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October 27, 1994

Experimental Radio License
Renewal and Modification Request
Call Sign: K12XAG
File Number: 4398-EX-ML-94
Effective Date: June 11, 1993
Expiration Date: January 1, 1995

BNR INC.
Exhibit Number #1

FCC Form 442

¶ 3 This is a request for a **Renewal** and **Modification** of the Experimental License issued to BNR Inc. the Research and Development Subsidiary of Northern Telecom Inc. for joint BNR/NT (hereinafter called BNR/NT) Authorization.

Authorization is requested for:

- Section 5.202 (i) of the Regulations for: Development of radio technique, equipment, operational data or engineering data related to an existing or proposed radio service;
- Section 5.202 (d) of the Regulations for: Technical demonstrations of equipment or techniques, and;
- 5.202 (f) of the Regulations for Demonstrations of equipment to prospective purchasers for proposed stations in existing services by persons engaged in the business of selling radio equipment.

The expanded authority to demonstrate equipment is needed for on-site demonstrations to customers at the BNR/NT buildings identified in this application

BNR Inc. is the Research and Development Subsidiary of Northern Telecom Inc., one of the largest communication equipment manufacturers in the world. The BNR/NT low-power Public Cordless Telephone Service (PCTS) and the Personal Communications Services (PCS 1900) test programs are being managed from the BNR and Northern Telecom buildings in Richardson, Texas with addresses of 2201, 2221, 2150 and 2400 Lakeside Boulevard., Richardson Texas. Further, BNR/NT conducts training for system purchaser's employees at the BNR/NT training center buildings located at 1055, 1057, and 1059 Sherman Street in Richardson, Texas. The training center radio systems are closed loop, where no antenna is connected to the radio. Additional Research and Development operations are being established at 250 East Arapaho Road, Richardson, Texas in 1995. Research and Development is also being conducted at facilities located at: 1) 2305 Mission College Boulevard, Santa Clara, California, 2) 685A East Middlefield Road, Mountain View, California, and 3) 4600 Emperor Boulevard, Morrisville, North Carolina, 4) 35 Davis Drive, Research

Triangle Park, North Carolina, 5) 4001 Chapel-Hill Nelson Highway,
 Research Triangle Park, North Carolina.

¶ 4 Particulars of Operation

Table 1 **Operational Parameters**

4A	4B	4C	4D	4E	4F	4G
Frequency MHz	Max Terminal Power Watts	Max Antenna Power Watts	Mean or Peak Power Watts	Emission Type	Signal Modulation	Bandwidth kHz
864-868 ✓	0.01	0.01 (ERP)	Peak	F2W	CT2 - CAI	100 (100K)
902-928 ✓	1.0	1.0 (ERP)	Peak	F2W	CT2 - CAI	100 (100K)
930-960 ✓	0.01	0.01 (ERP)	Peak	F2W	CT2 - CAI	100 (100K)
add → 1850-1910	1.2	2.0 (EIRP)	Peak	W7W	TDMA- US GSM	200 (200K)
1930-1990 ✓	20	1000 (ERP)	Peak	W7W	TDMA- US GSM	200 (200K)
1850-1990 ✓	1.2	2.0 (EIRP)	Peak	A7W	CDMA - IS95	1250 or 2500 1M25 or 2M50
1930-1990 ✓	20	1000 (ERP)	Peak	A7W	CDMA - IS95	1250 or 2500 1M25 or 2M50
add → 901-904	3.0	3.0 (ERP)	Peak	W7W	TDMA-GSM	200 (200K)
946-949	1.0	1.0 (ERP)	Peak	W7W	TDMA-GSM	200 (200K)
add → 443-448	0.250	Closed Loop	Peak	W7W	TDMA - IS54	030 (030K)
488-493	0.250	Closed Loop	Peak	W7W	TDMA - IS54	030 (030K)
2400-2483.5 ✓	1.0	1.0 (ERP)	Peak			To Be Determined
5725-5850 ✓	1.0	1.0 (ERP)	Peak			To Be Determined

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¶ 4(A) PCTS

- The PCTS system utilizes 100 kHz channels in concurrence with the CT2 CAI standards.
- Northern Telecom BS1T and BS1P base stations will be used for all testing and development.
- The maximum ERP at the antenna will be at or below 10 milliwatts peak power.
- The maximum EIRP at the mobile/handset will be at or below 10 milliwatts peak power.

PCS 1900

- The initial test program for outdoor transmissions anticipate using up to eight (8) channels per antenna site, 200 kHz wide, for the PCS-1900 system.

- BNR/NT will use 80 MHz separation between the uplink and downlink in all testing programs.
- The test will initially use Northern Telecom TRX1900 experimental radio units with a maximum RF output at the transmitter terminal of 20 watts (+43 dBm). Terminals used in the test program have a maximum RF output at the transmitter of 1.2 watts.
- The maximum ERP at the antenna will be at or below 1000 watts (+60 dBm) peak power. Terminals used in the test program have a maximum RF output at the antenna of 2 watts EIRP (1.2 watts ERP).
- The maximum EIRP at the mobile/handset will be at or below 2 watts (+33 dBm) peak power.

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¶ 4(G) **PCTS**

Operation will be conducted on specific channels whose spectral characteristics are defined by the CT2 or CT2 Plus Common Air Interface Standards.

Each fixed station operates two unique channels, each requiring 100 kHz of spectrum.

PCS 1900

Operation will be conducted on specific channels whose spectral characteristics are defined by standards of the GSM-based PCS-1900 or CDMA technology employed.

In the case of the GSM-based PCS-1900 system, channel spacing of 200 kHz. will be employed in conformance with evolving PCS-1900 standards.

In the case of a CDMA-based system, channel width is not yet defined and will probably be 1.25 MHz. or 2.5 MHz.

Regardless of channel width and spacing, the specific channels selected for use will be selected within the above-defined frequency bands. The specific channels employed for the experimental operation will be selected to avoid interference to or from existing authorized microwave users in the area, and future Licensed PCS Operators. BNR/NT will be coordinating with existing microwave operators, future licensed PCS providers, and other future experimental permittees and licensees.

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¶ 5(b) The test programs will use low-power fixed stations at various locations within the vicinity of Richardson, Texas, Santa Clara, California, Mountain View, California, and Research Triangle Park, North Carolina. Indoor testing, using NT fixed stations, is currently being or is planned to be conducted within the BNR/NT buildings at or in the vicinity of:

Table 2 Site Locations and Antenna Totals

Site Description	Exhibit	Indoor Stations	North Lat	West Long
Richardson, Texas				
2201 Lakeside Blvd.	#2, 11, 12, 13	15	32° 58' 48"	96° 42' 44"
2221 Lakeside Blvd.	#2, 11, 12, 13	27	32° 58' 47"	96° 42' 38"
2150 Lakeside Blvd.	#2, 11, 12, 13	5	32° 58' 41"	96° 42' 38"
2400 Lakeside Blvd.	#2	2	32° 59' 32"	96° 42' 47"
2021 Lakeside Blvd.	#2	0	32° 58' 39"	96° 42' 48"
2100 Lakeside Blvd	#2	7	32° 58' 37"	96° 42' 41"
1055 Sherman Street	#3	1	32° 56' 16"	96° 44' 23"
1057 Sherman Street	#3	1	32° 56' 14"	96° 44' 25"
1059 Sherman Street	#3	1	32° 56' 12"	96° 44' 25"
Santa Clara, California				
2305 Mission College Boulevard	#5	17	37° 23' 19"	121° 57' 23"
Mountain View, California				
685A East Middlefield Road	#6	27	37° 23' 35"	122° 03' 04"
Research Triangle Park, North Carolina				
35 Davis Drive	#8	12	35° 51' 42"	78° 53' 21"
4001 Chapel-Hill Nelson Hwy	#9	12	35° 53' 07"	78° 51' 12"
Morrisville, North Carolina				
4600 Emperor Boulevard	#7	0	35° 52' 29"	78° 50' 21"

See Exhibit #2-9 for additional details of the BNR/NT Campuses of buildings, where wireless testing is being done under the current license or will be conducted under this license when renewal is granted.

