APPENDIX II

AN INTERVIEW WITH RICHARD K. EISNER

Richard K Eisner is the Director of the Bay Area Regional Preparedness Project (BAREPP) I interviewed him on 1 December 1989 in his office in Oakland, California. Ron Eguchi of Dames and Moore was also present during the interview.

Eisner: The print media is now doing stories about what went wrong, what we should have been doing, and what we should be doing now. So, it has changed from documenting the disaster as it is happening to more investigative reporting. I had two hours of interviews already today with a woman who wouldn't believe when I said, "I don't know." She said, "You must know. Just go ahead, come on!"

Katayama: You should know!

Eisner: It's not my job to do the investigation. It is her job.

Katayama: Tell me what you did just after the earthquake.

Eisner: During the earthquake, I crawled just right under here, under this desk. This building is designed to be an essential services building; so, higher standards. But it is much more flexible in the E-W direction than in the N-S direction. It was moving. We have some little cracks but no structural damage. The phones worked, the power worked here, but these phones are dependent on a line power from the company rather than the telephone company. If we would have lost electric power, we would have lost the telephones. But we had no damage, no power loss. We contacted Sacramento and they asked for our staff to be relocated to deal with response, except for Paula and myself. So Paula Shulz and I stayed here for two days. In the back, you see a mat that I slept on in my office. I slept maybe one hour. What we very quickly did was start doing an analysis; i.e., an analysis in the sense of "What is the pattern of damage, not of buildings, but what just occurred." As I was trying to sleep, at maybe two o'clock in the morning, I couldn't sleep under here. So, I went over to my shelf and I found the scenarios that were written in 1982, and started looking through what the scenario said would happen, and started saying, "Ha! This has in fact what happened". The Cypress structure was identified in the scenario as a collapse hazard. Liquefaction along the edge of the bay was identified in the scenario. Disruption of transportation, loss of ports and the approach to the bay bridge were identified. It was very clear that the scenarios that were done by Brian Tucker, Jim Davis and Chuck Real in Sacramento were very accurate. It's scary, very scary. And then also during midnight reading of reports, you know, there was a study done in 1984 by Lindh Sykes and Nishenko. They identified this segment of the fault as having a 70% probability of causing an earthquake within 20 years. So, they were right. It validates what the scientists have been telling us,

which is a problem because they are also saying we'll have another earthquake in 30 years of the same size or larger. For the next two days I dealt primarily with the media, answering calls, and dealing with the bigger picture. Because I stayed in this building, I didn't see any damage for two days. I worked through the weekend, also getting out Sunday and Monday with people from Federal Emergency Management Agency (FEMA) who were out here. They did a very quick site-visit with Bob Wesson, from the US Geological Survey, Jane Bullock and some people from FEMA who wanted to see the damage themselves. So, I spent two days in the field then seeing the damage and photographing it. And we have some excellent slides, which we can provide you if you'd like some photographs. The pattern of damage that we saw was basically predictable, damage to older wooden buildings which had no seismic bracing, damage to older brick buildings which were not seismic, damage to older concrete buildings, brittle (non-ductile) concrete frame buildings including the Cypress. Cypress is two stories high. We have buildings fourteen stories high with the same basic concept of design. We saw liquefaction. One of the things that's interesting, that you would be interested in, is we lost three power generating stations, one in Moss Landing, Hunters Point and Porterero Hill because of porcelain faliures. They were both gas-fired. It was on the outside of the bay, Metcalf. Diablo Canyon was working, had no damage, continued to operate. They didn't shut it down. They declared an unusual incident, which is the lowest level of concerned emergency, because the earthquake occurred but because they did not have any damage. Because there was no damage to the grid, they were able to continue power. The losses of power that we had were not because of damage to the grid but because of local distribution or areas where they shut off power because of the possibility of fires. The damage, according to PG & E which is a utility here, was related primarily to older Westinghouse circuit breakers that were not seismically designed and their porcelain breakage. In my understanding, there was no damage to the gas system except in the distribution system in the Marina. Actually, in Watsonville also, the distribution system in Watsonville. What they are doing there is excavating, and then they are putting plastic pipe inside the steel pipe. I believe the system is back up everywhere except maybe one or two areas of the Marina. Now, the gas service was re-established. The biggest problem is, they had 180,000 , I heard this number this morning, service interruptions. That means gas was shut off to either a residence or a business. In at least 160,000 of the cases, people shut the gas off for no reason. The earthquake occurred, they went and shut the gas off. Only 20,000 was because of damage. It took about a week and a half to get those people serviced again because the damage was so extensive and all over the region they had to bring in workers from as far south as San Diego and as far north as Oregon to re-light. And 160,000 calls were unnecessary.

