THE CITY OF SAN DIEGO

OFFICE OF THE INDEPENDENT BUDGET ANALYST REPORT

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Review of Citywide Asset Management Practices and Use of the Enterprise Asset Management (EAM) System

OVERVIEW

The City of San Diego owns and maintains a large and complex network of infrastructure assets, including streets, bridges, parks, public facilities, and airports. These assets represent a significant investment vital to public health, quality of life, productivity, competitiveness, and the economy. The City has faced tight financial constraints for many years and has limited dedicated funding sources and resources to fund many competing priorities. This has resulted in underinvestment in infrastructure and a deferred capital backlog that, as of the FY 2024-28 Capital Infrastructure Plan Outlook (CIP Outlook), has grown to $5.2 billion. Continued deferral of projects has led to deterioration of existing assets, increased costs and liability, and the inefficient allocation of resources towards addressing emergency repairs.

To address this growing backlog of unfunded needs, the City will ultimately need a large-scale and holistic financing strategy, including new revenue sources; but it will also require a well-developed and viable plan to execute projects that includes Asset Management practices, such as establishing service level goals, conducting condition assessments, and using Asset Management systems, to provide the data and strategies needed to support wise infrastructure investments.

Asset Management is a best practice for sustainably and cost-effectively maintaining, repairing, and replacing infrastructure assets over assets' lifecycle. Given the importance of using Asset Management for the City, our Office is providing a review of Citywide Asset Management practices, including an assessment of the status of recommendations from the June 2018 Strategic Asset Management Plan (SAMP), and the extent to which the Enterprise Asset Management (EAM) System is being utilized by the six departments/divisions that implemented the system in 2018. This report will be presented as an informational item at the March 22, 2023, Active

Transportation and Infrastructure (ATI) Committee. This report provides analysis and issues for Council to consider as it reviews future infrastructure-related items and the upcoming proposed FY 2024 Budget.

In preparing this report, we developed an Asset Management questionnaire and requested all Asset Managing Departments (AMDs) to respond via an online survey.[1] Additionally, we provided questions to Engineering & Capital Projects Department (E&CP) and the Department of Information Technology (IT)/ Enterprise Resource Planning (ERP) Division, which provides technical support for the EAM System. We coordinated our work with the Deputy Chief Operating Officer for Infrastructure. Our Office would like to thank staff from those departments for providing thoughtful responses and information.

How this Report is Organized

EXECUTIVE SUMMARY

Asset Management ensures the City's investments in critical infrastructure are both cost effective and optimized and is especially vital given the City's limited resources and the potential for an economic recession. Sound Asset Management practices build upon one another to support wise infrastructure investments that can begin to address the backlog of unfunded needs. Asset Management incorporates two important concepts for effective management of infrastructure assets: business practices and a supporting software system for optimizing maintenance, repair, rehabilitation, and replacement of assets.

Over the past decade, the City has taken positive steps by implementing Asset Management practices and the Enterprise Asset Management (EAM) System, as well as developing the Strategic Asset Management Plan (SAMP) in 2018. In this report, we review these practices, including an assessment of the status of the 27 recommendations from the SAMP; the extent to which EAM is being utilized by the six departments/divisions that implemented the system in 2018; and key ongoing Asset Management initiatives.

Asset Management Practices

Key Asset Management practices include developing and maintaining complete, accurate, and usable asset inventories, establishing Service Level Standards (SLS), conducting condition assessments to identify the current state of assets, conducting preventive maintenance, and developing Asset Management plans. These components progressively build upon one another. Up-to-date and reliable inventory, condition, and performance data allow AMDs to determine appropriate maintenance requirements and to plan optimal preventive maintenance schedules.

[1] We discussed the survey with the Housing and Homeless Strategies Department and determined they did not need to complete it at this time. Currently, the City's homeless shelters are maintained by GSD/Facilities Services and potential new shelters included in the CIP Outlook have not yet been built.

Preventative maintenance helps avoid asset deterioration and ultimately helps avoid more expensive replacement of assets. An Asset Management plan helps departments understand the operating and capital needs of their assets and supports CIP Outlook planning.

There are no Citywide requirements for consistent Asset Management across all AMDs. As a result, the extent, sophistication, and quality of Asset Management practices vary by department. For example, departments with strict legal requirements or dedicated funding generally have accurate information on the condition of their assets and use Asset Management plans and systems to identify capital needs. Other departments do not have the staff or budget needed to update the condition of their assets or to fully utilize their Asset Management systems.

Enterprise Asset Management (EAM) System

The City has taken a significant step towards implementing Asset Management through launching an Asset Management system, known as Enterprise Asset Management (EAM). EAM went live between 2017 and 2018 to six departments/divisions, including the Department of IT/Wireless Communications, Engineering & Capital Projects Department (E&CP), General Services Department (GSD)/Facilities Services, Public Utilities Department (PUD), Stormwater Department, and the Transportation Department. Key features of EAM include:

- ***Work Management*** – Automated and real-time Work Management that consolidates asset information into one system.
- ***Mobile Work Manager*** – Mobile, map-based capabilities that facilitate information sharing for workers in the field.
- ***Master Data Governance (MDG)*** – MDG is used with Work Management and Mobile Work Manager to consolidate and govern the master data for EAM
- ***Capital and Project Planning*** – The capital planning tools enables risk-based analysis, prioritization, and long-term capital planning and enables E&CP to coordinate work on co-located assets in bundled projects that avoid duplicative efforts and digging up the same street twice.

Departments use EAM to identify, plan, schedule and execute maintenance and repair work, and to identify and prioritize capital projects. The six departments utilizing EAM systems use various combinations of EAM functionalities based on their respective needs and resources, and the data, maintenance plans, and capital planning strategies that are currently in the system. The majority of departments using EAM report being able to more effectively manage their assets and work processes than before EAM implementation. Some departments said they are fully using EAM for some assets but not others. We identified several challenges with the system and opportunities for improvement:

- **Lack of Needed Staff:** Staff from several departments noted a lack of internal staff with needed technical skills to enable them to fully utilize EAM.

- **Lack of Complete Data and MDG Limits on Inputting New Data or Changing Existing Data:** The lack of complete and accurate data in EAM resulted in the continued need for all departments (except for Department of IT/Wireless Communications) to access legacy systems to obtain needed data, which leads to inefficiencies and could exacerbate data quality issues.

- **Need for Department of IT/Enterprise Resource Planning (ERP) Support:** ERP currently has a backlog of requests for service. Several departments indicated that enhancement requests are often not addressed in a timely manner (including capital planning and GIS components) and suggested that more resources are needed in the ERP to manage EAM.

- **Work Manager User Interface (UI) Is Not User Friendly:** Several departments noted the EAM UI is difficult to use and not user friendly. The replacement of Mobile Work Manager with BlueWorx is anticipated to increase usability and improve user experience.

- **Need for Additional EAM Training:** Several departments indicated that staff are not fully trained and EAM training in general is also needed when enhancements are implemented.

- **Need for Additional Maintenance Plans and/or Capital Asset Strategies:** Departments generally indicated they have not reassessed the need for additional Maintenance Plans or Capital Asset Strategies. Currently, water and sewer pipelines and streets (pavement) are the only assets being planned in EAM capital planning tool.

Key Ongoing Asset Management Initiatives

Several ongoing initiatives related to EAM System enhancements/upgrades are expected to improve EAM utilization, including the ongoing rollout of Blueworx to replace Mobile Work Manager, and a capital planning tool update for Stormwater to add all stormwater assets into the system. Another key ongoing Asset Managing initiative relates to the EAM Steering Committee. This Committee is leading implementation of Strategic Asset Management Plan (SAMP) recommendations. We discuss primary objectives and key accomplishment of the Committee in the *Key Ongoing Asset Management Initiatives* section of the report.

Summary of Recommendations

Key findings and recommendations discussed throughout this report are summarized in the *Conclusion and Recommendations* section. We recommend the following key items:

- The EAM Steering Committee develop Citywide guidance for consistent Asset Management practices.
- Asset Management and EAM-related budget requests be considered given the benefits of reducing lifecycle costs over the long term.
- The EAM Steering Committee lead development of condition assessment standards as recommended in the SAMP.
- Departments establish plans with interim milestones to achieve preventive maintenance goals over several years, recognizing that best practices for increasing preventative maintenance requires significant investments.
- The Department of IT work with the EAM Steering Committee to reassess support-related responsibilities and the level of ERP staffing that will be needed to fully support EAM.
- The EAM Steering Committee work with interested departments to provide an initial assessment based on business-related needs.

BACKGROUND

The Importance of Asset Management

Asset Management plays an important role in helping to effectively plan for investments in infrastructure. It is a best business practice for managing infrastructure assets to achieve desired service level standards (SLS) in the most cost-effective manner. Infrastructure assets have preventative and predictive maintenance needs that allow for strategies that support effective lifecycle management from acquisition to disposition. The Asset Lifecycle is shown in the figure below.

Recommended Best Practice

Asset Management is a recommended best practice by the:

- Government Finance Officers Association (GFOA);
- US Environmental Protection Agency; and
- US Department of Transportation, Federal Highway Administration; among others.

International Standards Organization (ISO) 55000 series provides standards for Asset Management business processes and systems to support effective and efficient management of assets.

The Institute of Asset Management (IAM) provides education, training, certification, and guidance on Asset Management best practices.

