



Peninsula Corridor Joint Powers Board
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TRANSIT ASSET MANAGEMENT PLAN

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EXECUTIVE SUMMARY

The overarching goal of transit asset management (TAM) is to ensure that a transit agency's assets are maintained and operated in a consistent, measurable state of good repair (SOGR). The TAM Plan is a document required by the Federal Transit Administration (FTA) per MAP-21 legislation for all agencies that receive federal funding and provides guideposts by which an agency can track progress toward a mature, data-driven asset management program. TAM involves all activities related to maintaining physical assets, such as rolling stock, maintenance facilities, and rail infrastructure, in SOGR, in order to provide safer and more reliable public transit service. MAP-21 also includes requirements for prioritizing reinvestments based on performance, condition, and risk assessment of assets that are within a provider's direct capital responsibility.

The Peninsula Corridor Joint Powers Board (PCJPB), which owns and operates the commuter rail line, known as Caltrain, conducts reinvestment process and oversees maintenance tasks performed by its Rail Operator, TransitAmerica Services, Inc. (TASI), to maintain its passenger rail service in a SOGR. With the emergence of new national best practices in asset management and Federal regulations, Caltrain has identified areas of asset management opportunity and growth for itself. These include, among others, developing a TAM strategic plan, performance monitoring against this strategic plan, identifying TAM leadership and governance, and managing and integrating asset data information.

This TAM Plan was developed during 2017-18, reflecting the reality and Caltrain maturity at this time. The TAM Plan is based on current asset management best practices and FTA guidance that reflect a practical and cost-effective asset management implementation program for years to come. This TAM Plan is a living document and can be easily updated to be consistent with any future regulations or requirements.

TAM PLAN DEVELOPMENT PROCESS

Development of Caltrain's TAM Plan was led by Caltrain's TAM representative in the Engineering department, in close cooperation with asset owners and subject matter experts from other departments under the guidance of executive staff. These asset owners and subject matter experts are responsible for overseeing SOGR activities for various asset types. Caltrain's TAM representative has acted as an agency-wide liaison for TAM through this process:

- Identify TAM stakeholders responsible for TAM implementation and for SOGR activities
- Conduct interviews with TAM stakeholders to identify current asset management practices and systems, and interest for TAM implementation
- Develop TAM and SOGR policy, goals, and objectives
- Identify gaps between current and best practices
- Develop a performance measurement framework, review asset systems, and consolidate asset information
- Develop capital reinvestment priorities
- Complete the TAM Plan and prepare for implementation

Acknowledgements

Development of the TAM Plan included participation and input from many key stakeholders that have an important role in the asset management cycle.

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TAM POLICY, GOALS, AND OBJECTIVES

With this TAM Plan, Caltrain adopts a new TAM policy to communicate throughout the agency its commitment to maintain its assets in a SOGR and foster an asset management culture within the organization.

Policy: Caltrain is committed to sustainably maintaining its assets in a State of Good Repair in order to deliver a safe and reliable passenger rail service. This commitment will be ensured through financial stewardship and resource allocation, promoting a culture that supports asset management across the organization, and focusing on high quality information to provide the foundation for a risk-based approach for decision making.

To implement the TAM policy, goals in five focus areas were established to promote asset management principles. For each goal, objectives were identified with corresponding, measurable outcomes. Caltrain's TAM goals and objectives are listed below.

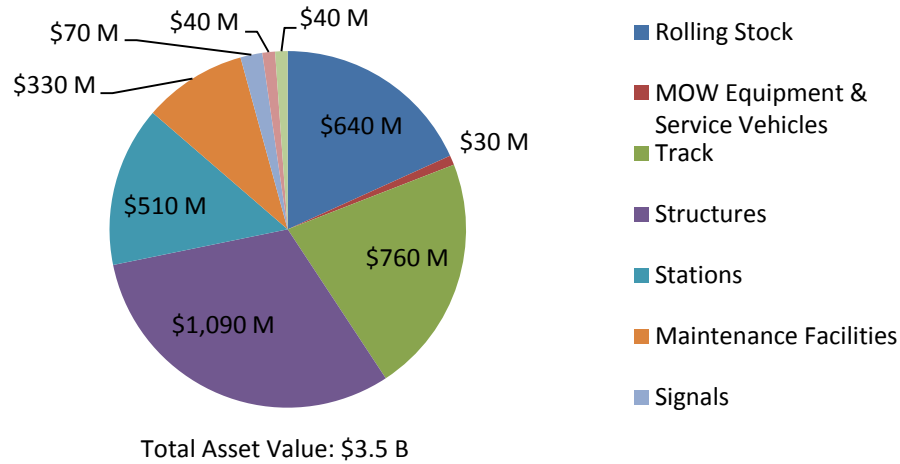
Focus Area	TAM Goal	Proposed Objectives
Safety	Maintain assets in a SOGR to support a safe operating environment for employees, customers, and the public	<ul style="list-style-type: none"> • Maintain infrastructure, systems, and vehicles in SOGR • Measure and manage TAM-related risks to minimize reactive maintenance practices • Provide root cause analyses for any asset failures
Fiscal Sustainability	Build and promote financial sustainability through implementation of asset management best practices	<ul style="list-style-type: none"> • Establish linkage between multi-year SOGR needs, annual budget process and Capital Improvement Program • Develop objective method to prioritize SOGR projects and assess trade-offs between competing investments
Infrastructure & Rolling Stock	Maintain assets in a SOGR to support a high quality passenger rail service	<ul style="list-style-type: none"> • Establish clear policies and plans for asset replacement and rehabilitation, and monitor adherence • Develop systematic approach for asset management activities
Organizational Efficiency	Strengthen asset management processes	<ul style="list-style-type: none"> • Develop a TAM plan and policy consistent with the FTA TAM rule and MAP-21 requirements • Assess and implement processes and tools to support data driven asset management decisions
People and TAM Culture	Promote asset management culture throughout the organization	<ul style="list-style-type: none"> • Advance TAM awareness across all organizational levels • Build understanding and support for asset management at the executive level • Train and develop a workforce familiar with TAM principles and best practices

ASSET PROFILE

Caltrain is responsible for approximately \$3.5 billion worth of assets. Assets are generally grouped into the following categories: Rolling Stock, MOW Equipment and Support Vehicles, Track, Structures, Stations, Maintenance Facilities, Signals, Communications, and Fiber. An overview of the replacement cost for each asset category is shown on the next page.

Additional assets will be introduced into the Caltrain system through positive train control system implementation and electrification of the railroad. Positive train control will introduce approximately \$19.2 million of assets before the end of 2018. Electrification will introduce approximately \$1.4 billion of assets in 2022.

Asset Replacement Value Breakdown

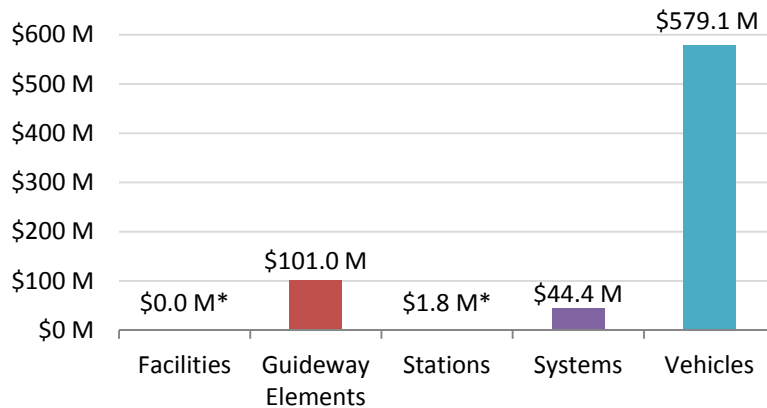


BACKLOG AND TWENTY YEAR NEEDS

Over the course of the past several years, there have been insufficient funds to address Caltrain's SOGR needs. These needs have been identified as Caltrain's SOGR backlog. An overview of the backlog value by asset category is represented below.

As of 2018, Caltrain has a capital needs backlog valued at \$726.3 million over the next 20 years. The majority of this backlog is made up of vehicles that have exceeded their 30-year useful life and existing deferred maintenance on revenue vehicles; most of this vehicle backlog will be addressed by the end of 2022 when several existing diesel vehicles will be retired and a new fleet of electric vehicles is put into service.

SOGR Backlog by Category (Total: \$726.3 M)

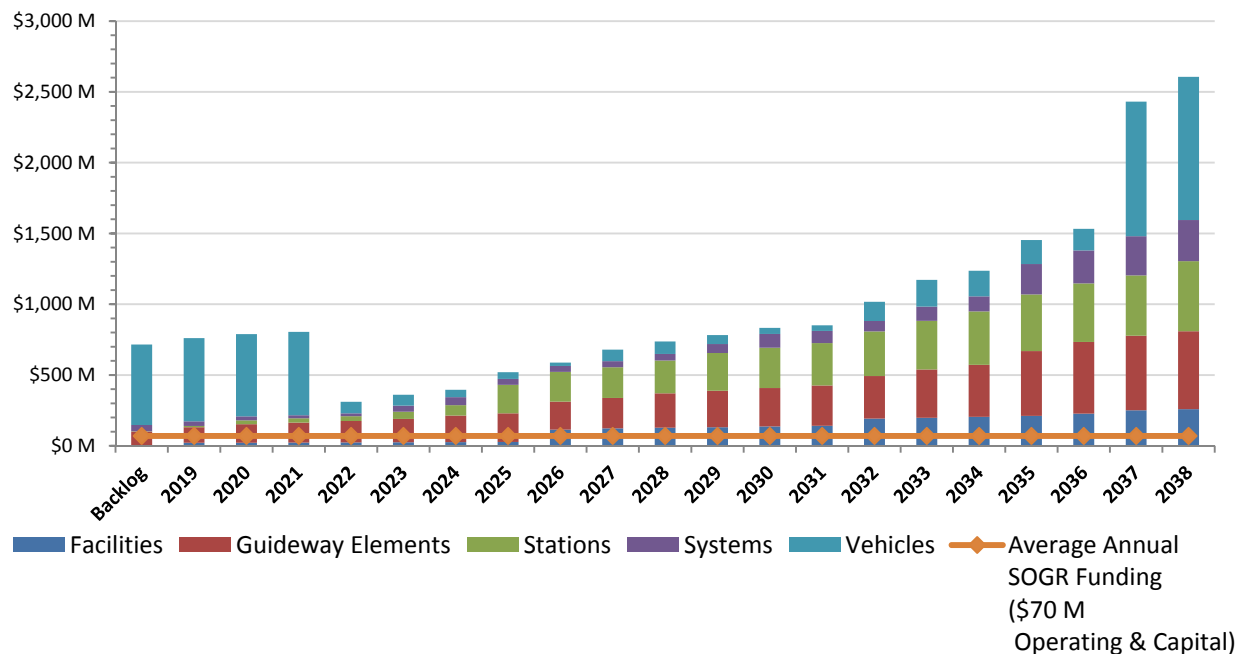


* The backlog shown for Facilities and Stations asset types is based only on deferred lifecycle replacement of assets. The backlog of deferred maintenance is still being determined.

Currently, Caltrain receives approximately \$70 million annually for all SOGR activities, which includes both capital and operating funds. This amount is not sufficient to address or maintain the current backlog due to upcoming SOGR needs as well as the introduction of a new positive train control system and electrified railroad environment. Due to rising future costs, the SOGR backlog value will continue to

grow if additional funds are not allocated to SOGR activities. Caltrain's forecasted SOGR backlog value will grow to approximately \$2.6 billion at the end of 20 years based on the current funding trend shown below.

SOGR Backlog by Category



TAM IMPLEMENTATION

This TAM plan includes a roadmap for Caltrain's TAM Program to implement asset management principles. The implementation identifies various actions, which include developing specific strategies to manage assets, establishing a tool to objectively prioritize SOGR needs, and implementing a new asset management system. The actions are grouped into five categories as illustrated below.

TAM Program Focus Area	Short Term	Medium Term	Long Term
	0-2 Years	3-5 Years	6+ Years
Lifecycle Management	■	■	
Data Management		■	■
Decision Support Tool		■	■
Risk-Based Framework	■	■	■
Asset Management Culture	■	■	

TAM PLAN SELF-CERTIFICATION

Caltrain Executive Officer



Michelle Bouchard, Chief Operating Officer, Rail

9.29.18

Date

Accountable Executive



Jim Hartnett, Caltrain Executive Director

9/29/2018

Date

INTRODUCTION

BACKGROUND

This Transit Asset Management Plan (TAM Plan, Plan) sets out the Caltrain asset management approach as well as recommendations for maintenance and capital programs necessary to meet service and performance needs, and achieve a state of good repair (SOGR) for Caltrain’s portfolio of assets.

Passenger rail service along the San Francisco Peninsula originally began in 1863. In 1992, passenger service continued as Caltrain, when the Peninsula Corridor Joint Powers Board (PCJPB) comprised of San Francisco, San Mateo, and Santa Clara counties took over the operation of the train. Today, Caltrain provides service along the San Francisco Peninsula and through the South Bay, beginning in San Francisco to San Jose and Gilroy. Caltrain operates over a 77 route-mile network, with 32 stations and approximately 62,000 boardings on weekdays. Maintenance and revenue train operations are contracted out to Transit America Services, Inc. (TASI).

