

## **CHRONOLOGY OF SELECTED YUCCA MOUNTAIN PROJECT EMAILS**

### **Introduction to the Email Chronology**

The following extracts from Yucca Mountain project emails come from two sources. The first is a selection of 1996-1998 emails about the Yucca Mountain project culled from DOE document files that the Department posted on the web in June 2004 in order to meet its responsibilities to the NRC in advance of filing an application for an NRC license. (The NRC later ruled that DOE's filing was incomplete and inadequate, but the emails we have are still very revealing.) DOE released hard copies of the second group of emails, which are from the period 1998-2000, in response to a demand from Congressman Jon Porter. The congressman chaired a hearing on revelations that certain Yucca Mountain investigations performed for DOE by the US Geologic Survey may have been falsified. These emails were heavily redacted before being made public, but even so they are revealing, as well.

The 1996-1998 emails include communications among DOE and principal contractor staff and managers during a period when the thinking about the Yucca Mountain project changed radically. The individuals sending and receiving these emails were at the center of project thinking. The emails give an inside picture of the project that is quite different from the one that DOE presented in public.

Originally, DOE planned to qualify the site on the basis of the ability of the geologic environment around the waste repository to retain any leakage from the radioactive waste packages. Congress had, after all, told the DOE to design a deep geologic repository. DOE planned to demonstrate the site's adequacy by means of elaborate computer simulations of the surrounding underground environment. The trouble was that the project and its contractors eagerly launched into extensive and complex—and highly remunerative—computer modeling of the Yucca Mountain underground environment before they had data. There was in fact little scientific support for not only for the physical parameters DOE selected, but for the models themselves, a matter that DOE glossed over in public but which the emails reveal the senior staff understood and acknowledged.

Around 1996, they were rocked back on their heels. The discoveries that (1) there was much more water in the Mountain, and (2) that it flowed much faster than DOE previously estimated, undercut the assumptions on which DOE picked the site. Most worrisome was the discovery of a Chlorine isotope (Cl-36) deep in the Mountain. This could only have come from nuclear weapon testing in the atmosphere. It meant that the water penetrated the Mountain in less than 50 years, orders of magnitude faster than DOE had earlier assumed. There were "fast paths."

While the project senior staff maintained a confident public face about the suitability of Yucca Mountain, they were in fact shaken by these discoveries and realized that the site would not qualify under then-existing DOE guidelines that emphasized the adequacy of geologic containment. Moreover the repository design would likely not pass NRC licensing requirements. Some of the emails are quite blunt on this point. According to the law—the 1982 Nuclear Waste Policy Act—in the event of adverse findings regarding the site DOE was supposed to return to Congress with the bad news. This, however, was not anything that the DOE Yucca Mountain bureaucracy or its major

contractor ever seems to have considered, for it would have meant killing their golden goose. In short, the project had taken on a life of its own.

Instead, the project staff scrambled for ways to keep the project alive. (Scrambling seemed to be the constant management mode—there was always lots of heat from the top and never time to do things right, with the inevitable result that everything took much longer than expected.) Since the Mountain was obviously not effective in retaining certain worrisome radioactive components, DOE shifted away from demonstrating the site's adequacy and adopted a new approach, one that put major reliance on the ability of the waste package to keep water away from the radioactive waste. This included putting a titanium "drip shield" over each waste package to divert water that could promote corrosion. (More accurately, the new design took credit for drip shields that some future entity was supposed to put in remotely before the repository closed—possibly in a hundred or more years, when tunnels may well have collapsed.) To cap off the changeover and to make the new approach look legal, DOE threw out the troublesome site selection geologic guidelines that DOE had on the books since 1984, but which the site could not pass.

A consequence of the new approach was that there was no longer "defense in depth"—the universal requirement of nuclear safety. When the packages fail—as they would eventually do—the geologic environment around the repository could not hold the radioactive components back effectively from the biosphere. In other words, the surrounding environment and the package were no longer redundant. All this is discussed quite frankly in the emails.

With the shift to dependence on the waste package, and the wildly optimistic assumptions about their corrosion-resistance, DOE managers lost interest in doing competent scientific work to ascertain the site characteristics. Some of the emails express the alarm of those doing the computer modeling of the surrounding environment about the reduction of their activity. A certain amount of this alarm stemmed from genuine concern about the soundness of the project, but it looks as if much of it had to do with the parochial interests of the modeling contractors who were mainly interested in continued funding.

Even with the change in strategy emphasizing packages, DOE still had the problem of how to meet radiation dose standards once the packages failed, even though they had pushed that off into the distant future. Because the site was so poor, no matter how DOE played with the computer codes, the peak dose after package failure was still too high to meet EPA standards. NRC and EPA came to DOE's rescue by limiting the period of regulatory compliance to 10,000 years, and thus allowing DOE to meet the radiation dose standard using any combination of environment and package. This opened the door to DOE qualifying for a license on the basis of its claimed corrosion-resistant packages alone. If they could get NRC to go along with the notion that the packages would last 10,000 years, they would never have to deal with the peak dose or the site geology.

To jump ahead of the period covering these emails: in July 2004 the federal Court of Appeals (DC Circuit) ruled that the period of regulatory compliance had to extend to the peak dose, whenever that came, even if that came after 10,000 years. The Court in effect told EPA and NRC that they could not let DOE get by relying on the waste

package alone. Whether these agencies will comply with the Court's ruling is still an open question.

To return to the emails, the second batch from 1998-2000 are different from the first. This one relates to Yucca Mountain work done for DOE by USGS, mainly in support of modeling the question of water infiltration into the Mountain. This formed one of the key modules of DOE's overall computer model that is supposed to calculate the radiation dose to the human population, on the basis of which NRC is supposed to decide whether Yucca Mountain qualifies for a license. These emails give us a window on what was happening at the working level.

As DOE shifted away from relying on the Mountain to retain the waste's radioactivity to relying on the integrity of the package, the ability of the waste package and the drip shield over it to resist water-promoted corrosion became crucial. In its presentations to the public, and to Congress and the president, DOE glossed over the science and maintained the waste package and drip shield would retain their integrity for tens of thousands of years.

DOE approached the technical problem in its typical fashion. The project continued to rely on inadequately-supported models—just as it had in dealing with the geology—but this time in dealing with the science behind package corrosion. DOE lacked data on the corrosion-resistance of the waste package and drip shield materials and the initial models did not incorporate the chemistry of the corrosive constituents of the Mountain.

The people working on the project, however, knew the amount of water reaching the package was critical. USGS was to supply the answer on water infiltration. On paper the agency worked for DOE, but in practice it worked for DOE's Yucca Mountain contractor.

In March 2005 DOE announced that certain USGS employees may have falsified work on Yucca Mountain. This came after a DOE contractor discovered incriminating emails. DOE was forced to turn the emails over to Congress after a demand by Congressman Jon Porter, who chaired a hearing on the issue. In the email copies available to Nevada, DOE/committee staff had blacked out the names of the originators and recipients and this makes it easy to identify these emails in the following chronology. DOE also blacked out some of the contents. Nevertheless, enough detail remains for us to gain a picture of USGS scientists under heavy pressure to produce quick results, and the shoddy, and sometimes dishonest, manner in which work was performed to satisfy the Yucca Mountain project. One thing is clear; the USGS scientists did not follow established quality assurance (QA) procedures to check the validity of their work. This supposedly scientific work was a key component of what the Energy Secretary repeatedly described as "good science," supporting the selection of Yucca Mountain as a repository site.

