Felicia Miller - A2PP - Revised Condition Noise-4

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Date: 7/26/2010 4:00 PM
Subject: A2PP - Revised Condition Noise-4
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Attachments: Almond 2 Revised Noise SA Revised Noise 4 TID.doc

Hi Felicia -

Attached, please find revised Condition Noise-4 which we discussed earlier today. Also, below is some additional information which summarizes what we discussed today regarding off-peak operation of the TID A2PP Project:

With its fast start / fast loading capability, the A2PP project will be called on to pick up lost generation during transmission system upsets and/or during the loss of other District generation resources such as the Walnut Energy Center. The need for this replacement power is significant during the District's peak load period.

During the off peak hours however, should the District experience loss of a generation resource, which required a start of A2PP, the District would initiate a start of the number of A2PP Units required to cover the lost resource. During such event, it is probable that one unit would be required. It is unlikely that all three units would be needed, since having all three units on-line would leave TID without a fast start back-up resource. Once the required number of A2PP Unit(s) were on line, the TID Scheduling personnel would immediately begin pricing other available market resources to locate sources of replacement energy at a lower cost than A2PP. If an outside resource could be found at a lower cost, the A2PP Unit(s) would then be taken off line. During the off-peak hours replacement energy is much more plentiful, and there are typically other more economical sources of energy available in the market. Therefore the District may only operate the started A2PP Unit(s) for approximately an hour until the replacement energy purchase can be put into place. Energy transactions are scheduled on the clock hour. If however an economical replacement energy source was not available, which is highly unlikely in the off-peak hours, the A2PP Unit(s) would continue to operate until an economical resource could be located. The A2PP Unit(s) would then resume their role as a backup resource.

Please let me know if you have any questions regarding this issue. Thanks.

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NOISE AND VIBRATION

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

California Energy Commission staff concludes that the TID the A2PP Power Plant project (A2PP) can be built and operated in compliance with all applicable noise and vibration laws, ordinances, regulations, and standards and, if built in accordance with the conditions of certification proposed below, would produce no significant adverse noise impacts on people within the affected area, either direct, indirect, or cumulative.

INTRODUCTION

The construction and operation of any power plant creates noise, or unwanted sound. The character and loudness of this noise, the times of day or night that it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices, such as blasting or pile driving. The groundborne energy of vibration has the potential to cause structural damage and annoyance.

The purpose of this analysis is to identify and examine the likely noise and vibration impacts from the construction and operation of the A2PP and to recommend procedures to ensure that the resulting noise and vibration impacts would be adequately mitigated to comply with applicable laws, ordinances, regulations, and standards (LORS) and to avoid creation of significant adverse noise or vibration impacts. For an explanation of technical terms and acronyms employed in this section, please refer to **NOISE Appendix A** immediately following.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Noise Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal (OSHA): 29 U.S.C. § 651 et seq.	Protects workers from the effects of occupational noise exposure.
State (Cal/OSHA): Cal. Code Regs., tit. 8, §§ 5095–5099	Protects workers from the effects of occupational noise exposure.
Local	
Stanislaus County General Plan, Noise Element	Establishes acceptable noise levels.
Stanislaus County Ordinance Code (Title 10, Chapter 10.46)	Prohibits noisy steam blows.
City of Ceres General Plan, Noise Element	Establishes acceptable noise levels.
City of Ceres Municipal Code(Chapter 9.36: "Noise" and Chapter 18.38: "Material Effects")	Limits construction noise to daytime hours and establishes acceptable noise levels.

FEDERAL

Under the Occupational Safety and Health Act of 1970 (29 USC § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations designed to protect workers against the effects of occupational noise exposure (29 CFR § 1910.95). These regulations list permissible noise exposure levels as a function of the amount of time during which the worker is exposed (see **NOISE Appendix A, Table A4** immediately following this section). The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed, assuring that workers are made aware of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.

There are no federal laws governing off-site (community) noise.

The only guidance available for evaluation of power plant vibration is guidelines published by the Federal Transit Administration (FTA) for assessing the impacts of groundborne vibration associated with construction of rail projects. These guidelines have been applied by other jurisdictions to assess groundborne vibration of other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from groundborne vibration. The FTA measure of the threshold of perception is 65 VdB,[1]

[1] VdB is the common measure of vibration energy.

which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

STATE

California Government Code section 65302(f) encourages each local governmental entity to perform noise studies and implement a noise element as part of its General Plan. In addition, the California Office of Planning and Research has published guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure. The State land use compatibility guidelines are listed in **Noise Table 2**.

Noise Table 2
Land Use Compatibility for Community Noise Environment

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE - Ldn or CNEL (db)													
	50		55		60		65		70		75		80	
Residential - Low Density Single Family, Duplex, Mobile Home														
Residential - Multi-Family														
Transient Lodging – Motel, Hotel														
Schools, Libraries, Churches, Hospitals, Nursing Homes														
Auditorium, Concert Hall, Amphitheaters														
Sports Arena, Outdoor Spectator Sports														
Playgrounds, Neighborhood Parks														
Golf Courses, Riding Stables, Water Recreation, Cemeteries														
Office Buildings, Business Commercial and Professional														
Industrial, Manufacturing, Utilities, Agriculture														

	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: State of California General Plan Guidelines, Office of Planning and Research, June 1990.

