SITE HISTORY

OLIVER IRON MINING COMPANY SHOPS AND LABORATORY

CANISTEO DISTRICT

COLERAINE, MINNESOTA

Prepared for

University of Minnesota
Natural Resources Research Institute

U.S. Economic Development Administration

April 1997

Patrick D. Nunnally, Ph.D.
2001 Sargent Ave.
St. Paul, MN 55105
612-698-2727

MANAGEMENT SUMMARY

The Coleraine Minerals Research Laboratory (historically known as the Oliver Iron Mining Company Shops and Laboratory) is a complex of buildings situated on the north side of the town of Coleraine, Itasca County Minnesota (Figure 1, Plates 1, 2). Originally created by the Oliver Iron Mining Company, part of the United States Steel Corporation, in support of its operations in the Canisteo Mining District, the facility was initially constructed in 1906 with modifications until at least 1963. In 1962, U.S. Steel moved its research laboratory from Duluth to the Coleraine facility. By 1986, as mining activity on Minnesota's Iron Range decreased, U.S. Steel negotiated an agreement with the University to carry out its research activities under contract with the Natural Resources Research Institute. Under this arrangement the staff, and much of the equipment, was transferred to the University. U.S. Steel retained ownership of the property until October 16, 1996, when it officially transferred title to the University.

In 1995 the University applied to the Economic Development Administration, a federal agency, and to the Minnesota Legislature for grants to renovate the facility, which included the proposed removal of some buildings. Both sources have been obtained. Consultation with the State Historic Preservation Office, required under Section 106 of the National Historic Preservation Act, resulted in a finding that the property was historically significant and was eligible for nomination to the National Register of Historic Places. The property is significant for its association with the development of the Mesabi Iron Range.

This report discusses the history of the Oliver Iron Mining Company Shops and Laboratory in the context of the company's activity in the western Mesabi. After a brief discussion of ore conditions in the western Mesabi, and how those posed particular obstacles to successful mining, the report discusses the activities of the Oliver Iron Mining Company. The final section of the report addresses the facility in greater detail. The Oliver Iron Mining Company Shops and Laboratory is eligible for nomination to the National Register under Criterion A, for its association with the development of iron ore on the Western Mesabi. Although the property has been modified, it retains sufficient integrity to convey its historic significance. The period of significance for the property extends from 1906, when the oldest extant buildings were constructed on the site, to 1947, which marks the National Register's "50 year rule." This report, however, discusses the continued evolution of the site and its functions beyond 1947 in the interest of developing a more complete history of the facility and its use. Accordingly, there is a discussion of the research function at the Oliver Iron Mining Company as it developed in Duluth in 1943, was moved to the Coleraine facility in 1962-63, and continued through the transfer of the facility to the University of Minnesota in 1986. Sponsored applied mineral research continued at the facility after that point, but the transfer to public ownership provides an appropriate end date for this history.

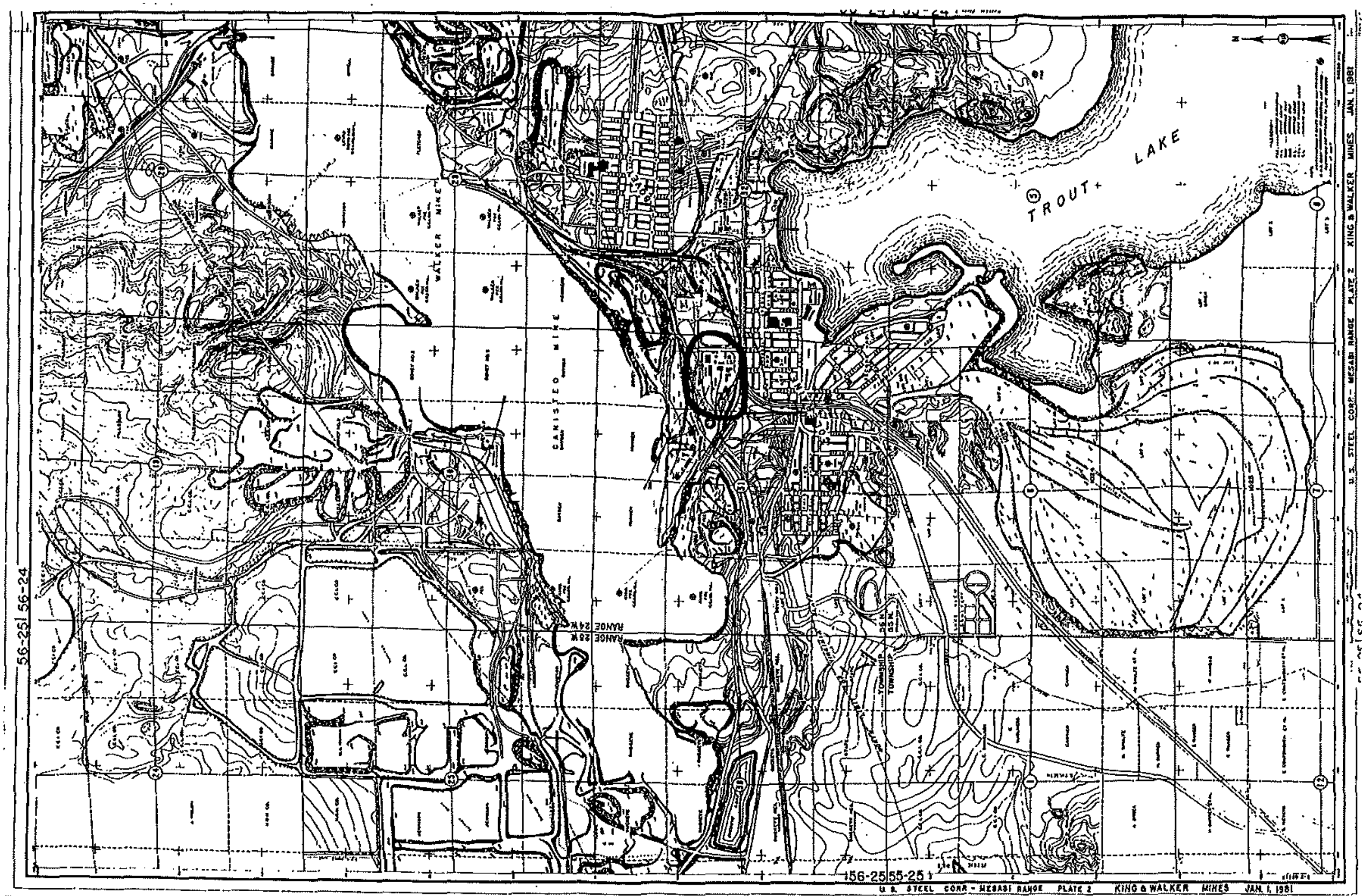


Figure 1 Regional Map, showing Coleraine and the Oliver Iron Mining Company Shops and Laboratory.

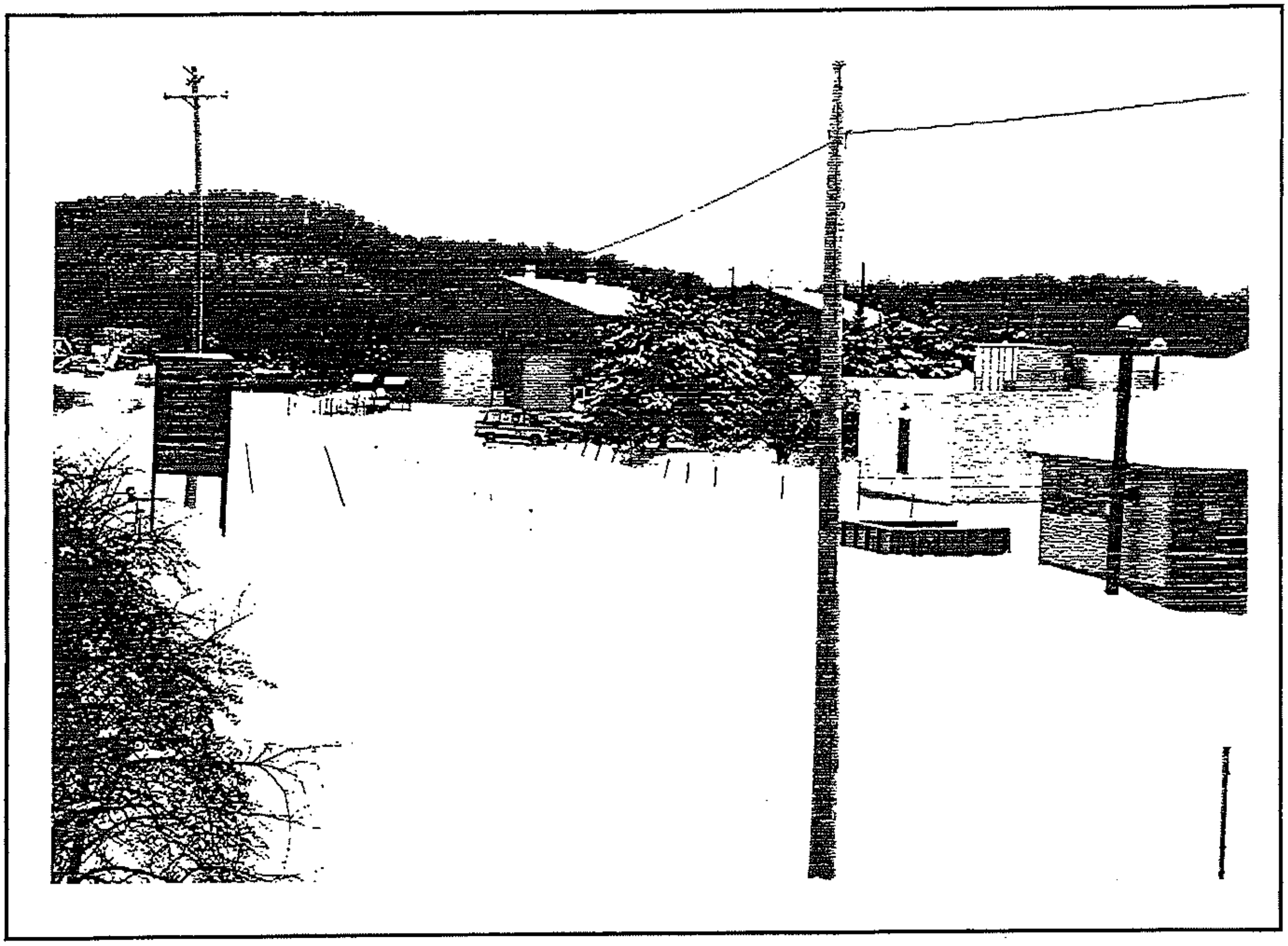


Plate 1: Coleraine Minerals Research Laboratory, formerly the Oliver Iron Mining Company Shops and Laboratory, Coleraine, MN. Building #19, a pyro-metallurgical pilot plant constructed in 1957, is at center. Photo, December 1996 by Patrick Nunnally, Collections of the Minnesota Historical Society.

