Bureau of Mines Boulder City Experimental Station (Date Street Complex, Bureau of Mines Metallurgy Research Laboratory)
Date Street North of U.S. Highway 93
Boulder City
Clark County
Nevada

HABS No. NV-35

HABS
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Buildings Survey
National Park Service
Western Region
Department of the Interior
San Francisco, California 94107

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HISTORIC AMERICAN BUILDINGS SURVEY

BUREAU OF MINES BOULDER CITY EXPERIMENTAL STATION
(Date Street Complex, Bureau of Mines Metallurgy Research Laboratory)

HABS No. NV-35

Location: Bounded by U.S. Highway 93 Truck Route, Elm and Date streets
Boulder City, Clark County, Nevada

Boulder City, Nev. 7.5' Topographic Quadrangle, U.S.G.S., 1958, Photorevised 1983, Universal Transverse Mercator Coordinates: 11.694480.3983360 (approximate center of project area)

Present Owner: U.S. Department of the Interior, Bureau of Reclamation
Lower Colorado Regional Office
Date Street Complex
Boulder City, Nevada

Present Occupants: The buildings within the project area are currently abandoned

Present Use: Abandoned

Significance: The Bureau of Mines, once part of the U.S. Department of the Interior, used the Date Street Complex for the purposes of testing methods of recovery and processing of low-grade minerals located within a 200-mile radius of the Hoover Dam area. In 1983, a nomination for the Boulder City Historic District, which encompassed the Date Street Complex, included two of the buildings, now known as Buildings 100 and 200. Two in-house Bureau of Reclamation reports of the complex (Pfaff 1991, 1992) extended the contributing elements to include Buildings 400, 500, 600, the Pump House, and the Weigh Station (Scale House). These additional buildings were included because they fell within the period of significance for the Boulder City Historic District, which was part of the Boulder Canyon Project (Hoover Dam), and was an integral part of the history of American City Planning. The period of significance identified in the nomination was 1931 to 1945, with two phases: one of construction, the other of operation. The second phase applies to this complex, in that the Bureau of Mines was a federal agency that established operations in Boulder City. Access to plentiful and inexpensive energy and water, as well as land, were the important features for the new Electrometallurgical Experimental Station, where testing could be conducted on a larger scale than that done in Reno and at other Bureau of Mines facilities. The buildings considered as contributing elements are not significant on their own, but as a part of the complex, they "convey enough of their historic character to be considered contributing....based on National Register Criteria [*sic*] A" (Pfaff 1992:3).

The buildings addressed in this Historic American Buildings Survey are those that will be demolished. These are: Buildings 300, 400, 500, 600, 900, the Pump House, and the Scales Building. Buildings 300 and 900 are not considered

contributing because their construction dates are not within the period of significance.

STRUCTURES AND BUILDINGS TO BE DEMOLISHED

Structure/Building No. or Name	Year of Initial Construction	Year(s) Modified	National Register Status*
300	1952	1957-1964, c. 1977	Not eligible
400	1942	1942-1946, 1958-1965	Criterion a
500	1941	c. 1944, 1957-1964	Criterion a
600	1941	1951, 1959-1962	Criterion a
900	1949	Unknown	Not eligible
Pump House	c. 1941	None	Criterion a
Weigh Station	c. 1941	Unknown; moved c. 1963	Criterion a
Neutralizer Facility	1981	None	Not eligible
Anderson Steel Building	c. 1979	None	Not eligible
Concrete block Test House	c. 1979	None	Not eligible
Ore bins	Post 1949-pre 1953	None	Not eligible

*Pfaff 1991, 1992

PHYSICAL SETTING AND DESCRIPTION OF THE DATE STREET COMPLEX

Physical Setting

Located 23 miles southeast of Las Vegas, Boulder City is situated between the River Mountains to the north and the Eldorado Mountains to the south. It lies in a saddle formed by two granite hills separating the Hemenway Wash on the northwest and the Eldorado Valley to the south. Boulder City was built on the south-facing slopes of the two hills in a fan-shaped plan following the topography. The focal point of the plan is the summit at the east end of the granite hills from which two main roads emanate. On the west is the Nevada Highway (U.S. Highway 93), which splits below the summit with part of the route going through the downtown area to the southeast and a northern truck route that by-passes the city. Utah Street, which forms the east arm of the fan, runs southeast (downslope), connecting with New Mexico Street, the third major street in the plan. New Mexico Street forms the base of the fan and transects Nevada Highway, as well. The northern focal area was the "Government Center" with zoning for city services as well as commercial and single and multi-family areas radiating outward to the south in decreasing density and within the frame of the primary road network. The residential area extended to the east, west and south of the fan, as well (DeBoer 1933:73:154).

The Date Street Complex is situated at the west end of the granite hills near the industrial area located on either side of the railroad, but is within the Boulder City Historic District. The district boundaries begin at the crest of the granite hill to the north where the Six Companies, Inc. (Six Companies), had built guest and executive lodgings and the city water tank is located. "The boundary descends southward to the intersection of Colorado and Birch Streets [*sic*] and then southwest roughly along the Railroad spur which separates the city's west residential district from the industrial area and desert beyond. The southwestern edge of the District follows Date Street south to Nevada Highway and then north to New Mexico Street....The southern-most limits of the historic district are along Fifth Street to California Avenue and along New Mexico Street to the center of the residential block east of Avenue F. The eastern boundary is a stepped configuration north to Wyoming Street, east past Avenue I, north again towards Arizona Avenue, and east to Avenue L encompassing the east side government residential area. The northeast boundary of the district follows the loop roadway on the north side of the saddle thus including the government center and major geographic features of the townsite" (Woodward et al. 1983:7.1).

There is a total of 514 buildings or structures in the historic district, of which 408 were constructed within the initial phase of construction and operations (1931-1942) of the city. For the period between 1945 and 1950, 66 were constructed, and the last 40 buildings or structures were built after 1950.

At the Date Street Complex, seven of the eleven major buildings or structures were considered contributing to the Boulder City Historic District (Woodward et al. 1983:7.3; Pfaff 1992:3-4). These include Buildings 100, 200, 400, 500, 600, the Weigh Station (Scale House), and the Pump House. However, only Buildings 400, 500, 600, the Weigh Station, and the Pump House are addressed herein. These buildings have construction dates between 1941 and 1945, placing them within the District's age criterion, and are scheduled to be demolished. Although the nomination recognized the significance of two of the buildings associated with the complex, Buildings 100 and 200, identified, respectively, as the

Bureau of Mines Engineering Laboratory and the Bureau of Mines Metallurgical Laboratory (Woodward et al. 1983:7.3), these two buildings lie outside the demolition area. The remaining buildings in the demolition zone, not considered contributing elements because both have post-1945 construction dates, are Buildings 300 and 900.

Physical Description

The Date Street Complex, as it is today, consists of 17 buildings, structures, and structural remains, two ponds, and concrete pads and platforms. Of these, four buildings are currently in use. These are Buildings 100, 200, 700, and 800. The building in the switchyard may be in use, as well. The remaining buildings, Buildings 300, 400, 500, 600, 900, the Pump House, the Weigh Station (Scale House), a metal shed, and a concrete block test house, are abandoned. Structures and structural remains include the Neutralizer Facility with retaining wall, concrete ore bins, a building foundation near the ponds, a concrete retaining wall with gated wire fencing, and concrete pads/foundations/silos located beside Buildings 300, 400, and 500, and west of Building 600. In addition, there are two smaller transformers on the east sides of Buildings 300 and 400.

In 1936, the property taken over by the Bureau of Mines (BOM) for their electrometallurgical laboratory in Boulder City, consisted of one building, now known as Building 200. Originally part of the Six Companies (the primary construction contractor for the Hoover Dam Project), the building had been used as their truck maintenance garage. When taken over by the BOM, modifications were made to include "office space, an analytical laboratory, machine shop, electrolytic bench, ore dressing section, and an area for electric furnaces" ([Stephens] c. 1983:1).

When the Boulder City station (Date Street Complex) was considering expanding the property, it was advised they consider moving west of their location to land that was not currently earmarked for Bureau of Reclamation (BOR) use, or too close to the residential area to the east (Irving C. Harris BOR, to Dr. J. Koster, BOM, Letter 9 June 1938:[131]73903). The property size was increased to 17 acres, which was formalized in a Memorandum of Agreement signed in 1941 (Colorado River 1941:[131]4594[last digit missing]).

A second Six Companies building, their old carpenter shop, was purchased in 1938. Called the "Annex" and now designated as Building 800, this building was constructed in 1931. Later used by the National Park Service, it was moved by sections to its current location on the Date Street Complex west of Building 200 (Pfaff 1992:7). This building was renovated for use as a pilot plant for manganese processing.

In 1940, as part of a new United States preparedness program, funds were allocated for expansion of the Boulder City facility. A wood-frame warehouse was built that year, just north of Building 800. In 1941, a new L-shaped administrative building, now Building 100, was constructed, as were a pilot mill concentrator (Building 600), hydrometallurgical pilot plants, electrolytic manganese pilot plant (Building 500), and a change room/electric shop. An addition to the Administrative Building was built in 1945, changing the configuration to a T-shape (Metallurgical Division 1952:6-7). Between 1942 and 1952, the

remaining buildings of the facility were constructed. Below is a list of these buildings and their dates of construction (Metallurgical Division 1952:5; [Stephens] c. 1983:3):

Building	**Year of Construction**
Electrolytic Magnesium-Chromium Pilot Plants*	1942
Carpenter Shop	1942
Riggers Shop	1943
Sponge Iron, Alumina, Titanium Pilot Plants (Building 400)	1942-1945
Titanium Research Addition (Building 400)	1945-1946
Warehouse Addition (possibly Building 700)	1951
Titanium Development Plant (Building 300)	1952

*Note: Photographs (NV-35-D-8, NV-35-D-9, NV-35-D-10) of this building suggest that it was part of Building 400 based on the proximity to the primary transformer yard on the east side of the complex; however, a c. 1953 map (NV-35-12) shows a "CHROMIUM PILOT PLANT" located directly to the west of Building 800. This is corroborated by two aerial photographs of the complex (NV-35-2; NV-35-3), which show a building in the same location with the same footprint as that provided by the floor plan drawn at the same time as the c. 1953 map.

Unfortunately, no mention was made of when the Pump House and the Weigh Station (Scale House) were constructed. A site plan dated 1 January 1942 indicates that they probably were built in 1941 at the time of the first major period of construction. It should be noted that on this plan, as well as the c. 1953 site plan, that the Weigh Station was located on the north side of the scale. A photograph of the Sponge Iron Screening Plant, dated 26 November 1942 (NV-35-9) shows the building in the background in the general locale of the scales. The c. 1949 aerial photograph (NV-35-2) also shows the Scale House, as does a 1953 aerial photograph (NV-35-3). The latter photograph shows a large window on the south elevation. The Weigh Station of today has no windows on the south elevation, but does have a large sliding window on the north elevation. These documents suggest that the Weigh Station was moved to its new location between 1957 and 1965, possibly in 1963 after the wood warehouse was removed ([Blue] 1966:30). An aerial photograph taken in 1965 (NV-35-4) with a north view of the complex shows the building as it appears today.

Building 900 has a 1949 date cut into the concrete pad at the entrance. It appears on the c. 1953 map and 1953 aerial photograph but not on the c. 1949 aerial photograph. The addition to Building 700 occurred between 1963 and 1965 (it appears on the 1965 aerial photograph). The concrete ore bins, located west of Building 500, were constructed between c. 1949 and 1953, based upon the c. 1949 aerial photograph (not present) and the c. 1953 map (present).

During the course of the modernization program undertaken between 1957 and 1965, the chromium plant (1959, 1964), boiler building (1959), dolomite kiln and adjoining structure (1959), hydrometallurgical plant (1960, 1965), wood-framed warehouse (1963), conveyor system and crusher from Building 600 (1960), wood acid storage building (1964), acid leaching shed (1965), carpenter shop (c. 1965), and electric shop/change room (c. 1965) were dismantled. Removed from the yard area were towers, tanks, thickeners and concrete footings (1960), concrete footings and floors (1961), and wooden shelters

(1957). New items added were natural gas lines throughout the complex, concrete retaining walls in the yard area, asphalt next to Building 300 (all 1957), a one million BTU cooling tower next to Building 300 (1962), and a new fence line and parking area on the Date Street side of the complex (1965). The remainder of the work noted dealt with building renovation ([Blue] 1966:28-31).

From the beginning, until it was dismantled in the late 1970s, the Union Pacific had a spur line for the BOM plant and a connector line to Boulder City that ran through the Date Street Complex to the south of Buildings 700 and 300 (view of lines near Building 700, NV-35-8). The spur line ran beside Building 700 and the south platform on Building 300, which was curved to follow it The main line lay to the south.

More recent additions to the property include the metal storage building located west of Building 500. Called the Anderson Steel Building, it has a construction date of c. 1979. Plans were drawn for the pad on 22 November 1978 (Concrete Pad for Anderson Steel Bldg. 1978:X-300-1155). The concrete block building between the metal storage shed and Building 500 also was constructed in c. 1979 as part of a test for sulphur spray bonding (Peterson 29 July 1979:27J).

Between 1979 and 1981, a semi-automated neutralization system was built south of Building 500. The complete system included an organic skimmer and sand bed filter, as well as two evaporation ponds located at the north end of the property ([Stephens] c. 1983:15; Agitator Supports for Neutralization System 1981:X-300-1179; Retaining Wall and Control Rm. Slab - Neut. Fac. 1981:X-300-1181). What remains in the yard area around the extant buildings (300, 400, 500, and 600) are the remnants of concrete tank pads, a cooling tower, concrete kiln piers, concrete pads and platforms from dismantled structures and transformers, and the concrete retaining walls.

HISTORICAL CONTEXT OF THE DATE STREET COMPLEX

Development of Boulder City

Created in 1902 by Secretary of the Interior E. A. Hitchcock following the passage of the Newlands-Hansbrough Reclamation Act, the United States Reclamation Service was established to assist in the reclaiming and settlement of western arid lands. The premise of the new service was that the federal government had an obligation to not only open this extensive new area for farming settlements, but to convey water to these areas. Essential to this new service was the building of dams, canals and reservoirs. However, during the 25-year period following its establishment, the Reclamation Service evolved from this single-purpose effort to a larger role as a "water resources agency, integrating irrigation, hydroelectric power, flood control, land and wildlife management, and recreation" (Woodward et al. 1983:8.2). The project that heralded this new approach was the Boulder Canyon Project Act passed in 1928, considered "the most significant American public works project of the twentieth century" (Golzé 1961:168-176)

Frederick H. Newell, the first Chief Engineer of the Reclamation Service, had early on realized the necessity of addressing social problems as part of the reclamation process. Unfortunately, the Reclamation Service was not yet equipped to deal with the much broader and more complex issues of

the social and economic implications of these irrigation projects. Thus, the Reclamation Service successfully accomplished several important irrigation projects in the west, but only in the area of engineering. Initially, the sale of public lands was to pay for each of these projects; however, most of the land that would have been available for homesteaders under the Reclamation's projects was usurped by states, politicians, and private real estate concerns. Added to this was the high cost of the projects, ineffectual repayment plans, and the post-World War I agricultural market failure. Between 1923 and 1928, this trend was reversed by the implementation of reforms within the Reclamation Service by Secretary of the Interior, Dr. Hubert Work (Robinson 1979:19; Golzé 1961:24-28). Resurrected as the Bureau of Reclamation, the new service had two offices, the Commissioner of Reclamation and the Chief Engineer, each with separate responsibilities. The former dealt with "policy development, direction, and congressional liaison," whereas the latter was concerned with "design, supervision of construction, research and technical activities" (Woodward et al. 1983:8.2-3). Another important change was the creation of a seven-member committee, the Committee of Special Advisors on Reclamation (known as the Fact Finders Committee), whose purpose was to examine how the government reclaimed arid lands by studying how the government applied and operated its policies. The committee members were all experts in the area of western water reclamation and included former Arizona governor, Thomas E. Campbell; author of works on irrigated and dryland farming, John A. Widtsoe; former Secretary of the Interior, James Garfield; and the West's leading authority on water resources and land reclamation and settlement, Dr. Elwood Mead (Robinson 1979:44).