Eguchi: Why did they shut the gas off?

Eisner: I think people have been told. They heard part of the message. What we have been saying is: "Because the gas is odourized, if you have a leak you know it very quickly and the range of flammability is very narrow." So, we tell people, "Don't shut off the gas unless you smell the gas; that is, you have a leak." But what people heard was "In an earthquake, shut off the gas." Also, one radio station gave out that message.

Eguchi: I heard some reports. I don't know whether it was TV or radio.

Eisner: It was one of the radio stations in San Francisco. It was a mistake, I think, because what it does is increase the work load unnecessarily because there is

a greater danger of people going back and turning on the gas without lighting the pilot lights or starting a fire without knowing a leak has occurred because the gas is off so they don't smell the gas. They turn it back on, they smell the gas, they don't know and then they light a match. So, what we have told people consistently is "Only shut it off if you smell it." The media was a problem and the utility is now working with the radio stations to make sure the message is clear the next time. But this was a major problem. We will do better hopefully the next time. The electric utility and gas performed quite well. What we did during office time for the first week and a half was just to deal with the media.

Katayama: How did you organize it?

Eisner: How did we organize that? We didn't. What we have done is, for the last five years, we have mailed out these cards. I will get you cards like this. It essentially says, "For earthquake information, call BAREPP." It is a standard roller-dex card. We have sent this to all the radio stations, all the television stations, all the print media. So, we have positioned ourselves to play this role after a disaster. It worked extremely well and I think our only difficulty was for the first maybe four hours, we had no information. For the first hour, first twenty minutes, the television stations were off the air. Many of them were off the air so we had literally no information. We have always told people, "Have a portable radio and listen for instructions." Well, the radio stations were off the air as well. So, the ability to communicate with the general population was lost. When we started to get the radio stations and television stations back on, the phone was ringing They wanted to know what had occurred. So, we went and looked at the television, the reports from the ABC television station, and then told the people on the telephone what we had just seen or just heard. It was a cycle, you know, a closed cycle, because we weren't getting information to or from Sacramento. Well, all the local governments are supposed to report to Sacramento on what damage occurred. They would then tell us. That wasn't occurring for several hours because the local governments were too busy. But we had a unique situation because we had the World Series here.

Katayama: That's right.

Eisner: We had two complete satellite television broadcasting facilities in the Bay Area, one at Candlestick and one in Oakland. And people in New York City had better coverage of the earthquake, not factual but visual images, because the people who were reporting didn't know the Bay Area, didn't know the significance of very much of anything. We had the Goodyear blimp with television images of the Marina, and you know, the reports we were getting on the radio said, "The Marina is on fire." I looked at the pictures and I said, "It is one building." So, I was able then to interpret the significance of it. But it was chance that we had that television capability. Also very interesting. The week after the earthquake, we were reassigned to what we call "the disaster field office", which is basically dealing with recovery, dealing with getting money to people who had loss and local governments. And there was an 800 number, a free telephone number, that people could call to register to say, "I had a loss, this is what it was" or "I need information about applying for a loan". Well, the Goodyear blimp was here for about three weeks and it was flying over the area at night and on the bottom, with their electric lights they would say, "If you are a victim, call 1-800." So, we had aerial advertising, you know, again by chance that we had this blimp here. We then went into a different sort of mode. My job for the second, third, and fourth week was to keep the legislators, the State

legislators informed of what was occurring. I worked at the telephone all day, calling people and telling them what was occurring, and sending out fax messages, officially being a public relations person for the State. And now, I am back doing my job. Finally, finally. I have a very unhappy family. They haven't seen me very much.

Katayama: I see. For four weeks.

Eisner: Yes, for four weeks. I go home at night. I leave in the morning before six.

Katayama: My wife may say she is happy.

