APPENDIX A.2

ATTACHMENTS FOR SEGMENTS B, C, AND D

Attachment 1
Pertinent Data on Gopher Ordnance Works. Undated.

Attachment 2
U.S. Public Health Service, Westman, Ragnar T., *Report of Field Investigation of Gopher Ordnance Works, Rosemount, Minnesota, and the Possibility of Using Surplus Property for Local Community Needs,* August 1946

Attachment 3
War Assets Administration, *Classification of Structures at Gopher Ordnance Works, Rosemount, Minnesota,* 7 January 1947

Attachment 4
War Assets Administration, Klemme, G.H., Resident Engineer, Minneapolis Reg. Z3-WAA, Memorandum with Subject: *Joint Survey of Extraordinary Preventive and Preservative Maintenance of National Security Clause Plants, Gopher Ordnance Works,* 24 October 1947

Attachment 5
War Assets Administration, Milinowski, A. S., Technical Specialist, *Report on Visit to Gopher Ordnance Works – W-Minn-16,* 7 December 1946

Attachment 6
War Assets Administration, Sekran, C.G., *Gopher Ordnance Works, Rosemount, St. Paul, Minnesota, Survey made on July 1 and 2, 1946,* 10 July 1946

Attachment 7
Dakota County Environmental Management Department, Farr, P., Letter with Subject: *U.S. Department Ranney Radial Well Collectors in Rosemount, MN,* 17 Jun 1993

Attachment 1

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MAPS, CHARTS AND DIAGRAMS

PERTINENT DATA ON GOPHER ORDNANCE WORKS

INTRODUCTION

To enable presentation of pertinent information concerning the Gopher Ordnance Works, the following resume has been prepared. The compilation of all information relative to the functioning of all features and the presentation of information on physical features, would involve too much detail and would defeat the purpose in mind. This narrative will, therefore, be limited to a brief description of the functions of the physical features which must be created to enable the manufacture of smokeless powder, and enumeration of the various features developed.

The plant site is composed of approximately 18 square miles, located in the township of Rosemount and the township of Empire. The northwest corner of the site is adjacent to the easterly boundary of the Village of Rosemount in Dakota County, Minnesota.

In addition to the 18 square miles contained in the site proper, there are 1.6 square miles of land contained in the right of way for the water supply lines from Spring Lake (Mississippi River) and land adjacent to Spring Lake upon which the Ranney Wells and pump houses are located. There are also approximately 1,500 acres of land involved in the Vermillion River right of way which is required for process water runoff purposes.

To illustrate the location of the plant site and the other features mentioned, a small scale location map is attached.

E. I. du Pont de Nemours and Company is the architectural engineer, the constructing contractor, and will be the operating contractor when the plant is placed in operation. This company developed and planned the manufacturing processes, the type of structures and the equipment which will be used.

The plant is divided into several subdivisions or Areas. The subdivision is based on functions and is not geographic. All buildings within an Area have similar or relative functions and are named according to their function. In addition to the name, each Area is assigned numbers within a specified range and each unit of an Area is assigned a specific number. The following tabulation gives the classification of the various areas:

Name of Area	Number of Area	Building or Unit Number Range
Nitrocellulose Area	100	101 - 199
Smokeless Powder Manufacturing Area	200	201 - 299
Acid Area	300	301 - 399
Power and Water Supply Area	400	401 - 499
Outside Lines Area	500	501 - 599
General Facilities Area	600	601 - 699
Administrative and Maintenance Facilities Area	700	701 - 799
Organic Area	900	901 - 999
Staff Residence Area	1100	1101 - 1199
Oleum Area	1500	1501 - 1599

The plant is designed so as to provide for carrying on the same operations simultaneously at several different points. To accomplish this, there are six manufacturing Lines or series of buildings necessary for the manufacture of powder. One of these Lines, known as the "A" Line, is equipped to manufacture rifle powder only. The "B" and "C" Lines are so equipped that either rifle powder or cannon powder can be made. The "D", "E", and "F" Lines are for cannon powder manufacture only.

The process for the manufacture of rifle powder and cannon powder are essentially the same except that in rifle powder manufacturing some additional steps are taken. To enable appreciation of the number of buildings required in each Line and the equipment involved, a brief description of a typical cannon powder Line is presented. On the attached flow chart, the various building numbers have been indicated. Each building is treated separately below under the Area in which it falls.

100 AREA - NITROCELLULOSE AREA

The manufacturing Lines are laid out so that the flow of the product in manufacturing is from the north to the south. The 100 Area contains the buildings through which the product passes first.

Building 101 - Cotton Storage House

Any grade of raw cotton or wood pulp can be used for the manufacture of smokeless powder cotton linters. The raw cotton is cooked in a digester for a specified period of time and is treated with caustic soda under pressure at a relatively high temperature. The caustic removes resinous materials and other impurities. The cotton is then bleached and washed free from alkali.

Cotton which has been treated in the above manner is then brought to the plant in paper covered bales and is stored in the cotton storehouse (Building 101). This building is a one story frame structure with concrete floor and contains 23,000 square feet of floor area. It has a storage capacity of 1,900,000 pounds of treated cotton.

Building 104 - Cotton Dry House

The cotton is brought to this building from the cotton storage house via a conveyor. In the cotton dry house the cotton is fed into a picker which consists of a horizontal wooden roll revolving at approximately 1,000 r.p.m., carrying six evenly spaced rows of sharp hooked teeth. The cotton moves along a feed trap and passes under this roller where it is torn apart by the teeth and attains a fluffy state. It is then blown through a duct system into the drier.

The drier is a long rectangular steel chamber through which the cotton is carried on a perforated steel belt. Air is blown into the drier by blowers along the side. The temperature inside is held at 95 to 98 degrees centigrade. Cotton requires about three-quarters of an hour to pass through the drier. It is discharged from the drier into fiber containers in specified amounts by weight. Each container is filled with the correct weight of charge for a dipping pot.

Building 105 - Nitrating House

Each nitrating unit consists of a battery of four stainless steel dipping pots arranged in a square. The dipping pots are each equipped with an impeller at one side which quickly drags the cotton below the surface of the acid. In making the charge, the measured acid is first run into the dipping pot and the cotton, trucked from the drier house in fiber containers, is then dumped in. At the end of the nitration, the contents of the dipping pot is dumped into a centrifugal wringer, one of which is located below each nitrating unit. (Each unit is composed of four dipping pots). When the wringing process is completed, the operator

starts "White Water" flushing through a small sump below the wringer. ("White Water" is waste processed water from washing operations in a subsequent part to the system.) Then the operator opens the bottom of the wringer and forces the nitrocotton into the sump from where it is flushed through a trough into a drowning tub.

In the drowning tub, of which there are two in each 105 Building, the nitrocotton is mixed with more "White Water", to make a slurry of about 1% solids which is pumped to the boiling tub house.

Building 108 - Boiling Tub House

In the boiling tub house, the slurry from the drowning tub is pumped into one of fifty-six wood tanks. The slurry is boiled for a specified time (60 hours for high grade nitrocotton and 30 hours for pyrocotton) followed by two 5 hour boilings, then two cold water washes. Between each boiling or washing, 40% of the liquid is drawn off and replaced by fresh water.

The slurry is heated to boiling by live steam which is admitted to the tubs inside of a hollow vertical wood cylinder in the center. The boiling tubs are provided with two wood floors, the upper one of which is perforated so that liquid can flow into the space below to be drawn off between washes and boilings without drawing off any of the nitrocotton.

Upon completion of the boiling process, the cotton is flushed into one of three wood slurry tubs. The slurry is then pumped to the pulping house.

Building 109 - Pulping House

In the pulping house, the slurry first passes through the initial dewaterer which is a baffle device for removing some of the water. The slurry then runs through the initial stuff tank which is a wooden tub 20 feet in diameter and 16 feet high. Here the slurry can settle and be further concentrated if desired. The slurry is neutralized with soda ash in this tank.

In the pulping house, the high grade nitrocotton slurry is kept separate from the pyrocotton slurry. There is one Line for each grade, each Line having its initial dewaterer, two initial stuff tanks and a series of Jordan engines. The water collected from each Line goes to separate save-alls.

From the initial stuff tank, the slurry goes to the first Jordan stuff tank. From this tank it is fed through three Jordan engines in series, between each of which it is further concentrated in dewaterers. In the Jordan engine the cotton fibers are cut up by passing between a set of fixed blades and a set of rotating blades which pass close to them. Each engine contains several sets of fixed and rotating blades through which the slurry passes in series.

From the last Jordan engine, the slurry runs to a slurry tank from which it is pumped to the poacher tub house.

Building 112 - Poacher Tub House

In the poacher tub house, the acid which is still contained in the cotton fibers is washed out and the nitrocotton is boiled in an alkaline solution. The slurry is then pumped to one of thirty-eight wooden poacher tubs which are 13 feet in diameter and 10½ feet in height. Soda ash is added in the ratio of one pound soda ash to 3,000 pounds of nitrocotton. In these tubs the slurry receives one 4 hour boiling, followed by three 1 hour boilings, then eight cold water washes. Again between each boiling and washing the slurry is allowed to settle and 40% of the liquid is removed.

Upon the completion of the poaching process, the slurry is run through a sand trap and a dewaterer and is pumped to the blending tubs.

Building 113 - The Blending Tub House

Each blending tub house contains four wood blending tubs 24 feet in diameter and 20 feet high, painted inside with a protective coat of chlorinated rubber paint. In these tubs, the slurries are mixed in the ratio of about 17,000 pounds of pyrocotton to 33,000 pounds of high grade nitrocotton. The tubs are equipped with agitators in order to thoroughly blend the two slurries. The final blend of slurry is allowed to settle in the tubs and the liquid is decanted from the tubs.

The slurry is then sent to a centrifugal wringer where it is wrung to a moisture content of approximately 30%. The wet nitrocotton is loaded into nitrocellulose cars and is sent to the Powder Area (200) for further treatment.

The buildings mentioned are those in which the main processing functions are carried on. In addition to these buildings, there are several auxiliary or supporting structures. A few of these are: Nitrocellulose Area Tank Farm (102) (this includes facilities for F-83 storage, fuming sulphuric acid storage, acid mixing, acid warming, Spent acid and mixed acid storage), Spent acid filters (106, nitrocellulose slurry tank (111), chilled water house (115), and savealls (120).

200 AREA - SMOKELESS POWDER MANUFACTURING AREA

Building 202 - Dehydrating Press House

In the dehydrating press house water is removed from the nitrocotton by use of a large vertical press having an upper and lower head. The upper head is raised and 53 pounds of cotton (dry weight) is placed in the cylinder. This head is then lowered and held by 3,000 pounds pressure. The lower head is then brought up and about 66 pounds of alcohol is forced through the mix of cotton. The alcohol added at the top head flows downward through the compressed mix of cotton, displacing water ahead of it and flows out through a screen on the lower head. First water, then weak alcohol, and then strong alcohol are discharged. The pressure on the lower head is then increased and the remaining alcohol is forced out until only the desired amount of strong alcohol is left in the cotton. The amount of alcohol which remains is determined by the solvent ratio established for the powder type involved.

Upon removal from the press, four of the resulting cakes are placed in a steel covered carriage and sent to the mixing house.

Building 208 - The Mixer House

In this building, the nitrocotton from the blending house is charged in a mixer (4 cakes per charge). The blocks are broken in the mixer and the required amount of ether is added from a scale tank to provide a solvent of correct proportions (65% ether and 35% alcohol). The ether and alcohol are thoroughly mixed with the nitrocotton and a colloid results. Diphenylamine is added to all mixes as a powder stabilizer and to preserve the nitrogen content.

The powder is then transferred to a macerator where the mixing process is continued to insure the breaking of all fiber lumps and the external coating of all particles with solvent. From the macerator, the powder is sent to a preliminary blocking press where it is subjected to a pressure of about 3,500 pounds. The resulting blocks are then sent to the horizontal screening and press house.

Building 211 - Horizontal Screening and Press House

In this building, three blocks of the cannon powder from the blocking press are placed end to end in a large horizontal screening press. In front of the blocks are three screens of 12, 24 and 40 mesh, respectively. The head of the press carries a steel plate in which there are a series of small macaroni holes. A pressure of 3,000 pounds per square inch is applied with a brass ram and the powder is forced through the screens and comes out in the form of macaroni. The purpose of this operation is to insure thorough mixing of the colloid and removal of all lumps as well as the removal of extraneous materials. The macaroni is discharged through a tube to one of two vertical blocking presses known as the final blocking press. When the cylinder of this press is full, a pressure of 3,000 pounds is applied and the resulting block slides down a chute to the finishing press or graining press.

This press is a large horizontal graining press which carries dies in the head having either 1, 5, 7, 10 or 19 holes. The number of holes utilized depends upon the caliber of cannon powder to be produced. The powder is forced through the die and comes out in long strings like macaroni. Each string falls into a slowly revolving bucket on a turn table where it coils. In the case of the larger multi-perforated powder, the strings are carried directly to the cutter on a canvas belt.

The buckets containing the coils of powder in string form, are taken to the cutter where the strings are fed into a cutting machine by hand. The cutting machine is so designed that the feeding of the strings is at a consistent rate and the knives are geared at such a speed that the powder is cut off at the proper length. The resulting grains fall into a fiber container which is then dumped into the top of a solvent recovery card. The powder at this point is known as "green" powder and approximately 7,000 pounds of it are in each car.

The solvent recovery process is carried on at the time the car is being loaded in order to minimize the loss of vapor. This process consists of the recirculation of air through the car. Air passes through a copper aerofin air heater under forced circulation and is warmed. This air enters the top of the car through a duct connection and is forced through and around the powder grains and evaporates solvent. The evaporated vapor, both alcohol and ether, then passes out through the screened bottom and through a duct connection at the bottom of the car. This air is saturated with alcohol and ether vapor at a high temperature. The saturated air passes through a brine cooled aerofin condenser where the solvent is condensed out of the air until the dew point at the temperature of the condenser is reached. The condensed solvent is pumped to recovery solvent storage tanks (215-AA, BB, and CC) from which it is pumped to the alcohol rectification house (207). The air coming out of the condenser is still saturated with solvent vapor at the dew point of the condenser. It is reheated and recycled through the car. As soon as the car is loaded, this process is discontinued and the car is closed and sealed and moved immediately to the solvent recovery building.

Building 214 - Solvent Recovery Building

In this building the solvent which still remains in the powder is removed and recovered through a temperature control process. Air is first circulated through the car at 30 degrees centigrade and is increased at the rate of 2 degrees centigrade per hour until a rate of 55 degrees centigrade is reached. When this process has been completed, the temperature is allowed to drop to 25 degrees centigrade before opening and disconnecting the car.

After the cars have been disconnected from the air ducts and removed from the 214 Buildings, they are sent to the unloading and screening house.

200 AREA - SMOKELESS POWDER MANUFACTURING AREA (Cont'd)

Building 218 - Unloading and Screening House

In the unloading and screening house the cars are rolled onto a hydraulic lift which tilts one end of the car. The powder grains are then washed out of the car through a door in the bottom and to a hopper at the bottom of which is a water jet. Water is furnished from a jet pump furnishing 200 gallons per minute and the powder grains are forced up a 4 inch pipe to the feed hopper over the powder screens.

The powder grains are then passed through two shaker screens. The top screen retains any grain clusters which are known as clinkers and the powder or correct grain is retained on the second screen. The clinkers and broken grains, and chips which pass through the second screen are returned to the scrap rework house and are again sent through the process. The good powder passes from the second screen to the production hopper from which it is carried to the water dry house in a 4 inch pipe by a stream of water.

Building 219 - Water Dry House

In this building the powder is discharged into a wooden tank containing a false bottom and a sluice gate. Approximately 50,000 pounds of powder is introduced in the tank and hot water is circulated continuously through the tank and out the false screen bottom. The temperature of the water is kept at 55 degrees centigrade and the powder is allowed to remain in the water dry tanks from 4 to 6 days. The purpose of this process is to remove the remaining three to five per cent of solvent left in the powder.

At the conclusion of this process, the water is removed and the powder is hosed out into a car which transfers it to the controlled circulation drier.

Building 220 - Controlled Circulation Drier

In this building the powder is dumped from the cars into a hopper at the bottom of which there is a water jet which lifts the powder to a series of drying trays or racks, where heated and filtered air is passed through the drier racks until the moisture content becomes low, at which point the air is passed through the powder. Samples of the powder are taken for moisture analysis during this operation and the correct degree of dryness is obtained. The powder is held on the "Christmas Tree" tracks until samples are taken and ballistic tests are made.

The powder is next transferred to the blending tower and packing house.

Building 228 - Ballistic Range and Proving Grounds (Including Storage Buildings)

Here, by actual firing tests and through laboratory methods, the ballistical value of each batch of powder is determined. Records are made of each test made from samples taken from cars held on the "Christmas Tree" tracks and the final blending of powder in the Blending Tower is based on the proportioning of batches in such a manner as to produce a powder of correct, uniform ballistic value for the use for which it is intended.

Building 221 - Blending Tower and Packing House

Here the powder is hauled to a large elevated bin by a conveyer. From this bin it is dropped to two other bins beneath, each bin receiving approximately half of the original amount. From these two bins it is dropped to four smaller bins. It is then removed and transferred to the top where the process is again repeated until the various batches are thoroughly mixed. Generally, approximately 100,000 pounds of cannon powder is blended together to make a load.

When the powder is blended, it is packed in galvanized steel or copper lined wood boxes which have been previously air tested to be sure that they are tight. The powder is then placed in storage in one of the shipping houses (Building 229) in the Shipping Area where it is held for shipment at a future date.

The buildings mentioned are those which are most important to the manufacturing process. There are a myriad of auxiliary buildings, water tanks, acid storage tanks, sawalls, etc., which would be too numerous to attempt to enumerate. A few of these are as follows: Alcohol and dabutylphthlate storage (203), solvent recovery car washing and drying house (213), box storehouse (223), air test house (224), air rupture test is given box linings, dry ingredients storehouse (227), for K_2SO_4, etc., shipping houses (229), box repair shop (232), screen cleaning house (233), for cleaning screens in screening presses, bag repair and stencil house (255), DBT service house (257), containing a micro-pulverizer to make finely powdered DBT for the sweetie barrels, dry ingredient storehouse (260) (igloo type), and shaker sieve transfer platforms (262).

The small scale maps included show the general layout of the "A", "B" and "C" manufacturing Lines (100 and 200 Areas) and the "D", "E" and "F" Lines, respectively.

300 AREA - ACID AREA

In this Area appropriate acids are manufactured, mixed and stored for use in the nitrocellulose Area. There are two acid Areas in the plant known as the "A" and "B" Areas. The functions and equipment in these two Areas are identical except that the productivity of the "A" Area is greater and hence has more units of equipment. The products made in the "A" Area are intended for use in the "A", "B" and "C" Lines and the production of the "B" Area is used in the "D", "E" and "F" Lines. The buildings in a typical Area are treated below:

Building 301 - Anhydrous Ammonia Storage Building

Here anhydrous liquid ammonia is received in tank cars (each holding about 50,000 pounds) and is transferred to storage tanks. To facilitate the transfer, this building is equipped with an unloading platform with facilities enabling the unloading of two cars at a time. The transfer of liquid ammonia from the tank car to the storage tanks is accomplished by a Frick ammonia compresser which exhausts gas from the storage tank and applies pressure to the tank car, forcing the liquid ammonia through a stand-pipe to the storage tank.

At this plant there are 8 such storage tanks in the "A" Area and 6 in the "B" Area. Each tank has a storage capacity of 30,400 gallons and usually one is left empty for emergency filling. All pipe lines into this building are very heavily insulated.

From this storage the liquid ammonia is next transferred via pipe line to the ammonia oxidation plant.

Building 302 - Ammonia Oxidation Plant

Liquid ammonia is forced to a vaporizer by ammonia gas pressure through heavily insulated pipes. The vaporizer is approximately 10' high and 4' in diameter and contains a double coil of 2" steel pipe through which 150 pound steam is passed to produce sufficient heat to vaporize the ammonia as it enters the bottom of the vaporizer tank. The gaseous ammonia then passes through a series of screens and Spence valves and is mixed with oxygen in the form of compressed air. This mixed gas is then transferred to a converter composed of two conical stainless steel sections 24" high and 10" in diameter at the head. In this converter, there are 33 sets of 60 mesh screens made from platinum containing 10% rhodium. In the converter the oxidation of ammonia occurs and nitrous oxide and water are produced.

From this point, quite an involved process is carried on in which absorption towers, 40' high and 64" in diameter, are utilized. There are 6 absorption towers in the "A" ammonia oxidation plant and 5 in the "B" plant. The resulting product of this process is 61% nitric acid.

Building 303 - Nitric and Sulphuric Acid Concentrators

In this building the concentration of sulphuric acid and nitric acid is accomplished.

Nitric Acid Concentration

In order to concentrate weak (50 - 60%) nitric acid to about 95% HNO_3, it is necessary to use a dehydrating agent for removing the water. The general procedure is to mix the diluted nitric acid with a strong dehydrating agent and then distill off the strong nitric acid. Substantially all of the water remains with the dehydrating agent.

In concentrating nitric acid by the Tower and Cascade process, mixtures of weak nitric acid and strong sulphuric acid, and mixtures of weak nitric and certain weak acids, are used. These are blended in definite proportions so that the resulting mix will meet certain predetermined specifications.

The complete plant for concentrating nitric acid is composed of the Tower and Cascade unit proper, equipment for preparing concentrating mix from strong sulphuric and weak nitric, equipment for condensing, cooling and receiving the strong nitric, storage tanks, pumps and piping for concentrating mix and residual sulphuric and an absorption system for recovering oxides of nitrogen.

The process produces (when operating with the regular concentrating mixture of 92% sulphuric and 60% nitric acids) concentrated nitric acid (95%), recovered weak nitric (50 - 60%) and residual sulphuric acid (70 - 71%).

Sulphuric Acid Concentration

The concentration of sulphuric acid from 71% to 93.2% is accomplished in this unit. The concentrators are fed from the storage tanks of the 90 series holding cooled residual acid (71%) from the nitric acid concentrators. The plant is equipped with three concentrators and two coolers. These concentrators can be operated batchwise, each concentrator operating separately or in continuous series flow in which the acid will be concentrated as follows: In No. 1 from 71% to 78%, in No. 2 from 78% to 87.5%, and in No. 3 from 87.5% to 93.2%.

The plant is equipped to operate at a rated output of 500 tons of acid per day when using all three concentrators. The entire area process is intended to accomplish the evaporation of water contained in the weak acid, thus producing a concentrated acid as required.

Building 305 - Acid Area Tank Farm (Including Acid Mixing, Fuming Sulphuric Acid Storage, Residual Acid Storage, Mixed Acid Storage and Waste Acid Storage)

The function of the acid mixing plant or Tank Farm is to prepare mixes of sulphuric and nitric acid for the nitric acid concentrating plant and for the nitrocotton Area. The three principal kinds of mixed acids made are:

1. Concentrating mixed acid - made by mixing 93% sulphuric acid with 61% nitric acid from the ammonia oxidation plant;
2. Spent mixed acid - made by mixing 61% nitric acid with Spent acid resulting from the manufacture of nitrocotton; and
3. Fortifying mixed acid - made by mixing 95% nitric acid from the nitric acid concentrators with 93% sulphuric acid.

The tanks in the Tank Farm are as follows:

5 high chrome iron tanks where storage is 61% nitric acid;
4 high chrome iron tanks where storage is 95% nitric acid;
2 steel tanks for storage of Spent mixed acid;
2 steel tanks for storage of concentrating mixed acid;
2 steel tanks for storage of Spent acid from the 100 Area;
2 steel tanks for storage of fuming sulphuric acid from the Oleum Plant;
2 steel tanks for storage of 93% sulphuric acid from the sulphuric acid concentrators;
2 steel tanks for storage of weak nitric acid produced in the nitric acid concentrators;
2 steel tanks for storage of residual sulphuric acid;
2 steel tanks known as Spent acid mix scale tanks;
2 steel tanks known as concentrating mix scale tanks; and
3 tanks known as fortifying mixed acid scale tanks.

Plot plans showing the general layout in both the "A" and "B" Acid Areas are included. There is also included a flow chart of a typical Acid Area.

400 AREA - POWER AND WATER SUPPLY

Water Supply System

The water supply used for manufacturing and fire protection at the Gopher Ordnance Works is obtained from two different sources. That water which actually enters into contact with the product is secured from a battery of four Ranney Wells which are located on the bank of the Mississippi River and the adjacent Spring Lake. Water used for condenser cooling purposes is obtained directly from the Mississippi River. Both supplies of water are carried from the river to the plant, a distance of about three miles, through a pair of 42" concrete and steel pipes.

Upon reaching the plant site, each of the pipe lines is split, delivering approximately half of the water to each of two reservoirs. The one reservoir is located adjacent to the "A" Power House which serves the "A", "B" and "C" Lines, and the other reservoir is located adjacent to the "B" Power House which serves the "D", "E" and "F" Lines. Each reservoir is divided into two sections of approximately equal size, one for well water, the other for river water.

The greater portion of the well water is pumped from the reservoir into a 30" main which carries it to the manufacturing Areas. A portion of the water is taken off from this main to supply the boilers in the Power House. Water for fire protection is also taken from the well water reservoir. The river water, also termed raw water, is pumped into a 30" main and thence to the manufacturing Areas.

404 - Process Wells and Pumps

The Ranney Wells consist of a reinforced concrete caisson with a wall thickness of 18" and an inside diameter of 13'. The caissons are sunk into the ground to a depth sufficient to reach a stratum of water bearing sand and gravel. Test borings were made in advance of the construction work to determine the extent of the water bearing stratum and the most desirable locations for the wells. Two of the caissons have been constructed with an inside depth of 64'. The other two caissons will have an inside depth of approximately 115'.

Near the bottom of each caisson and parallel to the bottom slab, there are constructed two rows of portholes through which are projected lateral collector pipes. These pipes are 8" in diameter and have slots in their walls through which water may flow into the pipe and thence through a control valve attached to the porthole assembly and so into the caisson. The collector pipes are projected out from the caisson to a distance varying from about 50' to almost 200'. The number of slots in the collector pipe is such as to result in an area of openings of not less than 18% of the area of the pipe. The size of the slots is determined from samples of the sand and gravel obtained from the preliminary test borings.

During the operation of projecting the collector pipe, the finer sand in the path of the digging head attached to the pipe is removed by flowing along with the water into the pipe. The result is that a layer of coarser gravel is left surrounding the pipe. This serves to arch over the slots in such a manner that water is able to enter freely through the slots.

Ranney Wells Nos. 1 and 2 will each be equipped with a pump having a capacity of 5,000 gallons per minute at 485' head and an 800 h.p. motor. These pumps will pump directly from the caissons into 24" lateral pipe lines which connect with the main 42" line to the plant. The 24" lines leading from the caissons are Universal joint cast iron for a distance of about 1,055' and 795', respectively. A section of the lateral line to Well No. 2, 1,812' in length and connecting the Universal joint pipe with the 42" main, is constructed of bell and spigot cast iron pipe. From the junction of these laterals, the 42" main is constructed of 5/8" steel pipe for a distance of about 1,000' up the bluff from the river bottoms.

Ranney Wells No. 3 and 4 will each be equipped with two 8,000 gallons per minute pumps, 175' head and two 400 h.p. motors. These pumps will pump from the caisson into 30" Lock Joint reinforced concrete pipe laterals and their combined flow will be carried in a 36" Lock Joint concrete pipe to an auxiliary reservoir located near the river pump house. This auxiliary reservoir will be approximately 50' x 80' in size and will be equipped with 6 pumps each having a capacity of 5,000 gallons per minute at 485' head. The water will be pumped directly from the auxiliary reservoir into the 42" line leading to the plant.

This 42" pipe is constructed of steel plate surrounded by spiral reinforcing bars covered with a shell of gunite concrete. The inside of the pipe is lined with a shell of centrifugally spun concrete. The pipe was manufactured by the American Pipe and Construction Company at a temporary plant which was erected for this purpose at South St. Paul, Minnesota.

414 - River Pump House

The river water is obtained from the Mississippi River through a channel which was dredged from the bank of the river across Spring Lake to the bank of the bluff bordering the Mississippi valley. This channel is approximately 2,700' long, has a minimum depth of 12' below normal water elevation and has a bottom width of 50'. The channel leads to a pump house which is a reinforced concrete and tile structure having overall dimensions of 63' by approximately 73' and a height of 45'.

The pump house will be equipped with 5 pumps having a capacity of 7,500 gallons per minute each at 415' head. Five 1,000 h.p. motors are provided for operating the pumps. The water is pumped directly into a 42" main leading to the plant site. This main is constructed of the same pipe used for the well water main, except that the first section leading from the pump house up over the bluff is constructed of 5/8" steel pipe for a distance of 380'.

402 - Reservoir Settling Basins

The reservoirs at the plant site are each constructed with overall dimensions of about 242' x 242' and 240' x 242', respectively. The "A" Reservoir has a capacity of 3,075,000 gallons for the well water, and 3,275,000 for the river water. The water from each pipe line, before entering the reservoir proper, passes through the chemical inlet house where there is introduced a charge of Calgon which acts as a stabilizer. This reservoir is a reinforced concrete structure with a timber roof supported on timber posts. The concrete structure has a depth of 17'.

400 AREA - POWER AND WATER SUPPLY (Cont'd)

412 - Pump House for Filter Plant and Reservoir

Constructed adjacent to one end of the "A" Reservoir is a reinforced concrete pump house with overall dimensions of 169' x 19½'. On the well water side of the pump house, there are 4 pumps, each with a capacity of 6,500 gallons per minute and each operated by a 350 h.p. motor. These four pumps are the ones which deliver the water to the process water mains. Provision is made for two future pumps. The water for fire protection is delivered by two steam driven pumps each with a capacity of 1,000 gallons per minute and one motor driven pump of the same capacity. The river water is delivered by means of four 6,500 gallon per minute pumps operated by 350 h.p. motors. Provision is made for one future pump.

The "B" Reservoir has a well water capacity of 3,000,000 gallons and river water capacity of 3,200,000 gallons. This structure differs from the "A" Reservoir in that it is constructed of plain concrete with gravity section walls. The roof is of timber construction similar to that in the "A" Reservoir.

The pump house at the "B" Reservoir is of reinforced concrete and the same dimensions as the "A" structure.

Process water is delivered by four 6,500 gallon per minute pumps with provision for two future pumps. Fire protection water pump equipment is the same as in the "A" Reservoir. The river water is delivered by five 6,500 gallon per minute pumps in contrast to the four pumps used in the "A" Reservoir. There is no provision made for any future pumps for the river water.

