

APPENDIX A

GPR REPORT

**GPR Survey and GPS-GIS Services for the
North Birmingham Sloss-Sheffield Site (1Je808) within the
Proposed Finley Boulevard Extension Corridor in
Birmingham, Jefferson County, Alabama**

Submitted to:

MRS Consultants, LLC.
P.O. Box 3146
Tuscaloosa, Alabama 35403
April 5, 2016

Kent A. Schneider, Ph.D.
Douglas Luepke
Underground Imaging Solutions
P.O. Box 605
Auburn, Georgia 30011

Introduction

Underground Imaging Solutions (UIS) was contracted by MRS Consultants, LLC. (MRS) to provide ground penetrating radar (GPR), global positioning system (GPS), and geographical information system (GIS) services for an area along the proposed Finley Boulevard extension in Birmingham, Jefferson County, Alabama. The study area is found to the east of the intersection of Finley Boulevard and 27th Street North. An extension of Finley Boulevard will impact part of a historic industrial site, which is related to the North Birmingham furnaces of Sloss-Sheffield Steel and Iron Company that operated between 1888 and 1958. This site is recorded on the Alabama Archaeological Site File as Site 1Je808. MRS is under contract with the Alabama Department of Transportation (ALDOT) to conduct Phase II archaeological and historical research for Site 1Je808.

The ALDOT is extending Finley Boulevard across the northern portion of the site. The southern portion of the ROW exists in the gravel parking lot and storage yard of the Birmingham Sanitation Department. The northern portion of the ROW is found within a grassed field. Sanborn Fire Insurance maps and historical aerial photographs indicate that structures and other features once existed in and adjacent to the project right-of-way (ROW). MRS has identified several concrete foundations on the surface of the gravel parking lot that are related to the old furnace facility.

A GPR survey was conducted to determine if any subsurface features exist within the project ROW. The GPR survey was restricted to the project ROW, although it was unable to cover the storage yard where light poles and other materials are currently stored. UIS was also contracted to take points for the concrete surface features that exist in and adjacent to the ROW using a sub-meter accuracy GPS. UIS also georeferenced aerial photographs and Sanborn maps to determine exactly where the old furnace facilities existed, which would also help interpret data from the GPR survey. Dr. Kent A. Schneider conducted the GPR research, while the GPS/GIS research was provided by Douglas Luepke.

1. GPS-GIS, Historical Sanborn Maps and Imagery Overlays

Black and white aerial imagery from 1956 and 1960 were acquired from the USDA, Farm Service Agency, Aerial Photography Field Office, Salt Lake City, UT, covering Jefferson County, AL. The scale of the aerial imagery was 1:20,000. This imagery was georeferenced using ESRI ArcMap to existing digital ortho-photography imagery. A portion of a scaled 1951 Sanborn Map from the Sanborn Library was also georeferenced. During the fieldwork, several surface features that were visible on the ground were marked/collected with a Trimble Geo7 using Trimble's TerraSync Centimeter Edition data collection software. This data was then differentially corrected and exported into ESRI shape files and displayed on the georeferenced maps in both yellow and orange. **Figures 1-3** depict the structural features recorded in the field overlain atop aerial images and the 1951 Sanborn map.

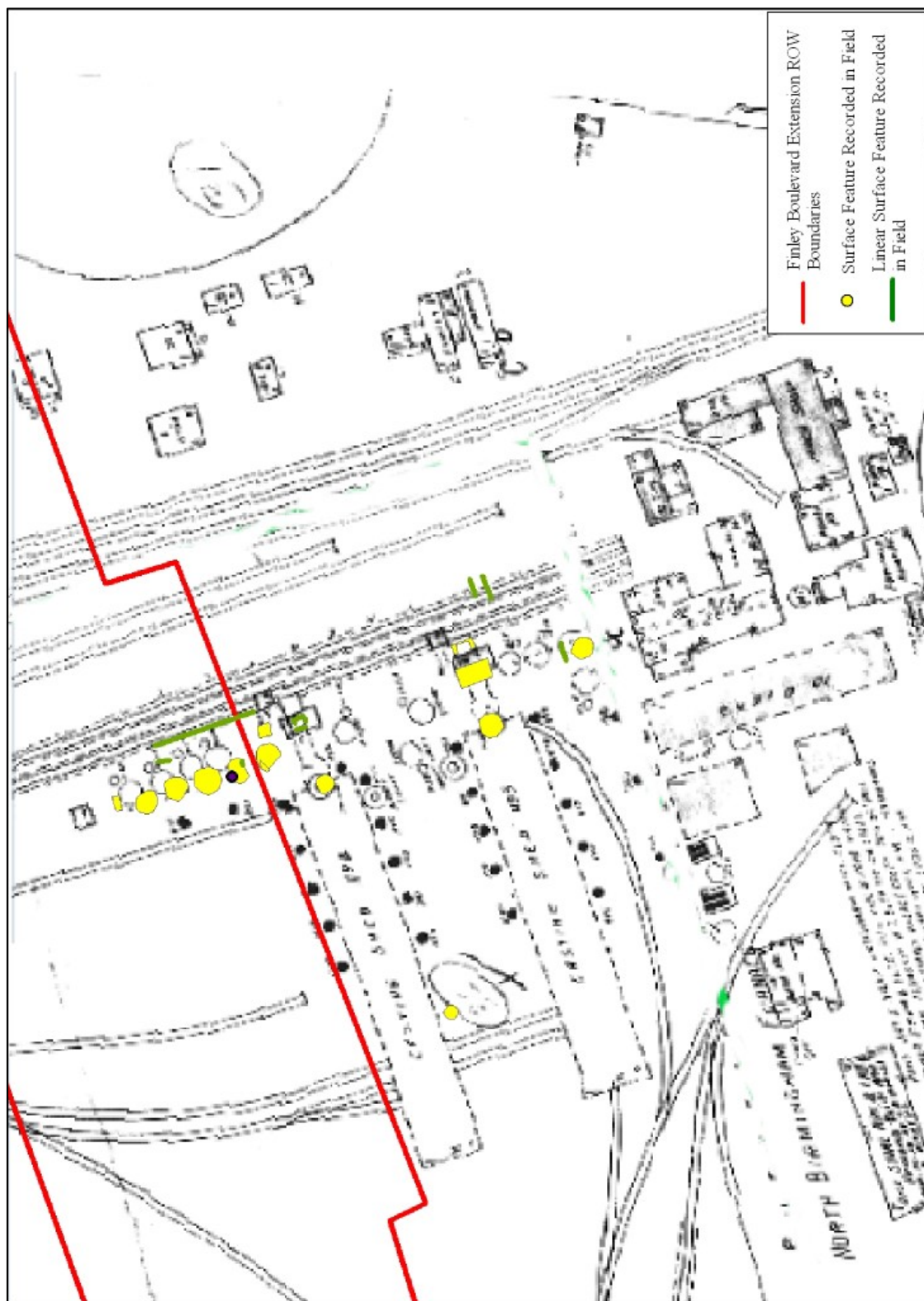


Figure 1.
1951 Sanborn Map

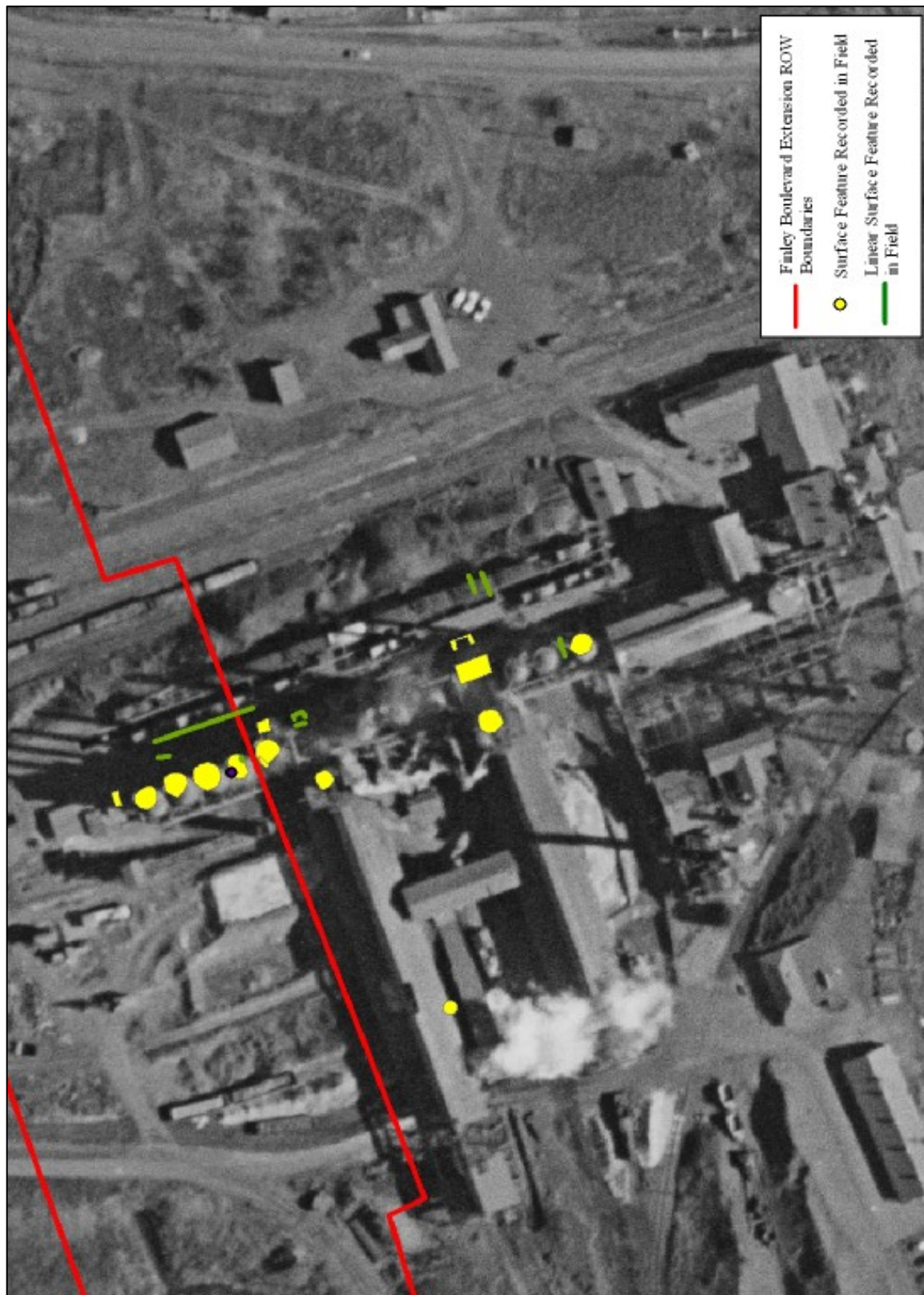


Figure 2.
1956 Aerial Photograph

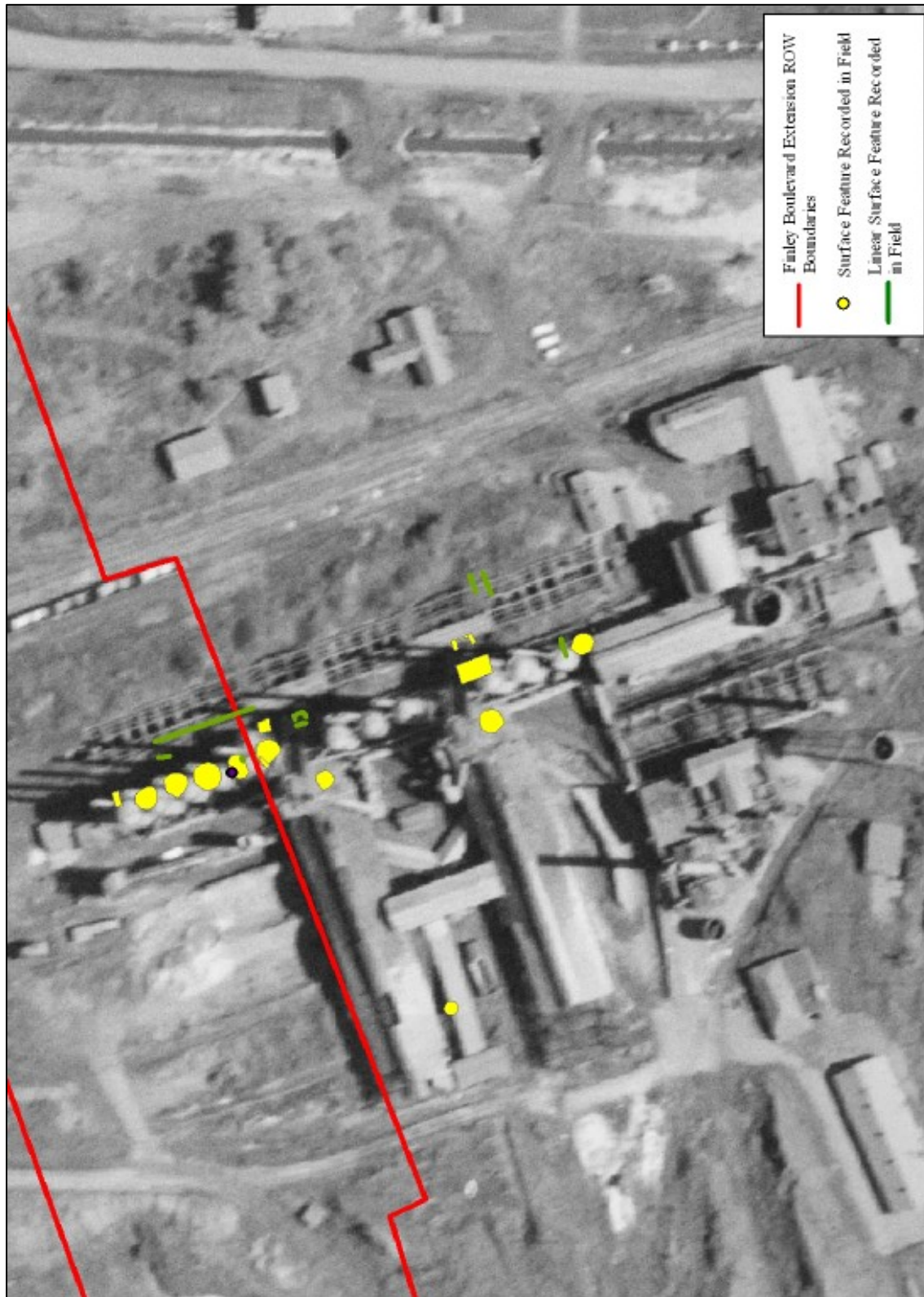


Figure 3.
1960 Aerial Photograph

2. The GPR Survey

A GPR survey was done within the existing gravel parking lot and the adjacent grassed field located at 2413 27th St. N, Birmingham, AL. A total of 8213 linear meters was surveyed with a GPR antenna on 1 meter intervals. Many anomalies appeared in the GPR data. Some may need to be tested to determine if they are part of the historical landscape or if the anomalies represent insignificant debris from decades of industrial use.

The project area was divided into a north section (a field) and a south section (a parking lot) divided by a fence (**Figure 4, Figure 5**). The north section measured 0 meters – 135 meters west-east and 40 meters to 80 meters south-north. One hundred thirty five (135) lines of GPR data on 1 meter line spacings each measuring 40 meters long were collected. The south section measured 0 meters – 85 meters west-east and 0 meters - 33 meters south-north. Eighty-five (85) lines of GPR data each measuring 33 meters in length were collected on 1-meter line spacings.

An encoder-equipped cart-mounted GSSI SIR3000 digital control unit and a 400MHz antenna were used to collect the data. A total of 8213 linear meters was surveyed. Data was post processed using GPR-Slice software. The radar data was composited into 20 amplitude slice maps to approximately 2.19 meters deep and 2 GPR maps were selected for data presentation in this report (**Figure 10, Figure 11**).

The time window was set to 50ns after test runs to observe signal attenuation and optimum penetration depth for the features sought. Radar profiles were acquired in forward and reverse directions on alternate lines. Lufkin fiber glass tapes were pulled to guide antenna travel and make survey notes. GPR data was collected along the profile traverses at 40 scans per meter.

