## 26 P25 MT GRACE


The P25 MT GRACE radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 MT GRACE | |
|---|---|
| Site ID | 26 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

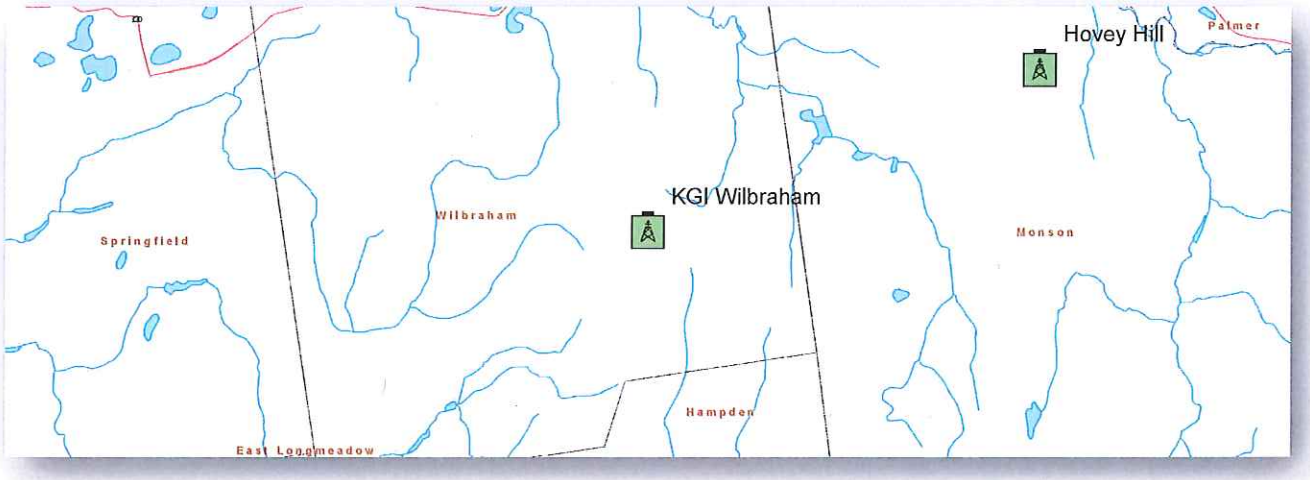
| Total Costs | | Total Cost |
|---|---|---|
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | $ | 95,000.00 |
| Engineering and Project Management | $ | 15,000.00 |
| **Total** | **$** | **110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 27 P25 WILBRAHAM




The P25 WILBRAHAM radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 WILBRAHAM | |
|---|---|
| Site ID | 27 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

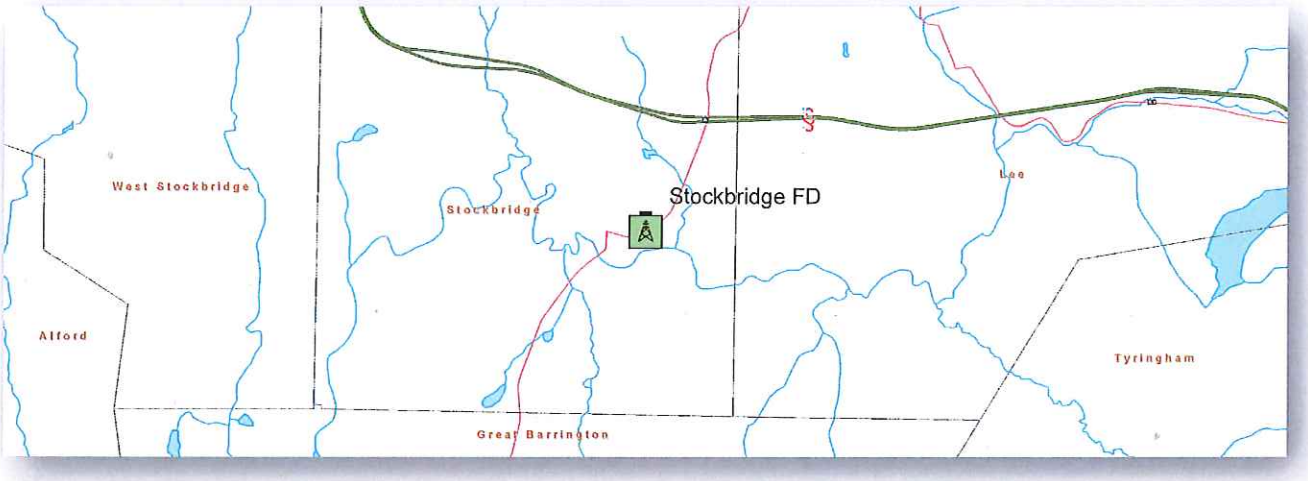
| Total Costs | | Total Cost |
|---|---|---|
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | $ | 95,000.00 |
| Engineering and Project Management | $ | 15,000.00 |
| **Total** | **$** | **110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 28 P25 STOCKBRIDGE




The P25 STOCKBRIDGE radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $140,000.00.

| P25 STOCKBRIDGE | |
|---|---|
| Site ID | 28 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

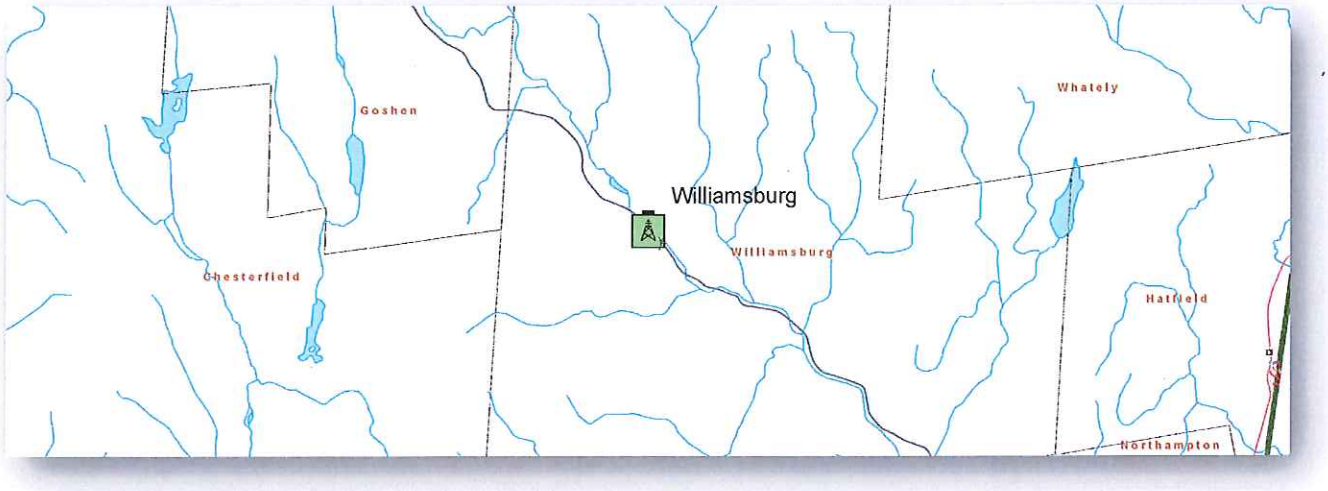
| Total Costs | Total Cost |
|---|---|
| Site Preparation | -- |
| RF Site Equipment | -- |
| Central Switching Equipment | -- |
| Console Equipment | -- |
| Subscriber Equipment | -- |
| FDMA Radio Site Upgrades | $ 125,000.00 |
| Engineering and Project Management | $ 15,000.00 |
| **Total** | **$ 140,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | 3 | $ | 30,000.00 |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **125,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 29 P25 WILLIAMSBURG




The P25 WILLIAMSBURG radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 WILLIAMSBURG | |
|---|---|
| Site ID | 29 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

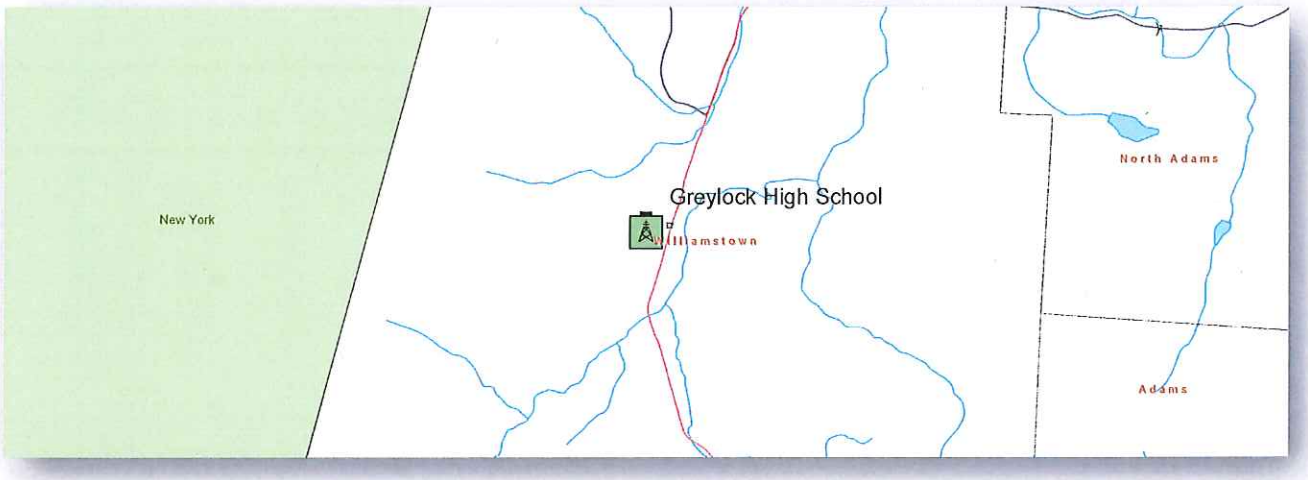
| Total Costs | | Total Cost |
|---|---|---|
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | $ | 95,000.00 |
| Engineering and Project Management | $ | 15,000.00 |
| **Total** | **$** | **110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 30 P25 GREYLOCK HS




The P25 GREYLOCK HS radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 GREYLOCK HS | |
|---|---|
| Site ID | 30 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

