STATE OF MICHIGAN
DEPARTMENT OF TECHNOLOGY,
MANAGEMENT AND BUDGET PROCUREMENT
P.O. BOX 30026,
LANSING, MI 48909
OR
525 W. ALLEGAN, LANSING, MI 48933

NOTICE OF CONTRACT NO. 071B5500115

between

THE STATE OF MICHIGAN

and

NAME & ADDRESS OF CONTRACTOR	PRIMARY CONTACT	EMAIL
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CONTRACT ADMINISTRATOR	DTMB - Purchasing	David Hatch	(517) 284-7044	HatchD@michigan.gov

CONTRACT SUMMARY			
DESCRIPTION: Enterprise Asset Management Solution for MDOT.			
INITIAL TERM	EFFECTIVE DATE	INITIAL EXPIRATION	AVAILABLE OPTIONS
7 Years	July 13, 2015	July 12, 2022	5, One Year
PAYMENT TERMS	F.O.B.	SHIPPED TO	
Net 45	NA	NA	
ALTERNATE PAYMENT OPTIONS			EXTENDED PURCHASING
P-card ☐ Direct Voucher (DV) ☐ Other			☒ Yes ☐ No
MINIMUM DELIVERY REQUIREMENTS:			
Delivery of the implemented and integrated Transportation Asset Management System for MDOT per the Statement of Work.			
MISCELLANEOUS INFORMATION:			
Contract is available for use by other MDOT subdivisions and other State agencies.			
ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION:	$4,242,893.00		

Notice of Contract #: **071B5500115**

For the Contractor:

_____ , _____

Contract Administrator

Date

For the State:

_____ , _____ **Date**

State of Michigan

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Article 1 – Statement of Work (SOW)

1.000 Project Identification

1.001 PROJECT REQUEST

The State of Michigan ("**State**"), through the Department of Technology, Management & Budget ("**DTMB**"), and Department of Transportation ("**MDOT**")(collectively "**Client**"), has issued this Contract ("**Contract**") for an Enterprise Asset Management System ("**EAMS**") or as used by MDOT a Transportation Asset Management System ("**TAMS**") Solution. Solution will improve the business processes and enabling information systems that support the management of MDOT's assets. This project includes the implementation of a Commercial Off-The-Shelf ("**COTS**" or "**Solution**") solution, data conversion and migration, training, and maintenance and support as detailed in Section 1.101. This contract is available for use by other MDOT divisions and State agencies.

1.002 BACKGROUND

MDOT's stated mission is to "**Provide the highest quality integrated transportation services for economic benefit and improved quality of life."** One of the goals within the strategic plan supporting this mission is to provide cost-effective, integrated and sustainable transportation solutions. The two objectives underlying this goal are directly related to the TAMS initiative:

- Apply asset management principles to prioritize and implement the most cost-effective transportation investment strategies.
- Optimize the value of transportation investments by employing sustainable solutions that reduce congestion, energy use, emissions and life cycle costs that support job creation and improved quality of life.

Client seeks to implement a TAMS that will improve the business processes and supporting information systems that will enable management of transportation assets across all levels of the Department's organization, locations, and facilities. An effective TAMS will help MDOT maximize value of its physical assets, improve utilization and performance, reduce capital and operating costs, and extend asset life. The implemented TAMS will allow the whole-life optimal management of the MDOT's assets, both physical (e.g. buildings, equipment, infrastructure, etc.) and non-physical (e.g. accounting systems, design, right-of-way, planning), to maximize value. This will also support the Department in adopting a performance-based operational system ("**PBOS**") to deliver the Department's core highway maintenance services.

The initial benefits of implementing TAMS include:

- Improved transparency in decision making on the basis of sound data and robust processes;
- Improved understanding and optimization of Life-Cycle Costs;
- Defined Levels of Service to focus investment, rather than just fixing what is broken;
- Ability to track performance of assets and activities at all levels of the organization;
- Ability to link desired outcomes to resource and budgetary needs;
- Optimized maintenance expenditures through the development of work programs that achieve the highest Level of Service within available funding;
- Demonstrated asset custodianship to highway users;
- Better communication as a result of greater access to information and longer term planning; and
- Fewer surprises going forward – resulting in a more efficient and effective organization.

The TAMS implementation is being done incrementally. The initial phase of the project is intended to focus on high priority functionality with additional modules to be added over time. Specifically, the following initial functionality is required of the system being procured through this Contract:

- *Road Network Management* – manage the location of highway assets, integrate roadway data from multiple referencing system (including coordinates and Linear Referencing Systems – "**LRS**") networks, visualize / analyze road network assets, and ensure the TAMS is built in accordance with MDOT's existing LRS;

- *Asset Inventory Management* – record, centrally store and manage multiple asset types through a geo-referenced database with the ability to record physical description, location, historical data, value, performance, etc. with initial focus on a) Lanes, b) Signs, c) Culverts and d) Guardrails;
- *Highway Maintenance Management* – capture and report maintenance activities, quantities, location, costs, performance-based planning / budgeting, resource needs, annual work program, work order scheduling-tracking, performance monitoring and customer-service delivery; and
- *Application Integration* - enable future integration with other existing and planned application systems to be incorporated within the TAMS environment (for example: bridge management, pavement management, safety management), and integrate data from mobile field data collection systems and e-Construction as-built files.

Contractor will work on-site with Client's TAMS implementation team at MDOT's Central Office in Lansing. No other State agencies or MDOT contractors are involved with this initial procurement, although it is envisioned that TAMS functionality may be provided to MDOT partner agencies and MDOT contractors in the future.

1.100 Scope of Work and Deliverables

1.101 IN SCOPE

This project consists of the following scope:

- COTS Software Acquisition
- Project Initiation
  - Project Kick-off Meetings
  - Implementation Plan development
  - COTS software orientation
  - TAMS software requirements validation and solution configuration specifications
- Implementation
  - Configuration (COTS)
  - Data Migration
  - Interfaces/Integration
  - Pilot Projects
  - Testing
  - Production Go-live
- Training
  - Network Manager
  - Asset Manager
  - Maintenance Manager
  - System Administrator
  - End user inquiry / reporting: desktop / web clients
  - Systems Integration
- Documentation
- Maintenance and Support
  - Help Desk
  - Onsite Technical Support
  - Solution Release Management Support
- Knowledge Transfer/Transition
- Other
  - Contingency Services – to address scope changes

A more detailed description of the software, services (work) and deliverables sought for this project is provided in Article 1, Section 1.104, Work and Deliverables.

Longer Term Potential TAMS Functionality

Client may expand the TAMS functionality in subsequent project phases. These expansions may be added through submission of Statements of Work for review and Contract amendment; or Client may go out to bid for these expansions. This additional functionality may include:

- Incorporating additional Highway Asset Classes
- Integration with other Existing and planned Corporate Systems
- Strategic Investment Planning
- Multiple Asset Optimization Programming
- Risk Management Programming
- Organizational Change

Additional Use by MDOT Divisions or Other State Agencies

The COTS software and associated services available through this contract may be used by other departments, divisions, or bureaus of MDOT. Additionally other State agencies and their subdivisions may use this contract for all software and services provided by Contractor under this contract.

Expansion of Use

Contractor is making available all modules of its software for future use in other TAMS phases or by other divisions of MDOT and other State agencies. Requests for use by MDOT divisions or other agencies will be presented to the vendor for proposed pricing and licensing; and processed through the standard change management process as governed by DTMB Procurement.

Additional pricing and licensing will be adjusted based on tiered levels tied to agency usage and number of concurrent users; to ensure appropriate security and access agencies cannot just add on licenses to TAMS project. Licenses are to be added through the change notice process and separate agreements for number of concurrent users is to be processed through the change management process for this contract. If inadvertent use of licenses happen, a true-up to manage licensing use and pricing will be conducted by the vendor annually, at their discretion per Article 1, Section 1.603. Payment adjustments will be prorated based on use prior to and considering future use after the true-up review is completed.

VUEWorks software licenses and DTS services are available through this Agreement to other departments and divisions of the Michigan Department of Transportation. Such licenses and services shall be defined in detail through a scope of service with accompanying fee provision for license and/or implementation service. Any changes shall be mutually agreed to by both parties in writing through the change management process. Such licenses and services shall include but not be limited to extension of VUEWorks licenses and configuration services to other departments for work flows, forms, reporting, system configuration, etc.

1.102 OUT OF SCOPE

The following products / services are out of scope for this Contract:

- Hardware
- Custom development (unless included within the agreed COTS configuration scope or requested in a new Statement of Work under this contract as part of COTS configuration scope)

1.103 ENVIRONMENT

The links below provide information on the State's Enterprise information technology ("**IT**") policies, standards and procedures which includes security policy and procedures, IT strategic plan, eMichigan web development and the State Unified Information Technology Environment ("**SUITE**").

All services and products provided as a result of this Contract must comply with all applicable State IT policies and standards.

Enterprise IT Policies, Standards and Procedures:

http://www.michigan.gov/dmb/0,1607,7-150-56355-107739--,00.html

All software and hardware items provided by Contractor must run on and be compatible with the DTMB Standard Information Technology Environment. Additionally, the State must be able to maintain software and other items produced as the result of Contract. Therefore, non-standard development tools may not be used unless approved by DTMB. Contractor must request, in writing, approval to use non-standard software development tools, providing justification for the requested change and all costs associated with any change. The DTMB Project Manager must approve any tools, in writing, before use on any information technology project.

It is recognized that technology changes rapidly. Contractor may request, in writing, a change in the standard environment, providing justification for the requested change and all costs associated with any change. The State's Project Manager must approve any changes, in writing, and DTMB, before work may proceed based on the changed environment.

Enterprise IT Security Policy and Procedures:

http://www.michigan.gov/documents/dmb/1310_183772_7.pdf

http://www.michigan.gov/documents/dmb/1310.02_183775_7.pdf

http://www.michigan.gov/documents/dmb/1325_193160_7.pdf

http://www.michigan.gov/documents/dmb/1335_193161_7.pdf

http://www.michigan.gov/documents/dmb/1340_193162_7.pdf

http://www.michigan.gov/documents/dmb/1350.10_184594_7.pdf

The State's security environment includes:

- DTMB Single Login
- Secured Socket Layers
- SecureID (State security standard for external network access and high risk web systems)

DTMB requires that its single - login security environment be used for all new client-server software development. Where software is being converted from an existing package, or a client-server application is being purchased, DTMB recommends the use of its single – login security environment if feasible. At a minimum, an authentication tool is required. Contractor's proposed security mechanism must be approved in writing by the State's Project Manager and DTMB Office of Enterprise Security.

IT Strategic Plan:
http://www.michigan.gov/itstrategicplan

IT eMichigan Web Development Standard Tools:
http://www.michigan.gov/documents/som/Look_and_Feel_Standards_302051_7.pdf

The State Unified Information Technology Environment (SUITE):
Includes standards for project management, systems engineering, and associated forms and templates – must be followed: http://www.michigan.gov/suite

Support for Mobile Technologies
It is envisioned that THE completed TAMS solutions will include mobile field data collection tools as a component of the overall Solution. Contractor is advised that the State has developed mobile application development standards. These are included for reference as Attachment G.

Agency Specific Technical Environment
TAMS will be implemented within MDOT's current business application architecture. In order to maximize the potential for TAMS integration as described within Section 1.104 C Implementation Services - Interfaces / Integration below, Solution will provide support for this architecture.

The DTMB/MDOT Standard Information Technology Environment consists of the Desktop Environment, Project Management Tools, the Business System Development Environment, the Web / Intranet Site and Application Development Environment, the Security Environment, and the Network Environment. These environments include but are not limited to the following identified IT tools:

Desktop Environment
Windows 7 and Windows XP
Microsoft Office 365
Microsoft Internet Explorer 8.0
Mozilla Firefox 17.x +
Oracle Net Services 10g +
Adobe Standard X

Development Languages, Tools
JDK 6
JEE 6
Spring Framework 3.x
JQuery 1.x
JPA 2.0
Hibernate 3.x
Apache CXF
    Apache Maven
    Nexus (Maven Repository Manager)
JBoss BRMS 5.x
JBoss ESB 4.x

JavaScript, JQuery
PowerBuilder 9.x, 10.x, 11.x
XML
HTML
CSS
AJAX
Microsoft .NET 2.x, 3.x, 4.x
C#
ASP.NET
ColdFusion 7.x, 8.x

JBoss Developer Studio

Microsoft Visual Studio 2008

Eclipse, CFEclipse

TOAD Data Modeler
Toad for Oracle 11

Enterprise application Studio (PowerBuilder 9.x PowerJ 3.x, PowerSite)
- Sybase Powerbuilder Enterprise

Web/Application Servers
Apache 2.x
JBoss SOA Platform 5.x
Microsoft Internet Information Server 6, 7
Cold Fusion, 8
Enterprise Application Server 3.x (Jaguar CTS 3.x, PowerDynamo)

Database Server
Oracle 11g (with spatial)
SQL Server

Spatial
ArcGIS Server 10
ArcSDE

Content Management
Serena Dimensions CM
Serena Dimensions RM
Serena Business Manager
Serena Prototype Composer

Document Management
IBM FileNET
Bentley ProjectWise
Adobe Acrobat version 6.0 +

Electronic Forms
Presentation: Adobe Acrobat version 6.0 +
FileNET eForms for document management

Testing Environment
Junit 4.x
HP LoadRunner 11.5
SoapUI 4.x
Quick Test Professional 11

Security Environment
Java J2EE Security
IBM Tivoli Single Sign On
SSL
SecureID (State Security Standard for external network access and high risk Web systems)
Spring Security

Operating Systems
Windows Server 2003, 2008
Sun Solaris 10
RedHat Enterprise Linux 5

Network Environment/Hardware
Cisco Routers
Dell, Sun, HP, Redhat servers
Citrix ICA Client
Citrix Metaframe

Reporting
Crystal Reports 2011
Business Objects XI 3.1

1.104 WORK AND DELIVERABLES

I. Services and Deliverables

The State is implementing a COTS Transportation Asset Management System (TAMS) Solution. The proposed Solution will be hosted on the State's network. This project includes the implementation of a COTS TAMS solution, data conversion and migration, training, and maintenance and support as detailed in Section 1.101. The system will be installed, configured, tested and in operation by October 1, 2016.

A. COTS Software Acquisition

Contractor to provide COTS software licenses in sufficient quantities to meet TAMS functional requirements as summarized below and specified in detail within Attachment A - Solution Requirements.

Road Network Management

The Road Network Management component of Solution will provide the following high level functionality:

- Manage the location of highway assets throughout the asset life cycle (support temporal data management);
- Integrate roadway data from multiple linear referencing system (LRS) networks into the Michigan Geographic Framework ("**MGF"**) Physical Road ("**PR**") segment based LRS network;
- Translate asset location references amongst the various MDOT business Linear Referencing Methods ("**LRMs**") and the MGF PR LRM, and between LRMs and other geospatial referencing methods (coordinates, indirect referencing);
- Visualize / analyze / map / report road network assets, including the capability to produce customized Straightline Diagrams ("**SLDs**");
- Coordinate / synchronize road network updates with DTMB's Michigan Geographic Framework (MGF) spatial database; and
- Support MDOT and DTMB standards for location metadata fields.

It is presently envisioned that the initial TAMS will operate independently of the DTMB MGF edit environment and must update the LRS data with each MGF release. It is a future objective of Client to investigate the capability of the TAMS solution to be able to integrate with the MGF edit environment, which has recently migrated to an Oracle Spatial and Intergraph Advanced Data Editing ("**ADE**") environment.

Asset Inventory Management

The Asset Inventory Management component of Solution will provide the following high level functionality:

- Record, store and manage multiple user-defined asset types through a geo-referenced database that is integrated with other TAMS modules to enable enterprise wide asset management, with initial focus on a) Lanes, b) Signs, c) Culverts and d) Guardrails;
- Provide the capability to record user defined data attribute fields such as physical description, historical data, value, performance, etc.;
- Support Client standards for asset inventory metadata fields;
- Integrate with the TAMS Road Network Management module for asset location management, geospatial analysis and reporting;
- Integrate with the TAMS Highway Maintenance Management module to support asset maintenance management;
- Provide flexible data loaders with robust Q/A functionality to migrate legacy data (for example: existing sign inventory) and also to support future mobile data collection technologies; and
- Integrate with the DTMB MGF environment for sharing of MDOT business data (where applicable).

Maintenance Management

The Maintenance Management component of Solution will provide the following high level functionality:

- Capture and report maintenance activities, quantities, location, costs, performance-based planning / budgeting, resource needs, annual work program, work order scheduling-tracking, performance

monitoring of defined service levels, and customer-service delivery for both MDOT direct forces and contracted maintenance service providers;

- Integrate with the TAMS Road Network Management module for location management of maintenance activities, work orders and work programs;
- Integrate with the TAMS Asset Inventory Management module to support asset maintenance management, geospatial analysis and reporting;
- Integrate with a number of existing MDOT maintenance related systems:; and
- Provide web based Maintenance reporting functionality to replace that currently available in WebFANCY.

Future Integration Capability
The TAMS Solution includes functionality to permit future integration with other existing and planned application systems to be incorporated within the TAMS environment, such as TMS, MIDB, MIBridge, and integrating data from e-Construction as-built files. The State is also currently investigating the implementation of an Enterprise Resource Planning ("**ERP**") solution within the next several years.

Solution will support future integration initiatives through published Application Program Interfaces ("**APIs**"), access to foreign tables and other linkage mechanisms.

Deliverable(s)

- Procurement of COTS software on suitable media – delivery format to be agreed with DTMB. Two (2) copies to be provided.
- *Detailed installation manuals / instructions in support of the above, in electronic PDF format.*
- Any other deliverable Contractor deems appropriate

Acceptance Criteria
High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.

Contractor Agreement & Approach in regards to Section 1.104, A. COTS Software Acquisition	
x	I have reviewed the above section and agree with no exception.

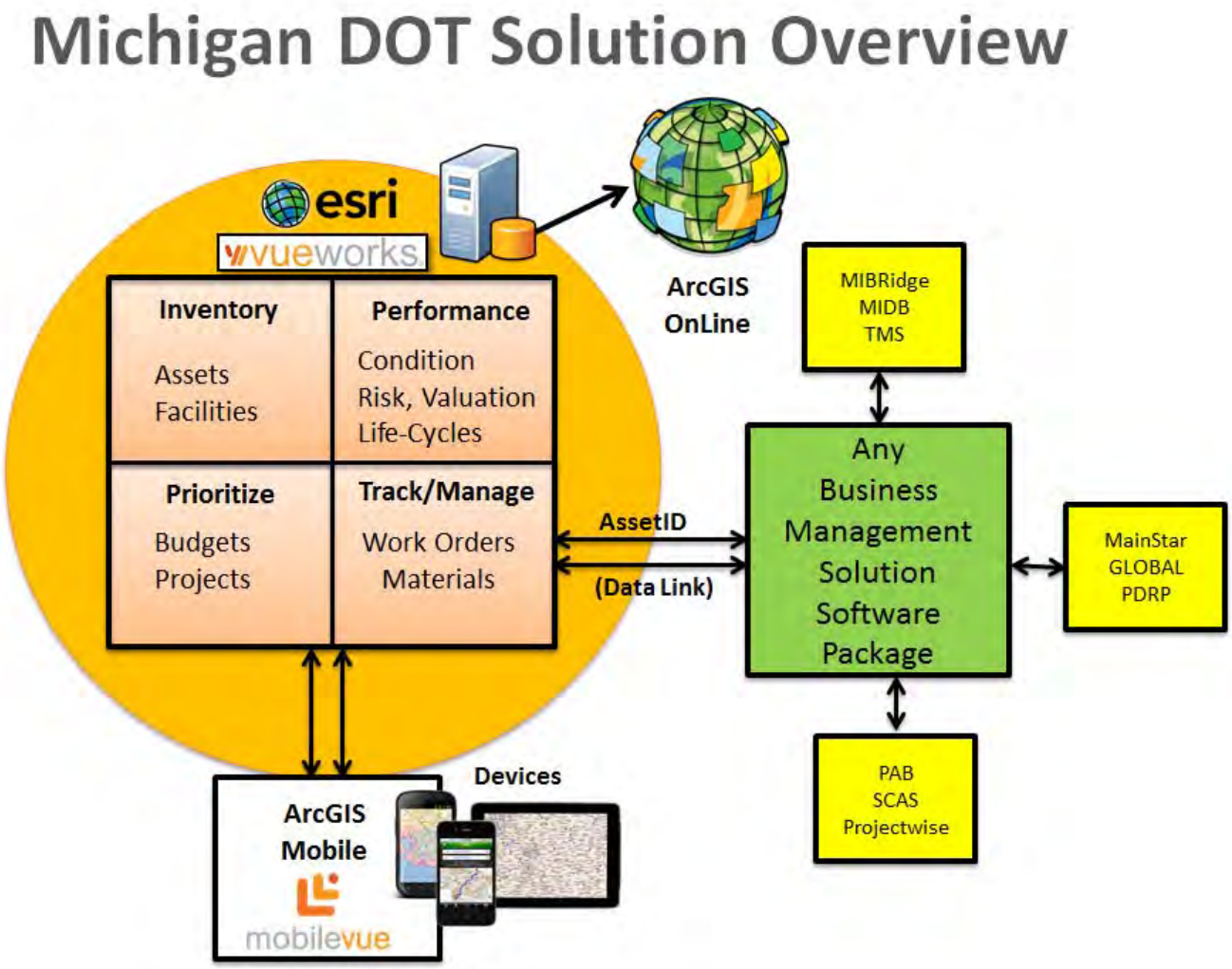
Executive Summary/Solutions Overview

The DTS team is proposing a solution that will meet MDOT needs for an TAMS that is web-based, user friendly, affordable and GIS-centric to support Work, Asset, and Inventory Management as well as provide a seamless platform that supports Enterprise Resource Planning (ERP) commercial off-the-shelf (COTS) integration in future phases of the overall vision for the MDOT TAMS.

During The TAMS Phase 1, this proposed solution will provide:

- **Road Network Management** – managing the location of highway assets, integrating roadway data from multiple linear referencing methods (LRMs), visualizing / analyzing road network assets and coordinating / synchronizing road network updates with the Michigan Department of Management and Budget (DTMB);
- **Asset Inventory Management** – providing the ability to record, store and manage physical description, historical value, performance and other attributes of multiple asset types through a geo-referenced database with the ability to record physical description, historical value, performance, and more with an initial focus on a) Lanes, b) Signs, c) Culverts and d) Guardrails;
- **Highway Maintenance Management** – allowing MDOT to capture and report maintenance activities, quantities, location, costs, performance-based planning / budgeting, resource needs, annual work program, work order scheduling-tracking, performance monitoring and customer-service delivery and

- **Application Integration** - ensuring that future integration capability is adequately tested and confirmed within the scope of the initial TAMS project (for example: bridge management, pavement management and safety management) with integrated data from mobile field data collection systems as well as e-Construction as-built files.



The diagram above provides a high-level overview of **DTS's flagship Asset and Maintenance Management System: VUEWorks** which is fully integrated with the **Esri Roads and Highways** Linear Referencing System Framework as well as **Transcend Spatial Solutions' Straightline Diagramming Application** and **VUEWorks Mobile Solutions**. In addition, the diagram represents the strong data linking and integration modules that can be utilized to build one or bi-directional relationships with any business management solution. Each application component is discussed in more detail below.

DTS's Asset and Maintenance Management Software, **VUEWorks**, is a full service, web-based, GIS-centric, asset and work management software and services solution.

DTS's VUEWorks software is a web-based, geospatially-enabled, enterprise-level asset and work management system that provides government agencies with the ability to manage, analyze, integrate and share valuable asset and work management information.

VUEWorks can manage infrastructure capital assets to minimize the total cost of owning and operating them, while delivering the service levels the State desires. Our objective is to provide the State of Michigan with a comprehensive and scalable system built on our web-based technology that will not

only address the points that were outlined in Contract, but will also be capable of fully leveraging the State's current and future geospatial data infrastructure, ERP and TAMS resources.

The following is a listing of some of the advantages of our approach and solution:

- VUEWorks uses the International Infrastructure Management Manual's approved and accredited "all assets" approach to infrastructure asset management, eliminating the need for the State to purchase specific modules for different workflows or asset types and allowing uniformity in the State's DOT asset management program.
- VUEWorks is a 100% web-based application coded in .NET that uses a service-oriented architecture allowing it to interface with nearly any external database or application, and it is 100% mobile.
- The VUEWorks solution provides seamless integration with Esri's ArcGIS Server and Roads & Highways LRS/M platform and standard relational databases.

ESRI

Esri's will provide a GIS-based, complete Linear Referencing System (LRS) solution combined with COTS configurable and embeddable technologies. **The Roads and Highways LRS solution will provide a seamless path to Transportation Asset management implementation statewide.**

Transcend Spatial Solutions (Transcend) – Transcend will provide the following Services :

- **Linear Referencing Systems (LRS) Design and Implementation –** As the foundation for data integration, LRS is a vital component in DOT operations. Transcend's knowledge of the latest solutions such as Esri Roads & Highways (R&H) is substantial. As federal reporting requirements become more stringent in terms of the amount of data as well as the roads to be included, many DOTs are embarking on initiatives to revamp their LRS. Transcend is a recognized leader in assisting DOTs with LRS implementation projects.
- **Federal Reporting Support –** Transcend keeps current with the Federal Highway Administration (FHWA) reporting requirements for DOTs. Their professionals have experience in delivering tools to facilitate delivery of the Highway Performance Monitoring System (HPMS) submittal, addressing Moving Ahead for Progress in the 21st Century Act (MAP-21) reporting requirements, generating Model Inventory of Roadway Elements (MIRE) and the Fundamental Data Element (FDE) data structures and integrating other reporting functions related to the National Bridge Inventory (NBI), safety reporting and rail crossing reporting.
- **Data Visualization and Decision Support –** Visualization tools support effective decision-making by providing easy access to a wide variety of enterprise business data. These tools mine, analyze, map and report the data stored in data warehouses and repositories and managed by LRS. These tools provide basic mapping functions, but also more advanced capabilities such as sophisticated spatial analysis, **straight-line diagramming displays and business intelligence (BI) integration**.

eVision Partners, Inc. – eVision Partners is a management consulting firm dedicated to assisting public sector clients to plan and execute significant business and technology change projects. eVision Partners specializes in providing consulting support to transportation agencies that will ensure the successful planning and implementation of transportation asset management and associated core information systems.

Contractor /Sub-contractor Team Will Provide:

- An Asset and Maintenance Management Solution that is web-based, GIS-centric, natively integrated with Esri Roads & Highways and provides fully-functional, risk-based asset, maintenance and performance management enabling asset valuation and budget forecasting to support program and project level lifecycle transportation infrastructure asset management.

- A mobile asset and maintenance management solution that can be utilized on any platform (Toughbook, tablet, smartphone) in both connected and disconnected modes.
- A team of proven system integrators (DTS, Esri and Transcend) and system integration planners (eVision Partners) that not only are skilled in the requirements of the TAMS program to support Phase 1, but have the necessary skillset to provide insight, planning and implementation for future phases of the program.
- A senior level management team of professionals with proven track records who are also owners of their companies where a project of this magnitude is of upmost importance to both our and MDOT's success.
- COTS and configurable products where ongoing support and portions of the implementation can be performed by the State's technical resources if desired. The team of DTS, Esri, Transcend and eVision Partners will offer unique opportunities for end user support, implementation and sustainment.
- Given the number of initial users identified in Contract, MDOT will be provided an enterprise site license for all components of the TAMS solution. We understand the goals of the Phase 1 Program are limited to a few asset classes; however, having access to the site license from the outset of the project will provide configuration benefits across assets as well as enable potential work bundling activities that will maximize cost savings and return on investment.

Product Descriptions

VUEWorks® Software Description

VUEWorks software is a, web-enabled GIS-integrated Transportation Asset management solution.

VUEWorks is designed for use to track the condition, minimize failure risk and optimize expenditures and service delivery of physical assets. VUEWorks integrates directly with GIS data, allowing users to share geospatial and non-geospatial data on any physical asset within any infrastructure domain.

VUEWorks software employs an all assets model that is based on asset types and asset classes, and therefore does not require users to purchase separate modules for individual assets.

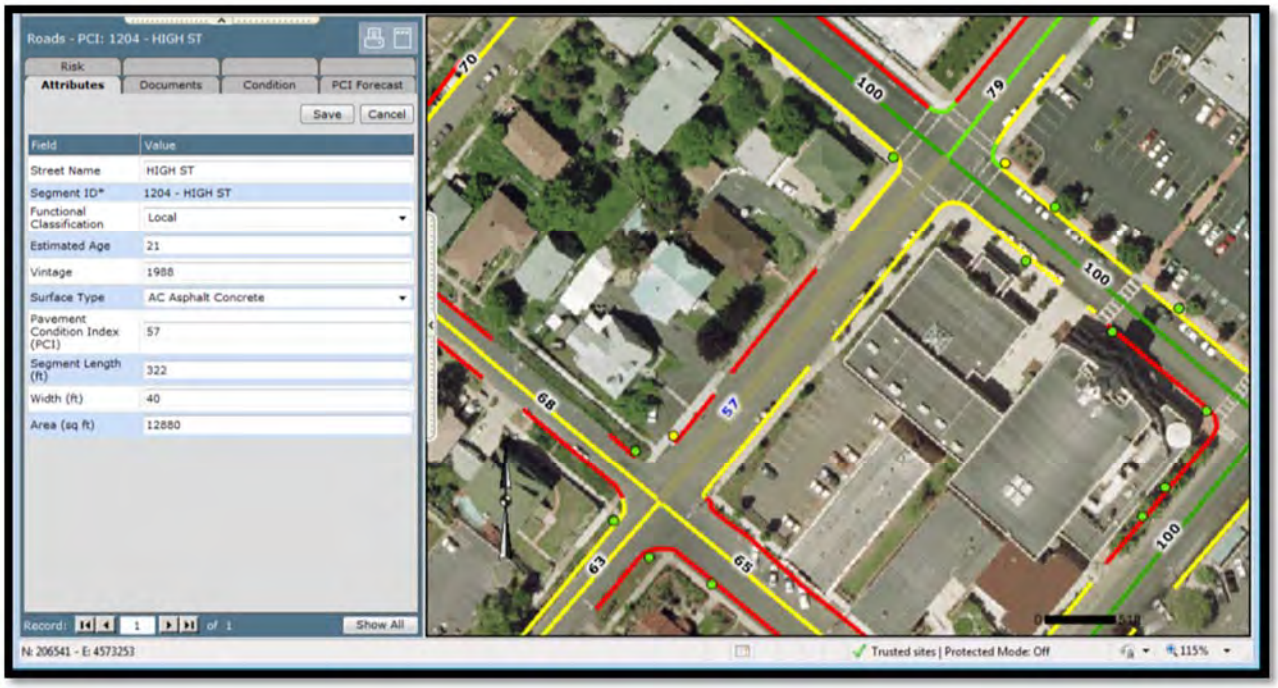
VUEWorks and its modules can be thought of as building upon each other. The base (red) allows for map and data sharing. Work management tools (steel gray) integrate with the core module of the system by creating relationships between asset features and the resources used to maintain them – this integration provides much greater functionality when used to perform standard daily, weekly, monthly and as-needed tasks to maintain assets. Strategic asset management (gold) from a long-term perspective (depending upon the asset type) may look decades into the future.

VUEWorks® Core

Web-based access to all your GIS and asset management data

VUEWorks Core is the foundation for all other VUEWorks modules, connects existing GIS data to the VUEWorks strategic asset and work management system. Link documents and databases to specific

assets, conduct multi-level searches, buffer queries, measure distances and create reports. It is very configurable and easy to navigate and use. As a web-based application, VUEWorks can be accessed with Microsoft Internet Explorer via the Internet/intranet, Wi-Fi and wireless communication cards. Users can access VUEWorks from the office, the field or home using a traditional desktop computer, notebook or tablet.



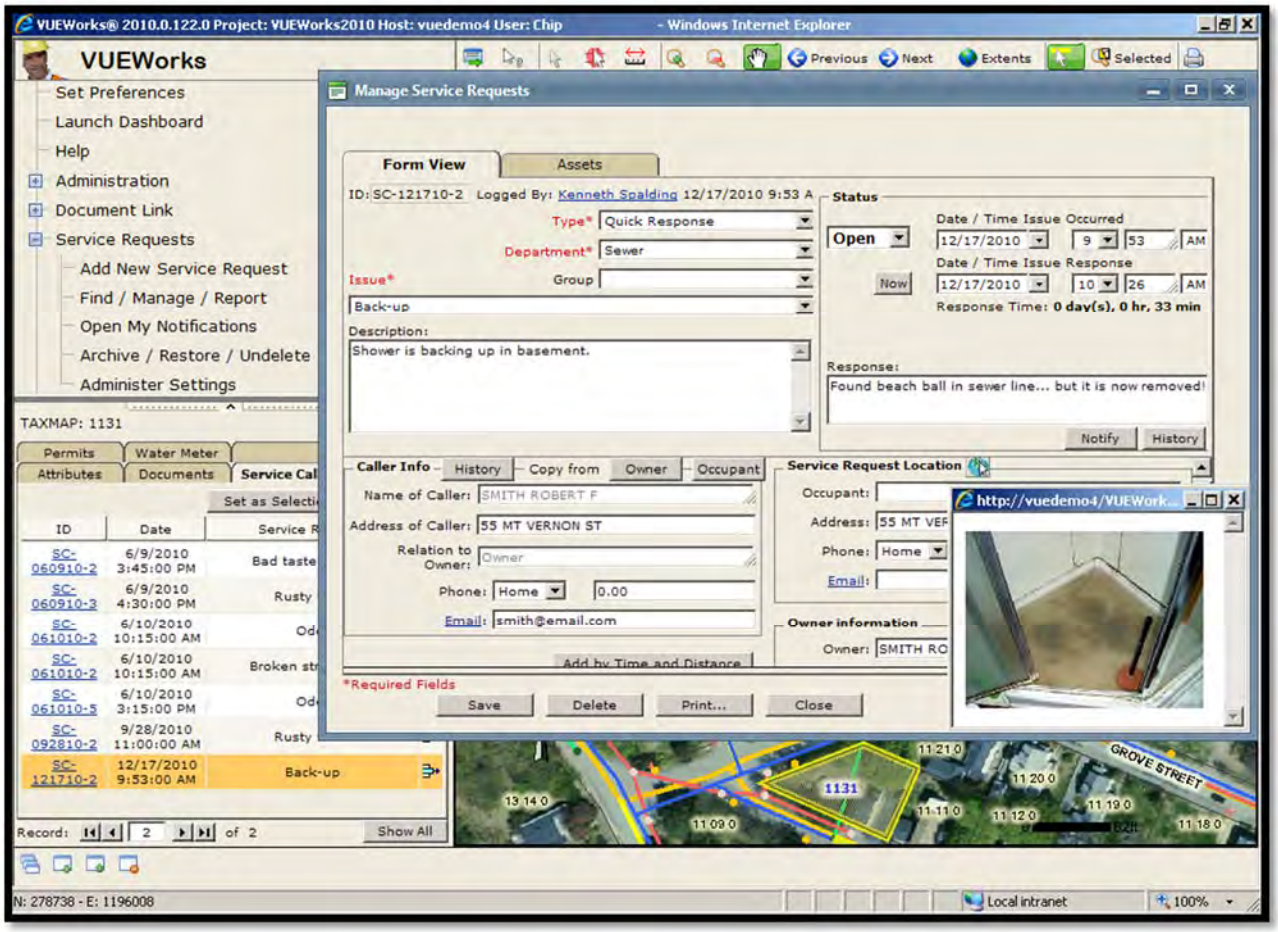
Features & Benefits

- Integrated with Esri ArcGIS Server and Roads & Highways
- Manage read/write/edit permissions by department, role and user
- User defined dashboards to graphically display statistical data for service requests and work orders
- Easily link documents such as image files, PDFs, videos and many other formats to any asset for quick viewing anytime, anywhere
- Use Data Link to seamlessly link external databases in Access, Excel, SQL Server, Oracle or any ODBC-compliant database

Request Portal

For internal and external customers to place requests online

The VUEWorks Request Portal module delivers online access for citizens and customers to place their requests using the Web. No customization or third party database is required. The Request Portal interfaces directly to the Service Request module. And the Request Portal status is kept up-to-date when a service request is closed. At any time, a citizen or customer can review the status of their request by entering the portal and viewing “My Requests” or by searching for a Service Request ID.



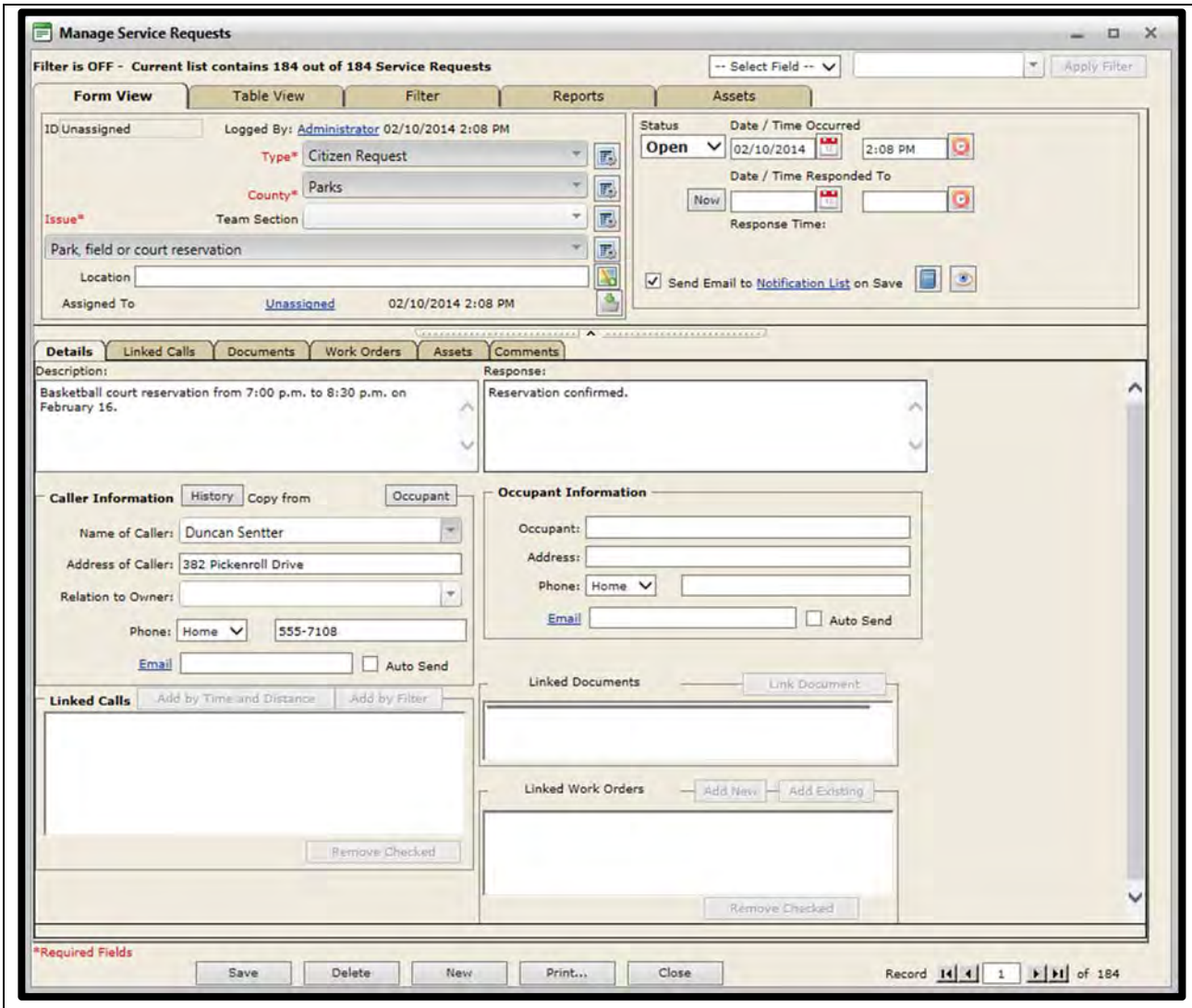
Features & Benefits

- Allows citizens and customers (both internal and external) to issue requests directly, reducing the burden on your call takers or front office staff
- Minimizes errors by directly populating the Service Request module
- Complete integration between the Request Portal and the Service Request and Work Order modules
- Request Portal status is kept in sync with work orders that have linked service requests
- Allows your agency to receive and share request status after hours, 24/7, 365 days a year
- The Request Portal can be accessed via smart phone mobile devices

Service Request

For managing service requests from any source

The VUEWorks Service Request module enables you to record and track requests. This configurable module allows you to attach requests to assets in the GIS or in the Facilities module. Request takers can quickly fill out the information for the request and, if the Work Order module is in use, create a work order directly from the service request.



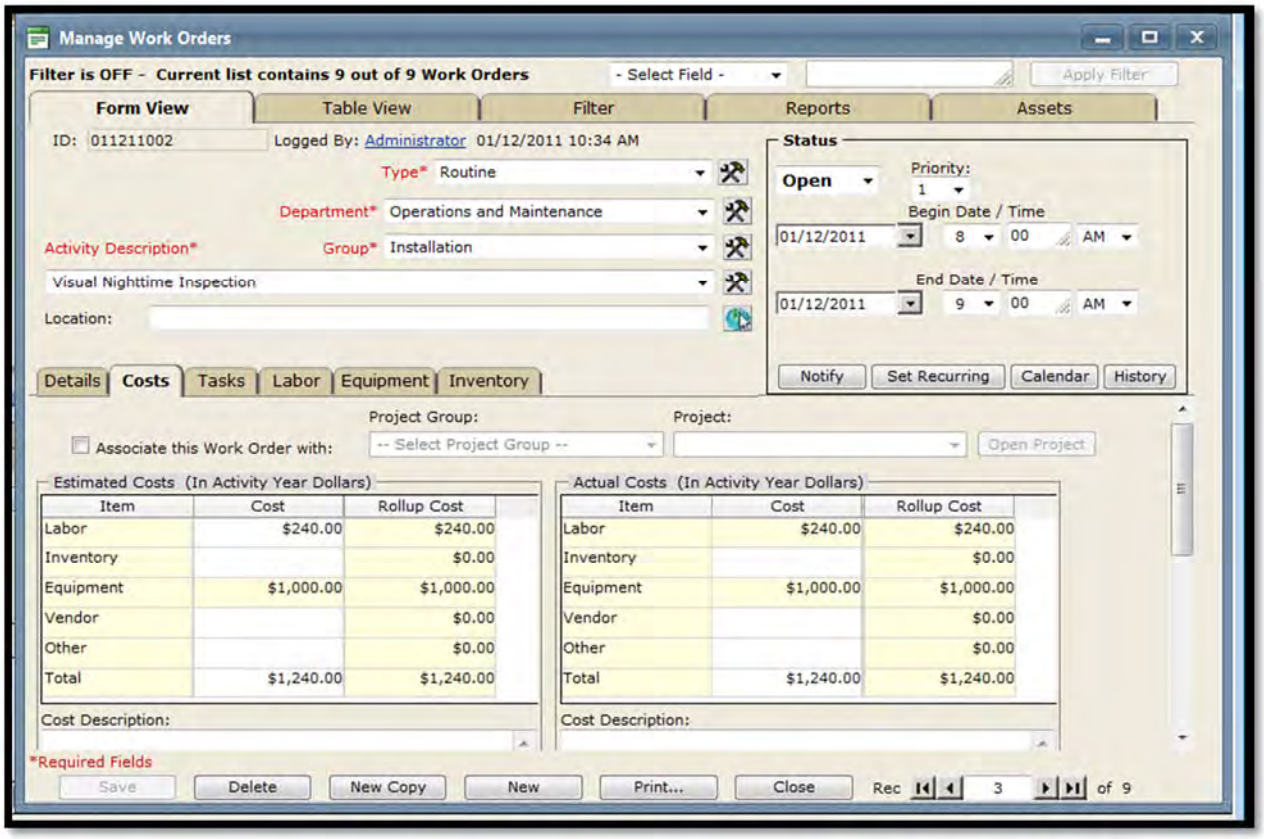
Features & Benefits

- Service request forms can be easily filled out while talking with the requester
- Record and track requests from both internal and external customers
- Can be used for maintenance activities (potholes, missing signs, etc.) and for reservation activities
- Allows for calculating resolved time between the request and the time the request is closed
- Identify and track duplicate requests to avoid creating multiple work orders for the same incident

Work Order

For work activities, preventative maintenance, tracking progress & costs and notifications & reporting

The VUEWorks Work Order module combines the computerized maintenance management systems (CMMS) with geographic information systems (GIS) to manage and plan work activities. Work orders can be configured to match your existing work order forms to maintain the look and feel of your existing workflow, right down to the activity level. Easily create preventative maintenance schedules linked to a calendar to view activities by day, week or month. Trigger work orders based on data measurements or events from SCADA systems or other data links. The Work Order module can be integrated with other VUEWorks modules.



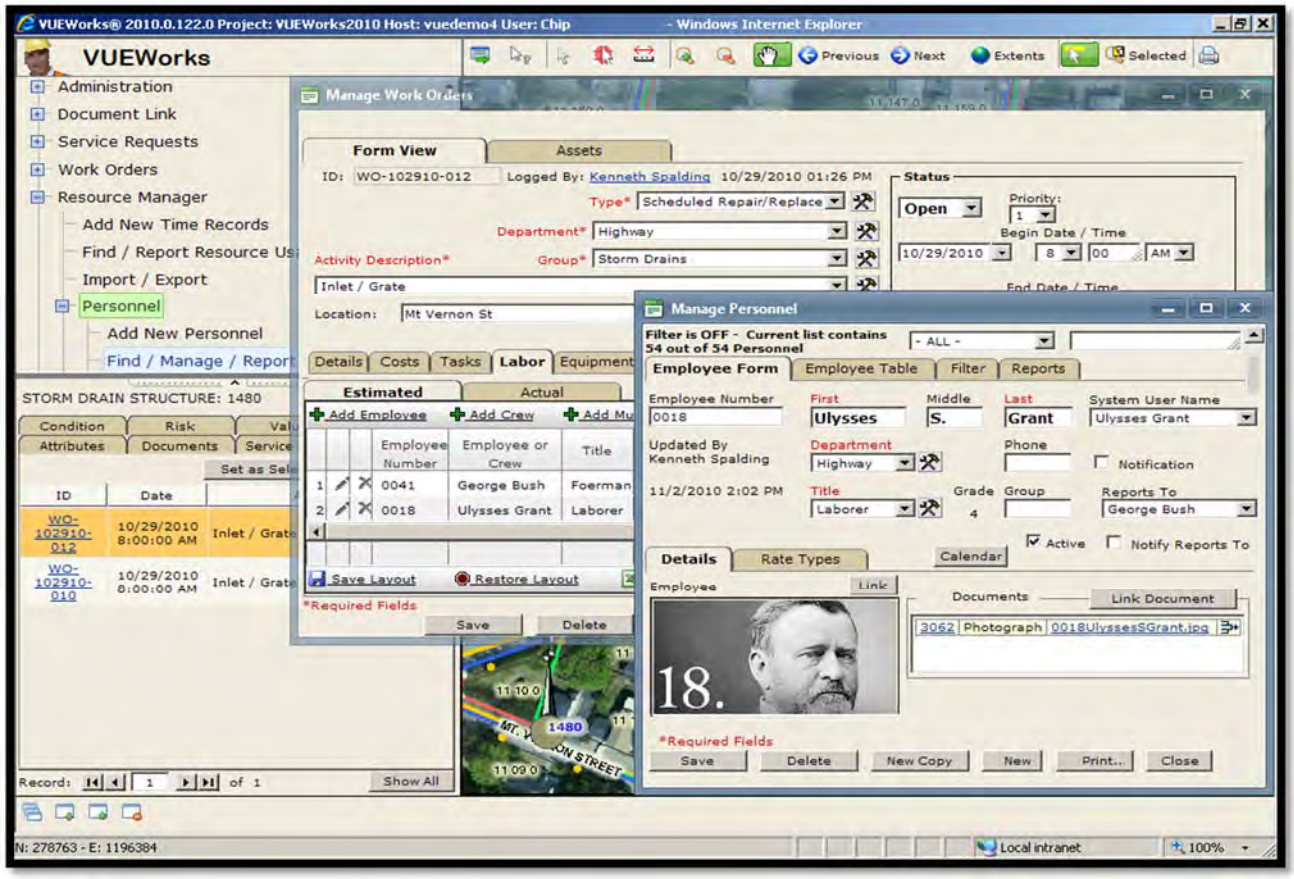
Features & Benefits

- Work order forms can be user defined to fit your “look & feel” and existing work process
- Attach work orders to any physical asset on the map or non-GIS asset in the Facilities module for easy reference
- Robust reporting features include pre-defined report templates and wizards
- Automated email notices can be sent to any email program
- Work orders can be logged from the field in a fully disconnected mode.

Resource Manager

For quick cost calculations on labor, equipment and inventory used (parts & materials)

The VUEWorks Resource Manager module is tightly integrated with the Work Order module so that associated time and costs for personnel, crews, Contractor, vendors, equipment and other items pulled from inventory can be tracked. Time for labor and equipment can be accounted for independently with the Time Recorder feature, then passed on to external accounting systems. Multiple billing rates can be assigned for different labor roles and activities. Set up personnel so that employees can be placed on a work order based on job classification, availability and cost. Personnel managers can be set up to search for an employee job classification, availability and cost in an easy-to-use calendar interface.



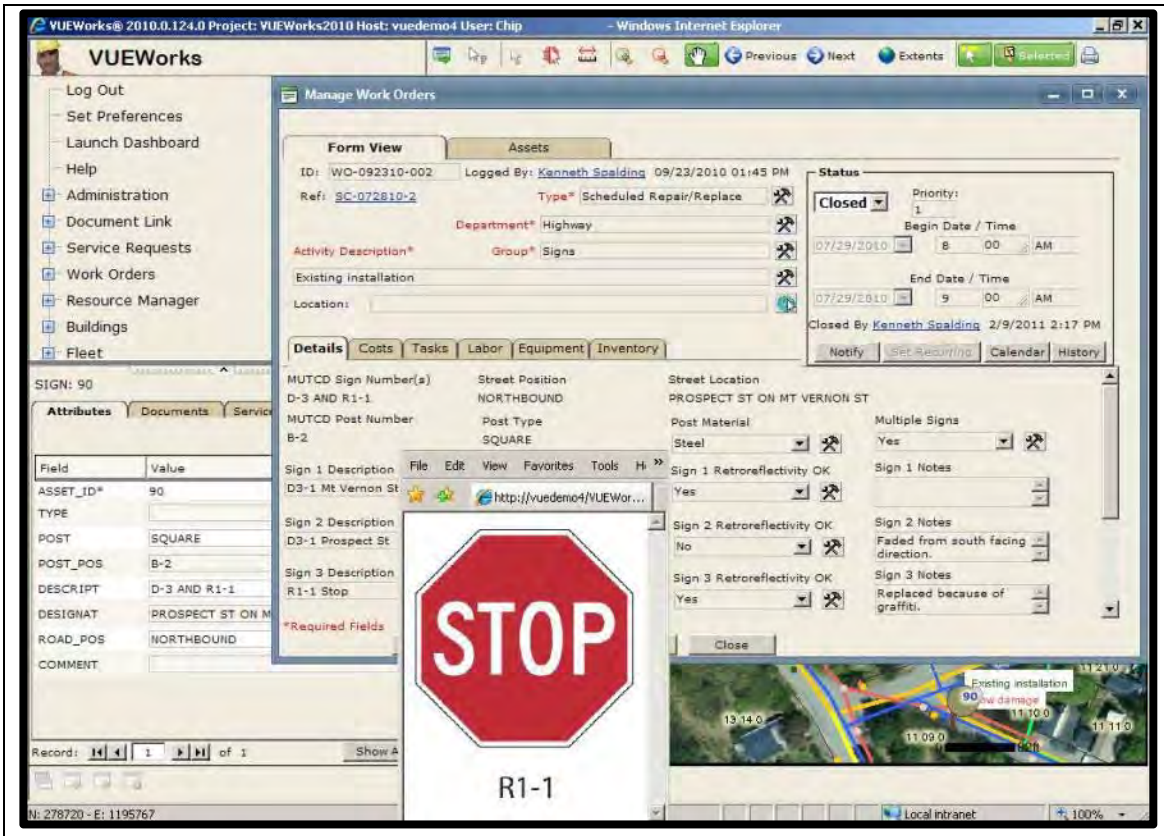
Features & Benefits

- Personnel, equipment and inventory items/costs can be added and tracked in work orders
- Assign multiple labor rates to special field activities to get quick cost estimates
- Get real-time inventory tracking with alerts for low inventory
- Use the calendar interface to track availability of employees and equipment
- Automatic notification of employees and supervisors when assigned to a work order
- Import/export personnel, equipment and inventory to accounting systems

Condition

For condition tracking and reporting on any physical asset

The VUEWorks Condition module is highly configurable, allowing you to collect, summarize, analyze, rate and report on the condition of any asset (whether signs, culverts, guardrails, street lights, pipes, roads, power lines, playground equipment, trees or something else). Develop your own condition inspection criteria or use condition data collected with the use of other software. Either way, VUEWorks provides configurable tools that allow you to build your own rating criteria as simple or as detailed as required. History features show how condition has changed over time for each asset or the entire system. The Report Designer lets you design just about any style of report with data from all sources including GIS data and linked databases that contain condition assessment details.



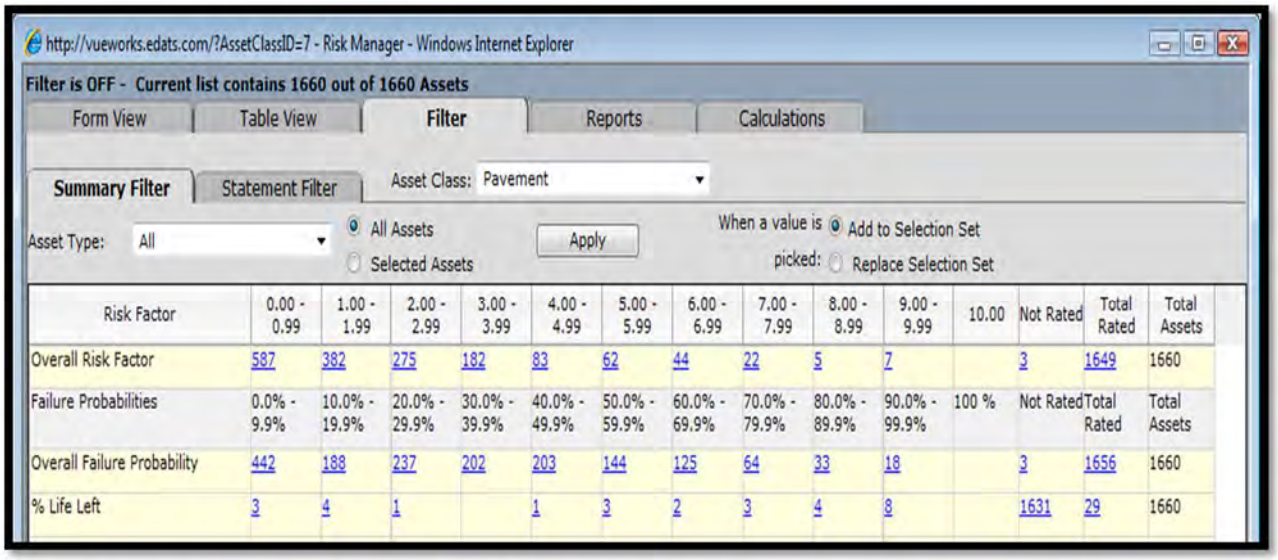
Features & Benefits

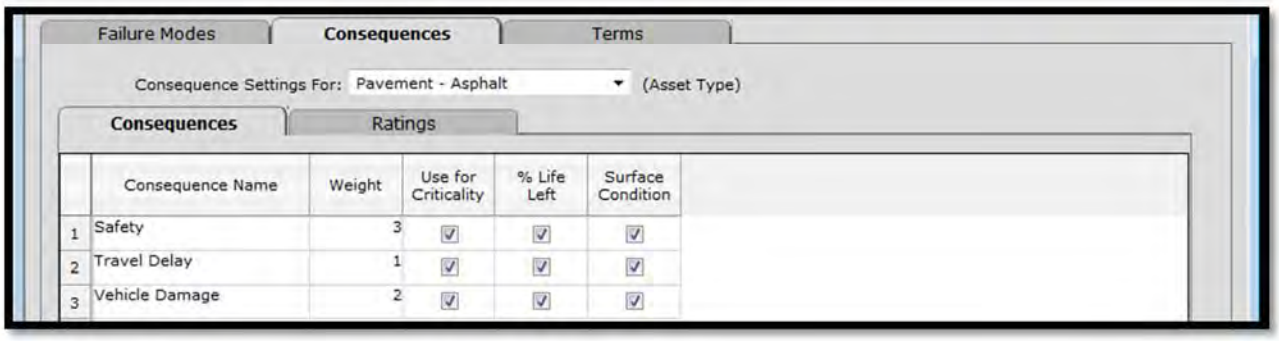
- Supports condition ratings using the following methods: Simplified, Itemized and Defect
- Link to external condition data to summarize, analyze, rate and report
- Integrates with GIS to visualize color-coded conditions for viewing on a map
- Using the VUEWorks Work Order module, capture condition data directly on work order forms
- Integrated ASTM templates measure pavement condition for asphalt and concrete
- Condition inspections can be performed in the field in a connected or disconnected mode.