In 1924, using Mead's ideas as a conceptual base, the report presented by the committee recommended that the government continue to develop projects, establish a long-term credit program for payment of projects, guide and manage the use of agricultural lands, as well as be discerning in choosing people to settle these lands. Mead was later appointed as the new Commissioner of Reclamation by Secretary Work.

To understand the importance of Dr. Elwood Mead to the development of the Bureau of Reclamation and the development of the Boulder Canyon Project, as well as Boulder City, it is necessary to briefly examine his background. From 1899 to 1906, Mead served as head of the Office of Irrigation Investigation in the U.S. Department of Agriculture. He published a textbook on irrigation in 1903, and in 1904 was invited to establish the Department of Irrigation at the University of California. His position was that of professor of Irrigation and Practices of Irrigation. In addition to his technical expertise, Mead was known for his advocacy of "humanitarian and social reform in the context of improving rural society" (Woodward et al. 1983:8.3). His work in Australia between 1907 and 1914 as the chairman of the States Rivers and Water Supply Commission of Victoria was the basis of this philosophy. It was here that he directed over 30 projects in government-supported reclamation and settlement, including the establishment of government-financed planned villages. The principles applied to the development of Australia's arid areas were brought back by Mead to the United States and served as the groundwork for the Boulder Canyon Project and the planned community of Boulder City (Robinson 1979:45).

Passage of the Boulder Canyon Project Act on 21 December 1928 provided the Bureau of Reclamation with the first opportunity to show how these principles could be applied to a major, multi-purpose federal conservation undertaking. The principles essentially stressed the importance of organization and planning with regards to successfully establishing a community in an arid setting; that increased federal

accountability did not decrease or limit freedom; and finally, the area of reclamation provided the best arena in land reform to demonstrate the excellence in planned rural communities. In addition, this project would bring economic growth to the Southwest by enhancing agricultural development in Southern California (Imperial and Caochella valleys provided water via the All-American Canal), and provide water resources for domestic and industrial use, as well as power (Golzé 1961:29, 106, 171-175; Robinson 1979:50-51).

Originally, Boulder Canyon was selected as the location for the dam, but the site was relocated downstream several miles to Black Canyon. This canyon was more suitable because of deeper bedrock, rock formations, and an increase in the size of the water storage area. The sole drawback to this new location was its isolated nature. The nearest community was Las Vegas, which was deemed unsuitable because of distance and social environment. A community would have to be built to provide housing and other amenities for the thousands of workers building the dam, and administrative and operational facilities for post-construction management. Thus, the planning of Boulder City as an ideal rural community was developed (Reining 1950:8).

The ideal planned community used as a prototype for Boulder City was Radburn, New Jersey. Conceived and partially built in 1929, this community's plan followed the ideas of the American City Planning movement which incorporated those of the "Garden City" of Englishman Ebenezer Howard with greenbelts, curvilinear streets, community centers, and appealing residences; and the "community movement" with its combination of "civic reform, social integration, innovative site planning, long-range development economics, and scientific management of urban regions" (Woodward et al. 1983:8.6). Unfortunately, the town of Radburn was never completed and never attracted industrial interests. However, the idealized concept of this planned community appealed to the developers of the Boulder Canyon Project, who used it as the basis for their ideal community. Moreover, they "successfully incorporated development economics, governmental structure, environmental concerns, and social planning as integral parts of the planning process" (Woodward et al. 1983:8.6). Where Boulder City succeeded over Radburn was the presence of the federal government as the chief employer during the six-year dam construction period, as well as the administrative force during and after construction. Coupled with the inexpensive land used for the entire project and the long-term financial program for construction costs utilizing power as the commodity, the government's commitment to Boulder City for its first 30 years provided a sound base for its success as the first fully-developed planned community. Further, the willingness of the developers to accept modifications where necessary to the plan (e.g., the Six Companies' single family residential area and businesses along the Nevada Highway near the Boulder City Company Store) played a part in the overall development of the community.

As created by S. R. DeBoer, the Boulder City Plan utilized the topography of the area placing the government or civic center at the apex of a triangular pattern. The apex was the summit of a granite hill, and the remainder of the community covered the south-facing slope of the hill. Placed along the northwest side of the community, at the top of the other hill, was an open, triangular-shaped area. This is where the buildings under study are located.

As noted earlier, there were two parts to the early phase of development in Boulder City. The first, from 1931 to 1936, dealt with the construction of the dam and the city, and establishing the basic structure of

the community, e.g., systems of physical support (water, sewage, electricity), social and civic support (churches, schools, private business), and government administration. Following was the operation period, from 1936 to 1945, when various Federal Government organizations established offices in Boulder City, including the National Park Service, the United States Coast Guard, and the Bureau of Mines. A Memorandum of Agreement in October 1936 brought about a separation of the reservation with the Bureau of Reclamation taking control of the dam and the city, and the National Park Service taking over the newly forming reservoir and surrounding area. Boulder City gained permanency in 1943 when the Bureau of Reclamation was reorganized. The reorganization resulted in the formation of six regional headquarters in the West with the Boulder City office becoming the headquarters for Region III (covered portions of four states), including offices related to the Lower Colorado River area (Woodward et al. 1983:8.10; Reining 1950:12-15).

In addition to the change in emphasis from construction to operation, there was a substantial population decrease between the two periods. While the dam was under construction the population was at 8000; however, after completion, it was reduced to between 2000 and 3000 by 1937. Throughout, the Bureau of Reclamation continued much of the governing policies established during the construction period.

By 1949, there was growing concern over the future of Boulder City. Henry Reining, Jr. wrote a report of a survey conducted for the Bureau of Reclamation regarding Boulder City. In it was discussed the development of the community, expansion and attempts at stabilization, federal organizations that came to make use of the available power and other nearby resources, and how these organizations affected the community socially and economically. Reining (1950:38) made note that there were some difficulties related to town expansion, as well as financial concerns. Generally a favorable document, when presented to Congress by Senator Patrick McCarran of Nevada, it provided the background data required for relinquishing federal control and providing home rule to the city. In 1951, the Secretary of the Interior separated the administration of Boulder City from that of Hoover Dam. Seven years later, the Boulder City Act allowing the city to become independent was signed and passed on 9 July 1958. Boulder City became incorporated on 4 January 1960 following the receipt of the city's deeds and contracts from the Bureau of Reclamation (McBride 1981:28-29).

General Background of the Bureau of Mines

Prior to discussing the history of the Bureau of Mines in Boulder City, the following is a brief history of the Bureau, itself. As early as the 1890s, people associated with mining were requesting the formation of a federal organization that would "collect, evaluate, and disseminate scientific, technologic, and economic data of value to the mineral industries" (Kirk 1994). Among those requesting such an organization were the American Mining Congress at its 1896 convention, and the conservation movement. By 1904, a Bureau of Mines was established as a technologic branch within the U.S. Geological Survey (USGS). Its purpose was to investigate fuels and mine explosions. In 1907, President Theodore Roosevelt suggested that a Bureau of Mines be established under the aegis of the Department of the Interior. He was expressing concern over the loss of life and natural resources. Although Western congressional representatives presented a number of bills for the creation of such an organization, nothing materialized until after a series of devastating coal mining disasters in 1907 and 1908, where the loss of life numbered more than 3,000 in 1907 alone. On 16 May 1910, the Organic Act (Public Law 79) was

passed by Congress which established the BOM. It became effective on 1 July 1910 (Holmes 1912:3; Kirk 1994).

The goals of the newly established BOM, as noted in the director's first annual report, stated

> The general aim and purpose of the inquiries and investigations made by the bureau under the terms of the organic act are to increase health, safety, economy, and efficiency in the mining, quarrying, metallurgical, and miscellaneous mineral industries of the country (Holmes 19112:4).

The Organic Act specified what the work entailed (such as safe conditions for miners, use of explosives and electricity, improvements in mining equipment), including providing reports of investigations conducted and data pertinent to the mining industry (Holmes 1912:3). All employees of the USGS in its technologic branch were transferred to the newly formed BOM. Joseph A. Holmes, the first director of the bureau, was best known for his work in the progress of mine safety and reduction of mine related accidents, and authored the slogan "Safety First."

Another important aspect of the work initiated by Holmes was the need for statistical data. One area of immediate concern was data regarding mining accidents, beginning with coal mines but extending to other types of mines and quarries, as well as to mills, ore dressing plants, and other facilities involved with the mining industry. He was aware that investigations into more efficient methods of mining, quarrying, and production were necessary not only from the standpoint of preventing waste of natural resources, but also in view of safety (Holmes 1912:9-10, 43-44).

In 1913, an amendment to the Organic Act (Public Law 386) increased the scope of the BOM. Included were scientific and technological investigations that would not only improve safety in the mining industry, but economic development, as well; investigations into the economics of mining and mineral related industries; investigations of explosives and peat; investigations into more efficient mining, production, and use of mineral fuels and unfinished products; and provide the information resulting from these investigations. In his first annual report, Holmes (1912:47) indicated that reports would be written in two formats, i.e., technical and non-technical, disseminated as either a bulletin or a report of investigation/technical report in the former format, and as miners' circulars (Information Circulars) in the latter.

For ten years, the BOM was under the Department of Commerce following a 4 June 1925 executive order passed by President Calvin Coolidge. The move was initiated because Coolidge thought that the work done by the BOM was more closely related to and would be better coordinated if part of the Department of Commerce. Franklin D. Roosevelt returned it to the Department of the Interior in 1934.

Between the 1920s and the 1970s, the BOM grew in scope to include statistical data on mineral resources, work with helium, and mine safety inspection and its enforcement. The BOM also provided programs to educate the mining industry in safety practices, new methods of extraction, and other technologies, many resulting from their investigative research. An international program dealing with mineral resource statistical data and commodities was implemented in the 1960s, with representatives

placed in several U.S. embassies around the world. In addition to these aspects of the BOM, another arena was assisting in the discussion of how to best serve the Wilderness Act passed in 1964 while still developing the economic potential of public lands (Kirk 1994).

Despite the earlier progress and achievements of the BOM, in 1995, while determining the budget for fiscal year 1996, a divergence of views regarding the BOM (e.g., the Senate Interior Subcommittee supported the asked for budget, the House of Representatives Appropriation Subcommittee recommended that the BOM be abolished), resulted in the formation of a joint Conference Committee. This group determined that the BOM be closed with specified programs transferred to other agencies. (Note: The history of the BOM, along with a list of accomplishments during its 85 year history was an addition made to the last *Minerals Yearbook: Metals and Minerals* Vol. 1, 1994.)

The Bureau of Mines in Boulder City

In 1930, the Secretary of the Interior, Ray L. Wilbur, removed all lands associated with the dam site and the proposed city from the public domain. To prevent conflict with Nevada, which wanted to have control over the city allowing for taxation as well as voting rights, the Boulder Canyon Project lands officially became a Federal Reservation on 26 May 1931, similar to those lands set aside for Native Americans. This gave the Bureau of Reclamation both developmental and jurisdictional control of the project lands. There would be no taxation or voting, but it was felt that with proper administration the people residing in the new city would retain their freedom (Woodward et al. 1983:8.12).

The first contact between the Bureaus of Reclamation and Mines appears to have occurred in 1934. In a letter dated 29 March (Colorado River 1934:[131]430), Dr. Mead informed Scott Turner, Director of the Bureau of Mines (BOM), about salt deposits located in the reservoir area of Boulder Dam. The St. Thomas Nevada Rock Salt Co. was interested in selling the deposits, but the Bureau of Reclamation (BOR) needed to have a value placed on them and was requesting the assistance of the Bureau of Mines. Apparently this information was provided. Then, in 1935, John W. Finch, the new Director of the Bureau of Mines, contacted Dr. Mead about a report written by Dr. F. W. Lee and William O. Vanderburg on specific mineral deposits in the Boulder Dam area, including a study regarding various methods of application in exploring the deposits. In this letter, Finch also thanked Mead for the opportunity of doing the investigation because of funds provided by the Bureau of Reclamation. He stated that, "As you know, the Bureau of Mines is unable to conduct such investigations without help from the outside." He further noted that if the BOR would like the investigations continued, the BOM would be willing to do so (Colorado River 1935:[131]555).

Later that year, on 27 June, Finch again wrote to Mead regarding the need of an electrometallurgical industry in the Western states, especially Nevada, built near new dams in the West. Local interest would be augmented by a broader interest in the "development of strategic mineral processes many of which will be of an electrometallurgical nature." For this purpose, the Bureau of Mines received an increase in appropriations, albeit a small one, for building an electrometallurgical laboratory in Reno. The limited funds would not allow for extensive tests or assessing many problems. Because the Boulder Dam area was considered an ideal area for these types of investigations, even on a limited basis, Finch was looking into how to establish a facility near the dam. Based upon previous discussions between Messrs. Dean

and Koster of the BOM and Mr. Taylor of the BOR Chief Engineer's office, Finch thought that with the BOR's assistance, the BOM could obtain an already built structure, and with the use of scrap materials from dam and building construction, remodel the structure into an acceptable facility within their limited budget and still allow funds for operations. However, this was contingent upon the cooperation of the Nevada State Relief Administration for manpower. What was needed from the BOR at that time was assurance of the possibility of a building and materials. Dr. Koster would be available to visit the Boulder City area and detail what was needed for the laboratory at a later date (Colorado River 1935:[131]10809).

Mead's response was for Finch to contact John C. Page, the Chief Engineer of the Boulder Canyon Project, as he was better able to assess the situation. Between Mead's response on 29 June and 10 July 1935, the request for building space and materials was approved and the BOM applied for a *Federal Projects Application for Allotment of Funds* for the conversion of a BOR property into a "pilot plant for demonstrating commercial feasibility of electrometallurgical production of ferro-chronium, ferro-manganese, magnesium, and light alloys, from ores available to Western power project." This would include the acquisition, preparation and storage of said materials, and the operation of the plant which would require some construction and remodeling of buildings. Materials were to be provided by the BOR following completion of the Dam and the buildings associated with the dam. The results would be a power-consuming industry. The justification for building the laboratory at Boulder City was that various mineral resources were located in the area that "need only metallurgical development to convert them into useful metals and that Boulder Dam area thus is favorably situated as a potential electrometallurgical center" because of the considerable amount of energy available from the dam. It was further noted that some of the metals, such as manganese and chromium, were imported to the U.S. in considerable quantity because there were no facilities to process them. Therefore, an electrometallurgical center located "at or near Boulder Dam is economically desirable" and "labor from Nevada relief rolls" would be used in construction and remodeling (Colorado River 1935:[131]).

