



November 6, 2019

Dear Mr. Marshall:

Attached are a copy of the slides that we plan to present at the October 13, 2019 Planning Board meeting. Also included to the attached file is a request for information (RFI) that was recently provided to DEP with respect to air, odor, noise, dust, visual and other potential impacts to nearby uses. We ask the Planning Board to make a similar request of the applicant. Much of the data requested is listed under the “noise” umbrella, but the data requested also would be used for air quality, so that is why it is appended at this time. To be clear, we are not requesting to testify on noise at this hearing.

Attached to that RFI is a Technical Bulletin that was published in cooperation with a number of state agencies, including DEP. The Bulletin is intended to help municipalities develop noise standards and to help Boards and public officials understand the intent of the individual standards. The bulletin is set up in an excellent two column format with individual “standards” in one column and a “discussion” in the other for maximum understanding and reference. While this public bulletin was developed for noise, the general approach and “discussions” can be applied to all potential impacts on nearby uses to the proposed project. Again, even though this is a Noise Ordinance Bulletin, we are not requesting to testify on noise at this hearing, as it is our understanding from your email posting to us that this hearing is limited to air emissions.

As you will see from the slides, there is significant information provided that was not provided to the City in the application. We anticipate that this presentation will take 20 minutes to complete properly. It really should not be shortened as it is important to travel from the beginning, through the regulations, to the concerns, and to the two example model runs, so the Planning Board can best visualize the concerns. While I understand that a 20 minute presentation may exceed the allotted 10-minute window for Interested Parties, it has been my professional experience when presenting to municipal volunteers that when (1) someone is providing new information to a Board that can aid in their understanding, that they often see the benefit and make an exception, especially if it is requested in advance like herein, and (2) the time limits and the number of systematic hearings have drastically reduced the number of commenters at any one hearing. They have served their purpose. The focus now should be on the best public review process possible.

Lastly, after the proponent reviews the attached presentation, and if they would like to provide additional comments to the Board outside of their application in response to the attached testimony, Upstream Watch is willing to agree to reduce the 7-day window for them to provide comments to the Board, so that the meeting on November 13, 2019 does not need to be rescheduled. As long as we receive a copy of their presentation by Close of Business (5 PM) on Friday, November 8, 2019, Upstream Watch will have time to review and make verbal comments at the meeting in response.

Please note that the model outputs provided in the attached presentation are not intended to be used to confirm or deny actual compliance, and therefore it is not imperative that the proponent respond with models themselves immediately, and especially by this next meeting. They are intended simply to illustrate our concern, and to suggest future compliance work as the public review process continues.

Thank you and I will see you next Wednesday.

Sincerely,

Michael Lannan, P.E.

On behalf of Upstream Watch

# NAF Air Quality Study Review

On behalf of Upstream Watch



# Air Quality Definitions

- Belfast Zoning Sec. 102-1126
  - **Air pollution.**
  - Uses which would cause emission of dust, fly ash, fumes, vapors or gases which will have an adverse impact on human health, animals, vegetation, or property, or strain persons or property, at any point beyond the lot line of the commercial or industrial establishment creating that emission shall be prohibited. **All such activities shall also comply with applicable federal and state regulations.** **Construction is not a use** for the purposes of this section.
  - **Based on this Section, it is important that the proponent be able to demonstrate compliance at the local, state and federal air quality rules prior to approval**
  - **Construction emissions are not exempt from the Clean Air Act, which is a federal requirement enforced at the state level**



# Air Quality Definitions

- DEP 06-096 Chapter 100: DEFINITION REGULATIONS
- **9. Allowable emissions.** "Allowable emissions" means the emission rate of an emissions unit or source calculated using the maximum rated capacity of the emissions unit, unless the emissions unit is subject to license conditions which restrict the operating rate, or hours of operation, or both, and the most stringent emission rate applicable to the emissions unit as reflected in the emission license (including those with a future compliance date) or applicable state or federal standards or regulations.
  - **The Air Quality Analysis is performed on "Allowable Emissions" since annual hours of operation of the power plant are restricted by a maximum of 900,000 gallons of fuel usage per year**



# Air Quality Definitions

- Chapter 100: DEFINITION REGULATIONS
- **55. Fuel-burning equipment.** "Fuel-burning equipment" means any furnace, boiler, apparatus, and all appurtenances thereto used in the process of burning fuel, for the primary purpose of producing heat and power, including stationary internal combustion engines...
  - **At a minimum the following fuel burning activities may be necessary at this facility:**
    - Facility Power Plant (Included in the Air Quality Application)
    - Boilers for the Process Buildings (Not Included)
    - Boilers for the Wastewater Treatment Operations (Not Included)
    - Boilers for the Water Treatment Operations (Not Included)
    - Boilers for the Slaughterhouse Operations (Not Included)
    - Boilers for the Administrative Buildings (Not Included)



# Air Quality Definitions

- Chapter 100: DEFINITION REGULATIONS
- **22. Building, structure, facility or installation.** "Building, structure, facility or installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)...."
  - **Although smaller boilers need not be considered for assessing the source classification, they are part of the "Facility" for compliance with the Clean Air Act**



# Air Quality Definitions

- Chapter 100: DEFINITION REGULATIONS
- **89. Minor source.** "Minor source" means any source which emits or has the potential to emit regulated pollutants excluding GHGs at rates less than significant emissions and is not defined as a Part 70 source.
  - The air quality analysis assumes a Chapter 115 minor new source application based upon Table 2 from the Air Application Report and the Part 70 Source Thresholds

Table 2-2: Facility Wide Annual Potential To Emit (TPY) & Regulatory Thresholds

Pollutant	Engines 1 - 8 PTE	Modeling Threshold	Major Source Threshold	Major/Minor Designation
NOx	49.8	50	100	Minor
PM	1.4	n/a	100	Minor
PM <sub>10</sub> & PM <sub>2.5</sub>	1.9	25/15	100	Minor
CO	49.8	250	100	Minor
VOC	2.7	n/a	50	Minor
SO <sub>2</sub>	0.1	50.0	100	Minor
CO <sub>2</sub> e	10395.0	-	-	-



# Air Quality Definitions



- Chapter 100: DEFINITION REGULATIONS
- **137. Potential to emit.** "Potential to emit" means the maximum capacity of a stationary source to emit any regulated pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a regulated pollutant, including air pollution control equipment, and restrictions on the hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design only if the limitation or the effect it would have on emissions is federally enforceable as a practical matter. Secondary emissions do not count in the determining the potential to emit of a source.
  - The potential to emit (PTE) is limited by the engine fuel limitation, but no fuel is considered for other sources facility-wide
  - Although mobile sources are not included in the Potential to Emit that does not mean that they are exempt from an air quality compliance demonstration

# Air Quality Definitions



- Chapter 100: DEFINITION REGULATIONS
- **152. Secondary emissions.** "Secondary emissions" means emissions which occur as a result of the construction or operation of a source or modification, but do not come from the source or modification itself. Secondary emissions must be specific, well defined, quantifiable, and impact the same general areas as the source or modification which causes the secondary emissions. Secondary emissions include, but are not limited to: (1) emissions from any offsite support facility which would not be constructed or increase its emissions except as a result of the construction or operation of the source or modification; (2) emissions from ships, trains, trucks or other mobile sources associated with the new source or modification.
  - **As described in the Potential to Emit definition, secondary emissions are not included in the calculation for classification, however construction activities meet the definition of secondary emissions**

# Air Quality Requirements



- Chapter 115: MAJOR AND MINOR SOURCE AIR EMISSION LICENSE REGULATION
  - **Chapter 115 (1)(B)(2):** An air emission license is required for the following:
    - (a) **Fuel-burning equipment (or combinations thereof), whose total maximum design heat input is equal to or greater than 10.0 million British Thermal Units per hour.** Fuel-burning equipment, excluding stationary internal combustion engines, less than 1.0 MMBtu/hr shall not be included in this threshold assessment and stationary internal combustion engine less than 0.5 MMBtu/hr shall not be included in this threshold assessment.
    - (b) **Stationary internal combustion engines (or combinations thereof) whose total maximum design heat input is equal to or greater than 5.0 million British Thermal Units per hour** or a gas/propane fired stationary internal combustion engine (or combination thereof) with a total maximum design heat input of equal to or greater than 10.0 million British Thermal Units per hour. Units less than 0.5 MMBtu/hr shall not be included in this threshold assessment.
  - **While the boiler PTE around the site may, or may not, trigger permitting by themselves, (there is no data to make this determination) the Power Plant alone triggers permit requirements**

