# NOISE MITIGATION PLAN

**MACON ANIMAL SHELTER**
**4220 FULTON MILL ROAD**
**MACON, BIBB COUNTY, GEORGIA**
**GEC PROJECT NO. 170103.240**

**PREPARED FOR**

**MR. CASS HATCHER**
**RIVER EDGE BEHAVIORAL HEALTH CENTER**
**175 EMERY HIGHWAY**
**MACON, GEORGIA 31217**

**PREPARED BY**

**GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS, INC.**
**514 HILLCREST INDUSTRIAL BOULEVARD**
**MACON, GEORGIA 31204-3472**

**ISSUE DATE**

**MARCH 22, 2017**

# NOISE MITIGATION PLAN FOR MACON ANIMAL WELFARE

This Noise Mitigation Plan describes the recommended mitigation measures at Macon Animal Welfare, on 4220 Fulton Mill Road in Macon, Georgia, to reduce the impact of the subject site's operational noise upon the surrounding properties. The study was conducted at Macon-Bibb County's request in response to complaints made by residents surrounding the animal shelter. This plan is based on noise readings conducted by Geotechnical & Environmental Consultants, Inc. (GEC) on February 22, 2017. The study found noise levels in the subject study area ranging from 66.7-96.3 decibels (dB) on site and 63.0-63.4 along Fulton Mill Road, approximately perpendicular to where residential buildings are located.

## Background

Sound is indicated in two ways: frequency and intensity. Frequency, measured in hertz (Hz), is expressed as the number of vibrations per second. One vibration per second is a hertz (Hz). Intensity is expressed in decibels (dB). Because the ear is more sensitive to sound in the middle range of frequencies, intensity (dB) is determined at a frequency of 1,000 Hz. This means that on the decibel scale, a measurement of 0 dB indicates a level of sound at 1,000 Hz which is just barely audible by a person with unimpaired hearing.

The A-weighted scale of a sound meter is designed to adjust the sensitivity of a sound meter to sounds of different frequencies that closely approximate how the human ear might respond to moderate sound levels in the 1,000 to 4,000 Hz range.

Sound becomes noise when the receiver of the sound finds it to be loud, unpleasant, or otherwise cause a disturbance. Noise assessment studies determine the sound on-site and attempt to limit the intensity of the sound to levels that are within an acceptable range to no longer be considered noise. What some consider sound, others will consider noise. Therefore, the purpose of a noise assessment report is to reduce the measured value of sound on site to a level that can be considered an audible difference between the initial measurement on site and the final estimated values after noise mitigation.

## Methods

Mr. Todd Peterman and Ms. Victoria Kerry of GEC conducted a noise study at Macon Animal Welfare on February 22, 2017. Due to the nature of the study, GEC attempted to measure the maximum possible noise at the animal welfare site. To do this, employees on site were asked to bring dogs to fenced-in dog kennels located outside on the western and southern perimeter of the property. Personnel attempted to excite the dogs while taking noise measurements at various areas on site. Noise levels were recorded at 10 different noise assessment locations (NALs) around the site.

Noise was recorded using a 3M™ SoundPro DL noise detection meter at an A-weighted scale and measured 10-second intervals at each NAL. Later, the data was reviewed, and the highest reading was selected for each NAL and mapped on Figure 1. NALs 1 and 9 were located along Fulton Mill Road, and involved some traffic noise interference. Therefore, the sound readings for NALs 1 and 9 were selected based on the average sound reading during the 10 second recording intervals.

It should be noted that the readings recorded at NALs 3 and 10 were recorded next to a temporary holding area located in front of the property, and a dog was brought in specifically for the recording of these two NALs. These two NALs have been dropped from the attached noise contour map, as we do not feel that they represent the usual noise complaints made by the surrounding residents. The noise contours were then estimated using the eight remaining NALs and included in Figures 1, 2, and 3.

**Proposed Noise Mitigation Plan**

Two different barrier configurations were evaluated. The first configuration includes a noise barrier wrapping around the fence line on the southern side of the property. The configuration is outlined in red in Figure 2 along with a map key for two cross sections showing the effectiveness of the proposed barrier configuration. The cross sections show the ground elevations of the building, the proposed barrier, Fulton Mill Road, and the southern edge of the property, respectively. The cross sections, labelled View 1 and View 2, have been attached to the report.

The second configuration is a more conservative design and includes a noise barrier wrapping around the holding cages on the southern end of the property. The configuration is outlined in red in Figure 3 along with a map key for two cross sections showing the effectiveness of the proposed barrier configuration. The cross sections show the ground elevations of the building, the proposed barrier, Fulton Mill Road, and the southern edge of the property, respectively. The cross sections, labeled View 3 and View 4, have been attached to the report.

The attached cross sections show the elevation height for a 12 foot barrier, however calculations have been performed based on a barrier of 6 feet, 8 feet, and 12 feet on each of the two barrier configurations. The effectiveness of each barrier based on the height and is determined using HUD methodology to provide conservative estimates for barrier mitigation. Those values are listed in Table 1 below.

**Table 1: Proposed Barrier Noise Attenuation – dB reduction**

| Barrier height | Barrier Plan 1 | | Barrier Plan 2 | | |
|---|---|---|---|---|---|
| | View 1* (dB) | View 2** (dB) | View 3* (dB) | View 4** (dB) | View 5* (dB) |
| **6' wall** | None | None | -5.7549 | -6.2829[A]<br>-0.0255[B] | -7.3269 |
| **8' wall** | None | -5.0307 | -8.1217 | -8.1243[A]<br>-6.5624[B] | -9.8911 |
| **12' wall** | -4.5417 | -10.1315 | -11.4298 | -10.9804[A]<br>-10.5825[B] | -13.1794 |

* looking west

** looking south

[A] Reduction for barrier closest to building

[B] Reduction for barrier next to southern kennels

The numbers in Table 1 reflect the amount of noise that can be safely deducted from the noise source in relation to the height of the proposed barrier. As shown in Table 1, for Barrier Plan 1, the barrier must be at least 12 feet tall to be effective from the west side of the property and at least 8 feet to be effective from the south side of the property. For Barrier Plan 2, all options will block some noise; the higher the wall, the more noise that will be mitigated.