Conducting ongoing planned preventative and predictive maintenance is critical for strategically optimizing the life of capital assets in a cost-effective manner. When ongoing maintenance is not fully funded, it contributes to deferred maintenance and capital needs, accelerates asset depreciation, and increases repair and replacement costs as well as public safety and liability risks.

Asset Management incorporates two important concepts for effective management of infrastructure assets, including business practices, and a supporting software system for optimizing maintenance, repair, rehabilitation, and replacement of assets. Asset Management practices relate to core questions shown in the box on the right, and include establishing service level goals, conducting condition

Core Asset Management Questions:

- What assets do I own?
- What is my required level of service?
- What is the current state of my assets?
- Which assets are critical to sustained performance?
- What are my best operations and maintenance and capital investment strategies?
- What is my best long-term funding strategy?

assessments, prioritizing projects based on risk, and developing Asset Management plans. Given the significant amount of information and data needed for effective and sustainable management of infrastructure assets for a large city like San Diego, an Asset Management system is required to support work management and planning with the goal of maximizing investment strategies.

The City's Enterprise Asset Management (EAM) System

The City's primary Asset Management system is called SAP Enterprise Asset Management (EAM).[2] The EAM System was developed and implemented at a cost of $54 million from 2015 through 2018 and went live for six departments/divisions (Phase 1 EAM departments), including the Department of IT/Wireless Communications, E&CP, General Services Department (GSD)/Facilities Services, Public Utilities Department (PUD), Stormwater Department, and the Transportation Department. EAM replaced 28 outdated, in some cases paper-based, departmental legacy systems and applications.

Key components of the EAM System include Work Management, Mobile Work Manager, Master Data Governance (MDG), and Capital and Project Planning. Essentially, EAM is used to identify, plan, schedule and execute maintenance and repair work, such as repairing potholes or conducting plumbing repairs in City facilities. EAM is also used by AMDs to identify and prioritize capital projects, such as replacing water and sewer mains and repaving streets. Subsequently, E&CP uses prioritized projects in the EAM capital planning tool to plan and bundle co-located projects, which helps to leverage project costs and reduce multiple excavations into streets.

The Citywide Strategic Asset Management Plan (SAMP)

Following EAM System implementation, the City developed a Strategic Asset Management Plan (SAMP), which was finalized in June 2018 and established Citywide Asset Management objectives and strategies based on consensus among representatives of the City's AMDs. The SAMP's objectives and related strategies are shown in the table on the next page. The SAMP also provided 27 action items that were needed to achieve the objectives and ensure investments the City made in EAM were fully realized. We highlight these objectives, strategies, and recommendations throughout this report. We provide the status of SAMP action items that have been implemented thus far in Appendix A to this report. We also include our Office's recommended priority categories for the action items which have not yet been implemented, including near-term (1-2 years), mid-term (3-4 years), and long-term goals (5 or more years). Our prioritization is based on some action items being higher priority with a need to be implemented in the near term and/or that may be a prerequisite for accomplishing other action items. Some action items are more advanced or complex and are more appropriate as longer term goals.

[2] The City chose to implement the SAP module of EAM rather than other alternatives, such as IBM Maximo, because SAP is the City's existing enterprise resource system, and SAP EAM was considered easier to integrate with existing SAP financials, budget, and other modules.

SAMP Objectives and Strategies

Objective 1: Establish a Holistic Inventory	Objective 2: Provide Resilient Service	Objective 3: Provide Transparent + Translatable Prioritization	Objective 4: Ensure Supported Investment
♦ Build and Maintain an Asset Inventory ♦ Standardize Asset Management Procedures ♦ Manage Data as an Asset ♦ Conduct Regular Condition Assessments and Inspections ♦ Implement Condition Assessments and Inspections Guidelines	♦ Establish Service Level Standards for Assets ♦ Use the EAM System to Conduct Condition-based Lifecycle Planning for Assets ♦ Incorporate Planning for Future Assets into EAM ♦ Centralize Facilities Maintenance across Assets	♦ Uphold the Prioritization Process from Council Policy 800-14 and Implement Recommended Revisions ♦ Use the EAM System in Capital Planning Prioritization ♦ Establish Capital Project Bundling Guidelines ♦ Optimize Capital and O&M Expenditures ♦ Confirm Maintenance Funding in Capital Plans	♦ Review Current Funding Structures at Regular Intervals ♦ Develop a Financing Strategy ♦ Build Support through Public Outreach Initiatives ♦ Measure Satisfaction of Stakeholders

EAM Steering Committee

The first SAMP recommendation was to create an advisory committee to coordinate Asset Management efforts, provide a holistic approach to Asset Management, and provide leadership towards completing the remaining action items. The EAM Steering Committee was established in November 2022 and meets monthly. The committee is co-chaired by Deputy Chief Operating Officers that oversee the Phase 1 EAM departments and includes department directors and representatives from the Mayor's Office and the Department of Finance. Currently the committee is also supported by a consultant. Committee representatives noted that after several years of dealing with the COVID-19 Pandemic and signficant management and staff turnover across many of the EAM System Phase 1 departments, the committee's primary objective is to rebuild the EAM program and regain momentum.

The Steering Committee recently created a cross-departmental EAM Working Group comprised of key EAM operational representatives from Phase 1 departments, charged with working on high priority action items as established by the Steering Committee. The primary focus is operations as enabled by the EAM System. Priorities and accomplishments of the Committee and Working Group thus far are discussed in the *Key Ongoing Asset Management Initiatives* section of this report.

FISCAL/POLICY DISCUSSION

In the 2011 City Auditor's Report on the Capital Improvements Program (CIP), implementing citywide Asset Management practices was recommended. In 2013, our Office provided an update in our report Asset Management: Citywide Practices for Maintaining Infrastructure and Identifying Capital Needs. Since that time, the City has taken positive steps by implementing Asset

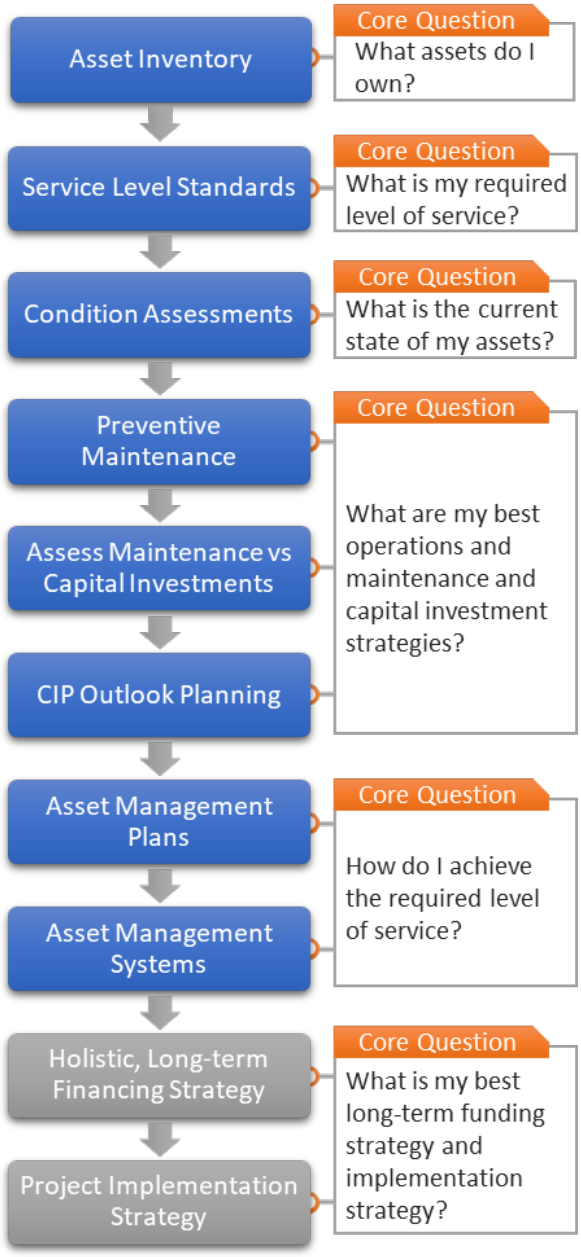
Management practices and the EAM System and developing the SAMP in 2018. While the pandemic may have impacted further progress, we believe the establishment of the EAM Steering Committee in November 2022 will provide leadership critical to the success of the City's Asset Management program.

Based on our current assessment, there are challenges primarily for General Fund departments, because the needed resources to support both practices and the system have thus far not been invested. Investing in Asset Management requires a cultural change to provide needed resources earlier so that an asset's lifecycle is optimized, and overall lifecycle costs are reduced. Asset Management practices build upon one another to provide needed information and strategies to support wise infrastructure investments. This also must be balanced with a consideration of affordability to guide the City toward efficient use of funds. It also serves as a foundation for the City moving to the next step: development of a holistic financing strategy with new revenue sources to begin addressing the $5.2 billion backlog of unfunded needs.

In the following sections, we review Citywide Asset Management practices, including an assessment of the status of recommendations from the June 2018 SAMP; the extent to which the EAM System is being utilized by the six departments/divisions that implemented the system in 2018; and key ongoing Asset Management initiatives.

Review of Current Citywide Asset Management Practices

The City's AMDs manage a wide range of asset types and have diverse goals and priorities. Key Asset Management practices are outlined in the SAMP objectives and strategies noted in the previous section. To determine where AMDs are in terms of implementing Asset Management strategies and objectives, we assessed Citywide Asset Management practices based on some key components of Asset Management, shown in the figure on the right. It is important to note that these components progressively build upon one another. The City should develop Asset Management plans and effectively use its Asset Management systems before pursuing significant new funding sources as part of a long-term financing strategy. We reviewed the foundational elements (those in blue boxes shown in the figure on the right) of Asset



Management practices that the City has been working on developing in this section of the report. All elements, including the next steps (elements in gray boxes) must be completed to provide satisfactory services sustainably and cost-effectively to communities.

