6 December, 2012

The Honorable John Hickenlooper
Governor, State of Colorado
136 State Capitol
Denver, CO 80203

and

The Colorado Joint Budget Committee
136 State Capitol
Denver, CO 80203

The Consolidated Communications System Authority (CCSA), established through HB 12-1224, has been seated and has met twice as of 1 November, 2012. One of the responsibilities of the CCSA is to "advise the Governor and the General Assembly on the development, maintenance, upgrade, and other operation of the system".   To that end we are submitting to you the 2012 Annual Report for the Colorado Statewide Digital Trunked Radio System (DTRS). Since the CCSA Directors have only recently been appointed this report has been prepared by CDX Wireless and was funded by the State Office of Information Technology (OIT). This Annual Report is comprehensive in nature and specifically addresses operational and capital infrastructure needs, as well as potential funding options for the future.

Since its inception the DTRS has been built out and maintained by funding from local governments, member agencies, the Consolidated Communications Network of Colorado (CCNC), and State OIT. The CCSA, as tasked, will be researching and evaluating future funding sources and alternatives to not only maintain, but upgrade the DTRS as needed for the foreseeable future. However, as identified in the Annual Report, we recognize that the software for the DTRS network core must be upgraded as soon as possible in order to ensure system reliability and prevent possible security breaches.

Unfortunately DTRS member agencies and State OIT are unable to fund these necessary upgrades through their current budget allocations and funding schemes. The immediate need that has been identified is a DTRS Core Software Upgrade at a cost of $13,904,760.00

Failure to perform the system upgrade in the short-term will most certainly result in degraded or diminished wireless communication capabilities that local and regional public safety organizations rely on to accomplish their missions. In addition communications interoperability between supporting and mutual aid agencies will suffer and the lack of this capability will be detrimental to effective daily and large-scale emergency response and recovery operations throughout the State. We urge the Joint

Budget Committee (JBC) and the members of the House and Senate to address these immediate monetary requirements of the DTRS in the Fiscal Year (FY) 2014 budget cycle.

Moving forward the CCSA will continue to digest the remainder of this annual report and evaluate the identified mid-term and long-range DTRS funding requirements needed to maintain and upgrade the system. Some additional future public safety communications related challenges that have been identified include:

- Continued support and build-out of the DTRS
- Plan for and complete the Federal Communications Commission's (FCC) proposed narrowbanding requirement for 700 MHz frequencies
- The development and implementation of a National Public Safety Broadband Network (NPSBN), which will initially provide enhanced data transmission capabilities for first responders
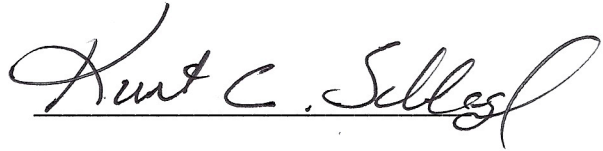
We remain available to provide further information or testimony as needed regarding the current financial needs of the DTRS and look forward to working closely with the CCNC, the JBC, the Colorado House and Senate, and the Governor's office to brainstorm, identify, and develop ongoing funding scenarios in order to ensure that the DTRS remains a viable and effective wireless communication tool.

Respectfully submitted on behalf of the CCSA,

Robert Ricketts

CCSA Chair

Kurt C. Schlegel

CCSA Vice Chair

Deliverable Cover Letter

The attached final report was prepared by CDX Wireless, Inc. in accordance with our project Statement of Work to collect, assemble, and document the material to be used by the Consolidated Communications System Authority for the 2012 annual report to the Colorado Joint Budget Committee (to be delivered by October 15th) that describes:

- The operational and capital infrastructure needs to maintain the system

- The potential funding options to meet the operational and capital infrastructure needs of the system

Questions or comments regarding its contents should be directed to:

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About CDX Wireless

Founded in 2008, CDX Wireless is a consulting firm dedicated to improving communications and interoperability for public safety and critical infrastructure agencies. The staff of CDX Wireless has an average of approximately 20 years of experience in deploying major communications systems, interoperability programs, and financial and governance strategies in both urban and rural areas. The company's communications-related offerings to the public safety and critical infrastructure industry include strategic and tactical planning, functional needs analysis, technical design, procurement support (specification writing, evaluation and selection, negotiation), project management, independent validation and verification, procedure and training development, and governance support. The company's staff have completed cost and governance analyses of radio systems including those that serve state, county, and regional service areas. The company's business model focuses on maintaining a small core team of highly-skilled individuals to ensure that a client's technical and functional needs, as well as their resource constraints, are considered in the implementation of right-sized communications solutions to their emergency preparedness and response requirements.

Consolidated Communications System Authority

2012 Annual Report:

Operational & Capital Infrastructure Needs and Potential Funding Options

for the

Colorado Statewide Digital Trunked Radio System

Date: July 19, 2012

Submitted by:

CCSA Contact Info

Table of Contents

1. Executive Summary

The Colorado Digital Trunked Radio System (DTRS) is a two-way voice communications network that serves state, local, federal, and tribal public safety agencies across the state of Colorado. This report describes the operational and capital infrastructure needs to maintain DTRS and the potential funding options to meet the operational and capital infrastructure needs of the DTRS network.   This report is based on surveys and interviews with the DTRS's owners, users, vendors, and providers-of-service and its primary findings are:

Regarding Operational & Capital Needs

- The network has needs of high, medium, and low priority – all have varying levels of impact to the reliability, security, interoperability, maintainability, and continued expandability of the DTRS network and those of highest priority are:
  - The network's core (of four master sites) must be upgraded as soon as possible to new software.
  - The microwave backhaul links that interconnect the network's core and its over 200 radio sites must be redesigned and replaced starting with the contracting of design services followed by system implementation.
  - Fifteen radio towers must be replaced soon and proper maintenance of radio equipment requires an annual increase of the OIT Communications Services Budget.

High Priority Needs	2013	2014	2015	2016	2017
Core software	$14.9M				
Microwave Design	$300k				
Microwave Implementation		$20M - $25M			
Radio Towers	$4.5M				
OIT Comms Services	$336k	$336k	$336k	$336k	$336k
Medium & Low Priority Needs	2013	2014	2015	2016	2016
Other Medium & Low Priorities		> $72M			

- Other technical needs exist and must be planned for the coming years

Regarding Funding Options

- Unlike the statewide public safety radio systems deployed in other states, DTRS currently has no identified or secured mechanism for funding operations, maintenance, or regular capital updates.
- Options may exist to address the technical needs listed above through the Capital Improvement process but a method to maintain and operate the network must be developed and should not unfairly burden the public safety agencies that depend on the network

Regarding Network & Membership Sustainability

- In addition to identifying and securing a funding mechanism, the DTRS network's sustainability is dependent on resolving the current lack of:
  - A process for planning the operations & technical architecture/expansion of the network that is comprehensive, inclusive (of agencies from the State and from metropolitan and rural counties and municipalities), and constrained to the real budgets of all DTRS users & owners; and
  - Agreements, or processes to establish agreements, regarding the responsibilities of DRTS ownership, usage, maintenance, and funding.

As described below, the 2012 fire season underscored both the value of DTRS in coordinating public safety resources during responses to critical incidents and the vulnerability of DTRS' legacy design,

outdated core software, and aging equipment. **Action and funding is needed immediately to sustain DTRS' value and to eliminate its vulnerabilities for future response and public safety efforts.**

2. Introduction

2.1 Background

The infrastructure of DTRS is comprised of: i) radio sites that are spread out across the state and that house radio repeater equipment, ii) master sites which control the operations of the radio sites, iii) dispatch centers that interface to allow 9-1-1 dispatch positions to directly connect to the network, and iv) backhaul links ("transport links") that interconnect the sites to each other and to the master sites and dispatch centers. There are currently 212 radio sites, 4 master sites, 115 dispatch centers (approximately 60 of which connect via wireline links) comprising the network. The technology used in DTRS involves 700MHz and 800MHz digital voice trunking as defined by the APCO/TIA[1] Project 25 standards for public safety voice communications. The backhaul links that provide the interconnections primarily use point-to-point microwave technology but also use optical fiber in some instances.

The ownership of DTRS is diverse: the State of Colorado's Governor's Office of Information Technology (OIT) owns a significant amount of the equipment used in the network as do several municipalities and regional partnerships of municipalities including Adams, Arapahoe, Douglas, Jefferson and Weld Counties, the Northern Colorado Regional and Pike's Peak Regional Communications Networks (NCRCN and PPRCN, respectively). Additionally, numerous smaller municipalities and county governments own portions of the equipment used in the network. For the most part, regardless of ownership, usage of the network is ubiquitously open to all authorized users[2], and statewide access is available to all user agencies independent of their jurisdiction[3].

The governance of the DTRS network had, until recently, been solely performed by the Consolidated Communications Network of Colorado, Inc. (CCNC), a 501c(3) organization made up of participating user agencies. The CCNC operates an Executive Committee and a Technical/Operations Committee, the former to provide guidance to planning and use of the system, as well as to approve user agencies, and the latter to review and approve technical operations of the system including the addition of talkgroups.