413 - Filter Plant, Including Softeners

At each of the reservoirs, water for the boilers is taken off the well water main in a 10" line which leads to the flash mixer tank. Here the water is mixed with chemicals in a 20'6" diameter by 22' high concrete mixing chamber. The detention time in this tank is 20 minutes. The water then flows to two precipitater tanks, operating in parallel. These tanks are 42' in diameter by 22' high. The total detention period in these tanks is 176 minutes. Both the flash mixer and the precipitator tanks are constructed of gunite concrete reinforced with wire mesh and steel bars. From the precipitator tanks, the water flows through a battery of 6 wood gravity filters into the clearwell in the softener room which is a part of the power house. The filtered water in the clearwell is given an acid treatment to reduce the pH value to approximately 7.5. The water is then pumped from the clearwell through a battery of 6 softeners for hardness removal and thence to the boilers.

411-A and B - Drinking Water Supply

Drinking water will be supplied from two deep wells as described below.

411-A - McCarthy Well - This well is a 24" cased well, 418' deep. At the present time, the well is being used as a temporary source of supply for drinking water and is equipped with a 200 h.p. deep well turbine pump rated at 2,000 gallons per minute. Water is pumped to a 200,000 gallon steel tank from which it is distributed to the temporary system by two booster pumps. Ultimately, this temporary system will be discarded and a 200 h.p. turbine pump will be hooked up to pump directly into the drinking water supply system.

411-B - Layne Western Well - This well is also a 24" cased well, 386' deep. The well will be equipped with a vertical turbine deep well pump rated at 2,000 gallons per minute and powered by a 200 h.p. motor. Water will be pumped from this well directly into the distribution system with a provision being made for surplus water unconsumed in the system to be stored in an elevated steel tank 115' high, having a capacity of 55,000 gallons. When the elevated tank is full, surplus water will be discharged from the drinking water supply system to the Ranney well water portion of the "A" Reservoir in the 400-A Area. It is anticipated that the pumps on this well and the McCarthy well will be run more or less continuously. It will be possible, however, to shut the pumps down for short periods and supply by gravity from the 55,000 gallon storage tank.

The drinking water supply distribution system is an independent system and will furnish all drinking water in the Administration Area, 100 Areas, 200 Areas, 300 Areas, and 400 Areas. In view of the fact that only a limited amount of water is used for manufacturing in the latter stages of the 200 Areas, this drinking water system will be the only one run through those Areas.

There is included a diagram which shows the general plan for water supply, treatment and distribution as outlined. This diagram is not to scale and is intended to show the general arrangement only.

401 - Power House

There are five steam generating units in power house 401-A and four units in 401-B. Each steam generating unit is practically complete in itself, and by this arrangement it will be possible to operate one or more boilers in either power house.

Each steam generating unit consists essentially of the following items:

a. Boiler - One Combustion Engineering Company's 4 drum bent water tube boiler with water cooled walls and water screen grates. Boiler operating pressure is approximately 450 pounds per square inch. Steam temperature at 450 pounds per square inch is 460° F. No superheaters are furnished on this installation. Capacity of boiler is 190,000 pounds of steam per hour with an average peak capacity of 200,000 pounds of steam per hour, but only for short periods. Feed water temperature is approximately 240° F.

b. Pulverizers - Two Raymond Coal Pulverizers, each with a capacity of approximately eight tons per hour. Total capacity of pulverizers is 16 tons. The actual coal consumption at 190,000 pound per hour boiler capacity will be approximately ten and one-half tons per hour.

c. Pulverized Coal Burners - Four pulverized coal burners per boiler. Each pulverizer supplies two burners. Forced draft (from air preheater) is supplied to each burner through a wind box surrounding the burner nozzle. Under normal operating conditions the boiler load must be in excess of 35,000 pounds of steam per hour before pulverized coal can be safely used.

d. Oil Burners - Four oil burner nozzles per boiler. These oil burner nozzles are placed in the same location as the pulverized coal burners. Oil will be used for starting the boilers prior to cutting in with pulverized coal. Each nozzle will have the capacity to produce 40,000 pounds of steam per hour. In an emergency, oil burners will produce 160,000 pounds of steam per hour. Heated air for oil combustion is supplied by the same wind boxes as those used for the pulverized fuel burners.

e. Forced and Induced Draft Fans - One Buffalo Forge forced draft fan with a capacity of 58,000 C.F.M. at 13 inches static pressure. One Buffalo Forge induced draft fan with a capacity of 112,000 C.F.M. at six inches static pressure. These fans are so connected that they are driven by a single Westinghouse 365 h.p. steam turbine.

f. Air Preheater - One Combustion Engineering air preheater located at the boiler flue gas outlet. Boiler flue gases enter the preheater at approximately 770° F. and leave at a temperature of approximately 400° F. Flue gases pass through the air preheater to the induced draft fan which in turn, forces the gases through the boiler breeching and out the smoke stack. The forced draft fan forces room air at approximately 80° F. to 100° F. through the various passes of the air preheater where it is heated to approximately 600° F. before being discharged to the burners (either coal or oil).

All feed water for the boilers will be chemically treated to eliminate iron, to lower the silica content, and to reduce the water to zero hardness. In addition the feed water will be passed through deaerating water heaters where the dissolved gases will be removed from the feed water. Continuous blowdown of the boilers (approximately 10 per cent of the boiler feed) will be required in order that the total soluble solids in the boiler water will not exceed 2,500 parts per million. The waste heat in the continuous blow-down will be utilized to preheat the boiler feed water.

Coal delivered at the boiler plants will be Illinois bituminous, 3/4 inch size, with average heat values of 11,300 to 12,000 BTU per pound as fired. After pulverizing, 70 per cent of the coal will pass through a 200 mesh screen.

An Allen-Sherman-Hoff System will be used for removing ashes from the boilers. This system employs the use of water for removal and conveyance of the ashes.

Boiler feed pumps will be Allis-Chalmers' five stage centrifugal pumps, driven by Westinghouse 310 h.p. steam turbines. Each pump will have a capacity of 625 G.P.M. at 1,450 feet head which is the equivalent of 640 pounds per square inch.

A drying period of approximately one to two weeks (with a wood fire) will be required for each boiler after the brick setting is complete.

The predicted performances on each boiler as outlined by the Combustion Engineering Company are as follows:

a. Boiler:

Evaporation, lbs./hr.	100,000	160,000	190,000
Pressure at header outlet, lbs./sq. in.	450	450	450
Saturation steam temperature, degrees F.	460	460	460
Draft loss, boiler, "w.g.	.36	1.02	1.28
Feedwater temperature entering boiler, degrees F.	240	240	240
Total fuel, as fired, lbs./hr.	11,000	17,400	20,900
CO_2 at boiler outlet, per cent	13.2	14.4	14.5
Furnace temperature, degrees F.	1,700	1,950	2,000
Combustion rate, BTU/cu. ft./hr.	10,100	14,500	19,100
Weight of gas through heater, lbs./hr.	135,000	203,000	244,000
Weight of air through heater, lbs./hr.	84,200	134,000	170,000
Temperature of gas entering heater, degrees F.	630	710	770
Temperature of gas leaving heater, degrees F.	353	386	405
Temperature of air entering heater, degrees F.	80	80	80
Temperature of air leaving heater, degrees F.	545	585	615
Draft loss, gas side, "w.g.	.52	1.12	1.60
Draft loss, air side, "w.g.	.73	1.79	2.83
Overall efficiency, per cent	82.0	83.1	82.5
Maximum air pressure drop through burners and windbox		2.80	3.50
Pressure loss through ducts - air		.40	.50
Pressure loss through ducts - gas		.20	.25
Gas temperature entering boiler tubes, degrees F.		1,860	1,990
Gas Temperature leaving boiler tubes, degrees F.		710	770

b. Pulverizer:

(1) Air capacity of pulverizer exhauster - 450 pounds of air per minute at 100% of pulverizer capacity.

(2) Air temperature required to pulverize 16,000 pounds per hour per mill of specification coal with 13% moisture and 70% through 200 mesh - 525° F.

(3) Power consumption of two mills at 190,000 pounds per hour evaporation (motor input) - 16.2 K.W. per ton based on 13% moisture.

(4) Per cent coal through 50 mesh screen under above conditions - 99%.

(5) Stable minimum load carried on (a) two burners - 35,000 pounds per hour, (b) four burners - 70,000 pounds per hour.

There are plot plans of the "A" and "B" Areas attached which show the general layout and some details.

405-L - Purchased Power Incoming Transmission Line

To facilitate following the outline of the electric power distribution system contained in the next few pages (405-L, 405-S, 501-S and 501-L) the attached diagram has been prepared and is attached.

The Northern States Power Company will install switching equipment at Rogers Lake Substation and build a 110 KV Line from Rogers Lake to the Gopher Ordnance Works site at Gopher Ordnance Works coordinates E 11,900, 5880, one span inside the Gopher Ordnance Works site. At this point a meter house and metering equipment will be installed. The line will be four wire, star connected, using #4/0 ACSR wire, suspension type insulators, with wood poles (generally 65' poles), H type construction, prevailing spans approximately 500'.

The du Pont Company will continue the 110 KV Line from this point to substation 405-A, tapping off the same type of line to substation 405-B and a 110 KV Line to substation 405-C for the river and Ranney Well pumping.

The lines to 405-A and 405-B will be similar to Northern States Power Company construction except that #2/0 Copperweld Copper will be used and prevailing span will be approximately 485'. The line to 405-C will be the same except that one-half inch low resistivity galvanized iron wire will be used for the conductors.

405-S - Purchased Power Substations

At substation 405-A and 405-B, two 12,500 KVA, three phase 110 KV/13.8 KV transformers will be installed in parallel with air break switch, 600 ampere circuit breaker and lightning protection on the 100 KV side of transformers. The 13.8 KV circuits go into the Power House 401-A and 401-B where the control is located. Four 13.8 KV radial feeders arranged with emergency ties and sectionalizing switches go to:

From 405-A - 401-A:

1. Substations 501A-1, 501B-1 and 501C-1
2. Substation 501F-1
3. Substation 501K-1
4. Substation 501D-1

From 405-B:

1. Substations 501A-2, 501B-2 and 501C-2
2. Substation 501F-2
3. Substation 501K-2
4. Substation 501D-2 and 501FLS (fence lighting switch) then to 501FL-1, 501FL-2 and 501FL-3 (fence lighting)

These feeders are #2/0 MHD copper.

At substation 405-C there are three 3,333 KVA single phase 115/6.9 KV transformers, delta connected, with air break and lighting protection on the primary side and 600 ampere oil breakers on the secondary feeders. The river and Ranney pumps are 6.9 KV fed from four feeders. Three 15 KVA 6900/490 volt transformers and one 69/115/230 volt transformer are connected to the lines for incidental power and light.

500 AREA - OUTSIDE LINES

501-S and 501-L - Electric Power and Light Distribution Lines and Substations

Substations 501A-1, A-2, B-1, B-2, C-1 and C-2 have three single phase 13.8 KV delta transformers for power, with six feeders from each. In 501B-1 and 501A-2, three 1500 KVA, 13.8 KV delta to 2300 volt delta connected transformers have three 2300 volt power feeders and one 2300 volt lighting feeder.

Substation 501D-1 and 501D-2 have three 1500 KVA 13.8/2.3 KV delta connected transformers with three 2300 volt feeders for power, one 2300 volt feeder for lighting, and one 2300 volt feeder for constant current street lighting and fence lighting regulators.

Substations 501E-1 and 501E-2 have three 1500 KVA, 13.8 KV/2.3 KV delta connected transformers with two 2300 volt feeders for power.

Substations 501F-1 and 501F-2 have three 1500 KVA, 13.8 KV/2.3 KV delta connected transformers with three 2300 volt feeders for power and one 2300 volt feeder for light.

From switch 501FLS three 13.8, single phase lines, go to substations 501FL-1, FL-2 and FL-3 each of which has one 150 KVA, 13.8 KV/2.3 KV transformer, and two 30 KVA 6.6 ampere constant current regulators for series fence lighting. One 2300 volt feeder for guard tower lighting comes off the 2300 volt lines.

All 2300 volt lighting feeders except for guard towers are three phase. The single phase lighting transformers are 2300/115/230 volt.

Lightning arrestors are installed at each transformer bank and every 1000 feet on the primary lines.

The schematic diagram on the following page illustrates the electrical distribution system.

502 - Steam Lines

All steam on the area will be generated in one of the two power houses. Power House 401-A will furnish steam required for heating and process purposes in the "A", "B" and "C" Lines, the 300 Area and the Administration Area; the 401-B Power House Area will service the "D", "E" and "F" Lines, 900 Area and the 300-B Area. All steam lines are overhead pipe lines and are covered with standard 1" pipe insulation materials. There will be a total of 17,700 lineal feet of such lines.

The steam distributed to the mains will be high pressure steam. The mains distributing steam for process purposes will carry 300 pounds per square inch and mains distributing steam for heating purposes will carry 150 pounds per square inch. Pressure will be reduced through the use of pressure reduction valves at all buildings where required.

503 - Water Lines

All water lines are installed underground. There are four different types of water lines. These are fire water lines, drinking water lines, raw water lines, and process water lines. There will be a total of 419,000 lineal feet of underground water lines of all different sizes.

504 - Air Lines

Air lines are installed over head and are used for the distribution of air to the various manufacturing buildings from the Power House Area and throughout the Acid Area from building 302-A and B. There will be a total of 97,800 lineal feet of such lines.

505 - Sewer Lines

This includes disposal lines for all operations and functions in the plant. In general, sewers fall in two categories - process and sanitary.

Sanitary sewers are all vitrified tile, bell and spigot pipe. All sizes of pipe will be used and a total of 42,156 lineal feet will be placed.

Process sewers are for the most part vitrified tile bell and spigot pipe, and 63,374 lineal feet of tile pipe will be placed. The main trunk sewer is constructed of Laminex box culvert sections. These sections are pressure treated wood with laminated sides, bottom and top. The sections vary according to the load anticipated. The maximum section is a double box 7' x 8' and the minimum is a single box 3½' x 4'; 11,160 lineal feet of Laminex trunk sewer will be placed.

506 - Brine Lines

These lines carry brine for cooling purposes and for condensers. They are installed over head and are of varying size; 44,320 lineal feet of such lines will be installed.

507 - Process Lines

These lines carry the various items required in the preparation and manufacture of powder. They are installed overhead. The items carried include acids, ether, alcohol, solvent and stuff. There will be a total of 259,940 lineal feet installed in the plant.

508 - Hydraulic Lines

These lines are underground and carry high pressure water supply. Pressures of 3,500 pounds per square inch and 500 pounds per square inch are carried. The return lines carry 150 pounds per square inch. These lines supply hydraulic pressure for the operation of hoists, presses and other operating equipment. There will be a total of 37,000 lineal feet of such lines.

509 - Pipe Supports

All overhead lines are supported on pole structures of appropriate design. Some supports carry several different lines and are appropriately designed. Others carrying one or two lines only are, of course, much lighter. A total of 10,000 pipe supports must be placed.

510 - Fire Protection

Water for fire protection purposes is furnished from the two reservoirs 402-A and B. For this purpose there are two 1,000 gallon per minute steam powered pumps and one pump 1,000 gallons per minute capacity powered by a 150 h.p. motor in the pump house at each reservoir. Distribution of water is direct

from the reservoir with a 100,000 gallon elevated tank 115' high in the center of the Area to insure a supply at all times. Sprinkler systems are provided in all buildings where fire hazards warrant. A total of 223 buildings contain such systems. A total of approximately 105,000 lineal feet of underground cast iron pipe Class 250 bell and spigot will be laid for fire protection.

511 - Open Drainage Ditches (Vermillion River Work)

The process wastes from the plant will be acid in nature. The degree of acidity appears to be an unknown quantity. It is sure that it will be sufficiently acid to be unfit for consumption by farm livestock and will have deteriorating effects on concrete and steel structures.

There will be 160 second feet of process runoff for which provision must be made. The only logical disposition is drainage to the Vermillion River channel and thence to the Mississippi River. As a large portion of the surface runoff from the plant will be drained the same way, the facilities must be increased to carry approximately 240 second feet more or a total of 400 second feet.

It is proposed that a small detention reservoir will be created in the southeast corner of the site and that process waters (plus surface runoff involved) will be held for a period of at least 18 hours. This will then be released through the access channel to the Vermillion River.

To insure sufficient capacity for the normal flow of the river, plus the increased flow created by the plant process runoff, it was found necessary to deepen and widen the river channel, place drop structures to reduce velocity, reconstruct several bridges to increase cross sectional area of opening, protect structures against acid and revise the dams in the Mississippi River Pool #3 into which the Vermillion River empties.

The following is a summary of the work to be done:

A - EXCAVATION - Total yardage involved 327,503 cubic yards:

(a) Outfall ditch from the end of the Lamimer culvert trunk sewer to the detention reservoir This work includes the excavation of 124,135 cubic yards of dirt.

(b) Access Channel. Work on this includes the excavation of a channel from the detention reservoir to the Vermillion River, a distance of approximately 9,000'. The channel excavated has a bottom width varying from 18' to 20', with side slope of 2 to 1. The average cut is approximately 5'. The total yardage of excavation involved totals 74,272 cubic yards.

(c) River Channel. This work includes the deepening, widening and straightening of the existing Vermillion River channel from the point of intersection of channel by the access channel and to the Mississippi River for a distance of 12.7 miles. This includes the excavation of 129,096 cubic yards. All of this dredging work has not been continuous dredging but has included spot dredging as required.

B - HIGHWAY BRIDGES

There are three highway bridges which had to be reconstructed in order that the cross section area of the opening might be sufficient to carry the increased flow brought about by the introduction of process waste from the plant.

(a) New bridge on State Highway No. 52 - Ordinarily the small water course which was enlarged to provide a portion of the access channel passed through a small concrete culvert. The culvert could not be economically enlarged so it was decided that a new bridge would be constructed to augment it. The new bridge constructed was a two-span concrete deck bridge supported on treated wood piling. The cost of construction of this bridge, including material and labor, was $7,377.00.

(b) Bridge on State Aid Road No. 24 - Here again the original drainage facilities were inadequate to take the increased flow in the water course and a new bridge was required. A single span bridge with reinforced concrete deck supported on treated wood piling was constructed at a cost of $4,331.00.

(c) Bridge at the Village of Empire - At the point at which this bridge was constructed, drainage facilities for the existing water course had never been sufficient. To care for the increased flow, a two-span timber deck bridge supported on wood piling was constructed. The wood deck is to be treated with a bituminous wearing surface. Cost figures on the construction of this structure are not available.

C - FARM BRIDGES

(a) To enable farmers to have access to their property, it may be necessary to construct two bridge structures as farm crossings. There is some possibility that through further negotiations, an arrangement may be worked out whereby the lower farm crossing which is proposed to enable access to Hubert Gore's property may be eliminated. At this time, a definite statement in this respect is impossible.

The bridge to be placed to facilitate access to Jacob Hiniker's property has not as yet been definitely designed. Soil conditions and the existance of bed rock at a maximum depth of 5' seem to prohibit the use of a structure supported upon wood piling bents. In the event that a structure has to be built, it will undoubtedly be composed of piers constructed of wood cribbing filled with rock. Negotiations are being carried on for the construction of a new road enabling the elimination of this bridge but a definite statement of the action which will be taken is impossible.

D - DROP STRUCTURES

(a) To minimize erosion and channel maintenance work, it has been deemed necessary that suitable structures be provided to reduce the velocity of the stream's flow by taking care of the drop in elevation at two different points. Two structures are, therefore, being constructed at Stations 14 + 00 and 69 + 00. These structures will be constructed of timber and appropriate rock riprap. Due to the anticipated acid content of the river flow, steel bolts and other materials ordinarily used in timber construction cannot be utilized. All the timber will, therefore, be held by the use of wood dowels.

E - DAMS

(a) Prior to the construction of the various dams in the Mississippi River, the flow from the Vermillion River emptied into Vermillion Slough and flowed either north or south into the Mississippi as water levels permitted. When the dam in the Mississippi River was constructed below the Village of Hastings, a closing dam across Vermillion Slough was constructed north of the point at which the Vermillion River emptied into the Slough, thereby providing that the flow from the Vermillion River would empty into the Mississippi River via the Vermillion Slough at a point below Dam No. 3. Under these circumstances, the acid water from the Vermillion River would flow the entire length of the Slough and would presumably materially affect vegetation and the utility of lands adjoining the Slough. Plans, therefore, call for the removal of the closing dam originally constructed north of the discharge of the Vermillion River, and construction of a similar dam south of the discharge point of the Vermillion River. This will insure the discharge of the acid water directly into the Mississippi River through the utilization of but a short stretch of the Slough. The construction of this new closing dam will reverse the direction of flow of the discharge of the Vermillion River.

Between the new closing dam and the Mississippi River channel, Lake Isabel discharges into the Slough. To prevent the infiltration of the acid water into this lake, it will be necessary that a small earth filled dam be constructed across the discharge of the lake. This work, being quite removed from the project area, would require the transportation of a considerable amount of equipment some distance; it would also require a great deal of cost in transporting men and materials. It has, therefore, been decided that a bid solicitation will be made for the work and that it will be accomplished as a subcontract.

(b) Detention Reservoir Dam - Present plans call for the neutralization of the process discharge from the plant to a point where it will approach 100% theoretical neutralization. Apparently, there is some difference of opinion as to whether or not this degree of neutralization can be effected. A detention reservoir is, therefore, proposed on the site where process runoff will be retained for a period of 18 hours and then gradually released. A small dam will be required in the water course in the southeast corner of the project property. According to present plans, this dam will be of simple construction with an overflow spillway sufficient width to care for the automatic release of water in direct proportion to that water taken in. There will also be provided a gate arrangement whereby the detention reservoir basin can be completely drained if required.

F - RIPRAP AND CHANNEL PROTECTION

(a) Due to the acid content of the runoff from the plant, all existing structures, drop structures and dams, including the dam at the King Midas Mill at Hastings, Minnesota, must be adequately protected. It is proposed that this protection be provided by the placing of riprap rock having acid resisting qualities. Some tests have been run on Dresser Junction rock and granite from Jasper, Minnesota, and Duluth, Minnesota. Apparently, all of the rock tested will suffice and the procurement of suitable quantities for the work to be done is underway. In addition to the riprap work, it will be necessary to apply some acid resisting Mastic material to existing concrete bridge abutments, etc.

G - FENCING OF RIGHT OF WAY BOUNDARIES

(a) The entire right of way boundary will be fenced and the total amount of fencing involved will be approximately 27 miles. As the larger portion of the right of way passes through farm and pasture lands, it will be necessary to erect fence of a nature suitable to exclude all livestock from the right of way. The farmers occupying adjacent lands have been consulted and insofar as possible, fencing conforming to their requirements will be erected.

There is a small scale diagram attached showing the general layout of the work on the Vermillion River. The locationsof the various structures and items of work are indicated.

600 AREA - GENERAL FACILITIES

601 - Broad Gauge Railroad Track

Railroad trackage within the plant site is of two different types - heavy rail trackage and light rail trackage.

Heavy Rail Trackage - In this type of trackage the minimum weight rail used is 75 pounds. This trackage is primarily for the facilitating of the receipt and distribution of materials, equipment and supplies necessary for construction and operation. Receipts go to the classification yard and are distributed from there. The trackage connects with the Chicago, Milwaukee, St. Paul and Pacific and the Rock Island Railroads on the west boundary, and with the Chicago, Great Western Railroad on the east. There are twenty-six miles of trackage of this type.

Light Rail Trackage - In this type of trackage the minimum weight rail used is 40 pounds. This trackage is intended for use in distributing supplies throughout the plant from the classification yard, and to facilitate the manufacturing process by transporting the materials in process from one building or Area to another. There are fifty miles of this to be constructed.

603 - Roads and Walks

Roads on the Area fall in one of two categories. They are either patrol roads or service roads required for the facilitating of manufacturing operations. There are 62.6 miles of road on the Area including patrol roads and service roads. All are crushed rock roads composed of a 5" base course of large sized ($2\frac{1}{2}$" maximum) crushed rock topped with a layer of 2" of fine crushed rock (3/4" maximum). In most cases calcium chloride has been used to assist in compaction and to minimize dust conditions. Water has also been used for compaction and bond.

There will be 2.5 miles of concrete road or wheeling walk in the 200 Areas. This road or walk will be 8' and 12' in width and is to facilitate transportation of the process materials.

There is attached a small scale map showing the road layout within the manufacturing Area.

The patrol roads extend entirely around the manufacturing area fence and the entire length of the river pipe line right of way.

With the exception of the walks in the Administration Area, all walks are crushed stone. There is no set figure as to the amount of walk which will be required but it is not anticipated that there will be any large amount, however.

In the administration Area, concrete walks were deemed necessary where continuous travel of personnel between buildings is necessary. Eighthundred and fifty lineal feet of 6' walk and 275 lineal feet of 10' walk were placed.

605 - Fences

Fencing in the Area proper is of two types. The fence around the outside perimeter of the boundary consists of wood posts 16' on centers, carrying two strands of #9 barbed wire. Seventeen miles are required.

The fence around the manufacturing Area consists of wood posts 15' center to center, carrying 9 strands of #9 barbed wire. Eleven miles will be required.

600 AREA - GENERAL FACILITIES (Cont'd)

Along the Vermillion River right of way, the type of fencing varies. All will be carried on wood posts and there will be a total of 27 miles of fencing of all types involved. The type of fencing will be determined by the adjoining farmer's needs.

At the river water supply setup, it is anticipated that approximately 40,000 lineal feet of chain link fencing on steel posts will be erected around the River Pump House and the four Ranney Wells. (These materials were secured through transfer.)

610 - Sewage Pumping Station

In laying out the sanitary sewage system, it was found that it would be impossible to carry sewage from the "D", "E" and "F" Lines by gravity to the sewage treatment plant which is located west of the "A", "B" and "C" Lines. Rather than install a treatment plant for this sewage, a pumping plant was installed to force the sewage to the treatment plant. The pumping plant is composed of a reinforced concrete well 14' I.D. 24.5' below ground level. Approximately one-third of this is wet well where the sewage is received and from which it is pumped. The remainder of the well houses two Chicago Pump Company sump pumps, 500 gallon per minute capacity, and powered by a 7½ h.p. motor.

612 - Sewage Acid Neutralization Plants

There are two such plants on the Area. The plants are identical and are so placed that one acts to neutralize the process runoff from the "A", "B" and "C" Lines and the 300 Area, and the other acts on the runoff from the "D", "E" and "F" Lines and the 300-B Area.

The plant provides for delivery in carload lots of pulverized limestone. This stone is elevated by a bucket conveyor and screw conveyor to a concrete silo. This silo is 20' I.D. and 49'7" high and is made by covering a solid wood frame with gunite concrete in which appropriate reinforcing has been placed. There is a storage capacity for 450 tons of limestone. The bottom of the silo is pitched to the center where limestone is discharged through a slide gate to a controlled feeder, which feeds powdered stone to a small hopper over an injector. Raw water is introduced through the injector and at the point of zero pressure the lime powder is mixed with it. The resulting mixture passes through an agitator and the lime slurry therefrom is introduced into the acid runoff water in the trunk sewer.

Just before the process trunk sewer reaches the detention basin, a pH recorder station is installed where a sample is pumped from the sewer and through a pH recorder. This station acts as a basis of control over the amount of limestone introduced in the neutralization plant.

613 - Permanent Parking Areas

To facilitate parking of private automotive equipment belonging to operating employees, a total of 493,722 square yards of parking areas have been created. These parking areas are surfaced with a layer of approximately 6" of coarse crushed rock (2½" maximum) covered with a layer of 2" of fine crushed rock (3/4" maximum). The areas are located adjacent to the gatehouse and clock area servicing the "A", "B" and "C" Lines, and gatehouse and clock area servicing the "D", "E" and "F" Lines, and at the main office in the Administration Area.

614 - Guard Towers

At strategic points around the entire fence line inclosing the manufacturing Area, there have been constructed wooden guard towers. These towers are 14' high to a floor of a small inclosure 6'4" x 6'4". Each inclosure is equipped with an electric heater and is completely inclosed by glass windows. Access to the inclosure is gained through use of a series of stairs. On top of each tower, there is mounted a 1,000 watt search light which can be directed up or down and in a complete circle. There are 30 such towers within the manufacturing area proper. There is one such tower on top of the River Pump House (Building 414) and there will be four such towers on top of the pump house at each Ranney Well (404). It is anticipated that there will also be one of these towers on the hillside above the entire river water supply layout.

615 - Fence Lighting

At intervals of 125' around the fence line inclosing the manufacturing area, appropriate lights have been installed. These lights are 300 watts each and are mounted with suitable reflectors on a 35' pole. There are 10.8 miles of fence lighting circuit.

617 - Sewage Treatment Plant

This plant is designed to care for the treatment of the sanitary sewage from the several change houses, offices, shops, etc., in the manufacturing area. It is anticipated that 7,500 employees will frequent the area served.

Sewage is received in the plant from the sewer system through a bar screen to a wet well from which it is pumped, via a chlorinating chamber, to the settling tank by three 500 gallon per minute sewage pumps operated by 5 h.p. motors. The chlorinating chamber is small and serves only as a means of introducing Cl_2 by means of a semi-automatic vacuum type chlorinator. The sewage enters the settling tanks from the chlorinating chamber over a small weir. The settling tank is concrete and is divided into two sections each 48' long and 8' wide. Each section is equipped with a Link Belt sludge collector (endless chain cross flight type) driven by a $\frac{1}{2}$ h.p. electric motor.

The effulent is discharged from the far end of the settling chamber over a weir and into the process trunk sewer. There is another weir set slightly higher than the effulent weir over which grease is discharged to a grease trap. The sludge which settles out on the bottom of the settling tank is propelled by the sludge collector to a small chamber from which it is pumped to the primary digestion tank by a 4" sludge pump powered by a $1\frac{1}{2}$ h.p. motor. The primary digestion tank is 24' I.D. and 17' deep and is equipped with pipe coils for circulating hot water for heating the sludge to accelerate bacterial action. There is an overflow between the primary and secondary digestion tanks (30' I.D. x 17') and remaining effulent and surplus sludge can be drained to the secondary tank to a limited level. The sludge not consumed in the primary tank is pumped to the secondary digestion tank for holding during periods when the sludge drying beds can not be used.

Under ordinary circumstances, sludge not consumed by bacterial action is pumped directly to the sludge drying beds. There are five beds constructed of sand and gravel with tile underdrains. The overall dimensions of the drying beds are 165' long and 60' wide.

700 AREA - ADMINISTRATIVE AND MAINTENANCE FACILITIES

The items contained in this area are as indicated in the area name, facilities provided for administrative and maintenance purposes. Due to their functions, the various buildings are scattered throughout the several manufacturing areas or are located in the service and administration area.

