Berlin Land Trust, Inc.

April 10, 2018

Karl J. Wagener, Executive Director
Connecticut Council on Environmental Quality
79 Elm Street
Hartford, CT 06106

Re: Tilcon/City of New Britain Public Act 61-61

Dear Mr. Wagener:

I write on behalf of the Berlin Land Trust, Inc. ("BLT"). The Board of Directors has authorized me to indicate the strong opposition of the BLT to the proposal of the City of New Britain to allow the strip-mining of watershed land owned by it on Bradley Mountain in Plainville.

It is our position that watershed land must be protected from all types of private uses, particularly when the plans proposed lead to the total destruction of a trap rock ridge, a forest, wetlands and flora and fauna, some of which are protected.

Of particular concern to us is the conservation value of the trap rock ridge which will be destroyed. To that end I attach hereto a copy of a paper commissioned by BLT in August 2011. Carya Ecological Services, LLC prepared this report for us. The points made in this report apply directly to the requested destruction of the trap rock ridge habitat on Bradley Mountain. This report was written by Sigrun N. Gadwa, M.S. PWS. She is eminently qualified to tender the opinion contained in the report. I have attached her Curriculum Vitae as evidence of her qualifications

We strongly recommend that the Connecticut Council on Environmental Quality recruit third party, independent ecologists experienced in trap rock habitat to visit the site in question. We are confident that these independent ecologists will confirm the value of the trap rock ridge which will be destroyed under the Tilcon/New Britain plan.

Please include this letter and its attachments in your file with regard to the aforesaid Application.

Thank you,

Dennis L. Kern
President
DLK/tt
Enclosure

Carya Ecological Services, LLC

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TRAPROCK RIDGES OF CENTRAL CONNECTICUT: OVERVIEW OF CONSERVATION VALUES

Most of the higher traprock ridges of Central Connecticut are already protected open space, especially those with spectacular views, such as the Hanging Hills, Ragged Mountain, West Rock, Sleeping Giant, and Mount Higby. The Berlin Land Trust has commissioned this document, believing that a better understanding of the natural resources associated with these ridges would be helpful to land use boards and decision-makers, as pressure grows to develop the remaining privately owned portions of the volcanic ridges. Decision-makers have long been aware of the recreational and scenic value of the higher traprock ridges, but the ecological, educational, and geological value of the lower ridges and the lower slopes of ridges are less obvious, and many are already developed.

1.0 GEOLOGY OVERVIEW

Connecticut does not have cone-shaped mountains that once rumbled and spewed ash and lava. Instead the lava oozed more slowly from deep, elongated cracks, which started to form about 200,000 years ago, when the super-continent Pangaea, began to pull apart. Tension between the freshly separated continents opened up two elongated cracks (faults). The land settled between two deepening faults, creating a rift valley. Molten lava oozed up through the deepest cracks and spread across the valley, and then cooled and hardened into trap rock (basalt). Three separate periods of lava flows formed three beds of variable thickness. The middle bed (Holyoke Basalt) may be hundreds of feet thick.

The valley gradually filled with sediment, eroded from what used to be high mountains in eastern and western Connecticut. The eastern and western highlands are still many

hundreds of feet higher in elevation than the lowlands of the Connecticut valley. Each successive bed of basalt (cooled lava) was buried by sediment that was compressed into a reddish-brown sedimentary rock, known as brownstone or New Haven Arkose. Total sediment deposition was two miles thick at the Eastern Border Fault in Middletown. Climate conditions at that time were tropical, which accounts for the red, oxidized color of the sedimentary rock and its relatively low mineral content.[1]

Because the rift valley was still deepening along the Eastern Border Fault (often called the trapdoor), the rock beds all tilted down to the east, by 15 to 25 degrees. The broad basalt beds were glued together by sedimentary brownstone. Eventually they broke apart into several "sandwich" chunks. Over time, especially during the periods of glaciation, the process of erosion exposed the higher, western, "up-tipped" edges of the these basalt beds, since trap rock is considerably harder than brownstone. The broken western edge of each broad basalt slab became a basalt ridge. This explains the characteristic profile of traprock ridge, visible on Mount Higby, driving south on Interstate 91: a steep western slope/cliff and gentler eastern slope. As west-facing summits continue to erode, chunks of basalt keep falling onto the western slopes, creating the *talus slopes* so characteristic of traprock ridges.

The ridges often show an interesting triplet pattern: a taller ridge corresponding to the Holyoke basalt bed is associated with two much lower parallel ridges, an anterior and a posterior one (corresponding to the thin slabs of Talcott and Hampden Basalts). The brownstone "glue" between the up-tilted layers of basalt rock has been weathered away. The far north end of Cathole Ridge shows this pattern very clearly. Sometimes the smaller ridges have been squeezed against the primary one. Wetlands are often found in the dips between ridges, including outstanding vernal pools.

Most of our traprock ridges originated as described above, from the western edges of cracked lava slabs. In central Connecticut (Berlin, Southington, Plainville, New Britain, Newington, and Rocky Hill) these include the four ridge systems extending northerly from four prominent peaks in Meriden and Middletown: The Hanging Hills, Cathole Mountain, Mount Lamentation, and Mount Higby, as shown in Figure 1, an annotated topographic map.

[1] An infertile "tropical" soil forms from brownstone parent material unless it is enriched by basalt glacial till or by river sediment.

However, some "intrusive" formations like West Rock[2] in Hamden and Cheshire and the Barndoor Hills in Granby, were formed underground. The oozing lava cooled slowly underground, rather than on the surface. Crystals are larger in this slow-cooled rock, called diabase, visible to the naked eye. The rock weathers more slowly, but mineral composition is identical to basalt. These intrusive ridges or *dykes* were buried by sediment and then gradually exposed by weathering and glacial scour, just like the basalt ridges.

Connecticut's continuous, above-ground trap rock ridge system extends northerly into Massachusetts, but cracks in the rift valley oozed lava as far north as Newfoundland. Intermittently exposed basalt also occurs in Newark and Hoboken, New Jersey (the Palisades) and in the Pomperaug valley in Southbury and Woodbury, Connecticut.