We note that there are no Citywide requirements for consistent Asset Management across all AMDs. As a result, the extent, sophistication, and quality of Asset Management practices vary by department. For example, departments with strict legal requirements or dedicated funding generally have accurate information on the condition of their assets and use Asset Management plans and systems to identify capital needs. Other departments do not have the staff or budget needed to update the condition of their assets or to fully utilize their Asset Management systems.

Asset Inventory

Creating and maintaining a complete inventory of assets is the first step in strategic Asset Management. It addresses the fundamental question – "what assets does the department own?". This involves determining what assets should be inventoried, and gathering data on the type, location, quantity, age, useful life, impairments, and other appropriate characteristics of each asset. The asset inventory data needs to be complete and reliable and have an appropriate level of accuracy so that decision-makers can effectively plan condition assessment, preventive maintenance, and replacement. [3]

All AMDs have some asset inventory data; however, the level of completeness, accuracy, and consistency varies by department due to legal requirements and/or availability of staffing and resources. For instance, the Stormwater Department maintains an inventory of a variety of assets including pipes, channels, ditches, inlets, outlets, cleanouts, basins, headwalls, energy dissipaters, spillways, tide gates, pump stations, etc., but some existing assets are missing from its inventory database and some assets that have been removed or replaced still remain in the inventory. PUD's Wastewater Division faces similar issues with data completeness and accuracy: data on new infrastructure like sewer mains and manholes is incomplete and treatment plant inventory data is not verified. PUD's Water Division also identified a significant number of assets that are yet to be entered into the inventory system. The Water Division has developed a multi-step plan to ensure remaining assets are entered into the system and that assets with incomplete or inaccurate attributes are corrected.[4] While we note challenges with PUD and Stormwater inventories, they use EAM to manage their inventory and are more advanced than other departments in understanding their inventories.

Transportation staff noted that they have complete, consistent, and usable inventory data for sidewalks and traffic signals, but newly installed streetlights are not yet included in the inventory and the recorded map locations of streetlights are approximate locations only. Transportation Department is working on developing an inventory with its ongoing street tree program. A few departments currently do not have a structured asset inventory and are taking steps to develop one. For instance, GSD/ Facilities Division is onboarding an EAM Program Coordinator this fiscal year to support the review and validation of inventories. The Parks & Recreation Department plans to

[3] Although it would be optimal to have highly accurate data, the cost of data collection generally increases as the accuracy level increases, while in some cases not necessarily improving the results of asset management planning and decision making. The goal is to develop the inventory as accurate as possible given the resources available.

[4] PUD Water Division estimated that the timeline to fully implement the plan is late summer/early fall 2023.

develop an inventory starting with an ongoing internal process to document asset data utilizing existing applications.

An up-to-date and reliable inventory is the foundation for developing a capital improvement plan, and an Asset Management system is an effective way to manage inventory, condition assessment data, and maintenance history.[5] Additionally, asset inventory and condition assessment should be performed concurrently when feasible to achieve cost savings.

Managing Data as an Asset

Given the importance of reliable asset inventories, data governance is necessary to ensure that inventory data is consistent, usable, secure, and available. Not having asset data that meets quality standards could jeopardize departments' ability to make Asset Management decisions. The EAM System includes a component called Master Data Governance (MDG) for ensuring data standards and consistency of data in the system, as discussed in the *Assessment of the Use of the EAM System* section later in this report. This is important to ensure unauthorized changes are not made in the system, so data integrity is maintained.

Service Level Standards

One of the goals of strategic Asset Management is to achieve the desired level of service in the most effective and efficient way. Service Level Standards (SLS) help focus efforts and resources to achieve a goal or target and also provide a means of assessing overall performance toward that goal.[6] SLS are a critical element of accountability for public assets. Because of the limited funding available for infrastructure investment, the desired levels of service must be balanced with affordability. Therefore, it is important to quantify cost of SLS. When it comes to budgetary decisions, SLS can serve as a parameter for identifying asset needs, comparing options, and optimizing investment decisions. It should be noted that target SLS for different departments may be governed by legal mandates or requirements.

All AMDs have established SLS which are summarized in the following table. Most departments' SLS are based on regulatory requirements. Stormwater Department staff noted that most SLS are not met due to lack of funding. GSD/Facilities Services also noted that SLS would require funding for implementation.

Service Level Standards and/or Legal Requirements by AMD

Department/Division	Service Level Standards and/or Legal Requirements
Department of IT/Wireless Communications	99.999% availability of public safety radio services based on public safety standards.
DREAM/Airport Management	Goals based on Federal Aviation Administration (FAA) Design Standards and annual Caltrans Division of Aeronautics inspections.

[5] The EAM Steering Committee's highest priority is to for all Phase 1 EAM department to develop complete and consistent asset inventory data in SAP and GIS for asset types on a prioritized basis, thereby establishing core building blocks for all EAM processes.

[6] SLS are also referred to as Level of Service (LOS).

Department/Division	Service Level Standards and/or Legal Requirements
ESD [a]	Goals based on various regulatory requirements enforced by agencies including CalRecyle, State Water Resources Control Board (SWRCB), Regional Water Quality Control Board (RWQCB), Local Enforcement Agency (LEA), California Air Resources Board (CARB), Air Pollution Control District (APCD), etc.
Fire-Rescue	Goals based on firefighting safety standards.
GSD	Facilities Services – No formal goals established.
	Fleet – Fleet availability: 90% priority 1 and 95% priority 2 vehicles; Percentage of fleet within designated lifecycle.
Library	No formal goals established for facilities (facility maintenance managed by GSD/Facilities Services).
Parks & Recreation	Goals based on general industry standards for items such as replacement or renovation of turf and irrigation systems which are based on usage and standards for playground safety and accessibility.
Police	No formal goals established for facilities (facility maintenance managed by GSD/Facilities Services).
PUD	Goals are based on (1) regulatory requirements for water and wastewater systems per the Water and Sewer Design guidelines and (2) permit requirements issued by various regulating agencies, such as the CA Department of Public Health, and EPA.
Stormwater	Vary by programmatic assets as established in WAPM 2.0. Based on asset useful life, condition, and/or capacity depending on the asset type.
Transportation	Streetlights – Respond to service requests within 175 days.
	Pavement – Have an average overall network condition index (OCI) of 70 or higher.
	Street Trees – Palm trimming every 2 years and shade tree trimming every 10 years depending on funding availability.
	Traffic Signals – Prioritization of traffic signal repairs based on the issue.

[a] Although ESD does not have explicit SLS, the department's assets are subject to various regulatory requirements which can be considered SLS.

The SAMP recommended that staff assess the appropriateness of current service levels and establish SLS for remaining assets. **Given that the majority of departments have established SLS and the remaining department currently lack the needed resources to establish SLS, we recommend this as a mid-term priority for the EAM Steering Committee**.

Condition Assessments

Condition assessment is the process of periodic inspection of assets and analysis of resulting asset data to determine the current condition, remaining useful life, and the need and estimated costs for preventive or remedial actions for various assets. By having an inventory of assets *and* information on those assets' current condition and remaining useful life, AMD staff can make data-supported decisions on the maintenance and capital projects needed to achieve established SLS. The

following table provides information on the status of condition assessments the City has been conducting for facilities, streets, sidewalks, developed parks, and water and wastewater assets, over the past 10 years.

Condition Assessment Status by Asset Type

Asset Type	Condition Assessments Status
Facilities – General Fund	Facilities Condition Assessments from FY 2014 to FY 2016 **Requesting funding in FY 2024 budget process for updated assessment.*
Facilities – Park and Recreation	Parks and Recreation facilities are included in the General Fund Facilities above. Balboa Park Amenity Condition Assessment in FY 2016
Facilities – Public Utilities	Public Utilities Facilities Condition Assessment from FY 2014 to FY 2015
Developed Park Amenities	Developed Parks Condition Assessment from FY 2014 to FY 2016; Developed Park Amenities Condition Assessment in FY 2019
Sidewalks	Sidewalk Condition Assessment from FY 2014 to FY 2015
Streets	Pavement Condition Assessment in 2016 **Request for Proposals (RFP) for updated assessment pending in the next couple of months.*
Stormwater Assets	Ongoing condition assessments are typically performed on all assets regardless of maintenance history. Some assets are targeted for re-inspection based on maintenance history (e.g. inlets/cleanouts). Condition assessment for pipes are targeted based on materials that are exceeding or near exceeding their useful life. **Staff note that more resources are needed to support the planning of targeted condition assessments.*
Water and Wastewater	FY 2021 to FY 2026 Sewer mains CCTV and Assessment; FY 2022 to FY 2023 Trunk Sewer Condition Assessment; FY 2015 to FY 2022 Programmatic Water Pipelines; FY 2023 to FY 2027 Dams & Outlet Towers

Regularly conducting condition assessments ensures asset data is up to date. Recommended timelines to update those assessments vary by asset types. However, as discussed our Office's Review of the FY 2024-2028 Five Year Capital Infrastructure Planning Outlook, several departments have outdated condition assessments. For example, industry standards recommend conducting building condition assessments every five years; the latest condition assessment for existing City facilities was conducted between 2014 and 2016. An up-to-date assessment would better reflect the current state of facilities and provide an update on the existing facilities maintenance and capital backlog. GSD/Facilities Services requested $3.2 million for condition assessments in the FY 2024 budgetary process**. It will be important to consider this budget request, so that the City can obtain data on the condition of the City's existing facilities and possible failures in the foreseeable future.**

Condition Assessment Standards

The majority of departments contract condition assessments out to various expert consultants. We note that an important recommendation from the SAMP is to have standard guidelines for condition assessments so they can be provided by consultants in a consistent way and be easily input into EAM or other Asset Management systems maintained by the City. This would provide consistent requirements across all contracts. However, the City currently does not have such guidelines and the format of condition assessments varies. For instance, PUD's condition assessments are stored in EAM, in a standard report format provided by EAM based on maintenance plan data elements. Stormwater Department and Transportation Department tree team has some inspection results in EAM and some in other databases outside of EAM. Transportation Department Street Division stores condition assessments in its pavement management system Cartegraph. Fire-Rescue uses a cloud-based Fire-EMS software to store condition assessments.[7] DREAM/Airport Management's and GSD/Facilities Services' condition assessments are PDF documents.