Risk

For strategic planning and prioritization of work activities

The VUEWorks Risk module allows you to capture stakeholder concerns in a risk model to strategically prioritize limited resources and work activities. Determine the consequences of failure by analyzing failure modes and failure probabilities for asset classes and types. Configure priorities by assigning weight factors. Once you have the risk model configured and calculated, VUEWorks Risk makes it easy to quickly look at every aspect of the risk model by highlighting assets on a map and illustrating findings to stakeholders to justify work priorities. Avoid costly failures before they occur.





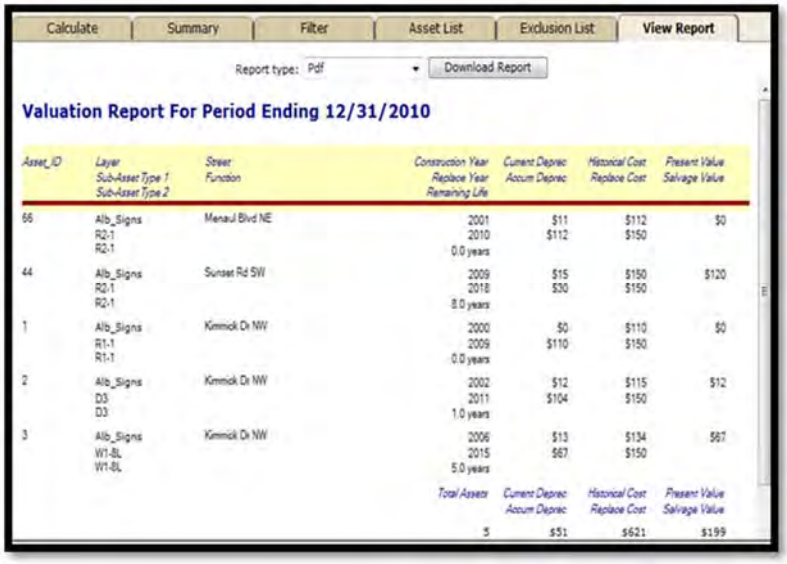
Features & Benefits

- Use GIS data with the VUEWorks Multi-edit and Buffer tools to quickly assign consequence of failure values to assets in the GIS
- Utilize the consequence of failure values as a measure of criticality when comparing assets
- Configure up to ten consequence and failure modes for each asset type
- Use data from the Work Order module (e.g., number of work orders as a variable) or any external database such as a capacity analysis to keep risk models current
- Use risk data to forecast budgets for asset maintenance and replacement

Valuation (GASB 34)

For calculating the value and depreciation for all physical assets

The VUEWorks Valuation module removes the drudgery and expense of meeting the Government Accounting Standards Board (GASB) Statement No. 34 or Canadian PSAB 3150 requirements for maintaining and reporting value and depreciation of infrastructure assets. With reporting under your control, you can leverage depreciation and related financial information to help plan budgets and projects. Missing historical cost data? No problem – Valuation will calculate historical costs back to the time of construction. You can also enter historical costs directly or enter unit costs and let VUEWorks calculate the total value.



Features & Benefits

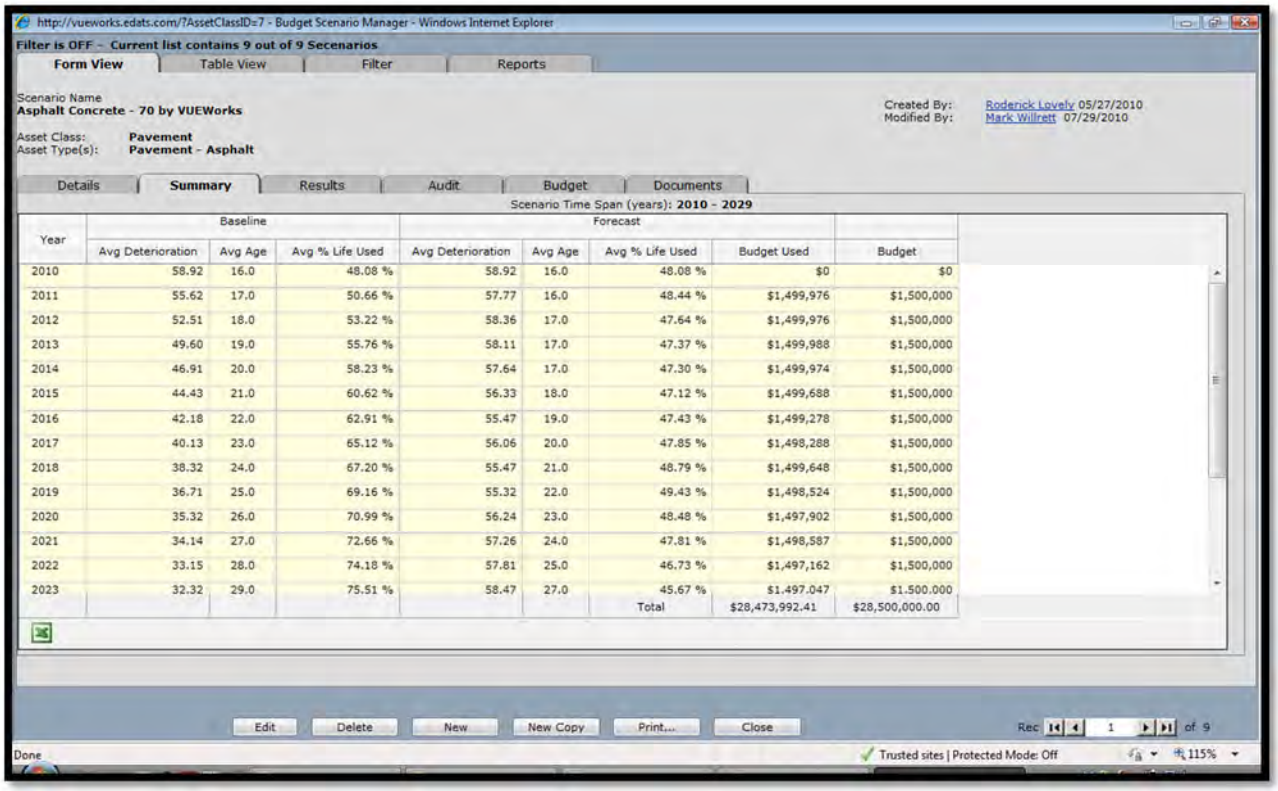
- Integrates seamlessly with the VUEWorks Facilities module & your GIS
- Determine and report historical and replacement costs
- Calculate value and depreciation for all infrastructure assets including buildings, streets, bridges, pipes and equipment
- Take control of depreciation parameters to realize the full value of your assets
- Account for maintenance through work orders that add value and extend asset life
- Powerful search and filter capabilities allow users to report by location or other criteria

Budget Forecasting

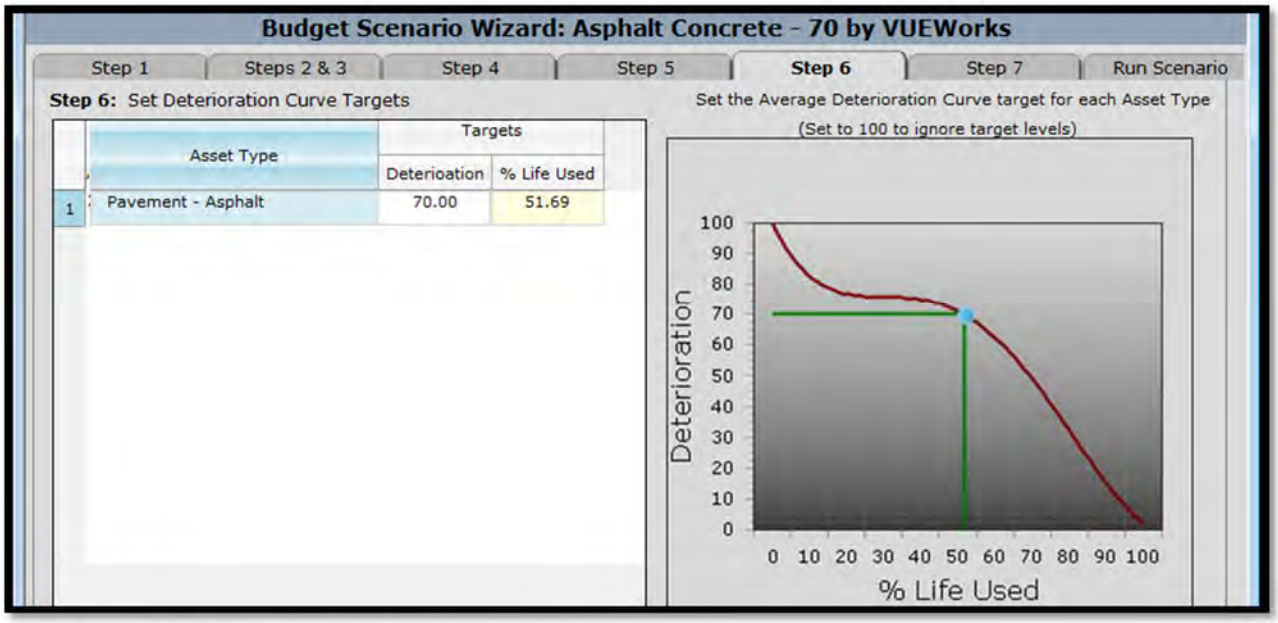
For multi-year capital improvement budget forecasts

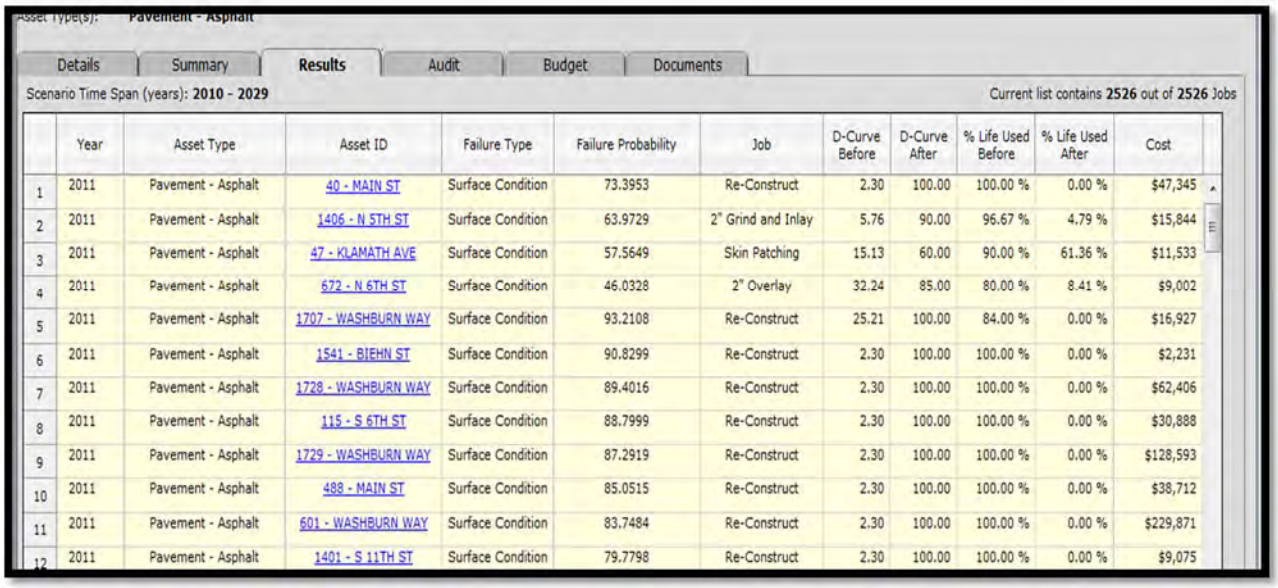
The VUEWorks Budget Forecasting module delivers configurable, multi-year capital improvement planning capabilities to help determine long-term budget needs based on deterioration curves. Use one of the supplied deterioration curves or one of your own as a basis for forecasting and then identify at what point on the deterioration curve an asset should be rehabilitated or replaced based on risk and condition. “What-if” budget scenarios can be created by adjusting budgets, project types and prioritization criteria – then run forecasting models to see if your budget will meet service level goals. For pavement, PCI values can be used to determine the work activities and cost to maintain a roadway pavement surface condition that supports the needs of the user.

VUEWorks cost-benefit analysis capability takes into consideration not only direct life-cycle costs of projects, but also social and environmental costs. These features allow transportation agencies to incorporate the costs of factors such as lost travel time, accident rates and fuel consumption when planning projects.



Year	Baseline			Forecast				
	Avg Deterioration	Avg Age	Avg % Life Used	Avg Deterioration	Avg Age	Avg % Life Used	Budget Used	Budget
2010	58.92	16.0	48.08 %	58.92	16.0	48.08 %	$0	$0
2011	55.62	17.0	50.66 %	57.77	16.0	48.44 %	$1,499,976	$1,500,000
2012	52.51	18.0	53.22 %	58.36	17.0	47.64 %	$1,499,976	$1,500,000
2013	49.60	19.0	55.76 %	58.11	17.0	47.37 %	$1,499,988	$1,500,000
2014	46.91	20.0	58.23 %	57.64	17.0	47.30 %	$1,499,974	$1,500,000
2015	44.43	21.0	60.62 %	56.33	18.0	47.12 %	$1,499,688	$1,500,000
2016	42.18	22.0	62.91 %	55.47	19.0	47.43 %	$1,499,278	$1,500,000
2017	40.13	23.0	65.12 %	56.06	20.0	47.85 %	$1,498,288	$1,500,000
2018	38.32	24.0	67.20 %	55.47	21.0	48.79 %	$1,499,648	$1,500,000
2019	36.71	25.0	69.16 %	55.32	22.0	49.43 %	$1,498,524	$1,500,000
2020	35.32	26.0	70.99 %	56.24	23.0	48.48 %	$1,497,902	$1,500,000
2021	34.14	27.0	72.66 %	57.26	24.0	47.81 %	$1,498,587	$1,500,000
2022	33.15	28.0	74.18 %	57.81	25.0	46.73 %	$1,497,162	$1,500,000
2023	32.32	29.0	75.51 %	58.47	27.0	45.67 %	$1,497,047	$1,500,000
						Total	$28,473,992.41	$28,500,000.00





	Year	Asset Type	Asset ID	Failure Type	Failure Probability	Job	D-Curve Before	D-Curve After	% Life Used Before	% Life Used After	Cost
1	2011	Pavement - Asphalt	40 - MAIN ST	Surface Condition	73.3953	Re-Construct	2.30	100.00	100.00 %	0.00 %	$47,345
2	2011	Pavement - Asphalt	1406 - N 5TH ST	Surface Condition	63.9729	2" Grind and Inlay	5.76	90.00	96.67 %	4.79 %	$15,844
3	2011	Pavement - Asphalt	47 - KLAMATH AVE	Surface Condition	57.5649	Skin Patching	15.13	60.00	90.00 %	61.36 %	$11,533
4	2011	Pavement - Asphalt	672 - N 6TH ST	Surface Condition	46.0328	2" Overlay	32.24	85.00	80.00 %	8.41 %	$9,002
5	2011	Pavement - Asphalt	1707 - WASHBURN WAY	Surface Condition	93.2108	Re-Construct	25.21	100.00	84.00 %	0.00 %	$16,927
6	2011	Pavement - Asphalt	1541 - BIEHN ST	Surface Condition	90.8299	Re-Construct	2.30	100.00	100.00 %	0.00 %	$2,231
7	2011	Pavement - Asphalt	1728 - WASHBURN WAY	Surface Condition	89.4016	Re-Construct	2.30	100.00	100.00 %	0.00 %	$62,406
8	2011	Pavement - Asphalt	115 - S 6TH ST	Surface Condition	88.7999	Re-Construct	2.30	100.00	100.00 %	0.00 %	$30,888
9	2011	Pavement - Asphalt	1729 - WASHBURN WAY	Surface Condition	87.2919	Re-Construct	2.30	100.00	100.00 %	0.00 %	$128,593
10	2011	Pavement - Asphalt	488 - MAIN ST	Surface Condition	85.0515	Re-Construct	2.30	100.00	100.00 %	0.00 %	$38,712
11	2011	Pavement - Asphalt	601 - WASHBURN WAY	Surface Condition	83.7484	Re-Construct	2.30	100.00	100.00 %	0.00 %	$229,871
12	2011	Pavement - Asphalt	1401 - S 11TH ST	Surface Condition	79.7798	Re-Construct	2.30	100.00	100.00 %	0.00 %	$9,075

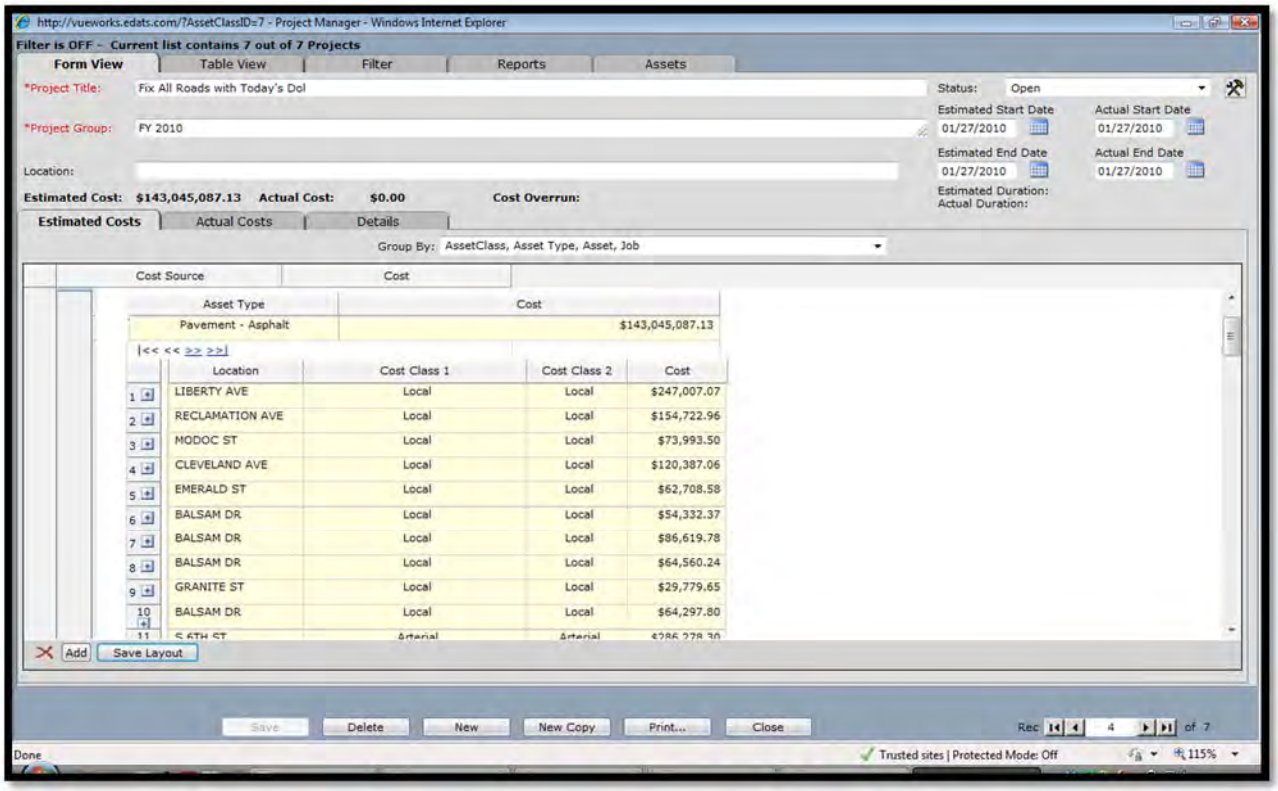
Features & Benefits

- View how different budget scenarios impact the overall condition of any asset class
- Select from risk and failure probability criteria to define how rehabilitation will be prioritized
- Automate the assignment of rehabilitation jobs based on failure modes such as capacity and condition
- Pre-determine the impact of rehabilitation jobs on the life-cycle of the asset.

Projects

For construction cost estimation and budget analysis

The VUEWorks Projects module delivers capabilities to define projects, calculate estimated costs, group them for budgeting purposes and compare estimated costs with actual costs through integration with the VUEWorks Work Order module. Features allow you to assign job costs for an entire asset, a portion of it or multiple point repairs along it. The Projects module allows you to group and summarize projects hierarchically by asset classes, asset types and jobs through a simple interface. Once you have one or more jobs defined, simply select the assets involved in the project, assign the jobs and let VUEWorks perform all the calculations and generate summaries.



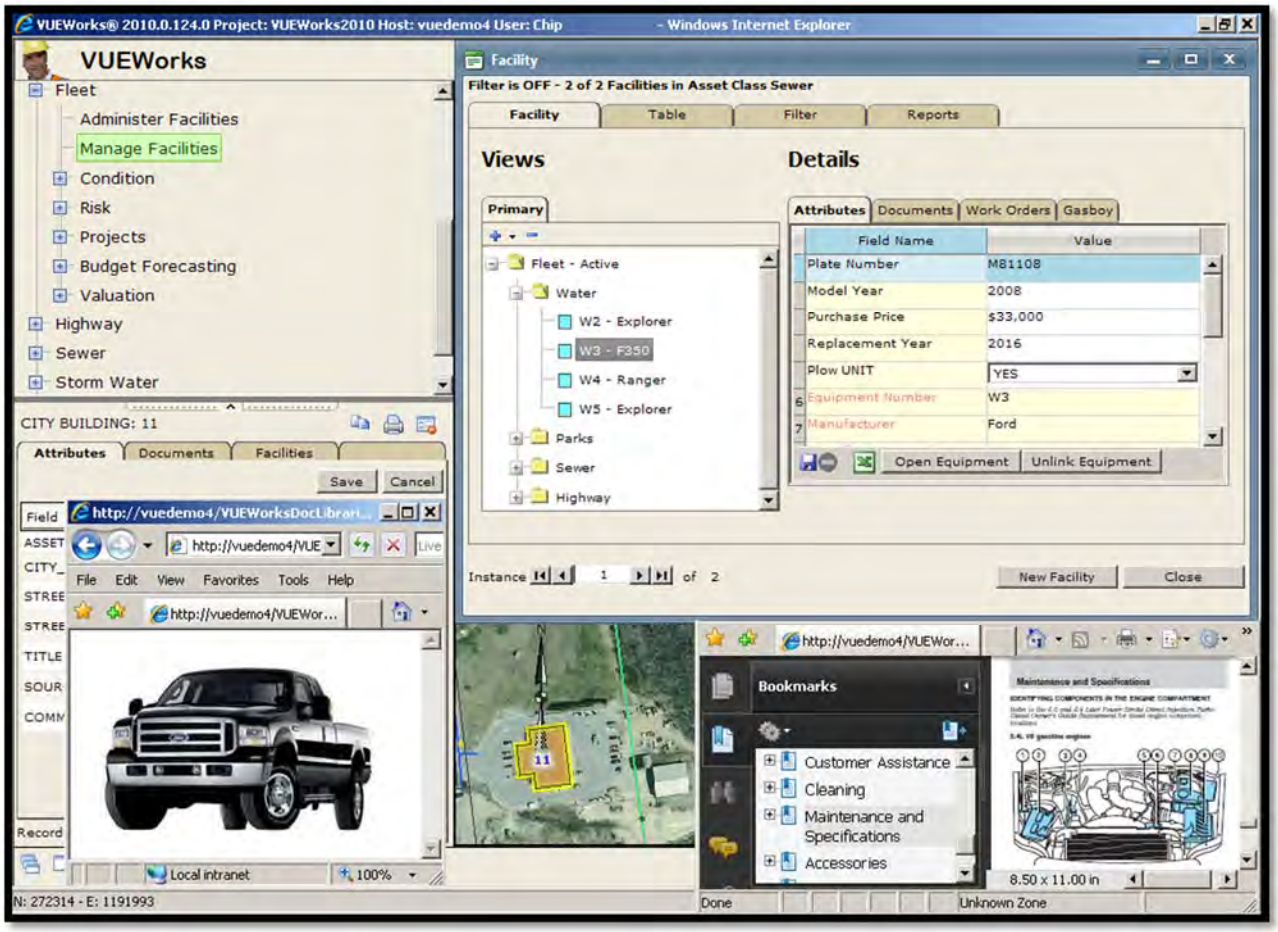
Features & Benefits

- Include any asset classes and types within the same project – great for corridor projects involving multiple asset classes
- Create a library of comprehensive and point repair job types
- Configure your own status terms to display such as Pending, On Hold, In Progress, Completed, Backlogged, etc.
- Allows adjustment of a project cost by forecasting inflation rates
- Run projects through the Budget Forecasting module to analyze the best cost–benefit ratio, extending asset life

Facilities

For buildings, pump stations, treatment plants & vehicle fleet

The VUEWorks Facilities module provides access to physical assets not found in a GIS but which still need historical service/work records, data links, condition assessment, valuation, preventative maintenance scheduling and access to key operational documentation. The types of facilities that can be managed are virtually limitless including pumps, motors, fleet and building components. The Multi-view feature allows assets to be organized in different categories (e.g., location/floor level, department or manufacturer). The VUEWorks Facilities data linking features combined with the Work Order module allow automatic work orders to be issued based on user defined triggers from a 3rd Party Database.



Features & Benefits

- Manage non-GIS assets like building components and internal equipment
- Create and organize assets in a hierarchical structure for easy reference
- Inventory fleet and mobile equipment in the Resource Manager module for use with work orders
- Structure your asset hierarchy to include work orders, condition, valuation and more. Manage facilities with trigger work orders based on equipment run-time or other data

VUEWorks for Mobile Field Asset Management

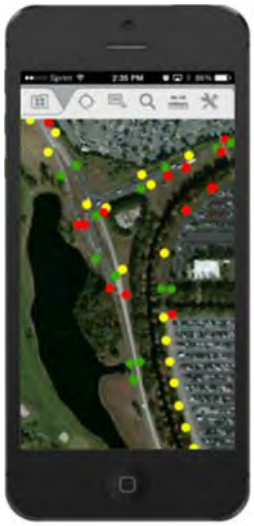
VUEWorks functions in both disconnected and connected environments. The application is built on Esri's ArcGIS Mobile platform. This allows the VUEWorks user to take the application into the field. Since it is built on Esri ArcGIS Mobile, a user can take the map and all the GIS and asset data with them regardless of location. Perform asset condition inspections, manage work orders, collect new assets and interact with your GIS from a tablet or other mobile device.

VUEWorks allows for the creation and editing of geospatial GIS data. For field inspection data, the Condition Records tools can be used for recording data for individual assets from laptops, tablets and other small devices to record new data and modification of existing values. Furthermore, VUEWorks allows the passenger

in a moving vehicle to perform asset assessment tasks, via touch screen interface on a standard tablet computer. VUEWorks recommends use on a rugged tablet computer with the following minimum specifications: 9.7” screen, touch interface and a built-in camera.

VUEWorks integrates seamlessly with the Collector for ArcGIS and improves the efficiency of your field work force and the accuracy of your GIS. Devices are used to collect and update information in the field, whether connected or disconnected, from service requests, work orders and damage reports, allowing end users to create the data that matters most to your organization.

VUEWorks with ArcGIS showing Attribute editing in the field

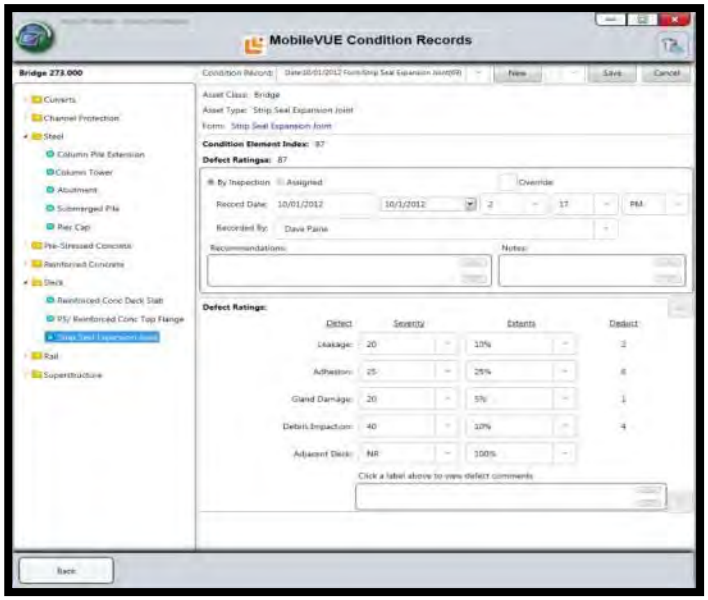


Collector for ArcGIS

Features and benefits:

- Geocode locations, plan routes and get directions.
- Improve your data quality with map-driven forms.
- Captured multiple photos and videos.
- Configurable to fit your organization’s workflow.

The asset data file is editable by either assessment buttons or editing the feature attribute data table directly. Time/date stamp and user information is logged.



The “feature” attribute table includes the ability to sort the data in ascending or descending order based on the column heading and ability to select which attribute fields are to be displayed for assessment.

The application can automatically connect via Wi-Fi and 3g/4g with a repository (master) asset database to extract a copy of the asset database used within VUEWorks. The connection serves as the

synchronization of completed and newly assigned service requests and work orders from the database to MobileVUE and vice versa.

With VUEWorks, field crews can add or verify data inputs, apply time and track and assign materials and costs for each asset. This allows field crews to go significantly deeper into the management of assets while away from the office.

Features & Benefits

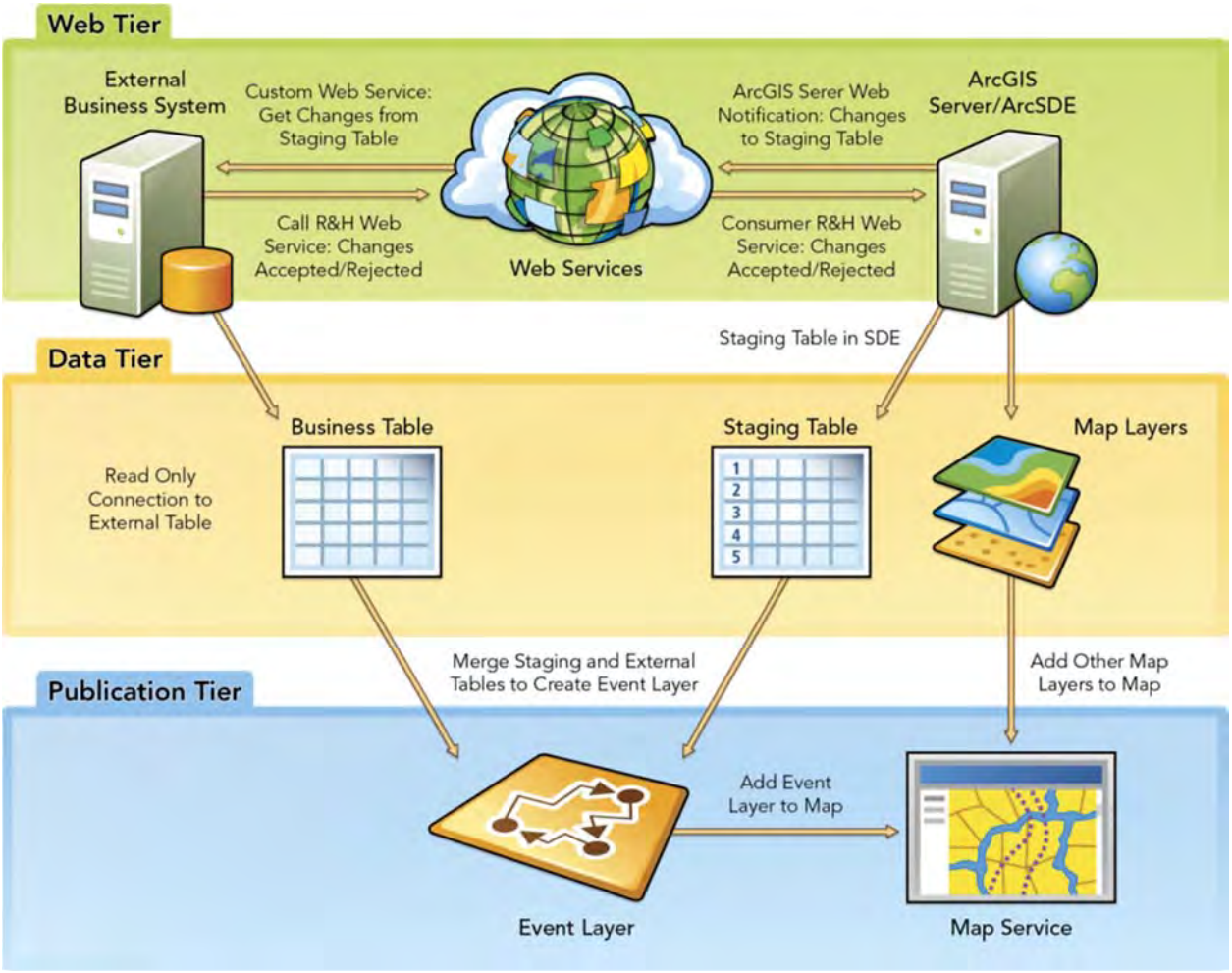
- Syncs with VUEWorks for simple “grab and go” field device use
- Work with your GIS data in a fully connected or disconnected state
- Perform asset condition inspections, asset attribute updates and capture new assets
- Designed for tablet form factors and touch input

Esri Roads and Highways

The Esri Roads and Highways solution enables integration with authoritative business systems for display of related data on GIS maps, in tables and within reports. Business systems interface with Esri Roads and Highways through two distinct data exchange paths. A read-only path from external business systems to Esri Roads and Highways solution via REST-based web services enables LRS Users and GIS Users to view and report on information contained in those external business systems as it relates to LRS tabular and map based data managed by Esri Roads and Highways solution. A create/update/retire path allows external systems to connect to Esri Roads and Highways solution and inspect the LRS as well as ingest changes to the physical network or measures on the network.

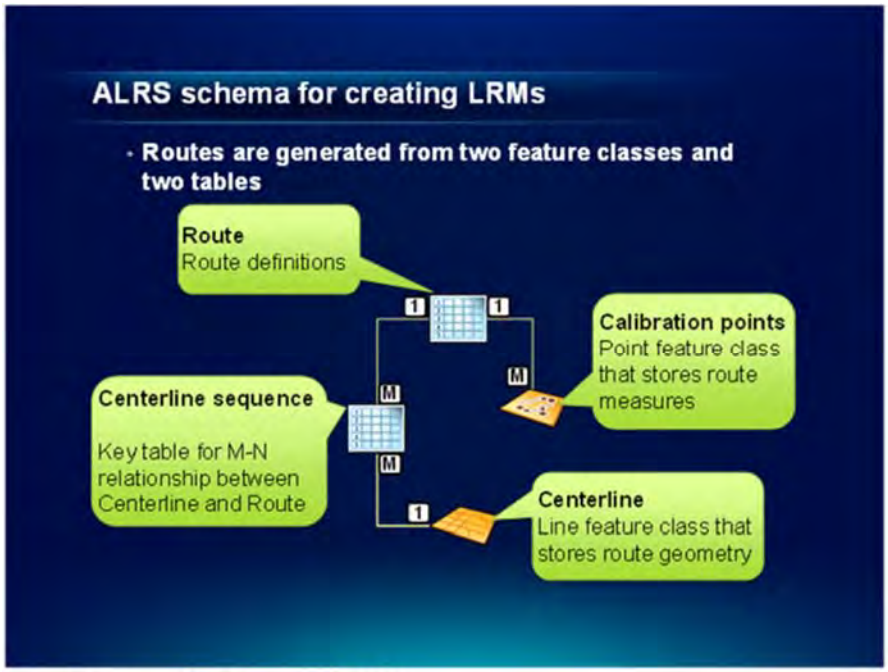
When changes are made to the LRS Network using Esri Roads and Highways (realign route, retire route and extend a route), the solution automatically analyzes the impact these changes have on registered event layers from an external system. Any impacted events are read from their native system and compared with registered events within the Esri Roads and Highways GIS environment with measure and/or route reference modifications, as appropriate according to the preconfigured event behavior rules. When the change is committed to the database, a web service call notifies the external system that event records have been impacted. This change notification can happen when the change is published, during a scheduled synchronization process or when synchronization is triggered by a user.

Change records that have been rejected will be dealt with by the LRS maintenance TAMS within MDOT. Change records that have been accepted and incorporated into the target system will be reflected in Esri Roads and Highways when the event records are refreshed by redrawing a map or otherwise querying the database. The figure illustrates the integration process concepts.



Esri Roads and Highways External System Integration Framework

The Esri Roads and Highways schema is designed to manage multiple LRMs and support a wide variety of business systems leveraging a common centerline geometry within a single advanced linear referencing system (ALRS).



Esri Roads and Highways ALRS Schema

The above figure illustrates the Roads and Highways ALRS schema. Route geometry is stored as a single Centerline feature class within the geodatabase. This feature class stores only the geometry, not the route definitions or measures. Route definitions are stored in the Route table. The Route table contains definitions for all identified routes in all LRMs. Between the Centerline feature class and the Route table resides a cross reference table called CenterlineSequence. CenterlineSequence supports the many-to-many relationship between centerlines and routes. When routes are constructed from centerlines, CenterlineSequence provides the keys that indicate to Roads and Highways which routes are made up of what centerlines.

In this manner, centerline features are reused to create multiple routes across multiple LRMs. This allows Roads and Highways to represent multiple routes leveraging a common set of geometry for all. It also supports concurrent or overlapping routes within the same LRM as well as gapped or discontinuous routes. Finally, measure values are stored in the Calibration Point feature class. By supporting measures separate from centerline geometry, Roads and Highways avoids error prone translations between LRMs by allowing the system to read across all LRMs simultaneously. It is not necessary to transform event measures from one LRM to another in order to perform overlay analysis across multiple LRMs.

These four ALRS schema elements are managed automatically and maintained through the Roads and Highways Desktop tools. When routes are updated using the Roads and Highways tools, Centerline, CenterlineSequence, Route and Calibration Point are automatically updated as well and synchronized to the new highway alignment.

Transcend Solutions

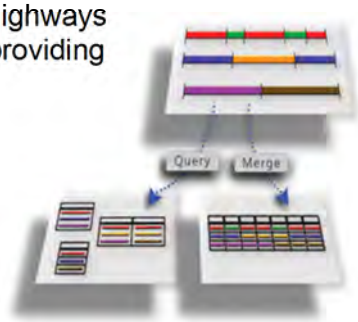
Road Analyzer™ – Road Analyzer is Transcend's configurable straightline diagramming environment. It provides access to roadway business data in a stacked bar display format and is especially useful when many types of data elements need to be visualized at a single location on a transportation network. Road Analyzer can be integrated with Transcend's Map Analyzer (described below), Transcend's custom Videolog viewer or several commercially-available videolog viewing tools.

For clients that have Esri's Roads and Highways (R&H) Solution, Road Analyzer has been integrated with this toolset. Road Analyzer can be launched from within the Roadway Characteristics Editor (RCE) module of R&H and can be used in conjunction with RCE for editing business data.

Map Analyzer™ – Map Analyzer is Transcend's geospatial web portal. It builds upon Esri's tools providing streamlined functionality specifically for the transportation industry. In addition to basic mapping functions, Map Analyzer provides sophisticated thematic mapping, redlining, temporal and advanced querying capabilities. Together with Road Analyzer, Map Analyzer provides users with a full range of data access, editing, analysis and reporting capabilities. Map Analyzer can be integrated and used in conjunction with Road Analyzer or it can be configured as a separate solution.

MAVRIC™ – Mobile Asset Verification and Roadway Inventory Collection (MAVRIC) is Transcend's geospatially-enabled, tablet-based mobile field data collection tool. MAVRIC provides easy to use GPS-enabled data collection that integrates with an agency's LRS and mapping environment. Data is stored on an enterprise server and synced to the MAVRIC environment to provide local access to data while in the field. MAVRIC allows users to view roadway data through wireless networks (where available) or in disconnected mode via easy-to-use touch/stylus tools that include maps (native or commercial formats), straightline views of infrastructure and data elements and videologs. MAVRIC is fully integrated with Road Analyzer, Map Analyzer and Esri's R&H Solution.

Roads and Highways Productivity Tools – The Roads and Highways Productivity Tools augment the Esri Roads and Highways solution by providing efficient tools for managing and analyzing your transportation data.



- Segment Analyzer – Advanced dynamic segmentation tools
- Intersection Manager – Automated intersection attribution creation for MIRE
- HPMS Assistant – Streamlined HPMS validation and submittal tools
- Report Engine – Customizable report formatting and generation
- LRM Converter – Batch and on-the-fly LRM-to-LRM transformation tools

B. Project Initiation Services

Contractor will work with the State to initiate and provide planning resources and services to ensure Solution is ready for go-live production by the target date listed above. This includes all the services detailed in 1.300 Project Plan and 1.400 Project Management in addition to the activities specified below.

Project Kick-off Meetings

Contractor will work with Client to arrange official project kick-off meetings as follows:

- *Orientation Meeting* – as further defined within Article1, Section 1.301;
- *Project Initiation Meeting* – a joint presentation by Contractor to the Project Steering Committee and Working Group outlining the proposed approach to the TAMS Phase 1 implementation, including but not limited to the following: an overview of the proposed COTS software, project plan, Contractor resources, costs, Critical Success Factors ("**CSFs**") and risk mitigation plan.

COTS Software Orientation Workshop

Contractor will prepare and deliver a COTS Software Orientation Workshop for Client's Project Working Group to demonstrate in detail the functionality contained within the proposed TAMS solution. This workshop will also cover the technical environment requirements for the proposed Solution and required Client staff support resources.

Deliverable(s)

- Project Kick-off Meetings and Presentations
- COTS software orientation workshop
- Project Plan as per Article 1.300
- Project Management as per Article 1.400
- Any other deliverable Contractor deems appropriate

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.
- Project Plan in conformance with specifications detailed within Article 1.300
- Proposed Project Management services in conformance with specifications detailed within Article 1.400

Contractor Agreement & Approach in regards to Section 1.104, B. Project Initiation Services	
x	I have reviewed the above section and agree with no exception.
	Project Kick-off Meetings The DTS team will work with the State to arrange official project kick-off meetings as follows: **Orientation Meeting** Within 10 calendar days from execution of Contract, the DTS team will attend an orientation meeting to discuss the content and procedures of Contract. This meeting will be held in Lansing, Michigan at a date and time mutually acceptable to the State and the DTS team. The DTS team understands that the State will bear no cost for the time and travel of the DTS team for attendance at the meeting. **Project Initiation Meeting** The DTS team will provide a joint presentation to both the Project Steering Committee and Working Group. During this meeting the DTS team will outline the proposed approach to satisfy the requirements for the TAMS Phase 1 implementation. Items included as part of this meeting will be but not limited to the following: an overview of the proposed COTS software, project plan, Contractor resources, costs, Critical Success Factors and risk mitigation plan.

VUEWorks, Roads & Highways and Road Analyzer Software Orientation Workshop

The DTS team will prepare and deliver a COTS Software Orientation Workshop for the State's Project Working Group to demonstrate in detail the functionality contained within the proposed TAMS solution. This workshop will also cover the technical environment requirements for the proposed Solution and required State staff support resources.

Project Plan Information

The DTS team believes a solid Project Plan must include several key elements, including, but not limited to, the following:

1. Identification of stakeholders (internal, external, project team, departmental, etc.)
2. Identification and documentation of stakeholder needs and project goals
3. Identification of needed resources, budget and schedule
4. Identification of potential risks and risk mitigation strategies
5. Listing of tasks, duties, responsibilities and timeframes
6. Quality/performance metrics in order to establish task completeness
7. Additional complementary plans such as communication, issues, configuration, change and risk management plans

Our Project Plan/Schedule is included in Attachment C and below we describe our approach to project management, implementation and key guidance documents that we use throughout a project's lifecycle. In addition, the plan and schedule combined define the roles and responsibilities of both the DTS and MDOT teams in relationship to requirements building, configuration, implementation, testing and reviews.

Project Management and Implementation Approach

The Agile Process – DTS Approach to Project Management and Implementation

The agile process is based on collaboration and the ability of the implementation team and the stakeholder organization to work together openly and collaboratively. It relies on the constant inspection and adaptation of the process itself and the backlog of requirements. As such, it is a communications-intensive approach to software implementation. The collective group of agile practices DTS actively employs on software implementation projects is known as Scrum. It is a set of guidelines and practices that encourages frequent communication and collaboration and intensely focused requirements gathering, COTS software configuration and deployment effort throughout the life of a project. It is an iterative approach and is described in detail below.

Backlog Development

DTS will work closely with the State to develop a backlog of requirements and critical issues for the workflow definition, software configuration and deployment phases of this project. The backlog will initially be developed at a high level. After creating the backlog, DTS will work with the State to prioritize the user stories (i.e. requirements) within the backlog to ensure that the most valuable software modules are configured first.

Iteration Planning

The DTS software implementation teams work in two-week iterations. At the start of each iteration, the implementation team and the State will conduct an iteration planning meeting. Upon selection of the backlog items to be addressed during the iteration, the State and DTS will collaboratively discuss the user stories selected in detail. This discussion will allow everyone involved to adequately define the requirements and conditions of satisfaction so that DTS can provide high quality deliverables at the conclusion of the iteration. Following this discussion, the DTS team will internally decompose the user stories into detailed tasks to be accomplished during the upcoming iteration. Time estimates are placed against the tasks and DTS team members select the tasks they will work on during the iteration. An

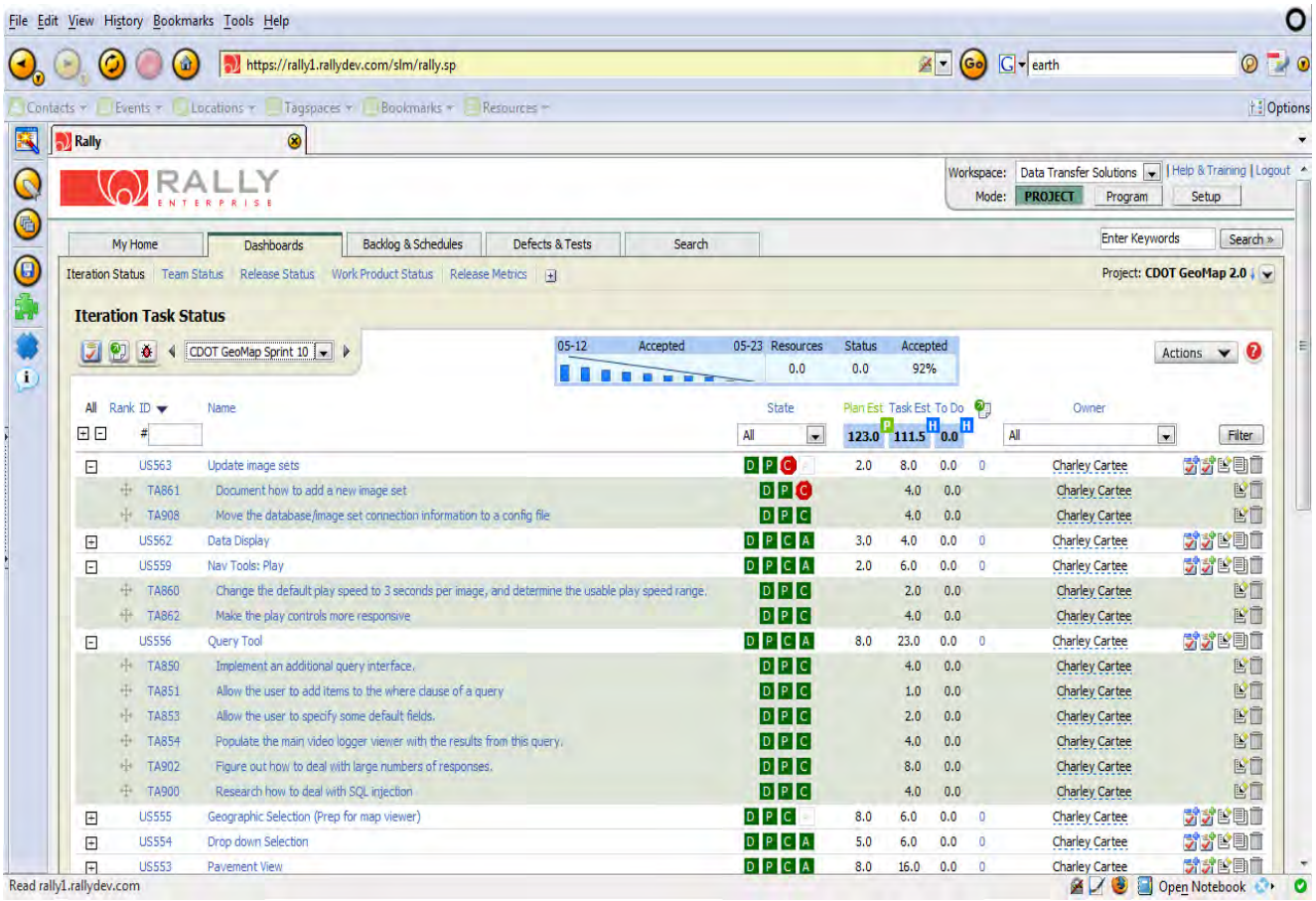
example of an iteration may include the development and testing of the Work Order Module specific to particular maintenance activities (e.g., inspection of sign condition, or culvert compliance).

The Iteration

Following the Iteration Planning Meeting, the implementation team will immediately begin working on the functionality, to be configured during the iteration. Our implementation team is completely dedicated to the user stories in the iteration without disturbance from external influences or other project work. They will work closely with the State during the iteration to ensure that what is being produced is precisely what the State requires.

The work of the iteration typically includes configuring, testing and documenting VUEWorks, Roads & Highways or systems integration functionality, but frequently will include workflow diagrams, software configuration mockups and any other work products configured during the iteration.

The DTS team will provide a web-based Project Management and Implementation task tracking, defect reporting, configuration management and testing tool free of charge. This agile software tool provides a transparent approach to project management and implementation where MDOT is able to review the backlog, progress, testing and completion of a particular COTS software configuration and/or systems integration component. An example is provided below:



DTS will initially prepare a project plan for approval by MDOT, and as the project progresses will have an installation test plan prior to installing the system on the State's servers. DTS implementers can use load and performance testing software/tools if requested by MDOT. Load and performance testing and capacity evaluation can be conducted once the application is installed in the test environment. Test results can be tracked and reported as the test deliverables.

Also, as part of our Project Initiation activities, we will work with MDOT to establish guidance documents that will be used to manage the project throughout. These documents will address Issues, Risk and Change Management and some of their expected content is highlighted below:

Issue Management Plan

The purpose of the issue management plan is to specify the processes used to identify and manage project issues. The issue management plan addresses both internal and external issues on the project. Using specific project management tools to enter, track and report issue activity. Both the issue management plan and the issue log will be reviewed regularly throughout the project to monitor existing issues and to identify new ones.

DTS will maintain an issue log for issues relating to the provision of services under this Contract. This issue management log will be communicated to the State's Project Manager on an agreed upon schedule, with email notifications and updates. The issue log must be updated and must contain the following minimum elements: description of issue, issue identification date, responsibility for resolving issue, priority for issue resolution (mutually agreed upon by the State and DTS), resources assigned responsibility for resolution, resolution date and resolution description.

Issues will be escalated for resolution from level 1 through level 3, as defined below:

Level 1 – Subject Matter Experts (SMEs) / Business leads

Level 2 – Project Managers / Business Owner

Level 3 – Executive Sponsor

Identification/Communication of Issues

Issues will be identified during the draft review period for project deliverables. DTS will provide access its online issue tracking tool highlighted above. The State's team will have complete access to the tool to track issues. The State will either enter issues into the tool or communicate all issues to the DTS team in an Excel format prior to the end of the review period.

Process/Tool for Issue Tracking

DTS will use a web-based tool to track and manage issues identified in each of the gates specific to the ***TAMS*** project. User accounts for the following user groups will be created by DTS in the tool.

1. State's Management Team
2. DTS Management and Development Team
3. Esri Management and Development Team
4. TSS Management and Development Team

Users will have the ability to create/update issues, track status and generate issue tracking report. Specifically, the users will have the ability to track the following:

1. Status: New, Assigned, Resolved, In QA or Closed
2. Priority: Low, Normal, High or Immediate
3. Assignee: Name of the person assigned to the issue
4. Target version: Development version
5. Verified: Yes or No
6. Start date: Start date for when the issue needs to be worked on
7. Due date: Date the issue needs to be addressed by
8. % Done: Percent complete
9. Subject: Subject of the issue
10. Description: Description of the issue
11. Attachments: Upload any documents specific to the issue

Relationships among Issues, Risks and Change Requests

Issues are events that are occurring now or have already occurred. An issue is not an event or item that may occur at a time in the future. If something is definitely going to happen or it has already happened, then it is an issue. If it is something that might happen - whether it is very likely or very unlikely - then it is a risk. An issue can turn into a risk and a risk may result from an issue. An issue can be associated to a risk. Prompt issue resolution can minimize project changes.

Risk Management Plan

A formal risk management plan format will be submitted to the State for approval within twenty (20) business days after the effective date of Contract. DTS has reviewed the State's PMM Methodology document and will submit a risk management plan for the initial planning phase of TAMS project, in accordance with the State's PMM methodology. DTS understands that once both parties have agreed to the format of the plan, it will become the standard to follow for the duration of Contract. This plan will be updated bi-weekly, unless another timeframe is agreed upon.

The purpose of the risk management plan is to specify the processes used to identify and manage risk. The risk management plan addresses both internal and external project risks associated with the project, and is drafted prior to completion of the project planning phase. Both the risk, management plan and the risk log will be regularly reviewed throughout the project to monitor existing risks and to identify new ones.

The project manager is responsible for facilitating sessions with project stakeholders to identify risks. A risk owner is assigned to each risk, with responsibility for developing, documenting and executing risk action plans. The project manager is responsible for monitoring the status of all project risks and escalating as appropriate.

DTS can provide the tools to track risks and will work with State to allow for their input into the prioritization of risks.

DTS understands it is responsible for identification of risks for each phase of the project and that mitigating and/or eliminating assigned risks will be the responsibility of the DTS team. Furthermore, DTS understands that the State will assume the same responsibility for risks assigned to them. Project risks can be identified by using one or more of the following techniques:

Technique	Description
Interviews	Interview relevant project stakeholders to identify their concerns, which may provide insight into real project risks.
Risk brainstorming workshops	Conduct risk brainstorming workshops with relevant project stakeholders to identify risks, including key risk influencers, risk levels and possible impacts.
SWOT analysis	Conduct a strengths, weaknesses, opportunities and threats (SWOT) analysis to gain a holistic view of the project with respect to risk. Threats are project risks Opportunities represent lost potential benefits if not pursued Weaknesses, if not properly mitigated, can negatively impact a project Strengths should be leveraged to help the project mitigate the identified project threats
Process reviews	Identify process-related risks by reviewing the various project management processes, tools and techniques described in the Quality Management Plan.
Previous project reviews	Identify risks from previous projects of similar size and complexity, using available project data and lessons learned.

MDOT Example Risk Management Plan

Introduction

The purpose of the Risk Management Plan is to define the plan for managing risks and provide a process for identifying, analyzing, prioritizing and controlling risks during all gates associated with the TAMS project. Project risks will be collaboratively identified early on during the planning gate and will be updated during the remainder of the gates. This Risk Management Plan serve as a guide for managing project risks throughout the life of the project and will be updated on a weekly basis or when there is a change in the risk status.

Risk Identification

Project risks identified will be entered into the Risk Register (separate Excel spreadsheet delivered along with the Risk Management Plan). The Risk Register will be updated on a weekly basis by DTS and will be submitted to MDOT along with the weekly project status reports.

The Risk Register will include the following information:

1. Risk Statement: a clear and concise explanation of the context of the risk. The risk statement includes the:
    a. Risk (Event) Description: explanation of the risk event or the occurrence that has caused the risk (e.g., customer submits changes to requirements after requirements are baselined)
    b. Risk Consequence: potential effect or outcome of the risk (e.g., changes could extend project delivery completion date)
2. Risk Trigger/Causes: act or event that serves as a stimulus and initiates or precipitates the risk
3. Assessment: a value (e.g., Low=1, Medium=2, High=3) that represents the result of identifying, classifying, analyzing and prioritizing risk
    a. Impact: result of determining the nature of possible effects of the risk
    b. Probability: degree of likelihood or chance that the risk will occur
    c. Level of Control: extent to which the project team lacks control over the risk being realized
    d. Total: sum of the Impact, Probability and Level of Control values
4. Risk Response Strategy: one or more options to address the risk
5. Actions Required to Implement Response Strategy: activities that will be carried out in order to accomplish the risk response strategy (e.g., revising the Project Plan to include additional activities, defining various alternatives to address the risk)
6. Risk Owner: name of the individual(s) or party(s) responsible for managing the risk
7. Completion Date: date mm/dd/yy the risk response actions were completed

Risk Status

The Risk Status Report as shown below will be updated on a weekly basis by DTS and will be submitted to MDOT along with the weekly project status reports.

