



Ohio Department of  
Administrative Services

Multi-Agency Radio  
Communication System (MARCS)

# Performance Audit

April 2023

OHIO AUDITOR OF STATE  
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OHIO AUDITOR OF STATE  
KEITH FABER



**To the Governor's Office, General Assembly, Director of the Ohio Department of Administrative Services, Ohio Taxpayers, and Interested Citizens:**

The Auditor of State's Office recently completed a performance audit of the Multi-Agency Radio Communication System (MARCS) within the Ohio Department of Administrative Services (DAS). This service to DAS and to the taxpayers of the state of Ohio is being provided at the request of the Department and pursuant to the Ohio Revised Code § 117.46.

This audit report contains recommendations, supported by detailed analysis, to enhance the overall efficiency, effectiveness, and transparency of the Program's financial operations. This report has been provided to the Department and its contents have been discussed with the appropriate staff and leadership within DAS. The Department is reminded of its responsibilities for public comment, implementation, and reporting related to this performance audit per the requirements outlined under Ohio Revised Code § 117.461 and § 117.464. In future compliance audits, the Auditor of State will monitor implementation of the recommendations contained in this report, pursuant to the statutory requirements.

It is my hope that DAS will use the results of the performance audit as a resource for improving transparency, operational efficiency, and the MARCS Program's overall effectiveness. The analysis contained within are intended to provide management with information to consider while making decisions about the Program's operations.

This performance audit report can be accessed online through the Auditor of State's website at <http://www.ohioauditor.gov> and choosing the "Search" option.

Sincerely,

A handwritten signature in black ink that reads 'Keith Faber'.

Keith Faber  
Auditor of State  
Columbus, Ohio

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# Ohio Department of Administrative Services

## Multi-Agency Radio Communication System

### Performance Audit Summary

#### WHAT WE LOOKED AT

MARCS, the Multi-Agency Radio Communication System, is a state-of-the-art radio and data system that provides radio networks for emergency responders and other entities. The system is designed to facilitate communication between multiple entities and is typically used during emergency situations or at large pre-planned events. By using this system, entities can coordinate an appropriate response and improve the overall effectiveness and efficiency of individual efforts.

The Department of Administrative Services, a statewide agency, is responsible for managing the MARCS program through its Office of Information Technology. At the request of the Department, we conducted a performance audit of MARCS. The two primary objectives of the audit were to provide a comparison of MARCS' funding dynamics to similar programs in other states and to provide detailed insight into the fiscal health of MARCS, including a review of historical financial data and modeling of future expectations.

#### WHAT WE FOUND

All 50 states have some sort of radio system that functions similarly to MARCS, allowing for the communication between organizations on a secure radio frequency. The need for such systems was highlighted by the terrorist attack on 9/11 and Hurricane Katrina. During the response to both of these events, responders had limited ability to speak to each other, which hampered the overall response effort. MARCS uses technology that is in-line with federal guidelines developed by the Department of Homeland Security. Due to variations in operational need from state to state, comparisons between states were limited to a high-level review, which is contained in the following report.

Approximately 2,200 public service or safety organizations use MARCS for communication. To access the system, users must register individual radios and pay a monthly subscription fee per radio. In FY 2022, the revenue generated from these user fees covered the majority of MARCS operational expenditures. While we found that, historically, MARCS has maintained a substantial fund balance, there is danger that the fund balance will be depleted in the near future. Based on our financial modeling, it is likely that expenditures will begin to outpace revenues without some sort of change in fee structure or intervention from the Ohio General Assembly.

During the course of the audit, the Governor released his biennial budget proposal. If passed, this proposal would provide funding to MARCS that is expected to cover all currently identified operational expenditures. Under this proposal, user fees would be eliminated for governmental agencies and would be free for new agencies to join.

## KEY OBSERVATIONS

**Key Observation 1:** Since beginning operations in the mid-2000s, MARCS has seen steady growth in its user base. As of FY 2022, there were approximately 2,200 public service or public safety organizations subscribed to the network. While there has been steady, sustained growth, MARCS administrators lack insight into the number of potential users that have yet to join the network. This is particularly important when considering the potential impact of the Governor’s budget proposal, which could result in an influx of new users. If passed, the Governor’s budget proposal could also impact the program’s tier partnerships, particularly with those that currently fund their systems with local tax dollars.

**Key Observation 2:** MARCS has historically maintained a substantial ending fund balance. However, as expenditures continue to rise, the fund balance represents a smaller portion of annual expenses. This is problematic because it can limit the ability of MARCS administrators to quickly react to unforeseen events or circumstances. Our financial modeling indicates that MARCS could have an overall fund deficit as early as FY 2027 without some sort of intervention.

**Key Observation 3:** Ending fund balances are typically how a program’s fiscal health is monitored. However, due to the timing of large expenditures related to contracts, MARCS experiences low fund balances mid-year. These mid-year low point balances have already reached critically low levels in FY 2020, increasing the risk that the program will experience a mid-year zero balance, which would preclude program spending prior to the year end.

**Key Observation 4:** Typically, MARCS does not actively pursue delinquent accounts. At the time of our analysis, nearly 22 percent of all MARCS user accounts were delinquent 60 days or more. This equated to roughly \$1.2 million in uncollected revenue. These uncollected revenues could help MARCS improve month-to-month fund balances and prevent mid-year low point issues.

## SUMMARY OF RECOMMENDATIONS

**Recommendation 1:** MARCS is a critical government service that provides emergency communications to organizations throughout the State and cannot be allowed to go offline. In order to maintain the personnel and systems necessary for operations, MARCS must remain fiscally stable. The financial modeling conducted by our office indicate that the program may be unable to meet financial obligations in approximately 2027. To prevent the need for emergency funding measures from the state General Revenue Fund, DAS must work to secure the program’s future financial stability now. This could include increasing the program’s user base, increasing fees, or considering alternative funding models. By working to resolve future financial issues now, the Department can avoid catastrophic disruptions to MARCS services.

**Issue for Further Study:** MARCS administrators have indicated that the current system should remain viable for several years and can handle a large increase in user base over time. However, due to the potential impact of providing MARCS services for free to all governmental users, MARCS administrators and the General Assembly should further consider the implications of a sudden increase in demand that may occur if the budget proposal is approved, along with several other business intelligence considerations.

**Recommendation 2:** When individuals or organizations receive a service, there is an expectation that any associated bills will be paid in a timely manner. MARCS user fees that are not paid within a 30-day period are considered delinquent and are referred to the Ohio Attorney General’s office for collection purposes after 45 days. We found that while DAS takes some action to pursue collections through informal procedures, there is no coordination to collect the delinquent fees once they are referred to the Attorney General’s Office. MARCS administrators should develop a formal policy which addresses existing delinquent account collection activities. Doing so will ensure the MARCS program is addressing all user accounts in a fair and transparent manner.

**Recommendation 3:** Having a sufficient level of cash reserves is critical for ensuring adequate, uninterrupted delivery of program services. Cash reserves that are appropriate to the level of a program’s operating expenses are not only an indicator of overall financial health, but in practical terms, they help to mitigate the risks of failing to cover both routine expense obligations, as well as those resulting from unforeseen circumstances. While the MARCS fund’s cash balances appear to be healthy at the end of each fiscal year, they tend to dip below safe levels throughout the course of a year as a result of the timing of payments associated with some of its largest contracts. This leaves the program more susceptible to cash shortfalls, which could translate into service levels that are not optimal. DAS should take steps to proactively manage program cash flows through some combination of modifying vendor payment timing and revenue receipts from customers, to ensure fund balances exceed a minimum safe level throughout the year. Doing so would mitigate the risk of fund deficits in the future. Adjusting the timing of either expense payment terms for its largest contracts or the timing of revenue receipts from its customers could mitigate the risk of fund deficits in the future and would help ensure the seamless delivery of services.

# Table of Contents

Introduction.....	1
Department of Administrative Services.....	2
Interoperable Radio Systems .....	2
Multi Agency Radio Communications System.....	4
Program History.....	4
Services and System Configuration .....	5
Financial Information.....	6
User Base .....	8
What We Looked At .....	11
What We Found .....	11
Summary of Recommendations.....	12
Program Comparisons to Other States.....	13
Financial Modeling.....	16
Recommendation 1: DAS Should Ensure Program Stability .....	22
Issue for Further Study: Further Assess Market Saturation and Conduct Program Capacity Planning .....	30
Recommendation 2: Address Delinquent Account Collections Management.....	34
Recommendation 3: Address Mid-Year Low Point Balance Issues.....	38
Client Response Letter.....	42
Appendix A: Purpose, Methodology, Scope, and Objectives of the Audit .....	45
Performance Audit Purpose and Overview.....	45
Audit Scope and Objectives.....	45
Appendix B: Supplemental Information.....	47
Interoperable Radio Systems in Other States.....	47
Mobile Voice and Application Services .....	48
Tier Partners.....	50
Delinquent Accounts.....	51
Financial Analysis Supplemental Information.....	52
Rates Supplemental Information.....	54
Projections and Capacity Supplemental Information .....	55



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# Introduction

Whether it is an emergency like a multi-car accident on the interstate or natural disaster such as a tornado, communication is necessary for an organized and effective response. Emergency responders must be able to communicate with each other effectively and securely. These agencies rely on radio communications to perform response activities, and effective communications can often be the difference in saving lives and property.

In Ohio, the need for communication between different responder groups was brought to light in the early 1990s. In 1993, a prison riot at Lucasville state penitentiary lasted for 11 days and resulted in the death of one guard and nine inmates. This riot, along with a deadly flood which occurred in Belmont County, highlighted the need for a dedicated line of communication when an event required a multi-agency response. After a call to action from then Governor Celeste and approval from the Ohio General Assembly, the Multi-Agency Radio Communications System (MARCS), an interoperable communication system, was developed by the Ohio Department of Administrative Services (DAS or the Department) in response to this need.

Ohio was a vanguard regarding developing such a system. On a national level, the need for such systems was highlighted by events such as the terrorist attacks on the World Trade Center on September 11<sup>th</sup> and Hurricane Katrina in 2005. Both events required massive coordination of local, state, and federal agencies when dealing with the immediate event and the response in the days and weeks that followed. Today, all states have an interoperable radio communication system that is capable of voice and data transfer. These systems allow for the communication between users on radio frequencies that are typically reserved for public safety purposes by the Federal Communications Commission (FCC) and, with the use of technology, experience little interruption and interference.

In November of 2022, DAS requested a performance audit of MARCS from the Auditor of State’s Ohio Performance Team.<sup>1</sup> The narrowly defined scope and objectives of this audit were agreed to based on the specific request of the client. The audit includes a detailed financial analysis of future expenditures and revenues so that the Department could plan for the program’s long term financial sustainability. In addition, DAS requested a review of other state interoperable radio systems to better understand how MARCS compares to the structure and funding of similar programs in other states. The Department asked that this audit be completed by April of 2023 so that the audit findings could be used to inform the Department’s FY 2024 budget requests.

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<sup>1</sup> The Ohio Auditor of State, through its Ohio Performance Team (OPT), is required by Ohio Revised Code (ORC) § 117.46 to complete at least four performance audits of state agencies or, at its discretion, institutions of higher education during each biennium. This performance audit was conducted at the Department’s request in accordance with this requirement. Performance Audits are conducted in compliance with Generally Accepted Government Auditing Standards (GAGAS). Please see [Appendix A](#) for additional details.

# Department of Administrative Services

The Department of Administrative Services (DAS or the Department) provides a variety of administrative and support services to other government entities, primarily state agencies. These services include information technology services, facilities and asset management, and human resources management. The majority of DAS’s operations are funded by revenues collected from other government entities. In fiscal year (FY) 2022, the Department’s total budget was \$757.9 million. Of this, \$592.1 million, or 78 percent, came from revenue for services provided to other agencies.

The Department is a cabinet level agency and is led by a Director who is appointed by the governor. The Director is supported by Deputy Directors and Assistant Directors, which head each of the agency’s subdivisions: the Office of Collective Bargaining, Office of Information Technology, Human Resources, Equal Opportunity, Administrative Support, and General Services.

The Office of Information Technology within DAS is responsible for delivering statewide information technology and telecommunications infrastructure. The MARCS program is housed within the Office of Information Technology and has 28 employees with a program budget of \$30.9 million in FY 2023, with an additional state subsidy of \$2.5 million. These individuals are responsible for the daily oversight, maintenance, and repair of the MARCS network.<sup>2</sup> In addition to DAS, which is responsible for MARCS, there is a MARCS Steering Committee, a stakeholder driven body with representation from state and local government agencies, which provides general oversight and guidance. The MARCS Steering Committee is responsible for strategic oversight of the system including planning for future repairs, maintenance, and statewide upgrades, as well as advising in determining the amount of user fees.

## Interoperable Radio Systems

Radio systems used by first responders can be broadly divided in to “trunked” and “non-trunked” systems. Traditionally, emergency responders used non-trunked systems, which use short range radios that are manually tuned into a specific frequency and channel to communicate with each other. Non-trunked systems have limited range and are difficult to coordinate across organizations.

Interoperable radio systems use trunked networks, which allow for multiple lines of communication using the same primary network. A modern interoperable trunked radio communication network operates like a cell phone network. Using a network of towers and central computers, or cores, radios can be assigned to open channels on the network as needed. These trunked systems automate the assignment of radios to channels using a core computer, and

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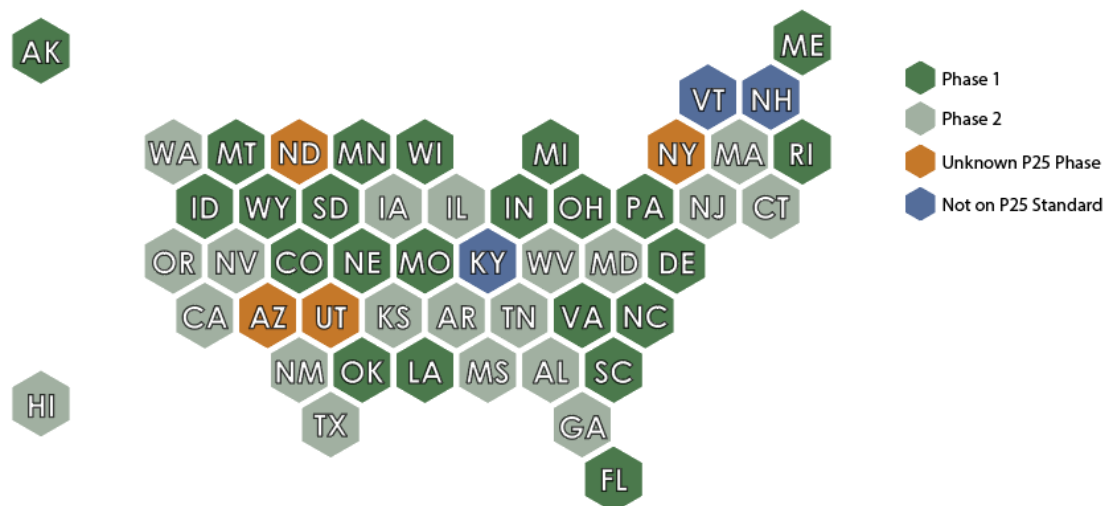
<sup>2</sup> Maintenance and repair of radio towers is outsourced to a third party.

because of this, fewer channels are needed. MARCS is the interoperable radio system that is maintained by Ohio.

MARCS, and other interoperable radio systems, digitally transmit data using a packet system. When a user speaks into the radio, the data is broken up into packets and transmitted through a nearby tower. Towers receive and instantaneously project back out the information. Other radios on that channel will reorganize and unpack the data to be heard by the user on the other end.

The federal government, through the Department of Homeland Security’s Cybersecurity and Infrastructure Security Agency (CISA), has set some standards for the use of interoperable radio systems for emergency responders. Per these standards, users must purchase compliant radios and register them with the radio network. Once registered, radios will be able to enter talk groups or channels to actively communicate. Modern systems operate on the Project 25 (P25) set of standards. P25 standards offer guidance for how radio manufacturers design their products. These standards are divided into two phases, Phase 1 and Phase 2. The variation in the two phases is in relation to how users are assigned to channels while using the network. Phase 2 uses a more efficient technology that allows for increased capacity. P25 standards include security and encryption standards to prevent unwanted intrusion into the network. While this prevents unregistered users from talking on the system, any trunked radio scanner could read the signal and listen to the chatter. The map below shows each state’s status regarding the adoption of P25 standards. Ohio’s MARCS system currently operates using Phase 1 standards. The system itself could be upgraded to be Phase 2 compliant, should DAS choose to do so in the future.<sup>3</sup>

### Technology P25 Status



<sup>3</sup> Phase 2 devices may not be backwards compatible with Phase 1 devices as they transmit data through different formats, while multimodal radios can operate in both Phase 1 and Phase 2. As such, migrating to a Phase 2 system may necessitate significant capital investment from end users.

# Multi Agency Radio Communications System

MARCS is a digital communication network comprised of more than 370 towers strategically located throughout Ohio. It enables state, local, and federal public safety agencies to communicate instantly and seamlessly with one another during critical incidents and normal day-to-day operations. The System allows for data transmissions, Law Enforcement Automated Data (LEADS) inquiries, and Computer-Aided Dispatch (CAD). The system is part of the state of Ohio's vision to have all responders throughout Ohio to operate on a standards-based, shared, system of systems, allowing seamless communications across all disciplines, ultimately offering all users a single integrated platform maximizing operability and interoperability.

MARCS funding mechanisms are governed by Ohio Revised Code (ORC), more specifically section 4501 of ORC. This includes collecting user fees from participants,<sup>4</sup> ensuring that new communication infrastructure projects are using up-to-date technology when funded by federal or state grants,<sup>5</sup> and that DAS seeks controlling board approval before purchasing the necessary communication systems.<sup>6</sup>

## Program History

The need for communication between responding agencies was identified in 1990 when a deadly flash flood occurred in Belmont County, killing 26 individuals. After this flood, then-Governor Celeste issued a directive to design a new, interoperable radio system. Such a system would allow agencies to communicate with each other and coordinate response activities to maximize their effectiveness.

