ATTACHMENT A

NOISE IMPACT EVALUATION

LANDING ZONE AND RAVEN UAV TOWER PROJECT, PLYMOUTH TRAINING SITE

Background

- MEARNG has identified the increase in Sikorsky UH-60 Black Hawk helicopter overflight frequency as the primary source of noise impact that will result from the proposed action.
- MEARNG estimates 20 days or fewer of UH-60 training flights per year at the Plymouth Training Site (3% of a year).
- MEARNG estimates that individual training missions at the Plymouth Training Site will last less than one (1) hour. Overflight of abutting property on approach and exit from the training site are anticipated to last less than five (5) minutes in each direction of travel.
- All flights will take place during daylight hours (07:00 to 22:00).
- Given that MEARNG proposes to build two landing zones at the Plymouth Training Site, MEARNG conservatively estimates that maximum noise impact will involve two UH-60s in flight over the training site at the same time.

Existing Operational Noise Environment

- The current training noise environment at the Plymouth Training Site includes intermittent use of heavy vehicles, pyrotechnics, a .50 caliber machine gun simulator, and an improvised explosive device (IED) simulator.
- Table 1 summarizes the peak noise pressure/power of a .50 caliber machine gun blank in a free field environment. The peak noise profile of .50 caliber blanks is extremely similar to the propane-fired .50 caliber machine gun simulator that is used by MEARNG at the Plymouth Training Site.

Table 1. Predicted Peak for Machine Gun .50 Cal Blank Round

Distance	Predicted Level, dB Peak
1/8 mile	103-119
1/4 mile	91-107
1/2 mile	84-99
3/4 mile	79-94
1 mile	77-92

- In use, the .50 caliber simulator produces 10-to-15 high-pressure sound blasts per second.
- MEARNG's IED simulator produces a single loud percussive blast that exceeds 125 dB Peak at close range.
- When not in use for training, the Plymouth Training Site noise environment is relatively quiet, with intermittent recreational noise associated with snowmobiles and hunting.

- Land use surrounding the Plymouth Training Site likely produces noise typical of residential development (e.g., lawn mowers, automobiles), intermittent gun fire from hunting and target shooting, snowmobiles, all-terrain vehicles, and logging operations.
- The findings of a recent comprehensive noise study determined that blast noise such as the IED simulator is the most annoying noise source among the eight sources of military training noise, including aviation, vehicle traffic, and small arms fire (U.S. Army Construction Engineering Research Laboratory, 2014).
- To date, MEARNG has not received complaints from the public regarding training noise at the Plymouth Training Site.

Impact Minimization of the Proposed Action

- While training noise is unavoidable, MEARNG has selected a flight path designed to minimize potential noise impacts to local residents.
- The best setting for minimizing potential noise impact is flying at high altitude where sound energy can dissipate without any impediment to the damping of sound over distance. Thus, the selected flight path calls for a relatively high altitude (2,000 feet above ground level) on approach and exit from the Plymouth Training Site.
- For the descent from cruising altitude to the Plymouth Training Site landing zones, MEARNG used recent publically-available aerial photographs to determine the location of area residences, and then selected a flight path to and from the Plymouth Training Site that was consistent with aviation safety considerations regarding topography and wind-direction and avoided overflying residences to the greatest extent possible.
- A map of the flight path in the vicinity of the Plymouth Training Site is attached below as Figure 1. A three-dimensional rendering of the flight path is attached below as Figure 2.

Impact Evaluation of the Proposed Action

- The sound energy produced by UH-60s in flight is relatively constant.
- The most critical variable in evaluating potential noise impacts is the distance between the aircraft and noise receptors. Sound intensity dissipates as a factor of distance following an "inverse square law". For example, the intensity of sound at a distance:
    - Noise at a distance 2X from the source is one fourth as intense as at distance X:

      $1/4 = 1/(2^2)$

    - Noise at a distance 3X from the source is one ninth as intense as at distance X:

      $1/9 = 1/(3^2)$

  Thus, increasing the distance between the aircraft and noise receptors decreases the potential noise impact.
- Table 2 provides a summary of sound levels experienced by a noise receptor located on the ground at select distances from two (2) UH-60s that are flying at a relatively low elevation of 500 feet above ground level.

