NPS Form 10-900
(Oct. 1990)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determination for individual properties and districts. See instruction in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Cardiff Coke Ovens

other names/site number Colorado Fuel & Iron Coke Ovens E; 5GF461

2. Location

street & number Approx. 1.5 miles south of Glenwood on CR 116 [N/A] not for publication

city or town Glenwood Springs [X] vicinity

state Colorado code CO county Garfield code 045 zip code 81601

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this [X] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [X] meets [ ] does not meet the National Register criteria. I recommend that this property be considered significant [ ] nationally [ ] statewide [X] locally.
(See continuation sheet for additional comments [ ].)

Signature of certifying official/Title — State Historic Preservation Officer — October 10, 1996 — Date

State Historic Preservation Office, Colorado Historical Society
State or Federal agency and bureau

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria.
(See continuation sheet for additional comments [ ].)

Signature of certifying official/Title — Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

[√] entered in the National Register
See continuation sheet [ ].
[ ] determined eligible for the National Register
See continuation sheet [ ].
[ ] determined not eligible for the National Register.
[ ] removed from the National Register
[ ] other, explain
See continuation sheet [ ].

Signature of the Keeper — Date

Edson H. Beall — 11-15-96

Cardiff Coke Ovens
Name of Property

Garfield County, Colorado
County/State

5. Classification

Ownership of Property
(Check as many boxes as apply)

[X] private
[ ] public-local
[ ] public-State
[ ] public-Federal

Category of Property
(Check only one box)

[ ] building(s)
[ ] district
[ ] site
[X] structure
[ ] object

Number of Resources within Property
(Do not count previously listed resources.)

Contributing	Noncontributing	
0	0	buildings
0	0	sites
1	0	structures
0	0	objects
1	0	Total

Name of related multiple property listing.
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register.

0

6. Function or Use

Historic Function
(Enter categories from instructions)

PROCESSING: manufacturing facility

Current Functions
(Enter categories from instructions)

NOT IN USE

7. Description

Architectural Classification
(Enter categories from instructions)

OTHER: beehive coke oven

Materials
(Enter categories from instructions)

foundation STONE
walls BRICK
roof
other

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

Cardiff Coke Ovens
Name of Property

Garfield County, Colorado
County/State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

[X] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

[ ] **B** Property is associated with the lives of persons significant in our past.

[ ] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

[X] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

[ ] **A** owned by a religious institution or used for religious purposes.

[ ] **B** removed from its original location.

[ ] **C** a birthplace or grave.

[ ] **D** a cemetery.

[ ] **E** a reconstructed building, object, or structure.

[ ] **F** a commemorative property.

[ ] **G** less than 50 years of age or achieved significance within the past 50 years.

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

Areas of Significance
(Enter categories from instructions)
INDUSTRY
ARCHAEOLOGY: HISTORIC--NON ABORIGINAL

Periods of Significance
1888 - 1910

Significant Dates
N/A

Significant Person(s)
(Complete if Criterion B is marked above).
N/A

Cultural Affiliation
Euro-American

Architect/Builder
Grand River Coal & Coke Company

9. Major Bibliographic References

Bibliography
(Cite the books, articles and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

[ ] preliminary determination of individual listing (36 CFR 67) has been requested

[ ] previously listed in the National Register

[ ] previously determined eligible by the National Register

[ ] designated a National Historic Landmark

[ ] recorded by Historic American Buildings Survey

#_____

[ ] recorded by Historic American Engineering Record

#_____

Primary location of additional data:

[X] State Historic Preservation Office

[ ] Other State Agency

[ ] Federal Agency

[ ] Local Government

[ ] University

[ ] Other:

Name of repository:

Cardiff Coke Ovens
Name of Property

Garfield County, Colorado
County/State

10. Geographical Data

Acreage of Property 3.7

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing		Zone	Easting	Northing
1.	13	301350	4375120	3.			
2.				4.			

[ ] See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Kae McDonald / Director

organization Frontier Historical Society/Museum date 11/29/1995

street & number 1001 Colorado Avenue telephone 970-945-4448

city or town Glenwood Springs state Colorado zip code 81601

Additional Documentation
Submit the following items with the completed form:

Continuation Sheets

Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs
Representative **black and white photographs** of the property.

