Exhibit R

Preliminary Geotechnical Engineering Report

REPORT

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

NOTTINGHAM SOLAR FACILITY

Submitted to:

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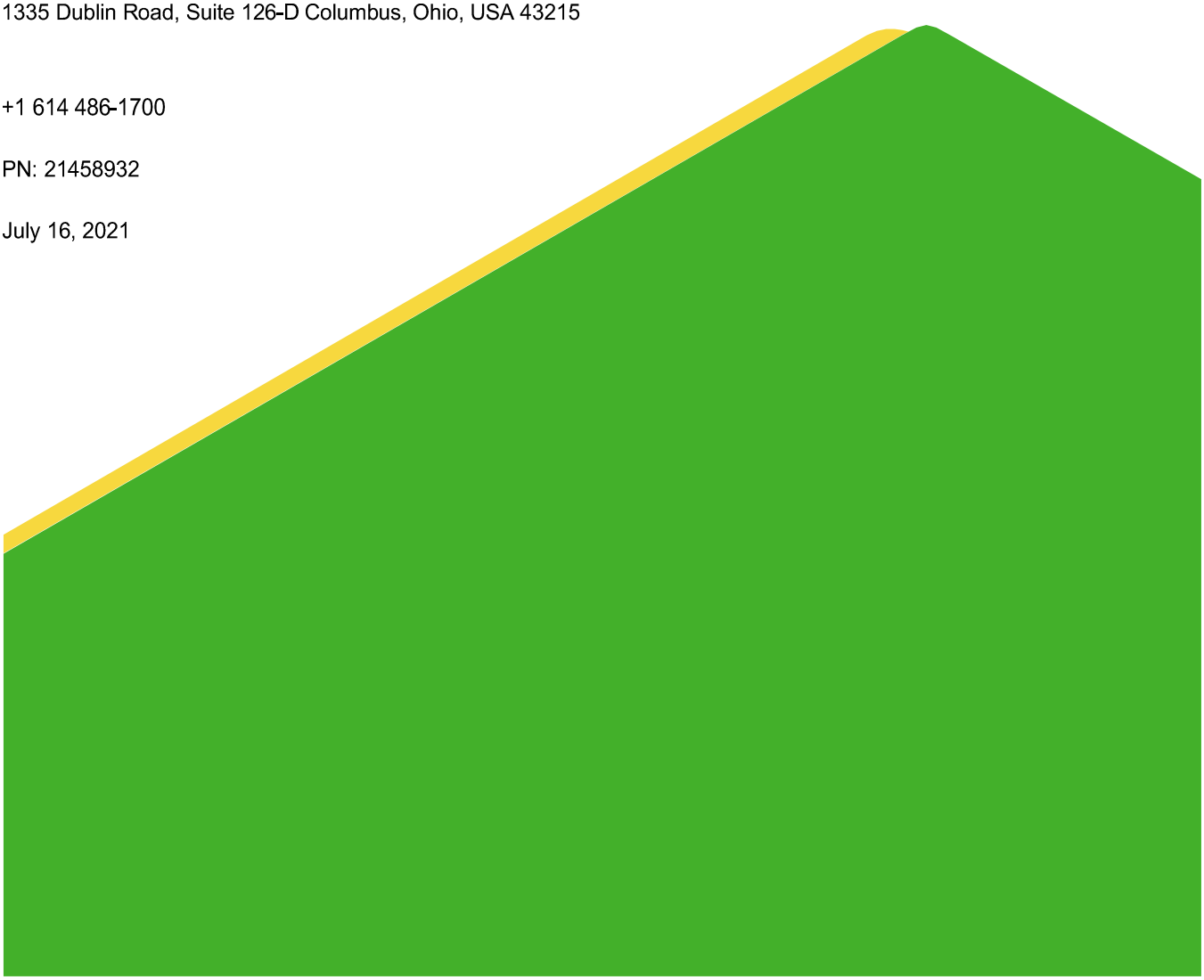

Executive Summary

Nottingham Solar LLC (Nottingham Solar) intends to develop a utility-scale 100 megawatt (MW) solar energy facility at the formerly mined 400-acre Nottingham Site (the Site) located in Harrison County, Ohio. The proposed facility will include the installation of solar panel arrays, buried collection lines, various substations, as well as other ancillary structures.

BQ Energy LLC, the parent company of Nottingham Solar, retained Golder Associates Inc. (Golder) to complete this preliminary geotechnical engineer study to evaluate the geotechnical feasibility of the site for development as a solar facility. This study includes a desktop review and limited initial subsurface exploration program (test pits excavations). Golder initially performed a desktop review of the Site's publicly available subsurface data and information based on proposed development plans and information provided by Nottingham Solar. In May 2021, Golder completed a test pit exploration program consisting of 15 excavations across the Site to support findings from the desktop study and observe subsurface conditions in the upper portions of the ground.

Harrison County and the New Athens, Ohio area have a long history of coal mining. Mining, including both underground and surface, has been occurring in this area for more than 100 years. Mine maps archived by the ODNR indicate that the Site has a history of various stages of surface mining (i.e. mountain top, contour mining, or area mining), auger mining, as well as underground mining. The mine maps and aerial images suggest most of the site is covered by mine spoil of varying in thickness up 125 feet thick.

Mine spoil was encountered in the test pits and consisted of a wide range material consistent with overburden that has been excavated and placed in an uncontrolled manner; and was generally described as rock fragments (sandstone, shale, and limestone) varying in size from boulders, cobbles, and gravel, in a matrix of generally soft cohesive moderately plastic silty clay. Only one test pit encountered measurable water (TP-6), all others were relatively dry with damp to moist soils.

The limited test pit exploration program completed confirmed that subsurface conditions across the Site were in agreement with the results of the desktop review. Other factors unrelated to the former mining land use were not identified that would hinder redevelopment of this site for the proposed solar facility. Geotechnical general industry practices are necessary to support the more detailed stages of design. Development of previously mined lands with mine spoil presents technical challenges due to the heterogeneous nature of the mine spoil material and the variation of spoil thickness across the site. However, successful redevelopment of formerly mined land is common in this area of Ohio. Development of the proposed solar facility is feasible at the proposed Site, assuming proper geotechnical evaluations, designs, and controls are implemented.

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1.0 INTRODUCTION

1.1 General

BQ Energy LLC (BQ), the parent company of Nottingham Solar, retained Golder Associates Inc. (Golder) to complete a preliminary geotechnical engineering study of the proposed Nottingham Solar Site (the Site) in Harrison County, Ohio. Golder completed the scope of service in general accordance with our proposals dated March 19 and May 20 which were approved by BQ. This report has been prepared to support the Nottingham Solar application to the Public Utility Commission of Ohio-Ohio Power Siting Board (OPSB).

1.2 Project Background

Nottingham Solar intends to develop a utility-scale 100 megawatt (MW) solar energy facility at the formerly mined 400-acre Nottingham Site in Harrison County, Ohio (Figure 1 and Figure 2). The proposed facility will include the installation of solar panel arrays potentially supported on pilings, buried collection lines, various substations, as well as other ancillary structures.

This region of Ohio and the Site has an extensive history of coal mining that must be considered for appropriate redevelopment of the Site. A phased geotechnical program will be completed to properly evaluate site conditions and support the proposed development. The initial phase of the geotechnical program consists of this preliminary study.

1.3 Study Objectives

This study was completed as a preliminary geotechnical site investigation to evaluate the geotechnical feasibility of the Nottingham Solar project. This study consists of a desktop review and a nominal initial subsurface exploration program (test pits excavations). The objective of the preliminary study is to verify the site is suitable for cost-effective development of the proposed solar facility. High-level preliminary geotechnical considerations are provided herein. However, more detailed geotechnical evaluations are necessary to support the advanced stages of design and construction of the proposed facility.

2.0 SCOPE OF SERVICES

Golder's scope of services for this study consisted of (1) a desktop review of the site based on publicly available data and (2) a nominal subsurface exploration program. This report presents a culmination of Golder's preliminary geotechnical study.

2.1 Desktop Review

Golder complete a desktop review of the Site based proposed development plans and information provided by Nottingham Solar as well as publicly available data which included:

Information Provided by Nottingham Solar

- Available area comparison map (.pdf file)
- Buildable area boundary for proposed solar development footprint (.kmz file)

Publicly Available Data

- Ohio Department of Natural Resources (ODNR)
- Pipeline and Hazardous Materials Safety Administration (PHMSA)

- Ohio Department of Transportation (ODOT)
- United States Fish and Wildlife Service (USFWS)
- United States Department of Agriculture (USDA)
- United States Geological Survey (USGS)
- GoogeEarth Aerial Imagery

2.2 Subsurface Exploration

Golder completed a subsurface exploration program between May 26 to May 28, 2021 consisting of excavation of 15 test pits located across the site. The test pit locations are shown in Figure 3. The excavations were observed by a Golder geological engineer who documented subsurface conditions (logging and photographs), compared conditions to those identified during the desktop study, and obtained representative samples for geotechnical laboratory testing, as necessary. Test pit logs and photographs are included in Appendix A.

Test pits were excavated using a Kobelco SK170 excavator. The excavation dimensions were approximately four feet wide (one excavator bucket width) and advanced to the limit of the excavator reach or excavator refusal, whichever was shallower. During excavation, the onsite geological engineer logged and characterized subsurface conditions including groundwater, depth to bedrock, and subsurface stratigraphy. Additionally, the onsite geological engineer worked with the excavator operator to collect select samples. Following completion of the excavations, the excavations were backfilled, tamped down with the bucket, and generally smoothed out to near original grades. The excavation area was then mulched with straw and seeded.

With the exception of test pits TP-3 and TP-16, the test pits encountered mine spoil to termination. In most cases termination was the limit of the excavator reach (approximately 17 to 20 feet below ground surface). However, four excavations (TP-5, TP-7, TP-10, and TP-12) encountered large boulders prior to the excavator reach limit, resulting in early termination. TP-3 and TP-16 encountered apparent natural ground and bedrock at depth. The mine spoil encountered consisted of a wide range of material but was generally described as rock fragments (sandstone, shale, and limestone), sized from boulders and cobbles to gravel, in a matrix of soft cohesive moderately plastic silty clay with trace sand. Only one test pit encountered measurable water (TP-6), all others were relatively dry with damp to moist soils.

3.0 GEOLOGICAL SITE CONDITIONS

3.1 Site Location and Setting

The Site is located in Harrison County, approximately two miles west of the town of New Athens, Ohio (site coordinates 40.188753°, -81.064152°). The area of potential development, called the available area boundary, is bordered by Stumptown Road to the north, Muntz Road to the west, Jockey Hollow Road to the south, and Cadiz Flushing Road to the East. Busby Road and several unnamed access roads intersect the approximately 400-acres of rolling hills within the available area boundary.

As a remnant from the mining and reclamation activities on the Site, the Site topography consists of gently rolling hills with some steeper slopes generally located near low lying areas as well as near the north side of the property. The surface of the Site generally consists of rocky, uneven terrain with boulder on the surface and isolated small low spots. The Site is covered by tall grasses with isolated areas of brush or small trees.

3.2 Surface and groundwater

During strip mining[1], the topsoil was reportedly stockpiled in designated areas around the Site and subsequently placed to cap the mine spoils and then revegetated during reclamation. As a remnant from mining and reclamation activities, there are several low-lying areas throughout the site that pond water. According to the USFWS, several of these locations have been delineated as freshwater emergent wetlands, freshwater forested/shrub wetlands, and freshwater ponds (Figure 4).

According to the ODNR D-2100 mine map, there are several undeveloped and developed springs located throughout the Site that drain into sediment ponds and unnamed streams. Site surface water eventually flows into Boggs Fork on the south side of the Site. Boggs Fork resides in the Ohio River watershed.

3.3 Regional Geology

The ODNR Division of Geological Survey indicates that the Site is underlaid by bedrock geology from the Monongahela Group with smaller areas designated as the Conemaugh and Dunkard Group (Figure 5). A stratigraphic column of the regional geology, from ODNR, is shown in Figure 6. The following descriptions of the Monongahela, Conemaugh, and Dunkard Groups as described by the USGS:

- *Monongahela Group - Shale, siltstone, claystone, and mudstone; black, red, gray and green to variegated red and yellow in the southeastern areas of Ohio; clayey to sandy; nonbedded to thin bedded; locally calcareous. Sandstone, greenish-gray weathers to shades of yellow-brown, silty to locally conglomeratic; thin to massive to cross bedded; locally calcareous. Limestone, gray, micritic, clayey to silty, thin to medium bedded; generally more common in middle and lower portions of unit. Coal, banded, bituminous, thin to as much as 8 feet thick in central and northern areas, thinner to absent in southeastern Ohio. Lateral and vertical lithic variability and gradation common. Unit as much as 350 feet thick.*

- *Conemaugh Group - Shale, siltstone, claystone, and mudstone: Shale, black, gray, green and red; clayey to silty; locally contains marine fossils in lower half of unit; calcareous in part. Siltstone, gray, green and red, locally variegated; clayed to sandy; thin bedded to nonbedded. Mudstone and Claystone, black, gray, green, red, and yellow, variegated in part; clayey to silty; locally calcareous; commonly nonbedded. Sandstone, green-gray weathers to shades of yellow-brown; mostly very fine to medium grained, locally conglomeratic; thin to massive to cross bedded; locally calcareous. Limestone and coal; thin and discontinuous. Limestone, black, gray and green; micritic to coarse grained; thin bedded to concretionary with marine fossils common in lower half of interval; thin to medium bedded, nonmarine limestone common in upper half of unit. Coal, thin, bituminous, impure; very locally thick enough for economic development. Lateral and vertical lithic variability and gradation common. Unit as much as 500 feet thick.*

- *Dunkard Group – Claystone, mudstone, shale, and siltstone (60-70 percent); shades of red, yellow, olive, and/or brown in southern areas of Ohio to gray, green and black in northern areas; clayey to sandy; non-bedded to thin bedded; locally calcareous. Sandstone (25-35 percent); blue-gray weathers to shades of yellow-brown; fine grained to locally conglomeratic; thin to massive to cross bedded. Limestone and coal (5 percent): Limestone, gray, micritic, clayey to silty, thin to medium bedded in northern areas of Ohio, nodular bedded to argillaceous in southern areas. Coal, black, banded, thin, discontinuous, impure; poorly*

[1] Strip mining is the practice of mining a seam of mineral, at this site coal, by first removing a long strip of overlying soil and rock (the overburden) to reach and extract the coal. Mining related to the site history is further explained in subsequent sections.

developed in southern areas of Ohio. Limestones and coals best developed in lower 90 to 200 feet. Lateral and vertical lithic variability and gradation common. Unit greater than 600 feet thick in southeast Ohio.

