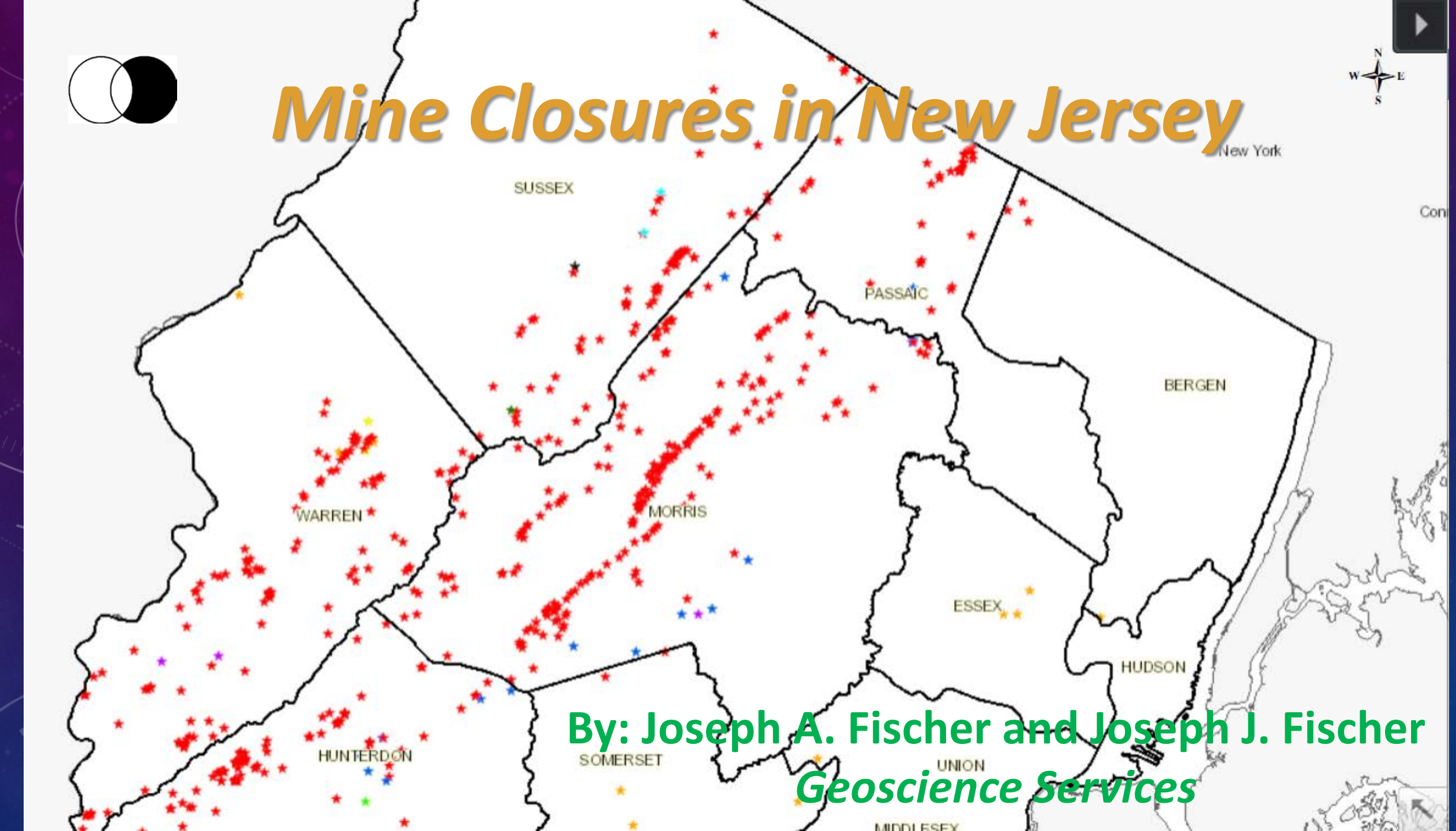
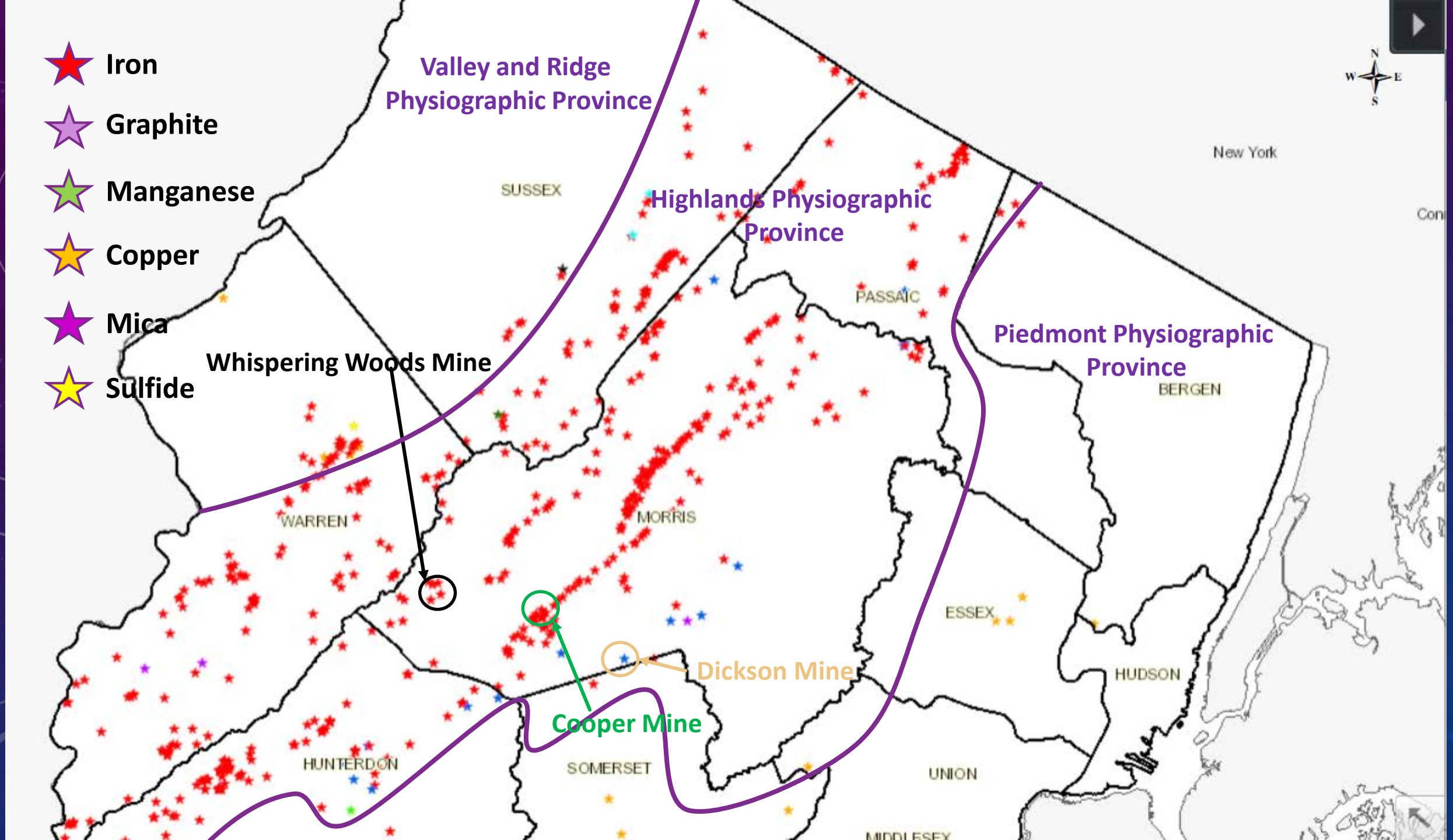
Mine Closures in New Jersey