The facilitating buildings in the manufacturing areas vary but each area is supplied with a sufficient number of four main types to enable efficient operations. The four main types are 704 - Supervisors' Offices, 706 - Laboratories, 707 - Change Houses, and 722 - Area Shops.

For the most part, the 704 Buildings, or supervisors' offices, are for the purpose of housing clerical personnel required for the compilation of records, statistics, etc. Each one of the various manufacturing stages is supplied with sufficient Change Houses to care for all manufacturing personnel on a three-shift basis. These houses contain lockers for each employee, shower and bath facilities, and ordinary toilet facilities. Each manufacturing stage is also provided with an area shop. This shop is equipped to make minor repairs on the manufacturing equipment utilized in the stage. Major repairs are accomplished in the service area.

In addition to the four main types of facilitating buildings, there are, at strategical points, fire headquarters, medical buildings, laundries, and comfort stations.

The Service Area contains a building complement sufficient to provide for the accomplishment of all service and maintenance functions. In this Area, there are general storage facilities, car repair shops, salvage buildings and storage facilities for spare equipment. There is also a combined shop which is a building 540' long and 80' wide containing shop facilities for all crafts. This includes blacksmith shop, pipe shop, millwright shop, carpenter shop, etc.

In the main administration area, buildings are provided for all administrative and control functions. For the most part the title of the buildings involved are selfexplanatory.

The following tabulation shows the number of administrative and facilitating buildings which are located within each area:

100 Area:
- 4 - 704 Supervisors' Office
- 2 - 706 Cotton Drying Laboratory
- 8 - 707 Change Houses
- 4 - 722 Area Shops

Service Area:
- 5 - 707 Change Houses
- 2 - 713 General Store House
- 1 - 714 Material Shed
- 2 - 715 Oil and Paint Storage
- 2 - 716 Car Wash and Repair Shops
- 2 - 717 Combined Shops and Sand Blasters House
- 1 - 718 Locomotive House and Sand Dryer House
- 2 - 722 Area Paint Shop and Riggers' Shop
- 3 - 725 Parking Garage
- 1 - 726 Acetylene Storage
- 4 - 729 Span Machinery Storage
- 1 - 731 Salvage Building
- 1 - 733 Service House
- 1 - 742 Lumber Storage House

700 AREA - ADMINISTRATIVE AND MAINTENANCE FACILITIES (Cont'd)

200 Area:
- 11 - 704 Supervisors' Offices
- 2 - 706 Laboratories
- 18 - 707 Change Houses
- 1 - 709 Fire Headquarters
- 1 - 721 Inspectors' Office
- 6 - 722 Area Shops and Checking Stations
- 1 - 727 Comfort Stations
- 1 - 731 Salvage Building

300 Area:
- 1 - 704 Safety and Fire Inspectors' Office
- 2 - 706 Acid Area Laboratory and Supervisors' Offices
- 2 - 707 Change Houses
- 1 - 709 Fire Headquarters
- 4 - 722 Area Shops

400 Area:
- 2 - 704 Supervisors' Offices
- 3 - 707 Change Houses
- 1 - 709 Fire Headquarters
- 2 - 719 Medical Buildings
- 1 - 722 Area Shops
- 1 - 723 Laundry

900 Area:
- 1 - 707 Change House
- 1 - 722 Area Shop

Administration Area:
- 3 - 701 Gate Houses and Clock Alleys
- 1 - 702 Communications Building
- 1 - 703 Main Office
- 1 - 705 Employment and Examination Building
- 1 - 707 Change House
- 1 - 708 Cafeteria
- 1 - 720 Guard Headquarters
- 1 - 728 Staff Car Garage
- 1 - 730 Garage for Guard Highways

Also included in the 700 Area are communication facilities and alarm systems. The plant is serviced by a complete telephone system which has been constructed and which will be operated and maintained by the Northwestern Bell Telephone Company.

Construction of this system was accomplished as per the agreement between the Chief Signal Officer and the various telephone companies as pertaining to communication systems on temporary war projects. The responsibility for such construction work is delegated by the Chief Signal Officer to the Signal Officer of the Service Command involved who, in turn, delegates the responsibility to a Signal Officer on the particular post or project. Captain F. E. Mullen has been designated as Signal Officer for this project.

All telephone service required at the plant has been procured from the Northwestern Bell Telephone Company on a rental basis. This system is composed of an 8 position multiple manual switchboard system, providing for 800 lines and a guard reporting magneto switchboard system. Plans for the general plan were prepared by the du Pont Engineering Division in Wilmington and received the approval of the Wilmington District Office of the Army Engineers. Subsequent to approval by higher authority, the plans were turned over to the telephone company which provided working details and which accomplished the actual construction work. There is attached a small scale diagram of the system which is being installed.

900 AREA - ORGANIC AREA

When the plant was originally proposed, the plans included the construction of facilities for the manufacture of materials required in the production of diphenylamine. Since the original considerations, the proposed plan has been amended and aniline required for the manufacture of this product will be shipped to the plant via tank car. The buildings in the 900 Area which would be required for the production of aniline have been discontinued. The object of the operation is to produce D.P.A. which is used as a stabilizer to prevent deterioration in smokeless powder.

Crude D.P.A. is formed by autoclaving aniline in the presence of ammonium chloride and ferrous chloride as catalysts. The reaction is carried out in an autoclave equipped with a reflux column and is controlled to 150 pounds pressure for a period of 24 hours. During the period, by-product ammonia is given off and tends to collect in the upper section of the reflux column. To prevent reaction equilibrium, this ammonia is continuously released by a temperature controlled valve. The released ammonia is then stripped of entrained aniline and impurities and collected in water tanks known as absorbers.

At the end of 24 hours reflux period some unconverted aniline remains in the autoclave. This aniline is manually released from the top of the reflux column, condensed and sent to a reuse aniline storage tank for recharging the autoclaves.

The remainder of the autoclave charge, which consists of crude D.P.A. and aniline, is then processed through a packed column fractioning still. In this process, carried on under vacuum, the main purpose is to produce refined D.P.A. for graining. Aniline recovered from the distillation is sent back to the autoclave feed. After the refined D.P.A. leaves the still, it is grained or crystallized in a batch type graining kettle and then packed in barrels for storage and future use.

The following buildings and equipment are required for the process outlined.

Building 924 - Car Spot for Refined Aniline, Including Pump House

This building is to be complete with all equipment necessary for the unloading of refined aniline. From the car spot, the aniline will be pumped to the aniline storage tanks.

Building 909 - Aniline Storage

This structure will be composed of four horizontal aniline storage tanks, 9' in diameter and 36' long, each having a capacity of 17,700 gallons. As a safety and protective measure, tanks will be installed in dikes; they will be equipped with one La Bour pump and will be steam heated.

Building 910 - Autoclave Charge House

1 Aniline storage tank - 8' x 20' horizontal w/ scale tank charging pump.

1 Autoclave charging scale tank - 4' x 7'6" vertical steel w/2 autoclave charging pump.

1 Recovered aniline storage tank - 6' x 12' horizontal steel.

1 Barrel storage bin 7'2" x 3' x 2'9" steel, steam heated.

Building 911 - D.P.A. Autoclave House

In this building provision for the installation of 12 autoclaves will be made. Only 10 autoclaves will be installed and if future production requires it, 2 additional units will be provided. The structure will be steel framing with corrugated asbestos siding and roofed with brick fire walls and steel barricades.

Building 912 - Ammonia Recovery Building

The equipment in this building will be as follows:

1 Aniline catch tank, 4' x 10' horizontal, steel
2 Ammonia scrubbers, 4' x 10' horizontal, steel
3 Ammonia absorbers, 8' x 20' horizontal, steel

Building 913 - D.P.A. Vacuum Still House

In this building, there will be two D.P.A. vacuum stills and two graining kettles. In addition to these items, the following equipment will be required.

1 Crude D.P.A. storage 8' x 20' scale and condenser
1 emergency D.P.A. receiving tank 8' x 20'
1 Crude D.P.A. pump
2 Aniline water tanks, 4' x 4' horizontal, steel
2 Recovery aniline tanks, 4' x 10' horizontal, steel
2 Hexite aniline tanks with coils
2 Refined D.P.A. tanks with coils
1 Caustic Tank, 2 compartments each, 4'5-3/4" x 4' x 4'
2 Vacuum systems, 2 stage and single stage
1 Separating tank, 6' x 6' vertical steel
1 Topping still reflux column and condenser
1 Topping still pump
2 Oil system expansion tanks
1 Topping still vacuum system - 2 stage
1 Scrap D.P.A. tank, 4'6" x 3' vertical steel
1 Caustic feed tank
1 Scale
1 Lemonade cooler

Building 914-A - Oil Superheater House

The equipment in this building willconsist of two Merrill absorbers complete with Kinney pumps, expansion tanks, two fuel oil pumps, 1 fuel oil tank, and 1 circulating oil tank in pit.

Building 915 - Fuel Oil Storage

This will consist of 1 fuel oil storage tank 22' in diameter and 20' high, having a storage capacity of 55,000 gallons.

Building 920 - D.P.A. Storehouses

There will be two such buildings. Each building will be 30' wide and 150' long, and will be frame construction with concrete floor.

Building 921 - Chemical Storage

This building will be 30' wide and 50' long, frame construction and will contain a Dry sprinkler system.

1100 AREA - STAFF RESIDENTIAL AREA

In this Area, there are located 25 houses which are intended to provide living quarters for the families of key members of the operating staff (both du Pont Operating and Ordinance Department).

1101 - Residences, Including Garage

There will be 10 two-story, 6 room houses constructed at a maximum cost of $7,200.00 (this figure includes the cost of all facilities within 5' of the building line). The rooms included are one livingroom 12' x 12', one diningroom 11' x 12', one kitchen 10' x 11', complete with electric range and refrigerator, two bedrooms 12' x 15', one bedroom 10' x 12', and one bathroom 6' x 9'.

Attached to each house there will be a one stall garage 11'6" x 12'6", and a screened porch 8' x 12'.

There will also be 14 five room bungalows, constructed at a maximum cost of $5,700 each (this figure includes the cost of all facilities within 5' of the building line). These buildings will include a livingroom 12' x 18', a diningroom 10' x 12', a kitchen 8' x 12', complete with electric range and refrigerator, a bedroom 11' x 13', a bedroom 11' x 12', and a bathroom 6' x 8'.

Attached to these buildings, there will be a one-car garage 11' x 21', and between the garage and building proper a screened porch 8' x 11'.

1102 - Roads and Grading

The general layout of the staff residential area is illustrated on a plot plan attached. This plot plan adequately illustrates the layout of the road and drainage system and also includes a section of the road showing the type of construction used.

1103 - Water Mains and Fire Protection

The water supply for the residences is secured from the supply system for the Village of Rosemount. To procure the water supply, 2,200' of 8" cast iron water main will be laid to the Village pump house and storage tank. The storage capacity of the Village water tank is 75,000 gallons which insures adequate fire protection.

1104 - Sewers

The sewer system being installed for these houses is very simple and is composed of a concrete cess pool 4' x 4' x 20' deep, located in front of each house. The location of the cess pool in the front rather than the rear of the houses was deemed advisable as there is every possibility that the sewage facilities of the Village of Rosemount may be utilized at some future date.

1105 - Electric Lines

The source of power for the houses is still under consideration. There are three alternatives but it appears most likely that the power will be procured from a Northern States Power Company substation which services the Village of Rosemount. Negotiations are under way with this company whereby they will construct the necessary line to bring power to a point on our west boundary directly opposite the location of the residences. The overhead distribution system required from that point will be constructed by the prime contractor.

1500 AREA - OLEUM PLANT

The Oleum Plant is for the manufacture of sulphuric acid in oleum form. The plant is designed to produce 200 tons per day of 100% sulphuric acid in the form of 40% oleum (109% sulphuric acid equivalent) when obtained entirely by the burning of sulphur. Among the various items of equipment contained in the plant are the following:

a. A waste head boiler for the generation of steam at 300 pounds per square inch gauge pressure, including feed water heater, steam driven steam water pumps, feed water regulator and continuous manual blowdown equipment.

b. Sulphur storage facilities capable of storing sufficient sulphur for a 30 days supply. This storage is to include suitable weighing and loading apparatus.

c. Two riveted steel storage tanks for furnishing 40% oleum with each tank to have a capacity of 1,800 tons.

d. Two riveted steel storage tanks 24' in diameter and 20' high, for storage of 93.2% or 73% sulphuric drip acid.

e. Two horizontal steel storage tanks 9' in diameter and 36' long, for anti-freeze acid mix.

The operating building will be complete with a control room blower, starting equipment and all other items of equipment necessary for the successful operation of the plant.

ACKNOWLEDGMENT

This data has been collected and assembled at the direction of Captain J. O. Ackerman, Area Engineer, Gopher Ordnance Works, Saint Paul, Minnesota, by Walter E. Vroman, Associate Engineer.

STATISTICS ON IMPORTANT PHASES OF THE PROJECT INCLUDING ACCOMPLISHMENT

Description of Particular Phase	Quantity Involved	Accomplishment as of
BUILDINGS - STRUCTURAL STATUS		
Number of permanent buildings to be constructed	784	
BUILDINGS - MECHANICAL INSTALLATION STATUS		
Number of permanent buildings having mechanical installations including plumbing and drainage; sprinkler systems; equipment; process piping; heating and duct work	568	
BUILDINGS - ELECTRICAL INSTALLATION STATUS		
Number of buildings requiring wiring for power and lighting	646	
OTHER PERMANENT STRUCTURES		
Number of other structures including tank farms, conveyors, guard towers, etc.	127	
OVERHEAD LINES		
Pipe Lines - Including steam, air, brine and process lines	580,000 lin. ft.	
Poles for carrying overhead pipe lines	10,000	
Electric Lines - Including lines of the following voltages:		
110,000 volts		
13,800 "		
2,300 "		
440 "		
220 "		
Miscellaneous voltages and control circuits		
UNDERGROUND INSTALLATIONS		
Including all water lines and high pressure hydraulic lines	421,600 lin. ft.	
RIVER WATER SUPPLY SYSTEM		
Pipe Line - 42" concrete pipe	31,050 lin. ft.	
36" concrete pipe	19,844 lin. ft.	
30" concrete pipe	6,415 lin. ft.	
42" steel pipe	1,377 lin. ft.	
24" Universal Joint C. I. pipe	1,858 lin. ft.	
24" Bell and spigot C. I. pipe	1,795 lin. ft.	
42" Lock-Joint concrete pipe	8,000 lin. ft.	
30" Lock-Joint concrete pipe	3,000 lin. ft.	
Ranney Wells	4 wells	
Well #1 - Concrete caisson	65 lin. ft.	
Collector pipe	1,000 lin. ft.(min.)	
Pump house and equipment	1	
Well #2 - Concrete caisson	65 lin. ft.	
Collector pipe	1,000 lin. ft.(min.)	
Pump house and equipment	1	
Well #3 - Concrete caisson	115 lin. ft.	
Collector pipe	1,000 lin. ft.(min.)	
Pump house and equipment	1	
Well #4 - Concrete caisson	115 lin. ft.	
Collector pipe	1,000 lin. ft.(min.)	
Pump house and equipment	1	
River Pump House -		
Structure only	1	
Equipment installation		
Intake channel dredging	2,700 lin. ft.	

STATISTICS ON IMPORTANT PHASES OF THE PROJECT INCLUDING ACCOMPLISHMENT (Cont'd)

Description of Particular Phase	Quantity Involved	Accomplishment as of
POWER AREAS		
"A" Area - Reservoir, pump house and chemical house	2	
Coal silos and stacks	1	
Boilers	5	
Equipment installation	5	
"B" Area - Reservoir, pump house and chemical house	1	
Coal silos and stacks	4	
Boilers	4	
Equipment installation		
ROADS AND WHEELING WALKS		
Roads - Includes all roads in the manufacturing Area, Patrol roads around the manufacturing Area and to the river water supply setup	62.6 miles	
Wheeling Walks - 8' and 12' wide	2.5 miles	
FENCES		
Vermillion River (woven wire and barbed wire)	30 miles	
River water supply system (chain link)	8 miles	
River water pipe line (woven and barbed wire)	Unknown	
Around project boundary (2 strand barbed wire)	17 miles	
Around manufacturing Area (9 strand barbed wire)	12 miles	
SEWER LINES		
Vitrified clay pipe (process and sanitary)	20.3 miles	
Laminex wood culvert (process trunk sewer)	11,160 lin. ft.	
RAILROADS		
Heavy weight (75# min.) trackage	26 miles	
Light weight (40# min.) trackage	50 miles	
Rails and ties placed		
Ballast placed		
Light rail allocated	518,810 lin. ft.	
SANITARY SEWAGE FACILITIES		
Sewage pumping station (610)	1	
Structural status		
Equipment installation status		
Sewage treatment plant (617)	1	
Structural status		
Equipment installation status		
PROCESS SEWER FACILITIES		
Acid Neutralization Plant (612A)	1	
Structural status		
Equipment installation status		
Acid Neutralization Plant (612B)	1	
Structural status		
Equipment installation status		
pH Recorder Station (612C)	1	
Structural status		
Equipment installation status		
GUARD TOWERS - Towers on manufacturing Area	30	
Towers at River Water Supply setup	6	
CONCRETE (Estimated total of all types required)	162,000 cu. yds.	
STAFF RESIDENCES	25	

STATISTICS ON IMPORTANT PHASE OF THE PROJECT INCLUDING ACCOMPLISHMENT (Cont'd)

Description of Particular Phase	Quantity Involved	Accomplishment as of
VERMILLION RIVER WORK		
Excavation - Outfall ditch	124,135 cu. yds.	
Access channel	9,730 cu. yds.	
River channel	135,000 cu. yds.	
Highway Bridges - State Highway #52	1	
State Aid Road #24	1	
Empire	1	
Farm bridges	2	
Drop structures - Station 14 + 00	1	
Station 69 + 50	1	
Dams - Closing dam - Vermillion Slough	1	
Outlet dam - Lake Isabel	1	
Removal - existing slough closing dam	1	
Settling basin dam	1	
Fencing - Right of way		
Post erection	30 miles	
Wire erection	28 miles	

Attachment 2

REPORT OF FIELD INVESTIGATION OF

GOPHER ORDNANCE WORKS

ROSEMOUNT, MINNESOTA,

And The

Possibility of Using Surplus Property For

Local Community Needs

Prepared By:

Ragnar T. Westman, Senior Surgeon (R)

UNITED STATES PUBLIC HEALTH SERVICE

District No. 7 Kansas City, Mo.

August, 1946

INTRODUCTION

By request of the War Assets Administration to the U. S. Public Health Service, Senior Surgeon (R) Ragnar T. Westman, District Office No. 7, U. S. Public Health Service, Kansas City, Missouri, made a field investigation of the Gopher Ordnance Works at Rosemount, Minnesota, on August 20-25, 1946, the University of Minnesota having requested acquisition of certain land, buildings and equipment for hospital and medical research purposes.

Data about the Ordnance Works were obtained primarily from Resident Engineer L. S. Trueheart, Chief Project Auditor K. W. Smith, the Historical Report of the E. I. Du Pont Company, and the Industrial Facilities Inventory. The courtesy and cooperation of these men is gratefully acknowledged.

REPORT OF FIELD INVESTIGATION OF GOPHER ORDNANCE WORKS ROSEMOUNT, MINNESOTA.

SUMMARY AND CONCLUSIONS

SUMMARY:

1. A survey was made of the Gopher Ordnance Works limited to public health interests and proposed medical uses by the University of Minnesota. The report is presented in the following pages.

2. This Ordnance Works is now in the hands of the War Assets Administration, which has advertised it for sale for some time, so far unsuccessfully. It is about to be entirely demolished for salvage, except for those buildings desired by the University Of Minnesota. Some land in question is in the hands of the Farm Credit Administration.

3. The University of Minnesota has made formal application to the War Assets Administration to acquire at 100% discount some 148 buildings and 7200 acres of land (11-1/4 sections) to establish a permanent special campus, operated as an integrated unit, for a new supersonic research center for aeronautical engineering, and for supplementing present inadequate laboratory and research facilities for Mechanical Engineering, Agricultural Engineering, Civil Engineering, Physics, School of Public Health, Army and Navy ROTC Units, Physiological Medicine, Aviation Medicine, Animal Husbandry, Agricultural Experimental Station, Engineering Experiment Station, Medical School (Cancer and Infantile Paralysis Research), University Hospital, and Botany Department. All property requested will be used for educational, medical, or research purposes.

4. The proposed public health, hospital, and medical research uses of property is limited to land Sections 27 and 34, and buildings 705-A, 706-A, 703-A, 720-A, 707-B, 1101-1106, and 76-47 in entirety, and jointly with other uses to buildings 702-A, 730-A, 723-A, and 13 other miscellaneous buildings. The proposed plan for using these properties is described under "Conferences with Local Officials", although a mimeographed copy of the University's formal application is attached to the end of this report. In brief, the plan proposes to establish a 50-bed hospital for ambulatory patients (attending the University's Outpatient Dispensary) in building No. 705-A; a small animal house and cancer research laboratory in building 706-A; and a physiological laboratory in the west central wing and vault of building 703-A.

5. The University is in urgent need of these additional hospital and medical research facilities.

CONCLUSIONS:

1. The plan for using the entire property requested as an integrated unit, chiefly for educational and research purposes, appears to have been carefully thought out and is altogether practicable. The investigator is enthusiastic about the entire proposal, believes that immeasurable benefits far exceeding costs will accrue to the United States particularly in time of war but also in time of peace, and suggests that the entire property be sold to the University of Minnesota at a 100% discount, particularly since no other buyer has appeared and the Ordnance Works is about to be demolished.

2. The investigator agrees that the University of Minnesota is in urgent need of facilities for hospital, public health, medical research and medical education purposes, and further that the proposed plan of use is practicable. However, he felt some hesitation at first because of the 24 mile distance from the main campus and the temporary, non-fireproof character of the buildings.

3. The proposed public health and medical uses of the property requested will accrue benefits to the United States far exceeding acquisition costs, and therefore it is recommended that property so used be sold to the University of Minnesota at a 100% discount.

CONFERENCES WITH LOCAL OFFICIALS

A conference on August 20th and subsequently with Mr. Lloyd S. Trueheart, Resident Engineer, and Mr. Kenneth W. Smith, Chief Project Auditor, at the Gopher Ordnance Works, Rosemount, Minnesota, revealed that copies of maps and plans were not obtainable, there is no Completion Report available, but there is an Industrial Facilities Inventory in three volumes of doubtful value in this survey, and a du Pont Historical Report to consult. This Ordnance Works has most recently been under the general supervision of the District Engineer's Office in Omaha, Nebraska.

Construction on this plant was started in May, 1942 and discontinued in April, 1943. Three lines of the plant, known as ABC, had been practically completed, but three other lines, known as DEF, were only partially completed. From January to August, 1944, demolition work was carried on almost entirely in the DEF area. The project to reactivate construction of the DEF lines was started in August, 1944 and ended June, 1945. The ABC lines started to manufacture smokeless powder on February 9, 1945, but on August 11, 1945, the plant received an order to stop manufacturing, and did so about a month later. Because of these changes in plans it is a

little difficult to calculate actual costs, records having changed hands a number of times. Construction and operation was under the direction of the E. I. du Pont de Nemours Company. The estimated cost of the project before construction was begun was $125,000,000, but instead the final cost was about $286,000,000.

All of the Gopher Ordnance Works was declared surplus quite some time ago and is now in the hands of the War Assets Administration, which has advertised it for sale unsuccessfully. Some U. S. Engineer Office representatives are still there winding up affairs. Gunpowder is being burned and areas are slowly being decontaminated. The contract for demolition has already been let, it was said, and the contractor is setting up his office in the former hospital, Building 705-A, from which the plumbing has been moved and set aside for later reinstallation. All medical and cafeteria equipment has been removed by the Veterans Administration. Engineers of the Reconstruction Finance Corporation were present making appraisals for the War Assets Administration. The buildings desired by the University of Minnesota were being kept more or less frozen for eventual disposal to that agency.

On August 21st conferences were held with the following officials on the campus of the University of Minnesota in Minneapolis:

Dr. A. J. Chesley, Executive Officer & Secretary, Minnesota State Board of Health.
Mr. W. T. Middlebrook, Vice-President, University of Minnesota.
Mr. John D. Akerman, Prof. & Head of the Department of Aeronautical Engineering.
Mr. Ray Amberg, Superintendent of University Hospital.
Dr. Gaylord Anderson, Prof. & Head of the Department of Public Health.

From them the following facts were learned. Mr. Akerman was the first to be interested in the Gopher Ordnance Works, and it is he who is coordinating the requests of the various departments of the University into a single application. At first he was interested only in acquiring the large air compressors, and the land on which they stood, for which the University made application on June 3, 1946. However, other departments became interested later so that a supplementary application was filed by the University with the War Assets Administration on July 15, 1946, for the following sections of land: 4, 33, S-1/2 28, S-1/2 27, 34,

S-1/2 26, 35, 2, 11, 14, 13, W-1/2 12, W-1/2 1, W-1/2 36, and SW-1/4 25. Because it was subsequently learned that some of the land applied for to the War Assets Administration had been declared non-industrial land and was being offered for sale by the Farm Credit Administration, the University made application on August 13, 1946, to the latter agency for the following sections of land: S-1/2 28, 33, 4, SW-1/4 27, 14, S-1/2 11, W-1/2 12, and 13 (all of which had been included in the application to WAA) and also NW-1/4 plus tracts 16 and 17 of section 34. The application of July 15th also requested a number of buildings, and presented a brief in mimeographed form explaining the proposed uses of land and buildings, a copy of which is attached at the end of this survey report. A copy of the letter of application to the Farm Credit Administration and of certain correspondence is also included. These two applications explain the proposed uses rather well, and will be only briefly summarized here.

The land may be roughly divided into five parts on the basis of proposed use: For agricultural (educational and research) purposes, sections 28, 33, and 4; for medical physiological (educational and research), storage and miscellaneous purposes, sections 27 and 34; for a supersonic aerodynamics laboratory (educational and research), sections SW-1/4 25, W-1/2 36, W-1/2 1, W-1/2 12, E-1/2 26, E-1/2 35, E-1/2 2, E-1/2 11, and E-1/2 14; for ROTC training ground purposes (educational), including use of tanks, sections W-1/2 26, W-1/2 35, W-1/2 2, W-1/2 11, and W-1/2 14; and section 13 will be used as a drainage area as at present.

War Department "Boundary and Ownership Map" of the Gopher Ordnance Works, dated 7-16-42, no drawing number, gives the section outlines of the land and the names of former owners.

The University in effect proposes to establish another special campus, as presented on page one of its brief under Section I, "Brief Summary of Objectives". Regular transportation facilities will be established connecting it to the main campus, including the main University Hospital and Outpatient Dispensary. The new campus will be operated as a University unit with utilities in common for its various subdivisions; Water supply, water distribution, sewerage system, sewage disposal, electric distribution, fire protection, heating, telephone service with direct lines to the main campus, transportation facilities, police protection, auditing service, and the like. The University has requested that all utility distribution lines, both above and below ground, needed for the proposed uses of the property, be left intact. It will function as a unit, Mr. Akerman making it clear that because of the danger of accidents in the proposed supersonic aerodynamics

laboratory (jet-propelled engines, planes, and rockets using explosive materials) he must have an emergency hospital there, that he will not establish the laboratory without a hospital, and that the overhead would be too great for him to set up a separate special hospital for this purpose alone; and Mr. Amberg made it clear that he would not establish the hospital there if no other University departments were there to provide and use utilities in common and thus reduce overhead expense for the hospital. Most of the property requested by the University will be used for educational and research purposes, which places such property outside the scope of the present survey. However, an understanding of the different proposed uses of the various divisions of the property is needed to properly evaluate the relative importance of public health and strictly educational uses in the University's application, particularly as to cost of the property asked by each purpose, the proportionate costs of utilities used in common, and the benefits which will accrue from their use. Speaking relatively, the hospital and medical research part of the University's application is small, but nevertheless important.

It was noted that Mr. Akerman was using the "Plot Plan Map of E. I. du Pont de Nemours and Co., Drawing No. C-60, of 4-1-45" to obtain the numbers assigned to the various desired buildings. This map is larger but slightly different from U. S. Engineer's "Plot Plan Map, File QGM 4-1-1, of July 24, 1946", used by the Resident Engineer at the Gopher Ordnance Works. This may explain the remark of the Resident Engineer that the University is using some building numbers which do not exist officially and he therefore does not know what the University means.

Mr. Amberg emphasized the need for additional hospital space. He has been trying for a long time to find additional beds, and was even considering erecting Quonset huts upon the beautiful University Hospital grounds. Because of crowded living conditions in the city, and because commercial rest homes are not satisfactory, out-of-town patients are not able to attend the out-patient dispensary of the University Hospital as they used to. There are about 30,000 fewer visits a year to the dispensary now than formerly, but some of this decrease may be due to people having more money. Many interesting and instructive cases are being sent home without study or treatment because they have no place to stay for a week or two while being treated, while quite a number of ambulatory patients are being admitted to the hospital and so using beds which should be used only by bed patients. These patients are ambulatory and are being treated in the outpatient dispensary; they may be taking a series of deep X-ray treatments, varicose vein treatments, diabetes treatments, psychoneurosis treatment, and the like, which require repeated visits to the clinic. It is hoped to develop the psychiatric

part of the outpatient clinic in the future. They do not need the continuous medical and nursing care of bed patients usually admitted to the hospital. At present the Social Service Department is spending much time trying to find places for these people to stay, most of which places are altogether unsatisfactory. All of these patients are indigent and charges of the various counties.

The University Hospital is full when it has 450 patients at one time; about 10,000 patients are admitted annually. The Out-patient Dispensary (OPD) has now about 7000 visits by 1200 patients a month, or about 85,000 visits a year.

It is proposed to establish a 50-bed hospital for these ambulatory patients in the southern part of building 703-A, the former hospital part of the Employment, Examination and First Aid Building, at the Gopher Ordnance Works; the northern part of this building will be used for housing hospital personnel. There is plenty of room to put one hundred hospital beds in the southern part of the building if the need should arise, for the many rooms used previously for laboratory, X-ray, and office purposes will not be so used in the proposed hospital. Patients will be taken by University busses to the dispensary for diagnosis and treatment and brought back to this hospital. Should they become bed patients they would be admitted to the University Hospital on the campus. It is proposed to have two resident physicians, four graduate nurses, and other hospital attendants full-time at the proposed hospital. A kitchen will be installed, the hospital will be partially remodeled, decorated, and painted so that it should be both satisfactory for the work intended and attractive. Although the building is not fireproof, automatic sprinkler systems are already installed in the southern part of the building, and when a fire door is placed between the two halves of the building, it is believed that this one-story building will be relatively safe. It is expected that this hospital will be operated for about 3 years, at which time the University hopes to have additional hospital beds at the University Hospital on the campus.

