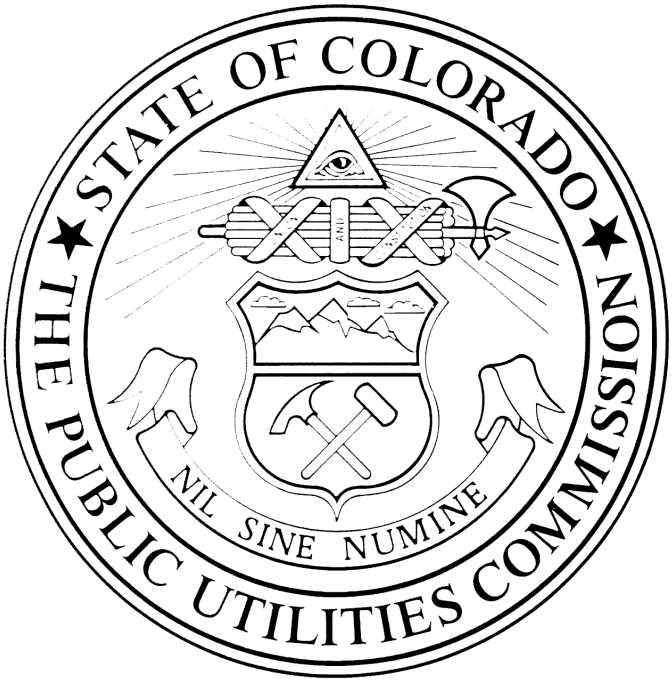
Report on the State of 9-1-1 Services in Colorado

2022-2023



Prepared by:

The Colorado Public Utilities Commission Staff

September 13, 2023

COLORADO
Department of
Regulatory Agencies
Public Utilities Commission

Eric Blank, Chairman
Megan Gilman, Commissioner
Tom Plant, Commissioner
Rebecca White, Director

Patty Salazar, Executive Director
Jared Polis, Governor

September 13, 2023

The General Assembly
State Capitol Building
Denver, Colorado 80203

Dear Members of the Colorado General Assembly:

The purpose of the attached report is to fulfill the requirements of § 40-2-131, C.R.S., which requires the Commission to produce a State of 9-1-1 report for the members of the General Assembly, covering seven specific topic areas.[1] Statute also requires that the Commission present the report to the Senate Committee on Business, Labor, and Technology, or its successor committee, and the House of Committee on Business Affairs and Labor or its successor committee, on or before February 1.

Additionally, the statute requires that the report be developed in consultation with Public Safety Answering Points (PSAPs), 9-1-1 governing bodies, and statewide organizations that represent public safety. For a description of how this consultation was obtained, and how input from the stakeholders was incorporated into this report, see Appendix B.

9-1-1 technology is complex, as are the funding and governance issues that are involved in the provision of 9-1-1 service to the public. This complexity has resulted in jargon and acronyms that can make it difficult to follow for newcomers to the topic. The reader is encouraged to consult the glossary (Appendix A) as necessary.

The Commission is pleased to present this sixth edition of its State of 9-1-1 Report to the members of the General Assembly, and looks forward to presenting this material and providing the members with a deeper understanding of this critical service. 9-1-1 is the first service to be accessed by members of the public in an emergency, and it must be a strong first link in the public safety chain. The Commission looks forward to working with the members of the General Assembly in ensuring that Colorado has the most robust, effective, and efficient 9-1-1 system possible.

[1] § 40-2-131(1)(a)-(g), C.R.S.

Respectfully submitted,

Eric Blank, Chairman
Colorado Public Utilities Commission
1560 Broadway Suite 250
Denver, CO 80202

Megan M. Gilman, Commissioner
Colorado Public Utilities Commission
1560 Broadway Suite 250
Denver, CO 80202

Report on the State of 9-1-1 Services in Colorado

2022-2023

Key Points

A Commission-established stakeholder group is actively planning future development of Next Generation 9-1-1 (NG9-1-1) in the state.

In early 2023, the Commission concluded a rulemaking process to improve 9-1-1 network resilience. A proceeding is currently underway for implementation.

Colorado's existing local 9-1-1 funding mechanisms are sufficient for most 9-1-1-related costs in the state. However, significant inequities exist in local emergency telephone surcharge fees, varying widely between local jurisdictions.

Colorado remains one of a shrinking minority of states with no minimum operational or training standards for 9-1-1 call centers.

Colorado is one of only five states that have no state-level purchasing mechanism for 9-1-1 related expenses, hampering some efforts for deploying NG9-1-1 technology and addressing geographic inequities.

This report contains recommendations to address the lack of operational and training standards, the lack of a state-level purchasing mechanism, and a lack of statutory guidance for the assessment of emergency telephone charge applications, which may be contributing to local ETC rate disparities.

Table of Contents

Executive Summary

***Key Points*:**

- ***The ESInet Users Group continues to plan for future deployment of Next Generation 9-1-1 (NG9-1-1) services.***

- ***The Commission concluded a rulemaking process creating a mechanism for improvement of 9-1-1 network resiliency. Implementation of the new rules is underway.***

- ***Colorado remains one of a shrinking minority of states with no minimum operational or training standards for 9-1-1 call centers.***

- ***Some projects and programs that would benefit from being deployed at a state level would require a state-level funding mechanism, which currently doesn't exist. A potential legislative solution is proposed by the Commission's 9-1-1 Advisory Task Force, as described in Section 5.***

- ***The disparity of local emergency telephone charge rates continues to grow between some rural areas and the urban areas of the state, with some consumers paying as much as five times what others pay in monthly surcharge rates.***

The state of 9-1-1 services in Colorado continues to be in transition. While some Colorado Public Safety Answering Points (PSAPs) have implemented over-the-top solutions to match the capabilities available to the public through commercial telecommunications services, the tariffed Basic Emergency Service Network lags behind commercially available functionality. However, Colorado has taken the first steps towards implementation of advanced services. The migration of Colorado's Public Safety Answering Points from a legacy (analog) 9-1-1 network to an Emergency Services IP Network (ESInet) is essentially complete.

In the meantime, Colorado's local 9-1-1 governing bodies, through the ESInet Users Group, are discussing future steps with Colorado's Basic Emergency Service Provider (BESP), CenturyLink (also known as Lumen Technologies). One tool to help guide this transition is the Next Generation 9-1-1 Strategic Plan, which helps solidify the development of the ESInet into an NG9-1-1 system. The first edition of the Plan was approved in August of 2022 by a stakeholder group formed by the Commission, and will be updated annually.[1]

The Commission continues to address issues related to reliability and resiliency in the portion of the 9-1-1 call flow that is regulated, referred to as Basic Emergency Service (BES). A rulemaking completed at the end of 2022 and effective on March 31, 2023, outlines a new staff-led outage investigation process and a BES network improvement plan process, both of

[1] https://docs.google.com/document/d/1SbsHfCjbJ_aKAkD8lfGZqRRz6-44-ZBu35BW1DZmXCw

which are underway. This is an area of particular focus from the Commission, and is discussed further in Section 4.

The passage of HB20-1293 facilitated the first steps toward NG9-1-1 deployment through the creation of a state 9-1-1 surcharge to reimburse local 9-1-1 governing bodies for the increased costs of call delivery via the ESInet, which freed up local funds for use on other costs within the PSAP.[2] However, 9-1-1 funding in Colorado remains entirely local. All surcharge funds are either remitted by telecommunications service providers directly to the 58 local 9-1-1 governing bodies or they are remitted to the state, which then distributes the funds to those governing bodies. For most costs related to the provision of 9-1-1 service in the state, including implementation of NG9-1-1 services, this is sufficient. Some of these costs may be integrated into the existing CenturyLink ESInet tariff on file with the Commission, and may be reimbursed to the governing bodies through annual Commission adjustment of the state 9-1-1 surcharge rate. Other costs will be borne by the local 9-1-1 governing bodies themselves, and those costs may be recovered through adjustment of local emergency telephone charge rates.

However, other costs related to a robust, ubiquitous 9-1-1 service and full implementation of NG9-1-1 are harder to pay for through local funds. A discussion of these items and potential solutions can be found in Section 5.

The Commission makes several recommendations to the legislature for consideration. **These recommendations are the recommendations of the Commission, and not of the Commission's 9-1-1 Advisory Task Force, the Department of Regulatory Agencies, the Governor's Office, or any other organization.**

- **The legislature should work with 9-1-1 professionals and stakeholders to develop minimum operational and training standards for PSAPs.** This could include minimum training standards for public safety telecommunicators, standard goals for call answering times, standards regarding the use of emergency medical dispatch protocols and the provision of medical pre-arrival instructions, the use of foreign language interpretation services for 9-1-1 callers who do not speak English, and other standards that will enhance the baseline level of 9-1-1 service offered statewide.[3] As of 2021, Colorado was one of only 11 states with no minimum training standards.[4]

- **The legislature should consider legislation to create a 9-1-1 services enterprise, based on draft legislation being proposed by the Commission's 9-1-1 Advisory Task Force.** The draft legislation would provide the state-level funding mechanism for statewide 9-1-1 service needs discussed above and in more detail in Section 5. Without this mechanism, those needs will continue to go unfunded, having an adverse impact on the consistency of the level of service provided to callers in different regions of the

[2] For more information regarding the impact of HB 20-1293, see Section 7.
[3] See Section 5 for more detail regarding this recommendation.
[4] https://www.911.gov/issues/911-stats-and-data/

state. Colorado is one of only five states with no state-level spending mechanism for 9-1-1 funds.[5]

- **The legislature should consider providing more guidance to the Commission regarding the criteria used for approval of local Emergency Telephone Charge (ETC) rates that exceed the Commission's application threshold, or take other action to address growing disparities between local ETC rates statewide.** Local 9-1-1 governing bodies are authorized to set an emergency telephone charge rate to be assessed per telephone line per month.[6] The Commission annually sets a threshold above which ETC rates must first receive Commission approval through an application process,[7] but very little guidance is provided in the statute for criteria to use when considering such applications. Due to differing local circumstances, ETC rates vary widely across the state, with some residents paying more than five and a half times what others are paying for 9-1-1 service based on their service or billing address.

[5] Pages 119-122. FCC. "Fourteenth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges for the Period January 1, 2021 to December 31, 2021." Published Dec 30, 2022. Retrieved July 18, 2023. https://www.fcc.gov/file/24628/download
[6] § 29-11-102(2)(a), C.R.S.
[7] § 29-11-102(2)(f), C.R.S.

1. Commission Activity Regarding 9-1-1 Service

Commission Activity During the 2022-2023 Fiscal Year

During the 2022-2023 Fiscal Year the Commission undertook the following activity:

- Received four applications for an increase in the local emergency telephone charge (ETC), filed by the Phillips County 911 Emergency Telephone Service Authority for $4.00 per line per month,[8] the Elbert County Communications Authority for $2.25 per line per month,[9] the Park County Emergency Telephone Service Authority for $3.00 per line per month,[10] and the Gunnison/Hinsdale Combined Emergency Telephone Service Authority for $3.00 per line per month.[11] All were approved.

- Conducted a proceeding to set the state 9-1-1 surcharge rate, the threshold for Commission approval required for emergency telephone charge rates, the prepaid wireless 9-1-1 charge rate, and distribution formulas for the state 9-1-1 surcharge and prepaid wireless 9-1-1 charge, by October 1, 2022, m, for 2023, as required by § 29-11-102.3 and 102.5, C.R.S.[12]

- Concluded a rulemaking "to improve the Commission's rules regarding Basic Emergency Service network reliability and to prescribe a tariff-based mechanism for funding Basic Emergency Service network improvements."[13] The final rules were adopted following an extensive workshop process and became effective March 31, 2023.

- Initiated a rulemaking to streamline remittance procedures for the 9-1-1, 9-8-8, and Telecom Relay Service (TRS) surcharges.[14] If adopted, new rules will go into effect January 1, 2024.

- Filed one set of comments with the Federal Communications Commission in a Notice of Proposed Rulemaking (NPRM) regarding location-based routing of 9-1-1 calls.[15]

- Facilitated six meetings of the Commission's 9-1-1 Advisory Task Force, created pursuant to 4 *CCR* 723-1-2145.[16] Beginning in 2022, staff has arranged

[8] See Proceeding No. 22A-0339T.
[9] See Proceeding No. 22A-0351T.
[10] See Proceeding No. 22A-0430T.
[11] See Proceeding No. 22A-0476T.
[12] See Proceeding No. 22M-0341T.
[13] See Proceeding No. 22R-0122T.
[14] See Proceeding No. 23R-0246T.
[15] The Commission's comments to the FCC may be viewed at https://drive.google.com/drive/folders/1nBCw5l6RF1b2bdOkEW5mGnpWX56KQCqa
[16] The Commission's authority for creating the Task Force derives from its oversight of Basic Emergency Service. See § 40-15-201 (2), C.R.S. See the Task Force's website at

"lunch-and-learn" webinars for local 9-1-1 stakeholders between meetings of the Task Force.

- Continued facilitation of the ESInet Users Group, a committee of the 9-1-1 Advisory Task Force, created by Commission Decision.[17]

- Filed an annual report to the Federal Communications Commission pursuant to the New and Emerging Technologies 911 Improvement Act of 2008 (NET 911 Act).[18]

- Participated in an annual data collection effort conducted by the National 911 Program.[19]

- Continued collaboration with the 9-8-8 Program Manager at the Colorado Behavioral Health Administration to further establish relationships between 9-8-8 and 9-1-1 and aid a smooth implementation of 9-8-8 services and mobile crisis response services.

- Transitioned to a new custodial agent for the receipt of state 9-1-1 surcharges (as well as 9-8-8 surcharges, TRS surcharges, and Colorado High Cost Support Mechanism contributions).

- Oversaw two proceedings initiated by CenturyLink to amend the existing BES tariff. One was withdrawn, and the other became effective April 21, 2023.[20]

- Received and began considering a BES Improvement Plan Application from CenturyLink (ongoing).[21]

- Facilitated development of an initial draft to the ESInet Users Group of a Next Generation 9-1-1 Strategic Plan, which was adopted by the Users Group in August 2022.[22]

- Initiated a project in conjunction with the state Office of Information Technology and the 9-1-1 Task Force's GIS Committee to create an accurate, GIS-based interactive map of the governing bodies' emergency telephone charge boundaries. Once completed, this resource will serve both citizens and telecommunications companies in determining correct authority boundaries for emergency telephone charge amounts and remittances.

---

https://sites.google.com/state.co.us/9-1-1-advisory-task-force/home.
[17] See Decision R18-1063T.
[18] See https://www.fcc.gov/general/911-fee-reports
[19] See https://resourcecenter.911.gov/code/9-1-1ProfileDatabase.aspx
[20] See Proceedings 22AL-0356T and 23AL-0133T, respectively.
[21] See Proceeding 23A-0197T.
[22] https://docs.google.com/document/d/1SbsHfCjbJ_aKAkD8IfGZqRRz6-44-ZBu35BW1DZmXCw/edit

In addition to the activity of the Commission listed above, Commission staff was also very engaged in statewide and national activities regarding 9-1-1 service, including:

- Serving as an officer on the board of the Colorado 9-1-1 Resource Center and the National Association of State 911 Administrators.
- Served as co-chair of the technology committee for the Colorado joint chapter of the National Emergency Number Association (NENA) and the Association of Public Safety Telecommunications Officials, Intl (APCO).
- Leading several committees of the Commission's 9-1-1 Advisory Task Force.
- Participated in meetings of the Colorado Homeland Security Advisory Committee's Public Safety Communications Subcommittee.
- Participated in the working groups of Transform911, an initiative of the University of Chicago Health Lab.[23]
- Serving on NENA's FutureThink Committee.[24]

Commission staff assigned to 9-1-1 related matters for the 2022-2023 fiscal year primarily consisted of the following:

- Daryl Branson, state 9-1-1 program manager
- Holly Bise, state relay administrator
- Jolene Sena, surcharge administrator

Ms. Bise and Ms. Sena have other duties not related to the 9-1-1 program. Between the three positions, there are roughly 2.0 FTE working specifically on 9-1-1 issues. We are happy to report the hiring of a new state 9-1-1 program manager, Jennifer Kirkland, who will be taking the lead on 9-1-1 issues within Commission Staff while Mr. Branson transitions to a different role within the Commission.

Commission Activity Planned for the 2023-2024 Fiscal Year

In 2019, the Commission initiated a proceeding and working group to examine issues related to 9-1-1 network reliability.[25] In its order closing the proceeding the Commission directed staff to prepare a notice of proposed rulemaking (NOPR) to modify the current 9-1-1 reliability rules to incorporate the findings of the working group. The NOPR was issued on March 9, 2022, and following an extensive series of workshops, final rules were effective on March 31, 2023.[26]

The amended reliability rules require two new processes at the Commission. First is the

[23] See transform911.org for more information.
[24] See https://www.nena.org/page/FutureThink for more information.
[25] See Proceeding No. 19M-0026T, Decision C21-0036.
[26] See Proceeding No. 22R-0122T.

implementation of an informal outage investigation process. A miscellaneous proceeding was established to serve as a repository for these staff-led investigations.[27] At the time of the writing of this report, one investigation has been completed and many others are underway.

Second, the new rules require the state's BESP, CenturyLink, to file an "Improvement Plan" with proposed projects that would improve the reliability, redundancy, or geographic diversity of the BES network. As described in the rules, the Commission may approve this plan, in whole or in part, and approve a respective tariff rate to pay for the project(s) in the plan. This tariff rate would be paid by the local 9-1-1 governing bodies, and the Commission would consider it when setting the state 9-1-1 surcharge rate for the following year.

CenturyLink filed its Improvement Plan application on April 24, 2023.[28] The proceeding has been referred to an Administrative Law Judge and is still pending. The projects proposed within the application were dependent on CenturyLink winning grant awards from the National Telecommunications and Information Administration, and it has since been determined that CenturyLink will not be awarded grants related to these projects. The application proceeding will remain open pending amendments.

As stated above, Commission staff have been working with the 9-8-8 program manager in the Behavioral Health Administration under the CDHS to aid implementation of 9-8-8 service, particularly as it relates to interaction with 9-1-1 service. This is an ongoing effort which also involves working with Rocky Mountain Crisis Partners, the state's 9-8-8 call center contractor. One ongoing task is the development of a model policy that PSAPs may use as a starting point for their own policies on when and how calls may be transferred between the two services.

CenturyLink also completed an amendment to its BES tariff to add a Management Information System (MIS) called ECaTS at the request of and for the benefit of the local governing bodies and PSAPs.[29] ECaTS is a call metrics and analysis system that will assist PSAPs with staffing decisions, among other capabilities. Deployment of this new service has not yet begun and Commission staff anticipates opportunities to help facilitate the implementation.

Staff also anticipates providing recommended updates to the ESInet Users Group's NG9-1-1 Strategic Plan in August 2024. The nature of the document requires that it be updated and revised regularly to ensure that the Plan continues to reflect the desires of the local agencies and an ambitious, but realistic, vision for the future of 9-1-1 service in the state.

Commission staff will complete annual reporting requests from the Federal Communications Commission and the National 911 Program. Staff will also continue to administer the Commission's 9-1-1 Advisory Task Force and facilitate its meetings and agendas, pursuant to 4 *CCR* 723-2-2145(a), as well as facilitate the meetings of the ESInet Users Group. Staff will continue to participate in NENA, APCO, National Association of State 911 Administrators (NASNA), and the National Association of Regulatory Utility Commissioners (NARUC) activities

[27] See Proceeding No. 23M-0145T.
[28] See Proceeding No. 23A-0197T.
[29] See Proceeding 23AL-0133T.

and events.

2. The Current 9-1-1 Service Environment

Structure

9-1-1 service in Colorado exists in three domains, represented in Figure 2.1, below.

1. **The Originating Service Domain**: When a service user dials 9-1-1 the call is initially handled by the caller's telephone service provider, which delivers the call to the Basic Emergency Service Provider (BESP). The call may pass through one or more intermediary aggregation service providers before reaching the BESP.

2. **The Basic Emergency Service Domain:** 9-1-1 calls are aggregated by the BESP from all of the Originating Service Providers (OSPs) and their intermediates and routed to a demarcation point for the appropriate Public Safety Answering Point (PSAP). Being the portion of the call flow handled by the BESP, this is the regulated portion of 9-1-1 call flow described in the Commission's definition of Basic Emergency Service.

3. **The Local Domain:** Once received from the BESP at the local demarcation point 9-1-1 calls are the responsibility of the local agencies, including the PSAPs.

