THE WORLD WAR II ORDNANCE DEPARTMENT'S GOVERNMENT-OWNED CONTRACTOR-OPERATED (GOCO) INDUSTRIAL FACILITIES: BADGER ORDNANCE WORKS HISTORIC INVESTIGATION

by
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U.S. ARMY MATERIEL COMMAND HISTORIC CONTEXT SERIES
REPORT OF INVESTIGATIONS
NUMBER 2A

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US Army Corps
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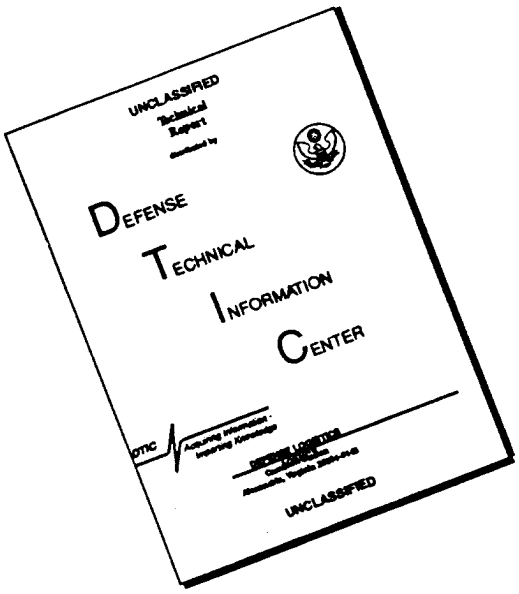

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This report presents the results of an examination of historical records related to the construction and operations of the Badger Army Ammunition Plant (BAAP), Baraboo, Wisconsin. This project was undertaken as part of a larger Legacy Resource Program demonstration project to assist small installations and to aid in the completion of mitigation efforts set up in a 1993 Programmatic Agreement among the Army Materiel Command, the Advisory Council on Historic Preservation, and Multiple State Historic Preservation Officers concerning a program to cease maintenance, excess, and dispose of particular properties. As part of the larger project to develop the national historic context of seven sample installations on a state and local level, the major focus of the project at BAAP was to document the impacts that the facility had on the state and local environments.

The project was conducted by Bear Creek Archeology, Inc., under subcontract to Geo-Marine, Inc., during February 1995. Duane Peter, Senior Archeologist at Geo-Marine, Inc., served as Principal Investigator. Scott C. Shaffer conducted archival research and was principal author of this documents. Deborah L. Crown conducted the oral history interviews and assisted during research and writing.

As one of the Ordnance Department's Government-Owned Contractor-Operated industrial facilities, BAAP was designed to provide munitions and materiel for European and American forces during World War II. In addition to the technical aspects of munitions production, this report discusses the direct and indirect effects construction and operations had on Baraboo, Sauk City, and the surrounding small communities.

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THE WORLD WAR II ORDNANCE DEPARTMENT'S GOVERNMENT-OWNED CONTRACTOR-OPERATED (GOCO) INDUSTRIAL FACILITIES:

BADGER ORDNANCE WORKS HISTORIC INVESTIGATION

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U.S. ARMY CORPS OF ENGINEERS
Fort Worth District
Contract No. DACA63-93-D-0014

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REPORT OF INVESTIGATIONS
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Geo-Marine, Inc.
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MANAGEMENT SUMMARY

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Many individuals were instrumental in the successful completion of this document. We thank the employees of both the Olin Corporation and the federal government whose work at the Badger Army Ammunition Plant was often interrupted for our convenience. Don Hartmann and Doug Rheid provided information and guided very thorough tours of the facility. Robert Bobrowicz and Jeff Paulson provided detailed maps and structural plans; Mr. Bobrowicz also assisted in interpreting the World War II period production process. We also acknowledge the oral history informants: Mrs. Dorothy Bohnsack, Mr. Floyd Allen, Ms. Laverna Hackett, Mr. Howard Rittmann, Ms. Dorothy Krueger, and Mr. Elroy Hirsch. These individuals provided invaluable information concerning everyday life at the powder production facility during World War II. This document would be incomplete without their generous contributions.

We would like to thank Joseph Murphey of the U.S. Army Corps of Engineers, Fort Worth District, who was most supportive of our efforts. He provided constructive criticism and management direction throughout this project. In the Bear Creek, Inc., office in Iowa, Ms. Jacqueline Foster contributed to the editing of the draft. Mr. Colin Betts drafted several figures and Ms. Deanne Doyle compiled the information for several tables. In the Plano office of Geo-Marine, Inc., the final editing and overall production of the report were the responsibilities of Ms. Sharlene Allday. Ms. Sandy Carr and Mr. Michael Brown provided computer graphics and Ms. Denise Pemberton generated the computerized format for the layout and design of the book.

CHAPTER 1
INTRODUCTION

This report presents the results of research into the historical record of Badger Army Ammunition Plant, Baraboo, Wisconsin, 1941-1995. The purpose of this report was to partially fulfill the goals of a larger project that entails not only this specific historic investigation, but also a national context for the World War II Ordnance Department's Government-Owned Contractor-Operated (GOCO) industrial facilities, 1939-1945 (Kane 1995); detailed investigations into the history of seven former World War II-era Ordnance Department GOCO industrial facilities (present-day Badger, Indiana, Joliet, Kansas, Radford, Ravenna, and Twin Cities army ammunition plants); and photographic documentation of the same sample installations. Goals of the larger project included investigation and documentation of World War II and pre-World War II buildings and structures now under the jurisdiction of Army Materiel Command (AMC) as part of a Legacy Resource demonstration program of assistance to small installations, as well as the completion of mitigation efforts stipulated in a 1993 Programmatic Agreement among the AMC, the Advisory Council on Historic Preservation, and multiple State Historic Preservation Officers concerning a program to cease maintenance, excess, and dispose of particular properties. The detailed historic investigation of Badger Army Ammunition Plant, like the detailed historic investigations for the other sample installations, was undertaken in order to develop the national historic context on a state and local level. The major focus is upon the impacts of the facility on state and local history.

In September 1993, Geo-Marine, Inc. (GMI), was contracted by the Army Corps of Engineers, Fort Worth District, to complete the national historic context, detailed historic investigations, and photographic documentation. The research for the Badger Army Ammunition Plant detailed historic investigation was conducted by Bear Creek Archeology, Inc., under contract to GMI, during February 1995. Duane Peter, Director of the Cultural Resources Division at GMI, served as Principal Investigator. Scott C. Shaffer of Bear Creek Archeology, Inc., conducted archival research and was principal author of this document. Deborah L. Crown, of Bear Creek Archeology, Inc., conducted the oral history interviews and assisted during research and writing. The work was performed under Delivery Order No. 014 of Contract No. DACA63-93-D-0014.

Chapter 2 of this report describes the objectives of and the methods used in the detailed historic investigations. Chapter 3, the historic context portion of the report, is divided into eight major sections. The first presents the military/political background of the Badger facility. The second section provides information on the architecture/engineering design of the installation, including data on the history of Hercules Powder Company and the construction of the Badger facility. The third consists of an account of contractor operations at Badger during World War II, and the fourth presents details on the technology of the facility. Social history is the subject of the fifth section within the historic context. The topics of land

acquisition, the boom town phenomenon, the social history aspects of wartime operation, and Badger's World War II-era environmental legacy are covered in the social history section. The effects of the end of the war upon the Badger facility are described in the sixth section. Information on the post-World War II years at Badger is presented in the seventh section. The eighth and final section within the historic context consists of a summary and conclusions. A list of references cited follows the body of the document.

CHAPTER 2
OBJECTIVES AND METHODS

Historic contexts are the cornerstone of the historic preservation planning process in the United States. The Secretary of the Interior's *Standards for Preservation Planning* states:

> Decisions about the identification, evaluation, registration and treatment of historic properties are most reliably made when the relationship of individual properties to other similar properties is understood. Information about historic properties representing aspects of history, architecture, archeology, engineering and culture must be collected and organized to define these relationships. This organizational framework is called a "historic context." The historic context organizes information based on a cultural theme and its geographical and chronological limits. Contexts describe the significant broad patterns of development in an area that may be represented by historic properties [National Park Service (NPS) 1983:44717].

Historic context development results in a document that is designed to serve both the technical and informational needs of preservation planners. A single historic context describes one or more significant historical themes or patterns of historical development represented by individual historic properties. Historic contexts are developed at a variety of scales, delineating important themes relating to the heritage of a neighborhood, town, county, region, state, or the nation as a whole (NPS 1991:9-10). Thematic, geographical, and chronological boundaries between historic contexts often overlap. While the goal of historic context development is the creation of a complete, fully documented, comprehensive study of a particular set of cultural resources, it is assumed that historic contexts will need to be refined and modified as more data become available.

Historic context research and writing involves five basic steps: (1) identify conceptual, geographical, and temporal boundaries; (2) define research questions; (3) assemble and analyze existing data about the historic context; (4) synthesize the data in the form of a written narrative; and (5) identify information needs. These activities need to be carefully planned in order to produce a useful final product and must take into account the sponsoring agency's planning needs; its legal obligations under the National Historic Preservation Act (1992, as amended), Executive Order 11593, and other preservation regulations; time and funding limits; and the nature of the cultural resources under investigation.

The Badger Army Ammunition Plant (BAAP) was originally referred to as the Badger Ordnance Works (BOW). This designation continued through the World War II and Korean conflict operations. It was not until the southeast Asia operation that its official name was changed to the BAAP. It has always been referred to as just "Badger" by operating personnel and local residents. Development of the historic context

for the BAAP involved archival research in both primary and secondary source materials. Primary sources of information concerning the BOW included published and unpublished documents and graphic material generated by various agencies of the U.S. government and its contractors, state and local governments, and individuals connected with the BOW. Of particular interest were the textual and graphic records of the property's physical development and operation. Much of this material has been deposited in the National Archives or is on file in the BOW library located at the plant. Additional data are archived at the U.S. Army Corps of Engineers, Rock Island and Fort Worth district offices.

Secondary sources consisted of books, monographs and pamphlets; articles in scholarly and professional journals and magazines; articles in newspapers and popular periodicals; maps, atlases and plans; and unpublished research papers and reports. A limited number of general works on U.S. military history, wartime arms production, and industrial architecture were also consulted. Bibliographic control for research in secondary source materials was provided by a number of standard reference works, the most useful of which were those compiled by Higham (1975) and Higham and Mrozek (1993).

Researchers used the facilities of the Wisconsin Historical Society and the University of Wisconsin-Madison libraries. A substantial amount of archival material from the National Archives was photocopied and additional archival research was also carried out at the BAAP and at the Baraboo, Wisconsin, public library.

Oral histories were conducted by Bear Creek Archeology, Inc. (BCA), personnel in February 1995 in the Baraboo and Madison areas. Six interviews were scheduled with former employees of the BOW. Interviews with three women and three men, all of whom were employed at the BOW during World War II, were recorded for approximately 90 minutes each, using a high quality tape recorder. The questions asked during the interviews were reviewed prior to conducting the interviews. Informants were asked about working at the plant and about general conditions of the local area during the war. The tapes were indexed, but not transcribed. Data obtained from the oral histories are incorporated into the "Social History" section of this document.

The first interview was conducted in Sauk City, Wisconsin, with Ms. Dorothy Bohnsack at her home. During World War II, Ms. Bohnsack handled accounts payable in the administrative department at BOW. She is a lifetime resident of the area and lived in her present house during World War II. She returned to work at the plant during the Korean and Vietnam conflicts.

Mr. Floyd Allen, long-time resident of Baraboo, was interviewed at his home. His wife was present for the interview, but offered few comments. During World War II he worked on construction of BOW and then worked in the Nitric Acid area as a pumper. He also worked as a painter at BOW and at "Staff Village." He, too, returned to the plant during the Korean and Vietnam conflicts.

The third interview was conducted with Ms. Laverna Hackett in her home in Baraboo. Ms. Hackett and her late husband lived in Badger Village during World War II and both worked at BOW. She was a chemical lab driver, or "sample runner," during World War II. She also returned to work at the plant during the Korean and Vietnam conflicts.

Mr. Howard Rittmann was interviewed in his home in nearby Portage, Wisconsin. Like Mr. Allen, he worked at the plant during the construction phase. He was a lab technician during the war, and also returned to work during the Korean and Vietnam conflicts.

Ms. Dorothy Krueger was interviewed in her home in West Baraboo. Before taking a job at the plant she had mainly worked only in the home. She worked on several production lines during her tenure at the plant. After World War II she returned to her home to be with her family.

The sixth and final interview was conducted with Mr. Elroy Hirsch in his home in Madison, Wisconsin. Before World War II, Mr. Hirsch was a student and well-known football player (often called "Crazy Legs") at the University of Wisconsin-Madison. When the war began, he joined the Marine Corps and, while waiting to be shipped overseas, took a job as a guard at the plant. After the war, he played professional football with the Los Angeles Rams, and later became Athletic Director for the University of Wisconsin-Madison, a position he held for 18 years.

Both the historical documents and oral histories should be viewed as important tools for understanding the past, and the present study is not an argument for the superiority of one over the other. Middle range theory suggests that the disparity between certain data sets, in this case documentary and oral tradition evidence, be considered as "ambiguity" (see Leone and Potter 1988). This ambiguity can only be clarified through a critical use of all available resources. This middle range theory has been criticized as reductionism (Beaudry 1990:116; Hodder 1986:4); however, interpretation, like any form of human perception, is reductionist. This reduction is lessened by acknowledging the diversity of biases inherent in both documentary records and oral history tradition as well as the multiplicity of possible and potential interpretations. The present study intends to use both in a complimentary fashion, in order to create a richer interpretation of the socio-cultural history of the people who were involved with the BOW.

CHAPTER 3
HISTORIC CONTEXT FOR BADGER ARMY AMMUNITION PLANT, A WORLD WAR II ORDNANCE DEPARTMENT GOCO INDUSTRIAL FACILITY, 1941 -1995

The BAAP is a complex of industrial buildings, structures, sites, and landscapes located in Sumpter and Merrimac townships, Sauk County, Wisconsin in a rural setting approximately halfway between the towns of Baraboo (pop. 8,000) and Sauk City (pop. 2,900). It is further located in the heart of a fertile, prosperous farming center immediately south of the Southern Range of the Baraboo Bluff and along the west bank of the Wisconsin River (Figures 1 and 2). BOW was to have been practically a duplicate of the smokeless powder production facilities located in Radford, Virginia. A great deal of time would have been saved if the completed plans for the Radford plant had been used in Wisconsin with comparatively minor changes necessitated by terrain and climate. It was not possible to duplicate the Radford plant fully, however, due to new considerations regarding the use of steel, copper, aluminum, and other critical materials (Voight 1945).

The property's historic boundaries encompass 10,565 acres. In 1995 the BAAP federal land totals 7,354 acres and includes 33 acres of ponds and streams, 314 acres of pavements and rail grades, and 1,642 acres devoted to production and support facilities including approximately 1,500 buildings which cover 104 acres. The installation is owned by the federal government and is presently part of the U.S. Army Armament, Munitions and Chemical Command (AMCCOM; Figures 3 and 4).

Contextually, the BAAP is a product of the Government-Owned Contractor-Operated (GOCO) war materiels production program established by the War Department during World War II. Originally known as the BOW, the plant was initially designed and constructed immediately prior to and during World War II to produce smokeless gunpowder and solid rocket propellant fuel in the form of 2.75-inch rocket grains. Additional and supporting production of oleum, nitric acid, sulfuric acid, nitrocellulose, and nitroglycerin also took place at BOW during World War II.

The original contractor for the BOW, under the War Department, was the Hercules Powder Company (HPC) of Wilmington, Delaware. A letter of intent dated November 10, 1941, was sent to HPC authorizing it to proceed with preliminary surveys and to initiate design for the plant. HPC was contracted to design and buy equipment, train personnel, and operate the plant facilities, for which the firm of Mason & Hanger of New York contracted to prepare architectural plans and manage engineering and construction work. Construction of the plant began in February 1942. The first operations included the production of oleum, which started on January 1, 1943, smokeless powder and solvents, which began on January 18, 1943, and rocket powder

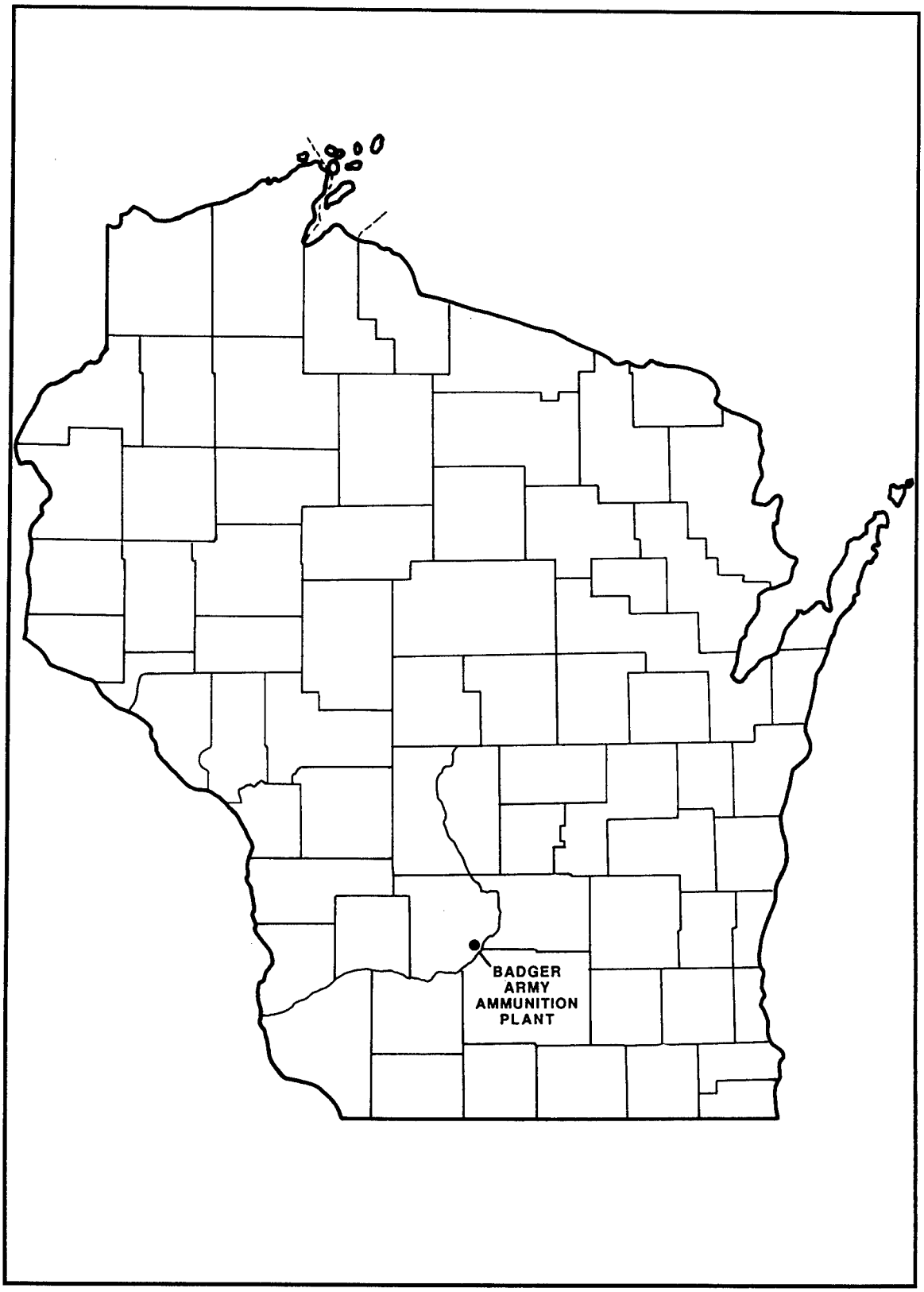

Figure 1. Map showing location of BAAP within the state of Wisconsin.

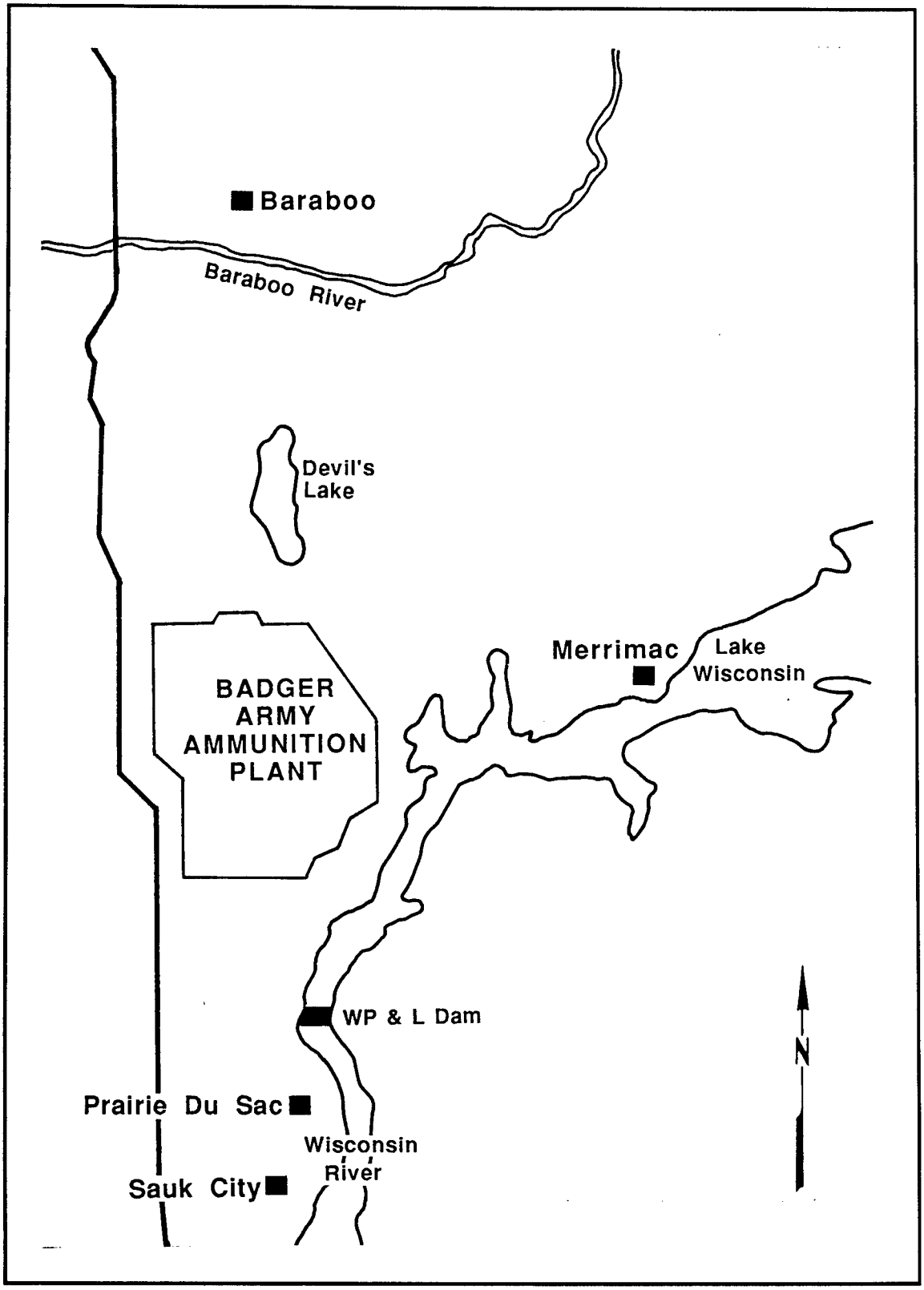

Figure 2. Map showing location of BAAP within Sauk County.

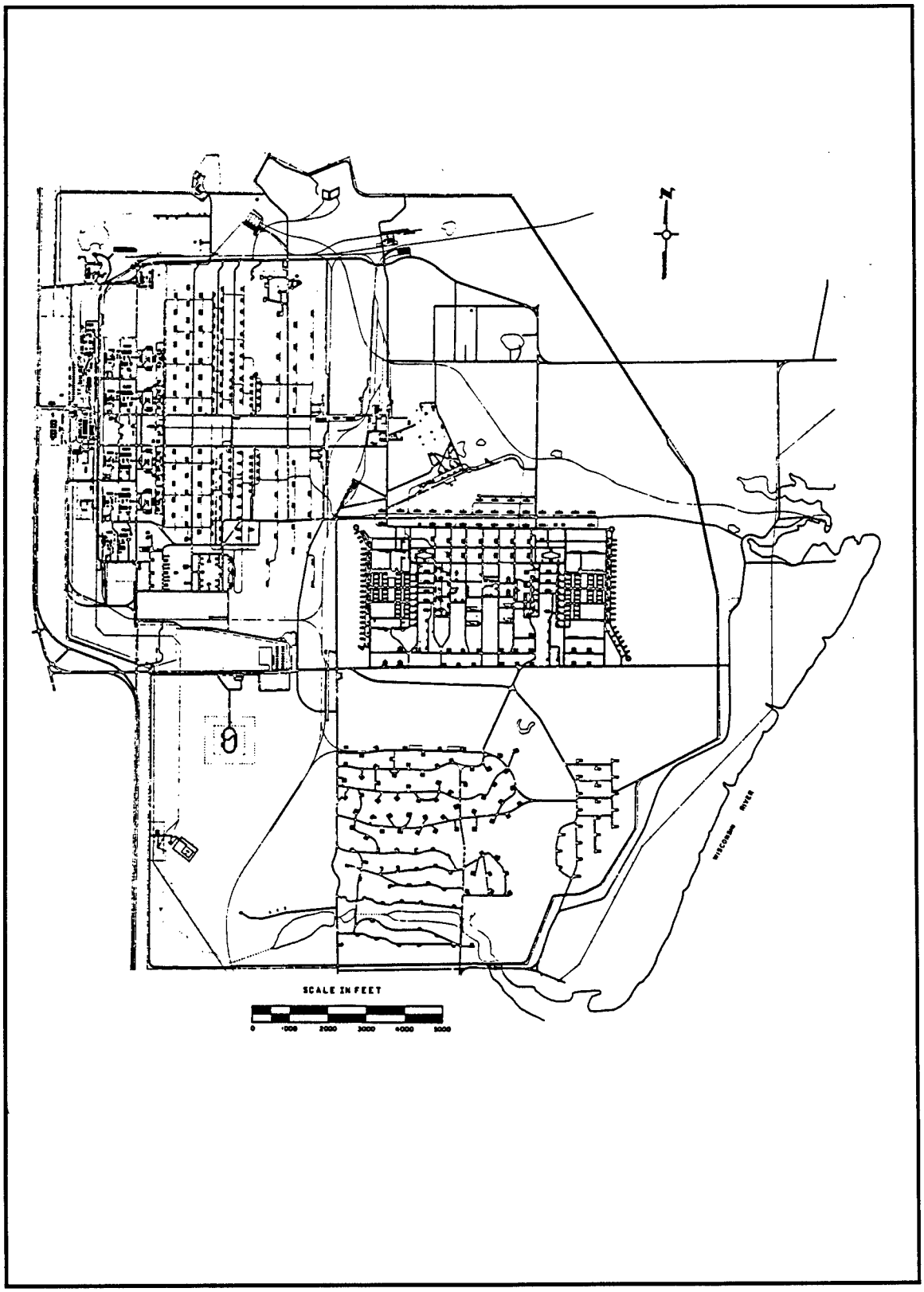

Figure 3. Map showing modern layout of BAAP.

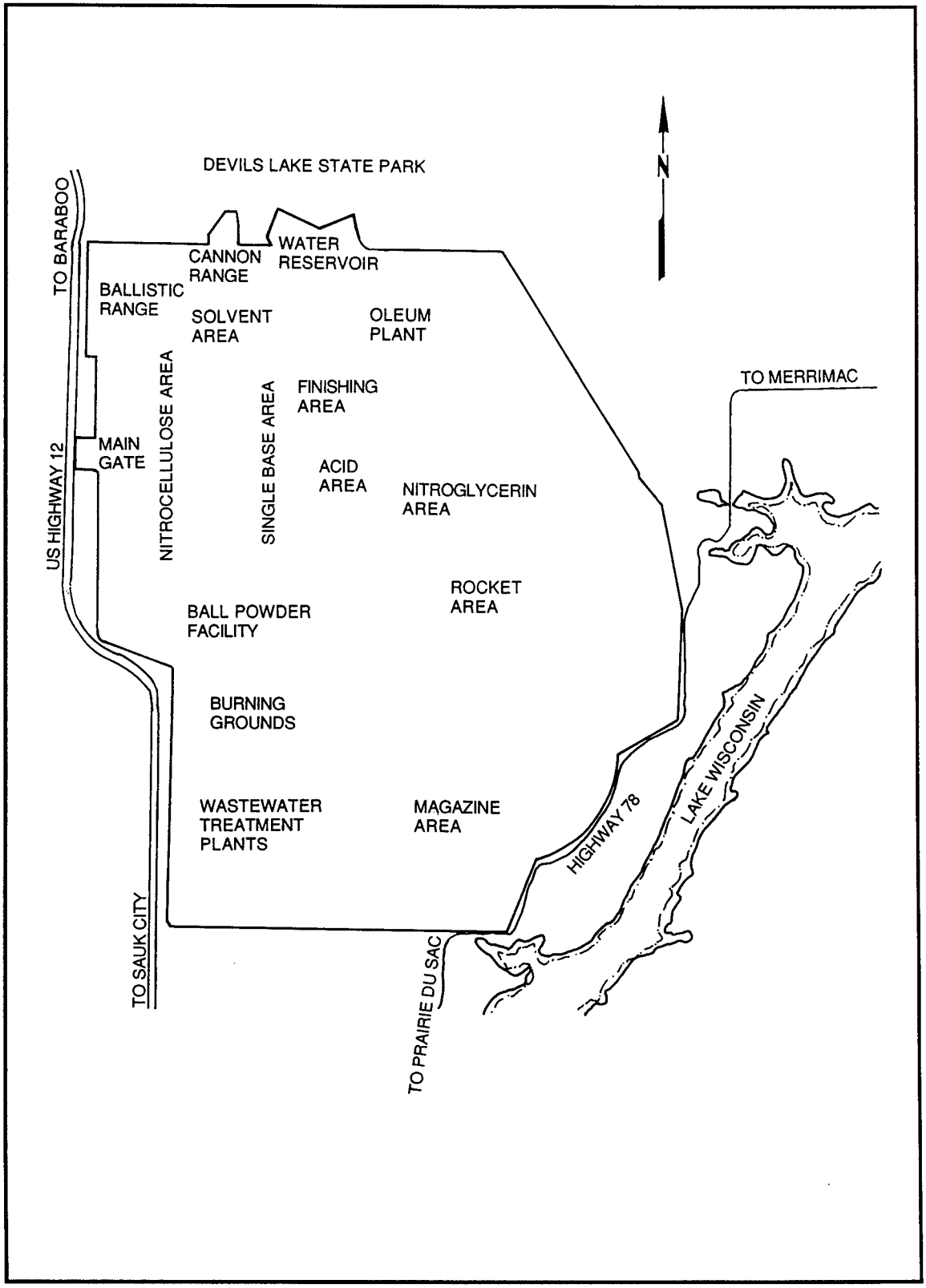

Figure 4. Map designating locations of present facilities at BAAP.

which began somewhat later in March 1945 (Voight 1945:1). Construction at the plant continued and new lines were added until nearly V-J Day, when some facilities were left partially completed. Construction stopped on August 13, 1945.

In anticipation of V-J Day, the production of rocket powder was discontinued in the third quarter of 1945. After V-J Day, the Field Director of Ammunition Plants, later designated Ordnance Ammunition Center and still later Ammunition Procurement and Supply Agency, in Joliet, Illinois, designated BOW as a standby plant effective September 7, 1945. During its World War II operation between January 1943 and September 1945 production at Badger included 109,267,500 pounds of small arms powder, 148,701,400 pounds of cannon powder, and 13,394,700 pounds of rocket grains (Badger Army Ammunition Plant [BAAP] 1992). During the period 1945 through 1950, various portions of the plant were in surplus, excess, standby, and caretaker status and were maintained by a small compliment of government employees.

In February of 1951, rehabilitation of Badger was begun by the Fegles Construction Company of Minneapolis, Minnesota, under the direction of the Corps of Engineers. Rehabilitation was completed in November 1954 (Anonymous n.d.a). On April 30, 1951, the Liberty Powder Defense Corporation of East Alton, Illinois, a subsidiary of Olin Mathieson Chemical Corporation which was later designated as Olin Corporation, became the operator of Badger and continues as such today (Anonymous n.d.a). During 1954 and 1955, new facilities for the manufacture of ball powder propellant were constructed on a "lump sum" bid let by the Corps of Engineers. The Architect-Engineer contractor was the H. K. Ferguson Company of Cleveland, Ohio (Anonymous n.d.a). Ball powder propellant was a new high-energy gun powder for use in modern rifles. After the Korean War armistice in July 1953, the government also constructed a facility to recycle old gun powder as a base for the new propellant. Badger remained in production until the Army's Ball Powder Propellant need was met and the magazines were full. On March 1, 1958, the plant was placed in inactive status and remained in this capacity until December 23, 1965, when it was reactivated (Anonymous n.d.a). During the inactive period from 1958 to 1965 the plant was maintained in standby status by Olin Corporation.

In the late fall of 1965, management at the plant had an indication of possible reactivation. Olin Corporation received official notice to reactivate the plant on January 3, 1966, with the initial powder for this operating period being produced on May 19, 1966. Badger produced Ball Powder Propellant, Rocket Propellant and Smokeless Powder for the Vietnam conflict. Production continued from January 1966 through January 1975. In 1972, the government began a major modernization of Badger that included production safety improvements, upgrading plant utilities, and environmental process controls. The improvements made the production process safer, more economical, and environmentally sound. Modern sewage treatment, acid production, and nitroglycerin facilities were also constructed. All production at Badger had ceased by January of 1975, and the plant has remained on standby and modernization status under the management of Olin Corporation since that time (BAAP 1983:3).

The BAAP is historically significant because of its historical, physical, and social association with U.S. industrial mobilization during World War II and the development of the military-industrial complex during the postwar and Cold War periods. This is especially true for its contribution to rocket propellant production. World War II industrial mobilization and its long-term effects on American culture and society represent a significant broad pattern of events, and the BAAP reflects the importance of the war on the home front. The effect of this facility's impact on a quiet, rural farm district is further evidenced in the oral histories conducted during the course of this investigation.

Significant aspects of the plant's World War II operation, which will be discussed below, include the use of Native Americans for construction purposes, the importation of Barbadians and Jamaicans as workers in the nitro-cotton and smokeless areas, the almost constant need for additional employees, the employment of women, innovations and improvements in propellant production, and the way in which the government and local community dealt with the housing shortage.

Architecturally, portions of the property are significant as products of mid-twentieth-century industrial design, and areas of the plant retain much of their 1940s character. The buildings constructed during World War II were simple, utilitarian structures designed for temporary use. Although they took different forms due to their varied structural and functional requirements, most were wood-frame structures sitting on either a cement slab or a perimeter foundation wall. While most lack architectural distinction, they collectively represent a specific historical environment. Although they do not satisfy the National Register of Historic Places requirements for buildings less than 50 years old, the major production buildings in the Ball Powder facility, ca. 1954-55, have been classified as Category III Historic Properties because they are an excellent example of a highly intact industrial process, and constitute the only such facilities at a GOCO plant in the United States (MacDonald and Mack 1984:43). Some of the production machinery has been removed from the plant; much of the remaining hardware is of World War II vintage and may be important to engineering history research because of Badger's role in the development and implementation of rocket propellant production technologies.

MILITARY/POLITICAL BACKGROUND

The first global war of 1914-1918 mobilized whole societies in the pursuit of victory, and the military application of industrial technology produced revolutionary effects, both on the battlefield and the home front. The U.S. entry into the war in 1917 forced the military to launch a crash program for arming the nation. Eventually, an army of nearly 5 million was raised, 1 million of whom were sent "over there." In its effort to arm, clothe, feed, and transport the military, the federal government created a giant new bureaucracy to run a managed national economy. Under the energetic leadership of Bernard Baruch, the War Industries Board (WIB) allocated strategic resources, set factory production schedules, and established a comprehensive government purchasing policy. Millions went to work in factories where government contracts guaranteed high wages, an eight-hour work day and equal pay for comparable work. The demands of war production brought unprecedented numbers of women, African Americans, Mexican Americans, and other nontraditional industrial workers into the job market. To forestall worker discontent, the Wilson Administration created the National War Labor Board (NWLB), appointing Samuel Gompers of the American Federation of Labor (AFL) to one of the seats on the Board. The NWLB guaranteed the rights of unions to organize and bargain collectively on behalf of war industry workers. The logistical achievements of the U.S. in World War I were impressive, with more than eight million tons of military supplies delivered to Europe in less than 19 months (see Baruch 1941).

With the signing of the armistice on November 11, 1918, most Americans genuinely believed that the Great War had been the "war to end all wars," and the national military establishment was promptly dismantled, along with much of the centralized economic and industrial planning bureaucracy. U.S. industries quickly invested their wartime profits into the production of consumer goods, and the small military establishment was content to make do with surplus equipment and stores. With the national debt running at $20 billion in 1920, roughly 10 times its prewar level, Congress was little inclined to invest more in defense planning or preparation (see Fussel 1975).

The National Defense Act of June 4, 1920, literally turned back the clock for the U.S. military by reverting control of logistical functions to the individual service supply departments. Procurement was taken out of the hands of the services and placed under civilian control, and the Office of the Assistant Secretary of War (OASW) was made responsible for planning (Risch 1989:562-585). Fourteen ordnance districts were created and charged with undertaking industrial surveys and mobilization plans (Cambell 1946:23). Wisconsin was included in the Chicago District (Thomson and Mayo 1991:14). From 1920 until 1942, there was no centralized command over the supply bureaus and virtually no coordination of the national defense logistics system below the level of the secretary of war (Green et al. 1955).

According to Murphey (1993b:2), "[i]n the early 1920s, America's industrial mobilization plan and records consisted of a few notecards in an old shoebox." The Army-Navy Munitions Board, the brainchild of Assistant Secretary of War Dwight F. Davis, was created in June 1922 in an attempt to facilitate interservice planning, but was underfunded and lacked the necessary political support to be effective. The Munitions Board sponsored a series of Industrial Mobilization Plans (IMPs) and championed the concept of a centralized command authority for economic and industrial mobilization but otherwise accomplished very little that would serve the nation's interests in the next war. It was not until the 1930s that the War Department began to undertake realistic planning for another global war. Even then, however, the General Staff was preoccupied with manpower issues and neglected problems of industrial mobilization and supply (Smith 1959:39-45).

