NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

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NATIONAL REGISTER

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Sedan Crater

other names/site number Project Sedan

2. Location

street & number Area 10 on the Nevada Test Site ☐ not for publication

city or town Mercury XX vicinity

state Nevada code NV county Nye code 023 zip code 89023

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☒ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Lois M. Thompson 1/31/94

Lois M. Thompson, Federal Preservation Officer
Signature of certifying official/Title Date

U.S. Department of Energy, Nevada Operations Office
State of Federal agency and bureau

In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Ronald M. James 11/23/93

Ronald M. James, Nevada State Historic Preservation Officer
Signature of certifying official/Title Date

Nevada Division of Historic Preservation and Archaeology
State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☑ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other, (explain:) _____

Signature of the Keeper Date of Action

3/21/94

Sedan Crater
Name of Property

Nye, Nevada
County and State

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ☐ public-State
- ☒ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☐ district
- ☒ site
- ☐ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
One		sites
		structures
		objects
One		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

None

6. Function or Use

Historic Functions
(Enter categories from instructions)

Industry/Processing/Extraction
Energy Facility

Current Functions
(Enter categories from instructions)

Industry/Processing/Extraction
Energy Facility

7. Description

Architectural Classification
(Enter categories from instructions)

No style

Materials
(Enter categories from instructions)

foundation N/A
walls N/A
roof N/A
other N/A

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] **B** Property is associated with the lives of persons significant in our past.
- [ ] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

- [ ] **A** owned by a religious institution or used for religious purposes.
- [ ] **B** removed from its original location.
- [ ] **C** a birthplace or grave.
- [ ] **D** a cemetery.
- [ ] **E** a reconstructed building, object, or structure.
- [ ] **F** a commemorative property.
- [x] **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Invention

Period of Significance

1957-1975

Significant Dates

July 6, 1962

Significant Person
(Complete if Criterion B is marked above)

N/A

Cultural Affiliation

N/A

Architect/Builder

N/A

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [ ] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # _____
- [ ] recorded by Historic American Engineering Record # _____

Primary location of additional data:

- [ ] State Historic Preservation Office
- [ ] Other State agency
- [x] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Name of repository:

USDOE Coordination and Information Center, Las Vegas, Nevada

Sedan Crater
Name of Property

Nye, Nevada
County and State

10. Geographical Data

Acreage of Property 27

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	11	681380	8848400
2	11	681780	8835400
3	11	680280	8833400
4	11	680330	8844900

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Robert C. Furlow, Environmental Compliance Specialist

organization U.S. Department of Energy, Nevada Operations Office date 10/5/93

street & number 2753 South Highland Drive telephone (702) 295-0845

city or town Las Vegas state Nevada zip code 89109

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional items
(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of SHPO or FPO.)

name

street & number telephone

city or town state zip code

7. Present and Historical Appearance

The Nevada Test Site (NTS) is an outdoor scientific laboratory approximately the size of the state of Rhode Island, located in an unpopulated region of the Mojave and Great Basin Deserts in south-central Nevada, approximately 65 miles northwest of Las Vegas. The NTS contains 1,350 square miles of Federally owned land with restricted access. It is significant to note that the NTS is bordered on three sides by 4,120 square miles of land comprising the Nellis Air Force Range, another Federally owned, restricted area. This restricted area provides a buffer zone to the north and east between test areas and land that is open to the public. The Sedan Crater is located in Yucca Flat, on the western side of Area 10, in the northwest corner of the NTS, approximately 25 miles north of the Mercury townsite. The Mercury townsite is located at the southern entrance to the NTS approximately 65 miles northwest of Las Vegas. The predominant vegetation of the area prior to the Sedan detonation consisted of low growing shrubs, primarily creosote bush, spiny hopsage, blackbrush and associated bunchgrasses. The topography was relatively flat, typical of the Transition Desert ecosystem in Yucca Flat.

At detonation, on July 6, 1962, the 104 kiloton explosion ejected approximately 7 1/2 million tons of alluvial material over an area of about 2,500 acres. The depth of ejecta varied from 15 to 90 feet at the crater edge and from 3 to 15 feet at a distance of 1500 feet from ground zero. The effect of this deposition of ejecta was the creation of many "dunes" of different shapes and sizes in the immediate vicinity of the crater edge. These "dunes" still exist today, but they have been weathered by wind and water erosion, thus reducing their size and softening their appearance.