In 2009, ODOT drilled three geotechnical borings north of the Site as part of a bridge replacement project. They documented the nearby site as rolling unglaciated Allegheny Plateau Region, shallow residual soil overly flat (little to no dip) lying sandstone and claystone (Pennsylvania age). The bedrock encountered is consistent with the USGS and ODNR descriptions presented.

3.4 USDA Soil Survey

According to the USDA soil survey, the Site consists of primarily reclaimed silty clay loam (Figure 7), associated with the mine spoil. The USDS soil survey notes that these soils are well drained, variable, with deep groundwater and bedrock (greater than 80 inches).

3.5 Other Geological Features (Karst and Seismic Activity)

According to the ODNR Division of Geological Survey, karst features are not present within Harrison County. However, there is history of seismic activity within Harrison County to the northwest of the Site. Epicenters were located within 3.5 miles from the Site (Figure 8).

3.6 Existing Facilities (Wells, Utilities, and Other Infrastructure)

The ODNR Division of Oil and Gas Resources Management has documented two oil and gas well pads located within the buildable area boundary with a total of eight oil and gas wells between the two pads (Figure 9). The Pipeline and Hazardous Materials Safety Administration has documented four pipelines traversing the Site: 3-gas transmission pipelines and 1-hazardous liquid pipeline (Figure 10). A review of Google Earth imagery indicates that the right-of-way (ROW) associated with these pipelines are approximately 75 to 100 feet wide.

According to information gathered from the ODNR Division of Water, private drinking water wells in the area show static water level elevations ranging from 1088-1253 feet above mean sea level (ft-amsl). There are no known drinking water wells within the project site.

3.7 Mining History

Harrison County and the New Athens, Ohio area has a long history of coal mining. Mining, including both underground and surface mining, has been occurring in this area for more than 100 years. Figures 11 thru 15 are included to present the available mining history and background of the area. Figure 6 provides the coal bed formations and names in the area and shows their stratigraphic relationship. Figures 16 and 17 illustrate basic mining methods historically used within this region.

The mine maps archived by the ODNR show that the Site has a history of various stages of surface mining (i.e. mountain top[2], contour mining[3], or area mining[4]), auger mining[5], as well as underground mining[6]. The two coal seams primarily mined within the site boundary are the Pittsburgh No. 8 (Elevation 1060+/- to 1110+/- ft-amsl) and the Meigs Creek No. 9 (Elevation 1155+/- ft-amsl).

The only underground mine (Franklin No. 125 Mine) that had been mapped within the project area is located south of the buildable area boundary provided by Nottingham Solar. Various stages of surface and auger mining were completed by Consolidation Coal Company over the years from the 1960s to 2000s; however earlier undocumented mining also likely to have occurred at the Site as well. A summary of documented stages of mining, based on the mine maps available, is as follows (Also refer to Appendix B):

- Permit ID A-0097
  - Owner: Hanna Coal Company (Division of Consolidation Coal Company)
  - Title: Crescent Valley No. 07 Mine, 55-B Shovel Area
  - Timeframe: Between 9/15/1966 – 9/15/1967 under License No. A-97
  - Area Affected: 225.84 acres – Areas of the western and central buildable area boundary
  - Mining Type: Strip Mining
- Permit ID A-0813
  - Owner: Consolidation Coal Company
  - Title: Progress Map for License A-813
  - Timeframe: Area Re-Affected around 4/10/1975 under License No A-813
  - Area Affected: 38.5 acres – Areas of the eastern buildable area boundary
  - Mining Type: Strip Mining
- Permit ID A-1007
  - Owner: Consolidation Coal Company
  - Title: Progress Map for Bradford No. 16 Mine showing Re-Affected Acres of License A-1007
  - Timeframe: Area re-affected by B-0114 and B-0390 dated 3/13/1975

[2] Strip mining where all or much of the top of the hill is removed to reach the coal.

[3] Strip mining where the hillside is excavated a typically common distance/depth (where economically viable) from the slope face creating a highwall that wraps around and follows the topographic contours of a mountain/hillside.

[4] Generally larger scale strip mining operation.

[5] Auger mining is the practice of mining coal at an exposed highwall by drilling holes into and at the dip of the coal seam from the highwall and extracting coal through auger flights.

[6] For this site generally refers to room and pillar mining where tunnels are excavated into the coal where rooms of coal are extracted, leaving square/rectangular pillars between them which are sometimes mined (retreat mined) as the mine moves away from an area.

- Area Affected: 31.2 acres – Areas of the eastern buildable area boundary
- Mining Type: Strip Mining

- Permit ID C-314
  - Owner: Consolidation Coal Company
  - Title: Progress Final Report Map for Strip Mining Permit C-314 Year 3 Operations - 46-C
  - Timeframe: Area affected by Permit C-314 is permitted to be re-affected by C-1115. Dated 9/11/1979
  - Area Affected: 61.3 acres – Areas of the northern available area boundary
  - Mining Type: Strip Mining
- Permit ID D-2100
  - Owner: Consolidation Coal Company
  - Title: Permit D-2100 Annual Map Year 6
  - Timeframe: Based off the mine map, it is estimated that the mine was permitted between 2001 – 2007
  - Area Affected: 1511.7 acres – Most of the buildable area boundary
  - Mining Type: Strip and Auger Mining
  - Coal Seams: Pittsburgh #8 (1060+/- to 1110+/- ft-amsl) and the Meigs Creek #9 (1150+/- ft-amsl)
- Permit ID C-1126
  - Owner: R&F Coal Company
  - Title: Final Map for C-1126
  - Timeframe: Permit prepared March 7, 1980
  - Area Affected: 17.4 acres – Areas of the northeastern buildable area boundary
  - Mining Type: Auger Mining
  - Coal Seams: Meigs Creek #9 (1160+/- ft-amsl)

4.0 PRELIMINARY SITE UNDERSTANDING AND ANTICIPATED SUBSURFACE CONDITIONS

Based on our review of the available information, our subsurface exploration program, and our understanding of the local geology and mining activities, Golder has developed high-level preliminary concepts regarding the anticipated subsurface conditions, as outlined within this section. Our site interpretation is based on publicly available information available at the time of the desktop study as well as the limited subsurface exploration (test pit excavations) conducted. Our document review did not discover as-built drawings/records from the Consolidation Coal Company; therefore, determining the limits of the mine spoils is difficult without deploying an advanced subsurface geotechnical investigation.

In general, the desktop review and limited site subsurface exploration confirmed the following observations:

- Most of the site has been impacted by previous mining activities and has since been reclaimed or partially reclaimed. The most recent mining activity, D-2100 mine, affected the majority of the Nottingham Solar buildable area boundary, where the anticipated solar energy facility will be installed (Figure 11).
- Based on the extensive surface mining history, available records suggest the site was mined through the Meigs Creek No. 9 Coal Bed (approximate top of coal elevation 1150+/- ft-amsl). Thus, any material located above this elevation is anticipated to be composed of mine spoil.
- Additional mining of the Pittsburgh No. 8 Coal Bed (1060+/- to 1110+/- ft-amsl) was also performed, generally around the perimeter of the site. Records indicate the mining resulting in a buried highwall[7] down to the elevation of the No. 8 bed. Mining of the coal seam on the north side of the Site is present in 2006 Google Earth Images, and the No. 8 highwall is shown on some available mine maps. Thus, areas on the perimeter of the site may have bedrock that "steps down" over a buried highwall, having mine spoil which extends below roughly 1150 ft-amsl to as low as 1060 ft-amsl, or with mine spoil on the order of 50 to 90 feet thicker compared to the center.
- Most recent elevations of the site's buildable area boundary (October 2017) from Google Earth are generally between 1088-1193 ft-amsl. Assuming the Pittsburgh No. 8 bottom elevation is approximately 1060 ft-amsl, it is estimated that the depth of mine spoils at the site ranges from 25 to 125 feet in the previously mined areas. Although, bedrock is shallower in near the perimeter of the reclaimed mine lands and the unmined areas (i.e. TP-3 and TP-16).
- With the additional mining of the No.8 coal seam, backfilled highwalls are documented throughout the site. Highwalls are generally highly susceptible to irregular (highly-variable) settlement (see Figure 17 for a backfilled highwall illustration). The areas outside of the buried highwalls will have the thickest mine spoil, whereas areas inside the highwall advancement would typically have thinner mine spoils. Figure 11 shows the location of some of the known buried highwalls. Additional undocumented highwalls may also be present.
- Many of the low-lying areas near the center of the Site appear to be at an elevation near the bottom of the Meigs Creek Coal Seam (1135+/- to 1140+/- ft-msl). It is probable that these low-lying areas comprise the bottom extent of the strip mining operations in those areas, where the overburden was removed and the coal was mined. We anticipate these areas may have a very thinner layer of mine spoil, with bedrock closer to the surface.
- Mine spoil encountered during test pit exploration is generally described as soft and highly heterogeneous in its composition, which consisted of a mixture of soil and rock materials. Mine spoil is also highly variable in maximum particle or fragment size and distribution, durability, and moisture content. The material consists of various rock lithologies, including sandstone, claystone, and shale, each with different strength and weathering/degradation characteristics. The particle sizes in the spoil range significantly; from boulder and cobbles to gravel, sand, and clay.

[7] A steep slope carved by mining operations into the hillside above the stripped area, largely through bedrock,

- Additionally, multiple pipelines route through the backfilled material around the Site. The hazardous liquid pipeline that is mapped in Figure 10 intersects a backfilled highwall along a side slope, posing a potential area of stability concern.

5.0 GEOTECHNICAL CONSIDERATIONS FOR DEVELOPMENT

5.1 Site Geotechnical Feasibility Suitability

The desktop review indicated the site has an extensive mining history and the vast majority of the site is underlain by mine spoil of various thicknesses. Golder's desktop review and limited subsurface exploration program did *not identify or encounter conditions that would prohibit development of this site for the proposed solar facility*. Additional details studies are recommended, and geotechnical general industry practices will need to be followed to support the more detailed stages of design.

Redevelopment of previously mined lands with thick layers of mine spoil presents technical challenges due to the heterogeneous nature of the mine spoil material and the variation of spoil thickness across the site. However, successful *redevelopment of formerly mined land for solar facilities is feasible and common* in this area of Ohio assuming proper site-specific geotechnical evaluations, designs, and controls are completed.

5.2 Construction Considerations

5.2.1 Foundations

A range of structures including solar panel arrays as well as electrical substation will be included as part of the proposed development. These range of structures will likely require various foundation types. Heavily loaded structures may require deep foundations bearing on bedrock. Whereas lightly loaded structures may be supported on shallow foundations (i.e. spread footings), depending on settlement requirements.

Mine spoil of various thicknesses is present across the Site, more detailed location specific geotechnical analysis should be completed for any structures that bear within the mine spoil. Due to the soft and heterogeneous make up of mine spoil, it can be highly susceptible to differential settlement if proper geotechnical evaluations and design are not implemented.

Geotechnical foundation analysis (i.e. bearing capacity, settlement, etc.) were not included within this current phase of the project. More detailed analysis will be necessary to support advanced stages of design and planning.

5.2.2 Frost Depth

The Harrison County and the state of Ohio building code list a frost depth of **32 inches** for foundations.

5.2.3 Excavation

We understand excavation will be required to construct the multiple foundations and facilities. Subsurface conditions are variable and known only at the test pit locations shown. Based on Golder's understanding of the subsurface conditions, conventional earth moving equipment should be capable of excavating the mine spoil and shallow surface soils across the site. However, excavations within the mine spoil will likely encounter boulders of varying size. All excavations should comply with OSHA regulations for excavation safe work practices (29 CFR 1926.652).

5.2.4 Dewatering

Golder anticipates groundwater will be encountered during excavation and construction. Only one of the test pits (TP-6) encountered significant water. However, mine spoil is highly variable and isolated perched zones or "pockets" of ground water can be common. Although typically isolated, perched zones can vary greatly in aerial extent and depth in the mine spoil. Therefore, caution should be taken during excavation. An excavation may appear to be "dry" until water bearing layer(s) are encountered. If an excavation into a water bearing layer (or layers) is left open, it can be assumed that the excavation will fill with water over time. Therefore, we recommend limiting the time an excavation is open as much as feasibly possible. If groundwater is encountered, the excavation should be dewatered and measures will be needed to keep the excavation dry during foundation construction. Further, water seeping into excavations may reduce the excavation stability, and will allow degradation of the shale and soil from uptake of water.

5.2.5 Use of Onsite Fill Soils

We understand the solar facility development will include general site grading and earthwork. In general, mine spoil is not suitable for use as a structural fill. Additional evaluations and geotechnical laboratory testing should be completed to determine the suitability of onsite soils for the specific solar facilities at this site.

5.2.6 Seismic Site Classification

As discussed in Section 3.5 of this report, there have been few recorded seismic events in the region. The site is in a region of the U.S. with relatively low seismic activity. USGS provides a peak ground acceleration (PGA) of 0.045g for use in detailed seismic analysis and design.

5.3 Advanced Geotechnical Evaluations

As previously stated, the objective of this study was to evaluate the geotechnical feasibility of the site for the proposed solar facility development. More advanced geotechnical evaluations are warranted to support the final design. In general, these evaluations could include:

- Site geophysics (resistivity and seismic) surveys to better define the mine spoil thickness and variation across the site.
- Additional subsurface exploration programs consisting of test pits and boreholes at targeted location for proposed critical infrastructure. The test pits would evaluate the shallow subsurface conditions and obtain bulk samples. The boreholes would be evaluating the subsurface conditions at depth and would be advanced through the entire mine spoil thickness and into the underlying bedrock.
- Soil suitability evaluation including testing for corrosivity and frost susceptibility.
- A geotechnical laboratory testing program to obtain data and better characterize site subsurface materials.
- Geotechnical engineering evaluations to identify the suitable foundation systems and construction recommendations for the proposed solar facility and related structures.

6.0 LIMITATIONS

Golder based our findings and recommendations on our project understanding, our interpretation of the geologic conditions observed and tested, and our experience with similar terrains. This report has been prepared as a preliminary geotechnical study intended to evaluate the geotechnical feasibility of site development. This report is not intended to support final geotechnical design for the proposed site. Our professional services have been

performed, our findings derived, and our recommendation prepared in accordance with generally accepted geologic and engineering principles and practices. Golder is not responsible for the conclusions, opinion, or recommendations of others based on these data.

The use of and limitation inherent with Golder's geotechnical evaluation are in part explained in the document, "Important Information about Your Geotechnical Engineering Report," which is included in Appendix C of this report. This document has been prepared by the Geoprofessional Business Association (Professional Firms Practicing in the Geosciences), of which Golder is a member. The statements presented in this document are intended to advise you of what your expectations of this report should be, and to present you with recommendations on how to minimize the risks associated with the earthworks for this project, given the variability inherent with subsurface conditions between boreholes. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so.