The need for such a system was again highlighted in 1993 when inmates rioted at the Southern Ohio Correctional Facility in Lucasville. During the Lucasville prison riot, there were several instances where limited communications hampered the ability of officials to appropriately respond to the event. When the riot began, it took nearly three hours for the Warden to arrive at the prison, and while traveling he was unable to communicate. This resulted in delays before control and containment steps were taken by prison staff. As the riot and siege continued, difficulties associated with communication between responding agencies continued to hamper the attempts to manage the situation.

Final negotiations between inmates and authorities involved individuals meeting in the prison yard and operated similar to a game of telephone. The State Highway Patrol Officer who was involved in negotiations used a radio with a weak signal to communicate with someone on the

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<sup>4</sup> ORC § 4501.29

<sup>5</sup> ORC § 4501.301

<sup>6</sup> ORC § 4501.303

other side of the prison wall. The person receiving the radio messages then had to travel to where the Warden was located to relay the message and obtain a reply. Once a reply was received, the individual traveled back to the prison wall and sent a radio signal back to the Highway Patrol Officer. Eventually, the inmates surrendered and control of the facility was returned to proper authorities. However, during the course of negotiations, the inmates threatened to leave because it took so long for demands to be reviewed.

The MARCS Steering Committee was established in 1994 by House Bill 790 during the 120<sup>th</sup> General Assembly. The Committee was established to provide assistance to the Director of DAS for the effective and efficient implementation of MARCS and to develop policies for the ongoing management of the system. In 1999, MARCS had been designed, DAS issued a request for bids on the project, and a vendor had been identified to build the system. Construction on MARCS began in 2000, and in 2002 it began operations.<sup>7</sup>

By 2013, MARCS reached its service capacity and required a system upgrade so that additional users could be added. The upgrade took two years and finished in 2015, at a cost of approximately \$90 million, which was financed by the state using proceeds from the capital budget. The upgrade provides Ohio with an internet-protocol based, integrated system with the coverage and capacity to provide voice and data service for up to 256,000 devices across the state. The upgraded system is projected to meet user demand through 2039, based on the expected useful life of existing infrastructure and technology.

## Services and System Configuration

MARCS allows for two primary types of services, voice services and application services. Voice services allow organizations to communicate with each other over radio. MARCS provides a network that is secure for sharing communications. Application services include Computer Aided Dispatch (CAD), Mobile Data Terminals, and Records. CAD is used by dispatchers and 911 operators and allows for the prioritization of incident calls. CAD also enables the ability to locate responders in the field and effectively dispatch personnel when necessary. Mobile Data Terminals allow for the transfer or submission of data to share information between agencies when appropriate and authorized.

Generally, MARCS uses a system of radio towers located across the state and individual radios for communication purposes. In instances where there is a planned event or unplanned emergency, additional radios may be available for use and mobile towers can be deployed to increase system availability. In maintaining MARCS, DAS is responsible for ensuring the infrastructure of the system is in good, operating condition. This includes maintaining radio towers and network systems that are used for data sharing purposes. The radios that are used to access the system are owned or leased and maintained by individual organizations. Users are

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<sup>7</sup> The initial network was considered completed in 2004 when the last tower of the initial plan was constructed and county by county testing was completed.

charged a monthly fee, based on the number of radios that are registered, to DAS in order to access MARCS.

MARCS users are assigned to talk-groups, which is a predefined group of radio users who can privately communicate with one another and can use any of the channels available in a trunked system. During critical incidents and events, responders can effectively communicate across agencies, which is known as intra-agency communication. This can be done via the assignment to specific talk-groups designed for users that need to communicate across agencies during critical incidents and events. The specific talk-group for use is normally determined by the commanding personnel or even potentially assigned by dispatch. Once the critical incident or event is over, then the user may return to their regular assigned talk-group used for routine daily activities.

## Financial Information

The MARCS program maintains a vast network of radio towers and a complex computer system that facilitates communication. In order to maintain this system, MARCS requires both operational and capital funding. Operational funding is derived from a combination of user fees and direct appropriations from the state through the General Revenue Fund. Capital expenditures are typically financed through bonds, which are issued by the state for the purposes of raising funds. These bonds are then retired using appropriations from the state's General Revenue Fund. Because capital funding does not impact the annual MARCS budget, our analysis focused on operational revenues and expenditures.

### MARCS Revenue

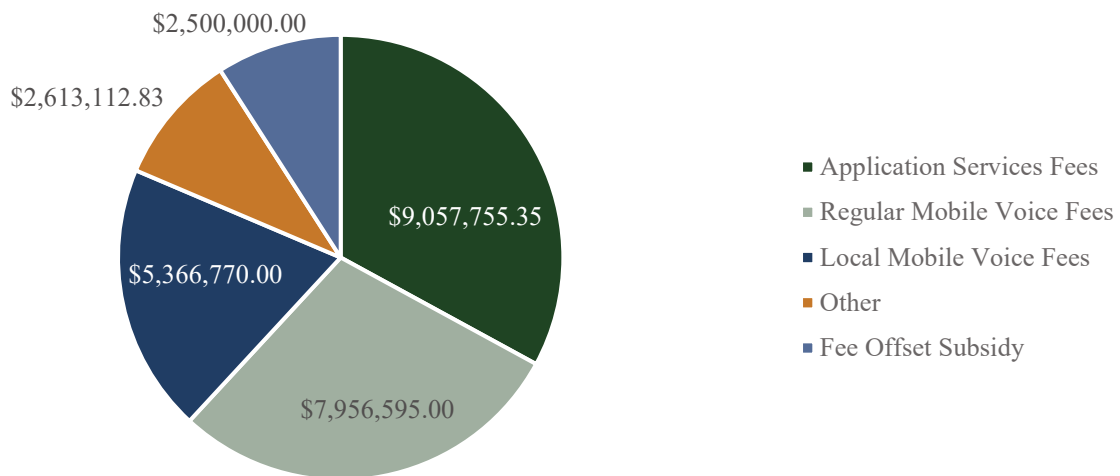
MARCS is primarily funded through a subscription-based, user fee model. Local, state, and private entities obtain their own equipment then pay a monthly subscription for the equipment to be connected to MARCS. Additionally, there is a state funded subsidy, the MARCS Fee Offset, which was introduced in FY 2018, with the purpose of keeping subscription fees low for local governmental users. In FY 2022, MARCS had operational revenue from user fees of approximately \$22.4 million and a subsidy of \$2.5 million. These two revenue sources comprised the majority of the approximately \$27.5 million of total operational revenue in FY 2022, as seen in the chart on the following page.<sup>8</sup>

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<sup>8</sup> "Other" as indicated in the chart below refers to revenue from co-location, other temporary rate reductions, a one-time settlement, and miscellaneous non-billed revenue.



## FY2022 MARCS Revenue



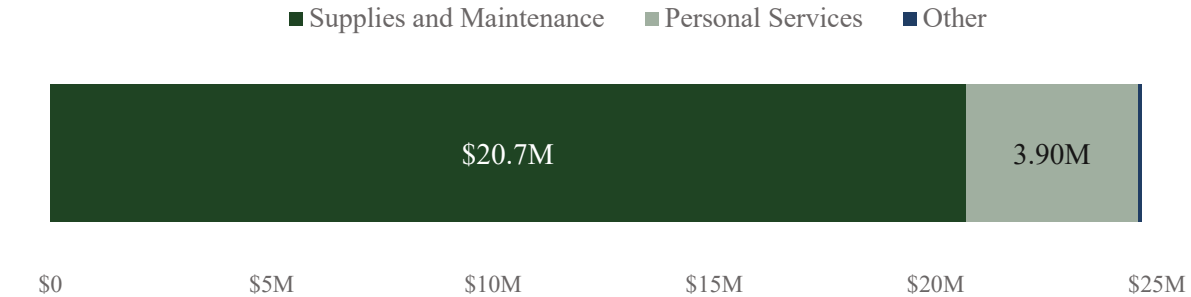
Source: OAKS

Notably, statewide mobile voice and local mobile voice are the same basic radio communication service that is provided by MARCS. The local mobile voice revenue is generated from fees assessed to local government users that are charged \$10 per radio. The statewide mobile voice revenue is generated from fees assessed to state government users that are charged \$25 per radio. The \$25 per radio is considered the regular rate, and local governments are provided a discounted rate by DAS due to the MARCS Fee Offset Subsidy which is designed to keep rates for local governments low.

## MARCS Expenditures

MARCS had \$24.7 million in operational expenditures in FY 2022. The majority of MARCS program operational expenditures are related to supplies and maintenance, which equated to more than \$20.6 million in FY 2022. The remaining operational expenditures of approximately \$3.9 million are related to personal services. The majority of the supplies and maintenance costs, or about \$10 million in FY 2022, are paid to its largest contracted vendor. Under the current contract, DAS pays the vendor in the early months of each fiscal year (see [Recommendation 3](#) for more details). The remaining \$10.6 million are related to internal goods and services, IT, fuel, and utilities.

## FY2022 MARCS Expenditures

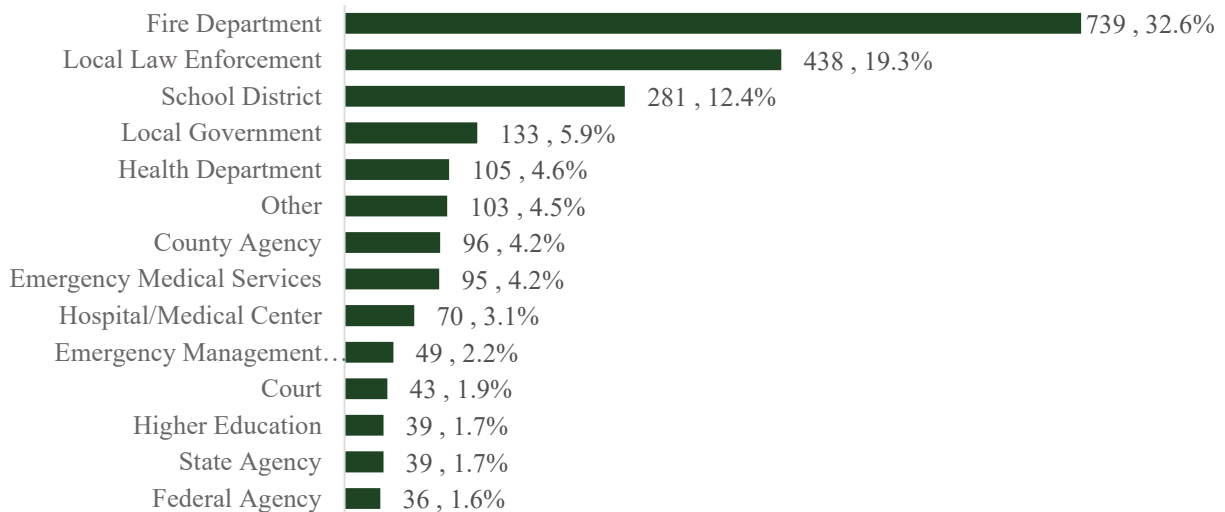


Source: OAKS

## User Base

As of December of 2022, there were 2,226 organizations with nearly 150,000 total radios registered with the network using MARCS. The vast majority of these organizations are governmental, including federal agencies, state agencies, and local governmental entities. In addition to the governmental organizations, there are a small number of non-governmental organizations including private schools and universities, non-profit organizations, and private businesses. A breakdown of entities using MARCS, by organizational type, is seen in the chart below.

## Number of Entities Using MARCS

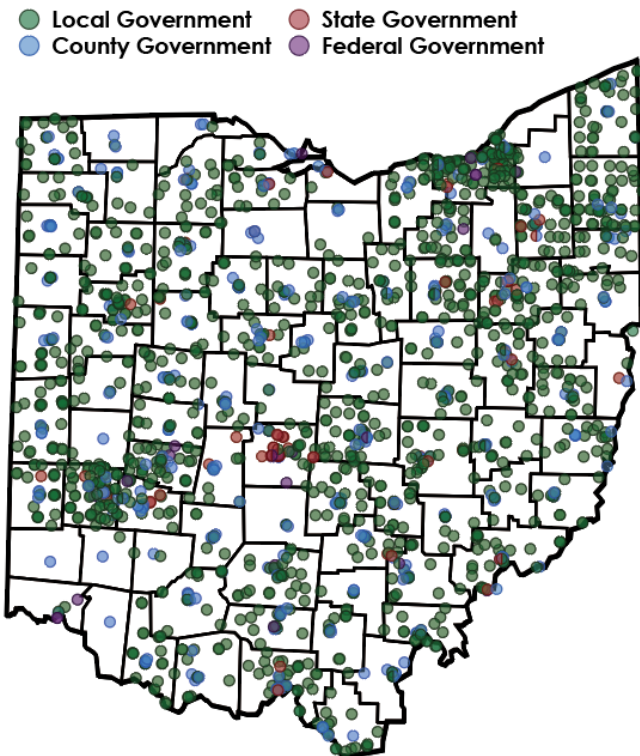


Source: MARCS/DAS

Note: The category “Other” includes dispatch operations, animal control, coroner’s offices, children’s services, non-profit foundations, hazmat, aviation operations, military bases, and 16 private companies.

The map on the following page shows the location of government entities that have joined MARCS. These organizations are spread throughout the state, however there are noticeable areas where there is limited participation. For example, southwestern Ohio has a large population center, but very few organizations that have joined the MARCS program. In many cases, these areas of limited participation may be due to locally developed and operated radio systems.

## Government Entities on MARCS



### Coverage Issues

In any interoperable communications system, radio coverage may at times be insufficient due to geographic factors. Our [Issue for Further Study](#) discusses the potential for increases to the user base. As DAS works to assess market capacity, the Department should consider how best to minimize gaps in coverage.

Source: MARCS/DAS

MARCS is used primarily for regular voice services, the ability to communicate via radio over a secure network. In those areas, like southwestern Ohio, where there is limited participation, it does not mean that organizations lack the ability to communicate with each other; nor does it mean that organizations would be unable to access MARCS in the event of an emergency.

Instead, those areas where a local radio system has been developed and is in operations work in partnership with MARCS. These organizations are given access to MARCS when needed and, in exchange, the organizations own and maintain infrastructure that is used by MARCS to maintain statewide radio coverage. For basic voice services, users are charged a monthly fee based on a tiered system. This system takes into account infrastructure investments an organization may make that would benefit the MARCS system as a whole. In Tier 1 and Tier 2, users are subscribed directly to MARCS and communicate using the state's network. In Tier 3, Tier 4, and

Tier 5, an organization operates a separate interoperable radio network. These partners allow MARCS to use their radio towers and, in return, are granted access to MARCS when they need to communicate or coordinate with organizations on MARCS. For example, in Lucas County there is a countywide communications system that is managed by the County Sheriff's Office. This system provides a platform for radio communications for all first responders in the county. The system includes 12 towers and has over 9,000 active radios. Lucas County is considered a Tier 3 partner.

- **Tier 1 (The Basic Subscriber Model):** This level of user procures their own radios and subscribes to the systems. They are charged a monthly rate and receive the basic services MARCS provides.
- **Tier 2 (The Enhanced Local Infrastructure Model):** This level of user requires either more intense portable radio coverage or more capacity to support additional talk paths. The end user funds additional tower sites or additional repeaters in the existing MARCS sites to increase radio coverage. The ownership, management control, and maintenance of these infrastructure improvements are handed over to MARCS. The local governments receive user fee credits in exchange and pay half the published monthly rate.
- **Tier 3 (The Connecting Existing Zone Controller Model):** This level is a partnership between the statewide MARCS platform and existing county or regional P-25 platforms in place. The Zone Controller at the existing county or regional platform is connected with the primary MARCS Zone Controller. The end user has control over the platform as well as responsibility for the maintenance of the towers which save the State of Ohio operating costs. Therefore, no monthly rate is charged. An example of a Tier 3 partner would be the Butler County Board of Commissioners.
- **Tier 4 (The Sharing of Core Resources Model):** This level of user is looking to migrate to a P-25 system and will be invited to utilize an existing MARCS Zone Controller core rather than purchasing their own Zone Controller. In exchange, similar to Tier 3 users, the end user will maintain control and operational costs saving the State of Ohio ongoing costs. An example of a Tier 4 partner is the Geauga County Board of Commissioners.
- **Tier 5 (The Shared Zone Controller Model):** In this partnership, the State of Ohio/MARCS and a regional P-25 based system joint purchase one or more Zone Controllers and agree to share in the operational costs associated with the Zone Controller. The system will remain in control of the end user and will be responsible for operational costs which saves the State of Ohio ongoing costs. An example of a Tier 5 partnership is the Lake County Board of Commissioners.

Tier 1 and Tier 2 users obtain services directly from MARCS. Tiers 3 through 5 maintain systems independent from MARCS, however the systems can speak to each other when necessary. Further, these systems have radio towers that can be used by MARCS users, such as the Ohio State Highway Patrol, that operate in that area. The combination of the statewide system and locally controlled systems create a network of coverage throughout the state.

## What We Looked At

Our audit had two primary objectives, or questions to answer. The first was to determine if the funding model for MARCS resulted in financial sustainability and the second was to compare MARCS to similar programs in other states regarding functionality and funding. To answer these questions, we conducted a series of analyses on financial data and created multiple financial models for review. We also conducted research on other interoperable radio systems and interviewed several states that were deemed to have similar operations.

## What We Found

There are a variety of ways in which a state can create an interoperable radio system that complies with federal P25 standards. Ohio's system is compliant and generally meets the needs of its user base.

MARCS has historically maintained ending fund balances that are within acceptable ranges based on guidelines set by the Government Finance Officer's Association (GFOA). While the ending fund balances are acceptable based on best practices, due to the timing of payments, the mid-year balances at times can drop to dangerously low levels. This could be addressed by improved cashflows, which are discussed in [Recommendation 3](#).

Generally, the revenues obtained through user fees and the state subsidy have been enough to cover operational costs associated with MARCS. However, our financial modeling indicates that the current fee levels may not be sufficient to account for increased expenditures over the next several years. During the course of the audit, the Governor's biennial budget proposal was released, which would provide \$28 million in direct funding for MARCS, eliminating the need for user fees for all governmental users.

