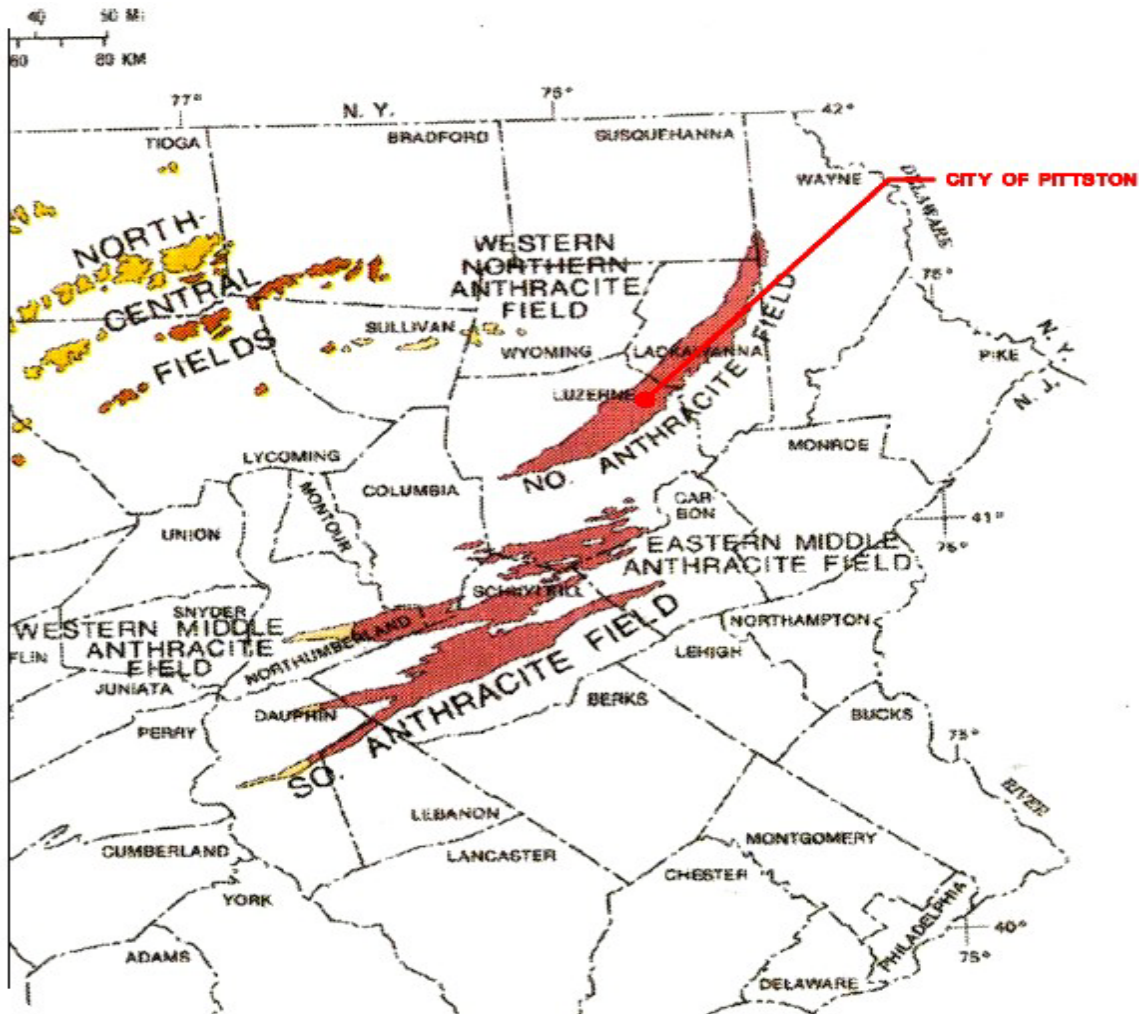




# City of Pittston Mine Subsidence Study

Presented at the 14<sup>th</sup> Annual  
Pennsylvania Statewide Conference on  
Abandoned Mine Reclamation,  
August 2-4 2012, State College, PA