Please note the findings presented in this report are based on samples from discrete locations from the site. It is not uncommon for subsurface conditions to vary significantly over short lateral distances. Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations.

Test pit logs have been provided as part of this report to be included with the OPSB application. Additional subsurface exploration will be completed to support more advanced stages of design and provide specific engineering information, it is not proposed that nay addition subsurface exploration logs or data be provided to OPSB staff. The results of any additional subsurface exploration and not anticipated to significantly alter the proposed solar panel facility location or feasibility do development.

In preparation for and/or during construction, Nottingham Solar or its agent(s) should promptly notify Golder in the event that specifications or conditions are different than those upon which our conclusions and recommendations are based. Golder requests that Nottingham Solar confer with us if any of the following are noted:

- If Golder's assumptions or Golder's project understandings, as indicated periodically in this report, are stated inaccurately.
- If the design of the proposed facility and appurtenances differs from that described herein.
- If subsurface conditions encountered during construction differ from those described in the exploration logs.

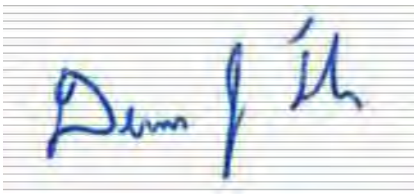
For any of these situations, Golder requests that we be provided the opportunity to review, potentially on an out-of-scope basis, final design drawings and specifications so that the earthwork and foundation recommendations are properly interpreted and implemented to conform to newly identified site construction and subsurface conditions.

7.0 CLOSURE

Golder prepared this report for Nottingham Solar's use to support this phase of the proposed Nottingham Solar project. We trust the information presented in this report meets your needs for this phase of the project. Should you require clarification or have any questions, please contact us.

Golder greatly appreciates the opportunity to support Nottingham Solar with this project. We look forward to continuing to offer our services to you in support of your site redevelopment.

Golder Associates Inc.



for

Eric Hoying
Senior Project Environmental Scientist

Joshua Nasrallah, PG
Associate and Senior Consultant

https://golderassociates.sharepoint.com/sites/143154/project files/6 deliverables/preliminary geotech report 16july2021/prelim geotech-bq nottingham.docx

FIGURES

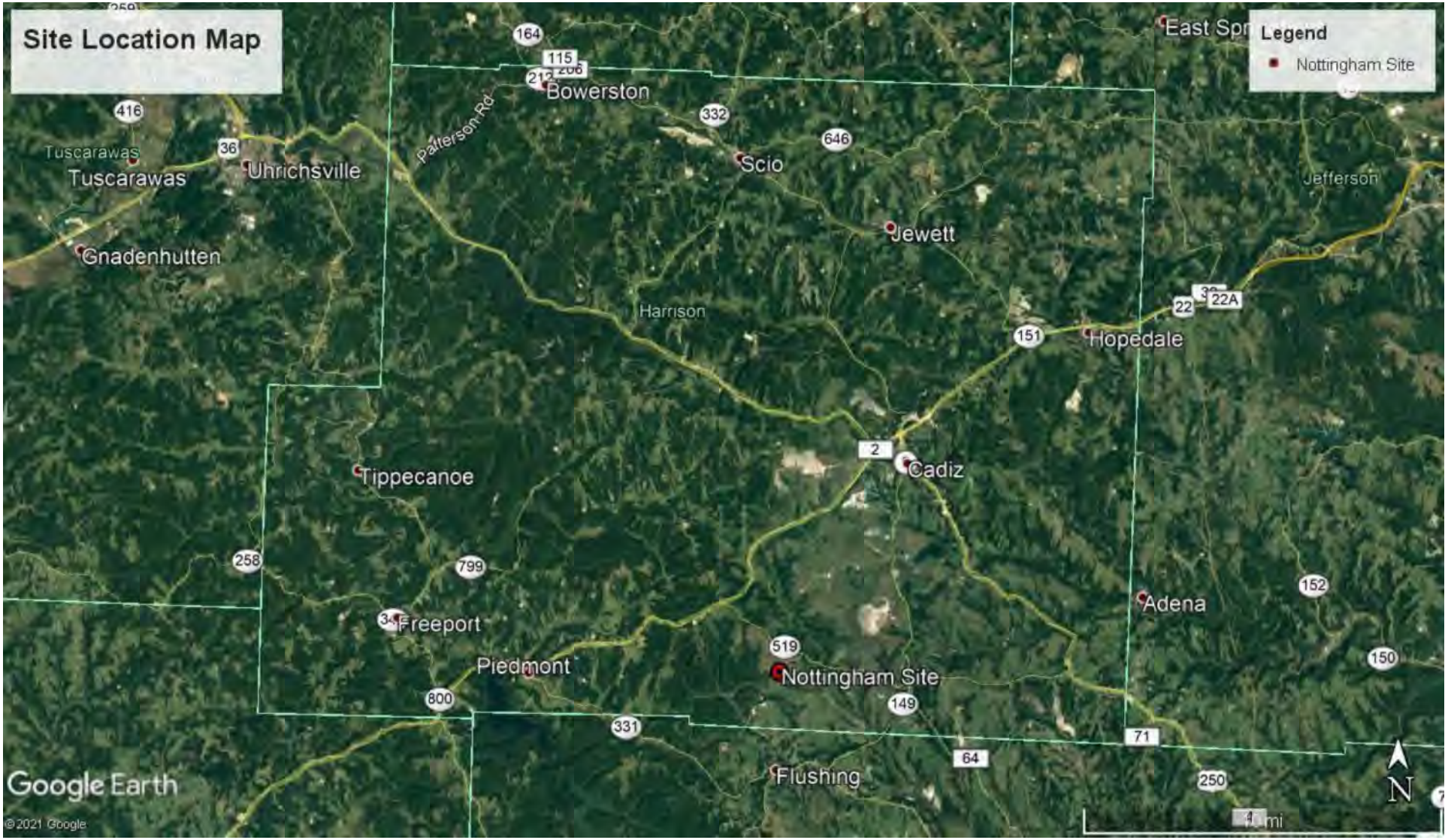


Figure 1 - Site Location Map

Figure 2 - Site Layout

Figure 3 - Test Pit Locations

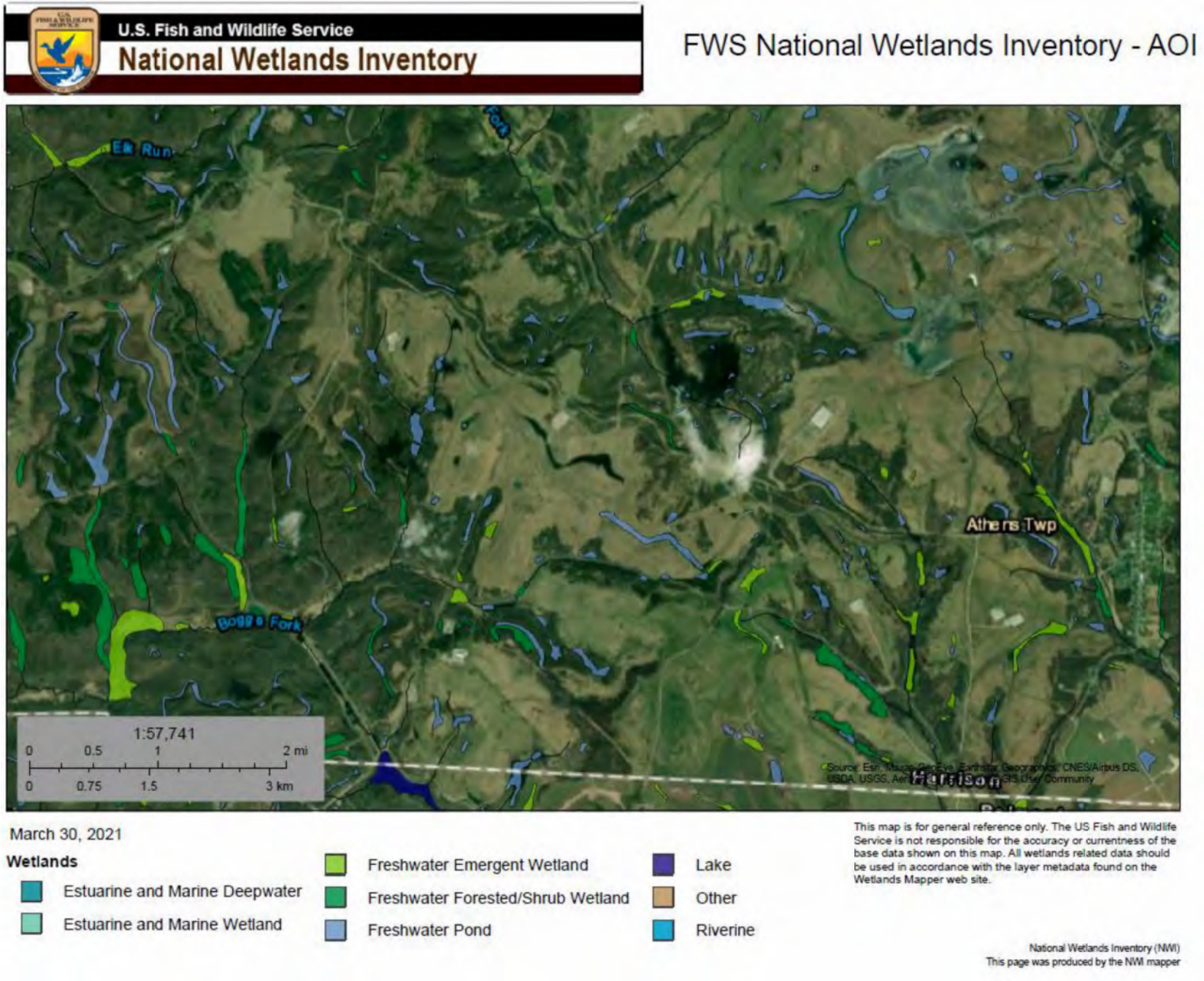


Figure 4 - FWS National Wetlands Inventory of the Site

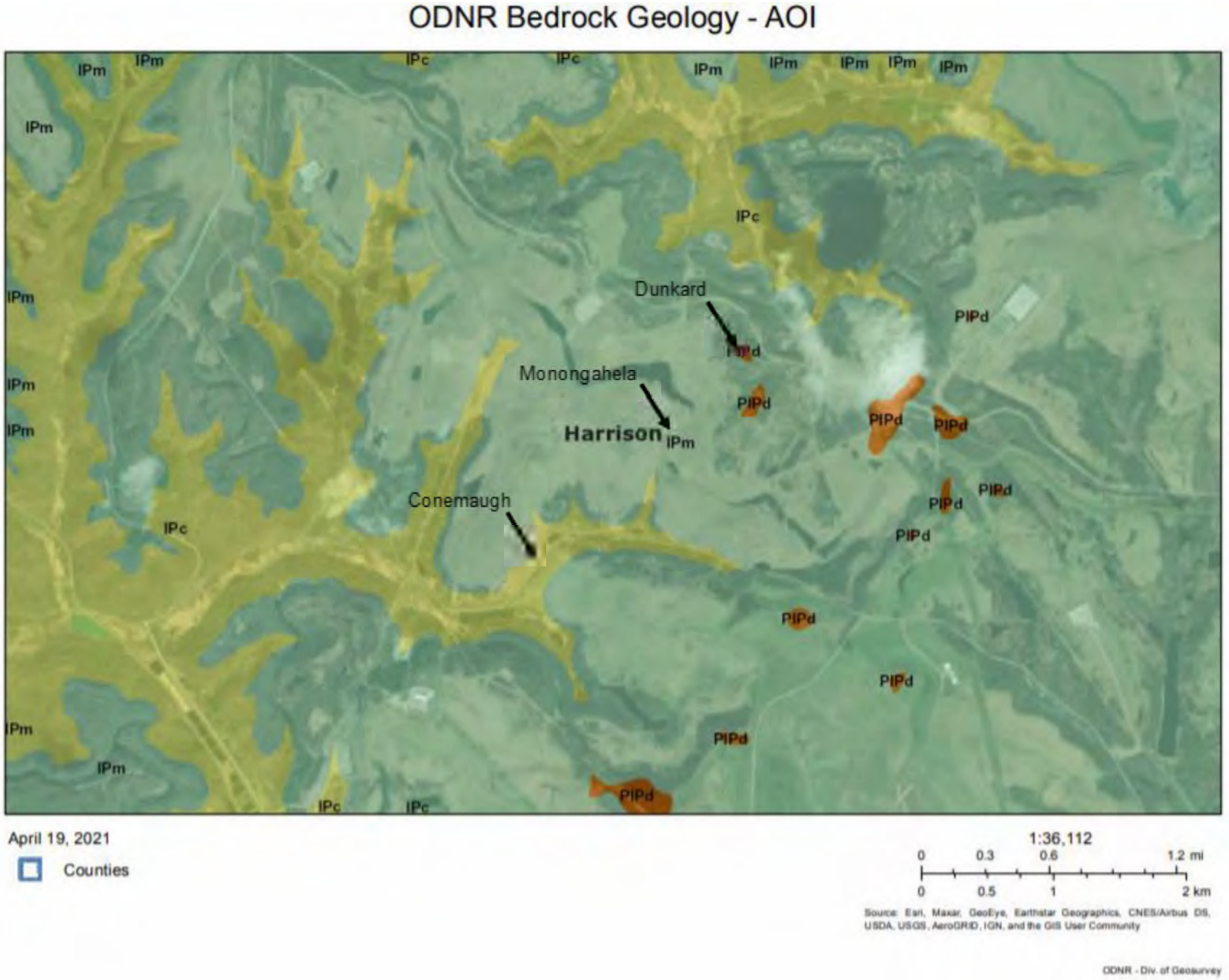


Figure 5 - ODNR Division of Geological Survey - Geology Map

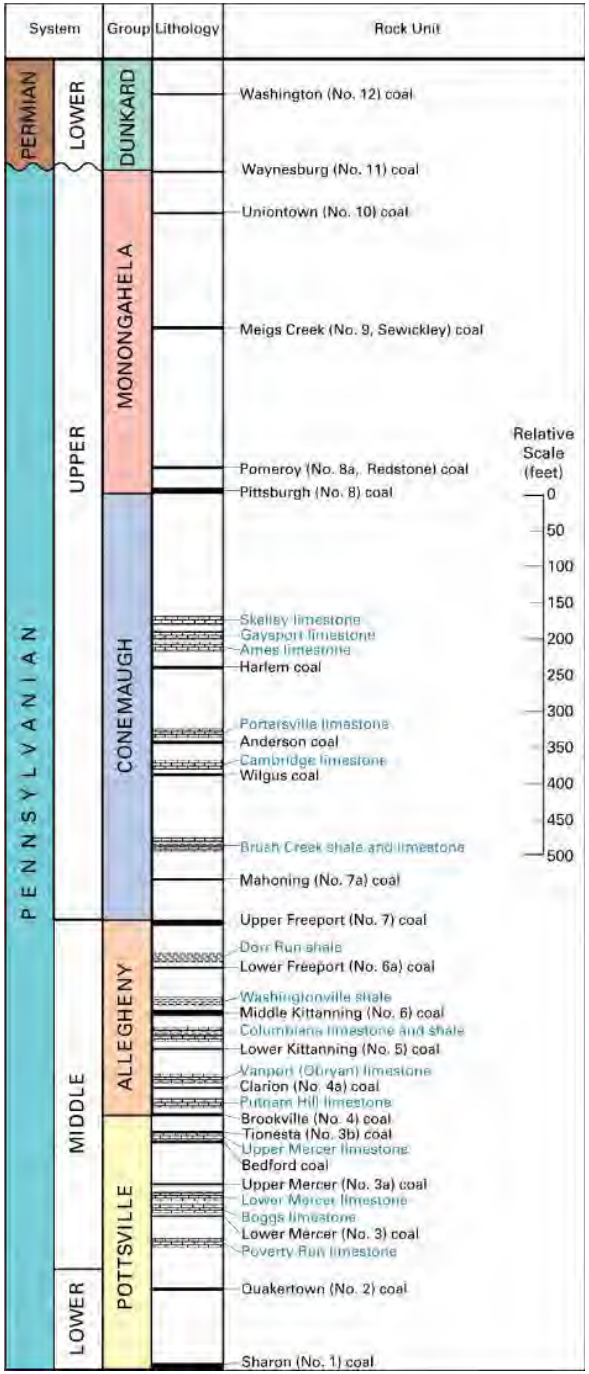


Figure 6 - Local Geologic Stratigraphy Column (Source: Ohio Department of Natural Resources)