The University was informed that the demolition contractor was moving into the hospital in a few days and it was suggested that they write the proper persons at the Ordnance Works asking that other quarters be provided for the contractor. (Mr. Tudg of the WAA there had stated that the contractor could set up his office in the Administration Building, No. 703-A).

Dr. Maurice B. Visscher, Professor and Head of the Department of Physiology at the University of Minnesota Medical School, proposes to convert the Cafeteria, Building No. 706-A, into a medical building and cancer research laboratory. This building has

a concrete floor throughout and numerous plumbing connections. The operating and dissecting rooms will be in the former kitchen, and the animals will be in the large eating hall. There are a number of small rooms for offices. Like building 705-A, the cafeteria building is entirely insulated and sealed with interior plywood, which if painted would be quite attractive. At present Dr. Visscher has 12,000 mice upon which cancer experiments are being performed in Millard Hall, where he is being crowded out. He proposes to move most of these mice to the new laboratory at the Ordnance Works. An outside pen for dogs will be built on the west side of the present cafeteria building. The walk-in refrigerator in the cafeteria has been removed by the Veteran's Administration.

Nearby Administration Building, No. 703-A, is very large, having three two-story wings on the east, two-story connecting corridors, and three two-story wings on the west. A two-story concrete, brick, and steel vault, without interior stairway, leads off the north side of the west central wing of the building. The University is requesting the entire building and will tear down all of it except the west central wing and the vault, proposing to use the lumber for veterans housing on the campus, the remaining wing for offices and laboratories of the Department of Physiology, and the vault for hot, cold, or high altitude experiments, for which it appears to be almost ideally suited. This building does not have plywood coverings on the interior in some parts.

Building No. 707-U, known as a Change House, is a small one-story structure located near the Cafeteria Building, and contains toilets, showers, and lockers. It will be used as a clothes change and wash-up house in connection with the physiological research laboratories.

Building No. 720-A, the Police Patrol Headquarters Building, is a spacious one-story building once used to hold classes and line-ups for some 600 patrolmen once employed. There are several large classrooms, locker-rooms, wash-up rooms, and the like. There is a pistol range in the basement. A 15' square room on the first floor is entirely lined with cedar and is used for storing uniforms, woolen blankets, etc. The University proposes to use this building partly as a police patrol headquarters, and partly for medical classrooms, also installing a small laboratory. Blankets can be stored in the cedar room.

In the northwest corner of the reservation, one-half mile from the village of Rosemount and two miles from the Administration Building, is a group of 25 houses arranged on a half-circle street. The University proposes to house some fifty scientists there. The hospital and physiology department wants six of these houses for permanent or semi-permanent personnel assigned to these medical projects.

A temporary building, TE-47, known as Temporary Boiler No. 1, located near the buildings so far described, is about 20x20x30 feet in size, has a red composition single asphalt siding exterior and a steel smokestack perhaps 40 feet high, and contains two 150 H.P. manually coal fired boilers built by Pacific Steel Boiler Corporation, Waukegan, Illinois and Bristol, Pennsylvania; serial numbers are 21541 and 21642. This boiler house was built during the early construction days to heat the administration area. During operation of the large power house when gunpowder was being manufactured heat was supplied all over the reservation by that power house. The small boiler is being used again now that the large power house is not operating. The University proposes to heat these buildings from the large power house when that is operating, and from the small boiler house when the large power house is not operating.

The telephone building is a small one-story white brick structure, No. 702-A. It used to have a switchboard seating eight operators, but this board has been removed. It is proposed to install a switchboard serving all university buildings on this project with direct lines to the University. The proposed hospital is particularly anxious to have this building.

Building No. 730-A is a six car enclosed and heated garage for and across from the Police Patrol Headquarters. It will be used as a garage for various departments. Heated garages are needed in cold Minnesota winters.

Building No. 723-A is the laundry. It has a concrete floor. The University wants the equipment which is still in place and is inventoried later in this report, and proposes to use this building as a laundry for the entire project, and not the medical buildings alone.

Mr. Akerman listed several other structures to be used mainly by the supersonic aerodynamics laboratory but benefitting the medical program somewhat. They are included in the following list of buildings desired by the University for public health, medical research, and hospital purposes.

BUILDINGS DESIRED BY UNIVERSITY FOR MEDICAL USES

Bldg. No.	Present Name of Building	Proposed Use
	As A Hospital	
705-A	Employment, Examination & First Aid Bldg.	S-1/2 as Hospital N-1/2 as hospital quarters
1101-A	Four staff houses	Four staff residences.
	For Medical Research and Teaching	
708-A	Cafeteria Bldg.	Small animal building and cancer research
703-A	Administration Bldg. (West central wing and vault)	Physiological research
720-A	Police Patrol Headquarters Bldg.	Patrol headquarters; classrooms.
707-U	Change House	Change House
1105-A	Two staff houses	Two staff residences
	For Both Hospital & Medical Research Use	
70-47	Temporary Boiler House No. 1	Standby heating for all medical buildings.
	To Be Used Only Partly by Hospital & Medical Research (With Other Depts.)	
702-A	Telephone Bldg.	Telephone Bldg.
730-A	Police Patrol Garage	Heated garage
723-A	Laundry	Laundry
729-A	Field First Aid Station	First Aid Station
707-XX	Change House, Rifle Tower	Change House
722-N	Area Shop - Finish State	As designed, fix anything

Bldg. No.	Present Name of Building	Proposed Use
717-A & B	Combined Shop	As designed, fix anything
716-A & B	Garage, Storage Rack & Repair Shop	As designed, fix anything
725-A-B-C	Parking Garage (Open)	As designed
726-A	Acetylene Storage	Store any volatile gas
713-A-B	General Storehouse	General Storehouse
605	Fence	Fence to assist guards.

It is evident that the University has given considerable thought to this project and apparently has planned it rather well as an integrated unit.

It was suggested that the University prepare suggestions to assist in calculating the benefits that will accrue to the United States should the University acquire and use the property for the medical purposes stated. Mr. Akerman stated he would have this done, particularly since the War Assets Administration had made a similar request for the entire project.

On August 23rd a conference was held with Mr. Glen F. Kleene, Project Supervisor, Real Property Management, War Assets Administration, and his assistant, Mr. F. E. Twigg. Some of the things learned from them have been presented earlier for proper continuity of subject matter. Mr. Twigg conducted for the writer a tour of the buildings desired by the University for medical purposes; a description of the buildings as seen on this tour has been presented earlier in this report along with the proposed uses. They introduced Mr. Karl Moulton, Supervisory Engineer, Reconstruction Finance Corporation, who was making an appraisal of all the buildings on the reservation; some figures obtained from Mr. Moulton will be presented later in this report under "Costs". These figures represent what the War Assets Administration believes it ought to receive in payment as "profit" for the materials of each building after they have been torn down and piled up neatly on the reservation.

The following newspaper article was seen during the survey:

"MINNEAPOLIS MORNING TRIBUNE - Sat., Aug., 24, 1946"

"FIRM TO RAZE 497 ORDNANCE BUILDINGS—— Receipt of a contract for dismantling 497 buildings at Gopher ordnance plant, Rosemount, is expected within a few days, a Standard Construction Co. official said Friday. Another 148 buildings included in a University of Minnesota request for Rosemount property are to remain, as are 14 contaminated by powder and two the government is retaining for warehouses. The university, however, has received no definite word on its bid for the property."

DESCRIPTION OF THE GOPHER ORDNANCE WORKS

(NOTE: This presentation is limited to data of public health significance or pertinent to the University's request for buildings to be used for medical purposes, and does not go into the technical phases of manufacturing explosives).

A. GENERAL:

1. Official Name: Gopher Ordnance Works, Rosemount, Minnesota.

2. Location: The site is located 2-1/2 miles east of Rosemount, 18.5 miles south of St. Paul, and 22.1 miles south by southwest from Minneapolis, Minnesota.

The area is bounded on the north by County Road 11, on the east by U. S. Highway 52, on the South by County Road 24, and on the west by County Road 6, and comprises 11,500 acres all in Dakota County, Minnesota. More specifically, the land lies in all of Sections 33, 34, 35, 36, parts of Sections 25, 26, 27, and 28 of Rosemount Township, and Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, of Empire Township. The southwestern portion is cut by coulees or draws which drain into the Vermillion River.

In general, the surface soils consist of loams varying from sandy loam to clay in texture. Subsurface soils below three feet are generally a mixture of sand and gravel and range from 0 to 200 feet in depth.

The following tabulation shows populations and rail distances to surrounding cities and towns:

City or Town	Population	Miles to Site
Minneapolis	492,370	22.1
St. Paul	287,736	18.5
South St. Paul	11,844	10.0
Hastings	5,662	12.4
Red Wing	9,962	41.7
Rochester	26,312	93.5
Albert Lea	12,320	80.7
Owatonna	8,694	49.2
Faribault	14,427	33.6
Mankato	15,654	84.5
Shakopee	2,418	31.2
Farmington	1,580	7.2
Rosemount	341	2.5

3. Purpose or Function: This plant was designed, constructed, and operated for the War Department by the E. I. duPont de Nemours Company for the daily 24 hour manufacture of 600,000 pounds of nitrocellulose smokeless gunpowder, 30,000 pounds of tetryl starting from benzene, and 10,000 pounds of diphenylamine starting from benzene, including necessary 40% oleum for powder, and sulphuric and nitric acids.

4. Date of Original Construction: Construction was started in May, 1942 and stopped in August, 1943, with the three ABC lines completed and the DEF lines only partially completed. Demolition of the DEF lines was carried out partially during January to August, 1944. Construction on DEF lines was resumed in August, 1944, but ended incomplete in June, 1945.

5. Size: The main reservation contains 11,500 acres of land owned in fee simple by the Government acquired by exercising its rights of eminent domain and having recourse to condemnation proceedings. In addition the Government owns 10 acres for a railroad right-of-way, 846 acres for water lines to the river, and 1,497 acres along the Vermillion River for waste disposal. Several easements to permit water lines to cross county and State highways were obtained.

6. Previous Land Use: The site supported diversified farming, and was held by 98 unit ownerships containing complete sets of farm buildings, a few of which buildings and barns remain. Approximately 50 acres of land clearing was required on the site while the presence of rock near the surface was limited to but three acres along the southern boundary.

7. Buildings: A complete list of buildings as of July, 1944, in mimeographed form is attached to the end of this report. A contractor's description of the buildings desired by the University for medical purposes follows. However, it would be well to first explain how the various buildings and other constructions on the project were numbered by a code plan:

100	Area	– Manufacture of nitrocellulose.
200	"	– Smokeless powder.
300	"	– Acid production.
400	"	– Power and water supply.
500	"	– Outside lines, i.e., water, sewer, steam, electric lines, etc.
600	"	– General facilities, i.e., roads, railways, fences, autos, tractors, sewage treatment, etc.
700	"	– Administration and maintenance facilities.
900	"	– Production of organic chemicals.
1100	"	– Staff residential area.
1500	"	– Production of oleum and sulfite.

Building No. 706: Employment, Examination and First Aid Building (Hospital in south half). One floor, wood frame, concrete block on concrete footings, built up roof - surfaced with rolled roofing paper, dropsiding sides, wood flooring, volume 367,938 cu. ft., 20,141 sq. ft. of floor area, 29,928 sq. ft. of roof area, dimensions: Hospital Utility Wing: 103'6" x 39'6" x 15'6"; Hospital Proper Unit: 189'0" x 39'6" x 15'6"; Employment Unit: 220'5" x 38'6" x 15'6". Quantities per building: concrete 141 cu. yds; concrete blocks 6,264 sq. ft.; lumber 210,323 board feet. Started 3-18-42. Completed 3-1-43.

Building No. 708: Cafeteria Building. One floor, wood frame, concrete block on concrete footings foundation, built-up roof - 3" sheathing, dropsiding sides, concrete flooring, dimensions 105'6" x 96'6" x 10'0"; volume 135,057 cu. ft., floor area 10,389 sq. ft.; roof area 10,540 sq. ft. Quantities of concrete 249 cu. yds., concrete blocks 2,246 sq. ft., 57,911 board feet of lumber. Started 5-28-42. Completed 4-17-43.

Building 720-A: Police Patrol Headquarters. One floor, wood frame, concrete block on concrete footings foundation, built-up roof - surfaced with rolled roofing paper, dropsiding sides, wood flooring, dimensions 41'0" x 98'6" x 16'0". Volume 64,288 cu. ft., floor area 4,038 sq. ft., roof area 4,752 sq. ft. Quantities of concrete 208 cu. yds., concrete blocks 2,932 sq. ft., 65,267 board feet of lumber. Started 6-11-42. Completed 3-1-43.

Building 720-A: Telephone Building. One floor, brick frame, concrete block on concrete footings foundation, concrete slab roof, brick walls, concrete on sand fill flooring, dimensions 52'7" x 24' 0" x 10' 0". Volume 10,800 cu. ft., floor area 1,200 sq. ft., roof area 1,350 sq. ft. Quantities: concrete 78 cu. yds., concrete blocks 140 sq. ft., 452 board feet of lumber, 19,760 common bricks. Started 4-3-42, Completed 3-1-43.

Building 703-A. Main Office Building. Two floors, wood frame, concrete block on concrete footings foundation, built-up roof - composition asphalt shingles, drop-siding on shiplap sides, single soft wood flooring. Volume 1,494,080 cu. ft., 109,974 sq. ft. floor area, 61,594 sq. ft. roof area. Dimensions: Three buildings connected by a central corridor. Building wings are 40'0" x 373'0" x 19'0", Connecting sections between buildings - 40'0" x 107'8" x 19'0". Quantities: Concrete 442 cu. yds., concrete blocks 16,125 sq. ft., 846,428 board feet of lumber, 122,846 common brick. Started 5-14-42. Completed 6-24-43.

Building 719-A. Field First Aid Station. One floor, wood frame, concrete block on concrete footings foundation, built-up roof-asbestos shingle, drop siding on 1" sheathing on sides, wood flooring, dimensions 70'0" x 40'0" x 17'7". Volume 49,700 cu. ft., floor area 2,500 sq. ft., roof area 3,100 sq. ft. Quantities: Concrete 26 cu. yds., concrete blocks 2,089 sq. ft., 36,500 board feet of lumber. Started 4-15-42. Completed 2-6-43.

Building 723-A. Laundry. One floor, wood frame, concrete blocks on concrete footings foundation, built-up roof - surfaced with rolled roofing paper, drop siding sides, concrete flooring. Dimensions 83'0" x 31'8" x 13'6". Volume 37,000 cu. yds., floor area 2,742 sq. ft., roof area 2,891 sq. ft. Quantities: Concrete 63 cu. yds., concrete blocks 1,630 sq. ft., 20,926 board feet of lumber. Started 8-29-42. Completed 4-10-43.

Building 707-H: Change House. One floor, wood frame, concrete block on concrete footings foundation, built-up roof - 1" T. & G. sheathing, drop siding over 1" sheathing and building paper siding, concrete flooring. Dimensions: 50'0" x 31'4" x 12'6". Volume 21,020 cu. yds., floor area 1,733 sq. ft., roof area 1,846 sq. ft. Quantities: Concrete 41 cu. yds., concrete blocks, 1,480 sq. ft., 14,121 board feet of lumber. Started August, 1942.

Building 722-H: Area Shop Building. One floor, wood frame, concrete foundation, roof 1" T. & G. sheathing surfaced with rolled roofing paper, drop siding over 1" sheathing and building paper, concrete flooring. Dimensions: 2060" x 40'0" x 12' 0". Volume 6,800 cu. ft., floor area 800 sq. ft., roof area 863 sq. ft. Quantities: 12 cu. yds. concrete, 725 sq. ft. concrete blocks, 4,955 board feet of lumber. Started 7-25-42. Completed 4-26-43.

Building 717-A: Combined Shops. One floor, wood frame, concrete blocks on concrete footings foundation, roof built-up gravel, siding - dropsiding over 1" sheathing, concrete flooring. Dimensions: 77'8" x 600'0" x 21'0". Volume 982,916 cu. ft., floor area 42,996 sq. ft., roof area 48,474 sq. ft. Quantities: Concrete 1,173 cu. yds., concrete blocks 6,487 sq. ft., 336,585 board feet of lumber. Started 7-4-42. Completed 9-10-43.

Building 717-B: Sandblast House. One floor, concrete block frame, concrete block on concrete footings foundation, built-up roof 3" T. & G. sheathing, 8" concrete block walls, concrete flooring. Dimensions: 8'0" x 16'0" x 8'0". Volume 1,024 cu. ft., 128 sq. ft. floor area, 139 sq. ft. roof area. Quantities: concrete 2 cu. yds., concrete blocks 463 sq. ft., 654 board feet of lumber. Started 9-12-42. Completed 3-24-43.

Building 716-A: Garage & Repair Shop. One floor, wood frame, concrete blocks on concrete footings foundation, roof 1" sheathing, siding - dropsiding over 1" sheathing and building paper, concrete flooring. Dimensions: 80' 0" x 140'0" x 20'0". Volume 224,000 cu. ft., floor area 11,200 sq. ft., roof area 11,470 sq. ft. Quantities: concrete 240 cu. yds., concrete blocks 1,716 sq. ft., 69,678 board feet of lumber. Started 8-24-42. Completed 4-26-43.

Building 716-B: Car Washing & Greasing Rack: Same as 716-A except dimensions - 25'0" x 40'7" x 15'0". Volume 15,195 cu. ft., floor area 1,013 sq. ft., roof area 1,083 sq. ft. Quantities: concrete 24 cu. yds., concrete blocks 802 sq. ft., 10,034 board feet of lumber. Started 8-22-42. Completed 3-24-43.

Buildings 725-A, 725-B, 725-C: Parking Garage. One floor, wood frame, concrete blocks on concrete footings, roof - 1" T. & G. sheathing, siding - drop siding over building paper on ends of building only, flooring - crushed rock. Dimensions: 45'0" x 108'0" x 14'0" for each. Per each - volume: 68,040 cu. ft., floor area 4,860 sq. ft., roof area 5,076 sq. ft. Quantities per building: concrete 13 cu. yds., concrete blocks 382 sq. ft., 17,616 board feet of lumber. Started 9-3-42. Completed 3-1-43.

Building 726-A: Acetylene Storage. One floor, wood frame, concrete block on concrete footings foundation, built-up roof with rolled roofing surface, drop siding over 1" sheathing on sides, earth flooring. Dimensions: Section One 33' x 27' x 8', Section Two 16' x 9' x 8'. Volume 9,432 cu. ft., floor area 1,179 sq. ft., roof area 1,386 sq. ft. Quantities: concrete 11 cu. yds., concrete blocks 1,018 sq. ft., 5,871 board feet of lumber, 160 cu. yds. excavation, 200 cu. yds. backfill. Started 8-29-42. Completed 7-1-43.

Buildings 713-A and 713-B1 General Storehouse. One floor, wood frame, concrete blocks on concrete footings foundation, roof 1" T.&G. sheathing, siding - dropsiding over 1" sheathing, concrete flooring. Dimensions: (A) 80' x 220' x 15', (B) 80' x 140' x 15'. Volume: (A) 316,800 cu.ft., (B) 168,000 cu.ft. Floor area: (A) 17,600 sq.ft., (B) 11,200 sq.ft. Roof area: (A) 17,915 sq.ft., (B) 11,428 sq.ft. Quantities: concrete (A) 285 cu.yds., (B) 180 cu.yds; concrete blocks (A) 3,898 sq.ft., (B) 2,722 sq.ft; board feet of lumber (A) 91,818, (B) 57,892. Started 8-5-42. Completed (A) 3-10-43, (B) 4-6-43.

Staff Houses: Twenty-five staff houses were erected at the beginning of construction of the plant at the northeast corner of the site. Ten of these are two-story, three-bedroom houses, and fifteen are two-bedroom bungalows, one of the latter being a rebuilt tract house. Houses are equipped with 2,500 watt hot water heaters, electric stoves and refrigerators. They were heated with stoker fired furnaces operated by a 1/6 H.P. motor and 1/4 H.P. fan. Residences were erected on either side of a road 1,456 feet in length laid out in a half circle. The roadway was surfaced with a layer of approximately four inches of crushed rock. 3,500 lineal feet of 8" cast iron pipe line for water and fire protection were laid from the residence area and connected with the 6" water mains at Rosemount. Individual cesspools were installed at each house for sewage disposal. Electrical service was purchased from the Northern States Power Company and consisted of 50 KVA, 3-phase power at approximately 13,800 volts.

Ten buildings of two floors, six rooms, wood frame, concrete block foundation, asphalt roof, shiplap and shingle siding, wood flooring. Dimensions each house: 24'x28'x16'; garage 21'6"x20'6". House volume: 10,752 cu.ft., floor area 1,344 sq.ft., roof area 892 sq.ft. Garage volume: 1,840 cu.ft., floor area 230 sq.ft., roof area 242 sq.ft. Started 10-26-42. Completed 6-10-43. Buildings numbers: 1101 to 1110.

Fourteen buildings of one floor, five rooms, wood frame, concrete foundation, asphalt roof, shiplap and shingle siding, wood flooring. Dimensions: house 32'x28'x8'; garage 21'x11'x8'. House volume: 8,000 cu.ft., 896 sq.ft. floor area, 1,000 sq.ft. roof area. Garage volume 1,848 cu.ft., 231 sq.ft. floor area, 231 sq.ft. roof area. House numbers 1111 to 1125. House 1111 is the remodeled farm house.

There is another former farm house, not remodeled, somewhere on the reservation.

Pictures of as many of the above buildings as negatives could be obtained through the courtesy of Mr. Kenneth Smith are attached to the end of this report.

8. Summary of Costs:

Land:	Purchased	$ 860,095.00	
	Easements	6,550.00	
	Land Improvements	4,184,381.00	
			$ 5,053,026.00
Buildings, etc:	Building installations	26,364,443.00	
	Leasehold improvements	13,812,451.00	
			40,176,894.00
Machinery, Equipment, etc:			31,295,493.00
	Total Feature Cost		76,525,413.00
	Service Cost Not Spread to Features		6,092,049.00
	Dismantling Cost as of 31 December 1943		697,879.00
	Total Contract Cost		$ 83,315,341.00

Total Building Costs of Certain Buildings:

Bldg.	705-A	Employment & Examination Office	$ 196,220.00
"	708	Cafeteria	93,585.00
"	720-A	Guard Headquarters	139,395.00
"	703-A	Main Office	632,181.00
"	605	Fences (ABC: $76,941.46) (DEF: $80,552.52)	159,493.98
"	719-A	Field First Aid Station - (A: $31,238.00) (B: $31,238.00)	62,476.00
"	723-A	Laundry	30,322.00
"	707-XX	Change Houses	21,842.00
"	722-N	Area Shop - Finished Stats	4,179.13
"	717-A	Combined Shops	248,688.21
"	717-B	Sandblast House	298.78
"	716-A	Garage and Repair Shops	66,472.30
"	716-B	Car Wash and Grease Shop	4,393.69
"	725-A,B,C	Parking garage, @ $8,615.00 Ea.	25,845.00
"	726-A	Acetylene Storage	7,036.00
"	713-A,B	General Storehouse, @ $62,704.00 Ea.	125,408.00
"	70-47	Boiler House, approximately	16,000.00
1101-1110		2-story Staff Houses, @ $8,134.40 Ea.	81,344.00
1111		1-1/2-story remodeled farm house	7,618.14
1112-1125		1-1/2-story Staff Houses, @ $7,456.55 Ea.	105,391.70

Cost of Equipment Only in Certain Buildings:

Bldg.	705	$ 20,511.00
"	708	43,954.00
"	720	23,151.00
"	703	1,266.00
"	719	4,577.00
"	723	15,291.00
"	717	242,060.00
"	716	9,976.00
"	713	10,584.00

Mr. Karl Moulton, Supervising Engineer of the Reconstruction Finance Corporation, was at the Ordnance Works at the same time this survey was made, making an appraisal evaluation of the various buildings on the reservation. It will be recalled that all of them, except those desired by the University, will be demolished for salvage. He first figures out the OPA value of the material in the buildings before demolition, then subtracts the estimated cost of tearing down the buildings at standard union wages, and finally arrives at a figure representing the amount of money the War Assets Administration hopes to receive as a "profit" from the operation. If Mr. G. F. Klemme, the WAA Project Supervisor, was understood correctly, priority claimants are expected to pay this last "profit" figure less allowable discounts, whether the building is torn down or allowed to stand. Here are these figures for some of the buildings:

Bldg. No.	Name of Building	Value of Material Before Demolition	Above "Profit" Figure
705-A	Equipment & Examination	$ 16,435.39	$ 8,072.75
708-A	Cafeteria	4,411.75	1,402.15
703-A	Administration (entire 6 wings)	51,747.60	29,145.60
702-A	Telephone	575.35	473.08
719-A	Field First Aid Station	2,205.04	1,271.36
720-A	Police Patrol Headquarters	7,652.25	3,760.25
723-A	Laundry	1,851.31	899.60
707-B	Change House	512.51	270.07

9. Transportation Facilities: Rail facilities available at Rosemount are the Chicago, Milwaukee, St. Paul & Pacific Railroad, and the Chicago & Rock Island Lines. The Chicago, Great Western Railroad passed through the site at Coates. These lines adequately serviced the required needs. In addition, shipping via the Mississippi River is available with dock facilities at Twin City ports. The immediate regional area is served by three high type surfaced highways and numerous secondary roads. A class 3 and class 4 airport is available 18 miles from the site over paved highways. Supplies are received and shipped over Rock Island Lines from Rosemount.

On the site there is a Track Scales - No. 601-A, which is a small wood frame building on concrete foundations with built-up roofing and drop siding, which measures 10'x8'3"x12' in height. The pit is 67'x10'x7'. It is equipped with a Fairbanks-Morse Track Scale. It is located at S 8860 - E 14818, just south of the seven track switching yard.

In the ABC area there is a total of 52.25 miles of railroad track. In the DEF area there is a total of about 16 miles of railroad track of which a third is not completely ballasted. Two-thirds of this is 75 lb. track, and one-third is 40 lb. track.

Rolling stock consisted of the following:

2 - 65 ton locomotives
55 - 12,000 lb. flat cars
27 - 25,000 lb. flat cars
6 - 90,000 lb. flat cars
75 - box cars, wood sides
50 - box cars, canvas sides
35 - transfer trucks
14 - Brookville locomotives
14 - Plymouth locomotives
1 - Tank car - residual
2 - Tank cars - Oleum
1 - Rotary snow plow

There is one 50 watt Motorola transmitter at 32,600 Kilocycles, call letters WUGH. There are two police patrol automobiles, each having a 25 watt Motorola send-receiver. There were 12 such equipped automobiles.

Roads vary in width from eight to fifty feet. Permanent roads were surfaced with crusher run limestone, placed in two courses. A base course of three inch stone was placed first and covered with two inches of three-quarter inch stone. All rock was placed in accordance with Minnesota Highway Specifications. There are 55.4 miles of permanent roads. All walks except those in the Administration Area are crushed stone. The Administration Area has 850' of 6' concrete walks and 275' of 10' concrete walks. There are 2.5 miles of concrete roads or wheeling walks in the 200 Area. No work was done on area roads or walks in the UEF Area.

B. HOSPITAL FACILITIES:

A first aid type of hospital was operated in the southern half of building 705-A during construction and operation of the Ordnance Works. It had one three-bed ward for females and two eight-bed wards for males, and a small number of single rooms, making a total of perhaps 25 or 30 beds. There was one medical supervisor, an assistant, four registered physicians, six registered female nurses and one registered male nurse. There is a long corridor between waiting room at the employment office end and the hospital wards, and on both sides of this corridor were a series of rooms used as laboratories (serology, etc.), X-ray, electrocardiographic, and physical examination rooms. Walls are of unpainted plywood except that in the laboratory, operating, and X-ray rooms they were painted. Floors are of pine wood apparently, with a linoleum covering in the operating room. The operating room was only about 12' x 15' in size. All medical equipment had been removed. Most of the medical work done consisted of making pre-employment physical examinations.

Plumbing in public toilets leading off main corridors remain in place, but plumbing in ward toilets and utility rooms in connection therewith have been removed. The partition between the two eight-bed wards has been removed for use as an office by the demolition contractor. A steam powered water heater, about 400 gallons in size, was still in place in a separate small room. A small diet kitchen, about 11' x 15' in size, was completely empty.

The employment part of building 705-A is built like the top bar of this T-shaped building. A short corridor separates this part from the waiting room of the southern vertical leg of the building. The University is considering putting in a fire door at this point. The top horizontal bar part of the building has a long central corridor throughout with small offices rooms on each side, except that one end is a large entrance waiting room where new employees waited to be interviewed.

Building 705-A is a one-story wood frame building resting on concrete footings. It is not fire proof. There is an automatic sprinkler system against fire in the southern hospital part of the building but not in the northern employment part.

There appeared to be no point in describing the various rooms in greater detail since they stand empty and the partitions may be easily torn down and moved.

A small shed on the side of one eight-bed ward room was used to store oxygen cylinders; there was a 15"x15" door in the wall between permitting connections thereto, so that oxygen could be given to patients in the ward.

C. CLINICAL AND ADJUNCT FACILITIES:

As noted above there was only one operating room in this emergency hospital, which, like all the other rooms, has been entirely stripped of equipment, operating lights, etc. There had been no dental clinic or maternity department. The X-ray room remains with lead covered walls, and the developing room remains. The medical laboratory rooms also stand empty.

D. HOUSING FOR PERSONNEL:

As described earlier in this report under "Buildings", there are 10 one-story and 15 two-story residences located on a half-circle two miles from the Administration Building in the northwest corner of the reservation, about one-half mile from the village of Rossmount. These were the only housing facilities provided for personnel.

E. UTILITY SERVICES:

1. Water Supply:

Water for the Gopher Ordnance Works is obtained from three sources: drinking water from two deep wells located on the plant site; water for manufacturing purposes from Ranney wells located on the bank of the Mississippi River and on Spring Lake; and water for condenser cooling purposes directly from the Mississippi River.

(a) Ranney Wells and Pump Houses - No. 4Ok: Four wells have been constructed. Wells A and B were not equipped for operation. The process water supply came entirely from wells C and D. The well cassions are of reinforced concrete with a wall thickness of 18" and are 13' in depth. Wells A and B are 64' deep; well C is 107'6" deep; well D is 104'3" deep. Collector pipes, 8-5/8 inches in diameter project through portholes at the bottom of each cassion. The pipes for each well have a minimum footage of 1800'. Wells C and D are equipped with two 8,000 G.P.M. pumps at 177.5' head and are driven by two 500 H.P. motors. The pump houses on wells C and D have overall dimensions of 22'x31'6"x13'. They are constructed of concrete, tile and brick.