The California Occupational Safety and Health Administration (Cal/OSHA) has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095–5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards (see the **Worker Safety and Fire Protection** section of this document, and **NOISE Appendix A, Table A4**).

LOCAL

Stanislaus County General Plan, Noise Element

The County's General Plan Noise Element identifies single-family and multiple-family residential uses in residential zones as noise sensitive land uses (Stanislaus 2006, Chapter 4, section 4.0). As shown in Figure 3 of the Noise Element the County General Plan adopts the state land use compatibility guidelines (shown in **Noise Table 2**, above). Additionally, Policy Two of the Noise Element requires new stationary noise sources to mitigate noise emissions so that noise levels at noise sensitive land uses do not exceed the noise level standards presented in Table 4; this table is reproduced here as **Noise Table 3**:

Noise Table 3 – Stanislaus County Noise Element
Maximum allowable Noise Exposure – Stationary Noise Sources

	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
Hourly level (L_{eq}), dBA	55	45
Maximum level (L_{max}), dBA	75	65

Source: Stanislaus 2006, Table 4

The General Plan further states that where measured ambient noise levels exceed the standards, the standards (as shown above in **Noise Table 3**) should reflect the ambient noise levels.

Stanislaus County Ordinance Code

The County Code prohibits the production of "loud and raucous" noise, defined as noise that would be a nuisance to a person of ordinary sensibilities. The Code enumerates high pressure steam blows from stationary internal combustion engines as a public nuisance subject to this noise prohibition.

City of Ceres General Plan

The City of Ceres General Plan, policy 7.H.2, requires that noise created by new proposed non-transportation sources be mitigated so as not to exceed the noise level standards presented in Table 7-1 as measured at the property line of lands designated for noise-sensitive uses. Table 7-1 of the city's general plan is identical to Table 4 of the Stanislaus County General Plan Noise Element, reproduced in **Noise Table 3**, above (City of Ceres 1997).

City of Ceres Municipal Code

The City of Ceres has adopted the state land use compatibility guidelines (presented in **Noise Table 2** above) in its Municipal Code (City of Ceres 2008, section 18.36.060). Additionally, noise regulations applicable to the construction and operation of the project are set forth in the municipal code. Regulation section 9.36.020 limits noise level variation during nighttime hours, stating that "the erection (including excavation), demolition, alteration or repair of any building other than between the hours of seven o'clock (7:00) A.M. and eight o'clock (8:00) P.M" would be in violation of the provisions of the code.

SETTING

The A2PP would be constructed on land adjacent to the existing TID Almond Power Plant, located approximately 2 miles southwest of the City of Ceres, in Stanislaus County. The land surrounding the project site is zoned for agricultural and residential uses (TID2009a, AFC §§ 1.1, 5.6.1)

The ambient noise regime in the project vicinity consists primarily of traffic from Highway 99 and local roads. The nearest sensitive noise receptor is a residence located approximately 0.3 miles northeast of the project site (TID2009a, AFC § 5.7.2.1, Figure 5.7-1).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (Cal. Code Regs., tit. 14, App. G) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

1. exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance or applicable standards of other agencies;

2. exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

3. substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

4. substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The Energy Commission staff, in applying item 3 above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA or more at the nearest sensitive receptor.

Staff considers it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA is considered significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of the case.

Factors to be considered in determining the significance of an adverse impact as defined above include:

1. the resulting combined noise level;[2]
2. the duration and frequency of the noise;
3. the number of people affected;
4. the land use designation of the affected receptor sites; and
5. public concern or controversy as demonstrated at workshops or hearings or by correspondence.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- the construction activity is temporary;
- use of heavy equipment and noisy activities are limited to daytime hours; and
- all industry-standard noise abatement measures are implemented for noise-producing equipment.

Staff uses the above method and threshold to protect the most sensitive populations, including the minority population.

Ambient Noise Monitoring

In order to establish a baseline for comparison of predicted project noise to existing ambient noise, the applicant has presented the results of an ambient noise survey (TID2009a, AFC § 5.7.2.2; Tables 5.7-3 through 5.7-7). The survey was conducted January 20 through July 22, 2009, and monitored existing noise levels at the following locations, shown on **Noise and Vibration Figure 1**:

[2] For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments and with industrial noise regulations adopted by European jurisdictions. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive receptors, and the resulting noise level would be 40 dBA or less, the project noise level would likely be insignificant.

1. Location M1: Near a residence located approximately 2700 feet northwest of the project's northern boundary.

2. Location M2: Near the center of an existing residential development within the city of Ceres, located approximately 3,375 feet northeast of the project's northern boundary.