Depth of Penetration

To assess depth, measurements of the microwave velocity for the survey were estimated at the site using the hyperbola fitting method. Shown in **Figure 6** is a target from an existing hyperbola. A hyperbola search was fitted to this target using an option in the filtering menu of **GPR-SLICE V7.0** Software. A dielectric permittivity of 9.97 corresponding to a velocity of about 9.5cm/ns, was estimated for a recording depth of approximately 2.19 meters. This estimate was made using the 400 MHz antenna. Microwaves are “dispersive” which means that the microwave velocity can sometimes depend on the frequency transmitted into the ground. The GPR antenna, although it has a central frequency near 400 MHz, other energy at different frequencies are propagated into the ground. For estimating the depth of the radar reflections, however, the estimated velocity of the microwaves ignores the possibility of dispersion.

Radargram Signal Processing

Before the radargram data was used to construct images, signal processing on the raw radargrams was implemented. The processes applied to the recorded data are briefly described:

- 1) Regaining of the radargrams in post processing was implemented to account for limitation in the control unit for the SIR 3000 to apply direct gain during recording. Small adjustments were made just below the ground surface reflection for regaining.
- 2) DC drift removal was implemented during the radargram conversion to remove low frequency signal which cause the radar pulse to float away from the 0 line. The DC drift was removed in a time domain moving filter.
- 3) Background filter to remove horizontal banding.

Other signal processing options are available in **GPR-SLICE v7.0** Software such as bandpass filtering. These filters are generally applied in the event that strong line noises are seen in the radargrams. Particularly for high-conductive soils, the signal-to-noise ratios are much weaker since recorded reflections need more amplification during recording.

Time Slice Processing

Radargrams represent vertical slices taken across the ground. Time slices represent horizontal slices taken across the survey area. Time slices can be used to show variations in reflected return amplitudes at various depths across a site. Time slices are found by cutting data from all the radar profiles in a specified time window and presenting the information from this slicing window in a pixel map. Depending upon the time window in which the slicing is made across the parallel profiles, depth information regarding important targets can be determined.

The time slices were interpolated using an inverse distance algorithm. Data within a 2.5 meter search radius were used to weight data in estimating the interpolated reflection data. The gray scale was selected to show the data. In some cases the data are presented in either a linear, square root, or logarithm transform to delineate various features which have a large dynamic range in recorded reflection intensity. In addition, minimum and maximum thresholding was applied to the data to enhance suspected anomalies within the datasets.

The time slices are presented as depth slices by using the nominal microwave velocity of 9.5cm/ns estimated for the soils at the site. Twenty slices to a depth of approximately 2.19 meters were prepared for review. One time slice was selected to show possible unmarked grave location in this report. The written report is by no means meant to replace the study of the full animation dataset that is available on Dropbox accompanying this report.

Results

Table 1. Anomaly coordinates to possibly test.

North Grid			
ITEM	X meters	Y meters	Description
A	55	75	possible linear feature
B	67	75	possible linear feature
C	59	50	circular-like feature
D	85	66	circular feature
E	90	55	circular feature
F	124	75	possible linear feature
G	129	76	possible linear feature
South Grid			
A	29	18	disturbance
B	75	26	disturbance
C	74	14	disturbance

Note: XY is the approximate center of the anomaly.

North Grid

Figure 7 shows the North Grid and South Grid processed GPR data. Numerous anomalies appear in the GPR data. Seven (7) may be worthy of testing (**Figure 10**) in the North Grid. The circular anomalies that appear in the north grid shown in **Figure 7** and from approximately 60 meters to 120 meters in the images in **Figure 8** may have had an industrial function. Alternatively the anomalies might be the result of soil or vegetation.

South Grid

Figure 9 shows the South Grid processed GPR data. Numerous anomalies of unknown origin appear in the data. Three (3) are may be worthy of testing (**Figure 11**).

Conclusion

No previous GPR data is available for comparison with the currently collected GPR data. Therefore, some limited testing of anomalies in the current GPR data may be worthy of exploration depending upon the goals of the archaeological and historical research. Broken lines that may represent walls, trenches, buried pipes, or railroad lines are difficult to identify in the current GPR data. Ten (10) of many anomalies, some appearing as possible short broken lines, or circular or semicircular shapes, are noted in the GPR data. Any of these or others seen in the GPR data may be examined for possible historical significance.



Figure 4.
Project Area



Figure 5.
North survey area base line

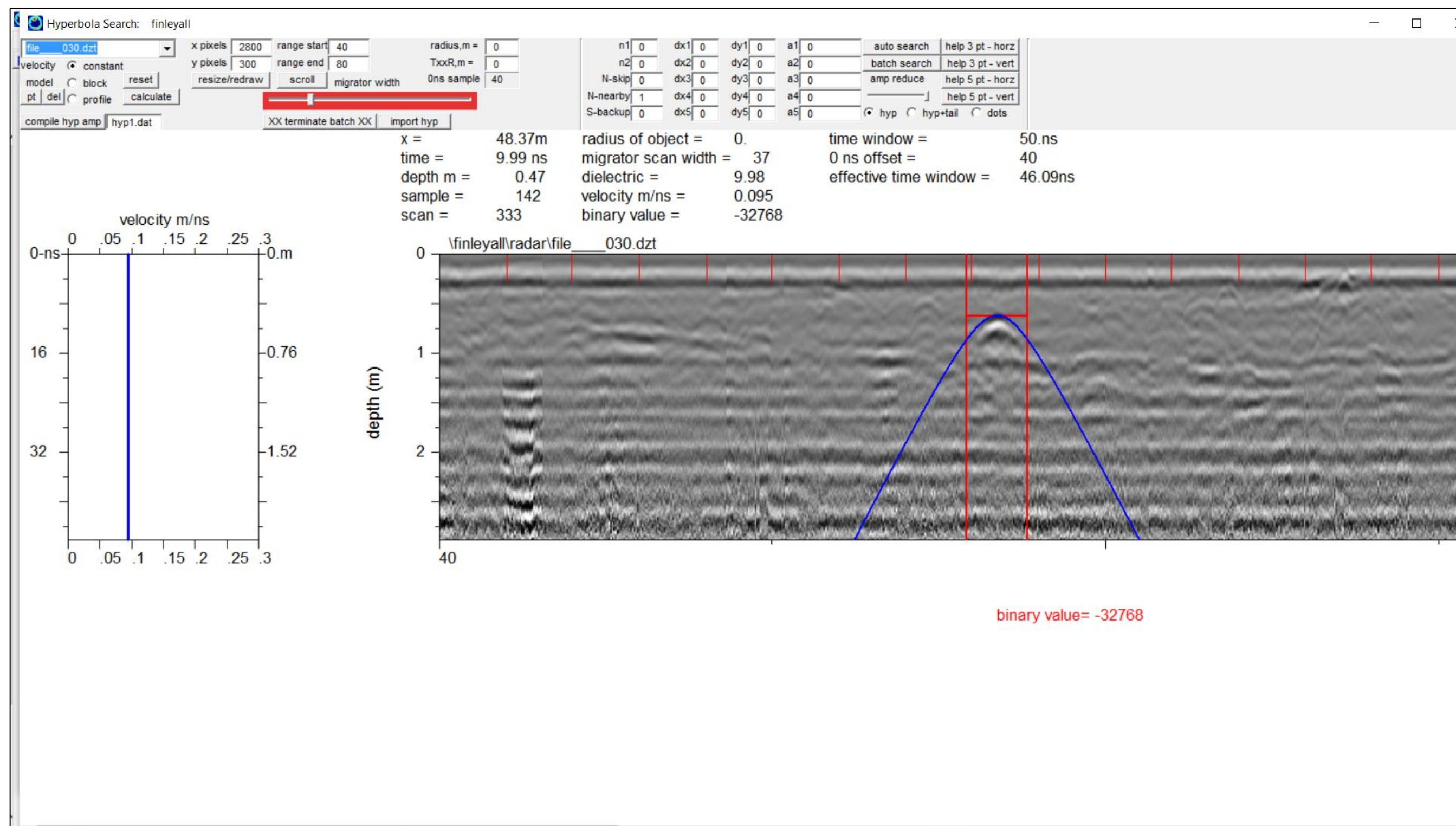


Figure 6
Depth assessment



Figure 7.
North and South grids GPR maps

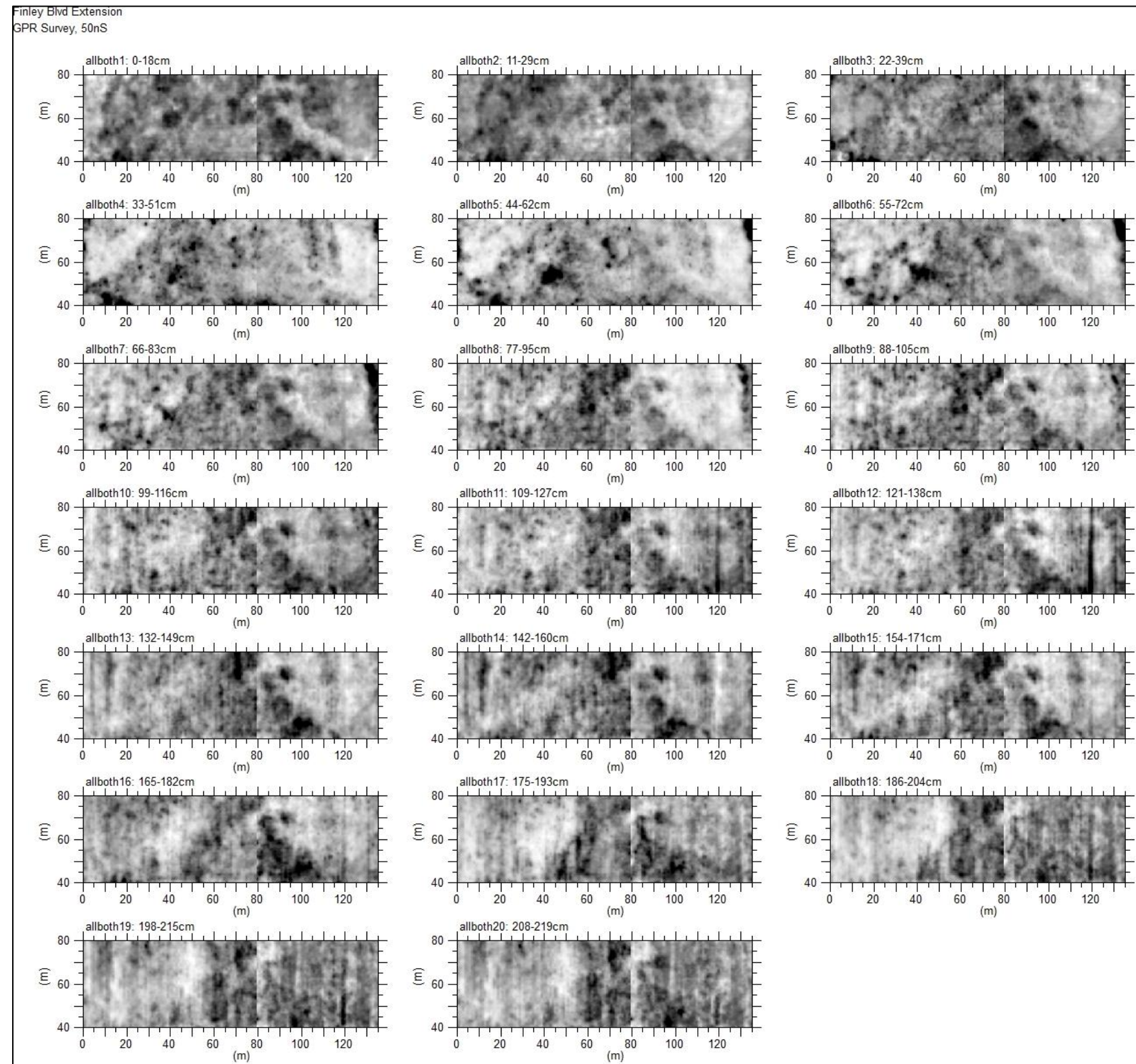


Figure 8
North grid GPR map, 20 slices

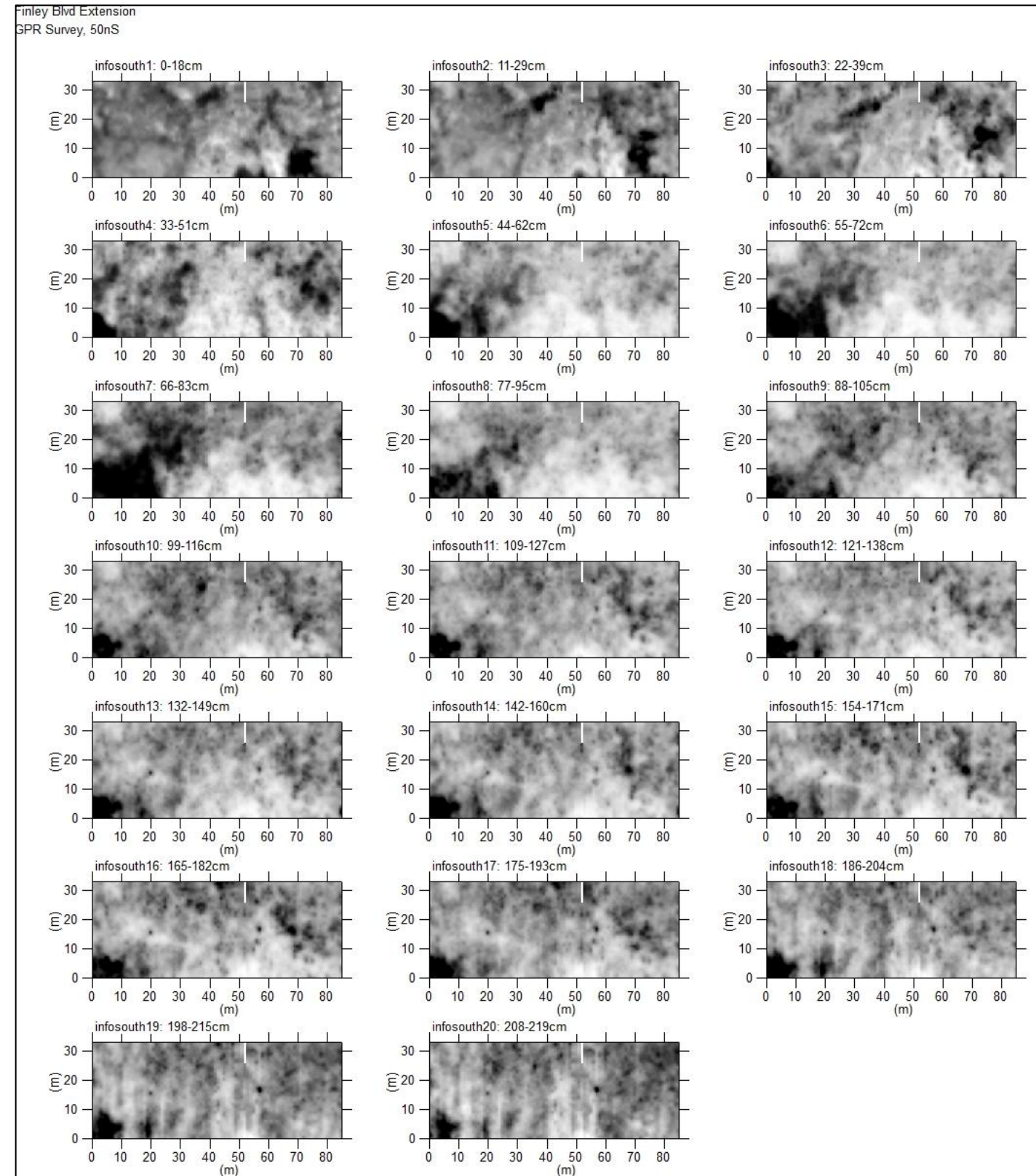


Figure 9.
South Grid GPR map, 20 slices

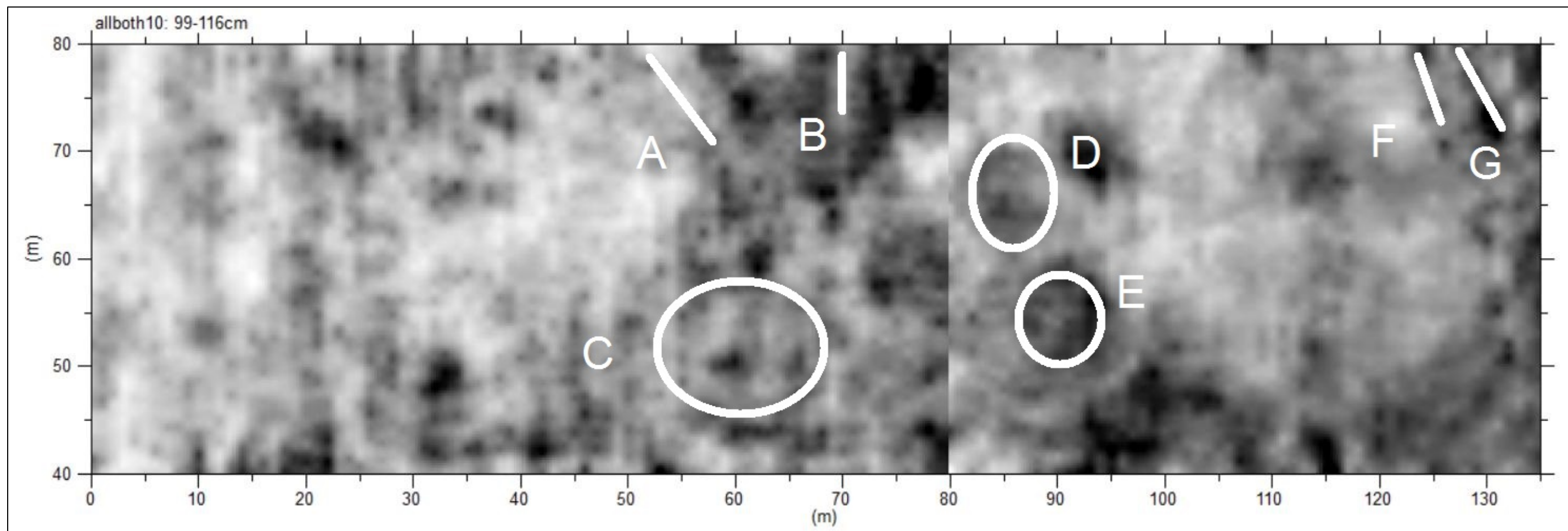


Figure 10.
North grid Slice 10. Seven anomalies to possibly test (see **Table 1**)