The pipe lines connecting wells A and B with the 42" main which extends to the plant are 24" universal joint cast iron and bell and spigot cast iron pipe. The water from wells C and D is pumped from the cassion in 30" lock joint reinforced concrete pipe laterals and the combined flow is carried in a 36" lock joint concrete pipe to the Booster Pump House and Auxiliary Reservoir 412-C. Water is carried from the Booster Pump House to the 42" main, a distance of 577', in 36" cast iron bell and spigot pipe. The 42" mains for both raw and process water are constructed of steel pipe surrounded by spiral reinforcing bars covered with a shell of gunite. The inside of the pipe is lined with a shell of centrifugally spun concrete.

Location:	Well A	X 34304 - N 8082	64% completed
	Well B	X 32046 - N 8496	64% "
	Well C	X 37370 - N 13732	
	Well D	X 26825 - N 15220	

The Booster Pump House was added to the plant design because of the extreme distance of wells C and D from the manufacturing area. The reservoir is 51'2" x 69'4" in depth and is of concrete construction with a plank and timber roof. It has a capacity of 300,000 gallons. The pump house is of concrete, brick and tile construction, and has an overall dimension of 81'10" x 32'. It is equipped with six 500 G.P.M. pumps at a 500' head operated by six 800 H.P. motors. Location is at X 31360 - N 7780.

(b) River Water: River water is obtained from the Mississippi River through a channel which was dredged from the bank of the river across Spring Lake to the bank of the bluff bordering the Mississippi Valley. This channel is approximately 2,700' long, has a minimum depth of 12' below normal water elevation, and has a bottom width of 50'. This channel leads to the River Pump House which is a reinforced concrete, brick and tile structure, having overall dimensions of 69' by approximately 73', and a height of 45'.

The pump house is equipped with five pumps with a capacity of 7,500 G.P.M. at a 500' head which are operated by five 1,000 H.P. motors. The water is pumped directly into a 42" O.D. steel pipe which carries the water a distance of 375' to the 42" concrete main which extends to the manufacturing area. From the northeast corner of the plant site 36" concrete pipes were constructed to carry water to the "B" area and 30" concrete pipes to the "A" area. Location is at E 31493 - N 7922.

(c) Joint Ranney Well and River Water Reservoir and Pump House: The reservoir is of reinforced concrete construction with a timber roof supported on timber posts. The overall dimensions are 242' x 241'. The Water Inlet House is 29'6" x 23'6". The reservoir is divided into two sections: one for river water (242' x 129') with a storage capacity of 3,275,000 gallons; one for Ranney well water (242' x 112') with a storage capacity of 3,075,000 gallons. It is 17' deep. It is located at S 5560 - E 18965. The Reservoir Settling Basin - 408-B, is located at S 7315 - E 13261.

Adjacent to the south end of the reservoir is the Pump House, building 412-A. It is 169' x 19'6". It is of concrete and tile construction. It contains four 6,500 G.P.M. pumps for well water which are operated by 350 H.P. motors and give 6,500 G.P.M. pumps for river water which are operated by 350 H.P. motors. Provision has been made for future pumps. There are two steam driven 1,000 G.P.M. pumps for fire protection and one, 1,000 G.P.M. motor driven pump for fire protection. Location of 412-A is at S 5560 - E 18800. Location of 412-B is at S 7315 - E 13261, but construction was cancelled 4-10-43 when 47% complete.

(d) Drinking Water Well - No. 411-A: This well is a 24" cased well 418' deep. During the construction period this well was used as a temporary source of supply for drinking water and was equipped with a 200 H.P. deep well turbine pump rated at 2,000 G.P.M. Water was pumped to a 200,000 gallon steel tank from which it was distributed to the temporary system by two booster pumps. On discard of the temporary system, a 200 H.P. turbine pump was hooked up to pump directly into the drinking water system. It is located at S 2750 - E 13950.

(e) Drinking Water Well - No. 411-B: This well is a 24" cased well 385' deep. The well is equipped with a vertical turbine deep well pump rated at 2,000 G.P.M. and powered by a 200 H.P. motor. Water is pumped directly into the distribution system with a provision being made for surplus water to be stored in an elevated steel tank 115' high having a capacity of 55,000 gallons. It is located at S 4240 - E 15350.

(f) Chlorinators: At each drinking water well there is one Wallace & Tiernan Type 8A5VEM chlorinator, semi-automatic solution feed, visible vacuum type, furnishing 100 pounds per hour against 125 pounds main pressure, each having cost $1,948.38. The serial number at 411-A is L-6944, and at 411-B is L-6956.

(g) Water Lines - No. 501: Water lines are installed underground. There are five types of water lines: drinking water lines, fire protection lines, soft water lines, raw water lines, and process water lines. Process water, raw water, soft water condensate in Power House and Factory buildings and drinking water pipes in pump houses are schedule 40 seamless steel pipe. Process water, raw water, soft water and drinking water pipes 2-1/2" and smaller are 150 pound screw cast iron pipe and 3" and larger are Class B bell and spigot pipe. Process and raw water pipes 4" to 18" are Class 150 "transite" and 30" to 42" 150 pound pressure reinforced concrete. Fire protection lines 2-1/2" and smaller are schedule 40 seamless steel pipe; 3" and larger exposed pipe are schedule 40 and 3" underground pipe is Class B bell and spigot cast iron pipe. Total ABF installed was 244,441 feet. Estimated total DEF required was calculated as being 150,928 feet, but only 6,527 feet were installed, 3,539 feet were installed, not bridled, tested, or backfilled, and 2,005 feet of pipe were laid, ditch open.

(h) Summary On Water:

Source: Spring Lake (Mississippi River back water.
Two Ranney Wells on bank of Mississippi River.
Two deep wells for drinking water located in plant proper.

Daily Capacity:	From Spring Lake	- 43,200,000	Gal. per Day
	From Ranney Wells	- 28,800,000	" " "
	From Drinking Wells	- 5,760,000	" " "
	Total	- 77,760,000	" " "
Storage Capacity:	Well Water Reservoir	- 3,075,000	Gals.
	River Water Reservoir	- 3,275,000	"
	Elevated Drinking Water Tank	- 50,000	"
	Fire Tank - Elevated	- 100,000	"
	Elevated Soft Water Tank	- 100,000	"
	Total	- 6,600,000	"

Treatment: All drinking water is chlorinated.
All cooling water is treated with sodium Hexametaphosphate.
All soft water is treated with lime and ferrisul, filtered and treated with acid and then softened in Zeolite Softeners.

2. Sewers - No. 505:

Sewers are of two categories; process and sanitary. The process sewer system is designed to carry all acid residue to the Acid Neutralization Plant. All channels are made of acid resistant materials. The flow through manholes is controlled by masonry work so constructed as to direct flow and change of elevation without a direct fall. This system was constructed with vitrified clay pipe sealed with acid resisting mortar and with manholes constructed to resist acid.

The sanitary sewer system is designed to take all other waste to the Sewage Disposal Plant. This system is constructed of vitrified tile, bell and spigot pipe. The main trunk sewer is constructed of Laminex box culvert sections. These sections are pressure treated wood with laminated sides, top, and bottom. Wood box sewers are used for acid and combination wastes. Total ABS pipe installed 96,800 feet; Laminex Box Sewers installed 11,160 feet; manholes 200; Laminex Manholes 19. The DEP lines needed 49,015 feet, but none were laid in place.

(a) Sewage Pumping Station - No. 510-A: The Sewage Pumping Station was erected to force sewage from the DEP lines to the sewage treatment plant which is situated west of the ABS lines. The pumping plant is composed of a reinforced concrete well 14' in L.&D.Sh. 24'6" below ground level with a superstructure 15'2" x 15'2" x 8'6". Approximately one-third of this well is wet well where the sewage is received and from which it is pumped. The remainder of the well houses two Chicago Pump Company sump pumps, 500 gallon per minute capacity, powered by a 7-1/2 H.P. motor. It is located at S 7562 - E 15560.

(b) Sewage Acid Neutralization Plant - No. 512: The acid neutralization plant consists of a car shelter, lime storage building and a silo. The lime storage building is 35'6" x 80'4" x 12', and has a storage capacity of 450 tons of limestone. The car shelter is 22' high and 19' wide by 50' long. The silo is 49'7" high and has an inside diameter of 20'. The silo is a wood frame building covered with reinforced gunite concrete. Limestone is elevated by a bucket conveyer to the silo. The bottom of the silo is pitched to the center where limestone is discharged through a slide gate to a controlled feeder, which feeds powdered limestone

to a small hopper over an injector. Raw water is introduced through the injector and at the point of zero pressure the lime powder is mixed with it. The resulting mixture passes through an agitator and the lime slurry therefrom is introduced into the acid runoff water in the trunk sewer. Before the process trunk sewer connects with the Outfall Ditch a pH recorder station (612-G) is installed. Samples are pumped from the sewer through a pH recorder. This station acts as a basis for control over the amount of limestone introduced in the neutralization plant. 612-A is located at S 5103 - E 18860. 612-E is located at S 6890 - E 12900, and is only 46% completed; i.e., the building is complete but no equipment has been installed. 612-G is located at S 6636 - E 20690.

(e) Sewage Treatment Plant - No. 617-A: This plant, which has an overall dimension of 76'10-1/2" x 32' x 11', is designed to treat the sanitary sewage from the change houses, offices, shops, etc. It was anticipated that approximately 7,500 persons would frequent the area served.

Sewage is received in the plant from the sewer system through a bar screen to a wet well from which it is pumped, via a chlorinating chamber, to the settling tank by three 500 G.P.M. sewage pumps operated by 5 H.P. motors. The sewage enters the settling tanks from the chlorinating chamber over a small weir. The settling tank is of concrete and is divided into two sections each 48' long and 8' wide. Each section is equipped with a link belt sludge collector driven by a 1/2 H.P. motor.

The effluent is discharged from the far end of the settling chamber over a weir and into the process trunk sewer. There is another weir set slightly higher than the effluent weir over which grease is discharged into a grease trap. The sludge which settles out on the bottom of the settling tank is propelled by the sludge collector to a small chamber from which it is pumped to the primary digestion tank by a 4" sludge pump powered by a 1-1/2 H.P. motor. The primary digestion tank is 24' in diameter and 17' deep and is equipped with pipe coils for circulating hot water for heating the sludge to accelerate bacterial action. There is an overflow between the primary and secondary digestion tanks (30' in diameter x 17' deep) and remaining effluent and surplus sludge can be drained to the secondary tank to a limited level. The sludge not consumed in the primary tank is pumped to the secondary digestion tank for holding during periods when the sludge drying beds cannot be used. Under ordinary circumstances, sludge not consumed by bacterial action is pumped directly to the sludge drying beds. There are five beds constructed of sand and gravel with undertile drains. The overall dimensions of the drying beds are 145' x 60'. Location is at S 6871 - E 18773.

In building 617-A is installed a Wallace & Tiernan type 2ASV chlorinator, 50 lbs. per hour, Serial No. L-8000, Cost $2,038.20.

(d) Open Drainage Ditches - No. 511: Approximately five miles of open ditches were constructed. Drainage ditches are wide and shallow with a bottom width of four feet. They were constructed to serve for drainage and snow storage. The plant site drains to the northeast and southeast. Steel, wood, and concrete were used for culverts.

(e) Vermillion River Trade Waste Project - No. 511-11: The trade waste disposal system makes use of the Vermillion River which flows along the southern boundary of the plant site, then southeast to Vermillion Slough and from there either north or south, depending on water levels, into the Mississippi River.

The sewer empties into an Outfall Ditch at location S 9100 - E 21100 and drains into the Waste Settling Basin No. 611. The Waste Settling Basin consists of a reservoir and detention dam at Station 9 and 75A designed to control the speed of release of waste from the plant. An access channel extends approximately 9,000' from the detention dam to the Vermillion River. The channel has a bottom width varying from 18' to 20' with a side slope of 2 to 1 and the average cut is approximately 5 feet. Two drop structures, one at Station 14/00 and the other at Station 69/50 have been constructed to control the velocity of the stream's flow. These structures are constructed of timber and riprap. The channel of the Vermillion River was widened, deepened and straightened from the point of intersection with the access channel to the point of intersection with Vermillion Slough. This work consisted of spot dredging. A dam was constructed across Vermillion Slough to change the flow so that the stream would empty into the Mississippi River to the north rather than to the south. As this system was not to be used after all a culvert was installed in the dam to maintain the water level in Vermillion Slough. This dam is constructed of timber piling, earth and riprap. Between the closing dam and the Mississippi River, Lake Isabel empties into the Slough. A small dam of timber, earth and riprap has been constructed across the discharge of this lake to prevent the infiltration of acid water. The work on the Vermillion River made necessary the construction of three highway bridges to provide for the increased flow of water which would result from the operation of the plant.

(f) Summary on Sewage: There is one sewage treatment plant. Raw sewage is chlorinated and pumped to a settling basin where the solids are separated from the liquid. The liquid passes to the acid sewer and the solids are pumped to a Primary Digester and Secondary Digester. The solids are then distributed to sludge beds on the ground surface. This plant will serve a population of 15,000 people.

3. Process Lines - No. 506:

Process lines are installed overhead. These lines carry the various items used in the preparation and manufacture of powder. They were assembled in short lengths. Companion flanges were introduced every 100' to permit cleaning and draining. Sunshades were erected over solvent recovery lines. Process lines were insulated. Schedule 80 seamless steel pipe was used for 500 pound alcohol piping; other piping was Schedule 40. A total of 202,823 feet was installed in the ABC area.

4. Brine Lines - No. 507:

Brine lines are installed overhead. All brine used for solvent recovery in the powder area was supplied by Building No. 226. Brine is first chilled by ammonia compressors (5 duplex vertical ammonia compressors) and then discharged to the solvent recovery, horizontal screening and press houses and the vertical press houses. All spent brine is collected in a return line and conducted to a brine storage adjacent to Building No. 226. Brine lines are of Schedule 40 seamless steel pipe and are insulated. A total of 16,844 feet of pipe was installed in the ABC plants.

5. Hydraulic Lines - No. 506:

The Hydraulic System consists of three classes of underground lines; high pressure, low pressure and return. These lines originate in Building No. 226 and furnish pressure for the operation of hoists, presses and other operating equipment. High pressure (3,500 pounds per square inch) is supplied by five high pressure hydraulic pumps, and low pressure (300 pounds per square inch) by four low pressure hydraulic pumps. High pressure hydraulic piping 4" and under is double extra heavy Grade A, while 6" and over is double extra heavy Grade B; low pressure piping is Schedule 40 steel pipe. The return hydraulic lines are Schedule 40 carrying a pressure of 125 lbs. per square inch.

6. Air Lines - No. 504:

Air lines are installed overhead. Compressed air is furnished by three two-stage compressors developing 1505 c.f.m., operated by three 300 H.P. motors installed in the engine room of Power House 401-A, which discharges into two sets 11 vertical air receivers with a capacity of 4,28[illegible] cubic feet, located adjacent to the engine room. A third air receiver is located in the field. Air for the acid area is distributed from Building 302-A. It is equipped with four Primary Air Compressors, Type PRE-2, and four Power Recovery Compressors, Type HRD-2, and four horizontal air receivers 66" x 18'. Compressed air piping is 1/2" to 12",

Schedule 40; 14" and over is Schedule 20, with a maximum operating pressure of 100 pounds per square inch. Total ABC installed was 63,824 feet; total DEF required was estimated as 35,396 feet.

7. Fire Protection - No. 510:

The fire protection system forms an independant unit. Three pumps, each with a capacity of 1,000 G.P.M., located in Pump House 412-A, provide water directly for fire protection and to a 100,000 gallon tank #510 to insure an adequate supply at all times. Sprinkler systems are installed in all buildings where fire hazards warrant. Fire plugs, hose boxes, and an alarm system have been installed. The temporary lines in the DEF area are connected with the permanent lines in the ABC area for fire protection.

There are two steam driven fire pumps of 1,000 G.P.M. each, one electrical driven pump of 1,000 G.P.M. capacity, and one 500 G.P.M. electric driven leakage pump.

Fire Protection Tank No. 510 is a 100,000 gallon wooden tank, outside diameter 30'6", height 20', the bottom of which is 115' above ground on steel supports, located at S 5950 - E 14,950. Vendor was Woolford Tank Mfg. Co.

There was a fire department organized and there was a fire station containing mobile fire-fighting equipment. The automatic fire alarm system has been disconnected. Fire headquarters were in buildings 709-A-B in the ABC area and 709-C in the DEF area. The University is requesting building 709-B "with its installed equipment". But the only equipment in Building 709-B now remaining is as follows:

1 "Patterson Kelly" 100 G.P.H. Hot Water Heater.

1 Multi Breaker Panel Board Switch Box with 8 toggles.

1 Wood Locker, 4 sections.

Perhaps the University has made a mistake in the building numbers for all principal fire-fighting equipment is located in Building 709-A.

On checking the official application of the University, it is seen that Building 709-A is requested.

NOTE: See attached Appendix "A" for list of fire-fighting equipment located in Building 709-A.

8. Garbage and Rubbish Collection and Disposal:

The plant had a refuse collecting or "sanitary" crew which kept the place clean. It collected garbage from the cafeteria and apparently brought it to a disposal grounds on the reservation. Presumably disposal was by the sanitary fill method, or burning on the ground. Rubbish was similarly burned on the ground. Present personnal remaining at the Ordnance Works could tell very little about it.

9. Insect and Rodent Control:

Apparently there were no special insect or rodent control problems and no specific control work was carried on.

10. Health Hazards:

There was a Safety Department organized which combatted the industrial hazards relative to construction and operation of an ordnance works. There is no malaria problem in this region.

11. Heating:

During construction some eight temporary boilers were erected in various parts of the reservation of which one remains as boiler No. 1 in building TC-47 in the administration area. During operation of the plant when manufacturing gunpowder all buildings on the reservation (except the distant staff houses) were heated by steam from the main power house. When the main power house was not operating the boilers in TC-47 heated the administration area buildings: the employment and hospital, change, cafeteria, administration, police patrol headquarters, and patrol garage buildings.

The staff houses are heated with individual stoker-fired furnaces.

12. Purchased Electric Power Supply:

(a) Purchased Power Incoming Transmission Line No. 405-1:
Two Northern States Power Company power lines are built to the Gopher Ordnance Works. The power company erected a 115 KV line from its Roger Lake substation to a meter house at E 11900 - S 880, one span within the plant site. The du Pont Company continued this line to a switching station at E 20896 - S 3714 at which point the line continues to substations 405 S4 and 405 S5. The line is suspended from wood poles, 65' in height, H-type construction, prevailing spans approximately 450' apart. The original design called for the construction of a similar line from a switching station at E 14625 - S 3714 to substation 405 S3.

The emergency purchased power line enters the plant at the 69 KV meter house (E 13438 - S 858). It has been continued by the du Pont Company to the emergency substation 405-D, and from there to the switching gear in power house 401-A. This line is suspended from single poles 45' in height.

(b) Purchased Power Substations - No. 405-S: Plant design originally called for four purchased power substations: 405-A located adjacent to Power House 401-A; 405-B adjacent to Power House 401-B (cancelled); 405-C located adjacent to Pump House 414 and designed to serve the river area; and switching station 405-D on the 69,000 V. emergency purchased power line. Substation 405-A has two 115 KV, 600 ampere, oil circuit breakers and two 3-phase 12,500 KVA 100,000/13,800 V. transformers. From the controls in 401-A four 13.8 KV radial feeders with emergency ties and sectionalizing switches go to: (1) Substations 501-A, 501-B, 501-C (100 area); (2) Substation 501-F-1 (300 area); (3) Substations 501-D-1, 501-E-1 (200 area); (4) Substation 501-F13 (Fenna Lighting). Purchased Power Substation 405-C has three 3333 KVA 100,000/6,900 V. single phase transformers and six 15 KV oil circuit breakers. There are three 10 KVA 6900/730/1160 V. transformers and one 25 KVA 6900/115/230 V. transformer for incidental power and light. Four 6.9 KV feeders go to the wells and two 6.9 KV feeders go to the Pump House 414. A barricade has been constructed around this substation. 450-D is the switching station on the 69,000 V emergency line and is of pole construction and has one three-phase 4500/6000 KVA 61,000/13,800 V. transformer, and one 5 KVA 13.8/240/120 control transformer. Locations: 405-SA at S 6140 - E 18684; 405-SB at S 7937 - E 13067; 405-SC at S 7973 - E 31455, and 405-SD at S 6004 - E 14760. 405-SD was only 14.7% completed.

13. Power House No. 401-A:

The Power House contains a boiler room, an engine room, an electrical bay, a silo bay, a heater bay, and a water treatment bay. It is constructed of reinforced concrete, steel, tile, brick and transite. The overall dimensions of the building are: 250'8" x 154'5" x 86'2-1/4". A total of 3,168 cubic feet of concrete and 807.65 tons of structural steel was used in its construction.

The boiler room is 209'8" x 79' x 86'2-1/4". The operating floor is 21' above ground floor elevation. The fan floor elevation is 37'6". The fan floor between columns H and G is 41'. The intermediate platform, columns D to E, has an elevation of 49'. The top platform, columns G to D, has an elevation of 55'3", and columns D to H, 58'3/4". The boiler room contains five steam generating units (Power House 401-B was designed for four steam generating units). Each steam generating unit consists of the following items:

(a) Boiler: One Combustion Engineering Company's four drum bent water tube boiler with water cooled walls and water screen gates. Boiler operating pressure is approximately 450 pounds per square inch. Steam temperature at 450 pounds per square inch is 460° F. No superheaters are furnished at this installation. Capacity of boiler is 190,000 pounds of steam per hour with an average peak capacity of 200,000 pounds of steam per hour for short periods. Feed water temperature is approximately 240° F.

(b) Pulverizers: Two Raymond Coal Pulverizers, each with a capacity of approximately eight tons per hour. Total capacity of the pulverizers is sixteen tons. The actual coal consumption at 190,000 pounds per hour boiler capacity will be approximately ten and one-half tons per hour. (It costs about $150-$200 an hour to operate this power plant).

(c) Pulverized Coal Burners: Four pulverized coal burners per boiler, each pulverizer supplying two burners. Forced draft (from air preheat) is supplied to each burner through a wind box surrounding the burner nozzle. Under normal operating conditions the boiler load must be in excess of 35,000 pounds of steam per hour before pulverized coal can be safely used.

(d) Oil Burners: Four oil burner nozzles per boiler. These oil burner nozzles are placed in the same location as pulverized coal burners. Oil is used for starting the boilers prior to cutting in with pulverized coal. Each nozzle has the capacity to produce 40,000 pounds of steam per hour. In an emergency, oil burners will produce 160,000 pounds of steam per hour. Heated air for oil consumption is supplied by the same wind boxes as those used for the pulverized coal.

(e) Forced and Industrial Draft Fans: One Buffalo Forge forced draft fan with a capacity of 58,000 C.F.M. at 13 inches static pressure. One Buffalo Forge induced draft fan with a capacity of 112,000 C.F.M. at six inches static pressure. These fans are so connected that they are driven by a single Westinghouse 365 H.P. steam turbine.

(f) Air Preheater: One Combustion Engineering air preheater located at the boiler flue gas outlet. Boiler flue gases enter the preheater at approximately 770° F. and leave at a temperature of approximately 460° F. Flue gases pass through the air preheater to the induced draft fan which, in turn, forces the gases through the boiler breeching and out the smoke stack. The forced draft fan forces room air at approximately 80° F. to 150° F. through the various passes of the air preheater where it is heated to approximately 600° F. before being discharged to the burners (either coal or oil).

An Allen-Sherman-Hoff System is used for removing ashes from the boilers. Boiler feed pumps are Allis-Chalmers five stage centrifugal pumps, driven by Westinghouse 310 H.P. steam turbines. Each pump has a capacity of 625 G.P.M. at 1450 feet head.

The silo bay is 209'8" x 11'3" x 42'. There are five silos erected by the Consolidated Chimney Company. Inside diameter of silos is 21', overall height 57'6", intermediate floor 30' above foundations, height of chimneys above top of silo roof slab 42'.

The electrical bay is 26' wide and 156' long. The elevation of the operating floor is 21' and the elevation of the pipe gallery is 37'6". The roof of the electrical bay is 49'8". The heater bay is 22' x 79'. The operating floor has an elevation of 21' and the roof 42'2-1/2". The engine room is 22' x 61' with a roof elevation of 31'3/4". The engine room is equipped with three air compressors feeding into two vertical air receivers located adjacent to the engine room. The water treatment room is 146' x 49'. On the second floor there are six wood gravity filters 12' in diameter and 14'3" high and on the ground floor there are six water softeners 10' high and 10' in diameter. A laboratory is included (19' x 25') in the northwest corner of the building.

Adjacent to the power house on the north are two precipitator tanks 22' high and 42' in diameter, and one flash mixer tank 20'6" in diameter and 22' high. Both are constructed of gunite concrete reinforced with wire mesh and steel bars. The coal conveyor, on the south side of the power house, was erected by the Link Belt Company and has a capacity of 150 tons per hour for handling run of the mine coal. The soft water tank is a wooden storage tank with a capacity of 100,000 gallons on a steel frame and the bottom of the tank is 95' above ground elevation. There are two fuel storage tanks each with a capacity of 12,000 gallons, measuring 24' in length and 9' outside diameter. 401-A is located at S 5835 - E 18865. 401-B, only 27% complete, is located at S 7590 - E 13161.

The Salt Dissolving Pit, No. 406-A, is a reinforced concrete structure having an overall dimension of 35'6" x 21'. It is divided into two tanks which are 16' x 12' x 7'6". Each tank has a storage capacity of 80,000 pounds. The building is equipped with two 20 G.P.M. brine pumps, at 25' head, and powered by a 1 H.P. General Electric motor, and one 44 G.P.M. 70' head fuel transfer pump powered by a 3 H.P. motor. 406-A is located at S 5431 - E 19607. 406-B is located at S 7355 - E 13680, but is only 67.1% complete.

The Ash Disposal Basin, No. A10-A, (or Ash Sluice Sump) is a reinforced concrete building with a wood roof, the overall dimensions of which are 43'6" x 23'6" x 12'6". It discharges into a 36" V.P. sewer. A10-A is located at S 6044 - E 18918. A10-B is located at S 7799 - E 13215, but is only 82% complete.

14. Electric Power and Light Distribution Lines and Substations - No. 501-A and 501-B:

Substation 501 A-1 has three single phase 500 KVA 13800/480 Volt transformers for power with six feeders. The switching and meter panels are installed in a concrete block building 19'4" x 10'7" x 13'4", and the enclosure is 20'5" x 28'3".

Substation 501 B-1 has three single phase 500 KVA 13800/480 Volt transformers for power with six feeders and three 1500 KVA 13800/2400 volt transformers with four feeders. The controls are installed in a concrete block building 21' x 19'4" x 13'4", and the enclosure is 39'6" x 23'1".

Substation 501 C-1 has three single phase 500 KVA 13800/480 volt transformers for power with six feeders. The switch and meter panels are installed in a concrete block building 19'4" x 10'7" x 13'4" and the enclosure is 20'5" x 28'3".

Substation 501 D-1 has three single phase 1500 KVA 13800/2400 volt transformers with five feeders; three for power, one for lighting and one for constant current street lighting and fence lighting regulators. The switch and meter panels are installed in a concrete block building 19'4" x 10'7" x 13'4", and the enclosure is 20'5" x 28'3".

Substation 501 E-1 has three 1500 KVA 13800/2400 volt transformers with one 2300 volt feeder for power. The switching gear for this substation is installed in Building No. 226.

Substation 501-F-1 has three 1500 KVA 13800/2400 volt transformers with three 2300 volt feeders. The switching gear for this substation is installed in the adjacent Building No. 302-A.

From switch 501 FL8 three 13.8 KV single phase lines go to substations 501 FL-1, 501- FL-2, and 501 FL-3 for fence lighting. Each of these substations has one 150 KVA, 13.8 KV/2.3 KV transformer; two 30 KW 6.6 ampere constant current regulators for series fence lighting; one 5 KVA transformer and in addition substation 501 FL-3 has one 15 KW constant current regulator.

In the DEF area 501-1 is only 46% completed, and 501-2 is 80% completed.

In the total plant area there are approximately 5,000 poles set and 1,250,000 feet of wire in place.

ABC Coordinates:		DEF Coordinates, and Percent Complete:		
501 A-1	S 5261 - E 17669	501 A-2	S 7027 - E 12015	80%
501 B-1	S 5261 - E 17069	501 B-2	S 7019 - E 11412	23%
501 C-1	S 5261 - E 16469	501 C-2	S 7019 - E 10812	22%
501 D-1	S 4868 - E 17544	501 D-2	S 8405 - E 11967	84%
501 E-1	S 4403 - E 17526	501 E-2	S 8193 - E 11801	21%
501 F-1	S 4604 - E 17338	501 F-2	S 5331 - E 13226	28%
501 FLS	S 7022 - E 18682			
501 FL-1	S 8050 - E 20599			
201 FL-2	S 17259 - E 14201			
501 FL-3	S 5466 - E 11058			

15. Summary on Electric Power:

Source: Northern States Power Company, St. Paul, Minnesota.

Substation: Two - three phase, 100,000 to 13,800 volt, 60 cycle, 3333 KVA transformers at River Pumping Station.

One - three phase, 69,000 to 13,800 volt, 60 cycle, 6000 KVA transformers for standby service.

Distribution System: Three phase, Delta-connected, 13,800 to 460 volts, and 13,800 to 2300 volts for distribution.

Distribution Transformer Capacity:

12	Single	Phase	1500 KVA	13,800 to 2300	volt	transformers	
9	"	"	500 KVA	"	" 460	"	"
7	Three	"	500 KVA	"	" 460	"	"
2	Single	"	100 KVA	"	" 115/230	"	"
2	Three	"	2000 KVA	"	" 2300	"	"

There is one 1500 KW Emergency Turbo Generator, non-condensing.

16. Steam Lines - No. 5021

Steam lines are installed overhead. All steam for heating and process purposes is generated in Power House 401-A. Three steam lines emerge from 401-A; a 12" line carrying 450 pounds of steam, a 24" line carrying 150 pounds of steam, and a 6" line carrying 300 pounds of steam. Steam lines are covered with one inch standard pipe insulation. Pressure is reduced by pressure reduction valves at all buildings where required. High pressure steam piping is schedule 80; high intermediate pressure is schedule 40; low intermediate pressure piping under 12" is schedule 40; 14" and larger is schedule 20; medium low pressure piping 12" and under is schedule 40; 14" and over is schedule 10; and steam piping for building heating is schedule 40. In ABC area 110,964 feet were installed. In DEF area 10,101 feet out of 58,049 required have been installed.

