PA.03-4

Aerospace

PA.3

Contract No. W-7405-eng-26

Health and Safety Research Division

PRELIMINARY SITE SURVEY REPORT FOR THE FORMER SUPERIOR STEEL MILL AT CARNEGIE, PENNSYLVANIA

T. E. Myrick
C. Clark

Work performed
as part of the
REMEDIAL ACTION SURVEY AND
CERTIFICATION ACTIVITIES

April 1981

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
operated by
UNION CARBIDE CORPORATION
for the
DEPARTMENT OF ENERGY

CONTENTS

LIST OF FIGURES

LIST OF TABLES

PRELIMINARY SITE SURVEY REPORT FOR THE FORMER SUPERIOR STEEL MILL AT CARNEGIE, PENNSYLVANIA*

Introduction

A portion of the former Superior Steel Company facility, located in Carnegie, Pennsylvania, was utilized under contract with the Atomic Energy Commission from 1952 to 1957 for the handling and milling of uranium metal. This processing consisted of a combination of salt bathing, rolling, brushing, shaping, cutting, stamping and coiling, depending on the desired final product. A schematic of the operations conducted in 1955 is presented in Fig. 1. Due to this treatment and handling, large quantities of radioactive dust (principally uranium) were generated during operation. Ventilation of this airborne material was provided to varying degrees during the operational life of the plant, although the system was probably not adequate to prevent contamination of the working environment. No details of the post-operative facility decontamination are available.

At the request of the Department of Energy, a preliminary radiological survey at the former Superior Steel plant was conducted on July 31, 1980, by members of the Health and Safety Research Division at Oak Ridge National Laboratory (ORNL). The site visit was intended to provide information on the present condition and use of the former mill area and to determine the need for a detailed survey.

Site Description

The building that originally housed the uranium-handling facilities is owned by Lange Machinery of Coraopolis, Pennsylvania. The site manager is Bob Cahlan. The large steel structure (see Fig. 2) is divided into three basic areas, the former mill area (area A), the former motor room (area B), and the former rolling area (area C) as shown in Fig. 3.

Area A (Figs. 4 and 5, approximately 24,000 sq. ft.) originally contained the salt bath, roughing mill, brushing station, finishing stands and shear, and was the location where the majority of the uranium metal handling and shaping is believed to have occurred. Only portions of the roughing (breakdown) mill were intact during this survey, all other machinery had been removed and sold or scrapped in previous years. The roughing mill has since been removed. Subfloor pits (approximately 8 ft. deep) over which the former mill, brushing station, finishing stands and shear were originally located are presently being filled in with rubble, with final plans for concreting the surfaces over at floor level.

---

*The survey was performed by members of the Off-Site Pollutant Measurements Group of the Health and Safety Research Division at Oak Ridge National Laboratory, under DOE contract W-7405-eng-26.

The former mill area is presently being utilized in the rebuilding of coke oven doors. During the rebuilding process, significant quantities of fine coke is removed, part of which becomes airborne and settles out on surrounding surfaces. Years of this operation have resulted in coating the north end of the building with a layer of this material (up to 2 inches thick on the floor).

Area B (Fig. 6) housed the former motor room and control panels for the mill. This area (approximately 8250 sq. ft.) contained the large motors that provided power to the mill equipment in the adjacent room (area A). This area was considered the "clean" side of the mill, where the atmosphere was controlled to provide proper conditions for motor and instrument operation. The area is now being used for storage purposes.

Area C (Figs. 7 and 8, approximately 12,000 sq. ft.) was originally the location of the tail end of the mill process where the metal was rolled for shipping, or prior to further handling. Two pits at the south end of the building (Fig. 9) indicate the prior locations of the bliss downcoiler and upender. Both pits are currently being filled in with rubble, with plans to concrete to floor level upon completion. The area is sealed off from the former mill area (area A) by a sheet-metal wall, and is used primarily for storage purposes. A small storage shed is attached to the west side of the building at the south end (Fig. 10).

Several parts of the original roughing mill and shear were located in a storage warehouse at the industrial park, also owned by Lange Machinery. This machinery was being stored prior to shipment to buyers. A list of the known buyers of the original mill equipment is provided in Table 1.