In 2012, the State of Colorado enacted House Bill 12-1224 to create a Consolidated Communications System Authority (CCSA) which established a board to: i) solicit and accept appropriations, grants, and other monies to support the DTRS network, ii) represent users of DTRS regarding operational and technical aspects of the DTRS network, iii) advise the Governor and General Assembly on the development, maintenance, upgrade and operations of DTRS, and iv) produce, on an annual basis, a

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[1] APCO is the Association of Public Safety Communications Officials, International and TIA is the Telecommunications Industry Association which adopted P25 in its Suite 102 of standards.

[2] Authorized users must be: i) from a public safety and public service agency from a State, Tribal, County, and Local government; federal agencies; special districts; and EMS provider; ii) eligible under Title 47 of the Code of Federal Regulations (CFR) Part 90 Private Land Mobile Radio Services §90.20 Public Safety Pool, and iii) approved by the CCNC as described in this report.

[3] Exceptions to this statement do exist wherein, by explicit agreement, certain owners allow visiting, out-of-jurisdiction users to access selected statewide mutual aid channels and talkgroups instead of those users' home talkgroup.

report with the scope and purpose listed above in Section 1, above. The CCSA is, by legislation, explicitly not to levy any taxes, assess any user fees, or take any DTRS assets without prior agreement.

2.2   Scope and Purpose

This report serves to document: i) the operational and capital infrastructure needs to maintain the DTR system and ii) the potential funding options to meet the operational and capital infrastructure needs of the DTRS network.

The motivations for this report to be produced at this time are: i) to comply with the requirements of the enacted House Bill 12-1224 and ii) to address a request from CCNC users/members for information of the same nature.

2.3   Relevance to Prior Reports

In late 2010, the OIT and CCNC commissioned and received a report entitled "Digital Trunked Radio System Operational Cost Assessment" which estimated the total amount of monies spent by all owners on the operations and maintenance of the DTRS network. The 2010 "cost assessment" report found that: i) the typical annual cost to operate the DTRS network, which is borne by all owners, operators, and users, is approximately $11 million and ii) there are several special capital costs (such as upgrades from CENTRACOM and QUANTAR equipment which are described in both that 2010 report as well as this one) that will significantly increase the costs beyond the typical in the coming years.

While the 2010 "cost assessment" report was a strategic view to the amounts of all monies spent on DTRS (including those that had both secured and unsecured funding sources), this report provides a tactical view to unmet needs that need to be addressed immediately as well as those that should be part of near-term planning and budgeting activities.

3. Terms and Methods

To gather, analyze, and report on the information included in this report regarding needs and funding options, a number of specific terms and methods were used.

3.1 Terminology Used

To avoid confusion, specific definitions for "DTRS" and "need" were developed and confirmed.
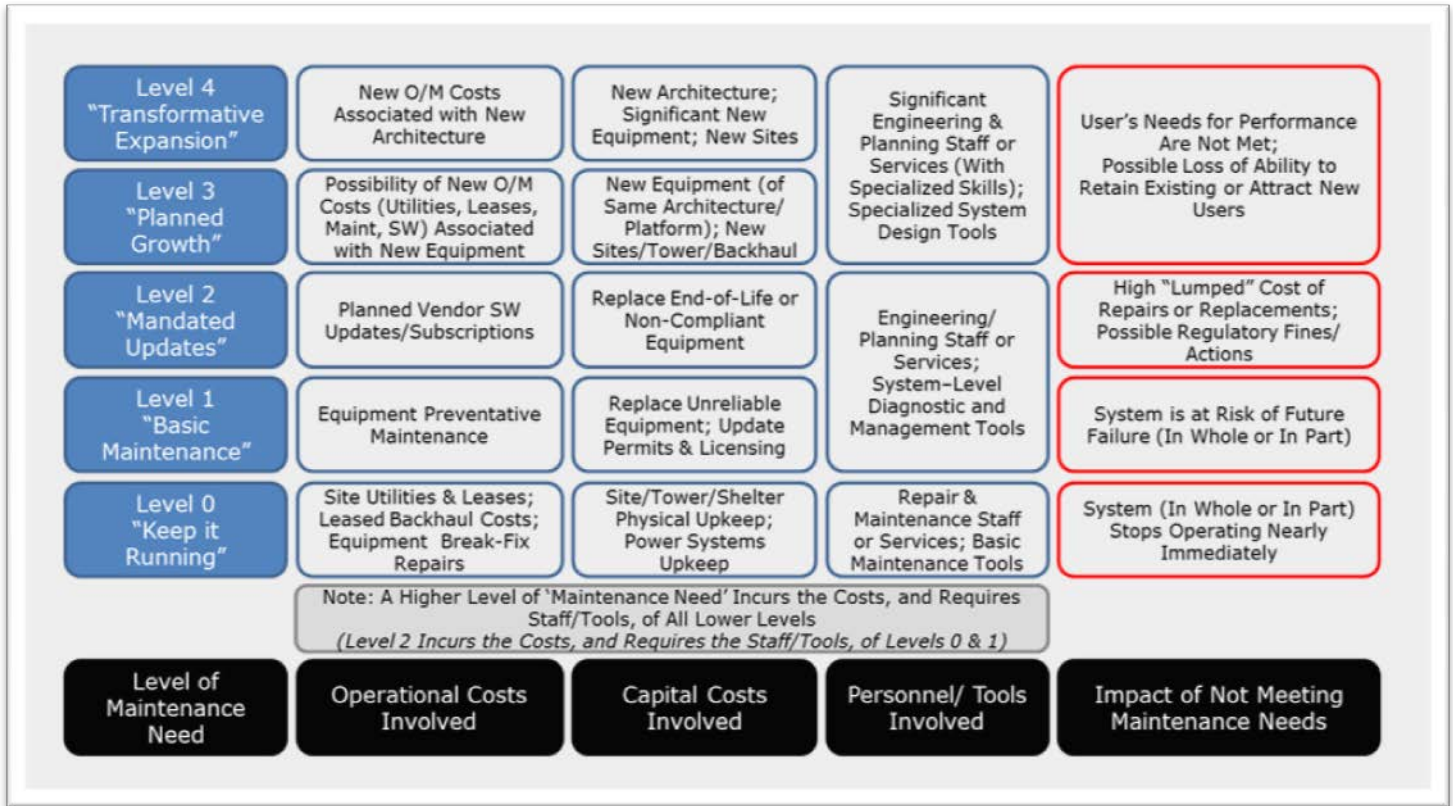
3.1.1 Term: "DTRS"

"DTRS" as used in this report refers only to the infrastructure of the DTRS network. This includes radio sites (and the repeater and supporting equipment at those sites), master sites, backhaul links (microwave and optical fiber), and wireline dispatch centers. Items not included in DTRS infrastructure are user mobile and portable radios and dispatch centers that connect via wireless (radio control station) links.

Because the DTRS network is owned and used by such a diversity of agencies, those different agencies tended to define it differently. For example, users from State agencies tended to view the DTRS network in the broadest sense as all radio sites, all master sites, and all transport links that, together, provide statewide coverage. Users from the municipalities and regional partnerships of municipalities that own significant amounts of DTRS equipment[4] tended to view DTRS principally as the assets they own, which fulfill their needs as their primary-use radio systems, and secondarily as the rest of the assets that exist statewide, which fulfill their needs for interoperability and in cases of travel outside of their normal area of operation. Users from rural areas that own either relatively little or no DTRS assets tended to view DTRS as the portion(s) of the statewide system (mainly owned by others) that serve(s) their primary area of operation and that also serves areas to which they may travel. To serve these different views, the term "DTRS" is used to mean any portion of the DTRS network's infrastructure, regardless of ownership, that connects or is used to connect to the existing four master sites (including those master sites). In this way, the survey and interviews described below allowed respondents to address their needs regarding DTRS in multiple levels: they could first describe their needs for their 'local system' (i.e., only the portion of the system they own and/or use primarily for daily use) and then describe their needs for the statewide system in its entirety.

3.1.2 Term: "Need"

Additionally, the term "need" required clarification as a need for one set of users might not be viewed as a need by all users. A hierarchy of needs was developed to differentiate between types of needs. This hierarchy, shown in the following graphic, includes 5 levels of needs ranging from Level 0 ("Keep it Running") to Level 4 ("Transformative Expansion"). Each different level includes differing operational costs, capital costs, and personnel and tools and each level has a different impact should it not be fulfilled or met.

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[4] Namely Adams, Arapahoe, Douglas, Jefferson and Weld Counties and the Northern Colorado Regional and Pike's Peak Regional Communications Networks.

