

**LAND USE REGULATORY OPTIONS AND
STRATEGIES FOR TELECOMMUNICATION
TOWERS, ANTENNAS, AND RELATED
TELECOMMUNICATIONS EQUIPMENT**



**PREPARED FOR
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TABLE OF CONTENTS

GLOSSARY OF TERMS.....	1
INTRODUCTION.....	2
EXECUTIVE SUMMARY	3
REGULATORY AUTHORITY	4
REGULATORY AUTHORITY BY TYPE OF FACILITY.....	4
<i>Amateur (Ham) Radio Towers and Equipment.....</i>	<i>4</i>
<i>TV and Radio Broadcast Towers.....</i>	<i>5</i>
<i>Wireless Services: Cellular Towers, Monopoles, and Equipment (CMRS).....</i>	<i>6</i>
<i>Emergency Communications Equipment</i>	<i>7</i>
<i>Satellite Dishes and Television Reception Antennas</i>	<i>7</i>
MORATORIA.....	8
COLORADO PUBLIC UTILITIES COMMISSION JURISDICTION.....	9
FAA REGULATIONS.....	10
BEST REGULATORY PRACTICES AND INITIAL REVIEW OF LARIMER COUNTY REGULATIONS.....	11
INTRODUCTION	11
CASE STUDIES.....	11
<i>Jefferson County, Colorado.....</i>	<i>11</i>
<i>Montgomery County, Maryland</i>	<i>12</i>
<i>Clark County (Las Vegas), Nevada.....</i>	<i>13</i>
TECHNICAL ISSUES AND SITE PLANNING CONSIDERATIONS	14
<i>Inventories and Forecasting.....</i>	<i>14</i>
<i>Technical Review of Applications</i>	<i>15</i>
BEST REGULATORY PRACTICES.....	17
LARIMER COUNTY REVIEW.....	18
LOOKING TO THE FUTURE – POTENTIAL IMPACTS OF TECHNOLOGICAL TRENDS	20
DIGITAL TELEVISION.....	20
DIGITAL AUDIO RADIO SATELLITE	20
LOW-POWER FM AND TV.....	21
CONCLUSION	21
CONTACTS	22

GLOSSARY OF TERMS

The following glossary is provided to clarify the meaning of legal and technical terms frequently used in this report.

CMRS. Commercial Mobile Radio Service. A generic term used to refer to various forms of wireless telephone service, typically with ground-based stations. CMRS includes cellular phones, PCS, and point-to-point (i.e., Nextel) wireless facilities.

Co-location. Placement of two or more transmitters, antennas, or other form of telecommunication device on a common support structure. Co-location is technically feasible for most telecommunications equipment and is a strategy for minimizing the number of towers, poles, and monopoles necessary to build the communications infrastructure. For “wireline,” e.g., traditional phone service by wire, the Public Utilities Commission has the authority to compel co-location. In the context of wireless communication and other towers and antenna, access to existing facilities is either privately negotiated or established through a local government program.

Digital television. Over-the-air broadcast of digitally encoded television signals. Digital television uses narrower bandwidth than existing analog signals. The Federal Communications Commission is recapturing a portion of the radio frequency (RF) spectrum by requiring conversion to digital broadcasts. Closely related to high-definition television (HDTV), a large screen format capable of receiving digital signals. (See HDTV definition below.)

FCC. Federal Communications Commission. The federal agency charged with regulatory oversight and policy-making related to electronic media. The Communications Act of 1934 created the FCC.

GIS. A geographic information system, combining database and mapping functions. In the telecommunications context, a GIS provides several useful analyses, such as the location of possible sources of interference, other towers, and possible co-location sites on non-tower tall structures.

HDTV. High-definition television. A broadcasting standard for television intended to improve picture quality to something “approaching that of 35 mm film,” according to the Federal Communications Commission (FCC). HDTV was originally developed in competing digital and analog formats. The FCC determined that HDTV would be a digital format in 1993.

RF. Radio frequency, a range of the electromagnetic spectrum used to send communications signals. The telecommunications industry uses this term in numerous contexts. For example, an “RF device” is an electronic device used to send or receive some form of radio signal. Also used in this report, RF mapping is a geographic analysis of sources of radio signals. RF mapping may be used, for example, to calculate potential interference between nearby transmitters, or it may be used to demonstrate gaps in a wireless service area.

TCA. The Telecommunications Act of 1996. The Telecommunications Act of 1996 was the first major statutory overhaul of federal telecommunications policy since 1934. The TCA contained numerous provisions preempting local authority to regulate wireless towers, as well as other types of telecommunications devices.

INTRODUCTION

This assignment is the result of Larimer County's desire to identify regulatory, technical, and other practical issues related to the control of towers and telecommunications equipment by a county government in Colorado. Larimer County has witnessed recent activity related to a variety of towers, including various wireless services and a large broadcast tower, and is seeking guidance regarding the policy choices available for land use regulations affecting telecommunications towers.

In a preliminary conference call, Clarion Associates and Larimer County planning staff refined a scope of work for this project. Our mutual goal is to provide an overview of the options available to Larimer County as it prepares to develop new policies related to telecommunication and tower regulation.

Three primary areas are covered by this report: (1) county regulatory authority over telecommunications land uses, by type of facility; (2) best regulatory practices, based on case studies; and (3) technological trends that may affect regulation. In this document, we describe the results of research into telecommunications-related regulation, FCC decision-making, and representative regulations from other jurisdictions. Production of this report also involved conversations with officials from other county governments, the Colorado Public Utilities Commission, and the Federal Communications Commission.

EXECUTIVE SUMMARY

Telecommunication facilities frequently require some form of antenna, tower, or transmitter. These facilities are routinely subject to the broad authority of local land use regulation. However, the overlapping authority of other government agencies, particular preemption by federal regulations, requires local governments to closely coordinate local land use regulations regarding telecommunications equipment with applicable federal rules. In general, the extent to which local government authority is preempted depends on the type of telecommunications equipment. In Colorado, a county has relatively broad power to regulate amateur radio and over-the-air broadcast towers. In contrast, towers for wireless services, such as cellular telephone and personal communications services (PCS), are subject to a greater amount of regulatory constraint under federal laws.

However, despite partial federal preemption, many local jurisdictions appropriately regulate tower location, tower height, and design, including tower color, lighting, and screening of base facilities. On the other hand, some types of regulation, such as signal strength and electromagnetic radiation levels, are completely preempted by state or federal regulations.