We also found that while fees are assessed and billed monthly under the current model, some entities do not remit payment in a timely manner. When an account is unpaid for 30 days or more, it is considered delinquent, which triggers the OAKS Financials system to generate an aging account statement. The Office of Finance distributes the aging statements to the customer address on file once per month. The aging statements continue to run, and be distributed once per month, until the invoice(s) are paid. Delinquent accounts are then referred to the Attorney General's Office, as required by the ORC, after 45 days to be certified in order for collection activities to commence. However, while delinquent accounts are referred to the Attorney General, these accounts are not pursued for collections at the request of DAS.

We found that DAS and the General Assembly should carefully consider a variety of issues in relation to MARCS. Our recommendations are based on detailed financial modeling and reviews of industry standards and best practices and are designed to improve the effectiveness, efficiency, and transparency of MARCS, particularly in relation to its continued financial stability.

# Summary of Recommendations

**Recommendation 1:** MARCS is a critical government service that provides emergency communications to organizations throughout the State and cannot be allowed to go offline. In order to maintain the personnel and systems necessary for operations, MARCS must remain fiscally stable. The financial modeling conducted by our office indicate that the program may be unable to meet financial obligations in approximately 2027. To prevent the need for emergency funding measures from the state General Revenue Fund, DAS must work to secure the program's future financial stability now. This could include increasing the program's user base, increasing fees, or considering alternative funding models. By working to resolve future financial issues now, the Department can avoid catastrophic disruptions to MARCS services.

**Issue for Further Study:** MARCS administrators have indicated that the current system should remain viable for several years and can handle a large increase in user base over time. However, due to the potential impact of providing MARCS services for free to all governmental users, MARCS administrators and the General Assembly should further consider the implications of a sudden increase in demand that may occur if the budget proposal is approved, along with several other business intelligence considerations.

**Recommendation 2:** When individuals or organizations receive a service, there is an expectation that any associated bills will be paid in a timely manner. MARCS user fees that are not paid within a 30-day period are considered delinquent and are referred to the Ohio Attorney General's office for collection purposes after 45 days. We found that while DAS takes some action to pursue collections through informal procedures, there is no coordination to collect the delinquent fees once they are referred to the Attorney General's Office. MARCS administrators should develop a formal policy which addresses existing delinquent account collection activities. Doing so will ensure the MARCS program is addressing all user accounts in a fair and transparent manner.

**Recommendation 3:** Having a sufficient level of cash reserves is critical for ensuring adequate, uninterrupted delivery of program services. Cash reserves that are appropriate to the level of a program's operating expenses are not only an indicator of overall financial health, but in practical terms, they help to mitigate the risks of failing to cover both routine expense obligations, as well as those resulting from unforeseen circumstances. While the MARCS fund's cash balances appear to be healthy at the end of each fiscal year, they tend to dip below safe levels throughout the course of a year as a result of the timing of payments associated with some of its largest contracts. This leaves the program more susceptible to cash shortfalls, which could translate into service levels that are not optimal. DAS should take steps to proactively manage program cash flows through some combination of modifying vendor payment timing and revenue receipts from customers, to ensure fund balances exceed a minimum safe level throughout the year. Doing so would mitigate the risk of fund deficits in the future. Adjusting the timing of either expense payment terms for its largest contracts or the timing of revenue receipts from its customers could mitigate the risk of fund deficits in the future and would help ensure the seamless delivery of services.

# Program Comparisons to Other States

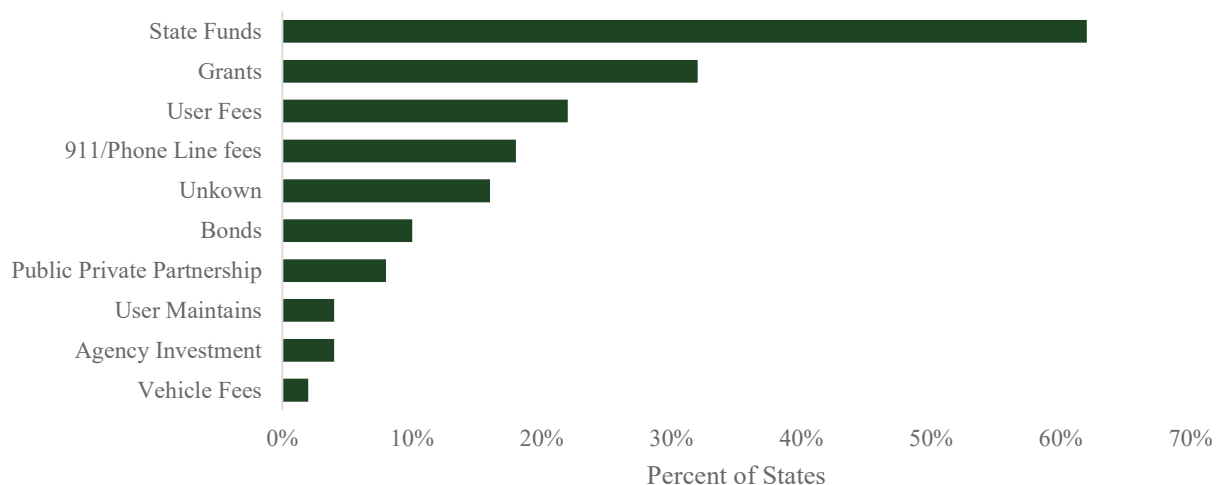
To better understand the MARCS financial funding model and operating technology, we reviewed all 50 states’ interoperable emergency communication systems across the country using publicly available information and solicited feedback from a select number of states through surveys and interviews. Our insight into this area was also limited at times due to the lack of response from other state agencies.

All 50 states have an interoperable radio communication system that is capable of voice and data transfer. The majority of these systems were created in the mid-2000s with California’s system, created in 1980, being the oldest. The technology used to transmit radio signals can vary between states and is largely dependent on terrain. While technological superiority is difficult to determine, we did compare the technology used for the MARCS program to that of other state radio systems. We found that Ohio is operating on the same type of radio frequency as many other states and that it is one of 47 states that are P25 compliant. While the MARCS program is Phase 1 compliant, there are 20 states that have moved on and are operating according to Phase 2 requirements.

MARCS uses both fiber and microwave technology to transmit signals between towers. This is a best practice in that it provides redundancy in case one method fails. Also, using microwave technology is considered to be the best option as it is not reliant on a cable to create a connection between towers.

## Funding Models

States rely on a wide range of funding sources for interoperable radio systems, as seen in the following chart. More than 60 percent of state systems rely on some form of state funding, including Ohio. Federal grants, user fees, partnerships, surcharges, and other methods are also

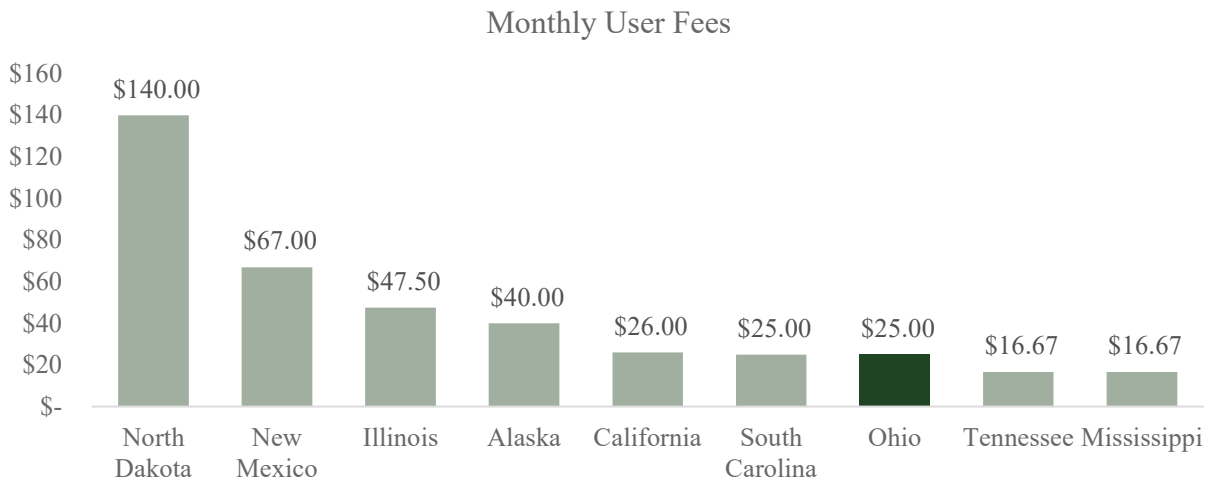


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used to generate revenue to operate the radio systems. Many states, like Ohio, rely on more than one funding mechanism to raise revenue.

Using publicly available information, we identified other states that charge user fees. The chart below shows how Ohio’s current fees compare to other states. We found that, of the states with a user fee, Ohio’s was among the lowest. Further, we used the full rate of \$25 for this comparison; the \$10 rate paid by local government organizations would be the lowest fee assessed.

### *User Fee Comparison: All State with User Fees*



While Ohio has one of the lowest user fees, it is important to note differences in some of the states represented in the chart. In particular, North Dakota, New Mexico, and Alaska all have low population density, which may limit the total user base. Further, the terrain that must be covered in these states includes more variation than Ohio, which could require more radio towers.

### **Other State Outreach**

After conducting general research, we sent a survey to 33 states and requested interviews with representatives from 21 of those states. We received a total 15 responses; eight states responded to our survey and we conducted interviews with seven states.

Based on our outreach to other states, we confirmed that there are a variety of funding models that are used by interoperable radio systems. The responding states relied on some combination of user fees, state funding, or federal grants. Notably three states, West Virginia, Michigan, and Utah have moved from a user fee-based model to alternative funding models. Through our interviews, we were able to obtain additional information regarding the opinions of the administrators of other state interoperable radio systems. Based on their experiences,



interviewees provided us with a select number of recommendations for interoperable communications programs, in general. These included:

- Focus on building relationships with communities;
- Prioritize microwave connections over fiber optic;
- Participate in Motorola Trunked User Group and FEMA region collaboration opportunities;
- Have strong contractual language on rates, outages, and equipment; and,
- Maximize the number of users.

Ultimately, our review of other state interoperable radio systems did not identify a best practice for funding models. There is variation from state to state and little industry guidance on how best to finance an interoperable radio network.

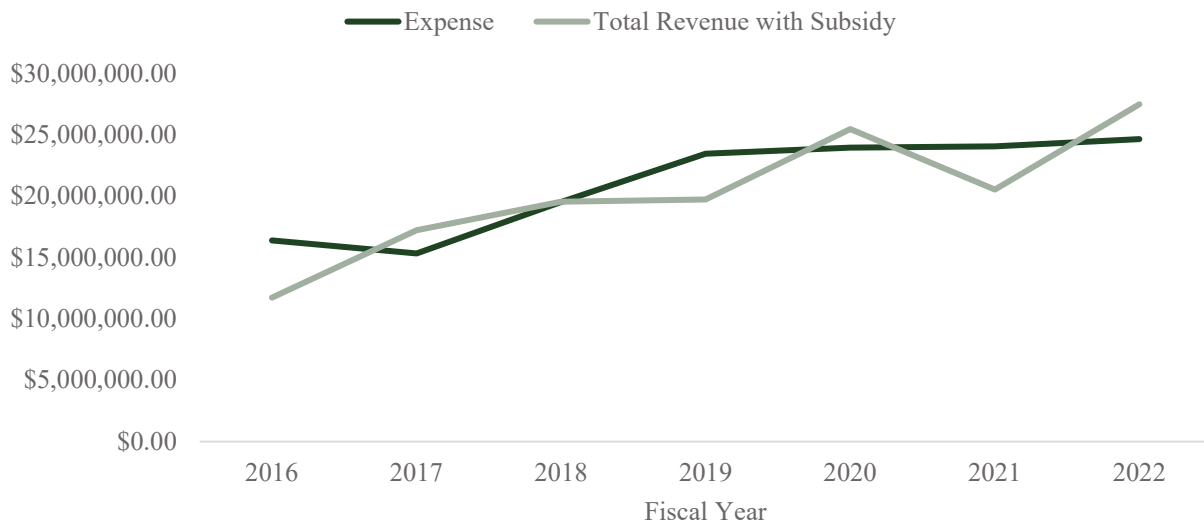
# Financial Modeling

Financial modeling allows an organization to forecast future revenues and expenditures based on historic trends and results of operations. These models can be used as decision-making tools and, in the case of governmental organizations, can allow for the strategic allocation of taxpayer funds.

## Historic Financial Data

Prior to creating financial forecasts, we reviewed and analyzed historic MARCS financial data. Revenue and expenditure data from the seven prior fiscal years were used to develop our model. As seen in the chart below, both expenditures and revenues have grown during this timeframe. It should be noted that the jump in revenue from FY 2019 to FY 2020 was, in part, due to the increase in user fees and that the dip in revenue from FY 2020 to FY 2021 was due, in part, to a change in the timing of when MARCS services fees were collected.

## Operational Revenue and Expenditures



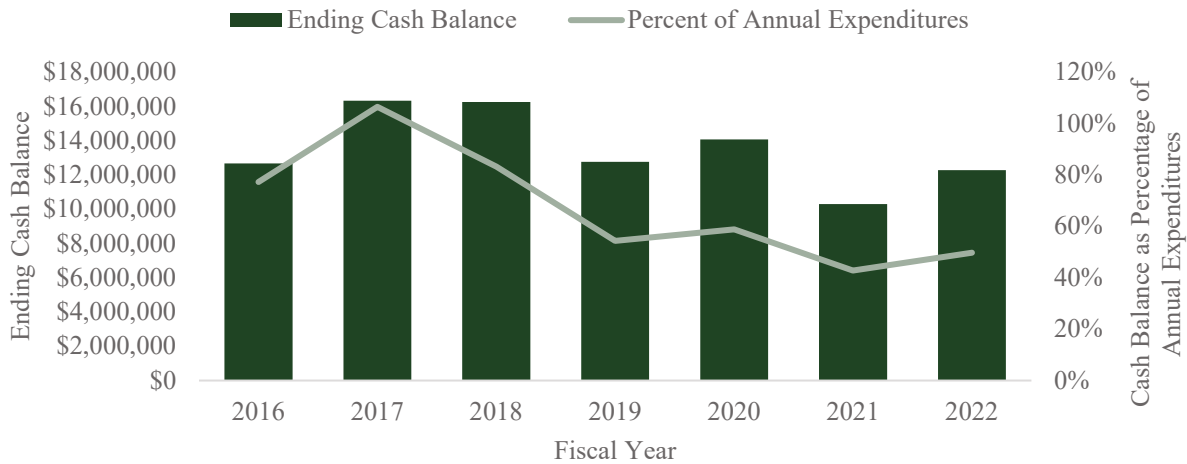
Source: OAKS

It is critical to understand that while revenues have generally kept pace with expenditures, this was due to the increase in user fees and the state subsidy that provided direct operational funding for MARCS. Notably, in FY 2019, prior to the increase in user fees, expenditures exceeded revenue by more than \$3.7 million.

The resulting fund balance for the MARCS program has remained relatively steady in terms of the size within the fund. However, the fund balance effectively has been declining when viewed as a percentage of annual expenditures. This look shows how much of a year's expenditures can be covered by the end of year fund balance. A value of 100 percent indicates that the ending fund

balance is sufficient to cover an entire year of expenditures. While the fund balance’s effectiveness is declining primarily due to increasing operating costs, it is still above the Government Finance Officer’s Association recommended level of two months or 17 percent of coverage by year end as shown in the chart below. The fund balance during the course of the year was looked at in further detail within [Recommendation 3](#).

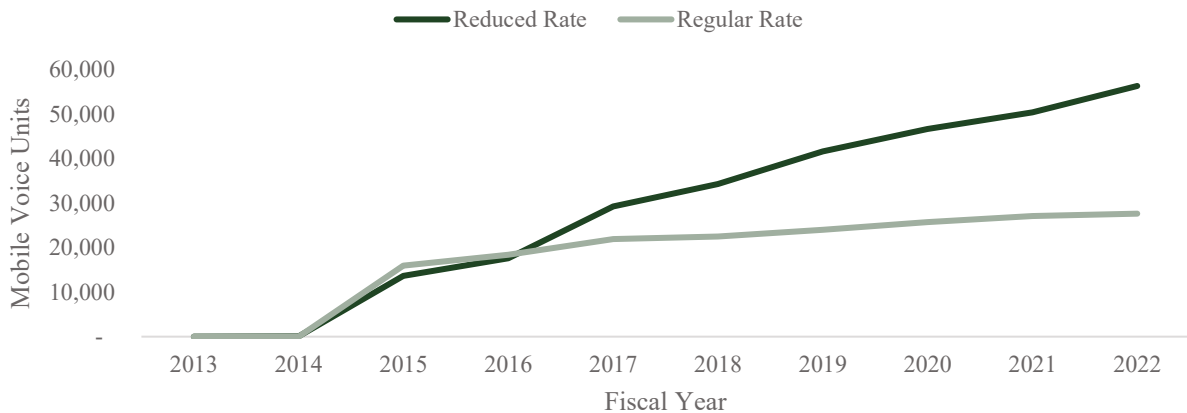
### Ending Cash Balance Over Years



Source: OAKS

The chart below shows growth in both reduced rate and regular rate billable units over time. As the chart indicates, there has been significant growth in the number of units in the program since 2016, particularly with the reduced units. During this seven-year timeframe, the number of radios registered with MARCS more than doubled, going from approximately 36,000 to approximately 84,000 units.

### Total Billable Mobile Voice Units



Source: MARCS/DAS

Again, it is important to note that the majority new units, or radios, during this time frame were added at the reduced rate. These reduced rate radios provide minimal additional revenue for operation.

Subscribers for application services are largely limited to three state departments; ODNR, ODPS, and OEPA. The amount of subscriptions from these departments has generally been on the decline since FY 2017. For more information, please see [Appendix B](#).