Risk Status Report			
Agency/Organization Name		Version Number	
Project Name		Revision Date	

Rank	Risk Statement		Rank This Time	Rank Last Time	# Times on List	Risk Response Progress
	Condition	Consequence				

Change Management Plan

The purpose of the change management plan is to describe the process involved with identifying, escalating and managing project changes. A project change is defined as something that is outside the documented and approved project scope or is a change to project requirements, project schedule or project cost (including resource effort). A project change requires approval for additional resources, funding or modifications to the project schedule. The change management process defines how to handle project changes that present either a negative or positive impact on deliverables, schedule, budget and/or resources. DTS will utilize project management tools is the repository for all project changes.

- **Change Management Roles and Responsibilities**
  - **Project Sponsor** The project sponsor does not directly participate in change management activities, but serves as a point of escalation as required. The project sponsor has sole decision making authority to approve changes to the total project budget.
  - **Project Manager** The project manager is responsible for bringing change requests to the Change Control Board (CCB) for its review and decision making. Upon approval of a change request, the project manager is responsible for overseeing the change and making appropriate modifications to appropriate project documents.
  - **Change Control Board** The CCB meets on a regular basis to review, approve or reject proposed project changes. The project manager may convene a special session for the purpose of reviewing a specific change request(s) as required. The makeup and formality of the CCB will depend on the size and complexity of the project.
  - **Project Team Members** Project team members are empowered to initiate change requests. Members serve as subject matter experts and are responsible for analyzing, documenting and estimating impacts of change requests on schedule, budget, resources, scope and quality.

DTS understands that if a proposed contract change is approved by the State, Contract Administrator will submit a request for change to the Department of Technology, Management and Budget, Procurement Buyer, who will make recommendations to the Director of DTMB-Procurement regarding ultimate approval/disapproval of change request. Furthermore DTS recognizes that if the DTMB Procurement Director agrees with the proposed modification and all required approvals are obtained (including State Administrative Board), the DTMB-Procurement Buyer will issue an addendum to Contract, via a Contract Change Notice. DTS understands that provided products or services prior to the issuance of a Contract Change Notice by DTMB-Procurement, risk non-payment for the out-of-scope/pricing products and/or services.

Out of Scope Process Description

Out of Scope project changes will be proposed in the form of a change request that has been captured in project management tools. The change requests are started by a Change Request Initiator who provides as much information as possible to document and initiate the request. The change requests will contain information such as brief description, impact, alternatives, detailed description, final recommendation and other pertinent information.

Out of Scope Change Request Tasks:

Task	Action	Responsibility / Agent
1.	Identify and document change requests	Change Request Initiator
2.	Assign Change Request Person Responsible	Project Manager
3.	Collect and document project impacts, including changes to costs and schedule	Change Request Person Responsible
4.	Validate change requests in the Enterprise PPM	Project Manager
5.	Review change request details for feasibility	Project Manager
6.	Facilitate CCB review / make decision	Project Manager/CCB Members
7.	Communicate decision and closure	Project Manager
8.	Update appropriate schedules and documents	Project Manager
9.	Update status and close change request	Project Manager

DTS will employ the change control methodologies to justify changes in the processing environment, and to ensure those changes will not adversely affect performance or availability.

C. Requirements and Solution Architecture Validation Services

TAMS Software Requirements Validation and Solution Configuration Specifications

Contractor is responsible to meet with State staff to review the specified requirements (see Article 1, Section 1.103 above and Attachment A) to ensure that Solution can be implemented successfully within the State IT environment. Contractor will identify any functional or technical issues that need to be addressed for successful implementation and propose resolutions to be undertaken as part of both the initial software installation and Section E - Implementation Services.

As a result, Contractor will provide a Solution Configuration Plan to detail how Solution will be set up to provide the State's requested functionality. Contractor will provide a Screen Configuration Plan to portray data to the State's satisfaction. At the State's request, Contractor will provide Solution and Network Architecture information relevant to DTMB submitting and approving an Enterprise Architecture Solution Assessment (see Attachment H) and an IT Security Assessment.

Deliverable(s)

- TAMS Solution Configuration Plan
- TAMS Screen Configuration Plan
- TAMS Solution and Network Architecture information
- Any other deliverable Contractor deems appropriate

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.
- TAMS Solution Configuration Plan and Screen Configuration Plan must comply with State specifications for these document deliverables.
- TAMS Solution and Network Architecture information provided must be sufficient in detail to support State assessment requirements.
- Any other deliverable Contractor deems appropriate

Contractor's Agreement & Approach in regards to Section 1.104, C. Requirements and solution Architecture Services

x I have reviewed the above section and agree with no exception.

Solution Configuration Plan Overview

Purpose

The purpose of this Configuration Management (CM) Plan is to provide an overview of the organization, activities, overall tasks and objectives of Configuration Management for the Michigan Department of Transportation (MDOT) Transportation Asset Management System (TAMS) project. It addresses configuration item (CI) identification, change control and configuration audits at a high level. Additional details regarding CM activities, techniques and tools are provided in the CM-related procedures.

Configuration Management Plan Scope

The MDOT TAMS project has established several levels of baseline, with appropriate levels of control for each, as summarized in the following table:

Baseline	Contents	Control Level
Requirements	• System requirements • Allocated requirements • Detailed requirements	MDOT IT Team
Production	Operational software and hardware	Change Control Board (CCB)
Process	Documented processes, plans and procedures	Project Management Team
Test	• System Test • User Acceptance Test (UAT) • Deployment Test environment	QA/QC Team CCB
Development	Local development environment	Local development team management

References

Document	Description
Concept of Operations (ConOps) Report.pdf as provided in original RFP. Concept of Operations (ConOps)	System Requirements and Design Requirements
TAMS As-Is and To-Be Process Flowcharts and Documentation.pdf as provided in original RFP.	Business Requirements

EAMS As-Is and To-Be Process Flowcl	
Attachment H - SOM Enterprise Architecture Solution Assessment Worksheet.doc	SOM Information Resources Architecture
SOM_PMM_Manual_456390_7.pdf	Project Management Methodology

Key Terms

Key Term	Description
CCB	Configuration Control Board
CCR	Configuration Change Request
CM	Configuration Management
IA	Impact Analysis
TAMS	Transportation Asset Management System
MDOT	Michigan Department of Transportation

Configuration Management Activities

Configuration Control Procedures

Non-Code Configuration Item

Document Item	Description
Test Item Transmittal Report	Test plan, procedure and reporting document
Release notes	Contains details of project/phase/sprint release information
Implementation Plan	Lists detailed implementation requirements and how/when against each of the requirements
Miscellaneous MS Office documents	Word, Excel files (Microsoft Office 2007)
Miscellaneous PDF documents	Adobe Acrobat files
Project schedule documents	Microsoft Project Standard 2003
Visio documents	Microsoft Visio 2007

Software Configuration Item

Software Item	Description
Web application tier source code files/binary files/installation files	Visual Studio 2008 environment
Database files (DB design and program files)	SQL Server
Version management of all software items	Subversion
Spatial Data Repository	ArcSDE on SQL Server
GIS files (shapefiles, maps, etc.)	ArcGIS

Status Accounting, Reviews and Reporting

Configuration status accounting will include recording and reporting of the change process. The goal of configuration status accounting is to maintain a status record of all items in the configuration baseline, thus providing traceability of all changes to the TAMS. Configuration status accounting will answer the following questions:

- What changes have been made to the system and when were they made?
- What components were affected by this change?

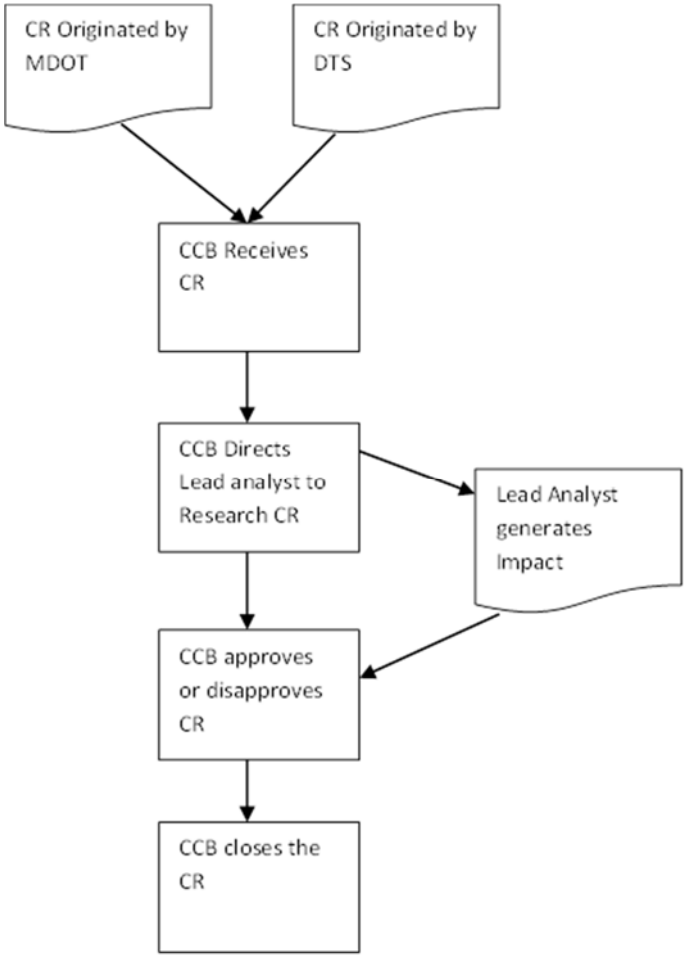
The major activities of configuration status accounting include:

- Identifying the configuration status information to be recorded
- Maintaining a record of configuration changes upon release of the code
- Reporting the status of TAMS system configuration management

At the TAMS architecture level, only the CCB will have the authority to approve and make changes to the components of the TAMS architecture baseline. Before considering any change, the potential change must be documented using a TAMS Change Request (CR) form as provided under Appendix A. This form describes the desired change, the justification for the change, the impact of implementing the change and the eventual CCB decision regarding the proposed change. CRs normally document code changes originating from the Lead Analyst, but a CR may be submitted by any of the project stakeholders.

The CR will be submitted to the Chair of the CCB who will route the CR to each Lead Analyst. Each Lead Analyst will fill in the Impact Assessment (IA) section in the CR documenting the impact of the change upon the phase/component. If a phase/component will be affected by the change, the IA will be returned with notations or comments documenting the Lead Analyst's technical analysis; the impact on the phase/component schedule, cost and labor resources and any suggested alternatives to the proposed change. If a phase/component will not be affected by the change, the IA will be returned indicating "no impact".

The CCB will meet either in person or by teleconference to discuss proposed changes. The CCB will use the IAs and the meeting discussion to decide whether to approve or disapprove a proposed change. The CCB meeting minutes will clearly document its decisions and the rationale supporting its decisions. These CCB minutes will be distributed to all project stakeholders. The figure below represents the Change Management process:



CM Process

The following sections present the configuration status accounting activities for the TAMS.

Identify Status Tracking Information

The following configuration status information will be regularly tracked on the TAMS-project level:

- Current architecture document
- Associated components
- Open Change Requests
- Closed Change Requests
- Components affected by Change Requests

At the component level, the CRs will provide configuration status information for each individual TAMS component.

Maintain Status Tracking

Project level configuration status information will be recorded and maintained in a centralized repository that using Subversion. This repository will contain the current architecture as well as any proposed and implemented changes to the project. Component configuration status information will be recorded and maintained in respective component folders.

Since the configuration status information is crucial to ensuring the integrity of the baseline, its components and the CM process, only authorized personnel should update this data. The CCB will identify the specific personnel authorized to update the status information changes and the specific changes that each person is authorized to make.

Report Status Tracking

Regular monitoring of the configuration status information will enable the Architecture Group and the Deployment Group to identify trends and potential trouble spots in the TAMS. Each of the two groups and the CCB in collaboration with MDOT's IT will determine the reports required for performing this analysis.

Management of Data Conversion/Migration

Asset Inventory Dataset	Migration Approach	Details
Lane Inventory	Geodatabase Feature Class	• Based on MGF
Signs	Application Data	• Functional requirements and an existing application may increase the complexity of the migration
Guardrail	Geodatabase Layer	• Currently not in a system • No legacy issues
Culverts	Events and Geodatabase Layer	• Currently not in a system • No legacy issues

Management of Interfaces to Other Systems

Application	Description	Database Type	Integration
MAIN	The MAIN (Michigan Administrative Information Network) vendor/payee file is the State of Michigan's centralized database maintained by the Michigan Department of Management and Budget (DMB) for all individuals and entities receiving payments from the State.	ORACLE	VUEWorks Database Link (Through MIDB)
DCDS	Data Collection Distribution System – Time sheet collection and payroll Distribution	ORACLE	VUEWorks Database Link (Through MIDB)
LAPS	Local Agency Payments System - Streamlines the payment process for local agency maintenance contracts. It is a cross- functional information system consisting of five modules to track and process billing information. The system is primarily vouchers for payment and maintaining and forecasting budgets. It is responsible for collecting routine and non-routine bills submitted by local contract agencies, validating billing transactions against MDOT data, assisting in review and approval of bills and audit bills.	ORACLE	VUEWorks Database Link (Through MIDB)
LARS	Local Agency Reimbursement System	ORACLE	VUEWorks Database Link (Through MIDB)

MIDB	Management Information Database – A data warehouse consisting of data from the State of Michigan's accounting, purchasing and human resources systems.	ORACLE	VUEWorks Database Link
TMS	The Transportation Management System (TMS) is an integrated and automated decision-support tool. Within the context of asset management, TMS provides the capability to identify and monitor infrastructure condition, analyze usage patterns and determine deficiencies. The system was developed to integrate multiple systems that use a consistent, collaborative decision- making process that supports planning, program development and implementation. Included Modules: Bridge,	ORACLE	These Event Tables will be registered as foreign event tables for access within TAMS. Road and Highway database integration strategy is based upon MGF
MaintStar	MaintStar is the Fleet Management Program that MDOT uses to track the inventory and services of all MDOT owned vehicles and equipment. MaintStar is also used to create work orders for needed equipment services and repairs and calculates the cost of maintaining the equipment fleet.	ORACLE	VUEWorks Database Link
Global Database	This database is the central repository for information that will be shared by many systems supporting MDOT. It holds location-based (spatial) and other data that is considered to be at the enterprise level. Ownership of the contents will cross MDOT organizational boundaries with DTMB staff acting as data custodians. The current methods for data delivery are direct database access, spatial data access through ArcServer / ArcSDE and/or services within an SOA Architecture.	ORACLE	VUEWorks Database Link
MiBridge	MIBridge is a new web- based application designed to replace the current MBRS system as of January 2014. It will allow users to securely and conveniently view and/or export bridge data from the PONTIS database. This database is large and is being updated continually.	ORACLE	VUEWorks Database Link
MGDR (MDOT Geospatial Data Repository)	This database contains MDOT's current SDE asset inventory. All absolute location (x, y, z) data is stored in the MGDR. The MGF road centerline network layer and other MGF basemap layers are also stored here. It is used by a number of MDOT users / applications to gain access to spatial data through ArcGIS for Server / ArcSDE.	MS SQL Sever	ArcGIS for Server / ArcSDE
PDRP	Property Damage Reclamation Process is the process used by MDOT to recover moneys spent on road repair due to damage created by traffic accidents.	ORACLE	VUEWorks Database Link
PAB	Project Accounting and Billing - Used by Financial and Project Accountants (FOD staff) for viewing project accounting details at the lowest level	ORACLE	VUEWorks Database Link

M5 Fleet Focus	Vendor: AssetWorks FleetFocus M5 Fleet Management System is a comprehensive application that provides fleet asset management and operations data and functionality	ORACLE	VUEWorks Database Link
SCAS	Signal Cost Accounting System - Web app used for entering Electricians Job Reports. Finance uses this application for creating the Invoice Report for the local agencies.	ORACLE	VUEWorks Database Link
Project Wise	Document Management System used to store drawings, documents and other content.	N/A	Link to VUEWorks

Staffing – Roles and Skills

CM Entities

The CCB will provide cross-phase CM control and coordination.

Change Control Board

The CCB will be established as a formal approval authority for changes. It primarily exists to control changes to the EMAS architecture; however, any TAMS issue with significant cross-component impact should involve the CCB. Written Change Requests (CRs), Impact Analyses (part of CRs) and meeting minutes will document the CCB's consideration of an issue. Appendix A represents the Project Change Request template.

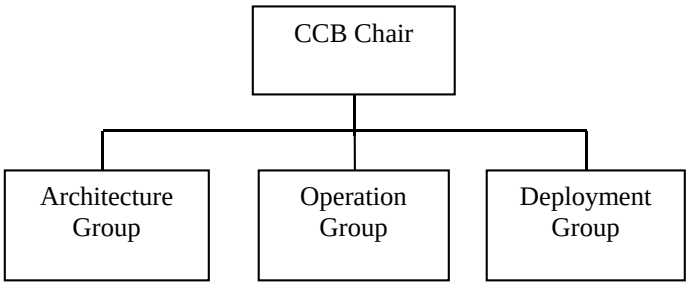
A Change Request (CR) form will initiate CCB consideration of a change. Any project stakeholder will have the ability to submit a CR to the CCB. The Architecture Group will generate most configuration specific CRs. Upon receipt of a CR, the CCB will request each member to research the incident and record its analysis on an IA. These IAs will document the data upon which the CCB will have based its decision. The CCB will identify the appropriate change resolution activities and will authorize the affected phase/component to be modified. The CCB will be notified immediately when the actual change has been completed and the configuration status information will be updated accordingly. The decision of the CCB and its rationale will be recorded on the CR. The CR will be closed and copies distributed to each member organization.

The CCB will be comprised of representatives from the following IT organizations:

- Architecture Group
- Operation Group
- Deployment Group

One representative from each of these groups must be identified as group head and have the authority to commit to his or her group. Any changes that are within the group's scope and do not affect the other groups will be authorized by the respective group head. Since the CCB will consider and resolve cross-component issues, its Chair should be a person with the authority to mandate actions across the organization and its groups. In addition, since final responsibility resides with the CCB Chair, this person will have the authority to mandate or override decisions made by the CCB.

Figure 3-1 graphically presents the organization of the CCB.



Change Control Board

Configuration Management Plan Maintenance Process

A configuration baseline is the foundation of configuration management. The initial baseline is outlined in the scope of this document. Each baseline captures an approved snapshot of the TAMS and its components at a given point in time. The conventional configuration management model constructs a system baseline from the top-down. In this model, a baseline is comprised of a specific release of each component and any change to any component must be considered and approved by the CCB. The following information will be recorded for each CCB Meeting:

- Meeting date, time and duration
- List of attendees and their organizations
- Items discussed
- Existing action items
- New action items
- Decisions made

Version Control

Naming Convention

All document type files will have the following naming format: {Prefix}_{ShortDescription}_{Version}.{doc type}

Below are the list of document type and their prefix:

Document	Prefix
Project Plan	PP
High level design	HLD
Low level design	LLD
Database model	DDD
Software Requirement specification	SRS
Software Functional specification	SFS
Workflow diagram	WF
Test Plan	TP
Test result	TC
Configuration files	CONF
Meeting Minutes	MM
Change Request	CR
Trouble Report	TR
Release package file	RL

{ShortDescription} – indicates the subject area of a document

{Version} – indicates the release that a document is associated with

{doc type} – indicates the application that a document is associated with. For example: Microsoft Word documents will be named *.doc, Microsoft Project plan documents will be named *.mpp, etc.

Document Version Control

Documents will be maintained and versioned using Subversion. Version control allows for the ability to revert a page to a previous revision, which is critical for allowing authors to track each other's edits and to correct mistakes.

Release Management

Release Notes

The release notes document will be a text file with .txt extension.

The release notes filename will be "ReleaseNotes.txt".

Release notes will have the following sections:

Release version

This section contains the version of current release. This section also identifies major updates done from the previous release.

Installation

This section briefly outlines important pre-installation steps to be performed, if any, to ensure proper installation of the current release.

Manifest

This section lists out the contents of the release package.

Minimum System Requirements

This section provides the information on minimum system requirements.

- System Processor:
- System Memory:
- Free Disk Space:
- Operating System:
- Networking:
- Existing Software:

Version Compatibility

This section explains the compatibility with previous releases. This section may also explain steps to be performed to make some of the functions from the previous version work with this release version.

Release Matrix

Release Types

Sprint Release	Contains the most up-to-date code for the entire system. The focus for testing/review of a sprint release is the code/documentation developed during the sprint.
Phase Release	Contains all components/documents related to the specific phase being released. The focus for testing/review of a phase release is all the code/documentation developed during the phase.
Project Release	Contains all components/documents up to and inclusive of the most recent version of all sprints and phases. Testing/review is done on all code/documentation for the project.

Revision History

Name	Date	Reason for Changes	Version
Initial		Initial draft	1.0 draft 1

Screen Configuration Plan

Since the agile process is based on collaboration and the ability of the implementation team and the stakeholder organization to work together openly and collaboratively, the screen configurations the State will use for the UAT testing process are configured as part of each iteration and iteration review process. The State will have constant involvement in the configuration of the screens and will sign off on both the mockups and working prototypes prior to the implementation team proceeding to the next stage in the process. Furthermore the workflow tools and API's within VUEWorks will aid in the process since the team can utilize these tools during the workflow workshops meetings conducted with the State.

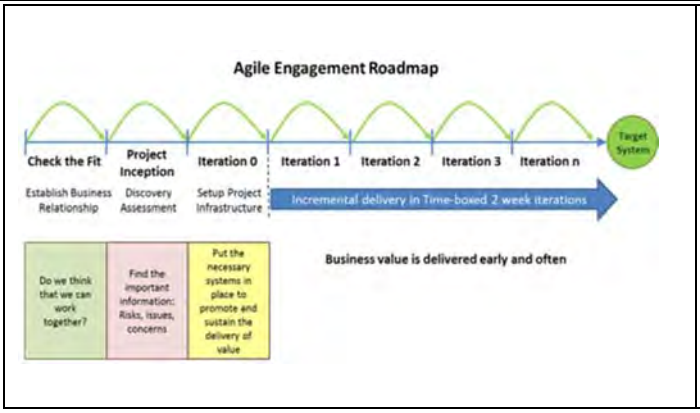
The Iteration

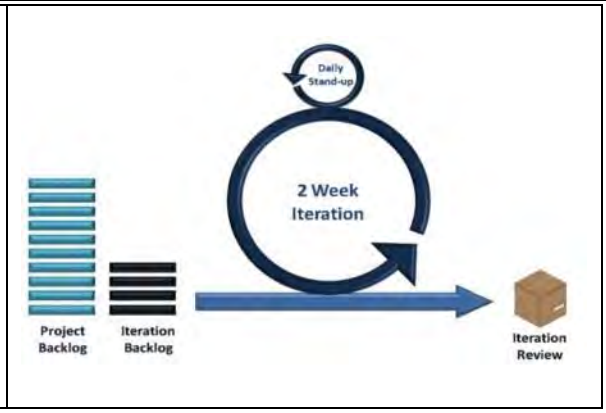
Following the Iteration Planning Meeting, the implementation team will immediately begin working on the functionality, to be configured during the iteration. Our implementation team is completely dedicated to the user stories in the iteration without disturbance from external influences or other project work. They will work closely with the State during the iteration to ensure that what is being produced is precisely what the State requires.

Iteration/Release Review

At the conclusion of each iteration, the DTS implementation team will conduct a review meeting in which the functionality configured during the previous iteration will be demonstrated live. The team will review the user stories that were included in the iteration and demonstrate and software functionality configured that correlates to each user story for the initiative.

At this time, the DTS team will solicit feedback from the State on the functionality configured in Roads and Highways, VUEWorks or the systems integration components depending on where we are in terms of the Project Plan. These review meetings provide a very high level of visibility into the TAMS project process and allows for an effective feedback mechanism for the implementation team.

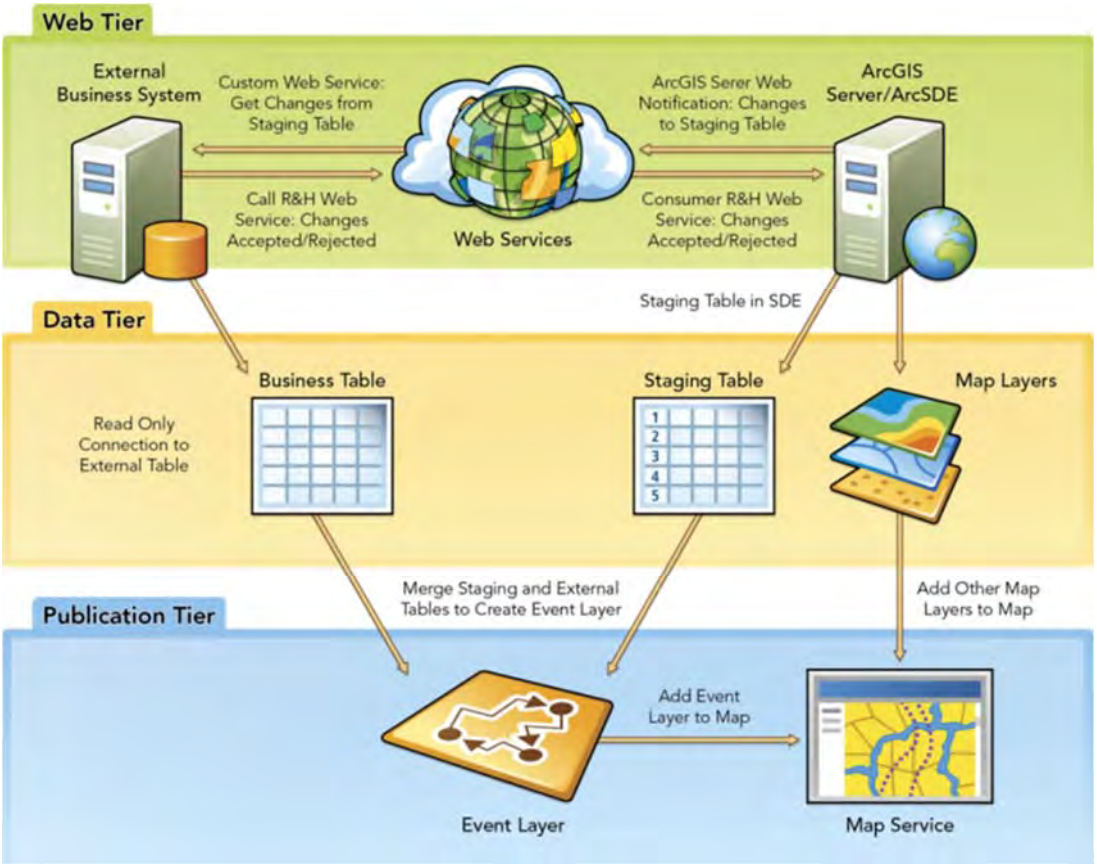




The following diagrams highlight the TAMS solution and Network Architecture information. The architectures below are recommended, but can be modified based on direction from MDOT and IT requirements of the State.

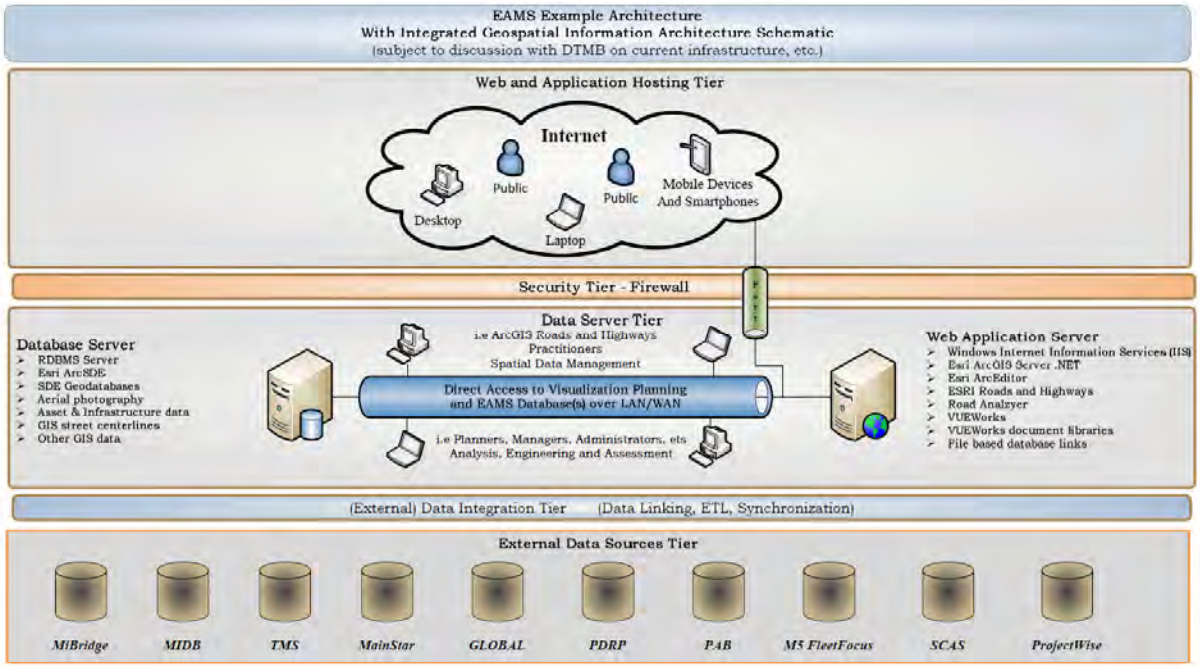
Solution and Network Architecture

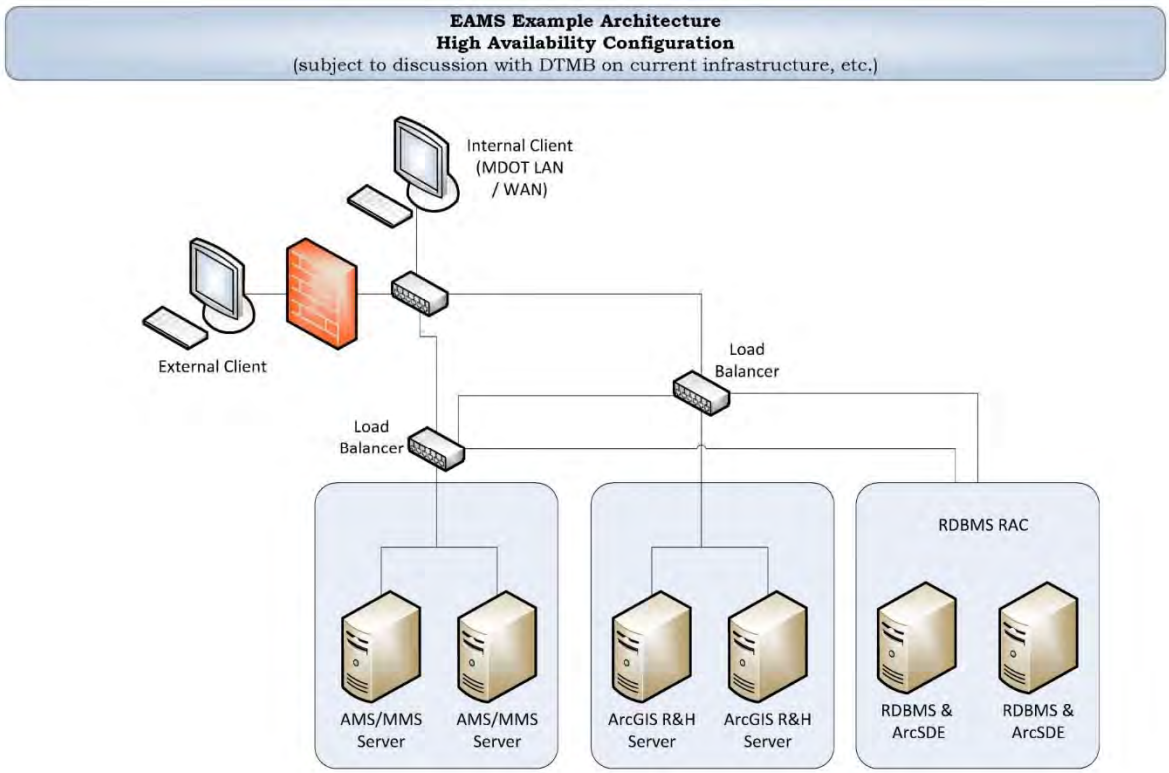
Esri Roads and Highways



VUEWorks TAMS Solution

The diagrams below represent a conceptual system architecture for the TAMS as both the minimum needs to be viable as well as a high availability architecture with load balancing for an optimal representation based on numbers of users and future growth.





Contractor completed, and the following documents are now attached to Contract.	
x	Attachment A – Solution Requirements
x	Attachment H – Proposed Enterprise Architecture Solution Assessment

D. Installation and Configuration Services
Contractor is responsible to install and configure the TAMS COTS working in cooperation with State IT and MDOT business user staff. This will include possible onsite troubleshooting to rectify TAMS COTS configuration and installation within the MDOT IT development, QA and production architecture environments. Specific service activities are described below.

TAMS Software Installation
Contractor is responsible to work with DTMB / MDOT IT staff to install the specified TAMS COTS software modules within the MDOT IT architecture environment specified in Article 1.103 above. Contractor will verify the successful operation of the installed "out of the box" COTS functionality within the MDOT IT environment using Contractor supplied test data and use cases sufficient to confirm that the software performs without malfunction within this environment.

Configuration (COTS)
Contractor will work with State IT staff to install and verify the TAMS Solution software within the specified MDOT application Development ("**DEV**") environment. Verification of software functionality will be conducted using Contractor supplied test data and test scripts in the presence of State IT staff that will be responsible to confirm the successful completion of the verification scripts. Contractor will configure the TAMS Solution to meet MDOT requirements in accordance with the approved TAMS Solution Configuration Plan and Screen Configuration Plan detailed above.

Deliverable(s)
- TAMS COTS installation within the MDOT IT environment
- Configured TAMS solution
- Any other deliverable Contractor deems appropriate

Acceptance Criteria
- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.
- TAMS COTS software modules are installed and functional within the MDOT IT environment to the satisfaction of MDOT IT staff and Business Leads
- Configured TAMS Solution in conformance with agreed TAMS Solution Configuration Plan and Screen Configuration Plan

Contractor's Agreement & Approach in regards to Section 1.104, D. Installation and Configuration Services	
x	I have reviewed the above section and agree with no exception.
	Installation and Configuration Services The project will begin with a series of planning and configuration validation activities. The objectives are for the DTS and MDOT project teams to first finalize the implementation plan and to review and validate solution architecture and configuration specifications for all TAMS components. The final outcome is an accepted configuration specification which will be a key acceptance milestone for the project. Once the configuration specification has been accepted, our team will continue with a database design, test data migration and **configuration of the MDOT R&H implementation, VUEWorks software and systems integration components** based on the configuration items defined during planning. Our team will use a phased-delivery approach for the deployment and is planning to configure the implementation in three iterations that will successively build on each other. Each implementation component is discussed below:

ESRI's Roads and Highways LRS Solution
This task will start with project initiation and planning:

- **Project Initiation and Planning**:
  - A review of MDOT's existing linear referencing items.
  - A review of MDOT's business processes mapped to Esri's Roads and Highways solution.
  - On-site workshop to define configuration of Esri's Roads and Highways solution, including the identification of MDOT data and workflows to be implemented.

- **Prototype Implementations, COTS Experience**: Esri will establish a staging system to support rapid availability of the Roads and Highways COTS Solution. Simultaneously it is recommended that MDOT and DTS prepare / stand up their own internal systems. A solution architecture review (webcast) led-by Esri will be phased in early on the project to guide MDOT and DTS with respect to readying their systems. Technical resources at Esri will review MDOT's and DTS's current (and proposed) systems and provide recommendations based on institutional knowledge from similar prior engagements and from the documentation MDOT and DTS provides with respect to specific workflows and potential number of users.

  The Esri controlled cloud-based staging system will be used for the following three iterations / activities:

  1. Prototype 1. Provides Roads and Highways configured with a mutually agreed upon, representative migrated subset of MDOT's data. MDOT and DTS team members can log into and utilize the Prototype version of the planned implementation. This approach enables MDOT and DTS project members the ability to better understand the intended solution as well as be able to envision how they will adapt MDOT business processes to best accommodate the Roads and Highways solution. The staging system will also facilitate feedback from MDOT and DTS team members to Esri.

     It is recommended that MDOT prepare to provide an internal environment for getting experience with the Roads and Highways applications during the first prototype.

  2. Prototype 2: Provides Roads and Highways configured with MDOT data maintenance workflows using Esri Workflow Manager (WMX). This iteration will allow MDOT and DTS project members to experience the engineered workflows in the context of the Roads and Highways framework using a subset data. The iteration will also facilitate feedback from MDOT and DTS team members to Esri.

     It is recommended that MDOT also stand up an internal environment with the same applications and datasets. The purpose of the MDOT internal environment is to let the users get acquainted with the applications and to be able to start testing system integrations inside the firewall.

3. Prototype 3: Provides Roads and Highways configured with migrated Statewide LRS data (full migration performed by DTS or MDOT) and an agreed upon subset of engineered WMX workflows. Esri will provide WMX training to MDOT staff so any remaining workflows required to complete LRS management data maintenance business processes can be configured by MDOT staff. This final configuration will be coordinated with the Statewide MDOT LRS Data Cleansing and Migration.

- Validate Configuration in QA Environment: Installation and configuration on the MDOT Test/Dev environment for the full set of migrated data. This environment will be used for complete series of configuration validation checks.

- Rollout: Support (onsite and remote consulting as needed) to the MDOT and DTS team to assist on deploying the system into production mode.

Esri will demonstrate the results of each prototype deployment through an iterative “gate” process. The objective for this process is to reach initial acceptance of each configuration stage before proceeding to the next step. System rollout and training will occur once quality assurance implementation has been completed and the system has been accepted into the MDOT infrastructure.

Install and Configure Roads and Highways
Esri will install the COTS Esri Roads and Highways solution on an Esri-controlled hosted configuration environment. Esri will use this site to configure Roads and Highways based on MDOT configuration items as documented in the Configuration Specification.

The key subtasks to be accomplished under this task include:

- **Configuration environment setup** - Includes the setup of Esri internal environment including servers and the installation of test database environment.
- **Prototype (Iteration) Configuration** - Includes the configuration of the Esri COTS Roads and Highways solution per the specifications in the Roads and Highways Configuration Report document. Functional testing will only be performed to confirm that the MDOT data is accessible within the Esri COTS Roads and Highways solution.
- **Software Demonstrations** - At the conclusion of each iteration, Esri will provide a webcast demonstration of the configuration to demonstrate the capabilities that have been accomplished and to communicate project status with key DTS and MDOT project stakeholders. Following each demonstration, the demonstration site will be made web accessible for users from DTS and MDOT for a two-week period to allow for additional review time.

The subtasks below provide more detailed information on the work that will be performed under the Roads and Highways configuration task. It should be noted that with the exception of the environment setup the configuration activities associated with the overall implementation project are actually running in concurrency to the geodatabase modeling and loading tasks.

Roads and Highways Configuration Environment Setup
Esri will setup Roads and Highways Configuration environment using cloud-based infrastructure controlled by Esri. This environment will support COTS software release management, regularly scheduled service packs and internal functional testing and validation using the Roads and Highways Configuration Report as a guide. This includes:

ALRS configuration

- Creating the ALRS and LRS Networks (LRMs) during data load
- Creating ALRS event layers and establishing event behavior
- Creating Intersection layers

RCE configuration

- Esri will support MDOT in the creation of map services for roadway characteristics editing
- Esri to host Attribute Sets white boarding session to determine how to configure attribute sets
- RCE user authentication (COTS .NET authentication)

Workflow Manager Configuration

- Tying R&H COTS workflow to MDOT business processes
- Establishing a versioning strategy managed by WMX
- Creating an end-to-end workflow that supports web-based redlining, desktop LRS edits, QC, and web-based event creation and editing

Roads and Highways Web Services

- Publish R&H web services through ArcGIS Server
- Configure R&H REST API Samples

The purpose of the Roads and Highways Configuration environment is to provide Esri's implementation team with the ability to implement the required COTS functionality in an integrated and systematic manner and to manage new software releases and any configuration work based on the planned project schedule. Additionally, the configuration environment will allow the Roads and Highways solution to be configured and deployed within an environment that closely aligns to the intended usage.

After the Roads and Highways solution has been deployed to the MDOT QA environment, Esri will remain onsite for an additional two days in order to conduct a Roads and Highways data and configuration validation. The validation will include:

1. Software installation checklist – was all the software properly installed?
2. Data installation checklist – was the database loaded correctly into the SDE instance and is it accessible by the appropriate staff?
3. RCE deployment checklist – are all the required RCE deployments set up, accessible to the appropriate staff, have the correct layers in the web maps and have the correct attribute sets creates?
4. Desktop Roads and Highways functionality checklist – run a series of common desktop editing tasks and verify they complete correctly.
5. Web functionality checklist – run a series of common RCE editing tasks and verify they complete correctly.
6. VUEWorks Integration – run a series of asset and work order location tasks to determine proper placement of assets against the LRS. This part of the validation will be executed by DTS.

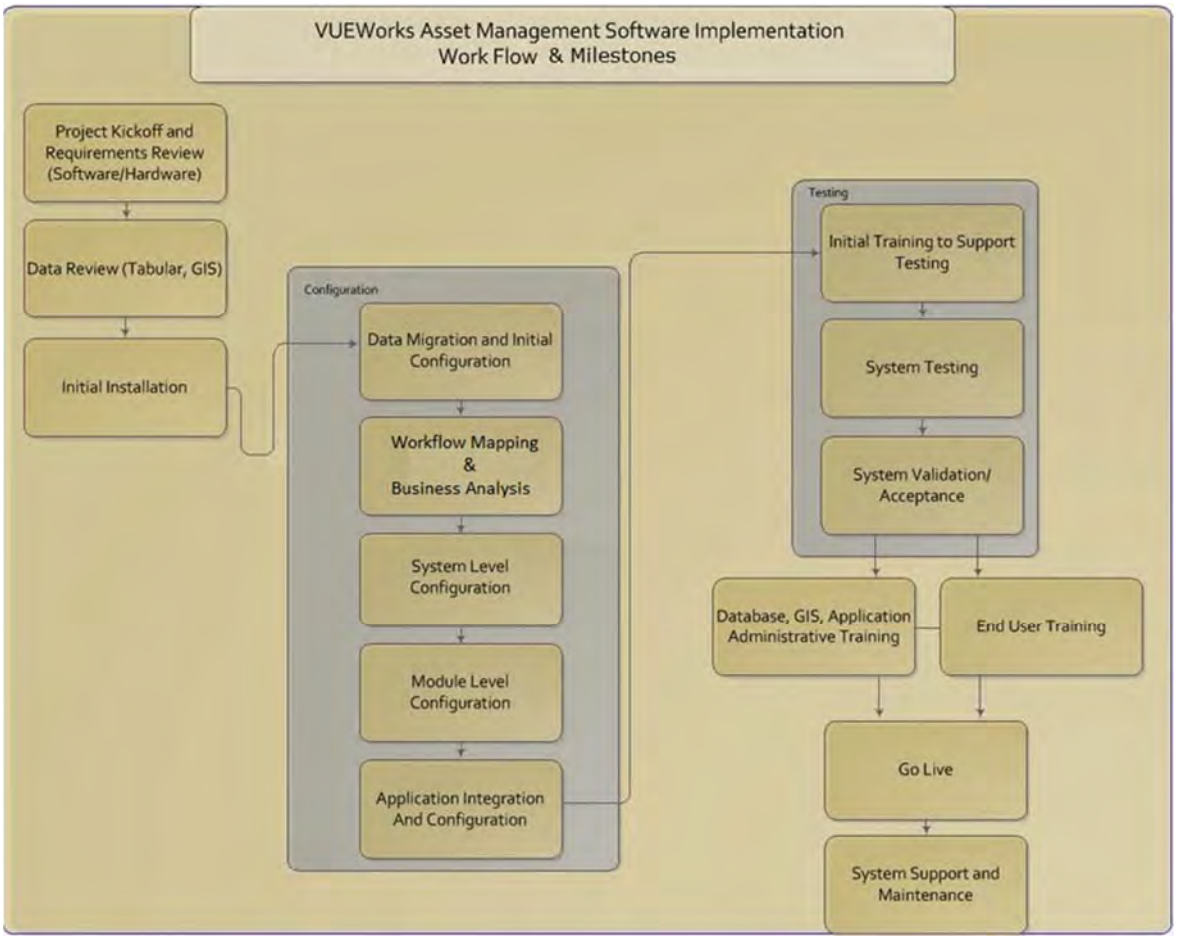
VUEWorks MDOT TAMS Implementation

The VUEWorks system is fully configured as a turnkey system ready for use by the entire organization.

Tier 2 Implementations contains the following as part of the scope of work:

- Exhaustive workflow and business process mapping,
- Work order and service call user interface configuration specifications,
- Creation of work order, condition and service call forms,
- Creation of reports and dashboards,
- GIS data development,
- Integration of Esri Roads & Highways components,
- Linking to external databases and migrating data from external systems into the VUEWorks database (as directed by MDOT if it is preferred to migrate data from particular systems to be integrated, or to simply link the data in one direction, or bidirectional),
- Integration with 3rd party software systems such as financial systems (e.g. for payroll, purchase order or inventory integration),
- Training all levels of system users, to include managers, VUEWorks administrators, non-technical field staff and mid-level management.

The Tier 2 implementation can be scaled to include myriad services as mentioned above, or it can be tightly focused on a single business process.



The Tier 2 Implementation: In what we call a *focused Tier 2 implementation*, we focus on a small number of very well understood and documented work management activities. The State is also prepared to take ownership of the configuration and subsequent administration of VUEWorks during the course of the focused Tier 2 implementation. This deepens the customer's participation in the implementation and training process, typically resulting in significant progress being made in the State becoming self-sufficient in implementing additional work and asset management activities without DTS professional services.

The implementation will occur in a stepwise process moving from one department to the next over a period of time. Implementation and training will focus on the State's first selected asset class and specifically addressing these assets and related workflows.

Phase 1 VUEWorks Kickoff Meeting
The goal of this meeting is to clearly identify the subject matter experts, VUEWorks Administrator(s) and other points of contact between DTS and the State. The meeting will establish dates and overall initial project timeline.

Workflow Definition Workshop
Implementing the work and maintenance management modules of VUEWorks requires careful identification of the work activities to be managed in the system and the relevant data to be recorded at the work activity level. Work activities are the most granular level of work management and form the basis for asset specific work and preventive maintenance management, reporting and analysis.

Prior to the first implementation workshop, State staff will identify 2 to 4 well understood asset specific work activities and 2 to 4 service requests issues related to their asset types as the work activities. Any supporting documents such as paper-based work orders, inspection forms, service request

documentation, etc. is typically provided to DTS. DTS will review the information prior to the workshop to step through the work activities and service request issues.

The goal of this first workshop is to begin defining how VUEWorks will be configured before the second workshop. The process of defining work activities in a work order system can be complex initially. This stems from the fact that any given work activity is composed of several parts: work planning, work assignment, doing the actual work and closing out the task or work order correctly. The challenge in implementing any work management system is that the above steps are often not completely understood by a single individual; in fact, it is more common for these steps to be handled in a sequential fashion with different State staff largely confined one or two parts of the sequence.

In addition, when the State works with DTS to define these steps it is common for changes to be introduced to the workflow process now that it's being completely reviewed. Finally, VUEWorks can bring a great deal of flexibility to the entire workflow. Collectively, these factors create a time period during the implementation where the workflow surrounding a work order is somewhat fluid. Therefore, the initial meeting is designed to get the State thinking about all these moving parts so the actual implementation workshops can be as productive as possible.

Prior to the first implementation workshop, the State will identify the subject-matter expert(s) (SME) for each of the work activities, as well as the overall VUEWorks Administrator. The SME(s) needs to understand the entire workflow for any given activity that will be managed via work orders but they do not necessarily need to be the employee(s) who perform the work. The purpose of the SME(s) is to break down each of the work activities into a step-by-step series of events, where at each step key information to be collected is identified, and the actions necessary to move to the next step are defined.

The VUEWorks Administrator is the lead person(s) responsible for administering the application. The VUEWorks Administrator is responsible for taking ownership of the system and will expand it over time. As such, they will need to understand the workflows, how to use the various configuration user interfaces to build new workflows, master the report designer and more.

Asset and Maintenance Management Workflow Workshops

The first workflow workshop has two goals:

1. Finalize and sign off on the work order activities, service request issues and the associated workflows. DTS will spend a half day on each workflow with significant input from the workflow SME(s). The VUEWorks Administrator must attend.

2. Expose the SME(s) and VUEWorks Administrator to the actual work management modules in VUEWorks to begin designing actual work order forms, service request issues, reports and dashboard gadgets. Furthermore, data entry requirements for employee names, pay rates, rate types (e.g. standard, overtime, etc.) and similar information for equipment and inventory will be identified. Populating VUEWorks with this data will be tasked to the VUEWorks Administrator.

Workshops for Work Order Specification

The actual content of the work order form in VUEWorks is highly configurable. The contents of the work order has two drivers: 1) the flow of the work activity and 2) data to be captured in the course of performing the work activity. This workshop will be scheduled for each work activity being configured in VUEWorks. Based on the completed workflow exercise, the DTS implementation team will have a draft work order specification already built for each work activity, and a concomitant work order form set up in the software for live interaction during the workshop.

The goals of the work order specification workshops are:

1. Sign off on draft work order forms and service request issues for use in VUEWorks, which will be finalized during the second workshop,
2. Have live work order forms in the system for the VUEWorks Administrator to begin interacting with prior to the second workshop and

3. Have draft reports set up in VUEWorks for the VUEWorks Administrator to begin interacting with prior to the second workshop.

Workflow Workshop
This second workshop marks a turning point in the implementation process. Final changes will be made to the work order specification documents as well as the actual work order forms in VUEWorks. DTS will update the specification documents during the workshop; however the VUEWorks Administrator will perform updates to the actual work order forms in VUEWorks, condition inspection forms as well as service request issues. The SME(s) and the VUEWorks Administrator will step through the workflow process in a role playing exercise to test drive the configuration. We will step through the reporting capabilities of the system, and the VUEWorks Administrator (and others in attendance as appropriate) will run reports and learn how to create their own reports.

The goals of these workshops are:
1. Sign off on the work order specification, condition inspection and service request issues,
2. Final configuration of the work order and condition forms in VUEWorks,
3. VUEWorks Administrator is now responsible for existing work order and condition configuration (both the workflow and the content of the actual work order forms),
4. VUEWorks Administrator is now responsible for creating reports.

Road Analyzer (Straightline Diagramming - SLD) TAMS Implementation

Kick-Off Meeting - The SLD kick-off meeting will include final discussions of project expectations, risks, goals, scope clarification and definition discussions and project management procedures before starting the project. During this meeting, the project team and MDOT will document the project core team(s) and the groups that must be consulted for requirements, testing and training. A final baseline work plan, project repository and other project management documentation will be the results of this effort.

Deliverables:
- **Kick-off Meeting Notes and Baseline Work Plan** – Following the kick-off meeting, notes including any decisions made will be delivered to MDOT. In addition, a final baseline work plan will be submitted with the notes.

Project Requirements – The project team will conduct requirements workshops and interviews with the various stakeholders and document the detailed needs of the SLD application. Transcend will begin the requirements sessions with an overview of Road Analyzer. Changes and enhancements will then be documented in a Requirements Matrix. The project team will conduct meetings onsite on the day immediately following the kick-off meeting.

Deliverable:
- **Requirements Matrix –** The requirements matrix will be a Microsoft Excel spreadsheet that lists a requirement number, priority, level of effort, any known prerequisites and any necessary comments so that the entire team has a thorough understanding of the functionality to be included in the final SLD application.

Version 1 Design - A High-Level Design will be developed to incorporate the MDOT specific components to the existing SLD tool foundation. This design will be the guide for the development cycles as Road Analyzer is implemented and customized to meet MDOT needs. At this time, the Test Plan containing test scripts that match the workflows and use cases outlined in the design will be created.

Deliverables:
- **High-Level Design** - The High-Level Design will document what components are available in Road Analyzer, what will need to be configured, what needs to be customized and the interactions and communication between the different components of the system.

- **Test Plan –** The Test Plan will include test scripts as well as procedures for logging errors or requests for enhancements into the Tracking Database.

Version 1 Development and Testing - At the completion of the high level design phase, the application will be developed using the Requirements Matrix and High-Level Design to guide the development team. The application will be developed in two iterations. The first iteration will focus on the core modules that are available in Road Analyzer. Although this is a product, the application will need to be configured to use MDOT's data and to meet the unique requirements of how MDOT would like to access and display data.

This phase will not include any formal deliverables, but the core modules will be made available to a small group of users on a Transcend server at the end of the first iteration. At some point during this phase, the project will conduct an onsite visit to review progress and to make any necessary adjustments to the work being completed.

Version 1 Deployment **-** Near completion of the first iteration of development, the project will initiate Implementation Planning. The first step will be to create the Implementation Plan. Transcend's standard Road Analyzer documentation will also be updated to reflect MDOT workflows, data, and customization. The project team will then be onsite to assist MDOT with reviewing/testing the application (on Transcend's servers), logging any found defects and documenting requested enhancements.

Deliverables:

- **Implementation Plan –** The Implementation Plan will document the details and timeline for each of the tasks in the implementation phase. It will establish responsibilities for each task including those of MDOT personnel.
- **User and Technical Documentation –** Two electronic documents will be customized as a part of this project – a User Guide and a Technical Guide.
    - **User Guide –** The User Guide will include an explanation of the data available in the stick diagram and through the data bars as well as the associated attributes available for display. A definition of any code values will be included. The User Guide will also include example workflows that describe how to use the functionality available in the SLD from an end-user perspective. It will be provided in PDF format as well as through online help.
    - **Technical Guide –** The Technical Guide will include a data dictionary, a description of the technical architecture, an explanation of the configuration capabilities of the SLD and other information needed by the technical team to describe the administrative components of Road Analyzer.

Requirements Update - Based on the results of the UAT and other project documentation requesting changes or enhancements, the Requirements Matrix from the first iteration will be updated.

Deliverable:

- **Updated Requirements Matrix –** The requirements matrix will be a Microsoft Excel spreadsheet that lists a requirement number, priority, level of effort, any known prerequisites and any necessary comments so that the entire team has a thorough understanding of the functionality to be included in the final SLD application.

Version 2 Design - The High-Level Design from the first iteration will be updated to reflect the custom components to be addressed during Iteration 2.

Version 2 Development and Testing - The second iteration will build upon the core modules and will be used to develop the custom modules that are not currently a portion of the Road Analyzer core product. At the end of the second iteration, the custom functionality will be made available on a Transcend server.

	• **Updated High-Level Design** - The High-Level Design will document what components are available in Road Analyzer, what will need to be configured, what needs to be customized and the interactions and communication between the different components of the system. • **Updated Test Plan** - The Test Plan will also be updated to reflect additions (customized modules) for the MDOT implementation. **Version 2 Deployment -** Using the Implementation Plan as a guide, the final steps of the SLD portion of the project will be to conduct onsite deployment of the application in MDOT's environment, conduct a more thorough UAT and to provide one day of training. • **Updated Implementation Plan –** This document will be updated to reflect any needed changes based on the outcome of Iteration 1. • **UAT –** Transcend will be onsite with MDOT as they thoroughly test the application using MDOT test scripts. • **Training Plan –** The training plan will document the approach for training MDOT personnel on the SLD application. The training will meet the needs of end-users and more technical staff and will be designed to train 10 end-users and 2 technical staff. • **User Training –** The project team will provide an onsite one-day training course for up to 12 participants. • **UAT-Tested SLD Tool –** Following UAT and any necessary bug fixes, Transcend will provide the Road Analyzer/SLD executable as well as the source code for the custom modules.

E. Implementation Services

Contractor is responsible to work with State staff to implement the TAMS Solution within the State IT environment described within Article 1, Section 1.103 above. Specific implementation service activities are described below.

<u>Data Conversion / Migration</u>

Contractor will work with MDOT staff to perform data conversion / migration of business data from existing sources for use with the TAMS Solution Development environment as follows:

- MGF road network and other base map layers (to be determined as part of Project Initiation and Planning Services)
- Construction of the MDOT LRS linear datum and definition of the PR-MP, Route-MP and Control Section-MP Linear Referencing Methods (LRM) based upon MGF road network feature attributes
- Lane Mile Inventory
- Sign Inventory
- Culvert Inventory
- Guardrail Inventory
- Other business data as determined as part of Project Initiation and Planning Services

Contractor will work with State IT staff to migrate TAMS data from the Development environment to the Quality Assurance ("**QA**") and Production environments to support further project services and deliverables as specified below.