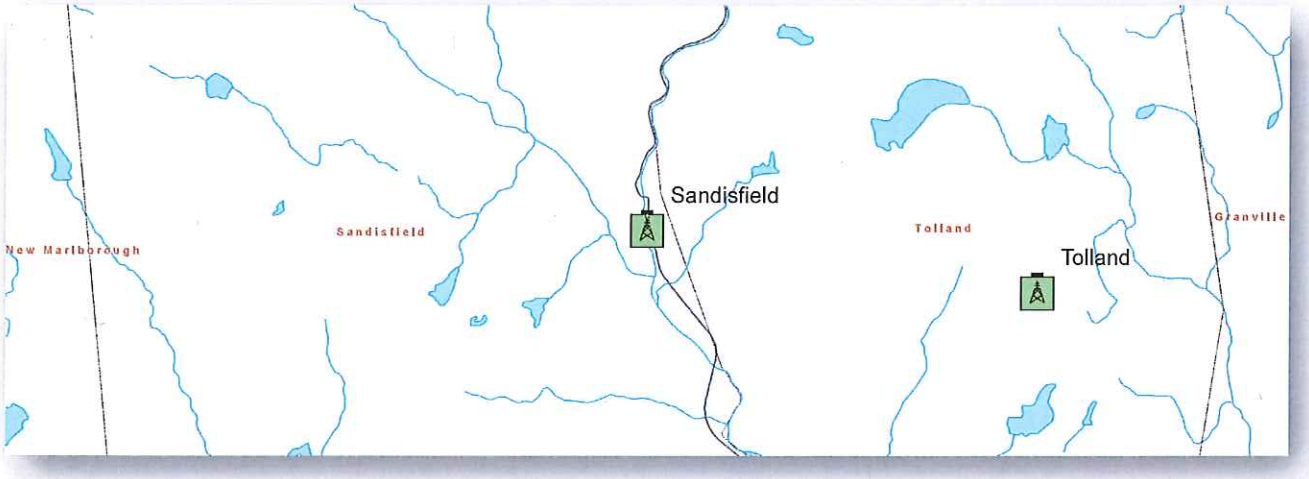
| Total Costs | | Total Cost |
|---|---|---|
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | $ | 95,000.00 |
| Engineering and Project Management | $ | 15,000.00 |
| **Total** | **$** | **110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 31 P25 SANDISFIELD




The P25 SANDISFIELD radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $140,000.00.

| P25 SANDISFIELD | |
|---|---|
| Site ID | 31 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

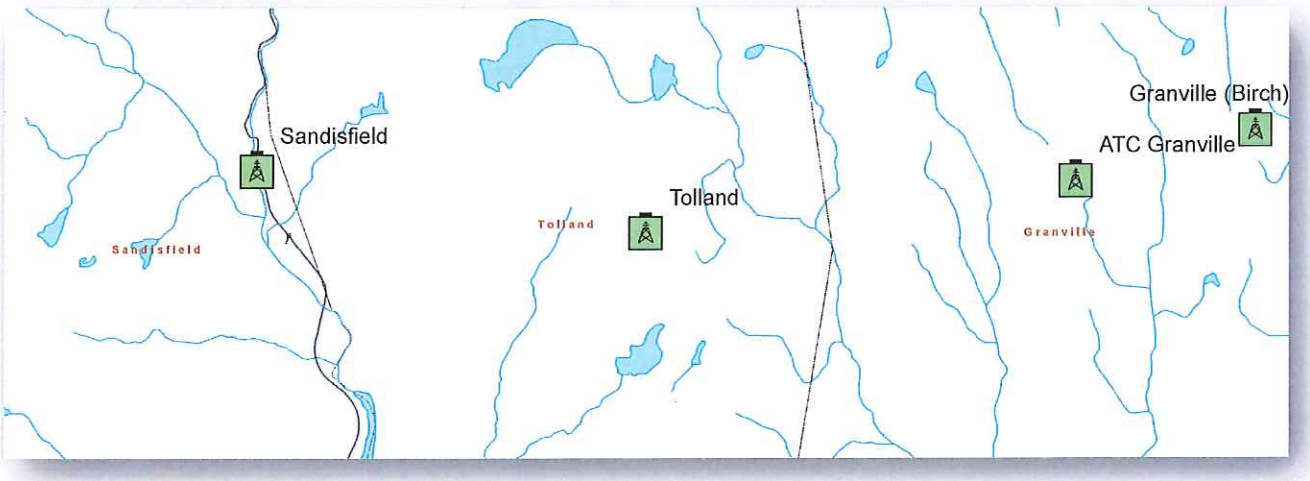
| Total Costs | Total Cost |
|---|---|
| Site Preparation | -- |
| RF Site Equipment | -- |
| Central Switching Equipment | -- |
| Console Equipment | -- |
| Subscriber Equipment | -- |
| FDMA Radio Site Upgrades | $ 125,000.00 |
| Engineering and Project Management | $ 15,000.00 |
| **Total** | **$ 140,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | 3 | $ | 30,000.00 |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **125,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 32 P25 TOLLAND




The P25 TOLLAND radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 TOLLAND | |
|---|---|
| Site ID | 32 |
| Site Used in Current Trunked Systems? | Yes |
| Site To Be Used in Digital System? | Yes |
| Number of Talkpaths | 4 |

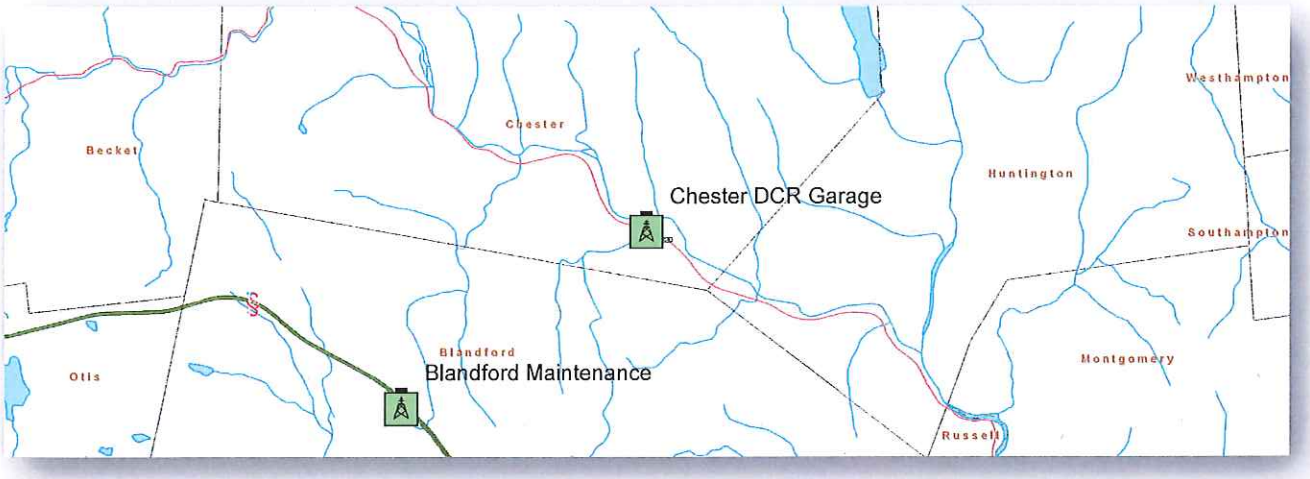
| Total Costs | | Total Cost |
|---|---|---|
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | $ | 95,000.00 |
| Engineering and Project Management | $ | 15,000.00 |
| **Total** | **$** | **110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 33 P25 CHESTER RTE 20




The P25 CHESTER RTE 20 radio site is an existing radio site on the CoMIRS analog radio network. It will not be part of a simulcast region. This radio site will support four talkpaths. The total estimated cost of modernizing this West Massachusetts radio site is $110,000.00.

| P25 CHESTER RTE 20 | | |
|---|---|---|
| Site ID | | 33 |
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | Yes |
| Number of Talkpaths | | 4 |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 95,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 110,000.00** |

## Detail Radio Site Cost Breakdown

| FDMA Radio Site Upgrades subcategory | Units | | Total Cost |
|---|---|---|---|
| Site preparation required for system technology refresh↓ | | | -- |
| Antenna and feedline modification for Diversity | | | -- |
| Base Station TDMA Licenses | 6 | $ | 60,000.00 |
| Site controllers TDMA License | 2 | $ | 20,000.00 |
| Simulcast prime/control point - TDMA License | | | -- |
| Switches and routers | 10 | $ | 10,000.00 |
| Installation and configuration support | 5 | $ | 5,000.00 |
| Radio sub-system - TDMA License | | | -- |
| Console sub-system TDMA License | | | -- |
| Installation and configuration support | | | -- |
| **Total** | | **$** | **95,000.00** |

| Engineering and Project Management subcategory | Units | | Total Cost |
|---|---|---|---|
| Detailed engineering design and procurement management | | | -- |
| FCC License coordination | | | -- |
| Project coordination, oversight, and contingency | 15 | $ | 15,000.00 |
| Decommission Surplus Analog Site | | | -- |
| **Total** | | **$** | **15,000.00** |

## 8.1.4.18 Other Radio Network Modernization Cost Centers

In addition to radio sites planned for the P25 TDMA CoMIRS system, other costs are associated with other cost centers on the existing analog trunked system network. Some costs are assigned to the two Zone Controllers located in Boston and Framingham. Other costs are assigned to the locations where aging dispatch consoles must be replaced as part of the modernization project. The final set of costs in this section address the decommissioning costs associated with analog radio sites that are not planned to be part of the future digital site map.