### Financial Projections

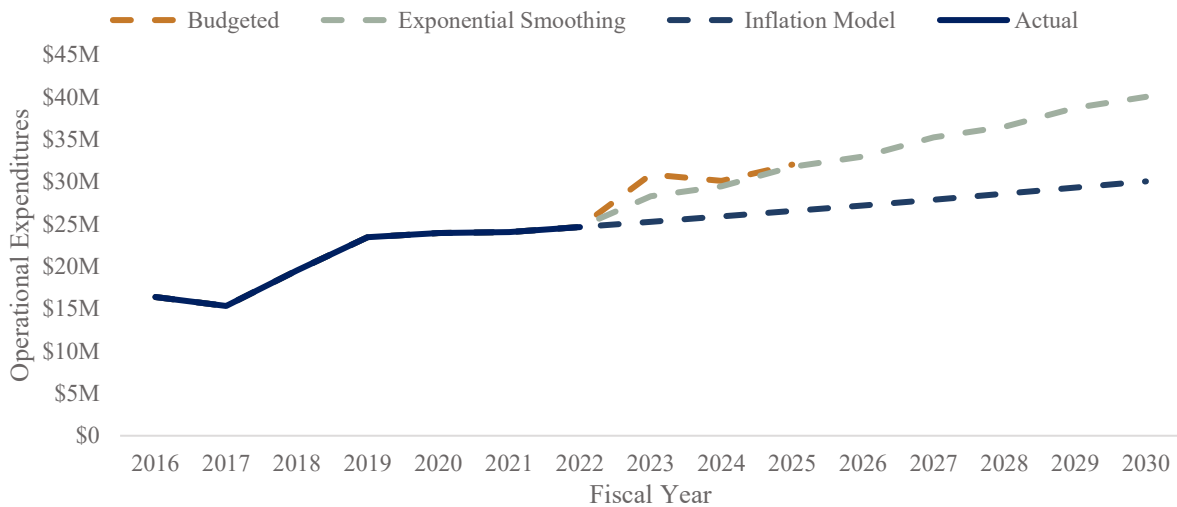
MARCS administration expenses, or operational expenses, were used for fiscal years 2016 through 2022 to project a trend into future years up to FY 2030 using a financial model that is based on historical performance and extends that line of best fit to future years. This model, exponential smoothing, is a time series forecasting method using weighted averages of past annual expenditures. The chart below shows the cost projections along with the budget requests through FY 2025. Notably, the exponential smoothing largely follow the budgeted amounts up to FY 2025.

### Future Budget Proposals

During the course of the audit, the Governor released his budget proposal for the FY 2024-25 biennium. This proposal includes funding for MARCS that would cover all projected operational expenditures in FY 2024 and FY 2025.

Our analysis was conducted prior to the announcement of this budget proposal. As such, our projections do not include this funding. If the budget were to pass as proposed, the expected revenues and expenditures for MARCS would likely drastically change.

### MARCS Operational Cost Projections



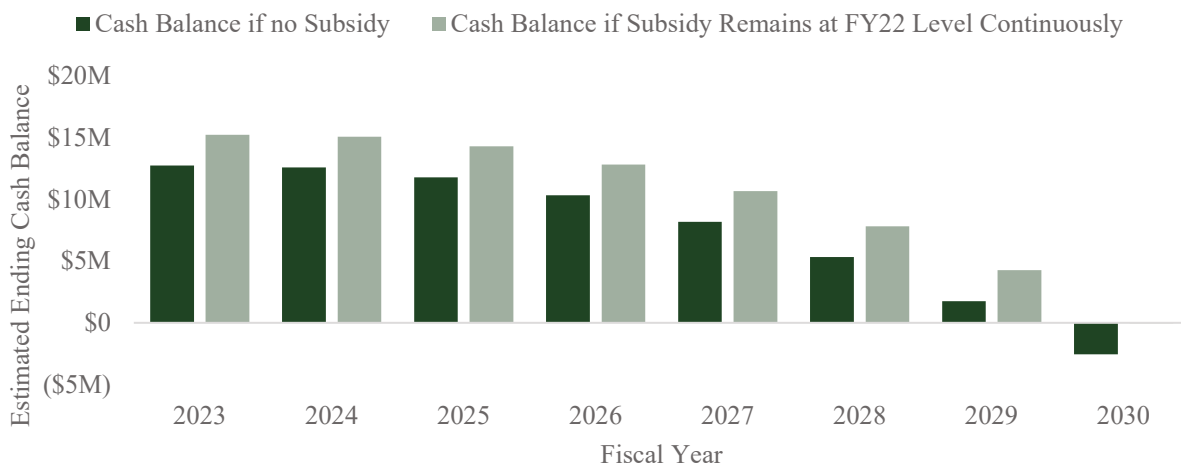
Source: MARCS/DAS

The projected expenditure growth, as seen in the chart above, predicts a 6 percent effective rate of increase annually. Alongside the increase in expenditures, we project the program to see growth in the user base. Local mobile voice users are expected to grow by 90 percent and statewide mobile users are expected to grow by 48 percent. Application services would decrease by 23 percent during this timeframe, resulting in a loss of revenue.

To understand the impact increasing expenditures would have on the MARCS program’s fiscal stability, we created two models:

**Model A**, the inflation model, assumes a scenario in which there is no program growth. This means the number of users remain the same as they are in the most recent year, user fee rates stay as they are in the most recent year, and the impact on the program’s sustainability based on cash balances against expenditures if expenditures were to only rise with inflation continues. This was mapped out through FY 2030. The inflation rate used was the historical annual rate over the past decade, which is effectively 2.5 percent. As seen in the chart below, without additional revenue, MARCS would have a negative fund balance at year end in FY 2030 solely from the average rate of inflation.<sup>9</sup>

### Model A: Inflation Based Financial Projection



Source: MARCS/DAS

It is important to note that **Model A** is a conservative approach to future cost projections in that it does not assume any growth, even though the program has indeed experienced steady increases in participation from year to year. As a result, the marginal cost associated with adding new users is not factored into the projection, and therefore, is not likely to be as accurate of a representation

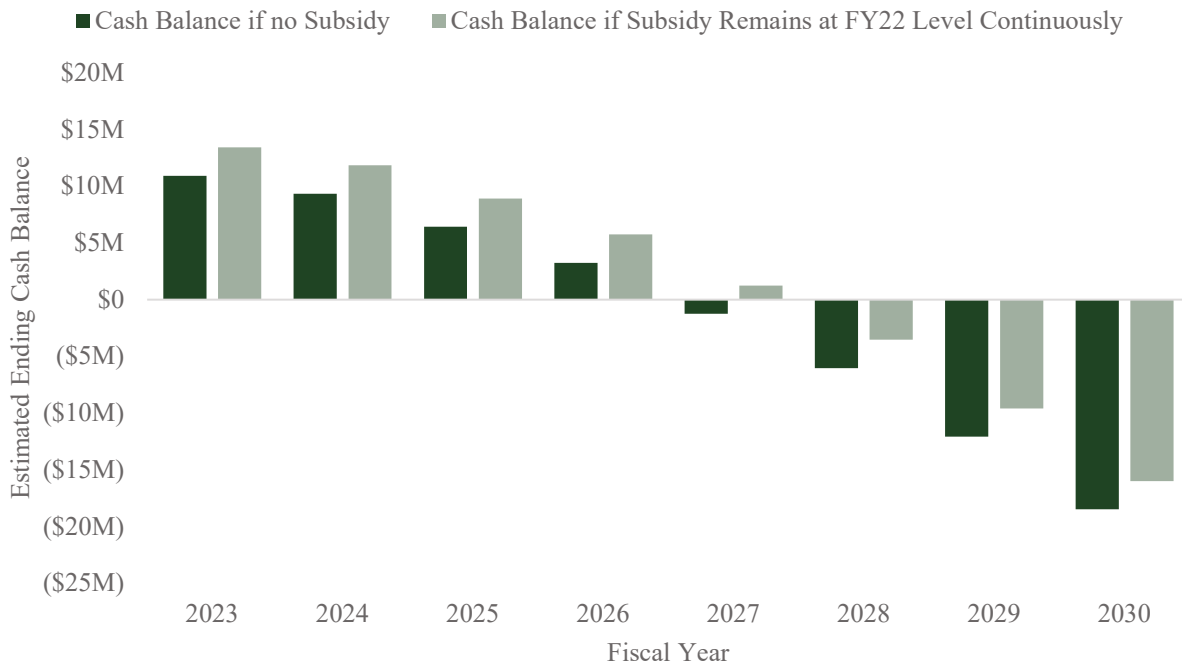
<sup>9</sup> While program controls would prevent a negative balance from materializing, it is shown here for the purposes of projecting the size of the deficit.

of future cost in comparison to a projection that accounts for historical growth and the associated expenses.

**Model B**, the exponential smoothing model, assumes a scenario in which the current trend of program growth continues into the future. This means the number of users increase at the expected rate based on historical experience, but user fee rates stay the same, and the impact on the program’s sustainability based on cash balances against rising expenditures following the exponential model continues. This was also mapped out to FY 2030.

While current revenues are sufficient to cover the current operational costs, this model shows that the MARCS program expenditures may grow at a faster rate than the MARCS program revenues. This may result in a negative fund balance over time. As seen in the chart below, without additional revenues, MARCS could have a negative fund balance at year end in FY 2027. Further, as discussed in [Recommendation 3](#), due to the current cashflow of the MARCS program, there could be a period prior to FY 2027 where the MARCS program could risk a mid-year zero balance at a point during the fiscal year, which would preclude program spending prior to the year end.

### Model B: Exponential Smoothing Based Financial Projection



Source: MARCS/DAS

Both models show that revenue increases are needed in order for the program to breakeven. The Department will need to consider three revenue-related changes that can impact the program: increasing the subsidy, increasing user rates, and/or significant growth to the program.

Alternatively, DAS would need to seek out alternative funding for ensuring financial stability. [Recommendation 1](#) shows the impact of the subsidy on the fund balance and what the subsidy would have to be in order to breakeven for **Model B**. Also, the monthly rates needed for each service were calculated in future years based on multiple scenarios. Finally, the number of subscribers needed in future years to breakeven with the exponential model was calculated, holding application services constant.

## Ongoing Capital Expenses

The financial modeling contained within this report focuses primarily on operational revenues and expenses. However, ongoing capital expense is a key consideration with respect to the future financial sustainability of the program. As discussed in the Introduction, debt service on the bonds issued to pay for the immediate costs of capital projects is paid through appropriations from the state’s General Revenue Fund. Based on the program’s current configuration of equipment and capital assets, the debt service appropriation has hovered around \$6.6 million annually. However, the needs of the program may evolve due to future program growth, which could necessitate future capital investment, and subsequently, additional capital expense. As such, any future budgets should consider the cost implications of needed equipment and infrastructure expansion. See [Issue for Further Study](#) for additional discussion related to future capacity planning.

Ultimately, DAS must make decisions regarding the MARCS program to ensure its continued fiscal stability. The following recommendations provide detailed information and analysis regarding the steps DAS officials should take in determining how to address the projected budget issues. Our recommendations are supported by the financial modeling we conducted, which provides the basis for why it is necessary to make proactive decisions to ensure the efficient use of taxpayer resources.

# Recommendation 1: DAS Should Ensure Program Stability

MARCS is a critical government service that provides emergency communications to organizations throughout the State and cannot be allowed to go offline. In order to maintain the personnel and systems necessary for operations, MARCS must remain fiscally stable. The financial modeling conducted by our office indicate that the program may be unable to meet financial obligations by 2027. To prevent the need for emergency funding measures from the state General Revenue Fund, DAS must make changes to secure the program's future financial stability now. This could include increasing the program's user base, increasing fees, or considering alternative funding models. By working to resolve future financial issues now, the Department can avoid potential disruptions to MARCS services.

## Impact

The MARCS program provides critical communication channels to emergency responders and other member organizations. Because this service is necessary to ensure the health and safety of Ohioans, it cannot be turned off due to fiscal insolvency. If DAS allowed the MARCS fund balance to reach critically low levels, it would likely necessitate direct funding from the state's General Revenue Fund and could require diverting funds from other statewide programs that DAS operates.

## Cash Flow Issues

Cash flow is an additional concern when creating financial forecasts. As discussed in [Recommendation 3](#), it is possible MARCS will experience critically low funding levels on a monthly basis before the program experiences a year end negative fund balance.

## Background

As discussed, MARCS is Ohio's interoperable radio system which facilitates the communication between organizations and is used in emergency situations or large events. The program has been operational since 2002 and has already gone through one major systems upgrade, which was completed in 2015.

As of December 2022, there were approximately 30 DAS employees that worked on MARCS, but employee costs make up only a small portion of the program's annual budget. The majority of the program's annual expenditures are related to the maintenance and upkeep of the radio towers, which is provided through a contract with a third-party vendor. Due to the make-up of the program's expenditures, it is likely that to meet future fiscal needs, DAS will have to identify additional revenue sources.

Currently, MARCS is funded through a combination of user fees and state subsidy, with capital related expenditures being paid using bonds issued directly by the state. User fees are set at \$25 per radio for regular mobile voice users, but the majority of organizations pay a reduced rate of



\$10 per radio. The reduced rate is offset by a state General Revenue Fund subsidy which, in FY 2022, was \$2.5 million.

In our analysis, we developed two financial models to project revenues and expenditures. In both of the models we developed, MARCS may have a negative cash balance within the next decade, based on increasing expenditures, stagnant user fees, and current state subsidy levels. **Model B**, the exponential smoothing model, is likely more realistic than the inflation model due to it reflecting continued growth in the program and its corresponding costs. The following analysis will be reflective of expenditures from that model.

## Methodology

Our financial modeling indicated that MARCS may need to make program adjustments to ensure financial stability. To provide DAS with recommendations regarding how to prevent negative cash balances, we reviewed best practices regarding long-term strategic planning.

We identified potential options to consider associated with increasing revenues or altering funding mechanisms. This was done through an in-depth analysis of user rates, market saturation analysis, and interviews with peer states.

## Analysis

According to the GFOA, organizations should engage in long-term financial planning that goes beyond the annual budget cycle and multi-year capital plan. Long-term financial plans include revenue and expense projections, as well as the identification of key factors and potential risks that could have an impact on the organization’s financial sustainability and the continued delivery of its services.<sup>10</sup> The analysis contained within this recommendation could provide a foundation for such planning efforts in the future.

As previously discussed, the MARCS program may have a negative fund balance within ten years if expenditures continue to increase in-line with historic trends alongside growth in the MARCS program userbase. DAS will need to make adjustments to proactively address the expected budget shortfalls in the coming years. Because reducing expenditures is likely not an option, the Department will need to consider three revenue-related changes that can impact the program: increasing user rates, significant growth to the program, or seeking out alternative funding.

*During the course of the audit, the Governor released his biennial budget proposal. This proposal calls for a direct budget appropriation of \$31.3 million in FY 2024 and \$33.2 million in FY 2025 to the MARCS program. This appropriation would, according to officials from DAS, fully fund the MARCS program and eliminate all governmental user fees. The analysis presented in this recommendation was conducted prior to the publication of the proposed budget and does*

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<sup>10</sup> *Long-Term Financial Planning* (GFOA, March 2022)

*not take into consideration the changes that may occur as a result of the proposal. We have created an Issue for Further Study that discusses various elements that should be understood as the General Assembly considers the proposal.*

### Subsidy and User Rate Analysis

For regular mobile voice, MARCS charges a rate of \$25 per radio, but offers a reduced rate of \$10 per radio to local government organizations. The vast majority of organizations using MARCS, 86 percent, pay the reduced rate. This equates to approximately two-thirds of all radios on the system. In FY 2022, user fees generated approximately \$25 million in revenue. This revenue, combined with the \$2.5 million subsidy from the state, was enough revenue to cover operational expenditures in FY 2022.

While current revenues are sufficient to cover the current operational costs, our financial model shows that the MARCS program expenditures may grow at a faster rate than the MARCS program revenues. This may result in a negative fund balance over time. As previously mentioned with **Model B**, without additional revenues, MARCS could have a negative fund balance at year end in FY 2027. Further, as discussed in [Recommendation 3](#), due to the current cashflow of the MARCS program, there could be a period prior to FY 2027 where the MARCS program could risk a mid-year zero balance at a point during the fiscal year, which would preclude program spending prior to the year end.

**Model B** assumes a steady rate of growth in the MARCS program user base as well as continued historic trends in expenditure levels. Assuming this rate of continued growth with current rates, one mechanism for staving off fund balance deficits could be an increase to the state subsidy. An increase of the subsidy to \$6.4 million would be needed to maintain fund solvency through FY 2030.

The projection also does not consider the potential for increased user fees. According to the Government Finance Officer's Association (GFOA), there are certain elements that should be considered when setting charges and fees for services:

- What applicable laws and statutes are there regarding charges and fees?
- Are formal policies in place regarding the pricing factors or rationale for any subsidies?
- What is the full cost of providing the service?
- Are rates periodically reviewed and updated?
- Are long-term forecasts and plans consistent with the decision-making in the rate setting process?
- How will the public be involved in the fee-setting process, and how will they be informed of the result?

The Director of DAS is authorized to determine the amount of user fees under ORC 4501.29. Since some entities use federal grants to be on MARCS, the fees are set in accordance with Appendix V to Part 200 of Title 2 of the Code of Federal Regulations and includes tying fees to

the estimated costs of providing the services, which includes an estimate of allocable central service costs. The federal regulations establish standards for cost principles for fees and services, and so federal grants cannot be charged additional costs outside of the determined allowable costs.

DAS has increased fees for MARCS once, in 2020. The table below shows the fees necessary to generate enough revenue to cover direct costs, or operational expenditures, through the end of this decade.