During the two decades between the world wars, the U.S. was a minor producer and supplier of military hardware. Armaments production between 1920 and 1940 was concentrated in six "old line" arsenals with production facilities dating back to the early nineteenth century. Before Lend-Lease, arms exports were negligible, and U.S. army units relied upon World War I stockpiles of weapons and ammunition. Several factors contributed to this situation. First and foremost, the traditional American ambivalence toward involvement in foreign affairs fostered isolationist policies that caused the U.S. to adopt a posture of military neglect. At the same time, successive Congresses showed little inclination toward funding anything more than the most rudimentary national defense establishment, particularly land-based forces. This reflected a basic conviction held by the majority of Americans during the interwar period, that a large peacetime military establishment was antithetical to traditional American notions of what constituted the national defense. Another reason for military neglect was the cost of the armaments themselves. Consequently, the low priority the national leadership assigned to military affairs served to dampen the army's own institutional desire to modernize and prepare.

A renewal of the arms race among the great powers occurred in the 1930s, with the U.S. the most reluctant participant. From 1931 onward, the Japanese aggressively expanded their empire at the expense of the Chinese, while in Europe the rise of Italian and German fascism made a general war inevitable by the time Hitler's forces occupied the Rhineland in 1936. Encouraged by British and French governmental policies of appeasement, the Nazi dictator marched his troops into Austria in 1938 and Czechoslovakia in 1939. On September 1, 1939, the Germans invaded Poland, and on September 3 Great Britain and France declared war on Germany. Within a year, German forces had overrun Denmark, Norway, and the Low Countries and had forced the capitulation of France. Only the British Isles remained unconquered. In June 1941 Hitler turned against the Soviet Union, bringing the British some reprieve from a situation that had appeared hopeless. After the fall of France, Japan secured control of French Indo-China, and when the U.S. and Great Britain responded with economic sanctions, including an oil embargo, Japanese leaders set in motion plans that would culminate in the December 1941 strikes against Hawaii, the Philippines, Malaysia, and the Dutch East Indies.

Frustrated by neutrality legislation and opposed by isolationist political forces, President Franklin D. Roosevelt formed the War Resources Board (WRB) in August 1939, but its recommendations were largely ignored, and it disbanded after a few months. The German invasion of Poland provided Roosevelt with his first opportunity to ask Congress to authorize additional funds for national defense. Roosevelt also sent his Secretary of War, Henry L. Stimson, to ask Congress to amend the National Defense Act to give the Secretary complete authority over military procurement. This was accomplished, and on May 25, 1940, the Roosevelt Administration created the Office for Emergency Management. Four days later Congress established the Advisory Commission of National Defense, in effect the first war mobilization super-agency, whose functions were shortly thereafter absorbed by the Office of Production Management (OPM), which was itself replaced by the Supply Priorities and Allocations Board (SPAB) in August 1941. The Military Supply Act passed by Congress on June 13, 1940, contained a $1.8 billion appropriation for defense projects and put the U.S. on the path to becoming the world's foremost producer of armaments (Green et al. 1955; Thomson and Mayo 1991).

On December 29, 1940, in a famous year-end "fireside chat," Roosevelt proclaimed that the U.S. must be the "arsenal of democracy" for Great Britain. Five months later, the president declared an unlimited state of national emergency, shortly after signing into law the Lend-Lease Act. Based upon a 1940 agreement between the Roosevelt Administration and the government of Prime Minister Winston Churchill, the U.S. "loaned" Great Britain 50 obsolete destroyers in exchange for base rights in the British Commonwealth and committed the industrial power of the U.S. to the defeat of Nazi Germany and Fascist Italy. Although the U.S. was still technically neutral, Lend-Lease "jump started" the U.S. war machine (Murphey 1993b:5) and initiated direct American involvement in World War II (Catton 1969; Drummond 1955; Green at al. 1955:65-82).

By late 1941 it was obvious that the existing War Department logistical organization was not up to the demands being placed upon it, but when the Japanese raided Pearl Harbor on December 7, 1941, the Army-Navy Munitions Board was still the only functioning industrial mobilization organization in place. The structure of the logistics system soon changed, however. The War Production Board (WPB) was created in January 1942 and quickly emerged as the chief coordinating agency for national defense. The WPB controlled war plant construction and supervised contracting, and its Controlled Materials Plan (CMP) became the centerpiece of the federal government's control of the wartime economy. The old Army-Navy Munitions Board, meanwhile, was reorganized in February 1942 and became somewhat of a liaison office between the War Department staff and civilian mobilization agencies.

Far more important than the administrative shuffle involving the Munitions Board and the WPB was the so-called Marshall reorganization of the U.S. Army. By presidential executive order issued on March 9, 1942, the army was divided into three major commands: the Army Air Forces (AAF), the Army Ground Forces (AGF), and the Services of Supply. The latter, in part because of its unfortunate acronym (SOS), was soon rechristened the Army Service Forces (ASF). The War Plans Division (renamed Operations Division or OPD) became the central War Department planning entity, with the Logistics Group in the OPD responsible for implementing procurement and distribution policies. Under the command of Lt. Gen. Brehon B. Somervell, ASF was assigned responsibility for administering the supply and service operations of six technical services, eight administrative services, nine corps areas (i.e., service commands), six ports of embarkation, and nine general depots. Creation of the ASF represented a major step toward centralized planning and is widely regarded as a major victory in the fight against the Axis (Smith 1959:48-72).

The practiced doctrine of U.S. military field commanders prior to and during World War II was to pave the way for advancing infantry soldiers with massed artillery fire and aerial bombing. These tactics helped to achieve the goal of victory at a minimum cost in American lives, but expended ammunition at a rate never before considered feasible. Massed fire power on the scale employed during World War II was beyond the capability of the U.S. Army in the summer of 1940, or even as late as the summer of 1941 (Thomson and Mayo 1991:104). Only a handful of small plants were making propellant powder and high explosives. Stocks of ammunition on hand were so low that Secretary of War Stimson stated, in 1943, that the U.S. did not have enough powder on hand in the whole country to sustain the men currently overseas for even a day's fighting.

For such products as smokeless powder or propellant, TNT, and ammonia, there were no existing plants that could be readily converted. As powder plants offered little attraction for private capital investments, it was recognized that new plants would have to be built at government expense. This was realized by Ordnance engineers during the interwar years. Cooperating with the nation's small peacetime explosives industry and using technical developments of the Picantinny and Frankfort arsenals, Ordnance engineers drew up plans and specifications for typical plants to be built in a time of need (Thomson and Mayo 1991:11). In 1937 they established an office in Wilmington, Delaware, to carry on this work, and in 1938 congress appropriated funds for the purchase of highly specialized machinery for the production of propellants. By the summer of 1940, the government had a fairly clear idea as to the type of new facilities it would need to produce smokeless powder, explosives, ammonia, and TNT (Thomson and Mayo 1991:12).

To meet the situation at hand in the summer of 1940, the Ordnance Department took steps to create something new in American economic life: a vast interlocking network of ammunition plants owned by the government and operated by private industry (Thomson and Mayo 1991:105). The decision was made to construct this national system of armament manufacturing plants in 1940, and the first GOCO plant contract was awarded in July 1940 to Du Pont to construct the Indiana Ordnance Works smokeless powder factory. By December 1940, 22 GOCO plants were under construction by the War Department (Thomson and Mayo 1991:32, 200-203), and by the end of 1941, 17 of these installations were in operation (Murphey 1993b:3-4).

The GOCO Industrial Facilities Program was administered by the Ordnance Department of the U.S. Army Quartermaster Corps, one of the U.S. Army's seven technical services. The Ordnance Department was a venerable institution that traced its lineage to the Continental Army of the American Revolution (Green et al. 1955:14-64). In the twentieth century, the Ordnance Corps was concerned with supplying the army with arms, ammunition, vehicles, and fire control instruments. Another major function of the Ordnance Department during World War II was the repair and maintenance of the army's munitions. On the eve of World War II, the Office of the Chief of Ordnance was organized into four groups: the General Office, the Technical Staff, the Industrial Service (formerly the Manufacturing Service) and the Field Service. The Industrial Service staff had broad responsibility for production and procurement as well as for research and development of new weapons technologies, and it was assigned the mission of building and operating the new system of arms manufacturing plants.

From a procurement point of view, all parts of a bomb or projectile round fall into two categories: metal components, and powder and explosives. In general, the metal components were produced from private industry using existing plant capacities; powder and explosives were produced almost entirely by the new GOCO plants under the direction of the Ammunition Division of Industrial Service (Thomson and Mayo 1991:107). The hazardous nature of propellant production obviously was not for amateurs. Unfortunately, in 1940 there were few companies in the U.S. familiar with explosives and propellant manufacture, and their experienced personnel were few in number. Adding to the problem of experience with propellants, established companies had recently come through the "Merchants of Death" era when everyone connected with the manufacture of munitions had been publicly chastised.

The first two waves of GOCO defense plant construction were launched by the Ordnance Department in 1940-1941. Of the 77 GOCO industrial facilities, the contract for BOW was let rather late, with contracts for 50 facilities being let before that of BOW. Additionally, the contract for BOW was the sixteenth signed, out of the 23 propellant and explosives works (Voight 1945). As with most facilities, BOW performed more than one function and produced more than one product. BOW was originally intended to provide only three smokeless powder lines, but soon after construction began, the contract was revised to add double-base powder and TNT, and still later solid rocket propellant fuel in the form of 2.75-inch rocket grains. This late addition of rocket propellant production was the result of both the development of the dry-extrusion process for the production of solventless rocket powder and the 1945 battlefront rocket propellant requirement of more than 18 million pounds per month (Thomson and Mayo 1991:137-138).

The OPM established a Plant Site Board to select locations for the new facilities in 1941 (Fairchild and Grossman 1959:102-103). Site selection criteria included a variety of factors. The policy of avoiding coastal areas in favor of the less vulnerable interior regions set certain limits, as did the policy of avoiding, on the grounds of safety, large centers of population (Thomson and Mayo 1991:108). The availability of raw materials such as water and natural gas, the availability of electric power, proximity to railroad and highway transportation routes, and a reliable pool of skilled and unskilled labor for construction and facility operation were also major concerns (Thomson and Mayo 1991:108). Recommendations made by the War Department Site Committee generally concurred with the above considerations, with the suggestion that facilities be located west of the Appalachians, east of the Rockies, and 200 miles from the Canadian and Mexican borders to reduce the risk of attack (Fine and Remington 1972:134-135). Ordnance plants producing explosives also required large tracts of land, not because the buildings were large but because safety considerations

demanded wide open areas between the production lines and between the storage areas (Thomson and Mayo 1991:108). An additional requirement for nitrocellulose and smokeless powder plants was an ample supply of water, and because of this, any plant of this type had to be located on or near a large river with a relatively constant flow (Hercules Powder Company [HPC] 1945a:35). Whenever possible, facilities were also constructed on land that was not well-suited for agricultural use and that could be purchased at reasonable cost.

As the War Department's choice of sites meant financial prosperity to communities and individuals, the transfer of large tracts of private land to public ownership and the establishment of hundreds of new installations and facilities had a wide-ranging significance (Fine and Remington 1972:131). Due mainly to the monetary factors involved, there were strong political pressures at work. Friends who had friends in high places influenced the decisions being made on where to locate GOCO facilities. This sometimes led to decisions in favor of the less desirable locations.

Republican Representative William H. Stevenson was permitted to make the public announcement regarding the choice of Sauk County for a GOCO plant in 1941; however, details were provided by the War Department. In making the public announcement, Stevenson said on October 29, "This particular location was selected because it is ideal for powder work. The area is well drained and sandy and it is hidden away . . . it is desirable to have plants of this type established away from the sea coast and away from large centers of population" (*Baraboo News Republic [BNR]* 8 August, 1989; Figure 5). There was some puzzlement over the selection of the site and many people demanded to know why such a rich agricultural land was selected rather than sandy wastes available in other parts of the state. To blunt the criticism of conservationists and local Sauk Prairie farmers, the army further explained that the good soil of the Sauk Prairie area was vital to the proposed plant because of landscaping for camouflage. Twenty-eight years after locating the plant in Sauk County, Leo T. Crowley, a man of great behind-the-scenes influence throughout the years of Franklin Roosevelt's presidency, revealed some truth in the matter. Bud Williams, then president of North Western Railroad, told Crowley he wanted the powder plant located in the Merrimac-Baraboo area because his railroad ran through this area and he wanted to get some business (BAAP 1992). Crowley decided he would help Williams and both men went to the office of General George C. Marshall, the then Army Chief of Staff. In 1941, War Department officials would admit only that the Sauk County site was selected because of influence from the White House (BAAP 1992). It appears that the influence was exerted by Crowley through his good friend, the occupant of the White House.

The proposed site consisted of rolling cultivated and pasture farmland (Figure 6). There were no gas, oil, or water lines within the site limits, nor were there any developed mineral deposits or assignments of mineral rights (HPC 1945a:36). The site was accessible by rail from important shipping centers including Chicago, Milwaukee, Minneapolis, St. Paul, Kansas City, and St. Louis. U.S. Highway 12, one of the most important north-south highways in central Wisconsin, forms the western boundary of the facility. Labor and population density studies were conducted within a radius of 25 miles prior to construction of the facility. These indicated a potential labor pool of approximately 7,000 unskilled and 3,400 skilled and semi-skilled working men (HPC 1945a:43). The United States Census of 1940 indicated that the total of workers employed in Sauk County was 10,739, of which 15.7 percent were women. Sauk County with only 1,361 unemployed in 1940, was in a better position with respect to unemployment than the average county in the U.S., and local workers were only able to supply a small part of the working force needed for war-time expansion (HPC 1945a:43). A survey of housing facilities in the territory surrounding the proposed facility indicated very few vacancies and that additional housing would have to be furnished due to the anticipated influx of construction and operation personnel (HPC 1945a:43).

The location of the BOW was ideal when considering several of the government's criteria. Its location in a favorable rural farming district, however, contradicted one criteria and brought about problems that would plague the facility during its World War II and subsequent operations. These problems were the almost constant need for operating personnel and the need for places to house both construction and operating workers.

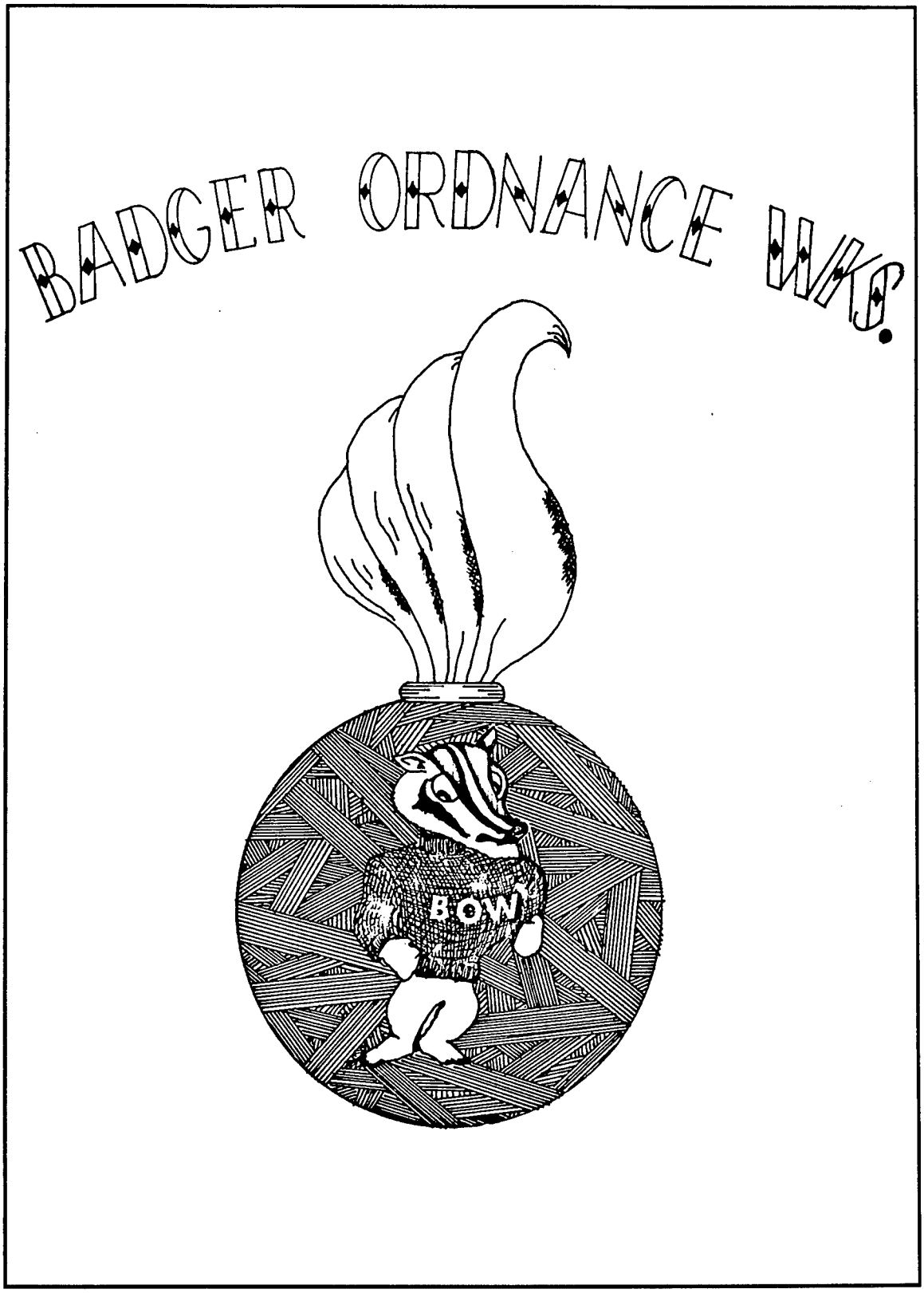

Figure 5. The BOW Symbol.

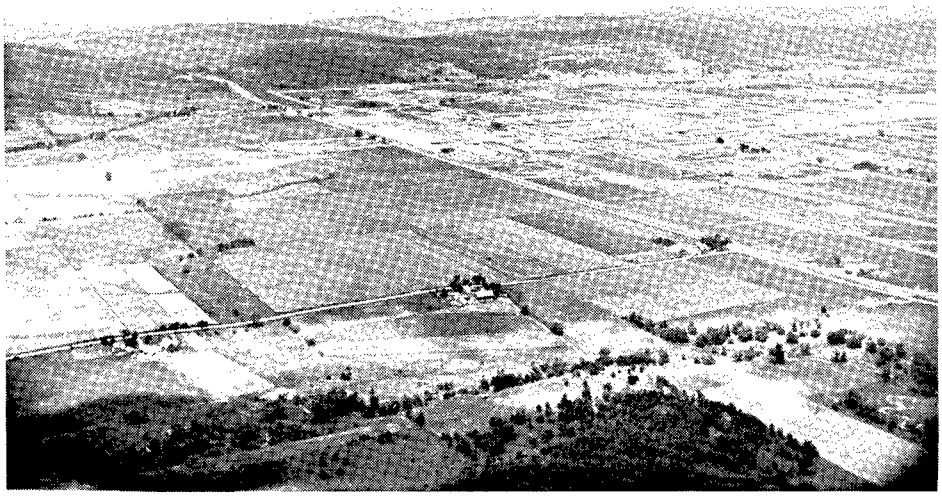

Figure 6. Overview of farmland surrounding BOW, World War II Operation (original photograph on file, BAAP Library).

ARCHITECTURE/ENGINEERING DESIGN BACKGROUND

While the plant site seems to have been selected due to its rural setting and proximity to established transportation facilities (Fine and Remington 1972:134-135; Thomson and Mayo 1991:108), political pressure played a substantial role in the Sauk Prairie area emerging as a potential GOCO candidate (BAAP 1992).

The Hercules Powder Company, having just designed and constructed a similar plant near Radford, Virginia, designed the BOW and supervised its construction and operation (MacDonald and Mack 1984:15). On November 10, 1941, a letter of intent was directed by the Chief of Ordnance to Hercules Powder Company containing authorization for surveys, tests, and investigations, and for the initiation of design of the plant. Shortly thereafter, in November, the first representatives of Hercules visited and approved the site. The original contract between Hercules Powder Company and the government was signed on January 1, 1942, and provided for "the furnishing of complete designs covering the manufacturing aspects and schematic drawings of the other aspects of; consultation with and advice to the architect-engineer-manager for; and, at the option of the Government, training key personnel for and the operating of; a new ordnance facility for the manufacture of nitrocellulose smokeless powder and diphenylamine" (HPC 1945a:60). Mason & Hanger Company of New York had served as the architect-engineer-manager at Radford and performed the same services at BOW. At the time the contract for BOW was let, Hercules Powder Company was engaged in the designing stage of three other ordnance facilities for the U.S. government (Hercules Powder Company 1945a:46). The existing engineering department facilities and manpower were expanded to accommodate the additional work. On February 12, 1942, construction work began, with the Chicago and North Western Railroad laying six miles of spur track from its main line to the plant area. Less than a year after construction began, powder production was begun.

History of Hercules Powder Company

The following introduction to the Hercules Powder Company is presented so that the reader may better appreciate the World War II accomplishments of a company whose sole peace-time function was to produce explosives for the civilian industries related to mining, quarrying, construction, and sporting powder. The majority of this background information was derived from the historical report on the Badger Ordnance Works produced shortly after World War II (HPC 1945a).

The Hercules Powder Company began operations on January 1, 1913. As stated above, the sole peace-time function of its original approximately 1,000 employees prior to World War II was to produce and sell explosives for the mining, quarrying, construction, and sporting powder industries. In 1913, Hercules operated five sales offices, two dynamite plants, five black powder plants, one black sporting powder plant, and one smokeless powder plant. By the end of 1917, personnel had increased to 8,600 and by the signing of the World War I armistice on November 11, 1918, the number had increased to 14,500.

Prior to 1914, the company had manufactured neither military high explosives nor military powders. With the outbreak of World War I, there was a great change in the company's products and the addition of two plants. The decrease in industrial explosives was offset by the new production of military munitions. While none of the employees had experience with the production of military explosives, in the early months of 1915 Hercules accepted large contracts for the production of cordite powders, pyro smokeless powders, and TNT. These orders were placed by the Allied governments who found themselves in great need of such powders and explosives.

The smokeless sporting powder plant at Kenvil, New Jersey, was enlarged to produce cordite for the British government. Acetone, required as a solvent in the production of cordite, was in extreme shortage in England. A provision in the contract for the production of cordite required Hercules to obtain a new source of supply for acetone. Additionally, with the delivery of cordite, there had to be delivered an additional amount of acetone equivalent to that required for the production of the cordite delivered. As a consequence, Hercules designed and built a plant near San Diego, California, for the extraction of acetone from kelp, the seaweed growing in the shallow, rocky waters off the California coast. Sometime before this, arrangements were made with the U.S. Alcohol Company to produce acetone from acetic acid made by the fermentation of alcohol, and a plant was constructed at Curtis Bay, Maryland, for this purpose. Prior to the outbreak of war in 1914, the U.S. could produce no more than 500,000 pounds of acetone per year. Hercules increased this by 1,400,000 pounds monthly.

The cordite manufactured for the British government was made at the Kenvil plant using a process developed by Hercules. This process represented an advance in both safety and economic factors over methods previously used by the British government. In 1916, the Kenvil plant was producing 3,000,000 pounds of cordite monthly.

The increased output of cordite resulting from the Hercules methods of manufacture rendered useless many of the buildings at the Kenvil plant. Additional machinery was soon installed, and the manufacture of nitrocellulose or pyro powder was started. At first production was for the Russian government and later for the British. When the U.S. entered the war, the demand for cordite had practically ceased; however, the demand for pyro powders increased dramatically. The last cordite was produced in July 1917 and work was soon begun to convert all the cordite lines to the manufacture of pyro powders, principally for field cannon. Pyro powder was also manufactured at the Union Plant in Parlin, New Jersey. This facility was constructed in 1915 by the Union Powder Corporation for the production of smokeless powder and sold to Hercules in November 1915. Hercules manufactured black powder at its plants for U.S. government use in shrapnel, primers, fuses, and ignition charges. With the purchase of the Parlin plant, Hercules' capacity increased to 850,000 pounds per month.

Production of TNT by Hercules began with operations in one plant only. A single production line was located at the Hercules plant in California and had a capacity of 500,000 pounds monthly. By the time the U.S. entered World War I, Hercules was operating four TNT lines at this plant. In January of 1918, a fifth line was finished and put into operation. By September 1918, seven additional lines had been constructed and put into operation, for a total of 12 production lines.

Earlier, construction had begun on two TNT lines at the Kenvil plant in October 1917. By early 1918 these lines had a production capacity of 900,000 pounds of refined TNT monthly. Together, the Hercules plants in California and at Kenvil, New Jersey, had a combined capacity of 7,000,000 pounds of crude TNT monthly. Although Hercules did not construct a new plant for the manufacture of ammonium nitrate, this was produced at all of its dynamite plants. The production capacity for ammonium nitrate surpassed the demand for its use in commercial explosives.

Late in 1917, the U.S. government decided to finance the construction of a number of powder plants to be operated under contract by private companies. On May 9, 1918, Hercules signed a contract with the government to operate the U.S. Explosives Plant "C" at Nitro, West Virginia. The original plant consisted of five lines and production soon reached 900,000 pounds daily. Operations at this plant continued through the end of World War I. The last powder left production for storage during late January 1919.

By December 1918, Hercules had manufactured more than 100,000,000 pounds of smokeless powder, including 3,000,000 pounds of small-arms powder, more than 54,000,000 pounds of pyro cannon powder, more than 46,000,000 pounds of cordite, 70,000,000 pounds of TNT, and 30,000,000 pounds of other war materials such as nitrate of ammonia, black powder, and pyro cotton. While Hercules was producing munitions for war, it was also manufacturing commercial explosives, for which the demand had increased.

During the period between World War I and World War II, Hercules kept pace with the growing industries of the nation. When World War II started, the company had broadened its activities as a producer of industrial explosives and sporting powders, including small amounts of military powders, into the field of industrial chemicals such as nitrocellulose, rosin and turpentine and their derivatives, and ingredient materials for the paint and paper industries.

At the close of June 1940, just prior to the increased industrial activities once again brought on by the demand for war materials, Hercules employed 7,300 people in its plants, laboratories, and offices. With the outbreak of World War II, Hercules was again called upon for the production of munitions for war. At the same time, its nonmilitary production had to be stepped up to supply manufacturing ingredients and other items needed in the expansion of industrial establishments.

During World War II, Hercules contracted with the British government to build and operate a smokeless powder plant. It also contracted with the U.S. government to design, build, and operate one smokeless powder plant, and to operate two other smokeless powder plants, one TNT plant, one powder bag-loading plant, and one ammonia-manufacturing plant. By April 1945, Hercules operations at GOCO plants required the employment of 35,000 people. In addition, 10,200 people were employed in the company's own plants and offices at this time. During the years 1941 through 1945, the company produced 1,227,000 pounds of smokeless powder, 828,640,744 pounds of TNT, 27,661,415 pounds of pentolite, and 159,171 tons of anhydrous ammonia. By November 1, 1944, 12 Hercules plants and five Hercules-operated U.S. ordnance works had received the Army-Navy "E" Award for excellence in production of war materials (HPC 1945b).

The company's history shows that by the beginning of World War II, Hercules had an established record of designing and operating large industrial facilities for the production of explosive and propellant materials. This fact, coupled with the lack of large numbers of experienced propellant companies in the U.S., led the government to work closely with Hercules. This cooperation was undertaken before the outbreak of major hostilities in 1939. In 1937 Major John P. Harris established an Ordnance Department suboffice in

Wilmington, Delaware, to draw up plans for ammunition production and to take council with representatives of the private explosive firms who had offices at that location (Thomson and Mayo 1991:108). In the past, Hercules had consistently adhered to the policy of aiding the government in every way possible in its planning for a war emergency and in the execution of plans during such an emergency (HPC 1945a:19). Hercules gladly assisted the Ordnance organization office in Wilmington. Due to the past communication and planning between the Ordnance Department and private companies, the production of war materials was made less difficult. The Congress was passing appropriation bills authorizing the procurement of munitions; the government departments were able to place orders and the manufacturers, such as Hercules, were able to begin production of those orders without undue delay and confusion (HPC 1945a:12).

Construction of BOW

The design and construction of BOW closely followed specific requirements set by the Ordnance Department. All engineering work was under the direct supervision of the chief engineer and the assistant chief engineer of Hercules in Wilmington. Preliminary design work started on October 16, 1941, and followed the general design of the Radford Ordnance Works, with essential variations due to climatic conditions (HPC 1945a:48). Construction schedules were somewhat hampered by the cancellation of partially completed TNT facilities and the addition of rocket powder production facilities.

As originally designed, BOW consisted of more than 1,400 buildings and structures (Table 1). The layout of the plant was organized into self-contained production areas connected by access roads and rail lines. Administrative and service buildings, including main offices, garages, change houses, a cafeteria, and a hospital were located along the west side of the site, where they were accessible from Highway 12. The raw material warehouses and preliminary processing buildings of the single-base smokeless powder lines were located immediately to the east of these buildings, and the lines proceeded to the east, allowing small distances between safer production steps and correspondingly larger spaces between more hazardous steps. Acid and solvent works were located to the north of the single-base powder lines and the nitroglycerine area was located to the east of the single-base powder lines. The rocket area (double-base smokeless powder lines) was later located to the south and west of the single-base lines. The powder storage magazines were placed beyond the rocket area to the south. The water filtration plant and reservoirs were located on the bluffs at the northern side of the site, where the natural elevation provided system pressure.

During the design phase of the plant's construction, Hercules architects and engineers encountered few difficulties. Of concern, however, were the changes due to alterations and additions to the original contract agreement. These changes, made between the original contract date of January 2, 1942, and October 30, 1945, included 24 Supplements and Change Orders made to the original contract (HPC 1945a:61-71).

The buildings at BOW were simple, utilitarian structures designed for temporary use (HPC 1945a:50; MacDonald and Mack 1984:16; Figures 7 and 8). While there were many forms because of varied structural and functional requirements, most were wood frame structures sitting on either a cement slab or a perimeter foundation wall. A typical building was constructed with 8" monolithic concrete foundations. The foundation wall was carried 6" above the floor line to form a curb. The side walls were framed with 2-x-6" wood studs, 2'-0" on center, and enclosed with novelty siding. Where spans would permit, wood rafters spaced 2'-0" on center were used in roof construction. Longer spans were constructed of light wood trusses, spaced 2'-0" on center. The roofs were sheathed with $^{7}/_{8}$" T&G (tongue and groove) lumber covered with Class B roll roofing. The doors, windows, ventilators, etc., were of standard design and of a type that could be furnished by any mill. The interior was left unfinished, except for a rough concrete floor. Where necessitated by occupancy or operation, the buildings were lined with plywood or transite, and the floor was finished with a nonconductive or acid-resisting surface (HPC 1945a:50). Examples of buildings constructed in this manner were the Line Offices (Figure 9), Change Houses (Figure 10), Shops and Storehouses, as well

Table 1
List of Completed Buildings
(as of June 30, 1943)*

Description	Units
Office and Administrative Area	
Main Offices	1
Main Laboratory	1
Garages	4
Gate Houses	9
First Aid Hospital	1
Barracks	5
Mess Hall (Barracks)	1
Government Office	1
Mess Hall (Shops)	1
Sentry Houses	47
Fire House	1
Ballistics House	1
20 mm Firing Range-Bomb Proof	1
Ballistics Magazine	1
Powder Sample Magazine	1
Change Houses	3
Incinerator	1
Employment Office	1
Gate Houses	2
Mess Hall (Administrative Area)	1
Guards' Headquarters	1
Office and Storeroom (Barracks)	1
Mess Hall's Food Store	1
Salvage Warehouse	1
Garage and Office	1
Car Storage Shed	1
Telephone Exchange Building	1
Bus Station	1
Central Heating Plant (Administration)	1
Central Heating Plant (Barracks)	1
Safety and Service Building	1
Smokeless Powder Maintenance Office	1
Ambulance Garage	1
Inspection Houses (Clock Alleys)	5
Guard Equipment Store	1
Telephone Maintenance Garage	1
Cannon Proving Ground	
Gun Range Tunnel and Cannon Emplacement	1
Assembly House	1
Gun Storage and Gun Repair	1
Primer Magazine	1
Constant Temperature Magazines	1
Cannon Magazines	3
Unloading Station	1

Table 1 (cont'd)

Description	Units
Igniter Magazine	1
Waste Storage	1
Oil Storage	1
Power Area	
Power House	1
Power House (TNT)	1
Pump House-River	1
Filter Plant and Fire Pump	1
Recovered Water Storage	2
Waste Acid Disposal Plant	5
Inert Gas Producer	1
Sewage Disposal Plant	1
Shops and Storehouses	
Combined Shops	1
Combined Shops (TNT)	1
Locomotive Shops and Store	1
Oil and Solvent Store	1
Paint Store	1
Lumber Store	1
Ingredient Warehouses	4
Main Storehouse	1
Combined Tool House	1
Change Houses	6
Excess Material Store (fenced area)	1
Excess Material Store (shed)	1
Car and Truck Garage	1
Laboratory Stores	1
Forge and Welding Shop	1
Gas Cylinder Store	1
Tram Repair Shop	1
Lead Burning House	1
Scale and Instrument House	1
Head Grinder Shop	1
Broad Gauge Tool House	1
Tram Tool House	1
Acid Area (Cotton and Pulp Lines)	
Compressor House	1
Ammonia Storage	1
Oxidation House	1
Nitric Acid Concentrator	1
Sulfuric Acid Concentrator	1
Weak Nitric Circulators	1
Strong Nitric Circulators	1
Acid Weigh House	1
Denitrated Sulfuric Storage	1
Pyro Spent Storage	1
Con. Mix Storage	1
66° Sulfuric Acid Storage	1

Table 1 (cont'd)

Description	Units
Unloading Stations	11
Unloading Stations (N.C. Area)	4
Ammonia Compressor House	1
Spare Parts Storehouse	1
Office and Lab.	1
Repair Shop	1
Change House	1
Oleum Storage	1
Mixed Acid Storage	1
Nitric Acid Recovery (Cotton Line "E")	1
Acid Area (for TNT)	
Compressor House	1
Ammonia Storage	1
Oxidation House	1
Denitrated Sulph Storage	1
66° Sulfuric Acid Storage	1
Ammonia Compressor House	1
Office and Lab.	1
Repair Shop	1
Change House	1
Oleum Storage	1
Mixed Acid Storage	1
Oleum Mfg. Plant (Contr.)	1
Denitr. Spent Acid Sto. (Dark A.)	1
Sellite Plant	1
Anti-Freeze Storage	1
Outside Lines	
Hose Houses (1 unit)	1
Men's Latrines	31
Women's Latrines	15
Powder Facilities Common to Lines "B," "C," "D," and "E"	
Solvent Receiving Houses	42
Water Dry Houses	42
Coating Houses	12
Air Dry Houses	17
Rest Houses	24
Glaze Houses	7
Pre-Blend Houses	4
Final Blend Houses	4
Screening Houses	8
Wet Screening Houses	2
Screen Storehouses	5
Wet Screen Filter Houses	2
Can Pack Houses	4
Box Storehouses	6
Box Repair and Wash Houses	2
D.N.T. Storehouses	8

Table 1 (cont'd)

Description	Units
Magazines	34
Powder Line Offices	8
Change House and Offices-Magazine Area	2
D.N.T. Screen House	1
Powder Rework House	1
Hydro Jet Houses	21
Pulp Line "B"	
Pulp Warehouses	1
Acid Mix and Weigh House	1
Spent Acid Storage	1
Mixed Acid Storage	1
Acid Screening House	1
Acid Heat and Circulation House	1
Acid Heat Exchanger	1
Emergency Catch House	1
Nitrating House (8 wringers)	1
N.C. Pump House	1
Nitrating Area Office	1
Nitrating Area Change House	1
Boiling Tub House (32 tubs)	1
Boiling Tub Settling Pit	1
Hot Water Storage Tanks	1
Beater House	1
Poacher and Blending House	1
Poacher and Blending Settling Pit	1
Wringer House (8 wringers)	1
Purification Area Office	1
Purification Area Change House	1
Spent Acid Pump House	1
Women's Change House	1
Nitrating Area Shops	1
Chemical Store	1
Final Wring. Receiving House	1
Pulp Dry House and Conveyor	1
Purification Area Office and Workshop	1
Constant Level Tank	1
Powder Line "B"	
Dehy. Press House (12 Presses)	1
Alcohol Pump and Accum. House	1
Change Houses	2
Diphenylamine Mix House	1
Mix Houses (6 Mix - 8 Macerat.)	2
Block Press Houses	3
Horizontal Press Houses	2
Hydraulic Station and Refrigeration	1
Solvent Rec. Cooling Tower	1
Solvent Rec. Cooling Tower Pump House	1
Pump Houses #2, 3, 4, 5	4
Shop (Solvent Area)	1

Table 1 (cont'd)

Description	Units
Powder Line Shop	1
Containers, Buggies and Bags	1
Powder Line Office	1
Laboratory (Powder Area)	1
Change House	1
Material Storehouses	2
Inert Stores	1
Change Houses	1
Material Stores (Spare Parts)	1
Cotton and Pulp Line "C"	
Cotton and Pulp Warehouse	1
Acid Mix and Weigh House	1
Spent Acid Storage	1
Mixed Acid Storage	1
Acid Screen House	1
Acid Heat and Circulation House	1
Acid Heat Exchanger	1
Dry House and Conveyor	1
Emergency Catch House	1
Nitrating House (8 wringers)	1
N.C. Pump House	1
Nitrating Area Office	1
Nitrating Area Change House	1
Boiling Tub House (32 tubs)	1
Beater House	1
Poacher and Blending House	1
Wringer House (9 wring)	1
Purification Area Office	1
Purification Area Change House	1
Spent Acid Pump House	1
Women's Change House	1
Nitrating Area Shops	1
Chemical Store	1
Final Wringer Receiving House	1
Pulp Dry House and Conveyor	1
Purification Area Office and Workshop	1
Constant Level Tank	1
Barrel Dump House	1
Powder Line "C"	
Dehy. Press House (12 pr.)	1
Alcohol Pump and Accumulation House	1
Ether Still House, Pump House #6 and 7	1
Change Houses	2
Diphenylamine Mix House	1
Mix Houses	2
Block Press Houses	3
Vertical Press Houses	3
Cutting Houses (14 cut.)	3
Hydraulic Sta. and Refrigeration	1

Table 1 (cont'd)

Description	Units
Powder Line Shop	1
Containers, Buggies, and Bags	1
Powder Line Office	1
Material Store Houses (Mix House)	2
Women's Change House	3
Caustic Screen Cleaning Houses	2
Material Store (Spare Parts)	1
Cotton Line "D"	
Cotton Linter Warehouse	1
Acid Mix and Weigh House	1
Spent Acid Storage	1
Mixed Acid Storage	1
Acid Screen House	1
Acid Heat and Circulation House	1
Cotton Linter Dry House and Conveyor	1
Emergency Catch House	1
Nitrating House (9 wring.)	1
N.C. Pump House	1
Nitrating Area Office	1
Nitrating Area Change House	1
Boiling Tub House	1
Beater House	1
Poacher and Blender House	1
Wringer House (8 wringers)	1
Purification Area Office	1
Purification Area Change House	1
Laboratory	1
Spent Acid Pump House	1
Women's Change House	1
Nitrating Area Shops	1
Chemical Store	1
Laboratory Area Storehouse	2
Solvent Storehouse	1
Final Wringer Receiving House	1
Purification Area Office and Workshop	1
Powder Line "D"	
Dehy. Press House (12 pr.)	1
Alcohol Pump & Accum. House	1
Ether Still House	1
Change Houses	2
Diphenylamine Mix House	1
Mix Houses	2
Block Press Houses	3
Vertical Press Houses	3
Cutting Houses	3
Unloading Station-Pump House #1	3
Powder Line Shop	1
Containers, Buggies, and Bags	1
Powder Line Office	1

Table 1 (cont'd)

Description	Units
Material Stores (Mix House)	2
Laundry	1
Change Houses (Women)	4
Material Stores (Spare Parts)	1
Powder Line Office	1
Cotton and Pulp Line "E"	
Cotton and Pulp Warehouse	1
Acid Mix and Weigh House	1
Spent Acid Storage	1
Mixed Acid Storage	1
Acid Screen House	1
Acid Heat and Circulating House	1
Cotton Dry House and Conveyor	1
Emergency Catch House	1
Nitrating House (9 wringers)	1
N.C. Pump House	1
Nitrating Area Office	1
Nitrating Area Change House	1
Boiling Tub Houses	1
Beater House	1
Poacher and Blending House	1
Wringer House (9 wringers)	1
Purification Area Office	1
Purification Area Change House	1
Spent Acid Pump House	1
Woman Change House	1
Nitrating Area Shops	1
Chemical Store	1
Final Wringer Receiving House	1
Pulp Dry House and Conveyor	1
Purification Area Office and Workshop	1
Powder Line "E"	
Dehy Press House (12 pr.)	1
Alcohol Pump and Accum. House	1
Ether Still Houses	1
Change Houses	2
Diphenylamine Mix House	1
Mix Houses	2
Block Press Houses	3
Vertical Press Houses	2
Cutting Houses	2
Powder Line Shop	1
Containers, Buggies, and Bags	1
Powder Line Office	1
Change Houses	5
Material Store Houses	2
Chemical Preparation Bldgs. (in 507-4)	1
Material Stores	1

Table 1 (cont'd)

Description	Units
Five TNT Areas	
Mono-Nitrating Houses	5
Bi- and Tri- Nitrating Houses	5
Fortifying Houses	5
Acid and Fume Recovery	3
Wash Houses	5
Nailing Houses	3
Supervisor's Offices	3
Change Houses (6 and 7 not started)	5
Spare Parts Store	1
Government Inspection Office	3
TNT Magazine Area	
TNT Magazines	30
Staff Houses	
Staff Houses	15
Garages	5
E.C. Powder Line	
E.C. Incorporator House	1
E.C. Forced Air Dry House	3
E.C. Screen House	1
E.C. Screen and Sweetie Barrel House	1
E.C. Blending House	1
E.C. Rest House	1
E.C. Pack House	1
E.C. Chemical Storehouse	1
E.C. Nitro-Cotton Storehouse	1
E.C. Powder Line Office	1
Latrines	2
Containers, Buggies, and Bags	1
Keg Store and Paint House	1
E.C. Warmer House	2

* Source: HPC 1943b.

as the majority of small- to medium-sized utility structures throughout the plant. Large buildings, such as the Boiling Tub and Poacher and Blender houses, employed heavier mill-type construction, with wood columns and trusses on concrete foundations.