3. Location M3: Near the southern edge of a residential development within the city of Ceres, located approximately 1,875 feet to the northeast of the project's northern boundary. This location represents the nearest sensitive receptor, the one most likely to be impacted by project noise.

4. Location M4: Near a residence located approximately 3,375 feet southeast of the project's southern boundary.

5. Location M5: Near a residence located approximately 2,275 feet west of the project's western boundary.

Noise Table 4 summarizes the ambient noise measurements:

Noise Table 4
Summary of Measured Ambient Noise Levels

Measurement Location	Measured Noise Levels, dBA		
	L_{eq} – Daytime[1]	L_{eq} – Nighttime[2]	L_{90} – Nighttime[3]
M1: Northwest Residence	55	53	43
M2: Northeast Residences	55	46	41
M3: Nearest Receptor	60	55	40
M4: Southeast Residence	59	56	46
M5: West Residence	63	60	43

Source: TID2009a, AFC Tables 5.7-3 through 5.7-7
[1] Staff calculations of average of 15 daytime hours
[2] Staff calculations of average of 9 nighttime hours
[3] Staff calculations of average of 4 consecutive quietest hours of the nighttime

DIRECT IMPACTS AND MITIGATION

Noise impacts associated with the project can be created by short-term construction activities and by normal long-term operation of the power plant.

Construction Impacts and Mitigation

Construction noise is usually considered a temporary phenomenon. Construction of the A2PP is expected to be typical of similar projects in terms of schedule, equipment used, and other types of activities (TID2009a, AFC § 5.7.3.2).

Compliance with LORS

Construction of an industrial facility such as a power plant is typically noisier than permissible under usual noise ordinances. In order to allow the construction of new facilities, construction noise during certain hours of the day is commonly exempt from enforcement by local ordinances.

The Applicant has predicted the noise impacts of project construction on the nearest sensitive receptors (TID2009a, AFC § 5.7.3.2.1, Tables 5.7-9 through 5.7-11). A maximum construction noise level of 89 dBA L_{eq} is estimated to occur at a distance of 50 feet from the acoustic center of the construction activity (most often the power block) and attenuate to no more than 57 dBA L_{eq} at the nearest sensitive receptor, location M3 (TID2009a, AFC Table 5.7-9; and staff calculations). A comparison of construction noise estimates to measured ambient conditions is summarized in **Noise Table 5**.

Noise Table 5
Predicted Power Plant Construction Noise Impacts

Receptor	Highest Construction Noise Level[1] (dBA L_{eq})	Measured Existing Ambient[2] (dBA L_{eq})	Cumulative (dBA L_{eq})	Change (dBA)
M1: Northwest Residence	54	55 daytime	57 daytime	+2 daytime
		53 nighttime	57 nighttime	+4 nighttime
M2: Northeast Residences	52	55 daytime	57 daytime	+2 daytime
		46 nighttime	53 nighttime	+7 nighttime
M3: Nearest Receptor	57	60 daytime	60 daytime	+0 daytime
		55 nighttime	59 nighttime	+4 nighttime
M4: Southeast Residence	52	59 daytime	60 daytime	+1 daytime
		56 nighttime	57 nighttime	+1 nighttime
M5: West Residence	55	63 daytime	64 daytime	+1 daytime
		60 nighttime	61 nighttime	+1 nighttime

1 Source: TID2009a, AFC Table 5.7-8; and staff calculations
2 Source: TID2009a, AFC Tables 5.7-3 through 5.7-7; and staff calculations of average of daytime and nighttime hours

The applicable local noise LORS do not limit the loudness of construction noise, but staff compares the projected noise levels with ambient levels (please see the following discussion under **CEQA Impacts**).

Noisy construction work would be allowed only during the daytime hours of 7:00 a.m. to 8:00 p.m. in compliance with the City of Ceres Municipal Code. To ensure that these

hours are, in fact, enforced, staff proposes Condition of Certification **NOISE-6**. Therefore, the noise impacts of the A2PP construction activities would comply with the noise LORS.

CEQA Impacts

Since construction noise typically varies with time, it is most appropriately measured by, and compared with, the L_{eq} (energy average) metric. As seen in **Noise Table 5** above, last column, the highest increase in the ambient noise levels at the project's noise-sensitive receptors would be 7 dBA. An increase of 7 dBA would be noticeable and potentially significant. Given that noisy construction activities would be limited to daytime hours, however, the noise effects of plant construction are considered to be less than significant.

To ensure the project construction would create less than significant adverse impacts at the most noise-sensitive receptors, in addition to Condition of Certification **NOISE-6**, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a notification process and a noise complaint process to resolve any complaints regarding construction noise.

In light of the following proposed conditions of certification, the noise impacts of the A2PP construction activities would be less than significant.

Linear Facilities

New offsite linear facilities will either include a 9.1-mile-long or 11.1-mile-long natural gas pipeline, as well as two transmission lines (approximately 0.9 and 1.2 miles long, respectively). The applicant intends to utilize an existing water supply pipeline from the adjacent Almond Power Plant (TID2009a, AFC §§ 2.1, 2.1.1.1).