### Projected Breakeven Rate Calculations

<b>FY</b>	<b>MARCS Projected Expenditures</b>	<b>Local Mobile Voice Rate Monthly</b>	<b>Regular Mobile Voice Rate Monthly</b>	<b>Application Services Monthly</b>
2023	\$28,300,699.97	\$9.60	\$24.00	\$456.78
2024	\$29,491,439.99	\$10.02	\$25.05	\$476.85
2025	\$31,785,887.88	\$10.83	\$27.08	\$515.53
2026	\$33,002,584.16	\$11.26	\$28.16	\$536.04
2027	\$35,271,075.78	\$12.07	\$30.17	\$574.28
2028	\$36,526,848.28	\$12.51	\$31.28	\$595.45
2029	\$38,756,263.69	\$13.30	\$33.26	\$633.03
2030	\$40,051,112.40	\$13.76	\$34.40	\$654.86

Source: MARCS/DAS

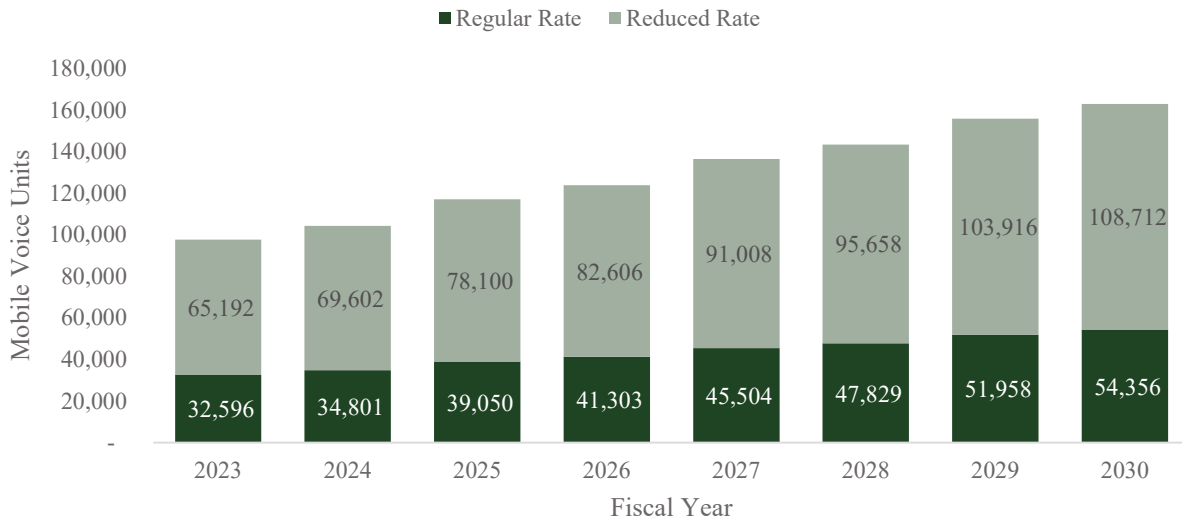
Note: This calculation assumes the full collection of user fees

In addition to assuming the full collection of user fees, this analysis assumes a consistent rate of growth for mobile voice users amongst both the reduced and regular rate. Additionally, the analysis assumes a consistent rate of decline for application services subscriptions. If the state subsidy does not increase from the current amount of \$2.5 million annually, the rates for all users will need to increase beginning in FY 2024 and would continue to increase in each year of our projection. DAS could incorporate periodic fee increases as a part of a long-term strategic plan associated with MARCS.

### Program Growth Analysis

MARCS could increase revenue through growth to the program from additional users. To keep rates at their current levels, the number of mobile voice units subscribed to MARCS would have to significantly increase in order to breakeven on operational expenditures. As seen in the chart below, approximately 163,000 mobile voice units are needed by FY 2030 to support growing expenditures with current rates, while assuming the mix of mobile voice users remains the same and application services subscriptions remain constant.

## Mobile Voice Units Needed to Breakeven with Current Rates



Source: MARCS/DAS

This level of increase in regular and reduced rate mobile voice subscriber units equates to growth of 97 percent and 93 percent, respectively, which far outpaces the historical growth trend of 48 percent and 90 percent, respectively, from FY 2016 to FY 2022.<sup>11</sup>

While MARCS has a robust user base across Ohio, it has not yet achieved 100 percent market saturation. DAS was unable to provide us with a definitive number of government organizations that are not on MARCS, but that would potentially benefit from the network. To approximate the opportunity for growth, we focused on developing a model to identify the number of radios attached to fire departments, local law enforcement, and emergency medical services that could be added as new subscribers.

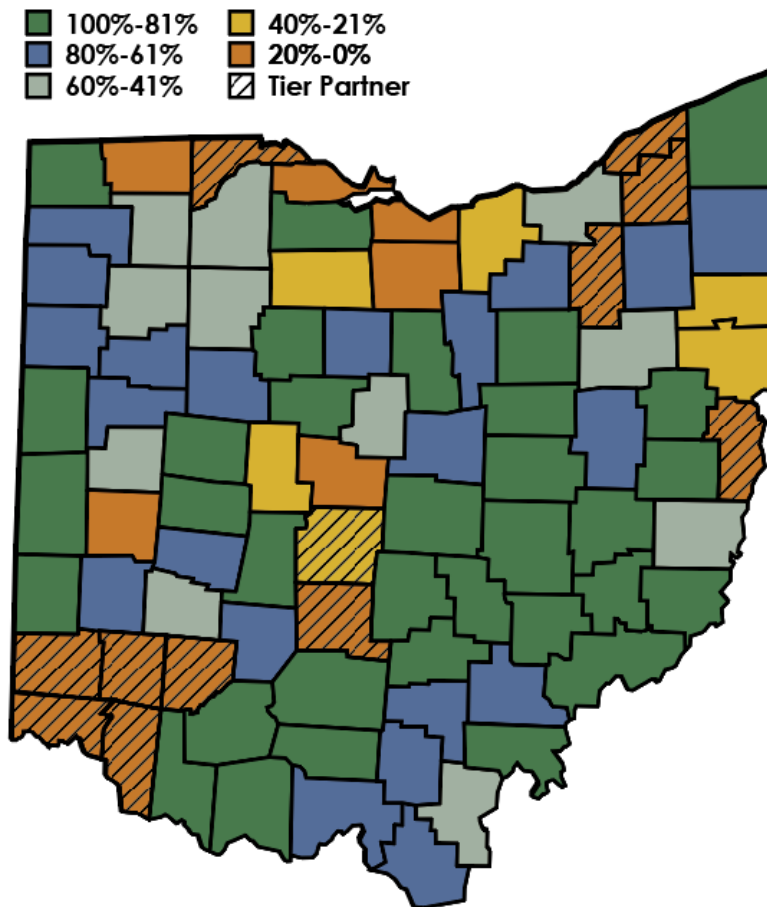
To better understand the current market share of the MARCS program, we looked at program adoption rates of the program’s highest usage category, first responders,<sup>12</sup> in each county, as seen in the map on the following page. In total, the MARCS program currently is capturing approximately two-thirds of the available first responders market.<sup>13</sup>

<sup>11</sup> According to DAS, the 2013 upgrade to the MARCS system allows for capacity of up to 256,000 devices, and so operationally the system could support the projected needed growth in users.

<sup>12</sup> First responders include police, fire, and EMS. For the purposes of the market saturation analysis, we limited our research to the largest user categories in order to get a conservative estimate of the captured market. The full extent of all eligible entities in the state, across all categories, was not possible within the scope of this audit.

<sup>13</sup> The available first responders market only includes counties that are not currently a tier partner.

## Adoption Rate of First Responders by County



Source: MARCS/DAS

Note: The market saturation analysis was limited to first responders within the state of Ohio. It assumes any first responders within a county that has a tier partnership as not an eligible entity. First responder entities outside of the tier partnership counties were assumed to be eligible for joining MARCS.

Based on the populations of the counties with the highest program adoption rates and the average number of MARCS radios those counties have on the system, we determined an average demand ratio of approximately 134 residents per radio.<sup>14</sup> Using this ratio, we estimate that there are close to 28,000 additional radios available to MARCS in the market.

Using the total annual costs associated with mobile units and the number of mobile units on the system in each year from 2016 through 2022, we determined a marginal annual cost of bringing

<sup>14</sup> The population per radio metric was determined using all counties with a first responders adoption rate of 90%-100%. The five counties with the highest adoption rates in the state include Ashtabula, Licking, Marion, Muskingum, and Ross.

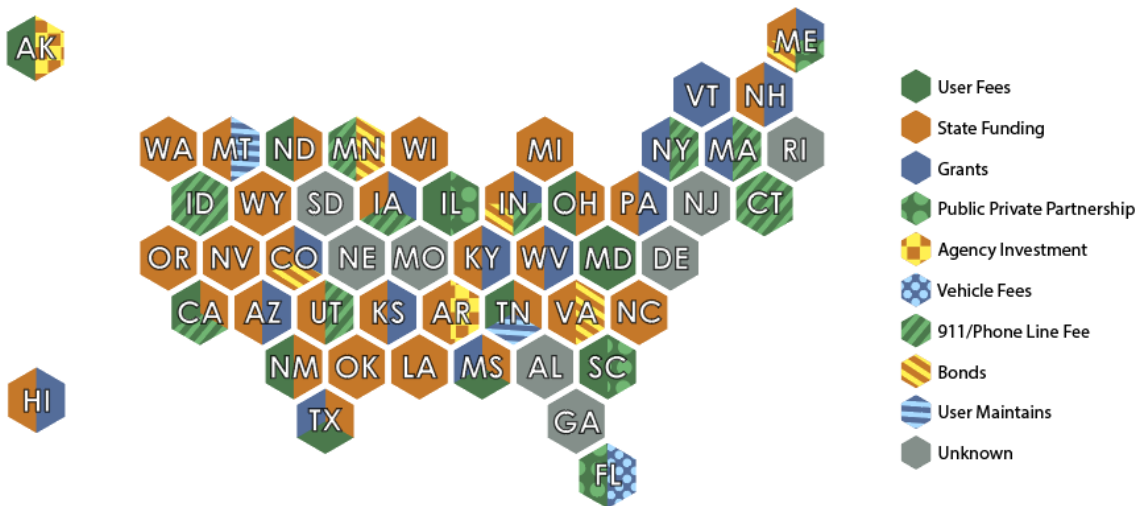
a mobile unit onto the system of \$64.06, when adjusting the 2016 cost value for inflation and placing it in terms of its equivalent value in 2022. Based on the regional government mobile unit rate of \$10 per unit, the calculated marginal cost of adding a unit, and the total number of additional radios available to MARCS in the market, we estimate that maximizing program adoption among first responders not currently subscribed to the program could generate potential annual revenue increases of over \$1.6 million.<sup>15</sup>

The estimated revenue generation that could occur from new users is based off the limited information which was available to us. It should be noted that we were unable to tie the percent of population currently served by organizations on MARCS in any given county. Further, we did not make any adjustments based on the population density of a county. This analysis was conducted to provide DAS with an idea of what may be available regarding additional revenue generation. However, should the Department choose to pursue this option, it should conduct further market research to fully understand what opportunities exist in this area.

### Alternative Funding Model Analysis

If DAS determines that raising fees is not a viable option for revenue generation, it could consider alternative funding models. Ohio is one of only five states in the country that uses a combination of user fees and state appropriations to fund a statewide interoperable radio system. The map below shows the many ways in which other states have opted to fund their respective radio systems.

#### Types of Funding



Source: AOS

<sup>15</sup> The non-inflation adjusted marginal cost of bringing a mobile unit onto the system is \$97.22. The non-inflation adjusted annual revenue of maximizing program adoption is approximately \$680,000. See [Appendix B](#) for additional detail.

Setting fees or identifying alternative funding is a sensitive issue. DAS must work to balance the need for a robust MARCS program with the desire to ensure it is accessible to organizations across the state. In doing so, DAS can look to other states to determine what funding mechanism may work in Ohio.

## **Conclusion**

MARCS is a critical government service that provides emergency communications to organizations throughout the state. To ensure program sustainability, DAS must work to secure the program's financial stability. The Department should look to other states to identify options that may work for Ohio. This could include identifying additional users, increasing the user fees, or obtaining additional funding directly from the state through a budget appropriation. By working to resolve future financial issues now, the Department can avoid potential disruptions to MARCS.

# Issue for Further Study: Further Assess Market Saturation and Conduct Program Capacity Planning

With any public service program, it is important for those in leadership roles to understand not only the current demand for services, but also the full landscape of potential future demand, as well as the program's capacity to satisfy that demand. The Governor's budget proposal, which was published during the course of the audit, provided funding for the MARCS program that would offset all revenue previously generated through governmental user fees. As a result of this proposal, as it was introduced, MARCS will be provided free of charge to all government users; local, state, and federal.

While administrators within MARCS have considered the program's ability to handle regular growth over the next several years, there are key issues that must be considered as a result of the budget proposal. The passage of this proposal could result in significant changes to the program, including a rapid increase in user base, the change in status of tier partners, and additional capital and operational expenditures related to the maintenance of the network itself. While the budget proposal is likely sufficient to cover operational expenses through FY 2024 and FY 2025, future budget allocations may need to be substantially increased.<sup>16</sup> Based on the historical rate of growth alone, we projected expenditure increases of up to \$40 million by FY 2030 (see [Financial Modeling](#)). However, increases in the user base beyond historical trends could result in ballooning program costs into the future.

These issues, along with the potential implications that should be considered are addressed in the following issue for further study.

## Market Share

The primary users of MARCS radios are public safety, local governments, state agencies, and federal agencies. While DAS has detailed records of current subscribers, the Agency has not produced comprehensive market studies to estimate the overall size of MARCS' potential market. [Recommendation 1](#) includes an analysis that estimates the number of local public safety agencies not yet on MARCS, which ends up being about one third of existing public safety agencies. DAS should extend this type of analysis for other types of agencies, as public safety only comprises roughly 56 percent of current customers.

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<sup>16</sup> We project MARCS operational expenditures to be approximately \$29.5 and \$31.8 million for FY 2024 and FY 2025, respectively, while the Governor's proposal includes a budget request of approximately \$31.3 and \$33.2 million in the corresponding years.



In a scenario where MARCS subscriptions are funded at the state level and free to federal and local users, it is reasonable to assume a large influx of demand will materialize. DAS will need a relatively accurate estimate of potential new users in order to both budget expenses and ensure capacity for the program. Further, DAS will require a system of prioritization for users if demand exceeds its on-boarding capacity.

## **Tier Partnerships**

As previously explained, DAS maintains a tiered structure for its user base. Any governmental entity can join MARCS and pay a standard user fee to access the system. Some entities have chosen to build infrastructure using local tax dollars. In consideration for bringing their hardware infrastructure onto MARCS, tier partners receive favorable pricing deals from DAS as an alternative to the per-radio subscription fees paid by most local entities. Other entities have chosen to build and operate independent radio networks. MARCS has partnered with these entities and use locally owned radio towers in those areas. In exchange, MARCS allows the local entities access to the statewide system when necessary. There are currently 17 tier partnerships in place, representing some of the largest counties and cities in Ohio such as Hamilton, Butler, and Lucas counties and the cities of Columbus and Cincinnati. Collectively millions of Ohioans are within range of the tier partners' towers.

The existing partnership agreements may be at risk if the funding dynamics shift dramatically, as identified by the Governor's most recent budget proposal. Because the tier partner networks are typically funded by local taxes, there may be pressure to seek out ways to minimize the cost associated with the maintenance and operation of the local network if MARCS becomes free to all government entities. For example, partners that have invested tax dollars into existing infrastructure that wish to continue to operate an independent radio network may seek out some sort of cost-sharing agreement from DAS. Such an agreement could allow MARCS to use the existing tier partner infrastructure, at a cost, in order to rationalize the expense of maintaining the system to the local community. Alternatively, a tier partner may choose to move directly to MARCS and cease operating its independent network. In this instance, DAS would need to consider the impact of locally owned towers potentially going offline.<sup>17</sup>

To prepare for potential changes in these relationships, DAS should hold robust and ongoing conversations with tier partners to determine the extent to which current tier partners may wish to continue to maintain their own infrastructure. Furthermore, DAS should consider alternative future scenarios in which tier partners may request to more fully integrate with MARCS. It is possible that DAS would need to purchase the existing towers or negotiate some sort of buyout with the tier partner to maintain continuity of radio coverage across the state.

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<sup>17</sup> Potential changes to existing partnerships would be dependent on existing contractual agreements and are subject to future negotiations between DAS and partner organizations. The scenarios presented in this report are for illustrative purposes only and are not expressly endorsed by the Auditor of State.

## System Capacity

In conversations with DAS regarding system constraints on the total number of users (agencies and radios) the Agency pointed to a quoted figure of 256,000 radios that was generated during the 2015 capital upgrade. (For reference, there were 146,040 MARCS radio subscribers as of December 21, 2022.) DAS did not, however, provide any additional detail and analysis regarding steps needed to achieve this maximum system capacity. It is unclear what level of additional buildout in towers, repeaters, or networking hardware would be required to support this 256,000 figure. And it is further unclear, referencing the holes in the existing market analysis, whether new demand will exceed 256,000 radios or whether DAS will have to undertake further system upgrades to increase this quoted capacity. Yet another consideration is the infrastructure currently owned by tier partnerships—what will be tier partners' responsibilities going forward for replacing aged infrastructure or adding additional capacity?

An additional constraint in system capacity is human capital, rather than technology, related. DAS personnel will need some level of involvement in onboarding and continued management of local MARCS users, and DAS will need an accurate understanding of time commitments in order to set the correct staffing level to deal with new demand.

## Marginal Costs

Every new user brought onto the MARCS system will add some level of incremental costs to the program. Some of these costs will be associated with onboarding consultations and continued management by DAS staff; other costs might entail DAS investment in new equipment and hardware to add capacity; and yet other costs might arise in the maintenance contract with Motorola. Further, depending upon how the tier partnerships are handled going forward, DAS could incur additional marginal costs onboarding these users.

To ensure accurate budget requests and sufficient funding levels to operate the program, DAS should study the marginal costs of adding new users in such a way as to attach marginal costs to the new-user estimates. The Agency's current approach to estimating costs for new users is based on projections of total prior-year expenses, and does not necessarily factor in marginal costs. However, this approach may not hold for sudden influxes of users. In **Recommendation 1**, audit analysis does calculate a historical marginal cost using end-of-year financial statements, which could serve as a best-estimate until DAS conducts a more detailed study of component costs.

## Onboarding of New Users

Removing MARCS user fees could result in a sharp influx of new local users. In addition to ensuring the Agency maintains enough program staff to handle this demand surge, DAS should produce a plan to equitably and rationally prioritize which new users will be onboarded first. Setting rules for new-customer priority and transparently communicating them will help avoid a queuing "free-for-all."

