UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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In the Matter of:

PACIFIC GAS AND ELECTRIC COMPANY : Prehearing Conference

HUMBOLDT BAY POWER PLANT UNIT NO. 3 : Docket No. 50-133

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Veterans Memorial Building
11th and H Streets
Eureka, California

Tuesday, June 3, 1980

The above-entitled matter came on for prehearing conference pursuant to notice at 9:30 a.m.

BEFORE:

ROBERT M. LAZO, CHAIRMAN
GUSTAV A. LINENBERGER
DAVID R. SCHINK

APPEARANCES:

On behalf of the NRC Staff:

STEVEN GOLDBERG, ESQ.
VERN ROONEY, Project Manager

On behalf of the Applicant, Pacific Gas and Electric Company:

BRUCE NORTON, ESQ.
Norton, Burke, Berry and Chuck
3216 N. Third Street
Phoenix, Arizona

RICHARD F. LOCKE, ESQ.
Pacific Gas and Electric Company
77 Beale Street
San Francisco, California 94106

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On behalf of the Interveners:

LINDA J. BROWN, ESQ.
Jones, Brown and Clifford
100 Van Ness Avenue, 19th Floor
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Arcata, California 95521

P R O C E E D I N G S

(9:30 a.m.)

CHAIRMAN LAZO: Good morning. Would the prehearing conference come to order, please?

This is an administrative proceeding before an Atomic Safety and Licensing Board of the United States Nuclear Regulatory Commission in the matter of Pacific Gas and Electric Company regarding Humboldt Bay Power Plant Unit No. 3. The proceeding is identified as Nuclear Regulatory Commission Docket No. 50-133.

The proposed administrative action is the issuance of an amendment to facility operating license number DPR-7, issued to the licensee, Pacific Gas and Electric Company, for operation of the Humboldt Bay Power Plant, Unit No. 3, located near Eureka, California.

In accordance with the licensee's application for amendment dated May 20, 1977, the amendment would delete requirements in the license relating to seismic updating of safety-related equipment and resolution of geologic-seismic concerns based upon satisfactory completion of those requirements, and allow for the restart of Humboldt Bay Power Plant Unit No. 3.

The Notice of Application for issuance of the proposed license amendment and of the opportunity for hearing was given general public distribution, including the news media, and was published in the Federal Register on June 23, 1977. The citation is 42 Federal Register 31847.

That notice, among other things, provided that any person whose interests may be affected by this proceeding may file a petition for leave to intervene with respect to the issuance of the amendment to the subject facility operating license. Two petitions for leave to intervene were thereafter filed in this proceeding.

The first petition was filed on July 29, 1977 by Thomas K. Collins, Dr. Elmont Honea, Frederick P. Cranston, Wesley Chesbro, Demetrios L. Mitsanas, and the Six Rivers Branch of the Friends of the Earth. The second petition, which was filed on August 16, 1977, was a request by the Sierra Club to join in the Collins et al. petition for leave to intervene and to be represented by the same attorneys who f ed the Collins et al. petition.

While these petitions for intervention were under consideration, the licensee filed a motion to hold the proceedings in abeyance. On May 15, 1978, the Licensing Board, which had been constituted to rule on petitions for intervention, granted both petitions, consolidated the participation of the Sierra Club with that of Collins et al. for all purposes in this proceeding, and directed that an evidentiary hearing be held on licensee's application for an amendment to its operating license. Thus, there are three parties to this proceeding: the licensee, Pacific Gas and Electric Company; the regulatory staff of the Nuclear Regulatory Commission; and the joint interveners, Collins et al.

Now, let me introduce the members of the Atomic Safety

and Licensing Board which will hear and decide this case. Seated at my right, your left, is Gustav A. Linenberger. Mr. Linenberger is a physicist and has been a member of the Atomic Safety and Licensing Board panel since 1972. Seated at my left is David R. Schink. Dr. Schink is an environmental scientist who is a professor of chemical oceanography at Texas A&M University. He has been a part-time member of the ASLB panel since 1974.

My name is Robert M. Lazo. I am a lawyer who was appointed to the Atomic Safety and Licensing Board panel in 1970.

On March 24, 1980, this Licensing Board issued a Notice of Prehearing Conference in this proceeding to be convened today here in Eureka at this location to consider licensee's request that this proceeding continue to be held in abeyance. That notice was also given general public distribution, including the news media, and was published in the Federal Register on March 31, 1980. That citation is 45 Federal Register 21064 and 65.

Now may we have the appearances of the parties, please? For the licensee.

MR. NORTON: Thank you, Mr. Chairman.

My name is Bruce Norton, and I'm lead counsel in this matter for Pacific Gas and Electric. With me at the table is Richard Locke, who is senior counsel with Pacific Gas and Electric. He is immediately to my right. Immediately to my left is Mr. Don Brand who is Vice President-Engineering for Pacific Gas and Electric. To Mr. Locke's right is Mr. Frank Brady who is the Project Engineer

for Humboldt; and to Mr. Locke's right is Mr. Lloyd Cluff, C-l-u-f-f, of Woodward-Clyde Consultants, the geology-seismology consultants on the Humboldt project.

CHAIRMAN LAZO: And for the Nuclear Regulatory Commission.

MR. GOLDBERG: Yes, Mr. Chairman.

My name is Steven Goldberg. I represent the NRC staff in this proceeding. My mailing address: U.S. Nuclear Regulatory Commission, Office of the Executive Legal Director, Washington, D.C. 20005, zip.

To my right is Mr. Vern Rooney, the NRC Project Manager for this docket.

MR. SCHINK: Sir, how does that gentleman spell his name, please?

MR. GOLDBERG: R-o-o-n-e-y.

MR. SCHINK: Thank you.

CHAIRMAN LAZO: Thank you, Mr. Goldberg.

And for Collins et al. and the Sierra Club, joint interveners?

MS. BROWN: My name is Linda Brown, and I'm lead counsel in the case. To my immediate left is Dr. Elmont Adam Honea, one of the interveners, and to my far left is Mr. Steven Gompertz, co-counsel from this area.

CHAIRMAN LAZO: Would you spell Mr. Gompertz's name, please?

MS. BROWN: Steven G-o-m-p-e-r-t-z.

CHAIRMAN LAZO: Thank you, Ms. Brown.

In the notice of prehearing conference to which we referred moments ago, the Board indicated that the parties should be prepared to address certain items on the Board's proposed agenda. Let us ask now, have any of the parties prepared additional agenda items or have prepared a proposed agenda for this conference?

MR. NORTON: The applicant has not, Your Honor. We are prepared to proceed with the agenda as proposed by the Board.

CHAIRMAN LAZO: And no other parties have a proposed agenda to put forth?

MR. GOLDBERG: No, Mr. Chairman.

CHAIRMAN LAZO: Thank you.

MS. BROWN: No, Mr. Chairman.

CHAIRMAN LAZO: Now, do any of the parties wish to make an opening statement?

MS. BROWN: The interveners would like to make an opening statement.

CHAIRMAN LAZO: Fine. Why don't you proceed?

MS. BROWN: We have assumed that this hearing is going to be an open dialogue discussion, and given that assumption we've already introduced to the parties and to the Board our beginning of that dialogue, which is the historical summary leading to the present status of the plant.

I understand that Pacific Gas and Electric Company is going to be putting on a presentation by their geologic consultants

here today. We're hoping that the interveners will have an opportunity, either during or immediately following that presentation, to ask questions to gain information. We understand that this is not under oath, but we feel that it should be an exchange of information; and we hope that we can participate by being able to ask questions of the people that are making the presentation and making comments.

CHAIRMAN LAZO. Yes, it is indeed our wish that this conference be as fruitful as possible. It is not an evidentiary session, but it is a meeting of counsel for the parties with the Licensing Board. It need not be as formal as an evidentiary session.

We had noted that we wanted to get together with the parties today to try and find out just what the status of this case is and perhaps establish a schedule for further proceedings.

The members of the public have not been invited to make limited appearance s atements at this conference. That opportunity, of course, will be provided later on in the event that the proceeding does go forward to an evidentiary hearing.

Well, Mr. Norton, would you proceed?

MR. NORTON: Well, may I inquire of the Board, the last exchange between the intervener and the Board, I'm not sure I understand precisely what we're about. As I understood the Notice of Prehearing Conference, the Board wished to be informed of certain things which we are here prepared to do. As I understand Ms. Brown's query, she wishes to cross examine --

MS. BROWN: No. I did not make that statement. I indicated I wish to ask questions that may lead to additional information to give both the Board, the staff, and interveners a better idea of exactly what your position is, and you in turn are given the opportunity to ask us questions with regard to our position and any information that we may have.

MR. NORTON: Excuse me, Mr. Lazo. I was addressing my remarks, of course, to the bench, to the Board.

CHAIRMAN LAZO: We do not intend that this be an evidentiary session. I see no reason for technical witnesses to be sworn. However, since these people are here and are available to provide information to the Board, I think that if there are questions by any of the other parties by way of clarification that we should try to proceed in that fashion.

MR. NORTON: Well, Your Honor, I guess I have some objections to that as a procedural matter. The notice does not provide for -- it's cross examination. If the attorney for the other party examines my witness by asking questions, that's cross examination. You can call it formal or informal, but it is in fact cross examination.

We did not come prepared for cross examination. That's an entirely different ballgame. As an attorney I'm sure you're aware when your client is going to be deposed or when your witness is going to be deposed, you prepare in one manner as opposed to when he's going to make a presentation. You anticipate some of the

questions and so on.

We're perfectly free to answer all the Board's questions, but to get into cross examination by other counsel is something that the notice I don't think gives fair notice of. I'm not saying we're not going to participate or not going to do it. Certainly we are going to do whatever the Board desires. But I do object to that procedure, and I'd like to make that a formal objection on the record.

CHAIRMAN LAZO: Well, perhaps we can allay your fears by adopting a procedure in which any of the counsel for the other parties who wish to have clarification, they could address their questions to the Board.

MS. BROWN: That's fine.

CHAIRMAN LAZO: And then we could proceed in that fashion, make them Board questions.

MR. NORTON: I'm not sure that allays the problem. That's getting to the same place in a roundabout way.

CHAIRMAN LAZO: Well, your objection is noted for the record, and you may be free to renew it. If we stray into ground where you feel that the proceeding is prejudicing your position, then I'm sure you'll let us know.

Mr. Norton, would licensee lead off then, please?

MR. NORTON: All right. If I might give a brief introduction of what we are going to present. Mr. Brady has been asked to give a historical summary which you have requested in your

prehearing conference order, and he will do that. We do not anticipate that summary will, of course, be too long. Then Mr. Cluff of Woodward-Clyde Consultants has a presentation which consists of slides and viewgraphs, of course in addition to his oral presentation.

The slides and viewgraphs can be made into 8 1/2 by 11 xerox or something of that size to be marked for the record. Unfortunately, there are several, as you can see hanging behind you, diagrams that are not so easily marked. However, Mr. Cluff informs me he can have those reduced to a size that can be marked. However, that wouldn't be done today but at some later time and mailed to the Board and to the court reporter and the parties.

Mr. Cluff's presentation will take approximately two to three hours. That's the best we can do in terms of timing. It might only be two, but it could be as long as three hours. I say that so that the Board can perhaps schedule the breaks around that.

Finally, the Board did ask that we have a corporate officer here, and of course, that's what Mr. Brand is here for, to answer any questions the Board may have of him. However, he does not have, of course, any presentation to make other than in response to Board questions.

At this point I would like to ask if Mr. Brady would proceed with a historical summary.

MR. LINENBERGER: Excuse me, Mr. Norton. The acoustics are not the best here, and your last comment with respect to

Mr. Brand and his posture here, I did not hear.

MR. NORTON: Well, the last paragraph of the Board's prehearing conference order, the next to the last paragraph, asked the applicant to have a responsible corporate officer present who can speak directly to the utility's posture regarding the Humboldt Bay facility.

MR. LINENBERGER: Right.

MR. NORTON: We assumed you contemplated asking that corporate officer some questions.

MR. LINENBERGER: Right.

MR. NORTON: Mr. Brand is here to respond to those questions, but he doesn't have a formal presentation to make.

MR. LINENBERGER: I see. I just couldn't hear you, that was all. Thank you very much.

CHAIRMAN LAZO: And, Mr. Norton -- pardon me -- who will lead off with the historic summary?

MR. NORTON: Mr. Brady.

CHAIRMAN LAZO: Mr. Brady.

MR. NORTON: Project Manager.

MR. BRADY: Please tell me if the microphone is not functioning properly.

By way of historical summary leading to the present status, I'd like to describe four periods in the history of Humboldt Bay Power Plant Unit No. 3, each of which I think is fairly distinct in the nature and character of the proceedings that

took place.

The first period that I'd like to describe starts with the provisional operating license which was granted on February 15, 1963. Shortly after, in August of 1963, Humboldt Bay Power Plant Unit No. 3 was turned over to the operating part of the company for its first commercial operation.

Prior to the initial operation, in fact, prior to construction of the plant, geologic and seismologic studies were performed in 1958 to determine the suitability of the site for the nuclear unit. These were by Dr. Perry Byerly of the University of California and Dr. William Quaid.

In April of 1969 updated geologic and seismologic studies were conducted. These resulted from an agreement between Pacific Gas and Electric Company and the then AEC staff and the ACRS during discussions leading to what was called the full-term operating license. In those days it was standard procedure to issue a provisional license for the early parts of operation and later a full-term operating license.

The reason for these updated studies was that changes had occurred in the methods of analysis of plant structures and equipment. Specifically, the systematic application of dynamic analysis methods had come into pretty wide usage, whereas in the original design of Humboldt Bay Power Plant Unit No. 3 the seismic response was largely on the basis of equivalent lateral load, although certain items which were considered important to safety

were analyzed by dynamic analysis methods, even in the original design.

These updated geologic and seismologic studies and subsequent seismic analyses of plant structures and equipment were completed, were made available to the AEC staff in May of 1970.

The next period that I believe is significant in the history starts with information that became available in July of 1971, and this was data from the Braunner well, which was a 7,0[illegible] foot plus exploratory boring completed by Standard Oil for the purposes of exploring for oil on Humboldt Hill, a few miles southeast of the plant site.

This boring went through what is known as Little Salmon Fault, one of the significant faults in the Humboldt Bay region, and provided information which could be interpreted to mean that faulting occurred closer to the plant site than had been thought from the earlier studies; so this was clearly a new element in the geologic and seismic studies for the area.

Subsequent to this information becoming available, meetings occurred between the, I guess it was still the AEC then, staff and PG&E, and additional geologic studies were conducted in order to obtain information on Little Salmon Fault. These studies, as further studies in this area have a way of doing, provided information showing that the geology of the area was in fact complex, and in fact there was an additional fault that came to light called the Bay Entrance Fault which is fairly close

to the plant site.

While these studies did provide a great deal of additional information on the geology of the area, a few years later in May of 1976 after a series of studies, review of studies, the NRC staff felt that their requirements were extensive enough that they would write a list of information that had to be provided in order to successfully resolve the geologic problems at Humboldt Bay. And this was a specification, if I may refer to it as such, consisting of six items.

These items were attached to the operating license for Humboldt Bay Power Plant Unit No. 3 in May of 1976 and appear as paragraph E.2 of the license.

During this same period in 1973, PG&E was asked by the NRC staff to proceed with a seismic reanalysis of plant structures and equipment using then current dynamic analysis methods to qualify an agreed upon list of safety-related equipment for a .25g operating base earthquake.

Inasmuch as the safe shutdown earthquake level had not been agreed to at that time, we were further asked to calculate the margin of this safety-related equipment to withstand a safe shutdown earthquake level.

So PG&E did proceed with these analyses and completed these analyses for the most part by 1976. And it was our plan to make the required plant modifications during the refueling and maintenance outage which started July 2, 1976.

The NRC staff put further conditions on the license -- and I believe this is paragraph E.1 -- which listed these safety-related structures and equipment to be qualified for the .25g operating basis earthquake. So in May of 1976 then we had two conditions added to the license. One was the list of geologic and seismologic requirements; the second was the list of safety-related structures and equipment to be qualified for a .25g operating basis earthquake.

The third period that I'd like to talk about is the period from the time the license was amended until August 5, 1977 when PG&E received a letter from the Nuclear Regulatory Commission. During that period, additional geologic studies of approximately a year's duration were conducted in the hope of obtaining the information required to satisfy the geologic conditions that had been placed on the license.

These studies were somewhat more extensive, included deeper borings than had been previously included in the geologic investigations, and included a 1600-foot long trench at the plant site, which was a new item for those investigations.

These studies were completed in early 1977, and the results submitted to the Nuclear Regulatory Commission staff.

CHAIRMAN LAZO: I'm sorry. You said early 1977?

MR. BRADY: Early 1977.

CHAIRMAN LAZO: But I thought you said the letter from the staff was in August of '77.

MR. BRADY: That's correct. The report was submitted in several parts over a period that I would estimate went from March until perhaps as late as June 1977. Then there was a review period involved where there were meetings between PG&E and the NRC staff. And then on August 5th as a result of that review process, the NRC staff advised PG&E that based on the information available to them at that time, they were unable to support our bid to restart the unit, and specifically they listed two concerns.

One was that they didn't feel they could say with a reasonable degree of certainty that surface faulting would not occur at the plant site during the remaining lifetime of the facility. And secondly, they felt that there was a possibility that the seismic design level may have to be substantially upgraded.

CHAIRMAN LAZO: Mr. Brady, had a staff of the NRC assigned a value yet to the safe shutdown earthquake?

MR. BRADY: I'm sorry. I didn't catch that.

CHAIRMAN LAZO: Had the staff established a value for the safe shutdown earthquake?

MR. BRADY: No, they hadn't.

CHAIRMAN LAZO: At that time.

MR. BRADY: At that time. What they did do when they asked us to do the seismic analysis was to do it for a .25g operating basis earthquake and calculate the margin to safe shutdown earthquake capacity. As a practical matter, what happens when you do that analysis is you do it for a .25g operating basis earthquake.

and a .50g safe shutdown earthquake. It simply has to be done that way because of the peculiarities of the analysis techniques.

I would say that the tone of the August 15, 1977 letter was based on the information then available to them. In other words, they felt that there was insufficient data to support the interpretation that we had placed on it, or at least to sufficiently support it.

The other point I wanted to make about this period in time was that starting with the July 2, 1976 outage, PG&E did make extensive seismic modifications to the plant structures and equipment which were necessary to satisfy the seismic criteria from the dynamic analysis.

This consisted of modifications to certain of the plant structures, namely the refueling building which received additional roof trusses and supporting columns. It consisted of extensive work on pipehangers and work on equipment supports and items such as laboratory table testing of electrical equipment and control room readout devices to qualify them for the, in this case, the safe shutdown earthquake level.

The fourth period of time I'd like to talk about is the time subsequent to the August 5, 1977 letter. After meeting with the NRC staff and receiving the information that they would not support us in our bid to restart the unit, PG&E requested additional information from the staff regarding the basis for their judgment in this matter, and subsequently retained Woodward-Clyde

Consultants to perform a thorough review of the geologic investigations performed to date and to look at the geologic issues at Humboldt Bay and advise us as to our prospects for eventually resolving these issues.

MR. LINENBERGER: Pardon me, sir. At what point in time chronologically was the firm of Woodward and Clyde retained by PG&E?

MR. BRADY: They were retained in October of 1977. This was shortly after the letter from the NRC staff.

MR. LINENBERGER: Thank you.

MR. BRADY: Subsequent to retaining Woodward-Clyde, PG&E then did request certain extensions of time from this Board to obtain time to do additional geologic investigations which were recommended by Woodward-Clyde. And these extensions are detailed in our September 27, 1979 motion before this Board.

MR. NORTON: That concludes Mr. Brady's summary.

I would like to emphasize again, and I think this will become perhaps more important when you hear Mr. Cluff's presentation, that the letter of August '77 from the NRC to Pacific Gas and Electric is clearly based on a lack of information. It was not based on data that was available that suggested something. It was based on a lack of data, concerns that arose from a lack of data. And it has been that lack of data which has put us in the posture we're in today, which is extensive gathering of data since October of 1977. And Mr. Cluff is prepared to present to you

basically two and a half years' collection of data in two to three hours. It's an awful lot of material, and we're prepared to proceed whenever you are.

MR. LINENBERGER: Before we do, I should like to ask a question of Mr. Brady.

You indicated that perhaps the earliest field information that gave cause for reconsiderations came out of some Standard Oil exploration information, if I understood you correctly.

MR. BRADY: That's correct.

MR. LINENBERGER: I'm curious to understand here what was the mechanism whereby licensee obtained access to or knowledge of that information.

MR. BRADY: Well, that's a pretty tricky business when you're dealing with oil companies, as I'm sure you can appreciate.

MR. LINENBERGER: That's the basis for my question. I'm curious whether Standard Oil came knocking on your door and said look what we've found or whether you had sources of information that indicated there may be something further available that you should pursue. I don't want to get into company matters here that are not relevant to the Board; I'm just interested to understand is it the company's policy to maintain an updated knowledge of all information related to geology and seismology explorations that are going on in this general area, or how did you --

MR. BRADY: Well, I think it certainly is our policy to the extent that we become aware of such information, and certainly

at the current time we have exchanges of information with various parties obtaining information.

As to historically how it happened, I have to claim a certain amount of ignorance because this predated my involvement with the Humboldt Bay project. However, I can tell you that the Braunner well was completed in late 1970, and we and the NRC staff -- and I'm not sure who obtained it first -- did become aware of that data in mid-1971, so it was relatively quickly after that well was completed that we got the information.

MR. LINENBERGER: Fine. Thank you.

(Pause.)

CHAIRMAN LAZO: Well, Mr. Cluff, would you proceed, sir?

MR. CLUFF: The purpose of my discussion this morning is to continue in the beginning this historical chronology to the present status of the work that is now ongoing and is continuing. And I will summarize the background of the technical nature of the geology and seismology issues that preclude the resolution of the amendment to the license, and also present a summary of the technical basis of the need for further delay, including the nature of the geology and seismology data that we are gathering and the analysis of the entire program that is presently in progress.

I will be using some viewgraphs and slides, and what I have prepared is a -- it's my request that we need more time from PG&E in our evaluation, and so I have prepared a conceptual presentation without going into all of the details; it would take

several days. So I'm presenting conceptual ideas aiming at the technical basis for the need for the delay, which is my understanding of the basis for this prehearing.

So in the first viewgraph I will begin the chronology of our work. In August of 1977 the NRC concluded that it could not state with reasonable certainty that sheer failure displacement caused by earthquakes will not occur at the Humboldt Bay site during the remaining life of the plant. This was the staff's conclusion. And that based on that conclusion, the NRC informed PG&E that the Humboldt Bay Unit No. 3 must be suitably designed to withstand the effects of surface faulting.

In October of 1977, as has been stated previously, Woodward-Clyde Consultants were retained, and our assignment is as stated. Woodward-Clyde Consultants' assignment was to make a critical review of geologic and seismologic data and the conclusions reached by PG&E, the NRC, the U.S. Geological Survey, the California Division of Mines and Geology, and to advise PG&E of the potential for resolving the technical issues.

I think it's important to make sure that I emphasize a few key words there. Our assignment was not to have a prejudged conclusion but to independently look at all of the conclusions and technical reports that have been prepared, including both sides of the issue, and to advise PG&E on the potential for resolving the issues, not necessarily to lay the entire matter to rest. But was there data to allow confident resolution, whichever

way that might come out.

MR. LINENBERGER: Excuse me, Mr. Cluff. Is it your understanding at that point when Woodward and Clyde was given this assignment, was it your understanding that the NRC had indicated the extent of surface faulting or extent of surface displacement that they were worried about the occurrence of, or was this quantified in any way what their worry was, as you understand it?

MR. CLUFF: The two statements that I state there was basic technical conclusions, and there were some backup reports. However, I had the same question you have, and so -- I was not going to go through the sequence here -- we had meetings with the NRC and U.S. Geological Survey to understand and clarify that very question. And if you'll allow me, I'll go through that process.

The next point was our assignment that continued through November or through December of 1977, and it included basically the items that I've listed there: review of the available data, the published literature -- and I must point out that the published literature in this area of California is very sparse, it's quite old, and the purpose of a lot of the published geologic and seismologic work in this area was not for the purpose of resolving seismic issues or active faults, capable faults, but primarily more for economic geology, petroleum exploration and so forth. So one can't expect the results of those published maps and reports to resolve all the issues that might come out of a reactor

licensing process.