Contractor's Agreement & Approach in regards to Section 1.104, E. Implementation Services – Data Conversion / Migration	
X	I have reviewed the above section and agree with no exception.
	The DTS team will work with MDOT staff to perform data conversion / migration of business data from existing sources for use with the TAMS Solution Development environment as follows:

- MGF road network and other base map layers (to be determined as part of Project Initiation and Planning Services)
- Construction of the MDOT LRS linear datum and definition of the PR-MP, Route-MP and Control Section-MP Linear Referencing Methods (LRM) based upon MGF road network feature attributes
- Lane Mile Inventory
- Sign Inventory
- Culvert Inventory
- Guardrail Inventory
- External Business Systems

Four Stages of Data Migration Process

- Planning and Design – This entails mapping all of the attributes to their appropriate fields in the TAMS application database, preparing scripts / automation for import and setting a migration schedule around the implementation schedule for TAMS;
- Initial Load for Testing and System Integration – loading the information into the development and testing instances for use by the integration specialists and testers. This tests the loading of the data as well;
- Final Load for Production – Once TAMS is ready for production a final data load takes place and the old system to maintain the asset inventory is frozen and
- Operation and Maintenance – If the TAMS is used for network adjustments, it can be used to update event locations. If the MGF is used, then each year, event data needs to be adjusted through back-end database scripts.

MGF and Lane Mile Inventory

During the implementation of the statewide data cleansing, migration and loading process, it is anticipated that the data cleansing and migration process will be performed by DTS and MDOT and will follow the steps documented in the Data Migration document prepared by DTS. Esri will provide support during this effort, including high level review of the results of the migration based on the data migration and QA plans.

Data Migration Planning – Migration of route and event data to the roads and highways environment requires a review of the existing route and event data to determine whether incompatibilities exist between the current LRS and Roads and Highways. This review will also determine if manual steps are required to migrate the data. Key elements for review include:

- Route ID structure
- Route calibration methods
- Route gaps and concurrencies
- Event data structures

Create Migration Scripts and Tools – Depending on the results of the data migration planning, portions of the data migration can be automated. A set of scripts will be created to aid in the initial and periodic migrations of data. This will reduce the overall effort and increase the quality of the migrated data. Some manual effort will be needed to maintain the centerline and calibration point data, modify any new data that requires edits to fit the new model and perform QA/QC tasks. The scripts will assist in the following tasks:

- Build Advanced Linear Referencing System (ALRS) networks from existing routes
- Calibrate the new route networks
- Create source to table mappings for event data

- Migrate event data to new formats, if necessary
- Register event tables with the ALRS networks
- Identify potential migration errors

Esri will provide COTS documentation of the R&H external business systems integration patterns and specifications. Esri will communicate and demonstrate integration patterns with external business systems owners and technical staff.

Sign, Culvert and Guardrail

Data Conversion and Migration Methodology

DTS has extensive experience in the migration of data from the multiple systems into the VUEWorks and Esri solutions. The next section contains a sample migration task list (assets) that is being used for this project. DTS has prior experience conducting these migrations as a team for other clients with success.

DTS will assist MDOT with the following:

1. Document the functional requirements for the asset data by asset type
2. Investigate exiting asset systems operational features and database structure for asset data
3. Provide MDOT system administrator(s) with an overview of VUEWorks table structure, data views and configuration options
4. DTS will prepare a detailed work plan that covers all aspects of the migration with assistance from MDOT. Sections of the work plan will be created as required to meet the functional requirements of the State. The following aspects of the migration will be covered in the work plan:
    a. Functional requirements for the asset data by asset type.
    b. Identification of asset types and fields that will be migrated to GIS feature classes for use by VUEWorks.
    c. Identification of asset types and fields that will be migrated to the VUEWorks modules.
    d. Identification of the asset hierarchy that will be replicated in the VUEWorks modules.
    e. Identification and migration of dropdown field data that will be transferred. The functional aspects of the dropdown fields will be migrated to GIS domains or VUEWorks dropdowns as appropriate.
    f. Define data structure and templates required in the GIS or VUEWorks modules.
    g. Identification of any special considerations for the migration. (For instance, numerical data should be migrated to a numerical field even if numerical data is currently stored in a text field).
    h. Identification of any data that will not be transferred (obsolete data or data that has no value to the State).
    i. Document data integrity issues discovered during the process. Data integrity issues consist mostly of misspellings and/or inconsistent terminology. While it may be possible to address some data integrity issues, DTS will be limited to documenting any issues discovered that may be addressed in the future by the State.
    j. Plan to accommodate final migration of data immediately prior to the Go Live date.
5. MDOT will review the work plan with DTS for approval. The review requires DTS to attend one on-site meeting. Additional meeting time can be arranged as needed using telephone and/or screen sharing technology.
6. DTS will execute the work plan collaboratively. DTS will be responsible for tasks that require DTS' expertise with SQL Server, Oracle and the VUEWorks database.

Interfaces / Integration

Contractor must provide appropriate system interfaces / integration to the following MDOT applications:

1. Name of application: Michigan Bridge Management System ("**MIBridge**")
   Details of interface:
   - Definition of Bridge Structure feature class within the TAMS GIS database environment
   - Management of Bridge Structure LRS location references within TAMS
   - TAMS access to Bridge Structure data:
     - Inventory data
     - Maintenance requirements
   - MIBridge access to TAMS functionality:
     - Creation and deletion of TAMS Bridge Structure features from within the MIBridge application environment
   - MIBridge access to TAMS data:
     - Maintenance work
     - Capital work
     - Inspection data
2. Name of application: Michigan Information Database ("**MIDB**")
   Details of interface:
   - TAMS access to MIDB data:
     - Vendor / Payee data
     - Budgets
     - Local Agency Work Order data (agency, accomplishments, costs)
   - MIDB access to TAMS data:
     - Timesheet data
     - Asset inventory / accounting data
     - Project cost data
3. Name of application: Transportation Management System ("**TMS"**)
   Details of interface:
   - TAMS access to TMS LRS event classes
4. Name of application: Michigan Fleet Management System ("**MainStar**")
   Details of interface:
   - TAMS access to MainStar materials issued data
   - MainStar access to TAMS data:
     - Materials issue requests
     - Costs
     - Work Orders
5. Name of application: MDOT Global Database (GLOBAL)
   Details of interface:
   - TAMS access to Oracle tables: code tables, name / address tables, etc.
6. Name of application: Property Damage Reclamation Process System ("**PDRP**")
   Details of interface:
   - TAMS access to PDRP data:
     - Damaged asset location
     - Crash event ID
   - PDRP access to TAMS data:
     - Crash event costs
     - Work orders
     - Accomplishments
7. Name of application: M5 FleetFocus
   Details of interface:
   - TAMS access to FleetFocus data:
     - Vehicle rates

- Preventative maintenance queues
- FleetFocus access to TAMS data:
  - Vehicle usage data

8. Name of application: Signal Cost Accounting System ("**SCAS**")
   Details of interface:
   - TAMS access to SCAS data:
     - Electrician job reports
     - Accomplishments
     - Costs (labour, equipment, materials, Contractor)
9. Name of application: ArcGIS Server / ArcSDE
   Details of interface:
   - TAMS access to MDOT spatial data layers existing in MDOT spatial data repository
10. Name of application: Local Agency Payment System (LAPS)
    Details of interface:
    - TAMS access to local agency payments.

Contractor may at MDOT's option be asked to provide appropriate system interfaces / integration to the following MDOT applications (cost, project schedule, resources to be agreed upon by MDOT and Contractor through a SOW and the change management process). These interfaces / integrations may be built in a future phase at MDOT's options as well:

1. Name of application: Project Accounting and Billing System ("**PAB"**)
   Details of interface:
   - PAB access to TAMS data:
     - Projects
     - Accomplishments
     - Costs (labour, equipment, materials, Contractor)
2. Name of application: ProjectWise
   Details of interface:
   - TAMS access to ProjectWise documents

For each of the above application interfaces / integration, Contractor to specify details regarding:

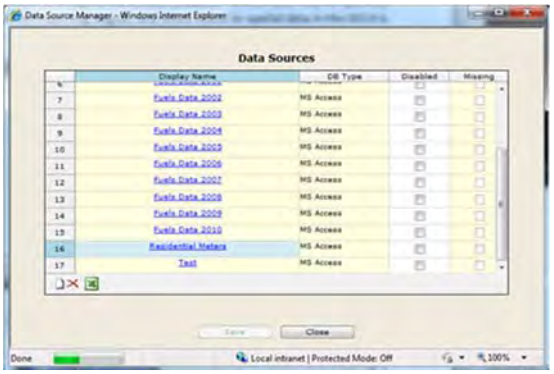
- The manner through which TAMS gains access to the MDOT business application data, and whether this will be achieved through TAMS configuration or custom software programming
- The manner through which the MDOT business application gains access to TAMS functionality (for example: API) and the extent of custom programming required
- Support for custom software developed in future TAMS product releases

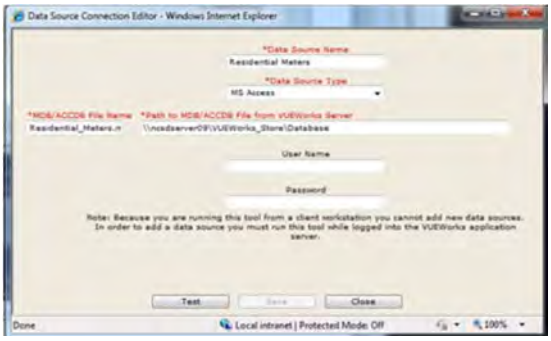
Contractor to work with State IT staff to achieve knowledge transfer regarding skills required to integrate MDOT business applications with TAMS.

Contractor's Approach in regards to Section 1.104, E. Implementation Services – Interfaces / Integration	
X	I have reviewed the above section and agree with no exception.
	Data Management VUEWorks is capable of linking directly into spreadsheets, MS Access, SQL, Oracle and any ODBC compliant database. These linkages can be one direction or bi-directional based on the openness of the 3rd party system being integrated with. Linked data can be used to autopopulate dropdown lists, populate specific modules (such as asset condition like pavement PCI or PACP ratings, or ownership information for Service Calls), trigger work orders and be available for reporting. This is a great way to maintain visibility into legacy databases without the cost or complexity of migrating the data into VUEWorks (yet this can be accommodated as well based on MDOT's desires). Linked data can also be associated with GIS features, allowing spatial queries to be performed on data that is external to VUEWorks.

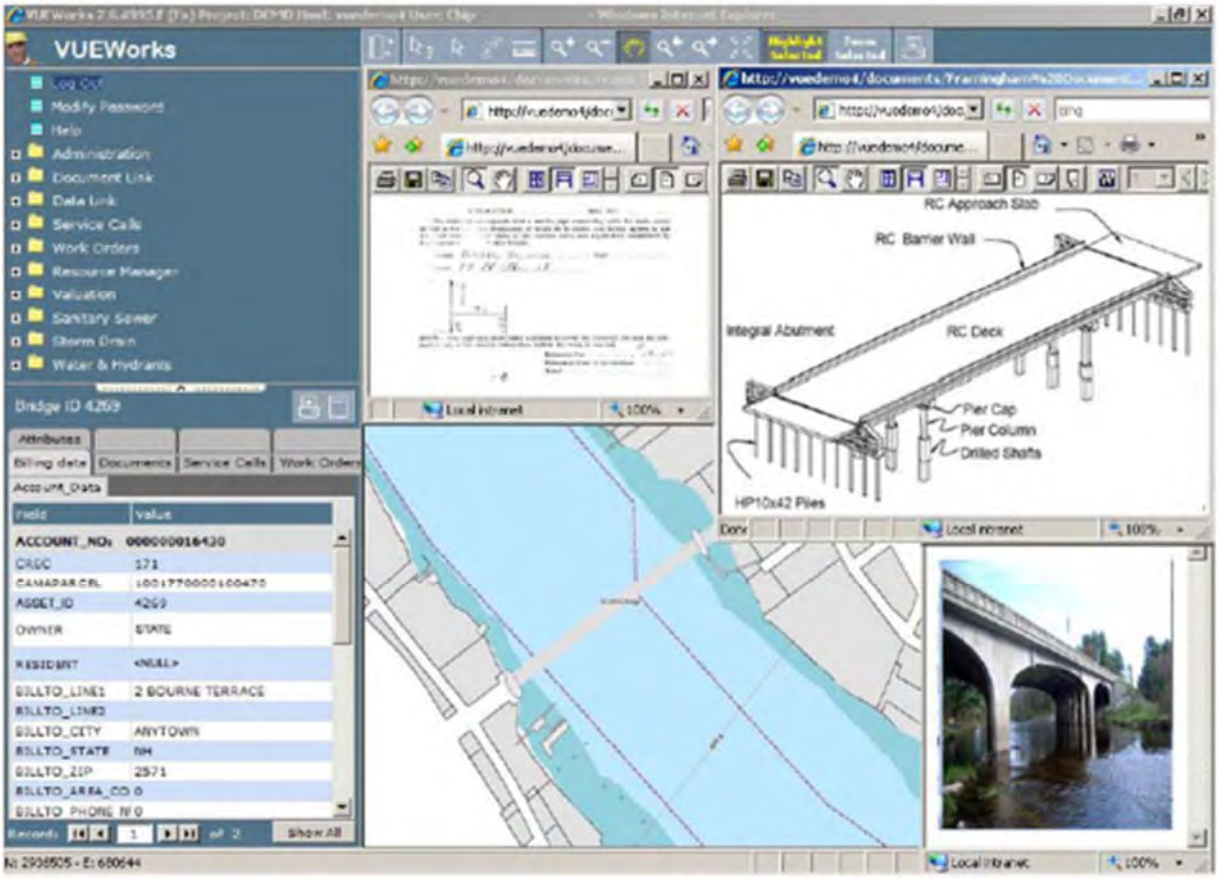
External databases can have any type of data in their columns, and can even provide hyperlink data a web form that opens, allowing users greater access into the external database. Because VUEWorks is a 100% web-based application, as soon as the new data is collected from the web form it is immediately available for display, reporting and other uses. Data Link can link to an unlimited number of external databases and tables, to views of tables and directly to Excel spreadsheets. Tables can contain links that launch 3rd party applications.

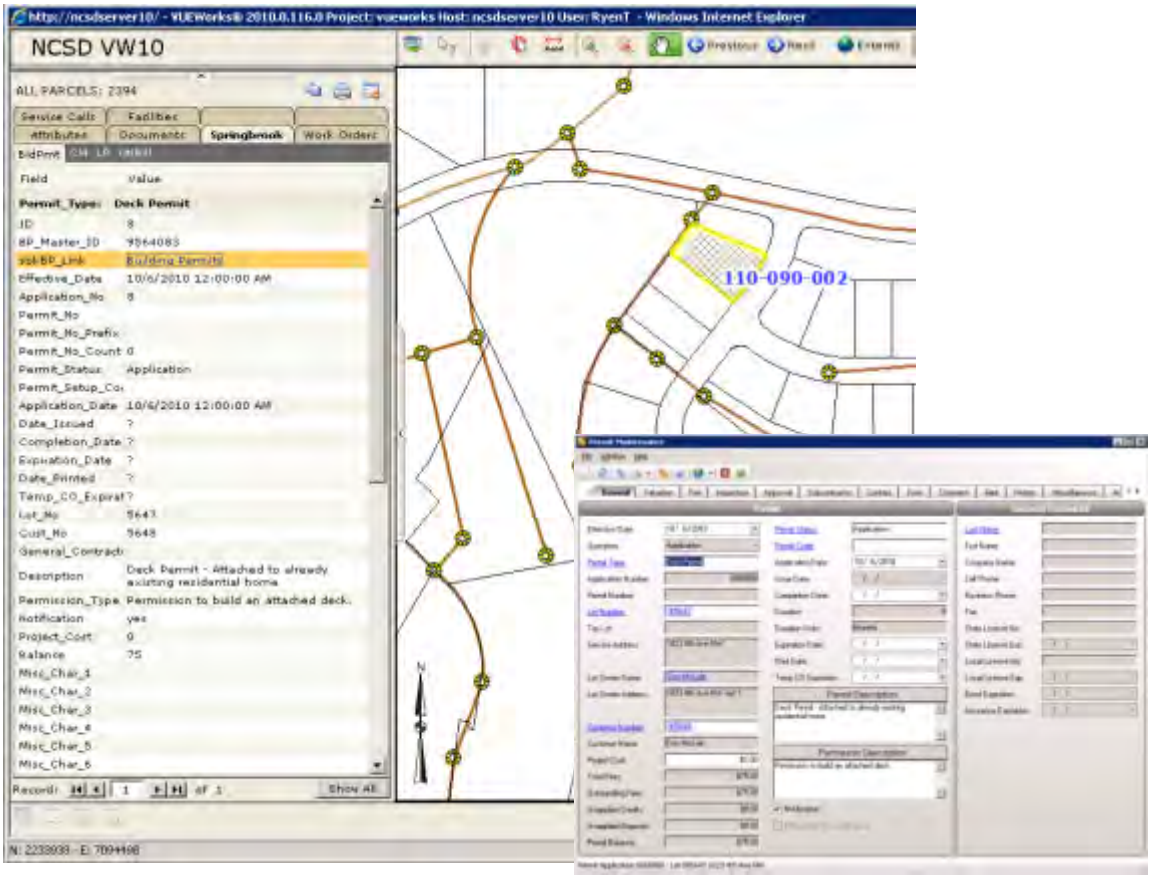
VUEWorks also has the capability to migrate legacy data directly into VUEWorks forms. A common example of this is to create a VUEWorks work order for every historic legacy work order. We have done this for clients that desire to have a full work order history pulled from their legacy system into VUEWorks. This requires separate data migration services, but is typically very simple.





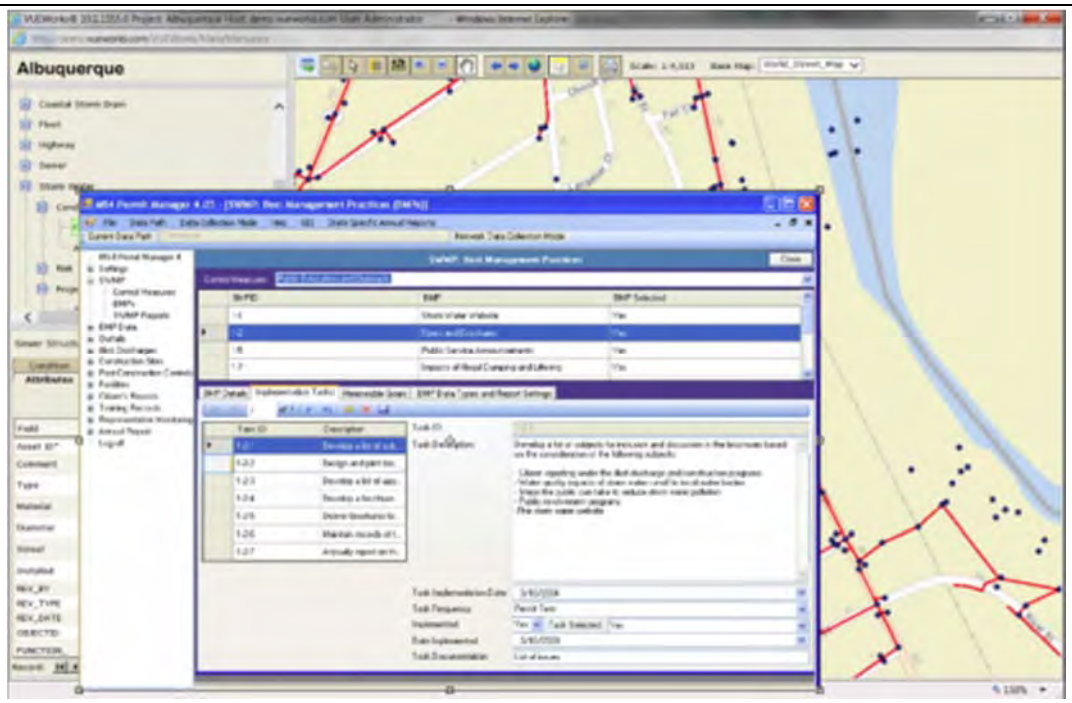
In the screenshot shown below is a legacy MS Access database for bridge condition inspections that has been linked into VUEWorks and associated with the GIS and other flat file documents.



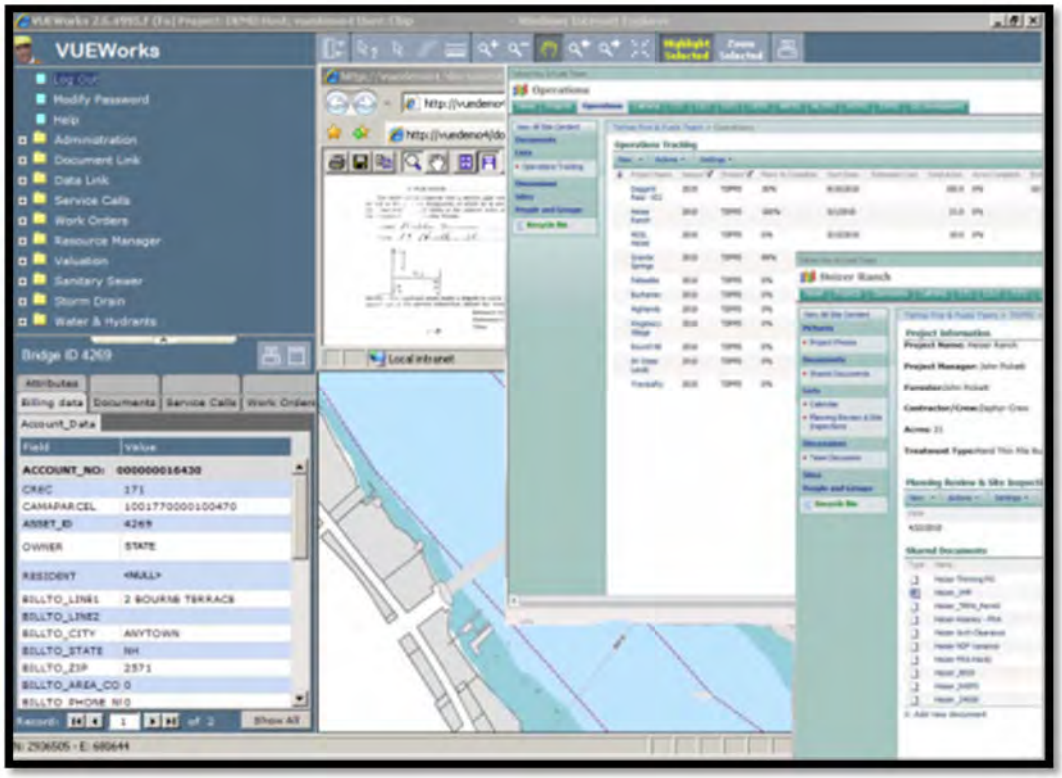


Above are Billing, Permits, Licensing and other modules from a leading Finance/ERP system linked into VUEWorks. This inherently makes the external Financial & Permitting data geospatially enabled – supporting such operations as mapping all accounts more than 30 days past due, or showing all parcels with open permits that need an inspection (for routing purposes), etc. Not only can VUEWorks read and expose data from these modules, via the hyperlink shown, the module can be launched and opens directly to the record. External data can be exposed through VUEWorks geospatially via the GIS or non-spatially.

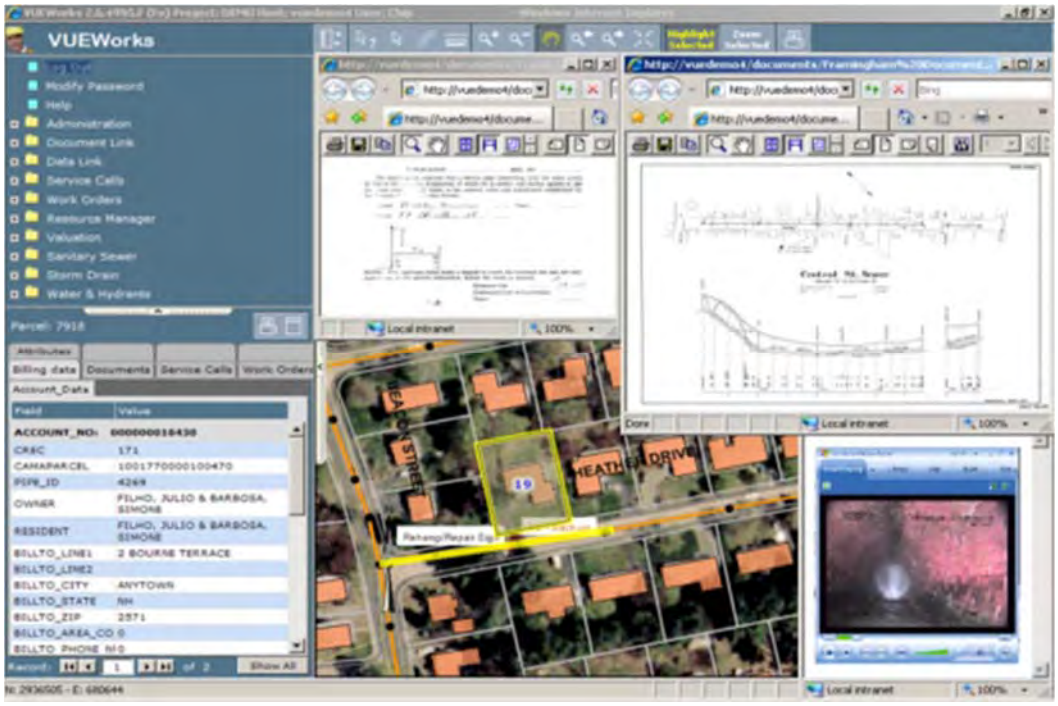
For another example using the Data Linking functionality, VUEWorks links associated documents directly and can interface with the EPA Permit Manager. Below is an example of a VUEWorks data link to environmental data.



Using the Data Linking functionality VUEWorks links associated documents directly and can interface with a document management system, SharePoint. Below is an example of a VUEWorks linkages to the Tahoe Integrated Information Management System (TIIMS) SharePoint site. TIIMS utilizes the document version control native to SharePoint to maintain the documents; these updates are immediately available within VUEWorks via the data linking functionality.



Using the Data Linking functionality in VUEWorks, links associated to AutoCAD documents can be performed directly and interface with video documents for pipe and culvert inspections. Below is an example of a VUEWorks linked to a video system along with the corresponding CAD as-built drawings:



For the MDOT systems, the DTS team foresees utilizing this functionality for a basis of integration as well as the inherent VUEWorks, Roads and Highways LRS solution for any spatial data that MDOT prefers to be located along an LRS. To be clear though, VUEWorks can ingest <u>any</u> MDOT spatial data and 3rd party data whether it is located along an LRS or not.

<u>Pilot Projects</u>

Contractor is responsible to work with State and County / Municipal agency staff to conduct limited scope pilot projects as described below.

1. *County and Municipality Pilot Testing* – to confirm TAMS functionality to integrate / support external agency requirements by inclusion of three County agencies and one large municipality.
2. *Mobile Data Collection Pilot Testing* – to confirm TAMS functionality to improve business processes associated with the reporting of inspection results and maintenance accomplishments within one MDOT Region.

Contractor will be responsible to work with State and County / Municipal agency to conduct limited testing of the use of mobile field data collection technologies as a means of improving business processes associated with the reporting of inspection results and maintenance accomplishments. This testing would be conducted early in the TAMS implementation schedule within selected MDOT maintenance garages in one Region enabling field staff to begin collecting inventory, condition and maintenance activity data in order to align with the requirements and implementation schedule of the associated PBOS project. It is expected that this information would be stored in an interim database for eventual uploading to the TAMS once it is fully implemented. The timing for mobile data collection pilot testing is 2015.

Contractor's Agreement & Approach in regards to Section 1.104, E. Implementation Services – Pilot Projects	
x	I have reviewed the above section and agree with no exception.
	County and Municipality Pilot Testing During TAMS Phase 1 implementation DTS will conduct testing of the VUEWorks TAMS within Iosco, Kent and Bay counties and if needed one large sized city, allowing the State assess both the functional capabilities of the software to integrate external agencies. This pilot testing will provide the State with the ability to discover related security, performance and IT infrastructure issues. The pilot will include all parts of the TAMS implementation including Esri Roads and Highways LRS solution, VUEWorks Asset and Maintenance Management solution, systems integration components and other software integrations such as Road Analyzer. **Mobile Data Collection Pilot Testing** Furthermore the pilot testing will provide testing for mobile data collection. This includes testing the use of mobile field data collection technologies as a means of improving business processes associated with the reporting of inspection results and maintenance accomplishments. For this phase of the project, DTS can provide the State with the ability to examine connected and disconnected work management mobile data collection, as well as mobile collection from various hardware platforms. The DTS team will conduct this early in the TAMS implementation schedule within selected MDOT maintenance garages in one Region and will enable field staff to begin collecting inventory, condition and maintenance activity data in order to align with the requirements and implementation schedule of the associated PBOS project. A testing environment will be created so this information can be stored in an interim database for eventual uploading to the TAMS once it is fully implemented.

<u>Testing</u>
Contractor is responsible to work with State staff to conduct TAMS Solution testing, including:

- System Testing; and
- User Acceptance Testing ("**UAT**").

Contractor responsibilities with respect to the above testing activities are as follows:

- Assist State staff in the development of the test plans;
- Assist State staff in the establishment and verification of the TAMS Test environment;
- Assist State staff in the migration of TAMS data from the Development environment to the Test environment;
- Participate in on-site test activities as requested by the State Project Manager;
- Verify and remedy software defects encountered during testing activities; and
- Obtain official sign-off from the State upon successful completion of testing activities.

Contractor's Agreement & Approach in regards to Section 1.104, E. Implementation Services – Testing	
x	I have reviewed the above section and agree with no exception.
	The DTS team understands our responsibilities with respect System Testing and User Acceptance Testing and will provide the following services to the State:: Development environment • Assist State staff in the development of the test plans; • Assist State staff in the establishment and verification of the TAMS Test environment; • Assist State staff in the migration of TAMS data from the to the Test environment;

- Participate in on-site test activities as requested by the State Project Manager;
- Verify and remedy software defects encountered during testing activities; and
- Obtain official sign-off from the State upon successful completion of testing activities.

DTS has also provided the State with a sample testing plan to illustrate our testing methodology.

Sample TAMS Testing Plan

Section 1. Overview

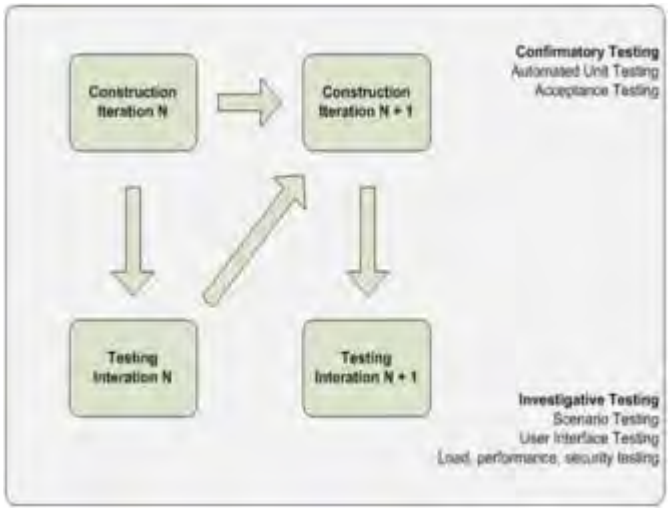
1.1 Introduction

The purpose of the Test Management and Acceptance Plan is to define the deliverables, acceptance criteria, acceptance schedule, problem resolution and testing approach associated with the MDOT TAMS Project. The methodology for the acceptance process will ensure that each deliverable has undergone State of Michigan review, problem identification and resolution and acceptance. This document details the overall strategy to be adopted, the activities to be completed, the resources required and the methods and processes to be used to complete the testing of the Commercial Off-the-Shelf (COTS) software based on the VUEWorks asset and maintenance management system solution. The testing process identified within this plan will ensure a better quality product overall which will meet MDOT TAMS Project requirements as specified by the State of Michigan.

Section 2. Test Management

The overall approach that the DTS team will employ to conduct effective testing of the VUEWorks asset and maintenance management system is to start by reviewing the requirements compliance matrix developed for the project.

The testing strategies that the DTS team will undertake can broadly be subdivided into confirmatory and investigative testing categories. Confirmatory testing is pursued through an agile approach where a certain feature is implemented and users are requested to confirm if the feature meets their requirements. Investigative testing regimes are traditionally defined in consultation with the client but may include exploratory or scenario-based testing along with some component of user testing of the system components as well. Investigative testing will be conducted during the data migration phase where the State of Michigan will review and verify the migrated data.



All defects will be recorded in web-based agile project management software available for MDOT's review at any time. This tool will be used to record defects and configuration changes detected during testing.

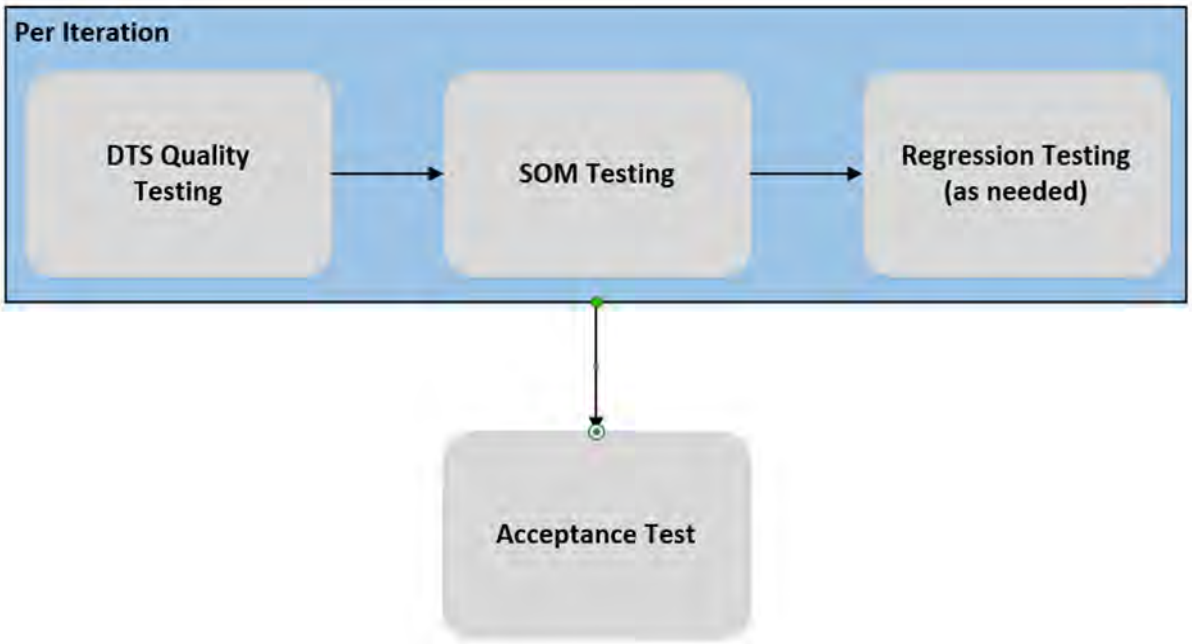
2.1 Staffing

Testing is a collaborative effort between the State of Michigan and DTS staff. Below is a table that identifies the key roles and responsibilities for the testing team.

Name	Role	Responsibility
DTS Team	Test Manager (DTS)	Responsible for developing and following the Test Management and Acceptance Plan, managing the DTS testing team and coordinating with the SOM Test Manager. The DTS Test Manager ensures that SOM feedback is reviewed, prioritized and assigned for resolution.
DTS Team	Quality Assurance Manager (DTS)	Responsible for overseeing that the quality control measures are followed. Performs quality assurance testing to ensure the workflows and requirements are met. Responsible for overseeing that all features are tested and ensuring that the team delivers a quality product.
To Be Identified by SOM	Test Manager (SOM)	Responsible for identifying testers, securing testing locations and coordinating the SOM testing team. The SOM Test Manager is responsible for ensuring the test team follows the test plan and utilizes the agile defect tracking software. The SOM Test Manager will coordinate with the DTS Test Manager to prioritize defects/changes and follow the Issue Management Plan for any identified issues.
SOM Testing Team	Testers (SOM)	Responsible for performing testing of each iteration to validate that workflows and requirements have been configured correctly in the system. Testers will also perform acceptance testing to ensure the solution works for the user. Testers are responsible for following the test plans and documenting any defects/changes into the agile defect tracking software.

2.2 Testing Strategy

There are several testing strategies that can be adopted for successful implementations of large scale systems. DTS recommends the following testing of each iteration for the implementation of the MDOT TAMS project.



2.2.1 Quality Testing of Each Iteration

Responsibility

The DTS testing team is responsible for conducting testing for each iteration as defined in the WBS, Schedule and Resource Allocation Management Plan.

Dependency to Begin Test

For the testing to begin on each iteration, the initial workflow analysis, configuration, data migration and data linking and reporting must be complete with successful results for that iteration.

Description

The goal of the testing for each iteration is to ensure that the system is meeting the specifications as detailed in the workflow and requirements documents. The testing team will work with the project requirements lead to ensure that the system is ready for SOM testing.

Test Document

There will be no physical document created at this time. Our agile web-based software application will be used as the primary tool to record any misconfigurations, missed requirements, etc. during the quality testing of each iteration.

Test Environment

This type of testing is conducted by the testing team on a DTS test site. There is no automated method of testing whether or not the system meets the required specifications, except through human interaction with the system.

Desired Test Output

The quality iteration testing will be conducted by the DTS testing team and any changes identified will be tracked using the agile tool.

2.2.2 SOM Testing of Each Iteration

Responsibility

The State of Michigan testing team is responsible for conducting testing for each iteration as defined in the WBS, Schedule and Resource Allocation Management Plan.

Dependency to Begin Test

For the testing to begin on each iteration, the initial workflow analysis, configuration, data migration, data linking and reporting and DTS quality testing must be complete for that iteration.

Description

The goal of the testing for each iteration is to validate documented workflows and identify misconfigurations. Performing testing of each iteration ensures that misconfigurations or inaccurate processes are identified and resolved early and do not propagate elsewhere in the system. In addition, testers will gain crucial experience interacting with the system.

Test Data

DTS will provide sample test data required to perform testing of each iteration. As DTS and State of Michigan testers perform iteration testing on the system, the test data will accumulate to establish a greater data set.

Test Plans

DTS will provide test plans to the SOM testers for each iteration. The test plan will document the functions to test, the steps to perform the function and the expected outcome.

Test Document

There will be no physical document created at this time. Redmine (our web-based agile software tool) will be used as the primary tool to record any misconfigurations, missed requirements, etc. during the iteration tests.

Test Environment

This type of testing is conducted by the SOM testers on a DTS test site.

Desired Test Output

The testing of each iteration will be conducted by the SOM testing team and any changes identified will be tracked using Redmine.

DTS Review of Test Results

The DTS Test Manager will review any defects/changes reported during iteration testing to ensure that all defects/changes are well defined, reproducible and in line with the SOM requirements. The DTS Test Manager will work with the implementation team to prioritize the defects/changes based on SOM priorities.

2.2.3 Regression Testing (as needed)

Responsibility

The DTS implementation team along with the testing team will be responsible for ensuring that any configuration changes are completely tested across inter-related components of the TAMS.

Dependency to Begin Test

Before regression tests begin, the implementation team needs to complete and then test the configuration changes.

Description

The goal of regression testing is to uncover any defects created by a change to the configuration of a function. Regression testing is a continuous process and the State of Michigan testing team may need to spot test related features.

2.2.4 Acceptance Testing

Responsibility

The SOM testing team is responsible for conducting acceptance testing.

Dependency to Begin Test

For the acceptance testing process to begin, all configuration, data migration, data linking and reporting and iteration testing, as described above, must be complete with successful results.

Description

The goal of acceptance testing is to ensure that the system meets the specifications as detailed in the requirements compliance matrix and that the interactions between the functions tested during iteration testing meets requirements as defined by the SOM.

Test Data

DTS will provide sample test data required to perform acceptance testing. The test data set will include the test data created during DTS and the SOM iteration testing.

Test Plans

DTS will provide test plans to the State of Michigan testers for acceptance testing. The test plans will document the functions to test, the steps to perform the function and the expected outcome.

Test Document

There will be no physical document created at this time. Redmine will be used as the primary tool to record any misconfigurations, missed requirements, etc. during the acceptance tests.

Test Environment

This type of testing is conducted by the SOM testers on a DTS test site.

Desired Test Output

The testing of each iteration will be conducted by the SOM testing team and any changes identified will be tracked using Redmine. During acceptance testing, the State of Michigan testing team may document future enhancements and suggestions for improvement. The outcome of the acceptance testing is final acceptance and sign-off of the MDOT TAMS Project.

2.3 Defect Reporting and Tracking

Redmine project management software will be used to record defects and configuration changes detected during iteration testing and acceptance testing. The DTS Test Manager will review any defects/changes reported during testing to ensure that all defects/changes are well defined, reproducible and in line with the SOM requirements and will work with the implementation team to prioritize the defects/changes based on State of Michigan priorities. The SOM will be provided with access to the Redmine system as users to enter in defects/changes and to track the status. Redmine users may opt to receive email notifications when a reported defect status changes. DTS will provide weekly reports in PDF format with a listing of the defects/changes and the status of each.

When reporting a defect, the following details will be captured to provide the implementation team a good description of the defect/change:

- Module Name, Title or File Name
- Description of steps leading to the error
- Priority (Immediate, High, Low)
- Type (defect, configuration change)
- Error message, if applicable
- Any associated screenshots (preferred but optional)

DTS will follow a testing cycle to ensure that every defect is tested thoroughly before it comes back for State of Michigan review.

1. Defect identification
2. Defect resolution by implementation team
3. Defect testing by QC test team
4. Acceptance testing by the SOM

This defect resolution testing cycle is utilized to ensure that resolution of a defect was accomplished without an impact to the implementation of other features.

2.4 Testing Schedule

The testing schedule will follow the schedule as documented in the WBS, Schedule and Resource Allocation Management Plan. DTS will work with the State of Michigan to identify individual testers prior to testing.

Section 3. Acceptance Management

3.1 Process

DTS deliverables will follow a strict acceptance process of (1) checking, (2) concurrence with comments, (3) change incorporation into the document/product and (4) verification that the change was completed prior to being delivered to MDC. The acceptance process will follow a milestone or a gated approach where the following will apply.

1. Gate decision points that precede every phase. Until specific deliverables are accepted by SOM, the project shall not move forward into the next phase.
2. Gate sessions will be attended by the DTS project management team and the State of Michigan's Core Team. Conditional approval of the deliverables will occur as the deliverables are submitted; however, acceptance of the deliverables will occur at the milestone sessions.
3. At each Gate, the SOM and the DTS team shall review the accepted deliverables in the previous phase to determine whether the project is on target.

3.2 Project Deliverables

The project schedule shows project acceptance review gates specific to the MDOT TAMS project. Each milestone will include delivery of several documents or items.

3.3 Project Acceptance Criteria

Upon the completion of all project work, as defined by the project schedule and list of deliverables, DTS will notify the SOM Project Manager and Project Sponsor in writing and submit the final invoice in accordance with the invoicing schedule. The SOM Project Manager and Project Sponsor will review, approve and formally accept or reject the components of the project work in accordance with the review time outlined in the project schedule. Formal acceptance of the project work constitutes complete implementation of the TAMS project and the commencement of the Warranty Period.

Production Go-live

Contractor is responsible to work with State staff to migrate the TAMS application from the QA environment into the Production environment following the successful completion of UAT activities. Contractor responsibilities with respect to the above testing activities are as follows:

- Assist State staff in the establishment and verification of the TAMS Production environment;
- Assist State staff in the migration of TAMS data from the Test environment to the Production environment;
- Participate in on-site Go-live activities as requested by the State Project Manager; and
- Obtain official sign-off from the State upon successful completion of Go-live activities.

Contractor's Agreement & Approach in regards to Section 1.104, E. Implementation Services – Production Go-live	
x	I have reviewed the above section and agree with no exception.
	Production Go-Live/Stabilization Plan The overall strategy that DTS will employ to conduct effective testing of the TAMS is to start with creating well-defined user stories, from reviewing the requirements matrix developed for the project, created during the Implementation Plans task. A user story (a requirement or a part of a requirement) is a feature oriented task that covers who, what, and why about the task. A well-defined user story is very closely lined up with a unit test specification for a component. Thus, a good user story leads to a good unit test which ensures that a component is accurately completing the task at hand. Additional testing phases ensure that the component appropriately integrates with the rest of the system. The testing strategies that DTS will undertake can broadly be sub-divided into confirmatory and investigative testing categories. Confirmatory testing is pursued through a combination of test driven development (TDD) and Agile Acceptance Testing while investigative testing regimes are traditionally defined in consultation with the client but may include exploratory or scenario based testing along with some component of user testing of the system components as well. **Unit Test** Unit testing or programmer testing is the first level of testing which ensures that a component in the TAMS meets a user story specification. This has to be completed by the developer of the component, and is the foundation of all other types of testing on a component. When addressing requirements of a system, DTS implementers typically use the Test Driven Development (TDD) methodology and first create test methods or unit tests that define requirements and configuration behavior before implementing the configuration for a functional application unit itself. **Integration Test** Integration testing can be internal or external to the TAMS. During the TAMS internal integration testing, TAMS will ensure that application components produced by two separate teams working independently "work and play well together". Once the specific components are integrated, automated unit tests will be run to ensure that the integration pieces are sound and do not have any immediate issues. This is also typically when peer review testing is conducted, by a person who is in the development team, but someone other than the program author. During the TAMS external integration testing, DTS will ensure that the TAMS integrates well with external systems listed in Contract.

System Test

The goal of system testing is to ensure that the application is meeting the specifics as detailed in the requirements matrix, created during the Implementation Plans task. The testing team will work with the project requirements lead team to ensure that unit tests and integration tests have been written for all components as per the specification, and the system is now ready for user acceptance testing.

Load Test

DTS will perform load testing wherever applicable on custom components of the system, to examine how they perform under load. This process determines whether positive test outcomes are dependent upon system loads and whether refactoring is necessary to increase performance.

Security Test

Security testing ensures that test users are created for every functional area in the system and have the proper access levels for the tools they would work with.

Usability Test

The goal of usability testing is to determine user flow, user interface, and basic usability issues with the application. It involves the user testing every page/function of the TAMS or parts of the TAMS, and documenting any comments, issues or difficulties encountered on the TAMS.

User Acceptance Test

This testing phase is open to a selected testing group from the client side, and typically is a prerequisite to the Beta testing phase. The goal of this type of testing is to ensure that the testing team can review the components configured and make sure it meets the specifications outlined in the requirements matrix, this document is created during the Implementation Plans task.

Typically the 2 main goals of this type of testing are requirements validation and usability testing from the client end.

Regression Test

The goal of regression testing is to uncover any configuration or software errors by the "fix" of a part of the program to solve an issue. Although this can be done manually, by having a group of testing (typically part of the quality assurance team) test all inter-related functions which could have been affected by this bug fix, it is becoming increasingly popular to write tests for user-defined test cases that can be automated in such a situation.

Operational Readiness Test

DTS's philosophy to operational readiness testing is to eliminate any surprises with respect to the TAMS implementation early on. As part of the agile software methodology approach that the DTS team will follow, DTS will conduct automated deployments of configurations into the hosting environment on a periodic basis.

During the initial iterations of the project, the development team will work at setting up a test environment for initial and incremental deployments of the project. This environment will be the future deployment environment, or will very closely mimic the final deployment environment.

During operational readiness testing, the testing team will use the “Beta Testing Checklist” and review all the functionality in the system, on the “production/stage environment”. This will ensure that any “system or configuration” issues are addressed in the deployed environment, before Beta testing is conducted in detail.

	Beta Testing Once the system has been deployed into the hosted environment during operational readiness testing, the testing team will perform detailed testing of all user stories completed in the last iteration cycle in the hosted environment (stage) and thereafter prepare to hand over the system to the project team for the final user testing. At the end of each iteration, the testing team will review the specifications for the components configured, to ensure that the component is meeting the user specifications outlined, and also test the functionality for each user story to ensure that it is working as intended. A preliminary user manual or user interface mock-ups, detailing all the components which have completed configuration, along with a list of functions/tasks to be tested in specific roles will be handed to the project team before Beta testing. **Final Sign-off** We will complete the steps below as part of our overall process to support sign-off and go-live activities: • Assist State staff in the establishment and verification of the TAMS Production environment; • Assist State staff in the migration of TAMS data from the Test environment to the Production environment; • Participate in on-site Go-live activities as requested by the State Project Manager; and • Obtain official sign-off from the State upon successful completion of Go-live activities.

Performance Warranty Period
Contractor will provide a 90-day Performance Warranty for Solution in production, per Section 2.311 of Article 2.

Contractor's Agreement & Approach in regards to Section 1.104, E. Implementation Services – Performance Warranty Period	
x	I have reviewed the above section and agree with no exception.
	The DTS team represents and warrants that Deliverables, after Final Acceptance, will perform and operate in compliance with the requirements and other standards of performance contained in this Contract (including all descriptions, specifications and drawings made a part of Contract) for a period of (90) ninety days. In the event of a breach of this warranty, the DTS team will promptly correct the affected Deliverable(s) at no charge to the State. The following items are included in the 90 day Performance Warranty Period: • LRS linear datum and associated LRMs • Lane Mile, Sign, Culvert and Guardrail Inventory event layers and attributes • Interface to the MDOT MIBridge system • Successful completion of pilot projects • TAMS UAT plan • Accepted Production TAMS Solution • Warranty services as required

Deliverable(s)

- LRS linear datum and associated LRMs
- Lane Mile, Sign, Culvert and Guardrail Inventory event layers and attributes
- Interface to the MDOT MIBridge system
- Successful completion of pilot projects
- TAMS UAT plan
- Accepted Production TAMS Solution
- Warranty services as required
- Any other deliverable Contractor deems appropriate

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.
- Successful completion of the Performance Warranty shall be the criterion for final acceptance of the TAMS Solution.

Contractor's Agreement in regards to Section 1.104, E. Implementation Services	
x	I have reviewed the above section and agree with no exception.

F. Training

Contractor will provide a Train-the-Trainer solution for State administrative staff at a State facility in Lansing, MI for up to 20 staff members, who will provide training for all other State staff to use and administer Solution. Contractor shall conduct a minimum of two separate Train-the-Trainer sessions to ensure that all participants have an opportunity to attend the training. Each Train-the-Trainer session should be designed for minimum of 8 to 16 hours (i.e., 1 to 2 day of training). Training will include:

- Technical training for State individuals who will be working with the services contractor to configure the applications including but not limited to establishing databases and interfaces, data conversion, customization, and upgrading the customized software;
- System administration training for State personnel who will be responsible for ongoing maintenance and administration of the system, including security;
- End-User Training for designated State personnel responsible for entering changes to the MGF road network database and associated LRMs (Road Network Editor);
- End-User Training for designated State personnel responsible for entering new assets, modifying existing assets, and deleting assets (Asset Editor);
- End-User Training for designated State personnel responsible for entering work requests, work orders and other information associated with maintenance management activities (Maintenance Editor); and
- End-User Training for designated State personnel responsible for inquiry, reporting and analysis against TAMS data (Inquiry User).

Additionally, Contractor will provide online / web-based access to End-User Training, so that users can access the training as desired and when needed.

Contractor will provide training at no additional cost for all upgrades and new versions to the system that affect end-users.

Deliverable(s)

- Train-the-Trainer training and associated documentation
- Online / web-based access to End-User Training
- Additional training ((e.g. classroom or online / web-based training, training flier, release features, etc.) at no additional cost for all upgrades and new versions to the system that affect end-user functionality

Training is provided in a variety of formats for product installation, use, and administration for a variety of levels (e.g. basic, advanced, refresher, etc.)

All training manuals, training plans and other documentation provided become the property of the State.

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501. Any additional or more specific criteria should be identified here.

Contractor's Agreement & Approach in regards to Section 1.104, F. Training	
x	I have reviewed the above section and agree with no exception.
	Training DTS has a wealth of training-related experience. In fact, DTS received an award from the American Planning Association and Federal Highway Administration for its development of the Sociocultural Effects Evaluation training program, delivered throughout the State of Florida. Moreover our training staff has conducted training for clients throughout the United States. Specific to TAMS implementations, training and support is one of the most critical of the project phases. To this end, DTS has extensive help documentation as well as routinely creates implementation-specific materials. We have Instructional Systems Designers (ISD) on-staff who are dedicated to developing training curriculum, resource toolkits, digital tooltips and user manuals. Additionally, we have full service multimedia capabilities to support HD video capture and production, interactive training media and 3-D animation. Our company is able to provide under one roof a combination of experience and services that spans from transportation planning professionals, to GIS and asset management technologies, to website design, programming and database development, to training development and the multimedia production capabilities to provide graphics, animations and video to support all of our disciplines. DTS personnel have delivered numerous training courses for clients including online courses, computer-based training courses, interactive training media, video and video simulation, tabletop exercises and stand-up training courses. **In addition, we typically deliver web-based "Resource Toolkits" that are customized to each type of TAMS user and administrator that is a job aid configured specifically to his/her business function. We have found this particularly useful when the user is focused on one particular area of interest and does not want to search through a large manual or complex help files.** Our personnel have an extensive background in training for a variety of types of delivery. Our personnel have not only written the courseware content, but have also designed and developed the technology format in which it is delivered. Our unique combination of video production and web designers and programmers makes it convenient for our clients to use us on a variety of projects. Our references, project history and client list demonstrate the consistency of production and client satisfaction. The DTS will provide the State with a Train-the-Trainer solution for State administrative staff at a State facility in Lansing for up to 20 staff members. Once trained these State staff members will then have the required skill sets to provide training for all other State staff to use and administer the solution. DTS will conduct a minimum of two separate Train-the-Trainer sessions to ensure that all participants have an opportunity to attend the training. Each of these Train-the-Trainer sessions will be designed for minimum of 8 to 16 hours. The training will include:

- Technical training for State individuals who will be working with the services contractor to configure the applications including but not limited to establishing databases and interfaces, data conversion, customization and upgrading the customized software;
- System administration training for State personnel who will be responsible for ongoing maintenance and administration of the system, including security;
- End-User Training for designated State personnel responsible for entering changes to the MGF road network database and associated LRMs (Road Network Editor);
- End-User Training for designated State personnel responsible for entering new assets, modifying existing assets, and deleting assets (Asset Editor);
- End-User Training for designated State personnel responsible for entering work requests, work orders and other information associated with maintenance management activities (Maintenance Editor); and
- End-User Training for designated State personnel responsible for inquiry, reporting and analysis against TAMS data (Inquiry User).

Here is an example of what is available as potential delivery mechanisms:

Train the Trainer

DTS realizes that train the trainer courses important for the sustainability of systematic, ongoing training. These sessions are a very effective way to train the system administrator responsible for understanding the total system as well as individual users or groups of users. Under this training model, the State's administrator(s) and other managers (as desired) can be trained either the training team or the actual DTS implementation team.

For a single department this is a highly effective method. It creates an in-house expert in the use of the system that keeps external training needs to an absolute minimum.

Under this training model, basic training manuals as well as context sensitive focus can be incorporated where desired.

The model training curriculum is as follows:

Phase 1: Identify customer staff that will be trained and subsequently become in-house trainers.

Phase 2: Develop any context sensitive focus desired (can be done at a later date as well).

Phase 3: Train the trainers.

This is done in a hands-on immersive setting, typically in a one-on-one setting. Training is heavily focused on making the student(s) subject-matter experts in the system, and then focusing on how the organization's business processes have been implemented. By understanding the underlying system architecture it becomes much simpler to train other users to use the system. This greatly facilitates the State's ability to configure and expand the system without any further assistance.

We find that one-on-one training for a minimum of two 4 to 6 hour sessions is optimal. After the initial one-on-one sessions, remote training is highly effective (e.g. GoToMeeting or WebEx). The duration of training is a function of the number of modules in use more than the number of user groups/roles. As with the enterprise training options, all training is done on an exact copy of the production system.

Enterprise Training with Context Sensitive Focus

This training option is the most thorough and comprehensive. The trainers begin developing the training curriculum early in the system's implementation. The training staff works closely with the implementation staff during the business process analysis phases of the project. This allows the training staff to perfectly understand the agency's workflows within the system on a user group by user group (e.g. "role") basis. The training team develops comprehensive training programs for each role – where field users will be trained in the use of the system as it specifically relates to how they need to get their jobs done, and where supervisors all the way up to senior managers are each trained to use the system specifically for their roles within the organization. An administrative role is included – where the customer always has a person(s) trained in the use of the system across *all* roles.

This training option includes "context sensitive" training materials. Our training staff will develop customized online materials, popups, manuals, resource toolkits, job aids, etc. that are specific to the agency's business processes and user roles.

The model training curriculum is as follows:

Phase 1: Define all agency user roles and related business processes to be supported by the implemented system. This is done in tandem with the implementation team.

Phase 2: Develop training storyboards with the agency's administrative user(s). The administrative user(s) will be the customer side PM to work with our training team to approve training course content.

Phase 3: For each role, create context sensitive media/materials that are embedded into the application, help files and training manual(s) in hardcopy and digital form.

Phase 4: Training a number of groups to train is driven by the number of roles in the organization. The size of a group is determined by the agency's timeline for training, facility size available and complexity of the role being trained. Duration of training is driven by the complexity of the role being trained:

- We prefer to limit training to 3 hours maximum in a given day to maintain optimal focus in the students, and to allow normal work duties to continue as best as possible.
- Depending on the customer's ability to commit staff to training in lieu of performing their normal work activities, the number of training sessions and the duration of the sessions may be affected.

