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G188 Geology

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The Geological impact of Nuclear Testing at the Nevada Test Site

The Nevada Test Site is an area designated by the United States Government for Nuclear Weapons testing. It is located in rural southern Nevada and is about the size of the State of Rhode Island. This location was founded in 1952 as one of 5 on land sites designated for this task. Above ground nuclear or atmospheric testing was conducted at the Nevada Test Site until 1958. There was a break in testing until the United States decided to begin underground testing in 1962. There were a total of 828 nuclear tests performed underground during these years. In 1963 a limited Nuclear Test Ban Treaty was signed by the United States that limited above ground tests world wide. These underground tests were performed until 1992, and nuclear testing in the United States seized all together in 1994 when the Nuclear Test Ban Treaty was signed. The majority of the testing was conducted to further the efforts of the Cold War, as well as, to further general understanding of the effects and results of nuclear testing. This paper will discuss the history, geological aspects, and impacts of the Nevada Test Site on this and surrounding areas of Nevada.

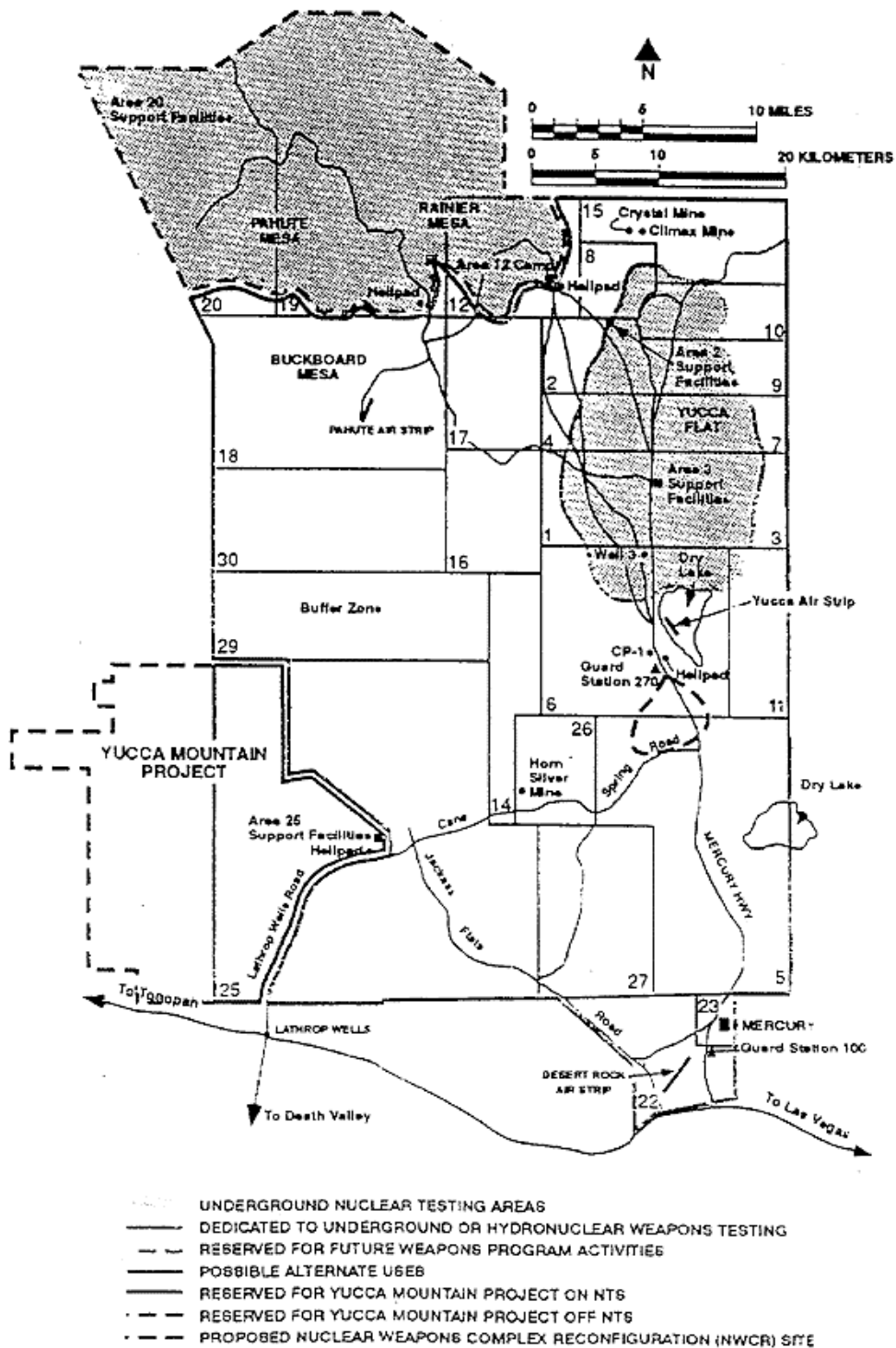


Figure 1. NTS Site Map

(www.nv.doe.gov 2004).

