Enterprise Infrastructure Asset Management (EIAMS)
MDC’s Design and Development Division
Putting conservation on the ground and connecting people with nature.
MDC’s infrastructure assets estimated replacement value is approximately $1.6 billion.

The objective of infrastructure asset management is to meet a required level of service, in the most cost effective manner, through the management of assets for present and future customers.

MDC does not have all the information that its decision makers need to effectively allocate construction and maintenance dollars and time between competing infrastructure needs at its many areas.

The department needs better information to balance infrastructure and operational expenditures.

Regulatory and audit requirements (GASB34)
## EIAMS Five Year Implementation Plan

<table>
<thead>
<tr>
<th>Task</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
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<td>Q3</td>
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<td>BMP Implementation</td>
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</tr>
</tbody>
</table>

**09/04/2013**

*Note: The software implementation plan is dependent on software vendor selection and the vendor’s implementation schedule.*
FY2013:

- Completed request for proposal (RFP)
- Established draft asset management policy, and recommended guidelines
- Began Implementation of software independent best management practices (BMPs)
- Evaluated asset management / computerized maintenance management system (AM/CMMS)
  RFP vendor responses
Best Management Practices (BMPs) Resource Types by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Both</th>
<th>MDC</th>
<th>Consultant</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>FY2016</td>
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<td>22</td>
<td>1</td>
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<tr>
<td>FY2017</td>
<td>1</td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>
EIAMS Implementation Plan

FY2014:
- Select and implement AM/CMMS solution
- Complete implementation of software independent BMPs
- Begin implementation of software dependent BMPs
- Establish business processes and procedures for data collection and inventory, condition assessment, maintenance requirements, frequencies, and work assignment
- Begin infrastructure asset data collection, validation and condition assessments
EIAMS Implementation Plan

FY2015:
- Full Implementation of AM/CMMS Solution
- Complete implementation of software dependent BMPs
- Develop condition assessment and maintenance programs
- Draft the initial reporting procedures
EIAMS Implementation Plan

FY2016:
- Continue asset data collection, validation and condition assessments
- Implement BMPs dependent on system data availability
- Draft and initiate procedures for reporting and forecasting
FY2017: (and beyond!)
- Continue asset data collection, validation and condition assessments
- Implement advanced reporting, forecasting and modeling procedures
- Complete BMPs related to full development of asset management program
150 BMPs in 15 Categories

- Administrative Business Process
- Planning
- Design
- Construction Asset Acquisition
- Construction
- Decommissioning
- Maintenance Organization
- Maintenance Management Administration
- CMMS Administration
- Maintenance Management
- Infrastructure Maintenance and Repair
- Operating Budget
- Capital Budgeting
- Reporting Requirements
- Business Practices / CAD
Infrastructure Maintenance and Repair

58. The condition of specific infrastructure assets are periodically inspected with at least once every 3 years (GASB) condition assessments.

Condition assessments should be utilized to make “eyes on the ground” adjustments to estimated remaining useful life of major components.
BMP – 58 Condition Assessment

- D&D – Management & Area/Site/Facility Managers
- Phase in as assets added to system.
- Matrix derived criteria from various facility maintenance resources, recommended managerial practices, and prior experience with other clients.
Resource Allocation and Actual Hours Worked

Number of Hours

Fiscal Year

Actual Hours Worked

Resource Allocations

FY2012 FY2013 FY2014

6/30/2013
Theory behind Performance Curves

![Graph showing the relationship between Condition Index and Age](image)

- Condition Index decreases as Age increases.
Treatment Bands
(Could be most severe distress)

- Do Nothing
- Routine Maintenance
- Preventative Maintenance
- Structural Rehabilitation
Treatment Band Cost Range

- Do Nothing: $1-$4 Sq Yd
- Routine Maintenance: $12 Sq Yd
- Preventative Maintenance
- Structural Rehabilitation: $72 Sq Yd
Reduce Life Cycle Costs

Condition Index vs. Age

- Do Nothing
- Routine Maintenance
- Preventative Maintenance
- Structural Rehabilitation

Costs:
- $12 Sq Yd (Surface Seal)
- $1-$4 Sq Yd
- $12 Sq Yd
- $72 Sq Yd
Creating a Performance Curves