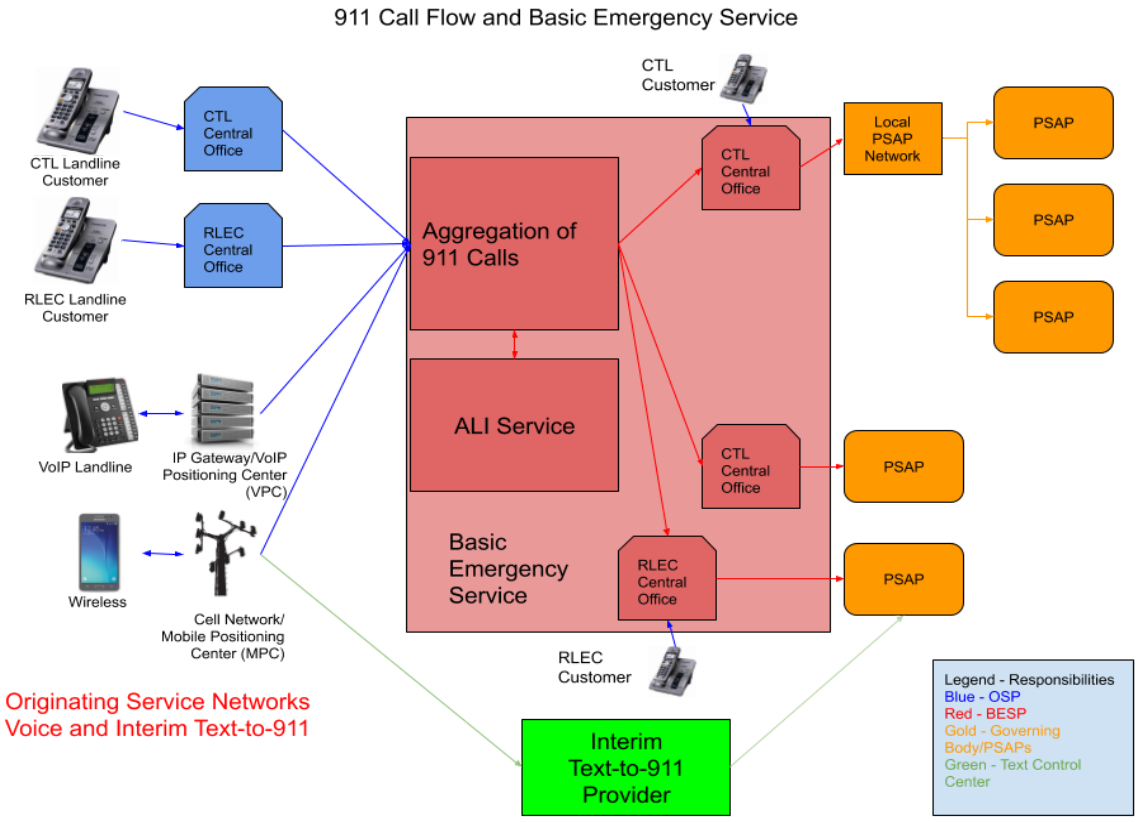


Figure 2.1: 9-1-1 Network Call Flow

Originating Service Providers (OSPs) include any vector by which a 9-1-1 call may be made, currently encompassing wireline, wireless, and Voice-over-Internet-Protocol (VoIP) services, and to a lesser extent satellite phones. In the future this may also include vectors from Internet-connected service, such as smart assistants.

Basic Emergency Service (BES) includes the aggregation, routing, and transport of 9-1-1 calls to a PSAP.[30] BES also includes the delivery of the location information that is associated with a 9-1-1 call.[31] CenturyLink[32] is currently the only BESP in Colorado that has an active tariff on file for 9-1-1 call delivery.

There are currently 81 primary PSAPs in Colorado (PSAPs that receive 9-1-1 calls directly from the BESP), and four secondary PSAPs (PSAPs that only receive 9-1-1 calls transferred from a primary PSAP), for a total of 85.[33] The Local Domain also includes 58 local 9-1-1 governing

[30] § 29-11-101(7), C.R.S.
[31] 4 *CCR* 723-2-2131(i).
[32] CenturyLink QC, also known as Lumen Technologies and Qwest Communications.
[33] A full list of Colorado's PSAPs may be found on the Colorado 9-1-1 Program web page. See:

bodies, or "governing bodies" (29-11-101(16), C.R.S.).[34] These governing bodies collect 9-1-1 emergency telephone charges from service users via their telecommunications service providers, fund local emergency telephone service, and in some cases provide technical support and local networks for PSAPs.

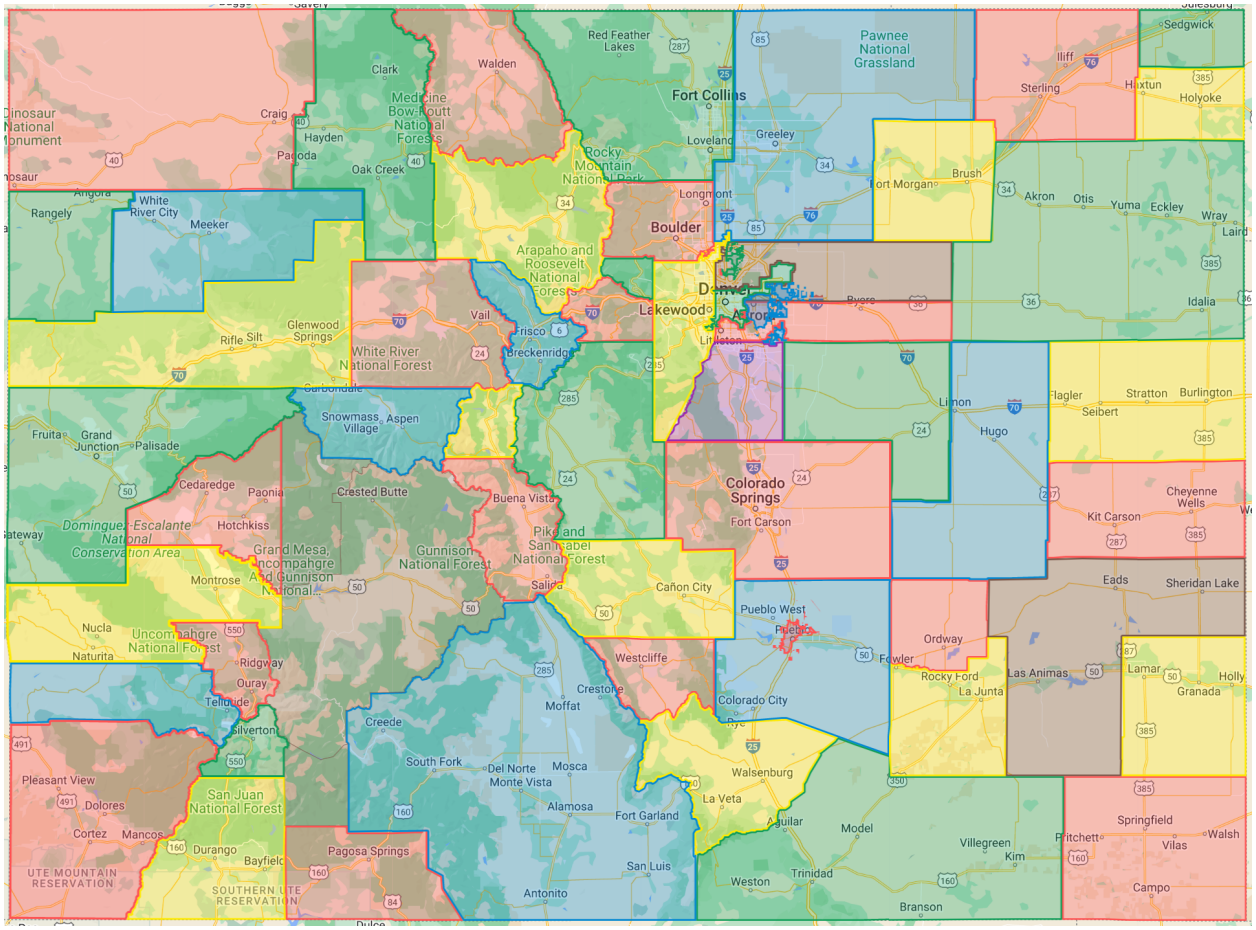


Figure 2.2: Colorado's 9-1-1 Governing Bodies. Each governing body may fund one or more PSAP.[35]

The Statutory Limits of Commission Oversight of 9-1-1 Service

It is important to differentiate what parts of the 9-1-1 call flow are overseen by the Commission, and what parts of the 9-1-1 call flow the Commission is statutorily restricted from regulating.

https://sites.google.com/state.co.us/colorado911program/home

[34] A full list of Colorado's 9-1-1 governing bodies may be found on the Colorado 9-1-1 Program web page. https://sites.google.com/state.co.us/colorado911program/basic-emergency-service

[35] An interactive version of this map may be found on the Colorado 9-1-1 Program web page. https://sites.google.com/state.co.us/colorado911program/basic-emergency-service

A 9-1-1 call begins with a service user dialing 9-1-1 on their wireline, wireless, VoIP, or satellite phone. It must then pass through a variety of networks owned by a variety of entities before it is delivered to the BESP for aggregation and delivery to the PSAP. This portion of the network is referred to as the Originating Service Environment (OSE), and providers in this space are Originating Service Providers (OSPs). The OSE and processing of 9-1-1 calls within it are not a part of Commission regulated emergency telephone service.

The portion of the BESP's network from the point of aggregation from OSPs or their intermediates to the point that the call is handed off to the PSAP is the Basic Emergency Service network. The aggregation, routing and transport of 9-1-1 calls via this network is what the Commission regulates as Basic Emergency Service.

After the call is delivered by the BESP to the demarcation point with a 9-1-1 governing body or PSAP, it is no longer part of regulated BES. Any failure that occurs within local PSAP networks or within the PSAPs themselves is outside the scope of the Commission's authority. This also means that the Commission has no authority to regulate the operation of PSAPs.

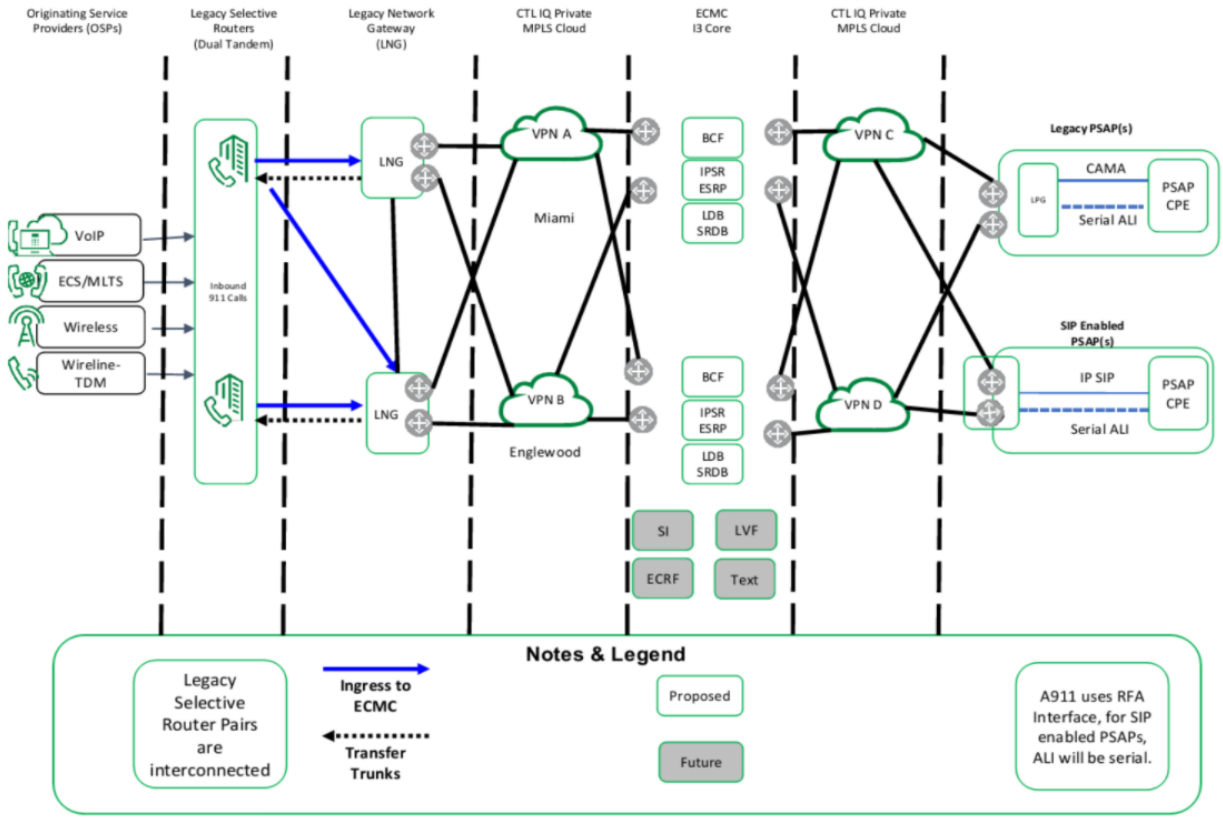
9-1-1 call failures can occur in the OSE and PSAP domains. Since the Commission is only granted authority by statute over the BES domain, they are not subject to Commission regulation.[36] It is important to note that some portions of the CenturyLink network may serve as part of both the OSE and BES networks, e.g. the same length of fiber optic cable may be used to transmit calls to the BES aggregation point (making it OSE domain) and to transmit calls from the aggregation point to the PSAP (making it BES domain). For a visual representation of this, note that in figure 2.1 above only the portion of the call flow shaded in red is regulated by the Commission.

In practical terms, this means that the Commission cannot require reporting of any outage other than those that impact the BES network. Nor can the Commission impose requirements, including outage reporting, on the PSAPs or governing bodies, with the exception of requiring annual reporting as allowed in § 29-11-102(4), C.R.S.

Technology

9-1-1 calls are delivered by OSPs or their intermediates to the BESP at several points of interconnection. The BES network converts the call to Session Initiation Protocol (SIP) format if necessary. A selective router compares the phone number or pseudo mobile phone number from which the 9-1-1 call is originating against a selective router database (SRDB) and routes the call to the appropriate PSAP. At some PSAPs the call is then converted back into an analog format for handling by the PSAP's 9-1-1 phone system, also referred to as Call Handling Equipment (CHE). If the PSAP's CHE is capable of handling calls in SIP format this last step conversion is unnecessary. It is anticipated that as older CHE is retired at the PSAPs, eventually all 9-1-1 calls will be handled locally in SIP format.

[36] § 40-15-201, C.R.S.



Legend:

BCF - Border Control Function
ECRF - Emergency Call Routing Function
ECS – Enterprise Communications System
ESRP - Emergency Services Routing Proxy
IPSR - IP Selective Router
LDB - Location Database
LNG – Legacy Network Gateway
LPG – Legacy PSAP Gateway
MLTS – Multi-Line Telephone System
MPLS – Multiple Protocol Labeling Service
SI - Spatial Interface
TDM – Time Division Multiplexing
Text - Text to 911 service
VPN – Virtual Private Network

Figure 2.3: ESInet 9-1-1 Call Flow with Legend. Source: CenturyLink/Lumen Basic Emergency Service Tariff, Colorado Tariff No. 25

Once received by the PSAP, the PSAP's CHE will use the phone number from which the 9-1-1 call originates to query the Automatic Location Identification (ALI) database. This database will then return basic information about the call, such as the subscriber name and address, to the PSAP. For wireless and VoIP calls, the OSP or its agent populates the ALI database with the caller's location, if known, in the form of X,Y coordinates and/or a dispatchable address.

Colorado's 9-1-1 network is currently a mix of "legacy" technology and "transitional" technology, as opposed to "Next Generation 9-1-1." As of the end of the 2022-2023 fiscal year, all but two PSAPs have been migrated to the "transitional" technology, a step toward a NG9-1-1 network. See Section 3 for information about Colorado's migration to NG9-1-1 NG9-1-1.

Legacy 9-1-1 networks are unable to deliver data types other than voice to the PSAP. For example, text to 9-1-1 service in Colorado is currently delivered separately from the BES network. Text to 9-1-1 calls are routed through a third party called a Text Control Center (TCC) which delivers the call directly to the PSAP. Text-to-911 service delivered via alternative connections rather than an ESInet is referred to as "interim" text to 9-1-1 service because it is considered a temporary solution until full NG9-1-1 service is implemented.

9-1-1 calls may currently be placed from one of three general categories of services.

- Wireline (or landline). These are 9-1-1 calls from traditional wired home or business phones.

- Wireless (or cellular). These are 9-1-1 calls from mobile phones, including smartphones. This category includes prepaid wireless telecommunications services.

- VoIP. These are 9-1-1 calls from phones that use the Internet for connecting the call. These may be either static (installed in a specific location), nomadic (meant to be portable to one Internet connection at a time), or mobile (hops from one Internet connection to another without terminating the call).

Multi-Line Telephone Systems (MLTS, also called Enterprise Communications Systems, or ECS), may use either wireline or (more commonly) VoIP call delivery. These are 9-1-1 calls from enterprise telephone systems in schools, office buildings, hospitals, factories, or anywhere else that makes use of multiple extensions branching from a single phone system. MLTS can also encompass several locations branching from a single phone system.

An unknown number of calls may also be placed from satellite phones.

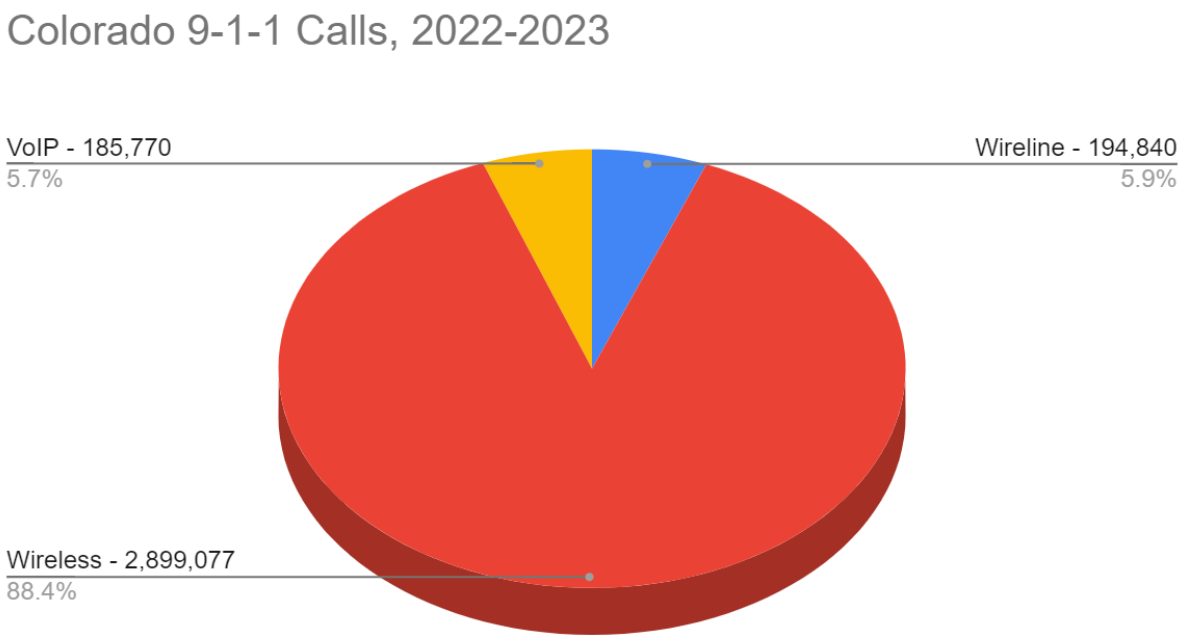


Figure 2.4: 2022-2023 Statewide 9-1-1 calls by type. Total call volume was 3,279,704. This includes initial calls to the PSAP and calls transferred in from another PSAP, so some calls may be counted twice.

All 9-1-1 service in Colorado is considered "Enhanced" 9-1-1 (or E9-1-1), which is distinguished by the use of selective routers for delivery of the 9-1-1 call to the appropriate PSAP. Perhaps more notably, E9-1-1 allows for the delivery of caller location information with the 9-1-1 call.

In order for a wireless 9-1-1 call to be delivered with location information, the PSAP must be capable of receiving and using such information. Every primary PSAP in Colorado is capable of this, whether the information is Phase I cell tower location or Phase II device coordinates.

Emergency Notification Services

Outbound emergency notifications to the public are provided using different services for different applications, including emergency notifications services (ENS). Local 9-1-1 governing bodies may use 9-1-1 funds to pay for ENS.[37] However, ENS is not part of the 9-1-1 system and its use and operation by local agencies is not regulated by the Commission.

During the 2023 legislative session Representative Elizabeth Velasco and Senators Perry Will and Tony Exum introduced HB23-1237, titled Inclusive Language Emergency Emergency

[37] See § 29-11-104(2)(a)(I)(C) and (D), C.R.S.

Situations. The final version of the bill directed the University of Colorado to conduct a study of available capabilities, with a final report due to the general assembly January 8, 2024. The study will determine what is needed to provide emergency alerts in minority languages, and also what is needed to provide live language interpretation on a 9-1-1 call.

