Formation of the Manhattan Engineer District

by Janet A. McDonnell

One of the Corps of Engineers' greatest challenges and responsibilities during World War II was the creation of the Manhattan District and the supervision of the Manhattan Project, the federal government's program to develop an atomic bomb. In late 1938, German scientists discovered that the uranium atom could be split. Scientists who had come to this country to escape Nazi oppression knew of the German research and feared that Germany would create an atomic bomb. In 1939, Albert Einstein and two other scientists sent a letter to President Franklin D. Roosevelt (FDR) emphasizing the importance of atomic research.

On 28 June 1941, FDR established the Office of Scientific Research and Development to coordinate atomic research. By spring 1942, research indicated that an atomic bomb was possible. Scientists experimented with different methods of separating the fissionable uranium–235 isotope from the nonfissionable uranium–238. They also tried to create plutonium, a new element that could be substituted for U–235, by bombarding uranium with neutrons. Their methods, however, had not yet been tested outside the laboratory and none had yielded anything close to the amount needed to make bombs.

By June 1942, the bomb program was ready for expansion and FDR placed the Corps of Engineers in charge of constructing production facilities. On 17 June 1942, Chief of Engineers Major General Eugene Reybold summoned to Washington, DC, Colonel James C. Marshall, the experienced district engineer of the Syracuse District—known to his subordinates as "Gentleman Jim"—a polished officer who was firm yet tactful. After arriving in Washington the next day, Marshall reported to Major General Wilhelm Styer, the chief of staff to the commanding general of the War Department's Services of Supply, a major division newly created to oversee Army logistics. From Styer, Marshall learned that

Reybold had chosen him to establish a new engineer district and construct new manufacturing plants for atomic fission bombs at a cost of $90 million. The plant would be part of a project already in progress to develop atomic energy for military purposes. Thus the Army became directly involved in a project in which it had been playing a minor role in since 1939. The next day Marshall received more information from General Styer and Dr. Vannevar Bush who headed the Office of Scientific Research and Development.

Marshall's task was unprecedented: to take the project from the laboratory stage to the production stage with the establishment of large industrial plants. He immediately began conferring with people and organizing. He opened a temporary headquarters in the new War Department building and began lining up personnel, drawing some of his staff from Syracuse. The Syracuse District had recently completed the major part of its war construction program, so Marshall was able to bring with him a small nucleus of key personnel without delay. For example, he brought with him from the Syracuse District Virginia Olsson, who served as secretary to the new district throughout its history. He named as his deputy Lieutenant Colonel Kenneth D. Nichols, a 34-year-old West Pointer who had been area engineer at the Pennsylvania Ordnance Works.

Although the new district was technically in existence from the date of the selection of its district engineer, 18 June 1942, it was officially activated on 16 August 1942, under the authority of General Order 33 of the Office of the Chief of Engineers (OCE). General Order 33 created an engineer district without territorial limits, to be known as the Manhattan Engineer District (MED), to supervise projects assigned to it by the Chief of Engineers. Special Order 177, OCE, dated 13 August 1942, officially assigned Marshall as district engineer and Nichols as assistant district engineer.

Marshall decided to locate his new district headquarters in Manhattan, New York, close to the North Atlantic Division and the offices of the major contractor, Stone and Webster. The name "Manhattan" provided an effective cover for the district's sensitive work since engineer districts were traditionally named after their headquarters city. Unlike other districts, MED had no geographic boundaries and its area

spread from Berkeley to Boston. Colonel Marshall, who was the only district head with the authority of a division engineer, reported directly to the Chief of Engineers. Moreover, this special district retained its own Washington Liaison Office on the sixth floor of the new War Department building.

One of the new district's first tasks was to acquire an adequate supply of vital materials. This experimental project did not get the high priority ratings reserved for essential weapons. To avoid attracting undue attention to the project, the overall priority was kept on par with other war construction. Officials assigned the project an AA-3 priority in July 1942. Policymakers regarded the atomic bomb as a long shot, and they believed that putting too much emphasis on it at the expense of planes, cargo ships, and other programs competing for resources could jeopardize the war effort. Only essential weapons slated for early production could claim the AA-l and AA-2 priorities. AA-3 was the highest possible rating for plant construction projects. Nichols and other MED officials were discouraged by the low rating.