And the unpublished data, which was very voluminous in a number of various quality data but nevertheless a lot that existed in the U.S. Geological Survey, Division of Mines and Geology of the State of California, and most importantly, work that had been done by professors at Humboldt State University, in particular Professor Carver and his students in looking at, in their senior thesis, in looking at the geology of the region. And so we evaluated, and this included field trips and so forth of various individuals. And then, of course, reports by PG&E, the NRC, and the USGS. And all of these included site visits on several occasions. And then a meeting, and a very important meeting, that addressed the question that you just raised, which was held in Bethesda with the NRC, U.S. Geological Survey, and the California Division of Mines and Geology.

And the purpose of that meeting was in fact to ask about the reasoning behind the conclusions that are stated there at the top, because I frankly had a lot of concerns about the nature of the geologic information that allowed those conclusions to be reached, as well as other conclusions that were reached by PG&E, which of course were opposite to those conclusions.

And that was a most interesting and fruitful discussion in that it was very open, laying all the data out on the table and talking about it. And maybe for just a moment I can go through a few slides to demonstrate what some of the technical issues that

came out of that discussion that answer your question.

MR. LINENBERGER: Well, I can wait for this to come out in the normal course of your presentation.

MR. CLUFF: That's okay. This follows so let me point out a regional map of this tectonic area that we're concerned with. We have the coast of California with the Humboldt area being about right here, and these lines on the map, one can see the boundary between California and Oregon. And then this Mendocino fracture zone, and of course the northward continuation of the San Andreas Fault or the plate boundary between the North American and Pacific plates. And then the change from what is one tectonic environment here into another tectonic environment that was over a long period of geologic time in a phase of transition.

And it was one of the concerns from the NRC and USGS that they were uneasy about an area that was in a state of tectonic transition.

This is another view of that same regional area. Again, California is positioned a little differently. Here's the boundary between Oregon and California and the Humboldt Bay area being up here. And I won't go a long time to go through. This was the hypotnesis that was put forth by Dr. Dickinson at Stanford and one of his students, Tanya Atwater, that was the beginning of the understanding of strike-slip faulting, transcurrent faulting in the plate tectonic model. And I won't go into the details of that.

But what this shows is that over a period of about 30 million years -- one can see the time intervals along here from 30 million to the right down to 5 million to the left, and then these stars that are located here also have numbers by them which are in millions of years. And this is the northward -- the hypothesis put fo rd here by Dickinson was the northward migration of the triple junction -- those stars represent the triple junction which presently exists offshore from just south of here where the San Andreas ties in and meets the Mendocino fracture zone that's striking offshore.

And one of the concerns that the NRC and USGS had was that given that this hypothesis was correct, then what is the tectonic processes as this continues. And they were uncertain about the area from the regional point of view given this hypothesis.

There have been a number of other workers who have postulated different hypotheses about this general region, and I won't take the time to go through all of them, but here's just one. Again showing the area with the Humboldt region of the plant site being right here, with the San Andreas and Mendocino fracture zone, and then over here a zone of faulting that this hypothesis connects southward into the Bay Area faults to the south, the Hayward, the Calaveras, the Maacama, and various other faults that continue to the north. This hypothesis would generally be one of transcurrent or strike-slip faulting down here, continuing to the north in an area which was at one time or may still be an area of

compression or thrust faulting. And this was another model that was being viewed and questions being asked, well, maybe this area over several million years is going through a transition state from a compressional environment to approaching, on some of the faults anyway, a strike-slip environment.

MR. SCHINK: Whose model is that that you're showing?

MR. CLUFF: This is a model put forth by, oh, two or three workers. I've forgotten the original person. I think Darryl Herd with the U.S. Geological Survey is the most recent person to emphasize this, and this is his map; but it was actually postulated by someone else before that. I've forgotten who it was.

MR. LINENBERGER: A question of logistics here. Dr. Cluff is referring to maps and diagrams, and has it been -- which will lead to some confusion perhaps in the transcript.

Now, has it been definitely established that copies of these will be made available?

MR. NORTON: Copies definitely will be made available. My understanding is this is informal, without rules of evidence and so on, and that's why we did not have them marked. We can probably keep fairly track of the chronological order and renumber them -- or excuse me, not renumber them but number them when we present them to you.

MR. LINENBERGER: Fair enough.

MR. SCHINK: Well, while we're talking about logistics,

could you arrange to get me reprints of the Atwater paper?

MR. CLUFF: Yes.

Let me come back to the chronological sequence here. We were discussing these issues with the NRC; in fact, I listed the issues. Let me just show those on another viewgraph. These essentially were the issues that we identified with the NRC and USGS that they were concerned about or was the basis for their concern from the regional geologic point of view.

Transitional tectonics in the region not being well understood· the capability and the relationship between faults at the site locality, Little Salmon and the Bay Entrance Fault; the continuity in age of marker beds under the plant. In other words, these marker beds, if you look at the NRC criteria, there's an age criteria, and so to meet that criteria one needs to identify marker beds and the age of those beds. And so it was the continuity and whether or not they were of sufficient age to allow judgments to be made, particularly those of stratigraphic units directly under the plant. And, of course, the potential for surface faulting and the review of the SSE or the vibratory ground motion in the design basis earthquake.

And as Bruce Norton stated earlier, we concluded that it was not a matter of what was known but of what was not known that seemed to be the primary basis of concern. And as I stated before, the purpose of this meeting with the NRC was to clarify the technical basis for their conclusions and to talk about

reasonable certainty. They had a lot of uncertainty in the design of the plant for surface faulting; in fact, if that's what may be necessary.

Now, after that series of steps, including the meeting, we concluded that additional data were required for us to complete our assignment from PG&E which was to look at the potential for confidently resolving the issues. And so at that time Woodward-Clyde Consultants and PG&E developed a program to gather the additional data which is the program that's presently underway.

Now, we discussed at that time with the NRC and the USGS some of the ideas that would come out of resolving the issues and the basic concern was getting more detailed information to be able to confidently resolve the technical issues, which was the basis of their concern. They were just uncertain about a lot of things. They seemed to have some confidence in data right at the plant site, but when they looked at the entire region and the lack of understanding about faults being discovered that weren't known to be there before and new data being generated, that they would like to have a confident understanding of the regional tectonics and that relationship to the plant site before they were willing to come to a conclusion any differently than the one that they had come to.

So what I would like to do now is to point out conceptually the kinds of data that one needs to resolve these kinds of issues; and I plan to do that through using some examples that

I've worked on in other tectonic environments to demonstrate environments where one doesn't have enough data in the kind of analysis you go through and then where one does have data and make the contrast, and then finally relate that back to the issue we're to address here, is the need to gather these kinds of data.

So I've prepared some slides, and I will quickly go through these; and it is a conceptual type of discussion.

I wanted to complete one item before I get into that conceptual presentation. It became clear to us after these meetings in this sequence of evaluations that the geology and seismology of this region was very complex and poorly understood, particularly from the regional point of view. And that we outlined a -- let me go through the rest of this chart so you can see where we're going.

In March of '78 we had formulated a program that we felt would allow us to advise PG&E about the ability to resolve the technical issues, and at that time in March of '78 we went back to Bethesda again with the NRC and the USGS and presented that program and had some quite lengthy discussions about the program and its objectives and so forth, and got a lot of very useful information on what in fact the NRC would like to see. And they kept emphasizing the importance of the regional understanding.

Again we pointed out that our purpose was to have a confident potential for resolving the technical issues.

Then in May of '78 PG&E authorized the program that we

had outlined to begin. In June of '78 we began - extensive field program, and that has continued. And in May of 1980 we again in preparation for this meeting, part of that preparation was to present to the Nuclear Regulatory Commission staff, as well as the U.S. Geological Survey, where we were in the program and the kinds of information that we were gathering and so forth, because it had been since March of '78 that we last formally met with those people, even though we had had some exchange of data through the mail, but we hadn't had a thorough review.

And so we did that just last month, and then today is where I have marked here, is the program is in continuation; there are people in the field today still working. The analysis is in its final stages on some aspects and in the mid-stages, preliminary stages on a few other aspects; and I will get into that in more detail later on. And then, of course, in September leading up to the October 1 deadline that PG&E has is when Woodward-Clyde Consultants will advise PG&E regarding the potential for resolving the technical issues.

So with that understanding now I want to present a conceptual discussion to kind of set the perspective about the kinds of information and why I personally have twisted PG&E's arm to allow us to work longer and request for delay so that we can gather the additional data that's necessary.

Now, this is going to require me standing up at the front.

(Pause.)

I want to just show very quickly a few examples of what kinds of information one needs to resolve technical issues on critical facilities like nuclear power plants. And this is a topographic map that is from Guatemala where in 1976 the Motogua Fault ruptured through here and --

MR. LINENBERGER: Excuse me, Dr. Cluff. The reporter advises that you're probably going to have to hold the microphone.

MR. CLUFF: In 1976 the magnitude 7 1/2 earthquake was caused by rupture along the Motogua Fault here, and this was a surprise to the Guatemalans in that that part of Guatemala was thought to be relatively aseismic. However, from this topographic relief map using low sun angle illumination or a floodlight as I used in taking this photograph, one can clearly see a topographic geomorphic delineation through that area that clearly demonstrates the existence of that Motogua Fault.

As a matter of fact, the kind of information that one needs to evaluate important faults in terms of their activity and so forth comes from a geomorphic evaluation, field mapping, air photo interpretation, and of course, subsurface investigation to assess those faults. And I just wanted to use this as an example of some very important concepts that have been learned and have come out of these kinds of studies.

This is a map prepared prior to that earthquake by Dr. David Schwartz who happens to be one of our geologists and is

working on the Humboldt Bay plant; and the lines that you see on the map are his lines where he expected future surface faulting to exist. And it was no surprise to Dr. Schwartz nor to us in working in that area that this fault ruptured and caused that earthquake. And it came from our evaluation of the geomorphic features which had not been studied by previous workers in Guatemala.

Just to show you what some of those features look like -- Frank, maybe you could kind of focus that -- this is an aerial view looking along that fault, and if you look very closely you can see a dark line traversing through these fields here. And what it's cutting, these young geologic materials, and it shows the extent of surface fault rupture from about five to six feet of faulting that occurred at the surface in that magnitude 7 1/2 earthquake.

And the important thing is if one comes into an area like Dr. Schwartz did before that earthquake, what do you look for to allow you to decide which faults are important. And it has to do with the Quaternary geology of the area that allowed him to map that fault; and he had precisely mapped the extent of the subsurface faulting and had identified that fault as being a potential source of surface faulting as well as a source of earthquakes. And it's that kind of information that allows one to predict exactly where these kinds of fault ruptures might occur.

Here's another view, a closer view of that same feature,

again showing the fault rupture. And the distance from here to here on the ground is about 10 feet.

Now, here's a cross-section that allows us to look at subsurface evidence of the Quaternary geology and look at the extent of the faulting at depth, and whether the fault tends to migrate or not. This is one of the concerns in the Humboldt Bay region from the regional point of view was well, how do you know that the fault is going to continue to displace at the same location? How do we know that it won't automatically jump to a new location?

Well, the kinds of information that we can see here in a long period of geologic time being represented by these materials here, and the fault that slipped in 1976 disrupted that plane right there about, oh, it was a little over four feet, if I recall. The slip continued after the earthquake, and the slip increased; but the initial slip was about a little over three feet at that location. And the actual displacement occurred across a plane that was only a few centimeters wide.

And one can see from the zone of rupturing -- here's a person standing there for scale -- that the distance from here to here, the fault zone which has experienced repeated displacements, that that zone has developed throughout hundreds of thousands, if not millions of years of geologic time. And when you have this kind of Quaternary geologic information, one can confidently predict exactly where future faults are going to rupture, and with confidence, if you have good quality information, come to

conclusions about whether or not this fault may automatically jump a 100 feet, a 1000 feet, or two miles in the next major rupture event.

And from the aerial view, just following that fault for a few more slides, one can see the fault rupturing through this soccer field and through here and right next to this school building and down through the town of Gualan. I'll show a couple of ground views of that.

Here's a measurement being taken on the edge of the soccer field where about three feet of displacement occurred laterally, and again you can see the zone of surface faulting like in the other places was on the order of about 10 to 15 feet. And here is where that fault zone passed within about 20 feet of that school building, and the school building came through without any serious problems. The only damage was some shaking damage to that unreinforced wall. The school building itself was a steel-reinforced concrete block building.

Let me go to another place where similar information that brings some relevance to the Humboldt Bay plant site -- this is Managua, Nicaragua. It's a photograph that I took two days after the earthquake. A magnitude 6 1/2 earthquake occurred there in 1972, caused by three faults that slipped; and I want to just show briefly some of the results of that earthquake and the faulting, because the same conceptual ideas came from here. A beautiful sequence of Quaternary deposits were here to allow us to accurately

locate the faults in the redevelopment and rebuilding of the capital city of Nicaragua. And that was the purpose of our assignment that continued for about two and a half years, assisting the country of Nicaragua to rebuild Manaua.

The map of Manaua that shows the faults that slipped -- there were one, two, three faults that slipped, and I'll show you one example of the displacement on this fault here and some buildings that were affected by faulting, again to show the effect of surface faulting on buildings.

Here is a view of the extent of the faulting on that fault. This was about eight inches at this location. The maximum location was about a foot.

This is Gary Carver. He was my field assistant on this assignment. And we mapped that fault, and this is a view of some of the effects of the shaking to non-reinforced masonry construction. You can see very extensive collapse. I took this from the top of a building that was not seriously damaged, which is that building. This is the Bank of Centeral building. The fault actually ruptured directly beneath this structure. That building came through without any serious structural damage; yet other buildings nearby that were not properly designed were seriously damaged from both shaking and surface faulting.

Just to summarize, the importance of the information out of this study that relates to the importance of having adequate Quaternary geology is that we had a beautiful sequence of volcanic

stratigraphy here that extended for more than 100,000 years, several tens of thousands directly underneath the plant site. And the red zone shows the fault that existed and the actual building location, the bank building -- this was the treasury of Nicaragua -- was located directly across that fault. This is a steel-reinforced fault beneath that building. And the fault slipped at this location, and the relative -- the difference between the strong vault basement under that building and the relatively weak deposits that that was sitting on, the volcanic materials, caused that fault to divert from the building and around the building; and this is one of the first documented cases of an actual building resisting surface fault displacement without any difficulty whatsoever.

We have published this in the published literature together with the structural engineering firm that helped us make this analysis.

Let me point out that this analysis to study this -- there are a series of banks here, all of which survived, particularly these two, without any serious damage whatsoever from shaking or even faulting here. This study took about a year to complete, and extensive geologic mapping -- these are our trenches here, here, another trench that extended here, and there was actually a series of trenches here, and a number of deep borings at this location to develop this information.

So in this area we had detailed information that allowed us to advise the Nicaraguan government about the potential for

future faulting and earthquakes that would occur directly beneath their facilities in Manaua.

MS. BROWN: May I direct a question to Dr. Cluff, if it's possible? And my question would be --

CHAIRMAN LAZO: Let's hear your question.

MS. BROWN: -- Is the Motagua Fault that you're describing at this time a case of a new fault trace forming?

MR. CLUFF: Should I answer?

CHAIRMAN LAZO: Well, can you respond to that?

MR. CLUFF: Sure.

MR. NORTON: Excuse me, Dr. Lazo. Again, for the record, you know, we don't have any problem with these kinds of questions, but this is a prehearing conference, not a hearing; and we didn't come prepared for a hearing. We came prepared to give information to the Board in answer to the Board's questions.

There are discovery procedures available for interveners to notice people's depositions, etcetera, etcetera. I don't believe that a prehearing conference is the proper place for discovery by an intervener. And I just want to go on the record. Again, we'd be happy to answer -- you know, it's not a question of not wanting to answer questions. It is a question of what are the proper procedures before this Board. And I don't think it's proper at all to notice a prehearing conference and then have cross examination by an opposing party.

But obviously it's an innocuous question; we'd be happy

to answer it. But, you know, the innocuous ones very quickly turn into the not so innocuous ones

CHAIRMAN LAZO: Well, we understand. Since you have raised the point, though, the question of discovery is one that we want to discuss before we leave here. Because of the position of this proceeding and licensee's many motions for holding the proceeding in abeyance, the joint interveners have effectively been denied any discovery rights up until this time.

MS. BROWN: That is correct. That is one of the reasons that we would like to just ask informational questions very much like the one I've just asked to try to get at least a sense of where Woodward-Clyde Consultants is. We've received no information from PG&E other than two or three-page outlines as to the studies that have been going on for the past three years.

I will try to hold my questions down to the innocuous level, but basically my questions are solely for the purpose of gaining information that I think everyone here should be sharing as opposed to holding back.

MR. NORTON: Excuse me, Mr. Lazo. Ms. Brown misleads a little bit. They were in attendance at the meeting with the NRC where this was presented for an entire day just a month ago; so for them to say gee, this is the first opportunity they've had to hear this is a little misleading.

CHAIRMAN LAZO: Would you want to repeat the question, Ms. Brown?

MS. BROWN: Yes.

Dr. Cluff, was the case of the fault underneath the new buildings, is that a case of a new fault trace forming?

MR. CLUFF: Let me answer that question by explaining the situation here. The red zone that I have shown here is where the fault existed prior to the building being built, and there was -- this fault here did exist as well, as well as part of this one.

This fault at this location did not exist prior to that event, and that the combination of that building being located here caused that fault to divert because of the strength of the building and to go around the building. So this failure plane here which is about -- I've forgotten the depth here, maybe 20 or 30 feet deep or maybe even 50 feet deep -- was caused to divert around that building because of the difference. So that failure plane did develop out of that new faulting; and so the building caused that fault to develop.

Again, coming back to California where we're getting back into understanding fault behavior, and that's an important point, and the value of Quaternary geology. This view of the San Andreas Fault to the south of San Francisco in the Carrizo Plains area, and again from this kind of information, geomorphic and stratigraphic information, one can clearly see where past fault ruptures have occurred and where future ones are most likely to occur with a great deal of confidence. In other words, we have very young, various age of geologic materials having been deposited across the

San Andreas Fault zone from here to here, and one can see a number of features that we call lineaments. And we have to be careful about all lineaments being faults; some of them are erosional, and some of them are related to faults.

But we see one here, a subtle one here, another subtle feature here, a very strong feature there, and another one there. Some of these are faults, and some are produced by differential erosion in this area. But it's very clear from the stream channel that at one time continued across here that that stream channel has been displaced some 1100 feet to there. And we know in having that information that that represents a zone that's only about 20 or 30 feet wide where multiple slip events have occurred on faults like this, and it's very clear that within that time interval, which is about 11,000 or 12,000 years, that all of the faulting events during that period of time have been concentrated along that main trace of the fault.

Now, of course, if we were putting a nuclear reactor near this location, we would certainly be concerned about whether or not these other lineaments are faults, and if they are, what the history of displacement on them is and whether it's related to this fault. So it comes about having sufficient Quaternary geologic information to allow one to apply tools of geologic mapping, geophysical profiling, air photo interpretation and trenching to come up with the kinds of answers to confidently decide where future faulting will exist, and to answer the question whether new

faults may develop, which is one of the basic issues that we are addressing.

Let me just spend a moment talking conceptually about the earthquake faulting process that's described in this diagram, and that the vertical line here represents the amount of energy release or the amount of faulting. They are roughly directly related to each other. And the horizontal line is the continuation of time, and the diagonal line here is the accumulation of regional strain that results in deformation in the earth's crust. And what we have is that strain accumulating through a period of time from here to here and then it being released and an earthquake occurring and a fault being -- or a slip occurring along a fault. And then a time interval again that we call the recurrence interval where that sequence proceeds, and then another earthquake occurring.

So it's one of strain accumulation, cyclic release along a fault zone; and what we find is that there are various ways to assess whether or not a fault has sufficient activity to qualify as a capable fault under the NRC criteria. And that we find one easy way of looking at that is to look at the rate of strain accumulation. In other words, this rate here is much slower than other rates. And let me just take a look at three rates of strain accumulation: one, high rate accumulation, a moderate, and a very slow rate accumulation. And what one generally gets is a relationship of shorter recurrence intervals associated with bigger slip on the fault and usually bigger earthquakes.

These types of faults, active faults or capable faults, are usually associated with plate boundaries like the San Andreas and other similar faults. Then we have strain rates that are associated with slower slip rates where one might get various recurrence times and various sizes of earthquakes occurring. And then one can get very slow strain rate accumulation with longer recurrence intervals. And usually the size of earthquake diminishes as one finds lower slip rates.

Let me put this in perspective in terms of where we are up here in this region, the plant site area. Again, the plate boundary, this is the western United States with the Mendocino fracture zone here, triple junction here, and San Francisco here. These dots are large earthquakes that have occurred in historic times.

And what I want to do is again bring one more example -- well, actually two more examples, one that shows the kind of Quaternary information that exists over here on the Wasatch Fault that allows one to come to very clear information that allows resolution of the kinds of issues that we're talking about here because of the unique preservation characteristics of that tectonic environment, and then contrast that with an environment that doesn't have those Quaternary geologic records which comes from what we call the western Sierran foothills. It's a zone on the west side of the Sierran foothills, and one can see part of the answer to why one has perserved very beautiful stratigraphic and

geologic information, Quaternary information, to allow faulting to be confidently evaluated, because of the vertical tectonic nature and the great basins developed or the basin and ranges developed in this great basin that preserves the geologic record to allow that information to be gathered.

And in the western Sierran foothills is one of the Sierras being uplifted. The fault system that I will show you is in an area of erosion where the basic Quaternary geologic information, except geomorphic information, is being stripped away by erosion, and so it becomes very difficult if one is working in this kind of environment to resolve these kinds of issues with the same confidence that one can here. And I want to just contrast those two areas very quickly.

This is the Wasatch fault zone near Salt Lake City, and one can see the fault, the black line, traverses through that area. And we have a large contract with the U.S. Geological Survey where we are doing work for them to do research to understand fault behavior and how one estimates fault activity and so forth. And this will be applied throughout other parts of the United States when the results of this research are completed. And it's in its fourth year of completion right now, and we have about one more year of study.

The kinds of geologic information that one looks for are these geomorphic features. The fault has cut off these spurs, and the younger Quaternary deposits have been displaced. And so

with this kind of information we can say with a great deal of confidence that this is where this fault exists, and given the tools to, say, explore an area out here, one can investigate with those same deposits whether or not there is a potential for this fault to all of a sudden move out in this area.

And going through these analyses we do an air photo interpretation and a linement analysis. One can see various lineaments here, here, here, and over here. These are fault lineaments, or they are the trace of the Wasatch Fault. These are linements that are not faults; they are based on depositional horizons from the old Lake Bonneville that was located in that area several tens to hundreds of thousands of years ago.

Here's the kind of information that we find in making geomorphic analysis, is the fault scarps that are developed in various age materials. These are late Pleistocene moraines, and these are glacial outwash moraines that have been displaced. And allows you with confidence to demonstrate that for a long period of geologic time that fault has continued to rupture at the same location.

This is a view locking northward from that same location. This is that little lake. One can see the width of the zone of disruption and the extension of that zone as it traverses out through this area here.

And, of course, subsurface investigations are extremely important, and within the age limits of the materials exposed here.

These are Lake Bonneville gravels, some of which go back several tens of thousands of years in this exposure. And one can clearly see the concentration of faulting. And with this kind of information one can say with a great deal of confidence that in the period of time that's represented by the stratigraphic column that this is the area within which the faulting has occurred. One could clearly state that outside of that zone one can clearly see that within that period of time no new faults have developed. So it's this kind of information that is of extreme value to making these studies.

We have conducted three detailed sites that I will just quickly look at -- Hobble Creek site, Cottonwood site, Kaysville site -- to work out the history of that fault to answer these kinds of questions for earthquake hazard zoning along the Wasatch Fault for the U.S. Geological Survey.

The kind of area where the Quaternary geology accumulates to allow you to look at the location of faulting and so forth are these little graben areas along the zone, and we excavated long trenches across this area where we knew we had good geologic information to allow those assessments to be made.

This is the extent of some of the trenches in this location. Trenches were on the order of about 20 feet deep; it ranged from about 10 to 20 feet deep. Several months to log each one of these trenches.

The kinds of information that we find where we find the

fault, this kind of information where you can see the fault cutting the various materials, and going through and dating and coming up with the displacement history on the fault allows one to show that the faulting has continued to develop in this zone, how often it goes off, and how much the displacement is, and what the size of the earthquake is. This is a very powerful tool in being able to come to those assessments.

Another location, this is the Little Cottonwood site, again just to show the extensiveness of the trenching and the shoring and so forth that goes into those areas where similar kinds of information were developed. And one can see again the detailed stratigraphic nature of the fine laminations that allows one to very accurately not only look at major displacements but even minor displacements that might be associated with related faults that might occur a few feet on one side of the fault, and the history of the development of those faults.