Level 4 "Transformative Expansion"	New O/M Costs Associated with New Architecture	New Architecture; Significant New Equipment; New Sites	Significant Engineering & Planning Staff or Services (With Specialized Skills); Specialized System Design Tools	User's Needs for Performance Are Not Met; Possible Loss of Ability to Retain Existing or Attract New Users
Level 3 "Planned Growth"	Possibility of New O/M Costs (Utilities, Leases, Maint, SW) Associated with New Equipment	New Equipment (of Same Architecture/ Platform); New Sites/Tower/Backhaul		
Level 2 "Mandated Updates"	Planned Vendor SW Updates/Subscriptions	Replace End-of-Life or Non-Compliant Equipment	Engineering/ Planning Staff or Services; System–Level Diagnostic and Management Tools	High "Lumped" Cost of Repairs or Replacements; Possible Regulatory Fines/ Actions
Level 1 "Basic Maintenance"	Equipment Preventative Maintenance	Replace Unreliable Equipment; Update Permits & Licensing		System is at Risk of Future Failure (In Whole or In Part)
Level 0 "Keep it Running"	Site Utilities & Leases; Leased Backhaul Costs; Equipment Break-Fix Repairs	Site/Tower/Shelter Physical Upkeep; Power Systems Upkeep	Repair & Maintenance Staff or Services; Basic Maintenance Tools	System (In Whole or In Part) Stops Operating Nearly Immediately

Note: A Higher Level of 'Maintenance Need' Incurs the Costs, and Requires Staff/Tools, of All Lower Levels
(Level 2 Incurs the Costs, and Requires the Staff/Tools, of Levels 0 & 1)

| Level of Maintenance Need | Operational Costs Involved | Capital Costs Involved | Personnel/ Tools Involved | Impact of Not Meeting Maintenance Needs |

This report, and the information gathering methods described above, included only Maintenance Levels 0 through 3. Maintenance Level 4, "Transformative Expansion", was not included as, by definition, it would radically transform DTRS beyond its current technologies and capabilities and would involve near wholesale replacement of DTRS equipment.

| **Important Note:** ☞ | Much attention is currently being paid to a nationwide Public Safety Broadband Network (PSBN), especially following the passage and enactment in February, 2012, of the "Middle Class Tax Relief and Job Creation Act of 2012" which provides funding, spectrum, and a governance board for such a nationwide PSBN. The goal of this legislation and initiative is to deploy and operate a nationwide broadband radio system in specific band of the 700MHz spectrum (adjacent to but different from the band currently used in DTRS) and using a technology known as Long Term Evolution, or LTE. The technology of LTE was developed by the cellular phone industry to provide fourth generation (or "4G") data services and which is entirely different from the Project 25 technology used in DTRS.

Although this initiative promises to enhance public safety communications, it should be considered "Transformative Expansion" that is outside the scope of this report because: i) the deployment of the nationwide PSBN is only currently in its planning stages and it will take many years to reach any significant level of deployment and ii) the technology upon which is it based is "… would not provide mission critical voice communications for many years [because] LTE, the standard FCC identified for the |

public safety broadband network, is a wireless broadband standard that is not currently designed to support mission critical voice communications.[5]"

The State of Colorado is somewhat unique in that it is home to an early-deployment of a local PSBN in Adams County which received a waiver from the Federal Communications Commission (FCC), as well as a grant from the Department of Commerce, National Telecommunications and Information Administration (NTIA), to deploy a countywide 700MHz LTE-based system. It is unsure, however, how the Adams County LTE deployment would fit into a statewide or the nationwide PSBN as the NTIA recently required its grant recipients to hold off on purchases of equipment while the plan for the nationwide system is solidified[6].

Also, no respondents to the surveys or interviews identified the type of features provided by a PSBN (i.e., in-field access to high-bandwidth mobile data applications) as a need.

In summary, while new technologies like 700MHz LTE and new initiatives like local or nationwide PSBNs are important and should be a focus at the local and statewide levels in Colorado, the DTRS (and land mobile radio systems of similar technology) should be seen as the viable option for providing mission critical voice communications services to public safety agencies for at least the next five to 10, or more, years.

3.2   Information Gathering Methods Regarding Needs

To gather information regarding needs, users of DTRS (and other DTRS stakeholders) were contacted using two methods: i) an on-line survey and ii) interviews that were conducted either face-to-face or via phone conference. Both methods sought to gather answers to the same questions about how well DTRS, in its current configuration, is meets user needs regarding the system performance attributes of coverage (the ability to make or receive calls in all areas of operation), capacity (the ability of the system to carry calls without overloading the available equipment or channels), reliability (service without outages), capabilities (the availability of user features), interoperability (the ability to communicate between agencies or jurisdictions), security (defense from physical or electronic threats), maintenance (upkeep and repairs of failures), monitoring/reporting (tracking performance and providing reports), training and exercises (regarding usage of the system), and other aspects of system performance (an open-ended question). For the on—line survey, participants were asked to address the degree to which DTRS meets their operational needs on a scale from 1 ("Needs not met") to 5 ("Needs very well met").

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[5] Excerpted from Page 22 of United States Government Accountability Office, Report to Congressional Requesters, "EMERGENCY COMMUNICATIONS - Various Challenges Likely to Slow Implementation of a Public Safety Broadband Network", (Publication GAO-12-343, February 2012) which goes on to state "Commercial wireless providers are currently developing voice over LTE capabilities, but this will not meet public safety's mission critical voice requirements because key elements needed for mission critical voice, such as push-to-talk, are not part of the LTE standard. While one manufacturer believes mission critical voice over LTE will be available as soon as 5 years, some waiver jurisdictions, experts, government officials, and others told us it will likely be 10 years or more…"

[6] According to an April 18, 2012 email from Bill Malone, Director of ADCOM 9-1-1 and also according to http://urgentcomm.com/networks_and_systems/news/ntia-lte-deployment-caution-20120410/

Although both methods used the same questions, the more open-ended nature of interviews allowed the collection of additional information. A copy of the on-line survey is included in Appendix A of this report.

The stakeholders that were contacted included representatives from the State of Colorado OIT, users of DTRS from agencies in metropolitan area around Denver, users of DTRS from agencies in rural areas, users of DTRS from State and Federal agencies, users of other radio systems that have important interoperability interconnections to DTRS, and the two major vendors that supply radio equipment to DTRS and to other radio system that interconnect with DTRS. A listing of the stakeholders that were contacted (including those that did not, or were unable to, participate) is included in Appendix B of this report.

3.3   Method for Determining the Priority of Needs

As needs were gathered and classified according to the terms and methods described above, they were prioritized according to two factors: i) the need 'level' and ii) the scope of user agencies impacted. A need of highest priority is one that is at a lower need 'level' (e.g., "Level 0 – Keep it Running" or "Level 1 – Basic Maintenance") and one that impacts all or nearly all DTRS users.

3.4   Method for Determining the Costs of Needs

The operational and capital costs for maintaining the DTRS network were, for the most part, derived from one of the following three sources: i) from the agency that identified the need (who typically derived cost figures from vendor quotes, historical data, or estimates included in their future budgets), ii) direct quotes from vendors, or iii) the information included in the 2010 "Digital Trunked Radio System Operational Cost Assessment" report described above.

3.5   Information Gathering Methods Regarding Funding Options

To gather information regarding funding options, research was conducted into two areas: i) the status of federal grants and or earmarks that pertain to public safety communications and ii) the availability of the following State-source options: general budget, sales taxes, other assessed revenue, state funds, bonds, and general budget(s). Research into State-source options was performed through discussions with members of OITs financial staff, with staff from the General Assembly's Joint Budget Committee (JBC), and with staff from the Governor's Office of State Planning and Budgeting (OSPB).
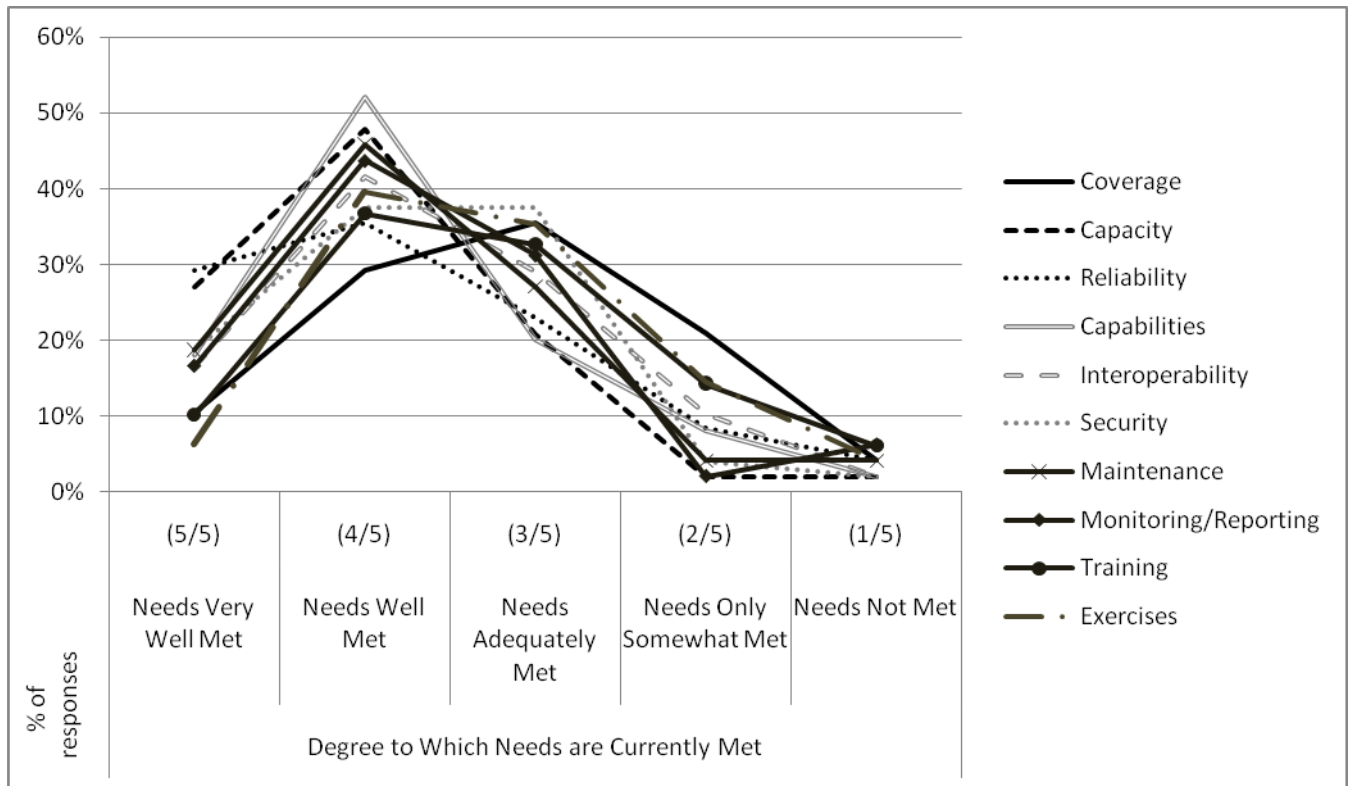
Additionally, the funding mechanisms of other statewide public safety radio communications systems were investigated through research into publically-available documentation and through phone conversations or email correspondence with financial or operational managers of those systems.