## Capital Replacement Cycle

The current MARCS technology platform has been quoted by DAS to remain non-obsolete through at least 2039. This technology is the result of the upgrade that took place in 2013 and required a \$90 million capital investment. DAS continues to make annual capital investments in MARCS infrastructure as hardware components reach the end of their useful life, and in some cases, to expand system capacity. What is unclear is the extent to which a scenario of rapid user growth would necessitate additional capital investment and upgrades beyond DAS' current baseline capital plans. A long-term capital plan that incorporates the potential for an immediate influx of new users and corresponding costs of major system components is directly applicable to current budget discussions. DAS should produce capital budget estimates for a variety of user-growth scenarios so stakeholders can be informed of the full cost implications of proposed funding model changes.

# Recommendation 2: Address Delinquent Account Collections Management

When individuals or organizations receive a service, there is an expectation that any associated bills will be paid in a timely manner. MARCS user fees that are not paid within a 30-day period are considered delinquent and are referred to the Ohio Attorney General’s office for collection purposes after 45 days. We found that while DAS takes some action to pursue collections through informal procedures, there is no coordination to collect the delinquent fees once they are referred to the Attorney General’s Office. MARCS administrators should develop a formal policy which addresses existing delinquent account collection activities. Doing so will ensure the MARCS program is addressing all user accounts in a fair and transparent manner.

## Impact

There are currently more than \$1 million in delinquent account fees that could be pursued by the Ohio Attorney General and the MARCS program. While this revenue may not make a significant impact to the program’s ongoing budget concerns, it is still important to ensure all users are being treated in a similar manner.

## Background

MARCS users are assessed fees based on the organization type and the associated tier of the organization. These fees are assessed on a per-radio basis. For approximately 60 percent of all units on the system, users pay either \$10 or \$25 per radio for voice services.

While fees are assessed and billed on a monthly basis, some entities do not remit payment in a timely manner. When an account is unpaid for 30 days or more, it is considered delinquent, which triggers the OAKS Financials system to generate an aging account statement. The Office of Finance distributes the aging statements to the customer address on file once per month. The aging statements continue to run, and be distributed once per month, until the invoice(s) are paid.

Delinquent accounts are then referred to the Attorney General’s Office after 45 days, as required by law, to be certified in order for collection activities to commence. However, based on feedback received from its local partners regarding the financial hardship some government entities faced with paying the monthly subscription fee for MARCS, DAS certified outstanding delinquent accounts to the Attorney General’s Office in December of 2021, as required by Ohio Revised Code, but requested they place the accounts in a “hold” status. According to DAS, there have not been any collections achieved as a result of the referrals.

Collections on delinquent accounts can be a sensitive topic. In particular, a state agency such as DAS may be hesitant to pursue collections for organizations with smaller budgets where MARCS is potentially a program that may be cut during budget reductions. Additionally, DAS may not want to cut access to a critical service due to non-payment of fees. It is possible that the benefit of maintaining a robust user base outweighs the benefits of collecting additional revenue. However, ignoring delinquent accounts may set a dangerous precedent and ultimately disrupt other partnerships with users that are regularly paying user fees.

## Methodology

As a part of our financial analysis, we found that there were a high number of accounts that were delinquent. We analyzed these accounts to understand the nature of delinquencies including the rate of delinquent accounts and the types of organizations that are delinquent.

We also reviewed best practices relating to account collections in order to identify options for addressing the delinquent accounts.

Finally, we analyzed the potential impact that the additional revenues would have on the program’s overall operational budget.

## Analysis

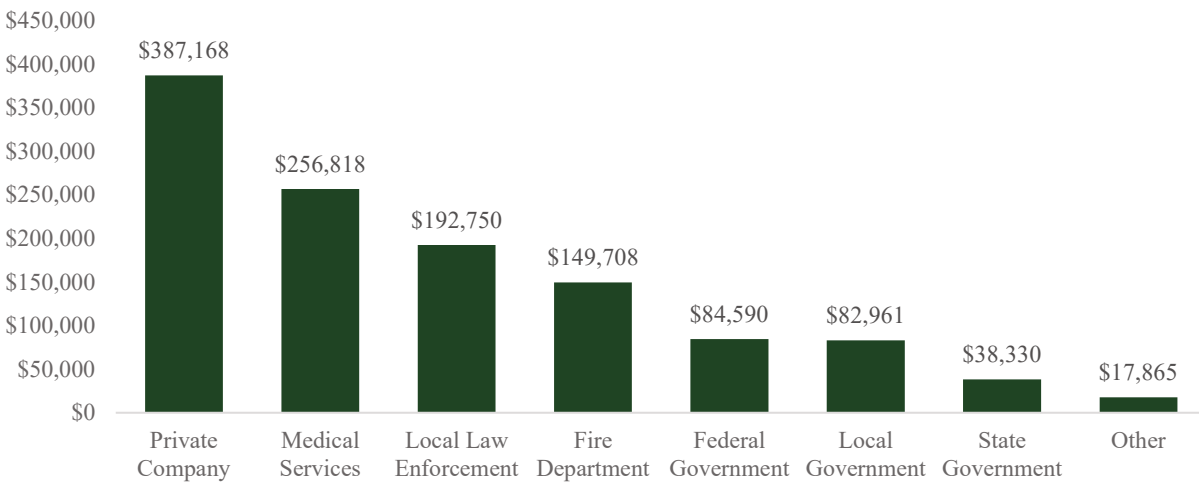
After reviewing current and delinquent accounts, we found that approximately 21.8 percent of the total subscribers have accounts that are at least 60 days past due. The majority of delinquent accounts are over 60 days past due. More than half of all delinquent accounts are comprised of fire departments, hospitals and medical centers, or local law enforcement.

In total, as of January 2023, the delinquent accounts totaled more than \$1 million in uncollected revenue.<sup>18</sup> These accounts vary in the amount owed. Fees are assessed on a per-radio basis, so a small organization that is delinquent may only owe \$100 or less. For example, one entity has a delinquent invoice that totals just \$12. The average delinquent account balance is \$3,025 and the median delinquent account balance is \$630. Because the average balance is significantly higher than the median, it indicates that there are outliers with significantly higher balances than the rest of the accounts. The chart on the following page shows the total value of delinquent accounts by entity type.

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<sup>18</sup> A private entity, First Energy, had the highest delinquent account balance at the time of our analysis and was responsible for more than \$300,000 of the total delinquent debt. The Greater Cleveland Regional Transit Authority had the second highest delinquent account balance of approximately \$90,000. The third highest delinquent account balance was the Norwalk Wireless Internet Works, LLC of approximately \$45,000. A list of all delinquent accounts, and the amount owed, can be found [here](#). During the course of the audit, DAS indicated steps were being taken to begin collection activities on the delinquent account balances of private entities.

## Total Delinquent Amounts by Type



Note: Amounts are as of 1/11/2023

Source: DAS/MARCS

In *Revenue Control Policy* (GFOA, October 2012), the GFOA recommends that governments establish a formal revenue control policy that dictates the management of overall receipts and receivables. A revenue control policy should be customized for the size and resources of the government entity, it should be regularly reviewed, and should include direction on how to manage accounts receivable. Regarding delinquent account management specifically, the GFOA states:

“All accounts receivable should be recorded in a manner that allows for aging analysis. After reviewing available collection options, governments should establish procedures that maximize collections. Collection agencies that are familiar with federal, state, and local notice requirements and regulations should be considered when their use proves cost-effective.”

Unpaid delinquent account receivables represent over 4 percent of the program’s FY22 operating budget. While full collections of the outstanding bills would not likely have a material impact on the program’s operations or improve the overall financial position in such a way that would stave off future projected fund deficits as discussed in [Recommendation 1](#), they could be leveraged in any number of ways. The revenue captured from unpaid balances could be redirected toward user fee rates, possibly to postpone implementing rate increases. This added revenue could also be used to help fund capital improvements or enhance cash reserves to help mitigate the risks discussed in [Recommendation 3](#). Most importantly, however, equitable collections of user fees will likely be beneficial for sustaining healthy partnerships with all users and may encourage program growth among those entities that have not yet subscribed.

While the Governor’s budget proposal, if passed, would likely eliminate the possibility of delinquent account totals increasing beyond their current levels, it is still important for DAS to

have a strategy for addressing delinquent accounts. Even in the absence of user fees going forward, any collections achieved could be redirected into the program.

## Conclusion

DAS should develop a formal policy for delinquent account collections management within 45 days of being due and coordinate with the Attorney General's Office to actively pursue past due receivables. Doing so could increase the program's total revenue, which in turn could improve the program's cash position. Collecting unpaid balances could also provide for additional options for DAS to redirect revenue into the program that would otherwise not be available.

## Recommendation 3: Address Mid-Year Low Point Balance Issues

Having a sufficient level of cash reserves is critical for ensuring adequate, uninterrupted delivery of program services. Cash reserves that are appropriate to the level of a program’s operating expenses are not only an indicator of overall financial health, but in practical terms, they help to mitigate the risks of failing to cover both routine expense obligations, as well as those resulting from unforeseen circumstances. While the MARCS fund’s cash balances appear to be healthy at the end of each fiscal year, they tend to dip below safe levels throughout the course of a year as a result of the timing of payments associated with some of its largest contracts. This leaves the program more susceptible to cash shortfalls, which could translate into service levels that are not optimal. DAS should take steps to proactively manage program cash flows through some combination of modifying vendor payment timing and revenue receipts from customers, to ensure fund balances exceed a minimum safe level throughout the year. Doing so would mitigate the risk of fund deficits in the future. Adjusting the timing of either expense payment terms for its largest contracts or the timing of revenue receipts from its customers could mitigate the risk of fund deficits in the future and would help ensure the seamless delivery of services.

### Impact

The MARCS fund balance experiences its lowest point in the middle of the fiscal year. This is due to the timing of large contractual expenditures. Because of the mid-year reserve balance depletion, MARCS will likely experience cash shortfalls before it reaches technical insolvency.

Adjusting the timing of expense payment terms for large contracts could help MARCS maintain safer reserve balances throughout the year. Similarly, there may be further opportunities to manage revenue receipts toward the goal of preserving a safe reserve cash balance. Strategically managing cash flows throughout the course of the year would allow MARCS administrators to better ensure safe levels of operating contingency and more flexibility to adjust to unforeseen program developments.

### Background

Currently, DAS contracts out the majority of the MARCS maintenance and support services. The current contract with its largest vendor is on an annual renewal basis. The annual renewal begins on July 1<sup>st</sup> of each year, or the beginning of the fiscal year, and ends on June 30<sup>th</sup>, or the last day of the fiscal year. Under the current contract terms, DAS pays for all future services rendered during the first few months of the fiscal year.



## Methodology

Our financial analysis and forecast modeling involved reviewing the MARCS program fund balances throughout the course of the year. To do this, we reviewed financial information, including revenues, operational expenditures, capital expenditures, and fund balances, for the MARCS program using OAKS BI.<sup>19</sup> Our revenue and expenditure analysis included data from FY 2016 through 2022 and the cash balance analysis included data from FY 2005 through FY 2022.

For purposes of this recommendation, we compared the MARCS program’s monthly cash balances and operating expenditures to the best practices set by the Government Finance Officer’s Association (GFOA).

## Analysis

The GFOA recommends that a fund balance should take into account each government’s own unique circumstances and risks and recommends that an entity should maintain a minimum fund balance of no less than two months of operating expenditures. This means an organization should maintain a balance that is equal to approximately 17 percent of annual expenditures.

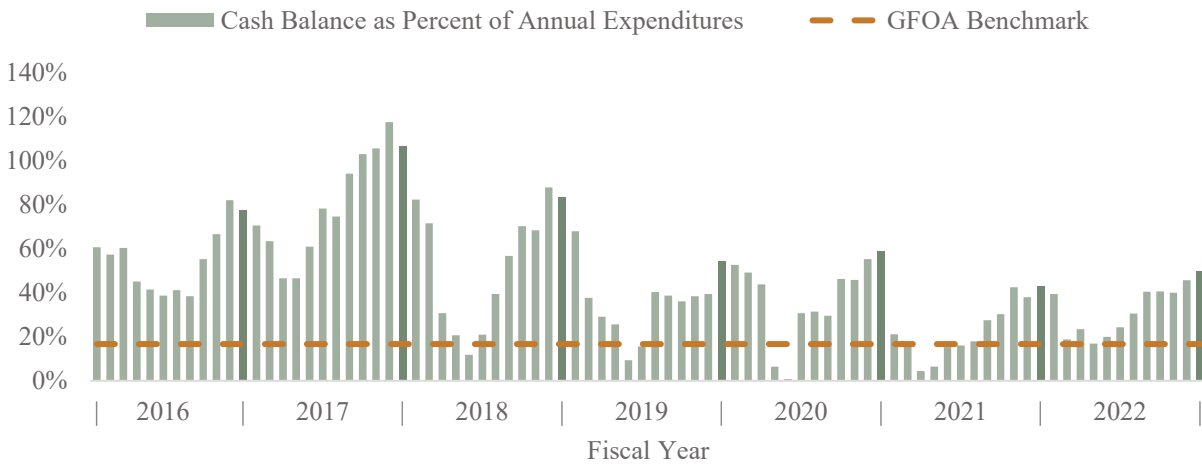
Our initial analysis focused on the year-end fund balance. When we reviewed the ending cash balance amounts as a percent of annual expenditures for MARCS from FY 2016 through FY 2022, we found that the program was in-line with the GFOA standard. In 2021, the year with the lowest ratio of ending fund balance to operational expenditures, the ending fund balance equaled approximately 43 percent of annual expenditures.

However, we then conducted the same analysis on a monthly basis. This was done in part due to the understanding of the timing of MARCS program expenditures. The contract MARCS has with its vendor for maintenance and other services requires a single annual payment, which significantly depletes the balance mid-year. As a result of this payment, the monthly fund balance typically dips to its lowest levels during the first half of the fiscal year and then is built back up over the remainder of the year. A visualization of this process is seen in the chart on the following page.

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<sup>19</sup> Ohio Administrative Knowledge System (OAKS) business intelligence (BI) service provides reporting, enterprise data warehousing, and decision support solutions to all state agencies, boards and commissions, and institutions of higher education.

## Ending Cash Balance, Monthly



Source: OAKS

Using the monthly analysis, the lowest point for the fund balance compared to annual expenditures occurred in FY 2020, when the November cash balance was equal to just 1 percent of the annual expenditures.

### Midyear Low Point

This ‘mid-year low point’ balance, seen in October and November, contrasts dramatically with the end of fiscal year balance seen in June. Analyzing program financials solely through the end-of-year balance statement will provide an incomplete picture of operating capital reserves. When viewed at the monthly level, it becomes clear the MARCS program reserve balance drops well below the GFOA-prescribed ‘safe’ levels in the most recent five years.

Mid-year cash balance projections become especially relevant in the context of the type of projections conducted in [Recommendation 1](#). In this analysis, it was shown that the MARCS program would become fiscally insolvent in the year 2027 under a certain set of assumptions. Due to the mid-year reserve balance depletion dynamic shown in the chart above, however, it is likely the program would experience shortfalls in operating cash reserves prior to the fiscal year MARCS reaches technical insolvency.

## Conclusion

The MARCS fund’s end of year cash balances do not reflect the program’s operating capital reserves throughout the year. Viewed on a monthly basis, the program’s cash balances fluctuate widely throughout the course of a year, and at points in time do not meet GFOA minimum standards. This could result in sub-optimal timing of purchases, maintenance, or other operational expenditures. Cash balances are drawn down in the earlier portion of the fiscal year as a result of the timing of payments to the program’s largest contracted vendors. This may result

in some level of increased susceptibility to shortfalls for unforeseen expenses in the months following the large vendor payments. Therefore, DAS should take steps to proactively manage program cash flows through some combination of modifying vendor payment timing and revenue receipts from customers, to ensure fund balances exceed a minimum safe level throughout the year. Doing so would mitigate the risk of fund deficits in the future.

## Client Response Letter

Audit standards and AOS policy allow clients to provide a written response to an audit. The letter on the following pages is the Department's official statement in regards to this performance audit. Throughout the audit process, staff met with DAS and MARCS officials to ensure substantial agreement on the factual information presented in the report. When the Department disagreed with information contained in the report, and provided supporting documentation, revisions were made to the audit report.



April 12, 2023

Keith Faber, State Auditor  
Office of the Auditor of State  
88 E. Broad Street, 5<sup>th</sup> Floor  
Columbus, Ohio 43215

Auditor Faber:

The Department of Administrative Services (DAS) is truly appreciative of the efficient and dedicated efforts of your Ohio Performance Audit Team in completing a review of Ohio's Multi-Agency Radio Communications System (MARCS). DAS seeks to sustain and grow essential first responder services that the MARCS program offers, and your insightful review and recommendations are key to achieving that goal.

Understanding that, in his FY24 and FY 25 operating budget request, Governor DeWine has proposed significant investments in support of the MARCS program, below are comments in response to your recommendations.

### **Recommendation 1: DAS Should Ensure Financial Stability**

This recommendation was the catalyst for our requested review. We are grateful for the General Assembly's past general revenue fund appropriations to the MARCS program to offset the cost of subscription fees for local government users. Additionally, our current budget proposal requests the elimination of the subscriber fees for local government users. If enacted, this proposal will ensure the financial stability of the MARCS program.

### **Issue for Further Study: Further Assess Market Saturation and Conduct Program Capacity Planning**

Our goal is to maximize MARCS system use to support first responders. We expect that our budget request will attract more users to the program, and we are committed to bringing on new users in a responsible way. The technology supporting the MARCS system is complex and uniquely different in each area of the state. Depending on where new demand for the program arises, the system capabilities will be assessed to determine how best to accommodate additional users. Future capital budget requests will incorporate technology enhancements to support expanded growth as we better understand where expanded system capacity is needed.

### **Recommendation 2: Address Delinquent Account Collections Management**


We appreciate your recognition of the difficulty that arises in collecting MARCS user fees from local government users. While it is certainly our intent to collect subscriber fees, in our collection activities we consistently hear from local communities the barrier that some face in paying. As a result, we have worked towards a more permanent and comprehensive solution to alleviate the burden of these fees on government users. For non-government users, prior to the completion of this audit, all delinquent accounts were certified to the Attorney General's Office for collections in accordance with Ohio Revised Code 131.02. We will create a policy to outline the process of certifying past due MARCS fees to the Attorney General's Office when required.