The history of atomic testing begins during the Second World War. The majority of testing during this period was done at the Los Alamos test site in New Mexico. All of the locations where testing was done have several key things that make them good locations for nuclear testing. They are all away from areas of large population density. For example the Nevada Test Site is 65 miles northwest of Las Vegas but has little or no population in the immediate area. They are also in areas where there is little or very deep ground water aquifers, and little amount of runoff. These are key aspects as the ground water contamination involved with radioactive material has proven to cause cancer, and sever birth defects. They are both arid environments which makes it easier to reduce the amount of water runoff. The Nevada Test Site is built on top of a chain of several volcanic and seismically active locations. Even with these potentially dangerous conditions the Atomic Energy Commission gave it the go ahead in 1952.



During the years of above ground or atmospheric testing 119 tests were conducted. The majority of these tests were conducted using helium balloons, and tethered systems. There were also a few crater tests conducted during this time, these were conducted by submerging a small nuclear weapon just below the ground surface. When testing resumed in 1962 the majority of tests were conducted deep underground, although a few crater tests were still conducted, atmosphere testing was banned in 1963. Since then all of the testing was performed underground though this purposed different risks of nuclear contamination it was still found to be over all safer then the above ground testing. Many tests were conducted to tests response times for hazmat teams, and other resources for the cleaning up and reconstruction if such an attack were to take place. These tests were also the cause of much seismic activity, as well as, social unrest in the area. (Eckel, 1968)

“The entrance to the Nevada Test Site still has cyclone-fence pens to hold protesters who used to assemble at the gate and get arrested. Military police, tired of the caging, once bused a group of arrestees 60 miles out into the desert, dropped them by the side of the road, and drove off.

Now, with the Cold War over, as many as 10,000 tourists a year take tours of the bleak site. What they see are the structural remnants of what became known as the strategy of Mutual Assured Destruction, or MAD: twisted bridge girders, smashed igloo bunkers and shattered windows, the glass still lying in the dust and glinting in the Nevada sun. Scientists built hangars and set out airplanes, cars, locomotives, fuel tanks and freight cars.” (Seattle Times Company 1995)

This entire endeavor is a result of the Cold War and use of the atomic bomb in World War II in Japan. The advancement of knowledge and power was a large part of the arms race. Although many believed that this was an unfounded endeavor created solely to make the United States extremely

powerful, it was also in an effort to understand the long term impacts of such an explosion and advance the knowledge of this potentially deadly science. Nuclear testing slowed proportionally to the slow of tensions involved with the Cold War. As a result for many years everything going in and out of the test site was highly monitored and classified. To prevent spies and threats to national security the location was always monitored by its own set of federally funded police, just like any other military base. Fear and hatred rested in peoples hearts for many years towards the Soviet Union. Some of the results from nuclear tests were used in “educational” propaganda to warn of the consequences of a nuclear attack. For example, there was one test where there were houses built and furnished accompanied by manikins which were filmed during an explosion to give the United States population an idea of what things would be like during a nuclear explosion.

(Seattle Times Company 1995)

As people came to realize that nuclear weapons and power had major health hazards involved it became less and less politically acceptable to be involved in large scale nuclear testing. The government spent less and less money developing nuclear science and more money on satellite guided missiles and weapons that caused less potential worldwide damage. There were also many experiments conducted to see if this great power could be used for more constructive tasks like building deeper harbors, creating lower lakes for sport or other such ideas. Though in the end it was discovered that none of these were

feasible situations it was an interesting endeavor to attempt to use this new found power for constructive means.

There are several specialized facilities inside the site including a Radioactive Waste Management Site (RWMS), a Device Assembly Facility (DAF), the HAZMAT Spill Center and the U1a facility for underground nuclear testing. The U1a facility is 960 vertical feet underground, and 1,460 feet long. It is used for the long term storage, and a few of the larger scale nuclear tests. A few more infamous locations are Sedan Crater which is 1200 feet across and 320 feet deep at the center, the Frenchman Flat which is the site of the first atomic test in this location, and Control Point 1 the location where all of the tests are constantly monitored. These locations can be seen through scheduled tours, but there are also many locations that are unsafe to the public and so people are not allowed to roam free about the complex. This site is of large interest not only to geologists, but also to historians as it exemplifies a piece of United States Cold War history that is unmatched. There are many reasons that it was protested against but also a great historical value in maintaining it as it is to preserve the portion of nuclear testing history. (<http://www.nv.doe.gov/>, 2004)

(www.nv.doe.gov 2004)

Currently this area is the proposed site for the dumping of millions of tons of nuclear waste from many nuclear power reactors around the country. Though for many years the Nevada Test Site did house a massive amount of its own nuclear waste the idea that it will house that for the entire country poses even

more threat to the surrounding areas. The Yucca Mountain project is a topic of much controversy among locals of the area. As a result protests have been conducted there recently to persuade government officials that the Yucca Mountain project will cause more harm to the ecosystem that has already been harmed by so much nuclear testing. This site is designated for at least the next thousand years.