Buildings such as the Powerhouse, Nitrating Houses, and the Oxidation Houses were framed of steel skeleton construction with concrete foundations and floors of concrete, steel plate, or steel grid (HPC 1945a:50). The Powerhouse was enclosed with tile walls and its roof was constructed of 2" T&G sheathing and a 10-year guaranty composition roof. The walls of the Nitrating House were constructed of brick. The roof was constructed with 2" T&G wood sheathing with Class "B" roll roofing. The Oxidation House was enclosed with wood girst, $^{7}/_{8}$" T&G wood sheathing, building paper, and wood novelty siding. Wood rafter construction was used on the roof, over which was applied 1" T&G sheathing and Class "B" roll roofing.

Figure 7. Typical Pre-Dry House at BAAP (Bear Creek Archeology, Inc., photograph).

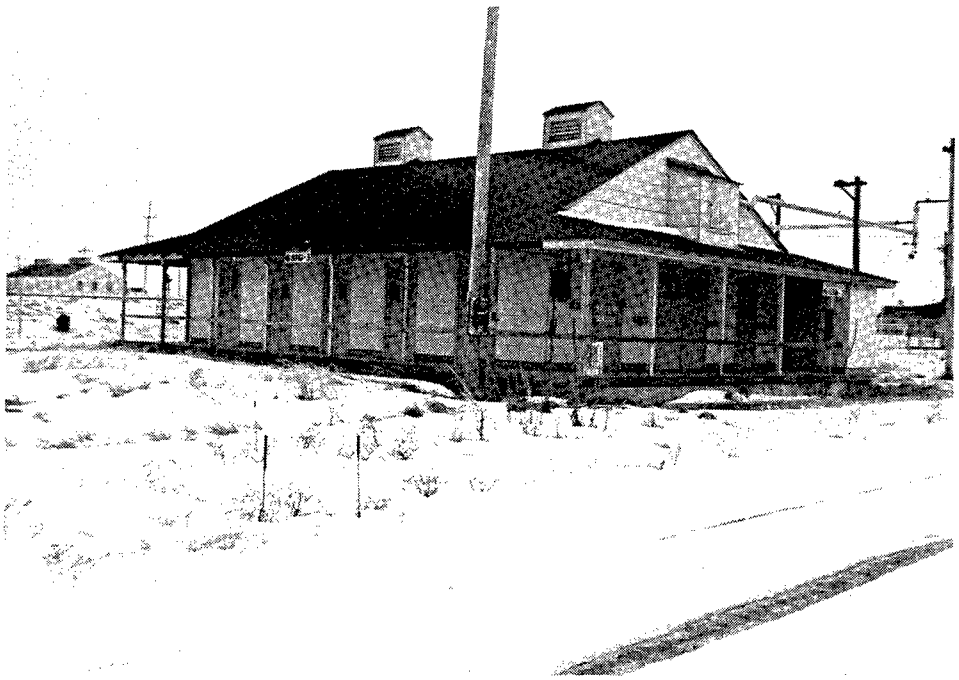

Figure 8. Typical Final Inspection House at BAAP (Bear Creek Archeology, Inc., photograph).

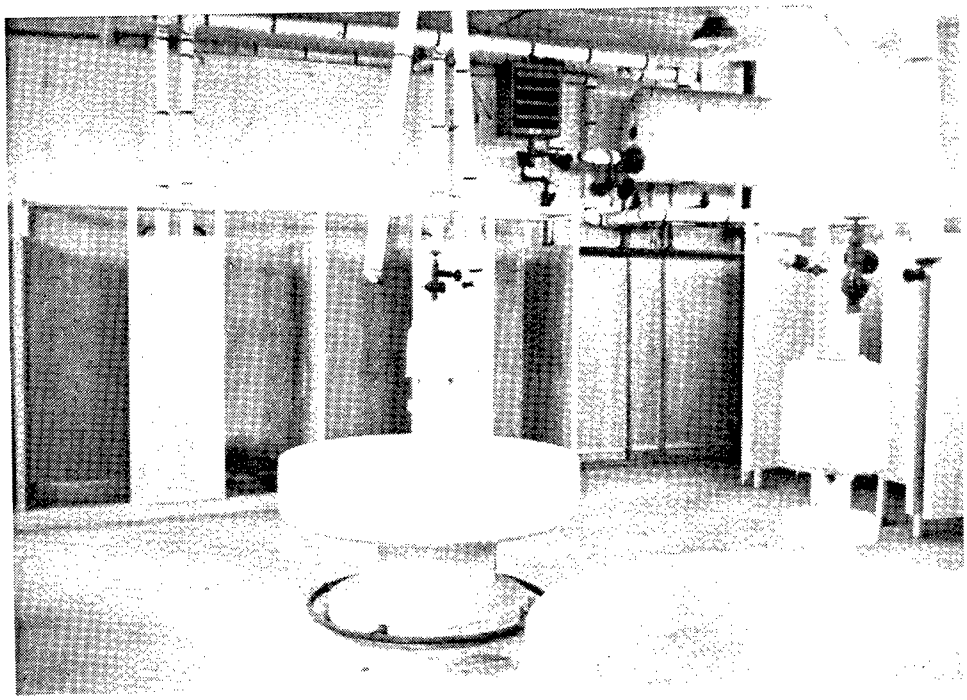

Figure 9. Modern interior view of Change House at BAAP (Bear Creek Archeology, Inc., photograph).

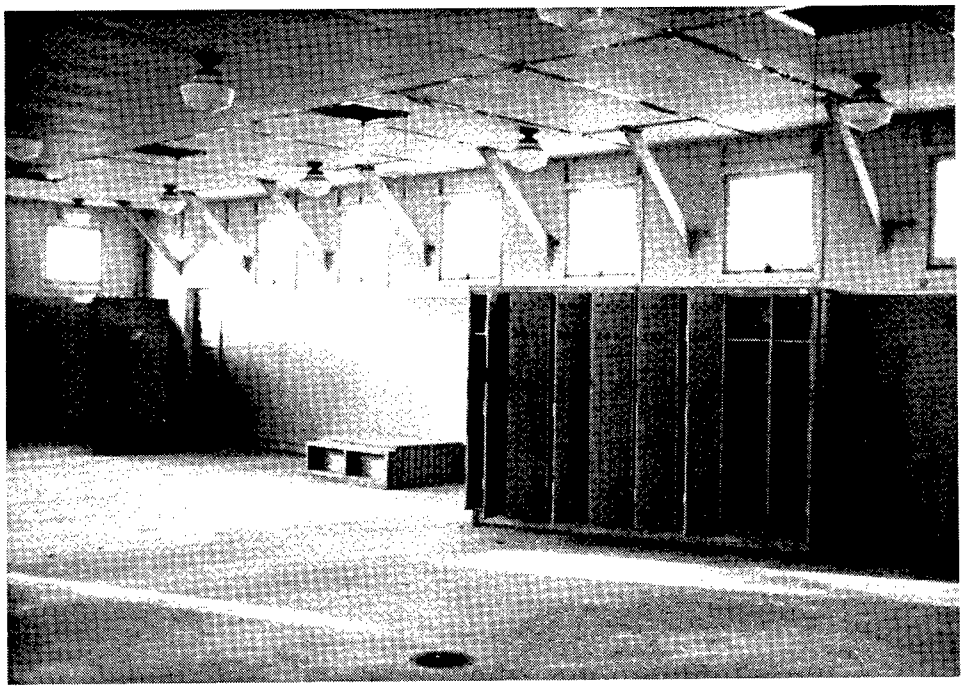

Figure 10. Modern interior view of Change House at BAAP (Bear Creek Archeology, Inc., photograph).

Four types of special construction were employed in the Smokeless area (HPC 1945a:51). Type I was employed on buildings similar to the Final Mix houses and the Press houses (Figure 11). These buildings were constructed on concrete foundations and had concrete end and rear walls. The buildings were divided into bays with concrete division walls. The concrete division walls extended three feet beyond the outside face of the front wall and three feet above the roof line. Type II was employed on buildings such as the Air Dry houses and the Solvent Recovery houses. These were constructed with concrete foundation end walls. Division walls were constructed of concrete to the operating floor level, and of 2-x-12" studs faced with ¼" transite and filled with poured monolithic gypsum above the operating platform. The front walls and the roof were framed of typical wood construction, except that hinged blow-out monitors were incorporated in the roof. Type III was employed on buildings similar to the Glaze and Blend houses and included a first-floor slab covered with Hubbellite. The interiors of these buildings were finished in accordance with high-explosive details. All joints in plywood were covered with tape, and wood moldings were installed in all internal corners. Type IV was employed on buildings similar to the Rest houses. These sat on concrete piers and included a floor of wood-beam and joist construction with a 2" wood T&G rough floor and a $^{3}/_{16}$" conductive rubber finish floor. Types II, III, and IV were barricaded with Repauno-type barricades (HPC 1945a:51-52; Figure 12).

Figure 11. Typical N-Line Press House at BAAP (Bear Creek Archeology, Inc., photograph).

The N-Line buildings, constructed for the manufacture of rocket powder, were built generally in the same manner as the buildings of the original plant. However, as lumber had become a critical material, composition sheathing was substituted for wood novelty siding on the exterior of the buildings. Since buildings exposed to nitroglycerin vapor or fumes and lined with paraffin-impregnated transite had proved very satisfactory at the Sunflower Ordnance Works in Kansas, the buildings at BOW were lined in the same manner (HPC 1945a:52). In another lumber conservation measure, buildings requiring barricades under 16 feet in height were barricaded on three sides with mound-type barricades requiring lumber facing on one side only (Figure 13). Standard Repauno-type barricades were used on the fourth side which faced the service road (HPC 1945a:52).

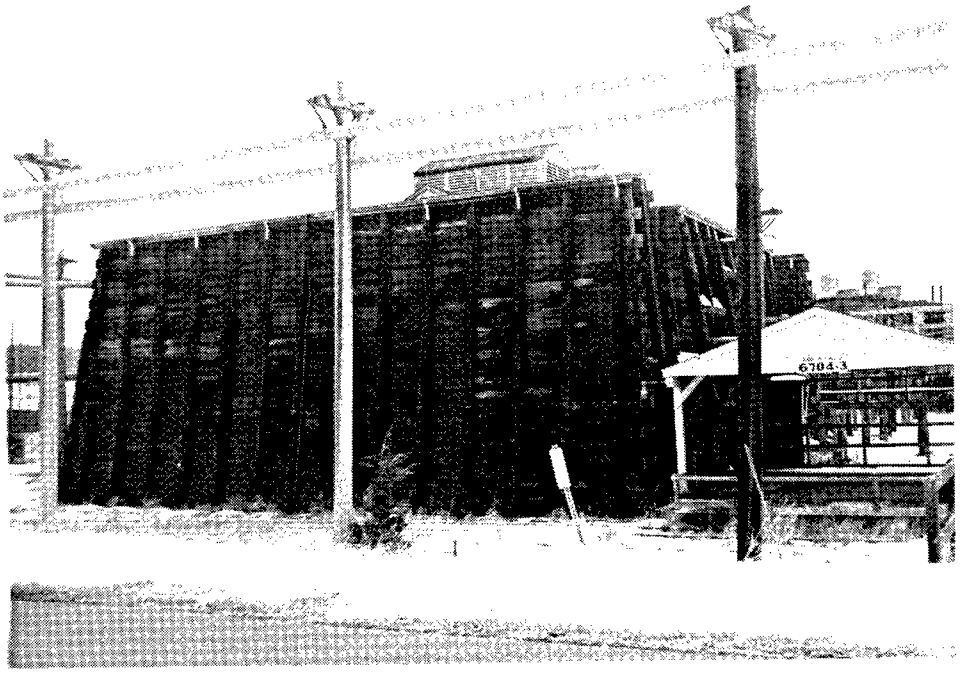

Figure 12. Repauno-Type Barricade at Final Mix House at BAAP (Bear Creek Archeology, Inc., photograph).

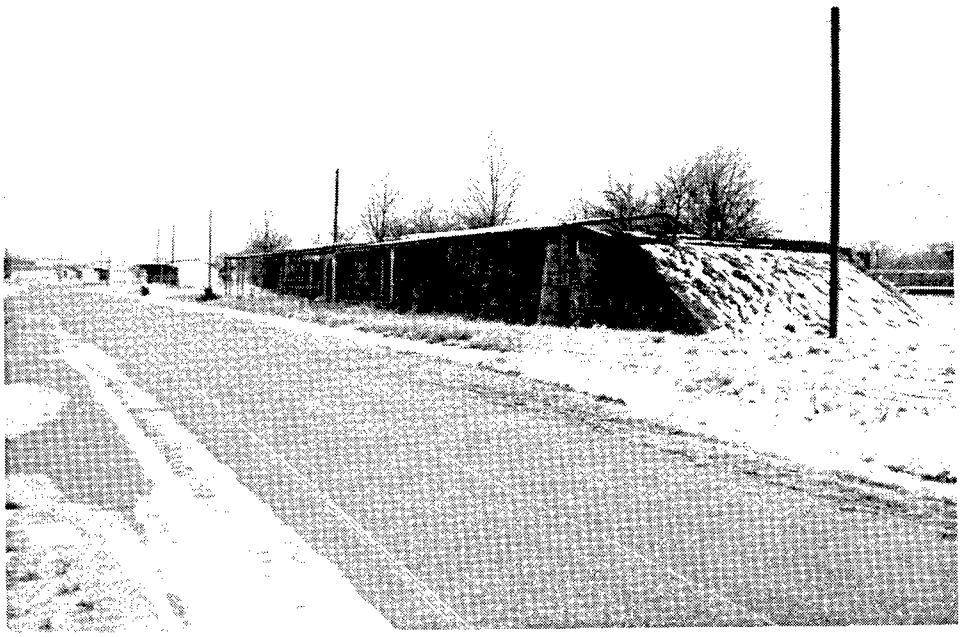

Figure 13. Barricade at Pre-Dry House at BAAP (Bear Creek Archeology, Inc., photograph).

The construction of the plant also included infrastructure and utilities such as roads, railroads, parking lots, sidewalks, bridges, and fences, as well as gas, water, electric power, and telephone lines. A fresh-water distribution system and a steam power plant were also included. The plant water supply, the most important raw material for a powder plant, was provided by the Wisconsin River with a system of temporary wells used during the main construction phase. Electrical power for the plant was supplied by the Wisconsin Power and Light Company, with a 30,000-kw., hydroelectric plant within one mile of the powder plant. The BOW had its own sanitary sewer and storm sewer systems including a sewage disposal plant. Steam heat was supplied by a central heating system with boilers designed to burn coal, fuel oil, or natural gas.

The GOCO plants were built in record time, between five and 18 months from ground-breaking to initial production, with an average construction time of nine months (Murphey 1993b:3). Prior to construction, local media speculated at the scale of construction work and reported rumors of proposed plant additions, including Bag-Loading facilities (*BNR* 9 January 1942). It was even printed that BOW would be the world's largest powder plant (*BNR* 7 January 1942). Actual construction on the plant was started on February 12, 1942. There were four principals involved in the construction of the plant: U.S. Army Corps of Engineers, which was ultimately responsible for the construction of the plant and which generally supervised the administration of construction activities to the best interests of the government; U.S. Army Ordnance Department, which, while assuming no active part in the engineering or construction, had overall authority since the facility was to be operated as an Ordnance responsibility; Hercules Powder Company, the operating contractor who was chosen because of its knowledge of design and operation of similar ordnance facilities and which was responsible for consulting advice, engineering inspection, and procurement of manufacturing equipment and supplies; and Mason & Hanger Company, the architect-engineer-manager, which along with Hercules worked out the details of the plant to meet the requirements of the Ordnance Department (HPC 1945a:150-151). Mason & Hanger Company, selected by the War Department as the principal contractor, was an established company continuously in the contracting business since 1819. Since that time it had been involved in the construction of roads, railroads, bridges, tunnels, dams, and other large projects, including two other large ordnance plants (HPC 1945a:151).

Toward the later part of March 1942, construction became evident. The two main administration buildings, as well as the plant fence, temporary wells, roads, and railroads had been started (Figure 14). Demolition and removal of farm buildings was also well under way. Weather and ground conditions during the month had not been conducive to rapid progress, but on the whole, a promising start had been made (HPC 1945a:161). Frequent heavy rains occurred, and with work progressing in less than favorable weather conditions, delays were common in both building construction and in the installation of equipment (HPC 1945a:163). Such delays can not be attributed to any one particular factor. At times, the shortage of labor was critical and, on other occasions, delays were due to difficulties in obtaining materials and equipment. During the early months of the construction, the rate at which contracts were being awarded was too slow to continually absorb the labor already employed. This resulted in frequent short-period layoffs becoming necessary (HPC 1945a:162). Even with the layoffs taking place, BOW was experiencing the first need for workers in a long series of labor shortages, and continued to advertise with highly motivational advertisements (Figures 15 and 16). To add to the confusion, on July 13, 1942, the diphenylamine line was canceled.

As with all large projects, the majority of the actual construction work was accomplished by subcontractors to both Hercules and Mason & Hanger. A total of 146 firms completed 116 contracts for Mason & Hanger and 20 firms completed 22 contracts for Hercules during both the construction of the plant as originally designed and construction of the added N-Line for the production of rocket propellant (HPC 1954a:193-194, 242-243). Shortly before construction began, Sauk County workers met to discuss the establishment of a Building Trade Council that would be used to help local tradesmen secure jurisdiction over powder plant work (*BNR* 15 January 1942). As it would turn out, subcontracting individuals and companies were many and were drawn from local, regional, and national labor pools. Cement, as one example, was obtained from many sources. Orders were placed with at least 12 companies with plants located in the states of Michigan,

Figure 14. Overview of railway at BOW, World War II Operation (original photograph on file, BAAP Library).

Wisconsin, Illinois, and Iowa, so that a continuous supply could be maintained at all times (HPC 1954a:41). Several Winnebago tribe members were also involved in the plant construction, including three De Corah brothers who were descendants of the famous Chief Decorah (*Badger Ordnance News [BON]* 10 April 1942).

As employment, concrete production, and carload receipts all reached peak levels (Figure 17), it became apparent that original target dates of operation would not be met, thus delaying the scheduled dates of operations for the various manufacturing lines and component facilities. Delays continued, caused chiefly by a shortage of vital construction materials and equipment that could not be obtained.

The existing labor supply among both the architect-engineer-manager and the subcontractors was not always sufficient, nor was it as efficiently used as it could have been under normal circumstances. Also, worker morale and discipline, in both white collar and labor classes, were not geared to the tempo of the urgent needs for fast construction completion (HPC 1945a:165). Further delays were attributed to poor work schedules, layoffs, transportation difficulties, and the existence of labor-union strength, creating a twilight zone of authority on the job site (HPC 1945a:165). All of these factors together contributed to unpredictable delays that were by no means limited to the BOW project, but were characteristic of the nation as a whole (Fine and Remington 1972:285; HPC 1945a:165).

On August 1, 1942, additional delays were incurred when telegraphic instructions were received by Lieutenant Colonel Griffith, commanding officer at BOW, ordering him to cancel all construction work on the five TNT lines (HPC 1945a:164; Figure 18). Immediate action was taken to comply with the orders. Buildings with superstructures that were substantially erected were protected by covering all openings, and nine TNT magazines (which were essentially complete) had to be finished later in accordance with original plans and specifications. It was estimated that the facilities affected by the cancellation order were left as slightly less than 10 percent complete.

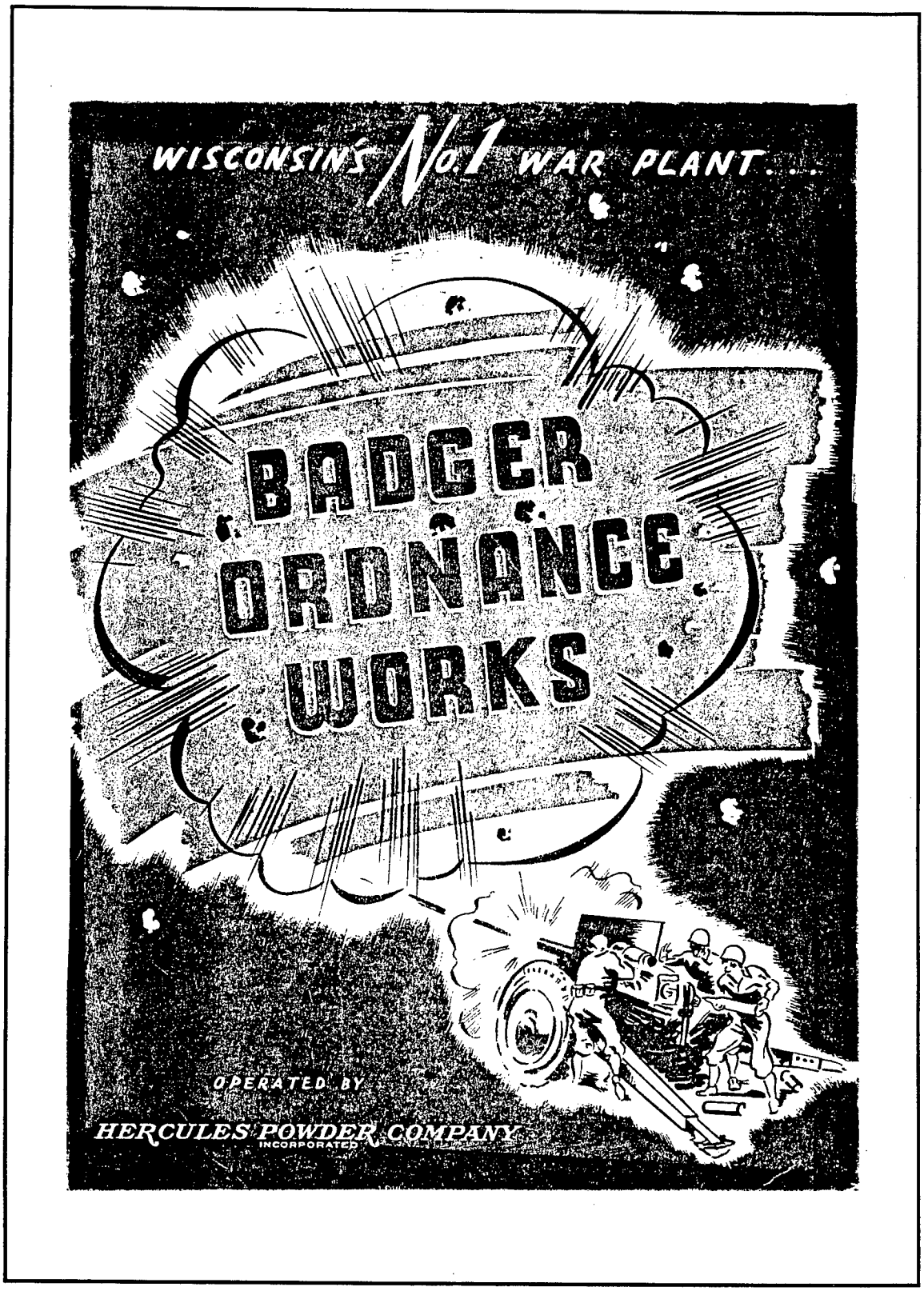

Figure 15. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

Figure 16. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

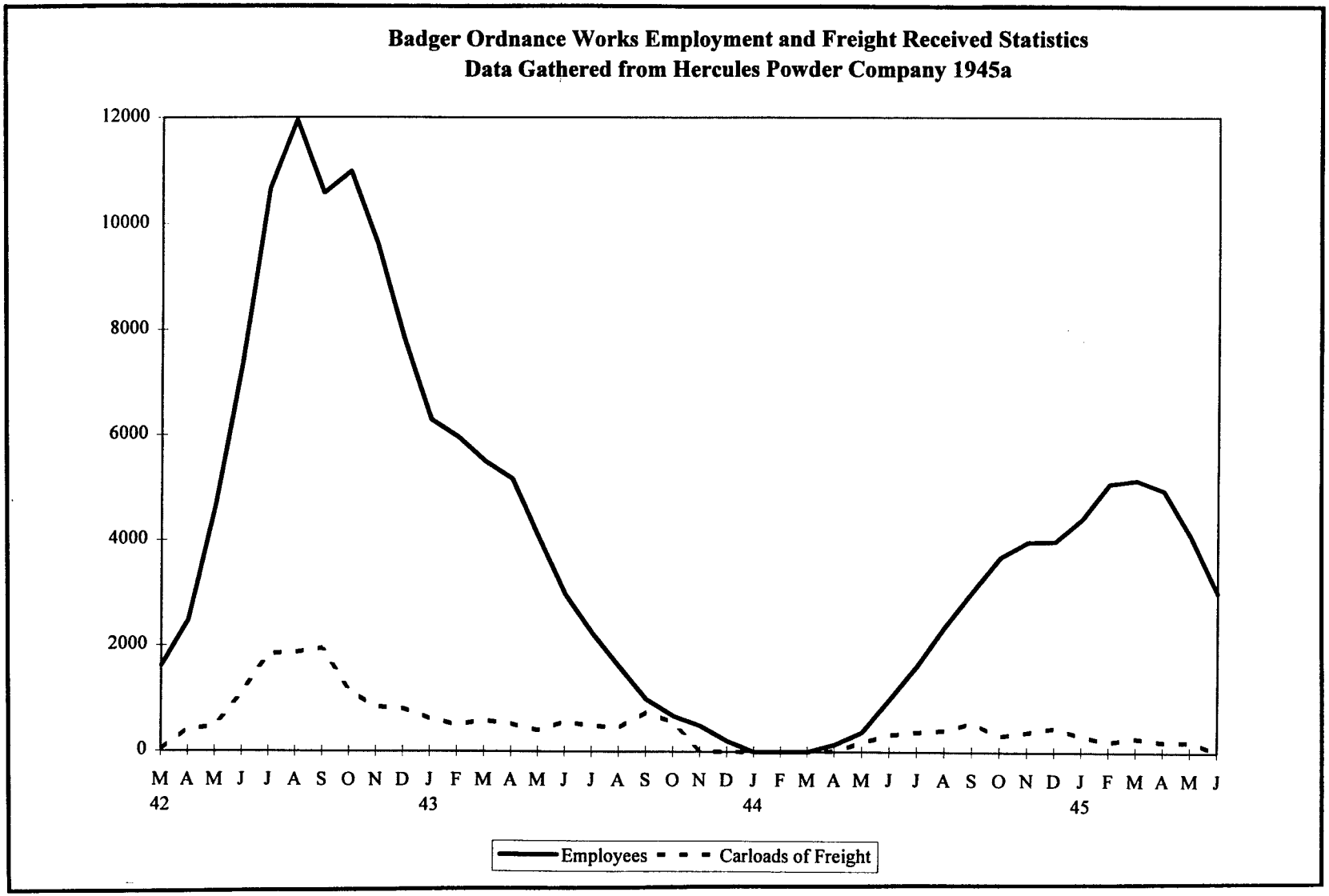

Figure 17. BOW statistics for employment and freight received (Hercules Powder Company 1945a).

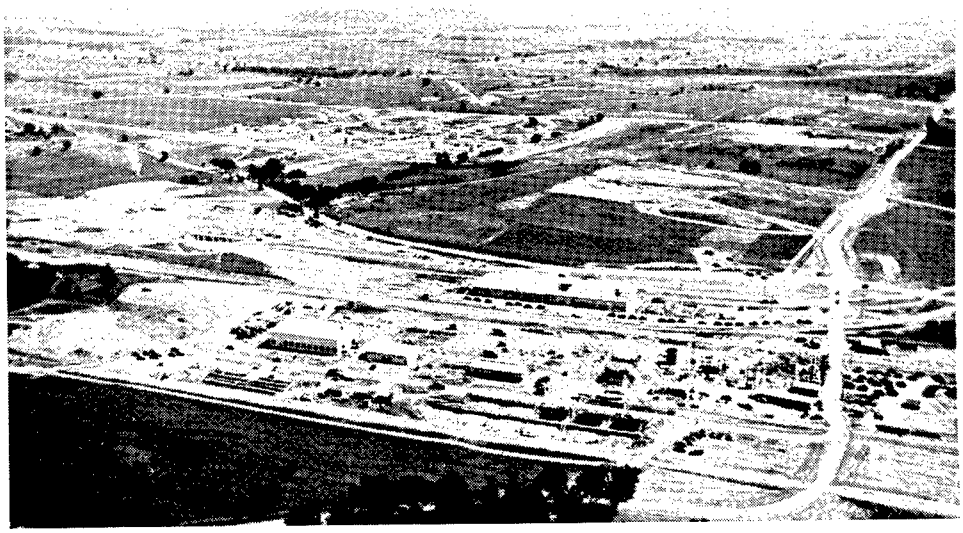

Figure 18. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

Construction activities increased until a peak of 12,188 employees engaged in the construction work was reached August 5, 1942, and included those of Hercules, Mason & Hanger, and the contractors (HPC 1945a:159; Figures 19 and 20). As construction continued into September, employment, concrete production, and excavation for buildings all showed a downward trend. Heavy rains accompanied by an electrical disturbance caused damage to two buildings and also caused such damage to water lines that were left exposed that it was necessary to re-lay 1,264 feet of 58-inch and 1,500 feet of 16- and 24-inch line (HPC 1945a:165). By mid-October, however, construction was 50 percent complete, and on October 15, 1942, the first three buildings and structures were officially reported to the commanding officer as complete.

From the end of September until December 1942, carload receipts and construction declined rapidly, as during the late fall many buildings and structures neared completion (Figures 21 and 22). Inspectors representing Hercules, the Corps of Engineers, and Mason & Hanger made group inspections of the more important buildings, closely checking every detail to determine that construction had proceeded in accordance with the plans and specifications. By December 31, 1942, total construction employment had been reduced to 7,005 people (HPC 1945a:168).

Actual production of oleum began on January 6, 1943, and production of powder began on January 23, 1943, while construction on other operating facilities at the plant continued. The acceptance of completed construction was predicated upon inspection reports prepared by Hercules engineers. The first structures to be accepted were the Employment Office, an Inert Store House, and the flag pole. As work on various buildings reached a stage of completion, they were inspected and accepted when ready for occupancy, with or without reservations. No building was accepted until fully completed, unless it had been previously occupied. When occupied before being fully complete, they were accepted with deficiencies, and when the deficiencies were completed the building was fully accepted (HPC 1945a:199).

