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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Title: NRC STAFF BRIEFING ON DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR A PROPOSED HLW GEOLOGIC REPOSITORY PUBLIC MEETING

Location: Rockville, Maryland

Date: Tuesday, September 21, 1999

Pages: 1 - 61

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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OFFICE OF THE SECRETARY

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NRC STAFF BRIEFING ON

DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

FOR A PROPOSED HLW GEOLOGIC REPOSITORY

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PUBLIC MEETING

Nuclear Regulatory Commission

One White Flint North

Building 1, Room 1F-16

11555 Rockville Pike

Rockville, Maryland

Tuesday, September 21, 1999

The Commission met in open session, pursuant to notice, at 9:30 a.m., the Honorable GRETA J. DICUS, Chairman of the Commission, presiding.

COMMISSIONERS PRESENT:

GRETA J. DICUS, Chairman of the Commission

NILS J. DIAZ, Member of the Commission

EDWARD McGAFFIGAN, JR., Member of the Commission

JEFFREY S. MERRIFIELD, Member of the Commission

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STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

KAREN D. CYR, General Counsel

ANNETTE L. VIETTI-COOK, Assistant Secretary

LAKE H. BARRETT, Acting Director, Office of Civilian Radioactive Waste Management

WENDY R. DIXON, EIS Project Manager, Yucca Mountain Site Characterization Project

ALAN BROWNSTEIN, Director, Regulatory Coordination Division, DOE

JOSEPH ZIEGLER, Booz-Allen & Hamilton, Technical Support Contractor to DOE Yucca Mountain Project

P R O C E E D I N G S

[9:33 a.m.]

CHAIRMAN DICUS: Good morning, ladies and gentlemen. On behalf of my fellow Commissioners I would like to welcome the representatives from the Department of Energy, DOE, for today's Commission briefing on one of our favorite topics, Yucca Mountain and the draft Environmental Impact Statement, the DEIS.

DOE's completion of the High Level Waste Viability Assessment was the last related major milestone the Commission was briefed on, which was I think back in February. At that point DOE recommended to the President, the Congress and the public to continue site characterization, demonstration and testing for the performance confirmation process.

I would like to recognize that this briefing is part of an ongoing constructive dialogue on a very important topic. Today we will hear from DOE regarding the status of the progress made subsequent to completing the viability assessment as well as specifics related to the DEIS proposed action to construct, operate, monitor and eventually close a geological repository at the Yucca Mountain site.

Do any of my fellow Commissioners have any opening remarks that they would wish to express?

[No response.]

CHAIRMAN DICUS: At this time, then, I would like welcome Mr. Lake Barrett, DOE's Acting Director of the Office of Civilian Radioactive Waste Management and one of today's presenters, and if DOE does not object, and Mr. Barrett in particular, if you do not object, we may stop your presentation from time to time to ask pertinent questions. However, we will endeavor to let you get through your presentation with minimum interruption, if any, and then save our general questions until the end, so if you would please take a minute to introduce your colleague and then proceed with the briefing.

MR. BARRETT: Thank you very much, Madam Chairman.

I would like to introduce Wendy Dixon, who is our Environmental Impact Statement Project Manager for the Yucca Mountain Project. She was in charge of the DEIS product that we have so far and that aspect at NEPA.

What I thought I would do is take about two or three minutes and put the Environmental Impact Statement effort to which the DEIS is the first major product into perspective in the entire program and then turn it over to Ms. Dixon, who will present the details of the Environmental Impact Statement. I will move to the mike and the chart here.

I believe that this will be on the TV and also Commissioners will have copies.

The viability assessment was completed at the end of last year, and as the Chairman mentioned, to continue onward, the draft Environmental Impact Statement just came out this past July. It was actually published in August.

It is part of our integrated program at the Department of Energy to determine whether the Yucca Mountain site is suitable and, if suitable, continue onward. These symbols represent the next milestones, which would be the site recommendation to the President if the site is determined to be scientifically suitable, and then the license application that follows that, and I will describe that a little bit on how the draft Environmental Impact Statement and final will fit into that, and the interactions we have with the Commission.

In the site recommendation, which we have currently scheduled for July '01 to the President, under the statute there's actions for the Secretary to do and there's also actions for the Commission. Basically the entire milestone rests on our science and technology program, which is an integrated science and technology program for both the environmental activities, the draft EIS and the final EIS as well as the site suitability, site recommendation process.

If you notice that under the statute the Nuclear Regulatory Commission has an important role to play where it would provide under law, and I will quote from the law, "The

Commission's preliminary comments concerning the extent at which the Act depth site characterization analysis and waste form proposal for such site seem to be sufficient for inclusion in any application submitted to the Commission."

That letter with any views of the Staff would basically accompany the Secretary's letter to the President at that time. Also, the final Environmental Impact Statement, which would be built upon the draft Environmental Impact Statement, which we will be discussing here today, would also be accompanied with that package.

Then if we finish that and the site is determined to be suitable, then we would continue on to the license application, of which the EIS would accompany the license application to the Commission, so I think it is timely that the Commission focus on the draft EIS, and also there we will have the post-closure in our safety analysis report and the pre-closure aspects to it of which the quality assurance requirements will go all through all aspects of it. As I believe you are aware -- the Staff has briefed you -- we are working very hard on our quality assurance to qualify our data to establish the necessary documentation of the processes that were followed for the license application.

As you are aware, we are under severe budget uncertainty at this point until Congress later this month acts on our budget, and hopefully there will be some

longevity to the decision that they may have, as to how we are going to handle these milestones and their timing.

Our first priority is to focus on the site recommendation to see if we have a scientifically suitable site, and our second priority would be the license application. We would have to maybe defer this. Now the NRC sufficiency letter is an important part, so you are a major activity within our site recommendation plan, so we have a constant interaction with your Staff. We run an open and transparent scientific program. All the information is available to all the parties as we go forward, but what we would do is we would defer the majority of the preclosure activities.

This would focus on the buildings and the handling facilities. We know how to safely handle fuel and we believe we can make an application that would address fuel handling. What has never been done before is the demonstration of the post-closure, 10,000 year performance, so this is our main focus, and we will do what is necessary in the pre-closure for the sufficiency letter, but our main focus is here, so until we know the outcome of the budget, we don't know what the schedule will be.

I suspect that the license application date is the one most in jeopardy. The site recommendation date we will hold as best we can based upon the money available to do the

necessary work and also what we find in our science programs as we go forward.

That is sort of in summary where we are. We can go to Ms. Dixon's presentation or whatever the Commission would desire.

CHAIRMAN DICUS: Are there any questions on these slides before we go further, anyone?

COMMISSIONER McGAFFIGAN: Just one question, on quality assurance, which you have in that vertical line there. How are you going to prioritize getting the information you need for the site recommendation done within budgets or can you get it all done in time for the site recommendation, the quality assurance on the date that is going to be underlying the site recommendation?

MR. BARRETT: For the integrated science and technology program for the site recommendation it has a lot of components to it. There are over 1400 datasets and there are over 140 what we call analysis in model reports, and then there are nine primary process model reports, which are then synthesized into the TSPA -- Total System Performance Assessment activities.

We are working on the quality assurance documentation for all of those things and we are tracking those with metrics on the datasets as to how many are qualified and how many are not. Basically the work being

done is world-class science and we basically are focused on getting the best scientists in their field to work in a particular area. We are not working with them in the National Labs and in the USGS and others to basically assure that the documentation and the processes are properly documented and were done under Nuclear Regulatory Commission rules as the staff and we have basically an improvement plan that we have submitted to the Staff and discussed with the Staff and your onsite Staff and the Staff here monitors that, so we are in a process of qualifying the data.

I suspect in the site recommendation not 100 percent of the data will be qualified. That will have to be at the license application, so we don't know what -- we have goals, we have commitments that we have made to the Staff, but it will not all be qualified at that time, but it will be good data, but it will not have the necessary -- you know, we explain to our folks that world class science is necessary but insufficient for a Nuclear Regulatory Commission submittal, and we are working to do that with the Staff.

CHAIRMAN DICUS: If I could follow up on the Commissioner's question and your response, I understand -- I want to be sure I understand this -- that maybe about 20 percent of what is submitted will not be qualified or roughly in that ballpark.

Now looking at this Slide 4, would the bulk of the unqualified be in that top tier, Total System Performance Assessment, et cetera, or are there other places?

MR. BARRETT: At the period of site recommendation, I believe the number around 20 percent may not be qualified as yet at that time. At the time of the license application we expect to have 100 percent of the data will be qualified at the license application.

COMMISSIONER McGAFFIGAN: If I could just follow up, in terms of you face this budget crisis -- which we wish you well on and hope you get your full budget -- but how high a priority is this, depending on what the depth of the cut is? Will you continue to make trying to get the quality assurance -- getting the data qualified a priority, or could -- you said earlier you are going to try to hold to the site recommendation date to the extent you can and the license application date could slide -- could there be a significantly less than 80 percent of the data qualified at the time of site recommendation or would you try mightily to make that another thing that doesn't slide?

MR. BARRETT: We don't know until we look at it. Here is where straight numbers -- 60, 80, 90 percent -- are difficult.

What we have done to prioritize our work, we have a repository safety strategy which is based on the total

system performance assessment and we are using that as a guide for what data and what process models are the most important as it relates to long-term performance, the 10,000 year performance.

If we have a dataset which are very important in the long-term performance, that is the dataset that we put our priorities on to get the best pedigree on that information, whereas maybe we will have a lot of datasets, but those datasets may be feeding a process model that is not as important to the overall performance as the Staff sees it or as we see it, so we work carefully so we try to prioritize and put our efforts where it is most meaningful to most effectively use whatever resources we get through the process.

We don't use numerics so much as the guide is it the most important data in the processes that's most meaningful to the performance of the site and the suitability of the site.

CHAIRMAN DICUS: Commissioner Merrifield, did you have a follow-up?

COMMISSIONER MERRIFIELD: No.

CHAIRMAN DICUS: Okay. Ms. Dixon.

MR. BARRETT: Ms. Dixon.

MS. DIXON: Thank you. It is a pleasure being here this morning.

CHAIRMAN DICUS: A pleasure to have you.

MS. DIXON: As you know, the topic of my presentation is tied to our recent release of the draft Environmental Impact Statement. On Slide 2 we discuss what the Environmental Impact Statement drivers are, in addition to the requirements under NEPA.

Certainly the Nuclear Waste Policy Act requires a final EIS to accompany both the site recommendation as well as the license application. It also states that we need to prepare a technically adequate EIS that can be adopted to the extent practical by the Nuclear Regulatory Commission.

The Nuclear Waste Policy Act is something else as well, and it provides a roadmap for the actual preparation of the Environmental Impact Statement. That roadmap basically includes statements from the Nuclear Waste Policy Act that stated that the EIS need not consider either the need for a repository, the time of initial availability of a repository, alternatives to geologic disposal or alternatives to Yucca Mountain.

So DOE is the lead agency for preparing the document. We went out and competitively solicited for a contractor to help us prepare the document, and that contractor is Jason Associates. Jason has several subcontractors, including Tetra Tech NUS, Battelle, and Dade Moeller and Associates.

To prepare the information for this EIS, we did, as Lake was mentioning, rely on existing technical studies and information that have been gathered and collected over the last couple of decades by the M&O contractor, by USGS, and by the national laboratories. And where necessary and appropriate, we also developed new information to supplement the existing information.

Next slide.

The proposed action, as you indicated, clearly is to construct, operate, and monitor and eventually close a geologic repository for the disposal of spent nuclear fuel and high-level nuclear waste.

The Nuclear Waste Policy Act basically says that you can't put any more in the repository beyond the 70,000 metric tons until such time as a second repository is in operation, so the proposed action is limited to that 70,000 metric tons of heavy metal, 10 percent of which is allocated to the Department of Energy spent nuclear fuel and high-level waste, the rest to the commercial spent nuclear fuel side of the house.

The EIS describes and evaluates the current preliminary design concept, and it also identifies design features and alternative design concepts that DOE is considering in the final design. We recognize up front in this DEIS that this is not necessarily the design that we'll

be going forward with, and the Department will continue to try to enhance and improve performance of the repository as time progresses.

The analytical structure of the document is on slide 5. The real decision that this EIS is supporting is tied to whether or not to recommend the site to the President, and it has per our discussion two major alternatives. One is the proposed action to construct, operate, and monitor and eventually close, and the other one is the no action analysis, which in our calculations is basically the status quo, leaving the material where it is.

There are two scenarios tied to that. One is dealing with institutional control for the entire 10,000-year time frame, and the other one is tied to institutional control for 100 years, and then like the repository not taking credit for institutional controls after that 100-year time frame is over.

What our attempt was was to provide a baseline from which to compare the proposed action against. In order to understand the full range of environmental impacts in the EIS, we looked at three different thermal load scenarios, a high tied to 85 metric tons, immediate, which is 60, and low, which is 25. When we looked at what the impacts were for long-term performance, there were not great differences as it related to long-term performance in the calculations,

but there were differences in the preclosure time frame, tied principally to the fact that the low thermal load is a larger repository, it requires more construction material, more people to help support the activities, more land will be disturbed. So there are a number of differences, but the larger difference are really the preclosure differences rather than the postclosure differences.

We also looked at transportation scenarios. We on a national level tied them into two different groupings. One was doing the calculations, looking at a mostly rail scenario, and we said mostly rail because we recognized that there were a few reactor sites that did not have rail access or did not have the heavy crane capability to actually deal with the heavier casks. The other side of the house was the mostly legal-weight truck scenario, and in that scenario we drove all the transportation through legal-weight truck when possible, recognizing that there were a few areas where you could not use legal-weight trucks, such as the Navy Spent Fuel, which is too heavy to, you know, be transported by a legal-weight truck.

In the State of Nevada, we have additional transportation scenarios that we took a look at, principally because Nevada does not have rail access all the way to the Yucca Mountain site. So we looked at the potential impacts of constructing a rail corridor in the State of Nevada, and

there were five different alternative corridors that we evaluated along those lines.

We also looked at the potentiality of constructing an intermodal transfer station. There are three intermodal transfer stations that are evaluated, and then five resulting heavy-haul truck lines that would come from that.

On the packaging side of the House, again trying to get a reasonable understanding for potential impacts that could occur as a result of this program, we looked at two scenarios. One was mostly canistered, where the fuel would come in canistered when at all possible, so that you would no have to handle it again. And on the other end of the coin, we looked at the fuel coming in mainly uncanistered. And obviously there are key differences in the size of the waste-handling facility, the numbers of workers involved, the amount of land that would be disturbed. The worker dose calculations are different between the two scenarios.

