October 18, 2020

Ms. Jennifer Roy
Zoning Enforcement Officer
Town of Somers
600 Main Street
Somers, CT. 06071

RE: Hydrogeologic & Environmental Assessment – 40 Hallie Lane, Somers, CT

Dear Ms. Roy;

Lenard Engineering, Inc. (LEI) is pleased to provide you with this letter/report which summarizes the finding of our hydrogeologic and environmental review of the prior rock quarrying activities as well as the recent application (application #20-009) submitted by Amy L. Eastman to the Town of Somers Zoning Commission (the "Town") for her residence at 40 Hallie Lane. LEI's assessment and recommendations are based upon our review of documents provided to us by the Town; electronic mail correspondence, letter/reports and mapping provided directly to LEI by the applicant's consultants; and our review of scientific and technical studies, papers and mapping relevant to the subject area. A list of documents reviewed is provided as Appendix A to this letter. Our report ends by discussing our concerns for the prior and proposed work and presents four proposed conditions of approval that we believe will address the concerns should the Town decide to approve the application as submitted.

Summary of Prior Work (2018 and 2019)

The owner of the subject property, Amy L. Eastman (the "applicant") has submitted a number of applications to the Town requesting special use permits for the excavation, removal, and earth filling at her property. According to the applicant's consultants, during February 2018 six bedrock blast events occurred after which approximately 5,425 cubic yards of bedrock was excavated. Two additional blast events occurred in May 2019 when 925 cubic yards of rock was removed. The consultant reports that between 600 pounds and 1,500 pounds of explosives were used during each of the eight events.

An unspecified volume of this rock was transported to the western property boundary and used to create a rubble wall (Photo #1 and Photo #2) of varying height which was regraded/backfilled on the east side to create a flat land surface at about elevation 602 feet (ft.). This area was then loamed and seeded (Photos #3 and #4). The remaining volume of blasted bedrock was trucked 800 ft. to the north where it was piled on a north facing slope between the elevations 570 ft. and 585 ft. and contoured to the existing slope. This rock slope was graded/filled on the south side to facilitate truck access to the area (Photos #5 and #6). These stacked rock areas are visible on aerial photographs and topography provided by the applicant's consultant and attached here as Appendix B.

A pre-blast domestic drinking water well receptor survey was not conducted by the applicant and therefore no pre-blast well water quality testing was completed. The applicant's consultant has provided to LEI blast records including seismic monitoring for the February 2018 and May 2019 events. The bedrock that was removed was located immediately to the rear of the residence and was the western extension of a northeasterly trending bedrock ridge lying between elevations of about 602 ft. and 618 ft. A residual small rock outcrop located to the northwest of the residence is the western remnant of this ridge (Photo #7). The remaining portion of this bedrock ridge to the northeast of the residence is the subject of the pending application (Photos #8 and #9).

Proposed (Revised) Work Plan

The applicants most recent zoning application proposes to remove and relocate approximately 9,650 cubic yards of material consisting almost entirely of bedrock. The applicant has withdrawn their request to continue to blast and has proposed that the rock will be drilled and then mechanically broken into large boulder size fragments. A very small volume of overburden soil will also likely be moved to facilitate access to the bedrock surface in a few locations. The applicant proposes to breakup and then relocate much of the bedrock outcrop located to the north and northeast of the Eastman residence. The applicant's consultant submitted two brochures to LEI from Elco International (Elmwood Park, New Jersey) containing information on the Darda® series of hydraulic rock splitters. One of the brochures is for the Darda® C20 splitter. The brochure says that the splitter is capable of generating up to 1,800 tons of force using closed system fluid hydraulics and requires a nine ton or larger excavator to move the splitter from drill hole to hole. The brochure sells the benefits of the system as an alternative to traditional blasting and/or hydraulic hammering. The product information indicates that 3-inch diameter holes are drilled to a depth of about 3 ft. into which the wedges are inserted followed by the splitter. The C20 is recommended for bedrock types such as granite and gneiss.

Geologic and Environmental Setting

The geologic and environmental setting is based on LEI's observations made during an October 1, 2020, site visit as wells as our review of available geological maps and technical documents.

Geologic Overburden

The Eastman property is located near to and at the crest of an un-named hill in the northeastern portion of Somers. The topography slopes down in all directions; moderately steeply towards the south and east in the direction of Gillette's Brook and more gently towards the northwest. The *Connecticut Natural Drainage Basins Map, Somers, Connecticut* (May 2011) prepared by the Connecticut Dept. of Energy and Environmental Protection shows that a local basin (watershed) divide separates Basin 4202-00 to the west and Basin 4202-02 to the east. Most of the proposed site activity appears located within Basin 4202-00 which drains towards Gillette's Brook although some precipitation also likely drains westerly within Basin 4202-02. This basin ultimately drains to Avery Brook.

The *Quaternary Geologic Map, Somers, Connecticut (December 2010)* shows that the area beneath and surrounding the Eastman property is underlain by thin till overlying bedrock. At the hill crests the till is thin to absent but thickens down slope. Till (often referred to as hardpan) is a poorly sorted and non-stratified material that was deposited by glacial ice. The composition of till varies throughout the state in part as a function of the source rock from which the till material was derived. Typically for Connecticut tills that means the bedrock to the north and northwest of the deposit which was the direction of glacial ice advance across New England. The thin tills of Connecticut are typically sandy with a significant percentage of silt and clay as well as a few small to larger cobbles. Most of the thin tills are moderately dense reflecting their deposition adjacent to or beneath thick glacial ice. Tills are not very permeable and seasonal springs are often found weeping from steeper hillsides especially in the early springtime when the overlying soil zone is typically saturated prior to the onset of the growing season. In our experience, bedrock recharge from precipitation (including snow melt) in areas overlain by thin till varies significantly depending on the topography, thickness of the till, groundcover, and is often seasonally dependent.

Based on our observations during the site visit, the till cover is mostly absent at the hilltops where bedrock is visible and is no more than 3-4 ft. thick on some of the side slopes. In the wooded areas it is likely that infiltration into the bedrock is very low during the growing season (mid-April through early November). Once the trees have dropped their leaves, the bedrock aquifer probably receives limited local recharge through the till overburden. For all these reasons, we believe that the local recharge of the underlying bedrock aquifer through the native soil and underlying till is probably relatively low for most of the year and slightly higher during the late winter and early spring.

The existing lawn area to the north of the Eastman residence was reportedly backfilled with at least 12-inches of material including topsoil. The topography of the new underlying bedrock surface is not known. The slope of the bedrock surface may now play an increased role in changing the characteristics of bedrock aquifer recharge in the local area. According to the Eastman permit application, the proposed new rock excavation will be completed in a similar manner to the prior work and we therefore expect that infiltration through the bottom of the proposed excavation will likely increase compared to the prior undisturbed condition; particularly if the new bedrock surface is relatively flat lying.

Bedrock Geology

The bedrock beneath the area is primarily composed of Glastonbury Gneiss. The gneiss is located to the east of the Eastern Border Fault which separates the younger sedimentary rocks found in the Hartford / Springfield Valley lowlands from the older metamorphic rocks in the Eastern Uplands. The surface expression of the Glastonbury Gneiss extends about 30 miles northeasterly as a 1-5 mile wide linear feature from the eastern shore of the Connecticut River in Portland, Connecticut north into Massachusetts. The Glastonbury Gneiss was intruded into the older Bronson Hill Anticlinorium and is identified as the core of the "Glastonbury Dome" in some literature. The Bronson Hill Anticlinorium is a series of large folds developed during the Taconic Orogeny (approximately 470 million years ago). It was at this time that the proto-European continental plate collided with the eastern North American continental plate. As the plates collided the rocks at the continental edges were faulted, folded, intruded and ultimately uplifted, building the northern end of the Appalachian Mountains. In this part of Connecticut, the thin mantling rocks of the Bronson Hill Anticlinorium are the Collins Hill Formation and the Middletown Formation in Connecticut[1].

The *Bedrock Geologic Map of Connecticut (Rodgers, 1985)* provided as Attachment C shows that the Eastman property and most of the surrounding land is located within the Glastonbury Gneiss which is described as a grey, medium to coarse-grained, massive to well-foliated, granitic gneiss. This description is consistent with most of the bedrock outcropping observed during LEI's site visit on October 1, 2020 (Photo #10). Several pegmatite veins were also observed in the site outcrops (Photos #8 and #11). Pegmatites are silicate rich igneous rocks that cooled very slowly allowing for the crystal

[1] Glastonbury Gneiss and Mantling Rock, Massachusetts and Connecticut; USGS, 1984.

structure to grow quite large (a minimum of ¼-inch). Of interest in Picture #1848 is that the center of the rock fragment contains a clast of schist that was torn from the surrounding rock when the pegmatite was injected. Compositionally, the pegmatite veins we observed are probably similar to the surrounding Glastonbury Gneiss.

The bedrock geologic map shows the Collins Hill Formation located approximately 600 ft. to the west of the excavated site. This rock is described as a weathered medium to coarse grained schist. The United States Geologic Survey (USGS) description of this rock indicates that the schist of the Collins Hill Formation may be transitional with the gneiss.

Hornblende gneiss, a variation of the Glastonbury Gneiss or possibly part of the Middletown Formation was observed in an excavated (loose) rock pile to the north (Photo #12). The Collins Hill formation was observed in the remnant outcrop to the immediate northwest of the residence as a thin (about 4-6 ft. thick) layer of micaceous (biotite) schist with vertical foliation. The schist was weathered and is much less competent than the surrounding gneiss. It is likely that some of the area bedrock wells, particularly to the west of the property, intersect the Collins Hill Formation.

The larger residual bedrock outcrop to the northeast of the residence exhibits a number of nearly vertical to subvertical fractures. Some of the fractures appeared to be new; however, iron staining is present on most of the fracture surfaces indicating that the fractures predate the blasting and rock excavation. Iron staining is visible on the rock fragment in the foreground of Photo #13.