The Federal Transit Administration (FTA) defines TAM as a strategic and systematic process through which an organization procures, operates, maintains, rehabilitates, and replaces transit assets to manage their performance, risks, and costs over their lifecycle to provide safe, cost-effective, reliable service to current and future customers. The term “asset” refers to physical equipment and infrastructure including rolling stock, stations, facilities, systems, tools, etc. that make up Caltrain’s commuter rail system. This TAM Plan is a living document that provides a strategy to coordinate various interdependent business processes, activities and tools necessary to give Caltrain the ability to manage its assets at optimal efficiency.

This TAM Plan examines current TAM practices at Caltrain, FTA guidance, and recommends a set of action plans that will help ensure that the Caltrain system continues to provide a safe, reliable, and high quality service in the long run. The benefits of asset management activities described in this plan to Caltrain are listed below in Table 1.

Table 1. TAM Benefits for Caltrain¹

Agency Business Benefits	Results
Improved customer experience and safety	Improves reliability / on-time performance and service operations, vehicle and facility cleanliness, reduces missed trips, speed restrictions Strengthens customer confidence in system safety and reliability Avoids or minimizes repair or replacement on failure scenarios often resulting in unplanned reactive crisis type repairs and replacements Focuses investments around customer-centered goals and metrics
Improved productivity and focused, optimized and planned investments	Maintains assets more efficiently, using condition based approaches and using predictive and preventive maintenance strategies (where these can be employed) to focus and optimize investments with sufficient lead times to avoid costly repairs/replacement on failure or crisis repairs while improving service delivery. Benefits for SOGR projects exceed expenditures

¹ Source: USDOT, FTA. Asset Management Guide; Focusing on the Management of our Transit Investments, 2013 and Paterson, L. and Vautin, D. Evaluating User Benefits and Cost-Effectiveness for Public Transit State of Good Repair Investments, Paper submitted to the Transportation Research Board (TRB) 94th Annual Meeting, Washington, D.C. November 14, 2014.

Agency Business Benefits	Results
Optimized resource allocation	Helps implement SOGR commitments Better aligns spending with an agency's goals and objectives to obtain the greatest return from limited funds. Incorporates life-cycle cost, risk and performance trade-offs into capital programming and operations and maintenance budgeting.
Improved stakeholder communications	Provides stakeholders with timely, accurate, and transparent SOGR assessments and commensurate needs Allows SOGR to be implemented in an organized methodical manner Provides stakeholders with more accurate and timely customer-centered performance indicators Provides tools to communicate forecasted performance metrics (including level of service) based on different levels of funding

PURPOSE

This TAM Plan allows Caltrain to demonstrate its compliance with FTA's requirements related to the MAP-21 rulemaking.

In July 2012, MAP-21 was signed, requiring that all FTA grant recipients develop TAM Plans that consider:

- Building and completing a capital asset inventory
- Describing the decision criteria for asset investment
- Establishing appropriate condition and performance targets
- Assessing and reporting the state of assets against those targets
- Describing the work required to meet these targets

In July 2016, FTA issued the Final Rulemaking on Transit Asset Management and the National Transit Database (NTD) (docket number FTA-2014-0020). A summary of these requirements are shown in Table 2 below.

Table 2. FTA TAM Elements

Element	Description
1 Asset Inventory	List of transit capital assets (required by TAM and NTD)
2 Condition Assessment	Asset condition ratings
3 Decision Support Tools	Methodology and/or tools used to create TAM Plan
4 Investment Prioritization	Prioritized list of SOGR projects, using criteria such as safety and cost
5 TAM and SOGR Policy	Policies, strategies, executive directions to support goals for TAM Plan
6 Implementation Plan	Processes to follow to achieve TAM Plan
7 List of Annual Activities	Activities deemed critical to achieving TAM goals for the year
8 Identification of Resources	Estimate of financial resources necessary to implement TAM Plan
9 Evaluation	Continuous TAM improvement plan with milestone and timelines
NTD Performance Measures	Agency and FTA required performance measures and targets

The TAM Plan also provides a "roadmap" for TAM program implementation. This roadmap contains a program of activities which will provide guidance for Caltrain's efforts in the short, medium, and long

term. Benefits, as identified above, in addition to compliance with FTA, are expected to include: reliable operating service; improved productivity and reduced costs; optimized resources allocation; and improved stakeholder communications.

Over time, Caltrain will be able to better manage and report on asset conditions, forecast costs for rehabilitation and replacement, and make optimal cost-effective investment prioritization decisions in a systematic manner.

Caltrain's TAM Plan will help the agency manage and maintain its assets more effectively by providing guidance for the following:

- Systematic implementation of SOGR programs and projects to avoid or minimize the reactive, costly, crisis-type repair and replacement of assets
- Implementation of business processes that integrate prioritized asset renewal needs based on condition and performance, with recommendations for SOGR project selection in the annual budget process
- Application of a phased approach for implementing a new Enterprise Asset Management system to collect, track and report TAM inventory, performance and condition data in one centralized system
- Development of an asset management culture at Caltrain and increasing the organizational efficiency of asset management processes.

CONTENTS

The TAM Plan is organized to address all nine (9) of FTA's TAM Plan Elements. Part 1 discusses the Transit Asset Management program at Caltrain and addresses FTA TAM Plan Elements 5-9. Part 2 discusses Caltrain's Asset Lifecycle Management and addresses FTA TAM Plan Elements 1-4.

Table 3. TAM Plan Contents

Section	Contents	TAM Element
Introduction	Introduction to the document, including purpose and methodology	N/A
Section 1: Asset Management Policy, Goals, and Objectives	Caltrain's TAM policy, goals, and objectives which form the basis for Caltrain's vision for asset management	5
Section 2: TAM Program	Roadmap for Caltrain's TAM program implementation, including: high level schedule; internal organization; list of actions/milestones/resources; systems/enterprise asset management; performance measures; and process for continuous improvement	6, 7, 8, 9
Section 3: Asset Inventory and Condition Assessment Overview	Broad description of existing asset management practices. Overview and listing of Caltrain's asset inventory. Description condition assessment methodologies and associated results	1, 2
Section 4: Capital Reinvestment Program	Description of Caltrain's decision support tools and its capital project prioritization approach. Analysis of Caltrain's capital asset backlog is provided, followed by both constrained and unconstrained needs projections. Recommended list of asset investment priorities.	3, 4

A copy of FTA's compliance checklist for the TAM Final Rule is completed and attached as an appendix to this document.

PART 1 – TRANSIT ASSET MANAGEMENT PROGRAM

Part 1 of Caltrain's TAM Plan provides an overview of Caltrain's TAM Program, which will implement the TAM Plan. The TAM Program includes guidance through policies, goals, objectives, and best practices to implement asset management procedures and integrate as part of Caltrain's business process, and roles and responsibilities to develop an asset management culture.

SECTION 1: ASSET MANAGEMENT POLICY, GOALS AND OBJECTIVES

Section 1 establishes the vision and direction to guide implementation and growth of Caltrain's Asset Management program. This section addresses FTA TAM Plan Element 5 – TAM and SOGR Policy.

1.1 Policy

Caltrain's TAM policy provides top-down direction to implement a strategic and systematic process for maintaining and improving transportation assets serving San Francisco, San Mateo, and Santa Clara counties.

By way of this policy, Caltrain commits to, and formalizes support for, the implementation and growth of a Transit Asset Management (TAM) program, maintenance of its assets in a State of Good Repair (SOGR), and communication of its progress to all relevant stakeholders.

A draft TAM policy was developed for review after reviewing the Caltrain Strategic Plan (2014) and other agencies' TAM policies. Feedback was incorporated from internal stakeholders listed in roles and responsibilities below, from the Chief Operating Officer and Executive Director to individual asset owners and contributors to TAM related activities.

1.2 Policy Statement

Caltrain is committed to sustainably maintaining its assets in a State of Good Repair in order to deliver a safe and reliable passenger rail service. This commitment will be ensured through financial stewardship and resource allocation, promoting a culture that supports asset management across the organization, and focusing on high quality information to provide the foundation for a risk-based approach for decision making.

1.3 Roles and Responsibilities

Several Caltrain working groups and departments as identified below share the responsibility to carry out the TAM policy.

Overall Responsibility: Caltrain's Executive Director has overall responsibility for overseeing the development of the TAM Plan and related procedures, in cooperation with the executive leadership team, and reporting any status updates to the Board. TAM program leadership and enforcement of the policy will be the responsibility of the Rail Division Chief and Manager, Engineering, TAM.

Day-to-Day Responsibility: The lead responsibility and overall management to implement the TAM program is within the Rail Engineering Department, specifically within the Quality Assurance and Standards group. Key responsibilities include coordinating TAM efforts throughout the agency,

preparing SOGR programming recommendations, preparing TAM Plan updates and employee training in TAM processes and procedures.

Support for the TAM program is provided by Rail Operations, Rail Engineering, Capital Delivery, Rail Contracts and Budget, Grants, and Finance Departments and Caltrain's Rail Operator. Additional details for each of these departments' role in TAM implementation are in 2.2 Internal Organization.

1.4 Goals and Objectives

With the direction of the TAM policy, Caltrain established goals and objectives to guide and improve TAM maturity. Goals were developed after reviewing TAM related elements of Caltrain's Strategic Plan. These elements were then mapped to the following focus areas: safety, fiscal sustainability, infrastructure and rolling stock, organizational efficiency, and people and TAM culture. Finally, TAM goals were established for each of the focus areas. Each goal has associated objectives identified. The objectives are intended to have outcomes that will help Caltrain realize its TAM goals. Table 4 lists Caltrain's goals and objectives.

Table 4. Caltrain TAM Goals and Objectives

Focus Area	TAM Goal	Proposed Objectives
Safety	Maintain assets in a SOGR to support a safe operating environment for employees, customers, and the public	<ul style="list-style-type: none"> • Maintain infrastructure, systems, and vehicles in SOGR • Measure and manage TAM-related risks to minimize reactive maintenance practices • Provide root cause analyses for any asset failures
Fiscal Sustainability	Build and promote financial sustainability through implementation of asset management best practices	<ul style="list-style-type: none"> • Establish linkage between multi-year SOGR needs, annual budget process and Capital Improvement Program • Develop objective method to prioritize SOGR projects and assess trade-offs between competing investments
Infrastructure & Rolling Stock	Maintain assets in a SOGR to support a high quality passenger rail service	<ul style="list-style-type: none"> • Establish clear policies and plans for asset replacement and rehabilitation, and monitor adherence • Develop systematic approach for asset management activities
Organizational Efficiency	Strengthen asset management processes	<ul style="list-style-type: none"> • Develop a TAM plan and policy consistent with the FTA TAM rule and MAP-21 requirements • Assess and implement processes and tools to support data driven asset management decisions
People and TAM Culture	Promote asset management culture throughout the organization	<ul style="list-style-type: none"> • Advance TAM awareness across all organizational levels • Build understanding and support for asset management at the executive level • Train and develop a workforce familiar with TAM principles and best practices

SECTION 2: TAM PROGRAM

Section 2 describes TAM Plan implementation which acts as a guide for Caltrain to incorporate asset management principles into existing business practices and establish the foundation for continual improvement. Implementation will be carried out through Caltrain's TAM program.

This section addresses FTA TAM Plan Elements 6, 7, 8, and 9 – Implementation Strategy, List of Key Annual Activities, Identification of Resources, and Evaluation Plan, respectively.

2.1 Program Overview

The Institute of Asset Management (IAM) has developed a conceptual model (see Figure 1) of all activities or functions required to implement asset management.



Figure 1. IAM Asset Management Conceptual Model

IAM identifies the following business processes critical to the implementation of asset management at any organization:

- Strategy and Planning – Policy objectives advanced by asset management strategy and implementation
- Lifecycle Delivery (also known as Lifecycle Management) – Data-driven activities to evaluate asset life cycle cost, condition, and performance

- Asset Information (and Enablers, not shown) – Provides the infrastructure and methodology to support data-driven, performance-based decision making; supportive processes or activities that act as the foundation for successful asset management implementation
- Asset Management Decision Making – Enterprise level decision making processes used to communicate the level of service that can be delivered at different funding levels allowing for performance based decisions with financial constraints
- Risk and Review – Addresses topics such as risk assessment and management, resilience, audit and assurance, and stakeholder engagement to develop asset management in a sustainable manner
- Organization and People – Includes leadership, organizational structure and culture, and training because *people* do asset management

Based on the business processes defined above, Table 5 below identifies primary focus areas of Caltrain’s TAM program and the associated timeframes anticipated for implementation.

Table 5. TAM Program Actions Overview

	Short Term	Medium Term	Long Term
TAM Program Focus Area	0-2 Years	3-5 Years	6+ Years
Lifecycle Management			
Data Management			
Decision Support Tool			
Risk-Based Framework			
Asset Management Culture			

2.2 Internal Organization

Establishing a structure for governance and obtaining executive sponsorship are critical for successful implementation. Furthermore, the FTA requires that an Accountable Executive be designated to ensure that the necessary resources are available to carry out the TAM Plan.

The development of Caltrain’s TAM Plan required engaging Caltrain employees at various levels in various departments performing TAM related functions. This process provided visibility into existing TAM practices at Caltrain, increased awareness, and created an opportunity to express the importance and benefits of TAM practices.

Caltrain’s TAM Program acts as the “hub” overseeing asset management related activities across the organization. Figure 2 shows the organizational chart for TAM implementation and the relationships between departments that play a role in TAM. The identified groups will provide direction and help develop and implement business processes.