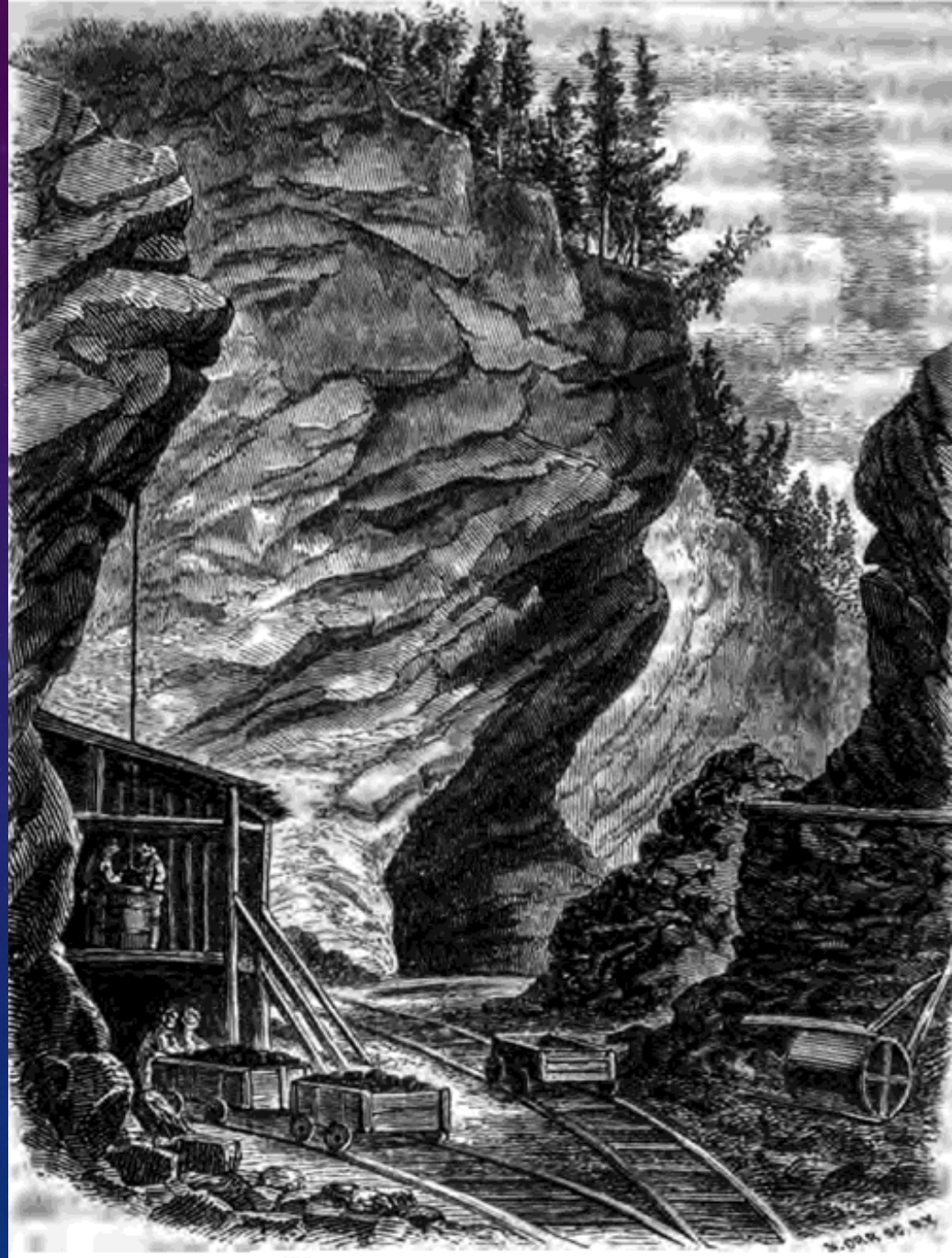
By: Joseph A. Fischer and Joseph J. Fischer