4. Survey and Interview Results Regarding Needs

4.1 Survey Quantitative Results

Representatives from 50 agencies that use DTRS (listed in Appendix B) participated in the on-line survey regarding DTRS' ability to meet user needs (shown in Appendix A). The compilation of their quantitative responses is shown in the following table and graph.

Distribution of survey respondents answers regarding ability of DTRS to meet needs	Degree to Which Needs are Currently Met				
	Needs Very Well Met (5/5)	Needs Well Met (4/5)	Needs Adequately Met (3/5)	Needs Only Somewhat Met (2/5)	Needs Not Met (1/5)
Coverage	10%	29%	35%	21%	4%
Capacity	27%	48%	21%	2%	2%
Reliability	29%	35%	23%	8%	4%
Capabilities	18%	52%	20%	8%	2%
Interoperability	17%	42%	29%	10%	2%
Security	19%	38%	38%	4%	2%
Maintenance	19%	46%	27%	4%	4%
Monitoring/Reporting	17%	44%	31%	2%	6%
Training	10%	37%	33%	14%	6%
Exercises	6%	40%	35%	15%	4%

(Performance Attribute)

As described above, the term "DTRS" is used differently by different owners and users of the network and its definition ranges from the all-encompassing statewide system to the local sub-system owned, operated, and primarily-used by a local agency. Although a positive or negative view to any of DTRS' performance attributes could be directed toward the statewide or the local definition of the network, **the comments offered by respondents from local municipalities implied that they primarily view DTRS as the sub-systems and sites that serve their local area.**

4.2   Summary of Survey and Interview Qualitative Results

A summary of DTRS user's unmet needs, as collected from interviews and as reported by those respondents that stated that their needs were "only somewhat met" or "not met", is as follows:

- Remarks regarding unmet needs about DTRS' Coverage performance fell into three categories: i) Several agencies from rural areas noted that DTRS provides coverage along main federal or state highways but not across the entire county[7], ii) several agencies from municipalities of moderate population noted that specific, important buildings (police headquarters, courthouses, etc.) were not covered, and iii) several notices were made of specific, hard-to-reach canyons (e.g., Boulder Canyon between Boulder and Nederland) being totally devoid of coverage.

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[7] The State of Colorado's advertised "baseline" coverage criteria for DTRS are 95% coverage reliability to a mobile (car-mounted) radio on state highways. Enhancements on these criteria have been provided by local governments.

- Remarks regarding unmet needs about DTRS' Capacity performance mainly focused on the need to restructure either the network's fleetmap (which defines which groups of users can talk to each other and on which sites) or the entire architecture of the network in a way that promotes regional communications and interoperability above statewide communications and interoperability (which could entail redistributing and rearranging the ways in which radio sites are interconnected to master sites).

- Remarks regarding unmet needs about DTRS' Reliability performance needs fell into two categories, with most respondents expressing strong concern over the first category: i) the microwave links that connect radio sites to each other and to master sites utilize very old equipment that has failed repeatedly, and ii) the power systems that provide power to the radio equipment at some radio sites is aging and has failed.

| Important Note:

👉	A significant portion of the microwave backhaul that is owned by the State OIT is approximately 15 to 20 years old. (In comparison, the 2010 report titled "Digital Trunked Radio System Operational Cost Assessment" noted that the average age of similar equipment owned by municipalities in metropolitan areas is 4 years.) The age of the OIT's microwave equipment, and the design of the overall backhaul network, are the major factors to its unreliability in that: i) there are limited or no replacement parts to upkeep the equipment, ii) there is no ability to monitor or report on the status of the equipment, iii) the architecture of the backhaul system generally uses 'spur' topologies in which multiple sites connect to the master sites only through each other in one long string, meaning that the failure of one site causes the disconnection of all sites 'behind' it. The danger of the non-fault-tolerant design of DTRS' microwave backhaul was underscored in the fires of the summer of 2012.

- The High Park Fire of Larimer County[8] covered an area of over 87,000 acres, caused one fatality and 3 injuries, and destroyed 259 structures and 112 outbuildings or other buildings. This fire twice 'burned over' the DTRS site at Buckhorn, endangering the firefighters and first responders that were actively fighting the fire and, because it is the sole DTRS connectivity hub for all of Northeastern Colorado, potentially severing and disabling a significant portion of the network.

- The Waldo Canyon Fire of El Paso County covered an area of over 17,000 acres, caused two fatalities and 3 injuries, and destroyed 346 structures and threatened a total of over 23,000 others. This fire threatened the DTRS sites at Cedar Heights and Stanley Canyon. Had it destroyed the later, it would have also severed the Eastern portion of the Pikes Peak Regional

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[8] Photo of Buckhorn Site courtesy of David Rowe, Larimer County

Communications Network, a significant sub-system of the DTRS network.

- The Weber Fire of Montezuma County covered an area of over 9,000 acres, and (as of the time of this report) has threatened 75 homes. This fire has threatened the DTRS site of La Monte whose destruction would have severed the majority of the radio sites in Southwestern Colorado from their master site (at Zone 2).

A microwave network design that includes redundant paths, in fault-tolerant loop configurations, would eliminate the risk of the failure/destruction of one site from affecting others.

- Remarks regarding unmet needs about DTRS' Capabilities/Features performance mainly focused on replicating in DTRS some features that are available in older, legacy VHF radio systems (such as paging) as well as for improved integration between DTRS and those systems.

- Remarks regarding unmet needs about DTRS' Interoperability performance fell into three categories: i) Several agencies noted the need to improve interoperability with those agencies in the Denver metro area that do not use DTRS by providing an interface that supports a greater commonality of features (transmission of radio ID, etc.) between the two systems; ii) several agencies expressed a need to communicate with federal agencies that do not currently use DTRS, and iii) selected agencies expressed a need to communicate with agencies from neighboring states (Wyoming, Kansas, etc.).

- Remarks regarding unmet needs about DTRS' Security performance identified: i) there is concern that the software used in the core of the network (the master sites) has support for current/updated antivirus protection only through the end of the 2012 calendar year (after which antivirus updates will not be available, leaving the network's core exposed to newly-developed cyber threats) and ii) that many rural sites are physically protected at a minimal level and are therefore vulnerable to vandalism or natural damage, either of which could result in outages of significant duration.

Important Note:	This pending lapse in virus protection is inconsistent with CRS 24-37.5-401 thru -406, most specifically with 401.1(c) which, as a declaration of the General Assembly, states: "Securing the state's communication and information resources is a statewide imperative requiring a coordinated and shared effort from all departments, agencies, and political subdivisions of the state and a long term commitment to state funding that ensures the success of such efforts."

- Remarks regarding unmet needs about DTRS' <u>Maintenance</u> performance included several agencies strongly expressing concerns that the four master sites that are the core of the system, have not been upgraded to any recently-released level of software, which impacts the stability, supportability, security, and expandability of the entire network. [See the "Results of Vendor Interviews" section, below, for more details on the constraints and concerns with the current version of software used in the master sites.] Also, some owners of significant infrastructure expressed concern over the few number of staff, mainly at OIT, that have the requisite training and skills to provide direct maintenance of the master site equipment used in DTRS. Such owners felt that the lack of backup maintenance resources for the master sites left the system vulnerable to failure and they wished for more trained and available radio and master site technicians. Finally, some agencies noted again that many of the backhaul links (microwave equipment) are aging and requiring a disproportionate amount of maintenance resources.