![Graph showing condition index vs age](image-url)
Creating a Performance Curve
Creating a Performance Curve

Generating a curve from median condition based on age
WEST DES MOINES PAVEMENT MANAGEMENT SYSTEM

How Proactive Maintenance Extends Pavement Life

Very Good

$1.00 For Preventative Maintenance Here
(Crack Sealing & Timely Patching)

40% Drop in Quality

75% of Life

Good

Or $2.00 or $3.00 For Rehabilitation Here
(Overlay & Patching)

Average

40% Drop in Quality

Below Average

12% of Life

Below Average

Poor

Extended Pavement Life Due to Maintenance

Failed

Time in Years (Pavement Life)

* Based on a graph from U.S. Army Corp of Engineers

01/24/2012 CIP Budget Handout
WEST DES MOINES PAVEMENT MANAGEMENT SYSTEM
Determining Future Work with Pavement Curves

West Des Moines PCC Pavement and HMA/PCC Performance Curves
(Based on Typical Street Conditions)
(Typically PCC Streets Can be Overlayad 2 or 3 times Before Reconstruction)
WEST DES MOINES PAVEMENT MANAGEMENT SYSTEM

Future OCI By Different Budget Scenarios

The City's Projected Street Network Condition Per Year
(By Different Rehab Budget Scenarios)

- Actual
- Projected

- Very Good
- Good
- Average
- Below Average

Past Rehab Budget:
Recommended rehab budget to meet target condition. Accounts for inflation, street growth, annexing county roads, and development.

Future Current, 2 Mil, 1 Mil, & Zero funding scenarios. These are all less than the recommended needed long-term projected rehab funding. These scenarios do not account for inflation and street network growth.
## 1.1 Team Assignments

The following individuals will participate as EIAMS team members. Each member’s time commitment to this project is indicated as a percentage of time available over the duration of the project (4/16/13 – 12/31/13). Shaded resources are in the process of being verified.

<table>
<thead>
<tr>
<th>ROLE</th>
<th>ASSIGNED</th>
<th>% AVAILABLE</th>
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<tbody>
<tr>
<td>Sponsor</td>
<td>Jacob Careaga</td>
<td>25%</td>
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<tr>
<td>Steering Committee – Design and Development</td>
<td>Alicia Weaver</td>
<td>40%</td>
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<tr>
<td>Lead Subject Matter Expert (SME) – Executive</td>
<td>Carter Campbell</td>
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<tr>
<td>Lead SME – Technical</td>
<td>Josh Jacobm</td>
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<td>Jeff Lutfenh</td>
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<tr>
<td>Dedicated Operational SME – Data Collection and inventory</td>
<td>Don Arnold</td>
<td>50%</td>
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<td>Dedicated Operational SME – Condition Assessment</td>
<td>Kenny Poore</td>
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<tr>
<td>Dedicated Operational SME – Maintenance</td>
<td>John Hinkle</td>
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<td>Roles and Frequencies</td>
<td>Eric McMillan</td>
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<td>Ralph Adams</td>
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<td></td>
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<td>Nathan Woodland</td>
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<td>Randy Doman</td>
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<td>Amy Buhchler</td>
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<td>Craig Scroggins</td>
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<td></td>
<td>Cheryl Schroeder</td>
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<td></td>
<td>Ricky Nix</td>
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<td></td>
<td>Lisa Lucas</td>
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<tr>
<td></td>
<td>Kirk Keller 4/16-5/3</td>
<td>100%</td>
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<tr>
<td></td>
<td>Joe Martin 5/3-12/31</td>
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<td></td>
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<td></td>
<td>Todd Hart</td>
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<td></td>
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<td>TBD</td>
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</tbody>
</table>
EIAM DCI Team Accomplishments