Survey Procedures

The preliminary radiological survey of the former uranium mill facility consisted of: 1) an external gamma-ray scan of floor and lower wall surfaces in all buildings, 2) fixed alpha measurements on floor and wall surfaces at random locations in all areas, 3) beta-gamma dose rate measurements at selected locations, 4) external gamma radiation and fixed alpha measurements on original machinery surfaces, and 5) sampling and analysis of mill residues. The present conditions at the facility (coke dust, debris in pits, stored materials covering floor) reduced the extent of the survey in certain locations. Future, more detailed surveys, could only be performed after a significant amount of building cleanup had been completed.

The instrumentation utilized in the performance of this survey included a gamma scintillation survey meter, a beta-gamma sensitive GM tube (with open/closed window option), and an alpha scintillation survey meter.

Survey Results

Area A (Former Mill Area)

The gamma-ray scan of this area indicated evidence of low-level contamination in the former roughing mill area, in and around the open pits (see Fig. 11). Gamma-ray exposure rates 2 to 8 times the background level for the building were measured in this area (up to 50 μR/h in open pit). Gamma radiation levels tended to increase toward the bottom of the pits, although, in this area, the bottom could not be reached due to the presence of fill rubble. Gamma radiation levels in the former finishing stands area where the pits had been concreted over were at background values. Beta-gamma measurements in the pit area ranged from 0.01 to 0.04 mrad/h. Fixed alpha levels on walls, floors, and machinery in area A showed no evidence of significant radioactive contamination, with a maximum recorded reading of approximately 50 dpm/100 cm^2.

Area B (Former Motor Room)

The gamma-ray scan of this area showed no evidence of radioactive contamination. All measurements were at the background level, except for stacks of bagged cement material which read up to 30 μR/h at the surface. This slightly elevated activity is attributed to natural radioactivity present in the cement. Random fixed alpha measurements on walls and floor showed no signs of alpha contamination (<10 dpm/100 cm^2).

Area C (Former Rolling Area)

Two areas of significant radioactive contamination were located by the gamma-ray scan of this area (see Fig. 11). The open pits exhibited gamma-ray exposure levels 2 to 50 times the building background, with a maximum reading of approximately 500 μR/h observed at the bottom of the bliss downcoiler pit. The beta-gamma dose rate at this point was determined to be 0.8 mrad/h, with a beta component of 0.3 mrad/h. The direct alpha measurements on this dirt surface yielded 640 dpm/100 cm^2. A sample of the residues present at the bottom of the pit at this location was taken and returned to ORNL for analysis. The sample was a combination of steel shavings, soil, and various other unidentified materials. The uranium content of the sample was determined to be 5800 pCi/g ^{238}U (1.4% by wt.). No other radionuclides were present in sufficient quantities to be detected. Alpha measurements taken in the area surrounding the pit also showed evidence of low-level contamination (up to 100 dpm/100 cm^2). In the upender pit, gamma radiation levels of up to 75 μR/h were recorded, although access to the bottom of the pit was restricted by rubble.

The other area where contamination was found was in the small storage shed attached to the western side of the building. This shed (as shown in Fig. 10) has a wooden floor with fill dirt under the floor. The gamma-ray scan of the shed indicated floor surface exposure rates varying from 75 to 400 μR/h, with a measurement at 1 m in the center of the room of approximately 90 μR/h. At the point of maximum gamma, the beta-gamma dose rate was determined to be 0.25 mrad/h (open-to-closed window ratio of 1:1). Direct alpha contamination at this point was

50 dpm/100 cm^2. Outside the structure, gamma radiation levels dropped off rapidly away from the shed walls, with a maximum exposure rate of about 200 μR/h nearest the corner with maximum indoor readings. Based on this information, it was suspected that the fill under the floor was the source of radioactive contamination and a sample of the material was collected from the only accessible location (not the point of gamma maximum) for laboratory analysis. The results of this analysis indicate that the material under the floor of the shed was similar in makeup to that found in the downcoiler pit. The ^{238}U concentration in the sample was determined to be approximately 1100 pCi/g. No other radionuclides were detected.

Equipment in Storage

Several portions of the former roughing mill and shear that were currently in storage were gamma-ray scanned and spot checked for fixed alpha. None of the equipment showed evidence of alpha contamination, although the gamma readings were 2 to 3 times the background level (up to 30 μR/h).

Conclusions

Based on the results of the preliminary radiological survey of the former uranium-handling facilities of Superior Steel Corporation, it was determined that residual uranium contamination from former mill operations exists in several areas of the remaining structures. Evidence of this contamination was found in the former mill room, the rolling area, and in a storage shed adjacent to the rolling area. The extent of the contamination in these areas, in particular in the floor pits below previous machinery locations, could not be adequately determined due to conditions of the buildings at the time of the survey.