Geoscience Services


Iron
Graphite
Manganese
Copper
Mica
Sulfide
Valley and Ridge Physiographic Province
Highlands Physiographic Province
Piedmont Physiographic Province
Whispering Woods Mine
Dickson Mine
Cooper Mine
New York
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
HUNTERDON
SOMERSET
UNION
MIDDLESEX
N
W
E
S

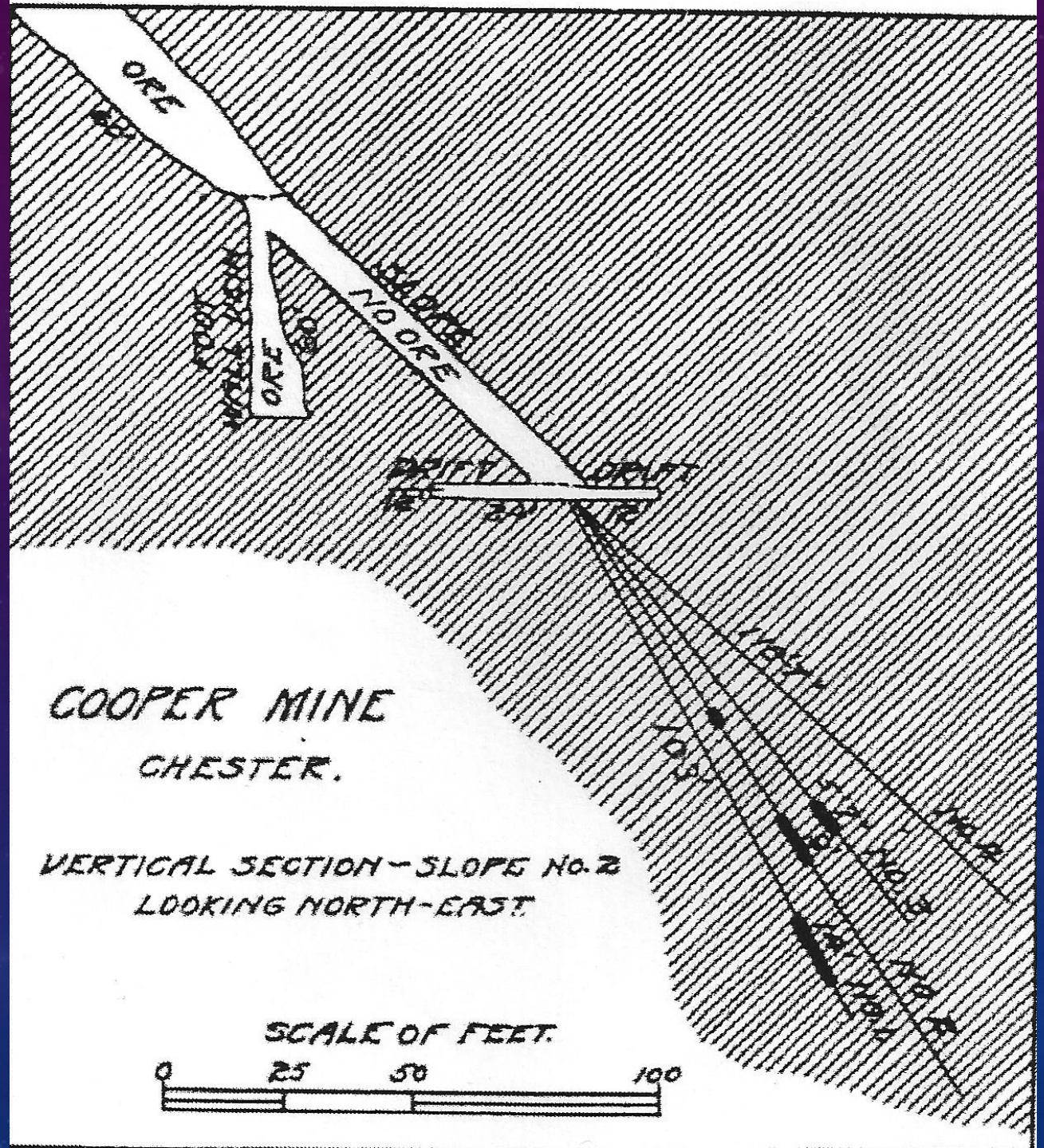
IRON MINES IN NEW JERSEY

- NJ was the largest producer of iron in the USA from before the Civil War to the later 19th century.
- Mine closures fall under the purvey of the Dept. of Labor, Mine Safety Div. MCPs are submitted to the DoL by a licensed NJ Prof. Engineer.
- The NJG&WS keeps a catalogue of historic and existing mines and will freely disseminate the information.
- The magnetite and graphite mined in northern NJ was considered high-grade ore at the time.
- Most mining in NJ started from the surface and the beds/veins of ore were followed downward, usually at an angle, forming a stope.
- Copper was also mined in NJ during the same period, though not as extensively as iron.



