

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
Pa'ina Hawaii, LLC)
Material License Application)
_____)

Docket No. 30-36974-ML
ASLBP No. 06-843-01-ML

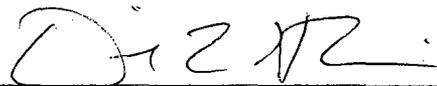
DOCKETED
USNRC
October 15, 2007 (8:47am)
OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

NOTICE OF FILING ORIGINAL SUPPLEMENTAL DECLARATION OF GEORGE
PARARAS-CARAYANNIS, Ph.D. IN SUPPORT OF CONCERNED CITIZENS OF
HONOLULU'S CONTENTIONS RE: FINAL SAFETY EVALUATION REPORT

Attached hereto is the original, signed supplemental declaration of George Pararas-
Carayannis, Ph.D., filed on October 8, 2007 in support of Concerned Citizens of Honolulu's
reply to applicant Pa'ina Hawaii, LLC's Answer To Intervenor Concerned Citizens of
Honolulu's Contentions Re: Final Safety Evaluation Report.

Dated at Honolulu, Hawai'i, October 12, 2007.

Respectfully submitted,



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Pa'ina Hawaii, LLC)	Docket No. 30-36974-ML
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**SUPPLEMENTAL DECLARATION OF GEORGE PARARAS-CARAYANNIS,
Ph.D. IN SUPPORT OF CONCERNED CITIZENS OF
HONOLULU'S CONTENTIONS RE: FINAL SAFETY EVALUATION REPORT**

Under penalty of perjury, I, Dr. George Pararas-Carayannis, hereby declare that:

1. In my September 12, 2007 declaration, I focused on the statements the Nuclear Regulatory Commission Staff made in its August 17, 2007 Safety Evaluation Report ("SER") (ADAMS Accession No. ML072260186) regarding the risks that earthquakes pose to the irradiator Pa'ina Hawaii, LLC proposes to build and operate on Palekona Street in Honolulu. As discussed in that declaration, the Staff has no basis to conclude that the actions Pa'ina proposes to take would be adequate to avoid liquefaction or that a horizontal separation of six inches between the sides of the irradiator pool and the building slab would provide adequate isolation during a seismic event. Based on my decades of experience in the field, I have concluded there is a substantial risk of liquefaction from an earthquake at Pa'ina's selected site and there is no basis for the SER's assumption about what constitutes "a seismic event typical of the area," undermining its conclusion the irradiator design would provide "adequate isolation" in the event of an earthquake.

2. I have now reviewed Pa'ina's answer to Concerned Citizens' contentions, which was filed on October 1, 2007. In its answer, Pa'ina does not contest that liquefaction might occur. Instead, it claims no damage would result even in the event of complete liquefaction of all the soil around the pool. The SER did not make a similar claim, relying instead on "[a]ctions that the applicant will take to avoid soil liquefaction," and, accordingly, I did not previously have occasion to address it. For the following reasons, I conclude Pa'ina has not adequately demonstrated that liquefaction would not pose a safety risk.

3. Liquefaction, but mainly strong ground motions, enhanced in the unconsolidated sediments of Pa'ina's chosen site could cause cracks in the pool structure, allowing escape of pool shielding water and/or radioactive material. Notably, even in the absence of liquefaction, enhancement of ground motions could occur in alluvial deposits like those underlying the Palekona Street site. Thus, damage to the structure could occur with full liquefaction, partial liquefaction or no liquefaction at all. Liquefaction may result in the settling, sinking, tilting and/or cracking of the entire structure or in its separation from the superstructure above it. Damage could occur from strong ground motions caused by the seismic surface wave, which travels much like a sea wave. The rupture geometry of the seismic source region can affect the directivity and frequency of the surface seismic waves. Furthermore, the surface waves could separate into trains of certain periods.