To bring the issues up to date, EPA and NRC now have to adopt new rules that meet the Court's July 2004 decision. (Instead of following the Court's direction, they are apparently looking for some way to return to the rules the Court threw out, which means the issue may return to the Court.)

Then, immediately after the 2004 Court of Appeals decision, DOE ran into problems from another direction—an NRC administrative panel threw out DOE's pre-

hearing document submission. NRC rules require a complete DOE document submission six months before DOE submittal of a license application. DOE's June 2004 document submission was grossly inadequate.

And even more recently, DOE has gotten entwined in the falsification scandal involving the USGS scientists—the issue brought up by the 1998-2000 emails. As of May 2005 DOE has yet to respond publicly on how it will deal with this matter. A plan to do so was posted on DOE's web site but hastily withdrawn a couple of days later, which indicates some managerial confusion.

Altogether, the project is in deep trouble. DOE failed to submit an NRC license application by December 2004, as it had promised for years that it would do. DOE is now bogged down in three problem areas—coping with the Court of Appeals ruling, compiling a document base to meet NRC's requirements, and in assessing the impact of the document falsification issue—and will not likely submit an application in 2005.

Some of the entries below, in dark blue rather than black, are project-related events—milestones in the project chronology—that provide context for the email messages. We have provided web links to the original documents for the first batch of 1996-1998 emails. The chronology also includes March 2005 DOE senior management memoranda, heavily redacted, that describe DOE's reactions to the discovery of the USGS-related emails.

We plan to add to this chronology as interesting documents that add to our insight about the Yucca Mountain project become available.

## CHRONOLOGY

- 1982 Nuclear Waste Policy Act
- 1984-12-06 DOE adopted site selection guidelines (10 CFR Part 960) under the Nuclear Waste Policy Act. NRC had concurred in 1984-07.
- 1987 Congress restricted site characterization to the Yucca Mountain site; and established the Nuclear Waste Technical Review Board to oversee DOE's technical work on Yucca Mountain.
- 1992 The Energy Policy Act of 1992 directed EPA and NRC to develop Yucca Mountain-specific regulations based on recommendations to be obtained from the National Academy of Science.
- [1996-05-16](#) David Sevougian to Abe Van Luik:  
"Bob [Andrews] has tasked me and also some Sandia folks to study the implications of the CI-36 data w.r.t. to TSPA [Total System Performance Assessment]. . . .I don't think we should jump the gun too much and declare the repository to be dead before we have a chance to spend some time on this."
- [1996-05-16](#) Larry Rickertsen to Abe Van Luik:  
". . . the message you need to get from the fast path calculation is that the effect is huge. . . . Even if very little water goes into them, you will still get very large dose rates . . .  
I am not suggesting the CI-36 data doom this site. . . . The radiotoxicity of spent fuel is so high that even if only a very small amount of water can contact the waste and reach the accessible environment, there will result a substantial dose."
- [1996-07-03](#) Larry Rickertsen to Larry Rickertsen:  
"Steve B. [Brocoum] said he did not move to Las Vegas to shut the project down, but it looks to me that is just what will happen."
- [1996-07-09](#) Robert Andrews to Steve Brocoum:  
"Dispersive effects are prevalent in virtually every natural system. . . .  
. . . Testing is of limited value because the space and time scales are generally too short in comparison to the scales of interest in the transport model . . . . Did we capture these effects correctly [in our software]? What is correct? . . . No one will know because we can't test it.
- 1996-07-29 [Abe Van](#) Luik to Larry Rickertsen: quotes earlier LR email with which AVL disagrees:

“No multibarrier approach is possible when you adopt a transport picture. . . . A multibarrier approach means that you [have] multiple barriers that work, the backup barriers account for uncertainties in the other barriers: you have to have failure of all of them for the system to fail. . . . [In the DOE calculations] you only need one barrier to fail for the system to fail. Thus the uncertainties in each barrier are crucial.”

AVL also disagrees in part with LR comment in which he is again advocating emphasis on package rather than on “Monte Carlo calculations that [LR believes] require probability distributions that cannot be supported by adequate statistics and that historically have not fared well in scientific, administrative, or regulatory reviews.”

[1996-08-06](#)

Larry Rickertsen to Larry Rickertsen:

“I have seen the light. . . Ed [Taylor]’s approach essentially serves the purpose of increasing attention on the wetting of the waste.

That is, if we define the current PA approach as

- 1) define the amount and rate of contact of liquid water with the waste packages
- 2) determine the waste package lifetime
- 3) determine the release of radionuclides into water contacting the waste (waste mobilization)
- 4) calculate the transport of radionuclides through the engineering and natural barriers
- 5) determine the dilution

. . . the principle reliance in this [current Yucca Mountain] program will be on step 4. with dispersion dominating the calculation. Steps 3 and 5 are next most important. Step 2 gets a lick and a promise. Our model for 1 is very primitive . . . The ‘alternative’ approach simply is an emphasis on 1, some increased, some increased emphasis on 2, and diminished emphasis on 3-5. . . . a focus on the first piece of the process and showing that little or no water contacts the waste.”

[1996-09-03](#)

Larry Rickertsen to Larry Rickertsen:

“So we model the corrosion of the waste package. We have no measurements regarding the environments nor for many of the corrosion mechanism we are modeling. . . .

But somehow we have drifted into a mode where we believe the world is going to be convinced by our TSPAs. In part our delusion is nourished by managers who misunderstand performance assessment and who impute to us more brains than we have . . .”

[1996-09-05](#)

Larry Rickertsen to David Sevougian:

“The objective of my figures is to show you why complex modeling of the type we have been pursuing will not show the repository is safe.”

[1996-09-05](#) Larry Rickertsen to Robert Andrews; Jean Younker; Thomas Statton (copy of memo to Jerry McNeish):  
“The uncertainties in the models and parameters, the complexity of the way the models interplay, the probabilistic aspects, and the difficulty of showing the validity of the models we use all tend to make it difficult for people to follow or have confidence in these analyses. . . . We have been able to get by NWTRB reviews and other similar situations, but . . . we will have severe difficulties when we get into the real arenas . . .  
. . . . I am convinced that the data we have been using are not only uncertain, they are not even representative of the ranges that we will be able to defend when we get into those arenas.  
This [TSPA] calculation used a hydrodynamic dispersivity of 500 m. The information in the literature strongly suggests that the dispersivity is closer to 10 m. . . .the use of the more representative dispersivity increases the results significantly [to 1 rem/year]..  
The coupling between the fractures and the rock matrix considered in the base case above does not yet have a defensible basis. In fact, it is probably wrong. The CI-36 data suggests there are fast paths from the surface to at least the repository horizon . . . . If the waste packages last only a few thousand years, the calculated dose rate would exceed 100 mrem/year in less than 10,000 years. . . . Fortunately there is a way that gets around those problems. It focuses on keeping water away from the waste.”