County governments across Colorado and the nation vary in their approach to tower regulation. Some counties take a simple, straightforward approach by applying standard zoning controls regarding height and site planning to telecommunications towers. However, a growing number of jurisdictions have developed either specialized regulations and processes or specialized policy documents to address unique issues related to tower location and appearance. Efforts in these other jurisdictions have been focused on issues such as co-location, aesthetic impacts, and restrictions on speculative siting. While building an inventory of existing tall structures can be useful for county regulators, counties surveyed indicated they did not regard forecasting future demand for tower sites as a useful, much less accurate, exercise.

Two best regulatory practices stand out from the case studies for this report: First, localities should develop an overall “philosophy” as to where telecommunications equipment should be located. Second, they should create a process that encourages the telecommunications industry to work with regulators and other necessary entities to achieve the desired result.

Technological advancements in the telecommunications field have occurred rapidly and with some lack of predictability. In the future, digital television, satellite radio, and low-power broadcasting may all have an effect on the demand for local telecommunications sites, although in the short-term need will probably be weak. However, regulations written with the purpose of broadly protecting local planning interests will continue to be responsive to the emerging variety of telecommunications facilities, and no special regulatory treatment is warranted at this point.

REGULATORY AUTHORITY

REGULATORY AUTHORITY BY TYPE OF FACILITY

A county government in Colorado generally has broad authority under state zoning enabling legislation (C.R.S. §§ 29-20-101, *et seq.*) to regulate telecommunications facilities as it would any other land use. However, federal regulations (typically administered by the FCC) supplant or modify local authority in several areas, resulting in residual authority at the local government level that depends on the type of equipment. For example, amateur (ham) radio towers and TV broadcast towers are both the subject of rather mild FCC regulations, but wireless facilities fall under the more restrictive preemptive provisions of the Telecommunications Act of 1996 (TCA). Thus, local government has only limited powers over wireless facilities and more leeway to regulate broadcast towers. This memo describes the unique considerations for various types of “tower” and communications equipment that may be encountered in a regulatory context. The basic categories of such equipment, each treated in turn below, are:

- Amateur (ham) radio towers and equipment
- TV and radio broadcast towers
- Cellular towers, monopoles, and equipment (CMRS)
- Emergency communications equipment
- Satellite dishes and television reception antennas

Amateur (Ham) Radio Towers and Equipment

Ham radio is a common hobby in jurisdictions across the United States. The basic equipment for a ham operator consists of a tuner and listening equipment within a building and a relatively short (most substantially under 100 feet) lattice tower with a transmitter at the top. At the upper height limit of ham radio towers, supporting cables may be required for stability. However, many ham radio towers are self-supporting and land use regulation, as demonstrated by the majority of litigated cases involving ham radio towers, focuses almost exclusively on the height of structure (especially in residential zoning districts).

The FCC does license ham operators, but land use-related regulations are very limited at the federal level. First, the TCA does not apply to amateur towers. Because ham radio towers are not covered by the TCA, local governments are generally at liberty to process applications involving amateur radio towers as they would any other land use case (as opposed to the special procedural concerns raised by TCA Section 704, described below). Nevertheless, a few federal regulations must be taken into account in local amateur radio cases. Local governments should note that the PRB-1 regulation, promulgated by the FCC in 1985, states that “local regulation [of amateur radio towers]... must constitute the minimum practicable regulation necessary to accomplish the... local authority’s legitimate purpose.” One effect of FCC regulations, common to many other types of telecommunications equipment, is that local governments are not permitted to establish regulations that are intended to prohibit amateur radio towers. (See *Thernes v. Lakeside Park*, 773 F.2d 1187, 1188 (6th Cir. 1986).) PRB-1 is regularly revised under FCC rulemaking authority. Recent case law has also implied that FCC regulations prevent a local government from denying an amateur ham radio tower based on the type of transmission (personal versus commercial) rather than a physical land use consideration. In a recent California case, the court ruled that a ham radio antenna reviewed and permitted for personal use may be changed to a commercial use if no physical feature

of the radio facility is changed, only the type of transmission. (*City of Rancho Palos Verdes v. Abrams*, 124 Cal.Rptr.2d 80 (Cal. App. 2002).)

These limited federal regulations have not hampered Colorado counties in enacting and defending land use ordinances directed at ham radio towers. Boulder County ordinances establish height limitations and require a special permit process for amateur towers in most zoning districts. In 1993, a federal court upheld the county's ordinance in a challenge based on the PRB-1 regulation. (*D.R. Evans v. Board of County Comm'rs*, 994 F.2d 755 (10th Cir. 1993).) Boulder County's approach is typical: Amateur radio towers are classified as an accessory use (i.e., a "Non-Commercial Telecommunications Site" in Boulder County) and subject to height limitations identified for each standard zoning district.

In residential districts particularly, a local government may consider treating amateur radio as a special use. Using a discretionary permit process has the advantage of allowing contextual standards to be applied, instead of one-size-fits all height restrictions that may be variously over-inclusive and under-inclusive in different situations. In any case, clear definitions relating to this use are essential. In other words, the ordinance should expressly state that ham radio towers are an accessory use, or a special use, as the case may be. The definition of the use should specify whether or not an amateur radio facility includes supporting foundations, guy wires, and other structural equipment.

TV and Radio Broadcast Towers

Television and radio broadcast equipment is a familiar icon in some settings. In many smaller cities, the latticework of a broadcast tower is the tallest object on the horizon. In some larger U.S. cities, the function of the masts that perch atop the tallest buildings is to house broadcast equipment. In Denver, the mountain backdrop has a large concentration of broadcast towers on one of the nearest foothills to the city, Lookout Mountain. Though it is the aesthetic impact of a broadcast tower's height and scale that are most frequently the subject of public concern, broadcast towers are also regulated by local governments on the basis of lighting impacts, color, and potential hazards in the event of a collapse.

Broadcast towers are not regulated by the Telecommunications Act of 1996, and despite repeated attempts by industry proponents, the FCC has never asserted any sort of control over siting or other fundamental land use attributes (e.g., zoning, height limitations) of local government decisions regarding broadcast towers. Based on Section 704 of the Telecommunication Act (47 U.S.C. § 332(c)(7)(C)(i)), the FCC specifically rejected a claim that state and local government restrictions on the siting of broadcast facilities should be preempted. The FCC found that the language of the TCA was specifically limited to "personal wireless services" and that there was insufficient evidence to warrant any further preemption of local authorities. In addition, claims that the FCC has implied authority to regulate broadcast towers have been struck down by the Federal Court of Appeals for the 10th Circuit, which upheld appropriate height restrictions, finding they were not preempted by FCC regulations.