Results of studies dealing with close-in effects of the Sedan detonation on native vegetation showed that within a radius of 2,000 feet from ground zero, the vegetation was completely destroyed by cratering and blast, with the original soil surface covered by a foot or more of radioactive throwout. For a band from about 2,000 to about 5,000 feet from ground zero, the vegetation had been damaged by blast effects and throwout. About 50% of the shrubs present in this area were blown away. From about 5,000 to 10,000 feet from ground zero, the vegetation and soil were heavily blanketed by radioactive dust from fallout material.

The recovery of vegetation at Sedan has followed essentially the same pattern observed at other above ground nuclear blast sites in Yucca Flat. Russian thistle (tumbleweed) has dominated new plant cover in the interior crater sides, the ejected area, and in the outlying areas disturbed by the blast. Other winter and summer annuals and several species of grasses are now prevalent in the crater itself, and in disturbed areas not heavily covered by ejecta. There has been virtually no recovery of the original perennial shrubs except in areas where regrowth has occurred from the original root crowns which survived the blast and fallout radioactivity.

The physical appearance of the Sedan Crater has changed very little since its formation, 31 years ago. This is because the NTS is Government-owned land and closed to public access. Hence, the crater has not been subject to public vandalism. At formation, the crater measured 1,214 feet in diameter and 320 feet deep. Today's dimensions are virtually the same, varying less than 10 feet in diameter and 5 in depth. Some sloughing of the interior sides of the crater has resulted in the deposition of alluvial material in the bottom of the crater, thus decreasing the depth by a few feet. The crater has been fully protected by the DOE Field Office, Nevada (DOE/NV) since its formation and has not been altered in any way by other DOE/NV activities.

The most noticeable change in the appearance of the crater has been the reestablishment of vegetation on the interior sides, the crater edge, and in the surrounding area about 1,500 feet from the crater edge. Although the reestablishment of vegetation inside the crater and surrounding area has changed the appearance of the landscape, the size of the crater has not been significantly affected. It is the sheer size of the crater which gives it its historical significance. The reestablishment of vegetation is a natural occurrence and is expected to continue into the future without any significant, detrimental effects. The eventual revegetation of the interior crater sides could be beneficial, in that the root systems of the newly established vegetation may prevent soil erosion, thus preserving the present size of the crater.

