

TELECOMMUNICATIONS ENGINEERING

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RADIO FREQUENCY ELECTROMAGNETIC FIELD MEASUREMENTS

MT. VISION ANTENNA SITE (LEASEHOLD #2)

SALT LAKE CITY, UTAH

Prepared for

UNIVERSITY OF UTAH

BRIGHAM YOUNG UNIVERSITY

CITADEL BROADCASTING COMPANY

9 August 2006

Purpose

On 27 July 2006, measurements of the ground-level ambient radiofrequency electromagnetic field were made at the Mt. Vision (Leasehold #2), Utah, antenna site. These measurements were occasioned by several changes in facilities made at the site since the last measurements were made on 15 May 2005 and sought to determine compliance with the Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields as outlined in FCC OET Bulletin 65 (Edition 97-01). This report is being prepared on behalf of the University of Utah, licensee of KUER-FM, in furtherance of Condition 3 imposed in construction permit BXPED-20050624AAR; Brigham Young University, licensee of KBYU-FM, in response to the replacement of its main and auxiliary antennas; and Citadel Broadcasting, licensee of KBEE-FM, in response to the replacement of its main antenna. The weather was seasonably warm and dry.

Site Description

The Mt. Vision Leasehold Number 2 antenna site is located within the confines of the Kennicott Utah copper mine in the Oquirrh Mountains, west of Salt Lake City. The entire mining area is fenced and not open to the public. The site is approximately 11 miles from the nearest public road and access is restricted by two locked gates. Access to the site is restricted to the road by rugged terrain. The road is used solely to provide access to several antenna sites and does not lead elsewhere. For the purpose of compliance with OET 65, the site can be considered not accessible to the general public.

The broadcast facilities of KUED-TV, Channel 7, KUEN-TV, Channel 9, KBYU-TV-Channel 11, KUER-FM, 90.1 MHz., KBYU-FM, 89.1 MHz, KBEE, 98.7 MHz and KJMY, 99.5 MHz. are located at this site, as well as the auxiliary facilities of KTVX-TV, Channel 4. (The main facilities of KTVX are located elsewhere.) KUER-FM, KBYU-FM, KBEE and KJMY maintain auxiliary facilities at the site. KUER has a second auxiliary antenna located at the site that is used exclusively for HD radio transmissions. KUED and KUEN share a single auxiliary antenna which can be used by one of the stations at a time. There is also a former KBYU-TV antenna on the site which is no longer in service. KUER, KBYU, KBEE and KJMY are engaged in HD radio broadcasting.

Attached as Figures 1 and 2 are plan and elevation drawings of the site showing the location of the various antennas and antenna support structures. Figure 3 shows the licensed power of each of the main facilities and the operating power of each of the auxiliary facilities, as well as the antenna types employed and their approximate heights, AGL. The information for Figures 1 through 3 was provided by Lewis Downey of the University of Utah.

Measurement Protocol

The measurements were made using a Narda RF Radiation Survey Meter, Model 8715, S/N 19006, and a Narda Model 8722, S/N 03027, isotropic electric field probe, both in current calibration. The 8722 electric field probe has a shaped frequency response that produces an output proportional to the IEEE/ANSI C95.1-1982. Maximum Permissible Exposure Standard from 300 KHz. to 40 GHz. Using this probe, the 8715 meter produces a reading equal to a percentage of the MPE of the aggregate radiofrequency electric field.

Over the range of frequencies used by the broadcasters at the Mt. Vision Antenna Site, the C95.1-1982 MPE standard is the same as the FCC Occupational/Controlled Environment MPE standard shown in Table 1 (A) of Appendix A, OET Bulletin 65 (Edition 97-01).

All measurements were made according to the provisions of IEEE/ANSI C95.1-1991, *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz*, and IEEE/ANSI C95.3-1991, *IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields-RF and Microwave*.

Experience gained through the measurement of ambient radiofrequency electromagnetic fields at other antenna sites where the field is dominated by FM broadcast and VHF Television signals emitted by antennas several wavelengths above ground level has shown that invariably the electric field component dominates as regards compliance with the MPE standards at ground level. That is, at such sites, if

electric field measurements show compliance with the MPE standard, magnetic field measurements will also be in compliance. For this reason only electric field measurements were made.