Construction of linear facilities typically moves along at a rapid pace, thus not subjecting any one receptor to noise impacts for more than two or three days. Further, construction activities would be limited to daytime hours. To ensure that these hours are, in fact, adhered to, in compliance with the LORS, staff proposes Condition of Certification **NOISE-6**.

Pile Driving

The applicant has not specifically discussed the possible use of pile driving during construction of The A2PP, but pile drivers have been listed as common construction equipment (TID2009a, AFC § 5.7.3.2.1, Table 5.7-11). If pile driving is required for construction of the project, the noise from this operation could be expected to reach 104 dBA at a distance of 50 feet. Pile driving noise would thus be projected to reach levels of 73 dBA at location M3, the nearest residential receptor (TID2009a, AFC Table 5.7-11; staff calculations). As shown in **Noise Table 6,** the greatest increase over ambient noise levels resulting from pile driving would occur at location M1 with an increase of 14 dBA. While this would produce a noticeable impact, staff believes that limiting pile driving to daytime hours, in conjunction with its temporary nature, would result in impacts tolerable to residents. Staff proposes condition of certification **NOISE-6** to ensure that pile driving, should it occur, would be limited to daytime hours.

Noise Table 6
Pile Driving Noise Impacts

Receptor	Pile Driving Noise Level (dBA L_{eq})	Daytime Ambient Noise Level (dBA L_{eq})	Cumulative Level (dBA)	Change (dBA)
M1	69	55	69	+14
M2	67	55	67	+12
M3	73	60	73	+13
M4	67	59	67	+8
M5	71	63	72	+11

Source: TID2009a, AFC Table 5.7-11 and staff calculations

Vibration

The only construction operation likely to produce vibration that could be perceived off site would be pile driving, should it be employed. Vibration attenuates rapidly; it is likely that no vibration would be perceptible at any appreciable distance from the project site. Staff therefore believes there would be no significant impacts from construction vibration at the project's noise-sensitive receptors.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized those applicable LORS that would protect construction workers (TID2009a, AFC § 5.7.3.2.3). To ensure that construction workers are, in fact, adequately protected, staff has proposed Condition of Certification **NOISE-3**, below.

Operation Impacts and Mitigation

The primary noise sources of the A2PP include combustion turbine generators, SCR units, stacks, compressors, and transformers (TID2009a, AFC § 2.1.2, 2.1.4, Table 5.7-11). Staff compares the projected noise with applicable LORS. In addition, staff evaluates any increase in noise levels at sensitive receptors due to the project in order to identify any significant adverse impacts.

Compliance with LORS

The applicant performed noise modeling to determine the project's noise impacts on sensitive receptors (TID2009a, AFC § 5.7.3.3.3, Table 5.7-13). The applicant has predicted operational noise levels, summarized in **Noise Table 7** below.

Noise Table 7
Predicted Operational Noise Levels and Noise LORS

Receptor	Project Alone Operational Noise Level L_{eq} (dBA)[1]	Stanislaus County General Plan, L_{eq} (dBA)[2]
M1	~~46~~ 47	55 day/ 53 night
M2	~~44~~ 45	55 day/ 46 night
M3	49	60 day/ 55 night
M4	~~44~~ 49	59 day/ 56 night
M5	47	63 day/ 60 night

Sources: [1] TID2009a, AFC § 5.7.3.3.3; staff calculations; CH2MHILL2010d;
[2] Noise Table 3 and Noise Table 4, above

The applicant has incorporated noise reduction measures into the design of the project to ensure that there will not be a substantial increase in noise levels at the nearest receptors. The local planning policy guidelines for Stanislaus County and the City of Ceres require new projects to meet the acceptable exterior noise level standards listed in **Noise Table 3**, in residential areas. Existing ambient conditions at the residential receptors closest to the project site for the A2PP, however, are higher than those noise level standards described in the guidelines. The LORS state that in such an instance the noise level standards shall be increased to the ambient levels, as shown in **Noise Table 7**, above.

As seen in **Noise Table 7**, the project's operational noise level at the nearest receptors would be no more than 49 dBA L_{eq} and would be within the LORS noise limits. ~~This is 11 decibels below the 60 dBA Leq daytime noise limit and 2 decibels below the 46 dBA Leq nighttime limit at location M2, which is the most noise impacted sensitive receptor.~~ Therefore, the project's operational noise impacts at the nearest sensitive receptors (M1 through M5) would comply with both the City of Ceres and Stanislaus County noise LORS. To ensure compliance, staff proposes Condition of Certification **NOISE-4**.

CEQA Impacts

Power plant noise is unique. A power plant operates as, essentially, a steady, continuous, broadband noise source, unlike the intermittent sounds that make up most of the noise environment. Power plant noise therefore contributes to, and becomes a part of, background noise levels, or the sound heard when most intermittent noises stop. Where power plant noise is audible, it tends to define the background noise level. For this reason, staff typically compares projected power plant noise to existing ambient background (L_{90}) noise levels at affected sensitive receptors. If this comparison identifies a significant adverse impact, then feasible mitigation must be applied to the project to either reduce or remove that impact.