2.0 SOCIETAL CONSIDERATIONS

2.1 Hiking

The long traprock ridge systems already have some excellent ridge-top hiking trails, with fine views across central Connecticut from exposed summits and outcrops. West Peak of the Hanging Hills is 1,024 feet above sea level, and is well-used as it is reachable by car. East Rock and West Rock are also accessible by car. At present in central Connecticut trailheads from roads are usually unmarked on the lower ridges, with poor connections between adjacent ridges. Trail systems could be improved, extended, and better publicized. [3]

In contrast to the very steep grades on many side slopes, ridge crest terrain undulates gently up and down, alternating between exposed sunny, rocky outcrops, and shaded dips, for aerobic but only moderately-stressful exercise. Ridge trails pass through grassy glades, an important vegetation community, with special, almost magical appeal. Trees in the glades are dwarfed, though they may be very old. One finds unusual plants like bottlebrush grass and ebony spleenwort, and colorful wildflowers in spring and fall.

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[2] The name of West Rock (West Haven and Hamden) changes, first to Prospect Ridge, and then to Peck Mountain in North Cheshire.

[3] Where Connecticut Forest and Park Association volunteers are active, trails are in excellent condition, e.g. Mount Higby.

Blueberries are a mid-summer attraction, sunflowers in late summer and early fall. Deeply shaded hemlock groves are also common.

2.2 *Aesthetics, Heritage, and Microclimate*

The undeveloped ridges form contiguous greenbelts that contrast with the developing valley, a green respite for the eye. Basalt cliffs are visually striking - whether eight or eighty feet tall - changing in color with light conditions. Lichen-covered rock outcrops, boulders, and talus are also visually interesting, and good photo-subjects. The distinctive ridge profiles are part of our local heritage. An unaltered rock geologic formation can tell a rich, geologic story, of interest valuable to a high school earth science student and a PhD researcher. Long distance views from traprock summits also teach local geography.

The traprock ridges also contribute to our quality of life in other ways. Transpiration from trees on the ridges cools ambient temperatures in the intervening developed valleys. Even low ridges serve as a windbreak against bitter winter winds from the west and northwest. They are important refuges for songbirds and wildlife, allowing many species to persist in the Hartford metro area, even after the valleys are largely developed, for us to observe and enjoy.

2.3 *Erosion Prevention*

Many ridge side slopes are extremely steep, especially to the west, but are naturally protected by a layer of rock chunks (talus), with compost in the crevices, often several feet thick. Rainfall that falls on these slopes infiltrates; it is filtered and enriched with plant nutrients by the compost, resulting in fertile slope base plant communities of exceptional quality. The underlying soil is fine-textured and highly erosive, either Wethersfield loam or Ludlow silt loam. Even a road cut parallel to the steep contours results in erosion when the protective talus is removed and the soil is exposed. This can be observed along a gas line service road on the east slope of Prospect Mountain in Cheshire. Grading of ridge terrain with fine soils derived from traprock is especially risky from an erosion and sediment control standpoint. The eastern slopes are usually gentler, but they also have highly erodible soils.

2.4 *Water Supply*

The majority of the trap rock ridges have at least one reservoir at the base of a slope, for example the reservoirs around the Ragged Mountain. Large, linear wetlands are usually found at the base of traprock ridges, parallel to the lower slopes, the headwaters of streams. Mirror Lake at the base of the Hanging Hills, is the centerpiece of Hubbard Park in the City of Meriden. Rainfall onto the forested ridges often flows underground to replenish the reservoirs and wetlands with clean water. Flowing streams high on the hillsides are apt to disappear into the ground, as the water switches to below-ground channels. Grading and blasting on traprock ridge slopes has a high likelihood of degrading groundwater and downgradient wetlands and surface waters, and altering flow patterns.

3.0 CRITICAL HABITATS

The diverse ecological communities found on trap rock ridges are distinctive; very different from the plant communities found on ridges in the Eastern and Western Highlands of Connecticut, but remarkably similar to each other. There are two reasons for this. First, the sub-acidic, volcanic soil on traprock ridges is less acid, richer in minerals, like calcium and magnesium, and finer textured than most Connecticut soil (soil derived from brownstone, granite, gneiss or schist). Second, the thin soil, rocky outcrops, cliffs, steep talus slopes, and boulder fields create a variety of unique ecological conditions. In each of the habitats listed above, plant species may need (or prefer) the mineral-rich, sub-acidic soil derived from basalt; these species often also thrive in circum-neutral soils derived from limestone, found only in the far western part of Connecticut.

This is true, regardless of the elevation of the ridge. During the past growing season, I have observed all the plant species and most of the wildlife in the habitat descriptions below, and shown in the slide shows.[4] Several dozen other rare, state-listed plant species also grow in traprock habitats, but were not encountered during the 2011 surveys. They are listed in the attached Table 2.[5]

[4] Scientific names are provided in Table 1.
[5] This table of endangered, threatened , and special concern species was compiled with the assistance of botanist William Moorhead, who was a consultant to CTDEEP at that time.

CT DEEP Ecologist Kenneth Metzler and other wildlife biologists have identified six Critical Habitats (CT ECO[6]) that overlap with five of the Twelve Key Wildlife Habitats [7] on the traprock ridge system. These include exposed summits, grassy high-elevation glades, high-elevation shrublands, talus slopes (both sunny and shaded), and dry, sub-acidic forest on summits and upper slopes.[8, 9] These are shown and described in the accompanying slideshows. A critical habitat is uncommon statewide, and is known to supports uncommon and state-listed species.

Each ridge encompasses multiple critical habitats. Their limited extent in the state adds to the value of these habitats. The total land area of the traprock ridge system is low, occupying less than five percent of the central valley in Connecticut and Massachusetts. This is clearly evident on the Bedrock Geology Map of Connecticut, showing multiple, narrow red and pink basalt or diabase ribbons, within a broad expanse of tan-colored sedimentary rock (see Figure 2.)

Sedimentary rock still underlies most soils in the central valley. Most of the basalt is still deeply buried by layers of sedimentary rock; just the high western edges of the basalt beds are exposed. The depth of glacial till in some areas underlain by basalt bedrock may be such that soils lack the special properties conferred by contact with basalt. It should be noted that on the periphery of a ridge system, characteristic species – and traprock rarities[10] - are still likely to be found, if traprock is close to the surface, but not the full ecological communities. Other areas are currently infested by invasives, but could be restored, if seed sources of native traprock species are still nearby.

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[6] Connecticut Environmental Conditions online (cec.cteco.uconn.edu); the four trap rock critical habitats are described in Legend Descriptions Section, for Connecticut's Critical Habitats. Botanist Ken Metzler updated this list in 2009 before he retired from CT DEEP.