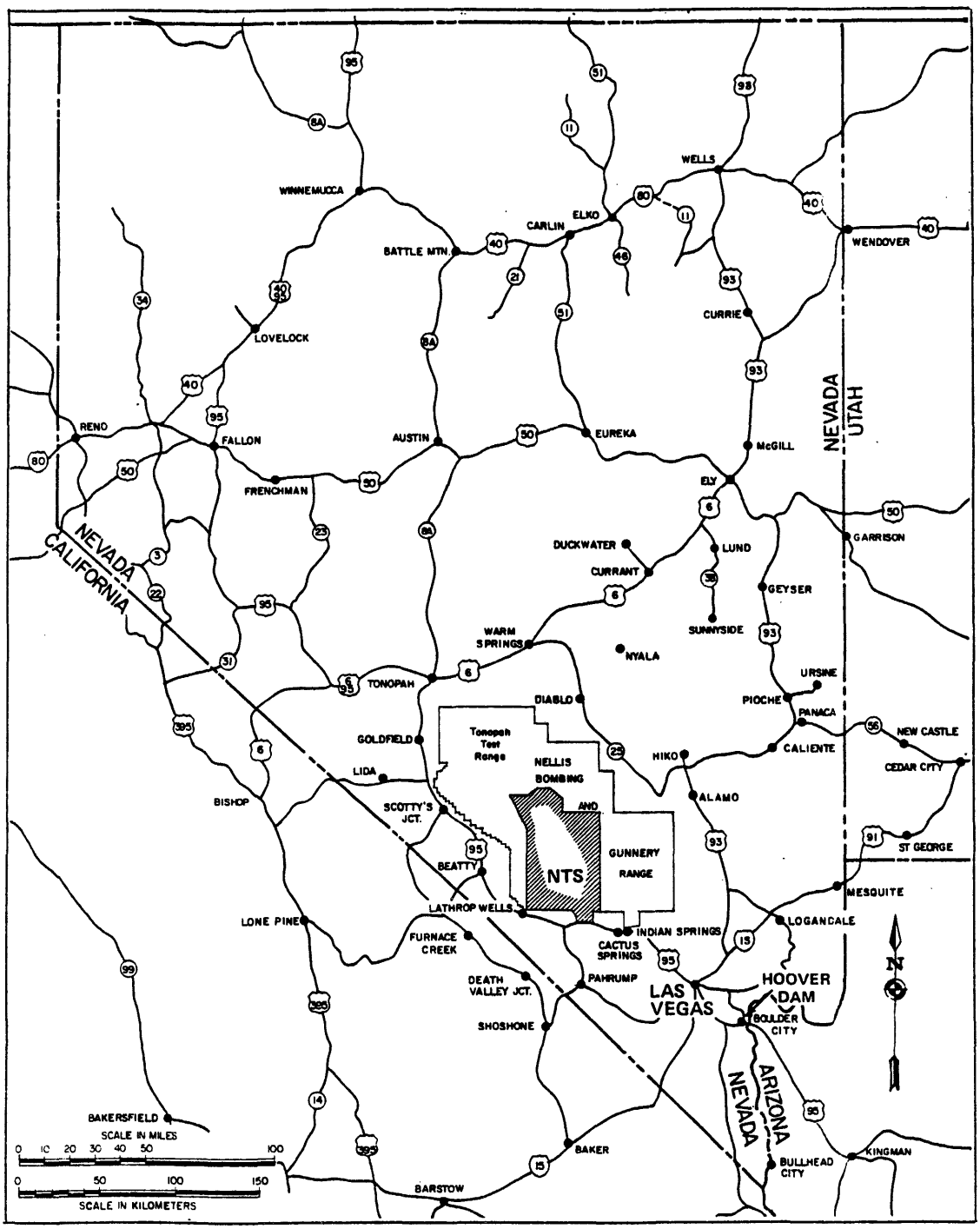

Figure 1. Location of the Nevada Test Site

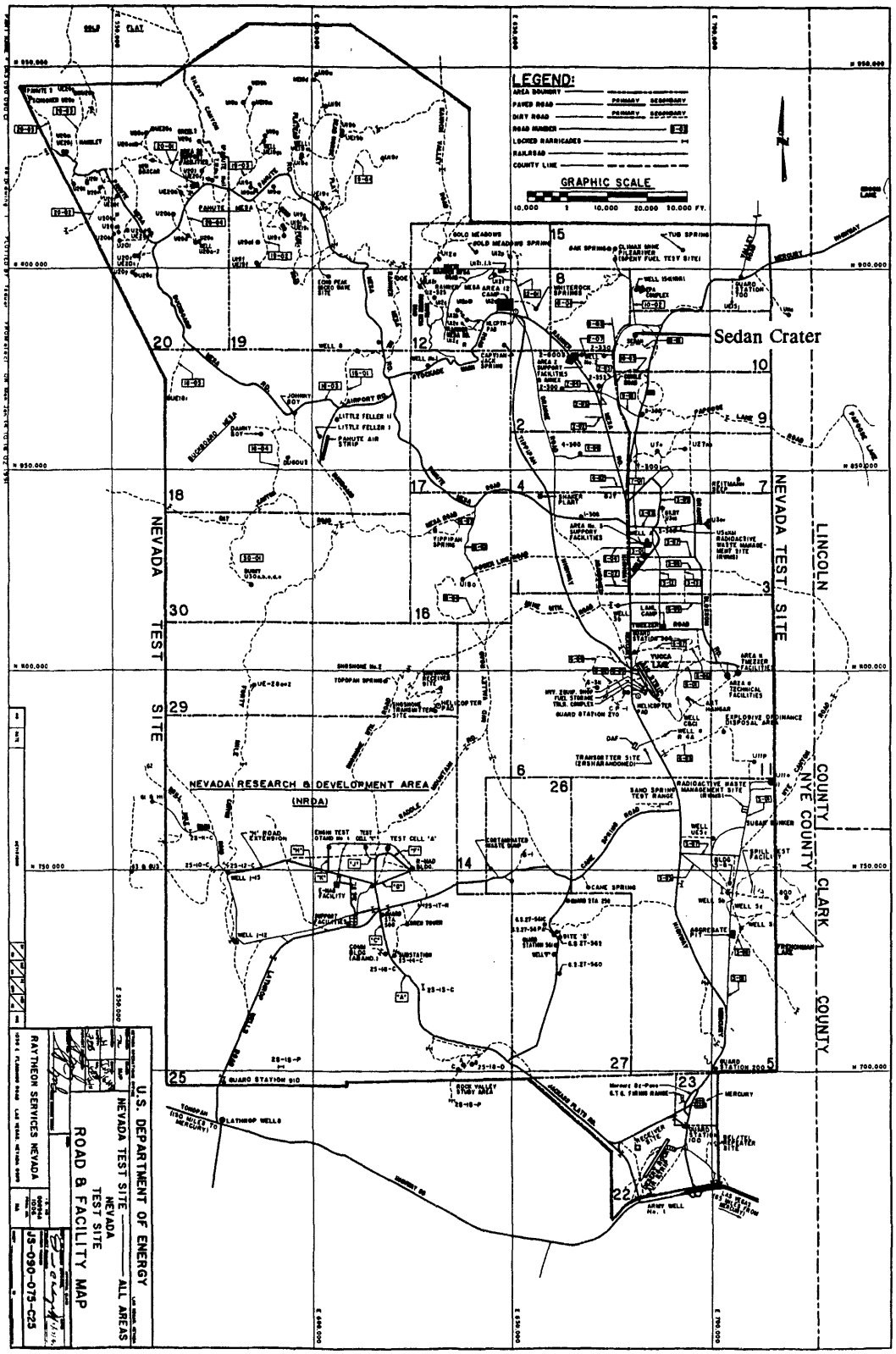

Figure 2. Location of the Sedan Crater on the Nevada Test Site.

The following information applies to all photographs:

3. Name of photographer: Johnson Controls World Services.

5. Location of original negative: Johnson Controls World Services, Mercury, Nevada.

Photograph number NF-494

4. Date of photograph: December 1975.

6. Description of view indicating camera direction: aerial view, looking southwest.

Photograph number NF-495

4. Date of photograph: December 1975.

6. Description of view indicating camera direction: aerial view, looking south.

Photograph number N-976

4. Date of photograph: August 1969.

6. Description of view indicating camera direction: aerial view, looking north.

8. Statement of Significance.

Summary

The Sedan Crater is eligible for the National Register under Criterion A and Criteria Consideration G, because its formation was directly associated with the atmospheric testing period of nuclear research in the United States. This period was extremely significant as it was during this time that the tremendous destructive forces of nuclear detonations were first revealed to the nations of the world. The NTS played a major role in this era. The primary mission of the NTS is to provide an on-continent site for conducting nuclear explosive tests. Secondary missions include: 1) disposal of Defense Programs radioactive low-level waste and mixed waste; 2) execution of tests involving spills of large quantities of hazardous gases; and 3) conducting specialized tests involving radiation and radioactive materials. It was designated the continental test site for nuclear weapons testing in 1950 and over the next 12 years (the atmospheric