For residential receptors, staff evaluates project noise emissions by comparing them with nighttime ambient background levels; this evaluation assumes that the potential for

public annoyance from power plant noise is greatest at night when residents are trying to sleep. Nighttime ambient noise levels are typically lower than daytime levels; differences in background noise levels of 5 to 10 dBA are common. Staff believes it is prudent to average the lowest nighttime hourly background noise levels to arrive at a reasonable baseline for comparison with the project's predicted noise level.

Adverse impacts on residential receptors can be identified by comparing predicted power plant noise levels with the nighttime ambient background noise levels at the nearest sensitive residential receptors.

The applicant has predicted operational noise levels; they are summarized here in **Noise Table 8**.

Noise Table 8
Predicted Operational Noise Levels and CEQA

Receptor	Project Alone Operational Noise Level L_{eq} (dBA) [1]	Measured Existing Ambient, Average Nighttime L_{90} (dBA) [2]	Project Plus Ambient L_{90} (dBA)	Change in Ambient Level
M1	~~46~~ 47	43	48	+5
M2	~~44~~ 45	41	46	+5
M3	49	40	50	+10
M4	~~44~~ 49	46	~~48~~ 51	~~+2~~ 5
M5	47	43	48	+5

[1] Source: TID2009a, AFC § 5.7.3.3.3; staff calculations; CH2MHILL2010d
[2] Source: TID2009a, AFC Tables 5.7-3 through 5.7-7; and staff calculations of average of four quietest consecutive nighttime hours

Combining the ambient noise level of 46 dBA L_{90} (**Noise Table 4**, above) with the project noise level of ~~44~~ 49 dBA at M4 would result in ~~48~~ 51 dBA L_{90}, ~~2~~ 5 dBA over the ambient. As described above (in **Method and Threshold for Determining Significance**), staff regards an increase of up to 5 dBA as a less-than-significant impact. Therefore, staff considers the above noise impacts at M4 to be less than significant.

Combining the ambient noise level of 41 dBA L_{90} (**Noise Table 4**) with the project noise level of ~~44~~ 45 dBA at M2 would result in 46 dBA L_{90}, 5 dBA above the ambient. Combining ambient noise levels with project noise levels at M1 and M5 also results in an increase of 5 dBA above the ambient. While this is a noticeable increase, it lies within the range staff considers less than significant. To ensure these noise levels are not further exceeded, staff proposes Condition of Certification **NOISE-4**, below.

Combining the ambient noise level of 40 dBA L_{90} (**Noise Table 4**) with the project noise level of 49 dBA at M3 would result in 50 dBA L_{90}, 10 dBA over the ambient. Staff regards an increase between 5 dBA and 10 dBA to be potentially significant; given that this increase would occur at nighttime when people are trying to sleep, a 10 dBA increase would be significant and mitigation would be required.

The applicant has submitted a document showing what the expected project operational profile would be (CH2MHILL2010d). According to this document, the project is intended as a backup power plant when the Turlock Irrigation District's Walnut Energy Center power plant is offline. Additionally, the applicant states that in the event of nighttime operation, the project likely would not operate continuously during nighttime hours. For these reasons, the applicant has requested that the project-alone operational noise level of 49 dBA be the limit at receptor M3. Staff agrees that with such an operating profile, the project would likely only operate occasionally during the late night and early morning hours. However, an increase of 10 dBA in the existing nighttime ambient level could still constitute a significant impact if the project is dispatched for nighttime operation. Moreover, receptor M3 is situated on the southern edge of a residential development, so impacts at M3 would affect multiple residences. Staff believes that an operational noise level in the mid range of what is generally viewed potentially significant (an increase between 5 and 10 dBA over ambient levels) would be acceptable, given that potential nighttime operation would be expected to be sporadic and of short duration. Staff suggests that the noise level attributed to the operation of the project alone should not exceed 46 dBA at receptor M3, which would result in an increase of 7 dBA over ambient at that receptor. Condition of Certification **NOISE-4** has been modified to reflect this concession. Additionally, Condition of Certification **NOISE-2** would remain in place to ensure that any noise complaints, if they should occur, are resolved.

Tonal Noises

One possible source of disturbance would be strong tonal noises. Tonal noises are individual sounds (such as pure tones) that, while not louder than permissible levels, stand out in sound quality. The applicant plans to address overall noise in project design, and to take appropriate measures, as needed, to eliminate tonal noises as possible sources of annoyance (TID2009a, AFC § 5.7.3.3.4). To ensure that tonal noises do not cause annoyance, staff proposes Condition of Certification **NOISE-4**, below.

Linear Facilities

All gas piping would lie underground and would be silent during operation. Noise effects from the electrical interconnection line typically do not extend beyond the right-of-way easement of the line and would thus be inaudible to any receptors.

