Sussex County, NJ Radio System Coverage Analysis

March 9, 2007

RCC Consultants, Inc.
2425 Millcreek Court
Tallahassee, Florida 32308
Voice: (850) 224-4451
Fax: (850) 224-3059
www.rcc.com

TABLE OF CONTENTS

1. INTRODUCTION

Sussex County, New Jersey, (The County) through its Emergency Management Department has contracted with RCC Consultants, Inc. (RCC) for an analysis of dispatch radio system coverage. The County has six Public Safety Answering Points (PSAP) which take incoming emergency related calls and dispatch personnel based on the locality and the nature of the emergency. These PSAPs are distributed geographically across the county and generally serve the surrounding contiguous political subdivision. However, this is not a uniform arrangement. Several PSAPs provide services to entities which are distant and non-contiguous. This requires interconnection and co-ordination of communications facilities and equipment. It was desired to analyze the overall system and to depict the coverage in graphical format.

2. EXECUTIVE SUMMARY

RCC Consultants was engaged to provide an analysis of the coverage and propagation characteristics of various Public Safety radio transmitting sites within Sussex County, New Jersey. The stated objective of this analysis was to depict the potential coverage for a possible consolidation of sites. In order to develop this coverage, on-site surveys and individual interviews were conducted to collect technical information related to the systems involved.

It was desired to separate the various systems within the county into frequency bands to better depict the capabilities and facilities in use. Three standard frequency bands were used. The county operates systems in VHF Low Band, VHF High Band, and in UHF. Fire and EMS dispatch services are predominantly located in the VHF Low Band, although there is a small segment of those in the High Band. EMS providers make significant use of VHF High Band as a tactical band. Police systems are generally located in VHF High Band, with Vernon being the single user of UHF for dispatch purposes. Several centers utilize UHF as a link from site to site, but not for dispatch.

In addition to the operational data, searches were conducted on the FCC data base to collect licenses for the systems operating within the county. From the assembled data, computer models of the predicted coverage were developed. The results are depicted in maps with coverage zones and intensities for each dispatching facility within the three frequency ranges. A composite map for all facilities within the selected band is also provided. Additionally, the license and location data is presented in tabular format for reference.

3. OBJECTIVES AND GOALS

The objective of the survey was to determine the coverage from each individual dispatch unit and the aggregate coverage of all units combined. The intent was to segment the coverage into frequency bands and provide models and maps for each frequency band. The selected bands include VHF Low Band (30 to 50 MHz), VHF High Band (150 to 170 MHz), and UHF (450 to 512 MHz).

As several services operate in multiple bands, some coverage maps were developed across disciplines. Some Fire and EMS operations are lumped into a single group of coverage maps as they share common facilities or frequencies. Many sites are used for local communications only. These sites have not been included in the models. Only sites utilized for dispatch operations have been studied.

4. METHODS AND PROCESSES

Multiple agencies operate Public Safety radio dispatch systems within the county. Many are connected to some governmental unit, but a significant number are either loosely coupled (such as volunteer fire fighter / EMS units) or are commercial entities. In some instances, the radio system facilities are not owned or operated by the dispatching PSAP. This requires the dispatch agency to operate as a control station which is part of the radio system of the responding agency and under a license of the responding agency. In other instances, the PSAP is connected by a remote radio link or landline to the responder's local radio system and operates the equipment directly. The responder is the licensee of the system equipment and site under these conditions.

Information from a previous state sponsored survey was provided to RCC by The County. This material contained some radio transmitter site information, but was lacking in detail. There was no method to determine which transmitter site served any particular agency, and which site was used for dispatching It was determined that an on-site survey and data collection would be desirable to further define the system parameters before the modeling would begin. A representative of RCC traveled to Sussex County in late December 2006 to conduct these interviews and surveys.

Personal interviews were conducted with staff and management of the individual PSAPs as well as the Emergency Management staff. The responding service agencies were generally not interviewed. The intent was to develop an accurate physical description of the facilities and equipment for each PSAP and the local entities which each served. From this survey data, and research into the FCC license data base, it was anticipated that a robust model of the radio system could be developed.

During the course of the interviews, several scenarios developed. In some instances the staff members were well informed and able to provide a complete picture of their operations. Unfortunately, this was not always the case. A number of the sites visited either did not have the needed information or had key staff unavailable to discuss the radio system. Even those with well documented licenses frequently did not have a complete picture of the physical layout and interconnect of their system. Several inquiries to local communications service providers were made to partially supplement the needed information.

In an effort to better document the system, searches were performed on the FCC data base to locate the licenses and operating parameters of the various elements of the system. In these searches, several units were determined to have relocated facilities without updating their respective licenses. Other information on some site locations was determined to be in error on the licenses, with latitude or longitude being erroneously listed. Additionally, RCC was not able to locate any licenses for some facilities although the sites appear to have been in use for many years.

In addition to the physical and regulatory data, it was necessary to determine the inter-unit relationships of the multiple agencies and governmental units. Several emergency responders are independent, commercial or quasi-commercial service providers. Many of the fire services and EMS units are not politically or financially attached to their local government and some provide services to more than one locality. Some provide their own internal or tactical communications facilities, but depend on the county PSAPs to provide dispatch services and supporting radio station facilities. Due to the large number of diverse political entities, several responders were attached to more than one PSAP.

Development of a reliable dispatch map became more difficult than originally anticipated. RCC staff had to depend on review and consultation with local staff to validate the information collected.

5. MODELS AND PARAMETERS

RCC utilizes ComSite Design™, a robust radio modeling program to develop coverage maps for systems. This program uses industry recognized techniques and computational models to predict the radio signal intensity and reliability for a radio system or site. In addition, the model adjusts for land use and land coverage including forestation, building density, and other environmental conditions which may influence the propagation of radio signals. Coupled with geographic data depicting elevation and path factors, this produces a depiction of the area coverage a system should provide.

Statistical methods are used to insure a selected level of reliability for the prediction model. In the Public Safety field, reliability is generally set at 90% to 95% for the covered area. Other factors are evaluated to insure a selected level of voice quality or pager activation. The Telecommunications Industry Association in its standard TSB 88-B provides a standardized set of methodologies and techniques for measuring this "Delivered Audio Quality" or DAQ. Under this method, a DAQ of 3.0 on a scale of 5 is the minimum recommended for reliable public safety communications, and most systems are designed to produce a DAQ of 3.4. The Models used in the Sussex County radio system were adjusted to provide a DAQ of 3.0 at an area reliability of 90%. This gives the minimum acceptable levels of both parameters and maximizes the predicted coverage. This is not intended to bias the results. Rather, this indicates the "Best" coverage that the system should be expected to provide. Using the higher 95% at DAQ 3.4 will reduce the coverage of the system as depicted by the models produced for this report.

In evaluating pager performance, additional parameters must be considered. The pager is a less sensitive radio receiver than a portable or mobile unit owing to its reduced antenna size and its proximity to the wearer's body. The height of the pager above the ground is a significant issue in signal reception. Consideration must also be given to the environment into which the pager is carried. Building construction absorbs and blocks radio signals. Depending upon the density of the construction, significant losses may be incurred in residences, commercial buildings, and even in vehicles.

Paging receivers encompass two distinct levels of service. For activation, the unit must receive the radio signal and enough of the paging tone information to activate its internal decoder. This level is typically lower than the level to allow quality voice reception. Therefore, pagers are normally modeled at the higher signal levels required for voice and speech.

Mobile radios generally have the advantage of a fairly constant physical mounting, more efficient antennas, and more open geographic conditions than pagers. While signals are attenuated or even blocked by terrain, the mobile typically has a higher antenna position than a personal unit and may receive a stronger signal as a result.

Portable or hand held radios fall between the two extremes. The antennas are generally more sensitive than a pager, but are still less efficient than a properly installed mobile unit. Portable radios used for paging reception are generally more sensitive than a belt worn pager, but still suffer the same reduction of signals inside buildings.

Coverage maps typically depict two different coverage predictions. Transmission from the base or fixed site to the remote vehicular or personal unit is referred to as “Talk Out” Conversely; the transmission from the remote to the base is called “Talk In”. System designers strive to provide balanced coverage between talk out and talk in for either mobile or portable operation. Obviously, a system designed for balanced coverage using mobiles will show a significant reduction in coverage when a portable is used and a system structured for portables will require many more sites and higher signal levels. As the stated intent of the project was to identify the capabilities of the dispatch systems, the models are focused on outbound paging and dispatch to the various types of subscriber radios.

5.1 RADIO HARDWARE

The hardware used in the models represents typical commercial vehicular and pager units in use. Technical parameters for receiver sensitivity and other factors have been taken from manufacturer’s data sheets. Specific equipment in some installations may vary from the models, but the operating parameters and sensitivities should be very similar. Portable units have been modeled only as paging receivers. Fixed site information is extracted from the parameters on the various licenses and from other information collected during the interviews.

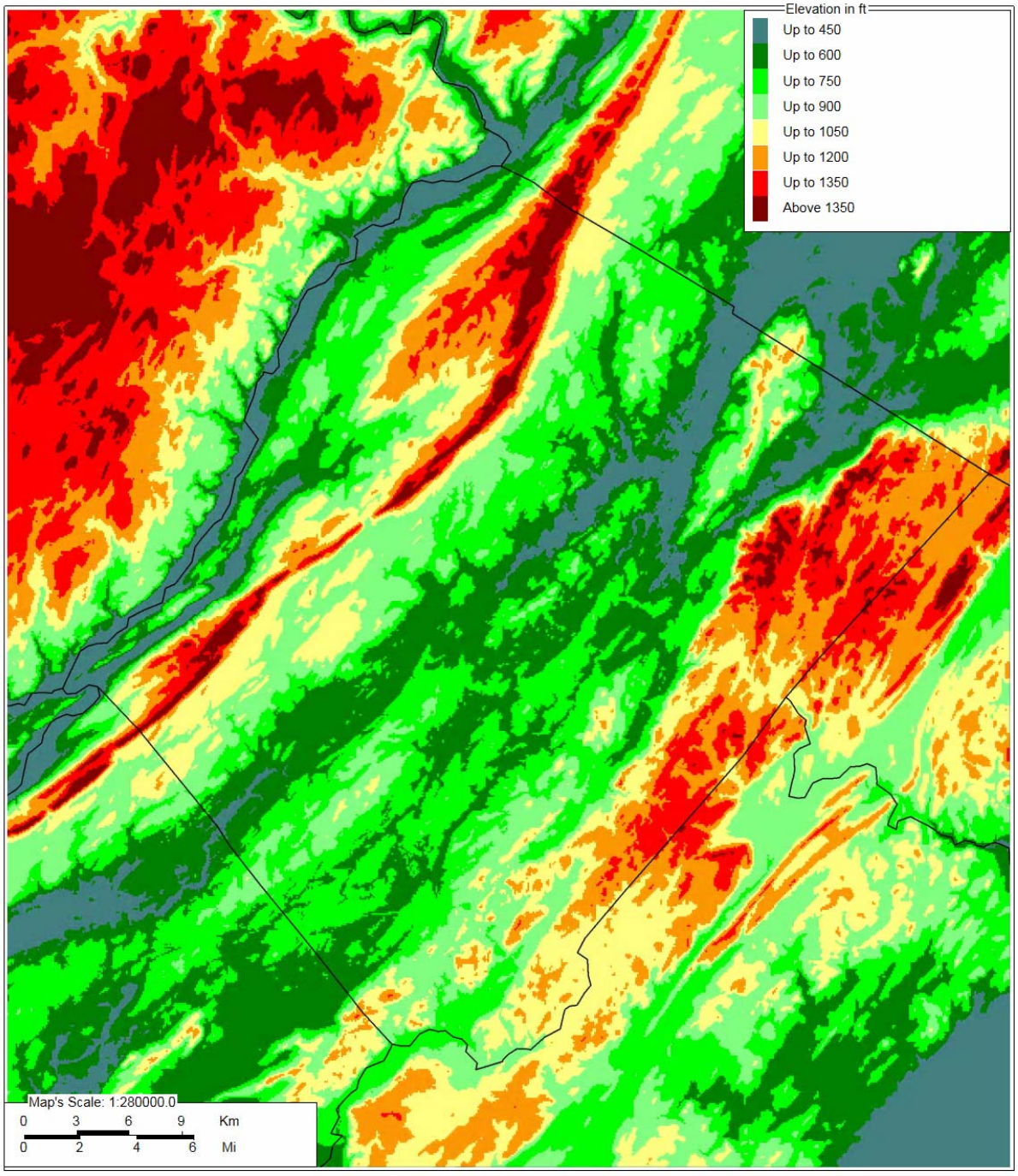
5.2 RADIO ANTENNAS

Radio antennas may be designed to concentrate certain portions of their radiated energy in selected directions. Such antennas are referred to as “Gain” or “Directional” antennas. The resulting signal power in the concentrated area is compared to a standard antenna with no concentration, and a figure calculated to reflect the power improvement. The resulting equivalent transmitted power with this enhancement is referred to as “Effective Radiated Power” or ERP. The FCC frequently considers this issue in licensing both fixed and mobile radio transmitters. All fixed sites have been modeled using the licensed ERP as the basis for the models. In general, all VHF Low Band antennas are non gain or “Unity” antennas. Their radiation patterns are essentially non directional and provide uniform radiation in all directions. VHF High Band antennas are frequently chosen to provide a small amount of signal enhancement. Where the type of antenna is known from survey or interview data, the effect of this gain is included in fixed station signal calculations. Unknown antennas were modeled as industry standard types and the ERP adjusted to meet the license conditions. As specific mobile antenna arrangements were not determined during the surveys, all High Band mobile antennas are modeled as unity gain. The additional improvement of a mobile unit gain antenna will generally not produce significant increases in the total coverage area, although it may provide better communications under marginal conditions.

Communications performance is significantly influenced by the effective height of the transmitting and receiving antennas. Locations atop mountains and high structures are chosen to enhance coverage and system capability. Sussex County has a unique ridge dominated geographical profile which is depicted in the Elevation Profile map that follows. This allows some sites to provide considerable radio coverage. Other antennas are mounted on radio towers or water tanks to achieve enhanced elevation. As previously noted in the section on Methods and Processes, some installations have been relocated from their licensed positions to higher structures without modifying the license. The models have been developed to reflect the actual locations and heights of the transmitting antennas where that information is known. All other sites have been modeled with the elevation and location parameters reflected in their respective FCC licenses.

RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 10:52:17 AM

Sussex County Land Elevations



5.3 RADIO NOISE

Radio noise can be significant factor in the performance of a communications system. This noise may be divided into two principal sources. Ambient atmospheric and static noise is considered in the radio parameters and filter specifications used by ComSite design™. However, man-made noise from computers, lighting, and other electrical sources cannot be predicted. Based on data from TSB-88B and the nature of the environment in Sussex County, a fixed amount of local electrical noise has been included in the model analysis. This noise is most prevalent in the Low Band systems and may vary significantly from location to location. The High Band systems will experience a lesser amount of impairment from these sources, and the UHF systems will typically be even less affected. . Atmospheric anomalies such as “skip” and “ducting” are not included in the analysis nor is co-channel interference from other nearby licensees.

5.4 SELECTION OF MODELS

To reflect the differences in the various parameters, multiple models have been developed for some situations. Low Band talk out has been modeled for both vehicular units with exterior mounted antennas and for pagers worn on the body. The High Band models represent coverage to a typical mobile unit with and without noise. The UHF coverage depicts only a single level for a mobile unit with external antenna and no noise.

The pager coverage maps are segmented into four signal strength categories to represent anticipated conditions. The coverage models depict these differences in color coded regions surrounding the transmit sites. The outer zones depict the maximum anticipated coverage in “open” or outdoor environments with no man-made noise. The first inner zone reflects the anticipated reduction of coverage as the noise is considered. The last two inner zones reflect expected coverage inside two different density structures with the noise included. As expected, the zones diminish in size as each signal reduction factor is included.

A table depicting the PSAPs, the services dispatched, and the various associated sites is provided below. This is a compilation of data from the multiple sources researched in the surveys. Call signs associated with the specific entity are representative and there may be others that are licensed to that site but are not listed. License data for all available sites is attached in Appendix A.