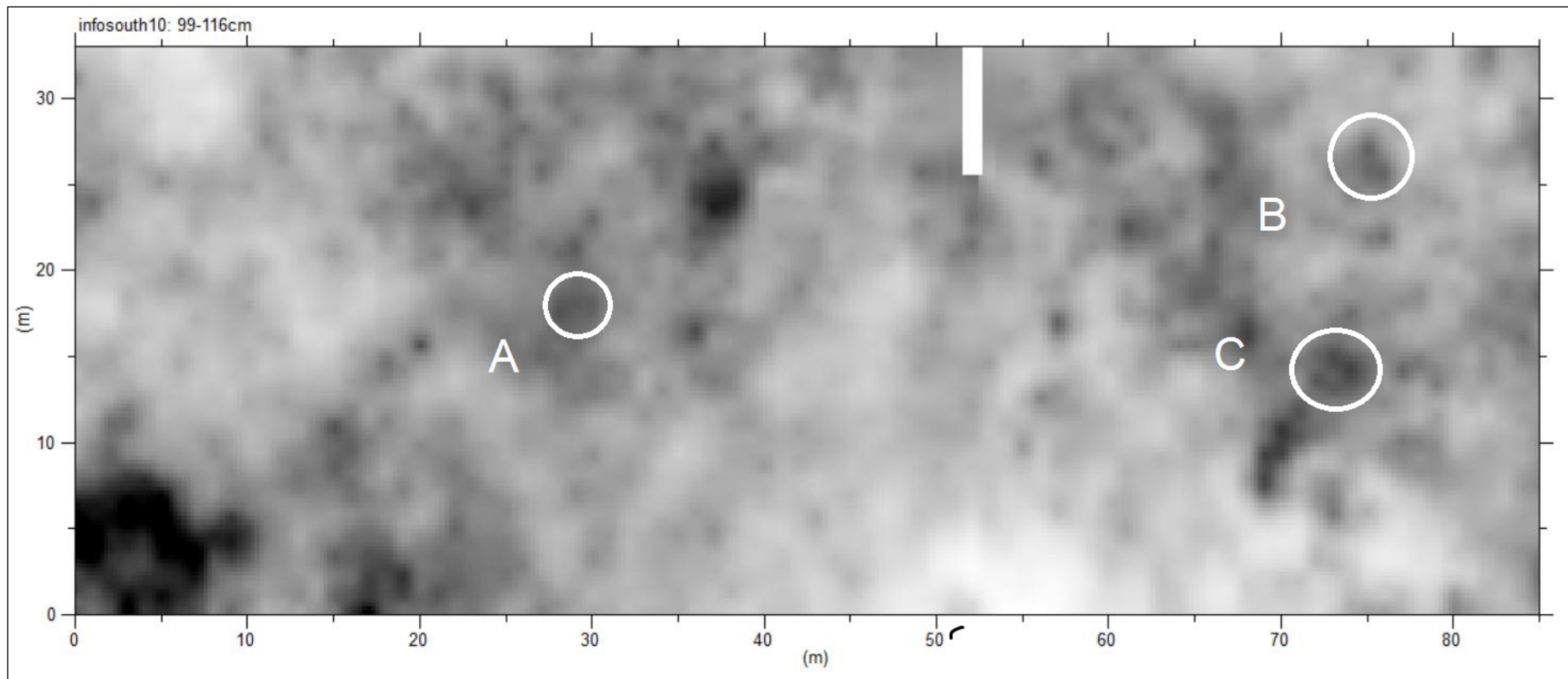


Figure 11.
South grid Slice 10. Three anomalies to possibly test.

APPENDIX B
EDR REPORTS



Old Sheffield-Sloss Furnace Property

2413 27th Street North

Birmingham, AL 35234

Inquiry Number: 4602517.9

April 26, 2016

The EDR Aerial Photo Decade Package



6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
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EDR Aerial Photo Decade Package

04/26/16

Site Name:

Old Sheffield-Sloss Furnace Pr
2413 27th Street North
Birmingham, AL 35234
EDR Inquiry # 4602517.9

Client Name:

MRS Consultants, LLC.
Po Box 3146
Tuscaloosa, AL 35403
Contact: Cathy Meyer



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Search Results:

<u>Year</u>	<u>Scale</u>	<u>Details</u>	<u>Source</u>
2011	1"=500'	Flight Year: 2011	USDA/NAIP
2009	1"=500'	Flight Year: 2009	USDA/NAIP
2006	1"=500'	Flight Year: 2006	USDA/NAIP
2005	1"=500'	Flight Year: 2005	USDA/NAIP
2002	1"=500'	Flight Date: March, 28 2002	USGS
1997	1"=500'	Acquisition Date: March, 06 1997	USGS/DOQQ
1992	1"=500'	Flight Date: February, 28 1992	USGS
1990	1"=750'	Flight Date: February, 25 1990	USGS
1988	1"=500'	Flight Date: May, 26 1988	USGS
1981	1"=500'	Flight Date: February, 24 1981	USGS
1977	1"=500'	Flight Date: March, 25 1977	USGS
1970	1"=500'	Flight Date: February, 21 1970	USDA
1967	1"=500'	Flight Date: October, 11 1967	USDA
1956	1"=500'	Flight Date: January, 08 1956	USDA
1951	1"=500'	Flight Date: March, 09 1951	USGS
1947	1"=500'	Flight Date: March, 22 1947	USDA
1941	1"=500'	Flight Date: February, 17 1941	USGS

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YEAR: 2011

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INQUIRY #: 4602517.9

YEAR: 2009

— = 500'



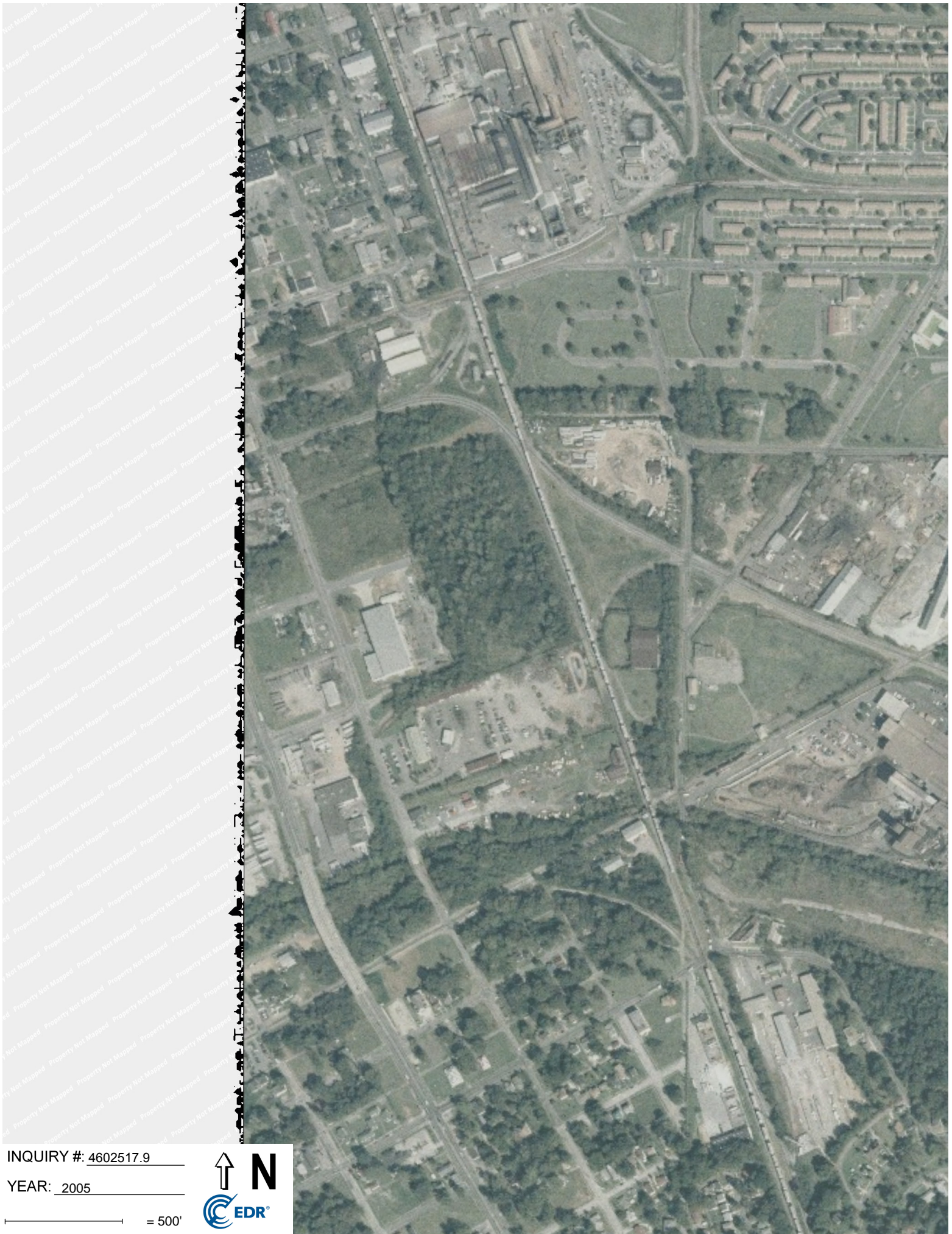


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INQUIRY #: 4602517.9

YEAR: 2002

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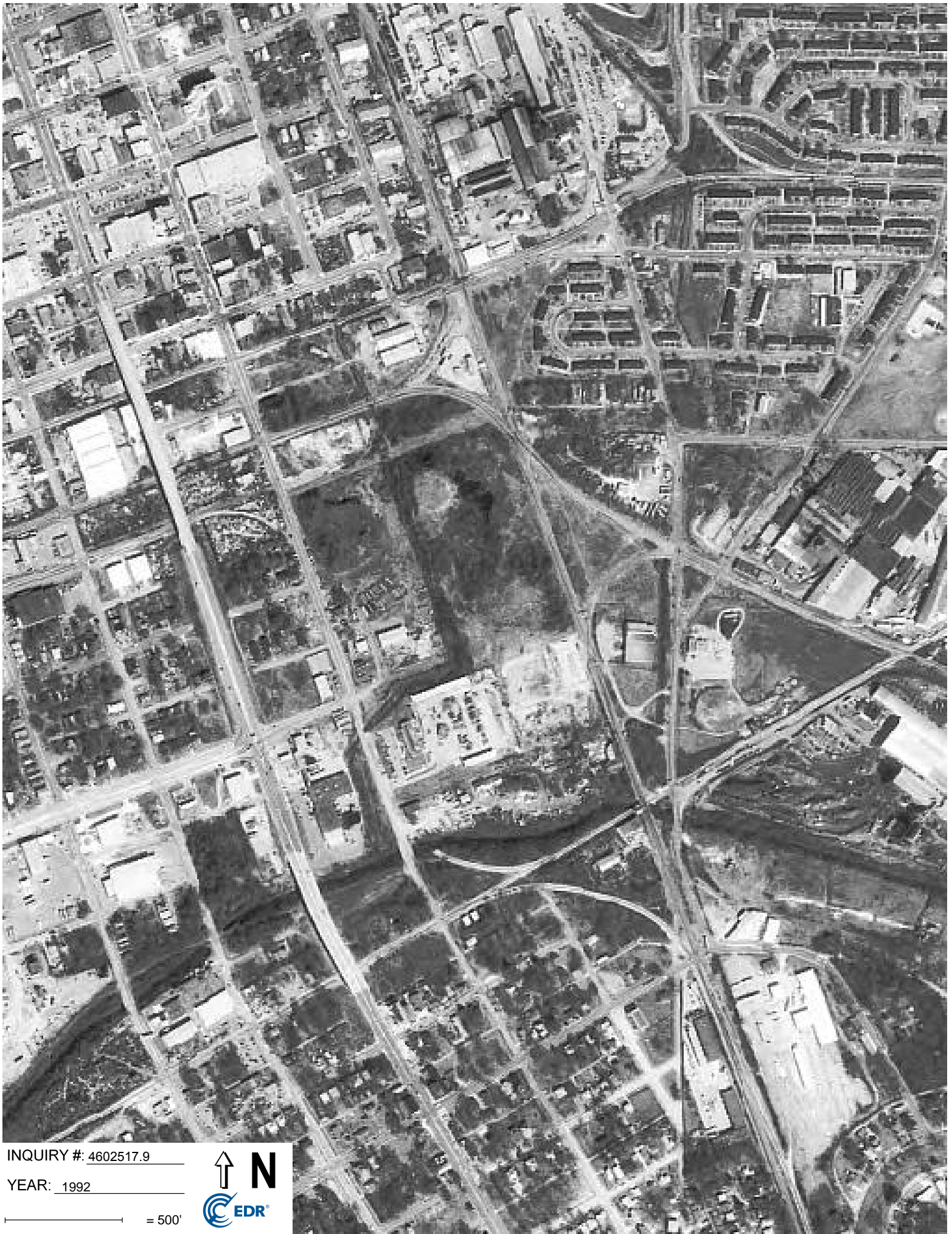


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YEAR: 1992

— = 500'





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YEAR: 1990

— = 750'





INQUIRY #: 4602517.9

YEAR: 1988

— = 500'





INQUIRY #: 4602517.9

YEAR: 1981

— = 500'





INQUIRY #: 4602517.9

YEAR: 1977

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INQUIRY #: 4602517.9

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INQUIRY #: 4602517.9

YEAR: 1967

— = 500'





INQUIRY #: 4602517.9

YEAR: 1956

1" = 500'





INQUIRY #: 4602517.9

YEAR: 1951

— = 500'





INQUIRY #: 4602517.9

YEAR: 1947

— = 500'





INQUIRY #: 4602517.9

YEAR: 1941

— = 500'





Old Sheffield-Sloss Furnace Property

2413 27th Street North

Birmingham, AL 35234

Inquiry Number: 4602517.4

April 26, 2016

EDR Historical Topo Map Report

with QuadMatch™



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Shelton, CT 06484
Toll Free: 800.352.0050
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EDR Historical Topo Map Report

04/26/16

Site Name:

Old Sheffield-Sloss Furnace Pr
2413 27th Street North
Birmingham, AL 35234
EDR Inquiry # 4602517.4

Client Name:

MRS Consultants, LLC.
Po Box 3146
Tuscaloosa, AL 35403
Contact: Cathy Meyer



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Search Results:**Coordinates:**

P.O.#	MRS-2015-29	Latitude:	33.546351 33° 32' 47" North
Project:	Site 1Je808	Longitude:	-86.812159 -86° 48' 44" West
		UTM Zone:	Zone 16 North
		UTM X Meters:	517438.39
		UTM Y Meters:	3711873.93
		Elevation:	563.00' above sea level

Maps Provided:

2014	1895
1997	1892
1978	1889
1971	
1959	
1907	
1906	
1904	

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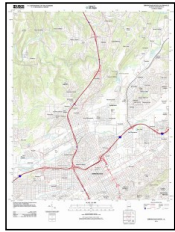
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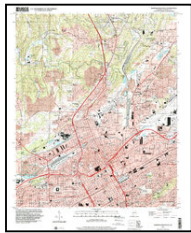
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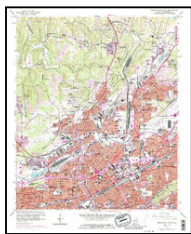
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7.5-minute, 24000

1997 Source Sheets



Birmingham North
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7.5-minute, 24000
Aerial Photo Revised 1997

1978 Source Sheets



Birmingham North
1978
7.5-minute, 24000
Photo Revised 1978
Aerial Photo Revised 1975

1971 Source Sheets



Birmingham North
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Photo Revised 1970
Aerial Photo Revised 1970

Topo Sheet Key

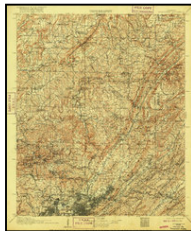
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1959 Source Sheets



Birmingham North
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7.5-minute, 24000
Aerial Photo Revised 1957

1907 Source Sheets

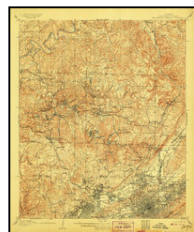


Birmingham
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1906 Source Sheets



Birmingham Coal District
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15-minute, 62500



Birmingham Special
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1904 Source Sheets

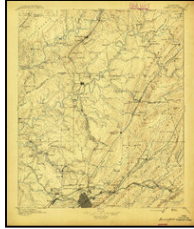


Birmingham Coal District
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Topo Sheet Key

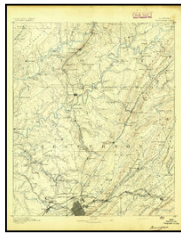
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1895 Source Sheets



Birmingham
1895
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1892 Source Sheets

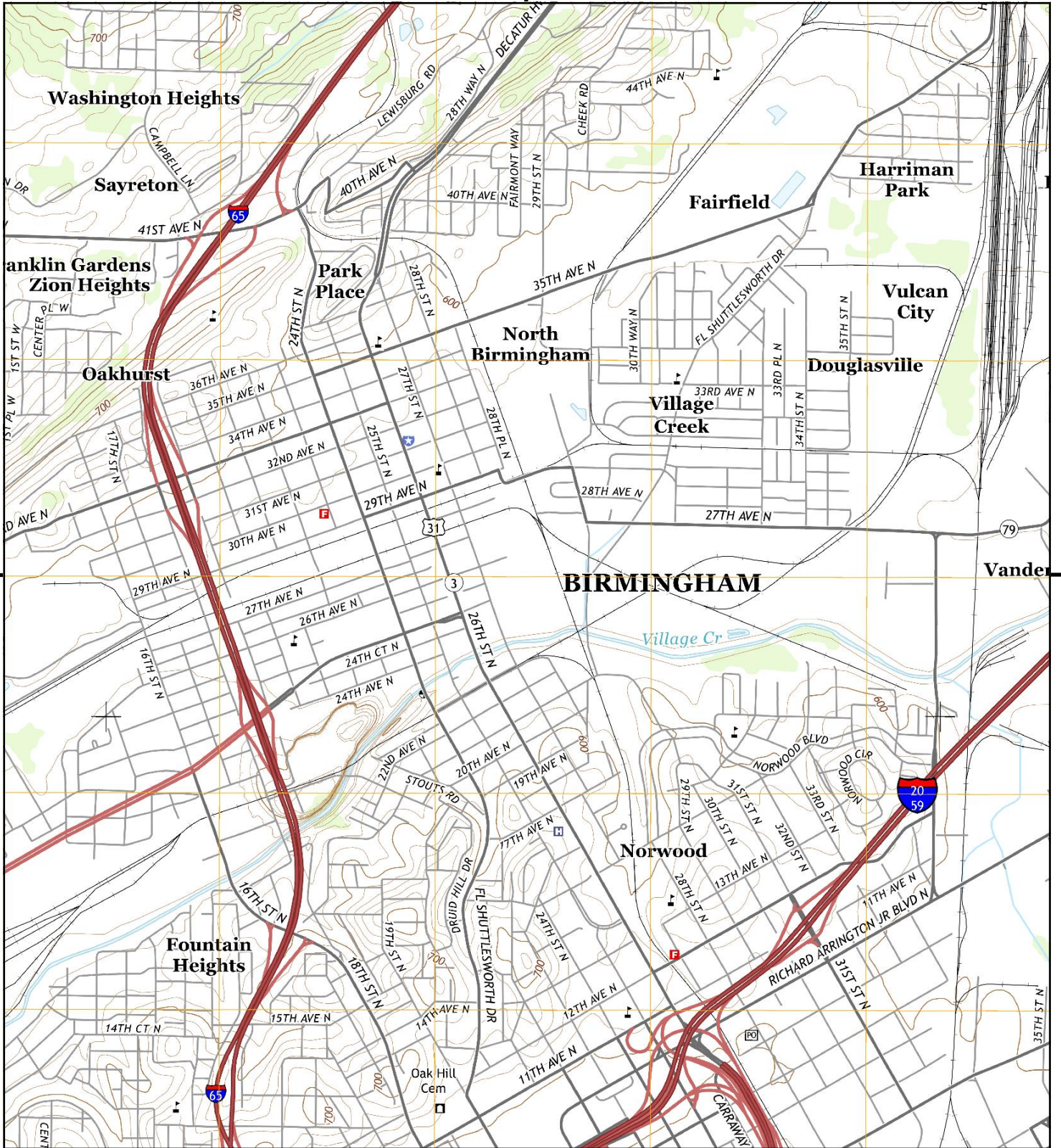


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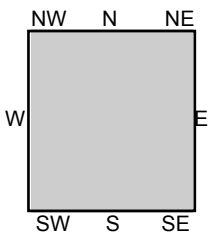
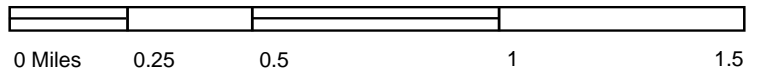
1889 Source Sheets



Birmingham
1889
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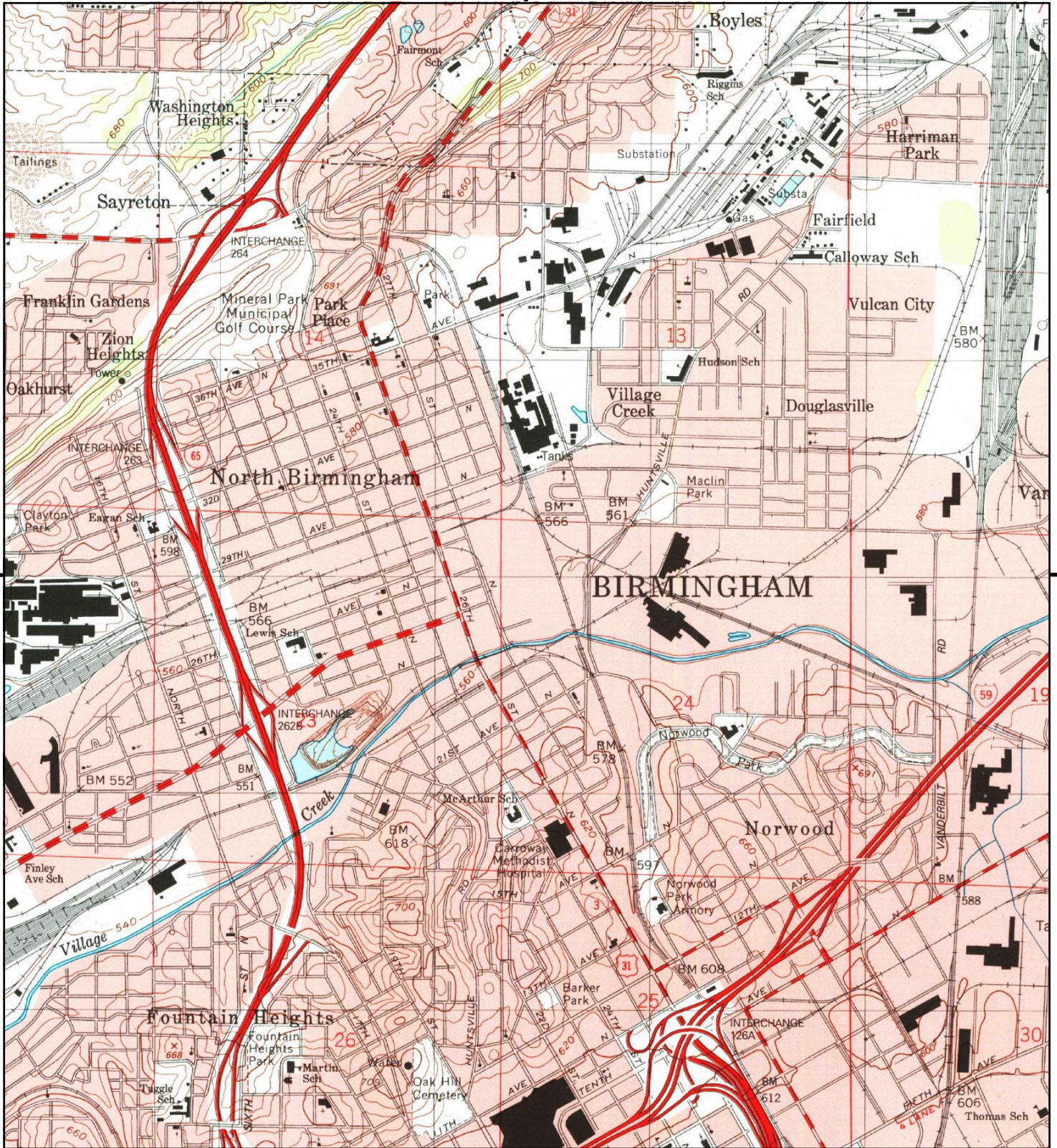
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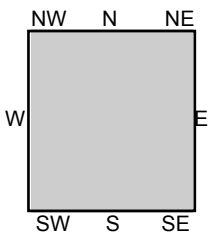
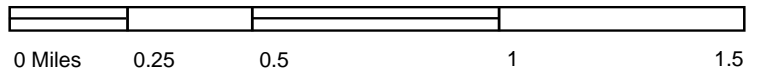
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 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.





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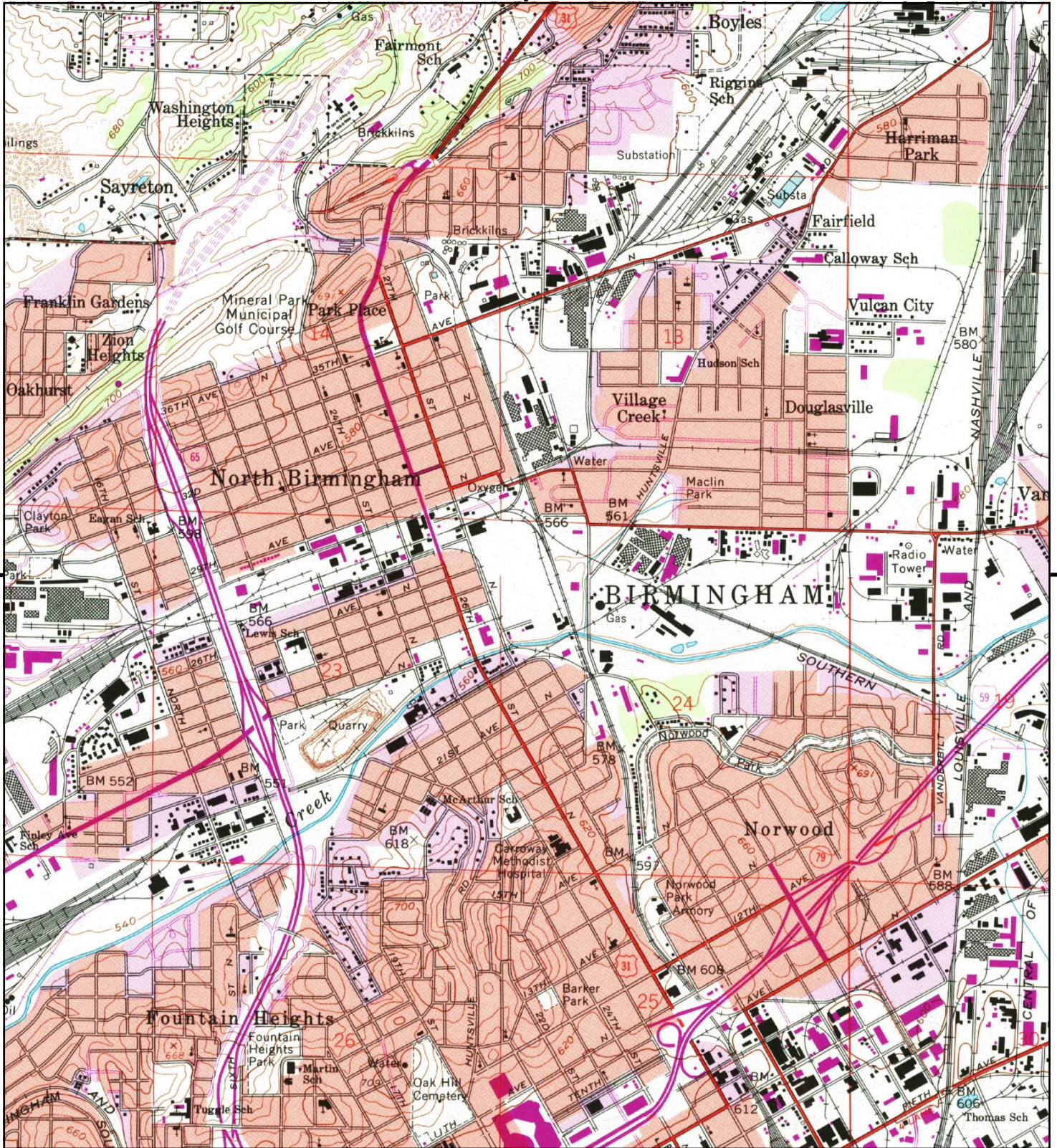
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 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.

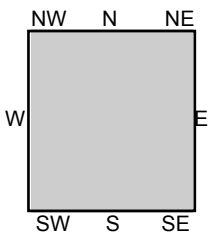
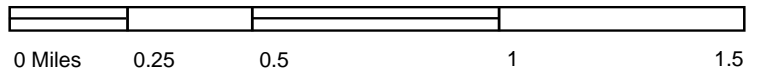


Historical Topo Map

1978



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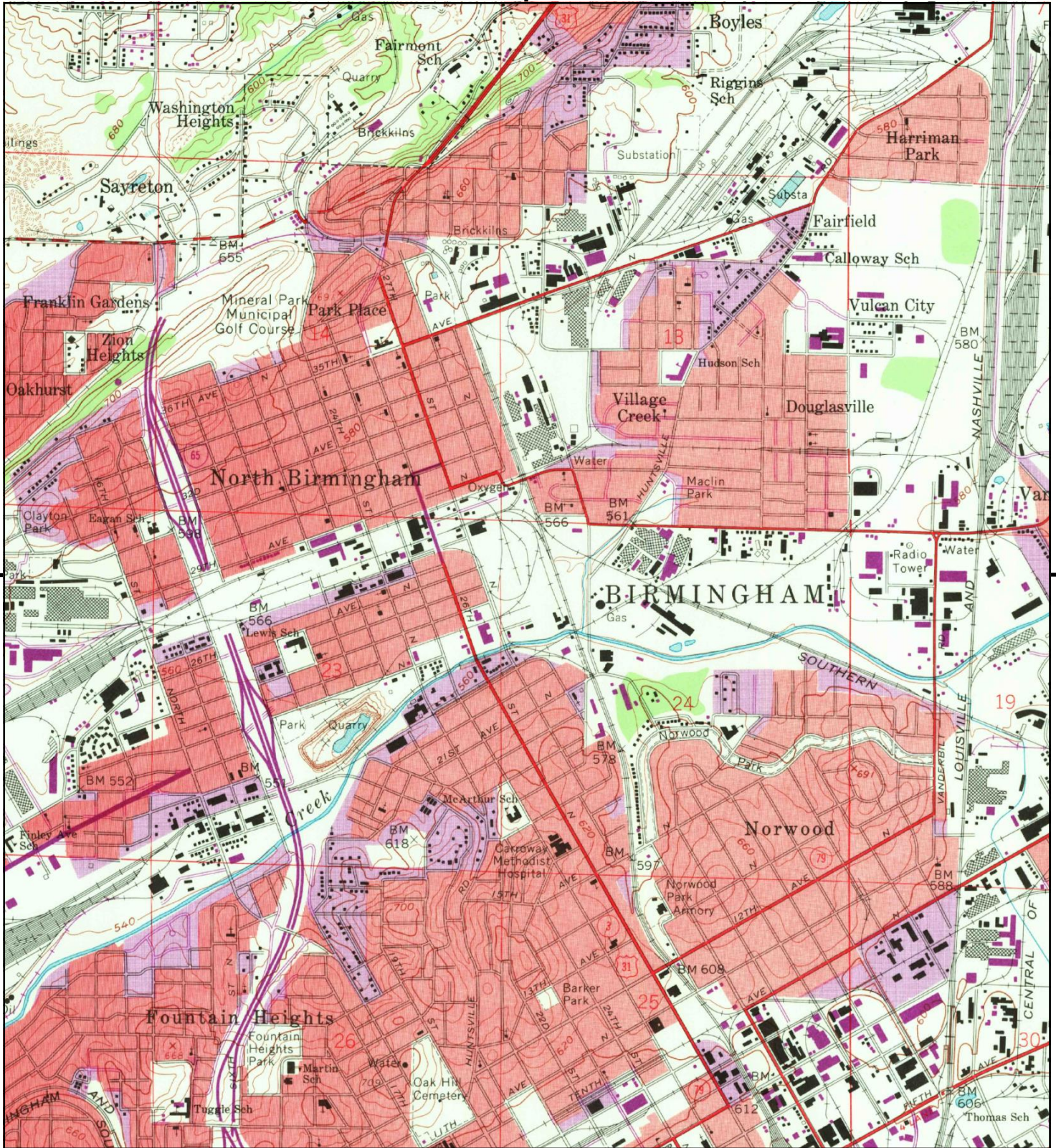
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 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.