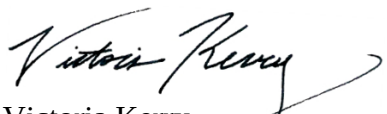
For View 4, estimations have been calculated for both the barrier wall that will be closest to the building as well as the barrier wall that is next to the southern kennels. Because the barrier walls for Barrier Plan 2 will be as close as they are to the noise source, sound reverberation will be a factor to consider as well. While the sound will be reduced outside the wall (off property), the noise can bounce back into the property louder than would be without a barrier wall depending on how much sound the material being used reflects sound.

With either barrier configuration, the material used can change the effectiveness of noise on the outside of the barrier as well. The Sound Transmission Class (STC), measured in decibels, is used to measure building material's ability to absorb sound. The higher the STC rating of the material being used, the more noise that can be reduced on site along with what can already be mitigated by the height of the barrier.

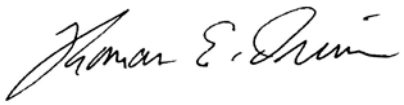
The U.S. Department of Housing and Urban Development (HUD) *Sound Transmission Class Guidance* contains a list of commonly used building materials and their respective STC ratings. For instance, a material such as hollow core brick that has been mortared together contains an STC rating of 51 which means it will have a sound reduction intensity of 51 dB whereas 3-cell lightweight concrete masonry blocks have an STC rating of 45 which means it will have a sound reduction intensity of 45 dB. This sound reduction is only possible in the event that the barrier is tall enough to effectively block noise. The cross sections for each View as well as calculations showing the effectiveness of each barrier configuration in respect to height, has been attached.

GEC appreciates the opportunity to provide our professional services to you. If you have any questions concerning this report, or if we can be of further assistance, please feel free to contact our office.

Sincerely,
Geotechnical & Environmental Consultants, Inc.