Below is a list of these other cost centers and their estimated costs. Details for each cost center are included on the pages that follow.

| Site | Radio Site Preparation | Central Switching (Core) | Console Replacement | FDMA Upgrade | Engineering and PM | Line Cost |
|---|---|---|---|---|---|---|
| **Zone 1 Switch - MSP HQ - Framingham** | **$ -** | **$ 2,000,000.00** | **$ -** | **$ 320,000.00** | **$ 55,000.00** | **$ 2,375,000.00** |
| **Zone 2 Switch - Police HQ - Boston** | **$ -** | **$ -** | **$ -** | **$ 320,000.00** | **$ 55,000.00** | **$ 375,000.00** |
| **Dispatch Console Replacement** | | | | | | |
| Dispatch Console - MSP HQ - Framingham | $ - | $ - | $ 844,000.00 | $ 15,000.00 | $ 15,000.00 | $ 874,000.00 |
| Dispatch Console - Troop H - South Boston | $ - | $ - | $ 284,000.00 | $ 15,000.00 | $ 15,000.00 | $ 314,000.00 |
| Dispatch Console - Troop A - Danvers | $ - | $ - | $ 284,000.00 | $ 15,000.00 | $ 15,000.00 | $ 314,000.00 |
| Dispatch Console - Troop C - Holden | $ - | $ - | $ 284,000.00 | $ 15,000.00 | $ 15,000.00 | $ 314,000.00 |
| Dispatch Console - Troop D - Middleboro | $ - | $ - | $ 396,000.00 | $ 15,000.00 | $ 15,000.00 | $ 426,000.00 |
| Dispatch Console - Troop B - North Hampton E911 | $ - | $ - | $ 620,000.00 | $ 15,000.00 | $ 15,000.00 | $ 650,000.00 |
| Dispatch Console - New Braintree E911 | $ - | $ - | $ 508,000.00 | $ 15,000.00 | $ 15,000.00 | $ 538,000.00 |
| Dispatch Console - Shelburne Falls E911 | $ - | $ - | $ 508,000.00 | $ 15,000.00 | $ 15,000.00 | $ 538,000.00 |
| **Decommissioned Analog Radio Sites** | | | | | | |
| IR - Mt Toby | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| IR - Shelburne Mtn | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp A - Wrentham | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp A -Morse Hill | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp C - Quabbin | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp C - Oxford | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp D - Hanson | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp D - Judges Hill | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |
| Trp D - Long Hill | $ 4,000.00 | $ - | $ - | $ - | $ 65,000.00 | $ 69,000.00 |

*Figure 8-44: Other Radio Network Modernization Cost Centers Cost Summary*

## Zone Controllers

Below are the total costs assigned to the two CoMIRS zone controllers and the system Core.

| Zone 1 Switch - MSP HQ - Framingham | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | $ 2,000,000.00 |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 320,000.00 |
| Engineering and Project Management | | $ 55,000.00 |
| **Total** | | **$ 2,375,000.00** |

| Zone 2 Switch - Police HQ - Boston | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 320,000.00 |
| Engineering and Project Management | | $ 55,000.00 |
| **Total** | | **$ 375,000.00** |

| Central Switching Equipment subcategory | Units | Total Cost |
|---|---|---|
| Radio Sub-system | 1 | $ 500,000.00 |
| Console Sub-system | 1 | $ 200,000.00 |
| Voice Logging Recorder | 1 | $ 300,000.00 |
| Network Management Sub-system | 1 | $ 300,000.00 |
| Alarm Reporting Sub-system | 1 | $ 100,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 400,000.00 |
| Installation and Configuration Support | 1 | $ 200,000.00 |
| **Total** | | **$ 2,000,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Site preparation required for system technology refresh↓ | | -- |
| Modifications for RF Diversity | | -- |
| Base Station – TDMA Licenses | | -- |
| Site Controllers – TDMA Licenses | | -- |
| Simulcast Prime/Control Point – TDMA Licenses | | -- |
| Switches and Routers | 100 | $ 100,000.00 |
| Installation and Configuration Support – FDMA Radio Sites | | -- |
| Radio Sub-system – TDMA Licenses | 200 | $ 200,000.00 |
| Console Sub-system – TDMA Licenses | | -- |
| Installation and Configuration Support – Central Switching | 20 | $ 20,000.00 |
| **Total** | | **$ 320,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Site preparation required for system technology refresh↓ | | -- |
| Modifications for RF Diversity | | -- |
| Base Station – TDMA Licenses | | -- |
| Site Controllers – TDMA Licenses | | -- |
| Simulcast Prime/Control Point – TDMA Licenses | | -- |
| Switches and Routers | 100 | $ 100,000.00 |
| Installation and Configuration Support – FDMA Radio Sites | | -- |
| Radio Sub-system – TDMA Licenses | 200 | $ 200,000.00 |
| Console Sub-system – TDMA Licenses | | -- |
| Installation and Configuration Support – Central Switching | 20 | $ 20,000.00 |
| **Total** | | **$ 320,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Detailed Engineering Design and Procurement Management | | -- |
| FCC License Coordination | | -- |
| Project Coordination, Oversight, and Contingency | 55 | $ 55,000.00 |
| Decommission Surplus Analog Site | | -- |
| **Total** | | **$ 55,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Detailed Engineering Design and Procurement Management | | -- |
| FCC License Coordination | | -- |
| Project Coordination, Oversight, and Contingency | 55 | $ 55,000.00 |
| Decommission Surplus Analog Site | | -- |
| **Total** | | **$ 55,000.00** |

## Dispatch Console Replacement

Below are the costs assigned to each of the eight MSP dispatch console locations that require replacement as part of the CoMIRS modernization project.

| Dispatch Console - MSP HQ - Framingham | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 844,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 874,000.00** |

| Console Equipment subcategory | Units | Total Cost |
|---|---|---|
| Consoles | 7 | $ 665,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 7 | $ 119,000.00 |
| **Total** | | **$ 844,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Troop H - South Boston | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 284,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 314,000.00** |

| Console Equipment subcategory | Units | Total Cost |
|---|---|---|
| Consoles | 2 | $ 190,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 2 | $ 34,000.00 |
| **Total** | | **$ 284,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Troop A - Danvers | | |
|---|---|---|
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 284,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 314,000.00** |
| | | |
| **Console Equipment subcategory** | **Units** | **Total Cost** |
| Consoles | 2 | $ 190,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 2 | $ 34,000.00 |
| **Total** | | **$ 284,000.00** |
| | | |
| **FDMA Radio Site Upgrades subcategory** | **Units** | **Total Cost** |
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Troop C - Holden | | |
|---|---|---|
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 284,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 314,000.00** |
| | | |
| **Console Equipment subcategory** | **Units** | **Total Cost** |
| Consoles | 2 | $ 190,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 2 | $ 34,000.00 |
| **Total** | | **$ 284,000.00** |
| | | |
| **FDMA Radio Site Upgrades subcategory** | **Units** | **Total Cost** |
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Troop D - Middleboro | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 396,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 426,000.00** |

| Console Equipment subcategory | Units | Total Cost |
|---|---|---|
| Consoles | 3 | $ 285,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 3 | $ 51,000.00 |
| **Total** | | **$ 396,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Troop B - North Hampton E911 | | |
|---|---|---|
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 620,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 650,000.00** |

| Console Equipment subcategory | Units | Total Cost |
|---|---|---|
| Consoles | 5 | $ 475,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 5 | $ 85,000.00 |
| **Total** | | **$ 620,000.00** |

| FDMA Radio Site Upgrades subcategory | Units | Total Cost |
|---|---|---|
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |

| Engineering and Project Management subcategory | Units | Total Cost |
|---|---|---|
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - New Braintree E911 | | |
|---|---|---|
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 508,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 538,000.00** |
| | | |
| **Console Equipment subcategory** | **Units** | **Total Cost** |
| Consoles | 4 | $ 380,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 4 | $ 68,000.00 |
| **Total** | | **$ 508,000.00** |
| | | |
| **FDMA Radio Site Upgrades subcategory** | **Units** | **Total Cost** |
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

| Dispatch Console - Shelburne Falls E911 | | |
|---|---|---|
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | -- |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | $ 508,000.00 |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | $ 15,000.00 |
| Engineering and Project Management | | $ 15,000.00 |
| **Total** | | **$ 538,000.00** |
| | | |
| **Console Equipment subcategory** | **Units** | **Total Cost** |
| Consoles | 4 | $ 380,000.00 |
| Ancillary Servers, Routers, Switches, Backhaul Interface | 1 | $ 60,000.00 |
| Installation and Configuration Support | 4 | $ 68,000.00 |
| **Total** | | **$ 508,000.00** |
| | | |
| **FDMA Radio Site Upgrades subcategory** | **Units** | **Total Cost** |
| Console Sub-system – TDMA Licenses | 10 | $ 10,000.00 |
| Installation and Configuration Support – Central Switching | 5 | $ 5,000.00 |
| **Total** | | **$ 15,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Project Coordination, Oversight, and Contingency | 15 | $ 15,000.00 |
| **Total** | | **$ 15,000.00** |

## Decommissioned Analog Radio Sites

Below are the cost estimates associated with the nine analog trunked radio sites that are not planned to be included in the future digital radio site plan. These costs are largely associated with the decommissioning of the analog components used at these radio sites

| IR - Mt Toby | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| IR - Shelburne Mtn | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp A - Wrentham | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp A -Morse Hill | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp C - Quabbin | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp C - Oxford | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp D - Hanson | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp D - Judges Hill | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

| Trp D - Long Hill | | |
|---|---|---|
| Site Used in Current Trunked Systems? | | Yes |
| Site To Be Used in Digital System? | | No |
| | | |
| **Total Costs** | | **Total Cost** |
| Site Preparation | | $ 4,000.00 |
| RF Site Equipment | | -- |
| Central Switching Equipment | | -- |
| Console Equipment | | -- |
| Subscriber Equipment | | -- |
| FDMA Radio Site Upgrades | | -- |
| Engineering and Project Management | | $ 65,000.00 |
| **Total** | | **$ 69,000.00** |
| | | |
| **Site Preparation subcategory** | **Units** | **Total Cost** |
| Combiner / Multi-coupler Alignment | 1 | $ 2,000.00 |
| Intermodulation Test (IM and PIM) | 1 | $ 2,000.00 |
| **Total** | | **$ 4,000.00** |
| | | |
| **Engineering and Project Management subcategory** | **Units** | **Total Cost** |
| Detailed Engineering Design and Procurement Management | 1 | $ 15,000.00 |
| Decommission Surplus Analog Site | 1 | $ 50,000.00 |
| **Total** | | **$ 65,000.00** |

### 8.1.5 ❷ Upgrade User Radios – Subscriber Unit Costs

The second major cost area for the CoMIRS modernization is the replacement of old and incompatible subscriber units (or radios). Many of these radios are more than fifteen years old and operate on technology that will not be supported by the planned P25 TDMA system.

