



Biodiversity Studies • Wetland Delineation & Assessment • Habitat Management • GIS Mapping • Permitting

2016 Bird and Bat Fatality Monitoring Results

Colebrook South Wind Energy Facility

Flagg Hill Road, Colebrook

Submitted To:

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A handwritten signature in blue ink that reads "Eric Davison".

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INTRODUCTION

BNE Energy Inc. (BNE) operates the Colebrook South Wind Energy Facility in northeastern Litchfield County, Connecticut. The project is located at 17 and 29 Flagg Hill Road in Colebrook, CT and currently contains two 2.85 megawatt (MW) GE wind turbines at 322-foot hub heights with three 165-foot rotor blades (see *Figure 1 – Site Location Map* and inset below).

Under the conditions of the project approval set forth by the Connecticut Siting Council (CSC), BNE was required to monitor the project site for turbine-related bird and bat fatalities for a period of three years. BNE contracted with Davison Environmental LLC (DELLC) to conduct this fatality monitoring.



Aerial photograph (2016) showing Turbines 1 and 2 with surrounding cleared areas.

STUDY OBJECTIVES

The State of Connecticut does not currently have guidelines for studying the impacts of wind energy projects on wildlife. Therefore, DELLC has developed the following survey protocol based on a review of Strickland et. al., 2011. The objectives of the post-construction fatality monitoring study are:

1. To assess the level of bird and bat mortality attributable to collisions with wind turbines on an annual basis.
2. To provide a general understanding of the factors associated with the timing, extent, species composition, distribution, and location of the fatalities found.

Note that this protocol does not include statistical analysis of the data, which might include adjusted fatality estimates through consideration of factors such as searcher efficiency and carcass removal rates, but rather is focused strictly on inventory of bird and bat carcasses found at the project site.

METHODS

The specific survey methodology employed is described in the report entitled *Bird and Bat Fatality Monitoring Protocol* prepared by DELLC dated June 2, 2016. The extent of forest clearing surrounding the two turbines was mapped in the field. The cleared areas were divided into three search grids at the south turbine (T-1) and four search grids at the north turbine (T-2). Previous studies indicate that mortality may be highest near the base of the turbines, and therefore the search grids were designed to cover all cleared areas immediately surrounding the turbines as well as all available cleared areas beneath the length of the rotor blades. Given the density of ground and shrub cover present in the forest adjacent to the existing clearings, the search areas do not extent into forested areas around the turbines.

Each search grid was walked by an observer in parallel tracks with a 20-foot offset. The vegetation within the search area is herbaceous meadow. Therefore, it was assumed that the observer could readily observe a carcass within 10 feet in grass that has a maximum height of approximately one to two feet.

Standardized carcass searches were conducted at both turbines once per week beginning on May 4th¹ and terminating on October 24th, 2016, for a total of 26 searches. The condition of each bird or bat carcass found was recorded as:

- Intact - a carcass that is completely intact, is not badly decomposed, and shows no sign of being scavenged;
- Scavenged - a carcass that shows signs of being scavenged, a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass, etc.), or a carcass that has been heavily infested by insects; or
- Feather spot - ten or more feathers or two or more primary feathers in one location.

All casualties found where labeled "CS" and numbered consecutively. The following data were collected: species; date and time collected; Global Positioning System (GPS) coordinates; condition and any comments that indicate possible cause of death. Photographs of the casualties were taken *in situ*.

¹ Note that due to the delayed initiation of work in 2016, the first search began on 5/4/16. In subsequent years, searches will be initiated on or around April 15th

RESULTS

A total of 18 mortalities were observed including 10 bats and 8 birds. Mortalities are summarized in Tables 1 and 2 and illustrated on *Figure 2 – Bat Mortalities*, *Figure 3 – Bird Mortalities* and *Figure 4 – Mortalities (All Species)*.

Three bat species were observed; big brown bat (6 mortalities), hoary bat (1 mortality) and silver haired bat (3 mortalities). Bat carcasses were bagged, labeled and placed in a freezer on the property.