Thus, local governments in Colorado have broad authority to enact regulations to control the location and character of broadcast facilities. The most prominent example is Jefferson County, the location of Lookout Mountain. Jefferson County's regulations are described in greater detail in the case studies below. Overland Park, Kansas (a suburb of Kansas City), is another noteworthy example of a municipality with regulations specifically addressing broadcast towers: Overland Park sets a maximum height in most districts for all communication towers, including TV and radio

broadcast towers; a special use permit process is established that requires a plan, technical report on tower equipment, and a siting study analyzing all potential host sites (including their availability as an alternate location) within a half-mile radius of a proposed tower or antenna.

Unlike amateur (ham) radio towers, local government rarely classifies broadcast equipment as an accessory use. As a primary use, broadcast towers are typically limited to a few zoning districts specifically intended for industrial and other large-scale equipment. There have been some attempts by opponents of towers to claim they are a nuisance per se, but, due to the special attention paid to selecting appropriate zoning districts for these facilities, courts have not been receptive to such nuisance claims.

For regulatory purposes, the authority to review and control broadcast towers discussed in this section includes the authority to regulate digital and high definition television towers and low power broadcast towers, as further discussed in the Technological Trends section of this report.

Wireless Services: Cellular Towers, Monopoles, and Equipment (CMRS)

Wireless service is a broad category of communications services that includes several subcategories. As defined by Montgomery County, Maryland (a large urban county just outside Washington, D.C.), wireless services consist of cellular services and broadband personal communications services (PCS), wireless point-to-point and point-multipoint services, common carrier microwave, paging, and narrowband PCS. Though each of these subcategories is associated with different ground-based equipment, the authority to regulate the land use impacts of wireless services, such as towers, poles, and antennas for any of these types of equipment is essentially equivalent.

Wireless tower location and design controls are the subject of extensive preemption by TCA Section 704. While local permit review is specifically allowed by the statute, TCA provisions prohibit certain types of actions. Specifically, a local government cannot:

- Unreasonably discriminate among service providers;
- Expressly prohibit wireless facilities or have the effect of prohibiting wireless services; or
- Regulate on the basis of electromagnetic radiation that complies with FCC regulations.

The TCA also imposes procedural requirements on local jurisdictions hearing cases involving wireless services, most importantly that denials must be based on written record supported by “substantial evidence” and also that decisions must be made within a reasonable period of time.

FCC regulations under the Telecommunications Act are frequently a major concern, but a vast number of local jurisdictions have adopted regulations intended to preserve local planning authority over wireless facilities while also complying with federal law. Larimer County’s CMRS (commercial mobile radio services) ordinance is one such example of a local zoning ordinance intended to coexist with federal regulations. Larimer County’s ordinance contains an assortment of features held valid by courts examining local ordinances for wireless facilities, including co-location preferences, special restrictions for historical resources, paint regulations, and integration with on-site screening.

Though a majority of jurisdictions have adopted special ordinances to address wireless uses, it is also possible to regulate wireless services entirely within standard zoning districts and site plan or special use review. For example, under its “Utility and Public Service Use” category, Boulder County identifies a “Telecommunications Facility, new structure or not meeting height requirements” use. In most zone districts, this use is subject to special use review. Treating wireless equipment as an

accessory use has received mixed results in court challenges and should be considered only where accessory uses may independently receive zoning review.

Emergency Communications Equipment

Emergency communications equipment is assigned to special frequencies distinct from other categories of telecommunications equipment. Emergency communications equipment is therefore readily defined as any RF device or part of such device designed and authorized to operate in the part of the spectrum assigned to emergency services. In the field, emergency communications may be indistinguishable from equipment in other telecommunications categories. Jefferson County, for example, refers to emergency equipment in its provisions regarding low power mobile radio, a component of the overall CMRS regulations for the county.

Federal regulations generally support exemptions and special accommodations for facilities or regulations that are necessary for public safety. Under this rule, a jurisdiction that frequently encounters citizen opposition to monopoles and other wireless equipment may put up a police radio facility that looks substantially the same as a previously denied CMRS proposal without having to subject itself to the same level of scrutiny under federal (and possibly local) law. Boulder County provides an example of an ordinance that incorporates special categories for emergency equipment, having a special category (“Public Safety Telecommunication Facility”) and an expedited process (“Limited impact special use review”) for emergency communications equipment.

Satellite Dishes and Television Reception Antennas

Relative to other categories of telecommunication devices discussed in this memorandum, the scale and impact of satellite dishes and television reception devices is not, most would agree, in the same order of magnitude. Modern household satellite dishes are frequently smaller in area than six square feet, and television antenna, where they are still visible at all, are generally accepted as an accessory use for residences and most other types of uses. A brief discussion of these devices is included here to note that federal preemption is still an issue even at this smaller scale. This section will also be relevant to Larimer County’s current study of tower-related issues to the extent that the county may be seeking to develop a system of uniform regulations for lattice towers.

Section 207 of the Telecommunications Act prohibits “restrictions that impair a viewer’s ability to receive video programming through devices designed for over-the-air reception of television broadcast signals... or direct broadcast satellite services.” The statute goes on to describe three classes of satellite dish: small satellite dishes (less than one meter in diameter), large satellite dishes, and satellite dishes in commercial and industrial zones. For the second category, large satellite dishes, local governments have wide latitude to adopt standard zoning controls. However, in the other two categories, federal law controls most land use considerations, excepting safety issues and historic resources that require land use controls for small satellite dishes. Federal law also provides a safe harbor for satellite dishes of all sizes in commercial and industrial zones, where local land use regulations will only apply if the FCC grants a waiver to the local government.

Control of television reception antennas (as distinguished from satellite dishes) is subject to federal preemption under 47 CFR Section 1.4000. The essence of this rule is similar to Section 704 of the Telecommunications Act as it applies to wireless facilities: Local government regulations may not prevent, delay, or impair the availability of television reception. If public safety is at issue (the FCC cites an example of a regulation prohibiting the installation of an antenna in the path of a fire escape), local government regulation is permitted. Historic properties are also subject to an

exemption from the FCC regulation, presumably to prevent television antennas from interfering with the historic character of a property.

Few court cases interpret the effect of Section 207 on standard zoning provisions regarding television antennas. A typical ordinance might establish a maximum antenna height for a zoning district, or it might state that a television antenna will extend no more than five feet above the highest point on the roofline of a house. Both of these regulatory approaches to television antennas have been endorsed by pre-Telecommunications Act courts. (Current Larimer County policy does not establish height limitations for television antennas. Larimer County Land Use Code § 8.19.1: “The maximum height limitations of this Code do not apply to... appurtenances that are usually installed above roof level”.) Where height limitations are adopted for this category of telecommunications equipment, compliance with FCC regulations under Section 207 may be most easily attained by allowing hardship waivers to uniform height limitations or by adopting a performance standard reflecting the basic requirements of the FCC rule. Currently, the FCC regards uniform height restrictions on such devices as generally preempted, but the safety-related height restrictions found in the UBC (and IBC) as enforceable through local building codes as a safety measure. Unfortunately, any special review or discretionary process by local government may be regarded under Section 207 as an unreasonable delay.