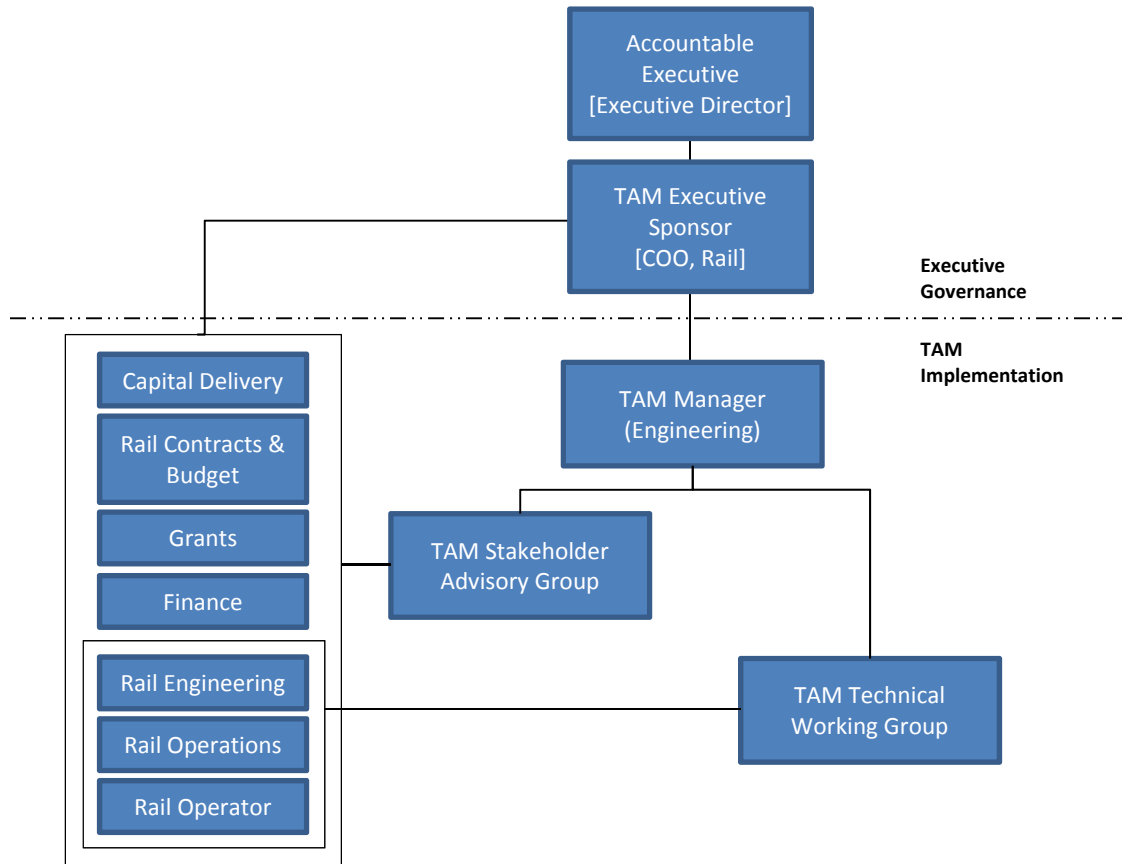


Figure 2. Caltrain TAM Program Internal Organization

Roles and responsibilities of each stakeholder shown in the organizational charge are described below. These stakeholders are important to establish a TAM culture at Caltrain to ensure consistency and implementation of TAM practices agency-wide. Central TAM functions are led by the Engineering Department.

The **Accountable Executive** is the Executive Director, who has overall responsibility for overseeing TAM Plan development and implementation, in cooperation with the executive leadership team, and for enforcing Caltrain’s TAM policy.

The **Executive Sponsor** is the Chief Operating Officer, Rail, who will provide guidance and leadership of the overall asset management effort at Caltrain. The Executive Sponsor sets the overall policy direction and provides oversight for the TAM program.

The **TAM Manager** is the lead responsibility for Caltrain’s asset management program and functions out of the Rail Engineering Department, Quality Assurance and Standards group. In addition to providing guidance, leadership and enforcement, key responsibilities include coordinating TAM efforts throughout the agency, preparing SOGR programming recommendations, preparing TAM Plan updates and developing asset management plans and procedures.

Additional **departmental support** is provided for TAM Plan implementation as described below.

- **Rail Operations Department** is a stakeholder as the asset owner of revenue vehicles and associated maintenance equipment. Specific support includes stewardship and oversight of SOGR maintenance of these assets. This department also tracks budgets and expense data for ongoing analysis of maintenance practices.
- **Rail Engineering Department** is a stakeholder as the asset owner of fixed physical assets including track, structures, stations, facilities, Maintenance of Way equipment, signals, and communications. Specific support includes stewardship and oversight of SOGR maintenance of these assets. This department also tracks budgets and expense data for ongoing analysis of maintenance practices.
- **Capital Delivery Department** is responsible for project implementation and provides updates to the asset inventory upon project completion.
- **Rail Contracts and Budget Department** is responsible for administering rail contracts, facilitating accounting functions, financial reporting and analysis, and budgeting SOGR activities that support the TAM program.
- **Grants Department** is responsible for tracking FTA-stipulated TAM regulations as they pertain to applicable FTA funding, capital programming, supporting TAM Plan updates, and assisting in the coordination of regional MPO TAM efforts.
- **Finance Department** is responsible for tracking all assets purchased or developed with capital funds in order to meet requirements for federal grants and financial progress reports.
- **Rail Operator (TASI)** is responsible for conducting SOGR maintenance and for reporting expense data for ongoing analysis of maintenance practices. The Rail Operator also provides analyses and recommendations for future SOGR activities and needs.

The **TAM Stakeholder Advisory Group** consists of representatives from the identified departments overseeing TAM related processes and functions. This group will facilitate coordination between staff performing TAM-related functions across various departments and provide input and guidance during the development or refinement of TAM related business processes.

The **TAM Technical Working Group** consists of a subset of representatives from the TAM Stakeholder Advisory Group. These representatives are Caltrain's asset owners, who are responsible for managing a specific set of assets or performing TAM-related processes. This group will provide input and guidance for technical issues, including setting standards, measuring performance and risk, and prioritizing SOGR needs.

2.3 TAM Program Activities

Table 6 establishes an implementation strategy for Caltrain's TAM program. The implementation strategy identifies program improvement activities based on identified gaps between existing and best practices. The activities are grouped into focus areas identified in 2.1 Program Overview.

Table 6. Benchmarks, Gaps, and Implementation Strategy Action Items

Best Practice Benchmark/Reference	Identified Gap	Activity ID	Action Items
Lifecycle Management			
Asset inventory contains accurate and current information.	Semiformal TAM asset inventory program has been established with defined fields	LCM-01	Develop asset inventory based on TAM principles
	Not all assets are entered or maintained in TAM asset inventory system; asset records are at different levels of detail	LCM-02	Collect sufficient, accurate, and current data to facilitate continued updates to asset inventory
Agency establishes target conditions and/or performance targets as part of condition monitoring and reporting	Physical condition data is not comparable across similar asset types	LCM-03	Develop condition assessment scoring to incorporate normalized rating scale (i.e. TERM-Lite, or similar)
	Facilities condition assessment process is dependent on individual inspectors	LCM-04	Standardize guidelines for facilities condition assessments and provide training
	No established performance measures / some anecdotal	LCM-05	Implement Section 2.5 Performance Measures
Data Management			
Agency has lifecycle decision support tools that assist understanding of performance implications with proposed investments across asset categories.	Objective decision support tool is not established	DAT-01	Develop objective methodology to prioritize SOGR projects across categories
Asset inventory and decision support tools provide available, accessible, accurate, current, and reproducible information to support performance monitoring and decision making.	Asset management system not implemented	DAT-02	Conduct software requirements assessment and identify software needs. Select vendor for software implementation
	Asset information is stored across multiple data sources, repositories and systems	DAT-03	Ensure integration of systems and data sharing capabilities. Incorporate as an identified software need for TAM software implementation
	Asset information control framework is restricted to immediate departmental use and not integrated into decision support tool	DAT-04	Develop a Caltrain asset management data policy
	Reports are difficult to obtain	DAT-05	Ensure dashboard can be created to display current asset performance. Incorporate as an identified software need for TAM software implementation
	Required reporting is compiled manually with extensive coordination effort with various asset owners	DAT-06	Ensure that asset data can be exported to meet reporting requirements. Incorporate as an identified software need for TAM software implementation
Decision Support Tool			
Prioritization criteria of SOGR projects are based on desirable outcomes as identified in TAM goals.	Difficult to compare needs across departments	DST-01	Establish prioritization criteria as the basis to prioritize SOGR needs

Best Practice Benchmark/Reference	Identified Gap	Activity ID	Action Items
Decision Support Tool (Continued)			
Life-cycle decision support tools are available to explore performance implications of a proposed program of projects, capital versus maintenance tradeoffs, and investments across categories.	No established link exists between capital reinvestment needs with budgeting process	DST-02	Determine associated prioritization criteria weights for various asset categories to develop and refine prioritization model
		DST-03	Work with Caltrain Business Plan development team to identify and document how Caltrain's SOGR needs will contribute into the budgeting process
Asset management principles are articulated and clearly recognized as the driving force for resource allocation and utilization.	Caltrain does not have a dedicated and consistent source of direct funding to meet all SOGR needs	DST-04	Implement consistent format to identify additional SOGR needs to justify additional funding requests
Risk-Based Framework			
Performance-based decision making optimizes how and when funds are expended for SOGR and maintenance, reflecting input from the lifecycle management plans.	Asset management does not prioritize projects beyond "worst first;" sometimes assets are run-to-failure	RBF-01	Develop asset policies for all asset categories
		RBF-02	Develop lifecycle maintenance management plans as appropriate for identified asset categories
	No risk-based management framework formally exists	RBF-03	Establish risk-based register approach
Asset Management Culture			
Asset management principles are articulated and clearly recognized throughout the Agency.	No formal TAM Plan adopted	CUL-01	Formally adopt a policy for TAM with vision, goals and objectives to engage leaders to support implementation of TAM actions
	No guidance or strategies in place to optimize maintenance and renewal of assets based on desired performance	CUL-02	Develop policy and strategies for each asset category to make TAM a priority and incorporate data driven decision making as part of TAM best practices
Asset management roles and responsibilities are clearly defined.	No formally defined TAM roles and responsibilities	CUL-03	Develop procedures that include identification of TAM related roles and responsibilities related to specific positions or functions
	No formal procedures established in case of staff turnover or succession planning	CUL-04	Develop procedures with TAM stakeholders and include in onboarding new staff
	Limited resources to add in-house staff dedicated to TAM implementation	CUL-05	Reprioritize key staff roles to incorporate TAM Plan implementation activities
Asset management is well understood across the organization	No formal learning and development related to TAM program activities	CUL-06	Provide general asset management training for all agency employees
Agency staff uses the language of asset management and it guides their day to day work decisions, in addition to broader agency strategic decisions.	No continual improvement program in place	CUL-07	Implement 2.6 Continuous Improvement Plan
Asset Management engages staff across agency divisions and offices through effective communications	Employee collaboration minimal due to functions existing in separate departments	CUL-08	Develop procedures with involvement of various departments, as applicable, to help engage staff beyond functional departmental boundaries

Table 7 establishes planned activities and timeline for Caltrain to implement its TAM program improvement activities based on identified gaps between existing and best practices. These activities are also grouped into the focus areas identified in 2.1 Program Overview. Identified with each activity is an anticipated timeframe and estimated FTE level of effort. Timeframes are based on short, medium, or long term – 0-2 years, 3-5 years, or >5 years, respectively. Level of effort is estimated low (0.25-0.5 FTE), medium (1 FTE), or high (2 FTE). Implementation of these program activities will be subject to available resources, whether from funding, personnel, or other factors.