Eisner: Well, maybe not so, maybe not so. My children want to know who I am when I come home. This has been exciting for me but it was terrifying for them at home during the earthquake.

Katayama: Where do you live?

Eisner: I live just on the other side of the lake here, maybe a mile away from here. It is very close. We had no damage. My house had electricity and water and gas. But we had a lot of friends staying with us, who were in areas that lost power because of substation damage. Also, it is sort of interesting. We tried to call the US Geological Survey, our colleagues in Menlo Park. Well, they have a phone system like this. They lost electricity, they had no phones. Bill Boken has a private telephone in his office. That was one of the two phones in the entire Geological Survey that were working. All the other phones were down. So anyone who has a proprietary system like this, has to have a generator. It changes, you know, when we just had the push button phones, the old phones, they are powered by the phone company.

Katayama: From your point of view, which organization did better? Can you evaluate the organizations involved in this disaster?

Eisner: You want to know about the Red Cross. Let me...

Katayama: No. Any order.

Eisner: Any order? Okay. I think, this was a local emergency. It was primarily the responsibility of the local governments. The capability varied. San Francisco, I don't think did very well, although they managed. Oakland did, I think, extremely well given the circumstances, in the response period. Other jurisdictions, Santa Cruz did very well also in the response period. The difficulty is now in recovery and reconstruction and none is doing well. It is primarily because the people who were impacted by this earthquake were the poor, the elderly, single people, or migrant workers. They are people who fall out of the system. In Oakland, we lost eight hundred housing units. We had zero vacancy rate before the earthquake. We lost eight hundred housing units we call SRO, single-room occupancy. We have no solution. We don't have housing for them.

Katayama: Where are they now?

Eisner: They are gone. We don't know. I mean, some are still in shelters, some are still sleeping on a gymnasium floor or in a school.

Katayama: I saw one of those shelters near BART.

Eisner: Yes, yes. This is now six weeks after the earthquake. They are still sleeping in a shelter. In Watsonville, it wasn't single-room people. It was primarily low-income, but in wood-frame houses. In some cases, two or three families were in a house. The houses have been destroyed. They are living in tents. They tended to be people like Latin American, Mexican. Some were illegal, most were legal. Most were essentially marginal workers. Some were migrant workers, but mostly people who just worked in agriculture in that area. There is no place for them to go. So they are sleeping in tents now in Watsonville, in tents in the public park.

Katayama: So, there are still several thousands homeless.

Eisner: Several, we estimate. We don't know where some of them went. There may be three or four thousand people still displaced. We know that there are now five hundred and sixty-three still living in shelters as of one week ago. Four shelters are still open. We have an urban housing problem and it affects primarily low-income, poor people, and we don't have a solution. The people in the Marina are primarily what we call yuppies. They are older professionals, their jobs are still there. They essentially bought their way out of the disaster. The elderly in the Marina had more problems, but they still were not poor elderly. They had incomes, they had savings. I have a limited amount of sympathy. My sympathy doesn't go for the Marina. It goes for the people in Oakland and Watsonville, which brings up the issue of the Red Cross. The Red Cross has a mandate to provide shelter, not housing, provide shelter. They were totally incapable of dealing with this disaster.

Katayama: Is that true?

Eisner: Yes. They could not deal with the cultural issues. We have a very diverse culture and cultures. They couldn't deal with long-term shelter. They are primarily volunteers, who come and go to a school, public school, and set up a shelter for one day or two days and then they go home. Well, this was not one day or two days, but this was weeks. Their system broke down. Secondly, this is one issue that will explode at some point in the near future. They collected 36 million dollars in disaster contributions. They spent maybe two million dollars. We don't know where the rest of the money went. They are not stealing it, but they are putting it into a pool to use elsewhere, in other disasters. And this money was contributed specifically for this earthquake. Some local television stations, two local television stations, KPIX and KRON, each generated maybe five million dollars in contributions to the station which were turned over to the Red Cross. They want an accounting. They want to know where this money went and how it is being used to help people here. The Red Cross is saying, "No, no, we don't do that. We collect money and we use it anywhere it is needed in the country." There are going to be some very difficult times for the Red Cross. Particularly in this area, we need innovation, we need change, we need new concepts of shelter and housing. And the Red Cross is saying, "Well, we manned the shelter, we closed the shelter, that's all we do. We don't build housing." Something is going to happen and it's going to be, I think, very difficult for the Red Cross.