Outdoor Antennas:

PCS 1900 outdoor antennas are located at the 2150 Lakeside building, on an antenna structure, that has the location of: NL 32° 58' 39", WL 96° 42' 42" (See Exhibits #11, 12,). Additional antennas are planned for the BNR building at 2201 Lakeside Dr., proposed location: NL 32° 58' 47", WL 96° 42' 44" (See Exhibits #2 & 11), , and also at the 4600 Emperor Drive, Morrisville, North Carolina, proposed location: North Latitude 35° 52' 29", West Longitude 78° 50' 21" (See Exhibit #7 for proposed location).

PCTS outdoor antennas are proposed at the 2150 Lakeside building, on a roof mounted antenna structure, that has the location of: NL 32° 58' 41", WL 96° 42' 37".

Closed Loop Systems:

Training with closed loop systems using all licensed frequencies will be conducted at the Training Center campus of buildings on Sherman Street in Richardson, TX.

PCS 1900, CT2, and CT2 Plus closed loop systems, where radios are not connected to an antenna, will be used at various locations in and around the campus buildings described in Exhibits #2-9.

- ¶ 5(c) PCS 1900, CT2, and CT2 Plus radios will be used at various locations in and around the "Vicinity of Richardson, Texas, Mountain View & Santa Clara California, and Research Triangle Park & Morrisville North Carolina. Accordingly the application requests authority to operate fixed location radios within the Vicinity of the cities noted above. Details of existing BNR/NT campus buildings are further described in Exhibits #2-9.

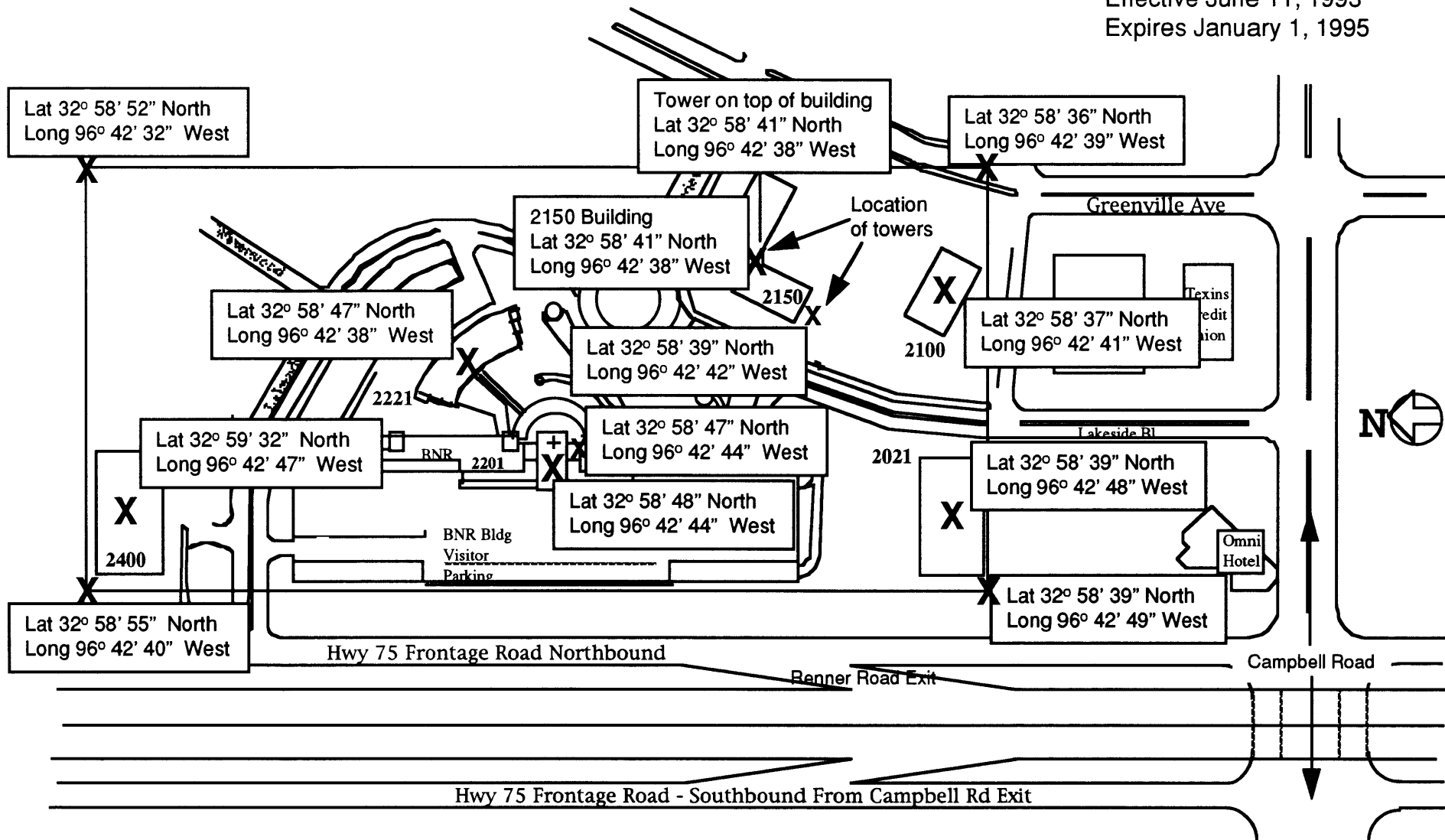
¶ 5 (d) & (e)

PCS 1900, CT2, and CT2 Plus mobiles will be used at various locations in and around the "Vicinity of Richardson, Texas, Mountain View & Santa Clara California, and Research Triangle Park & Morrisville North Carolina. Accordingly the application requests authority to operate mobiles within "The Vicinity of" the cities noted above. For the purpose of ¶ 5, The Vicinity of the cities noted above should include locations within fifteen miles of the city limits of the cities noted above.