General Operations

Operations within Colorado's 85 PSAPs are locally controlled. PSAPs are often operated as a part of a local law enforcement agency but are sometimes operated as independent agencies of a city or county government, as part of a fire agency, or as a separate legal entity of the state. While the term "PSAP" refers only to facilities that answer 9-1-1 calls from the public, every PSAP in Colorado is also a dispatch center, dispatching calls for service to first responders for one or more law enforcement agencies, fire protection service, emergency medical service, and other agencies. PSAPs also field a large number of non-emergency calls from the public, usually exceeding the number of 9-1-1 calls received.[38]

Commission staff have begun using the data collection authority provided to it by statute to track trends in PSAP service capabilities.[39] Specifically, staff have begun tracking the adoption of three categories of PSAP services that are generally considered essential to PSAP operations but are not universally adopted in Colorado.

Text-to-9-1-1

Text-to-9-1-1 service allows users to send a message by entering "911" in the recipient field of their texting app. No federal or state mandate to provide text-to-9-1-1 exists. It was first made available in Colorado in 2013 in Pitkin County. Currently, it is available in the jurisdictions of 50 out of the 58 9-1-1 governing bodies. The Black Hawk Police Department also makes text-to-9-1-1 service available, although the service is not available in other parts of Gilpin County. Each PSAP providing text-to-9-1-1 service is doing so via "interim" methods that bypass the ESInet, using either dedicated connections to a Text Control Center (TCC) provider or, more commonly, using the public Internet and a browser-based solution.

The current status of text-to-9-1-1 is illustrated in the map below. In this map green indicates 9-1-1 governing bodies which provide it anywhere there is cellular service. Yellow indicates that text-to-9-1-1 is available in some parts of the jurisdiction but not others. Red indicates that text-to-9-1-1 is not available anywhere in the jurisdiction. Since our last report, Jackson, Lincoln, and Huerfano Counties have implemented text-to-9-1-1 service.

For the purpose of this map, a PSAP is considered to have text-to-9-1-1 service even if that

[38] Note: There is an industry trend to move away from the term "Public Safety Answering Point" or "PSAP" in favor of the term "Emergency Communications Center" or "ECC". For the purposes of this report, we continue to use the term PSAP since it is the term defined in statute and specifically refers to ECCs that receive 9-1-1 calls, whereas the term "ECC" can be more broad.

[39] §29-11-102(4), C.R.S. requires 9-1-1 governing bodies to comply with annual reporting requirements established by the Commission for assisting the Commission in meeting federal reporting requirements and data requests and to gather information for inclusion in this report.

service is being provided by another PSAP.

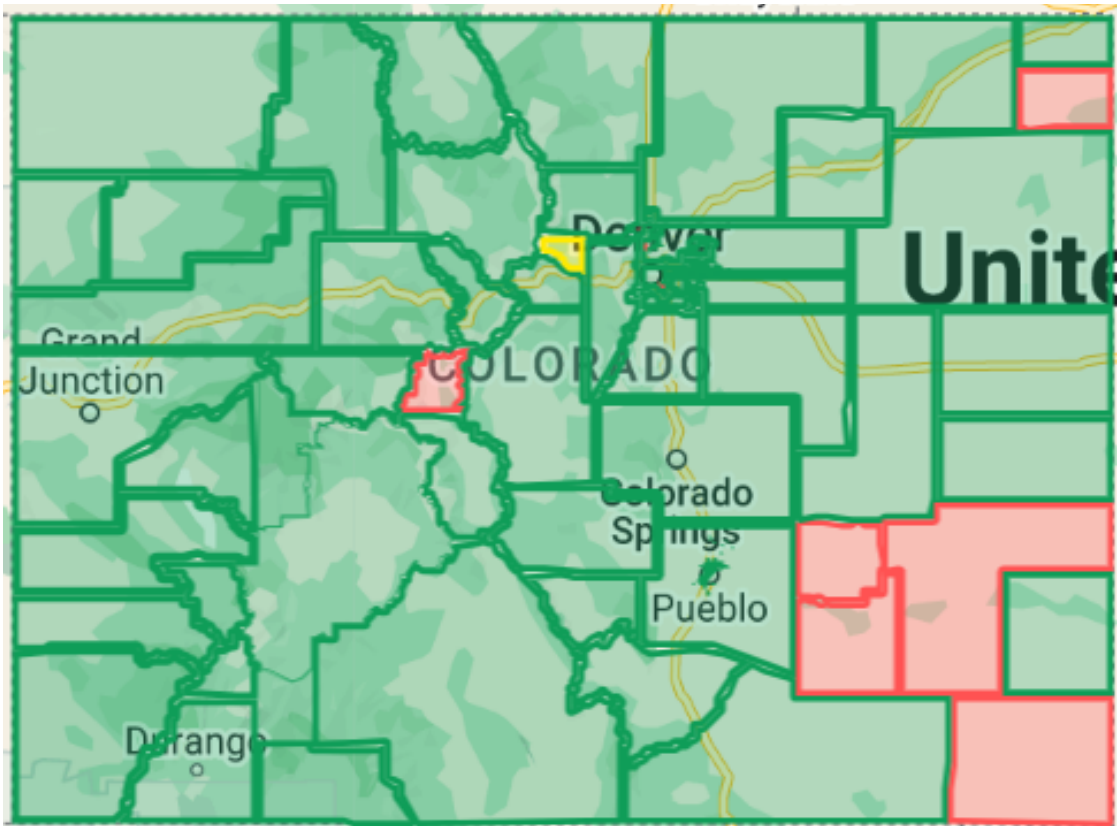


Figure 2.5: Text to 9-1-1 service in Colorado by governing body.
Red = No text to 9-1-1 service.
Yellow = Text to 9-1-1 service offered in some parts of the governing body's jurisdiction.
Green = Text to 9-1-1 service offered in all of the governing body's jurisdiction.

While optional, the implementation of text-to-9-1-1 service can mean the difference between life and death for individuals who may be unable to make a traditional voice call. This includes callers who are deaf, hard-of-hearing, or may have a speech impairment, and also include callers reporting dangerous incidents in which the suspect may still be present, such as a domestic abuse situation or an active shooter. Text-to-9-1-1 may also work in some instances where a cellular signal may not be strong enough to maintain a voice 9-1-1 call.

For these reasons, the Commission's 9-1-1 Advisory Task Force strongly supports implementation of text-to-9-1-1 in every PSAP, and discussions regarding how to encourage and facilitate statewide deployment of the service are ongoing. These efforts are being assisted largely by the Colorado 9-1-1 Resource Center, a non-profit entity created by order of the Commission in 2006 to provide support and informational resources to local 9-1-1 officials.

The ESInet Users Group, a committee of the Task Force, has held discussions with CenturyLink regarding the possibility of ubiquitous text-to-9-1-1 being delivered statewide via the ESInet, thereby using the same path as voice 9-1-1 calls. By doing so, the service would receive the benefit of being delivered over a secure, dedicated network with that network's redundancy and diversity. It would allow PSAPs that currently receive text-to-9-1-1 calls via an Internet browser to begin receiving them natively in CHE, subject to the equipment supporting that functionality. It would ensure 100% coverage and add a layer of redundancy that could help make the public's ability to contact 9-1-1 more reliable. PSAPs that wish to also continue receiving text-to-9-1-1 via interim methods for additional redundancy could do so.

The Task Force's Equal Access Committee has also urged the Task Force, the ESInet Users Group, and CenturyLink to identify solutions for statewide deployment of text-to-9-1-1, and is monitoring adoption of text-to-9-1-1 by governing bodies and PSAPs.

EMD/PAI Implementation

The use of Emergency Medical Dispatch (EMD) protocols including the delivery of Pre-Arrival Instructions (PAI) for medical calls is standard throughout most of Colorado, with the service being implemented fully by PSAPs related to 53 out of the 58 governing bodies. In Otero County one PSAP (Rocky Ford FD) provides EMD for its service area, but the other PSAP (La Junta PD) does not.

For the purpose of the map below, a PSAP is considered to provide EMD/PAI even if that service is being provided by another PSAP on its behalf.

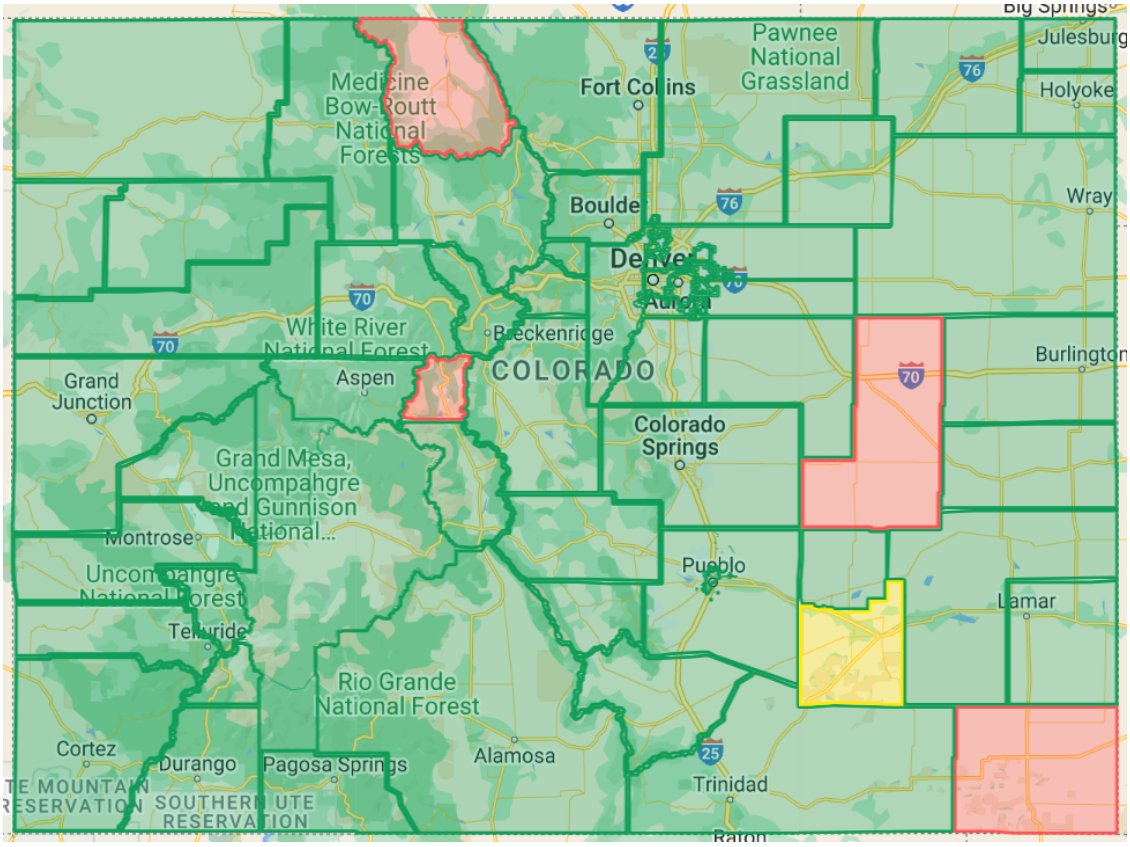


Figure 2.6: EMD/PAI service in Colorado by governing body.
Red = No EMD/PAI service.
Yellow = EMD/PAI offered in some parts of the governing body's jurisdiction.
Green = EMD/PAI offered in all of the governing body's jurisdiction.

Although EMD is not mandated in Colorado, it is a critical service that may make the difference between life and death for callers requesting medical assistance. The ability to provide CPR instructions over the phone, provide instructions to control bleeding, or other instructions to stabilize a patient prior to arrival of emergency medical service personnel can and does have an impact on patient outcomes.

It should be noted that among the counties denoted in green, a variety of different EMD protocol systems are in use. The quality of the protocol system in use may vary from PSAP to PSAP. Most, but not all, PSAPs are using nationally accredited protocol systems with both national and local medical oversight.

Foreign Language Interpretation for 9-1-1 Calls

Every PSAP in Colorado faces the possibility of receiving 9-1-1 calls from callers who do not speak English fluently, or who might be better able to communicate if provided the

opportunity to use their native language. Several vendors provide services that allow PSAPs to initiate a three-way call with non-English-speaking callers, bringing a trained interpreter to facilitate communication between the caller and the call taker. Often, these services can even help the call taker identify the language being used by the caller, if unknown, then bring onto the line an appropriate interpreter.

Currently, 51 out of the 58 governing bodies in Colorado utilize interpretation services at their respective PSAPs. Jackson County's interpretation service is provided through a partnership with Larimer Emergency Telephone Authority. In La Plata County, the Durango-La Plata 911 center utilizes an interpretation service, but the Southern Ute Police Department PSAP does not.

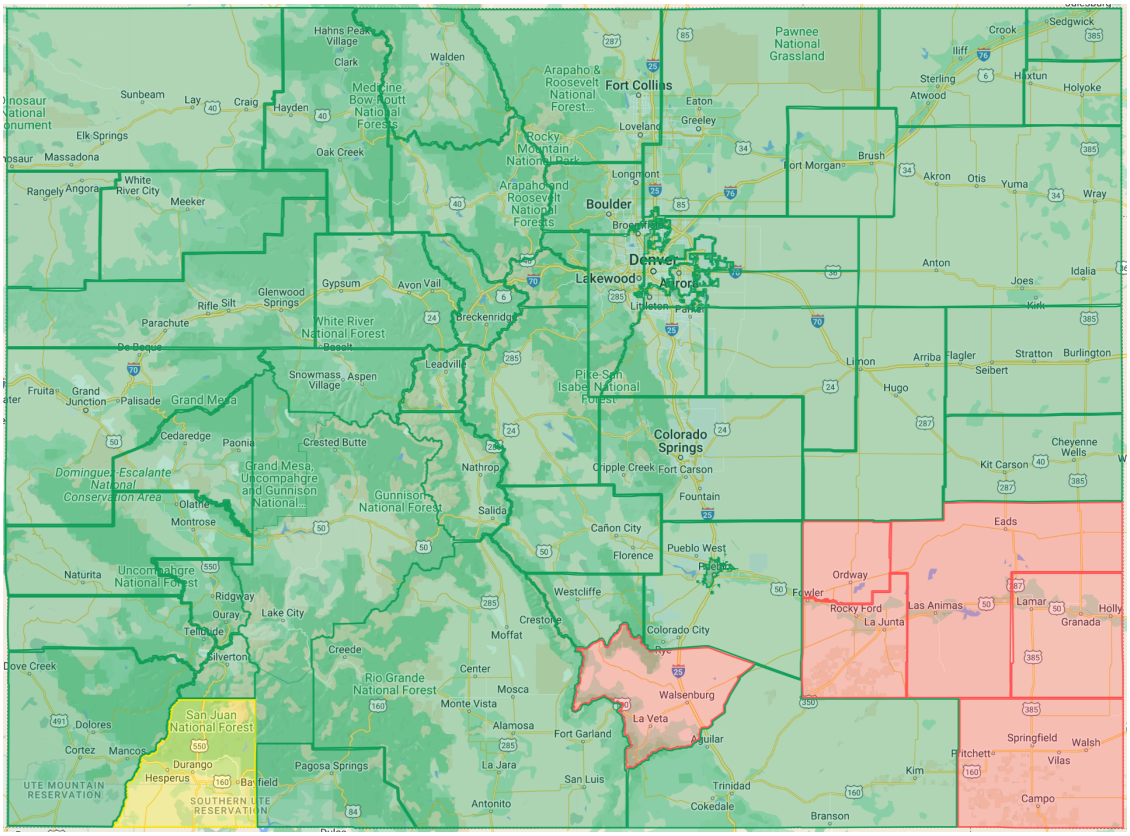


Figure 2.7: Foreign Language 9-1-1 Call Interpretation Service Availability by Governing Body
Red = No foreign language interpretation service for 9-1-1 calls.
Yellow = Interpretation service offered in some parts of the governing body's jurisdiction.
Green = Interpretation service offered in all of the governing body's jurisdiction.

In addition to Colorado residents who do not speak English as their primary language, Colorado is an international destination for travelers who come to enjoy the state's natural beauty, visit family, or conduct business. Without the ability to communicate with callers who

speak a variety of different languages, PSAPs run the risk of not being able to fully serve a caller, leaving them no other option than to simply dispatch law enforcement to meet with the caller, at best. In some cases, the PSAP may not even be able to determine the caller's location without interpretation services to facilitate communication.

Some of the PSAPs which don't have contracts for interpretation services reported they have Spanish-speaking dispatchers or law enforcement officers who can assist with Spanish translation. This is not considered a sufficient alternative to an interpretation service because it is (1) dependent on those Spanish-speaking personnel being on duty and available when a call needs to be interpreted, (2) does not guarantee that the personnel are sufficiently proficient in Spanish to interpret the call, and (3) does not provide for interpretation of other languages that the caller may be using.

Other Service Capability Categories

Future editions of this report the Commission may include other PSAP service capability criteria of potential interest to the legislature, such as the use of established minimum training standards, backup equipment capabilities, and other information that the Commission may be able to aggregate through its annual data collection efforts.

Accessibility

Access to 9-1-1 services for individuals with accessibility needs is a consideration that must be included in any evaluation or planning regarding the future of 9-1-1 services. There are a number of ways persons with accessibility needs can use the 9-1-1 system in Colorado.

TTY, Relay Services, and Other Accessibility Devices

TTY (an abbreviation that originally stood for "teletypewriter") is a method still used by some individuals who are deaf, hard of hearing, deaf-blind or have speech disabilities. It enables the user to connect a keyboard telephone and type to send and receive responses. The individual on the other end of the call may also be using a TTY device or may communicate through a third-party relay service if using a traditional telephone. Although it is no longer considered a primary method for individuals with communications-related disabilities to contact 9-1-1, the U.S. Department of Justice still requires all PSAPs nationwide to be able to accept and respond to 9-1-1 calls made with TTY devices. Due to the widespread availability of text messaging via mobile devices, and due to limitations of TTY devices, fewer people continue to use TTY.

Relay services include traditional Telecommunication Relay Services (TRS), Captioned Telephone Services (CTS), Video Relay Services (VRS), and IP Relay Services. Use of traditional TRS has declined in recent years due to migration to Internet-based relay services and video

relay services that accommodate sign language. Because relay services involve a third party to relay the call to the PSAP, location information for the caller is sometimes not available.

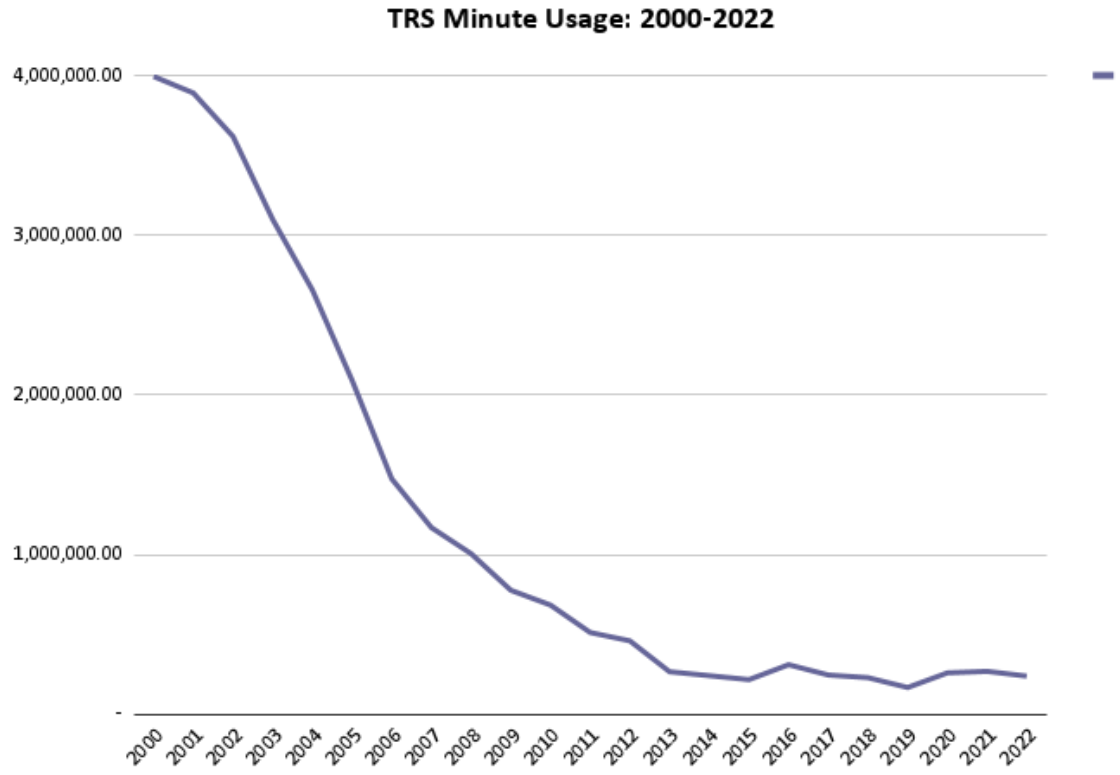


Figure 2.5: Number of minutes of state TRS service usage by year.