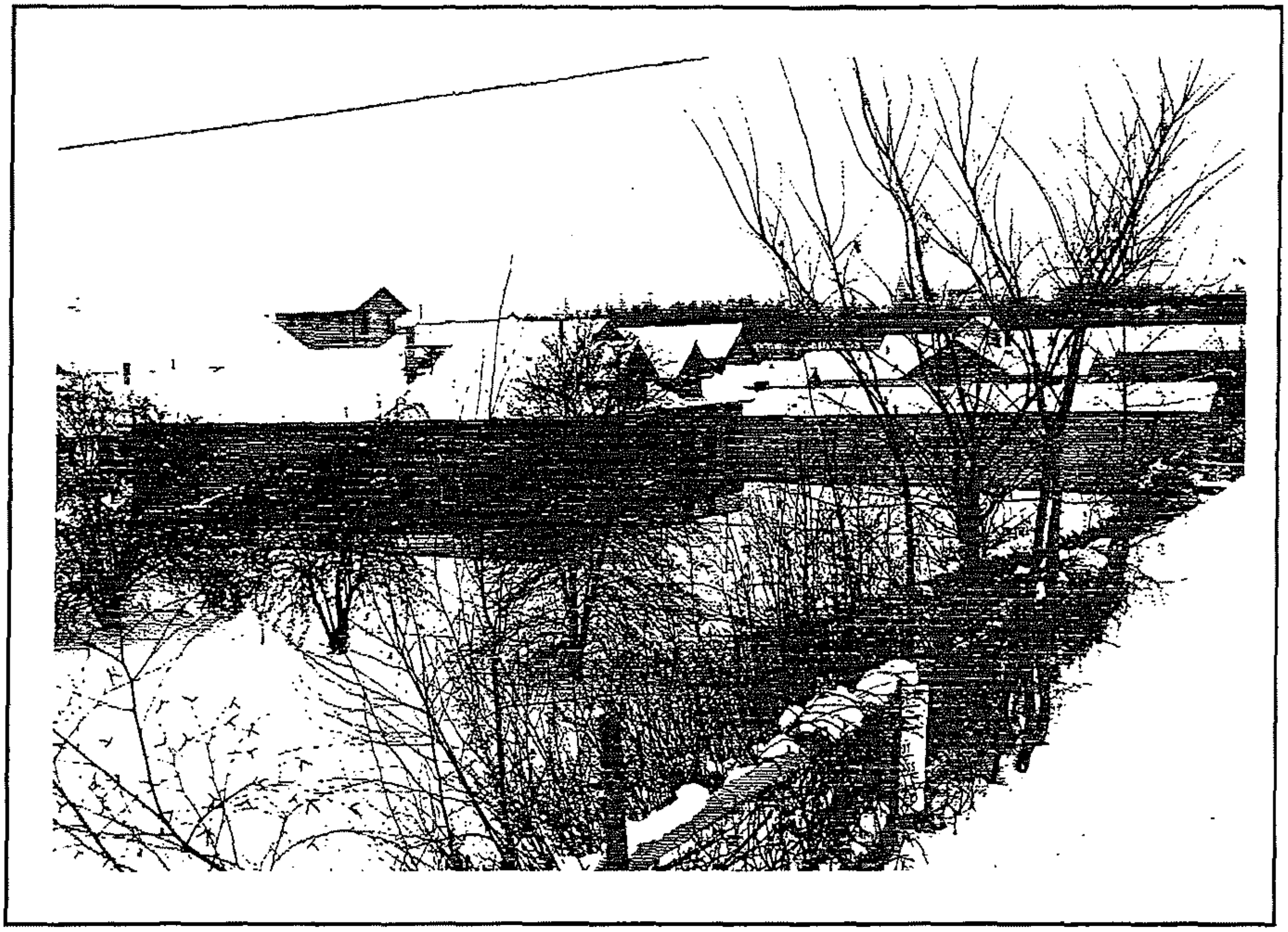


Plate 2: Coleraine Minerals Research Laboratory, formerly the Oliver Iron Mining Company Shops and Laboratory, Coleraine, MN. View to northwest from the Gayley Avenue Bridge Structure #239. The District Chem Lab (Building #250) is at center. Photo, December 1996 by Patrick Nunnally, Collections of the Minnesota Historical Society.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

Many people provided assistance in the completion of this report. Foremost, Thys Johnson of the Natural Resources Research Institute, University of Minnesota, Duluth, offered insights into the history of the Coleraine facility and oversaw the administrative aspects of the project. Rod Bleifuss of the Coleraine Minerals Research Laboratory generously shared his expertise on how the facility has functioned as part of the Research Department at U.S. Steel and, more recently, as part of the NRRI. Dennis Hendricks and John Elofson of U.S. Steel graciously provided access to the corporation's historical map files. Paul Waller of Coleraine, a retired engineer at USS, generously provided detailed accounts of activities at the site and some of the daily operations procedures followed in the Oliver's Western District. At the Minnesota Historical Society, Dennis Gimmestad and Susan Roth of the State Historic Preservation Office provided timely and insightful comments on the process. The material contained in this report was gathered from diverse archival collections, both in the Twin Cities and on the Iron Range. Thanks go to staff from the Minnesota Historical Society, the University of Minnesota, the Iron Range Research Center, particularly Ed Nelson of that facility, the Itasca County Historical Society and the Coleraine Public Library.

LIST OF FIGURES

LIST OF PLATES

INTRODUCTION

Change is a constant on Minnesota's Iron Range, and the history of the Oliver Iron Mining Company (OIM) Shops and Laboratory in Coleraine certainly demonstrates that rule. What might appear to be the simplest (and least documented) functions of the facility, its service as repair and maintenance shops, quickly became complicated by industry-wide conversion from steam to electric powered shovels, and from rails to trucks in hauling ore. Extraction and propulsion machinery constantly evolved as companies sought more efficient ways to produce ore. The service, analytical, and design functions provided by the OIM Shops necessarily evolved to keep pace with the changing needs of the company.

Much of what is written here may be self-evident to experts in mining and mining history; it is nevertheless included so that the history and significance of the shops complex may be more fully understood. Much of what has been included in this narrative has been pieced together from secondary sources, since the shops that supported mining rarely were documented or analyzed in contemporary reports, photographs, or maps. Nevertheless, these often-overlooked facilities and the functions they contained, are central to the historical story of mining on Minnesota's Iron Range and how the work of extracting and processing iron ore was conducted. The study is not a history of mining technology, or of metallurgy, although those are important contexts for the work done at Coleraine. One of the little-known stories of the Range is how mining operations, analysis, and processing were conducted, how those functions were connected, and how they changed over time. Studies of the men involved with the opening of the Range, and general narratives of the mine labor and the development of locations and towns have been done, (see, for example, Alanen 1989, Walker 1979) but the process and machinery of exploration, extraction, analysis, processing, and transportation, await systematic historical study. Likewise, this report is not a full history of the Oliver, its construction of towns, and the intersecting role of the Oliver's Research team with Operations and Management in developing the region's ore resources. This study touches on those diverse subjects as they are reflected in the historical patterns of activity in one place: the OIM Coleraine Shops.

This report begins with summaries of mining in the western Mesabi and of the activities of the Oliver Iron Mining Company in order to establish a context, or framework, within which the specific activities at the Coleraine facility may be understood. The OIM Shops facility is described, with subsequent report sections detailing its function as a shops complex and its changing laboratory role within the Oliver Iron Mining Company and, later, its role within US Steel.

THE WESTERN MESABI

The story of iron mining in that portion of the Mesabi Range west of Nashwauk and known as the western Mesabi has been ably told in a number of places (see, for example, Virginia Enterprise 1909; Van Barneveld 1913; Grand Rapids Herald 1921; Folwell 1925; Boese 1976; Walker 1979). This summary section of the present report sets the stage for understanding the significance of the shops and laboratory facility at Coleraine. Shortly after mining began in the Mesabi Range in 1892, geologists discovered that the ore bodies in the western part of the range differed fundamentally from those in the east. The overall ore grade was much lower than the east, as soft iron ore was mixed with silica and other materials in such a way that ore couldn't be shipped directly to the steel mills. Several attempts to mine and ship the soft ores of the western Mesabi failed in the late 19th century. Only the Arcturus Mine, east of Grand Rapids, managed to ship any ore at all. In 1897, 10 tons went via Grand Rapids to the Illinois Steel Company, but were judged unsuitable (Boese 1976:4). Efforts stagnated because, as historian Donald Boese put it, "Sandy ore was not needed when there was rich ore easily available just a short distance to the east (Boese 1976:1-5, see also Alanen 1989, Blegen 1963, Folwell 1925).

The first years of the 20th century changed the face of the western Mesabi. Guilford G. Hartley, a Duluth lumberman familiar with the area around Grand Rapids from his timber cruising days, formed a partnership in 1904 with Chester A. Congdon, a Duluthian who had until 1901 been legal counsel for the Oliver Iron Mining Company (Walker 1979:233). The Oliver had been engaged in buying high grade ore lands to the east, but had not moved into the western Mesabi because of the sandy quality of the ore. Hartley and Congdon, though, were interested in the ores around Grand Rapids, and formed the Canisteo Mining Company. They began buying property after attracting the support of financial backers, and even reopened the Arcturus Mine. The Canisteo Company experimented with a process of ore concentration, but it was both expensive and inefficient. Nevertheless, it was soon learned that the ore bodies in the Mesabi consisted of high-grade iron ore interspersed with granular sandy layers. If a process could be developed to wash the sandy material away, the so-called "washed ores" might be equal in quality to "direct shipped" ores from elsewhere on the range. Yet it would take resources far greater than those of the Canisteo Mining Company to develop the mines, processing plants, labor pool, and all the other ancillary elements that would be required to mine the western Mesabi effectively. As Hartley and Congdon sought additional support, they attracted the attention of the Oliver Iron Mining Company, which had in 1901 become a part of United States Steel, the largest corporation in the world.

Within a decade of the OIM's commitment to the region, ore was being mined in the western Mesabi on a grand scale. John C. Greenway of the Oliver Iron Mining Company is generally credited as having been the most instrumental single individual in opening the western Mesabi, building the town of Coleraine along with establishing the Oliver's mining operations, which were the first in the district. Greenway left Minnesota in 1910, coincidentally the same year that Charles E. Van Barneveld began the field work for the first systematic survey of Minnesota iron mining operations. Iron Mining in Minnesota was published in 1913 as the first technical bulletin from the University of Minnesota School of Mines Experiment Station in order to "meet the constant demands for both technical and popular information concerning mining practice on the Minnesota iron Range (9)." Van Barneveld's work provides a wealth of insights into early 20th century iron mining in Minnesota. Van Barneveld describes a process that was innovative and complex from the beginning of iron mining in 1892. The Mesabi ore was soft, and arrayed in horizontal beds located between 40 to 100 feel of glacial overburden, in sharp distinction to the ores of the Vermilion

Range, which were hard rock, and arrayed in vertical lenses. Not only did the Mesabi ores require different mining methods, including the widespread use of open pit methods as well as underground shaft mining, but the soft ores were new to the entire iron and steel industry. The ore, though quite rich, was unsuited to eastern blast furnaces, which had been engineered for harder rock composition ores. Adjustments were made and the blast furnaces began to utilize the softer ores, but continual analysis and planning was required to achieve the most advantageous ore shipping. As Van Barneveld describes it, the problem facing Minnesota's mining companies was how to mix the ores from complementary ore bodies (which may or may not be located within the same mine) to achieve a uniformly high grade ore that did not deplete the richest ores first and then leave only unusable ores which were not suitable in grade, texture, or composition (Van Barneveld 11). The sandy ores of the western Mesabi complicated the process, further, as the necessity of concentrating the ore through washing and other processes added another critical factor to estimating the capacity and viability of mining. As Van Barneveld put it: "Present-day estimates in the Western Missabe district are made with success only after the ore-body has been thoroughly tested to determine the ratio of washable to non-washable ore and the ratio of concentration possible (39)." In the first decade of the 20th century, only the Oliver Iron Mining Company had the resources to engage in the combined analysis and processing that was required if western Mesabi ore were to be developed profitably.

THE OLIVER IRON MINING COMPANY

Henry Oliver, a former employee of Andrew Carnegie, formed the Oliver Iron Mining Company (OIM) in 1892 after a trip to the new ore fields in Minnesota. Carnegie supported the venture, reluctantly at first, but acquiesced as he realized that the OIM could provide a reliable source of vital materials for his steel mills. When United States Steel (USS) was formed in 1901, the Oliver Iron Mining Company was one of the Carnegie-based companies that was part of the merger. With the enormous resources of USS behind the company, the Oliver quickly became one of the most prominent mining companies on the Range (Walker 1979, Boese 1976).

Thomas Cole, president of the Oliver after 1902, was approached by Congdon and Hartley with a plan to develop the sandy ores of the western Mesabi. In 1904 Cole inspected lands in the region, including the Canisteo's Arcturus mine and the small concentrating plant that Congdon and Hartley had established. Cole persuaded USS to pursue mining in the western Mesabi, and the company began buying and leasing properties, committing around ten million dollars to the venture (Boese 1976:9-20).

In 1905 John C. Greenway, a Yale graduate and Rough Rider veteran of the Spanish-American War, was appointed general superintendent for the newly-formed Canisteo District. It would be up to Greenway to implement the entire mining operation in the area, which was as yet little more than wilderness. Greenway immediately set about building the town of Coleraine (named for Thomas Cole) and establishing an office there "along with barns for the numerous horses, shops for the blacksmiths and for the carpenters, a sizable machine shop and large warehouse type buildings for storage and for later servicing of steam shovels and locomotives (Boese 65)." Blacksmith and carpenter shops were open by May of 1906, along with "large sheds to house steam shovels and locomotives in need of repair (Boese 115)." Plate 3 illustrates the shop area during the winter of 1905-06, when the only access to the site was over extremely rough wilderness roads. All the materials in the photograph had been either hauled 8 miles overland from Grand Rapids or cut from on-site timber. Although most of these buildings have subsequently been demolished (the horse barns, for example, as other forms of locomotion were utilized) some buildings from this period remain. Building #90, a locomotive house built in 1906, has subsequently undergone some alterations, but retains its essential form and character (Plate 4).

