ASSESSMENT OF THE PHYSICAL CHARACTERISTICS AND POSSIBLE CAUSE OF GROUND MOVEMENT AT 445 SCRIBNER ROAD, TOWN OF PEMBROKE, NEW YORK

Prepared for:

County Line Stone Co., Inc.
Akron Quarry
4515 Crittenden Road
Akron, New York 14001

September 2022

ALPHA GEOSCIENCE

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1.0 INTRODUCTION

This report was prepared jointly by Alpha Geological Services, DPC (Alpha) and Adirondack Geologic Services, DPC (AGS) to present the results of an assessment of the physical characteristics and causes of ground movement at, and in the vicinity of, 445 Scribner Road in the Town of Pembroke, Genesee County, New York. The 445 Scribner Road property (Lot 445) is located on the north side of Scribner Road approximately 4,700 feet northeast of the Akron Quarry of County Line Stone Co., Inc. (CLS) and approximately 1,800 feet south of Interstate 90 (Figure 1).

According to the local residents and anecdotal reports from the news media, a series of bangs and pops could be heard within the area at and around the residence at Lot 445 starting around Monday, August 1, 2022 and continuing through Saturday, August 6, 2022. The resident at Lot 445 noticed that doors and windows in the home could not be opened or shut properly on Sunday, August 7. Cracking was observed in Scribner Road adjacent to Lot 445, and cracked/broken cinder blocks were observed in the cellar wall at the same residence. Theories of possible causes were reported in the local newspaper that included sinkhole formation possibly due to ground water pumping at the Akron Quarry of CLS and also by blasting at the quarry. The house at Lot 445 was temporarily declared unsafe by the local authorities, and Scribner Road was closed to through-going traffic by the Pembroke Department of Public Works.

This assessment of conditions and cause was conducted by Alpha and AGS at the request of CLS. The primary objectives of the assessment were to observe the physical condition of the site area and formulate a plausible cause that is consistent with observed physical conditions in order to assess whether activity at the quarry resulted in the ground movement and to offer recommendations for further monitoring to assess ground stability. The investigation methods, results of the investigation, and recommendations for additional data collection are detailed in this report.

2.0 METHODS OF INVESTIGATION

The investigation was conducted by completing the following tasks.

- Conducting a site visit on August 15, 2022
  The investigation team included Dr. Samuel Gowan, PG of Alpha; Mr. John Hellert, PG, of

AGS; and Mr. Jeff Slade, PG, of AGS. The tasks completed included:

  - Conducting a drone survey to take aerial photographs of the site area and collect elevation data for a topographic contour map;
  - Recording spot locations of ground fractures using a global positioning system (GPS);
  - Measuring and recording fracture dimensions and orientations;
  - Taking ground-based photographs of fractures in Scribner Road, in the ground surface, and in the residential structure at Lot 445;
  - Noting observations by Mr. Norm Gardner, PG, of Clark Patterson Lee (CPL), and by residents, which includes Mr. and Mrs. Gene Nati of Lot 445 and Mr. Zach Staebell of 450 Scribner Road;
  - Reviewing water level data collected by Mr. Gardner, PG in the vicinity of Lot 445; and
  - Conducting site reconnaissance of the CLS Akron Quarry;
- Reviewing historic water levels measured by CLS in residential wells on the east side of the Akron Quarry;
- Reviewing blasting records for the Akron Quarry;
- Researching and reviewing geologic information for the region containing the mine to assess various potential causes. This information is focused on the potential sinkhole formation, seismic faults, and other stress relief structures; and
- Analyzing data as needed.

3.0 RESULTS

This section of the report provides the data from the site and quarry reconnaissance, quarry blasting records, historical water level monitoring results, Mr. Gardner's water level monitoring results, and regional seismic data. Some analysis of this data will be provided in this section; however, the likely significance of the data relative to the observed conditions in the area of Lot 445 will be reserved for the discussion of results in Section 4.0.

3.1 Results of the Reconnaissance at and near 445 Scribner Road

3.1.1 445 Scribner Road Site Area Topographic Base Map

A topographic map of the Lot 445 location and surrounding area is provided on Figure 2. The map also shows the location of residential wells, soil borings provided by Mr. Gardner of CPL, and observed fractures. The soil borings were installed on behalf of the Town of Pembroke. The topographic contours were derived by the drone survey and have been contoured relative to feet above mean sea level at an interval of 2.0 feet. The contours are anticipated to represent an accuracy of ±2.0 feet in the vertical direction and ±0.7 feet in the horizontal direction.

The topographic contours show that the area where the fractures were observed occupies a topographic high with the fractures crossing the road at the peak of the high ground, which is at an approximate elevation of more than 834 ±2.0 feet above mean sea level. The fractures extend along the axis of the topographic high.

3.1.2 Observations of Ground Surface and House Foundation Cracks at 445 Scribner Road

Dr. Gowan inspected and documented the observed fractures. The documentation includes field notes, air photographs from the drone survey, ground-based photographs taken by Dr. Gowan (Appendix A), and ground-based photographs provided by Mr. Norm Gardner (Appendix B).

Some fractures and other linear features on the ground surface and in the road had been modified prior to the arrival of Alpha and AGS at around 11:00 am on August 15, 2022. These modifications included the removal of the road surface using a front end loader, as is evident in the photographs in Appendix A, and also by spraying a white substance on presumed fractures. Alpha and AGS inspected all the marked features and determined that not all were visible fractures at the time of the inspection. Those features that were found to be a fracture were measured for length and orientation and other characteristics. These features that were identified as fractures are displayed on Figure 3. The locations of fractures observed in the road are based on a combination of ground-based photographs and air photographs from the drone survey.

The fracture data, which are illustrated on Figure 3, show that there is a cluster of fractures extending

from northeast of the garage and across the driveway southeast of the garage at Lot 445. More fractures were present in the driveway prior to the morning of August 15; however, these were masked by activities related to the drilling of Boring #2. No fractures were visible to the northeast of the fracture labeled as SWG-138, and no fractures were visible between the driveway and Scribner Road. The SWG-138 label corresponds to Dr. Gowan's field notes. AGS used a GPS to locate the fractures.

A cluster of fractures were visible extending diagonally across the road and into the yard at Lot 440. In general, the fractures encountered at Lot 445, in the road, and at Lot 440 were oriented approximately S29°W and covered a distance of approximately 345 feet from the northeast end of the northeastern-most fracture to the southwest end of the southwestern-most fracture. The only other visible fracture not in the 345-foot-long area is a 4-foot-long fracture located at Lot 430 and approximately 230 feet to the south-southwest of the southwestern end of the 345-foot-long area that ends at Lot 440. The fracture at Lot 430 had an orientation of S3°W.

The 4-foot fracture observed to the south (SWG-133, Figure 3) in Lot 430 is an apparent extension crack with an aperture of approximately 0.5 inches (see Image 3023 in Appendix A). The fracture near the road at Lot 440 (SWG-134, Figure 3) appears to show a small vertical offset (see Image 3024 in Appendix A). The apparent vertical offset extends a very short distance along the 11.75-foot length of the fracture, and the down-dropped side is downslope of the fracture in an area sloping toward the roadside ditch. The 8-foot-long fracture near the mailbox at Lot 440 exhibited a maximum aperture of approximately 1 inch (see Image 3025 in Appendix A). The fractures in the road are recorded on several photographs that are provided in Appendices A, B, and C. Unfortunately, the road was being deconstructed at the time of our inspection so that there was not much time for direct inspection; however, the removal of the black top did allow for an inspection below the pavement.

Damage to the foundation of the home was documented by Dr. Gowan. Images 3028 and 3026 (Appendix A) show that the northwest basement wall was buckled in starting at the fracture that was located approximately 16 inches in from the northeast end of the wall. Image 3026 shows an extension fracture where the buckling appears. Image 3029 (Appendix A) shows an extension

fracture at the northeast corner of the northwest wall of the "Southwest Addition" to the house (Figure 4). The inward buckling of the northeast wall of the "Southwest Addition" is apparent but is less visible than along the northwest wall. A steel support beam is visible on Image 3033 where it has punched through the buckled cinder block wall approximately 10 to 12 feet from the northeast end of the northwest wall.

Image 3037 (Appendix A) shows an extension fracture in the northwest wall. This crack is at the southwest corner of the northwest wall of the "SW Addition" (Figure 4).

Image 3030 (Appendix A) shows the northeast corner of the northwest wall where the extension cracks are visible on both the northwest and northeast walls (Figure 4). Image 3032 shows the same northeast corner of the northwest wall (foreground) with an extension crack visible in the background on the northwest wall of the "Original" part of the house at Lot 445. Image 3031 provides a closeup view of the fracture. It is apparent on Image 3031 that the blocks on the right (southwest) have moved up a fraction of an inch relative to the left side (northeast).

Image 3038 (Appendix A) is a view looking to the northeast along the portion of southeast wall that extends out from the rest of the southeast wall of the "SW Addition" (Figure 4). This picture shows a complex of extension fractures related to the movement of the blocks on the left side toward the northeast relative to the blocks on the right side. Image 3039 provides a wider view of the same location at the front (southeast side) of the house. Images 3040 and 3041 (Appendix A) show tension cracks in the northeast end of the portion of the house represented on Images 3038 and 3039.

3.1.3 Observations by Residents

Observations by the residents were provided as verbal communication from Mr. and Mrs. Gene Nati of Lot 445 and Mr. Zach Staebell of 450 Scribner Road. According to these residents, they began to hear noises (mostly pops and bangs) starting around August 1. They thought these noises were associated with human activity, but later thought they were most likely associated with the ground movement and property damage. These noises were heard periodically and continued through the afternoon of Saturday, August 6. The damage to Scribner Road and the house at Lot 445 was observed on Sunday morning (August 7, 2022) when windows and doors did not open/close properly.

Mr. Nati thought that blasting was occurring in the CLS Akron Quarry, but found that the mine was shut down for the weekend.

3.1.4 Additional Crack Observations

Additional observations were made of one of the cracks in the driveway at Lot 445 by Mr. Gardner. He documented that a large opening had developed in the driveway when he was at the site on August 17, 2022, after a large rainstorm (see photograph in Appendix B). This feature had opened up due to erosion from storm water draining down the crack. The drainage was being naturally funneled to the hole. The hole grew significantly after another significant rain event that occurred before he photographed the feature again on August 22, 2022 (Appendix B).

3.2 Seismic Data

The potential that seismic activity, whether natural or artificial (quarry blasting), is the primary cause of the Lot 445 damage is being evaluated in light of the observations made by the Scribner Road residents. This section provides data regarding the occurrence of quarry blasting and natural seismic activity up to, and during, the event at Scribner Road.

3.2.1 CLS Blasting Data

Blasting has been conducted at the Akron Quarry in 2022 with the start of the construction season in March and continues to the present. Blasting occurs one to three times a week during weekdays. The blasting record at the quarry is provided on Table 1.

County Line Stone (CLS) contracts with Hilltop Energy Inc. to provide and blasting services for its Akron, New York quarry. The New York State Department of Environmental Conservation (NYSDEC) mine permit for the quarry (special condition #12) requires all blasts to be monitored with a properly calibrated seismograph. CLS is required to maintain the records of the blasters report, seismograph records and shot/seismograph location map for each production blast. CLS has conducted 45 blasts at the Akron Quarry, as of August 11, during the current 2022 production season. Table 1 contains a summary of the blast monitoring data for the 2022 production season. The table provides the general location of the blast, seismograph locations, distance between

seismograph and shot, recorded peak particle velocity (PPV) and frequency, as well as the peak overpressure (air-blast). The summarized monitoring data for two seismographs is provided in the table, and it should be noted that seismograph 1 is always the unit located nearest the shot; therefore, the PPV values for seismograph 1 are typically higher than those recorded by seismograph 2. The first blast for the 2022 production season occurred on March 16, 2022, and the most recent blast data on the table was for shot number 45, which took place on August 11, 2022.

This review of the blasting record is focused on the period around the time noises and damage were noted in the Lot 445 area on Scribner Road. CLS conducted two shots on August 1, 2022; two shots on August 5, 2022; and one shot on August 11, 2022. The detailed blasters' reports for these five shots (shot #41 - #45) are included in Appendix C for reference. A map in Appendix C shows the locations of the five CLS August shots with the corresponding distances to the seismograph monitoring locations and the distance to the Nati residence on Scribner Road.

3.2.2 Natural Seismicity

Alpha and AGS reviewed data from the United States Geological Survey (USGS) and other sources to assess whether there was any recent earthquake activity in the region containing the Scribner Road site. The USGS documented ten earthquakes in the northeast from June 10 through August 15, 2022 (Figure 6). Two of these occurred in western New York. The closest of these events occurred in Genesee County, between Batavia and LeRoy, approximately 20 miles east of Lot 445. The data for these events are provided on Table 2.

Additional seismograph records for other sites in the northeast region of the U.S. are accessible at the Lamont-Doherty Cooperative Seismographic Network (LCSN). According to the LCSN website, LCSN lost its USGS funding, but the seismographs are still actively recording data. The closest seismograph in the LCSN is at Canisius College in Buffalo, NY (CCNY). The seismograph at CCNY recorded more than 100 events between June 8 and August 15, 2022 (Figure 7); however, a minimum of three stations must record the event in a broad area to obtain a reasonable estimate of the event's location.

Alpha identified an event recorded at the CCNY location that occurred at approximately 4:25 pm, on

Saturday, August 6, 2022. This event was also recorded at several other stations in the LCSN. The seismograph records at Buffalo, NY (CCNY); Ithaca, NY (PRNY); Middlebury College, VT (MCVT); and Kent School, CT (KSCT) had suitable records to determine the approximate distance between the seismograph and the seismic event's epicenter. These records are provided in Appendix D, and the station locations are shown on Figure 8.

The determination of an array of seismographs distributed across a region is based on the concept that primary vibration waves (P-waves), which pass through earth materials directly from the source to the seismograph, move at a rate that is faster than secondary waves (S-waves), which move along the earth's surface. It is assumed that the P and S waves each move at constant rates, such that the difference between the arrival times of the P and S waves at the seismograph can be used to estimate the radial distance between the seismograph and the event. The approximate event location occurs somewhere in the general area where the radial distances from all the seismographs intersect. The interpretation, which was conducted by Mr. Josh Gowan, PG of Alpha, is shown on Figure 8. The results appear to show that the event recorded at 4:25 pm, on August 6, 2022 occurred somewhere in western New York State. Alpha considers this result to be a reconnaissance-level analysis since it was very difficult to get precise measurements between the P- and S-wave arrival times from the seismograms available from the LCSN database.

3.3 Review of Ground Water Level Data

Review of ground water level data is important to this investigation because there is a potential for sinkholes to form when the water table gets drawn down to greater depths than normal, followed by periods of high precipitation/ground water recharge that causes soil overlying voids in the rock to collapse into the underlying voids. Voids form in rocks, such as limestone, that are susceptible to being dissolved by water. An explanation for how these sinkholes develop was previously provided to CLS, by Mr. John Hellert of AGS, to describe sinkholes that were found in the vicinity of the Akron Quarry in 2010. The report is included in Appendix E.

There is potential for sinkholes, of the type described by Mr. Hellert, in the area of Lot 445. It is also our understanding that the residents along Scribner Road have expressed concern that the water table has become depressed in the area due to pumping at the Akron Quarry, and a well at Lot 445 was

found to be dry when measured sometime shortly after August 7, 2022. There are no data regarding when it went dry since the well was not being used due to the area being on public water. The rest of this section provides historical water level data collected by CLS and data collected by Mr. Gardner from local wells and a monitoring well installed by the Town behind the house at Lot 445.

3.3.1 Water Level Data from CLS Residential Well Monitoring

CLS has been measuring water levels in residential wells around the Akron Quarry on a semi-annual basis since the fall of 2003. The wells on the east side of the quarry are the most important to the evaluation of the Scribner Road condition. The east side wells include six along Cohocton Road and one on Scribner Road. These water level data are provided on Table 3, and the well locations are shown on Figure 5.

Hydrographs for the six Cohocton Road wells and the single Scribner Road well are provided in Appendix F. The hydrographs show that the water levels in wells 283, 300, 328, and 390 on Cohocton Road increased after first being measured in 2003. The water levels in these wells stopped trending upward during the past few years, and there has been an increase in the range between the high and low water levels. The other two Cohocton Road wells (301 & 472) have had relatively constant average levels over time. Overall, there is no evidence that there has been a decline in average water levels in any of the residential wells on the east side of the quarry along Cohocton Road.

