



# Notes on the Effective Use of RF Technical Resources in Crafting and Implementing Site Zoning Strategies

Prepared for  
***The Elements of Zoning:  
Crafting a Successful Site Zoning Strategy***  
**Workshop at the 2002 PCIA Tower and Site  
Management Forum**

By  
**Lawrence Behr, CEO**  
Lawrence Behr Associates, Inc.

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***Lawrence Behr Associates, Inc.***

3400 Tupper Drive, Greenville, North Carolina 27834

800-522-4464 / 252-757-0279 / Fax 252-752-9155

Email [Lbassc@Lbagroup.com](mailto:Lbassc@Lbagroup.com) / LBA on the Web [www.Lbagroup.com](http://www.Lbagroup.com)

# Notes on the Effective Use of RF Technical Resources in Crafting and Implementing Site Zoning Strategies

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The radio frequency (RF) technical issues confronting wireless system planners are pervasive and complex. Complex to “techie” usually means incomprehensible to non-engineering professionals, regulators and the public. But, there is gold in the hills, and a skilled independent technical expert can apply RF engineering fruitfully – sometimes spectacularly – in the zoning process.

Too often, experts are brought in after positions have been taken and damages done. Good zoning strategy cannot be done at 6 PM for the 8 PM hearing! For best effect, use your independent RF technical team early – and often.

Using the framework of the two PCIA zoning case studies created for this workshop, I have attempted to identify crucial areas of application for the RF expert team’s skills as identified from my over twenty years of zoning support and our LBA ZoneTek™ experience. The notes below are not exhaustive, but are intended to provide a perspective for further discussion and consideration in the workshop context.

PCIA case fact assumptions are stated below, with the notes in *Italics*.

[For more information on LBA ZoneTek™, click here.](#)



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## CASE 1

### A 170' TOWER IN A CRITICAL ENVIRONMENT

#### Fact Assumptions

##### A. Site

1. Wireless Provider (“Provider”) identifies a gap in coverage in a rural/suburban area that is heavily forested and hilly.

*An RF technical team, such as LBA’s ZoneTek™ team, can create maps of coverage gaps using propagation tools or audits maps created by Provider’s RF engineer for third-party opinion of coverage deficiencies.*

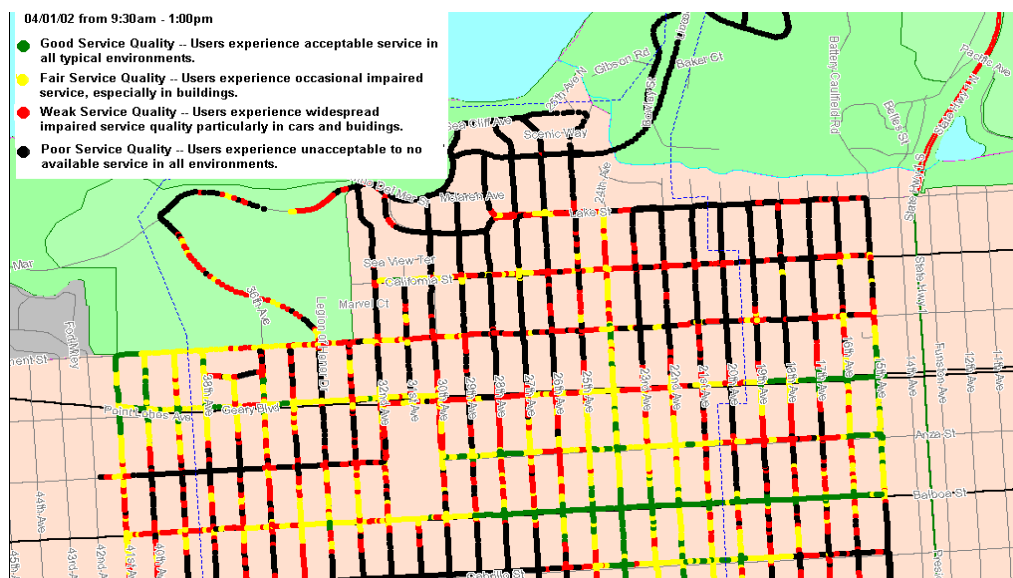
2. The radio engineers of the Provider indicate they need 170 feet in order to have seamless coverage based upon its current network. Due to the hilly terrain, and dense wooded areas, anything lower than 170 feet will result in coverage gaps between the proposed site and existing sites.