Greenway faced a number of immediate problems. One was that the ore bodies required systematic mapping so that the OIM could know the extent of its holdings. Second, and just as pressing, were the difficulties of creating a village and mine miles away from the nearest rail connection. During the winter of 1905-06 an average of 100 tons of freight per day was moved along the dirt road between Coleraine and Grand Rapids. Only after rail connections to Coleraine had been established, in 1906, would actual stripping of the overburden covering the ores begin, because otherwise there was no way to get the huge steam stripping shovels to the site. Early in the process Greenway and his engineers had recognized that open pit mining was necessary for efficient development of the sandy ores (Boese 1976).

In 1906 the OIM began opening the Holman Mine, first in the Canisteo District, as well as the Canisteo Mine. As Boese put it, "It was a dramatic moment when the first steam shovel took the first bite of earth from the Canisteo District at the Holman Mine on the afternoon of Friday June 22, 1906 (Boese 115)." The task was daunting: miners had to strip off millions of cubic yards of overburden before the first shipments of ore could go out. By 1908-09, when the mines

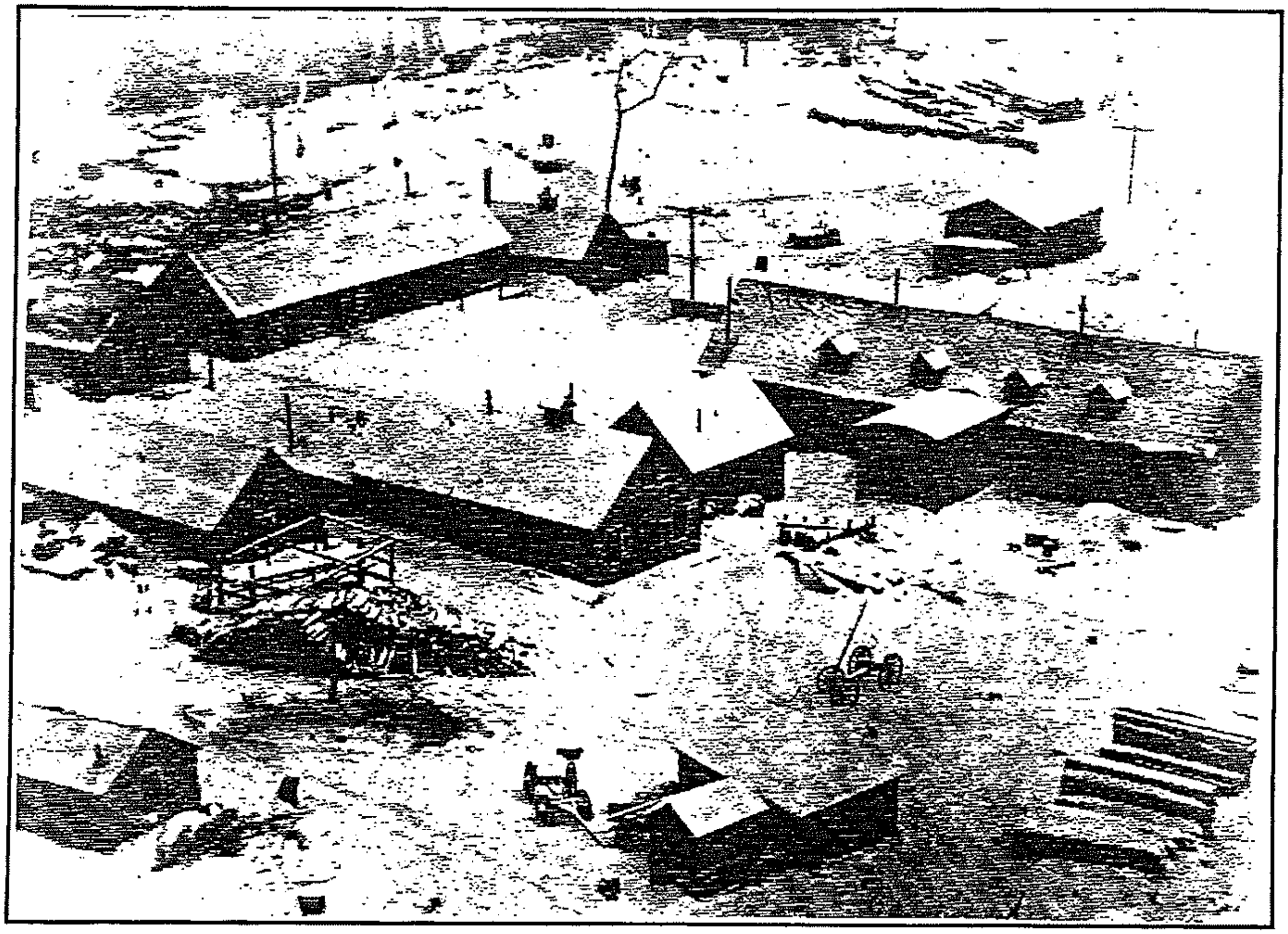


Plate 3: The Oliver Iron Mining Company Shops and Laboratory, Coleraine. Photograph taken in the winter 1905-06. Photograph from the collections of the Iron Range Research Center, Chisholm, MN..

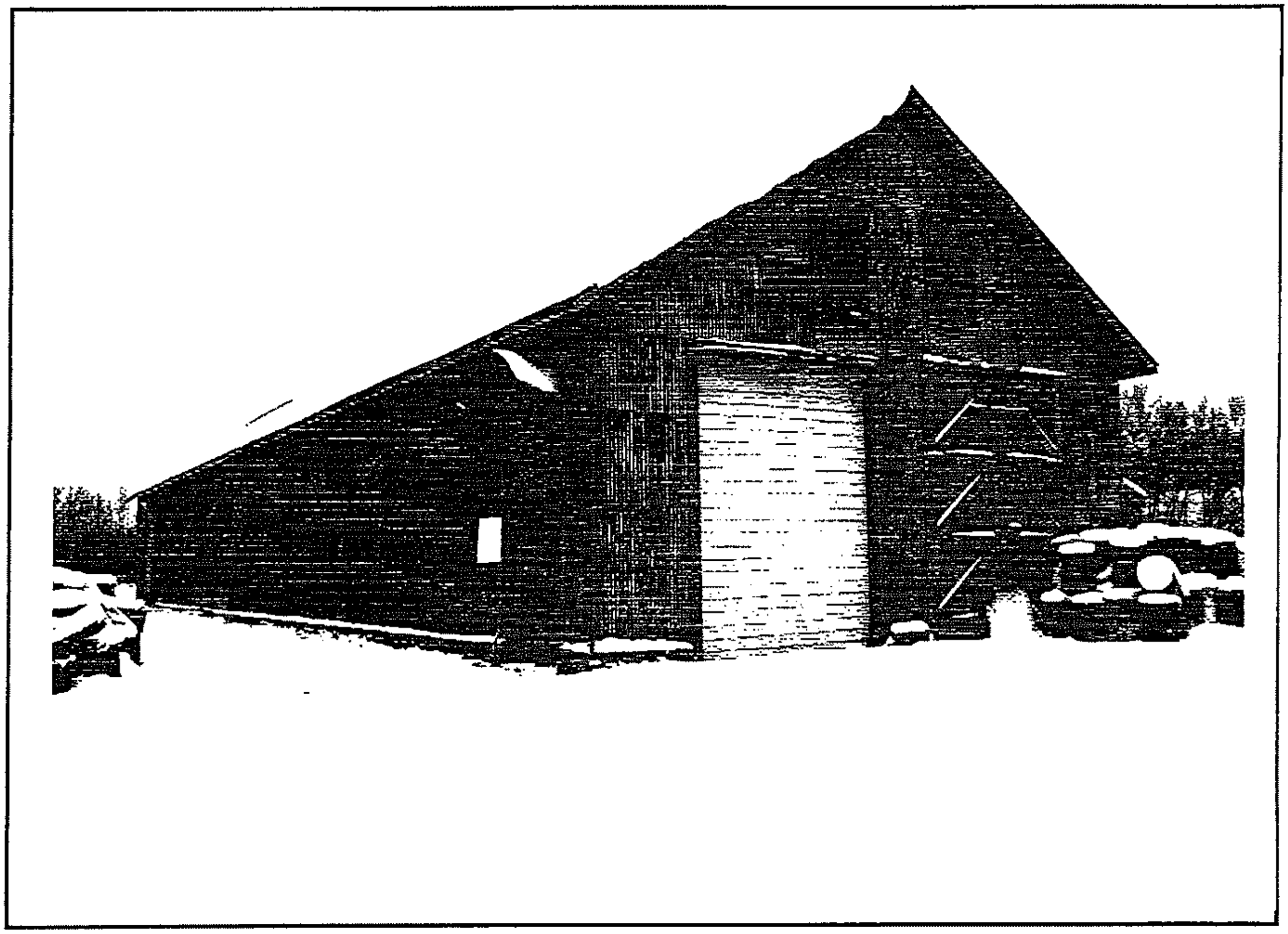


Plate 4: Building #90, built in 1906 as a locomotive house, retains its essential form and characteristics from the earliest period of development at the Oliver Iron Mining Company Shops and Laboratory, Coleraine, MN. Photo December 1996 by Patrick Nunnally, Collections, Minnesota Historical Society.

finally went into production, a large array of machines were serving the Canisteo District (and being repaired and maintained at the Coleraine Shops). Boese lists 18 steam shovels, 38 locomotives, and 645 dump cars (165). By 1910, when Greenway left, four mines (Canisteo, Walker, Holman, Hill) were in production and the villages at Taconite, Marble, and Coleraine had been established on the western Mesabi.

The historical development of the "model company town" of Coleraine is contemporaneous with the establishment of the Canisteo District in the western Mesabi and the construction of the shops to serve that district. The first residences in Coleraine were built by the OIM in 1905, with stores following in 1906. Census records have not been studied, but it can be fairly certain that nearly everyone in Coleraine worked for the Oliver, and a high percentage of those individuals probably worked in the shop complex. The OIM built a district headquarters building in town, but that facility was dwarfed by the extensive shops being erected on the north side of town. Greenway designed the town as a "model village," with wider house lots, strict controls on the number of lots an individual could purchase (to avoid speculation) and deliberate planning of nearly every feature of the town. Nearby Bovey was reputed to have the highest ratio of saloons to population on the Range; by contrast, Greenway allowed only one saloon in Coleraine. The town was not formally incorporated until 1909, meaning that for the first four years of its existence, Greenway's word literally was law in town. Even after incorporation and the election of a city council, the town's interests and those of the OIM tended to coincide closely (Boese 1976, Coleraine Jubilee).

The OIM was one of the preeminent companies within the overall development of Mesabi Range mining operations. This report does not address matters such as labor relations and strikes, the succession of managers controlling OIM operations, or even the subsequent development of particular mines. Conversations with Paul Waller, a retired USX (the successor corporation to USS) engineer, have given rise to some insights about general operation and management of mining activity.

The Canisteo District became the westernmost of the OIM's three administrative districts on the Range. Each of the district headquarters sites--Coleraine, Hibbing, and Virginia--had a shops facility, which performed similar service, maintenance and repair functions throughout the district. According to Waller, by the 1950s, when his career started, the Coleraine shops were the smallest of the three. The OIM main headquarters for the region was in Duluth, with important rail facilities (managed by the Duluth, Missabe, and Iron Range Railroad) at Proctor. Each of the district's mines had a mine engineer and crews for that engineer. Each month, the mine's engineer was responsible for making a mine map, which was created in the headquarters building on Trout Lake in Coleraine. This map, then, was used for predicting operations at the mine, both with regard to amount and the quality of ore, for the next month. During most of this period, mining was a seasonal activity, with ore going to the Trout Lake concentrating plant only in the summer. The large amounts of water used in preparing the ore for shipment made ore production necessarily a seasonal activity, although Waller reports that there was always pressure to start the season as soon as possible and to operate the Trout Lake plant as late into the fall as possible before cold weather shut the plant down. Winter was the time to take care of maintenance and repair at the plant and to strip overburden from areas of the mines that were to be developed during the next season.

The production of ore in the western Mesabi was a more complex process than in the east, and necessitated close communication among a large number of people on a daily basis. According to Waller, an "ore meeting" at headquarters started each day during the production season. The individual mine superintendents, the district superintendent, and the chief chemist (who supervised work in the laboratory buildings in the shop facility) met each morning to review what had taken place the previous day and to arrange for the day's work. The Oliver's head grader, who had been in touch with the steel plants from his office in Duluth, had established a production goal for the day, both in terms of car-lots of ore and of the required quality (Ore quality was measured not only by the percentage of iron but also by relative percentages of impurities such as silica and phosphorous. Bessemer ore was the highest quality, more than 51% iron, but more significantly, less than 0.043% phosphorus. This allowed mass production of the highest quality steel using the Bessemer process.) The ore from the district would be sent to the Proctor yards, where it would be made up into train lots of uniform grade for forwarding to the docks and eventual shipping. At the ore meeting, the superintendents, or their representatives if they couldn't personally attend, worked out how the individual ore cars to haul the material would be dispersed, and which mines would contribute how much to the day's production. If a day's quota, for example, was 180 cars, one mine might be in a relatively rich area and able to contribute more than, say, a mine in a weak zone, or one where there were some machinery problems which needed attention. The mine map developed by the mining engineer, and the chemical analyses developed in the district labs were critical factors in understanding precisely the nature of the ore that was being extracted on a given day. During the production season, mines ran seven days a week, often around the clock (see also "People and Projects" 7-8).