[1996-09-06](#) Larry Rickertsen to David Sevougian: “. . . the only possibility of demonstrating safety is that no (or extremely little) water contacts the waste packages . . .  
I simply believe we should be using dispersivities that are representative. . . a key reason for the low dose rates [in the TPA] is the velocity dispersion in the Markovian model. . . . If we do not have such data, it seems to me we are not being realistically conservative.”

[1996-10-01](#) Larry Rickertsen to Jean Younker:  
“Alan Flint gave his tour de force on infiltration. . . . He probably knows more than anyone in the program about the site in this regard. . . . His analyses suggest that the precip[itation] at YM will increase as a result of global warming. . . . I now believe that surface infiltration fluxes greater than 30 mm/yr cannot be precluded by anything Alan has done.

1996-12-16 DOE proposes to amend its 1984 site recommendation guidelines (10 CFR Part 960). DOE's proposal would create a new Yucca Mountain subpart to part 960, and limit analyses to an *overall* evaluation of repository performance—including the waste package—and dropping specific geologic requirements.

1997-01-14 Larry Rickertsen to Jean Younker et al:  
“In his December summary, Ed Taylor outlined a design-for-dry approach that appears to be the only way to a credible waste isolation statement for the Viability Assessment to be completed in the next 20 months.” LR recommends alternative to TSPA approach.

1997-01-14 Jerry King to Ed Taylor, Larry Rickertsen, et al:  
“I like the idea, but I’m concerned about the necessary longevity of any umbrella [drip shield] mechanism. The engineers . . . won’t make any quantitative predictions about drift longevity. . . . Can we come up with a design to keep all water away from the waste after the drifts have collapsed?”

1997-03-07 Larry Rickertsen to Jean Younker:  
“Poor Bo [Bodvarsson, Director, Earth Sciences Division, Lawrence Berkeley National Laboratory]. He is wrestling, trying to figure out how to defend his indefensible flow models, grasping at every straw he can find. The beauty of the drip-shield approach is that I don’t need to know that stuff anymore.”

1997-05-07 Larry Rickertsen to Dale Wilder:  
“One comment on sporadic flow. The picture you need to understand is that the flow is fundamentally unpredictable and inhomogeneous. . . because of the nonlinear behavior of the cohesive and frictional forces involved in unsaturated flow and because of the heterogeneity of the fracture system at all scales. . . The fundamental unpredictability is what is bothering me (not only for flow, but for every other process that involves a multitude of contributing sub-processes, some of which are highly nonlinear).”

1997-08-13 Roger Henning to Larry Hayes: re questions raised by Steve Hanauer:  
“Why did we choose a UZ site? 1) Relatively inexpensive . . . mining and emplacement operation; 2) Relatively easy retrievability (and much safer) for a long period; 3) Long flow path through the UZ with much more chance of sorption and inhibition into the UZ rock. By comparison, most other sites in the world are planned to be below the water table . . . . we will be in a free draining unit, so



even if we have leachate entering the water table, it will likely dilute significantly even if it moves away quickly. . . “  
[Is a rising water table a problem?] Yes, in the extreme . . . maybe the correct answer is ‘so what?’ It is only a problem if NRC thinks it is a problem. We can never test . . . “

[1997-08-14](#) Ed Taylor to Larry Rickertsen:  
“That expert elicitation meeting blew my mind. I had nothing left to bring to Berkeley except anger. . . .We have now seen Bo [Bodvarsson, Director, Earth Sciences Division, Lawrence Berkeley National Laboratory] confronted in public with good arguments that his model is irrelevant, and both times he blew sky high.”

[1997-08-15](#) Ed Taylor to Robert Strickler et al:  
Re expert-elicitation meeting 1997-08-11,12 in San Francisco.  
“All of this came to an ominous (but tentative) conclusions: Flow at Yucca Mountain will probably be in thin tubes that do very little mixing with each other. The radionuclide transport pattern will be a bunch of long snakes, probably enduring for kilometers. The ‘stirred tank’ model of mixing we have been using in PA appears unacceptable. . . Dilution is unknowable, and—for now—not even estimable. We . . .have a lot to think about in a big hurry. . . .  
These uncertainties tend to emphasize the significance of a long-life engineered barrier in a demonstration that we can build a safe repository. However, that demonstration will depend crucially on the credibility of the geohydrological expertise we use to assess the effects of leaks in the engineered system. . . ”

[1997-08-26](#) Ed Taylor to Larry Rickertsen:  
“. . . the program is dead if we don’t show that the EBS will offset the irreducible uncertainties in the natural barrier. Nobody wants to say this so we have to jam it down their throats.”

[1997-09-08](#) Larry Rickertsen to Larry Hayes  
“. . . the TSPA results seem to be indicating now that what we are likely to about site characteristics including percolation, flow and transport pathways, and dilution in the saturated zone will have little impact on demonstrating compliance with performance standards. . .  
. . .  
Many key assumptions made for TSPA presentations that have been presented up to this point are not likely to have a defensible basis by VA or even LA. . . .[including] the amount of water that can drip onto a waste package, the number of waste packages that might be exposed to dripping water, the interaction of the seepage water with the waste package materials, and the water moving through the waste package and mobilizing radionuclides. . .

Also of concern is colloidal transport of plutonium. . .  
Corrosion is critical to performance. Corrosion models have been updated based on inputs from an expert panel, however these modifications are subjective.

[1997-09-10](#) Larry Rickertsen to Jan Docka  
“I think I am arguing that drip shields don’t help you either (you will still get some water contacting the waste, and if Andrews is right, that means the eventual dose is 1 rem/year—or 10 rem/year when he comes to himself). . . .  
Ed and everybody else thinks there is some secret out there that is so obviously good even an idiot can demonstrate it. I think it is impossible to show the doses will be less than 10 rem/year even for drip shield. . . “

[1997-09-22](#) Larry Rickertsen to Ed Taylor: we are going to engineered barriers “because the natural ones in themselves cannot do the job. . . The only purpose of the natural system now is to provide a benign environment for the engineering.”

[1997-09-23](#) Russ Dyer to Jean Younker  
Re Barrett meeting  
“I understand this as attempt to expose Lake (and several other DOE managers) to the type of discussion/brainstorming that went on several weeks ago in a M&O PA-focused meeting that Steve Hanauer attended. . . .  
Current internal debate centers over the question of whether a . . . VA reference design that has an expected performance of 20-30 mrem releases is dead on arrival and drags down the program with it—or whether . . . with a suite of ready options that could credibly and defensibly (and economically) improve performance by 2-3 orders of magnitude by the time of the LA would attract sufficient support from OMB and administration that program would survive long enough to realize this design/concept.”

[1997-09-24](#) Ed Taylor to Jean Younker et al:  
“Since the VA is now only a year away, and since Lake Barrett is breathing down our necks, we ought to be able to compose a satisfactory abstract now. Here’s my shot:  
A 15-year international research effort on geologic disposal has defined significant and irreducible uncertainties in natural environments for repositories. For safe disposal at any site considered so far, these uncertainties must be offset by engineering. . . .”