By September 1942, when Brigadier General Leslie R. Groves, the deputy chief of the Construction Division, as-

General Leslie Groves reviews papers with his secretary Mrs. Jean O'Leary.

sumed administrative leadership of the Manhattan Project, it was evident that the AA-3 base rating Marshall had secured in July would not be adequate to insure the uninterrupted

development of the atomic program. So MED moved to acquire broad authority to issue an AAA priority whenever there was a need to break a bottleneck. War Production Board Chairman Donald Nelson agreed to give the new rating. On 26 September, MED received a blank check to assign the AAA priority.

MED continued to grapple with problems of shortages of essential items. Unable to acquire the large quantity of copper needed for separating U–235 from U–238, the Corps borrowed 14,700 tons of silver from the U.S. Treasury (over $300,000 million worth) as a substitute. When it returned the silver after the war, only 1/36th of one percent was missing. Meanwhile, Groves took steps to procure another vital supply—uranium ore. There was already a contract in place to purchase uranium ore from Edgar Sengier, head of Union Miniere. MED acquired from the Belgian Congo the company's reserve of ore that it had stockpiled on Staten Island in 1940. Nichols arranged to purchase not only the large supply of high grade ore on Staten Island but additional ore stored in the Belgian Congo.

While officials grappled with the problems of acquiring adequate authorities and supplies, in the summer of 1942 they also sought to acquire suitable sites for the project. Project leaders had approved the location of the proposed plutonium pilot plant in the Argonne Forest near Chicago and leased 1,000 acres from Cook County. In addition, the University of Chicago agreed to provide an additional acre on the campus for future construction of additional lab space. To administer site acquisitions and oversee construction activities, Colonel Marshall established the Chicago Area Engineer Office in August 1942 and named Captain James F. Grafton as area engineer.

On 1 July 1942, Colonels Marshall and Nichols and representatives of Stone and Webster and the Tennessee Valley Authority (TVA) began surveying possible sites in the Knoxville area for the main production plants. The site had to have a nearby source of large amounts of continuous electric power and large quantities of water for cooling and processing. It had to be close to railroad lines and have good access roads for the delivery of heavy construction materials and supplies. The area also had to be large enough to construct a town.

Despite some advances, in its early months the program floundered because it lacked well-organized dynamic leadership. On 17 June 1942, FDR approved proposals made by Vannevar Bush and James B. Conant that the Army assume overall direction of the atomic program and that the Joint Committee on New Weapons and Equipment (JNW) of the Joint Chiefs of Staff establish a special subcommittee to consider the military application of atomic energy. At a meeting in September 1942 between Bush, Styer, and Lieutenant General Brehon B. Somervell, commanding general in charge of Services of Supply, the decision was made that a policy committee would be formed to oversee the program and that an Army officer would be chosen to carry out the policies established by the committee.

To strengthen the military leadership of the project, Secretary of War Henry L. Stimson named Leslie R. Groves, who had supervised the construction of the Pentagon, to supervise Army activities relating to the development, manufacture, and use of the atomic bomb. At his own request, however, Groves did not take official charge of the project until 23 September, the day he was sworn in as brigadier general. As the deputy chief of the Engineer Construction Division, Groves had already spent much time advising Marshall in the selection of sites for the Manhattan District facilities. This hard-driving, confident officer was not always popular, but he was an effective administrator.

Groves was directed to operate closely with the Construction Division and other elements of OCE. He would have complete responsibility for administering the entire project and determining priorities, for the formation of a committee to formulate military policy governing the use of the project's output, and for procurement of the Tennessee site as the location for its major activities. He was also to make plans for the organization, construction, operation, and security of the project and to implement those plans after they had been approved.

The same day that Groves took charge, Secretary Stimson and Generals Marshall, Somervell, Styer, and others agreed to establish a small Military Policy Committee to formulate project policies on research, development, construction and

production, and strategic and tactical matters. The committee, acting through Groves, assumed virtually complete control over all aspects of the atomic energy program.

After his appointment on 23 September, Groves immediately left Washington, DC, for Knoxville, Tennessee, to survey proposed project sites. He and Marshall spent the day going over the proposed site, which was 16 miles long and 7 miles wide, until they were satisfied that it met their needs.

