DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

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The Honorable Barbara A. Mikulski
United States Senate
Washington, DC 20510

Dear Senator Mikulski:

I am writing to you in response to your letter of November 16, 2006, regarding the potential vibration problems associated with the Biomedical Research Center on the Johns Hopkins Bayview campus. Although detailed answers to your fourteen questions are provided in the enclosed document, I would like to summarize the current status of the project in this cover letter.

The vibration concerns described in the *Baltimore Sun* article on October 15, 2006, originated from measurements conducted in August 2005 when the facility was only partially constructed. These measurements were fed into a predictive model by a vibration consultant who informed the National Institutes of Health that these predictions were conservative in nature and represented the worst-case scenario.

As the facility construction progressed, further measurements were taken by two other specialists. These measurements in April 2006 and June 2006 indicated that the vibrations were lower than had been predicted due to the normal curing process associated with concrete floors as well as the installation of interior and exterior walls. These measurements indicated that the facility was in much better condition than had been predicted in August 2005. On November 8, 2006, with the facility construction nearly completed, additional measurements were conducted by the original consultant who had conducted the first predictive analysis. The results of the November 8, 2006, measurements are significantly better than the August 2005 values and reveal that the facility fully complies with the design criteria.

As is industry practice, several especially sensitive pieces of laboratory equipment might require isolation tables, and some especially sensitive pieces of equipment might remain in the adjacent facility on the Johns Hopkins Bayview campus.

In summary, the latest data indicate that the facility will be capable of accommodating state-of-the-art biomedical research for the National Institutes of Health in Baltimore.

Sincerely,

Elias A. Zerhouni, M.D.
Director

Enclosure

Enclosure

1. **Is there a vibration problem facing the new Biomedical Research Center? If so, how severe is the problem?**

In order to accurately answer this question, it is appropriate to provide some background information regarding the NIH Biomedical Research Center (BRC) located on the Bayview Campus of Johns Hopkins Medical Center. Consistent with industry practice when designing and constructing biomedical research facilities, vibration has always been an important criterion. Specifically, this facility was designed and constructed to provide a vibration-resistant environment of not more than 2,000 micro-inch per second (μin/sec), which is the standard NIH established for its research buildings and an accepted industry design standard for biomedical research buildings. In order to ensure that the completed facility complies with this criterion, NIH employed the services of specialized vibration consultants. In August of 2005, while the facility was only partially constructed, a consultant conducted vibration measurements and used a proprietary model to predict the future vibration levels. This model, which included certain factors of safety, indicated that vibration levels were likely to exceed the design criteria. Vibration measurements conducted in November of 2006, with the facility construction nearing completion, showed a marked difference between the vibration levels predicted in August 2005 and the actual vibration levels measured in November 2006. The new measurements indicate that the facility complies with the design criteria. The difference between the early forecasts and the recent measurements are attributed to the curing of concrete, construction of the exterior and interior walls, and the normal stiffening of a facility as construction progresses.

The research experiments conducted by National Institute on Aging (NIA) involve a large number of highly vibration-sensitive instruments, which have the vibration thresholds substantially below the design criterion. As is common industry practice for biomedical research facilities, building stiffness alone is not always sufficient to operate highly sensitive equipment. In many cases, commercially manufactured vibration-isolation system will be employed to further mitigate the vibration levels. Working with vibration-isolation system experts, NIH will be evaluating every one of NIA's highly vibration-sensitive instruments to determine whether each instrument will operate properly with a vibration-isolation system in the new building.