Exhibit #2
BNR/NT Campus Facility,
2200 Lakeside Drive,
Richardson, TX

BNR/NT Site Co-ordinates

Renewal & Modification Request
Experimental Radio License
Call sign: KI2XAG
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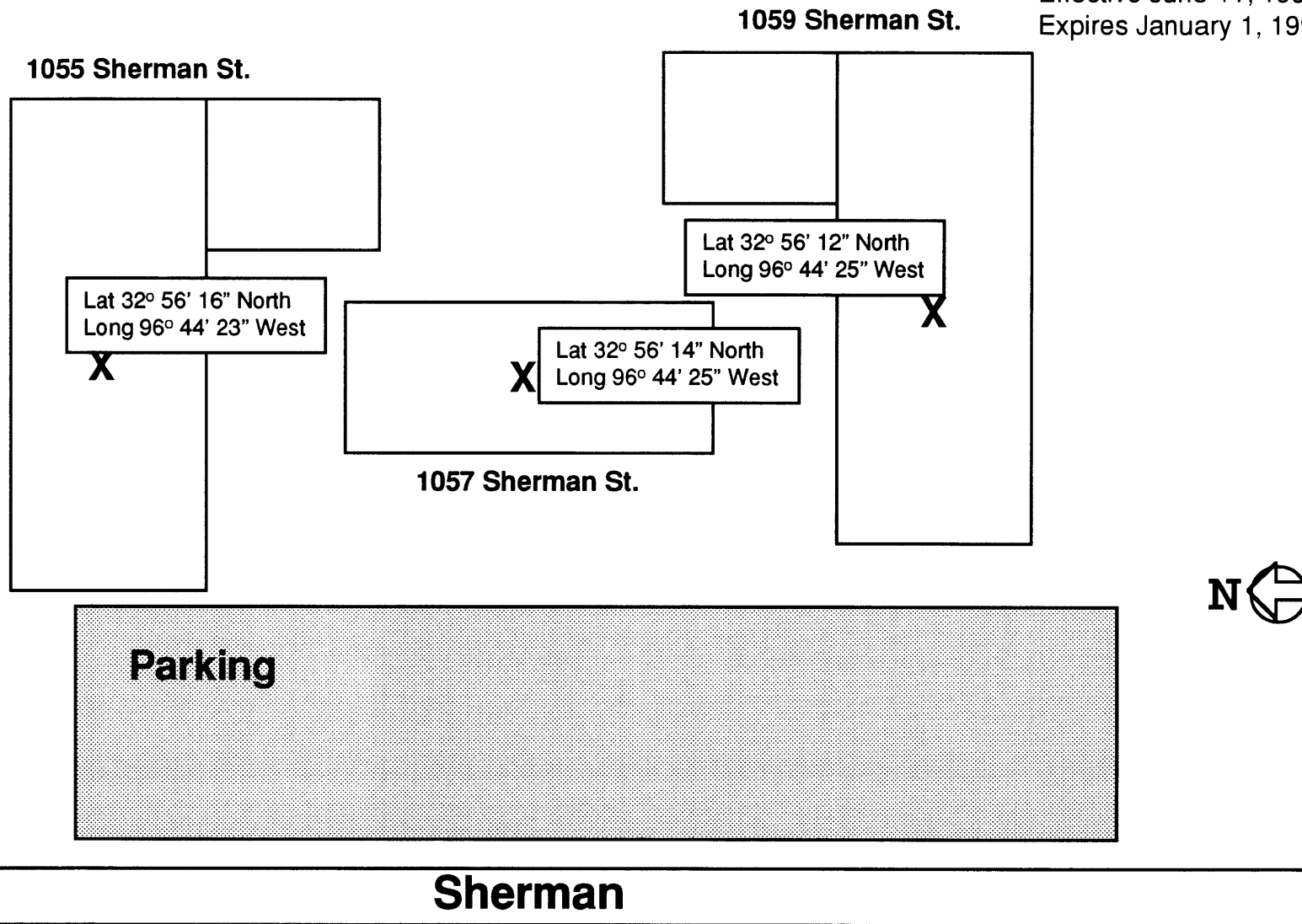


X = Location Information Reference

Exhibit #3
BNR/NT Training Campus,
Sherman Street, Richardson, TX

BNR/NT Site Co-ordinates

Renewal & Modification Request
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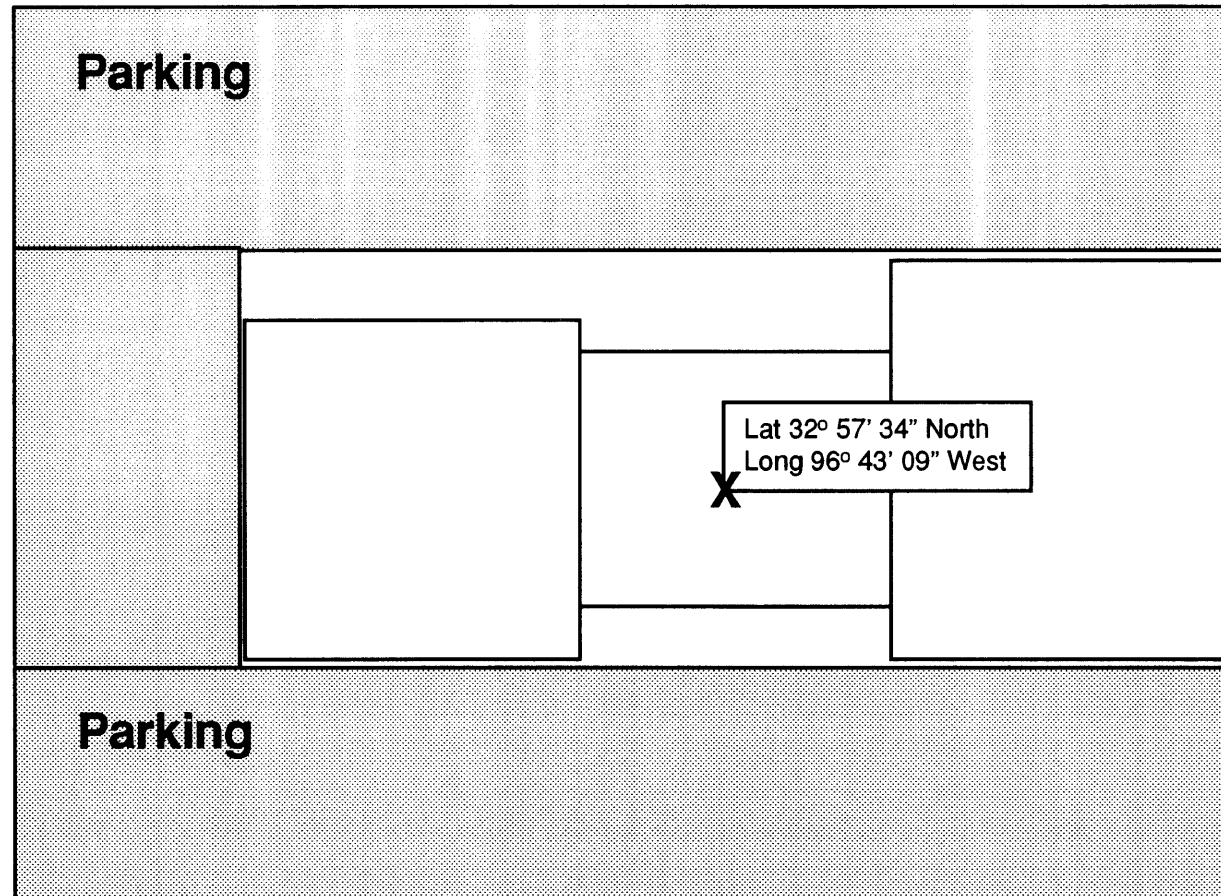


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Exhibit #4
BNR/NT Development Campus,
250 East Arapaho Road, Richardson, TX