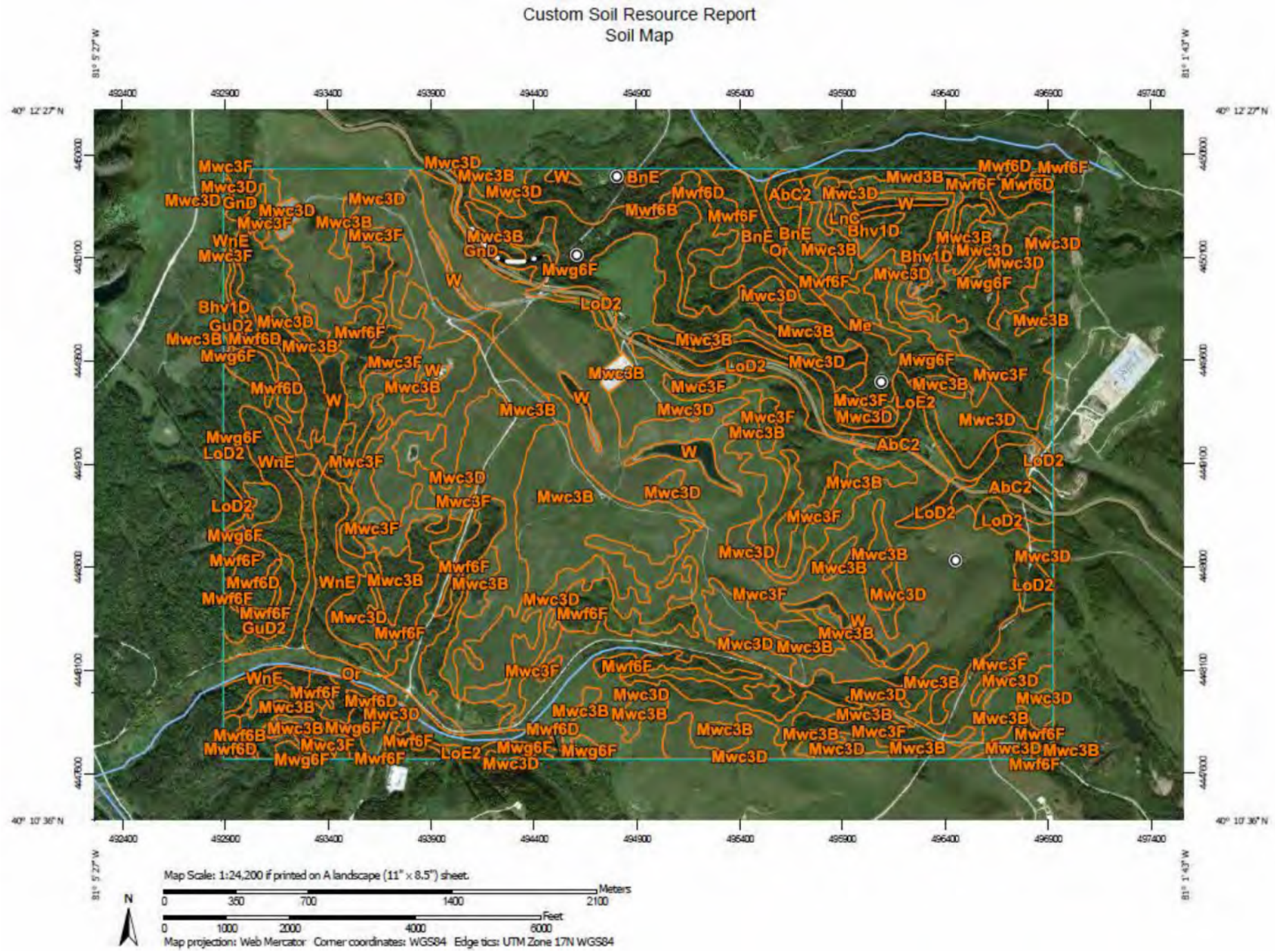


Figure 7 - USDA Soil Report

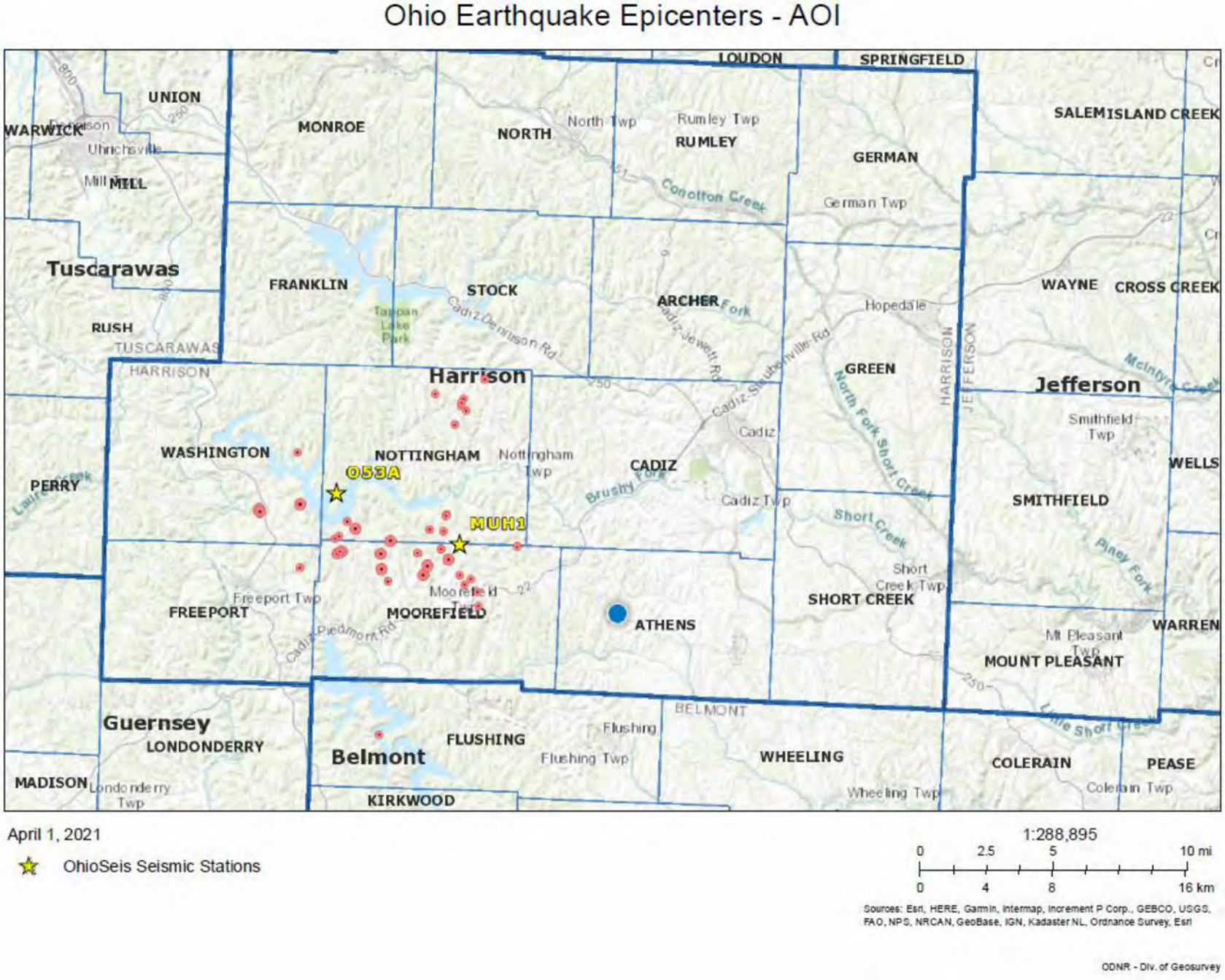


Figure 8- ODNR Division of Geological Survey - Earthquake Epicenters

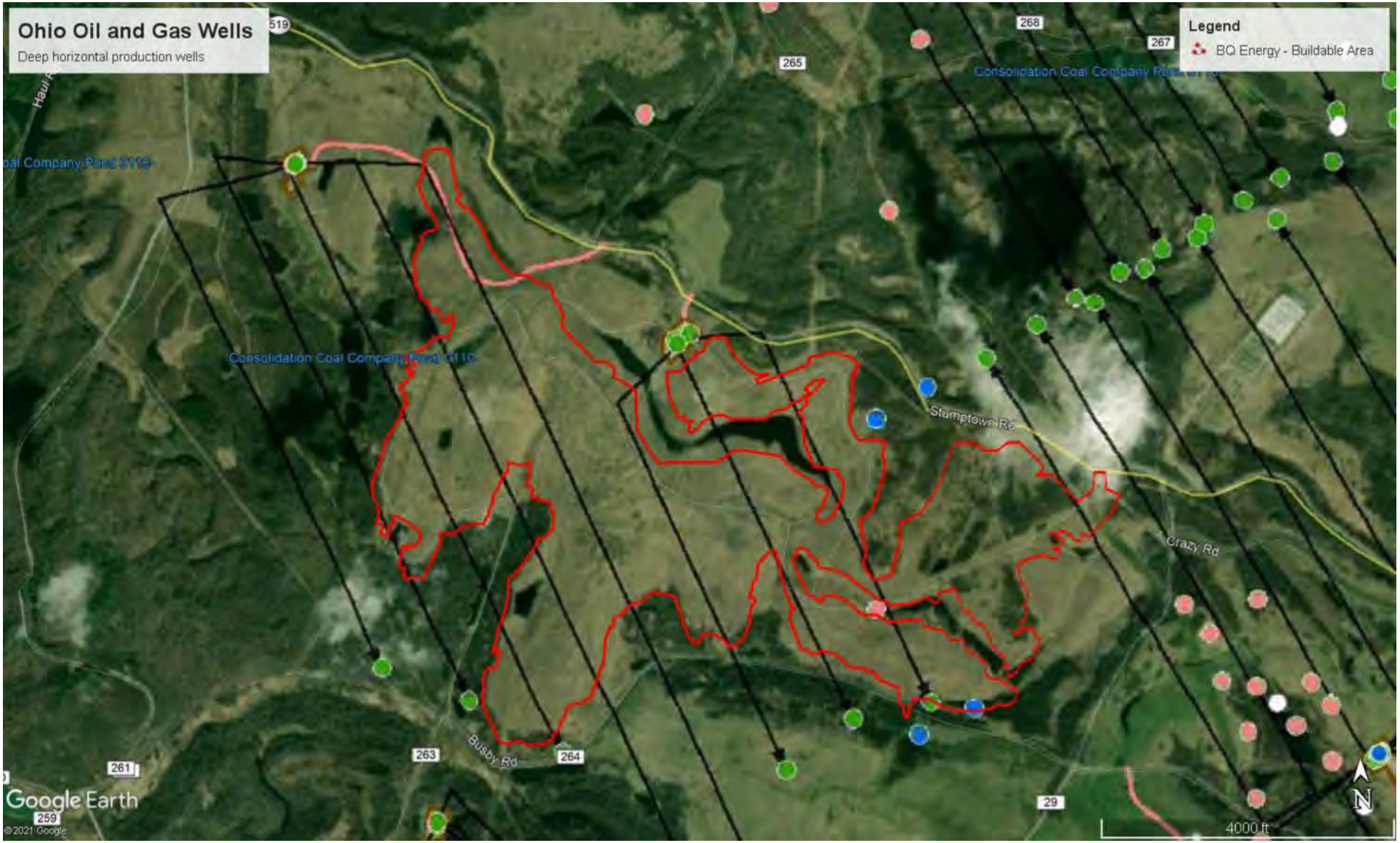


Figure 9 - Ohio Oil and Gas Wells

Pipeline and Hazardous Materials Safety Administration

NATIONAL PIPELINE MAPPING SYSTEM

Figure 10 - National Pipeline Mapping System

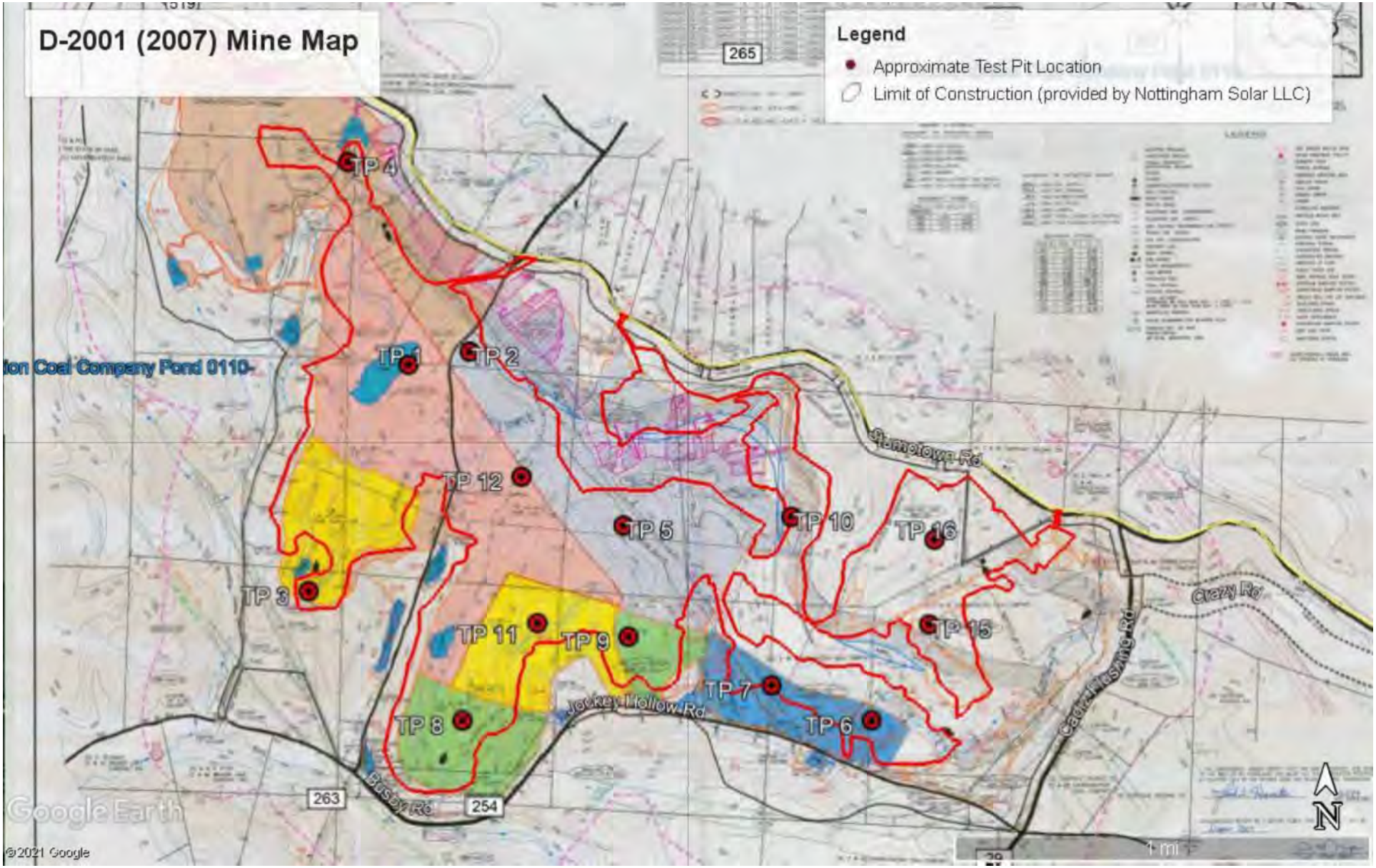


Figure 11 - Consolidation Coal Company D-2100 Mine Map with Site Boundaries

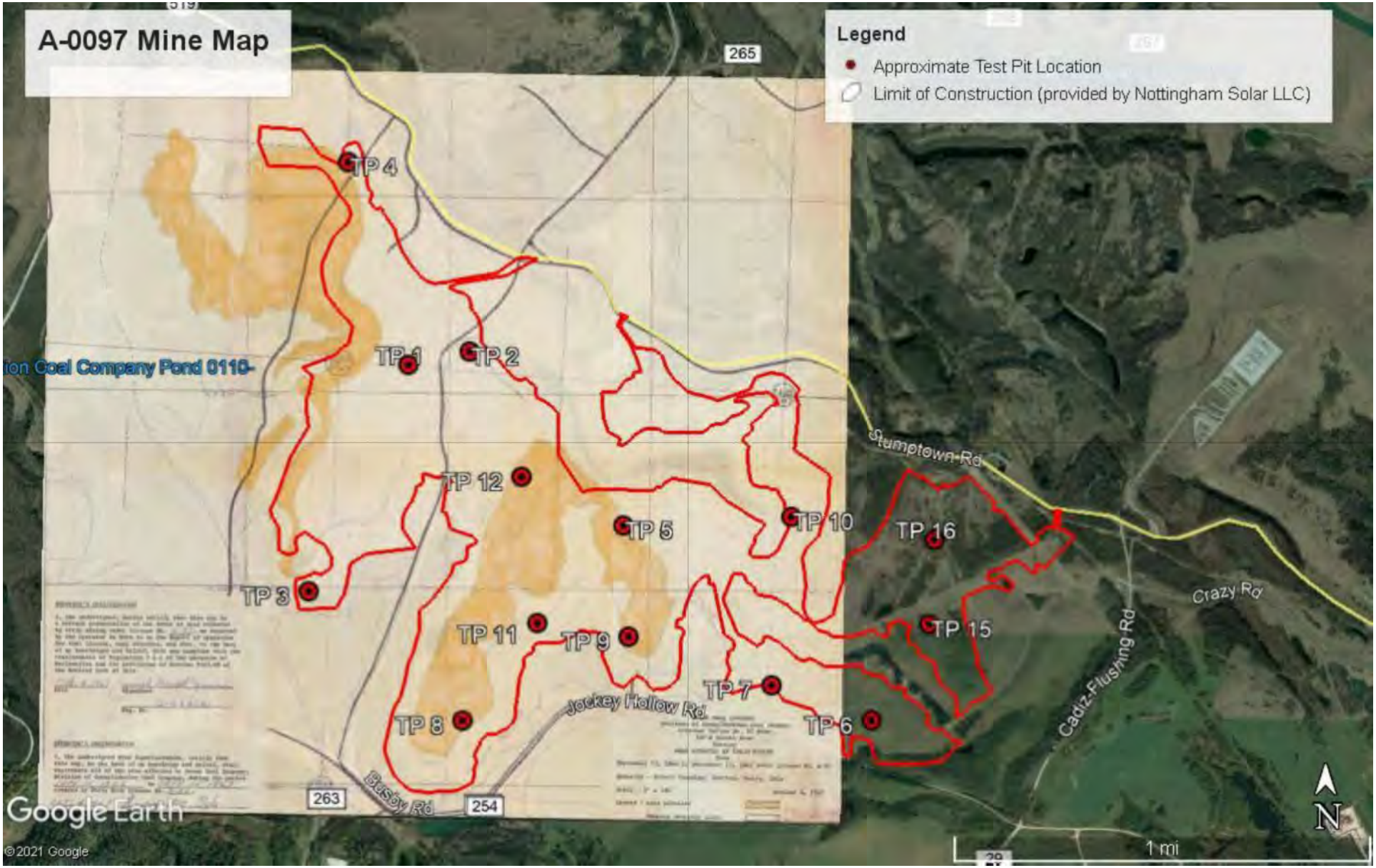


Figure 12 - Consolidation Coal Company A-0097 Mine Map with Site Boundaries

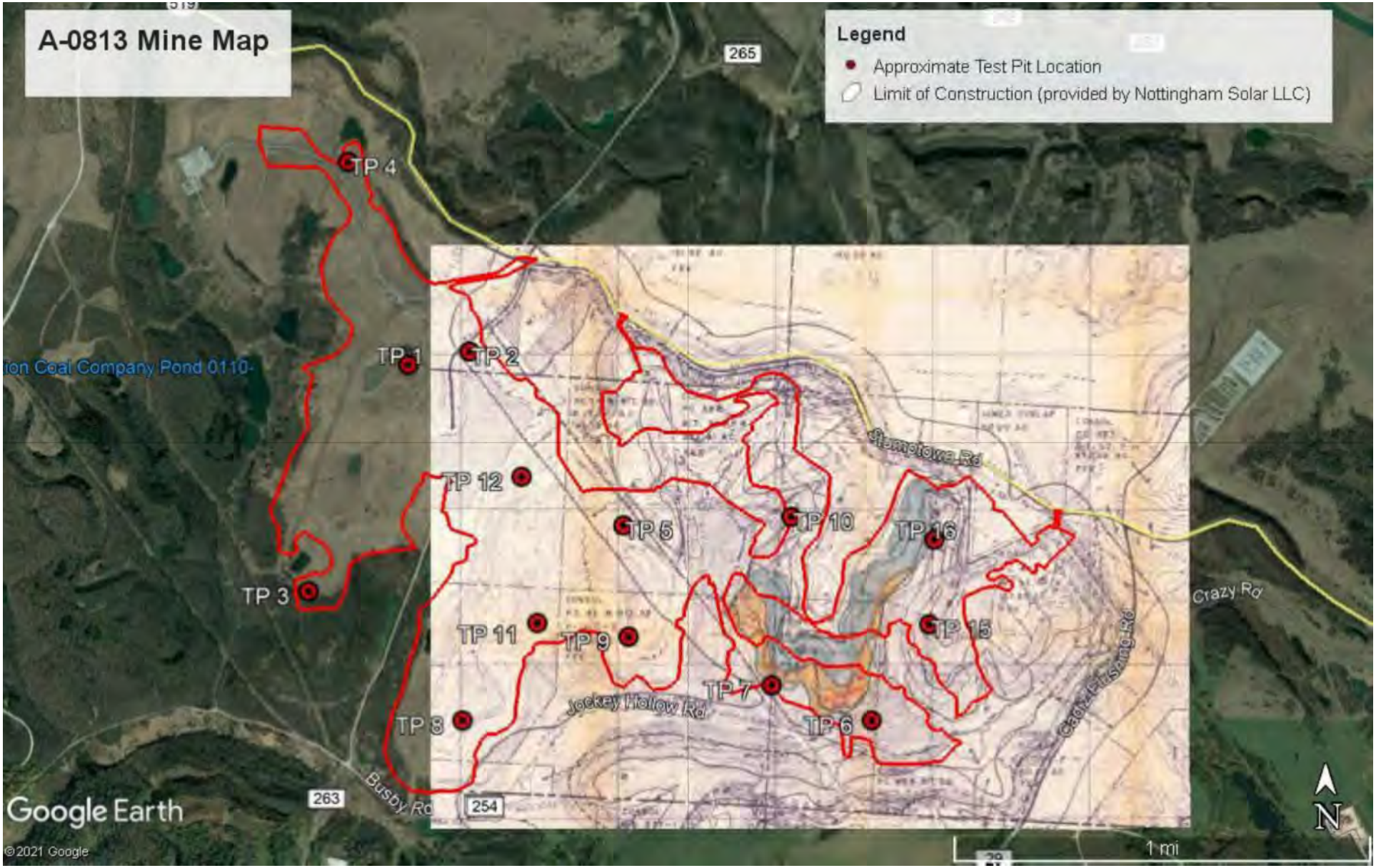


Figure 13 - Consolidation Coal Company A-0813 Mine Map with Site Boundaries

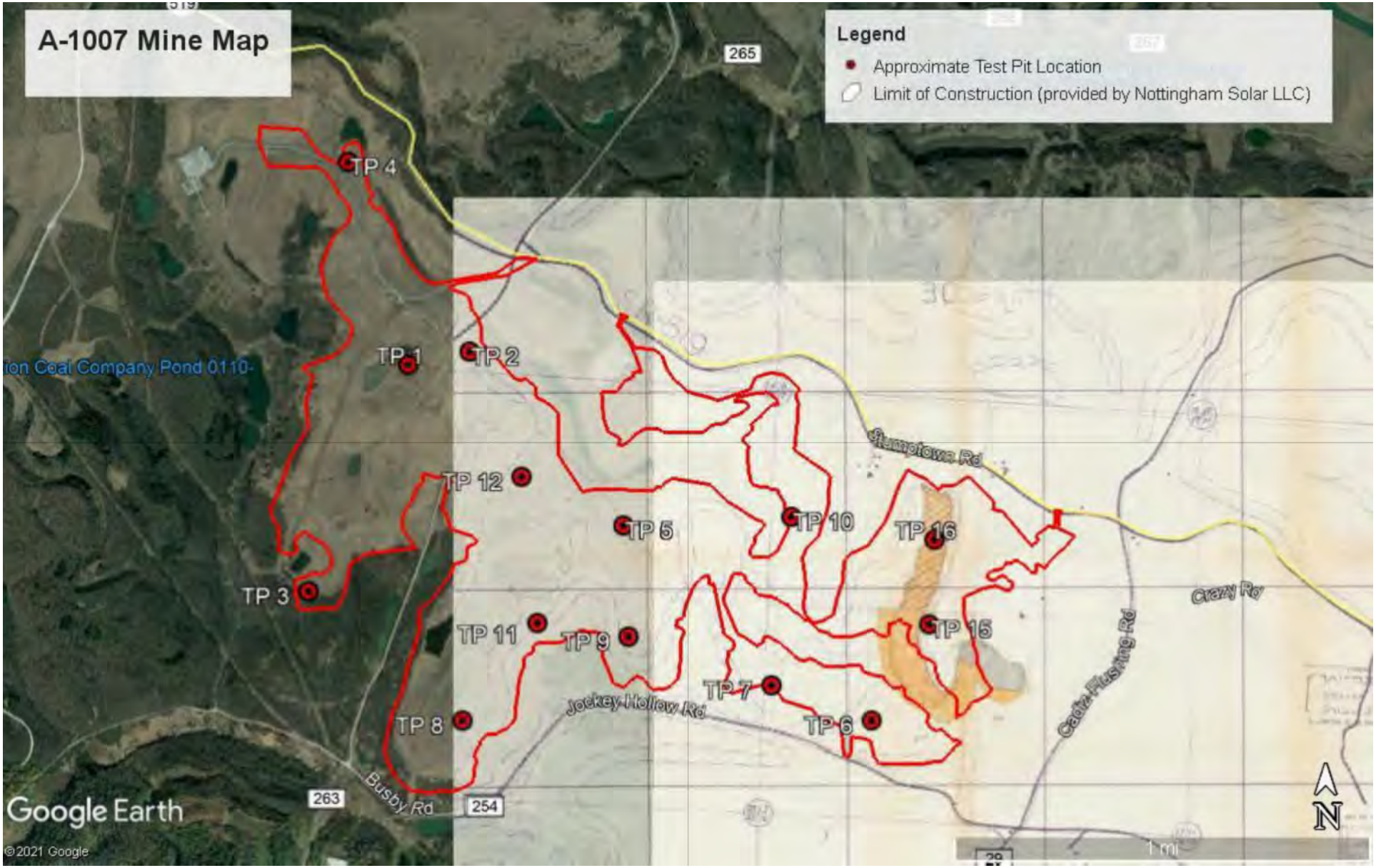


Figure 14 - Consolidation Coal Company A-1007 Mine Map with Site Boundaries

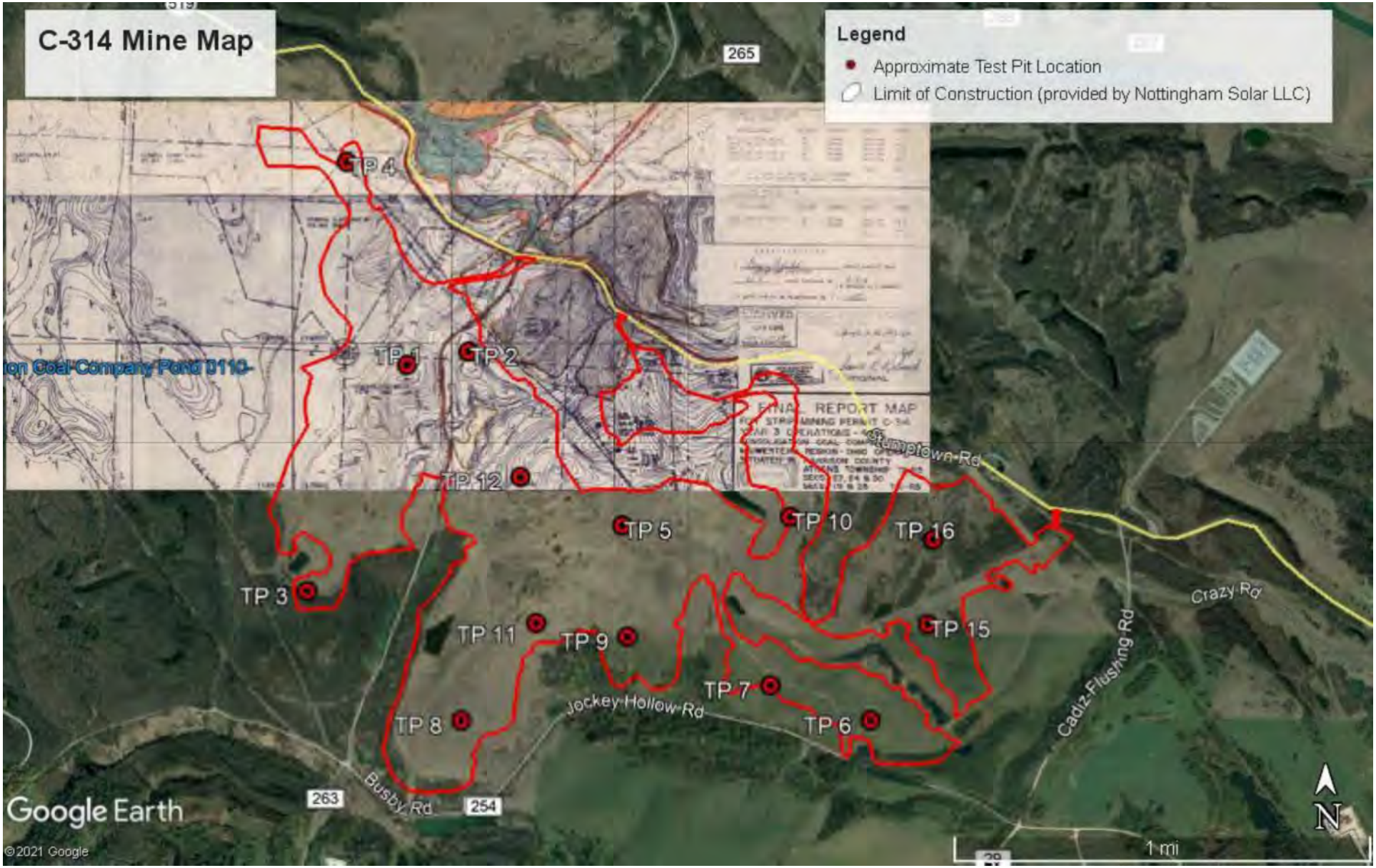


Figure 15 - Consolidation Coal Company C-314 Mine Map with Site Boundaries

Figure 16 - R&F Coal Company C-1126 Mine Map with Site Boundaries

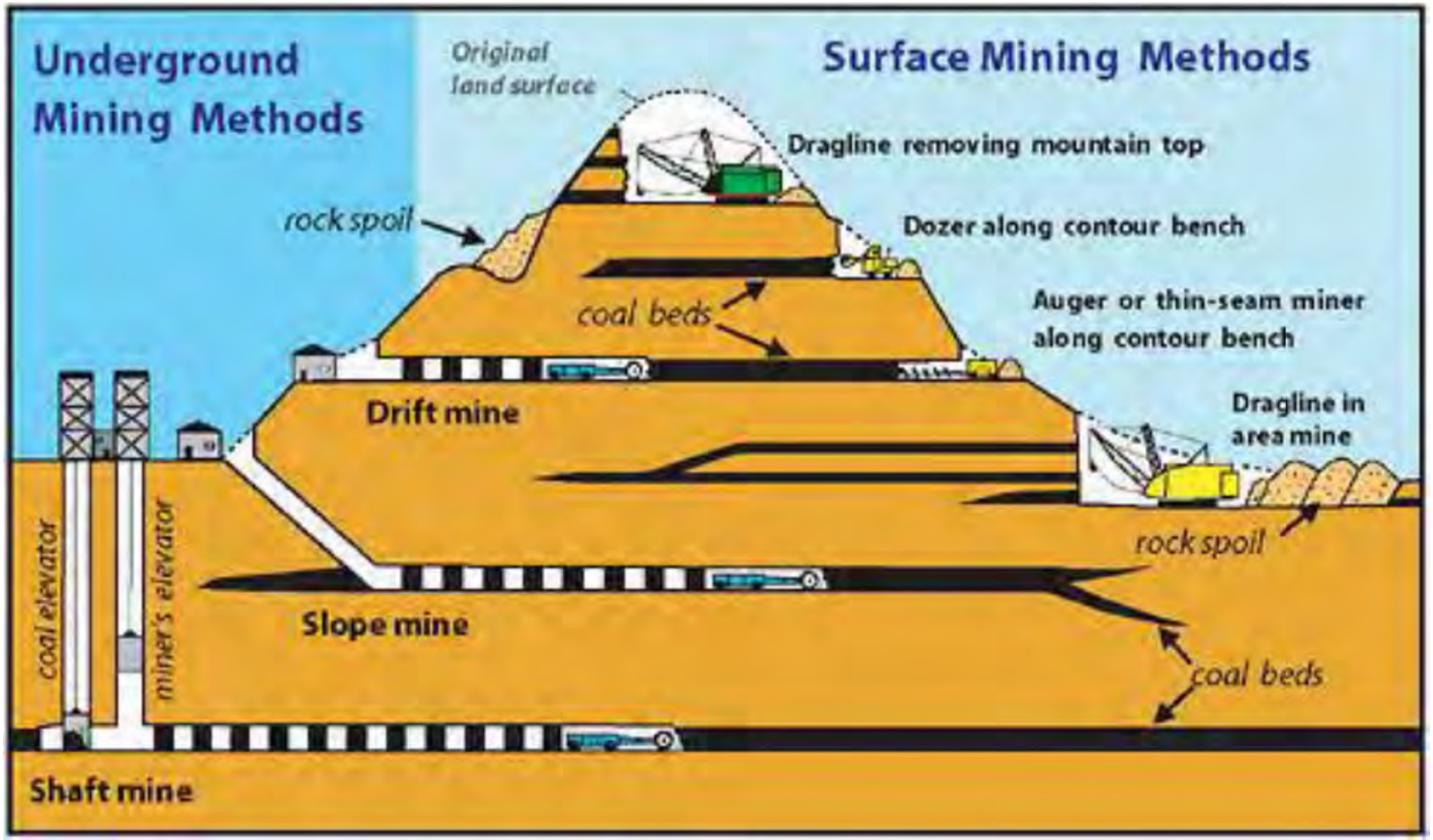


Figure 17 - Illustration of Mining Methods (Source: Ohio Environmental Protection Agency)

Figure 18 - Surface Mining Diagrammatic Section (Source: The Open University)

APPENDIX A

Test Pit Logs and Select Photographs

RECORD OF TEST PIT: TP-01

CLIENT:	Nottingham Solar LLC	DATE:	May 28, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.196269° Long: 81.070169°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 1% by volume, subrounded to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 16	GS	
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
20			End of hole at 20.0 ft.						19.50 ft: Excavator reach

DEPTH SCALE: 1:165

REV:

GOLDER
MEMBER OF WSP

DIMENSIONS: 20.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 28, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

TP-1 Summary Photos

RECORD OF TEST PIT: TP-02

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.196736° Long: 81.067371°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone, siltstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 14	GS	
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									17.50 ft: Excavator reach
18			End of hole at 18.0 ft.						
19									
20									

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 22.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-2 Summary Photos

RECORD OF TEST PIT: TP-03

CLIENT:	Nottingham Solar LLC	DATE:	May 28, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.188395° Long: 81.074713°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine subangular gravel; weathered, no staining, no odor; sandstone, 1% by volume, subrounded to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 17	GS	
0.5			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subrounded to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			10.50 ft: Refusal on apparent sandstone bedrock
10.5			End of hole at 11.0 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 20.5 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 28, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-3 Summary Photos

RECORD OF TEST PIT: TP-04

CLIENT:	Nottingham Solar LLC	DATE:	May 28, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.203288° Long: 81.072909°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, no staining, no odor; sandstone, 6% by volume, subrounded to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 15	GS	
0.5			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
19.50									19.50 ft: Excavator reach
20			End of hole at 20.0 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 28, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-4 Summary Photos

RECORD OF TEST PIT: TP-05

CLIENT:	Nottingham Solar LLC	DATE:	May 26, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.190676° Long: 81.060390°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