17. Gas Supply:

A natural gas line is adjacent to the reservation, but no connection has ever been made to it.

18. Food Service Facilities:

The cafeteria in building 708-A, located in the administrative area, was operated under contract by the Rosemount Caterers. This building now stand empty, all equipment, including the walk-in refrigerator, having been removed. Apparently it has a seating capacity of about 400, people eating in staggered shifts. In addition there were five canteens in the industrial area at which hot food was served from heated containers.

19. Laundry Service:

The laundry is in building 723-A. It was used primarily to launder clothes in connection with the industrial plant, but also served the hospital. However, this laundry was too small to adequately serve the needs of the plant so much laundry was sent out under contract. The building has been described earlier in this report under "buildings". The contents of this laundry building, all desired by the University, are listed below:

SPB-1 Declaration of Surplus Property Still in Laundry, Bldg. 723-A:

		Total Cost
7	Lockers, wood, 4 sections, @ $21.80	$ 152.60
1	Square D, 60 Amp. elec. switch	10.42
1	Counter scale, Howe, Serial B-6401	35.81
1	Switch box, 60 Amp. Square D	6.20
1	Extractor, 26" open top, Ellis Drier Co., @ 5 H.P. Crocker Wheeler Motor	689.20

		Total Cost
1	Extractor, 40" open top, Ellis Drier Co., w 4. H.P. Continental Electric Motor	$ 1,603.00
5	Steam driers, 36"x30", Hasbach Elec. Co., w 1/2 H.P. Motors, 125 lb. cap., @ $225.20	1,126.00
1	Machine, Button, Singer, Mod. 178-1	128.00
1	Machine, Sewing, Singer # M837630	138.00
1	Machine, Sewing, Singer, # AG463296	128.00
2	Marker, Portable, Natl. Marking Machine Co. @ $129.50	260.00
12	Buggy, fiber, Continental Diamond Fiber Co., 26"x30"x30", @ $65.73	788.76
6	Tub, metal, truck, 32"x22"x25", American Laundry Co., @ $306.00	1,836.00
1	Washer, Gearless, Zepher Gearless Washer Co., 2 H.P. Reliance Motor	1,364.00
1	Washer, for laundry & dry cleaning, Hoffman Varelons Co., 1 H.P. Allis motor	1,034.00
1	Davenport, 3 cushion	17.50
1	Switch box, Elec. 12 toggles, Trumbull, 100 Amp.	33125
3	Chairs, wood, @ $5.00	15.00
2	Chairs, wood, Executive, @ $16.00	32.00
1	Desk, executive, wood,	22.50
1	File Cabinet, 4 drawer, metal letter	13.00
1	Table, executive, wood	10.00
2	Table, utility, @ $10.00	20.00
	TOTAL	$ 9,463.74

20. Miscellaneous:

a. Warehouses: Three central stores, total 50,000 sq. ft.
b. Motor Vehicle Sheds: 1 Garage, 3,000 sq. ft.
3 Sheds, 1,500 sq. ft.
c. Magazines: 96 - 243,792 sq. ft.
d. Cold Storage Buildings: None
e. Firing Ranges: 6 Ranges (Ballistics)
f. Recreational Facilities: None
g. Cemeteries: None.

Respectfully submitted,

Ragnar T. Westman

RAGNAR T. WESTMAN
Senior Surgeon (R)

Attachment 3

WAR ASSETS AIMINISTRATION
Office of Real Property Disposal
Minneapolis, Minn.

CLASSIFICATION OF STRUCTURES AT COPPER ORDNANCE WORKS, ROSEMOUNT, MINNESOTA

January 7, 1947

Class (1) Structures reserved for U. of M. with all personal property therein. Exhibit "E"

Class (2) Structures reserved for U. of M. with a portion of the personal property therein. Exhibit "EE"

Class (3) Structures left standing with personal property therein for sale (a) with structure (b) without structure. Exhibit "AA"

Class (4) Buildings retained by Warehousing Division. Exhibit "B"

Class (5) Buildings to be demolished and personal property stored in site warehouses or shipped. Exhibit "A"

Class (6) Buildings decontaminated and to be burned. Exhibit "D"

Class (7) Foundations, mass concrete, sub-structures and concrete floors remaining from the original demolition program. No further work is to be done on these items. Exhibit "C"

BUILDINGS AND STRUCTURES WHICH HAVE BEEN DEMOLISHED BY THE CORPS OF ENGINEERS AT GOPHER ORDNANCE WORKS, ROSEMOUNT, MINN., UNDER CURRENT PROGRAM. ALL PERSONAL PROPERTY HAS BEEN REMOVED, PREPARED AND STORED AT THE DIRECTION OF WAR ASSETS ADMINISTRATION.

EXHIBIT "A" January 7, 1947

Class (5) Structures

Building No.	
102D	Nitrocellulose Tank Farm
108 D, E,	Boiling Tub Houses
109 D, E, F.	Pulping Houses
111 D, E	Poacher Tub N-C Slurry Tank Houses
112 D	Poacher Tub House
113 D, E	Blending Tub & Final Wringer Houses
120 D, E, F, B & C	Savealls
122 D, E, F	Wood Pulp Dry Houses
201 A, C, D, E, F	N-C Lag Storehouses
202 G, H, J, K, L, M, P, D, E & F	Dehydrating Press Houses
205 A	DNT Screening House
206 D	Ether Mix House
207 D, C, CC, EC	Ether Manufacture & Alcohol Rectifying Houses
208 G, H, J, K, L, M	Mixer Houses
209 B	Scrap Rework House
211 A, B, C, D, E, F	Horizontal Screen and Press Houses
213 A	Solvent Recovery and Car Wash
214 A 9, A10, B1 thru B15, C1 " C16 D1 to D13, E1 to E15, F1 to F13	Solvent Recovery Houses
215 J, K, L, M	Solvent Recovery Storage
219 A, B, C, D, E, F, G	Unloading and Water Dry Houses
220 A, B, C, D, E, F, G, H, J, K	Controlled Circulation Dryer
221 A, B, C	Blending Tower and Packing Houses
222 A, B	Cannon Powder Blending Towers
224 B, C, D, E	Air Test Houses
226 B	Hydraulic and Refrigeration House
227 D, E	Dry Ingredient Storehouses
229-1 thru 4, 13 thru 16, 25 thru 28, 37 thru 99, 102, 103	Shipping Houses
232 A	Box Repair Shop
233 A	Screen Cleaning House
235 A, B, C	Rifle Powder Dry House
236 A, B, C, D, E, F, G, H, J	Sweetie Barrel Houses
237 A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T	Tray Dryer Houses
238 A, B, C, D, E, F, G, H, J, K	Glaze Barrel Houses
239 A, B, C, D, E, F, G, H, J, K,	Shaker Sieve Houses

Building No.	
240	C, D	Rifle Powder Blending Towers
251	C, D	Activated Carbon Solvent Recovery
255	A	Bag Repair and Stencil House
264	A,B,C,D,E,F,G,H,J,K	Barricades for Glaze House
269	A,B,C,D,E,F,G,H,J,K,L, M,N,P,R,S,T	Rifle Powder Unloading & Dry House #2
302	B	Ammonia Oxidation Plant
305	B	Acid Area Tank Farm
402	B	Reservoir
404	A, B, C, D	Process Wells and Pumps
405	SC	Purchase Power Station
410	B	Ash Disposal Basin
412	B	Reservoir Pump House
412	C	Reservoir Pump House (Booster Station)
414	A	River Pump House
501	A2, B2, C2, D2, F2	Substations
611	A	Waste Settling Basin
612	D	Secondary Neutralization Plant
614	A-32 thru A-35	Guard Towers
704,	A, AA, B, D, G, K, KK, L, M, MM	Supervisor's Offices
706	C, CC, K, AA, BB, and J	Laboratories
707	AA,AAA,B,BBB,C,CCC,D, DDD,E,EEE,F,GG,HH,M,N, P,R,S,SS,UU,WW,YY,ZZ	Change Houses
709	C	Fire Headquarters
719	B	First Aid
721	A	Inspection Office
722	BB, CC,E,F,FF,G,GG,M,T	Area Shops
724	A, D, E, F, G, H	Gasoline Stations
727	B, C, D, E, F, G, J, L,N	Comfort Stations
731	B	Salvage Building
903		Benzine Nitrating House
906		Still House
907		Reducing House
909		Aniline Storage
910	A	Change House
912	A	Ammonia Recovery
1	T	Government Field Office
30	T	" " "
41	T	Safety Office
45	T	Reinforcing Steel Shop
69	T	Storehouse
83	T	Storehouse
104	T	Pistol Range Shed
105	T	Guard House
107	T	Temporary Office
108	T	Sanitation Building
109	T	" "
115	T	Guard House
126	T	Storehouse
127	T	"
128	T	Guard House
197	T	Garage

Building No.	
201 T	Service and Layout Office
202 T	Field Office
203 T	" "
204 T	" "
205 T	" "
210 T	Receiving Warehouse
211 T	" "
212 T	Cement Shed
214 T	Carpenter Shop
215 T	Sheet Metal Shop
216 T	Millwright Shop
217 T	Millwright Shop
218 T	Millwright Shop
219 T	Electrical Shop and Office
221 T	Electrical Shop and Office
222 T	" " " "
223 T	" " " "
224 T	Field Office
225 T	Riggers Office
226 T	" "
227 T	" "
228 T	Clock Alleys
231 T	Pipe Shop
232 T	Pipe Shop
234 T	Warehouse
235 T	"
236 T	Filling Station
237 T	Ration Office
238 T	Ornamental Iron Works
239 T	Shelter
241 T	Temporary Warehouse

Under instructions and direction of the Ordnance Department, The Corps of Engineers will destroy contaminated buildings at the site.

THE FOLLOWING BUILDINGS WHICH ARE PARTIALLY DISMANTLED ARE TO BE LEFT IN THEIR PRESENT STATE OF DEMOLITION, REASONABLE SAFETY CONDITIONS CONSIDERED, PERSONAL PROPERTY IN THESE STRUCTURES IS TO BE REMOVED, PREPARED AND STORED AT THE DIRECTION OF WAR ASSETS ADMINISTRATION.

EXHIBIT "A"

Class (5) Structures January 7, 1947

102 A, B, C	Nitrocellulose Area Tank Farm
104 A, B (Same as 122, A, B, C)	Cotton Dry Houses
105 A, B, C, D, E, F,	Nitrating Houses
106 A, B, C	Spent Acid Filter Houses
108 A	Boiling Tub House

Building No.	
109 A	Pulping House
112 A	Poacher Tub House
113 A	Blending Tub & Final Wringer House
202 SA	Dehydrating Press House - Strong Alcohol Storage
206 A, B, C	Ether Mix Houses
208 A, B, C, D, E, F	Mixer Houses
209 A	Scrap Rework House
214 A1 thru A8, A-11 thru A-18	Solvent Recovery Houses
215 A thru F	Solvent Recovery Storage
226 A	Hydraulic and Refrigeration House
234 A thru R	Vertical Press Houses
301 B	Anhydrous Ammonia Storage Unit
401 B	Power House
501 E1	Substation
612 B	Acid Neutralization Plant
704 H	Supervisor's Office
707 GGG	Change House
722 B, C	Area Shops
33 T	Field Office
38 T	Clock Alley
908	Iron Storage
913	DPA Vacuum Still House
924 A	Car Spot

BUILDINGS AND FACILITIES TO BE LEFT STANDING AT GOPHER ORDNANCE WORKS, ROSEMOUNT, MINNESOTA, NOT INCLUDING BUILDINGS RESERVED FOR THE UNIVERSITY OF MINNESOTA

EXHIBIT "AA"

Class (3)b Structures — January 7, 1947

Personal property, if any, within these buildings is to be removed, prepared and stored in site warehouses by the Corps of Engineers, as directed by War Assets Administration

103 A	262 A	13 T
111 A	263 A	14 T
120 A	613 B	15 T
123 A, B, C (wheeling walks)	616 A	18 T
201 B	701 A	24 T
202 A	727 E	25 T
202 B	728 A	26 T
202 C	729 A	27 T
203 B (Alch. storage)	729 B	29 T
203 A " "	731 A	34 T
203 C " "	733 A	44 T
203 D " "	746 A-C-2	134 T
208 A, B, C, D, E & F	904	141 T
214-A-17	911 A	189 T
214-A-18	914 A	229 T
	915 (fuel oil storage)	230 T

Class (3)a Structures

The following structures will be left standing, and the personal property therein will be left in place for sale with the structure.

207 A	207 AC	501-C-1
207 B	207 BC	501-D-1
207 AA	251 B	
207 BB	501 A-1	

GOPHER ORDNANCE WORKS

ROSEMOUNT, MINNESOTA

BUILDINGS RESERVED FOR WAREHOUSE USE

EXHIBIT "B"

January 7, 1947

Class (4) Structures

223 A
223 B
101 B
101 C
122 C
227 A
227 B
227 C
T-32 (Wallboard)
T-16 (Millwork)
209-T (Known as Warehouse "A")
207-T (Known as Warehouse "B")
208-T (Known as Warehouse "H")
121-D (Known as Warehouse "C")
121-E (Known as Warehouse "D")
121-F (Known as Warehouse "F")
921-A

(920-A plus 920-B plus 206-T equals
1 unit known as Warehouse "L")

FOUNDATIONS, MASS CONCRETE, SUB-STRUCTURES AND CONCRETE FLOORS REMAINING FROM THE ORIGINAL DEMOLITION PROGRAM AT GOPHER ORDNANCE WORKS, ROSEMOUNT, MINNESOTA. NO FURTHER WORK IS TO BE DONE ON THESE ITEMS.

EXHIBIT "C"

Class (7) Structures January 7, 1947

102 E
102 F
106 D
106 E
106 F
108 F
112 E
112 F
113 F
124 B
124 C
124 E
202 SB
206 E
206 F
207 DD
207 DC
213 B
215 G
215 H
229-101
229-106
229-107
262 B
405 SB
406 E
501-E-2
707-T
701-A-1
701-B-1
614-A-30
614-A-31
701 B
727 H

GOPHER ORDNANCE WORKS

ROSEMOUNT, MINNESOTA

EXHIBIT "D" January 7, 1947

Class (6) Structures

Contaminated buildings which are to be burned:

106 B
106 C
108 B
108 C
109 B
109 C
111 B
112 B
112 C
113 B
113 C
120 B
120 C

Attachment 4

WAR ASSETS ADMINISTRATION
ZONE THREE
ONE NORTH LA SALLE ST.
CHICAGO 2, ILL.

October 24, 1947

TO: W.D. Foy, Chief
Property Management Div.

THRU: R.L. Bunn, Chief, Engineering Branch
J.W. Lowell, Chief, Fire Prevention Branch

FROM: G.M. Klemme, Resident Engineer, Minneapolis Reg.ZS-WAA
P.H. Kaneberger, Fire Prevention Engr-WAA Zone III-Ohi.

SUBJECT: Joint Survey of Extraordinary Preventive and Preservative Maintenance of National Security Claims Plants.
Gopher Ordnance Works
~~99. Twin-Minnesota~~ (Rosemount)

I. WAA Number - M-Minn-16.
Declaring Agency Number - ND350.

II. Name and Location - Gopher Ordnance Works, 12 miles south of St. Paul, Minnesota on Highways 52 and 218, one-half mile east of Rosemount, Minnesota.

III. Wartime use - Production of oleum, smokeless powder and other types of explosives.

IV. Declared value - $95,497,778.00.

V. Extraordinary preservative maintenance - land and underground improvements only. The underground process water used at Gopher Ordnance Works originated at the Mississippi River and was piped to the reservation in two 48" spun concrete pipes. At the edge of the reservation it was divided into smaller lines and piped to the "A" and "B" lengths which is included in this system.

		River Area	Plant Area	Total
24"	O.D. Cast Iron Pipe	5,700'		5,700'
30"	O.D. " " "	1,550	6,360'	7,910'
36"	O.D. " " "	9,975	19,780'	29,150'
42"	O.D. S/B Steel Pipe		375'	375'
48"	O.D. Spun Concrete Pipe	32,000'		32,000'

(None of this pipe is under pressure at this time)

Half of the above listed pipe comes from four water collecting wells near the Mississippi River. These wells have been filled and there is a variety of opinions as

V. (Contd.) to the possibility of trying to reactivate them. The man holes and valve pits on the lines between the river and reservation have been filled but is thought that the valves are in place. It should be noted that all lands on which lines and other well facilities were built and designated as River Area were sold by the Farm Credit Administration and there were no reservations made for future occupation.

There are two 84" cased wells within the plant area which will produce 4000 GPM and are being used at the present time.

The distribution system of the underground water lines within the limits of the reservation from various reservoirs and tanks are listed according to sizes and lengths. They include underground, drinking water, fire protection water, and process water, lumped as follows; 1-1/2" 6,855, 6" 10,040, 8" 10,100, 4" 20,220, 6" 47,050, 8" 65,740, 10" 20,005, 12" 11,416, 14" 550, 200 Fire Hydrants. Ten per cent of the piping is at present under pressure.

There exists a "Temporary Water System" in the productive area which has not been included in the above figures. This is a usable system but is not included because information is not easily available.

Sewers The main sewer trunk line is constructed of Lamlnex box culvert sections. These sections are pressure treated wood with laminated sides, top and bottom. The maximum section is 4' x 4'7" high and the minimum section 3'6" x 4' high. There are approximately 11,160 lineal feet of this trunk line. The rest of the sewers are the sanitary type built of B & B vitrified tile and the sizes run from 6" to 36". There is approximately 26,985 lineal feet of this material. There are five septic tanks of various sizes each with the accompanying leaching field.

Estimated Cost to Reactivate Fire Prot. System		$10,000.00
Estimated Cost to Reactivate River Water	"	75,000.00
Estimated Cost to Reactivate Plant Water	"	50,000.00
Estimated Cost to Reactivate Plant Sewer	"	10,000.00
(Within Federally owned lands)		

VI. Monthly cost to maintain above utilities - Estimated cost per month for maintenance of River Water System $300.00
Estimated cost per month of Plant Water System 300.00
Estimated cost per month for maint. Sewer System 100.00
Estimated cost per month for maint. Fire Prot. " 800.00

VII. Comments - The University of Minnesota for experimental, health and educational work has bought approximately 3,000 acres with some 200 buildings and certain equipment at this project which constitutes the main industrial area. This purchase has a twenty-five year recapture clause. The University is presently bidding on approximately 100 other buildings under a current GS program. A large percentage of underground and aboveground utilities will also be operated by them.

Therefore, Dopher Ordnance Works would prove a very desirable facility to list under the National Security Clause for special attention looking forward to possible reactivation.

Attachment 5

A. A. Larson, Chief
Maintenance Section

A. E. Hildermeier
Technical Specialist

7 December 1946

5

Report on Visit to Copher Ordnance Works - W-Minn-16

Herein are reported the findings and recommendations resulting from a visit made by the writer and J. E. Larson, Technical Specialist, to the Minneapolis Regional Office, and to the Copher Ordnance Works near Rosemount, Minnesota, October 30 to 31, 1946. This trip was made for the purpose of determining the status of the various utilities with respect to maintenance and ultimate disposal of the subject property, and of obtaining other incidental information. A chronological travel report was submitted by the writer to Mr. A. L. Sherman, Chief, Custody and Management Branch under date of 5 November.

I. STATUS OF THE PROPERTY

General

Copher Ordnance Works, covering an area of 11,994 acres, was declared surplus to the War Department by SOS-5 dated 10 January 1946. The property was classified on March 8 as agricultural (11,184 acres), industrial (680 acres) and residential (10 acres comprising the isolated staff house area). By reclassification of 18 July and 27 August, 697 buildings on the agricultural and industrial areas were designated as "war housing and other structures for use off-site." Demolition was authorized on 26 March 1946. Custody was assumed by WAA on 15 May 1946. The group of 20 staff residences was turned over to F.W.A. and is completely occupied.

Considerable amounts of manufacturing and other equipment have been removed and disposed of; also warehoused or stockpiled on-site. Demolition of buildings has been under way since 5 September. All powder magazines not yet demolished are empty and no powder remains in storage on the site. However, certain decontamination work remains to be done, including the burning of at least 14 buildings. Negotiations are in progress looking to the acquisition of 8,500 acres of land, some 180 buildings, a great deal of equipment and large portions of the utilities by the University of Minnesota, under an application of 15 July 1946. Pending decision on the University's application, these buildings, equipment and utilities remain "frozen". At the time of this visit, the University was about to submit its revised inventory of the property wanted, and the Regional Office was taking steps toward having outside consulting engineers make an appraisal based on such inventory. The University authorities, being anxious to enter upon at least certain portions of the property, the matter of giving them an interim permit was under consideration.

There is appended hereto a map on which are indicated:

1. The contaminated buildings to be burned.
2. The buildings wanted by the University.
3. The buildings, not wanted by the University, which are available for warehousing activities.
4. The buildings that have been or are to be demolished.
5. The buildings desired by the University but presently assigned to the Warehousing Division.

The land desired by the University is outlined on the map, and the co-ordinate system used in describing locations of structures in the University's application is indicated on the map margins.

The "personal property" still on the site is of the following categories:

1. The terminal inventory property declared surplus by the Corps of Engineers, and the powder production machinery and other equipment, accountability for which has been assumed by WAA. This includes the material still in its original location in buildings, as well as material resulting from demolition operations and now in warehouses or storage yards.

2. Corps of Engineers equipment, not declared surplus, which may be used in demolition operations.

3. Other War Department material, not surplus and soon to be shipped out, including administrative and automotive equipment.

4. Surplus from site-sale, stored in six warehouses and accountability for which had not yet been transferred from the Corps of Engineers to WAA.

5. Surplus property shipped in from outside Gopher Ordnance Works and stored in buildings being used for Minneapolis Warehouse Center No. 4, being operated by a Warehouse Company.

Decontamination

Most of Gopher Ordnance Works was never in operation, but so-called lines "B" and "C" were used in producing about 80 million pounds of explosives over a period of six months, and line "A" was used for the primary process only. Consequently, these particular structures and areas became contaminated.

All powder-storage magazines were emptied, and the decontamination required under OCE regulations for standby condition has been done, but additional decontamination is necessary before the property can be turned over for public use. Such further work will be necessary on certain industrial pipe lines, sewers and ditches which handled these explosives, and perhaps also some land areas.

has been accomplished

There are a number of buildings which, unless used for their original purposes, have been recommended for destruction by burning. Fourteen of these are on land desired by the University, but the buildings themselves are not included in the University's application. The buildings in this category are:

106 B & C	112 B & C
108 B & C	115 B & C
109 B & C	120 B & C
111 B	705 F

has been destroyed JAF

On the other hand, certain contaminated buildings are among those wanted by the University, with the intention of using most of them for their original purpose. If this intention is formally signified, these buildings will not have to be decontaminated. The numbers of these buildings are:

201 A		712 A	
201 A		712 A	
202 A		712 B	
203 A	(Sulf. Acid)	725 A	(Laundry)
203 A	(Nitric Acid)	726	

Two others, numbers 240 A and 240 B, wanted by the University, will not be used for their original purpose and so will need more decontamination. – has been accomplished JAF

Certain items of equipment also will need more decontamination before being disposed of to the University or anyone else. Other items of equipment, wanted by the University for their original use, could be turned over to them without further decontamination.

Incidentally, buildings 220 A through 220 H, though apparently safe enough for any use except the storage of food, are wanted by the University for that very purpose.

The War Department, in October, was requested to make an estimate of the cost of the additional decontamination, including the burning of the designated buildings. Presumably a matter of $200,000 or so would be involved, of which roughly half might be for decontamination of equipment.

Presumably the described decontamination will be done by the Corps of Engineers, either through the existing demolition contract, or by a separate contract. Steps toward having this work done should be initiated as soon as practicable, though some of it may necessarily be delayed until the situation regarding the University's request is entirely clear.

II. PRESENT ON-SITE ACTIVITIES

General

Since the date of take-over by WAA, 15 May 1946, protection and maintenance is being performed under a contract with Standard Construction Company.

Demolition is proceeding under supervision of the Corps of Engineers through a contract with Standard-Anderson-Commonwealth Company.

Salvaged building material resulting from the demolition is being shipped to FPHA and Veteran's Administration.

The Ordnance Department and Corps of Engineers are winding up their affairs (other than those connected with CofE supervision of demolition work), and War Department non-surplus material is being shipped out.

A large site-sale is in preparation by the Regional Office, in which will be included many railroad flat cars and other rolling stock, construction machinery, valves, fittings, electrical equipment, etc.

Minneapolis Warehouse Center No. 6 (for surplus property shipped in from plants other than Gopher) is being operated for the Warehousing Division by Security Warehouse Company. A special sales program was being contemplated by the Regional Office for disposing of this material, which is stored in the large warehouses 325 A and 325 B, which would release these buildings for storing material from the demolition work.

Separate groups of personnel are connected with each of these activities, and it is estimated that there are daily on the reservation about 1,000 persons, 600 of whom are on demolition and salvage work.

Demolition

Demolition work was started on 5 September 1946 by the contractor, Standard-Anderson-Commonwealth Company, under Corps of Engineers supervision. The immediate program of demolition includes the 689 buildings and other structures set in the University's request and not being used as warehouses, shops, offices, etc., in connection with the various on-site activities. The staff residences are, of course, excluded from the program. These operations began with dismantling of the mills and pumping stations at the Mississippi River and with the powder storage magazines in the south end of the reservation, is progressing northward through the westerly manufacturing area, and some work already has been done in the easterly manufacturing area, although most of the buildings there have been "frozen" pending disposition of the University's application. The work on the present program was on 15 November, reported 22.6% completed and estimated to be finished in June 1947.

In so far as it was possible to observe during this visit, at all places where work was under way, the workmen demolishing buildings and removing equipment were exercising due care not to damage the latter.

There has recently been under consideration a plan for discontinuing the contract demolition work, clearing out the equipment, and then disposing of the buildings, in place, for removal.

Protection and Maintenance

Standard Construction Company took over on 16 May 1946, and for the period ending 31 October had the following personnel on strictly maintenance and protection work:

Administrative and Office:			
Manager	1		
Storekeeper	1		
Stenographic, clerical, bookkeeping	3		
Telephone Operators	5		10
Field:			
Superintendent	1		
Carpenters and helpers	2		
Electricians	2		
Plumbers and Steamfitters	2		
Pump Operator	1	)Operating water supply,	
Boiler Operator	1	)sewage treatment and	
Firemen	8	)heating	
Janitor	1		
Laborers	5		
Truck Driver	1		
Caterpillar Operator	1		
Truck Maintenance Crew	5		27
Guards:	25		
Firemen:	10		45
		Total - Protection & Maintenance	80

In addition, this contractor had the following forces engaged in moving personal property and preparing shipments of material to FPHA and Veterans Administration:

Traffic Manager	1	
Shipping Clerk	1	
Typist	1	
Weighmaster	1	
Locomotive Engineer and Conductor	2	
Mechanic	1	
Oiler	1	
Switchman	1	
Laborers	4	
Total - Shipping		13

The field maintenance crew of 87 is, in the writer's opinion, an entirely reasonable number, and it is noted that this force does not include certain classes of personnel usually required in maintenance work, for instance, repairmen for automotive equipment. Apparently such work and other special services, when needed, are rendered by the maintenance contractor by the demolition contractor's larger facilities on "work orders", a practice which undoubtedly is economical.

At first sight, 40 firemen and guards seems an unnecessarily high figure, but in view of the several distinct activities under way on the reservation and the many persons engaged in them in scattered locations, the writer considers such a force not at present out of line. Theoretically, the maintenance and protection contractor may be not responsible for property which is in the hands of another contractor for demolition, or for the property being operated as a warehouse center. However, in actuality it is not practical thus to divide the responsibility for protection of the property. This is especially true where, as here, the different operations are not on separate areas but are going on side by side, often on identical areas; it will become increasingly true as demolition proceeds in portions where only part of the buildings are to be demolished.

Again, the large amount of in-and-out traffic requires policing. Particularly the outgoing! This property should go through a single, responsible channel, that is to say, the maintenance and protection contractor. The numerous sub-shipments of all sorts of material originating with the several different activities on the site should be given careful examination and control. This requires personnel, and whether they are called checkers or inspectors or guards i immaterial. If this service is not performed by the guard force, then it should be done by an equivalent number of the administrative staff.

When operations are going on in many different places, the hazards and necessary vigilance increase, and disposition of the protective force should be flexible. There should always be a guard or two available for assignment to a specific locality.

And there are other factors tending to swell the force of guards needed: Minnesota's long and severe winters add to the dangers and need for protection. Prompt discovery of trouble is essential. The Gamewell fire alarm system is no longer in use. There is no A.D.T. system and no watchman's watch-clock system for control of the guards. There are but a few telephone stations outside the administrative area.

While a total guard-fireman force of about 88 would be considered sufficient for inactive maintenance, the writer does not feel that under the conditions [illegible] at the time of this visit any substantial reduction in the total force of guards and firemen would be advisable, although perhaps the number of firemen might be reduced to about 18 if the policy of the Protection Section can be carried out to the fullest possible extent, i.e. to have as

guards persons with previous fire-fighting experience and to assign them definite duties with the firemen. It is said that not a few of the present guards have such training.

It goes without saying that, as activities diminish, the number of guards should be correspondingly reduced. Meanwhile, attention is called to the correspondence between the Protection Section and the Chicago Regional Office on or about 5 October 1946, to the effect that, for the time being, reduction of the force of 45 guards and firemen may be postponed if the added cost of the protection personnel ascribable to demolition work is charged to the demolition operations.

At the time of this visit, only one regular patrol car was in really usable condition. As a consequence, patrolmen were dependent on borrowing cars from others, for example, the Ordnance Department, and were said to be not getting around as they should. Only the single car was equipped with two-way communication. Under present conditions and in the writer's opinion, there ought to be not less than three patrol cars constantly in good running order, and fitted with two-way radio.

The fire equipment consists of two pumpers, with a capacity of 500 gpm and 750 gpm respectively. There are also two 1,000 gallon tank trucks and one crash truck. It should be mentioned here that in case of a major fire, help could no doubt be obtained from the City of South St. Paul, or even from the Twin Cities. There is also a volunteer fire department in the adjacent village of Rosemount, which should be available.

XII. UTILITIES MAINTENANCE AND DISPOSAL PROBLEMS

A. WATER SUPPLY

General Operation

Operation of the water supply system for fire protection and all needs of the various activities on the reservation is being commercially handled. It is not requiring the full time of any employee, but is being looked after as a part of the duties of the fire chief, with the help of some men of a group of seven, who also take care of the sewage treatment plant and heating. One of these men is classed as a "pump operator". Repairs to the distribution system, when necessary, are made by other employees of the maintenance crew. A certain physical improvement, to be discussed later, can be made in the distribution system.