The only residential well monitoring on Scribner Road (374) took place from 2003 through the spring of 2013. That well was also showing an upward trend over time. There is also no evidence of a long-term drawdown effect from the Akron Quarry in this well.

The water level elevation data for the Cohocton Road wells were used to construct ground water elevation profiles. The location of the profile is shown on Figure 5, and the profiles for all the measurements taken from 2003 through the spring of 2022 are provided on Figure 9. The profiles show that the water levels rise to the east in the direction away from the Akron Quarry until reaching Well 301 where there is a significant water level drop. The water elevation rises again further to the east at Well 328.

The approximate quarry face is shown on the western end of the profile section (Figure 9). Although there are no data for ground water levels on the quarry either at the location of the profiles or for the dates represented by the well data, Dr. Gowan was able to approximate the water table elevation for quarry face seepage on August 15, 2022. Photograph 3061 (Appendix A) shows seepage from the east side quarry face, and Photograph 3062 shows ground water seepage in the quarry face in the northeast corner of the quarry (see Appendix A). The top of the rock/base of the unconsolidated overburden in that area is estimated to be at an elevation of 825± feet. These photographs show that the water table is approximately 2/3 of the distance above the quarry floor in this area of the quarry. Precipitation data from the from the nearest weather station with a complete record (Buffalo Niagara International, NY station) shows that precipitation in the region has been below normal every month from March through July of 2022 (Figure 10).

3.3.2 Water Level and Soil Boring Data from Mr. Norm Gardner of CPL

Mr. Gardner of CPL measured water levels in residential wells at 430 Scribner Road and in a soil boring (SB-4) on the northwest side of the house at Lot 445. He measured water levels on four days (August 15, 18, 25 and 31, 2022). These data and the well locations are provided in Appendix G. According to Mr. Gardner, the measuring point elevation was surveyed with a GPS unit to an accuracy of 0.1± feet. The data also include a water level recorded by the USGS at a monitoring well in Batavia. The water levels in the wells were dropping slightly during August, which is normal for August and the overall dry conditions in the area. The well location and soil boring logs for the Lot 445 area are also shown on Figure 2.

Mr. Gardner also provided soil boring logs (SB-1 through SB-4), which are provided in Appendix H. The boring logs indicate that rock was confirmed at a depth of 29.5 feet in SB-2. All the holes encountered glacial till at a depth range of 16.3 feet (SB-1) to 28 feet (SB-4). The soil above the till appeared to be mostly fine silty sand, which is consistent with glacial lake deposits. Only SB-4 was confirmed to intersect the water table; though it seems likely that SB-2 and SB-3 would have also been below the water table, if wells had been set in those holes.

3.4 Surficial and Bedrock Geology

The surficial geology in the area of Scribner Road that contains Lot 445 consists of lacustrine (lake) deposited silt and clay based on mapping by the New York State Museum (Figure 11). These findings are consistent with the deposits encountered in the four soil borings included in Appendix H. It is apparent from the soil borings that a glacial till is present at the top of the underlying rock and below the lacustrine silt and sand. This till is mapped as being exposed at the land surface in the area around the Akron Quarry.

The bedrock in the Lot 445 area consists of the undifferentiated Onondaga Limestone (Figure 12). It is John Hellert's interpretation that the limestone is most likely the Seneca Member of the Onondaga Formation. The Seneca Member is the most susceptible of the Onondaga Formation members to dissolution and void formation in the rock.

4.0 DISCUSSION OF RESULTS

A general rule of thumb for assessing the cause of damage to the environment and property is that cause must be consistent with the data. This is the approach that is applied in the understanding of the Scribner Road event. The various data that have been reviewed will be discussed; and an opinion given as to whether the data are related to the cause, and if related, then what is the potential cause of the observed conditions.

4.1 Ground Water Drawdown by Akron Quarry Dewatering

It is our understanding that the formation of a sinkhole at Lot 445 has been postulated as the mechanism for damage at and around Lot 445 and that ground water pumping by the Akron Quarry has drawn the water level down at Lot 445 and triggered the development of a sinkhole. Analysis of the residential well data indicates that the ground water has not been drawn down in the Lot 445 area by the Akron Quarry dewatering.

The hydrographs for the Cohocton Road wells and the one well on Scribner Road show that water well levels have been either rising or stable during the past nineteen years. Unfortunately, the monitoring at 374 Scribner Road could not be continued after the spring of 2013; however, additional

evidence, to be discussed subsequently, shows that the area of that well and the residences further east, such as Lot 445, are isolated from the quarry drawdown area by one or more intervening ground water divides, which will be discussed next.

The ground water elevation profile provided along Cohocton Road (Figure 9) shows that there is a ground water divide that lies close to Well 301. A ground water divide is a line separating areas where ground water flow is in opposite directions on opposite sides of the line. This particular divide near Well 301 is shown on Figure 13. The location of this divide was established by the USGS and has been confirmed by the CLS residential well monitoring data. The ground water on the west side of the divide flows to the west toward the Akron Quarry, and ground water on the east side flows toward the drainage feature shown on Figure 13. The directions of flow along the divide to the north of Cohocton Road and in the area of Scribner Road are also shown on Figure 13. The effect of this divide is that water to the east of the divide has no connection to the Akron Quarry. The divide extends to the north and south, and effectively, also isolates the area around 445 Scribner Road from the drawdown effects of the Akron Quarry. It is the result of this separation that ground water drawdown effects by pumping at the Akron Quarry could not influence the water table at Lot 445.

4.2 Quarry Blasting

Seismographs are utilized for blast monitoring to record data associated with the ground vibration and the peak overpressure or air-blast. The peak particle velocity or PPV, which is provided on Table 1, is typically the first item that is looked at when interpreting vibration monitoring data. Along with the PPV, the frequency of the wave in hertz is recorded and a printout of the waveform is typically included with the seismograph dataset. As a general rule of thumb, a PPV value of 2.0 in/sec or greater is recognized as the level at which damage from blasting induced ground vibrations may occur. The NYSDEC mine permit for the CLS Akron quarry includes special condition 15, “Ground Vibration Limits,” which references the use of USBM RI 8507 and the graph that is included in Appendix C. The graph is widely used for compliance and determination of the potential for damage resulting from blasting. The graph plots the PPV versus the frequency values of the ground vibration and looks at plotted location with regards to a criterion line on the graph (see Figure C-1 in Appendix C). Special condition 14 of the CLS NYSDEC mine permit addresses the air blast limits and notes the air blast shall

not exceed 133 dB at the location of any dwelling, public building, school, church, or community structure outside the permit area.

As previously noted, CLS has conducted 45 blasts at the Akron quarry so far in 2022. These cover the period starting in mid-March and ending August 11, 2022. Approximately 60 percent of the blasts were located in the northwest corner of the quarry, approximately 30 percent of the blasts were located in the southern end of the quarry, and the remaining shots were located the central area of the quarry. The blast locations are shown on Figure C-2 in Appendix C. The recorded PPV values for all the CLS shots in 2022 are less than 2.0 in/sec. The highest recorded PPV values were from shot #4 on March 23, 2022. That shot resulted in a PPV of 1.48 in/sec and a corresponding frequency of 41 hertz when measured at a distance of only 400 ft to the closest seismograph, which was located at a nearby brine line. Shot #5 on March 30, 2022 recorded a PPV of 1.54 in/sec, and no frequency was recorded at the seismograph, which was located north of the face at a distance of 594 ft.

It can be noted that the majority of the PPV values for the 2022 season are below 1.0 in/sec, and that those in the 1.0 to 1.5 in/sec range are due to the close proximity of the seismograph (400-600 ft. distance) from the blast location. The associated frequency values are generally in the 35 to 55 hertz range. The air blast data shows no exceedance of the NYSDEC 133 dB permitted level. The highest noted value was 130.8 dB, and the majority of the values were in the 115 to 125 dB range. CLS conducted two blasts in the northwest corner of the north quarry (shots #43 and #44) on August 5, 2022, two days preceding the Scribner Road event, The vibration monitoring data for these two shots were 0.6 and 0.51 in/sec for the PPVs, with corresponding frequencies in the 40 hertz. range. Both of these shots were within the compliance limits and well below the criterion level for any potential for damage.

Distance is a critical factor or variable when considering the potential for damage from blasting. As the distance away from a blast is increased the corresponding blast energy and resultant ground vibrations decrease. This attenuation can be observed by looking at the seismograph data from shot #44 on August 5, 2022. Seismograph 1, which was located 734 ft from the shot, recorded a PPV of 0.51 in/sec; and seismograph 2, which was located 1135 ft from the shot, recorded a PPV of 0.054 in/sec; and seismograph 3 which was located 2521 ft from the shot,

recorded a PPV of 0.022 in/sec. The distance between the CLS shots in the northwest quarry area and the Nati residence on Scribner Road is approximately 5,490 feet or just over a mile. At this distance, the resultant blast energy and ground vibrations, from the CLS shots, are clearly reduced due to attenuation, and well below the vibration levels needed to result in major structural damage to a residential structure. In summary, nothing anomalous can be noted in the CLS blasting data for 2022, and CLS is in compliance with the NYSDEC's mine permit blasting conditions.

4.3 Significance of the Observed Ground Cracks

It has been Alpha's experience that cracks at the land surface provide important evidence of the nature of the movement of the ground in the subsurface. The fact that the surface cracks follow a relatively linear pattern extending for approximately 575 feet before terminating at both ends leads to the interpretation that the underlying mechanism is not a sinkhole. Alpha and AGS have been involved with the investigation of sinkholes for several decades and have found that cracks that form during the early stage of the development of these features form arcs around the center of the sink as the center subsides as shown by the two examples in Appendix I.

The significance of the subsurface motion at the Scribner Road site is best illustrated by looking at the fracture pattern crossing the road despite the fact that the fractures were being destroyed as Alpha and AGS were conducting the investigation. The fractures cross the road in a swarm of roughly parallel fractures in a zone that is approximately 15 to 18 feet wide in the area shown on Figure 14. All of these fractures are extension features (see Images 3009, 3010, 3012, 3016, 3017, 3018 in Appendix A and Gardner's images of cracks in Scribner Road in Appendix B).

Gardner's closeup picture of the center stripes in Scribner Road appears to show a down-drop to the left (northwest) relative to the right (southeast). This apparent displacement is illustrated on a reproduction of Gardner's picture as Figure 15. There also appears to be a right-lateral shift across the fracture; however, this apparent right-lateral shift may be an optical illusion resulting from the angle of the camera. The apparent right-lateral shift is also visible and annotated on the photograph taken of the road subbase (Figure 16). There is also less ambiguous evidence of a right-lateral shift in the foundation at the front of the house as illustrated on Figure 17. The location of this picture is

provided on Figure 18. A photograph of the northwest foundation wall of the "Original" part of the house shows that portions of the house to the right (southwest) have separated and are higher relative to the northeast parts of the "Original" house on the left side (Figure 19).

There is evidence that the cracks in the road and ground surface are extension features, which indicate that the road and ground are being pulled apart. The fact that the tension cracks occupy a zone that is 15 to 18 feet wide and forms a linear feature that is several hundred feet long suggests that the feature may be a linear zone of uplift that is consistent with the formation of a bedrock "pop-up," which is actually common in Genesee County, western New York and southern Ontario, Canada.

4.4 Discussion of Pop-ups

Pop-ups occur as the result of high horizontal stresses in bedded carbonate rocks like those that exist beneath Scribner Road. The concept is illustrated on page 4269 of Ghasemi et al. (2021), which is presented in Appendix J. The high horizontal stresses exist naturally in the region. According to Fakundiny et al. (1978), pop-ups form in the shallow (near-surface) rock zone in western New York due to high, residual horizontal stresses that persist throughout the region due to a variety of possible, natural causes. These stresses are oriented generally east-west to northeast-southwest. The pop-ups form orthogonally to the stresses and are predominantly oriented northeast to southwest but vary between north-south and northeast-southwest (Fakundiny et al., 1978). Fakundiny et al. (1978) noted that pop-ups tend to be associated with the Clarendon-Linden Fault (CLF) System, which is a complex of north-south faults passing through Genesee County east of Lot 445 (Figure 20). A map by Fakundiny showing the clustered pop-ups around the CLF System is provided in Appendix K. Fakundiny documented more than 80 pop-ups in the region.

It is generally understood that pop-ups occur in seismically active areas (Wallach et al., 1993; Fakundiny et al., 1978; Ghasemi et al., 2021). The Scribner Road area is within a seismically active area. Although no earthquake event has been documented at this specific location, the evidence shows that recent, natural seismic events did occur in the region around the time that damage occurred in the Lot 445 area.

Pop-ups have been documented in open fields, beneath lakes, in the bottoms of quarries, in underground openings (mines and tunnels, and in streams (Lewis, 1995; Wallach et al., 1993). The photographs in Appendix L show pop-ups from open fields and in quarries (Wallach, et al., 1993). A map of pop-up locations from Wallach (1993) is provided in Appendix L. Some pop-ups are relatively old and likely formed soon after the glacier left New York (Gilbert, 1892). Appendix M provides photographs of open field pop-ups; which are located in Caledonia, New York; that are relatively old. These open field pop-ups are part of a swarm that is visible on a lidar image of the Caledonia/LeRoy area (Figure 21). These Caledonia area examples are visible where the soil cover is much less than it is in the Scribner Road area. Many other pop-ups are known to be much more recent (Fakundiny et al., 1978; Wallach et al., 1993). In fact, Wallach et al. (1993) documents a pop-up that was observed forming in a central Kentucky creek bed in 1877. The farmer reported that he,

> *witnessed the bedrock in a stream heave up with such force that rocks flew up from the stream bed. The activity persisted and travelled [sic] upstream at the rate of a slow walk for about 150 feet before disappearing between the stream bank. Rumbling sounds were heard the rest of the day as the rock beneath the surface continued to rupture. The result was an upwarped ridge, known as an anticline, of bedrock about 3 feet wide, 10 inches high and 150 feet long with a crack at the crest that emerged parallel to and within the stream bed.*

These same types of pre-existing and recent features exist in the region near the Scribner Road area. For example, a pop-up was discovered in the floor of the Akron Quarry and was detected extending up through the rocks and overburden when the area was core drilled in 1996 and subsequently when mined more than ten years ago. Figure 22 shows the feature in the quarry floor (foreground) and in the quarry face on the west side of the quarry. Figure 23 shows the same feature on the east rock face. The slight upwarping of the glacial overburden is illustrated on the figures. This pop-up is documented in images 3048, 3049, 3050, 3059, and 3060 in Appendix A. The trace of this pop-up, which is oriented northwest to southeast across the quarry floor is shown on Figure 24.

A more recent pop-up has also been documented in the quarry floor at the CLS Akron Quarry on Images 3042 through 3048. Although this more recent pop-up is smaller and has an irregular shape, it does show the creation of voids that can occur at the base of the feature between the deformed rocks and the underlying rock layer that has remained in its original position; consequently, water can collect in the void between the uplifted layers as illustrated on the diagram from Ghasemi (2021) that

is provided in Appendix J. The Ghasemi diagram shows the void in the multi-layer buckling model. Vertical faulting through to the surface of the rock (Appendix L) will allow water to drain rapidly down from the surface like the condition documented by Mr. Gardner in the driveway at Lot 445 (see photographs in Appendix B).

5.0 SUMMARY OF RESULTS AND CONCLUSIONS

The fracture characteristics (linear extension (tension) fractures) are consistent with the formation of a neotectonic stress pop-up in the top of rock (Neotectonic describes deformation or motion in the upper layers of the earth that are recent or current.). The depth to the rock through the fine silty sand and till would subdue the expression of the uplift at the surface. The ability of water to flow down and erode/transport soil is consistent with a vertical breach through a rock pop-up and the development of a void beneath the arch.

The subtle suggestion that the tension cracks appear to have a small right-lateral movement along the structure has not been documented in other examples of pop-up structures; however, it is not unreasonable for a small amount of right-lateral sheer to occur along the strike of the structure. This subtle right-lateral movement is consistent with the sheer offset visible in the front of the house at Lot 445.