Five bird species were observed; eastern bluebird (1 mortality), yellow-bellied sapsucker (1 mortality), magnolia warbler (1 mortality), red-eyed vireo (2 mortalities) and yellow-throated vireo (3 mortalities). The bird carcasses were left in place in the field. The eastern bluebird (CS5) found on 7/18/16 died as a result of being trapped in the mesh erosion control blanket. Therefore, it is not included on Figures 2-4. With the exception of CS5, all mortalities were assumed to be attributable to turbine collision.

Most mortalities occurred at Turbine #2, with a total of 13 (10 bats and seven birds). All bird mortalities were found at Turbine #2. A total of four bat mortalities occurred at Turbine #1 and no bird mortality. Most mortalities (70%) occurred near the turbines and within the 338-foot diameter travel path of the rotor blades.

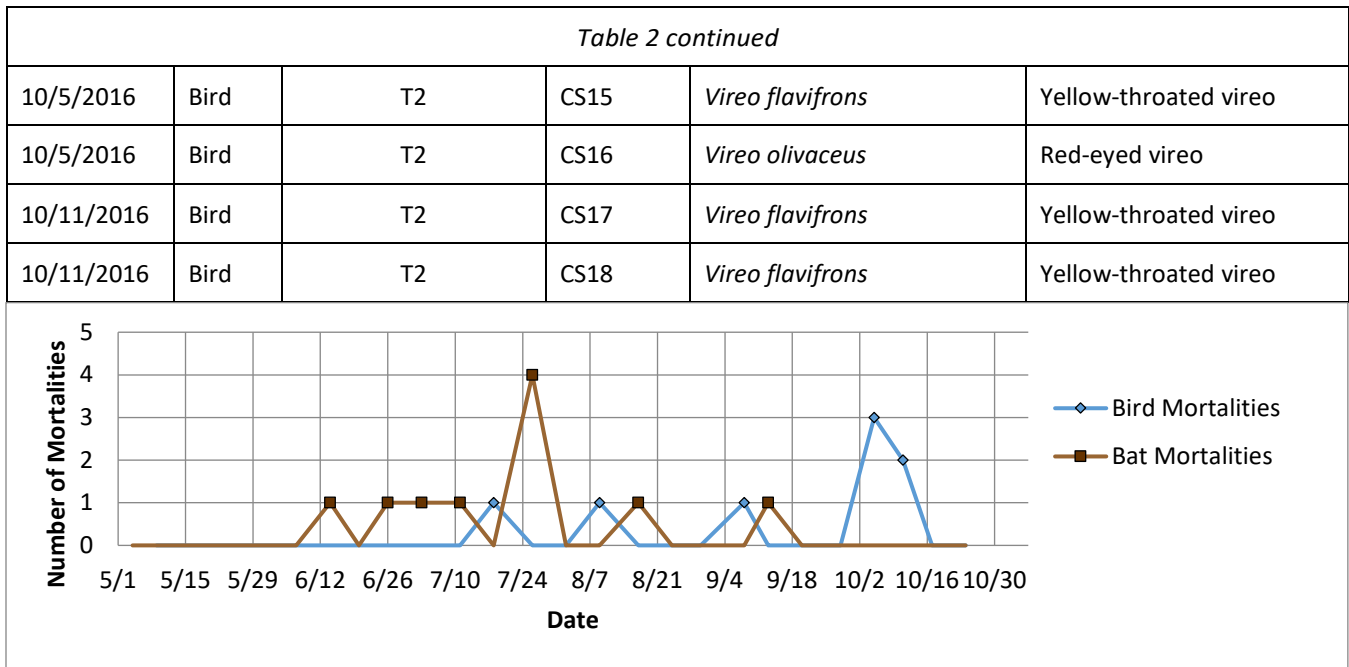
Table 1 lists mortalities CS1 through CS18 by species. The most common bat species observed was the big brown bat (n=6). The most common bird species observed was the yellow-throated vireo (n=3).