Vibration

Vibration from an operating power plant could be transmitted through two primary means: ground (ground-borne vibration), and air (airborne vibration).

The operating components of a simple cycle power plant consist of high-speed gas turbines, compressors, and various pumps. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors are attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, Energy Commission staff believes that ground-borne vibration from the A2PP would be undetectable by any likely receptor.

Airborne vibration (low frequency noise) can rattle windows and objects on shelves, and can rattle the walls of lightweight structures. The A2PP's chief source of airborne vibration would be the gas turbines' exhaust. In a power plant such as the A2PP, however, the exhaust must pass through the selective catalytic reduction (SCR) modules and the stack silencers before it reaches the atmosphere. The SCRs act as efficient mufflers. The combination of SCR units and stack silencers makes it highly unlikely that the A2PP would cause perceptible airborne vibration effects

Worker Effects

The applicant has acknowledged the need to protect plant operating and maintenance workers from noise hazards and has committed to comply with applicable LORS (TID2009a, AFC § 5.7.3.3.1). Signs would be posted in areas of the plant with noise levels exceeding 85 dBA (the level that OSHA recognizes as a threat to workers' hearing), and hearing protection would be required. To ensure that plant operation and maintenance workers are, in fact, adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-5**, below.

CUMULATIVE IMPACTS AND MITIGATION

Section 15130 of the CEQA Guidelines (Cal. Code Regs., tit. 14) requires a discussion of cumulative environmental impacts. Cumulative impacts are two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. The CEQA Guidelines require that the discussion reflect the severity of the impacts and the likelihood of their occurrence, but need not provide as much detail as the discussion of the impacts attributable to the project alone.

The applicant has identified thirty-three projects in the vicinity of the A2PP that have been approved by the City of Ceres Planning Department; only one of these projects (increased stand-by power at Blaker Reservoir) introduces a potential new noise source(TID2009a, AFC § 5.7.4). However this project is more than 2 miles away from the A2PP site; too far to cause cumulative impacts when combined with the A2PP.

FACILITY CLOSURE

In the future, upon closure of the A2PP, all operational noise from the project would cease, and no further adverse noise impacts from operation of the A2PP would be possible. The remaining potential temporary noise source is the dismantling of the structures and equipment and any site restoration work that may be performed. Since this noise would be similar to that caused by the original construction, it can be treated similarly. That is, noisy work could be performed during daytime hours, with machinery and equipment properly equipped with mufflers. Any noise LORS that were in existence at that time would apply. Applicable conditions of certification included in the Energy Commission decision would also apply unless modified.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Comment: The applicant has commented that a one-mile radius for notification for Condition NOISE-1 should be adequate.

Response: Staff agrees that a one-mile radius would include most of the nearby noise sensitive receptors, including the nearby residences at the community represented by measuring location M3 which would be the most noise impacted receptor. Condition NOISE-1 has thus been updated to reflect this change.

Comment: The applicant has commented that the project is not intended to operate continuously during nighttime hours. Additionally, the applicant states, with supporting data, that the project is expected to operate in a peaking capacity as a backup to the Walnut Energy Center and would not, therefore, be expected to operate at a full load output when dispatched (CH2MHILL2010d). With this expected operational profile in mind, the applicant has requested that Condition NOISE-4 be modified so the operational noise survey required in the condition reflects the anticipated operational profile. The applicant also suggests that, given that the project is not expected to run continuously during nighttime hours, the project operational noise level of 49 dBA at receptor M3 would not result in significant impacts at the receptor.

Response: Staff agrees that, given that the project would operate as backup generation in a peaking capacity at part load, the suggested modifications to the operational noise survey are warranted. Given the anticipated operating profile provided by the applicant, staff believes the suggested modified survey criteria ("the project shall be operated at full load during at least 4 consecutive nighttime hours and at least 50% capacity for the remainder of the 25-hour survey") would be adequate to ensure that project operation would most likely not result in significant impact to nearby sensitive receptors. Condition NOISE-4 has thus been updated to reflect this modification.

While staff acknowledges that, as a backup peaking facility, the project would not be expected to operate at nighttime on a regular basis and would not operate continuously if it were dispatched at night, staff believes that a noise level increase of 10 dBA, as would result at receptor M3 if noise levels attributed to project operation were allowed to reach 49 dBA, could still constitute a significant impact if the project is dispatched for even limited nighttime operation. Moreover, receptor M3 is situated on the southern edge of a residential development, so impacts at M3 would affect multiple residences. However, staff believes that an operational noise level in the mid range of what is generally viewed potentially significant (an increase between 5 and 10 dBA over ambient levels) would be acceptable, given that potential nighttime operation would be expected to be sporadic and of short duration. Staff suggests that the noise level attributed to the operation of the project alone should not exceed 46 dBA at receptor M3, which would result in an increase of 7 dBA over ambient at that receptor. Condition NOISE-4 has been modified to reflect this concession. Additionally, Condition of Certification NOISE-2 would remain in place to ensure that any noise complaints, if they should occur, are resolved.