Katayama: How did other organizations do? How was the State OES?

Eisner: How was it? It was mixed. And I will tell you, even on the record, I will tell you. We had just completed a major exercise in August.

Katayama: Yes, I heard about that.

Eisner: We worked on essentially a catastrophic earthquake response and I think that exercise provided many of us with training that we needed. So, we were ready. On the other hand, we have some archaic organizations. We have an office in Pleasant Hill, Region 2 office, which is supposed to coordinate the response here. What happened in this earthquake was actually recoordinated from Sacramento. So, you had an extra layer which was not necessary, that had to be staffed 24 hours a day. It was unnecessary. It was a waste of people's time because information went to one layer and then went to the next layer. It could have gone automatically to Sacramento. We will revise the plans. Secondly, the demands, typical in emergency response is you wait and when the phone rings, you pick up the phone and say "Yes", and you are asked for something and then you provide the resources, provide trucks or ambulances or doctors. That didn't work. The information, the requests were not coming up. So, I think we are going to revise our procedures. We are actually calling the jurisdictions and saying, "What do you need? We have trucks, we have doctors, we have engineers. What do you need?" It is essentially force-feeding rather than waiting for the request.

Eguchi: What was the problem in communicating this?

Eisner: The problem was that the locals were overwhelmed because it was a local disaster. First of all, they were busy. Secondly, they didn't know what resources to expect or to ask for. They didn't know everything that was available. Thirdly, it was bureaucratic. And they just say, "Screw it, we don't want to deal with it." So, we are reorganizing. One of the things we will do is to, essentially, eliminate Region 2, and to have those people go out in the field. We have actually State people out in San Francisco or Oakland saying, "What do you need? We are here to help you. What kinds of resources?" Essentially, it is like having a shopping list; "Do you need engineers, do you need trucks, do you need search and rescue, do you need generators?" It will be salesmen, which will be force-feeding. Yes, very positive, proactive rather than waiting for the request. The two things the State did were to provide search and rescue expertise at the Cypress and structural engineers throughout the region. We brought engineers up from Los Angeles to assist in assessing damaged buildings. That was primarily the only thing we were asked for.

Katayama: How did the communications system work in this?

Eisner: It worked very well but we never lost telephones. This is ATC-20. I don't know whether you've seen this.

Katayama: This is the one you used for...

Eisner: Damage assessment, yes. Less than a month before the earthquake on September twenty-first (good timing!), we had a seminar in Pasadena and one in San Francisco. We had three hundred and fifty people in Pasadena and about four hundred and eighty in San Francisco at the seminars where this material was presented. We had planned in this coming year to have training sessions for engineers as well as training for local officials to emphasize the resource. We didn't have the time.

Katayama: In Oakland, they said there were only two engineers, structural engineers, who had attended the seminar. They organized twenty-six inspection teams, but they did have some problems in teaching untrained inspectors.

Eisner: We have been trying to get them to use architects as well as engineers, because probably eighty percent of the requests for an inspection will be from single family, from individual homes. We thought architects were clearly capable of looking at a wooden building, whereas engineers should be looking at offices, schools, hospitals, and so forth. What Oakland did was to use architects for unreinforced masonry which they are not really competent to do. And for other buildings, they just used architects.

Katayama: Sometime ago, you gave me the booklet "Home Buyer's Guide to Earthquake Hazards" developed by your office. Do you remember what items were listed there?

Eisner: Yes.

Katayama: The booklet says, for example, "Does the house have a foundation?"

Eisner: Yes, whether the foundation is braced, whether the brick chimney is secure. In many cases, we saw very easy damage to identify but again, we didn't have time to do the training. You can buy these (ATC-20) but I'll give you one of these. Also placards, you can have. You can go back and put one of these in front of your office.

Katayama: Inspected, UNSAFE! When did you make the placards?

Eisner: After the earthquake.

Katayama: How?