[7] The Twelve Key Habitats are described in detail in Chapter 4 of the Connecticut's Comprehensive Wildlife Conservation Strategy.

[8] The CT-ECO Critical Habitats are: Dry Subacidic Forest (DSF), Subacidic Cold Talus Forest/Woodland (SubCTFW), and Subacidic Rocky Summit/outcrop (SubRSO) (with 3 subtypes Scrub Oak Woodlands (found on trap summits), Glades and Balds (found on dry trap rock exposed summits and outcrops), and sparsely vegetated Cliffs and Unconsolidated rock). Connecticut's List of Twelve Key Wildlife Habitats also includes Dry Oak Forests and pH Neutral Forests (moist).

[9] Many habitat units are small or were not included on the on-line CT-ECO map (only some towns were fully mapped), but the botanical and physical descriptions in the CT-ECO Key and in Chapter 4 of the Comprehensive Wildlife Management Plan, are clear, such that these critical (key) habitats can easily be identified in the field.

[10] I found the state-listed traprock sedge, *Carex molesta*, just south of Route 9 by the far northern end of Mount Lamentation, only a few feet higher than the surrounding terrain.

3.1. *Lower Slopes*

The rich, sub-acidic soils on the lower ridge slopes support sugar maple forest including white ash, basswood, tulip poplar, and hop hornbeam, all forest species characteristic of fertile mid-western soils. Canada moonseed is a distinctive, uncommon vine, the larval food plant of the rare pipevine swallowtail butterfly. Ferns, spring wildflowers, and sedges, are diverse, especially among talus chunks at the base of the western slopes. Christmas fern is dominant and wildflowers include Dutchman's breeches, Bloodroot, and Wild Ginger. Golden Ragwort, Pale Jewelweed, and Toothwort grow in nearby slope-base wetlands, which are also rich in minerals. On east-facing lower slopes, sugar maple forests include stands of Tulip Poplar.

3.2 *Talus Slopes*

This unique habitat is classified as a Critical Habitat by CT DEEP. Talus slopes range in length from under ten feet to several hundred feet long, and may be sunny or forested. Layers of rock chunks protect steep, erosible soil, infiltrate rainfall, and trap leaves to form fertile compost. Water that seeps though talus slopes enriches the forest and wetlands below. The pink-flowering geranium, Herb Robert is found on only on exposed traprock talus slopes, growing alongside Marginal Wood fern, Red Elderberry, and Virginia Creeper. Lichens grow on talus surfaces. Cool air sinks through the talus, creating a cool microclimate at the base of basalt slopes suitable for plants of more northern ecoregions, like Purple-flowering Raspberry. Several snakes species, like black rat snake, Spotted and Jefferson Salamanders, and Eastern Box Turtles find shelter under the rocks. Specialized insects, like the Six-spotted Tiger beetles, use talus habitat as well.

3.3 *Summits and Upper Slopes*

The *glade, dry forest, and open summit* communities are three additional traprock communities classified as Critical Habitat by CT DEEP, regardless of ridge elevation. The thin soils interspersed with rocks on the upper slopes and summits of the ridges support a distinctive forest community with hickories, White Ash, Hop Hornbeam Red Cedar, Chestnut Oak, and. Eastern Hemlock groves may also be present, though they may be stressed by sucking insects. These trees are low in stature for their age, and typically grow in a "grassy" *glade* (actually Pennsylvania Sedge) or *bald*. Diverse ferns,

wildflowers, and native grasses often grow in pockets of soil among boulders and rocks, sometimes in glades, and sometimes on exposed outcrops. Polypody Fern, Ebony Spleenwort, Harebell, Comandra, Wild Licorice, Smooth Rock Cress, and Bird's Foot Violet, Wild Oat Grass, and Bottlebrush Grass are characteristic, among many others. Fall-blooming wildflowers include uncommon species, also adapted to the mineral-rich soil derived from volcanic rock – like Wavy-leaved Aster and Elm-Leaved Goldenrod. Each of these plant species is associated with host-specific butterflies and other fauna. For example, the orange falcate butterfly, found only on traprock ridges, feeds on Smooth Rock Cress. Shadblow is visited by flocks of Cedar Waxwings in June when the fruit is ripe.

3.4 *Shrub Thickets*

Stable shrub thicket is yet another critical habitat category, per the CT DEEP classification. Thickets may be the dominant groundcover on exposed, treeless summits: Scrub Oak, Downy Arrowwood, and Black Chokeberry, and low mats of Low Bush Blueberry and Huckleberry. Edward's Hairstreak and many other insect species feed on oak on traprock summits, and blueberries are important food for wildlife as well as a treat for hikers. This cover type is uncommon in the eastern US, as trees usually grow up to shade out shrub thickets, unless soils are very thin.

4.0 WILDLIFE

As noted above, uncommon plants in each of the critical habitats are associated with host-specific insects or other animals, many uncommon and some rare. The ridges are also a refuge for many formerly common insects, which have grown scarce in suburbia, like the metallic blue Six-spotted Tiger Beetle. The traprock ridges also support larger state-listed listed wildlife, like Eastern Box Turtle and Jefferson Salamander. Caves under boulders serve as dens for the uncommon, though not state-listed Bobcat.

Many migratory forest songbird species fail to breed successfully in the fragmented forests in suburbia, but can do so in the large contiguous forested ridge systems, such as the Cathole Mountain, Hanging Hills, Prospect Ridge, and West Rock, with minimal loss of eggs and nestlings from predation and parasitism. Such birds include Scarlet Tanager, Ovenbird, Black and White Warbler, and Worm-eating Warbler. Forested acreage on this

scale (over 250 acres) is not available elsewhere in central Connecticut, except around Broad Brook reservoir.

The extensive contiguous forests also provide terrestrial habitat for some very large populations of Wood Frogs and salamanders. Traprock vernal pools are often tucked between primary and smaller ridges, and many have egg mass counts in the order of 300 to 500.

5.0 OTHER CONSERVATION CONSIDERATIONS

5.1 Genetic Reservoirs

The ridges provide continuous habitat bands connecting some sizable populations of these and other plants – and associated fauna. (The exact number depends on lifespan and extent of interbreeding, etc., but it is usually thousands of individuals.) From a conservation standpoint, plant or animal populations are not healthy unless the breeding population is large enough to encompass a healthy level of genetic diversity. This is very important for conservation of statewide uncommon species (not just rare ones). Many of the species that may be somewhat common in plant trap rock summit communities, like Bottlebrush Grass, Ebony Spleenwort, Red Columbine, and Bird's foot Violet, Hop Hornbeam, and Basswood, do occur elsewhere in the state, but are scarce and widely scattered.