This kind of puts together the results of the studies through time in that the faulting has developed within this zone along the Wasatch Fault, and one can see different time horizons here, here, and here that have been displaced different amounts. And I won't take the time to go into that, but in this older time period there's 56 meters; this next intermediate time period is 28 meters; the next is 12 meters. And so one can see that with continuing younger ages the fault has continued to displace along that zone. And with the Quaternary geology that's preserved in that

area one can confidently estimate and predict where these other faults are likely to experience future displacements, not only on the main fault but the related faults.

MS. BROWN: Could I ask one additional question here?

CHAIRMAN LAZO: Surely.

MS. BROWN: How large an area did you have to cover to study the Wasatch Fault?

MR. CLUFF: Let's see. We have been studying the entire fault from one end to the other, about 370 kilometers, and on both sides of the fault wherever we had the units; a mile or two on either side of the fault was sufficient to come to these answers.

And again, the relevance to the citizens of Salt Lake City is that this shadow that goes through Salt Lake City shows the location of the Wasatch Fault as it cuts through that city; and the topographic escarpment there demonstrates that that fault has experienced many multiple ruptures within the short period of time that we're looking at in the deposits there that are no older than a few tens of thousands of years.

And out of this we have now -- these are the results to date on that study. We are actually finding in this strain rate accumulation process the ability to take the recurrence interval -- that's the time between major earthquakes on that fault -- and to select a time window. This would be a period of interest right here. And the time interval between successive earthquakes, we can now estimate what it is, and it ranges, depending upon what

part of the fault one is on, between a few hundred years up to as much as about 1200 to 2000 years, so that varies depending on where one is on the fault.

And then the present, we know where we are in the present, and so we've developed the concept of elapsed time where if you know where you are since the last earthquake, you can predict with not detailed accuracy to the day or the month or the year but to within certainly a reasonable degree of certainty when the next slip event should occur given this earthquake generation process. And one can, based on this kind of information, develop a probablistic study to estimate the probability of a fault slip event, as well as the size earthquake occurring in a given period of time, as long as we know where we are in the elapsed time process.

Well, this is a future research area, but the relevance of this to looking at various other faults, let me just show where I've quantified a number of faults around the world that we've been studying in terms of what we call the slip rate or the strain accumulation rate -- this is the Fairweather Fault in Alaska -- comparing these highly active or highly capable faults with faults that nevertheless are active or may be capable, but a less amount of slip.

And so one can see -- this is in centimeters per year -- about 5.8, the San Andreas is about 4 or 3.7 centimeters per year. And then if we go down into the next area I'm going to contrast, the western Sierran foothills, the Cleveland Hill Fault which has a strain accumulation rate of .0006 -- in other words, four orders

of magnitude difference in the rate of activity on that fault. Nevertheless, this fault has the potential for slip, and under the regulatory criteria we call it a capable fault.

Now, if we look at the calculated cumulative slip in meters throughout different time intervals -- 10,000, 35,000, 100,000, 500,000 -- I specifically selected these time intervals to represent various criteria. This is the state of California. This is the single displacement in the nuclear criteria. This is the multiple displacement time interval. So we can make a comparison here to see the rate of activity.

Let's take the Fairweather or the San Andreas Faults. One can see that in 35,000 years about 2,000 meters of cumulative slip, many, many earthquakes occurring in that period of time; or on the San Andreas about 1,300 meters, with 500,000 years, 29,000 meters or 18,500 meters. And then we compare that with say this one fault that I'm going to talk about in a moment with .6, or excuse me, on 35,000, .2 meters, and this is .3. That decimal isn't shown on there.

Oh, excuse me. No, three meters -- I'm sorry -- in that period. Three meters. Then if we compare the maximum slip per a single event, we can see the comparison being about 10 meters here with about .24 meters in the maximum event that we believe can occur. And then if we compare the recurrence intervals, a few hundred or sometimes even less than a hundred years on these kinds of faults with the kinds of faults we're talking about here

being in the tens of thousands of years but small displacements.

Well, the point of this kind of comparison is that with those Quaternary geologic studies, it's the kind of information we can use to locate where faults are likely to slip and how much and how often; and that's relevant to going through all of this data that we need to come up with size of earthquakes and so forth.

CHAIRMAN LAZO: Dr. Cluff, it appears that you're going into another area now. This might be an appropriate time for us to take a brief recess.

MR. CLUFF: Could I just finish this slide, and there is a very natural break point as I finish this slide; and it will only take about a minute.

CHAIRMAN LAZO: Surely.

MR. CLUFF: This is a graphical representation of -- we have a contract with the National Science Foundation to categorize faults around the world to allow engineering judgments to be made about the importance of the different rate of activity of faults; and this is a progress of some of that work.

Let me just make a quick comparison. Here's the San Andreas showing displacement again in fault activity with time, and these numbers are millimeters per year. So the San Andreas is here at about four millimeters per year, or centimeters, or 40 millimeters. We see the Wasatch in Utah being here just above one. We see the fault that I'm going to be looking at in a moment at Cleveland Hill here being one, two, three, almost four orders

of magnitude less. And I'll use those concepts now to contrast this area that I will show next that doesn't have the Quaternary evidence to have the confidence that one has like the Wasatch and other similar locations.

(Pause.)

CHAIRMAN LAZO: The prehearing conference will stand in recess for 15 minutes.

(Recess.)

CHAIRMAN LAZO: Are you ready to proceed, Dr. Cluff?

MR. CLUFF: Yes. Thank you.

I will move on to the next slide. This photograph is a view of the western Sierran foothills, the other area I want to contrast, where we had a paucity or a lack of geologic information to allow the kinds of conclusions that one can essentially positively come to where one has not only geomorphic expression but stratigraphic information, as well as other subsurface information to evaluate faults and their behavior and activity and the size of earthquakes that may be associated with them.

But nevertheless, in these areas in which we spent about three years or maybe more than that, about five years studying for some important facilities to be located in that general environment, one can see a strong trend or lineation. And of course the question comes down to whether or not these are faults; if they are faults, are they important faults in terms of activity; and how do you go about assessing them in an area where the basic

environment is one of erosion that's stripping away the kinds of information that you'd like to have to make these assessments.

Well, one of the things that helped us in that -- Frank, that's a little out of focus -- that helped us in that environment was in 1975 a fault -- no, the top one, yes; there you go -- was that in that area you see this crack pattern. That is the surface disruption or surface faulting associated with what was named later the Cleveland Hill Fault. You can see it's not a whopping big displacement. And nevertheless, it was a fault that would be and was classified by us as being capable, clearly after the event but later on as well, with evidence that was found prior to that.

But the point of this brief discussion with a few slides here is to show where that surface faulting event occurred associated with faults in this area, and the general system of faults that exists in that tectonic environment that's on the western slope of the Sierra that's up here and is sloping down toward the Great Valley.

This is in the bedrock area that contains old rocks. These are many hundreds of millions of years old. And so most of the surface deposits with the exception of some of these outlying features here were areas where we didn't have young materials to allow confident judgments to be made at places like say here or here; only at places where we had the deposits could assessments be made.

So the question became in this environment, given this

event occurring here in surface faulting that indicated faults in this area, or at least that fault was active or capable, what about all of these faults in here. And so that was the basis of our evaluation.

Let me just quickly show you the difficulty we had in assessing the Quaternary geology in that area, although it still did allow conclusions to be drawn that were important regarding important facilities.

Subsurface investigation was an important tool, and this was part of -- and I meant to mention this before in the other discussions. We found it necessary to do what we call calibration studies. In other words, you find a place where you have the truth, and then you calibrate that so you can apply that information to areas where you're not so sure, and you make the comparisons to allow you to come to conclusions in your assessment.

Well, the surface cracks along that Cleveland Hill Fault are marked by these stakes; and one can see those cracks continuing. And so we said well, let's do a calibration study in this area to find out if in fact there was geologic information that would have allowed us to assess whether or not this fault is capable prior to that earthquake occurring. So this was a huge calibration area where a number of trenches were excavated, and one can clearly see that where that line passes in the soil out of that trench, you don't even need to look at the trench; there is a dramatic change in the type of materials right where this fault was through, so one

is already suspect of having a fault at that location.

These are the kinds of information we found in there. In fact, a dramatic contact between one type of geologic material and another, clearly demonstrating that in fact there was a fault there; but the problem at this location was there were no younger deposits above this other than some soil deposits that were extremely young to allow one to, other than the earthquake that occurred in August of '75, to assess that fault. So we had to look for other places in that calibration area, and we did find a number of places that were like this where we found -- this is the old bedrock that's cut by the fault.

Again, it's a little out of focus, I think, Frank.

And the reddish-brown materials above the older bedrock are what we call paleosoils. They are soil horizons that have developed throughout a longer period of geologic time. And to make a long story short, we found a number of these in this environment that dated back to in excess of 100,000 years. And so we had information that allowed us for this fault to say yes, at that location there was clear evidence of a bedrock fault and clear evidence -- you see this step in the bedrock with disruption of the old soil profile -- to show that that fault had an indication of repeated displacements during the period that postdated the deposition or formation of those old soil deposits.

So these are the kinds of informations that one likes to develop out of calibration studies and then apply that to the

remainder of the fault system. In other words, here's a view again of another part of that general trend of lineaments through the western Sierran foothills where in most places the young deposits have been stripped away, but in some little environments, micro-environments, you get younger materials and soils that allowed us to find exploration localities to apply the calibration information to assess faults in those locations.

And so that's what we did. We took the information that took us several months to develop from here, and then we started applying it at various locations where we found areas to assess the importance of those faults. And out of that came a basic lineament analysis where on aerial photographs and so forth in the area of interest -- in this case it was several tens of miles wide and 200 kilometers long -- we studied that entire fault system to get a feel about the places where those calibration studies allowed us to assess the activity of faults.

I'm going to skip -- well, no. I want to show that, as an example of how we applied that, at a southern location where these stars are located, we found a unique geologic environment that allowed some very positive assessments to be made. And I'll show you how that was done.

This is a view looking along the trend of what's called the Table Mountain latite. This is a basalt flow that is high now topographically compared to the surrounding areas; and what it represents is a volcanic eruption that occurred up near the

crest of the Sierra some 9 million years ago, and that basalt flow flowed down an old stream channel, an existing at that time stream channel, and then solidified. And so what we have now is what we call inverted topography. In other words, we have a timeline, topographically and timewise, to allow us to look at the amount of faulting that's occurred since that time, both topographically in the amount of displacement as well as the time interval that's involved in the zone of faulting, surface faulting that's occurred throughout 9 million years. So this is a beautiful type of topographic horizon that was developed that allowed us to look at faults. And if you look closely you can see that where this fault comes in -- I know because we've studied this, but there is a fault that comes through here -- there is disruption here of 75 feet up on the downstream side, and then another disruption right here of 55 feet, again up on the downstream side. And then this flow crossed over a number of other faults that pass beneath this without disrupting it. And down in here, which you can't see from this view but I can show a similar one where three places where a similar kind of disruption occurred on faults.

And so with this information we could clearly say aha, here's two faults at this location where there is clear evidence of younger than 9 million years of displacement, and here's a number of faults that pass beneath the surface here; and at those locations it's clear it's been 9 million years since slip has occurred on those faults, and we're not worried about those.

So with this kind of information it's extremely useful to focus other geologic studies to look at other information that allows you to meet whatever criteria you're dealing with.

This is a topographic profile. Here's that flow surface, and you can see 55, or maybe it was 75 and 55 -- I've forgotten which -- but at any rate, there are two displacements. I believe this was the 75, this was 55. And what we did was we found a geologic environment out here that contained younger materials that were within the time range that we were concerned about in terms of fault activity and capability, and we excavated -- well, we did some geophysical surveys through here, and we excavated a number of trenches -- one here, here, another one here, and a number of trenches at that location -- to apply the calibration information from the Oroville earthquake area to assess the faults in this area.

To make a long story short, here's what the trenches look like. And what we found was in fact where we had the younger deposits we could clearly show the fault in the bedrock, the old Mesozoic bedrock which is several hundred thousand years old, and the younger soil deposits that have been disrupted. You can see this plane where slip has occurred, and so we can say that yes, the faulting been post-9 million years and post -- in this case there were several layers here that were up to in excess of 100,000 years old. So we could come up with not only that the fault had been active in that period of time, but multiple slip events had

occurred on it. We could evaluate how much had occurred during individual, single events.

Just to show that there were a number of locations where those kinds of deposits allowed us to do that, here's another location where the metamorphic old rock is here, and then we painted the different soil horizons to -- and one can see the slip here. And so we were able to use that Quaternary geologic information to allow us to assess where faults had continued to rupture based on the geologic information that we were gathering from calibration studies.

Well, to conclude this area, the results of that study -- here is Oroville; the yellow zones are places where we had younger geologic information. This was where that Table Mountain latite extended completely across this fault system. And so what we found were a number of locations where these dots were placed on this map where the calibration study allowed us to conclude from the information up here that yes, in fact, we had places where those faults did disrupt not only the 9 million year horizon but younger deposits. We could see successive lesser amounts of displacements in younger materials. And a number of places throughout here where we found faults that passed beneath that, those materials, where no displacements had occurred. And our conclusion from those places was that those faults did not have, were not capable or did not have the potential for future slip.

So you can see that in a number of places, particularly

where we had a lot of data and we concentrated our information, we did find a lot of useful information to evaluate the faults.

Well, the point out of this -- this is almost on the opposite end of the spectrum from some of the other slides I've shown from other parts of the world, particularly the Wasatch where we had beautiful geomorphic, stratigraphic, subsurface information to allow us to come up with beautiful information about the rate and location of faulting. And at selected places even in this environment we were able to do that, but the level of confidence in this kind of an environment, given that one wanted to place an important facility say on this fault here, it's difficult to make a judgment there because you've got to extrapolate information along the fault and say well, is that fault behaving there like it is here, or is it behaving there like it is there. And it becomes one of a very agonizing process to sort out the scientific information. And that study we were involved in, like I said for about five years to work out that information, and we came to what we felt were realistic conclusions about faults in that environment.

Okay. Let's come back to the Humboldt situation now. Let me just make sure that I've covered all of the ideas that I wanted to cover.

This is a map of Ogle's 1953 published map that basically was the first published -- well, one of the most reliable maps that was done for the purpose of economic geology primarily, looking at structure and stratigraphy, but it was more for oilfield, oil

exploration. And here is the power plant site located here. The yellow is Quacernary deposits that are in the area, both these deposits, and these deposits, and these deposits. And of course the deposits even out in the bay are very young Quaternary deposits. Various ages of Quaternary deposits, and the Little Salmon Fault was what was the basis for the original geologic studies that existed at the time that PG&E first started looking at this area.

Now I want to put the viewgraph on to show you the program that we have been -- that we created with PG&E and reviewed with the USGS and NRC to look at not only this area but a much broader region, and then I'll focus on the kinds of geologic information that is coming out of this study.

(Pause.)

Let me just review again where we are. I'm taking you then back to March of 1978, and I'm going to show you the program that we formulated with PG&E. Woodward-Clyde and PG&E developed a program to gather additional data, the meeting with the NRC and USGS, and then bring you down through this process to where we are and what will be the future deadlines in terms of our evaluations.

The area that we essentially carried out various levels of detail, in some parts of the area more than others, but this was the general regional area that we looked at. We actually looked at the entire Northern California area on a reconnaissance basis, but this is, of course, the Humboldt Bay plant site here, and Trinidad, Trinidad Head, Patrick's Point. I'll be talking

about some of our geologic studies of some of the major fault systems that tend to parallel or these creeks are eroding along these zones of weakness, so we tend to get a northwestward trend along these major streams that often are eroding, like the Mad River and so forth, along these zones of weakness. And so we looked at the various faults, and I will show you some results of that work as we go along.

But the program that we prepared with PG&E consisted of regional geologic studies, regional mapping and dating of the deposits, Late Quaternary geologic studies. We studied the entire Quaternary but were concentrating on the Late Quaternary which is within the criteria of the NRC regulations. And, of course, out of that is coming the ability to evaluate the capability of faults. And then, of course, the site studies, these are the general studies in the location of faults in the site locality, the evaluation of capability, and of course the important part of the dating of the Hookton formation which is an important formation that the age has been somewhat controversial. And I will discuss with you the program where we're coming up with the important conclusions about that. And then, of course, an important part of this is the formation and propagation of faults, how do faults behave in this environment, are they different or similar, and what comparisons can be made with some of the kinds of studies that I've showed you earlier, and of course, detailed geophysical analysis. And I left off of this drilling -- I may have that on another slide --

but detailed drilling.

CHAIRMAN LAZO: Dr. Cluff, I'm sorry. Just before you remove that slide, when you're talking about preparing this program, when was this program prepared? Was it at the time you were retained in October of '77 or after the meeting with the staff and USGS in '78, or was it in connection with the scope of the work preparation in September of '79?

MR. CLUFF: Well, both.

CHAIRMAN LAZO: Or all three?

MR. CLUFF: All three. These programs were evolutionary in nature in that the basic ideas are expressed on this. I am starting with the regional ideas. I'll get into more detail. And it developed as we started finding information. In other words, you can't prejudge what you're going to find.

So what we did was to take information and set up calibration areas within this broad region to allow us to understand how faults behave in this area, how much they slip, how much the displacement is, what the age of the materials are that they're cutting, and how big of earthquakes might occur on them. And those calibration studies are what is the basis for looking at that and then gradually applying that information to the faults that are close by or in the region and site vicinity.

CHAIRMAN LAZO: You mean it's a continually evolving program.

MR. CLUFF: Yes, it is. So if you discover something,

some Quaternary deposits that weren't mapped by anyone else before that were very useful in your analysis, you have to go back and say well, we've got to change the scope of that Quaternary study because now we've found a tool that's extremely useful, and it's going to take us a lot less time or a lot more time to gather additional information.

So that program was presented in the general way with the NRC and the USGS in '7 -- let's see, Frank. It was '7 --

MR. BRADY: March '78.

MR. CLUFF: March '78 was when we first presented the ideas on how we were going to go about this, reviewed it with them, and then as we continued and as we went into different parts of this, we discovered things that caused us to make relatively moderate modifications, but nevertheless important ones to gather new data that was relevant to answering the questions.

CHAIRMAN LAZO: Thank you.

MR. CLUFF: Yes.

Other aspects of the study involved not only geology but seismology and earthquake engineering, a look at crustal structure from the standpoint of epicenter locations and focal mechanism studies and so forth; and I won't go into the detail of those at this time. The seismicity and its relationship to the geology that we're finding in the regional as well as local Quaternary and what we call seismic geology of the region, the kinds of studies that I've described to you in other places, and the crustal plate

parameters, as we called it, or the looking at the broad crustal plate theories and hypotheses that have been proposed by others in looking at what models seem to best represent what we felt was causing the seismicity and faults in the area. And then that information together, the seismology with the geology, to allow an evaluation of the ground motions or the shaking characteristics that have to do with the response spectra, the SSE-soil structure interreaction, and whether or not the materials in the area have the potential for liquefaction.

So these are basically the general studies, and these as well have been evolving as we've been going on; but this essentially was the program we presented to the NRC.

MS. BROWN: May I ask a question?

CHAIRMAN LAZO: Surely.

MS. BROWN: Did Woodward-Clyde have the opportunity to review earlier studies that were performed by Terra Corp. and Earth Science Associates that basically covered this same area?

MR. CLUFF: Yes, we did. They covered some of the same topics, but if you reflect back to the statements I made early on, the concentration of most of those studies were looking directly at the site, and that there wasn't a large effort put forth to understand the regional faults and information in this regard, although from a seismological point of view clearly you have to look at the region.

But our study was to take all of those data that had been

done by others, not only the previous consultants with PG&E but the oil companies, the students at Humboldt State, and a number of other people, but to start putting that all together in the context with both the broad regional plate tectonic review and gradually focusing in on understanding what was happening. And we used all the information we could get a hold of.

Now, if I might focus on the general approach that we've been using at the site studies themselves, and this, of course, has evolved through time. But item one there is to locate and evaluate the structures in the site vicinity with primary emphasis towards faulting, and particularly understanding the location and the displacement history of the Bay Entrance and Little Salmon Faults or other faults that we may find in our investigation.

That included the methods primarily of drilling, geophysical logging of the bore holes and so forth, and seismic high resolution, seismic reflection, with new data being generated as well as reinterpretation of existing data from others, including oil companies and others who had been doing geophysical work, particularly in the offshore environment.

Item two there is to look at the movement history of the faults that were known to exist or ones that we found in this -- again, "site" isn't directly at the site, but it's in the immediate vicinity within a few miles of the site -- and to interpret the relative movement history using the various data from the bore holes, and the age dating, a very important aspect, and to look at

the age of the materials that had been faulted, to look at the displacement history using what's called magnetostratigraphy. This is paleomagnetic methods that allow one to see the earth's fluctuation in magnetic reversals through time. It's a very powerful tool to use. Radioisotopic dates of volcanic ash deposits, and radiocarbon dates, Carbon 14, amino acid, and sea level changes in relation to the fluctuations in sea level that have occurred in this area throughout the Quaternary period.

And then, of course, out of that we've been locating any place where we have surface faults through aerial photo interpretation within several miles of the site; trench any surface breaks to see what the origin of that feature is, whether it's a fault or a zone of deformation or whether it's a differential erosion; and then, of course, the object there is to divine, to look at the zone of minor faulting that could be associated with any of the primary structures, in other words, secondary faults or places where the fault may break away and cause minor displacements associated with the primary structures. And we used the other techniques, particularly close spaced drilling, as well as high resolution geophysics.

Now, let me just show you quite briefly, and there isn't time to go into the detail of this, but here is a map that shows the amount of deep borings that we have made since 1978, March of 1978. The blue are borings, deep borings that existed prior to our program, and the yellowish-orange circles are places where we

have very deep borings. And the purpose and location of those borings was -- here's the plant site here -- was to get deep stratigraphic information on the postulated faults that were postulated through here and through here, in fact, the Little Salmon Fault that was located in this area.

These are some previous deep holes. The Braunner well is one of those blue dots.

CHAIRMAN LAZO: Have any of those deep holes been drilled south of Fields Landing at this date?

MR. CLUFF: Well, none of these deep holes. Here's Fields Landing here. We have some shallow holes that I didn't show on this map that were to look at those minor, small fractures at Fields Landing.

CHAIRMAN LAZO: But you've been planning some deep holes south of Fields Landing, have you not?

MR. CLUFF: Not as deep as these. Yes, we have. Let me show you the next slide and maybe that will help answer. How deep is deep I guess is the question.

Here is a kind of statistical summary of the drilling. From the dates here one can see that in 1972 there was roughly 2,400 feet of drilling; in '75 there was about 13,000; in '77, 61,000; and then in this period of time, '77, 53,000 to date additional drilling. And again, showing -- these are deep borings; these are borings again showing, the shaded areas showing the 1978-80. These are shallower borings. And then -- oh, I'm sorry. The

deepest borings are on the bottom. I had this mixed up.

This was just prepared yesterday. I wanted to show the depth. Here's a thousand feet. This is the shallow borings up here. I'm sorry. A thousand feet in depth, and these are 4,000 feet in depth, or this is the 4,000 foot level. The deepest is 3,500. One can see the amount of boring data available in different periods of time, and this was prepared up to June 2nd, 1980.

So the map that I showed was strictly the deeper ones to get a feel for the major faults in the area, and the relatively shallower ones that are several hundred to a thousand feet deep were in other parts of that area, including the Fields Landing.

MS. BROWN: Could I ask a question on this? Is that in cumulative feet or is that new drilling?

MR. CLUFF: Ashok, I'm going to have to ask you.

MS. BROWN: The first section.

MR. CLUFF: In the preparation of this is this cumulative to date or what?

MR. PATWARDHAN: The top is cumulative.

MS. BROWN: Could I see the top again, if that's possible?

MR. PATWARDHAN: That's cumulative. That's the total footage of borings drilled between '78 and '80.

MR. CLUFF: Total footage drilled between '78 and '80, 53,000 cumulative.

MR. PATWARDHAN: Since we started the program in '78, 53,000 feet or so of boring was done. The lower two are average

depths of borings separated arbitrarily by saying shallow borings are those up to a thousand foot depth or less, and deeper borings are those that are greater than a thousand feet in depth. And what it shows is the average depth of borings which were about a thousand foot or thereabouts -- well, it was about 1,200 feet. The average depth of borings that did exceed a thousand foot limit was around 3,500.

MS. BROWN: Can I ask one more question? How much of the activity in the first chart, the actual drilling between '78 and '80 was performed in '78?

MR. CLUFF: I don't know.

MR. PATWARDHAN: How much what?

MS. BROWN: How much actual total footage from the 53,000 to date was actually done in 1978?

