EMERGENCY MEASURES RADIO GROUP

OTTAWA ARES

Two Names - One Group - One Purpose

Revision Summary

2009-08-02 Create original document based on 2 site visits

Purpose Of This Document

This document shows the layout of equipment in Ben Franklin Place, to support users in BFP and 100 Constellation.

PROJECT OBJECTIVE

1. The Emergency Measures Radio Group (EMRG) primary objective for this project is to be able to provide radio communications from inside Ben Franklin Place (BFP), with two independent radio channels, to support Community Services if required in an emergency.
2. The secondary EMRG objective is to be prepared to support other City of Ottawa departments located in BFP or 100 Constellation Crescent, that might require communications assistance in a emergency. (Example is Public Health who have a command centre at 100 Constellation and might need to communicate with Hospitals, who are also an EMRG client)

BACKGROUND

- In an emergency where local phone or cell phone communications is not working, or not working in some places, EMRG could be requested by the City of Ottawa to provide radio communications to support humanitarian relief efforts.
- The radio communications would typically link the Community Services Command Centre at BFP with;
    - Ottawa Red Cross on Catherine Street
    - Reception centres (shelters) anywhere in the City
    - City of Ottawa Emergency Operations Centre (EOC) at City Hall
    - Any other location or organization that may be required.
- It is quite likely that 2 radio channels would be required. One radio channel would be used for operations, linking all reception centres with the Community Services Command Centre and the Ottawa Red Cross. The second radio channel would be used for command and control, linking the Community Services Command Centre, the Ottawa Red Cross and if required, the City EOC.
- While Community Services has not requested data capabilities from EMRG, EMRG believes that data (email or text) has tremendous advantages and that once it can be demonstrated, it will become a requirement. For that reason, support for data communications is included in the design.

CHALLENGES

- Radio communications from inside BFP to the repeater sites EMRG would use is difficult at best and may not be possible from some areas of the building.
- EMRG strategy is to offer flexible radio communications that allow the radio operator to be located where it is convenient for the supported users. Radio communications should meet user needs.
- The best solution to meet the primary and secondary objectives, while also providing flexibility to locate the radio operator anywhere in the building, is to implement a system that allows users inside BFP or 100 Constellation to communicate using hand held portable radios that connect with a portable or permanent repeater system on or near BFP, which links them to other systems and locations in the City.
- Using portable cross band repeaters would work, but there are questions about where the equipment would be located when deployed and where the equipment would be stored. If the equipment is stored at OFS Dispatch with other EMRG equipment, then transportation is required to BFP, while if the equipment is located at BFP, a secure location is required, which can be accessed by EMRG in an emergency.

PROPOSED SOLUTION

- The proposed solution is to install a permanent radio system at Ben Franklin Place, suitable to provide 3 independent voice channels and 1 data channel. This is similar to the existing VHF system at OFS Dispatch, which has a VHF repeater, simplex channel and data channel sharing a single antenna.
- Advantages of a permanent radio system ;
    - ability to use filters to connect multiple radios to a single antenna
    - equipment is always active so it can be tested remotely
    - equipment is ready to go any time, so only a radio operator with a portable radio is required to get started
    - AC power is backed up by a generator and the DC power has extensive battery backup
- If the 3 voice radio channels cannot be configured on a single system, then the cross band UHF to 220MHz option would be dropped from the design. This needs further technical discussion to confirm.

EQUIPMENT REQUIRED

- Much of the equipment required for this project has already been collected by EMRG through an ongoing effort to build an inventory of potentially useful used equipment. The equipment from EMRG supplies includes;
    - Equipment rack
    - 1 VHF & 3 UHF radios
    - Data TNC (New equipment donated by Ottawa Amateur Radio Club)
    - VHF Antenna
    - UHF Cavity Filters (some from Carlington Heights, plus other local donation)
    - Staticon Power supply / battery charger (local donation)

- Approximately $5000 of funding would be required to complete the project, to purchase the following equipment;
    - UHF repeater ($1200)
    - Two batteries ($500)
    - Radio shop services ($1200)
    - 220 MHz radio & antenna ($500)
    - Two cross band radio controllers ($600)
    - Hardware, connectors, mounting brackets ($400)
    - Two UHF portable radios ($600) – Portable radios stored on site with spare AA batteries, for use in an emergency.

TECHNICAL WORK REQUIRED

- EMRG volunteers would do the bulk of the work, which involves wiring appropriate connections on radios, preparing physical mounting of equipment in the rack and preparing wall mounts for cavity filters.