Per IEEE/ANSI C95.1-1992 Section 4.1.2 (b), all measurements were taken as spatial averages over an area approximately equivalent to an adult male human body. This was accomplished by sweeping the probe at a uniform rate vertically from a point 0.2 meters AGL to a point 2 meters AGL while automatically recording the electric field at a rate of 40 measurements per second. Individual sweeps took approximately 20 seconds, resulting in a total of about 800 measurements per sweep. The reported spatial average is the average of these measurements. This protocol is native to the Narda 8715 meter. No readings were taken closer than 20 cm from any conducting object. All measurements were made at ground level.

Initial measurements were made with all stations operating on their main antennas at licensed power. Two successive sets of measurements were made with KUER and KBYU on their auxiliary antennas and operating at the power indicated in Figure 3. No attempt was made to take measurements with more than one station at a time on its auxiliary antenna. A discussion with the licensees' engineering representatives indicated that such operation would be unlikely. The KUER-FM, KBYU-FM, KJMY-FM and KBEE FM HD digital radio were operational during all measurements.

A theoretical study evaluating the ground level radiofrequency electromagnetic power density produced by each individual antenna was performed prior to making measurements to use as a guide in locating areas where the field was likely to be highest and where high level fields from more than one antenna might coincide.

In general the measurement procedure involved slowly walking away from each of the antenna support structures along several radials while sweeping the measurement probe vertically. Each radial was traversed approximately 100 meters or until further progress was precluded by terrain. Particular attention was paid to those areas where the theoretical study predicted the potential for high fields. Areas of high radiofrequency field were noted and then returned to for more detailed study.

Points where spatially averaged measurements showed that the ambient radiofrequency electromagnetic field exceeded the Occupational/Controlled MPE standard were marked with fluorescent marking paint in an effort to delineate the area.

Results

Main Antenna

With all stations operating on their main antennas at licensed power, it was found that the Occupational/Controlled MPE standard was exceeded in very limited areas near the KBEE and KBYU antenna support structures. These areas are limited to an 18" radius around the tower legs indicated in Figure 4. Spatial averages around the KBEE tower leg approach 140% of the Occupational/Controlled MPE standard and those around the KBYU tower leg approach 125% of the standard.

The General Public/Uncontrolled MPE standard was exceeded over much of the site. Because of the complexity of these areas, no effort was made to define their extent and exact location. No areas outside of the immediate vicinity of the buildings and antenna support structures, including the main road, were found to exceed the General Public/Uncontrolled MPE standard. In general, the radiofrequency field inside the buildings was quite low and well below the General Public/Uncontrolled MPE standard.

KUER on Auxiliary Antenna

With KUER operating from its Auxiliary antenna, no additional areas were found which exceeded the Occupational/Controlled MPE standard.

KBYU on Auxiliary Antenna

With KBYU-FM operating on its auxiliary antenna, it was found that the Occupational/Controlled MPE standard was exceeded in an 18" radius around one leg of the KBYU antenna support structure with fields approaching 115% of the standard. This area is indicated on Figure 4.

Other Stations on Auxiliary Antenna

See my report of 15 May 2005 for a discussion of the fields produced with the other

stations operating on their auxiliary antennas.

Discussion

General Public/Uncontrolled Exposure

Since many areas on the site exceed the General Public/Uncontrolled MPE standard, and because of the complexity of defining these areas, it must be assumed that the General Public/Uncontrolled MPE standard is exceeded at all locations on the site.

The Occupational/Controlled Exposure limit “applies to human exposure to RF fields when persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure.” (OET 65, Edition 97-01).

All persons using the site, whether employees of the broadcast stations or not, must receive sufficient instruction and be given the tools necessary to control their exposure in order for their exposure to be considered Occupational/Controlled exposure and have this MPE standard apply. This must include all station contractors, such as electricians, HVAC repairmen, etc. and their subcontractors.

It is not sufficient to merely notify such contractors and sub-contractors, the licensee has a positive obligation to assure that each individual using the site has been notified and instructed. This needn't be burdensome. Suggestions for fulfilling this obligation are discussed below under “Recommendations.”

Occupational/Controlled Exposure

The areas adjacent to the KBEE main antenna support structure and the KBYU antenna support structure where the ambient radiofrequency electromagnetic field exceeds the Occupational/Controlled MPE standard with all stations operating on their main antennas are of particular concern.