Additional Items
(Check with the SHPO or FPO for any additional items)

Property Owner
(Complete this item at the request of SHPO or FPO.)

name see continuation sheet

street & number _____ telephone _____

city or town _____ state _____ zip code _____

DESCRIPTION

The Cardiff coke oven bank-system currently consists of 52 kilns located at the eastern base of a north-south trending ridge, approximately 300 meters from the west bank of the Roaring Fork River and 100 meters southwest of the remaining buildings of Cardiff. The ovens form a linear battery one unit deep and approximately 200 meters in length. Forty-nine of the ovens are nearly identical in construction and are typical of the common beehive design. However, three of the ovens exhibit a unique characteristic in that vents have been installed at the back of each oven. These vents may have connected to an internal system allowing the ovens to be ignited internally. The oven foundations consist of shaped sandstone slabs and the walls are of compressed brick. The funnel was shaped either by brick or masonry blocks. Shaped stone blocks once formed a uniform vertical face. Most of the facing stones have been removed for use in local area construction projects. A two-track dirt road in front of the ovens, heavily impregnated with coke and coal dust, is all that remains of the working area. Foundations at the north end of the ovens may have been part of coal bins used for storing, washing and crushing the coal.

Historic Design and Use

Coke ovens transform coal into coke for use in the furnaces of the smelting industry. The value of coke lies in its great crushing strength, porosity, freedom from foreign substances and the intense heat it generates while burning.

The beehive coke oven, so named for its shape, was the most widely used design in Colorado (Figure 1). Such ovens typically rest on a circular base of fire brick 11½ to 13 feet in diameter. A spherical dome of special fire brick rise from the base to a circular opening at the top about 13 inches in diameter. The top opening is used to load coal and for smoke release and is known variously as a *funnel* or *tunnel*. The door opening is located on the lower front of the oven and generally measures 3 feet square.

Coke ovens were normally grouped into long operating banks or batteries, two ovens deep, and containing from 25 to as many as 200 or 300 on a side. The ovens either back up directly on each other or are staggered. A stone retaining wall covers the front of each oven battery. A stone or brick pier occupies the space between each oven and supports the metal "I" beams which in turn support the rails upon which the larry cars (hopper-shaped steel cars) run to charge or fill each oven. Loam and well tamped earth fill the space around each oven to retain as much heat as possible. A wharf runs the length of each battery about 2½to 3 feet below the bottom of the oven doors. Each wharf measures about 16 feet wide and terminates in a short retaining wall which separates the oven area from the railroad tracks.

The process of coking the coal is one of distillation, whereby volatile matter, moisture, sulphur and phosphorus are expelled, leaving fixed carbon and ash. Prior to being placed in the coke ovens, coal is first crushed, washed, dried and pulverized to produce a clean, uniformly sized material the consistency of cornmeal. A conveyor transports the processed coal from the washery to a slack bin for storage prior to firing. Larry cars move 5-6 ton loads of coal to the coke ovens by means of the railroad tracks across the top of the coke ovens. The cars empty their contents into the