1	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, no staining, no odor; sandstone, 7% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 5	GS	
2			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 7% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
3									
4									
5									5.50 ft: Large boulder at depth
6			End of hole at 6.0 ft.						
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

DEPTH SCALE: 1:165

REV:

GOLDER
MEMBER OF WSP

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 26, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

TP-5 Summary Photos

RECORD OF TEST PIT: TP-06

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.183945° Long: 81.049074°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; 3% by volume, subangular to angular cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0			
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine angular sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 3% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
2									
3									
4									
5									
6									
7							Sample 9	GS	
8									8.00 ft: Seepage from ~8ft bgs resulting in standing water at test pit bottom at 18.5 ft bgs 5/27/2021 10:10:45 AM
9									
10									
11							Sample 10	GS	
12									
13									
14									
15									
16									
17									
18									18.00 ft: Excavator reach
19			End of hole at 18.5 ft.						
20									

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-6 Summary Photos

RECORD OF TEST PIT: TP-07

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.185122° Long: 81.053637°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone, limestone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 8	GS	
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone, limestone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
14			End of hole at 14.0 ft.						13.50 ft: Large boulder at depth

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-7 Summary Photos

RECORD OF TEST PIT: TP-08

CLIENT:	Nottingham Solar LLC	DATE:	May 26, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.183893° Long: 81.067678°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 5% by volume, subangular to angular, Shale, limestone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 4	GS	
0.5			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SOIL, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; Shale, limestone, 5% by volume, subangular to angular, Shale, limestone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.						
19									19.00 ft: Excavator reach
19.5			End of hole at 19.5 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 26, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-8 Summary Photos

RECORD OF TEST PIT: TP-09

CLIENT:	Nottingham Solar LLC	DATE:	May 26, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.186808° Long: 81.060136°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0			
1						0.5			
2			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.				Sample 6	GS	
3									
4							Sample 7	GS	
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									18.50 ft: Excavator reach
19			End of hole at 19.0 ft.						
20									

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 18.5 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 26, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-9 Summary Photos

RECORD OF TEST PIT: TP-10

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.190964° Long: 81.052742°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 13	GS	15.50 ft: Large boulder at depth
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
16			End of hole at 16.0 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 20.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-10 Summary Photos

RECORD OF TEST PIT: TP-11