Wells and Pumps

There are two drilled wells of large capacity on the property, located where indicated on the accompanying map. Each well is fitted with a deep-well turbine pump driven by a 300 h.p. electric motor and having a capacity of about 2,000 gpm under the 80 psi pressure normally maintained in the watermains. Both pumps discharge through short connections of 14-in. pipe directly into the "domestic", or "drinking water" distribution system hereinafter described. The wells and motors are housed in small wooden shanties.

The water is not metered, but the present daily pumpage is estimated (from time of pumpage and size of elevated tank) at 100,000 to 120,000 gallons.

Well No. 2 is being used for all normal pumping, Well No. 1 as standby. A Wallace & Tiernan chlorinator has been installed at Well No. 2. Chlorination should be performed regularly at both wells, and for this reason both pump-houses will have to be heated in cold weather. No other treatment of the water is provided or needed.

Since abandonment and dismantling of the Mississippi River pumping stations mentioned below, these two drilled wells constitute the only existing source of water for both domestic and fire use for the entire reservation with the exception of the remote group of 25 staff residences. Consequently, both of the wells, together with their pumps, motors and electric services must be kept in use as long as the Government is carrying on maintenance, demolition or other activities on the area. Both wells, together with their pumps and motors, are among the structures desired by the University of Minnesota for permanent use.

Domestic and Fire Distribution Systems

There are at present in use only two of the existing four separate but largely co-extensive systems of mains: one for domestic supply, the other for fire protection. These two systems cover the administration, shop, and easterly

manufacturing areas completely, but probably only partially the westerly manufacturing area. There are no watermains of any kind in the shipping magazine area in the southerly portion of the reservation. The isolated staff residence area has its own separate system, fed from the municipal system of the village of Beaumont.

The many miles of mains in the domestic system are from 4 in. to 12 in. in size, not counting the numerous service branches of smaller sizes. The equally extensive fire mains, including branches to sprinkler systems in buildings, as well as many thousands of feet of 8-in., 6-in., and 4-in. lines which were installed for temporary fire protection during the construction period, are up to 12 in. in size. The pipes are said to be either black steel or cast iron, laid generally at a depth of seven to eight feet in sandy or gravelly soil with few boulders. The total quantities are not available. The plans on file at the site show only the approximate locations and the sizes of pipes, and indicate neither the kind of pipe (i.e. whether steel or cast iron) installed in any given place, nor whether parallel pipes of the two systems were laid in the same trench and how far apart they are. Indeed, there is no assurance that all the lines were actually constructed where the plans show them.

The distribution systems are not requiring much maintenance work. Breaks have been few. Leakage from the fire system is estimated by the operator to be about 25,000 gpd. This leaves between 75,000 and 125,000 gallons as the daily total draft on the domestic system, its leakage included. These figures do not indicate an alarming amount of leakage. There are roughly 1,000 persons on the site daily.

Originally, the fire mains were supplied with untreated water from pumping stations near the Mississippi River, some two miles from the reservation, while chlorinated water from the two drilled wells described above was used for supplying the domestic system. Now that the river stations have been dismantled, both systems are supplied from the drilled wells. These wells, however, are directly connected only to the domestic mains. There is no known cross-connection between the two systems of mains, so the present arrangement for getting water into the fire system, as described to the writer, is as follows:

> On the ground near Well No. 2 is a 100,000 gallon steel reservoir which has a valved pipe connection with one of the domestic mains running nearby. This reservoir is kept filled with water from the domestic system, i.e. with well-water, by frequent manipulation of the valve. In two wooden shanties adjacent to the reservoir, there have been installed an electrically driven centrifugal pump, and for standby, two gasoline-engine driven pumps. Taking their suction from the reservoir, any of these three pumps, through a short connection, can pump stored water into a main of the fire system, which here runs near and parallel to the domestic main. Such pumping is done daily and often enough to keep replenished the elevated wooden tank to be described later. The electric pump delivers materially more than 500 gpm at the 80 psi normally maintained in the fire system. Each gasoline-driven pump is rated at about 400 gpm.

Thus, all water for fire purposes must first be led into the ground storage reservoir and thence re-pumped into the fire mains. In case of a break in the domestic main between the deep wells and the reservoir, the amount of water available for fire-fighting would be limited to that stored in the reservoir, and in the 100,000 gallons elevated tank (the water tank described below), at most a total of 400,000 gallons. The present arrangement is inconvenient, requires frequent attendance (to open and close the valve, fill the reservoir and operate a pump), and introduces an unnecessary bottle-neck and also human factor hazard into the fire-protection facility. These weaknesses could be corrected by the simple device of installing a cross-connection, say 16-inch, between the two mains, preferably near Well No. 8; better still, one near each well. Such cross-connection would not introduce a health hazard, because the water in both systems is derived from the same safe source. The connection should be valved in order to enable the closing of the connection in the event of a break in either system.

With this inexpensive improvement, the two distribution grids would become virtually a single system, fed directly from the two wells and with the water stored in both of the elevated tanks instantly available for fire-fighting. Routine operation of the ground storage reservoir could thus be eliminated, but that reservoir should be kept filled and ready for use if a power failure should put both well pumps out of commission for a considerable period of time.

As demolition of the buildings proceeds, sections of these distribution systems should be shut off as soon as no longer needed, in order to avoid maintenance expense and waste through leakage; in fact, some parts of the domestic system have already been closed off. But considerable portions of the two systems of mains will have to be kept in operation as long as Government activities continue on the area. The University of Minnesota authorities wish to take over large portions of both these systems for permanent use.

Ramsey Mill and River Water Supply and Distribution Systems

Besides the domestic and fire water systems discussed under the preceding heading, two extensive systems of pipes, now out of commission, were installed for supplying the high quantities of water needed for manufacturing processes. This water came from two sources.

One of these sources consisted of two so-called "Ramsey" wells located about a mile apart on the Mississippi River flat, two miles or more from the reservation. These wells furnished a relatively clean ground-water, which was pumped from each well to a booster pumping station, also located near the river. From there it was re-pumped to two six-million gallon storage reservoirs on the reservation (402 A and 402 B on the map), out of which it was pumped into the so-called "Ramsey Water Distribution System" of underground pipes for distribution to the manufacturing areas.

The second source was the Mississippi River itself. Raw river water was pumped by a large pumping station, located at the river and adjacent to the aforementioned booster station, to the same reservoirs just described (a partition in each reservoir divides it into two approximately equal compartments, to keep the Ramsey water separate from the raw river water), whence

it was pumped through the "Raw Water Distribution System", hereinafter described, to the places where needed.

The brick and tile well houses and pumping stations near the river have been dismantled and stripped. They are to be advertised for sale, but probably can be disposed of only for wrecking, if at all, unless perhaps to some hunting or boating club. Both wells have been filled with earth. Dangerous pits and holes in buildings are to be securely and permanently covered or filled.

Reservoir 402-B is being demolished. The other reservoir is intact and is the only portion of the Ramney and Raw Water Systems desired by the University.

The pipe-line from the Ramney wells to the booster station is about a mile long, probably of concrete and perhaps 42-in. in diameter. From the Ramney water booster station and the adjacent river water pumping station, the plans in the 402-E show twin lines of 42-in. concrete pipe -- one for each kind of water -- running as far as the reservation fence, a distance of two miles or more. There each apparently divides into a 30-in. and a 24-in. branch, the 24-in. branches leading to reservoir 402-B, the 30-in. to reservoir 402-A. Information regarding the exact total lengths and other details concerning these pipes was not available at the site. But the writer has reason to believe that 42-in. as well as 48-in. pipe, may actually have been installed; that they are of the "Lock-Joint" patent type and consist of steel cylinders made of plates 14 feet long, welded together to form 28 feet lengths; that they are lined on the inside with concrete placed by the Bamo centrifugal process; that they are reinforced against internal pressure with steel wound onto the cylinder and protected by a shell of concrete pneumatically sprayed on; that the joints probably are of the ball-and-socket type to allow for settlement; and that they were made at the site by the American Concrete Pipe Company of Los Angeles, who probably also had the contract for their installation.

Since the use of all these supply lines has been permanently abandoned, they do not present any maintenance problem. However, all the manholes ought to be filled with earth, as has already been done in part.

The distribution pipes for the Ramney and river water cover largely the same territory as the domestic and fire mains, except that they do not extend to the Administration area or south of the 8,000 co-ordinate. Like the domestic and fire mains, they probably were but partially completed in the area west of the 18,000 co-ordinate. To a large extent they may have been laid in the same trench together, or even in the same trench with pipes of the domestic and fire systems, though on this question the available information is not clear. The plans show these pipes to be from 3-in. to 24-in. in diameter, and they are probably black steel or cast iron. No maintenance work is necessary, because these systems are out of commission.

Disposal of the supply pipes from wells and river to the storage reservoirs, and of the distribution systems for the Ramney and river water, will presently be discussed as two separate problems. No part of either of them is wanted by the University.

Elevated Tanks

There are only two elevated storage tanks (see map for locations), one on the domestic distribution system near Hall No. 8, the other centrally located on the fire system. The former is of steel, has a capacity of 50,000 gallons and its overflow level is about 180 feet above ground. The latter is a 100,000 gallon wooden tank having its overflow at approximately the same height. The tanks float on the mains, so that by virtue of their heights, the water pressure usually maintained in both systems of mains is about 80 psi. Under present conditions, the water stored in either tank is available for immediate use only in its particular distribution system. If, on the other hand, the cross-connection recommended in the preceding section were installed, the two systems would to all intents and purposes be transformed into a single one, and then both the elevated tanks could feed either system. Steam heat for winter operation is being provided.

The function of the 100,000 steel ground storage reservoir, located near Hall No. 1, has already been described.

All three of these tanks should be kept in service so long as any Government operations continue. They are desired by the University.

Disposal of Water Distribution Systems

It is seen from the foregoing that there are four (or even five, if the small lines installed for fire protection during construction are separately counted) distinct sets of underground water distribution pipes on the reservation, namely the domestic, fire, Ramsey water and river water systems.

The University of Minnesota wishes to take over for permanent use most of the pipe-lines of the domestic and fire distribution systems lying east of the 18,000 ea-estimate, but nothing west thereof. It has prepared maps, on the basis of the War Department's plans left on file at the site, showing on a scale of 800 feet to the inch the lines they want in that territory, estimated to comprise 88,600 feet of 1½ to 14-in. pipes of the domestic system and 74,000 feet of 2 to 12-in. pipes of the fire system, complete with valves and about 100 hydrants. The lines in the same territory which are not wanted are indicated also and consist mostly of branches 8-in. or less in size. (These maps are identified by their numbers 3066-2, sheets 1 through 7 and 3066-4, sheets 1 through 3.) The University is not interested in any part of the Ramsey water and river water systems.

As long as Government operations continue on the property, considerable portions of the domestic and fire systems must remain in use.

Now the question is: how, after it is finally decided exactly what portions of the domestic and fire lines are going to be turned over to the University, can the largest possible salvage value be recovered from the remainder of this multiplicity of pipe-lines?

These four distribution networks are in such close relation to each other that, from the standpoint of possible salvage operations, they can only be considered together; it would be impractical to treat them as separate salvaging projects.

The problem is further seriously complicated by the lack of data regarding the type of pipe in any given location, the precise relative position of the several parallel pipe-lines, and even their actual extent. As has been mentioned, the plans available at the site do not disclose that information, yet it is on just those matters that the cost of removal and the value of the recoverable materials chiefly depend; and these, in turn, determine which lines, if any, it will pay to dig up. For example, although it certainly would not pay to remove the very small-sized lines, it might be profitable to salvage cast iron lines, perhaps even steel lines as small as 6-in. if they are so close to a parallel line that both can be removed by excavating a single trench. Obviously, if, on the basis of only the meagre information at hand, anyone should buy these underground systems in place, for removal, he would be buying a pig in a poke. Unless, therefore, this important detailed information can be obtained and clearly presented to prospective bidders, -- which is doubtful, and in any case probably would entail laborious search through construction records of the War Department or its rent Company, followed by the preparation of new and intricate drawings -- nothing like the best obtainable price would be realized for the salvageable parts of the systems, especially if the bids were taken on the usual lump-sum basis. More favorable bids could be expected if taken on a unit price basis, the purchaser to pay his bid prices for the quantities of the various kinds and sizes of pipe, fittings and valves (down to the minimum sizes named in his contract) actually recovered, and with suitable safeguards to prevent skimming off the cream and leaving the rest. A workable and equitable plan of this kind could be devised, and bids could be compared by applying the bidders' unit prices to a list of estimated (but not guaranteed) quantities published in advance. This method would largely offset the unfavorable effect of the bidders' uncertainty regarding the quantities of the different types and sizes of pipes, valves and fittings which actually exist in these lines. However, it still would not result in bids which would adequately reflect the extent to which two of more pipes may actually turn out to be recoverable by a single trenching operation.

In view of these contingencies and special circumstances, it is suggested that consideration be given to employing a contractor, on a cost-plus-fixed-fee basis, for demolishing the economically salvageable portions of the distribution systems for stockpiling and sale. By such a flexible contract, only such pipe-lines need be ordered dug up as would clearly yield a return exceeding the cost of their removal under the conditions discovered as the work proceeds. Under competent day by day direction by WAA, this procedure appears to promise the highest obtainable return for these surplus distribution systems.

In any event, it would be premature and impractical to take steps toward either sale-for-removal or demolition-for-salvage of any portions of the four underground distribution systems until (1) it is definitely determined what parts of the domestic and fire lines are not going to be disposed of to the University, and (2) all buildings have been removed from an area of such extent that a sufficient mileage of water pipes to provide a good-sized salvaging project can be released from further use.

These conditions are not fulfilled as yet, but both should be by next April, the earliest time of year when it is practicable to do this kind of excavating in Minnesota.

Whenever pipe-lines turn out to be economically unsalvageable, the hydrants and larger valves should of course be advertised for sale by themselves, and the pipes abandoned.

Disposal of Masonry and River Water Supply Lines

As discussed under the preceding heading, the disposition of the distribution lines for masonry wall and river water is a problem not separable from that of the domestic and fire systems. On the other hand, the large-size concrete supply pipe from the Masonry walls to the booster pumping station, and the twin supply lines of large diameter concrete pipe from the booster station and adjacent river pumping station to the storage reservoirs 402-A and 402-B, must be treated as a separate and entirely different kind of problem.

These supply lines are not wanted by the University. However, they are probably not so deep in the ground but that it would pay to salvage them for use -- within economical transportation distance -- if not as pressure conduits, at least as storm sewer or culvert pipe; for pipes as large as these are costly to make. After obtaining the most complete data possible regarding the specifications to which the pipe were made, the quantity of each size and the depth of earth covering, every effort should be made to dispose of them by sale for removal, either wholly or in part. Publicity should be given among nearby state, county and municipal highway and other public works officials, and more widely, to even distant contractors and manufacturers of large-sized concrete pipe, a number of whom do business on a regional or even national scale, including of course the Lock-Joint Company and the concern which made or installed these pipes. If the entire lot is not disposed of all at once, it may be possible to retail the lines bit by bit over a protracted period of time. And if the lines or any parts of them prove unsaleable in place, it may still be possible to obtain offers on an f.o.b. basis which would be profitable.

Under the climatic conditions in Minnesota, removal of the pipes would be impracticable before the latter part of next April.

B. ELECTRIC POWER

Electricity is supplied by the Northern States Power Company. Two transmission lines originally served the area; one, a 115 KV line from their Rogers Lake substation approximately 15 miles to the north, and, two, a 69 KV line taken off from their 69 KV line feeding the village of Rosemount at a point just north of that village. Only the portions of these transmission lines located on the reservation and the 115 KV transmission line to the river pumping stations are the property of the U. S. Government.

Service on the 115 KV system has been discontinued and power is now supplied over the 69 KV line to a metering station located within the reservation at a point just north of the administrative area. From this point, the line passes south of the administration buildings, thence south to a 6000 KVA substation (No. 405 on the map), where the voltage is reduced to 13,800, and feeds the

power distribution panel located in the main boiler house; electric energy is now supplied under a contract which ever without change by the War Assets Administration on June 15, 1946. This contract is based on an estimated demand load of 800 KW, the demand charges being calculated on the highest average rate for 15 minutes, but not less than 80% of the highest demand as determined during the preceding 11 months, nor less than 5 KW; these charges are:

First 10 KW of maximum demand	$6.00/KW.
Next 40 " " " "	3.00/ "
Next 50 " " " "	1.80/ "
Next 100 " " " "	1.70/ "
Excess	1.60/ "

Energy Charge:

First 1,000 KWH	$.020/KWH
Next 2,000 "	.015/ "
Next 10,000 "	.012/ "
Next 50,000 "	.010/ "
Next 50,000 "	.0090/"
Next 100,000 "	.0080/"
All additional "	.0070/"

And recent power bills have been:

July	$1,091
August	1,161
September	1,096

At present the demand is about 800 KW and as demolition progresses, requirements for power are lessened and certain portions of the electrical distribution system will become available for disposal.

The electric power contract should be reviewed and renegotiated with the Northern States Power Company, to obtain the lowest rates possible and so that any demand or standby charge will be equitably adjusted as the load is progressively reduced.

An example of the manner in which this may be accomplished is illustrated by the contract of the Ohio Public Service Company for services to Plum Brook Ordnance Plant. Four metering points are covered and the contract reads:

> "Each meter will record on one continuous strip chart the total 30 minute integrated KVA demand of each 33 KV circuit. The monthly demand shall be the 30 minute maximum integrated KVA demand recorded on the continuous strip charts at the 33 KV metering locations at the Plum Brook Ordnance Works plus the identical period demand recorded on the meters at the Lakeside Pumping Station and Cedar Point Pumping Station. This monthly demand shall be used in computing the bills for the current month only, in which the readings are taken."

The University of Minnesota has prepared a series of drawings showing the extent of the lines in their request, as well as the portions of the system that are not needed by them. They are requesting approximately 450,000 feet of power lines and 200,000 feet of light lines, including 2,000 poles, 29 lighting transformers and 45 power transformers.

It does not appear that operation of the electrical distribution system can be improved on at this time, as these portions of the system not now in use have been disconnected.

A temporary insulated enclosure was to be erected around the live distribution panels in the operating manual power house and sufficient heat supplied to prevent damage to the electrical equipment from condensation.

The Northern States Power Company has evidenced interest in the purchase for removal of the transmission lines not to be turned over to the University of Minnesota, including the 110 KV line serving the river pumping stations and the transformers located in substation #20 #4. They might possibly be interested in the custom distribution lines as well.

When definite disposition has been made of the University of Minnesota's application, the remaining power and light lines, poles and transformers can be advertised for sale for removal insofar as these not needed for Government activities on the site.

6. [illegible], AND OVERHEAD AIR LINES

The main boiler plant (#21 A) is completely shut down in standby condition except for the electric distribution center mentioned above. It consists of five Combustion Engineering Company boilers rated at 150,000 lbs. of steam per hour per boiler at 225 psi and 450°F. Each boiler is a complete operating unit in itself with the exception of the feed water treatment, coal handling and ash handling systems, which are common to all boilers. Each boiler is fired by pulverized coal and is served by its own pulverizing unit consisting of a 9-ft Raymond Bowl Mill and its appurtenant equipment and rated at 60 tons per hour.

Steam was distributed over the reservation at three different pressures through pipe lines ranging in size from 24-in. to 2-in. The steam pressures delivered to the system were 225, 100 and 150 psi. Compressors in the boiler plant building furnished compressed air to a system of overhead pipes about the manufacturing area.

The University of Minnesota has requested the building and two of the boiler units, leaving three of the units for other disposal. If these three remaining boilers are sold and removed from the site, a portion of the feed water treatment system would also not be required and could also be sold, including some of the filters and pumping equipment.

The University of Minnesota has also requested portions of the steam and air overhead pipe lines and they have prepared a series of drawings showing the extent of these lines included in their request, as well as those portions that are not wanted by them. They are requesting approximately 46,000 feet of steam pipe ranging in size from 3/4-in. to 12-in. and 28,000 feet of air pipe ranging in size from 1-in. to 6-in.

When definite determination has been made on the University of Minnesota's application, the remaining overhead steam and air lines can be advertised for sale for removal, except for those heating lines needed for Government operations on the site.

No particular maintenance problems are involved. The heating is being supplied as economically as possible. Heat is now, or will be, furnished to the administration buildings, fire station, shops, sewage plant and two water tanks by seven separate coal-burning boiler installations in small temporary buildings. Space heaters were in use in the sewage plant and warehouses and to furnish heat in a few spots pending completion of the temporary boiler installations. No data were available on the amount of fuel required.

Operation of the large central heating plant would not be economical under present circumstances as the heating load would be small in comparison to the capacity of even only one of the boilers. Distribution line losses would be high for the useful load carried. However, if the University of Minnesota takes over and operates the main boiler plant, arrangements could be made with them to furnish heat for the Government's requirements and there would be no further need for these isolated heating boilers, for steam could be supplied through the distribution system remaining.

D. SEWERAGE

There are two systems of sewers on the reservation, one for sanitary sewage, the other for industrial wastes. They cover both the east and west industrial areas and parallel each other to a considerable extent. A note on the file plan states that both systems were 100% completed.

Mains of the industrial system extend as far south as the 10,000 co-ordinate and consist of 8-in. to 36-in. pipe, with individual branches as small as 6-in. This system connects with a wooden box sewer, 8½ feet x 4 feet in size, extending from the easterly edge of the west manufacturing area across the southerly part of the east manufacturing area, where it is joined by another 8½ x 4 feet wooden box sewer from the north which forms the outlet for most of the easterly manufacturing area. From this junction point, a 4 x 8½ foot wooden box outfall sewer runs southeasterly to its outlet in the Vermillion River. The pipes of this system are said to be vitrified clay sewer tile, but it is possible that concrete pipe was used, especially for the larger sizes.

The sanitary system extends as far south as the 9,200 co-ordinate and consists of 8-in. to 18-in. mains with 6-in. service branches, probably all vitrified clay sewer tile. There is one sewage pumping station, No. 610 A, which lifts

all the sanitary sewage from the westerly manufacturing area through a 6-in. force main 650 feet long into the easterly system. It is a small, frame building. The sanitary sewers end at the small sewage treatment plant, SF A on the map, whence the clarified effluent enters the nearby wood box sewer of the industrial system described above. In addition to this extensive, principal system, there are half a dozen small isolated ones of 6-in. to 8-in. pipe. Each terminates in a septic tank. The principal one of these isolated systems serves the administration area, and is provided with a system of underdrains for the septic tank effluent.

The industrial system is entirely out of use. The wood box outfall sewer, common to both the industrial and sanitary systems, has been intercepted by a tile outlet sewer running to an abandoned gravel pit not far from the treatment plant, where the treated effluent from the sanitary sewers is adequately absorbed in the ground. Thus, it is not now being discharged into the river. With the present activities on the site, the daily flow arriving at the treatment plant is only between 12,000 and 15,000 gallons per day.

The treatment plant, SF A, of recent construction, consists of a coarse bar screen, two rectangular primary clarifying tanks with automatic sludge-scraping and skimming mechanism, a sludge digestion tank and sludge drying bed. These provide only so-called "primary" treatment. Only one of the clarifiers is in use. The sewage arriving at the plant is lifted into the clarifiers by means of two automatically controlled pumps. A chlorinator is provided in this building for sterilizing the treated sewage, but since the effluent is not being discharged into the river, the use of chlorine is now not necessary. The building has to be slightly heated in cold weather to prevent freezing of the clarifier tank due to the present small flow. Heat is provided by a small, temporary boiler in a nearby wooden shelter.

Portions of the collecting systems of sanitary sewers including the lift station and treatment plant, must be kept in use so long as Government activities continue on the site. No particular maintenance problems are involved in operation of the sanitary sewerage system. The sewers require insignificant attention, and the treatment plant and lift station need looking after only occasionally during the day shift. There is but one operator, who also has other duties. The field crew would be called upon for any necessary repairs or flushing of mains.

The University's drawing no. 3069 of October 14, 1946 shows the sewers of both systems wanted by the University and those not wanted. The total length of all mains in its application is apparently about 14 miles. According to these drawings, the University has requested all of the sanitary sewers in the easterly manufacturing area, with the exception of some 6-in. and 8-in. branches; also four of the outlying, small, individual sanitary systems, including that for the administration area. It does not want any part of the sanitary sewers in the westerly manufacturing area (i.e. west of the 18,500 co-ordinate) nor the lift station and its force main which serve that area.

The industrial sewers requested by the University consist only a portion of those in the easterly area, together with the wood box sewer which serves them

and runs all the way to the Vermillion River. They desire some of the industrial sewers in the westerly area, nor the steel box sewer serving them only.

It would pay no one to dig up the smaller sizes of sewers, say those less than 18-in. Consequently, there will be no part of the sanitary lines to salvage, since none of them are over 18-in., and all portions of the sanitary system that will not be turned over to the University can only be abandoned after they are no longer in use to serve activities on the area; and all small-sized sewers of the industrial system, if not turned over to the University, can be immediately abandoned because they are no longer in use.

It may not be impossible, however, to find purchasers for the sewers in place, of say, 18-in. diameter and over. Therefore, all industrial sewer lines of that or larger sizes, which will not be turned over to the University, should be advertised for sale for removal. They could be disposed of at any time, because none of the industrial sewers is needed for Government operations, but it will be more advantageous to wait until the University's application is finally acted upon, so that all sewer sewers can be offered at one time.

As in the case of the water mains, prospective bidders should be furnished the estimated total lengths of each size of sewer, their locations and depths at each manhole, and whether they are vitrified tile or concrete. Bidders should be permitted the privilege of limiting their bids to any desired kind, size or sizes and depths. Climatic conditions in Minnesota make it impracticable to dig up any sewer lines before the latter part of next April.

All cast iron manhole rings and covers on lines not disposed of and abandoned should be removed and stockpiled for sale, and the manholes filled with earth.

The lift station, not wanted by the University, can be stripped of all equipment and salvageable material as soon as operations in the west area are completed and sewerage service there is no longer needed.

E. RAILROAD TRACKS

The large amount of standard-gauge trackage on the site connects with the C.M.St.P.&P. RR, whose main line is west of the reservation, and the C.&O.W. RR east of the reservation. The University wants a considerable amount of this government-owned trackage, including the classification yard, a total of 200,000 feet of 40 lb. to 110 lb. rail. Some of the large remaining amount is already no longer needed; more will be released from use as demolition progresses.

All trackage no longer needed for operations on the site and not reserved for the University should be advertised for sale for removal, if this has not already been done. Steel can be removed in winter, but salvaging of ties, when the ground is frozen, would entail undue expense.

F. [redacted]

Telephone service is at present furnished through five trunk lines from Saint Paul and five from Minneapolis. The switchboard is owned by the telephone company, the lines about the reservation by the Government. There are only a few telephones in operation outside of the administration area. Five operators are employed.

The University apparently does not want the existing installations, which therefore can be disposed of when Government activities cease.

IV. CONCLUSIONS AND RECOMMENDATIONS

1. The earliest possible final determination regarding the disposition of the University of Minnesota's application is of paramount importance. Uncertainty regarding this question has made it extremely difficult to program the disposal of utilities, buildings and other property.

2. With a cost estimate by the Corps of Engineers as a basis, decision regarding the further decontamination to be done should be made and the work started as soon as practicable, although some of it may necessarily be delayed until the matter of the University's request is definitely settled. (Discussion on page 5.)

3. Insofar as it was possible to observe during this visit, at all places where work was underway, the demolition workmen were exercising proper care not to damage machinery and equipment (page 6).

4. The protection and maintenance contractor's protection force is not excessive for present conditions, in the writer's opinion, but as fast as demolition and other activities diminish, the number of guards should be correspondingly reduced. It is believed that not less than three patrol cars, in good condition and fitted with two-way radio, ought to be constantly available (pages 6-7).

5. The water supply and distribution system, including the two elevated tanks and the 100,000 gallon ground storage reservoir, as now being operated, must remain in service as long as Government operations continue on the site, except to the extent that sections of the distribution systems can be released as demolition of the buildings progresses. It is adequate and is being economically maintained and operated (pages 8-10).

6. It is recommended that a present weakness, from the fire protection standpoint, be corrected by the simple device of cross-connecting the parallel mains of the two separate distribution systems now in service, in order that they may operate as a single system (page 10). Continual chlorination should be practiced at each of the two wells whenever they are in operation. Heat must be provided for the chlorinator rooms.

4. Disposal of the salvageable portions of the four separate but closely related networks of pipe-lines should be considered a single problem, and it would be impractical to attempt to program it as separate salvaging projects. Owing to special circumstances, it is believed that the larger sizes of pipes in the four distribution systems can be economically salvaged, and that this can be done to best advantage by employing a contractor on a cost-plus-fixed-fee basis to salvage the pipe in certain portions of these four systems for stockpiling and sale. If administratively this is not considered feasible, then, as an alternative, it is recommended that proposals in place for removal be called for on a unit price basis, for reasons and in the manner explained in the body of this report on pages 12 and 13. In any event, it would be premature to initiate the salvaging of any portions of the four underground distribution systems until (1) it is definitely determined what parts of the domestic and fire lines are not going to be disposed of to the University, and (2) all buildings have been removed from an area of such extent as to release from further use a sufficient mileage of water pipes to provide a good-sized salvaging project. The hydrants and larger valves on these underground pipe lines which are found to be economically unsalvageable should be separately sold (pages 13-14). Actual removal of water mains cannot be done until next spring.

5. All manholes on the concrete pipe-lines which supplied Ramsey well and raw water and are now permanently out of commission, should be filled with earth for safety. Every effort should be made to dispose of the large concrete supply lines of the Ramsey and raw water systems by sale for removal, or on an f.o.b. basis, as discussed in the body of this report (pages 11 and 14). The stripped Ramsey well pump houses and the river pump station should be advertised for sale. It is doubtful that they can be disposed of except for the purpose of wrecking.

9. It is recommended that the electric energy contract with Northern States Power Company be reexamined and renegotiated to obtain a more favorable one to the Government under diminishing use conditions (page 15).

10. When a definite determination shall have been made of the University of Minnesota's application, the excess portions of the electric transmission and distribution systems and overhead steam and air pipe lines no longer needed for Government activities can be disposed of in place for removal (page 16).

11. Under present conditions, the heating is being handled as economically as possible. If and when the University of Minnesota takes over the operation of the large boiler plant, arrangements should be made with it to supply the heat required for Government operation, thereby releasing the several temporary heating plants (page 17).