The minerology of the Glastonbury Gneiss is well documented.[2] One sample identified in the scientific literature (Sample 5) was collected from the Glastonbury Gneiss approximately three miles to the north of the property and just across the Massachusetts state line. Another sample from the same source (Sample 10) was collected approximately seven miles south of the Eastman property just east of the center of Ellington. Compositionally these samples are nearly identical. The major elements identified were silica dioxide (74.9% and 69.3% respectively) and aluminum oxide (14.3% and 15.9% percent respectively). Minor elements detected in decreasing composition include calcium oxide, sodium oxide, iron(III) oxide, and iron(II) oxide. Several elements are also present at concentrations less than 1%. It is likely that the outcrops of Glastonbury Gneiss at the Eastman property are similar in composition to these samples.

Sulfide containing minerals were not identified in either of the Glastonbury Gneiss samples analyzed by the USGS (nor in samples collected from the Glastonbury Gneiss at greater distances). Table 2 in the USGS report shows the concentrations of minor elements detected in the samples. Thorium, which is a by-product of the decay of uranium, was found. The concentrations detected in samples 5 and 10 were 13.2 and 4.1 parts per million (ppm) respectively. Uranium was not analyzed in either of these samples but is known to be present in the Glastonbury Gneiss.

The rocks of the Collins Hill Formation are not as well documented in the report; however, a sample (Sample 51) of the rock was collected from a location to the east of the property. The major elements identified in this sample were silica dioxide (79.87%) and aluminum oxide (10.17%). Minor elements detected in decreasing composition include sodium oxide, calcium oxide, iron(II) oxide, and manganese oxide. Several elements are also present at concentrations less than 1%. Sulfide containing minerals were not identified in this sample (nor in any sample collected from the Collins

[2] USGS, 1984.

Hill Formation at greater distances). Therefore, with respect to the Glastonbury Gneiss as well as rocks of the Collins Hill Formation, our conclusion is that these rocks do not pose a risk of acid rock drainage.

We were not able to find any scientific references describing the composition of the pegmatite we observed at the Eastman property. A wide assemblage of minerals can be present in pegmatites. The rock specimen photograph attached as Photo #14 was collected from the northern rock debris pile. The sample is light in color and contains a high percent of silica-rich minerals, primarily feldspar and quartz. Biotite is present as secondary minerals along with deformed inclusions of schist from the Collins Hill Formation. It is possible that the pegmatite was excavated from the western portion of the site, near where the Collins Hill Formation was observed in outcrop. A larger pegmatite is present in the proposed work area which appears similar to the sample we found in the debris pile except that no mafic mineral inclusions were noted. Sulfide containing minerals (such as pyrite) were not visible in the pegmatite.

Historic and Proposed Rock Excavation Activities

According to the records provided to LEI, rock excavation by blasting occurred at the Eastman property during February 2018 and May 2019. The excavation work proposed in the current permit application does not include blasting and consists solely of mechanical fracturing. Since the environmental concerns presented by blasting verses mechanical fracturing methods are different, some of the concerns presented by the historic activities (blasting) are not present in the proposed activities (mechanical fracturing).

Physical Impacts to Private Wells

Seismic measurements were collected during each of the May 2018 blast events at 100 Long Hill Drive which is at a distance of between 450 and 600 ft. from the blast area. The seismic recordings show that the peak particle velocities measured were between 0.1 and 0.3-inches per second. We believe it likely that the seismic sensors used to measure the velocities were placed in the overburden soil and as a result probably measured a somewhat attenuated velocity from that which would occur in the underlying competent bedrock. Nevertheless, the peak particle velocities suggest that the blast energy at this distance appears to be relatively low.

An indicator of blast impact to adjacent private wells could be a sudden increase in well water turbidity following a blast event. This may occur in one of two ways; first, from the physical movement of the well casing sufficient to disrupt the casing shoe seal. This can provide a pathway for fine sediment used to backfill the casing to become entrained in migrating groundwater and to flow past the casing shoe. Second, blasting could open new rock fracture(s) that intersect both the open well bore and the ground surface, or other fractures that intersect the ground surface, providing a pathway for fine sediment (silt and clay) to travel with infiltrating precipitation from the near ground surface into the well bore. Our correspondence with Town staff suggests that no homeowner in the area complained of this condition.

A limited number of well completion reports were made available to LEI by the Town. Turbidity measurements in these wells were all below 5 nephelometric turbidity units (NTUs) at the time they were completed providing potential background condition for each of the wells prior to February 2018.

It is therefore our recommendation that turbidity should be measured in all drinking water well samples collected as part of our recommended drinking water well monitoring program. We acknowledge that bedrock well damage issues may be independent of the blasting which occurred. However, the absence of these well issues during the past two years would indicate that physical damage to area wells did not occur.

Geochemical Impacts to Private Wells

As we discussed above, the Glastonbury Gneiss and associated pegmatites are the dominant rock type beneath the subject property as well as beneath most of the surrounding properties. The Collins Hill Formation and the Middletown Formation are also present although not to the degree of the gneiss. Drinking water wells completed in the area may intersect all of these rock units.

The most significant environmental concern associated with drinking water wells completed in the Glastonbury Gneiss and the associated Collins Hill Formation is the presence of elevated concentrations of naturally occurring uranium and radon[3]. The scientific literature demonstrates that uranium (primarily the uranium^{238} isotope) decays to thorium, actinium, radium, radon and ultimately to lead^{206} which is a stable isotope. All of these elements (except the final lead isotope) are unstable, radioactive and transitionally present in any sample that also contains uranium^{238}. Under atmospheric conditions, radon is likely to be present in its gaseous phase.[4]

Data provided by the Town shows that some drinking water wells in this area contain concentrations of naturally occurring uranium and/or radon which exceed the State of Connecticut recommended drinking water standards. This is a regional problem demonstrated by hundreds of relatively recent well water samples collected in other Connecticut towns from wells drilled in the Glastonbury Gneiss. Well water samples from some of these studies shows that about 30% of the well water samples exceed the 30 part per billion (ppb) standard for uranium although there is a high degree of variability in the concentrations detected including between wells that are in close proximity to each other. Given the nature of groundwater movement in bedrock aquifers, there also exists the potential for significant concentration variations within the same well depending on the season and the activity (pumping) of neighboring wells.

The environmental concern associated with the prior bedrock blasting at the Eastman property is the potential for new fracture networks to have been developed that then contribute groundwater to a well. In the absence of extensive geophysical well surveys completed prior to and after blasting, there is no known way to assess the impact to a specific well. Consistent with the Connecticut Dept. of Energy and Environmental Protection (CT DEEP) guidance document for blasting, drinking water wells within 1,000 ft. of the rock excavation area should have been sampled for the parameters contained in the guidance document including uranium and radon. Since background water quality data for these wells is generally absent and the natural variation in the concentrations has not been established, it is not possible to determine the effect that blasting may have had on the concentration of these constituents in the neighboring wells.

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[3] *Geologic Radon Potential of EPA Region 1*; USGS, 1993.
[4] *Geologic Radon Potential of EPA Region 1*; USGS, 1993.

Since the proposed rock excavation method consists of mechanical fracturing at an incremental depth of about 3 ft., we do not believe that the proposed mechanical fracturing work will increase the fractures at depth. However, we do have a concern that the proposed work has the potential to increase the recharge to the bedrock aquifer from precipitation that falls on the work area. Under existing conditions precipitation that falls on the inclined bedrock surfaces runs off as sheet flow to adjacent areas where the slope is less and where thin till is present covering the bedrock. In these areas the low pH rainfall is buffered through the soil where some is taken up by the existing ground cover and trees during the growing season.

The proposed excavation contours show that the bedrock surface will be flattened and then covered and seeded to create additional lawn. Altering the sloping bedrock surfaces to a relatively flat lying surface which is then backfilled and planted could increase the infiltration of precipitation through the lawn (especially during the winter dormant period) and down through the freshly exposed bedrock surface and ultimately into the bedrock aquifer. Exposure of the fresh bedrock surface to infiltrating water could potentially increase the mass of uranium dissolved in the infiltrating water.

The scientific literature indicates that the uranium solubility increases in water with altered pH (either acidic or basic). Factors know to contribute to higher uranium solubility include the presence of carbonates, reducing conditions, and the humic content of the soil. Acid rock drainage is a potential concern at many rock excavation sites. However, as we discussed in the Bedrock Geology section of this letter/report, the minerology of the Glastonbury Gneiss and Collins Hill Formation are reasonably well documented in the U. S. Geologic Survey report. The minerals responsible for the acidification of water as it moves through rock material are sulfides which are not present in samples collected by the U. S. Geologic Survey from nearby locations. The pegmatite observed onsite is not well characterized in the literature reviewed, but our observations of this rock does not indicate that it contains pyrite, which is the most common sulfide mineral. Therefore, we are fairly confident that the excavated pegmatite will not result in ARD.

Conclusions & Recommendations

The material provided by the applicant's consultants and the Town as well as our review of the applicable scientific literature shows that the bedrock underlying the area includes the Glastonbury Gneiss as well as thin schistose rock of the adjacent Collins Hill Formation. During our site walkover we also observed silica rich pegmatites. These rocks are exposed at the surface to the rear (north) of the Eastman Residence where they form a northeasterly trending ridgeline between the elevation of about 600 ft. and about 625 ft. During 2018 and 2019 the applicant used between 4,800 and 12,000 pounds of ammonium nitrate-based explosives to breakup approximately 6,350 cubic yards of the bedrock outcrop at the rear of the residence. The blasting removed that portion of the outcrop that was directly to the rear of the residence leaving a small outcrop to the northwest and the larger remnant ridge to the northeast. The majority of the blasted rock was used to create a variable height rubble stone retaining wall along a portion of the western property boundary. The area to the east of the retaining wall was then graded flat and seeded to create a rectangular lawn of about one acre in size.

