

TRANSPORTATION DECISIONMAKING

Information Tools for Tribal Governments

# Asset Management



U.S. Department  
of Transportation  
Federal Highway  
Administration

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TRANSPORTATION DECISIONMAKING

Information Tools for Tribal Governments

# Asset Management

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**In coordination with:**

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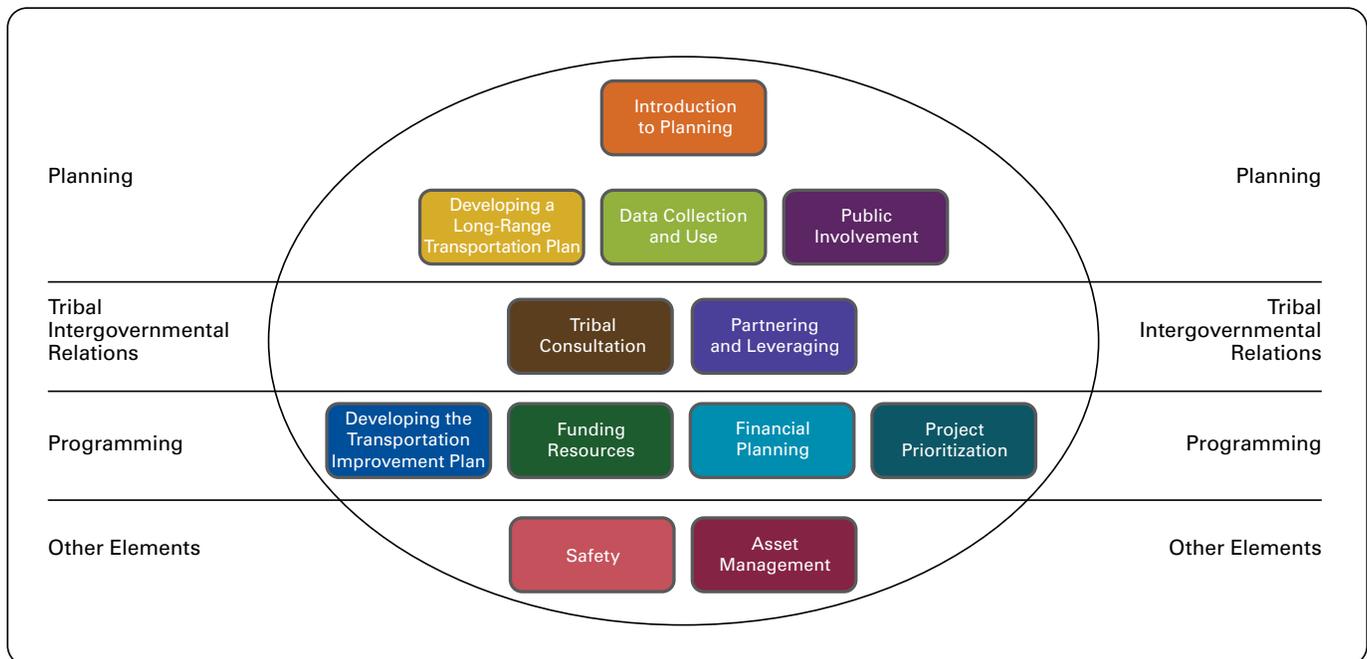


U.S. Department  
of Transportation

## OVERVIEW

You are participating in a training session sponsored by the U.S. Department of Transportation Federal Highway Administration (FHWA). It is part of a continuing educational series designed for tribal governments entitled *Transportation Decisionmaking: Information Tools for Tribal Governments*. The series offers modules in transportation planning, transportation programming, intergovernmental relations, safety and asset management. This is shown in Figure 1.

**Figure 1: Training Modules for Tribal Transportation Decisionmaking<sup>1</sup>**



This module topic is **Asset Management**. Let's begin!

<sup>1</sup> The *Transportation Decisionmaking Series* modules are available on the FHWA Tribal Planning web site at [http://www.tribalplanning.fhwa.dot.gov/training\\_series.aspx](http://www.tribalplanning.fhwa.dot.gov/training_series.aspx)

## I. INTRODUCTION

**What is Asset Management?** Asset management is a process that helps makes the best decisions about tribal transportation infrastructure given the resources available. Asset management uses asset information to help tribal leaders make better maintenance and improvement decisions about the tribal transportation system to extend the usefulness of transportation assets with available funding.<sup>2</sup>



### **Who should participate in this training?**

Any official responsible for tribal transportation planning, budgeting and decisionmaking.

**Why is this important?** Every day the tribe's physical assets age. Their maintenance needs increase but funding does not. If done properly, asset management enables you to most effectively manage the tribe's asset with available funds.

**How will I benefit?** You will be able to help the tribe achieve a higher level of performance from tribal transportation assets.

**How does this module relate to other modules in the training series?** As shown in Figure 1, this topic relates to all of the training modules. Asset management ties tribal planning, programming, and intergovernmental relations together for improved management of tribal resources.

**What can I expect from this module?** In this module you will learn about asset management and the important role it plays in ensuring a safe and reliable transportation system. You will be introduced to the information, concepts and tools required for asset management. An example of a tribal asset management program currently being put into place is also provided.

### **This module has six parts:**

- I. **Introduction.** Topic description.  
*Practice While You Learn!*
  - II. **How Do I Do Asset Management?**  
Step by step instructions.
  - III. **Toolbox.** Techniques for performing task.
  - IV. **Checklist.** Checklist.
  - V. **From Indian Country.** Tribal example.
- Appendices.** For Further Reading.  
Asset Management Quiz.

<sup>2</sup> The AASHTO *Transportation Asset Management Guide: Volume 2 - A Focus on Implementation* is a foundational document that has been used to develop the content for this training module. The FHWA Office of Asset Management is actively promoting and integrating this publication to improve asset management practice nationally. A brief summary of the document is available at: <http://www.fhwa.dot.gov/asset/hif10023.cfm>

## **Figure 2: *Practice While You Learn!***

### **Asset Management**

The project below is referenced throughout the module to help you “Practice While You Learn” asset management.

Your tribe has decided to implement a pilot asset management project for the area near the tribal school. This project will inventory transportation facilities within a one mile radius of the school. The tribal governing body expects this effort will aid decisionmaking in the maintenance and improvement of transportation facilities on roadways near the school. It is also anticipated that the tribal asset management program will reduce costs and improve safety near the school.

The purpose of *Practice While You Learn!* is to apply your learning to a hypothetical problem as you study the contents of this module. You will find useful information and tools in your reading. At certain points, you will be asked if the lesson you have just learned will help solve the problem described here.

## II: HOW DO I IMPLEMENT ASSET MANAGEMENT?

### What is Asset Management?

Asset management is a business process that:

- Is a data driven decisionmaking process that looks at both financial and technical issues, and
- Considers asset condition and performance to find the best maintenance and improvement investment.