5.2 The Role of Lower Slopes and Anterior & Posterior Ridges: Protection from Invasive Plant Infestation

Statewide, the spread of invasive plant species is steadily reducing plant diversity (and diversity of associated fauna). However, undeveloped lower slopes of trap rock ridges often serve as a buffer protecting the unique ridge crest trap rock communities from invasive plant infestation and human disturbance. If the ridges are high enough, or if the central ridge is protected by an anterior or posterior ridge, invasive propagules have simply not yet reached the critical habitats. Surprisingly, extensive trap rock ridge critical habitat is not yet infested with invasive plants, on the north end of Cathole Ridge in Berlin for example. This includes forests, glades, summits, and talus slopes. Peck Mountain in Cheshire is a contrasting example; lower and mid slopes have been

residentially developed for over twenty years, resulting in a severe infestation of the remaining ridge crest (north end of Peck Mountain in Cheshire) by Burning Bush. In Plainville, west of I-84, Autumn Olive has severely infested residual basalt ledge habitats, following extensive quarrying. Spotted Knapweed infests traprock ledges near Route 4 in Farmington.

On gentle forested lower slopes past farming has often reduced plant diversity, but they may still have rare or uncommon species, such as grape fern and unusual sedges (e.g., the lower slope of Cathole Mountain, west of Silver Lake in Southern Berlin). Lower ridge slopes are also important for terrestrial stages of vernal pool species and migratory song birds, as mentioned above. Some rocky, steep lower slopes have diverse, interesting minerotrophic plant communities, including Bloodroot, Wild Ginger, Sweet Cicely, Blue Cohosh, and Pipevine. Spring wildflowers, ferns and tall forests on these lower traprock slopes have aesthetic and natural heritage value, even if lower, forested slopes are not listed by CTD EEP as a critical habitat. As many have already been developed, the value of those that remain increases.

5.3 *Sewering and Wetland Resources*

One reason that ridge ecosystems in central Connecticut often remain intact from crest to base, is that traditional, non-sewered residential development has been excluded by shallow bedrock, high groundwater tables, and steep slopes. If sewers are brought into these areas and more homes and condos are built on trap rock hillsides and ridge crests, not only will invasive plants and human disturbance threaten the traprock critical habitats, but the linear wetlands at the base of almost every trap rock ridge will be threatened by erosion and loss of high-quality seepage through talus slopes. (Sewerlines typically divert groundwater along the stone trenches.) These vulnerable slope-base wetlands are mineral-rich and sub-acidic (almost neutral), just like the terrestrial plant communities on soil derived form basalt. They are also more diverse than comparable wetlands in a landscape with acidic bedrock.

6.0 CONCLUSION

The traprock ridges of Central Connecticut warrant more publicity, more emphasis in school curricula, and efforts to close the remaining conservation gaps between existing

parts and open space preserves, grounded in town regulations. With the growing interest nationwide, in fitness and in the environment, public support should be readily forthcoming. This report may guide changes in Zoning Regulations and the Plan of Conservation & Development.

ON-LINE PHOTO-APPENDIX:

Below are two links to slideshows showing traprock geologic features, plant community types, and other natural resources. Photographs were taken in the spring and summer of 2011, in Berlin, Rocky Hill, Meriden, Southington, and Cheshire. The first album focuses on critical habitats along summits and on upper slopes; the second on lower slope habitats and slope-base wetland resources.

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Instructions: Highlight and copy the entire URL and paste it into your browser, highlighting whatever address is in the browser to replace it. Press enter. Click first photo at upper left, and use arrows to proceed through slideshow, reading captions. You will not have access to any other part of FACEBOOK.

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Connecticut Forest and Park Association. Connecticut Walk Book, Middletown, CT

Lee, Cara. 1985. West Rock to the Barndoor Hills The Traprock Ridges of Connecticut. Vegetation of Connecticut Natural Areas, No. 4. State Geological and Natural History Survey of Connecticut. Dept of Environmental Protection.

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Wetherell. Traprock Ridge of Connecticut: A Naturalists Guide. 1997. CTDEP Bulletin No. 25. Most information in the book originally appeared in 1992, under the title Natural History Outings on Connecticut's Traprock Ridges, published by Diana Wetherell.

Written By Sigrun N. Gadwa, MS, PWS
Plant Ecologist & Soil Scientist

Curriculum Vitae

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EDUCATION:

M.S., Plant Ecology, Univ. of Connecticut, Storrs, CT, 1997.

B.A., Biology, Brown University, Providence, R.I., 1975.

Continuing Education

16 credit hours in Soil Science and Geology, 1993 – 2001
University of Connecticut, Storrs (for Soil Scientist certification)
Moss/lichen Instruction/Field Trips: CBS & Andrews Forays: 2011& 2014.
Arboriculture course, Quinnipiac College, Hamden, CT, 1984
Phycology course, Pan American U., Brownsville, Texas, 1982
Freshwater Mussel Short Course. New Hampshire Department of Environmental Conservation. August 2004.
CT DEEP Workshops (~10): Assessment techniques for Wetlands & Streams, including Rapid Bioassessment with benthic macro-invertebrates. Bethany Lab & Field Sites. 1996 - 1998.
Graduate Plant Pathology courses, Cook College, Rutgers U., New Brunswick, N. J. 1978 – 1979.
Sedimentation and Erosion Control Instruction, USDA & CPESC (Certified Professionals in Erosion Control), 2000.

Early Education: 1960's & 1970's

Farm work on family organic farm, summers: trail work & botanical inventories of local Nature Conservancy preserves. Helped father with Nissequogue River Resources Committee, opposing wetland filling.

CERTIFICATIONS:

Registered Soil Scientist,
Society of Soil Scientists of Southern New England (SSSSNE)
Certified Professional Wetland Scientist (PWS)
Society of Wetland Scientists

PROFESSIONAL AFFILIATIONS:

Society of Soil Scientists of Southern New England SSSSNE).
Connecticut Botanical Society (CBS), Board of Directors,
Connecticut Association of Wetland Scientists
Ecological Society of America
New England Wildflower Society
Connecticut Ornithological Society

Curriculum Vitae *(continued)* *Sigrun N. Gadwa, MS, PWS*

EMPLOYMENT HISTORY:

2001 to Present: Principal of Carya Ecological Services, LLC;
16 years as a Wetlands, Botany, & Farm Consultant,

- Since 2014, the botanist responsible for long-term vegetation monitoring of the North Cheshire well-field for the **Regional Water Authority,** New Haven, CT.