It is impermissible to allow anyone to be exposed to radiofrequency power in excess of the applicable MPE standard. Therefore, a mechanism must be put in place to assure that workers whose duties require them to be in this area are not so exposed.

47CFR1.1307(b)(3) provides, in part:

In general, when the guidelines specified in Sec. [1.1310](#) are exceeded in an accessible area due to the emissions from multiple fixed transmitters, actions necessary to bring the area into compliance are the shared responsibility of all licensees whose transmitters produce, at the area in question, power density levels that exceed 5% of the power density exposure limit applicable to their particular transmitter or field strength levels that, when squared, exceed 5% of the square of the electric or magnetic field strength limit applicable to their particular transmitter.

Therefore, those stations whose contribution the radiofrequency power density in this area exceeds 5% of the Occupational/Controlled MPE standard have an obligation to participate in whatever mechanism is put into place to assure that workers are not exposed to radiofrequency fields in excess of the MPE standard.

A theoretical study suggests that KBEE is the only significant contributor to the field in the area around the KBEE antenna support structure where the Occupational/Controlled MPE standard is exceeded; and KBYU is the only significant contributor to the field in the area around the KBYU antenna support structure where the Occupational/Controlled MPE standard is exceeded

All Stations on Main Antenna

KBEE contributes more than 5% of the Occupational/Controlled MPE standard in the area of interest around the KBEE antenna support structure and therefore is required to participate in any measures necessary to bring the area into compliance with this standard.

KBYU contributes more than 5% of the Occupational/Controlled MPE standard in the area of interest around the KBYU antenna support structure and therefore is required

to participate in any measures necessary to bring the area into compliance with this standard.

All other stations contribute less than 5% of the Occupational/Controlled MPE standard in the areas of interest and therefore are not required to participate in any measures necessary to bring these areas into compliance with this standard.

KUER on Auxiliary Antenna

KUER is in compliance with the Occupational/Controlled MPE standard.

KBYU on Auxiliary Antenna

KBYU is the only station that contributes more than 5% of the Occupational/Controlled MPE standard in the area of interest around the KBYU antenna support structure and therefore is required to participate in any measures necessary to bring the area into compliance with this standard.

Recommendations

General Public/Uncontrolled Exposure

Because it is to be assumed that the General Public/Uncontrolled MPE standard is exceeded over the entire site, the licensees must put into place a mechanism to assure that anybody entering the site has been warned that the General Public/Uncontrolled MPE standard may be exceeded and to sufficiently educate the entrant so that the Occupational/Controlled MPE standard will apply to him.

Since the ground level radiofrequency power density contribution by all of the licensees on the site exceeds 5% of the General Public/Controlled, all of the licensees have an obligation to participate in putting this mechanism into place.

In its simplest form, this might be a sheet notifying the worker that the General Public/Uncontrolled MPE standard is exceeded on the site, that in certain areas the Occupational/Controlled MPE standard is exceeded on the site, that these areas must not be entered, that he may reduce his exposure by leaving the confines of the site, that

the exposure has been evaluated only in certain areas (ground level) and that further evaluation must be done if his work takes him to other areas. After reading this sheet, the worker would sign it and return it to the sponsor (the licensee requesting the services of the worker). Those workers who did not have a signed sheet on file with the sponsor would not be allowed to access the site.

Additionally, even though the site is not accessible to the general public, it is recommended that signs be installed at both locked gates, at the junction of the drives to the KTVX/KBEE/KJMY transmitter building and the KBYU/KUER/KUED/KUEN transmitter building and at the junction of the old "back road" to the site where it joins the main road, indicating that the General Public/Uncontrolled MPE standard is exceeded in areas beyond the sign. The signs should further indicate that access to the site is restricted to those persons having received specific permission from one of the licensees and having received RF safety training and provide contact information. The signs on the locked gates should indicate how far ahead the transmitter site is.

Occupational/Controlled Exposure

All Stations on Main Antennas

KBYU on Auxiliary Antenna

The areas of high radiofrequency power density adjacent to the KTVX/KBEE and the KBYU-FM & TV antenna support structures must be delineated with appropriate signs indicating that the Occupational/Controlled MPE standard is exceeded in areas beyond the sign. Because of the very limited extent of these areas, three or four signs placed around the appropriate tower legs at a distance of two to three feet should be adequate. Alternatively, the tower legs could be fenced with non-metallic fencing at a distance of two to three feet and appropriate signs attached to the fence. Suitable signs may be purchased from a number of outlets, including www.radhaz.com.