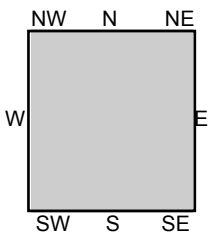
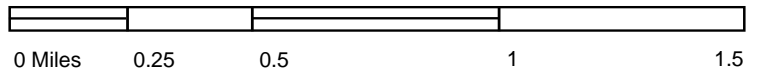


Historical Topo Map

1971



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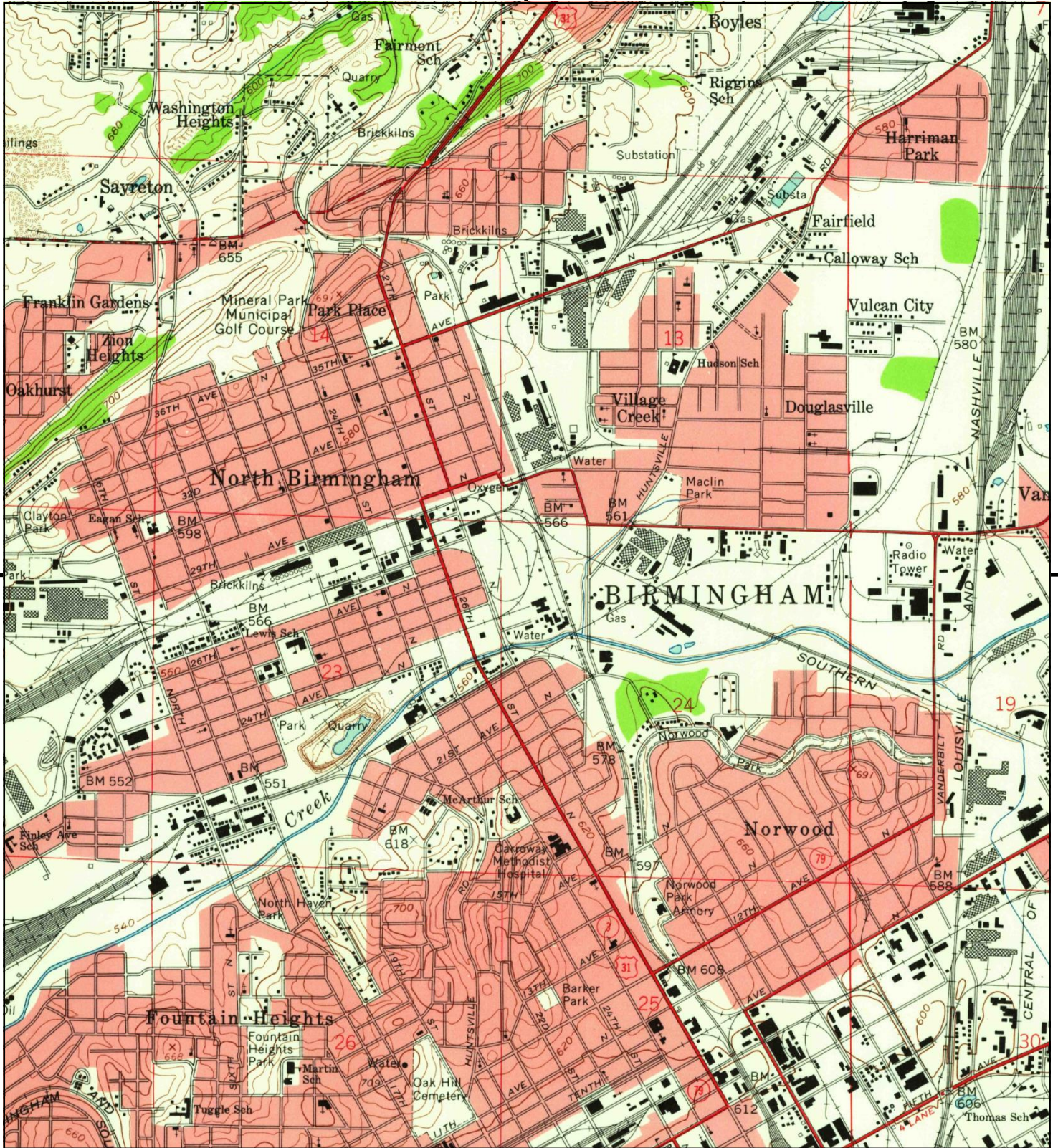
TP, Birmingham North, 1971, 7.5-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.

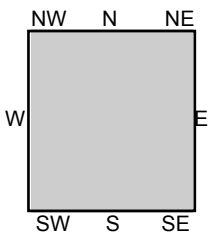
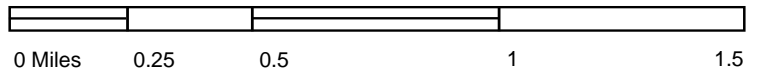


Historical Topo Map

1959



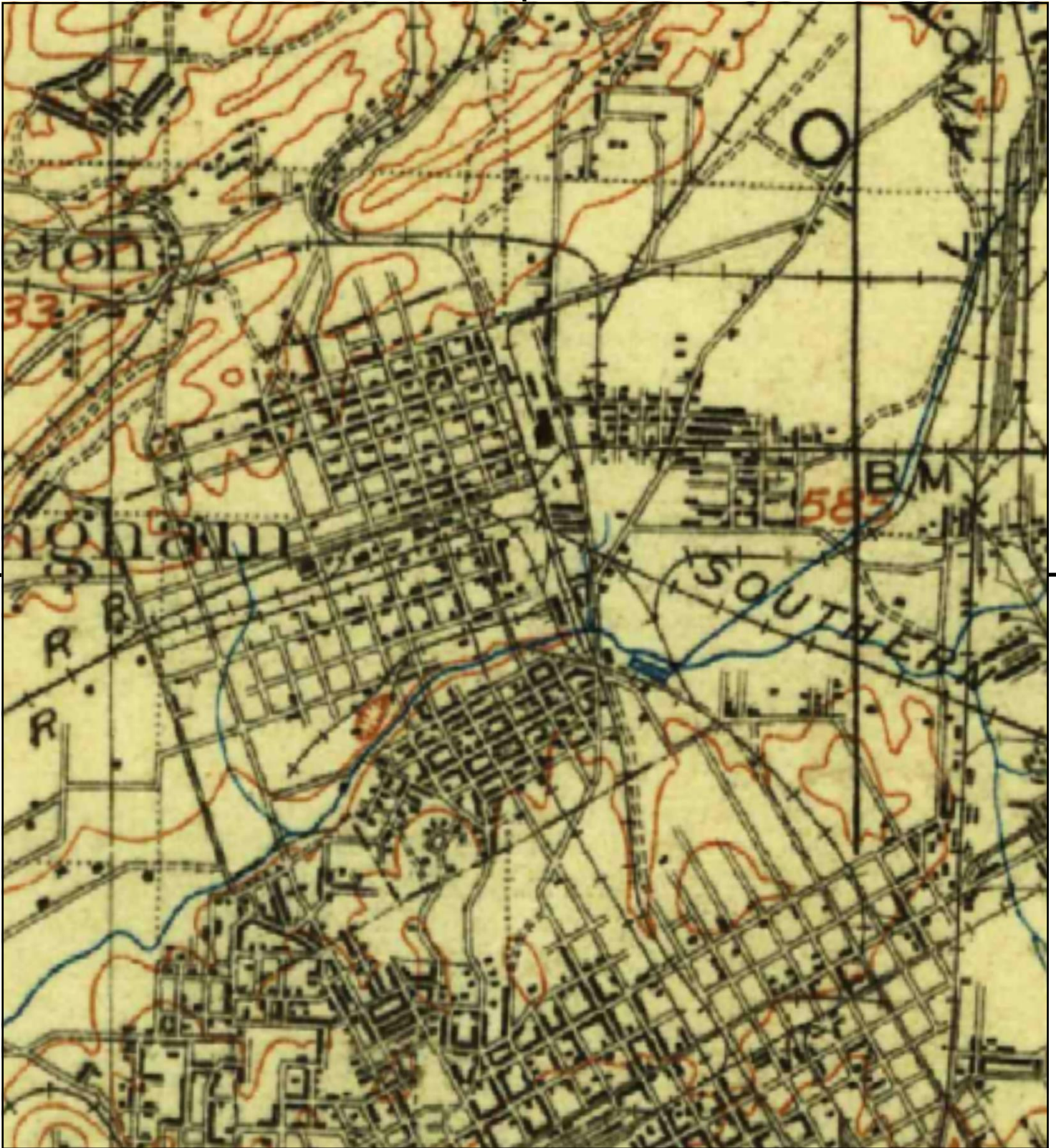
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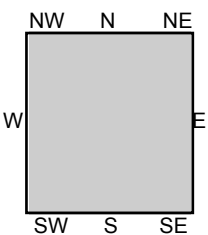
TP, Birmingham North, 1959, 7.5-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
ADDRESS: 2413 27th Street North
Birmingham, AL 35234
CLIENT: MRS Consultants, LLC.





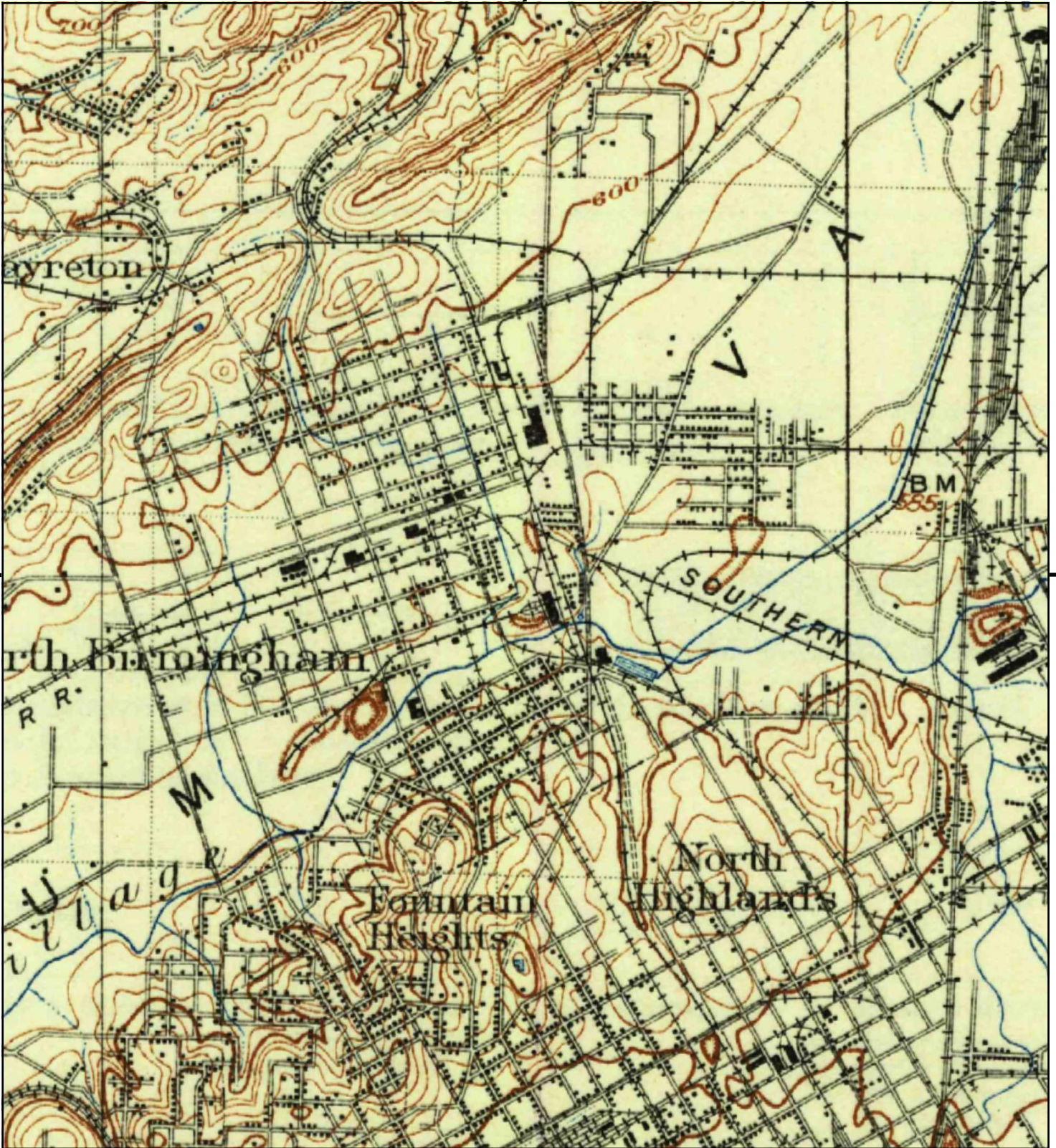
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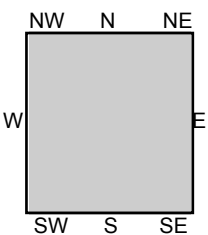
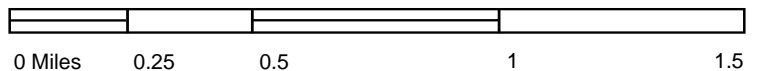
TP, Birmingham, 1907, 30-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.