Cumulative impacts is also an area that we spent quite a bit of time in in the environmental impact statement. When we went out for comments for the DEIS, we had a number of comments from various entities asking us to look at additional fuel inventories that may at some point in time end up coming to the repository. So we added a module that looked at the potentiality of 119,000 metric tons of fuel coming to the repository, of which 105 would be

commercial spent nuclear fuel. And that was presuming that all the reactors had another operating renewal lifetime of 10 years. There's also the remainder of the DOE spent fuel in that calculation and the high-level waste, DOE high-level waste.

We were also asked by several parties to look at other materials judged greater than Class C for cumulative impacts in the EIS. So we also looked at greater than Class C waste from the commercial side of the House, and DOE's equivalent of that, which is your special performance assessment required waste.

On the transportation side of the house, under cumulative impacts, we went back to basically 1943 to start looking at cume impacts and moved it out in the future to 2047, and our cume impacts for transportation include transportation of all radioactive materials, not just, you know, tied to spent fuel and high-level waste, but things that could occur or have occurred from the medical side of the house, from research labs and so forth. And it also includes the modules that I just discussed.

Other cumulative impacts included impacts from the Nevada Test Site, local mining in the area at the Beatty low-level radioactive waste disposal site, Nellis Air Force Base is just -- on the northern side of us is one of our neighbors. And there was a list of others.

The areas of analyses in the EIS are on the next slide. There are a number that tie to short-term analyses. This is the preclosure time frame, basically the first 100 years. And then we looked at long-term repository performance, no-action alternative, and cumulative impacts.

The ones that I underlined under the short-term analyses, health and safety, accidents, and transportation are the ones that I intended to spend the greatest amount of time with for this presentation, because we're of the belief that those were probably the ones that were of greatest interest to you, although the other areas are addressed also.

Let's start out with health and safety then. The primary sources of information for the health and safety calculations came from DOE site data, NCRP information, ICRP information, and DOE has a computerized accident/incident reporting and record-keeping system that we relied upon as well. Potential impact sources include radionuclide releases and direct radiation, silicar or cristobalite releases, and obviously industrial accidents.

Next slide.

The impact indicators include the public, which would be, you know, population dose and the hypothetically maximum exposed individual, and then we looked at both the involved and noninvolved worker, with the involved worker

being the worker that's directly associated with the activity that we're looking at, and the noninvolved worker being the other workers that are in the general area that could be affected by what that activity is. And again we looked at the population and the hypothetical MEI.

The analytical approach differs, obviously, depending upon which category you're looking at. As it relates to cristobalite, we estimated offsite concentrations and qualitatively evaluated the involved worker exposure. Obviously, you know, we need to stay within the limits of the law as it relates to the threshold limit value, and the assumption is obviously the fact that we will. On the industrial side of the house, we estimated the worker full-time equivalent and used the workplace fatality rate of 2.9 fatalities per 100,000 FTE's to calculate the number.

On the radiation dose side of the house, we estimated the dose from radon-22 and progeny, krypton-85, external radiation from fuel and waste-package handling and subsurface to ambient external radiation. We converted the public and worker dose estimates to human health impacts using ICRP-60.

With respect to an overview of the impacts that we found when we did the calculations for health and safety, the highest dose rate to the public, and this is on the low thermal load side of it, and the numbers that we're

presenting here are for 20 kilometers, was 1.8 millirem, and that came from radon during the preclosure time frame.

The highest annual population dose was 4 to 10 person-rems. The rad dose to the public in terms of impacts which we calculate in terms of latent cancer fatalities was up to .4, again contributed by the radon numbers over 100 years. And then the radiological impacts to workers that could result from this activity ended up being from three to four latent cancer fatalities over 100 years.

Industrial workplace hazards could result in up to 1 to 2 fatalities over the 100-year time frame. Again, these were all done, you know, in the preclosure time frame.

Accident impacts. The primary sources of information came from the Department of Energy, the Nuclear Regulatory Commission, and other agencies as well. Potential impact sources were from radiological releases and structural failures. Impact indicators, they include the public and both the involved worker and the noninvolved worker.

Analytical approach. We started out with approximately 69 different scenarios, trying to come up with, you know, what would be a reasonably foreseeable accident scenario. And from that 69 we binned a number of them. Some of them were not credible, and we dropped them off the table. And when we were finished, we ended up with

16 different scenarios that were considered. We used the MACCS2 code, and our consequence analysis did not include the probability of occurrence. We just assumed that there would be one, probability of 1.

Next slide.

On overview of impacts, our maximum reasonably foreseeable accident was an earthquake which was estimated to occur once every 50,000 years. And the highest dose to the public from such an occurrence was estimated at 320 millirems. This is a really large earthquake, as you can understand, and there will be bigger problems than perhaps the 320 millirem release to the public from this. We're presuming that under this scenario, the waste handling facility would collapse, the waste treatment facility would collapse, and the majority of the fatalities that would happen on the site would be from the collapsed structures. This is two times the design basis that is included in our design activities, the design basis accident.

Under transportation, primary sources of information evaluated included the information from the Department of Energy, information from the Department of Transportation and the Census Bureau, State accident data, information from other environmental impact statements who have done transportation impact analyses, and the Nuclear Regulatory Commission.

Impact indicators included workers, again both population and MEI, the public, which included populations within one-half mile of the route and hypothetically maximally exposed individuals within 50 miles for an accident, and other resource areas within Nevada, such as water biology and socioeconomics, and this is tied in large part to the construction of a rail line or upgrades for heavy haul in the State of Nevada.

Next slide.

Analytical Approach. We used a number of models in doing the calculations for transportation. One included CALVIN, which provided us with the numbers of commercial SNF shipments. We used HIGHWAY and INTERLINE to provide route data. We used RISKIND to provide us with MEI doses and population doses, and we used RADTRAN4 to provide us with dose to the public and workers and dose risk from accidents.

With respect to an overview of impacts, the impacts from a legal weight truck resulted in approximately 29 LCFs and 11 traffic fatalities. This is principally tied to very low doses to large numbers of people. On the traffic fatality side of the house, this includes commuting and transporting materials and equipment, as well as SNF and high level waste.

On the rail side of the house, the number equated to 6 LCFs with 16 traffic fatalities. The maximum

reasonable foreseeable accident that calculated, depending upon whether it was rail or truck, varied between 5 to 31 latent cancer fatalities, and the accident probability per year of such an accident occurring is 1.4 to 1.9 in 10 million.

Long-term repository performance. Primary sources of information evaluated included DOE reports, studies and data, other Environmental Impact Statements, the National Research Council report "Technical Basis for Yucca Mountain Standards," information from the viability assessment, USGS and National Labs, EPA, IAEA, and ICRP technical reports.

We did try to use the information from TSPA calculations that were integrated with the rest of the program on TSPA calculations. There is some small variations from the TSPA calculations that were done for the VA. This is a little bit more conservative in nature than some of the VA calculations, but the numbers are not substantially different.

Impact indicators included impacts to the public within an 80 kilometer radius, the public within the groundwater flow area.

Analytical approach, again, is tied to the TSPA that was used for the rest of the program. We did estimate population and the hypothetically maximum exposed individual, unlike VA, at four distances. We did our impact

calculations at 5 kilometers, 20 kilometers, 30 kilometers and 80 kilometers, and there was also a population dose number that we calculated.

Under analytical approach, Slide 17, we did a collective dose to LCF conversion using ICRP-60. We also did a calculation tied to the hazard constituents using the MCLs and comparing them to MCLs.

With respect to the overview of impacts, and, again, these numbers are all done at 20 kilometers, but, as I indicated, we do have information on the other distances as well, the maximum exposed individual during 10,000 years, and these are in terms of mean values, we also did the 95th percentile as well on the EIS, were .2 millirems per year. That equates to considerably less than 1 LCF.

Population impacts during the 10,000 years, again, in terms of mean value, were .37 person-rems. And, again, this calculates to considerably less than 1 LCF. And our chemical analyses as it relates to the MCLs, they were all below the MCLs during the 10,000 year period.

We also looked at carbon-14 as it related to long-term repository performance. These numbers were fairly small. The maximum release rate occurred at 19,000 years. We are talking .098 microcuries per year, with an average dose to the local individual of 7.8 times 10 to the minus 12 millirem per year, and the maximum population dose of 2.2

times 10 to the minus 10 person-rem per year.

Next slide, No Action. There were a number of comments that occurred during our scoping timeframe asking us to spend a lot of time and a lot of careful consideration to the no action alternative. And I guess I would say that this Environmental Impact Statement has more in the line of detailed analyses on no action than you would normally find in a no action discussion and Environmental Impact Statement, and a large part of it was done to, you know, respond to the comments that we had during the scoping timeframe.

The Environmental Impact Statement, when it discusses the no action alternative, recognizes upfront that we don't know what course of action might happen if this program is not viable. We don't know what the NRC would do. We don't know what the utilities would do. We don't know what Congress we do. We don't know right now what the Department of Energy would recommend. This is somewhat speculative at this point in time. So what we wanted to do was to provide a baseline for comparison, as I mentioned earlier, for the proposed action. And what we did look at was the long-term storage at current storage sites with effective institutional controls for at least 10,000 years.

We tied it into the EA for Calvert Cliffs for the IFSI as a typical, you know, storage facility and did our

calculations, you know, with that as our bases. And there is an MEI and a population dose tied to that.

We also did a long-term calculation that has the same information for the first hundred years, but after the first hundred years we did not include active institutional controls. And that was a very highly stylized approach. We relied on a lot of current site information from the sites around the country. We used population data and local information and the inventories that were available, but, again, it was stylized. We weighted the information to come up five different regions, there is five different MEIs in this calculation, there is five different intruder calculations that we did for the no action, loss of institutional control scenario, and, principally, we regionalized in part to simplify the information.

The desire that we had was to be able to compare the impacts from leaving the material at 77 sites as a total inventory with the impacts of moving the material to one site for the long-term, same amount of inventory.

Primary sources of information evaluated included the DOE reports and data, information from the Nuclear Regulatory Commission. We went to the NRC libraries, we pulled the EAs and NEPA documents that had been done for all the nuclear facilities that were available, and used that information in preparing our analyses. We also gathered

information from other NEPA documents that were tied to the Department of Energy and information from Total Systems Performance Assessment.

Impact Indicators, we focused on no action analyses on human health, that was our primary emphasis. We did calculations for the hypothetically maximum exposed individual. We calculated, as I mentioned, population doses, and there is also calculations for both the involved and non-involved workers.

Our resources that were evaluated, and they were evaluated but they were more qualitative in nature.

On Slide 21, the analytical approach, when we started the calculations we assumed that the spent nuclear fuel and high level waste was already in safe dry storage. This could be either in surface and below grade facilities that the material is in stainless steel dry storage canisters with concrete shields.

The hypothetical regions were used, as I mentioned, to simplify the analyses. They were mathematical constructs. We developed concrete storage degradation models to be able to do the calculations. There wasn't one for us to use from the rest of the program, so there was a lot of effort put forth to come up with a degradation model for this purpose.

We did adopt three process models from TSPA which

included the storage canister degradation process model, cladding degradation, and the SNF and high level waste dissolution model.

On the next slide, tied to analytical approach, we developed the facility active release model to estimate release of the dissolution products to the local environment. The computer code we used was called MEPAS. It's Multimedia Environmental Pollution Assessment System code. This is the code that was developed by P&L. It's been used in a number of DOE NEPA documents including the WIPP No Action analyses in their EIS.

One of the reasons we selected MEPAS was because it had the ability to look at transport through not only groundwater but surface water and air as well. In the No Action analyses, most of the impacts come from surface water, which is a little different than obviously the repository scenario.

This computer code also provides information on dose and generates latent cancer fatalities. Next slide.

We realize that the No Action scenario was somewhat sensitive in nature. We were very much concerned that there could be the optics, if we were not very careful, that people would say you're cooking the books, you're trying to make the proposed action look really good and the No Action look really bad, so we were very, very careful

when we did our calculations.

We did end up putting forth a senior technical panel that we wanted to have help us in coming up with the analyses that we were doing and reviewing the assumptions that we put forth in providing input into how we did the calculations and on Slide 23 you see the members of that panel, who were very, very helpful, very critical and provided us with a lot of good information and insight for us to do the No Action calculations.

In most cases where there was a side to err on as to whether or not you did the calculations which would result in either more impacts or less, for No Action we usually went down the path of the lesser in the terms of impacts, again because we wanted to make sure that no one could come back later and say, well, you have stacked the deck on this, so we feel fairly comfortable with our analyses.

There was a lot of spent on doing No Action in this EIS. In Slide 24 you see the overview of impacts, and the No Action calculation we have on the repository side of the house, basically the loss of jobs for not moving forward. In scenario 1, taking credit for institutional controls for the whole 10,000 year timeframe, we ended up with approximately 31 latent cancer fatalities and interestingly enough almost half of that number happens

during the first 100 years when our assumptions are that you have an IFSI located adjacent to an operating nuclear power plant and you are ending up again with small doses to large numbers of people because your non-involved workers are contributing largely to that dose number.

There would be approximately 1,100 commuting and worker accident fatalities and again we did do calculations on people going back and forth to work supporting the IFSIs, just as we did calculations on people going back and forth to work during the repository side of the house.

On scenario 2, where we did not take credit for institutional controls after 100 years, you find the first 100 years with the same kind of number for latent cancer fatalities. I don't have it here as a bullet but it ends up being approximately 16 and again it's the same exact calculation that you do for scenario number 1. For the remainder of the timeframe, we ended up with 3,300 latent cancer fatalities and obviously the potential contamination of all 77 sites and surrounding resources areas.

There was a lot of discussion on coming up with reasonably foreseeable accident scenarios under loss of institutional control and a lot of dialogue, as you can probably well imagine. We did include in there, and it was strongly encouraged to do an accident analysis for this one as well. The accident that we did for both scenario 1 and

2, although the impacts -- there were really only impacts for scenario 2 because at that time the facility is degraded is an aircraft crash into the degraded facility and that resulted in from 3 to 13 latent cancer fatalities.

Cumulative impacts -- cumulative impacts, as you know, include the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future federal and non-federal actions.

We already mentioned the national transportation of radioactive material on the Beatty low level waste disposal area, inventory modules, Nellis, the Nevada Test Site, other DOE complex-wide waste activities that could affect the Nevada test site, low level waste intermodal transfer station at Caliente, a proposed Timbisha Shoshone reservation in the general vicinity, Cortez pipeline gold deposit projects that would be a cumulative impact tied to one of our potential rail transportation routes, APEX bulk commodities intermodal transfer station, and shared use of DOE branch line are examples.

Primary sources of information evaluated DOE data and reports, other EIS's, Native American tribes and federal, state and local government agencies. The impact indicators are the same as that which was used in other resource impact areas. Analytical models and tools from other studies provided the data for this study.