Under present operating conditions, average radiation exposures to individuals working in the buildings are below the current federal guidelines for continuous exposure. In only two areas, the bliss downcoiler pits and storage shed (both in Area C), is the potential for exposure significant. Contact with the mill residues present in these locations should be minimized. In addition, time spent in the storage shed should be reduced to a minimum until a more detailed assessment of the radiological conditions in this area can be undertaken.

Prior to additional, more comprehensive radiological surveying, significant building cleanup would need to be performed. Included in this action could be the removal of rubble from the open pit areas. This operation would need to be supervised to control the potential spread of radioactive materials suspected to be interspersed within the rubble. The rubble would need to be checked upon removal for possible surface contamination, and handled accordingly.

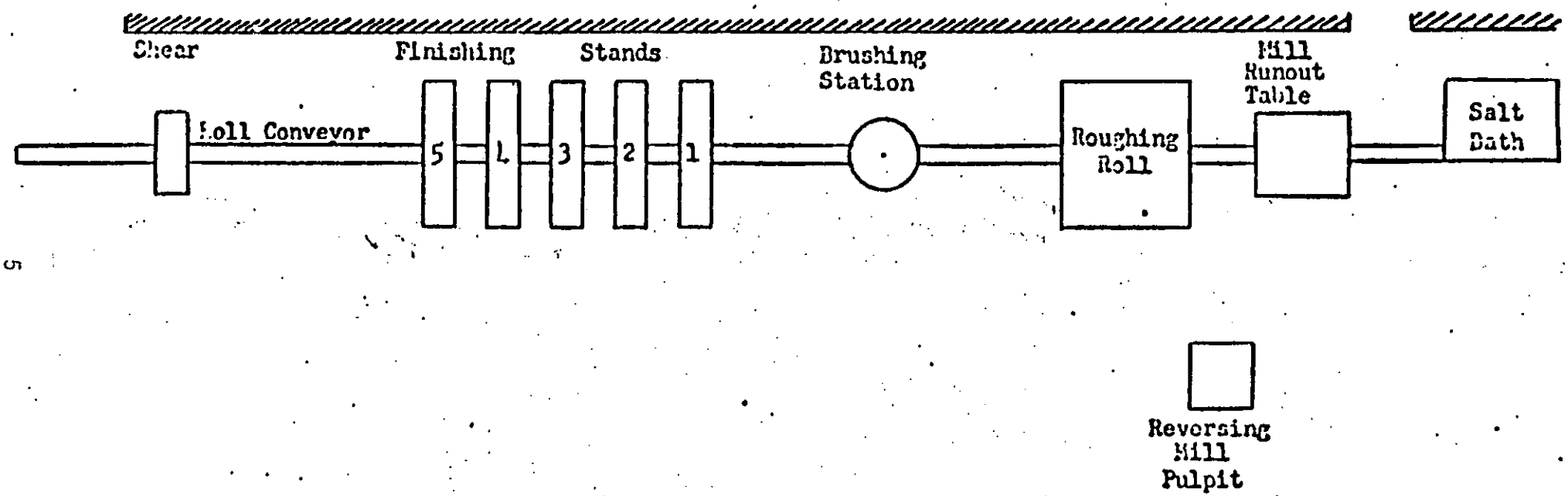

Fig. 1. Layout of hot strip uranium mill operation at Superior Steel Corporation, 1955. (Figure adapted from HASL-Superior Steel 4 report November 15, 1955.)