1997-09-24 Bob Levich to Paul Dixon

Re: VA Abstract

“. . . Ed Taylor . . . is as crazy as a coot. . . . We CANNOT and CAN NEVER rely completely (or even mostly) on engineering barriers for protection of the public health and safety in a geologic repository system. If we try to do so, this program is dead!!! Just build concrete pads on Jackass Flats and shove the waste inside concrete bunkers.

Unfortunately, the RW [Radioactive Waste] system has never even tried to understand the chemistry of radionuclide migration and therefore has never funded the appropriate and necessary work to test the benefits of geochemical retardation of radionuclides: the very reason for the concept of geological disposal. . . . It is ridiculous to completely rely on engineered barriers, the lifespan of which has never been tested for even 10s or 100s of years . . . .”

[1997-09-25](#)

Larry Rickertsen to Dwight Hoxie et al:

“[ET’s statement] is a fundamentally negative and defensive posture. It says the system does not work and we are trying to patch things up. A possible fix is to turn it around and focus on engineering primarily. But I don’t feel this solves my basic problem. I believe we cannot succeed unless we can show the engineering works and the site works. . . .”

[1997-10-03](#)

Larry Rickertsen to list: re 10-02 presentation to Lake Barrett

Attendees:

DOE: Lake Barrett, Russ Dyer, Susan Jones, Steve Brocoum, Tim Sullivan, Paul Harrington, Abe Van Luik, Richard Craun, and Linda Desell

M&O: Bob Strickler, Dale Faust, Mike Voegele, Larry Hayes, Dick Snell, Jean Younker, LR, Jack Bailey, Bob Andrews, Bill Derrickson, and ET

MTS: Chuck Metzger

“The implication of the performance assessments are that the only way to show peak dose rates will be substantially lower than 10 mrem/yr is to demonstrate engineered barriers; information about the site serves principally to tell when peak dose rates will occur, but not to give low values. Consequently we should give attention to engineered barriers, particularly the supporting evidence needed regarding material performance. . . .

Current justification for corrosion resistance of metal barriers is not strong. . . . In particular, data regarding C-22 steel, titanium, and zirconium are important . . . we need to be more aggressive in this area. . . .

Colloidal plutonium is a big concern. . .

Russ Dyer asked if the natural barriers . . . didn’t do something.

Andrews said there is value in looking at it, but the value is

basically in affecting when the peak occurs, not what the peak is. . . .  
. . . if we are looking for the most profitable way to spend our money,  
we should not sacrifice engineering to site considerations.  
Lake Barrett emphasized he is not dictating the testing or design  
that should be done by the Project, but is very much concerned that  
we have a basis for our assertions in the VA. . . .”

[1997-10-06](#) Ed Taylor to Larry Rickertsen with cc to list  
Re 1997-10-02 PA presentation to Lake Barrett

“I agree the key results are:

- 1) High-level management endorsement of the emphasis on long-life engineered barriers
- 2) High-level management endorsement of the emphasis on . . . supporting evidence.”

[1997-10-22](#) William Dudley to Larry Rickertsen:

“. . . my discomfort relates to how well we know some of the hydrological aspects of the expanded site and, thus, how badly our necessarily simplified models misrepresent the natural system. A case in point is our futile attempts to predict the maximum credible plume width at Amargosa Farms latitude. We simply do not have the geologic and hydrologic data . . . . we’re forced to play with dispersion coefficients . . . .”

[1997-10-24](#) William Dudley to Larry Rickertsen:

“The perfect repository would be one in which a foolproof engineered barrier is placed in a fully adequate site—on that could have provided isolation without engineered barriers. I agree we won’t get the fully adequate site, but I also am certain that we won’t get, or at least can’t afford, a foolproof engineered barrier. Therefore let’s not write off the characteristics of the site. . . . . . . . . the transport analyses indicate we show peak dose rates barely meeting expected standards, and that, only if we assume dilution factors and dispersion and flow and transport we cannot verify. . . . .  
The point is this: we cannot show a truly safe system by relying on natural or engineered barriers against radionuclide migration, but we can achieve it by relying on barriers which limit the water contacting the waste in the first place. . . . .”

[1997-10-29](#) William Dudley to Ed Taylor:

“You zeroed in on one of my concerns—that we haven’t addressed crucial technical issues associated with the engineered barrier.”

[1997-11-14](#) Larry Rickertsen to Ed Taylor:

"Drip shields are needed to address critical contingencies that we keep ignoring.: our flow model may be wrong, corrosion rates are not defensible, and colloid transport cannot be precluded. . . ."

[1997-11-25](#) MLWilson to Larry Rickertsen

"Larry, I wish I shared your confidence in drip shields and backfill, but I do not."

[1997-12-02](#) David Stahl to James Blink, Ed Taylor et al  
Re ceramic drip shield

"I disagree on many of the point . . .there is a wealth of information on C-22 and 625 as a function of various aggressive water chemistries. . . . A rough calculation that Kevin McCoy has performed utilizing the model indicates a lifetime of over 100,000 years for C-22. . .  
. . .the data on the ceramic materials is much more limited . . ."

[1998-01-21](#) Larry Rickertsen to John Clouet:

"I was informed of the change in design yesterday. . . .still needs to be approved by Lake Barrett. The problem has been that the old reference gives peak dose rates above the expected standards. The problem with colloids and radionuclide transport has caused the rethinking. In this new design . . . water does not contact the waste as long as the ceramic coating remains intact."

[1998-01-22](#) James Duguid to John Clouet, cc to Larry Rickertsen:

"Base case cannot change because it is due to DOE on Jan 29. . . . alternative design is planned to be analyzed as part of sensitivity analysis."

[1998-01-22](#) Larry Rickertsen to James Duguid:

". . . no way to determine how to address the flow uncertainties. . . . The base case flow model is unable to explain" the data.  
"Meanwhile a flow model that gives rapid travel through the PTn explains all of the data with a single set of parameters. . . . Flow uncertainties are only part of the problem. You are no doubt aware of the controversy regarding C-22 corrosion properties. And what about colloids? LANL people are advocating parameters that result in no significant impact. . . . no significant migration of nuclides. The huge misrepresentation in these cases has caused the Deputy Secretary [Moniz] to essentially discount all transport calculations by DOE contractors."

[1998-01-28](#) Ed Taylor to Larry Rickertsen

"In the absence of statistics, they [the YM Project] have relied on expert opinion alone . . . I would not characterize this as

emphasizing elicited information (Who's kidding who? These guys are going to assign probability distributions that keep the expected values in the right place. . . .)

There is no generally accepted way to calculate the behavior of the geohydrological environment as a function of heat releases from the disposed site. The time constant of the processes are such that there can be no confirmation of any calculation process for many years. . .

Observations at several DOE sites confirm that radionuclides tend to move farther and faster than model predictions. . .