Perhaps the single most important facility for the OIM on the western Mesabi was the Trout Lake concentrating plant. Without this plant, which washed ore and removed impurities to the point where it could be used by a steel mill, the ore was worthless for exploitation. John Greenway and others devoted immediate attention to the problem of developing a concentrating method for the western Mesabi ores, and succeeded in developing a pilot washing plant by 1907. Refinements were made, and by 1910, the Trout Lake plant was in operation, using a combination of gravity and forced-pressure washing to separate the larger iron ore chunks from finer silica. A 1909 special edition of the Virginia newspaper described how the plant would work:

> Loaded cars will be taken from the mines by easy grades to a point 100 feet or more above the lake shore where they will be dumped and the ore allowed to descend by force of gravity over a series of inclines. Streams of water forced against the descending ores at the proper pressure will carry with them the lighter sands while the washed or concentrated ores fall into empty cars ready for shipment. After treatment by this process these ores are of much higher grade than any other shipped from the range (Virginia Enterprise 1909).

The writer did not include the use of screens as part of the separation process, and it is uncertain if the washed ores were in fact of a much higher grade than natural ores, but the basic mechanics of the process are accurately described. Developed before the use of conveyor belts, the plant used gravity to separate the materials, which in turn required the construction of a long approach berm and ramp to bring the trainloads of ore to the starting point at the plant. When fully operational, the plant could handle over 70,000 tons per day (Walker 1979). The products were known as "wash ores" by contrast with the "direct shipped ores" of the eastern Mesabi.

For decades, as a later study was to put it, the plant was operated "with no semblance of metallurgical control ("People and Projects":6)." Only after the establishment of a Research Department in the 1940s was the processed ore examined to find ways to increase efficiencies. In the early decades, ore was run through the plant in batches from a given mine. Cars at the bottom of the plant were tagged with the name of the source mine so that the various mine fee-holders could be credited for the ore that came from their respective mines, and then the ore was shipped ("People and Projects":6-7).

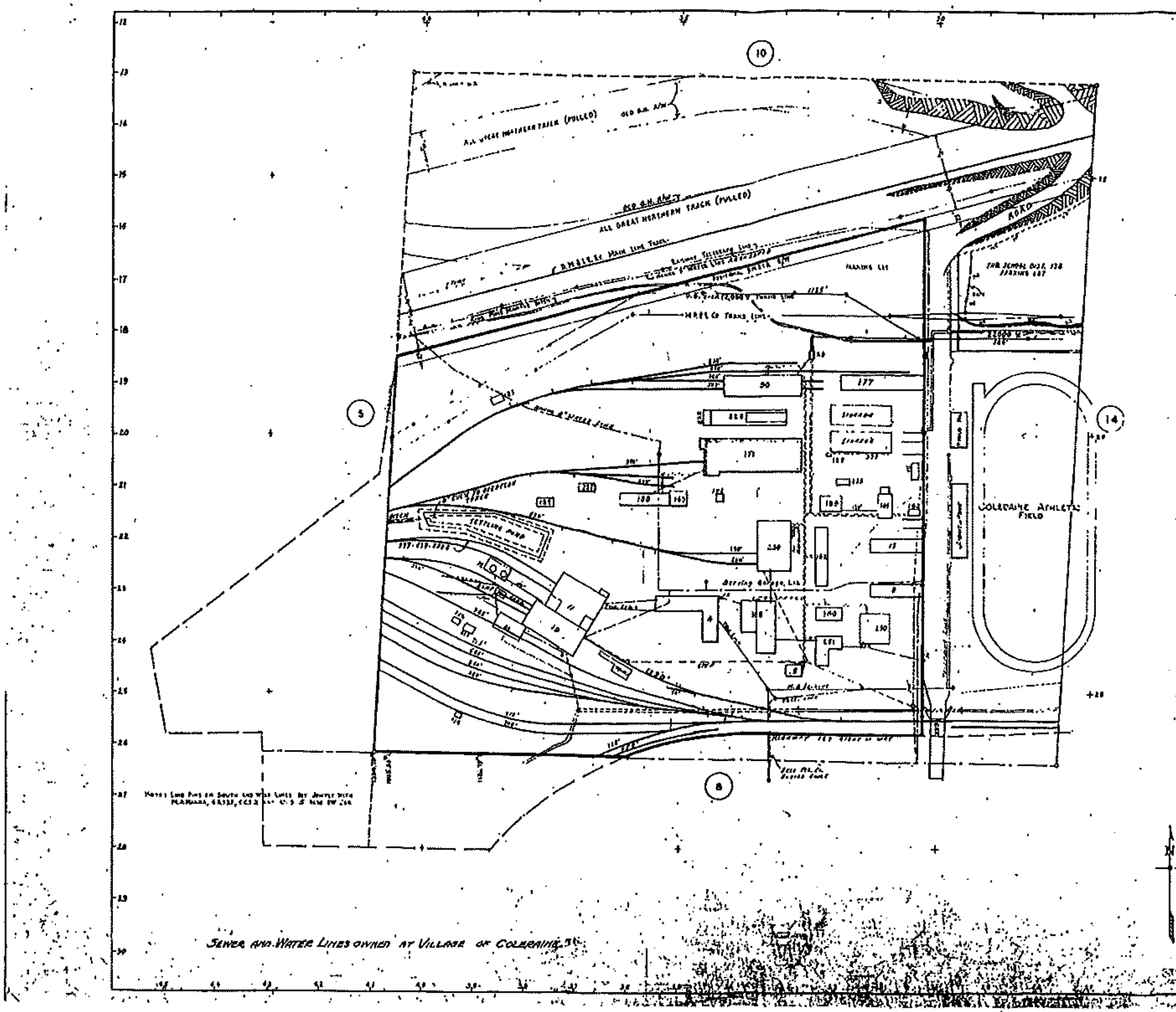
The Trout Lake plant was closed in 1973, as wash ore reserves across the range became exhausted. In 1981 the plant was razed and the site landscaped. Over the plant's life it treated 50-170 million tons of crude ore to produce 85-90 million tons of concentrate ("People and Projects").

THE OLIVER IRON MINING COMPANY
SHOPS AND LABORATORY, CANISTEO DISTRICT

It took many disparate services to keep the activities of the Canisteo District going, and the place where much of the activity took place was the OIM shop complex. This section of the report has three parts: a description of the complex as it exists today and some observations regarding its probable pattern of development; a discussion of its function as a shops complex; and a discussion of the laboratory functions carried out at the facility. In many respects, the historical significance of the complex is best assessed in relation to other facilities and developments, so there is necessarily some description of the USS research work at Duluth that preceded the conversion of the Coleraine shop to labs and some discussion as well of research work conducted in Coleraine since 1962.

Site Description

There are 23 buildings on the site. Dates of construction range between 1906 and 1962, according to USX records. It is important to note that the facility as a whole has been modified substantially from the earliest days, so that no very clear picture emerges of exactly how the facility looked at any given point during the first 50 years of its use. Extant buildings from a particular period of service are not the full representation of what was there at the time, as USX records indicate the removal of some 20 buildings formerly on the site (Figure 2). The former location of those buildings has not been determined. Furthermore, it is known that a large area of heavy timber docks was formerly in the site's northwest area, and that during its period of most intensive use, railroad tracks crossed the facility at a number of points (Waller 1997).



[illegible]	YEAR	USE	FINAL DISPOSITION
1	1905	RESIDENCE	SOLD 12/11
2	1905	RESIDENCE	SOLD 1955
3	1916	FLUE RATTLER HOUSE	RAZED 1953
89	1919	TRANSFORMER SUBSTATION	
90	1906	LOCOMOTIVE HOUSE	
91	1906	WAREHOUSE	RAZED 1963
125	1915	HOSE HOUSE	
160	1908	ORE SAMPLES HOUSE	
162	1909	GARAGE	SOLD [illegible]
163	1914	STAFF ENGRS OFFICE	
169	1906	STORAGE	SOLD 10/195
170	1912	LUMBER SHED	TRANSF. 1/54 TO [illegible]
171	1911	HEADQUARTERS SHOPS	
172	1916	MASON STORAGE	
173	1912	PAINT WAREHOUSE	RAZED 1960
174	1924	OXYGEN STORAGE	RAZED 1956
180	1910	DRY HOUSE	RAZED 1963
181	1908	BOILER HOUSE	
182	1920	GARAGE	
183	1924	CARBIDE PLATFORM	RAZED 1957
188	1910	ELECTRIC SHOP	
189	1923	LUMBER SHED	
190	1923	POLICE OFFICE	
226	1926	LOCOMOTIVE WATER TANK	RAZED 1942
227	1913	STORAGE & CEMENT SHED	
228	1912	PIPE RACK	RAZED 1955
229	1918	WAREHOUSE	RAZED 1957
230	1920	WELDING SHOP	
233	1909	FOREMANS OFFICE	
239	1906	GAYLEY AVE. BRIDGE	
250	1910	LABORATORY	
251	1910	LABORATORY CR. HOUSE	
252	1901	CAR OILING HOUSE	TRANS. TO [illegible]
253	1911	RIP TRACK REPAIR SHOP	
275	1923	SALT TANK	RAZED 1949
276	1923	TOOL HOUSE	To Map 1047
175	1934	COAL DOCK	TRANS. MAP 10
166	1941	SAMPLE STORAGE	To Map [illegible]
168	1942	TRACTOR & TRUCK GARAGE	
176	1943	RIP TRACK REPAIR SHOP	
177	1943	STORAGE WAREHOUSE	
272	1910	STORAGE WAREHOUSE	
8	1939	GARAGE	
208	1953	LOCOMOTIVE WATERTANK	MOVED 1956
9	1951	GARAGE	
10	1954	Diesel Fueling Sta.	
11	1954	Concentration Pilot Plant	
12	1954	DIESEL FUEL TANKS	
13	1956	GARAGE	TRANS. TO 1007
232	1937	IRON RACK OFFICE	RAZED 1961
215	1920	STORAGE HOUSE	RAZED 1963
15	1957	OIL HOUSE / GAS STA.	
14	1956	DISPATCHER'S OFFICE	
19	1957	Pyro-Metallurgical Pilot Plant	
4	1988	APPLIED RESEARCH BLDG.	

HEADQUARTERS
SHOPS
SE-NE, SEC. 31, 56N-24W
73-316-100

Figure 2 Site map, Oliver Iron Mining Company Shops and Laboratory.

The buildings at the site appear to have been wholly utilitarian in nature, being largely devoid of architectural embellishment. Dormers on the chemical lab building (Building 250) are about the only visible deviation from the standard rectangular shed design Plates 5, 6). The structures vary widely in size, from single story 25 foot by 8 foot sheds such as Building 15 to three story structures 180 feet by 75 feet (Building 171, Plates 7, 8). A 1990 study summarized the buildings this way: "The facilities could best be described as early industrial with a mixture of wood frame, steel frame, masonry and metal sheathed buildings (Koncker)." The current pyro-metallurgical lab, built in 1908 as an ore sample house, is representative of the complex (Plate 9).

The following descriptions are listed numerically, by the building identification number in the USX files and as illustrated in Figure 2. Building descriptions are taken from "Building Evaluation: Coleraine Minerals Research Laboratory" (Abe W. Mathews Engineering Co. 1991).

Building 4 is the main office building in the complex. It is listed as having been built in 1962, although Neimi indicates that it was a former motel in Hibbing that was moved onto the site when the research lab was moved to Coleraine from Duluth in that year. The building is wood framed, with drywall interior. It has metal exterior siding over wood siding. The floor is concrete slab on grade, and windows are wood single glazed double hung with storm sash.

Building 9 is a sample storage building that was originally constructed in 1951 as a vehicular garage. It has metal roofing and siding over a concrete slab foundation. Sample storage buildings are holding facilities for ore samples that have been (or are in the process of being) examined in the labs.