While awaiting the approval for the appropriation of funds, the BOR and BOM continued to maintain a dialogue on such issues as the general requirements of buildings needed based upon specific items for conducting the experiments (e.g., electric furnace room, ore bins and preparatory room, electrolytic room, laboratory), and what buildings might be available for the laboratory. Buildings that were suggested were all ones built by the Six Companies for their use while constructing the dam. These included the mess hall, a garage, office and club house, none of which would be available until 1 October 1935. Walter R. Young, the Reclamation Construction Engineer at Boulder City, determined that the best building for the BOM's purposes was the machine shop and warehouse still in use by the Six Companies and not available within the expected time frame (Colorado River 1935:[131]12279).

On 13 August 1935, the Advisory Committee on Allotments recommended that the BOM receive its allocation. Unfortunately, the Bureau of the Budget, part of the Executive Branch, disapproved the application. In a 27 December 1935 letter to Mead, Finch stated, "We are now asking the Congress to provide the funds for this work and have obtained an option until May 1 on the purchase of the main garage of the Six Companies, Incorporated. This option is, of course, subject to your approval and the transfer of the necessary land to this Bureau." The necessary land included an additional 500 by 500 feet area surrounding the garage/warehouse (Colorado River 1935:[131]19282). On 17 April 1936, Finch

received a letter from Albert R. Olds, the Manager of the Sales Department at the Six Companies, informing him that the option on the garage would be extended to 1 June; however, because of prior arrangements with the BOR, it would not be available until 1 October (Colorado River 1936:[131] 25597).

Finch requested that the BOR make the building available earlier than October of 1936, because an appropriation bill for the Department of the Interior would be passed soon, and he wanted to begin installing equipment in the garage. He indicated that any delay would be "a great disappointment to mining people of the region surrounding Boulder Dam and to Members of Congress who have been particularly interested in this project" (Colorado River 1936:[131]25697). Again, the garage, which was perfect for the work the BOR needed to service their larger vehicles, would not be available until 1 October, nor was there space in any of the other buildings still in use by the Six Companies available until that time, according to Ralph Lowry, the Construction Engineer at the Boulder Canyon Project (Colorado River 1936:[131]26479). Despite the lack of quarters for the new laboratory, Finch issued Administrative Order 189 in July 1936 authorizing the Boulder City Experimental Station (Metallurgical Division 1952:1; [Stephens] c. 1983:1).

Discussion of the acquisition of the garage and subsequent remodeling was provided in the *Las Vegas Evening Review-Journal.* In a 20 July 1936 article about the electrometallurgical test station, it was reported that Congressman James R. Scrugham, former Nevada Governor and supporter of the Boulder Canyon Project, was instrumental in the appropriation of funds ($48,400) for the new laboratory. The initial estimate of time to remodel and install all of the necessary equipment was three months, then the laboratory would conduct its work. This was to "determine the best commercial use to which the vast mineral deposits in this area can be put when developed thru [*sic*] cheap power from the dam project, and the Nevada congressman predicts that it will play an important part in the industrial advancement of southern Nevada" (*Las Vegas Evening Review-Journal* 20 July 1936:1, 4). The first project to be conducted was processing low-grade manganese into 100 percent pure manganese. The need was immediate for this product, and low-grade manganese ore was available in large quantities but not processed because of the expense. The second area of concern was processing a tungsten-cobalt alloy that was more durable and stronger than steel. Its projected use was in naval "big guns" to reduce loss of accuracy. Both of the minerals were present in Nevada, and the use of inexpensive and plentiful electrical power was believed to be a significant factor in producing this alloy commercially. In addition to the work at the laboratory, funds had been allocated for a geophysical survey of Nevada for ore bodies.

In an 11 August 1936 article, it was reported that minerals of interest included chromium, molybdenum, nickel, magnesium, aluminum, and iron that were found locally near the dam site. The work on producing a pure manganese was noted, as work had already begun in the Reno branch of the Nevada BOM station on a laboratory scale. Future projects included working on development of an exceptionally high-grade chromite, iron, and copper alloy and treating alunite in the electric furnaces to produce an alumina residue that could be processed into aluminum (*Las Vegas Evening Review-Journal* 11 August 1936:4).

A later article reiterated the types of mineral deposits that would be investigated and their locations around the state. Regarding the manganese work, it was noted that to make ferro-manganese required ores containing a minimum 40 percent manganese. The United States had small deposits of ores with this

percentage, but larger ore bodies containing 8 to 35 percent manganese were plentiful, particularly in southern Nevada. This was the ore that would be tested with hope of producing a commercially competitive electrolytic manganese, particularly as most of the manganese used in the United States was imported. In addition to experiments with other mineral alloys, the electrometallurgical laboratory was interested in the manufacture of white porcelain and chinaware using clays and other minerals such as feldspar and dumortierite (*Las Vegas Evening Review-Journal* 8 December 1936:3). Those tested included kaolin from Caliente and talc from Goodsprings, Nevada; feldspar from Kingman, Arizona; and fire clays for ceramic ware from California (Metallurgical Division c. 1952:3).

Another area of concern regarding the BOM electrometallurgical experimental station was the amount of electricity required to run the equipment. Between 23 April and 26 August 1936, a series of letters and memos passed between the BOR and BOM and within the BOR regarding power usage needed. O. P. Hood, Acting Director of the BOM, informed John C. Page, the Acting Commissioner of the BOR (following the death of Elwood Mead in January of 1936, and later Commissioner until 1943), that the new laboratory would need "2000 KVA available for operation. This would be most convenient for us if it were delivered at the building at 440 volts, three-phase." Hood also enquired as to the availability of the power and whether government agencies could receive it at no cost (Colorado River 1936:[131]25707). Power, at 2,300 volts, would be available following the transfer of three Southern Sierras substation transformers at the dam to the Boulder City substation. However, the BOM would need to purchase a transformer for their laboratory to reduce the voltage to 440 volts or other special voltage levels for their equipment. Further, they would have to pay for the cost of generation, transmission and losses of energy. It was advised that an interdepartmental agreement be drafted regarding this matter (A. F. Walter, Chief Engineer, Denver, to John C. Page, Acting Commissioner, Washington, D.C., 18 May 1936; Colorado River 1936:[131]27189). The memorandum of agreement regarding the use of power by the BOM at the Boulder City laboratory for the fiscal year ending 30 June 1937, and renewable on a yearly basis, indicated what the cost of power would be, how it would be paid, and approval of equipment used according to the BOR specifications. Dated 22 July 1936, it was approved by the Acting Secretary of the Interior, T. A. Walters, on 3 August 1936 (Colorado River - draft copy 1936:[131]29612).

According to the *Las Vegas Evening Review-Journal* (various dates), work began on remodeling the garage (Building 200) in mid August into the new laboratory. Improvements to the large steel and sheet metal building included an enlargement of the office area. Throughout the fall of 1936, work progressed on conversion of the building and installation of the equipment as it arrived, although only about 20 percent of it was installed during 1936, including the largest of the two electrical furnaces in December. Specific areas readied included the machine shop, the chemical laboratory, and an electric kiln. Some items were manufactured on the premises. Landscaping around the building was completed that fall, as well, with guidance from Wilbur Weed, the man in charge of landscaping Boulder City. By the end of December, eight men were working at the laboratory. The only work they were able to do during the set-up period was to experiment with clays from an unnamed mine near Kingman, Arizona. The process involved purifying cobalt, and the BOM was pleased with the results of the experiments (*Las Vegas Evening Review-Journal* 19 November 1936:1).

The next major issue of concern for the BOM was the use of water for laboratory equipment. In a 21 November 1936 letter to Page, Finch suggested that a memorandum of agreement be prepared by the BOR based upon the one signed earlier in July for electrical power as a stated contract between the two agencies. He further noted that water usage could reach as high as 50,000 gallons per day, and he hoped that the rates would be reasonably low (Colorado River 1936:[131]36679). By 14 January 1937, a draft agreement had been made and signed by the two agencies indicating cost of water, method of payment, and necessary equipment needed to disperse the water based upon BOR specifications. Included was a paragraph (Item 5) regarding payment of water usage effective from the first day of use to 30 June 1937, renewable on a yearly basis. Signed on 15 January 1937, it was approved by T. A. Walters on 26 January 1937 (Colorado River 1937:[131]40007).

According to newspaper articles from early 1937 (*Las Vegas Evening Review-Journal* various articles), a new transformer arrived in January for the furnace. Refractory brick for the furnace interior had already arrived, but the furnace itself would be built at the new laboratory. The BOM was already conducting tests on nickel ore deposits from the Key West Mine (Bunkerville District, Clark County, Nevada; Longwell et al. 1965:123-125; Koster et al. 1939). A smaller furnace was being used to determine the calibrations for fluxing the calcines of the nickel ore in the larger furnace. Other equipment, switch boards, a water cooled tube switch used in voltage regulation, and meters also arrived at this time. When installation was completed, there were three transformers placed at the rear of the laboratory. Additional equipment was constructed on the premises, including items to handle slag and metal and electrode holders for the shaft furnace. It was noted that mining in the region had increased as a result of the laboratory.

The next group of letters between the BOR and BOM dealt with the electricity for the laboratory. It was believed by the BOM that the power would be delivered by way of a line to the building or a pole located nearby. According to Finch, in a 5 February 1937 letter to Page, what was actually happening was that the BOR planned to locate the three transformers from the Southern Sierras Substation at the dam to within 75 feet of the BOM laboratory. The connection between the transformers and the building would require a heavy cable, provided by the BOM, which was an unexpected expense that would hinder beginning operations during that fiscal year. Finch requested from Page either to make a change in the transformers' location or provide the necessary cable (Colorado River 1937:[131]40685). In response to a request from Page, Ralph Lowry, the Construction Engineer in Boulder City, wrote back on 24 February that the best location for the transformers would still require the BOM to have a cable line, now 280 feet long, because of interference due to the operation of the laboratory, particularly the slag dumps from the furnace. He did suggest that some cable would be available from a temporary substation, provided that the BOM could wait two to three more weeks (Colorado River 1937:[131]42007).

Apparently this problem with the transformers and the cable was solved to everyone's satisfaction. However, on 17 June, Page sent an urgent telegram to the Denver office requesting help in providing a remedy for a new problem with the electricity for the BOM laboratory. It appeared that the "facilities [are] inadequate to supply power for furnaces [at] Boulder City" (Colorado River 1937:[131]). The immediate solution, until new transformers arrived and were connected, was for the Southern Nevada Power Co. to provide the needed power to the laboratory (Colorado River 1937:[131]49080). On 27

July 1937, Lowry wired Page to let him know that the BOM laboratory received power through the Boulder City Substation on 23 July (Colorado River 1937:[131]51300).

By mid September 1937, testing of large amounts of regional ore was underway. The new laboratory could handle up to 24 tons of ore daily in the ore dressing equipment. In addition to the "large, 1500 kilowatt hour arc three-phase furnace" for the larger production tests, there was a smaller "200 KWH tilting resistance arc furnace" for other tests. The station had a fully equipped chemical laboratory, an electric ceramic kiln for testing ceramic materials for industrial applications, and "flotation, gravity and concentrating ore-dressing equipment... commonly found in Nevada mills" (*Las Vegas Evening Review-Journal* 14 September 1937:3). Dr. John Koster was the supervising engineer of the laboratory, and R. G. Knickerbocker was the engineer in charge of the facility. A number of other projects to be conducted at the station included electric smelting of ferro-magnesium, producing "low carbon ferro chromium" from local ores, and producing a ceramic clay for such applications as pottery porcelain.

In November 1937, an explosion resulting from a lack of water in the boiler injured three men at the laboratory. The two nearest the explosion were burned, while a third was thrown and experienced a slight concussion. Little damage was done to the laboratory. The explosion was of an electrode on a converter (*Las Vegas Evening Review-Journal* 11 November 1937:3).

In early 1938, the BOM acquired the carpenter shop from the Six Companies and requested from the BOR some land to move the building closer to their existing laboratory facilities. The initial location was considered too close to the City of Los Angeles Bureau of Power and Light employee residential area and included land already allocated to the BOR. Irving C. Harris, Acting Construction Engineer, advised Dr. Koster in a 9 June letter that it would be better to go west of the current BOM building. He also noted that should the BOM operations expand in the future, which appeared likely, they should be looking at a permanent locale now that would allow for that expansion. The proposed carpenter shop location would be ideal for this purpose. Furthermore, there was concern regarding fumes and smoke from the current laboratory about which nearby residents had complained the previous year. Although not expressed, the intent appears to have been that this westerly location was not as likely to be as offensive (Colorado River 1938:[131]73903). According to Pfaff (1992:7), the building, constructed in 1931, was moved to its new location in sections in 1938 and is now Building 800.

In a 10 June 1938 article in the *Las Vegas Evening Review-Journal*, it was noted that funds had been allocated for the BOM Boulder City laboratory, along with the Hawthorne naval ammunitions depot, through a deficiency appropriations bill sponsored by Congressman Scrugham and passed by the House of Representatives. There would be $6,000 for constructing an additional building at the facility (*Las Vegas Evening Review-Journal* 10 June 1938:8).

In a September 30 article of that year, the *Las Vegas Evening Review-Journal* stated that the BOM had been successful in solving the problem of creating a commercially competitive, high-purity electrolytic manganese from low-grade ores. The article went on to explain the new process, which differed greatly from what had originally been described in a previous article on the subject. The end product was a 99.63 percent pure metallic manganese (*Las Vegas Evening Review-Journal* 30 September 1938:10).

At this time, the facility employed 22 men. According to Dr. Koster, who was the director of the experimental station, it had consolidated with the Reno station that year. In a talk given to a group of Las Vegas Rotarians and Kiwanians, Dr. Koster explained the purpose of the experimental station, saying that the metallurgical processes being tested were to assist in finding ways to treat ores found within 200 miles. Projects they were working on included "the production and utilization of manganese, chrome, alunite, ferro-alloys, ceramics, antimony, boron, magnesite, and nickel-copper ores" (*Las Vegas Age* 25 November 1938:12).