Andover								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Output	Max ERP
Goodale Road	EMS	KYU566	41-01-07.4N	74-45-05.6W	155.295	55m	30	19
Wallkill Ave.	EMS	WPNV232	41-09-15.3N	74-34-32.6W	46.1	33m	100	100
Goodale Road	Fire	KBY807	41-01-07.4N	74-45-05.6W	46.1	55m	110	90
Wallkill Ave.	Fire	WPNV232	41-09-15.3N	74-34-32.6W	46.1	33m	100	100
Goodale Road	Police	KYU566	41-01-07.4N	74-45-05.6W	155.01	55m	30	19
9 Orchard St.	Police	WPGI659	41-09-15.3N	74-34-32.6W	154.995	9m	40	40

Hardyston								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Power	Max ERP
Hamburg Mountain	EMS	WPCJ497	41-08-34.0N	74-32-23.0W	158.82	67m	45	12.8
Hamburg Mountain	Fire	KNEN690	41-08-34.0N	74-32-23.0W	46.1	67m	100	183.4
Hamburg Mountain	Police	WNDY962	41-08-34.0N	74-32-23.0W	158.79	67m	45	12.8

Hopatcong								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Power	Max ERP
Musconetcong Tower	EMS	WPMC486	40-56-28.4N	74-39-17.6W	155.295	13m	100	75
Hopatcong Mun. Bldg.	EMS	KUL917	40-56-02.4N	74-39-37.6W	45.12	27m	110	
Musconetcong Tower	Fire		40-56-28.4N	74-39-17.6W	46.1			
Musconetcong Tower	Police	WNKJ359	40-56-28.4N	74-39-17.6W	158.85	17m	30	25

Newton								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Output	Max ERP
Newton Hospital	EMS	N/A	41-03-27.6N	74-46-06.9W	155.295			
High Road Site	EMS	WNYW825	41-03-33.3N	74-45-59.6W	46.1	37m	110	110
Rt.206 Branchville	EMS	KLO302	41-10-21.3N	74-47-41.6W	47.5	46m	100	100
High Road Site	Fire	WNYW825	41-03-33.3N	74-45-59.6W	46.1	37m	110	110
High Road Site	Police	KEF288	41-03-33.3N	74-45-59.6W	155.49	37m	70	50

Sparta								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Power	Max ERP
Mill Creek Road	EMS	WPFQ901	41-03-30.3N	74-34-18.6W	155.325	24m	45	40
Morningstar Drive	EMS	WPNU751	41-01-37.4N	74-36-55.6W	46.1	30m	100	100
Morningstar Drive	Fire	WPNU751	41-01-37.4N	74-36-55.6W	46.1	30m	100	100
Sitlwater	Fire	WNRW518	41-03-00.3N	74-52-14.6W	46.1	18m	100	200
Morningstar Drive	Police	KZR693	41-01-37.4N	74-36-55.6W	155.64	30m	25	50

Vernon								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Power	Max ERP
Lake Panarama	EMS	WPVR575	41-11-04.3N	74-28-00.0W	155.55	21.2m	25	30
Mountain Trail	EMS	WNUK822	41-10-41.3N	74-29-48.6W	46.1	15m	100	100
Mondamin Road	EMS	WPMI513	41-11-04.3N	74-28-00.6W	47.5	18m	100	100
Mountain Trail	Fire	WNUK822	41-10-41.3N	74-29-48.6W	46.1	15m	100	100
Mountain Trail	Police	WQBZ928	41-10-41.3N	74-29-48.6W	478.5625	30m	90	221

Sussex Sherrif								
Site Id	Agency	Call Sign	Latitude	Longitude	Frequency	Att. Hgt.	Power	Max ERP
Sunrise Mountain	Sheriff	WNYT790	41-11-13.3N	74-45-59.6W	154.845	55m	70	140

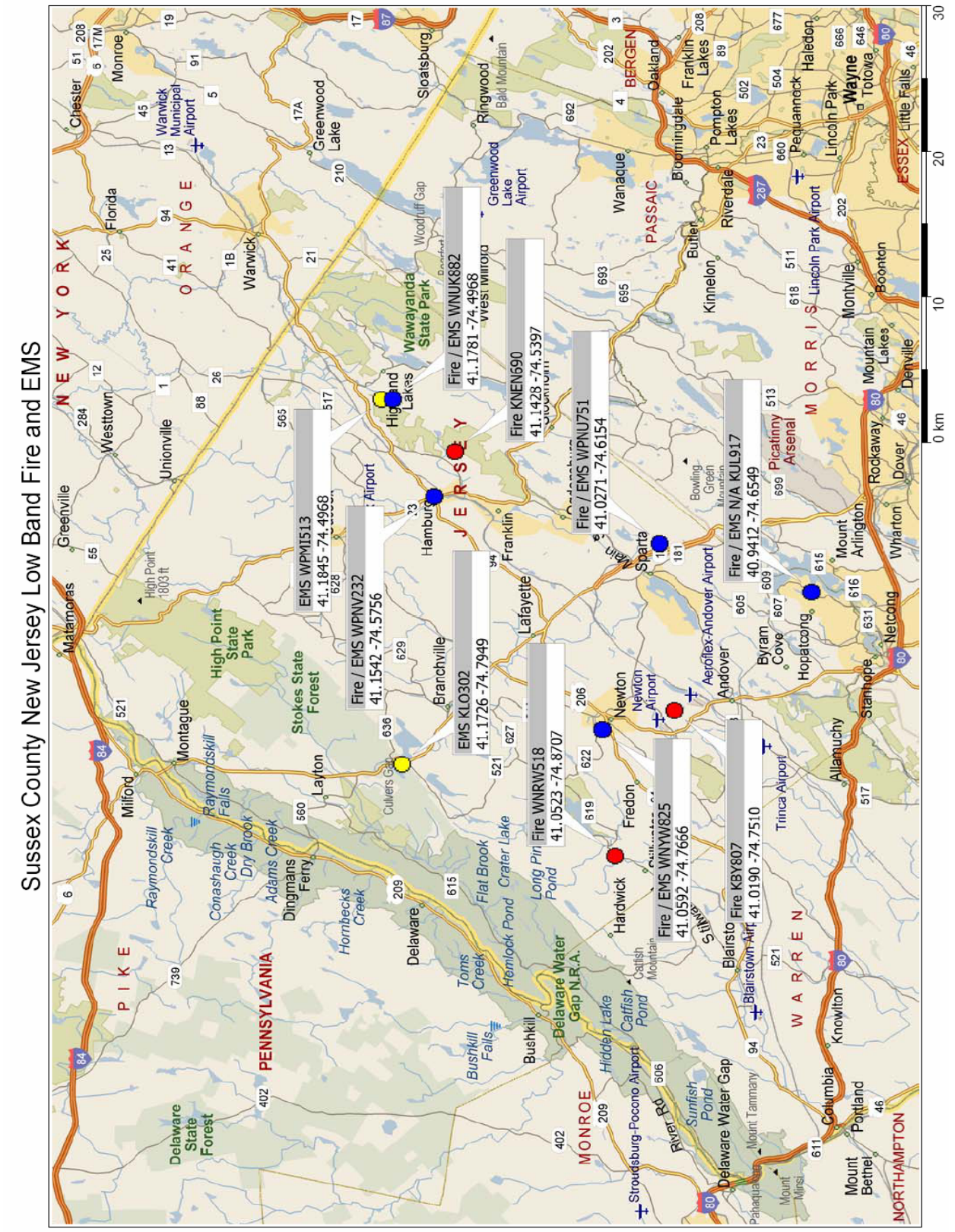
6. SITE LOCATIONS AND MAPS

Maps depicting the transmitting site locations for the various PSAPs have been developed. As previously noted, these maps represent only the dispatch transmission facilities and do not include any sites providing only local or tactical communications capabilities.

6.1 LOW BAND MAPS

The Low Band map depicts both Fire and EMS, with sites being depicted as providing only Fire or EMS, and those providing both services. The symbols are color coded to indicate whether the site is Fire only, EMS only or both. A table listing the data for the referenced map is provided. All sites are modeled using 46.1 MHZ as the transmit frequency. Other site specific frequencies have not been modeled as there is no significant difference in the coverage for small frequency differences.

Sussex County Low Band Fire Dispatch				
Site Name	**FCC License**	**Latitude**	**Longitude**	**Map Color**
Newton	WNYW825	41-03-33.3N	74-45-59.6W	
Sparta	WPNU751	41-01-37.4N	74-36-55.6W	
Stillwater	WNRW518	41-03-08.3N	74-52-14.6W	
Andover	KBY807	41-01-07.4N	74-45-05.6W	
Hamburg	WPNV232	41-09-15.3N	74-34-32.6W	
Vernon	WNUK882	41-10-41.3N	74-29-48.6W	
Hopatcong	N/A	40-56-28.4N	74-39-17.6W	
Hardyston	KNEN690	41-08-34.0N	74-32-23.0W	
Sussex County Low Band EMS Dispatch				
Site Name	**FCC License**	**Latitude**	**Longitude**	
16 Walkill Ave.	WPNV232	41-09-15.3N	74-34-32.6W	
Hopatcong Municipal Bldg	KUL917	40-56.28.4N	74-39-17.6W	
Rt. 206 Branchville	KLO302	41-10-21.3N	74-47-41.6W	
25 Morningstar Drive	WPNU751	41-01-37.4N	74-36-55.6W	
Mountain Trail	WNUK822	41-10-41.3N	74-29-48.6W	
Mondamin Road	WPMI513	41-11-04.3N	74-28-00.6W	
High Road Site	WNYW825	41-03-33.3N	74-45-59.6W	


Sussex County New Jersey Low Band Fire and EMS
EMS WPMI513
41.1845 -74.4968
Fire / EMS WPNV232
41.1542 -74.5756
EMS KLO302
41.1726 -74.7949
Fire WNRW518
41.0523 -74.8707
Fire / EMS WNYW825
41.0592 -74.7666
Fire KBY807
41.0190 -74.7510
Fire / EMS WNUK882
41.1781 -74.4968
Fire KNEN690
41.1428 -74.5397
Fire / EMS WPNU751
41.0271 -74.6154
Fire / EMS N/A KUL917
40.9412 -74.6549
NEW YORK
PENNSYLVANIA
NEW JERSEY
SUSSEX
WARREN
MORRIS
PASSAIC
BERGEN
ESSEX
ORANGE
PIKE
MONROE
NORTHAMPTON
Delaware Water Gap N.R.A.
Wawayanda State Park
High Point State Park
Stokes State Forest
Delaware State Forest
Aeroflex-Andover Airport
Picatinny Arsenal
Trinca Airport
Blairstown Airport
Greenwood Lake Airport
Warwick Municipal Airport
Newton Airport
Stroudsburg-Pocono Airport
Lincoln Park Airport
0 km
10
20
30

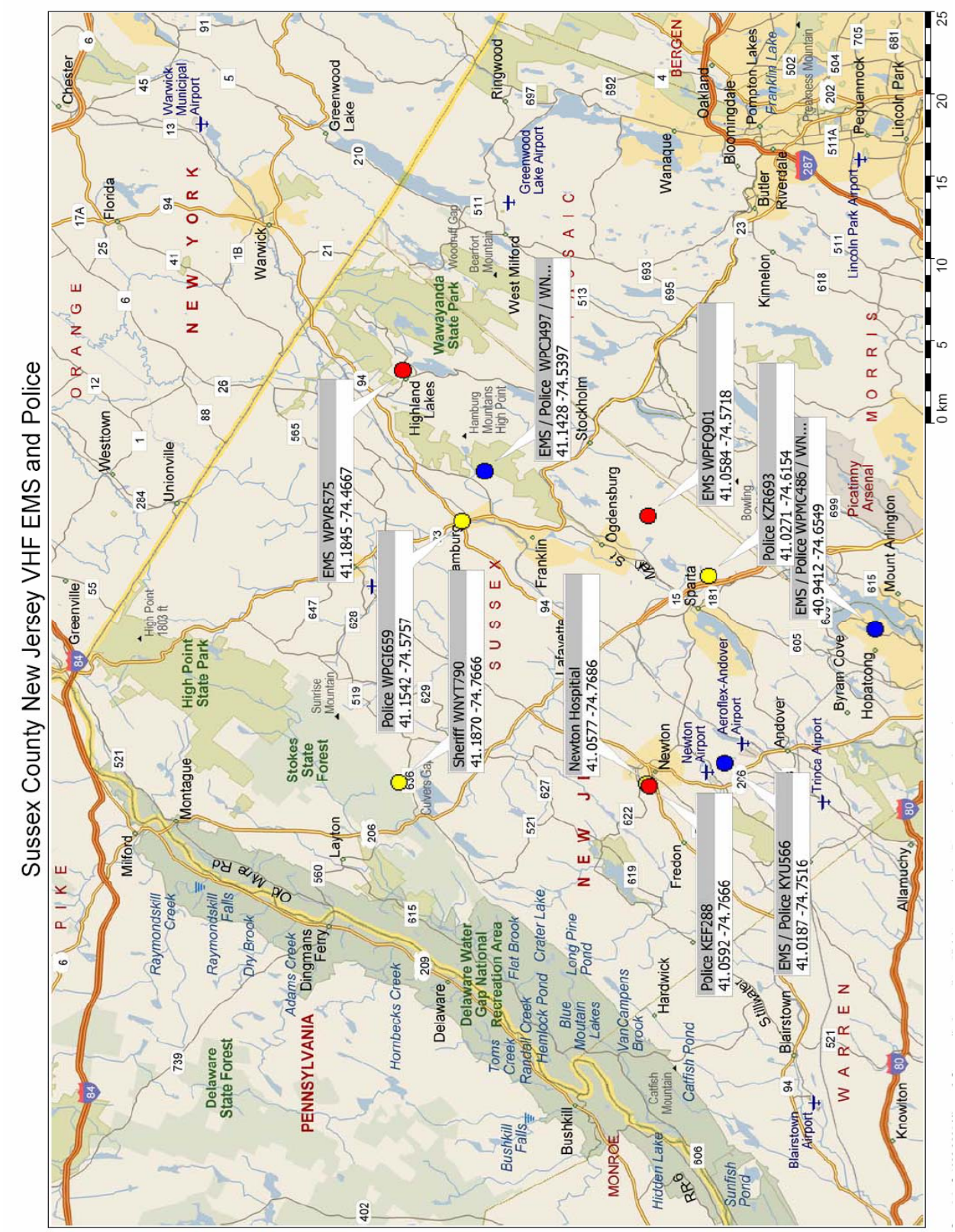
6.2 HIGH BAND MAPS

The high Band map depicts both Police and EMS services. Again, different symbols have been used to show the services dispatched from a given site. The sites are color coded as noted above and listed in the table accompanying the map. Sites with dual dispatching are noted. All high band sites are modeled at a frequency of 155 MHz for the same reason noted above.

Sussex County VHF Police Agencies				
Site Name	**FCC License**	**Latitude**	**Longitude**	**Map Color**
Goodale Road	KYU566	41-01-07.4N	74-45-05.6W	
9 Orchard Street	WPGI659	41-09-15.3N	74-34-32.6W	
Hamburg Mountain	WNDY962	41-08-34.0N	74-32-23.0W	
Musconetcong Tower	WNKJ359	40-56-28.4N	74-39-17.6W	
High Road Site	KEF288	41-03-33.3N	74-45-59.6W	
25 Morningstar Drive	KZR693	41-01-37.4N	74-36-55.6W	
Sunrise Mountain	WNYT790	41-11-13.3N	74-45-59.6W	
Sussex County VHF EMS Dispatch				
Site Name	**FCC License**	**Latitude**	**Longitude**	
Goodale Road	KYU566	41-01-07.4N	74-45-05.6W	
Hamburg Mountain	WPCJ497	41-08-34.0N	74-32-23.0W	
Musconetcong Tower	WPMC486	40-56-28.4N	74-39-17.6W	
Newton Hospital	N/A	41-03-27.6N	74-46-06.9W	
11 Mill Creek Road	WPFQ901	41-03-30.3N	74-34-18.6W	
Lake Panarama	WPVR575	41-11-04.3N	74-28-00.0W	

6.3 UHF MAPS

There is only a single UHF Police dispatch site in Vernon at this time, and no specific location map was developed for this service. The coverage map is included in the appropriate section of this report.


Sussex County New Jersey VHF EMS and Police
EMS WPVR575
41.1845 -74.4667
Police WPGI659
41.1542 -74.5757
Sheriff WNYT790
41.1870 -74.7666
Newton Hospital
41.0577 -74.7686
EMS / Police WPCJ497 / WN...
41.1428 -74.5397
EMS WPFQ901
41.0584 -74.5718
Police KZR693
41.0271 -74.6154
EMS / Police WPMC486 / WN...
40.9412 -74.6549
Police KEF288
41.0592 -74.7666
EMS / Police KYU566
41.0187 -74.7516
SUSSEX
NEW JERSEY
NEW YORK
PENNSYLVANIA
ORANGE
MORRIS
WARREN
MONROE
BERGEN
PIKE
Newton
Sparta
Franklin
Ogdensburg
Stockholm
Andover
Hardwick
Fredon
Blairstown
Knowlton
Allamuchy
Hopatcong
Byram Cove
Mount Arlington
Picatinny Arsenal
Lincoln Park
Pequannock
Kinnelon
Butler
Riverdale
Pompton Lakes
Bloomingdale
Oakland
Wanaque
Ringwood
West Milford
Greenwood Lake
Warwick
Greenwood Lake
Florida
Chester
Westtown
Unionville
Milford
Montague
Layton
Delaware
Bushkill
Highland Lakes
Wawayanda State Park
High Point State Park
Stokes State Forest
Delaware State Forest
Delaware Water Gap National Recreation Area
Blue Mountain Lakes
Catfish Pond
Sunfish Pond
Hidden Lake
Lake Aeroflex-Andover Airport
Newton Airport
Trinca Airport
Warwick Municipal Airport
Blairstown Airport
Lincoln Park Airport
0 km
5
10
15
20
25

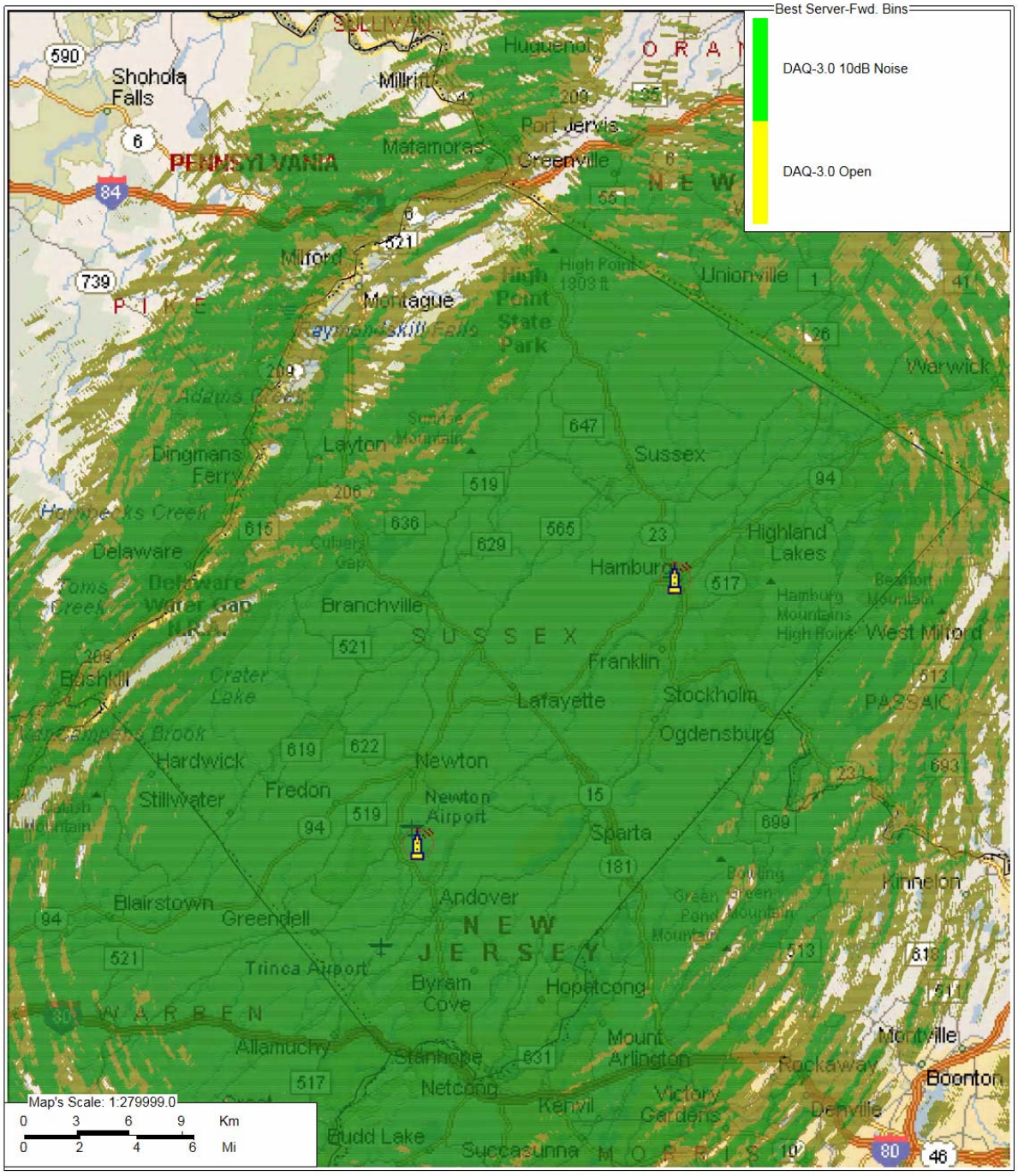
7. COVERAGE MAPS

The coverage predicted for all sites is presented below. Each dispatching agency on each frequency band is modeled and presented as a standalone map, and then all sites are provided in a consolidated map for each band. On the low band maps, both mobile coverage and paging performance are depicted. Again, the low band paging maps represent multiple environmental models with varying coverage. The outer area is the anticipated coverage in an open, unobstructed space, while the inner is the coverage inside a dense building with additional man-made noise.