### **Recommendation 3: Address Mid-Year Low-point Balance Issues**

Similar to our response in recommendation 1, we expect that our budget request, if approved, would eliminate the mid-year low-point balance issues the MARCS fund currently experiences. Should it not be enacted, we will review our ability to negotiate and implement more favorable terms.

I appreciate the quick response for a review of the MARCS program. Your team wasted no time diving in to understand the complexities of MARCS and the current financial condition of the program. I am deeply grateful for your partnership and collaboration on this and future projects.

Sincerely,

A handwritten signature in blue ink that reads "Kathleen C. Madden". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Kathleen C. Madden, Director

# Appendix A: Purpose, Methodology, Scope, and Objectives of the Audit

## Performance Audit Purpose and Overview

Performance audits provide objective analysis to assist management and those charged with governance and oversight to improve program performance and operations, reduce costs, facilitate decision making by parties with responsibility to oversee or initiate corrective action, and contribute to public accountability.

Generally accepted government auditing standards (GAGAS) require that a performance audit be planned and performed so as to obtain sufficient, appropriate evidence to provide a reasonable basis for findings and conclusions based on audit objectives. Objectives are what the audit is intended to accomplish and can be thought of as questions about the program that the auditors seek to answer based on evidence obtained and assessed against criteria.

We conducted this performance audit in accordance with GAGAS. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

## Audit Scope and Objectives

In order to provide the Department with appropriate, data driven, recommendations, the following questions were assessed within each of the agreed upon scope areas:

### Summary of Objectives and Conclusions

Objective	Recommendation
<b>Financial Performance and Modeling</b>	
Does the program’s funding model result in financial sustainability?	<b>R.1, R.2, and R.3</b>
<b>Program Comparisons</b>	
How does MARCS compare to similar programs in other states in terms of functionality and funding?	<b>R.1</b>

Although assessment of internal controls was not specifically an objective of this performance audit, internal controls were considered and evaluated when applicable to scope areas and objectives. The following internal control components and underlying principles were relevant to our audit objectives.<sup>20</sup>

- Control environment
  - We assessed the Department’s exercise of oversight responsibilities in regards to its plans, methods, policies, and procedures for the funding and implementation of the MARCS program.
  - We assessed the Department’s exercise of oversight responsibilities in regards to setting user fees and onboarding new users.
- Risk Assessment
  - We considered the Department’s activities to assess fraud risks.
- Information and Communication
  - We considered the Department’s use of quality information in relation to its financial data.
- Control Activities
  - We considered the Department’s compliance with applicable laws and contracts.

No internal control deficiencies were identified during the course of the audit.

## Audit Methodology

To complete this performance audit, auditors gathered data, conducted interviews with numerous individuals associated with the areas of the MARCS program included in the audit scope, and reviewed and assessed available information. Assessments were performed using criteria from a number of sources, including:

- Similar programs in other states;
- Industry Standards;
- Leading Practices;
- Statutes; and
- Policies and Procedures.

We selected programs similar in function for comparisons, where applicable, contained in this report. These programs are identified as necessary and appropriate within the section where they were used.

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<sup>20</sup> We relied upon standards for internal controls obtained from *Standards for Internal Control in the Federal Government* (2014), the U.S. Government Accountability Office, report GAO-14-704G



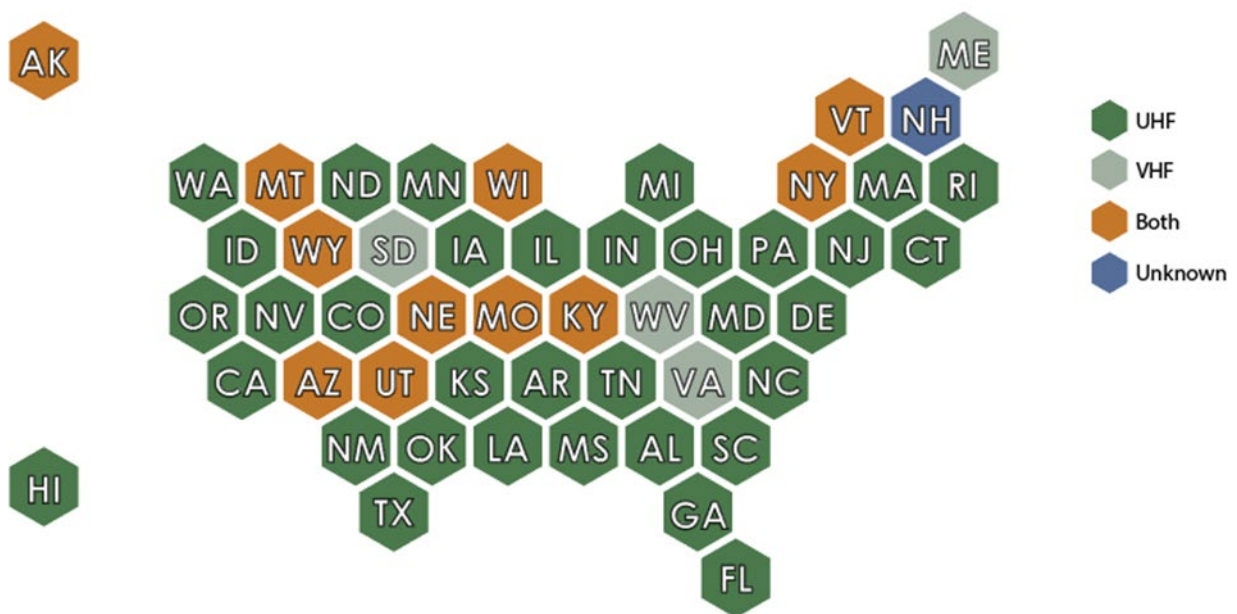
## Appendix B: Supplemental Information

In addition to the analyses presented in the main body of the report, we conducted several other analyses that did not result in a recommendation. The results of these analyses are discussed below.

### Interoperable Radio Systems in Other States

Statewide interoperable systems operate on Very High Frequency (VHF) and/or Ultra High Frequency (UHF) wavelengths. VHF can transmit longer distances but have less depth for information to be moved. UHF has a reduced range but is an information rich transmission. States may decide on which method is most suitable based on factors such as the geography of the area and data services offered. The visual below shows the frequency range each state uses.

#### Nationwide Use of Ultra High and Very High Frequency Systems



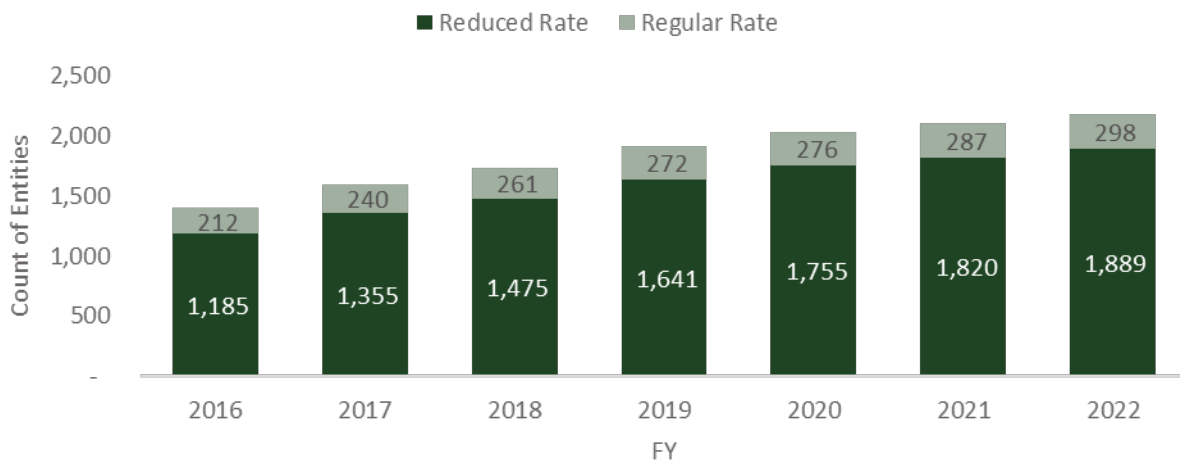
Source: AOS

## Mobile Voice and Application Services

Users can obtain mobile voice and application services through MARCS. Mobile voice is the system that allows for interoperable radio communication between organizations. Application services provides far more robust support including computer aided dispatch, mobile computer terminals, and records management system. For the vast majority of MARCS users, mobile voice is the only service to which they subscribe.

The number of organizations registered with MARCS over time is seen in the chart below. The dark green portion of the chart represents organizations that pay a reduced rate for services, and the light green portion of the chart represents organizations that pay the full, unreduced rate. MARCS has seen sustained growth during the seven year period we reviewed; however, the rate of growth has slowed over time. Each of these entities likely have multiple radios that are registered with MARCS. The review of radio, or unit, growth over time can be found in the [Financial Modeling](#) section of the report.

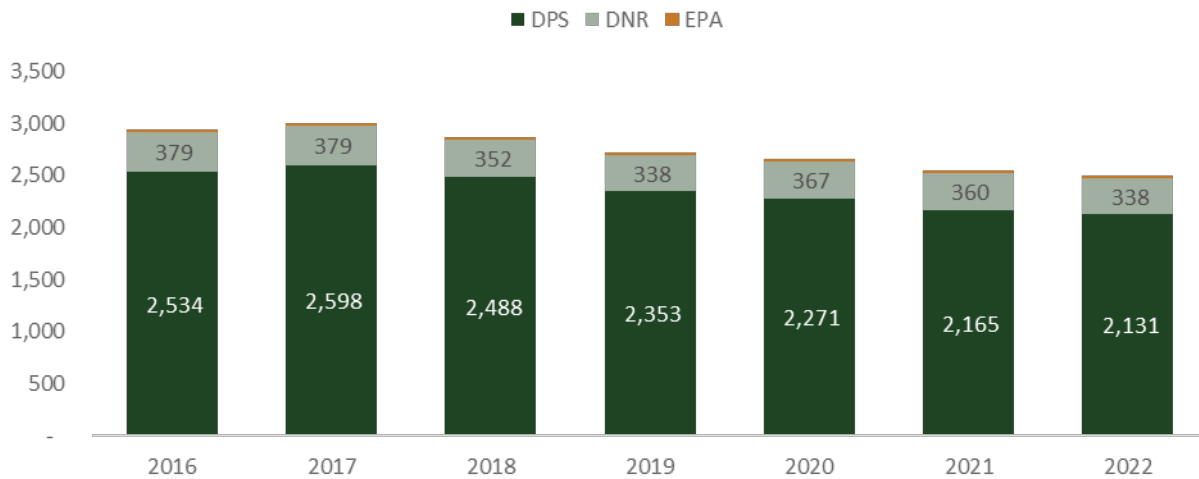
### Count of Mobile Voice Entities



Source: MARCS/DAS

Currently, there are three state agencies that use MARCS applications services: the Department of Public Safety (ODPS), the Department of Natural Resources (DNR), and the Environmental Protection Agency (OEPA). Each of these entities pays for multiple annual subscriptions to access the various application services offered through MARCS. The annual count of application service subscribers, by agency, can be viewed in the chart below. Overall, the number of total application services subscriptions has declined by approximately 15 percent since FY 2016.

### Count of Application Service Users by Entity



Source: MARCS/DAS

## Tier Partners

Several government entities throughout the state work in partnership with MARCS. These entities are referred to as Tier Partners. In addition to Tier 1 and Tier 2 partners in which users are subscribed directly to MARCS and communicate using the state’s network, Tier 3, Tier 4, and Tier 5 organizations operate separate interoperable radio networks. These partners allow MARCS to use their radio towers and, in return, are granted access to MARCS when they need to communicate or coordinate with organizations on MARCS. The following table shows the full list of the program’s Tier Partners.

### List of Tier Partners by Level

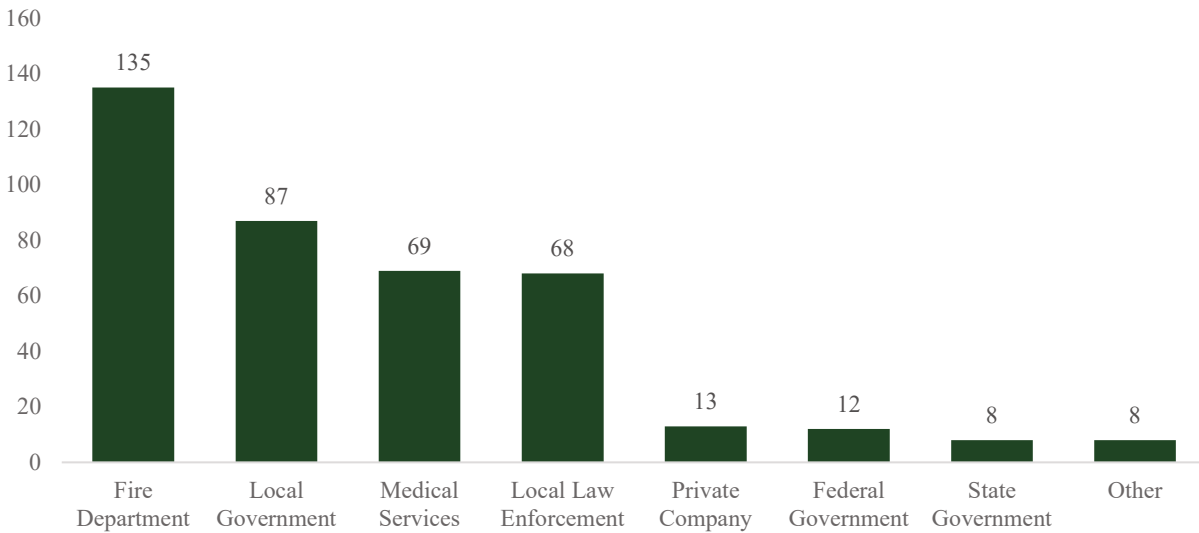
<b>Agency</b>	<b>Tier Level Partnership</b>
Clinton County Board of Commissioners	TIER 2
Harrison County Board of Commissioners	TIER 2
OSU	TIER 2
Stark County Commissioners	TIER 2
Tuscarawas County Commissioners	TIER 2
Butler County Board of Commissioners	TIER 3
Lucas County	TIER 3
City of Cincinnati	TIER 4
City of Columbus	TIER 4
Clermont County Board of Commissioners	TIER 4
Geauga County Board of Commissioners	TIER 4
Hamilton County Board of Commissioners	TIER 4
Pickaway County Board of Commissioners	TIER 4
Summit County	TIER 4
Warren County Board of Commissioners	TIER 4
Jefferson County Board of Commissioners	TIER 5
Lake County Board of Commissioners	TIER 5

Source: DAS/MARCS

## Delinquent Accounts

As of January of 2023, the delinquency rate for all MARCS accounts past due beyond 60 days was 21.8 percent. The chart below shows the number of accounts that are delinquent by type. The majority of delinquent accounts are local entities.

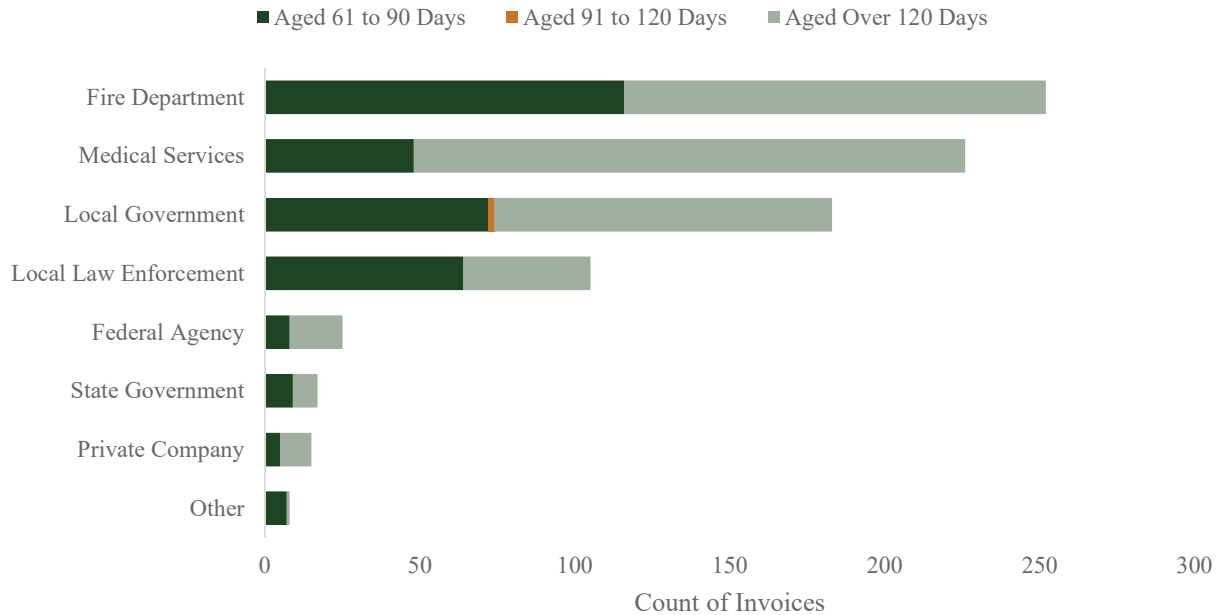
Count of Delinquent Entities by Type



Source: DAS/MARCS

MARCS invoices are sent monthly and are considered delinquent and sent to the Attorney General’s Office after 45 days. Because invoices are sent monthly, an entity could have multiple delinquent invoices. The chart below shows the count of delinquent invoices by organization type. For example, while there are 135 total fire departments with delinquent accounts, there are 252 delinquent invoices. The chart below shows the age of these delinquent invoices. The majority of delinquent accounts are more than 120 days, or 4 months, in arrears.