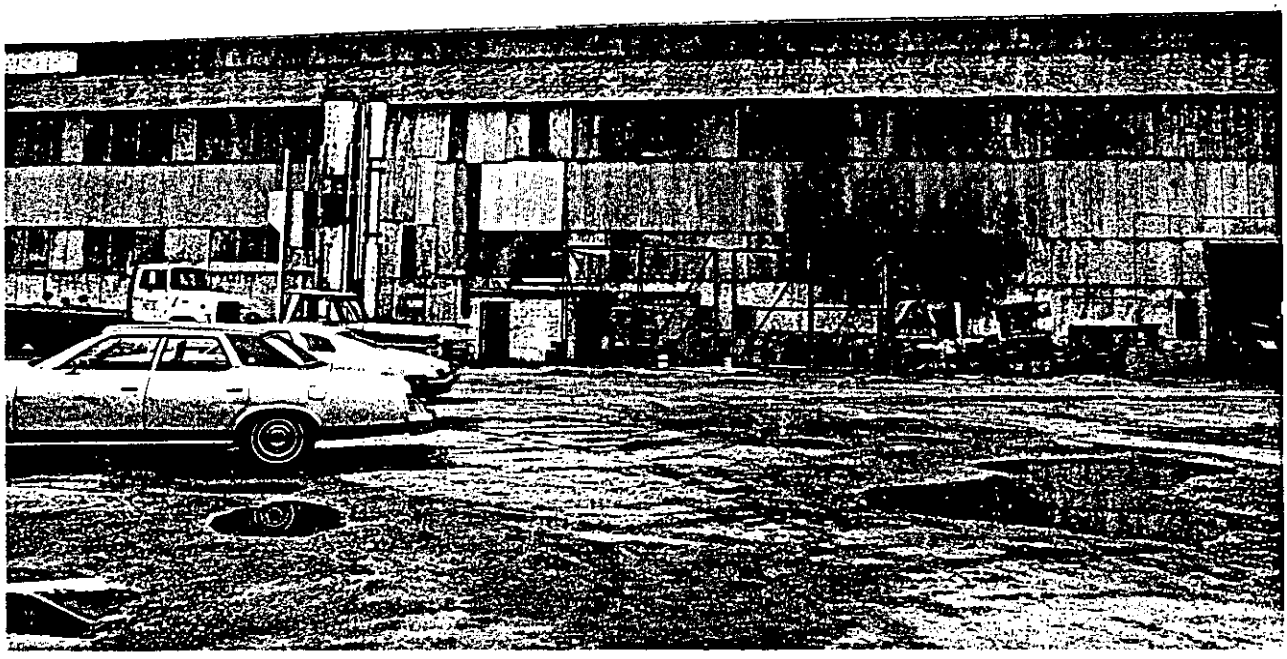

Fig. 2. Exterior view of the former uranium-handling facility at the Superior Steel Corporation Plant in Carnegie, Pennsylvania.

