

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )  
                        )  
                        )  
Unlicensed Operation in the TV         )         ET Docket No. 04-186  
Broadcast Bands                          )  
                        )  
                        )

To: The Commission

**Reply Comments of the Society of Broadcast Engineers, Inc.**

The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, with more than 5,000 members world wide, hereby respectfully submits its reply comments in the above-captioned notice of proposed rulemaking relating to higher power unlicensed Part 15 operation on "unused" TV Broadcast channels.

**I. Comments of IEEE 802**

1. IEEE 802 proposes unlicensed, Part 15, fixed base stations and customer premises equipment (CPE) devices with a transmitter power output (TPO) of up to 1 watt (30 dBm), and an effective radiated power (ERP) of up to 4 watts (36 dBm), on "unused" TV channels. SBE must respectfully disagree with IEEE 802: A 4-watt ERP device is NOT a low power device, suitable for unlicensed, Part 15, operation. If IEEE 802 would agree to reduce the proposed Part 15 power by two orders of magnitude, to 10 mW (10 dBm) TPO and to 40 mW (16 dBm) ERP, then SBE would agree these power levels could rightfully be characterized as "Part 15."
2. Base stations and CPEs with ERPs of up to 36 dBm would inevitably cause interference to both Part 73 TV broadcast stations and to Part 74 Broadcast Auxiliary (BAS) stations. SBE knows all too well from experience regarding unlicensed, Part 15, 2,400–2,483.5 MHz spread spectrum "wi-fi" devices that it wouldn't be long before such base stations start showing up at high-elevation sites, with line-of-sight to large metro areas.<sup>1</sup> Indeed, the IEEE 802 comments, at Paragraph 10, openly talk about not just wide area networks (WANs) on "unused" TV channels, but *regional* area networks (RANs).

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<sup>1</sup> See the May 3, 2004, SBE comments to the ET Docket 03-108 rulemaking ("Cognitive" or "smart" radios). See also the June 1, 2004, SBE reply comments to this rulemaking.

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3. Although IEEE 802 correctly acknowledges that Part 15 devices must not cause interference to, and must accept interference from, licensed services<sup>2</sup>, SBE is unconvinced that an entrepreneur which had invested tens or hundred of thousands of dollars in a system of base stations and CPE devices would simply shut down the system upon being informed that interference is being caused to a licensed TV service (including BAS). Instead, SBE fears that the operator of such systems would find all sorts of excuses to delay shutting off their bottom-of-the-RF-food chain system. Further, the requirement, in Section 15.5(c) of the FCC rules, that the interference notification come from an FCC representative, as opposed to a representative of a licensed station receiving interference, raises serious practicality issues, given the limited number of FCC Enforcement Bureau offices and staff.

4. And, for Part 74 Subpart H Low Power Auxiliary applications, such as wireless microphones, widely used by electronic news gathering (ENG) crews, virtually any time delay in shutting down an in-the-way Part 15 system operating on a supposedly unused TV channel would be unacceptable. Although the IEEE 802 comments discuss a "beacon" system, where licensed, Part 74 wireless microphones would transmit a Part 15 "shutdown" signal on an unspecified separate frequency, to let a Part 15 system know that a higher priority, licensed station needed to use a particular frequency, this would require Part 74 licensees to install new hardware to transmit the "no Part 15" beacon, a cost which BAS licensees should not be required to bear. Further, SBE is not convinced that it would be practical to enforce such a provision for Part 15 devices imported into the United States, as there would be a powerful incentive for the operators of such Part 15 systems to disable the beacon lock-out system. SBE views the proposed Part 15 "don't transmit" beacon system as "UUIC": Unrealistic, Unenforceable, and Impractical.

5. Then there is the issue of just what a "high power" Part 15 base station would have to protect. Putting aside for the moment the problem of licensed stations that might not be in a Part 15 system's current database, because of modifications to fixed stations since the Part 15 system

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<sup>2</sup> Section 15.5(a) of the FCC's Part 15 rules requires that "persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognized right to continued use of any given frequency by virtue of prior registration or certification of equipment."