*The zoning RF technical team can do multiple scenario studies for different tower heights to quantify and validate advantages of Provider’s chosen height. If the height does not validate, it alerts the zoning team early, while changes can be made and before credibility is damaged.*



3. Coverage is presumed to be a -85dbm. There already is coverage in the area that has been provided by cell sites that have been in existence for a number of years but the coverage is inadequate and results in many areas where calls are dropped or cannot be completed.

*The zoning RF technical team can undertake drive test studies of the coverage area to identify “real world” coverage deficiencies. Where Provider has made such tests, the team audits Provider’s studies for compliance with industry standards and can provide third party verification of quality improvement claims.*

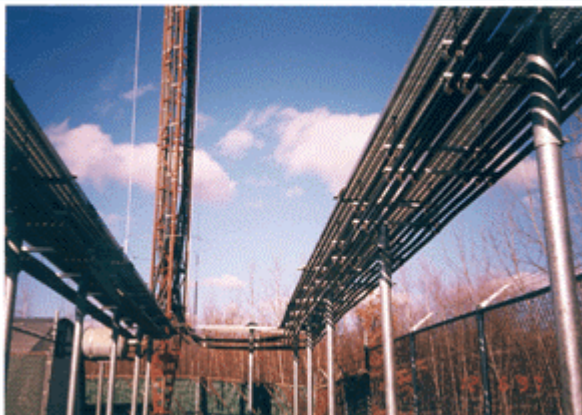


4. The site acquisition firm reports there are no existing tall structures within five (5) miles available for co-location (there are some concerns that the site acquisition people may be understaffed for the project and may not have been diligent in their search).

*The zoning RF technical team can make a records search of known potential tower or building sites to validate Provider’s site claims. Alternatively, it can physically inventory existing*



*towers or structures in the study area, screening for suitability and implementation cost/impact. Further, it can screen AM broadcast stations in the area to determine if there are AM collocation sites available. These processes may identify more cost/time effective sites, or, in excluding other sites, bolster the Provider's case.*



AT&T and VoiceStream Share WCCM - Boston

5. The search area is zoned residential and just outside the search area are small pockets of commercial zoning but they have been rejected by the radio engineers who insist that the site cannot be located there and fill the coverage gaps.

*The zoning RF technical team can document “what if” scenarios based on identified commercial zoned areas to demonstrate service quality impacts of site locations there.*

6. There is a Volunteer Fire Department (“VFD”) in the search area which under zoning regulations, would allow a cellular (PCS) tele-communications. (The VFD gets very little funding from the county and really needs the revenue from the tower).



*The zoning RF technical team can investigate and quantify the adequacy of existing public safety communications in the area, demonstrating the potential for a new 170’ tower at the Volunteer Fire Department to improve those communications by providing a collocation platform for those agencies. There may also be an opportunity to*



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*demonstrate computationally, and from firehouse anecdotes, inadequacy of the present VFD stationhouse antenna in reaching the VFD service area. Documented benefits from coordinating the location and maximum height of the proposed Provider tower with public safety needs can have a strong political appeal, as well as resonate well with the public.*

*The zoning RF technical team can provide intermodulation and other interference studies to demonstrate Provider interference compatibility with existing public safety facilities that might be at that site or added later.*

7. Also within the search area is a national park belonging to the United States government. Past experience indicates that it takes 2 to 3 years to get approval to build in a national park. While the property is on federal land and therefore not governed by local zoning regulations, it is the custom of the national park service to seek the input of local governments so a public hearing would be required at a minimum before the PC of the county within which the park is situated.