BNR/NT Site Co-ordinates

Renewal & Modification Request
Experimental Radio License
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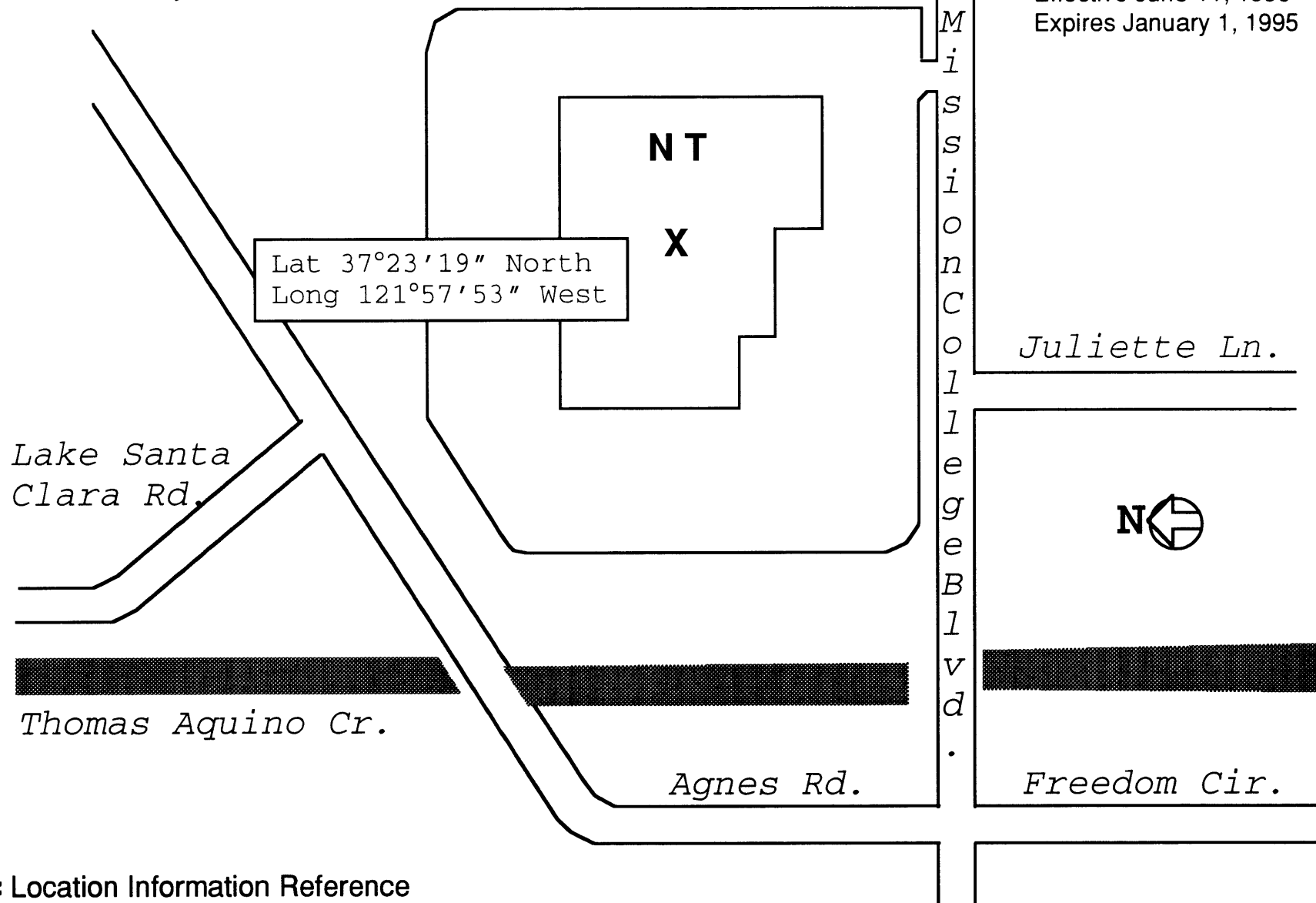
East Arapaho Road

X = Location Information Reference

Exhibit #5
BNR/NT Development Campus,
2305 Mission College Boulevard,
Santa Clara, California

BNR/NT Site Co-ordinates

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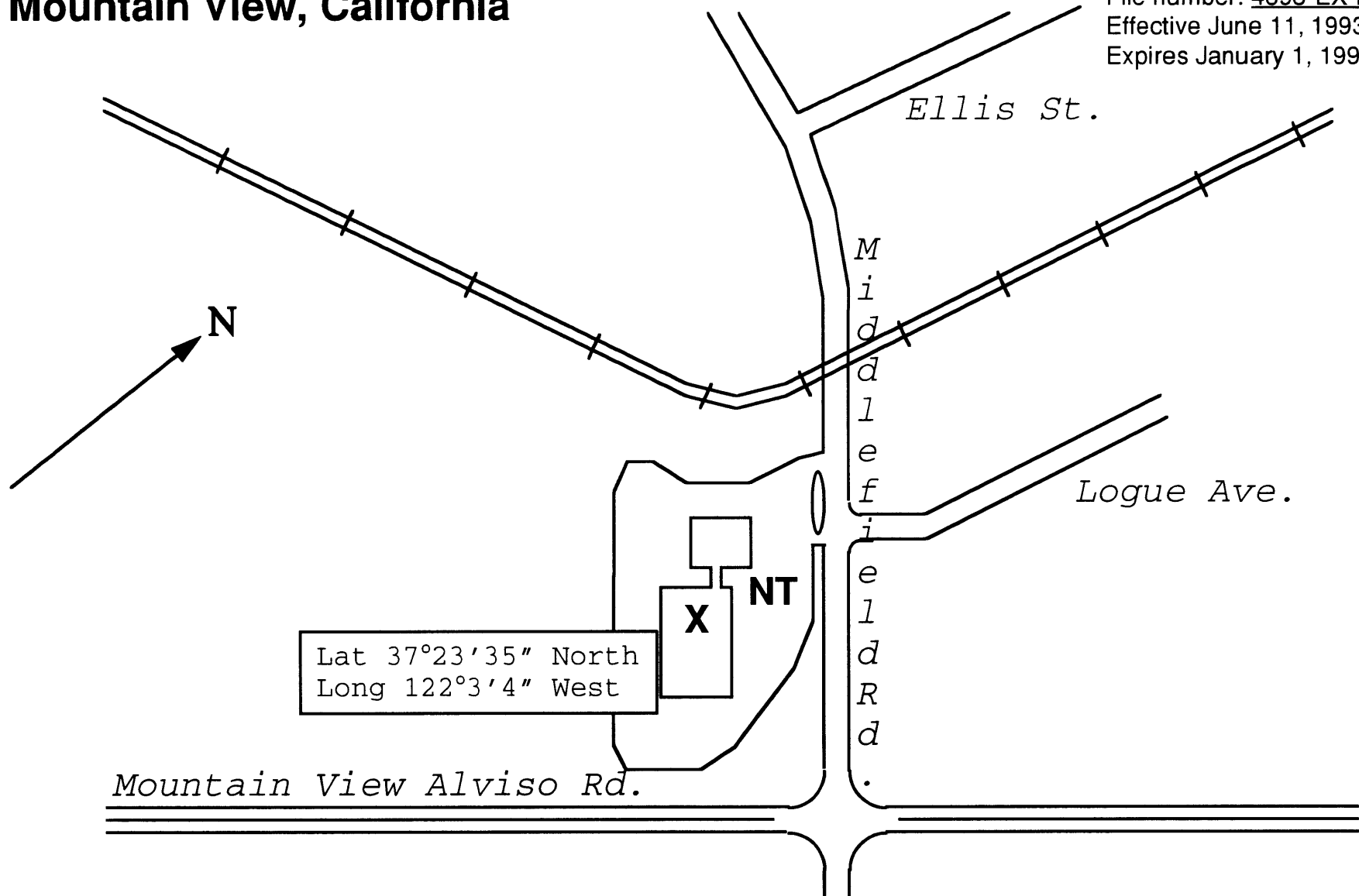


X = Location Information Reference

Exhibit #6
BNR/NT Development Campus,
685A East Middlefield Road,
Mountain View, California

BNR/NT Site Co-ordinates

Renewal & Modification Request
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X = Location Information Reference

Exhibit #7
BNR/NT Development Campus,
4600 Emperor Boulevard,
Morrisville, North Carolina

BNR/NT Site Co-ordinates

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Antenna mounted on top of building,
PCS1900 directional smart antenna,
85° at half power point, orientation
in horizontal 110°, 230°, 350°,
orientation in vertical 0°
Total height planned 70' AGL,
(Ground level 436' ASL)

Latitude 32N-52'-29"
Longitude 78W-50'-21"

Nearest Airport:
Raleigh Durham Airport
Latitude 32N-52'-39",
Longitude 78W-47'-15"
6 mi (km) distant