Figure 1. Cross Section Diagram of Typical Beehive Coke Oven

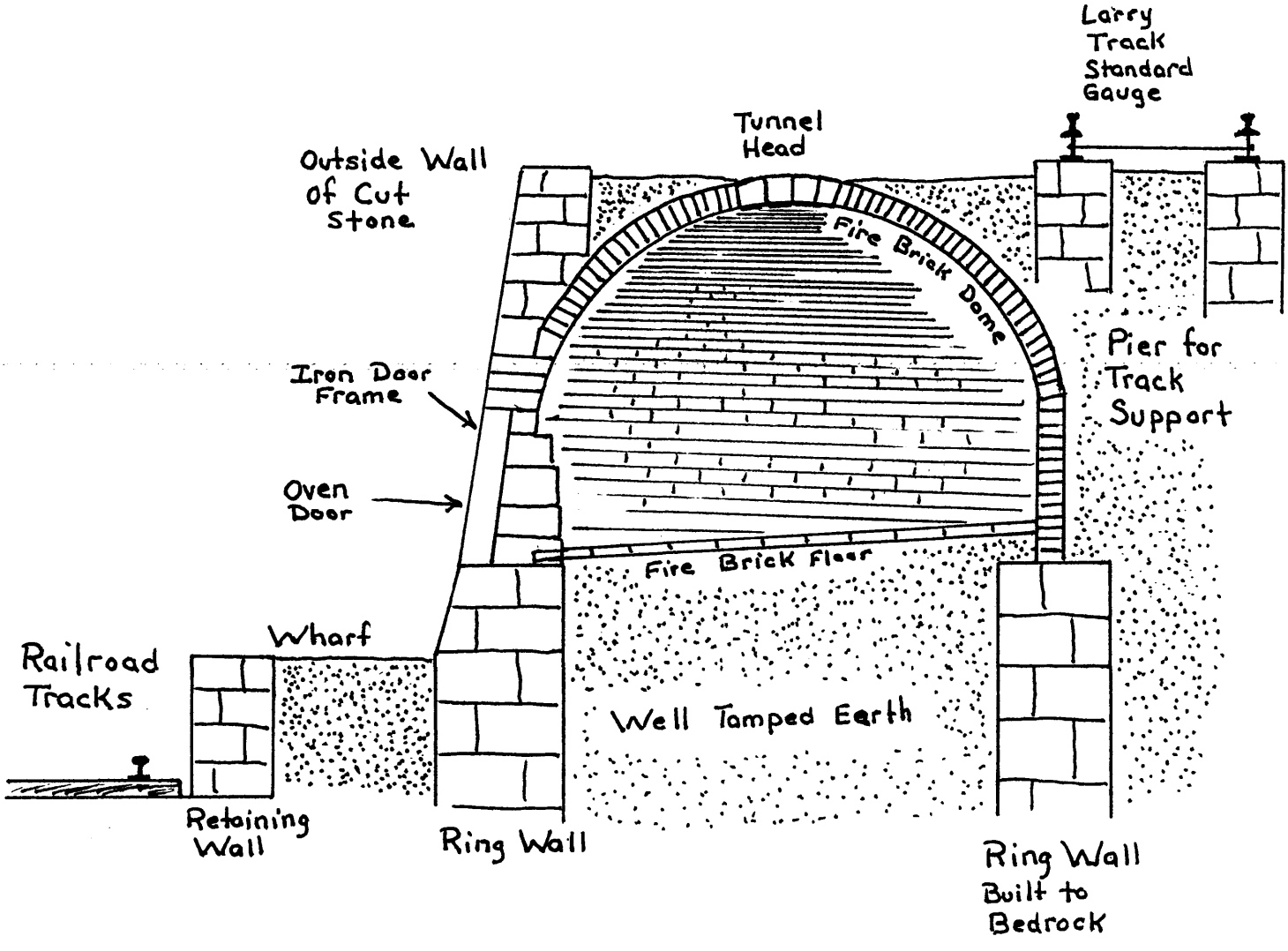

Diagram is based on sketch by Frederick C. Steinhauser in *Camp and Plant*, Vol. V., No. 2, p. 31, 1/23/1904

ovens through the funnel opening. The coal forms a conical shaped pile as it falls into the oven. Laborers level the coal with a long iron hook inserted through the door. The door is then bricked up except for a small opening at the top to control the air flow.

The heat remaining in the bricks from the previous operation begins the distillation of volatile matter in the ovens. Gases released by the heat mix with air coming in the door opening and ignite in the dome space of the oven. The coking process begins at the top of the coal pile and continues downward, and slightly inward, toward the base, emitting a bright flame after about twelve hours. Flames released through the funnel light the sky with a reddish glow and produce dense smoke as a byproduct. The coal fuse and expand to produce the cellular structure of coke. Gradually, the flames die off and after forty-eight hours, the coking is completed. The coke is cooled with about 450 gallons water. Workers pull the coke out through the front of the ovens with a tool known as a *ravel* or scraper. The coke is generally heaped on the wharf awaiting shipment by rail. Rail cars are brought along side the wharf and the coke is forked by hand into the cars to separate the undesirable ashes and fine coke or *braize*. Beehive coke ovens produced an average of 48 tons of coke per 48 hours of operation and usually yielded 60 - 65% by weight of coal charged.