- 2014-17: Erosion & Sediment Control Monitor at Platt High School, Meriden, **K & W Construction**, Woodbury, CT;

- 2000 to Present: Regular subcontractor for **Rema Ecological Services, LLC**, of Manchester, CT: Vegetation & wetland characterization; ecological impact assessments; & wetland delineations for wetland and open space subdivision permit applications. Application reviews for towns & neighbor groups. Searches for rare plant & herptile species. erosion control monitoring. habitat restoration, invasive removal, & wetland mitigation: preparing plans & planting tables & guiding implementation.

- 2005 – 2015: Advised the **Ships' Hole Farm Partnership**/tenants regarding invasive control, mowing, grazing, soil testing & lime application. Smithtown, NY.

- 2000-2004: Vegetation, wetland & habitat mapping/inventories. For CT DEEP inventoried two > 1000-acre wildlife Management Areas, Goshen WMA and Babcock WMA.

- Vegetation/Habitat studies & baseline surveys/management plans for non-profit land-protection organizations, Groton Open Space Association, Cheshire Land Trust, Berlin Land Trust, Joshua's Trust, including an in depth Atlantic White Cedar Swamp study (critical wetland habitat) in Windham, Connecticut

- **2006- present:** Delineation of wetlands, including US Army Corps of Engineers Plots. Assessment of functions and values, and searching for rare species, mostly bridge replacement/ rehabilitation jobs, for **Cardinal Engineering, Inc.** in Meriden.

2015 – Present: Adjunct Botany Instructor at **Post University;** includes herbarium skills & basic plant taxonomy, morphology, & physiology. Waterbury, Connecticut.

2013 to present: Workshop Leader for Spring Latin Day : I: Latin Plant Names of Familiar trees and Wildflowers ; II: Latin Church Music & Chants, Holiday Hill, Cheshire, Connecticut

EMPLOYMENT HISTORY, **continued:**

1995 – 2000 Executive director & staff scientist for **Quinnipiac River Watershed Association,** Directed a volunteer "Stream Team" from 1995 to 2000, providing local Towns & CT DEEP with watershed data, including turbidity data, used by regulators to achieve prompt correction of sediment discharge violations. Planned & taught Educational Programs, coordinating with high school science teachers. Meriden, Connecticut.

1991-1995: Wetland delineation & Planning; alternatives analyses using the US Army Corps of Engineers 3 parameter method. Resource mapping, wetland functions and values assessment, land records research & reporting, for highway interchanges and bypasses. Also monitoring well field vegetation. **DeLeuw Cather, Inc.,** East Hartford, Connecticut.

1987-1992: Wetlands Researcher, Part of an interdisciplinary team, studying man-made replication wetlands and natural reference wetlands. Took part in research design; collected vegetation, soils, & hydrologic data; literature searches; data analysis. Research used to produce a wetlands manual on mitigation/restoration for the Connecticut Department of Transportation and for master's thesis. **University of Connecticut Department of Civil Engineering,** Storrs, CT,

1975 Teaching Assistant, Plant Systematics, Brown Univ., Providence, Rhode Island

VOLUNTEER POSTS

2014 to Present: Board Member of Connecticut Botanical Society (CBS): frequent field trip and workshop leader. Chair of the Conservation and Ecology and Committee.

1998 to Present: Connecticut Invasive Plant Working Group (CIPWG): powerpoint presentations, & research on watch list species at risk of crossing the seed viability threshold (e.g., mugwort).

2004 to 2014: Volunteer, then advisory board member of LINPI, the Long Island Native Plant Initiative, including seed collection plant propagation work parties & training.

1995 to Present: Coordinated the QRWA "citizen science" volunteer turtle monitoring program "Turtle Crossing," which included volunteer training, public outreach & reporting to CT DEEP Wildlife Division, under a Scientific Collector's Permit.

1989 to 2004: Board member of the Cheshire Land Trust. Still volunteer/advisor.

PUBLICATIONS:

2014, S.N. Gadwa. *Invasive Threats to Upland Critical Habitats.Connecticut BotanicalSociety Newsletter, Volume 41, No. 1.*

2013. *Traprock Ridges of Central Connecticut: Overview of Conservation Values.* 12 pp. *(White Paper).* Berlin Land Trust2006, revised 2008 and 2011.

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WORKSHOPS &

Instructor: Advanced training, Connecticut Master Naturalist Program; *Bogs and Swamps* Fall 2015 & 2017. Classroom & field trip. 6hrs.

;

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REMA

• Ecology
• Soil & Wetland Studies
• Water Quality Monitoring • GPS
• Environmental Planning & Management
• Ecological Restoration & Habitat Mitigation
• Aquatic, Wildlife and Listed Species Surveys
• Application Reviews • Permitting & Compliance

VIA E-mail
April 2, 2018

Berlin Land Trust
Berlin, CT

ATTN: Mr. Dennis Kern, President

RE: **PROPOSED TILCON QUARRY EXPANSION**
New Britain Water Company Property

- The permanent and total destruction of 78 acres of a protected watershed (New Britain water company) a dangerous precedent. Loss of everything that grows there, lives there (all flora and fauna), and natural land resources and formations; also adverse indirect impacts to remaining adjacent habitats from noise, air pollution, and hydrologic changes (drainage of wetlands though cracks in rock formations)

- Critical traprock habitats (open summit & outcrop) and talus slope habitat. The 2018 proposed preserves much more of the high trapock habitat, but **not the knoll with the rarest species, a fir-moss, that had been believed extirpated since the 1880's,** and only half of the easternmost knoll.

- Vegetation communities were not mapped by the botany consultant, & search routes not shown, contrary to the scope at start of the report, though a species list of classic traprock plants was produced.

- A long section of headwater stream system which feeds into the West Canal and ultimately into the Shuttle Meadow Reservoir.

- Six of 8 vernal pools, one of which supports state-listed Jefferson salamanders, and all of which are likely used by the state-listed spotted turtles, on the site; also large numbers of the more widespread vernal pool species.

- An outstanding Eastern box turtle population on former farmland on east side of prposed quarry footprint. Ten individuals were found – a remarkably high density for this state.