- Deliverables 4/16/13 – 8/30/13
- Document Existing Data Sources
- Establish Asset Hierarchy (Network / System / Subsystem)
- Document Key Data Attributes for Asset Types
- Develop Documents to Support Future Data Processes
  - Checklists
  - Worksheets
  - Requirements for Interim Data Storage Location
- Establish Data Collection and Inventory Guide Template with Descriptions
- Establish Draft Data Collection and Inventory Guide (DCI)
- Establish Collection Plan Framework (Template)
- Establish Collection Plan for Runge Nature Center
- Establish Pre-Pilot Training and Test Plan for Runge Nature Center
- Perform Pre-Pilot Training for Runge Nature Center Test Plan – In Progress
EIAM CA Team Accomplishments

- Deliverables 4/16/13 – 8/30/13
- Establish Condition Assessment Ratings by Asset Type
- Establish Group 1 – Condition Assessment Simple Ratings
- Establish Group 2 – Condition Assessment Detailed Ratings (Asset Specific)
- Establish Group 3 – Condition Assessment Specialized Ratings
- Establish Condition Assessment Procedure Template with Description
- Establish Condition Assessment Training Procedure Guide
- Update Condition Assessment Training Procedure Guide – In Progress
- Perform Runge Pre-Pilot Test – In Progress
EIAM Maint. Team Accomplishments

- Deliverables 4/16/13 – 8/30/13
- Establish guidance document for roles and responsibilities
- Establish Maintenance Task Roles
- Establish Maintenance Task Frequencies
- Establish Maintenance Task Roles / Frequencies for Assets in Hierarchy – In Progress
EIAM File MGT Team 
Accomplishments

- Deliverables 7/3/13 – 8/30/13
- Establish File Management Procedures
- Develop Evaluation Criteria
- Develop Training Materials – In Progress
- Locating Existing Data Sources
  File Management Phase 1 Areas – In Progress
- Identify Missing Data Sources for File Management Phase 1 Areas – In Progress
3) Asset Hierarchy

The EIAMS is built around a four-tier asset hierarchy used to categorize the Department's assets. It works like a “taxonomy classification” that associates services, physical location, and functions. At the beginning of the hierarchy are five networks. Following the networks are four tiers that form a tree structure. An asset is defined by its location in the hierarchy. For example, a Water Supply & Distribution minor subsystem can fall under multiple Tier 2 major subsystems: Non-Potable Water and Potable Water. Similarly, a pump can fall under multiple Tier 3 minor subsystems: Water Supply & Distribution and HVAC. The attributes, maintenance tasks, and other information in the EIAMS can vary depending on where the asset falls in the hierarchy. The figure below provides a sampling of the Asset Hierarchy.
### Tier 2 Major Subsystem
- Cable-Based Communication Network
- Two-Way Radio
- Tower

### Tier 3 Minor Subsystem
- Aquarium Structure
- Bio Tower
- Filtration System
- Pump
- Temperature Control Equipment
- Ultra Violet Disinfection Unit

### Tier 4 Component
- Egg Jar System
- Production Tank
- Raceway
- Monitoring / Control
- Sensor
- Outdoor Production
- Fish Ladder
- Kettle
- Pond Liner
- Production Pond
- Raceway

### Tier 2 Major Subsystem
- Exterior Electrical Subsystem
  - Electrical
    - Exterior Lighting
    - Generator
    - Phase Converter
    - Resistive Load Bank
    - Transfer Switch
    - Transformer (MDG Owned)
    - Wind Generator

### Tier 3 Minor Subsystem
- Fishing & Boating Access Subsystem
  - Access Features
    - Boat Ramp
    - Boat Slide
    - Buoys
    - Dock
    - Fish Cleaning Station
    - Fishing Platform
    - Jetty

### Tier 4 Component
- Flood Protection Subsystem
  - Levee Features
    - Culvert
    - Diesel Power Unit
    - Levee Segment
    - Pipe Segment
    - Pump
    - Pump Structure
    - Spillway
    - Water Control Gate
    - Water Control Structure

### Tier 2 Major Subsystem
- Fish Production Subsystem
  - Effluent Management
    - Pipe Segment-Main
    - Pollution Control Pond
    - Water Control Gate
    - Water Control Structure
  - Feeding
    - Bulk Feed Storage Bin
    - Cooler / Freezer
    - Fish Feeding System
  - Indoor Production

### Tier 3 Minor Subsystem
- Exhibit Subsystem
- Aquarium
- Bio Tower
- Filtration System
- Pump
- Temperature Control Equipment
- Ultra Violet Disinfection Unit

### Tier 4 Component
- Egg Jar System
- Production Tank
- Raceway
- Monitoring / Control
- Sensor
- Outdoor Production
- Fish Ladder
- Kettle
- Pond Liner
- Production Pond
- Raceway
1. Introduction

The Missouri Department of Conservation (MDC) is modernizing its asset management program to more effectively manage infrastructure asset lifecycles and make better informed decisions regarding how future investments of funds can have the greatest impact on service delivery.