X = Location Information Reference

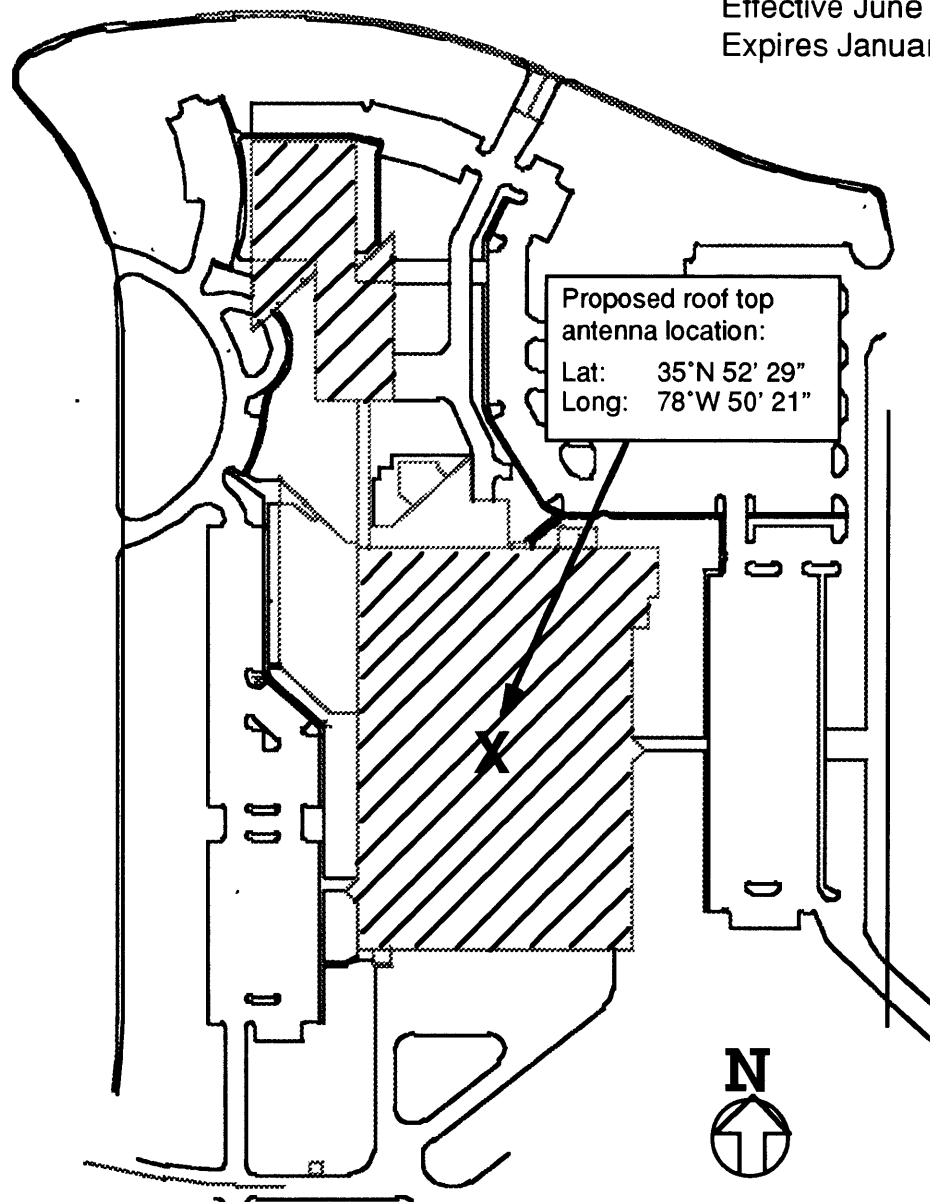
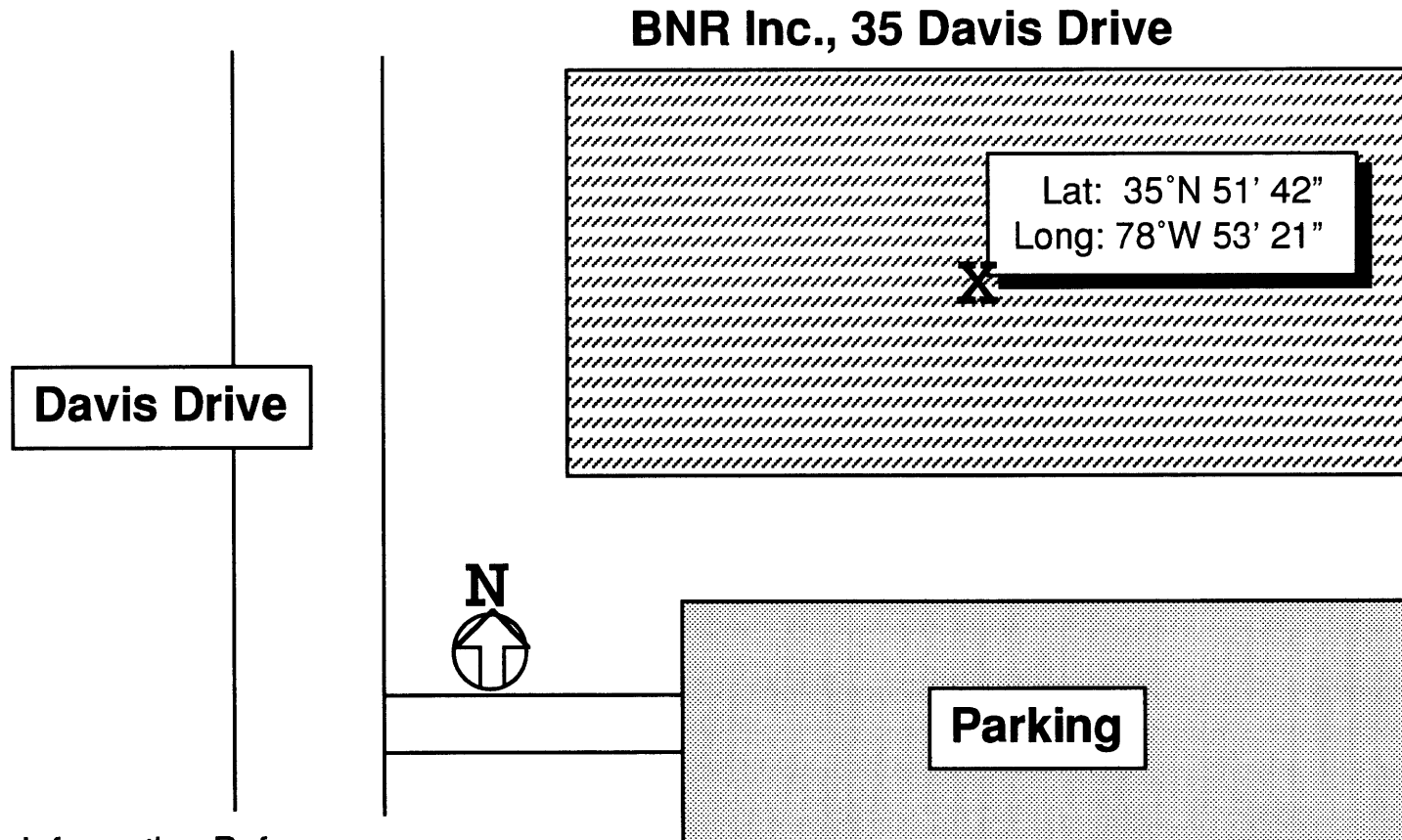


Exhibit #8
BNR/NT Development Campus,
35 Davis Drive,
Research Triangle Park, North Carolina