*The zoning RF technical team can study the adequacy of present Park Service and other Federal communications in the area and suggest how those communications could benefit from the proposed tower on NPS land. As in the fire station situation, the discovery of mutual benefits can favorably dispose authorities and the public to the Provider plan.*

*As in any site collocation scenario, it is also important to investigate interference compatibility between the Provider's proposal and other services which might locate at the site. Public and agency acceptance of Provider conclusions in these crucial areas are enhanced when offered by an independent expert.*

8. An environmental assessment is required for the NPS site but not for the VFD site.



*As part of its NEPA process, the Provider must certify compliance with FCC EME (RF hazard) rules. Failure to do so, for instance, by improperly relying on “categorically exempt” concepts, can invalidate NEPA determinations and trigger a full Environmental Assessment! Furthermore, zoning authorities often require independent validation of the present and future adequacy of the Provider’s EME compliance plans. The zoning RF technical team can audit the Provider’s EME compliance plans and advise on their adequacy before either time or credibility is lost.*

9. Both the national park and the VFD are situated on a road which has been placed within the registry of scenic byways.

*The zoning RF technical team can provide services to assist in minimizing the profile of antennas built or collocated at the site by appropriate interference studies to minimize spacing between users and other parameters.*

*In addition, the team can seek to validate that the Provider proposed height is the minimum necessary and, therefore, the least impact on the scenic highway. If the proposition cannot be validated, it provides the zoning legal team early warning, as well as possible alternatives.*

10. Provider can secure a lease with the VFD and is fairly sure it can get the NPS permit.

*The zoning RF technical team can review leases to insure realistic and proper technical interfaces with other required collocation tenants in various services.*

## **B. Public Opposition and Support**



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There is very strong opposition to the VFD site at 170 feet from a few very wealthy, sophisticated and well connected individuals. These individuals include amongst themselves, former high ranking cabinet members in past presidential administrations and some familiar with wireless technology. The VFD is also able to mobilize a substantial number of people, far in excess of those opposing, who are in support of this being located at the VFD, as it would supply the VFD needed income and aid safety in the area through better provision of wireless communication and 911 services.

*Proper use of independently verified technical positions can substantially improve the chances for approval of this case. Alternatively, early warning of potentially embarrassing missteps can help maintain a strong foundation of confidence with regulators and supporters. A third party can create the positive technical bridges to avoid misunderstanding and misrepresentation of possible public safety – Provider cooperation. It can also work within the Provider zoning team to communicate these benefits to the public.*

*There is also the opportunity here to determine if the interest of the highly influential individuals is self-serving. If a study revealed adequate existing service to their neighborhood, but denial of the tower request would result in continued inferior service to minority or less-fortunate neighborhoods, a powerful tool might exist to fragment the opposition. Among other reasons, the use of an independent technical assessment somewhat decouples the high profile Provider from a potentially sensitive issue until full assessment of the consequences can be made.*

## **C. Government Process**

1. Approval of a Special Exception requires an application to the local county Board of Supervisors (“BOS”) with a public hearing before an appointed body of Planning Commissioners (“PC”) who make a recommendation to the BOS as to whether to accept or deny the



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application. The time for presentation is limited and there is no cross examination of witnesses.

*A tightly focused, articulate and informed third-party presentation, given by an expert technical spokesperson, can add a high level of effectiveness to the Provider's presentation. Also, this person, working within a well-structured strategy, can be an important resource for authoritatively addressing PC and public questions.*

*It is also important to make the Provider's experts available to BOS/PC staff prior to hearing, preferable much prior to hearing. A skilled expert can relate to staff concerns and lay groundwork for favorable staff action. A good staff recommendation can be almost golden!*

*Unfortunately, no matter how well qualified a Provider's internal RF engineer may be, without professional strategic presentation sense and capability, engineers can make a shambles of the Provider's case. This is particularly important to recognize, as many knowledgeable RF engineers today are not skilled in public speaking, or do not have the language skills to relate to the local audience.*

2. Sensing a very volatile situation with the voting public as shown by the public hearing at the PC, the BOS agrees to hire an independent consultant to advise them and the PC on the application. Specifically, to find out whether there is a need as stated by the Provider and whether the Provider is meeting that need with the lowest possible facility. The consultant hired by the BOS is one recommended by the very well connected individuals in the community who oppose the site and this consultant has supplied advice to other counties in the area of a similar demographic.