Current Conditions

The Cardiff ovens differ from the typical design in that they form a battery only one oven deep. All of the ovens exhibit fairly uniform floor plans, each with a circular foundation of shaped stones measuring approximately 11 feet in diameter. Currently, the foundation stones are present only along the interior walls in each of the ovens, although the floor was totally covered by these stones during use.

All oven walls are composed of fire brick. Based on the distinct brick colors, it is suspected that different batches of brick were used for the construction of the ovens. The intense temperatures reached on the interiors of the ovens is exhibited by the thick glaze-like coating on the bricks. That the bricks, at times, reached a liquid state is exhibited by the small stalactites formed on the interiors of the ovens, especially near the funnel. In addition, the soil that is next to the exterior wall is "welded," and has remained intact, even after the removal of the brick. Numerous references mention the spectacle of the glow from the burning ovens and the fact that they were visible at night from many miles away.

Three of the ovens display an unusual venting systems. The oven vents installed at the back all utilize the same foundation and wall configurations as the other ovens, with the exception of the vent itself, each of which is constructed slightly differently. The vents lead to a subsurface channel which apparently drew the gases off and channeled them into the other ovens. It is possible that these gases were used to ignite new batches of coal in cool ovens. Two of the vents have an arch facade measuring 28 inches high at the center point and 28 inches wide at the base. The base of the arch is approximately 14 inches above the floor of the oven. The vent is 47 inches deep. At the back of the vent, in the floor, is a hole measuring approximately 27 inches in diameter. The vent in the third oven exhibits a circular facade just below the center of the back wall. The vent opening is 22 inches in diameter. The interior of the vent is similar to the other vents. The vents are constructed from the same brick as the walls, suggesting that they were created at the time of the oven construction.

The ovens are in variable states of decay, with some having only a few finishing bricks removed, while the bricks of others are nearly all gone. Currently, the walls of almost all the ovens are clearly visible due to the removal of the stone facing wall after the coke ovens were no longer in use. During the height of operations, the walls of the ovens were completely covered by a shaped-stone facing wall. This facing provided the foundation for larry car tracks that ran along the top of the ovens, with the coal loaded into the ovens by means of a chute running between the cars and the funnel hole on top of the ovens. Only a few railroad ties remain to indicate the presence of a larry car system which hauled the coal from the slack bins to the ovens. Originally, the track system was supported by the facing wall and packed earth/rubble which provided a flat base. A thick layer of coal dust coats the ground surface on top of the ovens.

The funnel was constructed with either bricks or masonry rings. The bricks were placed perpendicular to the wall bricks. The bricks used for the funnel were the same as those used for the walls. The masonry rings used in some of the funnels were in three pieces, measuring approximately 8"x 8". The funnel opening measured approximately 12 inches in diameter.

During use, the door was partially closed off with bricks. Although door dimensions cannot be determined at this time, they were probably approximately 3'x 3' with an arch along the top.

A small level area in front of the ovens indicates the wharf used during the removal of the coke from the ovens. This area, as well as a two-track dirt road located approximately 20 to 25 feet east of the ovens, are heavily coated with slag and coal dust. A deep ditch runs between the ovens and the two-track dirt road. Based on an examination of historic photographs taken during the coke ovens use, this ditch is in the same location as the Colorado Midland Railway tracks.

At the north end of the coke ovens there are a series of masonry foundations. It is suspected that these may have been the location of the coal bins which served to store, wash, and crush the coal prior to loading into the ovens.

The property was purchased in the early 1930s by New York financier George Sumers. The shaped stone facing wall was gradually dismantled and used in a subdivision (Glenwood Park) entrance sign, the fireplace in Mr. Sumers' lodge, and the sidewalk at the home of the nanny taking care of Mr. Sumers' children. Further deterioration and removal of shaped stone and bricks is suspected to have occurred throughout the past. Heavy development throughout the area currently threatens the coke oven property. Past impacts have included the destruction of an unknown number of coke ovens in the early 1980s to create a pistol shooting range for the local police department, and the destruction of more of the ovens in 1993 in preparation for the development of the property by the owners. At this time, only 52 ovens remain. Ten of the ovens were deeded to the Frontier Historical Society for preservation. Included in these ten ovens are the three vented ovens, and the most well preserved of the remaining ovens. The other 42 ovens remain under private ownership. All the ovens are deteriorating.