With respect to impacts, on Slide 27, the impacts for the pre-closure timeframe -- you know, there are fairly short-term impacts in some study areas such as cultural resources, aesthetics, electrical power, longer term impacts for pre-closure when you do cum analyses for your toxics and rad materials, and obviously some additional increase in atmospheric radioactive releases if you have more construction underground for your module activities.

Incremental increases in groundwater transport of radionuclides could also occur. We looked at the potential migration of NTS materials to the area of interest for the repository and based on the information we had available there is a potential cum impact there of two-tenths of a millirem per year dose to the MEI, less than one percent increase in linked cancer fatalities when combined with other national transportation activities.

There was a potential for some transportation impact increases at Caliente. Cask manufacturing -- we looked at the potential impacts of manufacturing all the casks that would support this program and obviously you are using resources to develop those casks and potential, you know, for small increases in impacts from the Carlin rail corridor as it related to the Cortez gold mine pipeline projects.

Other areas of analyses that we looked at in the

EIS -- land use and ownership. We're right now on federal properties. We would hope for a permanent withdrawal of approximately 150,000 acres now under federal control. Of that amount there would be a disturbance in total of 370 acres until closure that in reality it's only a disturbance of approximately 500 additional new acres, the rest already having been disturbed from the site characterization program.

Depending on whether or not you constructed a rail line and which line you would construct -- as I mentioned, we looked at five -- you could disturb from zero to 5,000 acres of land for Nevada transportation.

Air quality -- the criteria pollutants were less than 5 percent of the regulatory limits, Cristobalite exposure estimated at .026 micrograms per cubic meter for the public hypothetical MEI -- well below the threshold limit value. Slide 29 --

Utilities' energy, materials and site services -- the use of energy, materials and community services would be small in comparison to amounts used regionally. Transmission lines to the site would require some form of upgrade. From a waste management perspective, our radioactive and hazardous waste generated would be a few percent of the existing offsite capacity. Solid waste would be managed offsite or potentially at an onsite landfill. We

looked at both. Hazardous waste would be shipped offsite for disposal. Low level radwaste could be shipped to the Nevada test site for disposal. We recognized there were different places it could go, and one of the places that we did look at and analyze was the NTS.

We also looked at the potential for generation of mixed waste, and we believe that it would be a fairly unusual occurrence for it to occur, but we did recognize its potentiality.

In the biological resources/soils side of the house, this is principally tied to amount of acres disturbed. Impacts to plants and animals and habitat would be localized. Impacts to wetlands and soils would be small. We do expect that as a result of construction activities and land disturbance, some individual tortoises, which are a threatened species at the Yucca Mountain -- a threatened species would be anticipated to be killed, and that there could be localized vegetation and animal community shifts possible for some temperature changes at the repository block.

From a floodplains/wetlands perspective, there could be some small effect to floodplains in the Yucca Mountain area, no effect to wetlands. Along rail corridors, the effects to floodplains and wetlands would be small. We do recognize in this DEIS that there is the need for

additional floodplain and wetland assessments when more information is available, and that is tied to the selection of a rail corridor. You are talking about an awful lot of work and we have five corridors, and that would happen at a later point in time.

Cultural resources, again, these impacts are tied principally to the fact that workers would be in an area and land would be disturbed. We do recognize that activities at the repository could cause damage to cultural resources because you have people in the area. There is also the potentiality of illicit collecting at sites nearby. But we do have programs in place to mitigate these impacts and those programs would have to be continued through this entire period.

Studies are also likely needed in additional detail than what we have done to date along the transportation corridor lines.

From a socioeconomic perspective, the key counties that we looked at as it related directly to the repository were Clark, Lincoln and Nye Counties. Other counties were looked at as it related to the construction of a rail corridor. Estimated peak repository employment, i.e., you know, new hires coming in was 2,400. That was direct and indirect. The peak would occur in 2006. This is less than 1 percent of an increase in regional employment.

Approximately right now 79 percent of the workers at the site are residing in Las Vegas.

We estimated peak transportation construction employment would range from 1 percent to 5.7 percent of the total employment by county.

Slide 32. Noise, low impacts expected from the repository and from rail construction or other transportation activities. Aesthetics, again, this came out as a low adverse effect to visual or scenic resources in the region. And environmental justice, there were no proportionally high and adverse impacts to minority or low income populations or persons with subsistence lifestyles.

Hydrology. There would be some small effect on recharge and on floodplain and drainage channels. Additional delineations would likely be needed. We looked at water demand and we are expecting to use no more water for the repository construction and operation than what we have for the site characterization program, and that was reviewed in the EIS. We also looked at the potential withdrawal of 320 to 710, again, depending upon what rail corridor you would select, should you select one, for the construction of a rail line, and that would occur over a 2.5 year period of time.

So, in summary, the Draft Environmental Impact Statement assesses impacts of constructing, operating,

monitoring and eventually closing a geologic repository at Yucca Mountain, the potential long-term impacts of repository disposal, the potential impacts of transporting the high level radioactive waste and spent fuel nationally, as well as in the State of Nevada, and impacts from not proceeding with the proposed action.

The DEIS was distributed to the public on August 6th. The Federal Register Notice came out on August 13th, and we are now in the period of public comment, which will last 180 days. And the next slide walks through the number of public hearings. It is missing one, we have also included Carson City, which will probably be 12/2, it is not on this list. But there are 17 hearings total scheduled for the DEIS.

And on Slide 36, it shows you where we are today and what we have -- you know, where we have come from, I guess. I guess I would like to put it all in perspective, say that we did go out with a Notice of Intent and scoping for input into this DEIS in August of 1995. The scoping period ended in December, and, as some of you may recall, we ended up with a really dire budget year in 1996, so we terminated the DEIS activities for '96, resumed again with the hiring of Jason in 1997. And our first effort was to deal with the comment summary document responding to the comments that we got from scoping, and then we moved forward

with collecting our data, developing the DRAFT EIS. And we have pretty much maintained our projected schedule despite that year and are looking forward to initiating our hearings here in very short order.

CHAIRMAN DICUS: Okay. Well, thank you very much for a very crisp and I think rather thorough overview of a lot of work that has gone on and that you have accomplished.

I would like to begin with a question on defense-in-depth and also design basis considerations, accident considerations, and to what extent these have been dealt with, I know a great deal in here. But I would like to discuss it just with you a little bit.

You know, our Part 63 defines defense-in-depth, and I probably don't need to go through that, but it has to do with being sure that the barriers are diverse, that they are independent and redundant, so that if one barrier failed, that does not necessarily mean failure of the total system.

Part 63 also defines the Category 1 or Category 2 design basis events, with a Category 1 being events that might occur one or more times during the period of time that you have under consideration, with Category 2 being an event that would have at least one chance in 10,000 of occurring.

So my question would be, could you discuss how the DOE has designed and engineered defense-in-depth into the

total system performance modeling for the operating preclosure periods, and how the integrated safety analysis approach, which is criticality safety, chemical safety, fire protection, et cetera, was factored in or might be applied?

MS. DIXON: When we did the calculations for our accident analyses in the EIS, we used the standard approach. If there was a probability of something occurring one time in 10 million, 1 times 10 to the minus 7, we did the calculations. So, that was our rule of thumb. And, you know, as I had mentioned, you know, before sometimes we had to work out a lot of scenarios to try to come up with something that was a credible, you know, and fit within that guideline.

CHAIRMAN DICUS: Okay. Commissioner Diaz.

COMMISSIONER DIAZ: Yes. On Slides 9 and 10 where you talk about some of the real doses or potential doses. And the question that I have is, because there are three different scenarios, one DOE, NRC and EPA, on the hypothetically maximum exposed individual and the public impact indicators of NRC, the average members of the critical group and the EPA, the reasonably maximum exposed individual. Practically speaking, for the environmental statement, what are the significant differences of these three different approaches presented to you as a matter of resolving? And if there are significance differences, how

do you plan to reconcile them?

MS. DIXON: I am trying to --

COMMISSIONER DIAZ: On Slide 9. You start talking about the hypothetically maximum exposed individual. And, of course, that is your scenario.

MS. DIXON: Right.

COMMISSIONER DIAZ: We have a different scenario, and EPA has a different scenario. I don't know whether you have considered what are the practical differences for your presentation of the final EIS. What do these three different ways of calculating or doing things, what do they represent as far as the EIS?

MS. DIXON: The three different ways tied to the analytical approach.

MR. BARRETT: What we have done in the EIS is we have portrayed the environmental impacts based on conventional EIS type science that the NRC has done, DOE has done many times, based on the precedents set, and also those in court case law regarding NEPA. We have not done a one for one analysis against the NRC standard and the EPA standard, as yet, you know, they are not done. So we have not -- we have used what is usual and customary in the maximum exposed individual. We did not get into the discussion of, say, critical group versus the REMI and some of those issues that are being discussed in the regulatory.

So we tried to stay out of that, but, basically, take the curie releases and the source terms and project them into the environment as traditionally done in NEPA documentation, recognizing that defense-in-depth, as the Chairman mentioned, in the regulatory, preclosure criteria of Part 63, we will address in the license application in detail at that time. But for the defense-in-depth, for example, the EIS does not go into that. In preclosure they collapsed a whole building in a hypothetical earthquake, which was the maximum event that we could analyze.

COMMISSIONER DIAZ: Yes, I understand. But the question still is, you know, if you consider for the Environmental Impact Statement, especially in the area of doses, the -- let's call it three different approaches, does that make a difference? And if you don't have the answer, maybe sometime we could have the answer.

MS. DIXON: Yes, I am going to give a crack at it, and then I will turn to Steve and he can add to it. But if the question is, did we look at all pathways in doing our calculations --

COMMISSIONER DIAZ: It is the maximum hypothetically exposed individual versus the average member of the critical group, versus the reasonably maximum exposed individual. There are three different, you know.

MS. DIXON: This is Joe Ziegler, who is supporting

our EIS from Booz-Allen. Joe.

MR. ZIEGLER: Right. The way the calculations were done in the EIS, the Draft EIS are the same as was done in the DOE viability assessment. We assumed the average lifestyle and habits of a person in Amargosa Valley, Nevada. The only difference there in that assumption and what EPA has put in their 40 CFR 197 draft is that we assumed something like 1.8 liters of water per day for the all pathways dose calculations, and they have specified 2 liters per day.

The way the TSPA models are being run right now probably don't match up exactly with 197 and the different alternatives they have got about taking a cross-section or slice of the plume at Amargosa Valley. And I think the project has some decisions to make as to how they are going to go for site recommendation on that.

The final EIS will use the methodologies that the project decides to use for site recommendation. And because there are differences between the way NRC has specified and the way EPA has specified is we will try to resolve those, reconcile those differences to the degree possible, but since they are different, I don't know how we can be the same as both.

But I don't think there is much difference in the analytical results, you know, and I will tell you why,

because, basically, it is just a different shade of zero dose.

COMMISSIONER DIAZ: Well, but, no, it is a different shade of a slightly larger than zero dose. And the issue is, you know, since you have to consider the possibility that, you know, either one of these scenarios, it would be a good idea to bound them. Say this is this level, this is this level, and what are the differences in that slightly larger than zero dose? And I think that will be a helpful thing to have.

MR. BARRETT: Excellent comment, sir.

CHAIRMAN DICUS: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: Let me ask a few things. In looking at -- in one of the slides, you talked about low thermal load case, and you said there would be more disruption because it needs to be a bigger repository. But on the other side of it, as I understand it, both the Nuclear Waste Technical Review Board and our Advisory Committee on Nuclear Waste both are enamored of the low thermal load repository at the moment.

Which one, which is the current design? Is it the more dense repository with the heavier thermal loads? I know you are analyzing both, but which is the current DOE design?

MR. BARRETT: The Draft EIS looks at a high,

medium and low.

COMMISSIONER McGAFFIGAN: Right.

MR. BARRETT: The viability assessment design at that time was close to the high.

COMMISSIONER McGAFFIGAN: Right.

MR. BARRETT: We have gone to the alternative design, which is an enhanced design, which has a lower thermal load. It is comparable to the medium, it is not at the low.

COMMISSIONER McGAFFIGAN: Okay.

MR. BARRETT: It is basically the medium, and it has the flexibility through ventilation to basically behave thermally like the low without having the large area and a lot of tunnels with the additional cost and also radon exposure of the additional tunnel, so it is the more compact design.

COMMISSIONER McGAFFIGAN: But when you are weighing at the end of the Environmental Impact Statement process, when you have gotten all the comments and you are trying to weigh which way to go, you will have -- apparently you will have greater environmental disruption because it is bigger, weighing against perhaps greater licensability. Is that a fair thing to take into account in making a record of decision? I am asking you a hypothetical question which you can run away from. But is it fair consideration if, you

know, ACNW and Nuclear Waste Technical Review Board continue to press for the repository that they think will have less licensing problems.

MR. BARRETT: With the Technical Review Board, I believe we have resolved that. We have answered their last letter and we had our meeting, and I think it was last week, with them. We explained to them and documented our rationale, which was heavily weighted with policy considerations of maintaining flexibility, not foreclosing options in the design of a repository, to be able to have it monitored for extended periods of time, and those issues.

So it doesn't come down to strictly one number or another, it is a balancing of many times competing goods, as one would say. The design that we have, it is Engineering Design Alterative Number 2, basically does not disturb more area. We basically just arrange the tunnels, they are spread apart more, the tunnels have larger spacing, but we put a line loading, we put the packages closer together, so it is actually compared to the VA. There is not more disturbance with the design, but we basically have drainage, free drainage between the drifts, whereas, in the viability assessment, we did not have free drainage between the drifts. So this will make it simpler as far as the uncertainty case that we are presenting to the Commission and the license application, and when you review the SR

aspects.

So we think we have that behind us, but we don't really want to change the viability -- the Environmental Impact Statement. We still want that to encompass a broad -- because there will be further design enhancements as the design is constantly improving with time. For example, as the Chairman mentioned earlier, in defense-in-depth, we now have backfill which is a Richards barrier, besides metallic components and a titanium drip shield, as well as an alloy-22. So we are constantly evolving design, improving the design, and also the interface between the design and the natural environment and natural system that we find at Yucca Mountain.

So the DEIS we don't intend to be a decision-making document regarding that, it will be the design evolution leading to the LA.

COMMISSIONER McGAFFIGAN: And it brackets everything. Let me, on the transportation side, we just went through an EIS on transportation issues and there were various things that were sensitive there. How did you -- what assumptions do you have about fuel enrichment and fuel burnup in terms of your EIS? What is the maximum burnup of the spent fuel that you assume? What is the maximum fuel enrichment you assume? Do you know those numbers? Was a sensitivity analysis done with regard to those?