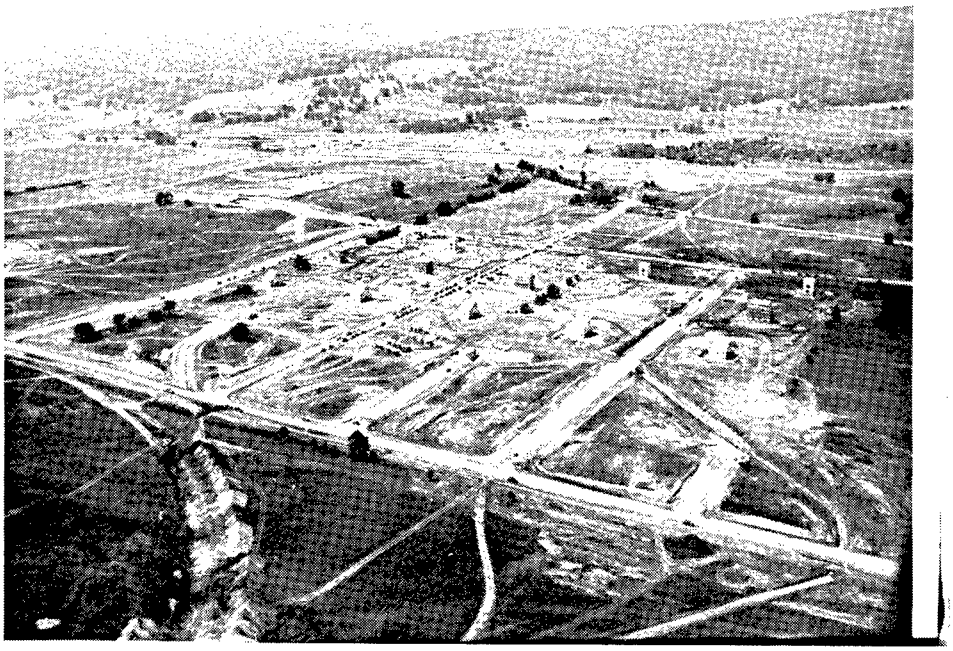

Figure 19. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

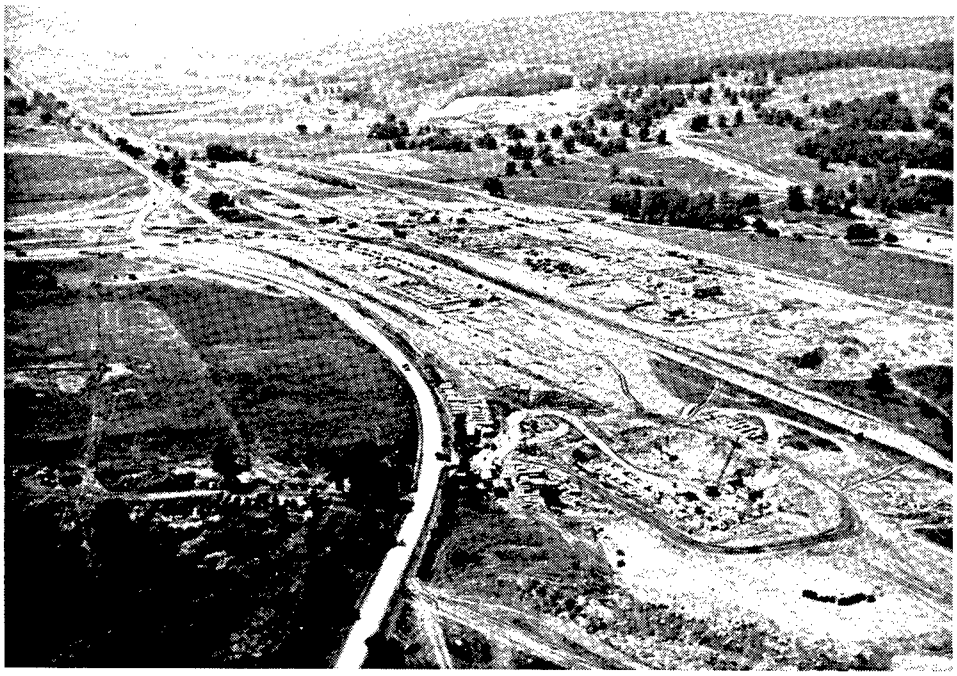

Figure 20. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

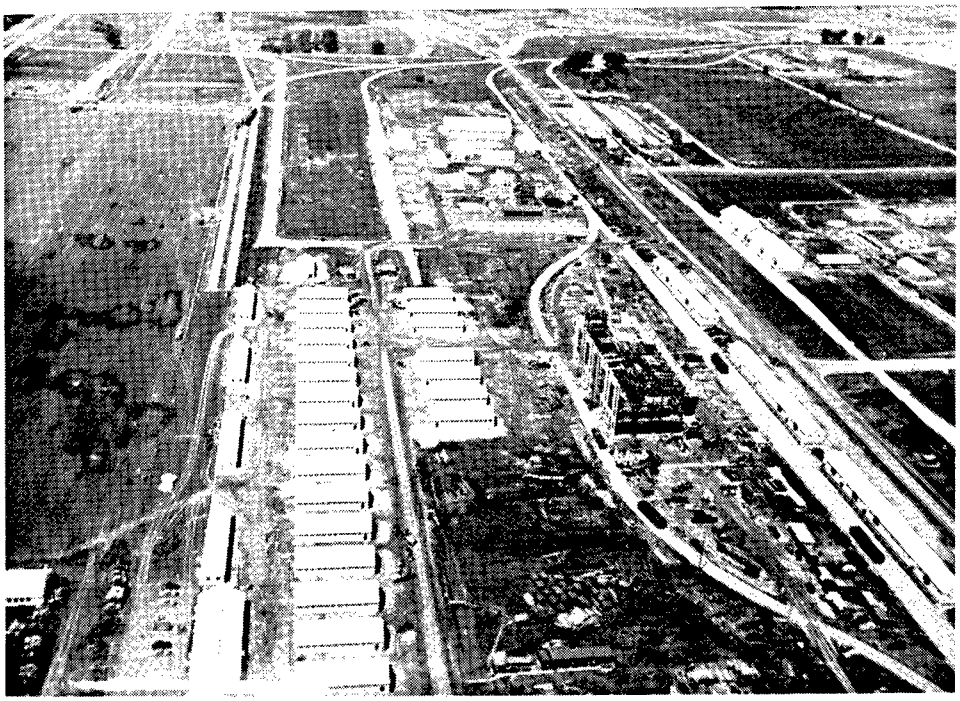

Figure 21. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

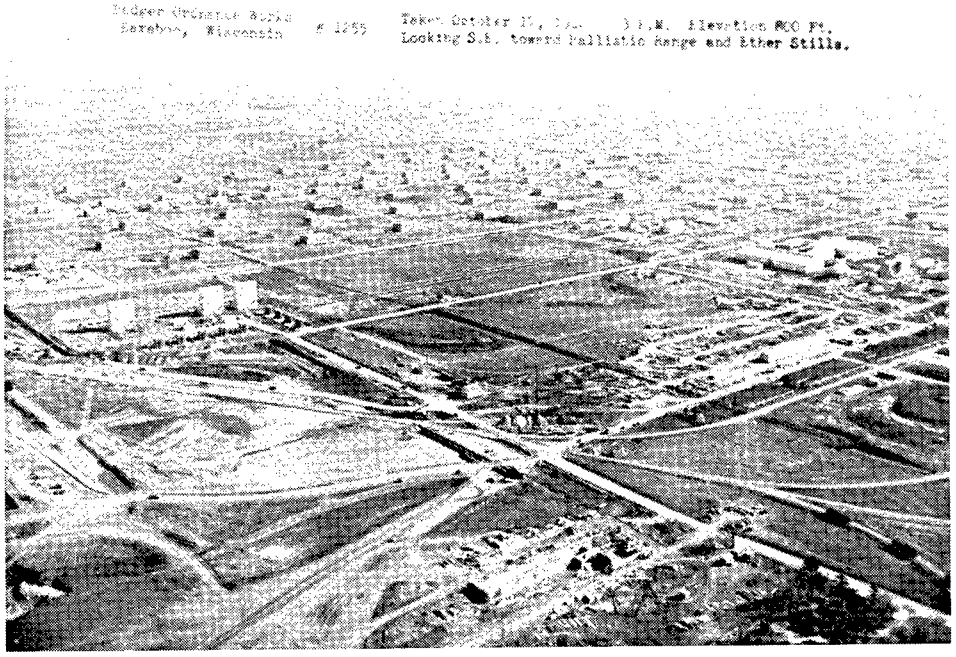

Figure 22. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

A meeting was held on November 28, 1943, at which time final determination was made to close out the construction activities of the Corps of Engineers and the architect-engineer-manager, and to formally transfer the BOW to the Ordnance Department. The Corps of Engineers terminated the original Mason & Hanger contract for construction at 11:59 PM, on November 30, 1943 (HPC 1945a:223). Outstanding and incomplete purchase orders for construction items were retained and completed by the Corps of Engineers.

On February 12, 1944, the War Department issued a letter of intent to Hercules in anticipation of a contract for the production of cruciform grain stick powder (extruded solventless stick powder) at BOW. A second major construction period, N-Line for the production of cruciform grain stick powder, began on April 27, 1944 (HPC 1945a:226). This facility was also known as the Rocket Powder Area. Construction on the first building in the N-Line, a Nitrating and Separating House, was begun on June 19, 1944.

During the months of June through August the weather was favorable; however, the lack of manpower was felt (HPC 1945a:228). Additional delays were due to slow deliveries of certain construction materials. During September and October, delaying factors were overwhelmingly due to labor shortages; carpenters and unskilled laborers were especially needed. Additional labor recruiters were employed by Mason & Hanger, who had been reinstated as architect-engineer-manager, to correct this situation. As the weather worsened in the month of December, absenteeism became a problem. Construction progressed slowly on the new line.

The lack of housing was a very important delaying factor in the N-Line construction. Due to inadequate housing, it was difficult to attract personnel willing to migrate to the area to accept work. An attempt was made to cure this problem with an intensive campaign to locate single rooms among the surrounding towns, by completion of the first 104-man barracks and near completion of the second, by activation of a trailer camp in which trailers were becoming available for occupancy, and by building 600 housing units (HPC 1945a:230; Figures 23 and 24). As the personnel situation did not improve, a new completion schedule was set up and on January 29, 1945, a directive was received from the Ordnance Department to transfer sufficient equipment for six Roll houses, two Rework Roll houses, and two Slitter and Carpet Roll houses to the Sunflower Ordnance Plant in Kansas. As some of this equipment had been installed, it was necessary to divert labor from construction work for this dismantling. In February, to relieve the critical labor shortage, furloughed army service men were added to the construction forces.

In March 1945, a considerable amount of electrical equipment and materials was obtained for Mason & Hanger from the Defense Plant Corporation, through the Ordnance Department, from their closed-down New Jersey Powder plants at Belvidere and Parlin (HPC 1945a:233). These materials were critically needed to meet the operating date.

April and May of 1945 saw a decline in the number of construction workers, partially due to the furloughed army personnel receiving orders to leave the plant. The Ordnance Department issued a directive to discontinue work on all facilities in the Acid and Nitro-cotton areas on May 15, 1945. Partially completed structures were protected by covering all openings and all labor was withdrawn from these areas.

On July 23, 1945, a meeting was conducted on the plant site pertaining to the closing out of activities of the Corps of Engineers and Mason & Hanger as well as to the transfer of the rocket powder line facilities and all other facilities to the Ordnance Department (HPC 1945a:235). It was concluded that all contracts would be continued until November 1, 1945, in order to compensate for additional work received and all deficiencies to be corrected. The rocket powder production facilities were 95.6 percent complete as of July 31, 1945.

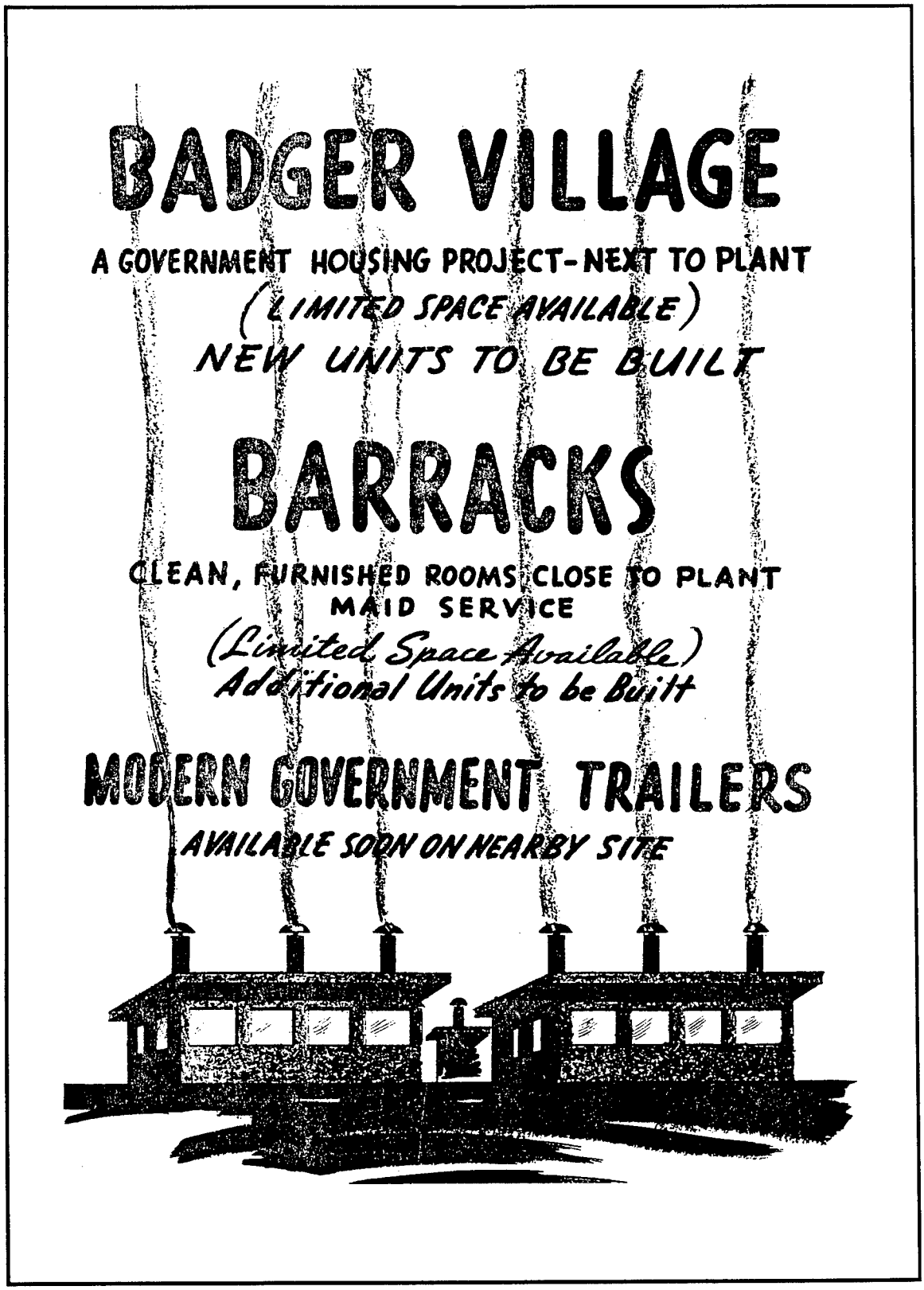

Figure 23. Employee housing flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

Figure 24. Employee housing flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

All equipment and materials remaining to be shipped by vendors were soon canceled. This was due to orders received by the Ordnance Department to shut down all smokeless powder facilities. Entire smokeless powder production was to be completed by August 1, 1945 (HPC 1945a:235). On August 13, 1945, a directive was received by the Corps of Engineers to cease all construction work on N-Line due to predictions of a quick end to the war in the Pacific (HPC 1945a:236). At this time, N-Line was approximated as 96 percent complete.

Construction at the plant continued, with new lines being added, until V-J Day, when some facilities were left partially completed (Figures 25 and 26). Between February 12, 1942, and August 13, 1945, construction crews laid 4,153,451 square feet of usable and covered floor space, built 77 miles of new roadway, laid 26 miles of railroad track, 65 miles of sewer line, and 216 miles of electrical wires. During World War II, the U.S. invested $8.2 billion in war plants, and another $7.9 billion went to purchases of industrial machinery and equipment (Smith 1959:6-13). Based on figures reported by the War Department in September 1945, construction costs charged to BOW amounted to $127,151,487 (Smith 1959:501). It was the second most expensive of all GOCO plants.

From August 1945 through January 1951, the plant was maintained in a standby status by the Ordnance Corps and the Fifth Army. Olin Corporation, with headquarters in Stamford, Connecticut, became the Operating Contractor in January 1951, and continues as such today. Reactivation of the plant for the Korean conflict began in February 1951 and was completed in November 1954. New facilities for the manufacture of ball powder were under construction during 1954-1955. Production during the Korean operation included the same general items as during World War II, excluding ethyl centralite (E.C.) powder and with the addition of ball powder. As production slowed toward the end of the Korean operation, many workers in the BOW area began to seek other employment. Unemployment was becoming a serious threat; even at times of high employment at the powder plant, the local unemployment rate was approximately 2.5 times that of the rest of the state (*Portage Daily Register (PDR)* 14 December 1957).

From January 1958 to December 1965, the Badger Army Ammunition Plant was again in standby status. On January 3, 1966, notice was received to reactivate the plant. Reactivation work was begun by Olin Corporation immediately and was completed early 1969. The production of ball powder started in June 1966, rocket propellant production started in September 1966, and smokeless powder production in August 1967. During the Southeast Asia operation the plant continued to face employment problems, including a high turnover rate and high absenteeism (*Wisconsin State Journal (WSJ)* 1 December 1968). The cessation of hostilities in Southeast Asia resulted in a reduction in requirements of propellants from the BAAP. Hence, production of smokeless powder ceased in August 1973, of ball powder in April 1974, and of rocket propellant in June 1975.

In 1972, a modernization program was begun with the construction of a new Acid complex that included Weak Nitric Acid, Oleum, and Nitric-Sulfuric Concentration facilities. The program continued with the amelioration of plant water lines, begun in the spring of 1974. In addition to these, the following modern facilities and projects have been completed: ADP Building (1972), Fire Station (1972), Main Powerhouse Conversion from coal to oil (1972), Secondary Sewage Treatment Plant (1973), Waste Water Treatment Plant (1974), Emergency Power for sanitary and waste treatment (1979), insulation of active buildings (1981), and a Contaminated Waste Processor (1982).

CONTRACTOR OPERATIONS

Production without a firm agreement, even in the cause of war for a benign and grateful government, was a risky and foolish procedure (Walton 1956:179). The BOW was built and operated by the Hercules Powder Company under original contract Number W-ORD-554 DA-W-ORD-36, signed January 1, 1942 (HPC 1945a:60). Hercules, as the Operating Contractor, was one of the principles involved with the construction

Figure 25. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

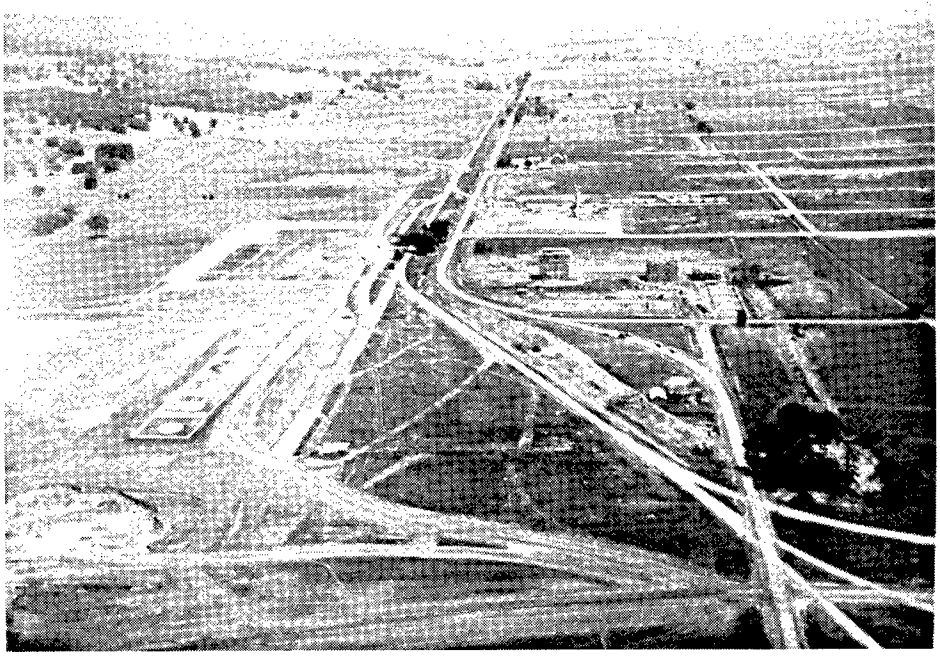

Figure 26. Overview of BOW during construction, World War II Operation (original photograph on file, BAAP Library).

of the plant. As construction continued at the plant throughout World War II, Hercules took control of buildings and structures as they were completed. The operating contract was a cost-plus-a-fixed-fee (CPFF) or "fixed fee" contract. This was one of the six emergency contract forms developed by the War Department in 1940 as a means of "reforming" military procurement practices (Smith 1959:48-72). The CPFF contract allowed greater flexibility in pricing, as compared with the standard fixed-price supply contract. Because many wartime contractors had little or no experience in defense contracting and were engaged in manufacturing material that had never before been produced on the scale required by the government, they were reluctant to pursue fixed-price contracts. CPFF allowed the government and contractors to bypass competitive bidding and made pricing "flexible." The official history of Ordnance Department procurement and supply in World War II describes the CPFF as follows:

> Each company was reimbursed at regular intervals for approved expenses in operating the plant, and in addition was paid a fee based on the number of rounds of ammunition or pounds of explosive produced. Under this arrangement the contractors ran no risk of failing to make a profit. To protect the government's interest, teams of auditors at each plant checked the company's accounts and approved or disallowed every item of expense in accordance with policies established in Washington [Thomson and Mayo 1991:113].

While the liberal provisions of CPFF contracts greatly expedited the construction of new Ordnance Department facilities at a time when the fate of the entire Allied cause hung in the balance (Cambell 1946:108), they came under criticism and were the subject of a series of Congressional inquiries known as the Truman Committee hearings (Fine and Remington 1972:562-585; Smith 1959:280-283; Thomson and Mayo 1991:113, 130). CPFF contracts provided incentives for quality control but not for cost-efficiency. Whether operating under a CPFF contract or under a loosely negotiated fixed-price contract, war suppliers behaved in much the same manner. The wartime tax structure, with marginal excess profits tax rates of 90 percent, removed much of the power of the profit motive to reduce costs. Lavish expenditures by many fixed price contractors cost them only ten cents on the dollar, and for all practical purposes placed them in a cost-plus status (Smith 1959:276).

The fees for the operation of GOCO facilities were a specified amount per unit of output, determined in advance of production on the basis of estimated costs. Fees for the production of powder and high explosives, percentage-wise, were among the lowest for all contracting operations in World War II (Smith 1959:297). The highest fees in this group were those allowed for the most complex and hazardous operations. At the newly developed ammonia plants fees averaged 6.5 percent of the total cost, and 6.2 percent of actual costs in the case of smokeless powder. In comparison, fees at shell-loading plants, which performed final operations on an assembly line basis, averaged only 2.3 percent (Smith 1959:297-298).

Administration of CPFF contracts improved substantially between the time the early construction contracts were let and the last years of the war. Noteworthy improvements included the expansion and refinement of policies, procedures and organizations for the advance estimating of costs, setting and revising fees, defining allowable elements of cost, and auditing contract operations (Smith 1959:297-298). However, the production conditions of a nation at war gave rise to numerous problems and questions not covered in regulations. The policy concerning specific reimbursement by the government of such costs as employee bonuses, overtime and shift premiums, vacation pay, retirement programs, and various welfare activities were not considered. Also of concern was the fee of professional accountants and attorneys being included as operating costs, payable by the government even when being used in litigation against the government. Limitations on advertising expenditures, entertainment, and contributions were several of the many other concerns not covered by regulations. Until definite answers were found, all cost reimbursements paid to contractors were purely conditional with the Comptroller General having the power to audit all CPFF contracts, to disallow specific cost items, and to suspend specific payments made by disbursing officers (Smith 1959:298-299). Using the traditional peacetime accounting methods put a burden on the War Department's often inadequate accounting services; thus, as much time and effort was spent on small inconsequential items as on large

important ones. Additional results included slow payments to contractors and hindered war production (Smith 1959:299).

In May 1942 an elaborate memorandum was sent to all technical services and other major components of the War Department announcing a new policy of selective and flexible audit procedures for work under CPFF contracts. These were designed to minimize routine checking, eliminate duplication of audit activities and expedite payments to contractors. The philosophy underlying the new approach was the development within the contractor's own accounting organization of a system of internal controls that would automatically reveal irregularities and enable trained government auditors using selective audit techniques to protect the interests of the government (Smith 1959:300).

At the end of 1943 the War Department employed approximately 6,400 auditors, most of whom were devoted to the auditing of CPFF contracts. There was a general desire to shift to fixed-price contracts. While the refinement of auditing controls was an important element in protecting the government against improper charges and wasteful expenditures under CPFF contracts, the War Department was equally concerned with fostering cost-reduction techniques in the basic process of production (Smith 1959:300). It was the belief of government officials that regular publication and analysis of production costs on a plant-by-plant basis would stimulate competition among the various plants. With every plant manager as well as all employees anxious to make a good showing, the competitive spirit could be harnessed to pride and patriotism in lieu of the profit motive (Smith 1959:301).

The new changes in auditing controls resulted in cost reduction, increased output, and technical improvements both in end products and in the production processes. For example, in April 1941, 7.61 gallons of alcohol were required for each 100 pounds of smokeless powder; however, by 1944 the figure had dropped to 1.9 gallons, saving an estimated 50 million gallons of alcohol for this one purpose alone (Smith 1959:302). Abandonment of the CPFF procedure in the ammunition procurement program would have resulted in grave damage without benefits. Unit costs of ammunition were highly sensitive to changes in volume, and the unpredictable fluctuations in ammunition requirements continuing to V-J Day rendered the use of fixed prices unsatisfactory. Also, the safety hazards of munitions production made it desirable to eliminate profit-motivated pressures upon cost. Throughout all of the efforts of the War Department to convert its CPFF contracts to a fixed-fee basis, the Ordnance Departments GOCO contracts were exempt (Smith 1959:302).

TECHNOLOGY

The Ordnance Department constructed GOCO industrial facilities, including 23 propellant and explosive plants, in 26 states during World War II. At the outbreak of World War II, there were no existing plants that could be readily converted to the mass production of smokeless powder or propellant, TNT, or ammonia. Cooperation between the nation's small peacetime explosives industry and the Ordnance Department created plans and specifications for propellant plants (Thomson and Mayo 1991:11). By the summer of 1940, the government had a fairly clear idea as to the type of new facilities it would need to produce smokeless powder, explosives, ammonia, and TNT (Thomson and Mayo 1991:12). The Ordnance Department created a vast interlocking network of ammunition plants owned by the government and operated by private industry (Thomson and Mayo 1991:105). The government began construction on this national system of armament manufacturing plants in 1940.

The mission of the BOW was to produce smokeless gunpowder and solid rocket propellant fuel. Additional production of oleum, nitric acid, sulfuric acid, nitrocellulose (for use at BOW and for shipment to other smokeless powder facilities), and nitroglycerin also took place during World War II. Although BOW was originally intended to provide only three smokeless powder lines, soon after construction began the contract was revised to add double-base powder and TNT, and still later solid rocket propellant fuel in the form of

2.75-inch rocket grains. In August 1942, all construction work of the five TNT lines was canceled (HPC 1945a:164). Initial operations in the rocket powder area started on January 30, 1945 with paste being obtained from Sunflower Ordnance Plant because neither the nitroglycerin nor the paste areas at BOW were operational (HPC 1945a:232). Still later, during 1954 and 1955, facilities were constructed for the manufacture of a new high-energy gun powder called ball powder.

Smokeless Powder

As with most GOCO powder plants, BOW produced numerous end products, but the majority of the efforts were put into the production of nitrocellulose and smokeless powder in the form of single-base cannon and double-base solventless rocket propellants. Until 1942, smokeless powder in the U.S. was produced using solvents. The basic manufacturing process had been developed during World War I (MacDonald and Mack 1984:21, 35). As with many things military, the terminology used in association with the description and manufacture of smokeless powder--"gun powder" to the lay person--can be misleading. Even the word "powder" is a misnomer since the "grains of powder" were actually pellets, a single pellet being one grain. A wide variety of grain types was produced by powder manufacturers, in sizes ranging from somewhat smaller than a cigarette butt to more than an inch in diameter and two inches long.

In the manufacture of "single-base" smokeless powder, nitric acid was mixed with a cellulose base, either cotton fibers or wood pulp, to form nitrocellulose. This nitrocellulose, called "NC" for short, was further refined by boiling, then solvents were added to displace moisture and make the mixture more plastic and malleable. This mixture, called the colloid, was then extruded by huge hydraulic presses through dies, which formed it into long threads. Some of these threads were "perforated" by pins inserted in the dies, which cut slots along the length of the threads. Perforating increased the surface area, altering the rate at which the finished grains would burn. Finally, the threads were cut into individual grains of powder, also called propellant. "Double-base" powder was a more powerful form of smokeless powder, and its manufacture involved first the addition of nitric acid to cellulose, then the addition of highly explosive nitroglycerin to the nitrocellulose--thus the term double-base. This more powerful powder was usually called rocket propellant.

The nitrocellulose production process involved several highly hazardous materials. According to plant records on file at the BOW plant library, the production process followed a sequential order (Anonymous n.d.b; Table 2). In the Cotton and Pulp Drying process, wood pulp or cotton cellulose was reduced to the desired size for nitration and the moisture content dried to one percent or less. It was then delivered to the dipping floor of the Nitrating House (Figure 27), where it was mixed with nitric and other acids (including the highly flammable and explosive Benzene, and the moderately hazardous DNT and Ethyl Acetate). This nitrated cellulose was then sent via a terra cotta flume line (Figure 28) to a Boiling Tub House. Crude nitrocellulose includes some sulfates and nitrates, impurities that must be removed in order to produce a more stable powder. After several boiling cycles, the processed nitrocellulose was pumped to a Beater House. There beaters similar to paper pulping machines ground the nitrocellulose to a finer consistency (Figure 29). Pulping also released unstable compounds, which facilitated the stabilization of the nitrocellulose in the Poacher House treatment, the next step in production. The processed nitrocellulose was pumped to the Poacher House where it underwent another series of boiling cycles. After being screened for foreign materials, including sand and metal fragments, the nitrocellulose was pumped to the Final Wringer House, where the water used in moving and processing the nitrocellulose was removed (Figure 30). By calculating the percentage of water after wringing, the operators were able to measure and weigh the nitrocellulose into increments of known dry weight (Figure 31). The dewatered nitrocellulose was then sent in cans by a Telpher system to the single-base cannon propellant line or in buggies by powder van motor trucks to the rocket Paste Pre-Mix House or the ball propellant auxiliary line.

Table 2
Production Processes*

Product		Process
Nitrocellulose		
New Manufacture:	Sequence No.	1. Cotton and Pulp Drying
		2. Nitration
		3. Boiling Tub
		4. Jordan Beater (Pulping)
		5. Poacher and Blender
		6. Final Wring
Deterrent Extraction:		1. Propellant Storage and Grinding
		2. Extraction Process
Single-Base Cannon Propellant		
	Sequence No.	1. Dehydration
		2. Mixing
		3. Blocking and Macaroni
		4. Finish Press and Cutting
		5. Solvent Recovery Process
		6. Hydro-Jet and Water Dry
		7. Air Dry and Pre-Blend
		8. Rest House, Final Blend, Can Pack
		9. Testing Cannon Propellant, Chemical and Ballistics (Closed Bomb)
Double-Base Solventless Rocket Propellant		
	Sequence No.	1. Paste Pre-Mix
		2. Paste Final Mix
		3. Paste Pre-Dry and Blending
		4. Roll House
		5. Slitter and Carpet Roll
		6. Extrusion Press
		7. Annealing, Fluoroscope and X-Ray
		8. End Saw and End Inhibit
		9. Dowel and Spiral Wrap
		10. End Trim and Sleeve

* The above production process sequences data were obtained from Vietnam Operation-era documents located at the BAAP library (Anonymous n.d.b; Anonymous n.d.c; Anonymous n.d.d)

Two additional sequences were often included in the production process and were commonly referred to as deterrent extraction. Obsolete propellants, small lots, tail ends of lots, propellants generated from ammunition rework, rejected lots, and deteriorating propellants were washed and ground during the Propellant Storage and Grinding sequence. The ground propellant was then pumped to an Extraction Still or pumped to the Powder Storage Pits prior to weighing. The final production step, and the second in the deterrent extraction, took place in the Extraction House. Here propellant was received, drained of the transfer water, mixed with solvents, reslurried, and the solvents removed. At the end of the cycle, the nitrocellulose was pumped to storage tubs in the Extraction House, the Hardening Weigh House, or to storage pits.

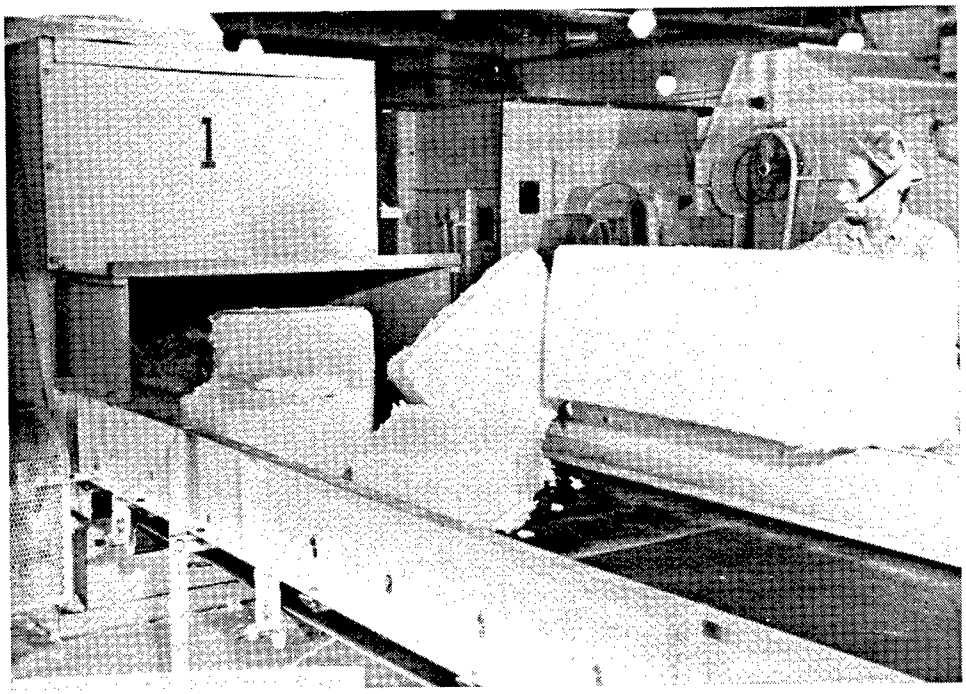

Figure 27. Employee working in a Cotton Dry House at BOW, World War II Operation (original photograph on file, BAAP Library).

The single-base cannon propellant operations at BOW included manufacturing processes beginning with the dehydration of nitrocellulose and including all subsequent operations such as mixing, granulating, solvent recovery, drying, blending, packing, and storage.

Further processing the nitrocellulose into single-base cannon propellant first involved the removal of moisture by pressure and the addition of chemicals in the Dehydration Press House. It was then compounded with solvents and modifying additives to form a rubbery paste in sigma-blade mixers (Figure 32) (Anonymous n.d.c; see Table 2). The colloided material was further mixed in macerators and transferred to blocking presses, which formed the unconsolidated mix into cylindrical blocks for easy handling (Figure 33). The blocks were placed in hydraulic extrusion presses and extruded into perforated strands, which were cut into grains (Figures 34 and 35). Next, the solvent-laden cut powder went through successive steps to remove the solvents (which were recovered and reused) by soaking the grains in hot water, then drying them in warm air. The dry powder was blended, tested for performance characteristics, and, when approved, packed into shipping containers (Figure 36).

The solvents used to form the colloid in the above process also altered the burn rate of the powder or propellant. If the solvents were not removed from the grains during manufacture, they would evaporate during storage, thus giving inconsistent performance in the field. However, drying the grains to evaporate the solvent could cause the grains to warp, especially the larger rocket propellant grains, making them unsuitable for use. This problem was solved in 1942 by the development of the dry extrusion process, which eliminated the need for solvents.

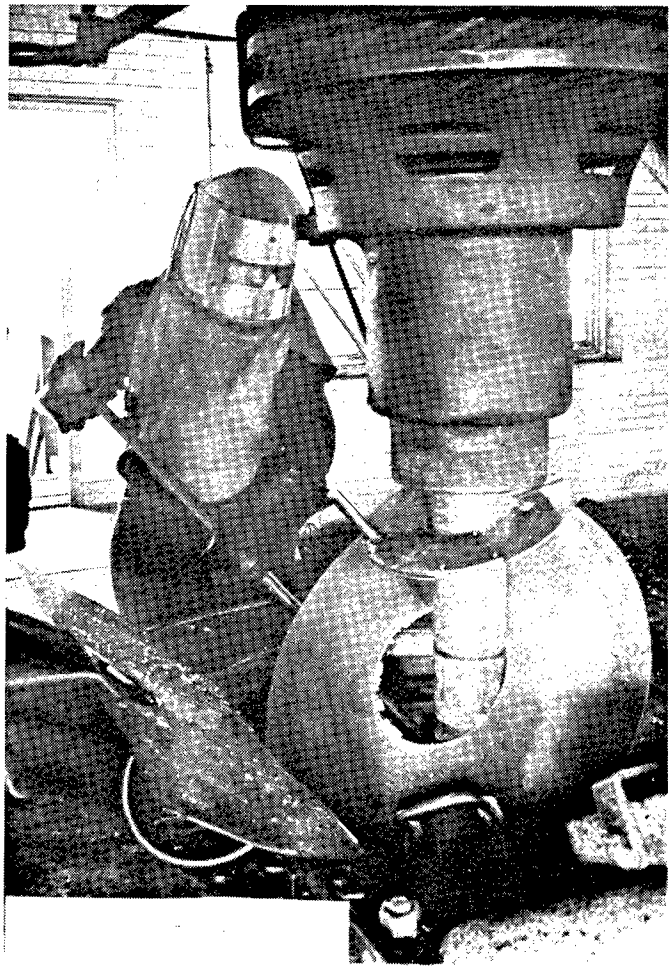

Figure 28. Employee forking the charge in a Nitrating House at BOW, World War II Operation (original photograph on file, BAAP Library).

In February of 1942, Hercules Powder Company's Radford facility was the first dry-extrusion process smokeless powder line to be approved in the U.S. (Thomson and Mayo 1991:138). This process was installed at BOW in 1945. The double-base solventless rocket propellant facilities at BOW were designed for the production of 2.75-inch rocket grains. Powder grains for the Mark 18, Mark 19, and Mark 22 rockets were produced as well (HPC 1945a:834). The sequences of the production process, obtained from plant records on file at the BOW plant library (Anonymous n.d.d; Figure 37; see Table 2), indicate that

> in the manufacturing of solventless double-base rocket propellant, nitrocellulose and nitroglycerine, with other chemical additives, are mixed in a water slurry. The slurry is dewatered in centrifuges and the resultant "paste" is air dried to a predetermined moisture level. The damp paste is consolidated in roll mills into a rubbery sheet form. The sheet stock is tested for burning rate characteristics. Proved material is slit and rolled into "carpet rolls" suitable for charging into a high-pressure oildraulic extrusion press. The powder is extruded into final perforated strand form. The strand is cut into an approximate finished length. Rough grains are machined in successive steps to exact final weight and dimensions. Ethyl cellulose inhibitors are cemented to the ends of the grains and a spirally-wrapped multi-layer sleeve of ethyl cellulose tape is applied. The inhibited grains are cured under mild temperature and a final trimming operation is performed. Samples of the finished grains are static tested

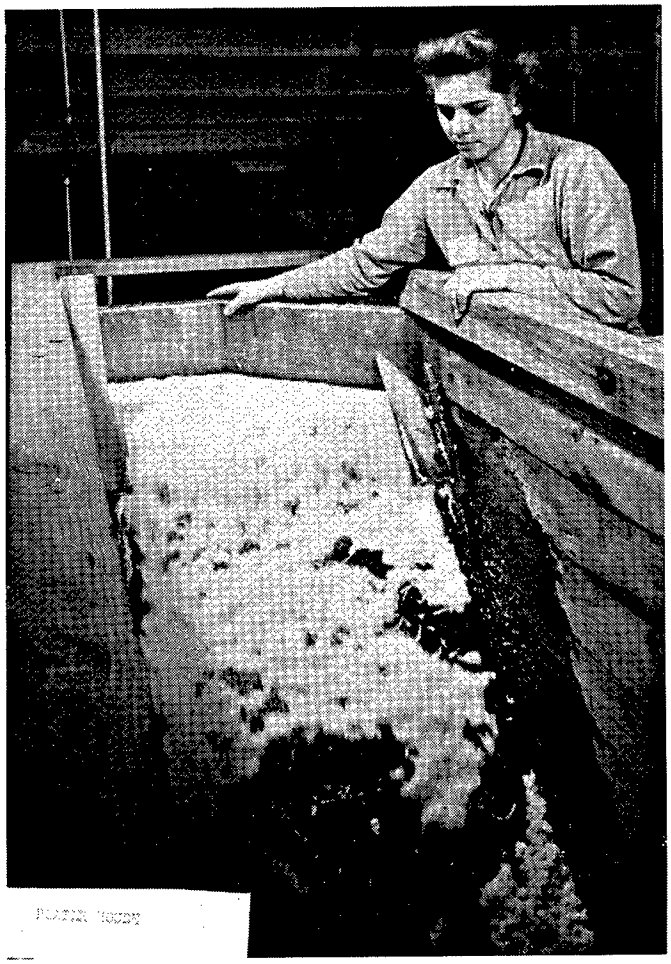

Figure 29. Employee working in a Beater House at BOW, World War II Operation (original photograph on file, BAAP Library).

to establish ballistic characteristics. Acceptable grains are packed in protective tubes and bundled into pallet containers for shipment (MacDonald and Mack 1984).