LEI's Concern: The Connecticut Dept. of Energy and Environmental Protection issued guidance (Attached as Appendix D) in December 2019 to municipal land use officials for earth moving or quarrying operations including blasting. The document states that one of the primary concerns for blasting is acid rock drainage (ARD) which they define as a natural process that can be exacerbated when rock is crushed and used for fill or where the freshly exposed surfaces are subject to the elements. The guidance goes on to say that the ARD condition is caused by the presence of iron sulfide minerals in certain bedrock. LEI's evaluation of the rock type in the area, both from a literature study as well as during our site walkover, indicates that the rocks that were blasted do not contain sulfide minerals and therefore the concern for ARD is not present.

The Glastonbury Gneiss and the associated schist of the Collins Hill Formation do contain natural uranium. Recent municipal water well sampling programs has found that about 30% of the residential wells completed in these rocks are polluted with uranium and radon in excess of the public health standards. Unfortunately, no pre-blast well receptor survey was completed to identify nearby water wells that might be affected by the blasting residue. Because no survey was completed there was no pre- and post-blast well water quality monitoring. Seismic monitoring during the blast events was completed and certain records were provided to LEI for review. The seismic records do not indicate that the blasting generated enough energy at the Eastman property boundary to damage adjacent structures or water wells.

Recommendation #1: We recognize that the Connecticut Dept. of Energy and Environmental Protection blasting guidance document was not available prior to the 2018 blasting event and was only published about a month prior to the 2019 final blasting event. Regardless, our recommendation is that as a condition of approval of the pending application the applicant should retain a consultant with the necessary qualifications to conduct a drinking water well receptor survey, consistent with Department guidance, for all wells within a 1,000 ft. radius of the previously blasted outcrop areas. The Department has published guidance for completion of these studies. We further recommend that the applicant use the receptor survey information to request homeowner permission to collect well water quality samples for certified laboratory analyses on the following schedule;

1. *30 days prior to beginning the next phase of bedrock removal.*
2. *60 days after completion of the rock removal.*
3. *180 days after completion of the rock removal.*
4. *365 days after completion of the rock removal.*

The parameters to be monitored are enumerated in the Department guidance and we recommend analyzing for all of the constituents. It is also our recommendation that the pH in each well water sample should be measured in the residence as soon as is practical but no more than 10 minutes after the sample aliquot has been drawn. The instrument used to measure the pH should have a valid two-point calibration completed and documented within 14 days prior to field measurement. The results of the receptor survey as well as all well testing results should be summarized in a letter report and provided to the Town for review. Separate letters should be sent to each of the residence by the consultant with a copy of their analytical result.

LEI's Concern: The applicant has withdrawn their request to the Town to conduct additional blasting to remove the remaining 9,650 cubic yards of bedrock. Instead, the applicant has requested approval to use mechanical rock splitting to break up the outcrop and has provided to the Town literature showing the equipment to be used. The literature for the rock splitter says that a thin coating of Elco lubricant "splitter grease" needs to be routinely applied as a means to reduce tool wear and increase the splitting force.

Recommendation #2: We agree that the proposed mechanical rock splitting activity is a preferred approach to complete the proposed site activities. As a condition of approval, the applicant should provide to the Town details on the splitting tool grease to be used. At a minimum an MSDS sheet for the grease should be provided along with a guarantee that the grease does not contain petroleum products.

LEI's Concern: Plans provided to the Town by the applicant show the area where the rock outcrop is to be removed, backfilled and then seeded. However, there is no detail showing the final bedrock grading. Picture #1798 shows the area to the northeast of the residence where bedrock was previously removed in 2018/2019. Note the standing body of water occupying the surface depression beginning at the bedrock surface soil interface and extending to the left (westerly). We believe that this standing water is a function of the low bedrock fracture permeability which impedes infiltration. It also suggests that the underlying bedrock surface may be fairly flat. Standing or poorly drained precipitation in direct contact with the fresh bedrock surfaces may increase the concentration of dissolved solids, certain metals (iron and manganese) as well as uranium in groundwater beneath the area.

Recommendation #3: We recommend that as a condition of approval the applicant should provide to the Town a detailed bedrock grading plan including cross-sections at a scale of about 1"=40 ft. The plan should provide an engineering solution to reduce infiltration as well as preventing the ponding of precipitation on the bedrock surface for extended periods of time. A solution that mimics the prior natural conditions and that incorporates a sloped bedrock surface with an overlying (perhaps 6-inch thick layer) of relatively impermeable material should be placed and compacted after which the final flat lawn grade should be established as desired. We also recommend that the work should not begin until about June 1st when the growing season is in full swing. Also, the work should be completed before October 1st so that the lawn has time to establish.

Recommendation #4: The existing / proposed rubble rock piles / walls to the north and northeast of the lawn area should not be covered or backfilled except to the extent needed for safe truck access. We envision that the removed rock rubble will continue to be piled in a similar fashion to the way it was done in 2018/2019 except that the southern side should not be flat and should be graded to direct precipitation away from accumulating in the area. Our recommendation is that the open rock rubble slope to the north will be maintained. The open rock matrix on the north side should aid surface evaporation and will prevent precipitation from lingering contact with the fresh rock surfaces. The open rock matrix will also allow the fresh rock faces to oxidize quickly reducing the potential to leach naturally occurring minerals including uranium into the underlying fractured aquifer system.

We believe the four recommendations that we have suggested will alleviate many of the concerns raised by adjoining property owners and Town officials.

Sincerely,
Lenard Engineering, Inc.

Mark R. Temple, LEP
President / Principal Hydrogeologist

Daniel Brockmeyer, LEP
Senior Hydrogeologist

cc: Atty. Carl Landolina – Fahey & Landolina

Attachment A

Hydrogeologic & Environmental Assessment – 40 Hallie Lane, Somers, CT

Documents reviewed for assessment include:

OTO letter to Mr. Eastman dated 10/16/19
Re: Discussion of Blasting Issues

1. *Potential arsenic release to groundwater and air*:
   1.1. OTO is not aware of data indicating arsenic is present at elevated concentrations in the vicinity in either the bedrock or soil;
   1.2. Three samples collected from bedrock outcrop and analyzed by method SW-846 6010D. COC instructs laboratory to "grind before testing";
   1.3. All results are below detection limits (1.6 – 1.7 mg/kg).
2. *Releases of Perchlorates in Blasting Formulations to Groundwater*:
   2.1. Blasting contractor states that only de minimus concentrations of perchlorates will be used in the formulation; Includes statement from Austin Powder Company Re: Perchlorate use in formulation of explosives.
3. *Impact of vibrations on nearby structures*:
   3.1. Based on public information, OTO states that "a residential structure should only experience structural damage in peak particle velocity exceeds 2-inches per second;
   3.2. It is OTO's opinion that the proposed blasting should not impact any of the neighboring structures.

OTO Letter to Mr. Eastman dated 10/27/19
RE: Discussion of Potential Nitrate Impacts to Groundwater as a result of Blasting

1. OTO estimates 4,000 cubic yards of rock to be removed;
2. Elevated concentrations can exist in groundwater due to several processes, including; the leaching of nitrates from unexploded nitrate compounds, the oxidation of reduced nitrogen compounds in explosives, and the injection of soluble nitrogen gases into the subsurface. (NH DOT, 2012)
3. OTO states that significant nitrate contamination due to blasting appears to be limited to operations where greater than 1,000,000 c.y. of rock is blasted.
4. Best practices include sampling drinking water well in vicinity prior to and during blasting.

OTO letter to Mr. Eastman dated 9/1/20
Re: Radon/Uranium in Well Water Issue

1. Presence of Uranium and Radon in Well Water Samples:
   1.1. Summary of existing conditions as described in July 19, 2020 letters from the town of Somers, Department of Environmental Health;
2. Effect of Blasting Operations on Groundwater Quality:
   2.1. Potential for vibrations to increase fracturing in bedrock

2.1.1. Increasing surface area allowing a greater concentration uranium to dissolve

2.1.2. Increasing the fractures providing more pathways for radon gas.

2.2. OTO concludes past activities unlikely to have contributed to increase

2.3. OTO states that the "proposed drilling and hydraulic fracturing operations should not adversely impact the concentrations levels of either Uranium or Radon in the nearby water supply wells"

OTO letter to Mr. Eastman dated 9/20/20
RE: Impact on Nearby Wells from Proposed Rock Excavation

1. OTO discussion of potential for increase of radon and uranium in residential drinking water wells serving properties near the site.

2. Rock removal method identified as hydraulic fracturing which consists of drilling shallow holes less than 5 feet and fracturing the rock using hydraulic pressure. OTO states that little to no fluid will be used.

OTO: Bay State Blasting - 2018 & 2019 Blasting Reports

1. Blasting reports were provided for six blasting events performed between February 2, 2018 and February 18, 2018.
2. Blasting reports were provided for two blasting events performed during May 2019.

Town of Somers: Uranium and Radon Results of Drinking Water Well Samples

Results for the following properties nearby properties were reviewed:

- 167 Mountain Rd
- 168 Mountain Rd
- 175 Mountain Rd
- 110 long Hill Drive

J.R. Russo & Associates: Drinking Well Analytical Results from the Town of Somers

Analytical results were reviewed for the following nearby properties:

- 155 Mountain Rd
- 159 Mountain Rd
- 175 Mountain Rd
- 36 Hallie Lane
- 100 Longhill Dr

Letter from William Warzecha addressed to Ms. Sandra Olearcek, dated October 2, 2020

1. Letter from Mr Warzecha identifying 10 concerns regarding the rock excavation work at the subject property.

Guidance Documents for Evaluating Potential Hydrogeologic Impacts Associated with Blasting & Development Activities, CT DEEP, Revised 12-12-19. Included as letter as attachment.