In Colorado, satellite dishes and TV reception antennas have traditionally been regarded as an accessory use, with specific case law supporting this position. In many instance, local governments may control the height and appearance of satellite dishes and television antennas, so long as adequate accommodations of federal law (e.g., exemptions where necessary for reception) are provided in the local regulation. Local government authority has also survived some non-statutory First Amendment challenges, based on language in a U.S. Supreme Court decision citing “the First Amendment right to receive telecasts,” to local controls over dish and antenna placement and appearance. Such regulations as a front-yard setback have almost invariably been held to be a legal, content-neutral time, place, and manner regulation.

MORATORIA

If the legal authority to regulate is fundamental to telecommunications issues, for local governments without existing regulations on the subject, the ability to declare a pause in applications and take the time to plan appropriate regulations may be almost as important. A moratorium is the conventional tool for halting applications or development while new regulations are being developed.

Local governments may declare a moratorium on telecommunications applications (or a particular type of telecommunications application) for the purpose of reviewing a current set of land use regulations and diligently working toward the drafting of new regulations. In the case of telecommunication regulation, the explosion of the industry in the 1990’s caused many jurisdictions to impose temporary moratoria on new applications for telecom-related facilities. These moratoria have ranged from a few weeks to over a year. Generally, Colorado jurisdictions have the inherent power to suspend land use approvals when a moratorium would be appropriate. (*Williams v. City of Central*, 907 P.2d 701 (Colo. App. 1995); see also *Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency*, ___ U.S. ___ (2002) (No. 00-1167) (local government moratoria for planning purposes upheld by the U.S. Supreme Court).)

Where TCA Section 704 (47 U.S.C. § 332(c)(7)(B)(ii)) applies (e.g., wireless services), moratoria should not be used as a delaying tactic. Under Section 704, decisions must be rendered within a

“reasonable period of time.” The FCC’s position is generally that moratoria should not be of an undefined length but it has not preempted local authority with regulations that specifically interpret a “reasonable period of time” with respect to moratoria. In judicial proceedings, Section 704 has been invoked in a situation where a municipality has halted an application for a wireless tower through a series of three moratoria over the course of 15 months. Sequential moratoria and bad faith in processing land use cases generally produce unfavorable court results for local governments imposing moratoria. (See Foster, *An Analysis of Facility Siting Issues Under Section 704 of the Telecommunications Act of 1996*, 30 Urban Lawyer 729, 735 (Summer 1998).) However, even where Section 704 applies, temporary moratoria are generally a valid tool if used to revise regulations or undertake other associated planning activities. (*Sprint Spectrum L.P. v. City of Medina*, 924 F.Supp. 1036 (W.D. Wash. 1996) (upholding a six-month moratorium on telecommunications applications).)

COLORADO PUBLIC UTILITIES COMMISSION JURISDICTION

The Colorado Public Utilities Commission (PUC), an agency created by state statute to oversee the regulation of public utilities, has the ability to intervene in certain types of land use cases. For example, C.R.S. § 29-20-108 specifically authorizes the PUC to review and potentially reverse local government decisions regarding certain energy industry facilities. For this report, we investigated the PUC’s authority to intervene in county land use cases regarding telecommunications towers.

The Colorado PUC’s statutory authority extends to “public utilities,” as defined by C.R.S. § 40-1-103. This definition includes “every common carrier, ...telephone corporation, telegraph corporation, ...and every corporation, or person declared by law to be affected with a public interest.” As clarified by the PUC’s rules, the statutory definition of public utility encompasses “radio common carriers” and “telecommunications service providers.” (See 4 CCR 723-1-4(b)(5), (b)(15).) “Public interest” is the defining quality of a public utility according to Colorado case law interpreting the statutory definition of PUC jurisdiction. Though both broadcast and personal communications facilities have an element of “public interest,” based on the necessity of allocating a finite natural resource (radio frequency bandwidth) for maximum utility, PUC practices sharply distinguish between the two general types of facilities.

Wireless telephone services (e.g., CMRS, commercial mobile radio services) have been subject to PUC authority for many years. (See *Contact-Colorado Springs, Inc. v. Mobile Radio Tel. Serv., Inc.*, 551 P.2d 203 (Colo. 1976).) When interviewed for this report, a PUC official noted that the characteristics of a service subject to PUC regulation as a radio common carrier included association with a unique telephone number, access to local switching networks, and voice service. A sample of current PUC regulations concerning wireless telecommunications includes allocation schemes for telephone numbers, subscriber confidentiality, 911 handling requirements, and quality of service standards. Overall, siting and land use-type regulations are not the subject of current PUC wireless regulations, and the appeal of local land use decisions to the PUC is limited by both statute and the relevant rule (4 CCR 723-32) to cases involving a “power authority,” “electric utility,” or “natural gas utility.” On this topic, the interviewed PUC official did not recall any cases in which PUC authority was invoked to challenge a local government land use regulation or decision regarding a wireless facility, though he did note that PUC intervention might be possible where access to a tower, for co-location purposes, was in dispute. In sum, the general effect of PUC regulations and practices respecting wireless equipment appears not to be a barrier to county CMRS land use regulations and may in fact provide an avenue to bring private parties together to negotiate co-location agreements.

In the case of radio and TV facilities, despite federal statutes declaring a public interest component

of broadcast communications, the Colorado PUC asserts no authority over towers or broadcast equipment. (See 47 U.S.C. § 309(k).) The PUC official interviewed for this report noted that federal law is presumed to cover the regulatory field for all broadcast facilities in Colorado. However, it is possible that, similar to regulation of wireless services, the PUC retains the ability to exercise concurrent authority in this area. Nevertheless, at this time, the Colorado Public Utilities Commission has disclaimed any jurisdiction over broadcast telecommunications equipment. Under the heading of “Not Jurisdictional to the COPUC,” the PUC’s website states, “ the Federal Communications Commission (FCC) is charged with regulating interstate and international communications by radio, television, wire, satellite, and cable.” It is also noteworthy that case law in other jurisdictions indicates that privately owned broadcast towers and equipment may not meet the definition of a “public utility.” (*Trustees of Washington Township v. Davis*, 767 N.E.2d 261 (Ohio 2002) (an FCC-licensed radio station is not a public utility); see also *Pennsylvania Cellular Telephone Corp. v. Zoning Hearing Board of Buck Township*, 127 F.Supp.2d 635 (M.D. Penn. 2000) (applying a rule that “public utilities” are businesses required by law to, inter alia, serve all members of the public, file tariffs, and obtain permission from a regulatory body to discontinue service).)