MR. BARRETT: We looked at a range after talking to the staff on exactly what -- I know we went, we follow what the intent is, and it went to the higher numbers. I thought it was -- Joe.

MR. ZIEGLER: What we did, and I can't give you the exact numbers, it shows up in Appendix A, but the assumptions we made were we used typical fuel, but that really doesn't affect the transportation analysis, because for transportation analysis purposes, we assumed that the doses were at the regulatory limit, which is a little bit more conservative than you did in your document. And since it is at the regulatory limit, then, you know, the burnup and things don't make much difference unless it changes the number of packages, and we don't think it does that.

COMMISSIONER McGAFFIGAN: That is the issue. One issue could be whether it changes the number of packages, or do you go to higher enrichments and higher burnups, you will have less transportation. And then there are things that we considered in our EIS, as you know, about longer cooldown periods before you transport. If you wait 20 years, then it doesn't matter, et cetera. So, that is fine.

MR. ZIEGLER: I guess the bottom line is the EIS does a bounding analysis. We don't think the impacts would be greater than that, and that is why we chose the regulatory limit, to make sure we bounded and we

conservatively stated those impacts.

COMMISSIONER McGAFFIGAN: Okay. Because the staff recently -- we are at 62 megawatt -- 62 gigawatt days per metric ton uranium, I think at the moment, and we just approved Surry or North Anna going to -- with eight fuel rods, going to 73. And so our analysis, you know, may not be conservative for those eight rods. And if the industry, over the next 20 years, can prove to us, and we approve higher burnups, then there may be a change needed at that time.

The last issue that came up a lot, and we have a petition for rulemaking from the Attorney General of Nevada before us, is whether the terrorism scenarios that we assumed are sufficiently robust. And you are doing a much more elaborate analysis, and if you go down this path, and I would be open to your comments, you would also have to look at the no action alternative.

And, you know, you're assuming more robust terrorism threats to the 77 sites where the stuff is located. But how have you handled thus far the criticism that RADTRAN4, et cetera, don't allow for the really big accident where somebody is using one of these rail cars for target practice with -- I think in one of the documents I saw everything including fighter jets were attacking the things.

MS. DIXON: Well, we didn't look at fighter jets.

COMMISSIONER McGAFFIGAN: I'm sure you didn't.

MS. DIXON: We did have -- there had been a report done some time ago in part for the NRC, Sandia had worked on it for, you know, sabotage/terrorism issues, and we did turn to Sandia for an update of that report, looking at whether or not the impacts would be any different today than when the report was done, considering the changes that, you know, could have taken place or have taken place with, you know, various types of, you know, weaponry. And those calculations were completed. The impacts really did not change substantively from the original report that had been done some time ago. That is I believe a reference document to the DEIS.

But to answer your question, and I believe the NRC does have a copy of it, we did take a look at, we did update the work that had been done before. We did look at, you know, what was reasonable with respect to a sabotage kind of event, and those impacts are included in the document.

COMMISSIONER McGAFFIGAN: Okay.

MS. DIXON: With respect to no action and so forth, a lot of those discussions are more qualitative in nature.

CHAIRMAN DICUS: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: Lake, my first question

goes to a followup of Commissioner McGaffigan in talking about the design of the facility relative to a lot of concerns that were in play at various points even relatively recently, backfill, the shielding over the casks themselves, concrete liners, whether it's natural circulation or forced circulation. And you had a variety of different things you were considering. And some of that, you know, some of the thinking did change arguably over a relatively short period of time.

How fixed are you at this point in terms of the direction you're going on what you're postulating on some of those design issues, and when do you have some sense that you'll have a better -- if it's not relatively fixed now, when do you think you will have some time line on that?

MR. BARRETT: The design process is constantly changing in a controlled manner, and the design control requirements that this program learned its lesson eight years ago on design control. So we've controlled the design, and the design changes constantly as we go forward, learning about the natural environment in Yucca Mountain, and then trying to basically make the design as good as technology reasonably will allow us to do it to basically contain and retard the materials in this longevity, in this lifetime.

When we did the viability, there's been an

evolution. Ten-plus years ago we were a thin-walled, quarter-inch stainless steel package. It was determined in the early nineties that a more robust package was appropriate from all parties, and we did that. We had not decided in the mid-nineties quite what the thermal load was. We put a reference design in. There was a Commission meeting, and it was Chairman Zech at the time, on -- I don't think it was; I don't remember who it was at that point. But we did that. We chose the design, which was the higher design.

Then we learned more about the national environment, and we changed -- we improved the design again toward where we are at the viability assessment. And then we recognized that there is still more work to be done, and the viability assessment design could be enhanced for basically the reference design to take us through site recommendation and the license application.

We did a major study with our M&O contractor, TRW, who looked at 26 different alternatives. We briefed the staff on this. And we came to a conclusion that at this stage for this evolution for the site recommendation and the license application, we would go with the design called Enhanced Design Alternative No. 2, which is sort of this mid-level thermal load in kilowatts per acre, but it's a line loading where the packages are together. It is a

ventilated tunnel for as long as we're monitoring to remove some of the heat and humidity.

And we also put in the backfill, which would be a Richards barrier for diversity and also redundancy, and titanium drip shields, which would also -- we balanced operational considerations in the license to build demonstrating the safety case to the Commission and also to the President basically on a site recommendation, cost, schedule, also added into it flexibility in the future. So the design, we've chosen that design, I've signed the internal design control documents, that that is our design, we have explained this to the technical review board, and also we've briefed your staff on that.

So we have basically selected a design for this next phase. We fully recognize that as we go forward in this, as we learn more about the site and more about materials and more about TSPA, we will refine that design again. But I don't expect major changes in the design on EDA 2 unless there is some technical reason to do so.

COMMISSIONER MERRIFIELD: So you would characterize the changes as being evolutionary, not revolutionary.

MR. BARRETT: Yes, sir.

COMMISSIONER MERRIFIELD: In nature.

MR. BARRETT: I do.

COMMISSIONER MERRIFIELD: That is not an insignificant issue, given the fact that we have our Center for Nuclear Waste Regulatory Analysis, which is trying to keep up with you to an extent in terms of trying to understand the science that you're using for this, and that's a challenge for them in terms of the resources we have to do that.

A second set of questions I have regards transportation issues. Are you anticipating producing another environmental impact statement when a final decision on the alternative transportation routes are utilized, or is there some other method you're using to analyze that?

MS. DIXON: On a national basis the answer is no. I mean, we looked at not necessarily the route but DOT-approved routes that could in fact be used. We recognized that, you know, as time progresses, you know, new highways could be built or States could come up with preferred alternative routes that currently don't exist today, but they would have to be in the bounds of the DOT preferred category, so we already believe that from a national basis we have bounded the impacts.

From a Nevada basis the answer is not the same. From a Nevada basis, if the decision is made as an example to construct a rail corridor and out of the NEPA process and through the SR there's at some point in time in the future a

decision to construct a particular rail corridor, we believe that there will be the need for additional NEPA analyses on that particular corridor that would include, you know, perhaps the flood-plain wetlands assessment activities that I mentioned earlier, additional detail on, you know, your cultural resources, your biological resources, you know, socioeconomic impacts for that particular corridor and potential variations in alignment at that corridor.

COMMISSIONER MERRIFIELD: I know your list of meetings that you have coming up, 17 meetings, includes a majority which are in Nevada, but obviously do outreach to other areas of the country and other cities. To what extent as it relates to transportation are you specifically seeking to get comments from other States on transportation issues? I mean, this is an issue which encompasses a vast majority of the States, or at least has the potential to.

MS. DIXON: Obviously we can't go to every State in the country, nor is there any requirement under NEPA. We have strongly encouraged -- and this document has gone to every single State in the country and, you know, political representatives of those States soliciting input and soliciting comments, and anybody, no matter whether or not there's a public hearing or not, any State can provide comments as it relates to transportation issues within their particular State or whatever concerns they have in the

entirety of the environmental impact statement.

There are several public hearings that we -- places for public hearings that we selected that were tied to the fact that they were transportation hubs. There's Saint Louis, there's Atlanta, there's Denver. We do have several that are there for that particular purpose.

We also -- and this is somewhat unique to EIS's -- but in the short-term impact analysis, transportation could have been a subelement in chapter 4 dealing with short-term impacts. What we did, because of its import and its national interest level, we have a chapter in the DEIS designated solely to transportation. So if you're a different State and you don't really care about all the things that, you know, could occur as it relates to Yucca Mountain site-specifically, you can turn to chapter 6 of the environmental impact statement and focus just on the transportation work that exists there.

COMMISSIONER MERRIFIELD: No further questions. Thank you, Chairman.

CHAIRMAN DICUS: Okay. Let me ask just a couple of questions. One of them has to do with your Part 963, and how would you envision -- this would probably go to you, Lake, but maybe anyone else can join in -- be able -- envision that being able to crosswalk with NRC's Part 63 from a risk-informed performance-based base point.

MR. BARRETT: Basically our Part 63 references what you're going to do in 63, and we follow you in the EPA.

CHAIRMAN DICUS: Okay.

MR. BARRETT: So, I mean, that's really how -- now exactly the wording, you know, our staffs are working on it now to find the set in the OMB review process.

CHAIRMAN DICUS: Yes. I recognize it's a work in progress. And one other question. It's a budgetary question. It has to do with the licensing support network, the LSN. Could you address DOE's LSN budgetary commitment for FY 2000, and given the fact that you may have some budgetary reductions, both in 2000 and any out years, how that might affect the LSN.

MR. BARRETT: Our intention would be in a constrained budget situation to do the minimum on the LSN. Now the minimum, we'll work together and define what that would be, the staffs.

CHAIRMAN DICUS: Okay. Commissioner Diaz.

COMMISSIONER DIAZ: Yes. On slide 14 you have a series of transportation-related LCF. Do you have a breakdown between workers and public?

MS. DIXON: Yes, we do. The environmental impact statement breaks these numbers down and fairly -- in a great amount of detail. And there's differentials between loading operations and materials going back and forth and the

general public, and those breakdowns all do exist. Yes.

COMMISSIONER DIAZ: Okay. All right, thank you.

CHAIRMAN DICUS: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: On slide 6 you talked about cumulative impacts, and you had these modules for larger amounts of waste. And then when you discussed impacts at the end, I'm not sure you addressed quite how -- is it proportional? If I go from 70,000 to 119,000, do I just multiply by five-sevenths, 1.57 -- 1.71 -- and get an answer, or is there any nonlinearity in the impacts when you go to these --

MS. DIXON: To the modules?

COMMISSIONER McGAFFIGAN: To the modules that are --

MS. DIXON: I'm trying to recall what the numbers were for the cumes. Do you --

MR. ZIEGLER: Yes, I can't recall the numbers. Basically the proportionality is for the commercial spent nuclear fuel component, which you start off with 63,000 metric tons of commercial fuel, so you go from 63 to 105, and that's relatively proportional.

COMMISSIONER McGAFFIGAN: How does -- could Yucca Mountain hold 125.1 metric tons of stuff -- it's --

MS. DIXON: It's 190.

COMMISSIONER McGAFFIGAN: It's 119,000 metric tons

and then another 6,100 cubic meters of greater than Class C waste in SPAR.

MR. BARRETT: We believe from a technical point of view it could -- it is rather moot, because there are statutory.

COMMISSIONER McGAFFIGAN: Right. I understand the statute. But technically it could hold this amount of --

MR. BARRETT: When we have the final EPA NRC regulations -- it's premature -- we're not saying the site is suitable today, we're saying this is the best science can do to project it.

COMMISSIONER McGAFFIGAN: Right.

MR. BARRETT: If you look at these numbers against reasonable standards, it probably would meet it at the higher levels.

COMMISSIONER McGAFFIGAN: The greater than Class C waste comes up, you know, because there are places like Trojan that is shut down, working to decommission itself, and it will have an ISFSI there. And it will have a bunch of dry casks with high-level -- with spent fuel in it, and then they'll have one or two that will have some greater than class C waste in it, and if that doesn't get off the site, then you still have 77 sites around the country where something's left behind in dry storage that looks -- DOE I guess has a mandate to come up with a solution for. And so

I think it's interesting that you -- and I commend you for looking at this within your site, but the no-action alternative, if everything isn't off the sites, then you still have some sites where the stuff is still there.

MS. DIXON: We did look at whether or not there was room available, spacing available for the material, and the answer to that is yes.

COMMISSIONER McGAFFIGAN: The other broad question I have is you've, in the Waste Isolation Pilot Plant, EIS process, how much of what you're doing here is built on that foundation? I mean, was there a big learning curve for DOE in doing the EIS for the Waste Isolation Pilot Plant and were there lots of lessons learned, or was it so different because it's true and not high-level waste that it didn't help you much?

MS. DIXON: I think that the WIPP EIS did help us, and that there were -- I mean, that's the only EIS that's out there that's really a 10,000-year --

COMMISSIONER McGAFFIGAN: Right.

MS. DIXON: Environmental impact statement, and there were a number of things that we looked to to understand how WIPP did it and how successful were they and what precedents had been established through the WIPP NEPA process. So yes, it was very important to us in the construct of this environmental impact statement.

COMMISSIONER McGAFFIGAN: Thank you.

COMMISSIONER MERRIFIELD: I guess more of a statement than anything else. It's brought out by the Chairman's question on the licensing support network. We are at the point now where we are beginning to become engaged in getting that all put together as is required. We have given the responsibility of that to our Atomic Safety and Licensing Board panel, and they have begun hiring of staff, and we feel that's an important resource to be able to respond to the concerns of individuals who live around these sites and around the country who want to know, want to have access to this information.

I'm somewhat concerned by your comment, Lake, that you will fund it to basically the extent minimum you can get away with. We'll have to obviously be engaged on that issue. This is an important one that the Commission has taken some important degree of responsibility for and has been actively involved with, and we certainly want to make sure has the resources necessary to function effectively for the users of that system, i.e., the public.

CHAIRMAN DICUS: Commissioner Diaz.

Commissioner McGaffigan.

Okay. Well, on behalf of my fellow Commissioners, I would certainly like to thank the Department of Energy for another very informed briefing for us today. I think it was

clear from our discussions that progress has been made toward narrowing total system performance, variability, and uncertainty, and improving quality assurance implementation and controls, and clearly though there's yet a lot of work to be done, which I think we all recognize.

And I think as we have expressed today and that you have expressed today, the implementation, documentation, and maintenance of a quality assurance program characteristic to 10 CFR Part 50, Appendix B, is essential to pursuing the licensing process if it is to occur, and in demonstrating performance, reliability, and availability of all safety-significant structures, systems, and components critical to waste isolation and containment. A solid QA program provides defensibility and traceability and allows for prompt and adequate deficiency identification, root-cause analysis, and implementation of corrective actions necessary to prevent recurrences.