In a 14 September 1939 letter from a gentleman named Koontz, apparently from the BOR, to a Mr. Price, who was with the BOM, the subject of land ownership was addressed with regards to the BOM purchase of the carpenter shop from the Six Companies the previous year. According to the "First Form withdrawal order of January 3, 1929 which embraces the land in question," the property was within the boundaries of the Boulder Canyon Project Federal Reservation, thus placing it under the jurisdiction of the Bureau of Reclamation. The only document indicating the presence of the Bureau of Mines was the 22 July 1936 Memorandum of Agreement between the BOR and the BOM for the operation of the electrometallurgical plant (Colorado River 1939:[131]). By late 1940, the BOM was planning to build a beneficiating plant for the treatment of manganese ores on the land to the west of the original laboratory. Additional power and water would be needed to operate this new facility, and plans were made by the BOR to provide for these increases. A new issue that arose, first mentioned in the above letter from Koontz, was the question of land rental. In a 8 November letter to the Chief Engineer (S. O. Harper) of the BOR, Mr. Harris stated that the BOM would have full use and control of the lands to be used for expanding the facilities in Boulder City. They would be using Boulder City utilities (water, sewage, power), depositing waste on these lands (white sand tailings would be dumped in a ravine on the property), producing waste water that would be cleansed of chemicals before being dumped into natural stream channels, compensating the BOR for the utilities including special services (a separate pipeline of untreated water), and paying a rental charge for the tract of land based upon use and equipment. The railroad right-of-way would be preserved, as would that for the pole line of the Nevada California Electric Co. However, the BOM would have to move a telephone line of the Southern Nevada Telephone prior to 1 June 1941 (Colorado River [131]37314).

The allocation for the land was approved on 16 November (S. O. Harper, Chief Engineer, to Irving C. Harris, Director of Power, Boulder City, Colorado River 1941:[131]3790[1]). Prior to the memorandum of agreement being signed, two changes included an increase in water usage to 150,000 gallons per day by the BOM Boulder City facility, and a revised cost for the untreated water conveyed to the facility (Irving C. Harris, Director of Power, BOR, Boulder City to District Counsel [Richard J. Coffey], Los Angeles, 19 December 1940, Colorado River 1940:[131]40488). After much discussion within the BOR and between the BOR and BOM, the Memorandum of Agreement that gave the BOM "the right to occupy a much larger area than it has occupied in the past for the purpose of constructing and operating a pilot plant or plants for the beneficiation and other treatment of domestic manganese and other ores," was approved and signed by E. K. Burlew, the First Assistant Secretary of the Interior on 7 March 1941. Indicated was the possibility of paying a rental fee for the property, but only at the determination of the Secretary of the Interior. As with the previous agreements, this was renewable on a yearly basis (Colorado River 1941:[131]4594?).

In a special section of the *Las Vegas Evening Review-Journal* (7 June 1941:7) commemorating the 10th anniversary of the Boulder Canyon Project, a lead article declared that the BOM laboratory was expanding. The article discussed the testing carried on at the facility, which was a unit of the electrometallurgical section of the Reno BOM headquarters until 1938. At that time, in August, the section was transferred to Boulder City. In 1940, as part of a preparedness program implemented by the federal government, the "need for an adequate and uninterrupted supply of manganese metal became evident." A special allocation of defense funds was provided for buildings and equipment for a pilot plant to find a method of processing low-grade domestic manganese ores in the event that foreign supplies were curtailed. The plant was to have "an ore-crushing unit, a concentrator for treatment by gravity or flotation, a hydrometallurgical unit for investigation and demonstration of various leaching processes, and an electrolytic unit for deposition of high purity manganese metal." A staff increase of 125 to 150 employees would be necessary. In addition to the pilot plant, another new building containing offices and a chemical laboratory was constructed for administrating and analyzing all procedures and units. The building, now designated as Building 100, was "L" shaped and constructed primarily of concrete blocks. It was designed by architect A. Lacey (or Lacy) Worswick (1940) and constructed by Las Vegas contractor P. S. Webb (1940). In addition to the laboratory and office space were a library, conference room, chemical storage room, and reception area. The plant was described as being nearly complete in a 19 August *Las Vegas Evening Review-Journal* article (1941:5).

In 1942, a sponge iron pilot plant (Building 400) was built at the Boulder City station. The pilot plant was for testing a sponge-iron process for making steel without the use of scrap iron, as discussed in the *Las Vegas Evening Review-Journal and Boulder City Journal* (14 October 1942:2; hereafter cited as *Las Vegas R-J and BJ*). The plant was completed and working at a rate of a feed of 12 tons of ore per day producing a 93 percent metallic iron equaling "'seven and two-tenths tons of sponge metallic iron per day'" (*Las Vegas R-J and BJ* 28 October 1942:1).

In the spring of 1943, the Boulder City station experienced the first layoff of personnel since it had opened. Budgetary constraints affected all but the work on the electrolytic manganese and magnesium processes. Other areas of research were reduced to pre-war scale and personnel numbers. At that time an appropriation bill was before Congress, but the *Las Vegas R-J and BJ* (29 April 1943:1) article indicted that approval would not be expected for another 60 days. The amount of the appropriations was not known.

According to an item in the August 1943 issue of *Engineering and Mining Journal* (144(8)101), the BOM received an allocation of over $16 million with over $5 million for the Geologic Survey for the new fiscal year. Included in the appropriations bill were specific fund allocations, including work on developing electrolytic manganese, processing alumina from clay, as well as the search for new sources, recovery and processing of magnesium, aluminum, chromium and manganese. Although not indicated in the article, it is likely that some of these funds were provided to the Boulder City manganese pilot plant and other projects concerning these minerals. In an earlier issue of the journal (June 1943:144(6)96), it was noted that the Boulder City station had successfully recovered magnesium from a substantial dolomite deposit in Sloan, Nevada.

In the fall of 1945, following the end of World War II, the BOM facilities in Boulder City came close to being closed due to the cancellation of defense appropriations by Congress in Appropriation Recession Bill HR4407, which passed on 22 October. Boulder City was concerned, as many of the professionals and scientists at the plant were community leaders. The House Appropriation Committee wanted plants, including the Boulder City facilities, to be closed and remaining monies returned to the Treasury. However, C. W. Davis, the chief of the division, was informed by Robert S. Dean, Assistant Chief of the BOM in Washington, that the Boulder City facilities would not be affected as dramatically as first implied. During the fall of 1945, Senator E. P. Carville and Congressman Berkeley L. Bunker of Nevada both worked to keep the Boulder City facility open by requesting that funding not be reduced in the appropriation bill for the Bureau of Mines and explaining the need for the Boulder City and Reno, facilities. By December, a group of 25 western Congressional members led by Congressman Bunker successfully pushed to keep funding in the appropriations bill for continued operation and possible expansion at the BOM Boulder City facilities. Bunker apparently had to continue to fight for the work done at the Boulder City branch into the following year. He stressed to the house appropriations committee the need to continue the work as an ongoing part of national security, as well as providing the needed impetus to resurrect mining, particularly of gold and silver, that was closed during the later years of the war (*Las Vegas R-J and BJ* various dates).

In September 1945, the BOM facility was discussed in an article about Boulder City in *The Nevada Magazine* (1945:19-25, 31). The author, Don Ashbaugh (1945:19, 31), who wrote the *Boulder Journal* segment of the *Las Vegas Evening Review-Journal*, wrote that during World War II, the facility, which was the regional headquarters for Nevada and California, operated on a 24-hour schedule "testing ways to provide the nation with new supplies of needed materials from Western minerals." He noted (1945:31) the success of the development of the electrolytic manganese process, and that all the work conducted during the war at the facilities "will be carried on for the constant improvement of America's way of life."

In the 1947 annual report for the BOM, R. R. Sayers, the director, gave mention of four projects that were being conducted at the Boulder City branch. Noted with regards to their importance to peacetime industries were electrolytic chromium, electrolytic cobalt, and the development of processing and producing ductile titanium and zirconium. Praise was given for previous work in producing an electrolytic manganese and sponge iron, which had been expanded since their initial success, particularly in the field of jet-propelled aircraft manufacture (*Las Vegas R-J and BJ* 21 February 1947:13). Despite the high praises, however, budget constraints in the BOM in 1947 again affected the continued operations at the Boulder City manganese pilot plant. Along with three other large plants and eight smaller ones, it was earmarked for closure because of a cut in appropriations for the BOM by Congress. Other operations in Boulder City would continue, but 40 percent of the personnel would be laid off with the budget decrease. According to the article, the budget cut also would affect the exploration for domestic minerals following the depletion of World War II supplies, including an inventory of radioactive mineral deposits (*Las Vegas R-J and BJ* 6 May 1947:11).

Despite these dire predictions, the Boulder City branch of the BOM continued operations, and in 1950 was to receive $600,000 for additional manganese tests of ores from the Artillery Peak area in Arizona, as well as other low-grade manganese deposits. From the Supplemental Appropriations Act approved on 27 September, the monies were for constructing a 50-tons per day experimental plant. These funds

were considered necessary because Congress determined there was a need for increased manganese production for the steel industry. Boulder City was selected as the most appropriate site because of the existing facilities and access to Boulder Dam power, allowing the work to begin earlier and move along farther than at any of the other proposed locations. The need was tied again to the lack of high-grade manganese ores in the United States. Artillery Peak was estimated to contain 50 million tons of low-grade ore. The new pilot plant was designed to "develop and demonstrate processes suitable for large scale operations. It will include an ore preparation unit with facilities for storage, crushing and coarse grinding; an ore concentration unit, and chemical treatment units" (*Nevada State Journal* 30 September 1950:6).

A report presented to the 81st Congress 2nd Session, Document No. 196, by Senator Pat McCarran, examined the economic, political, and social situation of Boulder City in 1950. Included in the report was a discussion of the four major employers, of which the BOM was one. A total of 102 people worked at the facilities, which covered 21 acres, with no plans at that time of expanding (Reining 1950). The purpose of the report was to determine if Boulder City would continue as an independent and incorporated city, which became finalized in 1960.

In 1950-1951, the station was selected for the site of a new titanium pilot plant, which was completed in 1952. Built with funds provided by Army Ordnance, the pilot plant and equipment cost $500,000 (Metallurgical Division 1952:5). The work in this area moved more quickly from the early laboratory scale work to commercial phase more quickly than other projects conducted by the BOM. Begun in Tucson in 1938, by 1944 work was carried out at the Boulder City station, with changes from the original Kroll process of metallurgical development to one best described as the Kroll-Wartman process, based upon the changes made by Frank S. Wartman, who took over the project when it was transferred to Boulder City. Not long after the new titanium development plant was in operation, it was being used by Timet as their training and production plant until theirs was completed in Henderson in 1952-1953 (Metallurgical Division 1952:15-17).

During the early 1950s, personnel cutbacks occurred as projects were completed. According to the *Las Vegas Evening Review-Journal* (27 August 1954:1), half of the staff of the Boulder City station were to be terminated because no new work orders had been received to provide work following the completion of several projects. The article also noted that the work would be research oriented. A 11 November 1954 article in the *Las Vegas Sun*, reporting about the new Chief of the station, Delwin D. Blue, noted that in 1953, 65 employees had been laid-off due to economic reasons. The staff had been 215 strong, but was less than half that number by the time Blue arrived. A new contract for doing research in the chlorination of titanium with occasional demonstration runs for visiting engineers would bring in 15 to 25 new employees (*Las Vegas Sun* 11 November 1954:9).

The Boulder City station continued to be an independent research laboratory until 1960, when the Reno Metallurgy Research Center was organized, and the Boulder City facility became a sub-laboratory. By 1962, direct communication and assigning of projects from Washington, D.C., to Boulder city had been terminated. Future projects and funds would be authorized and distributed from Reno. In the new organization, the Chief of the Boulder City station was in charge of the administrative activities, whereas, technical supervision came from Reno ([Blue] 1966:Preface, 4).

Between 1957 and 1965, the Boulder City facility underwent a period of change with the removal of several buildings and the modernization and renovation of others. Among those removed were the Hydrometallurgical Building, the Chromium Pilot Plant, the Old Warehouse, and the Carpenter Shop. The types of projects carried on during this time, some requiring changes in the equipment used, included working with titanium, zinc, aluminum silicates, zirconium, chromite, beryl, beryllium, tungsten, vanadium, columbium, uranium and hafnium. Processes used were electrorefining (reducing minerals to a pure metal by electrolysis - several of the above mentioned minerals and ores, such as titanium, hafnium, chromium), electrowinning (using chemical solutions to recover metals by electrolysis - titanium), smelting (manganese), beneficiation (preparing an ore for refining by processing it through either a mill or concentrator - chromite; Noble and Spude 1992:11), chemical recovery with caustic solutions (zinc), development of chlorination techniques (beryl and tungsten minerals), new uses for depleted uranium, and reaction kinetics infused-salt systems. Some of these experiments were conducted over two or more years, which were extended when a process for specific ores proved feasible ([Blue] 1966:9-17).

In 1965, the Boulder City station was again under threat of closure due to President Johnson's new economic program, although Secretary of the Interior Stewart Udall had indicated in February 1964 that there would be a consolidation of BOM activities resulting in the closure of several facilities. For the next two years, Nevada Senator Alan Bible, with assistance from the rest of the state's Congressional delegation (Senator Howard Cannon and Representative Walter Baring) presented evidence as to the necessity of retaining the Boulder City facility. In July 1965, a reprieve of one year was granted while an intensive study of the facility was conducted by a two-man team comprised of Paul Eaton, a member of the Senate's interior appropriations subcommittee, and Mike Mackdon of Senator Bible's staff. Senator Bible was, himself, a member of the Senate Appropriations Committee. Word came in September 1967 that the laboratory would not be closed, and that plans were under consideration for expansion of the facility. Two new projects for the laboratory dealt with solid waste disposal and developing a chlorination process for the removal of copper from automobile scrap (*Las Vegas Sun* 3 July 1965:22; *Las Vegas Review-Journal* 22 October 1965:2; *Las Vegas Sun* 13 January 1966:13; *Las Vegas Review-Journal* 18 September 1967:20). In addition, according to a 7 July 1966 (4) article in the *Las Vegas Review-Journal*, the Boulder City station metallurgical laboratory once again would be operating independently of the Reno metallurgical laboratory.

At the beginning of this period of uncertainty, Delwin D. Blue, the Chief of the facility, was asked to write up responses to questions that could be posed during a session with the Senate Appropriations Committee regarding funding for the BOM. It is likely that Senator Bible provided the questions and used Blue's report to assist in his campaign to save the facility. One area of questioning concerned the move of the work being done at the Boulder City station to the Reno laboratory. According to Blue (1966:5, 33-54), the most important difference between the two facilities was space. Reno had at least one building on the University of Nevada, Reno campus, had to contract out for equipment repair and minor construction needs, and, therefore, could not accommodate all of the personnel from Boulder City. Boulder City, on the other hand, had 17 acres of grounds with several buildings that could be modified as needed and a machine shop for repairs and construction. Also noted were projects that could not be moved due to the delicate nature of the equipment (beryllium research), or that the equipment was part of the structure (dry cell room in Building 500). Furthermore, Blue stated that the Boulder City facility was the remaining BOM laboratory in the Southwest which had a good location (excellent water and

power resources from the dam) that could be expanded as needed. He suggested that a future use of the Boulder City station was as an independent facility and research center that had many uses including providing technical information on minerals and ores and continuing research on treating and using these minerals. This last point of providing services to the general public was especially telling, because Blue indicated that in the early 1950s they lost the ability to advise or assist miners or perform simple tests on minerals for the general public ([Blue] 1966:54-56).