FAA REGULATIONS

Regulations of the Federal Aviation Administration are automatically triggered by towers over 200 feet in height (14 C.F.R. Parts 77.13(a)(1), (c) (FAA notice is required for “any construction or alteration of more than 200 feet in height above the ground level at its site”). Due to the administrative complication of coordinating local and federal review and the undesirability of the paint and lights required by the FAA, some jurisdictions establish an administrative process for towers under 200 feet, creating an incentive for tower developers to keep towers below 200 feet if at all possible.

FAA regulations will also govern the painting scheme for any towers located in a runway approach zone.

BEST REGULATORY PRACTICES AND INITIAL REVIEW OF LARIMER COUNTY REGULATIONS

INTRODUCTION

As noted in Larimer County's initial scope for this project, the authority to control telecommunication towers as a land use sets the basic parameters for regulation, but it does not determine the final content of these regulations. Policy choices identified in this report will therefore provide important guidance for future telecommunications and tower regulation in the county.

With varying approaches possible within the regulatory framework described in the first section of this report, it is helpful to review telecommunications regulatory programs in other jurisdictions. The approaches taken in three representative counties are compared in case studies below. We then examine some other key technical issues and finally briefly review Larimer County's current regulatory scheme in light of this experience.

CASE STUDIES

Our research demonstrates that a variety of approaches to tower and communications equipment are not only possible, but also that every jurisdiction is likely to have a unique combination of concerns from which a solution will be tailored to the needs of the community. Following the lead of other communities, the regulatory solution in Larimer County should be based on the rate of development for communications facilities, local community concerns, including aesthetics and safety, and the administrative resources of the county staff. To assist Larimer County in assessing policy options, regulatory programs in other jurisdictions are summarized below in terms of advantages and disadvantages. From these examples, we then draw some conclusions regarding the best regulatory practices for Larimer County.

Jefferson County, Colorado

As noted earlier, most of the broadcast facilities in the Denver metropolitan area reside on Lookout Mountain, in Jefferson County's jurisdiction. Due to the abundance of broadcast equipment and conflicts with the developing residential areas on Lookout Mountain, Jefferson County felt the need to develop a telecommunications land use strategy well in advance of other jurisdictions in the state. A Telecommunications Land Use Plan was adopted by the Jefferson County Planning Commission in 1985 and is currently undergoing a phased amendment process to bring sections regarding emergency radio, wireless, and broadcast towers up-to-date.

Jefferson County relies largely on policy documents to define the standards for development of all forms of telecommunication facilities. The Jefferson County Telecommunications Land Use Plan is a component of the county's comprehensive plan, with regulatory policies defined for several areas of concern, including engineering and economic concerns, visual and noise impacts, interference with residential electronics, health issues, and tower siting and review. In addition, the county's comprehensive plan contains addenda for low-power mobile radio service (intended to cover all wireless service facilities) and site selection for telecommunications equipment.

Under Jefferson County's regulatory scheme, the planning commission must review, using the telecommunications land use plan, all new telecommunications facilities as a rezoning – typically to a

planned development district. The board of county commissioners, acting in a legislative capacity, has the final say. The county's zoning code provides no other guidance regarding telecommunications facilities other than that they may be permitted only in a planned development or agricultural zone district. This approach may be seen as a disadvantage, in that it is expensive and provides little guidance to applicants and has resulted in an often contentious public process. However, by the same token, the county's use of policy documents to announce its regulatory strategy may be an advantage in its ability to make virtually any decision on a telecommunications case very difficult to challenge.

The telecommunications land use plan component of the comprehensive plan itself devotes substantial space to introducing the problem and forecasting demand for new facilities. While an abundance of background information and data are appropriate to a comprehensive plan document, this material is of questionable value to another jurisdiction looking for regulatory solutions. Many of the policies in the latter part of the document were obviously drafted with broadcast towers in mind (e.g., discussing tower heights at which the FAA will assert jurisdiction) and could be easily codified into a zoning regulation. The details of the section regarding Visual and Noise Impacts could be particularly helpful to Larimer County as a template for broadcast tower height restrictions, screening, and locational requirements.

Montgomery County, Maryland

Montgomery County is a large urbanized county on the outskirts of Washington, D.C. The county also has significant agricultural areas that have been the focus of an ambitious protection program. Besieged by applications for special exception telecommunication uses in the middle of the 1990's telecommunications boom, the county declared a four-month moratorium and set out to devise a regulatory program that would meet community goals without the time and expense of public hearing for each case.

The county ultimately implemented a special telecommunications review process based, according to the current administrator, on two simple principles: First, use existing tall facilities, both telecommunications-related and non-telecommunication-related for commercial equipment. Maximizing the use of existing infrastructure is intended to make permitting and construction easier for applicants, as well as slowing the proliferation of towers. Second, manage the rest; in other words, provide for zoning regulations and other standards that will guide tower development toward desired areas and away from sensitive areas (e.g., agricultural zones).

Key features of the Montgomery County ordinance and its implementing regulations include:

- An advisory board (the Telecommunications Transmission Facility Coordinating Group) to assure stakeholder awareness encourage discussion of upcoming projects and potential co-location opportunities. This includes representatives from other government agencies, including the state and federal governments.
- Central routing through one county official, the "tower coordinator," of all telecommunications applications.
- Intensive use of a GIS database of all current and potential telecommunication sites. The county initially created an inventory of all tall structures in the county, including especially water and electrical transmission towers, to encourage co-location agreements to the greatest extent possible. (The water and electrical utilities are also represented on the advisory board.)

- Initially focus on developing master contracts with major property owners of potential existing tall sites for telecommunications equipment – again, the water and electric utilities.
- Basic engineering review of the RF map, to determine if a facility is needed in the proposed location.
- Consent agenda-level approval for most cases. Planning Commission review, recommendation, and hearing for certain special exception uses and locations on public sites.

Montgomery County considers its system highly successful. Cases that once took months are now routinely processed in a matter of days. Officials stated that they have never attempted to forecast demand but simply decided that a process could be developed that would consolidate facility locations to the maximum extent possible.

The county is, incidentally, in the process of splitting off broadcast equipment such as radio and television towers into its own regulatory section. This is motivated by some specific issues with Montgomery County’s agricultural preservation zone, where additional measures are needed to guide the location of broadcast towers.

Possible drawbacks to the Montgomery County approach include the cost of dedicated administrative staff to facilitate the program, start-up costs for a GIS or equivalent database, and relatively little opportunity for public comment.