- EMRG will use the same policy for this project as used in Ottawa Fire Service sites. The final configuration and adjustment of the radio equipment will be completed and tested by a commercial radio technician to ensure that the operation of the equipment is independently verified.

PROJECT PLAN

1. SITE EVALUATION:

- Visit to Ben Franklin Place (BFP) to determine what options may exist for the installation of antennas and radio equipment. (Completed March 22, 2009)
  - Found existing antennas that appear to not be in use, which might be useful for EMRG.
  - Unable to locate where the antenna cables terminate.
- Visit BFP to find where antenna cables terminate. (Completed July 29, 2009)
  - Found it is not a simple path from antennas to end of cable. Cables split in different directions on the 3rd floor (RM 324 across from dumb waiter).
  - Found old radio abandoned in room 324, plus several radio cables that have been cut off and abandoned in place (abandoning radio cables and equipment is standard practice, since no one seems interested in clean up, or funding anyone to trace cables and remove them.
  - Found end of LMR400 cable in ceiling on 2nd floor.

2. DEVELOP SOLUTION PROPOSAL:

- Based on short and long term requirements, develop a proposed solution that could be implemented at BFP, including equipment required and costs. (Completed August 3, 2009)

3. EVALATUION TEST:

The proposal will work in theory, however an evaluation test is required to confirm that the proposal will work.

1. Locate the end of one of the pieces of RG-8 coax from antenna B or C. Install a connector if there is none.
   - It may not be possible to locate the end of the cable. If so, locate the cable far enough beyond room 324 that the cable can be cut an pulled back into room 324, with enough length to reach the radio equipment. This may be one floor down or somewhere on floor 3.
2. Test the antenna to ensure it is tuned (at least close enough for testing) for the Amateur radio UHF band.
   - If the antenna SWR is too high, the antenna will need to be adjusted to the proper SWR. This will require a ladder and tools to lower the antenna mast.
3. Once the antenna is tested OK, then attach a UHF repeater to the antenna cable and do a walk around radio test in BFP and 100 constellation to confirm that the UHF signal will penetrate the areas required and that within BFP there is sufficient down tilt to provide a signal within the building.

PROJECT PLAN - continued

4. CITY APPROVAL:

1. Confirm that space is available, and equipment can be installed on the 3rd floor (Room 324), or find another suitable location. Room 324 is a combination electrical and IT room, so the empty space may be reserved for future expansion.
    - The EMRG solution proposal details the space and power requirements for the EMRG equipment, which is required for the City to evaluate the request for space.
2. Confirm that Community Services and the Office of Emergency Management support the EMRG proposal, including requirements and the solution.
3. Confirm how the project can be funded and finalize the project plan.

5. PREPARE RADIO EQUIPMENT & ANTENNAS

1. Order the additional equipment required for this project.
2. Prepare the equipment including any special wiring for radios, controllers and the TNC.
3. Take the radios and cavity filters to Glentel and have them configured as required.
4. Install the equipment in the relay rack, install cables between equipment. Verify operation prior to installation at BFP.
5. Move all the equipment to BFP, install the relay rack and wall mounting brackets for the cavity filters, then install all equipment and interconnecting cables.
6. Prepare the antennas and antenna cables as required for this project.
7. Coordinate with Glentel for a site visit to verify final configuration on site and activate equipment and confirm that it is functioning properly.

PROJECT PLAN - continued

6. FINAL TESTING

1. Prepare a test plan that identifies specific areas that must be tested, along with areas where operation should be tested to gather a good understanding of system coverage.
2. Following the test plan, evaluate radio coverage for all areas within BFP and 100 Constellation, as well as coverage in the surrounding areas, including Algonquin College.

7. TRAINING:

1. Prepare an EMRG training course on how to use the radio system at Ben Franklin Place.
2. Provide training sessions with hands on practice at BFP.

8. EMRG EXERCISE:

1. Practice skills learned in the training and evaluate EMRG operations plans to ensure system performs properly and SOPs are workable.

9. DEMONSTRATE CAPABILITIES:

- The reason for developing the radio system at BFP is to support Community Services. In order to effectively support Community services, both groups need to understand each others requirements and capabilities.
- Demonstrate the services that EMRG can provide, seek input from Community Services on what works, what could be better and what is missing.
- Using information collected, work to improve systems and process.

Ben Franklin Place Radio Project

TECHNICAL DETAILS

	EMRG-618 **Ben Franklin Place (BFP) Radio System**		
Drawing Title:	Name: Peter Gamble		Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02	Page: 8

The dashed yellow line shows the area of interest that EMRG would like to cover with this system. Ben Franklin Place (BFP) and 100 Constellation are the main targets, while Algonquin College may be a potentially useful side benefit.