<i>Table 1: Summary of bat and bird mortalities by species</i>		
Scientific Name	Common Name	Code
Bat Mortalities		
<i>Eptesicus fuscus</i>	Big Brown Bat	CS1
<i>Eptesicus fuscus</i>	Big Brown Bat	CS2
<i>Eptesicus fuscus</i>	Big Brown Bat	CS4
<i>Eptesicus fuscus</i>	Big Brown Bat	CS6
<i>Eptesicus fuscus</i>	Big Brown Bat	CS7
<i>Eptesicus fuscus</i>	Big Brown Bat	CS8
<i>Lasiurus cinereus</i>	Hoary Bat	CS9
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	CS3
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	CS11
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	CS13

Bird Mortalities		
<i>Sialia sialis</i>	Eastern Bluebird	CS5
<i>Setophaga magnolia</i>	Magnolia Warbler	CS12
<i>Vireo olivaceus</i>	Red-eyed vireo	CS14
<i>Vireo olivaceus</i>	Red-eyed vireo	CS16
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	CS10
<i>Vireo flavifrons</i>	Yellow-throated vireo	CS15
<i>Vireo flavifrons</i>	Yellow-throated vireo	CS17
<i>Vireo flavifrons</i>	Yellow-throated vireo	CS18

Table 2 shows the mortalities observed by survey date, including the turbine where the carcasses were observed. The mortalities were charted by date, and show that bird mortalities were found from June through September and bat mortalities were found from July through October.

Date	Type	Turbine Location	Code	Scientific Name	Common Name
6/14/2016	Bat	T1	CS1	<i>Eptesicus fuscus</i>	Big Brown Bat
6/26/2016	Bat	T2	CS2	<i>Eptesicus fuscus</i>	Big Brown Bat
7/3/2016	Bat	T1	CS3	<i>Lasionycteris noctivagans</i>	Silver-haired Bat
7/11/2016	Bat	T2	CS4	<i>Eptesicus fuscus</i>	Big Brown Bat
7/18/2016	Bird	T2	CS5	<i>Sialia sialis</i>	Eastern Bluebird
7/26/2016	Bat	T2	CS6	<i>Eptesicus fuscus</i>	Big Brown Bat
7/26/2016	Bat	T2	CS7	<i>Eptesicus fuscus</i>	Big Brown Bat
7/26/2016	Bat	T2	CS8	<i>Eptesicus fuscus</i>	Big Brown Bat
7/26/2016	Bat	T2	CS9	<i>Lasiurus cinereus</i>	Hoary Bat
8/9/2016	Bird	T2	CS10	<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker
8/17/2016	Bat	T1	CS11	<i>Lasionycteris noctivagans</i>	Silver-haired Bat
9/8/2016	Bird	T2	CS12	<i>Setophaga magnolia</i>	Magnolia Warbler
9/13/2016	Bat	T1	CS13	<i>Lasionycteris noctivagans</i>	Silver-haired Bat
10/5/2016	Bird	T2	CS14	<i>Vireo olivaceus</i>	Red-eyed vireo



Searches were conducted under fair weather conditions. Table 3 summarizes the weather and search time for each survey. The search area was maintained as meadow throughout the survey period (see site photographs in the appendix). Grass height ranged from bare ground to a maximum of approximately 24 inches, but average between 6 and 12 inches.