Rema/Carya propose to finish generating testimony for the BERLIN LAND TRUST for an estimated total cost of $600, and guide BLT with entering it into docket for the Watter

Planning Board, and also submit it to the Council for Environmental Quality, by April 10th.

Attachments: A: Figures (1a, 1b, 1c, and 2 showing resources to be impacted, changes in proposed quarry extent since 2016 (~131 acres down to ~78 acres) and site vicinity.
B: Excerpt of Environmental Chapter with vernal pool data. Pools 1 & 2 to be preserved; Pools 3-8 to be quarried. Robust populations of Jefferson Salamanders, spotted turtles, Eastern box turtles 10 found) will be lost.

Connecticut Environmental Conditions Online

Advanced Map Viewer

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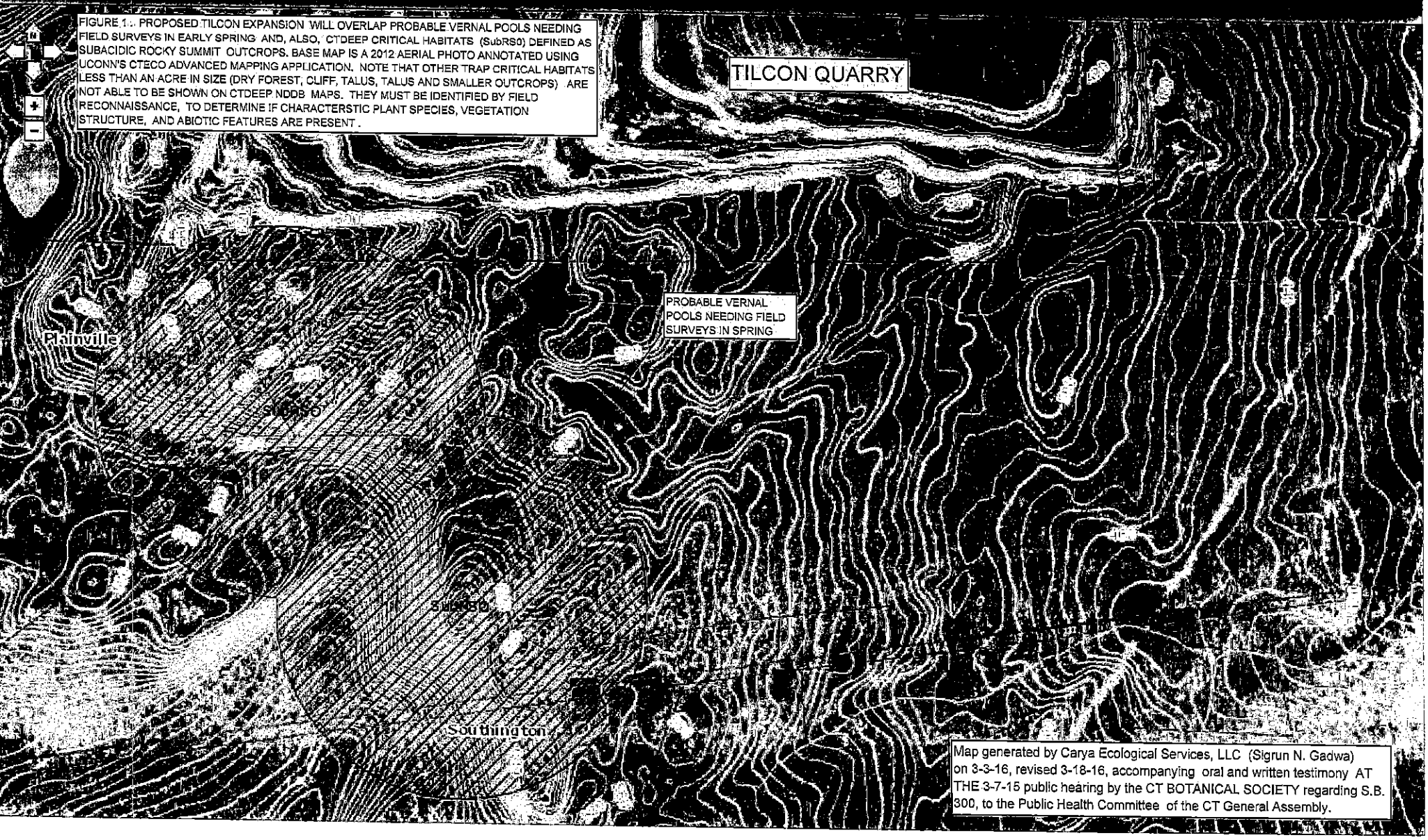