MR. PATWARDHAN: I, of course, can't give you the exact number, but I would say a major portion of it was done in '79, primarily in '79 with a little bit in '80.

MS. BROWN: And how much of the average depth boring was done in '78, the 12,000 that you mentioned on the second section of the graph?

MR. CLUFF: Ashok, I think since we prepared this just to show the general information, that information can be made available, and for us to make guesses about it right now without --

MS. BROWN: Was the majority of that also done in 1979?

MR. NORTON: Excuse me, Mr. Lazo. I thought we were going

to direct questions to the Board, and now all of a sudden I find my witness being cross examined on when borings were done, and he says he doesn't know. That's exactly why I didn't want to get into this procedure.

CHAIRMAN LAZO: Ms. Brown, I'm not sure the information is available here.

MS. BROWN: I don't even need an exact -- I'm not going to hold them to the exact number. I just want to know if the majority was done in 1978 or 1979.

MR. CLUFF: Ashok, who is project manager of this project, helped prepare this yesterday; I was out of town. And so I'm looking at this for the second time this morning.

MR. PATWARDHAN: I would say the majority were done in 1979, '80.

MR. CLUFF: Part of this has to do with --

MR. PATWARDHAN: And the relative distribution is between '79-'80 simply because the program started in 1978, and you cannot move into these programs. You have to accumulate a certain amount of minimal information before we can decide on the location of the borings. So such information became available sometime later in '78, and that's the reason why you find that once that basic information is available, you go into an appropriate plan for the borings.

MR. CLUFF: Let me move now to show the Quaternary geologic studies that focus on the evaluation of regional plus

faults near the site, and I'm going to be showing through slides the various studies we've done on the Trinidad Fault, which is a calibration fault, trenches and borings and so forth; Goose Lake lineaments -- we've now renamed some of those lineaments faults, although some of them turned out not to be faults, in the terrace mapping and Carbon 14 dating and drilling; McKinleyville area and College of the Redwoods area near the Little Salmon Fault; the Brazil property which is a long trend of the Little Salmon Fault to the west of the College of the Redwoods; and then the plant site vicinity.

I'm going to be showing slides that represent pretty much in that order, although one or two of them may be slightly different.

CHAIRMAN LAZO: Dr. Cluff, I apologize for interrupting you, but I wonder just for the completeness of the record would you identify the gentleman who recently spoke regarding the previous chart?

MR. CLUFF: Yes. Dr. Ashok Patwardhan. Ashok is his first name, A-s-h-o-k. Patwardhan is his last name, P-a-t-w-a-r-d-h-a-n. He is the project manager for Woodward-Clyde, working very closely with me on this analysis.

CHAIRMAN LAZO: Thank you, sir.

MR. CLUFF: So I have a series of slides now that will take us to the complete presentation of the information showing the kinds of data that we're finding in the studies.

Here is a map showing the published interpretation of faults in the site vicinity, the power plant site being here, the Bay Entrance Fault being interpreted here, and the Bay Entrance fault traversing down here with the Little Salmon Fault through here. And a lot of this came from, particularly in this area, came from Ogle's work, and the primary area of the previous studies was concentrated in this area. And a lot of this information came out of the boring data that were available. And so that's an area that we concentrated our site specific studies.

MR. SCHINK: Could we go back just for a minute?

MR. CLUFF: Sure.

MR. SCHINK: Just to give me some perspective, is this location where we're sitting right now on that map?

MR. CLUFF: Let's see. Eureka -- someone that knows this map better than I do --

MR. NORTON: The righthand corner, off the map.

MR. CLUFF: Up here?

MR. NORTON: Yes. Off the map.

MR. CLUFF: Up here, yes. Eureka is up here. King Salmon is here. We don't have geographic locations. This is a geologic --

This is again a much larger scale map showing Cape Mendocino down here, Arcata Bay here, the plant site being located here. And this was a slide prepared for the meeting that we thought was going to take place back in December, and we haven't updated

this; but it gives the idea that I wanted to present. It is the areas in which mapping had been completed at that time and areas, the darker areas are the areas of proposed future mapping. And it shows the detail of regional mapping showing the concentration of various mapping and calibration locations to get a general feel for the regional geology and particularly the Quaternary geology as it relates to understanding the regional tectonic framework.

MS. BROWN: Could I ask a question on that map, going back? Does that map reflect then where you were back in December of 1979?

MR. CLUFF: Well, it reflected the general level of effort expended in certain areas in December of 1979.

MS. BROWN: And has the brown area decreased since that time?

MR. CLUFF: Well, it has increased.

MS. BROWN: Increased.

MR. CLUFF: Yes.

MS. BROWN: I'm sorry. The brown area is where you've already done intensive work?

MR. CLUFF: Areas in which mapping is completed, areas in which future mapping is continuing, and then we've even filled in white areas.

MS. BROWN: Okay. How much of that is now basically concluded on that map that you have there?

MR. CLUFF: Oh, I would say close to 90-95 percent of

our work is. We're in the analysis stage really. There is still some work being done, but we're in the later stage of that work being completed. I don't know exactly because I'd have to ask the people we have got working on this.

And, of course, exposures like this in the sea cliff allow us to take a look at calibration areas to understand the stratigraphy and the type of materials we're dealing with, and particularly where they're cut by faults.

This is a view of one of the marine terraces. This is a Quaternary terrace that is raised, and this is another one of those kinds of stratigraphic and topographic profiles that allows one to look at the amount of deformation and faulting that may have affected that surface or those deposits since they were formed. So, again, we knew from the reconnaissance studies of the U.S. Geological Survey and particularly Gary Carver and some of his students were working that these were valuable tools to use to allow us to look at the activity of various faults and the location and rate of activity particularly.

This is a map representing an area from, let's see, I believe Eureka is just off the map to the south, Trinidad Head is here, so we're looking at a stretch where detailed Quaternary mapping was carried out to locate and map the various terrace levels. The youngest ones are closest to the coastline. So what we have is a sequence of raised terraces which are represented in this profile here. I'll show an enlargement of that in the next

slide. But the various different colors represent progressively older terraces which are horizons that we can evaluate to assess any faults that may cut through there to see if they've affected those terrace deposits, and that's a direct way to take a good look at that.

And here is the profile from a conceptual point of view to show to the west a sea stack out here, and the Patrick's Point terrace which has been estimated to be about 82,000 years old, the Savage Creek terrace about 105, Westhaven terrace about 124, Sky Horse terrace, 140, A-Line terrace, 160, and the Maple Stump terrace somewhere between 200 and 400,000.

Now, this again is from a conceptual point of view, the kinds of information that we were looking at to gather on a regional basis to look at how faults in the region have affected these, and one good example can be seen in the next fault I will talk about, is a calibration study that we did along the Trinidad fault that actually displaces this Patrick's Point terrace that at one time was thought to be two terraces. The previous interpretations of this thought that this was a younger terrace, and the studies along this fault indicated that that was a separated terrace due to faulting. And that's the kind of information we were looking for, so it's a valuable piece of information.

Regional studies were carried on, regional mapping. This just shows some of our field reconnaissance studies to look at outcrops and some of the details that one finds. One of the

difficulties, of course, is the intense vegetative cover in this area. If you come up close and look, you can see a fault that cuts through here. It's basically a thrust fault. This is a fault belonging to the Mad River fault zone. Again, we were looking at the width of deformation and the type of faulting and the amounts of displacement that one could see in roadcuts and various exposures like this.

This is the view, an aerial view looking straight down on the Trinidad Head area, and this I can see from a geologist's calibrated eyeball is this surface coming out, and there's an escarpment here that trends in this direction. This is that terrace surface that was thought to be two terrace surfaces, a younger one and an older one; and it was found that this might represent possibly the younger terrace surface being displaced by a fault. And so together with some work that we did and some preliminary work that had been done by some of the students at Humboldt State University and some mapping of the sea cliff out here, we excavated a number of trenches to put all this together in a calibration area to look at that faulting and its effect on that terrace.

And this is what the faulting looks like in that sea cliff, a spectacular kind of exposure to allow one to see the amount of faulting, the style of faulting, and looking at the amount of displacement and so forth of the various units. It's the kinds of information that we gather out of the trenches, but

when you have natural exposures it's often very spectacular with the weathering. And this was exposed out of a large storm that came through the area that uncovered this section and made it visible.

These are the trenches that were excavated across that topographic scarp, as we call it, which was a lineament on a map that we wondered whether or not was a fault, and that trenching, you can see again from the spoil pile the color change, and that was the location where we found the fault. And then we made the kinds of evaluations that I have previously discussed and presented to you in these other studies and looking at the age of the materials. Those studies and analyses are still going on. We clearly found a fault there and are in the process of evaluating the significance of that data?

MS. BROWN: May I ask a question with regard to the Trinidad Fault?

CHAIRMAN LAZO: Surely.

MS. BROWN: How much displacement was there as a result of that fault between what initially had been considered an older level and a younger level?

MR. CLUFF: I don't have all of the details. We've got about eight or ten -- well, we have 20 trenches that we've excavated. I didn't come with all of the facts prepared to make the presentation like we made to the NRC staff a couple of weeks ago. I'm not prepared to answer that question because I don't have

the facts in front of me. That will be part of the results of our analysis and study. Each one of these trenches will be -- I've got a trench log up on the wall, and it's a representative trench log of the McKinleyville trench. I can maybe use that as an example to show --

MS. BROWN: Dr. Cluff, was it more than ten feet?

MR. CLUFF: Well, yes, it was more than ten feet of displacement of the young materials on that terrace surface.

MS. BROWN: Was it more than 20?

MR. CLUFF: I don't remember.

MR. HONEA: I can answer it for her.

CHAIRMAN LAZO: Well, he said he doesn't know. Can you read the material off the chart behind us over our luncheon recess perhaps?

MR. CLUFF: Yes, sure. People can come up and look at that profile. It's very similar.

Again, this is along that Trinidad Fault showing the escarpment, and again, two trenches to get different information. What we learned is one has to be careful about relying on one data point because you find that your confidence increases as you get more data points just to repeat the information to allow you to come to confident conclusions about the type of faulting, and the amount of displacement, and the history of slip on the fault.

This is the McKinleyville location. This is the end of the runway. These are the Navy buildings, and I believe the

terminal is in the background here. And the runway is actually built out, and the reason there is fill on this end of the runway is because -- well, first of all, this was the lineament, and we suspected because of the topographic shift here that that fill had to be placed because that runway came over and crossed the feature that traverses about through here. One can subtly see it through here. And so we excavated some trenches across that feature.

I believe -- oh, sorry about the darkness of that slide. The feature comes through here, and our trench is located there. I'm sorry about that.

CHAIRMAN LAZO: You're working night and day?

(Laughter.)

MR. CLUFF: And I will talk about the log from that trench after I've gone through all of these exploration localities, because this is quite representative of what we're finding. There are subtle differences, but it shows the nature of what's being found.

Another area where we found -- this is at Goose Lake. Goose Lake is this area here. It was dry when I took this photograph. But one can see here a number of lineaments that are suspect of being possibly related to the geology. One is these set of lineaments that are here, here, and here, as well as a cross-cutting set of lineaments that are here, here, and here.

Now, without a great deal of discussion I think I can convince everyone that this lineament is a man-made lineament so we can dismiss that; it's a road, although sometimes roads follow

geologic features. But often when one is doing high altitude lineament analysis, straight lines like this that are cultural features are often interpreted by geologists as being important geologic structures; and one has to be careful about ground truth when you're at such a high elevation like Curt's Images(?) and so forth.

But the point I want to make here is that from this information I can clearly distinguish the difference between these kinds of lineaments, or at least I can make what I think is a reasonable guess of what they are. These, since there is a stream channel down here, these linements that are highlighted by the shadows here are old stream terraces probably belonging to this river, and the erosional and depositional terraces that result from flooding coming out of this stream throughout geologic time.

So what we see is a sequence of dates, datable horizons and materials, that appear to be affected by these features that are cross-cutting them. So this is a beautiful -- the kinds of information that had not been published, was not available in the published literature, that we were looking at to try to understand whether or not these features were faults; if they are, what has been their activity and amounts of displacement and so forth. And so this was an area of concentrated kind of calibration again, trying to understand fault behavior.

And we made a purpose in these calibration studies to try to find exploration localities where the materials were similar

to the materials that underlie the plant site. This is a criterion we used, so that we could say well, can we or can we not confidently assess whether the materials have been faulted. That was one of the basic questions that the NRC and the USGS were uneasy about on whether or not if faulting had occurred, could you see it. And, of course, that was one of the objectives of these studies was to try to answer that question with the highest confidence that we could.

And so this was an area -- and let me just show you the interpretations we made from aerial photographs. The dash lines are the boundaries between the stream terraces. The red lines are the features that we felt had a high likelihood of being false, primarily because you can see the differential offset between various floodplain or terrace horizons; and so we felt that there were a number of these, and we selected this one to excavate some trenches across to gather detailed information.

This is a view looking along that lineament. One can see a topographic profile. Our trench can be seen there in the lower part of the photograph. And then another view from a helicopte looking at the extensive and the length of that trench. We excavated a number of these trenches in these kinds of localities, and it takes literally weeks and months of many of our geologists mapping in detail to gather the detailed information that's needed to answer and meet the objectives that we set out in the beginning.

Another place that we felt important to look at is along

the mapped trend of the Little Salmon Fault. This general area through here is the trend of the Little Salmon Fault, and one can see some subtle but to the geologist's trained eye some lineaments that come through here, and these are old terraces related to some of the terraces down here. The plant site is located right here.

So this was the general trend in this direction in here of the Little Salmon Fault, and so we felt it important to take a look at those because one of our objectives was assessing the activity of the Little Salmon Fault.

Now, this is a parking lot for the College of Redwoods. The College of Redwoods is located at that location along those lineaments. And here are some of the trenches again that we excavated across some very subtle lineaments through here and one into here. The results of these are quite similar, and there isn't the time, and we're still going through the analysis; so the data will be presented in our report when we've completed it.

MS. BROWN: Dr. Cluff, have you finished the trenching on the Little Salmon?

MR. CLUFF: No. I'm missing a slide there. It doesn't want to go down. I don't think that other slide -- let me just -- ah, yes. This shows the extent of the shoring and so forth in those trenches that allow us to get down into these trenches to map them in detail.

Then here's a closeup view of Tom Stevens who's working with us on mapping the detailed geology in that trench. This just

gives you a feel for the depth of some of these trenches. They're from 10 to some of them as deep as 20 feet to expose the kinds of materials that were needed.

And here's one example of some of the information that we found out of that trench. One can see the markers that we've placed in here of a fault plane that comes up into these materials here, and another fault plane here. So there is a zone of faulting through here with two discrete planes of faulting. There are more than that, but this is the kinds of information that we were gathering out of these trenches in looking at the relative age of the materials with respect to the faulting and the history of the fault displacements.

Now, here's an aerial view photo taken in 1948, I believe. Again, the lighting here isn't very good. The plant site is here. This was part of the plant being built. And that Little Salmon trend is here, and there are some lineaments that under the proper lighting conditions one can see that come down through here. And the College of the Redwoods is located in this location, and that was one of our exploration localities. We call it the College of the Redwoods exploration locality.

Here's a closer view of that same area, and one can see a number of features that were the target of our studies.

Now, this is a view, again backing up a little bit, showing some of those features where we excavated those trenches here, and I believe another one in here. I was not in the field on the

detailed evaluation of that trench, but I did inspect these in here, and this is the College of the Redwoods that's located along that general trend.

Looking back in the other direction again, we had difficulty in that we would have like to have excavated trenches through this area, but cultural modifications precluded us from doing that. It's often a problem when one is dealing in these kinds of areas.

I have about eight or ten more slides, and I will be complete with my slide presentation, and then we'll have a brief summary.

(Pause.)

Here is one of those old --

CHAIRMAN LAZO: Pardon me. I'm sorry. I was just going to say we're getting close to a luncheon recess. If you could complete your presentation in the next five or ten minutes?

MR. CLUFF: Okay. I will run through these very quickly.

Here is the old photograph of the plant site location, and what we found was a very, very minor but nevertheless subtle lineament that traversed off in this direction -- the plant site is actually right in here -- over in this area. And that was a target for some of the ongoing trenching at the site itself.

Here is a photograph today of -- these are the storage tanks, and this is where the nuclear power plant exists. And the very subtle lineament that was one of our targets was a feature that passed -- I've forgotten -- but about right through here; and

we have an onsite trench that starts from here and completely crosses that and then jogs over and goes down here. And that's in progress right now.

Here is a view of the plant site, again showing this terrace surface that it's sitting on, and so the materials the plant site is sitting on is very similar to if not the same as some of the materials we've used in our calibration studies elsewhere in the region.

This is a view of the Centreville Beach just showing the stratigraphic relations that relate to some of the stratigraphy that we're dealing with in the vicinity of the plant site. I won't -- oh, the point I wanted to make here was an age dating technique other than paleomagnetic dating was some radiometric dating on ash, volcanic ash deposits. And we found a number of these in the area that have been extremely useful in dating the materials.

This is from another location. There are several ash beds that were extremely important in working out the stratigraphic sequences in this area.

And drilling, of course, that was done, all those drill holes, deep and shallow, were done with these kinds of drill rigs. And we logged every one of them in detail with the slummeberger downhole logging geophysical techniques, very sophisticated logging, to glean as much information as we can out of the borings other than the cuttings that come up.

And here's a sidewall sampler just to show the sophistication of some of the samplers that go out into the site of the boring to gather important information in our analysis.

And this is the kinds of information -- this was prepared for our December meeting -- the kinds of information that we're finding on the displacement history on the Bay Entrance Fault. This was out of the boring program. I won't take a long time to go through this other than it can clearly be seen -- this is a vertical offset or vertical displacement apparent. Again, the geometry is important, and we're still working that out.

Let's see. Was this in feet or meters?

MR. BRADY: Feet.

MR. CLUFF: Feet, right. This was in feet. And the depth. So one can see that the older in superposition, the older the material, the more displacement one gets; and so the younger materials in this area, one can see a progressive -- and in this place we had two interpretations. The evidence seems to be favoring this interpretation. But one can see successive lesser amounts of displacement with younger materials, or successively greater amounts of displacement with older materials. And we're working out the displacement history on the Bay Entrance Fault out of this in our analysis, and that is going on right now. So this is the kind of information we're gathering from those borings.

I think, yes, this is a view again -- I just wanted to show where the trench that was ongoing right now is. It starts

here and comes over across here, jogs over and comes down here, and we have another deep trench over here, and another one that goes down the face of Boune Point at that location.

And here's a slide from the trench of what we're finding, the trenches ranging from about 10 to, I think, 18 feet in depth. And it may not be too clear with the lighting in the room, but the detail or the fine laminations in the alternating clays and silts gives a very high resolution on being able to look for whether there have been fault displacements through these materials; and one of the objectives is to look at that as well as to see if we can't get a feel on the age of the materials.

Well, that's the last slide, and let me just take about two minutes, if I might --

MR. SCHINK: Can I interrupt with a question? How many ash beds, ash layers do you have that are dated in that trench?

MR. CLUFF: In this trench here?

MR. SCHINK: Yes.

MR. CLUFF: We don't have, I don't believe, Tom -- I'll have to ask Tom. No, we do not have any ash beds in this trench. If those ash beds exist in this area, they're probably deeper.

MR. SCHINK: And how do you date that terrace that the plant's sitting on?

MR. CLUFF: Well, there are several ways of looking at it. One is looking at the radiometric or radiocarbon --

MR. SCHINK: What age did you come up with?

MR. CLUFF: Well, we're still going through that analysis right now. Let me give you the range, okay. The range we're looking at is a few tens of thousands of years to somewhere between 150 to 250,000 years. That's the range of those materials that are being exposed beneath the plant site, and we're still going through that analysis.

Well, that's the last slide. Let me just summarize to say that the program that we have formulated is one at taking developed techniques that we have developed and others have developed and looking at the Quaternary geology, doing the calibration studies to allow us to see what the resolution of the information is, both in the age of the materials, the ability to see fault displacements in them, the ability to see where we have a fault, the style and amount and types of displacements that might occur so we can relate that to the sizes of earthquakes and how often those earthquakes might occur. And we're applying all of that information in our program I've outlined to address the question which is, as I showed in, well, the first, is to look at the potential; our charge from PG&E is to look at the potential to resolve the technical issues. And our schedule is to continue those studies and to give PG&E this what we're calling phase one to answer that question by October 1, or they will have a response to that answer.

We don't know what that answer is right now, and I can't prejudge it. Our full, intense assessment and evaluation is going

on right now, and then at that time PG&E will decide what they are going to do with our advice on what their decision will be, which the various representatives from PG&E will discuss later, and then we will probably meet with the NRC, depending upon that decision, to see to the extent of the NRC's evaluation of the data and whether or not additional information is required to gather more data at various locations.

We suspect that there will be additional data required to -- if there is a high potential of resolving the issues, additional data to actually resolve the issues one way or the other.

That concludes my presentation.

MR. LINENBERGER: Mr. Norton, going along with the most recent comments of Dr. Cluff, what is licensee's method of proceeding here with what's going on, and I mean this in the following respect.

Is the Woodward and Clyde information being accumulated for ultimate delivery and recommendations to licensee, who will then when it's all done relay it to the staff, or is the staff being kept up to date as the program evolves and as results come in?

MR. NORTON: Well, that's a multiple question. Let me start out by saying that one of the problems is the staff availability. The staff because of TMI and because of other investigations of other sites of larger facilities, operating facilities

and so on, because of financial commitments, as I understand it, or financial limitations, really doesn't have the people available to evaluate the data that has been accumulated to date. However, the data has not been presented to the staff in final result. We've been told that by the staff. It has not been presented to the staff in final form because it's not in final form.

We have periodically -- and that may not be the right word -- we have met with the staff, as you know, perhaps a month ago, and there have been several meetings prior to that early on. But until we have a complete picture to give the staff or at least enough of a picture for the staff to make an independent judgment of, and until they are free to evaluate that material, it doesn't make much point in hand-feeding it to them as we go.

The first part of your question as to how we proceed from here, I find myself in a unique situation. As a lawyer I think we frequently expect of the scientists to give us a definite date, and yet here the lawyers are demanding lawyers' specific dates, and scientists are telling us we can't give you a specific date.

I think October 1st is a very artificial date. It's a date that, you know, somehow we lawyers have dreamed up, but as this presentation by Mr. Cluff has stated, you can't prejudge what you're going to find. They're digging trenches. They're doing bore holes, although those are done now, and they're analyzing the data. They're digging trenches and so on. If they

find certain data that requires looking elsewhere, that's what's going to happen. And for us to sit here and say you will be done by October 1st or to have sat here two years ago and say you'll be done by December of '79 or whatever is frankly folly.

I think we cannot prejudge what we're going to find, and we're going to have to let the scientists do their work so that this Board and the Nuclear Regulatory Commission can arrive at a reasoned and informed decision.

I think the place -- and, you know, I'm glad we had this opportunity today for Mr. Cluff to present this data to you that the work is going on; indeed, millions are being spent. It's not -- somebody's not out there with just a backhoe digging up the ground. There are a number of geologists and seismologists involved in this study, and it's very important to Pacific Gas and Electric to proceed, and hopefully -- and again, we don't want to prejudge -- and hopefully the information we find will allow us to operate that plant.

MS. BROWN: Chairman Lazo, I'd like to point out first that interveners do have people available to begin analyzation of the documentation, and we would like to begin to proceed with that analyzation as soon as possible. We've been precluded from that review because of the technical proceedings and the status that they are in. So even though the staff is not able to proceed and doesn't have the time available to proceed, the interveners do; and we would like the opportunity to have that begin as soon

as possible, either under a formal order from the Board indicating that discovery is to open or on informal agreement between the parties reviewed by the Board.

I think we can then offer to the staff and to PG&E yet an additional analysis of the materials that are being presented to them, which I think will be helpful to everyone.

Secondly, I'm somewhat confused by PG&E's indication that they may not be ready by October 1st, since I understood the hearing today was to review their request to extend these proceedings until October 1st. If they have in mind another date, I'd like to know what that date is, as I'm sure the Board and staff would like to know.

CHAIRMAN LAZO: Well, thank you, Ms. Brown. You will have an opportunity to make any comments when the time comes for the joint interveners to make their presentation. And of course, if you wish to file any request in the form of an oral motion, that will be fine, too.

We've already indicated earlier that the fact that the interveners have not even begun any discovery process is of concern to us; and that is something that we do want to talk about some more before we leave Eureka.

MS. BROWN: I have a proposed order for a schedule that I've prepared in writing that I might as well circulate to the parties and to you at this point, giving you an opportunity to review it before we reconvene.

CHAIRMAN LAZO: All right. You could do that, I think, during the recess.