An important part of effectively managing infrastructure assets is to ensure the Department utilizes a consistent approach to conducting and applying condition assessments on all infrastructure assets that are in compliance with the requirements outlined in the GASB Statement 34. Utilizing a consistent methodology to assess and record the condition of the Department’s assets provides critical data for decision making, both on a project and system level. To address this need, these training procedures have been developed to assist in the consistent evaluation of the assets in the field.

This document is organized by rating scale type. Within each rating scale type, the assets for which its condition will be assessed utilizing the scale type are listed alphabetically. For ease of use, an alphabetical listing of all assets, their corresponding rating scale and document section can be found in Appendix A.

These training procedures consist of specific guidance on rating assets using one of the following three scale types.
- Simplified Rating Scale
- Asset Specific Rating Scale
- Specialized Rating Scale

Additional information related to the condition assessment of the assets included in this section can be found in the CA_Consolidated_Results Excel spreadsheet, including:
- Who conducts the condition assessment
- Frequency the condition assessment is conducted
- Equipment required to conduct assessment
- Training required to perform assessment
- Time estimate to complete actual condition assessment in field
- Total estimate to conduct condition assessment (Pre and Post field).

Key Questions to Relate Simplified and Asset Specific rating scale
- What is the age of the asset?
- Are replacement parts available? Are they hard to obtain?
- Does the asset qualify for efficiency Upgrade? Is the cost of operation comparable to new equipment?
- What is the maintenance activity on the Asset? Do you have maintenance records? Has scheduled maintenance been performed on this asset if applicable? Does the maintenance that has been performed on the asset more frequent than the normal scheduled routine maintenance?
2. Simplified Rating Scale

The Simplified Rating Scale demonstrates the basic approach that should be utilized when more defined rating elements are not required.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
</table>
| 5      | **As New or Very Good Condition:**  The asset has:  
|        | • Only the prescribed, scheduled routine preventive maintenance required  
|        | • Shows no appreciable signs of deterioration  
|        | • Fully provides the services intended  
|        | • Within first 1/3 of expected life  
|        | • There are no issues with obtaining replacement parts or performing service or maintenance functions  
|        | • Cost of operation comparable to new equipment  |
| 4      | **Good condition:**  The asset has:  
|        | • Minor deterioration, but no problems providing the intended service  
|        | • No rectification or repairs required to satisfy elemental function of the asset  
|        | • Minor maintenance required plus the prescribed, scheduled routine preventive maintenance  
|        | • Within first 2/3 of expected life  
|        | • There are no issues with obtaining replacement parts or performing service or maintenance functions  
|        | • Cost of operation comparable to new equipment  |
| 3      | **Fair or Moderate Condition:**  The asset has:  
|        | • Significant or continuous non-scheduled maintenance required to maintain service  
|        | • Detectable damage, but it is still working and providing the intended service (not failed)  
|        | • Shown signs of defects but still supports the required function of the asset and it provides the intended service  
|        | • Identified future major repairs or component replacement projected to be needed within the next 4-6 years  
|        | • There are no issues with obtaining replacement parts or performing service or maintenance functions  
|        | • Not exceeded its expected life by more than 10%  
|        | • Cost of operation is greater than new equipment, but cost savings of replacement does not justify replacement with new equipment  |
| 2      | **Poor condition:**  The asset has:  
|        | • A significant renewal/upgrade/replacement projected to be needed within the next 1-3 years to maintain service  
|        | • Projected as being within 1-3 years of needing complete replacement  
|        | • Projected to be near failure, but serviceable condition is still retrievable with repair, renewal or partial replacement  
|        | • Repair (rather than replacement) is an option that is still economically viable and possible. Repair may include partial replacement as an option to achieve  
|        | • Started having issues with obtaining replacement parts or performing service or maintenance functions  
|        | • Significantly higher operation costs than upgraded asset so replacement could be justified by lifecycle cost savings  |
| 1      | **Very Poor Condition or Failed:**  The asset has reached a condition where:  
|        | • There are safety issues that need to be addressed before the asset is placed back into service or the asset is unserviceable and complete replacement or disposal is required now  
|        | • Repairs need to be made to address safety concerns or repairs are not economically viable (or possible)  
|        | • Cannot obtain replacement parts or cannot perform service or maintenance functions  
|        | • Significantly higher operation costs than upgraded asset so replacement is justified by lifecycle cost savings  |
1.1 Bridge (Pedestrian)