There is no evidence that the event at, and near, Lot 445 was triggered by mining at the Akron Quarry. If a buried pop-up structure is the feature that has caused the damage at Lot 445, then continued deformation and associated noise should gradually subside since the stress that caused the pop-up has likely been relieved. There may be further extensions of the feature toward unrelieved areas to the northeast and southwest beyond the observed limits of the fractures. There also may be further adjustments in the area of Lot 445 as soil fills the voids beneath the pop-up, as has been observed by the creation of widened fractures by soil erosion in the driveway. This may continue for a period of time.

The following are the primary conclusions derived from this assessment:

1. Blasting at the Akron Quarry of County Line Stone (CLS) did not cause the damage at Lot 445 Scribner Road and the surrounding area based on:

a. The time of blasting at the quarry does not correlate with the time of noises and damage in the Lot 445 area.
b. There have been no reports of similar damage related to mine blasting over the 4,700-foot distance between the Lot 445 area and the quarry.
c. The peak velocities recorded during quarry blasting have been within permit limits, and the vast majority have been well below those limits.
d. The recorded blasting data for the Akron Quarry show that blasting energy is attenuated as the distance away from the blast increases; consequently, it is highly improbable that blasting at the Akron Quarry caused the impacts observed at and near Lot 445 Scribner Road at a distance of approximately 4,700 feet.

2. The water table in the Lot 445 area has not been drawn down by the dewatering at the quarry based on:
    a. The presence of a ground water divide, which was mapped by the USGS and confirmed by this investigation, that prevents the ground water from the Lot 445 area of Scribner Road from flowing to the quarry.
    b. The water levels in the region on the east side of the quarry do not show a declining trend during the past 19 years.
    c. Ground water drawdown is limited in the northeastern area of the Akron Quarry as indicated by the active seepage face that is two-thirds of the distance up the face from the quarry floor despite a relatively dry spring and summer.
3. The probable cause is not likely to be the result of the collapse into a natural underground void (sinkhole) based on the linear nature of the observed cracks.
4. A plausible potential cause of the ground movement and property damage at Lot 445 Scribner Road and adjacent property is a neotectonic stress relief structure that is referred to in the published literature as a pop-up. This is based on:
    a. Pop-ups are documented in the area, which includes the local area, Genesee County, western New York, and southern Ontario, Canada.
    b. Pop-ups form as the result of residual stress in the earth's crust that has been confirmed to have existed in the area for an extended period of geologic time.
    c. Pop-ups can form in open areas unrelated to mines and other excavations.

d. Pop-ups are generally linear and form fractures.
e. Pop-ups can make noise and may continue to progress over a period of time.
f. Pop-ups can have void space at depth and are fractured; consequently, they can be conduits for the movement and storage of water.
g. Pop-ups are associated with earthquake prone areas.
h. The Clarendon-Linden Fault System passes through the middle of Genesee County. The nearest fault line of that system is approximately 12 miles east of Lot 445, and at least one earthquake was documented along the fault system by the USGS on August 15, 2022.

5. There is insufficient information to assess whether further ground movement or property damage could occur in the Lot 445 neighborhood.

6.0 RECOMMENDATIONS

The following recommendations are focused toward the health and welfare of the residents living in the Scribner Road neighborhood and/or traveling along the road:

- Establish a microseismic monitoring network which is designed to:
  - Assess whether deformation is ongoing in the rock below the soil overburden;
  - If deformation is ongoing, whether the deformation is stabilizing; and
  - Where deformation is occurring.
- Install a shallow and a deep bedrock monitoring well along Scribner Road to:
  - Replace the residential well along Scribner Road that is no longer accessible to CLS; and
  - To provide more ground water monitoring in this area as the Akron Quarry still expands to the north.

7.0 REFERENCES

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TABLES

TABLE 1

County Line Stone Akron, NY Quarry Summary of Blast Monitoring Data for 2022 Production Season through August 15, 2022

Scribner Road Project

Town of Pembroke, Genesee County, New York

Shot #	Date	Group	Location	Seismograph 1 Data									Seismograph 2 Data			
				Seismograph #1 Location	Distance (ft)	PPV Tran	freq Tran	PPV Vert	freq Vert	PPV Long	freq Long	POP	Location	PPV Tran	PPV	POP
1	3/16/22	New Third - Upper South	New Third - 54' South Corner	Old Ent.	1670	0.121	32	0.05	35	0.146	36	130.7				
2	3/16/22	NW - lower Lift	NW - lower Lift	Yellow House	579	0.64	38	0.3	73	0.59	41	116.9	North of Face	1143	0.24	NA
3	3/23/22	NW - lower Lift	NW - lower Lift	Yellow House	776	0.4	41.8	0.26	78	0.65	42	125	North of Face	1087	0.23	NA
4	3/23/22	NE Corner	NE 50' Highwall	Brine Line	400	1.04	47	1.27	70	1.48	41	125	Yellow House	2803	0.02	119
5	3/30/22	NW - Upper Lift	NW - Upper Lift	North of Face	573	1.3		1.05		1.54			Yellow House	1030	0.05	126.9
6	3/30/22	NW - lower Lift	NW - lower Lift	North of Face	955	0.3		0.23		0.24			Yellow House	1008	0.06	117.1
7	4/4/22	NW - Upper Lift	NW - Upper Lift	North of Face	594	1.15		0.58		1.02			Yellow House	1024	0.15	125
8	4/7/22	New Third - Upper South	New Third - 54' South Corner	Lab Building	859	0.62	46	0.32	41	0.55	45	118	Old Ent.	1695	0.15	130.8
9	4/12/22	NW - lower Lift	NW - lower Lift	Yellow House	819	0.2	42	0.25	66	0.41	37	121	North of Face	1025	0.15	
10	4/19/22	NW - lower Lift	NW - lower Lift	North of Face	884	0.14		0.08		0.122			Yellow House	1014	0.05	114
11	4/19/22	NW - lower Lift	NW - lower Lift	Yellow House	574	0.51	37	0.43	62	0.79	32	117	North of Face	1080	0.09	
12	4/22/22	NW - lower Lift	NW - lower Lift	Yellow House	784	0.32	41	0.17	64	0.26	42	124	North of Face	961	0.09	
13	4/28/22	North Highwall	North 48' Face	North of Face	923	0.12		0.05		0.09			Yellow House	1196	0.02	120
14	5/6/22	New Third - Upper South	New Third - 54' South Corner	Lab Building	920	0.34	41	0.36	42	0.41	43	114	Old Ent.	1613	0.14	120
15	5/6/22	NW - lower Lift	NW - lower Lift	Yellow House	587	0.49	47	0.49	70	0.92	42	120	North of Face	950	0.13	
16	5/9/22	NW - lower Lift	NW - lower Lift	Yellow House	871	0.07	31	0.03	81	0.13	35	114	North of Face	905	0.09	
17	5/9/22	Road B	Road B	NT									NT			
18	5/13/22	New Third - Upper South	New Third - 54' South Corner	Lab Building	828	0.46	44	0.48	44	0.54	45	117	Old Ent.	1713	0.11	128
19	5/13/22	NW - lower Lift	NW - lower Lift	North of Face	853	0.16		0.1		0.16			Yellow House	1040	0.03	114
20	5/19/22	NW - lower Lift	NW - lower Lift	Yellow House	574	1.23	41	0.54	46	1.05	39	120	North of Face	896	0.17	
21	5/25/22	NW - lower Lift	NW - lower Lift	Yellow House	886	0.11	33	0.07	71	0.12	42	115	North of Face	832	0.16	
22	6/1/22	NW - lower Lift	NW - lower Lift	Yellow House	564	0.87	44	0.51	81	0.57	46	116	North of Face	928	0.13	
23	6/1/22	NW - lower Lift	NW - lower Lift	Yellow House	522	0.73	43	0.55	81	0.56	40	118	North of Face	1231	0.07	
24	6/7/22	NW - lower Lift	NW - lower Lift	North of Face	743	0.21		0.122		0.16			Yellow House	992	0.057	118
25	6/9/22	New Third - Upper South	New Third - 54' South Corner	Old Ent.	1635	0.07	35	0.06	68	0.14	32	118				
26	6/15/22	NW - lower Lift	NW - lower Lift	North of Face	751	0.49		0.24		0.23			Yellow House	1043	0.038	116
27	6/16/22	NW - lower Lift	NW - lower Lift	North of Face	746	0.16		0.11		0.18			Yellow House	986	0.06	115
28	6/16/22	New Third - Upper South	New Third - 54' South Corner	Old Ent.	1578	0.05	51	0.04	25	0.08	25	117				
29	6/22/22	Dev. Shot	4th lift, South Corner	Old Ent.	1264	0.13	66	0.16	100	0.23	62					
30	6/22/22	New Third - Lower South	New Third - 27' South Corner	South of Face	510	1.3	53	0.86	49	1.5	54	119	Old Ent.	1412	0.13	120
31	6/24/22	NW - lower Lift	NW - lower Lift	Yellow House	583								North of Face	917	0.14	
32	6/30/22	NW - lower Lift	NW - lower Lift	North of Face	706	0.25		0.26		0.3			Yellow House	1051	0.04	117
33	7/5/22	New Third - Lower South	New Third - 27' South Corner	Yellow Lab	1016	0.21	37	0.23	38	0.17	35	118	Old Ent.	1481	0.07	125
34	7/6/22	New Third - Upper South	New Third - 54' South Corner	Employee Lockeroom	829	0.39	43	0.27	39	0.34	42	118	Old Ent.	1635	0.07	
35	7/8/22	Old 3rd Lift	Old 3rd - 34' Face	Old Ent.		0.02	43	0.02	97	0.04	30	109				
36	7/8/22	Old 3rd Lift	Old 3rd - Western Side	Old Ent.	2462	0.02	39	0.01	39	0.03	39	104				
37	7/13/22	New Third - Upper South	New Third - 54' South Corner	Employee Lockeroom	843	0.29	40	0.36	42	0.38	43	117	Old Ent.	1663	0.09	118
38	7/13/22	NW - lower Lift	NW - lower Lift	North of Face	657	0.32		0.28		0.33			Yellow House	831	0.1	112
39	7/19/22	Dev. Shot	4th lift, South Corner	Employee Lockeroom	1220	0.4	43	0.35	42	0.41	43	119	Old Ent.	1291	0.16	120
40	7/21/22	New Third - Upper South	New Third - 54' South Corner	Employee Lockeroom	800	0.59	46	0.28	40	0.54	46	119	Old Ent.	1626	0.09	118
41	8/1/22	New Third - Lower South	New Third - 27' South Corner	Employee Lockeroom	1036	0.375	42	0.165	35	0.25	38	114	Old Ent.	1512	0.04	119
42	8/1/22	NW - lower Lift	NW - lower Lift	North of Face	650	0.39		0.37		0.39			Yellow House	815	0.14	116
43	8/5/22	NW - lower Lift	NW - lower Lift	Yellow House	571	0.6	43.6	0.42	73.1	0.5	52.5	114	North of Face	911	0.093	
44	8/5/22	North Highwall	North 48' Face	North of Face	734	0.51		0.16		0.38			Yellow House	1135	0.054	125
45	8/11/22	New Third - Lower South	New Third - 27' South Corner	Old Ent.	1546	0.04	81	0.03	68	0.05	47	119	Yellow House	3363	0.024	108

TABLE 2

USGS Earthquake Data for New York and Surrounding Region

June 10 through August 15, 2022

Scribner Road Project

Town of Pembroke, Genesee County, New York

Date/Time	Latitude	Longitude	Depth (miles)	Magitude	USGS ID	Epicenter Description	Distance from Site (miles)
2022-08-15 06:37:36.419Z	43.0004	-78.0614	5	1.2	us6000ib82	6 km WNW of Le Roy, New York	20
2022-08-12 07:33:49.403Z	44.8809	-75.1663	14.75	1.7	us6000ia5v	2 km SSE of Morrisburg, Canada	210
2022-08-08 14:20:07.215Z	44.667	-74.5337	10.24	1.6	us6000i9ma	1 km SE of Saint Regis Falls, New York	227
2022-07-27 16:38:16.935Z	44.6747	-74.5299	2.84	0.9	us6000i63i	1 km E of Saint Regis Falls, New York	227
2022-07-27 04:52:50.663Z	44.6614	-74.5626	8.09	2.5	us6000i5tm	1 km SW of Saint Regis Falls, New York	227
2022-07-15 07:36:11.064Z	43.4753	-78.1768	5.86	1.3	us6000i2yt	23 km NE of Lyndonville, New York	37
2022-07-13 07:28:22.606Z	44.8551	-74.6312	8.146	1.2	us6000i2aw	9 km WNW of Brushton, New York	230
2022-06-28 02:51:58.744Z	41.0307	-79.4775	7.08	2.1	us7000hkre	2 km ESE of Rimersburg, Pennsylvania	145
2022-06-24 13:54:28.796Z	44.9442	-75.1582	13.29	2.2	us7000hjws	5 km NNE of Morrisburg, Canada	212
2022-06-10 09:11:23.510Z	44.5301	-78.1565	5.25	2.3	us7000hgnl	13 km NE of Lakefield, Canada	108

Notes:

-USGS Earthquake Hazard Program online Earthquake catalog (https://earthquake.usgs.gov/earthquakes/map/). Search performed by date (6/10-8/15/2022), magnitude (greater than 0.5), and distance from site (less than 250 miles).

TABLE 3

County Line Stone Residential Water Level Data for the East Side of the Akron Quarry