- Remarks regarding unmet needs about DTRS' <u>Monitoring/Reporting</u> performance focused on the need to promote the awareness and consumption of the regularly-produced, detailed reports on usage (by agency) and busies (by site) so that expansion and local billing can be better planned.

- Remarks regarding unmet needs about DTRS' <u>Training</u> programs cited the existence of State-provided training classes but included requests for multiple levels of classes on usage (to include detailed product training for advance, or 'power', users) and maintenance repair.

- Remarks regarding unmet needs about DTRS' <u>Exercise</u> programs mainly pointed out the need for local agencies to develop and deliver their own exercises but some respondents noted the need for new multi-jurisdictional exercises that would be used to 'feed' the process of planning improvements to the network.

Important Note: ☞	Although no survey or interview question specifically addressed such topics, a significant number of participants strongly expressed concern over the current lack of: i) a process for <u>planning</u> the operations and technical architecture/expansion of the network that is comprehensive, inclusive (of agencies from the State as well as from metropolitan and rural municipalities), and constrained to the realities of the budgets of all users and infrastructure owners, ii) <u>agreements</u>, or processes to establish agreements, regarding the responsibilities of ownership, usage, maintenance, and funding of DTRS infrastructure and iii) the identification of a <u>funding mechanism</u> that is committed and capable of providing a reliable amount of funding that is dedicated to DTRS. The many agencies that expressed these concerns felt that the continued cooperative success of the DTRS depends on the establishment of a planning process, ownership and usage agreements (including a sustainable process for creating and refining agreements), and a reliable funding mechanism.

Two agencies that do not use DTRS as their primary networks for public safety radio communications (City of Denver Police and City of Boulder Police) but that do either interconnect to DTRS or do use DTRS on a secondary basis for interoperability expressed the following concerns: i) that there be more "standards-based" (or open architecture) interfaces between the DTRS network and equipment within other network) and ii) that the topic of public safety communications be viewed by all within the State of Colorado as more than just DTRS (i.e., that the owners of networks other than DTRS be included in discussions and decisions regarding the planning, funding, usage, and agreements related to Colorado public safety communications).

4.3   Summary of Vendor Interviews Regarding Needs

Motorola Solutions, Inc., the vendor that provides the majority of the equipment for the DTRS network infrastructure, expressed concern over the age of the software used in the master sites. The master sites currently operate with a software version known as "7.5" which was implemented in DTRS in mid-2009 and Motorola Solutions, Inc. recommends that master sites be upgraded with new revisions of software at least every two years in order to: i) to be fully supported (for issues like minor enhancements and 'bug fixes' and ii) to be compatible with the software in the radio site and dispatch center equipment with which they interface.

Motorola Solutions Inc.'s next major revision of master site software will be "7.14" which will be released in 2013 and which will address the following known issues with "7.5" as it is implemented in DTRS: i) "7.14" will include support for up-to-date virus protection software whereas "7.5" does not support up-to-date virus protection, leaving DTRS vulnerable to security and virus threats, ii) "7.14" will support a new interface to dispatch center equipment whereas "7.5" supports a dispatch-center interface that has been cancelled and for which repair parts are unavailable (which leaves those owners of the cancelled dispatch center interface at risk should their interface equipment fail), iii) "7.14" will allow DTRS to comply with the Federal Communications Commission's mandate to operate all 700MHz radio channels in a narrowband configuration by the year 2017 whereas "7.5" does not support such narrowband configurations[9], iv) "7.14" will support the expansions to the additional quantities of radio channels that are being planned by numerous infrastructure owners whereas "7.5" limits the number of radio channels to only a few more than the number currently used in DTRS), v) "7.14" will support a high total limit of radio ID's (i.e., the total number of user radios allowed to operate on the network) whereas "7.5" limits the number of radio IDs to only approximately 20% more than are currently operating on the network, and vi) "7.14" will support an interface (known as ISSI Rev2) to non-DTRS systems (such as the City of Denver system) that will provide a greater degree of interoperability and cross-network features whereas "7.5" supports an interface that has fewer capabilities.

Important Note:	As is noted above, these concerns over the version of master site software used in DTRS, and the need to upgrade that software, were also expressed by several agencies that are user and owners of DTRS equipment.

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[9] "7.14" will allow the repeater sites to operate in the 700MHz narrowband mode, however, all 700MHz radio sites will still require upgrades in order to fully operate in that mode

The upgrade to "7.14" would still support the existing dispatch center equipment that is based on the "CENTRACOM" platform, however, all subsequent upgrades of the master sites (to versions "7.15" and beyond) would require the replacement of all such "CENTRACOM" dispatch center equipment. As of 2010[10], there were approximately 240 dispatch center positions based on this "CENTRACOM" platform and the cost to replace each was approximately $150,000 (for a total "CENTRACOM" replacement cost of approximately $36M)[11]. Additionally, versions of master site software that are released in 2016 (i.e., version "7.17") and subsequent years (and versions) will not support the QUANTAR model of radio site repeaters. As of 2010[12], there were approximately 175 radio sites still utilizing QUANTAR repeaters and the cost to upgrade each site was approximately $205,0000 (for a total QUANTAR upgrade cost of $35M).

Harris Corporation, the vendor that provides public safety radio communications equipment to several non-DTRS networks (including those used by the Cities/Counties of Denver, Aurora, Arvada, Westminster, and Lakewood) expressed the same concerns as those raised by the agencies that do not use DTRS as their primary network and underscored the need for DTRS to support the enhanced interface that allows easier and more full-featured interconnections between networks (which is known as "ISSI Rev2").

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[10] According to the 2010 report titled "Digital Trunked Radio System Operational Cost Assessment"
[11] The cost to upgrade these "CENTRACOM" dispatch center positions is to be borne by their individual owners (i.e., the dispatch center operators) and not by any central agency or authority.
[12] Also according to the 2010 report titled "Digital Trunked Radio System Operational Cost Assessment"

5. Summary of Needs with Priorities and Costs

The following table provides a summary of the needs expressed above and also shows: i) the 'owner(s)' of the need (i.e., the agencies that expressed the need and/or the agencies that are responsible for the equipment that is not meeting existing needs), ii) the scope of the need (i.e., those agencies affected by the need); iii) the priority of the need (which is a factor of the level and scope), iv) the approximate capital and annual operations and maintenance (O&M) costs to resolve the need, and v) the desired timing for the expenditure of those costs in order to alleviate the need.

This section and the following table do not address the identified need to establish and sustain for DTRS a planning process, ownership and usage agreements (including a sustainable process for creating and refining agreements), and a reliable funding mechanism.   As noted, many agencies felt that the continued cooperative success of the DTRS network depends on the establishment of these important components of governance.

Additionally, this section and this table does not address the need that some agencies expressed for the DTRS network to be restructured in a way that promotes regional communications and interoperability above statewide communications and interoperability (which could entail redistributing and rearranging the ways in which radio sites are interconnected to master sites). Such an adjustment requires further evaluation regarding its costs, benefits, and methods of approach.

Need Description	Need Owner(s)	Need Level & Scope	Need Priority	Capital Cost (Approximate)	O&M Cost, (Approx, annually)	State Fiscal Year(s) of Expenses
The core platform of DTRS (the master sites) must be upgraded to a new version of software ("7.14").	The owners of the four master sites (State OIT, PPRCN, and the six owners of the "CCNC-Zone3" Master Site)	Levels 0, 1 & 2 Affects all DTRS users	**High**	$14,900,000	tbd *[Annual upkeep packages are available or full upgrades can be purchased individually, as needed]*	2013 for capital O&M costs will depend on approach (annual or as-needed)
The aging microwave equipment used in several backhaul links must be redesigned and replaced. The first activity will be to hire outside engineering assistance.	State OIT	Levels 1 & 2 Affects all users of sites connected by OIT microwave links	**High**	$300,000	n/a	2013 for capital
The aging microwave equipment used in several backhaul links must be redesigned and replaced. The second activity will be to contract a vendor to implement the findings of the outside engineering assistance.	State OIT	Levels 1 & 2 Affects all users of sites connected by OIT microwave links	**High**	$20,000,000 to $25,000,000 *[Cost is for replacement of existing equipment using similar, non-redundant design; actual cost may be higher for a design of higher reliability]*	$125,000 *[Cost is for regular maintenance of new microwave equipment, which may be a savings relative to upkeep of existing, aging equipment]*	2014 through 2017 for capital Annually afterward for O&M