There is a long list of other communications methods other than TTY that a caller with an accessibility need might use, depending on the nature of their disability. These include IP captioned telephone services, video relay services, IP instant messaging, email, voice carry over (VCO) phones, and more. All of these methods have various limitations, most notably that they require an Internet connection or specialized equipment that may not be convenient for mobile use. Some of these methods, such as IP instant messaging and email, are rarely, if ever, used to request emergency assistance.

Text-to-9-1-1

Although text-to-9-1-1 service has applications for hearing individuals, it is an important modern communications accessibility option for callers who are deaf, hard of hearing, deaf-blind, or have a speech disability. As discussed previously in this Section, text-to-9-1-1 service is optional and not universally available in Colorado.

Other Considerations Regarding Accessibility

Next Generation 9-1-1 provides opportunities for more consistency in the availability of accessibility functions for 9-1-1 services. It is essential that as NG9-1-1 and related applications or services are implemented the accessibility community is included in discussions to ensure their needs and concerns are addressed and accommodated to the greatest extent possible.

3. Migration to Next Generation 9-1-1

What Is Next Generation 9-1-1?

Next Generation 9-1-1 (NG9-1-1) is a set of technologies and components that, when implemented, comprise a standards-based approach to Internet Protocol (IP)-based 9-1-1 call delivery that incorporates scalable flexibility, capacity, and security into the 9-1-1 system for the PSAPs of a state or region. The National 911 Program Office has produced a good primer video for introducing NG9-1-1 and explaining its benefits.[40]

The implementation of NG9-1-1 is a transitional process. The FCC's Task Force on Optimal PSAP Architecture (TFOPA) developed an NG9-1-1 Maturity Model which helps illustrate the different areas of NG9-1-1 deployment, including legacy, foundational, transitional, intermediate, and end state for different aspects or "domains" of NG9-1-1 deployment, governance, and funding.[41] In its most recent annual report to the National 911 Office, Commission Staff estimated the state's NG9-1-1 maturity levels as the following for the various domains, using the definitions for each state provided by the National 911 Office, which were in turn based on the TFOPA report:

- Governance: Transitional
- Routing and Location: Legacy
- 9-1-1 GIS Data: Legacy
- NG9-1-1 Core Services: Transitional
- Network: Foundational
- PSAP Call Handling Systems and Applications: Legacy
- Security: Foundational
- Operations: Foundational
- Optional Interfaces: Foundational

Maturity levels in the TFOPA report range from lowest to highest as "legacy," "foundational," "transitional," "intermediate," and "end state."

[40] https://www.911.gov/issues/ng911/video-benefits-of-next-generation-911/
[41] https://transition.fcc.gov/pshs/911/TFOPA/TFOPA_WG2_Supplemental_Report-120216.pdf

While there is a national standard for NG9-1-1, there is disagreement about what actually constitutes "full Next Generation 9-1-1," meaning that there may not be a specific point in time when we can specifically say that "Today, we have implemented NG9-1-1." Viewing NG9-1-1 as an evolutionary process applying to the entire 9-1-1 call flow is more helpful in this regard.

The industry-recognized standard for NG9-1-1 protocols is the "NENA i3" standard, an ANSI-approved technical standard developed by a large array of stakeholders through NENA.[42, 43] APCO published their "Definitive Guide to Next Generation 9-1-1" in August 2022, which outlines additional considerations regarding implementation of NG9-1-1 and provides a draft scope of work if NG9-1-1 were to be purchased through a Request for Proposal process.[44] It should be noted that due to the purely local funding of 9-1-1 in Colorado, purchase of NG9-1-1 call delivery must currently be accomplished through a Commission-regulated tariff rather than a statewide RFP and contract.

NG911 and FirstNet

FirstNet, the common name for the National Public Safety Broadband Network (NPSBN), provided nationally by AT&T, is not the same thing as NG9-1-1. The purpose of the NPSBN is to provide a wireless data network for public safety agencies to communicate with *each other*, whereas one of the goals of NG9-1-1 is to provide a way for non-voice data to be sent *from the public* to 9-1-1 call centers. Together, these two systems would potentially allow the public to send non-voice data (pictures, video, medical data, etc.) to a PSAP which could forward such data to field responding units. Implementation of the NPSBN does not remove the need for NG9-1-1. They are two separate systems, and the functionality of both networks are needed to complete the additional-data chain from the public to the first responders.

Planning, Transition, and Implementation

On August 31, 2018, the Commission approved a jointly-proposed settlement between CenturyLink[45] and a number of local 9-1-1 governing bodies for transitioning the legacy 9-1-1 network to a fully IP-based ESInet. This settlement called for the creation of an ESInet Users Group to be formed as a committee of the Commission's existing 9-1-1 Advisory Task Force, to oversee the implementation and statewide deployment of the ESInet. A final version of the amended CenturyLink tariff at the Commission was filed on December 28, 2018[46], and was

[42] https://www.nena.org/page/i3_Stage3
[43] Colorado 9-1-1 Advisory Task Force, "Recommended 9-1-1 Standards". Published May 11, 2022. https://docs.google.com/document/d/1z2U7ABOpiGocRN84kvhYklWtZtxkW-qzF9k2y6Zm2N4
[44] https://www.apcointl.org/technology/next-generation-9-1-1/apcos-definitive-guide-to-next-generation-9-1-1/
[45] CenturyLink QC, doing business as Lumen Technologies, also sometimes filing as Qwest Communications.
[46] See Proceeding 18AL-0916T.

subsequently modified through additional filings on May 10, 2019[47] and March 17, 2023[48].

The Commission-approved tariff contained a schedule for each PSAP to migrate to the ESInet over the course of 13 months, starting in October of 2019 and completing in October of 2020. This schedule was revised on a rolling basis and was essentially complete by early 2022, with only two PSAPs remaining to be converted to the ESInet. They are operated by the Schriever Space Force Base and the Cheyenne Mountain Space Force Station. Our understanding is that there are plans to close the Cheyenne Mountain PSAP. It is unknown whether Schriever intends to migrate its PSAP to the ESInet.

The ESInet Users Group has been meeting regularly since 2019 and is instrumental in identifying concerns and issues of the local 9-1-1 governing body representatives that make up the voting membership. This Users Group will continue to monitor the progress of the implementation and help resolve issues as they are identified between CenturyLink and the 9-1-1 governing bodies or PSAPs. Commission staff also participate in the meetings. If issues cannot be resolved within the ESInet Users Group, parties may petition the Commission for resolution.

The migration of Colorado's PSAPs to the ESInet is only the beginning, not the end of NG9-1-1 implementation. The ESInet is the foundation upon which the core and advanced NG9-1-1 telephone services can operate, and with its implementation comes an opportunity for the 9-1-1 stakeholder groups to begin planning what they want Colorado's NG9-1-1 system to be. While much of the work of the ESInet Users Group has been focused on ensuring a smooth transition to the ESInet, planning future development of NG9-1-1 service and negotiating the details and costs with CenturyLink is a current task.

Recently the ESInet Users Group requested terms and pricing from CenturyLink for statewide delivery of text to 9-1-1 calls via the ESInet, for statewide implementation of a 9-1-1 call data metrics system known as ECaTS, and for the provision of Geographic Information System (GIS) data tools to 9-1-1 governing bodies to assist with preparing local GIS data for use in 9-1-1 call routing. A tariff amendment filed by CenturyLink on March 17, 2023 provides the pricing and terms for the inclusion of ECaTS call metrics and analysis.

The Users Group also monitors ESInet quality of service metrics, including latency, jitter, packet loss,[49] and others to ensure compliance with the ranges specified in the tariff.

[47] See Proceeding 19AL-0238T.
[48] See Proceeding 23AL-0133T.
[49] *Latency* is the time it takes data packets to traverse the network. Too much latency in IP-based telephony causes callers to speak over the top of each other. *Jitter* is the measure of inconsistency in the arrival of data packets between sender and receiver, which can cause a connection to be unstable and for data packets to be lost. *Packet loss* is the measure of how many packets of data are lost

A critical component of the planning, transition, and implementation of the ESInet has been ensuring proper funding. As outlined in the tariff amendment approved in late 2018, significantly higher ESInet 9-1-1 telephone service rates went into effect for the local 9-1-1 governing bodies to begin paying after their PSAPs migrated to the new network. The legacy 9-1-1 telephone service rates cost 9-1-1 governing bodies approximately $2.9 million per year in aggregate, whereas the costs for ESInet service totaled approximately $5.9 million per year. This sudden need for additional funding prompted 9-1-1 stakeholders, including the Legislative Committee of the Commission's 9-1-1 Advisory Task Force, to begin working with legislative sponsors to implement a solution.

The resulting passage of HB 20-1293 created a new statewide 9-1-1 funding mechanism to supplement existing local emergency telephone charges, in the form of a state 9-1-1 surcharge. This enabled the Commission to reimburse the 9-1-1 governing bodies for their monthly recurring ESInet tariff service costs. The surcharge can also be leveraged to offset costs of additional statewide features and services, such as ECaTS and the remaining components necessary for full implementation of NG9-1-1. See Section 7 for a more detailed discussion of funding.

Projected Timeline for Full Implementation

The NG9-1-1 Strategic Plan recently adopted by the Users Group categorizes different aspects of implementation, by timeline, as 1-3 year goals or longer-term goals.[50] Some of the timing, however, is dependent on CenturyLink and its subcontractors to implement the additional components necessary for the ESInet to be considered full NENA i3 NG9-1-1 service.

Most states which have made significant progress toward full implementation of NG9-1-1 have a state-level purchasing mechanism via a Request for Proposals and awarding of contracts, allowing more direct control over the timeline. Colorado currently only has a local purchasing mechanism for 9-1-1 telephone services, through the Commission-approved tariff. While the tariff model does have benefits over the contract model, it gives more control to the provider for changing or adding new services. The ESInet Users Group may propose a timeline for further NG9-1-1 implementation, but only CenturyLink can file a tariff amendment to bring that to fruition.

between sender and receiver. A high degree of packet loss in IP-base telephony can result in poor audio quality.

[50] See https://docs.google.com/document/d/1SbsHfCjbJ_aKAkD8IfGZqRRz6-44-ZBu35BW1DZmXCw

4. 9-1-1 Network Reliability and Resiliency

Current Status

Terms of particular importance to this section:

- *Redundancy: Additional or alternate instances of network devices, equipment and communication mediums that are installed within network infrastructure as a method for ensuring network availability in case of a network device or path failure and unavailability. Example: Having two separate paths between two points in the network.*

- *Diversity: The physical separation of redundant network devices, equipment, and communication mediums necessary to reduce the likelihood of one event causing a failure in both redundant components. Example: Routing two redundant network links via geographically separated paths so that a single event, such as a flood or a cable cut, is unlikely to damage both links.*

- *Resiliency: The level of ability of a network to continue operating despite damage or failure to individual components. The level of resiliency a network possesses is to a large extent the result of its redundancy and diversity.*

- *Basic Emergency Service: The Commission-regulated service that includes the aggregation of 9-1-1 calls from OSPs and the routing and transmission of those calls to the demarcation point of a PSAP or local network operated by a 9-1-1 governing body. Location information associated with 9-1-1 calls is considered part of Basic Emergency Service.*

As discussed in Section 2, Commission jurisdiction is restricted to only one portion of the 9-1-1 call flow. Because of this restriction, there are types of disruptions to 9-1-1 service that are **not** captured in the data collected by the Commission. Examples of those include:

- Outages due to failure of an originating service provider's network.

- Outages affecting local wireline customers but not affecting a PSAP directly.

- Outages that occur due to a failure of a local network on the governing body or PSAP side of the delivery demarcation point.

- Outages occurring due to an equipment failure at a PSAP, or due to the failure of a third-party hosted service contracted by a PSAP.

With these limitations in mind, the Commission provides the following statistics in regard to BES outages.

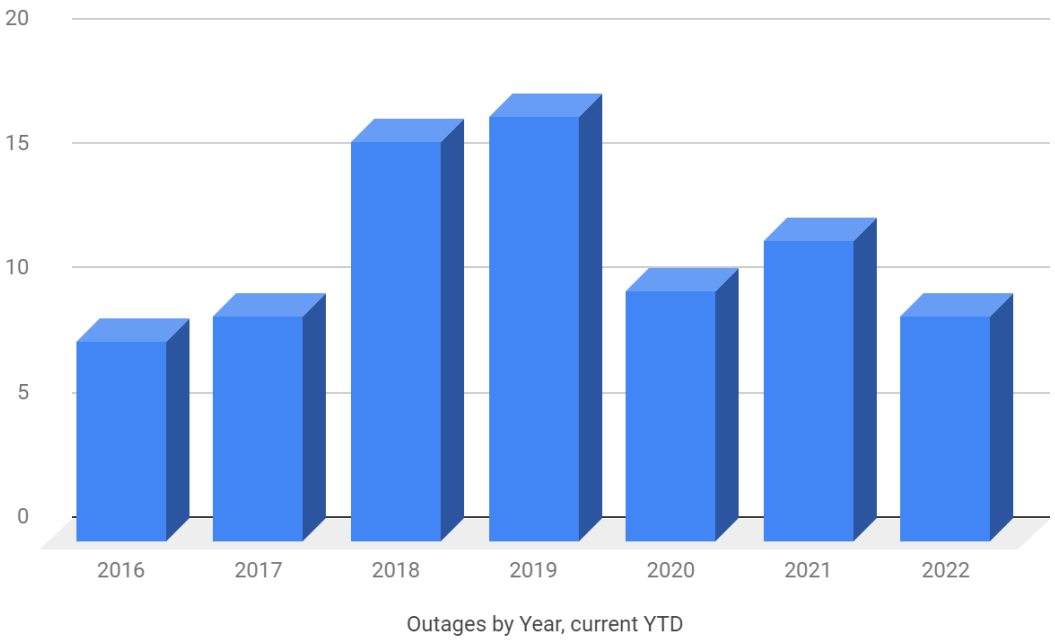


Figure 4.1: BES outages by Year, 2016-2022.

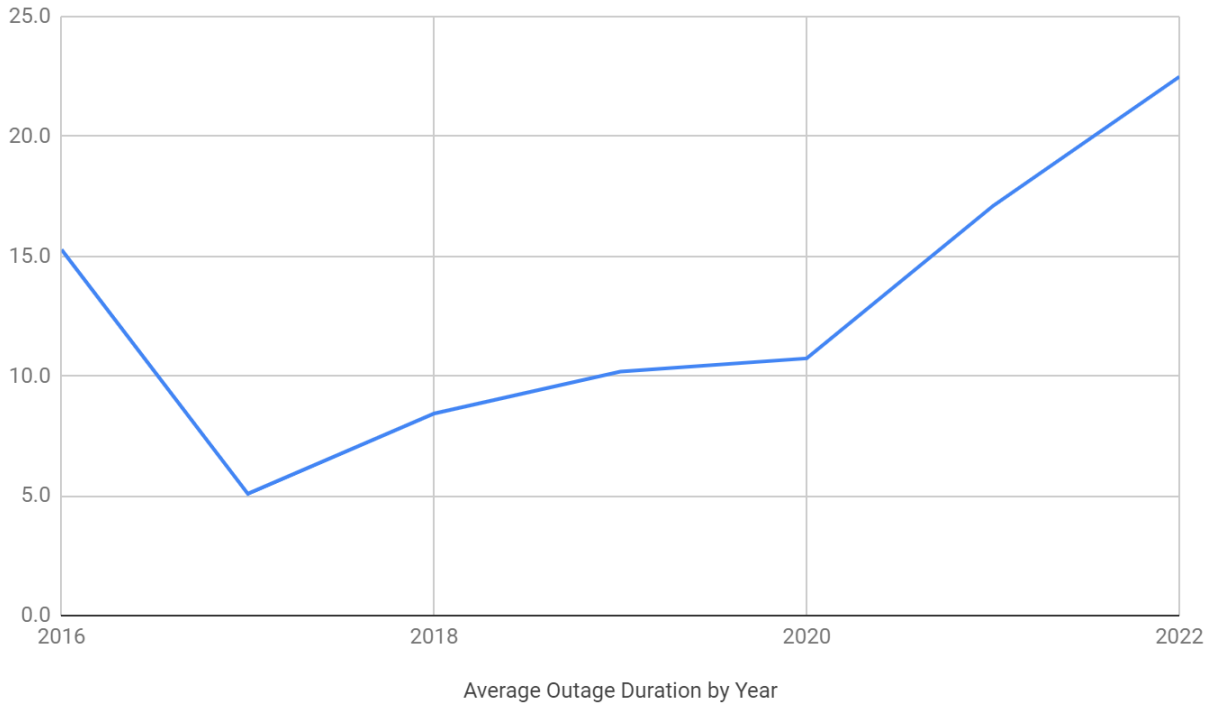


Figure 4.2: Average duration of BES outages in hours.

BES outage duration is measured in hours, with 2022 having the highest average duration of outages on record.

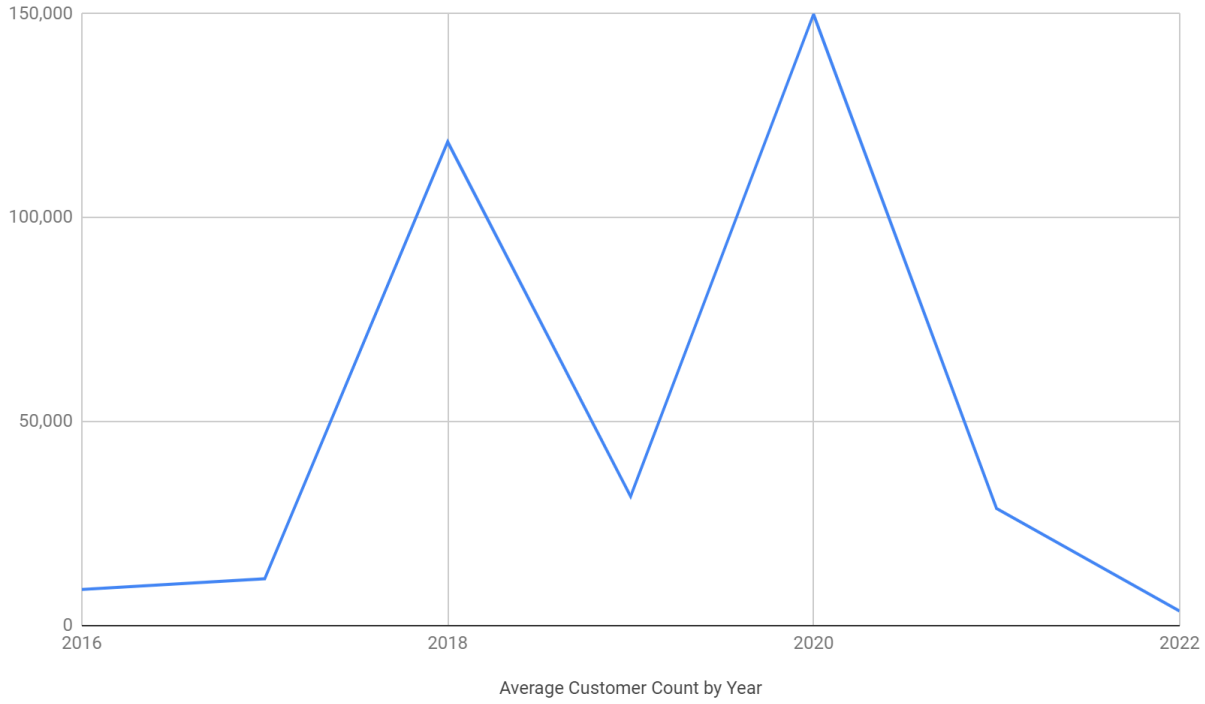


Figure 4.3: Average number of customers affected by a BES outage.

Figure 4.4 demonstrates that the average number of customers affected by a BES outage is, so far this year, the lowest number on record. Between this chart and figure 4.2, we can see that outages in 2022, on average, affected smaller communities for longer durations of time than in recent years. This pattern is a continuation of the trend indicated in 2021 and indicates that outages are more frequently occurring in rural areas where repairs may take longer to complete, and less frequently in urban areas where larger numbers of customers are impacted but the outage may be resolved more quickly.