As in the previous period of threatened closure, the importance of the facility to Boulder City was noted in Blue's report (1966:57-67). The facility assisted in the development of local industries, particularly titanium processing in Henderson. These, along with the Chambers of Commerce for Boulder City and Las Vegas and the Southern Nevada Industrial Foundation were concerned about the loss of advise, support, and new research provided by the Boulder City station should it be closed. Blue (1966:61) noted the numbers of companies advised and visitors to the facility during the period of 1961 to 1965. Although the figures decreased from a high of 45 companies and 75 visitors in 1961 to a low of 18 companies and 25 visitors in 1963 and 19 companies assisted with 27 visitors in 1965, Blue felt that they still had much to contribute to research people and industry. He cites one reason for the decline in company assistance to a reduction in large-scale work, or development research. The facility had provided assistance to other federal agencies, as well. Noted were instruction in welding and repairing techniques to the National Park Service and the U.S. Coast Guard (a station is located at Lake Mead); water analysis, mineral content of water, metal corrosion in water to the Bureau of Reclamation and Fish and Wildlife Service; instrumental analysis and training for U.S. Public Health Service personnel, as well as consulting on various analytical techniques; and a course on spectrography for the Nevada Southern University (University of Nevada, Las Vegas). In addition to these agencies, the Boulder City station did programs for the Clark County School District for students who excelled in science. He also pointed out that the closure would affect the economy of Boulder City, not only from the standpoint of the BOM facility, but in the positions held by family members and the sale of homes should they leave for positions at other BOM facilities.

Other changes occurred during this late period of operation. One important change was from doing pilot plant work to primarily research on a smaller scale. The number of personnel decreased from 129 in 1958 to 82 in 1965 stabilizing to 50 by 1970. Between fiscal years 1967 and 1970, the laboratory again reported directly to Washington, D.C., then returned to reporting to the Reno Center. In July 1971, the Boulder City facility underwent a change in research and a reduction in staff. The metallurgical research was to be phased out and only mining research would be continued at the facility with a staff of 17. However, by 1972, this changed again. It was determined that the facility was no longer suitable for mining research, but that it could continue with the metallurgical research ([Stephens] c. 1983:11).

One of the major projects during the last 10+ years the laboratory operated was work on the use of sulphur in construction materials as a resurfacing material, in preventing air and water pollution, and in environments where conventional materials could not be used. One area of investigation that was tested throughout the United States was the sulfur extended asphalt (SEA) technology, where the sulphur replaced up to 50 percent of the asphalt in the paving mixture ([Stephens] c. 1983:12). In addition to testing, a manual (Federal Highway Administration, U.S. Department of Transportation, FHWA-IP-80-14, August 1980) was produced with information regarding "design, quality control, and construction

of SEA paving" (Stephens c. 1983:12). In the Boulder City area, the on-ramp to Searchlight from U.S. Highway 93 is paved with this material (Herb Wells, personal communication 9 November 2000; Carl Dewey, personal communication 2 December 2000).

Other avenues of research included developing a concrete where sulphur replaced Portland Cement. This mixture produces a thermoplastic concrete that was more durable than Portland Cement. In addition, it was more resistant to all mineral acid corrosion and many salt solutions. Testing was carried out in more than 50 metallurgical laboratories where this new concrete was used for slabs, equipment foundations, and tanks, and replaced the traditional concrete flooring in six other laboratories. According to Stephens (c. 1983:13), who was the last Chief of the Boulder City facility, this sulphur concrete was selected by the Department of Commerce, National Technical Information Service "for licensing and patent filing in the United States and 20 foreign countries."

An article by Margaret Richardson in the *Las Vegas Review-Journal* (25 January 1976:17A) not only provided a brief history of the work done at the Boulder City laboratory, but discussed current projects, as well. A mention was made of the work on extracting alumina from domestic minerals, but most of the discussion was on the uses of surplus sulphur from the oil refining industry, particularly as sulphur bearing gas pollutes the environment. As part of their work, technicians built a sulphur concrete block structure. Instead of using mortar, they sprayed it with a composite material of sulphur that bonded the block's surfaces. With regards to the SEA project, Thomas Sullivan, a research supervisor, noted that it was already in practical use. In Boulder City patching was being done at several locations, including the intersection of Date Street and the Nevada Highway. The sulphur extended asphalt had no aggregate, which he indicated would be important in areas without a good grade aggregate available or where it would be too costly. At the time of the article, the facility personnel numbered 36.

A second article, in the *Las Vegas Review-Journal's Nevadan* magazine section (29 July 1979:6J, 27J), Brad Peterson examined the work done in the intervening years on sulphur and alumina. One use of sulphur discussed was the bonding spray and included a photograph of the concrete building being sprayed. The bond was comprised of sulphur, talc, milled glass fiber, and a chemical additive. The laboratory refined the coating, which had been in use in South America and Africa and was being used by the Chevron Corp. The SEA project incorporated recycled asphalt with as much as 50 percent sulphur, and had a longer life than regular asphalt. According to Peterson, in 1977, a 2,100-foot section of U.S. Highway 93 between Railroad Pass and Boulder City was paved by the BOM using their SEA. After two years of heavy use it showed no signs of deterioration. This was the second section of U.S. highway that was paved with the material. It further was noted that using this material on all U.S. highways would save up to "50 million barrels of crude oil per year." The sulphur concrete project also was discussed, mentioning a tank made of the concrete three years previously that continued to resist corrosion despite use as an acid bath.

The other major project during this period, also discussed by Peterson, was a mini-plant program examining six different methods for extracting alumina from sources other than bauxite, an imported mineral that was slowly being depleted. The most promising method used acid to break down Kaolin clay from Georgia. These clays were considered among the richest of non-bauxite sources of alumina in the United States. The process entailed separating the ore from the clay by heating the clay in a kiln. The

ore was then placed in an acid bath for leaching out impurities and refining the alumina ore. After crystallizing the resultant aluminum chloride hexahydrate, this was heated twice more to decompose the material into alumina. D. (Dwight) L. Sawyer, the project research director, indicated that their work on developing methods of processing alumina were not taken the last step to produce aluminum. The production phase was left to the aluminum industry, which could produce 25 tons per day of aluminum using the data resulting from the work done at Boulder City. New research into alumina sources that Peterson mentioned involved using oil shale or Dawsonite, a mineral that contains about 4 percent alumina.

Both projects were partially funded by industry. The Sulfur Institute, an organization comprised of 32 national and international companies, was the primary force behind the research on uses of sulphur in construction materials. The Boulder City laboratory was one of several working the project. Nine companies, including Reynolds Metal Co., Aluminum Company of America, Aluminum Company of Canada, Ltd., and Kaiser Aluminum and Chemical Corp. shared the costs for the alumina research. Because the work was subject to federal patent laws, no one company could patent any portion of the research (Peterson 29 July 1979:27J).

Between 1979 and 1983, new projects examined how tailing pond effluents were affected by design, construction materials, and "chemistry of constituent systems" by building and operating a "liquid waste disposal system" ([Stephens] c. 1983:15). The system consisted of "a semi-automated neutralization system [the tanks located next to Building 500], organic skimmer, sand bed filters and 2 double lined evaporation ponds" (only one of which was used; [Stephens] c. 1983:15; Herb Wells, personal communication, 30 November 2000; Carl Dewey, personal communication, 2 December 2000). A second project, that was not completed, was an evaluation of a zirconium/hafnium separation process on a mini-plant scale, which had been successful on the bench scale level.

Mining research work was begun during fiscal year 1982. One project conducted engineering research on an anhydrous process for separating zirconium and hafnium. A second evaluated current methods and tested new ways of extracting alumina from coal ash and coal shale. The third project was an engineering assessment of projects using extractive metallurgy processes to determine production and operating costs, which processes were suitable for pilot plant testing, and which required additional bench scale testing. Each of these resulted in the publication of technical reports.

On 26 January 1983, the BOM announced that the Boulder City Engineering Laboratory would be closing at the end of the fiscal year. A change in BOM research towards fundamental investigations, as well as economic cost reductions, were the determining factors for closing the facility. Transferred to the Albany Research Center were the personnel, supplies, equipment, and research from the sulphur utilization project. Other research projects were terminated, and the remaining time was spent writing reports on previous research and equipment disposal and transfer. A Memorandum of Agreement provided the BOR with unused space in Building 100 during the interim period. A Transfer of Property, dated 29 May 1984, listed the property to be transferred and an "effective transfer date of 6 June 1984, to coincide with the transfer of the land on which the described property is located."

The following table, taken from *The Bureau of Mines at Boulder City, Nevada, July 1936 - September 1983* ([Stephens] c. 1983:17-18), is a list of the directors of the facility from the beginning with their titles and the organizational name.

ORGANIZATION CHRONOLOGY

Effective Date	Incumbent	Title and Organization
July 1936	Ray G. Knickerbocker (reported to Dr. John Koster, Supervisory Engineer, Electrometallurgical Section, Reno)	Engineer in Charge Boulder Unit Electrometallurgical Section, Metallurgical Division
08/01/38[1]	John Koster	Supervising Engineer Electrometallurgical Section, Metallurgical Division
July 1941	Ray G. Knickerbocker (reported to Dr. R. S. Dean, Chief, Metallurgical Division, Salt Lake City)[2]	Supervising Engineer Electrometallurgical Section, Metallurgical Division
02/28/45	Ray G. Knickerbocker	Transferred
04/03/45	Charles W. Davis	Divisional Engineer Boulder City Division[3]
08/15/49 (Reorganization)	Charles W. Davis	Branch Chief Electrometallurgical Branch Region III[4]
02/21/50	Charles W. Davis	Deceased
08/06/50	Rex R. Lloyd	Branch Chief Electrometallurgical Branch Region III
07/02/54	Rex R. Lloyd	Resigned
07/01/54	Frank S. Wartman	Branch Chief Electrometallurgical Branch Region III
11/30/54	Frank S. Wartman	Retired
12/01/54	Delwin D. Blue	Chief Electrometallurgical Branch, Metallurgical Division Region III
01/01/55 (Reorganization)	Delwin D. Blue	Superintendent Electrometallurgical Experiment Station Division of Mineral Technology Region II
07/13/59 (Reorganization)	Delwin D. Blue	Chief Boulder City Metallurgy Research Laboratory
12/31/73	Delwin D. Blue	Retired

Effective Date	Incumbent	Title and Organization
01/01/74	Thomas A. Sullivan	Acting Chief Boulder City Metallurgy Research Laboratory
05/24/74	Thomas A. Sullivan	Retired
06/09/74	Donald G. Kesterke	Chief Boulder City Metallurgy Research Laboratory
07/01/76 (Name change)	Donald G. Kesterke	Chief Boulder City Metallurgy Engineering Laboratory
08/22/76	Donald G. Kesterke	Transferred
08/23/76	Howard O. Poppleton	Acting Chief Boulder City Metallurgy Engineering Laboratory
12/16/76	Stephen D. Hill	Acting Chief Boulder City Metallurgy Engineering Laboratory
02/01/77	William W. Stephens	Chief Boulder City Metallurgy Engineering Laboratory
August 1979 (Reorganization)	William W. Stephens	Chief Boulder City Engineering Laboratory

[1]Headquarters of Electrometallurgical Section moved from Reno to Boulder City
[2]In 1942, station became part of Western Region reporting to Salt Lake City.
[3]Responsible for administration of all metallurgical activities in Nevada and California including the station at Redding and Berkeley, California and Reno, Nevada.
[4]Report to Regional Director, Region III, San Francisco, California.

PROJECT INFORMATION

The Bureau of Reclamation needs to expand its facilities at the Lower Colorado Regional offices in Boulder City. The Date Street Complex has been selected as the location for the expansion. However, at this location, buildings formerly part of the Bureau of Mines Electrometallurgical Laboratory that have been abandoned for several years will have to be demolished first. These are Buildings 300, 400, 500, 600, 900, the Pump House, and the Weigh Station (Scale House). In 2000, Architect Ysidro R. Barron, A.I.A. of Henderson, Nevada was selected to examine, record, and coordinate the demolition project, which is to take place in 2001. Kautz Environmental Consultants, Inc. of Reno, Nevada, was selected to do the historical research and Historic American Buildings Survey (HABS) compilation. The archival research, building recordation, and report preparation were done by Monique E. Kimball, M.A. HABS photographs were taken and prepared by Andy Pernick and Kelly Conner of the Bureau of Reclamation. The measured drawings of the architectural floor plans and building elevations were prepared by Stephen C. Ranck, Project Manager of Architect Ysidro R. Barron, A.I.A.

ADDITIONAL INFORMATION

Project Location Map (Attachment 1)

Project Site Map (Attachment 2)

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Herb Wells, former employee, U.S. Department of the Interior, Bureau of Mines Metallurgy Engineering Laboratory, c. 1976-1983. Part-time positions held included adjunct faculty (from University of Nevada, Las Vegas) and shift supervisor. Interviews conducted 9 November 2000, 2 PM, by telephone from Kautz Environmental Consultants, Inc., 5200 Neil Road, Suite 200, Reno, Nevada, and 30 November 2000, 9:30 AM, on-site.

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Koster, John, and G. M. Babcock
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Reining, Henry, Jr.
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[Stephens, William W.]
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U.S. Bureau of Mines
c. 1940-1983 Manuscript Collection, File 26. Boulder City Museum and Historical Association, Boulder City, Nevada.

c. 1941-c. 1965 Photograph Collection, File 0022. Boulder City Museum and Historical Association, Boulder City, Nevada.

U.S. Department of the Interior, Bureau of Reclamation
1934-1942 Files on the Bureau of Mines Boulder City Experimental Station. Colorado River, File Group 131. Denver Archives.

1941-1981 Plan drawings of the Bureau of Mines Boulder City Experimental Station. Drawer Group X-300. Denver Archives. [Copies of the plan drawings used in this report and a list those at the Denver Archives have been included in the Field Records.]