Section 15.5(b) of the FCC rules states "Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station."

Section 15.5(c) of the FCC rules states "The operator of a radio frequency device shall be required to cease operating the device upon notification of a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected."

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owner did its frequency coordination study, IEEE 802 seems to be under the impression that a Part 15 system would have no obligation to protect the signal of a licensed station outside of its protected contour. This is incorrect. A Part 15 device has an absolute obligation not to cause interference to a licensed service. If a useable TV or DTV signal is being received at a given location, and if that reception is interfered with by a Part 15 device, even just a little, then the Part 15 device must give way.

6. A good example of this concept can be found in Section 74.703(b) of the FCC Rules, which requires that if a LPTV or TV translator station causes *actual interference* to the direct reception of a co-channel or adjacent-channel full-service TV or DTV signal, then the LPTV/translator station must resolve the interference, or reduce power, or find another channel, or go dark. Section 74.703(b) further states that

Interference will be considered will be considered to occur whenever reception of a regularly used signal is impaired by the signals radiated by the low power TV, TV translator, or TV booster station, regardless of the quality of the reception or the strength of the signal so used.

Thus, the FCC rules are clear that a secondary LPTV/TV translator station, even one that passed muster on a no-contour-overlap basis, or an OET-69 basis, and was thus granted a construction permit (CP), may not cause actual interference to the reception of a primary, higher priority TV or DTV station. It does not matter whether the interference is inside or outside of the primary station's protected contour. Or, in other words, a secondary LPTV/TV translator station is subject to two limitations: First, there must be no predicted interference, otherwise a CP will not be granted in the first place. Second, once the secondary LPTV/TV translator station is constructed, if actual interference to the reception of a higher priority TV or DTV station is caused, then the secondary LPTV/TV translator licensee must fix the problem, or find another channel, or go dark. That is what "secondary" means.

7. Contrast this to Part 15 operation, which is secondary to all licensed services, including secondary LPTV/TV translators and Part 74 Low Power Auxiliary stations. In effect, Part 15 operation is a "tertiary" service, although this reality is often lost on both Part 15 manufacturers, distributors, and end users. All too often the public expects that as unlicensed services become more pervasive and depended on, users of those devices feel an entitlement toward protection from interference where it does not exist. It would turn the concept of no-interference-to-licensed-services on its head if a Part 15 user were allowed to claim that it had no obligation to

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protect the direct reception of a TV or DTV signal, because the interfering contour of the Part 15 base station did not overlap the protected contour of a licensed station.

8. Even the FCC's own web site seems confused on this issue. On the "FCC History Project" page, at <http://www.fcc.gov/omd/history/>, the claim is made that "FCC equipment authorization rules protect you when:

- Your child plays with a radio-controlled airplane
- Your teenager upstairs sends their homework assignment to the printer downstairs via your new wireless home network
- You push the button on your garage door opener
- You lock your car with your remote entry system
- You activate your home alarm system before going to bed"

Yet all of these uses appear to be Part 15 applications. Unprotected, bottom-of-the-RF-food-chain Part 15 devices, have no entitlement to protection against interference from licensed stations, have no protection against interference from other Part 15 devices, and have no protection against interference from Industrial, Scientific or Medical (ISM) devices.

9. It is well known that coverage contours derived from the Commission's F(50,50) and F(50,90) curves are no more than an estimate, convenient for administrative purposes; only in the flattest of terrain will a station's actual coverage and its F(50,50) or F(50,90) protected contour coincide. Indeed, this reality is recognized in Section 73.683(a) of the FCC rules, which states

Under actual conditions, the true coverage may vary greatly from these estimates because the terrain over any specific path is expected to be different from the average terrain on which the field charts were based.

And, just so there can be no misunderstanding, Section 73.683(b) of the FCC rules goes on to state

It should be realized the F(50,50) curves when used for Channels 14-69 are not based on measured data at distances beyond about 48.3 kilometers (30 miles). Theory would indicate that the field strengths for Channels 14-69 should decrease more rapidly with distance beyond the horizon than for Channels 2-6, and modifications of the curves for Channels 14-69 may be expected as a result of measurements to be made at a later date. For these

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reasons, the curves should be used with appreciation of their limitations in estimating levels of field strength.