Training is done on an exact copy of the production version of the agency's final TAMS implementation.

End User Training

DTS steps through the use of the system with actual end users in a classroom setting. The VUEWorks Administrator and the SME(s) will attend and will play a dual role: receiving training as well as assisting with the training. The format is informal, where DTS staff will take the new system users through an overview of the application and then proceed to walk through activities correctly. It is critical that the VUEWorks Administrator and the SME(s) understand that their role throughout the implementation process is to correctly define and articulate the workflow process, with signoff at key steps along the way.

The VUEWorks Administrator will be expected to have already taken ownership of the VUEWorks configuration prior to the end user training, and will be fully capable of modifying the system as necessary to refine processes, workflows and configurations for the agency. Training should occur in an agency room/facility where trainees can sit at a computer that has access to the TAMS application. Doubling up or sharing a computer is often beneficial. A projector and screen is useful so students can follow along with the instructor.

Other Training Tools Available:

Training Workshops

Training workshops will be an important part of the development and implementation of this training. The workshops will be geared specifically to roll out the course and will include training workshops for:

- internal users (a variety of types of users will be trained)
- external users
- training the trainers

Online or Web-based Training

Web-based or online training is the most effective and most contemporary training methodology for software system training. The training can be modified and changes can be implemented immediately, as opposed to printed and published handbooks that can be outdated a month after publication. Decisions will need to be address to determine which types of users and courses will be developed to meet specific needs:

- Employing or not employing an LMS (learning Management System)
- Graded or non-graded structure/design
- Simple confirmation of a trainee finishing the course (non-graded)
- Certificate awards for finishing the course
- Training that is available at the individual's own pace
- Online training available during certain time frames

Manuals (Handbook) and Documentation

User manuals will be user-friendly with an inviting style and an easy-to-use reference format, including SMART Tips and practical information. These will be available online, in PDF format with users notified when updates are available.

Resource Toolkit

The Resource Toolkit is a collection of training resources, developed and targeted for specific users. For instance, an external user of the system does not need to have all of the training program information that a system operator or staff person needs. So resource toolkits will be geared for the end user. These will be a ready combination of quick helps, handouts and references. They will also include:

- Flash video "how to" demonstrations (audio narration and screen captures that are a few seconds to a few minutes long)
- Interactive training media with resources, maps, job aids, videos and animations as required
- Printed guides for specific users

Built-In Tool Tips

The software application will have built-in tool tips, helps and prompts for users.

Webinars

Training webinars are a very advantageous form of training because the training can be made available as needed to address specific training needs. These courses can be flexible and customized for large groups of users or for select, small groups.

G. Documentation

Contractor is responsible to provide a complete set of Solution documentation to the State including but not limited to the deliverables specified below.

Deliverable(s)

- User manuals
- Technical manuals
  1. Copies of the following documentation in electronic PDF format will be provided:
     a. User and Technical Manuals - On-line and Hard Copy
     b. Data Element Dictionary
     c. Operations Manual
     d. All updates of documentation during the term of Contract, software license and maintenance agreement
  2. The following documentation is provided for all modules and program development:
     a. System-wide documentation and specifications
     b. Baseline End-User training manuals to be used as a basis for "User Manuals" and online / web-based help
     c. Installation procedure

   d. Module configuration documents sufficient for configuration maintenance purposes
   e. Testing scripts
   f. Specification documentation
   g. Production migration
3. The documentation of components, features, and use of the hardware/software shall be detailed such that resolution of most problems can be determined from the documentation, and most questions can be answered.
4. All system, operational, user, change, and issue documentation must: be available in electronic format; published to an intranet website accessible to State users; updated regularly; include unique numerical identifiers for each section, and: be consistent with the most current version of the application(s) and three (3) previous versions.
5. All system, operations, user, change and issue documentation is to be organized in a format approved by the State and that facilitates updating and allows for revisions to the documentation to be clearly identified including the three (3) previous versions.
6. Contractor must develop and submit for State approval complete, accurate, and timely system, operations, and user documentation.
7. Contractor must notify the State of any discrepancies or errors outlined in the system, operations, and user documentation.

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501. Media format(s) for documentation are subject to approval by the State.

Contractor's Agreement & Approach in regards to Section 1.104, G. Documentation	
x	I have reviewed the above section and agree with no exception.
	User manuals and technical documents will be user-friendly with an inviting style, easy-to-use reference format, and with Tool Tips and practical information. These will also be available in on-line, PDF formats, which also makes updating page changes less costly (instead of re-printing and publishing, the on-line PDF is updated and users are notified). DTS will provide the training and required documentation as outlined below. In addition, DTS is willing to work with the State to determine other training types/delivery methods as we understand that not every user learns a system in the same way. DTS will provide training materials to train MDOT personnel in the use and maintenance of the system. The DTS team will initiate development of the VUEWorks, Roads and Highways and SLD Tool Training Materials once DTS has provided written acceptance of the Final Training Plan document. Training documentation will augment the TAMS online help documentation and will be relevant to the MDOT deployment. Materials will be developed to support training MDOT personnel to perform the basic workflows of the of Roads and Highways solution. This will include training in the use of the TAMS desktop and web-based components. Training materials will also address training of the GIS group on how to add other events and add more users (i.e. from other business units). Training Materials will be a combination of Microsoft PowerPoint presentations and Microsoft Word exercises. The class materials and exercises will be scenario based, incorporating MDOT's workflows known from this project and the TAMS operational procedures as defined during the configuration and design tasks of the project. **Resource Toolkit** The Resource Toolkit is a collection of training resources for specific users. These can be developed and targeted to the user. For instance, an external user of the system does not need to have all of the training information that a systems operator or program staff person needs. So resource toolkits will be geared for the end user. These will be a combination of quick helps, handouts and ready references. They will also include:

	• Flash Video "How To" demonstrations (audio narration and screen captures that are a few seconds to a few minutes long) • Interactive training with resources, maps, job aids, videos and animations as required • Printed Guides for Specific Users DTS will provide a complete set of solution documentation to the State as listed in deliverables above.

H. Maintenance and Support

Contractor is responsible for providing ongoing maintenance and support of the TAMS Solution to the State including but not limited to the deliverables specified below. Contractor is requested to specify any additional maintenance and support features provided in addition to those specified under Deliverables below. The resulting contract will integrate the attached schedule, Schedule A – Maintenance and Support, with this section (Section H – Maintenance and Support). Schedule A includes response and resolution times.

- Help Desk
- Onsite Technical Support
- Solution Release Management Support

Deliverable(s)

- Maintenance of TAMS Solution software:
  - Maintenance is available on an annually renewable contract.
  - Maintenance programs commence at the end of the 90-day warranty period.
  - The software maintenance program includes all future software updates and system enhancements applicable to system modules licensed without further charge to all licensed users maintaining an annually renewable software support contract.
- Support
  - Help Desk
    - Help desk support is available from 6 am – 6 pm Eastern Time Monday through Friday inclusive, with escalation as necessary to senior technical/engineering staff, and then to higher management and/or senior management.
    - A Web-enabled help desk interface is provided at no additional cost.
  - Technical
    - Remote diagnostic capabilities are provided.
    - Onsite support capabilities as needed (referred to as Second Line Support in Schedule A).
    - Support service options are provided including service from 6 am – 6 pm Eastern Time Monday through Friday inclusive, including onsite service (next day after remote support is determined unable to resolve).
    - Emergency assistance is available from 6 am – 6 pm Eastern Time Monday through Friday inclusive, at no additional cost to the State.
    - The State will be provided with information on software problems encountered at other locations, along with the solution to those problems, when such information is relevant to State software.
    - Support is provided for superseded releases and back releases still in use by the State.
    - For the first year and all subsequent Contract years, the following services are provided for the current version and one previous version of any Software provided with the deliverables, commencing upon installation of the deliverables or delivery of the Software:

1. **Error Correction.** Upon notice by State of a problem with the Software (which problem can be verified), reasonable efforts to correct or provide a working solution for the problem.
2. **Material Defects**. The State will be notified of any material errors or defects in the deliverables known, or made known to Contractor from any source during Contract term that could cause the production of inaccurate, or otherwise materially incorrect results; Contractor shall initiate actions as may be commercially necessary or proper to effect corrections of any such errors or defects.
3. **Update***s.* All new releases and bug fixes (collectively referred to as "Changes") for any software deliverable developed or published by Contractor and made generally available to its other customers at no additional charge will be provided to the State at no additional charge.

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501. Contractor agrees to the terms and conditions specified under Deliverables above.

Contractor's Agreement & Approach in regards to Section 1.104, H. Maintenance and Support and Schedule A – Maintenance and Support	
x	I have reviewed the above section and agree with no exception.
	Technical Support and Help Desk DTS will provide an account manager assigned to the state agency, to assist with set-up, state agency administrator and principle administrator training and ongoing support. The account manager will be our Project Manager. DTS will provide the agency a contact phone number that the state agency can use to report technical system problems. DTS currently provides a toll free line for its clients as well as direct contact to the VUEWorks support structure. In fact, depending on the issue, our clients have access to development/implementation resources to talk directly and work through issues on a case-by-case basis. DTS will provide technical/help desk support Monday through Friday that overlap with the normal state agency operating hours of 6:00 a.m. to 6:00 p.m. EST. In fact, VUEWorks support is currently provided from 6:00 a.m. to 8:00 p.m. Eastern time for our customers. DTS support staff will keep a log of all maintenance/technical support calls made to the help desk/technical support personnel, and document the complaints and problems reported to the help desk system by State agency staff utilizing the websites. This log will be made available to the State upon request. A Customer Relationship Management System is used that includes a complete reporting and web-based visualization tool to view any problems including the details listed below. The log will contain the following information: • Time of call • Name of caller • Caller's telephone number and/or email address • Description of reported problem/complaint • Indication of whether the problem/complaint was resolved at time of call • Description of any follow-up investigation/resolution plans • Assigned case number if resolution not provided during call • Date of and description of final resolution

DTS will make electronic support available to the State upon award of Contract. We understand that electronic support should include the ability to report problems to our support staff on-line, the ability to browse a database containing problems, technical questions and the ability to fix problems electronically. A web-based troubleshooting report application is maintained that can be used to review ongoing tasks and support issues as well as estimates to complete and client acceptance of fixes.

System Maintenance

DTS will provide system maintenance that includes but is not limited to upgrades, enhancements, new releases and technical support for all products/services provided including ongoing unlimited telephone technical support problem determination and resolution. We understand that this is contingent on the State paying the maintenance/purchase/subscription fees as specified within Schedule A. DTS will provide to the State all generally publicly available improvements and additions to the functionality, as well as new functions, of the licensed system and provide the maintenance services as specified herein. At least one new major VUEWorks release is provided each year as well as service packs to go with 3rd party vendor updates (Esri, Microsoft, Oracle, etc.).

DTS will maintain the licensed system so that it operates in conformity with all descriptions and specifications stated herein and as applicable in Contract Exhibits/Attachments including specifications for the performance of all improved or modified versions that the state agency has been licensed to use. We understand that any system components upgrades must accommodate and maintain the state agency baseline configurations required to fulfill the mandatory specifications in Contract.

DTS understands maintenance services shall include, at a minimum, the detection and correction of system errors according to the specifications described herein, in the applicable Exhibits/Attachment and in our team's documentation of the system and the implementation of all program changes, system configuration, new releases/updates, upgrades, enhancements, new versions and implementation of additional programs provided under this contract. We agree to respond to the State's inquiries regarding the use and functionality of the solution as issues are encountered by system users.

For the first year and all subsequent Contract years, the following services are provided for the current version and one previous version of any software provided with the deliverables, commencing upon installation of the deliverables or delivery of the Software:

1. **Error Correction.** Upon notice by State of a problem with the Software (which problem can be verified), reasonable efforts to correct or provide a working solution for the problem.
2. **Material Defects**. The State will be notified of any material errors or defects in the deliverables known, or made known to Contractor from any source during Contract term that could cause the production of inaccurate, or otherwise materially incorrect results; Contractor shall initiate actions as may be commercially necessary or proper to effect corrections of any such errors or defects.
3. **Update**s. All new releases and bug fixes (collectively referred to as "Changes") for any software deliverable developed or published by DTS and made generally available to its other customers at no additional charge will be provided to the State at no additional charge.

I. Knowledge Transfer/Transition

Contractor is responsible to liaise with State technical staff identified by Client to ensure that ample opportunity is provided for knowledge transfer during the performance of TAMS Solution installation, configuration, application integration, data migration and other implementation service activities. Contractor will work with State IT technical staff to prepare a Solution Transition Plan that will describe how the transfer of responsibility for TAMS Solution support will occur as part of the Go-live activity.

Deliverable(s)

- Knowledge transfer to State Staff
- Solution Transition Plan

Acceptance Criteria

- High-level acceptance criteria for Document Deliverables and Software Deliverables are listed in Section 1.501.
- Contractor proposed approach to knowledge transfer will be monitored for effectiveness during Solution Implementation activities and may require adjustments. Solution Transition Plan requires State approval.

Contractor's Agreement in regards to Section 1.104, I. Knowledge Transfer/Transition	
x	I have reviewed the above section and agree with no exception.

J. Reserve Bank of Hours / Other Services

Contractor agrees to provide additional services as required to meet requirements stated within this section.

Contingency Services

The State intends to establish a contingency reserve of resource hours that may be used to address scope changes encountered during the project. Contractor is responsible to ensure that technical resources are available to address this requirement at agreed upon all inclusive fixed rates.

Release Management Services

The State may request technical support services to install, configure, test and migrate new TAMS Solution software releases to Production. Contractor is responsible to provide estimates of required support hours and associated expenses upon request by the State, and to ensure that technical resources are available to address this requirement at agreed upon fixed rates.

Deliverable(s)

- Contingency services to meet new requirements (1,500 hours)
- Release management services – upon request

Acceptance Criteria

Contractor agrees to provide additional services upon request from the State. Firm hourly rates for these services are to be provided for a five (5) year period commencing with the project start date as outlined in Table 9 and Table 10 in the Attachment B Cost Tables.

Contractor's Agreement in regards to Section 1.104, J. Other Services	
x	I have reviewed the above section and agree with no exception.

II. Requirements

This section defines requirements for the TAMS Solution. Contractor is responsible to ensure that a response is provided where indicated below to address these requirements.

A. Technical System Requirements

TAMS Solution technical/general system requirements identify what Solution or product must run on or integrate with, including any standards that must be met, security requirements, service levels and interfaces. Technical/general system requirements will also identify the general framework in which the system or product must work, such as: capacity requirements (number of users, concurrent users, number of transactions to be handled, peak usage), documentation, audit, backup and recovery. These requirements are defined in detail within the attachment specified below.

B. Functional Requirements
TAMS Solution functional requirements identify what the product or system must do to enable performance of work tasks and any applicable service levels. These requirements are defined in detail within the attachment specified below.

Contractor has completed Attachment A Solution Requirements and it is attached to Contract.	
x	Attachment A – Solution Requirements

1.200 Roles and Responsibilities

1.201 CONTRACTOR STAFF, ROLES, AND RESPONSIBILITIES

A. Contractor Staff
Contractor has identified a Single Point of Contact ("**SPOC**"). The SPOC is:

Allen Ibaugh
CEO
Data Transfer Solutions, LLC

The duties of the SPOC shall include, but not be limited to:

- Supporting the management of Contract,
- Facilitating dispute resolution, and
- Advising the State of performance under the terms and conditions of Contract.

The State reserves the right to require a change in the current SPOC if the assigned SPOC is not, in the opinion of the State, adequately serving the needs of the State.

Contractor must submit a letter of commitment for Key Personnel, signed by the identified resource, stating their commitment to work for Contractor/subcontractor on this project contingent on award of Contract. If the identified personnel are currently assigned to a State project Contractor must provide a letter signed by the State Project Manager releasing the individual from the project upon execution of Contract.

Contractor will provide, and update when changed, an organizational chart indicating lines of authority for personnel involved in performance of this Contract and relationships of this staff to other programs or functions of the firm. This chart must also show lines of authority to the next senior level of management and indicate who within the firm will have prime responsibility and final authority for the work.

All Key Personnel may be subject to the State's interview and approval process. Any key staff substitution must have the prior approval of the State. The State has identified the following as key personnel for this project:

- *Project Manager*
- *Solution Architect*
- *Solution Trainer*

Contractor's Key Personnel

Project Manager – Sangeeta Reddy, DTS, 100% of time dedicated to TAMS.

Solution Architect – Kristen Koehn, DTS, 55% of time dedicated to TAMS.

Solution Trainer – Charles Brown, DTS, 25% of time dedicated to TAMS.

Contractor will provide a Project Manager to interact with the designated personnel from the State to insure a smooth transition to the new system. To facilitate project communication and scheduling, a project manager with PMP certification is requested. The project manager will coordinate all of the activities of Contractor personnel assigned to the project and create all reports required by State. Contractor's project manager responsibilities include, at a minimum:

- Manage all defined Contractor responsibilities in this Scope of Services.
- Manage Contractor's sub-contractor if any
- Develop the project plan and schedule, and update as needed
- Serve as the point person for all project issues
- Coordinate and oversee the day-to-day project activities of the project team
- Assess and report project feedback and status
- Escalate project issues, project risks, and other concerns
- Review all project deliverables and provide feedback
- Proactively propose/suggest options and alternatives for consideration
- Utilize change control procedures
- Prepare project documents and materials
- Manage and report on the project's budget

Contractor will provide a *System Architect* to design, configure, and implement the proposed TAMS solution. The System Architect should be a skilled, experienced individual that will accept responsibility for leading the design and implementation of the proposed solution in the MDOT environment.

Contractor will provide a *Trainer* to be responsible for delivering training in the use of the proposed solution within the MDOT environment. Experience in effective delivery of training and in depth knowledge of Contractor's solution is required.

Contractor will provide sufficient qualified staffing to satisfy the deliverables of this Statement of Work.

B. On Site Work Requirements

1. Location of Work

As necessary and as determined by the State, the work is to be performed, completed, and managed in the greater Lansing, Michigan area. Where appropriate, Contractor may perform work at their location.

2. Hours of Operation:

a. Normal State working hours are 8:00 a.m. to 5:00 p.m. EST, Monday through Friday, with work performed as necessary after those hours to meet project deadlines. No overtime will be authorized or paid.

b. The State is not obligated to provide State management of assigned work outside of normal State working hours. The State reserves the right to modify the work hours in the best interest of the project.

c. Contractor shall observe the same standard holidays as State employees. The State does not compensate for holiday pay.

3. Travel:

a. No travel or expenses will be reimbursed. This includes travel costs related to training provided to the State by Contractor.

b. Travel time will not be reimbursed.

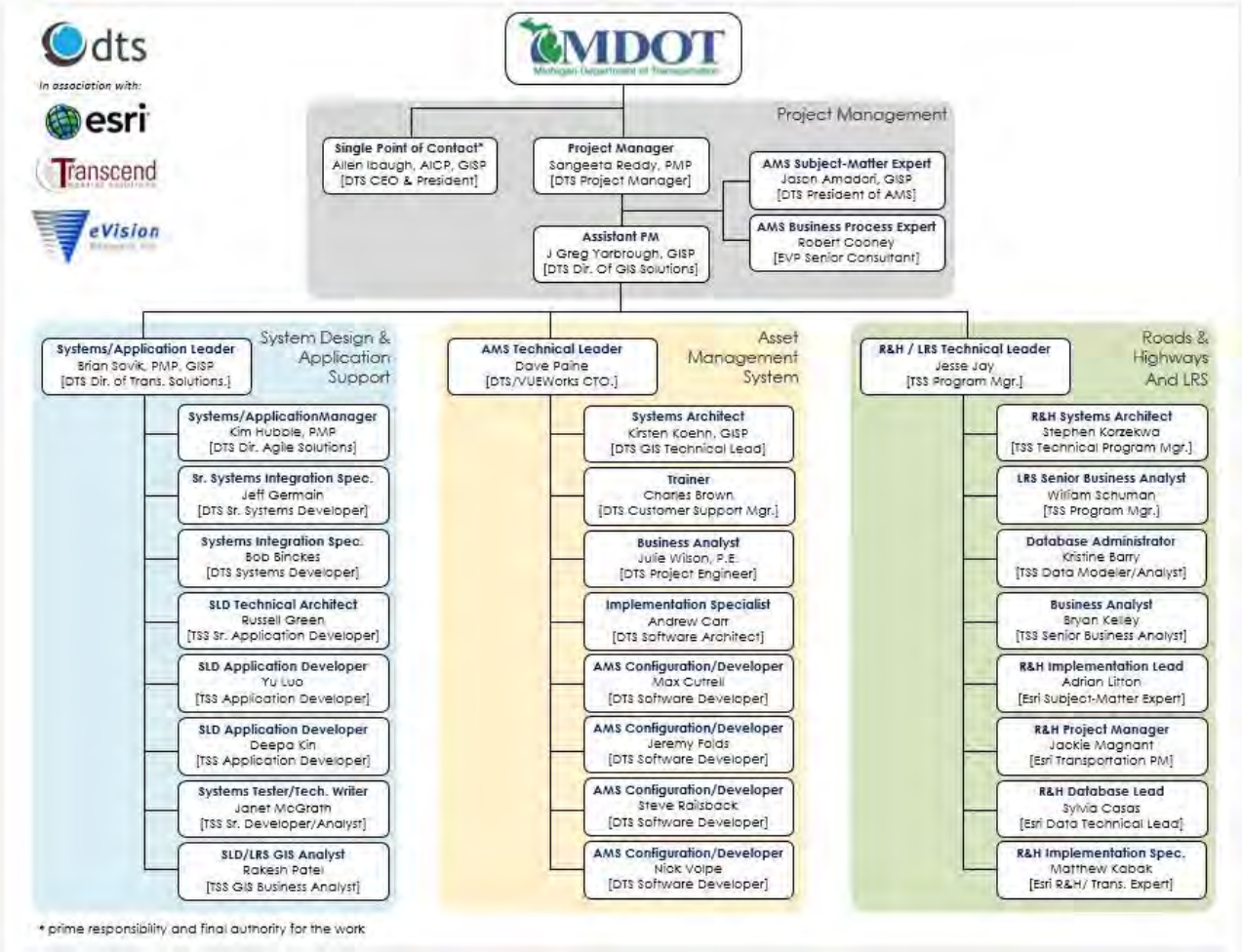
4. Additional Security and Background Check Requirements:

Contractor must present certifications evidencing satisfactory Michigan State Police Background checks, ICHAT, and drug tests for all staff identified for assignment to this project.

In addition, proposed Contractor personnel will be required to complete and submit an RI-8 Fingerprint Card for the National Crime Information Center ("**NCIC**") Finger Prints, if required by project.

Contractor will pay for all costs associated with ensuring their staff meets all requirements.

Contractor's Agreement & Approach in regards to Section 1.201, Contractor Staff Roles & Responsibilities	
x	I have reviewed the above section and agree with no exception.



1.202 STATE STAFF, ROLES, AND RESPONSIBILITIES

Agency should specify State personnel dedicated to project, and identify their associated roles and responsibilities.

The State will provide the following resources for Contractor's use on this project:

- Work space
- Minimal clerical support
- Desk
- Access to copiers and fax machine

The State project team will consist of Executive Subject Matter Experts ("**SMEs**"), project support, and a DTMB and Agency project manager:

Executive Subject Matter Experts
The Executive Subject Matter Experts representing the business units involved will provide the vision for the business design and how the application shall provide for that vision. They shall be available on an as needed basis. The Executive SMEs will be empowered to:

- Resolve project issues in a timely manner
- Review project plan, status, and issues
- Resolve deviations from project plan
- Provide acceptance sign-off
- Utilize change control procedures
- Ensure timely availability of State resources
- Make key implementation decisions, as identified by Contractor's project manager, within 48-hours of their expected decision date.

The State will identify SMEs as needed over the course of this project.

State Project Manager- (DTMB and Agency)
DTMB will provide a Project Manager who will be responsible for the State's infrastructure and coordinate with Contractor in determining the system configuration.

The State's Project Manager will provide the following services:

- Provide State facilities, as needed
- Coordinate the State resources necessary for the project
- Facilitate coordination between various external Contractors.
- Facilitate communication between different State departments/divisions
- Provide acceptance and sign-off of deliverable/milestone
- Review and sign-off of timesheets and invoices
- Resolve project issues
- Escalate outstanding/high priority issues
- Utilize change control procedures
- Conduct regular and ongoing review of the project to confirm that it meets original objectives and requirements
- Document and archive all important project decisions
- Arrange, schedule and facilitate State staff attendance at all project meetings.

The State will identify a Project Manager as needed over the course of this project.

DTMB shall provide a Contract Administrator whose duties shall include, but not be limited to, supporting the management of Contract. The State will identify a Contract Administrator as needed over the course of this project. DTMB will name a Contract Administrator upon execution of Contract.

Contractor's Response in regards to Section 1.202, State Staff, Roles & Responsibilities	
x	I have reviewed the above section and agree with no exception.

1.203 RESERVED

1.300 Project Plan

1.301 PROJECT PLAN MANAGEMENT

Preliminary Project Plan
Contractor will provide a Preliminary Project Plan with the proposal for evaluation purposes, including necessary time frames and deliverables for the various stages of the project and the responsibilities and obligations of both Contractor and the State.

1. In particular, the Preliminary Project Plan will include a MS Project plan or equivalent:
    a. A description of the deliverables to be provided under this contract.
    b. Target dates and critical paths for the deliverables.
    c. Identification of roles and responsibilities, including the organization responsible. Contractor is to provide a roles and responsibility matrix.
    d. The labor, hardware, materials and supplies required to be provided by the State in meeting the target dates established in the Preliminary Project Plan.
    e. Internal milestones
    f. Task durations
2. The Preliminary Project Plan shall include the following deliverable/milestones for which payment shall be made.
    a. Payment to Contractor will be made upon the completion and acceptance of the deliverable or milestone, not to exceed contractual costs of the phase. A milestone is defined as complete when all of the deliverables within the milestone have been completed.
    b. Failure to provide deliverable/milestone by the identified date may be subject to liquidated damages as identified in Article 2.

Note: A Final Project Plan will be required as stated in Article 1, Section 1.301 Project Control.

Orientation Meeting
Within 10 calendar days from execution of Contract, Contractor will be required to attend an orientation meeting to discuss the content and procedures of Contract. The meeting will be held in Lansing, Michigan, at a date and time mutually acceptable to the State and Contractor. The State shall bear no cost for the time and travel of Contractor for attendance at the meeting.

Performance Review Meetings
The State will require Contractor to attend monthly meetings, at a minimum, to review Contractor's performance under Contract. The meetings will be held in Lansing, Michigan, or by teleconference, as mutually agreed by the State and Contractor. The State shall bear no cost for the time and travel of Contractor for attendance at the meeting.

Project Control
1. Contractor will carry out this project under the direction and control of DTMB and MDOT.
2. Within 30 working days of the execution of Contract, Contractor will submit to the State project manager(s) for final approval of the project plan. This project plan must be in agreement with Article 1, Section 1.104 Work and Deliverables, and must include the following:
    - *Contractor's project organizational structure.*
    - *Contractor's staffing table with names and title of personnel assigned to the project. This must be in agreement with staffing of accepted proposal. Necessary substitutions due to change of*

employment status and other unforeseen circumstances may only be made with prior approval of the State.

- *The project work breakdown structure ("WBS") showing sub-projects, activities and tasks, and resources required and allocated to each.*
- *The time-phased plan in the form of a graphic display, showing each event, task, and decision point in the WBS.*

3. Contractor will manage the project in accordance with the State Unified Information Technology Environment (SUITE) methodology, which includes standards for project management, systems engineering, and associated forms and templates which is available at http://www.michigan.gov/suite
   a. Contractor will use an automated tool for planning, monitoring, and tracking Contract's progress and the level of effort of any Contractor personnel spent performing Services under Contract. The tool shall have the capability to produce:
      - Staffing tables with names of personnel assigned to Contract tasks.
      - Project plans showing tasks, subtasks, deliverables, and the resources required and allocated to each (including proposed Services to be performed within the next two (2) weeks updated bi-weekly).
      - Graphs showing critical events, dependencies and decision points during the course of Contract.
   b. Any tool(s) used by Contractor for such purposes must produce information of a type and in a manner and format that will support reporting in compliance with the State standards.

Contractor's Agreement in regards to Section 1.301, Project Plan Management	
x	I have reviewed the above section and agree with no exception.

1.302 REPORTS

Reporting formats must be submitted to the State's Project Manager for approval within five (5) business days after the execution of Contract resulting from this Contract. Once both parties have agreed to the format of the report, it shall become the standard to follow for the duration of Contract.

Contractor will provide a bi-weekly Project Update Report on the overall status to implement Solution, which will include:

- Updated project plan
- Deliverable status
- Schedule status
- Issues

Contractor's Agreement in regards to Section 1.302, Reports	
x	I have reviewed the above section and agree with no exception.

1.400 Project Management

1.401 ISSUE MANAGEMENT

An issue is an identified event that if not addressed may affect schedule, scope, quality, or budget.

Contractor shall maintain an issue log for issues relating to the provision of services under this Contract. The issue management log must be communicated to the State's Project Manager on an agreed upon schedule, with email notifications and updates. The issue log must be updated and must contain the following minimum elements:

- Description of issue
- Issue identification date
- Responsibility for resolving issue.
- Priority for issue resolution (to be mutually agreed upon by the State and Contractor)
- Resources assigned responsibility for resolution
- Resolution date
- Resolution description

Issues shall be escalated for resolution from level 1 through level 3, as defined below:

Level 1 – Subject Matter Experts (SMEs) / Business leads

Level 2 – Project Managers / Business Owner

Level 3 – Executive Sponsor

Contractor Agreement to Section 1.401 Issue Management	
Contractor must check one of the boxes below:	
☒	Can comply with State standards referenced in this section, without exception

1.402 RISK MANAGEMENT

Contractor is responsible for establishing a risk management plan and process, including the identification and recording of risk items, prioritization of risks, definition of mitigation strategies, monitoring of risk items, and periodic risk assessment reviews with the State.

A risk management plan format shall be submitted to the State for approval within twenty (20) business days after the effective date of Contract resulting from the upcoming Contract. The risk management plan will be developed during the initial planning phase of the project, and be in accordance with the State's PMM methodology. Once both parties have agreed to the format of the plan, it shall become the standard to follow for the duration of Contract. The plan must be updated bi-weekly, or as agreed upon.

Contractor shall provide the tool to track risks. Contractor will work with the State and allow input into the prioritization of risks.

Contractor is responsible for identification of risks for each phase of the project. Mitigating and/or eliminating assigned risks will be the responsibility of Contractor. The State will assume the same responsibility for risks assigned to them.

Contractor Agreement to Section 1.402 Risk Management	
Contractor must check one of the boxes below:	
☒	Can comply with State standards referenced in this section, without exception

1.403 CHANGE MANAGEMENT

Change management is defined as the process to communicate, assess, monitor, and control all changes to system resources and processes. The State also employs change management in its administration of Contract.

If a proposed contract change is approved by the Agency, Contract Administrator will submit a request for change to the Department of Technology, Management and Budget, Procurement Buyer, who will make recommendations to the Director of DTMB-Procurement regarding ultimate approval/disapproval of change request. If the DTMB Procurement Director agrees with the proposed modification, and all required approvals

are obtained (including State Administrative Board), the DTMB-Procurement Buyer will issue an addendum to Contract, via a Contract Change Notice. **Contractors who provide products or services prior to the issuance of a Contract Change Notice by DTMB-Procurement, risk non-payment for the out-of-scope/pricing products and/or services.**

Contractor must employ change management procedures to handle such things as "out-of-scope" requests or changing business needs of the State while the migration is underway.

Contractor will employ the change control methodologies to justify changes in the processing environment, and to ensure those changes will not adversely affect performance or availability.

Contractor Agreement to Section 1.403 Change Management	
Contractor must check one of the boxes below:	
☒	Can comply with State standards referenced in this section, without exception

1.500 Acceptance

1.501 CRITERIA

Document Deliverables

1. *Documents are dated and in electronic format, compatible with State of Michigan software in accordance with Article 1.302.*
2. *Requirements documents are reviewed and updated throughout the design/configuration/implementation process to assure requirements are delivered in the final product.*
3. *Draft documents are not accepted as final deliverables.*
4. *The documents will be reviewed and accepted in accordance with the requirements of Contract and Attachments.*
5. *DTMB will review documents within the timeframes detailed in section 2.250 Approval of Deliverables.*
    a. *Approvals will be written and signed by DTMB Project Manager.*
    b. *Issues will be documented and submitted to Contractor.*
    c. *After issues are resolved or waived, Contractor will resubmit documents for approval within 30 days of receipt.*

1.502 FINAL ACCEPTANCE

Final acceptance is expressly conditioned upon completion of ALL deliverables/milestones, completion of ALL tasks in the project plan as approved, completion of ALL applicable inspection and/or testing procedures, and the certification by the State that Contractor has met the defined requirements. For purposes of this Contract, please refer to Section 1.104 Work and Deliverable, Subsection D, implementation, regarding the Performance Warranty, which must be successfully completed prior to final acceptance.

1.600 Compensation and Payment

1.601 COMPENSATION AND PAYMENT

Method of Payment

1. Project Payments

Payments to Contractor will be made on a defined milestone basis upon the completion and acceptance of the deliverable or milestone, not to exceed 90% of contractual costs of the associated Contract items as defined in Attachment B Cost Tables. A milestone is defined as complete when all of the deliverables within the milestone have been completed. Failure to provide deliverable/milestone by the identified date may be subject to liquidated damages as identified in Article 2, Section 2.073.

Payment milestones are specified within the table below along with the associated payments per Contract items.

Milestone	Description	Associated Contract Items (Attachment B)	Estimated Acceptance Date	Payment
1	Upon successful delivery of the agreed Software licenses, executable code and set-up and installation scripts, and instructions to the State on agreed upon media. Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Project Initiation Services	Table 1 Item A – COTS Software Acquisition Table 1 Item B – Project Initiation Services	7/15/15	$593,395.00
2	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Installation and Configuration Services.	Table 1 Item D – Installation and Configuration Services	8/15/15	$88,889.00
3	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Requirements and Solution Architecture Validation Services.	Table 1 Item C – Requirements and Solution Architecture Validation Services	10/1/2015	$258,054.00
4	Upon successful completion of the following activities and deliverables for **COTS System Focused Configurations – Lane Inventory, Signs, and Guardrails** as described within Article 1, Section 1.104 Work and Deliverables: • Installation and Configuration Services, and • Implementation Services – Data Conversion / Migration, and • Testing; and • Production Go-live.	Table 5 Item D and E.1, E.4, E.5 (payments for these are divided across Milestone 4, 5, 7, 8, and 10).	12/1/2015	$222,715.00
5	Upon successful completion of the following activities and deliverables for **COTS System Focused Configurations – Culverts; and SLD Design & Implementation** as described within Article 1, Section 1.104 Work and Deliverables: • Installation and Configuration Services, and • Implementation Services – Data Conversion / Migration, and • Testing; and • Production Go-live.	Table 5 Item D and E.1, E.4, E.5 (payments for these are divided across Milestone 4, 5, 7, 8, and 10).	2/1/2016	$222,715.00

Milestone	Description	Associated Contract Items (Attachment B)	Estimated Acceptance Date	Payment
6	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Implementation Services – Interfaces / Integration.	Table 5 Item E Row E.2 – Total Interfaces / Integration	4/1/2016	$317,344.00
7	Upon successful completion of the following activities and deliverables for **FINAL: Module Level Configuration** as described within Article 1, Section 1.104 Work and Deliverables: • Installation and Configuration Services, and • Implementation Services – Data Conversion / Migration, and • Testing; and • Production Go-live.	Table 5 Item D and E.1, E.4, E.5 (payments for these are divided across Milestone 4, 5, 7, 8, and 10).	6/1/2016	$222,715.00
8	Upon successful completion of the following activities and deliverables for **ArcGIS Server/ArcSDE and Roads & Highways** as described within Article 1, Section 1.104 Work and Deliverables: • Installation and Configuration Services, and • Implementation Services – Data Conversion / Migration, and • Testing; and • Production Go-live.	Table 5 Item D and E.1, E.4, E.5 (payments for these are divided across Milestone 4, 5, 7, 8, and 10).	8/1/2016	$222,715.00
9	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Training.	Table 1 Item F – Training	9/1/2016	$141,382.00
10	Upon successful completion of the following activities and deliverables for **ESRI Roads & Highways Design and Implementation** as described within Article 1, Section 1.104 Work and Deliverables: • Installation and Configuration Services, and • Implementation Services – Data Conversion / Migration, and • Testing; and Production Go-live.	Table 5 Item D and E.1, E.4, E.5 (payments for these are divided across Milestone 4, 5, 7, 8, and 10).	9/1/2016	$222,715.00
11	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Implementation Services – Pilot Projects.	Table 3 Item E Row E.3 – Pilot Projects	10/1/2016	$98,032.00

Milestone	Description	Associated Contract Items (Attachment B)	Estimated Acceptance Date	Payment
12	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Knowledge Transfer / Transition; and • Documentation.	Table 1 Item I – Knowledge Transfer / Transition Table 1 Item G – Documentation	12/1/2016	$28,488.00
13	Upon successful completion of the following activities and deliverables as described within Article 1.104 Work and Deliverables: • Performance Warranty Period Holdback (20%) – see Article 1, Section 1.602.	Table 3 Item E Row E.5 – Performance Warranty Period All of the above	1/1/2017	$829,798.00

2. Maintenance and Support Payments

Payments to Contractor will commence on Solution's Production Go-live date, and will be made on an annual basis for the ongoing services, not to exceed the rates established in Contract per Table 7 as noted in the Exhibit 2 and as summarized below.

Cost Categories	Proposed Licenses	Annual Cost ($)					Total Cost ($)
		Year 1	Year 2	Year 3	Year 4	Year 5	
Total COTS Software License Cost		$0	$141,609	$141,609	$141,609	$141,609	**$566,436.00**

3. Operational Services

Payments to Contractor for operation services (for example: contingency services, release management services) that are authorized under a specific SOW will be made upon the completion and acceptance of the deliverable or milestone as stipulated within the SOW. Failure to provide deliverable/milestone by the identified date may be subject to liquidated damages as identified in Article 2, Section 2.073.

Cost Table
Please refer to Attachment B: Cost Tables for all detailed costs relating to services under this Contract.

Administrative Fee
Contractor is required to submit an Administrative Fee (see Article 2, Section 2.031) on all payments remitted under Contract.

Extended Purchasing Program
Extended purchasing program (see Article 2, section 2.281) volume requirements are included, unless stated otherwise.

Travel
The State will not pay for any travel expenses, including hotel, mileage, meals, parking, etc. Travel time will not be reimbursed. Any out of pocket costs to be included within Contract price. Rates provided for Contractor staff are to be fully loaded rates including travel, lodging, meals and miscellaneous costs.

If Contractor reduces its prices for any of the software or services during the term of this Contract, the State shall have the immediate benefit of such lower prices for new purchases. Contractor shall send notice to the State's DTMB Contract Administrator with the reduced prices within thirty (30) Business Days [or other appropriate time period] of the reduction taking effect.

Statements of Work and Issuance of Purchase Orders

- Unless otherwise agreed by the parties, each Statement of Work will include:
    1. Background
    2. Project Objective
    3. Scope of Work
    4. Deliverables
    5. Acceptance Criteria
    6. Project Control and Reports (including detailed project schedule with staff, hours, etc.)
    7. Specific Department Standards
    8. Payment Schedule
    9. Travel and Expenses
    10. Project Contacts
    11. Agency Responsibilities and Assumptions
    12. Location of Where the Work is to be performed
    13. Expected Contractor Work Hours and Conditions
    14. Cost Estimate (Detailed including staff hours, rates, etc.)

- The parties agree that the Services/Deliverables to be rendered by Contractor pursuant to this Contract (and any future amendments of it) will be defined and described in detail in Statements of Work or Purchase Orders ("**PO**") executed under this Contract. Contractor shall not be obliged or authorized to commence any work to implement a Statement of Work until authorized via a PO issued against this Contract. Contractor shall perform in accordance with this Contract, including the Statements of Work/Purchase Orders executed under it.

Invoicing
Contractor will submit properly itemized invoices to

DTMB – Financial Services
Accounts Payable
P.O. Box 30026
Lansing, MI 48909
or
DTMB-Accounts-Payable@michigan.gov

. Invoices must provide and itemize, as applicable:

- Contract number;
- Purchase Order number
- Contractor name, address, phone number, and Federal Tax Identification Number;
- Description of any commodities/hardware, including quantity ordered;

- Date(s) of delivery and/or date(s) of installation and set up;
- Price for each item, or Contractor's list price for each item and applicable discounts;
- Maintenance charges;
- Net invoice price for each item;
- Other applicable charges;
- Total invoice price; and
- Payment terms, including any available prompt payment discount.

The State may pay maintenance and support charges on a monthly basis, in arrears. Payment of maintenance service/support of less than one (1) month's duration shall be prorated at 1/30th of the basic monthly maintenance charges for each calendar day.

Incorrect or incomplete invoices will be returned to Contractor for correction and reissue.

1.602 HOLDBACK

The State shall have the right to hold back an amount equal to ten percent (10%) of all Milestone payment amounts invoiced by Contractor for Services/Deliverables. The amounts held back shall be released to Contractor after the State has granted Final Acceptance of the project.

1.603 TRUE-UP

Additional pricing and licensing will be adjusted based on tiered levels tied to agency usage and number of concurrent users; to ensure appropriate security and access agencies cannot just add on licenses to TAMS project. Licenses are to be added through the change notice process and separate agreements for number of concurrent users is to be processed through the change management process for this contract. If inadvertent use of licenses happen, a true-up to manage licensing use and pricing will be conducted by the vendor annually, at their discretion. Payment adjustments will be prorated based on use prior to and considering future use after the true-up review is completed.

The parties agree upon the following bundles for annual true-ups:
1. 0-49 users added - $1,500.00 per user
2. 50-99 users added - $1,250.00 per user
3. 100+ users added - $1,000.00 per user

Annual support and maintenance will also increase at a rate of 20% annually per true-up user added.

Article 2, Terms and Conditions

2.000 Contract Structure and Term

2.001 CONTRACT TERM

This Contract is for a period of 7 years beginning at Contract Start Date. All outstanding Purchase Orders must also expire upon the termination for any of the reasons listed in **Section 2.150** of Contract, unless otherwise extended under Contract. Absent an early termination for any reason, Purchase Orders issued but not expired, by the end of Contract's stated term, shall remain in effect for the balance of the fiscal year for which they were issued. This contract is available to all State agencies.

2.002 OPTIONS TO RENEW

This Contract may be renewed in writing by mutual agreement of the parties not less than 30 days before its expiration. Contract may be renewed for up to 5 additional 1 year periods. The State reserves the right to exercise one or more renewal options at one time; or, to exercise only a part of an option year.

2.003 LEGAL EFFECT

Contractor accepts this Contract by signing two copies of Contract and returning them to the DTMB-Procurement. Contractor shall not proceed with the performance of the work to be done under Contract, including the purchase of necessary materials, until both parties have signed Contract to show acceptance of its terms, and Contractor receives a contract release/purchase order that authorizes and defines specific performance requirements.

Except as otherwise agreed in writing by the parties, the State shall not be liable for costs incurred by Contractor or payment under this Contract, until Contractor is notified in writing that this Contract or Change Order has been approved by the State Administrative Board (if required), signed by all the parties and a Purchase Order against Contract has been issued.

2.004 ATTACHMENTS & EXHIBITS

All Attachments and Exhibits affixed to any and all Statement(s) of Work, or appended to or referencing this Contract, are incorporated in their entirety and form part of this Contract.

2.005 ORDERING

The State must issue an approved written Purchase Order, Blanket Purchase Order, Direct Voucher or Procurement Card Order to order any Services/Deliverables under this Contract. All orders are subject to the terms and conditions of this Contract. No additional terms and conditions contained on either a Purchase Order or Blanket Purchase Order apply unless they are specifically contained in that Purchase Order or Blanket Purchase Order's accompanying Statement of Work. Exact quantities to be purchased are unknown; however, Contractor will be required to furnish all such materials and services as may be ordered during Contract period. Quantities specified, if any, are estimates based on prior purchases, and the State is not obligated to purchase in these or any other quantities.

2.006 ORDER OF PRECEDENCE

Contract, including any Statements of Work and Exhibits, to the extent not contrary to Contract, each of which is incorporated for all purposes, constitutes the entire agreement between the parties with respect to the subject matter and supersedes all prior agreements, whether written or oral, with respect to the subject matter and as additional terms and conditions on the purchase order must apply as limited by **Section 2.005.**

In the event of any inconsistency between the terms of Contract and a Statement of Work, the terms of the Statement of Work shall take precedence (as to that Statement of Work only), provided, however, that a Statement of Work may not modify or amend the terms of Contract. Contract may be modified or amended only by a formal Contract amendment.

2.007 HEADINGS

Captions and headings used in Contract are for information and organization purposes. Captions and headings, including inaccurate references, do not, in any way, define or limit the requirements or terms and conditions of Contract.

2.008 FORM, FUNCTION & UTILITY

If Contract is for use of more than one State agency and if the Deliverable/Service does not the meet the form, function, and utility required by that State agency, that agency may, subject to State purchasing policies, procure the Deliverable/Service from another source.

2.009 REFORMATION AND SEVERABILITY

Each provision of Contract is severable from all other provisions of Contract and, if one or more of the provisions of Contract is declared invalid, the remaining provisions of Contract remain in full force and effect.

2.010 Consents and Approvals

Except as expressly provided otherwise in Contract, if either party requires the consent or approval of the other party for the taking of any action under Contract, the consent or approval must be in writing and must not be unreasonably withheld or delayed.

2.011 NO WAIVER OF DEFAULT

If a party fails to insist upon strict adherence to any term of Contract then the party has not waived the right to later insist upon strict adherence to that term, or any other term, of Contract.

2.012 SURVIVAL

Any provisions of Contract that impose continuing obligations on the parties, including without limitation the parties' respective warranty, indemnity and confidentiality obligations, survive the expiration or termination of Contract for any reason. Specific references to survival in Contract are solely for identification purposes and not meant to limit or prevent the survival of any other section

2.020 Contract Administration

2.021 ISSUING OFFICE

This Contract is issued by the Department of Technology, Management & Budget, Procurement and the Michigan Department of Transportation (collectively, including all other relevant State of Michigan departments and agencies, the "State"). DTMB-Procurement is the sole point of contact in the State with regard to all procurement and contractual matters relating to Contract. The DTMB-Procurement Contract Administrator for this Contract is:

David Hatch, IT Buyer
Procurement
Department of Technology, Management & Budget
Constitution Hall, First Floor
PO Box 30026
Lansing, MI 48909
hatchd@michigan.gov
517-284-7044

2.022 CONTRACT COMPLIANCE INSPECTOR

The Director of DTMB-Procurement directs the person named below, or his or her designee, to monitor and coordinate the activities for Contract on a day-to-day basis during its term. **Monitoring Contract activities does not imply the authority to change, modify, clarify, amend, or otherwise alter the prices, terms, conditions and specifications of Contract. DTMB-Procurement is the only State office authorized to**

change, modify, amend, alter or clarify the prices, specifications, terms and conditions of this Contract. Contract Compliance Inspector for this Contract is:

John Kalanquin, IT Manager
DTMB
Email - KalanquinJ@michigan.gov
Phone – (517) 241-0177

2.023 PROJECT MANAGER

The following individual will oversee the project:

Jim Lenahan, Senior Project Manager
DTMB-EPMO
Email - LenahanJ@michigan.gov
Phone - (517) 373-7639

2.024 CHANGE REQUESTS

The State reserves the right to request from time to time any changes to the requirements and specifications of Contract and the work to be performed by Contractor under Contract. During the course of ordinary business, it may become necessary for the State to discontinue certain business practices or create Additional Services/Deliverables. At a minimum, to the extent applicable, Contractor shall provide a detailed outline of all work to be done, including tasks necessary to accomplish the Additional Services/Deliverables, timeframes, listing of key personnel assigned, estimated hours for each individual per task, and a complete and detailed cost justification.

If the State requests or directs Contractor to perform any Services/Deliverables that are outside the scope of Contractor's responsibilities under Contract ("New Work"), Contractor must notify the State promptly before commencing performance of the requested activities it believes are New Work. If Contractor fails to notify the State before commencing performance of the requested activities, any such activities performed before Contractor gives notice shall be conclusively considered to be in-scope Services/Deliverables and not New Work.

If the State requests or directs Contractor to perform any services or provide deliverables that are consistent with and similar to the Services/Deliverables being provided by Contractor under Contract, but which Contractor reasonably and in good faith believes are not included within the Statements of Work, then before performing such Services or providing such Deliverables, Contractor shall notify the State in writing that it considers the Services or Deliverables to be an Additional Service/Deliverable for which Contractor should receive additional compensation. If Contractor does not so notify the State, Contractor shall have no right to claim thereafter that it is entitled to additional compensation for performing that Service or providing that Deliverable. If Contractor does so notify the State, then such a Service or Deliverable shall be governed by the Change Request procedure in this Section.

In the event prices or service levels are not acceptable to the State, the Additional Services or New Work shall be subject to competitive bidding based upon the specifications.

(1) Change Request at State Request
If the State requires Contractor to perform New Work, Additional Services or make changes to the Services that would affect Contract completion schedule or the amount of compensation due Contractor (a "Change"), the State shall submit a written request for Contractor to furnish a proposal for carrying out the requested Change (a "Change Request").

(2) Contractor Recommendation for Change Requests:
Contractor shall be entitled to propose a Change to the State, on its own initiative, should Contractor believe the proposed Change would benefit Contract.

(3) Upon receipt of a Change Request or on its own initiative, Contractor shall examine the implications of the requested Change on the technical specifications, Contract schedule and price of the Deliverables and Services and shall submit to the State without undue delay a written proposal for carrying out the Change. Contractor's proposal shall include any associated changes in the technical specifications, Contract schedule and price and method of pricing of the Services. If the Change is to be performed on a time and materials basis, the Amendment Labor Rates shall apply to the provision of such Services. If Contractor provides a written proposal and should Contractor be of the opinion that a requested Change is not to be recommended, it shall communicate its opinion to the State but shall nevertheless carry out the Change as specified in the written proposal if the State directs it to do so.

(4) By giving Contractor written notice within a reasonable time, the State shall be entitled to accept a Contractor proposal for Change, to reject it, or to reach another agreement with Contractor. Should the parties agree on carrying out a Change, a written Contract Change Notice must be prepared and issued under this Contract, describing the Change and its effects on the Services and any affected components of this Contract (a "Contract Change Notice").

(5) No proposed Change shall be performed until the proposed Change has been specified in a duly executed Contract Change Notice issued by the Department of Technology, Management & Budget, Procurement.

(6) If the State requests or directs Contractor to perform any activities that Contractor believes constitute a Change, Contractor must notify the State that it believes the requested activities are a Change before beginning to work on the requested activities. If Contractor fails to notify the State before beginning to work on the requested activities, then Contractor waives any right to assert any claim for additional compensation or time for performing the requested activities. If Contractor commences performing work outside the scope of this Contract and then ceases performing that work, Contractor must, at the request of the State, retract any out-of-scope work that would adversely affect Contract.

2.025 NOTICES

Any notice given to a party under Contract must be deemed effective, if addressed to the party as addressed below, upon: (i) delivery, if hand delivered; (ii) receipt of a confirmed transmission by facsimile if a copy of the notice is sent by another means specified in this Section; (iii) the third Business Day after being sent by U.S. mail, postage pre-paid, return receipt requested; or (iv) the next Business Day after being sent by a nationally recognized overnight express courier with a reliable tracking system.

State:
State of Michigan
DTMB-Procurement
PO Box 30026
Lansing, Michigan 48909

Contractor:
Data Transfer Solutions, LLC
3680 Avalon Park Blvd. E.
Orlando, FL 32828-9373

Either party may change its address where notices are to be sent by giving notice according to this Section.

2.026 BINDING COMMITMENTS

Representatives of Contractor must have the authority to make binding commitments on Contractor's behalf within the bounds set forth in Contract. Contractor may change the representatives from time to time upon giving written notice.

2.027 RELATIONSHIP OF THE PARTIES

The relationship between the State and Contractor is that of client and independent contractor. No agent, employee, or servant of Contractor or any of its Subcontractors shall be deemed to be an employee, agent or servant of the State for any reason. Contractor shall be solely and entirely responsible for its acts and the acts of its agents, employees, servants and Subcontractors during the performance of Contract.

2.028 COVENANT OF GOOD FAITH

Each party shall act reasonably and in good faith. Unless stated otherwise in Contract, the parties shall not unreasonably delay, condition or withhold the giving of any consent, decision or approval that is either requested or reasonably required of them in order for the other party to perform its responsibilities under Contract.

2.029 ASSIGNMENTS

Neither party may assign Contract, or assign or delegate any of its duties or obligations under Contract, to any other party (whether by operation of law or otherwise), without the prior written consent of the other party; provided, however, that the State may assign Contract to any other State agency, department, division or department without the prior consent of Contractor and Contractor may assign Contract to an affiliate so long as the affiliate is adequately capitalized and can provide adequate assurances that the affiliate can perform Contract. The State may withhold consent from proposed assignments, subcontracts, or novations when the transfer of responsibility would operate to decrease the State's likelihood of receiving performance on Contract or the State's ability to recover damages.

Contractor may not, without the prior written approval of the State, assign its right to receive payments due under Contract. If the State permits an assignment, Contractor is not relieved of its responsibility to perform any of its contractual duties and the requirement under Contract that all payments must be made to one entity continues.

If Contractor intends to assign Contract or any of Contractor's rights or duties under Contract, Contractor must notify the State in writing at least 90 days before the assignment. Contractor also must provide the State with adequate information about the assignee within a reasonable amount of time before the assignment for the State to determine whether to approve the assignment.

2.030 General Provisions

2.031 ADMINISTRATIVE FEE AND REPORTING

Contractor must remit an administrative fee of 1% on all payments remitted to Contractor under Contract including transactions with the State (including its departments, divisions, agencies, offices, and commissions), MiDEAL members, and other states (including governmental subdivisions and authorized entities). Contractor must submit an itemized purchasing activity report, which includes at a minimum, the name of the purchasing entity and the total dollar volume in sales.

Itemized purchasing activity reports should be mailed to DTMB-Procurement and the administrative fee payments shall be made by check payable to the State of Michigan and mailed to:

The Department of Technology, Management & Budget
Financial Services – Cashier Unit
Lewis Cass Building
320 South Walnut St.
P.O. Box 30681
Lansing, MI 48909

The administrative fee and purchasing activity report are due within 30 calendar days from the last day of each quarter.

2.032 MEDIA RELEASES

News releases (including promotional literature and commercial advertisements) pertaining to the RFP and Contract or project to which it relates shall not be made without prior written State approval, and then only in accordance with the explicit written instructions from the State. No results of the activities associated with the RFP and Contract are to be released without prior written approval of the State and then only to persons designated.

2.033 CONTRACT DISTRIBUTION

DTMB-Procurement retains the sole right of Contract distribution to all State agencies and local units of government unless other arrangements are authorized by DTMB-Procurement.

2.034 PERMITS

Contractor must obtain and pay any associated costs for all required governmental permits, licenses and approvals for the delivery, installation and performance of the Services. The State shall pay for all costs and expenses incurred in obtaining and maintaining any necessary easements or right of way.

2.035 WEBSITE INCORPORATION

The State is not bound by any content on Contractor's website, even if Contractor's documentation specifically referenced that content and attempts to incorporate it into any other communication, unless the State has actual knowledge of the content and has expressly agreed to be bound by it in a writing that has been manually signed by an authorized representative of the State.

2.036 FUTURE BIDDING PRECLUSION

Contractor acknowledges that, to the extent this Contract involves the creation, research, investigation or generation of a future RFP; it may be precluded from bidding on the subsequent RFP. The State reserves the right to disqualify any Bidder if the State determines that the Bidder has used its position (whether as an incumbent Contractor, or as a Contractor hired to assist with the RFP development, or as a Vendor offering free assistance) to gain a competitive advantage on the RFP.

2.037 FREEDOM OF INFORMATION

All information in any proposal submitted to the State by Contractor and this Contract is subject to the provisions of the Michigan Freedom of Information Act, 1976 Public Act No. 442, as amended, MCL 15.231, et seq (the "**FOIA**").

2.038 DISASTER RECOVERY

Contractor and the State recognize that the State provides essential services in times of natural or man-made disasters. Therefore, except as so mandated by Federal disaster response requirements, Contractor personnel dedicated to providing Services/Deliverables under this Contract shall provide the State with priority service for repair and work around in the event of a natural or man-made disaster.

2.040 Financial Provisions

2.041 FIXED PRICES FOR SERVICES/DELIVERABLES

Each Statement of Work or Purchase Order issued under this Contract shall specify (or indicate by reference to the appropriate Contract Exhibit) the firm, fixed prices for all Services/Deliverables, and the associated payment milestones and payment amounts.

2.042 ADJUSTMENTS FOR REDUCTIONS IN SCOPE OF SERVICES/DELIVERABLES

If the scope of the Services/Deliverables under any Statement of Work issued under this Contract is subsequently reduced by the State, the parties shall negotiate an equitable reduction in Contractor's charges under such Statement of Work commensurate with the reduction in scope.