2. **Was vibration known to be an inherent risk with the type of steel construction chosen by NIH for the building? If so, what assurances were received from the architect or other consultants to justify proceeding notwithstanding such risk?**

In June 1999, HLM Design, the initial design team for the BRC project, evaluated five different structural systems for the proposed biomedical research building: three concrete structural systems and two steel structural systems. Several factors were applied in the evaluation: cost, schedule, constructability, vibration characteristics, flexibility for future modification, depth of the floor structural system, and fire protection consideration. In the evaluation, every structural system ranked differently depending on the factor. The two steel structural systems (composite structural steel and open-web steel joist systems) ranked

higher than the three concrete structural systems with respect to cost, schedule, constructability, and flexibility for future modification. The concrete structural systems, on the other hand, ranked higher with respect to vibration characteristics, depth of the floor structural system, and fire protection.

CUH2A architect/engineer was chosen to finalize the design and prepare the construction documents for the BRC project. The type of steel construction CUH2A chose for the building is a composite structural steel system which consists of wide-flange beams and girders with poured-in-place concrete floor slab on metal deck. The reasons for choosing this steel structural system are cost consideration, speed of construction, flexibility for future modification, and that the system can be designed to meet the vibration standard. CUH2A provided the calculations supporting the composite steel frame structural design that meets the vibration standard established by NIH.

It is common to use the steel structural system for biomedical research laboratory buildings. In fact, in many parts of the country steel frame biomedical research buildings are dominant. To cite a few examples, the new Sloan Kettering Institute building, a 23-story steel frame structure, is designed to the same vibration standard and has similar structural bay dimensions for the laboratory areas. The building houses biomedical research similar to those being conducted by NIA scientists. It is currently 80% occupied and the researches have been conducted in Sloan Kettering for over a year. To date, no vibration problems have been reported. The biomedical research buildings at Yale Medical Center, University of Michigan and MIT are all built in steel structure and there is no reported vibration problem with research that is conducted in these buildings.

3. **What engineering studies of the vibration issues have been conducted and when?**
In October 2002, CUH2A, the architect and engineer of the BRC project, completed the vibration calculations of the steel structure being proposed for the new building. The calculations predicted that the vibration level in the new structure will be below the vibration criterion of 2,000 μin/sec.

In August and September 2005, Colin Gordon & Associates, a vibration expert retained by NIH, took vibration measurements of the new building during the early stage of construction when the steel structural framing was just nearing completion. Based on the measurements and factoring in the incomplete state of the building, the consultant predicted the maximum potential vibration levels in the research laboratory areas to be in the range of 5,800 and 6,200 μin/sec.

To obtain actual measurements of the BRC vibration characteristic as construction neared completion, NIH asked two additional vibration consultants to take separate and independent vibration measurements. In April/May 2006, Polysonics, a well-established local vibration consultant, conducted vibration measurements of the BRC building. In June/July 2006, Scantek, another local vibration consultant, took vibration measurements. The results of these two consultants' measurements are similar and show that the vibration levels are under 2,000 μin/sec.

In November 2006, Colin Gordon & Associates returned to the BRC building and also made actual vibration measurements. This time the building construction had advanced substantially with much of interior work in place. The measurements indicate that the floor vibrations are below 2,000 μin/sec as compared to much higher vibration levels predicted in September 2005 when the building structural frame had just been completed.

4. **What additional engineering assessments are planned? Please specify the stage of construction when the assessment will be performed.**
NIH will have the final vibration measurements taken when the building mechanical system consisting of motors, pumps, fans, and other vibration causing building equipment is in operation. Also, building vibrations resulting from wind impact will be measured. The final vibration assessment is expected to be complete by late January 2007.

5. **What advice have you received from your architect regarding the extent of the vibration issue?**
CUH2A, the architect and engineer of the BRC project, provided calculations demonstrating that the new building is designed to meet the vibration criterion of 2,000 μin/sec. CUH2A advised NIH that, wherever possible, highly vibration-sensitive equipment should be placed on the basement level, which is consistent with NIH vibration guideline. They also indicated that based on their experience with other biomedical research buildings designed by CHU2A to meet the 2,000 μin/sec standard, the majority of vibration-sensitive instruments will work with appropriate vibration-isolation systems.