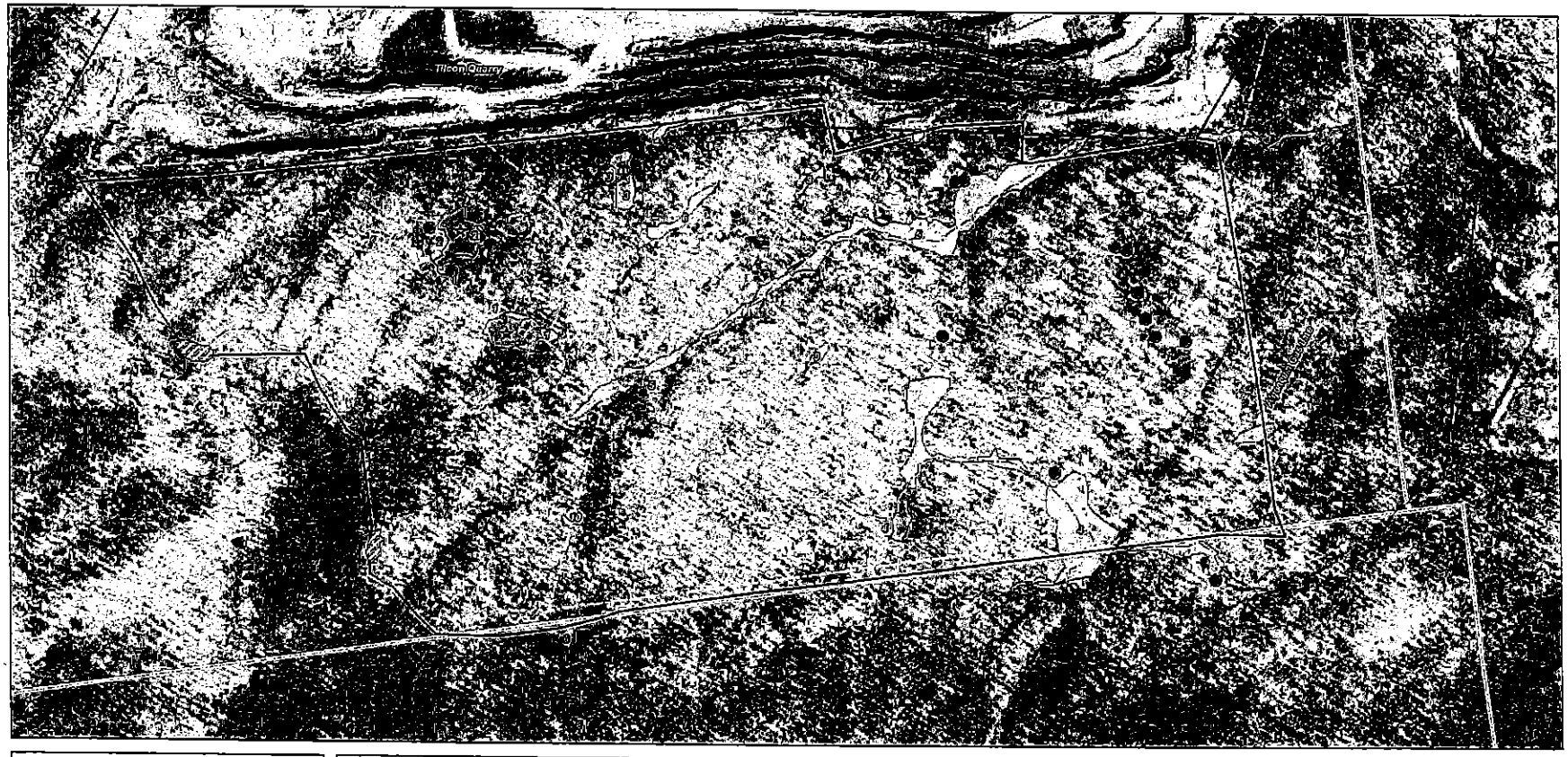

FIGURE 5
Wetlands, Vernal Pools & Rare Species

Map Description
Aerial photograph basemap (2016) showing the locations of wetlands, vernal pools and rare species. Resources illustrated were mapped based on field observations, GPS-collected data and aerial interpretation. Critical habitat locations were taken from the CT DEEP GIS dataset and confirmed by field observations.

Legend

- Site Boundary
- Wetlands (wetland numbers indicated in blue)
- Intermittent Watercourse (offsite flow indicated)
- Trails
- Recently logged forest
- Old field (gas line ROW)

Notable Habitats and State-listed Species

- Jefferson Salamander Breeding Pools (species of special concern)
- Eastern box turtle (state-listed species of special concern)
- Spotted turtle (state-listed species of special concern)
- Vernal Pools (pool numbers indicated in green)
- NDDB Critical Habitat (community type: sub-acidic rocky summit outcrop, data date 10/5/2009; habitat locations confirmed by field observations)
- Fir Clubmoss and Coastal Jointweed

SCALE
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Prepared by:
DAVISON ENVIRONMENTAL
Davison Environmental, LLC
www.davisonenvironmental.com

Fig. 1: Topography in Vicinity of Proposed Tilcon Quarry Enlargement.

The ~46-acre area to the south of the SW corner of quarry (rectangular,~2000-ft by 1000-ft) has many knolls & summits, >800 lf of steep north & east-facing slopes. Evergreen cover is common. Subacidic critical habitats are likely:cold talus slopes, cedar glades, woodland summit/outcrops. cold talus slopes, cedar glades, woodland summits, rock outcrops. Vegetation habitats not mapped.

Section of map produced by Tigh & Bond, p. 239 of February 2018 Lenard Report for City of New Britain.

NOTES

1. Based on 2016 Statewide Orthophotography, Courtesty of CTECO.
2. Contours (2000) provided by CT DEP.

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Annotated by Carya Ecological Services, LLC 3/11/2018

Fig. 2. Landscape Setting of of proposed Tilcon Expansion into Bradley Mountain

4.0 STATE-LISTED SPECIES

4.1 Spotted Turtle

The spotted turtle is a State-listed species of special concern. Spotted turtle inhabit a wide variety of shallow water aquatic habitats, both temporary and permanent. Spotted turtle commonly move overland between wetland habitats throughout the spring and summer. Upland forest adjacent to wetlands is often used during the summer (Klemens, 1993).

Multiple spotted turtles were observed within Vernal Pool 1, along with a shell (carapace) found adjacent to Wetland 2. While Vernal Pools 1 and 2 were considered the principal wetland habitats for these species, all the vernal pools on the site represent suitable habitat. In particular Pools 3 and 5 are likely utilized due to their proximity to Pools 1 and 2. Wetland/Vernal Pool 2 is likely used for hibernation based on its larger size and longer hydroperiod, and the absence of other wetland types such as red maple swamp on the ridgetop.

4.2 Jefferson Salamander Complex

The Jefferson Salamander complex is a State-listed species of special concern. This species occurs west of the Connecticut River, favoring upland sites. They inhabit upland forest, typically deciduous forest, but are also known to occur in forests dominated by eastern hemlock. Steep,

Table 3: Vernal pool indicator species observations

Pool	Indicator Species Present	Total Egg Masses		
		Ajef	Amac	Lsyl
1	Eub, Amac, Ajef, Lsyl, Aopa	n.o.	28	5
2	Eub, Amac, Ajef, Lsyl,	27	17	n.o.
3	Amac, Ajef, Lsyl,	126	77	21
4	Aopa, Lsyl	n.o.	47	4
5	Aopa, Amac		15	
6	Aopa, Amac	See note 2		
7	Aopa, Amac			
8	Aopa, Amac			

KEY:
Species: Amac = spotted salamander; Ajef = Jefferson salamander; Lsyl = wood frog; Aopa = marbled salamander; Eub = fairy shrimp
n.o. = not observed

Notes:
1. Pool 2 contains deep water and very dense vegetation, so egg mass counts in these pools should be considered conservative.
2. Pools 6, 7 and 8 were identified in June during offsite reconnaissance surveys. Due to the timing of our observations, total egg mass counts were not possible.

Vernal pools 1, 2, 3, 6, 7 and 8 are classic vernal pools. Pools 4 and 5 are cryptic vernal pools, as they are embedded within larger wetland systems (Wetlands 4 and 5). Both pools occupy the uppermost reaches (i.e., headwaters) of these wetlands that drain offsite to the east.