1.1.1 Asset Details

The following table provides additional details for the asset.

<table>
<thead>
<tr>
<th>Asset Description/Definition</th>
<th>Tier 2</th>
<th>Tier 3</th>
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</thead>
<tbody>
<tr>
<td>A structure constructed to suspend or support a walkway or small vehicle ATV pathway over water bodies, sleep ditches, or other obstacles that cannot be easily traversed.</td>
<td>Pedestrian Access Segment</td>
<td>Pedestrian Access Segment</td>
</tr>
<tr>
<td></td>
<td>Trail System</td>
<td>Trail Segment</td>
</tr>
</tbody>
</table>

Key Components to Assess Bridge Condition

1. Railing — Inspect for wear from ATV and check for rot that may compromise the structural integrity. Inspect attachment of main rail posts to the frame for a loose connection.
2. Decking — Inspect for loose, rotten, or severely cracked boards.
3. Foundation — If foundation material consists of wood check for rot which may compromise the structural integrity. Inspect foundation for differential settlement and inclination due to stream overtopping. If foundation material consists of concrete check for spalling, cracks, and rusted or exposed steel.

1.1.2 Condition Assessment Details

The following table provides details pertaining to the scheduling, preparation, and completion of the asset’s condition assessment.

<table>
<thead>
<tr>
<th>Condition Assessment Approach</th>
<th>Sampling</th>
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<tbody>
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<td>Sampling Approach Methodology</td>
<td>Beyond X percent of expected life</td>
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<tr>
<td>Number of People Required to Complete Assessment</td>
<td>1</td>
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<tr>
<td>Expected Life</td>
<td>20 years</td>
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<tr>
<td>Decay Curve Type</td>
<td>Straight Line</td>
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<td>Estimated time for completion</td>
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<tr>
<td>Service Outage Required to Complete Assessment</td>
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<tr>
<td>Special Considerations</td>
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Runge Pre-Pilot Results

Conducted August 2013
Runge Audio Visual Condition Assessment

Condition Rating

Audio/visual (auditorium)

Co-Op Students Rating

MDC Staff Rating
Runge Pump Condition Assessment

- Pump (aquarium)
- Pump (CWP 1 HVAC)
- Pump (CWP 2 HVAC)

Condition Rating

- Co-Op Students Rating
- MDC Staff Rating
Condition Assessment Summary

- 21 asset conditions tested by both trained teams (Missouri University of Science and Technology COOP Students and MDC Staff)
- 16 assets received the same rating by both teams
- 3 assets received a rating one point lower by the COOP Students
- 2 assets received a rating one point lower by the MDC Staff
Condition Assessment Summary

- 76% of assets received the same ratings
- 24% of assets had ratings one point different
- This proved that a consistent repeatable condition rating system can be implemented to meet the GASB 34 requirement
- Guidelines and training documents were improved based on the results of the Runge Pre-Pilot. This is expected to yield an even better result at the Central Office Pre-Pilot.
To: <Area Manager Name and Title>
From: Jacob Careaga, Design and Development Division Chief
<Managing Division Chief Name and Title>
Date: <6 months before data collection begins at the area>
Subject: EIAMS Data Collection and Condition Assessments at <Area Name>