We've approached getting on a quarter to 1:00. Why don't we recess until 2:00 p.m. this afternoon?

(Whereupon, at 12:45 p.m., the hearing was recessed until 2:00 p.m., the same day.)

AFTERNOON SESSION (2:00 p.m.)

CHAIRMAN LAZO: The prehearing conference will come to order, please.

Mr. Norton, have the licensees completed their presentation?

MR. NORTON: Yes, we have.

CHAIRMAN LAZO: Mr. Goldberg, we'll now call upon the Nuclear Regulatory Commission staff. Have you prepared any formal remarks in response to the Board's agenda or proposed agenda?

Do you wish to respond to the licensee's presentation?

MR. GOLDBERG: We have no comments on the licensee's presentation today. I will attempt to present the position of the staff on the matters that the Board raised in its prehearing conference order.

I should indicate at the outset that the position of the staff on the motion to hold the proceedings in abeyance remains unchanged from its December 26, 1979 response to that motion.

With respect to the question the Board raised about the reasonableness of the request for further delay in light of facility modifications and ongoing site explorations, we would offer the following position.

The facility modifications and site explorations were undertaken in response to the license conditions imposed on the Humboldt Bay facility as a result of the NRC order for modification of May 1976. The facility modifications have apparently been

undertaken in an effort to address the first item of those license conditions, namely the requirement that the licensee upgrade facility structures to withstand the effects of an operating basis earthquake of 0.25g's.

The staff has observed, though not reviewed, the facility modifications that have been undertaken at the station. The staff is further advised that the cost of such modifications is around $20 million. The staff feels that the nature of the modifications are generally responsive to the license condition that I refer to, but expresses no opinion on the sufficiency of those modifications or the possibility that there may be a need to further upgrade the facility seismic design following the results of the geologic and seismic investigations that are now being carried on.

However, as relevant to the motion, the performance of these modifications would tend to suggest that the licensee is in earnest in trying to address the relevant portions of the existing license which it seeks to have removed by virtue of its amendment application.

With regard to the ongoing site explorations, a presentation very similar to that made today by Dr. Cluff was made at a meeting with the staff on May 7th of this year. On the basis of that presentation it was the judgment of the Geosciences Branch of the Office of Nuclear Reactor Regulation that the investigation was reasonably directed toward the geologic and seismic concerns

which again form a portion of the license for which an amendment is sought.

The staff felt that the investigations were vigorous and appeared to be comprehensive; that they were further aimed at providing information which will be needed for both the licensee and the staff, assuming the licensee proceeds to hearing on its application to assess the geological and seismological input parameters for the site.

Again, as with the facility modifications, however, the staff has not assessed the technical adequacy of the data, nor can it express any opinion on whether the data will modify the staff's present position on the application, which was as stated in the August 1977 correspondence that was referred to earlier in the licensee's presentation.

However, the staff does feel that it would be worthwhile to permit the investigations to continue until October 1, 1980, but also believes it reasonable to expect at that time that the licensee be in a position to go forward with the prosecution of its application or otherwise make clear its intentions with respect to that application.

The Board further inquired of the staff as to the reasonableness of the licensee's occupational exposure review.

CHAIRMAN LAZO: Mr. Goldberg, perhaps before going on with that next item, there are a couple of questions. In the NRC staff's response to the licensee's motion, referring to your

December 26 response, you indicated that the staff has been under resource constraints. I think there was an affidavit filed by Mr. Gammill which referred to the press of the staff work and that the review of the investigations being conducted by the licensee would be postponed indefinitely. A further statement that it would be likely that the staff review would not be carried out for the foreseeable future.

Now, this doesn't offer much hope that the staff come October 1 is going to be prepared to say well, we're ready to go ahead; we're ready to tell the Board what our position is, if you by that time won't even have begun to review. I understand you're not even seeing the reports of the ongoing investigations by licensee.

MR. GOLDBERG: Well, of course, Mr. Chairman, it's fairly common that the staff performs its technical evaluation of an application while a proceeding is ongoing. Certainly this proceeding is in its very preliminary stages, and there are other activities that perhaps can be undertaken at the same time as the staff commences and decides a timeframe within which it could conduct its review.

I will say that the staff is under considerable resource constraints, particularly in the geology and seismological areas, that it cannot review any material relative to this docket before October; but at the same time I do not think the staff would be an inactive party to an ongoing proceeding. But I will stress

again that the staff will have to evaluate its ability to perform an evaluation and the timeframe within which that evaluation can be performed in October. I think we would be then in a better position to do so than perhaps we are at this date.

CHAIRMAN LAZO: Would the staff plan to prepare let's say a safety evaluation supplement and publish it, issue it in connection with these modifications?

MR. GOLDBERG: Well, certainly we would prepare a safety evaluation with respect to the license amendment; but I can't tell you right now the timeframe within which that evaluation would be performed, but it's not clear to me right now what document we're going to have to review in October, and I could better assess in October when that review could be undertaken.

MR. LINENBERGER: Continuing in this vein for a moment, Mr. Goldberg, correct me if I'm wrong but I think I hear you saying that the significance of the 1 October date that we've been talking about to the staff is that that represents perhaps the earliest date which the staff could get started on what the applicant has submitted, assuming that he has his information wrapped up in a nice, neat package by then. Let's make that assumption.

Am I correct in so characterizing 1 October?

MR. GOLDBERG: Well, perhaps coincidentally that's true. October also happens to be the end of fiscal 1980, and I could tell you that, reasonably confident, that we could not expand any

technical review effort in fiscal 1980, which would conclude in October of 1980; and that certainly as long as the proceeding is in the posture that it's in, it is not likely that there will be any staff effort expended on the review of this application.

I cannot give you a fixed date, even assuming that we have the applicant's entire technical case, when we could conclude that review; but I would say that we could be in a position to advise the Board in October, having seen what it is that will be presented at that date.

MR. LINENBERGER: Okay. Now, understand we're not trying to put anybody on the spot here, but I get the impression that maybe the applicant is perhaps carrying too big of a delay label on his back when if he had things ready to hand you right now, the NRC couldn't do anything about it. So I just wanted to understand the posture of things here.

Now, the Chairman asked you about a safety evaluation report or supplement or whatever. I guess this is as good a time as any to ask you what the staff's position is with respect to the fact that Humboldt Bay has never had -- the facility has never had a NEPA review.

Do you see the necessity for preparing, for the staff to prepare an environmental impact statement in conjunction with getting yourselves ready to prosecute this proceeding?

MR. GOLDBERG: Mr. Linenberger, the staff really hasn't formulated a position on that matter. If I had to just indicate

my preliminary view, it would be that the scope of this proceeding would be confined to the terms of the license that are sought to be removed, which are in the geologic and seismic areas. And it's not immediately apparent to me that issues which fall outside of those categories should be the subject of an adjudication in an amendment proceeding which typically has a more narrow scope than an operating license or a construction permit hearing.

(Pause.)

MR. LINENBERGER: With respect to the constraints that are currently upon the staff, I think I have heard two causative factors mentioned so far today. One related to Three Mile Island, and the other related to budgetary constraints.

Now, I can see that they may be intertwined or they may be entirely separate. With respect to the constraints on you right now or on the staff right now, is the problem that -- does the problem derive from the fact that the Three Mile Island incident has required that people of the same talents and discipline that would be needed on this problem are being used on something else, or has the Three Mile Island incident so soaked up the available manpower that it represents purely a budget and not a technical lack of resources?

MR. GOLDBERG: Can I have a moment before I answer that question?

MR. LINENBERGER: Surely.

(Pause.)

MR. GOLDBERG: Mr. Linenberger, I think the primary constraint right now is personnel resources in the branch within the staff office that would have to review the technical material for the Humboldt Bay project, and that is the Geosciences Branch. Certainly budgetary considerations come into play; it could be necessary, for instance, to retain consultants to assist in that review effort.

But I think we're moving beyond the point where personnel involved in the post-Three Mile Island review would have a serious future impact on the ability of the staff to review this particular application.

MR. LINENBERGER: Yes. It wasn't clear to me how Three Mile Island would need a heavy assistance from geoscientist types, but okay.

Now, let's continue still on the implications of the constraints you're operating under. Let's pose a hypothetical situation that Woodward-Clyde is bringing their investigation to a close and will have their final package of data wrapped up in, let's say, two weeks for the sake of the question I'm about to ask.

Under that circumstance, from a purely technical point of view, it would seem to this member of the Board to be quite logical to talk about initiating discovery based on contentions that interveners have submitted, although the admissibility of all contentions has not been ruled upon, but that the Board can accommodate

itself to very readily.

Now, what I'm getting at here is I think I've heard the implication from what you've said, or I make the inference from what you said, that the staff might not be able to respond or begin to respond to discovery requests perhaps before 1 October or next fiscal year because of the constraints you're talking about.

Now, do I go too far there, or is that perhaps an impact of your present situation?

MR. GOLDBERG: I think it would depend on the nature of the discovery that was sought and if it would require any considerable effort on behalf of these individuals who are unavailable to work on the project. I would have to say yes, it would not be possible to accommodate those kind of discovery requests before October.

But then again I'm not sure that the staff would be the principal party upon whom discovery would be sought during that period of time.

MR. NORTON: Excuse me, Dr. Linenberger. May I address that question a little bit from the applicant's standpoint vis-a-vis the staff.

Maybe we weren't as clear this morning as we might have been. There really is nothing available now but raw data, and some of it even pre-raw data. In other words, it's data being taken out of trenches; for example, the trench at the site that

was discussed this morning, there is data being taken out of that today, yesterday, the day before. Obviously it hasn't been submitted in report form so that there would be anything the staff could be discovered about it.

MR. LINENBERGER: My question was prefaced on a hypothetical assumption --

MR. NORTON: Okay. I misunderstood then.

MR. LINENBERGER: -- That the data might be available in an analyzed, wrapped up package in two weeks. I wanted to see what the staff's position is with respect to their restraints. I think I understood what your position is with respect to Woodward-Clyde information and its completeness or lack thereof at this time.

CHAIRMAN LAZO: Do you want to proceed then, Mr. Goldberg?

MR. GOLDBERG: The second matter that the Board inquired of the staff was the reasonableness of the licensee's occupational exposure review. The staff received occupational exposure data from the licensee for 1979 and the first four months of 1980, and based on that date would estimate that the workers at the plant will receive a collective dose equivalent of about 10 man-REMs during the next four months, which would be until October 1, in performing necessary maintenance work.

Based on a discussion I had with an inspection and enforcement inspector in the local region who had performed a

health physics investigation of the station in March, it would appear that the licensee's records are a reasonably reliable representation of the actual occupational dose commitment being received at the plant, and that the licensee is capable of maintaining those exposures as low as reasonably achievable pursuant to the requirements of 10 CFR Part 20, given the nature of the maintenance activities that are being performed and would be expected to be performed in that period.

The next matter that the Board --

CHAIRMAN LAZO: Well, it's been alleged that the average dose during 1977, I guess which was the first full year that the plant was shut down, no power was produced that year, that the average dose to occupational people was something like 1.8 REM. And am I correct in understanding that essentially it's the same workforce in a lightwater reactor whether it's down or whether it's running?

How does that square with your estimate of 10 man-REMs during the next four months? How many people are involved?

MR. GOLDBERG: May I have a moment, Mr. Chairman?

CHAIRMAN LAZO: Surely.

(Pause.)

MR. GOLDBERG: Mr. Chairman, I'm going to ask the Project Manager, Mr. Vern Rooney, to see if he could address this question for you.

CHAIRMAN LAZO: All right. He could take some time to

do it a little later if you want to proceed, or we can --

MR. ROONEY: If I understood the question correctly, I think I can speak to it very quickly.

CHAIRMAN LAZO: Oh, Mr. Rooney, please do.

MR. ROONEY: You cited exposures that had been recorded for an earlier period of time about two years ago, is that correct?

CHAIRMAN LAZO: Yes. I think it was for the year 1977 with an average dose to however many workers of about 1.8 REMs.

MR. ROONEY: Yes. Early in the outage there was a very intensive effort on the part of PG&E to get certain modifications done with the goal for subsequent restart, and that included some work in the reactor vessel.

CHAIRMAN LAZO: Oh, I see. So that would run up the dose --

MR. ROONEY: Sparger replacement --

CHAIRMAN LAZO: -- Until that work is done.

MR. ROONEY: -- And there were high doses at that time that haven't happened since then and are not anticipated in the future.

CHAIRMAN LAZO: Fine. Thank you.

MR. GOLDBERG: The third matter that the Board inquired of the staff was the apparent implied approval of the onsite storage of spent fuel and other radioactive materials, if any, during the delay. Under the expressed terms of the Humboldt Bay operating license, the licensee has the authority to possess such

by-product and special nuclear materials as may be produced by operation of the reactor pursuant to 10 CRF Parts 30 and 70 of the Commission's regulations. And I would refer to facility operating license number DPR-7, Section B.4.

This authorization, unlike the authorization for commercial operation, was not rescinded in the NRC order of May 21, 1976. And the staff, I should say, is not aware of any materials onsite that do not fall within this description of materials for which they have lawful permission to possess.

MR. LINENBERGER: Well, sir, in essence I guess you're saying that the materials they possess, they possess in accordance with license to possess, and that's what was meant here by the term "implied approval." But the question really had a slightly different orientation.

First off, by way of information, this member of the Board does not know the status of the fuel in the reactor. Can you tell us that, Mr. Goldberg, or your staff man?

MR. GOLDBERG: Mr. Rooney indicates that he can respond to you, Mr. Linenberger.

MR. ROONEY: I think I can give you the approximate status, and perhaps I can get corrected if I say something wrong. But I believe as it now stands the core vessel has fuel in it following a fuel movement, right? And a portion of that fuel is previously exposed and some is new. In addition, there is fuel in the storage basin.

Did your concern extend to radioactive wastes as well?

MR. LINENBERGER: Not primarily. I was primarily concerned about the fuel, the fact that part of it is fresh, the fact that part of it has been burned, exposed.

MR. ROONEY: There are about 250 assemblies in the storage basin.

MR. LINENBERGER: Okay. Now, the fuel is possessed in accordance with the license to possess the fuel. The reactor, however, is not operating because there is concern that potentially the geology-seismology makeup of the site would make it prudent to either improve the resistance of the reactor facility to catastrophe or else maybe there is no way to get there from here, that the potential catastrophes are just too horrendous to worry about.

Nevertheless, the reactor is sitting there and has been there for some years with spent fuel loaded in the core at a site whose seismic qualities we're still uncertain about. And to me this implies that the NRC does not worry about what an earthquake might do to that facility in terms of the radioactive material, radioactive fuel that's stored there.

Now, that is the thrust of this third part of this question. Why is it not appropriate to be concerned about radioactive material stored in the core?

Now, keep in mind this is not an evidentiary session. I'm not looking for dose calculations and detailed probability

assessments. I just want to understand the outlook of the NRC here in saying well, you can't run the reactor because it might be on a fault, but we're not going to worry about what that fault does to the fuel.

So if you could kind of address that in some manner that would put it in context, we would appreciate it.

MR. GOLDBERG: I don't think I would necessarily agree with your term "unconcerned." I think that the staff believes that the plant in its present cold shutdown condition does not present a radiological risk to the health and safety of the public. If it did, it would certainly be incumbent on us to take certain additional protective measures to see that that safety was assured.

MR. LINENBERGER: Excuse me. Go ahead.

MR. GOLDBERG: I'd like to continue.

The staff has over the course of the past several years performed certain analyses of the fuel in the reactor vessel and the fuel in the spent fuel pool to ascertain what the radiological risk would be in the event of an accident; and perhaps Mr. Rooney, although he did not himself perform those analysis, could describe their results as best as he's able. That might give you a little more comfort.

MR. LINENBERGER: Well, okay. I'm not looking for a highly technical discussion at this point; this is not the place for it. But I just want to understand what kinds of things the

staff might have been worried about, what kinds of things they have done in the face of that worry, and what kinds of conclusions they might have drawn so far.

MR. GOLDBERG: I'd like Mr. Rooney to address that question so far as he is able.

MR. LINENBERGER: Fine.

MR. ROONEY: Just briefly, we did think about possibilities to envelope the worst situations that could occur, and we satisfied ourselves with respect, I guess thinking primarily -- well, considering the area, for example, of cooling, spent fuel cooling needs, and satisfied ourselves that even for the BWR fuel that we had, that we were dealing with here, that it could sustain complete loss of cooling water, given the time that it had since it had been removed from the core.

We're looking at something -- of course, it's been about four years since it's been irradiated, with some room to spare. We looked at the consequences of an accident in which there was a release, and doing this very conservatively we did some calculations looking at a situation quite recently after shutdown -- in fact, I think it was 72 hours -- and determined that the resulting releases would be within regs for that situation.

So as far as cooling needs being threatened by a seismic situation or as far as a release being triggered by a seismic situation, we considered those cases and did calculations we felt that bounded them. We also considered possible criticality

situations and satisfied ourselves with the fuel that we had there that we did not have a problem.

Let me clarify. The release situation we looked at was a fuel handling accident inside containment in which one-fourth of the core was broken up by dropping a cask on the core. The calculation was done 72 hours after shutdown. The doses were calculated at the exclusion area and found to be appropriately below the part 100 limits, and at the site boundary were found to be much less than the part 20 doses for the year.

(Pause.)

MS. BROWN: Chairman Lazo, could I ask a question?

CHAIRMAN LAZO: Of the Licensing Board?

MS. BROWN: No. Of the staff, if that's possible.

CHAIRMAN LAZO: Let's hear your question.

MS. BROWN: What would happen if there was a complete loss of coolant in the vessel?

CHAIRMAN LAZO: Mr. Rooney, are you prepared to respond to that question?

MR. GOLDBERG: May we have a moment?

CHAIRMAN LAZO: Surely.

(Pause.)

MR. ROONEY: I think the situation -- are you expressing concern about releases or about cooling?

MS. BROWN: Well, let's take cooling first.

MR. ROONEY: Okay.

MS. BROWN: Assuming that there is no more cooling material in the core, there is no water available.

CHAIRMAN LAZO: Could you use the microphone, please?

MS. BROWN: I'm sorry. If it's possible, we would like to know both. If we could start with the event that there is no coolant left in the vessel, what would happen then?

MR. NORTON: Excuse me. We have someone here with the technical expertise to answer that question, and we'd appreciate the opportunity to do so.

MR. ROONEY: Yes. I think this might be appropriate if PG&E can speak to it. I think we can say broadly, though, that we did look at the situation as far as cooling, and as I said, the cooling needs of BWR fuel after it's been out of the core for the period of time we're talking about, it does not need water cooling any longer; and so we have no concern on the cooling situation.

MS. BROWN: It's my understanding you're saying there is nothing in the core at this time that needs --

CHAIRMAN LAZO: I'm sorry. Most of us cannot hear you.

MS. BROWN: I'm sorry.

MR. LINENBERGER: Pull the microphones up to you, please, ma'am.

MS. BROWN: It's my understanding then that what's being said is that there is no need for any cooling water in the core at this time. Is that what you're saying?

CHAIRMAN LAZO: Well, there seem to be two different questions here. We're talking about cooling in the spent fuel pool --

MS. BROWN: Right.

CHAIRMAN LAZO: And, of course, water covering the core itself.

MS. BROWN: Right. I'm talking about the core itself at this time.

Are you saying --

MR. ROONEY: I'm saying the calculation was done for what was in the fuel pool, and I don't have information right now. We didn't do that in the reactor vessel. I would expect that just looking at those numbers that there would be some room to spare there also. We don't have a concern on that situation.

I do think that the geometry of the Humboldt Bay vessel is such that the passage for water loss from it is a very small line at the bottom of the vessel. However, I think essentially that we don't have a concern for cooling needs.

MS. BROWN: If we then could go back to the spent fuel pools, you indicated apparently that there is no need for water in those pools, is that correct?

MR. ROONEY: No. I said we did a calculation that showed if it happened -- I wouldn't want anybody to think we're saying that they don't need water in the pools and drain them off. We assumed that happened, and we found that for the age of the

fuel, the time since it had been removed from the core, there was no further need -- actually what we calculated was the cladding would not reach the melting temperature, and the cladding would not be destroyed. And so we found the situation acceptable for the accident situation.

MS. BROWN: How long could the spent fuel pool go without coolant water?

CHAIRMAN LAZO: Well, I think he said you wouldn't need it, that simply in air with convection currents the fuel would not melt.

MR. ROONEY: That's correct, yes.

MS. BROWN: Thank you.

(Pause.)

MR. NORTON: Excuse me, Mr. Chairman.

CHAIRMAN LAZO: Mr. Norton.

MR. NORTON: We do have the superintendent here, Mr. Weeks; and when I said we have someone with the expertise to answer the question, I didn't mean to in any way impinge upon Mr. Rooney's expertise; but as we all know, people have different areas of expertise within this field, and Mr. Weeks could answer that question specifically. And as long as it has been raised by the intervener, if she's going to be able to ask questions, we'd at least like the opportunity to answer them.

CHAIRMAN LAZO: Yes, I think you should proceed.

MR. NORTON: Mr. Weeks.

CHAIRMAN LAZO: Would you identify yourself for the Court Reporter, please?

MR. WEEKS: My name is Ed Weeks, and I am plant superintendent at Humboldt Bay Power Plant.

The fuel that's stored in the reactor vessel and the fuel that is stored in the spent fuel pool is of such an age -- when I talk of age, I'm talking about the time since we've run at power operation -- that there is not enough decay heat remaining in the fuel to require cooling water. Just air circulating around the fuel is sufficient to prevent the fuel from heating up and melting and vaporizing.

There are no short-lived radioactive gases remaining in the fuel. There are no iodines. There are no short-lived noble gases. The only noble gas remaining would be Krypton-85, and that is only in trace quantities, much less quantities than exist at Three Mile Island, for example. It would be a similar kind of problem that they have today with the Krypton-85 in their containment.

To postulate some mechanism for releasing that small amount of Krypton-85 is very difficult for me, since there is not enough decay heat to melt the fuel or the cladding. So in my opinion and the opinion of my staff, we could tolerate complete loss of cooling water in the reactor vessel and in the spent fuel pool with no accident consequences at all.

The worst problem would probably be some contamination

on the outside of the fuel that would become airborne as the fuel dried, but that would be a minor problem that we could handle very easily.

Does that answer your question?

MS. BROWN: Yes.

CHAIRMAN LAZO: Mr. Goldberg, does that complete the staff's presentation?

MR. GOLDBERG: On those three matters, Mr. Chairman. I should also add with respect to the latter item that the NRC Office of Inspection and Enforcement is continuing to inspect the facility on a periodic basis, and the staff is well aware of those activities that are being conducted and will continue to monitor the plant as long as it remains in its present status.

CHAIRMAN LAZO: Thank you, sir.

Mrs. Brown, for the joint interveners what do you have to say?

MS. BROWN: You have asked us to address primarily the public health and safety issues that we fear.

CHAIRMAN LAZO: You are, of course, free to comment on any other matter that has been raised by the other two parties here today.

MS. BROWN: Hopefully, my presentation will incorporate those kinds of comments as we go on.

Our first concern is the fact that the NRC staff, the USGS, and the State of California Department of Mines and Geology

have real questions or concerns about the siting of this facility, and that immediately raises whether continued risk to the populace in this area is warranted. And I'm going to ask one of the interveners who also happens to be a professional in the area of geology to make a short slide presentation on our behalf; and I would appreciate it if you could bear with him in that presentation.

This will raise some of the questions and comments that I would like to make about the Woodward-Clyde presentation. This is Dr. Adam Honea who will be making the presentation.

CHAIRMAN LAZO: Excuse me.

MS. BROWN: Dr. Adam Honea.

CHAIRMAN LAZO: Honea. You are one of the original interveners, aren't you, sir?

MR. HONEA: Yes.

CHAIRMAN LAZO: Yes. Please proceed.

MR. HONEA: What I thought I would do is present to you what I perceive as the geologic hazards --

MR. SCHINK: You're going to have to use the microphone.

MR. HONEA: Okay. What I wanted to do was present to you what I perceived as the hazards at the time of the closing of the plant and how I perceive those hazards now with the passage of the last several years.

When I came to the faculty at Humboldt State in 1975, I asked for information in the area, and one person I contacted

was Tom Collins who worked for the Forestry Service here. And he had been looking at small faulting in the area of the Humboldt Bay plant, took me to that faulting, and I was going to show a couple slides of that faulting and what information we had at the time the plant was ordered not to reopen by the NRC.

And this I think is important, first of all because we did have quite a bit of information at that time. There had been studies since 1972 by Earth Science Associates in behalf of PG&E and the United States Geologic Survey had done studies; and so I'm going to present what I collected at that time.