All workers whose duties might take them into these areas must be informed of the fact that the area exist and the responsible licensees, KBEE or KBYU, must devise an appropriate safety plan to assure that workers are not exposed to fields in excess of the Occupational/Controlled MPE standard.

A reduction in transmitter power to 50% by KBEE or KBYU-FM would reduce the field in this area well below the Occupational/Controlled MPE standard. It is suggested that any worker whose duties require that he be in this area be accompanied by an engineering representative of the licensee sponsoring his work. It is suggested that a positive mechanism be put in place to assure that KBEE or KBYU-FM have reduced power to the appropriate level before a worker enters the area and to assure that the power cannot be inadvertently raised until the worker has left the area in question.

General Recommendations

Signs should be affixed to all antenna support structures on the site indicating that the Occupational/Controlled MPE standard may be exceeded at locations on the tower.

Signs should be affixed near each building entry indicating the radiofrequency field on the roofs of the buildings or other at elevated positions may exceed the Occupational/Controlled MPE standard.

Signs should be affixed near each building entry, or other prominent places, giving information on how to contact each of the licensees or their responsible parties.

All of the recommendations and suggestions made in this report to bring the site into compliance are just that – recommendations and suggestions. There may well be other operational and physical solutions to assure compliance with FCC radiofrequency exposure rules. It is the responsibility of the various licensees to select and implement the mechanisms necessary to assure compliance.

It is suggested that the licensees operating at this site codify the various safety concerns raised in this report into a Site RF Safety Plan.

Limitations

This report and the underlying measurements address only radiofrequency electromagnetic exposure at ground level. No attempt was made to measure or otherwise assess the electromagnetic fields on the antenna support structures or on

building roofs or other elevated working positions, and the results of this report and analysis may not be extrapolated to these areas.

It is the responsibility of the licensee to assure that a proper safety assessment as regards exposure to radiofrequency electromagnetic fields has been made before any work commences in areas beyond the scope of this report.

I, Gray Frierson Haertig, do hereby affirm that:

I am principal of Gray Frierson Haertig & Assoc.;

I have been retained by The University of Utah, Brigham Young University and Citadel Broadcasting to make measurements of the ambient radiofrequency electromagnetic field in the vicinity of its antenna site at Mt. Vision, Utah, assess its compliance with the exposure standards set out in 47CFR1.1310, provide recommendations to assure this compliance and prepare this report;

I have a particular interest and expertise in measuring radiofrequency electromagnetic fields and assessing human exposure to them;

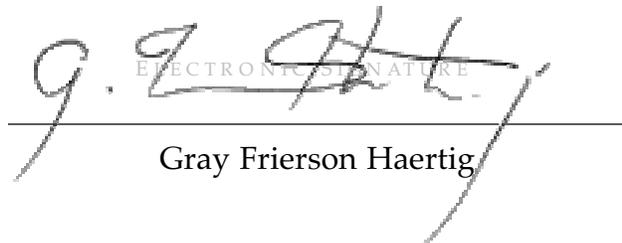
All measurements and analysis presented in this report were made personally by me;

All statement not attributed to others are accurate to the best of my knowledge and reflect the actual facts of the matter;