So again I would like to thank you, and unless my fellow Commissioners have any further questions or comments, then this meeting is now adjourned.

Thank you very much.

[Whereupon, at 10:55 a.m., the briefing was concluded.]

CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: NRC STAFF BRIEFING ON DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR A PROPOSED HLW GEOLOGIC REPOSITORY PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Tuesday, September 21, 1999

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Rose Gershon

Reporter: Mark Mahoney

"Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada"

Presentation to the
Nuclear Regulatory Commission
September 21, 1999

Wendy R. Dixon, EIS Project Manager
Yucca Mountain Site Characterization Project
U.S. Department of Energy

Environmental Impact Statement (EIS) Drivers

Nuclear Waste Policy Act (NWPA)

- Requires a final EIS to accompany a site recommendation and license application
- Prepare a technically adequate EIS that can be adopted, to the extent practicable, by the Nuclear Regulatory Commission
- EIS need not consider
  - The need for a repository
  - The time of initial availability of a repository
  - Alternatives to geologic disposal
  - Alternative sites to Yucca Mountain

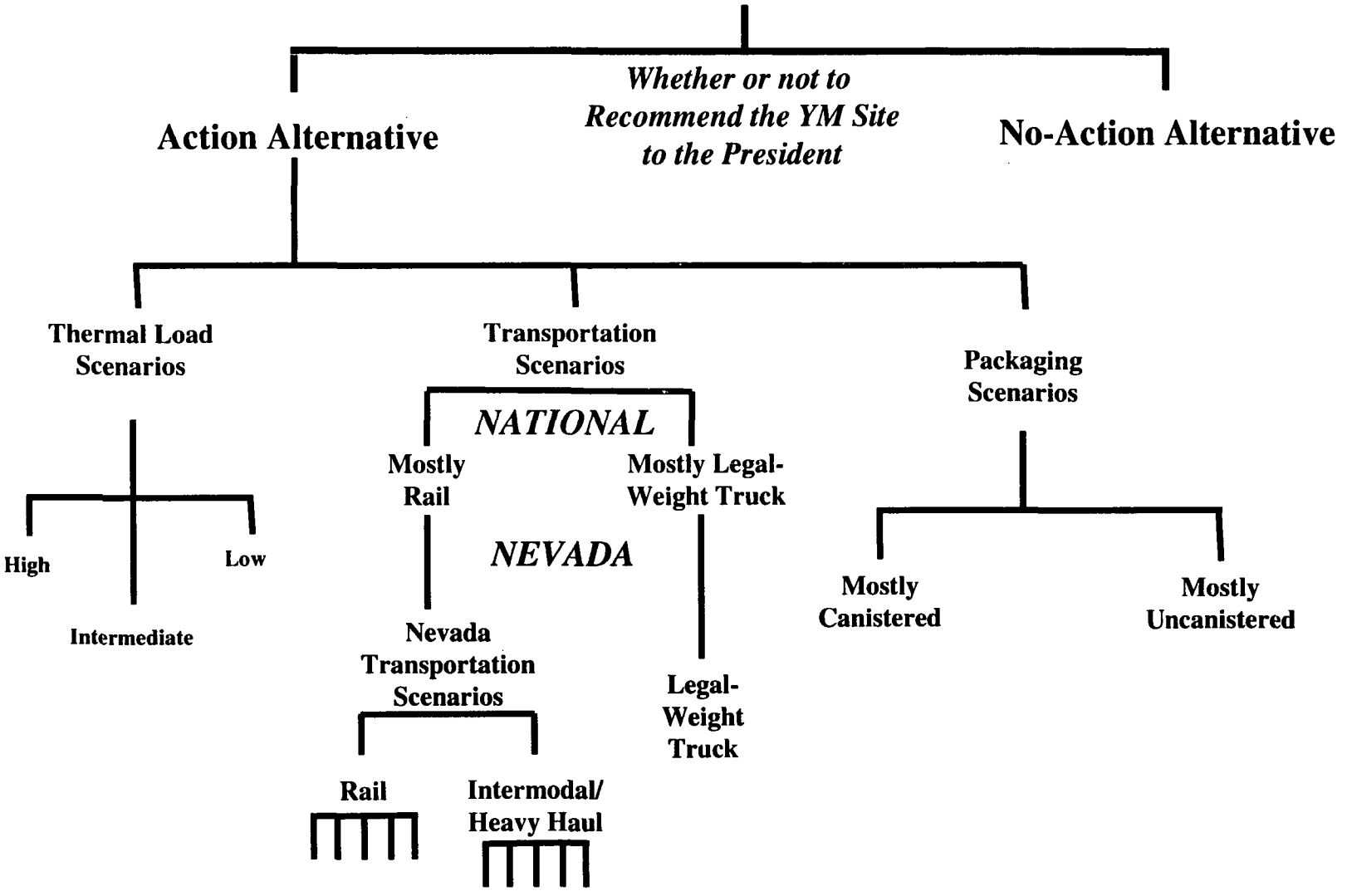
Preparation of the EIS

- DOE is lead agency for preparing the EIS
  - EIS Technical Support Contract under DOE - Jason Associates and subcontractors:
    - Tetra Tech NUS
    - Battelle
    - Dade Moeller and Associates
  - Relied on existing technical studies and information developed during site characterization activities by the CRWMS M&O Contractor, USGS and National Laboratories
  - Developed new information as necessary to supplement existing information

Proposed Action

- DOE proposes to construct, operate and monitor, and eventually close a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste
- 70,000 metric tons of heavy metal (MTHM)
  - 63,000 MTHM commercial Spent Nuclear Fuel (SNF)
  - 7,000 MTHM DOE SNF and High-Level Waste (HLW)
- The EIS describes and evaluates the current preliminary design concept and also identifies design features and alternative design concepts that DOE is considering for the final design

Analytical Structure



Cumulative Impacts

Modules

Module 1
- 119,000 MTHM
  - 105,000 CSNF
  - 2,500 DOE SNF
  - 11,500 HLW

Module 2
- 119,000 MTHM
  - 105,000 CSNF
  - 2,500 DOE SNF
  - 11,500 HLW
- 2,100 m^3 GTCC
- 4,000 m^3 SPAR

Transportation

- All national radioactive waste shipments from 1943 to 2047
  - Medical
  - Research Labs
  - etc.
- Historic and future DOE waste shipments
- Shipment of Modules 1 and 2

Other Cumulative Impacts

- Nevada Test Site
- National transportation of radioactive materials
- Local mining
- Beatty low-level radioactive waste disposal
- Nellis Air Force Base
- Others

Areas of Analysis

- Short Term Analyses

  Land Use and Ownership
  Air Quality
  Health and Safety
  Accident Impacts
  Utilities, Energy, Materials
  Waste Management
  Transportation
  Environmental Justice
  Hydrology
  Floodplains/Wetlands
  Biological Resources/Soils
  Cultural Resources
  Socioeconomics
  Noise
  Aesthetics

- Long-Term Repository Performance
- No Action Alternative
- Cumulative Impacts

Health and Safety

- Primary sources of information
  - DOE site data
  - Independent guidance organizations (National Council on Radiation Protection and Measurements (NCRP) and International Commission on Radiological Protection (ICRP))
  - DOE Computerized Accident/Incident Reporting and Recordkeeping System (CAIRS)
- Potential impact sources
  - Radionuclide releases and direct radiation
  - Cristobalite releases
  - Industrial accidents

Health and Safety (cont.)

- Impact indicators
  - Public (population and hypothetical maximally exposed individual (MEI))
  - Involved and noninvolved workers (population and hypothetical MEI)
- Analytical Approach
  - Cristobalite: estimate offsite concentrations and qualitatively evaluate involved worker exposure
  - Industrial: estimate worker full-time equivalents (FTE) and use DOE workplace fatality rate of 2.9 fatalities per 100,000 FTE
  - Radiation dose: estimate dose from radon-222 and progeny, krypton-85, external radiation from fuel and waste package handling, subsurface ambient external radiation
  - Convert public and worker dose estimates to human health impacts using ICRP-60 (2,000 rem = 1 latent cancer fatality (LCF) for public, 2,500 rem = 1 LCF for workers)

Health and Safety (cont.)

- Overview of impacts
  - Hypothetical maximally exposed individual (public)- highest annual dose estimated at 0.8-1.8 mrem (> 99% radon-222)
  - Highest annual population dose 4-10 person-rem (> 99% radon-222)
  - Radiological impacts to the public from repository activities could result in 280-810 person-rem or 0.14-0.4 LCF (> 99% radon) over 100 years
  - Radiological impacts to workers could result in 6,500-9,800 person-rem or 3-4 LCFs (~70% from SNF and HLW management) over 100 years
  - Industrial workplace hazards could result in up to 1-2 fatalities over 100 years

Accident Impacts

- Primary sources of information
  - DOE, Nuclear Regulatory Commission and other agencies
- Potential impact sources
  - Radionuclide releases and structural failures
- Impact indicators
  - Public, involved workers, and noninvolved workers
- Analytical Approach
  - 16 scenarios included in detailed analysis from 69 originally considered
  - Used the MACCS2 (MELCOR Accident Consequence Code System) code
  - Consequence analysis did not include probability of occurrence (accidents analyzed as if assumed to occur)

Accident Impacts (cont.)

- Overview of impacts
  - Maximum reasonably foreseeable accident is an earthquake estimated to occur once every 50,000 years (1.1g ground acceleration)
  - Highest dose to public MEI - 320 millirem (0.00002 probability of LCF)
  - Severe injury or death to involved workers from collapsed buildings
    - As many as 39 in Waste Handling Building and 36 in Waste Treatment Building

Transportation

- Primary sources of information evaluated
  - DOE (Studies, reports, and file information)
  - Department of Transportation and Census Bureau
  - State accident data
  - Other EISs
  - Nuclear Regulatory Commission
- Impact indicators
  - Workers (populations and hypothetical maximally exposed individual)
  - Public (Population within one-half mile of route and hypothetical maximally exposed individual, within 50 miles for accidents)
  - Other resource areas within Nevada (e.g., water, biology, socioeconomics)

Transportation (cont.)

- Analytical approach
  - CALVIN: Numbers of commercial SNF shipments
  - HIGHWAY and INTERLINE: Route data
  - RISKIND: MEI doses (routine); MEI & population doses (accident)
  - RADTRAN4: Dose to the public & workers (routine); dose risk from accidents
- Overview of impacts
  - Legal weight truck: About 60,000 person-rem or 29 LCFs and 11 traffic fatalities
  - Rail: About 5,100 person-rem or 6 LCFs and 16 traffic fatalities
  - Maximum reasonably foreseeable accident:
    - 9,400-61,000 person-rem or 5 to 31 latent cancer fatalities
    - Accident probability per year: 1.4×10^{-7} to 1.9×10^{-7}

Long-Term Repository Performance

- Primary sources of information evaluated
  - DOE reports, studies and data
  - Other EISs
  - National Research Council report Technical Basis for Yucca Mountain Standards
  - Viability Assessment
  - USGS and National labs
  - Environmental Protection Agency, International Atomic Energy Agency and ICRP technical reports
- Impact indicators
  - Public within 80 kilometer radius
  - Public within groundwater flow area

Long-Term Repository Performance (cont.)

- Analytical approach
  - Total System Performance Assessment simulated climate, water infiltration, the unsaturated zone, thermal hydrology, near-field geochemistry, cladding degradation, radionuclide mobilization and engineered barrier system transport, unsaturated and saturated zone transport, and biosphere pathways.
  - DOE also used alternate conceptual models, a contained gas release model, and Monte Carlo techniques to address aspects of uncertainty
  - Estimated doses to population within about 80 kilometers
  - Estimated population and hypothetical maximally exposed individual at four distances
    - 5, 20, 30, and 80 kilometers (Franklin Lake Playa)

Long-Term Repository Performance (cont.)

- Analytical approach (cont.)
  - Collective dose to LCF conversion: ICRP-60 (2,500 rem = 1 LCF for member of the public and 2,000 rem = 1 LCF for a worker)
  - Compared chemical impacts to Maximum Contaminant Levels (MCLs)
- Overview of impacts (at 20 kilometers)
  - Maximum exposed individual during 10,000 years - mean values
    - 0.059 to 0.22 mrem/year or

      << 1 LCF (2.1×10^{-6} to 7.6×10^{-6})
  - Population impacts during 10,000 years - mean values
    - 0.13 to 0.37 person-rem or

      << 1 LCF (6.7×10^{-5} to 1.8×10^{-4})
  - Chemical contaminant below MCLs during 10,000 years

Long-Term Repository Performance (cont.)

- Carbon-14
  - Maximum release rate (19,000 years)
    - 0.098 microcuries per year
  - Average dose to local individual
    - 7.8×10^{-12} mrem per year
  - Maximum population dose
    - 2.2×10^{-10} person-rem per year

No Action Alternative

- The EIS recognizes that the future course that Congress, the DOE, and commercial nuclear power utilities would take if Yucca Mountain were not recommended as a repository remains highly uncertain
- To provide a baseline for comparison with the Proposed Action, DOE decided to illustrate one set of possibilities by focusing its analysis of the No-Action Alternative on the potential impacts of two scenarios:
  - Long-term storage at the current storage sites with effective institutional controls for at least 10,000 years
  - Long-term storage at the current storage sites with no effective institutional controls after approximately 100 years

No-Action Alternative (cont.)

- Primary sources of information evaluated
  - DOE reports and data
  - Nuclear Regulatory Commission
  - National Environmental Policy Act documents
  - Total System Performance Assessment
- Impact indicators
  - Focused on human health
    - Hypothetical maximally exposed individual
    - Population doses
    - Workers - involved and noninvolved
  - Other resources were more qualitatively evaluated

No-Action Alternative (cont.)

- Analytical approach
  - SNF and HLW assumed to be in dry storage
    - Surface and below grade facilities
    - Stainless steel dry storage canisters with concrete shield
  - Hypothetical regions used to simplify analysis - mathematical constructs
  - Developed concrete storage module degradation model
  - Adopted three process models from Total System Performance Assessment
    - Storage canister degradation,
    - Cladding degradation, and
    - SNF & HLW dissolution

No-Action Alternative (cont.)

- Analytical approach (cont.)
  - Developed facility radioactive release model to estimate release of dissolution products to the local environment
  - MEPAS computer code used for
    - Groundwater, surface water, and air
    - Dose
    - Latent Cancer Fatalities

Senior Technical Panel Members

- Dade W. Moeller -- radionuclide multimedia transport, biosphere, and risk assessment
- Alan H. Wells -- spent nuclear fuel and high level radioactive waste storage container degradation
- Richard S. Denning -- waste form degradation and environmental release
- Stephen A. Short -- facility degradation and failure mechanisms
- Robert J Budnitz -- integrated performance assessment

No-Action Alternative (cont.)