Developing condition assessment standards as recommended in the SAMP is a priority that should be accomplished in the near term given the City is planning future assessments for facilities and pavement.

Preventive Maintenance

Preventive maintenance involves regularly scheduled maintenance and repair to avoid unexpected failure of assets and keep them in optimal working order. *Preventive* maintenance is a best practice and is different from *reactive* maintenance, which involves applying corrective actions after failures are observed, or *deferred* maintenance, which occurs when maintenance and repairs are deemed necessary, but are deferred, typically due to lack of resources. Although some level of reactive maintenance will always be necessary as unpredicted issues inevitably occur, adopting a preventive maintenance program can help to achieve a full asset lifecycle and reduce expensive emergency repairs and minimize service interruptions due to asset failures.

All AMDs perform some level of preventive maintenance for their assets, but the ratio of preventive maintenance to reactive maintenance varies, largely depending on available funding and staff. For instance,

- Department of IT/Wireless Communications performs preventive maintenance on all communication system assets. Preventive maintenance accounts for 80% of total maintenance work which is in line with industry standards.
- The Stormwater Department staff estimates that only 10% of its maintenance is preventive, significantly lower than industry standards. The Department performs preventive maintenance on certain asset types such as culverts, inlets and cleanouts, pump stations, diversion valves, and tide gates. However, the Department noted it does not have enough funding to plan or perform preventive maintenance for all asset types.
- GSD/Facilities Services' preventive maintenance constitutes about 20% of its work on various building systems, components, and equipment, with 80% of work being put towards reactive repairs. This is not in line with industry standards which recommend at

[7] Fire-Rescue uses Public Safety Tracking Systems (PSTrax).

least 70% for preventive maintenance. Staff also noted that the department does not have sufficient manpower or funding to support appropriate levels of preventive maintenance.

- The Parks & Recreation Department staff noted that preventive maintenance is subject to funding availability and dependent on several priority factors including safety. The Department conducts some preventive maintenance through regular inspections, but underfunding deferred maintenance has resulted in some parks assets exceeding their useful life.
- Transportation Department staff noted that for sidewalk repairs, approximately 25% of maintenance work is reactive, which is based on specific public complaints, and 75% is preventive, which is planned and prioritized maintenance not based on specific public complaints. Staff believe this is in line with industry standards.

Conducting preventive maintenance in line with recommended industry standards will require significant investments; however, we recommend departments establish plans with interim goals to achieve higher preventive maintenance goals over several years.[8]

Assess Maintenance vs Capital Investments

Regardless of value and size, all City assets require funding to maintain, repair, rehabilitate and replace. With limited Operations & Maintenance (O&M) and capital budgets, the City needs to make careful decisions about when to maintain, renew, and dispose of existing assets and create new assets. Considering the full life cycle and associated costs of an asset when making investment decision is critical to optimizing capital and O&M expenditures. A sound maintenance strategy not only lowers maintenance costs, but also reduces total asset lifecycle cost and improves asset performance. A lack of maintenance, on the other hand, accelerates asset deterioration and ultimately results in the more expensive need to replace an asset. **Optimizing Asset Management decision-making requires a data-driven and evidence-based approach where asset inventory, condition assessment, SLS, maintenance plan, and Asset Management Plan are integrated into an Asset Management System to drive decision-making.** We discuss Asset Management Systems in more detail in a later section of this report.

Overall, the process to make decisions between capital and maintenance spending on assets is decentralized and depends on the type of assets and resources available to the departments. For instance:

- The Stormwater Department assesses asset investment plans based on actual and long-term predictive performance. This methodology was developed as part of its Watershed Asset Management Plan (WAMP) 2.0. However, staff noted that this methodology has not been implemented yet in its Asset Management system since the current system is not configured to receive asset condition data. The Stormwater Department is working to have all operational sections collect inspection data in EAM as part of the BlueWorx project and ultimately have the data integrate into the EAM capital planning tool to support asset

[8] The November 2012 Performance Audit of the General Services Department – Facilities Maintenance Division recommended that Facilities management identify opportunities to refocus its operation from a costly breakdown maintenance model to one that prioritizes preventative maintenance.

investment decision making. We discuss BlueWorx in more detail in the *Assessment of the Use of the EAM System/ Ongoing Asset Management Initiatives* section later in this report.

- The Parks & Recreation Department makes capital and maintenance spending decisions based on several factors such as asset life cycle, safety, cost/benefit analysis, reliability, operational performance, regulatory compliance, O&M efficiency, maintenance cost reduction, and impact on asset utilization and quality of life.
- Transportation Department makes decisions regarding pavement based on deferred unit cost and funding source. For sidewalks, , by analyzing previously completed work, the Department determined that the approximate ratio between maintenance and capital sidewalk spending should be 1:6 to properly address sidewalk issues in areas that fall under the City's responsibility.

Business Care Evaluation (BCE)

One tool to help support asset investment decisions is a Business Case Evaluation (BCE), which is ultimately a cost/benefit analysis. The BCE identifies a problem, evaluates alternatives, and provides recommendations. It also includes cost estimates for each alternative and the overall recommendation for project execution. BCE takes a lifecycle view of costs, benefits, and related risks. This tool is currently used by PUD and Transportation Department/Street Division. The Parks & Recreation Department uses BCEs on a case by case basis through discussions and conducting a high level cost/benefit analyses of whether to rehabilitate or fully replace a tangible asset (building, pool, etc.) or re-imagine an entire park that no longer meets current standards. Departments that do not use BCEs or a similar tool, including Library, Police, GSD/Facilities Services, Stormwater Department, and Transportation Department for streetlights, noted that they do not have the expertise or resources to assess different scenarios. Environmental Services Department and Department of IT/Wireless Communications noted BCE is not applicable to their assets.

CIP Outlook

Capital planning should balance meeting demands for new infrastructure and addressing needs of aging infrastructure. These competing needs for limited funding should be weighed using sound Asset Management practices and objective data provided by Asset Management systems. While there are other important sources for identifying infrastructure needs such as the General Plan, Community Plans, and departmental master plans, Asset Management allows for data-driven decisions based on the lifecycle of assets in the most cost-effective manner.

We reviewed whether departments use Asset Management practices and/or systems to identify needed capital projects in the CIP Outlook. In general, enterprise-fund departments have more systematic processes for identifying and prioritizing capital improvement needs as they must comply with various regulation requirements or safety standards and generally have more resources available. For instance, for small diameter water and sewer pipe replacement projects, PUD works with E&CP to use the EAM capital planning tool to prioritize and group capital improvement projects based on asset information and condition assessment data. In addition, PUD uses Water and Wastewater Facility Master Plans to develop its Capital Improvement Projects (CIP) program. These master plans identify facility needs based on condition assessments, future demand, policies, regulatory requirements, and system hydraulic performance criteria as specified in Department Design Guidelines and Standards.

General Fund departments, especially those that have been chronically underfunded like GSD/Facilities Services, do not have the staff or budget to fully utilize EAM to identify capital needs for the CIP Outlook.

We recommend the development of consistent Asset Management practices Citywide, including how departments should identify capital needs for the CIP Outlook to support consistent, effective Asset Investment planning.

Asset Management Plans

An Asset Management plan provides the roadmap for achieving value from physical assets by optimizing cost, risk, and performance across the asset lifecycle in a sustainable way. An effective Asset Management plan minimizes the lifecycle cost for assets while targeting desired SLS and an acceptable level of risk, balancing financial, social, and environmental costs. Asset Management plans differ from a strategic plan, like the SAMP, or a capital plan in that they provide the maintenance and capital needs for specific assets or a group of assets based on criticality and risk over a long-term period, usually 20 years or more. This helps departments to understand their needs when submitting short-term operating and capital budgets. A good example of this is the Stormwater Department's Watershed Asset Management Plan (WAMP).

The Stormwater Department has a robust Asset Management program and developed the comprehensive WAMP in 2013 to meet its SLS and strict State and federal water quality requirements for each watershed. A series of updates were made to the WAMP in 2021 (WAMP 2.0). WAMP 2.0 includes asset inventory and hierarchy, criticality, estimated long-term costs, and funding strategies through FY 2040. Additionally, Department of IT/Wireless Communications developed an SAP EAM Implementation guideline with the latest update made in January 2023. The guideline includes inventory management, preventive maintenance, MDG, and performance metrics.