UHF band radios would be used due to their better building penetration. The antennas would be located on the roof of Ben Franklin Place (See red X), and would provide inside coverage downward into Ben Franklin Place and sideways into 100 Constellation.

The system may also provide some coverage East into Algonquin College, North into the school and NW to the Pinecrest community centre on Baseline. There may be some coverage to the South at Nepean Sportsplex.

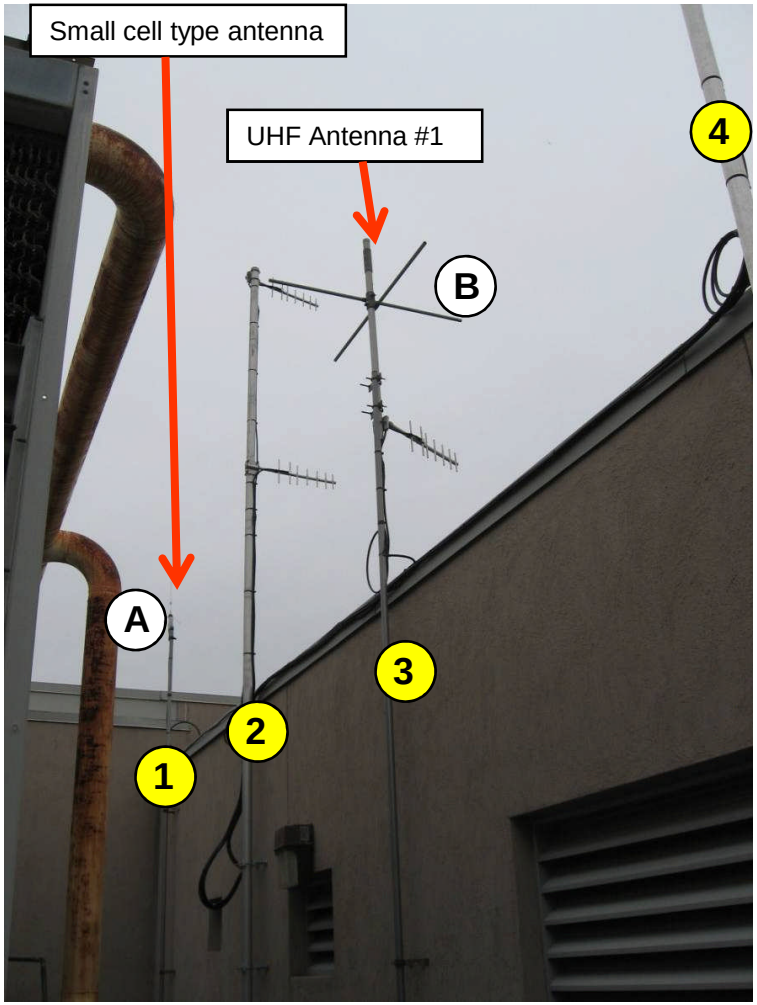
	EMRG-618	**Ben Franklin Place (BFP) Radio System**	
Drawing Title: **Coverage Area For BFP Radio System**	Name: Peter Gamble		Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02	Page: 9

The existing antennas clear the roof, but are not high, so they are not easily visible from the street.