# Air Quality Definitions and Requirements



- Chapter 115 (1)(B): MAJOR AND MINOR SOURCE AIR EMISSION LICENSE REGULATION
  - Chapter 115 (7). Ambient Air Quality Analysis
    - A. **General requirement.** It shall be the burden of any applicant to provide an affirmative demonstration that its emissions, in conjunction with all other sources, will not violate applicable ambient air quality standards...”
    - C. **New Minor Sources and Minor Modifications to Minor or Major Sources.** This Section applies to any new Minor source or Minor Modification of a Minor or Major source.
      - (2) The level of air quality analyses and air quality monitoring for any new Minor source, any Minor Modification to an existing Minor or Major source which emits or has the potential to emit regulated pollutants at a rate less than the emission levels in subsection 7(B)(3) of this Chapter or any Minor Modification to an existing Minor or Major source which emits or has the potential to emit regulated pollutants at a rate greater than the emission levels in subsection 7(B)(3) of this Chapter and has an air quality analysis incorporated into its existing air emission license shall be determined on a case-by-case basis considering:
        - (continued)

# Air Quality Requirements



- Chapter 115 (1)(B): MAJOR AND MINOR SOURCE AIR EMISSION LICENSE REGULATION
  - Chapter 115 (7)(c continued). Ambient Air Quality Analysis
    - (2) The level of air quality analyses and air quality monitoring for any new Minor source, any Minor Modification to an existing Minor or Major source which emits or has the potential to emit regulated pollutants at a rate less than the emission levels in subsection 7(B)(3) of this Chapter or any Minor Modification to an existing Minor or Major source which emits or has the potential to emit regulated pollutants at a rate greater than the emission levels in subsection 7(B)(3) of this Chapter and has an air quality analysis incorporated into its existing air emission license **shall be determined on a case-by-case basis considering:**
      - (a) Air quality data available in or representative of the area;
      - (b) **Good Engineering Practice stack height**. An analysis may be required, even in cases resulting in no increases in emissions, if a stack height is less than Good Engineering Practice or if there are changes in stack or building configurations or other factors which are determined to alter the dispersion characteristics of the Minor or Major source.
      - (c) **Similarity with other licensed sources in terms of size, emissions, and local topography;...**

# Air Quality Definitions and Requirements

- To get to a discussion of Chapter 115(7)(c)(2) above, one must first accept that the facility has taken sufficient restrictions to be considered emitting below the limit for a “synthetic minor” source....let’s explore that first....
- Chapter 100: DEFINITION REGULATIONS
  - 97. **Nitrogen oxide (NO<sub>x</sub>)**. "NO<sub>x</sub>" means all oxides of nitrogen, measured as NO<sub>2</sub> on a molar basis
    - The Criteria Pollutant NO<sub>x</sub> to be used for the next discussion



# Air Quality Requirements

- Chapter 115 (1)(B): MAJOR AND MINOR SOURCE AIR EMISSION LICENSE REGULATION
  - Is the PTE really below 50 tons per year for NOx if the maximum was limited so close at 49.8 tons per year with a warm, 100% load?
    - Only if the proponent ignores Start-up and Shutdown periods. While NOx emissions will increase close to double, in most cases this addition may be insignificant since it is only for a short period of time.
    - However, if the proposed minor is 99.6% of allowable, and it take 15 minutes to warm up and/or shutdown, then if the power plant is started up more than 10 to 20 times per year, then the facility exceeds 50 tpy

Table 2-2: Facility Wide Annual Potential To Emit (TPY) & Regulatory Thresholds

Pollutant	Engines 1 - 8 PTE	Modeling Threshold	Major Source Threshold	Major/Minor Designation
NOx	49.8	50	100	Minor
PM	1.4	n/a	100	Minor
PM <sub>10</sub> & PM <sub>2.5</sub>	1.9	25/15	100	Minor
CO	49.8	250	100	Minor
VOC	2.7	n/a	50	Minor
SO <sub>2</sub>	0.1	50.0	100	Minor
CO <sub>2e</sub>	10395.0	-	-	-

- Often power plants are asked to explore the emissions and impacts at 25%, 50%, 75% and well as full load. Unfortunately, at lower loads the temperature can drop which can affect the SCR efficiency.
- With operation at times at 50%-75% load, the facility may emit >50 tons per year on NOx, as well, and modeling would be mandatory



# Air Quality “Synthetic Minor” Restrictions



- With respect to NO<sub>x</sub> emissions, Nordic Aquafarms Power Plant is very large on a Potential to Emit Basis even with the proposed Tier 4 BACT Air Pollution Control:
  - There are 8 engines, each engine can emit 15.4 pounds per hour of NO<sub>x</sub>. That corresponds to an Potential to Emit of 540 tons per year
  - The facility is agreeing to a “synthetic minor” with two operational restrictions:
    1. To “only” consume 900,000 gallons of fuel per year, and
    2. To operate only 7 engines at one time (7 duty, 1 standby)
  - According to there application, the first restriction reduces the annual NO<sub>x</sub> emissions in their application to 99.6% of the 50 tpy tons per year threshold from 540 tons per year. This allows them to apply for a “Synthetic Minor” source permit
  - The second restriction however only reduces the hourly NO<sub>x</sub> emissions by a factor of one-eighth from 123 pounds per hours to 108 pounds per hour
  - The Clean air Act requires 1-hour and annual compliance

# Air Quality Emissions Similar to Large Power Plants



- This power plant will produce up to 14 MW of power. At **108 pounds per hour (lbs/hr) of NO<sub>x</sub>**, the actual emissions from Nordic Aquafarms will rival historical power plants in the state.
- For example.....
  - The 36 MW eEnergy Ashland Biomass Facility - **88 lbs/hr**
  - The 850 MW Wyman Energy Fossil Fuel Facility - **283 lbs/hr**
  - The 50 MW ReEnergy Stratton Biomass Facility - **161 lbs/hr**
  - The 407 MW Worcester Energy Biomass Facility - **106 lbs/hr**
  - The 265 MW Rumford Gas-Fired Power Plant emits - **25 lbs/hr**
- If any of these facilities had taken hourly restrictions to operate as a “Synthetic Minor” only for peak shaving power production, an air quality assessment would still be paramount to determine the potential short-term concerns, the reduced annual concerns, and facility-wide concerns
- **This power plant is similar to other power plants in size and emissions that require dispersion modeling and detailed air quality analyses for all pollutants emitted**