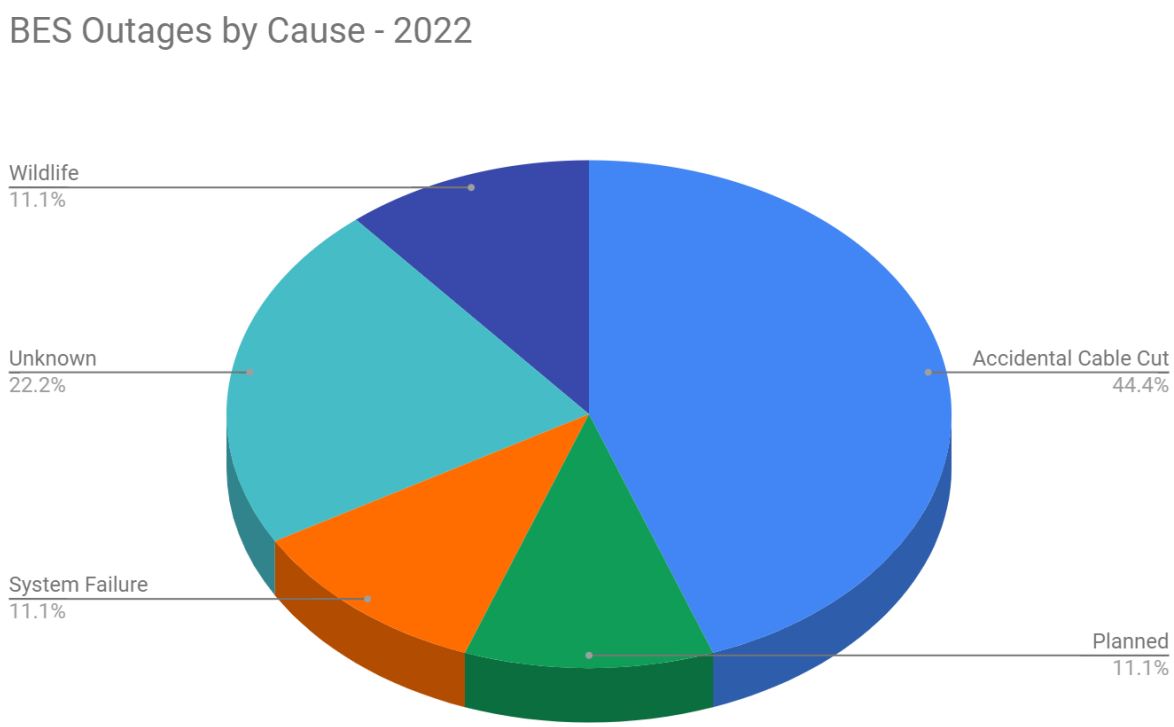


Figure 4.4: BES outages by cause.

Figure 4.4 shows the cause of BES outages in 2022, with the largest portion being accidental cable cuts. Commission staff maintain a BES Outage Dashboard that is available to the public.[51]

[51] https://sites.google.com/state.co.us/9-1-1-advisory-task-force/outage-dashboard

Commission Process for Improvement

In 2013 the Commission initiated an inquiry into 9-1-1 network performance following recent floods and fires[52]. As part of that proceeding CenturyLink filed a list of locations that lacked redundant routes with geographic or physical separation of the routes in the BES network. Areas without physical network diversity are at particular risk for outages since a single fiber cut or equipment failure in that part of the call delivery path will result in an outage.

This proceeding resulted in an order requiring semi-annual updates from CenturyLink regarding various aspects of their progress toward developing physical diversity in the BES network where it is lacking, particularly as it serves the Estes Park PSAP.[53] In March of 2023 CenturyLink filed a status report in this proceeding indicating intent to file a motion to request a termination of the reporting requirement, but has not yet done so.

On January 9, 2019, in response to a Commission rule that has since been revised, CenturyLink filed a list of all areas of its BES network lacking redundancy and diversity.[54] On January 29 the Commission issued an interim decision directing CenturyLink to conduct an informal stakeholder workshop to review CenturyLink's plan and to report back every two months to the Commission.[55]

Per the Commission's rules at the time, the result of this process was to be a 9-1-1 Diversity Plan that could be approved by the Commission, associated with either a modification of the existing BES tariff or a new tariff service charge to provide the funding for improvements to the BES network's redundancy, geographic diversity, and resiliency[56]. However, on December 29, 2020, Commission staff filed in the proceeding a letter recommending that the proceeding be closed to accommodate a rulemaking to change the Commission's rules about resilience and reliability of the 9-1-1 network. The reasoning was that with the passage of HB 20-1293 the Commission had the new state 9-1-1 surcharge to help fund improvements to the BES network and Commission rules should account for that.[57]

The Commission agreed, ordered the proceeding to be closed, and directed Commission staff to begin preparing a Notice of Proposed Rulemaking on the topic of 9-1-1 network reliability.[58] On the advice of Commission counsel, the new rulemaking was postponed until after completion of the 2021 rulemaking on 9-1-1 funding and audit procedures, which established regulations for the new state 9-1-1 surcharge.

On March 9, 2022, the Commission issued a Notice of Proposed Rulemaking specifically to

[52] See Proceeding 13I-1147T.
[53] See Decision R14-0303.
[54] See Proceeding 19M-0026T.
[55] See Decision C19-0117-I.
[56] 4 *CCR* 723-2-2143(a)(III).
[57] See https://www.dora.state.co.us/pls/efi/EFI.Show_Filing?p_fil=G_771812&p_session_id= for a direct link to the letter.
[58] See Decision C21-0036.

address BES network resiliency and reliability improvements.[59] Following the recommendations of Commission staff, the proposed rules sought to leverage the new state 9-1-1 surcharge to create a funding mechanism for improvements to the reliability of the BES portion of 9-1-1 call flow. Following issuance of the Notice and receipt of extensive comments from stakeholders, the overseeing Administrative Law Judge directed Commission staff to coordinate workshops to develop consensus-based draft language amending the rules. On December 22, 2023, the Commission adopted the consensus-based rules,[60] and they became effective on March 31, 2023.

Although the changes to the rules were extensive, two primary changes related to BES network resiliency and reliability are currently being implemented. First, 4 CCR 723-2-2143(b) establishes a BES Improvement Plan process which requires the BESP to file with the Commission every two years an Improvement Plan that lists areas of the BES network that lack diversity, proposes to improve certain sections of that network, includes pricing and timeframes for the improvements, and proposes an additional tariff rate to pay for those improvements. The Commission may approve the plan in whole or in part, and may approve an additional rate to be added to the tariff to pay for those improvements. The Commission will then take that additional tariff rate into consideration when setting the annual state 9-1-1 surcharge rate for the following year, so the improvement costs are not borne by the local 9-1-1 governing bodies without reimbursement.

On April 24, 2023, CenturyLink filed its initial BES Improvement Plan Application and it is currently under review by the Commission.[61] The tariff charge revenues for the three projects proposed by CenturyLink in the Application were to provide matching funds required for federal broadband middle-mile grant projects that would have coincidentally improved BES network diversity. CenturyLink has since learned it did not win federal grant funding for any of the three projects, meaning this application will likely be amended or withdrawn.

Second, new rule 2143(k) requires Commission staff to conduct informal investigations into any BES outage that meets certain criteria recommended by the Commission's 9-1-1 Advisory Task Force. The current criteria are:

- Multiple PSAPs affected.
- Details of the outage are unclear from the report.
- Outage over 4 hours in duration.
- Unusual pattern of impact.
- Apparent failure to notify PSAP in a timely manner.
- Repeated outages of a similar nature or in the same area over a short period of time.
- At the request of one or more affected PSAPs or 9-1-1 governing bodies.
- Any apparent violation of Commission rules.

Over the last year, CenturyLink has taken the position that BES network outages don't qualify as BES outages if they impact the ability of 9-1-1 calls to reach the aggregation point of the

[59] See Proceeding 22R-0122T.
[60] See Decision R22-0811.
[61] See Proceeding 23A-0197T.

BES network, treating them as being in the originating service domain not the basic emergency service domain. It has taken this position even if the same facility is also used to transport 9-1-1 calls from the aggregation point to the PSAP. CenturyLink has also taken the position that if 9-1-1 calls can be routed to an alternate PSAP instead of the designated PSAP then an outage has not occurred.

Commission staff, on the other hand, consider both of these situations to be outages because they result in an originally designated PSAP becoming incapable of receiving 9-1-1 calls for their service area. As a result of this conflict of interpretation, very few outages are being reported by CenturyLink to Commission staff via the notification mechanisms created for that purpose. This, in turn, has resulted in a situation where nearly every apparent BES outage that Commission staff learns of must be investigated through the new process established in Rule 2143(k), because one of the triggers for investigation is "any apparent violation of Commission rules."

Thus far, one staff-led BES outage investigation has been completed, with a significant number of others underway.[62] Commission staff is diligently working to complete outstanding investigations, and the Commission may choose to take action regarding the outage reporting situation based on the results of those investigations.

Finally, as a certified BESP actively providing service, CenturyLink is required by Commission rule 2143(e) to file a contingency plan annually, with the most recent being filed May 1, 2023 [63]. The purpose of this requirement is to ensure CenturyLink has on file a list of current contacts for all of the PSAPs as well as phone numbers for alternate routing of 9-1-1 calls when necessary. As a new requirement effective March 13, 2023, the BESP must also provide the results of its most recent 9-1-1 reliability filing with the Federal Communications Commission. Some aspects of this report, including the FCC filing, are typically filed confidentially due to the security-sensitive nature of the information.

Work of the 9-1-1 Advisory Task Force Outage Committee

Until recently the Outage Committee of the Commission's 9-1-1 Advisory Task Force conducted investigations into outages that met similar criteria to the ones now being used to trigger staff investigations. The Outage Committee investigations were informal and voluntary in that the Outage Committee did not have authority to require cooperation from CenturyLink, but generally CenturyLink did participate in the meetings and cooperate with the investigations.

With the implementation of the new staff-led investigation process the Outage Committee may still conduct parallel investigations if it chooses to do so, but such investigations would largely be duplicative. Instead the Outage Committee may choose to conduct investigations regarding outages that do not otherwise meet the criteria for a staff-led investigation.

[62] Completed investigations may be reviewed in Proceeding 23M-0145T.
[63] See Proceeding 18M-0294T.

The Outage Committee is also involved in the staff-led investigations, suggesting information to request, participating in meetings between CenturyLink, Commission staff, and the affected local 9-1-1 agencies, and providing input on ways to potentially reduce the likelihood of outages or mitigate their impacts.

Monitoring Outages in the Originating Service Environment

As discussed earlier, the Commission is precluded by Colorado statute from imposing outage notification requirements on originating service providers.[64] However, outages in the originating service environment do impact the ability of users to call 9-1-1.

The FCC requires all originating service providers to report outages via the FCC's Network Outage Reporting System (NORS). In September of 2022 the FCC began accepting applications from state agencies to gain read-only access to NORS. The Colorado Public Utilities Commission submitted an application and received approval for designated staff to access NORS under the FCC's rules and requirements.

However, all NORS data is considered confidential by the FCC. It may only be shared publicly in an aggregated form that does not reveal which companies were involved in outages. Commission staff designated to access NORS data must also undertake training approved by the FCC regarding the proper use and handling of the confidential data. Violations of these rules could result in the PUC permanently losing access to NORS data.

Despite these restrictions, Commission staff believe that NORS data can be a useful source of metrics for the legislature when considering the health of the complete 9-1-1 call flow from caller to PSAP. Because the Commission currently only has statutory authority to require reporting from BESPs about the BES portion of 9-1-1 call flow, any outage that occurs in the OSE, regardless of its impact on the ability of callers to reach 9-1-1, has been absent from reporting on the health of 9-1-1 service.

With those caveats, the Commission is able to provide the following aggregated statistics from the FCC's NORS.

From October of 2022 through May of 2023 there were 622 confirmed telecom outages in the State of Colorado, averaging 77.6 hours in duration each. Because this is the first year the data has been available to Commission staff we are unable to state whether this is an improvement or indicates an increase in outages over previous years. In future years this report will contain comparative year-to-year data so the legislature can gain an understanding of OSE reliability for the public's access to 9-1-1 services.

[64] See § 40-15-401, C.R.S.

5. Gaps, Vulnerabilities, and Needs

What follows is a list of gaps, vulnerabilities, and needs regarding the provision of 9-1-1 service in Colorado. Potential solutions are also presented with some discussion. While this document will be circulated in draft form and input received and incorporated as appropriate from Colorado's 9-1-1 stakeholders, the entire 9-1-1 community may not be in agreement on the challenges or solutions presented here.

Most of those identified below could benefit from the existence of a state-level funding source for certain 9-1-1 related expenses on a statewide basis. A potential mechanism to fund such statewide costs has been proposed by the Commission's 9-1-1 Advisory Task Force, and that mechanism is discussed at the end of this chapter.

Challenges to Be Addressed

Need to Continue Migration to Next Generation 9-1-1

The Challenge: National efforts have been underway for nearly two decades to transition old analog-technology based 9-1-1 systems to new IP-based 9-1-1 systems, and Colorado needs to participate in this transition for a number of reasons described below. This transition is difficult both logistically and financially, and presents particular challenges in Colorado's current 9-1-1 service regulatory environment.

The Details: Statewide and regional 9-1-1 systems were originally designed solely for fixed-location wireline 9-1-1 calls, then were eventually "retrofitted" in phases to include location information, handle mobile wireless calls with wireless location information, and to handle VoIP services which can be static (fixed-location), nomadic (one Internet connection per session), or mobile (hopping from one Internet connection to another). The legacy 9-1-1 system will become less and less capable of handling all 9-1-1 calls as new and emerging ways to reach 9-1-1 become available to the public, such as through personal assistants or smart devices.

The public has also become very accustomed to sending pictures, videos, and other types of data from one user to another, which is a capability that legacy 9-1-1 networks lack. The ability to provide these data plus medical, crash telemetry, and other safety systems data to first responders could be extremely beneficial to public safety responses for preservation of life, health, and property.

Another challenge to legacy 9-1-1 systems is that all analog telecommunications services have been gradually transitioning to IP-based services which are generally more resilient, flexible, and cost-effective. It puts legacy 9-1-1 networks in the position of becoming "islands" of analog technology in an "ocean" of digital IP-based technologies. This could, over time, increase the cost of providing 9-1-1 service due to additional retrofitting, increase the

likelihood of failures, and make it more difficult to make needed repairs.

The Solution: NENA has established technical standards for NG9-1-1. State and local jurisdictions are at various stages of implementing standards-compliant NG9-1-1 systems, with Colorado being neither at the leading nor the trailing edge of those efforts. Colorado has implemented an ESInet for delivery of 9-1-1 calls to PSAPs in IP format, albeit currently still using the legacy call flow framework. Much work remains to fully retire the legacy components of Colorado's 9-1-1 system and to enable delivery of data types beyond voice-only calls.

This work is being led by the ESInet Users Group committee of the Commission's 9-1-1 Advisory Task Force. In August of 2022, the ESInet Users Group adopted a Next Generation 9-1-1 Strategic Plan to help document the group's vision for the future of 9-1-1 call delivery in the state.[65]

Most, if not all features of Next Generation 9-1-1 could be offered through a cost-averaged tariff approved by the Commission, allowing the Commission to fund the features and services by increasing the state 9-1-1 surcharge rate within its statutory cap of $0.50 per line per month. However, not all features or services may lend themselves to statewide cost-averaging or incorporation into the existing tariff. If a different funding mechanism is required to pay for some of these advanced features and services, the potential solutions described at the end of this section may be beneficial.

For example, one of the foundational requirements for full implementation of NG9-1-1 is a statewide Geographic Information System dataset with the necessary data elements provided with sufficient detail and accuracy to be used for routing 9-1-1 calls to the appropriate PSAP for the location of the call. This method of 9-1-1 call routing is known as geospatial routing, and it is more accurate and has other benefits over the legacy routing methodology currently in use in Colorado. Each local 9-1-1 governing body will be responsible for providing their portion of the statewide GIS dataset, either directly or by partnership with a government GIS department or a vendor. If the development and maintenance of such data and amalgamation into a statewide dataset cannot be or will not be included in a future amendment to the BES tariff, then some other funding mechanism will need to be established to implement it.

Recommendation: The Legislative Committee of the Commission's 9-1-1 Advisory Task Force has drafted legislation to establish a funding mechanism for statewide 9-1-1 costs that do not otherwise lend themselves to being paid for at the local level or through a tariff. The Committee intends to work with a legislative sponsor to introduce the legislation in the 2024 session. **The Commission's Recommendation is for the legislature to consider this legislation when it is introduced.** More information about this legislation may be found at the end of this section.

[65] https://docs.google.com/document/d/1SbsHfCjbJ_aKAkD8IfGZqRRz6-44-ZBu35BW1DZmXCw/edit

No Public Safety Answering Point Performance and Service Standards

The Challenge: There are no minimum standards for the operation of a PSAP, potentially exacerbating uneven outcomes for 9-1-1 callers depending on where the 9-1-1 call takes place.

The Details: There is no statewide standard for operations and performance by Colorado's PSAPs. As a result, the level of service varies widely across the state. A person traveling through Colorado could experience different levels of care depending on where they place a 9-1-1 call. For example, *some but not all PSAPs provide or require*:

- Pre-arrival instructions for medical calls, such as CPR
- Quality assurance on random samples of their calls
- Language interpreter services for non-English speakers
- Text-to-9-1-1 capability
- Minimum training standards for public safety telecommunicators

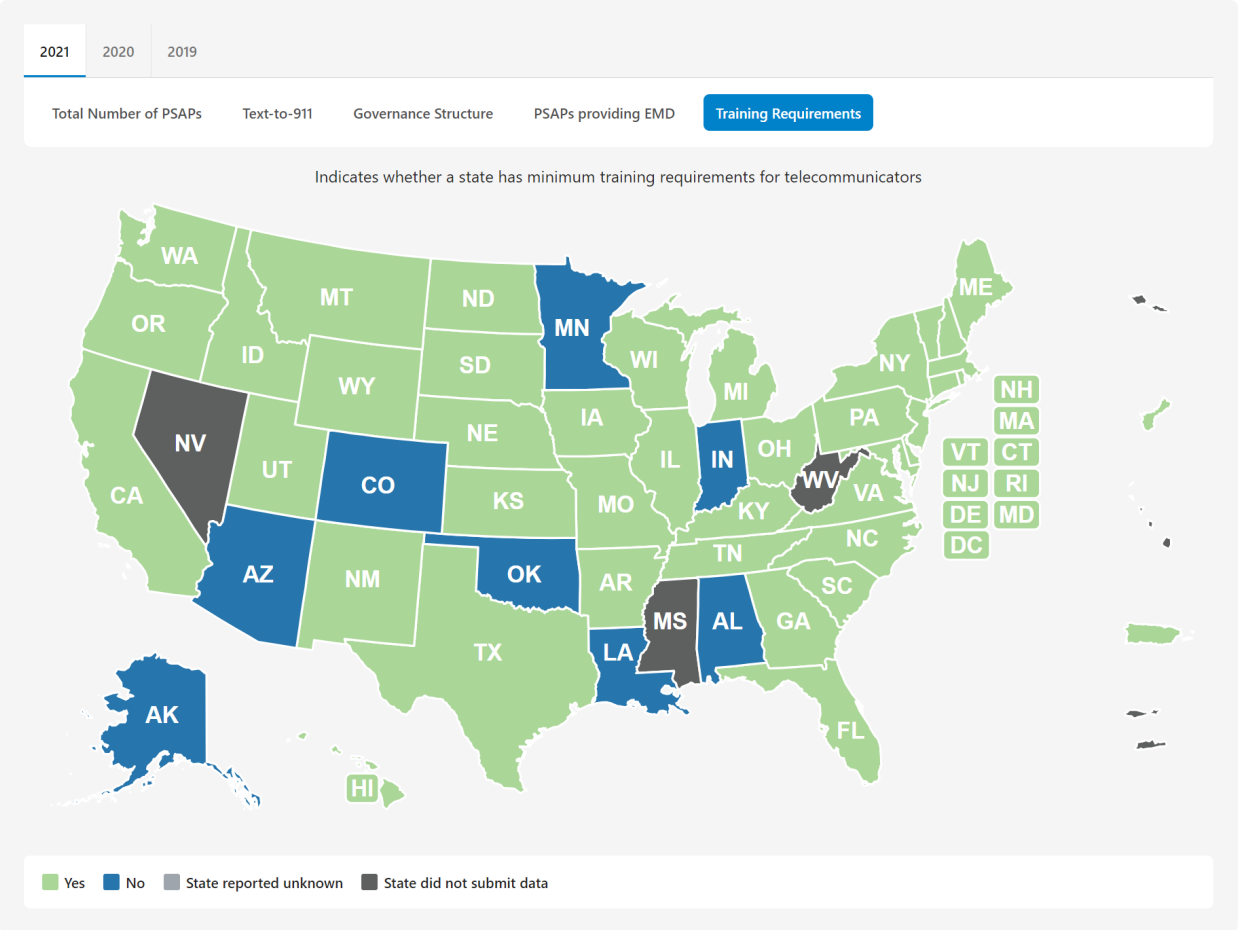


Figure 5.1: States with no minimum training requirements for telecommunicators shown in blue.[66]

[66] https://www.911.gov/issues/911-stats-and-data/

The Solution: The only solution to a lack of operational standards is to implement standards. Voluntary standards already exist through national organizations such as NENA and APCO. However, adoption of those standards has not been consistent. State adoption of such standards and minimum requirements will likely be necessary to achieve a baseline service level statewide.

It should be noted that all of the service disparity examples above can be funded with local emergency telephone charges,[67] and that 9-1-1 governing bodies may adjust those charges up to a threshold set by the Commission annually.[68] Governing bodies which determine that a charge greater than the threshold is necessary may file an application with the Commission for approval to exceed the threshold.[69] Therefore, a funding mechanism for implementation of minimum PSAP operational standards is already in place. However, if an alternate funding mechanism is necessary for rural 9-1-1 governing bodies and PSAPs to implement minimum standards without greatly impacting their charge rates, the potential funding mechanism described at the end of this section should be considered.