Good asset management practice is based on having reliable knowledge of what assets are owned, how they are performing, what investments are being made including maintenance, and how your tribe's actions are likely to affect performance. This knowledge involves routine collection of good data, and turning the data into useful information from which you can make decisions.

Every tribe has different needs and circumstances; therefore, the approach to asset management is not the same for every tribe. Asset management provides a decisionmaking structure for getting the best performance from the tribe's transportation assets given the available funds. Implementing asset management involves making decisions based on information about the performance of an asset and on how that asset can best support the overall tribal transportation network. This module focuses on how to set up an asset management program that supports the asset management decision process.

**Asset Management** is a process that helps makes the best decisions about tribal transportation infrastructure given the resources available.

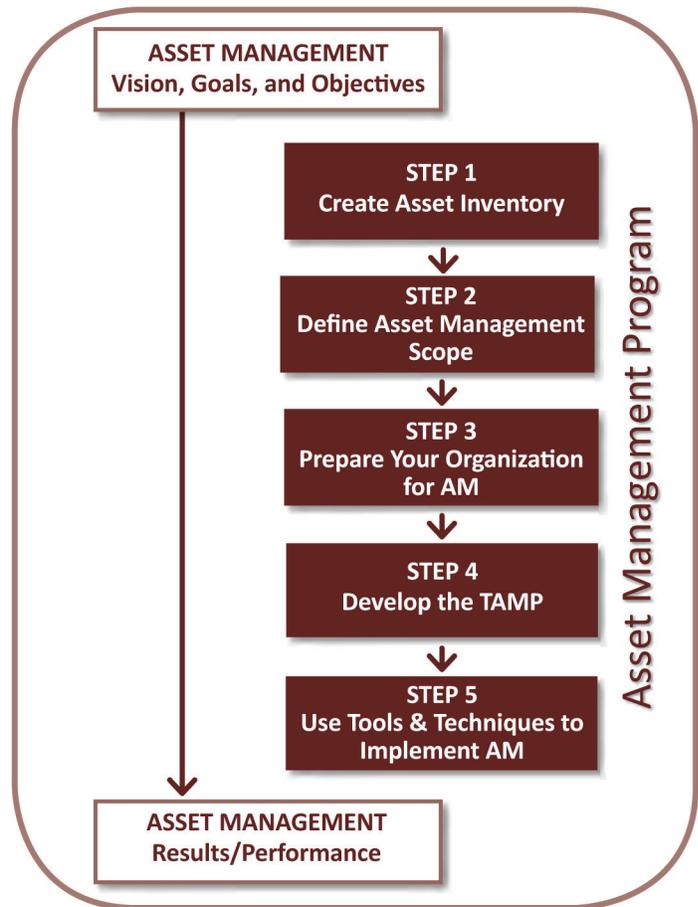
## Steps in Asset Management.

There are five basic steps to implementing an asset management program. We will discuss each step in detail but first, here is a summary:

**Step 1: Create Asset Inventory.** A transportation asset is a part of the road or other transportation system that your tribe relies on to move people and goods. In order to begin your asset management implementation effort, you start by getting an understanding of what assets you have. You then decide what assets to include in your budgeting process, and what information is needed about these assets.

### **An Asset is the physical transportation infrastructure.**

For example, roads, bridges, cattle guards, drainage culverts, signs, and other elements of the transportation system.



**Figure 3: Steps in an Asset Management Program**

### **Step 2: Define Asset Management Scope.**

The next step is to determine what you want to do with your asset management program. The scope you develop sets the stage for your tribal government's asset management program.

**Step 3: Prepare Your Organization for Asset Management.** An important part of asset management success is having the people in your organization ready to own the asset management improvements identified in Steps 1 and 2. This includes the tribe's organizational units agreeing on the scope and understanding who is doing what.

**Step 4: Develop the Transportation Asset Management Plan (TAMP).** The TAMP is the blueprint for the tribal government's asset management program. It is a checklist for monitoring accomplishments and coordinating each transportation unit in the tribal government, so that each knows what the other is doing.

**Step 5: Use Tools and Techniques to Implement Asset Management.** There are many tools and techniques available to help implement transportation asset management. They include management systems of asset inventories and methods for making smart decisions on ways to reduce risks. Deciding on which methods and tools are best for tribal government and then applying them is an important step.

## Step 1: Create an Inventory of What You Have – A Transportation Asset Inventory

**What is an asset?** An asset is an individual, separately-managed component of the infrastructure, such as a bridge deck, road section surface, or streetlight.<sup>3</sup>

**What is an asset inventory?** It is a record of the tribal government's transportation assets. Data describing each asset is an important element of the inventory. The following types of data are kept for each of the assets:



- Geographic location
- Age and condition
- Organizational unit in tribal government that manages the asset
- Information about the use of the asset
  - Traffic volume
  - Number of passengers
- Performance characteristics
- Construction history
- Maintenance activities
- Cost
- An electronic database of relevant documents

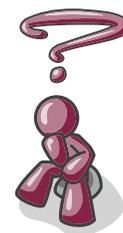
**Each asset type has different information that is important to know.** Make sure that you pick the right characteristics for each asset type.

Pavements and bridges have separate requirements for structural characteristics, geometrics, and functional assessments such as load ratings and clearances. Rolling stock (i.e., trucks, buses, transit vehicles) and equipment may include data such as manufacturer and model, purchase and warranty information, and repair and maintenance history.

**Should I develop a comprehensive asset inventory or just pick the most important assets?** This depends on the resources available to your tribal government. Key factors are the human and budget resources available to create and maintain an asset inventory, and funding available for data collection.

Most asset management programs keep an inventory for pavements and bridges since they are a big part of the transportation budget. Table 1 shows a list of possible assets that can be in a transportation asset management program.

**OK, How Do I Start?** There are many different guides and tools available to tribal governments on how to do asset management. Some of these resources are included in [Appendix A](#). As stated earlier, each asset management program varies depending on the organization, what is most needed, and the tribal government's capacity to manage the asset management program. Consider these steps.



<sup>3</sup> This definition is from the AASHTO *Transportation Asset Management Guide: Volume 2 - A Focus on Implementation*.

**What information should I keep about assets?** Inventories can be used to keep a wide range of data about a tribal government’s assets. An example is shown in Table 1 below. You can manage your data in many different ways. Examples include spreadsheets, electronic databases, and special-purpose management systems. No matter what system is used, the objective is to ensure the recorded data is current and accurate. Further, the data can be viewed by all those who need to see it. Many resources exist on what information can be collected about each asset. A quick source of information for getting specifications on the data to be collected is to find an organization similar to your tribe and get their data collection manual.