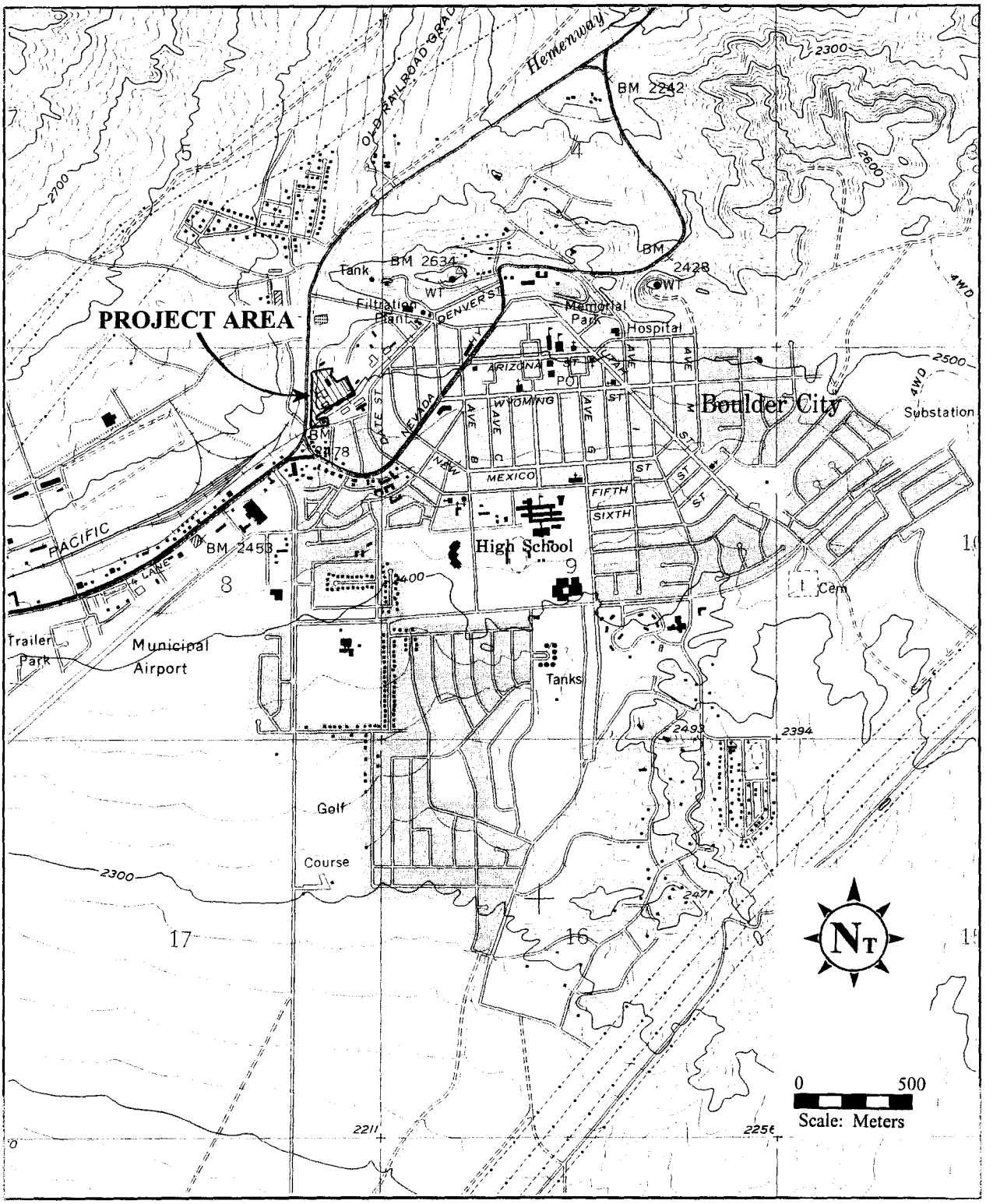
Webb, P. S.

1940 Contract No. IM-836 for Construction of Office and Laboratory Building [possible draft copy]. U.S. Bureau of Mines Manuscript Collection, File 26, Folder 2. Boulder City Museum and Historical Association, Boulder City, Nevada. [Additional folders in this collection include correspondence regarding construction of Building 100.]

Worswick, A. L.

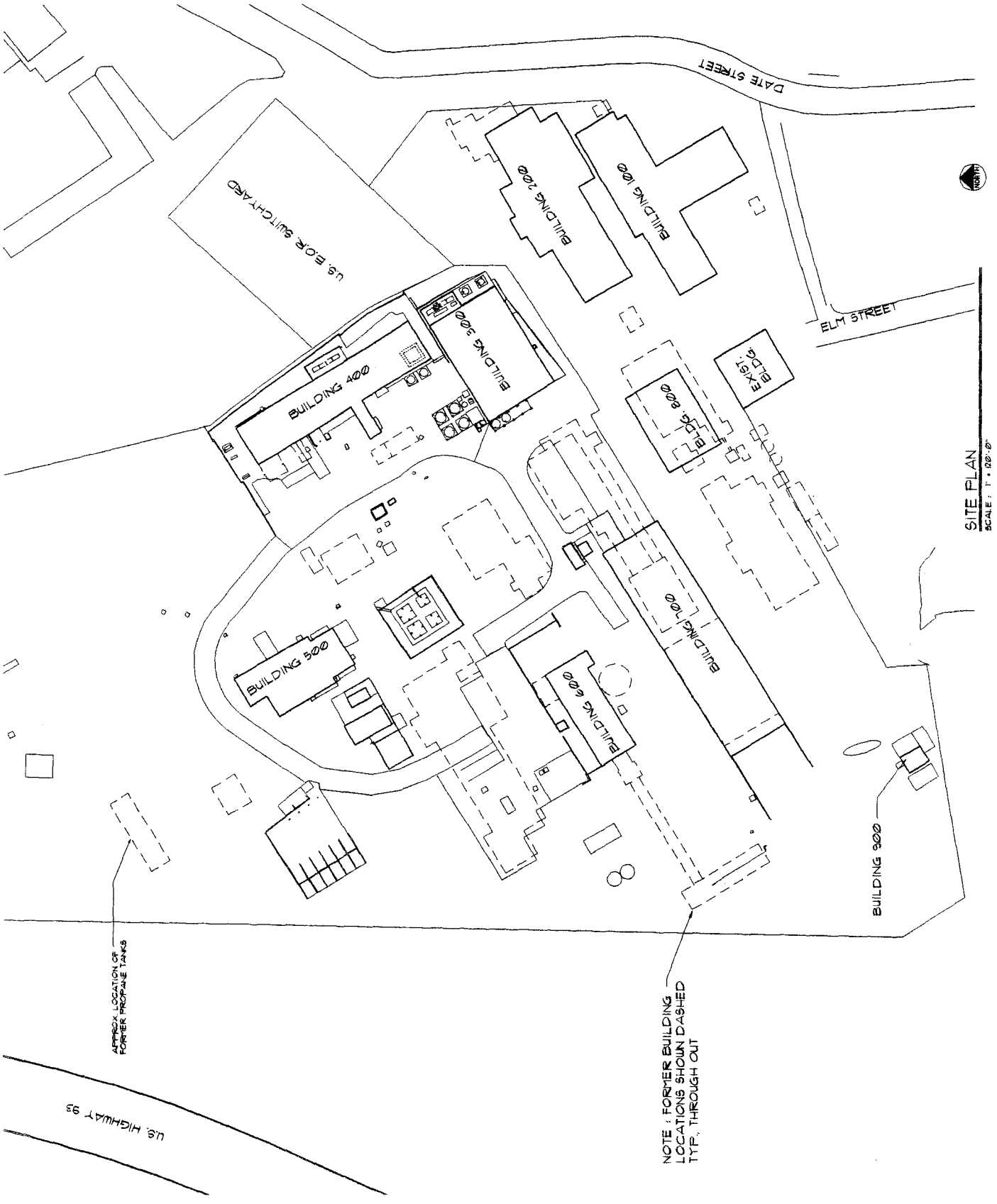
1940 Specifications for U.S. Department of Interior Bureau of Mines. Manuscript, File MS-18, United States Bureau of Mines Lab Collection, Department of Special Collections, Leid Library, University of Nevada, Las Vegas.

Attachment 1



Project Location Map **Base Map, *Boulder City, Nev.*, 7.5' Topographic Quadrangle, U.S.G.S., 1958 (Photorevised 1983).**

Attachment 2



ATTACHMENT
PHOTOCOPIES OF HISTORIC PHOTOGRAPHS AND PLAN DRAWINGS

The following attachments are photocopies of historic photographs from original prints in the U.S. Bureau of Mines Photograph Collection, Boulder City Museum and Historical Association, Boulder City, Nevada.

Photograph No. 1: File 0022, unnumbered items, c. 1949, untitled aerial photograph. VIEW OF COMPLEX LOOKING EAST

Photograph No. 2: File 0022, unnumbered items, 1953, untitled aerial photograph. VIEW OF COMPLEX LOOKING NORTH

Photograph No. 3: File 0022, unnumbered items, August 1965, untitled aerial photograph. VIEW OF COMPLEX LOOKING NORTH, BUILDINGS REMOVED MARKED

Photograph No. 4: File 0022, No. 0004, c. 1943, entitled "Administration, Genr'l View from Hydromet. Bldg." VIEW FROM HYDROMETALLURGICAL BUILDING, LOOKING SOUTHEAST, CARPENTER SHOP, BUILDING 400, PUMP HOUSE, ELECTRIC SHOP AND CHANGE ROOM, OLD WAREHOUSE, BUIDLINGS 200, 100, AND 800 IN BACKGROUND (from north to south)

Photograph No. 5: File 0022, No. 0024, 1945, entitled, "Service." VIEW OF BUILDING 400 SOUTH ADDITION CONSTRUCTION, LOOKING NORTHWEST, ORIGINAL MASS OF BUILDING 400 CENTER AND RIGHT, PUMP HOUSE AND BUILDING 500 IN BACKGROUND

Photograph No. 6: File 0022, No. 0061, c. 1943, entitled "Manganese." VIEW FROM BUILDING 400, LOOING NORTHWEST, PUMP HOUSE, HYDROMETALLURGICAL BUILDING, CARPENTER SHOP, AND BUILDING 500 IN BACKGROUND

Photograph No. 7: File 0022, No. 0068, c. 1952, entitled "Manganese Concentrator." VIEW OF BUILDING 600 WITH ORE BIN AND CONVEYOR SYSTEM, LOOKING NORTHEAST, HYDRO-METALLURGICAL BUILDING TO NORTH, BUILDING 700 AND UNION PACIFIC RAILROAD LINES TO SOUTH

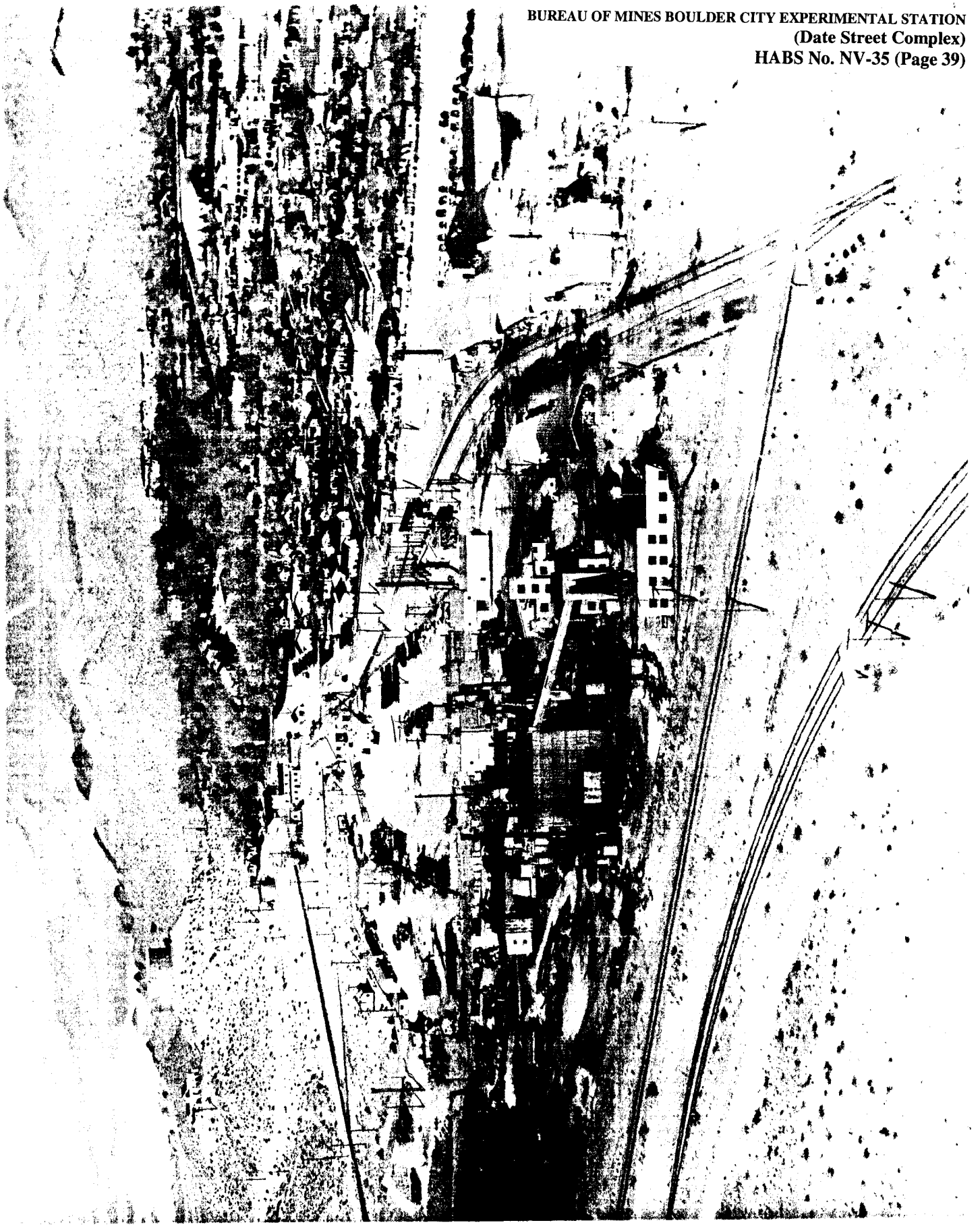
Photograph No. 8: File 0022, No. 0088, 1942, entitled "Sponge Iron, Screening Plant." VIEW OF BUILDING 400 "LEG" CONSTRUCTION, LOOKING WEST, OLD WAREHOUSE, WEIGHT STATION (Scale House), ELECTRIC SHOP AND CHANGE ROOM, BUILDING 600, AND HYDROMETALLURGICAL BUILDING IN BACKGROUND (from south to north)

Photograph No. 9: File 0022, No. 0093, c. 1943, entitled "Sponge Iron, plant in background." VIEW FROM HYDROMETALLURGICAL BUILDING, LOOKING EAST, BUILDING 400 ORIGINAL MASS (in center rear), CARPENTER SHOP, PUMP HOUSE, SWITCHYARD AND BUILDING, ELECTRIC SHOP AND CHANGE ROOM IN BACKGROUND (from north to south)

The following attachments are photocopies of plan drawings in the U.S. Bureau of Mines Lab Collection, MS-18, Department of Special Collections, Leid Library, University of Nevada, Las Vegas.