Fall 2003 through Spring 2022

Scribner Road Project

Town of Pembroke, Genesee County, New York

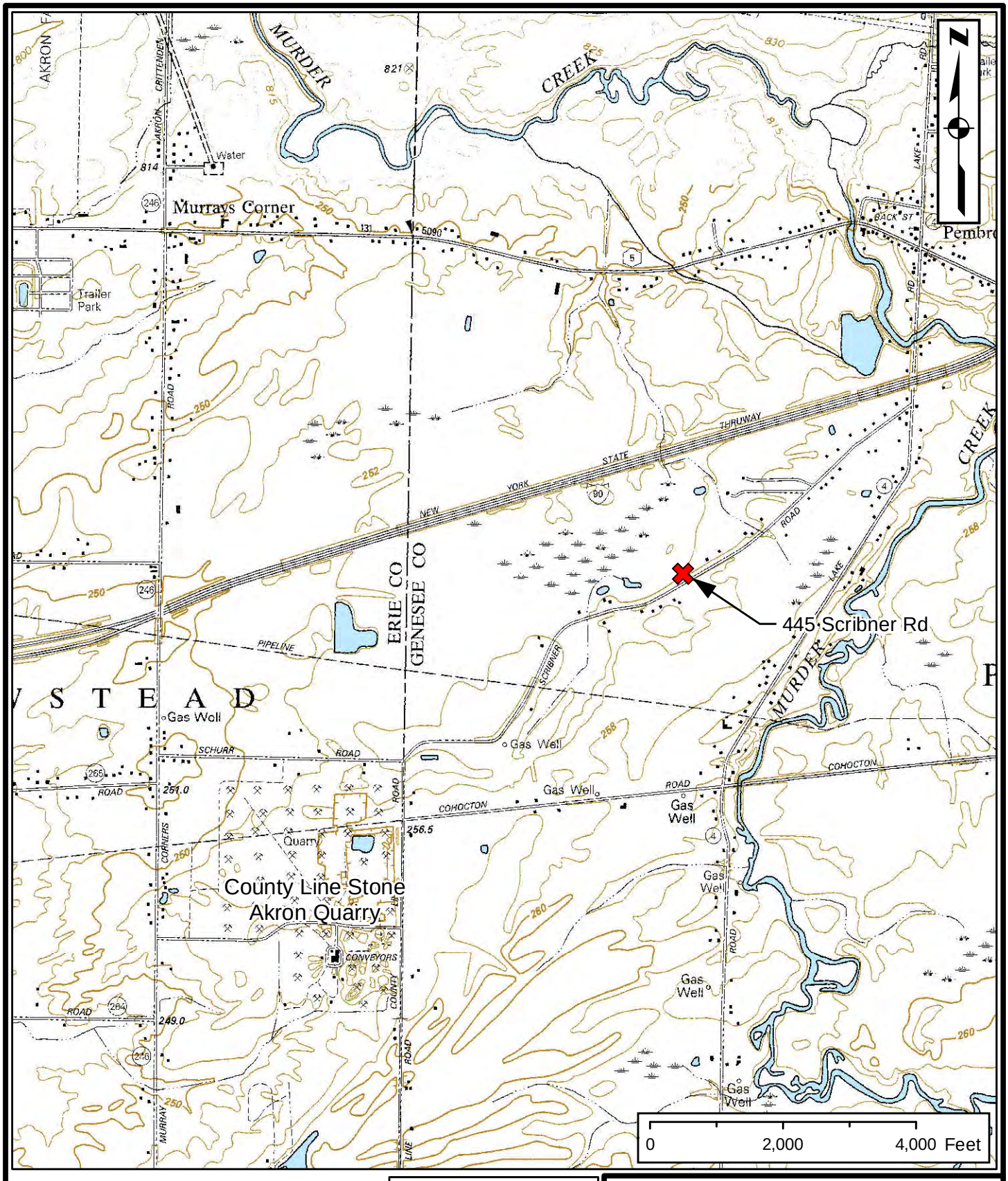
Measurement Season	283 Cohocton			300 Cohocton			301 Cohocton			328 Cohocton			390 Cohocton			472 Cohocton			374 Scribner		
	MP Elev = 842 feet			MP Elev = 843 feet			MP Elev = 842 feet			MP Elev = 844 feet			MP Elev = 848 feet			MP Elev = 850 feet			MP Elev = 833 feet		
	TD = 82.4			TD = 75.2 feet			TD = 102.2 feet			TD = 49.5 feet			TD = 41.6 feet			TD = 32.7 feet			TD = N/A		
	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)	Date	Depth (feet)	Elevation (ft msl)
Fall 2003	9/29/03	66.5	775.7	9/29/03	68.8	774.2	11/26/03	58.1	783.9	11/5/03	22.9	821.1	9/29/03	14	834.0	9/29/03	7.7	842.3	9/29/03	53	780.0
Spring 2004	4/14/04	52.0	790.2	4/14/04	60.5	782.5	4/20/04	53.5	788.5	4/12/04	19.6	824.4	4/21/04	13.2	834.8	4/23/04	6.5	843.5	4/8/04	39.9	793.1
Fall 2004	10/27/04	61.2	781.0	10/27/04	62.2	780.8	10/5/04	56.3	785.7	10/29/04	25.4	818.6	10/2/04	18.1	829.9	10/18/04	7.8	842.2	10/18/04	47.1	785.9
Spring 2005	4/11/05	50.4	791.8	4/11/05	60.2	782.8	4/11/05	52.7	789.3	4/11/05	20.1	823.9	4/11/05	12.9	835.1	4/11/05	9.6	840.4	4/22/05	40	793.0
Fall 2005	10/14/05	55.6	786.6	10/14/05	66.2	776.8	10/14/05	50.1	791.9	10/14/05	26.3	817.7	10/14/05	16.3	831.7	10/14/05	9.6	840.4	10/21/05	40.4	792.7
Spring 2006	4/7/06	47.1	795.1	4/7/06	55.9	787.1	4/7/06	50	792.0	4/7/06	17.9	826.1	4/7/06	16.9	831.1	4/7/06	7.8	842.2	4/24/06	35.8	797.2
Fall 2006	10/3/06	62.0	780.2	10/3/06	61.9	781.1	10/3/06	56.2	785.8	10/3/06	22.1	821.9	10/3/06	12.9	835.1	10/3/06	6.5	843.5	10/16/06	47.6	785.4
Spring 2007	4/10/07	51.1	791.1	4/10/07	55.8	787.2	4/10/07	50.8	791.2	4/10/07	19.1	824.9	4/10/07	15.9	832.1	4/10/07	6.9	843.1	4/24/07	34.3	798.7
Fall 2007	10/11/07	58.6	783.6	10/11/07	55.7	787.3	10/11/07	50.4	791.6	10/11/07	19.6	824.4	10/11/07	19.2	828.8	10/11/07	8.1	841.9	10/19/07	50.5	782.5
Spring 2008	4/8/08	50.2	792.0	4/8/08	59	784.0	4/8/08	52.5	789.5	4/8/08	17.7	826.4	4/8/08	13.1	834.9	4/8/08	5.5	844.5	4/22/08	38	795.0
Fall 2008	10/6/08	60.3	781.9	10/6/08	60.2	782.8	10/6/08	57.3	784.7	10/6/08	24.1	819.9	10/6/08	15.8	832.2	10/6/08	9.4	840.6	10/6/08	52.7	780.3
Spring 2009	4/16/09	48.0	794.2	4/16/09	55.2	787.8	4/16/09	49.7	792.3	4/16/09	17.1	826.9	4/16/09	19.6	828.4	4/16/09	9.5	840.5	4/28/09	31.0	802.0
Fall 2009	10/9/09	55.6	786.6	10/9/09	54.9	788.1	10/9/09	62.3	779.7	10/9/09	20.2	823.8	10/9/09	17.6	830.4	10/9/09	11.5	838.5	10/19/09	46.8	786.2
Spring 2010	4/8/10	44.4	797.8	4/8/10	52.3	790.7	4/8/10	56.1	785.9	4/8/10	17.4	826.6	4/8/10	19	829.0	4/8/10	7.2	842.8	4/16/10	37.3	795.7
Fall 2010	10/12/10	54.4	787.8	10/12/10	58.5	784.5	10/12/10	55.6	786.4	10/12/10	24.1	819.9	10/12/10	13.3	834.7	10/12/10	8.4	841.6	10/28/10	51.3	781.7
Spring 2011	4/6/11	40.3	801.9	4/6/11	50.4	792.6	4/6/11	47.6	794.4	4/6/11	16.2	827.8	4/6/11	16.5	831.5	4/6/11	8.1	841.9	4/18/11	33.5	799.5
Fall 2011	10/11/11	52.3	789.9	10/11/11	52	791.0	10/11/11	56.6	785.4	10/11/11	20.8	823.2	10/11/11	16.6	831.4	10/11/11	9.9	840.1	10/20/11	45.8	787.2
Spring 2012	4/6/12	46.2	796.0	4/6/12	49.1	793.9	4/20/12	51.9	790.1	4/20/12	22.7	821.3	4/20/12	16.9	831.1	4/20/12	12.4	837.6	4/20/12	37.2	795.8
Fall 2012	11/15/12	54.5	787.7	11/15/12	50.3	792.7	11/15/12	58.6	783.4	11/15/12	22	822.0	11/15/12	20.9	827.1	11/15/12	11.7	838.3	11/15/12	42.1	790.9
Spring 2013	4/15/13	43.2	799.0	4/15/13	49.8	793.2	4/15/13	48.7	793.3	4/15/13	17.9	826.1	4/15/13	16	832.0	4/15/13	7.7	842.3	4/15/13	33.7	799.3
Fall 2013	10/29/13	60.4	781.6	10/29/13	33.5	809.5	10/29/13	81.1	760.9	10/29/13	22.1	821.9	10/29/13	9.7	838.3	10/29/13	7	843.0			
Spring 2014	4/22/14	57.5	784.5	4/22/14	32.9	810.1	4/22/14	79.7	762.3	4/22/14	22.7	821.3	4/22/14	10.2	837.8	4/22/14	7.1	842.9			
Fall 2014	10/24/14	55.1	786.9	10/24/14	29.9	813.1	10/24/14	78.8	763.2	10/24/14	20.7	823.3	10/24/14	8.5	839.5	10/24/14	7.7	842.3			
Spring 2015	4/21/15	48.9	793.1	4/21/15	41.2	801.8	4/21/15	55.1	786.9	4/21/15	20.7	823.3	4/21/15	9.9	838.1	4/21/15	7.1	842.9			
Fall 2015	10/13/15	50.3	791.7	10/13/15	31.9	811.1	10/13/15	83.5	758.5	10/13/15	17.1	826.9	10/13/15	7.4	840.6	10/13/15	9.8	840.2			
Spring 2016	4/26/16	45.5	796.5	4/26/16	39.3	803.7	4/26/16	61.1	780.9	4/28/16	22	822.0	4/26/16	7.5	840.5	4/26/16	8.5	841.5			
Fall 2016	10/14/16	52.6	789.4	10/14/16	35.8	807.2	10/14/16	71.4	770.6	10/14/16	21.5	822.5	10/14/16	11.3	836.7	10/14/16	8.2	841.8			
Spring 2017	4/17/17	35.1	806.9	4/17/17	33.4	809.6	4/17/17	46.3	795.7	4/17/17	18.8	825.2	4/17/17	6.7	841.3	4/17/17	6.6	843.4			
Fall 2017	10/10/17	50.1	791.9	10/10/17	33.9	809.1	10/10/17	66.8	775.2	10/10/17	22.7	821.3	10/10/17	10.2	837.8	10/10/17	8.5	841.5	No Access Granted after April 2013		
Spring 2018	4/23/18	42.2	799.8	4/23/18	43.8	799.2	4/23/18	52.6	789.4	4/23/18	19.7	824.3	4/23/18	9.4	838.6	4/23/18	8.5	841.5			
Fall 2018	10/23/18	44.7	797.3	10/23/18	30.1	812.9	10/23/18	70.5	771.5	10/23/18	20.3	823.7	10/23/18	8.8	839.2	10/23/18	9.1	840.9			
Spring 2019	4/19/19	39.6	802.4	4/19/19	41.1	801.9	4/19/19	45.3	796.7	4/19/19	18.8	825.2	4/19/19	8.4	839.6	4/19/19	8.1	841.9			
Fall 2019	10/15/19	77.6	764.4	10/15/19	33.3	809.7	10/15/19	85.1	756.9	10/15/19	18.1	825.9	10/15/19	10.7	837.3	10/15/19	8.5	841.5			
Spring 2020	4/13/20	40.5	801.5	4/13/20	35.5	807.5	4/13/20	47.8	794.2	4/13/20	20.6	823.4	4/13/20	6.9	841.1	4/13/20	5.4	844.6			
Fall 2020	10/30/20	70.4	771.6	10/30/20	37.9	805.1	10/30/20	87.3	754.7	10/30/20	23.9	820.1	10/30/20	11.5	836.5	10/30/20	9.5	840.5			
Spring 2021	4/20/21	51.8	790.2	4/20/21	42.5	800.5	4/20/21	49.4	792.6	4/20/21	18.6	825.4	4/20/21	7.9	840.1	4/20/21	5.9	844.1			
Fall 2021	10/26/21	52.0	790.0	10/26/21	33.0	810.0	10/26/21	68.9	773.1	10/26/21	18.9	825.1	10/26/21	10.2	837.8	10/26/21	9.2	840.8			
Spring 2022	4/12/22	45.2	796.8	4/12/22	37.8	805.2	4/12/22	52.3	789.7	4/12/22	17.1	826.9	4/12/22	9.5	838.5	4/12/22	6.8	843.2			

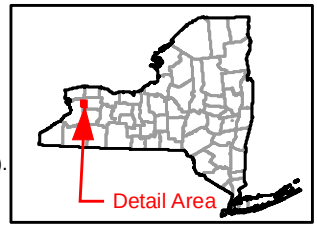
Notes:

-Data provided by County Line Stone

-Elevations are in feet above sea level (feet msl) relative to the North American Vertical Datum of 1988 (NAVD88).

FIGURES





Source:
-NYSDOT 7.5-minute topographic map (Corfu quadrangle).
-Elevations are shown in meters above mean sea level.
-Contour interval is 2 meters.

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FIGURE 1
Site Location Map

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Site_Location_Map.mxd
Date Saved: 8/29/2022 6:00:12 PM

LEGEND

- Boring Location
- Water Well Location
- Topographic Contour (feet msl)

Notes:
-Aerial imagery provided by Adirondack Geological Services, DPC. (AGS). Image date: August 15, 2022.
-Topography provided by AAGS and based on August 15, 2022 LiDAR imagery.
-Elevations are in feet above sea level (feet msl) relative to the North American Verdical Datum of 1988 (NAVD88).
-Wells and boring locatons provided by AGS.
-All locations are approximate.

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Proj. No. 22119

FIGURE 2
Site Features and Topography

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Site_Features_11x17.mxd
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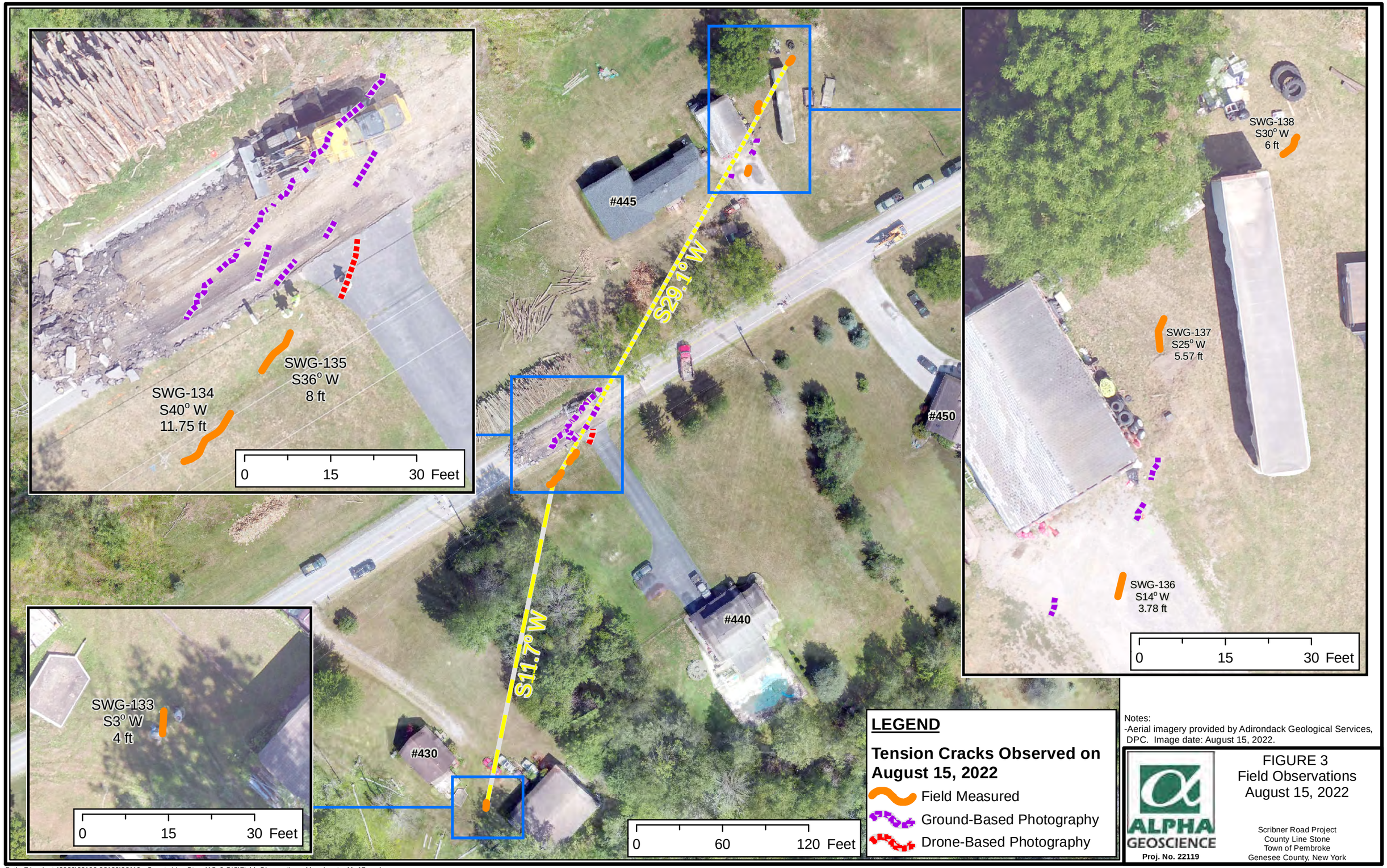

LEGEND

Tension Cracks Observed on August 15, 2022

- Field Measured
- Ground-Based Photography
- Drone-Based Photography

Notes:
-Aerial imagery provided by Adirondack Geological Services, DPC. Image date: August 15, 2022.