A slight color variation exists between the signal strength key on each map and the actual reproduction of that color when superimposed on the map background.

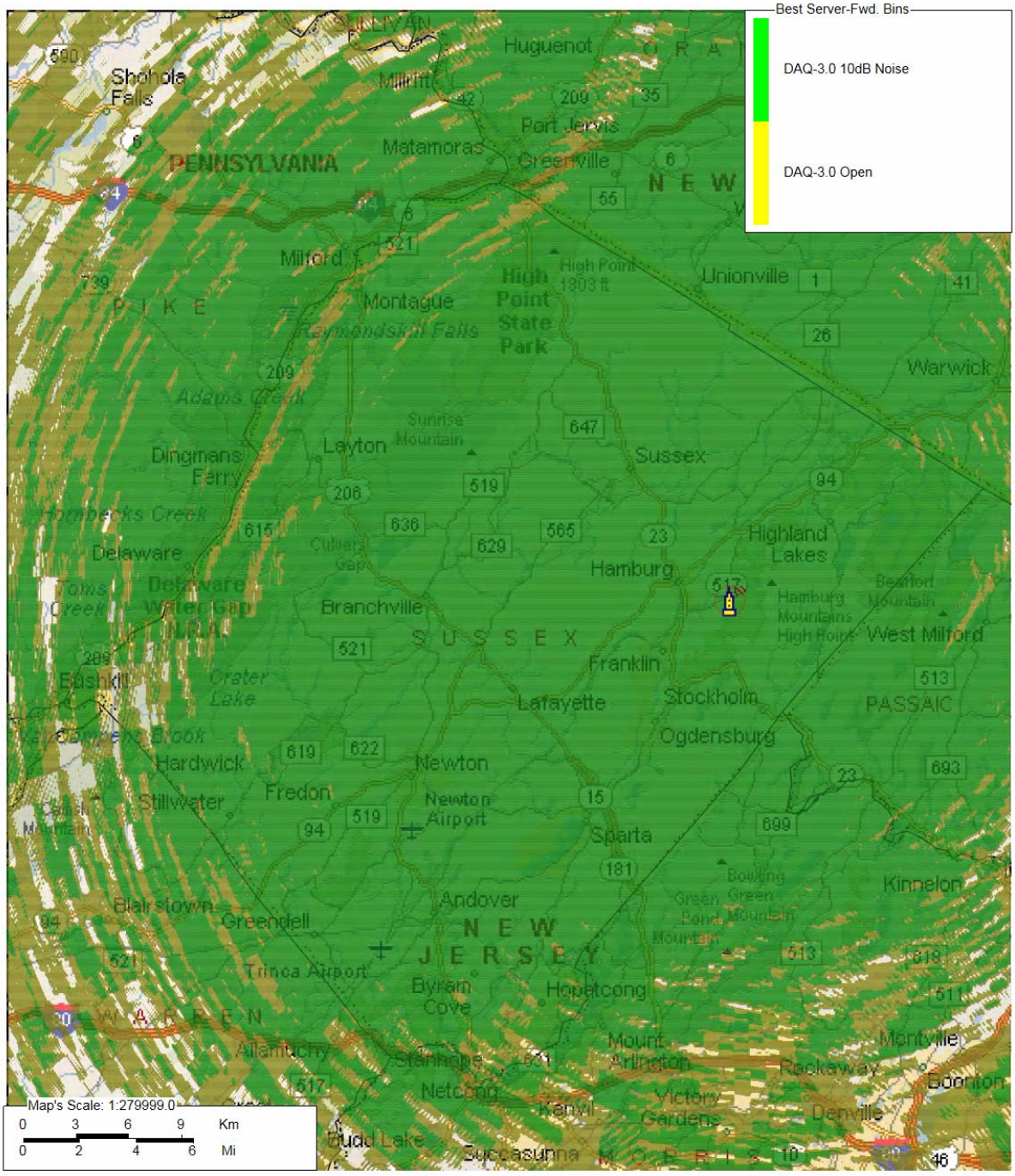
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:47:49 PM

Andover PSAP Low Band Mobile



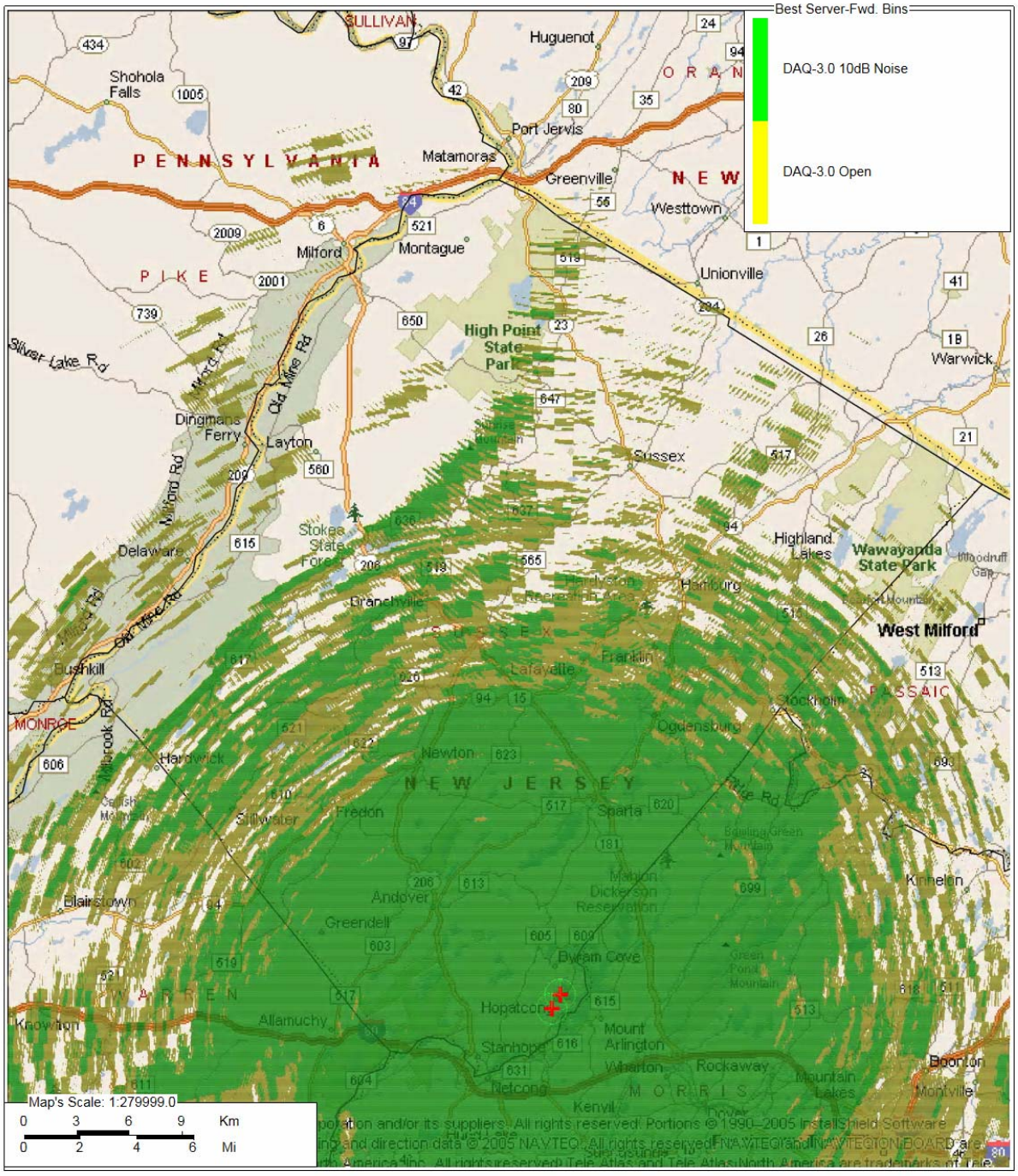
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:03:06 PM

Hardyston PSAP Low Band Mobile



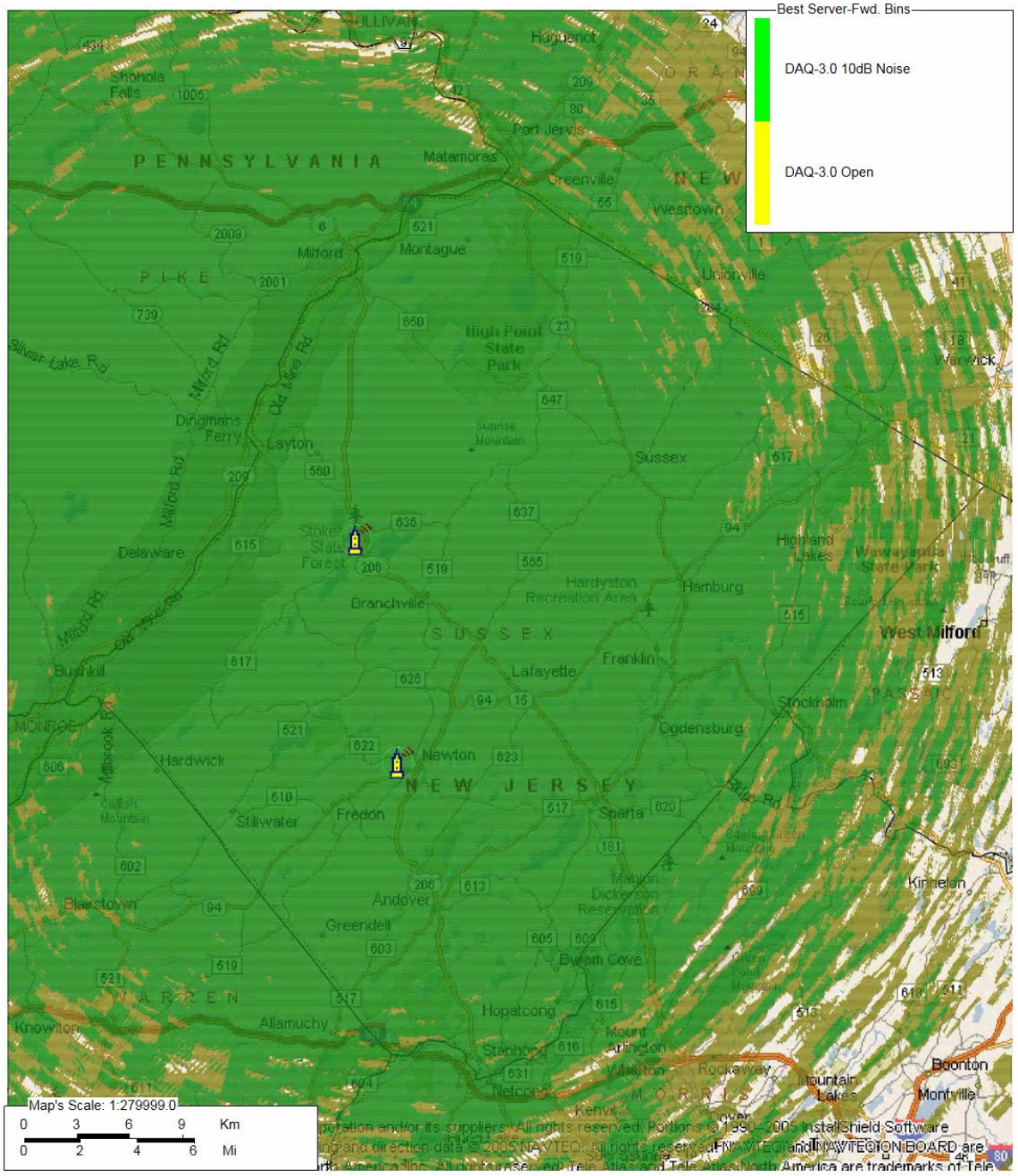
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 3:42:52 PM

Hopatcong PSAP Low Band Mobile



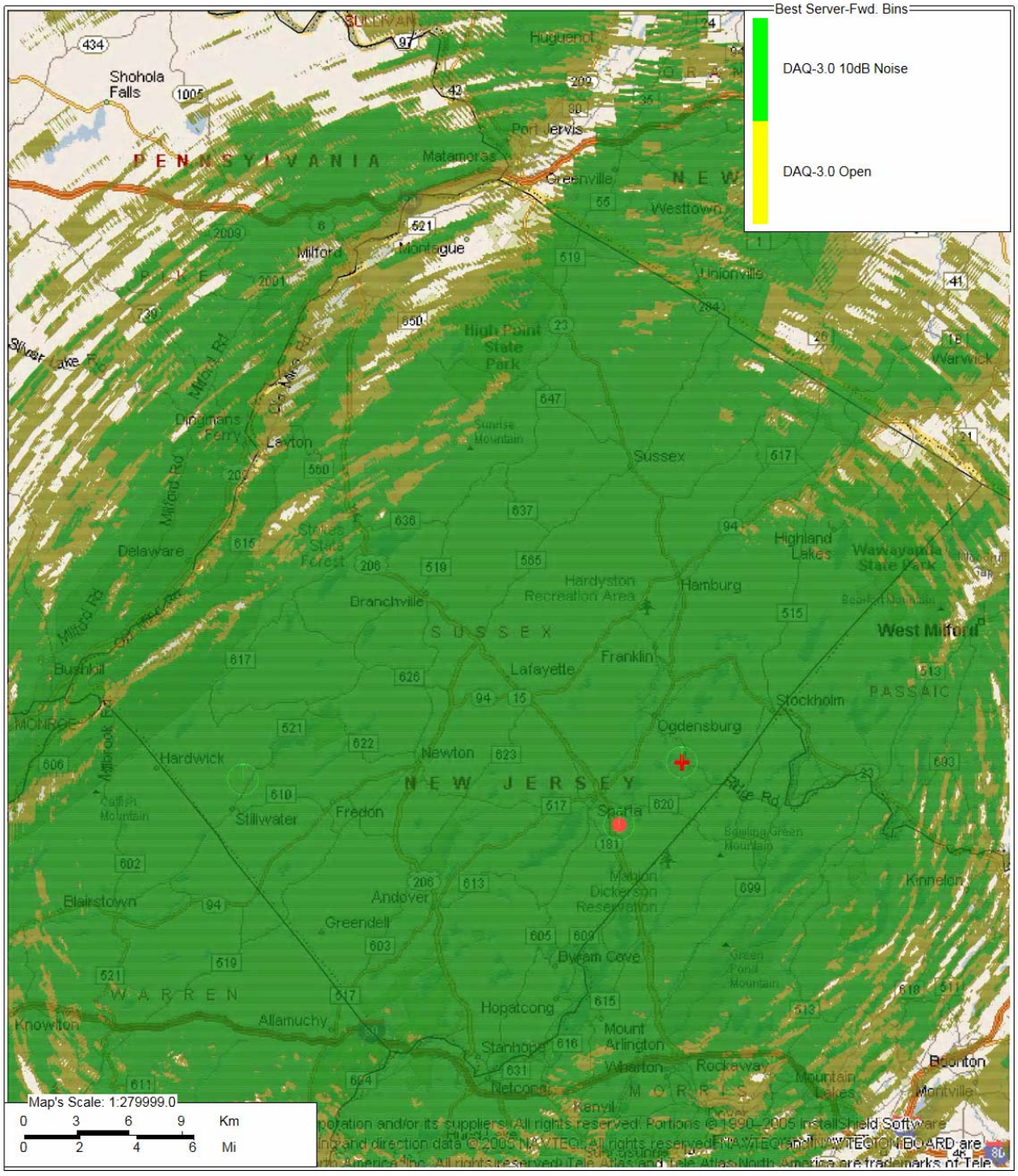
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:58:46 PM