# Anthracite Fields



**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL  
PROTECTION

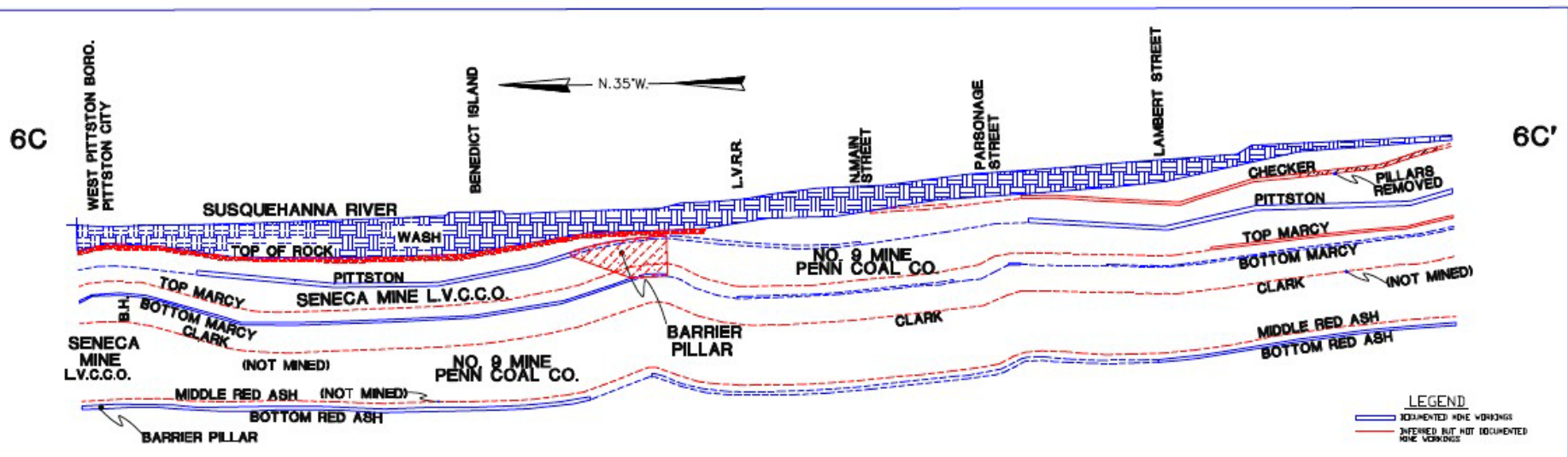
# Pittston Mine Subsidence Study

- To Determine Areas of High Subsidence Potential in the City of Pittston – 1.7 mi<sup>2</sup>
- Two Years in Making
- Published and Presented at Town Meeting
- Mine Subsidence Insurance
  - 473 Active policies in the City of Pittston which equates to only 12% of residential and commercial structures

# Mine Subsidence

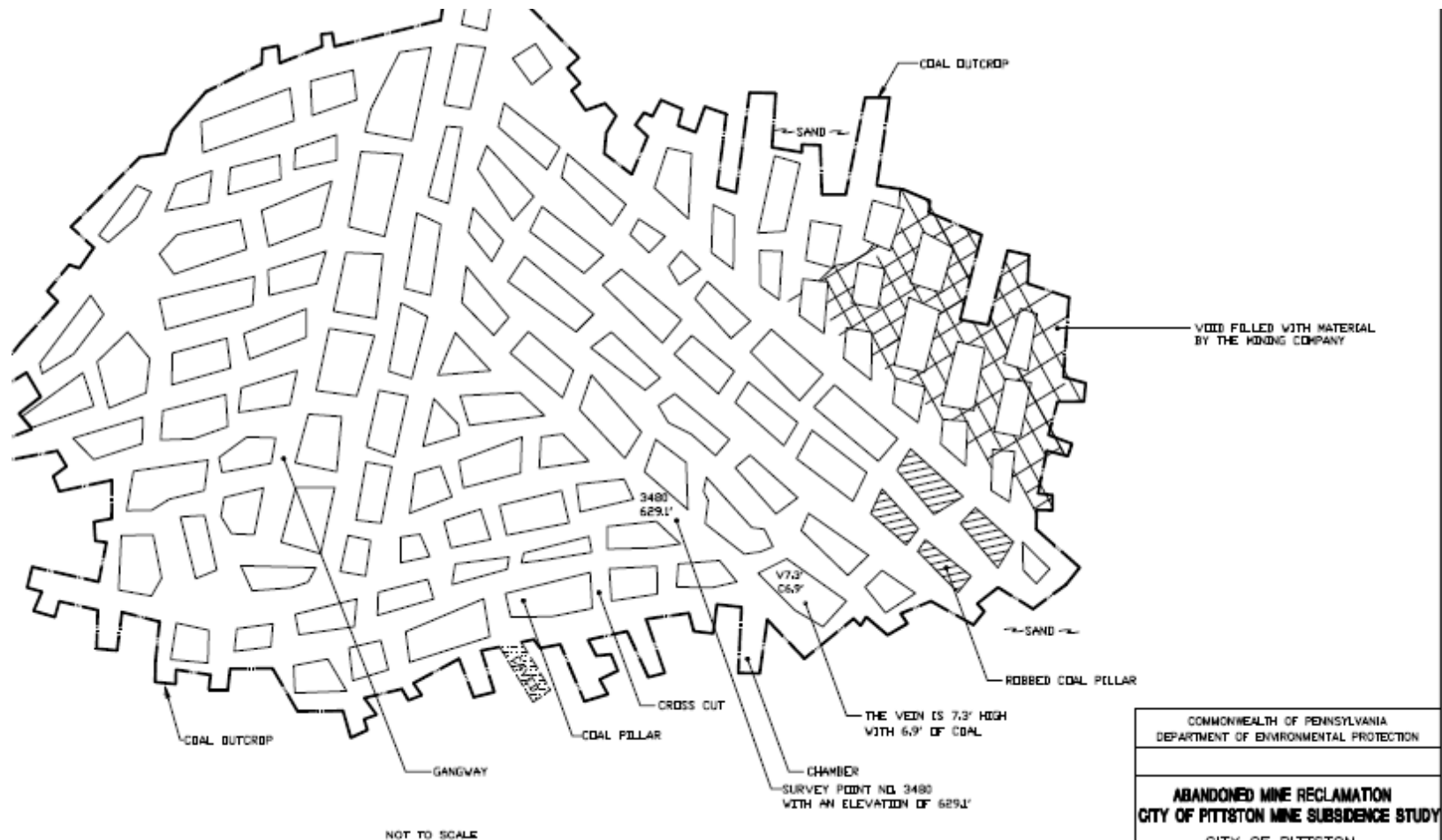


# Typical Cross Section Near Mill Street





# Typical Mine Workings



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# Tools Utilized in the Study

- Historical Mine Maps
- Drill Logs – 1980's to Present
- Historical Drill Logs – 1900 – 1940's
- LiDAR
- Mine Subsidence Inquiries
- OSM Emergency Projects
- Mine Flushing Data