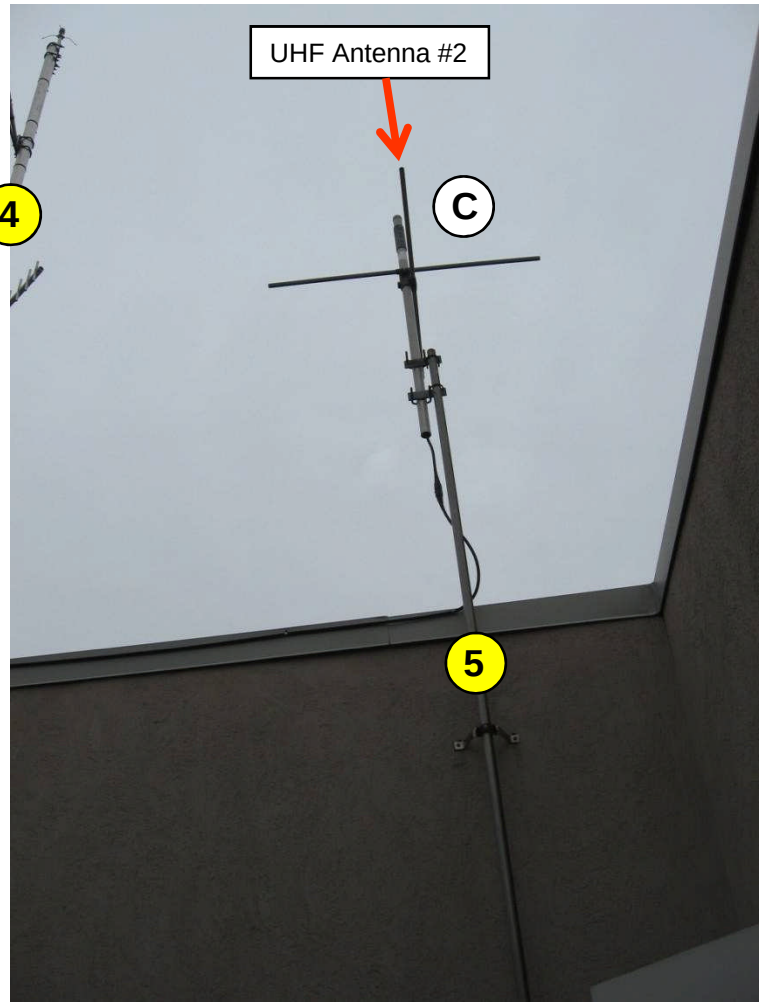
EMRG will use the same antenna height.

Antenna location on BFP. Small square area is recessed from main roof and antennas attach to the wall and stick up above the main roof

	EMRG-618	**Ben Franklin Place (BFP) Radio System**	
Drawing Title: **Arial View Of Antenna Location On BFP**	Name: Peter Gamble		Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02	Page: 10