Table 7. Implementation Strategy Timeline and Resource Requirements

Activity ID	Action Items	Level of Effort and Resources	Timeframes							
			Short			Medium			Long	
			0	1	2	3	4	5	6	7+
Lifecycle Management										
LCM-01	Develop asset inventory based on TAM principles	1 FTE								
LCM-02	Collect sufficient, accurate, and current data to facilitate manual updates to asset inventory	2 FTE								
LCM-03	Develop condition assessment scoring to incorporate normalized rating scale (i.e. TERM-Lite, or similar)	½ FTE								
LCM-04	Standardize guidelines for facilities condition assessments and provide training	½ FTE								
LCM-05	Implement Section 2.5 Performance Measures	¼ FTE								
Data Management										
DAT-01	Develop objective methodology to prioritize SOGR projects across categories	1 FTE; Decision Support Tool								
DAT-02	Conduct TAM EAM software requirements assessment and identify software needs. Implement asset management system software.	2 FTE; EAM software								
DAT-03	Ensure integration of systems and data sharing capabilities. Incorporate as an identified software need for TAM software implementation.	½ FTE								
DAT-04	Develop a Caltrain asset management data policy	½ FTE								
DAT-05	Ensure dashboard can be created to display current asset performance. Incorporate as an identified software need for TAM software implementation.	½ FTE								
DAT-06	Ensure that asset data can be exported to meet reporting requirements. Incorporate as an identified software need for TAM software implementation.	½ FTE								
Decision Support Tool										
DST-01	Establish prioritization criteria as the basis to prioritize SOGR needs	¼ FTE								
DST-02	Determine associated prioritization criteria weights for various asset categories to develop and refine prioritization model	¼ FTE; Decision Support Tool								
DST-03	Implement consistent format to identify additional SOGR needs to justify additional funding requests.	½ FTE								

Activity	Action Items	Level of Effort	Timeframes							
Risk-Based Framework										
RBF-01	Develop asset policies for all asset categories.	2 FTE								
RBF-02	Develop lifecycle maintenance management plans as appropriate for identified asset categories	2 FTE								
RBF-03	Establish risk-based register approach	1 FTE								
Asset Management Culture										
CUL-01	Formally adopt a policy for TAM with vision, goals and objectives to engage leaders to support implementation of TAM actions.	½ FTE								
CUL-02	Develop policy and strategies for each asset category to make TAM a priority and incorporate data driven decision making as part of TAM best practices.	1 FTE								
CUL-03	Develop procedures that include identification of TAM related roles and responsibilities related to specific positions or functions	1 FTE								
CUL-04	Develop procedures with TAM stakeholders and include in onboarding new staff	½ FTE								
CUL-05	Reprioritize key staff roles to incorporate TAM Plan implementation activities	½ FTE								
CUL-06	Provide general asset management training for all agency employees	½ FTE								
CUL-07	Implement 2.6 Continuous Improvement Plan	½ FTE								
CUL-08	Develop procedures with involvement of various departments, as applicable, to help engage staff beyond functional departmental boundaries	1 FTE								

2.4 Asset Management Software

Currently, Caltrain does not have an implemented Enterprise Asset Management (EAM) system to manage assets. Multiple software applications are being used by both Caltrain and its Rail Operator (TASI) to manage various functions as shown in the table below.

Table 8. Current Asset Management Software

General Function	Facilities		Guideway		Vehicles		Systems
	Admin & Maintenance	Passenger	Track	Structures	Rolling Stock	Service Vehicles	Signals
Asset Inventory & Information		CTAMS	CTAMS	CTAMS	CTAMS / HITS		
Asset Configuration/ Modifications		Station Asset Map Drawings			HITS		As-Built Signal Drawings
Asset Condition & Performance			Ensco				RailDOCS
Incident / Defect Management			Ensco				RailDOCS
Work Management (Work Orders)		OPRA	OPRA				
Materials / Inventory Management			HITS		HITS		
Purchasing & Receiving			HITS		HITS		
Capital Program / Projects							
Reporting & Analysis							

Software acronyms:

CTAMS – Caltrain Transit Asset Management System

HITS – Herzog Integrated Transit System

OPRA – Order Processing and Requisition Accelerator

2.4.1 EAM Implementation Planning

EAM software functionality for transit agencies has grown significantly since the FTA’s final ruling on TAM in 2016. In addition to the traditional maintenance management and work order management functions, EAM systems have incorporated additional features to track, inspect, and evaluate assets throughout their life-cycle. These additional features include:

- Expanded asset inventory and information
- Definable asset location and hierarchies
- Definable asset condition assessments
- Asset reliability and performance management
- Identification of life cycle costs
- Major capital maintenance planning

EAM systems may also include other software integrations, to support functions such as:

- Geographic Information Systems (GIS)

- Supervisory Control and Data Acquisition (SCADA)
- Automated data collection systems
- Decision support tools and SOGR optimization
- Asset degradation modeling and analysis
- Asset inspection programs
- Data analysis and reporting

During the TAM Plan development, discussion with other peer transit agencies with implemented EAM systems revealed the following best practices:

- All asset types should be managed within a single EAM software package to maintain data consistency and act as the authoritative source for analysis across asset types and to ensure that data is managed and stored within a central location
- Additional functionality may be supported through software integrations with the EAM software (i.e. GIS, SCADA, etc.) in order to incorporate relevant information for decision making and be able to visualize data through various mediums or graphics
- Ensure that EAM software technical support is provided throughout and beyond implementation to support software changes due to new assets or changes in business processes as asset management practices mature
- Institute procedures for control of reengineering EAM system or making EAM system upgrades
- User-friendly and intuitive interface to minimize learning curve and increase user acceptance of new software implementation
- Ability to configure software (not customize) to allow adaptation to every asset types' needs without impacting the ability to easily update the software application

Due to the various combinations of functions offered by different EAM systems, Caltrain will need to review existing business practices and comprehensively identify EAM system needs with input from all TAM stakeholders at all levels. Results of the review will then drive development of a scope and cost estimate for the EAM selection process. This action is included in Table 6 and is identified as DAT-02.

2.5 Performance Measures

FTA has identified objective nation-wide standards to measure the condition of transit assets as part of NTD reporting requirements. Through development of the TAM Plan, Caltrain TAM stakeholders have indicated that additional performance measures unique to passenger service operations should be identified to contribute towards decision making processes.

The following summarizes the major types of proposed asset management performance measures based on major asset categories:

Table 9. Asset Category Performance Measures

Asset Category	FTA Performance Measure	Proposed Performance Measures
Vehicles	Age	Mileage; Availability; Mean Distance Between Failures; Passenger Complaints
Guideway Elements	Age	Condition Assessment
Facilities (Administrative, Maintenance, Passenger)	Age; Condition Assessment	Corrective vs Preventive Maintenance Ratios; Passenger Complaints

Asset Category	FTA Performance Measure	Proposed Performance Measures
Systems	Age	Availability; Mean Time Between Failures; Delays Caused by Failure
TAM Program	N/A	Percent Completion of Implementation Strategy

Currently Caltrain maintains basic operational level performance measures supporting SOGR. Reporting availability for these performance measures vary between departments. Current performance measures include:

- Age (Remaining Useful Life)
- Condition Assessments
- Number of Delays
- Passenger Complaints

Table 10 identifies high level performance measures that address each of Caltrain's TAM goals and objectives. Also included is a proposed implementation timeframe for these performance measures, either short term (within three years) or long term (greater than three years). Some performance measures quantify progress for multiple objectives and are listed multiple times to ensure that each TAM objective has been addressed.

Table 10. TAM Program Performance Measures

Goals	Objectives	ID	Performance Measure	Short Term (< 3 years)	Long Term (> 3 years)
(1) Maintain assets in a State of Good Repair to support a safe operating environment for its employees, customers and the public	Maintain infrastructure, systems and vehicles in SOGR	1-1	Percent of facilities with a condition rating below 3.0 on the TERM scale	✓	
		1-2	Percent of guideway directional route miles with performance restrictions	✓	
		1-3	Percent of non-revenue vehicles at or beyond their useful life	✓	
		1-4	Percent of revenue vehicles at or beyond their useful life	✓	
		1-5	Mean miles between failure		✓
		1-6	Mechanical delays (and as a percent of total system delays)		✓
	Measure and manage TAM-related risks	1-7	Percent of SOGR improvements approved in budget that match priority		✓
	Provide root cause analyses for any asset failures	1-8	Percent reduction in asset failures		✓

				Short Term	Long Term
Goals	Objectives	ID	Performance Measure	(< 3 years)	(> 3 years)
(2) Build and promote financial sustainability through implementation of asset management best practices	Develop objective method to prioritize SOGR projects and assess trade-offs between competing investments	2-1	Percent SOGR backlog assets approved in budget	✓	
		2-2	Percent of SOGR improvements approved in budget that match priority		✓
		2-3	Percent SOGR backlog reduction	✓	
	Establish linkage between multi-year SOGR needs, annual budget process, and capital improvement program	2-4	Investment required to achieve SOGR outcomes (either to maintain or reduce percent annually)	✓	
		2-5	Ratio of SOGR needs to available funding	✓	
(3) Maintain assets in a SOGR to support a high quality passenger rail service	Establish clear policies and plans for asset replacement and rehabilitation, and monitor adherence	3-1	Percent of asset categories with established asset policies and, as applicable, lifecycle management plans		✓
		3-2	SOGR backlog cost	✓	
		3-3	Percent of asset categories with performance targets	✓	
	Develop systematic approach for asset management activities	3-4	Percent complete of TAM Plan Implementation Strategy activities	✓	
		3-5	Percent of asset categories with performance targets	✓	
(4) Strengthen asset management processes	Develop a TAM Plan and policy consistent with the FTA TAM rule and MAP-21 requirements	4-1	TAM policy adopted	✓	
		4-2	TAM Plan signed by Accountable Executive and is less than 4 years old	✓	
	Assess and implement processes and tools to support data driven asset management decisions	4-3	Percent of assets with complete data in TAM database		✓
		4-4	Percent of asset categories or TAM related functions utilizing new asset management system		✓

				Short Term	Long Term
Goals	Objectives	ID	Performance Measure	(< 3 years)	(> 3 years)
(5) Promote asset management culture throughout the organization	Advance TAM awareness across all organizational levels	5-1	Percentage of employees with TAM related functions aware of TAM policy and processes		✓
	Build understanding and support for asset management at the executive level	5-2	TAM policy adopted	✓	
	Train and develop a workforce familiar with TAM principles and best practices	5-3	Percent of TAM related positions staffed and trained on TAM related processes	✓	

2.6 Continuous Improvement Plan

A continuous improvement plan is required as the TAM program grows and matures. The TAM program is subject to a biennial internal review to better plan work associated with implementing TAM-related business improvements. Activities will include determining TAM Plan implementation strategy progress, measuring performance criteria towards meeting TAM goals, evaluating maturity of TAM related business processes, and reviewing the TAM Plan itself.

Business processes will be reviewed based on a 1-5 maturity scale in order to recommend further strategic actions for TAM implementation and growth.

- | | |
|----------------|--|
| 5 – Optimized | Processes are regularly improved and have reached a good practice level. Technology is used for workflow automation and provides tools for the improvement of quality and effectiveness. |
| 4 – Managed | Management monitors adherence to the processes and takes measures if processes are not effective. Tools are used in main business process areas. |
| 3 – Defined | Processes are documented and standardized. Processes are observed, however deviations are probably not recognized. |
| 2 – Repeatable | Same tasks are similarly solved by different persons. Responsibility and knowledge remains with a single person. Errors are likely due to manual processing. |
| 1 – Ad Hoc | Ad hoc processes where success depends on the authority and commitment of individual employees. |

Updates to the TAM Plan will be made at least every four (4) years in accordance with the TAM rule to document maturity progress, reassess TAM program maturity and identify further growth areas of Caltrain's TAM program. Changes to existing or introduction of new assets, update to SOGR investment needs, and other business practices will also need to be included as part of any updates.

PART 2 – ASSET LIFECYCLE MANAGEMENT

Part 2 of Caltrain’s TAM Plan provides additional detail into the management of specific assets, focusing on Lifecycle Delivery and related business processes as identified in Figure 1. IAM Asset Management Conceptual Model.

Asset Lifecycle

An asset’s lifecycle generally undergoes four phases as shown in Figure 3. A description of typical activities associated with each phase is provided in Table 11.

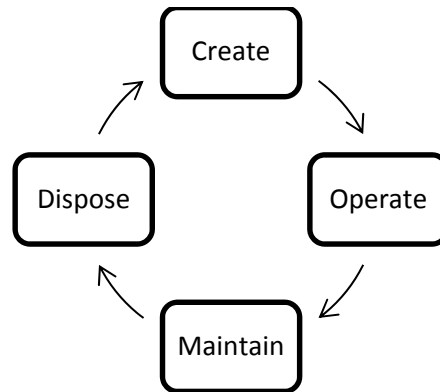


Figure 3. Asset Lifecycle

Table 11. Lifecycle Stage Activities

Lifecycle Stage	Description of Activities
Create	Establish asset requirements or standards; Design based on these requirements or standards; Procurement; Installation or construction of asset
Operate	Use of asset to deliver, or support delivery, of rail passenger service
Maintain	Management of asset through condition monitoring or assessments; SOGR maintenance activities based on asset’s maintenance strategy
Dispose	Removal of asset from service; Remaining departmental responsibility (cultural, hazardous, or other); Disposal of asset

Asset Management Strategy

Development of asset policies will provide guidance and direction for management strategies for specific asset types. This activity is identified as RBF-01 in 2.3 TAM Program Activities. In general, asset policy development will begin based on the largest related risks. These asset policies and strategies will identify the appropriate tier for its asset management strategy as summarized below and recommended in Table 12.

- Tier 1 Lifecycle Planning
Assets are known and identified by location, quantity, and additional attributes. Condition is either consistently monitored or assessed in regular intervals. Maintenance and rehabilitation projects are

based on risk management and reliability principles to prevent asset failures from occurring during operations.

- Tier 2 Condition Based Management
Assets are known and identified by location, quantity, and additional attributes. Condition assessments are performed in regular intervals. Maintenance and rehabilitation projects are developed based on results of condition assessments.
- Tier 3 Useful Life Based Replacement
Assets are known and identified by location and quantity. No condition assessments are performed. Assets are replaced when the asset's anticipated useful lifecycle has completed or is nearing its end.
- Tier 4 Replacement Upon Failure or Obsolescence
Assets are known and identified by location and quantity. No condition assessments are performed. Assets are replaced only when the asset fails or is no longer compatible with new technology.
- Tier 5 Incidental
No inventory or tracking is required for these assets. No condition assessments are performed. These asset types are of low dollar value and have no associated risks or impacts; typically these assets are routinely replaced as part of larger projects or replaced upon an incident (i.e. fencing).