10. While at UHF the F(50,50) and F(50,90) curves tend to over predict coverage, because they ignore terrain more than 16 km from the transmitter, even though they can be used at up to 18 times that distance<sup>3</sup>, this is not always the case. For example, it is well known that the UHF TV stations serving the California Central Valley communities of Bakersfield and Fresno have coverages up and down the California Central Valley that are almost double the distances predicted by the FCC F(50,50) and F(50,90) curves, as shown by the attached Figures 1 and 2. This is primarily because those stations have transmitting sites atop tall mountains, and the height above average terrain (HAAT) on radials shooting up or down the California Central Valley are much higher than the 8-radial HAAT, on which the station's allowable ERP is based.

11. Thus, for IEEE 802 to suggest that a Part 15 base station whose F(50,10) interfering contour clears the F(50,50) protected contour of a TV station, or the F(50,90) protected contour of a DTV station, would have no obligation to resolve instances of actual interference to viewers outside of a station's protected contour, is alarming to SBE. Such actual reception may be due to unusually favorable HAAT toward the viewer, or due to the use of a receiving antenna mounted on a tall tower or a nearby hill, using a high-gain receiving antenna with a mast-mounted preamplifier to overcome the long download cable loss. Such techniques are routinely employed at cable television headends, and sometimes by individual viewers. To suggest that reception in such cases need not be protected by a Part 15 device demonstrates to SBE a fundamental misunderstanding about the nature of Part 15 operation.

### **II. Comments of New America Foundation**

12. Even more misguided are the comments of New America Foundation (NAF). NAF would have the Commission permit high power Part 15 operation willy-nilly on all TV channels, including TV Channels 2–4, TV Channels 52–69, and have no restrictions in border areas. NAF misidentifies licensed, Part 74 Subpart H Low Power Auxiliary wireless microphones as "unlicensed devices," and cavalierly dismisses the threat of interference by Part 15 devices to these Broadcast Auxiliary Service (BAS) stations. NAF characterizes the priority of expanded Part 15 operations as co-equal with licensed LPTV stations. In short, the NAF comments in favor of wildly expanded Part 15 operation with virtually no technical controls show a breathtaking lack of engineering reality or common sense.

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<sup>3</sup> The F(50,50) and F(50,90) curves go out to 300 km, or more than 18 times further than the 16-km terrain extraction distance.

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### **III. Comments of NAB/MSTV**

13. SBE agrees with the joint comments of the National Association of Broadcasters (NAB) and the Association for Maximum Service Television (MSTV) that a) mobile higher-power Part 15 devices on "un-used" TV channels should never be allowed and b) that if higher-power fixed Part 15 devices are nevertheless to be allowed, then deployment not occur until after the end of the DTV transition. This is because, and as noted by both SBE and MSTV/NAB in their initial comments, of the "all or nothing" nature of DTV reception. To allow the marketing and distribution of higher power Part 15 devices that could transmit on "unused" TV channels would be the equivalent of sowing land mines on the DTV superhighway. SBE implores the Commission not to make this mistake. If a higher-power Part 15 device is capable of mobile, portable or itinerant operation, and does not require "handshaking" with a fixed Part 15 base station, then there is no practical way to enforce restrictions of how or where the device will be operated by the end user, who is often non-technically savvy user. Put another way, an over-the-counter Part 15 device can end up at any location, with any polarization, and at any height.