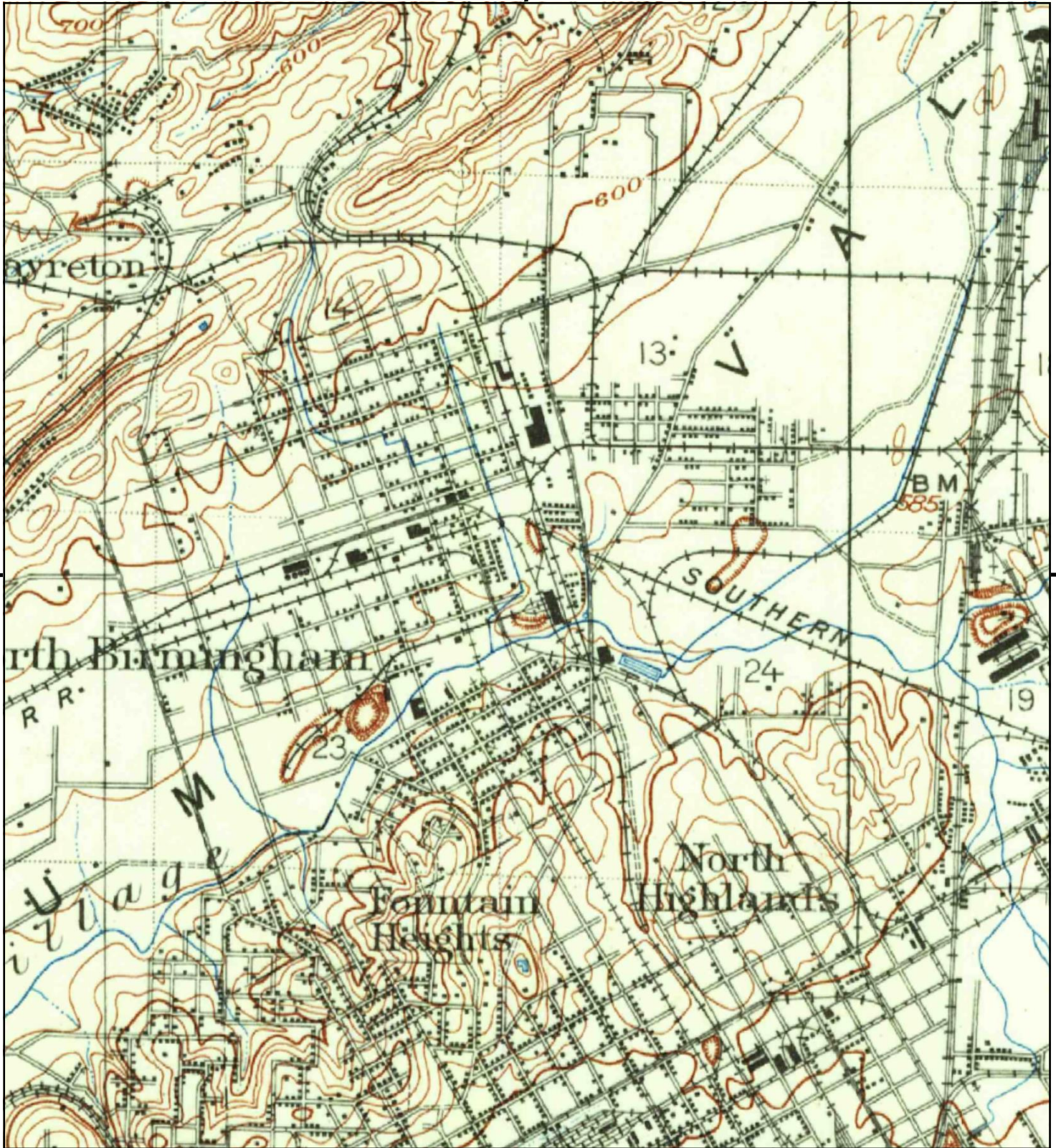
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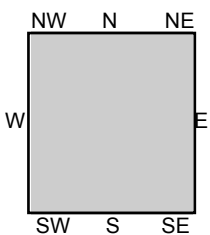
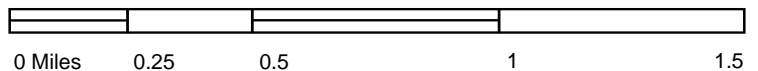
TP, Birmingham Coal District, 1906, 15-minute
TP, Birmingham Special, 1906, 15-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
ADDRESS: 2413 27th Street North
Birmingham, AL 35234
CLIENT: MRS Consultants, LLC.





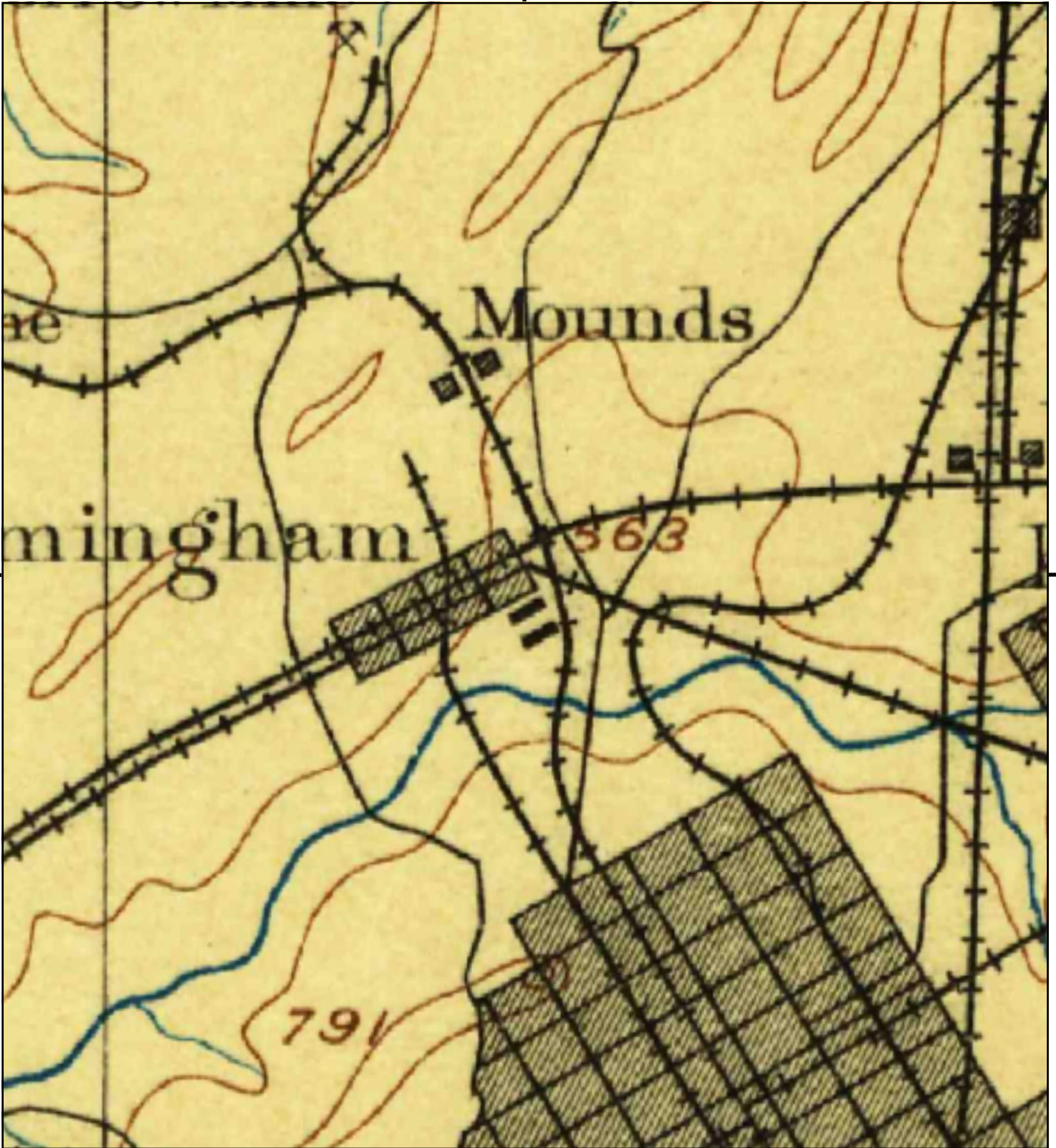
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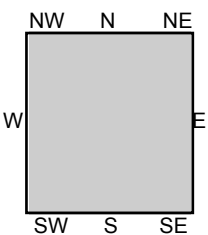
TP, Birmingham Coal District, 1904, 15-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.





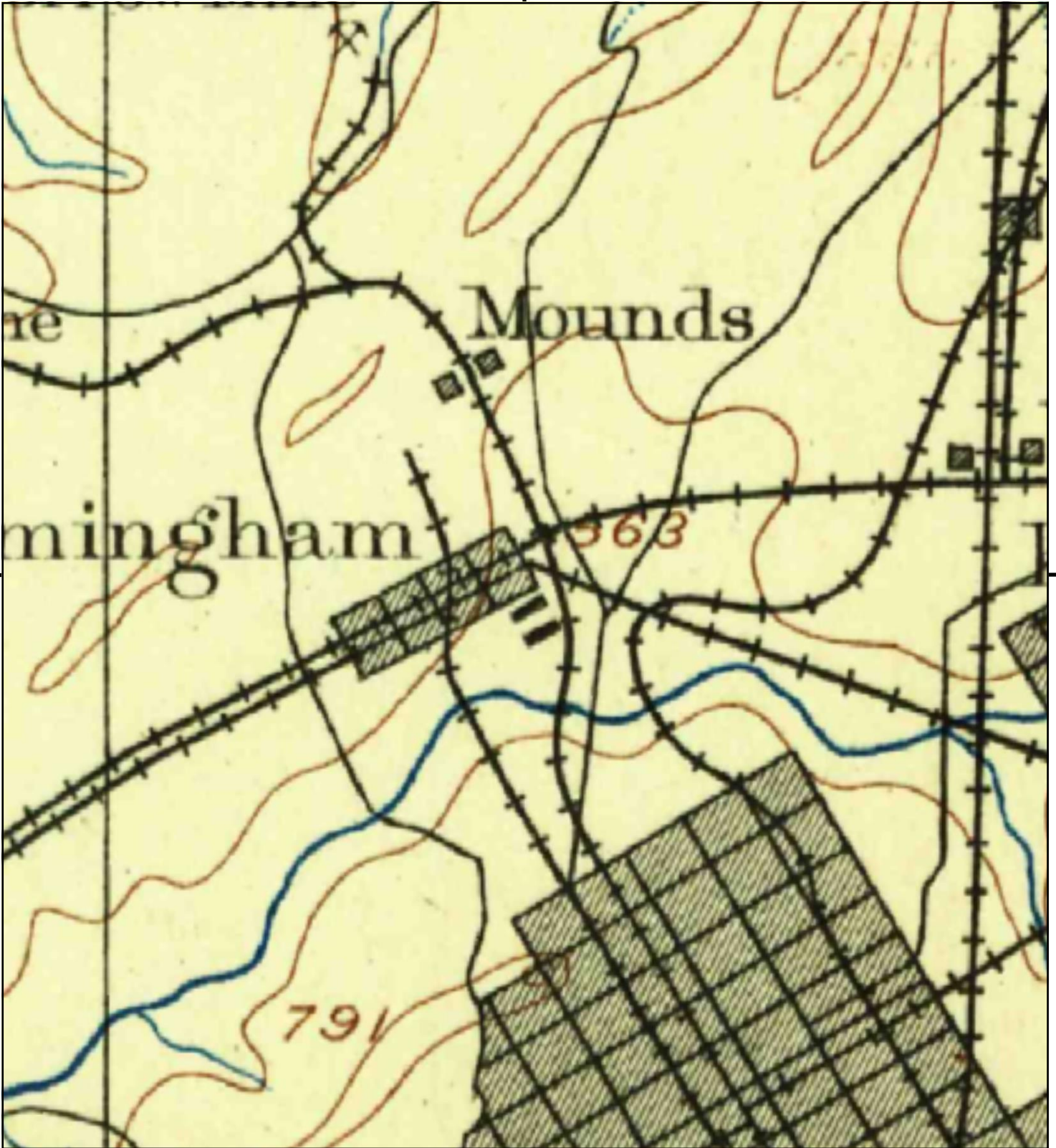
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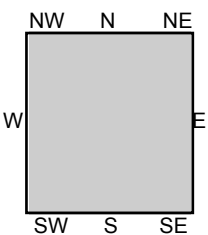
TP, Birmingham, 1895, 30-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.





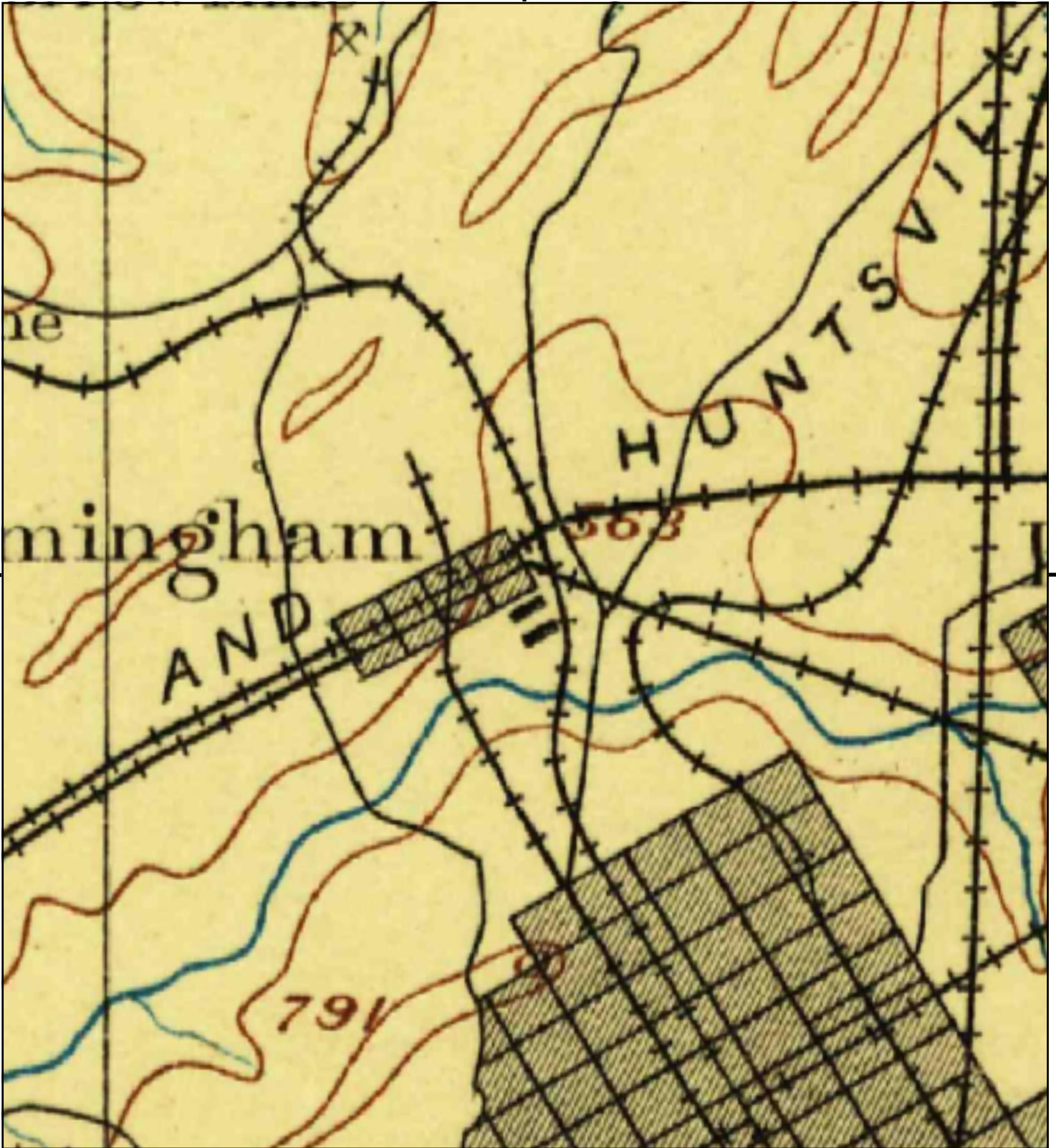
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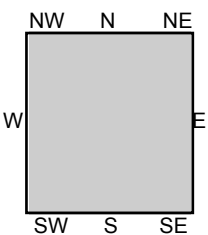
TP, Birmingham, 1892, 30-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.






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TP, Birmingham, 1889, 30-minute

SITE NAME: Old Sheffield-Sloss Furnace Property
 ADDRESS: 2413 27th Street North
 Birmingham, AL 35234
 CLIENT: MRS Consultants, LLC.