The SAMP provided a recommended approach and framework for an Asset Management plan, which is summarized in the following table. This framework serves as the foundation for departmental Asset Management plans and can be adjusted based on departments' specific asset types as appropriate.

Recommended Framework for Asset Management Plans

1. Executive Summary - A high-level summary of the document and its overall recommendations.	6. **Future Objectives for Asset Management** - Specific Asset Management objectives for the department.
2. Introduction - An introduction to the department, the type of infrastructure it manages, and its role in the City's operations.	7. **Implementation Recommendations** - Guidance for implementing the Asset Management plan, achieving the department's objectives, and communicating with and building support among stakeholders.
3. Inventory Management - A summary of the current asset inventory system for the department, asset classes, and current state of the infrastructure in the department.	8. **Funding Strategies** - An outline of the current funding levels and a discussion of future funding strategies for the department's Asset Management activities.
4. Lifecycle Optimization - A program for performing condition assessments, predictive maintenance, and preventive maintenance, including an explanation of prioritization.	9. **Citywide Asset Management Initiatives** - A discussion of Citywide Asset Management initiatives and how the Asset Management Plan achieves them.
5. Renewal and Replacement Management - A definition of the required service levels, a five-year cost projection, and a strategic plan for Asset Management activities.	10. **Resilience Plan** - A plan to sustain the right level of maintenance for infrastructure assets into the future.

Upon creation of the SAMP, only Stormwater and PUD had established Asset Management plans. Since then, more departments have developed Asset Management planning documents or procedures, which are at various maturity levels. The following table summarizes these plans and procedures. Some other departments such as GSD/Facilities Services expressed interest in developing Asset Management Plans but may not have the needed resources or expertise.

Asset Management Plans by AMD

Department/Division	Asset Management Related Plans & Procedures
DREAM/Airport Management	Airport Master Plans, currently being developed; Five-Year Airport Capital Improvement Program with the FAA
ESD	Uses quarterly facility inspections along with regulatory monitoring and reporting as practical Asset Management plans
PUD	Water and Wastewater Facility Master Plans
Department of IT/Wireless Communications	SAP Implementation Plan in Wireless Services Division
Fire-Rescue	Specific plans for firefighting equipment that requires routine evaluations, based on regulation requirements
GSD/Facilities	Draft Facilities Asset Management Plan
GSD/Fleet	Vehicle replacement plan
Library	Library Master Plan, currently being developed
Police	Specific plans for equipment based on departmental standards
Parks & Recreation	Parks Master Plan
Stormwater	Watershed Asset Management Plan Version 2.0
Transportation	Urban Forestry Program Five-Year Plan; San Diego Bicycle Master Plan; Sidewalk Maintenance Prioritization Standard Operating Procedure

The SAMP recommended that the EAM Steering Committee drive the planning effort and establish a timeline for completion of departmental Asset Management plans. EAM Steering Committee representatives indicate their first priority is working on asset inventory data, but providing a timeline for departments to develop Asset Management plans is a subsequent priority. **Such planning efforts can take some time; therefore, we believe this is a priority to be accomplished in the near term so that departments can work toward this goal.**

Asset Management Systems

As mentioned in the *Background* section of this report, given the significant amount of data needed for effective and sustainable management of infrastructure assets for a large City like San Diego, an Asset Management system is required to support work management and capital planning. An Asset Management system is a collection of data, software, hardware, and processes that support related business practices. Asset Management systems can have varied levels of sophistication, from a database that contains asset inventory and condition data to more advanced systems with inventory management, work orders, financial planning, asset lifecycles, GIS, modeling functions, and robust analysis and reporting capabilities. The need for and utilization of Asset Management systems vary by AMDs. Six departments are using EAM and six are using other Asset Management systems or other systems in addition to EAM. The following table shows Asset Management systems used by departments.

Asset Management Systems Utilized by Departments

Departments	Asset Management Systems
Department of IT/Wireless Communications	EAM, ServiceNow for IT Hardware Assets
E&CP	EAM
Fire-Rescue	PSTrax for equipment, apparatus, and facilities
GSD/Facilities Services	EAM
GSD/Fleet	Fleet Focus
Police	SAP for assets valued at or above $5,000, Quartermaster for equipment issued to personnel
PUD	EAM
Stormwater	EAM, ESRI-based inspection platforms for certain asset types such as channels and levees
Transportation	EAM, Cartegraph, Davey Tree Keeper, WCA Arbor Access, ArcGIS

Note: The Stormwater Department used a cloud-based asset management planning system up until FY23. The is working on migrating all inspections over to BlueWorx and all asset management planning over to the EAM capital planning tool.

We note that some departments that currently do not use an Asset Management system expressed interest in procuring/implementing a system. For instance, the Parks & Recreation Department uses existing resources such as spreadsheets and GIS mapping to manage its assets. The Department could benefit from having an Asset Management system that provides capabilities to consistently manage and track all asset inventories and optimize performance; to streamline its ability to log and enter data with ease; and to provide information to constituents and stakeholders with associated cost calculations. Parks & Recreation is exploring different software options, but procurement will depend on funding availability. The Library Department would also like to have a system to identify and keep track of maintenance needs and prioritize projects. The Department noted it would need to consult with E&CP and GSD/Facilities Services—departments responsible for the maintenance of Library's facilities—to implement such a system.

Some departments may not have the need for a sophisticated Asset Management system like EAM. For instance, airport infrastructure managed by DREAM/Airport Management has a predictable life cycle and is visually inspected twice daily. City-owned lands managed by DREAM are generally to be leased out or sold, and capital improvement and maintenance responsibilities of the City and the tenants are tracked in a lease administration software. ESD staff noted that they are not sure that the EAM or another Asset Management system could be tailored to ESD's needs.

Assessment of the Use of the EAM System

The following section discusses EAM utilization in six City departments/divisions. Based on our assessment of the extent to which departments are utilizing the EAM System, the majority of departments are either fully utilizing the system or indicated that they are more effectively managing their assets and work processes than before the implementation. However, we identified several challenges with the system and opportunities for improvement.

EAM System Components

The EAM System includes various components which can be primarily categorized as:

- ***Work Management*** *(includes SAP Plant Maintenance, Multi Resource Scheduling,* etc.) – An automated, real-time work management system that provides key asset information, such as asset condition, to support inventory management, planning, scheduling, and execution of maintenance and repairs.
- ***Mobile Work Manager*** *(SAP Work Manager to be replaced by BlueWorx)* – Mobile, map-based tablets used by workers in the field that enables paperless reporting and access to maintenance history and other key asset information.
- ***Master Data Governance (MDG)*** – MDG is used with Work Management and Mobile Work Manager to consolidate and govern the master data for EAM and ensure quality and consistency of data across departments. This is done by controlling permissions to add or edit information in the system and requiring approvals from Department of IT/ERP.
- ***Fiori*** *(SAP Fiori Forms)* – Fiori enables the Department of IT to customize and simplify the user interface (UI) for Work Management and Mobile Work Manager to improve user experience.
- ***Capital and Project Planning*** (*PowerPlan Asset Management Planning [PowerPlan AMP] and SAP Portfolio and Project Management (PPM*)) – The capital planning tools enables risk-based analysis, prioritization, and long-term capital planning. The map-based component of the tool enables E&CP staff to plan work on co-located assets in a bundled project and reduce the need to dig up the same street twice. PPM supports the planning and execution of projects and portfolios of projects.

The six departments utilizing EAM use various combinations of these components as shown in the following table.

EAM System Components and Use by Departments

	Department of IT/Wireless Communications	E&CP	GSD/Facilities Services	PUD	Stormwater	Transportation
Work Management	√		√	√	√	√
Mobile Work Manager			√	√	√	√
Master Data Governance (MDG)	√		√	√	√	√
Fiori	√		√			
Capital and Project Planning		√	√	√	√	√

The departments' use of various components is based on their differing needs and resources. It is also important to note that departments may be using EAM System components only for certain asset types and not others, depending on what data, maintenance plans, and capital planning

strategies are currently in the system. For example, Stormwater pipes were the only asset configured as part of the 2018 implementation of the capital planning tool. Stormwater is currently working with the software developer to configure the tool for all Stormwater asset types.

Challenges in Utilizing the EAM System

As reflected in the following table, while EAM was initially rolled out in 2017-2018 to six departments, only two out of the six departments—the Department of IT/Wireless Communications and E&CP—reported fully using EAM and having improved processes with EAM. Some departments said they are fully using EAM for some assets but not others. For example, Transportation reported that they are fully using EAM for sidewalks and traffic signals, but not for other assets such as pavement and trees.

Despite not fully using EAM, GSD/Facilities Services and Stormwater also indicated that they are better able to manage their assets/work processes with EAM compared with their previous legacy systems. Departments not fully using EAM reported various issues which are discussed in the following sections. It is notable that PUD and Transportation, two department with a significant number of assets, are not fully using the system, nor do they report they are better managing their assets with EAM compared with legacy systems.

Departments Reported Fully Using EAM and Processes Improved Over Legacy Systems

	Reported Fully Using EAM	Reported Processes Improved Over Legacy Systems
Department of IT/Wireless Communications	√	√
E&CP	√	√
GSD/Facilities Services		√
PUD		
Stormwater		√
Transportation		

Lack of Needed Staff

GSD/Facilities Services, Stormwater, and Transportation all noted that they lacked staff needed both during and after implementation. This includes a lack of internal staff with needed technical skills, to enable them to fully utilize the system, such as expertise in IT (such as Information System Analyst III), engineering, plant maintenance, planning/scheduling, and GIS to support updates to inventory and MDG, maintenance planning, and management of the EAM capital planning tool.