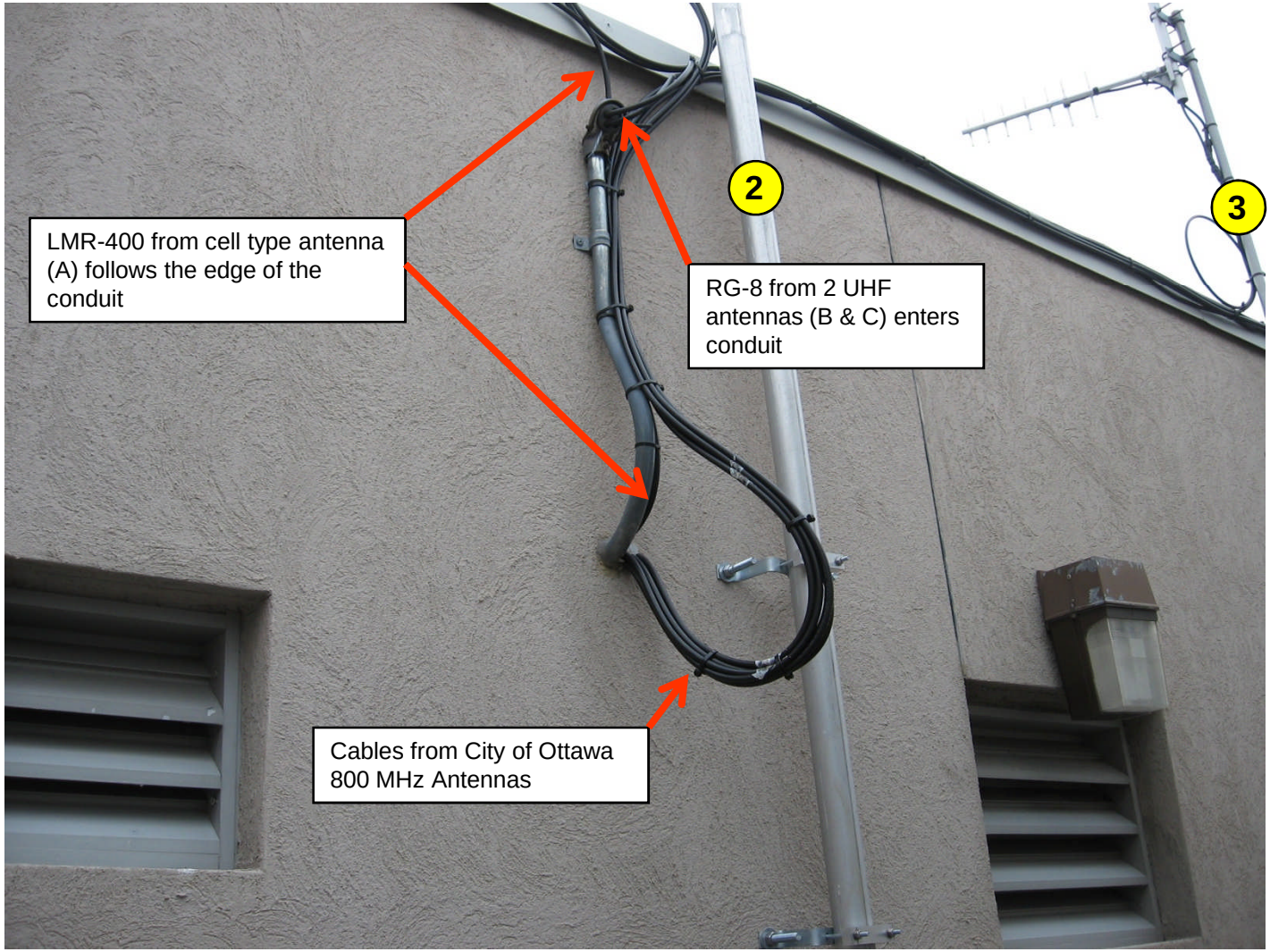


Mast 4 is seen in both pictures, which were taken from different angles



- There are 5 antenna masts attached to the wall. (Yellow circles 1 to 5)
- EMRG is interested in the antennas on top of masts 1, 3, 5. The antennas of interest to EMRG are labeled with a white circle and the letters A, B, C. The 3 antennas are no longer used, and were part of the old City of Nepean Bylaw services.
- All other antennas are part of the City of Ottawa 800 MHz trunked radio system currently in use.

	EMRG-618	**Ben Franklin Place (BFP) Radio System**	
Drawing Title: **Antennas & Masts At BFP**	Name: Peter Gamble		Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02	Page: 11



The 2 pieces of RG-8 coax cable (antennas B & C), plus the LMR-400 cable from antenna A, all appear in room 324 (3rd floor electrical/telecom room). From room 324, the 3 cables split and go in different directions.

BFP RADIO SYSTEM PLAN

1. Remove antenna A from mast #1. EMRG will save the antenna for use on a future project.

2. Remove UHF antenna B from mast #3, and re-install it on mast #1. It will be the new antenna A.
   - The UHF communications will have multiple frequencies on a single cable and antenna, so the LMR-400 that runs to mast #1 is the best cable of the 3 available, to use for this purpose.