<b>Table 1: Example of Asset List</b>	
<b>Asset Type</b>	<b>Data Attribute</b>
<b>Roadway</b>	<ul style="list-style-type: none"> <li>• Road name and/or route number</li> <li>• Location (begin and end milepost)</li> <li>• Descriptions and dimensions including:               <ul style="list-style-type: none"> <li>– ROW width</li> <li>– number of lanes</li> <li>– lane widths</li> <li>– speed limit</li> </ul> </li> <li>• Traffic volumes and loads</li> <li>• Jurisdiction data               <ul style="list-style-type: none"> <li>– ownership</li> <li>– department</li> <li>– political boundary</li> </ul> </li> <li>• Condition (i.e., pavement rating, road bed condition)</li> <li>• Maintenance activities (type and dates)</li> <li>• Pavement type</li> <li>• Construction date and update</li> <li>• Any special classification such as:               <ul style="list-style-type: none"> <li>– tourist route</li> <li>– historical significance</li> <li>– presence of school bus or transit routes</li> </ul> </li> </ul>
<b>Medians, curbs and gutters</b>	<ul style="list-style-type: none"> <li>• Location (longitude, latitude or milepost)</li> <li>• Type</li> <li>• Description and dimensions</li> <li>• Maintenance activities</li> <li>• Condition measure</li> <li>• Cost</li> </ul>
<b>Sidewalks and other roadside features</b>	<ul style="list-style-type: none"> <li>• Location</li> <li>• Description and dimensions</li> <li>• Surface</li> <li>• Maintenance activities</li> <li>• Condition measure</li> <li>• Cost</li> </ul>

**Table 1: Example of Asset List - *Continued***

<b>Asset Type</b>	<b>Data Attribute</b>
<b>Drainage</b>	<ul style="list-style-type: none"><li>• Dimensions, type</li><li>• Location</li><li>• Maintenance activities</li><li>• Condition measure</li><li>• Cost</li></ul>
<b>Traffic facilities</b>	<ul style="list-style-type: none"><li>• Location and type</li><li>• Quantity</li><li>• Maintenance activities</li><li>• Condition measure</li><li>• Cost</li></ul>
<b>Bridges and major culverts</b>	<ul style="list-style-type: none"><li>• Location</li><li>• Elements</li><li>• Condition/performance</li><li>• Dimensions</li><li>• Restrictions</li><li>• Maintenance activities</li><li>• Cost</li></ul>
<b>Street lighting</b>	<ul style="list-style-type: none"><li>• Pole location</li><li>• Material, type, dates, ownership</li><li>• Lamp type location, dates, ownership</li><li>• Bracket type, dates</li><li>• Power supply authority details</li><li>• Electricity lines company interconnection details</li><li>• Maintenance activities</li><li>• Condition measure</li><li>• Cost</li></ul>

***Practice While You Learn!***

As the first step in the asset management pilot, as described on [page 3](#), your job is to inventory all of the transportation facilities within one mile of the tribal school. To get started, you'll need information on:

- What types of facilities to inventory? Since we are concerned with the area surrounding the school, we should probably inventory the roads, sidewalks, bicycle paths, crosswalks, and signage.
- What information do you need to collect for each facility?
- What resources will help you assess the condition of each asset?
- Where will you obtain information about the date of the most recent repair for each facility?

## Step 2: Define Asset Management Scope

Once you complete the transportation asset inventory for your tribal government, you need to decide how you want to better manage your assets - the asset management scope. You can review your asset inventory and decide which assets are most important to the tribal community. These may be the assets you choose to focus on first. Based on the information you collected in Step 1, you can evaluate where you have the most need. In general, the bigger the scope of your asset management program, the more data you will need, the more sophisticated the analytical tools will have to be, and the more expensive and time consuming the program may be to implement.

Clearly defining the scope of the asset management implementation effort will make it easier to add value to your tribal government and complete the actions that create the value. Since asset management can cover so many different aspects of tribal government's work, defining a scope is important.

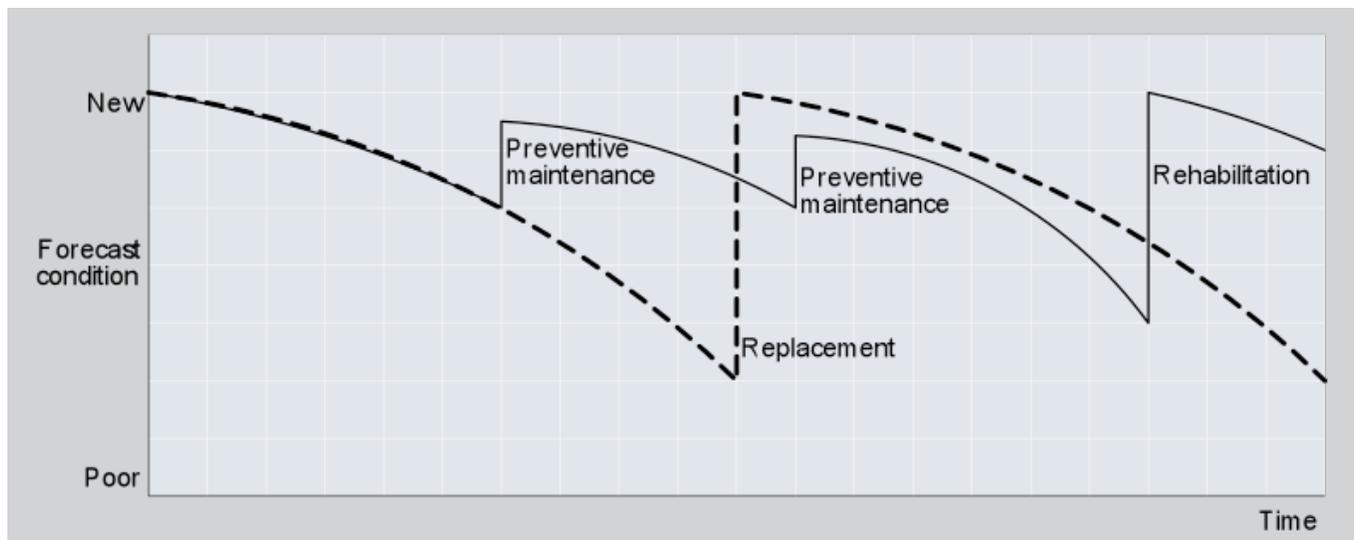
**Asset Management Decisionmaking.** Asset management helps improve decisionmaking about the best actions to take during the life cycle of your transportation assets. For example, is preservation of an asset worthwhile? Is the best decision to do nothing, or should you take an action such as maintain, repair, rehabilitate, or replace an asset?