Table 3: site visit summary including date, search time and weather

Search Date	Start Time	End Time	Weather	% Cloud Cover	Temperature (F)
5/4/2016	11:10	2:15	Overcast	90	45
5/9/2016	10:00	12:00	P. Cloudy	50	62
5/18/2016	13:35	16:25	Clear	10	70
5/26/2016	13:30	16:45	Clear	35	87
5/31/2016	13:00	17:00	Clear	10	86
6/7/2016	9:00	11:45	Clear	10	80
6/14/2016	11:20	14:45	Clear	5	72
6/20/2016	10:30	13:30	P. Cloudy	60	85
6/26/2016	9:20	13:40	M. Clear	25	79
7/3/2016	12:30	15:50	M. Clear	25	81
7/11/2016	15:30	18:40	M. Cloudy	80	80
7/18/2016	13:10	15:40	P. Cloudy	50	90
7/26/2016	11:20	15:40	M. Clear	20	87
8/2/2016	15:00	18:10	Overcast	90	71
8/9/2016	14:40	18:00	M. Clear	30	83

8/17/2016	15:20	18:10	P. Cloudy	50	75
8/24/2016	15:50	18:40	Clear	5	86
8/30/2016	15:10	18:20	M. Clear	25	82
9/8/2016	12:30	15:50	Overcast	90	87
9/13/2016	12:30	15:40	Clear	10	82
9/20/2016	14:00	17:40	M. Cloudy	60	81
9/28/2016	14:00	17:00	Overcast	90	61
10/5/2016	12:20	15:30	Clear	5	65
10/11/2016	13:50	17:30	Clear	5	62
10/17/2016	12:40	16:00	Overcast	80	73
10/24/2016	12:10	15:30	M. Clear	20	64

REFERENCES

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L., Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative, Washington, D.C., USA.

Appendices

(1) Figures

- Figure 1 – Site Location Map
- Figure 2 – Bat Mortalities
- Figure 3 – Bird Mortalities
- Figure 4 – Bat and Bird Mortalities