Old Sheffield-Sloss Furnace Property

2413 27th Street North

Birmingham, AL 35234

Inquiry Number: 4602517.3

April 27, 2016

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04/27/16

Site Name:

Old Sheffield-Sloss Furnace Pr
2413 27th Street North
Birmingham, AL 35234
EDR Inquiry # 4602517.3

Client Name:

MRS Consultants, LLC.
Po Box 3146
Tuscaloosa, AL 35403
Contact: Cathy Meyer



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PO # MRS-2015-29

Project Site 1Je808

Maps Provided:

1969
1951
1911



Sanborn® Library search results

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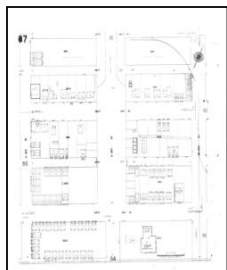
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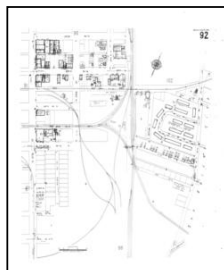
1969 Source Sheets



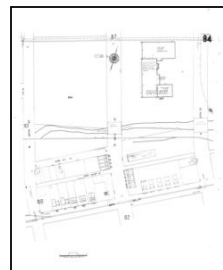
Volume 1, Sheet 87
1969



Volume 1, Sheet 88
1969



Volume 1, Sheet 92
1969



Volume 1, Sheet 84
1969

1951 Source Sheets



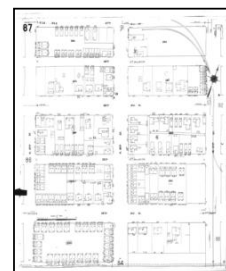
Volume 1, Sheet 84
1951



Volume 1, Sheet 88
1951

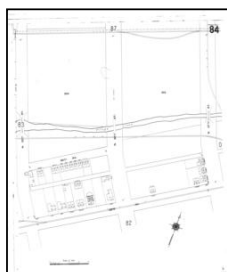


Volume 1, Sheet 92
1951

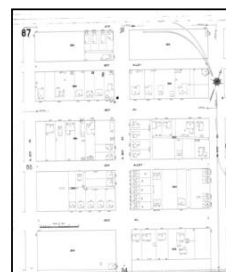


Volume 1, Sheet 87
1951

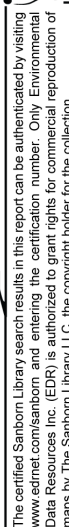
1911 Source Sheets



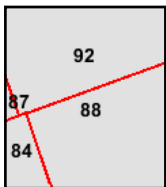
Volume 1, Sheet 84
1911

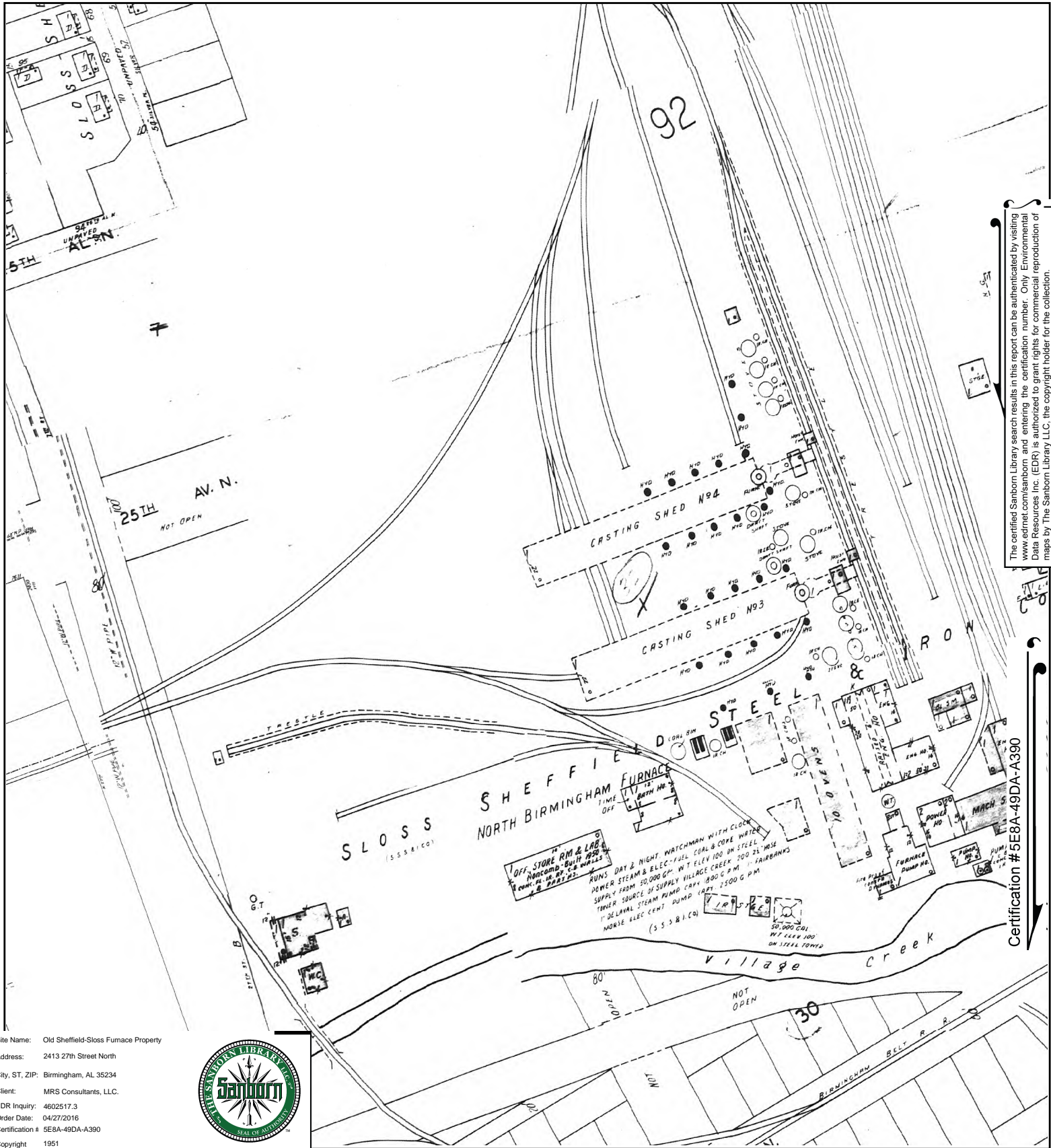


Volume 1, Sheet 87
1911



A horizontal number line representing distance in feet. The line starts at 0 and ends at 600. Major tick marks are labeled at 0, 150, 300, and 600. There are two horizontal brackets above the line. The first bracket spans from 0 to 150 and is labeled "150 feet". The second bracket spans from 150 to 300 and is also labeled "150 feet". A third bracket spans from 300 to 600 and is labeled "300 feet".





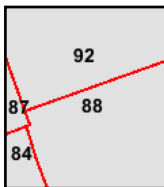
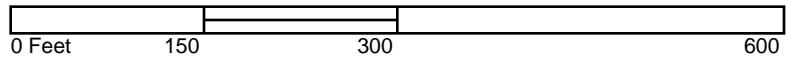
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Site Name: Old Sheffield-Sloss Furnace Property
 Address: 2413 27th Street North
 City, ST, ZIP: Birmingham, AL 35234
 Client: MRS Consultants, LLC.
 EDR Inquiry: 4602517.3
 Order Date: 04/27/2016
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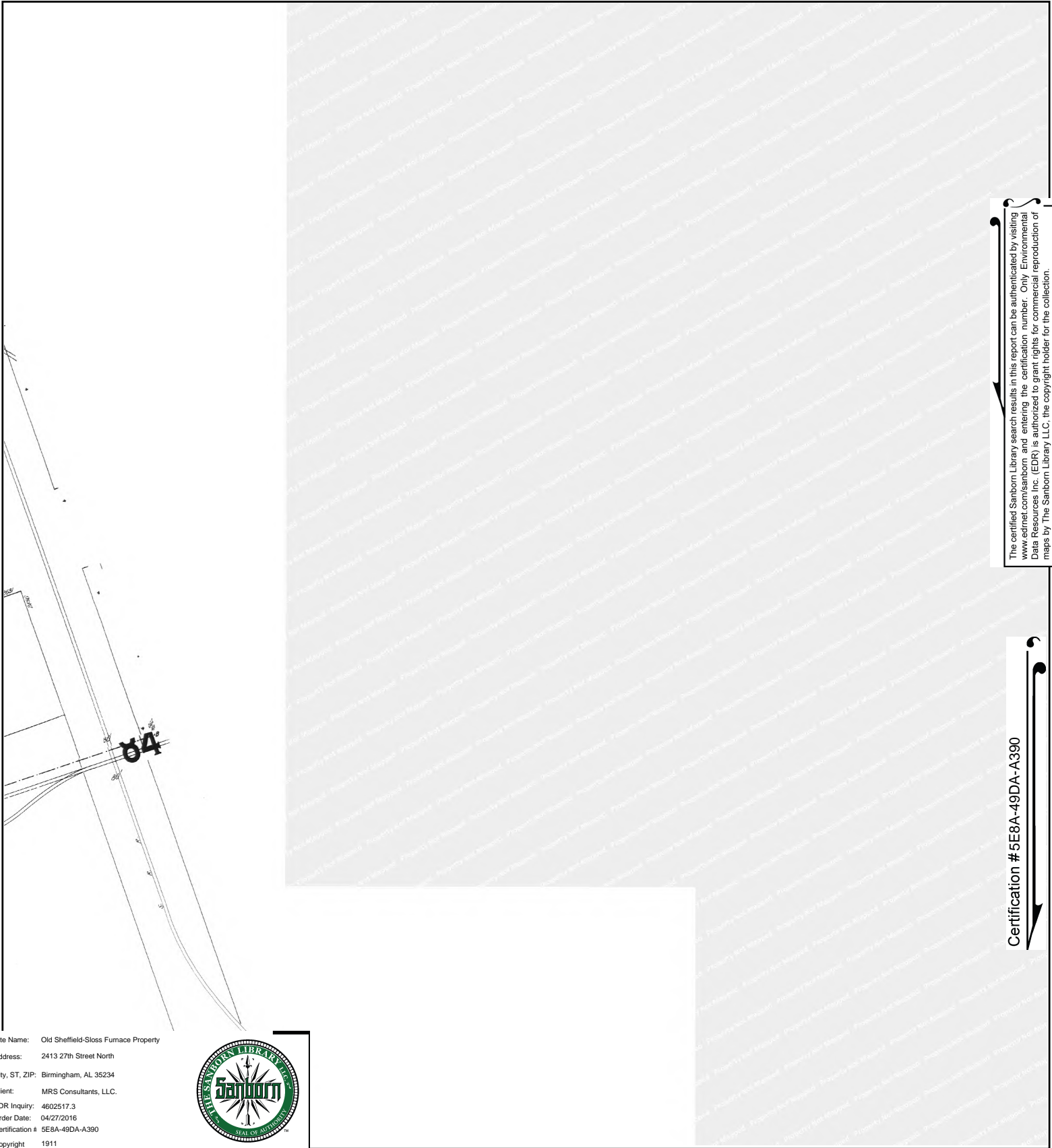


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Volume 1, Sheet 87
 Volume 1, Sheet 92
 Volume 1, Sheet 88
 Volume 1, Sheet 84





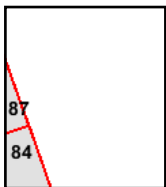
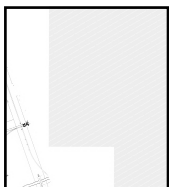
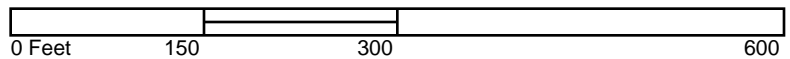
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Volume 1, Sheet 87
 Volume 1, Sheet 84





Old Sheffield-Sloss Furnace Property

2413 27th Street North

Birmingham, AL 35234

Inquiry Number: 4602517.3

April 27, 2016

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Site Name:

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2413 27th Street North
Birmingham, AL 35234
EDR Inquiry # 4602517.3

Client Name:

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PO # MRS-2015-29

Project Site 1Je808

Maps Provided:

1969
1966
1951
1950
1929



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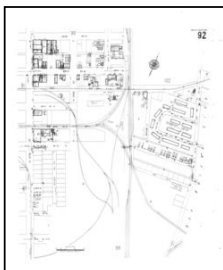
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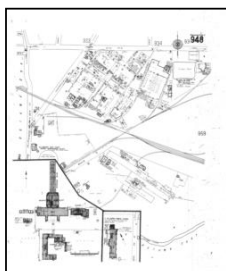


Volume 1, Sheet 88
1969



Volume 1, Sheet 92
1969

1966 Source Sheets



Volume 9, Sheet 948
1966

1951 Source Sheets



Volume 1, Sheet 88
1951



Volume 1, Sheet 92
1951

1950 Source Sheets



Volume 9, Sheet 948
1950

Sanborn Sheet Key

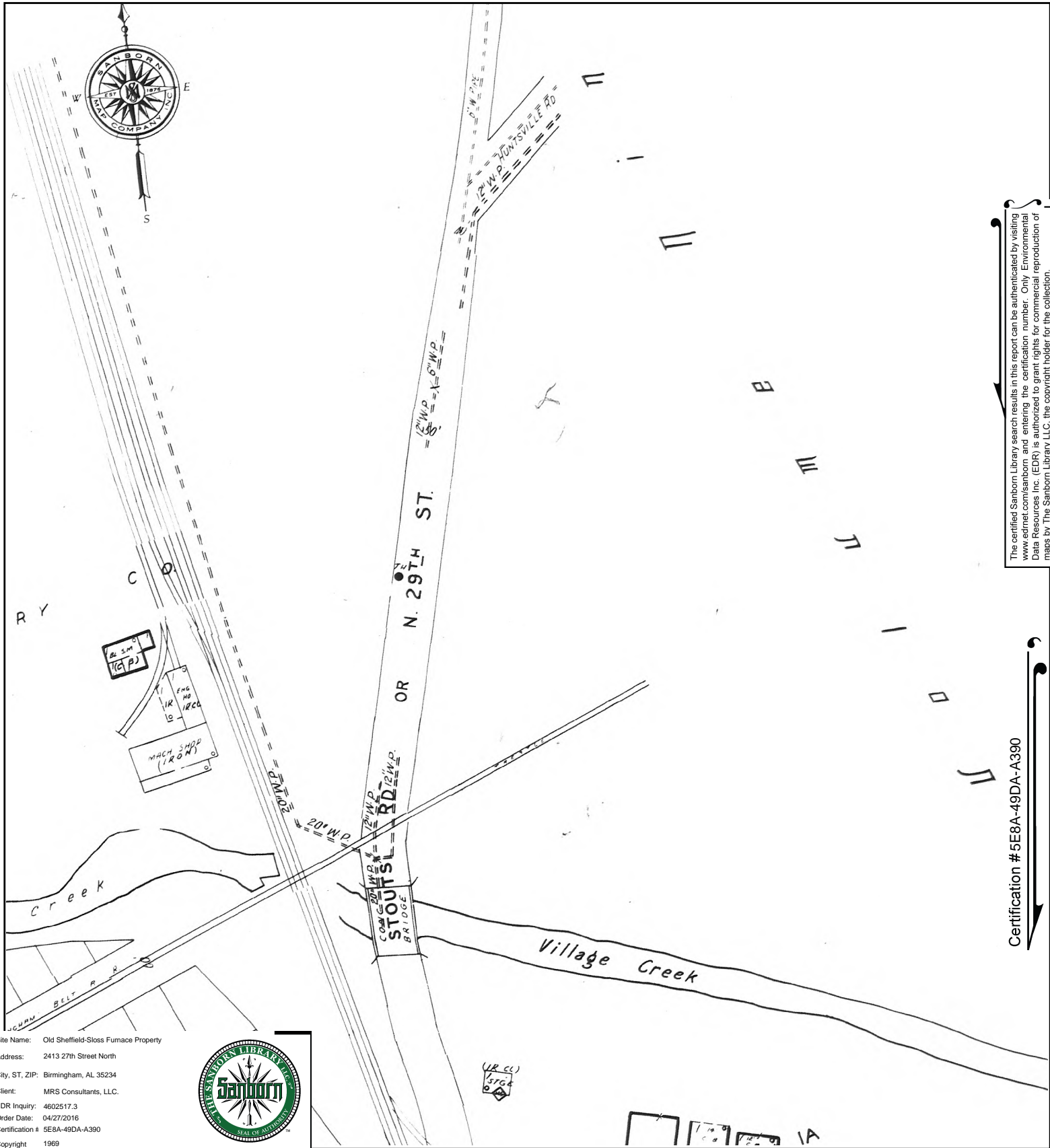
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1929 Source Sheets



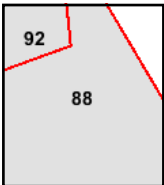
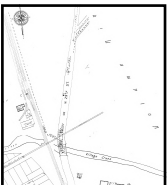
Volume 9, Sheet 948
1929