4. Waves of certain periods could enhance the ground accelerations – both vertical and horizontal – in the alluvial sediments of the Palekona Street site, causing significant damage. For example, I conducted the survey of Mexico City following the

catastrophic 1985 earthquake and found that most of the damage was due to maximum ground accelerations caused by a single monochromatic surface seismic wave traveling within a 30-foot layer of sediments. Similar conditions exist at the site Pa'ina has proposed for its irradiator.

5. To determine the potential for liquefaction and strong ground motions to cause structural failure of the proposed irradiator, one would need to make a number of assumptions regarding the vertical and horizontal seismic accelerations and then estimate how dynamic forces would affect the structural integrity of the pool structure. It is a problem of earthquake engineering that requires the introduction of input variables into a numerical or a scaled physical model, and then interpretation of the output results for adequacy of design.

6. While Pa'ina claims it performed such an analysis, the March 9, 2006 letter it cites fails to provide – and Pa'ina has not otherwise disclosed – the underlying data or calculations. Accordingly, it is not possible to conduct a comprehensive peer review of the assumptions Pa'ina made in support of its conclusion the pool structure would not be damaged in the event of total liquefaction. In the absence of supporting data and calculations, any reliance by the Staff on Pa'ina's analysis in concluding the proposed irradiator would be safe (and there is no suggestion in the SER that the Staff did rely on this analysis) would be based on blind faith, rather than reasoned inquiry.

7. While Pa'ina has not disclosed all of its assumptions, we do know that a key one – that effective peak ground acceleration would not exceed 0.15g – is flawed, rendering the rest of Pa'ina's analysis unreliable. As discussed in my September 12, 2007 declaration, there is no basis for Pa'ina's (and the Staff's) assumption that the

specified effective peak ground acceleration of 0.15g of Uniform Building Code seismic zone 2A designation is applicable to the reclaimed land at Pa'ina's preferred site, which has substrata of unconsolidated alluvial sediments. Unlike magnitude, which represents a single quantity of an earthquake's energy release, intensity does not have a single value for a given earthquake. Rather, it can vary significantly from place to place depending on substrata soil conditions. The potential horizontal seismic ground motions on which Pa'ina relied represent statistical estimates for the entire southern coast of O'ahu which may not be valid for the alluvial material at the proposed facility site. In addition, it does not appear Pa'ina took into consideration the potential focusing effects of seismic energy on O'ahu.

8. Due to the flaws in the underlying analysis, there is no basis for Pa'ina's assumption about the peak ground acceleration to which the proposed irradiator might be subjected. Accordingly, the value of 102 lbs/cf may not actually be the maximum pressure that would be exerted against the pool structure, as Pa'ina assumes. Since the maximum assumed peak acceleration of 0.15g could be enhanced in alluvial sediments, the 144 lbs/cf design pressure of the pool's wall could well be exceeded, threatening a rupture of the pool lining. A study far more extensive than the cursory analysis Pa'ina has performed would be necessary before the Staff could make an informed decision whether the pool structure would rupture in the event of liquefaction. The easiest way to warrantee safety is to chose an alternate site for the irradiator far from the shoreline and on solid ground.

9. Pa'ina's claim that the six-inch separation between the sides of the irradiator pool and the building slab would "insure[] isolation ... even in [the] worst-

scenario that was assumed for the purpose of this analysis” is similarly flawed since it is also based on the unsupported assumption that the peak ground acceleration to which the proposed irradiator might be subject would be 0.15g. As discussed in my September 12, 2007 declaration, the Lana‘i earthquake of 1871, the Maui earthquake of 1938, and the 1948 earthquake offshore of Honolulu all produced greater than Modified Mercalli Force V Intensities. In the event of another earthquake of similar intensity, the unconsolidated alluvial sediments at Pa‘ina’s preferred site could experience peak ground accelerations far in excess of 0.15g. Pa‘ina has failed to establish that its irradiator design would survive such an event.