Newly developed methods of inspection were integrated into the rocket propellant production process at BOW. The supersonics area, used for inspection, was an integral part of the rocket propellant production facilities (HPC 1945a:867). It was Hercules Powder Company who developed new X-ray and ultrasonic inspection techniques (Dyer and Sicilia 1990:234). These were significant innovations in quality control and inspection. At BOW, this equipment was in use from January 23, 1945, to September 5, 1945 (HPC 1945a:868). The supersonic scanning operations offered 100 percent inspection with Bardel and Picker fluoroscope machines internally inspecting grain blanks to identify air fissures and foreign material defects (Anonymous n.d.d). They were also used to provide production control on the individual extrusion press performances. The X-ray procedures, utilizing one machine which included a Westinghouse housing with an Andrex X-ray head, inspected grains for fissures and foreign material (Anonymous n.d.d). Throughout its operation period, the supersonics area was in a state of flux. This was due to the relative newness of such procedures and the introduction of many developments during the construction, maintenance, and operation of the facilities (HPC 1945a:869). The initial full-scale use of these procedures was delayed somewhat by

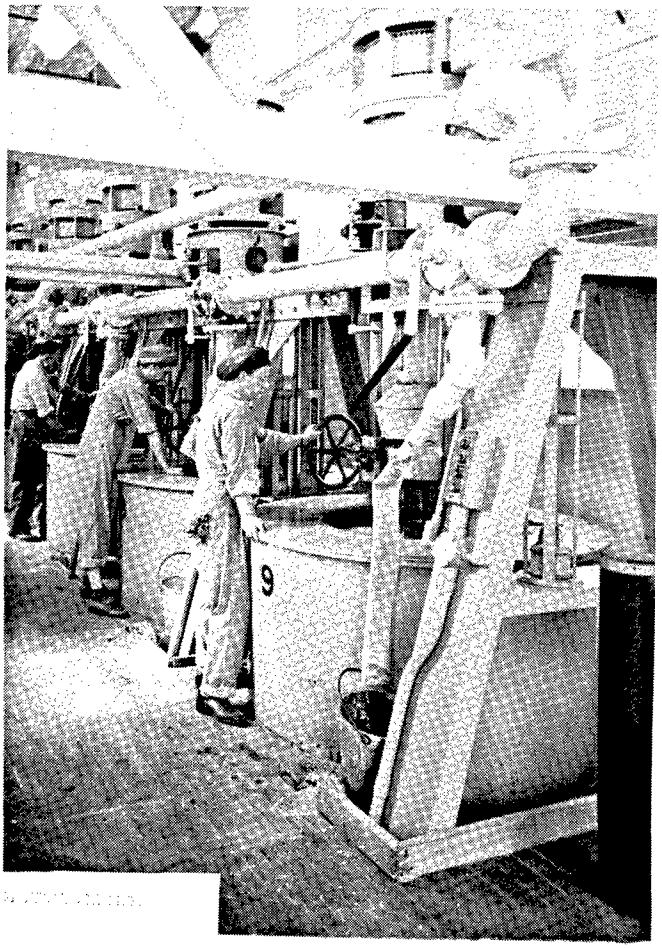

Figure 30. Employee operating a final wringer in a Wringer House at BOW, World War II Operation (original photograph on file, BAAP Library).

Navy technicians who doubted the reliability of the processes. Numerous significant modifications and technical changes were associated with BOW. While basic electronic development was conducted at the Radford facility, further development investigations were conducted at BOW to obtain satisfactory results from supersonic analyzers (HPC 1945a:876). Investigations led to the production of the Frequency Modulated System. This gave better operations during the continual 24-hour production periods at BOW (HPC 1945a:877). Also, the new devise was more flexible in its application to the detection of flaws. The sensitivity could be conveniently increased or decreased by means of a master control dial (HPC 1945a:877). Work at BOW also led to significant improvements in transducers used in the detection of powder grain flaws. By June 1945, all transducers in use at BOW were the new style, narrow-crystal type (HPC 1945a:878).

Electronic maintenance was somewhat hindered by the lack of trained servicemen. In many cases scanning facilities were out of production longer than necessary to correct the faults that developed in the units. The BOW Instrument Shop personnel were responsible for the maintenance of the equipment and hired sufficient men to capably service the units on all operating shifts (HPC 1945a:881). Due to the newness of the supersonic equipment, the servicemen had to learn on the job. By the time BOW operations were shut down, several men were sufficiently experienced to perform an efficient servicing of the equipment.

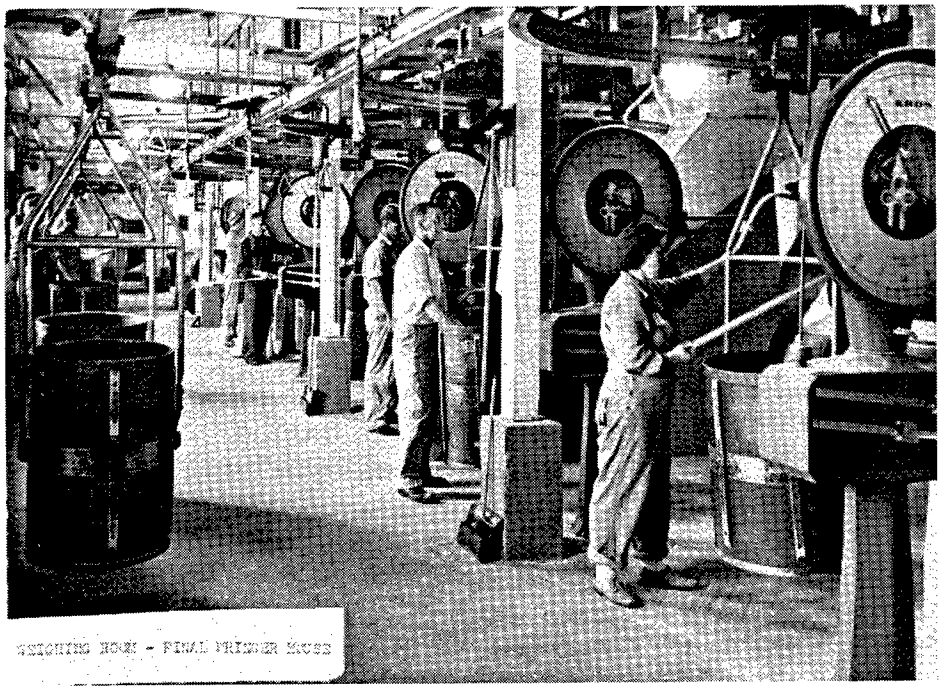

Figure 31. Operations in a weighing room of a Wringer House at BOW, World War II Operation (original photograph on file, BAAP Library).

SOCIAL HISTORY

Land Acquisition

Inexpensive and fertile farmland first attracted permanent Euro-American settlers to Sauk County in the 1840s. Early records indicate that the first settlers were predominantly German and Swiss. Many were undoubtedly attracted to the U.S. to obtain religious and political freedoms that was denied them in Europe, especially true after the failure of the liberal revolution of 1848 in Germany (Cooke et al. 1981:173). Agriculture shaped the local patterns of settlement (Figure 38), with land ownership and use one of the major concerns of nearly all of those who lived there.

In the fall of 1941, most of the countryside of the Sauk Prairie was owned by family farmers, many of whom were the descendants of nineteenth-century settlers. The farms were modern and cultivated in the latest and most scientific manner (HPC 1945a:38). Additionally, the farms were well-managed, relatively prosperous, and the community spirit was strong (HPC 1943a). The plant site comprised 79 farms with all but four being owner-operated (Figure 39; Table 3). Over 800 structures, including homes and farm buildings, were located on the farms.

Appraisal and acquisition of land started in November 1941 by appraisers representing the U.S. Army Corps of Engineers. Appraisals, including land and buildings, varied from $40 to $100 dollars per acre (HPC 1943a). Many farm owners were reluctant to accept the appraised values, and 65 of the total number of owners declined the original offer that was based on the appraisals. Final settlement was made only after

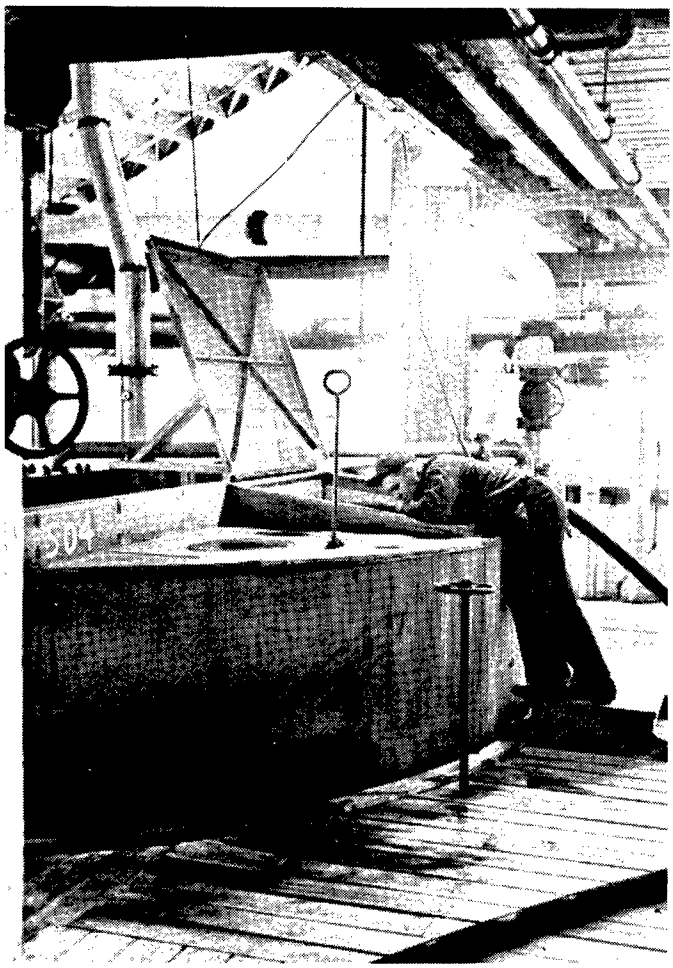

Figure 32. Operations in a Mix House at BOW, World War II Operation (original photograph on file, BAAP Library).

court litigation. A letter written by Secretary of War Stimson and addressed to the U.S. Attorney Generals called for condemnation of the unobtained land. Portions of this letter are reprinted below:

> It is necessary and advantageous to the interest of the Government that certain lands located in Sauk County, State of Wisconsin, be acquired by the United States of America for the site of the Badger Ordnance Works. . . . Therefore, pursuant to the provisions contained in the Act of Congress approved August 1, 1890 (26 Stat. 316) . . . the Act of Congress approved March 11, 1941 . . . and the Act of Congress approved April 5, 1941 . . . it is requested that you cause the necessary proceedings to be instituted for the condemnation of the fee simple title to the aforementioned lands. . . . The Act of Congress approved April 5, 1941 . . . appropriated funds for this acquisition. . . . It is requested that, pursuant to the provisions of 50 U.S.C. sec. 171, you procure from the court an order granting immediate possession of the aforesaid lands (HPC 1945a:147-148).

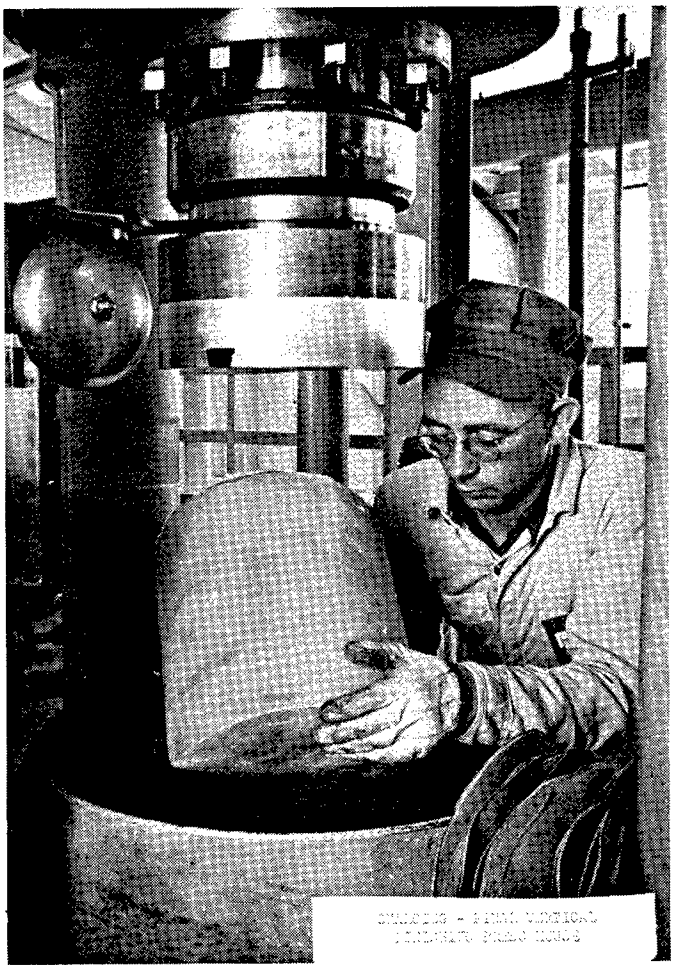

Figure 33. Operations in a Finishing Press House at BOW, World War II Operation (original photograph on file, BAAP Library).

This situation was by no means unique, but was part of a pattern of events that was taking place throughout the U.S. where more than seven million acres of land, much of it privately owned farmland or ranchland, was purchased for military bases and defense plants during World War II. Even though their land was regarded as vital to national defense, hundreds of area farmers staged protests and sent telegrams to President Roosevelt pleading that their fertile farms be spared in the search for a plant site (*BNR* 14 January 1942; *WSJ* 14 March 1975). Ms. Dorothy Bohnsack, former administrative worker at BOW and lifetime area resident, recalls the rich farmland at the plant site.

> That was all farms. They were better farms (you can tell by the buildings what type of farmers they are). It was sad for us to lose all those farms, and it was our good productive soil to grow food. Some of Badger is still being used in summer for growing crops. There's a two-story red brick house [nearby], and that came from the plant area and had just recently been built before these people got this notice that they had to leave. They were really upset. . . . Everybody was upset . . . [Dorothy Bohnsack, interview 1995].

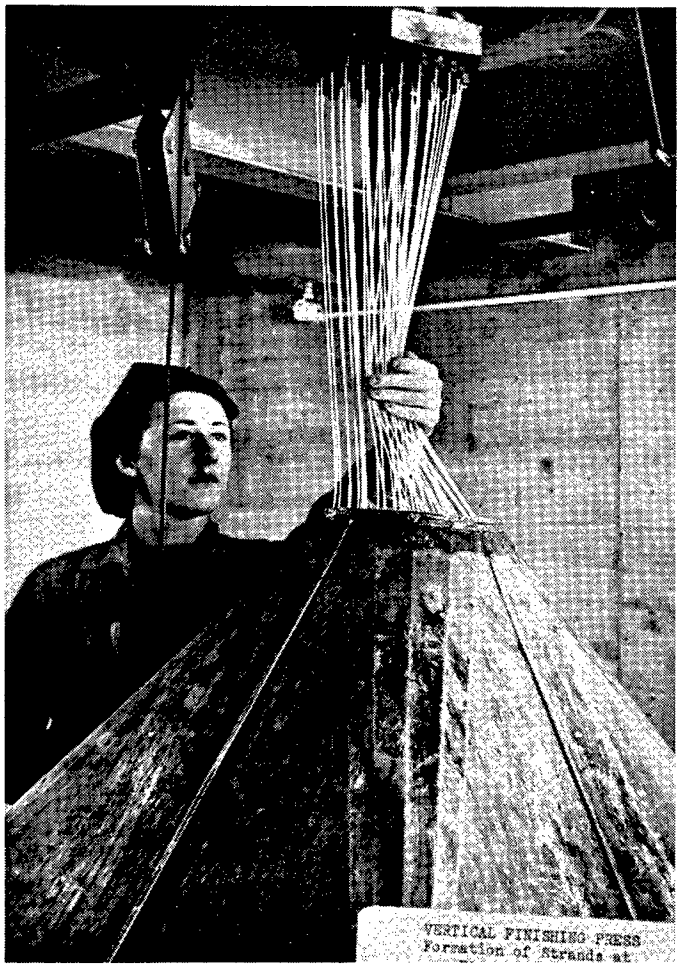

Figure 34. Formation of strands at a finishing press at BOW, World War II Operation (original photograph on file, BAAP Library).

Mr. Floyd Allen, former construction worker and pumper in the acid area at the plant, recalled conflicting receptions to the news of the plant's arrival: "The average person was pretty happy about it, but a lot of the farmers, those that had to sell their land, they didn't like it. A lot of them had lived there all their lives, and they didn't want to give up their farms. But, for the people here in town, it was going to be a big thing, a big economic boom, and they were pretty happy" (Floyd Allen, interview 1995). Ms. Laverna Hackett, former lab worker at BOW and long-time area resident agreed that

> [t]here were mixed reactions. The people that lived on the 'Prairie' as we called it [i.e., the plant site] were very definitely upset. And I can understand their point of view because it was prime farm land. These people had lived there for generations and they were losing their homes. . . . Baraboo has always been an area where there has been minimal plants to work in so the wages were never great; there were never a lot of factories. To the working class of people it was quite an asset [Laverna Hackett, interview 1995].

Figure 35. Feeding a cutting machine in a Cutting House at BOW, World War II Operation (original photograph on file, BAAP Library).

John Luetscher of the Committee of the Sauk Prairie Landowners stated that the Sauk Prairie farmers were not afraid of condemnation and were willing to sell at a fair price. Luetscher went on to say that although the farmers did not think they were getting a fair price, if they were offered a fair price, it would not take 30 minutes to sign over all the land titles (*BNR* 12 January 1942). The Sauk Prairie farmers were not satisfied with their offers because so-called disturbance value, that is, expenses incurred from the forced sale of crops, livestock, and supplies, were not included in the monetary offers for the condemned land. Also, the farmers were not compensated for sentimental value or the cost of moving which was between $300 and $1,000, depending upon the family's situation (*BNR* 27 January 1942, 5 February 1942).

The oral history informants for the present investigation were unsure of the prices the farmers actually received for their land. Informant responses indicated that many farmers were left feeling short-changed and slighted: "There was no farms equivalent in Sauk County to what they had. I don't think that they got the price that they should have" (Dorothy Bohnsack, interview 1995). Mr. Allen recalls that "there was a lot of complaining. A lot of them figured they didn't get enough money for their places" (Floyd Allen, interview 1995). Anticipating the loss of their land and hurrying to harvest their crops, the Sauk Prairie farmers put out a call for help in the form of additional balers to harvest their fall crop (*BNR* 30 January 1942).

Figure 36. Operations in a Can Pack House at BOW, World War II Operation (original photograph on file, BAAP Library).

Condemnation proceedings continued, and on February 13, 1942, it was advertised that many of the government's recently purchased farm buildings would be put up for sale (*BNR* 13 February 1942). During the first round of sales, 300 buildings were offered by the government (*BNR* 26 February 1942). Prospective buyers traveled as far as 100 miles to bid on these structures (*BNR* 5 March 1942). The second round of building sales included 600 structures with more than 800 people bidding (*BNR* 9 March 1942, 16 March 1942). The bidders for the second auction included Miss Marjorie Bwars of Baraboo who purchased 118 buildings (*BNR* 10 March 1942). Often, the price of a purchased building doubled, tripled, and even quadrupled due to the cost of dismantling and moving the structure (*BNR* 18 March 1942).

In addition to the farm residences and associated structures, three schools, three churches, and three cemeteries were acquired by the government. The schools and churches were still in use in 1942 but were all torn down during plant construction. The three cemeteries, Miller Family Cemetery, Pioneer Cemetery, and Theolke Cemetery, were avoided during construction of BOW.

Today, it is unclear what happened to the Sauk Prairie farmers after their farms were sold to the government. It is probable that many older farmers retired and that younger farmers were absorbed into the local employment market, including construction and operation positions at BOW. Also, many younger farmers were probably drafted into military service. Some farmers went elsewhere in search of comparable farming land. Ms. Dorothy Bohnsack recalls that "these farmers had to find a different area if they were going to stay in farming, and a lot of them went into Columbia County (east of us) toward Milwaukee because the soil was better, more like what they had here" (Dorothy Bohnsack, interview 1995).

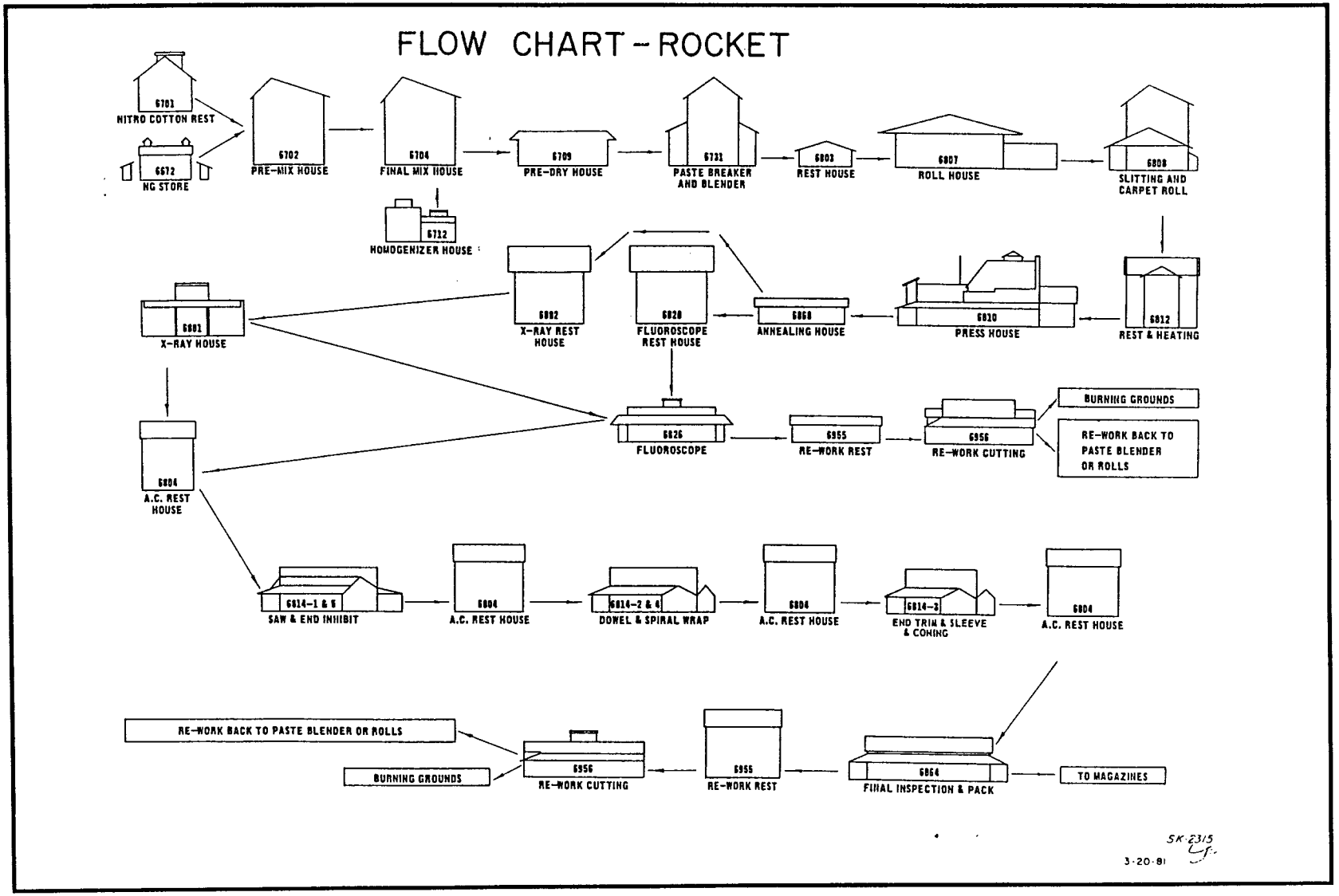

Figure 37. Rocket propellant flow chart for production during Southeast Asia Operation.

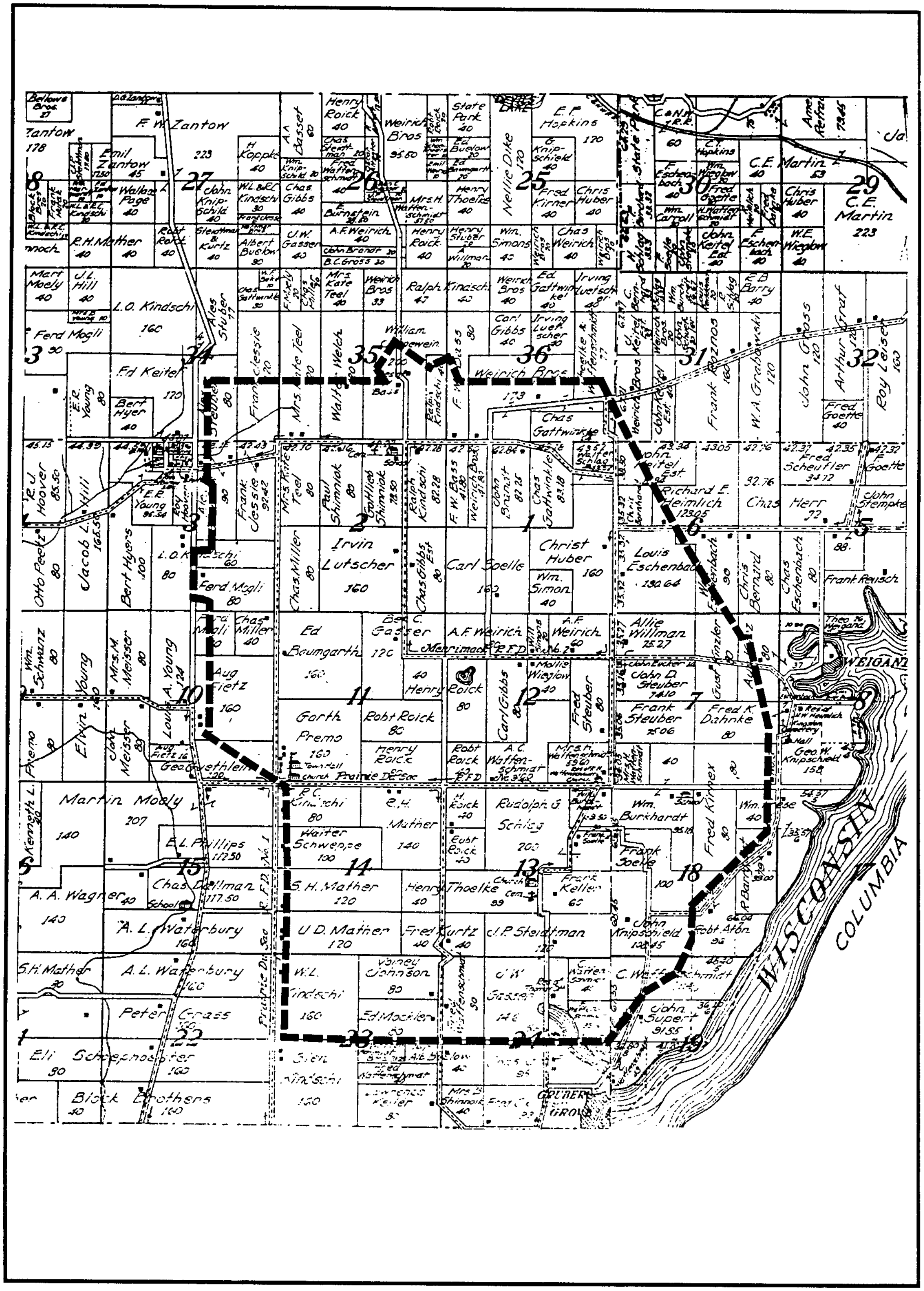

Figure 38. 1922 plat map coverage of BOW (George A. Ogle & Company 1922).

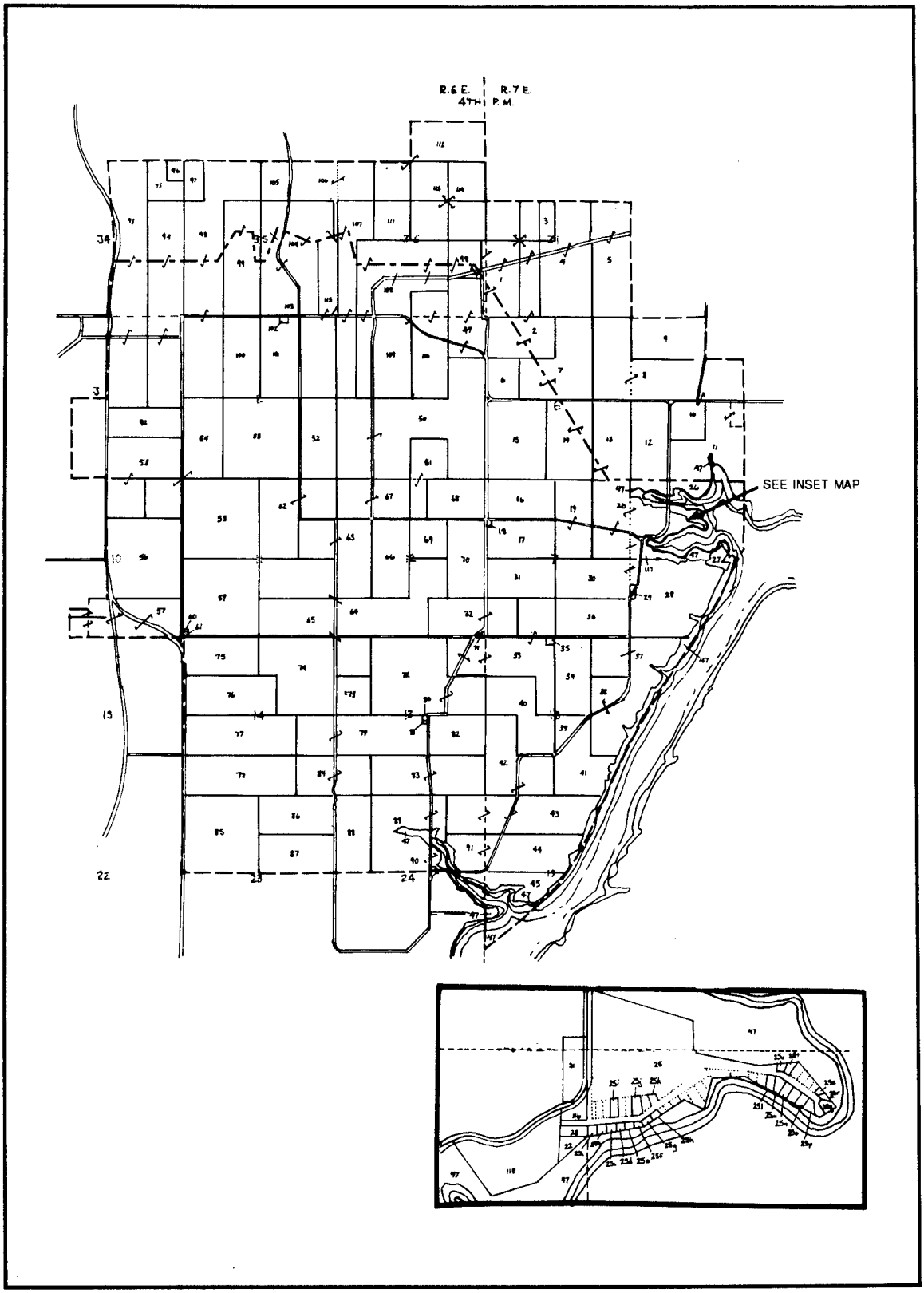

Figure 39. Map showing land ownership prior to government purchase.

Table 3
Property Owners Whose Land was Condemned*

Tract No.	Name of Owner	Acres
1	Henry Weirich	94.05
2	Elmer Keitel	155.63
3	John Stempke	20.00
4	Frank Roznos	159.82
5	Anton J. Pulvermacher	120.18
6	Louise Thoelke	35.32
7	Richard Heimlich	123.05
8	Charles Herr	154.18
9	Fred D. Scheufler	85.72
10	Herbert and Viola Alt	86.95
11	Frank and Ida Reusch	113.03
12	Charles Eschenbach	91.00
13	Christian Huber	80.00
14	Wm. A. Eschenbach	100.00
15	Louis Eschenbach	130.64
16	Raymond H. Wieglow	75.27
17	Louis Eschenbach	74.16
18	John Eucker	1.00
19	Gustav A. Kinzler	80.00
20	Carl A. and Margaret Kunz	115.30
21	George Jenewein	.90
22	Dean Van Matre	.10
23	Rudolph Walter	1.70
24	Frank and Will Eschenbach	5.10
25	Theodore Weigand	8.20
25a	Rudolph and Carl Walter**	
25b	Thelma M. Johnke**	
25c	R. E. Organ**	
25d	Erma C. Miller**	
25e	Fred Kessler**	
25f	Garth and Nora Premo**	
25g	Ralph E. and Bertha F. Thomas**	
25h	William H. and Rachel L. Stoneman**	
25i	R. H. Martin**	
25j	Henry and Eva Pobjoy**	
25k	Mrs. C. Andriese**	
25l	Frank G., Wm. F., and George K. Christ**	
25m	F. M. Asthma**	
25n	Elmer Gishwiller**	
25o	Emily Woods**	
25p	Edward A. and Estella E. Hamlin**	
25q	Lottie Osborne**	
25r	August and Caroline Wittmer**	
25s	Louis and Margaret Hartman**	
25t	Susan, Rose and Fern Asthma**	
25u	Susan, Rose and Fern Asthma**	

Table 3 (cont'd)

Tract No.	Name of Owner	Acres
26	Theodore Weigand	15.99
27	Mathilda Weigand	8.45
28	Kate Knipschield	150.83
29	Kingston Cemetery Association	2.20
30	Emma Kahnke	86.97
31	Frank W. Steuber	75.06
32	Robert Waffenschmidt	94.29
33	Wm. Burkhardt	172.64
34	Louisa Kirner	80.00
35	Joint School District No. 3	1.54
36	Paul Kirner	80.00
37	Louis Frese	103.10
38	Lyman Hatz	76.80
39	John Herr	23.50
40	Wm. B. Reusch	95.17
41	Frank Reusch	79.61
42	Anna M. Knipschield	108.45
43	E.M. Waffenschmidt	156.97
44	Ray Ederer and Caroline Ederer	95.58
45	E. M. Waffenschmidt	44.63
46	Vail E. Thompson	5.50
47-47e	Wisconsin Power and Light Co.	319.00
48	E. M. Waffenschmidt	36.83
49	Walter Schlag	80.35
50	Christian Huber	320.00
51	Wm. H. Simon	60.00
52	Katherine (Block) Patrick	80.00
53	Irvin Luetscher	160.00
54	Wm. P. Ballweg	120.00
55	Anna M. Magli	120.00
56	John Ehret	176.25
57	Jennie M. (Johnson) Spoors	99.75
58	Bertha Roick	160.00
59	Garth N. Premo	158.97
60	Town of Sumpter	.28
61	Trustees of the M. E. Church	.75
62	Benjamin C. Gasser	120.00
63	Mary J. Roick	120.00
64	Virgil H. Roick	220.00
65	Mary J. Roick	118.33
66	Carlton E. Gibbs	80.00
67	Arthur Weirich	80.00
68	Arthur Weirich	60.00
69	Wm. E. Wieglow	40.00
70	Fred H. Steuber	80.00
71	Trustees of the 1st German Independent Christian Ass'n.	.60
72	Clara Schlag	200.00
73	Virgil H. Roick	41.67
74	Roy H. Mather	140.00
75	Roy C. Kindschi	80.00

Table 3 (cont'd)

Tract No.	Name of Owner	Acres
76	Edwin Schweppe	100.00
77	Swain H. Mather	120.00
78	Alvin W. Hoppe	120.00
79	Harold Thoelke	139.00
80	Trustees of the Emmanuel Evangelical Church Ass'n.	.63
81	Thoelke Cemetery Association	.37
82	Martha Bauer Henry	60.00
83	Julius C. Steidtmann	120.00
84	Fred W. Hurtz	80.00
85	Walter L. Kindschi	160.00
86	Bernard L. Oelke	80.00
87	Edward G. Mochler	80.00
88	Fred Waffenschmidt	80.00
89	Jacob W. Gasser	143.90
90	Joint School District #5	1.10
91	Fred Waffenschmidt	38.80
92	Lyman O. Kindschi	140.00
93	Alex W. Steuber	249.30
94	George Carpenter	212.43
95	Charles Gattwinkel	30.00
96	Wm. F. Baker	10.00
97	Anna M. Magli	20.00
98	John Leutscher, Jr.	262.10
99	Walter J. Welch	120.00
100	Paul Shimnick	82.16
101	John Shimnick	79.83
102	Trustees of the Pioneer Cemetery Association	2.25
103	Joint School District No. 1	1.10
104	Edward F. Shimnick	198.00
105	Henry and Charles Weirich	33.00
106	Ralph M. Kindschi	210.28
107	Floyd K. Bass	121.25
108	Henry and Charles Weirich	212.75
109	Otto G. Erickson	82.84
110	Charles Gattwinkel	110.18
111	Carlton E. Gibbs	41.00
112	Henry and Charles Weirich	120.00
113	Harold Thoelke	80.00
114	Irvin Luetscher	80.00
115	Frank Bass	1.00
116	Wm. Eschenbach	.34
117	Frank and Will Eschenbach	3.10
118	Frank and Will Eschenbach	2.00

* Source: Final Project Ownership Map from December 11, 1945. On file, Drafting Department, Badger Army Ammunition Plant, Baraboo, WI.

** Property owners who owned small house lots located around Weigand's Point. Total acreage per tract was .10 acre.

Throughout its operation of the BOW, Hercules Powder Company carried on a campaign to seasonally employ local farmers. One advertisement stated, "You're doing a great job now on the farm . . . But how about arranging your affairs for this fall and winter so you can make this all important powder . . . Without your help we'll never meet the demands of our fighting men . . . Remember, after Germany collapses, we'll still need powder to lick the Japs" (*BNR* 16 November 1944).

Boomtown Phenomenon

At the center of today's popular view of the war is a picture of a rich, united, and confident U.S. It is this vision of homefront strength and prosperity that makes the war era appear to have been a golden age (Adams 1994:114). This golden view of the U.S. is in part accurate. The U.S. gross national product increased 60 percent during the war, and, while living costs rose only 30 percent, total earnings went up 50 percent (Adams 1994:114).