### **IV. Summary**

14. SBE urges the Commission to heed the warnings of the Consumer Electronics Association (CEA), the Community Broadcasters Association (CBA), Cox, Entravision Holdings, NAB/MSTV, the National Translator Association (NTA), Shure Incorporated, Qualcomm Incorporated, and, of course, SBE, to proceed very carefully. This rulemaking is toying with Pandora's Box. The Commission must avoid creating yet another "Part 15 disaster," such as occurred between Part 15 medical telemetry devices and newcomer DTV stations, and which continues to occur between 2,400–2,483.5 MHz Part 15 IEEE 802x "wi-fi" devices and licensed TV BAS operations on Channels A8 (2,450–2,467 MHz) and A9 (2,467–2,483.5 MHz). Indeed, SBE has seen recent reports<sup>4</sup> of interference to Part 15 garage door openers by a new 390 MHz communications system now being deployed at military bases throughout the United States. SBE estimates that 99.99% of the users of radio controlled garage door openers didn't have a clue that they had purchased a system that relied on a bottom-of-the-RF-food chain Part 15 use, and that they have no recourse if an authorized user causes their tertiary Part 15 device to quit working.

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<sup>4</sup> See, for example, the December 6, 2004, CNN story "Military Signals May Jam Garage-Door Openers," at <http://www.cnn.com/2004/TECH/12/06/garagewars.ap/>.

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**List of Figures**

15. The following figures or exhibits have been prepared as a part of these ET Docket 04-186 reply comments:

1. Map showing FCC contours plus terrain-sensitive coverage of a Bakersfield, California, UHF TV station
2. Map showing the FCC contours plus terrain-sensitive coverage of a Fresno, California, UHF DTV station.

Respectfully submitted,

Society of Broadcast Engineers, Inc.

/s/ Ray Benedict, CPBE  
SBE President

/s/ Dane E. Erickson, P.E., CSRTE  
Chairman, SBE FCC Liaison Committee

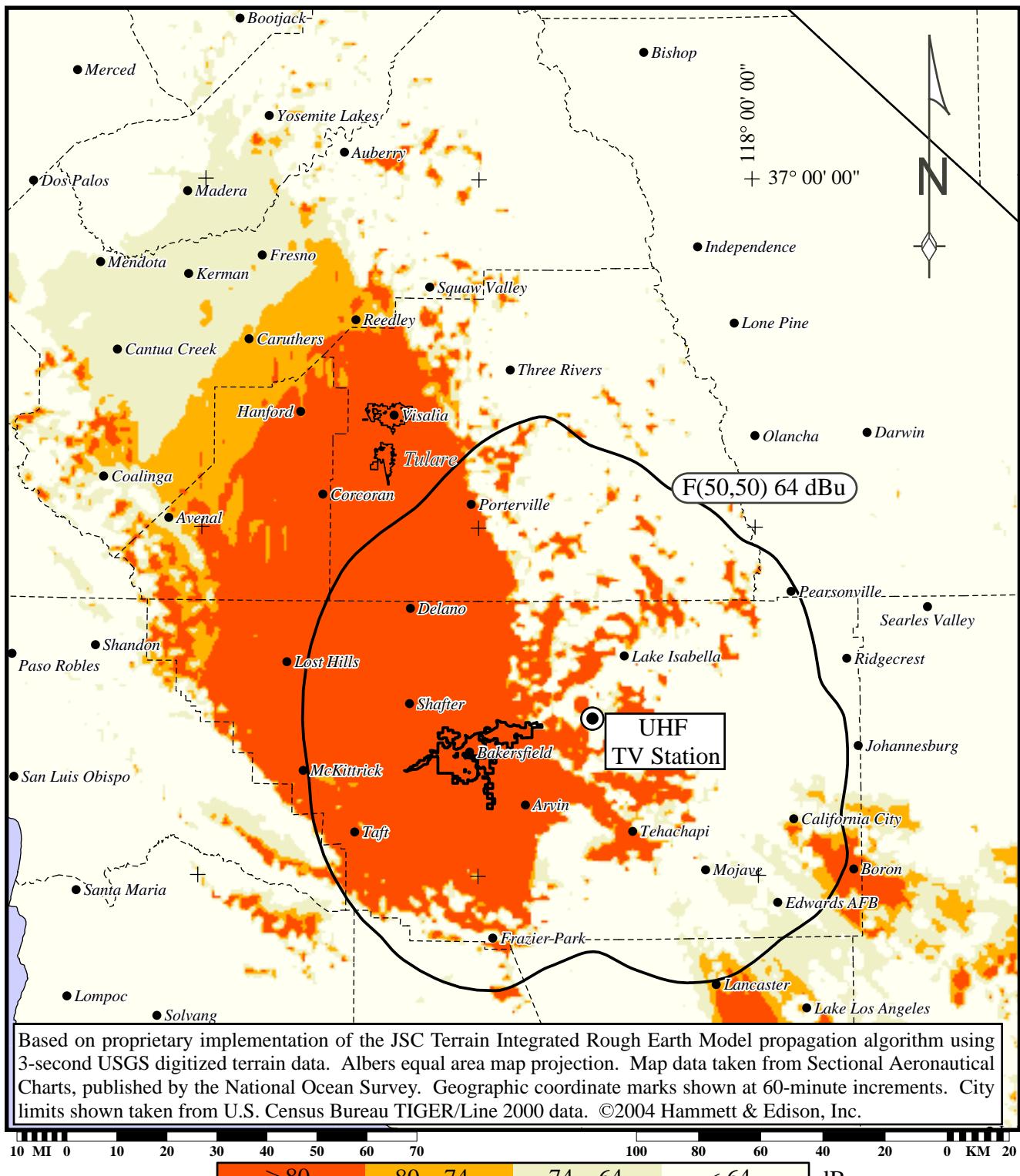
/s/ Christopher D. Imlay, Esq.  
General Counsel