Eisner: At the time of the earthquake, we had had two training meetings, one in Pasadena, the other here. We had printed initially, under our contract with ATC, fifteen hundred copies. We had distributed almost a thousand at the two workshops. With the distribution to FEMA, we had maybe three hundred and fifty left when the earthquake occurred. I called Chris Rojahn and I said, "Get me everything you have, send it up here, send me the artwork so we can reprint." He was just about to order reprinting so we ordered additional printings. The materials we had, the three hundred and fifty copies of the documents, we distributed to San Francisco and Watsonville, to the cities. We just gave them away. At that time, we had no placards printed, no forms printed. We had talked about budgeting it for the next year. But what happens in a disaster is everything becomes free. Not free, somebody pays but nobody worries about who pays. At that point, we got an emergency purchase, an emergency authorization to print thirty thousand of each placard plus ten thousand copies of forms. The difficulty was it took four days. Some jurisdictions, some cities literally took the book, cut the pages out, xeroxed them, and used xeroxed placards. Some had a print shop, they printed them. And then, four days later when we got the forms, we distributed them, and they were started to be used. But it was spontaneous. Improvisation. People had been to the workshop. They knew the books were there, they knew the forms were in the booklet, the placards were in the books and they used them.

Katayama: How do you evaluate the volunteerism during the disaster? Did you expect it?

Eisner: Yes, I think we did. The social scientists, like Dennis Miletti, Joan Nigg and Henry Quarantelli, who have done research in other disasters talk about emergent volunteers. The people who have studied other disasters,

tornadoes, floods, said there are always people who converge at a disaster, and there are people who spontaneously volunteer. So, our expectation is that that would occur. Their skills, we didn't know. We always say, we have been saying now for at least four or five years that the most important thing that a fire department can do is to train their officers to use volunteers. But they all say, "No, this is a professional service. We don't use volunteers, we don't trust volunteers, we won't use volunteers." And we keep saying, "But the volunteers will be there whether you like it or not. Figure out a way to use them." What happened in San Francisco was people volunteered and they were used. They were dragging hoses, they were carrying water, they were rescuing people, the same thing here in the Cypress and in San Jose. It's always difficult because you can't count on the volunteers and you can't count on getting the skills that you want in the volunteers, but they will be there.

Katayama: Is this a characteristic of this country, the American heritage, or is it universal?

Eisner: I don't know. In Mexico City, there were thousands of volunteers. I think it may not be cultural. I think people in fact respond. It is a human character to respond and to help. It occurred everywhere. We had doctors. We had people who do massage, who went to the shelter in the Marina and offered to give massages, hand, foot, back, massages to the victims and the workers. Everyone who had a skill to offer offered it.

Katayama: Do you think this depends on the size of the disaster?

Eisner: Not so much. I think the bigger disaster you get, the more volunteers. We had engineering professionals, the exact number I don't recall, but we had something like maybe five hundred engineers who volunteered their time to assist evaluating buildings. The commitment was three days. This was not to go in for a few hours. We asked for three days, no less, because it's not worth bringing anybody on board for less time. Otherwise, we spend more time in training than that they spend in the field. I think the volunteers will be there and it is important that we can use the volunteers. This is the discussion, and I may have a cultural bias. Okay, I'll be frank with you. When we were in Japan, maybe eight years ago, in one of the discussions, one of the people from the fire department in Yokohama said, "We have a plan but if the event is not like the plan, it will be very difficult." In Shizuoka, where they have decided that if they get an earthquake prediction, they will take the children from a school that is not strengthened and move them into a school building that is strengthened to resist earthquakes, we asked the question, "What will you do if you don't get a prediction?" I don't know if this is true by consensus but my observation is: there is in your culture much more dependence on plans and maybe some difficulty innovating, you know, improvising. I think Americans, in my observation, we pride ourselves with improvisation and we don't like planning.

Katayama: That may be right.

Eisner: We don't plan. That causes us some problems. It's sort of cowboy mentality.

Katayama: Too much planning and too much reliance upon the officials may be the typical Japanese attitude.

Eisner: I think from what we saw, you have plans for everything you can expect or predict. You plan for subsidence, liquefaction area, you plan for loss of communications, but there will always be surprises. The plans address what you expect, which frees you to improvise. That's what we are doing here in California. Because being cowboys, the people who think everything is going to be, you know, they go by the seat of their pants, we say, try by the seat of their pants. They are in trouble.

