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5707 Redwood Road
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Oakland, CA 94602

Subject: Peer Reviews of the Noise Assessment Study and the Noise Chapter of the Draft Environmental Impact Report, Head-Royce School Expansion, Lincoln Avenue, Oakland

Dear Ms. Moncharsh:

This report will provide you with our peer reviews of the Noise Assessment Study prepared by Illingworth-Rodkin and the noise chapter of the Draft Environmental Impact Report (DEIR) for the planned expansion of the Head-Royce School along Lincoln Avenue in Oakland.

Since the noise chapter of the DEIR is mostly a reiteration of the noise study, the noise study was reviewed first. The review of the DEIR and the comments made herein are limited to items that were not included in or are different than what was presented in the noise study. For the sake of brevity, similar items contained in both documents are commented on in just the first section of this report.

I. Illingworth-Rodkin Noise Assessment Study

PAGE 1

Definition of Sound Intensity is incorrect. Sound Intensity: *In a specified direction at a point, the average rate of sound energy transmitted in the specified direction through a unit area normal to this direction at the point considered.*[1]

Definition of Loudness is incorrect. Loudness: *That attribute of auditory sensation in terms of which sound may be ordered on a scale extending from soft to loud.*

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[1] Handbook of Acoustical Measurements and Noise Control. 3rd Edition, Cyril Harris, et al. 1991

PAGE 2

A-weighting gives a slightly greater weight to upper frequencies, but more importantly, it gives much less weight to lower frequencies and very high frequencies where humans do not hear as well. It replicates the acoustic frequency response of the human ear over a normal range of sound pressure level.

PAGE 3

Table 1 Definitions. The definitions shown in the Table are generally satisfactory with the exception of the L_{eq}. The L_{eq} is not the average A-weighted noise during the measurement period. The L_{eq} is correctly defined in the second paragraph on page 2. In addition, these definitions are not what are provided in Cyril Harris' Handbook of Acoustical Measurements and Noise Control.

PAGE 6

The CEQA checklist is incomplete. There are six items in the list, as shown below.

The CEQA compliance checklist:

a) 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?

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

PAGE 9

The study should identify which standards are applicable to the residences in the vicinity of the project and to what sources the various standards are being applied.

PAGES 10-13

The existing ambient noise section is completely flawed. There were no noise measurements made at the existing residential property boundaries around the South Campus where most noise impacts will occur. The TNM is inaccurate as it apparently did not take topography into consideration. Knowledge of the existing ambient noise environment is mandatory for determining if a project will or will not cause a substantial increase in the ambient noise levels. The administration of the CEQA guidelines through enforcement of the City of Oakland General Plan requires the use of the Day-Night Level for evaluating project-generated noise against the ambient. The existing noise exposures, in dB DNL, must be accurately determined and reported. The input parameters of the TNM were not provided.

PAGE 14

General Plan Consistency Analysis. "The impacts of site constraints such as exposure to excessive levels of noise and vibration are not considered under CEQA". We are not sure what this statement means. However, we are assuming that it refers to CEQA not addressing impacts to a project.

The study does not provide details of noise impacts to the project in relation to the General Plan, including noise measurement data of Lincoln Avenue traffic noise, and projected interior noise levels/exposures. Some classroom buildings are very close to Lincoln Avenue.

The significance criteria under 1.b are incorrect. The City of Oakland provides a threshold of significance in the General Plan in relation to CEQA.

These thresholds are:

(a) Cause a 5 dB permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or, if under a cumulative scenario where the cumulative increase results in a 5 dB permanent increase in ambient noise levels in the project vicinity without the project and a 3 dB permanent increase is attributable to the project.

The threshold of significance is not based on what the ambient noise exposure is or what it will be.

Item 2 is also incorrect. The City of Oakland CEQA Guidelines references the Federal Transit Administration (FTA) guidelines, criteria and methodologies. The FTA establishes a ground-borne vibration limit of 0.2 in./sec. PPV for typical residential structures. The vibration limits established in the Oakland guidelines use vibration levels in decibels (VdB). Since both of these descriptor are used throughout the “standards”, both should be identified in the noise study. The City of Oakland CEQA Guidelines for vibration are shown on page 5.