Table 12. Asset Management Strategy Tiers

Tier Level	Recommended Strategy	Asset Type Characteristics	
		Dollar Value	Risk or Impact
Tier 1	Lifecycle planning	Med – High	High
Tier 2	Condition based management	Med – High	Low – Med
Tier 3	Useful life based replacement	Low – Med	Low – Med
Tier 4	Replacement upon failure or obsolescence	Low	Med
Tier 5	Incidental management; no inventory or tracking	Low	None

The process of lifecycle planning as an asset management strategy is very resource intensive. Depending on the cost of the asset type and the associated risks or impacts with failure, this strategy may not be appropriate or feasible based on the associated level of effort required. While the major asset types will be categorized as a higher tier level, it may be acceptable to manage sub-assets or components at a lower tier level due to benefits being outweighed by an extensive level of effort.

SECTION 3: ASSET INVENTORY AND CONDITION ASSESSMENT OVERVIEW

Section 3 provides an overview of Caltrain’s asset inventory and condition assessment methodology. This section addresses FTA TAM Plan Elements 1 and 2 – Asset Inventory and Condition Assessment, respectively.

3.1 Asset Inventory

Caltrain manages a multitude of asset types in order to deliver passenger rail service. Assets generally fall into large groups of Fleet, Infrastructure, and Systems and are managed by the types identified below.

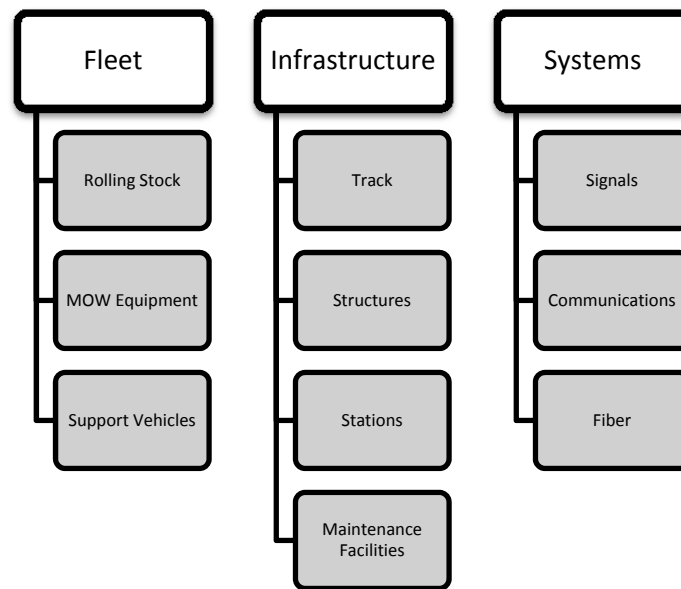


Figure 4. Asset Categories

Caltrain’s asset inventory is estimated to be approximately \$3.5 billion - meaning that it would cost \$3.5 billion were Caltrain to replace all of its assets, for which it has fiscal responsibility, in 2018. A high level summary of Caltrain’s assets is shown in Table 13.

Table 13. Asset Inventory Summary

Asset Type	Total Quantity	Date Built	Useful Life	Replacement Cost (in \$M)*	
				Total	Caltrain Responsibility
Rolling Stock	29 Locomotives	1985-2003	30	\$188.5	\$188.5
	98 Trailer Cars	1985-2008	30	\$318.5	\$318.5
	36 Cab Cars	1985-2008	30	\$128.7	\$128.7
Non-Revenue Vehicles	120 Rubber Tire Vehicles	1999-2016	6	\$5.1	\$1.9
	60 Heavy Machinery / Steel Wheel Vehicles	1970-2016	12-40	\$21.1	\$19.0
	2 Switch Locomotives	1974	40	\$9.6	\$9.6
Track	449,888 TF (85.2 Track Miles) Tangent Track	Unknown	70	\$402.0	\$360.9
	166,412 TF (31.5 Track Miles) Curved Track	Unknown	15	\$202.4	\$168.0

Asset Type	Total Quantity	Date Built	Useful Life	Replacement Cost (in \$M)*	
				Total	Caltrain Responsibility
Track (Continued)	185,328 TF (35.1 Track Miles) Freight Track	Unknown	80	\$70.4	\$0
	238 Items of Special Trackwork	1939-2010	40	\$107.2	\$82.9
	128,966 TF (24.4 Track Miles) Yard Track	Unknown	70	\$94.8	\$91.0
	192,258 Wood Ties (on main track)	1984-2006	35	\$36.5	\$28.5
	152,806 Concrete Ties (on main track)	1997-2016	50	\$32.1	\$27.6
Structures	91 Rail Bridges (6,639 LF)	1902-2013	100	\$604.4	\$589.5
	56 Retaining Walls (38,055 LF)	1907-2016	100	\$137.3	\$133.1
	4 Tunnels (8,814 LF)	1907	175	\$361.1	\$346.7
	3 Roadway Bridges (293 LF)	2017	100	\$18.5	\$18.5
Stations	32 Passenger Stations	1973-2010	40	\$340.8	\$287.5
	55 Structures	1863-2004	20-75	\$120.8	\$111.8
	29 Parking Facilities (7,652 Spaces)	1985-2013	50-75	\$145.7	\$107.3
Administrative & Maintenance (A&M) Facilities	2 Train Control Facilities	Unknown	75	\$25.5	\$25.5
	2 Train Crew Facilities	Unknown	40	\$2.8	\$2.8
	1 MOW Facility	Unknown	75	\$1.5	\$1.5
	1 General Maintenance Facility	2007	20-75	\$302.5	\$302.5
Signal	31 Control Points	Unknown	40	\$10.7	\$10.4
	40 Intermediate Signals	Unknown	40	\$6.3	\$6.1
	35 Signal Structures	1905-2010	40	\$36.8	\$35.7
	54 At-Grade Crossings	1970-2017	20	\$18.9	\$18.2
Communications	2 Train Control Networks	2002-2014	10	\$12.0	\$12.0
	19 Radio Base Stations	1997-2018	15	\$8.5	\$8.5
	183 Radios	1997-2004	15	\$8.5	\$8.5
	27 Public Address (PA) Systems	1997-2015	10	\$3.3	\$3.3
	118 Variable Message Signs (VMS)	1997-2015	10	\$3.5	\$3.5
	106 Ticket Vending Machines (TVM)	2000	12	\$4.6	\$4.6
Fiber	1 Fiber Optic Cable System	2015	20	\$43.3	\$43.3
Total 2018 Value of Existing Assets:				\$3,834.2	\$3505.8
Future Assets					
Positive Train Control	1 Back Office System	2018	5	\$1.5	\$1.5
	1 Wayside System	2018	5	\$0.6	\$0.6
	14 Radio Base Stations	2018	15	\$6.2	\$6.2
	67 Onboard Equipment	2018	5	\$11.0	\$11.0
Electrification	96 electric vehicles	2022	30	\$582.2	\$582.2
	(Up to) 37 electric vehicles, grant contingent	2022	30	\$224.4	\$224.4
	1 Overhead Contact System	2022	40	\$412.2	\$412.2
	1 Traction Power System	2022	40	\$131.8	\$131.8
Total 2018 Value of Future Assets:				\$1,369.9	\$1,369.9

*Replacement costs are in 2018 dollars and do not include soft costs. Estimated costs are based on a constant 3% inflation rate.

A general description of each asset type is defined below:

Rolling Stock	Revenue vehicles used to transport passengers
MOW Equipment	Heavy machinery equipment used to perform maintenance of way activities
Service Vehicle	Support vehicles used to transport maintenance personnel
Track	Track structure consisting of rail, crossties, and ballast
Structures	Rail bridges crossing over roadways, waterways, or other facilities
Stations	Passenger facilities
A&M Facilities	Facilities for administrative or maintenance employees or functions, such as train dispatching, train crews, maintenance personnel
Signal	Systems including train control signals and grade crossing signals
Communications	Systems consisting of data and voice radio, public announcements, and variable message signs
Fiber	System consisting of digital communications facilitated by fiber optic cable

Some assets are not included in this inventory. These include:

- Real estate (property) assets.
- Administrative offices, since Samtrans owns and is responsible for the administrative building which houses Caltrain administrative functions.
- Facilities offering connections to other transportation modes which are not owned, operated, or maintained by Caltrain.

3.2 Asset Condition Assessment

Condition assessments measure not only the condition or wellbeing of the asset, but also its performance. The assets not only differ in physical properties, but they also contribute to delivery of passenger rail service in different capacities. As such, different types of condition assessments have been developed.

Condition assessments for each asset type are currently stored in various manners depending on the asset owner and the format of the condition assessments performed. As part of action DAT-02 identified in the implementation strategy, implementation of an asset management system will include centralizing the collection of condition assessment information. Additionally, development of a consistent rating system to measure different asset types' condition along the same scale will be required for the development of a decision support tool.

Summary tables for each of the major asset categories are provided below.

3.2.1 Fleet

Table 14. Fleet Condition Assessment Overview

Asset Type	Assessment Type	Methodology Description	Rating Scale	Frequency	Tracking
Rolling Stock					
Trailer Cars, Cab Cars	Visual	Customer facing elements are inspected with a checklist	Pass/Fail	1x / year	Paper

Asset Type	Assessment Type	Methodology Description	Rating Scale	Frequency	Tracking
All	Visual, with hand tools	Mechanical elements are inspected visually, with hand tools, or load tested per CFR requirements.	Pass/Fail	15-, 30-, 46-, 92-, 184-, 368-, and 1472-day intervals	Paper
HVAC	Visual	Visual inspections of air conditioning and heating equipment on all rolling stock.	Pass/Fail	1x / year	Paper
Service Vehicles					
All	N/A	Assets are currently managed through a Tier 3 asset management strategy	-	-	-
MOW Equipment					
All	N/A	Assets are currently managed through a Tier 3 asset management strategy	-	-	-

3.2.2 Infrastructure

Table 15. Infrastructure Condition Assessment Overview

Asset Type	Assessment Type	Methodology Description	Rating Scale	Frequency	Tracking
Track					
Rail	Ultrasonic	Rail structural integrity is inspected with specialized equipment	Pass/Fail	2x / year	Paper
Track	Geometry	Geometric parameters are inspected with specialized automated track inspection vehicle	Pass/Fail	3x / year	Paper
Special Trackwork	Visual	Switches and special trackwork elements are inspected with a checklist	Pass/Fail	1x / month	ENSCO
Track Structure	Visual	Ties and ballast are visually inspected. Only defects are noted.	Pass/Fail	1x / year	-
Structures					
All	Visual	Structural elements are inspected with a checklist	1-6	1x / year	Paper
A&M Facilities					
Structural	Visual	Buildings and equipment are inspected	TERM-Scale	1x / 2 years	
Equipment	Visual	Moving equipment is inspected with a checklist. Other equipment is visually inspected.	Pass/Fail	Daily or prior to use	Paper, if checklist
General	Visual	Cleanliness and upkeep inspections are performed as ongoing audit	-	Irregular	-
Stations					
All	Visual	Platform and buildings are inspected with a checklist	TERM-Scale	1x / 2 years	Paper

3.2.3 Systems

Table 16. System Condition Assessment Overview

Asset Type	Assessment Type	Methodology Description	Rating Scale	Frequency	Tracking
Communications*					
Data Radio	Visual	Hardware inspection with forms	Pass/Fail	2x / year	Paper
Microwave	Visual	Hardware inspection with forms	Pass/Fail	2x / year	Paper
Train Control	Visual	Server inspection	Pass/Fail	Daily	-

Asset Type	Assessment Type	Methodology Description	Rating Scale	Frequency	Tracking
PA	Visual	Hardware inspection	Pass/Fail	Irregular	-
VMS	Visual	Hardware inspection	Pass/Fail	Irregular	-
Signals					
General	Monitoring	Malfunctioning equipment provides notification only	Pass/Fail	Ongoing	-
General	Visual	Per CFR requirements	Pass/Fail	Monthly, Quarterly, Semi-Annual, Annual	RailDOCS

* ATCS radio, microwave, PA, and VMS communications systems are all constantly monitored by a system for connectivity.

Fiber

Fiber system is a relatively new asset introduced to Caltrain and a baseline condition assessment is currently underway. Appropriate condition assessment type and frequency will need to be identified as part of the development of this asset's maintenance management strategy.

3.3 Reliability Centered Maintenance

Information gathered from condition assessments will provide input towards SOGR needs. Development of lifecycle maintenance strategies for asset types will provide guidance direction whether maintenance activities or capital rehabilitation or replacement will be needed. In order to discern appropriate maintenance strategies, the three (3) types of reliability centered maintenance are shown in Figure 5 and can be recommended based on Figure 6.



Figure 5. Types of Reliability Centered Maintenance ²

² Source: "Selecting Data to Best Support Asset Investment Decisions" Presentation at TRB 12th National Conference on Transit Asset Management by APTEch, Inc.