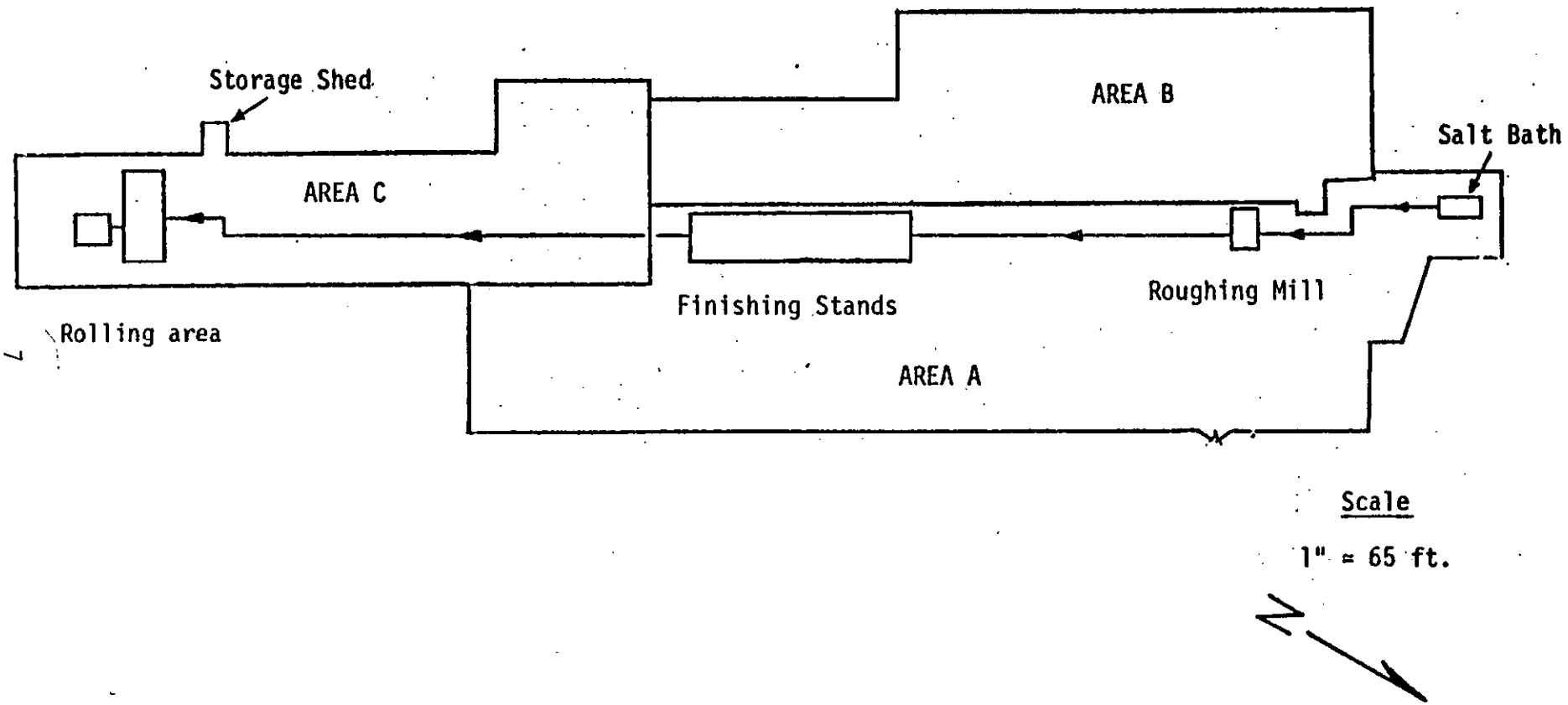

Fig. 3. Layout of former Superior Steel Facility, showing area designations and approximate locations of process line machinery.