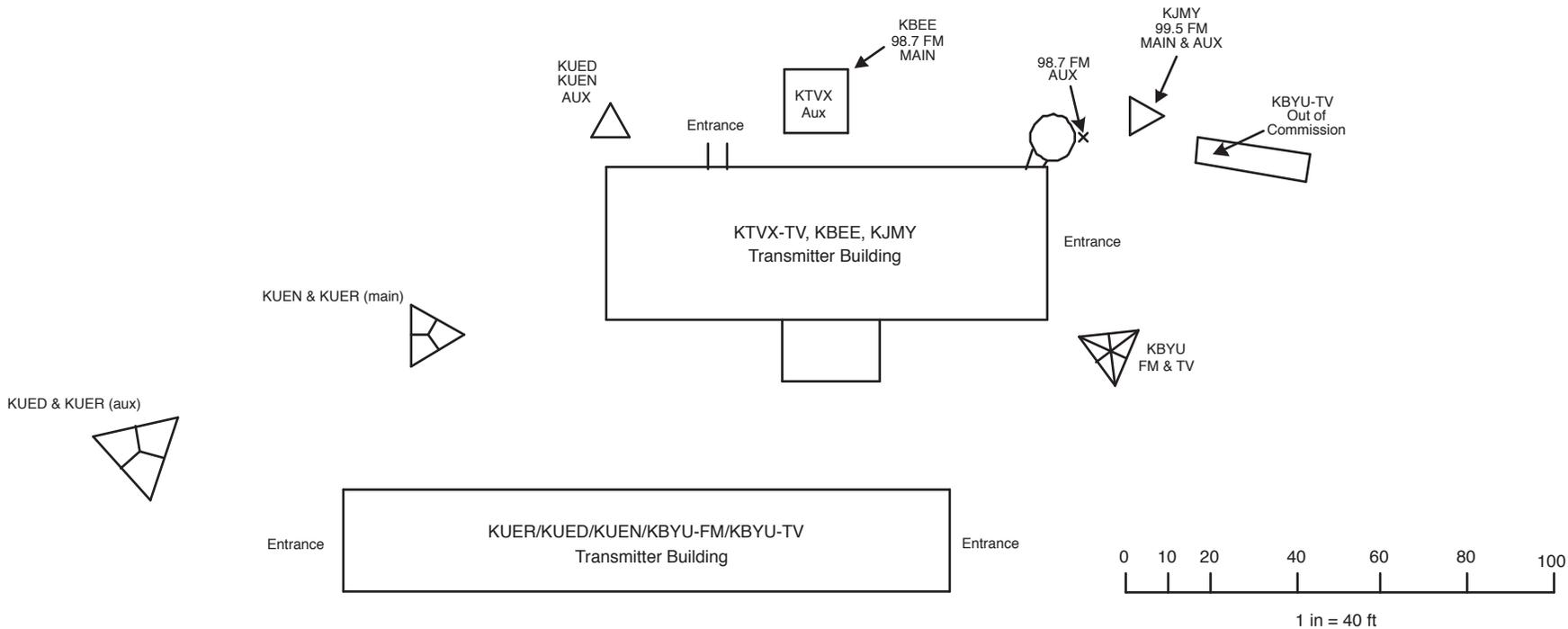
I am a broadcast engineer of 40 years experience;

And my credentials are a matter of record with the Commission.

Respectfully submitted this 9th day of August 2006,

 ELECTRONIC SIGNATURE

Gray Frierson Haertig



Mt. Vision Transmitter Site Plan
Figure 1

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Mt Vision Transmitter Site Profile Looking North
 Oquirrh Mountains
 Salt Lake City, Utah