Victoria Kerry
Environmental Specialist



Thomas E. Driver, P.E.
President/Senior Engineer
Ga. Reg. #17394

Attachments

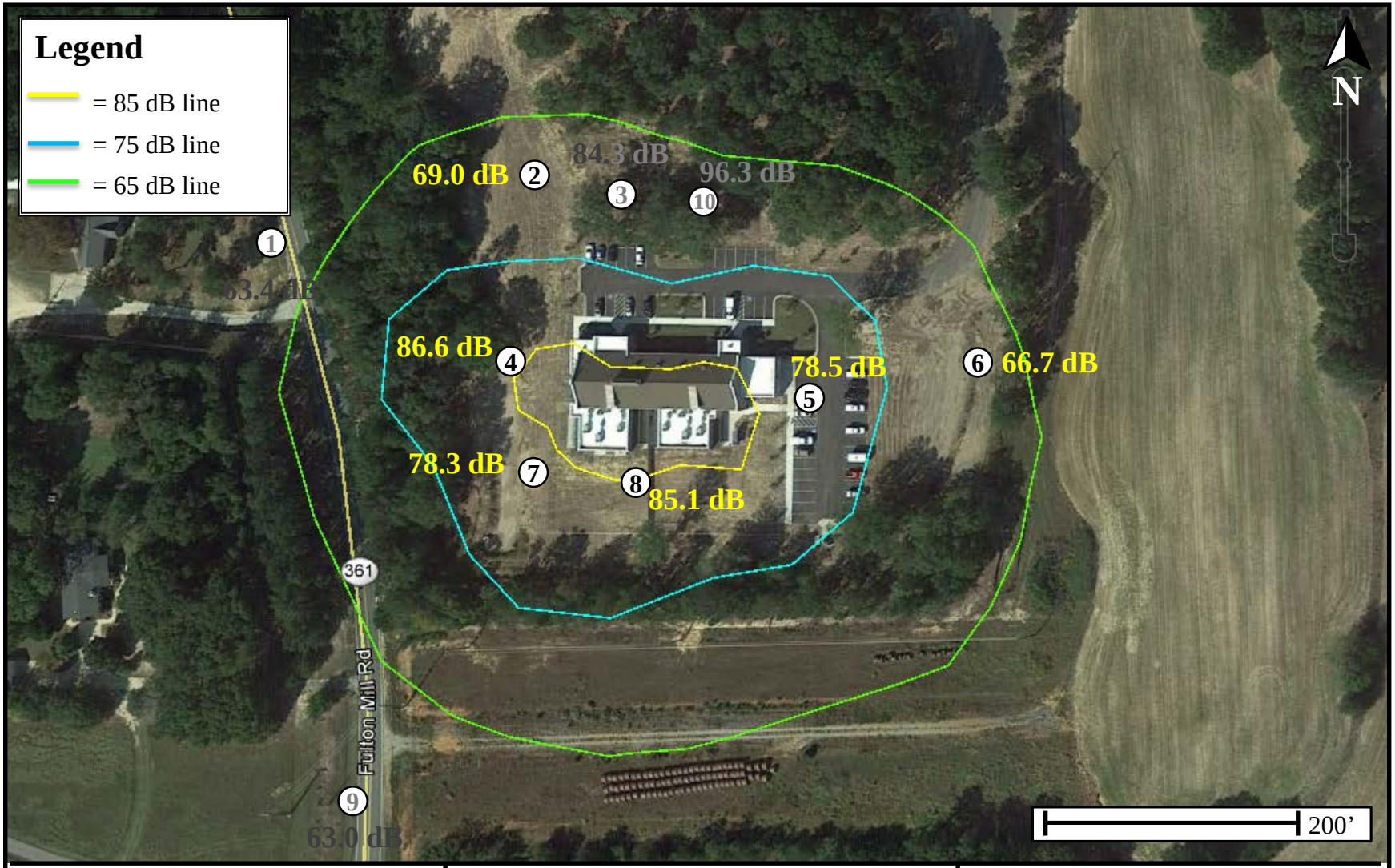



**Figure 1: NAL Result Summary**

**Macon Animal Welfare**
4220 Fulton Mill Rd