Glastonbury Gneiss and Mantling Rock, Massachusetts and Connecticut; USGS, 1984

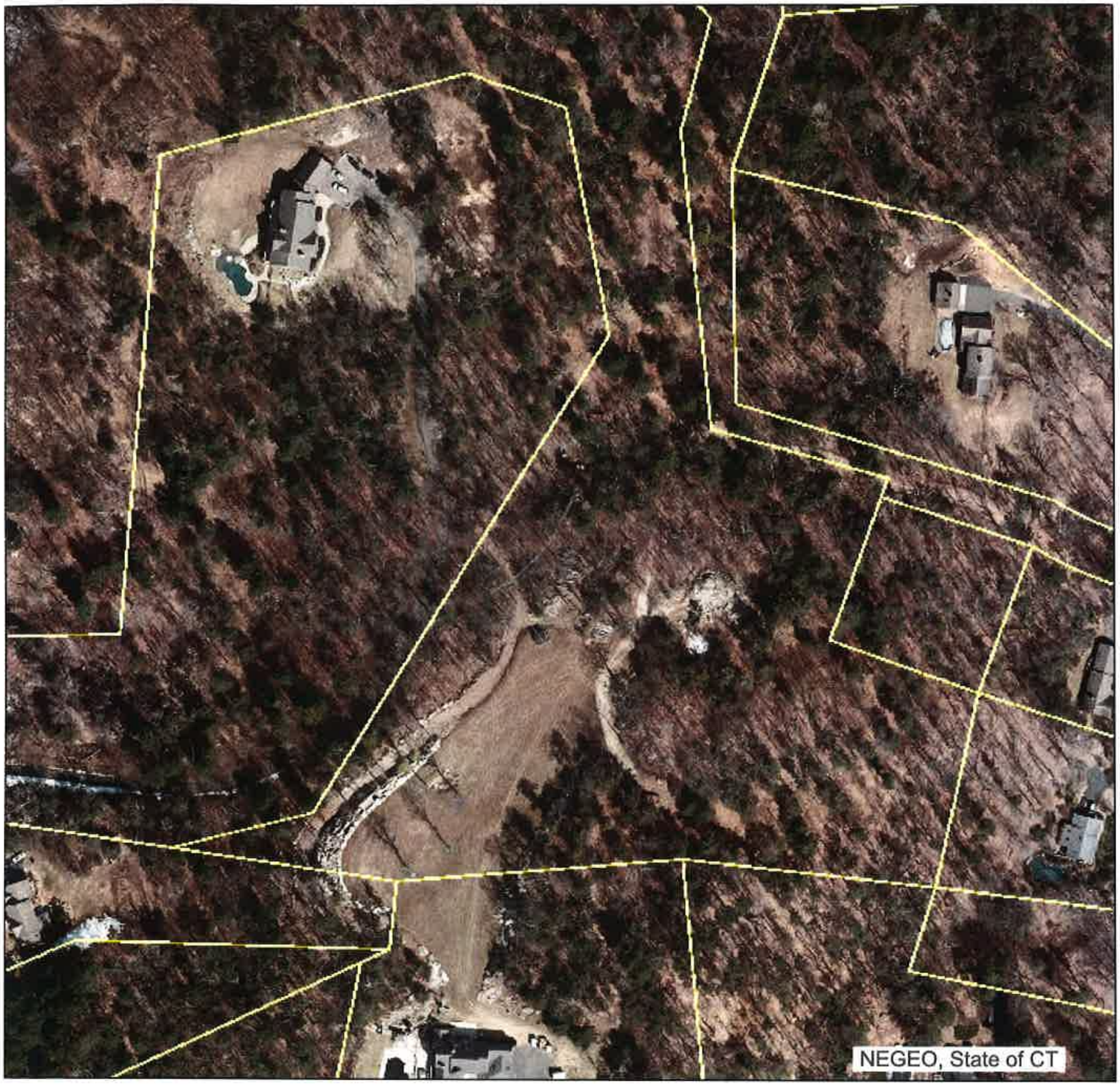
The Bedrock Geologic Map of Connecticut; Rodgers, 1985.

USGS Mineral Resources; State of Connecticut; accesses October 14, 2020.
https://mrdata.usgs.gov/geology/state/state.php?state=CT

Quaternary Geologic Map, Somers, Connecticut; Stone, December 2010.

Town of Somers
Geographic Information System (GIS)

Date Printed: 10/1/2020



MAP DISCLAIMER - NOTICE OF LIABILITY
This map is for assessment purposes only. It is not for legal description or conveyances. All information is subject to verification by any user. The Town of Somers and its mapping contractors assume no legal responsibility for the information contained herein.

Approximate Scale: 1 inch = 200 feet

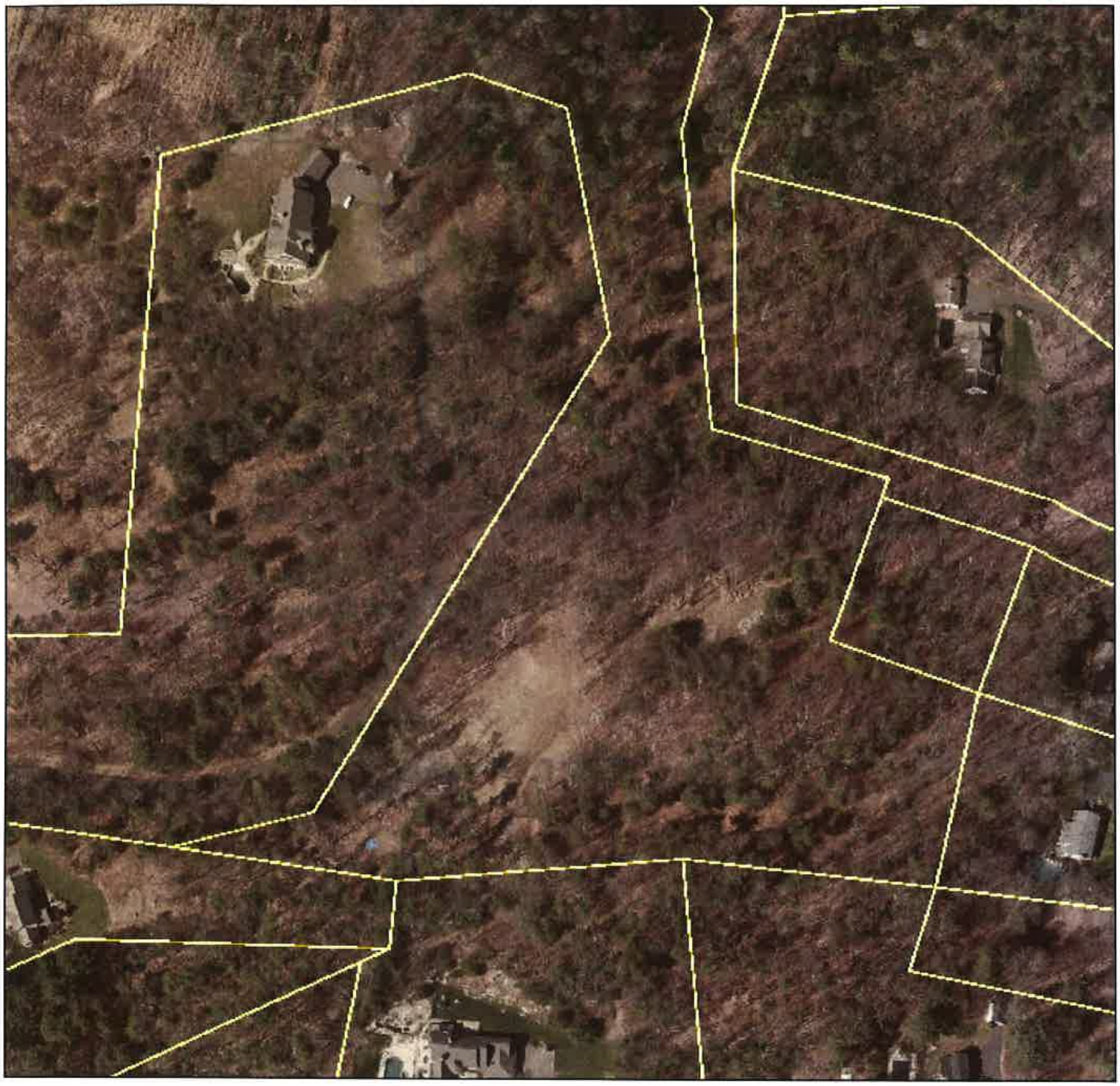
0 200 Feet

N W E S

2019

Town of Somers
Geographic Information System (GIS)

Date Printed: 10/1/2020



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Approximate Scale: 1 inch = 200 feet

0 200 Feet

N W E S

2016

Town of Somers

Geographic Information System (GIS)

TOWN OF SOMERS CONNECTICUT

Date Printed: 10/1/2020

MAP DISCLAIMER - NOTICE OF LIABILITY

This map is for assessment purposes only. It is not for legal description or conveyances. All information is subject to verification by any user. The Town of Somers and its mapping contractors assume no legal responsibility for the information contained herein.