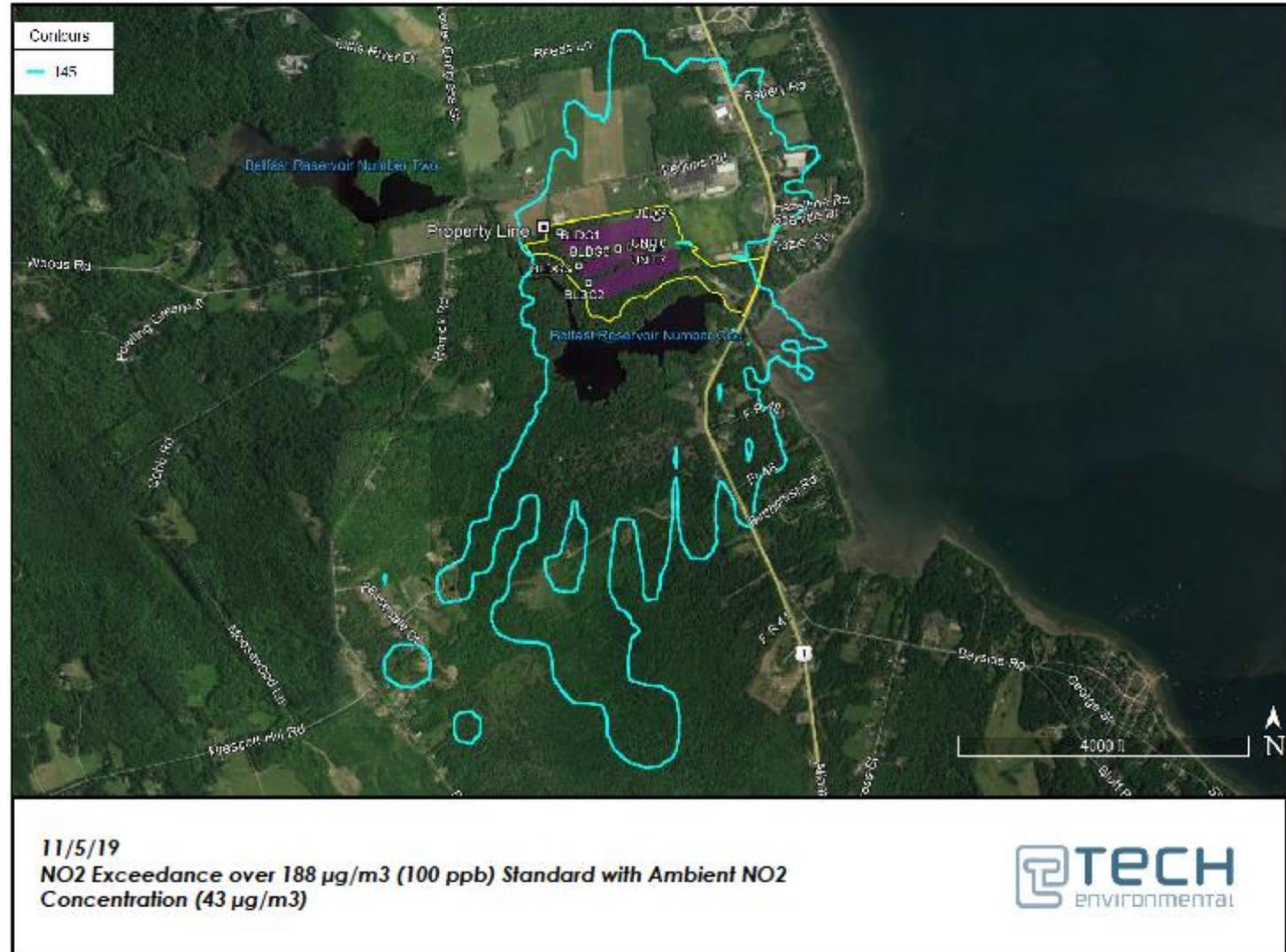
# Air Quality Conclusions

- Although dispersion modeling is not mandatory, compliance with the Clean Air Act is, so often it is still prudent to run a dispersion model to make sure the facility's construction or operational plans will not be out of compliance.
- A simple model run for NO<sub>x</sub> is summarized. Please note that this modeling exercise only includes the power plant, and not the other sources on-site.
- As one can see, the extent of the potential exceedance based upon the isopleths is well over the fenceline.
- The isopleth shown should be located 100% inside the fenceline to demonstrate compliance.



A simple NO<sub>2</sub> dispersion modeling exercise to demonstrate concern....

# Air Quality Conclusions



# Air Quality Conclusions



- In addition to the operational NOx from the engines, nuisance dust can be problematic from a construction site.
- Respirable dust from a construction project can be identified in a short period of time as a major concern, if not adequately addressed
- To illustrate this concern, a simple dispersion model was run for 24-hour PM<sub>10</sub> and the 98th percentile was plotted for clay excavation work in Area F.
- Only four different types of sources were needed for this simple model: front end loaders, excavators, bulldozers, and wind erosion of an 80,000 square foot area open. showing an exceedance of the 24-limit at the fence line.
- This simplistic model example did not include any mobile particulate emissions, and non-road equipment emissions, boiler emissions, or emissions from the power plant
- Although 24-hour period was analyzed to demonstrate a potential exceedance, this scenario could occur for some time all along the northern property line.
- There are many other scenarios that should be evaluated.

# Air Quality Conclusions



A simple Particulate modeling exercise to demonstrate concern....



11/5/19  
Construction-Related Particulate Matter (PM10) Exceedance over  
150  $\mu\text{g}/\text{m}^3$  with Ambient PM10 Concentration (47  $\mu\text{g}/\text{m}^3$ )



# Air Quality Conclusions



- We have evaluated the calculations in the air quality appendix and find them to be correct for 8 Caterpillar 3516C Tier 4F engines.
- Unfortunately, the permit application as written is incomplete and does not demonstrate that there will meet the National Ambient Air Quality Standards or No Unreasonable Adverse Effect On Air Quality:
  - It is not a facility-wide application that can be used for conditioning
  - Their list of air emission sources is incomplete
  - There is no analysis of off-road construction equipment and their potential emissions
  - There is no analysis of operational on-road mobile source emissions
  - There is no analysis of construction on-road mobile source emissions
  - This is a major construction project that will last a minimum of six years and no construction or operational air quality compliance demonstration has been provided
- The proponent has not satisfied its “burden...to provide an affirmative demonstration that its emissions, in conjunction with all other sources, will not violate applicable ambient air quality standards”

Questions?



*PRIVILEGED AND CONFIDENTIAL*  
**Work Product Prepared in Anticipation of Litigation**

November 4, 2019

David Losee, Esq. c/o  
UpStream Watch  
P.O. Box 113  
Belfast, Maine 04915

Ref. 4518

***Re: Request for Information To Assess Air Quality, Noise, Odor, and Dust***

Dear David:

Tech Environmental, Inc. (Tech) is pleased to assist Upstream Watch (UW) with a Third-Party evaluation and testimony for the proposed Nordic Aquafarms (NAF) project. Tech has begun this process by examining the applications, the questions and/or comments from MaineDEP (DEP), and the responses and/or comments from NAF (the Proponent).

Tech's intention is to review the applications and pertinent studies for approach, assumptions, and compliance demonstration for air odor, noise, and dust. The assumptions in the studies in the application must be provided, or a proper review of the studies by us or BEP cannot be completed. More importantly proper conditioning of the permits cannot be completed without thorough and complete studies.

In addition to the formal application materials, supporting information and studies are often provided to streamline compliance demonstrations for potentially more complex concerns. When a proponent is working closely with a regulatory body, the supplemental information and studies will typically follow a three-step process so that expectations can be properly identified and understood by the proponent, the regulatory agencies, and the public.

1. The first step is to provide the assumptions used to demonstrate that the study logic is reasonable and relevant to the project, rules and regulations, and local area.
2. The second step is to provide the analyses used to demonstrate that the study logic and analyses, when combined, would demonstrate compliance.
3. The third step is to recommend specific assumptions, used the proponent in the studies, as permit conditions to insure proper construction, operation, and/or maintenance of the project.

Unfortunately, it is clear that during our initial review, the information or compliance demonstration provided is cursory or incomplete in many areas of the applications. The project size, its unique nature,

the discharge in an oscillating bay, and the tight site, all suggest that more than typical, not less than typical construction, operational, and maintenance design parameters must be provided and justified in the permitting process.

This letter is a formal Request for Information (RFI). The RFI is organized by areas formally proposed with match lines by the proponent as Areas A-G, to make it easiest for the proponent to respond. Each study performed has specific additional data needs. The sound study will be addressed first because it has the most overlap with the other items in this RFI, so the requests for things like traffic rates, mechanical make and models, equipment locations, building penetration locations, etc. are only included in this RFI for noise once for brevity. The traffic information requested will be used for air quality, noise, odor, and dust testimony preparation.

## A Discussion of Sound Study Data and Analysis Provided

The original sound study report included a description of rules and regulations assumptions, but no assumptions on the operational system that was analyzed. There was a small description of the model used, and some select modeling parameters, but no list of equipment, no uncontrolled input or output assumptions, and no mitigation parameters. There was an isopleth figure that summarized the sound propagation model output but for operations only, and no numerical results. The only “numerical” discussion provided was a table with a label of “less than the proposed limits” for day and night. As a result of this missing information, DEP rightly requested the actual results in their RFI, but only a single table response was provided, with little to no additional assumptions or descriptive information. There was no justification of where or why these locations are representative for compliance demonstration.

The discussion of the sound in the application write-up, which should be the basis for proper project conditioning, consisted of three sentences. The first two sentences refer to the study author and location: *“Gridworks Energy Consulting LLC was retained by Nordic to prepare a full noise study presenting the potential noise-related impacts from construction and operation of the development. This Construction, Operation, and Maintenance Noise Impact Assessment has been included as Appendix 5-A.”* It is completely unclear what role, if any, Gridworks Electrical Consulting LLC plays in this sound study, as the only reference in Appendix 5-A of this firm is on the cover page. It is typical for a prime consultant to take ownership of a subconsultants work via an explanation of the scope of work, assumptions required, and the results, what the study means, and how it demonstrates compliance, but none are provided.

The entire summation of potential sound compliance is provided in the last sentence: *“According to the assessment, sounds associated with construction, operation or maintenance of the Project will be modest and in compliance with federal, state and local noise level requirements.”* Yet the sound study in Appendix 5-A, especially states on page 4, *“Construction equipment noise levels are presented here for informational purposes.”* When DEP asked about this discrepancy, the proponent remarked that construction sound was included in the model, but without a list of equipment used, and with no operational assumptions, no input files, no output files, no hours of operation, no construction sequencing, no equipment locations assumed, no description of the mitigation system provided, etc., it is impossible to evaluate how, what, or where construction was addressed.