### Count of Delinquent Invoices by Customer Type and Age



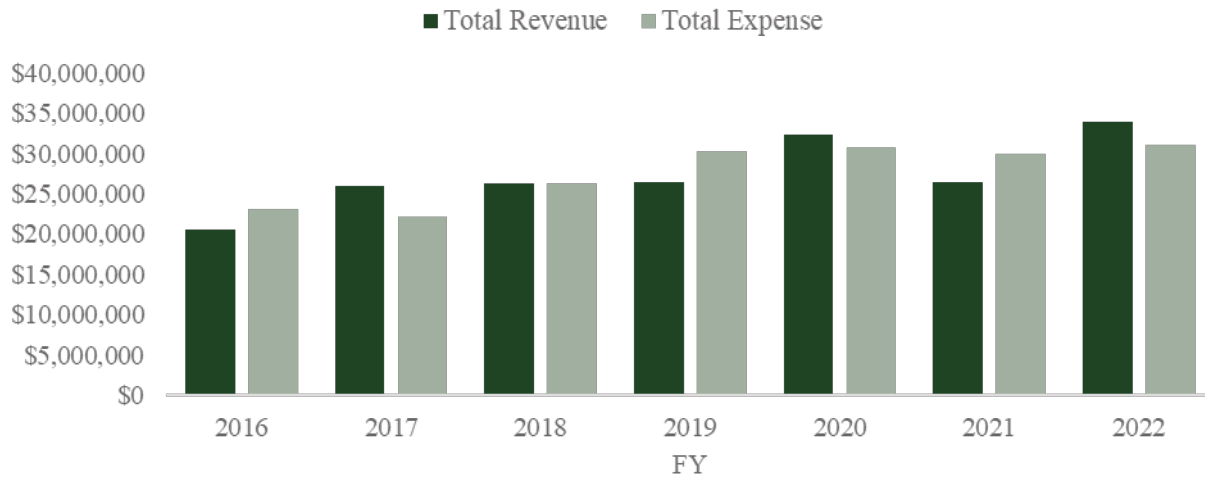
Source: DAS/MARCS

## Financial Analysis Supplemental Information

Our financial analysis focused on operational revenues and expenditures. This is because capital expenditures do not meaningfully impact the overall MARCS budgets. Capital expenditures are financed through bonds, which are issued by the state for the purposes of raising funds. The debt service on these bonds are then retired using appropriations from the state’s General Revenue Fund.

The MARCS budget includes expenditures for the debt service related to bonds, but it also includes an appropriation from the state General Revenue Fund as an offset for these expenditures. The chart below shows the total revenue against the full cost of the program from FY 2016 to FY 2022, where debt service is treated as both a revenue and expense.

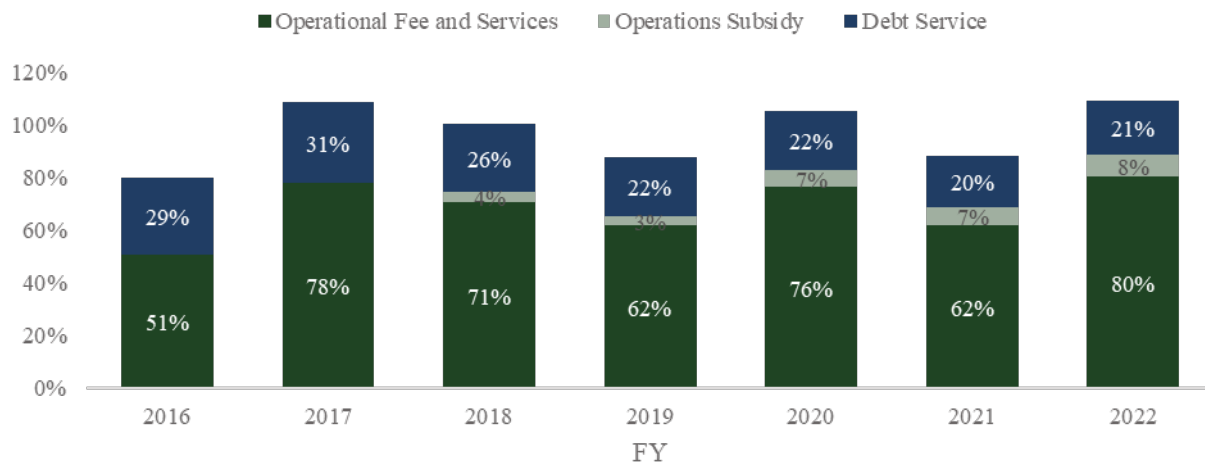
## Historical Total Revenue and Expense



Source: OAKS

To better understand the extent to which the state has historically subsidized MARCS, we reviewed revenue as a percentage of total expenditures. The following chart demonstrates the full level of support from the State in relation to the total cost of the MARCS program, and in comparison to local support from fees and services. In the current model, state support hovers around 30 percent of the program’s full cost.

## Revenue Categories as Percentage of Total Expenditures



Source: DAS/MARCS

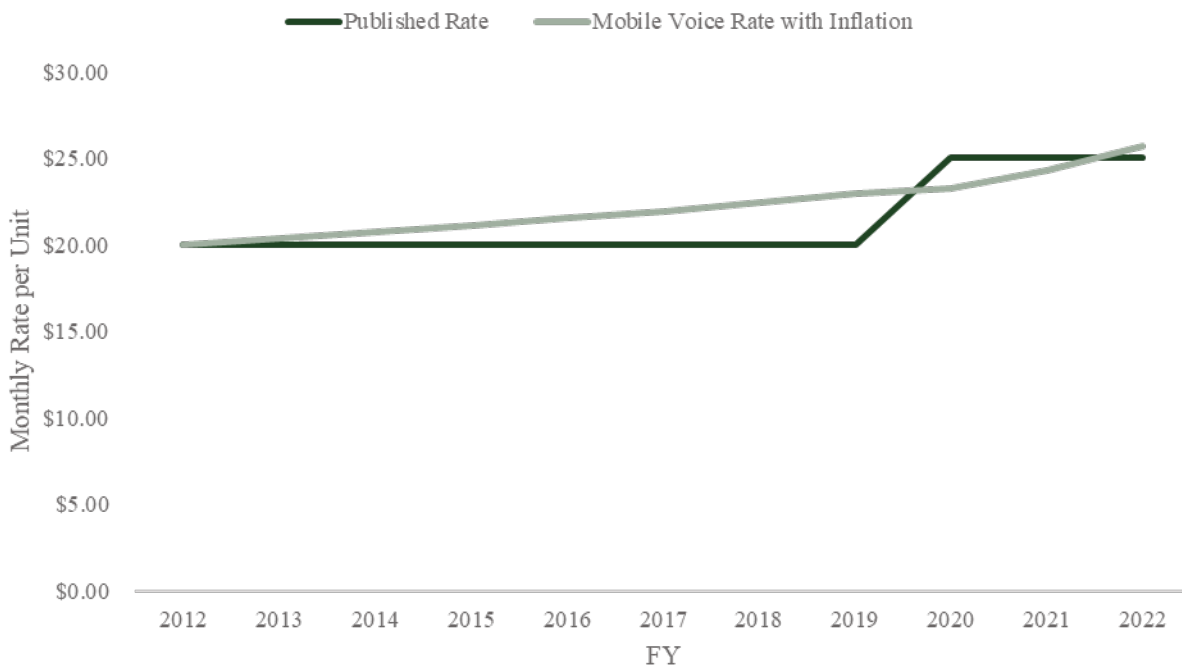
FY 2019 and FY 2021 both show a dip in total percentage of coverage of total cost. The decline in FY 2019 was caused by a significant increase in supplies and maintenance costs, while revenue from fees and services remained flat. The decline observed in FY 2021 was caused by a

shift in billing collection timing in which revenue was not collected in the fiscal period, but rather the next.

## Rates Supplemental Information

MARCS, just like any other government entity charging rates, is subject to federal regulations when charging users with federal grants. Specifically, Appendix V to Part 200 of Title 2 of the Code of Federal Regulations (CFR) outlines the establishment of state governmentwide central service cost allocation plans. The fees are set in accordance with this Appendix, which requires billing rates used to charge federal awards to be based on the estimated costs of providing the services, which includes an estimate of allocable central service costs. Historically, the rate for MARCS mobile voice services was stagnant until FY 2020 when a 25 percent increase was adopted that raised the rate to \$25 per unit, per month. The effective rate of inflation over the past decade has been 2.5 percent. The chart below shows the published rates for MARCS mobile voice compared to 2012 pricing that rises with the average inflation rate. The effective annual rate of increase for the published rates over this time period was 2.3 percent. Though the difference is small, the published rate increases haven't quite kept pace with average inflation, historically.

Mobile Voice Regular Rate Compared to Inflation

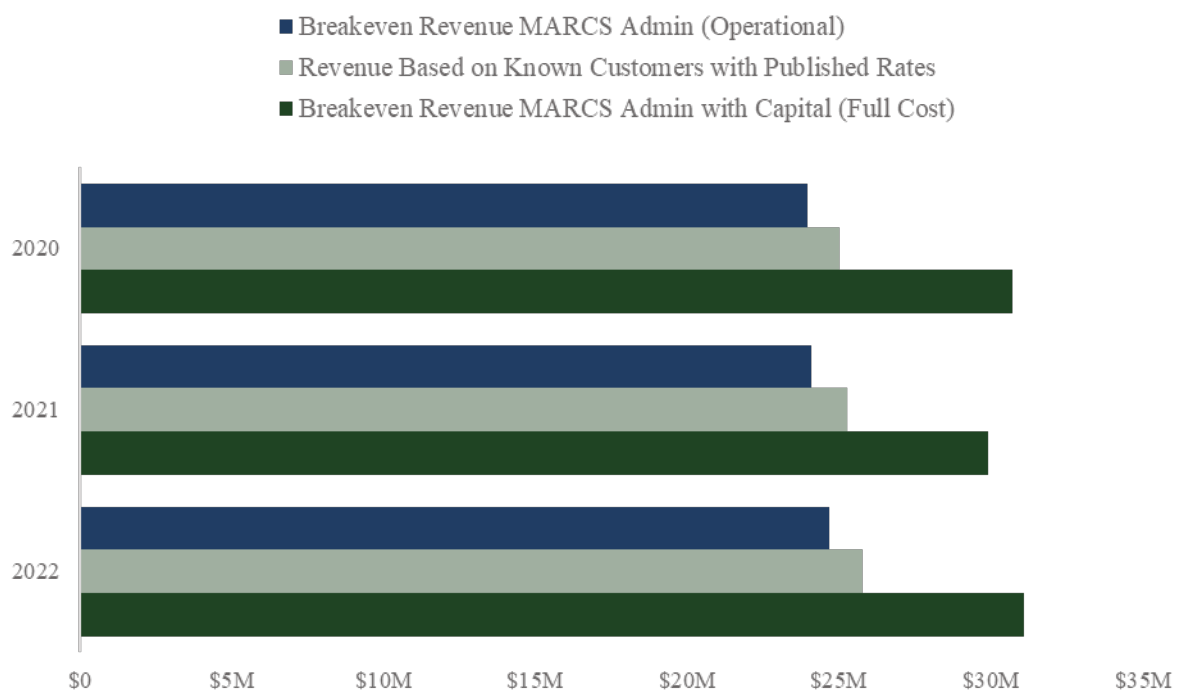


Source: DAS/MARCS & BLS



Our breakeven calculation only considers operational direct costs associated with the MARCS program. In practice, MARCS rates are calculated based on direct and indirect costs of the program. Indirect costs include administrative costs and annual depreciation. Full cost of the program would be inclusive of operational direct costs as well annual capital expenditures. As shown below, published rates are priced slightly above breakeven rates for operational costs. That is due to the rate setting process including indirect costs in the calculation. This can be viewed by comparing the annual amounts generated from the rates if 100 percent collection is assumed. The revenue generated from the breakeven rates in comparison to the published rates in FY2020 through FY2022 can be viewed below.

### Annualized Breakeven Comparison of Rates

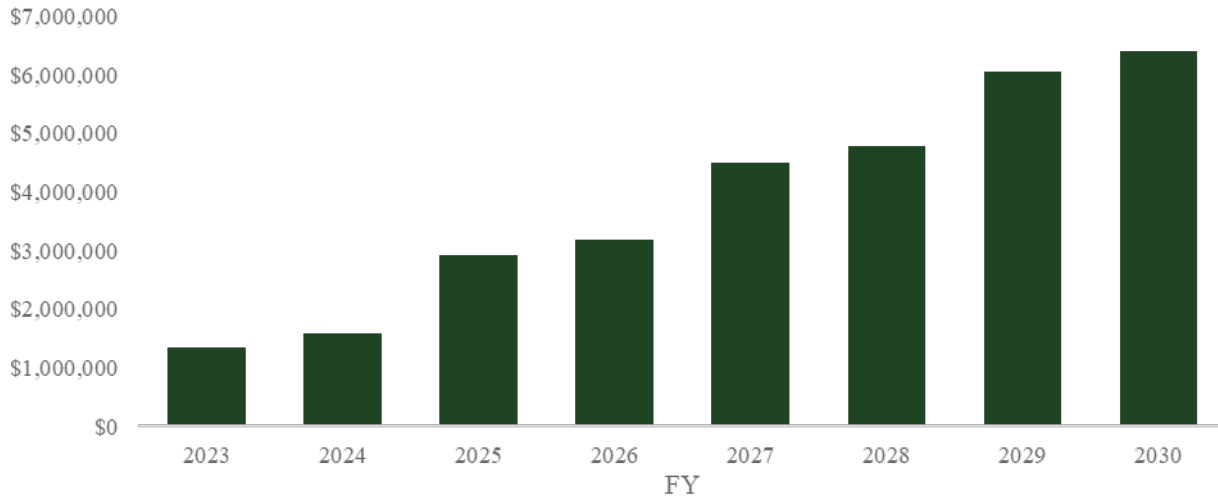


Source: DAS/MARCS

### Projections and Capacity Supplemental Information

As discussed in [Financial Modeling](#), the exponential smoothing model (**Model B**), assumes a scenario in which the current trend of program growth continues into the future. This means the number of users increase at the expected rate based on historical experience, but user fee rates stay the same. Increases in the annual general revenue subsidy for the MARCS program would potentially have to increase in order for the program to breakeven year to year. The chart below shows the subsidy amount needed in the projected years to breakeven in this model.

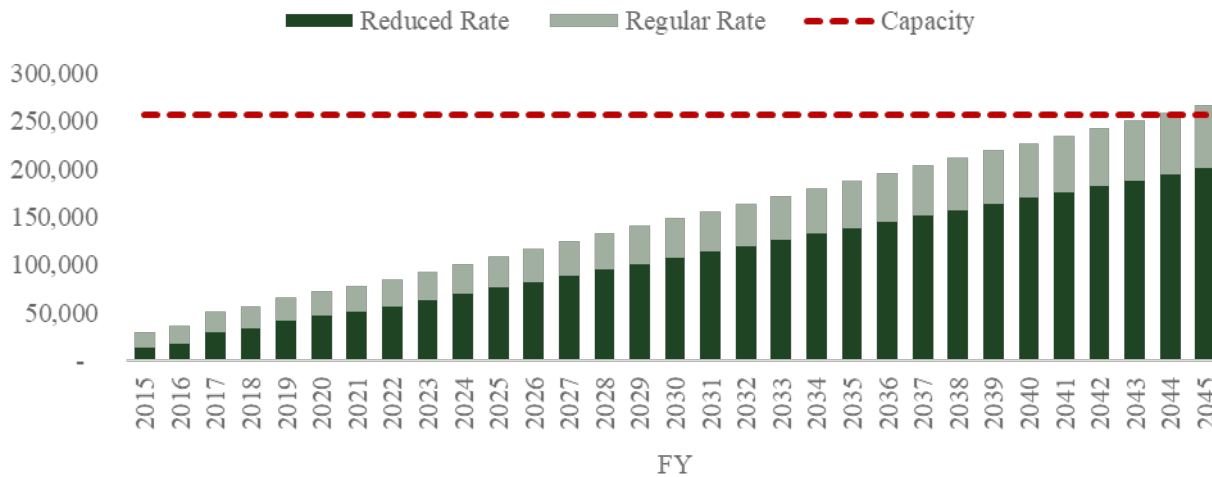
### Subsidy Amount Needed to Breakeven in Projection



Source: DAS/MARCS

The MARCS program upgrade in 2013 increased system capacity to provide voice and data services for up to 256,000 devices in the state. Comparing the system’s limit to projected growth in mobile voice users, based on the exponential smoothing method, shows that the system is potentially viable through 2044.

### System Capacity and Projection of Mobile Voice Units



Source: DAS/MARCS

It should be noted that the chart above is based on the historical rate of increase with their users. However, it does not consider a deviation from the historical trend that may occur from future circumstances, such as funding model changes, that may result in an influx of users to the MARCS program.

Another additional revenue source to help support the MARCS program would be to increase its user base. Our analysis was limited to first responders to serve as an estimate of market saturation. Estimates were used to calculate the impact of bringing those first responder entities that are not getting services from tier partners onto the system. One of the estimates is the marginal cost of bringing a new subscriber onto the MARCS system. Marginal cost was calculated as the change in expenditures over the change in billable units. This cost, when not controlled for inflation, is \$97.22 per unit, annually. However, one driver in cost can be attributable to inflation and not to the increase of a new users within the system. Controlling for inflation produced a marginal cost of \$64.06 per unit, annually. The following table uses marginal costs to show the financial implication related to the onboarding of eligible first responders.

### Financial Implication of Onboarding Eligible First Responders

	<b>Estimated Mobile Voice Units Needed</b>	<b>Potential Annual Revenue Local Government Rate</b>	<b>Estimated Additional Cost</b>	<b>Net Revenue (Expense)</b>
Not Adjusted for Inflation	27,839	\$3,340,680	\$2,706,436	\$634,244
Adjusted for Inflation	27,839	\$3,340,680	\$1,783,366	\$1,557,314

Source: MARCS/DAS

Note: The mobile voice units needed and corresponding revenue totals are based on the local rate.

# OHIO AUDITOR OF STATE KEITH FABER



**OHIO DEPARTMENT OF ADMINISTRATIVE SERVICES**

**FRANKLIN COUNTY**

**AUDITOR OF STATE OF OHIO CERTIFICATION**

This is a true and correct copy of the report, which is required to be filed pursuant to Section 117.26, Revised Code, and which is filed in the Office of the Ohio Auditor of State in Columbus, Ohio.



**Certified for Release 4/20/2023**

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Phone: 614-466-4514 or 800-282-0370

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