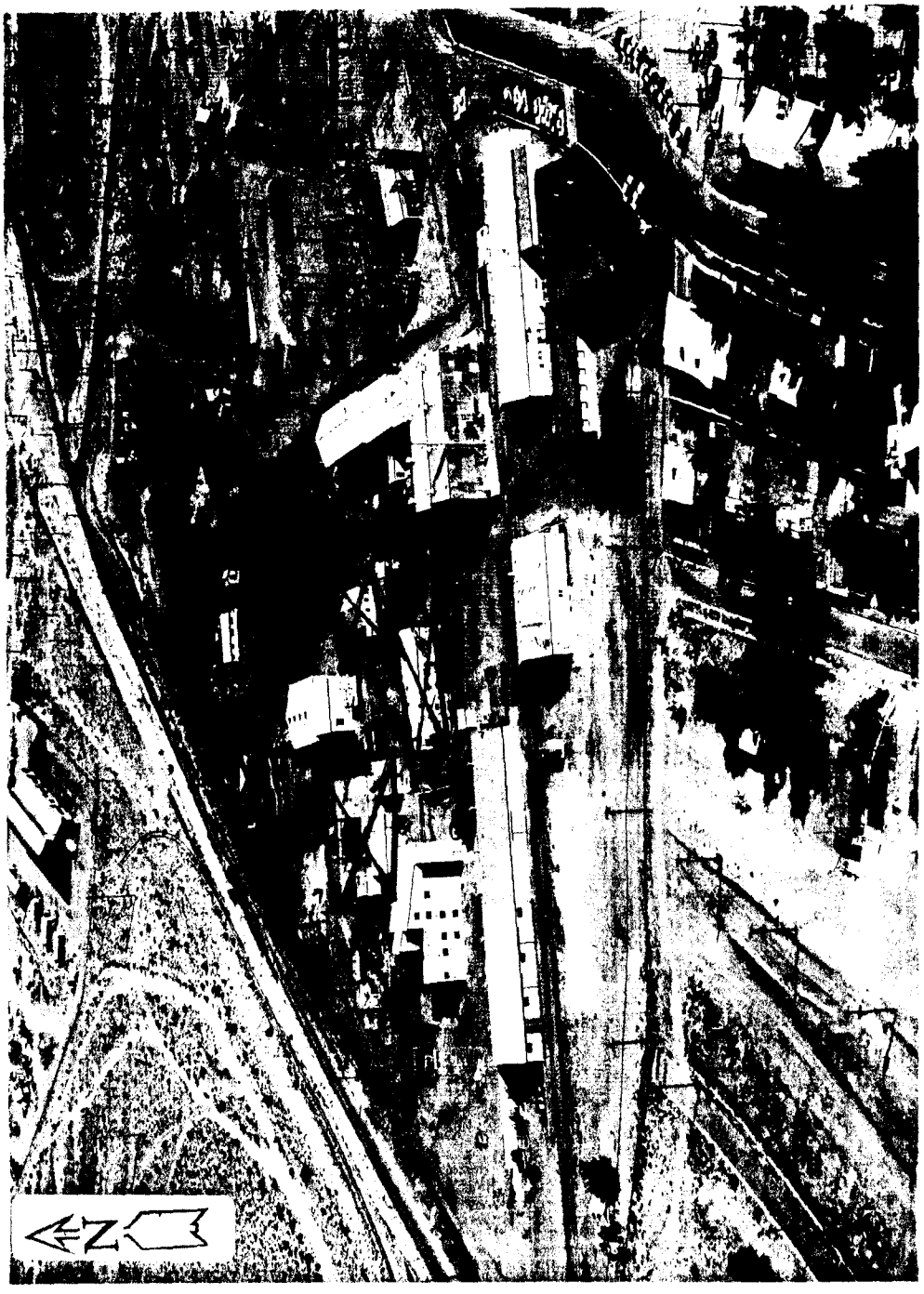
Drawing No. 1: "ADMINISTRATION" – PILOT PLANT AND LABORATORY LAYOUT, 1942