Need Description	Need Owner(s)	Need Level & Scope	Need Priority	Capital Cost (Approximate)	O&M Cost, (Approx, annually)	State Fiscal Year(s) of Expenses
Several of the towers at State OIT sites must be replaced to avoid failure and to maintain compliance to code. From the 18 originally slated for replacement, budget must be found for 15.	State OIT	Level 0 Affects users of the sites of the listed radio sites	**High**	$4,500,000 *[Cost is based on an average construction cost of $300,000 per tower.]*	n/a	2013 for capital
The State OIT requires additional resources to carry out its duties in maintaining the DTRS network. *[See notes following this table.]*	State OIT	Levels 0 & 1, Affects all DTRS users.	**High**	$336,000	Increase of $1,253,000 per year (above 2012 amount of $4.54M)	2013 for capital Annually starting in 2013 for O&M
Many radio site repeaters will need to be upgraded to new GTR8000 equipment to support future versions of master site software.	Numerous radio sites that operate "QUANTAR" repeater equipment	Levels 0, 1 & 2 Affects "QUANTAR" owners	**Medium**	$35,000,000	Per site: $5,000 *[O&M costs may not be an increase above costs for existing repeaters]*	2016 or later for capital
Many local dispatch centers will need to be upgraded to new equipment to support future versions of master site software.	Numerous local dispatch centers that operate "CENTRACOM" dispatch positions	Levels 0, 1 & 2 Affects "CENTRACOM" owners	**Medium**	$36,000,000	Per site: $4,000 *[O&M costs may not be an increase above costs for existing positions]*	2014 or later for capital

Need Description	Need Owner(s)	Need Level & Scope	Need Priority	Capital Cost (Approximate)	O&M Cost, (Approx, annually)	State Fiscal Year(s) of Expenses
Radio sites are required in rural areas to provide full countywide coverage (beyond the coverage provided by DTRS to major highways and population centers). This first requires the completion of planning and design work.	Various rural agencies	Level 3 Affects rural agencies that require coverage beyond that provided by existing DTRS sites	**Medium**	tbd [Per Site: between $250,000 (for a site with existing tower and shelter, both in good condition) and $1,000,000 (for an undeveloped site)]	tbd [Per site: $13,000 for a site using leased facilities and a generator]	2013 (or later) for capital Annually afterward for O&M
The enhanced method for interconnecting DTRS to other networks (known as ISSI Rev2) must be implemented in order to allow easier and more capable interfaces between networks.	State OIT, Owners of Non-DTRS networks	Level 3 Affects agencies that communicate between the DTRS network and other, non-DTRS networks	**Medium**	$200,000 per connection[13] *[This cost for ISSI Rev2 is based on the assumption that the master sites are upgraded to 7.14]*	$10,000 per connection	2014 (or later) for capital Annually afterward for O&M
Several remote/rural sites require enhancements to their physical construction to improve site security (and resistance to damage)	Various agencies	Level 1	**Medium**	tbd [Per site: $30,000 to $70,000, depending on current site condition		

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[13] Note: An initiative is currently underway by Colorado's North Central All-Hazards Emergency Management Region (NCR) to fund the establishment of a new interoperability link (based on ISSI Rev2) between DTRS and the system used by the City and County of Denver. The completion of this initiative, if funded by NCR, would eliminate the need for outside capital expenses for it, however, it would require the establishment of a method for funding its associated O&M costs. Links between DTRS and other non-DTRS networks would still require both capital and O&M costs.

Need Description	Need Owner(s)	Need Level & Scope	Need Priority	Capital Cost (Approximate)	O&M Cost, (Approx, annually)	State Fiscal Year(s) of Expenses
Bi-Directional Amplifiers (building signal boosters) are required to enhance coverage in important municipal or commercial buildings. This first requires the completion of planning and design work.	Various agencies	Level 3 Affects agencies that require in-building coverage beyond that provided by existing DTRS sites	**Medium**	tbd [Per Building: $60,000 to $120,000, depending on building type]	tbd [Per Building: $3,000 to $6,000]	2013 (or later) for capital Annually afterward for O&M
The feature of Over the Air Programming (OTAP) must be implemented in order to allow easier and remote programming of subscriber radios.	Several agencies that wish to utilize the capabilities of OTAP	Level 3 Affects agencies that wish to utilize OTAP	Low	$2,000 to $15,000 (per OTAP agency, depending on agency's network design)	n/a	2013 (or later) for capital
A method for interconnecting DTRS to networks outside the state, as well as to federal agencies that do not use DTRS, must be implemented in order to allow interoperability with such agencies. This first requires the completion of planning and design work.	State OIT, Owners of federal and "other-state" networks	Level 3 Affects agencies that communicate between the DTRS network and the networks of other states and of other federal agencies	Low	tbd [Per connection: $200,000, if ISSI Rev2 is used]	Tbd	2014 (or later) for capital

[Note: The following are cost increases associated with OIT's resources that maintain the DTRS network:

- Increase in staff salaries/benefits to account for an addition of 8 new staff: $800,000

  - From the current amount of $4,013,000 to the needed amount of $4,813,000

- Increase in allowances for clothing, cars, fuel, office equipment (including PCs), including such costs for 8 new staff: $122,500

  - From the current amount of $202.5,000 to the needed amount of $324,700

- Increase for costs of office space leases (including new, required repair shops): $95,000

  - From the current amount of $11,000 to the needed amount of $106,000

- Increases for rising costs of repairs of aging equipment: $75,000

  - From the current amount of $75,000 to the needed amount of $150,000

- Increases for rising costs of site fuel and batteries: $17,000

  - From the current amount of $11,000 to the needed amount of $28,000

- Increases for replacement snow cats (required to access sites) and associated training and registration (assuming a 12 year replacement cycle): $14,300

  - From the current amount of $22,000 to the needed amount of $163,300

- New expenses for updated radio test equipment: a new, needed amount of $336,000]

6. Funding Options

6.1 Current Funding Situation

Two facts regarding funding for DTRS are apparent: i) the continued cooperative success of the DTRS network requires a funding mechanisms to address both capital improvements and ongoing maintenance costs, and ii) there are currently no clear, unified funding mechanisms to support either the required capital improvements or DTRS as a whole.

As noted above, ownership of DTRS is diverse and therefore so is the current funding arrangement. The State of Colorado funds the maintenance of its sites and equipment via the budget provided to the OIT's group responsible for DTRS. For the most part, municipalities and regional partnerships that own DTRS infrastructure have been managing, operating, and maintaining their equipment with their own staff and limited local government funding. The ability to continue funding capital improvements and ongoing maintenance varies widely: it has been easier to accomplish for the municipalities and regional partnerships in the metropolitan areas than for those in rural areas. (None of the metro-area municipalities or partnerships (see footnote #4) stated a need for external funding for locally-owned DTRS equipment but they did express a need for funding assistance for the master site software upgrade.) The rural agencies reported that they are somewhat able to fund the maintenance of existing equipment but generally are unable to fund the capital improvements required to maintain a common technology platform (same radio repeaters and dispatch consoles) as is required by the DTRS master sites.

There are also a number of smaller agencies that are not owners of any infrastructure but that do use the infrastructure of others. In some cases, these non-owners pay owners local usage fees and in some cases they do not.

As per the previous section of this document, there are a number of capital improvement and ongoing maintenance needs that must to be addressed and a clear and unified funding mechanism must be identified to ensure the continued operation of DTRS.

6.2 Funding Options

6.2.1 State Funding for Capital Improvements

Funding for capital improvements could occur through a request from OIT to the Capital Development Committee (CDC). Such a request would need to specify the capital improvements to be made and the amounts required for those improvements. Approval of such a request and availability of funding would be dependent upon the amount requested and the priority placed on improving DTRS relative to other requests statewide. The OIT will need to work through the CDC process and develop the appropriate strategy for these types of projects.

A request to the Capital Development Committee could be accompanied by a request to raise the identified funds via bonds, however, requests for bonds may complicate, not simplify, the request as the review/approval process will then consider the accompanying cost of repaying the bonds.

6.2.2   Federal Grants

In the past, a number of the Department of Homeland Security's Preparedness Grant Programs had been viable funding sources for public safety radio projects. Recently, the Federal government has been reducing the amount of the Preparedness Grant Program's funding and programs specific to public safety radio projects. The table on the following page shows the changes to in the Preparedness Grant Program from 2010 to 2012[14].

	FISCAL YEAR		
	2010	**2011**	**2012**
Communications –Related Federal Grant Programs Available:	• Homeland Security Grant Program • Tribal Homeland Security Grant Program • UASI Nonprofit Security Grant Program • Emergency Management Performance Grants • Interoperable Emergency Communications Grant Program • Regional Catastrophic Preparedness Grant Program • Emergency Operations Center Grant Program • Driver's License Security Grant Program • Buffer Zone Protection Program • Port Security Grant Program • Intercity Passenger Rail (Amtrak) Program • Freight Rail Security Grant Program	• Homeland Security Grant Program • Emergency Management Performance Grants • Tribal Homeland Security Grant Program • Nonprofit Security Grant Program • Intercity Passenger Rail (Amtrak) Program • Port Security Grant Program • Transit Security Grant Program	• Homeland Security Grant Program • Emergency Management Performance Grants • Tribal Homeland Security Grant Program • Nonprofit Security Grant Program • Intercity Passenger Rail (Amtrak) Program • Port Security Grant Program • Transit Security Grant Program

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[14] FY10 Department of Homeland Security Preparedness Grant Program Overview: http://www.dhs.gov/xlibrary/assets/grant-program-overview-fy2010.pdf and FY12 Department of Homeland Security Preparedness Grant Program Overview: http://www.fema.gov/pdf/government/grant/2012/fy12_overview.pdf

	• Intercity Bus Security Grant Program • Trucking Security Program		
Total Funding (all programs):	**$2,714,879,947**	**$2,190,570,008**	**$1,381,476,000** (50% and 36% decreases from 2010 and 2011, respectively)

With the reduction in programs and funds, Federal grant funding is very competitive and difficult to acquire. The CCSA, OIT, or other organization, could still apply for any viable grants for public safety radio projects; however, the probability of funding large DTRS system upgrade and improvement projects is low.

