Chebeague Public Safety Radio Communications

ISSUES & PROPOSED SOLUTIONS
How Our Radio System Works

- CCRCC
- (Dispatch)
- Long Island
- Chebeague Rec Center
How Our Radio System Works

Currently radio transmissions are sent via microwave from CCRCC to Long Island which are then forwarded to the microwave antenna at the Chebeague Rec Center. All these transmissions require a clear line of sight between the antennas.

Our radio signal is then sent out across the island via a radio antenna at the Rec Center.

The radio antenna at the Rec Center currently faces several challenges:

- The location of the antenna is not centralized on the island.
- The antenna is located at a low elevation and radio signals cannot overcome all the topographical interference.
- There is an unknown source of radio interference near the Rec Center that we cannot resolve.
Radio Tests

RADIO TEST POINTS ACROSS THE ISLAND

RESULTS

- **December, 2011** – Tested radio points across the island with the Rec Center antenna and an antenna at the Fire Station.

- **October, 2012** – Tested same radio points again with RCM and a mobile antenna at the Fire Station vs. the Rec Center antenna. We also identified the height needed for line of sight from the Fire Station to the Long Island microwave antenna.
Radio transmissions from the Rec Center are unreliable for most of the island, and there are numerous “dead zones”.

Radio transmissions from the Rec Center are particularly bad for all of the east end, most of North Road, and all points north/east of Thompson’s Hill. A majority of fire & rescue personnel live in these areas of poor radio coverage.

Radio transmissions transmitted from a mobile test antenna raised by a weather balloon at the fire station outperformed the Rec Center antenna at all locations, and ALL test points could send and receive intelligible transmissions with the mobile antenna.

A stable, permanently installed antenna should outperform a mobile antenna on a swaying weather balloon!
Pros/Cons For Solution #1

- Can be done quickly and is the lowest cost solution (approx. 10-20K).
- Connecting the Rec Center and the Fire Station via fiber optics adds another step to the process = another potential problem area in our complete radio system.
- Will require the purchase and installation of another alarm system to identify any signal outages. Currently we have alarm systems alerting us to any outages between Chebeague and Long Island and between Long Island and CCRCC.
- The Town does not own the fiber optic cables; Chebeague.net owns those lines. Who will bear the responsibility and costs of any problems relating to the fiber optic cables?
- Currently, power outages require personnel to go to the Rec Center, manually start the generator, and unplug the radio system from its regular power source and plug it into the generator (there is a battery system that will give the radios power for a short period of time). The Fire Station automatically converts to generator power without any manual intervention.
Our Proposed Solution (Option #2)

Install a freestanding monopole antenna at the Chebeague Fire Station with direct line of sight (120’) to Long Island and eliminate the Rec Center from our radio system.
Pros/Cons For Solution #2

- Much more expensive solution (>70K)

- We may need to request an updated license with the FCC. The microwave will need to be installed at 120’ and the antenna will need to be installed between 40’-60’. However, we have an island resident already willing to assist us with this issue.

- All components will be housed at the Fire Station. A simpler system with fewer links will provide fewer opportunities for communication failures!

- All components, including power systems, will be Town owned and maintained.

- Power outages will no longer present significant demands and challenges – generator backup is automatic and requires no manual interventions.

- We know from our radio tests that this is the ideal location for a radio antenna on our island.
Next Steps

- RCM and the tower company are working on an updated proposal with specifications and costs for a monopole antenna at the Fire Station.

- Fire/Rescue (Ralph/Lisa) will meet with the island code enforcement officer this Friday to discuss possible site plans.

- Options for financing the installation of the new radio tower/antenna need to be discussed.

- RCM is available to meet with the Board of Selectmen and interested community members later this month to answer any technical questions.
Quotation

PORTLAND LOCATION
RADIO COMMUNICATIONS MGMT, INC
158 RAND ROAD
PORTLAND, ME  04102

Quoted to: CHEBEAGUE ISLAND FIRE DEPT
TOWN OFFICE
192 NORTH ROAD
CHEBEAGUE, ME  04017

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<td>CHEBEAGUE ISLAND</td>
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<td>SCOTT</td>
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<th>Unit Price</th>
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<td>Budgetary pricing to relocate radio equipment from Recreation Center to the Fire Station after new tower installation. To include: 1) Remove radios and multiplexer equipment from Rec Center. 2) Remove microwave radio and antenna from Rec Center 3) Reinstall radio equipment at Fire Station 4) Install new VHF antenna/cable and mount at new Fire Station tower 5) Install new microwave control cabling and re-install microwave dish on new tower. 6) Realign microwave dish at Long Island for new tower location. 7) Test system</td>
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<td>Tower to be provided and installed by others. RCM will only be responsible for removal and reinstallation of equipment and installation of antennas.</td>
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<td>Assumes new tower height is enough to clear</td>
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Subtotal: Continued
Sales Tax: Continued
Total: Continued
Quoted to: CHEBEAGUE ISLAND FIRE DEPT
TOWN OFFICE
192 NORTH ROAD
CHEBEAGUE, ME 04017

