology for obtaining the maximum sound levels.

In light of this data, we propose adding a third table that allows up to 60 dbA at the property line for inverter based units in 6' setback yards. This could be conditional such that if about half of available units eventually qualify under the 55 dbA limit, then the 60 dbA limit would be retired.

We're in favor of moving ahead with the current 55dbA limit for inverter units for now to allow projects that have been put on hold to proceed. Then staff should come back in 3 months or less with further analysis and either accept our proposal or make a counter proposal that would allow a greater choice of inverter units in 6' side yards.

Thanks for your attention to this and happy to answer questions or meet.

Best,

Bruce Hodge
Bret Andersen

Carbon Free Palo Alto

From: [Bruce Hodge](#)
To: [Council, City](#)
Subject: Fwd: Palo Alto's Proposed Noise Ordinance: Relevant Data and a Proposal
Date: Monday, October 30, 2023 7:56:16 PM
Attachments: [PastedGraphic-1.png](#)

CAUTION: This email originated from outside of the organization. Be cautious of opening attachments and clicking on links.

Forwarding to City Council since it didn't show up in public comment letters posted by the City.

Thanks,
Bruce Hodge

Begin forwarded message:

From: Bruce Hodge <hodge@tenaya.com>
Subject: <DRAFT>Palo Alto's Proposed Noise Ordinance: Relevant Data and a Proposal
Date: October 19, 2023 at 11:14:17 AM PDT
To: Jonathan Lait <jonathan.lait@cityofpaloalto.org>, Amy French <Amy.French@CityofPaloAlto.org>, City Council <city.council@cityofpaloalto.org>
Cc: Jonathan Abendschein <Jon.Abendschein@CityofPaloAlto.org>, "Eggleston, Brad" <Brad.Eggleston@CityofPaloAlto.org>, Bret Andersen <bretande@pacbell.net>

Hi All,

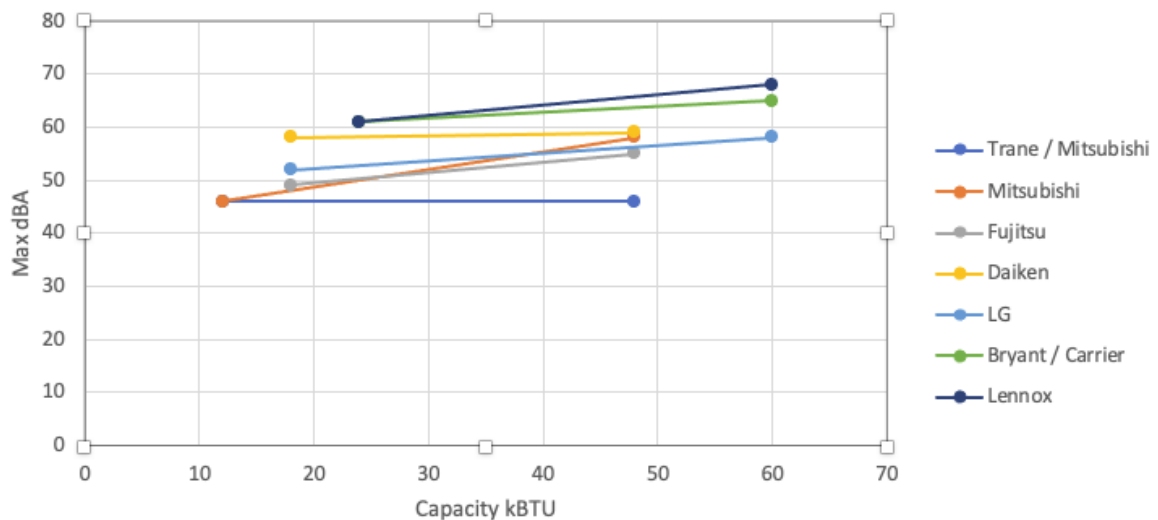
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Bruce Hodge
Bret Andersen

Carbon Free Palo Alto