To determine the cost of subscriber unit replacement, radio activity on the existing CoMIRS network was analyzed to determine how many different subscriber units each operable agency has used in the past several years. For the 16 operable agencies on CoMIRS listed below, there were 18,856 radios in recent active use. Unfortunately, the CoMIRS activity logs do not provide details about the type of device being used. Best effort was made to determine what percentage of those active radios are "analog only," "analog/P25 FDMA," or "analog/P25 FDMA/P25 TDMA." These estimated percentages of which types of radios are used by each agency are listed below.

| Agency (Operable on CoMIRS) | Network Radio Count | Estimated % Analog | Analog Only Radios | Estimated % FDMA | Analog/P25 FDMA Radios | Estimated % TDMA | Analog/P25 FDMA/P25 TDMA Radios | Est. Radios Needing TDMA Replacement |
|---|---|---|---|---|---|---|---|---|
| Massachusetts State Police | 7,235 | 55% | 3,979 | 30% | 2,171 | 15% | 1,085 | 6,150 |
| Barnstable County Cities and Towns | 3,700 | 90% | 3,330 | 10% | 370 | 0% | - | 3,700 |
| County Jails Prisoner Transportation | 1,700 | 40% | 680 | 50% | 850 | 10% | 170 | 1,530 |
| Department of Transportation | 1,400 | 10% | 140 | 50% | 700 | 40% | 560 | 840 |
| Dept of Conservation and Recreation | 1,050 | 70% | 735 | 25% | 263 | 5% | 52 | 998 |
| MWRA | 730 | 0% | - | 20% | 146 | 80% | 584 | 146 |
| Mass. Emergency Management | 674 | 20% | 135 | 50% | 337 | 30% | 202 | 472 |
| Department of Corrections-Transport | 537 | 15% | 80 | 80% | 430 | 5% | 27 | 510 |
| MBTA Police | 474 | 0% | - | 10% | 47 | 90% | 427 | 47 |
| Mass. Environmental Police | 433 | 0% | - | 20% | 87 | 80% | 346 | 87 |
| New Braintree E-911 Towns | 271 | 0% | - | 90% | 244 | 10% | 27 | 244 |
| Department of Fire Services | 217 | 10% | 22 | 80% | 173 | 10% | 22 | 195 |
| Barnstable Sheriff | 207 | 90% | 186 | 10% | 21 | 0% | - | 207 |
| Board of Parole | 123 | 50% | 62 | 50% | 61 | 0% | - | 123 |
| Northampton E-911 Towns | 70 | 0% | - | 0% | - | 100% | 70 | - |
| Shelburne E-911 Towns | 35 | 70% | 25 | 30% | 10 | 0% | - | 35 |
| **Total** | **18,856** | | **9,374** | | **5,910** | | **3,572** | **15,284** |

*Figure 8-45: Current CoMIRS Operable User Radio Upgrade Needs*

Based on this analysis, there are an estimated 9,374 analog only radios being used by operable agencies on CoMIRS. These radios must be replaced. They will not function on the new digital network. Additionally, there are an estimated 5,910 FDMA radios. FDMA radios can operate on some digital channels, but their use will dramatically reduce the overall capacity of the network and may not be supported by the future channel plan. These radios should also be replaced. Taken together, there are 15,284 radios used by operable agencies that need to be replaced. There is an estimated 3,572 radios that are already TDMA capable and should work on the new network.

Focusing on the 15,284 radios that need to be replaced, this analysis assumes that the preponderance of these radios are either portable radios or mobile (in vehicle) radios. For cost estimating, it was assumed that there are 7,500 mobile units that need to be replaced and 7,500 portable units that need to be replaced. This is in line with the ratio of radio replacement needs identified by the MSP.

For the estimated 7,500 mobile radios, each replacement unit is estimated to cost $4,500. In addition, there is a $300 vehicle installation fee and each radio will require programming at a cost of $25 each.

For the estimated 7,500 portable radios, each replacement unit is estimated to cost $4,500. In addition, there are $370 of accessories recommended for each radio. These include a case ($50), a charger ($100), an antenna ($20), a spare battery ($100), and a microphone ($100). Each radio will require programming at a cost of $25 each.

For the remaining 284 desk radio replacement units, each replacement is similarly estimated to cost $4,500. The installation of these units typically requires the purchase and installation of an antenna system on the building at a cost of $3,000 each. Also, there is a programming charge of $25 each.

Below is a summary of these cost estimates. The 7,500 mobile radios will cost an estimated $36,187,500. The 7,500 portable radios will cost an estimated $36,712,500, and the 284 desk radios will cost an estimated $2,137,100. The total cost of all subscriber units is $75,037,100.

| **Subscriber Units** | | | | **$ 75,037,100.00** |
|---|---|---|---|---|
| **Mobile Radio Replacement** | **Units** | **Cost per unit** | **Total** | **$ 36,187,500.00** |
| Mobiles - Units | 7500 | $ 4,500.00 | $ 33,750,000.00 | |
| Mobiles - Vehicular Installation | 7500 | $ 300.00 | $ 2,250,000.00 | |
| Mobiles - Programming | 7500 | $ 25.00 | $ 187,500.00 | |
| **Portable Radio Replacement** | **Units** | **Cost per unit** | **Total** | **$ 36,712,500.00** |
| Portables - Units | 7500 | $ 4,500.00 | $ 33,750,000.00 | |
| Portables - Accessories | 7500 | $ 370.00 | $ 2,775,000.00 | |
| Portables - Programming | 7500 | $ 25.00 | $ 187,500.00 | |
| **Desk Radio Replacement** | **Units** | **Cost per unit** | **Total** | **$ 2,137,100.00** |
| Desk Radios - Units | 284 | $ 4,500.00 | $ 1,278,000.00 | |
| Desk Radios - Antenna System w Install | 284 | $ 3,000.00 | $ 852,000.00 | |
| Desk Radios - Programming | 284 | $ 25.00 | $ 7,100.00 | |

*Figure 8-46: Subscriber Unit Cost Summary*

Looking across all radio types, the average unit replacement cost is $4,914. The graphic below summarizes the radio replacement costs for the operable users of CoMIRS.

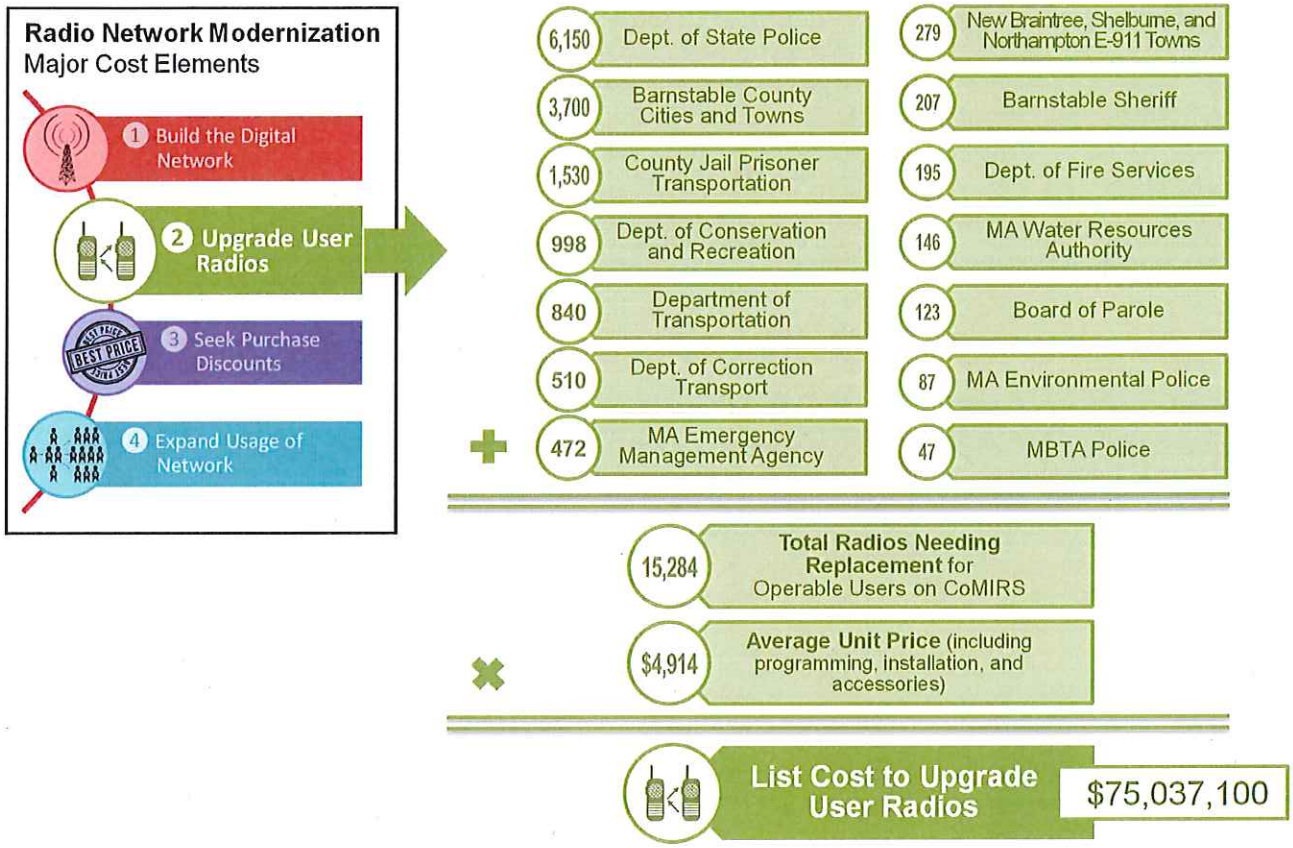



*Figure 8-47: Upgrade User Radios - Subscriber Unit Costs Summary*

Below are the estimated costs of upgrading all existing, non-TDMA radios for agencies currently operational on CoMIRS. These estimates assume an average cost of $4,914 per radio replaced, inclusive of accessories, programming, and installation.

| Agency | Radios | | Estimated Cost |
|---|---|---|---|
| Department of State Police | 6,150 | $ | 30,200,000.00 |
| Barnstable County Cities and Towns | 3,700 | $ | 18,200,000.00 |
| County Jails Prisoner Transportation | 1,530 | $ | 7,500,000.00 |
| Dept of Conservation and Recreation | 998 | $ | 4,900,000.00 |
| Department of Transportation | 840 | $ | 4,100,000.00 |
| Department of Correction-Transport | 510 | $ | 2,500,000.00 |
| MA Emergency Management Agency | 472 | $ | 2,300,000.00 |
| New Braintree E-911 Towns | 244 | $ | 1,200,000.00 |
| Barnstable Sheriff | 207 | $ | 1,000,000.00 |
| Department of Fire Services | 195 | $ | 1,000,000.00 |
| MWRA | 146 | $ | 700,000.00 |
| Board of Parole | 123 | $ | 600,000.00 |
| Mass. Environmental Police | 87 | $ | 400,000.00 |
| MBTA Police | 47 | $ | 200,000.00 |
| Shelburne E-911 Towns | 35 | $ | 200,000.00 |
| Northampton E-911 Towns | - | $ | - |

*Figure 8-48: Estimated Radio Replacement Costs for Each Operable Agency on CoMIRS*

The greatest costs for radio replacement will be for the Department of State Police ($30,200,000), Barnstable County cities and towns ($18,200,000), and county jail prisoner transportation ($7,500,000). Other state agencies will also face considerable replacement costs, including the Department of Conservation and Recreation ($4,900,000), the Department of Transportation ($4,100,000), the Department of Correction transportation ($2,500,000), MEMA ($2,300,000), the Department of Fire Services ($1,000,000), and others.