Figure 2

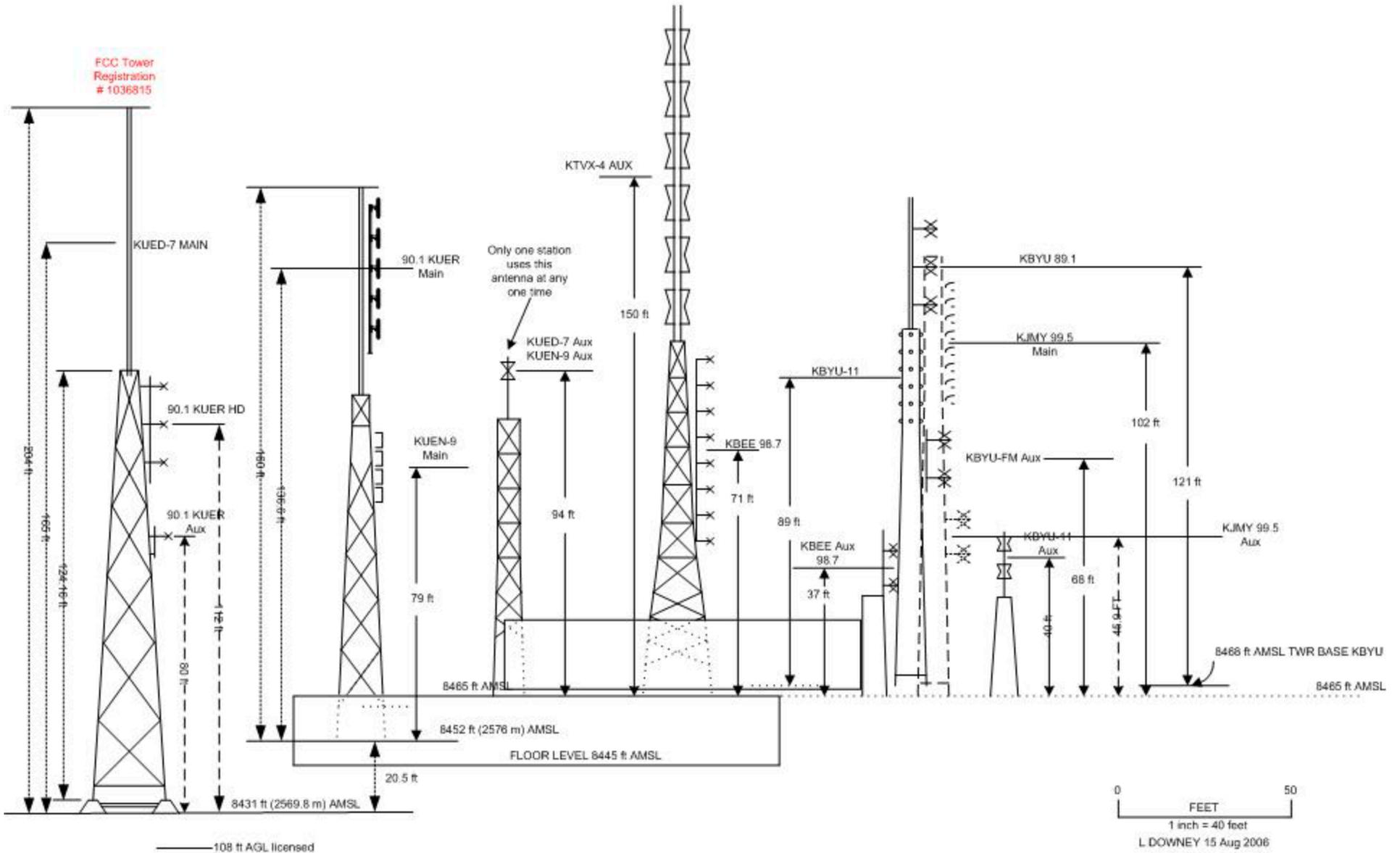
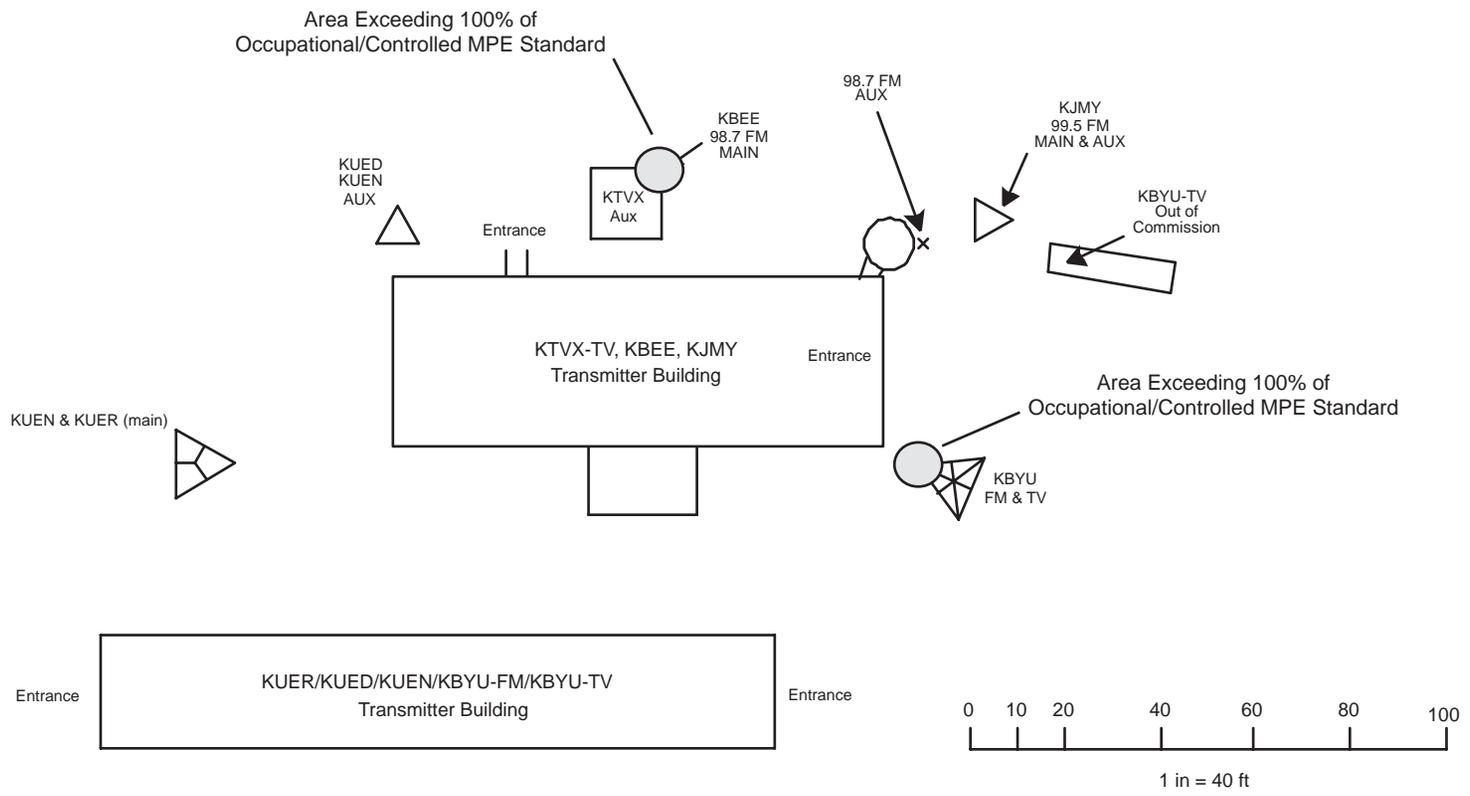