Macon, Bibb county, GA
GEC Project No. 170103.240

GEC
Geotechnical & Environmental
Consultants, Inc.

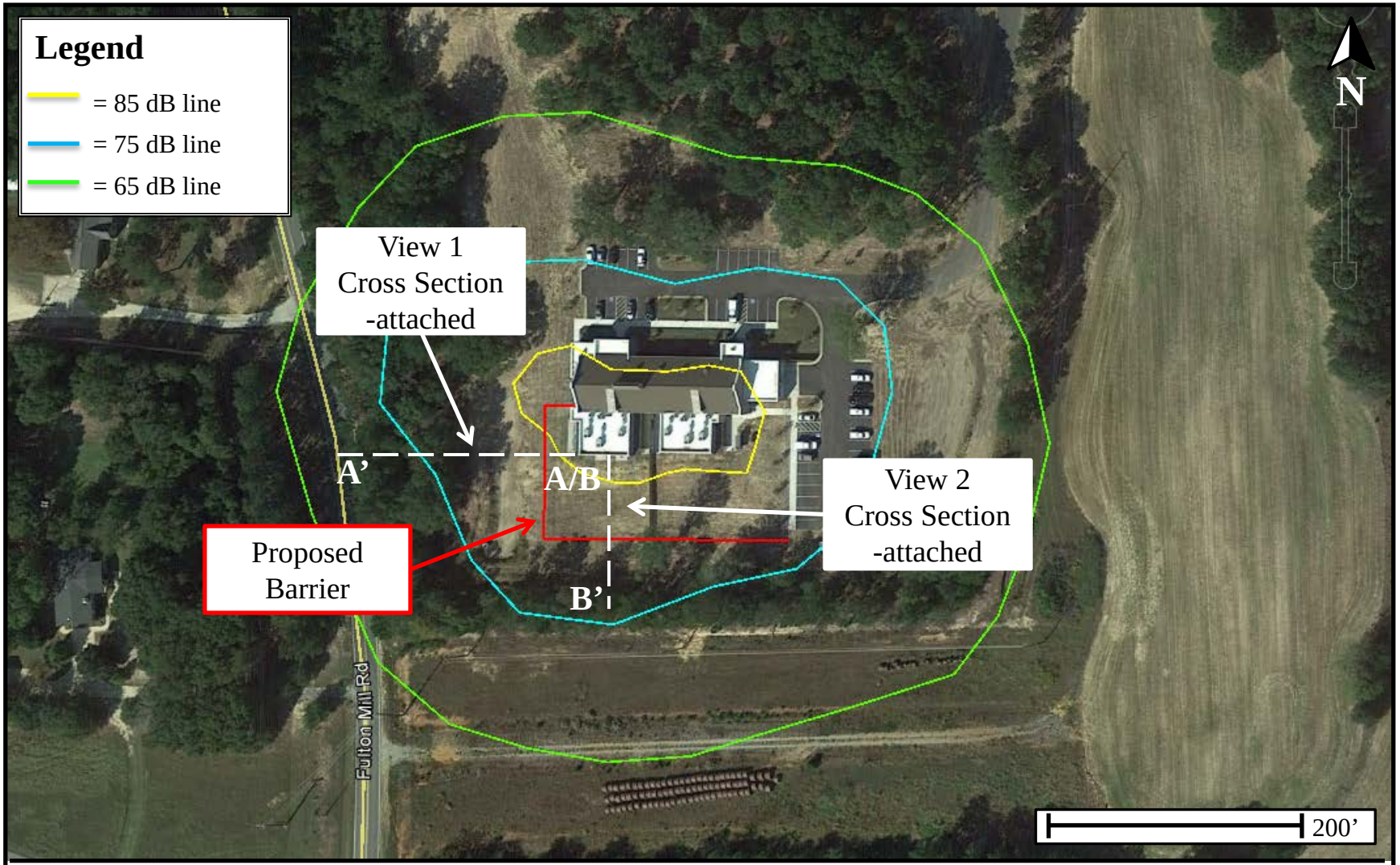
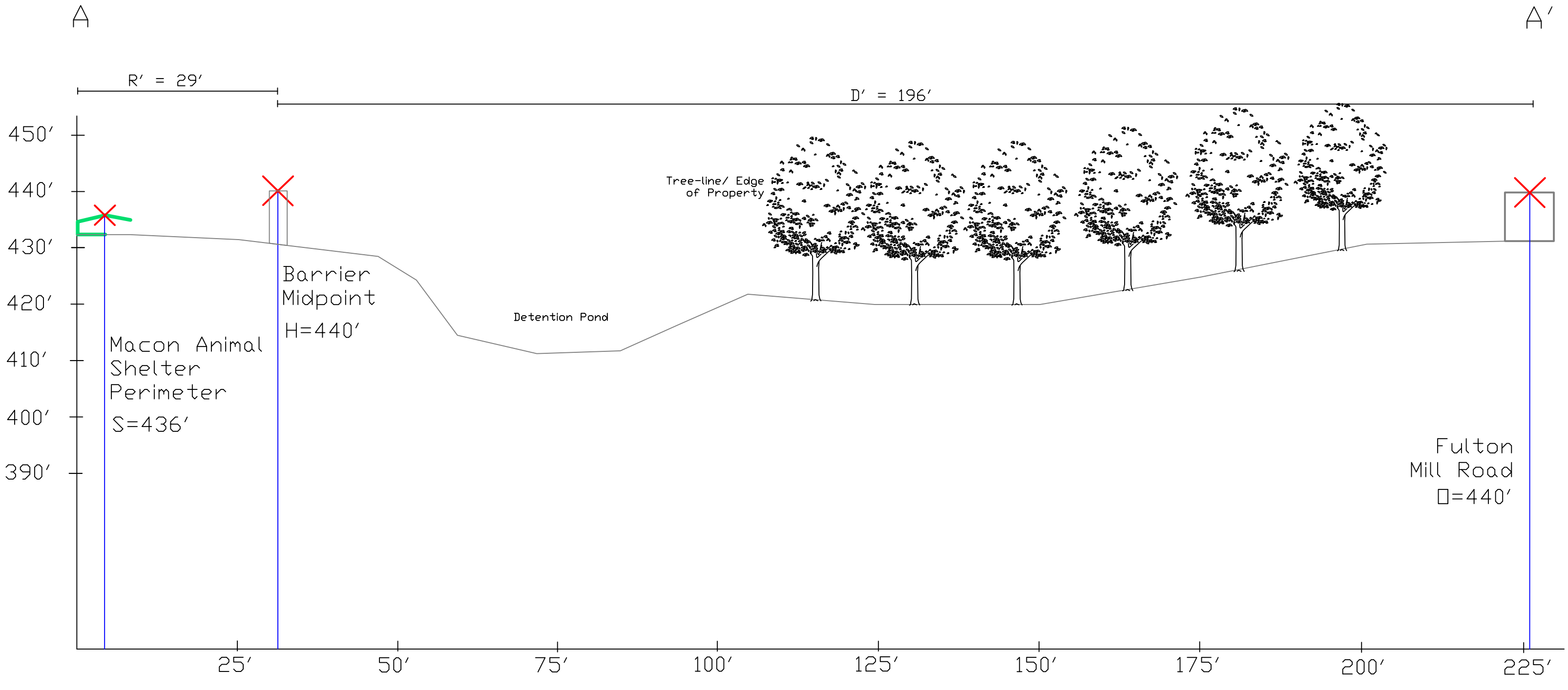