ALPHA GEOSCIENCE

Proj. No. 22119

FIGURE 3
Field Observations
August 15, 2022

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Field_Observations_Map_Insets_11x17.mxd
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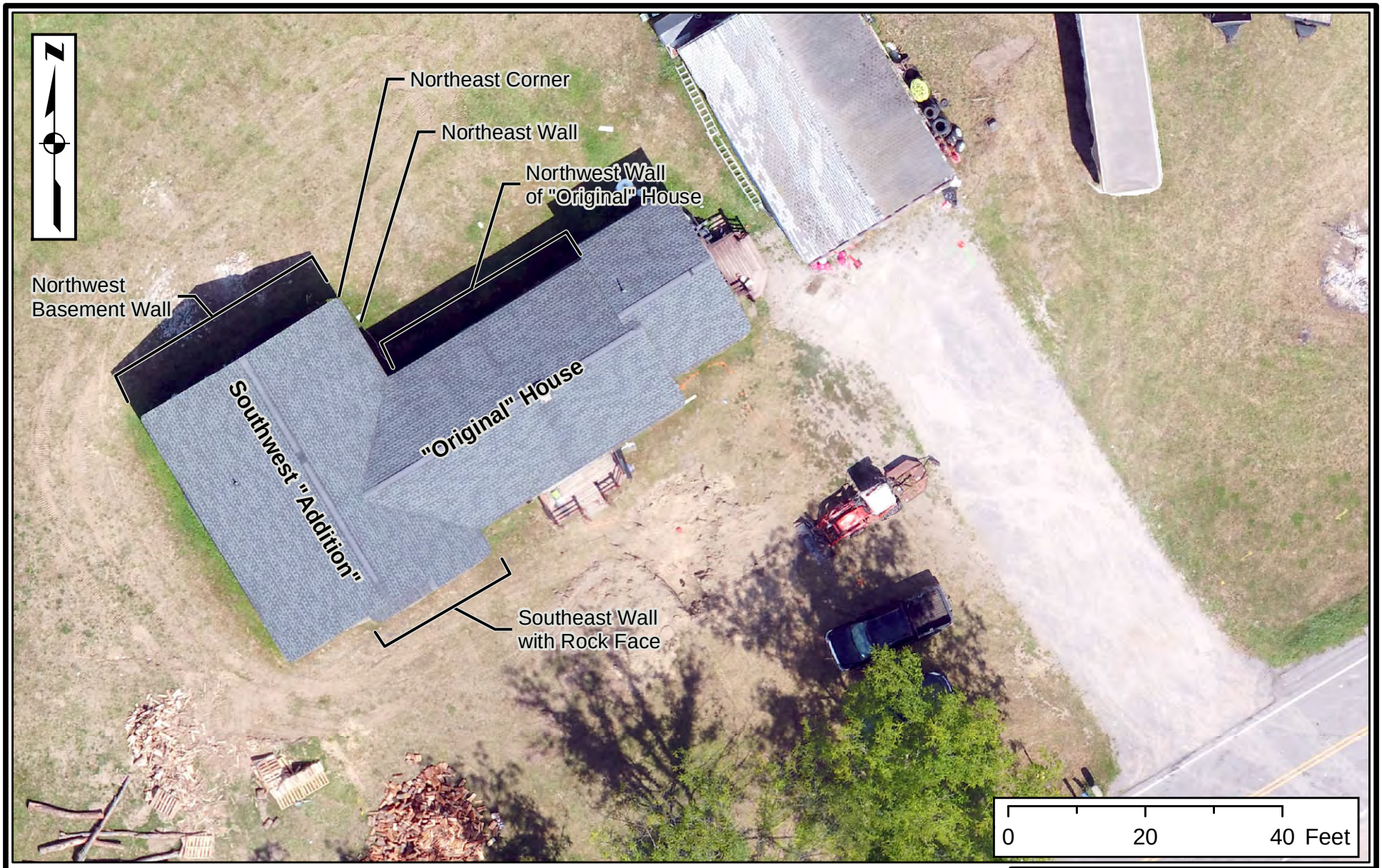

Source:
-Aerial imagery provided by Adirondack Geological Services, DPC. Image date: August 15, 2022.

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Proj. No. 22119

FIGURE 4
House at Lot 445 Scribner Road

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Site_Layout_445.mxd
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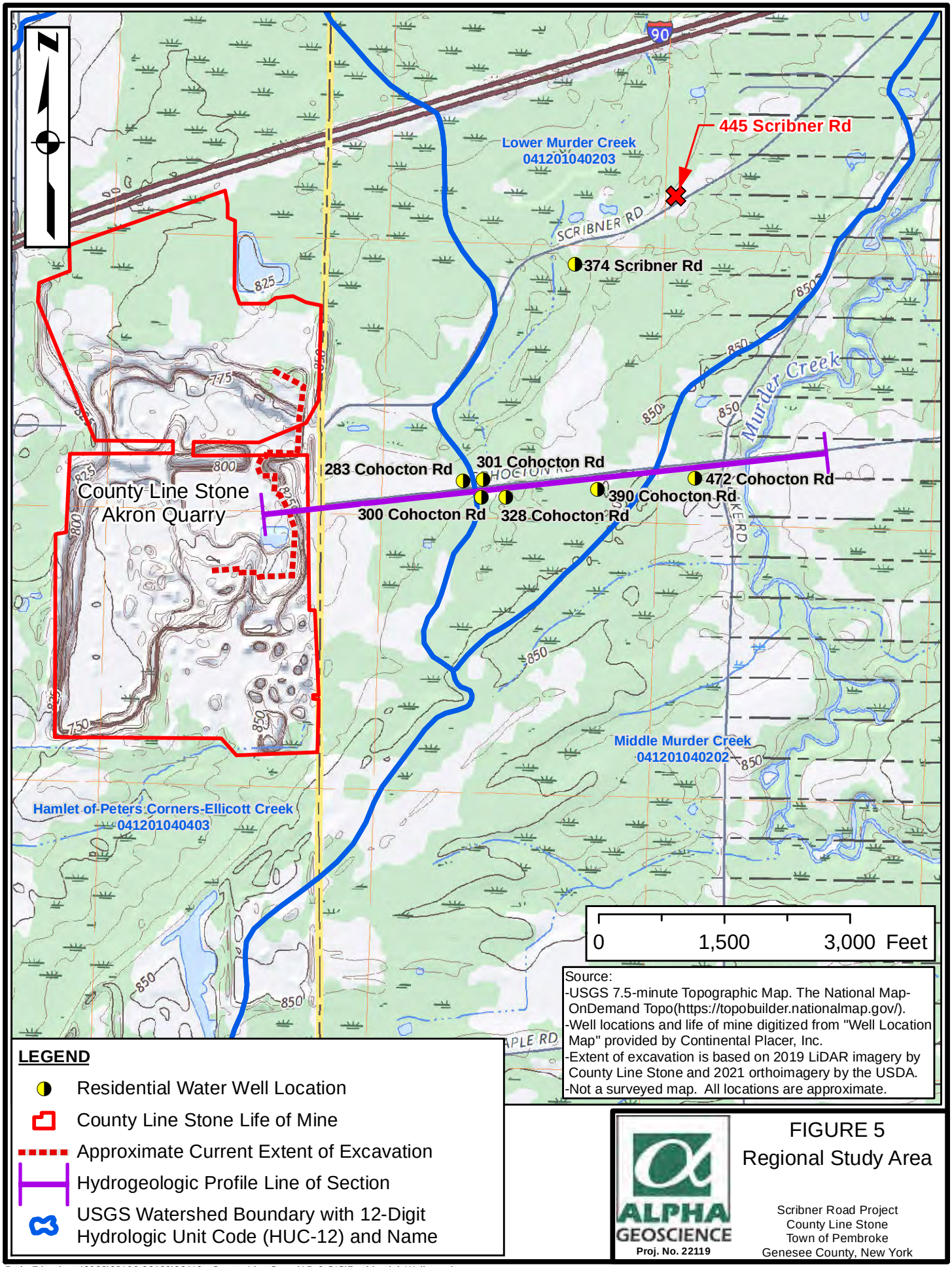

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Proj. No. 22119

FIGURE 5
Regional Study Area

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Residential_Wells.mxd
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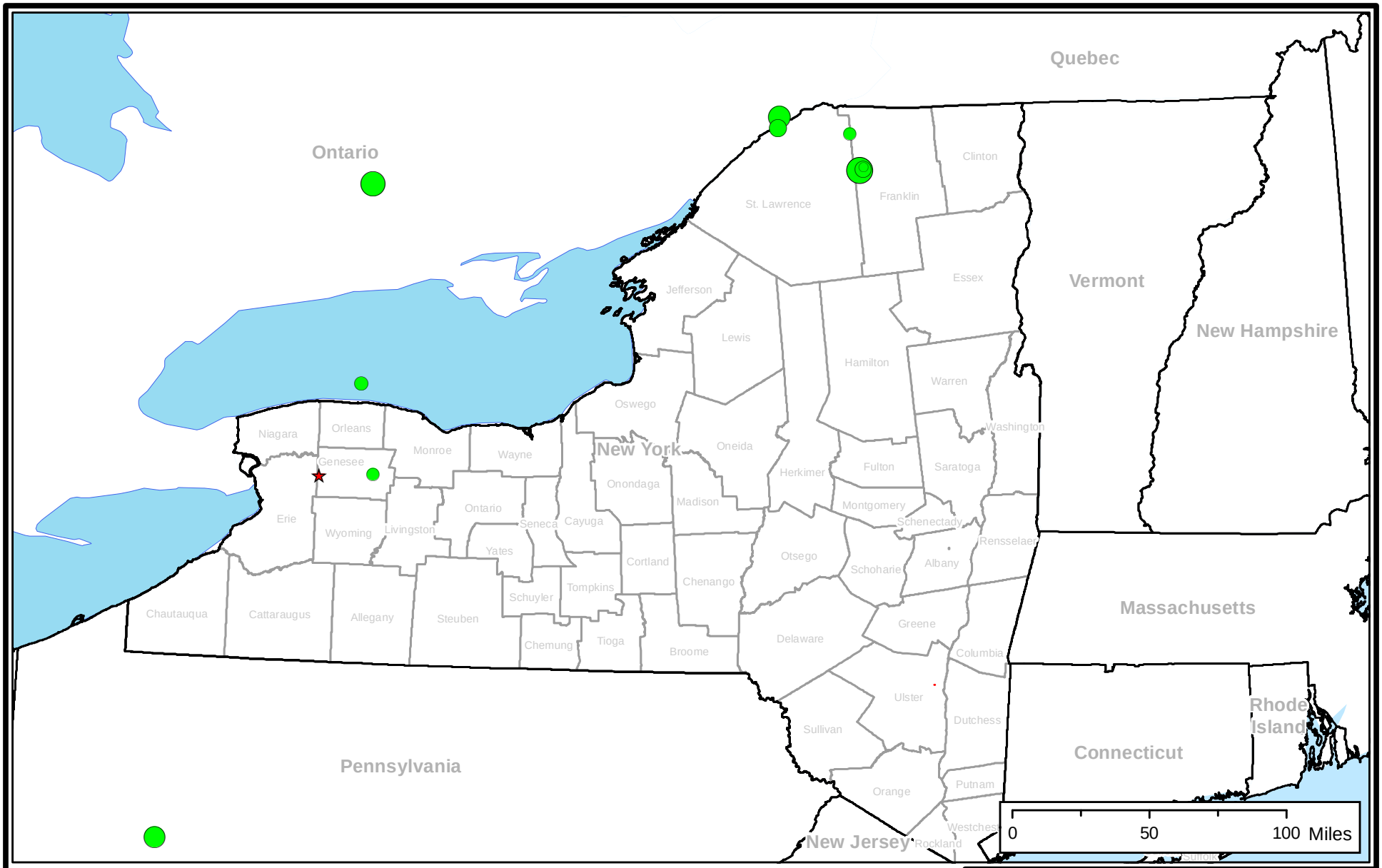

LEGEND

- ★ 445 Scribner Rd, Pembroke, NY
- ● Seimic Event (Size of Symbol is Relative to Magnitude)

Notes:
-USGS Earthquake Hazard Program online earthquake catalog (https://earthquake.usgs.gov/earthquakes/map/). Search performed by date (6/10-8/15/2022), magnitude (greater than 0.5), and distance from site (less than 250 miles).

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Proj. No. 22119

FIGURE 6

Seismic Events Map
June 10 to August 15, 2022

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Seismic_2022 June-Aug.mxd
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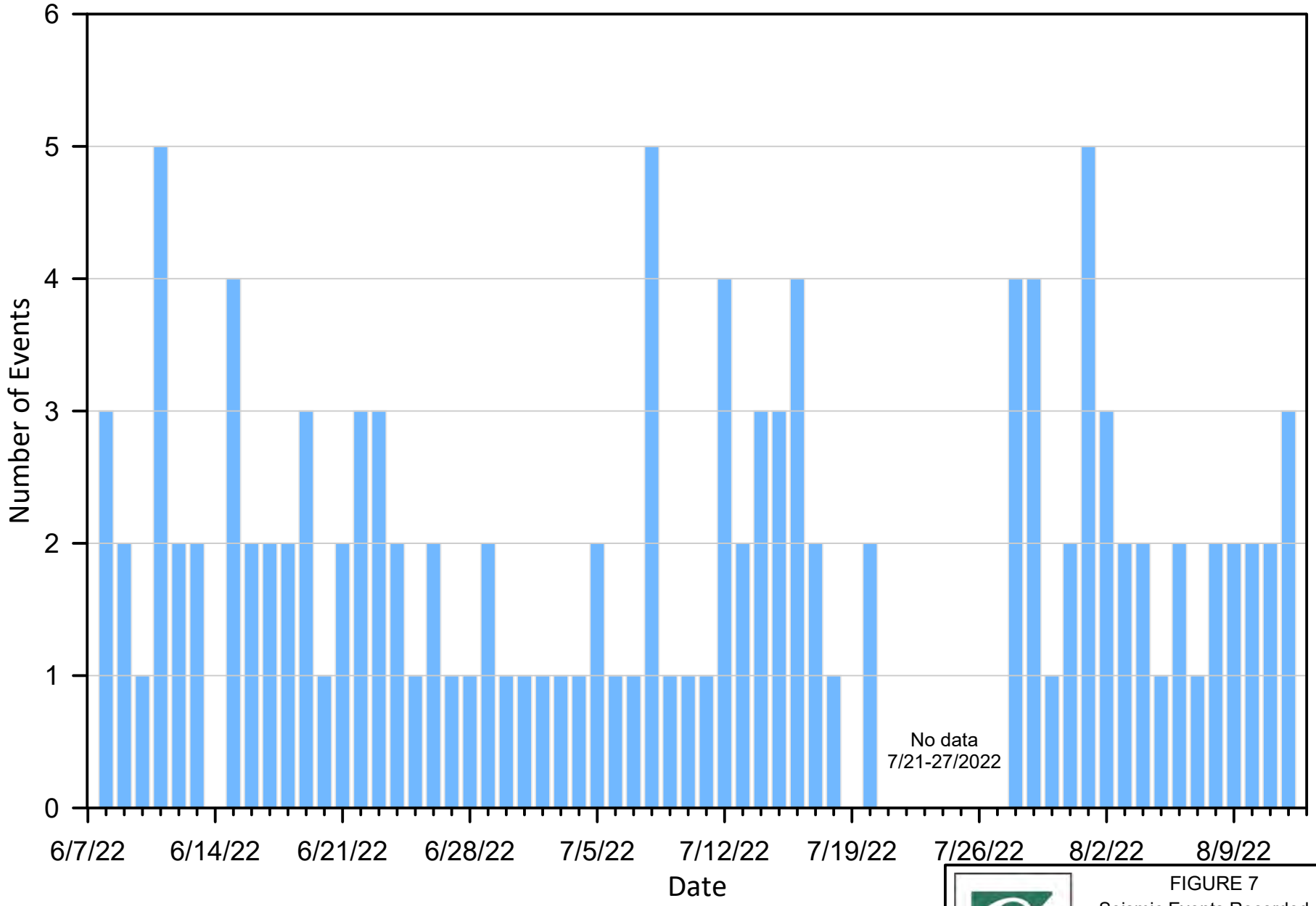
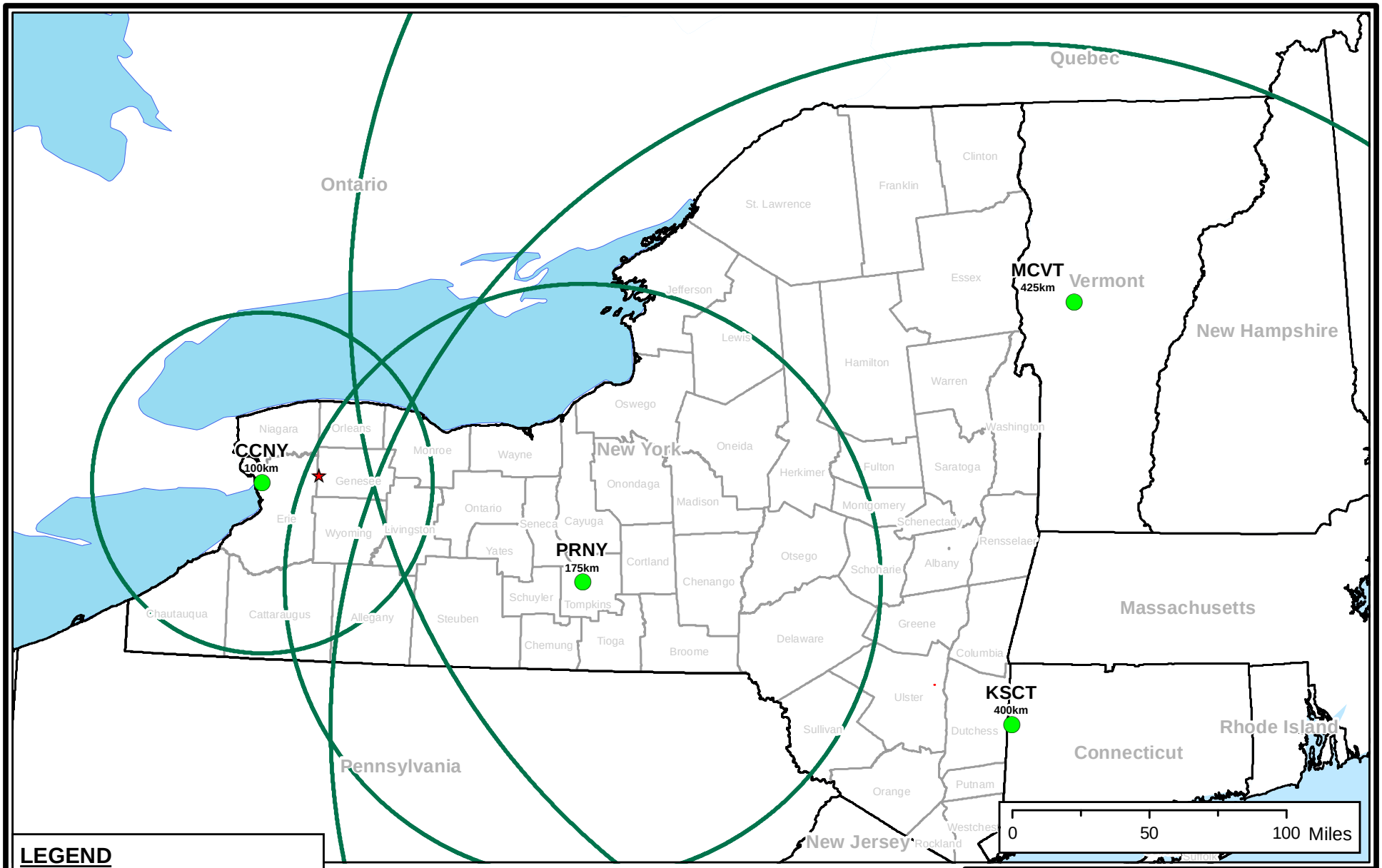