Figure 3
Station List
Mt. Vision Transmitter Site

Station	Frequency	ERP	TPO	CR-AGL	Antenna Type
KUER Main	90.1	38 KW		38 m	Shively 6810-5, 0.8 Wavelength Spacing
KUER Aux	90.1	6.8 KW		24 m	ERI SPX-1AE
KUER Aux (HD Only)	90.1	0.38 KW		34 m	ERI SPX-3AE
KBYU-FM Main	89.1	32 KW		37 m	Jampro 3 Bay
KBYU-FM Main	89.1	8 KW	5 KW	20 m	Jampro 2 Bay
KBEE-FM Main	98.7	40 KW		22 m	ERI DI-8A
KBEE-FM Aux	98.7	~8.5 KW	8.7 KW	11 m	Jampro 2 Bay
KJMY-FM Main	99.5	39 KW		31 m	ERI G5CPS-8AC3, 8 Bay, 1.4 Deg Beam Tilt
KJMY-FM Aux	99.5	~5 KW	5 KW	14 m	Jampro JHPC-2R, 2 Bay
KUED-TV Main	Channel 7	155 KW		50 m	RCA TW-9A7-R, 20% Aural Injection
KUED-TV Aux	Channel 7	~4.5 KW	4.5 KW	29 m	1 Bay Batwing, 20% Aural Injection (This antenna is shared with KUEN as an Aux. Only one station at a time can use.)
KUEN-TV Main	Channel 9	166 KW		24 m	Dielectric THP-C1-4-1
KUEN-TV Aux	Channel 9	~4 KW	4 KW	29 m	1 Bay Batwing, 20% Aural Injection (This antenna is shared with KUEN as an Aux. Only one station at a time can use.)
KBYU-TV Main	Channel 11	162 KW		27 m	Harris Panel Antenna, 6 Layers, 4 Around, 20% Aural Injection
KBYU-TV Aux					Out of Commission
KTVX-TV Aux	Channel 4	50.1 KW		46 m	RCA TF-6AM (Note, KTVX main facilities are located at another site.)



Mt. Vision Transmitter Site Plan
 All Stations on Main Antenna or
 KBYU on Auxiliary Antena
 Figure 4

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