Approximate Scale: 1 inch = 200 feet

0 200 Feet

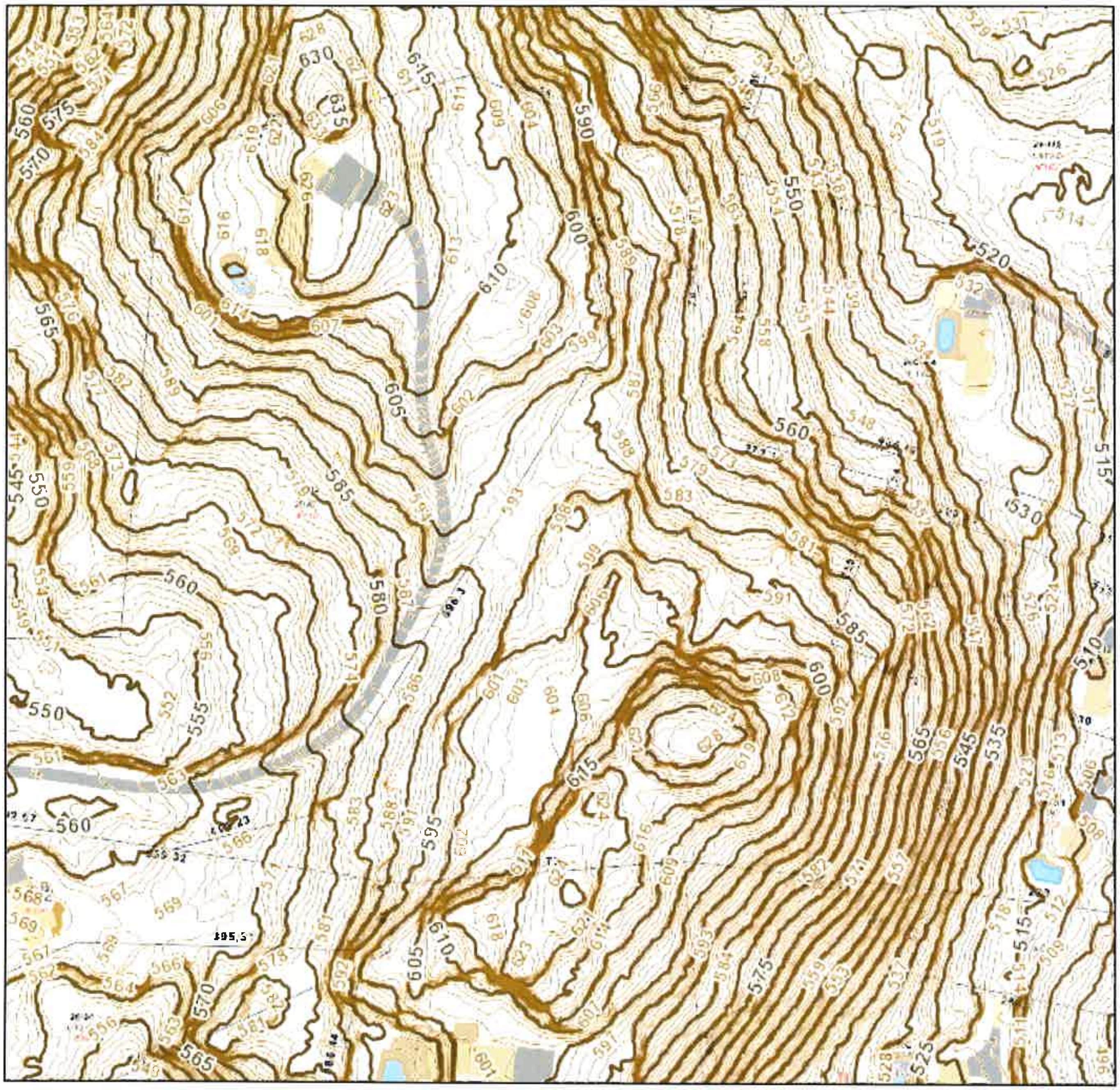
N W E S

2012

Town of Somers
Geographic Information System (GIS)

TOWN OF SOMERS CONNECTICUT

Date Printed: 10/1/2020



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N W E S

2016 Topo

Town of Somers

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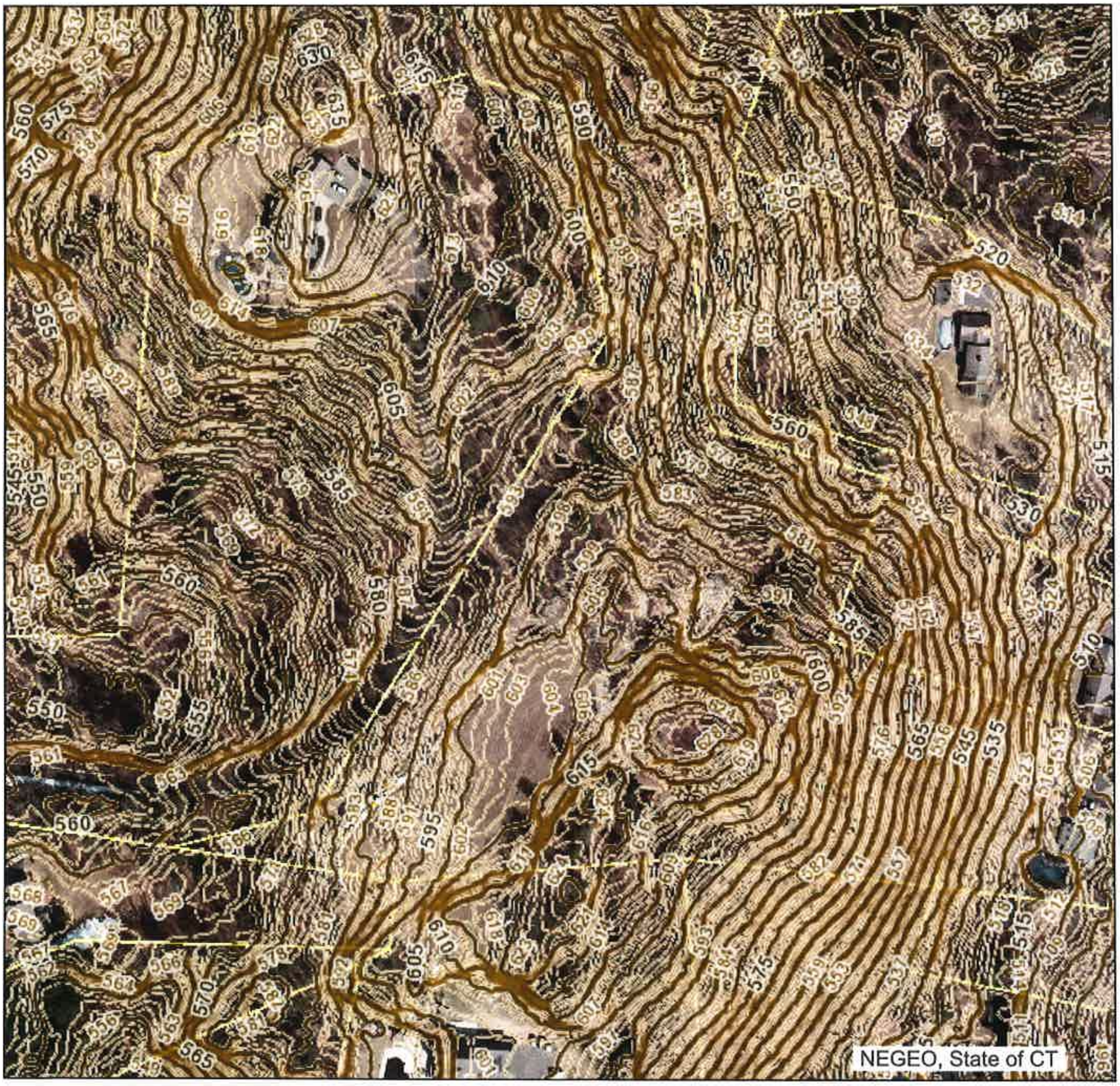

Approximate Scale: 1 inch = 200 feet

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N W E S

2019/2016T

Town of Somers

Geographic Information System (GIS)

TOWN OF SOMERS CONNECTICUT

Date Printed: 10/1/2020

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Approximate Scale: 1 inch = 200 feet

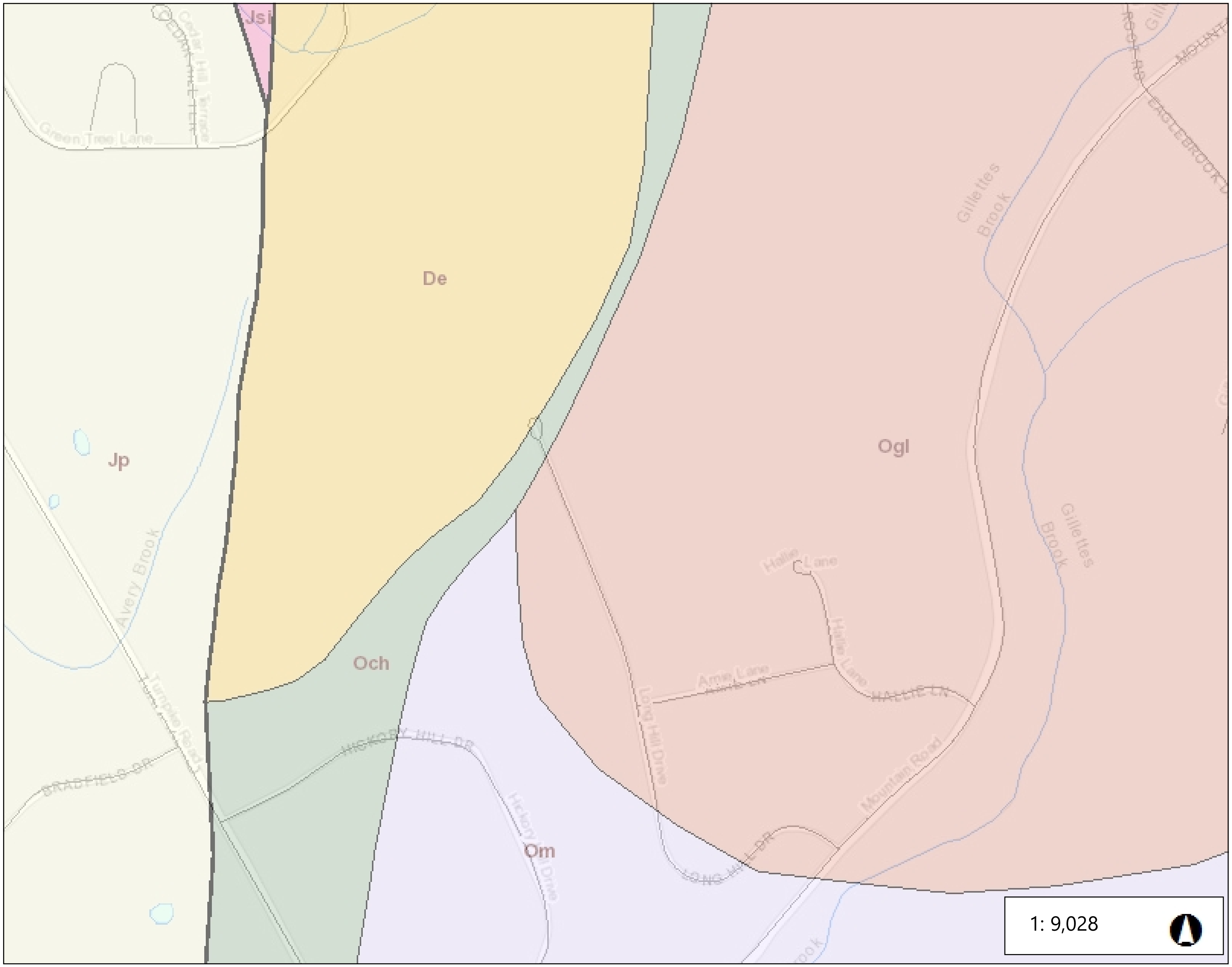
0 200 Feet

N W E S

2016 | 2016T

CT ECO CT Environmental Conditions Online

Bedrock Geology Map



Legend

Bedrock Geology Contacts

- Boundary
- Contact
- Fault
- Map Limit

Bedrock Geology

- D?d
- DSs
- DSsq
- DSt
- DSts
- DSw
- Dbl
- Dbl?
- Dblm
- Dc
- Dce
- De
- Dgg
- Dl
- Dld
- Dlp
- Dm
- Dn
- Dng
- Cc