### 8.1.6 ❸ Seek Purchase Discounts – Anticipated Total Cost

While projects like the CoMIRS modernization are often complicated by the number and diversity of stakeholders involved, the scale of this radio modernization project does provide an opportunity to achieve significant overall discounts in the procurement process. By procuring radio site enhancements and subscriber unit replacements in a series of large solicitations, the Commonwealth should be able to realize some significant bulk cost savings off of the list price of the purchased technology.

For this cost analysis, a 25% "off the top" discount has been assumed for total cost calculations. This cost savings is in line with vendors bids on prior solicitations and is reasonable to expect from a competitive procurement process.

Assuming a 25% discount, the Commonwealth could save upwards of $40,651,525 over the list price for the technology required for this modernization project. With that estimated discount, the total cost of modernizing the CoMIRS network statewide and upgrading subscriber units for all current operable agencies is $121,954,575.

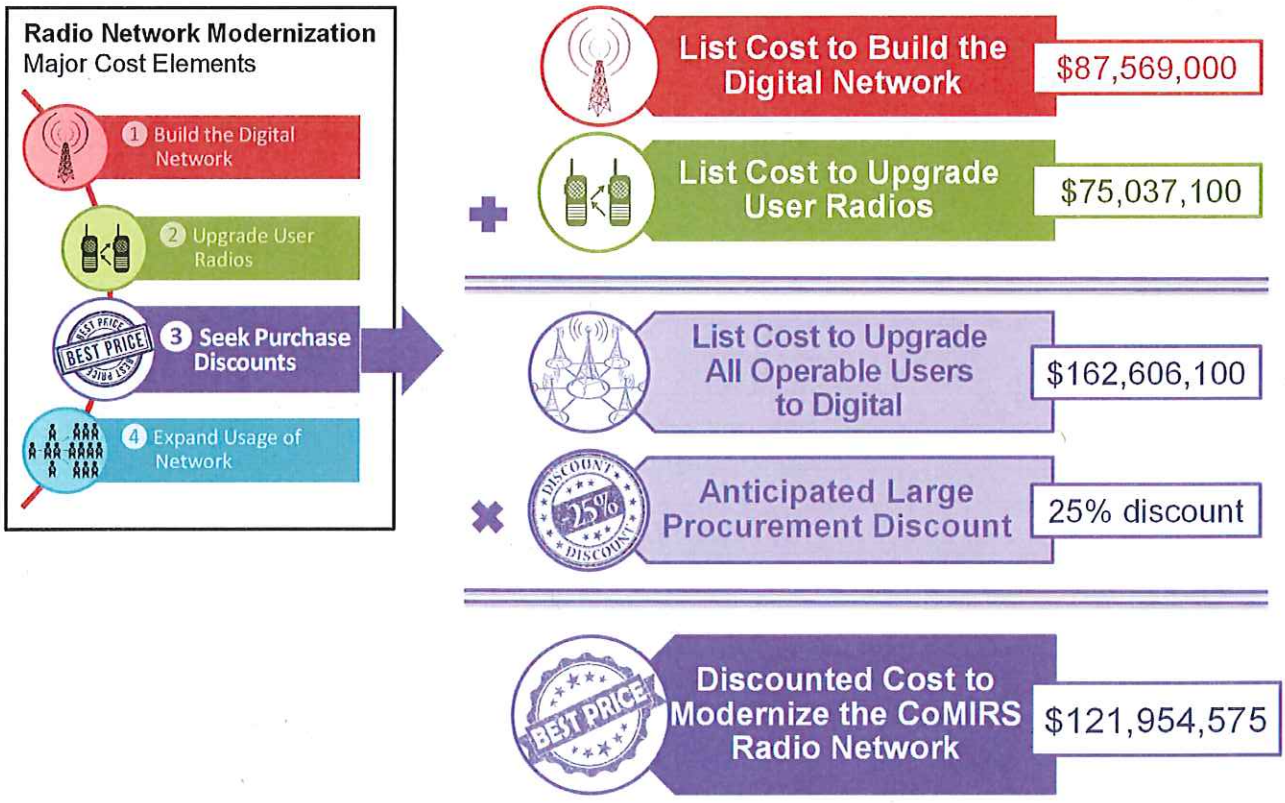



*Figure 8-49: Seek Purchase Discounts - Anticipated Total Cost Summary*

### 8.1.7 ❹ Expand Usage of Network – Additional Costs for New Agencies

Once the CoMIRS network is modernized and P25 TDMA communications are available throughout the state, the Commonwealth will have a significant new asset – capacity. This added capacity will not only support the anticipated growth of existing users on the network, but it will also allow CoMIRS decision-makers to consider allowing additional agencies to use the system operably.

CoMIRS is not the only aging radio network in the Commonwealth. It is just the biggest. Other regional entities and state agencies have been, or likely soon will, looking for funding for radio system replacement. The added capacity and total number of supported talkgroups on the modernized system will allow the manager of CoMIRS to welcome additional users on the network without jeopardizing the critical communications of its existing users.

The Executive Office of Public Safety and Security has already been approached informally, and in some cases formally, to request consideration for use of the CoMIRS network. Provided that additional capacity is not needed in the operational areas of the new user, the primary cost of adoption of the new users will be the cost of subscriber unit replacement. Agencies looking to move off of aging and out-of-support analog systems are unlikely to have invested in digital TDMA subscriber units, so the majority of their radios will need to be replaced.

Currently the major agencies interested in joining CoMIRS operationally are representatives of regional communications in Franklin and Berkshire Counties and the Department of Correction. The adoption costs for Franklin and Berkshire Counties would be the replacement of non-TDMA radios currently in use. For the Department of Correction, radios and radio infrastructure would need to be replaced. Details of the radio needs in western Massachusetts and the radio and infrastructure needs of the Department of Correction are included in Sections 8.1.7.1 and 8.1.7.2, respectively.

In total, an estimated additional $13,246,450 would be needed to add the users of Berkshire County, Franklin County, and the Department of Correction to CoMIRS. The list cost of radios and infrastructure to support these groups would be around $17.6 million. With a 25% bulk discount, the estimated total cost reduces to $13.3 million. The diagram below summarizes the estimated additional costs of adding these three groups to CoMIRS as operational users.

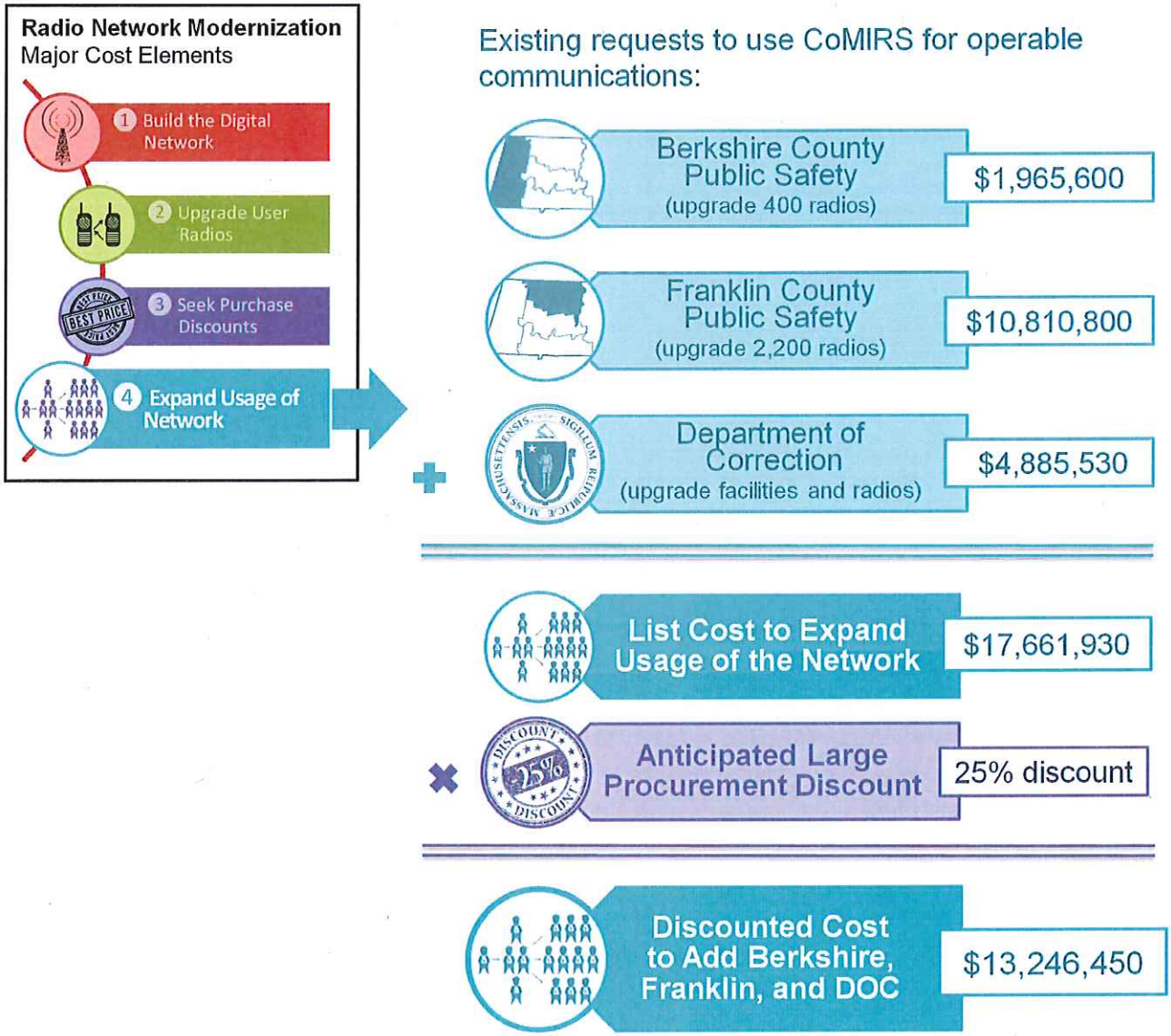



*Figure 8-50: Expand Usage of Network - Additional Costs for New Agencies*

Other statewide agencies, including MassDOT, also operate aging radio networks that are in need of replacement. Significant cost savings can be achieved for the Commonwealth as a whole if multiple aging analog radio networks can be replaced by the CoMIRS Radio Modernization Project.