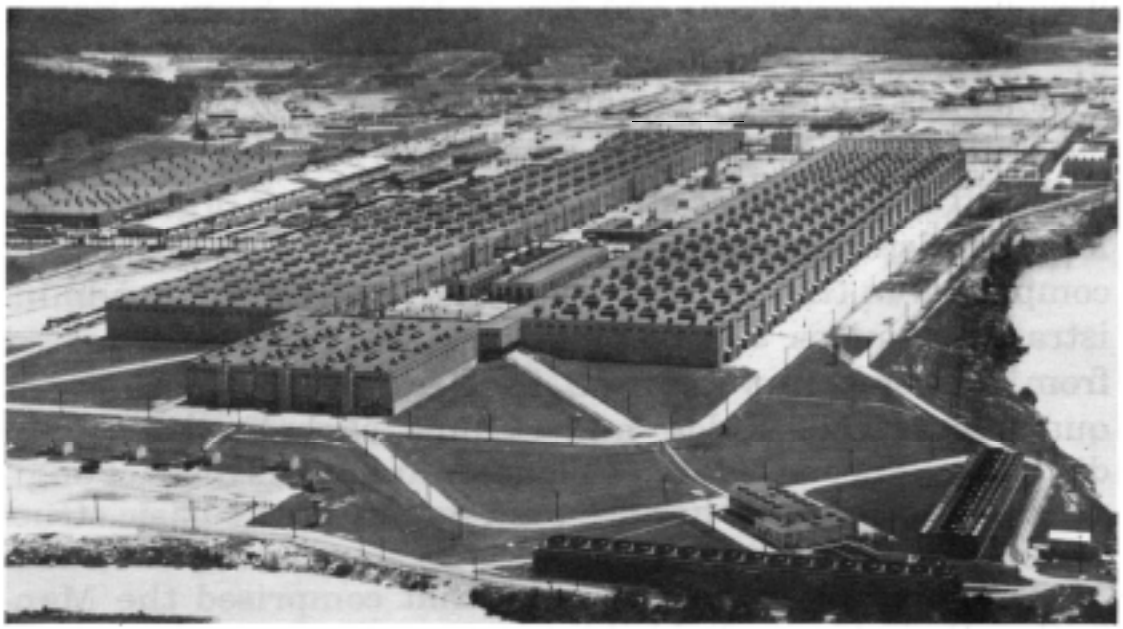
Groves and Marshall purchased 56,000 acres of rugged Appalachian terrain along the Clinch River in an area 12 miles west of Knoxville, near Clinton, Tennessee, for $3.5 million. The site provided water, power, transportation, the proper topography, and the isolation needed for security. Groves quickly began construction of the Clinton Engineer Works, and in a short time the Corps transformed this peaceful river valley into the bustling community of Oak Ridge.

One of the production areas at the Clinton Engineer Works, Oak Ridge, Tennessee, 1945.

Contractors provided the entire infrastructure of a city: roads, housing, schools, libraries, stores, churches, theaters, a police department, sewage system, and water supply. At its peak the Clinton works employed 47,000 workers, and by the end of the war, Oak Ridge would be the fifth largest city in Tennessee with a population of 75,000.

In addition, MED built the following production facilities at Oak Ridge to separate U-235 from U-238:

- **An electromagnetic separations plant operated by Tennessee Eastman, a manufacturing subsidiary of Eastman Kodak ($300 million to build and $77 million to operate).**
- **A thermal diffusion plant ($10 million to build and $5 million to operate).**
- **A gaseous diffusion plant ($460 million to build).**



Completed gaseous diffusion plant near Oak Ridge, Tennessee

The Manhattan Project took a giant step forward in December 1942 when Italian Nobel laureate Enrico Fermi set off the first successful controlled chain reaction at the University of Chicago. He found that U-238 could capture neutrons and be transformed into plutonium. Soon after, Groves acquired 500,000 acres of land in south-central Washington near Bonneville Dam, which provided the water, electricity, and isolation needed for the construction and operation of plutonium reactors. Much like Oak Ridge, the Hanford Engineer Works required a large labor force (45,000 workers at one point), massive plants, housing, laboratories, test facilities, roads, and railroads. The Corps brought in machinery and materials from its other projects and recruited labor throughout the Northwest.

In the spring of 1943, the project entered a new phase with the establishment of a laboratory in the Southwest. The 38-year-old J. Robert Oppenheimer, a University of California physicist, had been directing the theoretical aspects of designing and building an atomic bomb. Oppenheimer and his associates concluded that their studies should be concentrated in one central laboratory devoted exclusively to that work in order to eliminate waste and duplication, permit freer exchange of ideas, and provide centralized direction for all the work. Groves appointed Oppenheimer to direct a new weapons laboratory at the site of the Los Alamos Ranch School for Boys in a remote part of New Mexico. Los Alamos became a tense, heavily guarded community of 7,000 people.