12. The sewage disposal system is being economically maintained and operated and only to the extent actually necessary. Certain portions of the sanitary sewers, including the single lift station and treatment plant must be kept in use so long as Government activities continue (page 18).

12. It will not pay to salvage any part of wood box sewers or of the sanitary sewer lines, and all portions thereof that will not be turned over to the University can only be abandoned after they are no longer in use to serve activities on the area. All small size sewers of the industrial system which is entirely out of commission, except such as will be turned over to the University, can at once be abandoned (page 18).

14. For industrial sewers of 18" diameter or over, on the other hand, it may not be impossible to find purchasers, in place, for removal. Therefore, all industrial sewer lines of that size or larger which will not be turned over to the University should be advertised for sale. It would be advantageous to wait with such advertising until the University's application is finally acted upon, so that all common sewers can be offered at one time. Bidders should be permitted the privilege of limiting their bids to any desired kind, size or depth of pipe line. In any event, removal of such pipe could not be undertaken until next spring. All cast iron manhole rings and covers of abandoned sewer lines not disposed of should be removed and stockpiled for sale and the manholes filled with earth (page 19).

15. The sewage lift station, which is not wanted by the University, should be stripped of all equipment and salvageable material as soon as operations in the west area are completed and sewerage service there is no longer required (page 19).

16. All railroad trackage no longer needed for operations on the site and not reserved for the University, should be advertised for sale for removal, if this has not already been done. Steel can be removed in winter but salvaging of ties is better done when the ground is not frozen (page 19).

17. After conclusion of all Government activities, the Government-owned portions of telephone equipment and lines should be advertised for sale.

18. It is recommended that a copy of this report be forwarded to the Zone Administrator at Chicago.

19. It is recommended that a copy of this report be transmitted to the Deputy Director for Real Property Disposal of the Minneapolis Regional Office for his consideration of the suggestions contained herein.

20. It is recommended that a copy of this report be transmitted to Mr. E. J. Killingsen, Director of the Industrial Division.

21. It is recommended that a copy of this report be transmitted to Mr. William Hoffman, Chief of the Protection Section, for his information and comment.

88. It is recommended that additional copies of this report be made available to such other Divisions, Branches and Sections of the War Assets Administration as might find the information or suggestions contained herein of use.

J. E. LARSON, Technical Specialist
Custody and Management Branch
Property Management Division
(As to electrical and heating sections)

A. S. MILINOWSKI, Technical Specialist
Custody and Management Branch
Property Management Division

Attachment 6

WAR ASSETS ADMINISTRATION
Chicago 4, Illinois

TO: Mr. James S. Harvey — July 10, 1946

FROM: O. E. Cohrs

SUBJECT: Explosive Ordnance Works
Rosemount, St. Paul, Minnesota
Survey made on July 1 and 2, 1946

3

WA - Min - 1C

WD - 366

Your examiner contacted Messrs. Carl O. F. Peterson, Chief, Real Property Disposal Division; Glen E. Klemm, Assistant; Otto Hunter, Engineer; E. J. Galbraith, Fire Prevention; O. E. Chalberg, Fire Chief, V. F. W. Hunter, Guard Chief; also Mr. Ray Johnson of the Standard Construction Company, Inc., in securing data relative to the operations of this ordnance plant.

General Information. Subject plant is located approximately 20 miles south of St. Paul, Minnesota, just east of Rosemount, Minnesota. Land area is approximately 12,100 acres of which 4,000 acres comprise operating area inner fenced. Outer fencing encloses the entire area with all gate entrances locked or guarded.

Construction. There are approximately 604 buildings with a combined building area of 2,222,000 square feet. WAA Brochure, AP-20, a part of this file, identifies all major buildings of subject plant by number, designation, exterior construction, overall size, square feet area, etc., too numerous to outline in this narrative report.

Buildings are grouped in series from 100 to 900 and are from 1 to 4 stories in height, mostly 1-story. Structural frame is mostly wood with some steel and concrete. Exterior walls finish varied: sheathing, drop siding and cement asbestos; brick; concrete and brick. Roof construction principally wood, some steel. Generally 4-ply built-up roof. Flooring is varied - wood, concrete and soil.

General building areas comprise the following:

Staff residence area
Administration area
Service (Shop and maintenance)
Explosive storage and shipping area
Safety areas (unoccupied lands)
Sewage and waste disposal
Water supply
Powder plants
Acid areas
Nitrating area
Powder manufacturing area
Recovery area.

Plant is subdivided into two divisions, namely, A, B and C lines which were completed and the D, E and F lines which were not completed and consequently dismantling was performed.

(D)

Water Supply and Distribution Systems. There are no City water lines serving this plant. Two deep wells, equipped with manually-operated, electrically driven turbine pumps, each one unit, force water to a 50,000 gal. steel chlorinated drinking water tank at 128 foot elevation. This water is returned by gravity or pump pressure to a 500,000 gallon reservoir for fire protection purposes. All water is treated both for drinking and fire protection.

Two manually operated gas-driven pumps, 500 GPM capacity, adjacent to reservoir pump water from 500,000 gal. reservoir to charge the underground loop system and also fill a 100,000 gal. overhead gravity tank. Maximum of 75# pressure can be maintained on fire lines.

The 7,000,000 gal reservoir has been disconnected and conditioned as a standby. Two Kenney wells discontinued. Pumping station at river front has been shut down. This station originally took suction from Mississippi for raw water supply to plant.

Power and Lights. Northern States Power Company furnish power and light to this plant. Originally the installation consisted of one line, 110,000 volts, 3 phase, 60 cycle transformer on line, 30,000 KVA, and 1 line 69,000 volts, 3 phase, 60 cycle transformer on line 6,000 KVA. The 110,000 volt line has been de-energized. The 69,000 volt line remains with no emergency circuits set up. It was thought advisable not to make any radical changes which would involve considerable expense until disposition of plant was decided upon. Exterior lighting has been eliminated except a few street lights were required. Interior lighting has been minimized and the KW demand materially reduced to minimum.

Telephones. Of an original 50 incoming 2-way trunk lines, 10 are now in use, namely, 8 from Hastings and 2 from Minneapolis. Plant operates a two-position dial board of 200 lines of which 71 will remain in use with 26 extensions. Board operates 24 hours, 7 days a week, with 1 operator to each 8 hour shift and a relief operator. Instruments are being removed from some sections and other sections require additional instruments from time to time. A list of locations for the 71 instruments and 26 extensions is a part of this general file.

Heating. Power house building 401-a, located in the A, B & C line area, comprises 3 vertical tubular high pressure steam boilers with a total capacity of 900,000# of steam per hour. Pulverized coal fired and fed by blower system. Overhead steam lines feed entire area. Power house has been completely shut down and being conditioned as standby.

Powerhouse building 401-B was not completed and a portion has been dismantled.

Decentralized heating is provided for such areas as may require heat this coming season, namely; 2 boilers for administration building, 1 for fire house, 1 for shop area. Floor type radiators provide heat.

Sewage and Water Disposal. Plant equipped with sewage disposal facilities. Present method is by surface draining the area and discharging into Vermillion River thence to the Mississippi River at Hastings, Minnesota. Waste water is chlorinated with H-T-H, carried to settlement tanks and digester units, and forced through 8" line. Pressure flow from station by gravity 8# blocks to gravel pit with 40' drop flow to ground. Three Chicago electrically-driven

submersible pumps are used in handling this water program. Each pump has a 100,000 gal. capacity for each 24-hour period. Plant handles 12,000 gallons waste water in 24 hours.

Gas. All gas lines and connections have been shut down and no gas is used for any purpose.

Vehicles. Several trucks and other vehicles on hand are to be declared surplus. [redacted] Construction Company have been assigned 4 or 5 cars; 1 station wagon was sold during the week.

Sales. Some sales activities are in progress and additional site sales operations are scheduled for the immediate future. No further information available.

Plant Shipments. Warehouse buildings 222-a and 222-b have continual flow of material and equipment in and out of the area, approximately 18 trucks a day. These shipments move on loading manifests and various shipping documents. Trucks are check in and out.

Corps of Engineers have movement of property from its warehouses which will continue for the next four months, ship approximately 8 to 10 carlots daily. Ordnance ship coal, acid and chemicals approximately 18 cars a day.

Visitors. Approximately 75 visitors call at the plant daily for various reasons and are controlled by Visitor Register and guards at headquarters. Identification badges are furnished to all visitors. Registration Nos 4 and 6, 406

Ordinary and Special Hazards. Bulk storage of acids, chemicals, etc., is being moved entirely day by day.

Power lines, transformers, distribution line transformers, switches and all electrical connections well protected.

Bulk storage of smokeless powder in excess of a million pounds is being flashed off at approximately 15,000# per day.

Very little gasoline storage on hand and underground.

371,000 gal. ethyl alcohol to be moved.

D, E & F lines not having been completed sets up fire hazard as fire hydrants extend to buildings in this area and water tanks and pumpers are required.

Lack of adequate first aid fire extinguishers in warehouse buildings 222-a and 222-b and the fact that these buildings are not sprinklered sets up hazard.

Smoking in the warehouse buildings areas contributes to fire hazards.

Oil leakage on floor and on barrels in Bay 4, Section 22-23, Building 222-b, contributes to fire hazards.

Storage of flammable liquids in Building 222-b contributes to fire hazards.

Exposures. Buildings in various numbered groups being mostly of frame construction and not sprinklered obviously expose each other.

3, 5 & 7 Ln area does not have full fire protection as afforded A, B & C line area. This 3, 5 & 7 Area has but few temporary hydrants installed during the early construction period which are not dependable at this time. If a fire occurs in this area, the source of water supply is two 1000 gal. water tank trucks, hardly adequate for a fire of any proportion. Ordinary type hand extinguishers are of little value if lightning or short circuits started a fire. Constant vigilance is necessary and prompt action of the fire department is essential to continued protection.

No reduction in present fire department personnel is advised or recommended at this time. When demolition is complete and activities cease, reductions are in order as later outlined herein. Four grass fires reported in month of June. Weeds now overgrown constitute an exposure to buildings and the weed cutting program should be stimulated at once. Cutting by hand and mechanically is now in progress but not sufficient to eliminate the exposure hazard. Attention should be given to weeds adjacent to the powder magazine area.

Fire Protection. Plant is under fairly good local fire protection but certain corrections are needed to rate the plant as good. Being 20 miles out of St. Paul the plant does not have the advantage of paid city fire department protection and is entirely dependent upon its present force of 18 men plus whatever aid the guard force can furnish in emergency.

The Ordnance fire department is well organized and consists of 18 men, i.e., 1 chief, 4 captains and 13 firemen. Chief is on from 8 am to 4:30 pm, 5 days and subject to 24-hour call. There are four shifts of a captain and 3 firemen and 1 relief man, who relieves captain men who have a day off which is not the same as the day off for the balance of the men on that particular shift. Crews operate three 8-hour shifts with 1 shift off. Shifts rotate and work 48 hours a week.

Originally the plant had an inspection group but this has been dispensed with. In view of this much duties as checking condition of fire extinguishers, hose-keeping, fire hydrants, condition of plant roads and various other duties in the field are now taken care of by various members of each shift whenever it can be arranged. The guard patrol has been given the responsibility of checking all buildings in the administration area hourly each night for fire hazards.

All firemen and a portion of the guards are thoroughly trained in all phases of fire protection. The remaining guards should receive fire protection training. It is essential at this time to maintain present fire crew to man engine pumper in emergency. It may develop that more than 1 engine pumper will be required. Firemen are kept busy with equipment an maintenance duties and constantly checking pumps, tanks and reservoir for efficient operation.

A well-equipped fire station houses the following major equipment:

Engine #1 - Chevrolet (crash truck) with 500-gal. booster tank and a 250 GPM high pressure front mount pump, including ladders, extinguishers, etc.

Engine #2 - International truck with 500 GPM rotary pump, 1000' of 2½" and 750' of 1½" fire hose, 400 gal. booster tank and 150' of 1" hose.

Engine #3 - Chevrolet with 500 GPM pump, 1000' 2½" fire hose, 500 gal. booster tank and 150' of 1" hose. Foam Generator and 600# foam powder.

Tank truck #1 - 1000 gal. capacity - accompanies Engine #3 in outer areas.

Tank truck #2 - 1000 gal. capacity - accompanies Engine #2 in outer areas.

1 Ambulance.

Additional hose, 2500' - 2½" R.J. fire hose and 2500' - 1½" R. J. fire hose plus other equipment. Semi-annual hydrostatic tests are given all hose.

Maintain Engines #2 and #3, also trunk trucks #1 and #2 in conjunction with engine operations until the demolition program is complete, then cut off Engine #2 and tank truck #2 for protection on a shut down basis. Eliminate crash truck #1 as not essential. Maintain ambulance during demolition program. This may be released following completion of program.

The underground system consists of 8", 10" and 12" supply fire mains, totally looped and covers the entire A, B & C line area and a small part of the D, E & F line area. 200 fire hydrants are distributed along the line approximately 300' apart and a pressure of 55# to 60# is maintained at all times. Most of the hydrants are provided with dual 2½" outlets but no 4½" pumper connections.

178 hose houses with 150', 500' or 800' of 2½" fire hose are distributed throughout the A, B & C line area. Most of these hose houses are to be dismantled and the fire hose removed and declared surplus at a later date.

Two leaks in the underground, one on the west and south side of the mid area and one on the east section of the 824 series buildings have cut off 5 hydrants in the first group and 6 hydrants in the latter area. These leaks should be corrected before additional leaks decrease the line pressure too greatly.

Sprinkler Systems. Originally there were 137 automatic systems (wet and dry) in service. As of June 10, 1945, there were 84 dry and 53 wet operating. All of these systems have been shut off and drained with the following exceptions where they are believed to be necessary:

3 wet systems - Combined shop area Building 717-A
1 wet system - Fire house building 709-A
1 wet system - Hospital area Building 708-A (Except Surg. Department)
1 wet system - Stores (Receiving Wing) Building 715-A
1 wet system - Stores (Receiving Wing) Building 715-B

Automatic sprinklers in operation are apparently in good condition and checked regularly.

Standpipes. There are 27 standpipes installed in the 700 series group area as follows:

Administration area 700-A 18 Standpipes each 50' - 1½" hose
Engr. & Hospital Area 700-A 6 Standpipes each 50' - 2½" hose
Patrol Headquarters 700-A 3 Standpipes each 50' - 2½" hose

Extinguishers. The following types of hand extinguishers are distributed throughout the area:

118 - 40gal water pump cans.
8 - 4 gal water pump cans
72 - 1 qt. Carbon Tetrachloride
8 - 2½ gal. Foam
6 - 2½ gal Soda & Acid
8 - 10# CO2
1 - 10# CO2
1 - 5# CO2
222 - Total

The following comprise stock storage:

24 - 2½ gal water pump cans
10 - 5 gal. water pump cans
20 - 1 gal. carbon tetrachloride
15 - 10# CO2
25 - 4# CO2
4 - 2# CO2
1 - 2½ Cart
10 - 2½ gal. Foam
8 - 2½ gal Soda & Acid
200 - 1 qt. Carbon Tetrachloride
317 - Total

Some buildings are inadequately supplied with fire extinguishers. As an example, warehouse buildings 702-a and 703-b have 8 and 10 - 2½ gal. pump cans respectively. Proper coverage for these buildings with a total square foot area of 80,000 each would be 32 units to each building or 1 unit for each 2500 square feet of space where no automatic sprinkler protection is furnished. All buildings in use should have extinguishers furnished on the above basis. Where automatic sprinklers are installed the extinguishers can be distributed on a basis of one unit to each 5,000 square feet of space. A list of extinguisher locations by buildings is a part of this general file.

Fire Phones and Alarms. Originally there were 21 emergency fire telephones and 118 Gamewell fire alarm boxes distributed throughout the area. The fire telephones were discontinued and equipment removed. The Gamewell system was disconnected but the equipment is still in place.

With the fire alarms system out of operation the only dependable source of fire control is the two-way radio patrol. If this radio should fail as this type of equipment sometimes does, the report on fires would be seriously delayed. Even though the radio patrol discovered a fire it would have to be relayed to the fire department through the switchboard whereas the fire alarms should be a direct connection to the fire department. Five to ten minute delays often give a fire a headway that is difficult to overcome.

This point leads to the question of inadequacy of phone service insofar as fire protection is concerned.

The switchboard operates 24 hours a day with an operator on each shift. All fire calls must clear the switchboard. At various times the night shift operators fail to show up on the job and temporary arrangements must be made to handle this problem. This was the case on July 6, 1946, when the board had no service from midnight until 8 am.

One method employed in these situations is to plug in a connecting line at the fire station and at guard headquarters. These lines permit cross content between these two departments but the calls must clear through the St. Paul or Minneapolis telephone exchanges causing delayed action not conducive to good fire control protection. During such times the building telephones in the area cannot function and any call over building phones would not register without an operator.

In view of the above, very definite advance arrangements must be made to insure an operator on the switchboard at all hours. It would be economical in the long run to reconnect the Gamewell system for direct reporting to the fire station. Of the 118 boxes installed, it is indicated that we could dispense with approximately 60 boxes in certain areas and retain 78 boxes where they are most needed. This will insure prompt action in reporting fires which may occur in the area. Such locations are indicated on the fire map, a part of this file and will support the 2-way radio patrol cars.

It is not advisable to use special assigned building phones to report fires as some of these buildings are locked over the week-end and would cause considerable delay. Moreover, the fire may be in the area where phone is located making it necessary to go to some other building to locate a phone.

Gamewell alarm boxes and locations are indicated on listing, a part of this file.

Safety and First Aid. Plant has no organized safety program. Accidents are reported to Mr. Kimm, who in turn relays them to Mr. Johnson of the Standard Construction Company for whatever action seems advisable. Apparently there are no frequency nor severity detailed records maintained; therefore, no proper analysis can be made.

Ordinary first aid supplies are made available and for more serious types of accidents an ambulance is on hand to handle such cases. Safety program should follow pattern of our safety series letters.

Housekeeping. This is the subject of a separate report.

Guard Service. 88 guards comprise this department operating on a 48-hour week, [illegible] 8-hour shifts 3 days. Guard protection consists of 1 chief, four lieutenants and 80 patrolmen.

Ten Army radio patrol cars operate throughout the area. Car patrol and guards call headquarters on the half hour. Fire house calls guard headquarters hourly. Guard posts are changed hourly. Patrol travelled 9,884 miles during June.

Distribution of guards as follows:

	1st	2nd	3rd	Total	
Main Gate #8	1	1	1	3	
Main Guard House, #1	1	1	1	3	
Gate #12 (Shoe & Sales)	1			1	(3 days)
Gate #6 (Change of shifts)	1			1	(5 days)
Patrol Car #1	1	1	1	3	
Patrol Car #2	1	1	1	3	
Repair, Etc.	1	1	1	3	
Chief (5 days)	1			1	
Saturday & Sunday Relief				9	
				28	

Distribution of day shift as follows:

Supervisory - 1
Desk & Radio - 1
Foot Patrol - 1
Vehicle Gates - 2
Inside Gates - 1
Motor Patrol - 2

No reduction of guards or fire personnel is advisable at present due to varied activities requiring close checking.

WAA sales activities are in progress in the A, B & C area. Post Engineers' Sales activities in the D, E & F area. Car patrol checks Corps of Engineers warehouse buildings. Also a foot patrol of stores and combined shops. Buildings where inventory is complete are locked. 1/2 hour fence patrol 4 times per shift. Important buildings checked hourly. Balance of buildings in area checked four times on night patrols. Occasionally check of river front is made (69 in June).

Only 1 man assigned to a patrol car which is not a satisfactory set up but for the present will have to suffice.

Guards also have personnel to clear in and out of the plant. Standard Construction Company have approximately 102, to which is added Corps of Engineers, Ordnance, Security Warehouse group, WAA, DuPont and subcontractors for Corps of Engineers making a total of over 200 persons.

With regard to truck shipments, it is difficult for one guard at the truck gate to check material and equipment out of the plant with any degree of accuracy. If material on trucks is not checked, it is quite possible to effect a loss of Government property which over a period of time would amount to a considerable figure.

Guards do what they can to check but it is only fair at the best. Most material clears on a loading continent TD-10 or a vendor's shipping document either of which is adequate for checking purposes.

One outstanding weakness insofar as possible loss of Government property is concerned is the use of a material and package pass form G-672, which in many cases authorizes the guard to pass shipment on order number without description of the items. This pass is also used for personal property clearance. Items should be itemized in ink covering outgoing shipments so guards can make a complete check.

Sticker seals are often placed on rear compartment and glove compartment on cars which have permits to pass in and out of plant. If seals are broken the guard makes a search of compartments. No much faith cannot be placed on the effectiveness of this measure as seals can be removed without breaking and replaced. However, seals can be stolen and used generally to remove property from the area. The measure is a prevention but not a safeguard.

Checkers are supposed to accompany trucks to the gates but this is only done in Corps of Engineers shipments. Security warehouse shipments do not have this service and shipments are made on vendor's shipping documents subject to guard check.

Miscellaneous activities of the patrol division during June is a part of this file.

REMARKS.

Your examiner is cognizant of the demolition program soon to be made effective at this installation. However, the recommendations as made are in the interest of present safety and fire prevention and therefore essential to such security.

Following such demolition procedure the personnel of the guard and fire forces can be reduced to minimum requirements commensurate with shut down conditions. However, the two groups, guard and fire, can be consolidated under 1 unit with 1 directing head preferably a fire chief.

As a shut down installation, consideration can be given to a further reduction in fire alarm boxes only to the extent that can be justified by conditions.

Consideration should also be given to transfer of 2-way radio transmitter to fire department headquarters for efficiency. One patrol car can be eliminated under shutdown conditions and certain other gates closed and locked.

It should be possible to reduce present personnel of 48 to 35, on the following tentative basis (to be determined later plus or minus):

8 Patrol (1 car - 3 shifts)
3 Fire Lt. Supervisors
3 Fire Engine Crew
3 Fire Headquarters (Radio Control - 3 shifts)
1 Check personnel administration building
2 Make patrol of main administration building, 2nd & 3rd shifts
1 main gate (1st shift)
1 relief and general
1 Fire Chief
2 Saturday and Sunday relief

A complete report of patrol procedure consisting of 10 pages is a part of this general file.

Maps and other reference matter is a part of this file.

O. G. Ohman
Examiner

OGO:dmj

cc: Washington office (2)
WAA Files

RECOMMENDATIONS. Recommendations submitted herein are divided into two groups. Group I to cover present emergency and Group II to cover future operations as a shutdown plant when the demolition program is completed and general activities cease.

GROUP I

1. Increase the number of first-aid fire extinguishers to a total of 88 units for each of the warehouse buildings #325-A and 325-B, based on standard requirements of 1 unit for each 2500 square feet of floor space in unsprinklered areas. Automatic sprinklered areas require 1 unit for each 5000 square feet.

2. Clean up spillage or leakage from drums of flammable liquids in Bay 4, Building 325-B, both on floor and on drum tops.

3. Suggest if possible the use of small out buildings #325-A and 325-A immediately south of main warehouse buildings for the storage of all types of flammable liquids which now contribute to fire hazards in the warehouse buildings.

4. Enforce "No Smoking" rule in the warehouse buildings 325-A and 325-B, except in offices where smoking is permitted.

5. Make necessary repairs to the roof in building 325-B, Bay #1, to prevent water leaking into building.

6. If combustible storage is to be continued in the security warehouse buildings, it is essential for continued fire protection to install a 6" standpipe system. However, as complete demolition of premises is contemplated, recommendations covering such standpipe installation is temporarily suspended until status is determined. However, it has not been fully determined if the warehouse buildings are to be heated this fall in which case standpipes would not be practical.

7. All buildings in use should have extinguishers furnished on a basis of 1 standard unit for each 2500 square feet of floor space. Sprinklered areas require 1 unit for each 5000 square feet.

8. Repair two leaks in the underground fire system, one on the west and south side of the acid area and one at the east section of the 324 series buildings where 11 hydrants have been cut out thereby reducing protection.

9. Reconnect the Gamewell fire alarm system including control unit in fire station. 40 of the 115 boxes can be cut out leaving 75 boxes where protection is most desirable.

10. Maintain 24-hour service on telephone switchboard and arrange for immediate replacement for operators who absent themselves on any shift. Discontinue the practice of hooking up St. Paul and Minneapolis emergency lines to fire house and guard headquarters to overcome absence of operators on switchboard.

11. Maintain present strength of 10 firemen and 55 guards until major activities and demolition program is completed. Reductions to be made for shutdown conditions as outlined in Group II recommendations.

12. Organize a safety program and Safety Committee to hold safety meetings weekly and maintain complete frequency and severity records. Report all accidents on standard accident forms furnished and mail copy to Safety and Fire Protection Branch, WAA, 720 South LaSalle Street, Chicago 4, Illinois. Follow basic outline of Safety Service Letters furnished.

13. Place two guards at truck gates on day shift to closely check material and equipment leaving plant against loading manifest, vendor's shipping document and package passes.

14. Replace present package pass form G-279 with WAA standard numbered package pass and follow through on requirements as indicated on such pass to effect more efficient checking of merchandise and personal property taken off the premises.

15. Maintain tool box inventory on all persons bringing such equipment into plant and recheck against inventory card when tool boxes leave plant.

16. Maintain Fire Pumper Engines 2 and 3, and Water Tank Trucks 1 and 2 for present operational also ambulance. Crash truck #1 can be eliminated as not essential. See group II (A-7) recommendation for future reduction.

17. Retain a sufficient amount of 2½" and 1½" fire hose for replacements commensurate with units now in use on pumper engines.

18. All guards should have the benefits of training in safety and fire protection and training program should be continued to effect such measures under direction of the Fire Chief.

19. Particular attention should be given to fire doors in warehouse buildings so that they do not become blocked or material stored allowed to rest against doors which might interfere with their automatic operations.

20. Overgrown weeds constitute a very definite fire hazard particularly adjacent to frame buildings and in the powder magazine area. Weed cutting program should be stimulated at once and continued until the hazards are eliminated.

21. It is not advisable to depend upon special assigned telephones to report fire as some of these buildings are locked over the weekend and would cause considerable delay. Fire alarm boxes are primary and telephones secondary on fire calls. The former being direct to fire house, the latter relayed. A few minutes delay in reporting fire may be very costly in loss.

22. Continue operation of two patrol cars with 2-way radio control for the immediate present.

GROUP II (Future operations).

A-1. Following demolition program and other activities, the fire and guard personnel for a shut down plant should be materially reduced. It should be possible to reduce from 48 to 28, on the following tentative basis, accurately to be determined later, plus or minus:

3 - Patrol (hour - 8 shifts)
3 - Fire Lt. Supervisors
3 - Fire Engine Crew
3 - Fire Engine (Radio control 8 shifts)
1 - check personnel, Administration Building
2 - foot patrol of main Administration Building on 2nd & 3rd shifts if building is to be used.
1 - main gate (1st shift)
1 - relief and general
1 - Fire chief
3 - Saturday and Sunday Relief

A-2. Combine both fire and guard protection into 1 unit with 1 directing head, preferably a fire chief.

A-3. Consider further reduction in Gamewell fire alarm boxes only to the extent that can be justified by conditions.

A-4. Transfer 2-way radio transmitter and all apparatus to central fire headquarters for efficiency of operation. Establish 1 headquarters for fire and guards.

A-5. Eliminate one 2-way radio patrol car and place other car on continuous operation.

A-6. Close and lock all gates except main entrance gate from plant and Administration Building.

A-7. Discontinue use of pumper engine #2, water truck #1, and make necessary arrangements for disposition.

G. O. K.

Attachment 7

DAKOTA COUNTY
ENVIRONMENTAL MANAGEMENT DEPARTMENT
14955 GALAXIE AVENUE

BARRY C. SCHADE
DIRECTOR
(612) 891-7011
FAX (612) 891-7031
APPLE VALLEY, MINNESOTA 55124-8579

June 17th, 1993

Mr. Robert Dempsey, PE
Engineer Manager Design Branch
US Army Corps of Engineers
US Post Office and Custom House
St. Paul, MN 55101

RE: U.S. War Department Ranney Radial Well Collectors in Rosemount, MN

Dear Mr. Dempsey:

Based upon Dakota County (County) records, the former U.S. War Department constructed four Ranney radial well collectors located on the southwest corner of the Mississippi River at the above site for use beginning in 1942 and ending in 1945. At the present time, waterways and pipelines constructed for related operations remain in the area in addition to the radial collectors. The presence of both wells and structures is posing a potential threat to public health and the environment.

Under County ordinances and State statutes, generally, a person is considered legally responsible for sealing abandoned wells unless an agreement has been specifically drawn up between the original owner of the well and the property owner related to transfer of ownership.

The U.S. War Department was identifed as the original owner and party responsible for abandonment of the above wells. The County Water and Land Management Section is contacting you to formally request necessary abandonment activities at the above site.

We would like to have the Corp submit a response with an outline for abandonment. County staff will be responsible for approving any abandonment plans for the site. In approving the plan, the County will not assume any liability for design or implementation of the plan. The Corp will remain solely responsible for ensuring that the plan results in a successful corrective action/closure, without resulting in any harm to the surrounding areas or future problems.

The abandonment plan for the site should meet all State and County requirements to match current and projected land use at the site ie: in the future, the area can be developed and used without encountering any environmental problems.

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AN EQUAL OPPORTUNITY EMPLOYER

We are concerned with several issues related to abandonment at this site and would like to have them addressed by the Corp in an abandonment plan:

1) Because of the location of the wells in the Mississippi River flood plain, a suitable plan would include the use of bentonite grout pressure pumped into pipe laterals of each well before sealing the caisson with neat cement grout and concrete.

2) A minimum baseline sampling of sediments and groundwater in the collectors should be completed before sealing activities begin to ensure that contaminants of concern are not present.

3) At least one 42-inch pipeline is currently in use by the Metropolitan Waste Control Commission for discharging effluent to the Mississippi River. The possible abandonment or long term use of this pipeline and any other facility discharges or runoff should be included in your abandonment plan.

4) Establishment of a memorandum of agreement between the US Army Corp of Engineers (Corp) and the present landowners, (CF Industries and Koch Refining Company) regarding access issues, possible joint responsibility, etc.

5) Included prior to sealing would be the removal of obstructions, equipment or anything from the wells that might interfere with sealing operations.

6) Identification of any other possible parties involved in ownership of the radial collectors.

7) Define long term uses for any remaining buldings and waterways and any other associated structures remaining on the property.

Please contact me at 891-7549 or Ron Spong at 891-7542 if you have any questions regarding this matter.

Sincerely,

Pamela Farr
Environmental Specialist

cc: Koch Refinery
CF Industries
Metropolitan Waste Control Commission