This prosperity, however, produced conflicting results. Accompanying the war-time boom was a general public willingness to conserve, that, in turn, brought on a large decrease in total consumer expenditures (Walton 1956:139). This decrease, however, was due in part to limited availability because of rationing. As war-related industries were established in various parts of the nation, the boomtown phenomenon appeared, seemingly overnight, instigating radical changes in the surrounding vicinities adjacent to the facilities. The composition of the area populations underwent dramatic shifts as thousands of families were uprooted and internally disrupted when their lands were bought by the government.

Conversely, these areas near the facilities became host to huge migrant populations, many of whom were attracted by high factory wages. Some were farmers displaced by the construction of army camps and manufacturing plants (Adams 1994:114). Others were floating workers from collapsed small businesses and economically depressed small towns. The newcomers to war-boom communities, whose families were frequently crowded into insufficient and poorly maintained housing, often encountered hostility from the long-time residents (Walton 1956:138).

Like other areas across the country, Sauk County became a boomtown area, complete with prefabricated houses and the other vestiges that accompanied such growth. Badger Ordnance Works was connected by paved highways to Baraboo in the northern portion of the county, to Sauk City in the southern portion of the county, and to Madison, 30 miles to the southeast. While war work rejuvenated the regional economy, it also brought on problems in housing, transportation, and child care. The transportation and child care problems were addressed and, for the most part, favorably resolved. Housing, like the employment problem, plagued BOW throughout its World War II, Korean, and Southeast Asian operations.

Inspection of the proposed site was made by Hercules Powder Company representatives, and on November 8, 1941, authorization to proceed with an aerial survey was given (HPC 1945a:44). Within several months, an army of construction workers had transformed the original rural landscape into an enormous industrial site. The oral history informants who saw the plant site during construction remember conditions being somewhat chaotic. Mr. Howard Rittmann, former production worker at the plant, also worked on construction. He says he did "common labor" and worked from 4 pm to midnight. He received "excellent pay" (about $.75 per hour), but remembers "there was a lot of wasted time" during construction. "If it was rainy and nasty, it was very muddy. And the roads weren't constructed; they were just gravel paths. But it wasn't too bad. Of course, there was a lot of construction going on all over . . . " (Howard Rittmann, interview 1995). Mr. Allen, who also worked briefly on plant construction, remembers that

> [i]t was awful disorganized as far as I was concerned. I remember in the fall of the year, it was cold, and there was snow on the ground. . . . They were pouring a lot of concrete and they didn't want that to freeze so they built a tent over [individual building sites] and put these charcoal salamanders [small

> charcoal-burning heaters to prevent concrete from freezing] in there. Well, I was going around keeping the fires going. Every building is designated by a number. A guy came by . . . he had to load lumber or something there one night, and he said, 'Where is such-and-such a number?' I said, 'I don't know. I'm fairly new here; I don't know where that building is.' He was gone for a couple hours. Pretty soon he came back. He said, 'This is [the building] I was looking for!' [Floyd Allen, interview 1995].

In mid-January 1942, Major Griffith, the plant commanding officer, visited the site and several days later a list of employment requirements was published in the local Baraboo newspaper (*BNR* 1 January 1942, 14 January 1942). The employment requirements included the passing of a physical examination, the presenting of an original birth certificate, and being fingerprinted and photographed for an employee identification badge. All six oral history informants interviewed during the course of this investigation stated that they had "had no idea" what jobs at the new plant would be like. Nevertheless, they took jobs at the plant for a number of reasons. Mr. Allen stated that "nobody knew what a powder plant was like. Nobody around here had ever seen one. . . . I had visions of one big large factory-type thing, instead of sprawled out. . . . My old job was practically all outside, and in the wintertime I was getting pretty sick of that working outside. I thought at least I'd be in where it was warm. That was one of the big things" (Floyd Allen, interview 1995). Another worker remembered: "All I knew was [the plant did] something with powder. . . . It was a job, and I thought, 'all I can do is try it' because I had only been [working] mainly part-time, and I wasn't getting any savings saved up at all. I thought, if I don't go somebody else is going to be going" (Dorothy Bohnsack, interview 1995). Although some of the oral history informants expressed concern that jobs at the plant would only last as long as the war, the promise of high wages was tempting, especially since most still suffered emotional and financial hangovers from the Depression era. Mr. Floyd Allen said that he made twice as much money at the plant as he had at his prewar job (Floyd Allen, interview 1995). Ms. Laverna Hackett had several reasons for seeking a job at BOW:

> My husband was employed there. I felt a patriotic effort. I knew that my children would be adequately cared for. . . . I was sitting home hours on end not feeling like I was contributing anything. And, of course, my husband and I being newly married, we wanted to establish some kind of a savings account to start building up something for the future [Laverna Hackett, interview 1995].

On January 11, 1942, Major Griffith asked for the cooperation of local residents in providing housing. Except for the Sauk Prairie farmers, the Sauk County inhabitants appeared to welcome the powder plant and cooperated with government officials, especially in the area of housing for construction and operating personnel. Ms. Dorothy Bohnsack remembers the arrival of the construction workers:

> The federal government sent someone to each home to see what room they would have available. Madison at that time was only probably 40-50 thousand, and Baraboo wasn't that large. So, what were they going to do with these people? I came home, and [my mother] said, 'You're going to have to give up your bedroom.' I said, 'My bedroom?' We've got three rooms upstairs . . . and had to put up an outdoor stairway. Most of these people had just come out of this hard depression and were just happy to have a bed to sleep in. Mom put a rollaway there where my writing desk is [in her present dining room on the first floor of her house]. The people upstairs, all of them had children, needed two bedrooms at least [Dorothy Bohnsack, interview 1995].

Ms. Bohnsack recalls that she and her family had little contact and little conflict with the newcomers living in their home. The Bohnsack family didn't eat with the workers, but did have to share bathroom facilities with them. "They had a cookstove upstairs. We had an icebox. The only one that shared our refrigerator was Phoebe from Michigan [she was living in their car garage]" (Dorothy Bohnsack, interview 1995). Although contact between the Bohnsack family and their "roomers" was relatively minimal, Ms. Bohnsack tells the story of a friend of hers who became very acquainted with a worker living in her home:

> She lived down the road from me, and that's how she met her husband. He was from the east, and he came with the army. They brought army people in to help build the plant, and that's where she met her husband. He was living in her house [Dorothy Bohnsack interview 1995].

Most local people got along well with the newcomers, but some were apprehensive about the influx of strangers. According to Ms. Bohnsack (interview 1995), "Sauk [City] was only one thousand in population, and I think it was such a shock. I think people were afraid of what we were going to be getting into with all this influx of people. What are they going to be like? What are they going to demand?"

County tradesmen welcomed the new plant as a source of steady employment. They were, however, concerned about losing jobs to incoming workers. In mid-January, a central office for the newly established local Building Trade Council was founded with a priority of providing jurisdiction for local workers on plant construction work (*BNR* 15 January 1942).

Actual construction of the plant began on February 12, 1942. Peak employment at similar plants had indicated that as many as 22,000 construction workers might be employed. However, less than half of the number of workers anticipated for the peak construction period were actually employed. Actual peak construction employment, which occurred in August 1942, was approximately 11,000 workers (HPC 1943b:240). Interestingly, this included a group of Winnebago tribe members. At this time, the combined employment of all Mason & Hanger and Hercules Powder Company personnel was 12,642. Numerous workers commuted to the construction site. Approximately 20 percent had round trips of 60 to 80 miles per day, five percent traveled 80 to 100 miles per day, and another five percent journeyed 100 to 120 miles per day (HPC 1943b:241).

Before actual construction activities on the site were started, little planning had been done by the government and the surrounding communities. In February 1942, new arrivals to the community consisted chiefly of administrative and office personnel. Many of these people had come with their families and were prepared to stay for the duration of the construction and operation of the plant. The normal surplus of vacant homes, apartments, and rooms was soon absorbed. Therefore, most of the construction workers subsequently encountered difficulties in finding local temporary homes and lived in a variety of dwellings provided by the government, private investors, and private individuals. These facilities included government trailer camps, barracks, tents, rooms, and housing projects, as well as government staff housing for key operating personnel (HPC 1943b:244). As construction at BOW continued until V-J Day, the construction workers competed throughout the war years with the operating personnel for available housing.

As the housing situation worsened, local towns and communities cooperated to the fullest extent in the spirit of common benefit of the war effort and also for financial gain (HPC 1943c:50). Many home owners who had never before provided rooms for transient workers now made space available. Although the number of employees was influenced by the erratic delivery schedules of construction equipment and supplies, all available quarters were utilized for those construction workers who could be kept working.

A government trailer camp was set up several miles to the south of the plant in Prairie du Sac, with the first tenant moving in on October 28, 1942. This camp consisted of 250 trailers, of which 200 were the two double-bed type renting at $6.50 per week and 50 were the three double-bed type renting at $7.50 per week (HPC 1943b:243). Over the four-month winter period, the camp had a maximum occupancy of 80 percent. The availability of summer cottages on the rivers and lakes in the area and the decreasing construction force reduced the patronage at this location. Unfortunately, the trailer camp was not available until 60 days after peak construction employment. Other housing enterprises such as converted buildings and tent camps soon came into existence. These provided housing for both construction workers and for operation personnel after the peak employment of the construction workers had passed.

As a result of the Davis-Bacon Act, all wage scales were set by the U.S. Department of Labor on the basis of data that included a study of wage conditions in the locality, data submitted by the War Department, and information provided by the Department of Labor. Wage rates were to be considered prevailing for a period of 90 days and were inserted in the specifications of contracts. Periodic changes in some wage rates resulted in misunderstandings among contractors and tended to increase labor turnover (HPC 1943c:33). Shortages of skilled labor were serious delaying factors at all times during the construction of plant facilities. It was estimated during the early construction phase that surplus workers could be obtained from war-oriented projects which would be ending in Madison. However, progress on the Madison projects was not as rapid as originally anticipated and the BOW project entered its peak construction period with a serious labor shortage (HPC 1943c:34). Also, workers showed a preference for jobs in the Madison area as higher wage rates were paid. These higher rates prevailed because the Army assumed the role as architect-engineer-manager on many Madison projects and could meet periodic wage scale changes promptly. A sample wage scale for the BOW project, set by the Department of Labor effective December 9, 1942, is shown in Table 4.

The many effects from the construction- and operation-era booms were felt by the local communities. This is especially true of the road system and transportation infrastructures. Employee transportation to and from the project site was furnished by private car, government and commercially operated bus lines, and shuttle train railroad service (Figure 40).

On May 8, 1942, passenger train service was inaugurated by the Chicago and Northwestern Railroad Company between Madison and BOW for employees only. Fares were set at 20 cents each way. On June 1, 1942, this service was supplemented by an additional shuttle train operated by the Chicago, Milwaukee and St. Paul Railroad. After two months of operation, this latter train was discontinued due to a lack of patronage (HPC 1943c:47). The efficiency of rail passage was limited by the railroad equipment available and the idle time of railroad equipment and personnel. Further restrictions on rail passage were the time lost by patrons in Madison in getting to and from depots and the necessity of arranging train schedules to accommodate overlapping work shift times at BOW (HPC 1943b:242).

The Baraboo Range Transportation Company operated commercial buses from Sauk City, Prairie du Sac, Madison, Wisconsin Dells, Portage, and Baraboo, with round trip fares of $2 per day from Madison and $1.20 per day from Baraboo (HPC 1945a:384). Later, the Diamond Transportation Company also operated bus routes to and from the plant. For all their efforts, commercial bus lines were unable to adjust runs to accommodate an appreciable number of workers (Figure 41). On July 14, 1942, the Wisconsin Public Service Commission revoked the franchise of the Baraboo Range Transportation Company because of failure to fulfill franchise provisions. The Baraboo Range Transportation Company fleet of 12 buses was purchased by the U.S. Army and turned over to Mason & Hanger for operation (HPC 1943c:47). Additional buses were purchased later and bus routes to and from the plant were added until 32 buses were in daily use on 67 runs operating in a radius of 50 miles from BOW, contacting 47 towns and carrying approximately 1,400 passengers daily. The purchased buses were 29-passenger Ford vehicles. They carried very heavy loads, often numbering 55 passengers; however, an eventual limit of 44 passengers was adopted for safety reasons (HPC 1945a:387). The bus fleet grew with the addition of 12 more 29-passenger international buses. Operations, however, continued to be carried on under less than favorable conditions. In the fall, roads to the plant were almost impassable due to mud. Passengers and drivers suffered much discomfort as buses were not properly equipped or heated in winter (HPC 1945a:388). The operation of buses was taken over by Hercules on February 1, 1943, and a year later, the company came to an agreement with Greyhound to add its bus services to BOW.

Staggering the work shifts became necessary to prevent dangerous peaks of automobile traffic. This was an important consideration prior to December 1942 when gasoline rationing began, as a large percentage of workers depended upon privately owned automobiles for transportation (HPC 1943b:242). Transportation studies conducted by Hercules during the spring of 1943 revealed that a large majority of all employees

Table 4
Wage Scale for Sauk County as of December 9, 1942*

Position		Hourly Wage
Asbestos workers		$ 1.35
Asbestos improvers:	1st year	0.75
	2nd "	0.85
	3rd "	0.95
	4th "	1.00
Asphalt rakers		1.00
Asphalt shovelers		0.85
Blacksmith		1.00
Blacksmith helpers		0.75
Blasters, powdermen		1.10
Boilermaker		1.50
Boilermaker helpers		1.375
Bricklayers		1.375
Carpenters		1.15
Carpenter apprentices:		
1st 6 months 45% of Journeyman's rate		
2nd 6 months 50% of Journeyman's rate		
3rd 6 months 60% of Journeyman's rate		
4th 6 months 70% of Journeyman's rate		
5th 6 months 80% of Journeyman's rate		
6th 6 months 90% of Journeyman's rate		
7th 6 months 95% of Journeyman's rate		
8th 6 months 100% of Journeyman's rate		
Cement finishers		1.15
Curb setters		1.15
Electricians		1.38
Electrician apprentices:		
1st year - optional		
2nd year 1/3 of Journeyman's rate		
3rd year 1/2 of Journeyman's rate		
4th year 2/3 of Journeyman's rate		
Elevator constructors		1.37
Elevator constructor helpers		0.96
Fireman and Oilers		1.00
Glaziers		1.15
Iron workers, structural		1.50
Iron workers, ornamental		1.50
Iron workers, reinforcing		1.375

Table 4 (cont'd)

Position	Hourly Wage
Jackhammerman	1.00
Laborers, building	0.75
Laborers, unskilled	0.75
Lathers	1.30
Machinists	1.25
Machinist helpers	0.90
Marble setters	1.375
Marble setter helpers	0.75
Mason tenders	0.75
Mortar mixers	0.85
Mechanics, repairmen	1.25
Mechanic helpers	0.90
Millwrights	1.15
Operators of power equipment:	
air compressors	1.10
asphalt plant	1.65
backfillers	1.50
bulldozers	1.30
concrete mixers, on buildings	1.30
cranes, derricks, draglines	1.65
finishing machines	1.35
hoists	1.35
motor graders	1.50
piledrivers	1.45
pumps	1.05
rollers	1.65
pavers	1.50
Le Tourneau scrapers	1.50
shovels	1.65
tractors	1.30
trenching machines	1.65
Painters, brush	1.10
Painters, structural steel	1.20
Painters, spray	1.25
Pipe Layers	0.85
Plasterers	1.375
Plasterers tenders	1.00
Plumbers	1.375
Plumber helpers	0.75

Table 4 (cont'd)

Position	Hourly Wage
Riggers: receive rate prescribed for craft-performing operation to which rigging is incidental.	
Roofers, composition	1.15
Roofers, slate and tile	1.25
Sheet Metal workers	1.25
Sheet Metal apprentices:	
1st 6 months 35% of Journeyman's rate	
2nd 6 months 40% of Journeyman's rate	
3rd 6 months 45% of Journeyman's rate	
4th 6 months 50% of Journeyman's rate	
5th 6 months 55% of Journeyman's rate	
6th 6 months 60% of Journeyman's rate	
7th 6 months 70% of Journeyman's rate	
8th 6 months 80% of Journeyman's rate	
Soft Floor layers (linoleum)	1.15
Steam Fitters	1.375
Steam Fitter helpers	0.825
Stone Masons	1.375
Tank builders	1.50
Tank builder helpers	1.25
Terazzo workers	1.30
Terazzo worker helpers	0.90
Tile setters	1.25
Tile setter helpers	0.75
Truck drivers	0.75
Welders: receive rate prescribed for craft performing operation to which welding is incidental.	
Well drillers	1.25
Well driller helpers	1.05
Waterproofers, dampproofers	1.15

* Set by the U.S. Department of Labor - Effective December 9, 1942 (HPC 1943a).

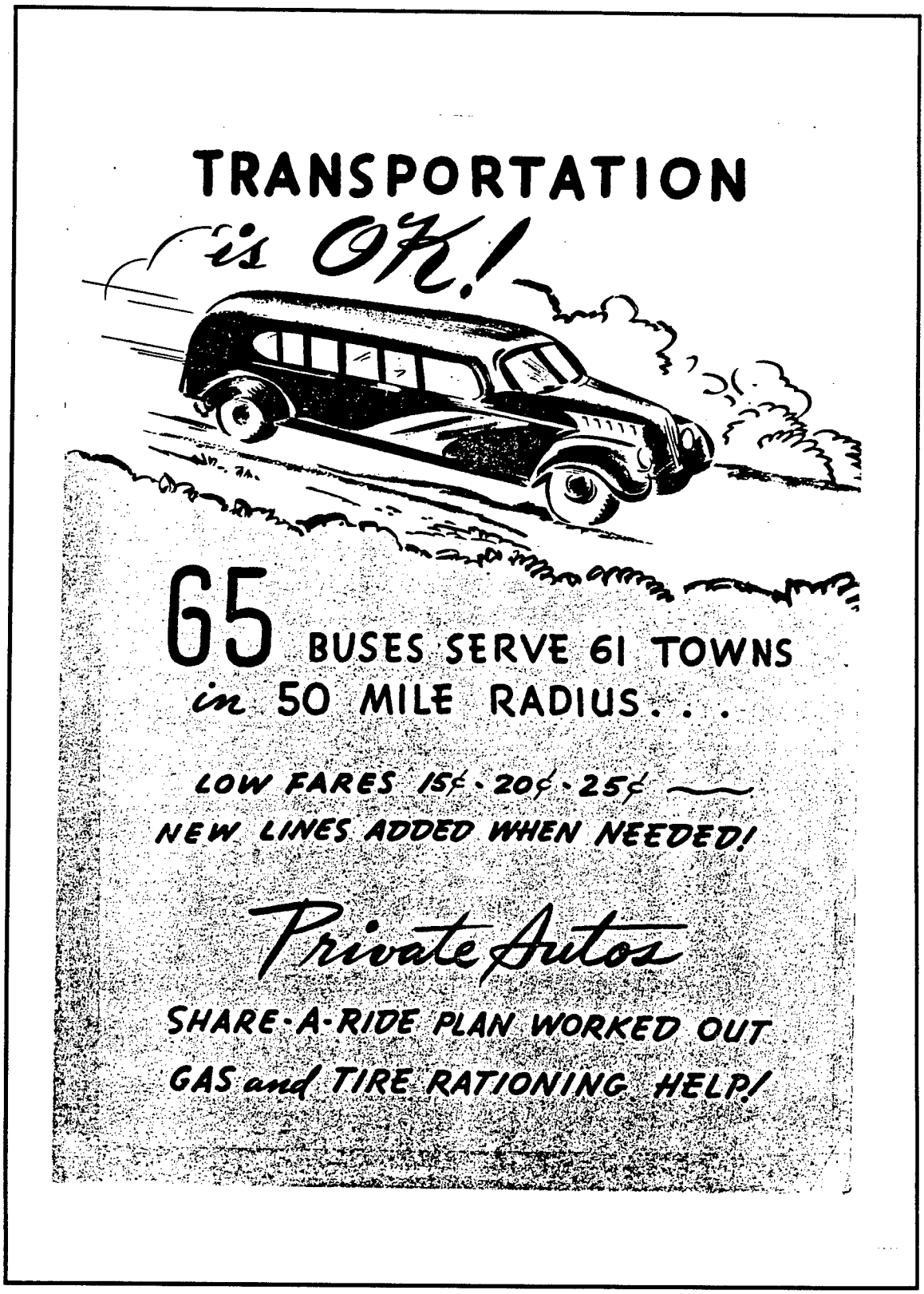

Figure 40. Transportation flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

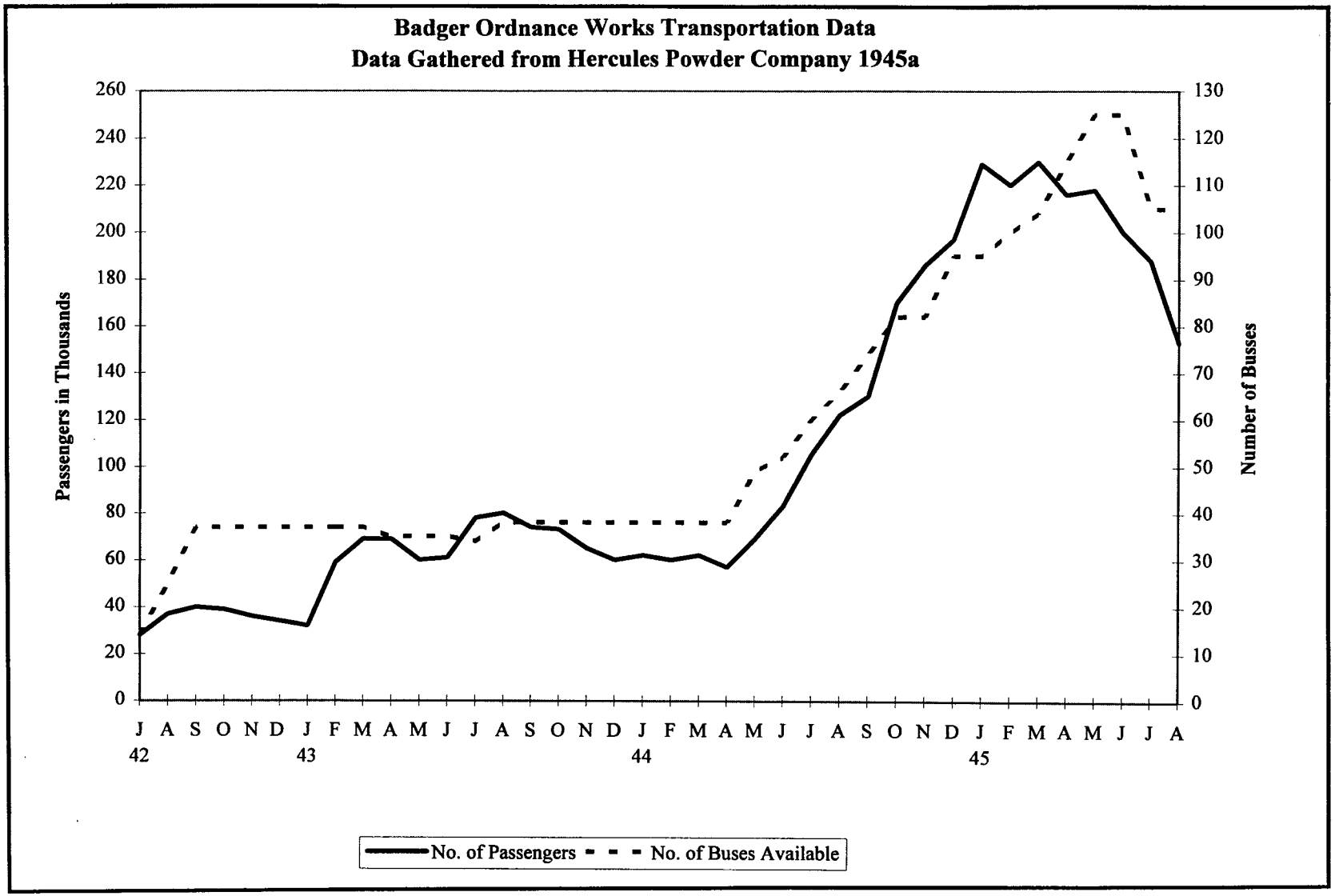

Figure 41. BOW transportation data statistics (Hercules Powder Company 1945a).

commuting to the project area in private automobiles pooled rides in most cases and averaged 3.5 persons per car (HPC 1943c:48-49). Car pools increased with the advent of gasoline rationing. In all cases where proof of ride sharing was produced, gasoline rationing coupons were provided to the automobile owners in sufficient amounts for occupational driving.

To permit two parallel lines of traffic through the congested area along the west side of the plant, the Wisconsin Highway Department constructed 14 miles of new concrete highway along Highway 12 in the spring of 1942 (HPC 1943c:46). This became Wisconsin's first four-lane highway (*WSJ* 8 December 1991). Commuter traffic safety, though, remained a high priority for both government and Hercules officials. While automobile safety training was an integral part of accident prevention, accidents continued throughout the operation of the powder plant. The first serious bus accident occurred on the morning of March 13, 1943. Five miles south of the plant site, during foggy and icy conditions, a bus collided with a semi-trailer truck (HPC 1945a:398). Two additional buses and two cars slid into the wreckage. The driver of the bus that hit the truck was killed and four riders injured. Another bus accident, three-quarters of a mile west of Lyndon, Wisconsin, killed a woman on April 3, 1945 (HPC 1945a:398). Minor bus accidents also routinely occurred causing no injuries but some damage to buses, cars, and an occasional mail box (HPC 1945a:398) and were blamed on automobile drivers, weather, and the bus drivers avoiding major accidents. Speed limits were established with a maximum speed of 50 miles per hour for passenger vehicles, 40 for trucks, 25 for all vehicles on the plant area, and 20 in congested areas (*BON* 10 April 1942).

As with other war production boom areas, Sauk County had its share of negative side-effects. The effects on the local economy, however, were favorable. The increased employment at BOW meant that less money was being paid out in public assistance. Laborer, watchman, surveyor's assistant, typist, restaurant and hotel worker, taxi driver, and store clerk were the most common jobs reported in the county, with wages ranging from $60 to $120 a month (*BNR* 14 March 1942). These jobs were reported mostly by younger workers. It was anticipated that older people requiring financial assistance would be able to support themselves working at the plant or by providing rooms and/or board to the incoming workers. Ms. Laverna Hackett (interview 1995) remembers: "I know my mother at that time was a widow. . . . She boarded fifteen men. She cooked for them every day. Five of the men stayed at her home, but then the other gentlemen all had rooms in the neighboring houses. [It was] quite common. She was compensated [for that]." Mr. Floyd Allen (interview 1995) recalls the increase in business in Baraboo and how some local business owners were able to profit during the construction period:

> Some [of the construction workers] would go home for the weekend, but the theater was swamped most of the time. If you wanted to go to a movie, you had to stand in line to get in. Of course, that was true in the grocery store or wherever you went; you were standing in line.

Ms. Dorothy Krueger, former production worker at BOW, also recalls how the local community profited from the influx of workers. Although she had never worked much outside the home, Ms. Krueger was called to waitress at a cafe because it was becoming very busy in the afternoon. "Before I went to work [at the plant], I worked some at a cafe. [Someone at the cafe] called me up and I worked from 4 in the afternoon until about 8 to take care of [the construction workers] coming in for supper" (Dorothy Krueger, interview 1995).

Wartime Operation

The process of starting up production was slow due mainly to construction delays. Construction crews were still heavily engaged at the BOW when operators and supporting personnel began work at the manufacturing facilities. The bustle and confusion of the newly built industrial site was increased as facilities were finished and turned over to Hercules Powder Company for operation. By November 1, 1942, the construction needed

to start some operations was complete. The peak of operating employment was reached in June 1945, when 6,688 total employees were on the payroll (HPC 1945a:526).

The plant was in operation 24 hours per day, seven days a week. Everyone was on shift work. The day shift went from 8 am until 4 pm; the "swing" shift was from 4 pm to midnight; and the graveyard shift went from midnight to 8 am. Many of the oral history informants said that they alternated shifts every two weeks or so. Some had difficulties adjusting their sleeping and eating schedules accordingly. Mr. Allen stated that he "never got used to going to work at midnight and working all night long. I never learned to sleep in the daytime. So at the end of that two weeks I was kind of bushed" (Floyd Allen, interview 1995). Mr. Elroy Hirsch, former guard at BOW, said that "working from 12 at night 'til eight in the morning, that was tough. You'd sit up in these guard shacks. . . . You had a flashlight, and the squad car came around (they patrolled inside the fence). As the squad car approached, you had to take your flashlight and blink it to let them know you were awake. They would flash their spotlight in acknowledgment, and then go on down to the next tower" (Elroy Hirsch, interview 1995). Mr. Hirsch also said that guards changed towers every two hours or so during the graveyard shift in order to keep themselves awake. Mr. Hirsch jokingly added: "One good thing--when you had the graveyard shift, you made the money and you were too tired to go out and spend it. You saved it all. It was perfect" (Elroy Hirsch, interview 1995).

Many of the former employees interviewed during the present investigation said that they met new people and were able to cultivate close friendships working at the plant during World War II. However, Ms. Krueger, who worked on the production line, said, "[a]t my job, the machines made so much noise, you couldn't talk [with anyone]. If anybody wanted to talk with you, they had to come up right beside you. You couldn't talk to the guy at the machine next to you at all. It was just like working alone all day" (Dorothy Krueger, interview 1995). Since the monotony of assembly line work could not be eased with friendly conversation, Ms. Krueger invented her own way of coping with the long hours: "The only thing you have to do when you have a job like that is to do better than you did the day before. You have to have a challenge, I think, to work for. That's how I feel about it" (Dorothy Krueger, interview 1995).

Mr. Hirsch stated that he had some problems when he first came to work at the plant as a guard. As a 19-year-old college student, some of the older men working at the plant wondered why he wasn't in the military. "I thought there was a resentment: 'Here's a college kid up here, taking this job.' I think that's normal when the guys' average age was 40 or 50, and here comes a kid 18 or 19 years old and making the same money. 'Why aren't you in the service, a healthy kid like you?'" (Elroy Hirsch, interview 1995). He said he was also teased about the possibility of espionage or an Axis attack, which made him admittedly nervous when he first started his job. He says that in the end, however, he got along fine with his co-workers.

The operating personnel had experiences during their employment at BOW similar to those of the construction-era workers. As the war-boom had affected the lives of the construction workers, it similarly affected the plant operation employees. The boomtown plights of housing and transportation continued as the operation employment rose.

As surrounding towns and villages used all available space for additional living quarters, a housing development sprang up on the east side of Highway 12, adjacent to the plant. Construction, which amounted to $1,300,000, was started on this federal housing project on December 23, 1942 (HPC 1943b:243). Although the construction schedule called for completion within 90 days, this was not met due to rains and mud (Mueller 1982:1). The development, called South Badger Village, included 500 living units in 80 demountable one-story row houses, 48 no-bedroom (efficiency-type) single family units, 324 two-room single family units with a part curtained off for a bedroom, and 124 two-bedroom single family units (Mueller 1982:2). Housing costs were fairly reasonable, with a two-bedroom row-house unit renting for $29.25 per month (HPC 1943b:244) and a single family home selling for approximately $2,500 (Mueller 1982:2).

Ms. Laverna Hackett lived with her husband and two sons at Badger Village during World War II. Her husband had decided to take a job at the plant due to the excellent wages that the plant offered. They had no car, so they moved to Badger Village to be closer to her husband's job. This move also made it easier for Laverna to get a job at the plant. Among other conveniences, Badger Village provided a nursery that was operated 24 hours per day, seven days a week to accommodate the workers' schedules. Ms. Hackett describes the nursery:

> I was very fortunate because Badger Village had been established and there were many, many families living there with children, and they had an excellent nursery. Whenever my shift would happen to be, I would take my children to the nursery with a change of clothes and they would stay there for the eight-hour shift. When I got home I picked them up. They had nurses there, teachers there. It was a school also. It was a real fun place for the kids. They had built little shelves with little cubicles and [the kids] would take their things and put their things in there. When you'd pick up your children at night, you'd pick up all the little things that they had made during the day and take them home with you.
>
> [My children] liked it. They had excellent supervision, excellent meals. And if anyone ever got ill, they had a nurse. . . . When [my children] were there, I think there were about 30 or 35 children in the class at the same time. They all had little mats on the floor for their nap time, and little beds for their night's sleeping. [The nursery operated] 24 hours a day, seven days a week because we didn't have any particular day off; we worked around the clock [Laverna Hackett, interview 1995].

Appliances at Badger Village were provided by the government and included cooking stoves and heating stoves. Mueller (1982:5) reports that it was impossible to bake bread in the cooking stoves as they did not generate enough heat. During the early years of the BOW World War II operation, "Warm Morning" heating stoves also presented a problem. Kindling was provided from the plant area, and occasionally this kindling was coated with powder. When ignited in the heating stoves, it blew the lids off and scattered firewood and ashes about the residences (Mueller 1982:5).

The limited number of housing units at South Badger Village soon filled up. Numerous social events took place. These were centered around the school administration building. A Parent-Teacher Association, Boy Scouts, Girl Scouts, Campfire Girls, and a Teen-Age Club were organized. Additionally, three church services were held every Sunday morning in the school auditorium. One South Badger Village resident was killed in a plant explosion on July 19, 1945. Explosions were always followed by great anxiety, as all residents had family working at the plant. Residents would appear at their doorways and cluster on the lawns apprehensively waiting for news (Mueller 1982:5).

The area just north of South Badger, called North Badger, was the location of five "H" buildings (barracks) and 15 houses that were the first housing units constructed for the BOW (Figure 42). The barracks were for unmarried operating personnel and each had quarters for 104 individuals. Each barrack building had 60 rooms, a central hallway, and a lounge room that was furnished with upholstered maple furniture. Rooms were supplied with maple furniture including a bed, lounge chair, straight chair, writing desk, and rug. Double rooms included bunk-beds. Daily maid service was provided along with fresh towels, linens, and blankets. Showers and toilet facilities were centrally located in each building. The barracks also included a barber shop, a mess hall, and a heating plant. In the summer month, vacancies at the barracks were caused by the availability of temporary summer cottages on local lakes and rivers.

The houses at North Badger were built for key operating personnel and were also known as "Staff Village." A mix-up in shipments of housing materials supposedly occurred at North Badger. The wooden staff houses were originally designed for the warmer climate of Alabama where another housing development was being constructed. The brick houses that were to have been built adjacent to BOW were constructed in Alabama (Mueller 1982:1).

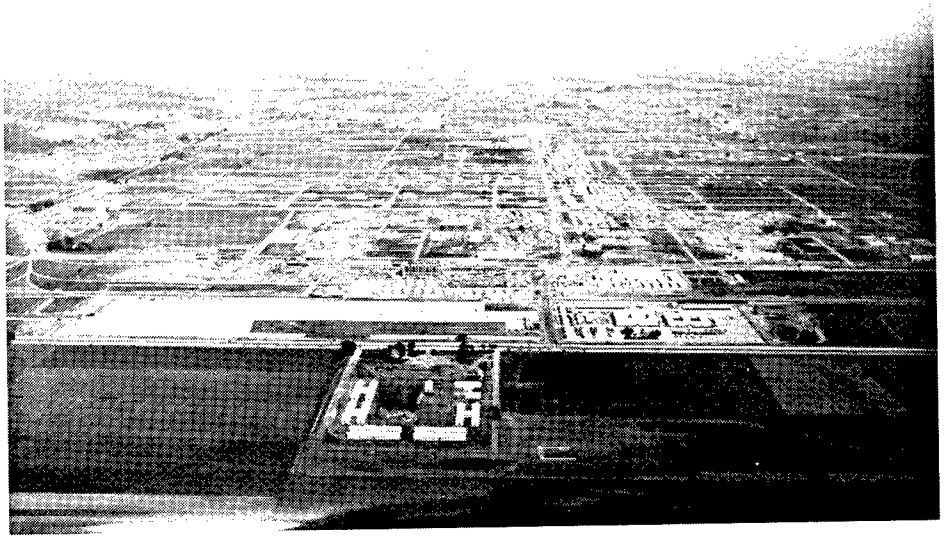

Figure 42. North Badger Village with BOW in background, World War II Operation (original photograph on file, BAAP Library).

North and South Badger Village alleviated some of the housing strain on local communities. Ms. Laverna Hackett remembers Badger Village as a convenient and fun place to live. She describes the living conditions in detail.

> They had barracks there [at Badger Village] for people who were single. It was mostly men that stayed there. [Our homes] were rather poorly constructed and they were in one long unit; there would be several apartments in one unit. You had a kitchen with shelves, no doors on the shelves; you had a living room with a coal-burning stove in it; you had one closet off the living room; and a very small bath. In our case, we had two children, so we only had one bedroom. The floor was mostly plywood. It was adequate, and we were all the same. Everyone had a unit, and everyone lived the same.
>
> We walked to work because they had built a path from Badger Village to the plant, so most everyone walked to work. . . . It was just a black top [path]. And the farmers would put corn [around it]. I was kind of afraid of the dark, so when I would go to work I would start singing, because I always thought if I sing and they hear me, they'd leave me alone . . . because I can't sing. . . .
>
> They had a cafeteria over there at the barracks that was an excellent place to eat; that was also [open] 24 hours. You could go there anytime and eat . . . or just go over there and sit and have coffee. That was kind of a meeting place, too, for most people.
>
> They had a grocery store (a very nice A & P), a drugstore, a pharmacy, a beauty shop for the ladies, a barber shop for the gentlemen, a post office [and a laundromat]. Actually, all your necessities were there. A lot of people didn't have cars, and of course we could not get gas, so it was a common practice for anyone that was going to Baraboo to tack on the bulletin board their name, their unit number [i.e.,

> apartment number], what time they were leaving, and what time they were returning. If you wanted to go with them, you could meet them there. Or if you wanted them to get you something, you could contact them. They would be very happy to do what they could for you because everybody had to work together. I wish I would have kept a diary because it was a delightful experience. Now that I'm this old and I think back on it, it was a delightful experience [Laverna Hackett, interview 1995].

The residents at Badger Village did have their share of problems, but were able to cope by helping each other. Ms. Hackett states that "we had all kinds of problems with water freezing up because the pipes were practically on top of the ground. And people would have fires because they wouldn't take care of their coal stoves. But everybody kind of helped out. If you had a problem or you needed something, somebody was always there to hand it out to you. It was like a big happy family" (Laverna Hackett, interview 1995).