ANDOVER IRON MINE SUSSEX CO

from: Annual Report of NJ State Geologist 1855, p.149

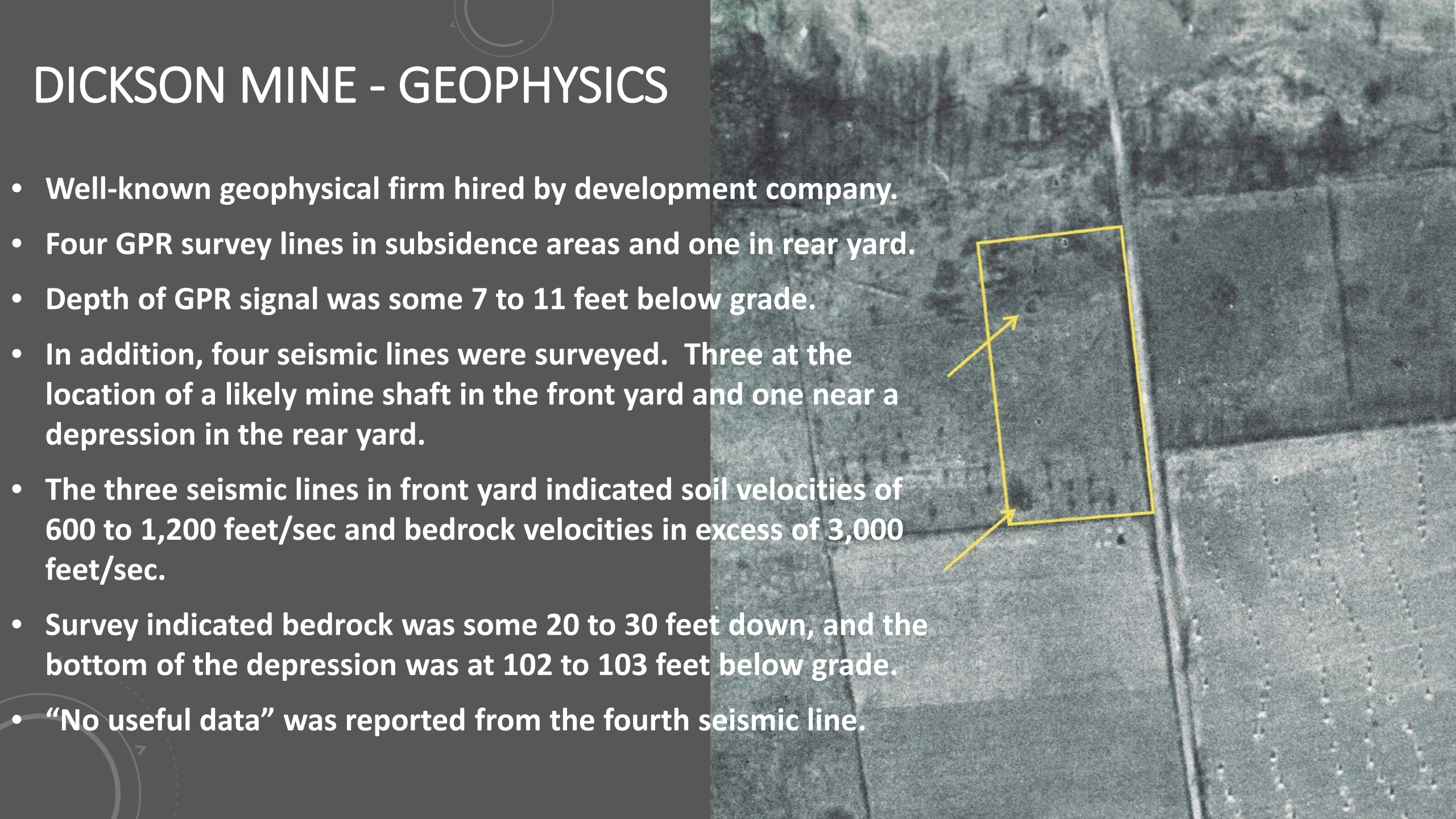

ORE
NO ORE
ORE
NO ORE
DRIFT
DRIFT
COOPER MINE
CHESTER.
VERTICAL SECTION - SLOPE No. 2
LOOKING NORTH-EAST.
SCALE OF FEET.
0
25
50
100

DICKSON MINE - INTRODUCTION

- A graphite mine in Mendham, opened in Middle Proterozoic rocks around the mid-1800's.
- Produced sufficient quantities to warrant the construction of small processing mill.
- Two depressions, likely evidence of mine workings, disguised by previous owner's landscaping.
- Current owner's have small child. Concern for subsidence in their front yard prompted contact with developer.

DICKSON MINE - GEOPHYSICS

- Well-known geophysical firm hired by development company.
- Four GPR survey lines in subsidence areas and one in rear yard.
- Depth of GPR signal was some 7 to 11 feet below grade.
- In addition, four seismic lines were surveyed. Three at the location of a likely mine shaft in the front yard and one near a depression in the rear yard.
- The three seismic lines in front yard indicated soil velocities of 600 to 1,200 feet/sec and bedrock velocities in excess of 3,000 feet/sec.
- Survey indicated bedrock was some 20 to 30 feet down, and the bottom of the depression was at 102 to 103 feet below grade.
- “No useful data” was reported from the fourth seismic line.



DICKSON MINE – DRILLING

- Authors asked by owners to develop a remediation plan.
- 38 probes holes were drilled by the developer's consultant and monitored by the authors.
- Representatives of the DoL visited the site.
- Probe holes encountered cavities and other evidence of mining activity.
- It is likely that a shallow water table hindered further exploration for ore in the area.

DICKSON MINE - REMEDIATION

- The shaft backfill was removed with a clamshell excavator to as deep as possible without sending anyone down into the shaft.
- The depression had obviously been used for dumping.
- Several feet of ½”-¾” crushed stone was placed across the bottom of excavation and pushed/pressed into small shaft extending from the side of the shaft.
- Cement slurry (roughly 1:1 Portland cement to water with about 5% bentonite for shrinkage) was introduced.
- Filter fabric was placed atop the stone/cement slurry and the area returned to grade with granular fill and topped with 2 feet of topsoil.