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<td>1.00</td>
<td>220-3AN SKU# 576793</td>
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<td>1.00</td>
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<td>8.00</td>
<td>TECHNICIAN-03</td>
<td>TECHNICIAN LABOR- Assist tower crew with installation of antennas on new tower</td>
<td>70.00</td>
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<td>10.00</td>
<td>INSTALLATION CREW</td>
<td>INSTALLATION LABOR - 2 MEN- Relocate equipment from Rec Center to Fire Station</td>
<td>120.00</td>
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<td>1.00</td>
<td>SUBCONTRACTOR</td>
<td>Tower Crew- Remove microwave from old tower and reinstall on new and install new VHF antenna and cable.</td>
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<td>4.00</td>
<td>TECHNICIAN-42</td>
<td>TECHNICIAN LABOR- Realign dish at Long Island and direct to new tower location</td>
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Sales Tax                  
Total                      5,111.80
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**Total**
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<td>Out-of-state sale, exempt from sales tax</td>
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Total $85,695.00
Design Considerations Using The ANSI/TIA-222-Rev G Standard

The Rev G TIA Standard contains new parameters that significantly affect the magnitude of wind, ice and earthquake loading. In addition to specifying the location of a structure for determining the basic wind speed, design ice thickness and earthquake accelerations, it is important to consider these new parameters for the design of proposed structures and for the modification of existing structures.

The following summary and explanations are intended to assist users of the Standard with these new parameters. Reference should also be made to the Rev G Standard, which contains more detailed information and an annex that provides additional procurement and user guidelines. In addition, please contact your ROHN Sales Representatives for any questions or for assistance in the use of the TIA Standard.

Classification of Structures (reliability)

Classification of structures allows for the adjustment of wind, ice and earthquake loading to match the reliability requirements for a specific application. Three reliability classes have been established based on the type of service provided and on the structure’s potential hazard to human life and property. Wind, ice and earthquake loading requirements progressively increase from Class I to Class III structures.

Class I: Structures used for services where a delay in returning the service would be acceptable and the structure represents a low hazard to human life and/or property. Example services would be: residential wireless and conventional 2-way radio communications; television, radio, and scanner reception; wireless cable; amateur and CB radio communications. Structures of this classification are exempt from ice and earthquake loading and wind loads are reduced 13% compared to Class II structures.

Class II: Structures used for services that may be provided by other means or structures that represent a significant hazard to human life and/or property. Example services would be commercial wireless communications; television and radio broadcasting; cellular, PCS, CATV, and microwave communications.

Class III: Structures specifically designed for essential communications or structures that represent a substantial hazard to human life and/or property. Examples of essential communications would be: civil or national defense; emergency, rescue, or disaster operations; military and navigation facilities. Loadings are increased for structures of this classification compared to Class II structures (15% for wind, 25% for ice and 50% for earthquake).
Exposure Categories (terrain)

Exposure categories are used to adjust wind loading based on the type of terrain surrounding a site. Reduced wind loads are associated with rougher terrains that tend to slow the wind down. Three exposure categories have been defined based on terrain roughness. Wind loading is increased as the exposure designation changes from Exposure B (roughest terrain) to Exposure D (smoothest terrain).

**Exposure B:** Urban, suburban or wooden areas. The wind load at ground level is reduced by 18% compared to Exposure C. This reduction diminishes with height, making the overall wind reduction less significant for taller structures. In order to qualify for the wind load reduction, the rough terrain must extend in all directions from the site at least twenty times the height of the structure but not less than one-half mile [0.8 km].

**Exposure C:** Flat, open country and grasslands. Shorelines in hurricane prone areas are currently included in this exposure due to the roughness of waves generated during hurricanes; however, research is continuing regarding wind loading for hurricane areas.

**Exposure D:** Flat, unobstructed areas exposed to wind flowing over open water or smooth terrain for at least 1 mile [1.6 km]. Examples would be shorelines of large bodies of water and areas adjacent to or within mud or salt flats. The wind load at ground level is increased 21% compared to Exposure C. The higher wind load applies to structures located within 20 times their height from an Exposure D terrain. An exception is permitted for sites located in an Exposure B terrain that are at least 2 miles [3.2 km] from the Exposure D terrain. Under these conditions, the site may be classified as Exposure C.

Topographic Categories (elevated sites)

Topographic categories are used to determine increases in wind loading for sites located on hills and other elevated locations (other than buildings). The shape and size (topography) of an elevated site determines the increase in wind load. Although many elevated sites have their own unique features, the intent is to idealize these sites into one of the standard topographic categories described below. For structures supported on buildings, it is only necessary to specify the height of the building and the surrounding exposure category.