Asset management helps tribal governments select the most economically efficient set of actions over the life of an asset while maintaining the services that asset delivers. Two different life cycle profiles are illustrated in Figure 4 in relation to condition. In the first profile, condition is allowed to deteriorate to a worse level under the replacement alternative compared to the preventive maintenance alternative. The preventive maintenance alternative features a larger number of actions, but they may add up to a lower life cycle cost when the time value of money is considered.

**Use the knowledge from your asset inventory to define your Asset Management scope.** Find out which assets have the greatest gap between acceptable performance and current performance.

**Asset Management Decisionmaking Is Focused on Improving Your Asset's Performance.** There are many choices of actions to improve your assets. The decisionmaking process that helps to determine the best choice given your situation. The most important wants of your leadership, the amount of money you have available, and how soon you need to show results are factors in your decisionmaking process.

**Figure 4: Preventive Maintenance versus Replacement Approach**



Asset management tools help analyze the cost-effectiveness of preservation and preventive maintenance opportunities and the overall size of these programs. Figure 4 above illustrates how preventive maintenance actions conducted early during an asset’s life cycle is a cost-effective strategy. To fully address this important policy issue it may be necessary for the scope of asset management activities to include smaller, preventive maintenance actions and routine maintenance, even though many of these actions might be funded under maintenance budgets and performed by in-house crews.

Many agencies approach maintenance by addressing the assets that are considered to be in the worst condition first, sometimes called a “worst first” approach. Asset management suggests moving to a decision process that includes preventive maintenance, to help extend the life of transportation assets. Moving from a “worst first” approach to focus on preservation of existing assets may be one of the key asset management decisions your tribal government makes. Depending on the condition of the network, a change to a preservation approach after years of addressing the assets in the worst condition first will result in a temporary drop in conditions and potentially some assets falling below acceptable condition standards. Over the short-term, changing to a preservation strategy may create a larger backlog of needs; however, in the long-term the overall performance of the asset classes should improve.

## ***Practice While You Learn!***

In Step 1 you collected an inventory of the transportation facilities within one mile of the tribal school. With that information, you are now able to make preliminary assumptions for the scope of your asset management program.

- What are the asset management program's goals and purpose? Since the study area, described on [page 3](#), is focused around a school, perhaps a good purpose is to improve safety.
- What are acceptable levels of performance for assets? This will help you compare the performance of individual assets with the standards you set. For example, you may establish performance thresholds that address visibility of crosswalks.
- Which assets have the greatest gap between acceptable performance and current status? In our example above, if the crosswalk is not clearly marked, is dirty, or no longer has a reflective surface, then it is not performing to standards.
- What will be your asset management policies? For example, preventative maintenance of safety assets could be your top priority. The tribe may adopt a policy that prioritizes expenditures for the upkeep of existing crosswalks first, and then applies leftover funds to repair underperforming crosswalks.

### Step 3: Prepare Your Organization for Asset Management.

An important ingredient for good asset management is the involvement of all tribal government units to ensure that they are on-board and moving forward together toward asset management improvements. Getting tribal governments ready to implement asset management involves developing an organizational change strategy, integrating asset management into the tribe's business processes, and establishing asset management roles for staff.

**Change Management is a Critical Part of Asset Management.** Asset management is not an independent activity. It must be aligned with the tribal government's current management strategies and business practices.

Alignment should be considered at every stage of asset management development and implementation to make sure that different functions within tribal government work together. This does not happen by accident. It requires leadership, communication, collaboration, and a constant awareness of the relationship between goals and the ways to achieve them.

Implementing asset management can happen in many different ways, with leadership in different parts of the organization. The ultimate goal is to have all of the pieces aligned, but the road to achieving this is dependent on where your organization is currently, how fast it is realistically able to move forward, and selection of the best implementation path.

Successful organizational change includes the following activities:

- A consensus among tribal leadership of the need for and benefit of change
- Development of a vision of changes and strategy
- Communication of that vision regularly
- Alignment of actions so that they are consistent with the vision
- Involvement of tribal leadership to empower you to make changes consistent with the vision
- Celebration of the change effort with short-term successes

**Asset Management Roles and Responsibilities.** Rather than being a separate unit of an agency, asset management is typically a structure for coordinating a set of important functions among existing organizational units. Therefore, having clear roles and responsibilities defined and understood throughout the tribal government is especially important for successful asset management. One key role needed in asset management implementation is the asset management champion. The champion is responsible for coordinating across governmental units, keeping a focus on implementing an asset management plan, and communicating constantly with all stakeholders. An example job description for this role is in Figure 5.

**Involve Multiple Business Units.** Getting all government units that are involved in the management of an asset helps build consensus on what is most important to do.

**Proactively managing change is a key ingredient to successful asset management.**

**Figure 5. Example Asset Management Champion Job Description**

### **Knowledge and experience**

- 10+ years of technical experience in a transportation setting
- Managing and leading teams
- Knowledge about infrastructure assets

### **Skills**

- Strong communication skills – ability to facilitate, speak in front of an audience, and influence others
- Able to present strategic concepts and complex written material in simple easy to understand language
- Understands politics and relates well to stakeholders and staff at all levels within the agency
- Effective planning and project management skills
- Understands economics and financial planning

### **Qualifications and training**

- Engineering with a focus on highway
- Economics
- Business management

Asset management is a team effort that needs many different skills and capabilities. Creating new roles and managing the development of asset management is an important task. It requires thinking about individual, team and tribe expectations. The responsibilities of key players may change during different stages of asset management implementation. As with any change, there may be times when differing viewpoints must be reconciled as your tribal government moves forward along the asset management implementation path.

### ***Practice While You Learn!***

In Steps 1 and 2, you developed an inventory of assets, established performance measures, and set policies for your asset management program. Now it is time to make procedural changes to your organization that will help you put the asset inventory to use. Important questions at this point include:

- Who will champion the improvements identified by the process?
- Will you be able to take on this task, or is additional staff needed?
- Which business units, departments, or offices within tribal government have a role in this asset management project?
- Who will be responsible for measuring the performance of assets?

## Step 4: Develop the Transportation Asset Management Plan

The Transportation Asset Management Plan (TAMP) is a central component of the asset management program. It is a blueprint that outlines your management strategies, how much money is needed for implementation, and the business management processes to support the program. TAMP is the management tool that brings together these processes with stakeholders to achieve common goals and strategies. It is also the action plan for implementing the scop you prepared in Step 2.

The TAMP formalizes and documents key information including:

- What you are trying to achieve with your asset management program
- The services that your organization’s assets deliver now and in the future, and why they are delivered
- The condition and performance of your assets
- The planned improvement actions
- How you are planning to manage your assets cost-effectively throughout their life cycles

The TAMP can be thought of as a “business plan” for the tribal government. The TAMP may be a single comprehensive document or a library of smaller documents. It can also serve as a communications tool.