2.043 SERVICES/DELIVERABLES COVERED

The State shall not be obligated to pay any amounts in addition to the charges specified in this Contract for all Services/Deliverables to be provided by Contractor and its Subcontractors, if any, under this Contract,.

2.044 INVOICING AND PAYMENT – IN GENERAL

(a) Each Statement of Work issued under this Contract shall list (or indicate by reference to the appropriate Contract Exhibit) the prices for all Services/Deliverables, equipment and commodities to be provided, and the associated payment milestones and payment amounts.

(b) Each Contractor invoice shall show details as to charges by Service/Deliverable component and location at a level of detail reasonably necessary to satisfy the State's accounting and charge-back requirements. Invoices for Services performed on a time and materials basis shall show, for each individual, the number of hours of Services performed during the billing period, the billable skill/labor category for such person and the applicable hourly billing rate. Prompt payment by the State is contingent on Contractor's invoices showing the amount owed by the State minus any holdback amount to be retained by the State in accordance with **Section 1.600**.

(c) Correct invoices shall be due and payable by the State, in accordance with the State's standard payment procedure as specified in 1984 Public Act No. 279, MCL 17.51 et seq., within 45 days after receipt, provided the State determines that the invoice was properly rendered.

(d) Contract Payment Schedule

1. *Contractor request for performance-based payment.*
   Contractor may submit requests for payment of performance-based payments upon completion and acceptance of the milestones in a form and manner acceptable to Contract Administrator. Unless otherwise authorized by Contract Administrator, all performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled.
2. *Approval and payment of requests.*
   Contractor shall not be entitled to payment of a request for performance-based payment prior to successful accomplishment of the event or performance criterion for which payment is requested. Contract Administrator shall determine whether the event or performance criterion for which payment is requested has been successfully accomplished in accordance with the terms of Contract. Contract Administrator may, at any time, require Contractor to substantiate the successful performance of any event or performance criterion, which has been or is represented as being payable.

   The approval by Contract Administrator of a request for performance-based payment does not constitute an acceptance by the State and does not excuse Contractor from performance of obligations under this Contract.

2.045 PRO-RATION

To the extent there are Services that are to be paid for on a monthly basis, the cost of such Services shall be pro-rated for any partial month.

2.046 ANTITRUST ASSIGNMENT

Contractor assigns to the State any claim for overcharges resulting from antitrust violations to the extent that those violations concern materials or services supplied by third parties to Contractor, toward fulfillment of this Contract.

2.047 FINAL PAYMENT

The making of final payment by the State to Contractor does not constitute a waiver by either party of any rights or other claims as to the other party's continuing obligations under Contract, nor shall it constitute a waiver of any claims by one party against the other arising from unsettled claims or failure by a party to comply with this Contract, including claims for Services and Deliverables not reasonably known until after acceptance to be defective or substandard. Contractor's acceptance of final payment by the State under this Contract shall constitute a waiver of all claims by Contractor against the State for payment under this Contract, other than those claims previously filed in writing on a timely basis and still unsettled.

2.048 ELECTRONIC PAYMENT REQUIREMENT

Electronic transfer of funds is required for payments on State Contracts. Contractors are required to register with the State electronically at http://www.cpexpress.state.mi.us. As stated in Public Act 431 of 1984, all contracts that the State enters into for the purchase of goods and services shall provide that payment shall be made by electronic fund transfer ("**EFT**").

2.050 Taxes

2.051 EMPLOYMENT TAXES

Contractor shall collect and pay all applicable federal, state, and local employment taxes, including the taxes.

2.052 SALES AND USE TAXES

Contractor shall register and remit sales and use taxes on taxable sales of tangible personal property or services delivered into the State. Contractors that lack sufficient presence in Michigan to be required to register and pay tax must do so as a volunteer. This requirement extends to: (1) all members of any controlled group as defined in § 1563(a) of the Internal Revenue Code and applicable regulations of which the company is a member, and (2) all organizations under common control as defined in § 414(c) of the Internal Revenue Code and applicable regulations of which the company is a member that make sales at retail for delivery into the State are registered with the State for the collection and remittance of sales and use taxes. In applying treasury regulations defining "two or more trades or businesses under common control" the term "organization" means sole proprietorship, a partnership (as defined in § 701(a) (2) of the Internal Revenue Code), a trust, an estate, a corporation, or a limited liability company.

2.060 Contract Management

2.061 CONTRACTOR PERSONNEL QUALIFICATIONS

All persons assigned by Contractor to the performance of Services under this Contract must be employees of Contractor or its majority-owned (directly or indirectly, at any tier) subsidiaries (or a State-approved Subcontractor) and must be fully qualified to perform the work assigned to them. Contractor must include a similar provision in any subcontract entered into with a Subcontractor. For the purposes of this Contract, independent contractors engaged by Contractor solely in a staff augmentation role must be treated by the State as if they were employees of Contractor for this Contract only; however, the State understands that the relationship between Contractor and Subcontractor is an independent contractor relationship.

2.062 CONTRACTOR KEY PERSONNEL

(a) Contractor must provide Contract Compliance Inspector with the names of the Key Personnel.

(b) Key Personnel must be dedicated as defined in the Statement of Work to the Project for its duration in the applicable Statement of Work with respect to other individuals designated as Key Personnel for that Statement of Work.

(c) The State shall have the right to recommend and approve in writing the initial assignment, as well as any proposed reassignment or replacement, of any Key Personnel. Before assigning an individual to any Key Personnel position, Contractor shall notify the State of the proposed assignment, shall introduce the individual to the appropriate State representatives, and shall provide the State with a resume and any other information about the individual reasonably requested by the State. The State reserves the right to interview the individual before granting written approval. In the event the State finds a proposed individual unacceptable, the State shall provide a written explanation including reasonable detail outlining the reasons for the rejection.

(d) Contractor must not remove any Key Personnel from their assigned roles on Contract without the prior written consent of the State. Contractor's removal of Key Personnel without the prior written consent of the State is an unauthorized removal ("**Unauthorized Removal**"). Unauthorized Removals does not include replacing Key Personnel for reasons beyond the reasonable control of Contractor, including illness, disability, leave of absence, personal emergency circumstances, resignation, or for cause termination of the Key Personnel's employment. Unauthorized Removals does not include replacing Key

Personnel because of promotions or other job movements allowed by Contractor personnel policies or Collective Bargaining Agreement(s) as long as the State receives prior written notice before shadowing occurs and Contractor provides 30 days of shadowing unless parties agree to a different time period. Contractor with the State must review any Key Personnel replacements, and appropriate transition planning will be established. Any Unauthorized Removal may be considered by the State to be a material breach of Contract, in respect of which the State may elect to exercise its termination and cancellation rights.

(e) Contractor must notify Contract Compliance Inspector and Contract Administrator at least 10 business days before redeploying non-Key Personnel, who are dedicated to primarily to the Project, to other projects. If the State does not object to the redeployment by its scheduled date, Contractor may then redeploy the non-Key Personnel.

2.063 RE-ASSIGNMENT OF PERSONNEL AT THE STATE'S REQUEST

The State reserves the right to require the removal from the Project of Contractor personnel found, in the judgment of the State, to be unacceptable. The State's request must be written with reasonable detail outlining the reasons for the removal request. Additionally, the State's request must be based on legitimate, good faith reasons. Replacement personnel for the removed person must be fully qualified for the position. If the State exercises this right, and Contractor cannot immediately replace the removed personnel, the State agrees to an equitable adjustment in schedule or other terms that may be affected by the State's required removal. If any incident with removed personnel results in delay not reasonably anticipatable under the circumstances and which is attributable to the State, the applicable SLAs for the affected Service shall not be counted for a time as agreed to by the parties.

2.064 CONTRACTOR PERSONNEL LOCATION

All staff assigned by Contractor to work on Contract shall perform their duties either primarily at Contractor's offices and facilities or at State facilities. Without limiting the generality of the foregoing, Key Personnel shall, at a minimum, spend at least the amount of time on-site at State facilities as indicated in the applicable Statement of Work. Subject to availability, selected Contractor personnel may be assigned office space to be shared with State personnel.

2.065 CONTRACTOR IDENTIFICATION

Contractor employees must be clearly identifiable while on State property by wearing a State-issued badge, as required. Contractor employees are required to clearly identify themselves and the company they work for whenever making contact with State personnel by telephone or other means.

2.066 COOPERATION WITH THIRD PARTIES

Contractor agrees to cause its personnel and the personnel of any Subcontractors to cooperate with the State and its agents and other contractors including the State's Quality Assurance personnel. As reasonably requested by the State in writing, Contractor shall provide to the State's agents and other contractors reasonable access to Contractor's Project personnel, systems and facilities to the extent the access relates to activities specifically associated with this Contract and shall not interfere or jeopardize the safety or operation of the systems or facilities. The State acknowledges that Contractor's time schedule for Contract is very specific and agrees not to unnecessarily or unreasonably interfere with, delay or otherwise impeded Contractor's performance under this Contract with the requests for access.

2.067 CONTRACT MANAGEMENT RESPONSIBILITIES

Contractor shall be responsible for all acts and omissions of its employees, as well as the acts and omissions of any other personnel furnished by Contractor to perform the Services. Contractor shall have overall responsibility for managing and successfully performing and completing the Services/Deliverables, subject to the overall direction and supervision of the State and with the participation and support of the State as specified in this Contract. Contractor's duties shall include monitoring and reporting the State's performance of its participation and support responsibilities (as well as Contractor's own responsibilities) and providing timely notice to the State in Contractor's reasonable opinion if the State's failure to perform its responsibilities in

accordance with the Project Plan is likely to delay the timely achievement of any Contract tasks. Notwithstanding the foregoing, Contractor shall not be liable for any liability arising out of its performance of any instruction or requirement given or made by the State or otherwise included in the Product Plan except to the extent that such liability arises out of Contractor's negligence or wilful misconduct. To the extent that the State makes or gives any instruction or requirement that Contractor identifies as a potential risk, Contractor will notify the State in writing, and wait for the State's response, not to exceed 10 business days, prior to performing such instruction or requirement.

Contractor shall provide the Services/Deliverables directly or through its affiliates, subsidiaries, subcontractors or resellers. Regardless of the entity providing the Service/Deliverable, Contractor shall act as a single point of contact coordinating these entities to meet the State's need for Services/Deliverables. Nothing in this Contract, however, shall be construed to authorize or require any party to violate any applicable law or regulation in its performance of this Contract.

2.068 CONTRACTOR RETURN OF STATE EQUIPMENT/RESOURCES

Contractor shall return to the State any State-furnished equipment, facilities and other resources when no longer required for Contract in the same condition as when provided by the State, reasonable wear and tear excepted.

2.070 Subcontracting by Contractor

2.071 CONTRACTOR FULL RESPONSIBILITY

Contractor shall have full responsibility for the successful performance and completion of all of the Services and Deliverables. The State shall consider Contractor to be the sole point of contact with regard to all contractual matters under this Contract, including payment of any and all charges for Services and Deliverables.

2.072 STATE CONSENT TO DELEGATION

Contractor shall not delegate any duties under this Contract to a Subcontractor unless the Department of Technology, Management & Budget, Procurement has given written consent to such delegation. The State shall have the right of prior written approval of all Subcontractors and to require Contractor to replace any Subcontractors found, in the reasonable judgment of the State, to be unacceptable. The State's request shall be written with reasonable detail outlining the reasons for the removal request. Additionally, the State's request shall be based on legitimate, good faith reasons. Replacement Subcontractor(s) for the removed Subcontractor shall be fully qualified for the position. If the State exercises this right, and Contractor cannot immediately replace the removed Subcontractor, the State shall agree to an equitable adjustment in schedule or other terms that may be affected by the State's required removal. If any such incident with a removed Subcontractor results in delay not reasonable anticipatable under the circumstances and which is attributable to the State, the applicable SLA for the affected Work shall not be counted for a time agreed upon by the parties.

2.073 SUBCONTRACTOR BOUND TO CONTRACT

In any subcontracts entered into by Contractor for the performance of the Services, Contractor shall require the Subcontractor, to the extent of the Services to be performed by the Subcontractor, to be bound to Contractor by the terms of this Contract and to assume toward Contractor all of the obligations and responsibilities that Contractor, by this Contract, assumes toward the State. The State reserves the right to receive copies of and review all subcontracts, although Contractor may delete or mask any proprietary information, including pricing, contained in such contracts before providing them to the State. The management of any Subcontractor shall be the responsibility of Contractor, and Contractor shall remain responsible for the performance of its Subcontractors to the same extent as if Contractor had not subcontracted such performance. Contractor shall make all payments to Subcontractors or suppliers of Contractor. Except as otherwise agreed in writing by the State and Contractor, the State shall not be obligated to direct payments for the Services other than to Contractor. The State's written approval of any Subcontractor engaged by Contractor to perform any obligation under this Contract shall not relieve Contractor of any obligations or performance required under this

Contract. A list of the Subcontractors, if any, approved by the State as of the execution of this Contract, together with a copy of the applicable subcontract is attached.

2.074 FLOW DOWN

Except where specifically approved in writing by the State on a case-by-case basis, Contractor shall flow down the obligations in **Sections 2.031, 2.060, 2.100, 2.110, 2.120, 2.130, and 2.200** in all of its agreements with any Subcontractors.

2.075 COMPETITIVE SELECTION

Contractor shall select subcontractors (including suppliers) on a competitive basis to the maximum practical extent consistent with the objectives and requirements of Contract.

2.080 State Responsibilities

2.081 EQUIPMENT

The State shall provide only the equipment and resources identified in the Statement of Work and other Contract Exhibits.

2.082 FACILITIES

The State must designate space as long as it is available and as provided in the Statement of Work, to house Contractor's personnel whom the parties agree will perform the Services/Deliverables at State facilities (collectively, the "State Facilities"). Contractor shall have reasonable access to, and unless agreed otherwise by the parties in writing must observe and comply with all rules and regulations relating to each of the State Facilities (including hours of operation) used by Contractor in the course of providing the Services. Contractor agrees that it shall not, without the prior written consent of the State, use any State Facilities or access any State information systems provided for Contractor's use, or to which Contractor otherwise gains access in the course of performing the Services, for any purpose other than providing the Services to the State.

2.090 Security

2.091 BACKGROUND CHECKS

On a case-by-case basis, the State may investigate Contractor's personnel before they may have access to State facilities and systems. The scope of the background check is at the discretion of the State and the results shall be used to determine Contractor personnel eligibility for working within State facilities and systems. The investigations shall include Michigan State Police Background checks (ICHAT) and may include the National Crime Information Center (NCIC) Finger Prints. Proposed Contractor personnel may be required to complete and submit an RI-8 Fingerprint Card for the NCIC Finger Print Check. Any request for background checks shall be initiated by the State and shall be reasonably related to the type of work requested.

2.100 Confidentiality

2.101 CONFIDENTIALITY

Contractor and the State each acknowledge that the other possesses and shall continue to possess confidential information that has been developed or received by it. As used in this Section, "Confidential Information" of Contractor must mean all non-public proprietary information of Contractor (other than Confidential Information of the State as defined below), which is marked confidential, restricted, proprietary, or with a similar designation. "Confidential Information" of the State must mean any information which is retained in confidence by the State (or otherwise required to be held in confidence by the State under applicable federal, state and local laws and regulations) or which, in the case of tangible materials provided to Contractor by the State under its performance under this Contract, is marked as confidential, proprietary or with a similar designation by the State. "Confidential Information" excludes any information (including this Contract) that is publicly available under the Michigan FOIA.

2.102 PROTECTION AND DESTRUCTION OF CONFIDENTIAL INFORMATION

The State and Contractor shall each use at least the same degree of care to prevent disclosing to third parties the Confidential Information of the other as it employs to avoid unauthorized disclosure, publication or dissemination of its own confidential information of like character, but in no event less than reasonable care. Neither Contractor nor the State shall (i) make any use of the Confidential Information of the other except as contemplated by this Contract, (ii) acquire any right in or assert any lien against the Confidential Information of the other, or (iii) if requested to do so, refuse for any reason to promptly return the other party's Confidential Information to the other party. Each party shall limit disclosure of the other party's Confidential Information to employees and Subcontractors who must have access to fulfill the purposes of this Contract. Disclosure to, and use by, a Subcontractor is permissible where (A) use of a Subcontractor is authorized under this Contract, (B) the disclosure is necessary or otherwise naturally occurs in connection with work that is within the Subcontractor's scope of responsibility, and (C) Contractor obligates the Subcontractor in a written Contract to maintain the State's Confidential Information in confidence. At the State's request, any employee of Contractor and of any Subcontractor having access or continued access to the State's Confidential Information may be required to execute an acknowledgment that the employee has been advised of Contractor's and the Subcontractor's obligations under this Section and of the employee's obligation to Contractor or Subcontractor, as the case may be, to protect the Confidential Information from unauthorized use or disclosure.

Promptly upon termination or cancellation of Contract for any reason, Contractor must certify to the State that Contractor has destroyed all State Confidential Information.

2.103 PCI DATA SECURITY STANDARD

(a) Contractors that process, transmit, or store credit/debit cardholder data, must adhere to the Payment Card Industry (PCI) Data Security Standards. Contractor is responsible for the security of cardholder data in its possession. The data may only be used to assist the State or for other uses specifically authorized by law.

(b) Contractor must notify the CCI (within 72 hours of discovery) of any breaches in security where cardholder data has been compromised. In that event, Contractor must provide full cooperation to the Visa, MasterCard, Discover and state Acquirer representative(s), and/or a PCI approved third party to conduct a thorough security review. Contractor must make the forensic report available within two weeks of completion. The review must validate compliance with the current PCI Data Security Standards for protecting cardholder data.

(c) Contractor must properly dispose of cardholder data, in compliance with DTMB policy, when it is no longer needed. Contractor must continue to treat cardholder data as confidential upon contract termination.

(d) Contractor must provide the CCI with an annual Attestation of Compliance (AOC) or a Report on Compliance (ROC) showing Contractor is in compliance with the PCI Data Security Standards. Contractor must notify the CCI of all failures to comply with the PCI Data Security Standard.

2.104 EXCLUSIONS

Notwithstanding the foregoing, the provisions in this Section shall not apply to any particular information which the State or Contractor can demonstrate (i) was, at the time of disclosure to it, in the public domain; (ii) after disclosure to it, is published or otherwise becomes part of the public domain through no fault of the receiving party; (iii) was in the possession of the receiving party at the time of disclosure to it without an obligation of confidentiality; (iv) was received after disclosure to it from a third party who had a lawful right to disclose the information to it without any obligation to restrict its further disclosure; or (v) was independently developed by the receiving party without reference to Confidential Information of the furnishing party. Further, the provisions of this Section shall not apply to any particular Confidential Information to the extent the receiving party is required by law to disclose the Confidential Information, provided that the receiving party (i) promptly provides the furnishing party with notice of the legal request, and (ii) assists the furnishing party in resisting or limiting the scope of the disclosure as reasonably requested by the furnishing party.

2.105 NO IMPLIED RIGHTS

Nothing contained in this Section must be construed as obligating a party to disclose any particular Confidential Information to the other party, or as granting to or conferring on a party, expressly or impliedly, any right or license to the Confidential Information of the other party.

2.106 SECURITY BREACH NOTIFICATION

If Contractor breaches this Section, Contractor must (i) promptly cure any deficiencies and (ii) comply with any applicable federal and state laws and regulations pertaining to unauthorized disclosures. Contractor and the State shall cooperate to mitigate, to the extent practicable, the effects of any breach, intrusion, or unauthorized use or disclosure. Contractor must report to the State in writing any use or disclosure of Confidential Information, whether suspected or actual, other than as provided for by Contract within 72 hours of becoming aware of the use or disclosure or the shorter time period as is reasonable under the circumstances.

2.107 RESPECTIVE OBLIGATIONS

The parties' respective obligations under this Section must survive the termination or expiration of this Contract for any reason.

2.110 Records and Inspections

2.111 INSPECTION OF WORK PERFORMED

The State's authorized representatives, at reasonable times and with 10 days prior notice, have the right to enter Contractor's premises or any other places where work is being performed in relation to this Contract. The representatives may inspect, monitor, or evaluate the work being performed, to the extent the access will not reasonably interfere with or jeopardize the safety or operation of Contractor's systems or facilities. Contractor must provide reasonable assistance for the State's representatives during inspections.

2.112 RETENTION OF RECORDS

(a) Contractor must retain all financial and accounting records related to this Contract for a period of 7 years after Contractor performs any work under this Contract (Audit Period).

(b) If an audit, litigation, or other action involving Contractor's records is initiated before the end of the Audit Period, Contractor must retain the records until all issues arising out of the audit, litigation, or other action are resolved or until the end of the Audit Period, whichever is later.

2.113 EXAMINATION OF RECORDS

(a) The State, upon 10 day notice to Contractor, may examine and copy any of Contractor's records that relate to this Contract any time during the Audit Period. The State does not have the right to review any information deemed confidential by Contractor if access would require the information to become publicly available. This requirement also applies to the records of any parent, affiliate, or subsidiary organization of Contractor, or any Subcontractor that performs services in connection with this Contract

(b) In addition to the rights conferred upon the State in paragraph (a) of this section and in accordance with MCL 18.1470, DTMB or its designee may audit Contractor to verify compliance with Contract. The financial and accounting records associated with Contract shall be made available to DTMB or its designee and the auditor general, upon request, during the term of Contract and any extension of Contract and for 3 years after the later of the expiration date or final payment under Contract.

2.114 AUDIT RESOLUTION

If necessary, Contractor and the State will meet to review any audit report promptly after its issuance. Contractor must respond to each report in writing within 30 days after receiving the report, unless the report specifies a shorter response time. Contractor and the State must develop, agree upon, and monitor an action plan to promptly address and resolve any deficiencies, concerns, or recommendations in the report.

2.115 ERRORS

(a) If an audit reveals any financial errors in the records provided to the State, the amount in error must be reflected as a credit or debit on the next invoice and subsequent invoices until the amount is paid or refunded in full. However, a credit or debit may not be carried forward for more than four invoices or beyond the termination of Contract. If a balance remains after four invoices, the remaining amount will be due as a payment or refund within 45 days of the last invoice on which the balance appeared or upon termination of Contract, whichever is earlier.

(b) In addition to other available remedies, if the difference between the State's actual payment and the correct invoice amount, as determined by an audit, is greater than 10%, Contractor must pay all reasonable audit costs.

2.120 Warranties

2.121 WARRANTIES AND REPRESENTATIONS

Contractor represents and warrants:

(a) It is capable in all respects of fulfilling and must fulfill all of its obligations under this Contract. The performance of all obligations under this Contract must be provided in a timely, professional, and workman-like manner and must meet the performance and operational standards required under this Contract.

(b) Contract Appendices, Attachments and Exhibits identify the equipment and software and services necessary for the Deliverable(s) to perform and Services to operate in compliance with Contract's requirements and other standards of performance.

(c) It is the lawful owner or licensee of any Deliverable licensed or sold to the State by Contractor or developed by Contractor under this Contract, and Contractor has all of the rights necessary to convey to the State the ownership rights or licensed use, as applicable, of any and all Deliverables. None of the Deliverables provided by Contractor to the State under neither this Contract, nor their use by the State shall infringe the patent, copyright, trade secret, or other proprietary rights of any third party.

(d) If, under this Contract, Contractor procures any equipment, software or other Deliverable for the State (including equipment, software and other Deliverables manufactured, re-marketed or otherwise sold by Contractor under Contractor's name), then in addition to Contractor's other responsibilities with respect to the items in this Contract, Contractor must assign or otherwise transfer to the State or its designees, or afford the State the benefits of, any manufacturer's warranty for the Deliverable.

(e) Contract signatory has the power and authority, including any necessary corporate authorizations, necessary to enter into this Contract, on behalf of Contractor.

(f) It is qualified and registered to transact business in all locations where required.

(g) Neither Contractor nor any Affiliates, nor any employee of either, has, must have, or must acquire, any contractual, financial, business, or other interest, direct or indirect, that would conflict in any manner or degree with Contractor's performance of its duties and responsibilities to the State under this Contract or otherwise create an appearance of impropriety with respect to the award or performance of this Agreement. Contractor must notify the State about the nature of the conflict or appearance of impropriety within two days of learning about it.

(h) Neither Contractor nor any Affiliates, nor any employee of either has accepted or must accept anything of value based on an understanding that the actions of Contractor or Affiliates or employee on behalf of the State would be influenced. Contractor must not attempt to influence any State employee by the direct or indirect offer of anything of value.

(i) Neither Contractor nor any Affiliates, nor any employee of either has paid or agreed to pay any person, other than bona fide employees and consultants working solely for Contractor or the Affiliate, any fee, commission, percentage, brokerage fee, gift, or any other consideration, contingent upon or resulting from the award or making of this Contract.

(j) The prices proposed by Contractor were arrived at independently, without consultation, communication, or agreement with any other Bidder for the purpose of restricting competition; the prices quoted were not knowingly disclosed by Contractor to any other Bidder; and no attempt was made by Contractor to induce any other person to submit or not submit a proposal for the purpose of restricting competition.

(k) All financial statements, reports, and other information furnished by Contractor to the State as part of its response to the RFP or otherwise in connection with the award of this Contract fairly and accurately represent the business, properties, financial condition, and results of operations of Contractor as of the respective dates, or for the respective periods, covered by the financial statements, reports, other information. Since the respective dates or periods covered by the financial statements, reports, or other information, there have been no material adverse changes in the business, properties, financial condition, or results of operations of Contractor.

(l) All written information furnished to the State by or for Contractor in connection with this Contract, including its bid, is true, accurate, and complete, and contains no untrue statement of material fact or omits any material fact necessary to make the information not misleading.

(m) It is not in material default or breach of any other contract or agreement that it may have with the State or any of its departments, commissions, boards, or agencies. Contractor further represents and warrants that it has not been a party to any contract with the State or any of its departments that was terminated by the State or the department within the previous five years for the reason that Contractor failed to perform or otherwise breached an obligation of Contract.

(n) If any of the certifications, representations, or disclosures made in Contractor's original bid response change after contract award, Contractor is required to report those changes immediately to the Department of Technology, Management & Budget, Procurement.

2.122 WARRANTY OF MERCHANTABILITY

Goods provided by Contractor under this agreement shall be merchantable. All goods provided under this Contract shall be of good quality within the description given by the State, shall be fit for their ordinary purpose, shall be adequately contained and packaged within the description given by the State, shall conform to the agreed upon specifications, and shall conform to the affirmations of fact made by Contractor or on the container or label.

2.123 INTENTIONALLY OMITTED

2.124 WARRANTY OF TITLE

Contractor shall, in providing goods to the State, convey good title in those goods, whose transfer is right and lawful. All goods provided by Contractor shall be delivered free from any security interest, lien, or encumbrance of which the State, at the time of contracting, has no knowledge. Goods provided by Contractor, under this Contract, shall be delivered free of any rightful claim of any third person by of infringement or the like.

2.125 EQUIPMENT WARRANTY

To the extent Contractor is responsible under this Contract for maintaining equipment/system(s), Contractor represents and warrants that it shall maintain the equipment/system(s) in good operating condition and shall undertake all repairs and preventive maintenance according to the applicable manufacturer's recommendations for the period specified in this Contract.

Contractor represents and warrants that the equipment/system(s) are in good operating condition and operates and performs to the requirements and other standards of performance contained in this Contract, when installed, at the time of Final Acceptance by the State, and for a period of (1) one year commencing upon the first day following Final Acceptance.

Within 30 business days of notification from the State, Contractor must adjust, repair or replace all equipment that is defective or not performing in compliance with Contract. Contractor must assume all costs for replacing parts or units and their installation including transportation and delivery fees, if any.

Contractor must provide a toll-free telephone number to allow the State to report equipment failures and problems to be remedied by Contractor.

Contractor agrees that all warranty service it provides under this Contract must be performed by Original Equipment Manufacturer (OEM) trained, certified and authorized technicians.

Contractor is the sole point of contact for warranty service. Contractor warrants that it shall pass through to the State any warranties obtained or available from the original equipment manufacturer, including any replacement, upgraded, or additional equipment warranties.

2.126 EQUIPMENT TO BE NEW

If applicable, all equipment provided under this Contract by Contractor shall be new where Contractor has knowledge regarding whether the equipment is new or assembled from new or serviceable used parts that are like new in performance or has the option of selecting one or the other. Equipment that is assembled from new or serviceable used parts that are like new in performance is acceptable where Contractor does not have knowledge or the ability to select one or other, unless specifically agreed otherwise in writing by the State.

2.127 PROHIBITED PRODUCTS

The State will not accept salvage, distressed, outdated or discontinued merchandise. Shipping of such merchandise to any State agency, as a result of an order placed against Contract, shall be considered default by Contractor of the terms and conditions of Contract and may result in cancellation of Contract by the State. The brand and product number offered for all items shall remain consistent for the term of Contract, unless DTMB-Procurement has approved a change order pursuant to **Section 2.024**.

2.128 CONSEQUENCES FOR BREACH

In addition to any remedies available in law, if Contractor breaches any of the warranties contained in this section, the breach may be considered as a default in the performance of a material obligation of this Contract.

2.130 Insurance

2.13.1 LIABILITY INSURANCE

For the purpose of this Section, "State" includes its departments, divisions, agencies, offices, commissions, officers, employees, and agents.

(a) Contractor must provide proof that it has obtained the minimum levels of insurance coverage indicated or required by law, whichever is greater. The insurance must protect the State from claims that may arise out of, or result from, or are alleged to arise out of, or result from, Contractor's or a Subcontractor's performance, including any person directly or indirectly employed by Contractor or a Subcontractor, or any person for whose acts Contractor or a Subcontractor may be liable.

(b) Contractor waives all rights against the State for the recovery of damages that are covered by the insurance policies Contractor is required to maintain under this Section. Contractor's failure to obtain and maintain the required insurance will not limit this waiver.

(c) All insurance coverage provided relative to this Contract is primary and non-contributing to any comparable liability insurance (including self-insurance) carried by the State.

(d) The State, in its sole discretion, may approve the use of a fully-funded self-insurance program in place of any specified insurance identified in this Section.

(e) Unless the State approves otherwise, any insurer must have an A.M. Best rating of "A" or better and a financial size of VII or better, or if those ratings are not available, a comparable rating from an insurance rating agency approved by the State. All policies of insurance must be issued by companies that have been approved to do business in the State.

(f) Where specific coverage limits are listed in this Section, they represent the minimum acceptable limits. If Contractor's policy contains higher limits, the State is entitled to coverage to the extent of the higher limits.

(g) Contractor must maintain all required insurance coverage throughout the term of this Contract and any extensions. However, in the case of claims-made Commercial General Liability policies, Contractor must secure tail coverage for at least three (3) years following the termination of this Contract.

(h) Contractor must provide, within five (5) business days, written notice to the Director of DTMB-Procurement if any policy required under this section is cancelled. The notice must include the applicable Contract or Purchase Order number.

(i) The minimum limits of coverage specified are not intended, and may not be construed, to limit any liability or indemnity of Contractor to any indemnified party or other persons.

(j) Contractor is responsible for the payment of all deductibles.

(k) If Contractor fails to pay any premium for a required insurance policy, or if any insurer cancels or significantly reduces any required insurance without the State's approval, the State may, after giving Contractor at least 30 days' notice, pay the premium or procure similar insurance coverage from another company or companies. The State may deduct any part of the cost from any payment due Contractor, or require Contractor to pay that cost upon demand.

(l) In the event the State approves the representation of the State by the insurer's attorney, the attorney may be required to be designated as a Special Assistant Attorney General by the Michigan Attorney General.

(m) Contractor is required to pay for and provide the type and amount of insurance checked ☑ below:

☑ **(i) Commercial General Liability**

Minimal Limits:

$2,000,000 General Aggregate Limit other than Products/Completed Operations
$2,000,000 Products/Completed Operations Aggregate Limit
$1,000,000 Personal & Advertising Injury Limit, and
$1,000,000 Each Occurrence Limit.

Deductible maximum:

$50,000 Each Occurrence

Additional Requirements:

Contractor must list the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents as additional insureds on the Commercial General Liability certificate. Contractor also agrees to provide evidence that the insurance policy contains a waiver of subrogation by the insurance company.

The Products/Completed Operations sublimit requirement may be satisfied by evidence of the manufacturer's Commercial General Liability Insurance. The manufacturer must list the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents as additional insureds on the Commercial General Liability certificate and must provide evidence that the policy contains a waiver of subrogation by the insurance company.

☑ **(iii) Motor Vehicle**

Minimal Limits:

If a motor vehicle is used in relation to Contractor's performance, Contractor must have vehicle liability insurance on the motor vehicle for bodily injury and property damage as required by law.

☑ **(v) Workers' Compensation**

Minimal Limits:

Contractor must provide Workers' Compensation coverage according to applicable laws governing work activities in the state of Contractor's domicile. If the applicable coverage is provided by a self-insurer, Contractor must provide proof of an approved self-insured authority by the jurisdiction of domicile.

For employees working outside of the state of Contractor's domicile, Contractor must provide certificates of insurance proving mandated coverage levels for the jurisdictions where the employees' activities occur.

Additional Requirements:

Contractor must provide the applicable certificates of insurance and a list of states where the coverage is applicable. Contractor must provide proof that the Workers' Compensation insurance policies contain a waiver of subrogation by the insurance company, except where such a provision is prohibited or limited by the laws of the jurisdiction in which the work is to be performed.

☑ **(vi) Employers Liability**

Minimal Limits:

$100,000 Each Incident
$100,000 Each Employee by Disease
$500,000 Aggregate Disease

Additional Requirements:

Contractor must list the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents as additional insureds on the certificate.

☑ **(viii) Professional Liability (Errors and Omissions)**

Minimal Limits:

$3,000,000 Each Occurrence
$3,000,000 Annual Aggregate

Deductible Maximum:

$50,000 Per Loss

☑ **(ix) Cyber Liability**

Minimal Limits:

$1,000,000 Each Occurrence
$1,000,000 Annual Aggregate

Additional Requirements:

Insurance should cover (a) unauthorized acquisition, access, use, physical taking, identity theft, mysterious disappearance, release, distribution or disclosures of personal and corporate information; (b) transmitting or receiving malicious code via the insured's computer system; (c) denial of service attacks or the inability to access websites or computer systems.

Contractor must list the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents as additional insureds on the certificate.

2.13.2 SUBCONTRACTOR INSURANCE COVERAGE

Except where the State has approved a subcontract with other insurance provisions, Contractor must require any Subcontractor to purchase and maintain the insurance coverage required in Section 2.13.1, Liability Insurance. Alternatively, Contractor may include a Subcontractor under Contractor's insurance on the coverage required in that Section. The failure of a Subcontractor to comply with insurance requirements does not limit Contractor's liability or responsibility.

2.13.3 CERTIFICATES OF INSURANCE

Before Contract is signed, and not less than 20 days before the insurance expiration date every year thereafter, Contractor must provide evidence that the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents are listed as additional insureds as required. Contractor must provide DTMB-Procurement with all applicable certificates of insurance verifying insurance coverage or providing, if approved, satisfactory evidence of self-insurance as required in Section 2.13.1, Liability Insurance.

Each certificate must be on the standard "Accord" form or equivalent and MUST IDENTIFY THE APPLICABLE Contract OR PURCHASE ORDER NUMBER.

2.140 Indemnification

2.141 GENERAL INDEMNIFICATION

To the extent permitted by law, Contractor must indemnify, defend and hold harmless the State from liability, including all claims and losses, and all related costs and expenses (including reasonable attorneys' fees and costs of investigation, litigation, settlement, judgments, interest and penalties), accruing or resulting to any person, firm or corporation that may be injured or damaged by Contractor in the performance of this Contract and that are attributable to the negligence or tortious acts of Contractor or any of its subcontractors, or by anyone else for whose acts any of them may be liable.

2.142 CODE INDEMNIFICATION

To the extent permitted by law, Contractor shall indemnify, defend and hold harmless the State from any claim, loss, or expense arising from Contractor's breach of the No Surreptitious Code Warranty.

2.143 EMPLOYEE INDEMNIFICATION

In any claims against the State of Michigan, its departments, divisions, agencies, sections, commissions, officers, employees and agents, by any employee of Contractor or any of its subcontractors, the indemnification obligation under Contract must not be limited in any way by the amount or type of damages, compensation or benefits payable by or for Contractor or any of its subcontractors under worker's disability compensation acts, disability benefit acts or other employee benefit acts. This indemnification clause is intended to be comprehensive. Any overlap in provisions, or the fact that greater specificity is provided as to some categories of risk, is not intended to limit the scope of indemnification under any other provisions.

2.144 PATENT/COPYRIGHT INFRINGEMENT INDEMNIFICATION

To the extent permitted by law, Contractor must indemnify, defend and hold harmless the State from and against all losses, liabilities, damages (including taxes), and all related costs and expenses (including reasonable attorneys' fees and costs of investigation, litigation, settlement, judgments, interest and penalties) incurred in connection with any action or proceeding threatened or brought against the State to the extent that the action or proceeding is based on a claim that any piece of equipment, software, commodity or service supplied by Contractor or its subcontractors, or the operation of the equipment, software, commodity or service, or the use or reproduction of any documentation provided with the equipment, software, commodity or service infringes any United States patent, copyright, trademark or trade secret of any person or entity, which is enforceable under the laws of the United States.

In addition, should the equipment, software, commodity, or service, or its operation, become or in the State's or Contractor's opinion be likely to become the subject of a claim of infringement, Contractor must at Contractor's sole expense (i) procure for the State the right to continue using the equipment, software, commodity or service or, if the option is not reasonably available to Contractor, (ii) replace or modify to the State's satisfaction the same with equipment, software, commodity or service of equivalent function and performance so that it becomes non-infringing, or, if the option is not reasonably available to Contractor, (iii) accept its return by the State with appropriate credits to the State against Contractor's charges and reimburse the State for any losses or costs incurred as a consequence of the State ceasing its use and returning it.

Notwithstanding the foregoing, Contractor has no obligation to indemnify or defend the State for, or to pay any costs, damages or attorneys' fees related to, any claim based upon (i) equipment developed based on written specifications of the State; (ii) use of the equipment in a configuration other than implemented or approved in writing by Contractor, including, but not limited to, any modification of the equipment by the State; or (iii) the combination, operation, or use of the equipment with equipment or software not supplied by Contractor under this Contract.

2.145 CONTINUATION OF INDEMNIFICATION OBLIGATIONS

Contractor's duty to indemnify under this Section continues in full force and effect, notwithstanding the expiration or early cancellation of Contract, with respect to any claims based on facts or conditions that occurred before expiration or cancellation.

2.146 INDEMNIFICATION PROCEDURES

The procedures set forth below must apply to all indemnity obligations under this Contract.

(a) After the State receives notice of the action or proceeding involving a claim for which it shall seek indemnification, the State must promptly notify Contractor of the claim in writing and take or assist Contractor in taking, as the case may be, any reasonable action to avoid the imposition of a default judgment against Contractor. No failure to notify Contractor relieves Contractor of its indemnification obligations except to the extent that Contractor can prove damages attributable to the failure. Within 10 days following receipt of written notice from the State relating to any claim, Contractor must notify the State in writing whether Contractor agrees to assume control of the defense and settlement of that claim (a "Notice of Election"). After notifying Contractor of a claim and before the State receiving Contractor's Notice of Election, the State is entitled to defend against the claim, at Contractor's expense, and Contractor will be responsible for any reasonable costs incurred by the State in defending against the claim during that period.

(b) If Contractor delivers a Notice of Election relating to any claim: (i) the State is entitled to participate in the defense of the claim and to employ counsel at its own expense to assist in the handling of the claim and to monitor and advise the State about the status and progress of the defense; (ii) Contractor must, at the request of the State, demonstrate to the reasonable satisfaction of the State, Contractor's financial ability to carry out its defense and indemnity obligations under this Contract; (iii) Contractor must periodically advise the State about the status and progress of the defense and must obtain the prior written approval of the State before entering into any settlement of the claim or ceasing to defend against the claim; and (iv) to the extent that any principles of Michigan governmental or public law may be involved or challenged, the State has the right, at its own expense, to control the defense of that portion of the claim involving the principles of Michigan governmental or public law. But the State may retain control of the defense and settlement of a claim by notifying Contractor in writing within 10 days after the State's receipt of Contractor's information requested by the State under clause (ii) of this paragraph if the State determines that Contractor has failed to demonstrate to the reasonable satisfaction of the State Contractor's financial ability to carry out its defense and indemnity obligations under this Section. Any litigation activity on behalf of the State, or any of its subdivisions under this Section, must be coordinated with the Department of Attorney General. In the event the insurer's attorney represents the State under this Section, the insurer's attorney may be required to be designated as a Special Assistant Attorney General by the Attorney General of the State of Michigan.

(c) If Contractor does not deliver a Notice of Election relating to any claim of which it is notified by the State as provided above, the State may defend the claim in the manner as it may deem appropriate, at the cost and expense of Contractor. If it is determined that the claim was one against which Contractor was required to indemnify the State, upon request of the State, Contractor must promptly reimburse the State for all the reasonable costs and expenses.

2.150 Termination/Cancellation

2.151 NOTICE AND RIGHT TO CURE

If Contractor breaches Contract, and the State in its sole discretion determines that the breach is curable, then the State shall provide Contractor with written notice of the breach and a time period (not less than 30 days) to cure the Breach. The notice of breach and opportunity to cure is inapplicable for successive or repeated breaches or if the State determines in its sole discretion that the breach poses a serious and imminent threat to the health or safety of any person or the imminent loss, damage, or destruction of any real or tangible personal property.

2.152 TERMINATION FOR CAUSE

(a) The State may terminate this contract, for cause, by notifying Contractor in writing, if Contractor (i) breaches any of its material duties or obligations under this Contract (including a Chronic Failure to meet any particular SLA), or (ii) fails to cure a breach within the time period specified in the written notice of breach provided by the State

(b) If this Contract is terminated for cause, Contractor must pay all costs incurred by the State in terminating this Contract, including but not limited to, State administrative costs, reasonable attorneys' fees and court costs, and any reasonable additional costs the State may incur to procure the Services/Deliverables required by this Contract from other sources. Re-procurement costs are not consequential, indirect or incidental damages, and cannot be excluded by any other terms otherwise included in this Contract, provided the costs are not in excess of 50% more than the prices for the Service/Deliverables provided under this Contract.

(c) If the State chooses to partially terminate this Contract for cause, charges payable under this Contract shall be equitably adjusted to reflect those Services/Deliverables that are terminated and the State must pay for all Services/Deliverables for which Final Acceptance has been granted provided up to the termination date. Services and related provisions of this Contract that are terminated for cause must cease on the effective date of the termination.

(d) If the State terminates this Contract for cause under this Section, and it is determined, for any reason, that Contractor was not in breach of contract under the provisions of this section, that termination for cause must be deemed to have been a termination for convenience, effective as of the same date, and the rights and obligations of the parties must be limited to that otherwise provided in this Contract for a termination for convenience.

2.153 TERMINATION FOR CONVENIENCE

The State may terminate this Contract for its convenience, in whole or part, if the State determines that a termination is in the State's best interest. Reasons for the termination must be left to the sole discretion of the State and may include, but not necessarily be limited to (a) the State no longer needs the Services or products specified in Contract, (b) relocation of office, program changes, changes in laws, rules, or regulations make implementation of the Services no longer practical or feasible, (c) unacceptable prices for Additional Services or New Work requested by the State, or (d) falsification or misrepresentation, by inclusion or non-inclusion, of information material to a response to any RFP issued by the State. The State may terminate this Contract for its convenience, in whole or in part, by giving Contractor written notice at least 30 days before the date of termination. If the State chooses to terminate this Contract in part, the charges payable under this Contract must be equitably adjusted to reflect those Services/Deliverables that are terminated. Services and related provisions of this Contract that are terminated for convenience must cease on the effective date of the termination.

2.154 TERMINATION FOR NON-APPROPRIATION

(a) Contractor acknowledges that, if this Contract extends for several fiscal years, continuation of this Contract is subject to appropriation or availability of funds for this Contract. If funds to enable the State to effect continued payment under this Contract are not appropriated or otherwise made available, the State must terminate this Contract and all affected Statements of Work, in whole or in part, at the end of the last period for which funds have been appropriated or otherwise made available by giving written notice of termination to Contractor. The State must give Contractor at least 30 days advance written notice of termination for non-appropriation or unavailability (or the time as is available if the State receives notice of the final decision less than 30 days before the funding cutoff).

(b) If funding for Contract is reduced by law, or funds to pay Contractor for the agreed-to level of the Services or production of Deliverables to be provided by Contractor are not appropriated or otherwise unavailable, the State may, upon 30 days written notice to Contractor, reduce the level of the Services or change the production of Deliverables in the manner and for the periods of time as the State may elect. The charges payable under this Contract shall be equitably adjusted to reflect any equipment, services or commodities not provided by reason of the reduction.

(c) If the State terminates this Contract, eliminates certain Deliverables, or reduces the level of Services to be provided by Contractor under this Section, the State must pay Contractor for all Work-in-Process

performed through the effective date of the termination or reduction in level, as the case may be and as determined by the State, to the extent funds are available. This Section shall not preclude Contractor from reducing or stopping Services/Deliverables or raising against the State in a court of competent jurisdiction, any claim for a shortfall in payment for Services performed or Deliverables finally accepted before the effective date of termination.

2.155 TERMINATION FOR CRIMINAL CONVICTION

The State may terminate this Contract immediately and without further liability or penalty in the event Contractor, an officer of Contractor, or an owner of a 25% or greater share of Contractor is convicted of a criminal offense related to a State, public or private Contract or subcontract.

2.156 TERMINATION FOR APPROVALS RESCINDED

The State may terminate this Contract if any final administrative or judicial decision or adjudication disapproves a previously approved request for purchase of personal services under Constitution 1963, Article 11, § 5, and Civil Service Rule 7-1. In that case, the State shall pay Contractor for only the work completed to that point under Contract. Termination may be in whole or in part and may be immediate as of the date of the written notice to Contractor or may be effective as of the date stated in the written notice.

2.157 RIGHTS AND OBLIGATIONS UPON TERMINATION

(a) If the State terminates this Contract for any reason, Contractor must, at no charge to the State, (a) stop all work as specified in the notice of termination, (b) return all materials and property provided directly or indirectly to Contractor by any entity, agent or employee of the State, (c) deliver to, the State, unless otherwise directed, all work flows, business process documents, and State owned data relating to this agreement at the termination of Contract and which are resulting from Contract, and (d) take any action to mitigate and limit any potential damages, or requests for Contractor adjustment or termination settlement costs, to the maximum practical extent, including terminating or limiting as otherwise applicable those subcontracts and outstanding orders for material and supplies resulting from the terminated Contract. For the avoidance of doubt, nothing herein shall be deemed to convey any ownership interest in any Contractor software to the State.

(b) If the State terminates this Contract before its expiration for its own convenience, the State must pay Contractor for all charges due for Services provided before the date of termination and, if applicable, as a separate item of payment under this Contract, for Work In Process, on a percentage of completion basis at the level of completion determined by the State. All completed or partially completed Deliverables prepared by Contractor under this Contract, at the option of the State, becomes the State's property, and Contractor is entitled to receive equitable fair compensation for the Deliverables. Regardless of the basis for the termination, the State is not obligated to pay, or otherwise compensate, Contractor for any lost expected future profits, costs or expenses incurred with respect to Services not actually performed for the State.

(c) Upon a good faith termination, the State may assume, at its option, any subcontracts and agreements for services and deliverables provided under this Contract, and may further pursue completion of the Services/Deliverables under this Contract by replacement contract or otherwise as the State may in its sole judgment deem expedient.

2.158 RESERVATION OF RIGHTS

Any termination of this Contract or any Statement of Work issued under it by a party must be with full reservation of, and without prejudice to, any rights or remedies otherwise available to the party with respect to any claims arising before or as a result of the termination.

2.160 Termination by Contractor

2.161 TERMINATION BY CONTRACTOR

If the State breaches Contract, and Contractor in its sole discretion determines that the breach is curable, then Contractor will provide the State with written notice of the breach and a time period (not less than 30 days) to

cure the breach. The Notice of Breach and opportunity to cure is inapplicable for successive and repeated breaches.

Contractor may terminate this Contract if the State (i) materially breaches its obligation to pay Contractor undisputed amounts due and owing under this Contract, (ii) breaches its other obligations under this Contract to an extent that makes it impossible or commercially impractical for Contractor to perform the Services, or (iii) does not cure the breach within the time period specified in a written notice of breach. But Contractor must discharge its obligations under **Section 2.170** before it terminates Contract.

2.170 Transition Responsibilities

2.171 CONTRACTOR TRANSITION RESPONSIBILITIES

If the State terminates this contract, for convenience or cause, or if Contract is otherwise dissolved, voided, rescinded, nullified, expires or rendered unenforceable, Contractor shall comply with direction provided by the State to assist in the orderly transition of equipment, services, software, leases, etc. to the State or a third party designated by the State. If this Contract expires or terminates, Contractor agrees to make all reasonable efforts to effect an orderly transition of services within a reasonable period of time that in no event will exceed 90 days. These efforts must include, but are not limited to, those listed in **Section 2.150.**

2.172 CONTRACTOR PERSONNEL TRANSITION

Contractor shall work with the State, or a specified third party, to develop a transition plan setting forth the specific tasks and schedule to be accomplished by the parties, to effect an orderly transition. Contractor must allow as many personnel as practicable to remain on the job to help the State, or a specified third party, maintain the continuity and consistency of the services required by this Contract. In addition, during or following the transition period, in the event the State requires the Services of Contractor's subcontractors or vendors, as necessary to meet its needs, Contractor agrees to reasonably, and with good-faith, work with the State to use the Services of Contractor's subcontractors or vendors. Contractor will notify all of Contractor's subcontractors of procedures to be followed during transition.

2.173 CONTRACTOR INFORMATION TRANSITION

Contractor shall provide reasonable detailed specifications for all Services/Deliverables needed by the State, or specified third party, to properly provide the Services/Deliverables required under this Contract. Contractor will provide the State with asset management data generated from the inception of this Contract through the date on which this Contractor is terminated in a comma-delineated format unless otherwise requested by the State. Contractor will deliver to the State any remaining owed reports and documentation still in Contractor's possession subject to appropriate payment by the State.

2.174 CONTRACTOR SOFTWARE TRANSITION

Contractor shall reasonably assist the State in the acquisition of any Contractor software required to perform the Services/use the Deliverables under this Contract. This must include any documentation being used by Contractor to perform the Services under this Contract. If the State transfers any software licenses to Contractor, those licenses must, upon expiration of Contract, transfer back to the State at their current revision level. Upon notification by the State, Contractor may be required to freeze all non-critical changes to Deliverables/Services.

2.175 TRANSITION PAYMENTS

If the transition results from a termination for any reason, the termination provisions of this Contract must govern reimbursement. If the transition results from expiration, Contractor will be reimbursed for all reasonable transition costs (i.e. costs incurred within the agreed period after contract expiration that result from transition operations) at the rates agreed upon by the State. Contractor will prepare an accurate accounting from which the State and Contractor may reconcile all outstanding accounts.

2.176 STATE TRANSITION RESPONSIBILITIES

In the event that this Contract is terminated, dissolved, voided, rescinded, nullified, or otherwise rendered unenforceable, the State agrees to reconcile all accounts between the State and Contractor, complete any pending post-project reviews and perform any others obligations upon which the State and Contractor agree.
(a) Reconciling all accounts between the State and Contractor;
(b) Completing any pending post-project reviews.

2.180 Stop Work

2.181 STOP WORK ORDERS

The State may, at any time, by written Stop Work Order to Contractor, require that Contractor stop all, or any part, of the work called for by Contract for a period of up to 90 calendar days after the Stop Work Order is delivered to Contractor, and for any further period to which the parties may agree. The Stop Work Order must be identified as a Stop Work Order and must indicate that it is issued under this **Section**. Upon receipt of the stop work order, Contractor must immediately comply with its terms and take all reasonable steps to minimize incurring costs allocable to the work covered by the Stop Work Order during the period of work stoppage. Within the period of the stop work order, the State must either: (a) cancel the stop work order; or (b) terminate the work covered by the Stop Work Order as provided in **Section 2.182**.

2.182 CANCELLATION OR EXPIRATION OF STOP WORK ORDER

Contractor shall resume work if the State cancels a Stop Work Order or if it expires. The parties shall agree upon an equitable adjustment in the delivery schedule, Contract price, or both, and Contract shall be modified, in writing, accordingly, if: (a) the Stop Work Order results in an increase in the time required for, or in Contractor's costs properly allocable to, the performance of any part of Contract; and (b) Contractor asserts its right to an equitable adjustment within 30 calendar days after the end of the period of work stoppage; provided that, if the State decides the facts justify the action, the State may receive and act upon a Contractor proposal submitted at any time before final payment under Contract. Any adjustment will conform to the requirements of **Section 2.024**.

2.183 ALLOWANCE OF CONTRACTOR COSTS

If the Stop Work Order is not canceled and the work covered by the Stop Work Order is terminated for reasons other than material breach, the termination shall be deemed to be a termination for convenience under **Section 2.153**, and the State shall pay reasonable costs resulting from the Stop Work Order in arriving at the termination settlement. For the avoidance of doubt, the State shall not be liable to Contractor for loss of profits because of a Stop Work Order issued under this Section**.**

2.190 Dispute Resolution

2.191 IN GENERAL

Any claim, counterclaim, or dispute between the State and Contractor arising out of or relating to Contract or any Statement of Work must be resolved as follows. For all Contractor claims seeking an increase in the amounts payable to Contractor under Contract, or the time for Contractor's performance, Contractor must submit a letter, together with all data supporting the claims, executed by Contractor's Contract Administrator or Contract Administrator's designee certifying that (a) the claim is made in good faith, (b) the amount claimed accurately reflects the adjustments in the amounts payable to Contractor or the time for Contractor's performance for which Contractor believes the State is liable and covers all costs of every type to which Contractor is entitled from the occurrence of the claimed event, and (c) the claim and the supporting data are current and complete to Contractor's best knowledge and belief.

2.192 INFORMAL DISPUTE RESOLUTION

(a) All disputes between the parties shall be resolved under Contract Management procedures in this Contract. If the parties are unable to resolve any dispute after compliance with the processes, the parties must

meet with the Director of Procurement, DTMB, or designee, to resolve the dispute without the need for formal legal proceedings, as follows:

(1) The representatives of Contractor and the State must meet as often as the parties reasonably deem necessary to gather and furnish to each other all information with respect to the matter at issue which the parties believe to be appropriate and germane in connection with its resolution. The representatives shall discuss the problem and negotiate in good faith in an effort to resolve the dispute without the necessity of any formal proceeding.

(2) During the course of negotiations, all reasonable requests made by one party to another for non-privileged information reasonably related to Contract shall be honored in order that each of the parties may be fully advised of the other's position.

(3) The specific format for the discussions shall be left to the discretion of the designated State and Contractor representatives, but may include the preparation of agreed upon statements of fact or written statements of position.

(4) Following the completion of this process within 60 calendar days, the Director of Procurement, DTMB, or designee, shall issue a written opinion regarding the issue(s) in dispute within 30 calendar days. The opinion regarding the dispute must be considered the State's final action and the exhaustion of administrative remedies.

(b) This Section shall not be construed to prevent either party from instituting, and a party is authorized to institute, formal proceedings earlier to avoid the expiration of any applicable limitations period, to preserve a superior position with respect to other creditors, or under Section 2.193.

(c) The State shall not mediate disputes between Contractor and any other entity, except state agencies, concerning responsibility for performance of work under Contract.

2.193 INJUNCTIVE RELIEF

A claim between the State and Contractor is not subject to the provisions of Section 2.192, Informal Dispute Resolution, where a party makes a good faith determination that a breach of Contract by the other party will result in damages so immediate, so large or severe, and so incapable of adequate redress that a temporary restraining order or other injunctive relief is the only adequate remedy.

2.194 CONTINUED PERFORMANCE

Each party agrees to continue performing its obligations under Contract while a dispute is being resolved except to the extent the issue in dispute precludes performance (dispute over payment must not be deemed to preclude performance) and without limiting either party's right to terminate Contract as provided in **Section 2.150**, as the case may be.

2.200 Federal and State Contract Requirements

2.201 NONDISCRIMINATION

In the performance of Contract, Contractor agrees not to discriminate against any employee or applicant for employment, with respect to his or her hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of race, color, religion, national origin, ancestry, age, sex, height, weight, and marital status, physical or mental disability. Contractor further agrees that every subcontract entered into for the performance of this Contract or any purchase order resulting from this Contract will contain a provision requiring non-discrimination in employment, as specified here, binding upon each Subcontractor. This covenant is required under the Elliot Larsen Civil Rights Act, 1976 PA 453, MCL 37.2101, et seq., and the Persons with Disabilities Civil Rights Act, 1976 PA 220, MCL 37.1101, et seq., and any breach of this provision may be regarded as a material breach of Contract.