At present the uncertainties in all reference process models is large. . . This implies a requirement for additional barriers . . . We do not yet have sufficient data to fully assess any of the proposed engineered barriers. . . .”

[1998-02-20](#) Ed Taylor to James Blink:

“ . . . at the TSPA review last Tuesday. Bob Strickler shocked everyone . . . by telling us our [DOE's] slick presentation has little substance. None of our technical mafia knew what he was talking about, and they concluded he just doesn't understand.

Nevertheless, any sharp outsider . . . would conclude the same thing . . .

The issue is the inertia of a human organization that is large, old, isolated, behind the times, in charge of its own money, self-grading, and self-satisfied.

We know everything we are ever going to know about the site, and it's enough. All that's left is 1) how to install a drip-shield and gravel and 2) how to make long-life waste packages . . .”

[1998-02-20](#) Larry Rickertsen to Jerry King:

“My problem is that, while PA is calculating negligible effects of colloids using laboratory parameters, when I calculate the dose with parameters that fit the NTS field data . . . I get 7,000 rems/year. Big hitter. . . Ok, maybe I'm wrong. . . But right now you have to allow something like a 50% probability of 7,000 rem/year. . . .

All this is completely unnecessary. If we adopt a simple design change that keeps the water off the waste, then there is no colloid issue at all.

[1998-02-24](#) Ed Taylor to James Blink:

“Experimental approaches and methods to determine crevice corrosion resistance are well established and do not require long test times. The Panel recommends that tests be run to determine the behavior of C-22, Ti, 625, and 825 in a range of environments not only to cover the expected repository conditions, but also to extend well beyond those conditions.

Remember that Joe [Payer] thinks crevice corrosion is the only thing we have to worry about. . . .we might have to go to lower temperature.”

[1998-02-24](#) Ed Taylor to Robert Andrews  
Re expert opinion—quotes expert Lynn Gelhar statement to NWTRB: “From my [Lynn Gelhar’s] perspective the saturated zone activities in the YMP suffer from a modeling deluge and a data drought. If the project is expected to meet the normal standards of scientific fact finding, I feel that the project faces some very difficult challenges. On the other hand, if the strategy is to use complex, pseudo-sophisticated modeling techniques primarily to obscure the real limitations of the existing information, the project would seem to be on the right course.”

[1998-02-25](#) James Blink to Ed Taylor:  
“Ed, I think you need to be careful how you characterize our organization . . . your words could easily be used out-of-context by others. . . .”

[1998-02-27](#) Larry Rickertsen to James Blink::  
“Here we are, only two years from closing down data for the LA and we are still trying to figure out a system that can work. Only three years ago the consensus was that the flow was predominantly in the matrix . . . Now we have learned the flow is predominantly in the fractures and we are unable to predict where or how much.  
All the experienced people who understand UZ flow . . . say we will not figure it out by LA. . . .  
I don’t see anything substantive going on except modeling that is unsupported by measurements.”

[1998-04-01](#) Larry Rickertsen to Ed Taylor:  
“Water, Water Everywhere [heater test]  
People did not expect the puddling on the floors or the sporadic nature so they clearly were not in the calculated result.”

1998-04-03 [Blacked out] to [Blacked out]  
Re: Infiltration and UZ flow  
“I have some maybe bad and maybe good news you should be aware of. . . basically, either our infiltration model is wrong or our [blacked out] flow model is wrong or both.  
Infiltration model wrong? . . .If we look at 2 analog sites, we see much different behavior than predicted by our infiltration model . . .  
.Our infiltration model has virtually no infiltration in washes; what infiltration there is in washes is basically put there as a fudge factor.



(I don't want to be too critical here—I could probably tear apart any of our models . . .) . . .

The unfortunate thing here is that the way we have the natural system modeled, we are probably not giving it enough credit.”

1998-04-03 [Blacked out] to [Blacked out]

Re: Infiltration and UZ flow

“. . . I think the main thing here is that if you think the flow will contact significantly fewer waste packages than what we are saying in our base case, then we are being way over conservative, especially considering that the fraction of packages seeped upon in the [blacked out] is the most important performance parameter.”

[1998-04-08](#) Ed Taylor to Larry Rickertsen

“What do you think of Brocoum's command that we continue to obfuscate? . . . How would we all fare at Nuremberg?”

[1998-04-19](#) William Boyle to Russ Patterson

Re Need for a Strategy for the SZ

“. . . The M&O should start working on this however they can. If they squawk and say they have no scope or funding to accomplish this, I'd point out that they are the ones who will lose out in the absence of a strategy. I have heard directly or second hand the following people suggesting that site work has had its day and should be wrapping up: Dreyfus, Dyer, Jones, Strickler, and Wilkins. . . “

1998-05-01 [Blacked out] to [Blacked out]

“Subject: qa shit

Attachment: [blacked out] “

[What is DOE hiding?]

[1998-08-05](#) Ed Taylor to Jan Docka

“. . . the 'scientific' bureaucracy—mostly the labs, and mostly LANL—is on top. Unfortunately, the science is all earth science and no material science. . . .”

[1998-08-22](#) Ed Taylor to Larry Rickertsen:

“I'm confused on where the program is on the demonstration of redundancy. Many times Steve Brocoum has said that calculations without the waste package are not allowed—'That kind of calculation will let the state argue we are engineering a bad mountain.' As you know, I consider this to be deliberate obfuscation, and also illegal.

I finished the proceedings you sent me, and I can see they are flirting with the idea [relying on engineered barriers]. . . .the guys who wrote the strategy for developing [NRC] part 63 understood it. .



. They are our hope. . . . the people writing [10 CFR] Part 63 are the Waste Management Division of the NRC Staff (. . . the same people who talked in the transcript). ..

1. A dose rate to individuals at 20 km of about 25 mrem/year. . .
  2. This standard will apply for 10,000 years, but trends after 10,000 years will be very important in deciding if the system is safe.
  3. No performance objective for individual barriers . . .
  4. Explicit requirement for defense in depth. . .
- . . the guiding principles are ok . . .”

1998-08-26 DOE draft Viability Assessment 1. Introduction includes the following statement:  
“Nothing has been found to date that would disqualify the site.”

1998-09-25 Ed Taylor to Larry Rickertsen:  
“The real problem is that the Las Vegas DOE . . . believe the best course is to go along with the labs, who are the brains of DOE—even Moniz thinks so. To the DOE, TRW, Woodward-Clyde, and even Intera are relatively ignorant. When Larry Rickertsen and Ed Taylor declare that Bo [Bodvarsson] is a swindler and that Los Alamos is scientifically out of it, Brocoum has a knee-jerk response [to dismiss it].”

1998-10-07 Larry Rickertsen to Ed Taylor  
“A new problem is the draft of Part 63. It says ‘the sole basis for its evaluation of compliance with the postclosure performance objective will be the quantitative performance assessments.’ Probably written by the Brocoum/Van Luik axis.”

1998-10-29 [Blacked out] to [Blacked out]  
Re: Design Features 23/24 – Period of Effectiveness  
“. . . Wait till they figure out that nothing I’ve provided them is QA. If they really want the stuff, they’ll have to pay us to do it right.”