Organizations can and do develop asset management capabilities without a written plan; but having a plan helps to speed up the process and reduces some of the communication problems that come with organizational change. The written plan is a clear sign that tribal leadership supports the change and is committed to seeing it through.

A successful asset management plan will be owned by the tribal government, not by a particular department or group within government. It should tell the story of the services the agency is responsible for delivering, and how it will utilize and manage the assets it has under its control for that purpose.

The TAMP is a living document which needs to be reviewed and updated regularly. Many organizations do this on an annual basis, as an input to the annual budget process. The asset management review period should not go beyond three years since it will lose relevance if it is not updated. Table 2 shows an example outline and contents for a TAMP.

**The TAMP is the roadmap for your asset management program.** It becomes the document that helps you build consensus and communicate what you are doing.

**Table 2: Transportation Asset Management Plan (TAMP) Content Example**

<b>Section Name</b>	<b>Description of Contents</b>
Executive Summary	<ul style="list-style-type: none"> <li>• A stand-alone high-level overview of the plan, used to communicate the content to stakeholders.</li> </ul>
Introduction	<ul style="list-style-type: none"> <li>• Sets the scene, provides a description of tribal government’s mission and goals, its role and the roles of other parties, and the purpose of the plan.</li> </ul>
Performance Measures	<ul style="list-style-type: none"> <li>• Tribal government’s mission is broken out into key objectives, transportation services and performance measures.</li> <li>• Identifies any Federal or tribal laws and regulations that impose mandates or constraints on performance or the implementation of asset management. May present strategies to overcome regulatory barriers.</li> <li>• May also identify needs to close identified performance gaps.</li> <li>• Identifies laws and regulations for performance measure criteria to guide the analysis for each asset type.</li> </ul>
Growth and Demand	<ul style="list-style-type: none"> <li>• Identifies what drives or influences change on the transportation network. Assesses how future growth and demand for transportation services will impact the demand for new or better assets and asset maintenance in the future.</li> <li>• Also describes tribal government’s current and desired capabilities to measure demand and growth as they affect asset management.</li> </ul>
Asset Inventory and Performance	<ul style="list-style-type: none"> <li>• Information about assets, including condition and performance summaries, asset life cycles, and identifies critical assets.</li> <li>• Life cycle strategies and management methods for all activities relating to the assets</li> <li>• An overview of current and desired capabilities in pavement and bridge management, and other asset management systems for life cycle management.</li> </ul>
Financial Plan	<ul style="list-style-type: none"> <li>• Brings together all needs identified in the TAMP into medium and longer term financial cash-flow forecasts – to support the more detailed annual budget process.</li> <li>• An overview of funding sources, constraints on the use of funding, long term funding needs and other aspects of the budgeting and funding processes that impact asset management.</li> </ul>

**Table 2: Transportation Asset Management Plan Content Example - *Continued***

<b>Section Name</b>	<b>Description of Contents</b>
Transportation Asset Management Practices	<ul style="list-style-type: none"><li>• Describes current tribal government processes supporting asset management decisionmaking, and reports current status of asset management practices.</li><li>• Describes the information systems and tools used to support asset management.</li><li>• Describes data needs and quality expectations.</li></ul>
Improvement/Maintenance Plan	<ul style="list-style-type: none"><li>• A work plan for improvements and/or maintenance activities, in order to move from the current state to the desired state in the agreed time frame. Includes a description of risk factors and anticipated problems.</li></ul>
Appendices	<ul style="list-style-type: none"><li>• Tables and documentation in support of the preceding sections.</li></ul>

***Practice While You Learn!***

If your pilot project were successful, you might consider bringing the results into a TAMP for all of your tribal lands. If you decide to proceed with a TAMP, some important questions are:

- Where can you obtain information for chapters of the TAMP? Even though the breadth of the TAMP can be daunting, you actually may have much of the information already collected. In Step 2 you established performance measures and policies related to asset management. These can probably be expanded and altered slightly to accommodate issues for the entire reservation. You should be able to obtain financial information from your tribe’s Long-Range Transportation Plan and current transportation improvement program (TIP).
- What actions will you take to make improvements? The pilot project may help direct you toward appropriate actions for the whole reservation.
- What management strategies will you use to maintain your assets in desired condition? The management strategies in the pilot could be revisited and reused for the TAMP.

## Step 5: Use Tools and Techniques to Implement Asset Management.

As stated at the beginning of this chapter, good asset management practice depends on having reliable knowledge of what assets are owned, how they are performing, what is being done to them, and how your organization's actions are likely to affect performance. This knowledge involves routine collection of good data, and turning that data into useful information to help you make decisions.

Many tools and techniques exist to support your asset management program. The list of resources in [Appendix A](#) provides you with more detail about these tools and techniques. Below is a discussion of the following tools and techniques: Risk Management, Life Cycle Management, Maintenance Planning, Program Delivery, Asset Management Systems, and Data Collection and Management.

**Risk Management.** Risk management is an important part of asset management. Risk is the threat to transportation operations caused by extreme events, other external hazards or from asset failure arising from any cause. Some examples of causes of asset failure are poor condition, unexpected loading, or poor work practices. Applying risk management to look at decisions being made about your transportation program makes it possible to identify threats and opportunities, assess and prioritize those threats and opportunities, and determine strategies so that decisions can be made on how to deal with potential risks.

**Managing risks can be a good tool in your asset management decision process.** What threats are you mitigating with your decisions?

A risk is a future event that may or may not occur. It may have a detrimental or beneficial impact on the tribal transportation system. Risk management is the systematic identification, assessment, planning, and management of threats and opportunities faced by your system. Steps taken to manage risk include 1) gathering information about future events, threats, and opportunities; 2) identifying what and how those future events trigger threats and opportunities; 3) assessing the likelihood and impact of risks; 4) prioritizing risks by their expected value and by their relative importance to your transportation system; 5) determining ways to deal with the risk; 6) carrying out risk management strategies, monitoring the implementation of strategies, and reevaluating risks.

**Life Cycle Management.** A large and important part of your asset management work is your response to deterioration caused by traffic, weather, time, and environmental factors. A tribal government's response to deterioration is typically called preservation. Life cycle management allows you to determine the best actions for your assets at its various stages of its life cycle. The stages of an asset's life cycle are:

- **New construction** (asset creation), which includes justification, scoping, design, and construction or acquisition of assets.
- **Preservation**, which involves actions to slow down or correct the deterioration of an asset to extend its useful life. It does not entail structural or operational improvement of an existing asset beyond its originally designed strength or capacity. Preservation may include repairs, corrective actions, reactive maintenance, routine maintenance, periodic maintenance, and preventive maintenance, during which time the asset is used and maintained in working condition.

**An asset has a life cycle from construction/implementation to disposition.** Managing its health is a key part of good asset management.