Artifacts were collected from the surface of the site and now are now stored at the Frontier Historical Museum, including bricks, rods (probably levers of some sort), a rake bed, and miscellaneous pieces of iron scrap (all heavily rusted). Purple glass shards are still present on the surface of the site, as are pieces of iron scrap and bricks. Unfortunately, the artifacts were collected by non-archaeologists and none of the surface artifacts were mapped prior to removal.

STATEMENT OF SIGNIFICANCE

The Cardiff Coke Ovens are being nominated under Criterion A for their association with the industrial history of the lower Roaring Fork valley. The ovens converted coal from the Spring Gulch Mine into coke for use by area smelters, the Grand Junction sugar beet factory, and the Pueblo steel mills of the Colorado Fuel and Iron Company. The site is also significant under Criterion D for its potential to yield important information concerning the construction and operation of coke ovens. The presence of an unusual venting system in three of the ovens may provide clues to the functioning of a subsurface coal ignition system.

Historical Significance

Cardiff was a major railroad stop on the mainline of the Colorado Midland Railway. The rails reached Cardiff from Leadville via Basalt to the southeast and continued on north to Glenwood Springs. The Jerome Park Branch split off at Cardiff and went south 10 miles to the end of track at the Spring Gulch coal mine. The Colorado Midland built a depot and four stall engine house in Cardiff in 1888. In addition, snow-clearing equipment for the Midland was housed at the Cardiff station. The coming of the railroad to the Roaring Fork valley provided a fast, reliable mode of transportation from the east side of the Continental Divide to the western slope. This in turn, provided an efficient way to transport goods to market and to bring larger populations to the area. The mineral wealth of the area, along with ranching and tourism, has provided the economic base for the local area.

Construction at the coke ovens began in December, 1887, by the Grand River Coal and Coke Company (GRCCC was a subsidiary of the Colorado Midland Railway). The first 50 ovens were completed in January of 1888 with processing beginning immediately thereafter. The ovens processed most of the coal from the Spring Gulch Mine, as well as coal from the Marion and Sunlight mines. The coal from the latter two mines was considered to be inferior to that of the Spring Gulch.

Originally square Belgium, or stack, ovens were constructed under the supervision of Walter B. Devereux, GRCCC general manager. Devereux aimed at producing a higher quality of coke than that available from the mines at Crested Butte. The stack ovens were rectangular and looked very different from the domed or beehive models then in general use in Colorado. The Belgium ovens proved to be too small for profitable operation, and while the coke produced was of good quality, it did not surpass the quality of coke produced in the standard beehive ovens. Devereux was strongly criticized for having built the Belgium ovens and he subsequently hired an expert from Pittsburgh, W.J. Morgan, to take over management of the ovens. Devereux resigned from the board of the GRCCC in 1889 and on August 15, 1889, he also resigned as general manager. Although no documentation can be found which explicitly states when the beehive ovens were constructed at Cardiff, records indicate that by December 31, 1891, 197 beehive and 52 rectangular ovens in a single battery were used at Cardiff, for a total of 249 ovens.

In August, 1892, the GRCCC sold their mines and coke ovens at Cardiff to the Colorado Fuel Company. In October, 1892, the Colorado Fuel Company and the Colorado Coal and Iron Company consolidated into the Colorado Fuel and Iron Company (CF&I) under the control of John C. Osgood. The Cardiff Coke Ovens were renamed by CF&I as coke ovens E.

CF&I operated several coke ovens in Colorado and northern New Mexico in conjunction with its mining and steel making operations. In addition to Cardiff, Colorado ovens were located at Tabasco, Starkville, Segundo, Sopris, Crested Butte and Redstone. Of these, only the Redstone ovens and a small remnant of the Crested Butte ovens survive.

In 1892, over 77,000 tons of coal mined at Spring Gulch was turned into slightly more than 53,000 tons of coke by the Cardiff ovens. In 1895, over 65,000 tons of coke were produced at Cardiff. The CF&I weekly company magazine, *Camp and Plant*, reported in December, 1901, that 66 men worked at the Cardiff Coke Ovens. In May, 1902, it reported that the town's population was 250, the majority of whom were Italians. Some community members worked for the Colorado Midland but the major employer was the CF&I coke ovens.