The SAMP recommends (action Item 27) that the EAM Steering Committee review job classifications to determine what additional classifications are needed or should be revised to effectively support Asset Management business practices and the EAM System. Given challenges with needed resources to support EAM in several departments, we believe this is a near-term priority. We also note that the Steering Committee advised departments to request needed resources in the FY 2024 budget process. **We recommend that these Asset Management and EAM-related budget requests be fully considered given the benefits of reducing lifecycle**

costs over the long term, including reducing the need for emergency repairs, and more efficient spending of City resources.

Lack of Complete Data and MDG Limits on Inputting New Data or Changing Existing Data

Another challenge relates to the lack of complete and accurate data in the system which has resulted in the continued need for all departments (except for Department of IT/Wireless Communications) to access their legacy systems to obtain needed data. In some cases, departments also use Excel files when data is not in the EAM system. Access to legacy systems is limited to a view only mode, and no new data can be entered into or modified in legacy systems. Not having asset data centrally stored in one system leads to inefficiencies and can exacerbate data quality issues.

The lack of complete data in EAM is exacerbated by MDG which limits the ability of staff to make changes in the EAM system, such as entering new or changing existing data. Since all asset owners do not have permission within the system to manage their own assets, the process requires departments to work through the Department of IT/Enterprise Resource Planning (ERP) team (which supports the EAM System).

Staff from several departments noted that the Department of IT/ERP is not fully staffed, which has led to delays, frustration, and a backlog of work. Staff further noted a possible solution to provide system refresher training for specified asset owners within each division so they can reestablish access to master data and allow them to manage their own assets. Department of IT/ERP told us that they have one vacancy and a current backlog of requests. Break-fixes are generally prioritized, which can lead to delays for other types of service requests. The need for Department of IT/ERP support is discussed in the following section.

The SAMP notes that MDG was intended to be supported by committees for both asset data and materials data which would be responsible for developing standards and guidelines and for approval of new data coming into the system. Although these groups have thus far not been created, EAM Steering Committee representatives indicated their top priority is to work to improve asset inventory data and MDG consistency/standardization at the department level. This is a basic EAM building block where progress will be measured in a Department Report Card. Representatives noted this is an on-going process as departments are in various stages of maturity with data. While not the original MDG Committees as conceived in the SAMP, they believe this is a start with a specific focus on asset data.

Given the challenges raised by departments regarding data and MDG, we recommend that the EAM Steering Committee prioritize the creation of these groups to address and resolve issues that have been raised by departments, including assessing the need for additional training and expansion of MDG-related roles. This should include working with the Department of IT/ERP to ensure issues are fully resolved.

Need for Department of IT/ERP Support

The Department of IT/ERP Division has an established process for identifying and resolving EAM-related issues. Aside from technical maintenance performed by ERP, all requests for enhancements or break-fixes are communicated to the EAM Team by each department's Business Process Coordinator (BPC). These items are recorded and prioritized by departmental BPCs in

ERP's system for managing EAM issues and are addressed by ERP accordingly. ERP currently has a backlog of 94 requests for service in various statuses and priorities within their system queue, as shown in the following tables. *Very High* priority tickets, such as break-fixes, receive immediate attention, and departments specify the level of priority for remaining tickets. ERP noted that the number of open requests will never be at zero as the business continues to add enhancement requests as use of SAP matures.

Status	Count
Customer Action (Dept)	17
In Process (ERP)	18
On Hold (Dept)	19
New	36
Production Validation	1
Proposed Solution	3
Total	**94**

Priority	Count
Very High	7
High	19
Medium	26
Low	42
Total	**94**

Several departments indicated that enhancement requests are often not addressed in a timely manner (including capital planning and GIS components) and suggested that more resources are needed in the Department of IT/ERP to manage EAM. The Department of IT/ERP's EAM team has 7.00 positions and currently has 1.00 vacancy. ERP indicated they have an open recruitment to fill that position, but have challenges attracting and retaining staff. They noted that demand for qualified candidates is at an all-time high and the City requires multiple/continuous recruitments to attract qualified candidates. Note that EAM is also supported to some degree by the whole ERP team (30.00 budgeted positions), including consultants (30), and the GIS team (14.00 budgeted positions).[9]

Given the challenges reported by departments, and the EAM Steering Committee's plans for rebuilding the enterprise-level EAM Program, we recommend the Department of IT work with the EAM Steering Committee to reassess support-related responsibilities and the level of ERP staffing that will be needed to fully support EAM.

Work Manager User Interface (UI) Is Not User Friendly

Several departments noted the EAM user interface (UI) is difficult to use and not user friendly. Stormwater indicated that the UI is challenging for staff to navigate, and hardware and software challenges with the mobile interface caused it to periodically be unreliable. As a result, some sections within the department still use GIS-based inspection products with more user-friendly UIs. The replacement of Mobile Work Manager with BlueWorx is anticipated to increase usability and improve the user experience, as discussed later in this section.

We note that Fiori was implemented in the Department of IT/Wireless Communications and GSD/Facilities Services to enhance the user experience. According to the Department of IT/ERP, Fiori was assessed for use by the remaining departments but did not fit with their needs.

[9] To determine needed support staffing, the Department of IT follows Information Technology Infrastructure Library (ITIL) Demand and Capacity Management guidelines. A base level of staffing is in place to meet the run the business needs. Historically, demands by departments are assessed against staffing levels and where additional support is required, the department uses its as-needed consulting services to bring additional resources onboard.

We recommend the Department of IT/ERP assess this issue further and consider a similar update for the Work Management interface to provide a more intuitive interface and improve user experience.

Need for Additional EAM Training

The Department of IT/ERP noted that the responsibility of delivering training to use the EAM System rests with each departments' BPC and their management team. The Department of IT/ERP supports the development of training materials using various software tools. For new solutions, a train-the-trainer model is used with key staff selected by each department to attend training provided by vendors. Those staff in turn develop system-related expertise to provide training for their department employees.[10]

Several departments indicated that staff nevertheless are not fully trained, and EAM training in general is also needed when enhancements are implemented. For example, PUD staff noted the need for training that covers basic navigation of EAM, understanding of the various related modules, working within EAM to enter or modify assets, create or modify maintenance plans, and utilize functional locations to find assets. Stormwater Department staff indicated there has been significant and frequent turnover for many of the department's EAM roles, and continuous trainings are therefore needed for all EAM job functions. Additionally, Stormwater staff recommended some job functions may require more thorough classroom style trainings beyond those provided by the ERP resource page and SuccessFactors, and that BPCs need more training resources to support as-needed training for field and office staff.

The SAMP does not address the need for additional departmental EAM-related training. **We recommend that the EAM Steering Committee include training as an item to be further assessed.**

Need for Additional Maintenance Plans and/or Capital Asset Strategies

Having additional Maintenance Plans and/or Capital Asset Strategies will enable departments to expand their use of EAM. Aside from the Stormwater upgrades discussed above, departments generally indicated they have not reassessed the need for additional Maintenance Plans or Capital Asset Strategies.

Maintenance Plans

Having Maintenance Plans in EAM enables the system to provide automated notifications of needed predictive or preventive maintenance so that work can be planned and scheduled. Maintenance Plans that are currently in the system were developed as part of the initial EAM implementation. It appears that the majority of departments have not assessed the need for additional maintenance plans.[11] The following table shows current and needed Maintenance Plans.

[10] To date, Department of IT/ERP staff indicated they have developed and published on the ERP-EAM intranet site: 100+ Detailed Work Instructions, 80+ How-to quick reference 1-2-page guides, 40+ FAQs providing information on EAM, 43 Training courses on SuccessFactors, and 6 Videos.

[11] One exception is Stormwater, which has a more robust and mature Asset Management program. Stormwater is also developing Maintenance Plans for additional assets, as well as updates to existing Maintenance Plans, though it lacks sufficient staff to plan and implement all those updates and is seeking additional resources as part of the FY 2024 budget process.

EAM System – Existing and Needed Maintenance Plans

Department	Existing	Needed
Department of IT/Wireless Communications	Preventive maintenance for hardware assets and needs for software asset management.	Additional plans are not needed.
GSD/Facilities Services	HVAC, Generators, Facilities Inspections, Lighting Inverters, Fire Extinguishers.	Have not assessed.
PUD	Assets related to water, quality, distribution, or delivery; Wastewater-related assets, such as pipeline and manholes.	None have been identified at this time.
Stormwater	Street sweeping, drain inspections, and pump stations.	Pipes, channels, culverts, ditches, outfalls, basins, structural best management practices (BMPs), and levees.
Transportation	Traffic signal quarterly inspections.	Preventative maintenance on traffic signal cabinets.

Note: E&CP does not have Maintenance Plans as they are focused on capital planning.

Capital Planning Asset Strategies

E&CP noted that utilizing EAM tools for capital planning, prioritization, and project planning has enabled them to develop a well-supported capital plan (CIP Outlook), because capital needs and projects identified using EAM are based on accurate data and agreed upon planning strategies. From E&CP's perspective, this system would be most effective if all AMDs were using it to plan and prioritize their key assets. Currently, water and sewer pipelines and streets (pavement) are the only assets being planned in the EAM capital planning tool. As previously noted, Stormwater is currently developing Asset Strategies for all asset types. GSD/Facilities Services would like to use the tool but currently lacks the staff needed to do so.