### 8.1.7.1 Berkshire and Franklin County Public Safety

Regional communications in Berkshire and Franklin Counties currently operate on aging analog systems that are in need of replacement. On March 28, 2017, the Franklin Regional Council of Governments (FRCOG) sent a letter to EOPSS Undersecretary Curtis Wood seeking support in exploring "how the state digital P25 800MHz system would perform in our location and what the financial impacts would be for the municipalities of Franklin County." The goal of this exploration would be "to migrate to the 800MHz system if the results of our research and the business model were found to be advantageous to all parties."

Both counties are currently covered by CoMIRS analog and P25 FDMA digital radio coverage in their operating areas. The plans proposed in this Strategy Report include sufficient coverage in western Massachusetts for these user groups to join CoMIRS. This includes the upgrade of western Massachusetts FDMA radio sites to TDMA over time. Activities are currently underway in Franklin County to confirm the suitability of existing CoMIRS coverage throughout the county.

The additional costs for the inclusion of additional users from Berkshire and Franklin Counties would be the replacement of incompatible subscriber units. Estimates from the FRCOG and the Franklin County Emergency Communication System (FCECS) Oversight Committee indicate that 2,200 radios will need to be replaced in Franklin County in order to join CoMIRS digitally. As of the publication of this report, the best estimates for radio replacement needs in Berkshire County are 400 incompatible radios. The total estimated costs of replacing these radios are nearly $2.0 million for Berkshire County and $10.8 million for Franklin County. With a discount, those estimated total costs drop to around $1.5 million and $8.1 million, respectively.

### 8.1.7.2 Department of Correction

The Massachusetts Department of Correction (DOC) is an EOPSS agency that currently operates various private radio networks to support activities in campus facilities around the Commonwealth. These campus systems all operate in the 800 MHz band, and none are currently connected to the CoMIRS Core. As such, each operates as a standalone system.

The Bridgewater and Shirley correctional facilities operate legacy analog trunked systems that must be totally replaced to operate in the P25 mode and connect to the CoMIRS Core.

The Framingham and the Cedar Junction/Norfolk correctional complexes currently operate using P25 FDMA trunked systems. These two systems can be connected to the CoMIRS Core with minor modifications. Both could also be converted to P25 TDMA, but all the portable radios would need to be replaced. Both currently have sufficient capacity to support DOC operations. For estimating purposes in this Strategy Report, it is assumed that the Framingham and Cedar Junction sites will continue to operate on FDMA for the foreseeable future.

The Concord and Gardner correctional facilities both operate with two channel P25 FDMA conventional systems. Conventional operation is sufficient at the present time. Both can be connected to the CoMIRS Core through the addition of conventional site routers at minimal costs.

Below are the estimated costs of upgrading the DOC radios systems and connecting them to the CoMIRS Core. Included in these costs are upgrade costs for older subscriber units that will to be compatible with the upgrade radio system.

| Cost Category | Current Sytem Description | Proposed Upgrade | | Total Cost |
|---|---|---|---|---|
| **Bridgewater Complex** | 1994 Analog Trunked System | Replace with Core-connected TDMA system | $ | 1,993,950.00 |
| **Shirley Complex** | 1998 Analog Trunked System | Replace with Core-connected TDMA system | $ | 1,877,500.00 |
| **Framingham Complex** | 2009 P25 Phase 1 Trunked | Connect to CoMIRS Core | $ | 70,000.00 |
| **Cedar Junction/Walpole Complex** | 2013 P25 Phase 1 Trunked | Connect to CoMIRS Core | $ | 20,000.00 |
| **Concord /Concord Farm** | 2013 P25 Phase 1 Conventional | Connect to CoMIRS Core | $ | 37,000.00 |
| **Gardner** | 2013 P25 Phase 1 Conventional | Connect to CoMIRS Core | $ | 37,000.00 |
| **Total** | | | **$** | **4,035,450.00** |

*Figure 8-51: Cost of Modernizing DOC Systems and Connecting to CoMIRS Core*

These costs do not include the cost of IP connections between the DOC radio sites and the Commonwealth Core. Wireline connectivity would be the most practical method of interconnection.

#### Costs Estimates for Each DOC Radio Site

The $4,035,450 total cost estimate is based on the following cost center calculations for upgrading the DOC radio systems.

The DOC Bridgewater complex will need its 23 year old analog system fully replaced. Below are the cost items required for its modernization and connection to the CoMIRS Core.

| Bridgewater Complex (New P25 TDMA trunked system) | | | |
|---|---|---|---|
| P25 TDMA trunked Repeater | 7 | $50,000.00 | $350,000.00 |
| Multicoupler/Combiner | 1 | $50,000.00 | $50,000.00 |
| Antenna System | 1 | $20,000.00 | $20,000.00 |
| CORE Licenses | 1 | $20,000.00 | $20,000.00 |
| Professional Services | 1 | $150,000.00 | $150,000.00 |
| ID Display Terminal | 4 | $15,000.00 | $60,000.00 |
| P25 TDMA Trunked Portable | 451 | $2,500.00 | $1,127,500.00 |
| Speaker Microphone | 451 | $100.00 | $45,100.00 |
| Charger | 451 | $100.00 | $45,100.00 |
| Spare Battery | 451 | $100.00 | $45,100.00 |
| P25 TDMA Trunked Mobile | 10 | $4,500.00 | $45,000.00 |
| P25 TDMA Desk Radio | 4 | $4,500.00 | $18,000.00 |
| P25 Radio Programming | 465 | $30.00 | $13,950.00 |
| Mobile Installation | 10 | $300.00 | $3,000.00 |
| Desk Radio Installation | 4 | $300.00 | $1,200.00 |
| **Bridgewater Total** | | | **$1,993,950.00** |

The DOC Shirley complex will need its nearly 20 year old analog system fully replaced. Below are the cost items required for its modernization and connection to the CoMIRS Core.

| Shirley Complex (New P25 TDMA trunked system) | | | |
|---|---|---|---|
| P25 TDMA trunked Repeater | 5 | $50,000.00 | $250,000.00 |
| Multicoupler/Combiner | 1 | $50,000.00 | $50,000.00 |
| Antenna System | 1 | $20,000.00 | $20,000.00 |
| CORE Licenses | 1 | $20,000.00 | $20,000.00 |
| Professional Services | 1 | $150,000.00 | $150,000.00 |
| ID Display Terminal | 4 | $15,000.00 | $60,000.00 |
| P25 TDMA Trunked Portable | 446 | $2,500.00 | $1,115,000.00 |
| Speaker Microphone | 446 | $100.00 | $44,600.00 |
| Charger | 446 | $100.00 | $44,600.00 |
| Spare Battery | 446 | $100.00 | $44,600.00 |
| P25 TDMA Trunked Mobile | 10 | $4,500.00 | $45,000.00 |
| P25 TDMA Desk Radio | 4 | $4,500.00 | $18,000.00 |
| P25 Radio Programming | 460 | $25.00 | $11,500.00 |
| Mobile Installation | 10 | $300.00 | $3,000.00 |
| Desk Radio Installation | 4 | $300.00 | $1,200.00 |
| **Shirley Total** | | | **$1,877,500.00** |

The DOC Framingham Complex radio system is relatively new. Below are the costs of connecting the existing FDMA system to the Commonwealth Core.

| Framingham Complex (Connect P25 FDMA system to CORE only) | | | |
|---|---|---|---|
| P25 TDMA trunked Repeater | 0 | $50,000.00 | $0.00 |
| Multicoupler/Combinger | 0 | $50,000.00 | $0.00 |
| Antenna System | 0 | $20,000.00 | $0.00 |
| CORE Licenses | 1 | $20,000.00 | $20,000.00 |
| Professional Services | 1 | $50,000.00 | $50,000.00 |
| ID Display Terminal | 0 | $15,000.00 | $0.00 |
| P25 TDMA Trunked Portable | 0 | $2,500.00 | $0.00 |
| Speaker Microphone | 0 | $100.00 | $0.00 |
| Charger | 0 | $100.00 | $0.00 |
| Spare Battery | 0 | $100.00 | $0.00 |
| P25 TDMA Trunked Mobile | 0 | $4,500.00 | $0.00 |
| P25 TDMA Desk Radio | 0 | $4,500.00 | $0.00 |
| P25 Radio Programming | 0 | $25.00 | $0.00 |
| Mobile Installation | 0 | $300.00 | $0.00 |
| Desk Radio Installation | 0 | $300.00 | $0.00 |
| **Framingham Total** | | | **$70,000.00** |

The DOC Cedar Junction/Walpole Complex radio system is also relatively new. Below are the costs of connecting its existing FDMA system to the Commonwealth Core.

| Cedar Junction/Walpole Complex (Connect P25 FDMA system to CORE only) | | | |
|---|---|---|---|
| P25 TDMA trunked Repeater | 0 | $50,000.00 | $0.00 |
| Multicoupler/Combinger | 0 | $50,000.00 | $0.00 |
| Antenna System | 0 | $20,000.00 | $0.00 |
| CORE Licenses | 0 | $20,000.00 | $0.00 |
| Professional Services | 1 | $20,000.00 | $20,000.00 |
| ID Display Terminal | 0 | $15,000.00 | $0.00 |
| P25 TDMA Trunked Portable | 0 | $2,500.00 | $0.00 |
| Speaker Microphone | 0 | $100.00 | $0.00 |
| Charger | 0 | $100.00 | $0.00 |
| Spare Battery | 0 | $100.00 | $0.00 |
| P25 TDMA Trunked Mobile | 0 | $4,500.00 | $0.00 |
| P25 TDMA Desk Radio | 0 | $4,500.00 | $0.00 |
| P25 Radio Programming | 0 | $30.00 | $0.00 |
| Mobile Installation | 0 | $300.00 | $0.00 |
| Desk Radio Installation | 0 | $300.00 | $0.00 |
| **Shirley Total** | | | **$20,000.00** |

To connect the existing DOC Concord FDMA conventional system to the Commonwealth Core, the following costs are required.

| Concord /Concord Farm (connect P25 conventional to CORE) | | | |
|---|---|---|---|
| Site Router (up to 8 stations) | 1 | $20,000.00 | $20,000.00 |
| CORE Licenses | 2 | $1,000.00 | $2,000.00 |
| Professional Services | 1 | $15,000.00 | $15,000.00 |
| **Concord Total** | | | **$37,000.00** |

