

Draft

Science Controversy in the Siting of Large Engineering Projects

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1. Background

The USGS has had a long history of direct involvement with major science applications projects in the United States and elsewhere. For example, many of our geologists were involved with the Military Departments during World War II, particularly in the mapping of South Pacific islands. Many engineering parameters were included with the investigations, such as trafficability, availability of materials for runway and road building, harbor configuration, all in addition to the basic topography. So the tradition of participating in real world engineering projects is well established in our agency. However, these efforts have been accompanied by more and more controversy as the post WW II years have passed.

In the early sixties the USGS began to assist the Atomic Energy Commission with the evaluation of geologic and hydrologic data associated with nuclear power plants. Since our previous speaker has described several of the more celebrated cases of these siting problems I will not repeat them here, but to say that the Survey was involved with each and every site for which a license application was filed (and some that never were filed) until the very last few when the Nuclear Regulatory Commission handled them alone.

The application of science to engineering projects is on the surface a proper and natural outcome to years of Federal funding to research agencies. So it to be expected that many of our scientists have been called upon to participate in reviews of major projects. However, the manner in which this participation is conducted can have varying degrees of effectiveness. Secondly, there is seldom sufficient science available to make its application fully understood and acceptable to all parties of the process. In many cases there is insufficient information to obtain universal agreement within any one party, much less all parties concerned. The following case studies will, I hope, bring out in a useful way some of the reasons for this and then some solutions. (also some non-solutions)

2 Overheads

2. Teton Dam

The world was shocked when in 1976 the brand new earth filled Teton dam in Idaho failed upon its first filling. There were a variety of findings that were identified to have contributed to this failure. I will not go into all of them here, but will concentrate on one of the elements that relate the subject of this talk. As early as 1972 some USGS geologists began to express, within USGS, their concerns about the "engineering integrity of the project in an earthquake-prone region" and "the possibility that rocks used as retaining walls for the structure could be shifted laterally." One of these geologists prepared a report describing his concern. After a colleague review this report was presented to the Bureau of Reclamation by the Survey. So far, so good. However, what happened next was - nothing; BuRec did nothing with that report, and USGS did nothing about BuRec's doing nothing. The controversy that arose here is in the area of peer review and supervisory imprint, and roles of those knowledgeable about but not directly involved with a major construction project.

First, the authors of the USGS report complained (after the failure of the dam) that the sense of urgency that was in their draft was removed by the time the final report received approval. Yet they admitted that the science was retained; that only the emotion was removed. But post mortem concerns were that without that emotion and sense of urgency the report's message was muted. To the outsider this constituted "censorship". Thus there still is uncertainty as to whether the science was really given a full hearing. However, this did not stop Congress from castigating the BuRec for not heeding the USGS warnings.

Secondly, there were questions as to how strongly the USGS should stress opinions based on reconnaissance work against the detailed site work that was done by the BuRec. Should the USGS have pressured the BuRec more actively and insisted on revisions to the design? The Survey managers at the time who did the editing would argue that their actions were proper and necessary. The officials who presented our report to the BuRec would argue that they went as far as was proper, given what was known. The decision of this type will always be a problem, as it will be the case that, in many instances, the whistle blower will be poorly informed or downright wrong. But that may not be obvious at the time.

Thirdly, there is the question of how seriously the BuRec considered the USGS report. After all, they had an excellent record of dam building in all kinds of earthquake regions. Also, while the USGS analysis of the condition of the right abutment was accurate our scientists tied failure to the occurrence of an earthquake. As you know the dam failed under static conditions, not during an earthquake

3. TAPS

An early experience of the Survey's application of its science to very large engineering projects was its involvement with the design of the TransAlaskan Pipeline System (TAPS). The TAPS designers had extensive experience in pipeline construction in the lower 48 States and in the Middle East, but were new to the Arctic. Based on their experience they designed a system that would have the line buried for nearly its entire length. But USGS Arctic scientists argued that the heated pipeline would melt the permafrost causing differential settlement and resulting pipe breaks. After much harangue, it was finally agreed upon that approximately 50% of the line would be placed above ground and that the supports would be cooled to prevent heat transfer to the permafrost. This caused a marked increase in the cost of construction and created concern in the environmental community that this elevated pipeline would interfere with caribou migration. The intensity of the arguments on all sides was very high, and the arguments unproven. It is only now almost 20 years later that the conclusion to elevate the line in permafrost areas has proved to be the right one. There have been no instances of failure due to melting along any of the elevated portions. Conversely, in the few areas where the line was buried in permafrost there have been settlement problems.

Overhead

4. Proposed Skagit Nuclear Plant

One of the most controversial and frustrating experiences in recent years concerning the application of science to large construction projects was the effort to obtain a construction permit for the Skagit Nuclear Power Plant. This site is located in the Pacific Northwest, an area of significant but not well defined earthquake potential. For several years the applicant tried to demonstrate an adequate understanding of the tectonics of the region and the Nuclear Regulatory Commission and the USGS tried to assure themselves of this adequacy. All to no avail. As more science was gathered and argued more questions were raised. During this time scientists began to fall into two camps, for no matter how unbiasedly they argued their science, they ended up in one camp or the other. The end result was twofold. First, the conclusion was finally reached that the science was inadequately known to provide the level of confidence necessary for the licensing of a nuclear facility. Second, the two science camps were bitterly split and were to remain so for a long, long time.

5. Cape Thompson

Last year a seemingly benign situation burst onto the scene with smoke and commotion far beyond that which was deserved. This resulted from the disclosure by a U of Alaska professor that he had "discovered" documents that indicated that the Atomic Energy Commission had placed nuclear material into the environment at Cape Thompson, Alaska. This Cape is the site of the proposed harbor to be constructed by the use of five nuclear detonations as part of the Plowshare program of the 1960's. In 1962, in preparation for understanding what would happen to the radioactive material after the explosions, the USGS performed some runoff experiments on site using tracer nuclear material. The results were published in a professional paper in 1966. The tracer material was buried on site and the activity was completed. As you know, the harbor was never constructed. Thirty years later the professor finds correspondence that discussed these tests and sounds the alarm. The politicians, some who were running for reelection, jumped to the rescue and announced that they would see to it that this radioactive dump would be cleaned up and the material removed! Immediately, the scientists indicated that there could not be more than 2 millicuries of radioactive material left at this site. Secondly, that material was securely bound in the permafrost and could not migrate anywhere. Also, the nearest village is 20 miles from the site, and access to the area is very difficult, so that hunters or fisherman would not likely to come across the area. So there was no real reason for any action to be taken at this site.

In spite of acknowledging the scientific fact that there was no threat to either man or animal, DOE in response to the public statements by the politicians announced that they would mobilize a team to remove all the material that could have come in contact with the radioactive tracers. And so they did.

The true disservice here is not the fact of the unnecessary removal of a large quantity of benign tundra but is the erroneous indication that this burial site was a contributor to the local natives' health problems. There are severe health problems among those natives, but it is a tragedy for them to believe that this site is the cause. There is a high degree of frustration

overhead.

among the scientific community that science has been given a bum rap and that they were not allowed to present their case. As the health related law suits come in, this frustration will only increase.

One can speculate that the true reason for the failure of the scientists to make their case, it is that there is little faith that the nuclear scientists are telling the truth.

7. Others

Jordanelle Dam

Ward Valley

~~Puerto Rico Use power sites.~~