CLIENT:	Nottingham Solar LLC	DATE:	May 26, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.187295° Long: 81.064268°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; Limestone, shale, 6% by volume, subangular to angular, Limestone, shale cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0	Sample 3	GS	
1			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; Limestone, shale, 6% by volume, subrounded to angular, Limestone, shale cobbles/boulders; w ~ PL to w > PL, Mine Spoils.			0.5			
19			End of hole at 19.0 ft.						19.50 ft: Excavator reach

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 17.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 26, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-11 Summary Photos

RECORD OF TEST PIT: TP-12

CLIENT:	Nottingham Solar LLC	DATE:	May 26, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.192356° Long: 81.064976°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine subangular to angular sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; Limestone, shale, 5% by volume, subangular to angular, Limestone, shale cobbles/boulders; w ~ PL to w > PL, Mine Spoils.	CL-ML		0.0			
1						0.5			
2			MIXTURE of SOIL and COBBLES/BOULDERS - (CL-ML) SILTY CLAY-CLAYEY SILT, low plasticity, trace fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; Limestone, shale, 5% by volume, subangular to angular, Limestone, shale cobbles/boulders; w ~ PL to w > PL, Mine Spoils.				Sample 2	GS	
3									
4									
5									
6							Sample 1	GS	
7									
8									
9									
10									
11									
12									
13									13.50 ft: Large boulder at depth
14			End of hole at 14.0 ft.						
15									
16									
17									
18									
19									
20									

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 17.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 26, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-12 Summary Photos

RECORD OF TEST PIT: TP-15

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.187260° Long: 81.046490°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
0	Kobelco SK170		(ML) SILT with slight plasticity, low plasticity, some fine rounded to subrounded sand, trace fine angular gravel; weathered, heterogeneous, iron oxide staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; moist to dry, Mine Spoils.	ML		0.0	Sample 11	GS	
0.5			MIXTURE of SOIL and COBBLES/BOULDERS - (ML) SILT with slight plasticity, low plasticity, some fine subangular to angular sand, trace fine angular gravel; weathered, heterogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; moist to dry, Mine Spoils.			0.5			
18.5									18.50 ft: Excavator reach
19			End of hole at 19.0 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 19.0 ft length x 3.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-15 Summary Photos

RECORD OF TEST PIT: TP-16

CLIENT:	Nottingham Solar LLC	DATE:	May 27, 2021	GROUND ELEV:	Data Not Available
PROJECT:	Preliminary Geotech			COORDINATES:	Lat: 40.190181° Long: 81.046223°
PROJECT NO:	21458932	CONTRACTOR:	DEI	COORD SYS:	Geographical Coordinates
LOCATION:	New Athens Township, OH			HORZ DATUM:	NAD83
				HOLE LOC:	New Athens Township, OH

DEPTH (ft)	EQUIPMENT	METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	ADDITIONAL OBSERVATIONS
1	Kobelco SK170		(ML) sandy SILT with slight plasticity, low plasticity, fine rounded to subrounded sand, trace fine angular gravel; weathered, homogeneous, iron oxide staining, no odor; Sandstone, shale, 6% by volume, subangular to angular, Sandstone, shale cobbles/boulders; moist to dry, Possible Mine Spoils. MIXTURE of SOIL and COBBLES/BOULDERS - (ML) sandy SILT with slight plasticity, low plasticity, fine rounded to subrounded sand, trace fine angular gravel; weathered, homogeneous, no staining, no odor; sandstone, 6% by volume, subangular to angular, Sandstone cobbles/boulders; moist to dry,	ML		0.0 0.5	Sample 12	GS	8.50 ft: Refusal on apparent sandstone bedrock
9			End of hole at 9.0 ft.						

