

**Berks County Public Safety Radio System
Signal Booster Technical Requirements
March, 2021**

1.0 Introduction

These requirements are not intended to mandate the installation of a signal booster in any structure. They are also not intended to define the enhancement in coverage that the signal booster will achieve. It is expected that these requirements will be defined in law or regulation by the Authority Having Jurisdiction (AHJ) using prevailing codes and standards. As such, these guidelines cannot be used alone in directing a building owner installing a signal booster.

Rather, the intent of these requirements is to limit the risk of unanticipated negative impacts to the public safety radio system that could result from the installation of a signal booster, and to provide reasonable protections to ensure such impacts can be mitigated if they become known. As such, it is the intent that these requirements will be used in conjunction with published requirements of the AHJ in which the signal booster is operated. If such AHJ requirements are in conflict with this document, and if the conflict defines conditions less restrictive or less stringent, or less protective of the County's radio system, this document shall prevail, or no Letter of Authorization (LOA) shall be issued.

The County assumes no liability for design or construction costs related to the implementation of a signal booster, including those incurred as a result of errors made by its employees or agents.

2.0 Preparation

A building owner, or contractor working for a building owner, shall perform due diligence as might be required by the local AHJ to determine if a signal booster is needed in a proposed or existing structure.

3.0 Application

Upon determining that a building requires a signal booster, an application package shall be submitted to the Berks County Department of Emergency Services following the process below.

- 3.1 In order for the owner/operator of a Class B signal booster to receive approval from Berks DES, the owner/operator must possess a Federal Communications Commission File Reference Number.
- 3.2 An Application for Authorization to Operate a Signal Booster as published by DES must be completed.
- 3.3 A non-refundable review fee of \$500.00 payable to the "County of Berks."
- 3.4 Documentation demonstrating the need for a signal booster, including a statement of requirement from an authorized official of the AHJ requiring which aspects of the County's channel package must be included in the system to be installed, shall be submitted with the application. This documentation may include testing results for existing structures or engineering design information for structures being evaluated pre-construction.

- 3.4.1 This documentation must include design calculations demonstrating that effective radiated power (“ERP”) of both the antennas serving the system, as well as the antennas serving the building interior, and demonstrate that the ERPs of all are the minimum necessary to achieve coverage needs. Irrespective of the maximum allowable power limitations set forth by the FCC or any other regulatory body for such devices, the minimum power requirements necessary for achieving required coverage shall be used.
- 3.5 Design drawings of all aspects of the system including donor antenna, amplifier and DAS network locations must be provided.
 - 3.5.1 All technical design aspects of the signal booster system must conform to the requirements set forth in the most current editions of NFPA 72, NFPA 1221 and Title 47 of the Code of Federal Regulations, as well as any prevailing local requirements. Except, in cases where this document is more restrictive, in such cases, this document shall prevail. The County of Berks reserves the right to make the sole determination whether its requirement or the requirement of another is more restrictive.
 - 3.5.2 Drawings must include:
 - 3.5.2.1 The location of emergency power off (“EPO”) switches including a circuit breaker to break the utility/emergency power and a switch to break the DC feed from any UPS. Alternative methodologies shall be considered, but the intent is to ensure that the unit is able to be fully powered down without any special skills or tools. Any such EPO devices must be clearly labeled as serving the “Berks County Public Safety Radio System Signal Booster.”
 - 3.5.2.2 The location and azimuth (where directional) of all antennas intended to provide uplink signal to the radio system.
 - 3.5.2.3 Any points of interconnection between the DAS serving the booster, and any other signal boosters for systems apart from the Berks County Public Safety Radio System. An intermodulation study for any proposed installation shall be required, and the study must include all frequencies planned to be combined through the DAS. Such shared usage is discouraged and may be a cause for refusal of a LOA.
- 3.6 Technical specifications must be included. As a minimum, these must include:
 - 3.6.1 All antennas proposed to be used in the system demonstrating that any gain inherent in the antenna is calculated into the ERPs. Visual representations of the antenna patterns shall be included.
 - 3.6.2 Line specifications demonstrating the accuracy of any loss values calculated into the ERPs.
 - 3.6.3 BDA chassis (booster) specifications including:
 - 3.6.3.1 Indication whether the booster is a Class A or Class B device and possesses the following characteristics:

- 3.6.3.1.1 System must be capable of operating with analog or digital (both FDMA and TDMA) modulation.
 - 3.6.3.1.2 Maximum signal propagation delay of 14 us.
 - 3.6.3.1.3 Uplink noise suppression circuitry that eliminates any measurable uplink noise when idle.
 - 3.6.3.1.4 Oscillation prevention circuitry that will disable the unit if a malfunction is detected.
 - 3.6.3.1.5 If the proposed booster is Class B, a statement indicating why a Class A booster is not possible. The County will only authorize a Class B device if adequate justification is offered. It is the County's position that Class B boosters shall be the exception, not the standard. Cost is not an acceptable justification. Sole determination of adequacy in this justification shall rest with the County.
- 3.6.3.2 Internal filters/channel plan to be used in the booster that supports the requirements set forth by the AHJ for which channel packages are being implemented.
- 3.6.3.3 Statements of conformance with most current versions of NFPA 72, NFPA 1221, the International Fire Code and 47 C.F.R. § 90.219.
- 3.6.3.4 Operation and installation manuals for the unit.
- 3.6.3.5 Any programming parameters intended for use in the installation.
- 3.7 A signed statement granting DES permission to access the signal booster for the purpose of ensuring compliance with these requirements and/or whether the signal booster is or will cause interference with the public safety radio system in substantially the same form as attached in Appendix C must be included.

The submittal must be clearly marked in a way that directs the reviewer to the data that supports compliance with each section defined above. Failure to mark the necessary data as pertinent to the section may result in the reviewer marking the submittal non-compliant for the section.

4.0 Preliminary Review

Upon receipt of a complete application package, DES will complete a structural review of the package. The intent of this step is to affirm whether the applicant has submitted a complete application package with all necessary components. If the submittal is found to be structurally deficient, it will be denied and returned to the applicant without further review.

If the submittal is structurally complete, DES will then conduct a technical review. At this review, DES may approve, deny, or request further details on the package. A request for further information could include additional written documentation or a meeting with the applicant, the AHJ, and/or the design team.

If the application package is denied twice for any combination of structural or technical

deficiencies, the plan review fee will be required to be paid again with the next submission.

5.0 Preliminary LOA

If the application is approved in preliminary review, a temporary LOA shall be issued. This LOA will authorize the applicant to operate the booster for installation and testing purposes only. While operating under the preliminary LOA, the booster must be attended. The applicant or applicant's agent must contact the County's 9-1-1 Center [(610) 655-4921] and notify the on-duty watch officer before powering on the device, and again at the conclusion of testing. This individual will be expected to provide a means of telephone contact to the watch officer and disable the BDA immediately upon demand of the watch officer. Conditions in the 9-1-1 Center with respect to call volume or severe incidents underway at the time of a request for activation may be grounds for refusal.

6.0 Post-Testing Submittals

Following installation and testing, the applicant shall finalize the submittals to the County. by:

- 6.1 Registering the booster in the FCCs signal booster database and providing a screenshot evidencing such registration (Class B devices only).
- 6.2 Submitting updates to all drawings and design documents required at the time of application with as built marks and highlighting any changes from the design submittals.
- 6.3 Providing a written statement from the AHJ that the installation and testing meets all requirements set forth by the AHJ.

This submittal must be by provision of a single pdf inclusive of all noted sections above.

Upon receipt of a complete final submittal package, DES will complete a structural review of the package. The intent of this step is to affirm whether the applicant has submitted a complete application package with all necessary components. If the submittal is found to be structurally deficient, it will be denied and returned to the applicant without further review.

If the submittal is structurally complete, DES will then conduct a final technical review. At this review, DES may approve, deny, or request further details on the package. A request for further information could include additional written documentation or a meeting with the applicant, the AHJ, and/or the design team.

Upon proper receipt of the final submittals, DES shall issue a final LOA authorizing operation of the signal booster.

If the final submittal package is denied twice for any combination of structural or technical deficiencies, the plan review fee will be required to be paid again with the next submission. The two opportunities for an approval of the final submittal shall be separate from the two opportunities for approval in the preliminary review.