BNR/NT Site Co-ordinates

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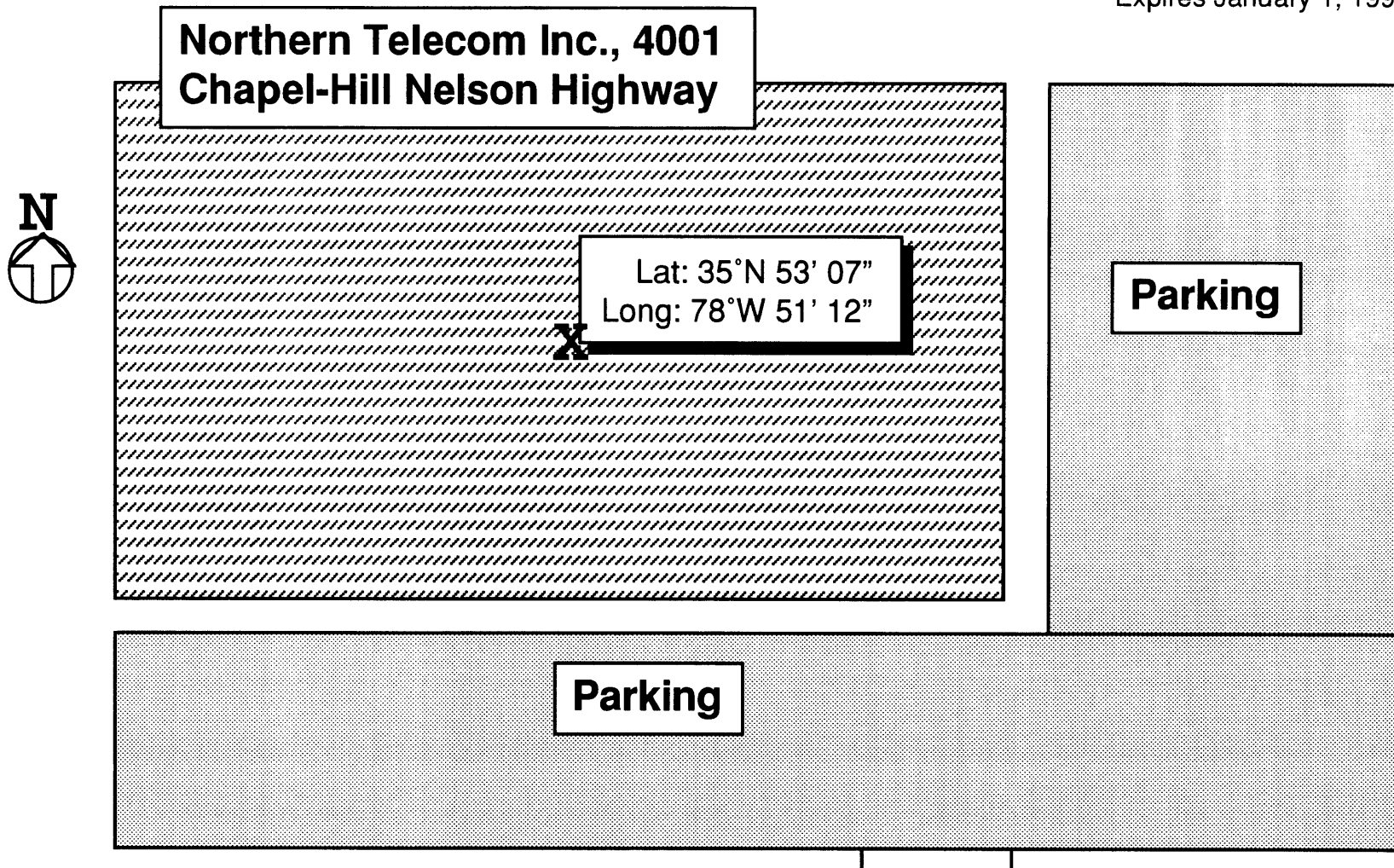


X = Location Information Reference

Exhibit #9
BNR/NT Development Campus,
4001 Chapel-Hill Nelson Highway,
Research Triangle Park, North Carolina

BNR/NT Site Co-ordinates

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X = Location Information Reference

Chapel-Hill Nelson Highway



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BNR INC.
Exhibit Number #10

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¶16(a) **CT2 Antennas:** These are all omnidirectional antennas with a down tilt of 30°. The beam width in degrees at the half-power point for all antennas at the Lakeside campus is 120°.

PCS 1900 Antennas: The beam width in degrees at the half-power point for all the outside antennas is 85°.

¶16(b) **PCS 1900 Antennas:** The Orientation in the horizontal plane of the external antenna at 2150 Lakeside is 110°, 230° and 350° from Magnetic North. The same orientation is planned for the Morrisville and 2201 Lakeside antennas.

¶16(c) **PCS 1900 Antennas:** The Orientation in the vertical plane of the external antennas at the 2150 Lakeside building is 0° down. The same orientation is planned for the Morrisville and 2201 Lakeside antennas.

BNR/NT closed loop laboratory radio systems, also included in this application, do not connect to an antenna. The Antenna information above is for live air systems that do connect to an antenna.

¶10(a)(b) & (c)

Test Program

The BNR/NT wireless test programs in Richardson, Texas, are ongoing product development programs for US PCS and low power wireless systems for public application. The license Renewal and Modification application only seeks authority to test in frequencies identified in Table 1, Exhibit #1. Most live air (systems that have radios connected to an antenna) radio emissions will be between low-power handsets and fixed stations within the BNR/NT facilities identified in Exhibit #1 - #9, no outdoor emission is from a source that will exceed 18.3 meters (60 feet) in elevation above mean ground level. Inside the 2221 Lakeside building complex no emission is from a source that will exceed 63.4 meters (208 feet) in elevation above mean ground level. The test

program is necessary for development of equipment that will be used for very low power wireless systems and future US PCS systems.

The test program will develop and demonstrate new generations of wireless systems, that will permit PCS operators to provide in building and pedestrian public wireless systems as well as full mobility wireless services complying to the US PCS frequencies. The BNR/NT program is projected to be a continuing program, that will continue for more than two years from the current date.

- Through these tests, Northern seeks to satisfy a number of objectives:
- 1) To establish relevant performance and design criteria for PCS systems utilizing the various technologies, including identifying and quantifying important variables such as: propagation losses associated with outdoor propagation, indoor and vehicle penetration; interference effects in a real-life environment; and the like;
 - 2) To validate and optimize RF and network-related performance of system hardware, including radio, transmission, switching, and inter-system networking elements of the PCS systems, as a necessary part of hardware and software development;
 - 3) To evaluate and validate performance of various handsets and subscriber equipment in real-world environments;
 - 4) To provide live demonstrations of PCS technologies to prospective operators, appropriate representatives of regulatory agencies, and others, to provide a forum for collecting user observations and developing a body of information to be used in further defining operator and user expectations for performance and features.

To provide the FCC with timely information regarding the location of new low power fixed stations BNR/NT proposes the following notice procedure:

For new indoor, fixed stations, inside BNR/NT buildings, BNR/NT will provide the building location information and the quantity of fixed stations in the next quarterly report filed with the FCC.

For new outdoor, fixed stations, BNR/NT will provide prior written notification, including the antenna location, height, frequency used, and if directional, the beam width and orientation, to the FCC before any new outdoor, fixed station is installed.

The BNR/NT Training Center conducts hands-on training for the employees of equipment purchasers. Operator employees need hands on training with the BNR/NT Wireless equipment to provide more efficient and effective service to their PCS customers. The Training Center uses closed Loop radio systems that do not connect to a radio antenna. The

Training Center, in Richardson, Texas, consists of three adjacent Northern Telecom Inc. buildings, all located on Sherman Street in Richardson. The Closed Loop radio systems within the buildings are adjusted to contain the radio signals within the building, and the signal strength outside the buildings is below a level that could create interference to the Cellular customers that would be traveling on Sherman Street, outside the buildings. BNR/NT trains more than 3000 students per year at the Training Center.

Within the BNR/NT buildings identified on Exhibit #2, BNR/NT has several closed loop laboratory radio systems. The laboratories use closed loop systems (where the radios are not connected to an antenna) for system validation, development, and verification.

Northern Telecom recognizes and accepts the requirement to coordinate its experimental operation with existing users including microwave users, and all future PCS operators, to avoid harmful interference. Northern Telecom will comply with this requirement during all of its experimental operations under the requested license, using conventional antennas, using the Smart Antenna, and closed loop systems that do not connect radios to an antenna. Northern's analysis and coordination activities will include appropriate consideration both of its fixed stations and of the mobile or portable subscriber equipment used in the experimental operations.