3. Install a new 220 MHz antenna on the top of mast #3. This will be the new antenna B.

4. Remove UHF antenna C from mast #5. EMRG will save the antenna for use on a future project.

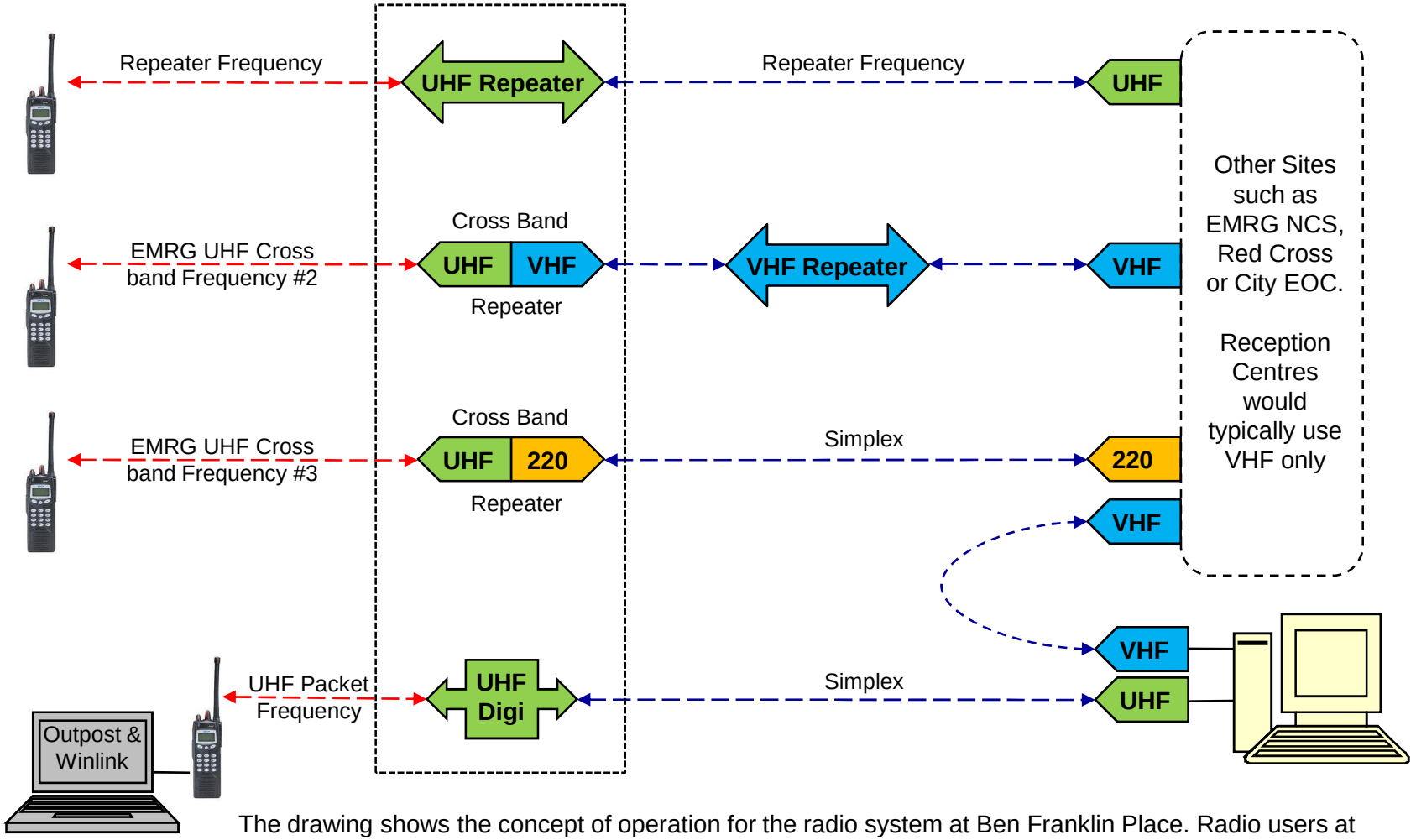
5. Install a VHF antenna on mast #5, of the same style as the UHF antenna that was just removed. This will be the new antenna C.

6. Install the radio equipment in room 324, the electrical/telecom room on the 3rd floor (across from the dumb waiter). Most of the equipment should fit into a relay rack, although some filter cans may need to be wall mounted on the plywood at the end of the room.

7. Locate each of the 3 coax cables far enough beyond room 324 that the cable can be cut an pulled back into room 324, with enough length to reach the radio equipment. This may be one floor down or somewhere on floor 3. It is not worth the effort to locate the ends of the cables and pull all the cable out. There are existing cables from other applications that have been abandoned in place.

8. Engage Glentel, the local radio company to provide final duplexer and radio tuning, to validate that the system is meeting commercial radio specifications. This is the same requirement that EMRG meets for all radio equipment in Ottawa Fire sites.

9. Activate the equipment and test the radio coverage for all channels.



The drawing shows the concept of operation for the radio system at Ben Franklin Place. Radio users at BFP or 100 Constellation would use UHF portables for all communications, and would have access to 3 voice channels and 1 data channel. It is assumed that users will be spaced far enough apart that there will not be a problem with desense between portable radios. The packet radio system at OFS Dispatch, will have multiple ports (VHF & UHF), which access the BBS on the computer, or the Winlink system, so users can connect on the band that is most convenient for them, since they do not need to directly connect to other users.