Finally, to connect the existing DOC Gardner FDMA conventional system to the Commonwealth Core, the following costs are required.

| Gardner (connect P25 conventional to CORE) | | | |
|---|---|---|---|
| Site Router (up to 8 stations) | 1 | $20,000.00 | $20,000.00 |
| CORE Licenses | 2 | $1,000.00 | $2,000.00 |
| Professional Services | 1 | $15,000.00 | $15,000.00 |
| **Gardner Total** | | | **$37,000.00** |

## FDMA or TDMA for Framingham and Cedar Junction/Walpole

Should the DOC seek to upgrade the Framingham and Cedar Junction/Walpole complexes to P25 TDMA, the following added costs would be incurred. For Framingham, a move from FDMA to TDMA would add $720,075 to the original cost of $70,000.

| Framingham Complex (Convert to P25 TDMA and connect to CORE) | | | |
|---|---|---|---|
| Base Station TDMA License | 5 | $10,000.00 | $50,000.00 |
| Site Controller TDMA License | 1 | $2,000.00 | $2,000.00 |
| CORE Licenses | 1 | $20,000.00 | $20,000.00 |
| Professional Services | 1 | $100,000.00 | $100,000.00 |
| P25 TDMA Trunked Portable | 200 | $2,500.00 | $500,000.00 |
| Speaker Microphone | 200 | $100.00 | $20,000.00 |
| Charger | 200 | $100.00 | $20,000.00 |
| Spare Battery | 200 | $100.00 | $20,000.00 |
| P25 TDMA Trunked Mobile | 10 | $4,500.00 | $45,000.00 |
| P25 TDMA Desk Radio | 1 | $4,500.00 | $4,500.00 |
| P25 Radio Programming | 211 | $25.00 | $5,275.00 |
| Mobile Installation | 10 | $300.00 | $3,000.00 |
| Desk Radio Installation | 1 | $300.00 | $300.00 |
| **Framingham Total** | | | **$790,075.00** |

For the Cedar Junction/Walpole site, a move from FDMA to TDMA would add $1,496,450 to the estimated total cost.

| Cedar Junction/Walpole Complex (Convert to P25 TDMA and Connect to CORE) | | | |
|---|---|---|---|
| Base Station TDMA License | 5 | $10,000.00 | $50,000.00 |
| Site Controller TDMA License | 1 | $2,000.00 | $2,000.00 |
| CORE Licenses | 1 | $20,000.00 | $20,000.00 |
| Professional Services | 1 | $100,000.00 | $100,000.00 |
| P25 TDMA Trunked Portable | 452 | $2,500.00 | $1,130,000.00 |
| Speaker Microphone | 452 | $100.00 | $45,200.00 |
| Charger | 452 | $100.00 | $45,200.00 |
| Spare Battery | 452 | $100.00 | $45,200.00 |
| P25 TDMA Trunked Mobile | 10 | $4,500.00 | $45,000.00 |
| P25 TDMA Desk Radio | 4 | $4,500.00 | $18,000.00 |
| P25 Radio Programming | 466 | $25.00 | $11,650.00 |
| Mobile Installation | 10 | $300.00 | $3,000.00 |
| Desk Radio Installation | 4 | $300.00 | $1,200.00 |
| **Framingham Total** | | | **$1,516,450.00** |

Since both of these systems are relatively new and limited in geographic area, it is assumed for costing purposes that these sites will remain as FDMA, though linked to the CoMIRS Core.

## 8.2 CoMIRS Financing

This section of the CoMIRS Radio Modernization Strategy Report focuses on how best to finance the modernization project. The first sub-section addresses financing considerations, the second examines a case study of how another similar state has approached its project financing, and the third sub-section identifies the tools available to finance this project.

The ultimate decision on which tools make the most sense for the financing of the project will need to be determined by the owners and primary stakeholders of the network.

### 8.2.1 Financing Considerations

Cost estimating the entire effort to modernize the CoMIRS radio network is the initial step, and it is relatively straight-forward. Determining how to finance the modernization is more complicated. Here are the primary considerations when considering financing options:

1. **Significant Total Cost**: The estimated total cost of modernizing the CoMIRS radio network is nearly $122 million. This is lower than the reported cost of ownership from the state's sampled in this study's Market Analysis. This is, in part, due to the relatively smaller geographic size of the Commonwealth. This results in fewer needed radio sites.

| State | Radio System Name | Approximate Total Cost |
|---|---|---|
| **Michigan** | Michigan Public Safety Communications System (MPSCS) | $230 M |
| **Minnesota** | Allied Radio Matrix for Emergency Response (ARMER) | $236 M |
| **Colorado** | Public Safety Communications Network Digital Trunked Radio System (DTRS) | $135 M |
| **Ohio** | Multi-Agency Radio Communication System (MARCS) | $272 M |

*Figure 8-52: Other State Radio Network Implementation Costs*

2. **Broad Usage**: The operable usage of the network is broad, including agencies at all three levels of Commonwealth government – state, county, and municipal. "Operable" usage in most cases means an agency's communications on CoMIRS are considered mission critical to that agency. When looking at financing options, all three levels of government need to be considered.

3. **Mixed Commitments over Time**: There has been uneven contributions to developing the existing radio infrastructure over time from the various partners currently on CoMIRS. Some

agencies were early users of the system, and others more recent. Some have financed significant portions of the existing infrastructure. Others have not.

4. **Lack of MOUs**: Memorandums of understanding that would govern cost sharing and the use of municipal digital infrastructure in the upgraded network do not exist.

5. **"All or None" Modernization**: The modernization needs of CoMIRS is largely an "all or none" proposition. In order to work properly, all radio sites must be upgraded to digital and all users must have digital-capable radios. Without moving all users to digital, the Commonwealth would need to support two radio networks (one digital and one analog) indefinitely.

6. **Differences in Financing the Two Primary Categories of Costs**: The two primary categories of costs anticipated for the CoMIRS modernization, radio site enhancements and subscriber unit replacements, are substantially different when considering financing. The first primary cost category, radio site enhancements, can be viewed as a statewide resource. It focuses on the infrastructure that is used by all users and agencies. The second category, subscriber unit replacement, is focused on individual user agencies. A decision to provide a method of statewide financing for the infrastructure upgrade may not be appropriate for the financing of individual agency radios. Different financing approaches may be needed for the two different primary cost categories.

7. **Five Year Implementation Timeframe**: When looking for financing options, the five and a half year implementation timeframe proposed in this study should be taken into consideration. If the financing does not support the costs over that duration and the implementation takes considerably longer, the overall cost of modernizing the network may significantly increase.

8. **Consider Whole Cost of Ownership**: Radio networks are expensive. When they are mission critical like CoMIRS, there is little that can be done to reduce the overall cost of deployment. When considering the overall cost of a radio network, however, an important consideration is the alternative cost of multiple networks. Currently, CoMIRS serves the operational needs of many state, regional, and municipal agencies. The largest among these agencies are the Department of State Police, Barnstable County cities and towns, county sheriff's prisoner transport, part of MassDOT, the Department of Conservation and Recreation, the Massachusetts Water Resource Authority, MEMA, parts of the Department of Correction, the MBTA Police, the Environmental Police, and many others. Without CoMIRS, each of these agencies would be looking for funding for agency communications systems. Together, they can achieve their communications needs at a significantly reduced overall cost.

   With the digital modernization of CoMIRS and the adoption of expanded talkpaths and TDMA statewide, CoMIRS will have added capacity to include other regional or statewide users operationally on the network. EOPSS has already been approached by representatives of regional groups in western Massachusetts looking to abandon their aging radio systems and interested in joining CoMIRS operationally. Additionally, there are other major state agencies (in particular MassDOT) that currently operate aging radio networks that will need replacement. Consideration of the capital costs of modernizing CoMIRS should take into account the total alternative cost of delaying the network modernization. With proper

agreements, the Commonwealth as a whole can save considerable capital funding by looking to leverage the added capacity of a modernized statewide radio network to address the communications needs of multiple agencies.

### 8.2.2 Financing Options Used by Other States

As identified in the Market Analysis portion of this Strategy Report, each of the four states examined utilized different options for funding the initial deployment and ongoing maintenance and enhancement of their network. In many instances, states use multiple funding approaches, including a combination of state, local, and federal funding sources, as well as both one time and ongoing funding streams.

In 2010, Ohio conducted a thorough study of approaches to funding state radio networks as part of its Multi-Agency Radio Communication System (MARCS) Task Force report. The Task Force surveyed forty-three states and two territories to determine how their public safety communication systems are funded. From this survey, three potential funding mechanisms emerged: 1) user fees, 2) increased citation fines and licensing fees, and 3) phone charges. Each is of these is discussed below.

#### User Fees

Charging user fees has the advantage of assessing charges to the agencies that are placing operational burdens on the network in proportion to their usage. In this way, user agencies can be assessed a fee per radio, or per talk group, or per active user ID. This approach charges heavier users larger fees.

The disadvantages to this approach are the budgetary constraints of local agencies who are considering joining the statewide system. If the intent is for the state to provide an infrastructure for anyone to use, then user fees will present a significant barrier to realizing that vision. Michigan has systematically decreased their user fees to the point where they are essentially nominal and would do away with them entirely if existing laws allowed.

#### Citation Fines and Licensing fees

Many states use increased citation fines and licensing fees to fund interoperable communication systems. Although the MARCS Task Force explored this option, it was not recommended, largely due to recent fee adjustments made to augment the Ohio State Highway Patrol budget. Moreover, Ohio has a larger population than Massachusetts (11.6 million vs 6.8 million) and, because of its more centralized location in the country, substantially more out-of-state drivers. Due to these factors, Massachusetts would raise considerably less funding than Ohio from citation fines and licensing fees.

#### Fees on Phone Bills

Taxes on monthly phone bills would be assessed similar to the way that 911 fees are currently assessed as a means of updating 911 centers. The Task Force proposed considering any fee on phone lines to include both wireless and wireline (landline) phone lines. The charge on both wireless and wireline phone lines would represent a broader based source of revenue collection than only wireless or only wireline.

Whatever approach they utilize, each state recognizes the importance of addressing both upfront and ongoing costs to maintain, enhance, and expand the network.

### 8.2.3 Case Study: Minnesota

Minnesota is often recommended as a case study for the build out and financing of a statewide network. Minnesota is the 12th largest state geographically (86,939 square miles) and the 22nd largest state by population. Massachusetts, by comparison, is the 44th largest state by geography and the 15th largest by population.