**Figure 2: Proposed Barrier 1**

**Macon Animal Welfare**
4220 Fulton Mill Rd
Macon, Bibb county, GA
GEC Project No. 170103.240

GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS, INC.

# PROFILE FOR VIEW1
# (Barrier Proposal 1 - West)

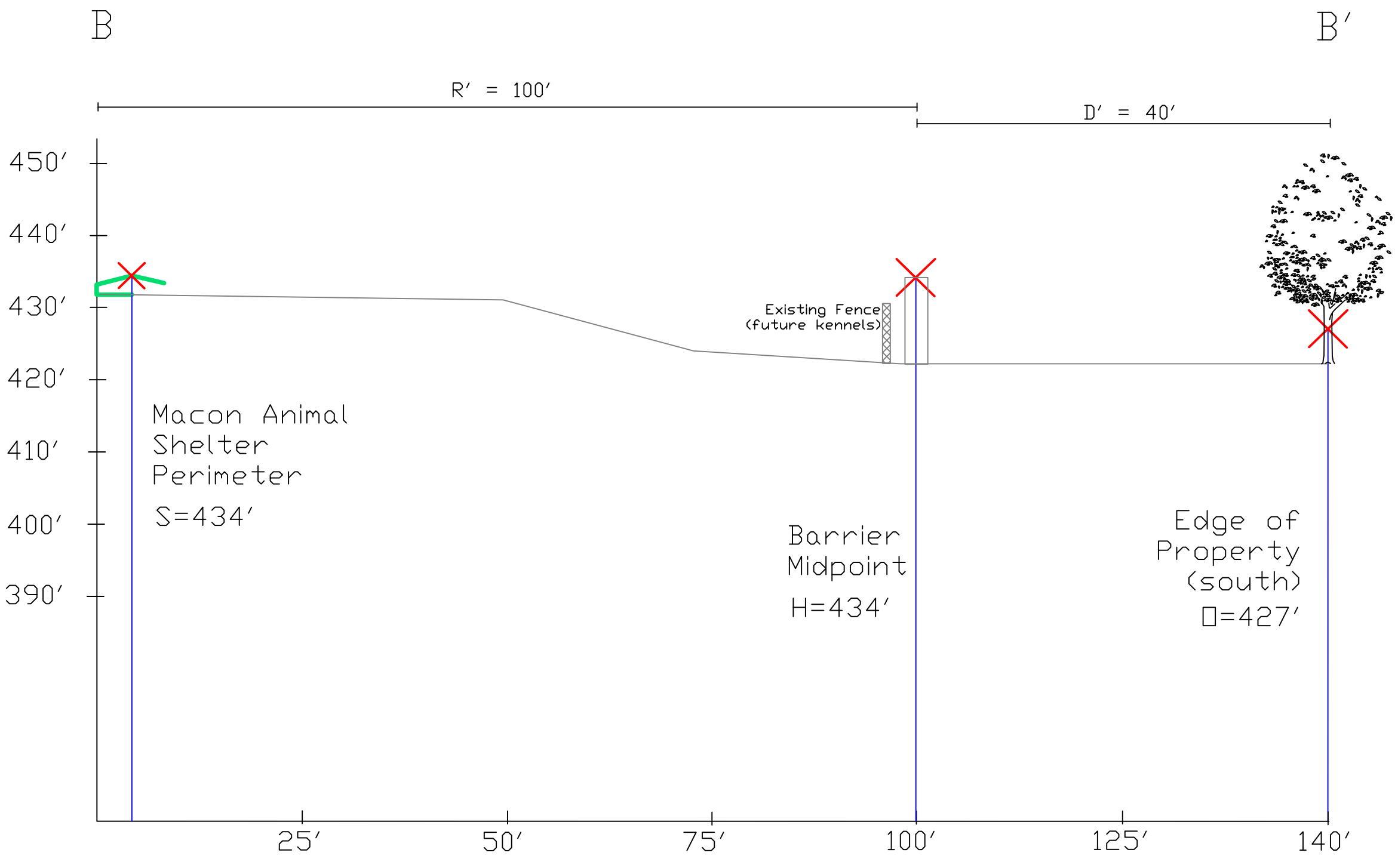



S: 433'(ground elevation) + 3'(observable height)=436'

H: 428'(ground elevation) + 12'(wall) = 440'