Notes:
-Number of Seismic Events recorded at CCNY (Canisius College, Buffalo, NY).

ALPHA GEOSCIENCE
Project No. 22119

FIGURE 7
Seismic Events Recorded at
Canisius College Station
June 8, 2022 to August 12, 2022
Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Z:\projects\2022\22100-22120\22119 - County Line Stone\9_0 Data Analysis\Seismic Activity Study\Event Recorded at CCNY.grf



LEGEND

- ★ 445 Scribner Rd, Corfu, NY
- ● Seismic Station with Distance to Epicenter from Seismic Recording Stations*

Notes:
* - Event occured at approximately16:25 on 8/6/2022

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Proj. No. 22119

FIGURE 8
Estimated Distance from Epicenter to Seismic Recording Station

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Seismic_2022-08-06.mxd
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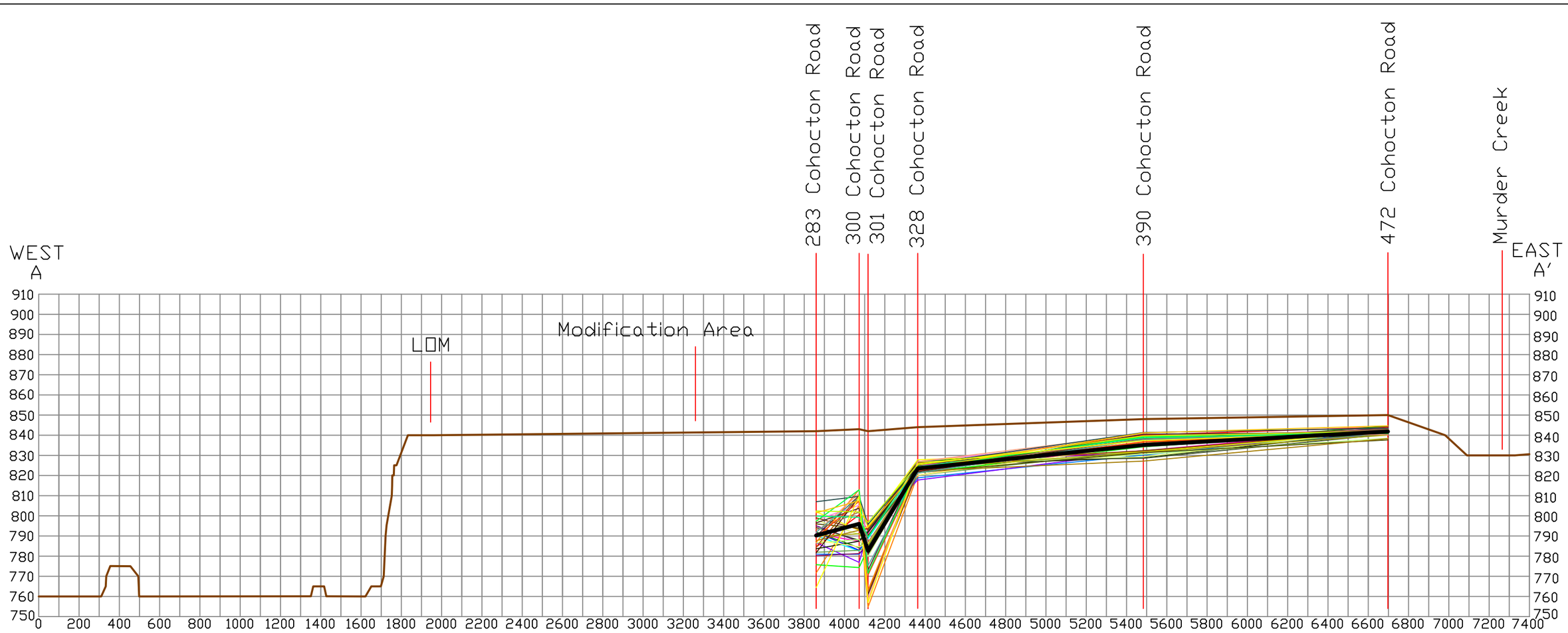

Note: 10x Vertical Exaggeration

500 0 250 500 1000 2000

Scale: 1" = 500'

LEGEND

- 2004 Spring Water Level
- 2005 Spring Water Level
- 2006 Spring Water Level
- 2007 Spring Water Level
- 2008 Spring Water Level
- 2008 Spring Water Level
- 2009 Spring Water Level
- 2010 Spring Water Level
- 2011 Spring Water Level
- 2012 Spring Water Level
- 2013 Spring Water Level
- 2014 Spring Water Level
- 2015 Spring Water Level
- 2016 Spring Water Level
- 2017 Spring Water Level
- 2018 Spring Water Level
- 2019 Spring Water Level
- 2020 Spring Water Level
- 2021 Spring Water Level
- 2022 Spring Water Level
- 2003 Fall Water Level
- 2004 Fall Water Level
- 2005 Fall Water Level
- 2006 Fall Water Level
- 2007 Fall Water Level
- 2008 Fall Water Level
- 2009 Fall Water Level
- 2010 Fall Water Level
- 2011 Fall Water Level
- 2012 Fall Water Level
- 2013 Fall Water Level
- 2014 Fall Water Level
- 2015 Fall Water Level
- 2016 Fall Water Level
- 2017 Fall Water Level
- 2018 Fall Water Level
- 2019 Fall Water Level
- 2020 Fall Water Level
- 2021 Fall Water Level
- Average Water Level
- Topography

Source:

-Topography based on NYSGIS Clearinghouse NYSGPO Erie, Genesee, Livingston 2019 LIDAR index (gis.ny.gov) and USGS Topographic Map Data, Corfu Quadrangle, 7.5x7.5 minute, 2019 (apps.nationalmap.gov)

-Ground water elevations provided by Residential Well Spring 2022 Groundwater Level Data, County Line Stone Co., Inc., prepared by Continental Placer Inc.

-Elevations are in feet above mean sea level (ft amsl) relative to NAVD88

ALPHA GEOSCIENCE

Proj. # 22119

FIGURE 9
Cross Section of Water Level Data

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

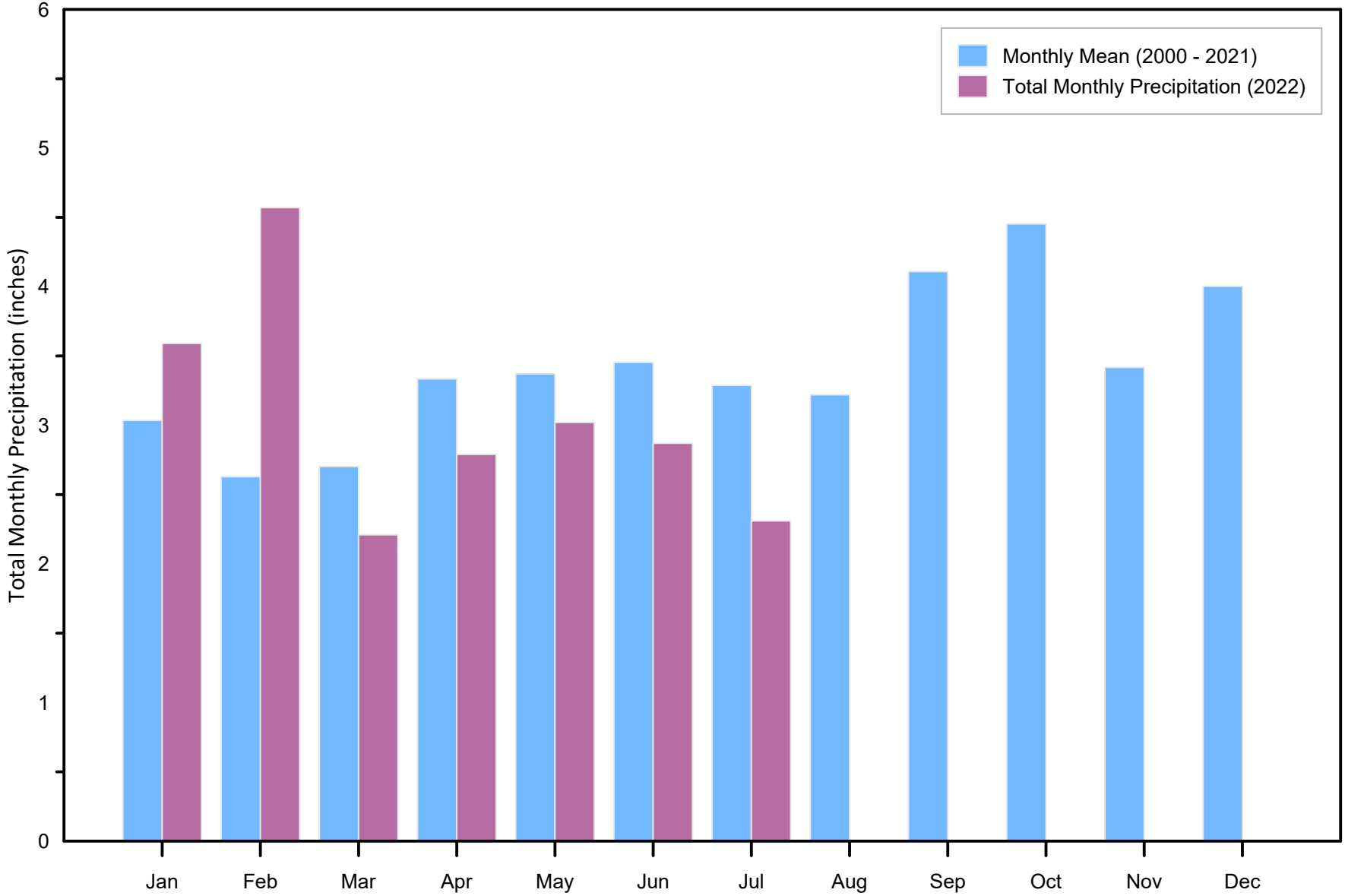

FIGURE 10
Monthly Total Precipitation

Notes:
-Precipitation data are from the Northeast Regional Climate Center (NRCC) CLIMOD2 database for the Buffalo-Niagara International Airport for years 2000 through July 2022. (http://climod2.nrcc.cornell.edu/)

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Project No. 22119

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

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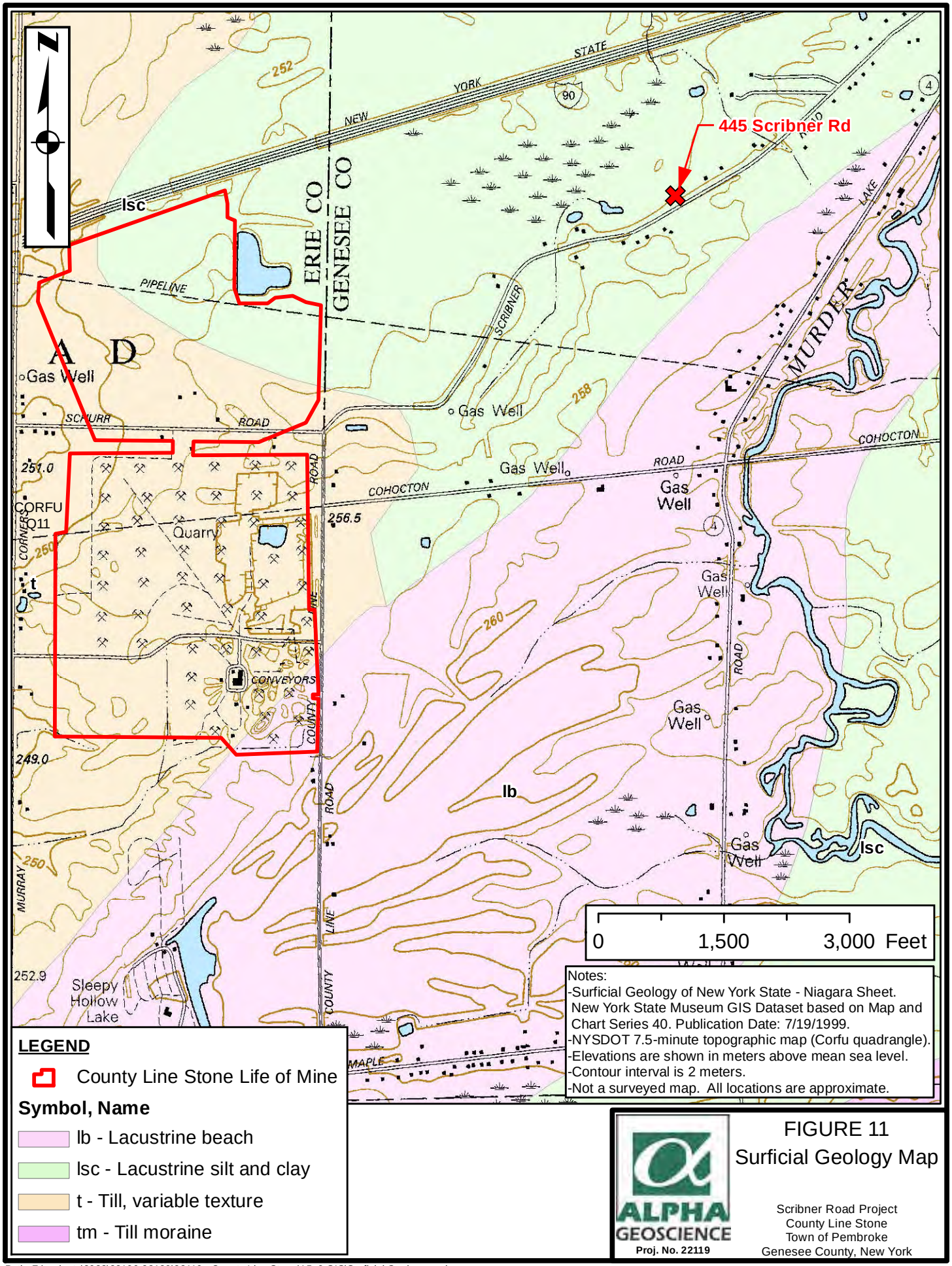