This is a photograph taken from a private airplane. This is the plant site. And the next few slides will be directly in this area. One place in particular is a ravine that exposes small fractures and faults that were of particular concern to us. This is because the trace as the United States Geologic Survey perceived it and Earth Science Associates in 1976 of the Bay Entrance Fault was somewhere in this area. In fact, Robert Morris, who gave a status report to the NRC, said that his interpretation was that it was several thousand feet from the plant site, and that it was tilted or dipping back under the plant site in this area.

The concern I had at that time was that if you go up to this ravine where erosion has exposed the rocks, you'll see the following things.

This next slide will be in this area. Okay. This is this ravine. There is also a quarry, and within this quarry you

can see some linear features. These are where water has eroded along some fractures. There are also some fractures that are exposed within this ravine.

This is another closeup of this ravine, and now I'll be down in the ravine. You should keep in mind that the Bay Entrance Fault is located somewhere roughly in here and passes the plant.

Now, the type of features you see in that ravine are fractures. This is a fault. This piece of wood is along this fault. This is about 39 centimeters of offset. There's a gravel layer, and then it's been offset along a vertical fracture.

There are a number of these fractures. When Tom Collins and myself asked Earth Science Associates why they had not noted these in their report, they said that they had interpreted them as landslide features and that they felt that they weren't really significant to have included.

It turns out that all these features have the bayward side, in other words the downslope side, up and this isn't typical of landslides. We would expect if it was slipping down the hill that those sides would be getting lower rather than higher. And so Tom and I spent some time looking at these fractures, and we found that some of these fractures were truncated and others went on up to the surface. This is more indicative of faulting than landsliding.

Another thing was many of the fractures showed large

offset near the base and then progressively smaller offset as you near the surface. This again is more like recurrent faulting than it is landslide features. So we had real questions if these small fractures were associated with the faulting in the area, the large faulting.

To give you a feeling for the proximity to the plant, this is just the other side. The previous slide was on this side of the ravine. These fractures appear in this area over here, and you can see the plant directly behind it. In fact, at this point we're 1.1 miles away.

Now, the real significance of being so close to the plant is our position geometrically. Excuse the quality of this, but I had no idea I was going to give a presentation today, so I at lunch break ran to my office, grabbed this.

This is a model that I was presented in 1975, not this drawing but this model, for the type of faulting we see in this area. And this again, there were workers in this area. For instance, Dr. John Young who is in the Department of Geology at Humboldt State University believed that he had seen this pattern for a number of years. That would mean that in the early '70s he was recognizing this pattern.

And what it was was one in which there were major faults that came up and cut through warped or flexed layers, and associated with these faults were a series of small fractures or sheer fractures. In fact, that diagram that was not used this

morning would be ideally what we would expect to see in this area. Also, we would see other small fractures.

What I thought the significance of this model was was that the Bay Entrance Fault or Little Salmon system which dipped under the plant with the plant somewhat in this position -- actually the layers appear warped differently at the plant than this; this is just a cartoon drawing more or less -- that there was a problem that those small fractures that Tom Collins and myself were seeing in the ravine were possibly the secondary fractures associated with the main fault. And this was presented to the NRC. This was also in concurrence with people like Ken Lajoie of the United States Geologic Survey. He presented in an oral presentation at Humboldt State a very similar diagram; that is, major reverse faults coming up, warping layers, as the regional picture.

This was part of our concern for the possibility of secondary fracturing at the Humboldt Bay plant. One of the things that I think caused complications in actually perceiving this pattern at the plant earlier was that generally as this upper plate moves upward along the fault -- and again, geometrically the plant would be up here -- you tend to get a lot of landsliding in this leading edge, because with the fault movement this leading edge actually comes out in the front and would cave off, so you tend to get debris in the front. And it admittedly makes it hard to tell.

So I would like to review, if I can go back to a slide,

what in 1976 I perceived as the situation here. One was that there was major faulting, perhaps the Little Salmon, the Bay Entrance Fault being one and the same or two faults, but a major fault that dipped under the plant; that the small, secondary faulting or fracturing that we saw here was associated with this faulting; and that there was a potential in this whole upper plate of that type of pattern.

We also had found this same type of faulting in the Table Bluff area. We had seen offsets in the bedrock which assured us that it was not landsliding in Table Bluff. There was very similar fracture patterns, but even more like those up there in the quarry.

The Earth Science Associates interpreted these as landslide features. We did not have another area at that time to say well, this looks more like tectonic features than landslide features; and so this area did not get as intensive coverage as this one did at the time when we'd do field trips with the NRC and the USGS and PG&E consultants.

However, since the closedown we have an exposure that was presented this morning in Trinidad which shows a pattern very similar to the one that's posted behind you, and that's nearly identical to the pattern we see in this quarry.

Today's the first day I saw the log trench from the McKinleyville airport. It's exactly what we would have expected, a series of these sheer fractures, small faults associated with

larger, reverse faults. And so a pattern that we felt was there I have seen be more and more confirmed throughout the years since the closure of the plant.

And so what I'm saying in terms of these major faults, the secondary faulting, that was critical at the time, and I feel that that's even more confirmed at this point.

By 1976, Terra Corporation, and this was the work of Dr. Stewart Smith who's at Washington University, had demonstrated that there was a plate at about 18 kilometers below the plant. We discussed this again with the USCS, other consultants, and the NRC.

Stu Smith felt that the plant would need to be designed for a 6 magnitude, 6.1 magnitude earthquake directly below it at 18 kilometers on this plate. In those discussions there was quite a diverse opinion, and the range was more between 6 and 7.5. Such people as Dr. Ben Page, Dr. George Thompson, Dr. Maxwell, other people felt that perhaps that was unreasonably low for the magnitude earthquake.

So in '76 we thought what would happen is we would proceed on and define a better approximation, because there was a real diverse opinion; and we didn't feel that it would take that long to do that.

So we had a plate under the plant at 18 kilometers capable of producing earthquakes, magnitude 6 to 7.5 depending on, you know, who you talked to. We had major faults that we knew

were dipping back under the plant. We had expression of secondary surface features. We also knew of an existence of a lineament coming up this valley and projecting to what was the North Spit Fault. We had information that there was fault activity along Table Bluff to the south of the plant.

Now, based on this, at that time I felt there was a real hazard. I felt that the Bay Entrance Fault was definitely capable. Part of the contention there was the age of these sediments, and I agree totally with the ages that were presented this morning, that this ranges between a few tens of thousands of years to several hundred thousand years. But we did have information by Way Miller, Kennedy and Lajoie in 1976 that the closure had dated these with a maximum of no more than 280,000 years.

Earth Science Associates said there was an offset of 480 feet out here, which definitely makes it capable, if you're talking about something less than 500,000 years with that much offset. It was only a couple thousand feet from the plant.

At the time of the closure the United States Geologic Survey released offshore data showing that there was fault disruption of the ocean floor, which even more confirmed that this fault was active and capable. Since that time there has been more offshore data, in part in response to the oil well leasing that is now proposed offshore of Humboldt. In the 1979 Bureau of Land Management map it shows active faulting offshore from the Bay Entrance and also from Table Bluff.

So what I have seen since 1976, the pattern that we were perceiving, that Robert Morris presents in his status report to the NRC, what many of us at the time the PG&E consultants weren't in agreement, but what I have seen proceeding that is not a new model coming up but confirmation of that model. And I perceived this as a hazard at the time, and consequently, since I've seen more confirmation of the model that the plant was closed on, I feel that there still exists a real hazard.

And I can't really talk about what was presented earlier about the hazard to the core or to the spent fuel rods, because that's outside my area of expertise. But there is a hazard that I'd like to speak to, and that's one that was recognized at Three Mile Island, and that was just the stress and anxiety of the community.

A study out of the Psychology Department at the University of Pittsburgh shows that stress and anxiety was a real problem in the Three Mile Island community.

And I think the studies have proceeded now for a number of years; in fact, unusually long for a geologic investigation. That is, I know that Woodward and Clyde has done larger investigations in approximately half the time. I can be corrected if that's not correct, but, for instance, the Auburn Dam investigation. This investigation started really vigorously in 1972, and what I was hearing this morning is that we're just starting it; but that's like eight years, and I think that's an unreasonably long

time for such an investigation. Other investigations have been completed in a much shorter time. And I think such long delays causes anxiety in a community that wonders is it safe, isn't it safe, and will it reopen.

I'll turn over this unless there are questions from anyone.

MS. BROWN: I would just like to ask one question.

Adam, as far as you could tell from the presentation today -- and I know you haven't had the opportunity to review any of the data that's been collected -- do you see any change in the information that was available in 1977, other than confirmation of the fact that the problem exists?

MR. HONEA: Well, let me say this. The way the study was presented today was what a lot of us couldn't understand why wasn't that done all along, since '72. So I have no complaints about the technique presented today; that is, the techniques that Mr. Cluff presented I feel were very applicable.

The problem I have is on the time scale at this point and on scheduling; that is, it's not like Woodward and Clyde just walked in brand-new to a project. This project had, gosh, you know, five years of intensive, intensive study before they came on to the scene; and it seems like the scheduling is off to me; that is, that we're not at the beginning of a project. We knew quite a bit back on 1976. The NRC felt it did. Its consultants felt they did. I feel that other geologists did.

And so from what I saw this morning it was a confirmation of that, and perhaps, you know, some of the work was much more appropriate. For instance, we wanted to put trenches where they finally put trenches back in '76, you know.

MS. BROWN: As far as you know, are they discovering anything that you did not already know in 1977 or suspect?

MR. HONEA: You know, I don't know what their data is. I mean, I didn't know any of this data, but it's what I would have expected from what I saw this morning; but we only saw a glimpse this morning. But it's what I would have expected from the model that I felt that people were entertaining in 1976.

MS. BROWN: Okay. The other comment that I would like to make on the data that Woodward-Clyde presented today was the fact that it interested me, and I hope the Board noticed this, that the Nicaragua study where they were helping Managua rebuild a city took Woodward-Clyde two and a half years. The Wasatch study that involved 180 miles, 370 kilometers, evaluating both sides of a fault line, took five years. The Auburn Dam, which was a tremendous project, tremendous number of manpower, tremendous number of man-hours, took five years.

And I also would like the Board to take notice that we're talking here -- at least reference has been made by PG&E's counsel and Woodward-Clyde that we're only in phase one, with no indication of how many more phases we have left to proceed on.

My information indicates that there is still a potential

radioactive air release as a result of the storage of materials at the plant. I also have information that indicates that if there is a major breach of the entire vessel that you are looking at materials, radioactive materials, eventually going into the tablewater or out into the bay. That is going to affect a major industry around this area, and that is the fishing industry.

Next and probably very, very important is the fact that this area is what is considered one of the most beautiful scenic and recreational areas of the world. The impact of this plant and the impact that the public is aware that there is a question as to its seismic siting appropriateness is affecting the influx of tourists, the question of whether they want to attend school here. And it does have an emotional effect on the community. It's already been alluded to in your Three Mile Island studies.

One of the other interveners who is a council representative from the city of Arcata would like to give you a brief idea as to how concerned his community is. He is also an intervener, and his name is Wesley Chesbro; and I would ask him to make his statement at this time.

CHAIRMAN LAZO: Before doing that, the Board does want to thank Dr. Honea for his presentation.

Very well, Mr. Chesbro.

MR. CHESBRO: I have some material I'd like to submit for the record.

CHAIRMAN LAZO: Do you have copies for all of the parties?

MR. CHESBRO: Well, I have four copies of the complete package. I could give one to you.

MS. BROWN: I can make copies available.

CHAIRMAN LAZO: That's fine. Why don't you be sure that licensees have one and the staff has one.

MR. CHESBRO: Well, what I would like to do is read from my original, and then I'll give it to him. It's the attachments that I don't have many copies of.

MS. BROWN: I should make it clear that Mr. Chesbro is appearing not only on behalf of himself as an individual intervener; he's also been asked by the city of Arcata to speak for the city of Arcata in this matter.

CHAIRMAN LAZO: Well, I'm not just sure what procedure we're getting into now. Is this to be a technical presentation?

MR. CHESBRO: It's an expression of concern about the technical data that has been presented. It's to illustrate that there is substantial local public concern about this information.

CHAIRMAN LAZO: Well, Mrs. Brown, could you not present this as attorney for the interveners? I really don't want to open this proceeding up to limited appearances.

MS. BROWN: As I indicated, I'm not asking that he be allowed to speak as a member of the public. I'm asking him to be allowed to speak as an intervener.

CHAIRMAN LAZO: Well, he's represented by counsel in this

proceeding.

MS. BROWN: Unfortunately, counsel across this table does not live in Humboldt County, and I cannot speak for the psychological impact that is occurring on the people that live here. I cannot speak to the effect that the plant has had on business in this area, but I know for a fact it has had an effect.

CHAIRMAN LAZO: Well, you've made that --

MS. BROWN: And what I would ask is that an expert on those issues be allowed to speak on how it's affecting the public health and safety in this area.

(Pause.)

MR. CHESBRO: Mr. Chairman?

(Pause.)

MR. CHESBRO: Mr. Chairman, I might mention that in the notice that was sent out, I as an intervener didn't note anywhere that there was a restriction that I had to be exclusively represented by counsel as an intervener. I had the impression that I was a party to this proceeding as an individual and would have the right to comment on the case.

CHAIRMAN LAZO: Well, our rules of practice do require, Mr. Chesbro, that parties be represented by counsel unless it is a pro se intervener who is not himself or herself a lawyer. If an intervener or an intervening group simply does not have counsel, we do, of course, permit a spokesperson to direct the examination and make the presentation. But as long as you're

represented by counsel, we really should have your counsel speak for you.

I think we are willing to make an exception here today, and we're anxious to hear your presentation; but this will be a single exception.

MR. CHESBRO: Thank you very much.

MS. BROWN: Thank you very much.

MR. NORTON: Excuse me, Mr. Lazo. May we be heard for a moment?

CHAIRMAN LAZO: I beg your pardon.

MR. NORTON: May we address the Board?

CHAIRMAN LAZO: Yes, you may.

MR. NORTON: The representations made by counsel that Mr. Chesbro, I guess is the name, is an expert on psychological impacts of nuclear power plants on the populace, may we have a little foundation from counsel as to the expertise of Mr. Chesbro, as long as that allegation is being made by his counsel?

MS. BROWN: Chairman Lazo, I don't think I claimed that he was an expert on the psychological impact of nuclear siting. I did say that he as a representative of the community can at least give the Board an idea of what kind of impact the city of Arcata for whom he has been authorized to speak has experienced as a result of the siting of this plant. And that is what I am asking him to speak to and the basis for his presentation.

MR. NORTON: Then, Mr. Chairman, I take it that Ms. Brown,

who is apparently entering into discourse with me, although I'm trying to conduct inquiries to the Board, I take it Ms. Brown is responding to my request of the Board to establish the expertise of this witness that she is willing to stipulate he is not an expert and is just giving his personal opinion.

CHAIRMAN LAZO: I think that's understood.

MS. BROWN: He's giving his personal opinion both as an individual and as a designated representative from the city of Arcata.

CHAIRMAN LAZO: Agreed?

MR. NORTON: Sure.

CHAIRMAN LAZO: You're welcome, Mr. Chesbro.

MR. CHESBRO: Thank you very much. I'll try to make this brief.

I would like to apologize for the formality of it. I understand this is not a formal hearing, but I put it in writing because it is an official representation of city policy of Arcata.

CHAIRMAN LAZO: We appreciate that.

MR. CHESBRO: As indicated in Attachment A, I was originally entered into this case in the summer of 1976 as an individual City Council member, and I had no sanction at that time of the City Council to represent the official city policy. I was expressing my own concern as one elected official for the public health and safety of my community.

That has now changed, and I would like to request that

the Board recognize my presentation as being on behalf of official city policy. This request is made by the Arcata City Council and is enclosed as Attachment B, as a result of the passage on April 8, 1980 of Proposition B, the Arcata Safe Energy measure. A copy of the text of that proposition is provided as Attachment C.

The vote in favor of Proposition B was 60.3 percent with just 34.9 percent voting against. And I have also included as an attachment those election results. The vote was not unanimous, and there was organized opposition to the measure with the "No on B" campaign being financed primarily by the utility involved here. In all, the vast majority of the financing of the campaign -- and I've included some figures here -- did come from the utility.

Under the circumstances, a vote of over 60 percent in favor passing in 11 out of the city's 13 precincts should be considered a fairly strong statement of concern on the part of Arcata's residents about the safety of the plant.

In addition to approving Proposition B, the voters elected three Arcata City Council members who had endorsed that measure, measure B, and who also support the permanent closure of the plant. And the City Council vote to authorize me to represent them today on this matter was unanimous.

The portion of Proposition B which is most relevant to today's proceedings is the second part which says, "Be it further resolved that the city of Arcata supports complete independence

from nuclear power, including the permanent closure of the Humboldt Bay nuclear power plant."

There were a number of concerns which prompted Proposition B and brought about its successful passage. First and foremost of these is concern over the seismic activity in this area, which you've heard evidence on today; and the fact that the plant was not built to withstand the potential earthquakes at the site.

The people of Arcata well remember the earthquake of June 7, 1975 and several lesser quakes since that time. The people of Arcata are concerned that a quake of much greater magnitude is a great possibility and that a major release of radioactivity could result.

Humboldt County is served by a very limited number of transportation routes. You probably didn't have to drive in for this hearing, but if you had you'd know what the problem is. Only three evacuation routes exist for all practical purposes for automobiles: Highway 101 to the south, Highway 101 to the north, and Highway 299 heading east. There's a typo there; it says "west." Heading east.

(Laughter.)

All three have extensive stretches of narrow, two-lane highway which would be in extremely congested conditions were an evacuation necessary even in the best of highway conditions. But the best of highway conditions are not anywhere near being guaranteed. Every winter in Humboldt County each of those highways

is shut for some period of time just as a result of weather conditions.

This last winter Highway 101 to the south was closed for several weeks 75 miles south of Eureka with no reasonable alternative route as a result of a massive earthslide that was caused by heavy ground saturation with rainwater.

Weather conditions are a serious enough threat to evacuation threats, but we would have to ask the question: what would a major earthquake do to these roads? We are concerned that such a quake would cause major road closures and trap the population of our community in a seriously contaminated area with no avenue of escape from the potential death and illness that would result from a serious nuclear accident.

Even with the plant inoperative there remains over 30,000 gallons of waste which could spill onto the land, into Humboldt Bay and into the air. This represents a serious threat not only to the health and safety and the sense of well-being of our community, but also to the economy.

The following economic hardships would be likely to occur as a result of a serious accident at the plant. First of all, serious damage would be done to our seafood and shellfish industries as a result of radioactive pollution inside the bay and inside the ocean. Secondly, the number of students attending Humboldt State University in Arcata would almost surely drop drastically. Many students attend the university because of its natural resources and

ecology emphasis, as well as because of the pristine environment which we enjoy here.

The presence of serious radioactive contamination would be a sufficient deterrent for a great number of students. HSU supplies the main source of revenue for Arcata's retail and service economy, and a substantial reduction in the enrollment would be devastating to our community.

The third point is that tourists from throughout the world are attracted to Humboldt County for the same reasons that the students are attracted to Humboldt State. The image of environmental quality which they seek would all but be destroyed by a major accident at the Humboldt Bay plant. Tourism, again, is a mainstay of our economy.

The fourth point is that much of the new investment capital for business expansion and diversification in Humboldt County is coming from urban residents who wish to move their homes and businesses out of the urban areas to a region with a high overall quality of life. This type of movement would all but disappear if the area became known for its radioactive contamination.

All of these economic problems come into much clearer focus when one considers the state of the existing economy in Humboldt County. We have an unemployment rate which is almost always double the national average, and many times in several years past it has approached 20 percent.

The lumber industry is declining because there are

fewer trees available, and no one can afford to build a house nowadays. The salmon fishing industry has been drastically curtailed by federal regulations, and fewer tourists can afford the gasoline to reach the redwoods.

Our economy cannot afford further erosion from any source. The economic disaster of a nuclear accident would turn Arcata into a near ghost town. And I think that is a psychological factor in itself.

On the other hand, permanent closure of the plant would create jobs. The other major provision of Proposition B called for "enactment of conscientious energy conservation measures and the accelerated development and active promotion of safe and economic alternative renewable energy resources for our community," as well as replacing the Humboldt Bay nuclear power plant with -- I quote again -- "safe, clean and efficient generating sources more compatible with the resources and health and safety of the north coast, such as conservation, solar power, and generation from wood waste."

Permanent closure of the Humboldt Bay plant would free PG&E's ratepayers from continuing to pay for the maintenance work as well as these expensive seismic studies and the other costs of keeping the facility in limbo. These freed financial resources could be channeled into replacing the energy which came from the plant.

There are many alternative ways to address the energy

problem on the north coast, and Arcata's safe energy measure lists just a few of them. The city is now developing a comprehensive program for conservation, weatherization, solarization, and research into development and planning standards for the sake of energy conservation.

This effort is being carried out by a new city board which has been, ironically, named the Arcata Energy Committee with the acronym AEC for short. In addition, several private firms have jointly formed the Humboldt Bay Power Company and are working with state and local agencies to develop an electrical generation plant combining and combusting wastes from our forest industry and our domestic waste in Humboldt County to replace some of the energy which would not be generated from the Humboldt Bay plant.

All of these activities are, even in their infancy, stimulating our local economy. They have much greater potential, and if PG&E were to direct greater attention and financial resources to them rather than attempting to reopen this antiquated and unsafe nuclear unit, they would be stimulating our economy as well as solving our energy problems.

In summary and conclusion, I would like to state loudly and clearly that it is the official policy of the city of Arcata to support permanent closure of the Humboldt Bay Nuclear Power Plant. The plant was not designed for the potential and probable future seismic activities in this area, and we do not believe that PG&E has been able to effectively demonstrate that the plant can

meet your own standards for seismic safety.

It is our understanding that under current siting requirements, seismic evidence would completely prohibit the plant from locating at this site, regardless of what safety systems or construction occurred.

The health and safety, property rights, psychological and economic well-being of Arcata's citizens are at stake in these proceedings, and we urge the NRC to stop giving in to PG&E's continuous requests for delays and proceed instead with an order to permanently close the Humboldt Bay Nuclear Power Plant.

Thank you.

CHAIRMAN LAZO: Thank you, Councilman.

(Pause.)

MR. SCHINK: Ms. Brown, could we go back to a point which you made before Mr. Chesbro spoke?

MS. BROWN: Yes.

MR. SCHINK: You said that you had information that there was remaining a danger of airborne releases of radioactivity. Are you at liberty to explain the source of your information?

MS. BROWN: Not completely. I can expand on what I was told, if you want me to do that.

MR. SCHINK: Yes. At least give us some idea of what the source of this information is or the basis for it.

MS. BROWN: Okay. It is my understanding that if there is an earthquake along the fault bed I believe PG&E's Woodward-Clyde

has admitted is active now -- that's the Bay Entrance Fault -- you could see a seismic potential of somewhere minimally of seven and arguably much higher than that, and in turn, a ground acceleration that could very well breach the containment vessel.

If that happens and if there is loss of coolant, you're looking at, as was referred to today, a drying of materials which would in turn be dealing with radioactive material going into the air. The winds are predominantly here from the northwest, though there was a recent balloon study that showed the winds went just about everywhere.

You're looking at that being carried. You're certainly looking at a panic. If there is an earthquake and you are dealing with a panic and your evacuation roads are all basically destroyed -- they can't even deal with the heavy rains during the winter -- you're looking at a Dunkirk, and I wouldn't wish that on these people.

There's tremendous fear as a result of a number of things that have been going on, primarily now the activity after Three Mile Island, and the realization that there is a potential for a serious problem. And you now have people that are more aware and in many senses more sensitive to the situation of this siting.

Given the potential for the earthquake, the potential for any radioactive release, you're going to have people that are going to want to leave and no way for them to leave. And I feel sorry for the people that have to deal with that panic.

MR. SCHINK: Well, you're suggesting then that in the event of an earthquake the containment structure will go, the reactor vessel will go, and radioactivity will be released generating a panic. That seems to contradict what we've heard from the staff and the applicant.

Could we go back and ask the staff to comment on that hypothesis?

MS. BROWN: I have no problem. I think that even today we heard from either the staff or PG&E that yes, there was some possibility -- I think it was Mr. Weeks -- that there was some possibility that there would be minor releases of the radioactive material as it dried.

Is that not the case?

MR. NORTON: Mr. Lazo, it seems to me that -- I find it incredible that someone sits there and says that the only problem is psychological fear, and let me scare you to death and instill that fear in you. And that's exactly what the interveners are doing. They're sitting here saying the only problem you're going to have if we wait to get the information to make a decision is the people are going to be afraid; now let me scare them.