Notes

Ogl = Glastonbury Gneiss
Och = Collins Hill Formation
Om = Middletown Formation

0.3 0 0.14 0.3 Miles

This map is intended for general planning, management, education, and research purposes only. Data shown on this map may not be complete or current. The data shown may have been compiled at different times and at different map scales, which may not match the scale at which the data is shown on this map.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

STATE OF CONNECTICUT

DEPARMENT OF ENERGY & ENVIRONMENTAL PROTECTION

GUIDANCE DOCUMENT FOR EVALUATING POTENTIAL HYDROGEOLOGIC IMPACTS ASSOCIATED WITH BLASTING & DEVELOPMENT ACTIVITIES

Bureau of Water Protection and Land Reuse
Remediation Division

December 2019
(Rev. 12-12-19)

The following guidance is provided by the Department of Energy & Environmental Protection's Remediation Division for use by municipal land-use officials when evaluating proposed developments, road construction projects, or quarries where significant earth removal and/or blasting activities are likely to occur. Because of those types of activities, there is concern for possible negative impacts to the quality and quantity of water in neighboring drinking water wells, as well as other environmental factors such as erosion, sedimentation, and decreased surface water quality conditions.

One of the primary concerns is acid rock drainage (ARD), which is a natural process, but can be exacerbated when rock is crushed and used for fill or other purposes that expose the freshly crushed rock to precipitation. ARD is caused by the presence of bedrock containing high levels of iron sulfide (which is present in Eastern and Western Highlands and sometimes the central valley of CT), especially such rock that is freshly exposed or crushed and has been subjected to the elements/precipitation. Under these conditions, there is an elevated risk for mobilizing naturally-occurring iron, manganese, and sulfur, which may adversely affect groundwater and drinking water quality. In addition, increased mobilization of arsenic, uranium and/or radon can occur in areas where these naturally-occurring minerals are present in the bedrock formation.

The Department recommends that land use officials consider the following as part of the overall application review process:

1. The developer or applicant (the Applicant) should retain a geologist/hydrogeologist or engineer (Environmental Professional) to evaluate the underlying bedrock in terms of its potential to cause ARD. The town's land-use office should make sure that the Applicant acquires the services of a qualified Environmental Professional that has experience testing the mineralogy and chemistry of the rock material and evaluating the potential impacts of ARD. As such, there needs to be a detailed site plan developed by the Applicant's Environmental Professional that addresses best management practices for minimizing ARD conditions by ensuring proper handling, storage or disposal of the rock material on- and off- site and minimizing its contact with infiltrating precipitation and surface water runoff at the site.

2. After identifying all drinking water wells within a 500-foot radius of the area to be disturbed by proposed construction activities, the Applicant's Environmental Professional should evaluate which drinking water wells need to be sampled in order to establish baseline drinking water quality conditions prior to any active earth work or blasting activity. Consideration should be given to factors such as: well type and construction details; the nature, geologic structure, and mineral make-up of the underlying bedrock; and blasting/rock removal techniques. The town's land-use office, as part of the permit application review process, or as part of the pre-blast survey if blasting is necessary, should also require that the Applicant document the yield and capacity of the wells before the site work or blasting commences. Testing the raw water quality (prior to any water treatment devices) of nearby drinking water wells prior to construction or blasting activities will establish a baseline for comparing post-project test results, in the event a property owner makes a complaint that the project activities negatively impacted their well.

3. In the absence of drinking water wells within 500 feet of the area to be disturbed, the Applicant's Environmental Professional should identify the closest drinking water wells, if any, within a 1,000-foot radius. Depending on the location, proximity, well construction and other factors, consideration should be made as to whether the proposed blasting activity poses a concern to the quantity or quality of water at these locations. Should a concern exist, and in the absence of closer drinking water wells to monitor, the Department recommends a minimum of annual monitoring of water levels and water quality of the closest drinking water well until the development project is completed and the site has been stabilized.

4. The Department recommends that drinking water wells at risk of ARD from proposed blasting and earth removal activities be analyzed for the following drinking water quality parameters:

    - pH
    - odor
    - color
    - turbidity
    - total iron
    - total manganese
    - nitrate
    - nitrite
    - sulfate
    - coliform bacteria
    - arsenic
    - uranium
    - radon
    - ammonia perchlorate *(if the salts ammonium, potassium, magnesium, or sodium perchlorate is an ingredient of the blasting agent)*
    - total petroleum hydrocarbons using the CT extractable total petroleum hydrocarbons test method *(if the blasting materials contain ammonium nitrate fuel oil mixtures)*

    All testing should be performed in an approved laboratory certified to test drinking water by the Connecticut Department of Public Health's Laboratory Certification Program.

5. Follow-up well water sampling should occur within one to two months following the blasting activity and again once the site has stabilized and ground cover has been established. The plan for such water sampling should be part of the Applicant's land-use application. Should the development project and site work continue over a prolonged period of time, annual testing of the potentially impacted drinking water wells should be performed to ensure there are no adverse effects to the drinking water quality.

6. If there is a change in drinking water quality during or after the blasting activity, the well owner should notify the Applicant and/or blasting contractor of the condition, and also

notify their local health department and DEEP's Remediation Division (860-424-3705) of the condition.

7. The static water level in potentially affected drinking water wells should also be monitored during and following completion of the site work and blasting activity to determine if the static water level in the well decreases to the extent there is a problem for domestic use. Major site work that significantly alters infiltration rates, diverts surface water flow, or creates deep rock cuts or fractures may seriously deplete the volume of water in nearby overburden or drilled bedrock drinking water wells. Wells accessed for purposes of water level monitoring will require the well to be properly disinfected prior to being reactivated following the Department of Public Health's *Publication #27: Disinfection Procedure for Private Wells*.

Other Considerations:

- There may be additional issues relating to blasting activities that the town, through its Fire Marshal, may need to address by the pre-blast survey. Such issues may include the potential for structural damage to neighboring properties due to air blasts and vibrations, and/or noise and dust control. Additionally, if municipal officials receive complaints regarding fugitive dust emissions due to the blasting and/or earth removal activities, DEEPs Bureau of Air Management (860-424-3436) can be contacted for guidance and possible follow-up inspection.

- The municipality may want to consider having large-scale developments, where significant site work including blasting is planned, be evaluated by the Connecticut Environmental Review Team (CTERT). A request for an ERT review must come from the municipality's chief elected official or the chairperson of one of the town's land-use or economic development commissions. Information regarding the CTERT and applying for an ERT review can be found at www.ctert.org or by calling 860-345-3977.

- Activities with proposed soil disturbances of one (1) acre or more that have not obtained local approval involving an erosion and sediment control review must register for the DEEP's General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. The Applicant can obtain information regarding the general permit at www.ct.gov/deep/stormwater.

ELCOIO2019.1

THE SOURCE FOR HYDRAULIC ROCK AND CONCRETE SPLITTERS

HYDRAULIC ROCK AND CONCRETE SPLITTING

INFORMATIVE OVERVIEW AND PRODUCT GUIDE

Hydraulic rock splitters are safe and efficient tools for the excavation of hard rock and removal of concrete. With handheld splitters delivering up to 400 TONS of splitting force and machine-mounted splitters delivering up to 1,950 TONS of splitting force, Darda splitters make quick work of even the hardest rock.

darda®

We've got the power.

WHEN HARD ROCK STOPS HAMMERS AND BLASTING IS TOO EXPENSIVE...

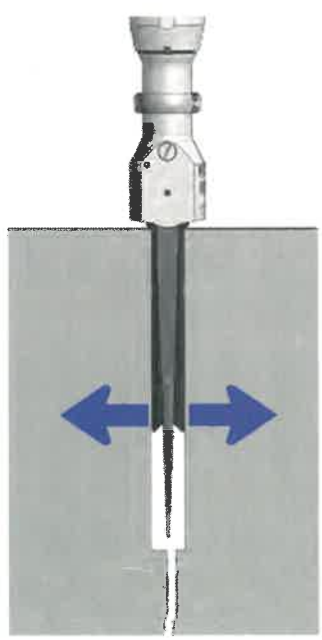
Introduction

Hydraulic rock splitting is a reliable and economical alternative to traditional breaking techniques – including large hydraulic hammers and blasting. That's why Darda splitters have been used throughout the world for over 50 years in a wide variety of applications. These tools allow operators to easily break rock that hydraulic hammers struggle to fracture. If you need a proven tool that offers maximum production rates in hard rock or concrete removal, then look no further. Darda hydraulic splitters will power through rock excavation and concrete removal projects with ease.

Principles of Splitting

Hard rock and high-pressure reinforced concrete is naturally resistant to impact breaking from hydraulic hammers. This is why hard rock can all but stop production rates when using hammers. Rock splitters deliver many times more force than even the largest hammers to the inside of the material, ripping it apart in its weakest direction.

To use hydraulic splitters, a specific diameter hole of minimum depth needs to be drilled in the rock or concrete. The wedge set of the splitter is inserted into the hole and the splitter is cycled. Handheld splitters produce up to 400 tons of rock and concrete splitting force while machine-mounted splitters deliver up to 1,950 tons of force.



