

Oak to Ninth Avenue Health Impact Assessment

Chapter 7 Community Noise

A. Summary

The Development of the Oak to Ninth Project will result in exposure to future residents of high levels of community noise. Parcels A, F, G, K, and M, closest to the freeway, have background noise levels currently over Ldn 70 dBA, and residential uses at these levels are considered normally unacceptable to clearly unacceptable based upon the Oakland General Plan. In addition they are subjected to numerous short term railroad horn noise exposures at the 5th. Street railroad crossing. The USEPA estimates that these unmitigated noise levels will result in community reactions ranging from threats of legal action to vigorous protest and may result in elevated blood pressure, circulatory disease, ulcer, colitis, and sleep deprivation. Implementation and evaluation of a comprehensive set of indoor and outdoor noise mitigations should be required as a condition of development.

Health Impacts

1. Regardless of the feasibility and effectiveness of indoor noise mitigations, some project residents are likely to be exposed to environmental noise to an extent that can create annoyance and adversely effect school and work performance.
2. Without mitigations, we estimate 53% of residents in dwellings adjacent to the railway line will experience sleep disturbance; even with a highly effective noise mitigation program capable of reducing noise by 50dB, 7% of residents would experience sleep disturbance.
3. Existing project area outdoor noise levels of greater than 70 dB will prevent normal voice level communication at unprotected exterior locations.
4. Plans under consideration for development of affordable housing include locating below market rate housing on project area parcels with the highest levels of noise create an adverse environmental justice impact.

Recommendations for Design and Mitigation

1. Reduce the speeds of the traffic on the Embarcadero and project's residential streets.
2. Notify all potential buyers that the property they are occupying has noise risks.
3. Installation of noise-insulating windows, exterior doors and walls, and individual HVAC system
4. Design units exposed to high noise levels with interior courtyards and patios that open into acoustically protected and shielded areas.
5. Require, as a condition of development, all feasible traffic demand management actions.
6. Integrate below market and market rate units in the same buildings to prevent environmental justice impacts.

B. Background: Noise and Health Impacts

Long term exposure to moderate levels of environmental noise can adversely affect sleep, school and work performance, and cardiovascular disease.¹ The health impacts of environmental noise depend on the intensity of noise, on the duration of exposure, and the context of exposure. For example, the World Health Organization noise exposure thresholds are much lower threshold for levels inside (30 dB) and outside (45 dB) homes than for commercial (70 dB) and other public areas.

Noise affects sleep both by waking people up and reducing the quality of sleep. A 10 dB change is generally perceived by the human ear as a doubling of noise. According to the WHO, reductions of noise by 6-14 dBA result in subjective and objective improvements in sleep. Environmental noise is a risk factor for cardiovascular disease. Chronic road noise can affect cognitive performance of children including difficulty keeping attention, concentrating and remembering, poorer reading ability, and poorer discrimination between sounds.² The combination of noise and poor quality housing can have additive effects. In one study, a combination of these factors was associated with higher stress and stress hormone levels.³ A comprehensive synthesis of the noise health effects and control is contained in the World Health Organization’s Guidelines for Community Noise.⁴

| Determinants of Urban Noise | Health Effects | Modifying Factors | Mitigations |
|--|--|---|--|
| Vehicle volume, Vehicle type Vehicle speed Roadway Conditions Mechanical Equipment | Sleep Stress Cognitive Function Hypertension Annoyance Speech Intelligibility | Noise Intensity Noise Duration Perceived risk associated with noise | Building Orientation Insulated windows, doors, and walls Ventilation System Placement Buffers Traffic Calming |

C. Established Standards and Health Objectives

The Oakland General Plan Noise Element, adopted in 2005, provides guidelines for assessing compatibility between various land uses and ambient levels of noise. With regards to residential uses, Oakland General Plan Noise Element’s Land Use Compatibility Chart considers residential uses “normally acceptable” if the Ldn is less than 60 dB. Residential uses are conditionally acceptable if the Ldn is between 60 and 70 dB but development requires noise analysis and mitigation. Residential uses are normally unacceptable at levels over 70dB and the General Plan proscribes residential uses as “clearly unacceptable” where noise levels are greater than 75 dB Ldn, stating that such “development should not be undertaken”.

¹ Dora C and Phillips M. Transport, Environment, and Health reviews of evidence for relationships between transport and health World Health Organization 1999.

² Noise and Health: Making the Link London Health Commission 2003
<http://www.phel.gov.uk/hiadocs/noiseandhealth.pdf>

³ Evans G, Marcynyszyn LA. Environmental Justice, Cumulative Environmental Risk, and Health among Low- and Middle-Income Children in Upstate New York. American Journal of Public Health 2004;94: 1942-1944.

⁴ Available at: <http://www.who.int/docstore/peh/noise/guidelines2.html>.

| Oakland General Plan Compatibility Chart for Residential Uses and Community Noise | | |
|--|--------------------------|---|
| Exposure (Ldn, dB) | Guidance | Interpretation |
| < 60 | Normally acceptable. | Development may occur without an analysis of potential noise impacts to the proposed development. |
| 60 - 70 | Conditionally acceptable | Development should be undertaken only after an analysis of noise-reduction requirements is conducted, and if necessary noise-mitigating features are included in the design |
| 70-75 | Normally Unacceptable | Development should be discouraged; it may be undertaken only if a detailed analysis of the noise reduction requirements is conducted, and if highly effective noise insulation, mitigation, or abatement features are included in the design. |
| > 75 | Clearly Unacceptable | Development should not be undertaken. |

Title 24 of the California Code of Regulations provides for noise insulation standards for residential buildings. The code requires an acoustical study whenever a residential building is proposed near an existing or planned freeway, major roadway, rail line, or industrial noise source and where those noise sources cumulatively produce an outdoor Ldn of 60 dB or higher. Residences must be designed to limit interior noise to no more than a Ldn of 45 dB.