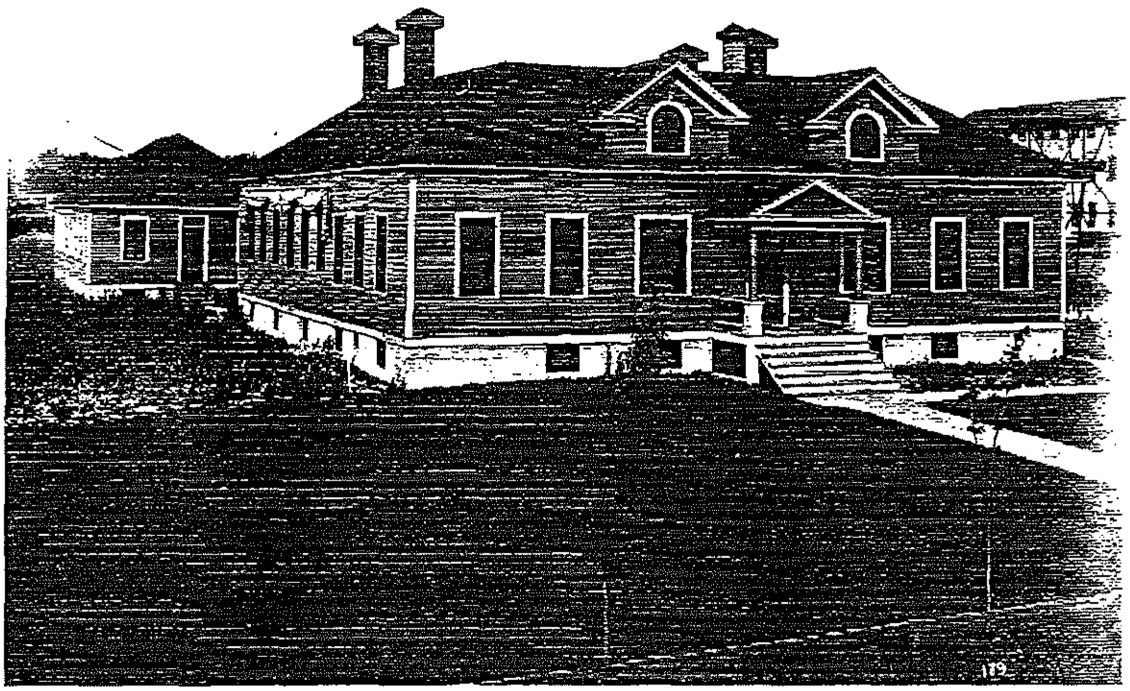


Plate 5: Building #250, the District Chem Lab. Date of photo unknown. From the Oliver Iron Mining Company collections, Minnesota Historical Society.

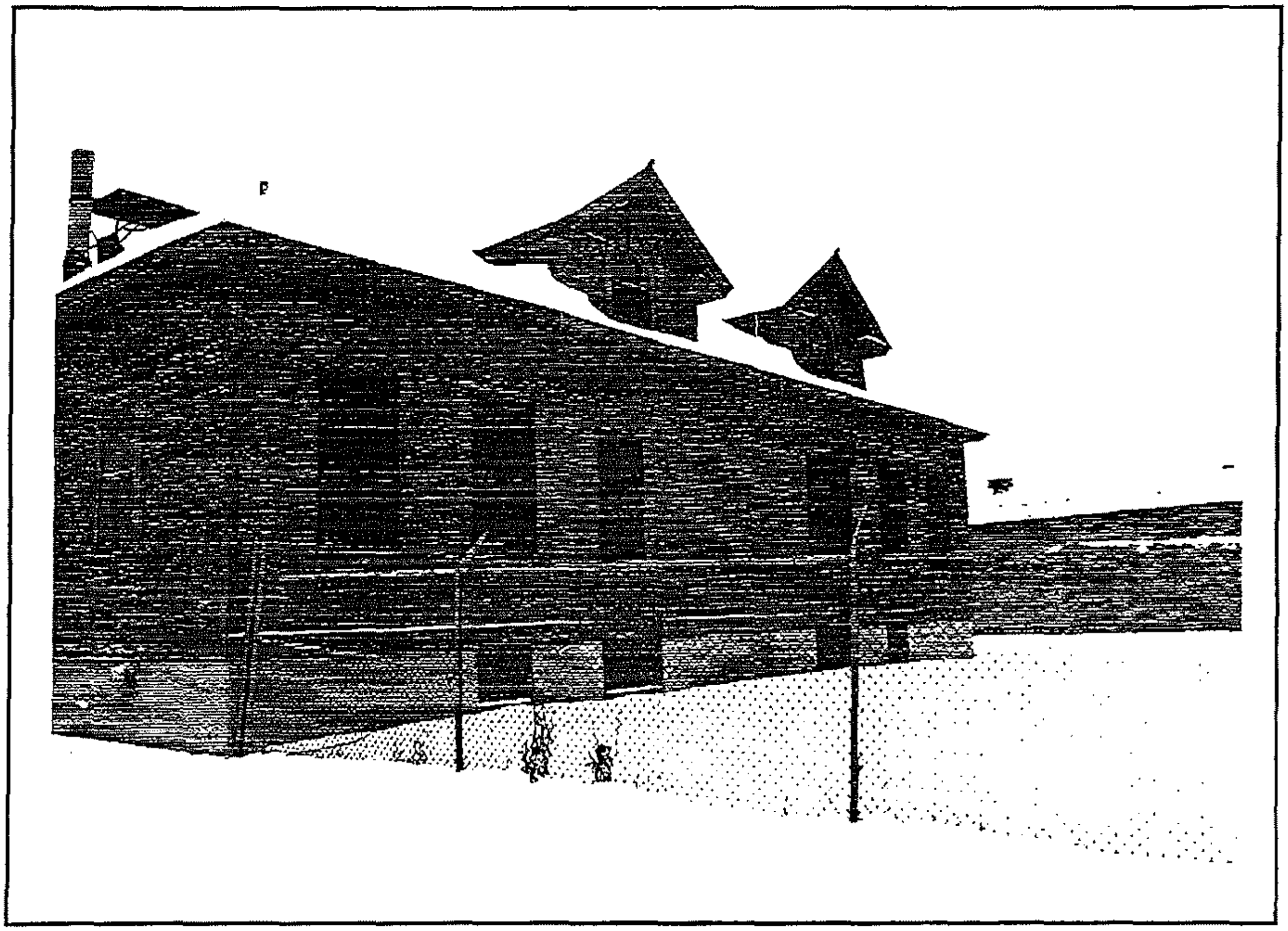


Plate 6: Building #250, the District Chem Lab, December 1996. Photo by Patrick Nunnally, from the collections of the Minnesota Historical Society.

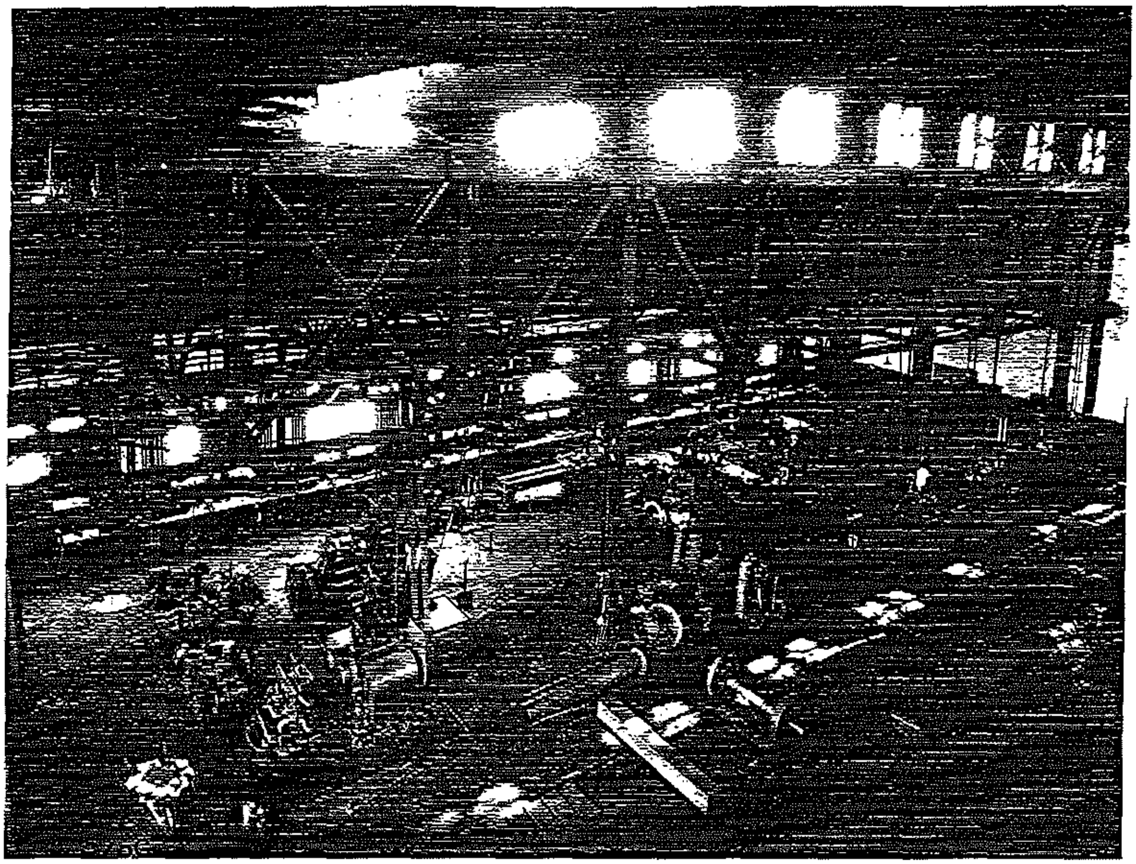


Plate 7: Interior view, district shops, Oliver Iron Mining Company. Date of photo unknown. From the Oliver Iron Mining Company collections, Minnesota Historical Society.

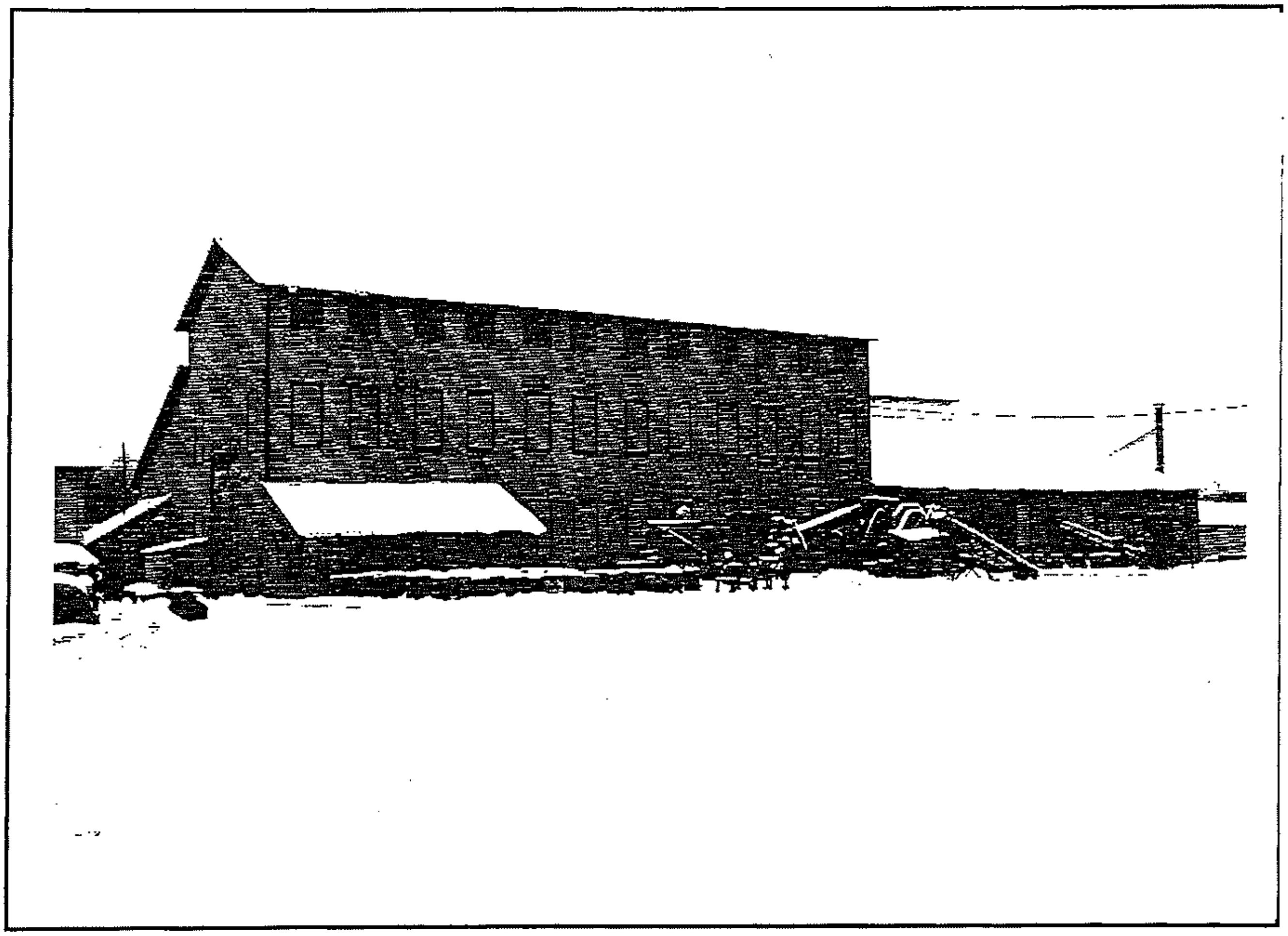


Plate 8: Building #171, originally built as the district shops in 1911. The building is currently used for preliminary sample processing. Photo December 1996 by Patrick Nunnally. Collections, Minnesota Historical Society.