Again, as reiterated by the proponent in a recent DEP FRI, the intent is to permit the entire facility in one exercise, at this time. Therefore, in order to properly assess impacts for this proposed project, source information for phase 1 construction, phase 1 operation, phase 1 maintenance, phase 2 construction, phase 2 operations, and phase 2 maintenance, and combinations thereof must be developed. Not all the scenarios developed must be fully explored, but equipment and operating scenarios all must be developed completely so that the proponent can then justify which of the combinations will result in a reasonable worst-case not just for sound, but for all potential impacts, and for all nearby residents. It is extremely likely that the reasonable worst-case assumptions differ at different areas around this very large site. For example the residents on Perkins Road, the residents across the river in Northport, the residents with private wells, the residents in Belfast across from the wastewater plant, and the shorefront residents in Northport and Belfast, will likely not be impacted the same by each construction, operation, and maintenance sequence.

## Construction, Operational, and Maintenance Sound Study Data FRI

Please note that the proponent has elected to divide the Construction up into Phase 1 and Phase 2, and site up with match lines into Areas A to G. The following questions use the proponent's nomenclature to make it easy for them to provide this information. Tech will take this information and the proposed construction sequencing in the application to develop some basic construction sequencing operations, as those are not provided in the sound study. The first few questions apply site wide to distinguish between Phases 1 and 2 and the remainder apply to each phase in each area as the proponent proposes.

1. Recently, at the Belfast Planning Board meetings the proponent discussed the discovery of clay soil and the need to remove hundreds of thousands of cubic yards at buildings/tankage locations, and replacing the current base with a gravel base. What is the quantity of clay soil will be removed in Phase 1?
2. What is the quantity of clay soil that will be removed in Phase 2?
3. How does the significant increase in unsuitable soil removal extend the site preparation duration in Phases 1 and 2?
4. How will the unstable clay remaining adjacent to the clay excavation areas be stabilized in each phase?
5. If sheet pilings or other temporary measures are to be used to hold back the silt clay, where would they be located?
6. It is construction Best Management Practice (BMP) good construction to provide sound barriers for concentrated areas of construction, so where are sound barriers proposed for this facility?
7. Will sound barriers be permanent or temporary?
8. What other specific construction sound reduction BMPs?
9. How much clay soil, top soil or suitable fill will be excavated and stored on-site in Phase 1?
10. How much clay soil, top soil or suitable fill will be excavated and stored on-site in Phase 2?
11. The following questions are requested for each area identified on the drawing using the nomenclature proposed by the proponent
  - a. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area A on CP101** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined below. These refined questions apply to all areas, though only the primary question is relisted for each area (A through G) in the interest of brevity.

- b. What type of non-road mobile equipment and how many of pieces of each will be used to excavate clay soils, top soil, or suitable fill in Area A on CP101?
- c. What type of non-road mobile equipment and how many of pieces of each will be used to prepare and construct Area A?
- d. How many passenger vehicle & truck trips per day are assumed for constructing Area A?
  - i. How many passenger vehicle & trucks per day on average will be needed for construction building supplies, the mechanical systems, and process equipment in Area A? Where will the make deliveries and queue?
  - ii. How many total truckloads of soil will be removed from Area A and up to how many trucks will be allowed to queue during soil removal in Area A?
  - iii. How many total truckloads of gravel will be required and up to how many trucks will be allowed to queue during gravel replacement in Area A?
  - iv. How many total truckloads of cement will be required and up to how many trucks will be allowed to queue during concrete placement in Area A?
  - v. How many total truckloads of pavement will be required and up to how many trucks will be allowed to queue during pavement placement in Area A?
  - vi. How many total truckloads of pipe will be required in Area A?
- e. Where will the non-road and on-road equipment construction, operational or maintenance equipment be operated in Area A?
- f. How many truck trips per day are assumed for operating zones in Area A?
- g. How many truck trips per day are assumed for maintenance activities in Area A?
- h. What is the make, purpose, and model number of mechanical equipment, HVAC, or power producing equipment assumed for indoors or outdoors in Area A as defined on CP101?
- i. What is the total sound data and tonal sound data in one third octave bands for equipment located indoors or outdoors that were used in the model in Area A as defined on CP101? **(Please note that it is understood that the actual equipment sound may differ as the final equipment selections are made during design, but assumptions had to have been made to accurately run the model. It is important to make sure that the proponent made accurate assumptions for equipment known at this time and reasonably conservative assumptions for unknown equipment, so that the model is still accurate after final design selections are made for the unknown equipment. The proponent can simply provide the model input and output files with the following assumptions, or answer the questions individually in i(i) to i(viii) instead for areas A-G in each phase.)**
  - i. For equipment located indoors, was attenuation assumed for the buildings in Area A, or was a conservative assumption of no attenuation made to keep it simple?
  - ii. If attenuation was assumed for buildings in Area A, what were the attenuation assumptions for the walls and the roofs assumed in the model?
  - iii. If attenuation was assumed for buildings in Area A, at what walls where the access doors in each building located?
  - iv. If attenuation was assumed for buildings in Area A, where in the walls or rooftops were combustion exhausts included in each building located?
  - v. If attenuation was assumed for buildings in Area A, where in the walls or rooftops were intake and exhaust louvers located for modeling in each building?

- vi. If additional attenuation was assumed for mechanical equipment in Area A in the model, the specific attenuation equipment proposed with octave band reductions or equal should be located in each building? The phrase beginning with specific is underlined for emphasis as attenuation can vary greatly for mechanical equipment not just in total sound, but across the sound spectrum, which when combined provide varying results.
  - vii. Where were the heating and ventilation systems that will be installed in each building in Area A included in the model?
  - viii. Where are the condensers to cool boilers, process equipment, ventilation equipment, air conditioning equipment, and/or power plant combustion processes that will be necessary in each building in Area A included in the model?
12. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area B on CP102** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area B in the identical form presented above in sub-items 11(a) to 11(i) for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.
  13. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area C on CP103** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area C in the identical form presented above in sub-items 11(a) to 11(i) for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.
  14. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area D on CP104** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area D in the identical form presented above in sub-items 11(a) to 11(i) for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.
  15. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area E on CP105** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area E in the identical form presented above in sub-items 11(a) to 11(i) for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.
  16. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area F on CP106** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area F in the identical form presented above in sub-items 11(a) to 11(i) for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.
  17. What is the list of each type of stationary or mobile construction, operational or maintenance equipment in **Area G on CP107** for phase 1 construction, phase 1 operations, phase 1 maintenance activities, phase 2 construction, phase 2 operations, and phase 1 maintenance activities, and combinations together thereof? These questions are further refined for Area G in

the identical form presented above in sub-items 8a to 8h for Area A. These refined questions apply to all areas (A through G) as defined by the proponent in the drawings.

While this data list may seem very long and possibly too complex for a permitting phase that is precisely the reason why it is needed. This project is very long and complex. **Please see the attached bulletin from various agencies in the State of Maine titled TA Bulletin #4.** It was developed to help municipalities understand what information may be necessary for proper review when developing a noise ordinance. The bulletin is set up with a proposed standard in column 1 and a discussion/rationalization of the need/purpose of that standard. After reading this bulletin it is even more unbelievable that the proponent simply ignored the double request for specific equipment sound information.

Specifically, on page 6, Item 3, in the **Standards** the applicant must provide “*A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation, and maintenance of the proposed development including their locations within the proposed development.*”

The **Discussion** in the bulletin explanation provided states “*The major sound sources on the site should be described including tonal and short duration noises. The sounds which will occur from both construction and operation should be noted. Any significant sounds which could result from maintenance operations should be noted. The description should reference the site plan so that the location and relationship to other sound sources can be easily understood.* The sound data request above simply follows this logic.