10. Pa‘ina fails to appreciate the significance of the discussion in my September 12, 2007 declaration of the Lana‘i earthquake of 1871. Regardless of the intervening upgrades to the building code, the mere fact the 1871 earthquake caused extensive damage to buildings on a location with relatively stable substrata conditions is indicative of the potential harm to structures at locations with far less stable conditions, such as the reclaimed land Pa‘ina proposes for its irradiator, should an earthquake of similar magnitude and intensity occur again.

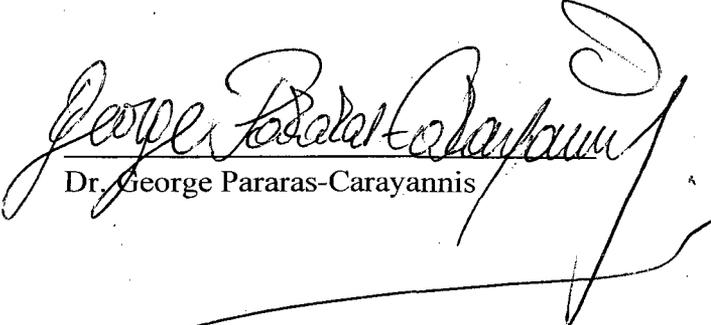
11. One cannot assume, as Pa‘ina apparently does, that, if an earthquake similar to the one in 1871 occurred again, there would be no damage to Punahou School buildings or other buildings on O‘ahu simply because the building code was upgraded to a zone 2A designation. To assume a code upgrade alone provides adequate protection from future earthquakes is erroneous. In California, the building codes were upgraded after the Long Beach earthquake of 1933 destroyed schools in the area. The codes were upgraded again after the destructive 1971 San Fernando Valley earthquake. Everyone

had a false sense of safety and believed the 1971 codes were adequate, until the 1994 Northridge earthquake struck, with devastating effect.

12. The lesson is that mere compliance with whatever building code happens to be in effect is no guarantee of safety. Particularly when a project with the potential for significant harm to public safety and the environment in the event of a structural failure is involved, as here, detailed analysis of the soil conditions at the specific proposed site is vital to assess whether public safety would be threatened in the event of an earthquake. Neither Pa'ina nor the Staff performed such an analysis, precluding the Staff from making an informed decision about whether Pa'ina's proposed irradiator would be "adequate to protect health and minimize danger to life or property," as 10 C.F.R. § 30.33(a)(2) requires.

I declare under penalty of perjury that the factual information provided above is true and correct to the best of my knowledge and belief, and that the professional opinions expressed above are based on my best professional judgment.

Executed at Athens, Greece on this 5th day of October, 2007.


Dr. George Pararas-Carayannis

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on October 12, 2007, a true and correct copy of the foregoing document was duly served on the following via e-mail and first-class United States mail, postage prepaid:

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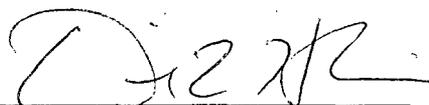
Administrative Judge
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In addition, the undersigned hereby certifies that, on October 12, 2007, a true and correct copy of the foregoing document was duly served on the following via e-mail:

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Johanna Thibault
JRT3@nrc.gov

Dated at Honolulu, Hawai'i, October 12, 2007.



DAVID L. HENKIN
Attorneys for Intervenor
Concerned Citizens of Honolulu



EARTHJUSTICE

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INTERNATIONAL JUNEAU, ALASKA OAKLAND, CALIFORNIA
SEATTLE, WASHINGTON TALLAHASSEE, FLORIDA WASHINGTON, D.C.

TRANSMITTAL LETTER

TO: Office of the Secretary FIRST CLASS MAIL
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Rulemakings and Adjudications Staff

FROM: David L. Henkin 

DATE: October 12, 2007

RE: In the Matter of Pa'ina Hawaii, LLC, Docket No. 030-36974-ML, ASLBP No. 06-843-01-ML

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