Why Split?

Hydraulic splitters offer many unique benefits. These benefits are especially noticeable in hard rock and urban / suburban locations where large support equipment is cumbersome or impossible to get onto the site. Splitting is also an excellent alternative to blasting in developed areas where excessive required permitting, engineering, or monitoring cancel out the efficiency of blasting.

Economical and Efficient

- Can be many times cheaper than hydraulic hammers and blasting
- Fast drill-split-dig cycles
- Rarely requires costly monitoring of nearby structures
- Typically lower insurance costs and no license costs

Safe and Controllable

- Set splitting direction
- Stop an undesirable split and leave rock intact
- No vibration, shockwave, or flyrock
- Drastically reduced permitting and approval requirements
- Lower risk of damaging nearby structures

Low Operating Costs

- Compact size leads to cheaper mobilization and demobilization
- Less support equipment required
- Smaller support equipment
- Reliability leads to little down-time

Environmentally Friendly and Socially Accepted

- Rarely (if ever) any complaints, unlike blasting and hammers
- Low dust emission
- Reduced continuous noise emission and levels
- Small, compact equipment is less intrusive to neighbors

APPLICATIONS OF SPLITTING

Production Work In Rock

Rock removal projects can prove challenging for both owners and excavation companies. As areas become built-out, the available land becomes less suitable for building – often consisting of rock at or near the surface. Blasting is often ruled out with permitting, monitoring, and engineering costing too much time and money. Hydraulic hammers are often too large to bring onto the site or simply can't break the rock. Splitters are a proven choice to excavate hard ledge rock in large volumes, typically ranging from tens of yards to over 1,000 cubic yards of solid rock. The efficient delivery of tremendous force makes rock splitting highly productive and profitable in urban and / or suburban environments.

Manifold for Increased Production and Precision

Using a manifold allows one operator to run up to five splitters simultaneously. Production rates can exponentially increase with the addition of each splitter. This method also allows for increased precision. Running the splitters in a line helps promote cleaner breaks in sensitive locations (such as along a foundation or footing) in both rock and concrete.

Close-Quarters and Sensitive Structures

Using hydraulic rock splitting allows operators to remove rock and concrete with surgical precision. Rock can be removed from within existing basements, straight down along footings and foundations, and even from underneath high-pressure gas mains. The controllable force exerted by the splitters is arguably the safest method of rock excavation. The gradual application of force also means that there are no impacts, shockwaves, vibrations, fly-rock, or explosions. When using rock splitters, operators can confidently work near sensitive structures and utilities without causing any damage. The splitters can also be used to modify existing concrete structures. The splitters have the ability to remove desired concrete from large masses or specific sections from existing structures. When properly used, the splitters will not affect the nearby sections of the structure, leaving the remaining concrete strong and stable.

Concrete Removal

Splitters can be used to increase profitability on concrete demolition projects – especially when comparing the method to saw-cutting, wire cutting, or using hydraulic hammers. Since the direction of the breaks can be determined with splitters, concrete can be quickly broken into sections as large as support equipment can handle. Hydraulic splitting eliminates the shocks and vibrations associated with hydraulic hammers and can be used to outperform even large excavator-mounted implements. Darda hydraulic splitters have proven effective and extremely economical in the removal and/or modification of: bridge decks, abutments, retaining walls, floor slabs, foundations, wall openings, reinforced concrete, locks, dams, culverts, road barriers, and piers.




HANDHELD SPLITTERS

Darda handheld hydraulic splitters are powered by Elco power units and accessories. A complete unit consists of a splitter, hydraulic power unit, 30 foot high and low pressure hoses, high and low pressure whips, and quick connect couplings. Conversion kits are available for quick changes between electric, gas, and air motors. Be sure to use the Elco lubricant that is required for these tools. Failure to use specified lubricant will result in increased component wear, premature failure, and reduced effective splitting force. Elco also offers flowbars for the use of multiple tools, as well as additional accessories.

C2

Hole Dia.	Hole Depth	Effective Force	Unit Weight
1-3/16 Inches	12 Inches	220 Tons	40 Pounds

The C2 is suited for small projects such as underground mining, pipe-jacking, and landscaping. The small size and light weight of the splitter make it ideal for close-quarters applications where small amounts of rock or concrete need to be removed. This splitter can be used for secondary splitting of boulders, excavating small amounts of ledge rock, or producing dimensional stone. The small hole diameter required for the C2 splitter makes drilling holes with an electric hammer drill possible- a unique advantage over the larger models which require a 1-3/4 inch diameter hole.

C9

Hole Dia.	Hole Depth	Effective Force	Unit Weight
1-3/4 Inches	18 Inches	220 Tons	50 Pounds

The C9 exerts the same amount of force as the C2 splitter, but engages more material with each split. The tool is capable of heavier work than the C2, and is well suited for concrete splitting and excavating soft rock (such as limestone, sandstone, and other sedimentary rock). The C9 is often used in more confined spaces or when the 18-inch minimal hole depth is desirable. The C9 is also well-suited for underwater demolition due to its light weight balanced with appreciable production rates.

C12

Hole Dia.	Hole Depth	Effective Force	Unit Weight
1-3/4 Inches	26 Inches	400 Tons	71 Pounds

The C12 is the largest handheld Darda splitter. The tool is used for the heaviest rock excavation and concrete splitting projects, especially where mass-amounts of rock or concrete must be removed. The C12 is most suited for ledge excavation and trenching in harder rock formations (such as granite, basalt, and similar rock). This model is also most desirable for splitting reinforced concrete. With the long feathers engaging an appreciable amount of rock over the C9 and a high splitting force, this tool offers the highest production rates. Multiple C12s can be used together with a manifold in order to increase production rates even further in both rock and concrete.

Comparison Table

Each handheld splitter has a specific application. The C2 is for extremely light work or confined spaces. The C9 is for softer materials and light rock excavation. The C12 is for reinforced concrete and hard rock excavation.

Model	C2	C9	C12
Weight (lbs)	40	50	71
Force (ton)	220	220	400
Hole Dia. (in)	1-3/16	1-3/4	1-3/4
Hole Depth (in)	12	18	26
Length (in)	30	40	50 3/4
Split Depth (in)	5-5/8	9-3/8	15-3/8
Expansion (in)	3/8	3/4	3/4 to 1-7/8

ELCO POWER UNITS & ACCESSORIES

01

Gas-Powered Hydraulic Power Unit

HP	RPM	Weight *a	Length	Height	Width
3.5	26-3,600	67	18	22	12-1/4

The 01 Gas Powered Hydraulic Power Unit is a self-contained model. The gas unit is ideal for highly remote locations or where holes are being drilled using handheld hydraulic/electric drills or with a drill rig. The stand-alone unit allows for splitters to be run without electricity or a large air compressor on site. The unit is also useful where holes are being drilled continuously and air flow cannot be diverted to run the power unit.

*a- Excludes fluid and hose weight

02

Air-Powered Hydraulic Power Unit

HP	RPM	Weight *a	Length	Height	Width
4.0, *b	3,000	67	18	22	12-1/4

The 02 Air Powered Hydraulic Power Unit is run by a rotor-type air motor. The air power unit is useful in remote sites where there is a large air compressor available, usually already on the jobsite for drilling the holes with a pneumatic rock drill. This model is popular since other air tools are typically required on the site and other power sources are not required.

*b- Requires 80 to 120 CFMs at 80 to 100 PSI

*a- Excludes fluid and hose weight

03

Electric-Powered Hydraulic Power Unit

HP	RPM	Weight *d	Length	Height	Width
1.5, *c	3,450	67	18	22	12-1/4

The 03 Electric Powered Hydraulic Power Unit is run by an electric motor. The electric model is extremely quiet and the most reliable power source. In more remote locations, the power unit can be run off a generator as small as 3000 continuous watts. This model is a good option for urban / suburban projects.

*c- 110 or 208-230 volt, 60hz, 16.8 amp startup, 8.4 to 9.1 amp running

*a- Excludes fluid and hose weight

08-1

Pressure Test Gauge and Shutoff Valve

The 08-1 Pressure Test Gauge and Shutoff Valve is for testing power units and splitters. The test gauge comes with quick disconnects so that it can be quickly installed on the high-pressure circuit. The design of the test gauge allows mechanics to test both power unit and splitter independently, drastically reducing diagnostics time and improving the rate of successful repairs.

014-3 014-4

Elco Lubricant

Hydraulic rock splitters require specially formulated splitter grease. Using alternative grease results in premature failure of wear components and up to 50% reduction in splitting force. An extremely thin film of grease should be applied every split in hard working conditions, and up to every three splits in softer materials. Grease is sold by the case of twelve 1-pint (014-4) or 1/2-pint (014-3) metal cans.

016-13 016-14

Flowbar Manifolds

All models of Elco hydraulic power unit can power up to five splitters (C2, C9, or C12). Using multiple splitters of the same model with a flowbar manifold allows one operator to run all the tools simultaneously. Production rates are higher with the manifold as opposed to multiple complete units. The flowbar manifold also allows operators to excavate rock and split concrete with the highest possible precision- an essential when working near structures.

DARDA C20 SPLITTER ATTACHMENT

FAST, POWERFUL, AND RELIABLE

With a splitting force of up to 1,950 tons and cycle times averaging under one minute, the Darda C20 machine mounted hydraulic rock splitter delivers an entirely new rock excavation solution to end users. The tool features an integrated pressure booster and automatic greasing system, further increasing the tool's flexibility and practicality. Weighing in between 770 and 1,100 pounds (depending on mounting configuration) and requiring just 23 GPMs at 2,500 PSI, the Darda C20 can be operated by machines as light as 5-tons. The speed of operation and wide range of carrier sizes allows this tool to be used efficiently in almost any rock excavation project.