## Construction, Operational, and Maintenance Air Quality Study Data RFI

The air quality assessment provided to date is not sufficient to address potential air quality concerns from this facility, and to condition the project to insure compliance with state law and the Clean Air Act. This is not a small family farm proposal. This is a proposal for many, very large, industrial processes that individually could have air quality impacts, but when proposed in one facility, on one-site, in two separate construction phases, the potential for exceedances and necessary conditioning cannot be determined simply by examining the engine plant emission factors and taking a synthetic minor. These industrial operations include:

- A 800,000+ square foot industrial development
- A 7.7 million gallon per day wastewater treatment plant
- A 1.8 million gallon per day water treatment plant
- A 20,000 fish per day slaughter house
- A 200,000 pound per day fish fillet food shipping operation
- A 100,000 pound per day food waste transfer station, and
- A 16 Mega-Watt power plant

The facility has elected to take a synthetic minor for the power plant through a simple limit on maximum fuel consumption, which is not unreasonable and well within their right. This synthetic minor removes the automatic compliance demonstration requirement, but still allows the DEP to require a compliance demonstration, as the burden of proof lies with the applicant. Equipment for each facility

approve needs to be provided. To make sure that each piece of equipment is identified, the information should be provided in the proponents A-G area limits.

- Air quality information is requested for the all the mechanical equipment and boilers in Area A.
- Air quality information is requested for the all the mechanical equipment and boilers in Area B.
- Air quality information is requested for the all the mechanical equipment and boilers in Area C.
- Air quality information is requested for the all the mechanical equipment and boilers in Area D.
- Air quality information is requested for the all the mechanical equipment and boilers in Area E.
- Air quality information is requested for the all the mechanical equipment and boilers in Area F.
- Air quality information is requested for the all the mechanical equipment and boilers in Area G.

The proposed project cannot be constructed in a normal construction single season. The proponent suggests a six year construction window, but as we know from past experience, it is more likely that the schedule gets extended by one construction season or more, than the project is completed on time. The proponent has proposed that this project would be built in two-phases and one permit submission, so in order to remain in compliance thorough this project buildout, all possible construction air quality impacts must be defined now. Tech requests air quality data in the Area A through Area G format provided above for:

- Excavation of millions cubic feet of clay soil
- Replacement of a fraction of the soil with gravel for a base
- Blasting for ledge and driving sheets to hold back the clay
- An onsite cement processing facility or even more trips
- Tens of thousands of truck trips annually during construction
- Construction and staging right up to the roadway
- Construction and staging right up to the residential abutters
- Construction and staging directly uphill from the Little River
- A Bypass road will be built for an entire summer on Route 1
- There will be construction disturbance on the bay floor for months

## Construction, Operational, and Maintenance Odor Study Data RFI

The odor evaluation will use all of the parameters requested in the noise and air quality sections above with expected odor data provided. The proponent should share the odor potential from each area on a concentration and quantity on-site basis, the maximum age of and maximum quantities material stored must be provided, so that odor loadings from each area can be evaluated, The RFI for odor is limited to areas of the plant that may be open for a period of time after completion as before full enclosure. Please provide the following:

- Odor data is requested for the all the mechanical equipment, processes and boilers in Area A.
- Odor data is requested for the all the mechanical equipment, processes and boilers in Area B.
- Odor data is requested for the all the mechanical equipment, processes and boilers in Area C.
- Odor data is requested for the all the mechanical equipment, processes and boilers in Area D.
- Odor data is requested for the all the mechanical equipment, processes and boilers in Area E.
- Odor data is requested for the all the mechanical equipment, processes and boilers in Area F.

- Odor data is requested for the all the mechanical equipment, processes and boilers in Area G.
- What are the specific odor Best Management Practices (BMPs) for each area from A-G?
- It is not sufficient to suggest that material will be kept fresh as an odor BMP, even “fresh odors” must be evaluated as their contribution to the overall odor profile. What is the fresh and malodor potential in each area from A-G?
- While exploring salmon facilities, it is clear that it is standard practice for many access and garage doors are left open to allow for free flow of the product throughout the facility. Which doors will be used regularly for construction, operation, and maintenance access?

Thank you for providing these important questions to DEP. The answers to these questions will allow our analyses to best match the proponent’s assumptions, which would streamline the review process for DEP and BEP.

Sincerely,

TECH ENVIRONMENTAL, INC.



Michael T. Lannan, P.E.  
President

# TECHNICAL ASSISTANCE BULLETINS

# Noise

A technical assistance  
series prepared by:

Maine State Planning Office

Maine Department  
of Environmental Protection

Oxford County  
Soil and Water  
Conservation District

Androscoggin Valley  
Council of Governments

with input from a number of  
professional and citizen planners.

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## Inside

Background Information  
Planning Considerations  
Review Process  
Review Standards

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## TA Bulletin #4

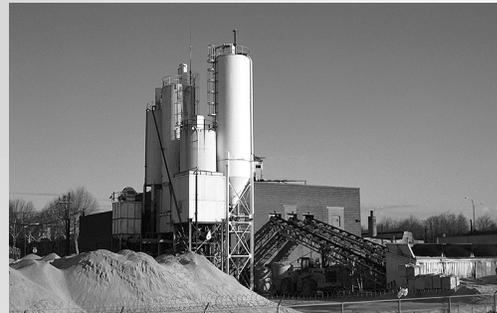
This TA Bulletin is one in a series of documents intended to provide guidance to volunteer board and committee members on specific planning topics. Emphasis is placed on the development review process.

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Financial assistance for the development of this document provided by the National Oceanic and Atmospheric Administration.

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May 2000



## Introduction

Noise has significant environmental impacts even though it is a transient occurrence. It does not accumulate in the environment, but its impacts can be long lasting affecting people's lives and property values. Noise causes a deterioration in the quality of life as much as, if not more than, many other environmental problems.

Noise standards can only be effective when the limitations and enforcement procedures are easily implemented.

# Background Information

## Importance of Noise and Noise Control

Prolonged noise exposure is a serious threat to human health; it can result in high stress levels and, at high sound levels, impaired hearing. Common environmental noise sources can cause or contribute to stress-related illnesses such as cardiac and circulatory diseases. Noise can also negatively impact concentration, communication, and sleep creating annoying and sometimes even hazardous conditions. These factors are important in setting noise standards for the community. It may be important to protect certain uses such as offices, schools, and churches from significant noise increases to allow effective communication. It is also important to protect neighborhoods so that residents can communicate and enjoy their property. Residential areas should also be protected from noise so that residents are able to obtain uninterrupted sleep. Interrupted sleep can result in serious health impacts and also affect personal safety at home and at work. Another consideration for municipal officials is property values. Neighborhoods subject to noise disturbance will generally have lower values.

## Principles of Noise

Noise travels in waves through the air. It has three components: intensity, frequency, and duration. The disturbance caused by noise is not just related to intensity, which we commonly call “loudness,” but it also depends on the frequency (or pitch) and the duration (or how long the noise lasts).

- **Intensity**, the sound level, is actually the sound pressure level (SPL): the pressure that sound waves exert as they travel through the air. It is measured in decibels (dB) on a logarithmic scale. This means that a sound of 60 dB is not twenty percent (20%) louder than one of 50 dB, it is ten (10) times (one thousand percent [1,000%]) louder. (Fortunately, the human ear does not perceive it as that great of an increase.)
- **Frequency** (not how often the sound occurs but the frequency of the sound wave) is measured in hertz (Hz) and is the number of cycles per second of a sound wave. The “pitch” of a sound is directly related to the frequency. Most noise covers a range of frequencies, but a concentration in a narrow frequency band, such as a whistle, is more bothersome than a mix of sounds across a wide range of frequencies.
- **Duration** is the length of time the sound lasts. Intermittent sounds (such as back up horns) are typically more annoying than steady ones (such as the hum of a motor). To account for the length of time that noises last, many noise standards use an equivalent sound level, although this adds complexity to measurements which

may need to be taken. The equivalent sound level “averages” the sound level over a given period of time, typically one (1) minute or one (1) hour.

For most municipal standards, noise is measured using a scale weighted to account for the higher frequencies to which the human ear responds. It is called the A-weighting scale and is noted by the abbreviation dBA. It is also measured in sound level equivalents (designated Leq). Sound levels often vary over time. The Leq is the equivalent constant sound energy to that emitted by the varying sound over a given period of time, usually one (1) hour.

The following table provides some examples of typical sounds.

COMMON SOUND LEVELS	
Sound Environment	Sound Pressure Level (dBA)
Threshold of hearing	0
Broadcast studio interior or rustling leaves	10
Quiet house interior or rural nighttime	20
Quiet office interior or watch ticking	30
Quiet rural area or small theater	40
Quiet suburban area or dishwasher in next room	50
Office interior or ordinary conversation	60
Vacuum cleaner at 10 ft.	70
Passing car at 10 ft. or garbage disposal at 3 ft.	80
Passing bus or truck at 10 ft. or food blender at 3 ft.	90
Passing subway train at 10 ft. or gas lawn mower at 3 ft.	100
Night club with band playing	110
Threshold of pain	120

There are some important characteristics about noise and noise measurement which must be kept in mind. An important principle is experienced daily; noise varies with distance. It is much louder close to the source than it is at a distance. Therefore, the standard must identify the **sound level limit** and the **location** at which the limit is applicable.