Katayama: Independence, an individualistic way of life, and living in the country of free enterprise, I guess.

Eisner: I think in a disaster, it can help you but it can also make it worse. So, the best may be somewhere in between. There are always unexpected things happening and you have got to be able to have the energy to focus on the unexpected. If you are either too rigid in a plan or spending all of your time in improvising, you can't deal, you can't address it.

Katayama: What happened to Tom Moore in Sunnyvale?

Eisner: Sunnyvale had almost no damage. It is an anomaly.

Katayama: No damage? It is so close to the epicenter.

Eisner: Yes, it is an anomaly. We don't know. Let me see. I have a slide, let me get some slides. I will see if I can show you...this is not going to work, because the slide is too small. I had a map that shows the accelerations. It is a map that is produced by the GS. The accelerations at the epicenter were sixty-two percent, sixty-three percent G. You have essentially a hole in the South Bay where the accelerations are around ten percent, eleven percent G. That includes Sunnyvale. We don't know why. It is an anomaly.

Katayama: Maybe because Tom was there.

Eisner: San Jose also. Mountainview also. Then you get accelerations here twenty-six, twenty-seven percent, and in San Francisco, twenty-four percent. It is very clear there is a linear relationship. The peak accelerations, the highest accelerations were parallel to the fault up the peninsula, but they missed San Jose.

Eguchi: You know, I heard that there were theories about the level of ground water. Apparently, it is very, very low in that area.

Eisner: They have had a drought. It is something to do - research. I am sure there are at least twenty seismologists and geologists submitting applications to NSF to do research.

Katayama: According to a very recent report which has been submitted to the Housner's Committee, on the twenty-ninth or twenty-eighth of November, there was a strong directivity in the ground motion.

Eisner: This is very interesting. Both in this area and in San Francisco, sixty miles or a hundred kilometers away from the epicenter, you had these very high accelerations with thirteen to fifteen second durations that just picked out the bad buildings. The freeway was garbage, the freeway was just a terrible structure. They had put instruments in Fort Mason, which is on sand-stone. They also had put the instruments out on the Marina. In the aftershock records, there is a three to four fold increase in amplitude between bedrock

and a site a hundred meter away on the sand. All of this is expected. On the sand, you get a very uniform period. Everything you would expect about soil resonance, extended duration, very uniform period, occurred in the Marina. I haven't seen records for the freeway here. There was a map published in the Chronicle, a newspaper, that showed the area of the freeway that collapsed and it was on very, very new, less than ten thousand year old, soils. Where the soil changed, because there was essentially a bay there, where the soils were older, the freeway didn't collapse.

Katayama: Vit Bertero told me that the length of piles changes abruptly from fifteen feet to fifty feet and the damage occurred in the portion with fifty feet piles.

Eisner: It is interesting. Also one of the things that came about was this. Somewhere in the Marina, they were doing holes, boreholes to drop instruments. The records they had from the turn of the century and shortly after the turn of the century in the 1920s indicated that there was about fifty feet of bay mud on top of bedrock in the Marina and the engineering designs assumed those conditions. In putting this borehole, they hit some debris at fifty feet. When they went through the debris, there was another hundred feet of mud. The quality of soil science eighty years ago couldn't, didn't know the difference. We find this is an unexpectedly deep sediment there. Surprises, once again.

Katayama: Very frankly speaking, the US engineers have not done much of downhole observation so far.

Eisner: Well, we are doing it now.

Eguchi: Would you explain what are the differences in the features of the earthquake damage in the Marina and in other filled lands with the same sort of conditions?

Eisner: Except in the Marina, there was almost no damage. There was some subsidence but it was not significant. But that area, we suspected. I was always concerned about Foster City because it was very cheaply done. They diked it, they dewatered the site, they changed the soil composition and then filled it and they did engineer the fill. Other areas, I don't know. Have you heard any reports about Emeryville?

Eguchi: No. The only reason I know about Foster City is because it was one of the Dames & Moore's projects.

Eisner: Redwood Shores had no damage which is another major landfill south, just south of Foster City. I think there is going to be a lot of changes. Caltrans has been embarrassed. They spent fifty-three million dollars in strengthening bridges. Clearly, it wasn't enough money. It was pathetic, the inadequate amount of money. This particular structure they had retrofitted, it was a bad design. It is a two-pin arch.