Table 2. A-Weighted[1] Sound from two (2) UH-60s flying 500 feet above ground level

Ground Track Distance	Maximum Sound Level
0 feet; directly overhead	86 dBA
1/4 mile away	77 dBA
1/2 mile away	71 dBA
3/4 mile away	68 dBA
1 mile away	65.5 dBA

- Using the flight path described above, MEARNG staff estimated the maximum A-weighted noise levels within 1.0 mile of the Plymouth Training Site caused by two (2) UH-60s travelling simultaneously along the flight path. MEARNG developed this maximum noise estimate by calculating the free-field noise at a range of distances from the flight path. The estimated maximum noise levels are depicted in Figures 1 and 2.

- MEARNG did not assess the impact of noise variables other than distance between the source and receptors. While local topography, ground cover, wind direction, weather, and other factors affect sound dissipation and noise impact, they are extremely difficult to model and are of secondary importance compared to the distance between the source and the receptor.

- Noise receptors located a mile or more from the flight path should experience a maximum estimated sound level less than 66 dBA (see Figures 1 and 2). Airport noise researchers have found that less than 1% of a population experiencing 66 dBA of frequent aircraft over-flight noise will be highly annoyed (Rylander *et al*, 1974). Please note that the anticipated 20 or fewer overflights per year, each lasting less than an hour is intermittent overflight, not frequent overflight.

- Noise receptors located less than a mile from the flight path may experience maximum sound levels between 65 and 86 dBA, with noise levels increasing closer to the Plymouth Training Site (see Figures 1 and 2). Airport noise researchers have found that between 5 and 28% of a population experiencing 66 dBA of frequent aircraft overflight noise will be highly annoyed (Rylander *et al*, 1974). Please note that the anticipated 20 or fewer overflights per year, each lasting less than an hour is temporary and intermittent, not frequent overflight.

Summary

- The intensity of sound produced during the proposed increase in aviation training at the Plymouth Training Site will result in temporary local noise impacts. The effect of this noise impact is offset in part by the low number of training event per year and their relatively short durations.

[1] A-Weighted Sound Level is a sound level (in decibels) that has been weighted to correspond with the non-linear sensitivity of the human ear. A-weighting discriminates against the lower frequencies and is used to measure most common military sounds such as transportation and small-arms fire.

- The direct effects of operational noise may include temporary disturbance to wildlife and annoyance of human noise receptors on, and around, the Plymouth Training Site. Temporary noise impact from the proposed action is only relevant at the local level, and no indirect effects from noise are anticipated.

- The source of aviation noise is lower in power/pressure than existing intermittent training noise at the Plymouth Training Site, which, to date, has not elicited complaints from the public.

- **MEARNG considers the potential noise impact of the proposed action to be less than significant. The primary factors in this assessment are:**

    - **The relatively infrequent number of anticipated aviation training operations and their short durations (totaling less than 20 hours a year); and**

    - **The existing operational noise environment at the Plymouth Training Site.**

References

- Rylander, *et al.* 1974. Re-Analysis of Aircraft Noise Annoyance Data against the dBA Peak Concept. Journal of Sound and Vibration. 36: 399-406.

- U.S. Army Construction Engineering Research Laboratory (CERL). 2014. An Investigation of Community Attitudes Toward Blast Noise: Final Report. SERDP Project WP-1546, Version 2

Plymouth to Bangor, Penobscot Co. ME

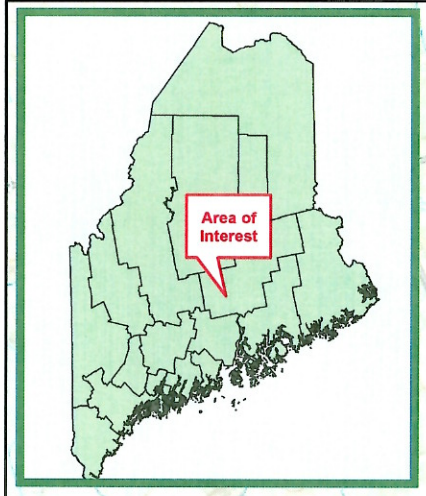


Figure 1. Flight Path to Plymouth Training Site with Descent from 2000-foot Above Ground Level Cruising Altitude