In addition to the three (3) components (intensity, frequency, and duration), the time of day that the noise occurs also contributes to the degree of disturbance and its impacts. Nighttime noise is more annoying than daytime noise and may cause more noticeable health impacts through the disruption of sleep. Thus, most standards provide a daytime criteria and a nighttime criteria, although the time periods vary from one municipality to another and may even vary by zone within a municipality.

To account for tonal noises (noises having a narrow frequency band), many standards add a fixed decibel equivalent to the measured noise level in order to account for the additional annoyance such a sound causes. This is also true for repetitive noises. (Repetitive noises are those noises which are generally of a short duration, but which occur at regular intervals such as a back-up horn on construction vehicles.)

Due to the logarithmic nature of noise measurement and the way noise levels are perceived by humans, care must be taken in using absolute limits. The following table provides some typical human perceptions of noise increases.

PERCEPTIONS OF NOISE INCREASES	
Increase in Noise Level (dBA)	Human Perception
0 to 2	Not usually noticeable
3	Just noticeable
6	Clearly noticeable
10	Twice as loud
20	Four times as loud

Noise standards consist of two (2) types. One controls the absolute sound level that can occur. The second controls the amount of increase in sound level that a use can add to the environment. A combination of these types can also be used.

If the noise standard sets a 65 dBA threshold for a rural area, but the background noise in the rural area is currently only forty-five (45), then the ordinance would permit an increase in noise level of 20 dB, perceived as a 4-fold increase. Thus, residents in the area would perceive a very significant increase in noise. However, unless extreme protection is warranted, limiting increases, especially daytime increases, to less than 5 dB is not generally recommended.

If a relative criteria which limits the difference in sound level—the change in sound level with and without the sound source operating—is used, then a clear distinction must be made between ambient and background sound levels. While sometimes used interchangeably, they are quite different.



Reviewers must take care to ensure the proper terminology is used in reports submitted in support of applications. The standards used in this publication refer to the predevelopment ambient noise level. This is the same as the background noise level prior to the development.

The **ambient sound level** is *all* sound sources in an area and, if measured after the development occurs, includes the source in question. The **background sound level** is the level of sound from all sources except the specific source in question. Relative criteria assess the difference between the ambient (the sound level in the area with all sources) and background (the sound level in the area with all sources except the one in question) sound levels.

This difference between ambient and background noise points out the importance of definitions. Definitions must be accurate and specific if the standard is to be enforceable. Most of the definitions (at the end of the bulletin) have been taken from the rules adopted pursuant to the Maine Site Location of Development Law. They are presented to encourage consistency between local and state standards.

As with any standard, the more complex the standard, the greater the chance for misinterpretation and the more difficult enforcement becomes. Also, remember that the standards will be enforced by people with little or no background in acoustics. Therefore, a relatively simple standard which only requires the use of a simple sound level meter, rather than the use of an octave band meter (one that measures varying frequencies), is preferable. However, the standard must be specific. With today's measurement techniques and legal requirements, vague qualifications on noise such as *nuisance* or *disturbance* without any quantification will not suffice. While seemingly simple, they are vague and subjective, and virtually unenforceable.

Sound level meters and calibration equipment must comply with the latest version of ANSI standard S1.4. This standard divides sound level meters into categories called types labeled by the numbers 0, 1, or 2. Type 2 meters are the least sensitive, and type 0 are the most sensitive.

# Planning Considerations

It is important to recognize the potential noise impacts on normal life events in a community. Some noise is necessary such as from emergency vehicles. Even noise from construction equipment may be necessary in order to maintain a vital community. But, much of the noise created today is capable of disturbing people as they work, play, and reside in the community. Noise is an important and often overlooked issue that requires “sound” planning.



The first part of the planning process is to consider existing and potential noise impacts in the community; this should be done in the comprehensive planning process.

The second part of managing noise in the community is to adopt clear and enforceable noise standards. The standards should be included in the standard section of site plan review, whether site review is a stand alone ordinance or part of the zoning ordinance.

## Comprehensive Planning Considerations

The comprehensive plan develops the information necessary to support noise standards in ordinances. As such, it is important to provide a thorough inventory and analysis as a basis for the goals, policies, and strategies to be included in the plan. The policies and strategies form the legal basis for the land use standards adopted in local ordinances.

- The first step in the comprehensive planning process is to conduct an inventory. The plan must consider the types of uses which currently exist in the community and their location. Where are residential neighborhoods located, where are hospitals, schools, and similar institutional uses requiring quiet located, and where are outdoor recreational facilities located? Also, the town must consider where existing significant noise sources are located, the probability of new sources being developed, and the potential locations for such new sources. Existing sources in rural areas such as gravel pits, farming operations, and sawmills should not be overlooked.
- An assessment of the existing sources and potential for new sources and their locations will provide guidance in the development of the Future Land Use Plan and on whether the town may need to vary noise standards by zone.
- Once these factors are inventoried and assessed, the town must develop policies which will protect its residents, businesses, and property values but allow for new uses. The

town may decide on a zoning ordinance which provides different criteria for different zones, or the town may decide on a single standard to use throughout the community. The standards in this bulletin are for town wide use as part of site review procedures.

Following are some example policies and strategies for consideration in developing a comprehensive plan.

### Sample Policies

- ⇒ To protect the residents, businesses, institutions, and outdoor recreational areas from noise sources which would disturb living and working conditions.
- ⇒ To maintain the tranquil settings in residential neighborhoods (and other quiet areas).
- ⇒ To reduce the noise levels in the ... (a particularly noisy area of town) section of town as development patterns change.

Note: Be careful not to consider all rural areas as particularly quiet because farming, forestry, and other uses permitted in these areas produce significant noise.

### Sample Strategies

- ⇒ The site plan review provisions should be amended to include noise standards which control noise from new development, changes in use, or expansions of use which will protect abutters, or future abutters, from noise which may disturb communications, sleep, or otherwise interfere with work and lives. The standard should be more restrictive for nighttime hours between 7:00 P.M. and 7:00 A.M.
- ⇒ The noise standard contained in the site plan review provisions should be amended to limit the increase in noise in the rural areas of town which are particularly quiet (identify the locations).
- ⇒ The noise standard in the site plan review provisions should include a requirement that uses proposed for locations which currently exceed the ambient noise level in the standard will emit a lower noise level than currently exists in the location.



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# Review Process

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The Review Process starts with the submittal of the required information by the developer. Noise may not be an issue with many types of commercial and service related development, although in some instances, noise from traffic or delivery vehicles may be a concern to abutters. Reviewers will need to determine if noise is an issue by considering the type of development and the location. At a minimum, it may be in the municipality's best interest to obtain a statement from the developer that the noise standards will be met. The reviewing authority can then make the statement part of the application: this gives the municipality enforcement authority if, for some reason, excessive noise is generated. For proposed developments where noise is not expected to be an issue, the reviewing authority can waive further submittals. This section of the bulletin provides model ordinance language for submittal requirements; it also provides a discussion of how to apply the requirement and of how to use the information during the review process.

The next section of the bulletin provides model "standards" that the development must meet to obtain approval. The Review Standards section presents several levels of standards. A Basic Standard is presented first, followed by additional standards or more detailed standards. This Review Process section is divided into subsections which correspond to the alternative standards presented in the Review Standards section.

The left column provides a listing of documents (submittals) which municipalities should require in order to adequately review proposals. Each submittal helps the reviewing authority determine whether the standard contained in the ordinance will be met. The reviewing authority has to review and understand the submittals. The background information provided in this bulletin and the discussions of the submittals and the standards will help the authority interpret the submittals. Submittal requirements should be included in local ordinances. The town may also develop a submittal checklist so that it can easily determine if an application is complete.

The right column provides a discussion of the submittal requirements – why they are needed and how they are used in determining compliance with the standard. For Noise, the submittal requirements are the same for both the Basic and More Detailed Standards.