*In a sense, the Provider is faced with "fighting fire with fire". It is crucial that the proponent retain a third party to investigate Provider vulnerabilities to ferret out in advance the potential findings of the opposition consultant. In part, this may be done*



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*by analysis of the “consultant’s” strategy and findings in other cases, game-played against the fact set of the Provider’s case. So alerted, the Provider’s legal team can prepare advance response actions. This is particularly relevant when, as in this case, the opponent expert is actually an advocate and not an independent third party.*

3. The consultant comes back with a report saying that there is a need for service but it can be provided at 140 feet through stealth designs such as a flagpole. The well-connected community continues to oppose this and insists that there is service as they have tested their own phones and they find that they work “most of the time.”

*This is an excellent example of the problems that can be avoided if the Provider commissions thorough research and documentation of its alternatives. Thus, it would be in a position to offer credible alternatives to or arguments against the consultant’s report.*

*Specifically, in this case, drive testing would be effective to establish the actual extent and severity of present service deficiencies. Through independent determination, using accepted industry standards, a common ground is established for a rational coverage discussion. Following the discussion above, for instance, drive testing may further validate theoretical conclusions that the area where the rich folks live is getting adequate service, but the area where the majority of the voters live is getting inferior service.*

4. In off the record negotiations with the community and some of the members of the PC and BOS, various comparisons are discussed. The radio engineers of the Provider reject the idea of a flagpole but say they can go at 140 feet and have acceptable –85db coverage if they can have the antennas spread. The opposition maintains it must be no higher than 100 feet. The matter on a close vote is sent forward with a recommendation of denial.



*Off the record negotiations on technical issues using Provider's internal RF engineers can be hazardous. The use of an independent outside expert permits much more negotiating flexibility, tighter focus on the issues, and some measure of "plausible denial" if negotiations go astray. When otherwise desirable, it is also easier to set up opposing independent experts to cooperate on mutual studies to resolve factual technical issues than to try to force collaboration between a Provider and an opposing expert.*

*An excellent example of that possibility would be the collaboration of opposing experts to deploy a crane supported test base station at 100 feet, 140 feet and 170 feet, subsequently conducting mutually agreeable drive testing to stipulate impact of the several height options on future coverage. Of course, proper exercise of the zoning RF technical team capabilities could have identified these debate options early on to avoid this controversy.*

#### **D. Issues**

Faced with other alternatives that may be more expensive or time consuming, or the uncertainty of the application being approved by the BOS in light of the political heat being brought to deny the application, what should the Provider do regarding:

1. Effectively creating a grassroots campaign to support the tower;

*Credible, well-articulated, technical fact is a plus for the Provider's campaign, as well as a plus for its strategists in developing that campaign.*

2. Developing an effective media message and message to the BOS;

*An articulate third-party spokesperson can be more effective in the media than a perceived Provider-owned "hack".*

3. Effective use of zoning support graphics, videos, photos, etc.;



*It is important that graphics showing technical matters be presented with a strong orientation to being understood and accepted by a lay audience, without compromising technical integrity. A zoning RF technical team can bring this experiential knowledge and provide the “glue” to interface technical presentation issues with the strategic needs of the Provider’s legal team.*

4. Proving this is the only location available from engineering and business (cost) perspectives (or seek other options);

*As discussed earlier, this pivots on adequate advance investigation, analysis and documentation of alternatives. Indeed, “proving” the case to satisfy internal RF department politics may be disastrous to the overall site acquisition objectives of the Provider if a solution is force-fit and the technical credibility of the Provider is damaged. A third-party perspective can help keep the Provider’s credibility high.*

5. How does Provider effectively address RF issues;

*As set out earlier, it is essential that a Provider address RF issues using a well-coordinated strategy incorporating fully the talents of a third-party expert and the organic resources of the Provider.*

6. Effectively addressing scenic trail and potential other historic or archeological issues;

*The resolution of scenic and historical issues requires a strong understanding of the degrees of flexibility available in the RF design process and the flexibility available in the definition of the service quality sought to be provided.*