The spotted turtle, a State-listed species of special concern which utilizes vernal pools particularly for feeding in spring and early summer were observed in Pool 1. Spotted turtles move across the terrestrial landscape often utilizing a group of vernal pools during their seasonal activity.

Other wetland-dependent amphibians observed within the vernal pools include red-spotted newt, spring peeper, gray treefrog and green frog. Wood duck, a disturbance sensitive wetland-dependent species that often inhabits larger, long hydroperiod vernal pools, was observed in Pools 1 through 3.

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rocky areas with rotten logs and heavy duff layers are favored microclimates (Klemens, 1993). Breeding occurs in vernal pools, most commonly perched wetlands in ledge and shallow-to-bedrock topography. Jefferson salamanders have a biogeographical affinity to the trap rock ridge system of the Central Connecticut Lowland, of which this site lies within.

The Jefferson Salamander complex was confirmed breeding in Vernal Pools 1, 2 and 3. These pools represent optimal habitat for this species and serve as a meta-population. Basically, due to the spatial proximity of these three pools to one-another, they serve as an ecological unit, with genetic exchange anticipated between them. All three of these pools are perched pools surrounding by bedrock outcroppings, talus, and mature forest. Pool 3 had the highest abundance of egg masses of the three pools; however, this egg mass count may be a function of the ease with which this pool can be surveyed (i.e., smaller pool lacking dense vegetation).

4.3 Eastern Box Turtle

The eastern box turtle is a State-listed species of special concern. Box turtle are widespread throughout the low-lying portions of Connecticut. They favor old field habitat and deciduous forest ecotones, including powerline cuts and logged over woodland (Klemens, 1993). Box turtles utilize different habitat types at different times of the year (Dodd, 2001). Early-successional habitats are generally inhabited during months with moderate temperate while forested habitats are utilized during the heat of the summer as well as for hibernation (Erb, 2011).

A total of 10 box turtles were observed. An additional five box turtle shells were found on the site or within the adjacent gas line ROW (upper shell, or carapace). Box turtles were observed in two areas of the site. Eight of the ten turtles, as well as all the turtle shells, were observed within the eastern portions of the site including the gas line ROW. The remaining two box turtles were found within the forest immediately adjacent to Wetland 2. Box turtle observation locations are shown on Figure 5. Photos of each of the ten turtles observed are included in Attachment A.

Box turtles strongly favored the areas of logged forest in the eastern portions of the site. A typical observation location consisted of a small, sunny tree-canopy opening within a former logging skid road or log landing. The ground was covered in woody slash and herbaceous and shrub cover including Japanese barberry, various ferns, Japanese stiltgrass and brambles were moderately dense.

Five males and five females were observed. Plastral scute ring counts (which can roughly be used to approximate age) exceeded 18 for all individuals observed. Most turtles were worn smooth (n=5) or had too much wear to accurately county the annuli (n=3). Based on these annuli data, turtles were assigned to three age classes: Five turtles were considered aged, three turtles were considered middle-aged, and two were considered young. These data point to a population that has recruitment. Additional research would provide a fuller picture of this population. The number of shells found (5) would indicate that this is a much larger box turtle population than these data collected to date indicate.

5.2d Fir Clubmoss

Two of the bedrock area along the northern property line are vegetated with patches of Fir Clubmoss. Both patches are within the proposed quarry limits and therefore will be lost. However, the presence of this species, at the margins of the existing clearing along the southern quarry limits, was likely enhanced by the quarrying activities which opened the tree canopy and improved the growing conditions.

5.2 Impacts to State-listed Species

Three State-listed special concern herpetofauna will be impacted by the proposed project. From a State-wide conservation perspective, the most severe impact will be to the Jefferson salamander. This species has a very restricted range in the Central Connecticut Lowland located atop trap rock ridges. While the spotted turtle is also at risk, its distribution is the Central Connecticut Lowland is much broader and less specialized than the Jefferson salamander. Both these species are concentrated in several vernal pools that will be in and very near the impact zone. The box turtle is the most widespread species of the three species in the Central Connecticut Lowland.

5.2a Spotted Turtle

The critical habitat for this species is Wetlands/Vernal Pools 1 and 2. These wetlands represent the observed locations and presumed hibernacula. Based upon the known movement patterns of this species, Vernal Pools 3 and 5, and the forest connecting Pools 3 and 5 west to Pools 1 and 2, are also likely habitat. No direct impact is proposed to occur within the primary wetland habitat for this species (i.e., Wetlands/Vernal Pools 1 and 2). The propose quarry will elimnate Pools 3 and 5 and will encroach within approximately 250 feet of Pools 1 and 2. The loss of terrestrial habitat and secondary wetland habitat will potentially impact this long-lived turtle species. Loss of a few adults could result in extirpation of the population atop Bradley Mountain.

5.2b Jefferson Salamander Complex

The Jefferson Salamander complex was confirmed breeding in Vernal Pools 1, 2 and 3 which serve as a metapopulation. Additionally, the forested habitat surrounding these pools represents their terrestrial non-breeding habitat. Of the three breeding sites, no direct impact to Pools 1 and 2 are proposed, but Pool 3 will be lost as it lies within the proposed quarry limits. With respect to impacts to terrestrial habitat surrounding Pools 1 and 2 (within 750 feet of the pool), there will be a loss of 34.52% and 17.35%, respectively.

The direct loss of Pool 3 is considered a significant impact to the onsite population of Jefferson salamander. Of the three pools where this species breeds, Pool 3 contained the highest abundance (126 total egg masses). In addition to loss of breeding habitat, terrestrial non-breeding forest habitat will be lost surrounding Pools 1 and 2, which could reduce the breeding productivity within these pools. The proposed development scenario is likely to lead to the extirpation of Jefferson salamanders at the site due to the outrights loss of one breeding pool and a significant reduction in the amount of terrestrial habitat required by these salamanders surrounding the two other nearby pools where they breed. Jefferson salamanders are the most disturbance-sensitive of Connecticut's mole salamanders, and exist on trap rock ridges in areas of core forest. While the current population exists near the edge of the quarry wall, the current proposal will greatly impact the survivability of this species by eliminating proximal forest habitat around two pools, and completely removing one pool.

Fig. 1: Topography in Vicinity of Proposed Tilcon Quarry Enlargement.

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