Exhibit #11
Antenna Location
BNR/NT, Richardson, TX

BNR/NT Site Co-ordinates

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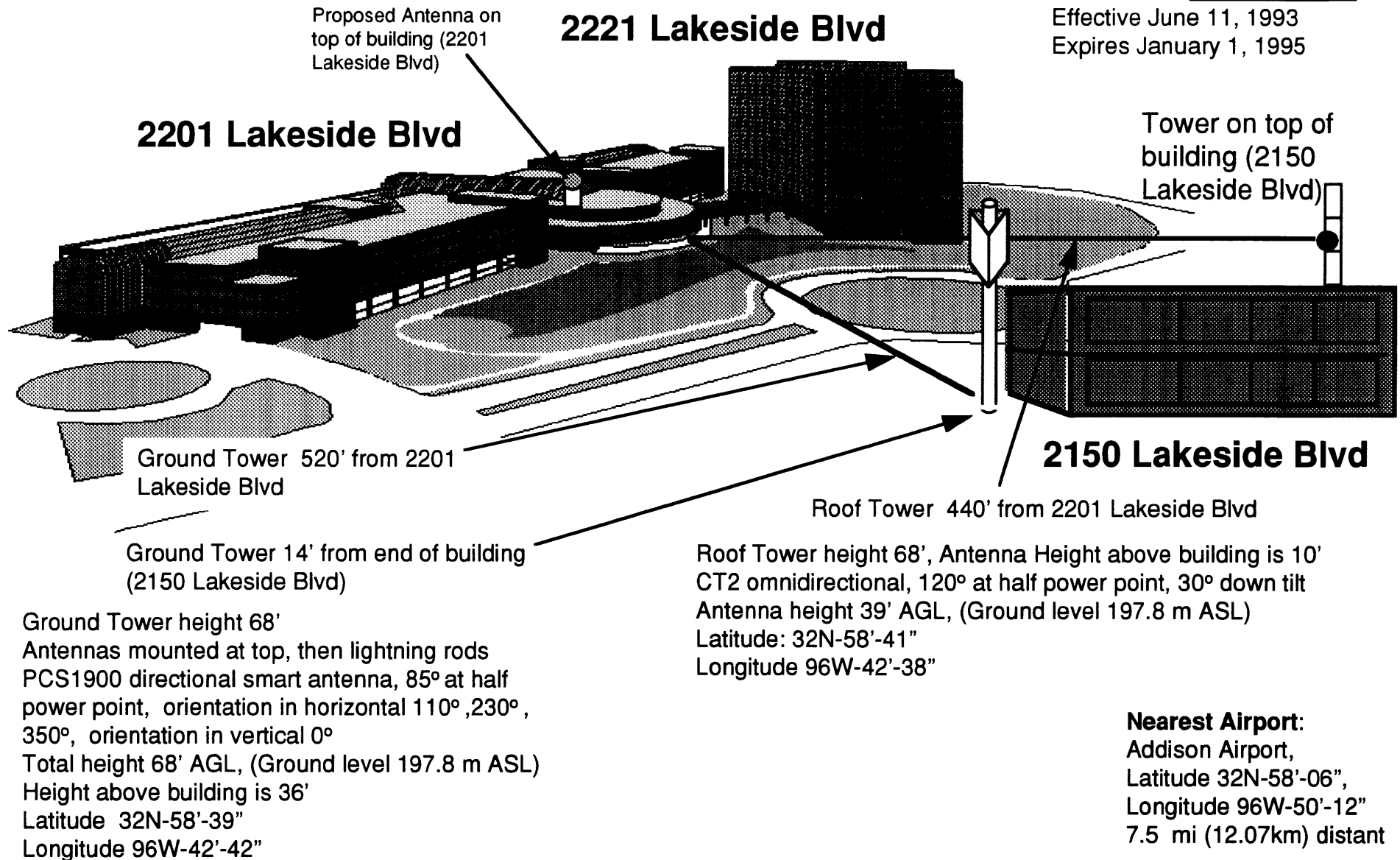


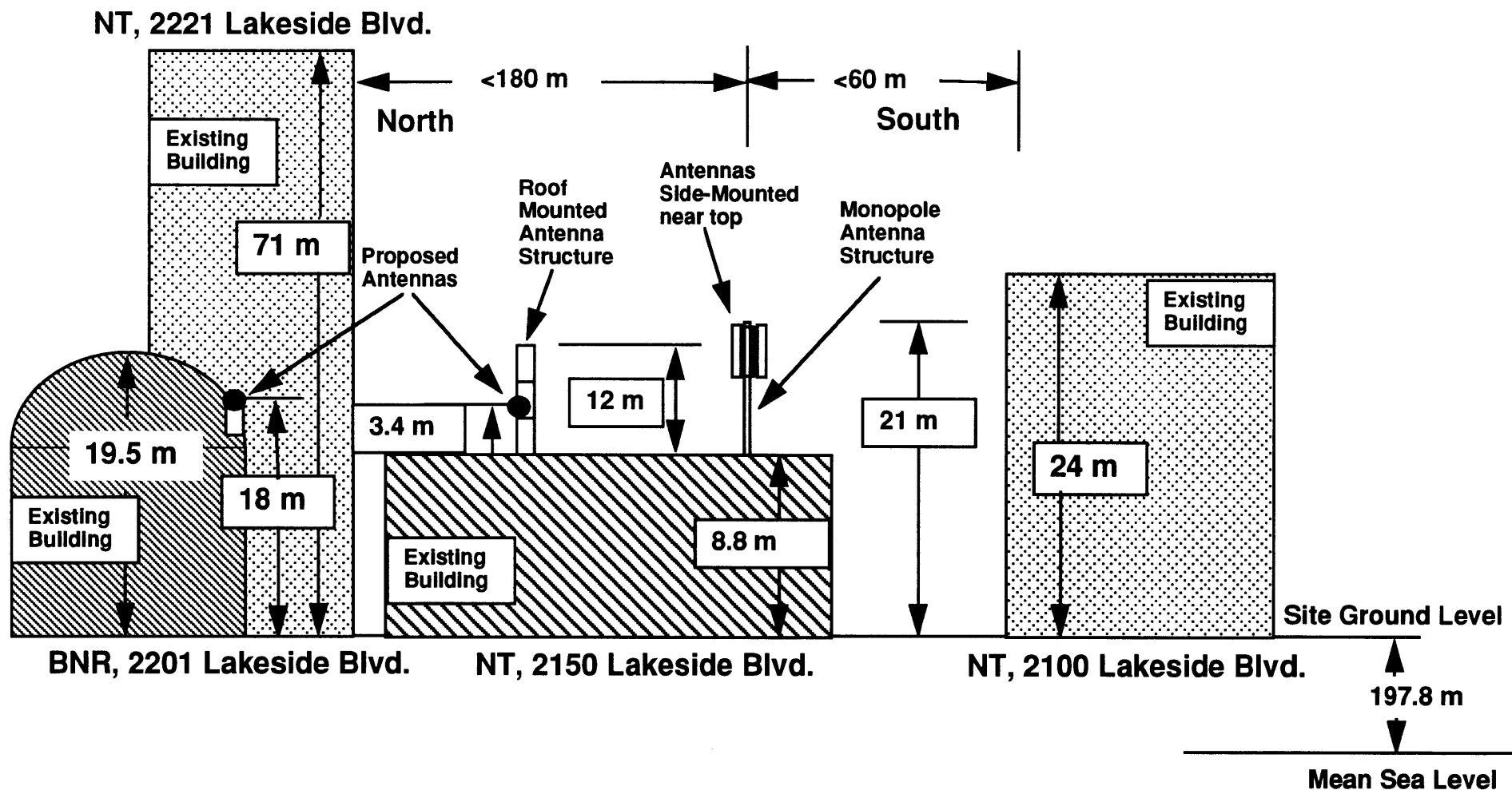
Exhibit #12

Antenna Description, Vertical Profile

BNR/NT, Richardson, TX

BNR/NT Site Co-ordinates

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Note: Drawing not to scale.