# Historical Mine Map – Checker Vein





# Drill Log - 1984

# Drill Log - 1910

G. E. RAY CONSULTING CO., INC.  
7. D. BOX 5335  
SOUTH CHARLESTON, WEST VIRGINIA

## DRILLERS REPORT

PROJECT NO. DSM 40(511-83) 101.1  
LOCATION Pittston  
STREET MILL ST. (Box House No. 170)  
DESCRIPTION Near Corner of Radcliffe  
BOREHOLE NO. BH# 25M DRILLED 1118-3724 1984  
DRILLED BY 2580W 7235 E SURFACE ELEVATION Approx. 542

STRATA	TYPE OF CORE	PIPE INSTALLED	DRILLED	TOTAL	VEIN	NAME OF VEIN
	IN.	FT. IN.	FT. IN.	FT. IN.	ELEVATION	
WASH			16			
Rock			4	20		
Rock			16	36		
L Broken			2	38		
Open			8	46		CLACKER
H Rock			65	111		
L Broken			2	113		
Open			4	117		
L Broken			4	121		Pittston
H Rock			34	155		
Open			7	162		
L Broken			6	168		Marcy
Bot. Rock			2	170		

REMARKS 20' 8" casing 150' 6" casing  
20' 8" casing 145' 6" casing  
Meeting @ 162' (162.5)

MACHINE NO. \_\_\_\_\_ DRILLER VAN FLEET

UNIVERSITY OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ABANDONED MINE RECLAMATION  
CITY OF PITTSBURGH SUBSIDIARY STUDY  
CITY OF PITTSBURGH  
LUISBURG COUNTY, PENNSYLVANIA

TYPICAL DRILLERS REPORT

FIGURE NO. 6

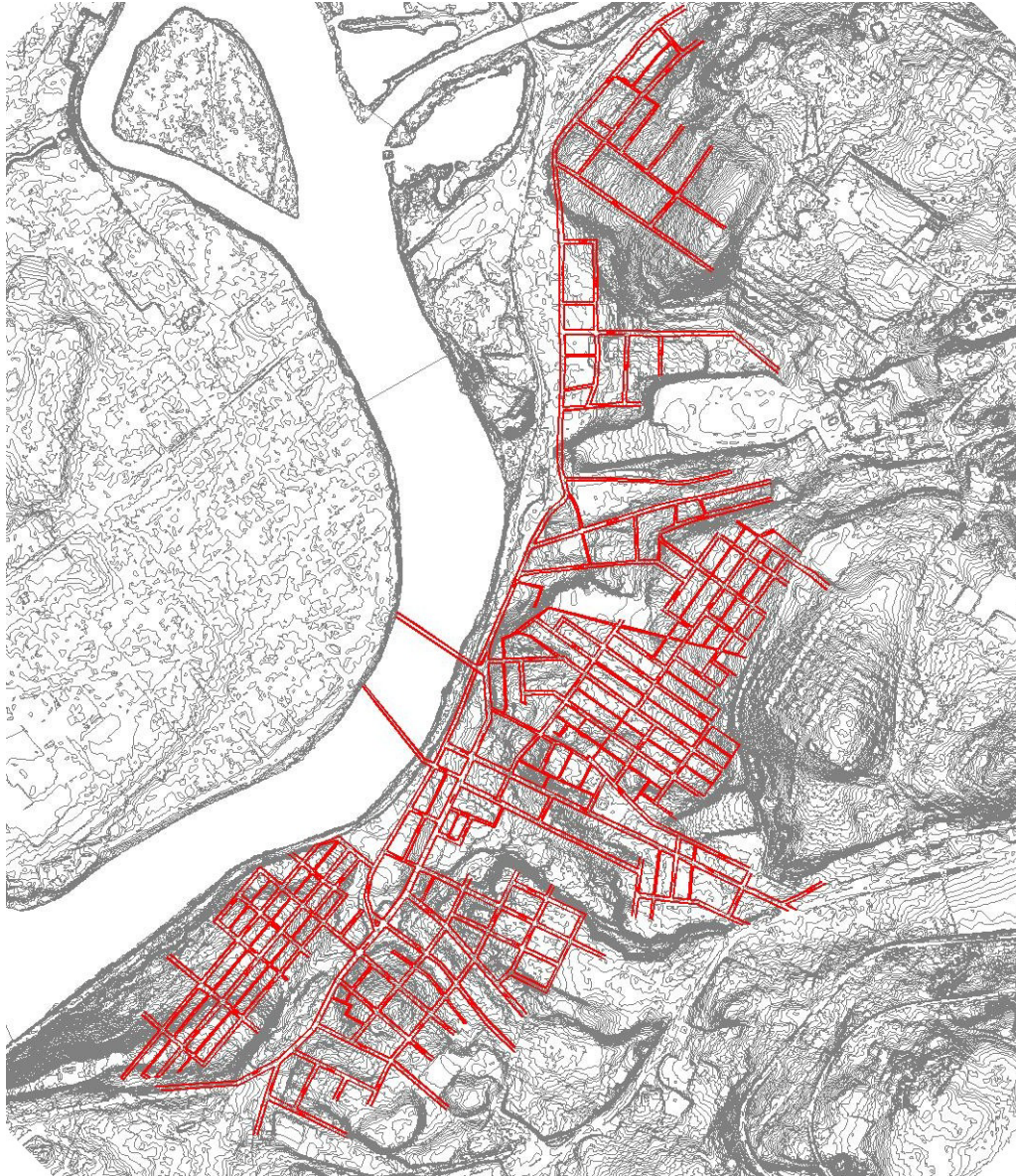
Bore Hole N<sup>o</sup> 1253. On the James W. Johnson Tract, Pittston City, located between the L.V.R.R. Main Line and Freight Branch 1910 PITTSBURGH and West Washington from the Center of Old No. 3 Shaft.