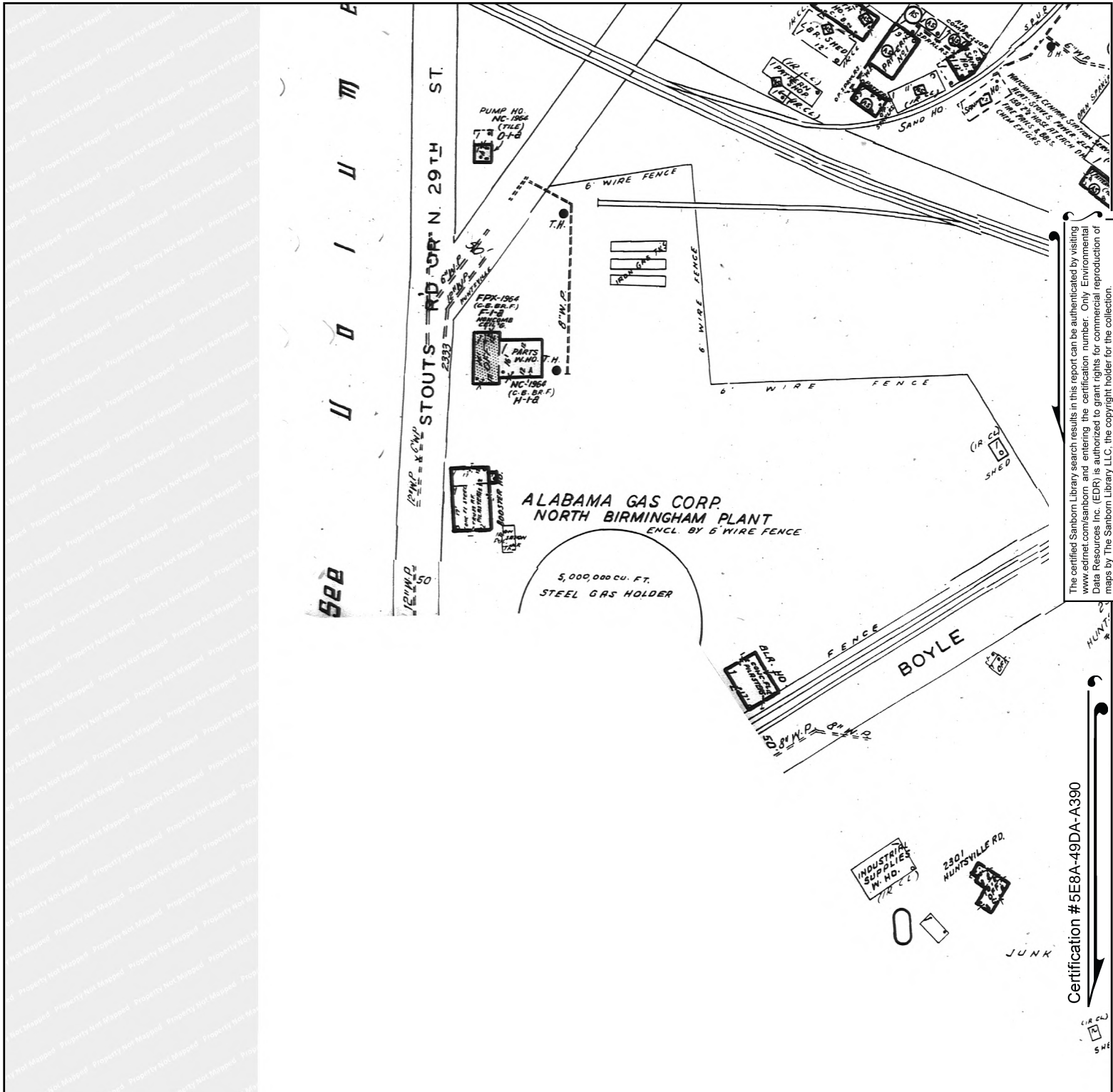
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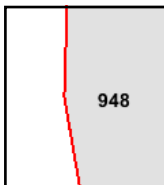
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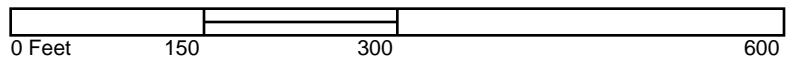
Site Name: Old Sheffield-Stoss Furnace Property
 Address: 2413 27th Street North
 City, ST, ZIP: Birmingham, AL 35234
 Client: MRS Consultants, LLC.
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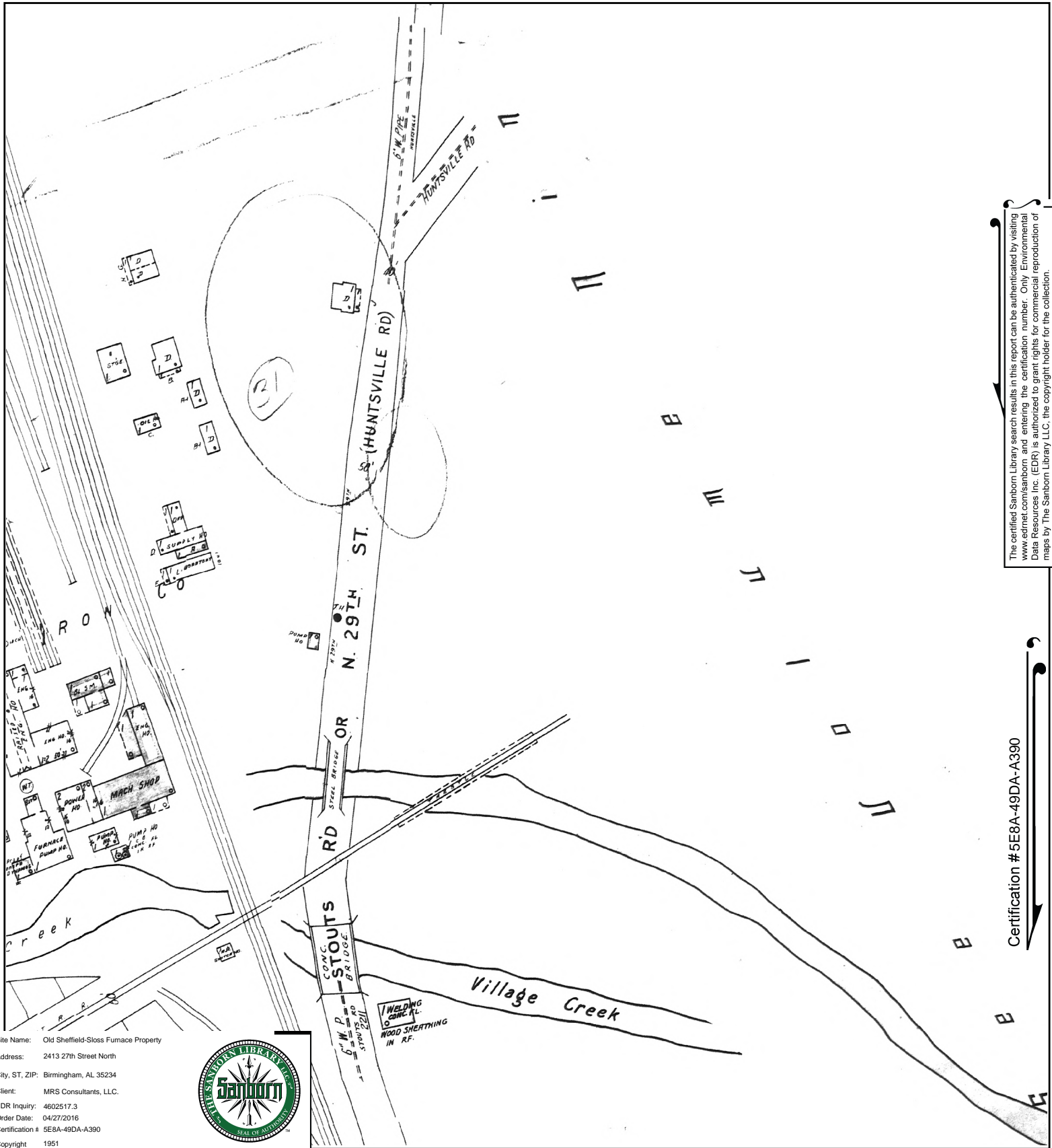


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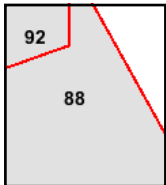




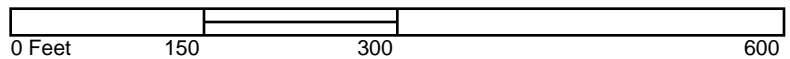
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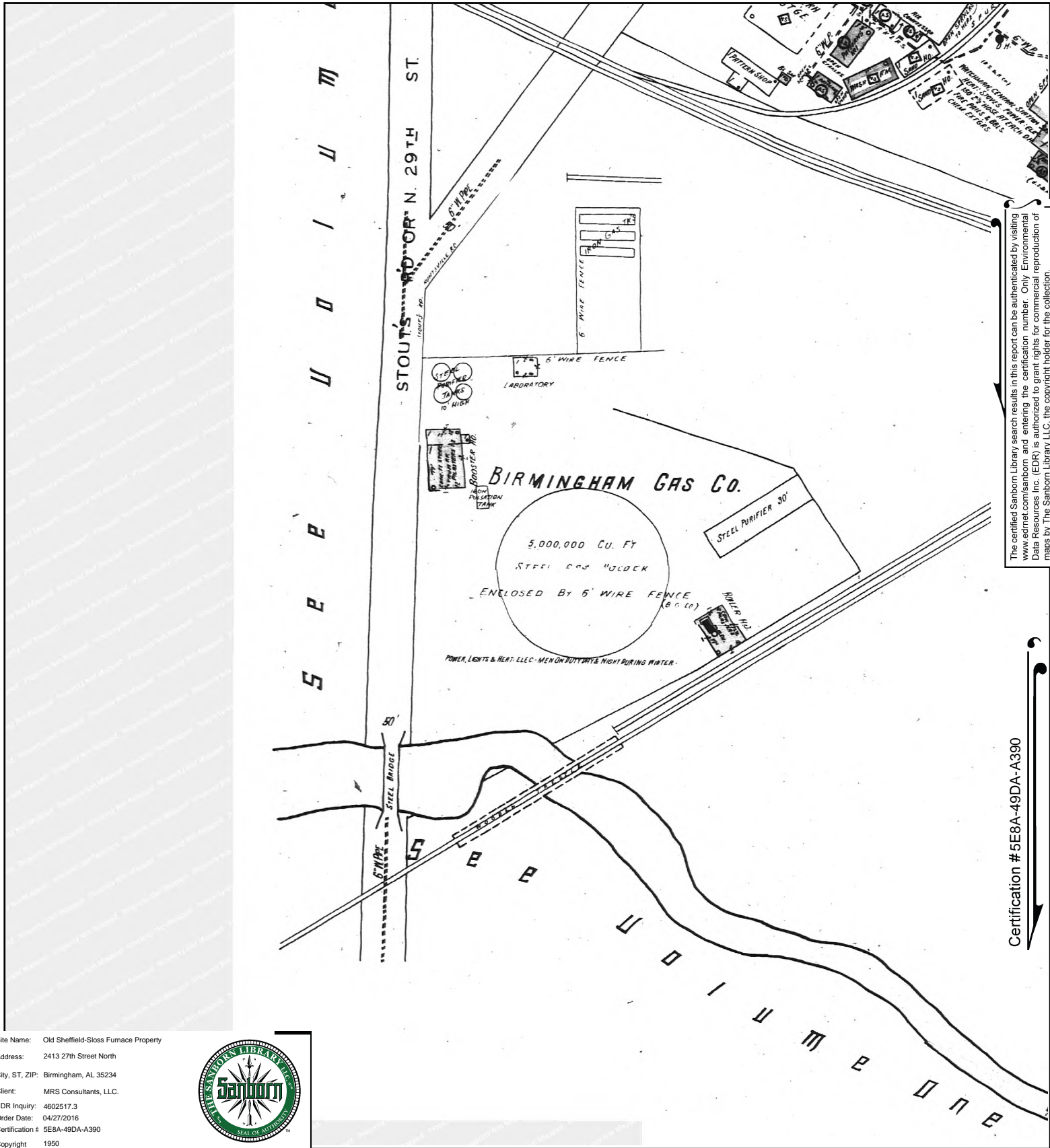


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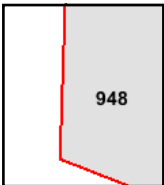
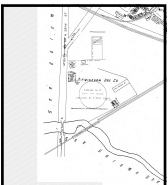
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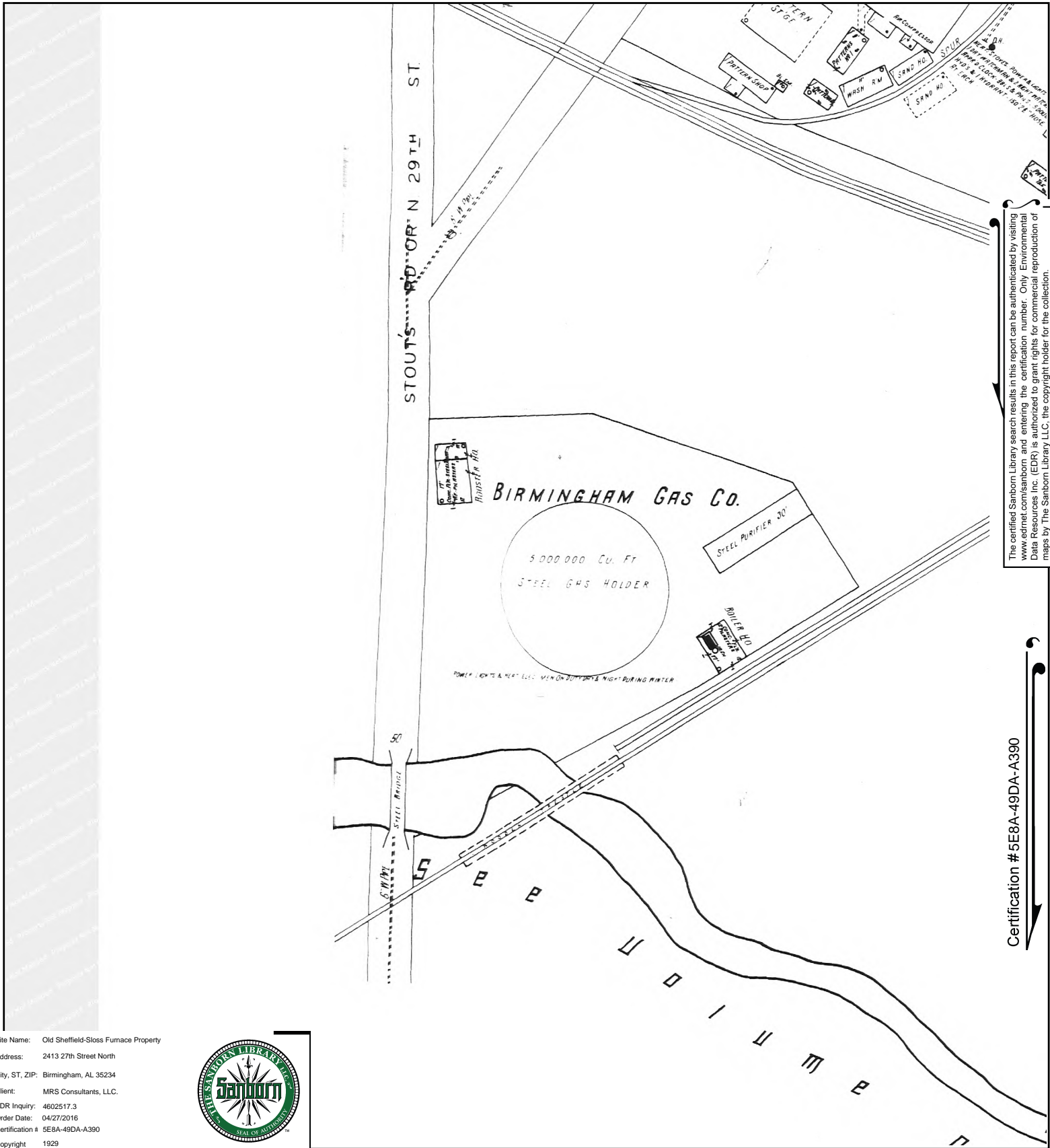
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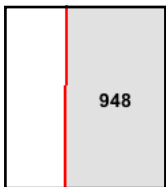
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Certification #5E8A-49DA-A390

Site Name: Old Sheffield-Stoss Furnace Property
 Address: 2413 27th Street North
 City, ST, ZIP: Birmingham, AL 35234
 Client: MRS Consultants, LLC.
 EDR Inquiry: 4602517.3
 Order Date: 04/27/2016
 Certification #: 5E8A-49DA-A390
 Copyright: 1929



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 9, Sheet 948