Katayama: Three pins.

Eisner: Three pins, yes. Three pins. So you had pin, pin and then a pin at the bottom.

Katayama: That's right.

Eisner: I don't know if you have seen photographs but it's not a very good construction, very few ties. It was designed as a frame, but I don't know how they could have conceivably had frame action given the lack of reinforcing. On a sight, it was questionable. They identified it in 1981 as a collapse hazard. They had retrofitted, interestingly, in the first phase of the retrofit program in 1977 but not the columns. They retrofitted the deck and the beams, but not the columns. Right after the earthquake, they appointed Ian Buckle to head the investigating committee.

Katayama: Who is he?

Eisner: He is an engineer that works for IDS, a contractor to Caltrans.

Katayama: A base isolation specialist.

Eisner: Yes, yes, who had been contracted to Caltrans. When that was pointed out, they fired him. How could you hire someone who has a proprietary system to sell, who had been contracted to Caltrans to evaluate Caltrans? The first statement that Ian Buckle made was, "Caltrans has done a tremendous job." I mean this was foolish. So, they fired Ian Buckle and appointed George Housner. The Housner's Committee is very interesting because it has soils people, it has engineering people, and it also has Chris Arnold who is an architect. Chris is probably one of the few people who can write coherently for the general public. Engineers will write for engineers. Chris will do a good job to make sure that it is written so people can understand it.

Katayama: How many members are there in the committee?

Eisner: I think eight or nine. Is that right? Something like that. But, it is a good group of people. The other thing that is very interesting is the Bay Bridge had no damage to the suspension structures, but the cantilever sections, the conventional bridge structures had been retrofitted maybe twenty years ago to keep them from pulling off the abutment. That may have saved the bridge, but it also resulted in this. As the motion, the bridge is maybe two miles long, impacted the bridge, it pulled apart somewhere else. They said the whole thing is now out of alignment although what they said yesterday at a briefing is, they have never known how long this bridge is. No one knew how long the bridge was. So, trying now to calibrate what occurred is impossible. They now have to measure the bridge. They know there was at least eleven inches of offset. That's because they can see where the bridge, where sections worked back and forth, expansion joints worked back and forth, and where they had failure. How long is the bridge, no one knows. This was in the 1930s when the bridge was designed and built. Now, we can measure a millimeter with a laser; then, they were doing it with steel tapes. A tremendous amount of liquefaction. Much more, you know. I thought liquefaction was something you would read about in a textbook. All of Interstate 80, the approach to the bridge subsided by four inches. Pavements buckled and ejected sand boils were all across the pavement. But there are very few pictures because everyone was taking pictures of the bridge. It is very difficult now to get documentation of what occurred at the approach to the bridge. Yes, all liquefied. A huge area liquefied. Maybe, it is twenty-four lanes wide. It is probably a mile or two miles long where it liquefied. When we were there a week after the earthquake, the only sandboil that we could find was off on a frontage road and it was about ten meters long and four meters wide. But everything else had gone. They had to grind the pavement down and they were in the process of resurfacing when we were there. Around the Toll Plaza, there was a break, the pavement dropped

4 inches because of subsidence, leaving the Toll Plaza which is on piles 4 inches higher relatively. There are some very interesting things we expected. In the scenarios of the earthquakes, we expected it. Yes, I have some pictures and I would be happy...I have your address. Unfortunately, I cannot fax you slides.

Katayama: When are you flying back to L.A.?

Eguchi: I have got a seven o'clock flight but I have some other options. I can fly at twelve. Don't worry if you want to continue.

Katayama: We are almost finished.

Eisner: It has been a very long day. It started for me at six this morning. Do you have any specific questions or general questions?

Katayama: No, thank you. I think this kind of talk is very important. Statistics will come later.

Eisner: Yes, and the engineering data. Are you going to be at the briefings, the EERI briefings tomorrow morning?

Katayama: No, I cannot stay.

Eisner: Okay. I have two of those to do tomorrow, one at Berkeley and one at Stanford. Then I have Sunday off. It is a holiday for me. I am working like a Japanese, six days a week.

Katayama: I am working six days and I am working on Sunday, too. I am a faculty coach of the University's Rugby Team.