6.2.3 Federal Earmarks

In late 2010, Congress began a practice of banning Federal earmarks. Since that time, "the number [of earmarks] has dropped by 98.3 percent, from 9,129 in FY 2010 to 152 in FY 2012. The [amount of earmarks] has decreased by 80 percent, from $16.5 billion in FY 2010 to $3.3 billion in FY 2012, which is the lowest amount since 1992."[15] With the trend for Federal earmarks to be on a significant downturn, it is unlikely that any type of earmark request would be successful.

6.2.4 Usage Fees

There is currently no organization that has the legal authority to impose statewide user fees for the use of the DTRS network. The legislation that established CCSA (HB-1224) expressly limited its ability to assess fees on members. Likewise the CCNC has no statutory authority to assess fees and its attempt to collect a modest, per-agency membership fee on a voluntary basis has encountered moderate success.

Should any organization be authorized to assess usage fees, a significant challenge would still exist in determining the levels of such fees. Some of the municipalities or regional partnerships that own DTRS infrastructure already charge their local agencies usage fees that are used to maintain and/or improve that locally-owned infrastructure. Therefore, it would be challenging to impose a statewide user fee "on top" of a local usage fee. Also, those owners of significant amounts of DTRS infrastructure already feel that they have paid their fair share towards the improvement and maintenance of the system through their investment in their local sites and equipment and they should thereby be exempt from a statewide usage fee. In contrast, those rural agencies that use but do not own DTRS infrastructure claim that they simply do not have the funds to pay for usage fees and, if such were imposed, they would simply stop using DTRS and revert to local, non-interoperable radio systems.

Should usage fees be considered as a funding mechanism for DTRS, these two issues of authorized-agency and equitable-rate would need to be resolved. Additionally, a long-term adoption plan would need to be created to give users a significant amount of time to plan and budget for the fees.

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[15] 2012 Congressional Pig Book Summary by Citizens Against Government Waste (http://www.cagw.org/assets/pdf-letters/2012-pig-book.pdf)

Important Note:	It should also be noted that usage fees place a direct burden on those agencies that use DTRS as a critical part of providing public safety services, and only an indirectly burden, if at all, on the citizens and industries that benefit from the use of DTRS in the consumption of such public safety services.

Because of all these issues, usage fees should be considered an option only when taken together with their challenges.

6.2.5   Taxes and Assessed Revenues

The State of Colorado could work to enact one or a variety of taxes that would generate funds for DTRS, however, the process for any such revenue generating taxes would be long, arduous, and highly political. Also, the population base of municipalities that use DTRS may support this option but the public safety agencies and population base of municipalities that do not use DTRS might be opposed to such efforts.

6.2.6   Existing State Funds

The State of Colorado has some ongoing as well as some "sun setting" funds that could be made available and repurposed for capital improvements to, and ongoing maintenance of, the DTRS network[16].   The repurposing of such a fund, or combination of funds, may be among the most viable of options to provide for the ongoing maintenance of DTRS, however, to be considered viable, such a fund would need to align with DTRS goals and to the benefits it provides to public safety agencies and, ultimately, the citizens and industries that consume public safety services.

6.2.7   9-1-1 Funds

The 9-1-1 centers in the State of Colorado are funded by telephone bill surcharges and disseminated to local Emergency Telephone Authorities (ETAs) for their use in funding their centers. Although it is known that some ETAs do direct some portions of their 9-1-1 surcharge funds to the maintenance of DTRS, no State-level organization currently holds the ability to influence how local municipalities utilize the 9-1-1 and no State-level organization could mandate the use of such funds for DTRS.

6.3   Funding Models of Other Statewide Communications Networks

Other states have statewide public safety radio communications networks and they use a variety of models to providing funding to them.

6.3.1   State of Texas

By passing HB422, which became effective on September 1, 2011, the State of Texas created an "Emergency Radio Infrastructure Account". The bill directs a small percentage (5.5904%) of various court costs to fund the "Emergency Radio Infrastructure Account. [17]" The funding can only be used for

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[16] An example of a fund whose future usage is being evaluated is the Telecom High Cost Support fund.
[17] Sources (http://www.hro.house.state.tx.us/pdf/ba82r/hb0442.pdf and
http://www.legis.state.tx.us/tlodocs/82R/fiscalnotes/pdf/HB00442E.pdf#navpanes=0) calculate the amount that will be directed to this fund to be approximately $20M to $22M per year.

activities and equipment that would further the goal of establishing a statewide public safety interoperable radio communications system.

6.3.2 State of Minnesota

Minnesota State Statute Chapter 403 provides for the use of 911 fees to support the bonding of the infrastructure of the statewide system (known as ARMER) including its continued maintenance. Additionally, legislation allows for the assessment of user fees, however, no users fees have been assessed as existing state-level funding sources support ongoing maintenance. Note that local subsystems may be added at the cost and ownership of the local agency or municipality.

6.3.3 Commonwealth of Virginia

Funding for Virginia's statewide system (known as STARS) is through State General Funds, as appropriated by the Virginia General Assembly for the Department of State Police, Communications Division. If a large improvement or capital improvement is required in future years a budget decision package goes to the Virginia General Assembly for funding consideration for the next biennium budget

6.3.4 State of South Carolina

The construction of the State of South Carolina's PALMETO 800 system was funded by a mix of federal grants and state budget initiatives, however, the costs of on-going operations and maintenance of the system (including larger, capital upgrades) are funded by user fees.

6.3.5 State of Michigan

As with South Carolina, the construction of the State of Michigan's' MPSCS system was funded by a mix of federal grants and state budget initiatives, however, the costs of on-going operations and maintenance of the system are funded by user fees. (User fees also provide for some capital upgrades, however, the most recent upgrade to the system's core platform (the master sites) had been funded by legislative action at the State-level.)   User fees as assed on a per-radio basis based a level of service desired: Level 1 pays $50/year, Level 2 pays $100/year, and Level 3 pays $200/year. Varying levels have more or less access to statewide and/or private talkgroups. (Data services and custom programming services are extra costs.) Local agencies that build and incorporate local enhancements (subsystems) may be eligible for credits on their usage fee, depending on the degree to which the enhancement "furthers MPSCS goals and policy objectives."

6.3.6 State of Wyoming

The State of Wyoming's WYOLINK system, which is owned and operated by the State's Department of Transportation (WYDOT), was also funded by a mix of federal grants and state budget initiatives. On-going operations and maintenance of the system (including larger, capital upgrades) are currently funded by state budget, however, the system's governing authority is empowered to collect user fees, should the funding situation require such actions.

Appendix A – Survey

Survey Purpose: The Consolidated Communications Network of Colorado (CCNC) and the Governor's Office of Information Technology are seeking to gather information about the operational and capital infrastructure needs to maintain the Digital Trunked Radio System (DTRS). We have prepared the following survey to help us identify the ability of the current system to meet users' needs and to gather ideas for solutions to meet those needs. The information you provide will help us be aware of those needs and also plan for the costs (capital and operational) to meet those needs. We will use this information for our planning and budgeting processes and we rely on your input to help us justify funding requests.

Instructions: This survey includes mandatory questions about the ability of DTRS' current performance to meet your organization's needs. These mandatory questions are marked with an asterisk (*) and are generally along the left edge of the survey form. There are also optional questions which allow you to elaborate on any unmet needs (including their impact to your operations) as well as to identify your ideas for solving those unmet needs. These optional questions are generally located to the right of the mandatory questions.

IMPORTANT: When answering all questions, please consider your organization's daily operational needs as well as special events and special areas of identified risk.

*** START OF SURVEY ***

1. What agency or organization do you represent?

2. Answer "Yes" to this Question and answer Question 3 if there is any aspect of this survey or this topic that you would specifically like to discuss.

○   Yes   ○   No

3. Please provide your name and contact information.

**************************** OPERATIONAL/TECHNICAL QUESTIONS ******************************

* 4. Current Coverage Performance: Identify the degree to which DTRS currently meets your organization's needs for coverage:

○   Needs Very Well Met (5/5)

○   Needs Well Met (4/5)

5. Coverage Needs – Describe areas that are known to have coverage that is less than satisfactory. Describe the operational requirement for coverage improvements (for example, coverage to portable at hip in a specific location or building).

6. Coverage Solutions – Describe any ideas you have for solving the Coverage Needs areas listed in your response to Question 5. Possible solutions include additional sites (perhaps at specific locations), reconfiguration of existing sites, bi-

directional amplifiers, etc.