Newton PSAP Low Band Mobile



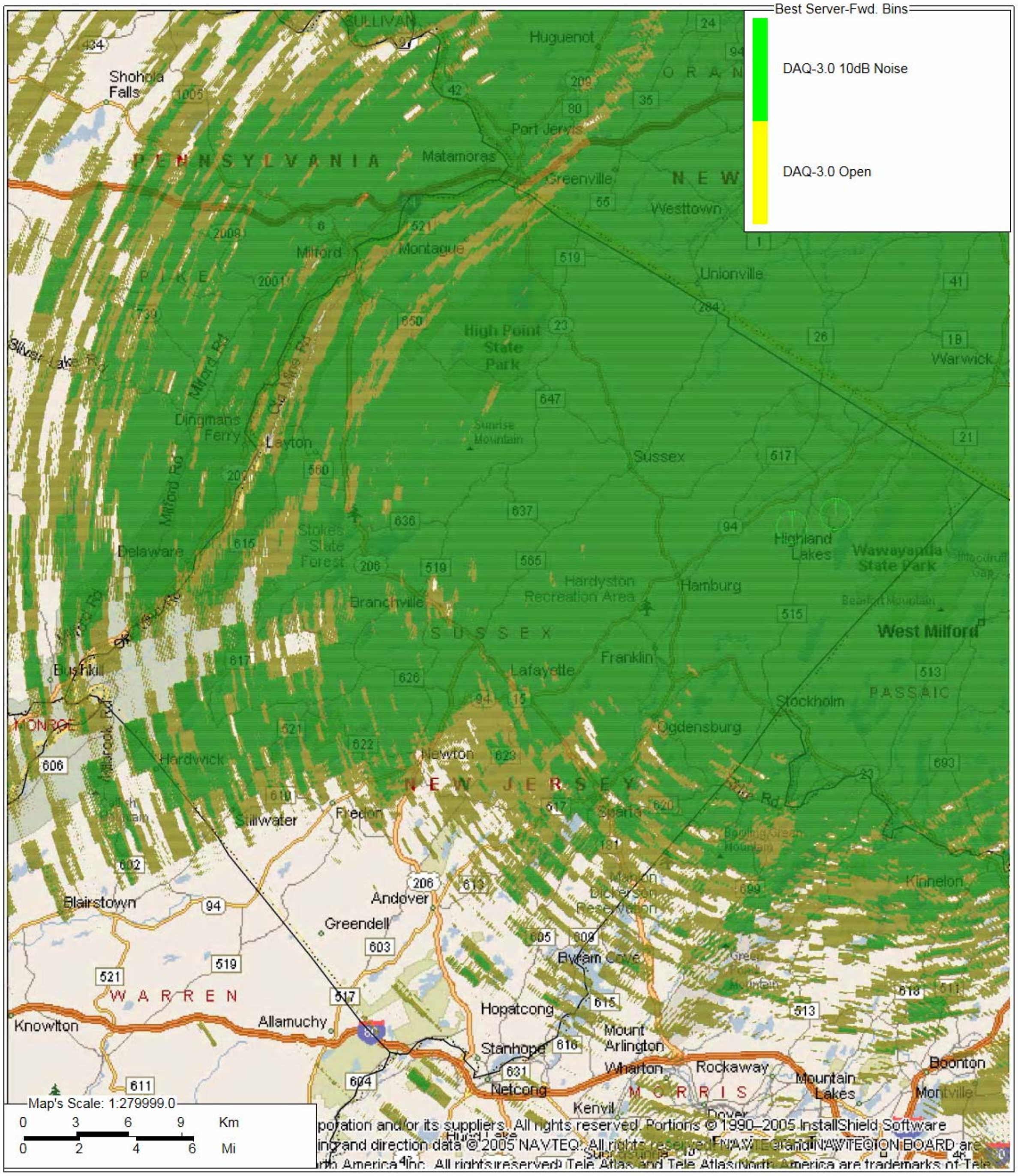
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:52:16 PM

Sparta PSAP Low Band Mobile



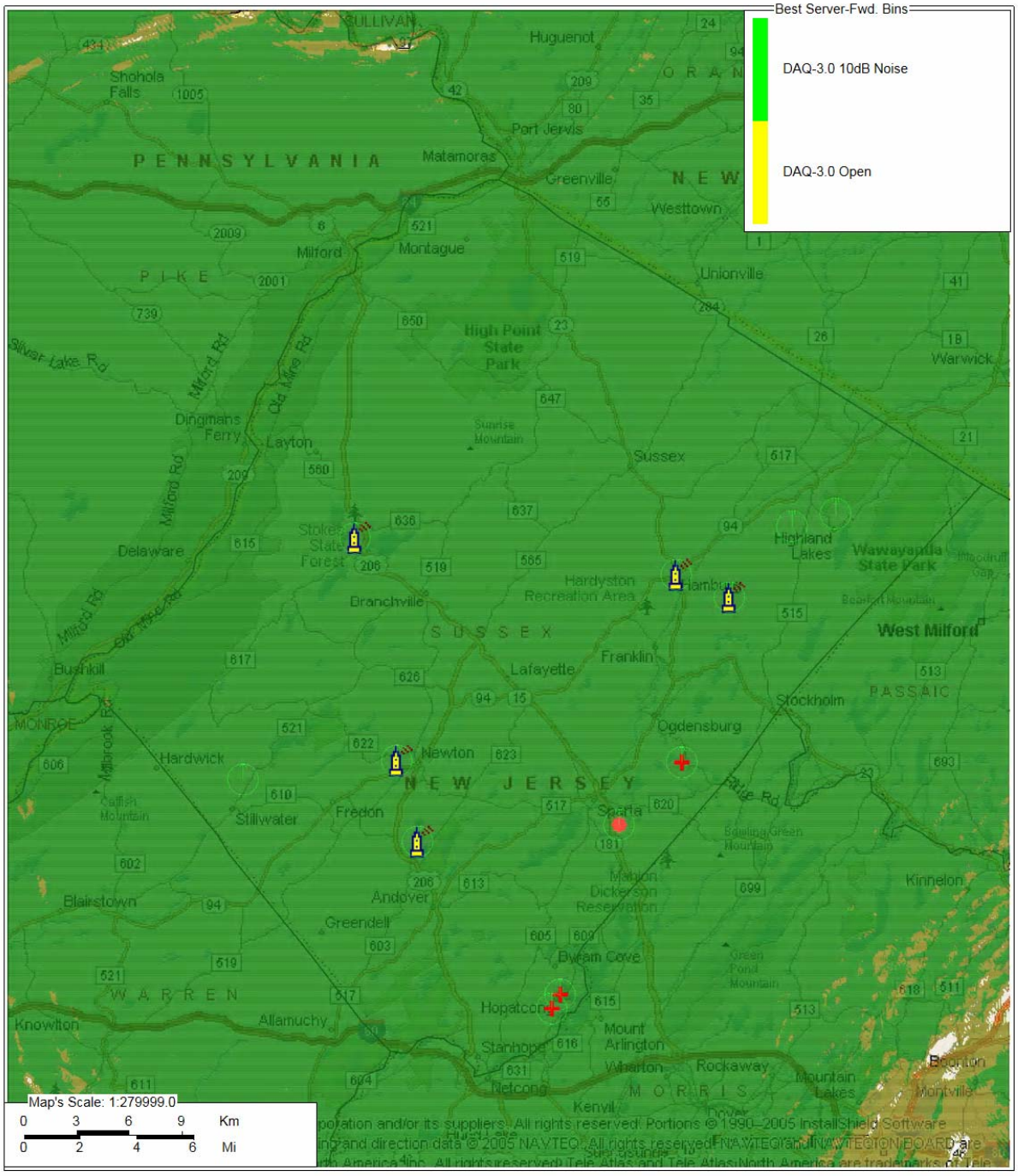
RCC ComsiteDesign Map **Page 1 of 1** **3/7/2007 1:44:03 PM**

Vernon PSAP Low Band Mobile



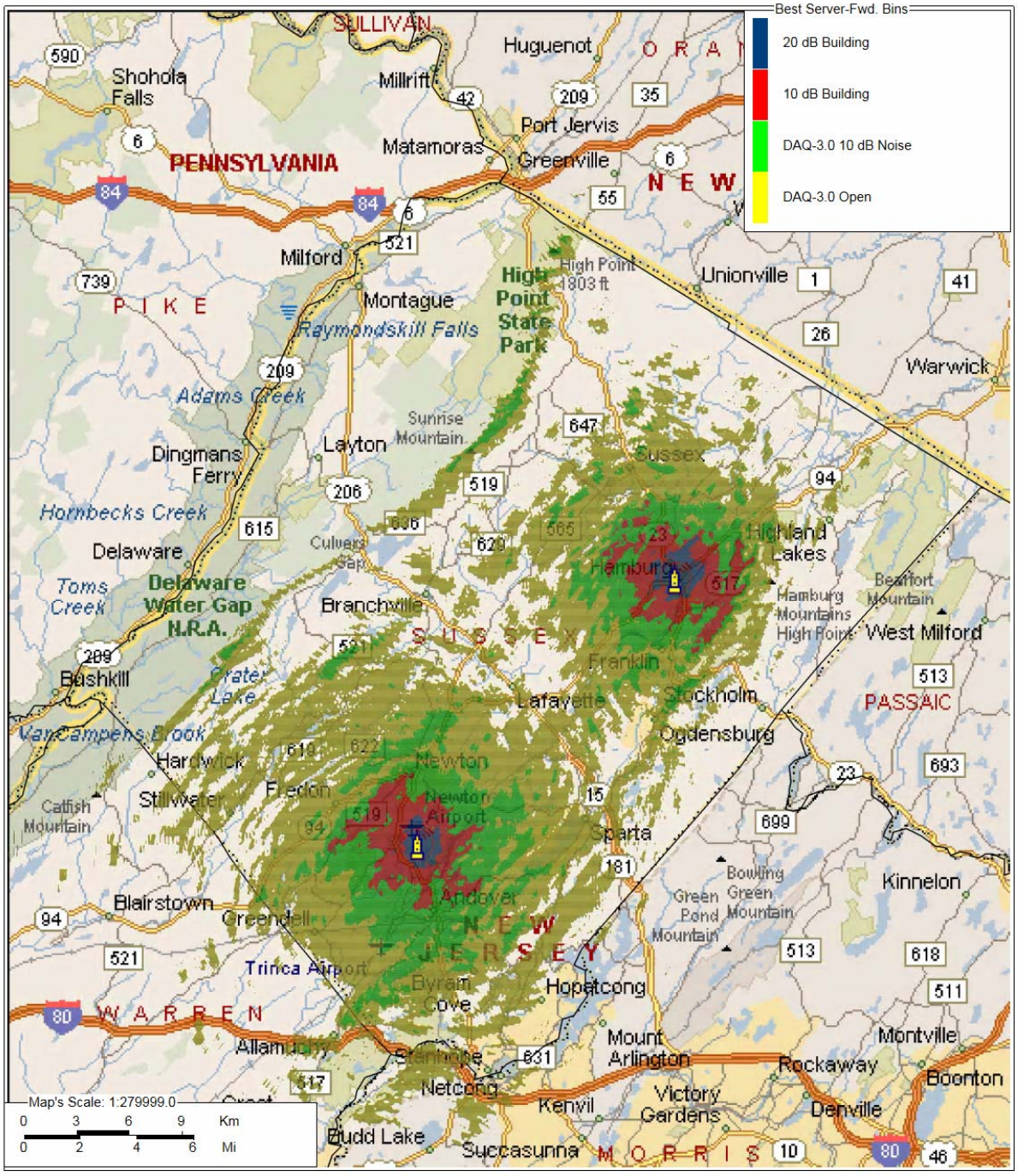
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:36:29 PM

Composite Low Band Mobile



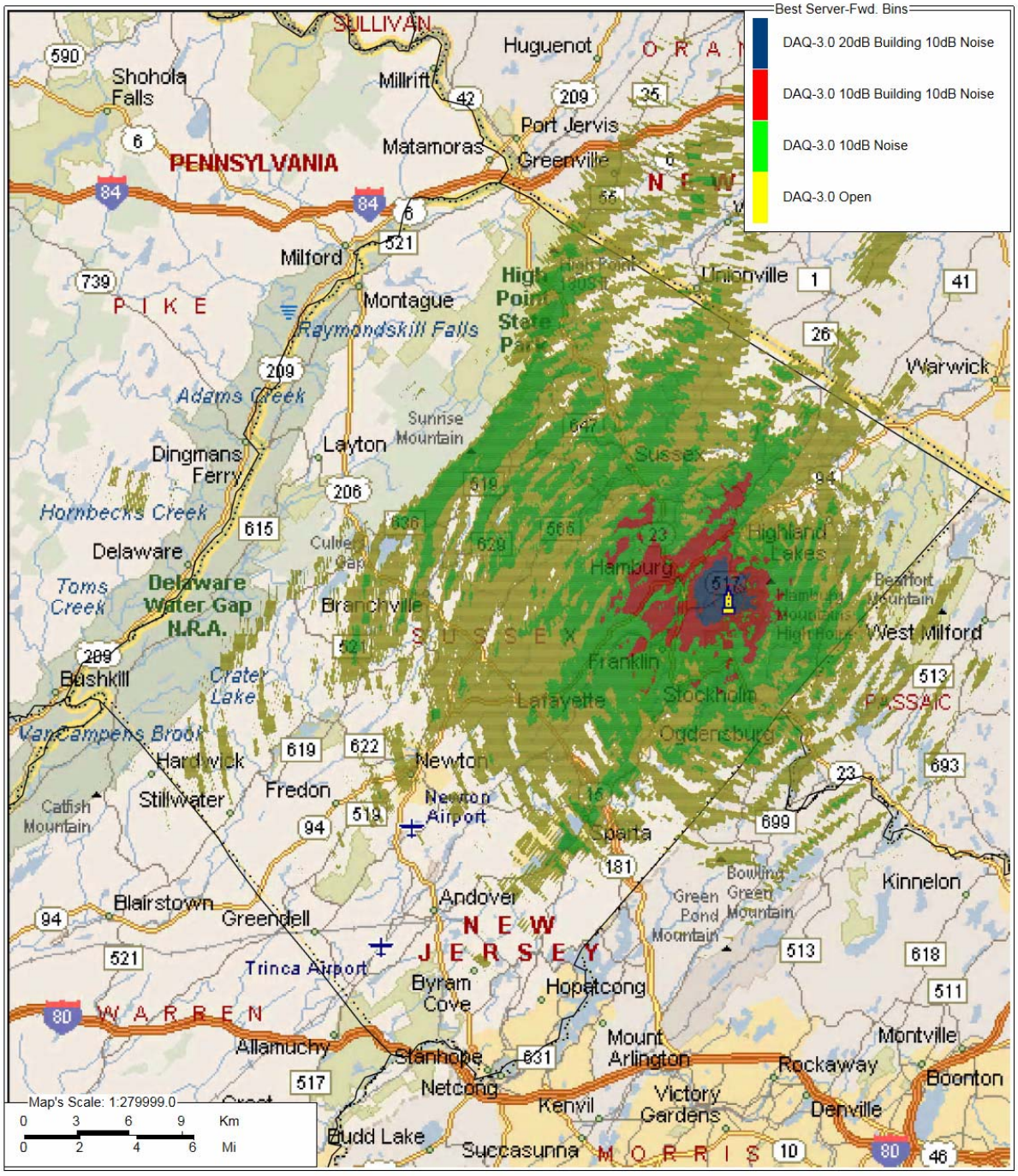
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:42:09 PM

Andover PSAP Low Band Pager



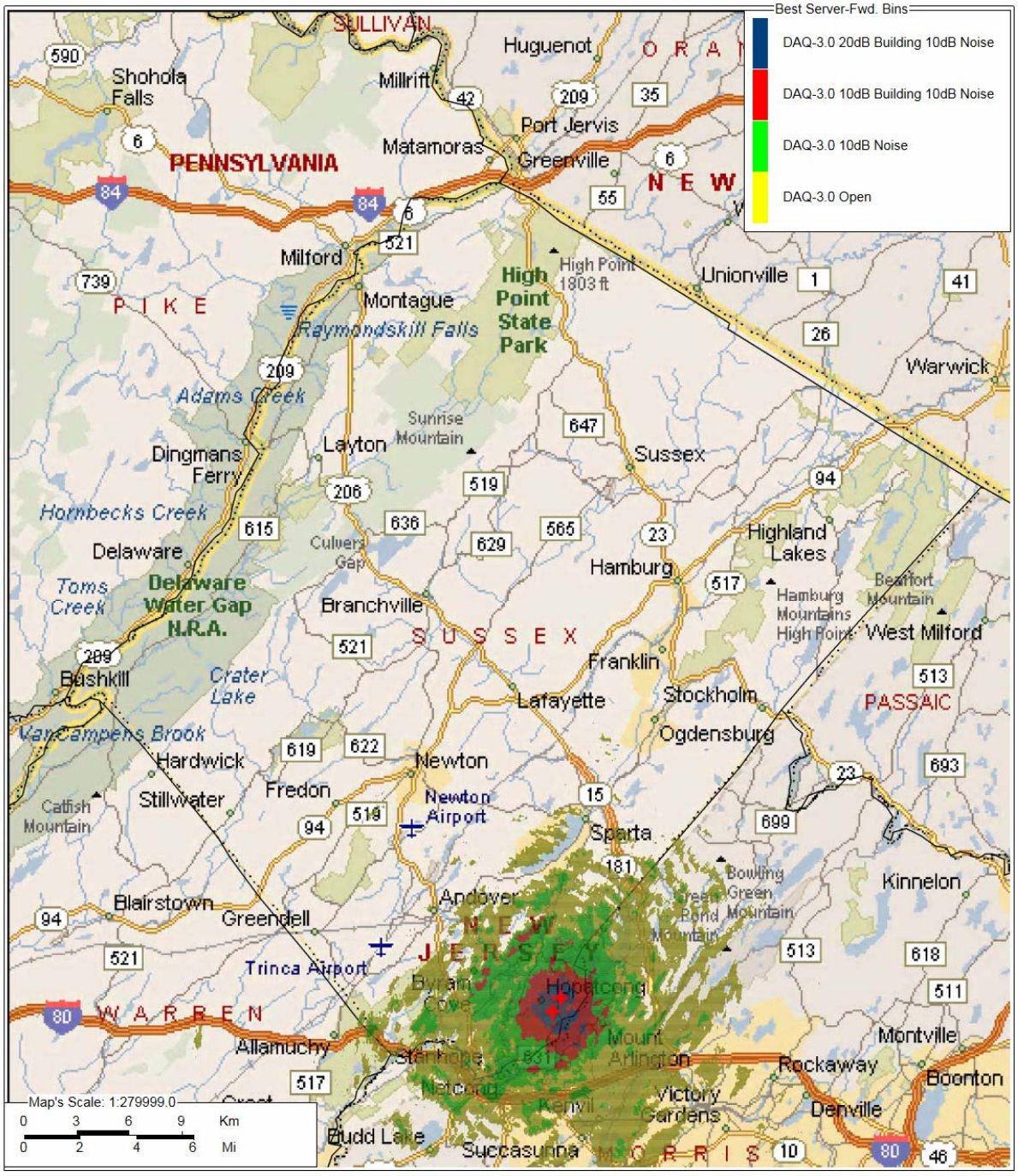
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:21:11 PM