CHARACTER OF STRATA	THICKNESS FT. IN.	DEPTH FT. IN.	ELEVATION
9-21-10 Elevation Top of Standpipe Standpipe Column Sandstone Slate Sandstone 8-12 Slate Sandstone	19 0 16 6 25 6	19 0 25 6	550.82
Coal "Bona" Coal "Bona" Rider Vein	1 9	273	516.58
Slate Sandstone Sandstone Sandstone Slate Sandstone Sandstone	23 11	812	
Coal "Slate" Coal "Slate" Coal "Slate" Pittston Bona Coal "Bona" Coal "Bona" Rider Vein	111	923	461.68
Slate Sandstone Sandstone Sandstone	279	1200	
Sulphate Coal "Slate" Coal "Slate" Top Marcy Bona Coal "Slate" Coal "Slate" Vein	3 10	1230	430.00
Slate Sandstone Sandstone Sandstone	10 4	1342	
Bona Coal "Bona" Coal "Slate" Coal "Slate" Bottom Marcy Bona Coal "Bona" Coal "Slate" Vein	4 7	1381	414.91
Slate Sandstone Sandstone	47 1	1840	
Bona Coal "Bona" Coal "Slate" Coal "Slate" Top Clark Slate Sandstone Bona Coal "Slate" Vein	3 2	1872	360.66
Slate Sandstone	11 10	2010	
Coal "Bona" Coal "Bona" Coal "Slate" Middle Clark Slate Coal "Bona" Coal "Slate" Vein	3 10	2040	349.00
Slate "Dark Sandstone" Sandstone "Slate" Sandstone	2 0	2060	
Coal "Slate" Coal "Slate" Bottom Clark Vein	1 11	2089	345.49
Sandstone "Slate" Sandstone Coal "Bona" Coal "Slate" Coal "Slate"	30 3	2390	
Sandstone "Slate" Coal "Slate" Sandstone	0 10	2470	313.25
Sandstone "Slate" Sandstone "Slate" Coal "Slate"	46 11	2869	
Bona Coal "Slate" Coal "Slate" ? Slate Sandstone Bona Coal "Slate" Coal "Slate" Bona	4 6	2913	262.58
Slate Sandstone Sandstone Sandstone	39 9	3310	
Coal Babylon Vein ? Inter	4 0	3350	218.85
Gray Sandstone "Dark Sandstone" Bona Coal "Bona" Coal "Slate" Coal "Slate" 2 5 min	12 6	3476	
Slate "Slate" Sandstone Sandstone "Slate" Sandstone	2 0	3496	204.35
Bona "Slate" Coal "Slate" Coal "Slate" Bona Slate Coal "Bona" Coal "Slate" Coal "Slate" Vein	35 3	3849	
Slate "Slate" Sandstone Sandstone Sandstone	7 8	3925	161.47
Bona Coal "Slate" Bona Coal "Slate" Coal "Slate" A Vein	18 1	4106	
Slate Sandstone Sandstone Sandstone	2 3	4129	141.08
10-25-10	12 9	4256	



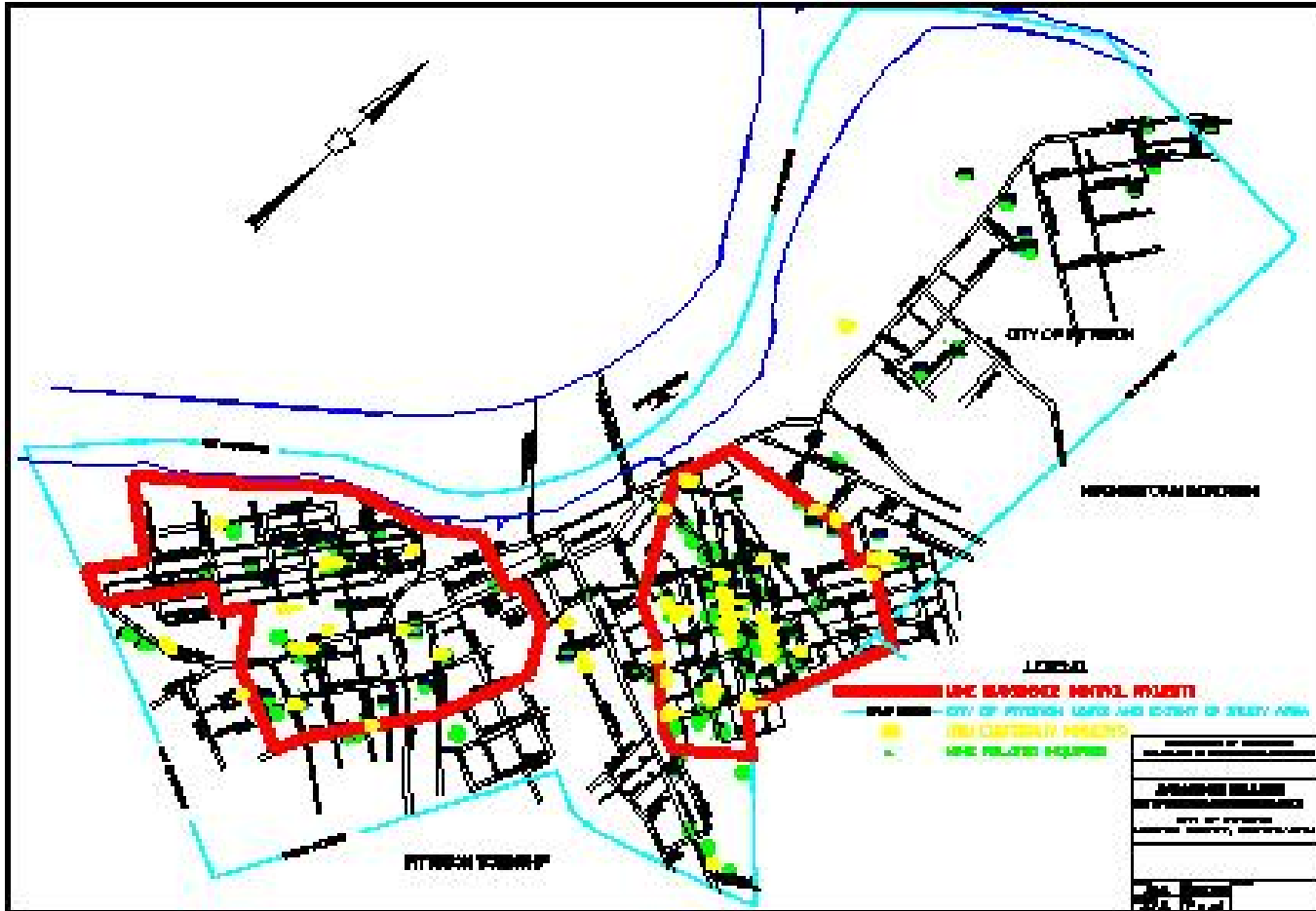
**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL  
PROTECTION