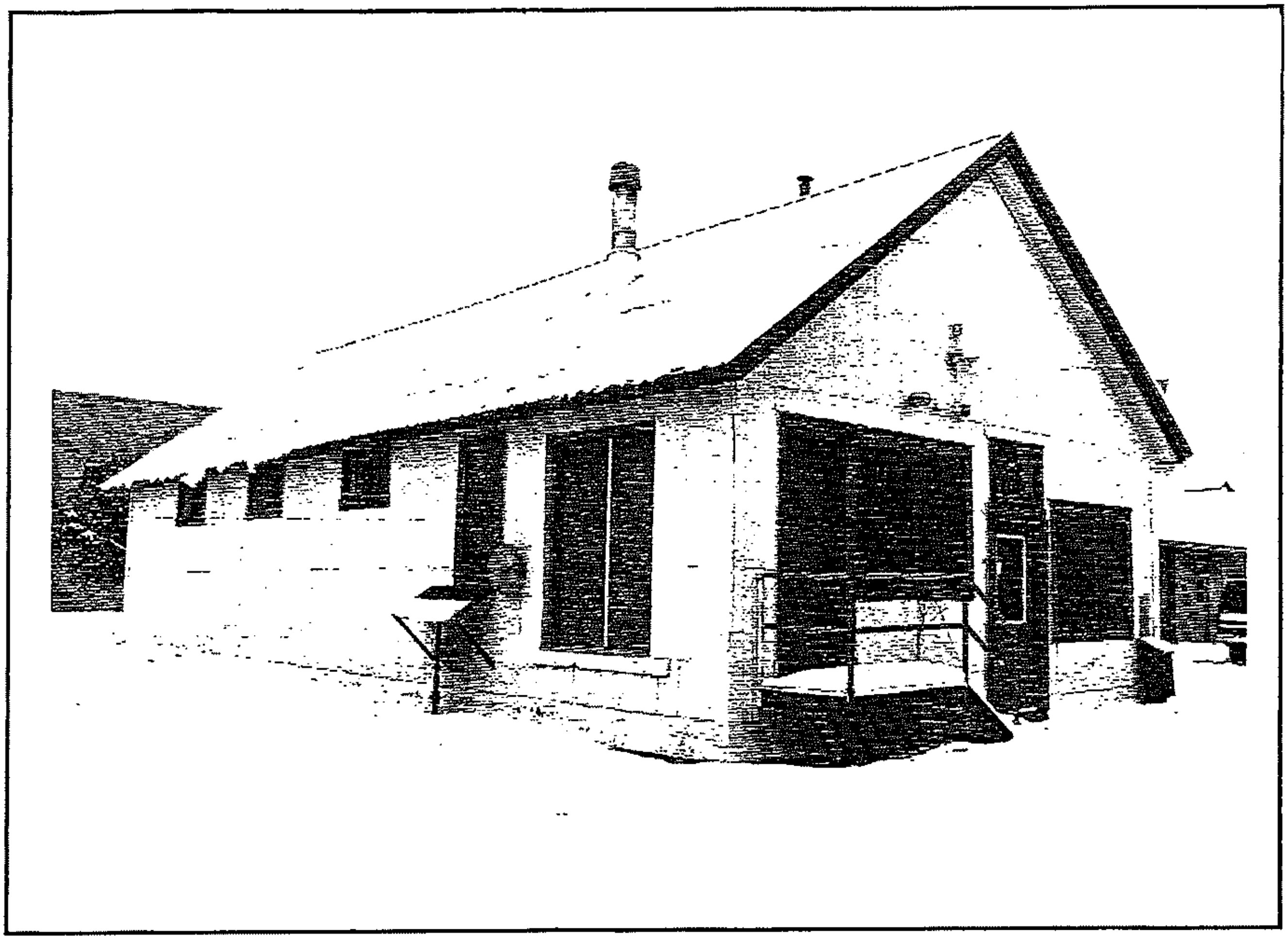


Plate 9: Building #160, originally built as an ore sample house in 1908, is representative of the facility's buildings in its plain facade and simple shape. The building currently houses the site's pyro-metallurgical lab facilities. Photo December 1996 by Patrick Nunnally. Collections, Minnesota Historical Society.

Building 10 is joined to Building 11 and Building 19; the three will be discussed as a unit. The buildings are used to prepare minerals for processing and further testing. Building 11 was built in 1954 as a concentration pilot plant, a use which it retains. Building 10 was also built in 1954 as a diesel fueling station in response to the advent of truck hauling. Building 19 was constructed in 1957 as a pyro-metallurgical pilot plant. The pilot plant functions are important parts of the facility, as they develop, sometimes on a smaller scale, machinery to test innovative methods of ore processing. After the main OIM lab facility was moved to Coleraine, pilot plant development became one of the most important activities at the site.

Building 15 was constructed in 1957 as an oil house and gas station to serve the increasing truck traffic through the facility.

Building 90 is among the oldest buildings on the site, having been constructed in 1906 as a locomotive repair shop. Currently it is used for equipment storage. The structure has wood stud framing with brick rubble infill. Painted metal siding covers the structure.

Building 160 was constructed as an ore sample house in 1908 and is currently used as the pyro lab building. The building has rubble masonry bearing walls and wood siding, with single glazed windows. Ore samples are cooked in this facility to examine chemical and mechanical properties.

Building 163 was built in 1914 as an addition to Building 188. Building 188 was an electrical shop when it was constructed in 1910; Building 163 was a staff engineers' office. The combination building has metal siding over a wooden frame.

Building 168 was constructed in 1942 as a tractor and truck shop. It has since been extensively remodeled and is used as a batch laboratory currently. This is the main laboratory currently used by the Coleraine Minerals Research Laboratory. The building, and its subsequent additions, are of timber frame construction, with a concrete slab floor. Metal siding is screwed or nailed over wood siding.

Building 171 was constructed in 1911 as the headquarters shop for the OIM Canisteo District. The building is used for screening and preliminary processing of materials to be tested in the pilot plant facility. The building has a steel frame, with rubble masonry infill.

Building 177 is currently used for equipment storage. There is apparently some confusion over the proper identification of this building; the authors of the 1991 study believe that it may be Building 253, constructed as a rip track repair shop in 1911. Other documentation lists the construction date as 1943. The building, currently used for storage, has a steel frame, metal siding, and a concrete slab foundation.

Building 181 was constructed in 1908 as the boiler house for the Oliver Iron Mining Shops facility. It has heavy timber wood framing with wood stud walls and rubble brick infill. Metal siding has been added to the original wood siding. There is a concrete loading dock and concrete block gas bottle storage unit on the building's north side.

Building 182 is a 10-stall vehicular garage that is currently used for storage. It has stucco and plaster siding over wood lath and a metal roof.

Building 189 was built as a lumber shed in 1923. The structure is wood frame with metal roofing and siding, and a simple wood plank floor.

Building 227 was built in 1913 as a storage shed. It retains its basic function, being used as hazardous material storage. The building has metal siding over a wood frame with single glazed windows and a split level slab concrete floor.

Building 230 was originally constructed as a welding shop in 1920. The building has a heavy timber frame over a concrete floor slab. Corrugated metal siding covers the building.

Building 250 is the Research Chemical lab building, constructed in 1910 for use as a laboratory. The building is one story wood frame construction, including an attic with dormers, and a full basement with poured concrete foundation walls. The floor elevation is approximately three feet above grade, and features wood siding, doors, windows, and trim. Interior walls and ceiling are plaster and the roof is asphalt shingles.

Building 251, the District Chemical Lab, resembles Building 250 in most respects. Also built in 1910, this building has a concrete floor slab instead of a basement.

Building 292 was constructed for storage in 1910.

Additional buildings shown in Figure 2 have been removed subsequent to the map's preparation. Although the earliest extant building was built in 1906, both Boese (1975:65) and the current facility map on file at USX indicate that activity began at the site as early as 1905. The USX map (Figure 2) is particularly instructive regarding the large number of rail lines that crossed the site, and for establishing data for the intense pattern of building removal and new construction that took place at the site over the course of its history. Tables 1 and 2 provide further analysis into the patterns of construction and removal activity at the site. Information in Tables 1 and 2 is taken from the USX map. It should be noted, however, that the data below does not account for the number of buildings that have been modified, both internally and externally, and those for which functions have changed.

Table 1: Construction history, Oliver Iron Mining Company Shops and Laboratory, Coleraine, MN.

Date	Building	Status
1905	Residence (#1)	sold 12/51
1905	Residence (#2)	sold 1955
1905	Garage (#162)	sold 12/51
1906	**Locomotive House (#90)**	**extant**
1906	Warehouse (#91)	razed 1963
1906	Storage (#169)	sold October 1956
1906	**Gayley Avenue Bridge (#239)**	**extant, modified**
1907	Car Oiling House (#252)	moved, no date
1908	**Ore Samples House (#160)**	**extant**
1908	**Boiler House (#181)**	**extant**
1909	Foreman's office (#233)	removed, no date
1910	Dry House (#180)	razed 1963
1910	**Electric Shop (#188)**	**extant**
1910	**Laboratory (#250)**	**extant**
1910	**Laboratory (#251)**	**extant**
1910	**Storage Warehouse (#292)**	**extant**
1911	**Headquarters Shops (#171)**	**extant**
1911	**Rip Track Repair Shop (#253)**	**extant**
1912	Lumber Shed (#170)	moved off site 1934
1912	Pipe Rack (#228)	razed 1963
1913	**Storage and Cement Shed (#227)**	**extant**
1914	**Staff Engineer's Office (#163)**	**extant**
1915	Hose House (#125)	removed, no date
1916	Mason Storage (#172)	removed, no date
1918	Flue Rattler House (#3)	razed 1959
1918	Warehouse (#229)	razed 1957
1919	**Transformer Substation (#89)**	**extant, modified**

Date	Building	Status
1920	**Garage (#182)**	**extant**
1920	**Welding Shop (#230)**	**extant**
1920	Storage House (#273)	razed 1963
1922	Paint Warehouse (#173)	razed 1960
1923	**Lumber Shed (#189)**	**extant**
1923	Police Office (#190)	removed, no date
1923	Salt Tank (#275)	razed 1949
1923	Tool House (#276)	moved, no date
1924	Oxygen Storage (#174)	razed 1958
1924	Carbide Platform (#183)	razed 1957
1928	Locomotive Water Tank (#226)	razed 1948
1934	Coal Dock (#175)	moved, no date
1939	Garage (#8)	removed, no date
1941	Sample Storage (#166)	moved, no date
1942	**Tractor and Truck Garage (#168)**	**extant**
1943	Rip Track Repair Shop (#176)	removed, no date
1943	**Storage Warehouse (#177)**	**extant**
1949	Locomotive Water Tank (#206)	moved 1956
1951	**Garage (#9)**	**extant**
1954	**Diesel Fueling Station (#10)**	**extant**
1954	**Concentration Pilot Plant (#11)**	**extant**
1954	Diesel Fuel Tanks (#12)	removed, no date
1956	Garage (#13)	moved, no date
1957	Iron Rack Office (#232)	razed 1963
1957	**Oil House and Gas Station (#15)**	**extant**
1957	**Pyro-metallurgical Pilot Plant (#19)**	**extant**
1958	Dispatcher's Office (#14)	removed, no date
1962	**Applied Research Building (#4)**	**extant**

Table 2: Construction and Removal Activity, by Decade, Oliver Iron Mining Company Shops and laboratory, Coleraine, MN.