- **Operations**, which involves activities to improve the efficiency and safety of traffic movement on the existing transportation system. This includes tasks such as incident response and traveler information.
- **Replacement**, which involves the reconstruction, or partial or complete replacement of an asset. Replacement typically restores an existing asset's level of service, capacity, or strength to original levels, or near to them, and sometimes involves replacement of the asset in a different location or configuration.
- **Functional improvement**, undertaken when improvements beyond the original level of service, capacity, or strength of the asset are needed. This will often occur as part of an asset replacement project. An example would be the replacement of an old, under-capacity bridge with a new structure with greater capacity and strength.
- **Disposal** is the final stage in an asset's life. The nature of infrastructure assets is that many will never be disposed of, that the levels of service they provide will be maintained indefinitely as the existing structure is continually rehabilitated, or is replaced when needed by new assets. However, some will eventually become unnecessary through road realignment or other changes and will then be disposed of.

**Maintenance Planning.** Being smart about how and when you maintain your assets can give you better performance at a lower cost. Maintenance activities can typically be organized under planned, reactive, and routine maintenance. Planned maintenance is

when a maintenance action is applied while the asset is still in good condition, extending the asset life by preventing faster deterioration. Planned maintenance effectiveness can be enhanced by the development of a maintenance management plan—a formal, detailed plan that describes the maintenance activities, schedules, objectives, and resources needed for the maintenance of the tribal transportation system.

**Proactive maintenance planning gets much better results than reactive maintenance.**

**Preventive maintenance** is intended to preserve a tribal transportation asset. It is performed before an item either fails or reaches the point where an unacceptable level of performance has occurred. An example of preventive maintenance is crack filling sealed pavement surfaces. This is aimed at preventing the entry of water and the consequent weakening and increased deterioration of the pavement structure.

**Reactive or unplanned maintenance** includes emergency repair, routine maintenance, and corrective action. These include actions such as emergency or other unscheduled maintenance or repairs that arise as a response to observed defects or performance problems (e.g., small bridge deck repairs, traffic signal repairs, incident response). Routine maintenance involves un-programmed non-urgent maintenance activity done by crews that are scheduled on a daily, weekly, or monthly basis.

**Good maintenance planning** involves ensuring that resources are allocated to planned maintenance activities while conducting reactive and routine maintenance.

**Program Delivery.** Program delivery is the process a tribal government takes to implement and deliver its plans and programs. It is the period where the resources that have been allocated are utilized. Key aspects of asset management during the program delivery phase are:

- Selecting a delivery method that yields the best results in terms of cost savings, output, and outcome
- Maximizing efficiency during delivery so that cost is minimized

- Maintaining flexibility to adjust delivery mechanisms if the chosen path is not yielding the desired results
- Minimizing the negative impacts to customers and stakeholders during delivery
- Monitoring to ensure that the goals and objectives driving the resource allocation decisions are being met

**Asset Management Systems.** An asset management system is a collection of hardware, software, data, and processes that support asset management business processes. A management system is used to collect, process, store, and analyze information about assets; to develop sound maintenance and rehabilitation strategies; and to schedule, track, and manage work. A management system typically includes:

**A management system is used to collect, process, store, and analyze information about assets.**

- Technical information about asset characteristics, condition, and performance;
- Financial information concerning current asset value and the level of resources needed to maintain and improve assets to meet established goals and service standards;
- Planning information about recommended or scheduled work on assets; and
- Historical information about work accomplished and investments made.

Systems can be as simple as spreadsheets that list assets and their condition ratings to more complex, graphical systems with data maintenance, simulation, optimization, and reporting capabilities. Systems for major assets with long life cycles, such as pavements and bridges, merit greater levels of sophistication because they support decisions about significant capital investments. Systems for lower value, shorter life cycle assets, such as pavement markings, guardrail, or signs, can be simpler and more focused on maintenance planning and management. The typical components of an asset management system are listed in Figure 6.

## Figure 6. Typical Components of an Asset Management System

**Asset inventory**—Database that identifies individual assets and their elements, with physical, operational, and administrative characteristics required for developing maintenance and rehabilitation strategies and budgets. Links to maps, photographs, video imagery, or construction plans, or combination thereof, may be included.

**Asset condition, performance, and utilization tracking**—Current and historical assessments of physical condition and operational performance. Asset management systems may store both raw observations and multiple levels of aggregated or summarized information.

**Asset condition and performance prediction**—Capability to predict future asset condition based on deterministic or stochastic models. Some systems include functions to develop deterioration or performance models utilizing historical data, expert opinion, or a combination of the two.

**Treatment selection**—Identification of maintenance, rehabilitation, and replacement treatments that are recommended to be applied to the asset at different points in its remaining life cycle based on maintenance cycles, asset age, or different levels of condition or performance, or combination thereof. Treatment information typically includes (1) rules for when the treatment can or should be applied, (2) unit costs—which may vary by asset characteristics and condition levels, and (3) effect on asset condition or performance when a treatment is applied.

**Resource allocation**—Analysis capabilities that estimate the current needs backlog, the budget required to meet a given performance level, the performance that can be achieved for a given budget level, or the “optimal” level of performance that minimizes long-term costs. Some systems address trade-offs across program categories or alternative packages of projects.

**Work planning and tracking support**—Automated or partially automated generation of work programs, creation of contract documents, creation of work orders, tracking of completed work, and work histories.

**Data Collection and Management.** A good asset management program is supported by data and information that helps decisionmaking at tactical, operational, and strategic levels. Having good data that is used for decisionmaking is challenging. It requires the collection of the right data, making sure the data is accurate, storing the data so that it is easy to access, turning the data into a format that is easy to use by decision-makers, and having decision-makers use the data to make good decisions. Keeping the data current and useful is called data management. Good data management practices include understanding the business framework for why you need the data, data standards that allow your organization to connect different data sets, and a data governance structure that clarifies who is responsible for what aspect of data management.

### ***Practice While You Learn!***

Could any of the tools described in this module be applicable to pilot project, which was first discussed on [page 3](#)?

- Risk Management
- Lifecycle Management
- Maintenance Planning
- Program Delivery
- Asset Management Systems
- Data Collection and Management

### III. ASSET MANAGEMENT TOOLBOX

**Y**ou now have a tool box of techniques and strategies that you have applied in this training session. These are summarized here.



#### **Asset Management Definition**

Understanding what asset management is and how it can help you is a critical tool in building your asset management program. It allows you to communicate clearly and develop a common understanding of what you are collectively trying to achieve.

#### **Creating an Asset Inventory**

A foundational element of your asset management program is the asset inventory. Determining what assets and their characteristics you are going to collect and maintain will be a big step forward in having a good asset management program.

#### **Asset Management Scope**

Clearly defining what you are trying to do with your asset management program is key to your success. An asset management program can fail if there are too many program parts or features without a clear understanding of what is to be achieved.