The Silver Crash of 1893 resulted in a significant reduction in silver smelting as well as the processing of other precious metals. This lead to a rapid decline in high country coal mining activities. The CF&I mines suffered the most as smelters in Aspen, Leadville and elsewhere stopped purchasing large quantities of coke. Production increased as the economy rebounded and by 1902 the Cardiff ovens were yielding a daily output of approximately 235 tons, but CF&I discontinued processing at the Cardiff Coke Ovens in 1910. Colorado Midland rail service was abandoned by federal government order in August, 1918. The tracks were removed shortly thereafter.

The property was purchased in the early 1930s by New York financier George Sumers The shaped stone facing wall was gradually dismantled and used in a subdivision (Glenwood Park) entrance sign, the fireplace in Mr. Sumers' lodge, and the sidewalk at the home of the nanny taking care of Mr. Sumers' children. Further deterioration and removal of shaped stone and bricks is suspected to have occurred. Heavy development throughout the area currently threatens the coke oven property. Past impacts have included the destruction of an unknown number of coke ovens in the early 1980s to create a pistol shooting range for the local police department, and the destruction of more ovens in 1993 in preparation for the development of the property by the owners. At this time, only 52 ovens remain. Ten of the ovens were deeded to the Frontier Historical Society for preservation. Included in these ten ovens are the three vented ovens, and the most well preserved of the remaining ovens. The other 42 ovens remain under private ownership. All the ovens are deteriorating.

Information Potential

Although the facade of the coke ovens suffered degradation through vandalism, the subsurface integrity of the area is good. Based on a surface reconnaissance of the site, there have not been any obvious ground-disturbing activities in the immediate area of the intact ovens. It is reasonable to expect that archaeological potential for determining construction methods of the foundation and the internal venting system is high. Research questions which the archaeological data from the coke ovens can answer include:

1) What is the design of the internal venting system and, if the venting system extends the length of the coke oven battery, how were each of the coke ovens ignited without an obvious vent?

2) At least two periods of construction have been noted for this site; the first being the construction of the Belgium ovens, and the second period being the construction of the beehive ovens. Based on archaeological investigations, as well as architectural and material comparisons of the oven themselves, can additional construction periods be determined?

3) Many of the workers hired by the coal companies operating in the Roaring Fork drainage system were Italian. Can ethnicity be determined from the archaeological remains at the site? How do the archaeological remains from this site compare to other coke-processing areas throughout the region, as well as throughout the country?

BIBLIOGRAPHY

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GEOGRAPHICAL DATA

Verbal Boundary Description

The boundary of the Cardiff Coke Ovens is shown as the triangular-hatched line on the accompanying scale map entitle, "Survey, Cardiff Coke Ovens, 1995."

Boundary Justification

The boundary includes all the remaining resources historically associated with the coke oven operation, including the remaining coke ovens, masonry foundations north of the ovens, the two-track dirt road and ditch directly east of the ovens, and a segment of the Colorado Midland Railway right-of-way adjacent to the ovens.

PROPERTY OWNERS

Frontier Historical Society
1001 Colorado Avenue
Glenwood Springs, CO 81601
970-945-4448