Hardyston PSAP Low Band Pager



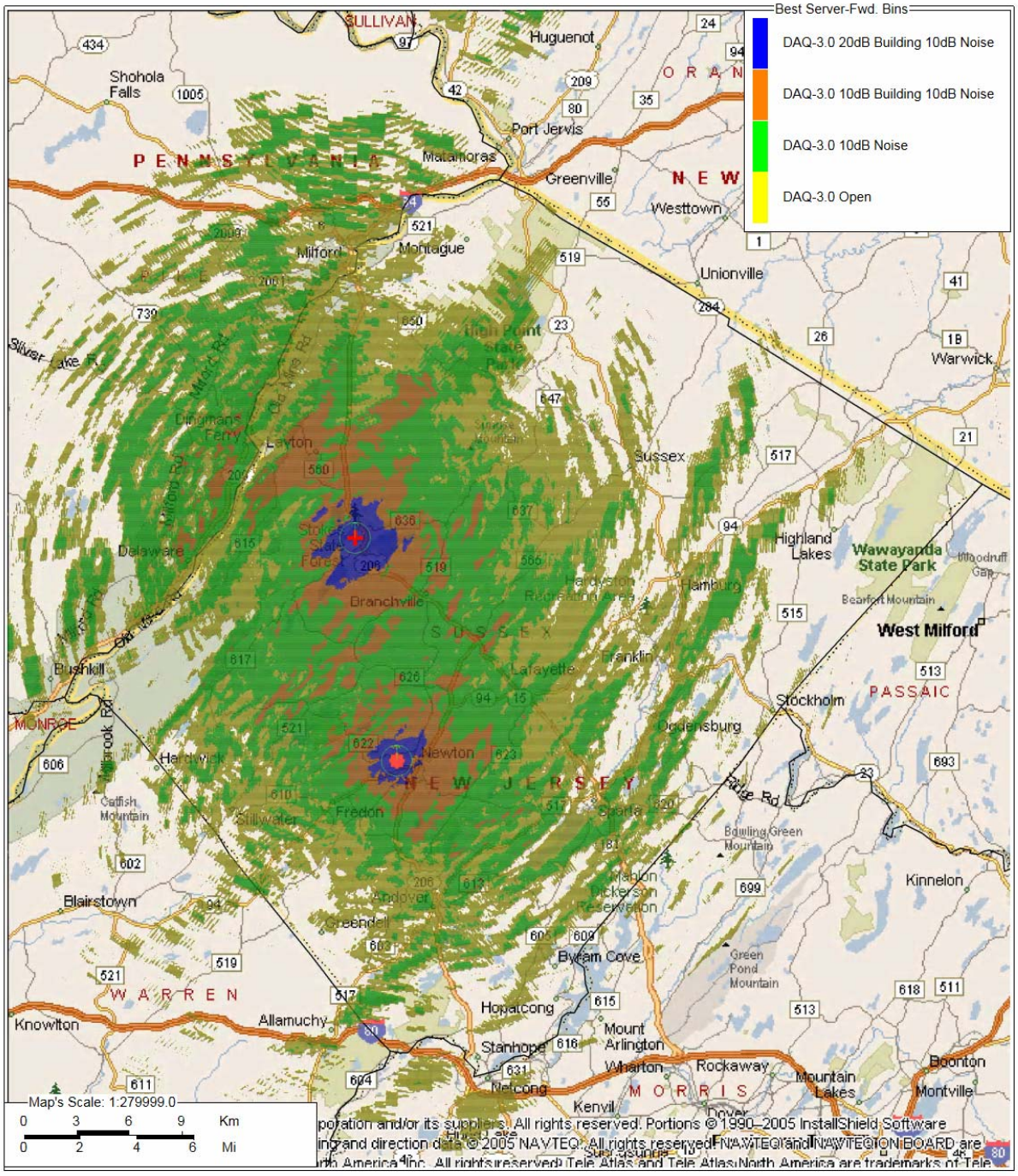
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:34:42 PM

Hopatcong PSAP Low Band Pager



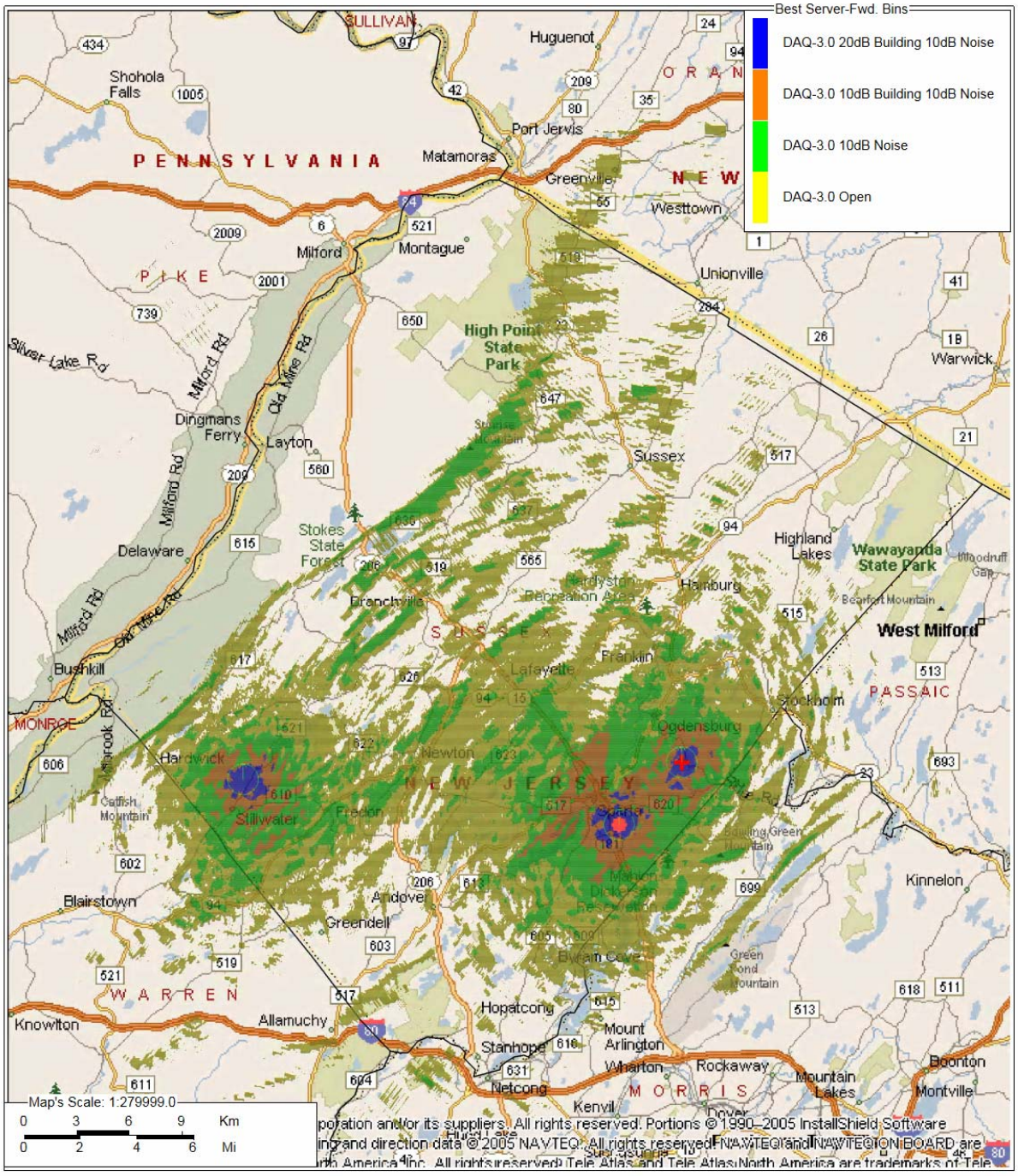
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:56:36 PM

Newton PSAP Low Band Pager



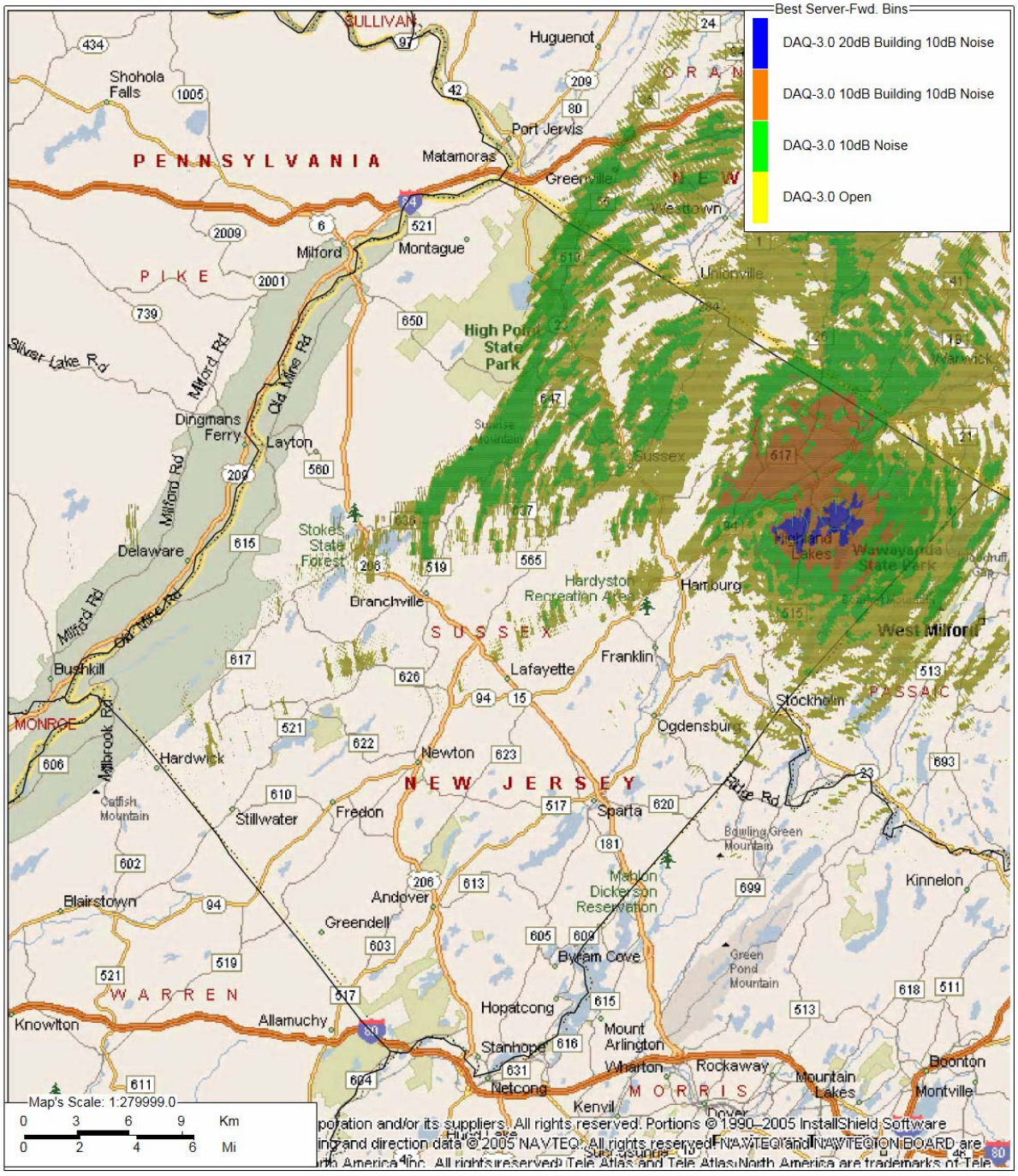
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:49:27 PM

Sparta PSAP Low Band Pager



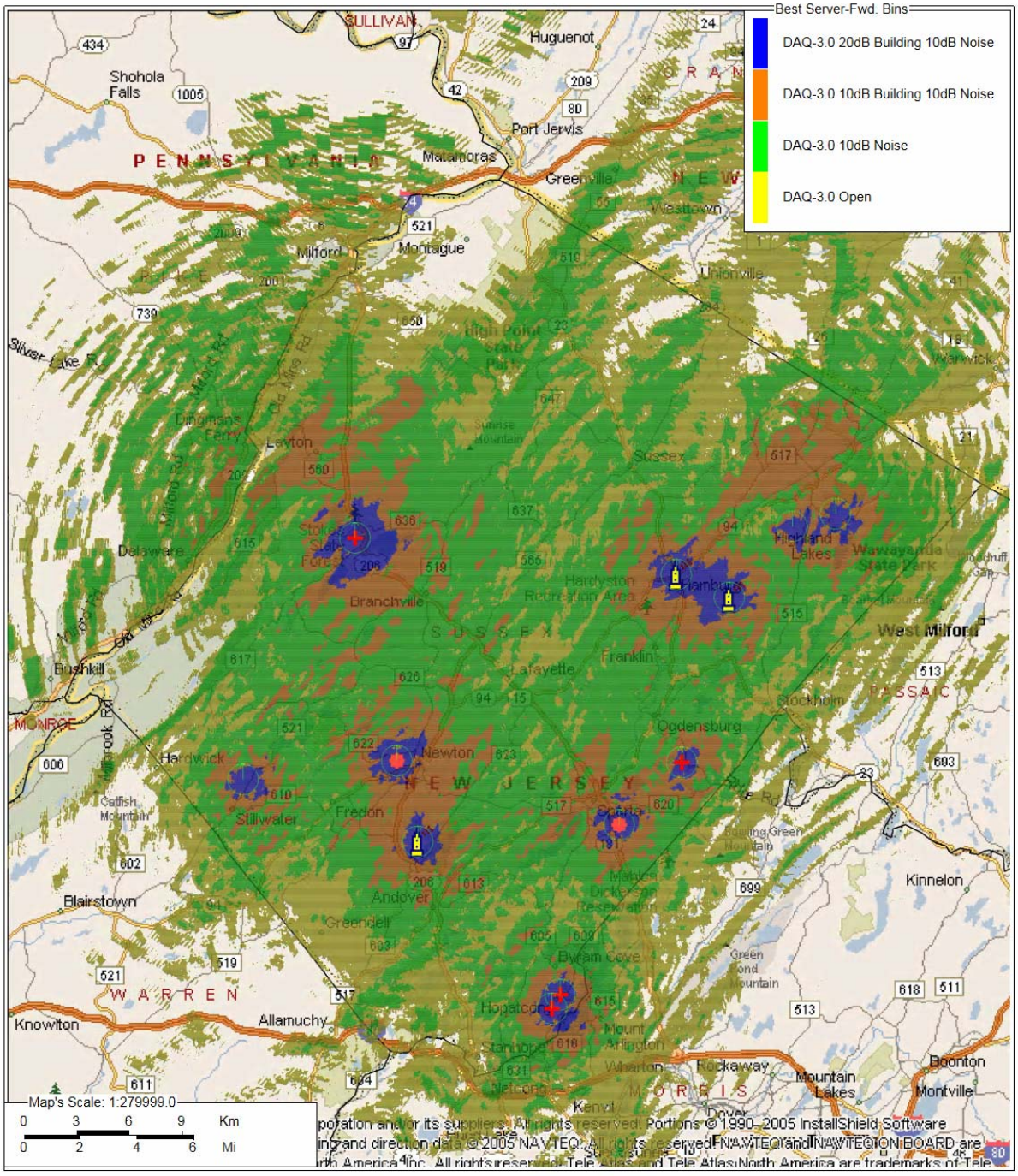
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:41:17 PM

Vernon PSAP Low Band Pager



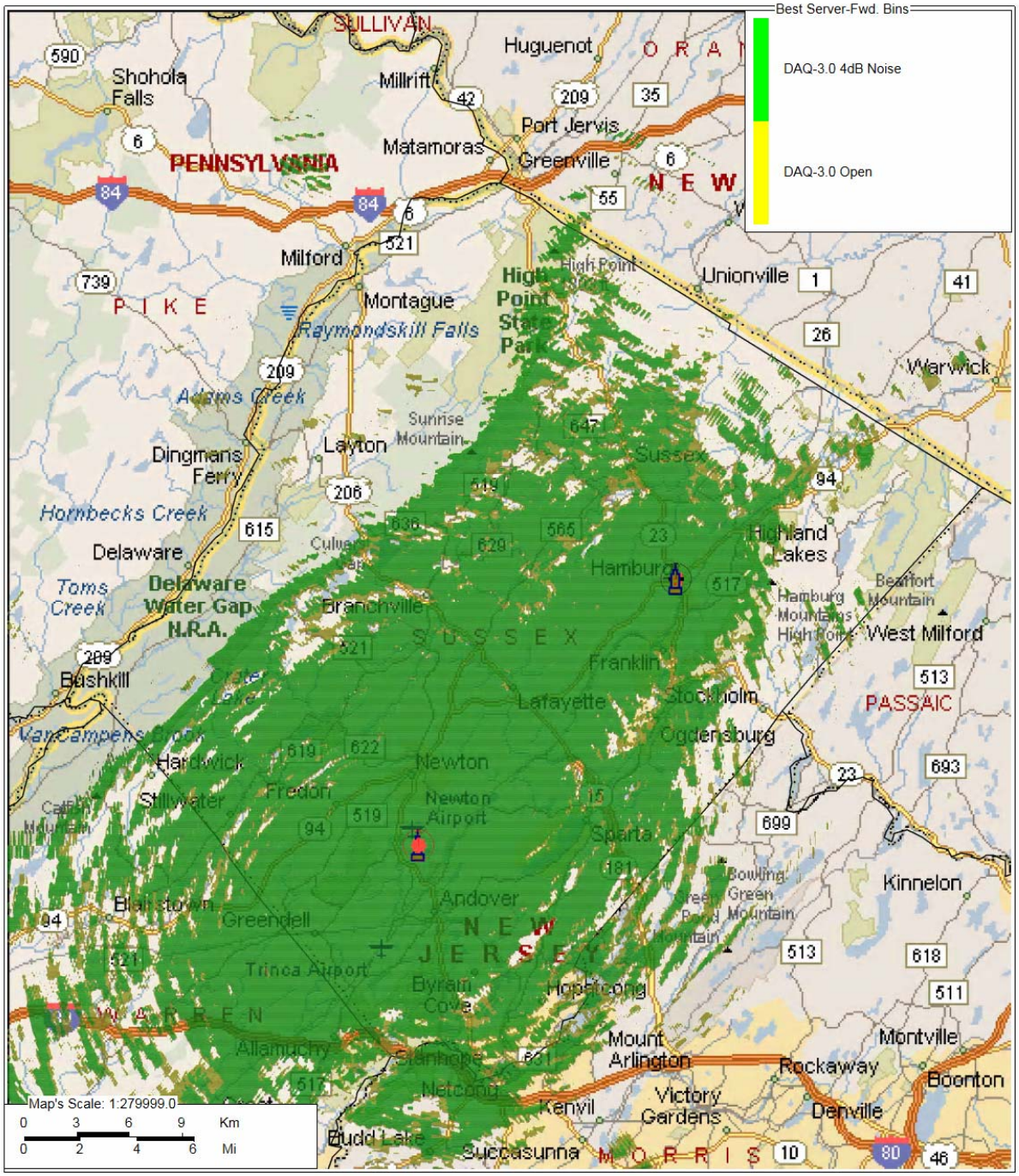
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:34:21 PM