7. Making record for appeal of local decision and potential litigation (deciding which court to file in).



*In highly contested cases it is important that the RF experts being employed have a background of litigation and expert witness document preparation in order to properly interface with the proponent's legal team and its litigation requirements. The expert should be capable of putting together a well-credentialed, multi-talented team with full strategic coordination. Due to the diversity of exposure and orientation, these talents are more often found in outside technical experts.*

## CASE 2

### A ROOFTOP SITE IN A HISTORIC SMALL TOWN

#### Fact Assumptions

##### A. Site

1. The prospective site is located in the middle of downtown (County seat). The population of the city is 35,000. The desired building appears to be quite old, but it is not listed on the historic register, yet.

RF engineers identify this location as the best “in-fill” location. The Provider wants to place panel antennas on top of the roof. If this location is denied, antennas will need to be located in two other portions of the city. In fact, one may need to be a 50' tower.

*An RF technical team, such as LBA's ZoneTek™ team, can focus on creating credibility by validating Provider internal conclusions that the target building is the only feasible site. Alternatively, if review finds available collocation sites, or other overlooked sites that might be faster and less costly to construct than the proposed downtown site, the zoning legal team can be alerted at an early stage, while changes can be more easily accommodated.*





## **B. Public Opposition and Support**

1. The “Keep our City Beautiful” citizen committee has made it their mission to have every building in the downtown area declared historical, Markers are in front of each building giving a story about the structure or the land. (It appears the citizen committee has stretched the definition of a “historical” site beyond what is covered under the ACHP sec. 800 rules and the NHPA).

*It would be helpful if the designated building were Marconi’s original workshop.*

2. The Citizen’s group doesn’t want any “ugly” antennas on “their” buildings.

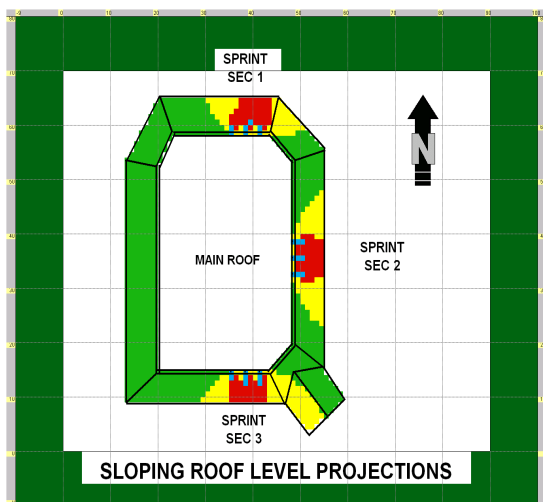
*The independent technical team can assist the legal team in defining appropriate antennas and validating proposed stealth configurations for technical adequacy.*

3. The building is owned by a prominent local church and is used as a counseling center for abused women. The church could use the lease money for their agency.



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*Antenna proposals on public use buildings, particularly where women and children may be present, frequently elicit emotional objections. Although the Telecommunications Act of 1996 precludes local authorities from evaluating health impacts of proposals, it does not bar them from examining the Provider's proposed and continued compliance with established OSHA and FCC Regulations. In fact, local authorities may impose conditions on approvals to require demonstrated continued compliance with these regulations. The assurance of independent technical review of the adequacy of the Provider's EME safety program can be an important factor in securing approval with minimal continued conditions. This independent assurance may also be critical in securing the support of the site owner and its constituency.*



4. The Citizen's group has convinced the City Council that there is already one cellular company with antennas in town so they don't need another one (at least that's what their attorney told them).

*Often, there is no comprehensive database to support resolution of coverage issues. Independent theoretical analysis and drive testing can provide a credible definition of existing cellular service in the community from both the Provider and other services. This may be particularly useful in showing lack of 911 coverage by Provider. Deployment of a temporary test*



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*cell site on the roof of the target building with independent drive measurements is an effective way to document the new service benefits. If opponents are urging alternative sites or heights not deemed adequate by the Provider, test transmitters can also be deployed to conclusively demonstrate the Provider's position.*

### **C. Government**

1. The City doesn't have an ordinance that addresses antenna or tower siting, but is considering a moratorium in order to draft one.