DEPTH SCALE: 1:165

REV:

DIMENSIONS: 15.0 ft length x 7.0 ft width

LOGGED: Benjamin Douvier DATE: May 27, 2021

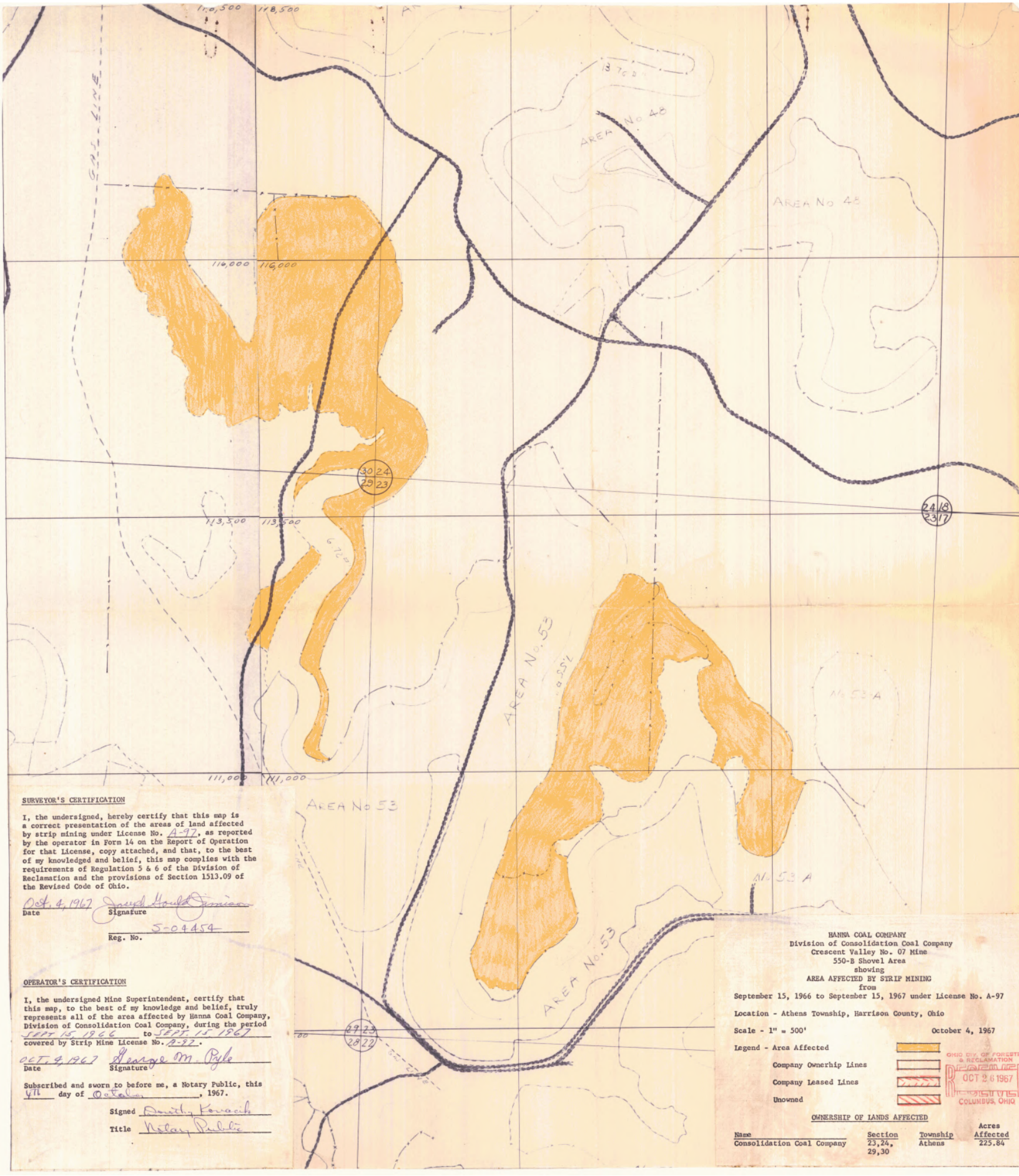
CHECKED: J. Nasrallah DATE: July 7, 2021

GOLDER
MEMBER OF WSP

TP-16 Summary Photos

APPENDIX B

ODNR Mine Maps



SURVEYOR'S CERTIFICATION

I, the undersigned, hereby certify that this map is a correct presentation of the areas of land affected by strip mining under License No. A-97, as reported by the operator in Form 14 on the Report of Operation for that License, copy attached, and that, to the best of my knowledged and belief, this map complies with the requirements of Regulation 5 & 6 of the Division of Reclamation and the provisions of Section 1513.09 of the Revised Code of Ohio.

Oct. 4, 1967 Joseph Hould Jamison
Date Signature

S-0445-4
Reg. No.

OPERATOR'S CERTIFICATION

I, the undersigned Mine Superintendent, certify that this map, to the best of my knowledge and belief, truly represents all of the area affected by Hanna Coal Company, Division of Consolidation Coal Company, during the period SEPT 15, 1966 to SEPT. 15, 1967 covered by Strip Mine License No. A-97.

OCT. 4, 1967 George M. Pyle
Date Signature

Subscribed and sworn to before me, a Notary Public, this 4th day of October, 1967.

Signed Dorothy Kovacich

Title Notary Public

HANNA COAL COMPANY
Division of Consolidation Coal Company
Crescent Valley No. 07 Mine
550-B Shovel Area
showing
AREA AFFECTED BY STRIP MINING
from
September 15, 1966 to September 15, 1967 under License No. A-97

Location - Athens Township, Harrison County, Ohio

Scale - 1" = 500' October 4, 1967

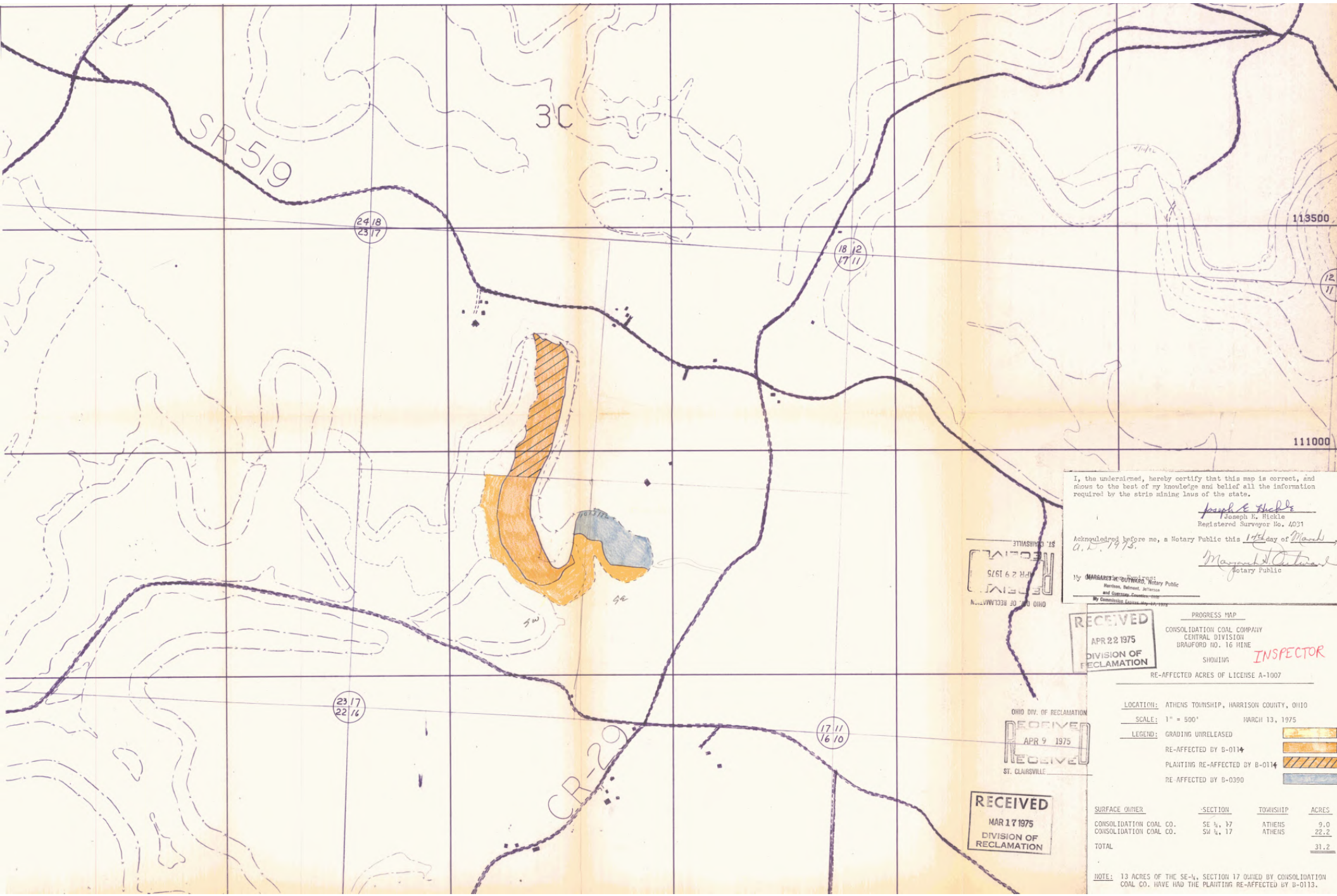
Legend - Area Affected
Company Ownerhip Lines
Company Leased Lines
Unowned

OHIO DIV. OF FORESTS & RECLAMATION
RECEIVED
OCT 26 1967
COLUMBUS, OHIO

OWNERSHIP OF LANDS AFFECTED

Name	Section	Township	Acres Affected
Consolidation Coal Company	23,24, 29,30	Athens	225.84


CONSOL
TRI CO 9
105.00 AC.
FEE
CONSOL
BIT. 18 TRI CO 12
191.42 AC.
FEE
MARY
JOHNSON
190.35 AC.
G-14
CONSOL
169.91 AC.
CONSOL
PC 74 & BIT. 52
P-13, T-18 2
CONSOL
PC 386
BIT. 52, P-4
252.61 AC.
FEE
JAMES DUNLAP
50.00 AC.
CONSOL
CC 367
BIT. 52, P-11
832.30 AC.
FEE
CONSOL
PC 44
BIT. 52, P-18
157.95 AC.
FEE
CONSOL
PC 42 & BIT. 52
P-19, T-2
174.20 AC.
FEE
CONSOL
CC 40
CONSOL
PC 498 BIT. 52
CONSOL
B-219-3
190.75 AC.
FEE
CONSOL
CC 337-1
BIT. 52, P-2
54.50 AC.
FEE
CONSOL
CC 488
BIT. 52, P-17
91.00 AC.
FEE
CONSOL
0.9465 AC.
CC 493 FEE
SEAWAY
155.83 AC.
CONSOL
CC 337-2
BIT. 52, P-2
32.50 AC.
FEE
AFFECTED AREA
RAILROAD
PROGRESS MAP LEGEND
FINAL AFFECTED LIMITS OF A-813
FINAL AFFECTED LIMITS OF B-0114
RE-AFFECTED ACRES
INSPECTOR
PROGRESS MAP FOR LICENSE A-813
SHOWING ACRES RE-AFFECTED BY B-0114
CENTRAL DIVISION
CONSOLIDATION COAL COMPANY
LOCATED IN SECTIONS 17 & 20,
MORRIS TOWNSHIP, MORGAN COUNTY, OHIO
SCALE 1" = 400'
JULY 19, 1979



I, the undersigned, hereby certify that this map is correct, and shows to the best of my knowledge and belief all the information required by the strip mining laws of the state.

Joseph E. Hickle
Registered Surveyor No. 4031

Acknowledged before me, a Notary Public this 14th day of March A.D. 1975.

Margaret H. Outwater
Notary Public

My Commission Expires:
MARGARET H. OUTWATER, Notary Public
Harrison, Belmont, Jefferson and Guernsey Counties, Ohio
My Commission Expires May 24, 1976