7.0 Notification of Trouble

The operator of a signal booster shall make immediate notification to the County of Berks Department of Emergency Services, any receipt of a trouble alarm or other indication of malfunction of the signal booster. Such notice shall be to the published "alarm line" of the

County's 9-1-1 Center and shall include a characterization of the nature of the problem.

The operator shall ensure a prompt (not more than two hours from time of receipt of trouble to arrival on site) response by a person qualified to evaluate and troubleshoot the issue.

Failure to make proper notification of trouble and/or respond to the trouble as required shall be reason for recension of the LOA.

8.0 Resolution of Trouble

In addition to any reinspection required by the AHJ, any failure/defect that causes the system to be taken offline/deactivated shall require a notification to the on-duty watch officer in the County's 9-1-1 Center [(610) 655-4921] before powering on the device. This notification shall be by an individual on location with the booster, and they shall immediately disable the system upon demand of the watch officer.

9.0 On-going Authorization

Irrespective of any obligations set forth by the AHJ, or other prevailing codes or standards for maintenance and testing, as a condition of authorization, the County requires the operator of a signal booster to, not less than annually, submit, without demand, updated contact/access information for the signal booster and a statement certifying that the system was properly maintained as per design requirements. Failure to submit same within 400 days of the date of the LOA (or the last submittal of an annual update) invalidates the LOA, and the owner/operator must disable the booster. In the event that the owner/operator does not disable the booster in a timely manner as determined by DES, DES may, in its sole discretion, power down the booster.

Upon verbal or written notice to the owner/operator or an agent of same, the County may suspend or rescind the LOA when, in its sole discretion, it determines the installation is a threat to the public safety radio system.

The owner/operator must promptly notify the AHJ of any recension of the LOA.

The owner/operator of a signal booster for which the LOA is rescinded for any reason shall be required to begin the application process with a new application filing.

10.0 Transfer of LOA

The LOA shall not be transferable due to change in owner or change in system.

A change in ownership of the property shall require the filing of a new application package. If there are to be no technical changes to the system as a result of the change, these sections of the package may be omitted, and substituted by a signed statement of the applicant stating same.

A change in the design of the system, including a replacement of the BDA shall require a new application filing.

Appendix A
Channel Plans

One or both of the packages below must be transmitted in full as dictated by the local jurisdiction

PACKAGE 1 (South and Tacticals)

Call Sign: WQSK886 & WQPJ427

South Site		
Chan #	TX (MHz)	RX (MHz)
1	773.96875	803.96875
2	772.56875	802.56875
3	774.21875	804.21875
4	773.19375	803.19375
5	774.88125	804.88125
6	769.79375	799.79375
7	769.78125	799.78125
8	770.09375	800.09375
9	770.08125	800.08125
10	771.79375	801.79375
11	770.64375	800.64375
12	772.29375	802.29375
13	771.78125	801.78125
14	772.28125	802.28125
15	772.55625	802.55625
16	773.18125	803.18125
Tactical Channels		
Chan	Tx/Rx	
Berks7TAC1	769.00625	769.00625
Berks7TAC2	769.01875	769.01875
Berks7TAC3	769.03125	769.03125
Berks7TAC4	769.04375	769.04375
Berks7TAC5	769.05625	769.05625
Berks7TAC6	769.06875	769.06875
Berks7TAC7	774.93125	774.93125
Berks7TAC8	774.94375	774.94375
Berks7TAC9	774.95625	774.95625
Berks7TAC10	774.96875	774.96875
Brks7TAC9ED	774.95625	774.95625
Brks7TAC10ED	774.96875	774.96875
Brks7TAC10ER	774.96875	804.96875
Brks7TAC11ED	774.98125	774.98125
Brks7TAC11ER	774.98125	804.98125
Brks7TAC12ED	774.99375	774.99375

PACKAGE 2 (North and Tacticals)

Call Sign: WQSK890 & WQPJ427

North Site		
Chan #	TX	RX
1	772.25625	802.25625
2	771.93125	801.93125
3	774.45625	804.45625
4	774.46875	804.46875
5	769.28125	799.28125
6	769.29375	799.29375
7	770.50625	800.50625
8	770.51875	800.51875
9	771.35625	801.35625
10	771.36875	801.36875
11	772.88125	802.88125
12	772.89375	802.89375