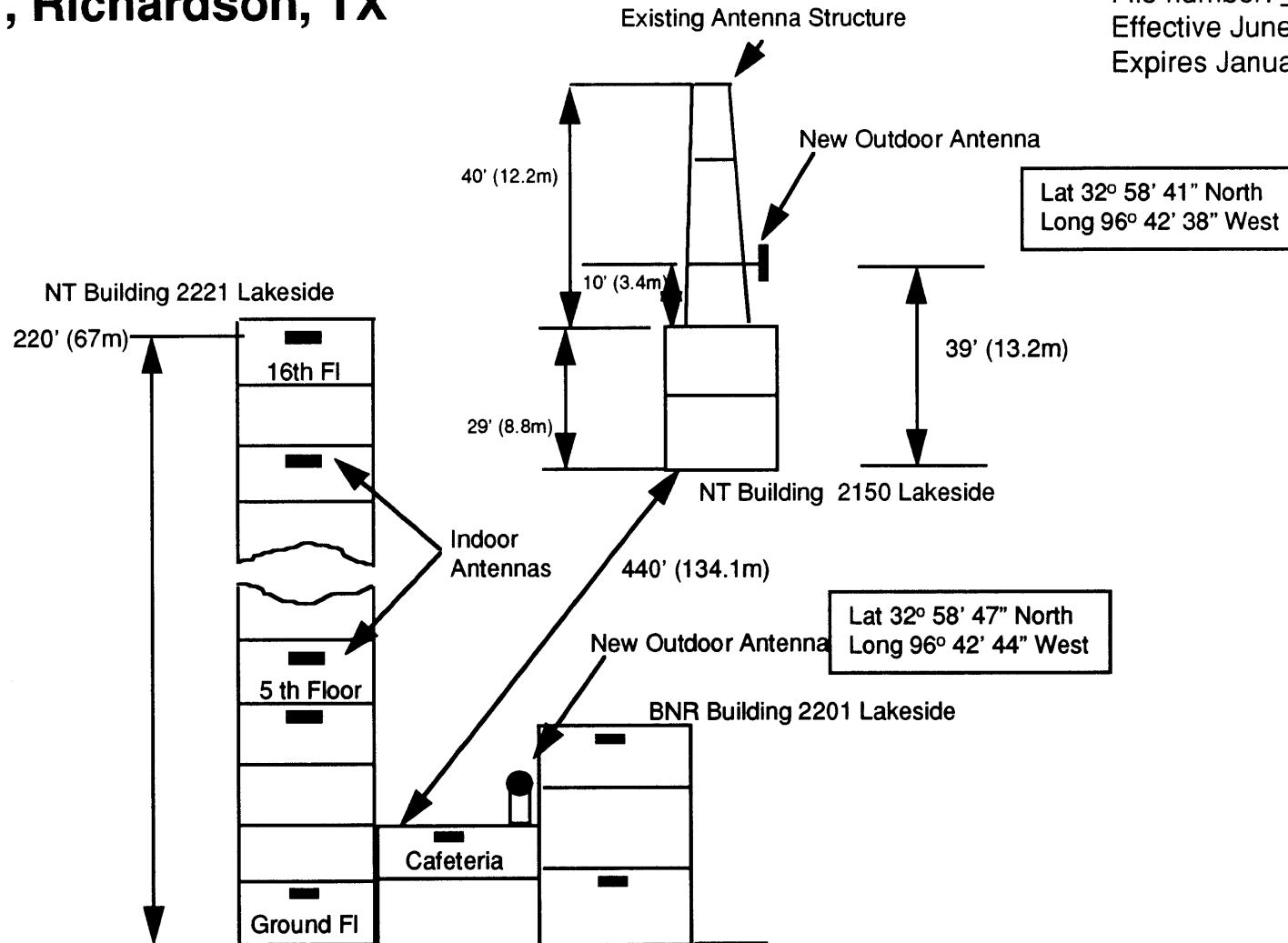
Showing locations of taller nearby existing buildings which shield proposed structure from aircraft

Exhibit #13

Antenna Description, Building Layout BNR/NT, Richardson, TX

BNR/NT Site Co-ordinates

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Note: Drawing not to scale.

Exhibit #14
Antenna Description,
Estimated RF Contours PCS 1900
BNR/NT, Richardson, TX

BNR/NT Site Co-ordinates

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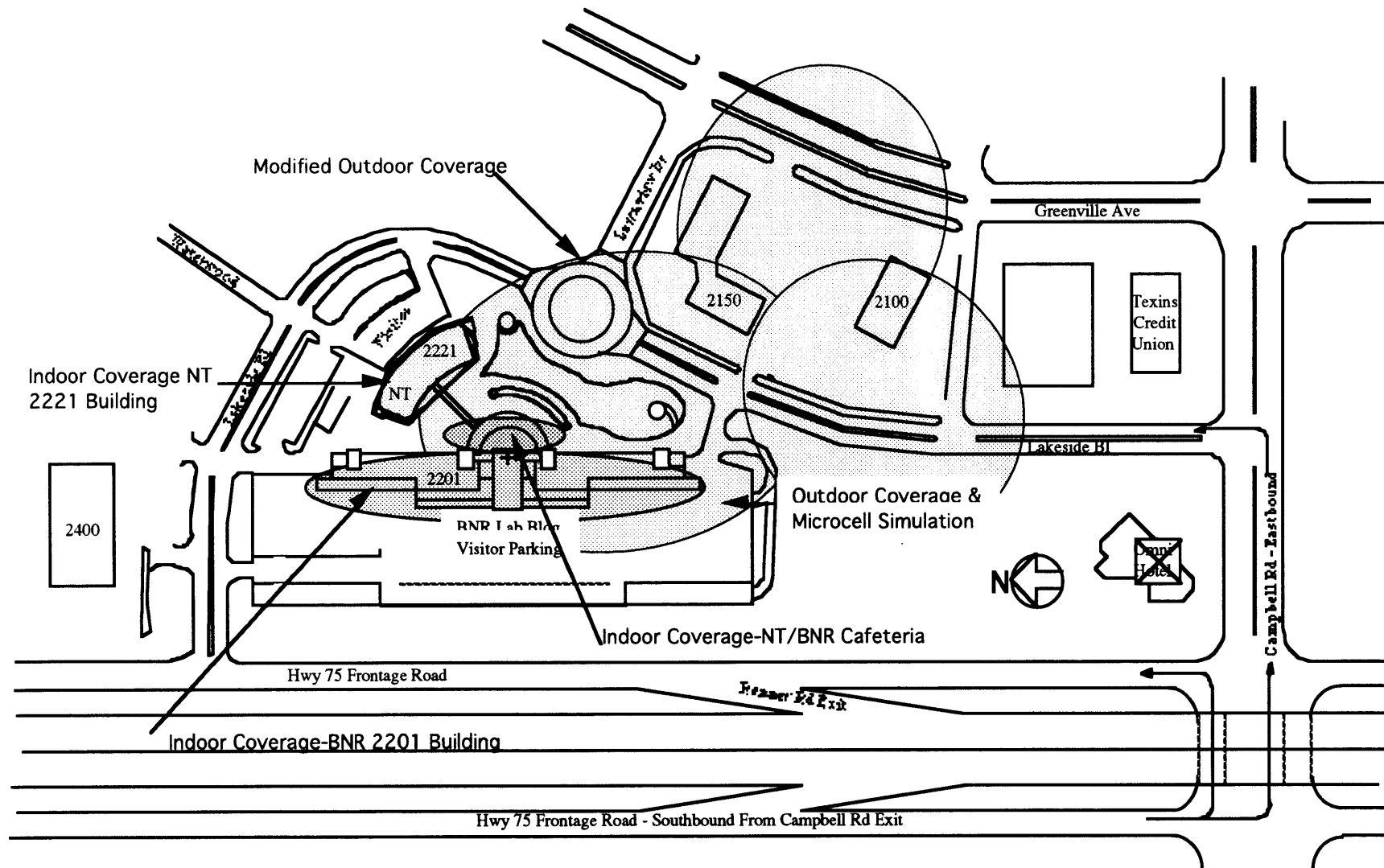


Exhibit #15

Antenna Description, Estimated RF Contours CT2 BNR/NT, Richardson, TX

BNR/NT Site Co-ordinates

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