OHIO DIV. OF RECLAMATION
RECEIVED
APR 29 1975
ST. CLAIRSVILLE

RECEIVED
APR 22 1975
DIVISION OF RECLAMATION

OHIO DIV. OF RECLAMATION
RECEIVED
APR 9 1975
ST. CLAIRSVILLE

RECEIVED
MAR 17 1975
DIVISION OF RECLAMATION

PROGRESS MAP

CONSOLIDATION COAL COMPANY
CENTRAL DIVISION
BRADFORD NO. 16 MINE

SHOWING INSPECTOR

RE-AFFECTED ACRES OF LICENSE A-1007

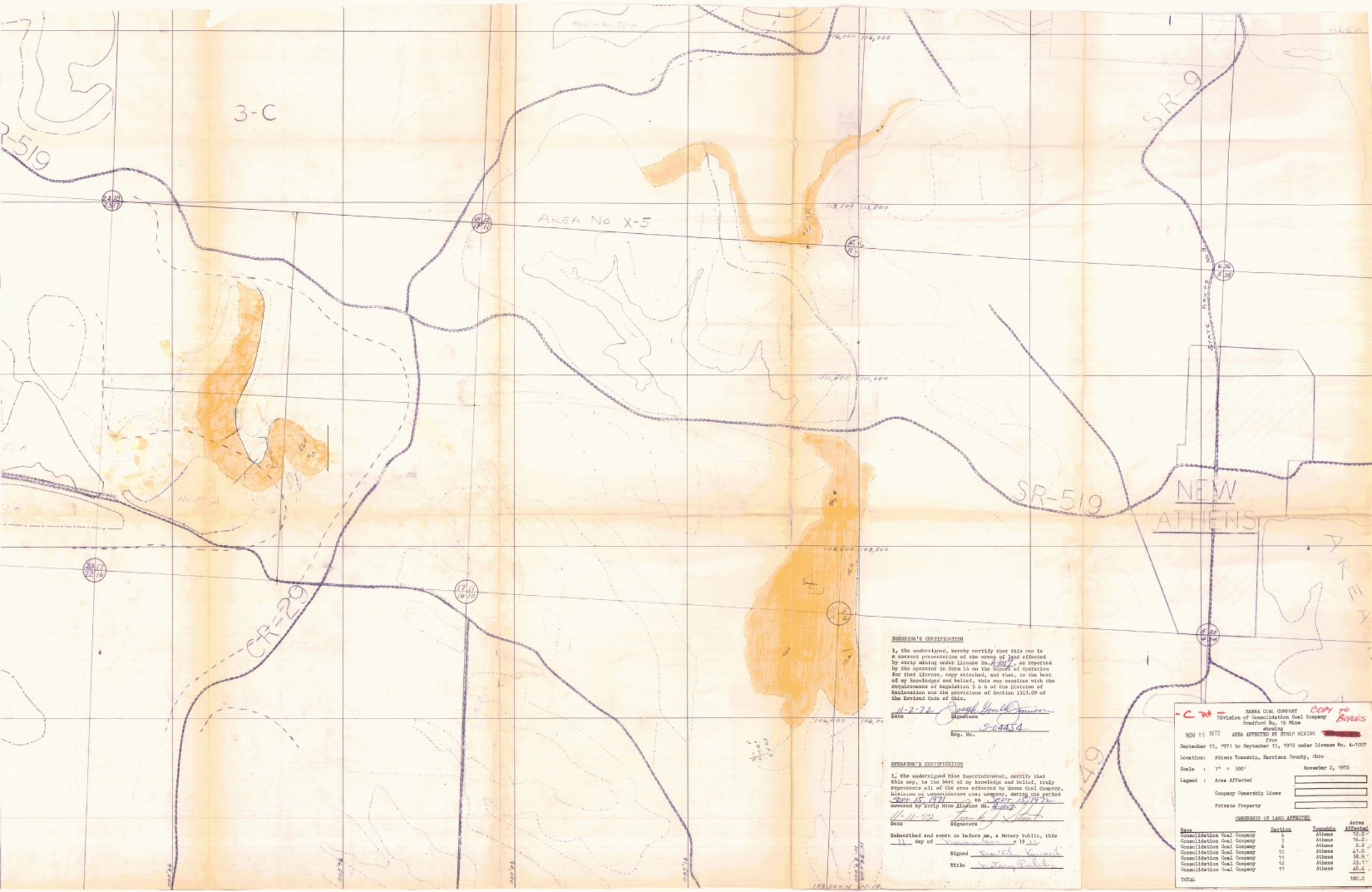
LOCATION: ATHENS TOWNSHIP, HARRISON COUNTY, OHIO

SCALE: 1" = 500' MARCH 13, 1975

LEGEND:
- GRADING UNRELEASED
- RE-AFFECTED BY B-0114
- PLANTING RE-AFFECTED BY B-0114
- RE-AFFECTED BY B-0390

SURFACE OWNER	SECTION	TOWNSHIP	ACRES
CONSOLIDATION COAL CO.	SE ¼, 17	ATHENS	9.0
CONSOLIDATION COAL CO.	SW ¼, 17	ATHENS	22.2
TOTAL			31.2

NOTE: 13 ACRES OF THE SE-¼, SECTION 17 OWNED BY CONSOLIDATION COAL CO. HAVE HAD THE PLANTING RE-AFFECTED BY B-0113.



SURVEYOR'S CERTIFICATION

I, the undersigned, hereby certify that this map is a correct presentation of the areas of land affected by strip mining under License No. A-1007, as reported by the operator in Form 14 on the Report of Operation for that License, copy attached, and that, to the best of my knowledge and belief, this map complies with the requirements of Regulation 5 & 6 of the Division of Reclamation and the provisions of Section 1513.09 of the Revised Code of Ohio.

11-2-72 — Date — Signature

S-04454 — Reg. No.

OPERATOR'S CERTIFICATION

I, the undersigned Mine Superintendent, certify that this map, to the best of my knowledge and belief, truly represents all of the area affected by Hanna Coal Company, Division of Consolidation Coal Company, during the period Sept. 15, 1971 to Sept. 15, 1972 covered by Strip Mine License No. A-1007.

11-11-72 — Date — Signature

Subscribed and sworn to before me, a Notary Public, this 11 day of November, 19 72.

Signed

Title Notary Public

- C 74 -

COPY TO BOYLES

HANNA COAL COMPANY
Division of Consolidation Coal Company
Bradford No. 16 Mine
showing
AREA AFFECTED BY STRIP MINING
from
September 15, 1971 to September 15, 1972 under License No. A-1007

NOV 15 1972

Location: Athens Township, Harrison County, Ohio

Scale : 1" = 500'

November 2, 1972

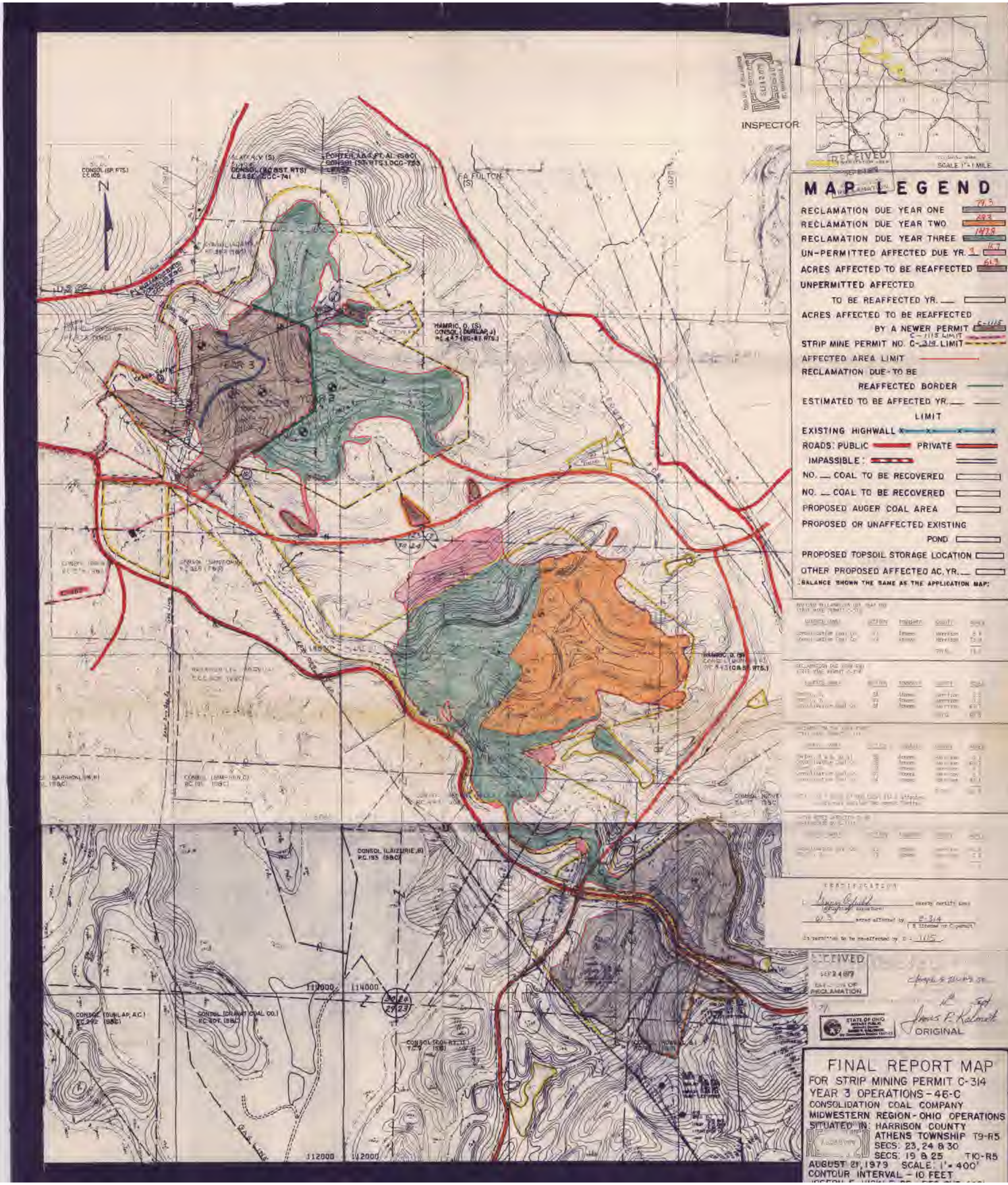
Legend : Area Affected

Company Ownership Lines

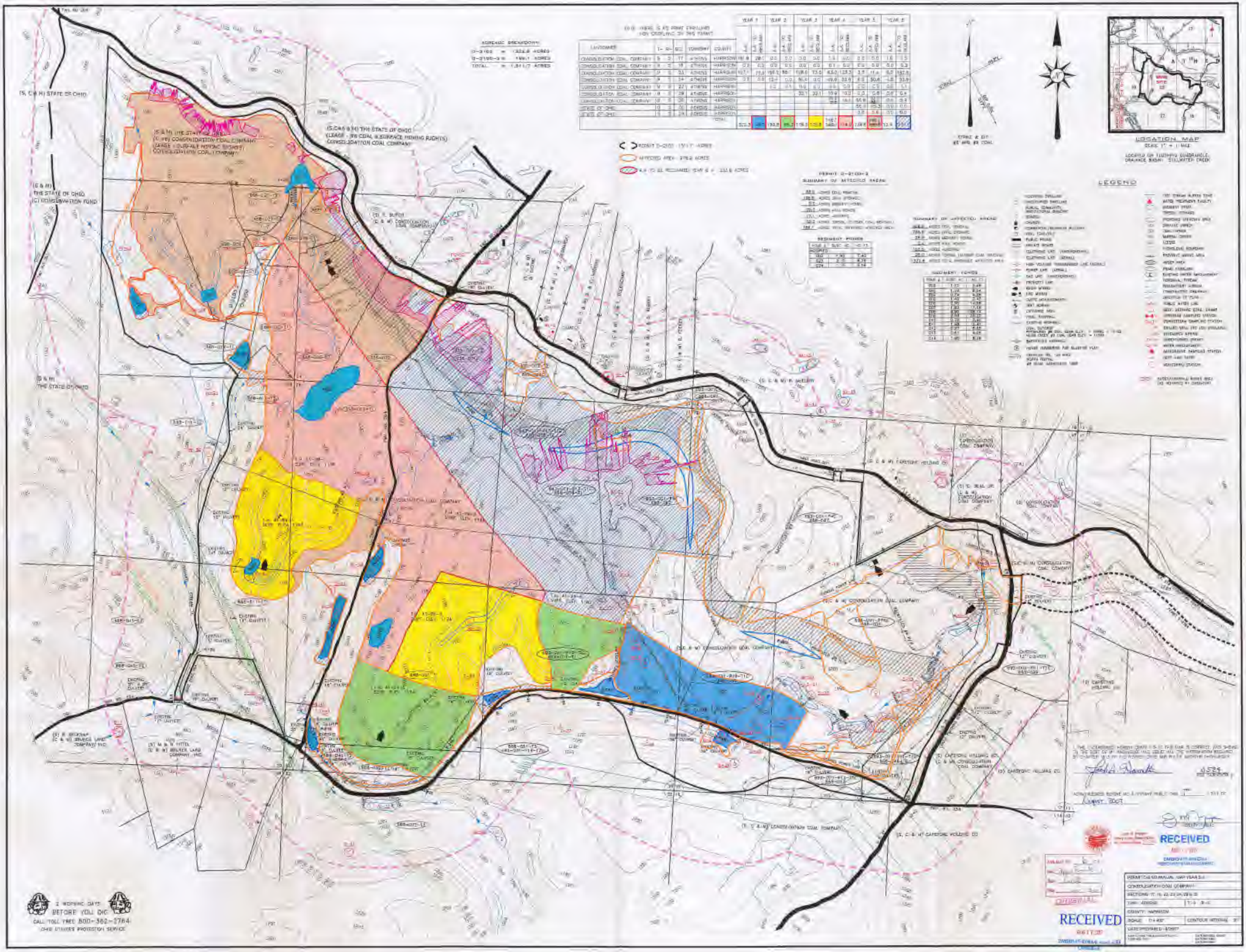
Private Property

OWNERSHIP OF LAND AFFECTED

Name	Section	Township	Acres Affected
Consolidation Coal Company	4	Athens	12.2
Consolidation Coal Company	5	Athens	76.2
Consolidation Coal Company	6	Athens	2.2
Consolidation Coal Company	10	Athens	4.1.0
Consolidation Coal Company	11	Athens	38.9
Consolidation Coal Company	12	Athens	23.1
Consolidation Coal Company	17	Athens	40.4
TOTAL			180.0



INSPECTOR
SCALE 1" = 1 MILE
MAP LEGEND
RECLAMATION DUE YEAR ONE 79.3
RECLAMATION DUE YEAR TWO 283
RECLAMATION DUE YEAR THREE 147.8
UN-PERMITTED AFFECTED DUE YR. 3 16.7
ACRES AFFECTED TO BE REAFFECTED 61.3
UNPERMITTED AFFECTED
TO BE REAFFECTED YR. ___
ACRES AFFECTED TO BE REAFFECTED
BY A NEWER PERMIT C-1115
C-1115 LIMIT
STRIP MINE PERMIT NO. C-314 LIMIT
AFFECTED AREA LIMIT
RECLAMATION DUE-TO BE
REAFFECTED BORDER
ESTIMATED TO BE AFFECTED YR. ___
LIMIT
EXISTING HIGHWALL
ROADS: PUBLIC
PRIVATE
IMPASSIBLE:
NO. __ COAL TO BE RECOVERED
NO. __ COAL TO BE RECOVERED
PROPOSED AUGER COAL AREA
PROPOSED OR UNAFFECTED EXISTING
POND
PROPOSED TOPSOIL STORAGE LOCATION
OTHER PROPOSED AFFECTED AC. YR. ___
BALANCE SHOWN THE SAME AS THE APPLICATION MAP:
CERTIFICATION
RECEIVED
SEP 24 1979
DIVISION OF RECLAMATION
James P. Kalmeth
ORIGINAL
FINAL REPORT MAP
FOR STRIP MINING PERMIT C-314
YEAR 3 OPERATIONS - 46-C
CONSOLIDATION COAL COMPANY
MIDWESTERN REGION - OHIO OPERATIONS
SITUATED IN: HARRISON COUNTY
ATHENS TOWNSHIP T9-R5
SECS: 23, 24 & 30
SECS: 19 & 25 T10-R5
AUGUST 27, 1979 SCALE: 1" = 400'
CONTOUR INTERVAL - 10 FEET
N
F.A. FULTON (S)
HAMRIC, D. (S)
CONSOL (LAIZURIE, R.) P.C.193 (SBC)
CONSOL (DUNLAP, A.C.) P.C.292 (SBC)
CONSOL (CRAVAT COAL CO.) P.C.307 (SBC)
110000
114000
112000


LOCATION MAP
SCALE 1" = 1 MILE
LEGEND
ORIGINAL
RECEIVED
RECEIVED

APPENDIX C

Important Information about This Geotechnical Engineering Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

golder.com