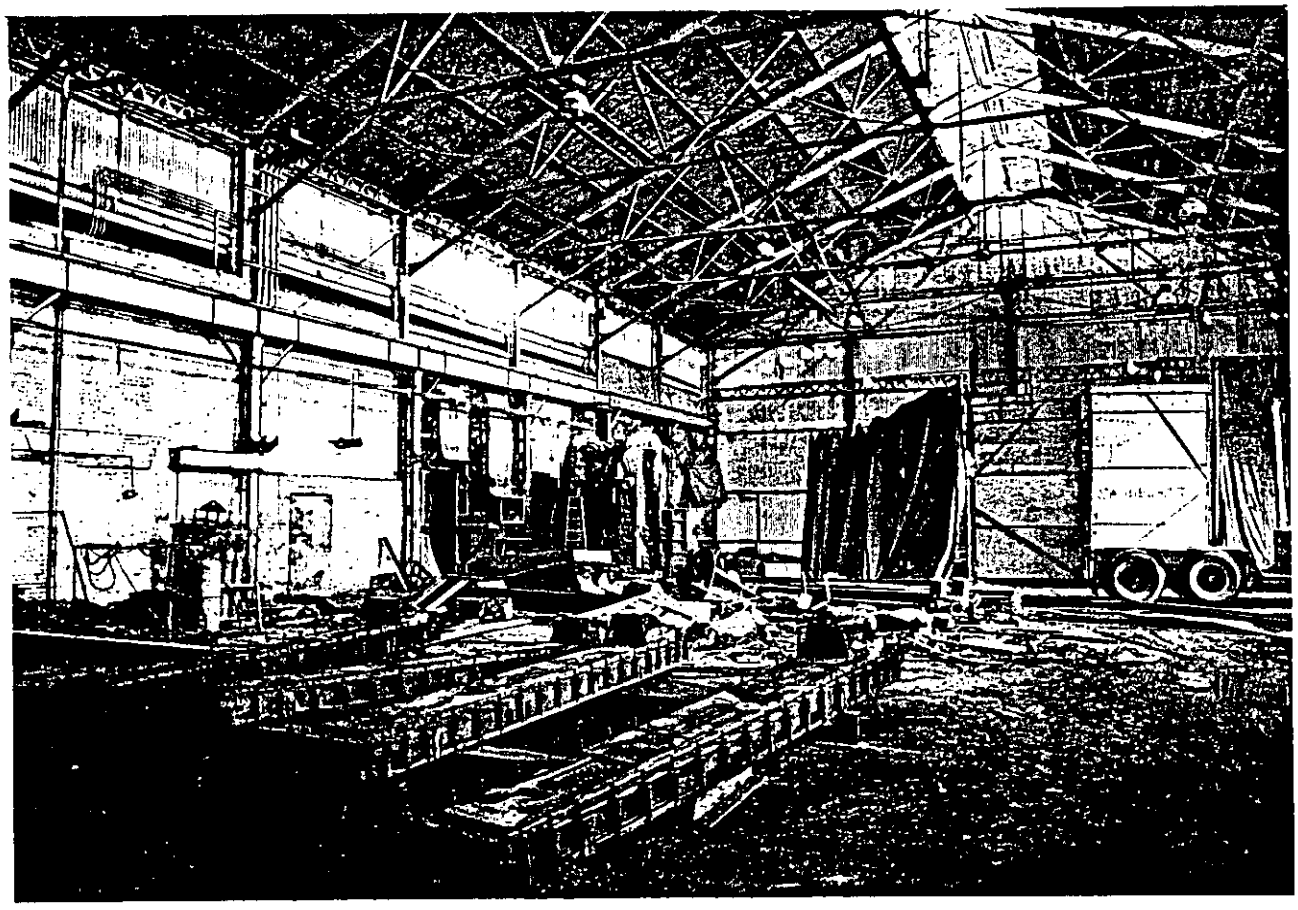

Fig. 4. Interior of former mill area (Area A), looking north. Note the remains of the roughing mill just left of center against the wall.

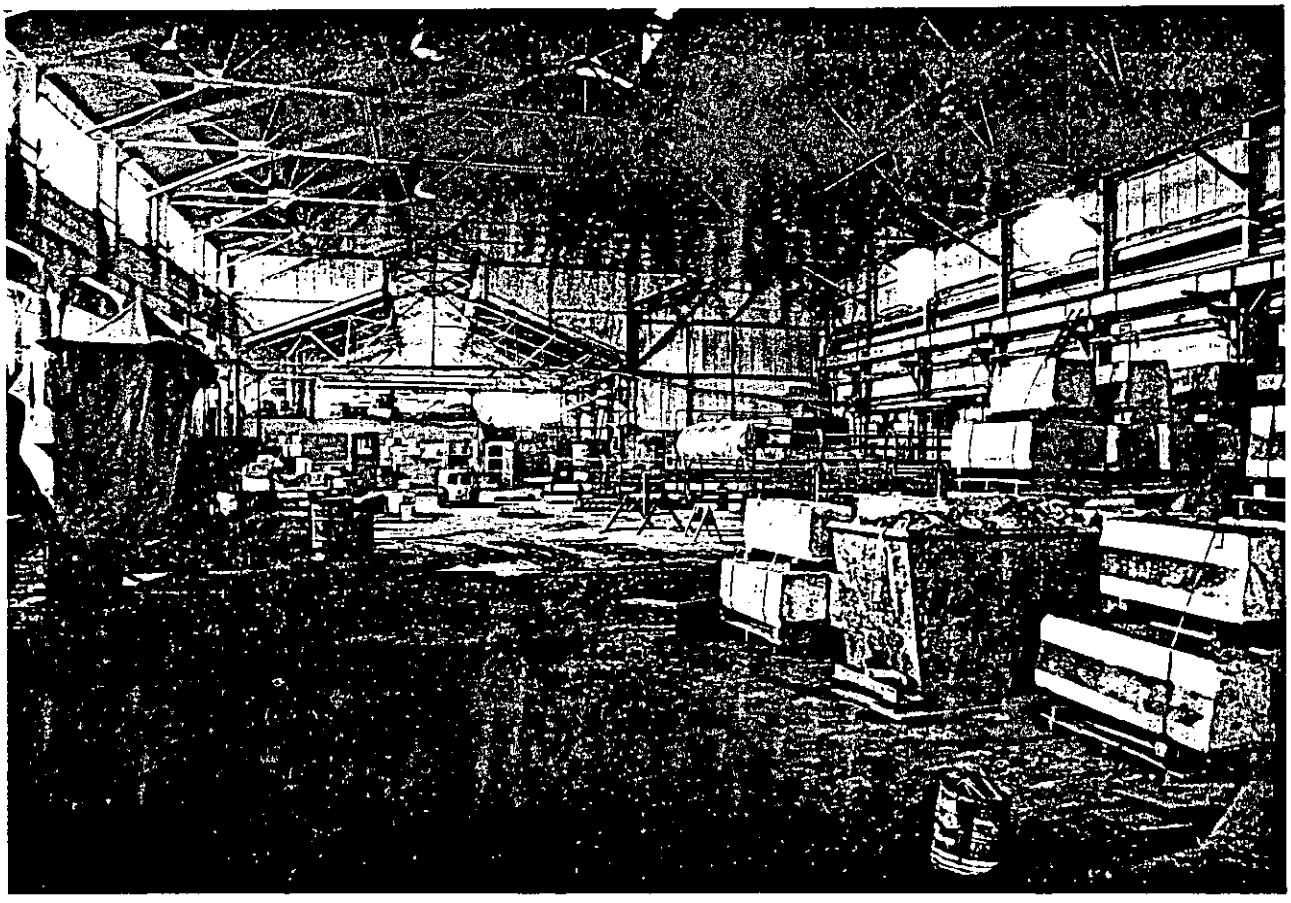

Fig. 5. Interior of former mill area (Area A), looking south.