THE COOPER IRON MINE

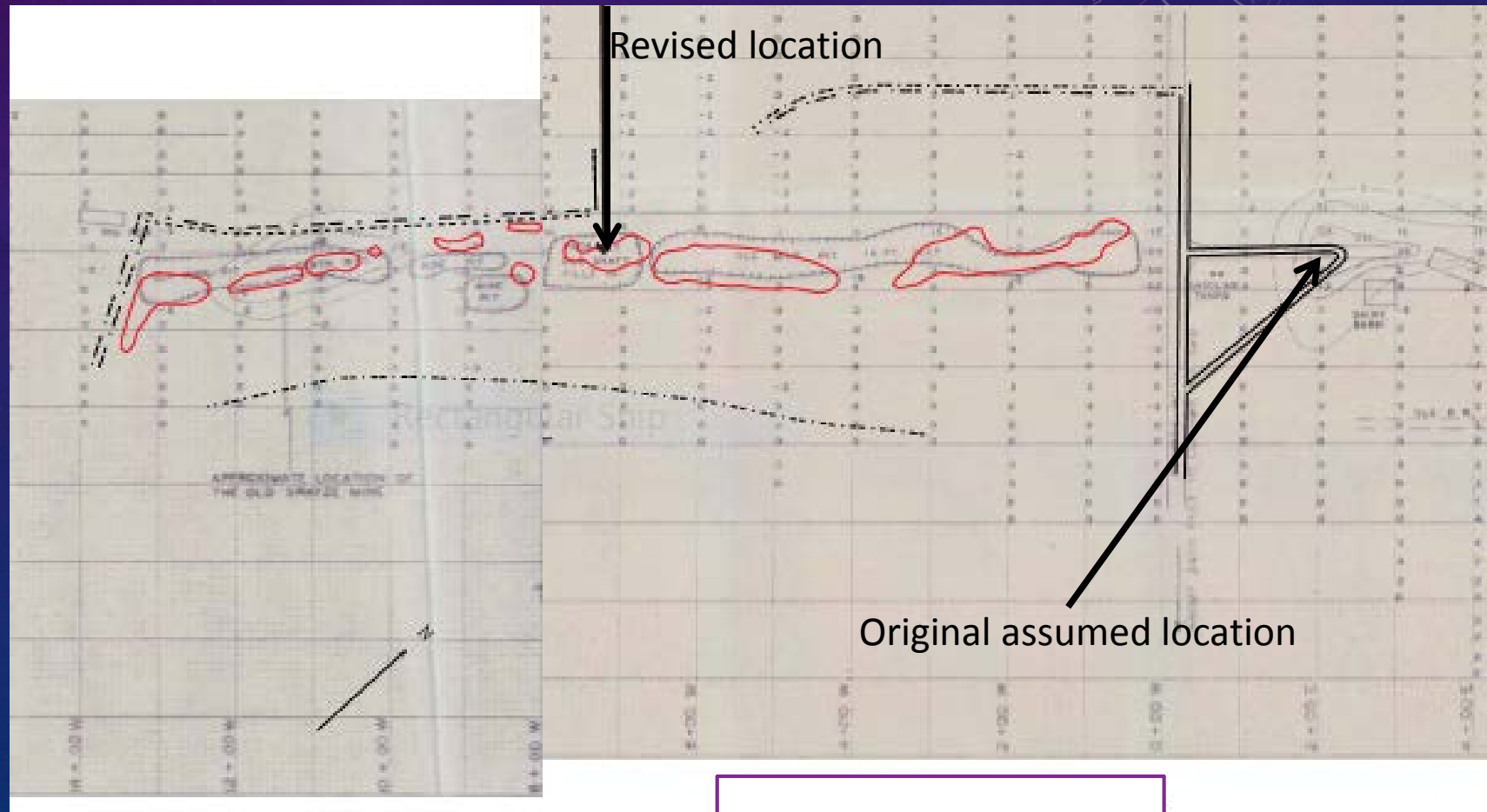
- Mine dates back to 1879.
- It is currently in the back of a residential lot built in the 1980's. The developer got permission to develop the lot despite mine features as long as no structures nearby.
- Historical data indicated a small stoped mine.
- MCP submitted in 2008 and accepted.
- Work authorized in 2015 by homeowner.

THE COOPER IRON MINE

- Plan was to block entrance to stope with large boulders, then reduce material size to choke opening.
- Reached the mine opening by dewatering with 2 large pumps for more than a week, excavation and timber cutting.
- Timber shoring, either for the mine or to close the mine was revealed.
- Dispute over costs with contractor, resulting from underestimating material costs causes cessation of work.

TIME TO REGROUP

- The shaft opening revealed was not consistent with the initial historic information provided by the NJGW&S.
- NJGW&S review found apparent discrepancies in older mapping.
- They replotted the information and attributed the opening to another part of the mine.
- Mining activities extend well beyond owner's property.
- New location makes it a shaft to a deep, stoped mine.
- Opening too large to choke with boulders.