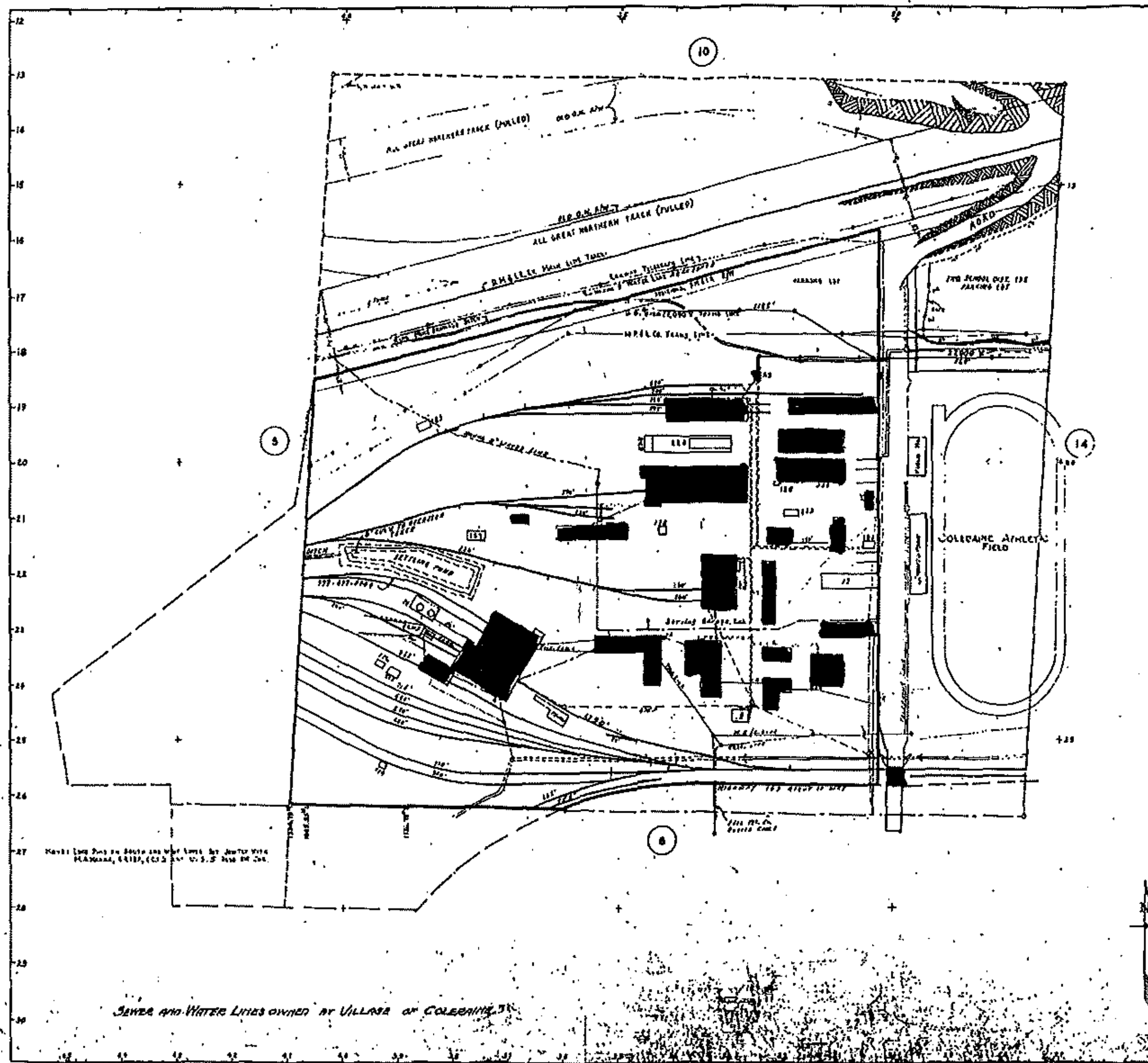
Decade	Number Built	Number Removed*	Extant 1997 (Building Number)
1900-1909	11	0	4 (90, 239, 160, 181)
1910-1919	16	0	9 (188, 250, 251, 292, 171, 253, 227, 163, 89)
1920-1929	11	0	3 (182, 230, 189)
1930-1939	2	1	0
1940-1949	5	2	2 (168, 177)
1950-1959	9	9	5 (9, 10, 11, 15, 19)
1960-1969	1	6	1 (4)

* Indicates partial information; not all dates of removal are listed.

Although Tables 1 and 2 give only an incomplete picture, nevertheless it is evident that the first decades of the facility's existence were years of unparalleled growth and development, as the OIM developed its mining activities across the Canisteo District. Likewise, the 1950s appear to have been a decade of substantial activity, as propulsion power was converted to diesel and record amounts of iron ore were shipped from the Mesabi as a whole (Mining Directory of Minnesota). Figure 3 illustrates the shops complex with extant buildings shaded for emphasis.

Shops Function and Use

Little has been written about the function and use of the facility as a shop complex. The OIM shops complex was apparently built to serve the nearby mining operations, in terms of providing repair and maintenance for the railroad locomotives and cars that hauled the ore, and by providing specialized work in



[illegible]	[illegible]	USE	FINAL DISPOSITION
1	1905	RESIDENCE	SOLD 12/31
2	1905	RESIDENCE	SOLD 1965
3	1910	FLUE RATTLER HOUSE	RAZED 1959
89	1919	TRANSFORMER SUBSTATION	
90	1906	LOCOMOTIVE HOUSE	
91	1906	WAREHOUSE	RAZED 1963
125	1915	HOSE HOUSE	
160	1908	ORE SAMPLES HOUSE	
162	1909	GARAGE	SOLD
163	1914	STAFF ENG'RS OFFICE	
169	1908	STORAGE	SOLD 10/195
170	1912	LUMBER SHED	TRANSF. 1/34 TO
171	1911	HEADQUARTERS SHOPS	
172	1916	MASON STORAGE	
173	1922	PAINT WAREHOUSE	RAZED 1960
174	1924	OXYGEN STORAGE	RAZED 1956
180	1910	DRY HOUSE	RAZED 1963
181	1908	BOILER HOUSE	
182	1920	GARAGE	
183	1924	CARBIDE PLATFORM	RAZED 1957
188	1910	ELECTRIC SHOP	
189	1923	LUMBER SHED	
190	1925	POLICE OFFICE	
226	1924	LOCOMOTIVE WATER TANK	RAZED 1948
227	1913	STORAGE & CEMENT SHED	
228	1914	PIPE RACK	RAZED 1963
229	1918	WAREHOUSE	RAZED 1957
230	1924	WELDING SHOP	
233	1909	FOREMANS OFFICE	
239	1906	GAYLEY AVE. BRIDGE	
250	1910	LABORATORY	
251	1910	LABORATORY CR. HOUSE	
252	1907	CAR OILING HOUSE	TRANS. TO PORTAL
253	1911	RIP TRACK REPAIR SHOP	
275	1923	SALT TANK	RAZED 1949
276	1923	TOOL HOUSE	
175	1934	COAL DOCK	TRANS. MAP 10
166	1941	SAMPLE STORAGE	
168	1942	TRACTOR & TRUCK GARAGE	
176	1943	RIP TRACK REPAIR SHOP	
177	1943	STORAGE WAREHOUSE	
292	1910	STORAGE WAREHOUSE	
6	1959	GARAGE	
208	1945	LOCOMOTIVE WATERTANK	MOVED 1956
8	1951	GARAGE	
10	1954	Diesel Fueling Sta.	
11	1954	Concentration Pilot Plant	
12	1954	DIESEL FUEL TANKS	
13	1956	GARAGE	TRANS. TO 1087
232	1957	IRON RACK OFFICE	RAZED 1983
275	1920	STORAGE HOUSE	RAZED 1963
15	1951	OIL HOUSE FOAS STA.	
14	1956	DISPATCHER'S OFFICE	
19	1957	Pyro-Metallurgical Pilot Plant	
4	1962	APPLIED RESEARCH BLDG.	

Figure 3 Site map, Oliver Iron Mining Company, Shops and Laboratory, extant buildings shaded.

electrical, masonry, and other building trades. As the actual mining processes grew more complex, the shop function evolved to meet changing needs. For example, the removal of overburden and mining of ore was originally conducted with steam shovels, which grew in size and mechanical complexity. The first steam shovels on the range appeared in 1893 and had a capacity of 2.5 cubic yards. Between 1905 and 1924, the OIM bought over 100 steam shovels, ranging in size up to 7 cubic yards. (Not all were used in the Canisteo District, of course.) Oliver engineers and field operators contributed to the modifications in design of steam shovels by communicating their experiences in the field under heavy work conditions. (The shovels ran nearly 24 hours a day during mining season.) One of the ancillary results of this kind of cooperation was that the shops must have quickly evolved from a place simply of maintenance to maintenance and design. Early steam shovels ran on rails, much like the railroad cars that hauled the ore out of the mines. By 1920, though, the emergent technology of "caterpillar type" tracks had largely replaced rail-mounted shovels. This development meant that fewer men were needed to operate the shovel, since ground preparation and laying of track ahead of the shovel was no longer necessary (Pyles 1954).

Van Barneveld writes eloquently of the importance of steam shovels in open pit mining, "Maximum efficiency at the steam shovel can only be maintained when every other operation is considered subservient to the steam shovel, which is the source of supply (144)." He notes that many mining companies could at that time (roughly 1910) manufacture every part of a shovel except for the boiler, engine, and some patented parts that were exclusive to the shovel manufacturers. From these comments, it can readily be seen that the shop facility, source of the weekly repair materials and the biennial complete overhauls that were required to keep a shovel operating at capacity, was a central part of a mining company's overall operation. Simply supplying the machines was a mammoth job: Barneveld reports that a shovel used, on average 2.5-3.5 tons of coal on a 10 hour shift, 5 gallons of black oil and 5 gallons of cylinder oil every 24 hours, and 12,000-15,000 gallons of water every 24 hours (147).

Change continued at the shops in the 1920s, with the conversion from steam-powered shovels to electric power. Electric shovels had been invented in 1905, and had come to the Mesabi in 1920. The advent of electric shovels further reduced manpower needs associated with ore procurement, since it eliminated coaling, watering, banking and maintaining fires, and boiler cleaning. The earliest electric shovels obtained by the OIM, in 1926, were purchased without the electric plant or equipment used to run the frame. Company managers felt that their in-house electric staff could do a better job of equipping the machine to fit their needs than the manufacturer. In addition to servicing mining and hauling equipment, the Coleraine shops served the Trout Lake concentration plant (Pyles 1954).

Paul Waller offered insights into the shop function of the facility as it had evolved into the 1950s. His first year of service, 1953, saw the last steam locomotive on the Canisteo District. The replacement of this engine with a diesel engine from Hibbing marked the completion of a conversion cycle from steam power shovels and steam locomotives, through electric shovels and steam trains, to the gradual replacement of all steam with diesel engines, and the finally, trucks. The shop facilities, of course, evolved to fit changing needs.

By the early 1950s, the estimated labor force on the site was 1100-1200 men, with a supervisory crew of 80, spread over multiple shifts. This was the smallest of the three headquarters shops facilities operated by the OIM. It drew workers mostly from Coleraine and Grand Rapids, but some from as far away as Hill City or Remer. There was a full hierarchy at the facility, with a maintenance superintendent responsible for the entire operation, and district carpenter, electrician, and other specialists in charge of particular crews. Supervisors of individual mines called the headquarters to arrange for the services of whatever crew might be needed, so the carpenters, machinists, and electricians often worked throughout the district as their skills were needed. Crews were on stand-by at night as well.

Laboratory Function and Use

Some of the most important activity undertaken at the Coleraine facility took place in a series of small frame buildings on the site's southeast quarter. This was the analytical laboratory complex, where iron ore coming out of the mines was analyzed for its iron content and for the presence of other chemicals. This was done as the trainloads of ore came from the mines, and helped develop the activity of the company's work in several ways. First, analysis allowed managers to determine if what was coming from the mine was what was intended. Reports from mining engineers documented the expected iron ore content at various places in the district's mines, but it wasn't until the ore was actually excavated that the predictions could be confirmed. Expectations about particularly rich, or conversely relatively poor, areas of each mine could be tested using the resources of the analytical labs. Furthermore, the testing was an important part of the company's economic activities. Lease arrangements, for example, might be based on expectations of ore richness. Blast furnaces in the eastern Great Lakes paid according to grade of ore, and the analysis done at the labs helped determine ore grade. This was especially important in the western Mesabi where the high silica content and relatively low iron content of the ore bodies necessitated the concentrating process described above. Lab analysis might help establish the need for beneficiation.

Rod Bleifuss was Research Manager at the Coleraine Mineral Research Laboratory from 1977-1986. He noted that USS had long had a substantial research interest, and that in fact the Carnegie steel companies had established analytical laboratories prior to the development of the western Mesabi. The sandy ore of the western Mesabi made these analyses more important than previously, though. By the 1930s, nearly all the companies mining on Minnesota's Iron Range were using chemical analysis as a form of quality control in their production. Various analyses required drying, crushing, and pulverizing ore from 5-10 pound samples in order to get statistically representative 1/2 gram samples for analysis. As analytical methods developed, and other forms of testing were required, sample sizes grew sometimes to several hundred tons, which would be used to test a complete processing facility.