CONCLUSIONS AND RECOMMENDATIONS

Staff concludes that the A2PP, if built and operated in conformance with the proposed conditions of certification below, would comply with all applicable noise and vibration LORS and would produce no significant adverse noise impacts on people within the project area, including the minority population, directly, indirectly, or cumulatively.

PROPOSED CONDITIONS OF CERTIFICATION

NOISE-1 Prior to ground disturbance at the project site and again prior to ground disturbance at the location of the linear facilities, the project owner shall notify all residents within ~~two~~ one mile~~s~~ of the site and one mile of the linear facilities, by mail or other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project and include that telephone number in the above notice. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

Verification: At least 15 days prior to the start of ground disturbance, the project owner shall transmit to the Compliance Project Manager (CPM) a statement, signed by the project owner's project manager, stating that the above notification has been performed and describing the method of that notification, verifying that the telephone number has been established and posted at the site, and giving that telephone number.

NOISE COMPLAINT PROCESS

NOISE-2 Throughout the construction and operation of the A2PP, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
- Attempt to contact the person(s) making the noise complaint within 24 hours, or 72 hours if the complaint is made over the weekend;
- Conduct an investigation to determine the source of noise related to the complaint;
- Take all feasible measures to reduce the noise at its source if the noise is project related; and
- Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise reduction efforts, and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within five days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a three-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is implemented.

NOISE-3 The project owner shall submit to the CPM for review and approval a noise control program and a statement, signed by the project owner's project manager, verifying that the noise control program will be implemented throughout construction of the project. The noise control program shall be used to reduce employee exposure to high noise levels during construction and also to comply with applicable OSHA and Cal/OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit to the CPM the noise control program and the project owner's project manager's signed statement. The project owner shall make the program available to Cal/OSHA upon request.

NOISE RESTRICTIONS

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the noise levels due to operation of the project alone will not exceed: an hourly average of 47 at location M1, 45 at location M2, 47 at location M3, 49 at location M4, and 47 at location M5 (as shown on **Noise and Vibration Figure 1**). ~~44 45 dBA, measured at or near monitoring locations M2 (approximately 3,375 feet northeast of the project site boundary), M3 (approximately 1,875 feet northeast of the project site boundary), and M4 (approximately 3,375 feet southeast of the project site boundary); an hourly average of 46 dBA, measured at or near monitoring location M1 (approximately 2,700 feet northwest of the project site boundary); and an hourly average of 47 dBA, measured at or near monitoring location M5 (approximately 2,275 feet west of the project site boundary).~~

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No new pure-tone components shall be caused by the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints.

~~A. When the project first achieves a sustained output of 85 percent or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at monitoring location M3, or at a closer location acceptable to the CPM. This survey during the power plant's full-load operation shall also include measurement of one-third octave band sound pressure levels to ensure that no new pure-tone noise components have been caused by the project.~~

~~During the period of this survey, the project owner shall conduct a survey of noise at monitoring locations M1, M2, M4 and M5, or at closer locations acceptable to the CPM. The short-term noise measurements at these locations shall be conducted during the nighttime hours of 10:00 p.m. to 7:00 a.m.~~

~~The measurement of power plant noise for the purposes of demonstrating compliance with this condition of certification may alternatively be made at a location, acceptable to the CPM, closer to the plant (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence. The character of the plant noise shall be evaluated at the affected receptor locations to determine the presence of pure tones or other dominant sources of plant noise.~~

A. If the results from the noise survey indicate that the power plant noise at the affected receptor sites exceeds the above values, mitigation measures shall be implemented to reduce noise to a level of compliance with these limits.

B. If the results from the noise survey indicate that pure tones are present, mitigation measures shall be implemented to eliminate the pure tones.

Verification: The project owner shall conduct a 25-hour noise survey at monitoring location M3, or at a closer location acceptable to the CPM, ~~shall take place~~ within 30 days of the project first achieving a sustained output of 85 percent or greater of rated capacity. During the period of this survey, the project owner shall also conduct short-term noise measurements between the nighttime hours of 10:00 p.m. and 7:00 a.m. at monitoring locations M1, M2, M4, and M5 or at closer locations acceptable to the CPM. All surveys shall measure one-third octave band sound pressure levels to ensure that no new pure-tone noise components have been caused by the project. During the 25-hour survey, output shall be maintained at a level of 50% or greater. Within 15 days after completing the survey, the project owner shall submit a summary report of the survey to the CPM. Included in the survey report shall be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limit, and a schedule, subject to CPM approval, for implementing these measures. When these measures are in place, the project owner shall repeat the noise survey.

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Deleted: , full load operation shall be maintained between midnight and 4:00 a.m. Outside of these hours.

As indicated above, the measurement of power plant noise for the purposes of demonstrating compliance with this condition of certification may alternatively be made at a location, acceptable to the CPM, closer to the facility (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence.

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NOISE-5 Following the project's first achieving a sustained output of 85 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations sections 5095–5099 and Title 29, Code of Federal Regulations section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal/OSHA upon request.