Composite Low Band Pager



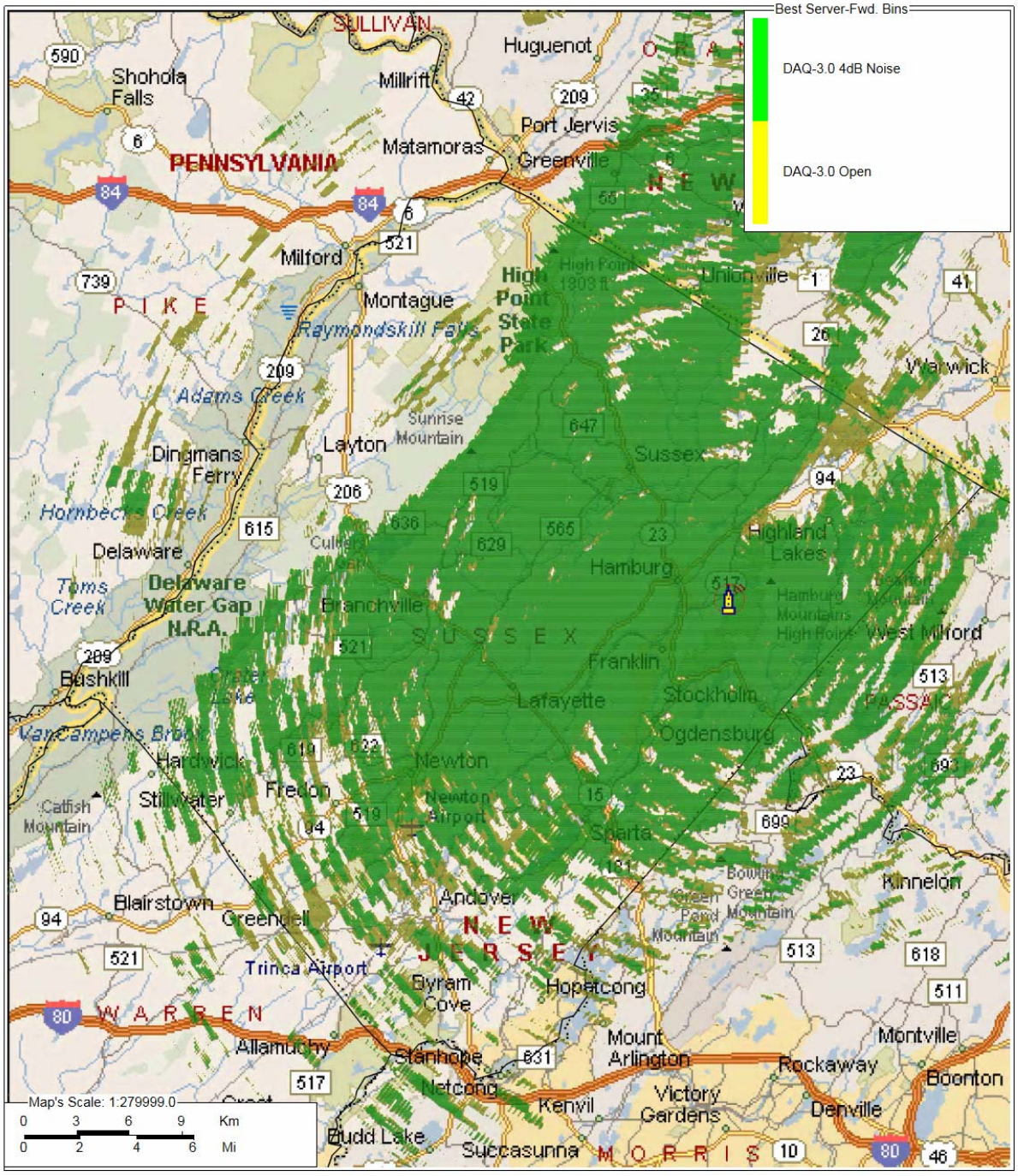
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:16:06 PM

Andover PSAP High Band Police



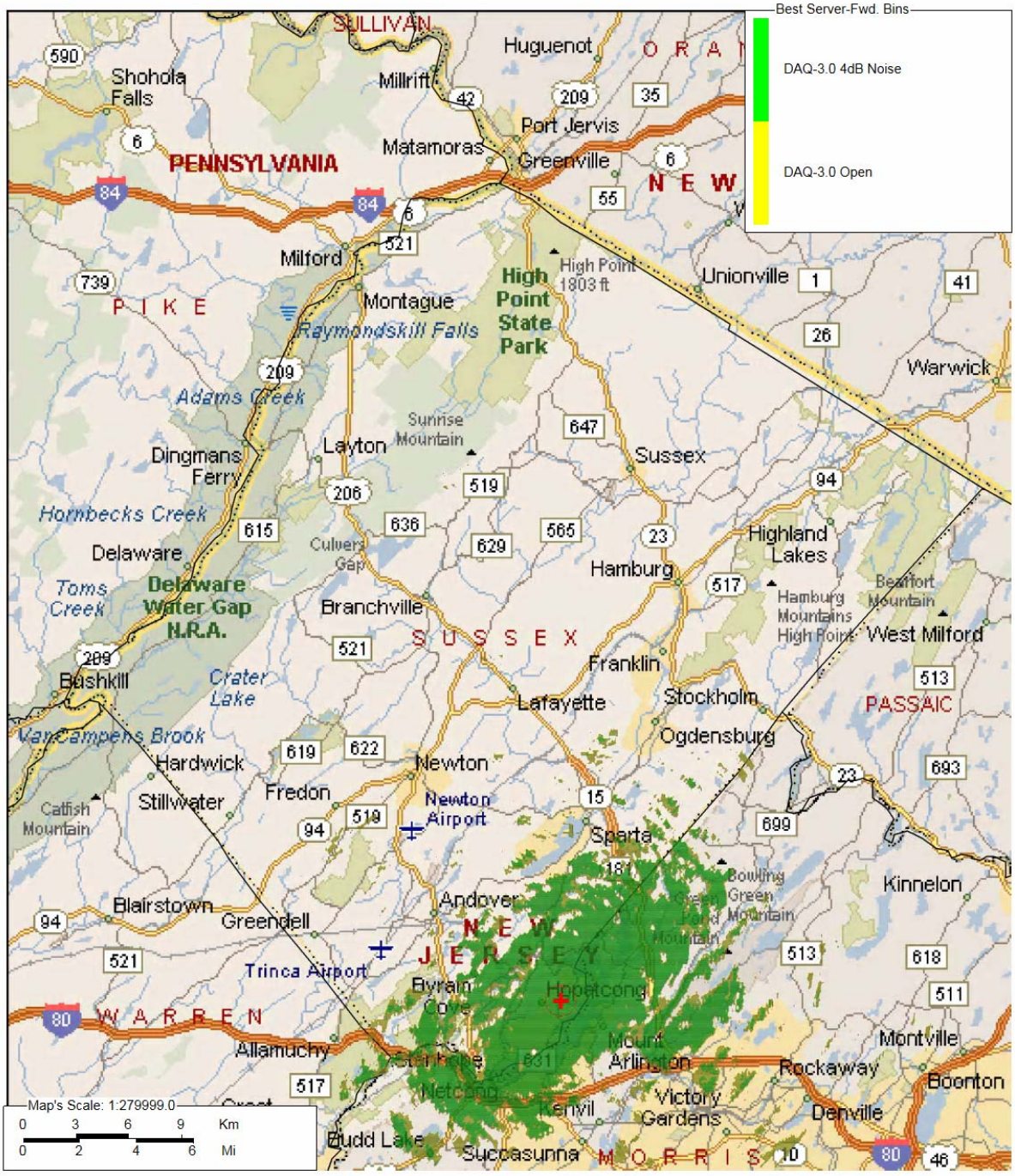
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:11:00 PM

Hardyston PSAP Police High Band



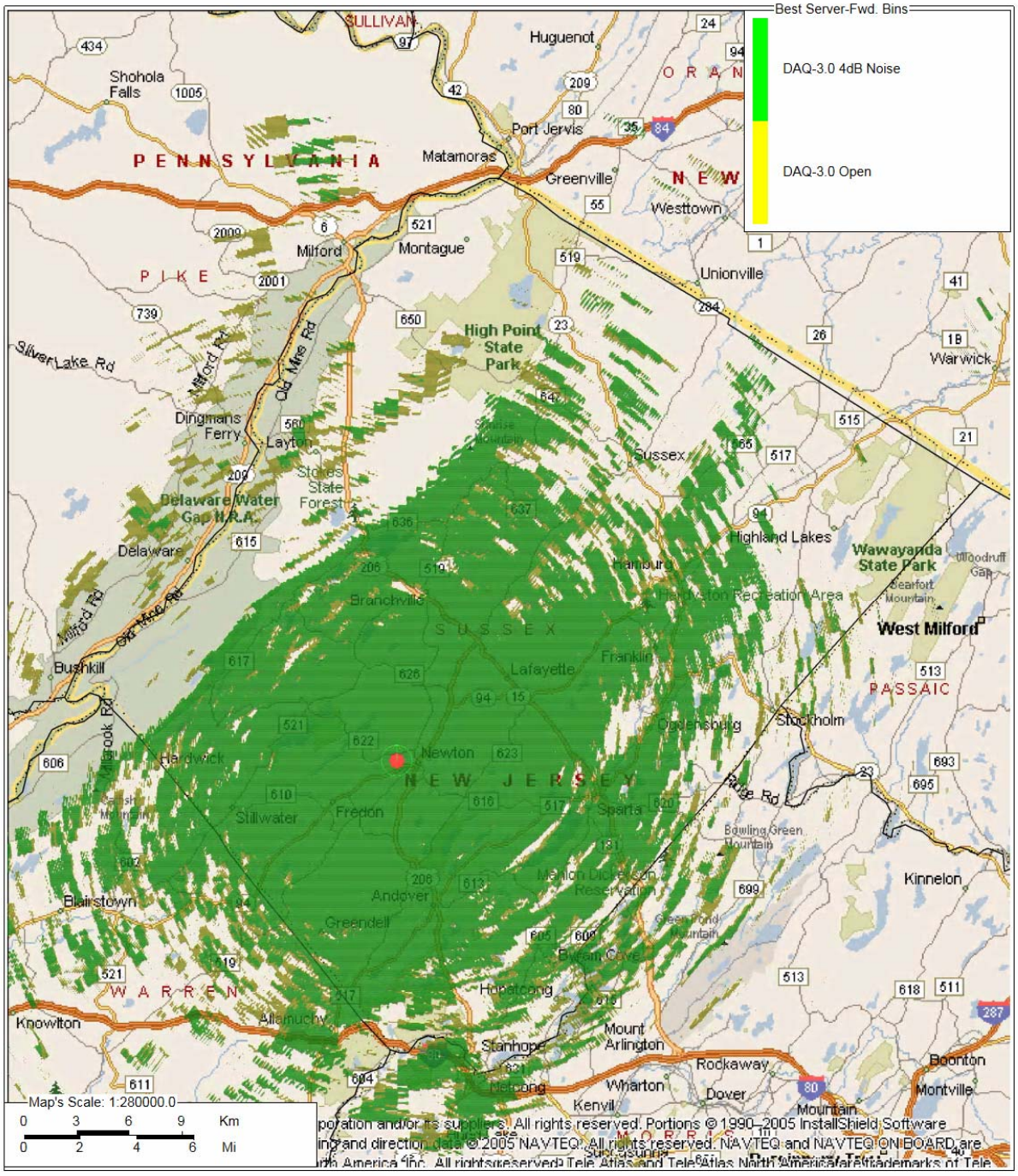
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:31:50 PM

Hopatcong PSAP Police High Band



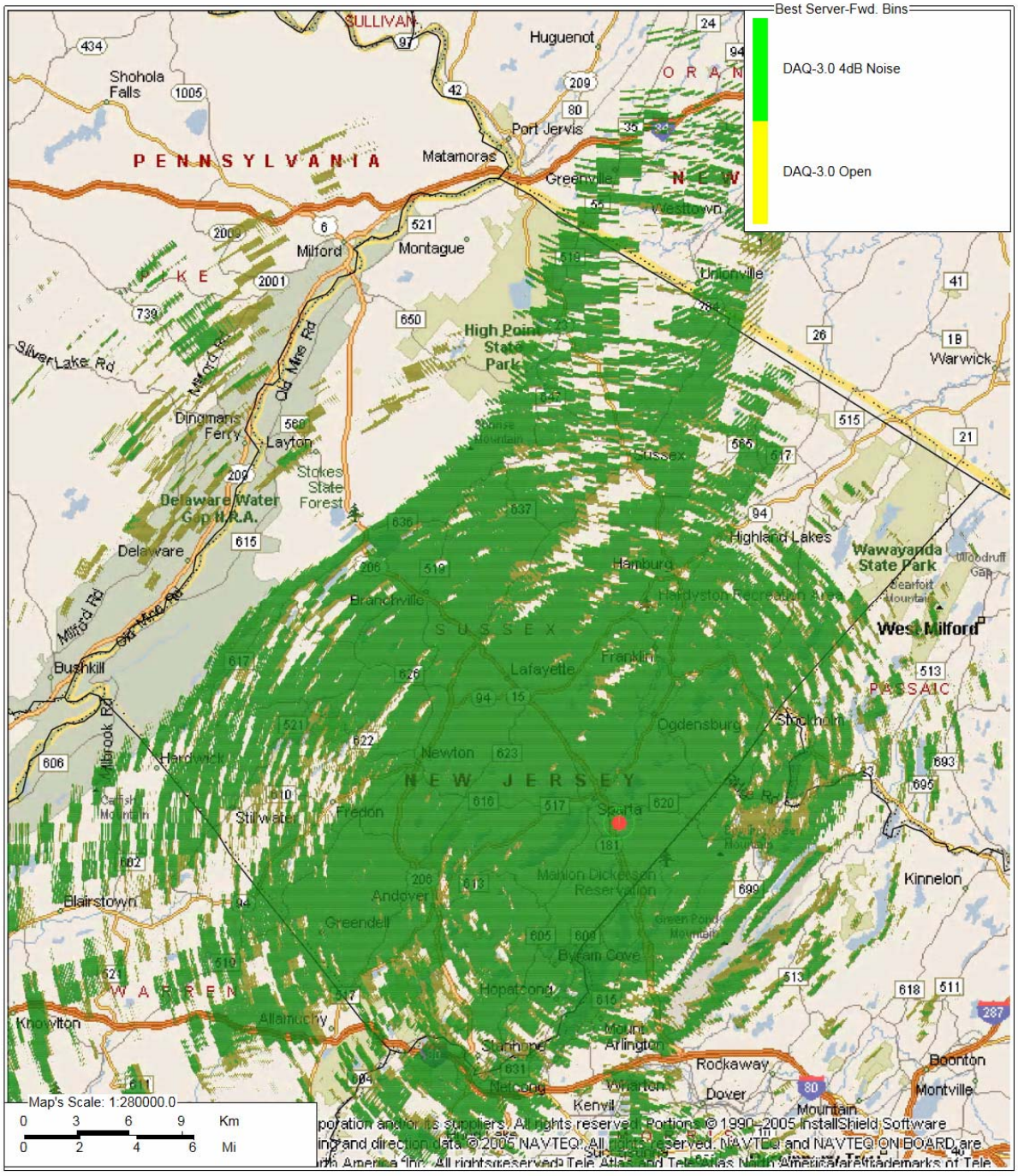
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 12:54:20 PM