In accordance with Missouri Revised Statutes Section 29.180, Missouri Department of Conservation must comply with generally accepted accounting principles (GAAP) and, as a public entity, with statements issued by the Governmental Accounting Standards Board (GASB). The GASB Statement 34 requires governmental entities to maintain a comprehensive inventory of infrastructure assets – including establishing targeted condition levels, conducting condition assessments, and funding a maintenance program designed to maintain the adopted condition levels. An annual report is required to demonstrate MDC compliance with the provisions outlined in GASB Statement 34.
### Communication & Coordination

<table>
<thead>
<tr>
<th>Task</th>
<th>D&amp;D Staff Involved</th>
<th>Area Staff Involved</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify primary site contact for data collection and condition</td>
<td></td>
<td>Area Manager</td>
<td>6 months before data collection begins</td>
</tr>
<tr>
<td>assessment effort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide initial communication to area staff</td>
<td></td>
<td>Area Manager</td>
<td>6 months before data collection begins</td>
</tr>
<tr>
<td>Identify area staff to participate in EIAMS Data Collection and</td>
<td></td>
<td>Area Manager</td>
<td>6 months before data collection begins</td>
</tr>
<tr>
<td>Condition Assessment Orientation / Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIAMS Data Collection and Condition Assessment Orientation / Training</td>
<td>Field Data Steward</td>
<td>Construction Maintenance Supervisor</td>
<td>3 months before data collection begins</td>
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<tr>
<td></td>
<td>Office Data Steward</td>
<td>Facility Maintenance Supervisor</td>
<td></td>
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</table>

**Area Staff Involved:** Area Manager, Field Data Steward, Office Data Steward, Construction Maintenance Supervisor, Facility Maintenance Supervisor.
### 32 Proposed Locations for Initial Inventory and Condition Assessment

<table>
<thead>
<tr>
<th>Proposed Priority</th>
<th>Network</th>
<th>Area Name</th>
<th>County</th>
<th>MDC Region</th>
<th>Division</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regional Office</td>
<td>Northwest Regional Office</td>
<td>Buchanan</td>
<td>Northwest</td>
<td>Fisheries</td>
<td>9022</td>
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<tr>
<td>1</td>
<td>Wetland</td>
<td>Grand Pass CA</td>
<td>Saline</td>
<td>Northwest</td>
<td>Wildlife</td>
<td>8010</td>
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<tr>
<td>2</td>
<td>Hatchery</td>
<td>Hunnewell Lake CA (Hatchery)</td>
<td>Shelby</td>
<td>Northeast</td>
<td>Wildlife</td>
<td>5302</td>
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<tr>
<td>2</td>
<td>Regional Office</td>
<td>Northeast Regional Office</td>
<td>Adair</td>
<td>Northeast</td>
<td>D&amp;D</td>
<td>200002</td>
</tr>
<tr>
<td>3</td>
<td>Nature Center</td>
<td>Cape Girardeau Conservation Campus Nature Center</td>
<td>Cape Girardeau</td>
<td>Southeast</td>
<td>O&amp;E</td>
<td>3603</td>
</tr>
<tr>
<td>3</td>
<td>Regional Office</td>
<td>Southeast Regional Office</td>
<td>Cape Girardeau</td>
<td>Southeast</td>
<td>PLS</td>
<td>9021</td>
</tr>
<tr>
<td>4</td>
<td>Education Center</td>
<td>Henges (Jay) Shooting Range and Outdoor Education Center</td>
<td>St. Louis</td>
<td>St. Louis</td>
<td>O&amp;E</td>
<td>3605</td>
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<tr>
<td>4</td>
<td>Nature Center</td>
<td>Powder Valley CNC</td>
<td>Saint Louis</td>
<td>St. Louis</td>
<td>O&amp;E</td>
<td>8709</td>
</tr>
</tbody>
</table>
Summary

- Budget and staffing projections to level peaks and valleys associated with maintenance requirements and asset failure
- Assurances that we are keeping up with maintenance liability associated with the identified levels of service
- Realize reduction of infrastructure asset maintenance lifecycle costs through more efficient management
Enterprise Infrastructure Asset Management (EIAMS)

52\textsuperscript{nd} Annual Association of Conservation Engineers Conference
September 18, 2013
by Howard Thomas, P.E. and Alicia J. Weaver, PMP