# LiDAR





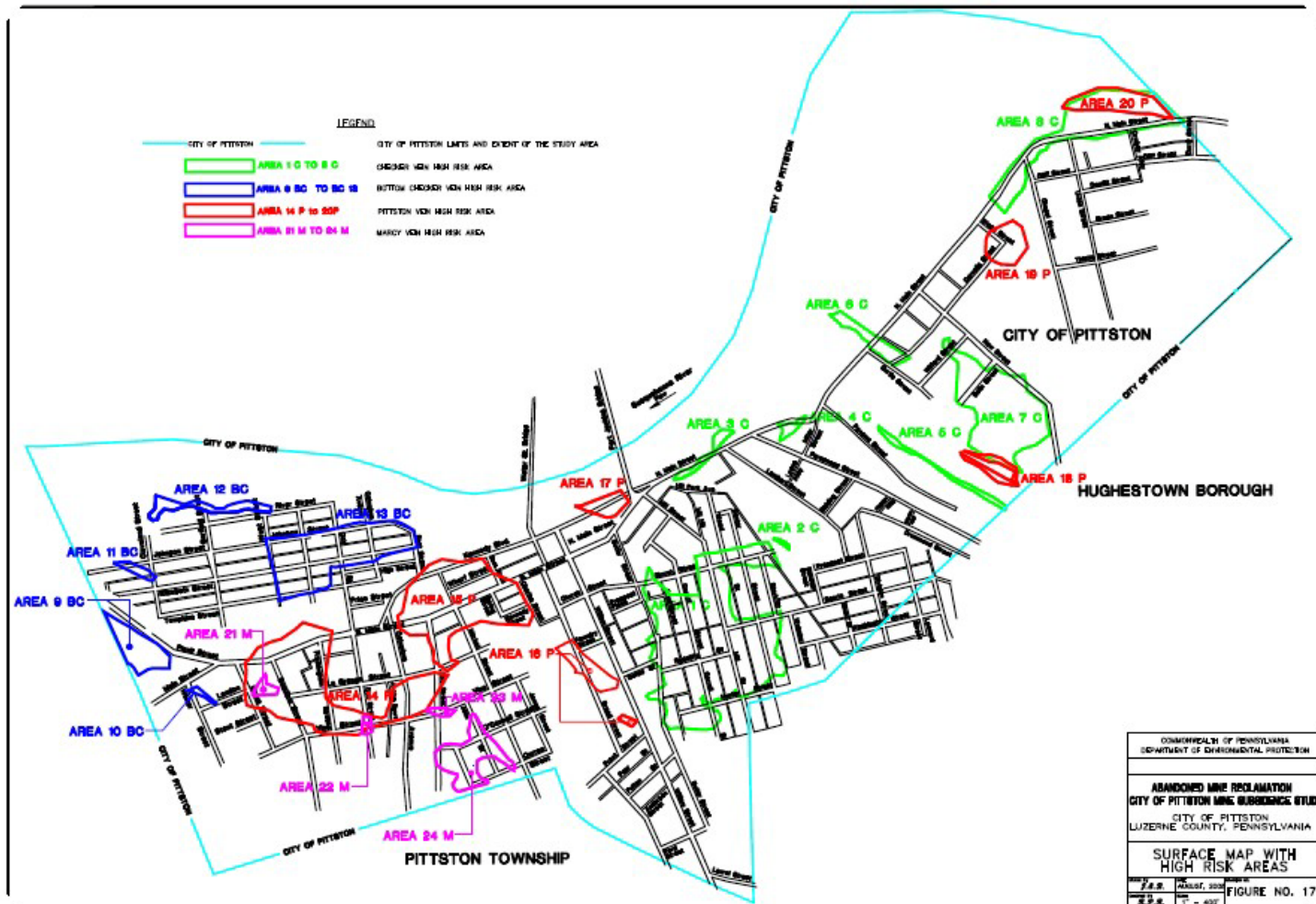
► **Inquiries & Emergency Projects**



# Drilling and Mine Flushing Data

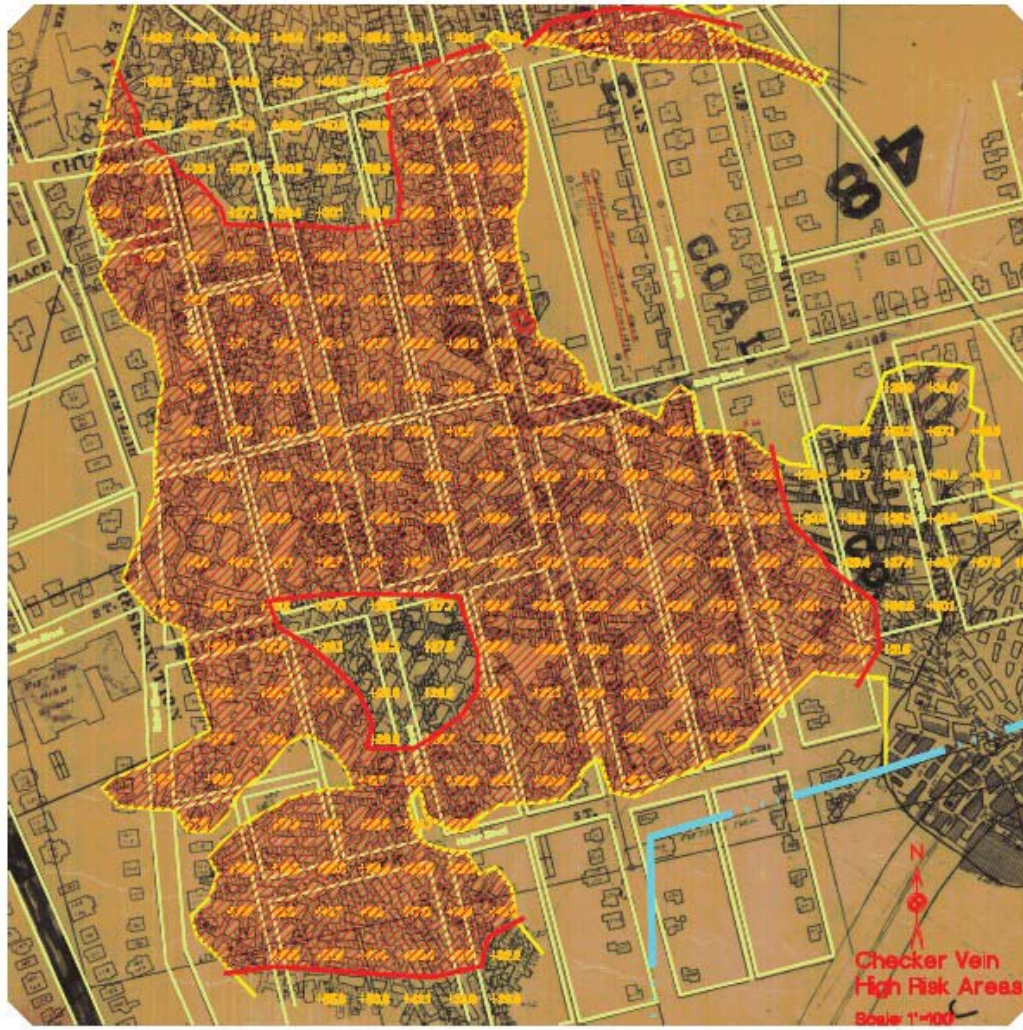


# Pittston City High Risk Areas





# Mill Street Neighborhood



# Study Completed December 2008

**PITTSBURGH CITY POTENTIAL MINE SUBSIDENCE STUDY**

**LUZERNE COUNTY, PENNSYLVANIA**

**PREPARED BY**