#### **Transportation Asset Management Plan (TAMP) Outline**

Developing a good TAMP provides a helpful blueprint on what you need to do and how to do it. It will help you make clear to all who are involved what they are responsible for doing and how it comes together for better asset management.

#### **Asset Management Systems**

An asset management system helps you determine what is needed to improve your asset's performance and helps you manage the improvement process.

## IV. CHECKLIST

The asset management list should be updated annually. Use the checklist below for reviewing and/or renewing your asset management plan and activities.



### ASSET MANAGEMENT CHECKLIST

		Date Done
<b>Step 1: Create an Inventory of What You Have</b>		
✓	Decide what assets to inventory	
✓	Decide what information you want to collect on your assets	
✓	Gather information to create your asset inventory	
<b>Step 2: Define Asset Management Scope</b>		
✓	Determine what decisions you want to influence with better asset management	
✓	Decide what assets are the most important to your tribal government.	
✓	Produce a list of what you want accomplished with your asset management program	
<b>Step 3: Prepare Your Organization for Asset Management</b>		
✓	Develop a list of asset management roles and responsibilities	
✓	Determine the individuals, teams, and organizational units that need to be involved in implementing the asset management scope	
✓	Think through the change management needed to implement the asset management scope and achieve the best results.	
✓	Identify an asset management champion	
<b>Step 4: Develop the Transportation Asset Management Plan (TAMP)</b>		
✓	Document what you are trying to achieve with your asset management program	
✓	Determine the performance measures that you are going to use to make decisions about what you will do with the assets and if you have been successful with the decisions	



## ASSET MANAGEMENT CHECKLIST - *Continued*

		Date Done
✓	Document the baseline information you have about your assets so that you can measure the improvements you make in the future	
✓	Decide on the actions you will take to make improvements	
✓	Describe management strategies for maintaining tribal assets in the desired condition	
✓	Describe the funds you have and are seeking for managing your assets	
<b>Step 5: Use Tools and Techniques to Implement Asset Management</b>		
✓	Inventory what tools exist within your tribal government for asset management	
✓	Determine what areas in your TAMP need support to implement asset management	
✓	Decide how you are going to manage and use the data you will be collecting on your assets – do you need an asset management system?	
✓	Evaluate the tools and techniques that are available from FHWA for asset management	
✓	Apply the tools and techniques to get the results you are seeking	

You have successfully completed the **Asset Management** training module!

## V. FROM INDIAN COUNTRY

### Navajo Nation

The Navajo Nation is a federally recognized tribe that extends into the States of Utah, Arizona, and New Mexico. The Navajo Nation Division of Transportation (DOT) is developing a transportation asset management program. Darlene Jenkins, Geographic Information Systems (GIS) Analyst and Asset Management, is leading this process for Navajo DOT.

**Transportation Asset Management.** The Navajo asset management program began in 2011 with the development of an asset management plan and an asset inventory. The plan and inventory are being prepared directly by Navajo DOT professionals, not relying on consultants. Work began first on the asset management plan and a year later, is nearly complete.

**Developing the inventory.** Because the Navajo Nation is so large, Ms. Jenkins and her colleagues decided to start the asset management inventory with a pilot project. Work on the pilot inventory began while the asset management plan was still in development. Through the inventory pilot project, Ms. Jenkins is able to strategize and determine how long it will take to collect data for the whole Nation, work out any issues with the technology, and find out what additional equipment and data storage capacity she will need. The Navajo Nation is organized into five Agencies with 110 Chapter communities. The Crystal Chapter was selected for the pilot asset inventory data collection project.

Navajo DOT is developing the inventory of transportation assets using geospatial technologies and digital cameras. Ms. Jenkins is collecting data for four types of asset infrastructure: bridges, culverts, cattle guards, and signs. For each asset type, Ms. Jenkins is collecting several attributes, such as basic information on location, route number reservation code, agency number and infrastructure specifications such as those in Table 3.



**Table 3: Navajo Asset List**

Asset Type	Data Attributes
Bridges	<ul style="list-style-type: none"> <li>• Number</li> <li>• Condition</li> <li>• Material</li> <li>• Notes</li> <li>• Comments</li> </ul>
Culverts	<ul style="list-style-type: none"> <li>• Type</li> <li>• Obstructed</li> <li>• Length</li> <li>• Notes</li> <li>• Comments</li> </ul>
Cattle Guards	<ul style="list-style-type: none"> <li>• Material</li> <li>• Conditions</li> <li>• Notes</li> <li>• Comments</li> </ul>
Signs	<ul style="list-style-type: none"> <li>• Sign description</li> <li>• Direction facing</li> <li>• Condition</li> <li>• Type of post</li> <li>• Speed limit</li> <li>• Number of supports</li> <li>• Support type</li> <li>• Notes</li> <li>• Comments (e.g. graffiti, bullet holes)</li> </ul>

The data is collected in the field using global positioning satellite (GPS) units to map the location of the assets. Several photos are taken of each asset to document current conditions (see Figure 7). Ms. Jenkins has found it wise to bring along extra cameras in case of breakdowns. Back in the office, this information is being managed using a GIS program. Through the BIA, the tribe was able to get free access to a license for the ArcGIS suite of products. Their GPS unit uses ArcPad and data is downloaded into ArcGIS 10 using Shapefile format for each infrastructure. Additionally, photographs are linked to each feature in the database.

Roads within the Navajo Nation are owned and maintained by a range of agencies, including the BIA, Navajo Nation, counties, and states. For the asset inventory, Navajo DOT has decided to focus on roads only administered by the BIA and Navajo DOT. The asset management inventory is not collecting any data on county, State and Federal highways, because the States and counties are responsible for those and have their own asset management programs. The BIA roadways are primarily paved roads, while the Navajo roadways are mostly earth or gravel roads.

Ms. Jenkins and a trainee spent 23 days in the field from June 29th through September 2nd, 2011 to collect data for the Crystal Chapter inventory. They planned to collect asset information on all 99 miles of the 29 routes in the chapter, but were only able to collect data for 80 miles due to road closures (barriers, no trespassing sign, gated, etc.). The shortest route was just over a tenth of a mile and the longest route was 13.2 miles.

Before each trip to collect data, Ms. Jenkins put out a public notice for nearby communities to let community members know that she would be out collecting data and what types of information she would be gathering. After the data collection was complete in an area, Ms. Jenkins presented the information back to the community. A total of 372 assets were inventoried in the Crystal Chapter area: 135 signs, 207 culverts, 25 cattle guards and 5 bridges. She is sharing the data with the Crystal Chapter local government so they can use it in their local transportation planning.