The Commission believes that citizens and visitors expect and deserve a foundational level of service when they call 9-1-1, and that the best way to achieve this statewide is with the implementation of minimum operational standards for PSAPs. The Commission also believes that the State has an obligation to ensure every 9-1-1 caller receives a minimum level of service.

Recommendation: The legislature should consider working with 9-1-1 stakeholders to develop minimum operational standards for PSAPs. Alternatively, the legislature could consider authorizing a state agency to develop and implement such standards through a collaborative process with stakeholders.

No Clear Path Toward Consistent Statewide Cybersecurity Defense at PSAPs

The Challenge: Cybersecurity of PSAPs is largely left to local IT resources, which may vary in their ability to ensure it with respect to systems, equipment, and personnel.

The Details: Although the ESInet provides a number of service benefits, it introduces additional cybersecurity risk. CenturyLink is responsible for cybersecurity on the ESInet up to the demarc with each PSAP.

However, PSAPs are responsible for all cybersecurity on their side of the demarc, from their systems and networks to operations and personnel. Those located in urban areas generally have robust information technology support to rely upon, whether internal, external from partner cities and counties, or vendors. It is unclear whether PSAPs in rural areas have sufficient cybersecurity support, or what can or should be done to ensure they are sufficiently protected. While the implementation of the ESInet provides a great number of benefits, it does introduce vulnerabilities to every PSAP on the network if one PSAP does not observe

[67] See the full list of allowable uses of 9-1-1 funds enumerated in § 29-11-104, C.R.S.
[68] See § 29-11-102(2)(a), C.R.S.
[69] See § 29-11-102(2)(c), C.R.S.

sufficient cybersecurity precautions.

The Solution: The Commission does not have sufficient cybersecurity expertise to fill this gap for rural PSAPs which may lack sufficient cybersecurity capabilities. Resources should be directed to this issue.

Recommendation: The legislature should consider directing other resources to provide cybersecurity support for PSAPs that do not have sufficient local resources. The potential funding mechanism described at the end of this section should be considered as a way to fund a statewide cybersecurity program for PSAPs.

Potential Funding Mechanism to Alleviate Statewide 9-1-1 Challenges

An analysis of the challenges listed in this section reveals a commonality: a funding mechanism for statewide 9-1-1 expenses could be very beneficial to addressing them. This is perhaps why most states have at least some level of spending authority regarding 9-1-1 service. In its most recent annual report to Congress regarding the collection and use of 9-1-1 fees by states, the FCC reported that 44 states have authority over some 9-1-1 expenditures.[70]

In 2022 the Commission's 9-1-1 Advisory Task Force voted to promote draft legislation developed by its Legislative Committee for creation of a 9-1-1 Services Enterprise, and to fund the Enterprise with a portion of the state 9-1-1 surcharge revenues. The Enterprise would use that funding to pay for needed statewide 9-1-1 related expenses which cannot be added to CenturyLink's tariff.

If enacted, this legislation would fund the 9-1-1 Service Enterprise without raising the state 9-1-1 surcharge cap previously established in § 29-11-102.3, C.R.S.at $0.50 per line per month. Currently, the state 9-1-1 surcharge is set at $0.09 per line per month.

As a general recommendation, the Commission suggests that the legislature should consider establishing a state-level funding mechanism for 9-1-1 service expenses that are state-level or statewide in nature but which inherently cannot be in a Commission 9-1-1 tariff. As a starting point, the legislature should consider the draft legislation developed by the Commission's 9-1-1 Advisory Task Force if it is reintroduced.

6. Federal Activities and National Trends

[70] The five states that reported having only local authority regarding the expenditure of 9-1-1 funds are Alaska, Colorado, Louisiana, Nevada, and Wyoming. Wisconsin did not provide a response. Pages 119-122. FCC. "Fourteenth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges for the Period January 1, 2021 to December 31, 2021." Published Dec 30, 2022. Retrieved July 18, 2023. https://www.fcc.gov/file/24628/download

Federal Activities

National 911 Program

The National 911 Program is housed within the National Highway Traffic Safety Administration (NHTSA) Office of Emergency Medical Services, and it is currently undertaking several activities.

- 9-1-1 Datapath: An initiative to create a national 9-1-1 data system that PSAPs could use for standardized classification of calls. It will allow data to be compared nationally regarding PSAP call volumes, types of calls received, types of calls for which first responders are dispatched, etc.
- CAD Assessment Project: Computer Aided Dispatch (CAD) systems, used to track calls for service and field responder activities, are used in almost all PSAPs but their functionality varies widely from vendor to vendor and even among different product lines. This nationwide assessment intends to summarize the current status of CAD systems and challenges for establishing interoperable data-sharing capability between all of them.
- COVID-19 & Other Emerging Diseases: The Program is collecting and making available resources for local 9-1-1 entities.
- Federal 911 Funding: Primarily refers to the federal NG9-1-1 grant program which has concluded, but this page lists other federal funding resources that could potentially be accessed by local 9-1-1 agencies.
- GIS Assessment Project: Intends to determine the status of Geographic Information Systems data in use by 9-1-1 agencies across the nation, identify the budget, resources, and organizations required to address challenges in current GIS initiatives, and develop strategies for addressing obstacles.
- Next Generation 9-1-1 for Public Safety Leaders: An initiative for educating public safety professionals about the benefits of Next Generation 9-1-1. Its web page contains a number of useful educational videos and other material created or collected for the purpose.
- NG9-1-1 Interoperability: This initiative involves generally supporting efforts of other organizations to ensure interoperability of NG9-1-1 components and systems and other public safety networks. It includes the efforts of the NG9-1-1 Interoperability Task Force to integrate NG9-1-1 and the National Public Safety Broadband Network (commonly referred to as FirstNet), and developing lessons learned through real-world implementations of NG9-1-1 systems and technology.

- NG9-1-1 National Roadmap: A publication which builds on work previously performed by the Federal Communications Commission's Task Force on Optimal Public Safety Answering Point (PSAP) Architecture for interoperability between state and regional NG911 systems. Commission staff participated in the development of this material.
- Next Generation 9-1-1 Self-Assessment Tool: It can be used by local and state 9-1-1 officials, including PSAP and local governing body leaders, to assess their readiness for NG911.
- NG9-1-1/PSBN Interconnection: A collaboration with public and private representatives to address the connections between Next Generation 9-1-1 systems and public safety broadband networks such as FirstNet.
- Public Safety Telecommunicator Job Reclassification: An effort to encourage local, state, and federal agencies (such as the Bureau of Labor Statistics) to recognize 9-1-1 telecommunicators as public safety personnel rather than classifying them as clerical workers.

The Federal Communications Commission

There are several FCC actions and proceedings of relevance to this report.

- For several years the FCC has maintained a timeline by which wireless carriers are required to improve indoor 9-1-1 location accuracy, including Z-Axis measurements which could be used to estimate which floor of a multi-level building a caller is on. A full timeline of the FCC's phased-in location accuracy improvements is available on the FCC's website.[71]
- In September of 2022 the Federal Communications Commission began allowing states, territories, and other government entities to obtain read-only access to its Network Outage Reporting System (NORS), through an application process which ensures compliance with data confidentiality requirements. PUC staff now have access to this data, which will inform future editions of this report.
- On November 17, 2022 the FCC adopted rules updating its requirements for 9-1-1 outage notifications to PSAPs by all telecom providers. The rules also strengthen requirements that the providers maintain contact information for PSAPs so that notifications can be more effectively delivered.[72]
- On December 21, 2022 the FCC adopted a Notice of Proposed Rulemaking (NPRM) for requiring all wireless carriers to provide location-based routing of 9-1-1 calls. The

[71] https://www.fcc.gov/public-safety-and-homeland-security/policy-and-licensing-division/911-services/general/location-accuracy-indoor-benchmarks

[72] https://www.fcc.gov/document/fcc-updates-rules-improve-911-reliability

intent is to enable carrier-based routing information per the caller's location instead of legacy routing per the cell tower antenna in use, as the antenna could be preprogrammed in the system for a different PSAP which doesn't serve the caller's location.[73] Location-based routing is an interim option, not full-fledged NG9-1-1 geospatial core services and routing. The PUC filed comments with the FCC generally supportive of the proposed rules, with some proposed modifications.[74]

- On June 8, 2023 the FCC adopted a Notice of Proposed Rulemaking to require OSPs (otherwise known as the telecom providers) to deliver 9-1-1 calls to ESInets in SIP format upon request by a state or local 9-1-1 authority, and within a certain compliance time period.[75] The underlying goal of the NPRM is to aid the timely implementation of NG9-1-1 systems, some of which are currently held back due to OSPs not delivering calls in SIP. This is of particular interest because CenturyLink recently informed the ESInet Users Group of intent to migrate all of the OSPs to SIP call delivery in the near future. The results of the rulemaking may include a framework for that migration. The Commission approved and submitted comments in response to this Notice on August 9, 2023.[76]
- Although not directly 9-1-1 related, it is of interest that the FCC made several actions related to improvement of the Emergency Alert System (EAS) and Wireless Emergency Alerts (WEA). In many jurisdictions Colorado local 9-1-1 governing bodies fund an emergency notification system which includes access to the EAS and WEA subsystems of FEMA's Integrated Public Alert and Warning System (IPAWS).

Federal Legislation

A number of 9-1-1 related bills introduced in the 117th Congress did not advance and could be reintroduced in the 118th Congress.

So far, three bills of interest to 9-1-1 stakeholders have been introduced:

H.R.3565: FCC Spectrum Auction Reauthorization[77]

- Summary: Among other things, would allow use of spectrum auction revenues to fund an NG911 implementation grant program for the states, would require states to maintain a sustainable funding mechanism for NG9-1-1, create an NG911 advisory board at NTIA, and create an NG911 Cybersecurity center at NTIA to coordinate with state and local governments.
- Status as of 7/19/2023: Passed by the Committee on Energy and Commerce. Awaiting a Hearing by the Committee on Armed Services.

[73] https://www.fcc.gov/document/fcc-proposes-rules-location-based-routing-wireless-911-calls
[74] https://docs.google.com/document/d/1r56AClqJfaUERr3ZNI2tVoGlD4VVjPT_/edit
[75] https://www.fcc.gov/document/fcc-proposes-action-expedite-transition-next-generation-911-0
[76] https://drive.google.com/file/d/1yjHzbgTy0fQtpKoiTlyCOk0BIuJPpoya/view
[77] https://www.congress.gov/bill/118th-congress/house-bill/3565

H.R.2763: Protect 911 Act of 2023[78]

- Summary: Addresses public safety telecommunicator mental health with the following initiatives: (1) developing best practices to identify, prevent, and treat posttraumatic stress disorder (PTSD), (2) developing resources to help mental health professionals better treat telecommunicators, and (3) establishing grants for health and wellness programs in emergency communications centers.

- Status as of 7/19/2023: Referred to the House Committee on Energy and Commerce.

H.R.1784: NG9-1-1 Advancement Act[79]

- Summary: Would allow for the creation of up to $15 billion in grant funding for NG9-1-1 advancement through the sale of spectrum.

- Status as of 7/19/2023: Referred to the House Subcommittee on Communications and Technology.

Because much of the nation has not yet fully implemented NG9-1-1 there is a great deal of interest in H.R. 3565, which is seen as the more likely of the two grant funding bills for NG9-1-1 deployment (the other being H.R. 1784). If the bill were to pass then the National Telecommunications and Information Administration (NTIA) would establish rules for the grant program and issue a Notice of Funding Opportunity (NOFO). Only then could Colorado's degree of eligibility and positioning to take advantage of the grant funding be determined. Because the grant funding would be derived from FCC spectrum auctions, several years might pass before it would become available to the states.

National Trends

National Next Generation 9-1-1 Status

A good source for the national status of NG9-1-1 deployment is the "National 911 Annual Report," previously titled the "National 9-1-1 Progress Report," published annually by the National 911 Program.[80] It uses data collected from the states and territories as well as other metrics such as the implementation of training standards and Emergency Medical Dispatch protocols. Although the data is outdated, being from 2021, the maps in the report help convey the patchwork nature of NG9-1-1 deployment across the nation.

Other Technological Trends

A technological trend over the past year that may have a significant impact on 9-1-1 services

[78] https://www.congress.gov/bill/118th-congress/house-bill/2763
[79] https://www.congress.gov/bill/118th-congress/house-bill/1784
[80] National 911 Program. National 911 Annual Report: 2021 Data. No publication date. Retrieved July 19, 2023. https://www.911.gov/assets/2021-911-Profile-Database-Report_FINAL.pdf.

is the hybrid use of wireless and satellite services for delivery of text-to-9-1-1. Apple announced that beginning with the iPhone 14 users may text 9-1-1 in areas where they have no wireless coverage.[81] In such instances the phone uses satellite connectivity to deliver the text message. This is of particular interest in Colorado where significant areas without wireless coverage still exist. Similarly, T-Mobile announced in August of 2022 that it was entering into a partnership with Starlink to provide texting service without a wireless tower signal.[82] If this becomes the standard for other wireless providers as well, it is possible that in the future people will be able to request help via 9-1-1 no matter their location, presuming that the local PSAP is able to receive the text message.

Another trend is PSAPs adopting technology that allows them to receive pictures or video from callers. These are third-party services which operate outside of the BES network and therefore are not regulated by the Commission. However, these services may help bridge the gap between legacy 9-1-1 and NG9-1-1 which has the same functionality by design.[83]

Finally, a trend that is creating a strain on PSAPs everywhere is the proliferation of smartphone features and personal devices capable of detecting falls and automobile crashes and automatically dialing 9-1-1. The Apple Watch, for instance, can detect a fall and after an alarm cancellation window will cause the user's iPhone to automatically call 9-1-1. Although the potential benefit of this feature is obvious, the resulting false alarms can be very burdensome on PSAP resources. This is of particular concern in PSAPs that serve Colorado's ski areas, where falling is a common occurrence and canceling the alarm may be difficult because the device is under several layers of clothing.

A recent update to the Android operating system resulted in the same functionality for Android devices, based on decelerometer hardware. As with iPhones, this feature also results in numerous unnecessary 9-1-1 calls.

NENA and other organizations have been in contact with both Apple and Google (the provider of the Android operating system) regarding these issues; reportedly, both companies are making efforts to reduce the likelihood of false alarms from these features.

9-1-1 and Behavioral Health Response

Last year this report included information about a University of Chicago Health Lab initiative referred to as Transform911, which was created to "explore how the nation's 9-1-1 system

[81] https://support.apple.com/en-us/HT213426
[82] https://www.t-mobile.com/news/un-carrier/t-mobile-takes-coverage-above-and-beyond-with-spacex
[83] Two of the first PSAPs in Colorado to adopt this technology were the Larimer County Sheriff's Office (https://www.coloradoan.com/story/news/2022/08/31/larimer-county-911-callers-can-share-real-time-videos-with-responders/65464699007/) and the City of Boulder (https://bouldercolorado.gov/news/city-boulder-dispatch-one-first-colorado-be-able-receive-livestreaming-video).

can better prioritize health and safety and ensure the right responder is dispatched at the right time."[84] This culminated in the publication of a "Blueprint for Change" that outlined seven primary recommendations for improving 9-1-1 service.[85] Several of the recommendations echo those of other organizations, such as NENA and APCO, for providing greater support for the 9-1-1 workforce in terms of staffing, training, and other resources. The other recommendations are more novel, such as ensuring community engagement on PSAP oversight boards and committees and making PSAPs independent entities equal to other first responder agencies instead of departments within law enforcement or fire agencies.

Figure 6.1: The Transform911 seven-point plan.

Commission staff participated in a number of the roundtable discussions that resulted in the Blueprint document.

In addition to the Transform 911 effort there has been ongoing discussion about how 9-1-1 service can be improved, particularly for people with behavioral health emergencies. The

[84] https://www.transform911.org/
[85] https://www.transform911.org/blueprint/

implementation of 9-8-8 as the national suicide crisis prevention hotline number helped invigorate these efforts, and a number of PSAPs and law enforcement agencies in Colorado now include mobile crisis response and co-responder programs as part of their services.

Commission staff and local 9-1-1 agency representatives continue working with the 9-8-8 Program Office under the Colorado Behavioral Health Administration and with a working group of the Colorado Department of Public Safety to help inform the discussions from the perspective of the PSAP, for identifying potential solutions.

Telecommunicator Training

Colorado is one of eleven states that do not have legislated minimum training standards for public safety telecommunicators or did not respond to the data request conducted by the National 911 Program Office on this topic.[86]

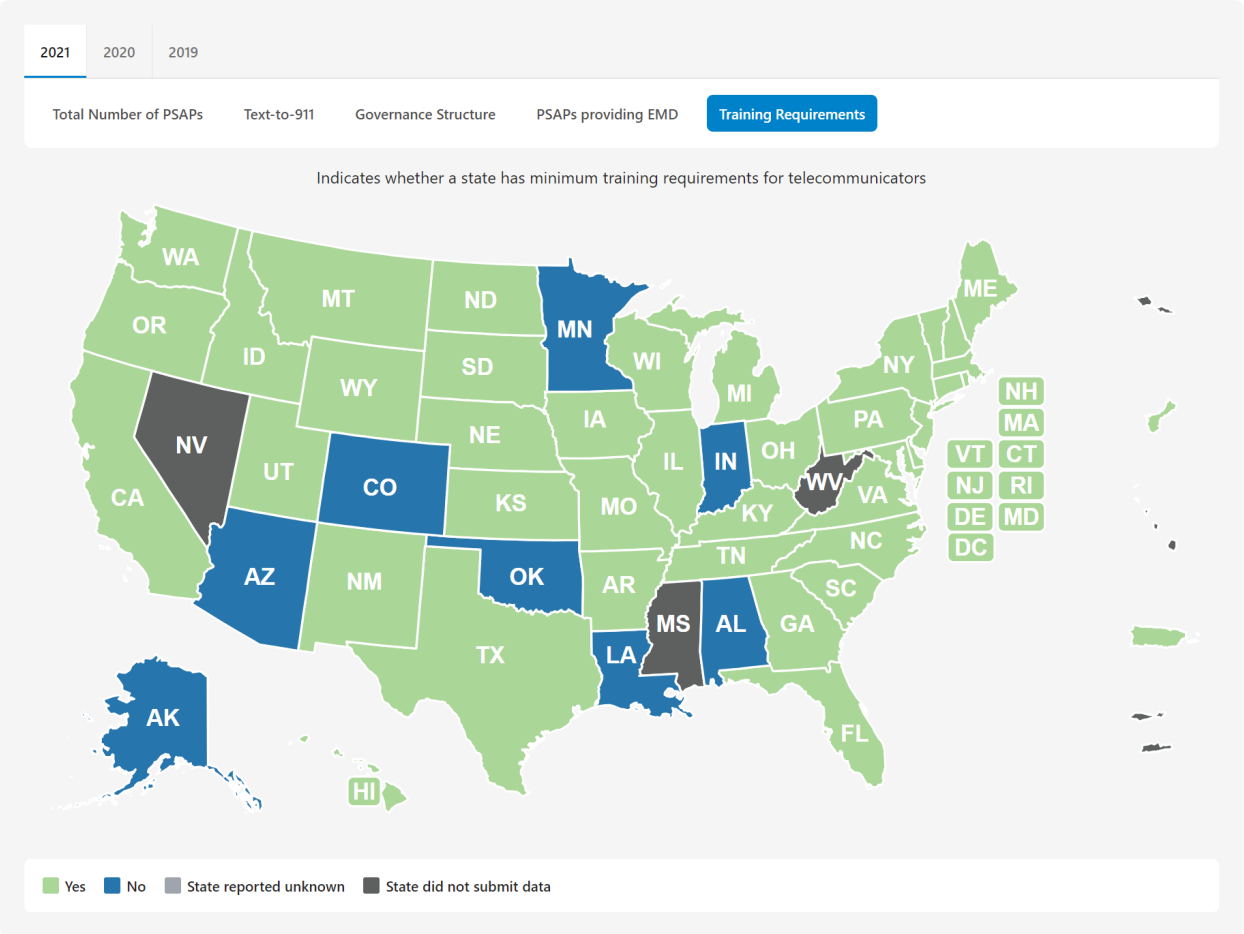


Figure 5.1 (reproduced): States with no minimum training requirements for telecommunicators shown

[86] Presuming that the three states that did not submit data to the National 911 Program Office's survey on this question, Nevada, Mississippi, and West Virginia, do not have minimum training standards.

in blue.[87]

Awareness of the need for such standards is rising, due in large part to the efforts of advocacy organizations such as the Denise Amber Lee Foundation which has called for improved training of public safety telecommunicators.[88] The American Heart Association, likewise, has advocated for training requirements specifically related to the provision of CPR instructions over the phone.[89]

Funding

Nationally, states have a mix of locally imposed 9-1-1 charges, a single statewide 9-1-1 surcharge, or a hybrid of both. The Colorado local emergency telephone charge average is currently $1.79, up from $1.62 in last year's report; with a low of 70¢ and a high of $4.00. Colorado local emergency telephone charge rates are neither the lowest nor the highest in comparison to those in other states. The highest charges include $6.00 in parts of Louisiana and $6.40 in parts of West Virginia.[90]

The Colorado state 9-1-1 surcharge is currently $0.09, which continues to be the lowest in the nation; with Arizona having the next-lowest at 20¢ and Alabama having the highest at $1.75.