Tactical Channels		
Chan	Tx/Rx	
Berks7TAC1	769.00625	769.00625
Berks7TAC2	769.01875	769.01875
Berks7TAC3	769.03125	769.03125
Berks7TAC4	769.04375	769.04375
Berks7TAC5	769.05625	769.05625
Berks7TAC6	769.06875	769.06875
Berks7TAC7	774.93125	774.93125
Berks7TAC8	774.94375	774.94375
Berks7TAC9	774.95625	774.95625
Berks7TAC10	774.96875	774.96875
Brks7TAC9ED	774.95625	774.95625
Brks7TAC10ED	774.96875	774.96875
Brks7TAC10ER	774.96875	804.96875
Brks7TAC11ED	774.98125	774.98125
Brks7TAC11ER	774.98125	804.98125
Brks7TAC12ED	774.99375	774.99375

Appendix B
System Sub-Site Locations

**NORTH
SITE**

SUB-SITE	LAT (DD)	LONG (DD)	LAT (DMS)	LONG (DMS)
ALBANY	40.59688767310	-75.93376949650	40° 35' 48.8" N	75° 56' 01.6" W
BETHEL	40.51433333340	-76.32788888900	40° 30' 51.6" N	76° 19' 40.4" W
BLUE MTN	40.53113798080	-76.20022271280	40° 31' 52.1" N	76° 12' 00.8" W
HAMBURG	40.55219444570	-75.97641666820	40° 33' 07.9" N	75° 58' 35.1" W
KUTZTOWN	40.52891666670	-75.78827777760	40° 31' 44.1" N	75° 47' 17.8" W
LONGSWAMP	40.47738889070	-75.68394444670	40° 28' 38.6" N	75° 41' 2.2" W
N HEIDELBERG	40.40508333330	-76.15183333340	40° 24' 18.3" N	76° 9' 6.6" W
NORTH CAMPUS	40.38555555630	-76.01561111070	40° 23' 8.0" N	76° 0' 56.2" W
WEST PENN	40.69480555560	-75.84736111110	40° 41' 41.3" N	75° 50' 50.5" W

**SOUTH
SITE**

SUB-SITE	LAT (DD)	LONG (DD)	LAT (DMS)	LONG (DMS)
ALSACE	40.40597222220	-75.85522222200	40° 24' 21.50" N	75° 51' 18.8" W
BALLY	40.42966666550	-75.59436111270	40° 25' 46.8" N	75° 35' 39.7" W
COURTHOUSE	40.33636111230	-75.92536111100	40° 20' 10.9" N	75° 55' 31.3" W
CUMRU	40.27002777790	-75.99077777780	40° 16' 12.1" N	75° 59' 26.8" W
EARL	40.35070519560	-75.68640425360	40° 21' 02.5" N	75° 41' 11.1" W
MT PENN II	40.34863519670	-75.90171098820	40° 20' 55.1" N	75° 54' 06.1" W
ONTELAUNEE	40.42072222250	-75.94005555600	40° 25' 14.6" N	75° 56' 24.2" W
ROBESON	40.28638888770	-75.89436111270	40° 17' 11.0" N	75° 53' 39.7" W
TURNPIKE	40.13387046120	-75.86581993250	40° 08' 01.9" N	75° 51' 57.0" W
UNION	40.22908333390	-75.80650000010	40° 13' 44.7" N	75° 48' 23.4" W

Appendix C
Grant of Access Rights

I, _____, am the owner/operator of a signal booster located at _____ and hereby expressly grant the Berks County Department of Emergency Services, its employees, contractors and agents (collectively, “DES”) permission to enter my property for the purpose of accessing the above-reference signal booster in order to 1) ensure that this signal booster is in compliance with the requirements set forth in Berks County Public Safety Radio System Signal Booster Technical Requirements; 2) ensure that this signal booster will not cause interference with the public safety radio system; and 3) power down this signal booster if it is not in compliance with the Technical Requirements or is causing interference. This grant of access to my property shall continue until I expressly revoke, in writing, DES’s permission to access my property, at which time I acknowledge that I will no longer be permitted to use the above-referenced signal booster.

Name: _____

Address: _____