FIGURE 11
Surficial Geology Map

ALPHA GEOSCIENCE
Proj. No. 22119

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Surficial Geology.mxd
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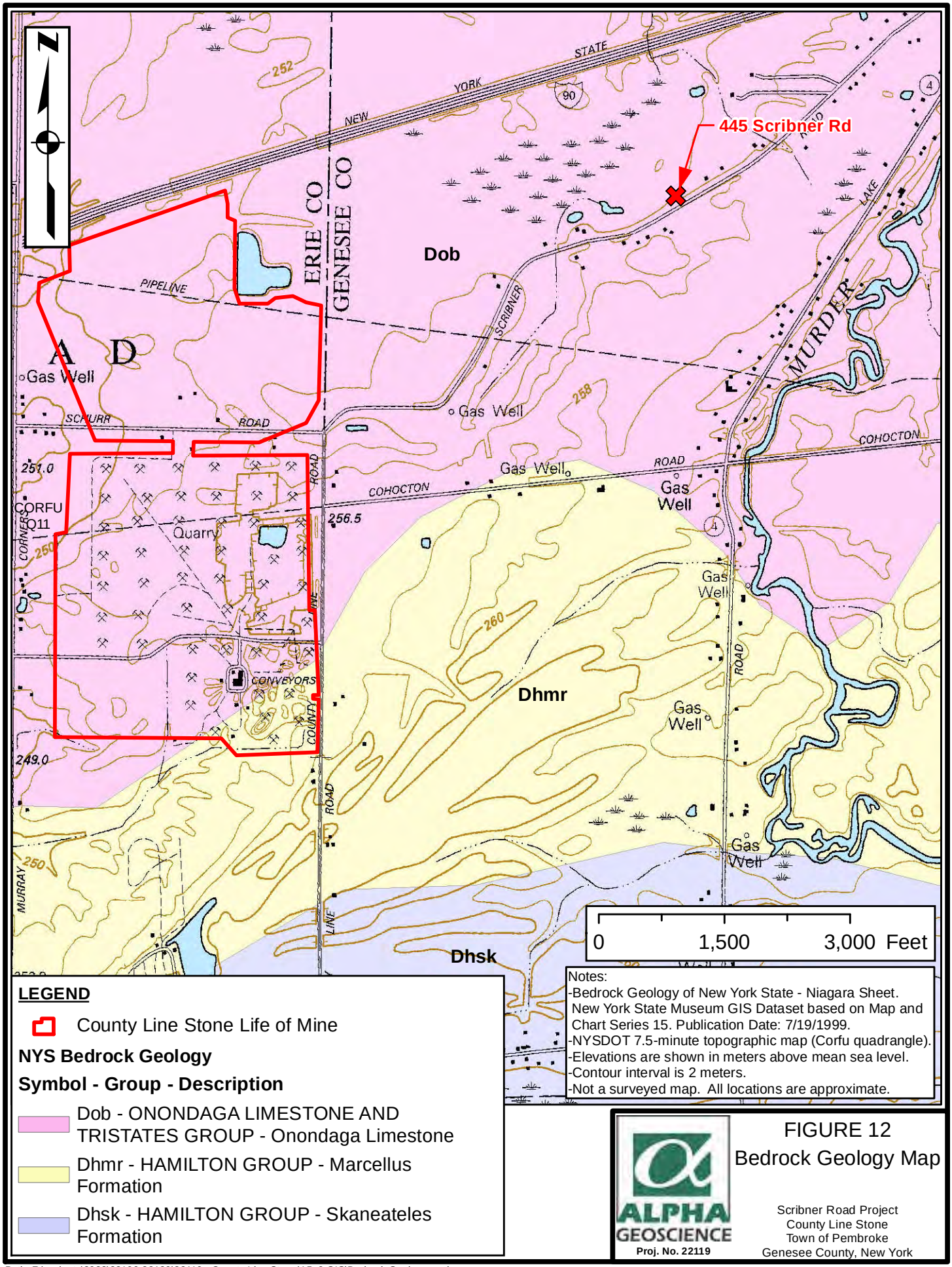

LEGEND

County Line Stone Life of Mine

NYS Bedrock Geology

Symbol - Group - Description

Dob - ONONDAGA LIMESTONE AND TRISTATES GROUP - Onondaga Limestone

Dhmr - HAMILTON GROUP - Marcellus Formation

Dhsk - HAMILTON GROUP - Skaneateles Formation

Notes:
-Bedrock Geology of New York State - Niagara Sheet. New York State Museum GIS Dataset based on Map and Chart Series 15. Publication Date: 7/19/1999.
-NYSDOT 7.5-minute topographic map (Corfu quadrangle).
-Elevations are shown in meters above mean sea level.
-Contour interval is 2 meters.
-Not a surveyed map. All locations are approximate.

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Proj. No. 22119

FIGURE 12
Bedrock Geology Map

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Bedrock Geology.mxd
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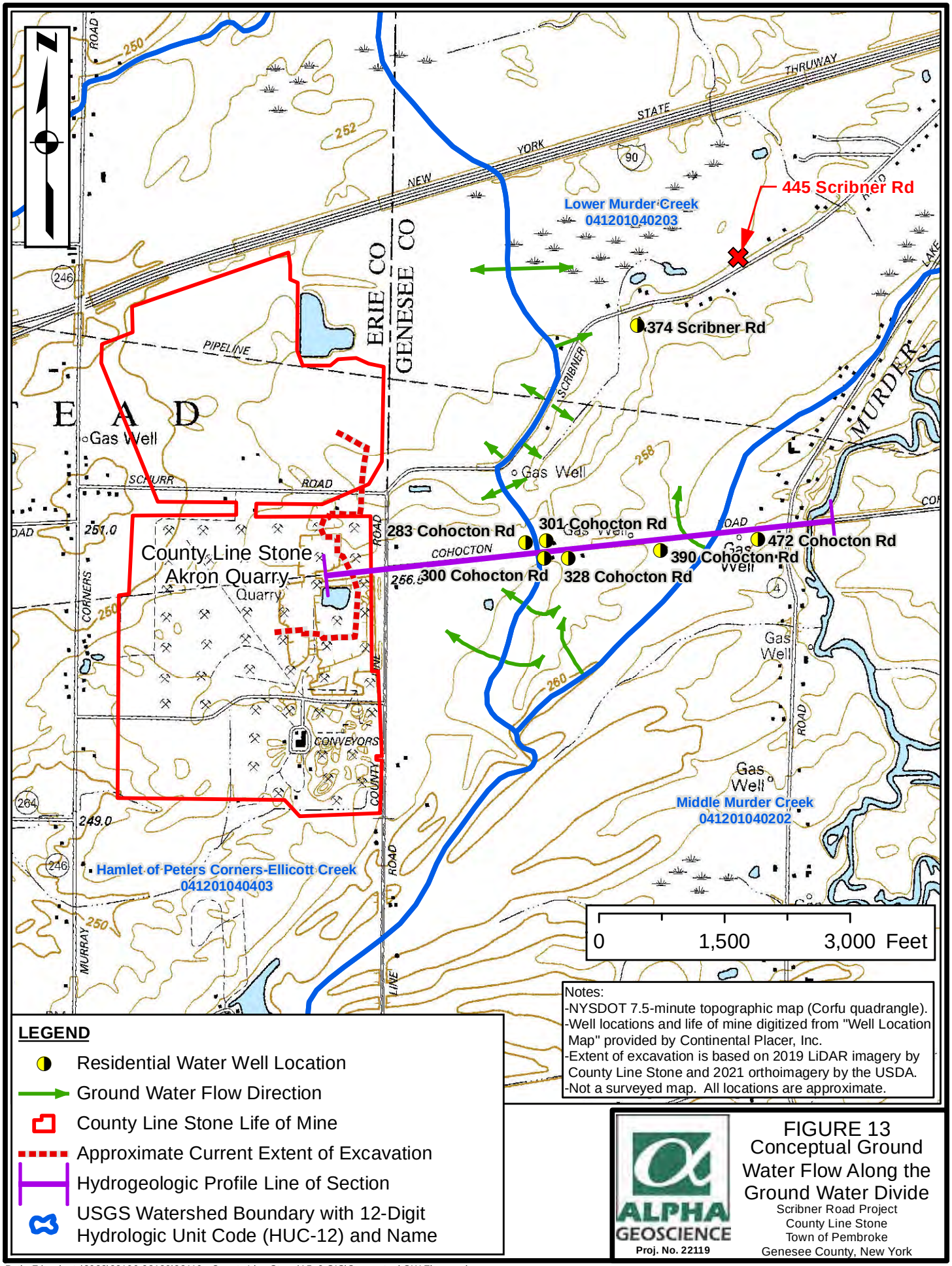

Notes:
-NYSDOT 7.5-minute topographic map (Corfu quadrangle).
-Well locations and life of mine digitized from "Well Location Map" provided by Continental Placer, Inc.
-Extent of excavation is based on 2019 LiDAR imagery by County Line Stone and 2021 orthoimagery by the USDA.
-Not a surveyed map. All locations are approximate.

LEGEND

- Residential Water Well Location
- Ground Water Flow Direction
- County Line Stone Life of Mine
- Approximate Current Extent of Excavation
- Hydrogeologic Profile Line of Section
- USGS Watershed Boundary with 12-Digit Hydrologic Unit Code (HUC-12) and Name

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 13
Conceptual Ground Water Flow Along the Ground Water Divide
Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Conceptual GW Flow.mxd
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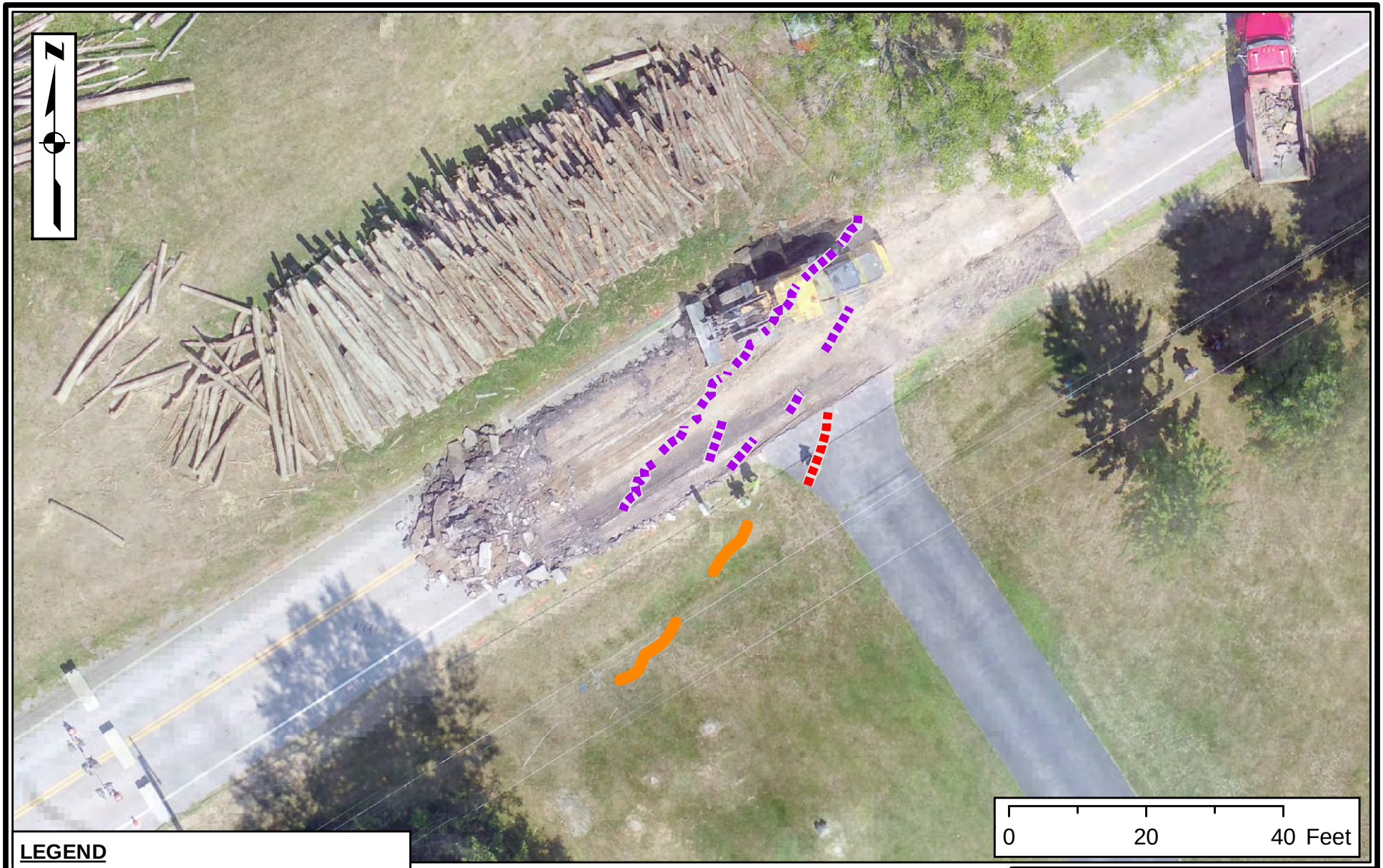


LEGEND

Tension Cracks Observed on August 15, 2022

- Field Measured
- Ground-Based Photography
- Drone-Based Photography

Source:
-Aerial imagery provided by Adirondack Geological Services, DPC. Image date: August 15, 2022.

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 14
Field Observations
August 15, 2022

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Field_Observations_Road.mxd
Date Saved: 8/31/2022 5:55:53 PM

Photograph Location near Lots 440 and 445 Scribner Road, Pembroke, NY
Photograph provided by Mr. Norm Gardner of Clark, P.G. of Patterson, and Lee
Photo date: circa August 7-15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 15
Scribner Road Fracture
Looking Northeast

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Photograph Location: Scribner Road adjacent to lots 440 and 445, with view to the south
Photograph taken by Sam Gown, Alpha Geoscience
Photo date: August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 16
Scribner Road Fracture in Road Base Below Pavement
Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Photograph Location: Southeast side of the northwest addition at Lot 445 Scribner Road, with view to the northeast
Photograph taken by Sam Gown, Alpha Geoscience
Photo date: August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 17
Southeast Side of 445 Scribner Road
Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

FIGURE 18
Field Observations
August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

Source:
-Aerial imagery provided by Adirondack Geological Services, DPC. Image date: August 15, 2022.