2.202 UNFAIR LABOR PRACTICES

Under 1980 PA 278, MCL 423.321, et seq., the State shall not award a Contract or subcontract to an employer whose name appears in the current register of employers failing to correct an unfair labor practice compiled under section 2 of the Act. This information is compiled by the United States National Labor Relations Board. A Contractor of the State, in relation to Contract, shall not enter into a contract with a Subcontractor, manufacturer, or supplier whose name appears in this register. Under section 4 of 1980 PA 278, MCL

423.324, the State may void any Contract if, after award of Contract, the name of Contractor as an employer or the name of the Subcontractor, manufacturer or supplier of Contractor appears in the register.

2.203 WORKPLACE SAFETY AND DISCRIMINATORY HARASSMENT

In performing Services for the State, Contractor shall comply with the Department of Civil Services Rule 2-20 regarding Workplace Safety and Rule 1-8.3 regarding Discriminatory Harassment. In addition, Contractor shall comply with Civil Service regulations and any applicable agency rules provided to Contractor. For Civil Service Rules, see http://www.mi.gov/mdcs/0,1607,7-147-6877---,00.html.

2.204 PREVAILING WAGE

Wages rates and fringe benefits to be paid each class of individuals employed by Contractor, its subcontractors, their subcontractors, and all persons involved with the performance of this Contract in privity of contract with Contractor shall not be less than the wage rates and fringe benefits established by the Michigan Department of Licensing and Regulatory Affairs, Wage and Hour Division, schedule of occupational classification and wage rates and fringe benefits for the local where the work is to be performed. The term Contractor shall include all general contractors, prime contractors, project managers, trade contractors, and all of their contractors or subcontractors and persons in privity of contract with them.

Contractor, its subcontractors, their subcontractors and all persons involved with the performance of this contract in privity of contract with Contractor shall keep posted on the work site, in a conspicuous place, a copy of all wage rates and fringe benefits as prescribed in Contract. Contractor shall also post, in a conspicuous place, the address and telephone number of the Michigan Department of Licensing and Regulatory Affairs, the agency responsible for enforcement of the wage rates and fringe benefits. Contractor shall keep an accurate record showing the name and occupation of the actual wage and benefits paid to each individual employed in connection with this contract. This record shall be available to the State upon request for reasonable inspection.

If any trade is omitted from the list of wage rates and fringe benefits to be paid to each class of individuals by Contractor, it is understood that the trades omitted shall also be paid not less than the wage rate and fringe benefits prevailing in the local where the work is to be performed.

2.210 Governing Law

2.211 GOVERNING LAW

Contract shall in all respects be governed by, and construed according to, the substantive laws of the State of Michigan without regard to any Michigan choice of law rules that would apply the substantive law of any other jurisdiction to the extent not inconsistent with, or pre-empted by federal law.

2.212 COMPLIANCE WITH LAWS

Contractor shall comply with all applicable state, federal and local laws and ordinances in providing the Services/Deliverables.

2.213 JURISDICTION

Any dispute arising from Contract shall be resolved in the State of Michigan. With respect to any claim between the parties, Contractor consents to venue in Ingham County, Michigan, and irrevocably waives any objections it may have to the jurisdiction on the grounds of lack of personal jurisdiction of the court or the laying of venue of the court or on the basis of forum non conveniens or otherwise. Contractor agrees to appoint agents in the State of Michigan to receive service of process.

2.220 Limitation of Liability

2.221 LIMITATION OF LIABILITY

Neither Contractor nor the State is liable to each other, regardless of the form of action, for consequential, incidental, indirect, or special damages. This limitation of liability does not apply to claims for infringement of United States patent, copyright, trademark or trade secrets; to claims for personal injury or damage to property caused by the gross negligence or willful misconduct of Contractor; to claims covered by other specific provisions of this Contract calling for liquidated damages; or to court costs or attorneys' fees awarded by a court in addition to damages after litigation based on this Contract.

2.230 Disclosure Responsibilities

2.231 DISCLOSURE OF LITIGATION

Contractor shall disclose any material criminal litigation, investigations or proceedings involving Contractor (and each Subcontractor) or any of its officers or directors or any litigation, investigations or proceedings under the Sarbanes-Oxley Act. In addition, each Contractor (and each Subcontractor) shall notify the State of any material civil litigation, arbitration or proceeding which arises during the term of Contract and extensions, to which Contractor (or, to the extent Contractor is aware, any Subcontractor) is a party, and which involves: (i) disputes that might reasonably be expected to adversely affect the viability or financial stability of Contractor or any Subcontractor; or (ii) a claim or written allegation of fraud against Contractor or, to the extent Contractor is aware, any Subcontractor by a governmental or public entity arising out of their business dealings with governmental or public entities. Contractor shall disclose in writing to Contract Administrator any litigation, investigation, arbitration or other proceeding (collectively, "Proceeding") within 30 days of its occurrence. Details of settlements that are prevented from disclosure by the terms of the settlement may be annotated. Information provided to the State from Contractor's publicly filed documents referencing its material litigation shall be deemed to satisfy the requirements of this Section.

If any Proceeding disclosed to the State under this Section, or of which the State otherwise becomes aware, during the term of this Contract would cause a reasonable party to be concerned about:

(a) the ability of Contractor (or a Subcontractor) to continue to perform this Contract according to its terms and conditions, or

(b) whether Contractor (or a Subcontractor) in performing Services for the State is engaged in conduct which is similar in nature to conduct alleged in the Proceeding, which conduct would constitute a breach of this Contract or a violation of Michigan law, regulations or public policy, then Contractor must provide the State all reasonable assurances requested by the State to demonstrate that:

  (1) Contractor and its Subcontractors will be able to continue to perform this Contract and any Statements of Work according to its terms and conditions, and

  (2) Contractor and its Subcontractors have not and will not engage in conduct in performing the Services which is similar in nature to the conduct alleged in the Proceeding.

(c) Contractor shall make the following notifications in writing:

  (1) Within 30 days of Contractor becoming aware that a change in its ownership or officers has occurred, or is certain to occur, or a change that could result in changes in the valuation of its capitalized assets in the accounting records, Contractor must notify DTMB-Procurement.

  (2) Contractor shall also notify DTMB Procurement within 30 days whenever changes to asset valuations or any other cost changes have occurred or are certain to occur as a result of a change in ownership or officers.

  (3) Contractor shall also notify DTMB-Procurement within 30 days whenever changes to company affiliations occur.

2.232 CALL CENTER DISCLOSURE

Contractor and/or all subcontractors involved in the performance of this Contract providing call or contact center services to the State shall disclose the location of its call or contact center services to inbound callers. Failure to disclose this information is a material breach of this Contract.

2.233 BANKRUPTCY

The State may, without prejudice to any other right or remedy, terminate this Contract, in whole or in part, and, at its option, may take possession of the "Work in Process" and finish the Works in Process by whatever appropriate method the State may deem expedient if:

(a) Contractor files for protection under the bankruptcy laws;
(b) an involuntary petition is filed against Contractor and not removed within 30 days;
(c) Contractor becomes insolvent or if a receiver is appointed due to Contractor's insolvency;
(d) Contractor makes a general assignment for the benefit of creditors; or
(e) Contractor or its affiliates are unable to provide reasonable assurances that Contractor or its affiliates can deliver the services under this Contract.

Contractor will fix appropriate notices or labels on the Work in Process to indicate ownership by the State. To the extent reasonably possible, materials and Work in Process shall be stored separately from other stock and marked conspicuously with labels indicating ownership by the State.

2.240 Performance

2.241 TIME OF PERFORMANCE

(a) Contractor shall use commercially reasonable efforts to provide the resources necessary to complete all Services and Deliverables according to the time schedules contained in the Statements of Work and other Exhibits governing the work, and with professional quality.
(b) Without limiting the generality of **Section 2.241,** Contractor shall notify the State in a timely manner upon becoming aware of any circumstances that may reasonably be expected to jeopardize the timely and successful completion of any Deliverables/Services on the scheduled due dates in the latest State-approved delivery schedule and must inform the State of the projected actual delivery date.
(c) If Contractor believes that a delay in performance by the State has caused or will cause Contractor to be unable to perform its obligations according to specified Contract time periods, Contractor must notify the State in a timely manner and must use commercially reasonable efforts to perform its obligations according to Contract time periods notwithstanding the State's failure. Contractor will not be in default for a delay in performance to the extent the delay is caused by the State.

2.242 SERVICE LEVEL AGREEMENT (SLA)

(a) SLAs will be completed with the following operational considerations:

(1) SLAs will not be calculated for individual Incidents where any event of Excusable Failure has been determined; Incident means any interruption in Services.
(2) SLAs will not be calculated for individual Incidents where loss of service is planned and where the State has received prior notification or coordination.
(3) SLAs will not apply if the applicable Incident could have been prevented through planning proposed by Contractor and not implemented at the request of the State. To invoke this consideration, complete documentation relevant to the denied planning proposal must be presented to substantiate the proposal.
(4) Time period measurements will be based on the time Incidents are received by Contractor and the time that the State receives notification of resolution based on 24x7x365 time period, except that the time period measurement will be suspended based on the following:
    (i) Time period(s) will not apply where Contractor does not have access to a physical State Location and where access to the State Location is necessary for problem identification and resolution.
    (ii) Time period(s) will not apply where Contractor needs to obtain timely and accurate information or appropriate feedback and is unable to obtain timely and accurate information or appropriate feedback from the State.

(b) Chronic Failure for any Service(s) will be defined as three unscheduled outage(s) or interruption(s) on any individual Service for the same reason or cause or if the same reason or cause was reasonably discoverable in the first instance over a rolling 30 day period. Chronic Failure will result in the State's

option to terminate the effected individual Service(s) and procure them from a different vendor for the chronic location(s) with Contractor to pay the difference in charges for up to three additional months. The termination of the Service will not affect any tiered pricing levels.

(c) Root Cause Analysis will be performed on any Business Critical outage(s) or outage(s) on Services when requested by Contract Administrator. Contractor will provide its analysis within two weeks of outage(s) and provide a recommendation for resolution.

(d) All decimals must be rounded to two decimal places with five and greater rounding up and four and less rounding down unless otherwise specified.

2.243 LIQUIDATED DAMAGES

Unauthorized Removal of any Key Personnel

It is acknowledged that an Unauthorized Removal will interfere with the timely and proper completion of Contract, to the loss and damage of the State, and that it would be impracticable and extremely difficult to fix the actual damage sustained by the State as a result of any Unauthorized Removal. Therefore, Contractor and the State agree that in the case of any Unauthorized Removal in respect of which the State does not elect to exercise its rights under **Section 2.152**, the State may assess liquidated damages against Contractor as specified below.

For the Unauthorized Removal of any Key Personnel designated in the applicable Statement of Work, the liquidated damages amount is $25,000.00 per individual if Contractor identifies a replacement approved by the State under **Section 2.060** and assigns the replacement to the Project to shadow the Key Personnel who is leaving for a period of at least 30 days before the Key Personnel's removal.

If Contractor fails to assign a replacement to shadow the removed Key Personnel for at least 30 days, in addition to the $25,000.00 liquidated damages for an Unauthorized Removal, Contractor must pay the amount of $833.33 per day for each day of the 30 day shadow period that the replacement Key Personnel does not shadow the removed Key Personnel, up to $25,000.00 maximum per individual. The total liquidated damages that may be assessed per Unauthorized Removal and failure to provide 30 days of shadowing must not exceed $50,000.00 per individual.

2.244 EXCUSABLE FAILURE

Neither party will be liable for any default, damage or delay in the performance of its obligations under Contract to the extent the default, damage or delay is caused by government regulations or requirements (executive, legislative, judicial, military or otherwise), power failure, electrical surges or current fluctuations, lightning, earthquake, war, water or other forces of nature or acts of God, delays or failures of transportation, equipment shortages, suppliers' failures, or acts or omissions of common carriers, fire; riots, civil disorders; strikes or other labor disputes, embargoes; injunctions (provided the injunction was not issued as a result of any fault or negligence of the party seeking to have its default or delay excused); or any other cause beyond the reasonable control of a party; provided the non-performing party and its Subcontractors are without fault in causing the default or delay, and the default or delay could not have been prevented by reasonable precautions and cannot reasonably be circumvented by the non-performing party through the use of alternate sources, workaround plans or other means, including disaster recovery plans.

If a party does not perform its contractual obligations for any of the reasons listed above, the non-performing party will be excused from any further performance of its affected obligation(s) for as long as the circumstances prevail. But the party must use commercially reasonable efforts to recommence performance whenever and to whatever extent possible without delay. A party must promptly notify the other party in writing immediately after the excusable failure occurs, and also when it abates or ends.

If any of the above-enumerated circumstances substantially prevent, hinder, or delay Contractor's performance of the Services/provision of Deliverables for more than 10 Business Days, and the State determines that performance is not likely to be resumed within a period of time that is satisfactory to the State in its reasonable discretion, then at the State's option: (a) the State may procure the affected Services/Deliverables from an alternate source, and the State is not be liable for payment for the unperformed Services/ Deliverables not

provided under Contract for so long as the delay in performance continues; (b) the State may terminate any portion of Contract so affected and the charges payable will be equitably adjusted to reflect those Services/Deliverables terminated; or (c) the State may terminate the affected Statement of Work without liability to Contractor as of a date specified by the State in a written notice of termination to Contractor, except to the extent that the State must pay for Services/Deliverables provided through the date of termination.

Contractor will not have the right to any additional payments from the State as a result of any Excusable Failure occurrence or to payments for Services not rendered/Deliverables not provided as a result of the Excusable Failure condition. Defaults or delays in performance by Contractor which are caused by acts or omissions of its Subcontractors will not relieve Contractor of its obligations under Contract except to the extent that a Subcontractor is itself subject to an Excusable Failure condition described above and Contractor cannot reasonably circumvent the effect of the Subcontractor's default or delay in performance through the use of alternate sources, workaround plans or other means.

2.250 Approval of Deliverables

2.251 DELIVERY OF DELIVERABLES

Before delivering a Deliverable to the State, Contractor shall certify to the State that (1) it has performed quality assurance activities, (2) it has performed any necessary pre-testing, (3) it has corrected all material deficiencies discovered during such quality assurance activities and pre-testing, (4) the Deliverable is in a suitable state of readiness for the State's review and approval, and (5) the Deliverable has all critical security patches/updates applied.

2.252 APPROVAL OF DELIVERABLES, IN GENERAL

All Deliverables require formal written approval by the State, in accordance with the following procedures. Formal approval by the State requires that the Deliverable be confirmed in writing by the State to meet its specifications, which, in the case of the COTS Solution and Enhancements, will include the successful completion of State User Acceptance Testing, to be led by the State with the support and assistance of Contractor.

The State's obligation to comply with any State Review Period is conditioned on the timely delivery of Deliverables being reviewed. If Contractor fails to provide a Deliverable to the State in a timely manner, the State will nevertheless use commercially reasonable efforts to complete its review or testing within the applicable State Review Period.

Before commencement of its review or testing of a Deliverable, the State may inspect the Deliverable to confirm that all components of the Deliverable (e.g., software, associated documentation, and other materials) have been delivered. If the State determines that the Deliverable is incomplete, the State may refuse delivery of the Deliverable without performing any further inspection or testing of the Deliverable. Otherwise, the review period will be deemed to have started on the day the State receives the Deliverable and the applicable certification by Contractor in accordance with Section 2.251.

The State will approve in writing a Deliverable upon confirming that it conforms to and, in the case of the COTS Solution and Enhancements, performs in accordance with, its specifications without material deficiency. The State may, but shall not be required to, conditionally approve in writing a Deliverable that contains material deficiencies if the State elects to permit Contractor to rectify them post-approval. In any case, Contractor will be responsible for working diligently to correct within a reasonable time at Contractor's expense all deficiencies in the Deliverable that remain outstanding at the time of State approval.

If, after three (3) opportunities (the original and two repeat efforts), Contractor is unable to correct all deficiencies preventing State approval of a Deliverable, the State may: (i) demand that Contractor cure the failure and give Contractor additional time to cure the failure at the sole expense of Contractor; or (ii) keep this Contract in force and do, either itself or through other parties, whatever Contractor has failed to do, in which event Contractor shall bear any excess expenditure incurred by the State in so doing beyond Contract price for

such Deliverable and will pay the State an additional sum equal to ten percent (10%) of such excess expenditure to cover the State's general expenses without the need to furnish proof in substantiation of such general expenses; or (iii) terminate this Contract for default, either in whole or in part by notice to Contractor (and without the need to afford Contractor any further opportunity to cure).

The State, at any time and in its own discretion, may halt the UAT or approval process if such process reveals deficiencies in or problems with a Deliverable in a sufficient quantity or of a sufficient severity as to make the continuation of such process unproductive or unworkable. In such case, the State may return the applicable Deliverable to Contractor for correction and re-delivery prior to resuming the review or UAT process and, in that event, Contractor will correct the deficiencies in such Deliverable in accordance with Contract, as the case may be.

Approval in writing of a Deliverable by the State shall be provisional; that is, such approval shall not preclude the State from later identifying deficiencies in, and declining to accept, a subsequent Deliverable based on or which incorporates or inter-operates with an approved Deliverable, to the extent that the results of subsequent review or testing indicate the existence of deficiencies in the subsequent Deliverable.

2.254 PROCESS FOR APPROVAL OF WRITTEN DELIVERABLES

The State Review Period for written Deliverables will be the number of days set forth in the applicable Statement of Work following delivery of the final version of the written Deliverable (failing which the State Review Period, by default, shall be five (5) Business Days for written Deliverables of one hundred (100) pages or less and ten (10) Business Days for written Deliverables of more than one hundred (100) pages). The duration of the State Review Periods will be doubled if the State has not had an opportunity to review an interim draft of the Written Deliverable prior to its submission to the State. The State agrees to notify Contractor in writing by the end of the State Review Period either stating that the written Deliverable is approved in the form delivered by Contractor or describing any deficiencies that shall be corrected prior to approval of the written Deliverable (or at the State's election, subsequent to approval of the written Deliverable). If the State delivers to Contractor a notice of deficiencies, Contractor will correct the described deficiencies and within five (5) Business Days resubmit the Deliverable in a form that shows all revisions made to the original version delivered to the State. Contractor's correction efforts will be made at no additional charge. Upon receipt of a corrected written Deliverable from Contractor, the State will have a reasonable additional period of time, not to exceed the length of the original State Review Period, to review the corrected written Deliverable to confirm that the identified deficiencies have been corrected.

2.255 PROCESS FOR APPROVAL OF COTS SOLUTION AND ENHANCEMENTS

The State will conduct UAT of each software Deliverable (including but not limited to the COTS Solution and any Enhancements) in accordance with the following procedures to determine whether it meets the criteria for State approval – i.e., whether it conforms to and performs in accordance with its specifications without material deficiencies.

Within thirty (30) days (or such other number of days as the parties may agree to in writing) prior to Contractor's delivery of any software Deliverable to the State for approval, Contractor shall provide to the State a set of proposed test plans, including test cases, scripts, data and expected outcomes, for the State's use (which the State may supplement in its own discretion) in conducting UAT of the software Deliverable. Contractor, upon request by the State, shall provide the State with reasonable assistance and support during the UAT process.

For each software Deliverable, the State Review Period for conducting UAT will be as indicated in the Statement of Work. The State Review Period for each software Deliverable will begin when Contractor has delivered the software Deliverable to the State accompanied by the certification required by Section 2.251 and the State's inspection of the Deliverable has confirmed that all components of it have been delivered.

The State's UAT will consist of executing test scripts from the proposed testing submitted by Contractor, but may also include any additional testing deemed appropriate by the State. If the State determines during the UAT that the software Deliverable contains any deficiencies, the State will notify Contractor of the deficiency by

making an entry in an incident reporting system available to both Contractor and the State. Contractor will modify promptly the software Deliverable to correct the reported deficiencies, conduct appropriate testing to confirm the proper correction of the deficiencies and re-deliver the corrected version to the State for re-testing in UAT. Contractor will coordinate the re-delivery of corrected versions of software Deliverables with the State so as not to disrupt the State's UAT process. The State will promptly re-test the corrected version of the software Deliverable after receiving it from Contractor.

Within three (3) business days after the end of the State Review Period, the State will give Contractor a written notice indicating the State's approval or rejection of the software Deliverable according to the criteria and process set out in this **Section**.

2.256 FINAL ACCEPTANCE

"**Final Acceptance**" shall be considered to occur when the software Deliverable to be delivered has been approved by the State in writing and has been operating in production without any material deficiency for fourteen (14) consecutive days. If the State elects to defer putting a software into live production for its own reasons, not based on concerns about outstanding material deficiencies in the Deliverable, the State shall nevertheless grant Final Acceptance of the Project.

2.260 Ownership

2.261 OWNERSHIP OF WORK PRODUCT BY STATE

Contractor owns all Enhancements and all United States and international copyrights, trademarks, patents or other proprietary rights in the Enhancements.

2.262 INTENTIONALLY OMITTED

2.263 RIGHTS IN DATA

The State is the owner of all data made available by the State to Contractor or its agents, Subcontractors or representatives under Contract. Contractor will not use the State's data for any purpose other than providing the Services, nor will any part of the State's data be disclosed, sold, assigned, leased or otherwise disposed of to the general public or to specific third parties or commercially exploited by or on behalf of Contractor. No employees of Contractor, other than those on a strictly need-to-know basis, have access to the State's data. Contractor will not possess or assert any lien or other right against the State's data. Without limiting the generality of this Section, Contractor must only use personally identifiable information as strictly necessary to provide the Services and must disclose the information only to its employees who have a strict need-to-know the information. Contractor must comply at all times with all laws and regulations applicable to the personally identifiable information. Within five days of termination or expiration of Contract, Contractor must, at no charge to the State, return to the State all State owned data.

2.264 OWNERSHIP OF MATERIALS

The State and Contractor will continue to own their respective proprietary technologies developed before entering into Contract. Any hardware bought through Contractor by the State, and paid for by the State, will be owned by the State. Any software licensed through Contractor and sold to the State, will be licensed directly to the State.

2.270 State Standards

2.271 EXISTING TECHNOLOGY STANDARDS

Contractor must adhere to all existing standards as described within the comprehensive listing of the State's existing technology standards at http://www.michigan.gov/dmb/0,4568,7-150-56355-108233--,00.html.

2.272 ACCEPTABLE USE POLICY

To the extent that Contractor has access to the State computer system, Contractor must comply with the State's Acceptable Use Policy, see http://michigan.gov/cybersecurity/0,1607,7-217-34395_34476---,00.html. All Contractor employees must be required, in writing, to agree to the State's Acceptable Use Policy before accessing the State system. The State reserves the right to terminate Contractor's access to the State system if a violation occurs.

2.273 SYSTEMS CHANGES

Contractor is not responsible for and not authorized to make changes to any State systems without written authorization from the Project Manager. Any changes Contractor makes to State systems with the State's approval must be done according to applicable State procedures, including security, access and configuration management procedures.

2.274 ELECTRONIC RECEIPT PROCESSING STANDARD

All electronic commerce applications that allow for electronic receipt of credit/debit card and electronic check (ACH) transactions must be processed via the Centralized Electronic Payment Authorization System (CEPAS).

2.280 Extended Purchasing Program

2.281 EXTENDED PURCHASING PROGRAM

Contract will be extended to MiDEAL members. MiDEAL members include local units of government, school districts, universities, community colleges, and non-profit hospitals. A current list of MiDEAL members is available at www.michigan.gov/mideal. Upon mutual written agreement between the State of Michigan and Contractor, this Contract may be extended to (a) State of Michigan employees, or (b) other states (including governmental subdivisions and authorized entities).

If extended, Contractor must supply all goods and services at the established Agreement prices and terms. The State reserves the right to negotiate additional discounts based on any increased volume generated by such extensions.

Contractor must submit invoices to, and receive payment from, extended purchasing program members on a direct and individual basis.

2.290 Environmental Provision

2.291 ENVIRONMENTAL PROVISION

Energy Efficiency Purchasing Policy: The State seeks wherever possible to purchase energy efficient products. This includes giving preference to U.S. Environmental Protection Agency (EPA) certified 'Energy Star' products for any category of products for which EPA has established Energy Star certification. For other purchases, the State may include energy efficiency as one of the priority factors to consider when choosing among comparable products.

Environmental Purchasing Policy: The State of Michigan is committed to encouraging the use of products and services that impact the environment less than competing products. The State is accomplishing this by including environmental considerations in purchasing decisions, while remaining fiscally responsible, to promote practices that improve worker health, conserve natural resources, and prevent pollution. Environmental components that are to be considered include recycled content and recyclables; energy efficiency; and the presence of undesirable materials in the products, especially those toxic chemicals which are persistent and bioaccumulative. Contractor should be able to supply products containing recycled and environmentally preferable materials that meet performance requirements and is encouraged to offer such products throughout the duration of this Contract. Information on any relevant third party certification (such as Green Seal, Energy Star, etc.) should also be provided.

Hazardous Materials: For the purposes of this Section, "Hazardous Materials" is a generic term used to describe asbestos, ACBMs, PCBs, petroleum products, construction materials including paint thinners, solvents, gasoline, oil, and any other material the manufacture, use, treatment, storage, transportation or disposal of which is regulated by the federal, state or local laws governing the protection of the public health, natural resources or the environment. This includes, but is not limited to, materials the as batteries and circuit packs, and other materials that are regulated as (1) "Hazardous Materials" under the Hazardous Materials Transportation Act, (2) "chemical hazards" under the Occupational Safety and Health Administration standards, (3) "chemical substances or mixtures" under the Toxic Substances Control Act, (4) "pesticides" under the Federal Insecticide Fungicide and Rodenticide Act, and (5) "hazardous wastes" as defined or listed under the Resource Conservation and Recovery Act.

(a) Contractor shall use, handle, store, dispose of, process, transport and transfer any material considered a Hazardous Material according to all federal, State and local laws. The State shall provide a safe and suitable environment for performance of Contractor's Work. Before the commencement of Work, the State shall advise Contractor of the presence at the work site of any Hazardous Material to the extent that the State is aware of the Hazardous Material. If Contractor encounters material reasonably believed to be a Hazardous Material and which may present a substantial danger, Contractor shall immediately stop all affected Work, notify the State in writing about the conditions encountered, and take appropriate health and safety precautions.

(b) Upon receipt of a written notice, the State will investigate the conditions. If (a) the material is a Hazardous Material that may present a substantial danger, and (b) the Hazardous Material was not brought to the site by Contractor, or does not result in whole or in part from any violation by Contractor of any laws covering the use, handling, storage, disposal of, processing, transport and transfer of Hazardous Materials, the State shall order a suspension of Work in writing. The State shall proceed to have the Hazardous Material removed or rendered harmless. In the alternative, the State shall terminate the affected Work for the State's convenience.

(c) Once the Hazardous Material has been removed or rendered harmless by the State, Contractor shall resume Work as directed in writing by the State. Any determination by the Michigan Department of Community Health or the Michigan Department of Environmental Quality that the Hazardous Material has either been removed or rendered harmless is binding upon the State and Contractor for the purposes of resuming the Work. If any incident with Hazardous Material results in delay not reasonable anticipatable under the circumstances and which is attributable to the State, the applicable SLAs for the affected Work will not be counted in a time as mutually agreed by the parties.

(d) If the Hazardous Material was brought to the site by Contractor, or results in whole or in part from any violation by Contractor of any laws covering the use, handling, storage, disposal of, processing, transport and transfer of Hazardous Material, or from any other act or omission within the control of Contractor, Contractor shall bear its proportionate share of the delay and costs involved in cleaning up the site and removing and rendering harmless the Hazardous Material according to Applicable Laws to the condition approved by applicable regulatory agency(ies).

Labeling: Michigan has a Consumer Products Rule pertaining to labeling of certain products containing volatile organic compounds. For specific details visit http://www.michigan.gov/deq/0,1607,7-135-3310_4108-173523--,00.html

Refrigeration and Air Conditioning: Contractor shall comply with the applicable requirements of Sections 608 and 609 of the Clean Air Act (42 U.S.C. 7671g and 7671h) as each or both apply to this contract.

Environmental Performance: Waste Reduction Program - Contractor shall establish a program to promote cost-effective waste reduction in all operations and facilities covered by this contract. Contractor's programs shall comply with applicable Federal, State, and local requirements, specifically including Section 6002 of the Resource Conservation and Recovery Act (42 U.S.C. 6962, et seq.).

2.300 Deliverables

2.301 SOFTWARE

A list of the items of software the State is required to purchase for executing Contract is attached. The list includes all software required to complete Contract and make the Deliverables operable. if any additional software is required in order for the Deliverables to meet the requirements of this Contract, such software shall be provided to the State by Contractor at no additional charge (except where agreed upon and specified in a Statement of Work or Contract Change Notice). The attachment also identifies certain items of software to be provided by the State.

2.302 HARDWARE

A list of the items of hardware the State is required to purchase for executing Contract is attached. The list includes all hardware required to complete Contract and make the Deliverables operable. If any additional hardware is required in order for the Deliverables to meet the requirements of this Contract, such hardware shall be provided to the State by Contractor at no additional charge (except where agreed upon and specified in a Contract Change Notice). The attachment also identifies certain items of hardware to be provided by the State.

2.310 Software Warranties

2.311 PERFORMANCE WARRANTY

Contractor represents and warrants that Deliverables, after Final Acceptance, will perform and operate in compliance with the requirements and other standards of performance contained in this Contract (including all descriptions, specifications and drawings made a part of Contract) for a period of (90) ninety days. In the event of a breach of this warranty, Contractor will promptly correct the affected Deliverable(s) at no charge to the State.

2.312 NO SURREPTITIOUS CODE WARRANTY

Contractor represents and warrants that the COTS Solution and any Enhancements provided to the State do not contain or will not contain any Self-Help Code or any Unauthorized Code as defined below. This warranty is referred to in this Contract as the “No Surreptitious Code Warranty.”

As used in this Contract, (“**Self-Help Code**”) means any back door, time bomb, drop dead device, or other software routine designed to disable a computer program automatically with the passage of time or under the positive control of a person other than the licensee of the software. Self-Help Code does not include Software routines in a computer program, if any, designed to permit an owner of the computer program (or other person acting by authority of the owner) to obtain access to a licensee’s computer system(s) (e.g. remote access via modem) for purposes of maintenance or technical support.

As used in this Contract, (“**Unauthorized Code**”) means any virus, Trojan horse, spyware, worm or other Software routines or components designed to permit unauthorized access to disable, erase, or otherwise harm software, equipment, or data; or to perform any other such actions. The term Unauthorized Code does not include Self-Help Code. Unauthorized Code does not include software routines in a computer program, if any, designed to permit an owner of the computer program (or other person acting by authority of the owner) to obtain access to a licensee’s computer system(s) (e.g. remote access via modem) for purposes of maintenance or technical support.

In addition, Contractor will use up-to-date commercial virus detection software to detect and remove any viruses from any software prior to delivering it to the State.

2.313 THIRD-PARTY MATERIALS WARRANTY

CONTRACTOR WARRANTS THAT IT WILL NOT INCLUDE IN THE COTS SOLUTION OR ENHANCEMENTS, AND OPERATION OF THE COTS SOLUTION AND ENHANCEMENTS WILL NOT REQUIRE, ANY THIRD-PARTY MATERIALS, UNLESS SPECIFICALLY APPROVED IN WRITING BY THE STATE.

2.314 OPEN SOURCE COMPONENT WARRANTY

Contractor warrants that it will not include in the COTS Solution or Enhancements, and operation of the COTS Solution and Enhancements will not require, any Open Source Components, unless specifically approved in writing by the State.

2.315 PHYSICAL MEDIA WARRANTY

Contractor represents and warrants that each licensed copy of the COTS Solution provided by Contractor is free from physical defects in the media that tangibly embodies the copy. If Contractor breaches this warranty, then the State shall be entitled to replacement of the non-compliant copy by Contractor, at Contractor's expense (including shipping and handling).

2.320 Software Licensing

2.321 LICENSE GRANT

2.321.1 License Grant. Contractor hereby grants to the State the right and license to use the COTS Solution and Documentation throughout the universe for the Permitted Use in accordance with the terms and conditions of this Contract. The rights and licenses hereby granted are non-exclusive, fully paid up, royalty-free, perpetual, and irrevocable. For purposes of this Section, ("**Permitted Use**") means use of the COTS Solution and Documentation by the State for the purposes set forth in Article 1 of this Contract.

2.321.2 Licensed Access and Use. Pursuant to the license granted under Section 2.321.1 and in accordance with the terms and conditions thereof, the State has the right and license to do each of the following for or in connection with the Permitted Use:

(a) install, execute and run copies of the COTS Solution on the State's computer network for use by authorized end users in accordance with Article 1;
(b) have authorized end users access and use the COTS Solution by any means whatsoever, including via the internet or any WAN, LAN or VPN, from any other device;
(c) generate print, copy, download and store all State Data and other data, information and content, including all GUI, audio, visual or digital and other displays and output, as may result from any execution or other use of the COTS Solution;
(d) use the COTS Solution in object code form, except that the licensed uses of the COTS Solution hereunder shall include use in both Source Code and object code form:
    (i) if and to the extent access to and use of Source Code may be necessary, in the State's reasonable judgment, for interoperability purposes; and
    (ii) for any Open Source Components, in accordance with the license therefor;
(e) prepare and use a reasonable number of copies of the COTS Solution and Documentation for the Permitted Use, including for purposes of:
    (i) operation with other software or systems;
    (ii) hardware or system maintenance or repair;
    (iii) software, hardware or system testing;
    (iv) disaster recovery; and
    (v) backup and archiving;
(f) train end users in any and all uses of the COTS Solution and Documentation permitted hereunder; and
(g) perform, and have end users perform, any other act, including the provision of any service, that is reasonably incidental to the operation of the COTS Solution for the Permitted Use in accordance with terms and conditions of this Contract.

2.321.3 Use Restrictions. Except as and to the extent expressly permitted, or as reasonably necessary to make any use of the COTS Solution permitted by Section 2.321.2 or elsewhere in this Contract, the State shall not, and shall not permit others to:

2.1 Reverse engineer, disassemble, decompile, decode or adapt the COTS Solution, or otherwise attempt to derive or gain access to the Source Code of the COTS Solution, in whole or in part, except as and only to the extent: (a) such action is taken for purposes of creating Enhancements to the COTS

Solution (b) such action is taken for purposes of ensuring or assessing interoperability or; (c) with respect to Open-Source Components included in the COTS Solution, these acts are permitted under the applicable open-source license.
2.2 Rent, lease, lend, sell, sublicense, distribute, publish, transfer or otherwise make the COTS Solution available to any third party.

2.330 Source Code Escrow

2.331 DEFINITION

"**Source Code Escrow Package**" shall mean:
(a) A complete copy in machine-readable form of the source code and executable code of the Licensed Software, including any updates or new releases of the product;
(b) A complete copy of any existing design documentation and user documentation, including any updates or revisions; and/or
(c) Complete instructions for compiling and linking every part of the source code into executable code for purposes of enabling verification of the completeness of the source code as provided below. Such instructions shall include precise identification of all compilers, library packages, and linkers used to generate executable code.

2.332 DELIVERY OF SOURCE CODE INTO ESCROW

Contractor shall deliver a Source Code Escrow Package to the Escrow Agent, pursuant to the Escrow Contract, which shall be entered into on commercially reasonable terms subject to the provisions of this Contract within (30) thirty days of the execution of this Contract.

2.333 DELIVERY OF NEW SOURCE CODE INTO ESCROW

If at any time during the term of this Contract, Contractor provides a maintenance release or upgrade version of the Licensed Software, Contractor shall within ten (10) days deposit with the Escrow Agent, in accordance with the Escrow Contract, a Source Code Escrow Package for the maintenance release or upgrade version, and provide the State with notice of the delivery.

2.334 VERIFICATION

The State reserves the right at any time, but not more than once a year, either itself or through a third party contractor, upon thirty (30) days written notice, to seek verification of the Source Code Escrow Package.

2.335 ESCROW FEES

Contractor will pay all fees and expenses charged by the Escrow Agent.

2.336 RELEASE EVENTS

The Source Code Escrow Package may be released from escrow to the State, temporarily or permanently, upon the occurrence of one or more of the following:
(a) Contractor becomes insolvent, makes a general assignment for the benefit of creditors, files a voluntary petition of bankruptcy, suffers or permits the appointment of a receiver for its business or assets, becomes subject to any proceeding under bankruptcy or insolvency law, whether domestic or foreign;
(b) Contractor has wound up or liquidated its business voluntarily or otherwise and the State has reason to believe that such events will cause Contractor to fail to meet its warranties and maintenance obligations in the foreseeable future;
(c) Contractor voluntarily or otherwise discontinues support of the provided products or fails to support the products in accordance with its maintenance obligations and warranties.

2.337 RELEASE EVENT PROCEDURES

If the State desires to obtain the Source Code Escrow Package from the Escrow Agent upon the occurrence of an Event in this **Section**, then:
(a) The State shall comply with all procedures in the Escrow Contract;

(b) The State shall maintain all materials and information comprising the Source Code Escrow Package in confidence in accordance with this Contract;
(c) If the release is a temporary one, then the State shall promptly return all released materials to Contractor when the circumstances leading to the release are no longer in effect.

2.338 LICENSE

Upon release from the Escrow Agent pursuant to an event described in this **Section**, Contractor automatically grants the State a non-exclusive, irrevocable license to use, reproduce, modify, maintain, support, update, have made, and create Derivative Works. Further, the State shall have the right to use the Source Code Escrow Package in order to maintain and support the Licensed Software so that it can be used by the State as set forth in this Contract.

2.339 DERIVATIVE WORKS

Any Derivative Works to the source code released from escrow that are made by or on behalf of the State shall be the sole property of the State. The State acknowledges that its ownership rights are limited solely to the Derivative Works and do not include any ownership rights in the underlying source code.

Article 3 – Reserved

Article 4 – Required *Contractor* Information

4.010 Contractor Information

4.011 AUTHORIZED CONTRACT SIGNATORY

Person named will be sole contact for your company to receive Contract. Include the name and telephone number of person(s) in your company authorized to expedite any proposed contract with the State.

Name:	Allen Ibaugh, AICP, GISP	**Title:**	Chief Executive Officer	**Phone:**	(407) 382-5222
Name:	Trey Fragala, AICP, PMP	**Title:**	Chief Operating Officer	**Phone:**	(407) 382-5222

4.012 – 4.014 RESERVED

4.015 STAFFING

Below is a list of all Sub-contractors who will work on this contract – including firm name, address, contact person, and a complete description of the work to be contracted.

4.015 SUB-CONTRACTORS

1. Contractor must provide the required Subcontractor information outlined in 4.015 for each subcontractor they are proposing:

Contractor Response:

Subcontractors for this proposal are:

ESRI
380 New York Street
Redlands, CA 92373-8100
Eric Floss

Esri will support the DTS team with a focus on implementing a modern linear referencing system. MDOT desires a single, authoritative GIS-based LRS system that will be leveraged as a "springboard" for unlocking the potential value of enterprise GIS-based business solutions across many MDOT departments. Serving as a centralized integration point, implementation of the enterprise LRS solution will enable MDOT to:

- Largely impact time savings in decision making processes.
- Streamline manual and disjointed workflows among business units.
- Simplify route management.
- Provide a framework for safety and performance management.
- Enable the department to use advanced geospatial analysis to guide project prioritization and planning, which could ultimately equate to putting pavement into the ground more efficiently.

Esri Roads and Highways has the capability to manage the existing MDOT linear referencing methods (LRMs) and also an ability to expand support for other LRMs which could include GPS Coordinate and Referent Offset.

Esri's Roads and Highways offers MDOT the security of a highly configurable, COTS product that is fully integrated with core ArcGIS technology.

Engaging Esri to support MDOT's configuration and deployment project will provide the agency many advantages that cannot be delivered by any other contractor or team. These advantages include:

- As the developer of the Esri Roads and Highways solution product, Esri is the only company that will have access to the research and development programming staff responsible for creating and implementing the next iteration of advances to the Esri Roads and Highways solution product.

- In developing the Esri Roads and Highways solution product over the last 4 years, Esri has consulted with many state DOT's, including MDOT. As a result, Esri has acquired critical knowledge of MDOT's data sources, requirements and needs within the organization, staff and GIS. We have demonstrated through this effort that we have the resources and experience to meet the LRS needs of MDOT in accordance with this scope of services document.
- Esri is the sole domestic provider of software maintenance for the Esri Roads and Highways solution product (technical support plus Esri software updates/upgrades).
- Esri is also the sole source of certain proprietary training courses, including any future Esri Roads and Highways training courses.
- Only Esri can provide the required technology capabilities in a single unified platform.
- Esri will make available subject-matter experts who specialize in many key aspects of transportation GIS and LRS, including the Esri Roads and Highways solution product.
- Members of the Esri Transportation Services and Database Services teams were key contributors to Designing Databases for Transportation (Esri Press, 2008), which the Esri Roads and Highways information model is based upon.

COTS Software Name	Usage	Comments
Esri's Roads and Highways Desktop	Implementation of an Advanced Linear Reference System (ALRS) accessible via ArcMap Toolbar	COTS implementation.
Esri's ArcGIS Server with Esri's Roads and Highways Server.	Publish ALRS content for editing / consumption within the Esri's Roads and Highways Characteristic Editor (RCE)	COTS implementation.
Esri's Roads and Highways Roadway Characteristic Editor (RCE)	Web based Roads and Highways redlining and event editor	COTS implementation.
Esri's Workflow Manager (WMX) – Desktop and Server	This software enables organizations to design and configure "workflows" that model their organizational business processes.	COTS implementation.
ArcGIS Data Reviewer – Desktop and Server	This software provides a complete system for automating and simplifying data quality control, which can quickly improve the integrity of your data.	COTS implementation.

Transcend Spatial Solutions LLC
2970 University Parkway, Suite 201
Sarasota, FL 34243-2401
Connie Gurchiek

TSS will support the DTS team with the implementation and integration of the Linear Reference System and Straightline Diagram components of the project.

Data Migration Planning – Migration of route and event data to the roads and highways environment requires a review of the existing route and event data to determine whether incompatibilities exist between the current LRS and Roads and Highways. This review will also determine if manual steps are required to migrate the data. Key elements for review include:

- Route ID structure

- Route calibration methods
- Route gaps and concurrencies
- Event data structures

Create Migration Scripts and Tools – Depending on the results of the data migration planning, portions of the data migration can be automated. A set of scripts will be created to aid in the initial and periodic migrations of data. This will reduce the overall effort and increase the quality of the migrated data. Some manual effort will be needed to maintain the centerline and calibration point data, modify any new data that requires edits to fit the new model and perform QA/QC tasks. The scripts will assist in the following tasks:

- Build Advanced Linear Referencing System (ALRS) networks from existing routes
- Calibrate the new route networks
- Create source to table mappings for event data
- Migrate event data to new formats, if necessary
- Register event tables with the ALRS networks
- Identify potential migration errors

Deploy to MDOT Environment
Server Setup – The project team will assist in the configuration of the R&H servers and the installation of all required software.
GDB Creation and Migration – The team will assist in creating the required geodatabases and users to support the R&H schemas, versions and workflows.
Application Deployment and Configuration – The project team will assist in the deployment and configuration of the desktop and web components of R&H including:

- Roads and Highways desktop extension
- Workflow manager extensions for desktop and server
- Data Reviewer extensions for desktop and server
- Roadway Characteristics Editor (RCE) web application
- Roads and Highways Productivity Tools
- Road Analyzer

Documentation and Training - The project team will provide detailed documentation and training materials for the use of all Roads and Highways tools and workflows. The documentation will include user guides, technical documentation, test cases for user acceptance and deployment documentation.

eVision Partners, Inc.
9660 Falls of Neuse Road, Suite 138 #256
Robert Cooney
Raleigh, NC 27615-2435

eVision Partners will support the DTS team in business requirements definition both short-term as well as long-term in relationship of the TAMS solution and future ERP COTS integration as well as other potential environmental (fiscal and the like) that could occur over the program lifecycle.

4.016 RESERVED

4.017 PLACE OF PERFORMANCE

Contractor, in the performance of any resulting contract, must identify the place of performance for work to be done by Contractor and any Subcontractor. The place of performance includes any facility that may be utilized during the term of the proposed Contract. If the place of performance is a State facility, Contractor must list the location of the office responsible for the performance. DUNS numbers may vary by location. Please provide a DUNS number for each place of performance listed below.

Place of Performance – Owner/Operator of facility to be used and full name and address including 9-digit zip code	Description of services to be performed at this location.	Percent (%) of Contract value to be performed at this location	Data Universal Number System (DUNS) #
Data Transfer Solutions 3680 Avalon Park Blvd. E., Suite 200 Orlando, FL 32828-9373	Software enhancement, configuration, implementation & integration for VUEWorks, R & H & SLD. Professional consulting services.	45%	17-003-8595
Data Transfer Solutions 1001 Elm Street, Suite 203 Manchester, NH 03101-1845	Software enhancement, configuration, implementation & integration for VUEWorks, R & H & SLD. Professional consulting services.	19%	01-721-5923
ESRI 380 New York Street Redlands, CA 92373-8100	Software enhancement, configuration, implementation & integration for VUEWorks, R & H & SLD. Professional consulting services.	20%	06-313-4175
Transcend Spatial Solutions LLC 2970 University Parkway, Suite 201 Sarasota, FL 34243-2401	Software enhancement, configuration, implementation & integration for VUEWorks, R & H & SLD. Professional consulting services.	15%	96-621-1927
eVision Partners, Inc. 9660 Falls of Neuse Road, Suite 138 #256 Raleigh, NC 27615-2435	Software enhancement, configuration, implementation & integration for VUEWorks, R & H & SLD. Professional consulting services.	1%	05-294-2994

4.018 - 4.019 RESERVED

4.020 SERVICES NEEDED IN PERFORMANCE – PRINCIPAL PLACE OF BUSINESS

Contract**or** certifies that any services procured to perform work under a Purchase Order or Contract for this solicitation will be purchased from a business whose principal place of business is in the State of Michigan.

___ Yes _**X**_ No If No, complete the table below for those services whose primary location is outside the State of Michigan.

Describe the Service to be purchased	Percent (%) of total contract value to be purchased	Service providers principal place of business (City and State)
VUEWorks®	64%	Orlando, FL, Manchester, NH
Esri Roads & Highways	20%	Redlands, CA
Professional Services	16%	Sarasota, FL, Raleigh, NC

4.021 SUB-CONTRACTOR NEEDED IN PERFORMANCE OF CONTRACT – PRINCIPLE PLACE OF BUSINESS

a. Contractor certifies that Sub-contractors will be used to assist the company to perform work required under a Purchase Order or Contract for this solicitation.

___ Yes _X__ No If No, does Contractor certify that Subcontractor used will have their primary location inside the State of Michigan?

___ Yes _X__ No If No, complete the table below for those services whose primary location is outside the State of Michigan.

Note: Do not complete table if responding Yes to both situations above.

Describe the work to be subcontracted	Percent (%) of total contract value to be subcontracted	Subcontractor name and principal place of business (City)
Roads & Highways (Esri)	20%	Esri – Redlands, CA
LRS/SLD (TSS)	15%	Transcend Spatial Solutions – Sarasota, FL
Professional Services (eVision)	1%	eVision Partners – Raleigh, NC

4.022 RESERVED

4.023 E-VERIFY

If the Michigan Department of Human Services or Michigan Department of Transportation receives goods or services under this Contract and pays for them using funds appropriated under 2012 PA 200, then Contractor must comply with the requirements of §§ 291 and 381 of 2012 PA 200, as applicable, and use the federal E-Verify system to verify that new hire employees of Contractor and its Subcontractor are legally present in the United States, and then certify the verification to the State.

4.025 EXTENDED PURCHASING PROGRAM

Contractor must check one box below:

XDeliverable(s) will be supplied to the State and **MiDEAL Members** according to the terms and prices quoted, subject to Section 2.22.1, MiDEAL Requirements.
□Deliverable(s) will not be supplied to **MiDEAL Members**.
□ Deliverable(s) will be supplied to **State of Michigan employees**.
□ Deliverable(s) will not be supplied to **State of Michigan employees**.
□ Deliverable(s) will be supplied to **other states** (including governmental subdivisions and authorized entities).
□ Deliverable(s) will not be supplied to **other states** (including governmental subdivisions and authorized entities).

Glossary

24x7x365	Means 24 hours a day, seven days a week, and 365 days a year (including the 366th day in a leap year).
Additional Service	Means any Services/Deliverables within the scope of Contract, but not specifically provided under any Statement of Work, that once added will result in the need to provide Contractor with additional consideration.
Addenda or Addendum	Means each amendment to this Contract issued by the Buyer and/or Project Manager as described in this Contract document.
Approved Date	Late start/late finish dates (backward pass). These dates are set as the baseline.
ArcSDE	Spatial Database Engine – software provided by ESRI as part of their overall GIS software product suite. ArcSDE provides the capability to store and manage spatial data and associated information within a Relational Database Management System (RDBMS).
Audit Period	See Section 2.110
Baseline	Original project plan.
Benchmark	Annual snapshot of the entire program that becomes the program “baseline”.
Contract Construction Cost	Contract construction cost changes based on the stage of the job. After the job is awarded, Contract amount is used for Contract construction cost. If this is absent the engineers estimate is used from Web Trns*Port.
Blanket Purchase Order	An alternate term for Contract as used in the States computer system.
Business Critical	Any function identified in any Statement of Work as Business Critical.
Business Day	Whether capitalized or not, shall mean any day other than a Saturday, Sunday or State-recognized legal holiday (as identified in the Collective Bargaining Agreement for State employees) from 8:00am EST through 5:00pm EST unless otherwise stated.
Blanket Purchase Order	An alternate term for Contract as used in the States computer system.
Characteristics	High-level scope information used to generate an initial network.
Chronic Failure	Defined in any applicable Service Level Agreements.
ConOps	Concept of Operations – report provided as an attachment to Contract which describes how TAMS is intended to operate within the MDOT applications environment.
Construction Cost	The construction cost changes based on the stage of the job. Initially the costs are from the concept statement. In the next stage the amount for the job phase is used. Once the job is obligated, the obligated amount is used.
Contract ID	*Not referenced in this document.* The lowest job number of packaged jobs, concatenated with control section.
COTS Solution	The web-based Commercial-of-the-Shelf software program provided by Contractor under this Contract, and any update, upgrade, release, or other adaptation or modification of the COTS Solution, including any updated Documentation, that Contractor may generally provide to its licensees from time to time, which may contain, among other things, error corrections, enhancements, improvements or other changes to the user interface, functionality, compatibility, capabilities, performance, efficiency or quality of the COTS Solution.
Days	Means calendar days unless otherwise specified.
DCDS	Data Collection Distribution System (State of Michigan time reporting system)
DTMB	Michigan Department of Technology, Management & Budget
Deliverable	The COTS Solution, Enhancements and Documentation, and all other documents, work product and other materials, that Contractor is required to or otherwise does provide to the State under this Contract and otherwise in connection with any Services, including any and all items specifically identified as Deliverables in the Statement of Work.
Documentation	All user manuals, operating manuals, technical manuals and any other instructions, specifications, documents and materials, in any form or media, that describe the functionality, installation, testing, operation, use, maintenance, support and technical and other components, features and requirements of the COTS Solution or Enhancements.
ECO	Environmental Clearance Organizer
EPE	Early Preliminary Engineering Job Phase

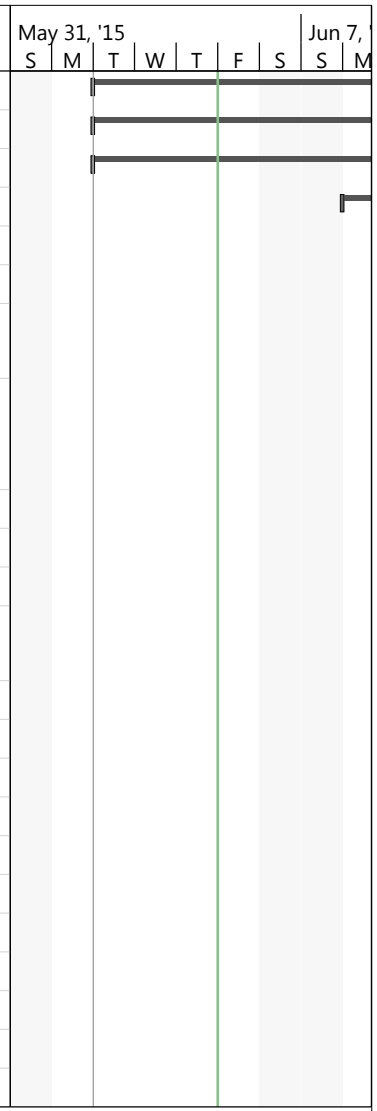
Enhancements	All modifications, corrections, repairs, translations, enhancements and other derivative works and improvements of the COTS Solution or Documentation made by Contractor pursuant to this Contract.
Environmentally preferable products	A product or service that has a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. Such products or services may include, but are not limited to, those that contain recycled content, minimize waste, conserve energy or water, and reduce the amount of toxics either disposed of or consumed.
Excusable Failure	See Section 2.244.
External Resources	Contractor Employees
Finish Date	A point in time associated with a schedule tasks completion. Usually qualified by one of the following: actual, planned, estimated, scheduled, early, late, baseline, target or current.
FleetFocus	Michigan fleet management system application
Funding Template	A source of funds which aligns funding and work to accomplish approved goals and performance standards.
Hazardous material	Any material defined as hazardous under the latest version of federal Emergency Planning and Community Right-to-Know Act of 1986 (including revisions adopted during the term of Contract).
Incident	Any interruption in Services.
Intellectual Property Rights	All or any of the following, in each case whether registered or unregistered and including all applications for, and renewals or extensions of, such rights, and all similar or equivalent rights or forms of protection in any part of the world: (a) patents, patent disclosures and inventions (whether patentable or not); (b) trademarks, service marks, trade dress, trade names, logos, corporate names and domain names, together with all of the goodwill associated therewith; (c) copyrights and copyrightable works (including computer programs), and rights in data and databases; (d) trade secrets, know-how and other confidential information; and (e) other intellectual property rights.
Internal Resources	MDOT Employees
Job	A work activity after the approval of funds, specifically, a number assigned by MDOT to uniquely identify all of the work activities required to be performed to prepare or maintain a specific transportation system component. See also Project.
Job Group	See Subprogram.
JobNet	JobNet is currently in development and will replace the current MPINS (MAP Project Information System). This system collects and tracks information about projects, from scoping through design, and builds documentation for projects.
Key Dates	Major milestone dates including but not limited to dates for plan completion, letting, ROW certification, and environmental clearance. These are the target dates or basis from which the schedule is generated.
Key Personnel	Any Personnel designated in Article 1 as Key Personnel.
Labor Hours	The time that a resource actually spends 'hands on' with a task, as opposed to duration (i.e. no periods of task inactivity). Project management defines this as work.
MainStar	Michigan fleet management system application
MAP	MDOT Architectural Project Database (Global MDOT database)
MDOT	Michigan Department of Transportation
MIBridge	Michigan Bridge System – a new MDOT application being implemented to replace existing legacy bridge management systems applications.
MFOS	MAP Financial Obligation System
MiDEAL	MiDEAL is an extended purchasing program which allows Michigan local units of government to use state contracts to buy goods and services.
Major Milestone	Plan completion date, let date, omissions error check (OEC), plan review, and plan turn in date.
Milestone	A significant event in the job, usually the completion of a major deliverable.
New Work	Any Services/Deliverables outside the scope of Contract and not specifically provided under any Statement of Work, that once added will result in the need to provide Contractor with additional consideration.
Network	Diagram of a project's tasks and their dependencies, applied in a logical order.
Open Source Components	Any software component that is subject to any open-source copyright license agreement, including any GNU General Public License or GNU Library or Lesser Public License, or

	other license agreement that substantially conforms to the Open Source Definition as prescribed by the Open Source Initiative or otherwise may require disclosure or licensing to any third party of any source code with which such software component is used or compiled.
Ozone-depleting substance	Any substance the Environmental Protection Agency designates in 40 CFR part 82 as: (1) Class I, including, but not limited to, chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or (2) Class II, including, but not limited to, hydro chlorofluorocarbons
P/PMS	Program/Project Management System
Package	Multiple projects linked together with the same letting date. Ideally when a change is made to one that applies to all of the jobs, that change would be applied to all. For example, if the let date changed for the package, it would be applied to all jobs.
Package ID	Unique identifier for a package of multiple projects linked together with the same letting date.
Performance Indicator	Indicator will be determined by MDOT based on departmental priorities (ex: WIGS). This can include but not be limited to dates and costs
Post-Consumer Waste	Any product generated by a business or consumer which has served its intended end use, and which has been separated or diverted from solid waste for the purpose of recycling into a usable commodity or product, and which does not include post-industrial waste.
Post-Industrial Waste	Industrial by-products that would otherwise go to disposal and wastes generated after completion of a manufacturing process, but do not include internally generated scrap commonly returned to industrial or manufacturing processes.
ProjectWise	MDOT computer application which stores information on Design / Construction projects
Program	Multiple projects as defined by MDOT to be let in a certain fiscal year or group of fiscal years. Could also refer to a roll-up of projects in the program management system.
Project	A related set of tasks performed to achieve a specific goal.
Project Development	Work involved in the plan development and design for the construction of a highway project.
Project ID	***Not referenced in document***. Unique identifier assigned to a group of jobs with the same environmental clearance and could be let over multiple years. When jobs are combined in this way, they will be given a Project ID.
ProjectWise	Central Repository of all MDOT production specs and documents for all projects
QA	Quality Assurance – used within the context of this Contract to refer to the DTMB IT environment used for the testing of applications prior to migration to Production.
REMIS	Real Estate Management System
Recycling	The series of activities by which materials that are no longer useful to the generator are collected, sorted, processed, and converted into raw materials and used in the production of new products. This definition excludes the use of these materials as a fuel substitute or for energy production.
Region	An artificial geographical division of the state used by MDOT and other departments for conducting state business.
Resource	People (MDOT employees) involved in and required to complete a task, that are assigned hours (hands on time) to work on a particular task. This is the smallest breakdown of the OBS. Also known at MDOT as a Work Unit, Organizational Unit, or DCDS Index Code.
Responsible Unit	Specific resource assigned to a task that is responsible for reporting the actual start and finish dates for that task.
Reuse	Using a product or component of municipal solid waste in its original form more than once.
SUITE	(State Unified Information Technical Environment) DTMB initiative that integrates effective methodologies for project management and systems development across all projects.
SafeStat	Safety Status Program System
Schedule	Network that has start and finish dates for all activities, as applied via the Critical Path method.
Scheduled Date	Early start/early finish dates (forward pass). These dates are allowed to move based on progress.
Services	Any of the services Contractor is required to or otherwise does provide under this Contract or the Statement of Work, as more fully described in this Contract or such Statement of Work.
Snapshot	The state of the program. Taken each Monday and the first day of each month. Consists of the listing of jobs (from which the number of jobs can be derived); job planned, engineer,

	estimated cost, actual cost; approved/scheduled/actual dates for major milestones (planned completion date, omissions and errors check, let date, plan review, plan turn in, base plan).
Source Code	The human readable source code of the COTS Solution to which it relates, in the programming language in which the COTS Solution was written, together with all related flow charts and Documentation, including a description of the procedure for generating object code, all of a level sufficient to enable a programmer reasonably fluent in such programming language to understand, operate, support, maintain and develop modifications, upgrades, updates, enhancements, improvements and new versions of, and to develop computer programs compatible with, such COTS Solution.
Source reduction	Any practice that reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, energy recovery, treatment, or disposal.
Standard Task	A specific work responsibility performed by one or more resources. Tasks include both resource labor hours and duration commitments.
Start Date	A point in time associated with the beginning of schedule tasks. Usually qualified by one of the following: actual, planned, estimated, scheduled, early, late, baseline, target or current.
State Location	Any physical location where the State performs work. State Location may include state-owned, leased, or rented space.
Subcontractor	A company that Contractor delegates performance of a portion of the Services to, but does not include independent contractor engaged by Contractor solely in a staff augmentation role.
Subprogram	Multiple projects as defined by MDOT to be let in a certain fiscal year or group of fiscal years. Refers to groupings in project management system. A set of jobs, projects and/or packages that have common templates (Road, Bridge, Traffic & Safety, Capital Preventative Maintenance, Increase Capacity).
TSC	Transportation Service Center which is a subdivision of the Region used for closer customer contacts.
Template	Group of tasks, default resources, durations and labor hours tailored for a particular type of work.
Third-Party Materials	Any materials and information, including documents, data, know-how, ideas, methodologies, specifications, software, content and technology, in any form or media, in which any person other than the State or Contractor owns any Intellectual Property Right, but specifically excluding Open-Source Components.
Trunkline	A state highway transportation system handling long-distance through traffic.
UAT	User Acceptance Testing – a formal process for the testing of the configured / customized TAMS solution prior to migration to a production environment. Testing will be conducted within the MDOT QA environment.
Unauthorized Removal	Contractor's removal of Key Personnel without the prior written consent of the State.
Validating Standards	Comparing actual durations and labor hours (gathered over time) versus what the system calculated, for specific scope situations. Significant differences would result in refining the standards to help ensure that the initial schedules generated are closer to real-life.
Waste prevention	Source reduction and reuse, but not recycling.
Waste reduction and Pollution prevention	The practice of minimizing the generation of waste at the source and, when wastes cannot be prevented, utilizing environmentally sound on-site or off-site reuse and recycling. The term includes equipment or technology modifications, process or procedure modifications, product reformulation or redesign, and raw material substitutions. Waste treatment, control, management, and disposal are not considered pollution prevention, per the definitions under Part 143, Waste Minimization, of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended.
WebFANCY	MDOT web-based, intranet Oracle application that is used for reporting budget/expenditure summary data to track all costs charged to a project
Web TRNS*Port	Web-based Transportation Software Management Solution
What-If	Capability that makes it easy to consider the impact of changes to the program/project without affecting program/project schedule.
Wizard	User interface that presents a user with a sequence of dialog boxes, leading the user through a series of well-defined steps to create a network.
Work in Progress	A Deliverable that has been partially prepared, but has not been presented to the State for Approval.