1998-11-24 Larry Rickertsen to Ed Taylor:  
“It’s great that PA finally admits ‘that everything is hinging on the corrosion-resistant waste package barrier.’ The next step is to realize that the [corrosion] resistance is not all that certain . . .  
I was just shown a version of the new Part 960, the DOE siting guidelines. What the DOE has finally admitted to itself is that the Yucca Mountain site fails the guidelines of the old 960, which was developed from the old transport picture of repository performance and the properties of saturated sites. So they had a quick one-week effort to write a new version. . . .”

1998-12-17 [Blacked out] to [Blacked out]

Re: [blacked out]

“ . . . YMP has now reached a point where they need to have certain items work no matter what, and the infiltration maps are on that list.

..

I can no longer wait for USGS to figure this out; I'm moving ahead according to the [blacked out] work plan we put together this week.

.. “

1998-12-17 [Blacked out] to [Blacked out]

Re: AP 3.10Q

“This is now CYA and we had better be good at it. I seem to have let this one slip too much in an attempt to cover all our work (and get us the hell out of the long term problem of Yucca Mountain). . . . These are very dangerous times, both funding wise and professionally. Mark my words on this one, it will not be long before our technical credibility with [will?] be challenged in an attempt to discredit us and redirect funding! . . .”

1998-12-18 [Blacked out] to [Blacked out]

Re: AP [blacked out]

“YMP is looking for the fall guys, and we are high on the list. . . . As [blacked out] told the lawyer who was there, YMP does not stand a snowball's chance in hell of making this work if that is the approach. . . .”

1998-12-18 DOE releases Yucca Mountain Viability Assessment

1999-02-22 NRC proposed Yucca Mountain-specific licensing regulation 10 CFR Part 63. The new regulation eliminates specific geologic requirements and allows compliance based on overall performance—lumping the waste package together with the surrounding underground environment—projected by computer model.

1999-03-15 [Blacked out] to [Blacked out]

“ . . . I have been trying to figure out what's really coming at us with the tiger team effort . . . . I am still working to the plan that we've all spent a significant amount of time on to make things happen for FY99. That's the inside scoop. The position we will take for the [blacked out] planners may be much different. So delete this memo after you've read it.”

1999-03-15 [Blacked out] to [Blacked out]

“This memo actually hits the nail on the head. You are exactly right: One, yes, we will do the work, Two, yes, screw the tiger team ( I

don't know exactly how yet but I'll figure it out), Three, yes, destroy this memo!"

- 1999-03-22 [Blacked out] to [Blacked out]  
“. . . How's the software QA coming? . . .”
- 1999-03-22 [Blacked out] to [Blacked out]  
“1. Software QA for the latest version of the model is coming along crappy. . .”
- 1999-03-26 [Blacked out] to [Blacked out]  
Re: Status of LADS phase 1 calc. report – USGS  
“. . . Yes, the LADS work is now behind schedule but so is everything else because I'm the only one doing this work, and I'll be damned if I'll drop everything else and work on nothing but LADS. . . I do not need to be developing M&O hoop jumping skills. . . . I guess this is another one of those memos that need to be destroyed.”
- 1999-04-01 NWTRB Report, *Moving Beyond the Viability Assessment*, states:  
“For the current VA repository design, a credible basis does not yet exist.”  
Nevertheless, the Board concluded:  
“. . . that Yucca Mountain continues to merit study as the candidate site for a permanent geologic repository and that work should proceed to support a decision on whether to recommend the site to the President for development. . . .”
- 1999-04-02 [Blacked out] to [Blacked out]  
Re: Precipitation Estimates in VA  
“. . . I am in agreement with [blacked out] that the mean annual precipitation estimates used in the VA are too high. . . . both temperature and precipitation are key drivers of infiltration.”
- 1999-04-22 [Blacked out] to [Blacked out]  
Re: Precipitation Estimates [blacked out]  
“Here's my perspective:  
. . . the amount of water that will be contacting waste canisters is still the key issue for repository performance. The primary factor controlling flux thru the [blacked out] is the infiltration rate. Some nights I have a hard time going to sleep because I realize the importance of trying to get the right answer, and I know how many serious unknowns are still out there, and how many quick fixes are still holding things together. I'm just trying to do the best I can with 3 equations and 15 unknowns. . . . I am looking forward to putting the YMP nonsense behind me. . . .”

- 1999-04-22 [Blacked out] to [Blacked out]  
“ . . . the message I am getting from QA is that I can't use or refer to [your] results. . .  
So, for the record, the seven analog sites have been arbitrarily (randomly) selected. Hopefully, these sites will by coincidence match the sites you have identified.  
[blacked out]  
P.S. please destroy this memo.”
- 1999-04-22 [Blacked out] to [Blacked out]  
Re: QA  
“The QA bullshit grows deeper. I may need to say I did everything by hand for the data package I am submitting that You and [blacked out] reviewed. The program I wrote is not in the system and QA will be all over it like flies on &%#\$. All references to [blacked out] are being deleted.  
Here's my question: When we go to start QA'ing the site-scale modeling work will I get taken to the cleaners because I am not referencing either a tech procedure or a scientific notebook? In other words, would it be cost-effective to create a SN for the site-scale work and back-date the whole thing??  
Can't wait to be far-far away from here!”
- 1999-04-22 [Blacked out] to [Blacked out]  
Re: QA  
“What if you just download the raw files from [blacked out] and say you used those? Do they need to know more than that? You don't really need to do an analysis just say this is the data I used. Maybe that would work.”
- 1999-04-23 [Blacked out] to [Blacked out]  
Re: [blacked out] help  
“. . . . I am thinking that if I want to remain viable team player on YMP (which may translate to continued funding), I need to show we can get the job done . . . I'm getting the impression that unlike USGS QA, the labs have the QA resources to actually get in there and do the work . . .  
The other option would be to stall . . . and we can let the site scale modeling go down the tubes. Dealing with all this QA bullshit is really starting to make me sick.”
- 1999-05-11 [Blacked out] to [Blacked out]  
Re: [blacked out] Flow (+climate+infiltration) section for [blacked out] document

“Still don’t quite know quite how to handle the air temp glitch. I’m continuing to keep mum about this, but, from a scientific integrity standpoint, it is tempting to let the end users know exactly what was provided to them in terms of effectivley [sic] cooler future climate simulations. Problem is, I don’t know how to do this without looking bad. . . . If they (DOE force us to put DTNs on these things, I would rather the truth come out sooner rather than later. . . .”

1999-06-16 Peter Swift to Larry Rickertsen DS: short list of trouble spots “for the defensible bounding case.”  
“1) water flux onto drop shield/waste package. UZ may give WP a lot more water than they are expecting. . . .  
2) floor buckling . . .  
3) seismic ground motion . . .  
4) igneous activity . . .  
5) juvenile failures . . .  
6) maybe chemistry contacting the DS/WP . . . NFE might give WP more aggressive conditions than they are expecting.”