testing period), 124 above ground nuclear devices were detonated at the NTS. Although less than 50 years old, the Sedan Crater is of exceptional importance, as it is the only example in the United States of the destructive power of atomic devices, accessible to the public.

Project Sedan was the second and largest nuclear excavation experiment in the Atomic Energy Commission (AEC) Plowshare program. Its purpose was to extend knowledge of cratering effects and phenomenology to the 100-kiloton[1] range of yields and to provide data on the general nature of the safety problems created by nuclear cratering detonations. It was detonated by the Department of Energy in Area 10 of the Nevada Test Site on July 6, 1962, with a yield of 104 kilotons; three and a half times greater than any other cratering detonation at NTS. The device was placed in cased hole, 36 inches in diameter, at a depth of 635 feet in alluvium containing 7 percent water. Seven and a half million cubic yards of earth were displaced by the thermonuclear detonation creating the Sedan Crater.

The crater is conical shaped, 1,215 feet in diameter, 320 feet deep and the largest crater produced in the United States by the detonation of a nuclear device, including military and peaceful applications. Only four other cratering experiments were conducted under the Plowshare program, all on the NTS. Sedan is by far the most impressive. Although only 31 years old, the crater is extremely important as it provides an awesome example of the tremendous explosive and destructive power of atomic devices, even when used for peaceful purposes.

In the following paragraphs, the development of nuclear energy for peaceful purposes, the potential peaceful uses of nuclear detonations and the Plowshare program are discussed at length.