Developing additional or enhancing existing Capital Planning Asset Strategies would enable AMDs and E&CP to utilize EAM more fully. E&CP staff indicated that having complete, updated data helps support effective and coordinated planning among departments and noted some current challenges associated with lack of asset data in the EAM capital planning tool. For PUD, knowledgeable personnel who participated in the 2018 EAM implementation have left the City, and updates of Capital Planning Asset Strategies for water and sewer pipelines will be needed soon. Transportation Department prefers to use their Cartegraph System for pavement planning, so regular updates or integration is needed to reflect this in EAM's capital planning tool. E&CP noted that having Capital Planning Asset Strategies for other transportation assets would be beneficial, as well as for parks and facilities.

For those assets not in EAM's capital planning tool, E&CP noted it is difficult and time consuming to seek out other programs, plans, and sources of information. For example, E&CP obtains data from GIS for the Bicycle Master Plan and Transportation Unfunded Needs List.

The SAMP included a recommended action item (9) that departments assess and refine both maintenance plans and capital planning asset models/strategies for Phase 1 departments. EAM Steering Committee representatives told us that their next focus beyond asset inventory data is to operationalize the data via asset Maintenance Plans and Capital Planning Strategies. They plan to

establish timelines for the development of these by department. We agree this action item is a near-term priority for fully utilizing EAM.

Lessons Learned from the 2018 Implementation

Some key lessons learned regarding the 2018 EAM implementation were provided by the departments. These primarily relate to the need for better data cleansing, additional internal departmental resources to get the maximum value from the system, and additional training and testing. These lessons learnt are summarized below:

Department of IT/Wireless Communications – The Department indicated that implementation was a huge and successful undertaking with major paradigm changes. Lessons learned include the need for repeated refresher training, inventory and database cleansing, organizational change management, change champions, BPC's, identification of "super-users", and repetition on work orders.

GSD/Facilities Services – The Department indicated that training is important and more Subject Matter Experts are needed.

Public Utilities – The Department indicated that greater time and energy should have been spent on data cleanup and standardization prior to import into EAM. As this was not the case, only partial data was imported into the system and the department has been working to fully enter all its assets ever since.

Stormwater – The Department indicated that it lacked sufficient resources for the full implementation of a new system. The Department also indicated that additional testing of the mobile work management component was needed to provide a more reliable platform prior to implementation, that continuous trainings should be supported by a team of trainers, and that Citywide support and guidance should be developed for all departments to ensure proper adoption, continued usage, and periodic system enhancements across the City.

E&CP – The Department indicated that the EAM capital planning would be more effective if data from AMDs was complete and up-to-date so that E&CP could facilitate project planning, bundling, and coordination.

Department of IT/ERP – The Department indicated that other AMDs may not have sufficient resources to get the maximum value from EAM.

Key Ongoing Asset Management Initiatives

This section discusses several ongoing positive initiatives related to EAM System enhancements/upgrades expected to improve utilization, EAM Steering Committee accomplishments, and key objectives for the EAM program.

System Enhancements/Updates Are Expected to Improve Utilization for Departments

The Department of IT/ERP division is responsible for supporting the EAM System and conducting updates and enhancements. Updates occur on a weekly basis. To date, more than 525 enhancements/updates either have been implemented or are in the pathway for implementation.

Two key projects are currently ongoing which are anticipated to improve utilization of the System: replacing the Mobile Work Manager with BlueWorx, and implementing an EAM capital planning tool upgrade for the Stormwater Department.

Ongoing Rollout of BlueWorx to Replace Mobile Work Manager

SAP Mobile Work Manager is an outdated mobile solution that is no longer supported by SAP. It also lacks functionality that can be used by departments to increase data capture and operational efficiency. The decision to replace SAP Mobile Work Manager was collaboratively made by all stakeholder departments currently using this application (GSD/Facilities Services, PUD, Stormwater, and Transportation) to increase usability and improve user experience. ERP told us the rollout to all participating departments is going well and anticipated to be completed during this Fiscal Year.

Stormwater Enhancements

Full adoption of EAM did not occur within the Stormwater Department when the system went live in 2018, with Mobile Work Manager only partially rolled out to the operational crews and the capital planning tool only configured for one asset class (stormwater pipes), largely because the department did not have the staffing resources needed to support full implementation. However, as part of a current effort to enhance Stormwater's Asset Management tools, BlueWorx is being rolled out to each Stormwater operational crew in FY 2023, and the EAM capital planning tool is being reconfigured to include all Stormwater asset classes, including data connections to GIS and other EAM modules. The Stormwater Department is requesting additional resources needed to support this effort as part of the FY 2024 budget process.

EAM Steering Committee representatives noted the successful pilot of the EAM capital planning tool by Stormwater is providing a blueprint for other departments to replicate and adapt for their own needs.

The EAM Steering Committee Is Taking the Lead to Implement SAMP Recommendations

In November 2022, the City formed the EAM Steering Committee which is now working with a consultant to assess and prioritize the SAMP recommendations. Committee representatives told us they agree with all of the SAMP recommendations and are making progress on implementation. Committee representatives noted that some of the recommended action items are ongoing and will need to be revisited at certain times rather than considered as implemented.

Primary objectives for the Steering Committee (in line with SAMP recommendations 1, 3, 9 and 23) for all Phase 1 EAM departments include:

1. Developing complete and consistent asset inventory data in SAP and GIS for asset types on a prioritized basis, thereby establishing core building blocks for all EAM processes and a blueprint for eventual use by Phase 2 AMDs.[12]

2. Deploying new, easier-to-use mobile devices for field crews to update inventory for new, removed, or replaced assets (the BlueWorx upgrade 5-month rollout across all Phase 1

[12]The Phase 2 strategy was planned as a rolling release over five fiscal years to six additional departments/divisions, including Department of IT/Operations Division, Library, Police, Fire-Rescue, ESD, and Parks & Recreation. This was delayed due to the pandemic.

Departments is currently in progress). This is intended to support on-going accuracy of asset information, accountability for Asset Management from top-to-bottom of the organization, and capturing field level knowledge that can inform process improvements.

3. Reviewing the EAM capital planning tool's current use and any additional requirements at a department level with the goal of potentially expanding usage to improve multi-asset planning and data-driven decision making in support of the CIP Outlook.

Key accomplishment for the Committee thus far include:

- Establishing a Committee charter, metrics, and conducting initial meetings.
- Requesting Phase 1 departments assess their needs and request additional resources/positions needed to fully support EAM activities as part of the FY 2024 budgetary process.
- Establishing a cross-departmental EAM Working Group that operates under the guidance/stewardship of the Steering Committee and takes on specific efforts and action items in support of the objectives noted above.
- Establishing an initial Department EAM Performance Report Card as part of a new metrics-based process that is just getting underway.
- Conducting s successful pilot of the EAM capital planning tool system by Stormwater, which will provide a blueprint for other departments to replicate and adapt to their department.

We support the Committee's efforts and recommend they provide an update on progress at a future ATI Committee meeting.

Expanding EAM to Other AMDs

During EAM System implementation, a high-level phase 2 strategy for expanding EAM to additional AMDs in future years was developed. As discussed in the *Review of Current Citywide Asset Management Practices* section of this report, several AMDs, including Parks & Recreation and Library, indicated that they have a need for an Asset Management system. E&CP also indicated that having more departments using the EAM capital planning tool would enhance their capital and project planning capabilities, specifically noting Parks, Facilities, Stormwater and additional Transportation assets (besides Streets data) would be beneficial.

Department of IT officials told us efforts for phase 2 were delayed due to the Covid-19 Pandemic as departments were dealing with other priorities. At this point, the City's overall SAP system is nearing its end of life, and the Department of IT is in the process of procuring a consultant to assess the City's existing ERP system and the current market, and to provide recommendations regarding the City's next generation ERP System. From an IT perspective, expansion of EAM to other departments will be on hold until this larger decision is made. However, Department of IT/ERP staff indicated that the recently established EAM Steering Committee will provide the leadership and governance to drive EAM expansion.

We agree expansion of EAM should be on hold until the decision is made on the City's next ERP system. However, the City should start assessing departments' potential need for an Asset Management system as this can be a complex and lengthy process. Additionally, there may be a valuable benefit to providing this tool to additional departments to support consistent and effective

asset investment planning. **Therefore, we recommend that the EAM Steering Committee work with interested departments to provide an initial assessment based on business-related needs.** This can provide a starting point for the Department of IT, once the larger decision has been made.

CONCLUSION AND RECOMMENDATIONS

The City's large and complex network of infrastructure assets represents a significant and vital investment. Years of tight financial constraints and limited dedicated funding sources for many competing priorities has led to underinvestment in infrastructure and a $5.2 billion deferred capital backlog. Continued deferral of projects has resulted in deterioration of existing assets, increased costs and liability, and the inefficient allocation of resources. This can be seen in the City's street, sidewalks, and buildings. To address this growing backlog of unfunded needs, the City needs both a viable plan to execute projects, and a large-scale and holistic financing strategy.

Asset Management that ensures the City's investments in critical infrastructure is both cost effective and optimized, is vital, especially when there are limited resources and the potential for an economic recession. Sound Asset Management practices build upon one another to support wise infrastructure investments that can begin to address the backlog of unfunded needs.