(2) Site Photographs

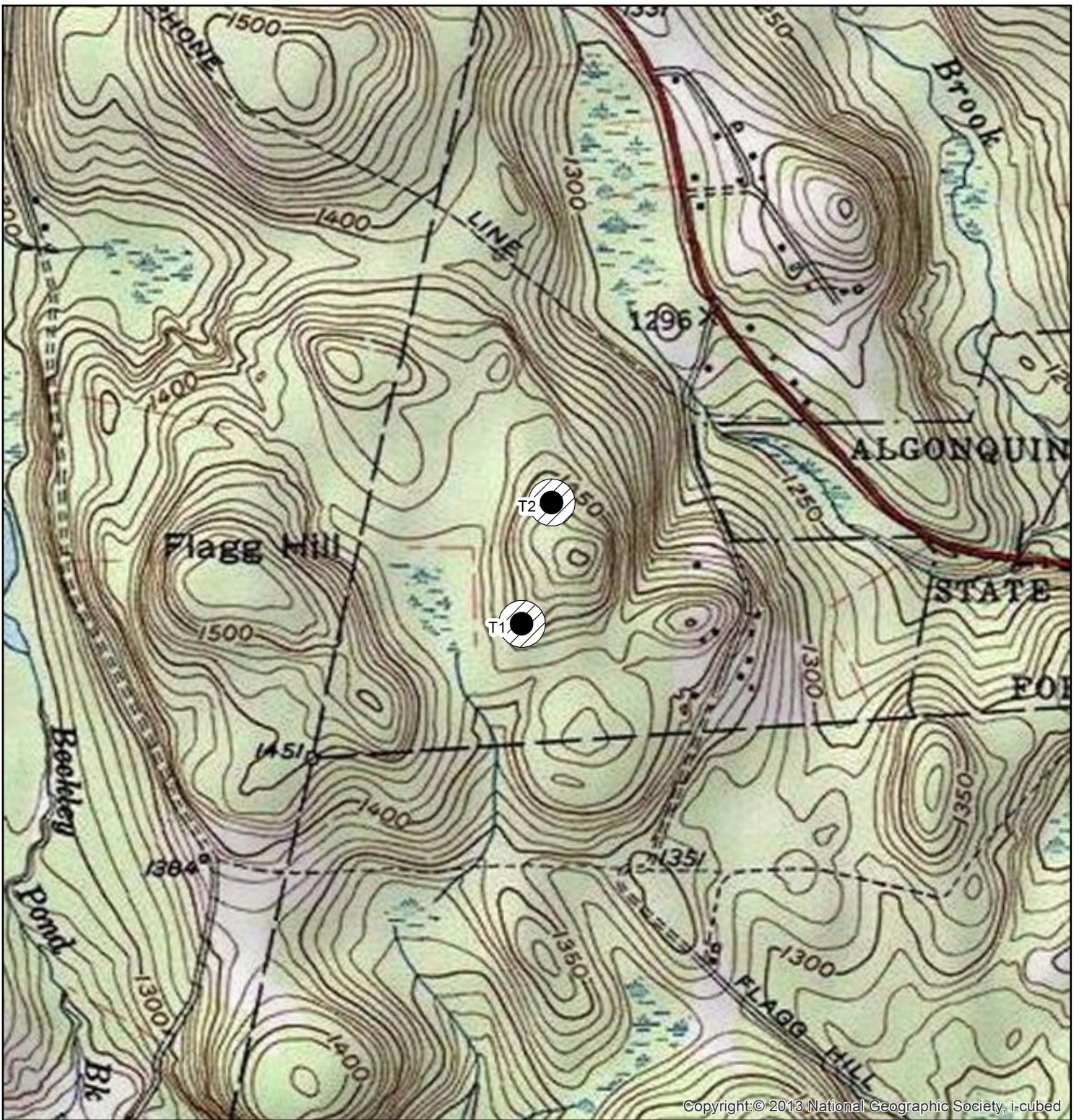




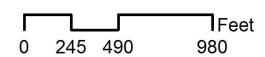
FIGURE 1:
Location Map

Map Description

Topographic Map (USGS) showing the