Ms. Hackett also relates a story about the kind of fun and camaraderie that she and other workers shared at the "Village."

> As I say, we had very little activity there because we couldn't go places or do things; we had no means; so we always made our own fun. And I remember there were a group of us that used to get together on holidays, special days. We had no place to go and we had time off so we'd say, 'You come over to my house and have a drink, to celebrate, like New Year's Eve.' So we'd have a couple come over to the house and we'd sit there and have a drink. [Then someone would say] 'Let's go over and see Mary and John.' The four of us would go see Mary and John. We'd do the same thing there; we'd sit and talk a bit and have a drink. [Then someone would say] 'Bill and Jane are down at the corner and I know they're sitting there all alone. Let's go visit them.' So before the evening was over, I think there were about thirty of us squeezed into one of those little tiny units, sitting on the floor, on each other's laps sometimes, but just enjoying it. Having a good time, talking and relaxing. We all worked hard; we spent a lot of time at the plant; we were all very dedicated. But it was a fun time [Laverna Hackett, interview 1995].

Additional housing included a government project in Baraboo, Wisconsin. Thirty houses were constructed with the first being finished in February 1943. Purchase of these houses was restricted by the War Production Board to defense workers, and the prices were fixed at $4,400 to $4,950.

The demand for houses and housing facilities was reflected in many cases by exorbitant rental prices charged to plant workers. During the early phase of the initial construction, the Baraboo Chamber of Commerce tried to stabilize rental rates in Baraboo (*BNR* 31 January 1942). Approximately one year later, the federal Office of Price Administration declared Wisconsin a defense area and froze rent prices as of March 1, 1943 (HPC 1943b:245).

The isolation of BOW, a government requirement for propellant and explosives plants, presented the problem of obtaining an adequate work force. Nearby Baraboo, Sauk City, Prairie du Sac, and Merrimac did not have the population to meet the employment requirements. The U.S. census of 1940 indicated that the total work-force employed in Sauk County was 10,739, of which 15.7 percent were women. Sauk County, with only 1,361 unemployed in 1940, was in a better position with respect to unemployment than the average county in the U.S. However, this group of unemployed people could have provided only a small part of the work force needed for the war-time expansion. A labor survey conducted by Hercules Powder Company just prior to the beginning of construction at BOW indicated that the potential labor supply was approximately 7,000 unskilled and 3,400 skilled and semi-skilled men. This survey was undertaken within a 25-mile radius of BOW and incorporated all of Sauk County and portions of Columbia, Dane, Richland, Iowa, Marquette, Adams, and Juneau counties (HPC 1945a:42).

As the national labor market became acute, the War Manpower Commission began classifying areas into groups: Group I indicated labor shortage; Group II, a balanced demand-supply situation; Group III moderate

labor surplus; and Group IV substantial labor surplus. The following classifications were assigned to BOW: February 1943, Group II; March 1943, Group III; October 1943, Group II; August 1944, Group I (HPC 1945a:511). A review of the *Badger Ordnance News*, the World War II-era plant newspaper, and other contemporary sources indicates a strong employment campaign, complete with war-time propaganda (Figures 43 and 44). With headlines such as "2,000 Workers Needed To Man 'Ghost' Lines" and "Many New Jobs Are Open; More Employees Needed," Hercules Powder Company advertised for operating personnel and support personnel such as secretaries, stenographers, and typists (*BON* 12 May 1944, 8 September 1944).

Tens of thousands of able-bodied young men were called into national service by the draft, which had begun in 1940. Thus, the supply of available factory workers was consequently declining just at the time that industry was expanding. This labor supply shortfall at BOW was partly filled by women, the elderly, and groups of foreign laborers.

During the first decades of the twentieth century, the number of women employed outside the home increased substantially, but much of the advance had come in middle-class occupations such as teaching, nursing, and secretarial work, rather than in the traditionally male-dominated smokestack industries (Wertheimer 1977). Although World War I had drawn hundreds of thousands of women into industry, most did not stay on after the end of the war. World War II brought more women into the work force than ever before. "Rosie the Riveter" became a national symbol, and, by 1944, 31.5 percent of the women in the U.S. were employed outside the home, many in defense work (Bingham 1989:452; cf. Thomson and Mayo 1991:112).

At BOW, former homemakers, store clerks, and typists often found themselves on a production line for the first time. Mr. Hirsch stated that "I would say a lot of [the women] were first-timers. Your work force was in the service. When the war wasn't on, this work force was all home; there wasn't the need [for women to work]. But they filled a great void. They did a great job, too. I don't know what they would have done without them" (Elroy Hirsch, interview 1995).

Women filled in for men in places like the smokeless department, maintenance department, nitro-cotton department, and in the laboratories (*BON* 28 May 1943; Figure 45). In the laboratories, because of stringent draft regulations, it was difficult to hire male technicians. The first female technicians were hired in February 1943 (HPC 1945a:565). Operations in the BOW laboratories began with the assumption that the bulk of routine chemical control would be performed by females, and this was the general practice throughout the World War II operation. It was the general policy to maintain one or two males technicians in each laboratory group for heavier work when needed. The ratio of female to male technicians was 4.6:1 at the end of June 1944 (HPC 1945a:566). The experience of the Technical Department with women was "highly gratifying" (HPC 1945a:566). The women performed their work in an efficient manner and their safety record was outstanding (HPC 1945a:566).

The first woman to work on the manufacturing lines started on March 15, 1943 (*BON* 19 March 1943). On the production lines, the women were described by male supervisors as doing an excellent job and as working hard and observing safety rules as well as the men. Some problems with the women employees did exist. These problems varied from granting an extra day off to leaves of absence for pregnancy, and it was difficult to administer the personal problems and still maintain a close-knit work crew (HPC 1945a:666). Many of the women employed at BOW had husbands and family members in the war and believed the work that they did at the plant had a direct impact on their loved ones' success in battle. Propaganda reinforced this belief. Although the three women interviewed during this investigation expressed some feelings of patriotism as a reason for seeking a war job, most admitted that they went to work for financial reasons more than anything else.

The social problems faced by many working mothers was somewhat alleviated at BOW. Unlike many GOCO plants, child care facilities and other supporting social institutions were readily available if needed. Child care facilities were available at Badger Village to all BOW employees. As BOW was running

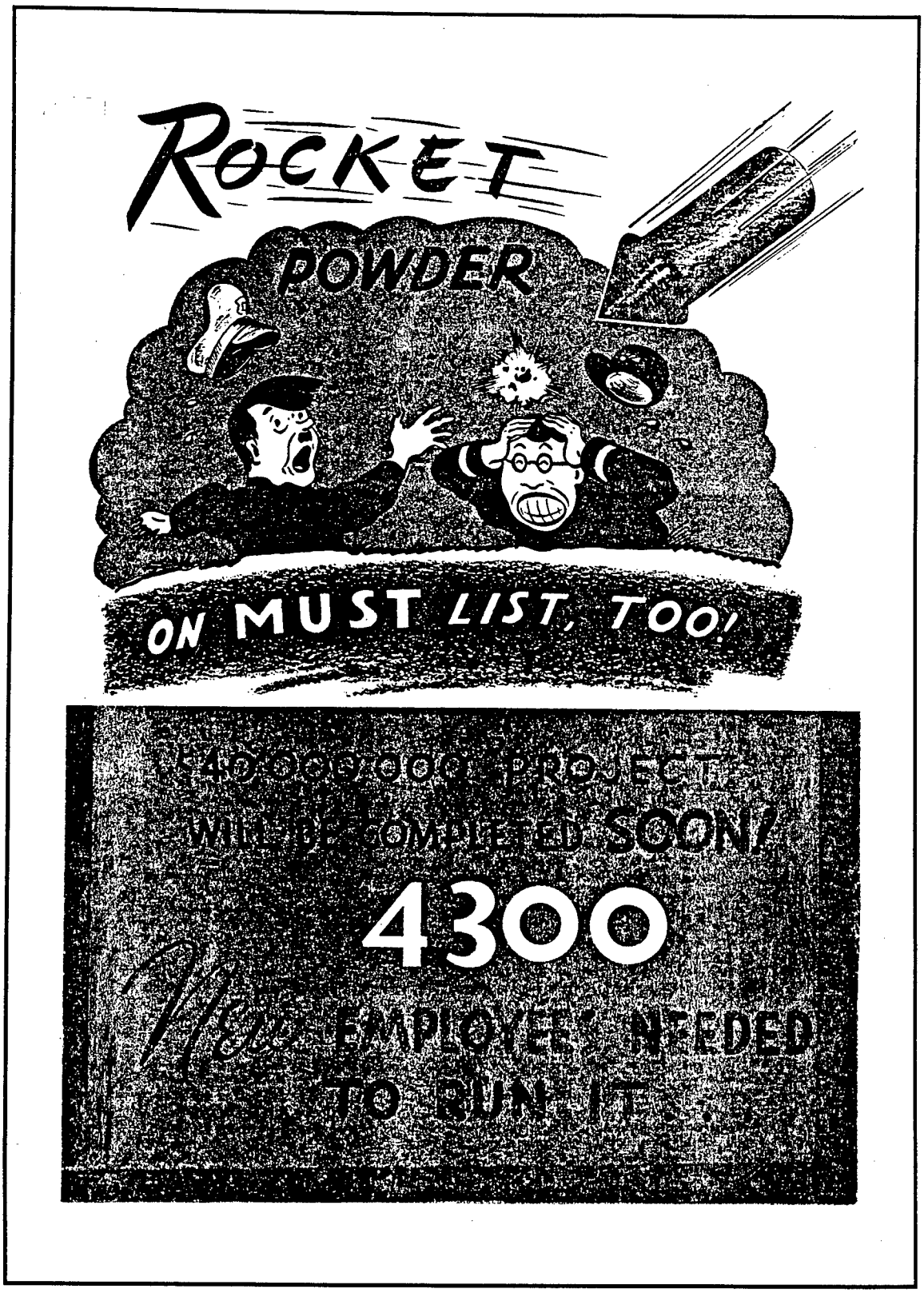

Figure 43. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

Figure 44. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

Figure 45. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

round-the-clock shifts, the well-equipped facility cared for children 24 hours a day, seven days a week (*BON* 21 July 1944; Laverna Hackett, interview 1995).

According to the Hercules Powder Company, there was never any question about the need for the services of a counselor for women employees at BOW and the only question was whether to hire men or women in this position (HPC 1945a:274). Mrs. Aimie White, BOW's first woman counselor, started work on February 1, 1943 (HPC 1945a:274). The duties and responsibilities assigned to counselors consisted of assisting women in getting started in their job positions, being available to help the women adjust, and aiding supervisory staff members in their dealings with the women employees. The counselors were also required to be familiar with the personal problems and affairs of the women employees and to know the jobs and working conditions of the plant (HPC 1945a:274).

Since the worker shortage had become so acute, elderly men and women also played a role in the operation of BOW. Many of the older women had sons fighting overseas and while they felt it was a man's job and not easy work, it was their duty to help (*BON* 8 September 1944). One 48-year-old mother found herself in Sauk County with her working husband. She did not know when she arrived that she would be able to help, but once employed, intended to stay on the job as long as the plant was open (*BON* 8 September 1944). Another 53-year-old mother of three servicemen had heard of the plant while living in Montana. When she came to Wisconsin to meet her sons, she thought it was her place to help win the war (*BON* 8 September 1944).

The Fair Employment Practices Committee was established by the Roosevelt Administration in June 1941 to prevent racial discrimination in defense industries. While the war effort depended heavily on the labor of African-Americans and Hispanics, little has been documented concerning the employment of these groups at BOW. Many of the oral history informants did not recall much about members of different races working at BOW. Some said that they were surprised that members of other races were scarce during construction and production, especially given the plant's constant need for workers. Mr. Allen stated:

> I've often remarked about it . . . we had very few Blacks that worked down there. Quite a few Indians, but a very small percentage of Blacks. I don't know why. . . . There was equal opportunity; they'd take anybody they could get. They were so short of help that [job-seekers] weren't turned away, but why they didn't come in, I don't know. Quite a few of the Indians were from up around the [Wisconsin] Dells. Anybody could get a job; if you could stand up and walk, you could be hired [Floyd Allen, interview 1995].

Because of critical labor shortages during the summer of 1944, it was found necessary to employ foreign workers. Jamaican and Barbadian men, all under 30 years of age and subjects of the British government, were hired by Hercules (*BON* 29 September 1944). On September 23, 1944, the first Barbadians were recruited from the Hoopeston Canning Company in Hoopeston, Illinois (HPC 1945a:522). On September 27, 1944, 128 Jamaicans were recruited directly from their home country (HPC 1945a:522). From that time on, small groups of Jamaicans were hired as the War Food Administration made them available to the War Manpower Commission, who in turn arranged for their employment at BOW. A peak enrollment of foreign workers was reached on October 30, 1944, with 223 on the payroll.

The foreign workers were hired on a 90-day contract that could be renegotiated at its end. A normal turnover rate was experienced with this group. Although they were under contract, homesickness, illness resulting from rigorous winters, and the discharge of several of the less efficient workers made it impossible for some of them to complete their contracts. When the original contracts were approaching their ends in December 1944, attempts were made to renegotiate. As Wisconsin was experiencing a rather severe cold spell, approximately one-third refused to renew their contracts and were released (HPC 1945a:523). The men who stayed on were ordered released by the War Manpower Commission in June 1945 as there was an increase in the availability of domestic labor.

An abandoned Civilian Conservation Corps (CCC) camp was made available to Hercules Powder Company for housing the foreign workers. The camp had accommodations for the 228 men to sleep and eat, but offered little in the way of recreation (HPC 1945a:524). Athletic equipment was provided, and during the winter months when outside activities were generally unpopular with these men, movies were shown twice a week. Dominoes, card playing, and gambling were other means of recreation, but it soon became apparent that gambling had to be abolished because of the high stakes and ensuing trouble (HPC 1945a:526). Probably though, this form of entertainment continued. While these men were well-provided for, Hercules Powder Company was constantly faced with a food problem (HPC 1945a:526). First, the diet approved by the War Manpower Commission was not always to the liking of these men. Second, food shortages made it difficult to obtain the sugar, fish, rice, and other staples these men demanded (HPC 1945a:526).

Although the Jamaicans and Barbadians proved themselves to be willing workers, "they required closer and more careful supervision than the average white worker . . ." and "[i]t was found best to concentrate the Negro workers . . . and to eliminate female operators . . . to avoid racial conflicts and ill-feeling (HPC 1945a:640)." Ms. Laverna Hackett remembers that "[a]t one time during the plant operation, they brought in a group of Jamaicans, and they were housed at the CCC Camp near Devil's Lake. They did work throughout the plant in various areas. [They were] very good workers apparently, and I never heard about any problems with them" (Laverna Hackett, interview 1995).

The work place environment at the BOW was probably not drastically different from that of a comparably large civilian manufacturing enterprise. The development of American manufacturing in the industrial era had been influenced by several factors, not the least important of which was scarcity of labor, which inevitably favored the creation of labor-saving machinery and the standardization of manufacturing processes. Just as important was freedom from tradition, which enabled manufacturers to develop and adopt new methods and products (see Noble 1984).

BOW, like many large defense plants, was a veritable self-contained town, with its own hospital, fire department, water system, telephone exchange, police force, and railway system. A plant newspaper and a Personnel Department which actively organized intramural sports leagues and club activities rounded out the plant's support services.

Considering its highly dangerous products and manufacturing processes, BOW was an efficient GOCO plant in terms of worker productivity and safety (Figure 46). "The plant had a very good safety record," states Mr. Rittmann. "They preached safety to us every week, and sometimes every day. A lot of it you even carried on in your own home. . . . Before you even got inside the door [i.e., before beginning employment] there was a regular class of safety. . . . [People wore] powder shoes that were steel-toed. When we were in the acid area we had to wear wool shirts and pants. Acid would not affect the wool as much as some other clothes. We had to wear goggles whenever we were out in the area" (Howard Ritmann, interview 1995). Mr. Allen recalls a preoccupation with safety that was manifested in the meetings that were held and the clothes that were worn.

> They took every possible precaution. You had an indoctrination as far as safety rules go [when you accepted the job]. That was a constant thing. Practically every week you'd have a meeting where you'd talk about safety. . . . In the acid area, [all clothing] was wool: wool shirts, wool pants, because it takes a little longer for acid to burn through that than what it does with cotton. Wool [provided] a little protection. We bought our clothes [at the plant], but we got them at a pretty reasonable price. You were allowed one pair or so every three months, and generally you'd have them pretty well burnt full of holes by that time. You had to wear a steel-toed shoe. In the powder lines they had a 'powder shoe.' It had some kind of a ground in them that kept static electricity from being built up in your body [Floyd Allen, interview 1995].

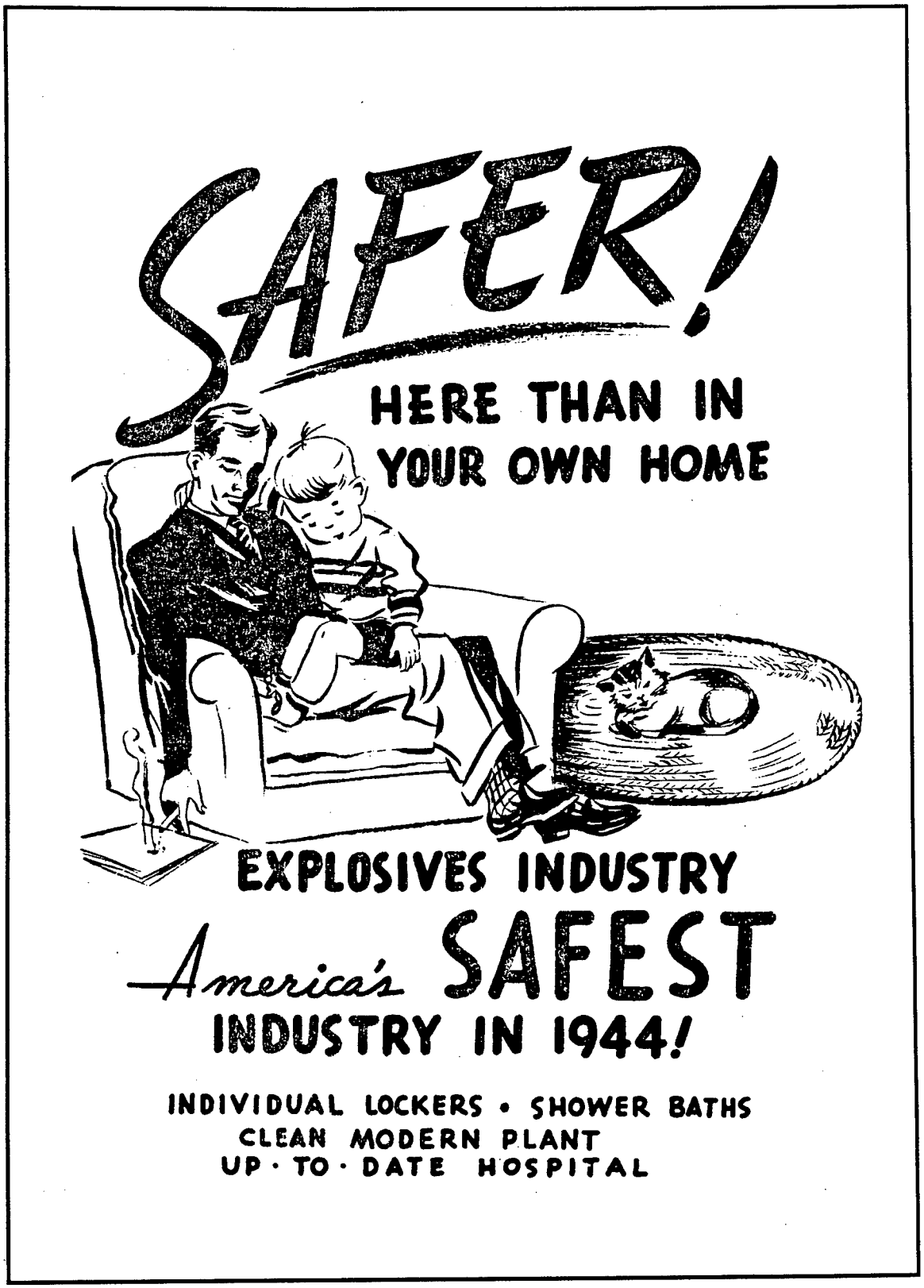

Figure 46. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

Even with a highly organized Safety Department and a guard force with additional responsibilities for safety, accidents and fatalities did occur at BOW. Ms. Krueger lost part of her thumb and required some skin grafting from catching her hand in a rolling machine when she worked on a rocket powder line. She says that she didn't lose time from work, however; she spent time doing light office work until her hand healed.

Mr. Rittmann tells of his accident:

> One time I got acid in my eye. Every first of the month we had to take inventory of the tanks; we had to take samples. We poured the acid into a graduate, and then poured it into a bottle. I had rubber gloves on, of course. We dipped this graduate down into the acid and got the sample out and then we'd pour it into the bottle. One time the graduate slipped in my rubber gloves because there was acid on them, and they were slippery. The graduate hit the wood floor, and the acid flew up into my [left] eye. I was taken in to the hospital by ambulance, and also taken to Madison. [My eye] was very sore for about a week; I didn't go back to work for over a week. When I have my eyes examined, my eye doctor can tell. It had burnt the white of my eye, but if it had gotten into the center of my eye, I would have lost my sight. That's the worst experience I had [Howard Rittmann, interview 1995].

The duty of the Safety Department was to assume responsibility for the accident prevention program, advise plant management on matters of safety, and to train supervisors and employees in techniques for preventing accidents (HPC 1945a:284). The guard force was responsible for searching individuals entering the plant to make certain that no matches, cameras, firearms, or intoxicants were carried in (HPC 1945a:331). This was no small task. In the early production period, nonworking employees were often found to be entering the plant production facilities between shifts for the purpose of loitering about (*BON* 29 May 1942). Other safety infractions also took place. As late as 1944, supervisors found employees possessing powder strand jewelry on several production lines. A novel demonstration was conducted to acquaint employees with this particular problem. A mannequin was bedecked with powder jewelry and upon ignition, quickly enveloped in flame (HPC 1945a:722). This demonstration was very effective.

Effective July 19, 1943, no person was to be allowed to smoke or carry matches within the plant guard fence (*BON* 16 July 1943). Individuals caught smoking were subject to immediate dismissal. Those caught with matches received one week off without pay for the first offense, two weeks off without pay for the second, and immediate dismissal for the third (*BON* 22 January 1943). Spot searches and searches of automobiles were common, and several employees were suspended for violating the no-match rule (*BON* 19 February 1943). Mr. Hirsch, a former guard, said that they had to conduct spot searches, and they "could nail you at any time you were inside the fence. You were not allowed any matches. . . . You were subject to search. That was a rule. There was always complaining. . . . A lot of people didn't like the guards. We could cost you two weeks pay" (Elroy Hirsch, interview 1995). According to Mr. Hirsch, most of the guards were uncomfortable searching the plant workers and

> [w]e all tried to dodge that searching job. None of us liked that. There were construction guys that came in every day and were building buildings there, and you had to go around and say, 'Empty your pockets.' And if, just by chance, a smoker happened to have a book of matches in his pocket, it meant a week off without pay. I didn't like that at all. Nobody wants to have people lose their livelihood. I'm sure we turned our heads a little, too [Elroy Hirsch, interview 1995].

Accidents at powder plants were common (Figures 47 and 48), and Sauk County residents were made well-aware of them before BOW construction work started. Several fatal accidents at other powder facilities were reported by the *Baraboo News Republic* in the months prior to the start-up of BOW construction. These included an explosion that killed five men at the National Powder Company plant in Eldred, Pennsylvania (*BNR* 18 October 1939), and a blast that killed four men in Joplin, Missouri. In the Joplin accident, 1,500 pounds of dynamite that was being packed into shells exploded (*BNR* 7 November 1939). Local news reports coupled with ongoing safety training informed BOW employees of the dangers they faced every day while at work.

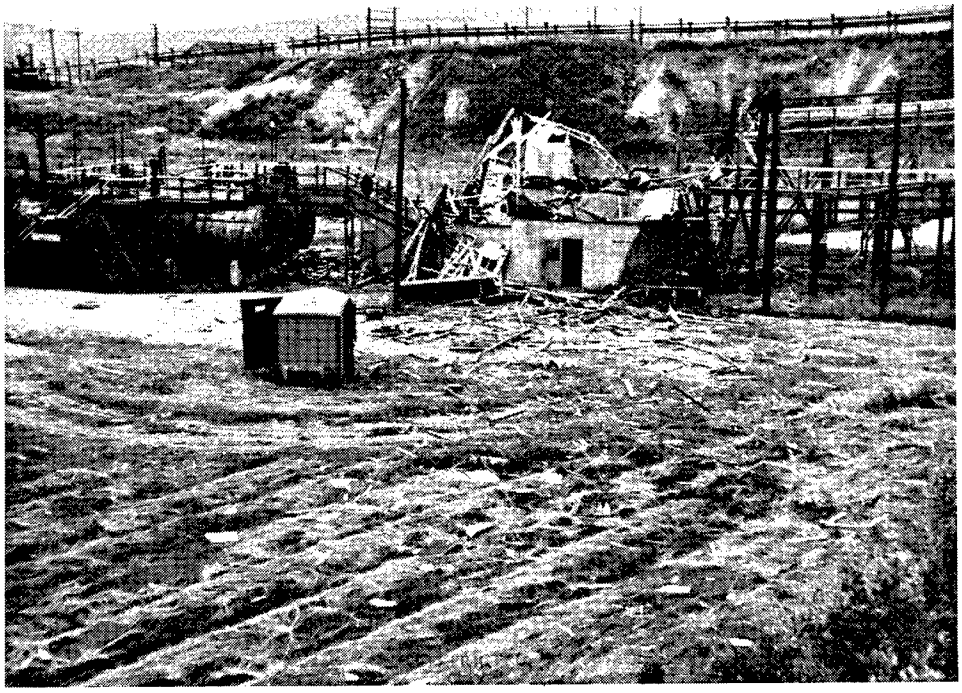

Figure 47. Building damaged during propellant explosion at BOW, World War II Operation (original photograph on file, BAAP Library).

Figure 48. Close-up view of above building damaged during propellant explosion at BOW, World War II Operation (original photograph on file, BAAP Library).

There were several serious construction-related accidents, with the first fatality at the plant occurring on August 2, 1942, when a worker died from injuries received during a pipe unloading operation (*BON* 28 August 1942). Along with falls, which were attributed to being the major cause of disabling injuries (*BON* 13 July 1945), production-related fatalities did occur. On April 8, 1943, an immersion bowl explosion killed a wringer operator (HPC 1945a:675). Only one fatal accident occurred in the single-base propellant operations when an operator in the finishing area fell from the safety car into the space between the safety car and the following flat car (HPC 1945a:725-726). Two fatalities and the complete destruction of a Blend House occurred on October 23, 1943, when 1,600 pounds of preblended powder blew up (HPC 1945a:823). Additionally, a serious explosion killed four workers on July 19, 1945 (*BON* 27 July 1945). These four men were buried at the Kingston Cemetery on the plant grounds. Not only did people worry about their own safety and that of their co-workers, an explosion could also seriously disrupt the powder-making process according to informant Ms. Laverna Hackett.

> We had some serious explosions there; we did have some people killed. It was frightening for the fact that we didn't want anyone to be killed or lose anybodys' lives, but we also didn't want the plant to be disrupted because we knew we had to make powder. If a serious explosion happens it could tie up the lines for months. [One explosion happened] on the rocket line. It was important that that line stay open. People kept working; nobody flinched. I was at home [at Badger Village] at the time, and I heard the explosion. We did go over to the plant; we went over to the main gate to inquire [about injuries]. Unfortunately, two [workers] were killed. But we went to work at our regular schedule [Laverna Hackett, interview 1995].

Constant training and education kept the number of accidents to a relative minimum (Figure 49). Job Instruction and Job Relations Training courses began in February 1943 (HPC 1945a:548). The importance of these courses grew as the need for properly trained house and area foremen increased. The Smokeless Department instituted a Training House program for production education of shift supervisors and line foremen. Three production buildings in the rocket powder area were set aside as training houses, and initial instruction was given by personnel trained at Sunflower Ordnance Works. The trainees, in turn, became instructors for the new hires and transfers who were shifted to the production houses as they finished their training. In this way a standardized, thorough training was accomplished. Additional safety training instruction was given to employees when their work facilities were occasionally shut down.

Although most of the local community welcomed the plant, some residents were concerned about their own safety. During the beginning of World War II when some wondered if battles would indeed reach the U.S. mainland, many were worried that they had become an Axis target. There were also unsubstantiated reports of espionage. Still others were concerned about pollution. Ms. Hackett remembers that "[t]here were comments made about the acid area. When they would make acid, the nitric acid has a very distinct smoke; it's a bright reddish, kind of a copperish red [color]. And when they would make the acid, the smoke fumes would come out of these chimneys and would go streaking across the sky. People did object to that. And it smelled; it wasn't a pleasant odor" (Laverna Hackett, interview 1995). The "boom" of testing powder in the cannon range tunnels was also a continual reminder of the plant's presence and of the war that sometimes no longer seemed far away from rural Wisconsin. When asked if she thought the presence of the plant made the war more real to the local people, Ms. Hackett responded, "I'm certain that it did. It was very prominent in most peoples' minds. You must understand that at that time there was no television. Everything that we got was either from the radio or from word-of-mouth (and the newspapers); communication was quite limited. I think [the plant's existence] brought home a realization that we were in trouble" (Laverna Hackett, interview 1995).

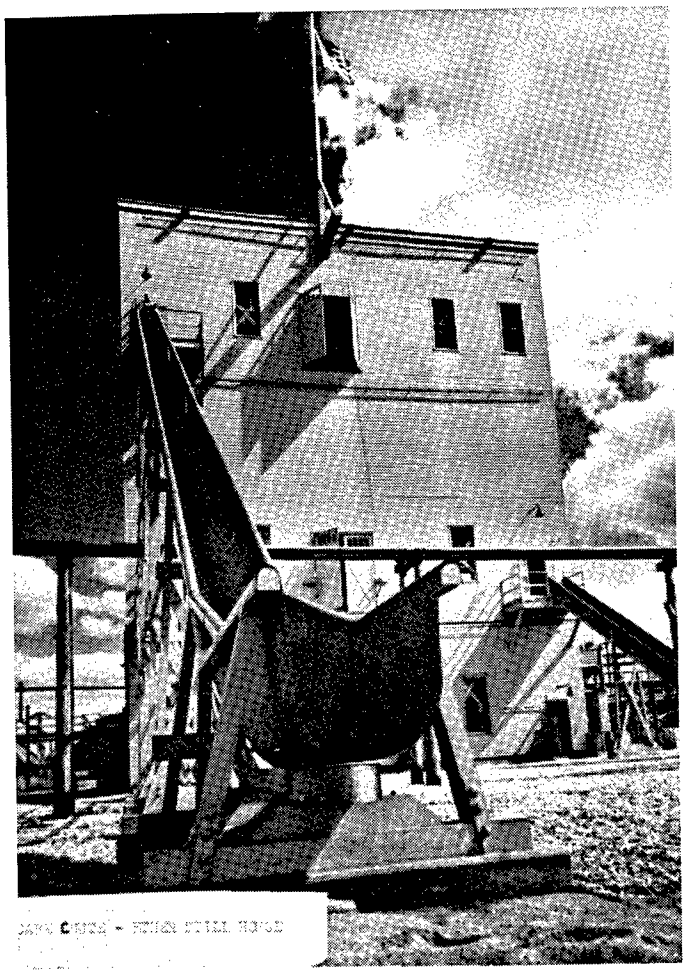

Figure 49. Escape chute of an ether still house at BOW, World War II Operation (original photograph on file, BAAP Library).

Numerous employee-focused departments and sub-departments existed at BOW for the purpose of maintaining good employee relations (Figure 50). The plant newspaper first appeared in April 1942. The purpose of the newspaper and its editorial policy was to help mold and maintain employee morale by keeping the workers familiar with current activities and creating interest in plant projects and programs (HPC 1945a:269). Ms. Dorothy Bohnsack (interview 1995) remembers that the newspaper contained "articles on different department heads, and something new that had been created by another plant, and maybe some little newsy items [i.e., stories about workers' activities]." Ms. Laverna Hackett also recalls "a kind of little news brief they would put out every month, and it would tell about the people who had done particular things, or someone's family, if they had done something. Also, there was news of the war" (Laverna Hackett, interview 1995).

A "Keep 'Em Shooting" program was launched on June 28, 1943. An important element of this program was the plant Suggestion System. Many valuable improvements in working conditions resulted from this program, particularly in the first few months when many problems stemming from the activation of a new

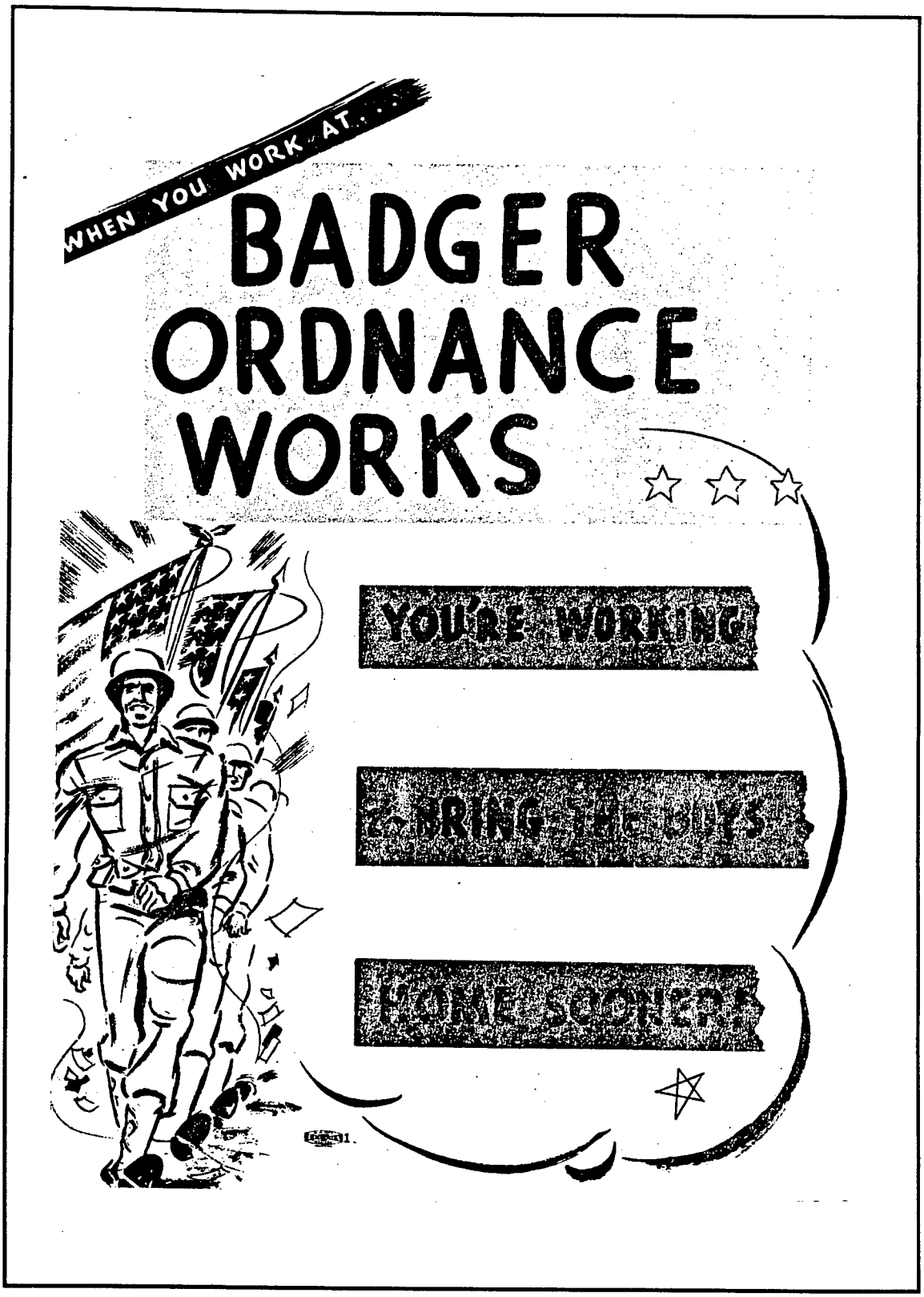

Figure 50. Employment flyer for BOW, World War II Operation (original on file, Wisconsin Historical Society).

plant had to be addressed. Important changes in the Intra-plant Transportation System, for example, were accomplished. A total of 1,187 suggestions had been received by July 1, 1944, with 388 being accepted, 724 rejected, and 75 being processed (HPC 1945a:295-297).

Another significant morale-boosting program implemented at Badger and at similar ammunition plants nationwide was the bond drive. Bond contributions were typically deducted from the employees' paychecks, and although the employee was not forced to participate, departments with 100 percent participation were praised. Thus, many felt pressure from fellow employees, as well as management, to pledge part of their check to the purchase of government bonds in order to achieve 100 percent participation in their department. Ms. Dorothy Bohnsack remembers that "we were preached at all the time. I couldn't buy big denominations. There was one woman, she wouldn't participate. It was holding the department up from 100 percent participation." She also recalls safety promotions where certain departments would receive awards for high numbers of hours without an accident (Dorothy Bohnsack, interview 1995).

Shortly after operation began, it was recognized by Hercules Powder Company that refreshments should be made available to plant workers. Steps were taken to establish a portable canteen service (HPC 1945a:263). The portable canteen service eventually gave way to permanent cafeterias, including a 400-person mess hall for the Administration area, a 200-person hall for the Barracks area, a 200-person hall for the combined shops area, and, with the opening of the N-Line operations, a cafeteria in that area. By April 1945, the entire cafeteria project was serving 5,014 persons daily, an all-time high for the number of employees served. The caterer was extremely successful in maintaining a high standard of sanitation, good quality foods, and reasonable prices during a period of severe food rationing (HPC 1945a:499).

While Hercules Powder Company tried to operate BOW as if it were one big happy family, many problems arose. From the beginning of construction work, the guards were required to check every automobile as it was driven onto the plant area (*BON* 3 July 1942). As employee theft started to become a considerable problem, spot searches were undertaken as the vehicles left the plant area. Due to war-time priorities and the lack of certain materials it was virtually impossible to buy certain commodities that were being used every day at the plant. Theft of these materials was tempting to certain employees, and at least one was sentenced to one year in the state penitentiary for the theft of an electric drill (*BON* 29 December 1944). There were many complaints of theft at the construction areas. Tools and wrenches belonging to contractors or to individuals were stolen. Also pipe fittings, valves, wire, tools, gasoline, and oil belonging to the government disappeared.

