Broadcast Signal Lab

Follow-on Comments on the SBA Application for a Special Permit to Install a Wireless Facility and Tower at 5 Craig Road, Acton, Massachusetts

1. Open Items

In our February 1, 2010 report to the Board on this matter, we concluded with a set of outstanding items, which are listed in the bullets that follow. After receiving additional information at the public hearing of February 2 and in submissions on March 11, we provide an annotation to each of the bullets below.

.

- Missing 500-ft radius documentation of average elevation.
    - We did not see any calculation of the average elevation within the 500-foot radius. If the tower base elevation is any more than 5 feet above the 500-foot average elevation, the tower is too tall as proposed.
- Further information on the structural, visual, and antenna/cable space impacts of CAM vs. Flush Mount, vs. proposed design is necessary to answer questions about design appropriate for the site.
    - We have not seen any further information on this question.
- Documentation of coverage available at lesser heights needed – try 100 and 135 feet.
    - T-Mobile coverage plots were submitted at these two elevations. There are observable but not major differences, primarily in the in-building coverage area. T-Mobile should explain how it feels coverage from the 170-foot height is significantly better than coverage at 100 and 135 feet.
- Documentation [to support] rejecting the possibility of using a shorter tower that could be increased in height in the future if proven necessary to the Board.
    - Board's discretion to consider this question. Applicant should be prepared to support answer with documented evidence.
- Consider allowing one or more shorter towers on the site, if and when necessary, if the resulting lesser tower heights provide a substantial reduction in objectionable visual impact.
    - Based on the T-Mobile coverage analysis, the penalty for reducing to 100 feet does not appear to be fatal to the objectives of the facility. Co-location would be reduced.

If substantial visual improvement is obtained with lesser height, it might outweigh the detriments of such a reduction.

- Documentation of any technical reasons (including RF engineering calculations or other data if applicable) for requiring changes to the 10-foot spacing or to the number of carriers able to use the tower if Flush Mount or CAM is required instead of the proposed platform arrays.
    - No documentation received.
- Applicant should explain what changes are necessary to achieve 6-7-carrier capacity on the tower. [as proposed with platform mounted arrays]
    - No documentation received.
- Clearwire could explain the possibility of sharing its proposed space on the tower with Sprint if Sprint were to join the site in the future.
    - No response provided.
- Coverage analysis needs additional information: proposed-only coverage plots (both carriers); Clearwire prospective coverage south and east of the proposed facility; published signal level thresholds and detailed rationalization for these thresholds instead of the -90 dBm presumption.
    - No documentation received
- Evaluate (coverage, availability, visual impact, zoning compliance) potential of alternative facility at the industrial area west of Hosmer Rd and south of Rt 2 (also, is the wooded area east of Hosmer Rd and south of Rt 2 available?). Provide applicant and consultant with suggestions for other sites (could be more than one site to jointly substitute for proposed) that might be more desirable for the community.
    - Some discussion of alternatives occurred at the previous hearing. Board's discretion whether to pursue any prospective locations.

2. Photosimulations

In addition to the foregoing, we would like to comment on the visual analysis prepared on February 2, 2010 by Tower Engineering Professionals, Inc. It consists of 12 pages with 6 photosimulations of the proposed tower that are paired with original photos from the same positions.

It requires a degree of precision to generate the most realistic photosimulations possible. We tend to see three areas where photosimulation technique may fall short of ideal.

First, balloons generally drift off center due to windage. With a steady wind, the drift can be reckoned with by moving the ground attachment point so the balloon is essentially above the proposed tower base. On long distance views, this error may not be material. As well, with windage, there is a reduction in balloon height. Was the height of the balloon actually measured? If not, how was the scope (length) of the line adjusted to compensate for windage?

Second, the choice of lens focal length can drastically affect the perceived result of a photosimulation. The zoomed photos in the original balloon test report are suitably labeled as zoomed. However, the spans of the wider angle shots are not reported. It has been generally accepted that a 50 mm lens focal length produces the most normal perspective with respect to human vision. This focal length is based on 35 mm film cameras (both the focal length and the film size are reported in millimeters). Digital cameras have specifications that differ from the old 35 mm film cameras. To allow comparison of camera specifications, digital camera focal lengths are often converted to the equivalent for a 35 mm film camera. For instance, a digital camera lens set to take a normal angle shot would be said to have a "50mm equivalent" focal length. Most digital cameras, when fully unzoomed, are operating in the wide angle range, not at the 50 mm equivalent normal range.

Third, the manner in which a simulated tower is inserted into a photo can err in its breadth-to-height ratio. Assuming the balloon height is accurate, the simulator has an absolute height reference in his photographs. Nevertheless, a simulated tower set to the balloon height may not be the correct width on the selected photograph.

We will assume that the balloon height and position are sufficiently close to target for the photosimulations.

We performed an evaluation of the photosimulations by taking photographs of a 170-foot tower in Medfield at certain distances from the tower. We then compared these images with the photosimulations. This addresses the camera lens focal length question and the tower simulation breadth question.

Below are

A) an original photosimulation from the Feb. 2 document,

B) one photograph of a real tower from the same distance with 35mm equiv. lens,

C) a second photograph of the real tower from the same distance with 50 mm equivalent lens, and

D) a superimposition of the real towers on the simulated tower image.

A) Original Photosimulation Submitted by SBA at about 1700 feet from tower site (unknown equiv. focal length) (from "Location 3" on the Feb 2 document)

B) BSL photograph of Medfield 170-foot tower at same distance (about 1700 feet) 35 mm equiv. focal length

C) BSL photograph of Medfield 170-foot tower at same distance (about 1700 feet) 50mm equiv. focal length

D) Superimposition of Medfield tower shots from 1700 feet 50mm (left) and 35mm (right) equivalent focal lengths.

The above sequence shows two things. First, it appears the original photos employed in the photosimulations do employ wide angle photography. Second, the photosimulation shown appears to understate the breadth of the tower by about ½.

On photo D, we positioned the 50 mm equivalent lens photo of the real tower to the left of the simulated tower. These images are literally lifted from the other images (A, B & C) at the same image sizes and proportions. The inset of the real tower with a 50 mm equivalent lens is much taller than the tower in the photosimulation. Since the simulated tower height is based on the balloon height, and since the photosimulation and the real tower were both photographed from approximately 1700 feet, it is clear that a 50mm equivalent image of a real tower of the same height is too tall for the original photo. This exercise suggests that the original photo for the photosimulation is not 50 mm equivalent focal length.

The right inset is the 35mm equivalent view of the real tower, also taken 1700 feet from the real tower. Like the outsized proportions of the 50 mm equivalent lens, the 35 mm equivalent lens

also captures a larger tower than the photosimulation. This suggests that the photosimulation employs a wider angle than the 35 mm equivalent lens. Further, the image of the real tower is broader than the photosimulation.

A quick comparison of shots from 1400 feet and 600 feet from the real tower compared to the photosimulations from the same distances yielded similar results.

Based on the foregoing, we believe the photosimulations understate the visual characteristics of the proposed facility from the several vantage points provided. The applicant should provide the equivalent lens focal lengths for review.

David Maxson
Broadcast Signal Lab, LLP
505 Main Street
Medfield, MA 02052
508 359 8833

March 12, 2010