[1]A unit for measuring the power of thermonuclear weapons. The explosive force of 1,000 tons of TNT.

Historic Development of Nuclear Devices for Peaceful Purposes

The peaceful uses of nuclear fission were a low priority for the U.S. Government before and during World War II. The rise of fascism in Europe and the emigration of European scientists to the United States in the mid-1930's encouraged the involvement of the U.S. Government in nuclear research. These scientists, who were aware of important developments in nuclear physics research in Germany, were concerned that Germany might put the atom to military use. Their fears deepened when it was revealed in 1938 that two German scientists had successfully split the uranium atom, thus proving that an artificially induced nuclear chain reaction was possible. In 1939, the emigre scientists drafted a letter to President Franklin D. Roosevelt. Signed by Albert Einstein, the letter informed the President about German nuclear experiments and the possibilities of a German nuclear weapon. The letter, and the extensive planning and preparation that followed, led eventually to the creation in 1942 of the Manhattan Engineer District.

The Manhattan Engineer District oversaw the Manhattan Project, the American Government's effort to construct a nuclear weapon before the Germans did. The Project proved successful, first with the detonation of Trinity, the worlds first nuclear explosive device, in 1945, and then with the detonation of two nuclear weapons over Japan the following month, which brought about the end of World War II. After the war, the Atomic Energy Commission was established to oversee and manage, in conjunction with the Department of Defense, the nation's nuclear energy development program, including military applications and peaceful uses.

In the fall of 1956, Dr. Harold Brown, then director of the Lawrence Radiation Laboratory (LRL), now the Lawrence Livermore National Laboratory (LLNL), in Livermore, California, studied the possibility of using nuclear explosives to assist in excavating an alternate sea-level canal across Israel. A second, similar proposal addressed the use of nuclear devices to excavate a second canal between the Atlantic and Pacific Oceans, either across the Isthmus of Panama or through Nicaragua or Columbia.

In February 1957, Dr. Brown organized a symposium involving the joint participation of the Los Alamos Scientific Laboratory (LASL), now the Los Alamos National Laboratory (LANL); the Sandia Corporation, now Sandia National Laboratory (SNL); and the LRL to discuss peaceful uses of nuclear explosives. Under the leadership of Dr. Brown, a group was formed at the LRL in the summer of 1957 to explore the range of potential engineering uses of nuclear explosives. The symposium and the subsequent meetings of this group stimulated scientific and public interest in the nonmilitary uses of nuclear energy.

In late 1958, the nuclear test moratorium caused a postponement of the nuclear weapons development program. Peaceful applications of nuclear detonations became a complicating factor at the nuclear test ban treaty negotiations in Geneva. In January 1959, the United States introduced a proposal for the development of peacetime applications of nuclear explosives under international control. The Soviets opposed this motion and charged the U.S. with desiring to continue nuclear weapons tests under the guise of peaceful purposes.

The test ban treaty talks were suspended in May 1960. The Soviet Union and the United States both resumed nuclear weapons testing in September 1961. In August 1963, a limited test ban treaty was signed in Moscow. This treaty ended the testing of nuclear explosive devices in the atmosphere, on land, and underwater, but not underground. The treaty prohibited the use of nuclear explosives for peacetime projects at or within the territorial limits of other countries or at underwater locations.

Peaceful Potential of Nuclear Detonations

The primary peaceful potential for nuclear detonations was that of large-scale geographic engineering. Another application considered for nuclear explosives was the development of water resources. It was thought that nuclear explosives might improve fresh water supplies, by greatly expanding the underground storage of water, by ensuring better distribution of surface water, by construction of earthfill dams, and by making possible economical water desalinization. Scientists and planners believed that nuclear excavation techniques would prove functional in mining, particularly in the recovery of lower grade ores. It was hoped that mining techniques using nuclear explosives to extract oil from tar sands and shale might provide a solution to the long-term petroleum problem.

One of the more novel applications suggested for nuclear explosives was changing raw materials very deep in the earth to chemicals important to science and industry. There were even considerations of using nuclear blasts for weather control and scientific experiments were suggested using controlled nuclear energy to power vehicles for the deep space exploration.