Glenwood Land Company, LLC
c/o Robert MacGregor
525 E. Cooper
Aspen, CO 81611

Figure 2. Cardiff Coke Ovens in Operation, ca. 1900

Figure 3. Cardiff Coke Ovens in Operation, ca. 1900

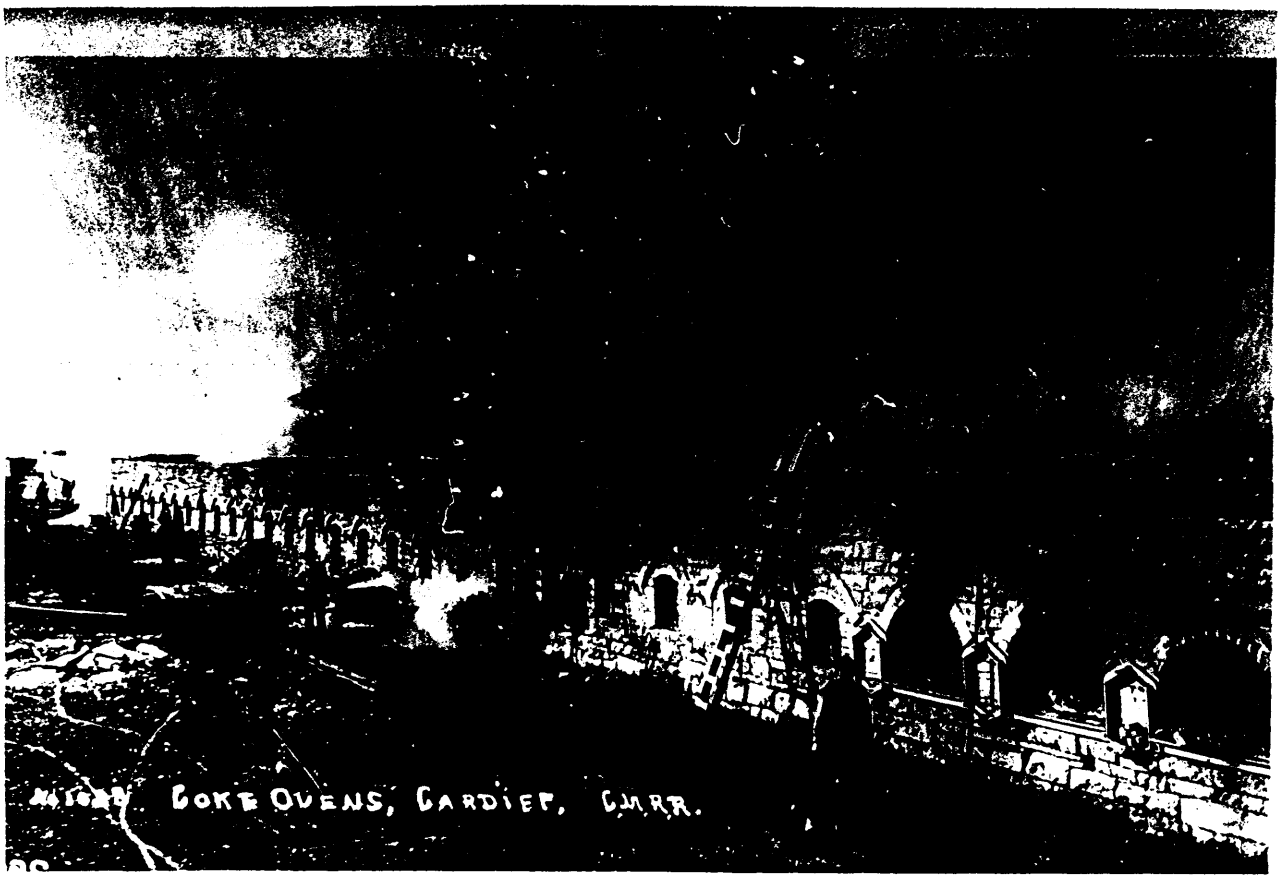


Figure 4. Cardiff Coke Ovens in Operation, ca. 1900

Colorado Historical Society.