In short, Colorado's local emergency telephone charges are high but not the highest, while our state 9-1-1 surcharge is the lowest in the nation. For more information about 9-1-1 charges please see Section 7.

Commission and Colorado Involvement in National Venues

The Commission has been involved in national 9-1-1 venues in the following ways over the past year:

- Filed comments with the FCC in support of an NPRM to require wireless carriers to provide location-based 9-1-1 call routing.[91]
- Commission staff have been and continue to serve as the vice president of the National Association of State 911 Administrators.[92] This position is a three-year commitment with an automatic promotion to president of the organization in June of 2024, followed by transition into the position of immediate past president" in June of 2025.

[87] https://www.911.gov/issues/911-stats-and-data/
[88] http://deniseamberlee.org/
[89] Kurz, et al. Circulation. "Telecommunicator Cardiopulmonary Resuscitation: A Policy Statement From the American Heart Association." Published Feb 24, 2020. https://www.ahajournals.org/doi/full/10.1161/CIR.0000000000000744
[90] https://www.nena.org/page/911RateByState?
[91] https://docs.google.com/document/d/1r56AClqJfaUERr3ZNl2tVoGlD4VVjPT_/edit
[92] https://www.nasna911.org/

7. Funding and Fiscal Outlook

Costs of Providing 9-1-1 Service

Key point: Based on partial responses to a data request sent to the 9-1-1 governing bodies, Commission staff estimated that at least $87 million was spent by all of the state's PSAPs combined.

It is difficult to determine with accuracy the total cost of providing 9-1-1 service in Colorado. Some costs are borne directly by the 9-1-1 governing bodies, which may serve as a funding entity for 9-1-1 service. Other costs are borne by the entities that operate the PSAPs. Some of those costs may not even be attributed to the PSAP budget, particularly when a PSAP is housed within a larger facility operated by a county or municipal government.

Early in 2023 Commission staff issued a data request to all of Colorado's 9-1-1 governing bodies, which included a question for the total annual expenses of their PSAPs in 2022. The total of all responses was roughly $87 million, but six governing bodies did not provide cost data, so the actual costs are certain to be even higher.[93] Note that § 29-11-102(4), C.R.S., requires governing bodies to respond to annual data requests provided by the Commission, but does not provide penalties for non-compliance.

Costs Per Capita

Dividing the total cost reported by the data request responses, approximately $87 million, by the state population results in a per capita cost of about $14.95 per year for 9-1-1 service, sans the costs of the six 9-1-1 governing bodies which did not respond. This includes all funding sources, not just local emergency telephone charges, the state 9-1-1 surcharge, and the prepaid wireless 9-1-1 charge; also accounting for additional funds spent out of county and municipal budgets.

What customers actually pay varies by jurisdiction. Local emergency telephone charges range from 70¢[94] to $4.00, the pre-paid charge amount is set at $1.71 for 2023, and the state 9-1-1 surcharge is currently 9¢; all per line per month.[95] Although the average cost is $14.95 per

[93] Governing bodies that operate PSAPs but failed to provide cost data: Denver E911 Authority Board, Huerfano County Authority Board, Lake County Emergency Telephone Service Authority, City of Pueblo E911 Authority Board, Pueblo County E911 Emergency Telephone Service Authority Board, and the San Juan County Emergency Telephone Services Authority. In particular, the lack of data from the City and County of Denver, City of Pueblo, and Pueblo County are likely to have caused costs to be significantly underestimated.

[94] Governing bodies at 70 cents per line per month are Arapahoe County, Baca County, Cheyenne County, Douglas County, Huerfano County, Moffat County, and San Luis Valley 911.

[95] Phillips County. Behind Phillips County are Gilpin County, Gunnison/Hinsdale 911, Las Animas County, and Park County at $3.00 per line per month.

year based on estimated PSAP expenditures and includes funding sources other than 9-1-1 charges,[96] annual 9-1-1 charges total that service users pay ranges from $9.48 to $49.08. Prepaid wireless telephone service customers pay a portion of 9-1-1 service costs on a different basis, with the prepaid wireless 9-1-1 charge being assessed per transaction, currently set at $1.71. If the customer purchases service minutes monthly they would pay $20.52 per year in 9-1-1 charges.

Funding Sources

Key points:

- *The current funding mechanisms are sufficiently flexible to meet the 9-1-1 funding needs of Colorado and its PSAPs.*

- *Roughly $113 million was raised through local emergency telephone charges, the prepaid 9-1-1 charge, and the state 9-1-1 surcharge in 2022, based on data collected from the local 9-1-1 governing bodies, sans the six which did not respond.*

- *Local emergency telephone charge rates vary widely across the state, with some being more than five and a half times greater than others due to increases requested by local 9-1-1 governing bodies and approved by the Commission through adjudicated proceedings.*

9-1-1 service in Colorado is funded from several sources, including:

- The state 9-1-1 surcharge, implemented in January of 2021 after the passage of HB 20-1293. Its rate is annually established by the Commission, with the statutory maximum being $0.50 per line per month. It is currently set at 9¢.

- Local emergency telephone charges (ETC), imposed separately by the 58 9-1-1 governing bodies on wireline, wireless, and interconnected VoIP telephone services per line per month.[97] By statute, these rates can be imposed without Commission oversight up to a threshold set annually by the Commission. ETC rates in excess of the threshold require approval by the Commission through an application process. These currently range from 70¢ to $4.00.

- The prepaid wireless 9-1-1 charge, which is set annually by the Commission and applied per purchase of service minutes. The charges are collected by retailers and remitted to the State DOR. The formula used to set the charge is prescribed by statute, being the sum of the average of the local emergency telephone charges and the state 9-1-1 surcharge. The current rate is $1.71 per transaction.

[96] As stated earlier the total statewide cost of $87 million is incomplete because it does not include costs from five of the governing bodies that did not respond to the survey, so the actual cost per capita is most likely greater than $14.95 per year.
[97] § 29-11-102(2)(a) and (b), C.R.S.

- Annual user fees paid by emergency response agencies to PSAPs for dispatching services.

- General funds of counties, municipalities, and Title 32 special districts.

The State 9-1-1 Surcharge

The state 9-1-1 surcharge was first implemented in January of 2021. Statute directs the Commission to reasonably calculate and set the rate annually to "to meet the needs of governing bodies to operate the 9-1-1 system."[98] The rate is capped at $0.50 per "9-1-1 access connection," meaning telephone line, per month.

Because local emergency telephone charges and prepaid wireless 9-1-1 charges also provide funding to meet the needs, the Commission has primarily used the state 9-1-1 surcharge to reimburse the governing bodies for the cost of BES 9-1-1 call delivery to the PSAPs. The tariff fees the governing bodies pay for BES are charged per concurrent session (9-1-1 line to a PSAP). Respectively, the revenues of the state 9-1-1 surcharge are distributed to the governing bodies based on how many BES concurrent sessions they purchase from CenturyLink.[99] The common basis of the concurrent session enables simple calculation of a state 9-1-1 surcharge rate that will reimburse the governing bodies for those costs.

The state 9-1-1 surcharge rate set by the Commission for calendar year 2022 was $0.09 per line per month. Revenues were $7,138,357.00, of which $7,019,939.89 was distributed to the governing bodies.[100] In contrast, the total statewide costs for BES monthly recurring charges was approximately $5.5 million, meaning that the Commission achieved its goal of reimbursing the governing bodies for the cost of 9-1-1 call delivery with an additional $1,519,939.89 that the governing bodies could spend on other expenses as allowed under § 29-11-104, C.R.S.

The Commission originally proposed to reduce the 2023 surcharge by a penny to 8¢ because the number of service user telephone lines had increased, enabling the same amount of revenue with a lower rate. However, several commenters noted a concurrent effort by CenturyLink to add services and fees to the BES tariff at the request of governing bodies, which might result in a surcharge decrease at the same time governing body BES costs were increased. As a result, the Commission chose to keep the rate at $0.09 for 2023.[101]

Local Emergency Telephone Charges

[98] § 29-11-102.3(1)(b), C.R.S.
[99] A "concurrent session" is a connection to the ESInet. The number of concurrent sessions that a PSAP has determines the number of simultaneous 9-1-1 calls that can be received by the PSAP.
[100] The difference between these two numbers is the amount retained by the Commission to cover actual expenses for administration of the surcharge. Statute allows up to 4% to be retained. The actual amount retained was roughly 1.66%. See § 29-11-102.3(3)(c)(II), C.R.S.
[101] See Decision C22-0562 in Proceeding 22M-0341T.

Based on the response to the Commission's 9-1-1 governing bodies data request in early 2023, staff estimates that at least $91 million was raised through emergency telephone charges in calendar year 2022. This estimate is again expected to be low because not all governing bodies responded. These charges are collected by telecommunications service providers and remitted directly to the 9-1-1 governing bodies. The rates for these charges vary across the state, with the current average being $1.79.[102]

Governing bodies may impose an emergency telephone charge rate sufficient for their service needs up to a threshold set annually by the Commission.[103] The effective date of a new rate must be either February 1 or June 1, and the governing body must provide notice of the new rate to telecommunications service providers at least 60 days prior to the effective date.

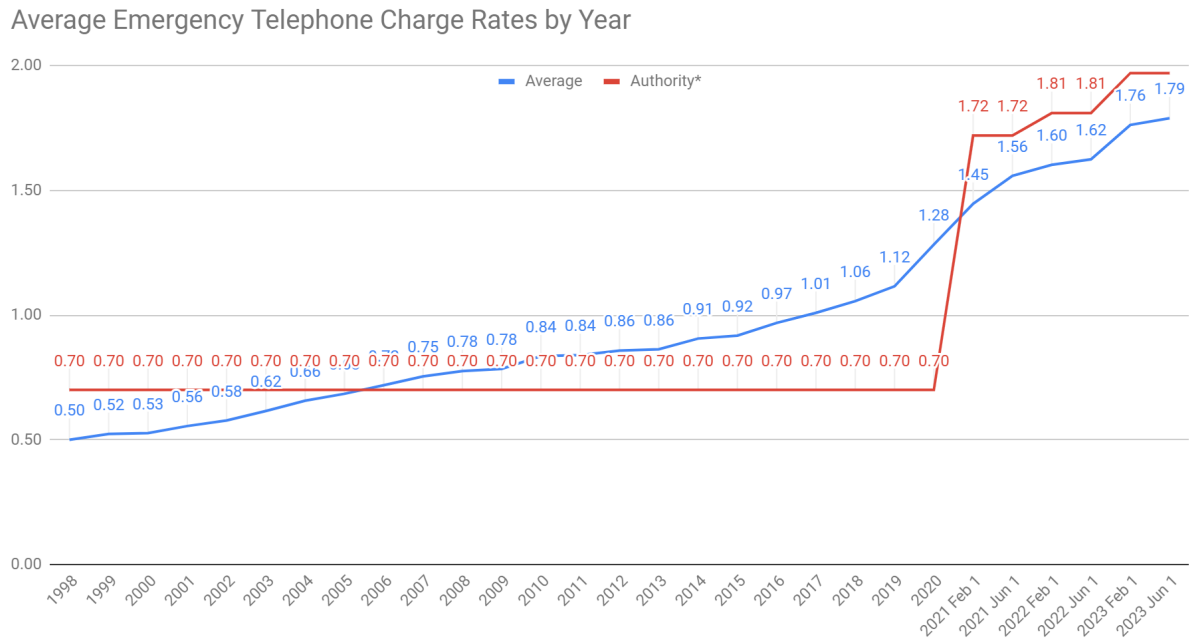


Figure 7.1: Average emergency telephone charge rates in Colorado Since 1998 (blue) compared to the threshold above which governing bodies must apply for approval from the Commission (red). Prior to 2021, the threshold was set in statute at $0.70 per line per month.

Prior to 2021, the threshold for local emergency telephone charge rates requiring approval by the Commission was statutorily set at $0.70. With the passage of HB 20-1293, the Commission now sets it annually, taking into account "inflation and the needs of the governing bodies."[104] The threshold is currently $1.97 per line per month, and as demonstrated by *Figure 7.1*, leads the average ETC rate in the state.

[102] A full list of the rates can be found at https://sites.google.com/state.co.us/telecom-surcharges/non-puc-surcharges
[103] See § 29-11-102(2)(b), C.R.S.
[104] See § 29-11-102(2)(f)(II), C.R.S.

This in turn means that governing bodies have more freedom to determine the appropriate emergency telephone charge rate for their needs, providing more local funding to pay for PSAP-related expenses such as equipment, personnel, and training. However, this enables significant disparities in ETC rates across the state. As discussed earlier, rates range from $0.70 to $4.00 per line per month.

The statute provides the Commission with very little guidance regarding what criteria should be used to approve an application for an ETC rate in excess of the threshold. Traditionally, the Commission has used three tests to evaluate an ETC rate application:

1. Whether the proposed expenses for the use of the ETC revenues are allowed pursuant to § 29-11-104, C.R.S.;
2. Whether the proposed expenses are sufficiently documented;
3. Whether budget projections, based on the eligible proposed expenses, demonstrate the need for the requested increase.

With changes to the statute due to the passage of HB 20-1293, the Commission is also now permitted to take into account efficiency of operations.[105] Comparing the efficiency of an applicant's PSAP operations against a statewide baseline requires an accurate baseline, which is difficult to establish without full participation in the Commission's statewide data collection efforts. Nonetheless, the Commission may exercise this additional authority in the future when considering ETC rates which could be significant outliers from the norm.

Prepaid Wireless 9-1-1 Charge

Based on data provided by the Colorado Department of Revenue, approximately $14.8 million of prepaid wireless 9-1-1 charges were collected in 2022.

Prior to the implementation of HB 20-1293 the prepaid wireless 9-1-1 charge was set in statute at 1.4% of the value of the prepaid wireless telecommunications service being sold, which resulted in approximately $200,000 collected per month in 2020. Beginning January 2021 the charge was changed to a flat rate of $1.38 per transaction. No data existed regarding how many prepaid wireless telecommunications transactions were taking place, so it was impossible to predict the revenue to be generated. Revenues dramatically increased after the change to the flat rate. These funds are distributed to the 9-1-1 governing bodies based on wireless call volumes at PSAPs.

Statutes now require the Commission to adjust the prepaid wireless 9-1-1 charge rate annually using a formula that is the sum of the average local emergency telephone charge rate plus the state 9-1-1 surcharge rate.[106] This resulted in a 2022 rate of $1.63 and a 2023 rate of $1.71. Based on the current monthly revenues, the total revenues for 2023 are predicted to be approximately $15.4 million.

[105] See § 29-11-102(6), C.R.S.
[106] See § 29-11-102.5(2)(c), C.R.S.

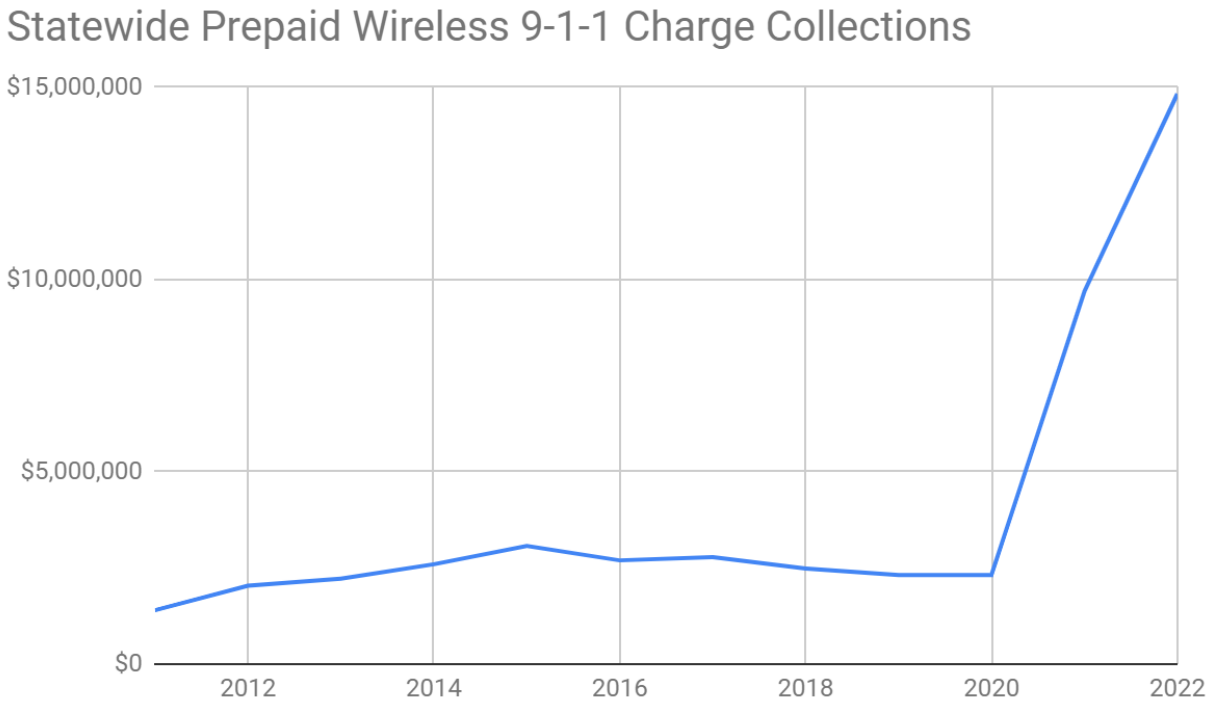


Figure 7.2: Prepaid 9-1-1 surcharge revenues by year. The sharp increase in 2021 was due to changes made by HB 20-1293, which took effect in January of 2021.
Source of data: Colorado Department of Revenue.

As can be seen from *Figure 7.2*, the revenue generated from the prepaid wireless 9-1-1 charge increased significantly. This represents millions of dollars being provided annually to local 9-1-1 governing bodies to fund expenses within their PSAPs.

In previous editions of this report, we expressed a concern that the flat rate per transaction fee could adversely impact low-income individuals who may be forced by circumstances to purchase prepaid wireless minutes in smaller increments, resulting in them paying more than customers who can afford prepaid services in larger quantities with fewer transactions or a subscription service. However, our research indicates that most prepaid telecommunications services are now purchased monthly, in which case the flat rate 9-1-1 charge should be on a parity with the average of what other consumers are paying in 9-1-1 charges.

Local Municipal and County General Funds

Commission staff is unable to determine from the data provided by the governing bodies how much of the total cost of providing 9-1-1 service was paid either through direct county and municipal appropriations or through agency user fees paid to the PSAPs for dispatching services. However, in most if not all cases PSAP costs are at least partially funded with local funds that are not derived from 9-1-1 charges.

In some limited cases local sales taxes have also been approved for funding public safety communications including PSAP services. Otherwise, the remaining costs of operating Colorado's PSAPs are paid out of local government budgets. These include human-resource-related services, building support services, IT-related services, and others. It is impossible to calculate the costs of these, and if included in the overall cost they would raise the total significantly.

Other Funding Sources

There are currently no federal or state grant programs specifically for 9-1-1 related expenses, although there is currently a bill in Congress that, if passed, would authorize up to $15 billion nationwide to promote NG911 technology deployment and implementation.[107]

The Commission also has a proceeding currently open to distribute remaining funds from a retired enforcement mechanism.[108] The stipulated agreement governing the enforcement mechanism requires that the Commission distribute remaining funds in a manner that benefits telecommunications, generally. Several of the comments in this proceeding have proposed 9-1-1 related projects for funding.

Funding Challenges

Per-line charges remain the primary method for funding 9-1-1 services, not just in Colorado but nationally.[109] However, this method has challenges.

Falling Line Counts in Rural Areas

Subscriber line counts have been decreasing in some rural areas of the state, which results in less revenue from per-line ETCs. This requires rural governing bodies to raise their ETC rates just to maintain revenue levels, let alone keep up with increasing costs of operating a PSAP.

Conversely, the number of lines in the state has increased. In 2020, the phone line counts reported to the Commission by the telecommunications service providers numbered at an estimated 5.9 million. For the period of June 2021 through May of 2022 the estimated number of lines reported was 6.3 million, an increase of 5.2% in one year. For the same period from 2022 to 2023 the number of lines reported was 6.6 million, an increase of 4.8% from the previous year.