The testimony of both the staff and the applicant is that there is no danger, or if there were a total loss of coolant, there would be no danger. I think the record is very clear.

CHAIRMAN LAZO: Well, we had asked the interveners, joint interveners to comment on their perceived prejudice to their

health and safety of a delay, and this is how we got into this matter. I think we are drifting away from our proposed agenda.

We've been around once --

MR. GOLDBERG: Mr. Chairman?

CHAIRMAN LAZO: Yes.

MR. GOLDBERG: I'd just like to follow up on this line of questioning. The staff obviously has an interest in assuring the public health and safety. I would say that at least on this given matter I'm in agreement with counsel for the licensee, and I would strongly urge the interveners to bring any information they may have to the attention to the staff that we may evaluate it.

I am always unsettled when, you know, we leave a proceeding and there are conflicting statements, because I think they do tend to unnecessarily alarm people and perhaps have an adverse effect on the psychological well-being of the community. So I would say that we would be more than willing to make our review of any information we receive public and perform it in a timely manner.

MS. BROWN: Well, our whole problem and the reason we're here is that nothing seems to be done with this plant in a timely manner. We didn't move to reopen this plant. We're simply opposing that.

And I understand in accordance with your procedures that once an application is made, it is incumbent upon the applicant to go forward with that application for amendment. And all I am seeing

is both a waste of time for the Board, for the staff, and in large part for the interveners and the community, because PG&E is obviously still not ready to proceed.

I have no trouble if you deny their application at this time and let them reopen at a time when they can proceed. But I do worry because holding the plant, as Mr. Chesbro said, in limbo is satisfying nothing and is causing concern in the community. And I'm not trying to exaggerate or instill fear. I'm trying to represent the input I've had from the community that is already there.

They're the ones that experience the closure of their roads every year, not the counsel from San Francisco. They're the ones that experience the isolation, and they're the ones that are experiencing the fear.

And I think what I would like to see come out of at least this hearing is either evidence that we're going to be proceeding or evidence that we're not.

CHAIRMAN LAZO: Well, counselor, that's why we're here.

MR. CHESBRO: Mr. Chairman, there was also, I think, included in my statement -- I'd just like for a moment to go back to the fact that the uncertainty also holds back and restrains the development of alternative energy sources for the community. I think that's very important, because there is an uncertainty as to what our energy supply is going to be in this area, of no decision and just holding it in limbo.

And I think if the plant were permanently shut down, it

would be clear that PG&E and the community would have to proceed with alternative sources of energy. We're pushing in that direction anyway, but I think the emphasis would come from a final decision.

MR. SCHINK: I'm considering at least the possibility that we should try to move forward with considerable dispatch on resolving this disagreement in fact between the interveners, on the one hand, and the staff and the applicant on the other as to whether there is a real danger to the population in this area posed by the potential radioactive release from this plant in its present condition.

It seems to me that this is a disagreement in fact which might be resolved by an evidentiary hearing, and if the interveners are correct, why, then, there is a much more obvious demand for prompt action on everybody's part than there would be if in fact the interveners proved to be incorrect.

MR. NORTON: May we respond to that, please?

CHAIRMAN LAZO: Surely.

MR. NORTON: I would agree with you if indeed there was a disagreement in fact, but I don't think there is. I think there's only one fact, and I haven't heard any facts to the contrary.

MR. SCHINK: You have heard a disagreement.

MR. NORTON: Yes, but not in fact, only supposition; and that's the scare tactic that bothers me. If there were someone here citing some facts other than someone here citing some supposition to scare people, I would be concerned; but the fact of the

matter is that competent testimony, the only testimony, is that there is no danger -- not only the competent but the only testimony.

CHAIRMAN LAZO: Well, I think --

MS. BROWN: I'm sorry. There was no qualifying of experts, so I don't know what any of the background of people that testified or made statements today was. But Dr. Honea can provide perhaps more information and facts as to what formed the basis for my disagreement.

MR. NORTON: I don't think a geologist is one to be testifying about radioactive releases. He can certainly testify about geology, and that's not what we're talking about. We're talking about if the fuel were exposed that is presently there.

MR. HONEA: That's not what I was going to testify about. I was going to give one of the sources for the information.

MR. SCHINK: If I may return to my statement, I would reiterate that I believe we have a disagreement over the facts, if you prefer; and I would assume that the applicant would be happy to see that disagreement resolved on the record. And it seems to me that the community might also be happy to see that disagreement resolved.

CHAIRMAN LAZO: It's getting on toward 4:00. Let's take a 15-minute recess, please.

(Brief recess.)

CHAIRMAN LAZO: Would the prehearing conference come to order, please?

MR. LINENBERGER: Mr. Brand -- and do I have the name correctly now, B-r-a-n-d? Thank you.

You have sat here very patiently through a lot of give and take today, and we appreciate that patience and forebearance on your part. It was with some calculated forethought on our part that we held back some of our questions to you until we had had an opportunity to hear some of the things that we have heard. But now just a few questions to you, sir.

First off, are you in a position to just make a summary statement as to PG&E's management interest in the restart of the Humboldt facility; and if you are in such a position would you make such a summary statement?

MR. BRAND: Yes, I am. Let me preface that by saying that we, PG&E, together with our consultants are pleased to be here in Eureka today and to be discussing the matter before this prehearing conference board.

Our geologic and seismic investigatory program is very expansive and, as you have heard today, is an evolving program. We think it is an impressive one and will hopefully lead to a positive conclusion.

We have a most sizable investment here in Eureka in our generating station, particularly our nuclear unit. We are most interested in seeing that unit returned to service. We are prepared to do that only when the necessary investigations have gone forward to show to those concerned that it is a safe generating

station and that we are committed to maintain it in that fashion.

We believe that it has been operated thus far in that fashion and are eager to return it to that state.

(Pause.)

That would be the end of any lead-in I might say, anticipating another question or two from you.

MR. LINENBERGER: Incidentally, do I understand correctly that your position is Vice President for Engineering?

MR. BRAND: Yes, sir.

MR. LINENBERGER: Now, is that a position in which you have direct line authority with respect to the Humboldt Bay activity?

MR. BRAND: With respect to the design adequacy of that facility, that is correct.

MR. LINENBERGER: Design adequacy.

MR. BRAND: Yes, sir.

MR. LINENBERGER: In your position as Vice President of Engineering would you have no line responsibility for the plant if and when it returned to operation?

MR. BRAND: With regard to the operation of the unit, no, I would not have a direct line responsibility for that.

MR. LINENBERGER: Right. Now, you were looking to Woodward-Clyde Consultants to provide you with information that will put you in a position to defend the adequacy of the site and the plant design in the face of seismic and geologic considerations.

For reasons which I think Mr. Cluff has talked about earlier, Woodward-Clyde has so far not been able to deliver to you the kind of package that would let you do that to this point in time.

The information that the Board has so far is that Woodward-Clyde anticipates being in such a position perhaps by October of this year, but with the caveat indeed that one knows not what further investigations might turn up, and so 1 October cannot be a firm, fixed date at this time, as we understand it.

Is that also your understanding?

MR. BRAND: Obviously we have been in frequent communication with Woodward-Clyde through the course of their entire investigation. We have not seen the completed report as yet. We are not aware of the analyses that will be included in that report. However, to date we know of no negative findings that would preclude our moving forward in the hearing process. And as we see the report's progress to date, we are still expectant to see the report from Woodward-Clyde in September, and presuming that their final analysis is as we have been led to believe it may be tending, yes, we'll be coming back to this Board and asking for the hearing process to continue.

MR. LINENBERGER: All right, sir. Now, the facts of business life being what they are or what I perceive them to be, I would presume that PG&E management is engaged in some sort of cost versus earnings potential evaluation or tradeoff comparison

here with respect to Humboldt Bay, and by that I mean in rather crude terms that if the Woodward-Clyde report that you receive in September says gee, there's still nothing negative, but there's still a lot left that we now know should be further investigated, and we need five more years to do it, it would appear to me that that might raise some questions of rather agonizing appraisal on the part of PG&E management. If they said ten more years to do it, I think the appraisal might not be so agonizing, but the answer might be a little more obvious. If they said one more year to do it, well, I don't know.

Now, you see where I'm leading you here, and believe me, I'm not trying to get into management's business per se at this point; but are you in a position to comment about, well, just how far might you be willing to let this kind of situation ride on before business prudence calls a halt?

And I don't expect a precise answer there, just kind of what your thinking is in this.

MR. BRAND: Thank you, because I cannot supply you with a precise answer. Of course, over the years we have continued to do a series of cost-benefit analyses, should we call them that, and to date they have strongly suggested our moving forward with our Humboldt facility.

The results of the Woodward-Clyde report will really be addressing the subject of the potential for resolving the technical questions. We expect that the report will suggest that there is

that potential. To date we have no information from Woodward-Clyde to suggest a very long, protracted continuation of the field investigatory program.

In terms of how long we might continue to deliberate that, I would not be able to speculate today. I would certainly say with regard to the energy supplies that now exist in California and their continued depletion, together with the continued spiral in the OPEC price of oil, as the oil price goes up, there is certainly additional support to our moving forward with the continuation of the program. At the same time, that does not mean that we would not be able to make finally the business judgment decision appropriate if Woodward-Clyde or anyone else presented to us that there would be little potential of ever resolving the technical situation.

MR. LINENBERGER: From a slightly different side of the problem, I have the impression that the current status of things with respect to Humboldt Bay at this point in time right now is not very much or has not been very much influenced by the aftermath of the Three Mile Island event.

And first things first, it would be logical that you would want to resolve the question of site suitability and facility design suitability, if you will. On the other hand, you must be well aware that many utilities not having the problem that Humboldt Bay currently has on the seismology issue, many utilities do have many problems stemming from Three Mile Island.

So where I'm going here is, to what extent have you looked at what kind of impact Three Mile Island is going to have on your readiness to go back into operation, separate and apart from the seismology-geology questions?

MR. BRAND: We, of course, are actively involved in applying those lessons learned from TMI to a backfit of our Diablo Canyon facility. Many of those lessons, shall we say, would have a direct application here at Humboldt in terms of many of the, shall we say, administrative changes that are moving forward within our organization. Those would be directly applicable to Humboldt as well, such as focusing of responsibility for the operation of the unit.

With regard to Humboldt site specific issues coming out of TMI, we obviously have deferred that subject in large measure until we see the direction coming out of our geologic and seismic investigations.

I would say that we have this spring commissioned a consultant study to be looking at the Humboldt situation and addressing the subject of the types of changes that would be necessary in this plant as a result of TMI.

The results of that initial work will be to us late this year, I expect.

MR. LINENBERGER: So if I understand you correctly, you're kind of concurrently carrying on an investigation of the TMI-2 impact on the Humboldt Bay facility.

MR. BRAND: Yes, but certainly not in any order of magnitude comparable with that that we're giving attention to the geologic and seismic issues.

MR. LINENBERGER: Well, lesser order of magnitude, now, does that statement reflect that in the judgment of PG&E management the TMI lessons learned impact is not likely to be of very great magnitude, that it's something you'll be able to accommodate to?

I don't mean that you're de-emphasizing it; I mean it's of lesser import or impact in terms of time, in terms of costs to accommodate?

MR. BRAND: No, not at all. What I am saying is that we have only this year begun to apply the lessons learned to TMI. We're still moderately early in that investigation and don't intend to complete any design modifications coming out of the TMI backfit until we see our way reasonably to a successful conclusion of the geologic and seismic matters.

MR. LINENBERGER: Well, for the moment then let's assume that the Woodward-Clyde package that's handed you in September contains everything you need to see your way through to a successful conclusion of the seismology and geology questions. Do you then see a significant additional delay coming along while you address yourself to and retrofit, change or whatever the Humboldt Bay facility because of TMI matters?

MR. BRAND: I would not want to answer that directly,

because our course forward on the Humboldt facility can take any one of a number of different routes. I would say that before we move forward with any specific design, we need to get a good deal more information coming out of our geologic work that can be factored into this design consideration, such as magnitude of safety, SSE, that would have a direct application to any subsequent design.

Presuming that we request to move forward with hearings on the geologic work, we would intensify, I think I would be fair in characterizing, our design activity to see where -- so that hopefully after we have resolved the geologic concerns, we can address directly and be in a position of addressing directly the remaining concerns, TMI or what have you, to move forward with initial operation of the unit, or continued operation.

MR. LINENBERGER: I'm sure you're well aware that one of the more interesting and in some cases troublesome aftermaths of TMI concerns changes in NRC policy with respect to emergency planning and evacuation and related matters.

Is that an area that you are currently giving thought to with respect to Humboldt Bay?

MR. BRAND: Of course we're giving thought to that. At the same time, the whole area of emergency planning coming out of the TMI experience is a moving target. While we're following that and we're in an activity of addressing that immediately to our Diablo Canyon facility. We will be addressing that to Humboldt

at a later time.

We believe that our present emergency planning is adequate for our Humboldt facility as it exists in its safe shutdown condition.

(Pause.)

MR. LINENBERGER: Have you looked at the question of -- you personally -- looked at the question of whether the Woodward-Clyde activity is being pursued at an adequate manpower level for your purposes? There are some investigations that ten men will bring to an end no sooner than one man can; there are some investigations for which ten men will bring to an end ten times quicker than one man can.

Is this kind of appraisal something that you have looked at?

MR. BRAND: I personally have not looked at that, to give you a --

MR. LINENBERGER: Do you think your management has?

MR. BRAND: Oh, yes, our management has. At the same time, I personally have some compassion with the difficulty caused by a program like this in the field. I've been personally involved in these types of programs in the past, and I can understand why they become protracted. Certainly our corporate management is following this program closely and has directed Woodward-Clyde to complete the program in a logical and reasonable series of activities.

I don't know what more I can say on the subject.

MR. LINENBERGER: Well, I'll offer you the opportunity to say one more thing. Do you consider that the level of effort on the part of Woodward-Clyde is a prudent one in the context of the technical problems that are being faced, or are you free to speak to whether there might be funding constraints that are preventing the effort from moving as expeditiously as it might, the Woodward-Clyde effort?

MR. BRAND: There are no funding restraints, at least from our standpoint or suggesting to Woodward-Clyde that they move more slowly. No, there aren't at all. We have continued to recommend to Woodward-Clyde that they complete this program as expeditiously as they can, and at the same time the investigation is theirs; we wish it to be an objective one and one not directed by PG&E. And we wish that they have the information that they need so that they can in all assuredness make their recommendations to us at the appropriate time.

These programs are very hard to schedule. At the same time I would say in this area there has been a great deal of field investigation on property owned by others than PG&E, and I would say that we would have excellent response from those local property owners here who have cooperated with us and have been patient with us as we're working in their property to resolve this situation.

CHAIRMAN LAZO: Mr. Brand, I'd just like to ask a follow-up question to Mr. Linenberger's question to you regarding the

level of effort of the Woodward-Clyde investigation, and I think you stated that you personally had not looked at it.

As I am sure you are aware, the Licensing Board had directed the licensee to make regular status reports on geologic and seismologic investigations, their first order of June 7, 1979 and a subsequent order of June 19th.

Since that time we have received progress reports which simply are copies of reports which have been sent by Woodward and Clyde to Mr. Frank Brady of your staff. There's been developing, in my opinion, an indication that there may be some delay in this work.

The first report that really was very helpful was the one of September 17th, 1979 which reported on the two months of July and August. And at that time we were advised that the scope of the work had been prepared and that the intensive investigations were to begin in September.

The next report of November 19, 1979 reports on the progress during September and October 1979, but states that some activities are behind schedule; for example, the dating of the Hookton formation has been postponed. That was to have been completed by December.

January 21, 1980, reporting on progress during November and December notes that the effort on field studies had been reduced. The studies postponed were the studies of the Hydesville area, the age dating of the Hookton formation, new borings south

of Fields Landing, work on assessing fault formation and propagation, and installation of free field strong motion accelerometers at the site -- all postponed.

Again, in March of 1980, reporting on progress for January and February, it appeared that this had been a busy period, but again the schedule had slipped. Items postponed again were the age dating of the Hookton formation, installation of the free field strong motion accelerometers, identification of faults at the North Spit of Humboldt Bay and in the Elk River Valley, and the deep drilling south of Fields Landing, and again, studies of fault formation and propagation.

The last report we received is dated May 19, 1980, and it notes that the age dating of the Hookton formation and the deep drilling south of Fields Landing is scheduled to begin during the next reporting period, May-June.

But I don't know whether it was a wet winter or spring or whether the work is progressing at as fast a rate as it might be.

MR. BRAND: You've raised a number of subjects. Would you allow us a moment before I respond?

CHAIRMAN LAZO: Surely.

MR. BRAND: Mr. Chairman, may I put our consultant on the hot seat to respond to this?

CHAIRMAN LAZO: Surely.

MR. NORTON: I think in addition to Mr. Cluff responding,

we ought to have the Project Manager for Woodward-Clyde Consultants respond to the question also. As to the details that you have pointed out, for example, the age dating of the Hookton formation, I happen to know the answer to that one myself.

CHAIRMAN LAZO: Why don't you take a moment and just talk about it? I see --

MS. BROWN: I have an additional question --

CHAIRMAN LAZO: Ms. Brown, yes.

MS. BROWN: -- That would fit right in here.

Would it be possible for Woodward-Clyde to provide us with an analysis of the men that were available and what they did -- certainly, at least from the period, the reporting period, up to the present date. In other words, how many men they actually had in the field, how many hours you spent?

CHAIRMAN LAZO: Well, let's get a response to the Board's question.

CHAIRMAN LAZO: Dr. Cluff, would you introduce --

MR. CLUFF: Yes. This is Dr. Patwardhan who is the Project Manager working directly with me.

CHAIRMAN LAZO: I'm sorry. The acoustics are so bad. Spell --

MR. CLUFF: Okay. Dr. Ashok, A-s-h-o-k -- that's his first name -- Patwardhan is his last name, P-a-t-w-a-r-d-h-a-n.

CHAIRMAN LAZO: And his title or position?

MR. CLUFF: His position is an associate, senior

associate with Woodward-Clyde and Project Manager of the Humboldt Bay power project.

CHAIRMAN LAZO: Thank you, Doctor.

MR. CLUFF: I'm the director of the project.

You've asked a lot of questions. Let me, I think, focus conceptually one or two, and Dr. Patwardhan might respond to some of the others also.

As we mentioned earlier or as I mentioned earlier, the program is an evolutionary one in which we feel and strongly recommended to PG&E be one of a stepwise, efficient operation to gather the information in a manner that was not wasteful in terms of man effort or resources in money and so forth and tied to the field operations.

And let me just pick drilling as one aspect. One could drill many tens of thousands of feet of borings without having a proper target to shoot for and show a tremendous amount of borings without very useful results being obtained. And so it's one of continually assessing the program to make sure that when we do pick a drilling site or a trenching site that it is appropriate and will achieve maximum information; and so often we do defer or delay, depending upon what we're finding in some other aspects of the project -- and we haven't chosen to go into all of the details in our report in the ones that you have received.

And I'm sure that's not a complete answer for all of the aspects that you see there, but I know that has been a direct one

that I personally participated in in making some judgments about the ongoing work.

Dr. Patwardhan might want to comment on some of those directly.

MR. PATWARDHAN: I think conceptually I don't have anything new to add over and above what Lloyd has said. By way of detail, let me point out that the primary purpose of many of these borings was threefold: a) to get a better idea of the location and geometry of some of the faults in the site vicinity; b) understanding and correlating stratigraphic and other relationships with respect to the various strata that one might encounter; and c) provide information that helps us either improve the overall regional tectonic picture or improve the calibration model that Lloyd talked about.

The planning for these borings as to their location, their proposed depth, or even the need for them is interlinked with the results as they may come out from other investigations. So it is not an independent process. For instance, if the information that one is seeking regarding the geometry of the faults in the plant site becomes available from other data that have been developed, then drilling these borings does not add substantially to our knowledge.

If the information available from other sources, such as geophysics, does not suggest the possible presence of faults which we would have further drilled to get more information on, then the

question of drilling would only be of marginal interest.

So basically the issue is one of optimizing the benefits that could accrue from carrying out any specific activity. I may point out that the program as outlined included a number of items that may be considered, depending upon the outcome of whatever preceded that. It was not intended that every item listed there was necessary or would have to be carried out; and in that regard you may see that certain items -- as I said, I don't have the list in front of me -- but many of these items were either postponed or not carried out in view of the determination that the information that they would have provided was generally available from whatever was done preceding that.

CHAIRMAN LAZO: Dr. Patwardhan, thank you.

I suppose part of the problem has been -- well, apart from the fact that I know virtually nothing about geologic and seismologic investigations -- is the title of the documents or the indication that they are indeed progress reports. And I think that's part of the reason why we determined to have this hearing conference.

It appeared from the early spring reports that it was difficult to tell whether indeed progress was being made. And then we hear from the NRC staff that because of budget restraints they're probably not going to be able to do anything on the studies until the end of the fiscal year. The interveners tell us two things: one, that it's unsafe to leave that plant sitting there

on what they allege to be a fault underneath it; at the same time, counsel for the interveners indicates that they're prepared to wait until next summer or late summer to have a hearing. I don't know how we're going to resolve all these problems, but it's clear that you or Woodward-Clyde is unable to say we'll have everything we need to know in hand by a fixed date. You've been unable to tell us that.

MR. CLUFF: Could I respond to that? I want to make sure -- we've talked about this, but I want to re-emphasize the point on the subtle difference but nevertheless a very important difference between the potential for resolving the technical issues and absolutely resolving the technical issues.

And our assignment all along in our discussions with the USGS and NRC has been very clearly understood in writing and in discussions that that was what our independent task was about, was to look at that potential.

Now, our --

CHAIRMAN LAZO: You can't make any promises.

MR. CLUFF: No. And our agreement with PG&E was that any time during that process if we discovered -- we outlined a very comprehensive program, as Ashok said. It contained a lot of things that as we get down near the end of it may or may not be required. So we tried to think of everything under the sun that we thought might be done, and some things are more important than others.

It was our agreement with PG&E that any time during the process -- and we would have project meetings to look at the results -- if we found information that clearly indicated to us caused a negative impact in the potential for resolution of the technical problems, we were to notify them within hours. There's no sense in continuing. And, of course, the fact that we haven't done that clearly indicates that we have yet to find anything that in our judgment has come up with that answer.

I'm not promising or prejudging what the end product is by saying that. I'm just saying that that's a fact. We haven't found that.

(Pause.)

May I just add an additional thought that I meant to include earlier? The general level of effort or our staff assigned to this project has fluctuated to some extent, and Dr. Patwardhan could be more exact about this. But I think our general level of involvement has ranged between about, oh, 15 to as many as 30 professionals working on this project throughout its duration.

CHAIRMAN LAZO: Thank you, sir.

MR. LINENBERGER: Would you say those numbers again, the range?

MR. CLUFF: Somewhere from a low of between 10 and 15 to a high of about 30.

MR. LINENBERGER: Thank you.

CHAIRMAN LAZO: Well, then, I think it's time to put

counsel for all of the parties on the spot, the fix that you've got us into.

What do you propose that we can do to expedite this matter?

Let me ask you, Ms. Brown. You have proposed a time schedule for the proceedings, and we've had a lot of talk since that time. What is it that you now would ask the Licensing Board to do to assist you in representing your clients?

MS. BROWN: I would like an order from the Board allowing us to begin formal discovery as soon as possible, from today's date if necessary. I would be directing that discovery primarily to PG&E because they're the ones with the information on the seismic and geologic studies that have been conducted. I would not be directing it toward the staff; they haven't had the opportunity to review the material. They don't have it in their possession either, nor apparently do they have the time to even consider it until October.

But I hate to waste the months between now and October doing nothing, which is what we have been doing on this particular application for a long period of time. Thereafter I would like to see a continuation of formal discovery until such time as either we felt that we were able to provide answers to the Board or the staff had finished their investigation; and I'm hoping that investigation would conclude before estimates I heard rumors of, between 18 and 30 months.

And then I hope that we would proceed to hearing, and I would like to see it happen sometime next year; and that, hopefully, is giving everyone ample time to prepare. It would be giving us ample time to prepare.

CHAIRMAN LAZO: Ms. Brown, we're in great sympathy with your need to begin some discovery, whether it's formal or whether parties can get together and utilize informal procedures. One of the early problems is that licensees nor staff have really responded to the contentions that have been filed by the joint intervenors; and if discovery is to be limited --

Our rules are very broad and liberal discovery rules, but there may be problems in terms of discovery relating to matters that are just outside the scope of the issues of the hearing. And unless we have some issues defined in terms of specific contentions, we well could get involved in motions to compel and objections because we haven't yet defined the issues in the proceeding.