January 31, 2005

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**FCC Contours Plus Terrain-Sensitive Coverage  
for a 1,700 kW ERP (DA) TV Station Licensed to Bakersfield, California  
C.O.R. = 2,352 m AMSL, 1,137 m HAAT**



**SBE**

**SOCIETY OF BROADCAST ENGINEERS, INC.**  
Indianapolis, Indiana

041211  
Figure 1A

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**About This Type of Map (TIREM)**

The coverage of a TV station is greatly affected by the nature of the terrain in which the station is located. In flat or gently rolling country, coverage extends approximately the same distance in all directions and is controlled mainly by the power radiated and the height of the transmitting antenna. In such smooth terrain, the simple method of predicting coverage used by the FCC for over forty years provides useful and reasonably accurate maps of coverage. However, for stations located in rough terrain, the FCC-style maps fail to provide a meaningful measure of TV coverage.

To prepare coverage maps that realistically predict coverage, Hammett & Edison, Inc. developed a complete system to determine and show the actual effects of terrain on coverage. This system uses the sophisticated propagation algorithm called the Terrain Integrated Rough Earth Model (TIREM), developed at the Joint Spectrum Center (JSC, formerly ECAC) in Annapolis, Maryland. TIREM uses detailed terrain profiles to compute values of basic transmission loss from point to point. The model evaluates the profile between two sites and, based on the geometry of the profile, selects automatically the most probable mode of propagation from various knife-edge models, a rough-earth diffraction model, and line-of-sight models. When combined with the United States Geological Survey (USGS) 3-second terrain database, as we have done, the TIREM model is the most accurate available means of predicting signal strength when details of terrain along the propagation path are known.