Over the past decade, the City has taken positive steps by implementing Asset Management practices and the EAM System, as well as developing the SAMP in 2018. While the pandemic may have impacted further progress, we believe the establishment in November 2022 of the EAM Steering Committee will provide leadership critical to the success of the City's Asset Management program.

Significant challenges remain, especially for General Fund departments, as the resources needed to support both Asset Management practices and the EAM system have thus far not been invested. Providing the needed resources to support effective asset management now can ultimately help to reduce asset lifecycle costs and yield a positive return on investment.

Key findings and recommendations discussed throughout this report are summarized in the following table.

Key Findings and Recommendations

	Key Finding	Recommendations
Overall	There are no City-wide requirements for consistent Asset Management across all departments. As a result, the extent, sophistication, and quality of Asset Management practices vary by department.	We recommend the EAM Steering Committee develop Citywide guidance or requirements for consistent Asset Management practices and revising Council Policy 800-16: Asset Management Guidelines and Plan Steps to reflect that guidance, as was recommended in the SAMP (action items 2 and 24).
	Eight out of 27 recommendations in the 2018 SAMP have been implemented, and it has been 5 years since the SAMP was adopted and EAM System went live. We have provided priority categorization for the remaining SAMP recommendations in Appendix A to this report.	We recommend the EAM Steering Committee proactively address the near-term action items and develop a plan and timeline for those remaining. Also, the committee should assess the need for additional resources to support this body of work. We also recommend the Steering Committee provide an update at a future ATI Committee meeting.
	Particularly for General Fund departments, there is a lack of needed resources to support full utilization of Asset Management practices and the EAM System. The EAM Steering Committee advised departments to request needed resourced in the FY 2024 budget process.	We recommend that these Asset Management and EAM-related budget requests be fully considered given the benefits of reducing lifecycle costs over the long term, including reducing the need for emergency repairs, and more efficient spending of City resources.
Asset Management Practices	Condition Assessments – Some condition assessments are outdated, and the City does not have accurate information on the conditions of these assets. This is the case for facilities condition assessments which were last conducted in 2014-2016 and are recommended to be conducted every five years. An updated assessment would better reflect the current state of facilities and maintenance and capital backlog for existing facilities.	Facilities Division requested $3.2 million for condition assessments in the FY 2024 budgetary process. It will be important to consider this budget request, so that the City can obtain data on the condition of the City's existing facilities and possible failures in the foreseeable future.
	Condition Assessment Standards – The City lacks condition assessment standards or guidance to ensure consistency and ensure data is provided in a way that is easily downloadable into EAM or another Asset Management System.	We recommend the EAM Steering Committee lead development of condition assessment standards as recommended in the SAMP (action item 6) as a priority to be accomplished in the near term given the City is planning future assessments for facilities and pavement.
	Preventive Maintenance – Many departments are conducting preventive maintenance well below industry standards, largely depending on available funding and staff.	Conducting preventive maintenance in line with recommended industry standards will require significant investments, however, we recommend departments establish plans with interim milestones to achieve preventive maintenance goals over several years.

	Key Finding	Recommendations
Utilization of the EAM System	Data and MDG Challenges – Several department indicated a lack of complete data in EAM that is exacerbated by Master Data Governance (MDG), which limits the number and roles of staff who can make changes in the system, for example for entering new or changing existing data. The SAMP (action item 3) notes that MDG was intended to be supported by committees for both asset data and materials data which would be responsible for developing standards and guidelines and for approval of new data coming into the system. These groups have thus far not been created.	We recommend that the EAM Steering Committee prioritize the creation of these groups be to address and resolve the issues that have been raised by departments, including assessing the need for additional training and expansion of MDG-related roles. This should include working with the Department of IT/ERP to ensure the issues are fully resolved.
	User Interface (UI) Challenges – Departments reported the EAM UI for Work Management and Mobile Work Manager has been difficult to use and not user friendly and therefore can be challenging for staff to navigate. The replacement of Mobile Work Manager with BlueWorx is anticipated to increase usability and improve user experience.	We recommend the Department of IT/ERP work with departments to assess this issue and determine a solution for the Work Management interface to provide a more intuitive UI and improve user experience.
	Department of IT/ERP Support – Several departments indicated that enhancement requests are often not addressed in a timely manner. ERP currently has a backlog of EAM service requests and has one vacancy in its EAM support team. Departments suggested that more resources are needed in the Department of IT/ERP to manage EAM. The Department of IT/ERP believes they are at the right staffing level, but noted challenges attracting and retaining staff which can require multiple/continuous recruitments to attract qualified candidates.	Given the challenges reported by departments, and the EAM Steering Committee's plans for rebuilding the enterprise-level EAM Program, we recommended the Department of IT work with the EAM Steering Committee to reassess support-related responsibilities and the level of ERP staffing that will be needed to fully support EAM.
	Training – Although ERP has provided numerous training materials, several departments indicated that staff are not fully trained and EAM training in general is also needed when enhancements are implemented. Also, continuous training is needed for all EAM job functions because there has been significant and frequent turnover for many of the department's EAM roles.	The SAMP does not address the need for additional departmental EAM-related training. We recommend that the EAM Steering Committee include training as an item to be further assessed.

	Key Finding	Recommendations
Asset Management Initiatives	The expansion of EAM to other departments is on hold until the larger decision is made regarding the City's next generation enterprise system.	Given that assessing departments' potential need for an Asset Management system can be a complex and lengthy process, we recommend that the EAM Steering Committee work with interested departments to provide an initial assessment based on business-related needs. This can provide a starting point for the Department of IT, once the larger decision has been made.

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APPENDIX A

Status and Recommended Priority Categorization of Action Items in the Strategic Asset Management Plan (SAMP)

Following the Enterprise Asset Management (EAM) System implementation, the City developed a Strategic Asset Management Plan (SAMP) in June 2018 which established Asset Management objectives and strategies based on consensus among representatives of the City's AMDs. The SAMP also provided 27 recommended action items needed to achieve the objectives and strategies and ensure investments the City has made in EAM would be fully realized. The status of the recommendations is shown in the table below. Thus far, action has been taken on seven of the recommendations and three have queued up as next priorities. We also include our Office's recommended priority categories for the action items which have not yet been implemented, including near-term (1-2 years), mid-term (3-4 years), and long-term goals (5 or more years). Our prioritization is based on some action items being higher priority and need to be implemented in the near term and/or may be a prerequisite for accomplishing other action items. Some action items are more advanced or complex and are more appropriate as longer-term goals.

	SAMP Recommended Action Items	Implemented	Next Priorities	Near term	Mid-term	Long-term
1	Create an advisory committee to coordinate Asset Management efforts, provide a holistic approach to Asset Management, and lead work towards completing the remaining action items.	√				
2	Standardize Asset Management procedures by development of Asset Management plans and policies.			√		
3	Carry out the planned MDG committees for asset data and materials data.		√			
4	Use maintenance history in the EAM System to target needed condition assessments.				√	
5	Expand the condition assessment program to include additional assets, as appropriate.				√	
6	Implement guidelines for condition assessments and inspections.			√		
7	Assess how capitalization of newly built or improved infrastructure can be done in the system and develop a policy/process for how this data is tracked and logged.					√
8	Assess appropriateness of current service levels, revise as needed, and establish Levels of Service (LOS) for remaining assets.				√	
9	Assess and refine both maintenance plans and capital planning asset models/strategies [Asset Management Planning (AMP)] for Phase 1 departments.		√			
10	Support implementation of the EAM System for Phase 2 departments so they can use the IAM System to conduct lifecycle planning for assets.			√		

	SAMP Recommended Action Items	Implemented	Next Priorities	Near term	Mid-term	Long-term
11	Identify additional assets that would benefit from development of maintenance plans or strategies and take steps or establish a plan to obtain the needed data.			√		
12	Assess options for including planned future assets into the EAM System, including those identified in Public Facilities Financing Plans (PFFPs).					√
13	Revise Council Policy 800-14 to (1) enable prioritization across departments/ asset types; and (2) incorporate ranking specifically for capital needs.	√				
14	Normalize risk to enable prioritization across asset types, as well as to quantify into dollar amounts.				√	
15	Finalize guidelines for bundling projects into Standard Operating Procedures (SOPs).	√				
16	Use Business Case Evaluations (BCEs) [or similar] to fully assess projects and ensure sound investments are being made.				√	
17	Consider including maintenance in long-range capital planning to ensure it is being accounted for in lifecycle costs of assets.				√	
18	Continue to regularly assess existing funding sources and pursue funding opportunities, such as grants.	√				
19	Develop a financing strategy to identify new sources of funds to address the existing and future funding gap.				√	
20	Build support and educate stakeholders through public outreach initiatives.	√				
21	Work with the Performance & Analytics Department to include questions related to infrastructure in future residents' surveys to gauge satisfaction of stakeholders.	√				
22	Ensure I AM San Diego Phase 2 departments have needed resources to implement Asset Management business practices and plans, as well as the EAM System.			√		
23	Drive the planning effort and establish a timeline for completion of departmental Asset Management Plans.		√			
24	Work with appropriate staff and the Infrastructure Committee [now Active Transportation and Infrastructure (ATI) Committee] to finalize the proposed new Council Policy 800-16.			√		
25	At the discretion of the Advisory Committee, a corresponding administrative regulation could be developed to reflect the revised Council Policy 800-16.				√	
26	Assess and finalize as appropriate recommended revisions to Council Policy 800-14.	√				
27	Review job classifications to determine what additional classifications are needed or should be revised to effectively support Asset Management business practices and the EAM System.			√		