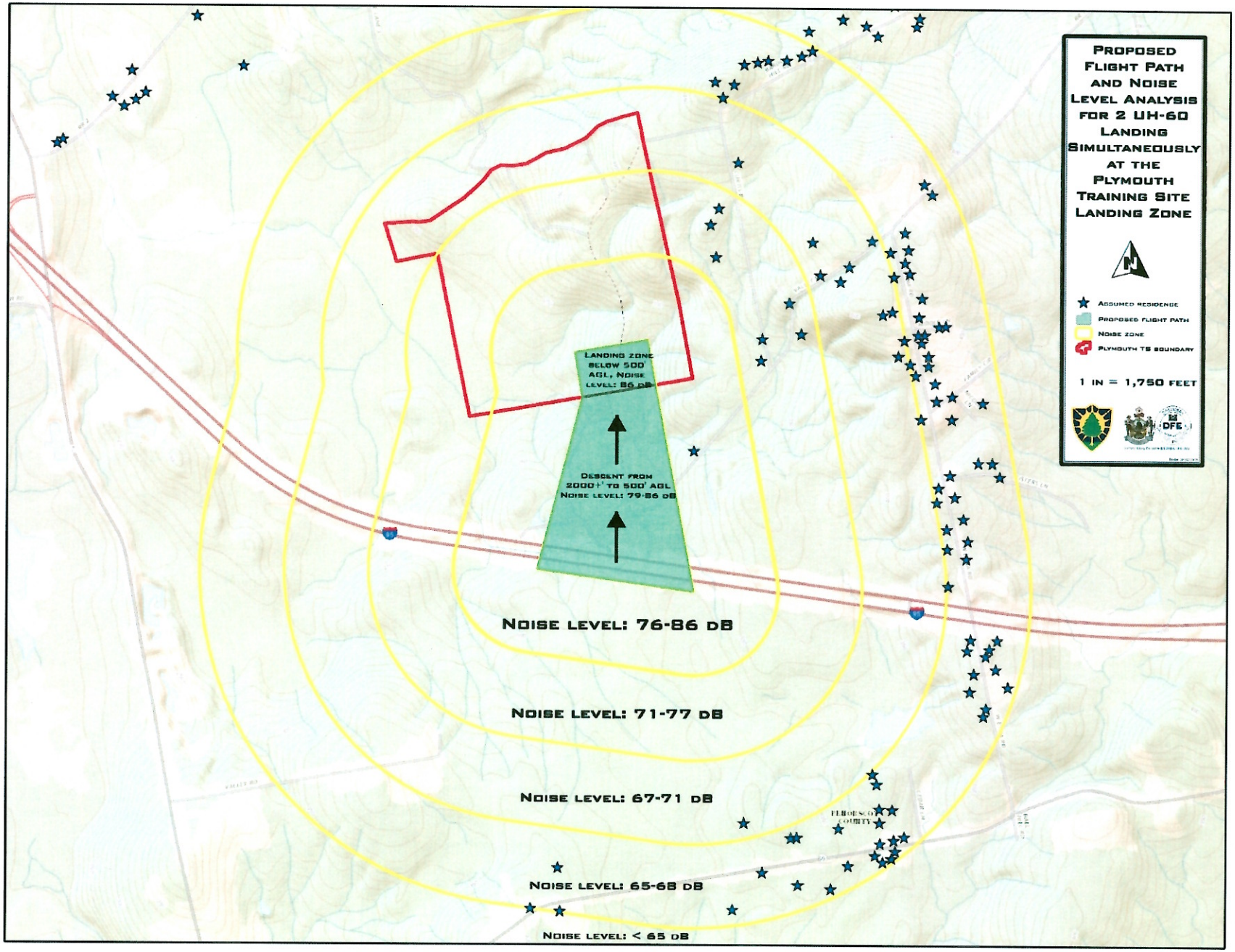
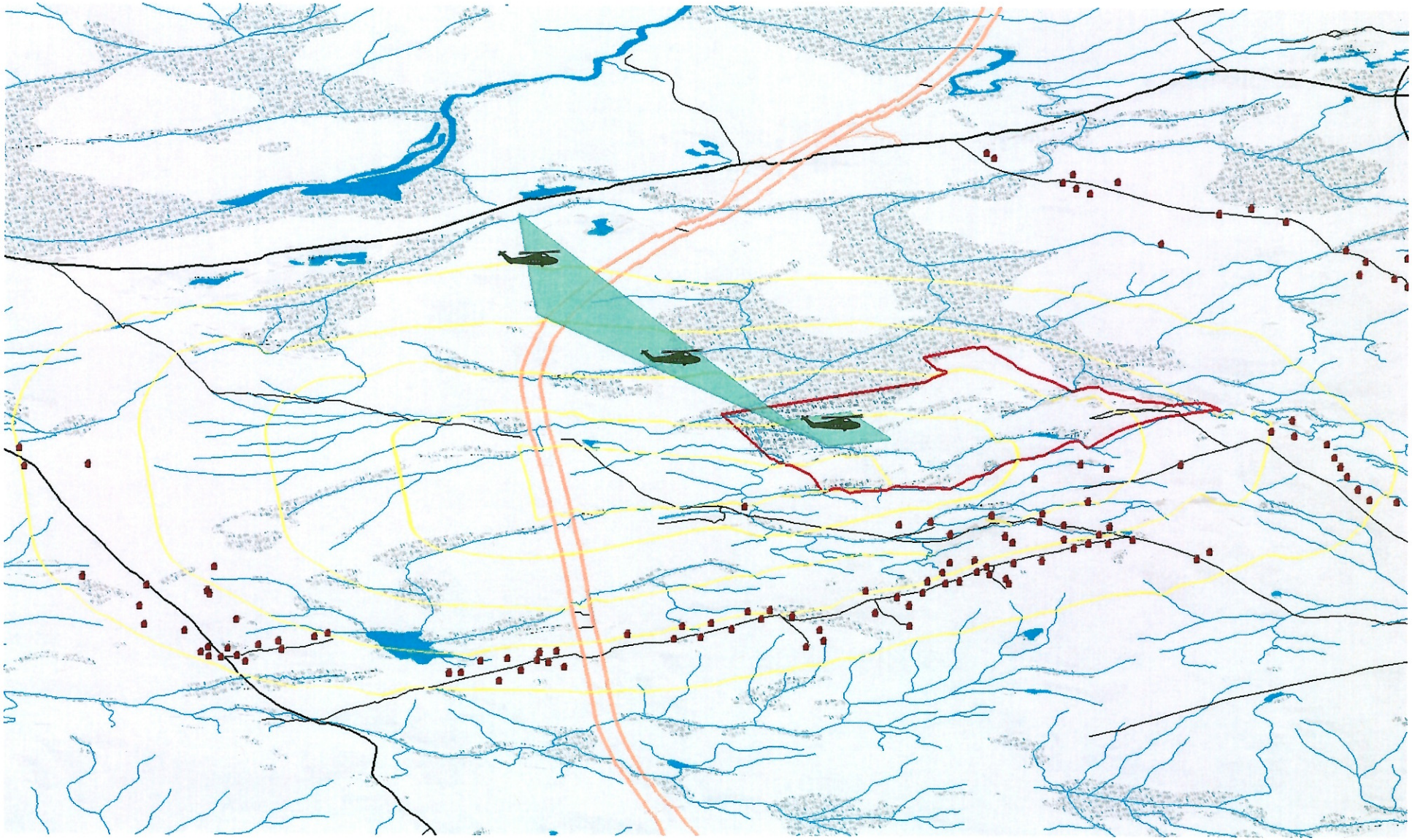


Figure 2. Three-dimensional Perspective Rendering of Flight Path



1. Training Site Boundary and Residences in **Red**
2. Flight Path elevations in **Aqua**
3. Estimated Noise Contours from Figure 1 in **Yellow**