Taken together, the decreasing number of lines being reported in rural areas and the increasing number of lines statewide means it may be necessary in the future to shift more costs from local emergency telephone charges to the state 9-1-1 surcharge. Alternatively, some other funding source may be needed to supplement emergency telephone charge

[107] H.R.1784: NG911 Advancement Act
[108] See Proceeding No. 23M-0210T.
[109] See https://www.nena.org/page/911RateByState for a list of 9-1-1 fees in other states.

revenue in rural areas. Taking neither action will likely result in greater pressure in rural areas for increasing local emergency telephone charge rates.

Non-Traditional Sources of 9-1-1 Calls

Another challenge to the per-line charge approach is that in the future a significant number of calls may originate from telecommunications services which do not have monthly billing. As an example, prepaid wireless telecommunications services have already proven a challenge to the traditional monthly surcharge model, requiring a separate charge applied only to them.

The proliferation of Internet-based sensors and other connected devices may increasingly become a source of 9-1-1 calls in the future, and could eventually represent a sizable portion of all calls. Examples of these include automated alarm systems, home-based Internet-of-Things (IoT) alarm systems, personal medical monitoring devices (including smartwatches that can monitor irregular heart rhythms and more), automatic crash notification systems installed in vehicles, smart cameras that can detect potential crimes in progress, and AI-driven smart speakers.

To date many of these already access 9-1-1, but do so using an existing smart phone connection so surcharge revenue is already being captured. In the future there may be a greater desire by the public for these devices to make requests for assistance directly to the ESInet. If that happens the number of ways 9-1-1 calls can reach a PSAP will no longer equal the ways that 9-1-1 charge revenue is collected, causing greater revenue shortfalls that will have to be made up or by either raising rates on the service users that do pay monthly 9-1-1 charges or by shifting more of the costs to local governments.

The Commission does not currently have recommendations about this for the legislature, but makes note of it for awareness of the trend. The potential for a future mismatch between usage and funding sources for 9-1-1 service is not limited to Colorado, and will likely be a growing topic of discussion nationally over the coming decade.

Potential Funding Mechanisms for Transition to and Implementation of Next Generation 9-1-1

Currently all costs for NG9-1-1 deployment are expended through the payment of BES tariff charges or paying for local NG9-1-1-ready equipment and services at the governing body or PSAP level.

All three of Colorado's 9-1-1 charges are either remitted directly to the local governing bodies or to the state and then distributed to the governing bodies. None are retained at the state level to pay for statewide 9-1-1 expenses, including costs related to NG9-1-1 deployment. As such, statewide NG9-1-1 related costs may benefit from the funding mechanism proposed by the Commission's 9-1-1 Advisory Task Force as discussed at the end of Section 5. Examples may include:

- statewide integration of GIS datasets for use in NG9-1-1 call routing;
- matching funds for potential future federal grants for NG911 deployment;
- funding of statewide 9-1-1 telecommunicator training and public education campaigns;
- implementation of 9-1-1 services not universally adopted in Colorado, such as foreign language interpretation for 9-1-1 calls, emergency medical dispatch protocol systems, including the provision of CPR instructions to callers, and text to 9-1-1; and
- grant programs to assist rural 9-1-1 governing bodies.

As discussed in Section 5, the proposed mechanism consists of a statewide 9-1-1 Services Enterprise, and authority for the Enterprise to receive and use a portion of the state 9-1-1 surcharge revenues for 9-1-1 expenses of statewide benefit. In 2022 the Commission's 9-1-1 Advisory Task Force proposed draft legislation to accomplish this, though a bill for it was never introduced. Currently, the Legislative Committee of the Task Force is working with a potential sponsor to introduce the bill in 2024.

Conclusion

This report is intended to meet the requirements of § 40-2-131, C.R.S., providing "overall understanding of the state of 9-1-1 service in Colorado" by addressing the topics listed in that statute. The goal is to help the reader understand the entire 9-1-1 call flow from service user to the PSAP, and the components and actors that make it work, not just the portion that is regulated by the Commission.

As described in this document, Colorado's 9-1-1 system is in a transitional period between legacy E9-1-1 service and Next Generation 9-1-1 service. The transition began with migration of Colorado's PSAPs from analog 9-1-1 lines to a modern digital ESInet. The deployment of the ESInet is essentially complete and the stakeholders are currently in discussions with the BESP, CenturyLink, regarding next possible steps.

In the meantime, Colorado's 9-1-1 stakeholders must continue to work to meet citizen expectations. This includes promoting local implementation of text-to-9-1-1 service, improving uniformity of minimum training standards for public safety telecommunicators, and improving the reliability and resiliency of the 9-1-1 network. Although the Commission has the authority and is taking action on certain issues, such as reliability and resiliency of the 9-1-1 call delivery network, it does not have authority to require PSAP adoption of text-to-9-1-1 service or minimum standards for operations and training. Avenues for oversight of these issues should be explored by the legislature.

An examination of the challenges discussed in Section 5 of this report reveals a common theme: some are difficult to address without a state-level funding source to pay for statewide

solutions. A potential mechanism for resolving this, which would not decrease local-level funding, is discussed at the end of Section 5.

Disparities in local emergency telephone charges are reaching levels that may warrant further examination and rural subsidization. Some Colorado residents pay as much as five and half times what others are paying per line for 9-1-1 service, due to requested and Commission-approved emergency telephone charge rates. Although the Commission is directed by statute to set a threshold above which those rates require approval, additional guidance regarding criteria to consider when evaluating such applications may be appropriate. Additionally, funding assistance for rural 9-1-1 governing bodies and PSAPs may be appropriate, whether through the mechanism noted above or otherwise.

Finally, the Commission is committed to continuing to work with Colorado's 9-1-1 stakeholders and the legislature to ensure that the 9-1-1 system is reliable, resilient, and meets the needs of residents and visitors. Our partners include the counties, municipalities, certain special districts, 9-1-1 governing bodies, PSAPs, the BESP, and the citizens and visitors who rely on 9-1-1 service. Together, we will continue to develop solutions and strategies to ensure access to high quality ever-improving 9-1-1 service they expect and deserve.

Appendices

Appendix A: Glossary

These definitions have been adapted from multiple sources, including *4 CCR 723-2-2131*, § 29-11-101, C.R.S., and the *NENA Knowledge Base Glossary*.[110] In a few cases, definitions were written specifically for this report.

9-1-1 - A three-digit abbreviated dialing code used to report an emergency situation requiring a response by a public agency such as a fire department or police department.

9-1-1 Access Connection - Any communications service including wireline, wireless cellular, interconnected voice-over-internet-protocol, or satellite in which connections are enabled, configured, or capable of making 911 calls.

9-1-1 Call - A request for emergency assistance from the public by dialing 9-1-1 or addressing the ESInet regardless of the technology used.

9-1-1 Governing Body - See *Governing Body*.

9-1-1 Service - The service by which a 9-1-1 call is routed and transported from the end user to the governing body or PSAP serving the caller's location. 9-1-1 service also includes location information routed to the PSAP.

9-1-1 Surcharge Fee - The statewide 9-1-1 surcharge fee established by § 29-1-102.3, C.R.S.

Automatic Location Identification (ALI) - The automatic provision to a PSAP for display, on equipment at the PSAP, of the telephone number and location of the caller.

Automatic Number Identification (ANI) - The automatic provision to a PSAP for display of the caller's telephone number at the PSAP.

Basic Emergency Service (BES) - The aggregation and transportation of a 9-1-1 call directly to a demarcation point with a governing body or PSAP, regardless of the technology used to provide the service. The aggregation of calls means the collection of 9-1-1 calls from one or more OSPs or IASPs for the purpose of selectively routing and transporting 9-1-1 calls directly to a demarcation point with a governing body or PSAP. The offering or providing of location information or selective routing directly to a governing body or PSAP is also a basic emergency service.

[110] https://kb.nena.org/wiki/Category:Glossary

(Note: This is a modification of the Commission's definition of BES simplified for the purpose of this report. See *4 CCR 723-2-2131(i)* or § 29-11-101(7), C.R.S. for the full definition.)

Basic Emergency Service Network (BES network) - the portion of the 9-1-1 call path that begins at the demarcation point between an OSP or IASP and a BESP and ends at the demarcation point between a BESP and a governing body or PSAP to provide basic emergency service.

Basic Emergency Service Provider (BESP) - Any person certificated by the Commission to provide basic emergency service.

Demarcation Point - The physical point where the responsibility of a portion of a network changes from one party to another.

Emergency Call Center (ECC) - a facility designated to receive and process requests for emergency assistance, which may include 9-1-1 calls, determine the appropriate emergency response based on available resources, and coordinate the emergency response according to a specific operational policy.

Note: The term "ECC" does not have the same meaning as "PSAP."

Emergency Communications Specialist - See *Public Safety Telecommunicator.*

Emergency Services IP Network (ESInet) - A managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG911 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).

Emergency Telephone Charge (ETC) - a charge established by a governing body pursuant to § 29-11-102(2)(a), C.R.S. to pay for the expenses authorized in § 29-11-104, C.R.S.

Enhanced 9-1-1 (E9-1-1) - a telephone system which includes network switching, database and Public Safety Answering Point premise elements capable of providing automatic location identification data, selective routing, selective transfer, fixed transfer, and a call back number.

FirstNet - The common name used to refer to the National Public Safety Broadband Network (NPSBN), a national network to provide prioritized wireless data coverage for public safety agencies. This network is operated by AT&T under the oversight of the First Responder Network Authority, which is housed within the National Telecommunications and Information Administration.

Governing Body - The organization responsible for establishing, collecting, and disbursing the emergency telephone charge in a specific geographic area, pursuant to §§ 29-11-102, 103, and 104, C.R.S.

Intermediary Aggregation Service Provider (IASP) - A person that aggregates and transports 9-1-1 calls for one or more OSPs for delivery to a demarcation point with a BESP.

Internet Protocol (IP) - The method by which data is sent from one computer to another on the Internet or other networks.

Legacy 9-1-1 - The original switch-based 9-1-1 system design, still largely in use throughout the United States. This design originally used analog CAMA (Centralized Automated Message Accounting) trunks for delivery of 9-1-1 calls, which are capable of delivering only voice and phone numbers to the PSAP. Today, "legacy 9-1-1" systems may include some IP technology and newer types of trunks known as SS7, but are still operated primarily using analog call delivery and tabular databases for routing. Legacy 9-1-1 systems are gradually being replaced with Next Generation 9-1-1 systems, which are fully IP-based and built around open standards developed through the National Emergency Number Association and other standards development organizations.

Multi-Line Telephone System (MLTS) - A system comprised of common control units, telephones, and control hardware and software providing local telephone service to multiple customers in businesses, apartments, townhouses, condominiums, schools, dormitories, hotels, motels, resorts, extended care facilities, or similar entities, facilities, or structures.

Next Generation 9-1-1 (NG9-1-1) - A secure, IP-based, open-standards system comprised of hardware, software, data, and operational policies and procedures that:

A. Provides standardized interfaces from emergency call and message services to support emergency communications;

B. Processes all types of emergency calls, including voice, text, data, and multimedia information;

C. Acquires and integrates additional emergency call data useful to call routing and handling;

D. Delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities based on the location of the caller; and

E. Supports data, video, and other communications needs for coordinated incident response and management.

Originating Service Provider (OSP) - A local exchange carrier, wireless carrier, Voice-over-Internet-Protocol service provider, or other provider of functionally equivalent services supplying the ability to place 9-1-1 calls.

Public Safety Answering Point (PSAP) - A facility equipped and staffed to receive and process 9-1-1 calls from a BESP.

- **Primary PSAP:** A PSAP to which 9-1-1 calls are routed directly from the 9-1-1 Control Office.

- **Secondary PSAP:** A PSAP to which 9-1-1 calls are transferred from a Primary PSAP.

Public Safety Telecommunicator (PST) or **Telecommunicator** - an emergency response coordination professional trained to receive, assess, and prioritize emergency requests for assistance, including, but not limited to:

- Determining the location of the emergency being reported
- Determining the appropriate law enforcement, fire, emergency medical, or combination of those emergency services to respond to the emergency
- Coordinating the implementation of that emergency response to the location of the emergency
- Processing requests for assistance from emergency responders.

Sometimes referred to as an "Emergency Communications Specialist" or similar title, and includes personnel who take 9-1-1 calls from the public, dispatched 9-1-1 calls for service to field responders, or both.

Selective Routing: The routing of a 9-1-1 call to the demarcation point with a governing body or PSAP based upon the location information or other factors as agreed upon by the governing body or PSAP. (Note: A "selective router" refers to a specific type of equipment in legacy 9-1-1 networks, but in this document the term selective routing is used more broadly to mean the routing of 9-1-1 calls to a specific PSAP based on either legacy methods such as tabular database or based on NG911 geospatial call routing routines.)

Teletypewriter (TTY) - A device that allows people who are deaf, hard of hearing, or speech-impaired to use the telephone to communicate. The device connects to a telephone and allows users to type messages which are received character-by-character on the receiving end. A TTY is required at both ends of the conversation in order to communicate. TTY devices, although still in use today, are rapidly becoming replaced by a variety of other types of devices. Also referred to as a "Telecommunications Device for the Deaf (TDD)."

Text-to-9-1-1 - *Also* Text-to-911 and SMS-to-911. A service that allows users of 9-1-1 to send a text message directly to "911" from their mobile device and allows that text message to be relayed to the appropriate PSAP. There are interim methods of text-to-9-1-1 service that relay text to 9-1-1 messages directly to a PSAP while bypassing the existing 9-1-1 network. If a Next Generation 9-1-1 system is available, text-to-9-1-1 messages may be relayed through the ESInet.

Voice-over-Internet-Protocol (VoIP) - a service that:

- enables real-time, two-way voice communications originating from or terminating at a user's in internet protocol or a successor protocol;
- utilizes a broadband connection from the user's location; and
- permits a user to generally receive calls that originate on the public switched network and to terminate calls to the public switched telephone network.

Appendix B: Participating Stakeholders

Pursuant to § 40-2-131(2), C.R.S., this report was developed in consultation with representatives of public safety answering points, 9-1-1 governing bodies, and state-wide organizations that represent public safety agencies.

This report was provided in draft form to the following organizations with a request for comment:

- The Commission's 9-1-1 Advisory Task Force
- The Colorado Chapter of the National Emergency Number Association and the Association of Public Safety Communications Officials, Intl.
- County Sheriffs of Colorado
- Colorado Association of Chiefs of Police
- Colorado State Fire Chiefs
- Emergency Medical Services Association of Colorado
- Colorado Emergency Management Association
- Colorado Counties Incorporated
- Colorado Municipal League

Additionally, a copy was provided to the following state agencies and bodies with a request for comment:

- The Colorado Department of Public Safety
- The Colorado Department of Homeland Security and Emergency Management
- The Homeland Security Advisory Committee's Public Safety Communications Subcommittee

Commission Staff involved in the development and updating of this report consisted of:

- Daryl Branson, PUC telecom program section chief
- Jennifer Kirkland, state 9-1-1 program manager
- Holly Bise, state TRS program manager
- Jolene Sena, telecom surcharge administrator

Appendix C: Additional Resources

For more information:

The Commission's 9-1-1 Program Webpage
https://sites.google.com/state.co.us/colorado911program/home?authuser=1

The Commission's 9-1-1 Advisory Task Force Webpage
https://sites.google.com/state.co.us/9-1-1-advisory-task-force/home?authuser=1

The Colorado 9-1-1 Resource Center
www.co911rc.org

The Colorado Chapter of NENA and APCO
www.conenaapco.org

The Colorado Council of Authorities
www.ccoa911.org

The National Emergency Number Association
www.nena.org

The Association of Public Safety Communications Officials, Intl.
www.apcointl.org

The National Association of State 911 Administrators
www.nasna911.org

The National 911 Program
www.911.gov

The FCC's Task Force on Optimal PSAP Architecture
https://www.fcc.gov/about-fcc/advisory-committees/general/task-force-optimal-public-safety-answering-point

The FCC's Communications, Security, Reliability and Interoperability Council
https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council

The FCC's Ending 9-1-1 Fee Diversion Now Strike Force
https://www.fcc.gov/911strikeforce

The National Public Safety Telecommunications Council
http://www.npstc.org/

The Next Generation 9-1-1 Interoperability Task Force
https://ng911interop.org/
Transform 911
https://www.transform911.org/

Denise Amber Lee Foundation
https://deniseamberlee.org/

Appendix D: 9-1-1 Frequently Asked Questions

Certain questions are often asked by members of the public about how 9-1-1 service works, or about perceived problems concerning 9-1-1 service. This section attempts to answer some of those questions, and may help legislators better understand issues of concern to their constituents.

"If my food delivery or rideshare app can find me, why can't 9-1-1?" or "Since my cell phone location is sent to 9-1-1 when I call, why do I have to tell the call taker my address?"

Location services for wireless 9-1-1 calls were developed at a time when the handsets had no location awareness. They relied first on network-based location triangulation, followed later by GPS location calculation. Today, smartphones have several sensors that can be used in combination to determine a much more accurate location for the caller. But because the 9-1-1 system wasn't originally designed to take advantage of handset-based location information, there hasn't been an easy way to deliver this data to the PSAP. As a result, the location information typically delivered to the PSAP is sometimes less accurate than handset-based location information that is available to non-911 applications and commercial services. Sometimes it is not available to 9-1-1 at all.

Currently, wireless carriers, handset manufacturers, and even smartphone operating system developers are working to fix this. For example, both Apple and Google have partnerships with a firm called RapidSOS to provide enhanced handset-based location data to PSAPs. The base level of this service is offered free of charge to the PSAPs, though some equipment and software vendors may charge for integrating the service into 9-1-1 call handling equipment.

Recently, national wireless carriers have also begun providing Z-Axis (elevation above sea level) coordinates with the location information for wireless 9-1-1 calls, in accordance with requirements imposed by the Federal Communications Commission. Although Z-Axis coordinates are of limited value now, they are the first step toward being able to pinpoint not only where on Earth a 9-1-1 call is coming from but what floor of a building the caller is on as well.

Generally speaking, 9-1-1 location technology has improved greatly over the years but it may

never be 100% accurate or reliable. It is extremely useful when there is no other way to obtain the location of the emergency, such as when the caller can't speak or they don't know where they are. However, whenever possible it is best practice for the telecommunicator to ask the caller for the location of the emergency. In most cases, this will be the very first thing asked of a 9-1-1 caller.

"Can I call 9-1-1 on a cell phone with no active service plan or prepaid minutes?"

The short answer is yes. Any wireless phone with a signal is able to dial 9-1-1. The Federal Communications Commission, which has regulatory authority over wireless telecommunications services, requires that the 9-1-1 call be delivered to the appropriate 9-1-1 telephone service provider (the BESP in Colorado). However, cell phones without a service contract or prepaid minutes can have limitations. They can call 9-1-1 but the PSAP will not automatically receive callback number information like normal. This will prevent the PSAP from following up if the call is disconnected before the phone number can be provided verbally. 9-1-1 calls from such phones are also frequently delivered without location information, which could prevent an emergency response if the connection is lost before the location is shared verbally.

"Why does the call-taker ask so many questions?"

9-1-1 call takers (also called telecommunicators or emergency communications specialists) have an important responsibility to gather all of the information necessary for emergency services to respond appropriately and quickly. This also includes keeping the responders safe, which requires having a comprehensive understanding of the situation at the location of the emergency.

Many PSAPs in Colorado also provide pre-arrival medical instructions and emergency medical dispatch (EMD) services. These are medical protocol systems developed by medical experts and often overseen by local medical professionals. Their purpose is to help stabilize a patient's condition until emergency medical services arrive, but doing so requires a lot of communication between the call taker and the caller. The best thing the caller can do is answer the telecommunicator's questions and follow their instructions to the best of their ability.

Typically, emergency medical services are dispatched early in the call and then EMD is performed while responders are en route, so there is little to no delay due to EMD questions.

"What happens if I text to 9-1-1 in an area which doesn't provide that service?"

If you attempt to send a text message to 9-1-1 in an area that does not have the service you will receive a "bounceback" message stating it isn't available and to instead make a phone call to 9-1-1. This may also occur if you're roaming on another service provider's network.

“Can someone who does not speak English call 9-1-1?”

Most PSAPs contract with third party interpreter services to provide language translation. If one is available at your PSAP they can bring on an interpreter for a 3-way call. However, not all 9-1-1 centers use such services.

“What is the difference between Next Generation 9-1-1 and FirstNet?”

Next Generation 9-1-1 (NG911) is the standards-based delivery of 9-1-1 calls and other information to a PSAP via modern Internet Protocol (IP) networks and services. Upgrading the existing legacy E9-1-1 service to Next Generation 9-1-1 service has many benefits, including making the system more resilient and flexible, allowing for dynamic rerouting 9-1-1 calls when necessary, and opening the network to accept other types of data such as medical information, automatic crash notification and metrics, pictures, videos, etc.

FirstNet, the commonly used name for the National Public Safety Broadband Network (NPSBN), is a wireless broadband network for public safety agencies that will allow responders in the field to share data and media such as pictures, building schematics, and more.

The best way to describe Next Generation 9-1-1 and FirstNet together is that both are needed to transmit and deliver data and multimedia all the way from citizens to field responders.