This might not be the most stable site for this purpose as the site is surrounded by many normal faults and is potential volcanically active. Though it is not the most active place in the area it is possible there could be a major earthquake that could destroy the storage facilities and containers contaminating a large scale area around that part of Nevada which could pose many health threats. However, due to recent research it is understood that this is one of the less areas of concern when it came to other potential sites, as even with this potential the population density of the area is smaller than many of the other proposed sites.

The results from the nuclear testing both above and underground are rather drastic.

“Ninety nuclear tests released almost 99% of the total iodine-131 entering the atmosphere from the bomb tests conducted at the NTS. These ninety tests released about 150 million curies of iodine-131, mainly in the years 1952, 1953, 1955, and 1957. Some radioiodine was deposited everywhere in the United States, with the highest deposits immediately downwind of the NTS. The lowest deposits were on the west coast, upwind of the NTS. In the eastern part of the country, most of the deposited iodine-131 was associated with rain, while in the more arid west; dry deposition (where particles settle on the ground) prevailed. Because iodine-131 decays with an 8-day half-life, exposure to the released iodine-131 occurred primarily during the first two months following a test.”(National Cancer Institute 2002)

During the 1950s when the atmospheric test was being done, there was quite a large amount of people affected by Iodine-131 poisoning due to the amount of cows who consumed food that was contaminated by the fallout. This in turn created contaminated milk that was consumed by a large amount of people who had consumed this milk. Though this was not wide spread enough to cause any major recalls, because once pasteurized much of the chemical was taken out of the milk. However, it was a major concern for people living in that area of Nevada, especially infants and small children who consume per capita the largest amount of liquid milk. The large amounts of iodine can cause thyroid problems and in extreme cases cancer. (National Cancer Institute 2002)

Much of the Nevada Test Site is covered with large craters created by the underground explosions of nuclear weapons. These craters create some potentially unstable and highly radioactive debris, and radioactive craters. These craters pose a threat to any wildlife in the area, because they could easily be contaminated by the left over radioactive materials. It also poses a threat to anyone who has to drink the ground water in the area, though the Department of Energy who controls the site, has attempted to say otherwise there is a significant risk to those people living in all of the surrounding areas of Nevada of water contamination, including the almost 4,000 employees of the Nevada Test Site Facility. This could lead to disasters like that of Chernobyl accident when large amounts of people were contaminated due to the explosion of a nuclear reactor. This caused wide spread cancers, birth defects, and other major health problems. Though this is only a potential danger and has not happened yet it

was still a major concern while nuclear testing was being done and is even more of a concern now that the storage facilities are proposed for that site.

The high temperatures and explosive nature of this testing create interesting effects on the rocks of the area. As far away as Mono Lake the high uranium and plutonium concentrations can be used to date core samples (Bob Jellison 2004). Eventually this will create an unusually high level of uranium and plutonium will eventually show up in the bed rock of the area. There will also be a large amount of strangely metamorphic rock in the area where the underground tests were exploded. In millions of years our ancestors will have no idea what to make of it all. Hopefully the testing will not still be affecting the ground water or any of the other aspects of their lives. There is no way to tell if this will have an impact on their lives as when the science was being conducted it was so new that the future implications were not taken into consideration.

The Nevada Test Site was an important location for nuclear testing from 1951 to 1992. It provided the United States with a better understanding of nuclear weapons and their destructive powers. Now that the site is being used for other purposes it will continue to serve the American public well as a nuclear waste depository. Though there were many hazards created by the testing done at the Nevada Test Site there was also much learned about what nuclear weapons are capable of doing. In the future people will have to try and deal with the consequences that nuclear fall-out creates and the impacts it will have on the local population in Nevada. Though the Nuclear Test Ban Treaty is in place it does not stop the threat of nuclear conflict in the future. If anything it makes the

threat greater. Hopefully knowing what nuclear weapons are capable of will encourage the United States to be judicial in their use of these weapons during times of conflict. Though it is difficult to tell if the Nevada Test Site will be activated once again it is important that people recall the history of its inception and also its purpose in the lives of the citizens of the United States at the time it was created. It was interregnal in giving the people a sense of protection during a time of turmoil in the Cold War era.

“There is also a drabness to them. The nuclear complexes were mostly sited in lonely or desolate places to maintain security. While the weapons are technologically impressive, the atomic reservations are bleak compounds of windowless concrete reactors and factories and hasty government-spec architecture: places frozen in the 1950s and 1960s.” (Seattle Times Company 1995)

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