**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**BUREAU OF ABANDONED MINE RECLAMATION**

**WILKES-BARRE DISTRICT OFFICE**



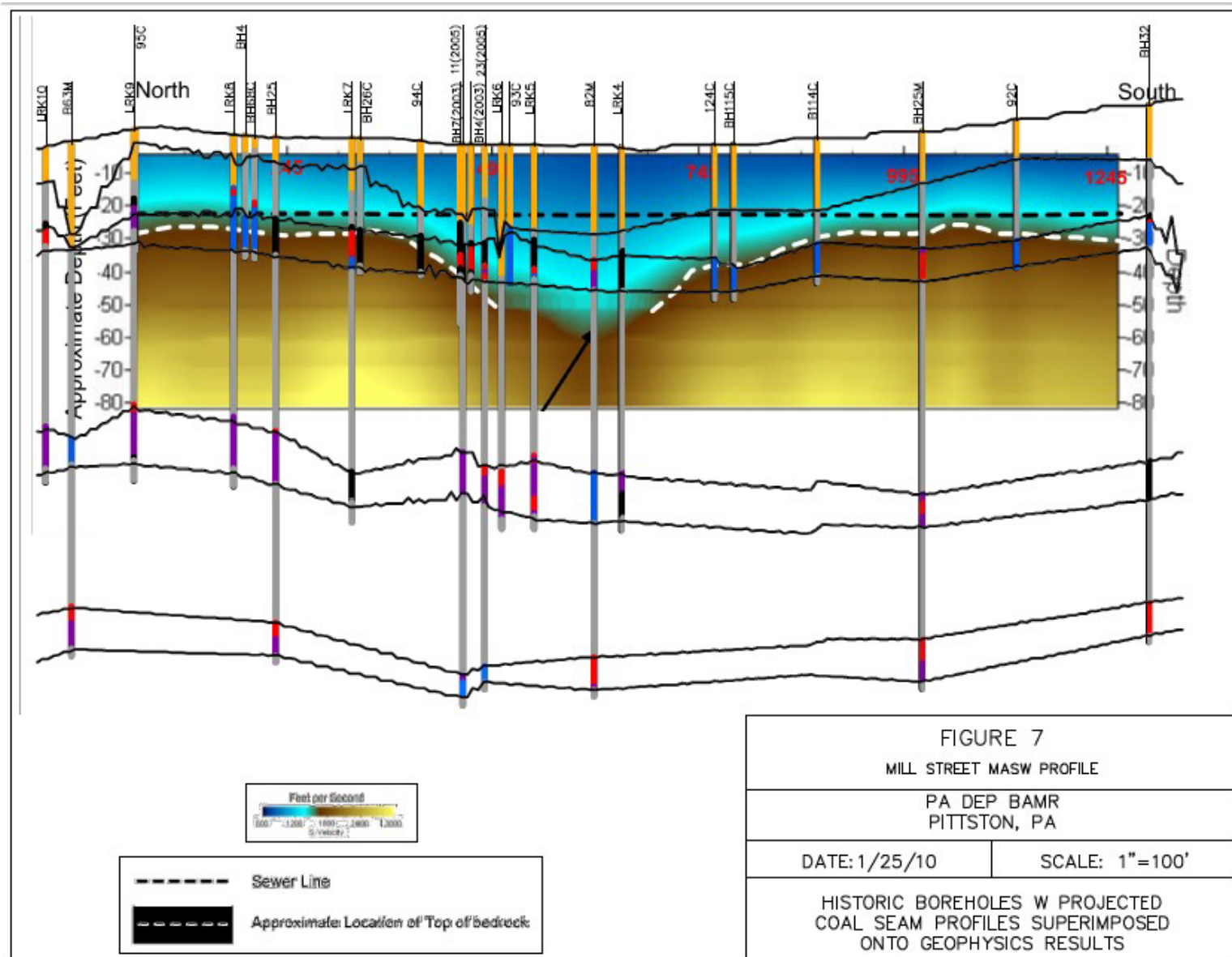
# ➤ Field Verification Kimball Engineering

## Geophysical Technology Utilized

- Electrical Resistivity Imaging
- Multi-Channel Analysis of Surface Wave (MASW)
- Ground Penetrating Radar (GPR)