approximate location of Colebrook South turbines.

-  Turbines
-  Turbine Coverage

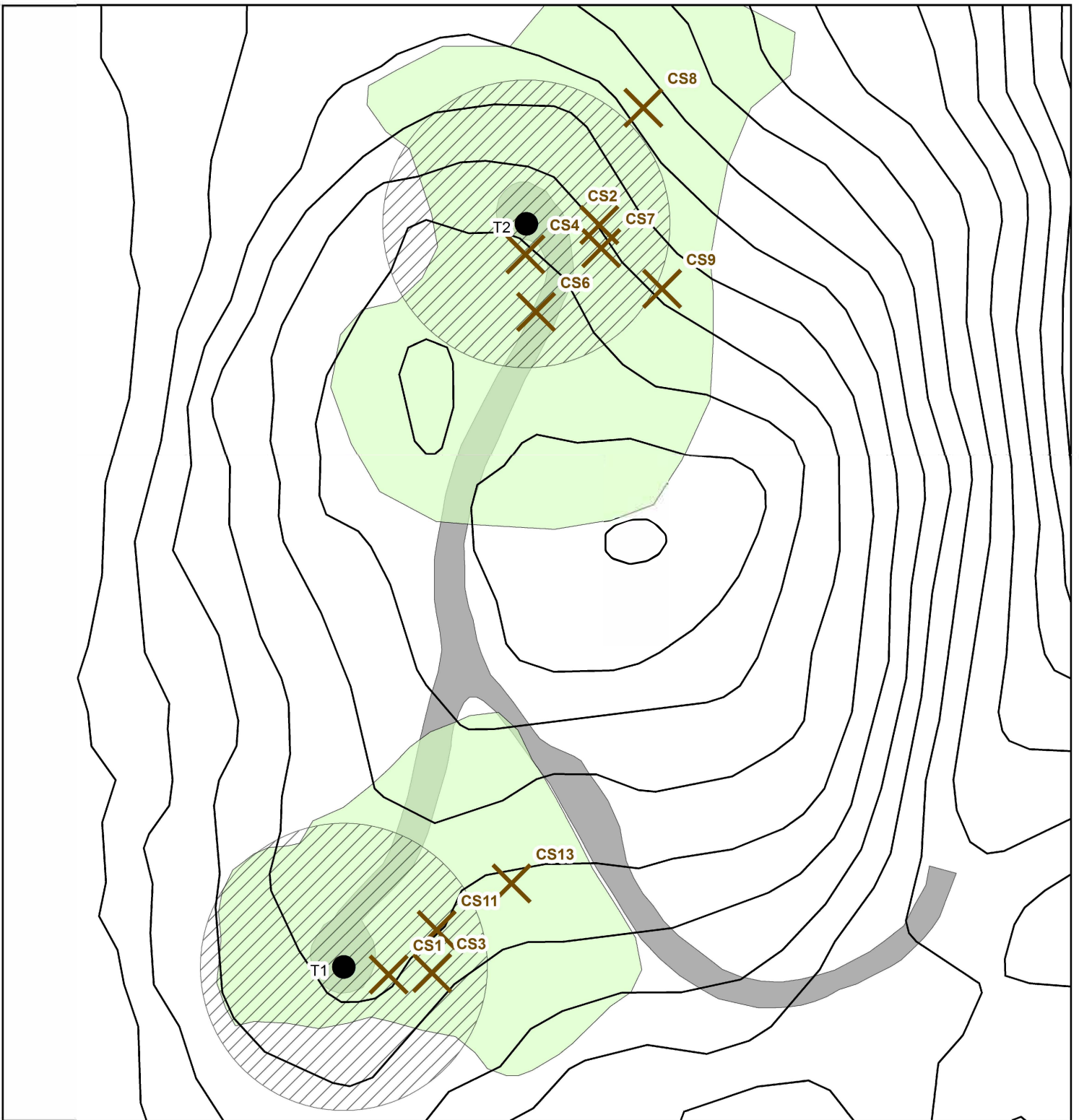
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