D. Noise Conditions at the Project

Standard methods exist to measure environmental noise and to predict changes in noise based on changes in vehicle traffic. The Oak to Ninth Project’s DEIR contained both field measurements of noise and a forecasting analysis predicting the changes in noise due to the project. Table IV.G-3 describes both long and short term measures at 23 locations on the project taken in 2002 by Charles M. Salter Associates measured long term environmental noise levels on parcels A, G, F, K, and M which are situated adjacent to the Embarcadero are very loud, with long term measures generally above 70 dB and above 75 Ldn at many measurement points (DEIR IV.G-11) These high noise levels can be attributed primarily to the parcels’ location in close proximity to I-880 and the adjacent railway corridor. Correspondingly, measured noise levels attenuate with distance from the freeway.

E. Project Health Impacts

Land use development may increase the exposure to environmental noise in several ways: (1) creating new uses that produce noise (e.g., factories); (2) construction; (3) increasing vehicle trips; and (4) bringing people in proximity to sources of noise. The project EIR concluded that the project would cause significant environmental impacts by developing a new residential uses in an area with high ambient noise levels.

Effects on overall health and well-being

The USEPA estimates that these unmitigated noise levels will result in community reactions ranging from threats of legal action to vigorous protest.⁵ This level of annoyance is directly related to several health effects associated with noise induced stress response, including: elevated blood pressure, circulatory disease, ulcer, and colitis. Regardless of the ultimate feasibility and effectiveness of indoor noise mitigations, some project residents are likely to be exposed to environmental noise to an extent that can adversely affect subjective well-being and school and work performance.

Effects on sleep disturbance

The DEIR failed to directly evaluate train horn noise and its potential affect upon sleep disturbance. The Federal Railroad Administration has determined the average train horn creates a single event level of 107 SEL at 100 feet.⁶ The Oak to Ninth DEIR states that in excess of 40 trains per day will cross the 5th Avenue railroad crossing resulting in exposures in excess of 103 SEL at parcels K and M. With windows open the exterior to interior building attenuation will be about 10 dBA resulting in an interior noise level of approximately 93 SEL. The U.S. Federal Interagency Committee on Noise has found that the relationship between sleep disturbance and noise is as follows⁷.

$$\%Awakening = (7.079 \times 10^{-6}) \times SEL^{3.496}$$

Without noise mitigations, we estimated that approximately 53% of the exposed population would be awakened. However, if acoustical insulation and HVAC were included in the design sufficient to reduce noise 50 dBA, we estimate a SEL of 53 dBA and a percent awakening of 7 percent.

Effects on speech

Existing project area outdoor noise levels of greater than 70 dB will prevent normal voice level communication at unprotected exterior locations.⁸

Environmental justice impacts

Project plans under consideration for development of affordable housing include locating below market rate housing on project area parcels with the highest levels of noise. Members of low income households may be more sensitive to the health and developmental impacts of high environmental noise levels. The construction of BMR units on high noise parcels creates adverse environmental justice impacts.

F. Recommendations for Design and Mitigation

California law requires the construction of dwellings include noise mitigation; however, these standards only affect indoor noise exposure. Other measures that might affect ambient noise include (1) Re-engineering, reducing or altering timing of automobile and truck traffic on routes; (2) Requiring noise controls on indoor and outdoor commercial equipment; (3) Re-orienting buildings in ways that create sound buffers for outdoor spaces; (4) Reductions in vehicle speeds. The Project EIR concludes that full

⁵ EPA, Noise Effects Handbook, 1979, p. 8-1, <http://www.nonoise.org/library/handbook/handbook.htm>

⁶ <http://www.fra.dot.gov/us/content/1174>

⁷ <http://www.fican.org/pdf/nai-8-92.pdf>

⁸ *ibid.*, p. 4-4, <http://www.nonoise.org/library/handbook/handbook.htm>

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mitigation, for instance via the construction of sound barrier walls is not possible due to the height of the proposed residential towers. The following are recommended actions to reduce project resident exposure to noise.

- Reduce the speeds of the traffic on the Embarcadero and project's residential streets through traffic calming measures.
- Require, as a condition of development, all feasible traffic demand management actions, including shuttle service to BART at frequency of no less than every 15 minutes, a pedestrian and bike pathway connecting development to the BART and surrounding neighborhoods, and greater affordable housing.
- Notify all potential buyers that the property they are occupying has significant noise risks .
- Construction standards required to meet Title 24 noise insulation requirements requiring the use of noise-insulating windows, acoustical exterior doors and walls would also be appropriate mitigations.
- Design units exposed to high noise levels with interior courtyards and patios that open into acoustically protected and shielded areas.
- Integrate below market and market rate units in the same buildings to prevent environmental justice impacts.
- Consider modifying the layout of the project in a way that places a multilevel parking structure to serve as an acoustical barrier between the residences and the freeway.