□: 432'(ground elevation) + 8'(observable height)=440'

# PROFILE FOR VIEW2
# (Barrier Proposal 1 - South)




S: 431′(ground elevation) + 3′(observable height)=434′

H: 422′(ground elevation) + 12′(wall) = 434′

□: 422′(ground elevation) + 5′(observable height)=427′

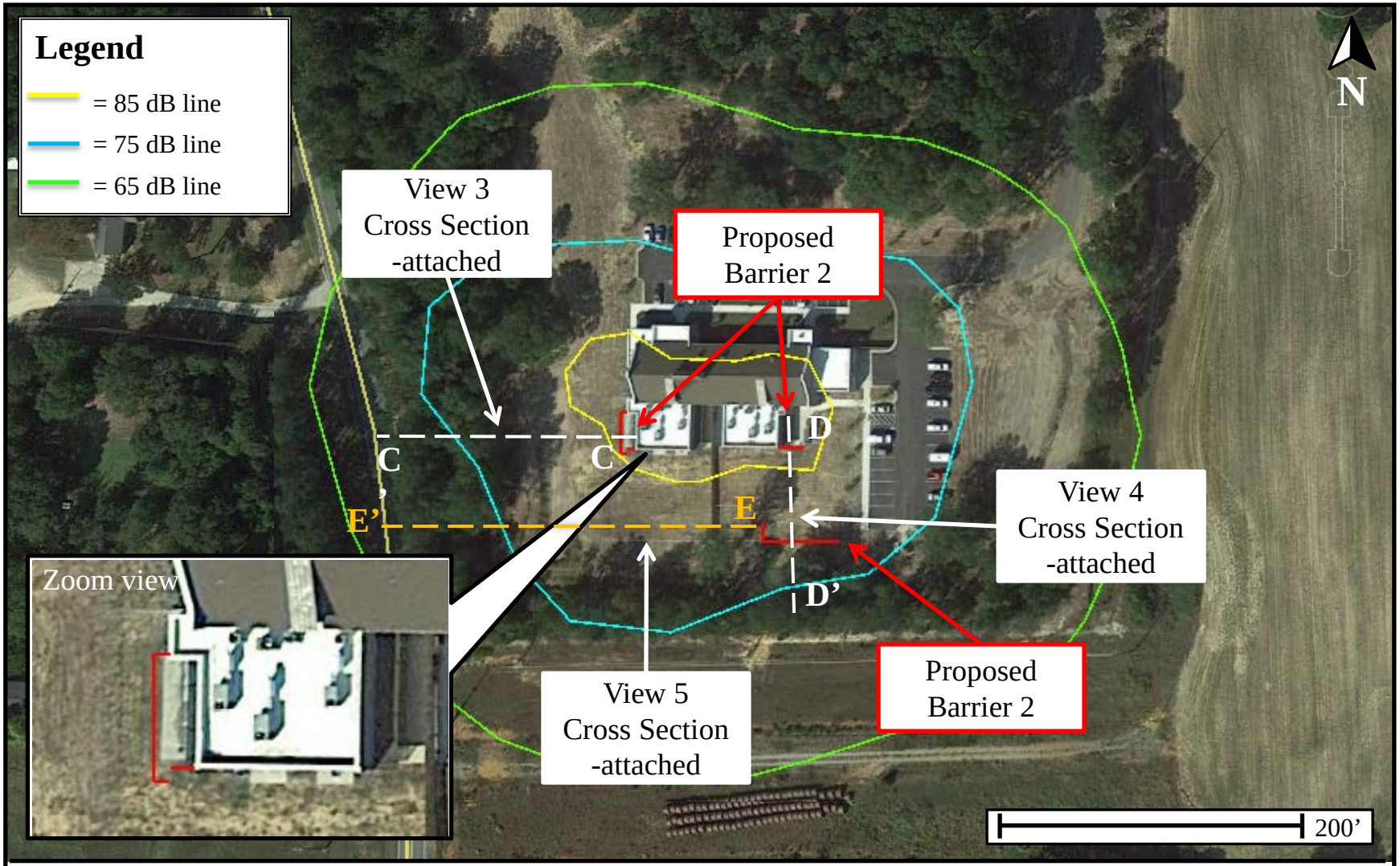
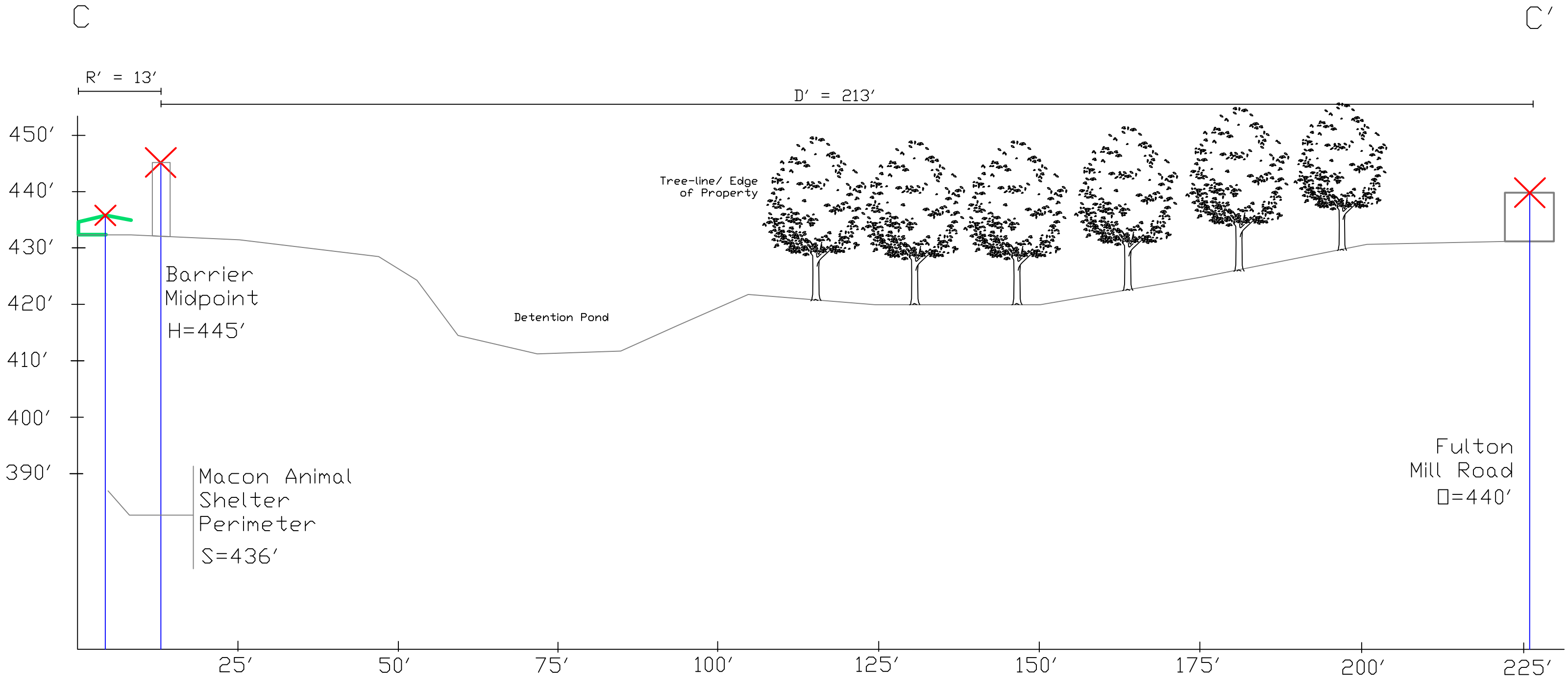