1999-08-05 [Blacked out] to [Blacked out]  
“FYI  
[blacked out] and I have responded to the recent issues concerning [blacked out]. We believe we’ve fixed all of the problems identified so that a stop work order should be averted. A copy of the fixed notebook was forwarded to [blacked out]. We have not yet heard anything back from QA.”

1999-08-05 [Blacked out] to [Blacked out]  
Re: [blacked out]  
“Piss on QA, how’s your recharge report (due Aug 31, 1999) coming. By the way [blacked out] may want to fund the transient recharge work!!!! Perfect for all you [blacked out] types!”

1999-09-25 [Blacked out] to [Blacked out]  
Re: 1999-09-16 [blacked out] Meeting  
“. . . . we have focused [blacked out] development on 10,000 years and do not have updated, or even Q information on the climates and durations beyond that (unless [blacked out] tell me I’m wrong . . . .). This is an example of cutting scope to what we considered the minimal necessary work.”

1999-09-28 [Blacked out] to [Blacked out]  
“Now the real question is: is the climate [blacked out] going to meet the need for the [blacked out] and the [blacked out] to have long term climate states (and infiltration changes accompanying those states) that are defensible???”

- 1999-10-15 [Blacked out] to [Blacked out]  
Re: 1999-09-16 TSPA Meeting  
“The climate thing, now in regard to SR and LA, is again a topic of concern. . . .”
- 1999-11-15 [Blacked out] to [Blacked out]  
“. . . I’ve deleted the lines from the “official” QA version of the files (which do have headers). In the end I keep track of 2 sets of files, the ones that will keep QA happy and the ones we actually used. . . .”
- 1999-11-30 DOE announces supplementary notice of proposed rulemaking 10 CFR Part 963, Yucca Mountain Site Suitability Guidelines, which would revise DOE’s previous (1996-12-16) proposal to amend the 1984 “General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories” (10 CFR 960).
- 2000-01-06 [Blacked out] to [Blacked out]  
Re: AMR [blacked out]  
“. . . There is of course no scientific notebook for this work. All work is in the form of electronic files. . . I can start making something up but then the [blacked out] projects will need to go on hold. . . .”
- 2000-02-17 [Blacked out] to [Blacked out]  
Re: finally the darn coordinates  
“. . . Please do not tell anyone how this was done because then we will need to get this whole thing through software QA!”
- 2000-03-06 [Blacked out] to [Blacked out]  
Re: USGS AMRs  
“I’ll cut to the chase:  
Infiltration AMR: Will not be completed by 3/13 – it needs to be put in the category of “the rare ones that get completed after the PMR is submitted.[“] We fully intend to complete during the period of the DOE PMR review. . . .”
- 2000-03-06 [Blacked out] to [Blacked out]  
Re: USGS [blacked out]  
“I checked the blocking ridge calculations using [blacked out] and they do not match what is in [blacked out]. . . . Again, the original calculation was not done by me and at this point I have no direct trace of the blocking ridge values in [blacked out] to the actual calculation. . . .  
I can fudge the attachment for [blacked out] for now but eventually someone may want to run [blacked out] to see what numbers come

out and at that point there will be problems, although it is my belief for now that an impact analysis would reveal that the differences are not critical to the end result.”

2000-03-20 [Blacked out] to [Blacked out]

Re: Installations

“ . . . I don’t have a clue when these programs were installed. So I’ve made up the dates and names (see red edits below). This is as good as its [sic] going to get. If they need more proof I will be happy to make up more stuff . . . ”

2000-04-05 [Blacked out] to [Blacked out]

Subject: Notes from [blacked out] staff meeting

“[blacked out] opened the meeting and discussed the following items:

. . . .

2) [blacked out] (DOE) visited [blacked out] during the ‘USGS talk to the customer meeting’ . . .

3) Organization Chart – Being developed and will be distributed electronically. Two versions –official one with just USGS personnel and an unofficial one with contractors on it. The [blacked out] Operations will be under [blacked out]. [blacked out] will still have technical interaction and direction through [blacked out] and [blacked out] teams. [blacked out] folks will be tied through [blacked out] operations because of their HRF ties. . . .”

2000-04-05 [Blacked out] to [Blacked out]

Subject: Notes from April 4 Denver staff meeting

“ . . . What good is QA if there is no data or analysis to QA? Do we just QA the QA? . . . ”

2001-06-13 EPA published its final site-specific radiation dose standards for Yucca Mountain (40 CFR 197).

2001-10-26 NRC Final Decision Related to DOE’s new general guidelines (10 CFR 963).

2001-11-02 NRC issues final Yucca Mountain licensing rule 10 CFR Part 63 that eliminates all specific quantitative requirements for site geologic characteristics.

2001-11-14 DOE issued the final 10 CFR Part 963 that eliminated its previous siting guidelines that had specific requirements for geologic characteristics. This clears the way for the Secretary to approve the site and claim he is acting in conformance with the Department’s



rules.

- 2002-02 DOE Secretary recommends the Yucca Mountain site to the President, and the President recommend it to Congress.
- 2002-05-03 Jerry McNeish to William Boyle  
Re: Help on fast path questions  
“Not a Federal Record  
I told Leon [Reiter, NWTRB staff] the following:  
1a. fast paths in the UZ above the repository don’t influence our post-closure model. . .  
2. fast paths do not affect the corrosion of WP’s . . .  
If this is incorrect, or needs to be expanded, please comment.”
- 2002-05-06 Kevin Mon to Claudia Newbury  
cc: William Boyle . . . Jerry McNeish . . .  
Re: (How the presence or absence of water . . . affects corrosion)  
“I indicated that assuming the effect of fast paths was to increase the amount of water contacting the waste packages and drip shields, that there would be little difference in the [current] TSPA-SR and SSPA waste package degradation models. . . .  
. . .in future models . . .if general corrosion and localized corrosion models were developed with chemistry dependence, the quantity and chemistry of the water would likely play a role in degradation . .  
. .  
What do we do next?”
- 2002-06-00 [June 2002 Report cited by DOE in March 2005 as showing that the USGS emails indicating falsification of work on infiltration, etc., do not significantly impact DOE’s conclusions]  
*Risk Information to Support Prioritization of Performance Assessment Models*, June 2002, Prepared for DOE, by [blacked out]  
. . . These results indicate that the details of the climate and net infiltration models do not play a significant role in the estimate of mean annual dose. This result is consistent with the results using the TSPA-SR model. Analyses of the nominal scenario using that model also show no significant impact of magnitude of the net infiltration or the details of the unsaturated zone flow field on the estimate of mean annual dose ([blacked out] Section 5.2.1.1, P 5-9; [blacked out] Section 3.2.1, p. 3-3) . . .
- 2002-07-23 On assurances of “good science” from Secretary Abraham, Congress passes a joint resolution approving the Yucca Mountain site, which the President signs into law on July 23, 2002.



2002-07-26 David Sevougian to Rob Howard  
Re: Waste package localized corrosion and interfaces  
"MacKinnon and I . . . expect that the WP analyses will show that there are zero packages affected by localized corrosion. If, in fact, there are a substantial fraction affected by localized corrosion, we believe that a more fully coupled (not a side calculation outside of the TSPA model) will have to be incorporated into the TSPA model---this will cause schedule slippage, but it is likely the only defensible way to incorporate it in the TSPA."