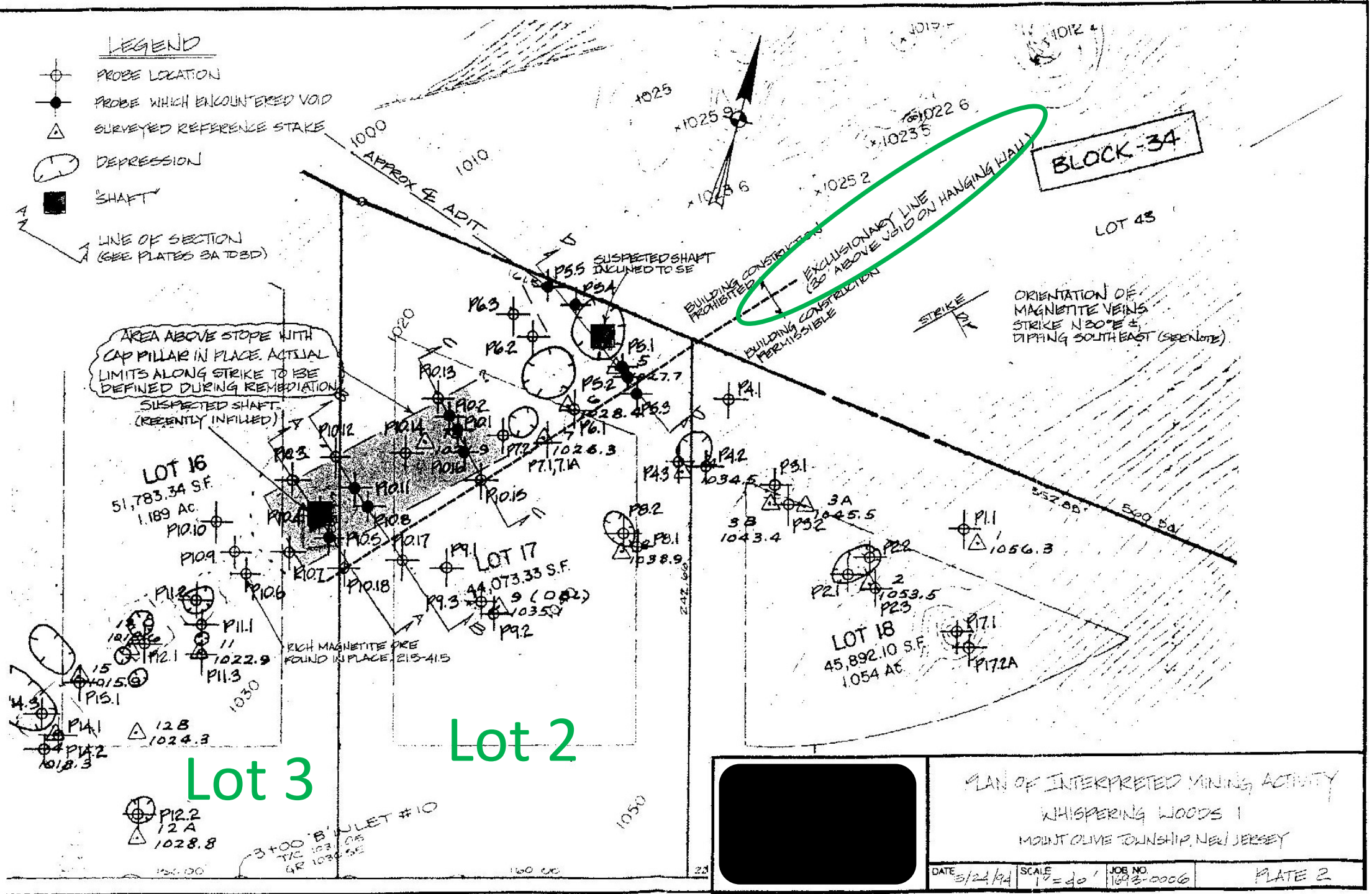
WHAT NEXT?

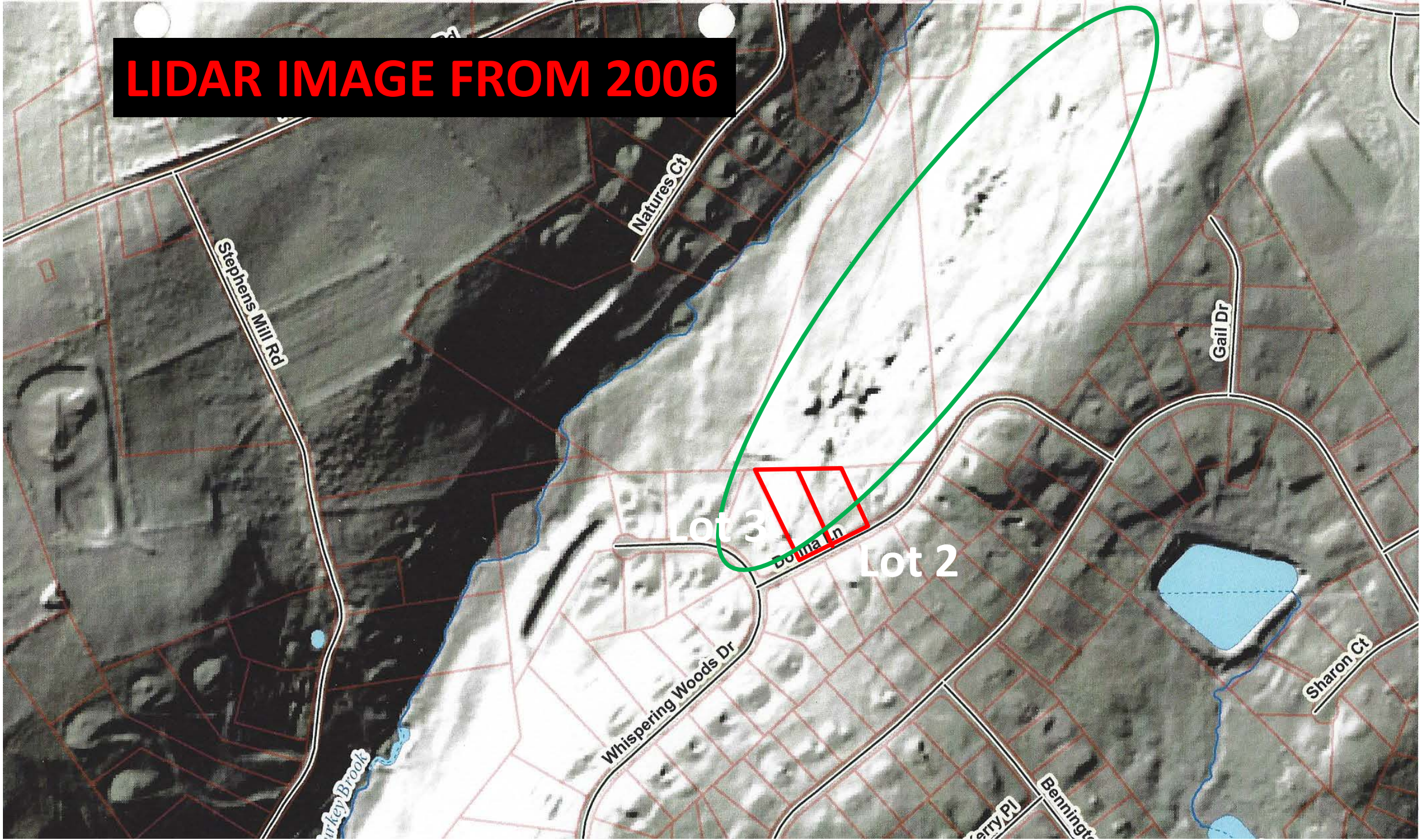
- As the mine is more extensive than originally anticipated and the original plan to choke mine with large stone/boulders is now not possible, what next?
- New plan is to attempt to grout stope from surface, hoping that the some mine infilling took place during abandonment and that overburden materials lost into mine would keep grout-takes down to manageable quantities.
- Homeowner put off by greater expense and uncertainty of future costs.