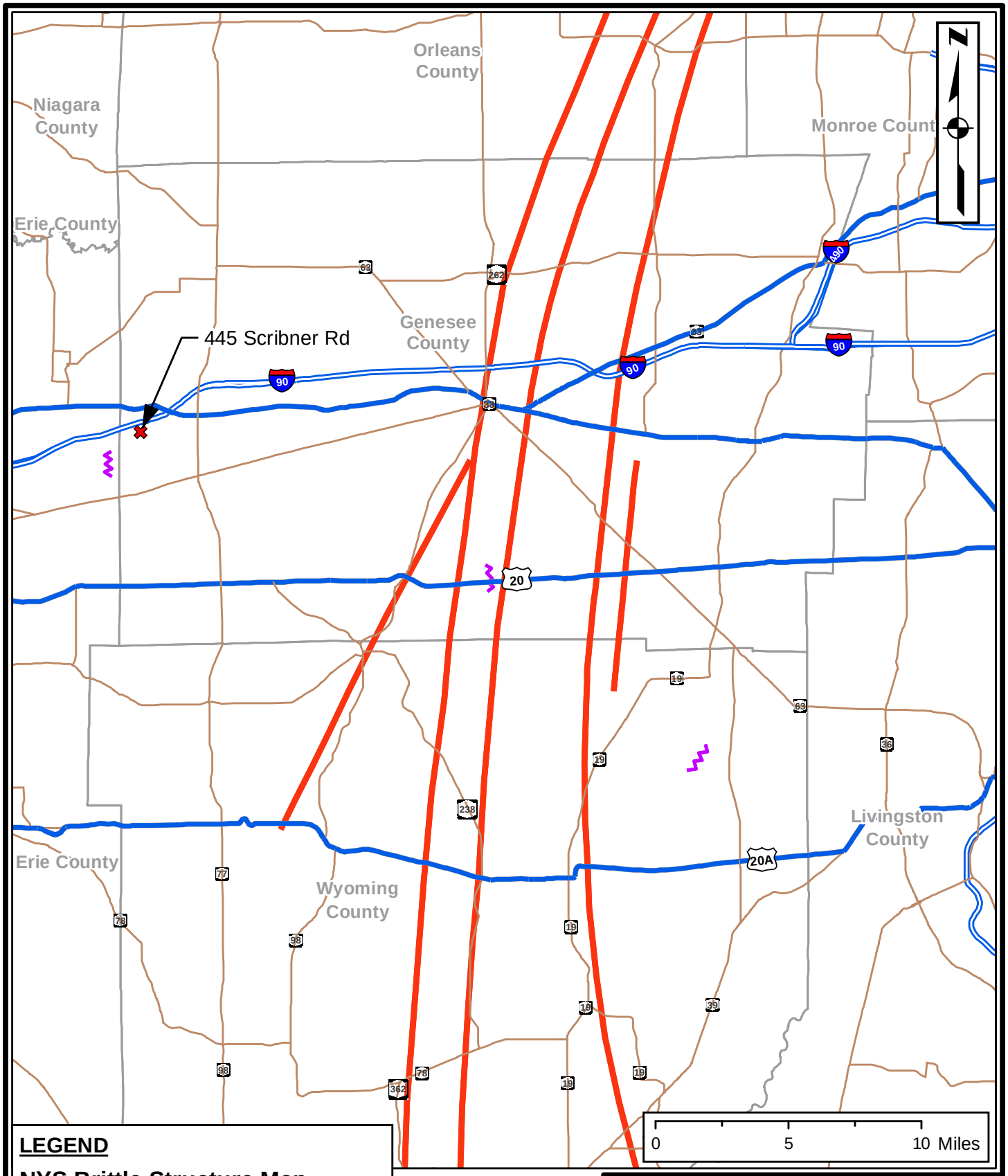
Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\Field_Observations_House.mxd
Date Saved: 9/1/2022 10:00:39 AM

Photograph Location: View to the southeast of the northwest basement wall of the “original” house.
Photograph taken by Sam Gown, Alpha Geoscience
Photo date: August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 19
Fracture and Relative Movement of Basement Wall at 445 Scribner Road

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York



LEGEND

NYS Brittle Structure Map

- Clarendon-Linden Fault System
- Pop-up Structures

Source:
-Preliminary Brittle Structures Map of New York StateNew York State Museum GIS Dataset based on Map and Chart Series 31. Publication Date: 7/19/1999

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 20
Clarendon-Linden Fault Location Map
Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

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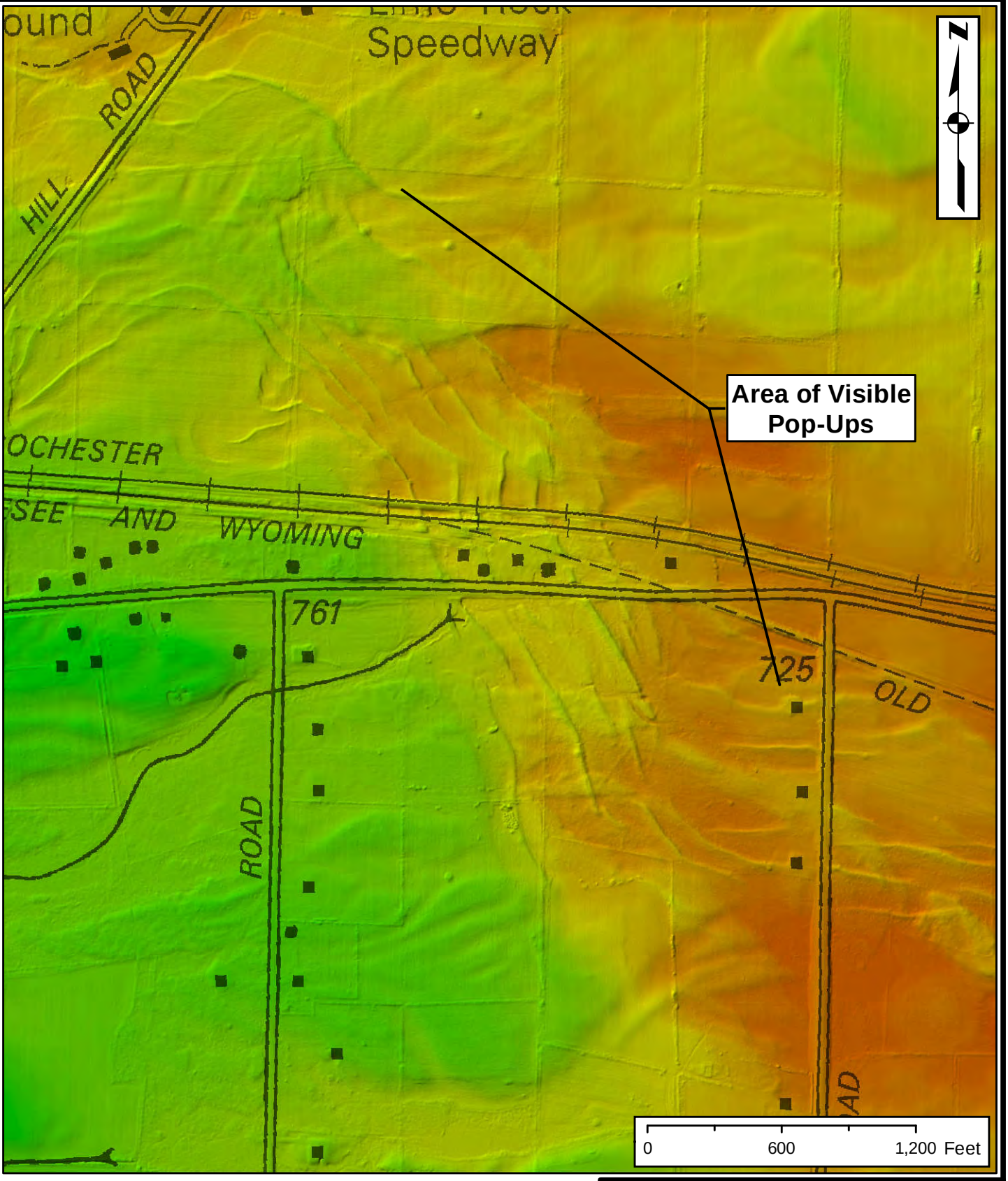


FIGURE 21
LiDAR Image of Pop-Ups in LeRoy and Caledonia, NY

Scribner Road Poject
County Line Stone
Town of Pembroke
Genesee County, New York

ALPHA GEOSCIENCE
Proj. No. 22119

Source:
-New York State 2019 digital elevation model (DEM), NYS Office of Information Technology Services (ITS). Image date: April 2020.

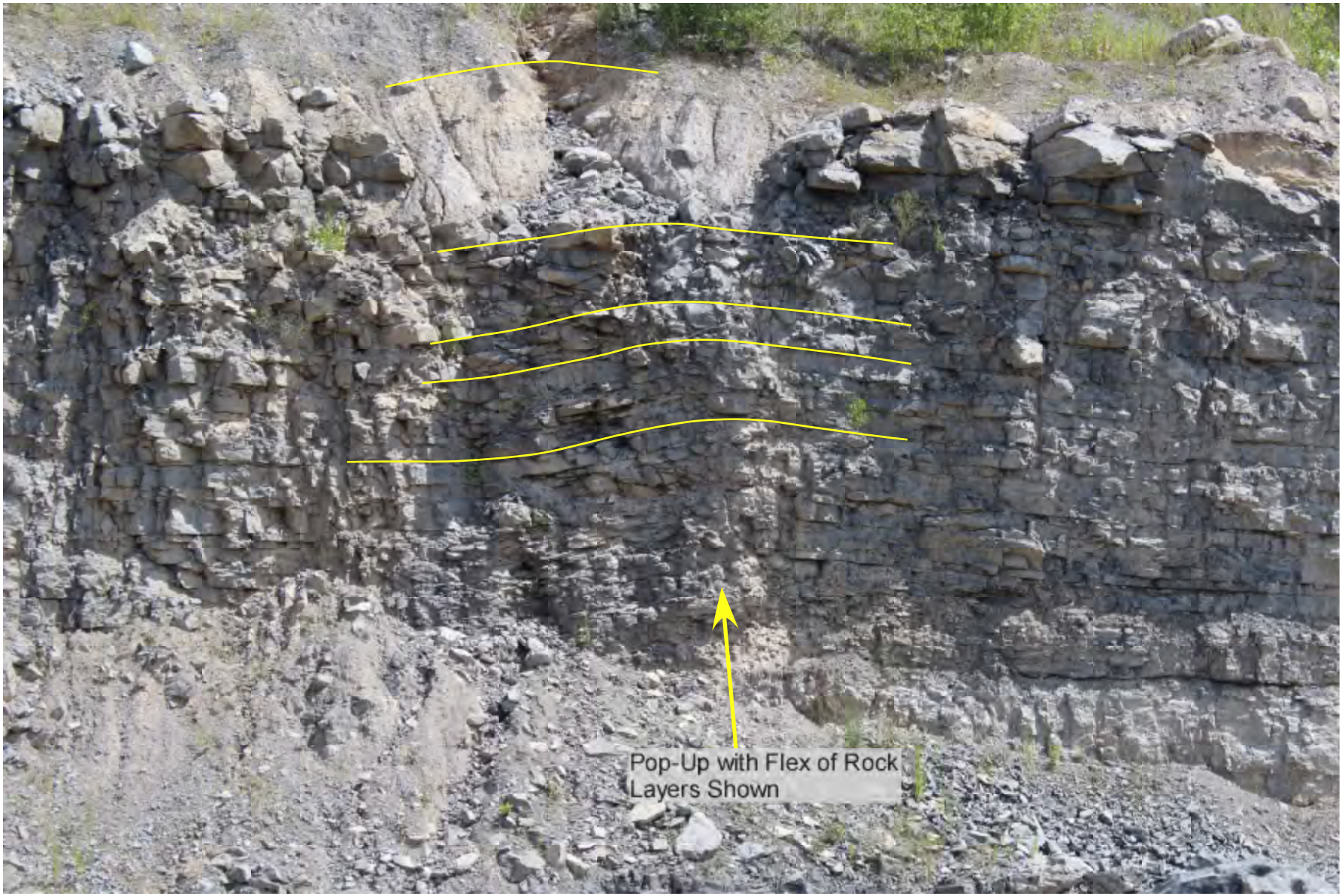
Path: Z:\projects\2022\22100-22120\22119 - County Line Stone\15_0 GIS\LimeRockRd_Pop Ups.mxd
Date Saved: 9/6/2022 2:11:04 PM

Photograph Location: Western face of the Akron Quarry
Photograph taken by Sam Gown, Alpha Geoscience
Photo date: August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 22
Pop-Up in Quarry Face and Floor

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

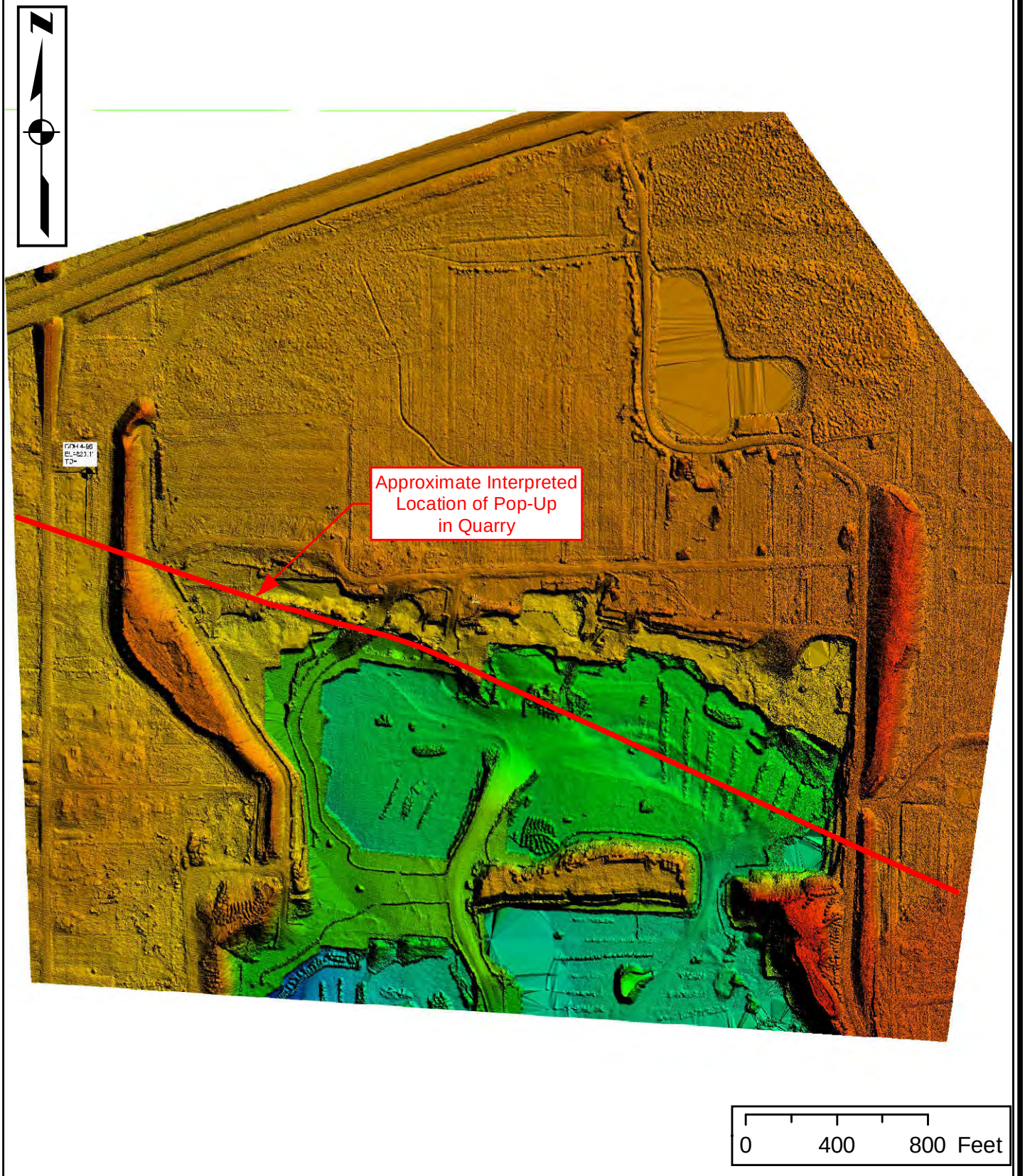


Photograph Location: Eastern face of the Akron Quarry
Photograph taken by Sam Gown, Alpha Geoscience
Photo date: August 15, 2022

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 23
Pop-Up in Rock Face and Overburden

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York



Source:
-Shaded relief image provided by Adirondack Geological Services, DPC and is based on 2019 LiDAR imagery by County Line Stone and.
-Not a surveyed map. All locations are approximate.

ALPHA GEOSCIENCE
Proj. No. 22119

FIGURE 24
Location of the Pop-Up in the Akron Quarry

Scribner Road Project
County Line Stone
Town of Pembroke
Genesee County, New York

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