	EMRG-618	**Ben Franklin Place (BFP) Radio System**	
Drawing Title: **Concept Diagram Showing Radios & Bands**	Name: Peter Gamble		Version: 0.1
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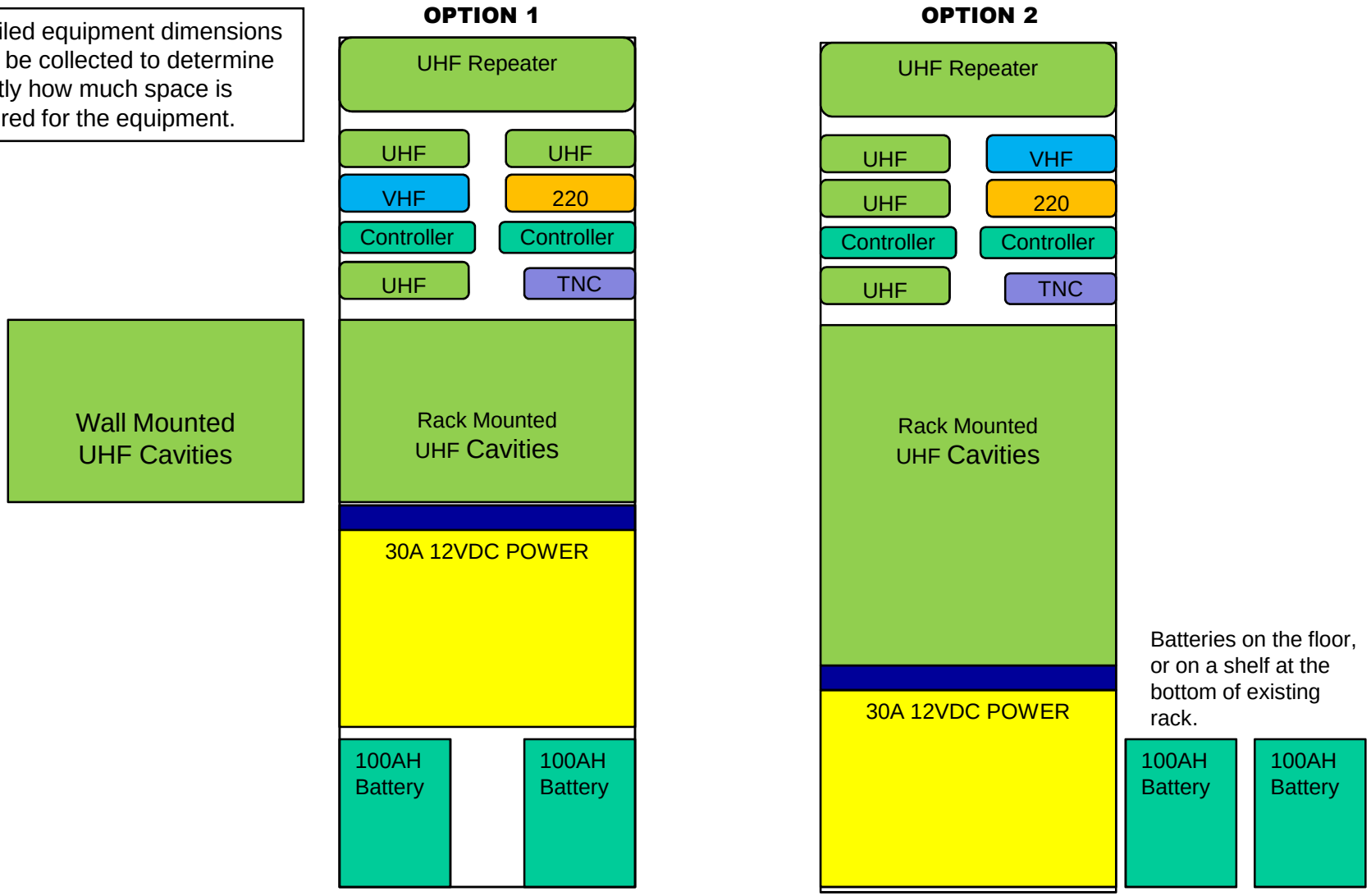
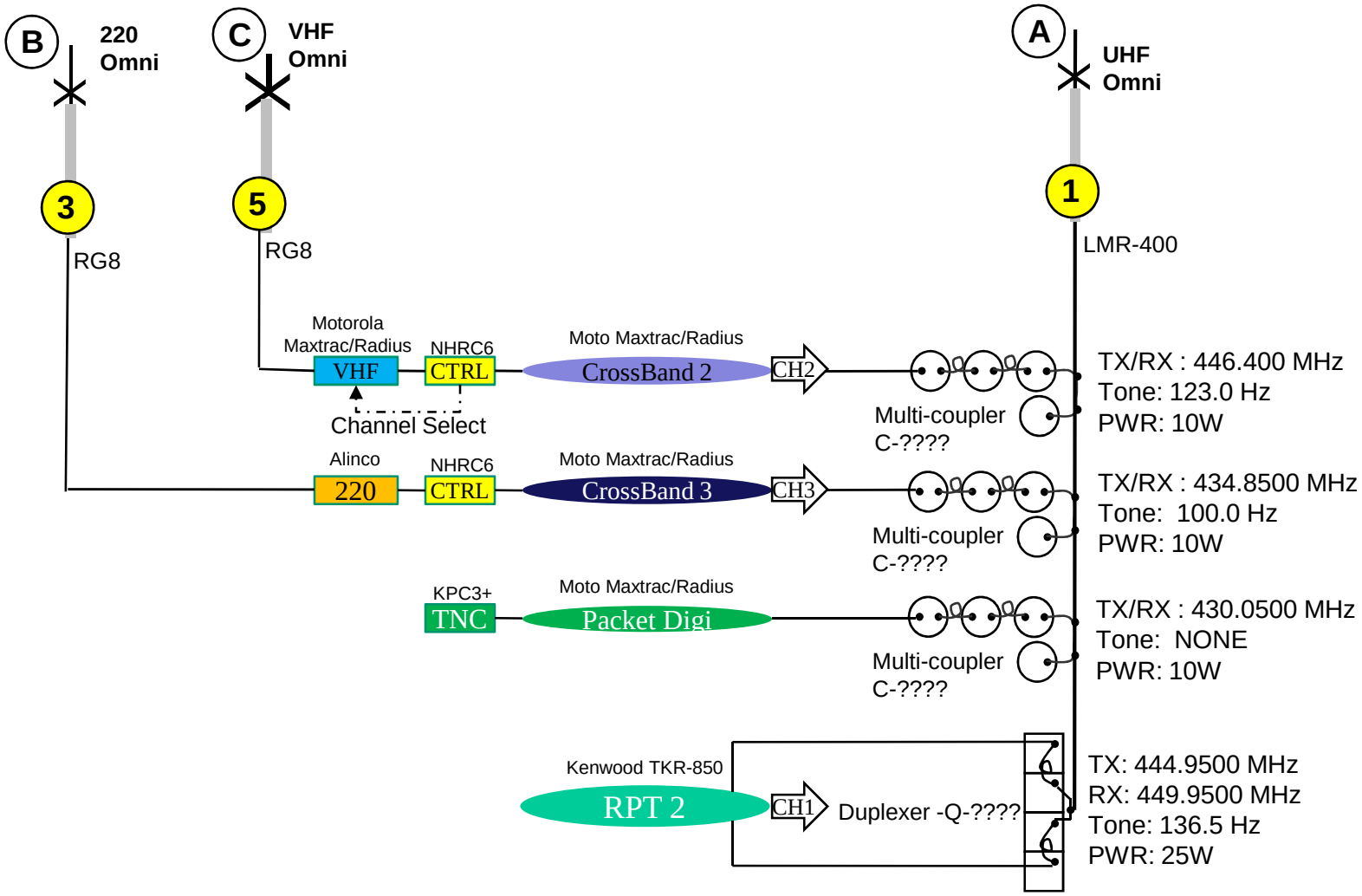
Detailed equipment dimensions must be collected to determine exactly how much space is required for the equipment.