In addition to the short term noise impact in relation to the City’s Noise Ordinance Table 2, the project-generated DNL must be calculated for the determination of the increase over the ambient as required by CEQA/Oakland General Plan.

8. During either project construction or project operation expose persons to or generate groundborne vibration that exceeds the criteria established by the Federal Transit Administration (FTA):[25]

TABLE 3
FTA Groundborne Vibration Impact Criteria

Land Use Category	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category I: Buildings where vibration would interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category II: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category III: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

Notes: 1) More than 70 vibration events of the same source per day.
2) Between 30 and 70 vibration events of the same source per day.
3) Less than 30 vibration events of the same source per day.
4) This criterion is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research should always require detailed evaluation to define the acceptable vibration levels. Ensuring low vibration levels in a building requires special design of HVAC systems and stiffened floors.

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[25] The FTA criteria were developed to apply to transit-related groundborne vibration. However, these criteria should be applied to transit-related and non-transit related sources of vibration.

PAGE 15

#2 Ground Borne Vibration – The CEQA Guidelines use the FTA criteria. The FTA documents specify a limit of 0.2 in./sec. PPV for typical residential structures impacted by construction and VdB limits shown in the above table for transportation sources. However, the City's guidelines apply vibration limits in both in./sec. PPV and VdB. This should be discussed and clarified in the noise study how they relate to each other and what the results are.

Impact 1 – Performing Arts Center Activity – Potentially Significant

We concur with Salter and RGD that football game spectator noise data are inappropriate for the analysis of the Performing Arts Center.

Noise from indoor events should be discussed more thoroughly, particularly if windows in the PAC will be operable and possibly open during events or performances, if doors will be opened during events or performance and what the building shell noise reduction values will be.

Events, whether indoor or outdoor that occur once or twice per year are often accepted by the neighboring community and the events are controlled properly. However, events that occur on a more regular basis can become annoying and tiring for the neighbors. Outdoor activity before and after events, whether the event is indoors or outdoors can have detrimental effects on the neighbors, especially during evenings or night times.

The noise study discusses PAC indoor and outdoor noise, but does not provide a detailed study of outdoor noise associated with the Commons/amphitheater. The various types of uses or events should be listed along with noise data for each, including spectator noise, sound reinforcement system noise, load-in and load-out noise from entertainers and noise generated at the stage.

There is also no discussion or analysis of the PAC mechanical equipment noise impacts.

PAGE 20

The statement regarding the daytime noise levels at the residences is not necessarily true. There are no data for these receiver locations.

PAGE 22 – Outdoor Classrooms

The baseline noise datum of 60 dBA @ 3 ft. is not valid. The teacher and students are likely to be much farther apart, likely in the 10 ft. to 25 ft. range, depending upon the size of the class. Thus, to maintain a 60 dBA sound level at the listener (clear speech intelligibility) at, say, 25 ft., the speaker must speak at a level of 78 dBA @ 3 ft. That is a raised voice level. There should be better analyses and controls of the outdoor classrooms, particularly the area just behind the Laguna Avenue residences. The Outdoor Classroom analysis should also include the "L exceedance" values per the Noise Ordinance.

Recess Activity

The recess activity noise levels are much too low. There is a wide variation in noise source levels depending upon the ages of the children and their particular activities. Young children's noise levels increase with age up to about age 13. During teenage years, breaks between classes or recess often do not involve the students running around, playing games, yelling and screaming. However, older children's voices get deeper in pitch and shouts and laughter can carry farther because of the greater acoustic power.

At 50 ft. from the acoustic center of a playground with 35 5-year olds, the average noise level will typically be about 73 dBA L_{eq}. Maximum noise levels from children screaming can be even higher than that. The values in Table 7 are about 14 dB too low. This results in a Significant Impact.

The study should include a more comprehensive analysis of the recess and break periods, which should include the number of children in each play or gathering area, their age ranges and descriptions and actual noise data of their activities.

PAGE 26

Impact 1b: There is no detailed analysis of noise impacts to residences along the new loop road. There is no objective or quantifiable method to back up the claim of no substantial noise impacts due to project traffic.

The precise ambient noise levels/exposures at the residences have not been determined. The project-generated noise exposures from traffic and other sources on-site have not been presented.