As an aside, the Township official responsible for mines promised to help in our data search for the information on the Cooper Mine on the lot, and promptly resigned. No replacement for them as of this date.

THE MINE AT WHISPERING WOODS - INTRODUCTION

- The site is an old iron mine in Morris County, NJ.
- Produced magnetite from 1848 to 1886 by following vein in gneiss bedrock.
- Original study performed in 1994 in effort to build on last lots in the development.
- NJGW&S provided useful archived historical information.
- Initial site visits in company of NJGW&S personnel brought into question the original 1994 study as features shown on consultants plan for easterly lot (Lot 2) were not evident in the field.


LEGEND
PROBE LOCATION
PROBE WHICH ENCOUNTERED VOID
SURVEYED REFERENCE STAKE
DEPRESSION
SHAFT
LINE OF SECTION (SEE PLATES 3A TO 3D)
APPROX ℄ ADIT
BLOCK-34
LOT 43
EXCLUSIONARY LINE (30' ABOVE VOID ON HANGING WALL)
BUILDING CONSTRUCTION PROHIBITED
BUILDING CONSTRUCTION PERMISSIBLE
SUSPECTED SHAFT INCLINED TO SE
ORIENTATION OF MAGNETITE VEINS STRIKE N30°E ±, DIPPING SOUTH EAST (SEE NOTE)
STRIKE
DIP
AREA ABOVE STOPE WITH CAP PILLAR IN PLACE. ACTUAL LIMITS ALONG STRIKE TO BE DEFINED DURING REMEDIATION
SUSPECTED SHAFT (RECENTLY INFILLED)
LOT 16
51,783.34 S.F.
1.189 AC.
LOT 17
44,073.33 S.F.
LOT 18
45,892.10 S.F.
1.054 AC
RICH MAGNETITE ORE FOUND IN PLACE, 215-415
Lot 2
Lot 3
[redacted]
PLAN OF INTERPRETED MINING ACTIVITY
WHISPERING WOODS I
MOUNT OLIVE TOWNSHIP, NEW JERSEY
DATE 5/24/94
SCALE 1"=40'
JOB NO. 1693-0006
PLATE 2


LIDAR IMAGE FROM 2006
Natures Ct
Stephens Mill Rd
Gail Dr
Lot 3
Lot 2
Whispering Woods Dr
Sharon Ct