The Plowshare Program

The Atomic Energy Commission (AEC) (now the Department of Energy, DOE) established the Plowshare program in June 1957. The program consisted of 23 thermonuclear detonations conducted at the Nevada Test Site, 2 in New Mexico and 3 in Colorado from 1961 to 1973. The Plowshare nuclear detonations were designed to determine nonmilitary applications of nuclear devices. The primary potential use envisioned was in large-scale geographic engineering, in such projects as canal, harbor, and dam construction, the stimulation of oil and gas wells, and mining. Considering the peaceful objectives of Plowshare, the AEC took the name of the program from the Bible: "And they shall beat their swords into plowshares" (Isaiah 2:4).

In the mid-1950's, after 20 years of research, the peacetime benefits of the controlled nuclear reaction were being demonstrated. However, concern was increasing over the radioactive fallout produced by nuclear detonations in the atmosphere. When the United States successfully contained a small nuclear detonation in a sealed tunnel at Shot Ranier at the Nevada Test Site in late 1957, a safer alternative means of continuing research on both nuclear weapons and civilian applications was demonstrated.

Although the Plowshare program was delayed during the nuclear testing moratorium, detailed planning studies were conducted for several Plowshare projects. In addition, President Eisenhower had authorized the preparation of a site near Carlsbad, New Mexico, for conducting a nuclear test deeply buried in a bedded salt formation. Among other purposes, the detonation was intended to enable studies of power production and isotope recovery. In October, 1961, President Kennedy authorized the first Plowshare project, Shot Gnome, at the Carlsbad site.

By the end of 1963, after five Plowshare experiments and many weapons tests, the program to contain radioactivity had made a successful start. Results showed that projected fallout in excavation projects would be 100 times less than that forecast at the start of the moratorium in 1958. After the signing of the limited test ban treaty, another 22 Plowshare experiments were conducted underground. The Plowshare program was concluded in 1975, two years after the last detonation.

The major goals of the Plowshare program were to make nuclear explosives cleaner and cheaper and to assure their performance and reliability in production prototypes. Scientists and planners responsible for the program believed that these goals could and would be met. They thought that Plowshare presented a new technology that would eventually contribute to the economic growth of the United States and of many other nations.

The ultimate goal of Plowshare, peaceful applications of nuclear explosives, was never realized. The 1963 atmospheric nuclear test ban treaty caused cancellations of many of the plans. Other factors contributing to the failure of Plowshare were changes in national priorities, Government and industry's disinterest in the program, public concern over the health and safety aspects of using nuclear power for civil applications and shortages in funding. Although the program remained alive within the Atomic Energy Commission until 1975, it was clear that the most practical applications of nuclear energy had been achieved in the further development and construction of nuclear power generators during the 1960s and 1970s. The enormous energy release provided by nuclear detonations remained within the domain of weapons research and national defense.

The Sedan Crater is significant in that it is the largest crater in the United States that has been produced by the detonation of a nuclear device. The Plowshare program was the United States' attempt to utilize the tremendous forces of nuclear detonations for peaceful purposes. Since atmospheric testing has long been banned worldwide, the possibility of a larger crater being formed from the detonation of a nuclear device no longer exists. Hence, this extremely important site should be preserved as a testimony to future generations of the great destructive power of nuclear devices.

9. Major Bibliographical References

Beatley, J.C. 1965. Ecology of The Nevada Test Site, IV. Effects of the Sedan Detonation on Desert Shrub Vegetation in Northeastern Yucca Flat. USAEC. Doc. UCLA 12-571. 54pp.

Gladstone, S. 1971. Public Safety and Underground Nuclear Detonations. United States Atomic Energy Commission, Oak Ridge, Tennessee. 276 pp.

Plowshare Program, Project Sedan. 1962. Application of Nuclear Explosives for Peaceful Purposes. United States Atomic Energy Commission. 7 pp.

Projects Gnome and Sedan, The Plowshare Program. 1983. United States Defense Nuclear Agency. DNA Document No. 6029F. 129 pp.

Romney, E.M., A. Wallace, and J. D. Childress. Revegetation Problems Following Nuclear Testing Activities at the Nevada Test Site. In Volume 2 of the Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. pp 1015-1022.

Shields, L.M., and P.V. Wells. 1962. Effects of Nuclear Testing on Desert Vegetation. Science 135: 38-40.

10. Geographical Data

Verbal Boundary Description

Boundary is shown on attached USGS topographical map.

Boundary Justification

Boundaries were selected on the basis of the above UTM coordinates, which form a polygon enclosing the crater.