NOTE: This map is intended for illustrative purposes only. It contains no authoritative data.



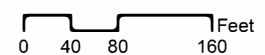
**FIGURE 2:
Bat Mortalities**

Map Description

Colebrook South Bat Mortalities
May 5th - October 24th, 2016. Data as
collected by Davison Environmental.
Location data recorded with <3 meter
accuracy. Additional data from CT DEEP
Topographic Contours and Political
Boundaries datasets.

-  Turbines
-  Turbine Coverage
-  Bat
-  Search Areas
-  Access Road
-  10 FT Contour

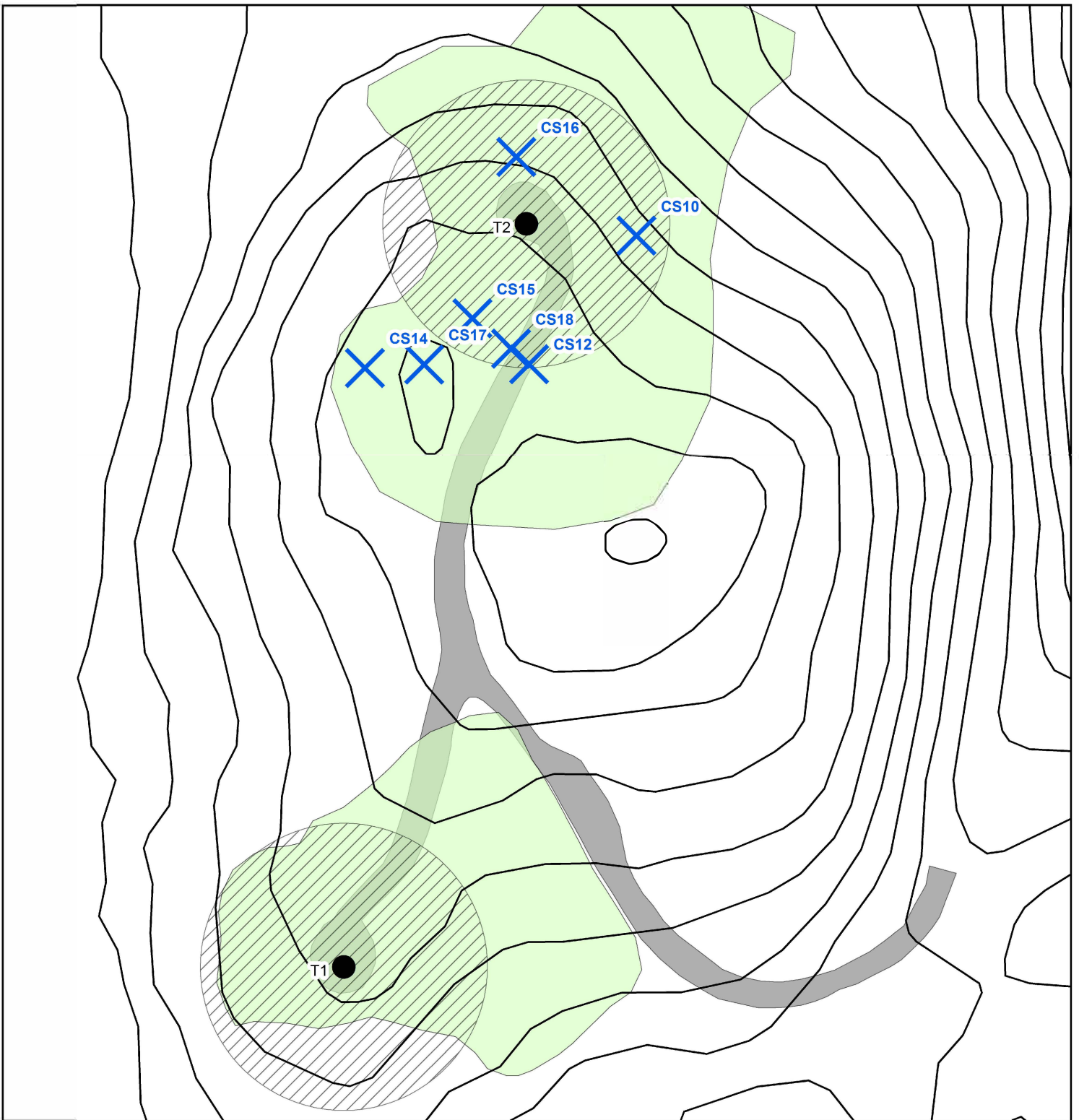
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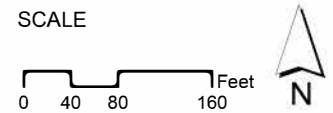


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**FIGURE 3:
Bird Mortalities**

- Turbines
- Turbine Coverage
- Bird
- Search Areas
- Access Road
- 10 FT Contour