THE MINE AT WHISPERING WOODS – NEW STUDY

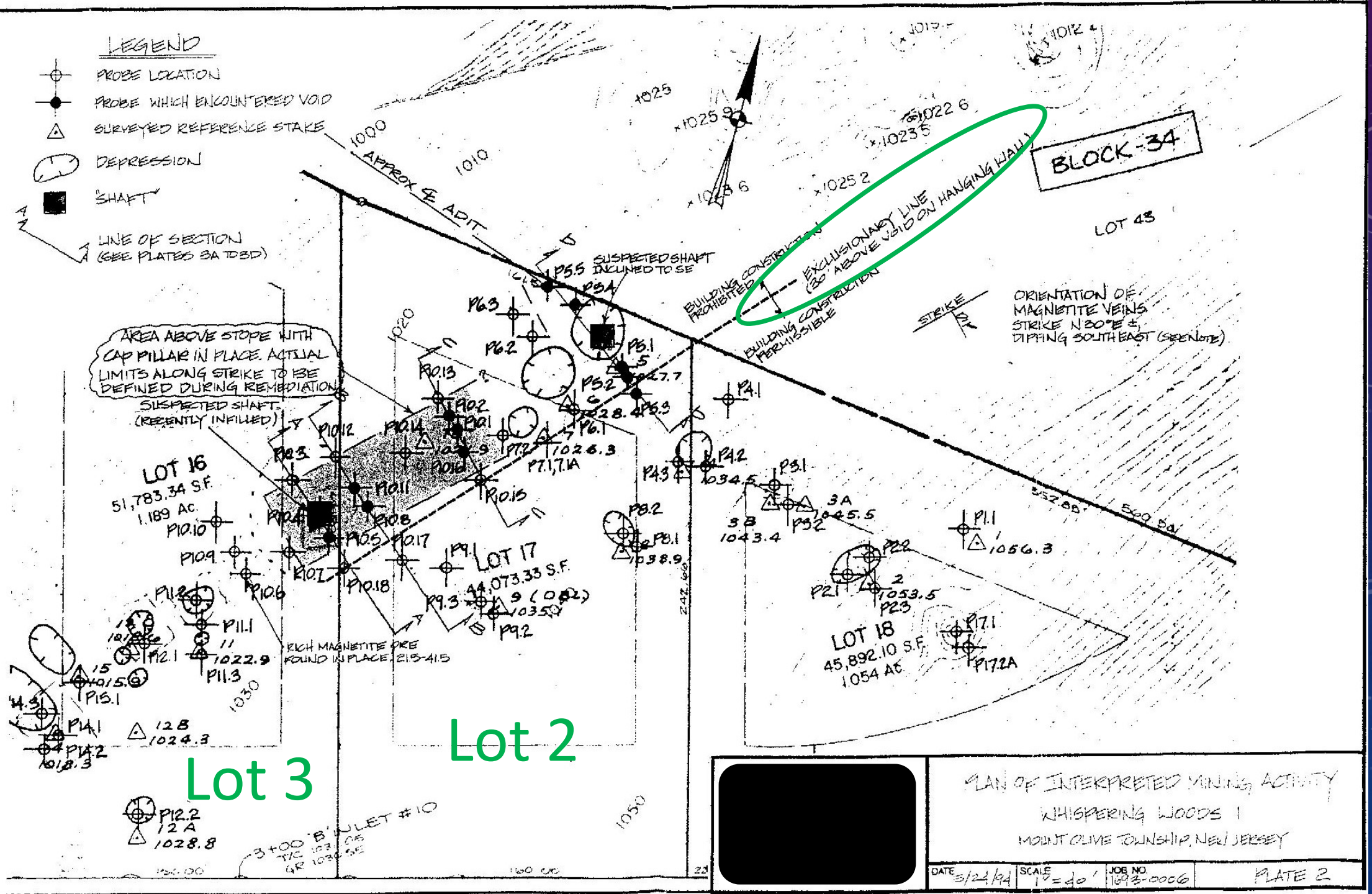
- A new survey was performed to stake out the property corners and “Exclusionary Line” from the original study. Original “features” could not be accurately identified.
- As a result of apparent discrepancies, authors drilled eight percussion probes within the mapped stope area (north and west of “Exclusionary Line”) to confirm or deny existence of mining activities.
- Five of the eight probes encountered voids. Two experienced drilling air return nearby at the surface.
- Little correlation with original study except at the location of mining shaft near northerly property line.
- While drilling, neighbor reports that area we were drilling in (Lot 2) was filled and graded in late 1990’s
- Determined that mines found in the original study are still extant.

THE MINE AT WHISPERING WOODS - MCP

- The two lots are to be treated differently upon the basis of work done to date.
- Property owner intends no construction north and west of “Exclusionary Line”, including a deed restriction for swimming pools, etc., so purpose of MCP is to stop overburden materials from eroding into the stope and densify the materials that fill the shafts to prevent undo settlement. A safety not structural issue.
- Lot 3 (westerly lot) had many surface features related to mining activity, but 1994 probes indicated that they are all likely a result of test pits searching for additional magnetite ore. Exception is a single shaft.
- Lot 2 has a mined stope below it and a shaft filled with soft materials.

THE MINE AT WHISPERING WOODS – LOT 2 MCP

- Lot 2 shows subsurface evidence of stope mining and a single mine shaft.
- Plan is to drill grout holes on offset 20-foot grid starting along the “Exclusionary Line” and continuing north and west until it is determined where the stope daylighted.
- Probes will extend 10 feet into hard rock and be grouted to seal voids.
- Grout will be site-mixed and the mix altered depending upon the encountered conditions.
- The mine shafts will be remediated using low-mobility (e.g., pressure) grouting techniques to densify materials and fill voids.


LEGEND
PROBE LOCATION
PROBE WHICH ENCOUNTERED VOID
SURVEYED REFERENCE STAKE
DEPRESSION
SHAFT
LINE OF SECTION (SEE PLATES 3A TO 3D)
APPROX ℄ ADIT
BLOCK-34
LOT 43
EXCLUSIONARY LINE (30' ABOVE VOID ON HANGING WALL)
BUILDING CONSTRUCTION PROHIBITED
BUILDING CONSTRUCTION PERMISSIBLE
SUSPECTED SHAFT INCLINED TO SE
ORIENTATION OF MAGNETITE VEINS STRIKE N30°E ±, DIPPING SOUTH EAST (SEE NOTE)
STRIKE
DIP
AREA ABOVE STOPE WITH CAP PILLAR IN PLACE. ACTUAL LIMITS ALONG STRIKE TO BE DEFINED DURING REMEDIATION
SUSPECTED SHAFT (RECENTLY INFILLED)
LOT 16
51,783.34 S.F.
1.189 AC.
LOT 17
44,073.33 S.F.
LOT 18
45,892.10 S.F.
1.054 AC
RICH MAGNETITE ORE FOUND IN PLACE, 215-415
Lot 2
Lot 3
PLAN OF INTERPRETED MINING ACTIVITY
WHISPERING WOODS I
MOUNT OLIVE TOWNSHIP, NEW JERSEY
DATE 5/24/94
SCALE 1"=40'
JOB NO. 1693-0006
PLATE 2

THE MINE AT WHISPERING WOODS – LOT 3 MCP

- Lot 3 has many surface features that are likely a result of test pits searching for additional magnetite ore. Exception is a single mine shaft to be grouted during Lot 2 work.
- Plan is to explore these features using excavation equipment during construction on Lot 2.
- If no evidence of mining is noted after excavation, the openings will be filled with controlled, compacted structural fill.
- If evidence of mining is discovered, remediation will be determined upon the basis of the encountered feature(s).

SUMMARY AND CONCLUSIONS

- Exploration of historic mine sites is highly unpredictable.
- The cooperation of state personnel and organizations, especially in mining the historic information, is most helpful.
- Aerial photos and Lidar images are quite useful.
- Information from neighbors and locals can also prove quite useful.
- Assume that unexpected problems will arise.

NONE BUT A FOOL IS ALWAYS RIGHT

David Hare