- Overview of impacts
  - Repository - loss of jobs
  - Scenario 1 - Credit taken for institutional control
    - About 70,000 person-rem or 31 LCFs
    - About 1,100 commuting and worker accident fatalities
  - Scenario 2 - No credit for institutional control after 100 years
    - About 7 commuting and industrial accident fatalities during first 100 years
    - About 6,600,000 person-rem or 3,300 LCFs
    - Potential contamination of all 77 sites, and surrounding resources
    - Aircraft crash into degraded facility -
      - 6,000 - 26,000 person-rem or 3 - 13 LCFs

Cumulative Impacts

- The incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future Federal and non-Federal actions
  - National transportation of radioactive materials
  - Beatty Waste Disposal Area
  - Inventory modules (discussed earlier)
  - Nellis Air Force Range
  - Nevada Test Site
  - DOE complex-wide waste activities affecting the Nevada Test Site
  - Low-level waste intermodal transfer station at Caliente
  - Proposed Timbisha Shoshone Reservation
  - Cortez pipeline gold deposit projects
  - Apex bulk commodities intermodal transfer station
  - Shared use of DOE branch rail line

Cumulative Impacts (cont.)

- Primary sources of information evaluated
  - DOE data and reports, other EISs, Native American tribes and Federal, state, and local government agencies
- Impact indicators
  - Same as used for other analysis of resource impacts
- Analytical approach
  - Analytical models and tools from other studies provided data to this study

Cumulative Impacts (cont.)

- Overview of impacts
  - Low short-term impacts in some study areas; cultural resources, aesthetics, and electrical power supply
  - Long-term impacts from toxic and radiological and same level atmospheric radioactive releases would increase incrementally
  - Incremental increases in groundwater transport of radionuclides (from NTS) could also occur (0.2 millirem per year dose to the MEI)
  - Less than 1% increase in LCFs when combined with other national transportation activities
  - Potential for small transportation impacts increase at Caliente (potential private LLW intermodal transfer site)
  - Cask manufacturing could increase impacts
  - Potential for small increase in impacts with the Carlin rail corridor implementing alternative (Cortez Gold Mine, Inc. - pipeline projects)

Other Areas of Analysis

- Land Use and Ownership
  - EIS assumption: Permanent withdrawal of 150,000 acres now under federal control
  - Active use (surface disturbance) of 870 acres until closure
  - 0 to 5000 acres of land disturbed for Nevada transportation
- Air Quality
  - Criteria pollutants <5 percent of regulatory limits
  - Cristobalite exposure estimated at <0.026 microgram per cubic meter for public hypothetical MEI

Other Areas (cont.)

- Utilities, Energy, Materials and Site Services
  - Use of energy, materials, and community services would be small in comparison to amounts used regionally
  - Transmission lines to site would require some form of upgrade
- Waste Management
  - Radioactive and hazardous waste generated would be a few percent of existing offsite capacity
  - Solid wastes would be managed offsite or potentially at an onsite landfill
  - Hazardous waste would be shipped offsite for disposal
  - Low-level radioactive waste could be shipped to Nevada Test Site for disposal
  - Generation of mixed waste could only occur in unusual circumstances

Other Areas (cont.)

- Biological Resources/Soils
  - 870 acres disturbed at the repository
  - 0 to 5000 acres of land disturbed for Nevada transportation
  - Impacts to plants and animals and habitat localized
  - Impacts to wetlands and soils small
  - Some individual tortoises anticipated to be killed
  - Localized vegetation and animal community shifts possible from temperature changes
- Floodplains/Wetlands
  - Small effect to floodplains in Yucca Mountain area
  - No effect to wetlands
  - Along rail corridors, effects to floodplains and wetlands would be small
  - Additional floodplain/wetland assessment may need to be done when more information is available upon selection of a rail corridor or heavy-haul route

Other Areas (cont.)

- Cultural Resources
  - Disturbance of about 870 acres at the repository
  - 0 to 5000 acres of land disturbed for Nevada transportation
  - Activities at repository could cause damage to and illicit collecting at nearby sites; programs in place to minimize impacts
  - Studies likely needed along transportation corridor
- Socioeconomics
  - Estimated peak repository employment of 2,400 (direct and indirect) occurring in 2006 would result in <1 percent in regional employment
  - Estimated peak transportation construction employment would range from less than 1 percent to 5.7 percent of total employment by county

Other Areas (cont.)

- Noise
  - Low impacts expected from repository, rail construction or transportation activities
- Aesthetics
  - Low adverse effects to visual or scenic resources in the region of the repository or from transportation
- Environmental Justice
  - No disproportionately high and adverse impacts to minority or low-income populations or persons with subsistence lifestyles

Other Areas (cont.)

- Hydrology
  - Small effect on recharge and on floodplains & drainage channels (Additional delineations will likely be needed)
  - Repository water demand (250 to 480 acre-feet per year) below Nevada State Engineer's ruling on perennial yield (low 580 acft/yr)
  - Withdrawal of 320-710 acre-feet from multiple wells and hydrographic areas over 2.5 years for rail construction

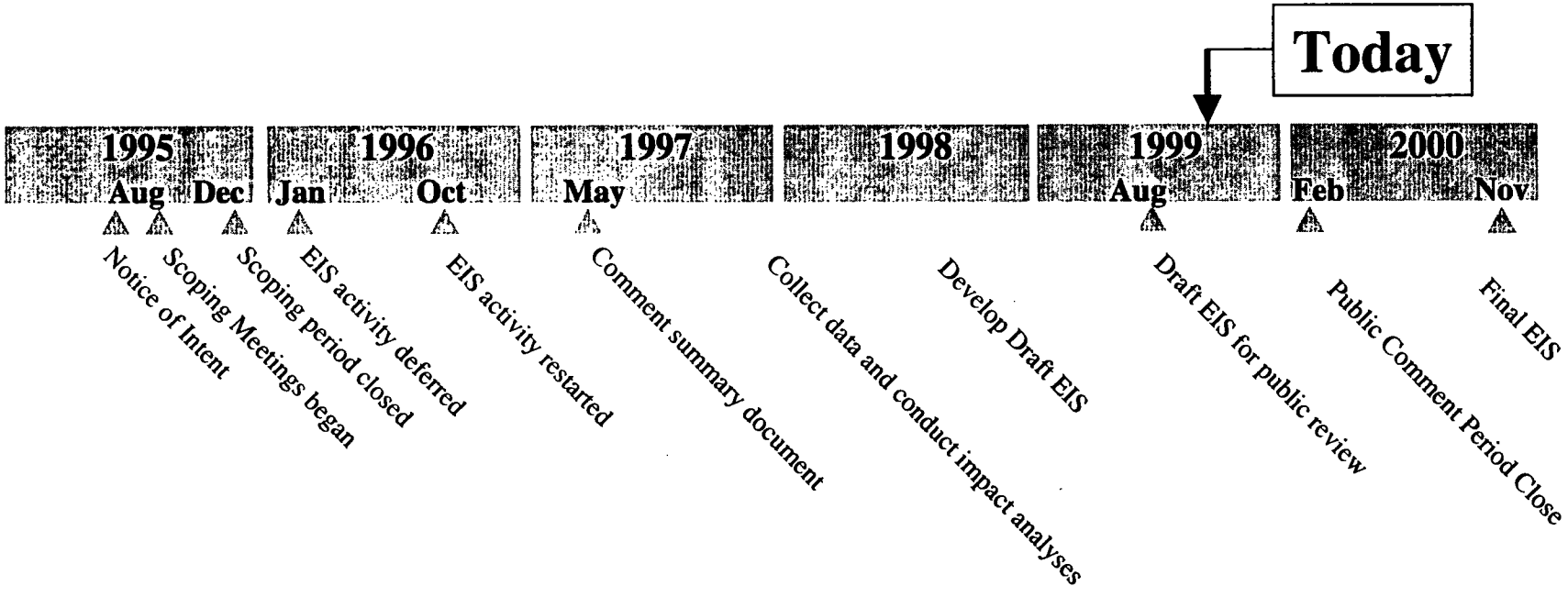
SUMMARY

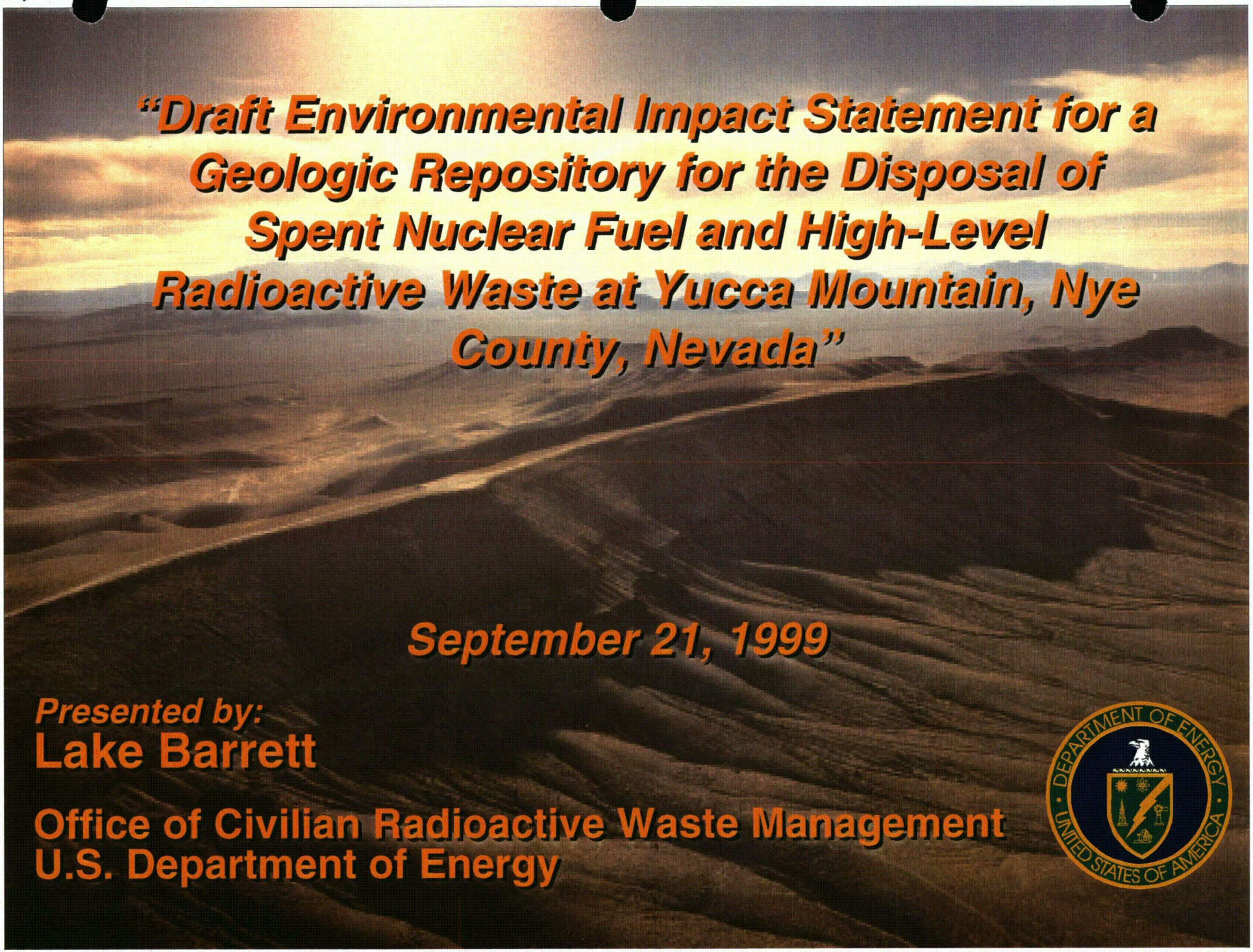
- DEIS assesses
  - Impacts of constructing, operating and monitoring, and eventually closing a geologic repository at Yucca Mountain
  - Potential long-term impacts of repository disposal
  - Potential impacts of transporting the high-level radioactive waste and spent nuclear fuel nationally and in the State of Nevada
  - Potential impacts of not proceeding with the Proposed Action.
- DEIS was distributed to the public on August 6, 1999
- Federal Register Notice of Availability published August 13, 1999
- An 180 day public comment period, with national and Nevada meetings to receive public comments, is planned.