○ Needs Adequately Met (3/5)

● Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

* 7. Current Capacity Performance: Identify the degree to which DTRS currently meets your organization's needs for capacity (Note - "capacity" refers to the ability of DTRS to process calls without delays or busies):

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

● Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

8. Capacity Needs – Describe areas that are known to have reduced capacity (Note - capacity does not meet your operational needs (busies that are too frequent for operational needs). If you believe that you know the site or sites where capacity is an issue, please note those sites.

9. Capacity Solutions - Describe any idea you have for solving the Capacity Needs areas listed in your response to Question 8. Possible solutions include additional sites (perhaps at specific locations), additional channels at existing sites, adjustments to the fleetmap or roaming agreements, etc.

* 10. Current Reliability Performance: Identify the degree to which DTRS currently meets your organization's needs for reliability:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

● Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

11. Reliability Needs – Describe areas that are known to have poor reliability of system access (areas often in failsoft or often without any service at all).

12. Reliability Solutions – Describe any idea you have for solving the Reliability Needs areas listed in your response to Question 11. Possible solutions include newer radio equipment, additional redundancy in equipment or links, improvements to site

* 13. Current Capabilities/Features Performance: Identify the degree to which DTRS currently meets your organization's needs for capabilities/features:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

14. Feature Needs/Solutions – Describe any features that you currently have that are not working as you expected and/or any features that you know exist but that aren't available on DTRS. Describe the operational impact of having (or not having) such

○ Needs Adequately Met (3/5)

◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

features.

*********************** INTEROPERABILITY/SECURITY QUESTIONS **

* 15. Current Interoperability Performance: Identify the degree to which DTRS currently meets your organization's needs for interoperability:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

16. Interoperability Needs – Describe any needs for interoperability (communications between different agencies or municipalities) that are not currently met by DTRS. Describe any problems with existing methods of interoperability (gateways, patches, mutual aid channels, etc.) or describe any requirements for interoperability that are not currently accommodated in any way. Describe the impact to your operations from any inability to interoperate.

17. Interoperability Solutions – Describe any ideas you have for solving the Interoperability Needs areas listed in your response to Question 16.

* 18. Current Security Performance: Identify the degree to which DTRS currently meets your organization's needs for security:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

19. Security Needs – Describe any real or perceived threats to the security of DTRS. Consider physical threats to sites (shelters and towers), equipment, or links as well as to the electronic/cyber resiliency of the radio link or WAN. Also, describe any unmet needs for encryption.

20. Security Solutions – Describe any ideas you have for solving the Security Needs areas listed in your response to Question 19.

**************************** CONTROL/MAINTENANCE QUESTIONS ***********************************

* 21. Current Maintenance Performance: Identify the degree to which DTRS currently meets your organization's needs for

22. Maintenance Needs – Describe any problems you have encountered regarding maintenance of the system

23. Maintenance Solutions – Describe any ideas you have for solving the Maintenance Needs areas listed in your

maintenance:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

including maintenance that is of poor quality or insufficient frequency. Describe also any procedural issues in reporting a need for, or obtaining delivery of, maintenance to the system. Describe the impact to your operations from any maintenance problems.

response to Question 22.

* 24. Current Monitoring/Reporting Performance: Identify the degree to which DTRS currently meets your organization's needs for monitoring and reporting

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

25. Monitoring/Reporting Needs – Describe any problems you perceive in the ways in which the performance of DTRS, including maintenance, is monitored and/or reported to users. Include any tools (software, hardware, service, or combination) that you know are available but not currently in use by your organization or by the organizations that manage DTRS.

26. Monitoring/Reporting Solutions - Describe any ideas you have for solving the Monitoring/Reporting Needs areas listed in your response to Question 25.

*** USAGE QUESTIONS ***

* 27. Current Training Performance: Identify the degree to which DTRS currently meets your organization's needs for training on the use of the system:

○ Needs Very Well Met (5/5)

○ Needs Well Met (4/5)

○ Needs Adequately Met (3/5)

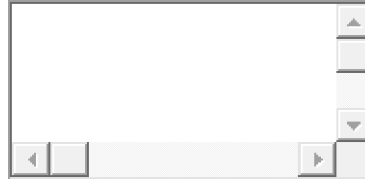◉ Needs Only Somewhat Met (2/5)

○ Needs Not Met (1/5)

28. Training Needs – Describe any training regarding DTRS that you feel is required including improvements to the existing training courses or the development of new/additional training courses. Describe the impact to your operations of any existing or currently-unavailable training.

29. Training Solutions - Describe any ideas you have for solving the Training Needs areas listed in your response to Question 28.
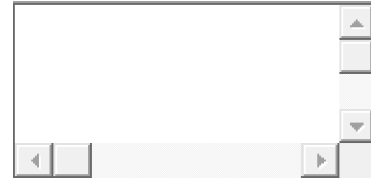
* 30. Current Exercise Performance: Identify the degree to which DTRS currently meets your organization's needs for exercises regarding the use of the system:

○   Needs Very Well Met (5/5)

○   Needs Well Met (4/5)

○   Needs Adequately Met (3/5)

◉   Needs Only Somewhat Met (2/5)
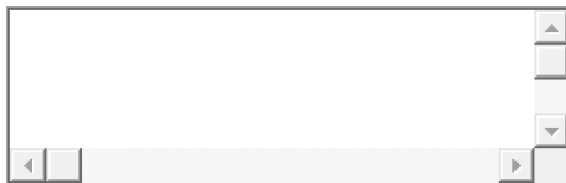
○   Needs Not Met (1/5)

31. Exercise Needs – Describe any need for specific, communications-related exercises that you feel would benefit your use (local or multi-jurisdictional) of DTRS. Describe the impact to your operations from any lack of pertinent exercises (or the benefit from new exercises).
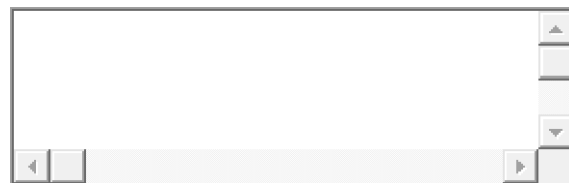
32. Exercise Solutions - Describe any ideas you have for solving the Exercise Needs areas listed in your response to Question 31.

* 33. Other Usage Needs –Describe any other issues related to DTRS or radio communications; including technical or non-technical topics; that impact your organization's ability to meet its mission.

* 34. Other Usage Solutions - Describe any ideas you have for solving the Usage Needs areas listed in your response to Question 33.

** END OF SURVEY **

Thank you for your time!

Appendix B – Stakeholders

- Agencies that use DTRS that were interviewed (face-to-face, via phone conference, or via email):
    - ADCOM
    - Arapahoe County
    - Boulder County
    - Bureau of Reclamation
    - City of Estes Park
    - City of Pueblo
    - City of Thornton (via ADCOM)
    - Douglas County
    - Eagle County
    - Grand County (East Grand Fire)
    - Jefferson County
    - PPRCN
    - Pueblo County
    - Routt County
    - San Miguel County
    - State of Colorado/OIT
    - Weld County
- Agencies that do not use DTRS on a primary basis that were interviewed (via phone conference):
    - City of Boulder
    - City/County of Denver
- Vendors Interviewed:
    - Motorola Solutions, Inc.
    - Harris Corporation
- Agencies that participated in web survey (50 total):
    - ADCOM
    - Arapahoe Co
    - Bureau of Reclamation
    - City of Broomfield
    - City of Carbondale
    - City of Cortez
    - City of Durango
    - City of Estes Park
    - City of Federal Heights
    - City of Glendale
    - City of La Junta
    - City of Longmont
    - City of Loveland
    - City of Monte Vista
    - City of Wellington
    - Custer Co
    - Delta Co
    - Dolores Co

- o Eagle Co
- o Elbert Co
- o Fremont Co
- o Grand Co (East Grand Fire)
- o Gunnison Co
- o Hinsdale Co
- o Holy Cross Energy
- o Huerfano Co
- o Kiowa Co
- o La Plata Co OEM/SAR
- o La Plata Co Sheriff's Office
- o Lake Co
- o Larimer Co
- o Logan Co
- o Montezuma Co
- o Montrose Co
- o Ouray Co
- o Park Co
- o Phillips Co
- o PPRCN
- o Prowers Co
- o RTD
- o San Juan Co
- o San Miguel Co
- o West All Hazards Region
- o Yuma Co
- o Colorado State Patrol
- o Colorado State Patrol (ESU)
- o Colorado Dept of Corrections
- o Colorado State Parks
- o State of Colorado OIT
- o Office of the District Attorney, 12th JD
- DTRS and Non-DTRS agencies contacted for interviews but with whom no interview was conducted:
  - o City of Durango
  - o City of Parker
  - o Garfield Co
  - o City of Durango
  - o NCRCN
  - o Otero Co
  - o Pitkin Co
  - o San Juan Co
  - o San Louis Valley HLS
  - o Washington Co
  - o City of Lakewood
  - o City of Aurora
  - o City of Arvada
  - o City of Westminster