Drawing No. 2: "LOCATION MAP OF THE BOULDER CITY, NEV., EXPERIMENTSTATION, c. 1953



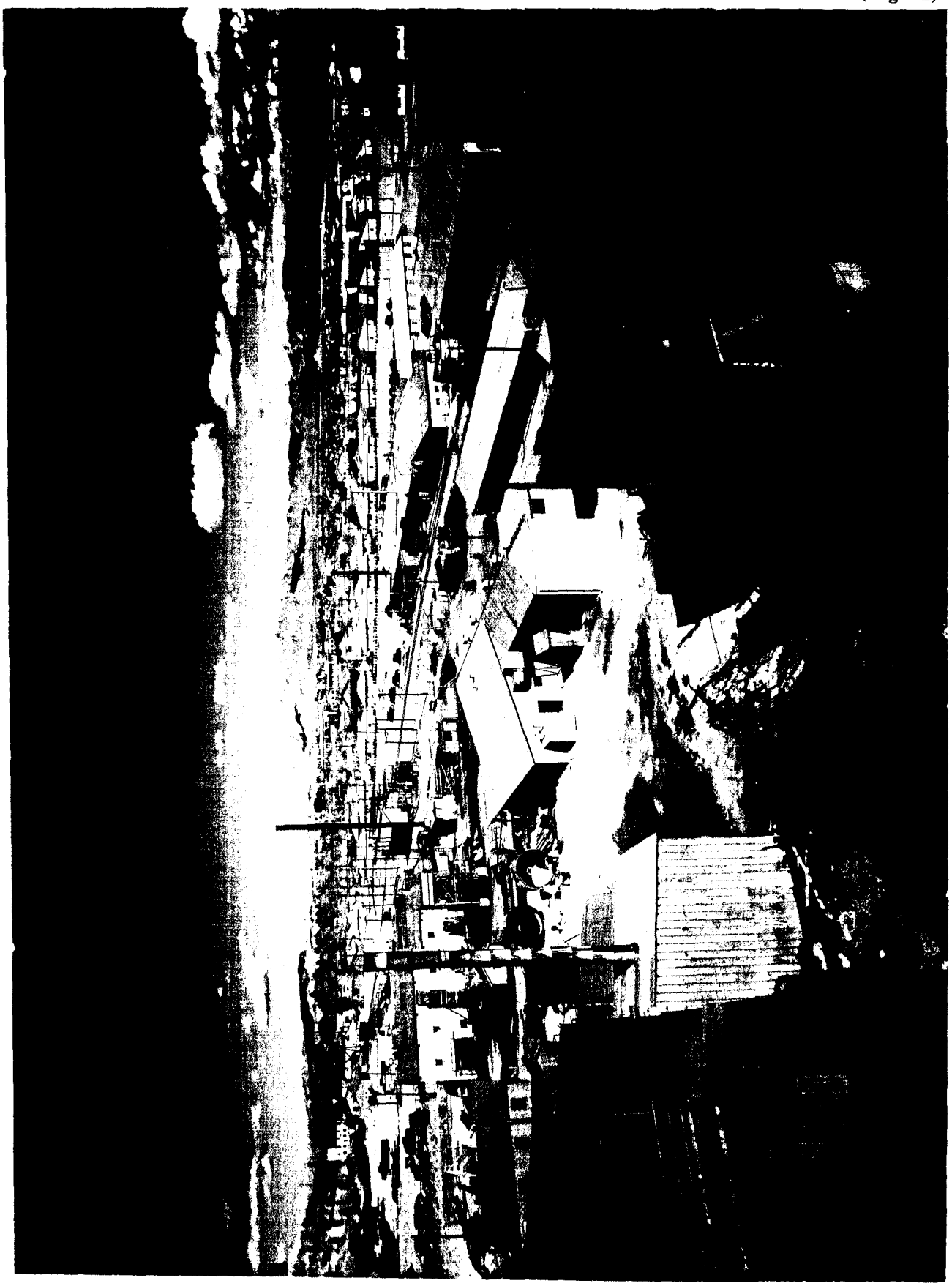
Photograph No. 1

Photograph No. 2

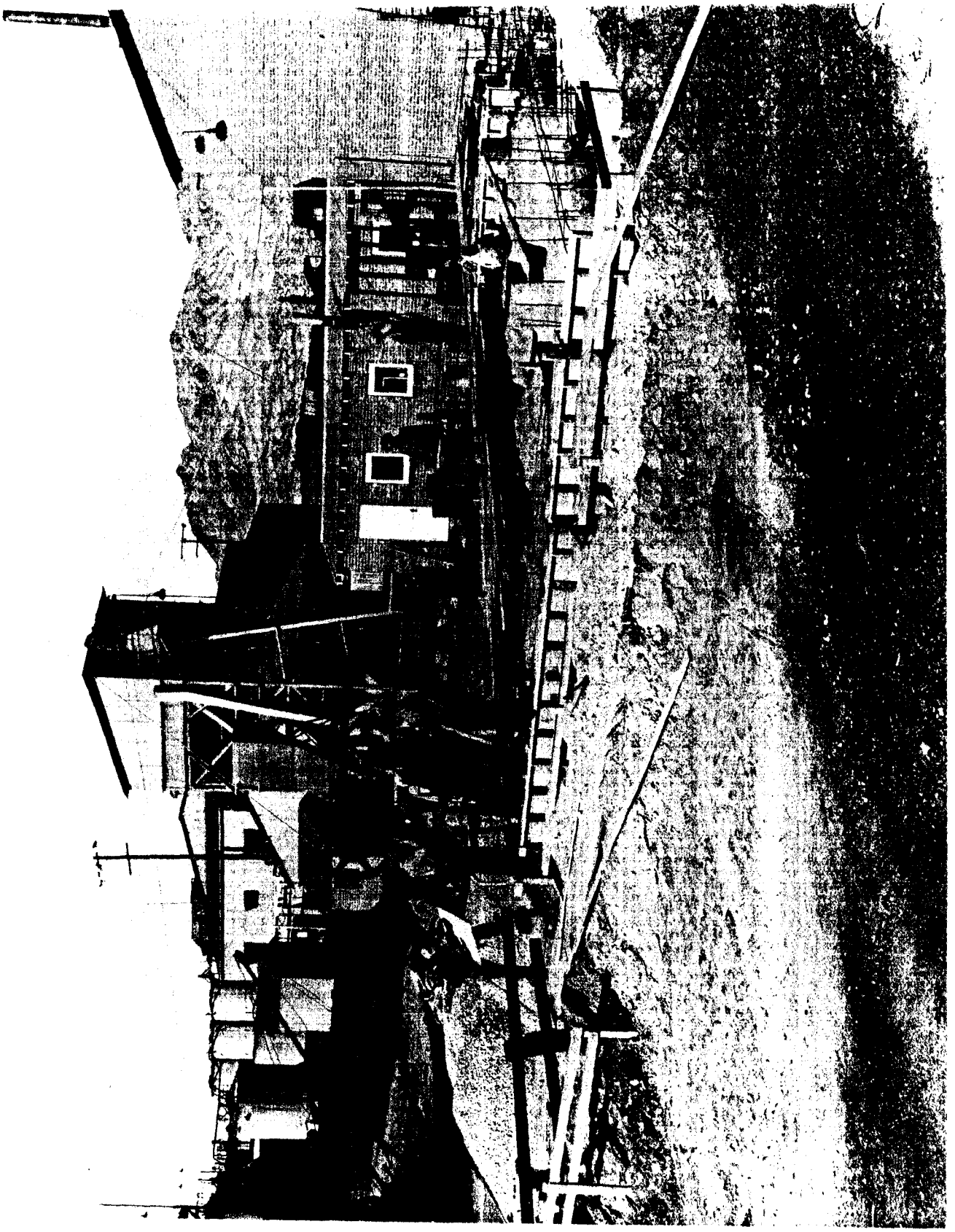


REMOVED

Photograph No. 3

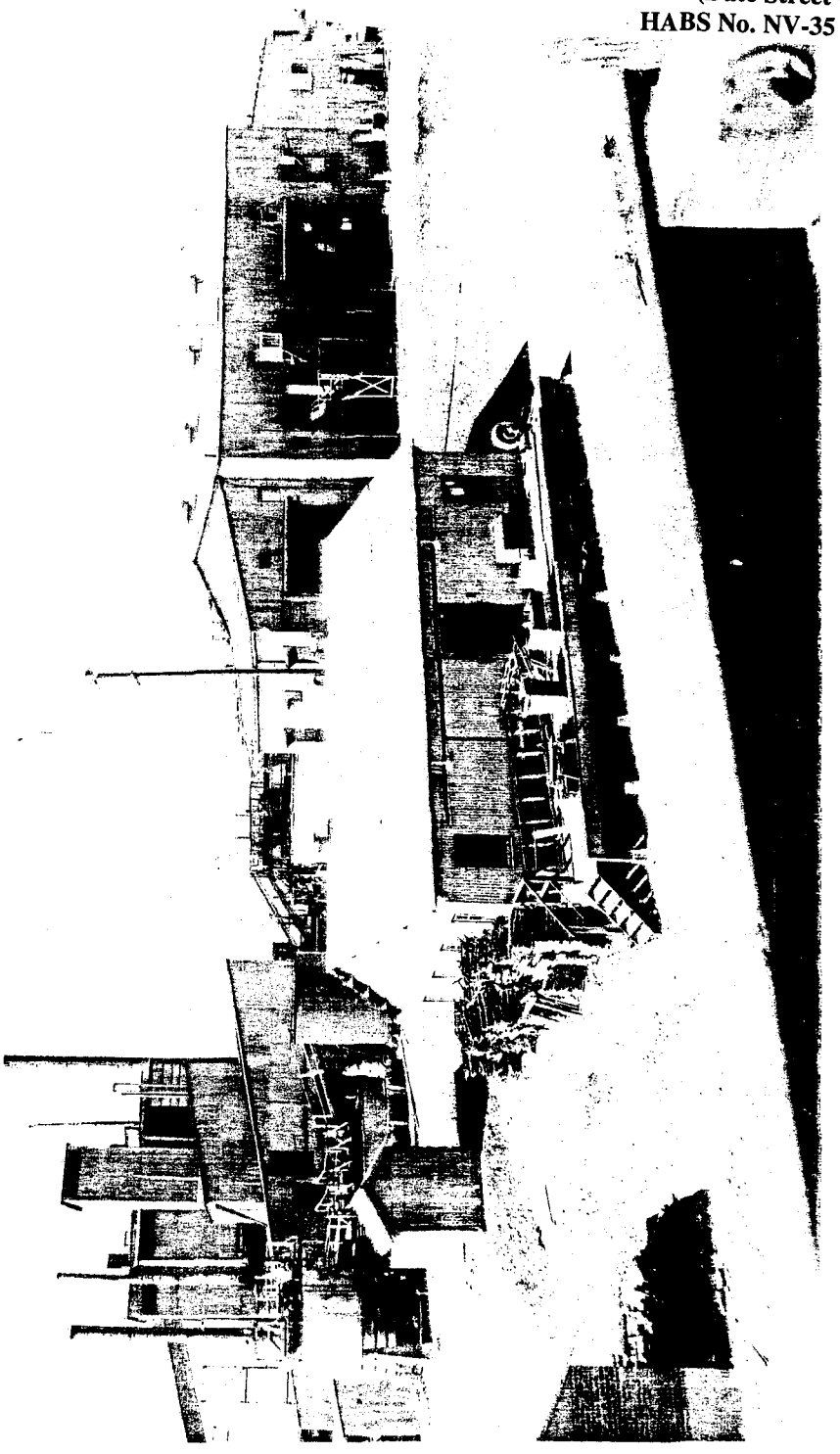


Photograph No. 4

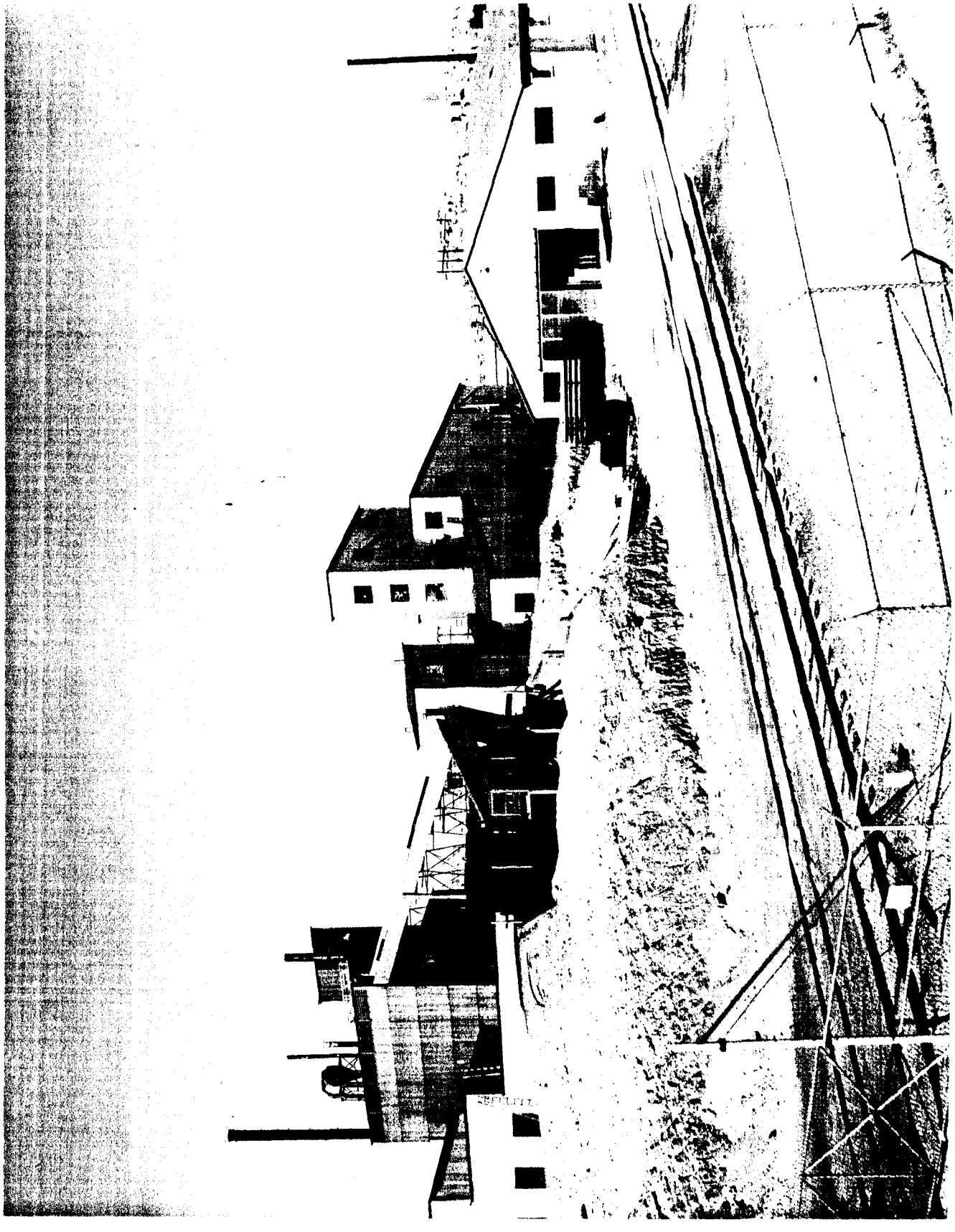


Photograph No. 5

File Copy



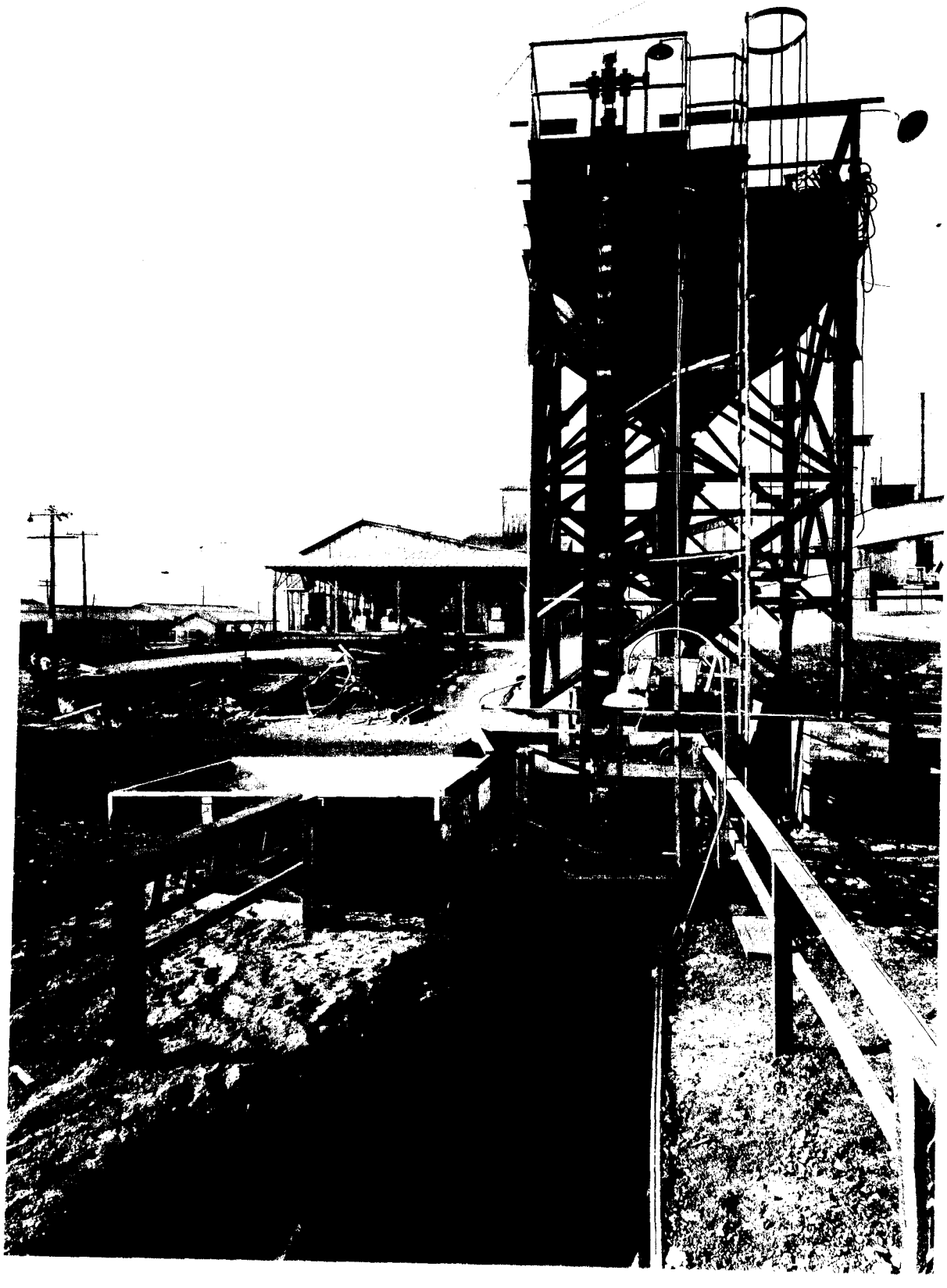
Photograph No. 6



FILE COPY

MANGANESE CONCENTRATOR

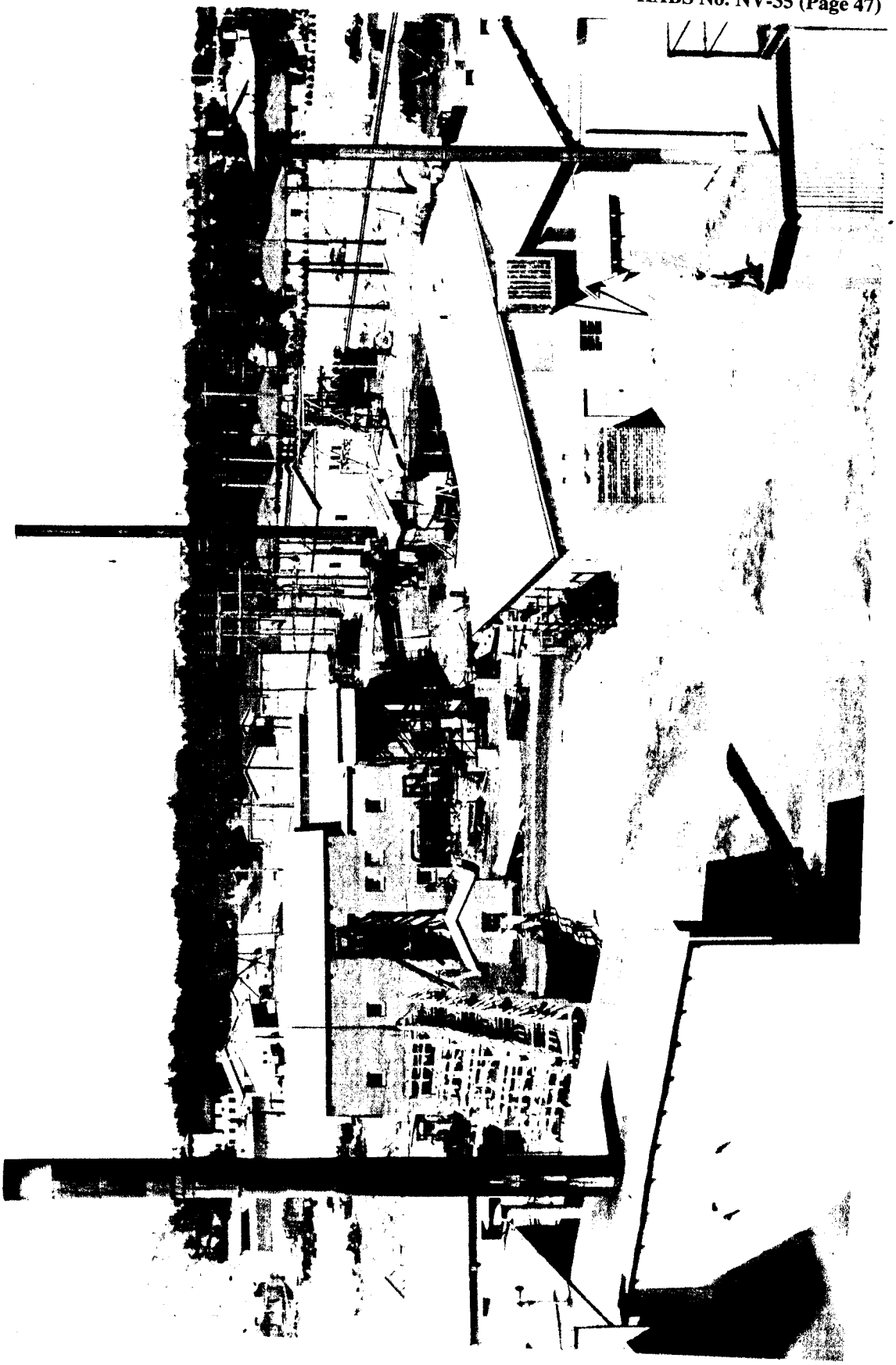
Photograph No. 7



File Copy

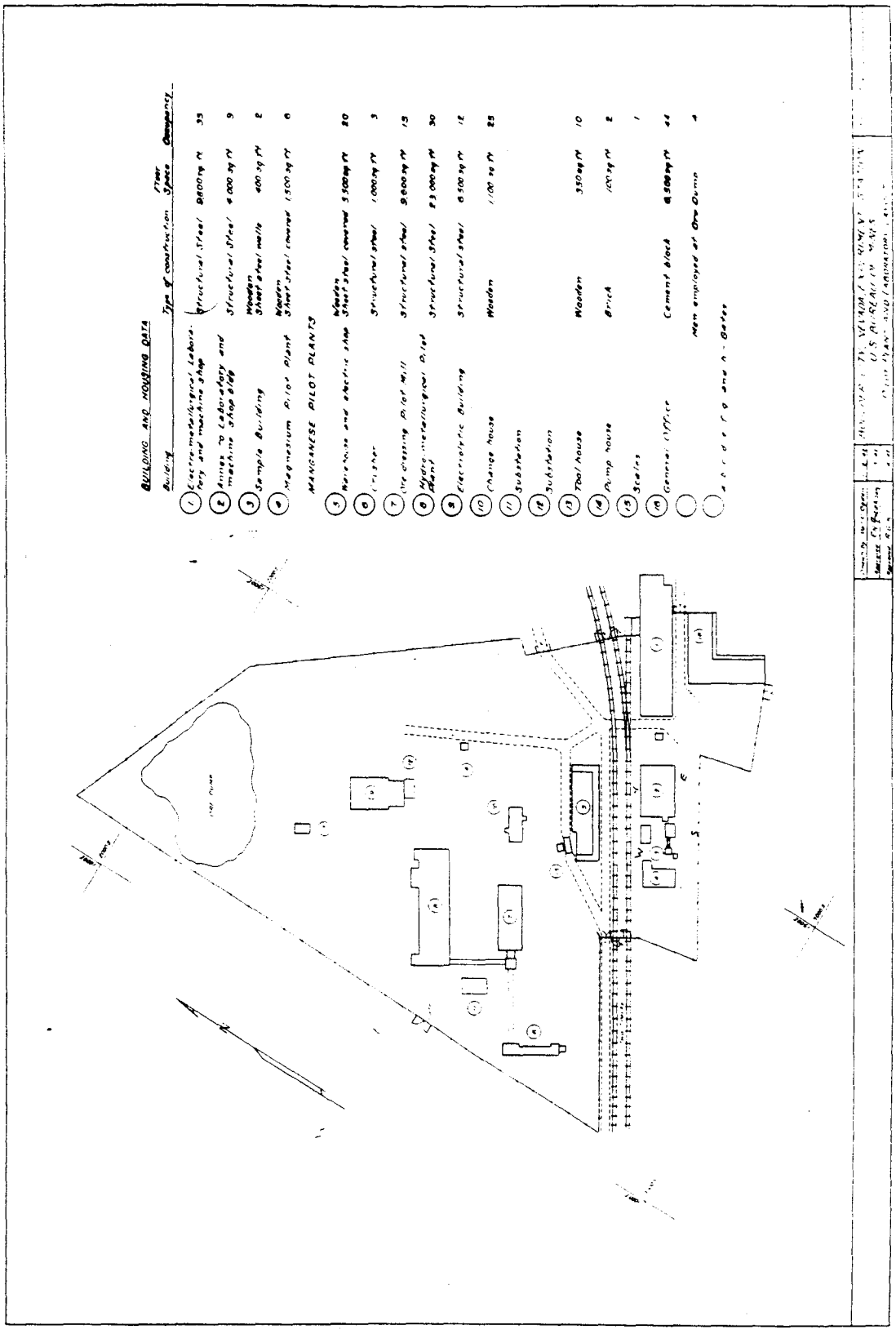
Photograph No. 8

Sponge Iron
Screening plant



Photograph No. 9

1/15/42



Drawing No. 1

BUREAU OF MINES BOULDER CITY EXPERIMENTAL STATION
(Date Street Complex)
HABS No. NV-35 (Page 49)