Clark County (Las Vegas), Nevada

Clark County represents the straight and narrow zoning solution to telecommunication land use regulation. The county’s use table (at 30.44-1 of the Clark County code) lists, across all zoning districts, “communication towers and antennas” as a special use and provides for several required conditions, also listed in the use table. These conditions include conformity with FCC regulations and co-location if feasible. The county’s use table provides an expedited process for certain amateur radio towers and, according to a county official interviewed for this report, the special use does not apply where telecommunications equipment is “invisible.” If a tower or other telecommunication facility is visible, the special use conditions contain height limits, setbacks, contextual design standards, and limitations on lighting and signs. The use table also requires conditional use approval with additional conditions for certain larger communication antennas and towers. The county’s stand-alone “Communication Towers & Antennas Checklist,” clarifies situations in which no permit is needed (i.e., an antenna is not visible), an administrative review is available (i.e., location on public property), or special use review is required.

Clark County’s regulatory approach and submittal documents are extremely accessible and have many advantages from an administrative perspective. The county feels its regulatory program is successful because avoidance of a public hearing is a major incentive for telecommunications developers. In the five years since the adoption of the current zoning regulations regarding communications towers and antennas, 66 hearings have been held on telecommunications cases. In the year immediately preceding the adoption of these regulations, 36 cases were subjected to public hearings. In addition to administrative successes, potential conflicts with federal law are avoided through language directly in the county’s use table. The use table helps assure compliance with federal law, for example, by compelling approval of wireless communications uses if denial will have the effect of preventing service. However, Clark County regulations are homogenous across all zoning districts and are not tailored in terms of type of communications equipment, as described above. While the regulation requires an applicant to prove that co-location is not feasible if a new

tower is required, the Clark County solution may not provide adequate mechanisms to achieve the “cooperative land use” to which its co-location provisions aspire.

TECHNICAL ISSUES AND SITE PLANNING CONSIDERATIONS

Beyond the bare regulatory authority to control telecommunications land uses, local governments need to establish the rational basis of these regulations through technical review and policy objectives. Effective regulation of telecommunications will also account for the dynamic nature of the telecommunications market and the development of new equipment. Regulations must be broadly written to ensure that new technologies are brought into the regulatory framework from the time of their introduction. This section provides an overview of the technological considerations that may be used to develop a process and specific standards to review telecommunications applications in Larimer County.

Inventories and Forecasting

County staff has asked us to explore the issues of forecasting future demand and inventorying existing facilities. The case studies offer some insights on these issues. In 1985, Jefferson County produced the studies that supported its telecommunications land use plan. Many of the inventory and forecasting data these studies yielded are contained in the findings of the plan. For example, the plan states that “two new UHF television stations, one allocated to Boulder and one to Denver, have construction permits.” Jefferson County used FCC public records for licenses by market area and construction permits for these licensed facilities to predict short-term demand. Other forecasting methods were inexact, with demand “in the foreseeable future” for cellular equipment vastly underestimated (“33 to 35 new tower sites for the metro area”) and the demand for microwave relays overestimated. This study demonstrates the challenges of a local government forecasting demand for any particular type of telecommunications facility in a highly dynamic technological environment.

It is possible, and probably prudent, for telecommunications planners to search FCC databases for license and construction permit information. This practice is routinely undertaken by planners in Montgomery County. However, transferable broadcast licenses and construction permits do not necessarily equate to built facilities, especially given the fact that proliferation of cable and satellite dish service options (e.g., including email access) has raised questions from current FCC Director Powell regarding the future prospects of over-the-air broadcasting as a mass medium.

Currently, the outlook for new types of broadcast facilities, other than low power stations, is marginal. (See discussion of low-power broadcasts below.) The number of broadcast licenses available is limited, a fact emphasized by FCC’s current announcement that it is not accepting applications for new commercial AM or FM stations. Similarly, the FCC has halted applications for new TV stations until conversion to digital television is completed in 2006. Thus, the only potential for major broadcast tower construction in Larimer County in the near future is either (a) the relocation of a transmitter (e.g., Clear Channel’s move with KGIN) or (b) the consolidation or improvement of towers for existing licensees in the market area. A market study might reveal the likelihood of such a scenario occurring, and in so doing provide some indication of where a new tower is likely to be built. However, a much less expensive option is to simply monitor FCC permitting activities for the area.

Forecasting the demand for other telecommunications facilities, particularly CMRS-type facilities, is possible. In fact, RF mapping of existing facilities is routinely done for both federal and local

government review for the purpose of testing for interference. For wireless or other short-range transmissions, this type of mapping, correlated with transportation corridors and population centers, is very effective at predicting locations that will generate complaints of dropped service. This is also a technique used by speculative tower builders to develop proposals for new co-location facilities. (See discussion below for a description of this process.)

Technical Review of Applications

- ***Siting Criteria***

Whether or not a telecommunications firm is interested in co-location, one of the first pieces of information it is likely to gather before entering a market is the latitude and longitudinal coordinates of licensed transmitters already in the area. This information is available from the FCC on-line database (<http://www.fcc.gov/oet/info/database/fadb.html>). Typically an applicant for a telecommunications land use (excluding satellite dishes and television antennas, where no transmitter is involved) will have several “RF maps” at their disposal prior to committing to a site and formally applying for a land use approval. Many jurisdictions employ or hire on a contract basis an engineer who can make an initial determination from these maps if a proposed transmitter complies with FCC rules and if there is a need for a new tower or if there is an opportunity to co-locate the proposed transmitter at a functionally equivalent site in the vicinity.

As a general rule, wireless facilities are reviewed for RF coverage, while broadcast facilities are reviewed for interference and secondarily signal strength (maintaining a signal of a certain strength is often a stipulation of the FCC broadcast license). Both types of review are the province of specialists, typically engineers, in technical aspects of radio emissions. The FCC requires this analysis for licensing of new transmitters, and local governments have the option of requiring this analysis to establish the need for new towers, transmitters, and other equipment.

In our review of practices relating to telecommunication siting, we noted several issues encountered by other local jurisdictions after they had adopted their first telecommunication land use regulations. First, microcells (smaller transmitters with a highly localized range favored over larger antennas according to Larimer County’s code) are no longer encouraged in Montgomery County because the county favors fewer, larger facilities. Under Montgomery County policy, microcells are acceptable where technically warranted but not favored in keeping with the County’s general policy of minimizing the total impact of telecommunication land uses. A second issue in Larimer County involved land owners leasing a series of small portions of a large lot to various telecommunication interests, which ultimately resulted in telecommunication development at a density greater than would be allowed if the lease parcels were subject to subdivision regulations. The county later amended its regulations to allow only one telecommunication land use (excepting co-location) per parcel, and required the land owner to be an applicant as a means of serving notice that unregulated subdivision through leases will not be possible. Finally, a review official noted that it is important to specifically look for interference with police and emergency radio frequencies, as this portion of the spectrum is close to the frequencies used by wireless service providers.