It's important to understand the lab work in the Coleraine facility in several contexts. In 1943 OIM established a research lab in Duluth, to expand the range and scope of research conducted by the company. Between 1943 and 1962 when the lab was closed and its functions transferred to Coleraine, the two labs had complementary duties. After 1963, until USX transferred the facility to the University of Minnesota in 1986, the Coleraine lab was part of the overall research function at USX. This section of the report describes the USX research work, particularly some of the roles that Coleraine played.

In 1943 OIM purchased a building in Duluth for a lab/research facility, created the Research Department and hired Walter Maxson as Vice-President, Research. The Duluth building contained a number of functions: pilot plant area in a section where ceilings had been removed for more vertical space, machine and carpenter shops, a room for sample preparation, offices, library, conference room, "batch" lab for small scale experiments, room for chemical analyses, pyrometallurgical and microscope labs also. The early 1960s saw a phasing out of the Coleraine Administrative District and the OIM shifted its emphasis to taconite production on the eastern Mesabi. As mining in the western Mesabi diminished the headquarters shops in Coleraine become surplus, and the OIM moved its research function to that facility, which was well suited to handling large batches of samples and the development of new analysis and processing methods. The Coleraine facility became part of the Engineering and Research Department of Minnesota Ore Operations (successor to the OIM). In 1964, it became Division 15 of the Applied Research Laboratory of USS at Monroeville, PA. By the end of the decade Research had become involved in US Steel's shift to exploration for any resources that might be profitable rather than just iron. The lab's activities became world-wide and involved uranium, copper, fluorspar, and titaniferous beach sands, among many other minerals.

The exploitation of taconite deposits at the present Minntac Mine, at Mountain Iron, is a good example of the kinds of work Research was involved with, and the way it worked with other divisions,. Research geologists examined core samples taken years earlier and conducted small scale tests that suggested that the raw ore could be economically processed. Taconite is iron ore embedded in hard rock, and had not been thought profitable or feasible to produce until Prof. E.W. Davis of the University of Minnesota devised ways to process and concentrate the raw taconite. Research then assisted in exploration drilling in the Mountain Iron area to determine the tonnage and quality of magnetic taconite in OIM held lands. Research teams developed flow sheets and process charts for design of a pilot plant at Pilotac to work out the prototype plant to refine the processing. Then, when Minntac came on line (1967), Research was involved in a number of stages and refinements to that mine complex. "Our mission was to assist Minntac in improving the chemical and physical properties and the uniformity of their pellets as delivered to the consumers ("People and Projects")."

SUMMARY AND CONCLUSIONS

At the very least, it can be concluded that the shops facility was central to the successful operation of the Oliver Iron Mining Company in the western Mesabi. It appears also to be the case that significant technological work was undertaken at the facility, first through the cooperative work of OIM engineers and the manufacturers of equipment such as power shovels and caterpillar tracked ore carriers. Innovative work continued during the period the shop facility was part of the research arm of USS during the 1960s-1980s period. Although specific activities and individuals are difficult to document, for a number of reasons, not the least of which is the proprietary nature of industry-sponsored research, it appears safe to say that the Coleraine labs facility serves as a lens through which historians may examine critically important, though often overlooked, aspects of the history of iron mining in Minnesota.

BIBLIOGRAPHY AND NOTE ON SOURCES

Published literature about mining, metallurgy, and Minnesota's Iron Range is voluminous. This report does not attempt to synthesize these disparate literatures, nor is it a history of the Oliver Iron Mining Company or mining technology. Standard sources on Minnesota's history include Theodore Blegen Minnesota: A History of the State, William Watts Folwell Minnesota History, and Clifford Clark (ed) Minnesota in a Century of Change (see Arnold R. Alanen "Years of Change on the Iron Range" pp. 155-194). These texts contain a great deal of information about the Iron Range, but pay little attention to how mining operations were conducted, and the relationships between maintenance, mining operations, and the diverse functions of research on the range. The same can be said for David Walker's Iron Frontier: The Discovery and Early Development of Minnesota's Three Ranges. The technical literature in engineering history is likewise voluminous, but does not directly address the work of the Oliver Iron Mining Company in the Western Mesabi. An important technical and summary volume is Charles E. Van Barneveld Iron Mining in Minnesota, which was published in 1913 as Bulletin #1 of the Minnesota School of Mines Experiment Station at the University of Minnesota. Van Barneveld's book contains a wealth of "process" information, including schematic drawings of varying types of mine shaft support arrangements and other technical data. This is an essential introduction to the technical and operational history of the subject. The Mining Directory compiled 1920-1975, 1977-present by the University of Minnesota School of Mines Experiment Station contains detailed statistical information about active and inactive mines, mining companies, and production, and includes maps of the various mining districts. The information found there is invaluable for the "big picture" of the changing mine production and company profiles in Range mining history, but doesn't contain specific information on the property that is the subject of this study, and how it was used. Perhaps the closest published work to the subject of the Coleraine Shops is Donald Boese's John Greenway and the Opening of the Western Mesabi (Bovey 1976), an excellent account of Greenway's activities during his five years in the region and the initial phase of Oliver operations during the 1905-1910 period. "People and Projects," a typescript history of research at U.S. Steel, was invaluable for establishing context for some of the activities at Coleraine.

Holdings of the following libraries were consulted during the course of preparing this report: Minnesota Historical Society, St. Paul, MN; University of Minnesota, Minneapolis, MN; Itasca County Historical Society, Grand Rapids, MN; Coleraine Public Library, Coleraine, MN; Iron Range Research Center, Chisholm, MN. Other valuable sources used in the compilation of this report include the following:

Abe W. Mathews Engineering Co.

1991 "Building Evaluation: Coleraine Minerals Research Laboratory" Report prepared for the University of Minnesota. Copy on file, Natural Resources Research Institute, University of Minnesota, Duluth, MN.

Alanen, A. R.

1989 "Years of Change on the Iron Range," pp. 155-194 in Minnesota in a Century of Change: The State and Its People Since 1900. Minnesota Historical Society, St. Paul.

Blegen, T.C.

1963 Minnesota: A History of the State. Minnesota Historical Society, St. Paul.

Bleifuss, R.L.

1997 Personal communication. Notes in possession of the author.

Boese, D.L.

1976 John C. Greenway and the Opening of the Western Mesabi. Itasca Community College Foundation, Grand Rapids, MN.

Coleraine Jubilee, 1909-1984

1984? Copy in the collections of the Coleraine Public Library, Coleraine, MN.

Folwell, W.W.

1969 A History of Minnesota: volume 4. Minnesota Historical Society, St. Paul, MN.

Grand Rapids Herald-Review

1921 "The Development of Itasca's Mining Industry" December 21, 1921.

Konckér, C.K.

1990 "UM/NRRI Coleraine Minerals Research Laboratory—Facility Study" University of Minnesota Physical Planning Office, Minneapolis, MN.

Mining Directory of Minnesota

n.d. Annual publication of the University of Minnesota Mines Experiment Station 1920-1977.

Neimi, C.

1997 Personal communication. Notes in possession of the author.

Oliver Iron Mining Company

n.d. Photographic albums held in the Audio-Visual Collections, Division of Archives and Manuscripts, Minnesota Historical Society, St. Paul. The albums detail many aspects of mining operations and buildings and mines associated with the Oliver during the first half of the 20th century.

"People and Projects"

1986[?] Typescript history of the Research Department, USS, in Duluth and Coleraine. N.p. Copy on file, Coleraine Minerals research Laboratory, Coleraine, Minnesota.

Pyles, G.B.

1954 "Canisteo District, Producing Division, King Mine, Power Shovels" typescript report in the Itasca County Historical Society, Grand Rapids, MN.

Stipanovich, J.

1979 The Report of the Iron Range Historical-Cultural Survey. Iron Range Resource and Rehabilitation Board and State Historic Preservation Office.

USX Corporation

n.d. Maps in the files of the Northern Lands office, Mountain Iron, Minnesota.

Van Barneveld, C.E.

1913 Iron Mining in Minnesota. Bulletin #1 of the Minnesota School of Mines Experiment Station, University of Minnesota, Minneapolis, MN.

Virginia Enterprise

1909 "Iron Ranges of Minnesota: Historical Souvenir of the Virginia Enterprise" (Virginia, MN: W.E. Hannaford).

Walker, D. A.

1979 Iron Frontier: The Discovery and Early Development of Minnesota's Three Ranges. St. Paul, Minnesota Historical Society.

Waller, P.E.

1997 Personal communication. Notes in possession of the author.

APPENDIX A

RESEARCH DESIGN

Introduction

The facility known historically as the Oliver Iron Mining Company Canisteo District Shops and Laboratory has been recommended as eligible for nomination to the National Register of Historic Places under Criterion A, for its association with the development of iron mining on Minnesota's Mesabi Iron Range. This rather plain collection of buildings has been recommended eligible based on its association with the patterns of ore extraction, processing, and shipping operations, and has not been evaluated as part of a hypothetical "mining industry architectural style" context. Such an evaluation is not necessary and is beyond the scope of the proposed work.

Published sources on the history of Minnesota's Iron Range generally have focused on a number of disparate subjects. There has been extensive attention paid to the story of the exploration, development, and initial production of iron mines in the region, generally analyzed from the perspectives of business, economic, or industrial history. Labor historians have examined conflicts between the workers of the mining region and management. Ethnic historians, as well as social historians and cultural geographers, have focused their attention on the ethnic makeup of the thousands of immigrants who came to work in the mines, as well as on their social patterns, living conditions, and the peculiar settlement patterns that grew up across the region. Historical literature searches have not identified recent studies that examine the operational processes of mineral extraction, processing, analysis, and transportation, however, whether in Minnesota as a whole or in the region served by this complex of buildings. The study seeks in part to remedy this gap.

Objectives

- To document the history of the physical development and use of the facility known historically as the Oliver Iron Mining Company Canisteo District Shops and Laboratory (today the Coleraine Minerals Research Laboratory). It is expected that the research will define how this property supported broader patterns of operations in the Mesabi Iron Range of Minnesota, how it was a part of the historical pattern of activity conducted by the Oliver Iron Mining Company, and how those activities differ across geographical areas in the Mesabi Iron Range. The research undertaken will contribute to the refinement of the Minnesota SHPO context "Iron Mining in Minnesota."

Methods

- To conduct research in state and regional libraries as appropriate.

- To conduct interviews with local informants as appropriate, although fully-developed oral histories are not expected to be needed or conducted, given project limitations.

- To conduct searches for graphic representations of the property in question, including maps, photographs, and drawings.

Expected Results

- It is expected that a history of the property will be developed and written in a clear, readable report, illustrated as appropriate with historic and contemporary images.

- It is expected that the results of this study, with appropriate graphic documentation such as maps and photographs, will be used in the development of a public exhibit to be put on display somewhere in the region broadly served by the historical activity of this facility (i.e. the iron range areas of Itasca County and western St. Louis County).

- It is hoped that copies of this report will be made available through normal channels of information dissemination, so that the results can be made more broadly available to historians and geographers.

APPENDIX B

CHRONOLOGY OF IMPORTANT DATES AND EVENTS

1904 The Oliver Iron Mining Company purchases land from the Canisteo Mining Company, headed by Chester Congdon and Guilford Hartley of Duluth, and commits to development of the western Mesabi.

1905 John C. Greenway appointed general superintendent of the Canisteo District, Oliver Iron Mining Company. First construction activity by the Oliver Iron Mining Company in the western Mesabi, including the beginnings of the model town of Coleraine.

1906 The earliest extant buildings at the Oliver Iron Mining Company Shops and Laboratory are constructed. Stripping of overburden at the Holman Mine, the first Oliver mine in the Canisteo District.

1907 Trout Lake Concentrating Plant pilot plant constructed and first ores processed.

1910 Trout Lake Concentrating Plant goes into production. John C. Greenway leaves the Mesabi Range to pursue other ventures in the copper mines of Arizona.

1943 United States Steel creates a Research Department and establishes its headquarters in Duluth.

1953 Last steam locomotive retired from use in the Canisteo District.

1962 United States Steel closes its Research Department facility in Duluth and moves that function to the shops and laboratory facility in Coleraine. The move is completed in 1963.

1973 Trout Lake Concentrating Plant closed.

1986 Agreement reached between United States Steel and the University of Minnesota whereby equipment at the shops and laboratory complex is sold to the University, staff are transferred, and applied research continues under the auspices of the Natural Resources Research Institute. The facility is renamed the Coleraine Minerals Research Laboratory.

1996 Title to the property transferred to the University of Minnesota.