The Minnesota statewide radio network, called Allied Radio Matrix for Emergency Response (ARMER), was established in 2004. It is administered in coordination with the Statewide Emergency Communications Board and manages the implementation of the 800 megahertz (MHz) shared, digital trunked radio communication system.

The Minnesota radio network supports 83 of its 86 counties and provides P25 digital radio coverage throughout the state to around 100,000 radios. The system is composed of 326 radio sites to provided mobile radio coverage at a 95% reliability level. ARMER is deployed in a six zone configuration with microwave backbone providing all system backhaul.

Membership in ARMER is optional, and prospective members must opt-in and submit a comprehensive participation plan. ARMER members includes 104 primary PSAPs answering 911 calls and five secondary PSAPs.

The Minnesota radio network also includes participation from the Minnesota Department of Transportation (MNDOT). MNDOT owns and operates the backbone of the radio network. The Minnesota Department of Transportation provides most of the maintenance on the network with minor support provided by outside contractors when required.

#### 8.2.3.1 Cost

Per the ARMER Project Status Report for the reporting period June 1, 2016 through July 1, 2016 the capital cost of the state's portion of the network was $236,652,831.

The annual maintenance budget for ARMER is $9.6 million and covers state-owned infrastructure. Local enhancements to the network are maintained by their local partners. Additionally, Minnesota spends approximately $500,000 annually for administration and support labor. This provides a dedicated 24x7x365 call center at the state level as well as technicians in the field at regional MNDOT centers who conduct equipment replacement and routine system maintenance when necessary.

#### 8.2.3.2 Funding

The ARMER network's upfront costs were covered by a $236 million state bond. The cost of ongoing maintenance, administration, and servicing the debt on the bond for ARMER are all paid by 911 fees assessed by the state and programmed into the state's annual budget. Transition costs for local users who wished to migrate onto ARMER from their own local networks were subsidized by the state's allocation of federal grant money that was available after September 11, 2001. This grant money

covered 44.78% of transition costs for local users. While this source of funds is no longer available, Minnesota continues to subsidize this same percentage of transition costs for users migrating to ARMER as an incentive to join the statewide network.

## 8.2.4 Analysis of Financing Options

Looking at how other states have financed their radio systems, there is a mix of funding options used. Below is a summary of the options used in the four states analyzed as part of this strategy project.

| State | Cost | Grants | State Appropriations | Subscriber Fees | 911 Fees | Locally Funded | Membership Fee | Bonds | Activation Fee |
|---|---|---|---|---|---|---|---|---|---|
| **Michigan** | $230M | | X | X | | | | X | X |
| **Minnesota** | $236M | X | | | X | | | X | |
| **Colorado** | $135M | | | X | X | X | X | | |
| **Ohio** | $272M | | | | | X | | | |

*Figure 8-53: Financing Tools Used by Other State Radio Systems*

These and other financing options are reviewed below. For each, a determination is made as to whether or not that funding tool is a recommended option for each of the following in Massachusetts:

- Capital Funding for the P25 Buildout
- Capital Funding for Radio Replacement
- Operational Funding for Maintenance and Enhancements

| Financing Option | Recommended for Capital Funding of P25 Buildout | Recommended for Capital Funding of Radio Replacement | Recommend for Operational Funding of Maintenance |
|---|---|---|---|
| **State Appropriations**<br>Direct appropriations for large capital expenditures are uncommon<br>State appropriations often cover on-going maintenance expenses |  |  |  |

| Financing Option | Recommended for Capital Funding of P25 Buildout | Recommended for Capital Funding of Radio Replacement | Recommend for Operational Funding of Maintenance |
|---|---|---|---|
| **Existing Capital Bond**<br>There is an existing earmark for capital funding of the radio system<br>Does not cover on-going, operational costs |  |  |  |
| **Federal Grants**<br>Federal grants that cover major infrastructure projects like CoMIRS currently are not available<br>BYRNE or homeland security grants could be utilized for radio replacement<br>Federal grants do not cover on-going operational costs |  |  |  |
| **Subscriber/ Membership/ Activation Fees**<br>Other states have reported issues with collection and with the ability of local communities to pay fees<br>The size of the capital needs are too significant to be funded by subscriber or other fees<br>User fees are an option to fund or subsidize going maintenance and operational needs |  |  |  |

| Financing Option | Recommended for Capital Funding of P25 Buildout | Recommended for Capital Funding of Radio Replacement | Recommend for Operational Funding of Maintenance |
|---|---|---|---|
| **Locally Funded**<br><br>Has been used chiefly when local radio needs are unique and can be funded by a large city government *(Boston, Cambridge, and Worcester have already funded digital upgrades to the radio networks in their cities)*<br><br>Local funding is only an option for the local geographic area and not a statewide buildout<br><br>Funding of radio replacement may be correctly identified as a local (or agency) responsibility<br><br>Local provision of operational support for a statewide network is unlikely |  |  |  |
| **Local Aid/Matching Contributions**<br><br>Similar to locally funded, this avenue of funding is not often used to finance statewide infrastructure projects nor to support the operational needs of a statewide system<br><br>Some states have set up state matching contributions to aid in paying for investments like radio upgrades |  |  |  |

| Financing Option | Recommended for Capital Funding of P25 Buildout | Recommended for Capital Funding of Radio Replacement | Recommend for Operational Funding of Maintenance |
|---|---|---|---|
| **New Bond/ Debt Service**<br><br>911 fund debt servicing has been an option for similar capital investments *(Most all dispatches from 911 centers are to first responders that are either operable or interoperable on CoMIRS)*<br><br>Debt servicing is typically used for capital expenditures and not operational expenses<br><br>Use of 911 funds for radio replacement may depend on the nature of the requesting agency (e.g., first responder or not first responder) |  |  |  |
| **911 Direct Funding (Fees)**<br><br>911 fees have been used by other states to substantially finance both the build-out and maintenance of public safety radio networks<br><br>Statutory authority may need to be clarified<br><br>Like 911 fund debt servicing, use of 911 fees for radio replacement may depend on the nature of the requesting agency |  |  |  |
| **Public Private Partnership**<br><br>Without fundamentally re-thinking the use and ownership of the State's network, this option is not viable for either capital or operational funding |  |  |  |

| Financing Option | Recommended for Capital Funding of P25 Buildout | Recommended for Capital Funding of Radio Replacement | Recommend for Operational Funding of Maintenance |
|---|---|---|---|
| **Fees or Fines**<br><br>Some states have examined using increased citation fees and fines to help finance the maintenance of their radio system<br><br>The amount collected is often variable and is often insufficient for large capital purchase |  |  |  |

*Figure 8-54: Analysis of Available Financing Tools*

### 8.2.5 Recommended Financing Options

Looking at the nine primary types of available financing tools, there are three recommended options for funding the capital needs of building out the radio system's infrastructure and three options for funding the on-going operational needs of maintaining the network.

For capital funding of the radio system buildout, the modernization effort can be financed by the capital bond, by debt service from the State 911 Department, or from a direct increase in 911 fees.

For capital funding of radio replacement, a larger set of options exists as funding authorities may consider end user radios an agency and not a statewide concern. Here, recommended funding options include the capital bond, local funding, local aid or matching state grants, debt service, and 911 fees. Different decisions can be made for the funding of replacement radios for incompatible existing radios than for new radio purchases going forward.

For operational funding, the on-going maintenance of the statewide network can be incorporated into annual state appropriations, or it can be subsidized in part or in full by user fees and/or 911 fees. Below is a summary of the recommended financing options by type of radio project expense.

| Recommended Options for Capital Funding of P25 Buildout | Recommended Options for Capital Funding of Radio Replacement | Recommended Options for Operational Funding |
|---|---|---|
| ▪ Existing Capital Bond<br>▪ New Bond with Debt Service<br>▪ 911 Direct Funding | ▪ Existing Capital Bond<br>▪ Federal Grants<br>▪ Locally Funded<br>▪ Local Aid/Matching<br>▪ New Bond with Debt Service<br>▪ 911 Direct Funding | ▪ State Appropriations<br>▪ Subscriber/ Membership/ Activation Fees<br>▪ 911 Direct Funding |

*Figure 8-55: Recommended Financing Options*

Looking at Minnesota's roughly $10 million operational costs for comparison, an example user fee of $20 per device per month would generate approximately $4.5 million in revenue from CoMIRS users. There are 18,856 identified active operational radios on CoMIRS. Twenty dollars a month or $240 per year would generate $4,525,440.00 from these 18,856 devices. This example fee would cover nearly half of Minnesota's annual operating expenses.

| Agency (Operable on CoMIRS) | Network Radio Count | Total Annual User Fees ($20/device/month) |
|---|---|---|
| Massachusetts State Police | 7,235 | $ 1,736,400.00 |
| Barnstable County Cities and Towns | 3,700 | $ 888,000.00 |
| County Jails Prisoner Transportation | 1,700 | $ 408,000.00 |
| Department of Transportation | 1,400 | $ 336,000.00 |
| Dept of Conservation and Recreation | 1,050 | $ 252,000.00 |
| MWRA | 730 | $ 175,200.00 |
| Mass. Emergency Management | 674 | $ 161,760.00 |
| Department of Corrections-Transport | 537 | $ 128,880.00 |
| MBTA Police | 474 | $ 113,760.00 |
| Mass. Environmental Police | 433 | $ 103,920.00 |
| New Braintree E-911 Towns | 271 | $ 65,040.00 |
| Department of Fire Services | 217 | $ 52,080.00 |
| Barnstable Sheriff | 207 | $ 49,680.00 |
| Board of Parole | 123 | $ 29,520.00 |
| Northampton E-911 Towns | 70 | $ 16,800.00 |
| Shelburne E-911 Towns | 35 | $ 8,400.00 |
| **Total** | **18,856** | **$ 4,525,440.00** |

*Figure 8-56: Example Total Revenue from a $20 per Device per Month User Fee*

At $20 per device per month on CoMIRS, the Massachusetts State Police would be responsible for the largest annual user fees at $1,736,400, followed by the cities and towns of Barnstable County at $888,000 and county jail prisoner transportation at $408,000. If user fees are to be utilized, a determination would need to be made as to how these fees would be paid, since they would affect municipal, county, and state budgets.

The final solution for financing the Massachusetts statewide radio network will likely use a combination of these financing tools, and differing approaches to financing the network build-out versus radio replacement is likely.