**Figure 3: Proposed Barrier 2**

**Macon Animal Welfare**
4220 Fulton Mill Rd
Macon, Bibb county, GA
GEC Project No. 170103.240

GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS, INC.

# PROFILE FOR VIEW3
# (Barrier Proposal 2 - West)

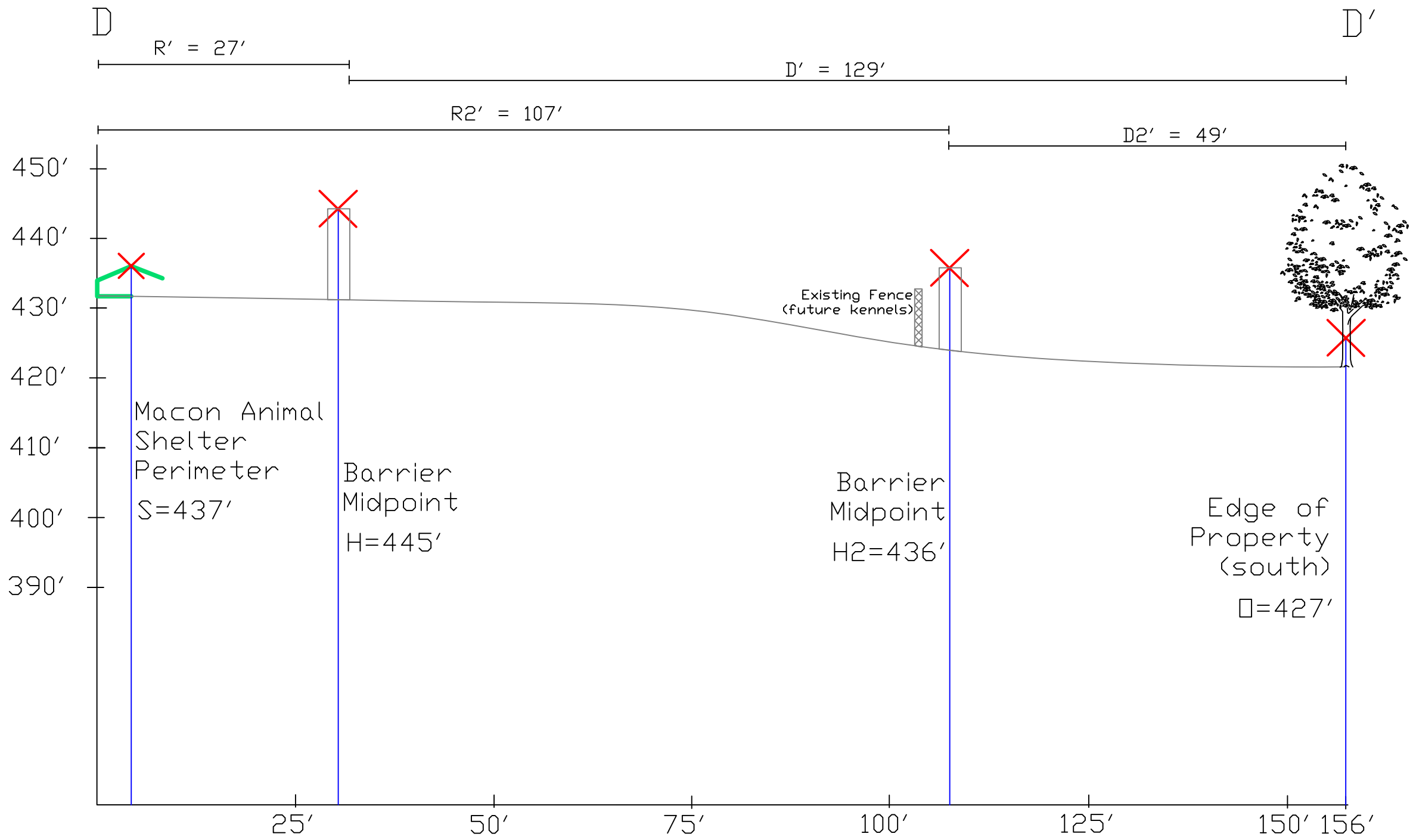



S: 433'(ground elevation) + 3'(observable height)=436'

H: 433'(ground elevation) + 12'(wall) = 445'

□: 432'(ground elevation) + 8'(observable height)=440'

# PROFILE FOR VIEW4
# (Barrier Proposal 2 - South)



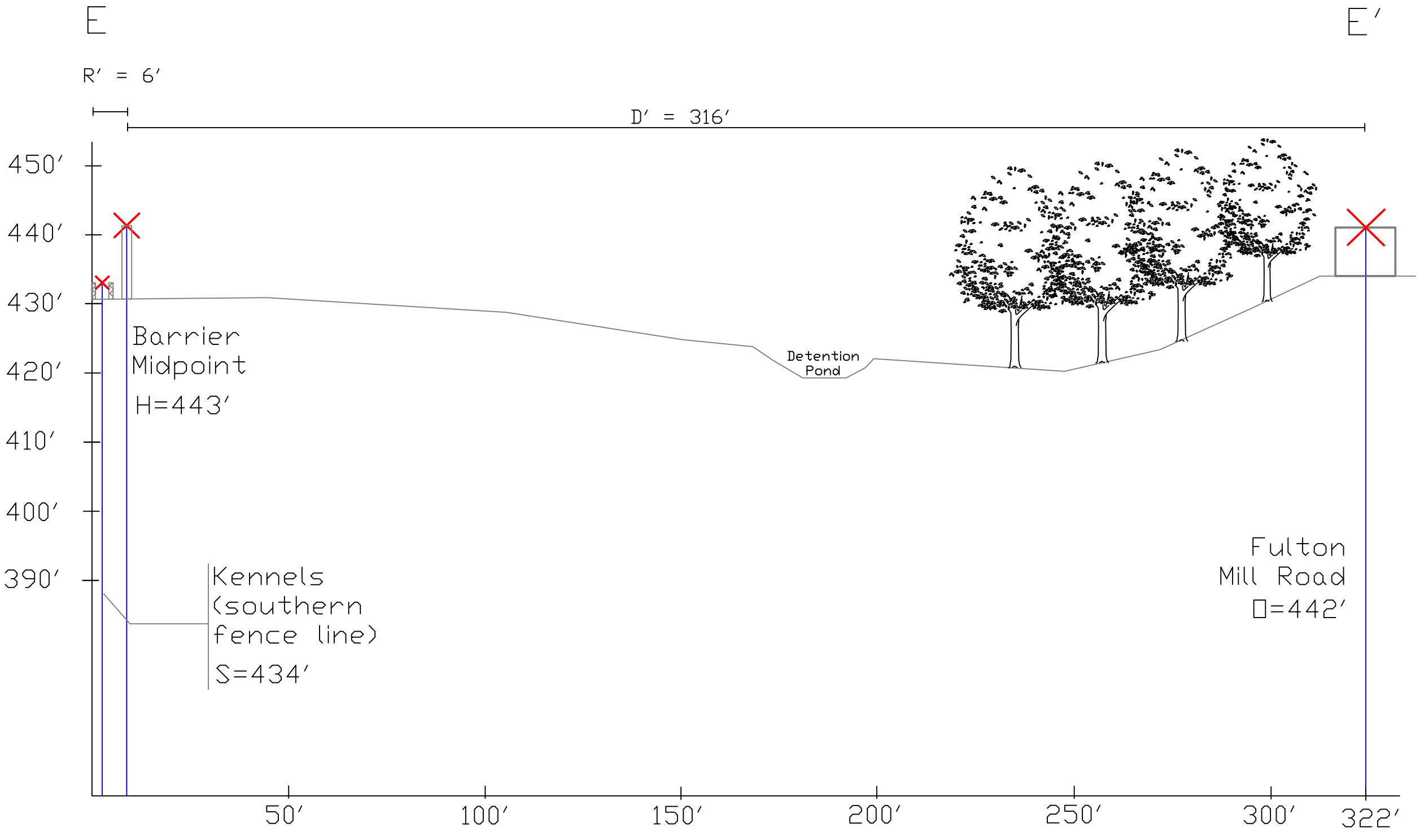

S: 434'(ground elevation) + 3'(observable height)=437'