2002-08-21 Dan Thomas to Joe Wang  
In the POB 8/14 meeting, an action item for ES and NS is to work backward from the critical corrosive in-drift chemical environment to determine the necessary porewater/seepage water composition needed to generate such a condition. . . .

2002-08-22 Joe Wang to Dan Thomas  
"We all know how critical [are] the effects of thermal load and water composition on the chemical environment, and the challenges in the parallel-track approach. . .

The POB wants us to take a look at the backward-looking approach from WP, in-drift mixing to host rock condition, not just the forward approach based on limited porewater data."

2002-11-12 Gerald Gordon to Tom Wolery  
Re: Definition of Range of Potentially Relevant Igneous Environments  
"As an input to the Igneous AMR under preparation, Kevin Mon and I are pulling together from the literature, the range of relevant corrosion/oxidation/sulfadation rate data that may pertain to Alloy 22 and Ti [titanium] Grade 7 subjected to igneous event generated in-drift environmental perturbation. . . "

2003-09-04 Cliff Howard to Paul Dixon et al:  
Re Localized Corrosion Meeting  
"Consensus is that there is bromide naturally occurring in pore water (hence seepage) . . .  
Look-up tables . . . need to be developed up to 180 degrees in order for TSPA to effectively implement their (WP derived) model of localized corrosion.  
The effect of bromide on localized corrosion of alloy 22 was estimated by Raul (someone at LLNL) to be similar or less aggressive than Cl-. The effect of bromide on localized corrosion of titanium is not known and needs to be assessed . . .

Tammy was tasked with making an assessment of how important bromide is to localized corrosion of titanium. This may impact the localized corrosion model and durability of the drip shield. . . “

2005-03-11 [DOE memorandum after the discovery of the USGS-related emails, first page missing, date and designation DIRECTOR appear on top of fax page, most of memorandum blacked out]

“ . . . Depending on the current status of the work to which he contributed, these e-mails may create a substantial vulnerability for the program. (We note that because AMR U0010 has been so substantially modified from its original version that [blacked out] work may no longer be of concern, but we need to know that.) . . .

Technical issues:

UZ Flow-infiltration report/future climate results (no DTNs)

Forty Mile Wash simulations

Work provided not QA but not revealed

Work package submitted to [blacked out] for review

Program not in the system

Reply by [blacked out] recommends subterfuge

(Timeframe April 22, 1999)

climate input files not QA

[blacked out] and [blacked out] Mesa precipitation files/

[blacked out]

[blacked out] (Nov 2004)

Simulations of Net Infiltration for Present-Day and

Potential Future Climates

Contributors include [blacked out]

Entire document revised from earlier version

[blacked out] and [blacked out] software not QA

[blacked out] blocking ridge numbers

[blacked out] . . .

Installation of unqualified codes

[blacked out]

[blacked out]

[blacked out]

. . .”

2005-03-13 [Date blacked out but appears on top of fax page]

Memorandum for [blacked out], Radioactive Waste Management, from [blacked out], Radioactive Waste Management for Repository Development

Subject: Status Report on Potential Falsification of Data

“On Friday, March 11, 2005, I sent you a memorandum from

[blacked out] regulatory counsel describing potential program

vulnerabilities from what appeared to be deliberate failures to follow

quality assurance procedures and possible falsification of data committed by a USGS employee. . .

- the e-mails were found by [blacked out] employees during routine reviews of e-mails for relevancy for the LSN.
- enclosed is a June 2002 report on risk information regarding mean annual dose using both USGS and non-USGS data. The results concluded that even when precipitation is used as maximum infiltration, dose results are not significantly affected for site recommendation. . .

Key points for your discussion with the Secretary:

- the e-mails are not in the LSN or any other publicly available database.
- The implications of the information contained in the e-mails does not impact the site recommendation and we do not believe that the questionable data has any meaningful effect on the results supporting the site recommendation. . . .

Attachment: *Risk Information to Support Prioritization of Performance Assessment Models*, June 2002, Prepared for DOE, by [blacked out]

. . . These results indicate that the details of the climate and net infiltration models do not play a significant role in the estimate of mean annual dose. This result is consistent with the results using the TSPA-SR model. Analyses of the nominal scenario using that model also show no significant impact of magnitude of the net infiltration or the details of the unsaturated zone flow field on the estimate of mean annual dose ([blacked out] Section 5.2.1.1, P 5-9; [blacked out] Section 3.2.1, p. 3-3) . . .

2005-03-15 [apparent DOE paper] "Investigation of Technical Impacts and Planned Corrective Actions Associated with Alleged Falsification of Records Associated with the Yucca Mountain Project

Background

. . . the first knowledge of the issues contained in the e-mails occurred during the first week of December, 2004. . . . The issues were discussed at a high level during each of these meetings. No specific action plan resulted from the meetings. Follow-up occurred March 9, 2005, when action was prompted by a conversation about other email issues. At that time, these issues were brought to the Employee Concerns Program (ECP). . . .

The potential for significant technical impacts is believed to be low. However, the credibility and defensibility of the USGS technical work supporting the project is brought into question. . . .

Path Forward

- Depending on outcome of technical/process reviews, further corrective actions may need to be defined.
- If missing computer input file is located and Model Results can be reproduced . . . However, if computer file is not found, then actions may include
  - o Technical evaluations to qualify Model Report outputs
  - o Develop and qualify alternative model”

**Abbreviations**

|       |  |
|-------|--|
| AMR   | Analysis Model Report                  |
| AVL   | Abe Van Luik                           |
| CFR   | Code of Federal Regulations            |
| CRWM  | Civilian Radioactive Waste Management  |
| PMR   | Process Model Report                   |
| DOE   | Department of Energy                   |
| DS    | David Sevougian                        |
| DTN   | Data Tracking Number                   |
| EBS   | Engineered Barrier System              |
| EPA   | Environmental Protection Agency        |
| ET    | Ed Taylor TRW                          |
| HRF   | Hydrological Research Facility         |
| LA    | License Application                    |
| JC    | John Clout                             |
| JD    | James Duguid                           |
| JY    | Jean Younker                           |
| LADS  | License Application Design Selection   |
| LANL  | Los Alamos National Laboratory         |
| LK    | Larry King                             |
| LLNL  | Lawrence Livermore National Laboratory |
| LR    | Larry Rickertsen                       |
| M&O   | Management & Operations [contractor]   |
| NFE   | Near Field Environment                 |
| NRC   | Nuclear Regulatory Commission          |
| NWTRB | Nuclear Waste Technical Review Board   |
| PA    | Performance Assessment                 |
| POB   |  |
| QA    | Quality Assurance                      |
| SZ    | Saturated Zone                         |
| TSPA  | Total System Performance Assessment    |
| USGS  | US Geologic Survey                     |
| UZ    | Unsaturated Zone                       |
| VA    | Viability Assessment                   |
| WP    | Waste Package                          |
| YM    | Yucca Mountain                         |
| YMP   | Yucca Mountain Project                 |