Map Description

Colebrook South Bird Mortalities
 May 5th - October 24th, 2016. Data as
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 Location data recorded with <3 meter
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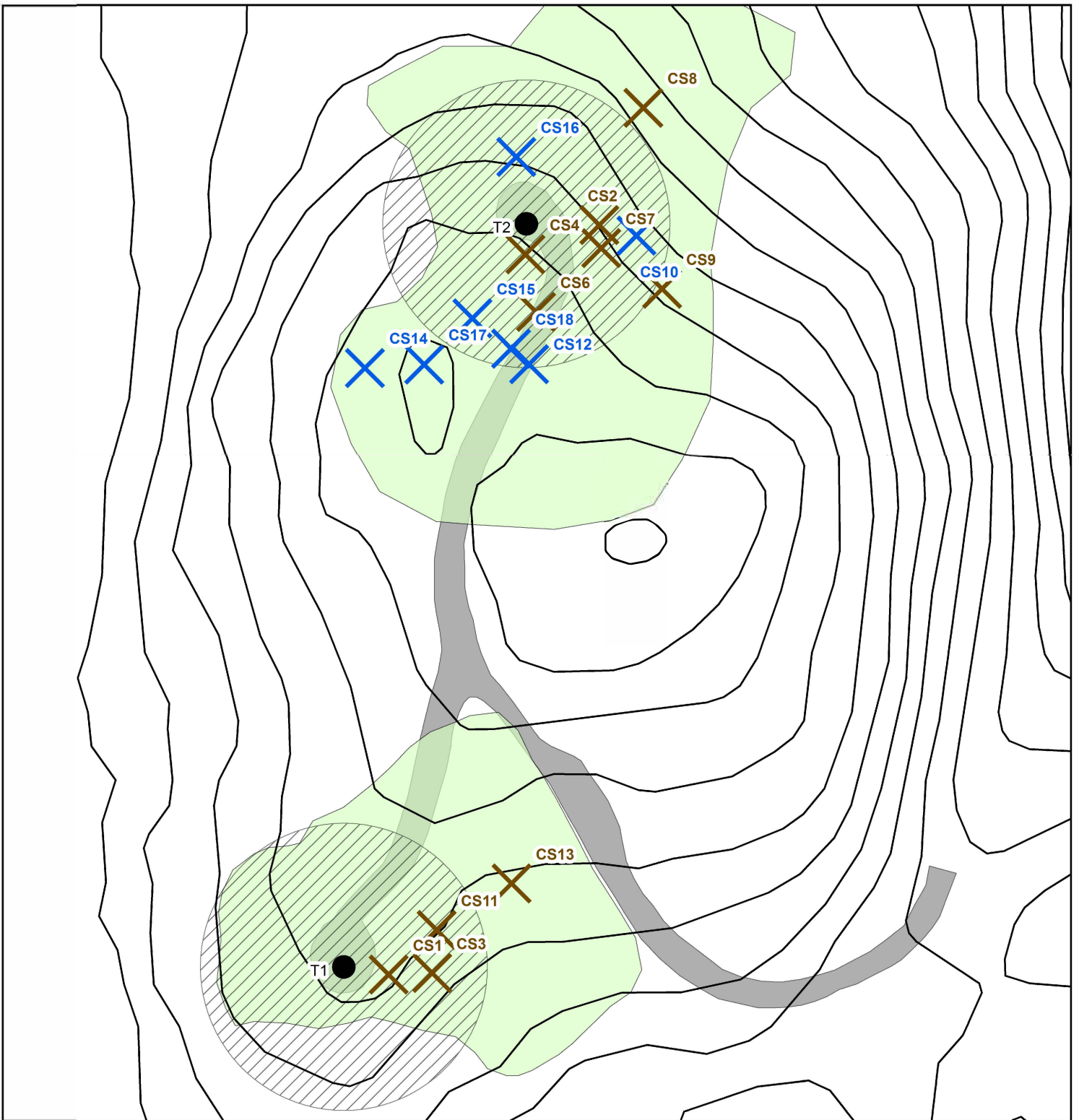


FIGURE 4:
Mortalities (All species)

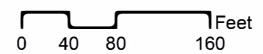
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- Turbines
- ▨ Turbine Coverage
- ✕ Bird
- ✕ Bat
- Search Areas
- Access Road
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Site Photographs



6/14/2016



6/26/2016

June Site Conditions: Some grass growth following hydroseeding in May. Some shrub growth. Two bat carcasses were located this month.



7/3/2016



7/18/2016

July Site Conditions: Grass now growing on most of site, with grasses up to 24 inches in some areas. Shrub growth now stabilized. Six bat carcasses and one bird carcass were located this month.



8/2/2016



8/24/2016

August Site Conditions: Grasses have now stabilized in height. Lack of precipitation this month resulted in browning grasses and shrubs. One bat and one bird carcass were located this month.



9/8/2016



9/20/2016

September Site Conditions: Some grasses were mowed mid-month near access roads. Grading and hydroseeding occurred on much of the property at the end of the month. One bat and one bird carcass were located this month.



10/17/2016



10/24/2016

October Site Conditions: Some grass growth was seen from late September hydroseeding. Additional mowing of shrubs and grasses occurred near service roads. Five bird carcasses were located this month.