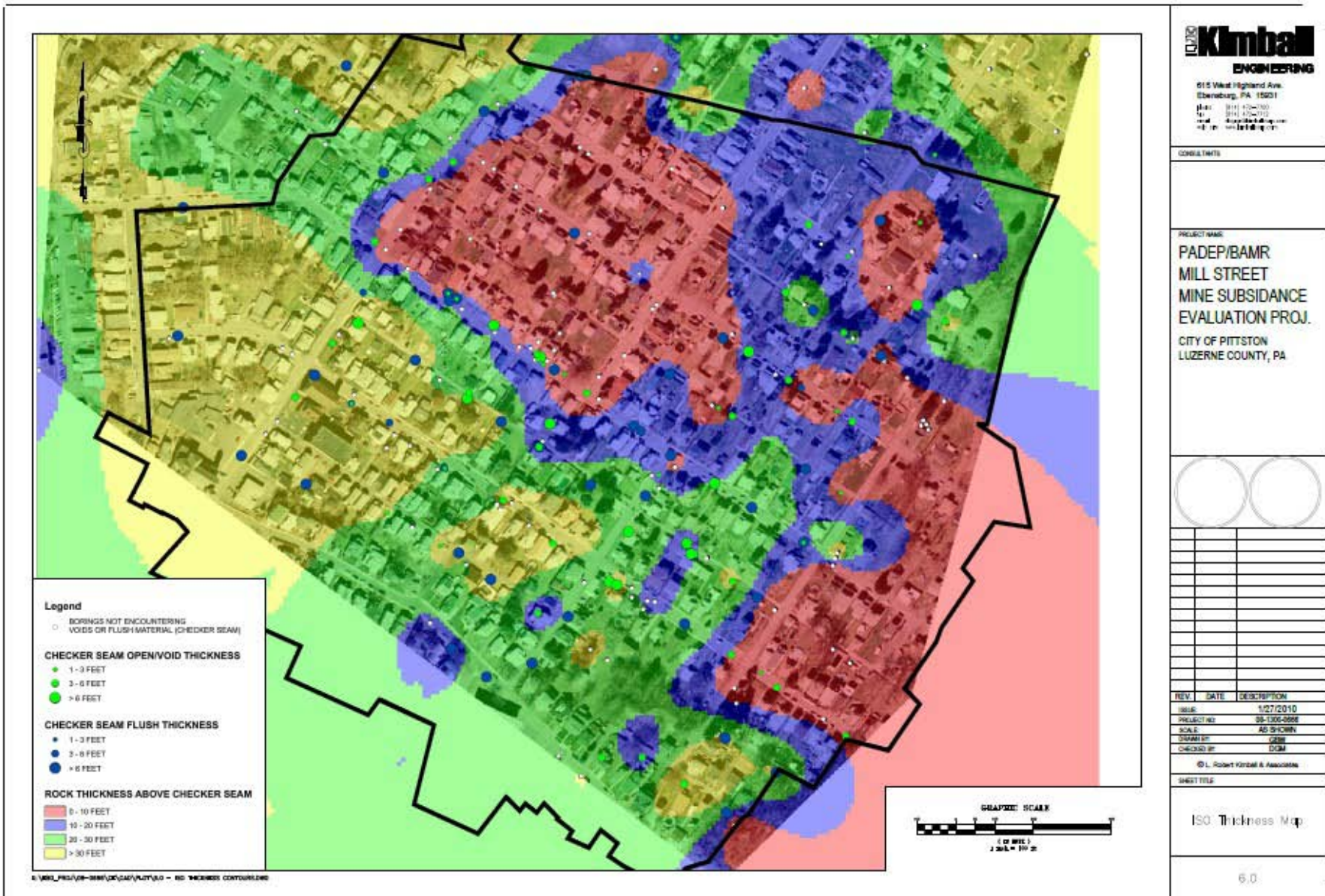


# Multi-Channel Analysis of Surface Wave Data



Table 2 – Kimball Boring Observations

Boring	Coal Vein	Depth to Bottom of Vein (feet)	Thickness (feet)				Notes
			Coal	Broken Rock	Flush	Void	
LRK1	Checker	55	7.1	2.9	0	0	
	Pittston	132.5	0	14	0	0	
LRK2	Checker	54.2	1.9	1.7	0	7.2	Installed 25 feet of 3-inch PVC casing and flush mount cover
	Pittston	135.8	0	16.5	0	0	
LRK3	Checker	64	0	6.5	0	5.9	Boring caved, no casing installed
	Pittston	127.7	0	15.8	0	0	
LRK3A	Checker	56.2	10.8	5.3	0	0	
	Pittston	123.6	1.8	14.8	0	0	
LRK4	Checker	44	11.1	0	0	0	
	Pittston	113.9	7.9	6	0	0	
LRK5	Checker	41.9	8.1	0	1.6	2.3	
	Pittston	113.9	0	12	0	6.1	
LRK6	Checker	41.6	1	0	0	0	
	Pittston	114.7	0	9.7	0	5	
LRK7	Checker	41.1	1.9	0	3.8	8	Installed 17 feet of 3-inch PVC casing and flush mount cover
	Pittston	111.8	9.8	0	0	0	
LRK8	Checker	36.5	0.5	0	18.6	1.5	
	Pittston	102.5	0	16	0	0	
LRK9	Checker	31	2.6	6.7	0	0	
	Pittston	101.5	1.3	13	0	2.9	
LRK10	Checker	30.4	2.6	0	0	4.5	Installed 11 feet of 3-inch PVC casing and flush mount cover
	Pittston	98.6	0	13.5	0	0	
LRK11	Checker	41.5	11.3	0	0	0	
	Pittston	112.5	10.5	0	0	0	
LRK12	Checker	44.2	10.4	1	0	0	
	Pittston	114.2	0.5	22.8	0	2	
LRK13	Checker	30	8.7	0	0	0	
	Pittston	101.2	11	0	0	0	



Isopach Thickness Map of Checker Vein

# Kimball Engineering Recommendations

- Checker Vein Highest Potential for Subsidence
- Mill, Stark and Center Streets Highest Priority
- Pressure Grout Voids in the High Potential Areas
- Jet Grouting to Stabilize Sand-Clay Wash
- Jet Grouting for Foundation Reinforcement in Certain Structures

# Necessary Action

- Pittston City Began Replacing Combination Sewer Line on Mill Street with Separate Systems in Spring 2011. BAMR Provided Pass-Through Funding for Stabilization of the Mine Voids along Mill Street in Early 2011. 400 C.Y. of Grout Placed
- Separate BAMR Drilling/Grouting Project Currently in Design to Address Potential High Subsidence Areas in the Mill Street Neighborhood



# What lies beneath?

## 130 acres of Pittston City at risk of potential mine subsidence

By JACK SMILES  