6. **What remedies have been proposed and what are their potential costs? When must decisions be made about the implementation of these potential remedies?**
For those vibration-sensitive instruments that will work in the new building with appropriate vibration-isolation system, the cost of each system can be as low $3,500 or as high as $60,000 depending on the type of system. For those highly vibration-sensitive instruments that will not work in the new building with any vibration-isolation system, the remedy will be to leave them in the adjacent existing Gerontology Research Center (GRC) building. If this results in vacant space in the BRC, NIH will place other research functions there.

7. **Does NIH view the vibration problem as potentially causing the building to not meet requirements for "substantial completion" under its lease and financing documents?**
For the new building to meet the requirements of "Substantial Completion" it must be completed in accordance with the construction documents which prescribes and specifies the design of the new building. Since the vibration measurements taken in the past six months demonstrate that the new building meets the vibration design criterion of 2,000 μin/sec as designed, there is no basis for NIH not to accept the new building when the Substantial Completion is achieved.

8. **What research in the two institutes slated to occupy the BRC may be affected by the vibration issue? To what extent?**
Based on design of the NIDA laboratory space and types of research equipment planned for the new building, there are no expected vibration issues for the NIDA research. Most of

the NIA research laboratories slated to occupy the BRC have highly vibration-sensitive instruments that will require a vibration-isolation system of one kind or another. Depending on the type of isolation system, in some cases the laboratory space consumption by the isolation system can be significant and will impact the space assignment of the laboratory. Until NIH completes the assessment of the isolation system requirements for the NIA research, the extent of space impact cannot be established.

9. **The article states that NIA research requiring sensitive equipment may be impacted by the vibration. Has NIDA raised similar vibration concerns?**
NIDA research involves a fewer number of highly vibration-sensitive instruments than NIA research does. During the design phase, recognizing the building was designed as a research lab building with the standard vibration criterion of 2,000 μin/sec, NIDA worked with the architect to place its highly vibration-sensitive instruments in the basement area. For the NIA research, this solution would not have been feasible due to lack of space in the basement area to accommodate a large number of highly vibration-sensitive instruments.

10. **What is the status of NIA and NIDA occupancy of the BRC?**
With respect to NIA, the uncertainties associated with the vibration issues impacted the ability to finalize its occupancy schedule. The occupancy move schedule is anticipated to be finalized in early 2007.

NIDA, which will be occupying about 45% of the new building, has been planning its relocation to the new building for the past 14 months. NIDA will be ready to move in when NIH completes the commissioning and acceptance of the new building during the second quarter of 2007.

11. **Is it feasible to reassign the NIA research that would be impacted by the vibration issues to other floors of the BRC or other facilities at Bayview? If alternative space is not available at Bayview, what is your plan regarding NIA's continued presence in Baltimore?**
The feasibility of reassigning the NIA research that would be impacted by the vibration issues to basement levels in the BRC is limited due to lack of space in the basement levels. The existing Gerontology Research Center (GRC), which requires extensive renovation to meet the requirements of modern research laboratory, can house the NIA research that would not work in the new building (even with the use of vibration-isolation systems). NIH is currently exploring renovation options for the Gerontology Research Center building. In the event that some highly vibration-sensitive research remains in the GRC resulting in vacant space in the BRC, NIH will place other research functions in the new facility. NIA's presence in Baltimore will continue.

12. **If NIA cannot occupy the space, are there other NIH programs that can occupy the space?**
Yes, NIH has several research programs that do not involve a large number of highly vibration-sensitive instruments. Any one of these programs could occupy the space in the new building that NIA does not occupy.

13. **When do you expect to fully occupy the BRC?**
NIH anticipates that the BRC will be fully occupied within 18 months of the Substantial Completion. Substantial Completion is estimated to be April 2007.

14. **If the space cannot be used as planned, how does NIH plan to pay the costs associated with the lease backed bonds?**
If NIA does not fully occupy its assigned space in the BRC, NIH will find other research programs to occupy the space and pay rent.