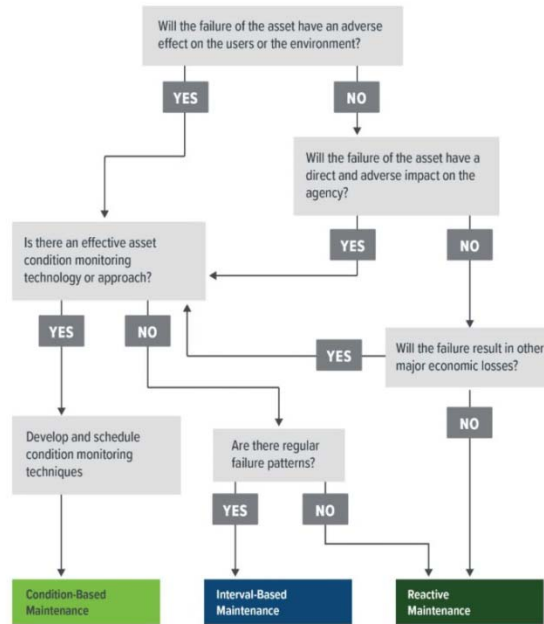


Figure 6. Reliability Centered Maintenance Decision Making Tree ³

³ Source: "Selecting Data to Best Support Asset Investment Decisions" Presentation at TRB 12th National Conference on Transit Asset Management by APtech, Inc.

SECTION 4: CAPITAL REINVESTMENT PROGRAM

Section 4 provides an overview of Caltrain’s decision making process, including the TERM-Lite tool, and identifies future SOGR needs. This section addresses FTA TAM Elements 3 and 4 – Decision Support Tools and Investment Prioritization, respectively.

4.1 Description of Decision Support Tool

Caltrain’s “decision support tool” combines both TERM-Lite software with an internal business process to approve TAM related SOGR projects.

4.1.1 TERM-Lite Tool

Caltrain uses FTA’s TERM-Lite as a forecasting tool to identify any upcoming large SOGR needs and identify any existing SOGR backlog, based on assets’ anticipated end of life. This tool will assist with Caltrain’s decision making process to identify any risk(s) associated with assets appearing on the backlog.

TERM-Lite’s output provides results based on four SOGR actions available for each asset in each year that is modeled. These options are:

None	No SOGR investment is required or funding is unavailable for SOGR investment
ACM	A percentage of the asset’s total replacement cost is spent on an annual basis to maintain the asset in a SOGR
Rehabilitation	A preset rehabilitation cycle is identified for the asset where a percentage of the asset’s total replacement cost is spent at regular intervals to maintain the asset in a SOGR
Replacement	The asset has reached the end of its lifecycle and requires to be replaced.

Additionally, asset types can be specified not to be replaced upon reaching end of life. This option is available for assets that cannot be feasibly replaced or for assets that are managed by performance and condition, rather than lifecycle.

TERM-Lite provides projections that serve as the basis for identifying and presenting SOGR projects for selection. Model output contains a ranked list of prioritized asset needs for each year of the model. TERM-Lite uses four criteria to prioritize asset capital needs and determine which assets should receive funding for SOGR activities. These criteria include both dynamic and static scoring components. The criterion with dynamic scoring is the asset’s condition, which is calculated based on remaining life for each year. The criteria with static scoring include safety, reliability, and impact to future operating and maintenance costs, which are provided by default for each type of asset as part of FTA’s national study. During the modeling effort for this TAM plan, Caltrain staff reviewed and modified the criteria rankings and the overall prioritization weighting to reflect its current priorities. This step helps ensure that TERM-Lite output aligns to the agency policy. Caltrain limited the review to those asset types which have assets entered into the model.

TERM-Lite’s output of prioritized SOGR needs remain only as a recommendation due to Caltrain’s business processes and the current functionality of TERM-Lite. Limitations of TERM-Lite include lack of application of funding source restrictions, integrated prioritization based on actual condition, and programmatic replacement or major rehabilitation only. TERM-Lite also does not account for deferred

maintenance that exists prior to the beginning modelling year. Additionally, TERM-Lite is not able to separate costs associated with SOGR activities over multiple years, as is typically required for design and procurement phases of larger projects. Further description of Caltrain's business process is described below in Section 4.1.2 Decision Making Process.

Caltrain desires to invest in a prioritization model that would factor in multiple additional criteria and various asset subcomponents in order to provide a truly objective prioritized list matching Caltrain's SOGR needs and priorities. Additional criteria include predicted asset condition deterioration, homogenous determination of an asset's criticality, and accounting for recently completed maintenance work orders.

4.1.2 Decision Making Process

While TERM-Lite provides support for objective decision making, Caltrain conducts an internal Call for Projects process to manage selection and approval of SOGR, improvement and expansion projects for the following fiscal year's budget. An overview of this process is outlined below:

1. Based on a combination of TERM-Lite results and incoming maintenance information, SOGR needs are identified by asset owners and developed into a project scope. These SOGR projects are submitted as candidates for approval through the Call for Projects process.
2. Candidate projects are initially reviewed by the Chief Operating Officer to ensure alignment with Agency objectives and priorities. Any projects not meeting these criteria are removed.
3. A project work plan is developed for candidate projects. These work plans include scoring criteria which are completed by the project manager. Scoring criteria include legal requirement, operational service, reliability, operational safety, community safety, political, and access. Scoring is also assigned for identification of the project type – SOGR, improvement, or expansion. Additional scoring is also allowed for large projects actively in construction where completion would span multiple years and additional funding is allocated each year.
4. Director level peer review workshop is conducted for all candidate projects. Projects are generally represented by project sponsors. Discussion includes scoring criteria to ensure consistent application of project scoring as well as identification of applicable phases of the project for the fiscal year.
5. Proposed budget is prepared by the Rail Contracts and Budget department, in conjunction with Finance, Budgets, and Grants departments, based on available funding for the type of project proposed.
6. Final review is provided by Chief Operating Officer, with final approval by the Caltrain Board.

4.1.3 Proposed Process Improvements

Further development of the TAM prioritization model will be able to identify more detailed actions that would be required to maintain Caltrain's assets. However, the TAM prioritization model only provides guidance for SOGR decisions, which represents a specific type of project requiring funding. As such, the highest ranking identified SOGR projects resulting from the TAM prioritization model would be provided into a separate decision-making tool.

The ongoing development of Caltrain's business plan includes creation of such a tool – an Integrated Business Model. This tool would be able to support Caltrain decision-making based on additional agency

level objectives and priorities which would include additional projects for service enhancements or expansion.

4.2 Capital Reinvestment Needs

A forecast of SOGR capital reinvestment needs has been identified by using the TERM-Lite tool. The process to prepare the TERM-Lite tool for Caltrain's use involved the following actions:

- Compile the Caltrain asset inventory into the TERM Lite format
- Review asset data and adjust costs to reflect Caltrain's capital responsibility
- Identify unique modeling needs, including the fleet transition due to electrification and outstanding SOGR needs from deferred maintenance
- Review and adjust the TERM-Lite asset type behavior to match agency practices
- Identify modeling parameters for scenarios

After the above actions were completed, certain asset types were designated not to be replaced upon reaching the end of their specified lifecycle. A list of these asset types are identified and described in more detail below.

Locomotives, Trailer Cars, Cab Cars	A portion of the diesel fleet will be retired upon delivery of the electric fleet from Caltrain's Peninsula Corridor Electrification Project. SOGR needs through 2022 are included in the model, but not afterward. SOGR backlogs generated by these assets are included through retirement. The diesel fleet that will remain in service is modeled on a normal lifecycle.
Ballast, Wood Ties, Rail, Yard Track	Ballast is managed by condition as a Tier 2 asset and is in a SOGR since there are no speed restrictions due to infrastructure in poor condition. SOGR costs are approximated by ACM based on historic data.
Tunnels	Tunnels cannot be feasibly replaced due to various factors including limited resources (such as funding and real estate), potentially large impacts to operations, and deep pile foundations due to above ground property development.

The unique modeling needs of Caltrain led to the use of an advanced TERM-Lite modeling technique. The deferred maintenance and the retirement of a section of the diesel fleet required modification intervention to ensure that the needs and backlog for these assets were accurately represented. TERM-Lite does not support "retirement" of an asset within the model. These capital needs were modeled separately on the basis that these needs would be prioritized first. The available budget for the constrained model was then reduced by the investment needs in the special model to accurately portray the funding resources available for SOGR needs among the other models. Less than 6 percent of assets were included in the special model.

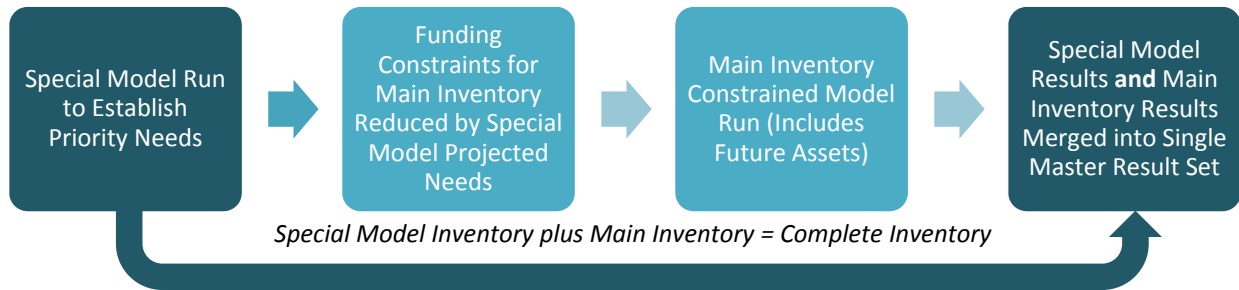
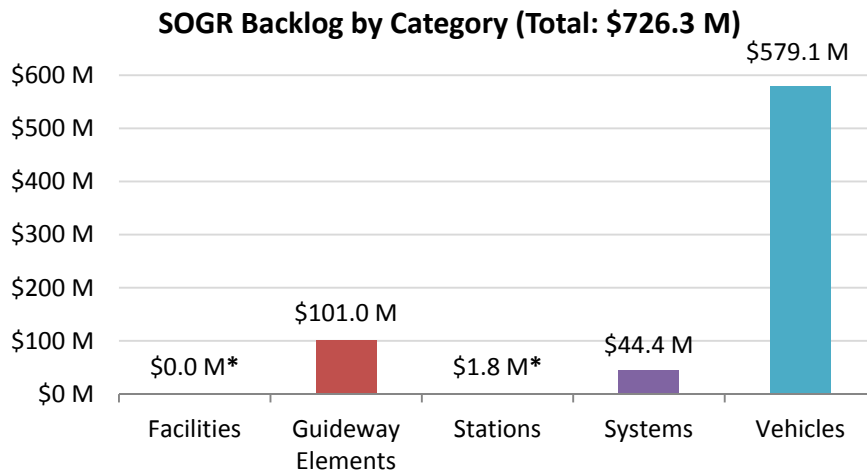


Figure 7 Modeling Process Overview

Two scenarios were developed to provide a 20-year SOGR outlook. Scenario A is an unconstrained funding scenario where sufficient funding is available to address all current and future SOGR needs. Scenario B is a constrained funding scenario where only a specified amount of funding is available to address SOGR needs. In each scenario, the cost for each asset is brought to the specified beginning year (2018). Soft costs associated with the replacement of each asset are also included in these scenarios. The scenarios and their results are described below.

4.2.1 TERM-Lite Current Backlog Results

This section discusses the current capital backlog at Caltrain. The starting backlog projected in both scenarios is identical. The backlog in TERM-Lite is calculated as the sum of the current replacement cost of all assets that have exceeded their useful life. In addition, Caltrain has modeled existing deferred maintenance. Existing deferred maintenance is typically not captured by a TERM-Lite analysis, but is part of the special model component of the analysis. Categories are based on the TERM-Lite asset type.



* The backlog shown for Facilities and Stations asset types is based only on deferred lifecycle replacement of assets. The backlog of deferred maintenance is still being

Figure 8. Current SOGR Backlog

As of 2018, Caltrain has a \$726.3 million capital need backlog. Most this backlog is made up of vehicles that have exceeded their 30-year useful life and existing deferred maintenance on revenue vehicles; most of this backlog will be addressed by the end of 2022 when the new fleet of electric vehicles is put

into service. At that time, a fleet of existing diesel vehicles will be retired and the backlog associated with them will be eliminated.

The primary driver of guideway backlog is related to guideway assets dating back to the early 1900s. These assets remain in service today as part of the guideway and are reaching the end of their projected useful lives. Several bridges and subway sections are identified as part of this backlog (\$92.1 million). Caltrain continually assesses the safety and adequacy of these guideway elements to ensure the safe and reliable operation of service. These assets are monitored with a condition-based approach with the assessments as described in Section 3.2.2 Infrastructure.

Within the systems category, communication equipment related to radios is the primary cause (\$19.2 million) of the backlog. Electronics often have a shorter useful life due to the obsolescence and evolving standards. A significant portion of the base radio station assets entered service in 1997, resulting in the backlog. In addition to communication equipment, there is a sizeable (\$6.5 million) set of ticket vending machines that are now beyond their useful life and due for replacement or refurbishment.

It is important to note that additional backlog exists with facilities and stations where these assets may not have exceeded their useful life, but have had maintenance activities deferred. The backlog value of deferred maintenance associated with these asset types is still being determined. As mentioned earlier, since the TERM-Lite model does not account for existing deferred maintenance, these SOGR needs will be incorporated into the decision making process separate from the TERM-Lite recommendation based on current condition assessments.