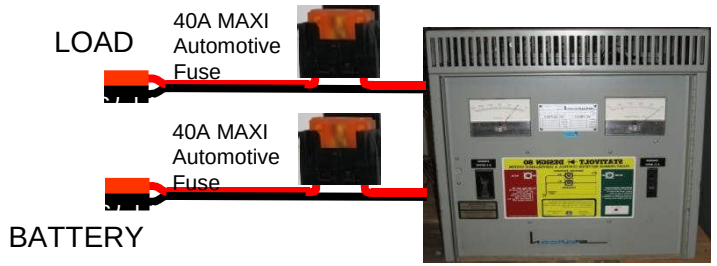


Two possible equipment layouts. The repeater, radios, controllers, TNC and 12 VDC power unit will definitely go in the rack. There is probably not enough space left for the cavities and batteries and removing the batteries probably still won't leave enough space for all the cavities, so option 1 is probably the way to go.

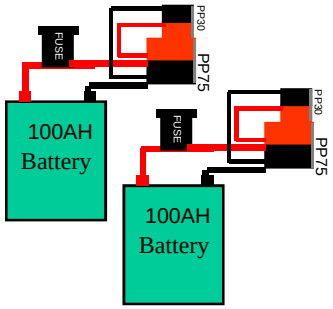


The BFP UHF Repeater is RPT 2, while the UHF repeater at OFS Dispatch is repeater 1.
The cross band frequencies are listed as crossband 2 & 3 in the EMRG frequency list.

	EMRG-618	**Ben Franklin Place (BFP) Radio System**
Drawing Title: **Wiring Diagram with proposed frequency assignments**	Name: Peter Gamble	Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02 / Page: 16



Staticon Series 80 - 30 Amp
Power Supply / Battery Charger



	EMRG-618 **Ben Franklin Place (BFP) Radio System**		
Drawing Title: **DC Power System To Support All Radios**	Name: Peter Gamble		Version: 0.1
Emergency Measures Radio Group Ottawa ARES	Classification: Public	Date: 2009-08-02	Page: 17