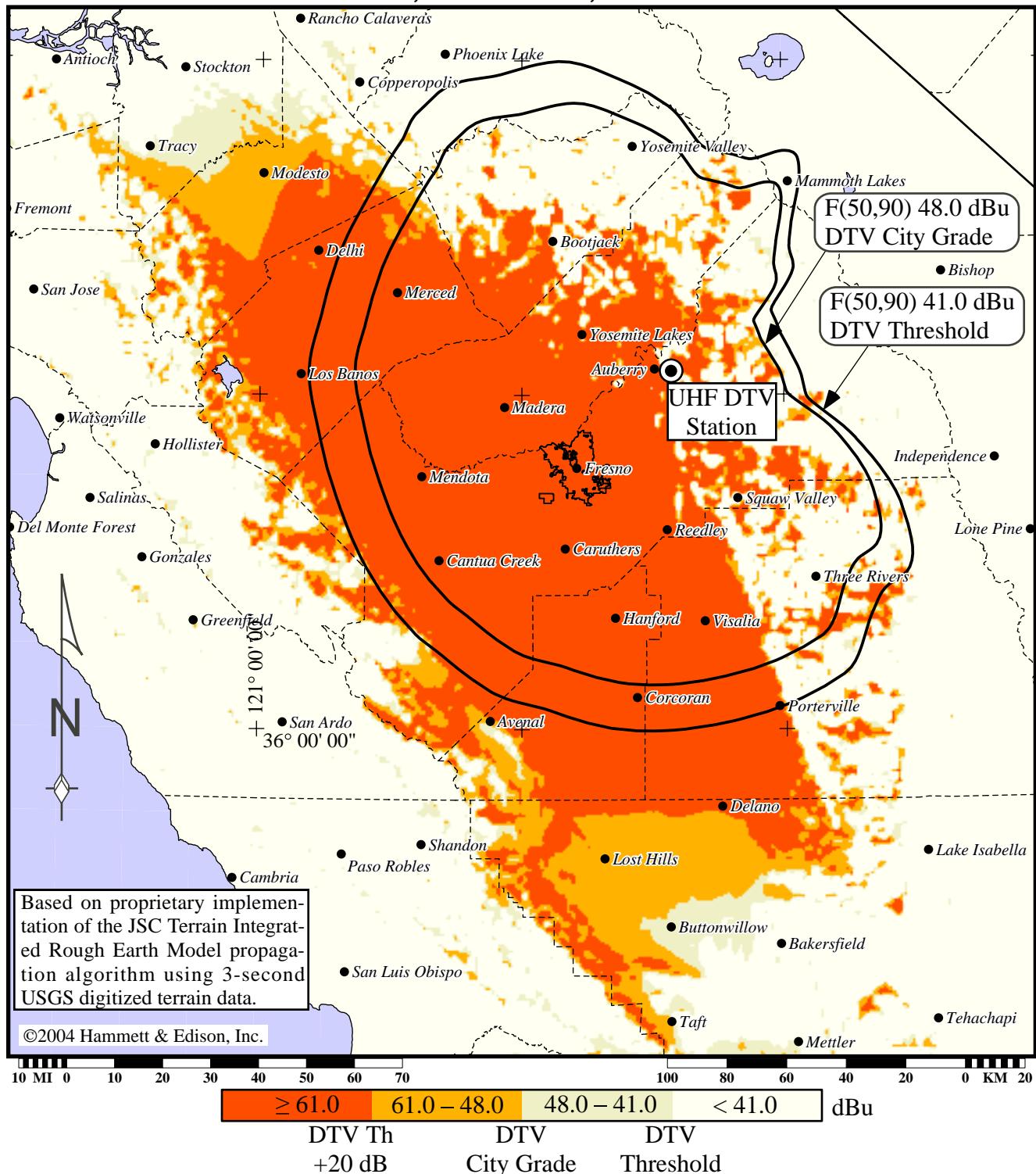
This map presentation, first copyrighted by Hammett & Edison in 1989, shows, in addition to the coverage, the locations of population centers taken directly from the 1990 Census of the United States. Each dot on the map is located at the center of each Census Block; the size of each dot is proportional to the number of persons in that Block. The concentrations of population in cities are quite apparent and in some cases even the street patterns of the cities can be discerned.

The contours shown on the attached map should not be considered as City Grade, Grade A, or Grade B service contours or as protected contours, because those are defined by the FCC Rules and apply only to maps prepared in accordance with the FCC's F(50,50) and F(50,10) curves. The contours shown here are of the specified field intensity, which may be the same as the service or protected contours. Shading is applied to the map to make it easy to understand. Such maps are powerful engineering tools used in the initial design or in the improvement of a broadcast facility.



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**FCC Contours Plus Terrain-Sensitive Coverage for a  
326 kW ERP (DA) UHF DTV Station Licensed to Fresno, California  
C.O.R. = 1,427.4 m AMSL, 601.1 m HAAT**



Albers equal area map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 60-minute increments. City limits shown taken from U.S. Census Bureau TIGER/Line 2000 data.



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Figure 2