4.2.2 Scenario A – Unconstrained

Description

Scenario A is an unconstrained scenario where sufficient funding is available to address all current and future SOGR needs. While this is unrealistic for current circumstances, this scenario clearly identifies Caltrain's existing SOGR backlog and future SOGR needs in upcoming years. This scenario is effective in identifying when different clusters of assets will enter into the backlog. The stated SOGR needs includes an inflation assumption of 3 percent, as with Scenario B, in order to provide consistent and comparable results.

It is important to note that the assets identified as not in a SOGR are because the asset has reached the end of its lifecycle, and is not reflective of the asset's actual condition. An asset exceeding its useful life is a sign that the asset is likely in need of reinvestment or replacement, but individual assets may over- or under-perform based on a variety of factors such as exposure to weather, manufacturing differences, or maintenance practices that are external to model considerations.

Results

Scenario A has generated an overview of both the current SOGR backlog and additional SOGR needs for the following 20 years. The current backlog calculated by Scenario A is illustrated in Figure 9 and discussed in the previous section. The overall projected capital needs over time are illustrated in Figure 10.

The SOGR backlog represents the approximate amount needed to replace all assets that have exceeded beyond their useful life. The total value of Caltrain's SOGR backlog is estimated to be \$715.9 million, including the revenue vehicles which are planned to be replaced as a result of the new electric revenue

vehicle fleet. 64.2 percent (\$460 million) of the total backlog is accounted for by the fleet that will be retired. Caltrain's total backlog over time is represented in Figure 10.

SOGR Backlog, by category (Unconstrained)

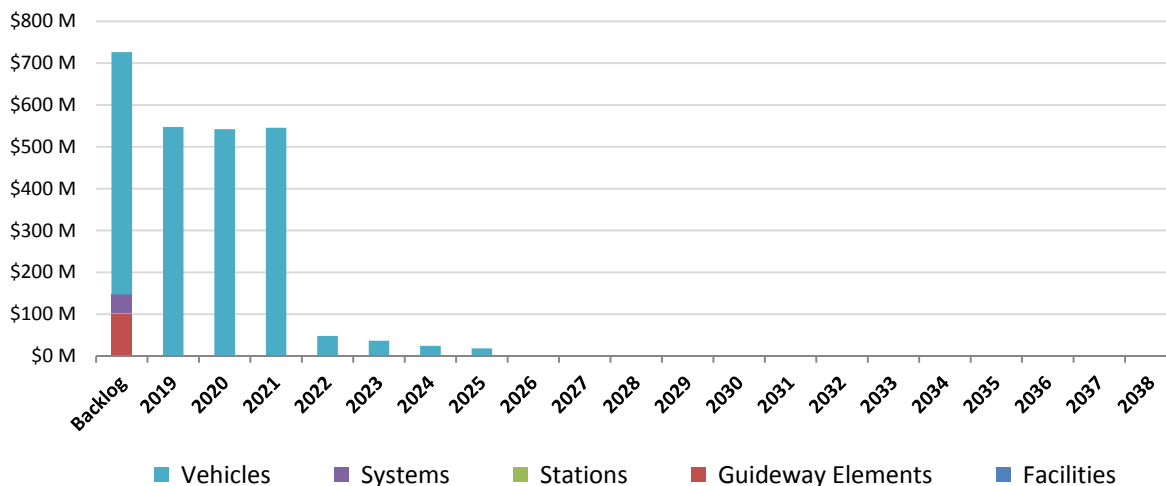


Figure 9 SOGR Backlog (Unconstrained)

In Scenario A, where funding is overly abundant, the backlog can be addressed immediately. Some backlog remains until 2026 when the last planned retirement of a diesel vehicle occurs. However, there will still be additional SOGR needs arising over the forecasted years as assets reach the end of their lifecycle. Over a 20-year average, SOGR needs are estimated to be \$477 million per year. The majority of the additional SOGR needs are mainly contributed from vehicles and guideway elements type of assets. Figure 10 identifies these additional SOGR needs along with the SOGR backlog which is addressed in the initial year.

Unconstrained SOGR Investment Expenditures by Category

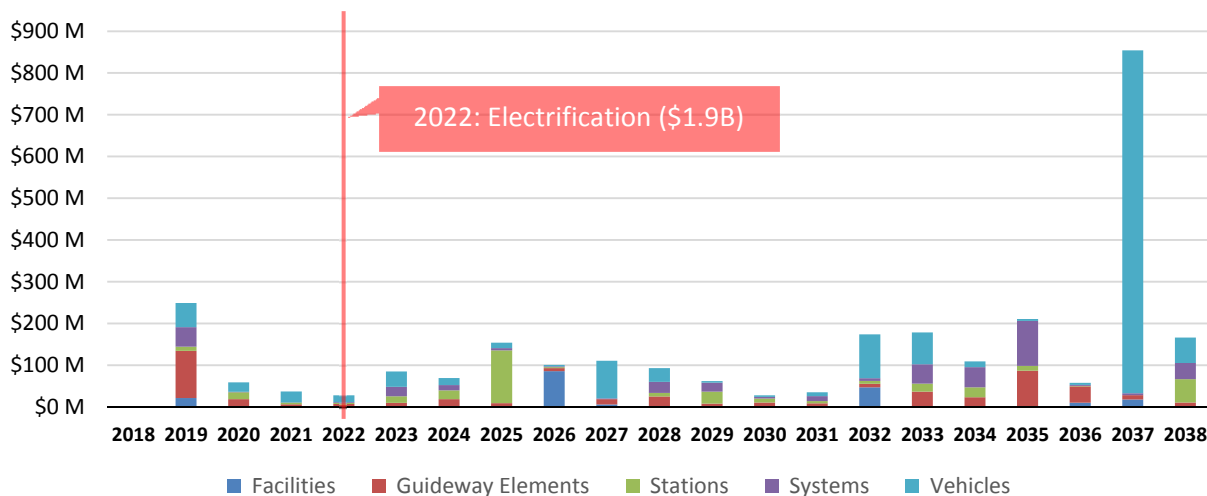


Figure 10. Scenario A Proposed Investment Expenditures

Spikes of SOGR need shown above will require advance planning on Caltrain's behalf in order to address these large needs in a timely manner. Funding is likely not to be available as a spike, but rather as an amount spread out over time. Additionally, passenger service must continue to be provided even as rehabilitation work is performed. In the case of rail vehicle assets, only a limited amount may be removed from service to accomplish this task – thus appropriate measures must be taken to address SOGR needs in a timely fashion.

The largest spike in SOGR need for vehicles occurs in 2037 when the new electric revenue vehicles are projected to require a midlife rehabilitation. In addition, part of the revenue fleet will remain in service after the completion of the electrification project. These vehicles are treated in the model as regular assets and replaced at the end of their useful life of 30 years. As a result, significant spikes are seen in 2027, 2032, and 2033. Each spike corresponds to a sub-fleet of the diesel revenue vehicles reaching the end of their useful life.

The most notable year of stations' SOGR needs is in 2025. In this year a significant number of stations completed in 1985 reach the end of their useful life. Continued condition assessments of stations as described in Section 3.2.2 Infrastructure will provide additional information to project when stations would be anticipated to reach the end of their useful life based on real time condition.

For guideway, ongoing on-going annual capital maintenance costs and a selection of bridges surpassing their useful lives cause the bulk of the SOGR needs. Guideway elements first put into service between 1919 and 1938 are included in these projected needs.

\$1.9 billion worth of electrification assets will come online in 2022. It is only noted above due to scaling issues. This does not represent a current SOGR need within the model, since the project is already funded separately. However, this notation designates the beginning of on-going SOGR needs after the "acquisition" of electrification assets which are included in the model. In addition, \$10.7 million worth of deferred maintenance will be completed with funds that were allocated from a previous budget. As a result, this is not shown as an investment need above since the funding for these actions were previously allocated but is shown as a continued SOGR backlog since the work was not completed.

4.2.3 Scenario B – Constrained

Description

Scenario B is a constrained scenario where only a specified amount of funding is available. This scenario is intended to more closely reflect real world conditions.

Based on the approved FY15-19 budgets for SOGR, an average of \$31.5 million capital funds is available each year to fund SOGR projects. The known funding level of \$36 million was used for 2019. Some projects listed that were not included. While these projects retired existing assets, the new assets constructed are different, either contributing to service or safety enhancement. Additionally, these projects were funded separately and did not receive any funding earmarked for SOGR.

Asset SOGR costs also included inflation at 3 percent. This 3 percent was not applied to the available SOGR capital budget of \$31.5 million since typically the available budget remains constant over several years, while other costs rise.

Additional costs for SOGR activities as required for operating the railroad have also been included in the model results. These costs are described below by category and have been applied to each year of the model's results to provide a holistic view of total SOGR program. This amount is not included as part of available prioritization funding because activities associated with these costs (i.e. FRA required inspections) cannot be deferred.

Facilities	\$1.56 M	Systems	\$1.83 M
Guideway Elements	\$7.38 M	Vehicles	\$21.80 M
Stations	\$5.46 M		

Results

With Scenario B, the results incorporate both operating and capital funding. The available SOGR capital funding is limited to \$36 million in 2019 and \$31.5 million per year thereafter. Since this amount is less than the estimated annual SOGR needs, funding will have to be applied selectively based on the prioritization of each asset. In comparison with Scenario A's results, the continued average of available SOGR funds is far from being sufficient to completely address each year's additional SOGR needs.

Scenario B provides insight into two factors that should be considered when making SOGR investment decisions. The first factor is how available SOGR funds are recommended to be spent each year. The second factor is how the SOGR backlog changes over time.

As mentioned in Section 4.1.1 TERM-Lite Tool, TERM-Lite only offers a recommendation as it currently does not differentiate between different types of funding and assumes that available funding can be used to address SOGR needs for any type of assets. Proposed funding for assets will need to be reviewed as part of the annual budgeting process.

In order to recommend how available SOGR funds should be allocated, TERM-Lite first identifies SOGR needs based each of the assets' lifecycle. These needs are prioritized through a scoring calculation based on criteria built into the model. Proposed funding is allocated to the highest scoring assets to address their SOGR needs. If funding is unavailable to address a high scoring asset's SOGR needs, funding will be provided for the next highest scoring asset's SOGR needs until all available funding has been allocated.

In addition, Caltrain has identified existing deferred maintenance and SOGR needs associated with the revenue fleet as priorities. Following the methodology shown in Figure 7, these were modeled first in a special model run in an unconstrained model. The amount of SOGR needs projected for this limited subset of assets is then removed from the budget available for the other assets in the main inventory model. The two model results are then combined into the final constrained results set. This allows Caltrain to have a "off the top" funding for these specially identified needs.

With the methodology described, allocation to each asset type varies each year based on the prioritization calculation for the assets. As with Scenario A, \$1.9 billion worth of assets come on line in conjunction with the completion of the electrification project. The initial acquisition value is excluded due to scaling but is noted in the Figure below. The projected SOGR prioritized expenditures from TERM-Lite is reflected in Figure 11.

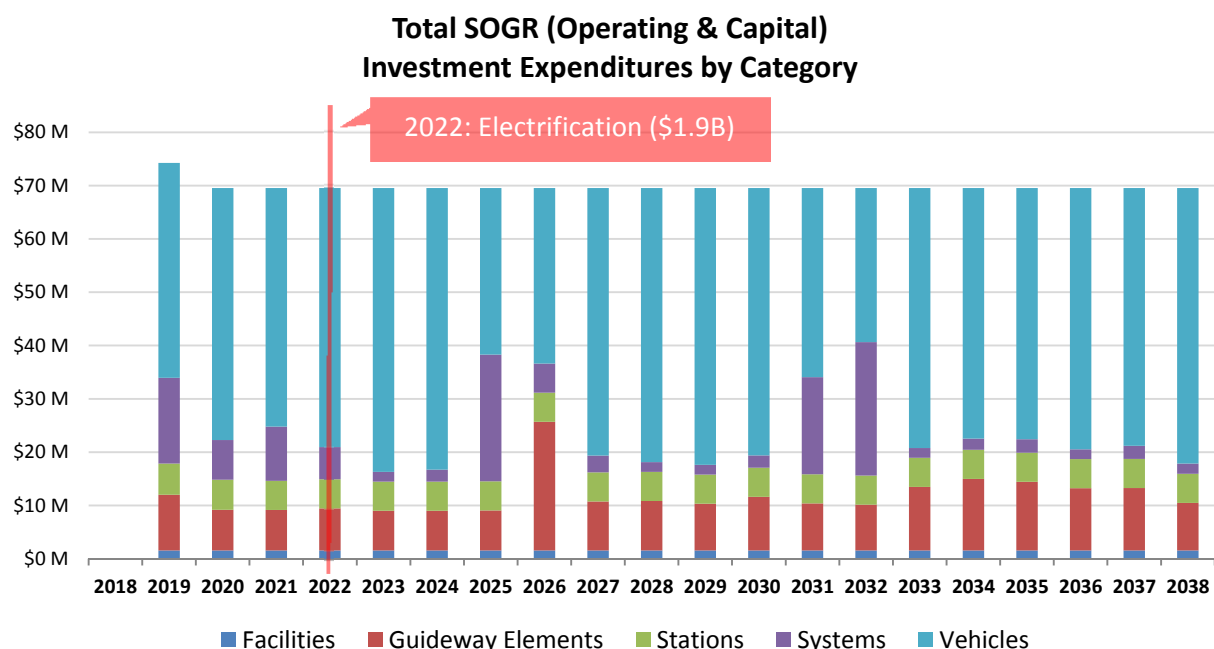


Figure 11. Scenario B Proposed Investment Expenditures

In Scenario B, as contrasted to Scenario A, funding is not sufficient to address all SOGR needs as evident by all available funds being used each year. ACM and deferred maintenance for vehicles consumes most the available funding. In order to identify outstanding SOGR needs that are unable to be addressed, TERM-Lite generates an SOGR backlog to provide an overview of additional remaining SOGR needs each year. This SOGR backlog, as shown in Figure 12, represents the associated cost needed each year to address all unfunded SOGR needs. Based on the current available funding trend, Caltrain’s backlog will grow to approximately \$2.6 billion at the end of 20 years.