Model	C20C N / L
Splitting Force	1,650 Tons / 1,950 Tons
Hole Dia. (in)	3
Hole Depth (in)	30 / 38
Weight (lbs)	770 / 800
Length (in)	94 / 106
Split Depth (in)	20 / 32
Expansion (in)	7/8 / 1
Excavator Weight	5 Ton Minimum, 9 Ton or Larger Recommended
Hydraulic Requirements	Minimum 23 GPM @ 2,500 PSI Maximum 27 GPM @ 3,900 PSI
Splits per 40-Pound	2,500 to 3,300
Splits per Reservoir	80 to 180 (depending on grease delivery rate)
Recommended Materials	Basalt, Granite, Gneiss, Hard Limestone, High-Strength Concrete
Recommended Applications	Site Development, Tunneling, Mass Concrete Removal, Trenching, Road Expansions, Quarries, Natural Stone Production

HYDRAULIC SPLITTING
DISCOVER THE SMART WAY TO EXCAVATE ROCK AND SPLIT CONCRETE WITH SPEED AND PRECISION

Questions?

Please feel free to contact Elco directly via phone or email. We can assist you with additional information, technical support, project design, or answer questions you may have about hydraulic rock splitting. We can also direct you to one of our dealers for service, support, sales, or rentals.

THE SOURCE FOR HYDRAULIC ROCK AND CONCRETE SPLITTERS

(201) - 797 - 4644
1 - 800 - 631 -3816
OFFICE@ELCO.COM

YOUR LOCAL ELCO-DARDA DEALER IS:

BENEFITS OF HYDRAULIC SPLITTING

Hydraulic splitting of rock and concrete has many practical and economical advantages over alternative methods, such as blasting or hydraulic hammering. In an ever-increasingly developed world, contractors are faced with not only carrying out the project, but also overcoming a myriad of regulatory, safety, and social restrictions. These companies must adapt to new tools and methods which increase productivity in spite of the hurdles and roadblocks laid out before them. Hydraulic splitting using Darda products is one of these unique methods.

Economical

Darda hydraulic rock and concrete splitters offer high production rates with low costs when compared to hydraulic hammers and even blasting. When taking into consideration all of the training, expertise, design, engineering, work stoppages, and safety features required in blasting, hydraulic splitting is often the preferred method of rock demolition in populated areas. In harder rock formations, hydraulic splitting will often outperform even large hydraulic hammers. Furthermore, the lightweight and compact design of Darda hydraulic splitters means lighter and less expensive support equipment is required to accomplish the same tasks- a tremendous economical advantage.

Safe and Low-Impact

Blasting and hydraulic hammering are becoming more regulated due to safety concerns and the general public becoming more wary of these methods. Complaints from nearby residences, offices, and/or medical facilities are often enough to seriously impede or terminate the project activities. Hydraulic rock splitting avoids the problems and setbacks incurred when using blasting or hydraulic hammers. Due to the operating principles, the Darda hydraulic splitters are the safest way to dismantle rock. Operation of these tools produces no fly rock, no shockwave, no audible explosions, and no vibrations. For a contractor, this means the ability to operate discretely without causing any damage to nearby structures or utilities and without alarming bystanders and nearby tenants. Monitoring, extensive engineering, regulations, and complaints all disappear, leaving the contractor to focus on productivity and profitability.

QUESTIONS?

Elco International, Incorporated is the sole distributor of Darda hydraulic rock and concrete splitters throughout the United States and Canada. We offer several free services, including educational literature, technical support, and suggested project designs.

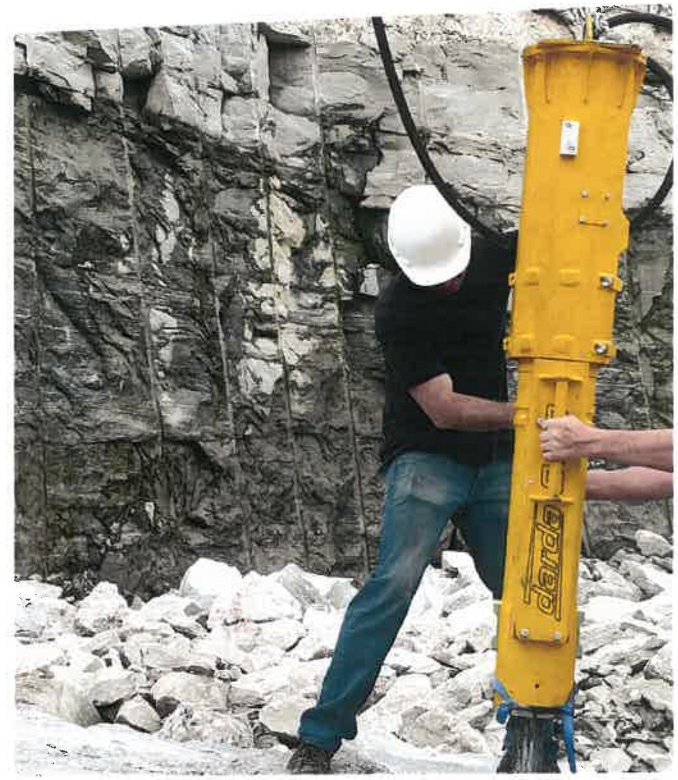
If you want to learn more about hydraulic rock splitting and how it can save you time while increasing production rates, then give us a call at the number below!

THE SOURCE FOR HYDRAULIC ROCK AND CONCRETE SPLITTERS

ELCO
INTERNATIONAL, INC.
101 VAN RIPER AVENUE
ELMWOOD PARK NJ 07407
201-797-4644
OFFICE@ELCO.COM

C20 SPLITTER

UP TO 1,800 TONS OF SPLITTING FORCE



AN EFFICIENT AND RELIABLE ALTERNATIVE TO HYDRAULIC HAMMERS AND BLASTING

EAST ROCK

DARDA C20
SPECIFICATIONS AND ADVANTAGES

Fast. Powerful. Reliable.

These are just a few of the many benefits that the Darda C20 hydraulic splitter offers.

This machine mounted attachment is used for the demolition of rock and large masses of concrete. Powered by the auxiliary hydraulic circuit of the carrier, the integrated booster increases the circuit pressure to over 7,000 PSI, delivering a total splitting force of 1,500 tons (short wedge set) to 1,800 tons (long wedge set). Using the time-tested and proven principles of the Darda handheld splitters, this tool is an excellent solution for mass excavation of hard rock formations. With an integrated lubrication system, the C20 further increases productivity while reducing premature wear of the wedge set. Able to be run off machines as light as 5 tons, this tool brings immense power to job sites where progress was previously limited by equipment size. However, this tool can be found on large projects as well, offering high production rates in site development, trenching, and road expansion work. The versatile splitter platform is offered in four unique mounting configurations, each designed to optimize efficiency in unique applications.

The Darda C20 hydraulic splitter increases production rates when excavating solid bedrock, breaking large boulders, carving trenches, tunneling, or reducing oversized rock from blasting.

C20 TECHNICAL SPECIFICATIONS

	C20CN / CL
Splitting Force	1,500 Tons / 1,800 Tons
Drill Hole Diameter	3 Inches
Drill Hole Depth	30 Inches / 38 Inches
Unit Weight	630 Pounds / 650 Pounds
Unit Length	64 Inches
Unit Width	12 Inches
Unit Height	18 Inches
Excavator Weight	5 Ton Minimum, 9 Ton or Larger Recommended
Hydraulics Requirements	Minimum 23 GPM @ 2,500 PSI Maximum 27 GPM @ 3,900 PSI
Splits / 40 Lb Pail	2,500 to 3,300
Splits / Reservoir	100 to 180
Recommended Materials	Basalt, Granite, Gneiss, Harder Limestones, High-PSI or Reinforced Concrete
Recommended Applications	Site Development, Tunneling, Dam Removal, Trenching, Road Expansions, Quarries, Natural Stone Production

The best way to learn about how new equipment can benefit your company is to see it in action on a job site. Contact Elco International for a free demonstration of the Darda C20 or handheld hydraulic splitters.

Elco
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NEW TO HYDRAULIC SPLITTING?

Hydraulic rock and concrete splitters are a powerful and economical alternative to traditional breaking methods, such as blasting, sawing, and hydraulic hammering. These tools, when implemented properly, will break even the hardest rock formations faster and cheaper than even large impact hammers. At the same time, these tools operate in a safe and controllable fashion, eliminating all the concerns and risks inherent to blasting. For a rough break in concrete or modification of existing concrete structures, these tools outperform wire and circular saws in terms of speed and reliability. These are just a few of the reasons that Darda hydraulic splitters have been used throughout the world for the past 50 years with great success.

Principles of Splitting

Rock and high-pressure reinforced concrete is naturally resistant to impact breaking from hydraulic hammers. Splitting techniques allow the breaking force to be exerted from within the material (much like blasting), resulting in large fractures. Application of hydraulic splitters requires a hole of specific diameter and depth to be drilled into the rock or concrete. The wedge set of the splitter is inserted into the hole and the tool cycled. The expansion from the wedges creates up to 400 tons of force on handheld models and 1,800 tons on carrier mounted models.

To learn more about hydraulic splitting, visit us at www.elco.com or contact us directly.

Picture 1 - Rubble wall on the western property boundary.

Picture 2 - Rubble along western property boundary.

Picture 3 - Lawn area looking North.

Picture 4 - Lawn looking northwest towards top of rubble wall.

Picture 5 - Excavated rock rubble pile to the north of the proposed excavation area.

Picture 6 - Excavated rock rubble pile to the north of the proposed excavation area.

Picture 7 - Collins Hill Formation looking Southwest.

Picture 8- Remaining bedrock ridge with pegmatite looking Northeast.

Picture 9- Glastonbury Gneiss with pegmatite vein looking Southeast.

Picture 10- Glastonbury gneiss.

Picture 11 - Outcrop of Glastonbury gneiss showing pegmatite vein looking East.

Picture 12 - Hornblende gneiss observed at site.

Picture 13 – Excavated rock to the North of the proposed excavation area showing iron-staining.

Picture 14 – Pegmetite from a vein within the Glastonbury gneiss with schist inclusion.

Picture 15 – Example of the Collins Hill Formation schist.