Provide a quantitative basis for the assertion that project traffic will not cause a 5 dB increase on its own or a 3 dB increase under the cumulative scenario.

The noise study should include a quantified and objective analysis of the drop-offs and pick-ups along the loop road. How much noise does a drop-off or pick-up make? Where is the L-exceedance value analysis? What is the project-generated DNL for drop-offs and pick-ups? Show the analysis to back up the "Less-Than-Significant" statement. Will the wall along the loop road shield the second floors of the homes that will now view to the loop road and drop-off area?

The TNM is not appropriate for school drop-offs and pick-ups. Actual noise data of drop-offs and pick-ups should be presented, which would include vehicles idling in queue, car doors closing, engines starting, people talking, etc.

PAGE 28

Parking Lot – If the parking lot sources are expected to be less than 15 minutes per hour, the hourly L_{eq} for the source is an incorrect methodology as it incorporates at least 45 minutes of "quiet" into the average. This can lower the 15 minute L_{eq} by about 6 dB. The source noise level over the duration of the source should be evaluated against the L_{17} standard. If the source ends up being more than 15 minutes per hour, then the more restrictive L_{20} limit should be used.

There are no ambient maximum or average noise level data measured for the residences. Comparisons of project-generated noise to the ambient for the purposes of determining the level of significance cannot be made.

We concur with the audible crosswalk signal analysis and recommendations.

PAGE 31

Loading Dock Mitigation – Additional measures are warranted, i.e., no music, dollies and hand carts should have soft wheels/tires, all surfaces should be smooth. Box trucks with roll-up doors should be used only if the dock is enclosed.

PAGE 31

Construction Noise – The noise reduction measure of installing a plywood barrier along property boundaries must be detailed. The height and locations of these barriers must be presented in the noise study to ensure compliance with the noise standards.

PAGE 37

Ground-born Vibration – The City's CEQA Guidelines reference the FTA methodologies which include a limit of 0.2 in./sec. PPV for typical residential structures. The expected vibration levels at the homes close to the construction areas should be calculated and if heavy equipment will be close to the homes, the distance limits should be presented.

II. Chapter 13 of the DEIR

Chapter 13 of the DEIR restates the Illingworth-Rodkin noise study, but with different report formatting and some additional analyses and noise control measures. This section of our review will address only new or different information than what is contained in the Illingworth-Rodkin report.

PAGES 13-10

Table 13-2 presents the correct vibration criteria from the FTA that is to be used on the project for conformance to the City of Oakland General Plan CEQA Guidelines.

The State of California Noise Insulation Standards are not applicable to this project.

PAGES 13-13 to 13-23

We concur with the application of the standard conditions of approval for this project. However, SCA Noise-6, indicates interior noise limits of 45 dBA, 50 dBA, 55 dBA and 65 dBA. These should read 45 dB DNL, 50 dB DNL, 55 dB DNL and 65 dB DNL.

PAGE 13-24

Daily Operational Noise – Noise 2. The conclusion that the daily operational noise impacts will be Less than Significant is incorrect. The Illingworth-Rodkin noise study concluded that some operation noise will be potentially significant or significant. See the first paragraph on page 20 and the first paragraph on page 26 of the noise study. In addition, operations that are indicated to be less than significant are likely to be significant when actual noise data are used in the analysis.

PAGES 13-42 to 13-44

The cumulative noise analysis was not included in the Illingworth-Rodkin noise study.

The cumulative analysis in the DEIR is incomplete as it does not list the various noise sources, their noise levels at the residential receiver locations and the sums of the various noise sources for the respective receivers. It is not clear what contributes to the noise levels presented in Table 13-16. In addition, since the daily operational noise generated by the project is a major environmental factor associated with the project, the noise exposures (dB DNL) due to all aspects of the project must be calculated and presented so that the project's short-term and long-term noise affects can be added together along with the background noise exposures necessary to determine the cumulative noise environment. Only then can an evaluation against the CEQA criteria, as administered by the City of Oakland, be made.

Since the Illingworth-Rodkin noise assessment study did not include any additive noise source analyses or cumulative noise analyses, we must assume that these acoustical analyses were performed by the environmental consultant. All sound/noise/acoustical calculations and consulting must be performed by a person or persons qualified to perform such tasks. The qualifications of the parties analyzing the additive and cumulative scenarios have not been disclosed.