- ***Co-Location***

Co-location is an option for both wireless and broadcast equipment. Many jurisdictions, like Montgomery County, require all new monopoles and towers be built to accommodate at least three transmitters. Reportedly, five wireless transmitters will usually fit onto a monopole. In addition to dedicated telecommunications facilities, co-location may also, to promote maximum use of existing facilities, be defined as placement of a telecommunications device on any other existing suitable

structure. Despite initial resistance from the electric power industry, one of the most common examples of multiple land use co-location are electric lattice towers.

- *Speculative Siting*

Larimer County may in the future be solicited by a speculative tower builder. These companies attempt to anticipate future demand for wireless services, locate optimal building sites for towers and monopoles, entitle the site for telecommunication use with local permitting authorities, then lease transmitter space on the pole or tower to wireless service providers. Speculative siting brings with it the advantage of predetermining the location of wireless facilities and avoiding potential battles among competing wireless service providers who refuse to co-locate on the other company's proposed tower. The major drawback of speculative siting is that the application typically lacks studies that establish the need for the facility. Inevitably, if RF mapping is produced for a speculative tower development, it is not able to accurately prognosticate future demand. Montgomery County no longer allows applicants without an FCC license to apply for a telecommunication land use approval.

- *Aesthetics*

The design characteristics of a telecommunications facility are an important aspect of technical review. The most basic aesthetic control is a height limitation. Height limitations may also be justified on the basis of safety, but most often towers are limited in height on the basis of what level of visual obstruction unacceptably obstructs views or generates visual disarray. Though height limitations are generally a valid part of local telecommunications regulation, it should be noted that FCC regulations may limit local authority if height limitations interfere with over-the-air or satellite reception.

When applicable, approving the design of concealment (or stealth) towers is also a major function of the telecommunications review process in many jurisdictions. The current Larimer County Land Use Code stipulates that a concealed antenna "screens or camouflages the presence of antennas and/or towers from public view in a manner appropriate to the site's context and surrounding environment."

In addition, the use of site design principles, such as vegetative and topographic screening, are required by regulations in Larimer County and other jurisdictions. The Montgomery County process requires applicants to describe the type, physical size, and orientation of towers and antennas. The application is then reviewed for conformity with the following regulation:

The antenna and support structure must be designed to minimize the visual impact on the community. The antenna and support structure should be designed to blend into the surrounding environment by use of available camouflaging, stealth design technology, or other means. The support structure and any related equipment buildings, or cabinets must be surrounded by landscaping that provides a screen of at least 3 feet in height. The support structure must be sited to minimize its visual impact.

Montgomery County Code § 59-G-2.43(j).

Jefferson County's Telecommunications Land Use Plan contains aesthetic provisions more specifically directed to large broadcast-type towers. For example, the under Policy 1 of the Visual and Noise Impacts component, the plan states, "It is acknowledged that large multi-use towers located within major use transmission areas cannot be effectively screened. In order to minimize the

visual impact, such new facilities should be located in close proximity to other comparable structures.” Another general aesthetic provision, Policy 4 of the same section states that, “The specific communication facility design issues that should be examined in looking at visual impact are: coloring, lighting, relationship to view corridors, topography, materials, and architecture. Towers and antennas should be neutral in color to blend with the visual backdrop, unless specifically required by the FAA to be painted otherwise.”

- ***Bird Kill***

In the May 2002 *Rocky Mountain Bullhorn* article regarding the Clear Channel Communications tower in northern Larimer County, the combination of lights and guy wires on a broadcast tower was cited as a lethal combination for migratory birds and golden eagles. This claim is somewhat substantiated by a U.S. Fish and Wildlife Service letter (dated September 2000) stating that “communication towers are estimated to kill 4-5 million birds per year.” In the same letter, the U.S. Fish and Wildlife Service outlines a 12-point strategy to mitigate wildlife impacts with recommendations on communications tower siting, construction, operation, and decommissioning. Examples of suggested mitigation tools include co-location; preference for free-standing, as opposed to guyed, structures; avoidance of towers in migratory corridors and other areas with high bird populations (e.g., wetlands); and, if night-lighting is absolutely necessary, the use of white strobe lights instead of solid red lights. Currently, the FCC has taken the issue under consideration, with no official action to date.

BEST REGULATORY PRACTICES

Based on our preliminary research, it is possible to synthesize several overarching principles for the regulation of communication towers. The following best regulatory practices are based on the experiences of jurisdictions researched for this report:

1. *Start with a location philosophy.* Controlling tower location is a key consideration, and decision-makers should adopt a location philosophy early on. An inventory of tall structures may be appropriate if maximum co-location is an objective. If few opportunities for co-location are likely, it may be more effective to focus on potential antenna farms, where telecommunications facilities are clustered in a single, highly intensive use area, or appropriate types of stealth design, where telecommunications facilities are widely distributed but less noticeable due to effective concealment.
2. *Build a process appropriate to local government objectives.* If public involvement is important, include a public hearing review of applications; if co-location and cooperation is a more critical factor, consider an advisory board composed of stakeholders and an administrative approval process.
3. *Consult community standards* established in other zoning regulations as a logical starting point for provisions related to the scope of safety and/or historical preservation-related restrictions, height limitations, and other aesthetic considerations.

4. *Define important terms clearly in the written regulations.* “Communication tower” (the optional supporting structure of a telecommunication device) and “communication antenna” (the necessary receiving or transmitting device) for example, should almost always be distinguished from one another in definitions due to their different land use impacts and regulatory options.
5. *Understand and integrate FCC and FAA regulations into the local land use process.* For example, treat all communications service providers equally and do not attempt to condition or deny permits solely on the basis of electromagnetic radiation or the type of transmission.
6. *Support decisions with substantial evidence recorded in the written record and buttressed with a written decision.* Where the TCA’s “substantial evidence” rule is applicable, a denial should be based on specific, verifiable evidence. For example, an Illinois jurisdiction demonstrated the impact of a proposed tower’s height by sending a fire ladder with a balloon to the proposed site and taking photographs from several angles.

Beyond these broad principles, common criteria for permit review include, among others, fire safety, raptor nesting impacts, signal coverage, and aesthetic compatibility. On the other hand, decision-making relying on evidence regarding EMF (electromagnetic frequencies) and RF interference is largely prohibited or preempted by federal law. As another example, ordinances stand a better chance of being upheld if a permit denial is challenged when a waiver or relief process is provided. One such waiver process in Hopkinton, New Hampshire provided that a waiver would be allowed if (1) the tower was not detrimental to the public health, safety, and welfare, and (2) based on an identifiable hardship. Waivers could also be tied to the necessity to provide adequate reception as required by federal law. Further definition of Larimer County’s specific concerns will provide additional guidance for the development of appropriate county regulations.