CONSTRUCTION TIME RESTRICTIONS

NOISE-6 Heavy equipment operation and noisy construction work relating to any project features, including pile driving, shall be restricted to the times delineated below:

Any Day: 7:00 a.m. to 8:00 p.m.

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Verification: Prior to ground disturbance, the project owner shall transmit to the CPM a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Almond 2 Power Plant
(09-AFC-2)

NOISE COMPLAINT LOG NUMBER _____

Complainant's name and address:

Phone number: _____

Date complaint received: _____
Time complaint received: _____

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: _____

Initial noise levels at 3 feet from noise source _____ dBA Date: _____

Initial noise levels at complainant's property: _____ dBA Date: _____

Final noise levels at 3 feet from noise source: _____ dBA Date: _____

Final noise levels at complainant's property: _____ dBA Date: _____

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

Approximate installed cost of corrective measures: $ _____
Date installation completed: _____
Date first letter sent to complainant: _____ (copy attached)
Date final letter sent to complainant: _____ (copy attached)

This information is certified to be correct:

Plant Manager's Signature: _____

(Attach additional pages and supporting documentation, as required).

REFERENCES

Ceres 1997 – City of Ceres General Plan, Chapter 7. February 1997

Ceres 2008 – City of Ceres Municipal Code, Chapters 18.38 and 9.36. 2008.

CH2MHILL2010d – CH2MHILL/S. Madams (tn: 57036). A2 Applicant Comments on SA. Dated on 06/07/10. Submitted to CEC/Docket Unit on 06/07/10.

Stanislaus 2006 – Stanislaus County General Plan Noise Element. 2005.

Stanislaus 2008 – Stanislaus County Code, Chapter 10.46. 2006.

TID2009a –Turlock Irrigation District/ R. Baysinger (tn: 51502). Application for Certification, Volume 1& 2. Dated 5/11/09. Submitted to CEC/Docket Unit on 5/11/09.

[INSERT NOISE AND VIBRATION FIGURE 1]

NOISE APPENDIX A
FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

To describe noise environments and to assess impacts on noise sensitive area, a frequency weighting measure, which simulates human perception, is customarily used. It has been found that "A-weighting" of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **NOISE Table A1** provides a description of technical terms related to noise.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (L_{eq}), or by average day and night A-weighted sound levels with a nighttime weighting of 10 dBA (L_{dn}). Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Outdoor day-night sound levels vary over 50 dBA depending on the specific type of land use. Typical L_{dn} values might be 35 dBA for a wilderness area, 50 dBA for a small town or wooded residential area, 65 to 75 dBA for a major metropolis downtown (e.g., San Francisco), and 80 to 85 dBA near a freeway or airport. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, those higher levels nevertheless are considered to be levels of noise adverse to public health.

Various environments can be characterized by noise levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (U.S. Environmental Protection Agency, Effects of Noise on People, December 31, 1971).

To help the reader understand the concept of noise in decibels (dBA), **NOISE Table A2** illustrates common noises and their associated sound levels, in dBA.

NOISE Table A1 Definition of Some Technical Terms Related to Noise	
Terms	**Definitions**
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the noise level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7 p.m. to 10 p.m., and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Level, L_{dn} or DNL	The Average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.

Source: Guidelines for the Preparation and Content of Noise Elements of the General Plan, Model Community Noise Control Ordinance, California Department of Health Services 1976, 1977.

NOISE Table A2 Typical Environmental and Industry Sound Levels			
Noise Source (at distance)	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		Very Loud
Very Loud Music	110	Rock Music Concert	
Pile Driver (50')	100		
Ambulance Siren (100')	90	Boiler Room	
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	
Large Transformer (200')	40		Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing

Source: Handbook of Noise Measurement, Arnold P.G. Peterson, 1980

Subjective Response to Noise

The adverse effects of noise on people can be classified into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise.

One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of 1 dB cannot be perceived.

2. Outside of the laboratory, a 3-dB change is considered a barely noticeable difference.

3. A change in level of at least 5 dB is required before any noticeable change in community response would be expected.

4. A 10-dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response (Kryter, Karl D., The Effects of Noise on Man, 1970).

Combination of Sound Levels

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a 3-dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus 3 dB). **NOISE Table A3** indicates the rules for decibel addition used in community noise prediction.

NOISE Table A3
Addition of Decibel Values

When two decibel values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0
Figures in this table are accurate to ± 1 dB.	

Source: Architectural Acoustics, M. David Egan, 1988.

Sound and Distance

Doubling the distance from a noise source reduces the sound pressure level by 6 dB.

Increasing the distance from a noise source 10 times reduces the sound pressure level by 20 dB.

Worker Protection

OSHA noise regulations are designed to protect workers against the effects of noise exposure and list permissible noise level exposure as a function of the amount of time to which the worker is exposed, as shown in **NOISE Table A4**.

NOISE Table A4
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: 29 CFR § 1910.95.