With the establishment of the Los Alamos facility on 1 April 1943, the basic structure of the Army's organization for administering the atomic bomb program was essentially completed. In the following months there were some administrative changes. For example, in mid-August MED moved from its temporary location in New York to permanent quarters at Oak Ridge, and Colonel Nichols, the deputy district engineer, replaced Colonel Marshall as district engineer. These changes, however, did not affect the basic structure of the Manhattan project.

The administrative elements that comprised the Manhattan Project were divided into two major categories: those that functioned as integral elements of MED and those that operated outside the MED structure, mostly in the area of high-level policy making or in executive direction of the atomic project. The central element in the high-level administrative hierarchy was Groves' personal headquarters, located in rooms adjacent to those already occupied by MED's Washington Liaison Office in the new War Department building. The Corps continued to assist the Manhattan Project, but the project functioned as a basically independent organization, with the project's commander (Groves) responsible to the Army Chief of Staff and the Secretary of War, and through them to the President. Groves, as officer in charge of the atomic bomb project for the Army, exercised command authority over MED, but he was not its chief executive officer. The district engineer held this position and reported to Groves. The district engineer presided over an organization that

was, as it emerged in mid-1943, similar to other Corps districts created for special purposes.

MED's administrative elements were grouped into two major categories: operating units, which were involved in the day-to-day monitoring of contractor operations; and staff units, which were engaged in overseeing and providing services. In both types of units, military personnel headed virtually all administrative elements down to the section level, although many MED employees who were in positions that required special knowledge or training were civil service workers. The chiefs of each of these units reported directly to the district engineer.

Operating units, each headed by a unit chief or an area engineer, were formed to monitor each of the major contractor-operated activities. In the early period of MED operation, the units conformed to the emphasis on construction activities, whereas later they reflected the shift to plant-operating activities. By the time MED headquarters moved from New York to Oak Ridge in August 1943, five major operating units had been established: Madison Square Area, Hanford Engineer Works, Clinton Engineer Works, New York Area, and Special Products.

The staff units concerned with overseeing project operations and providing services were divided into four categories: Unit Chiefs, Technical Division, Service and Control Division, and Administrative Division. The four unit chiefs, Y–12 (electromagnetic), K–25 (gaseous diffusion), X–10 (plutonium), and P–9 (heavy water), were responsible for the overall supervision of the construction and operations phases of the production process.

Despite the carefully crafted organizational structure, problems such as shortages of materials and labor, electrical failures, mechanical breakdowns, and low morale continued to plague the Manhattan Project. As the months passed, the sense of urgency and the pressure for success intensified. By spring 1945 the plants had produced enough material for a bomb. Before dawn on 16 July 1945, plutonium was detonated from a 100-foot steel tower in a barren desert area in southern New Mexico aptly named Jornada del Muerto (Journey of Death). The explosion, with the force of 20,000 tons of TNT, set off a huge fireball that rose slowly to 10,000 feet and

left a crater 1,200 feet deep filled with pulverized dirt. The steel tower evaporated; radioactive material was deposited 120 miles away.

Thus, the Corps of Engineers successfully completed one of the most challenging and unique construction projects of the war. The Corps rapidly converted its peacetime rivers and harbors organization to war activity; coordinated construction with research, created a livable environment for employees and their families, and coordinated the work of hundreds of contractors. Perhaps as impressive as the scope of the project was the patriotism demonstrated by civilians and soldiers alike who worked long hours under uncomfortable and often hazardous conditions. Although conflicts occasionally arose between scientists and officers, generally both groups approached the project with a true cooperative spirit.

Sources for Further Reading

The best sources dealing specifically with the Army engineers' role in the development of the atomic bomb are Vincent C. Jones, *Manhattan: The Army and the Atomic Bomb Project* (Washington, DC: Center of Military History, U.S. Army, 1985) and Lenore Fine and Jesse A. Remington, *United States Army in World War II. The Technical Services. The Corps of Engineers: Construction in the United States* (Washington, DC: Office of the Chief of Military History, U.S. Army, 1972).

A good source on the Manhattan Project in general is Stephane Groueff, *The Manhattan Project: The Untold Story of the Making of the Atomic Bomb* (Boston: Little, Brown, and Company, 1967).

For valuable accounts by actual participants in the project, see Leslie R. Groves, *Now It Can Be Told: The Story of the Manhattan Project* (New York: Harper and Brothers, 1962) and K. D. Nichols, *The Road to Trinity* (New York: William Morrow and Company, Inc., 1987).