jsmiles@sundispatch.com

It's common knowledge that there are long abandoned mine workings below Pittston. But most residents don't know the extent of the voids left by the gangways, chambers and "pillar robbing" or the extent of the potential for subsidence.

In fact, even experts like Dennis Palladino, a mining engineer with the Bureau of Abandoned Mine Reclamation (BAMR) in Wilkes-Barre, and his boss Ron Ryczak, the bureau's civil engineer manager, don't know exactly what lies below Pittston. And they have been studying mine-related subsidence problems in the city since 2006 when they were asked to conduct a study of Pittston by then-Congressman Paul Kanjorski.

In an interview last week in the BAMR

office, Ryczak and Palladino talked about the study, what they do know about conditions under the city and the plans for the next round of flushing to fill voids in the Mill Street area. Concrete grout will be injected into the voids through bore holes, where it hardens. In the past, flushing was done with crushed mine rock mixed with water. When the water drained off the rock material was left in place to fill voids.

### ON THE WEB

**Pittston Subsidence Study** contains much information including a narrative, borehole logs and mine maps. Go to <http://tinyurl.com/6sw4uqq>

federal drilling projects and reports from previous subsidence investigations, emergency stabilization projects and two large subsidence investigation control projects in Pittston in 1977 and 1985.



AS HE LEFT THE BUREAU OF ABANDONED MINE RECLAMATION

Dennis Palladino looks over copies of mining maps showing the extensive network of mine workings under the city.



# Questions?

The presenter would like to thank Mr. David G. Minnear, P.E. and the staff of Kimball Engineering for their work on the Mill Street Subsidence Evaluation that became a major contribution to this paper.



**Dennis M. Palladino. P.E.**

**Pennsylvania Department of  
Environmental Protection**

**Bureau of Abandoned Mine  
Reclamation, Wilkes-Barre, PA**

**[dpalladino@pa.gov](mailto:dpalladino@pa.gov)**