MS. BROWN: Which I would hate to see happen. That's why my motion or my proposed schedule indicated that it would be informal discovery during the period of June until October 1st, and thereafter formal contentions would be framed, and then formal discovery opened after that period of time.

I'm still willing to abide by that, but I would request that we not be told by PG&E if we do make an informal request for information that they don't have it in final report status. We're looking for not only their final report, but also for the

documentation that backs up that final report.

CHAIRMAN LAZO: Yes.

MS. BROWN: And we'd be limiting our initial discovery solely on the issues of the seismic and geological work that Woodward-Clyde has done, which is a fairly limited area.

CHAIRMAN LAZO: And then you would file what, amended contentions?

MS. BROWN: If need be, yes.

CHAIRMAN LAZO: If need be.

Well, licensee counsel, what do you say to that?

MR. NORTON: I unfortunately think it's another cart-before-the-horse proposition. We don't have the data either. We don't have the report. They want to discover it from us. We don't have it. Woodward-Clyde is in the process of putting it together.

There behind you is a trench log, and they're going to reduce those kinds of raw data to hopefully -- and I should say it a little stronger than that -- absolutely to understandable form.

CHAIRMAN LAZO: Mr. Norton, most lawyers object because the other party wants them to do some of their computations for them, and here they're willing to accept raw data and make their own --

MR. NORTON: Let me finish. They're going to interfere with them getting the job done. These people are trying to compile the data. These are geologists and technical people who are

trying to compile the data in an understandable, intelligible format for PG&E to reach a decision on.

We may -- I don't believe it's going to happen -- but we may reach a decision it's all over, withdraw our request based on their report, in which case there's no need for any discovery whatsoever. I don't think that's going to happen, but you don't start discovery before you have a litigable issue, and you really don't here until that report is in and a decision is made. Then they can discover. And they've got plenty of time to do it, because the staff's going to start its review when they receive that report; and they certainly can do their discovery while the staff is doing its review.

They can talk to all the technical people they want. They can look at all the backup data they want. Then can look at all the log trenches they want. But why do it now while those technical people are putting together the report? By way of analogy, it would be as if you allowed them discovery while the staff was putting its SER together and had a date like October 1 to get its SER out, and you allowed them to keep pulling the people off the project and the data out of their hands so that they couldn't write the SER. And that's basically the kind of situation you're in here.

MS. BROWN: I think --

MR. NORTON: Excuse me, Mrs. Brown.

MS. BROWN: No. I thought you were finished. Please

go ahead.

MR. NORTON: It's not a situation where -- in fact, you have a proceeding, but we have a motion to hold it in abeyance, and if indeed it is held in abeyance, the hearing proceeding, I don't see any vehicle for discovery. But worse than that, I don't see anything to discover until the report is done.

There is plenty of time after that. She's talking about a hearing, and her proposed schedule starts a hearing in August of 1981. We completed all the discovery on the seismic issues in Diablo Canyon, which believe me were far, far, far more involved than these in terms of people, and documents, and paperwork and years of study, probably an order of magnitude greater than this, completed all that discovery, the interveners did, in something like 60 days; and she wants a year and four months. I thought we were the ones taking a lot of time. It doesn't need a lot of time.

MS. BROWN: Can I respond now?

CHAIRMAN LAZO: Yes.

MS. BROWN: The first thing we are asked to believe is that the Licensing Board that's sitting before us now has already made the decision to grant the extension to October 1st, 1980, which I'm not sure that you have decided.

Secondly, the schedule that was proposed is one that we're more than willing to cut down in time. We had already heard from staff informally in Washington that it would be taking them 18 to 30 months to prepare their report; and we figured that by

cutting it this short we were still doing the staff a disservice.

Fine. If PG&E is ready to proceed and we can open discovery as soon as possible, we'll be willing to proceed as soon as possible. I'm not going to certainly limit the interveners to what PG&E is going to turn around and call us delaying, because that is not our position in the least.

If staff is willing to proceed faster, interveners are ready. Interveners have been ready.

MR. NORTON: Mr. Lazo, may I make one last point?

There are two things that bother me a great deal about where I find my client at this moment. We're being asked to hurry up and force people to make a decision without the right information, and that just kind of blows my mind in our present setting. We've just recovered from TMI a year and a half ago, and I find interveners who are supposedly concerned about safety wanting us to rush to hearing without the information. I don't understand that.

I would think they would want all the data that can be gathered to be brought in this proceeding. That's the first thing I don't understand. They want to come right now without the data having been compiled.

The second thing I don't understand is this theory that we're somehow stalling. Why are we stalling? What's our motive? We're not stalling. We want the plant licensed. But we don't want to go into a hearing without the data we need to get it

licensed. It's absurd for us to rush to the door without any information, and we want to proceed in an orderly fashion, but we have nothing to gain by "stalling." We want that plant licensed. We want it operating.

I feel like I'm being accused of a crime that I couldn't possibly have committed, and I just -- the whole tenor of the questions and the remarks of interveners are that we have some ulterior motive for not wanting to get to hearing, and that just isn't so. And I can't imagine in my wildest dreams why it would be so.

CHAIRMAN LAZO: Well, one of the things that the Commission has tried to do in the past years when they reconstituted their rules of practice was to bring the parties together at a very early stage of the proceeding. We've had lots of construction permit proceedings, for example, where the interveners have been identified and have become full parties to the proceeding almost immediately after the application has been docketed, rather than waiting until the last moment and then finding that it's the applicant that wants to move ahead, and there's not time to complete discovery by the interveners.

Here I think it's quite clear that the parties do understand the basic issue. The issue has been identified. It hasn't yet been accepted as a contention in controversy because the parties have just never taken that next step to do that. There may be other issues that should be placed into controversy

because there's been a perfectly adequate pleading of those issues.

There's no reason why after those issues have been accepted as contentions that the interveners shouldn't have the right to discovery, whether it's on information that may become your final position or simply information that's in your possession.

MR. NORTON: Okay. And I agree with that in theory, but you have to look at the practicalities of the situation. We have consultants who are trying to get this report out so we can proceed. To take the deposition of a gentleman like Mr. Cluff today who hasn't got the -- in fact, the trench, the facility that's being done now, that's being photographed and logged this very moment, materials that are being age dated in some other state by some other laboratory and the data isn't in -- to take his deposition today and pin him down is a waste of time because --

CHAIRMAN LAZO: They're not going to waste their money on a useless act.

MR. NORTON: Well, that's my point, and that's what discovery is at this point in time. It's a useless act until it's all brought together. Come October 1st or actually in September when the report is submitted, at that point it makes sense. At that point opinions are reached and data can be cited upon which those opinions are based. Today that's not so.

MS. BROWN: Are we going to get the report October 1st?

MR. NORTON: We are going to get the report in September is my understanding. We have a firm commitment, and that's why we

used the date October 1st.

MS. BROWN: When in September?

CHAIRMAN LAZO: That's the first I've heard of that.

MS. BROWN: My whole problem is that --

CHAIRMAN LAZO: I want Mr. Norton to hear this.

(Pause.)

CHAIRMAN BROWN: Ms. Brown.

MS. BROWN: My whole problem is I have been informed by my geologic consultants that it will take anywhere from two to three and a half months for this report to be written. That means they're probably in the process of writing the report right now.

Is that correct?

MR. NORTON: Are you asking the Board?

CHAIRMAN LAZO: Let us just go back a moment. I heard somebody say that a report has been promised by September. Is that --

MR. NORTON: October 1, that's correct. Obviously we would receive it at the end of September.

CHAIRMAN LAZO: So the Woodson-Clyde report --

MR. NORTON: Woodward-Clyde, that's correct.

CHAIRMAN LAZO: I'm sorry. The Woodward-Clyde report is expected by October 1.

MR. NORTON: It's been promised by October 1.

And, incidentally, there is again an implication that

people are being kept in the dark. In early December of 1979, which hasn't been all that distant in the past -- I guess it's now six months -- we were all set for a field trip up here. Woodward-Clyde was going to show the NRC staff, and the interveners were going to come along, as far as I know, certainly an announced meeting, open meeting, as this is an open hearing, for a field trip up here.

At the last minute the staff had to cancel out. I think it was money; I'm not sure. It could have been time commitment, resource commitment elsewhere. But again, they were going to show people trenches and show them the work that was going on. It's not a question of trying to hide things. Right now it's a question of trying to get the work done. And you can't be engaged in discovery of giving up your data and having your people deposed while you're trying to get that report out. And I don't see where they gain any time by starting now as opposed to October 1 with formal discovery. I don't see how they gain anything if they're talking about an August hearing. It just doesn't seem necessary. All it does is slow us down.

CHAIRMAN LAZO: Ms. Brown, what do you gain by --

MS. BROWN: Two reasons. The trenches that a lot of the data has already been done on have already been refilled. There are still some trenches open. We would like to have our consultants take a look at those trenches. We would like to see the data on the other trenches to make a decision whether we have

to go back and retrench and make those arrangements. There are a lot of things that have to be taken into consideration.

Interveners, if we are allowed to, I think can take an active and very positive part in developing an analysis that we could present to this Board as soon as possible, along with the Woodward-Clyde. But right now we're being prevented. The trenches are being refilled, and we do not have the asset resources in back of us right now to go back and reduplicate a lot of the work that Woodward-Clyde has done. That's known.

But by not allowing us to at least begin now -- there's a major trench open now at the site on the question of the Bay Entrance Fault. We would like to have an opportunity to take a look at that trench. And unless there is some kind of indication that our experts can go in to look at it now, it's going to be refilled, too.

(Pause.)

MR. NORTON: Excuse me, Mr. Chairman. Perhaps we could help you with a comment based on Mrs. Brown's last remark.

I don't perceive that as traditional discovery in terms of produce all the documents you've got here and produce so and so for a deposition and so on. If they've got somebody they want to go down into a trench that's open and that's being worked on, we have no objection to that whatsoever. As a matter of fact, we would love an order from this Board ordering the staff and interveners to come and look at those trenches that are open because

we can't get them out there. And we'd love you to order them to come out and look at them.

MS. BROWN: I'm somewhat confused. We've never received an informal invitation to go out and --

MR. NORTON: We're talking about the staff.

MS. BROWN: Oh, you're not going to invite the interveners.

MR. NORTON: No. You're perfectly welcome to come with the staff. You know, there's no question about that.

MS. BROWN: With the staff. That's our problem. The staff indicated they're not going to be proceed until October 1st. We have been ready to proceed, and basically a lot of information is being literally covered up. And that's a pun.

MR. NORTON: Oh, come on. There has never been a request by the intervener to see any trench until this very moment, never, ever, orally or in writing or in any other fashion, ever. And I resent --

MS. BROWN: We asked informally for more detailed progress reports, and we got no response to that letter. The informal requests that we've made, primarily to Mr. Locke, have not really been responded to other than the two or three-page reports that Woodward-Clyde has submitted.

MR. NORTON: Incidentally, the geologists that are up here in the field, as I understand it, one of the lead geologists is from Humboldt State, is one of the students over there. I

assume these people talk. I assume they know that the McKinleyville trench was dug. As I understand it, it was in the papers, a big flap about the new airport building being built on it. These are not secret trenches that are being dug in the middle of the night.

MS. BROWN: I'm not implying they are.

MR. SCHINK: Is it my understanding then that if the interveners were to request access to the trenches, they could have them even if the staff were not present?

MR. NORTON: Absolutely.

MR. SCHINK: Would it slow your work if they were to ask you for the trench logs such as we see behind us as they became available, just a copy of those?

MR. NORTON: That I don't know. I suspect it would. Yes, both our consultants are saying yes, it would. I mean, because they're in the process of analyzing that data and putting this report together. And their offices are in San Francisco and --

MR. SCHINK: But a copy of those logs could be turned over, couldn't they, without interfering with your work?

MR. NORTON: Is that any problem?

MR. CLUFF: Sure. A copy.

MS. BROWN: I'm not asking for the original documents and the original samples of soil. What we'd like to see is copies of the data; that would be more than enough.

MR. SCHINK: Well, it sounds as if the applicant then

is willing to grant you access to the trenches and make available copies of the trench logs so that you could verify the logs on a spot check basis or completely if you have the manpower.

MR. NORTON: And the access to the trenches, of course, is --

MR. SCHINK: It would be limited but --

MR. NORTON: We would limit it to access with our people. We don't want a Geology 202 class down in the trench for a week.

MR. SCHINK: Would that meet the needs of the interveners?

MS. BROWN: How are we going to be going about getting these informal arrangements, getting PG&E notified that our geologist and perhaps another intervener is going to be going down into the trench, or is going to be at the site, or is going to be at trenches off the site?

How do we get access? Are you going to prepare a formal order that this is our right, or is this going to be done informally between the parties?

CHAIRMAN LAZO: It all depends on how accommodating licensee wants to be.

MR. NORTON: I assume we can do it informally. If we can't, then I guess she can always apply for a formal order.

MS. BROWN: Given that, I would appreciate that a formal order could issue from the Board so that that clarifies most of the matters for both parties.

MR. LINENBERGER: Well, just as an ignorant technical type here, I sense more interest in an arm's length formal negotiations than interest in downright day-to-day cooperation, pick up the phone, what's going on today, is it of any interest to us, how about one of our guys coming over, would it bother you if we asked for a copy of some data, and so forth.

I don't see why we have to have formal orders --

MS. BROWN: I have no problem with that. I would prefer to work that way.

MR. LINENBERGER: Well, I thought I heard you say you would prefer a formal order.

MS. BROWN: Well, that was only after Mr. Norton indicated he assumed that that would be all right, and if it wasn't all right, then we would have to go to the Board for an order. And I suddenly see less cooperation than I'd like to see from counsel.

MR. LINENBERGER: You know, there are all sorts of ways of pulling this Board into this area of --

CHAIRMAN LAZO: Into the trenches?

(Laughter.)

MS. BROWN: Would it be possible --

MR. LINENBERGER: Let me just finish my statement, please. There are all sorts of ways of getting us involved, but I promise you that it may not always turn out to be in your best interest to get us involved. It may not -- particularly in terms of time.

MS. BROWN: Exactly, exactly.

MR. LINENBERGER: And so I have to personally -- I won't speak for the Board here, just for myself. For gosh sakes, see if you can't work something out informally.

MS. BROWN: I have a proposal then. Would it be possible for Mr. Honea to contact a designated representative from Woodward-Clyde and make arrangements directly with the consultant as to what he wants to see, when he has an opportunity to see it, and what person at Woodward-Clyde would be available at any one particular day for him to review the documents?

MR. NORTON: It's possible. If Mr. Honea wants to make connections with Mr. Cluff, he is perfectly free to do so. And Mr. Cluff has been instructed by us as we sit here to cooperate. He wants to go down into the trench to show it to him. However, if Mr. Cluff has any questions, he will obviously contact us; and if we have any questions, we'll contact the Board. I don't anticipate that we will have as long as the requests are reasonable in terms of time, place and so on.

MS. BROWN: I promise no midnight meetings in the trenches.

MR. NORTON: Certainly not with me.

(Laughter.)

MS. BROWN: That's probably true.

I'm assuming that this offer would include Mr. Honea being able to bring other geologists or even attorneys to review

the trenches or the data.

CHAIRMAN LAZO: Well, you say other geologists --

MS. BROWN: I'm talking about would I be allowed to accompany Mr. Honea, would another geologist at Mr. Honea's request be allowed to accompany him on these prearranged days and meetings?

MR. NORTON: Again, that depends on the circumstances. If somebody's working on a trench and they're down there photographing and measuring and the things they do in trenches, and he wants to bring 30 people through the trench, the answer is probably no.

CHAIRMAN LAZO: I think we're getting beyond the point where this is very fruitful. Can't we agree that everyone is going to act in a reasonable manner?

MS. BROWN: I will act in a reasonable manner. So will Mr. Honea. Though I don't hear assurances from --

CHAIRMAN LAZO: Well, do we have an understanding as far as --

MR. NORTON: As I understand it, there is only one trench open; that's the one at the site at the moment. And that's limited obviously; there are not going to be large groups of people permitted access to the site and wandering around in the trenches. If Mr. Honea wants to go out and see the trench, no problem. He can contact Mr. Cluff, and they will make arrangements to do so.

MR. SCHINK: Well, it appeared to me that the intervenors are asking for something like three people to enter the trench.

MS. BROWN: Exactly.

MR. NORTON: Well, it's a nuclear site. If I take it it's Ms. Brown and Mr. Honea, or Dr. Honea, and someone else -- I don't know who the someone else is -- but assuming it's the same type of people that Dr. Honea and Ms. Brown are, fine.

MR. SCHINK: So you have no trouble with three people?

MR. NORTON: As far as I know, there's plenty of room in that trench for three people.

MS. BROWN: Just to clarify one other item, I'm also assuming that this does involve copying of trench documents. You have no problems with that either?

MR. CLUFF: I think we have to be clear about the data that's shown on various trench logs. If we have our trench logs that are near the final stages of preparation and interpretation, then we have no trouble with that. But anyone who's been involved in logging trenches of the detail that we get engaged in, there's no way that I would allow anybody to have access to a trench log that we prepared yesterday, because it's going through an evolutionary process to get the information down, and it may be misrepresented. And so I don't see how we could have complete access to --

MR. NORTON: They can have the trench logs that are

completed as they're completed.

MR. CLUFF: Yes.

MS. BROWN: Fine.

MR. NORTON: No problem with that. As they've completed and are satisfied that they have a finished trench log and it's their finished product, we'll make copies of it and send it to the interveners.

MS. BROWN: Okay. Can Mr. Honea also obtain those completed trench logs also informally by contacting Dr. Cluff at Woodward-Clyde?

MR. NORTON: No. As far as documents go, I think we will do that through the attorneys and provide them. I mean, they'll be provided, but I think we want a record of them, not an informal passing on.

MR. PATWARDHAN: Just by way of clarification, I think on this project, as on any nuclear project, we're all bound by quality assurance requirements, so in terms of making documents available, it will be appropriate to make those documents available, only those documents available that have been processed through the quality assurance process.

CHAIRMAN LAZO: And that's what you're referring to as a completed log.

MR. PATWARDHAN: Right. As a completed log. For instance, any log or any raw information that one person takes is subject to review and the other steps of the quality assurance

process. Every completed log could be made available.

MR. NORTON: These will be provided by Woodward-Clyde to PG&E. As they're completed, we will pass them on with a transmittal letter copying the Board and NRC staff, and we'll probably pass the logs on the staff as well as the intervener at the same time, and the staff can put them in their file until they can get to them.

MR. SCHINK: Those would presumably be completed before October 1st since they'll be required for the final report.

MR. NORTON: I'll presume that. I'm operating under that assumption.

MS. BROWN: Dr. Honea has asked if he can address you just for a short period of time.

CHAIRMAN LAZO: I'm sorry, Ms. Brown.

MS. BROWN: May Dr. Honea address you just for a short period of time?

CHAIRMAN LAZO: Yes, surely.

MR. HONEA: Yes. I think what I want to look at is information that's valuable as we go along and do it informally, not to have final things that I can say well, wait, you said this. And what the problem is with all the delays, I haven't been able to keep abreast of it since literally 1977. Before there I was abreast of everything that was happening. I knew where trenches were going, why they were going, what was happening. But since then all that we get is delays, and so it's like, you know, there's

now almost three years of activity that I have no idea what actually has gone on.

Sure, I know where they are trenching because you can see them from the road and what have you but as far as what's going on, I need to have a better feeling for what they're finding and what's going on. That's a long, sort of dry period when you're abreast with a project.

CHAIRMAN LAZO: Well, then, are you asking for completed trench logs going back to some particular date?

MR. HONEA: Well, no. You know, the completed logs that they have for this period of study since material was available. I mean, material just hasn't been available because all we get is an outline that they're going to drill holes or they're going to do trenches, but we don't get any results. And so we can't evaluate even if the delays are justified or if they have already found, you know, important findings.

CHAIRMAN LAZO: Well, tell your counsel what it is you want. I think we've had an agreement that counsel ought to be able to work this out among themselves. They're not going to open up any old trenches.

MR. HONEA: Right.

CHAIRMAN LAZO: I can assure you of that.

MR. HONEA: Sure.

MR. LINENBERGER: Well, I'd like, Mr. Honea, for you to be -- perhaps not draw any improper inferences from our silence on

another point. You said you were unable to tell whether delays were justified.

Now, I would expect Mr. Norton to address this, but this particular Board member would feel a little concerned if you were making judgments about the expedience or lack of same with which Woodward and Clyde is doing their job as to whether delays are justified or what schedule they used to do things.

I say that I would suggest you stick to the facts and not pass judgments on the management decisions of Woodward-Clyde here. I think that gets into an area that comes under an different set of circumstances.

MR. HONEA: That wasn't what I intended. What I meant was I assumed that when they say we need more time to study the issues, that there's no negative things that have come up, I'd like to be evaluating the data to see if I feel that there has been negative things that have come up, you know.

It's just an evaluation. I didn't mean to go in and say how they should be doing it or anything like that. I didn't mean that.

(Pause.)

CHAIRMAN LAZO: Well, it does appear that we've made some progress. Just as a matter of housecleaning, let's be sure what it is we've agreed upon.

I think unless there are any further comments, the Board is in a position to rule on the motion to hold the proceeding

in abeyance until October 1, and I gather that there is a consensus that that is what we should do at this point. The Woodward-Clyde report has been promised by October 1. The interveners, joint interveners have been assured of some cooperation in terms of getting the information that they need between now and then as far as visitations to open trenches are concerned and completed trench logs that have been prepared in connection with the preparation of this report.

Are there any other matters that we can attend to while we're here or any open motions that have not been ruled upon?

MS. BROWN: Is it possible to take some step today and delineate when we're actually going to be framing contentions and proceeding to formal discovery and hearing?

CHAIRMAN LAZO: At the time that Collins et al. and Six Rivers filed their original petition, there were what appear to be some contentions attached to that document. They're interwoven with portions relating to interests of the various members. They're not well-written, although the original petition board did find at least one contention there which was acceptable.

We would be willing to provide a time period in which you could file amended contentions, if that would suit your purpose, and then give each of the other parties an opportunity to respond to those.

MR. NORTON: Mr. Chairman?

CHAIRMAN LAZO: Yes, sir.

MR. NORTON: I share your feelings regarding the so-called contentions that are present, but doesn't it make sense -- maybe it doesn't; maybe the interveners don't need to see the facts before they draw their contentions -- but doesn't it make sense that they see the report of October 1?

I would hope they would go into this with an open mind, and maybe their contentions would disappear when they see the report.

MS. BROWN: I didn't presume that you intended for us to frame our contentions before the October data was in.

CHAIRMAN LAZO: No. I was just trying to find a date. Well, why don't we do that? Set a date some certain period of time, reasonable time, after which -- after the report has been received, by which time the joint interveners would file an amended set of contentions.

MS. BROWN: And with a period of time thereafter for staff and PG&E to respond to those contentions?

CHAIRMAN LAZO: These would be set by the rules.

MS. BROWN: That's fine.

CHAIRMAN LAZO: Thirty days after the report's received or whatever is -- you feel comfortable with.

MS. BROWN: I'd like 45 days after the report is received, we'll be willing to do that.

CHAIRMAN LAZO: All right. We'll incorporate that in our order then.

MR. GOLDBERG: Mr. Chairman?

(Pause.)

MR. GOLDBERG: Mr. Chairman?

CHAIRMAN LAZO: Yes, sir.

MR. GOLDBERG: The staff certainly will do what it can to --

CHAIRMAN LAZO: Oh, you'll be in a new fiscal year by then.

(Laughter.)

MR. GOLDBERG: I wish I shared your optimism. I just would like to say without really belaboring the point, it's quite possible that we will have to seek some relief from that reply period, depending on the nature and scope of the contentions, if I'm unable to get the technical assistance I need.

I don't want to disturb your record right now, but we are still operating under some constraints, at least in the foreseeable future; and I don't know how that's going to be altered by the character of the document that we receive from PG&E, but that's still a consideration we labor under.

CHAIRMAN LAZO: Well, that's fair, and thank you for bringing it to our attention.

Well, unless there are any other matters that we can profitably devote our time to tonight -- it's getting on towards 6:00.

We would like to thank you for all coming and for your

patience. We also wish to express our thanks to the custodians of this building for making it available to us.

One more call. Any other matters?

Hearing no response, the prehearing conference is adjourned. Again, thank you very much.

(Thereupon, at 5:40 p.m., the conference was adjourned.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

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in the matter of: PACIFIC GAS AND ELECTRIC COMPANY
HUMBOLDT BAY POWER PLANT UNIT NO. 3
Date of Proceeding: June 3, 1980

Docket Number: 50-133

Place of Proceeding: Eureka, California

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Sharon Connelly

Official Reporter (Typed)

Sharon Connelly

Official Reporter (Signature)