LARIMER COUNTY REVIEW

Though not specifically a focus of this report, it is useful to compare Section 16 (Commercial Mobile Radio Service (CMRS) Facilities) of the Larimer County Land Use Code to the best regulatory practices described above.

As evidenced by the Antenna Location Regulations in Table 16.1.2.I, Larimer County’s regulatory approach is oriented toward stealth and attached (co-located) antennas. An effort to co-locate in general, however, is never compelled under Section 16. Microcell towers are preferred over standard size towers, though this preference could lead to more antennas than absolutely necessary to attain full wireless coverage.

The current CMRS regulations do not establish a maximum height for antennas in general. The only standards for concealed antennas are contained in the definitions section, and no relationship to tower height is mentioned.

The CMRS regulations in Larimer County appear to meet the substantive provisions of Section 704 of the Telecommunication Act, and the timeline for review (§§16.1.5(A), (B)) seems reasonable, but the county’s position with respect to Section 704 could probably be strengthened with the addition of language requiring a written decision and written record containing “substantial evidence.” The latter is especially important when an application is denied.

Further review of the Larimer County CMRS code may be appropriate should the county elect to proceed with a coordinated effort to update and amend land use code provisions related to telecommunications facilities. At this juncture it will be appropriate to gather more detailed information regarding Larimer County staff actual experiences and frustrations working with the current CMRS code.

We also note that Section 8.19.1(B) of the current Larimer County Land Use Code establishes a relatively broad exemption for amateur radio towers in the county. Though it would be unusual for a ham radio operator to erect a tower of over 200 feet, the county should consider setting a maximum height of 200 feet, to avoid FAA lighting and painting requirements, where commercial licensing does not create the need for a higher tower.

LOOKING TO THE FUTURE – POTENTIAL IMPACTS OF TECHNOLOGICAL TRENDS

Larimer County staff requested that we review emerging telecommunication technologies, focusing on instances where land use regulations might need to take these potential new telecommunications uses into account. The following section of this report highlights and analyzes the land use implications of three emerging telecommunication technologies that utilize tower structures.

DIGITAL TELEVISION

The advent of digital television (also referred to by its format, high-definition television) has been used as a broadcast industry argument for federal intervention to preempt local regulations as a means to expedite the implementation of the new equipment necessary for digital transmissions. According to the FCC's own fact-sheet on the topic of digital television, however, the fundamental requirements for towers are no different for digital television than analog television. In fact, the FCC notes that "broadcasters may be able to put digital television antennas on the same towers as other existing communications facilities."

Digital television does not require a proliferation of towers, nor, from the standpoint of land use impacts, does it require significant alterations to existing facilities. While there is a general trend toward "megatowers" that consolidate transmitters from several older towers and improve overall signal quality by virtue of a location at the highest possible point, development of these megatowers is driven largely by market forces in jurisdictions where the benefits of consolidation and other factors have created a favorable regulatory environment. Attempts by tower developers to persuade government at all levels that digital television will require an entirely new scheme of land use regulation have been unsuccessful.

Though land use requirements are unlikely to require adjustment to accommodate high-definition television (HDTV), upgrades to transmitters are likely within the span of 15 years, during which analog and digital signals are likely to be simulcast in most markets. Upgrading equipment to HDTV capabilities will present the opportunity for broadcasters to install more efficient transmitters, so it is very possible that HDTV will be an issue for existing towers, as well as new towers, in the near future. For example, upgrades of this nature to equipment on Lookout Mountain in Jefferson County will be used to bring existing nonconforming towers into the review process, at which time tower design, co-location, and even the need for a transmitter may all be examined according to regulation.

HDTV was an issue in the recent proposal by Pinnacle Communications to place a broadcast tower on Eldorado Mountain in northern Jefferson County. As opponents pointed out, the FCC never acted on a petition to expedite the implementation of new broadcast technologies (e.g., HDTV) through rulemaking that would preempt local zoning authorities. The rezoning proposal was ultimately defeated on the grounds that fire-fighting access was lacking.

DIGITAL AUDIO RADIO SATELLITE

Popularly known as "XM radio," digital audio radio satellite is a broadcast format typically received directly from a satellite. However, because satellite signals are sensitive to line-of-sight, in hilly or mountainous areas with a significant number of subscribers, digital audio radio satellite providers have sometimes elected to install ground-based transmitter to provide a redundant signal. As with

most broadcast signals, taller towers will cover the most area per ground transmitter, therefore, where a satellite signal is blocked, digital audio radio satellite may be a prime candidate for co-location on traditional radio and television broadcast towers. Other jurisdictions with XM radio experience report that the signal is close in frequency to various public safety transmissions and any proposal should be required to test for interference prior to final approval. It is unclear if there is either sufficient demand or satellite broadcast interference in Larimer County that would prompt a tower request from a digital audio radio satellite service.

LOW-POWER FM AND TV

Low-power broadcast media have technically been part of the FCC's licensing scheme for several years (since 2000 for low-power radio), but development of physical infrastructure has been negligible due to lengthy processing time and mass rejections for many applicants for low-power licenses. In general, low power FM and television are intended to provide access to educational groups and other non-commercial public interest users. FCC rules do not protect low-power licensees from RF interference, but do require applicants for these licenses to avoid interfering with commercial broadcasts. Because of the stringency of the FCC process, combined with distance separation requirements between transmitters, it is likely that Larimer County will encounter few, if any, requests for new towers for low-power broadcasts. If licenses are issued to property owners in the unincorporated county, FCC regulations include a maximum tower height of 100 feet above average terrain. Local governments are able to place additional regulations on low-power broadcast towers and equipment to the extent that they have authority to regulate any other type of broadcast equipment, as discussed above.

CONCLUSION

New forms of telecommunication land use are emerging and will continue to emerge as long as the electronic transfer of information is a fundamental force in our society. In the foreseeable future, the ground-based facilities for telecommunication technology will not, however, undergo significant changes that would require significant changes in land use regulations or review processes. In the next five years, for example, new technologies such as digital television and satellite radio will use towers that are not markedly different from existing towers and telecommunications equipment. Taller towers will not be required by any of the technologies discussed in this report. Moreover, because market demand is limited, a flood of new-technology tower applications is unlikely. Given these findings, the best approach for telecommunications regulation is to establish a process and regulations that will take into consideration appropriate height, location, and aesthetic considerations while broadly defining the basic land use features of telecommunications uses, such as towers, antenna, and telecommunications equipment. A solid process and inclusive definitions will ensure that existing standards and processes will apply as new technologies are introduced.

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