DEIS Public Hearings

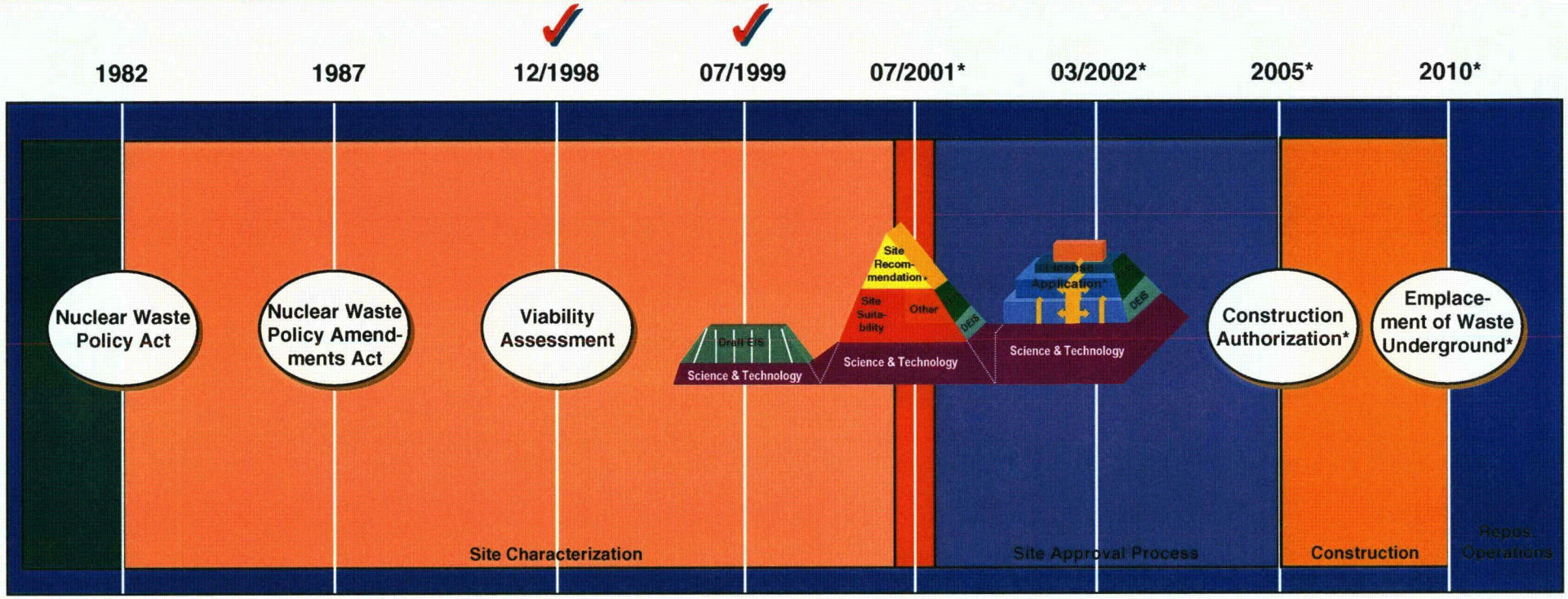
- 9/27 Amargosa Valley, NV
- 9/30 Pahrump, NV
- 10/4 Goldfield, NV
- 10/5 Boise, ID
- 10/19 Ely, NV
- 10/21 Atlanta, GA
- 10/26 Washington, DC
- 11/4 Lone Pine, CA
- 11/9 Caliente, NV
- 11/16 Denver, CO
- 12/1 Reno, NV
- 12/7 Austin, NV
- 12/9 Crescent Valley, NV
- 1/11 Las Vegas, NV, NV
- 1/13 Salt Lake City, UT
- 1/20 St. Louis, MO

Timeline of Events




"Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada"
September 21, 1999
Presented by:
Lake Barrett
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA

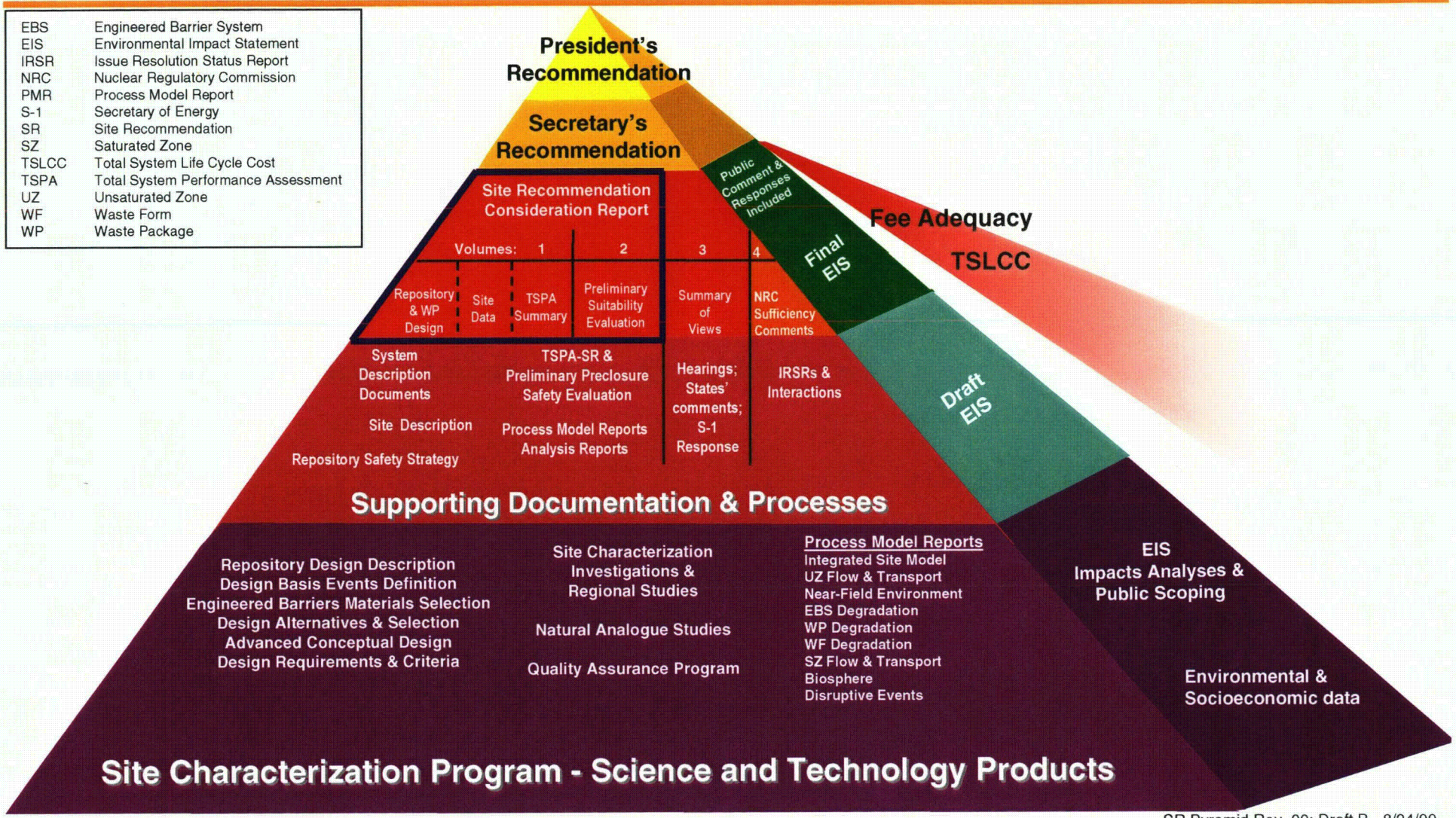
Major Repository Milestones



*If site is approved and budget supports schedule.

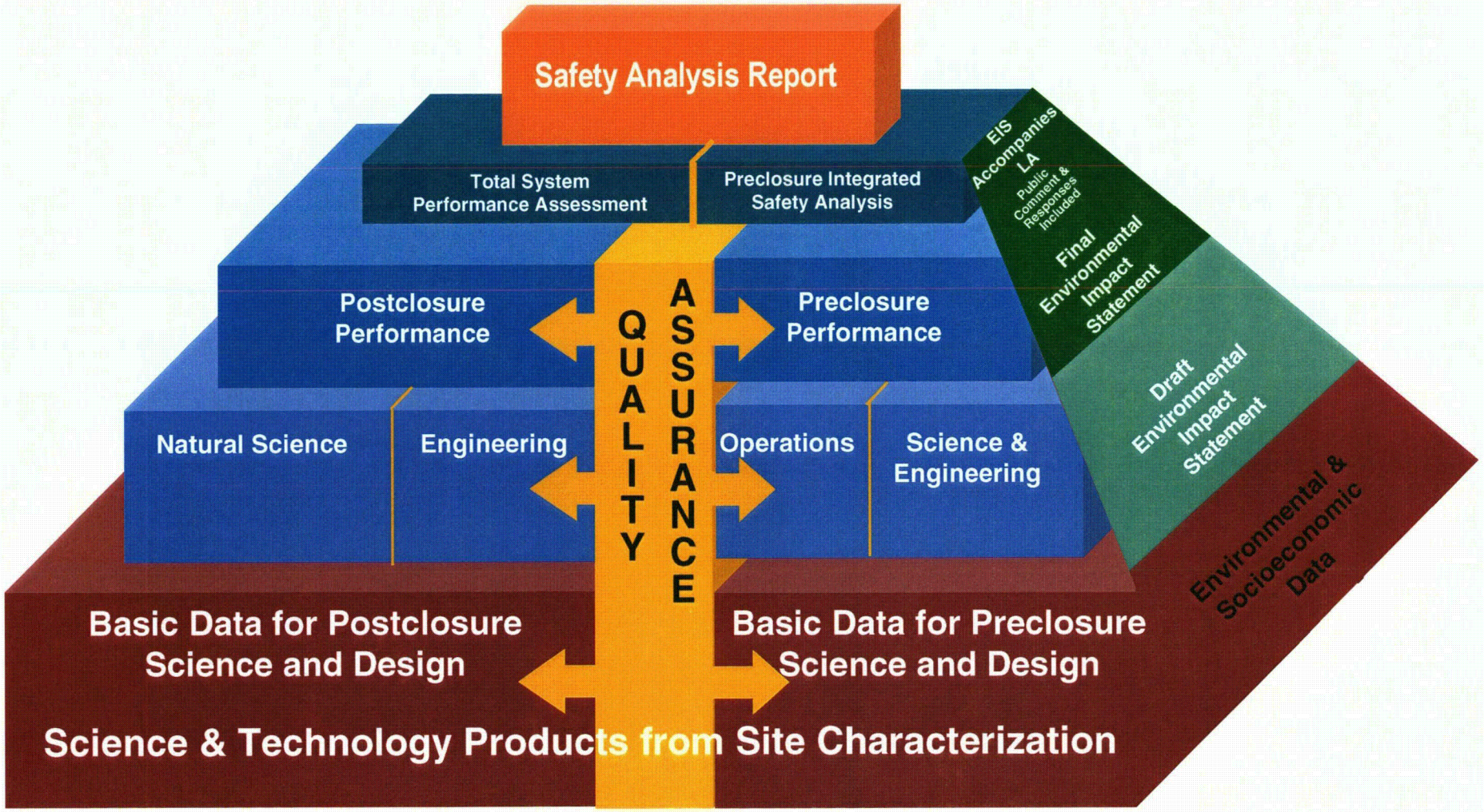
Site Recommendation Structure

EBS	Engineered Barrier System
EIS	Environmental Impact Statement
IRSR	Issue Resolution Status Report
NRC	Nuclear Regulatory Commission
PMR	Process Model Report
S-1	Secretary of Energy
SR	Site Recommendation
SZ	Saturated Zone
TSLCC	Total System Life Cycle Cost
TSPA	Total System Performance Assessment
UZ	Unsaturated Zone
WF	Waste Form
WP	Waste Package



SR Pyramid Rev. 00; Draft B - 8/24/99

License Application Structure



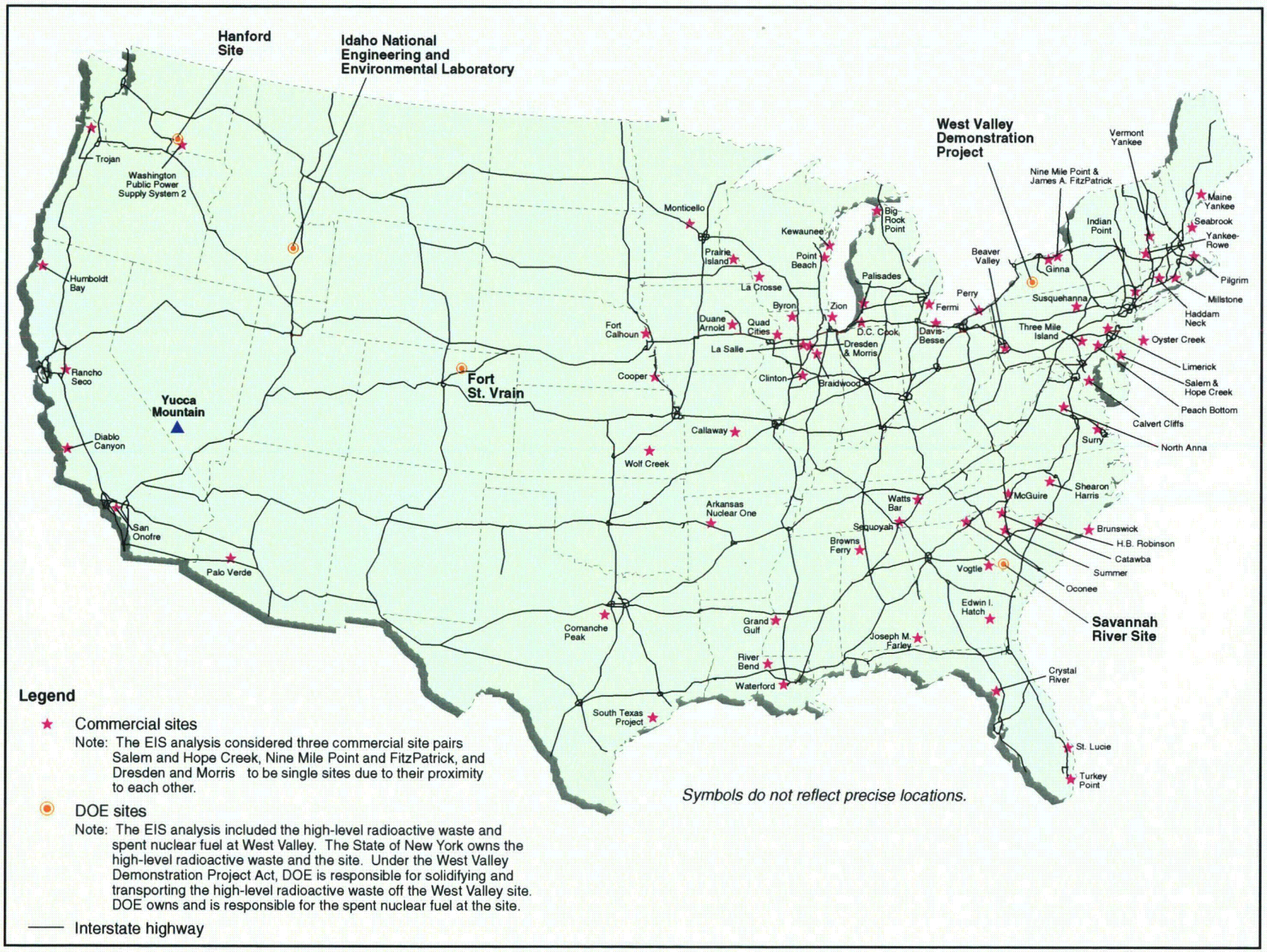
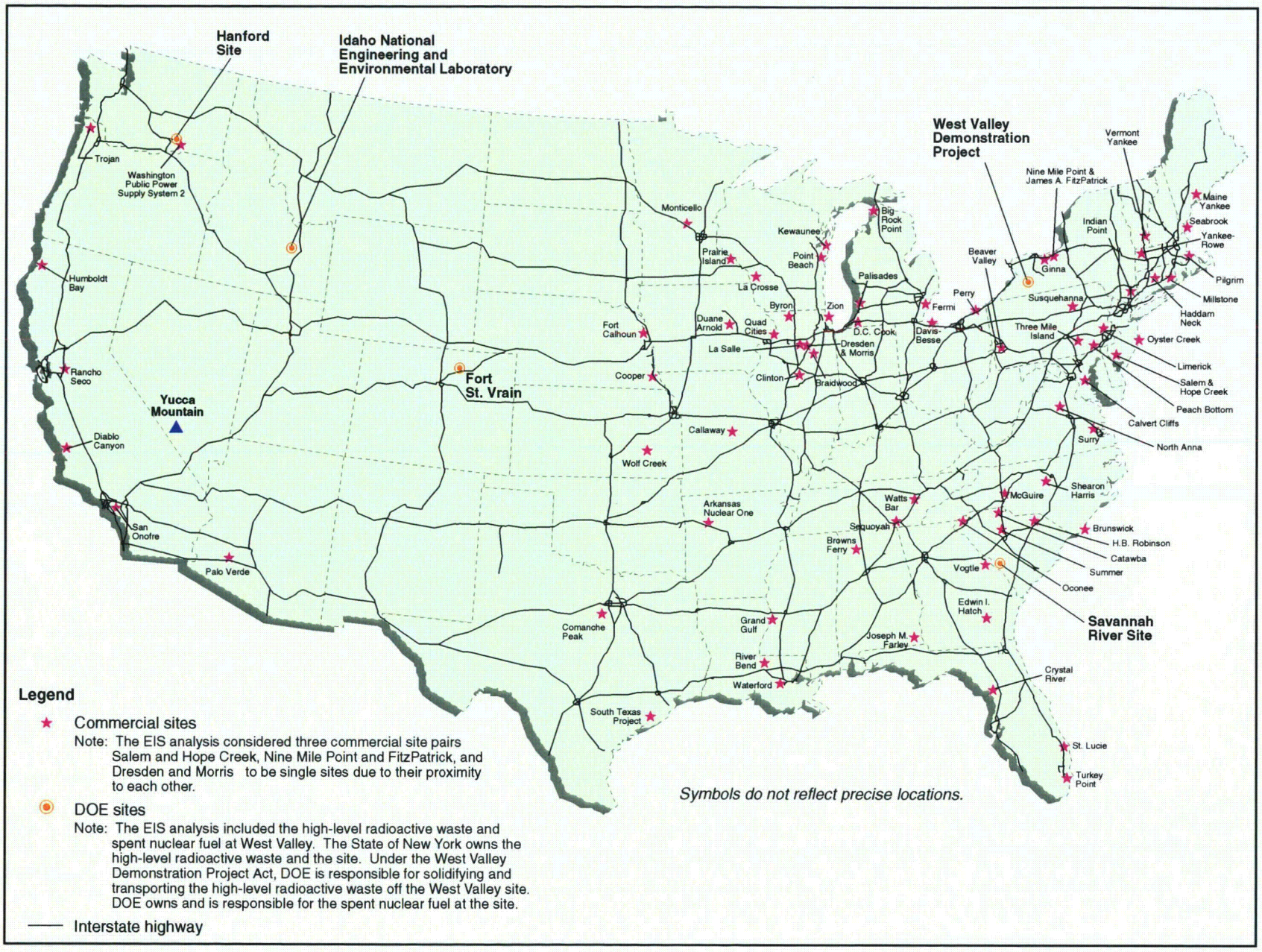