*When the City drafts an antenna or tower siting code, the zoning RF technical team can advise the Provider's legal team on the strategic and practical consequences of proposed RF technical conditions. Historically, some of these provisions have been entirely onerous, such as requiring periodic unannounced EME audits of the Provider's facility.*

2. Three member's of the Citizen's group sit on the Zoning Board and have hired the Committee's legal counsel to advise them about their right to assert local zoning rules on these cell phone companies.

*The zoning RF technical team can assist the Provider and its legal team in evaluating the technical aspects of arguments by the Citizen's group counsel and in strategizing appropriate response mechanisms for the zoning proceedings.*

3. Provider has been invited to make a presentation to the Zoning Board.

*The zoning RF technical team can work at a strategic and tactical level with the Provider and its legal team in order to create a highly focused, credible and articulate presentation of the technical matters under consideration. It provides articulate expert appearances where required and creates and provides graphics and other documentation to assist in presenting the Provider's case on technical matters.*



4. The City Council acts as the Appeal Board on all zoning issues.

*The zoning RF technical team can work with the Provider and its litigation team to do a post-mortem of prior proceedings and other relevant events and to craft appropriate arguments on relevant technical themes to support its appeal or subsequent litigation. It can also assist in “cost-effective/time-effective” evaluation of alternatives to appeal.*

#### **D. Issues**

Faced with few other alternatives what should the Provider do regarding:

1. Effectively creating a grassroots campaign to support the tower;

*Independent, credible, well-articulated technical fact is a plus for the Provider’s campaign and crucial for its strategists in developing that campaign.*

2. Developing an effective media message and message to the City Council and Zoning Board;

*An articulate third-party spokesperson on technical issues can be more effective in the media than a Provider’s internal spokesperson who may be perceived as a “hack”.*

3. Effective use of zoning support graphics, videos, photos, etc.;

*It is important that graphics showing technical matters be presented with a strong orientation to being understood and accepted by a lay audience, without compromising technical integrity. A zoning RF technical team can bring this experiential knowledge and provide the “glue” to interface technical presentation issues with the strategic needs of the Provider’s legal team.*



4. Proving this is the only location available from engineering and business (cost) perspectives (or seek other options);

*As discussed earlier, this pivots on adequate advance investigation, analysis and documentation of alternatives. Indeed, “proving” the case to satisfy internal RF department politics may be disastrous to the overall site acquisition objectives of the Provider if a solution is force-fit and the technical credibility of the Provider is damaged. A third-party perspective can help keep the Provider’s credibility high.*

5. How does Provider effectively address historic preservation issues;

*The resolution of scenic and historical issues requires a strong understanding of the degrees of flexibility available in the RF design process and the flexibility available in the definition of the service option to be provided.*

6. Addressing the “one carrier” is enough argument; and

*As discussed earlier, lack of access to 911 services by the “other” users denied service is frequently a strong positive position. Expert technical input may be needed to establish a record that the “other” phone services are incompatible with 911 access on the existing “one carrier” service.*

7. Making record for appeal of local decision and potential litigation (which court to file in).

*In highly contested cases it is important that the RF experts being employed have a background of litigation and expert witness document preparation in order to properly interface with the proponent’s legal team and its litigation requirements. The technical team should be well credentialed, multi-talented and capable of full strategic coordination with the Provider and its legal team.*



**Lawrence V. Behr, Chief Executive Officer  
LBA Group, Inc.**

Lawrence Behr is the founder of Lawrence Behr Associates, Inc., and subsequently, the LBA Group. A recognized leader in the telecommunications industry, Mr. Behr's more than forty years of experience span the areas of broadcast, military and commercial telecommunications technology. He has frequently served as an expert witness before the Federal Communications Commission, the courts and zoning authorities in communications regulatory matters. He presently serves as a Director of the National Association of Radio and Telecommunications Engineers. He is a frequent lecturer and author and holds patents on several inventions in antenna technology.



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