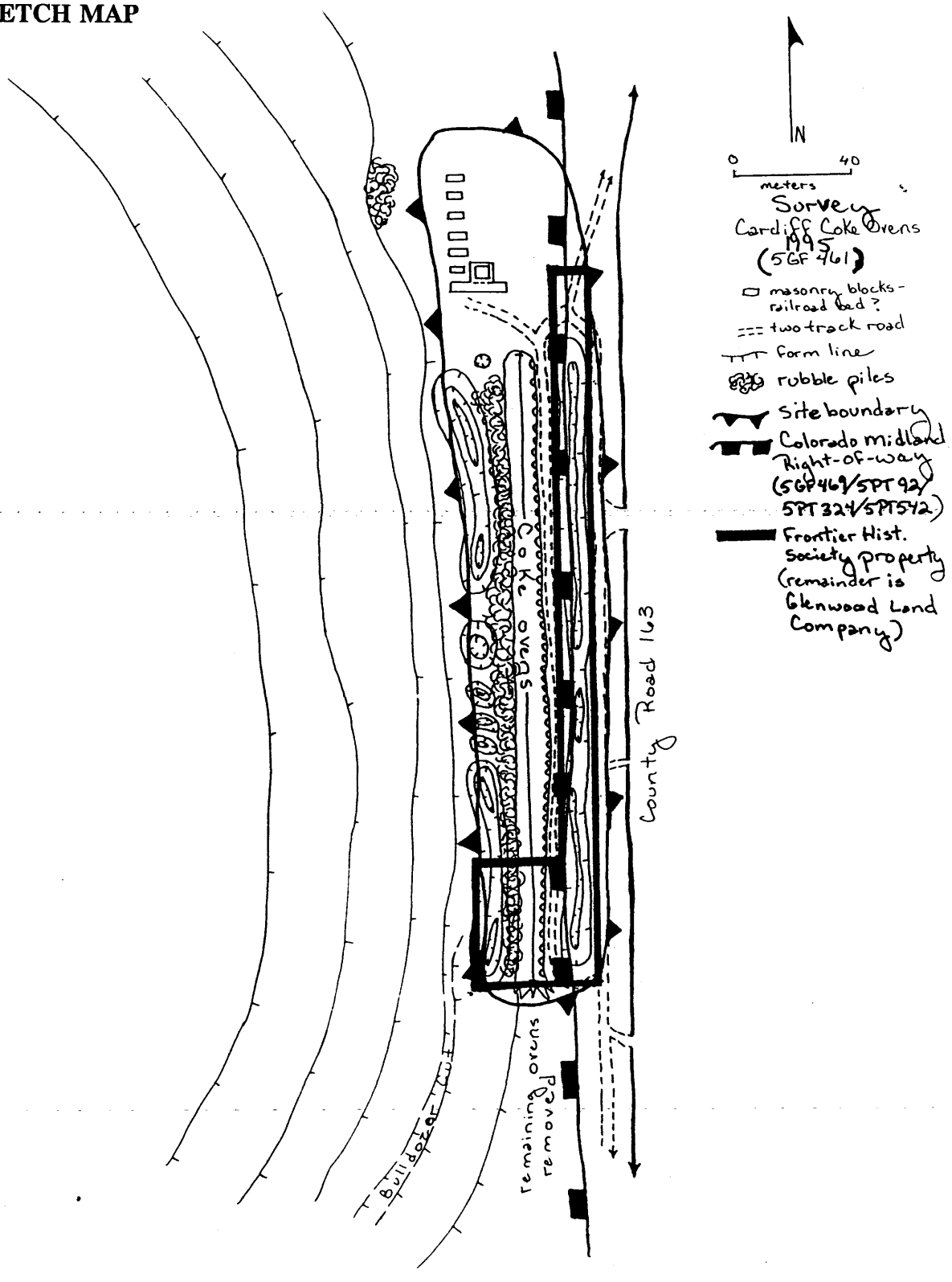
PHOTOGRAPH LOG

The following information pertains to photographs numbers 1 - 8:

Name of Property: Cardiff Coke Ovens
Location: Glenwood Springs vicinity, Garfield County, Colo.
Photographer: K. McDonald
Date of Photographs: July 26, 1995
Negatives: Frontier Historical Museum
1001 Colorado Avenue, Glenwood Springs, CO 81601

Photo No.	Information
1	Site overview looking north/northeast.
2	Looking south along two-track dirt road in front of the coke ovens.
3	Exterior view of a coke oven, looking west.
4	Looking down at the funnel head.
5	Looking north along masonry foundations of the coke ovens.
6	Vent, interior of coke oven.
7	Looking west at remaining stone facing.
8	Looking northwest at stone facing.

SKETCH MAP


N
0
40
meters
Survey
Cardiff Coke Ovens
1995
(5GF461)
masonry blocks - railroad bed?
two track road
form line
rubble piles
site boundary
Colorado Midland Right-of-way (5GP469/5PT92/5PT324/5PT542)
Frontier Hist. Society property (remainder is Glenwood Land Company)
Coke Ovens
County Road 103
Bulldozer cut
remaining ovens removed

USGS TOPOGRAPHIC MAP
Glenwood Springs, Colo.
7.5 Minute Quad
1961, Photorevised 1987