The height of an elevated site above the surrounding terrain must be specified in order to determine the full extent of wind loading in accordance with the Standard. This should not be confused with the elevation of the site. As described below, elevations of the site and the surrounding terrain may be used to determine height.

**Category 1:** Flat or rolling terrain with no abrupt changes in general topography. No increase in wind loading is required for this category.
**Category 2:** Sites separated from a lower elevation by a gently sloping terrain (escarpment). Wind loads at the crest are 2.0 times the wind loads for a flat site and diminish with height depending on the height of the escarpment.

Height for an escarpment is the difference in elevation between the upper and lower levels. Increased wind loads do not apply for structures located in the lower half of the sloping terrain or located beyond 8 times the escarpment's height from the crest.

**Category 3:** Sites located at the top or within the upper half of a hill. Wind loads at the top of a hill are 2.3 times the wind loads for a flat site and diminish with height depending on the height of the hill.

Height for sites on isolated hills is the difference in elevation between the top and bottom of the hill. For sites on prominent hills surrounded by other hills, height is the difference in the hill elevation at the site and the average elevation of the surrounding hills (within a 2-mile [3.2 km] radius). In other words, height is the projection of the hill exposed to wind. When there are hills surrounding the site, increased wind loads do not apply unless the height of the hill at the site is at least 3 times the average height of the surrounding hills.

**Category 4:** Sites located on a ridge. Wind loads at the top of a ridge are 3 times the wind loads for a flat site and diminish with height depending on the height of the ridge.

Height for a ridge is the difference between the top and bottom elevations of the ridge.

**Category 5:** This category is reserved for sites where site-specific investigations are performed to determine wind loading. A site-specific investigation may result in either higher or lower wind loads compared to using one of the standard topographic categories.
SPECIAL TOWN MEETING WARRANT

TO: Gloria Brown, a resident of the Town of Chebeague Island, in the County of Cumberland and State of Maine,

GREETING:

In the name of the State of Maine, you are hereby required to notify and warn the voters of the Town of Chebeague Island in the County of Cumberland, State of Maine, qualified by law to vote in town affairs, to meet at the Chebeague Island Community Hall, 247 South Road, Chebeague Island, Maine on XXXXX, the XX day of XXXXX, 2014 at 9 o’clock in the morning, then and there to act upon the following Articles, numbered 1 through X:

**Article 1:** To see what sum, if any, the Town will vote to appropriate for the purchase of a communications tower and associated emergency communications equipment to aid in the protection of the Town of Chebeague Island, and of such total appropriated amount to see what amount will be funded from the following sources: Fire Truck Reserve Fund, Undesignated Fund, such other Town funds or accounts to be identified at Town Meeting, or from the proceeds of Town bonds up to an amount of $100,000 (and notes in anticipation thereof), with such bonds as may be authorized to mature (not to exceed the maximum term permitted by law), bear interest and contain such other terms and conditions, including provisions for early redemption or prepayment, as may be approved by the Board of Selectmen to be in the best interest of the Town of Chebeague Island, and to further authorize the Town Treasurer to take any and all other action, including designating such debt as bank qualified under Internal Revenue Code Section 265(b), and to sign such other documents and certificates as may be necessary or convenient to accomplish the purchase of said Fire Truck and the issue and delivery of said bonds.

**Fire Chief Request:** $100,000

**Selectmen Recommend:** $100,000 with $XX,000 being appropriated from the Fire Truck Reserve, and $XX,000 from the Undesignated Fund.

**MUNICIPAL TREASURER’S FINANCIAL STATEMENT [30-A M.R.S.A. § 5772(2-A)]**

1. **Total Town Indebtedness.**
   
   A. Bonds outstanding and unpaid: $2,874,458.66
   
   B. Bonds authorized and un-issued: $0
   
   C. Bonds to be issued if this Article 2 is approved with borrowing: $107,812.14
   
   **TOTAL:** $2,982,270.80

2. **Costs.**
At an estimated maximum interest rate of 3% and an estimated term of 5 years, the estimated costs of this bond issue will be:

Principal: $100,000
Interest: $7,812.14
Total Debt Service: $107,812.14

3. Validity. The validity of the bonds and of the voters’ ratification of the bonds may not be affected by any errors in the above estimates. If the actual amount of the total debt service or the bond issue varies from the estimate, the ratification by the electors is nevertheless conclusive and the validity of the bond issue is not affected by reason of the variance.

_________________________________
Eric Dyer
Treasurer, Town of Chebeague Island

Given to our hands, this _____________ day of XXXXX, 2014 at Chebeague Island, Maine.

Chebeague Island Board of Selectmen

_________________________  _________________________  _______________________
Mark Dyer, Chairman     Bill Calthorpe     Susan Campbell

_________________________  _________________________
Donna M. Damon     David Hill

A True Copy

Attest: _________________________  _________________________
Town Clerk  Date

Town of Chebeague Island