Newton PSAP Police High Band



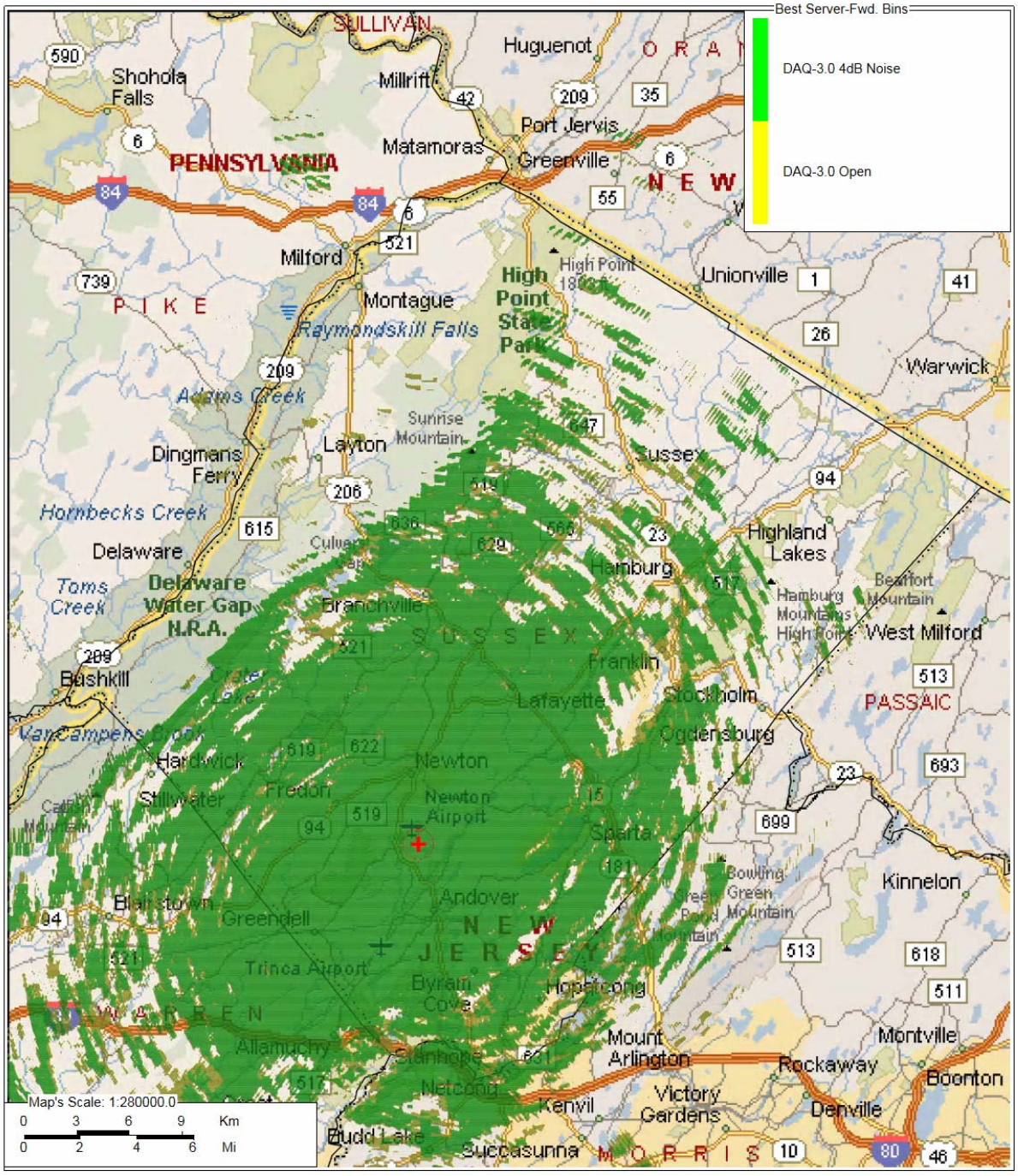
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 12:49:03 PM

Sparta PSAP Police High Band



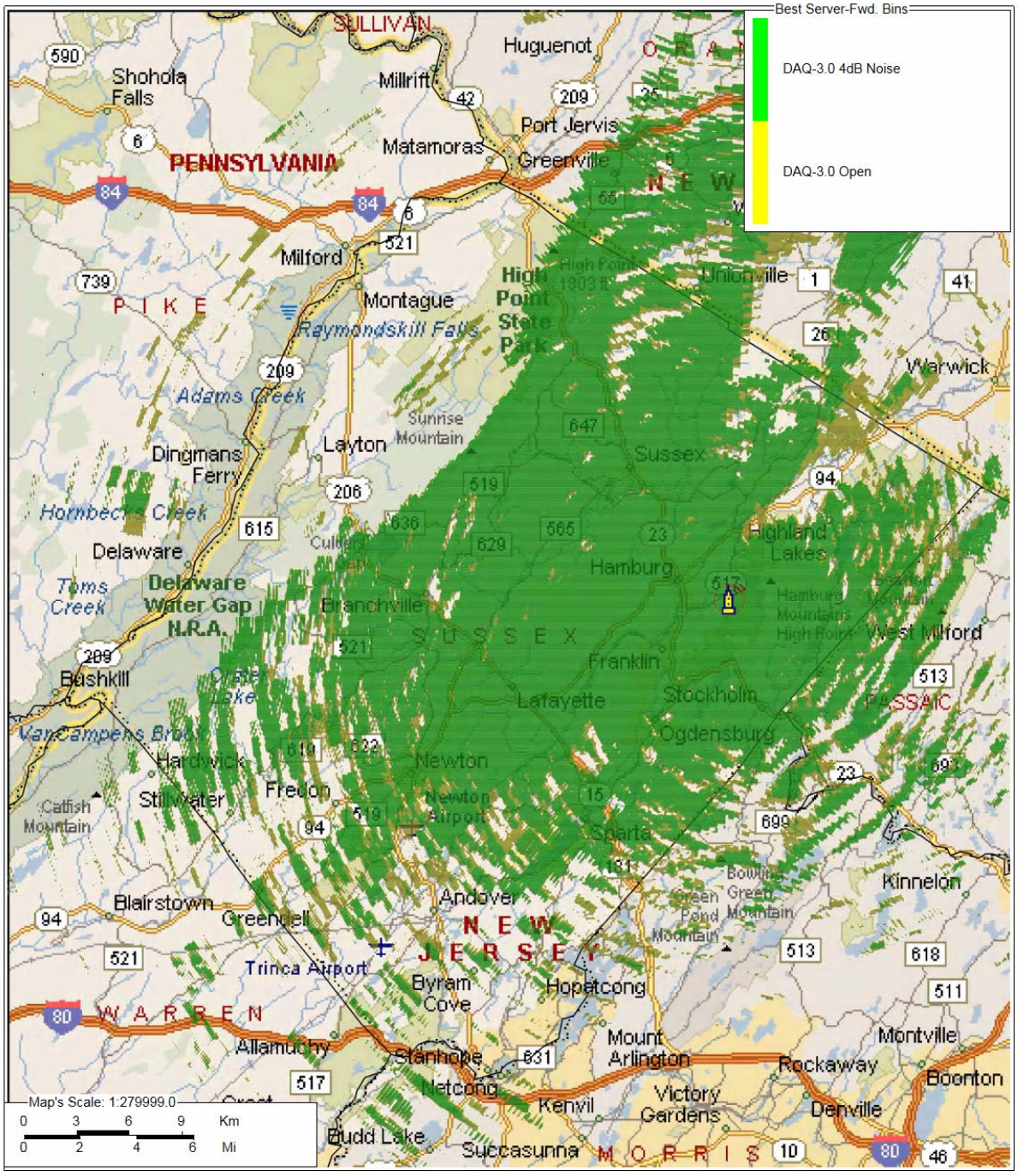
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 11:51:47 AM

Andover PSAP EMS High Band



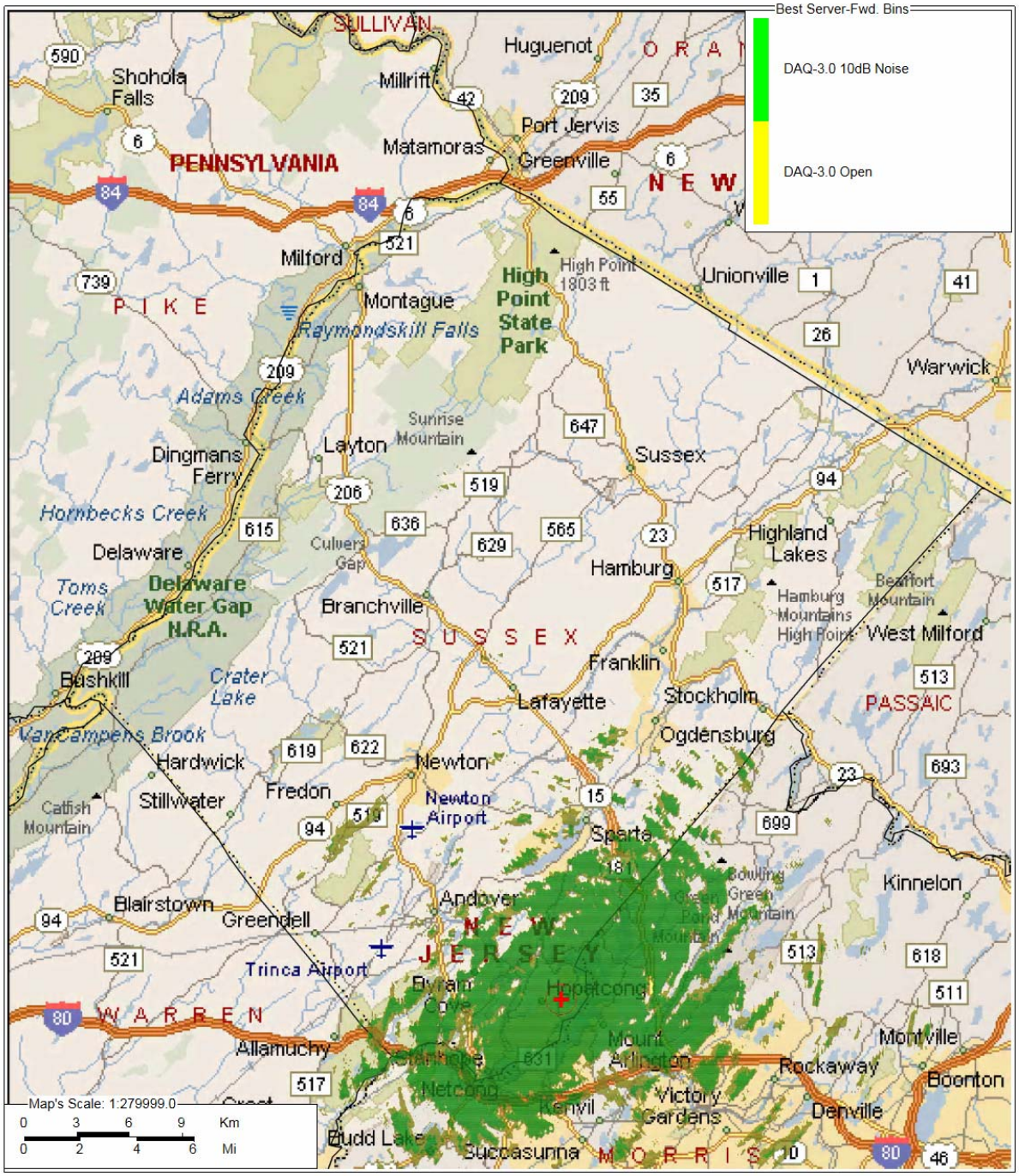
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:59:34 PM

Hardyston PSAP EMS High Band



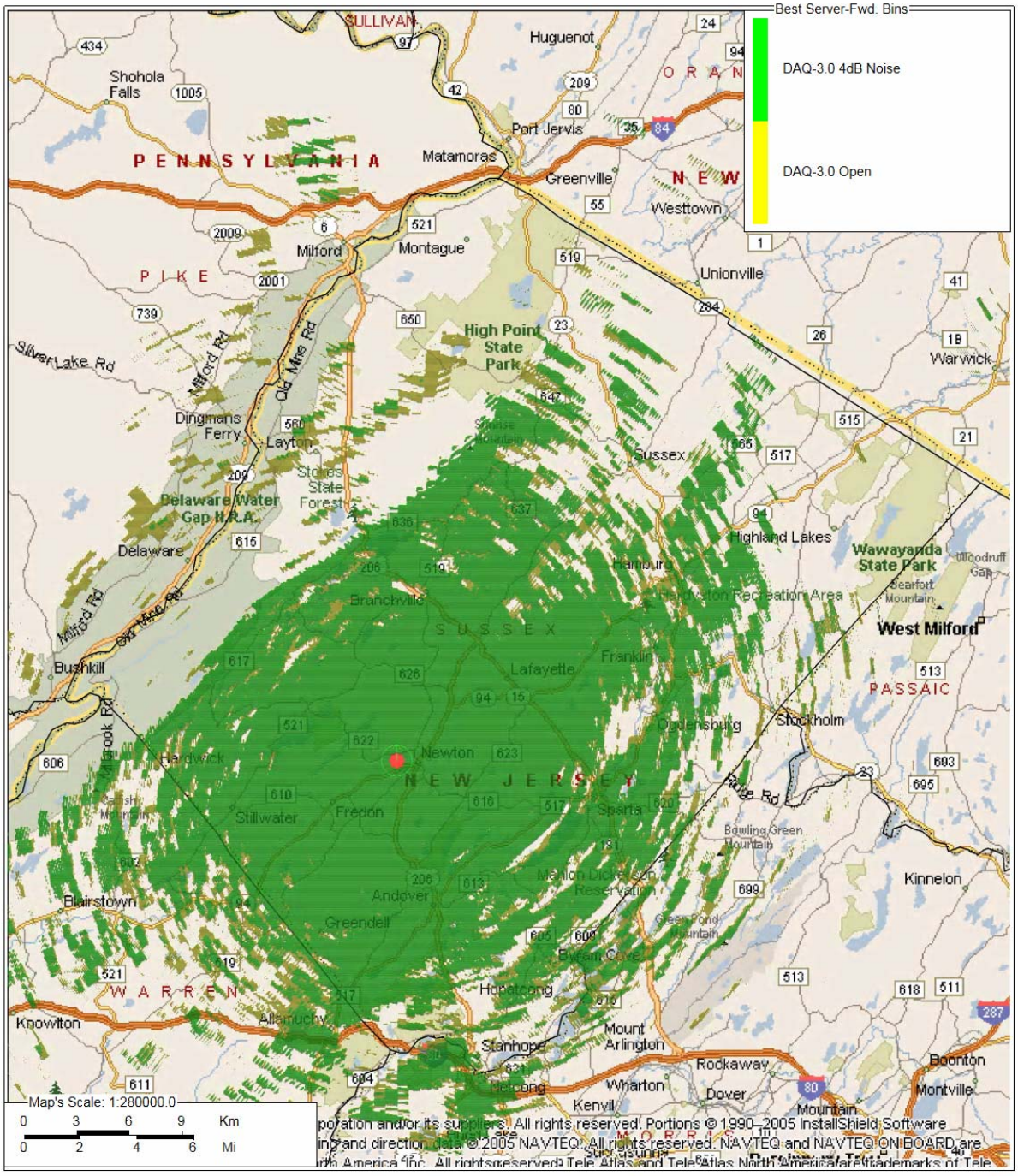
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:24:41 PM

Hopatcong PSAP EMS High Band



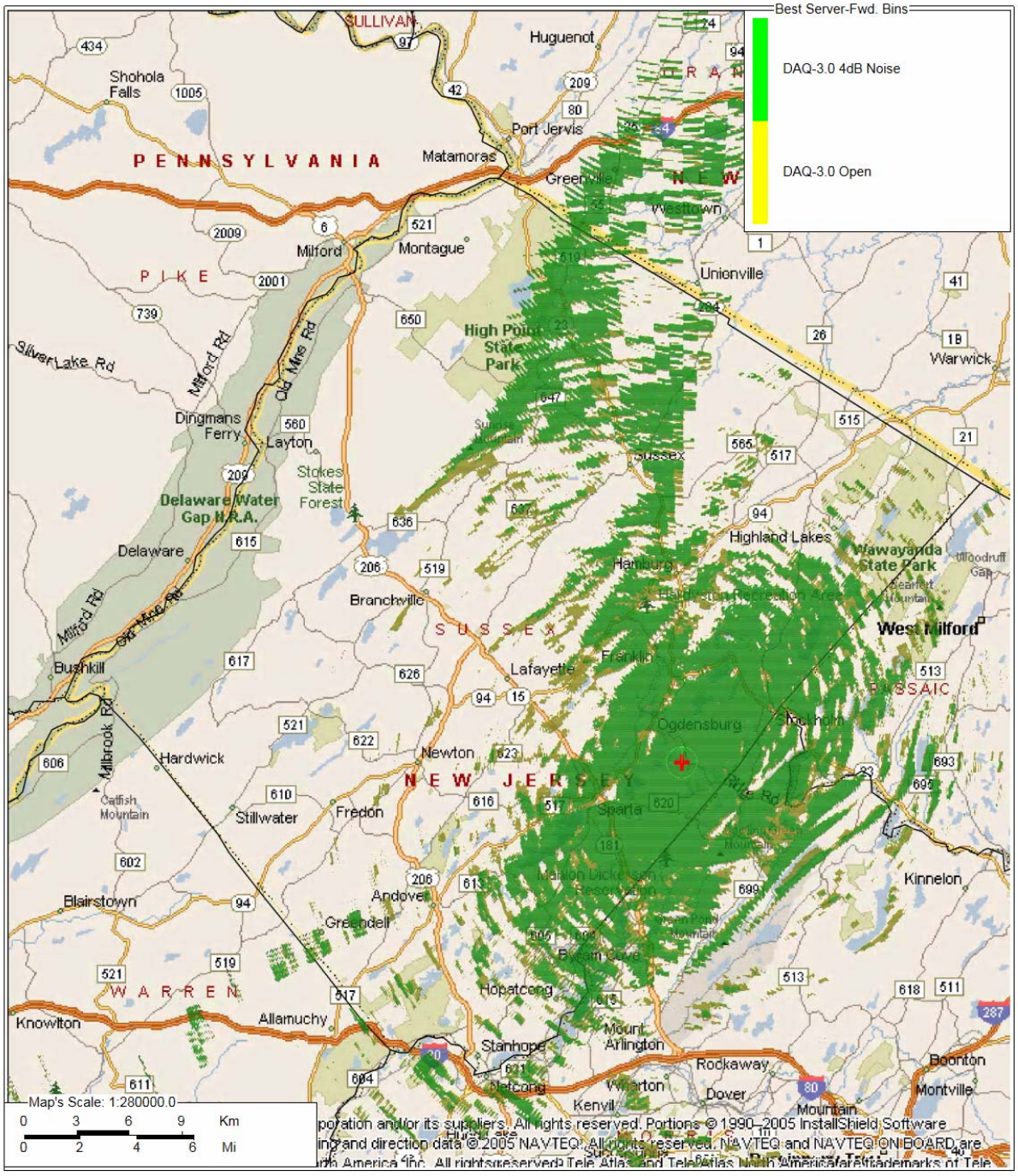
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 11:32:24 AM