III. Acoustically Significant Aspects of the Project and DEIR Expectations

The aspects of the project that will be acoustically significant for the neighboring community will be the change in traffic patterns and activities at the new performing arts center and amphitheater/Commons as the noises from these activities will be new noises for the neighbors surrounding the school.

The general increase in student population (38%) is a small increase acoustically. If you took the existing 906 students, placed them in one location and they made a bunch of noise, then increased the students to 1,250 and they made the same kinds of noises, the increase in overall noise level would be 1.4 decibels. This increase would not be audibly detectable.

Currently, school traffic includes drop-offs along Lincoln Avenue on both sides of the street between 8:00 and 8:30 AM and between 3:15 and 3:45 PM. Westbound vehicles drop the children off on the north side of the street, continue west on Lincoln Avenue, turn left on Alida Street, turn right on Laguna Avenue, turn right on Potomac Street then turn right to head east on Lincoln Avenue. This traffic "loop" has all vehicles passing by the fronts of houses along these streets.

The new traffic "loop" will contain all school vehicular traffic to the site. However, the school traffic will enter the site at the east end of the site, either park or drop off upper school children, or continue along a drive path along the southerly border of the site directly behind the homes on Charleston Street, then turn right to drop off the lower and middle school children directly behind or along the sides of the homes on Linnet Avenue and Alida Court.

Although the school traffic will be reduced for residences along the current "loop" path, the new "loop" will bring vehicles much closer to homes where 2-story homes will have upper floors near the grade of the drive path.

There will also be an increase in student population. Thus, there will likely be a corresponding increase in school related vehicular traffic.

The new performing art center building will be as close as about 50 ft. from the nearest residential property boundary at the home at the terminus of Linnet Avenue. The performing arts building will have another attached building at the southerly end of the building with a loading area. A floor plan or description of this building has not been provided. However, we are assuming that this building is the backstage area of the performing arts building. It appears that the backstage building will have a roll-up door at the loading area. Roll up doors usually don't reduce noise by much as there are often gaps between the panels and at the sides of the door along the wall tracks. Sound rated roll-up doors are available on the market.

Performing arts buildings can generate significant levels of noise, particularly during evening hours when most events occur. Theatrical production noise is mostly evident at the exterior by audience applause and cheers, theatrical music, whether produced by a live orchestra or pre-recorded music, and by on-stage music productions. More popular music and current audio technologies use large low frequency generating sub-woofer speakers. These very low frequencies are comprised of sound with very long wavelengths that penetrate building materials/wall and roof construction easily. Windows and doors are even much more susceptible to low frequency sound transmission due to their lack of mass, air-space and inadequate seals around operable panels. Actually, poor seals can also transmit higher frequency noise as well.

The Draft Environmental Impact Report (DEIR), which contains the technical noise study, should include the following methods and analyses:

- On-site noise measurements of the existing ambient noise environment at the property boundaries along the new loop drive during weekday and possibly weekend periods if the drive will be used weekends. Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived.

- On-site noise measurements of the existing ambient noise environment at the property boundary near the Performing Arts Center.

- Noise level measurements of the existing travel route and related operations (drop-offs and pick-ups) to use as accurate reference data for the purpose of calculating these operations under the new plan scenarios.

- Evaluation of both the project-generated long-term (DNL) noise exposures and short term noise levels per the standards of the Oakland General Plan/CEQA and the Oakland Noise Ordinance

- Realistic and accurate modeling of the various types of performances and their ancillary operations expected in the Performing Arts Center and Commons, including events sponsored by non-school renters. Complete descriptions of the performances, the sound reduction calculations from the interior to the exterior (walls, roof, doors and windows), the barrier effect of interposed structures and loading area operational noise should be provided.

- Noise from Performing Arts Center patrons coming and going outdoors should also be addressed as people exiting the facility after an evening performance may create significant levels of noise, particularly if performances end after 10:00 PM. Patrons should not be allowed to congregate on the south side of the PAC either before or after events regardless of the time of day.

- Mechanical system (HVAC) noise from the Performing Arts Center should be analyzed for noise impacts to the residences nearby.