On a national level, there were many reasons for absenteeism on war-related jobs. Walton (1956:298) has suggested that the American worker was susceptible to a high measure of irresponsibility when found to be in a market where a job was always available. Not all blame could be put on the worker, however. A national indulgence by management in labor hoarding frequently resulted in fostering an awareness of the idle or underworked hands around a plant site. This led to many workers believing it was not unreasonable for them to take a day off. The stocking of finished war materiel, in plain view and ready for transshipment by the military, sometimes had the same effect, destroying any sense of urgency (Walton 1956:299).

At BOW, considerable attention was given to the problem of employee absenteeism. Each employee's attendance was recorded daily. *Badger Ordnance News* carried a weekly attendance score showing the percentage of absenteeism in each department to create competition for a good record. Attendance record boards were designed and erected in many of the operating buildings to compare the attendance of the three shifts in each unit. Here again the purpose was to stimulate competition (HPC 1945a:265).

Worker health, being closely associated with safety, was a major concern of Hercules Powder Company. A Medical Department was set within the operating system at BOW. Its priorities were pre- and post-employment physical examinations, treating ambulatory and hospital-stay injuries, overseeing plant sanitation, and supervising both the venereal disease and tuberculosis control programs (HPC

1945a:322-328). During the World War II operation, plant medical staff varied from a maximum of 35 employees in May 1943 to a minimum of 18 in April 1944. All employees were required to have examinations once a year. Additionally, those regularly exposed to DNT were required to have an examination every two to four weeks. In May 1944, the annual examinations were discontinued due to the increased number of construction personnel that was brought on by the rapidly expanding building program. During the World War II operation, some workers reported headaches and other symptoms. It was generally believed that these were due to nitroglycerin exposure, a problem first discovered in 1942 in other nitroglycerin plants.

All of the informants interviewed during this investigation considered the nitroglycerin area the most dangerous area in which to work. When asked if only men worked in certain areas of the plant during World War II, many said that only men worked in the nitroglycerin area because it was too dangerous for women to work there. Mr. Rittmann recalls (interview 1995) that only men worked "in the nitrating house because that was kind of a dangerous place where they'd mix the nitrocotton and the acid. A lot of times . . . this nitrocotton would catch on fire in these big containers, and the fumes, yellow fumes, would just fill the place and they'd have to get out of there. It wasn't really fit for a woman to be in a place like that. Although, I think in the third operation [Vietnam conflict], I believe there were a few women that worked in there. . . ." Oral history informant Ms. Laverna Hackett mentioned the headaches due to nitroglycerin exposure:

> The nitroglycerin area was very dangerous. Not only was it dangerous to work there, but you had to be very precise and, another thing, you got very, very ill. Nitroglycerin is a heart medication, and it absorbs through the skin. If you should put a little bit on a table and happen to touch it, it's absorbed [by the skin], and you get violent headaches. Your head just throbs; you can hardly see sometimes, you get so sick. When they first started working in the nitroglycerin lab they did have a lot of headaches, but it's also something that you can become adjusted to. You can tolerate it after a while [Laverna Hackett, interview 1995].

The federal government forced the operators of the GOCO plants to allow union organization and collective bargaining (Fairchild and Grossman 1959:130). Nationwide, more than 12 million workers were organized in the CIO and AFL during World War II. Labor-management committees were set up in most factories, but these seem to have been little more than window dressing (see Zinn 1980:408). The Fair Labor Standards Act of 1938, which called for a 40-hour week, also went into effect late in 1940. Organized labor at all levels realized that while the unemployment, economic distress, and social turmoil that had marked the 1930s had been overcome by the war, the biggest gains were in corporate profits, which far outstripped rising wages.

From a national perspective, it is interesting to note that despite the overwhelming atmosphere of patriotism and total dedication to winning the war, many of the nation's workers went on strike. During World War II there were more than 14,000 strikes, involving 6,770,000 workers, more than in any comparable period in American history (see Zinn 1980:408).

While most workers at the BOW appear to have felt that the system was doing well for them, some objected to wage and price controls. A concerted drive by the AFL was made in the spring and summer of 1943; however, this failed to secure enough members to permit a request for recognition as bargaining agent. Failure was generally attributed to personnel policies being more liberal; a belief that the plant was to be temporary since it was a government plant at a time of national stress; and the management taking an active interest in handling personnel problems as though a union were actually representing the employees (HPC 1945a:269). BOW employees honored the no-strike clause in their contracts and there were no reported major work actions at the plant. When construction workers once again returned to the plant site in the summer of 1944, an interest in unionization was revived. This time, an agreement was signed by Hercules Powder Company and the AFL (HPC 1945a:269).

During the course of operations, there were many problems along the production lines. While most were satisfactorily solved, others continued. All the difficulties, coupled with the accomplishments, tended to keep the production efficiency in a state of general balance. Constant emphasis was placed on man-hour and equipment efficiencies, and every effort was made to conserve manpower and focus on better man-hour production. HPC undertook studies of newly introduced methods for increasing efficiency, and the ways in which efficiency was recorded were constantly changing. Even with safety policies being followed, to keep employee exposure to accidents at a minimum, production efficiencies increased as the operators became more familiar with their jobs.

World War II had important consequences for American institutions and values, some of which were apparent at the time and others that became evident only after the passage of time. From the general perspective of working class people, defense establishments represented the permanent presence and pervasive influence of the federal government and large corporations. Employment in defense work also created enlarged expectations and in many areas triggered a frenzy of consumerism. Throughout the U.S. liquor consumption increased, and night clubs, dance halls, and road houses proliferated. Attendance at movie theaters reached new peaks, and businesses expanded their hours to accommodate the new purchasing power of defense plant workers.

Due to comparatively high wages, workers at BOW experienced a rise in their incomes which in some cases may have led to a rise in their standard of living. While it would seem that increased worker buying power, even in a wartime economic environment characterized by rationing and shortages of consumer goods, would increase and stimulate nondefense businesses, this does not seem to have been the case according to the oral interviews. People were faced with rationing, and were only allowed to buy so much.

> Meat was very difficult to get. And sugar. That's when my husband and I decided we didn't need sugar in our coffee anymore. Gasoline was very hard to get. You had so many ration stamps issued per month. Like if you wanted to buy a beef roast, maybe they would take 25 of your stamps. About 100 stamps [were given to you] per month. Fortunately, we had a friend who had a meat market here in town. On occasion he would say, 'We have an extra ration for you. You can get an extra roast, which was very nice. It was difficult [Laverna Hackett, interview 1995].

Ms. Hackett maintains that ideas of wealth did not differ much from the Depression era. They had become accustomed to doing without certain necessities, and although they certainly enjoyed newfound prosperity, many remained conservative consumers. "We had just come out of a very serious depression. All of us were in the same situation with no money, and we were always very grateful to get the salaries that we did. It could buy us a few of the necessities that we'd sacrificed before; so we were very grateful" (Laverna Hackett, interview 1995).

Many workers were saving money for a house or new appliances which were difficult to afford during the Depression and nearly impossible to acquire during World War II. As stated earlier, many workers were buying war bonds with some of their paychecks. While the act of buying bonds was often seen as a patriotic gesture, many workers ultimately benefited. Mr. Allen believes that investing in war bonds was a good way to save money, especially when it was deducted directly from his paycheck: "When you don't get it in your pocket in the first place, why, it's a lot easier to save money. In about two years' time or so we saved up enough in bonds for a down payment on our house" (Floyd Allen, interview 1995). Mr. Rittmann said that they were paid well enough that people weren't spending an entire paycheck on living expenses. Mr. Rittmann also used his savings in war bonds to purchase a home in 1952 (Howard Rittmann, interview 1995).

Although wages and morale were relatively high during WWII, many workers had very few entertainment options, perhaps due to the rural area in which the plant was located, or perhaps because the lines for the movie theater were too long. Ms. Bohnsack recalls: "We had some rural dance halls. If somebody had a wedding or anniversary dance, that would be some recreation. This Riverview Ballroom was built. Saturday

nights, that was our recreation. My dad said, 'You might as well take your bed down there,' [because she spent a great deal of time there]. Well, I had to do something, and that was good exercise--dancing" (Dorothy Bohnsack, interview 1995). Ms. Laverna Hackett describes the recreational activities at the plant: "They had a recreation center at the plant. It was a building that was apart from the plant itself. We called it the 'Rec Building.' It was spacious. You could go over there and have pot luck dinners. They had a jukebox. You could have dances or card parties. Because of this situation during the war where there was no gasoline and very few tires to get, we could not get in the car and go places. So we had to make our own fun" (Laverna Hackett, interview 1995).

Mr. Elroy Hirsch quit going to school at the University of Wisconsin-Madison after the 1942 football season and joined the Marine Corps. While waiting to be sent overseas, he worked at BOW and lived in Madison. He mentioned some recreational activities at the University of Wisconsin:

> For students, the [Student] Union had dances a lot . . . every Saturday and Sunday. People hung out, but there weren't a lot of people to hang out with. A lot of people were in the service. Baseball still went on in Madison; softball still went on; in winter, basketball went on. I played for baseball teams. You kept busy; there was enough to do. You still went to the Union because it was an inexpensive place to go, and a nice place to go. You went to basketball games, and track meets were still going [Elroy Hirsch, interview 1995].

Environmental Legacy

As with many GOCO facilities, BAAP left a legacy of environmental problems. Throughout its half-century of existence, the facility disposed of waste and production by-products onsite, both knowingly and unknowingly. The plant contaminated the air, water, and ground during the three operating periods. During the periods of stand by, contamination occurred but not to the extent as when propellant was being produced.

Decontamination programs were regularly undertaken at the close of every operating period, with environmental degradation somewhat of a consideration during plant construction and operation. At the close of World War II, the work of decontaminating was performed by powder manufacturing personnel who had not yet been laid off. Decontamination was sufficient to make the installation reasonably safe for unrestricted occupancy, provided ordinary safety precautions were followed. Decontamination included the "flashing" of all equipment that had been coated with nitrocellulose. Flashing consisted of heating metal equipment to a temperature in excess of 200 degrees Celsius (Ordnance Department 1946). As a direct result of flashing, large quantities of metallic material became nonrepairable and was sold as scrap (Ordnance Department 1946).

Prior to 1971, BAAP utilized coal fuel for heating the plant facilities. After 1971, the plant began using gas fuel, and the air pollution in the surrounding area greatly decreased (Thompson and Welsh 1993:22). During operations, the plant discharged steam and pollution from the acid units, nitroglycerin production units, and the oleum production processes. During standby status, the only activity that contributes to air pollution is the periodic burning of waste explosives at the Burning Grounds. This activity releases small amounts of contaminants into the air.

BAAP has been the site of numerous chemical waste spills, including 12 since 1981 alone. The plant has active and abandoned waste disposal sites on the property. Some are considered to cause or threaten to cause pollution due to migration of the contaminants through ground water (Thompson and Welsh 1993:23). Results of a resent examination show that the Burning Grounds contains residues of lead, propellant wastes, and various solvents such as benzene, chloroform and carbon tetrachloride (Thompson and Welsh 1993:23). At the Deterrent Burning Ground, used between 1970 and 1975 only, solvents, propellant waste, and sulfates contaminate both the ground water and the subsurface soil. At the Nitro Pond, the sediment contains

nitroglycerin, chromium, lead, and mercury. The small pond in the rocket propellant production area received waste water from the manufacturing process. Today it contains lead, nitroglycerin, and chromium. The ditches in this area contain the same contaminants. While the presence of these contaminants has been defined, little has been done in the way of removing them or reversing their effects upon the environment.

EFFECTS OF THE END OF THE WAR

While some GOCO facilities were closed before the end of the war, BOW remained in production for the duration. With victory in sight, cancellation of orders and declining worker productivity reduced output. As production at BOW slowed, the Axis powers collapsed. Hitler committed suicide in his Berlin bunker on April 30, 1945. Several days later the last German forces surrendered. In the Pacific Theater, the noose around Japan was tightened with the capture of Okinawa in June and the annihilation of the remnants of the imperial navy. Allied strategy was to invade Japan late in 1945; however the development of the atomic bomb made this unnecessary. On August 6, the first atomic bomb was dropped on the city of Hiroshima, and three days later a second device was exploded over Nagasaki. Faced with this appalling weapon, the Japanese surrendered on August 14. On September 3, Japanese and Allied delegations signed the document of surrender ending World War II.

Throughout the summer of 1945, BOW production lines were being shut down and placed in stand by condition. On August 13, 1945, all production was terminated at BOW. During the months of September, October, and the early part of November 1945, the plant maintenance force, supplemented by additional help obtained from operations, was engaged in putting the plant in shutdown conditions. Over the next several months, there were substantial transfers of excess materials and equipment. Bids were let on small lots of materials that were being sold, and donations of miscellaneous equipment to schools for use in training took place. Also at this time, the University of Wisconsin expressed an interest in and shortly thereafter accepted custody of Badger Village (Mueller 1982:8; Ordnance Department 1946:905). This housing was acquired for the growing number of veterans who had enrolled in the university.

With the close of the World War II operation, the government transferred several portions of land that the War Department no longer needed. The Kingston Cemetery Association purchased 2.2 acres surrounding the cemetery, and 2,264 acres were transferred to the Farm Credit Association. Also, 2,061 acres of plant property were leased for agricultural purposes at an annual combined rate of $10,214 (Ordnance Department 1946:906).

The reconversion from a wartime to a peacetime economy actually began before the war ended. As early as 1943, the Ordnance Department had been carefully planning for the closure and disposal of the GOCO plants (see Thomson and Mayo 1991:229-230). As BOW was government-owned and eventually placed on stand by status, no reconversion work was undertaken.

Mr. Floyd Allen recalls the shutdown at the plant after World War II and the adjustments made both at the plant and in the community.

> A few days after Japan surrendered the word came through to shut the place down. Of course, when they built it they were only figuring on it operating five years. At the end of World War II they just shut it right down and they didn't even do too much in maintenance down there for a number of years. It deteriorated pretty bad. It was on standby, but there was very little actual repair work. The roofs went bad and buildings started to rot out (they were just kind of temporary buildings, all frame buildings in the first place). Machinery began to rust. When the Korean War started they got a general contractor in there again, and I think it must have cost them just as much to rehabilitate the thing as it did to build it in the first place. . . . But then after Korea then they maintained it in better shape of readiness; they figured they could put it back in operation in about thirty days if they had to. And they kept it up until

now. Very recently, now they're beginning to have their doubts about it, and there's just a handful of people working down there now.

[Regarding the newcomers that migrated to the area to work at the plant.] Some of them stayed; some of them went back to wherever they came from. I would say it was [difficult to find a job in the area after the plant closed]. Before they built it, about the only industry we had in Baraboo was the woolen mills out there; that was the only big employer we had. But right after the war, then the city bought this land for an industrial park down there. There was quite a lull there after [the war] . . . jobs were pretty scarce [Floyd Allen, interview 1995].

Ms. Hackett's job ended in 1946, and she was one of the last people to leave the lab. She helped put the plant in standby status and remembers those last days at work.

Germany surrendered. The plant closed for a day; that was just a bonus. Then as [the U.S.] was becoming more victorious, slowly we started letting people go because the demand for powder was not as great. As the demand for powder decreased, of course the personnel had to decrease. Little by little they would lay people off, but they always laid them off according to seniority. The last person hired would be the first person to go. Then when it got down to the very minimum, the skeleton crews, they gave you a choice: If you wanted to volunteer to take a layoff, you could do that. Because by that time, some of the men were starting to come home, some of the women wanted to be home with their families; and they would just as soon take the layoff rather than waiting two or three months and then get laid off anyway. I stayed until I was laid off.

[The plant was placed on standby] in late 1946. The production of powder, of course, ceased. But there was, oh my goodness, just lots and lots of equipment that had to be cleaned, preserved, checked, and stored. That was part of my job at the lab. We had to take all the equipment down . . . and put it in storage [Laverna Hackett, interview 1995].

The beginning of World War II had marked an end to the slow orderly change of life in Sauk County. Its end produced yet another change and the beginning of a new character for the Sauk County area. The local economy did not worsen after operations at BOW were stopped, and business trends took on a different nature. As the GIs returned, the area saw new business trends and expanded store operations were introduced. Returning local veterans, nearly all men, were easily absorbed into the local economy, particularly when some of the women returned home. Under social pressure to return to their traditional roles, the great majority of the women defense plant workers went back to being housewives or resumed low-paying, part-time jobs. Although many women wanted to quit their war jobs and return to work only in the home, others had become accustomed to the extra income and wanted to continue working. Ms. Hackett was fortunate enough to find adequate daycare for her two sons, and she chose to find another job after her job at the plant ended.

I think it was probably greed. At that time we didn't have a home. We needed furniture because the furniture that we had at Badger [Village] was very old and rickety. We needed a car. The boys were growing up, and they needed a lot of things. We had to start putting things together to make a better life for ourselves. I enjoyed working, I guess, after getting out into the working circle. I enjoyed the people.

I missed the job [at the plant]. I enjoyed my job. I enjoyed very, very much working in the lab. I enjoyed the people. I had wonderful supervisors. And I missed the money; it was great money [she and her husband both took pay cuts in taking postwar jobs]. The work was fascinating. It was very challenging [Laverna Hackett, interview 1995].

Badger Village, which once provided housing for ordnance workers, was pressed into use to accommodate the returning veterans who attended the University of Wisconsin. These new students were transferred to and from the university in buses that had previously carried BOW laborers.

The local communities had little need for the surplus of highly skilled labor produced by the eventual ending of operations at BOW. In the last months of operation, Hercules Powder Company was contacted by manufacturing companies regarding openings for ex-employees. Approximately 400 openings were available; however, these were located outside of Sauk County in urban areas such as Milwaukee and Beloit (*BON* 31 August 1945).

The oral history informants spoke of the reconversion to peacetime and the transition to everyday life. All expressed relief that the war had ended, and although their high-paying jobs at the plant were ending, some were compensated just to see the area shrink in population. "I think for my part it was kind of a relief to not have all that activity . . . a little more settled feeling. Economically, [the operation of the plant] was great for Baraboo. That brought in a huge payroll for this area, which was good. But I didn't like the idea of everything being so crowded, having to stand in line at the grocery store or wherever you went. I wasn't really comfortable, I guess, with that many people around. We were just overcrowded" (Floyd Allen, interview 1995).

Many of the workers that came from elsewhere returned to their pre-World War II jobs. Even the local people began to look for other kinds of work; they didn't trust the plant to provide steady employment. Ms. Bohnsack (interview 1995) recalls that "[w]hen the plant closed in the 40s, a lot of people that might have [stayed after the war] left. A lot of people never felt secure to go back [to the plant] to work; they needed a permanent job because it was one of these 'on and off' situations [at the plant]. Our local people didn't bank that much on the plant." While the momentum of the rapid construction and start-up of the BOW stimulated the local economy and changed the Sauk Prairie landscape, the end of BOW operations quickly taught Sauk County residents of the uncertainties which beset a boomtown. These uncertainties would plague Sauk County over the next several decades.

POST-WAR YEARS

After World War II, many GOCO plants were converted to new uses. During the period 1945 through 1950, BOW was in standby status and maintained by a small force of government employees. BOW was an integral part of the Cold War "military-industrial complex," a permanent armaments industry unparalleled in modern history. After 1945, a consensus emerged in the U.S. that this country had a responsibility to lead the "Free World" against Communism. In the hands of politicians, this grass roots feeling translated into national policies that made defense the highest priority of the federal government for almost 50 years. Reflecting the Cold War mentality, the Army continued to pour millions of dollars into maintaining BOW and other World War II-era facilities.

The oral history informants differed in their perceptions of what would become of the plant after World War II. Some had assumed it would stay on standby indefinitely; others had been sure it would be shut down and dismantled. "Originally after World War II, everybody figured that it would just shut down and they'd dismantle it or something. In fact, the government, when they built it, figured it would only last about five years" (Floyd Allen, interview 1995).

Reactivation of BOW was begun in February 1951 at the beginning of the Korean conflict. Liberty Powder Defense Corporation, later changing its name to Olin Mathieson Chemical Corporation, took over contractor operations on April 30, 1951. In March 1958, however, BOW was once again placed in inactive status. During that operation a new facility for the production of ball powder was constructed. In contrast to the World War II experience, the Korean operation was marked by labor disputes. Union employees came very

close to walking out over hourly wage rates. The union wanted a minimum wage of $1.40 and a maximum of $2.36; however, Liberty Powder officials were only willing to offer a minimum of $1.20 and a maximum of $2.00 (*BNR* 16 May 1952; 17 May 1952). Final contract negotiations set minimum and maximum hourly rate at $1.35 and $2.25, respectively (*BNR* 22 May 1952).

Peak employment at the height of the Korean conflict reached 4,900 (*BON* 5 July 1957). As during World War II, accident prevention was a high priority during the Korean operation. However, work at the plant continued to be dangerous. In late July 1952 one man died of skull fractures received in a fall (*BNR* 2 August 1952). Another worker was killed unloading light poles from a train car in August 1954. On the production line, one fatality occurred in November 1955 during a fire in the ball powder area (*BON* 9 December 1955). One explosion occurred when a violent chemical reaction took place. Two male operators were able to escape the building seconds before the explosion occurred (Figure 51). Stringent safety precautions were taken in October 1953 when two men were placed on probation for one year, and two men for six months, after being caught smoking within the confines of the plant area. In addition to being placed on probation, all four men faced federal charges and were fined a combined amount of $125 (*BNR* 29 October 1953).

Figure 51. Building damaged during propellant explosion at BOW, Korean Operation (original photograph on file, BAAP Library).

In February 1957, the Chief of Ordnance at BOW was quoted as saying that the plant was in "shaky" status as rumors of its shutdown spread (*PDR* 6 February 1957). This comment was followed by general consternation in Sauk County. While it was common knowledge that stockpiles of propellants had been accumulating, Sauk County officials hoped that BOW would be converted to production of materials related to nuclear weapons. As the economy of a large area of Wisconsin would be seriously harmed by closing the plant, delegations of civic leaders converged on Washington, D.C., to lobby for keeping the plant open (*PDR* 6 February 1957). While the Washington, D.C., salvage trip indicated that BOW would not close (*BNR* 30 March 1957), production slowed until March 1958, when once again the facility was placed in inactive status.

At the close of operation, Sauk County again found itself with an overabundance of skilled labor and steps were taken by Olin Corporation officials to lease BOW facilities for commercial production (*PDR* 14 December 1957). Little progress was made in leasing facilities, and the plant was maintained in standby status until Olin Corporation received official notice to reactivate in January 1966.

Production during the southeast Asian operation included ball powder and rocket propellant. By this time, the facility name had changed to Badger Army Ammunition Plant. Production continued from January 1966 through January 1975. In 1972, the government began a major modernization which included production safety improvements, upgrading plant utilities, and environmental process controls. The improvements made the production process safer, more economical, and environmentally sound. Modern sewage treatment, acid production, and nitroglycerin facilities were also constructed. Production ceased in January 1975, and the plant has remained in standby and modernization status, under the management of Olin Corporation, since that time (BAAP 1983:3).

During the Southeast Asian operation, production continued for the most part as it had in the two previous operations. Several fatal injuries occurred during both production and supporting activities as employment reaching a peak of 5,400 (*Badger World [BW]* December 1971; *Milwaukee Sentinel (MS)* 9 December 1971). Other explosions occurred that caused injuries, and numerous less serious injuries were also reported, including fire burns, acid and chemical burns, lacerations, and sprains (*BW* November 1971; *PDR* 8 May 1969). Employee theft also continued with numerous people reporting that valuables were stolen from their parked automobiles (*BW* February 1969).

Woodland, wildlife, and land management was encouraged at BAAP during this operation (*BW* May 1969). During the early 1970s, several attempts were made to clean up the pollutants associated with the plant. Olin Corporation engineers reported that they were "implementing 1980 technology to introduce safety and efficiency and meet or surpass pollution standards set by various governmental agencies" (*BNR* 1 June 1972).

Anti-war protesters first approached the gates of the powder plant during the Southeast Asia operation. In 1966, 45 protesters marched from Madison to BAAP. The protesters had hoped to enter the plant and persuade the workers to walk off the production lines; however, they were stopped at the gate (*Milwaukee Journal* 19 June 1966). There was no trouble at the main gate and the Sauk County Sheriff even passed out junior deputy badges to the children of the demonstrators. In August 1971, approximately 20 demonstrators once again appeared at the gates of BAAP (*WSJ* 9 August 1971). During this protest, a bus appeared at the front gate and dropped off several demonstrators. To everyone's surprise, the bus returned several minutes later and those who had just arrived, proceeded to get back on the bus and drive off.

On January 6, 1970, someone called the BAAP and warned of an impending attack. Reports circulated that the leader of a "terrorist group" had stolen an airplane and dropped several bombs on the BAAP (*BNR* 6 January 1970). The Sauk County Sheriff's office confirmed that a plane had been stolen and later abandoned, and, shortly thereafter, three unexploded bombs were found on the plant area (*Capitol Times* 6 January 1970). Mr. Floyd Allen remembers other protests and the bomb scare during the Vietnam conflict.

> There was a lot of dissatisfaction there with the [Vietnam] war, you know. A lot of people were unhappy that we were in it, and there was some opposition. I remember being called out to the gate. They had some "pickets" I guess, some anti-war demonstrators that congregated out there at the main gate. They didn't do any damage, but there was mostly vocal opposition, yelling and hollering at the people that drove into the plant. We had a bomb attempt down there. . . . There was some kind of incendiary bomb . . . the plane flew over, they were aiming at the powerhouse down there and it landed in a vacant field. It didn't hurt a thing. They missed their target. I don't know whether it even exploded; they found it out there in the field [Floyd Allen, interview 1995].

By 1971, reports began to circulate that inadequate safety precautions were exposing workers to nitroglycerin "addiction" in the rocket propellant production process. When off the job for a weekend or more, several

workers experienced chest pains that continued until they returned to the plant and resumed working with the nitroglycerin. The workers continued reporting withdrawal symptoms, and in two cases, heart attacks occurred as a result of constant exposure to the chemicals (*WSJ* 14 March 1975). This problem was first discovered in 1942 in other nitroglycerin plants. After the discovery, the World Health Organization issued guidelines on permissible dust levels within the plants. During the World War II operation, BOW had kept dust levels below this limit but persistent problems remained.

Approximately 1,000 workers were laid off during 1973 as ammunition requirements were reduced and troops returned from Vietnam. For the 800 workers remaining, the plant's third closing came as no surprise. In announcing that production of the rocket propellant made at BAAP would be switched to a newer facility in Radford, Virginia, the Army reported that the $400-million modernization program for the Sauk County plant would continue. Several unnamed sources reported that there had been an internal Defense Department dispute over which of the two major munitions contractors, the Olin Corporation or the Hercules Powder Company, would become the primary Defense Department munitions contractor. Olin Corporation lost (*WSJ* 26 March 1975). Undoubtedly, Hercules Powder Company's long and close relationship with the U.S. government played a role in the Defense Department's decision.

Unlike the closing of the plant in 1945, the mid-1970s closing came at a bad time for everyone in the labor force. Some reports during the mid-1970s showed that Sauk County had not been hit as hard by unemployment as many other areas of the country. Others reports, however, showed an unemployment rate for the Sauk County area as high as 14.4 percent (*BNR* 3 April 1975). This high percentage was recorded before plant layoffs took effect. Local officials observed that by the time the plant layoffs were in full effect, a seasonal increase in tourism and construction would help "take up the slack" (*MS* 14 March 1975). As Olin Corporation was concerned whether their ex-employees would find employment, their officials were more blunt in stating "[w]here in this area are we going to find jobs for 670 people?" (*BNR* 3 April 1975).

Currently, BAAP is in standby and modernization status. Its long-range mission is to be ready to supply military propellants upon quick demand, at a reasonable cost and high quality while meeting all safety and environmental requirements. The oral history informants were asked about whether or not they thought the plant should be permanently closed. Mr. Allen responded that

> [t]here's a lot of [people] that say, 'What in the world are they doing down there? Nothing going on now, why is there anybody working?' Well, I was told one time there was about 2,200 buildings in that complex, and that takes a lot of maintenance just to keep the buildings up. They've got to keep the roads plowed out in case of fire. . . . I don't know [if it should be closed or not]. If they knew we weren't going to have any more use for it, I'd say, 'Fine. Dismantle it and sell it for junk or whatever, and let the land revert back to the farmers.' But, they said during World War II that the next war's going to be all nuclear; we aren't going to have any use for powder. But during Korea, [the plant] was a big thing, and again in Vietnam. If we were to get into another war, who knows? I know the government has got a number of other plants and they probably don't need them all. What it would cost now to build a new one would go a long ways toward maintaining what they've already got. It's kind of a toss-up. If you knew what was coming, you could act accordingly [Floyd Allen, interview 1995].

Other informants think it should be closed for good, so their tax dollars can be put to better use. Mr. Rittmann (interview 1995) said, "I personally [think the plant should be permanently closed]. I really do. I think it's a big waste of money. I think our government is wasting a lot of money there, and I don't believe the plant will ever be used again anyway." Some still see BAAP as a facility that may be vital to national security in the future. Ms. Hackett stated that

> I think it should be there, and I don't think it should ever be let go. You never know what is going on; who can foresee the future? I don't think we should ever give it up. It's a tremendous installation. Who knows what tomorrow's going to bring? If we need it, we should have it available. There are quite a few people that think it's a very costly thing to have down there. It's costing a lot in the tax dollars; it's

taking a lot of money away from other things that could be using the money. I'm sure there are people that feel that way. I feel that we have to have a national security, and I think this is part of it [Laverna Hackett, interview 1995].

SUMMARY AND CONCLUSIONS

More than any other conflict in human history, World War II was a war of industrial maximum effort and logistics, and the work of the GOCO war industries was as important to the Allied victory as any battle. Badger Ordnance Works symbolizes the production miracle that overwhelmed Germany and Japan and transformed the industrial landscape of the U.S.

The national historical significance of the BOW is perhaps best understood within the context of U.S. rearmament in 1940-1942 and the role of supply and logistics in the defeat of the Axis powers. The U.S. was lacking in defense industries when it began to rearm in 1940, but by 1941 it was sending large shipments of war materiel to its overseas allies. The alliance between big business and the federal government that developed and intensified between 1941 and 1945 produced the largest sustained expansion in history. The shift in public opinion that made the GOCO program politically acceptable in 1940 was signaled by the fall of France and fostered by the Roosevelt Administration.

Officially, Sauk Prairie was chosen for a GOCO ammunition manufacturing facility for strategic, technical, and economic reasons. Political pressures may also have had an influence as War Department planners took little account of the fact that a large portion of Wisconsin's best farmland would be impacted. There also seems to have been no real understanding of the local labor market. While preinstallation studies revealed a fair market, the plant was in need of employees frequently. The War Department also ignored the social and environmental consequences of its decision to construct and operate the BOW in rural Sauk County.

BOW like many GOCO facilities, was constructed in record time and production well-passed what was expected. There is no reason to suspect that the BOW World War II experience was fundamentally different from that of any other larger rural-based munitions plant. The BOW was only one of many war industries, and while some aspects of the its World War II history illustrate important themes in national history, it differs from other GOCO plants only in the context of its local history. As planned by both the government and the plant operator, the technological history of the plant is closely related to that of other, similar propellant and explosives manufacturing facilities.

For Americans, World War II was a "people's war" against totalitarianism, militarism, and expansionism. Defense plant work paid high wages and brought prosperity to thousands of people whose increased purchasing power compensated somewhat for the wartime disruption of society. Nevertheless, it is apparent that the chief economic beneficiaries of the war were the "economic royalists" who controlled the largest corporations. Hercules Powder Company's lucrative CPFF contract made its owners and managers rich. BOW employee dissatisfaction with the way the plant was run and the level of resentment against corporate profiteering during the World War II operation is difficult to document. This has no doubt been obscured by the "good war" consensus that most Americans had during this period (see Adams 1994). This war was fought against "incalculable German evil" and "boundless Japanese military aggression" and it seems to have bolstered the pride in American values and way of life for the typical BOW employee.

There seems to have been some difference in the economic and social history effects of BOW on plant operators, workers, and neighbors. War production brought prosperity to Sauk County but not without high costs in environmental degradation and social disruption. Nearly as significant as the economic benefits from rising wages, increased savings, and better working conditions were the social impacts of war work at the BOW. Faced by recurrent labor shortages, GOCO plants welcomed women and minorities into the work force. This was part of a recurring historic pattern in which large numbers of women had been incorporated into the industrial labor force during times of national emergency. While social historian Howard Zinn

(1980:493) has described this process as the "escape from the prison of wifeliness, motherhood, femininity, housework, beautification, isolation, when their services have been desperately needed," it is probable that the social implications go far beyond this simple statement. Not only did men and women work side-by-side, but female war workers redefined the norms for dress at home and at work. Sleeveless blouses, two-piece swimsuits, trousers, and shorts reflected a redefinition of gender roles that would have a profound impact on postwar America.

Several "information gaps" are evident in the historic context of the BOW. As with all of the GOCO facilities, most of what has been written about the GOCO program, the World War II "miracle of production," and the defense industries is production facility or institutional history written from the perspective of the federal government, the military, or the defense industry. While data on BOW plant management and production are voluminous, its social history is recorded largely in the propaganda disseminated by the wartime newspapers, little of which was written from the point of view of the plant workers. A study undertaken from the workers' perspective would allow researchers to compare and contrast the obtained information with the plant management and production information. Oral history interviews could be targeted toward specific research questions, instead of being general questions concerning the plant. Efforts to record the workers' impressions of everyday life (whether they are substantiated by the archival record or not) should be initiated in a timely fashion, as many of the people working during World War II are now in their seventies and eighties.

When the government made plans to establish BOW on the rural Sauk Prairie, there were concerns about potential labor. The plant attracted large numbers of workers from outside Sauk County. Their presence created some disruption in communities and strained local government resources, particularly with regard to transportation and housing. The impact of the defense plants on local units of government has largely escaped the attention of social historians. Even more so than a setting such as the location of the Twin Cities Army Ammunition Plant in New Brighton, Minnesota, Sauk County offers the opportunity to examine the war-time phenomenon in a setting substantially different from that of a much larger urban area.

Another area of further research is an examination of worker discontent at this and other plants throughout the country during World War II. Zinn notes that during World War II there were over 14,000 strikes, more than that which occurred in any comparable period in American history (1980:408). Reasons for worker discontent, steps taken to solve problems, and effects of worker discontent on the family and on the society could be examined. Perhaps there were also notable regional differences in the way some of the plants were managed, causing workers to strike more often in particular geographical areas of the country. Worker discontent during World War II would be an interesting avenue of future research. This is especially true given the general atmosphere of patriotism at BOW that appears to have dominated the World War II years. Interestingly, only one decade later, this period was followed by numerous threatened walk-outs during the Korean operation.

Another interesting area of research would include the plight of the Sauk Prairie farmers who lost their farms to the vast military complex of the GOCO system. While the type of work performed at the BOW drew skilled laborers and professional workers, the decline of farm labor as a viable source of employment freed many rural folk for factory work. It is unclear whether these farmers relied on BOW for work after their forced agricultural retirement.

The plight of the foreign workers who were brought into this system should also be expanded upon. While foreign workers were not new to Sauk County, little is known of their impact during World War II. Further research should expand upon foreign workers' impact and experiences in the U.S., especially in rural areas where their presence may have been especially noticeable.

As many young men entered the military services, thousands of men and women moved to the Sauk County to work in the war industry. For most workers, employment at BOW brought high wages and safe working conditions, and their new found prosperity made it much easier to live with wartime restrictions. The

average household incomes of plant employees throughout the U.S. jumped as much as 100 percent between 1939 and 1945 and many workers were able to save money that was used to pay for homes, cars, and college tuition in the postwar period. It would be impossible to overstate the importance of the "winds of war" in changing social behavior in the U.S. While many of the manufacturing and support buildings are vacant and in a dilapidated condition (Figures 52 and 53), BOW has left a noticeable impression on rural Sauk County and most residents viewed the years 1942-1945 as their country's finest hour.

Figure 52. Modern view of dilapidated building at BOW (Bear Creek Archeology, Inc., photograph).

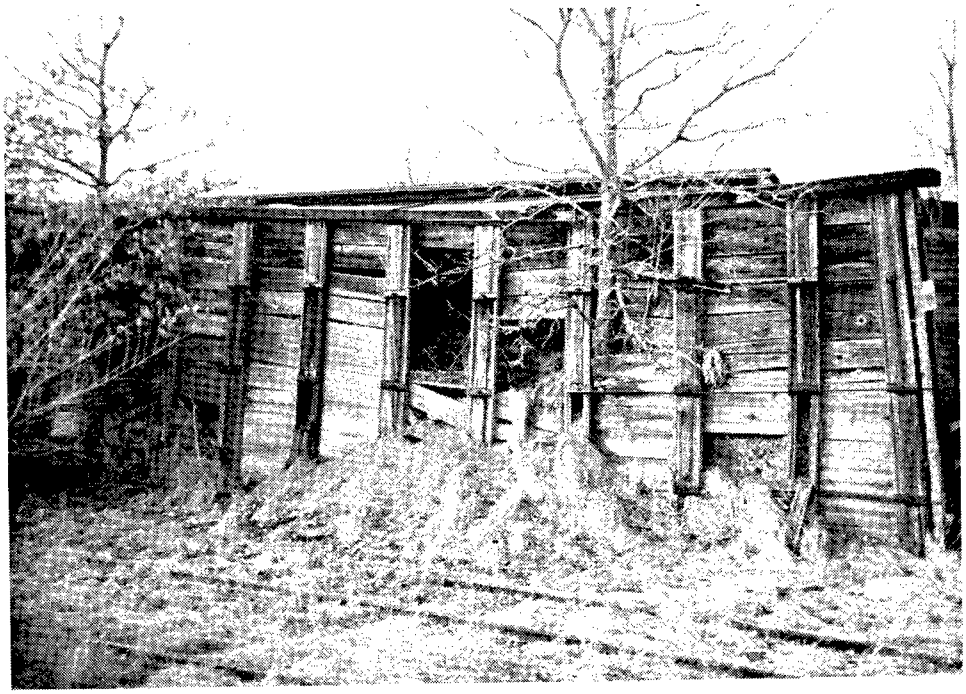

Figure 53. Modern view of dilapidated building at BOW (Bear Creek Archeology, Inc., photograph).

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