Fig. 6. Interior of former motor room (Area B), looking south. Wall at left adjoins Area A.

Fig. 7. Inside view of former rolling area (Area C), looking north.

Fig. 8. Inside view of former rolling area (Area C), looking south.

Fig. 9. Pit locations in Area C. Note the use of rubble in filling of pit.

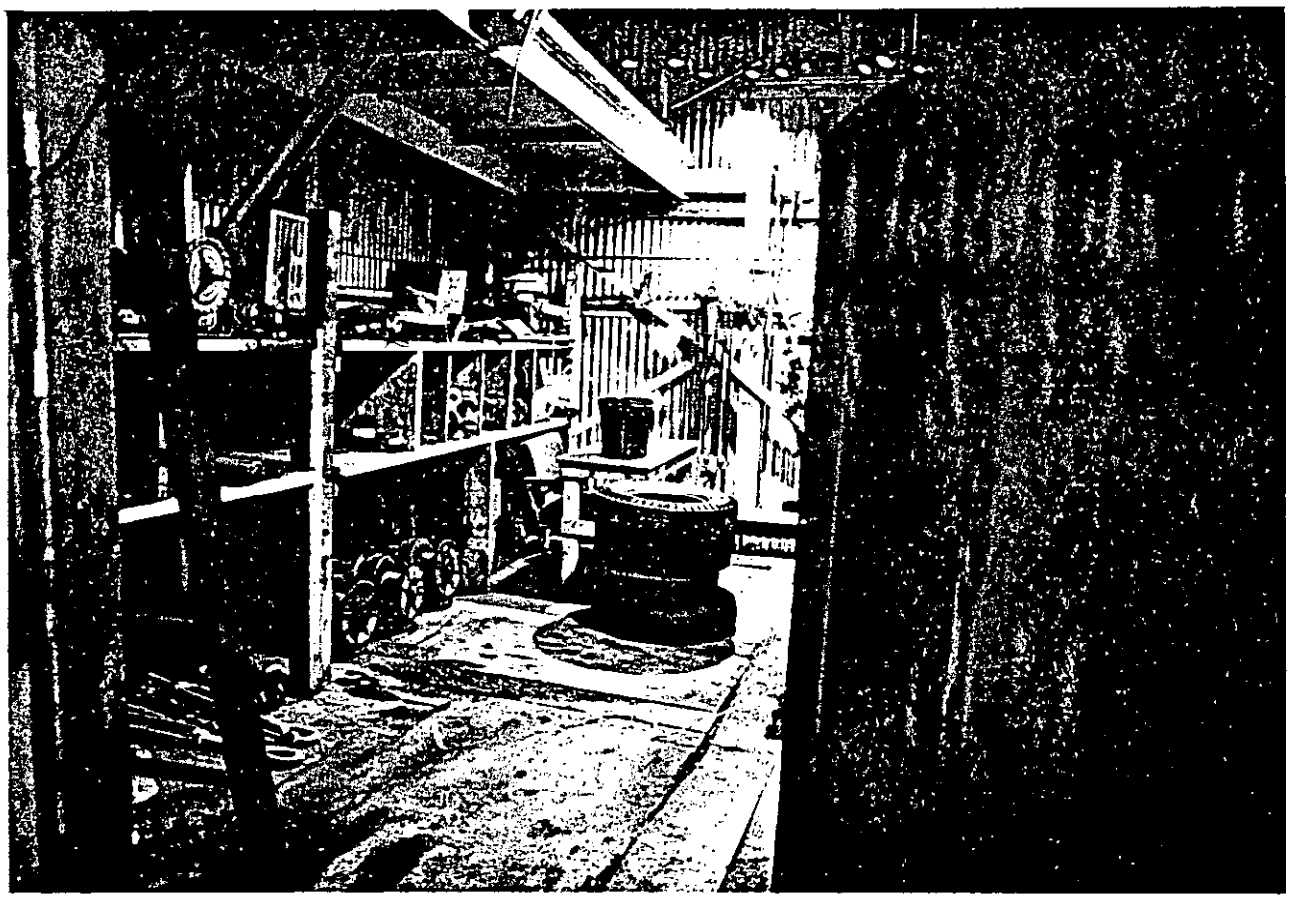

Fig. 10. Storage shed on west side of Area C.