- Although CEQA does not address noise impacts to a project, the City of Oakland General Plan does. Since some of the new buildings will be fairly close to Lincoln Avenue, the noise study should address potential noise impacts to the classroom and administrative offices.

- Detailed analyses of outdoor classroom conditions, recess activities and amphitheater/Commons activities for both school operations and any potential non-school use.

- The application of noise barriers must be detailed accordingly. The heights, materials, construction methods along with the expected amount of sound reduction for various noise sources must be provided to ensure intended compliance with the noise standards.

- Where noise exceedances occur, noise mitigation measures must be provided in detail and should not be deferred to a subsequent study. This is common when information, such as precise mechanical equipment data, is not available. The EIR then gets certified and the mechanical noise issues are left without being analyzed and are swept under the rug.

IV. Conclusions

The noise study and ensuing DEIR noise chapter are seriously flawed and should be re-done to be accurate and complete as too many conclusions were drawn based off of data that either does not exist, is inaccurate or were developed by parties of unknown qualification.

This concludes our peer reviews of the *Noise Assessment Study* prepared by Illingworth-Rodkin and Chapter 13 of the Draft Environmental Impact Report for the planned Head-Royce School expansion along Lincoln Avenue in Oakland. If you have any questions or would like an elaboration on this report, please call me.

Sincerely,

EDWARD L. PACK ASSOC., INC.

Jeffrey K. Pack
President

JEFFREY K. PACK

ACOUSTICAL CONSULTANT

Curriculum Vitae

EDUCATION

Berklee College of Music, Boston, Massachusetts, 1984
Bachelor of Music; Professional Music

University of Southern California, Los Angeles, 1981
Bachelor of Science; Geological Sciences

West Valley College, Saratoga, California, 1979
Associate in Science; Science and Mathematics

EXPERIENCE

7/81 to Present — President and Principal Consultant

Edward L. Pack Associates, Inc.
San Jose, California

Mr. Pack has experience in architectural, environmental, and industrial acoustics, including interior design of office buildings, hospitals, medical buildings, hotels, recording studios, auditoriums and residences, HVAC noise control, mechanical equipment enclosures, roadway and railroad noise barriers, transportation noise assessments and industrial facility noise control. Transportation noise assessments involve the analysis of automobile, truck, railroad and aircraft noise as they impact residential, commercial and industrial land uses. His responsibilities are involved with both the administrative and technical aspects of Edward L. Pack Associates and his duties also include presentations at public hearings, expert witness testimony, conducting seminars in acoustics, directing and monitoring construction corrective work in residential and commercial buildings and the design and construction direction of noise enclosures for mechanical equipment. Measurements, analyses, and evaluations are made to develop the specific recommendations required for the correction of noise and vibration problems.

He has extensive experience in the field of interior acoustics associated with auditoriums, multi-purpose rooms, gymnasiums, classrooms, churches, public meeting halls, TV and audio/visual recording studios, hospitals, and other acoustically critical spaces. Mr. Pack is an expert in architectural acoustics designing noise isolating walls, windows and floor/ceilings, particularly in multi-family housing for compliance with State and local building codes.

5/86 to 5/94 — President

The Techtonics Company
Sunnyvale, California

Mr. Pack designed, developed, and manufactured acoustic and electronic drum triggering devices, acoustic stringed instrument transducers, including piezoelectric pick-ups for guitars, violins, violas, cellos and basses from inception through final shipping. As President, duties included management of production personnel, purchasing, sales, marketing, and advertising. Retail stores and distributors carrying The Techtonics Company products are located worldwide.

2/93 to 3/94 — Adjunct Professor

Cogswell Polytechnical College
Cupertino, California

Adjunct professor of acoustics, which included teaching noise control engineering, audio engineering, architectural acoustics, and sound reinforcement system design.

7/84 to 12/87 — Owner

Mirage Music Technologies
San Jose and Hermosa Beach, California

Mr. Pack designed and constructed speaker cabinets, taught music, designed sound reinforcement systems, worked as a DJ for private and public events, worked as a performing musician.

His prior experience includes teaching assistant for Oceanography 210 at USC, 4 years as private drum and percussion instructor, conducting seminars in acoustics and noise control, and in music education as the South Bay Area Alumni Representative for the Berklee College of Music. Other engineering experience included geologic structure mapping, mineralogy, and geologic engineering.

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