**Figure 7. Photos Inventorying Current Conditions in the Crystal Chapter Pilot Asset Inventory**



**Clockwise from top left: culvert, bridge, sign, cattle guard**



**Roadway mapping project.** The asset management work is connected to an ongoing effort at Navajo DOT to improve its road inventory database. Since 2006, the Navajo DOT and its consultant have been working to create a digital map of all the public roadways in the Nation. The information from this project has allowed the tribe to add more roadways to the Indian Reservation Roads (IRR) inventory. Where the tribe had previously had mostly State or Federal roads and BIA roads in their inventory, they now have many Navajo roads listed as well. The roadway mapping project supports the asset management work by providing the basic data about roadway location. The asset management project adds additional information about the location and condition of assets along those roads.

**Next steps.** Ms. Jenkins plans to have the asset inventory for all 110 Chapters complete by the end of 2013. Besides some Navajo DOT staff assistance, she is looking into hiring college students over the summer to assist with the data collection. Based on the Crystal Chapter pilot, Ms. Jenkins is hoping to be able to pursue grant funding that would allow her to build up the asset management program.

**“There’s a lot of great potential for growth” through the asset management program.**

*-Darlene Jenkins, Navajo Nation DOT*

Once the inventory is complete, other professionals at Navajo DOT can help to estimate maintenance and life cycle costs for the assets. The transportation asset management plan and inventory will help Navajo DOT to optimize decisionmaking, project evaluation and prioritization; set better goals; and integrate budgets for the division. They can also be used to implement a work order system for the maintenance crews. Moving forward, the hope is to build up the tribe’s asset management program by expanding the types of infrastructure inventoried and tracked and improving the data collection, such as through the use of more advanced technologies.

Ms. Jenkins has been using the Crystal Chapter pilot project to help build support within the Navajo DOT for asset management. For example, she has discussed her equipment and staffing needs with her managers. She is also now working with other departments of the DOT to support their asset management efforts. She is currently training staff with the Navajo DOT’s Department of Roads (who maintain the Nation’s roads) and the Department of Aviation in asset management inventory techniques, who are very interested in using the data for their planning purposes.

## Mashantucket Pequot Tribal Nation

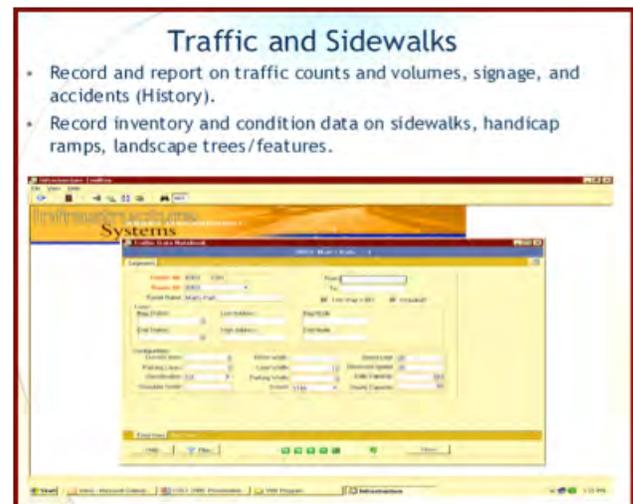
The Mashantucket Pequot Tribe in Connecticut maintains asset management system software to assist with transportation asset management.<sup>4</sup>

Through interactive data screens and management modules, the asset management system tracks traffic volumes, equipment, services, and labor functions. It also tracks mowing, litter removal, snowplowing, landscaping and roadway maintenance and construction schedules. The life cycles of the Tribe's equipment and vehicles are also tracked and calibrated to ensure they are replaced or maintained when required. The asset management system enables visual maps showing the location of roadway, culvert and drainage systems. Its records are centralized within the Public Works Department and transmitted electronically to other tribal departments for seamless information sharing. There is routine and mandatory staff training on the software to ensure proper use.



### Results:

- Successful application of an asset management system.
- Efficient tracking, monitoring and mapping of tribal public works assets.
- Improved program management and information sharing.



<sup>4</sup> *Infrastructure 2000* is the software that the Mashantucket Pequot Tribal Nation uses for their asset management system. It is no longer available for purchase. The reader may contact the Tribe directly for more information.

## APPENDICES

Appendix A  
For Further Reading

Appendix B  
Asset Management Quiz

### For Further Reading

- AASHTO, Transportation Asset Management Guide, Volume1. American Association of State Highway and Transportation Officials, 2002. <http://downloads.transportation.org/AMGuide.pdf>
- AASHTO, Transportation Asset Management Guide, Volume 2 – A Focus on Implementation. American Association of State Highway and Transportation Officials, 2011. A summary is available at <http://www.fhwa.dot.gov/asset/hif10023.cfm>
- FHWA, Asset Management Overview (includes a glossary). [http://www.fhwa.dot.gov/asset/if08008/amo\\_09.cfm](http://www.fhwa.dot.gov/asset/if08008/amo_09.cfm)
- FHWA, Asset Management and Management of Highway Performance (Peer Exchange). <http://www.fhwa.dot.gov/asset/hif10006/index.cfm>
- FHWA, Asset Management Primer. <http://www.fhwa.dot.gov/infrastructure/asstmgmt/amprimer.pdf>
- IIMM, International Asset Management Manual—v3.0. Thames, NZ: INGENIUM (Association of Local Government Engineering, NZ), Institute of Public Works Australia, Institution of Municipal Engineering Southern Africa, Institute of Asset Management U.K., 2006.
- FHWA Glossary of Terms Planning. [http://www.fhwa.dot.gov/planning/glossary/glossary\\_listing.cfm](http://www.fhwa.dot.gov/planning/glossary/glossary_listing.cfm)
- FHWA Glossary of Terms Tribal. [http://www.tribalplanning.fhwa.dot.gov/reference\\_glossary.aspx](http://www.tribalplanning.fhwa.dot.gov/reference_glossary.aspx)

## APPENDIX B

### Asset Management Quiz

1. Transportation asset management is a \_\_\_\_\_ that helps you make the best decisions for your assets.
  - a. Planning tool
  - b. Software application
  - c. Process
  - d. Math formula
  - e. All of the above
2. Which of the following stakeholders are involved in asset management?
  - a. Tribal governing body
  - b. Tribal managers and planners
  - c. State DOT managers and planners
  - d. The public
  - e. All of the above
3. Which of the following tools are at the core of an asset management program?
  - a. Project management
  - b. Travelers information
  - c. Pavement management
  - d. Financial management
  - e. Communications
4. Asset condition performance measures help you to determine \_\_\_\_\_.
  - a. If your project is on schedule
  - b. How much money has been spent
  - c. If there are safety issues
  - d. How well the asset is performing
  - e. None of the above
5. There is only one way to implement a tribal asset management program.  
True or False?

#### Answers:

Question 1: C / Question 2: E / Question 3: C / Question 4: D / Question 5: False



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