Newton PSAP EMS High Band



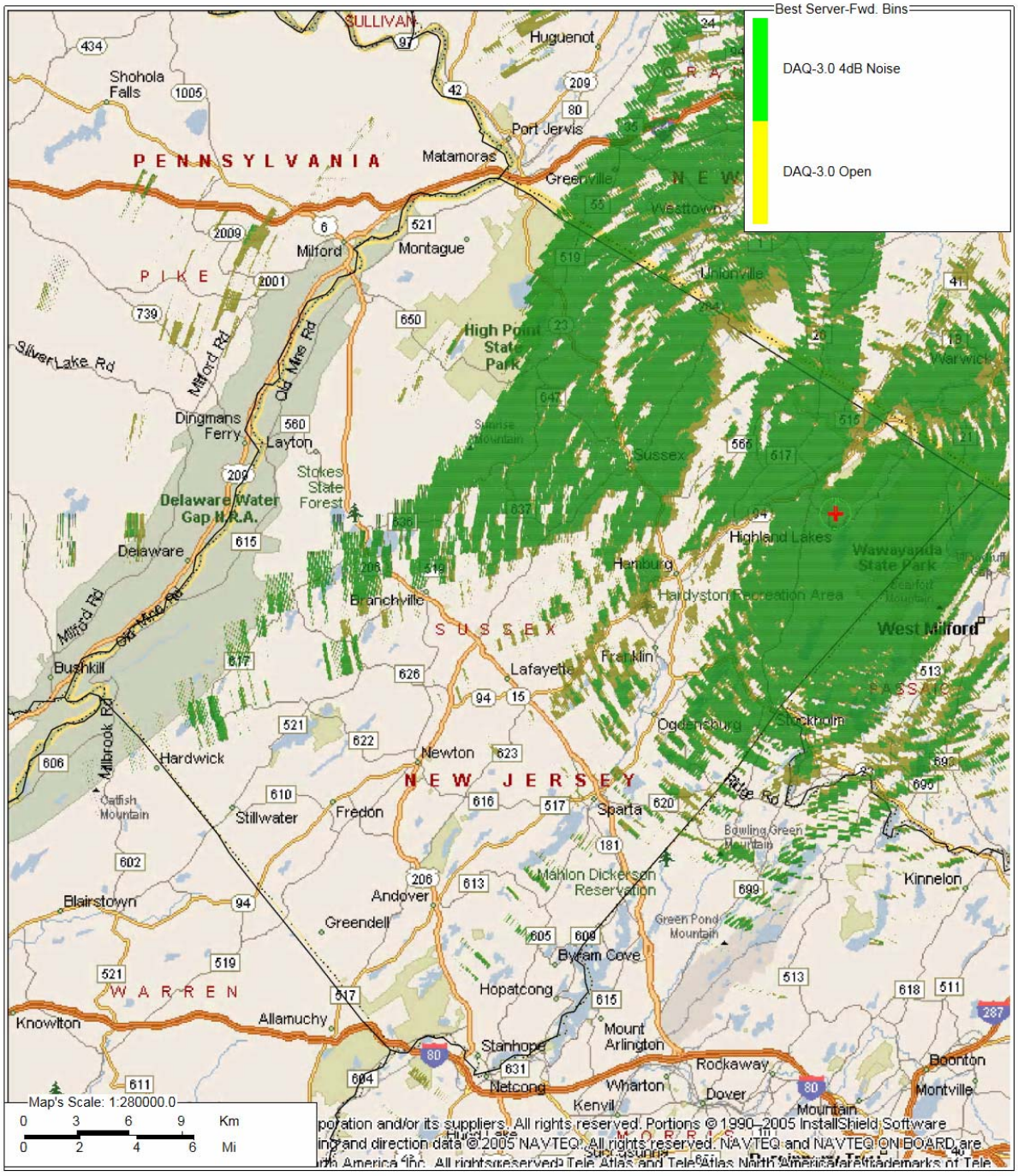
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 12:52:46 PM

Sparta PSAP EMS High Band



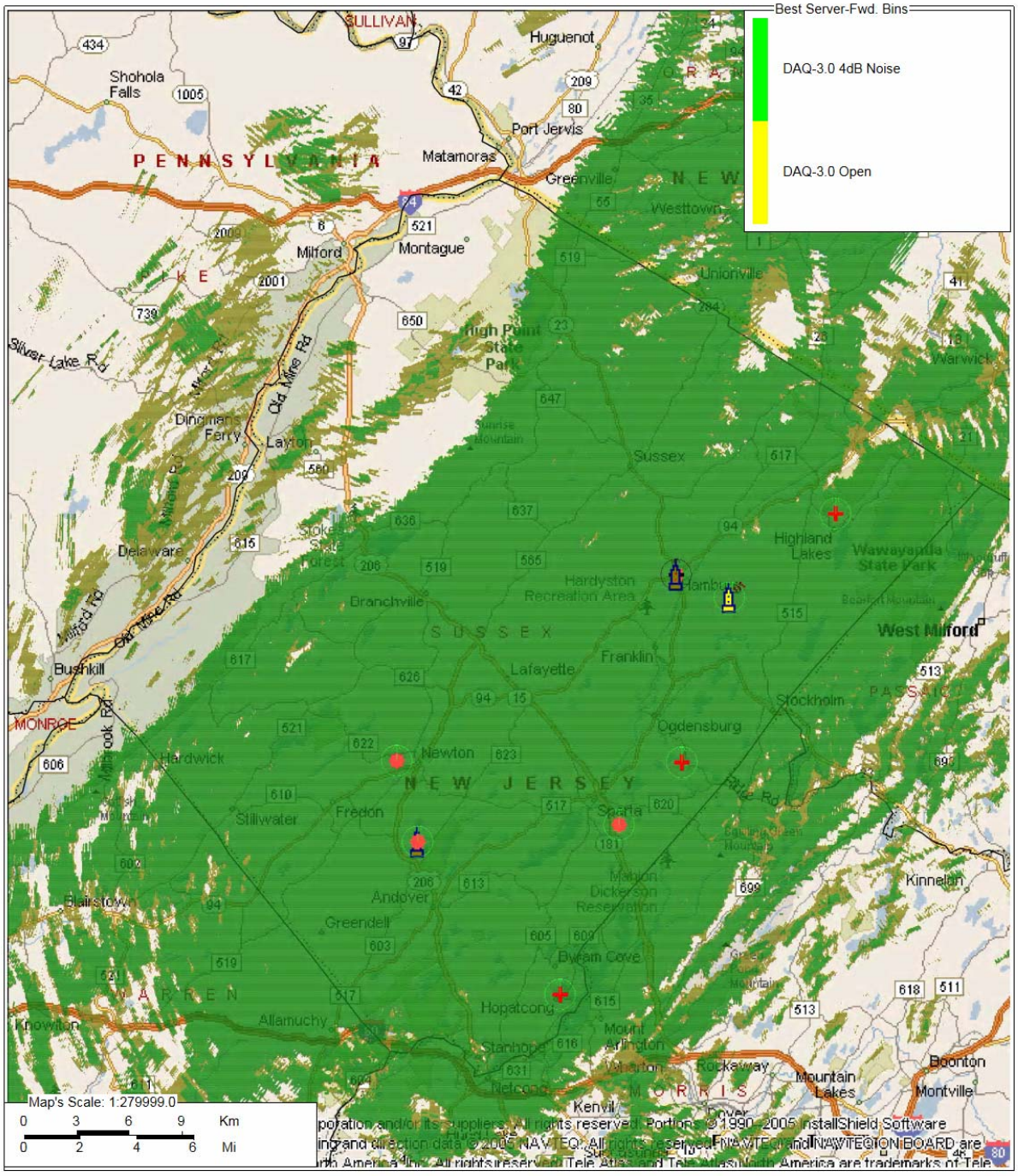
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 12:50:06 PM

Vernon PSAP EMS High Band



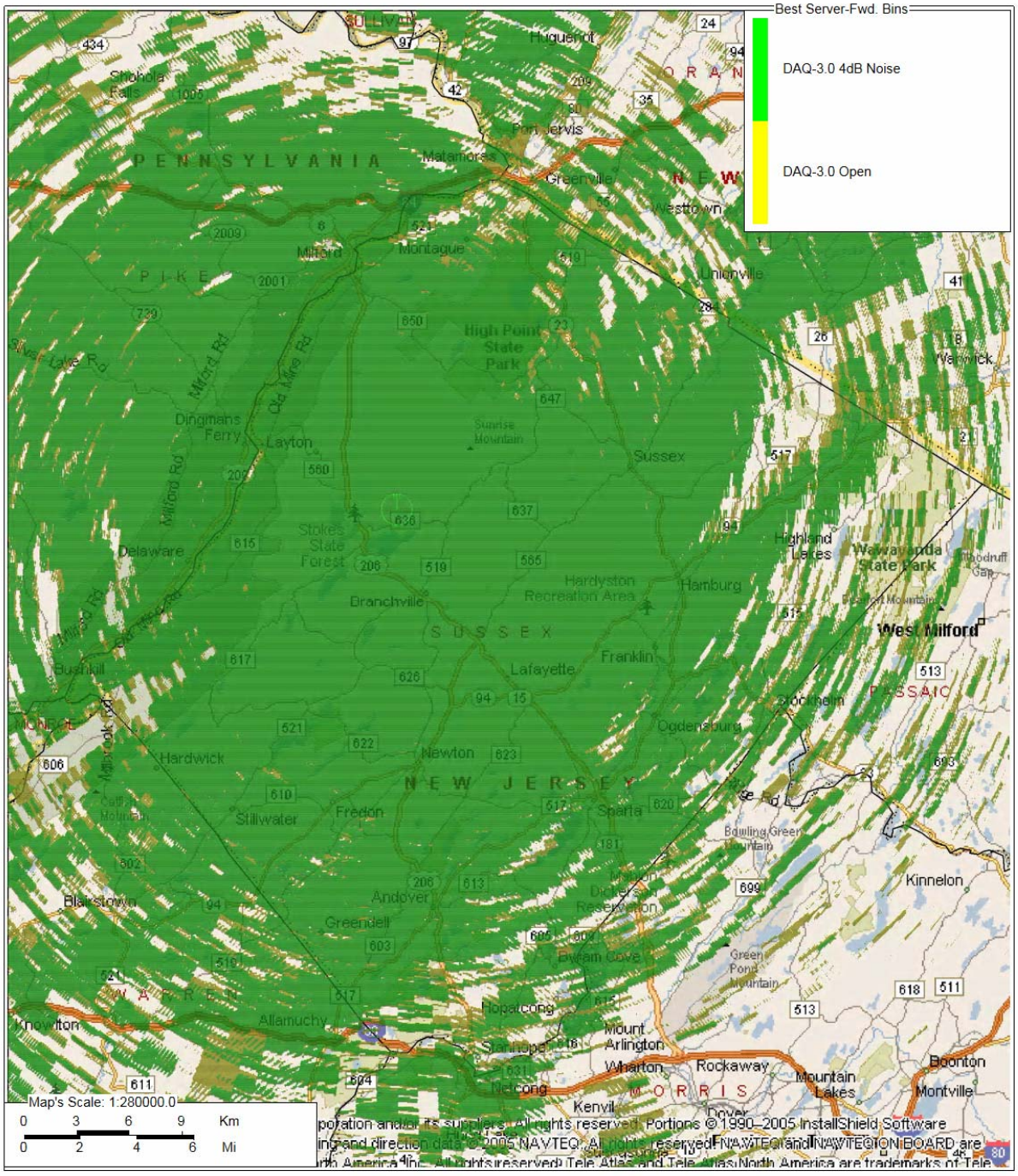
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 4:02:32 PM

Composite VHF High Band



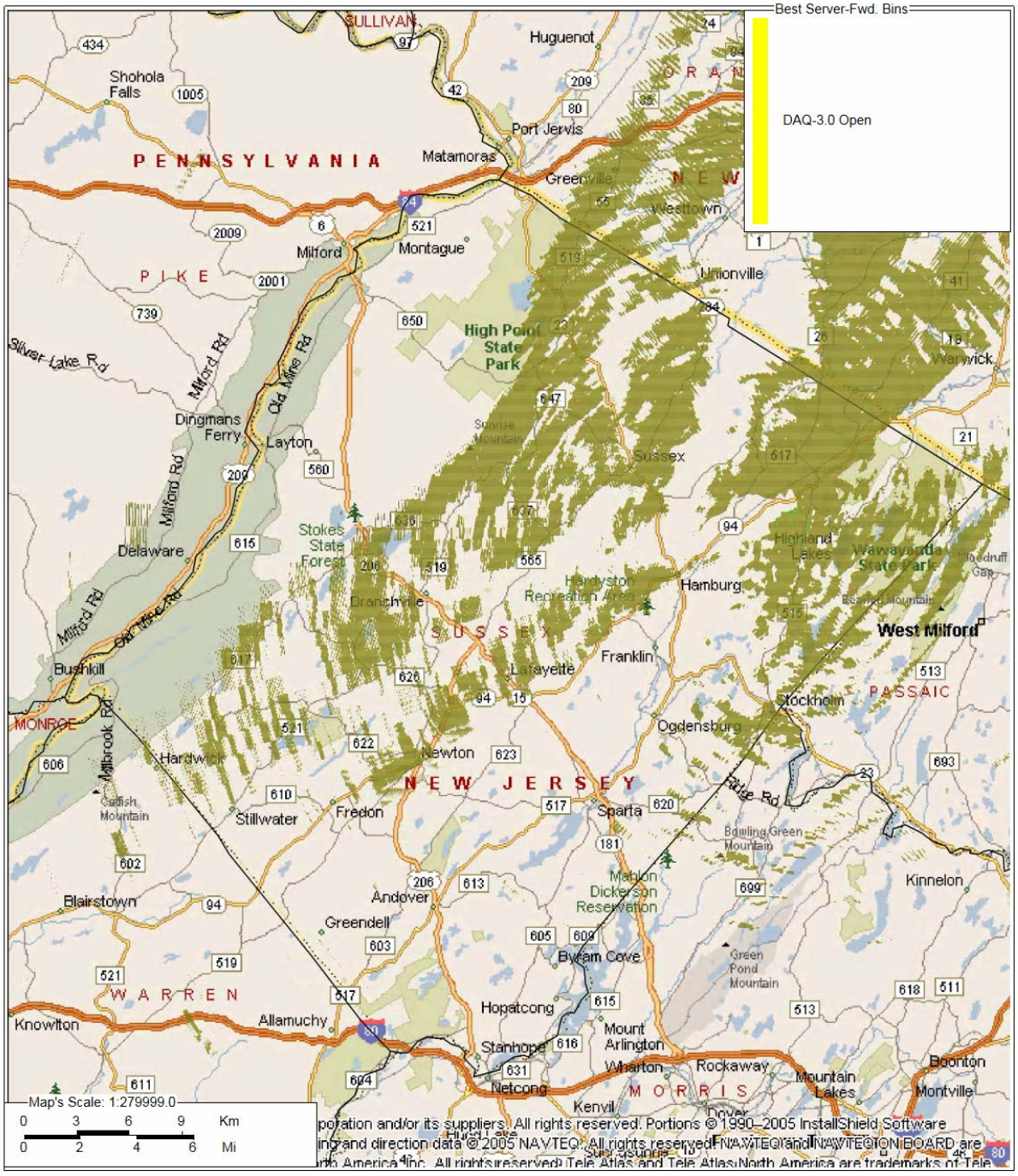
RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 1:06:58 PM

Sussex Sheriff High Band



RCC ComsiteDesign Map | Page 1 of 1 | 3/7/2007 2:04:16 PM

Vernon PSAP Police UHF



8. OBSERVATIONS AND DISCUSSIONS

The maps and the models provide a visual depiction of the potential coverage from each PSAP based upon the frequency bands in use. The Low Band sites predictably provide greater coverage for a given physical site. Each Low Band site provides more coverage than a similarly located High Band site and the aggregate coverage for all sites indicates apparent coverage throughout the entire county. However it is important to recognize that the aggregate map indicates the sum of coverage from multiple channels and sites within each frequency band. The total number of sites and their distribution creates this blanketing condition, but the reader should remember that this coverage does not represent a single frequency or channel. No single site produces reliable coverage to the entire region and simultaneous transmission (Simulcast) from multiple sites would require extensive and costly technical enhancements to the present installations. Due to placement along the outer boundaries of the county, some sites have coverage that extends well into the adjoining counties and states.

A second important consideration is that the model predicts the large area coverage only for mobile operation. Communication to personal pager units is significantly less pervasive and has multiple coverage holes. When the environmental and building loss factors are included, this can be even more significant.

The VHF High Band sites generally provide a smaller footprint and are limited by power and ERP constraints. Several sites are below 25 watts ERP and some have important antenna limitations. The reader is also reminded that some of the sites have been relocated and may be currently operating outside of their FCC licensed parameters and providing coverage not predicted by the models.

The very diverse nature of the geographical area of Sussex County creates some unusual issues in propagation. The placement of transmitter facilities on mountain sites provides both enhancement and shadowing. Several instances of abrupt discontinuities in coverage can be seen in the coverage maps. On the other hand, sudden lengthy extensions of coverage can be seen where a valley or pass exists and permits the signal to propagate much further. Some sites actually indicate loss of coverage due to the elevation of the site as the radio signals pass over the lower areas.

The dominant ridge line along the Northwestern side of the county effectively isolates the far Western portion of the county. No site provides reliable coverage to any significant part of that area.

No models have been developed for the local, tactical sites dispersed throughout the county. There are a significant number of licensed, local facilities that could possibly be incorporated into a consolidated communications system. Conversely, some of the sites modeled are located at these local facilities and remotely controlled or accessed by the dispatching centers.

The Sussex County Sheriff's system has been incorporated into the models although this resource is not utilized as a PSAP. Separate maps and data have been provided to allow the examination of this system in the overall analysis.