The backlog is significantly reduced in 2022 due to the retirement of a sub-fleet of diesel vehicles because of the implementation of the electrification project. In 2037, there is a significant spike in the backlog resulting from the rehabilitation needs of the new electric revenue fleet far exceeding available funding.

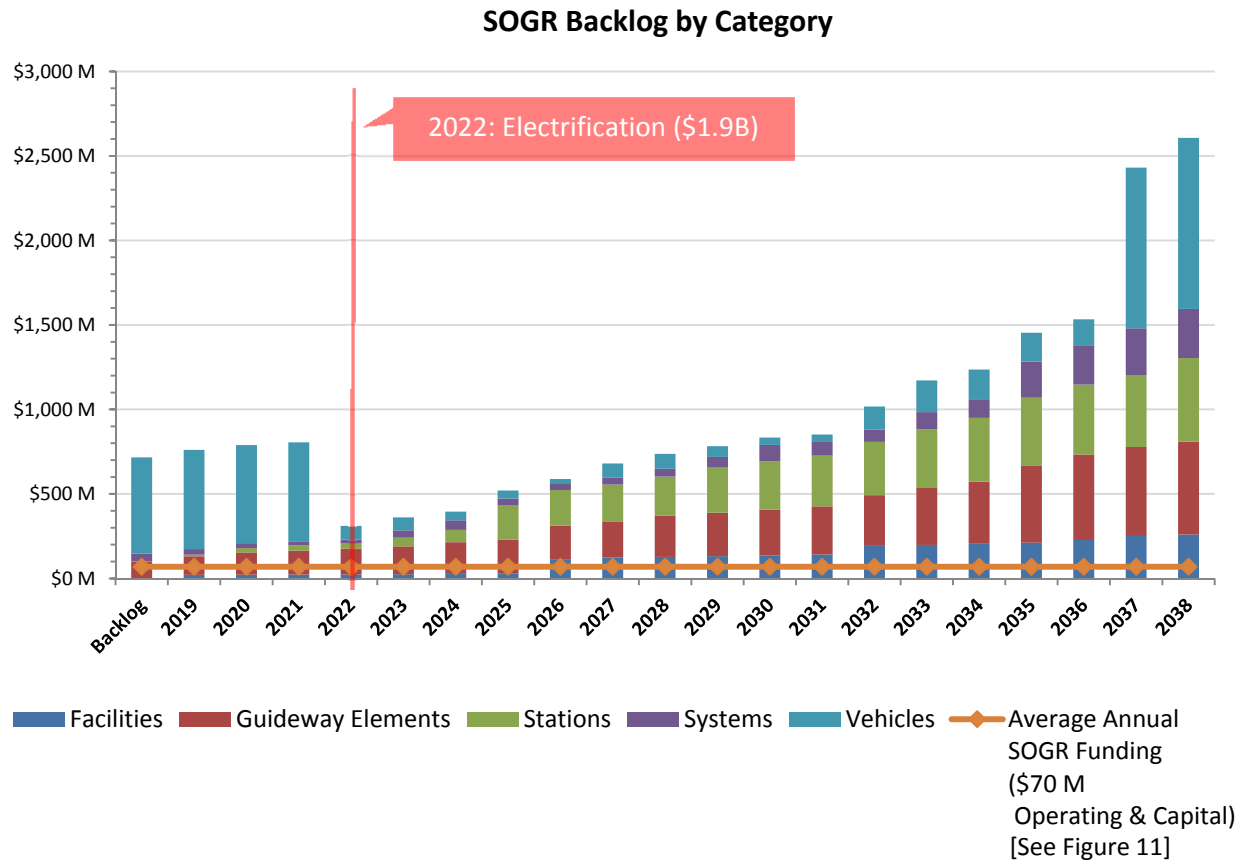


Figure 12. Scenario B SOGR Backlog Forecast

CONCLUSION

In summary, Caltrain intends on utilizing this TAM Plan beyond meeting FTA's TAM rule. The TAM Plan provides the framework to implement an asset management program with robust asset management processes and best practices. This will improve stakeholder communications and optimize resource allocation. The TAM Plan also lays out considerations for EAM software which will improve the selection process and subsequent implementation. Lastly, the TAM Plan's SOGR forecast provides insight to large upcoming SOGR needs. This allows Caltrain to take proactive measures to plan for future SOGR activities while showcasing the Agency's need for additional funds.

Overall, this TAM Plan is a living document that is the cornerstone on which Caltrain's asset management culture will be built.

APPENDICES

APPENDIX A – GLOSSARY

Accountable Executive

A single, identifiable person who has ultimate responsibility of a public transportation agency, responsibility for carrying out transit asset management practices, and control and direction over the human and capital resources needed to develop and maintain both the agency's Public Transportation Agency Safety Plan, in accordance with 49 U.S.C. 5329(d), and the agency's Transit Asset Management Plan in accordance with 49 U.S.C. 5326.

Asset

Any equipment, rolling stock, infrastructure, and facilities for use in public transportation, owned or leased by the transit provider. The Federal Transit Administration typically considers five main categories for capital assets: Vehicles; Systems; Guideway Elements; Facilities; and Stations.

Asset Inventory

A catalogue of an organization's assets which contains information about those assets. The inventory may be at multiple levels of granularity depending on the purpose and associated asset management strategy.

Asset Management

A strategic and systematic process, through which an organization procures, operates, maintains, rehabilitates, and replaces assets over their lifecycle to manage their performance, risks, and costs. Also included are processes for managing and maximizing the performance of an asset while minimizing its costs throughout the course of its lifecycle

Asset Owner

The person responsible for overseeing the management of a specific asset and its performance

Constrained

Limited funding that is not enough to address current outstanding or future SOGR needs

Lifecycle

All activities and phases involved in planning, design, procurement, operation, maintenance, rehabilitation, and disposal of an asset

Lifecycle Management

A business practice that supports better investment decisions across the lifecycle using management processes and data specific to each asset as a basis for predicting remaining useful life (including age, condition, historic performance, and level of usage).

Moving Ahead for Progress in the 21st Century Act (MAP-21)

A funding and authorization bill for federal surface transportation. Signed into law in July 2012, Section 20019 requires transit agencies to develop a Transit Asset Management Plan and to implement a Transit Asset Management System

Prioritization

A set of rules that determine which assets will obtain funding when funding is constrained.

Stakeholder Advisory Group

Comprised of members from senior leadership overseeing TAM related processes and functions

State of Good Repair (SOGR)

Assets functioning at their intended capacity and within their useful life

SOGR Backlog

A summary of SOGR activities that have not been performed due to deferred maintenance, funding constraints, or other variables. Typically, the backlog represents large replacement or rehabilitation costs that have not been addressed.

Technical Working Group

Comprised of members from technical level with responsibility for managing specific assets or working with TAM related processes

Tier I Transit Provider (Tier I Agency)

An entity that receives Federal financial assistance under 49 U.S.C. Chapter 53, either directly from FTA or as a sub recipient, that owns, operates, or manages either (1) one hundred and one (101) or more vehicles in revenue service during peak regular service across all fixed route modes or in any one non-fixed route mode, or (2) rail transit

Transit Asset Management (TAM)

Asset management principles applied to transit assets used to provide safe, cost-effective, reliable service to current and future customers; see “Asset Management”

Transit Asset Management Plan (TAM Plan)

A document developed by an agency that includes, at a minimum, discussion of current capital asset inventories and condition assessments, decision support project prioritization, and State of Good Repair performance

Transit Economic Requirements Model (TERM Lite)

A decision support tool software application for developed by the Federal Transit Administration to estimate future transit agency needs, backlog impacts and asset conditions

Transit Economic Requirements Model Scale (TERM Scale)

The 1-5 rating system used in the FTA’s TERM Life software to describe the condition of an asset, where 5 is excellent condition and 1 is poor condition

Unconstrained

Refers to unlimited funding that can immediately address all SOGR needs, both current and future

Useful Life

An asset’s expected operational life or acceptable period of use in service

Vehicle Revenue Miles

The miles that a vehicle travels while in revenue service

APPENDIX B – ACRONYMS

ACM	Annual Condition Maintenance
ATCS	Automated Train Control System
COO	Chief Operating Officer
EAM	Enterprise Asset Management
FTA	Federal Transit Administration
FTE	Full-Time Employee
IAM	Institute of Asset Management
MAP-21	Moving Ahead for Progress in the 21 st Century
MPO	Metropolitan Transportation Organization
NTD	National Transit Database
O&M	Operations and Maintenance
PA	Public Announcement
PCJPB	Peninsula Corridor Joint Powers Board
SOG	State of Good Repair
TAM	Transit Asset Management
TASI	TransitAmerica Services Incorporated
VMS	Variable Message Sign

APPENDIX C – TAM COMPLIANCE CHECKLIST

The following checklist is provided by FTA and addresses the requirements of the TAM rule in detail, and provides resources for further information. The checklist is for recipients and sub-recipients of Federal financial assistance that own, operate, or manage capital assets in the provision of public transportation.

Caltrain is a Tier I agency; only checklist items applying to Tier I agencies are shown here.

Tier I and Tier II recipients and Group Plan Sponsors

1. Do I have a TAM Plan that covers a four year period?

Yes. Within the TAM Plan, TAM program activities identified in Section 2 are projected to 7+ years and TAM Capital Reinvestment Needs are projected for up to 20 years.

2. Was the TAM Plan updated within the last four years?

Yes. This TAM Plan has been completed in October 2018. The next update must be completed by October 2022.

3. Do I have a TAM Plan that includes all of the required elements?

Yes. Table 3 of this TAM Plan identifies contents and TAM elements addressed in each section.

a. An asset inventory for all assets used in the provision of public transportation, including those owned by third parties?

Yes. See Section 3.1 Asset Inventory.

b. A condition assessment of all assets in my asset inventory for which I have direct capital responsibility?

Yes. See Section 3.2 Asset Condition Assessment.

c. An investment prioritization that:

- Ranks projects to improve or manage the state of good repair over the horizon period,
- Includes all capital assets for which I have direct capital responsibility, and
- Is at the asset class level

Yes. See Section 4.2 Capital Reinvestment Needs.

d. Did I document the analytical processes and decision support tools used in developing my TAM plan?

Yes. See Section 4.1 Description of Decision Support Tool.

4. Do I have documentation that I calculated performance for:

Equipment (non-revenue service vehicles, support-service and maintenance vehicles equipment): the percentage of those vehicles that have either met or exceeded their ULB for all assets for which I have direct capital responsibility.

Rolling Stock: the percentage of revenue vehicles by vehicle type that have either met or exceeded their ULB for all assets for which I have direct capital responsibility.

Infrastructure (rail fixed-guideway, track, signals, and systems): the percentage of track segments with performance restrictions for all assets for which I have direct capital responsibility.

Facilities: the percentage of facilities within an asset group rated below condition 3 on the TERM scale for all assets for which I have direct capital responsibility

Yes. Performance measures for the above identified assets are calculated through a separate spreadsheet prepared by MTC based on an asset inventory provided by Caltrain. This spreadsheet has not been included in the TAM Plan.

5. Do I have documentation that I set performance targets annually to project the following fiscal year for:

• Equipment

• Rolling Stock

• Infrastructure

• Facilities

Yes. Performance targets are set annually through a separate spreadsheet prepared by MTC based on an asset inventory and condition assessments provided by Caltrain. This spreadsheet has not been included in the TAM Plan.

6. Did I make my TAM plan, any supporting records or documents, performance targets, investment strategies, and the annual condition assessment report available to the State and/or MPO that provides my funding?

Yes. Caltrain's TAM Plan, which includes its investment strategy, will be shared with MTC, Caltrain's MPO, within 30 days of approval. Performance targets and annual condition assessment reports are shared through ongoing coordination with MTC's TAM subcommittee.

7. N/A; This question applicable to group plan sponsors only.

8. Does your tier I TAM plan include all of the required elements?

Yes. Table 3 of this TAM Plan identifies contents and TAM elements addressed in each section.

a. Documentation of a TAM and SGR policy?

Yes. See Section 1.2 Policy Statement.

b. An implementation strategy that outlines a plan to achieve its asset management goals?

Yes. See Sections 2.3 TAM Program Activities and 2.5 Performance Measures.

c. A written description of the key TAM activities that you intend to engage in over the TAM plan horizon period?

Yes. See Section 2.3 TAM Program Activities.

d. A summary or list of the resources, including personnel that the recipient needs to develop and carry out the TAM plan?

Yes. See Sections 2.2 Internal Organization and 2.3 TAM Program Activities.

e. An outline of how I will monitor, update, and evaluate, as needed, its TAM plan and related business practices, to ensure the continuous improvement of its TAM practices?

Yes. See Section 2.6 Continuous Improvement Plan.