Figure S-10. Commercial and DOE sites and Yucca Mountain in relation to the U.S. Interstate Highway System.



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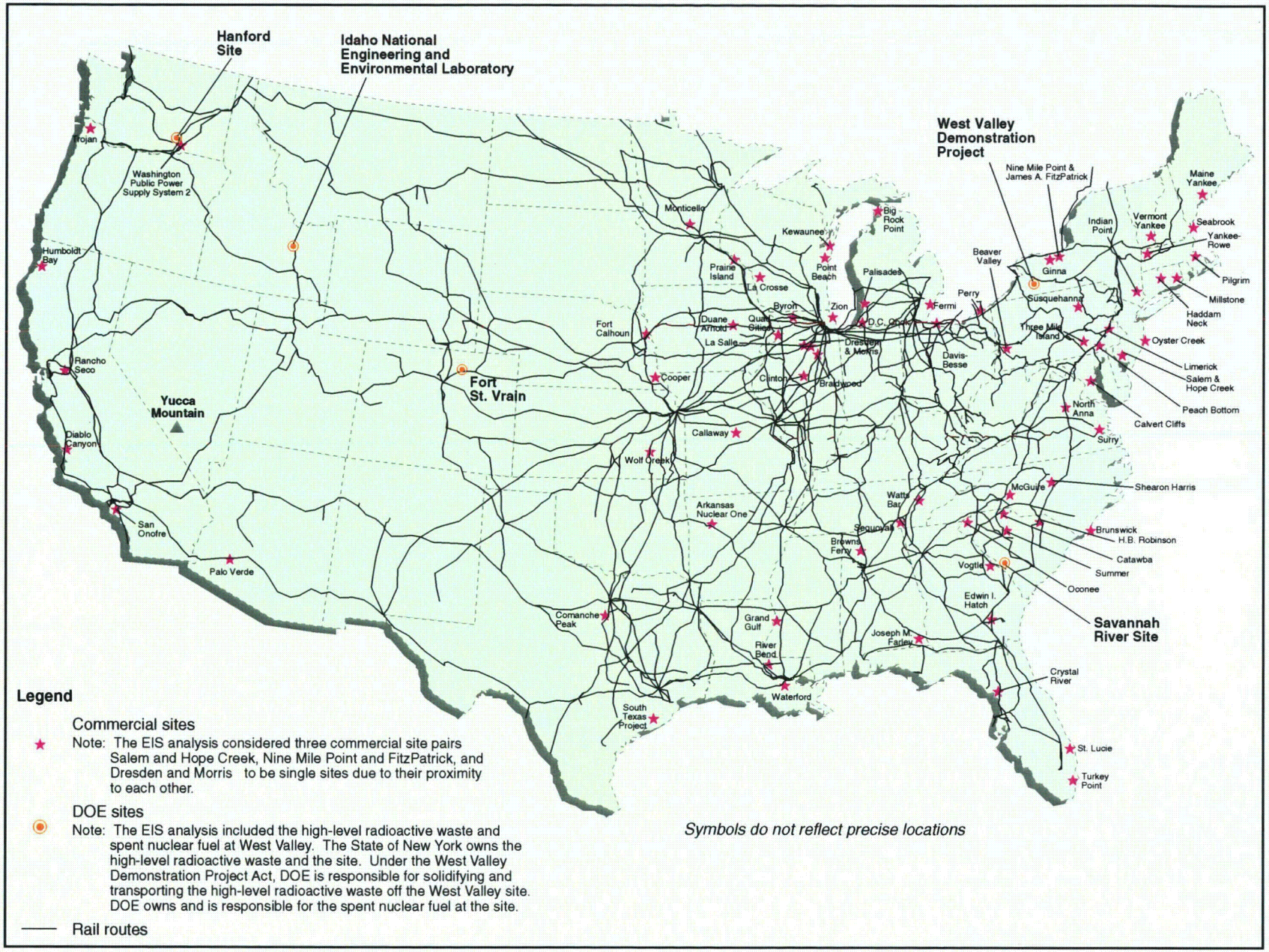

Figure S-11. Commercial and DOE sites and Yucca Mountain in relation to the U.S. railroad system.

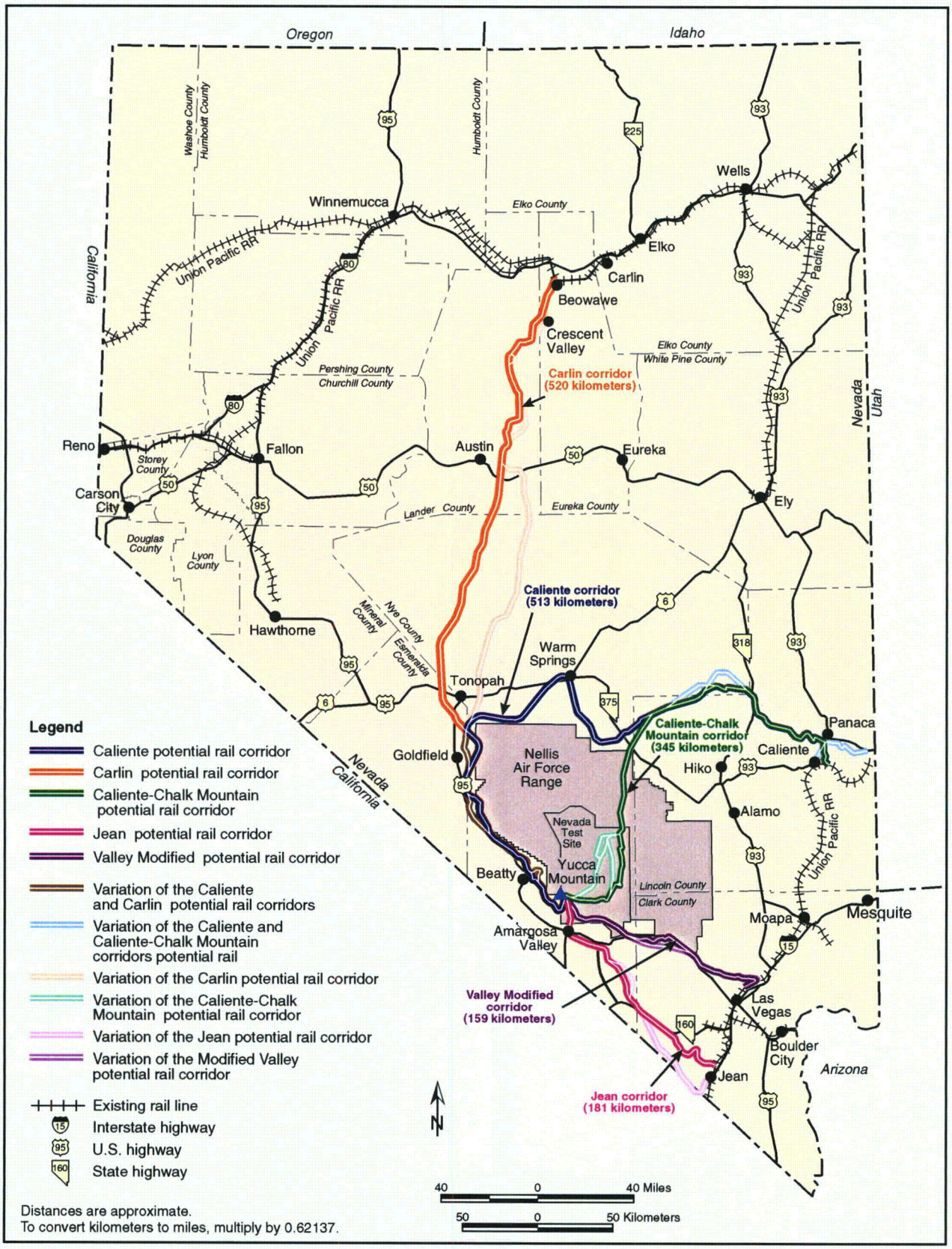

Figure S-13. Potential Nevada rail routes to Yucca Mountain.

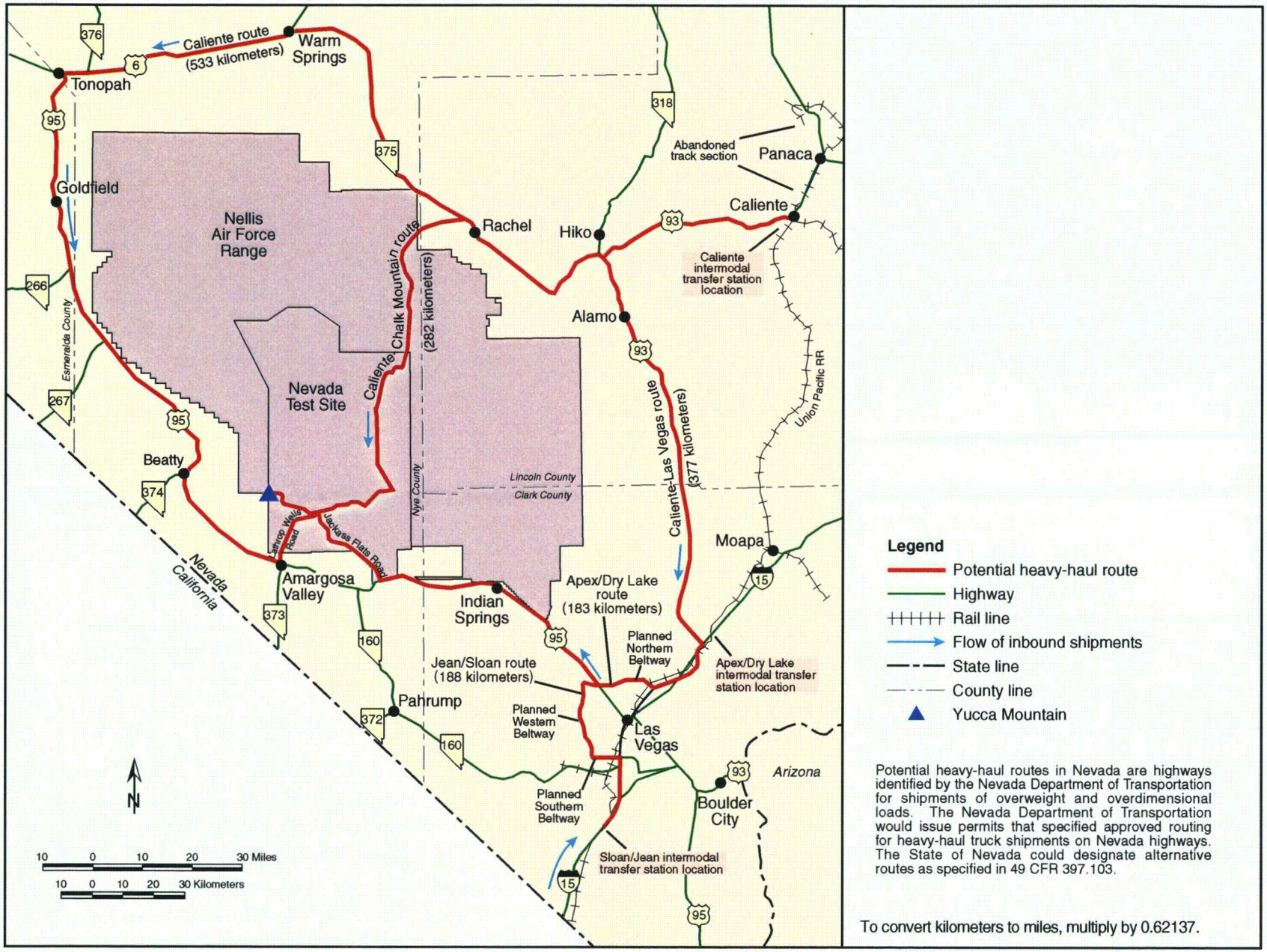

Figure S-14. Potential intermodal transfer station locations and potential routes in Nevada for heavy-haul trucks.