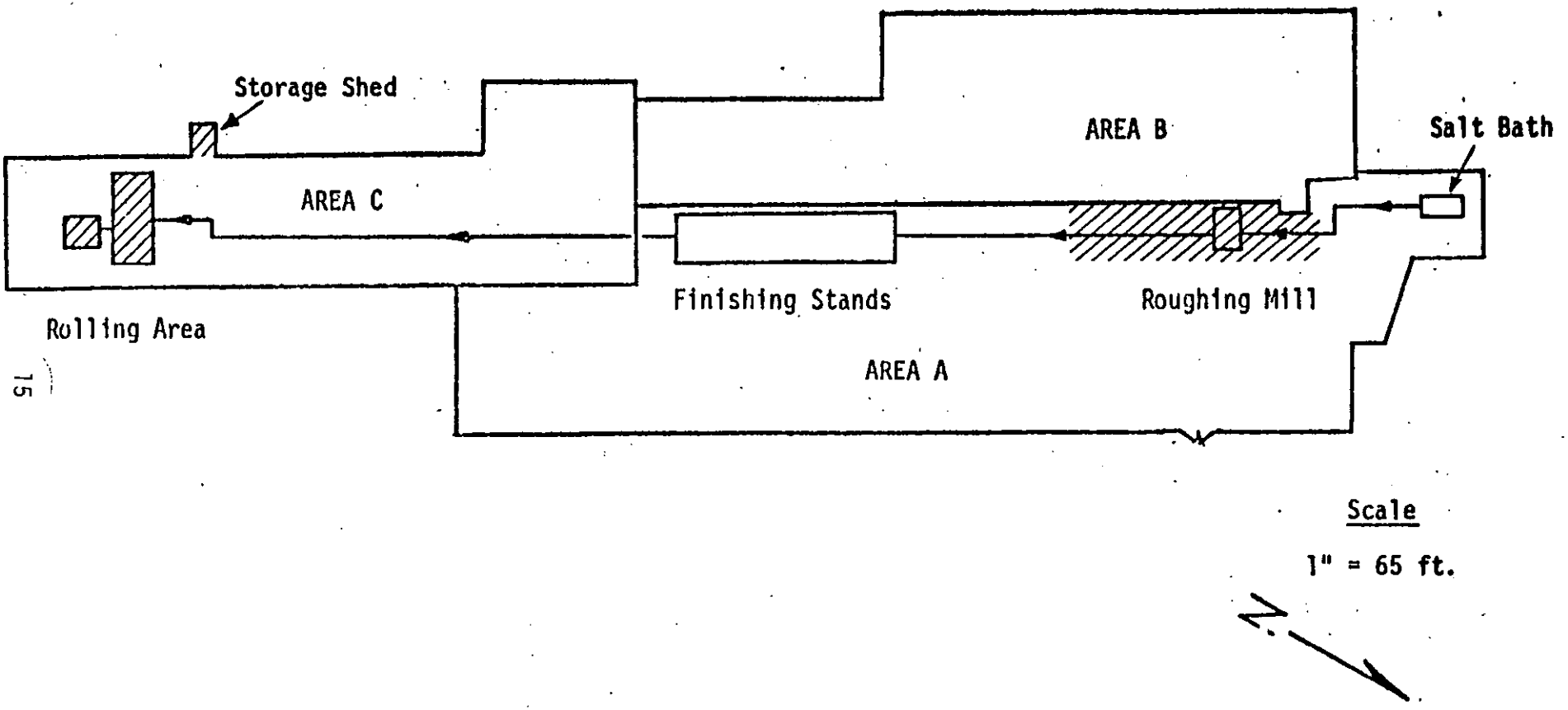

Fig. 11. Location of contaminated areas found during the 1980 preliminary survey.

Table 1. Known Buyers of Original Mill Equipment

Equipment	Buyer
Finishing Stands (5)	Tippins Machinery Co., Inc. 435 Butler Street P.O. Box 9547 Pittsburgh, Pennsylvania 15223 (412) 781-7600
29" Roughing (Breakdown) Mill	Casey Equipment P.O. Box 215 Cheswick, Pennsylvania 15024 (412) 767-5316