## Submittals

## Discussion

### Submittals for All Review Standards I through III

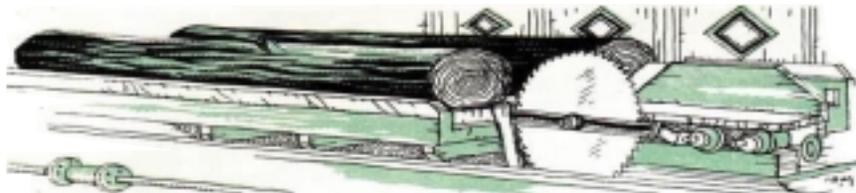
- |  |   |
|--|---|
| <p><b>A.</b> Technical information shall be submitted describing the applicant's plan and intent to make adequate provision for the control of sound. The applicant's plan shall contain adequate information on which to determine compliance with the standard. The information shall be prepared by a qualified professional. Information should include:</p> <ol style="list-style-type: none"><li>1. A site plan with the location of noise emitters, noise controls, and any sound measurement locations clearly shown. Also, a tax map showing property parcels that may be impacted and the most recent USGS map, both having the location of the site clearly marked. (The tax map and the USGS map may be required as a basic submittal for all development.)</li><li>2. Descriptions of the existing land uses, the local zoning, and the recommended future land use in the comprehensive plan for the area potentially affected by sounds from the development.</li></ol> | <p><b>A.</b> The plans (maps) submitted for the application and the review of other standards should usually be adequate for the review of noise, except that, if noise barriers are proposed, a detailed design may be necessary. Submittals should include a locator map (USGS quadrangle map or other suitable map) with the site clearly marked and a detailed site plan as noted below.</p> <ol style="list-style-type: none"><li>1. A detailed site plan showing the site, the locations of intended uses within the site, abutting property and its uses including structures and areas of intense outdoor uses, such as recreation areas that may be adversely impacted by noise, should be submitted so that the reviewer can understand the scope of the project and the properties which could be impacted. Pre- and post-development topographic maps of the site will be helpful where it is expected that topographic or physical features of the site will help to reduce noise and/or where topographic changes which may affect noise are proposed.</li><li>2. The abutting uses and uses beyond the abutters possibly up to one-half mile from the site should be described and their location clearly presented. Additionally, the zoning for the area potentially impacted should be shown and described. Uses beyond abutters can be shown on the tax map or the USGS map where appropriate.</li></ol> |
|--|---|

## Submittals

3. A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation, and maintenance of the proposed development including their locations within the proposed development.
4. A description of the pre-development ambient daytime and nighttime equivalent sound levels at the property boundaries of the proposed site.
5. A description of the daytime and nighttime equivalent sound levels and the short duration repetitive sounds and tonal sounds expected to be produced by these sound sources at the property boundaries of the proposed development. The description shall include the maximum sound level expected for short duration repetitive sounds and tonal sounds.
6. A description of proposed major sound control measures including their locations and expected performance.
7. A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.

## Discussion

3. The major sound sources on the site should be described including tonal and short duration noises. The sounds which will occur from both construction and operation should be noted. Any significant sounds which could result from maintenance operations should be noted. The description should reference the site plan so that the location and relationship to other sound sources can be easily understood.
4. The “pre-development ambient sound level” is the same as the pre-development background sound level. (After the development is in place, there is a difference between background and ambient noise.) The equivalent sound levels are either the one minute equivalent or the hourly equivalent depending on the standard selected. Any tonal or short duration repetitive sounds or any other unusual qualities about the existing sound in the area should be noted. Where noise is expected to be a significant issue, measurements should be taken at the property boundaries.
5. The description of the sound levels expected maybe based on recognized literature which references the specific type of development or on measurements at a similar type of facility. For situations in which noise is a significant issue, the reviewing authority may wish to have the applicant reference several source documents and take measurements at an actual facility and possibly require a model of the sound levels based on manufacturer’s specifications for the equipment generating the sound and/or any controls proposed. Noise experts sometimes use published average sound levels for varying types of neighborhoods instead of taking sound level measurements at the proposed site. They also must often use published levels for specific types of development, for example, lumber yards or junkyards, since the site is not yet developed.
6. The description should provide references which document the expected performance of the sound control measures. Where site features such as berms are proposed, the features should be clearly shown on a post-development topographic plan of the site. The type and location of all sound control measures, including topographic and landscaping features, should be carefully documented and made part of the plan approval by notation on the plan and/or by inclusion in the Findings of Fact.
7. A written report comparing the expected sound levels with the pre-development ambient sound levels will help determine compliance with the standard.



# Review Standards

This section presents review standards which should be included in the site plan review process of a zoning ordinance or in a stand alone site plan review ordinance. Several alternatives having varying amounts of detail are presented. The standards should be applicable to new development, expansions, and changes in use. Standards are presented in the left column, and a discussion of the standard appears in the right column.

Three (3) alternatives are presented: a basic standard, several additions to the basic standard which consider areas that may be unusually quiet and areas which currently exceed the standard, and a more detailed standard that varies with expected uses or zones.

The more detailed alternative is best used in towns with zoning so that there is no doubt about the type of future abutting land uses. It is most relevant to towns which have distinct patterns of growth and which expect considerable industrial development for which noise may be a factor. The discussion provides additional guidance on use.

## Standard

## Discussion

### I. Basic Standard

This is a relatively simple sound level standard which should be easily administered. It is most suitable for small communities with few planning and code enforcement resources. It may also be suitable for many rural communities where there are few noise sensitive uses such as schools, and it is unlikely that significant noise sources would locate near them. In these communities, it is anticipated that there would be sufficient open space to buffer significant noise on the source's land so that they would not create a nuisance to abutting uses.

- A. The proposed development shall not increase noise levels to the extent that abutting or nearby properties are adversely affected. In order to comply with this, the development must meet the following requirements.
1. The maximum permissible sound level of any continuous, regular, frequent, or intermittent source of sound produced by any activity shall be limited according to the time of day and land use which abuts it as listed below.

- A. As noted in the earlier discussions, the term "Adversely affected" is vague. The standard is defined by the conditions that follow the introductory wording.
1. The hours can be changed to reflect community values and patterns. Most standards use 6 a.m. or 7 a.m. as the separation of the nighttime to daytime standard; daytime to nighttime varies from 7 p.m. to 10 p.m.

Abutting Use	Sound Level Limits dBA	
	7 a.m. – 7 p.m.	7 p.m. – 7 a.m.
<b>Residential</b>	55	45
<b>Commercial</b>	65	55
<b>Industrial</b>	70	60
<b>Institutional</b>	55	45



2. Where the abutting property is undeveloped, the sound level shall be equal to or less than the most restrictive other abutting use. Where there are no uses on abutting properties, the sound level at the property line shall be equal to or less than the least stringent use allowed by zoning.

2. This is a provision to protect future uses of vacant land which abuts a noise generator. The first sentence makes the noise level at the abutting property line of vacant property less than or equal to the sound level required for the most restrictive abutting use. If a municipality is trying to transition an area to a more industrialized area, this requirement may not be appropriate. The second sentence allows the noise level for uses where there are no abutters to equal the noise level for the least

## Standard

3. Sound levels shall be measured at least four (4) feet above the ground at the property line of the development. Sound levels shall be measured by a meter set on the A-weighted response scale, fast response. The meter shall meet the latest version of American National Standards Institute (ANSI S1.4.) "American Standard Specification for General Purpose Sound Level Meters" and shall have been calibrated at a recognized laboratory within the past year.
4. The following uses and activities shall be exempt from the sound pressure level regulations.
  - a. Noises created by construction and temporary maintenance activities between 6:30 a.m. and 8:00 p.m.
  - b. The noises of safety signals, warning devices, and emergency pressure relief valves and other emergency activities.
  - c. Traffic noise on public roads.
  - d. Resource uses in rural areas.

## Discussion

restrictive possible abutting use. Thus, this type of setting could have the maximum noise level permitted by ordinance. It effectively discourages quieter uses from locating in the area.

3. This specifies the standard to be used for the sound level meter and must be included so that all measurements have a common base and accuracy.
4. Exemptions should be provided for some activities. The standard is based on common examples. For a list of additional exemptions, see Alternative III, Item 10.
  - a. The times for construction activities can vary from those presented based upon community needs. Additionally, the exemption could be limited so that it would not apply to Sundays and/or Federal holidays. Suggested wording follows: except that noise from construction and temporary, scheduled maintenance activities shall comply with the standards on Sunday.
  - d. Municipalities may want to exempt agriculture, forestry, mining in rural areas since these uses are generally allowed but often create noise above the allowable standard.

## **II. Possible Additions to Basic Standard**

Either one or all of these additions can be included in the Basic Standard (I). (Numbering is consecutive to that standard.)

Additional standard #5 provides additional protection to areas of the community where the ambient sound level is considerably below the allowed level. It is suitable for rural communities similar to the first alternative, but which may have some very quiet areas which the town wishes to preserve.