H: 433'(ground elevation) + 12'(wall) = 445'

□: 422'(ground elevation) + 5'(observable height)=427'

H2: 424'(ground elevation) + 12'(wall) = 436'

# PROFILE FOR VIEW5
## (Barrier Proposal 2 - South Border - West View)




S: 431′(ground elevation) + 3′(observable height)=434′

H: 431′(ground elevation) + 12′(wall) = 443′

□: 434′(ground elevation) + 8′(observable height)=442′

## Supporting documentation (via HUD's website) Barrier 1:

View 1 with **12'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 440 | $R^1$ | 29 |
| S | 436 | $D^1$ | 196 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 3 | R | 29 |
| D | 196 | FS | 4.5417 |

**New Site DNL:**

**-4.5417**

View 1 with **8'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 436 | $R^1$ | 29 |
| S | 436 | $D^1$ | 196 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | -1 | R | 29 |
| D | 196 | FS | No attenuation |

**New Site DNL:**

**No attenuatio**

View 1 with **6'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 434 | $R^1$ | 29 |
| S | 436 | $D^1$ | 196 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | -3 | R | 29 |
| D | 196 | FS | No attenuation |

**New Site DNL:**

**No attenuatio**

View 2 with **12'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 434 | $R^1$ | 100 |
| S | 434 | $D^1$ | 40 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 5 | R | 100 |
| D | 40 | FS | 10.1315 |

**New Site DNL:**

**-10.1315**

View 1 with **8'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 430 | $R^1$ | 100 |
| S | 434 | $D^1$ | 40 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 1 | R | 100 |
| D | 40 | FS | 5.0307 |

**New Site DNL:**

**-5.0307**

View 2 with **6'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 428 | $R^1$ | 100 |
| S | 434 | $D^1$ | 40 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | -1 | R | 100 |
| D | 40 | FS | No attenuation |

**New Site DNL:**

**No attenuatio**

## Supporting documentation (via HUD's website) Barrier 2:

View 3 with **12'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 445 | $R^1$ | 13 |
| S | 436 | $D^1$ | 213 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 9 | R | 13 |
| D | 213 | FS | 11.4298 |

**New Site DNL:**

**-11.4298**

View 3 with **8'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 441 | $R^1$ | 13 |
| S | 436 | $D^1$ | 213 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 5 | R | 13 |
| D | 213 | FS | 8.1217 |

**New Site DNL:**

**-8.1217**

View 3 with **6’** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 439 | $R^1$ | 13 |
| S | 436 | $D^1$ | 213 |
| O | 440 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 3 | R | 13 |
| D | 213 | FS | 5.7549 |

**New Site DNL:**

**-5.7549**

View 4 with **12'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 445 | $R^1$ | 27 |
| S | 437 | $D^1$ | 129 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 10 | R | 26 |
| D | 130 | FS | 10.9804 |

**New Site DNL:**

**-10.9804**

View 4, H2 (barrier at future kennels on southern border) **12'** border

# Input Data

| | | | |
|---|---|---|---|
| H | 436 | $R^1$ | 107 |
| S | 437 | $D^1$ | 49 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 6 | R | 107 |
| D | 49 | FS | 10.5825 |

**New Site DNL:**

**-10.5825**

View 4 with **8’** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 441 | $R^1$ | 27 |
| S | 437 | $D^1$ | 129 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 6 | R | 27 |
| D | 130 | FS | 8.1243 |

**New Site DNL:**

**-8.1243**

View 4, H2 (barrier at future kennels on southern border) **8’** border

# Input Data

| | | | |
|---|---|---|---|
| H | 432 | $R^1$ | 107 |
| S | 437 | $D^1$ | 49 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 2 | R | 107 |
| D | 49 | FS | 6.5624 |

**New Site DNL:**

**-6.5624**

View 4 with **6'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 439 | $R^1$ | 27 |
| S | 437 | $D^1$ | 129 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 4 | R | 27 |
| D | 129 | FS | 6.2829 |

**New Site DNL:**

**-6.2829**

View 4, H2 (barrier at future kennels on southern border) **6’** border

# Input Data

| | | | |
|---|---|---|---|
| H | 430 | $R^1$ | 107 |
| S | 437 | $D^1$ | 49 |
| O | 427 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 0 | R | 107 |
| D | 49 | FS | -0.0255 |

**New Site DNL:**

**0.0255**

View 5 with **12'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 443 | $R^1$ | 6 |
| S | 434 | $D^1$ | 316 |
| O | 442 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 9 | R | 6 |
| D | 316 | FS | 13.1794 |

**New Site DNL:**

**-13.1794**

View 5 with **8'** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 439 | $R^1$ | 6 |
| S | 434 | $D^1$ | 316 |
| O | 442 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 5 | R | 6 |
| D | 316 | FS | 9.8911 |

**New Site DNL:**

**-9.8911**

View 5 with **6’** wall:

# Input Data

| | | | |
|---|---|---|---|
| H | 437 | $R^1$ | 6 |
| S | 434 | $D^1$ | 316 |
| O | 442 | α | 180 |

Calculate Output

# Output Data

| | | | |
|---|---|---|---|
| h | 3 | R | 6 |
| D | 316 | FS | 7.3269 |

**New Site DNL:**

**-7.3269**