Standard #6 provides for areas which currently have noise levels above the allowable standard. The second is suitable for communities which have a noisy area(s) which the town would like to keep from becoming worse and would like to bring more in line with the standards as existing sources cease.

Standard #7 provides for sound measurement to determine compliance in the case where no pre-development ambient sound level measurements were taken.

5. When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level (Leq 60) is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level is equal to or less than 35 dBA, the hourly sound level resulting from the development shall not cause the ambient hourly
5. This standard limits the sound level emitted by new development in areas of a community that are particularly quiet. It provides for a 5 dB increase in ambient sound levels above the pre-development level. Thus, the increase will be noticeable, but it should not create a significant disturbance. It provides significant protection from noise intrusion.

## Standard

sound levels at the property lines of the development to be 5 dBA more than the ambient hourly sound level prior to development.

6. If the daytime and/or nighttime pre-development ambient sound level at property line of the development site exceeds the daytime and/or nighttime limits by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level.
7. In the absence of a measurement of “pre-development ambient” sound level, enforcement may be based on the post-development background level.

## Discussion

Towns with zoning may want to apply this standard to only some of their rural zones. Care should be used in applying this standard to areas where agriculture, forestry and/or mining are existing or expected uses.

6. This provides for a development which will be located in an area where the sound level exceeds the standard set in the first section. It requires new development to emit a noise level that is lower than the existing noise level such that no further disturbance results and so that as noisier developments cease to operate, the area will have an ambient sound more closely in compliance with the rules.
7. This standard accounts for cases where there is no pre-development sound level measurement. The pre-development level is approximated by the “background” level after development.

### **III. More Detailed Standard – Suitable for Use with a Zoning Ordinance**

This is an alternative standard which is somewhat more complex. It parallels DEP’s existing Site Location of Development rules but has been simplified. The sound levels and the times may be changed to reflect community needs. It accounts for future land use by referencing zoning and is probably best used as part of a Site Plan Review (or Conditional Use) procedure within a Zoning Ordinance. It is most suitable, with the levels used here, for a more developed community than the first alternative. Note that sound levels are generally 5 dB higher. It may be modified for use with a Site Plan Review Ordinance or for a more rural community.

A. The hourly sound levels at the property line of the development and resulting from the development shall not exceed the following limits:

1. Any location for which the zoning is not predominantly commercial or industrial:  
  
60 dBA between 7:00 a.m. and 7:00 p.m.  
50 dBA between 7:00 p.m. and 7:00 a.m.
2. At any location for which the zoning is predominantly commercial or industrial:  
  
70 dBA between 7:00 a.m. and 7:00 p.m.  
60 dBA between 7:00 p.m. and 7:00 a.m.
3. When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level is equal to or less than 35 dBA, the hourly sound levels resulting from the development shall not exceed the following limits when the zoning of the abutting use is not predominantly commercial or industrial.  
  
55 dBA between 7:00 a.m. and 7:00 p.m.  
45 dBA between 7:00 p.m. and 7:00 a.m.

1. This sets the standard where abutting uses are residential, institutional, or open space. The Zoning Ordinance would designate the abutting area as one of these types of uses.
2. This sets the standard where abutting uses are businesses or industrial use. It allows a source to emit more noise than the source could emit in a residential or institutional area. The noise allowed in this location would be perceived as being twice as loud for the location with a residential buffer.
3. This standard provides for a lower sound level for locations where abutters would be residential or institutional when the existing sound level is quite low. It allows for a doubling of the perceived increase.

## Standard

4. If the daytime and/or nighttime pre-development ambient sound environment exceeds the daytime and/or nighttime limits in subsection 2(a) or 2(b) by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.
5. When development produces tonal sounds or short duration repetitive sounds:

Five (5) dBA shall be added to the observed levels of these sounds for the purposes of determining compliance with the sound level limits herein established.
6. The maximum sound level of the short duration repetitive sounds shall not exceed the following limits:
  - a. At any location for which the zoning is not predominantly commercial, transportation, or industrial:

65 dBA between 7:00 a.m. and 7:00 p.m. and  
55 dBA between 7:00 p.m. and 7:00 a.m.
  - b. At any location for which the zoning is predominantly commercial, transportation, or industrial:

75 dBA between 7:00 a.m. and 7:00 p.m., and  
65 dBA between 7:00 p.m. and 7:00 a.m.
7. Sound from construction activities between 6:30 a.m. and 8:00 p.m. shall not exceed the limits established in the table on page 11 at the property line. Between 8:00 p.m. and 6:30 a.m., sound levels shall comply with the other standards presented herein.
8. All equipment used in construction on development sites shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition as originally provided with the equipment by its manufacturer.
9. Noise shall be measured by a meter set on the A-weighted response scale, fast response. The meter shall meet the latest version of American National Standards Institute (ANSI S1.4.) "American Standard Specification for General Purpose Sound Level Meters."
10. In the absence of a measurement of "pre-development ambient" sound level, enforcement may be based on the post-development background level.

## Discussion

4. This provides for a development which will be located in an area where the sound level exceeds the standard set in the first section. It requires new development to emit a noise level that is lower than the existing noise level such that no further disturbance results and so that as noisier developments cease to operate, the area will have an ambient sound more closely in compliance with the rules.
5. This standard accounts for the fact that tonal and repetitive sounds are more annoying than multi-band, constant noises. To account for this, 5 dB is added to the tonal or repetitive sound level measured (or expected). Thus tonal or repetitive sounds would not be as loud as other noises.
6. This standard controls the maximum sound level from short duration, repetitive sources.
7. This standard provides actual limits to noises produced during construction, and it requires all equipment to comply with federal standards and original equipment design.
8. This specifies the standard to be used for the sound level meter and must be included so that all measurements have a common base and accuracy.
10. This standard accounts for cases where there is no pre-development sound level measurement. The pre-development level is approximated by the

## Standard

11. Sound associated with the following shall be exempt from regulation by the Board:

<b>Construction Activity Sound Limits (7:00 a.m. to 7:00 p.m.)</b>	
<b>Duration of Activity</b>	<b>Hourly Sound Level Limit</b>
<b>12 hours</b>	87 dBA
<b>8 hours</b>	90 dBA
<b>6 hours</b>	92 dBA
<b>4 hours</b>	95 dBA
<b>3 hours</b>	97 dBA
<b>2 hours</b>	100 dBA
<b>1 hour or less</b>	105 dBA

- The noises of safety signals, warning devices and emergency pressure relief valves and other emergency activities.
- Traffic noise on public roads.
- Railroad equipment which is subject to federal noise regulations.
- Aircraft operations at public airports or which are subject to federal noise regulations.
- Bells, chimes, and carillons.
- Occasional sporting, cultural, religious, or public events.
- Farming and forest management, harvesting, and transportation activities.

## Discussion

“background” level after development. The post-development background noise is the noise after the development is constructed but with no noise being produced by the development.

11. This list is similar to the list from the DEP Site Location Law rules. It is more specific than the exceptions provided for the other Alternatives.



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# Definitions

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**Ambient Sound:** At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific development of interest.

**Background Sound:** The all-encompassing sound associated with a given environment, being a composite of sounds from many sources at many directions, near and far, prior to the construction of the proposed development. Also referred to as the **pre-development ambient sound**.

**Equivalent Sound Level:** The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period.

**Hourly Sound Level:** The equivalent sound level for a one- (1) hour period.

**Maximum Sound:** Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit of measure is the pascal (Pa).

**Pre-Development Ambient:** The ambient sound at a specified location in the vicinity of a development site prior to the construction and operation of the proposed development or expansion.

**Short Duration Repetitive Sounds:** A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten (10) seconds in duration, and which are inherent to the process or operation of the development and are foreseeable. They include sounds which repeat on a regular basis and sounds which have a scattered time of occurrence.

**Sound Level:** Ten (10) times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this regulation, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.

**Sound Pressure:** Root-mean-square of the instantaneous sound pressure in a stated frequency band and during a specified time interval. Unit of measure is the pascal (Pa).

**Sound Pressure Level:** Ten (10) times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.

**Tonal Sound:** For the purpose of this regulation, a tonal sound exists if the one-third (1/3) octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two (2) contiguous one-third (1/3) octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz. and 125 Hz.

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**Copies of this report are available** from the Maine State Planning Office, 38 State House Station, Augusta, ME, 04333-0038. Request the appropriate subject document from the Land Use Technical Assistance Series, or view and download this document from the SPO website (<http://janus.state.me.us/spo/>).