Work Product	Refers to any data compilations, reports, and other media, materials, or other objects or works of authorship created or produced by Contractor as a result of an in furtherance of performing the services required by this Contract.
Work Type	A code representing a recommended work activity. Provides primary classification for a set of work activities required to improve or maintain a specific, actual or proposed transportation component.
Work Unit	People (MDOT employees) involved in and required to complete a task, that are assigned hours (hands on time) to work on a particular task. This is the smallest breakdown of the OBS. Also known at MDOT as a Resource, Organizational Unit, or DCDS Index Code.

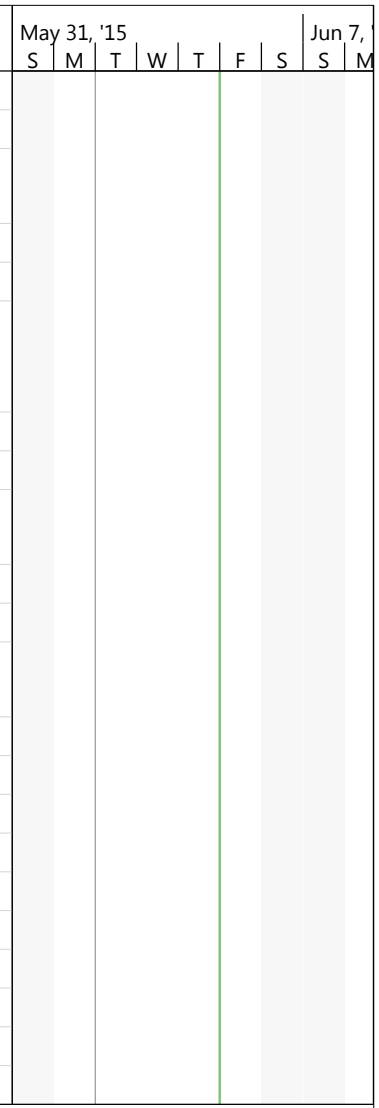
ID		Task Name	Duration	Start	Finish	Predecessors
1		**EAMS Implementation Plan**	**555 days**	**Tue 6/2/15**	**Mon 7/17/17**	
2		**GATE 1**	**23 days**	**Tue 6/2/15**	**Thu 7/2/15**	
3		**COTS Software Acquisition**	**6 days**	**Tue 6/2/15**	**Tue 6/9/15**	
6		**Project Initiation Services**	**19 days**	**Mon 6/8/15**	**Thu 7/2/15**	
17		MDOT Plan Review and Acceptance	5 days	Fri 7/3/15	Thu 7/9/15	16
18		GATE 1 Acceptance	1 day	Fri 7/10/15	Fri 7/10/15	
19		**GATE 2 - Requirements and Solution Architecture Validation Services**	**44 days**	**Mon 7/13/15**	**Thu 9/10/15**	
25		MDOT Roadway Network Management Requirements Document and Solution Architecture Review and Acceptance	14 days	Fri 9/11/15	Wed 9/30/15	24
26		GATE 2 Acceptance	1 day	Thu 10/1/15	Thu 10/1/15	25
27		**GATE 3 - Installation and Configuration Services**	**25 days**	**Mon 7/13/15**	**Fri 8/14/15**	
34		GATE 3 Acceptance	1 day	Mon 8/17/15	Mon 8/17/15	33
35		**GATE 4 COTS System Focused Configurations (Tier II)**	**112 days**	**Tue 8/18/15**	**Wed 1/20/16**	
36		**GATE 4a Lane Inventory**	**27 days**	**Tue 8/18/15**	**Wed 9/23/15**	
44		GATE 4a Acceptance	1 day	Thu 9/24/15	Thu 9/24/15	43
45		**GATE 4b Signs**	**27 days**	**Fri 9/25/15**	**Mon 11/2/15**	
53		GATE 4b Acceptance	1 day	Tue 11/3/15	Tue 11/3/15	52
54		**GATE 4c Guardrails**	**27 days**	**Wed 11/4/15**	**Thu 12/10/15**	
62		GATE 4c Acceptance	1 day	Fri 12/11/15	Fri 12/11/15	61
63		**GATE 4d Culverts**	**27 days**	**Mon 12/14/15**	**Tue 1/19/16**	
71		GATE 4d Acceptance	1 day	Wed 1/20/16	Wed 1/20/16	70
72		MDOT Tier II Final Testing and Acceptance	10 days	Thu 1/21/16	Wed 2/3/16	71
73		Gate 4 Acceptance	1 day	Thu 2/4/16	Thu 2/4/16	72
74		**Gate 5 - SLD Design and Implementation**	**134 days**	**Fri 8/7/15**	**Wed 2/10/16**	



Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

Task		Inactive Summary		External Tasks	
Split		Manual Task		External Milestone	
Milestone		Duration-only		Deadline	
Summary		Manual Summary Rollup		Progress	
Project Summary		Manual Summary		Manual Progress	
Inactive Task		Start-only			
Inactive Milestone		Finish-only			

ID		Task Name	Duration	Start	Finish	Predecessors
80		MDOT SLD Testing and Acceptance	1 day	Thu 2/11/16	Thu 2/11/16	79
81		Gate 5 Acceptance	1 day	Fri 2/12/16	Fri 2/12/16	80
82		**Gate 6 - Esri Roads and Highways Design and Implementation**	**280 days**	**Fri 8/7/15**	**Thu 9/1/16**	
87		MDOT Testing	1 day	Fri 9/2/16	Fri 9/2/16	86
88		Gate 6 Acceptance	1 day	Mon 9/5/16	Mon 9/5/16	87
89		**Gate 7 - FINAL: Module Level Configuration: Recheck for any conflicts in all Processes across Modules**	**60 days**	**Thu 4/14/16**	**Wed 7/6/16**	
90		**Maintenance Management**	**20 days**	**Thu 4/14/16**	**Wed 5/11/16**	
95		**Asset Management Modules**	**20 days**	**Thu 5/12/16**	**Wed 6/8/16**	
105		FINAL: SLD Configuration: Recheck for any conflicts in all processes	20 days	Thu 6/9/16	Wed 7/6/16	104
106		MDOT Testing and Acceptance	7 days	Thu 7/7/16	Fri 7/15/16	105
107		Gate 7 Acceptance	1 day	Mon 7/18/16	Mon 7/18/16	106
108		**Gate 8 - Implementation Services - Interfaces and Integration**	**165 days**	**Mon 8/17/15**	**Fri 4/1/16**	
119		MDOT Testing and Acceptance	7 days	Mon 4/4/16	Tue 4/12/16	118
120		Gate 8 Acceptance	1 day	Wed 4/13/16	Wed 4/13/16	119
121		**Gate 9 - ArcGIS Server/ArcSDE & Roads & Highwa**	**240 days**	**Fri 8/7/15**	**Thu 7/7/16**	
127		MDOT Testing and Acceptance	7 days	Fri 7/8/16	Mon 7/18/16	126
128		Gate 9 Acceptance	1 day	Tue 7/19/16	Tue 7/19/16	127
129		**Gate 10 - Pilot Projects**	**100 days**	**Thu 4/14/16**	**Wed 8/31/16**	
134		MDOT Testing and Acceptance	7 days	Thu 9/1/16	Fri 9/9/16	133
135		Gate 10 Acceptance	1 day	Mon 9/12/16	Mon 9/12/16	134
136		**Gate 11 - Training**	**52 days**	**Thu 6/9/16**	**Fri 8/19/16**	
146		Gate 11 Acceptance	1 day	Mon 8/22/16	Mon 8/22/16	145



Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

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Split		Manual Task		External Milestone	
Milestone		Duration-only		Deadline	
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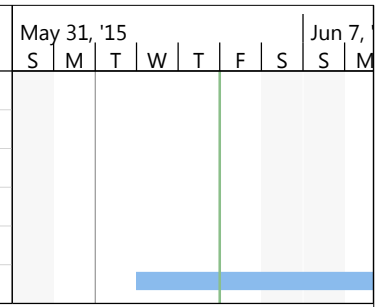
Project Summary		Manual Summary		Manual Progress	
Inactive Task		Start-only			
Inactive Milestone		Finish-only			

ID		Task Name	Duration	Start	Finish	Predecessors
147		**Gate 12 - Documentation**	**328 days**	**Thu 4/14/16**	**Mon 7/17/17**	
148		**Documentation**	**50 days**	**Thu 4/14/16**	**Wed 6/22/16**	
154		**Maintenance and Support**	**268 days**	**Thu 7/7/16**	**Mon 7/17/17**	
161		**Knowledge Transfer**	**5 days**	**Thu 12/8/16**	**Wed 12/14/16**	
164		Gate 12 Acceptance	1 day	Thu 12/15/16	Thu 12/15/16	163
165		**Reserve Bank of Hours/Other Services**	**391 days**	**Wed 6/3/15**	**Wed 11/30/16**	**4**



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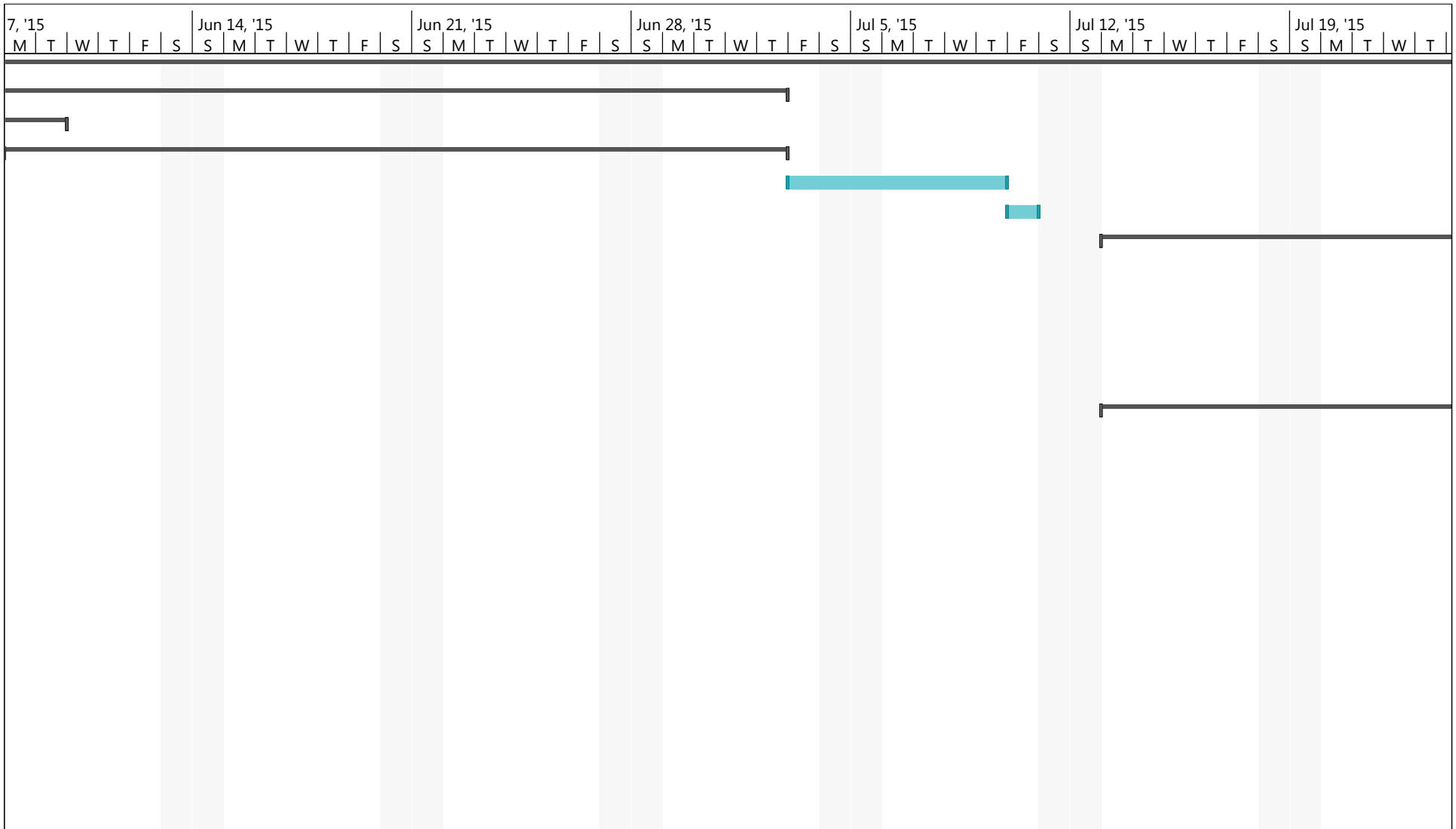

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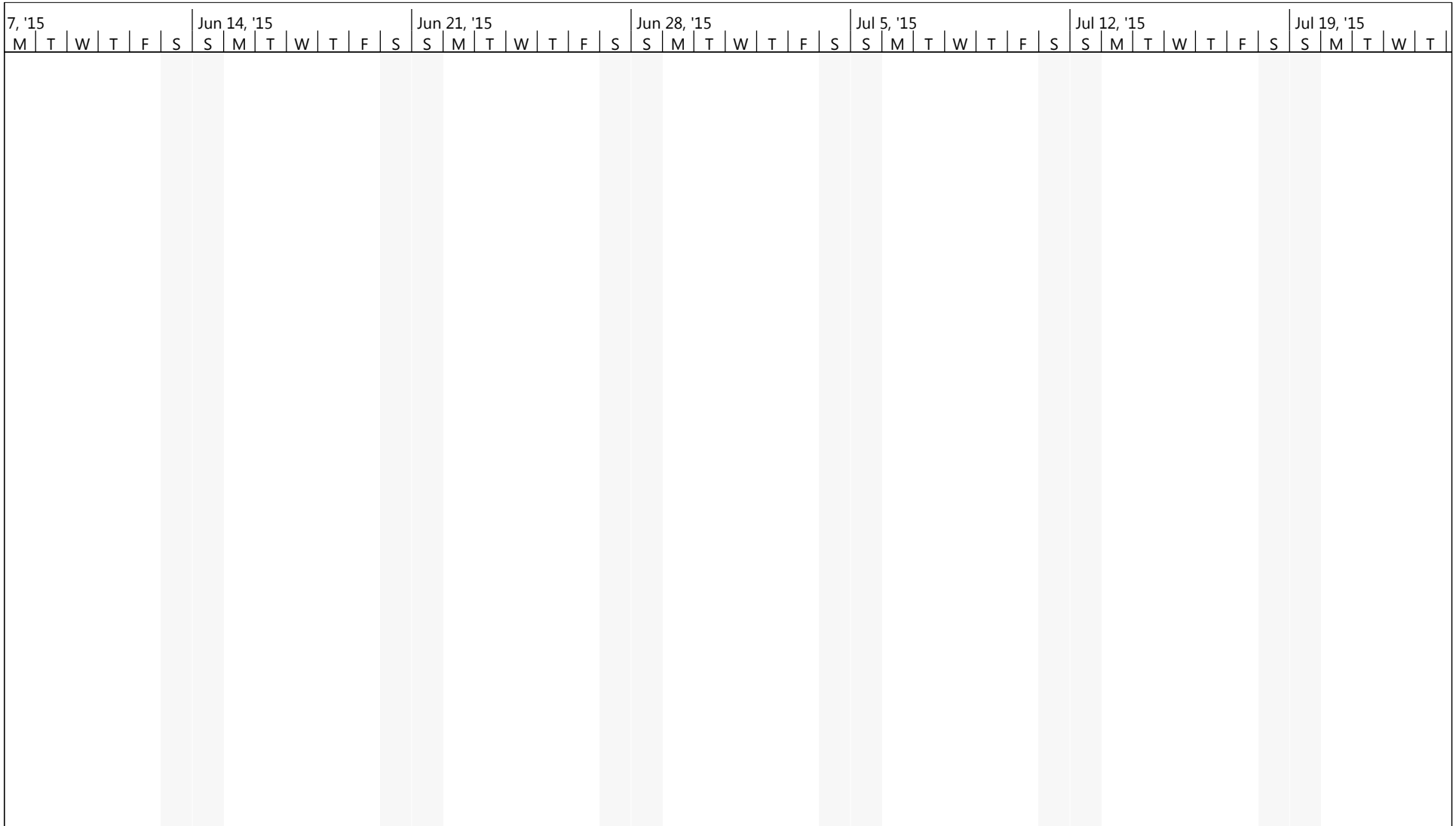

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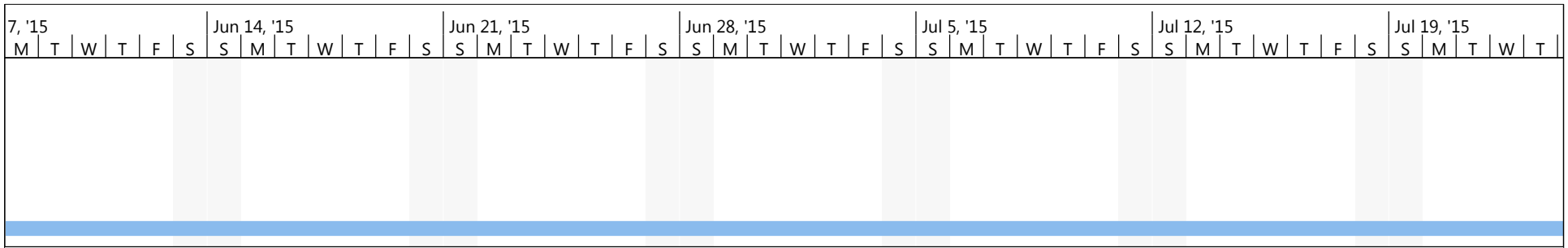

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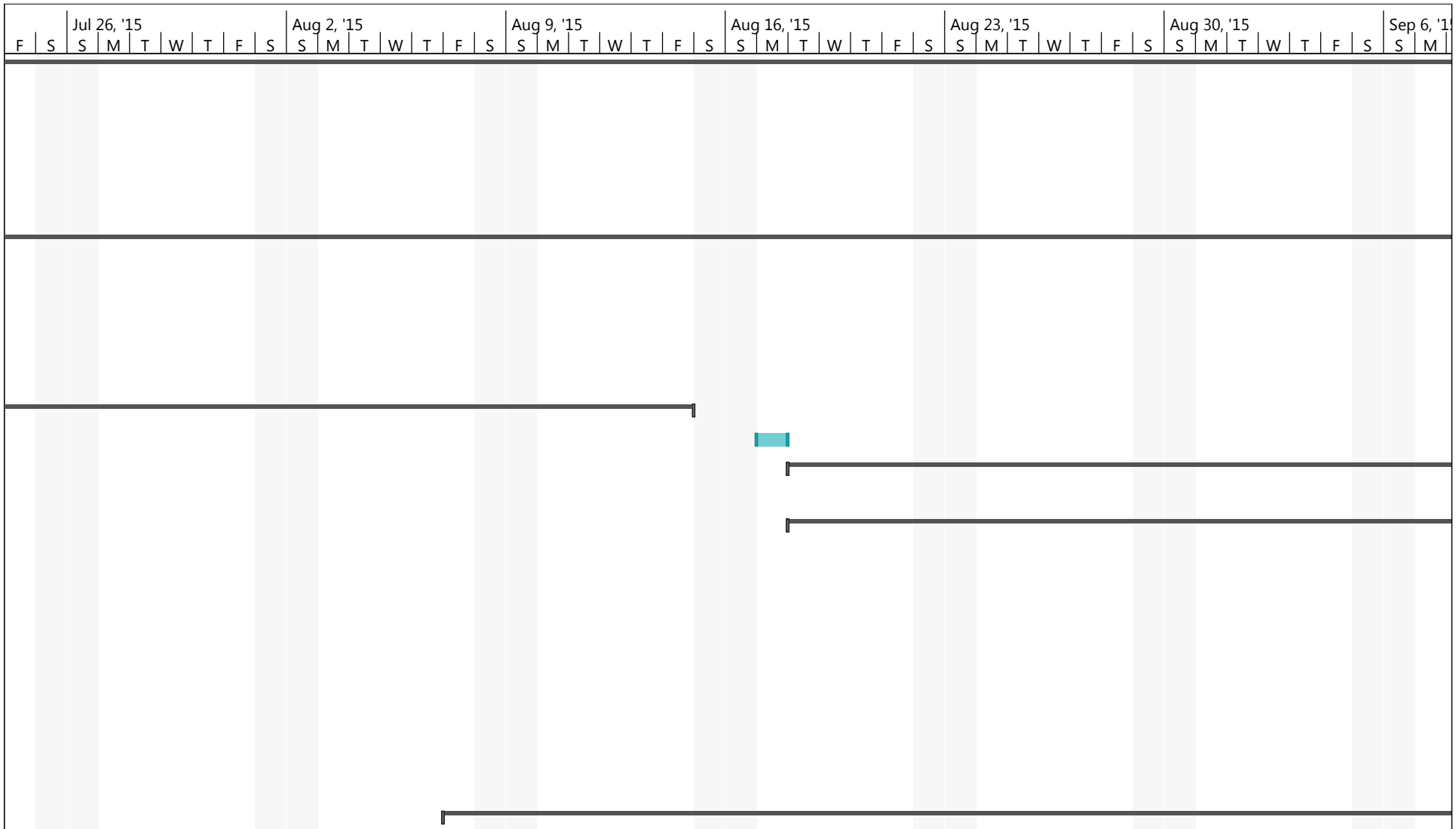

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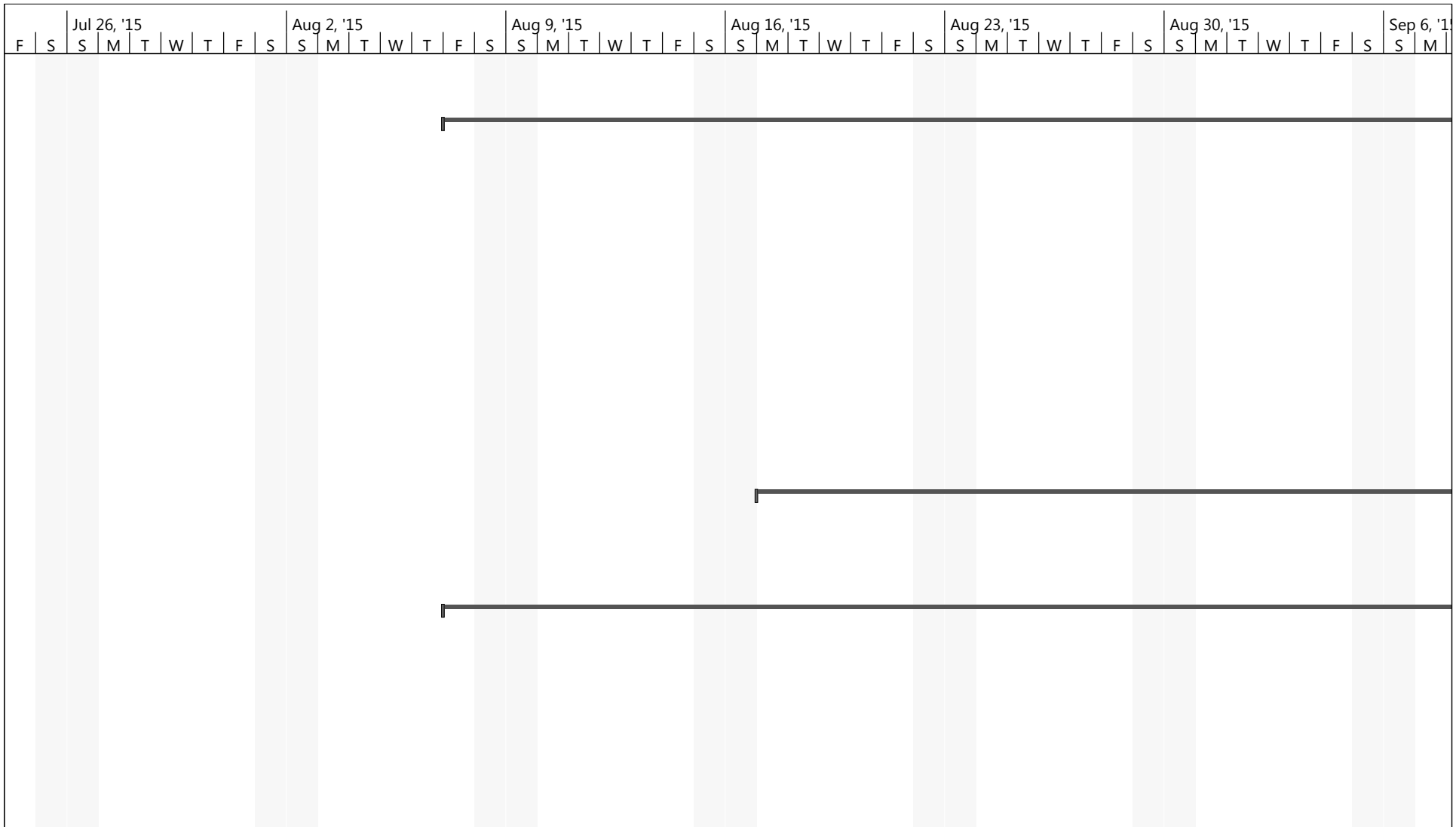

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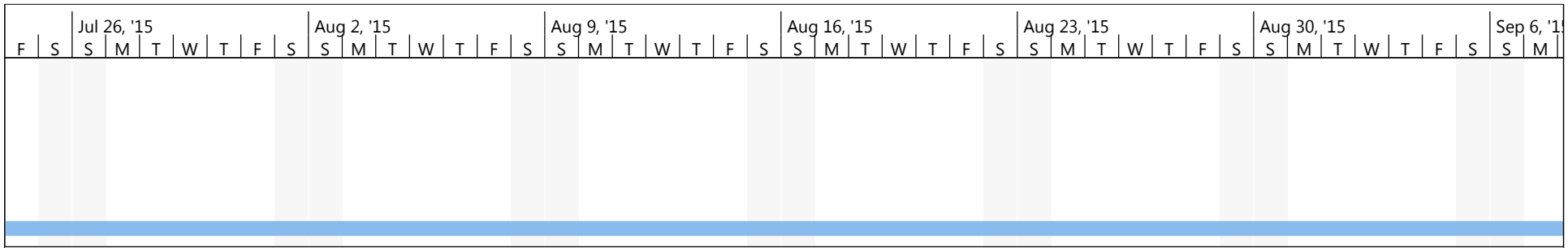

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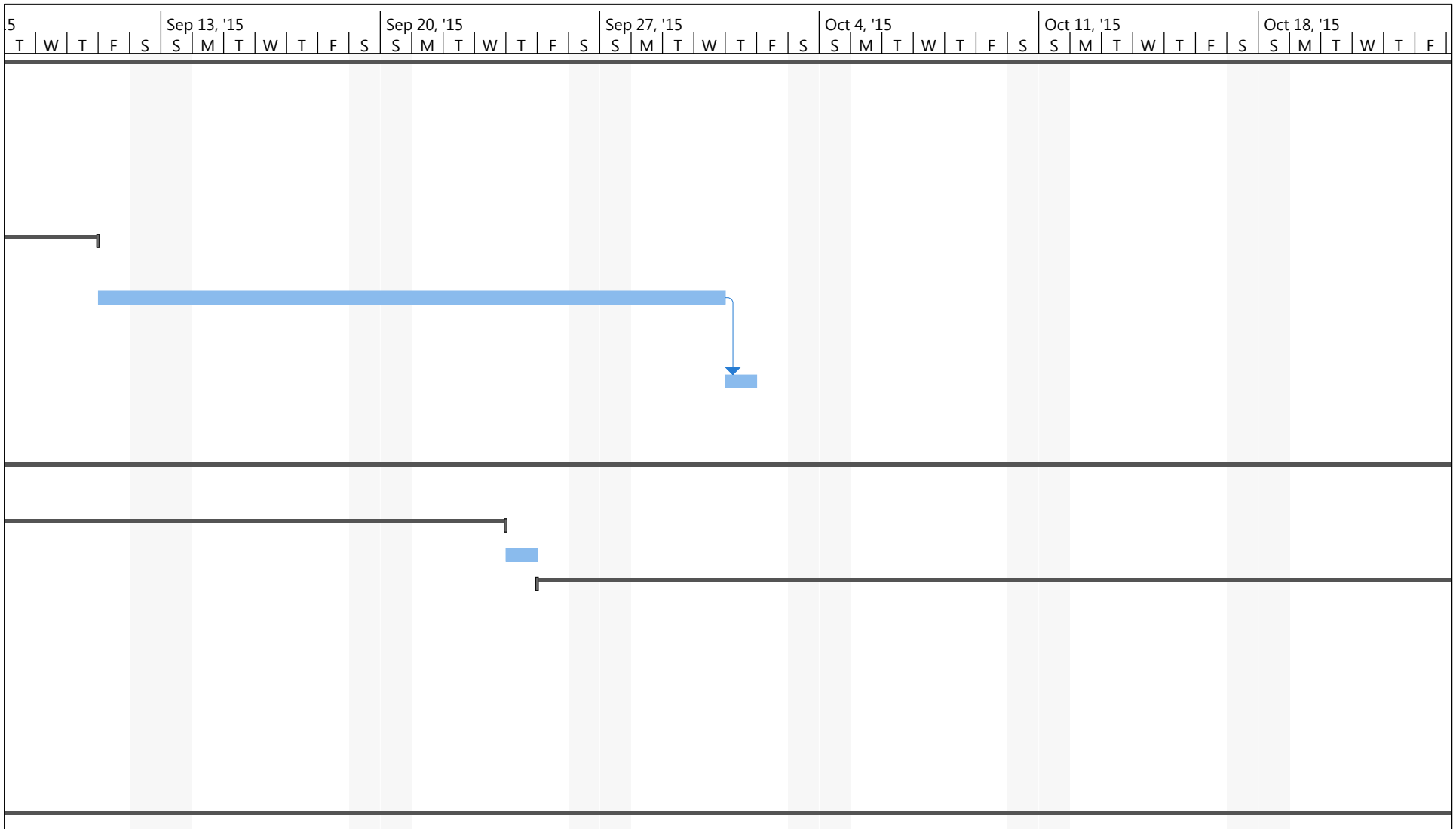

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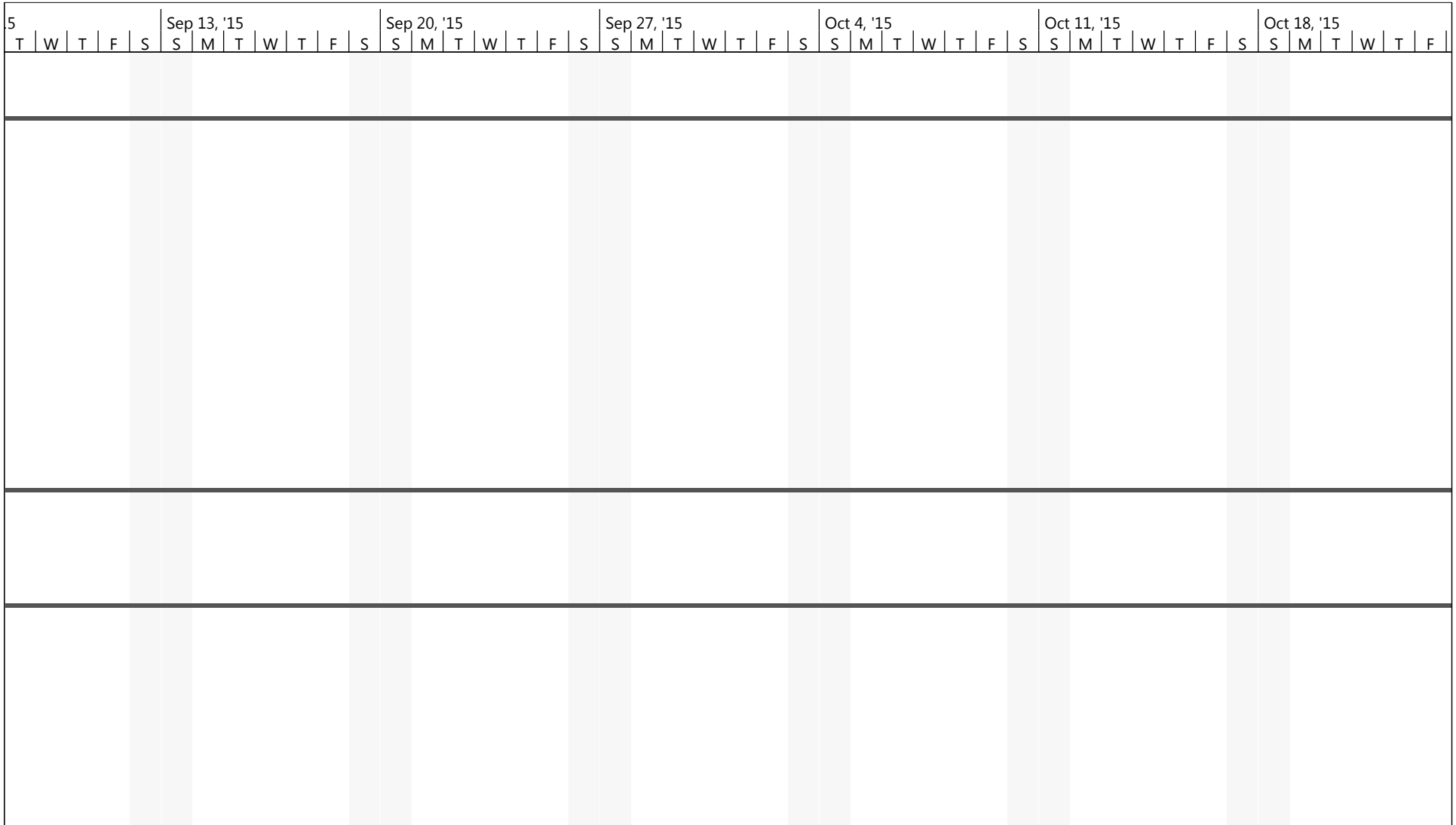

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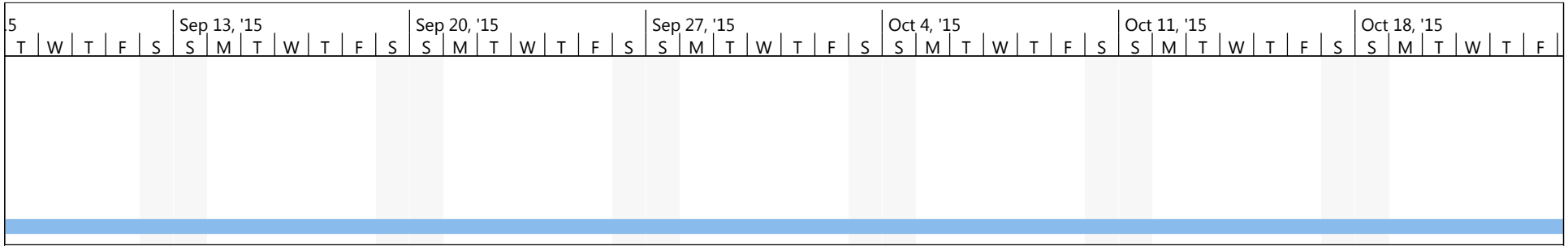

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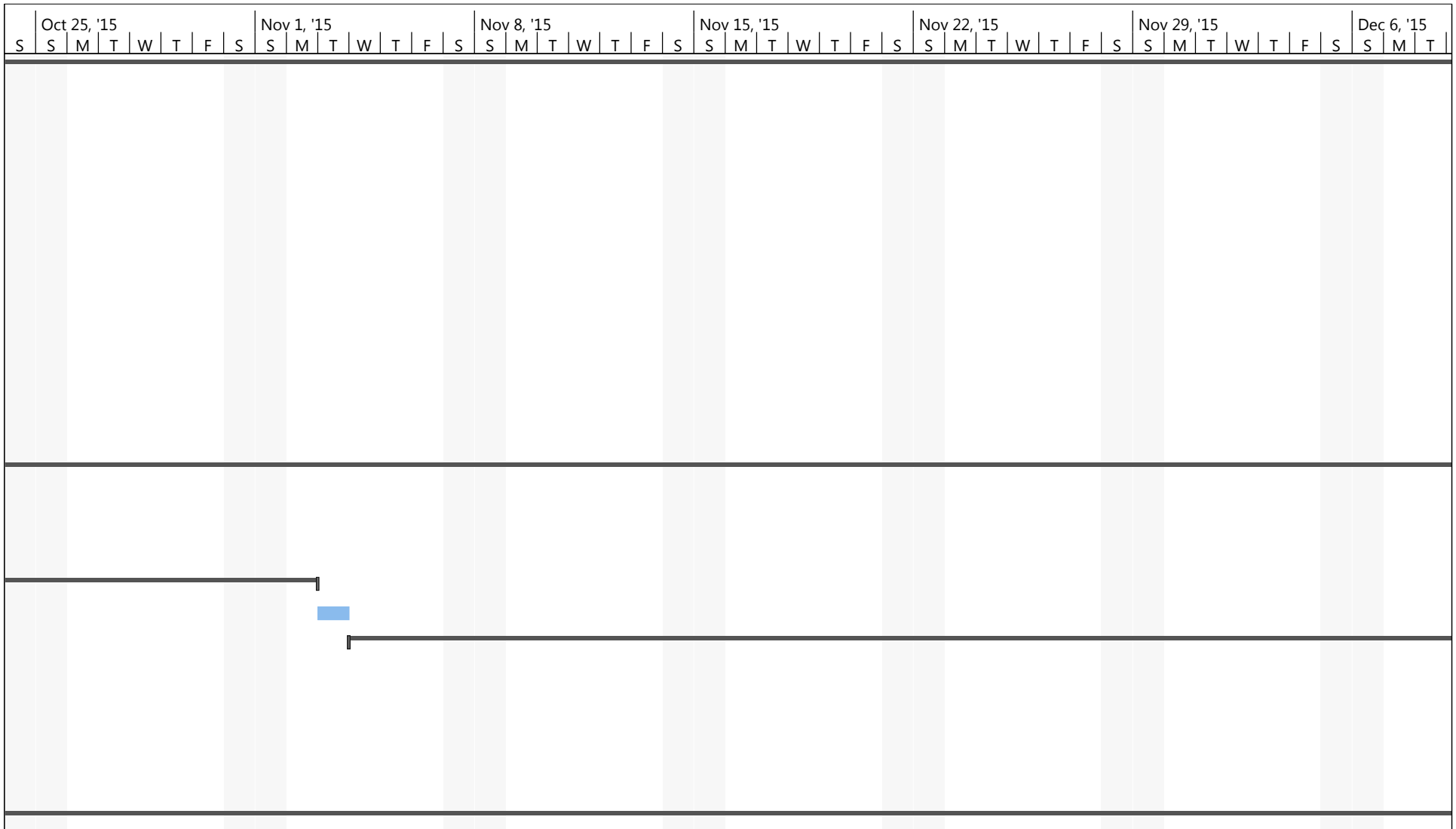

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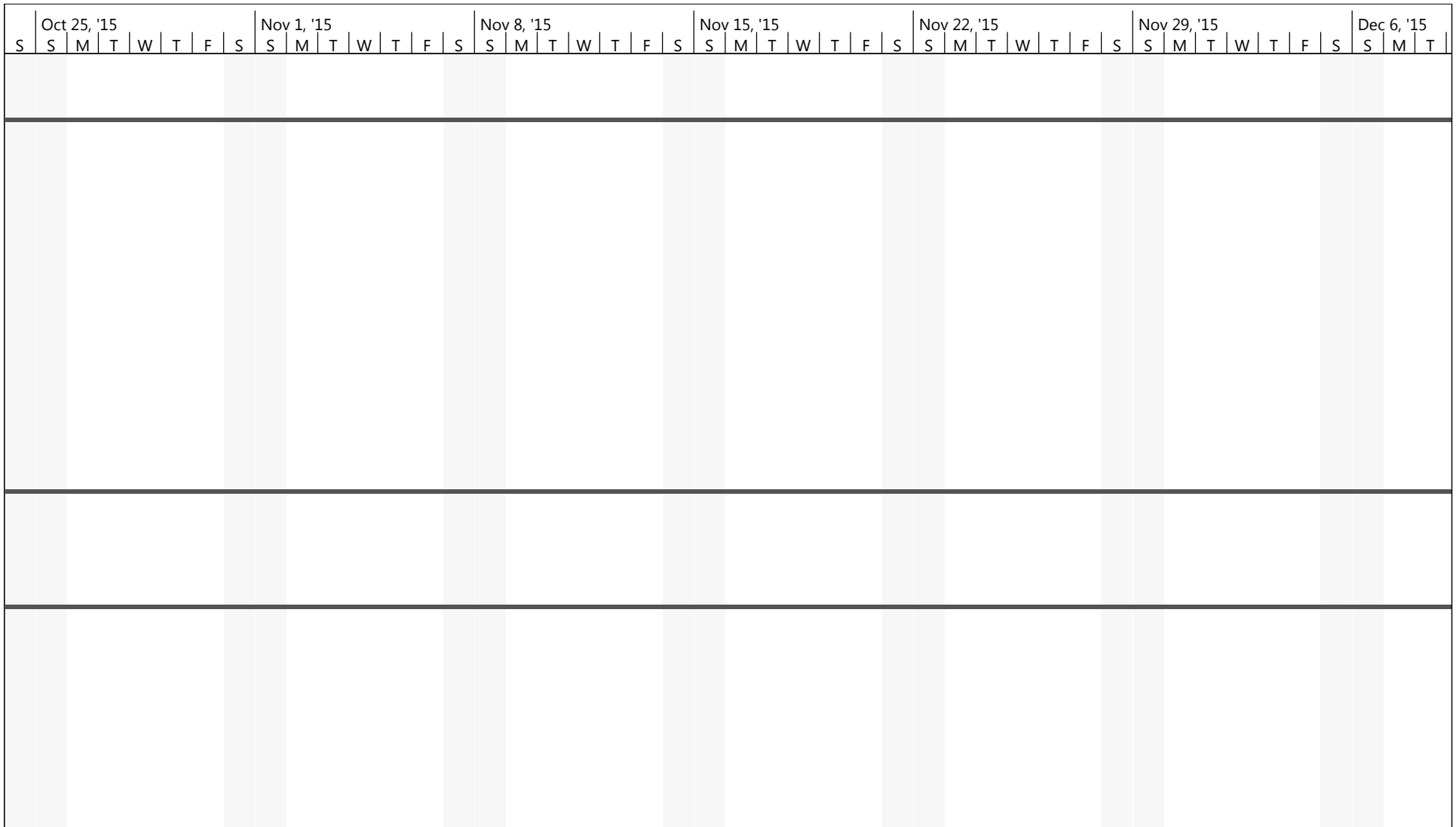

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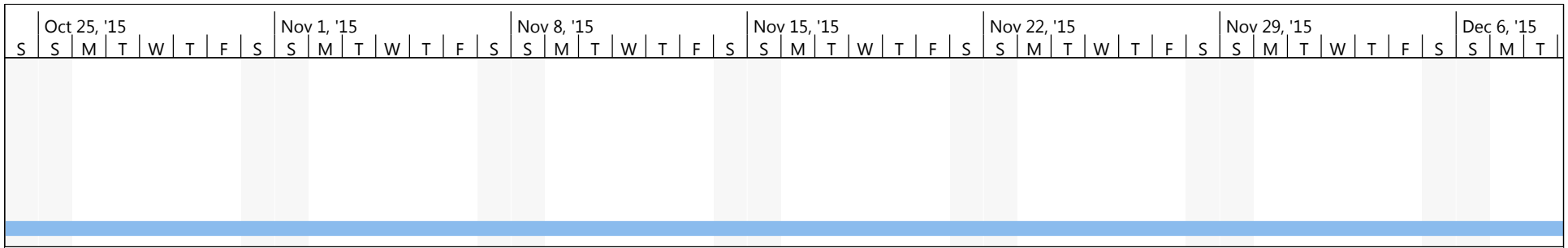

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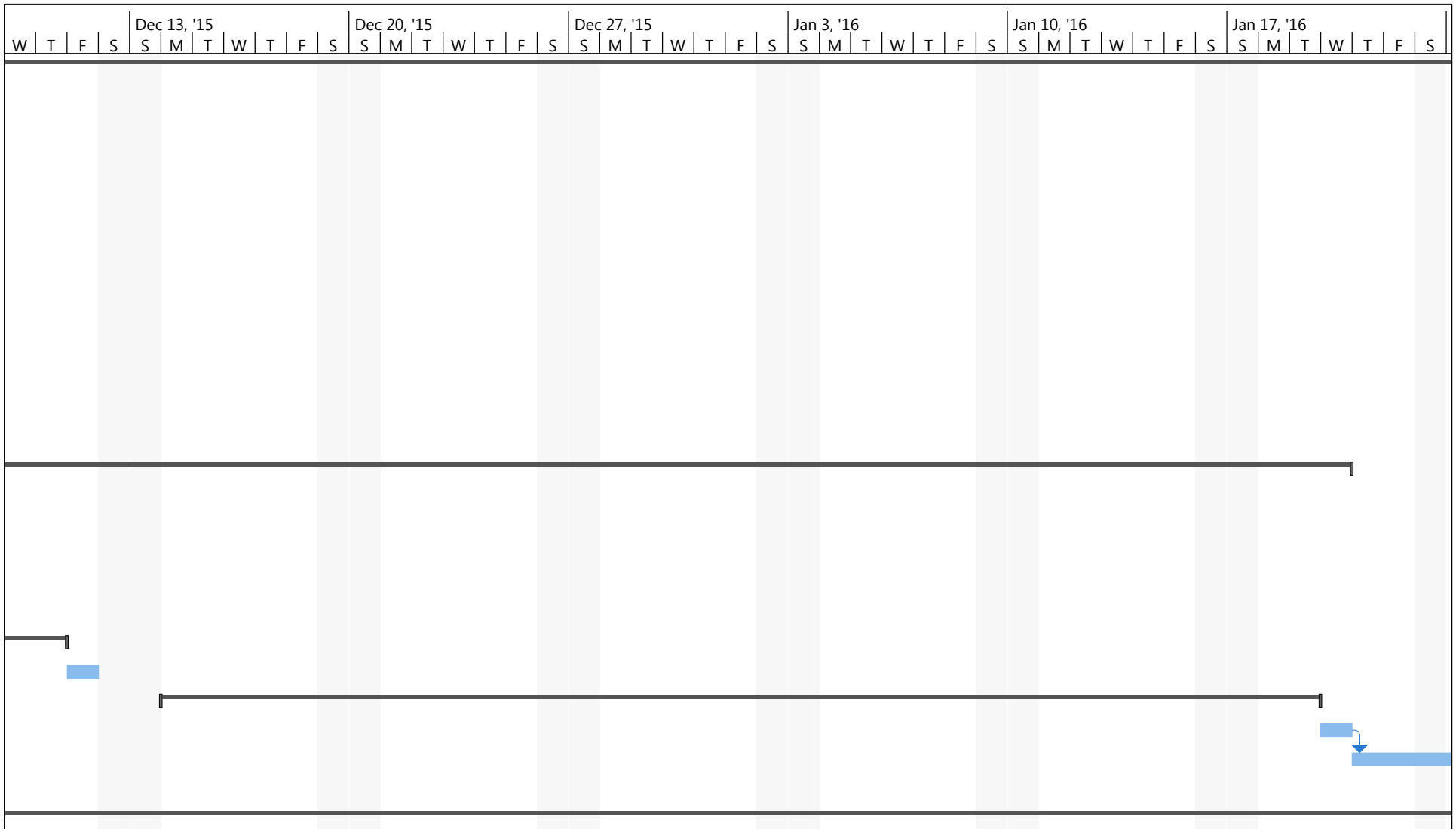

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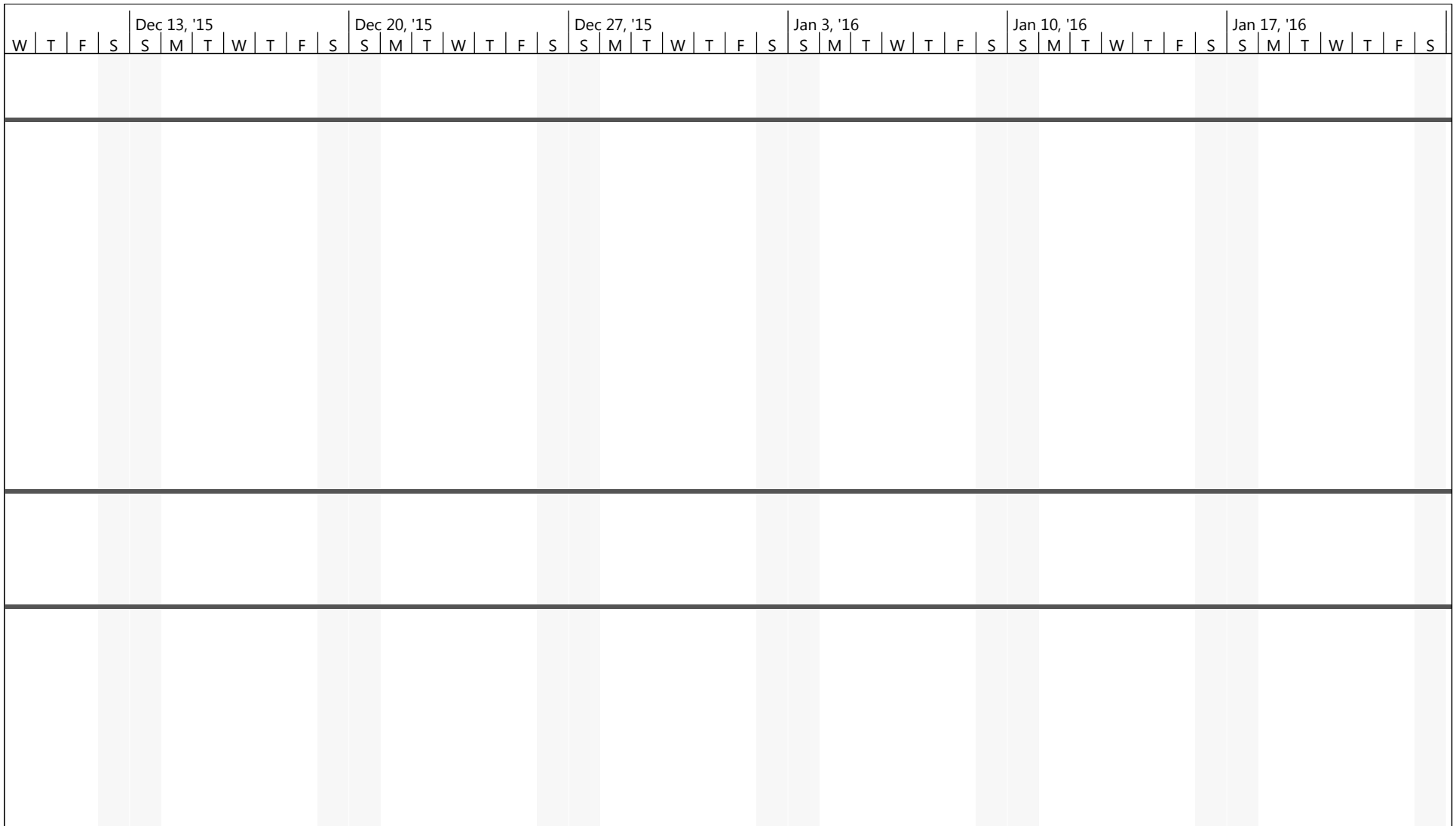

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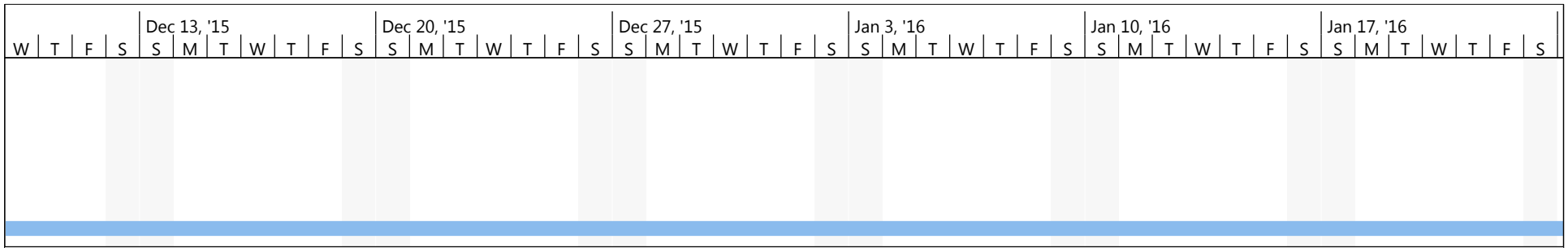

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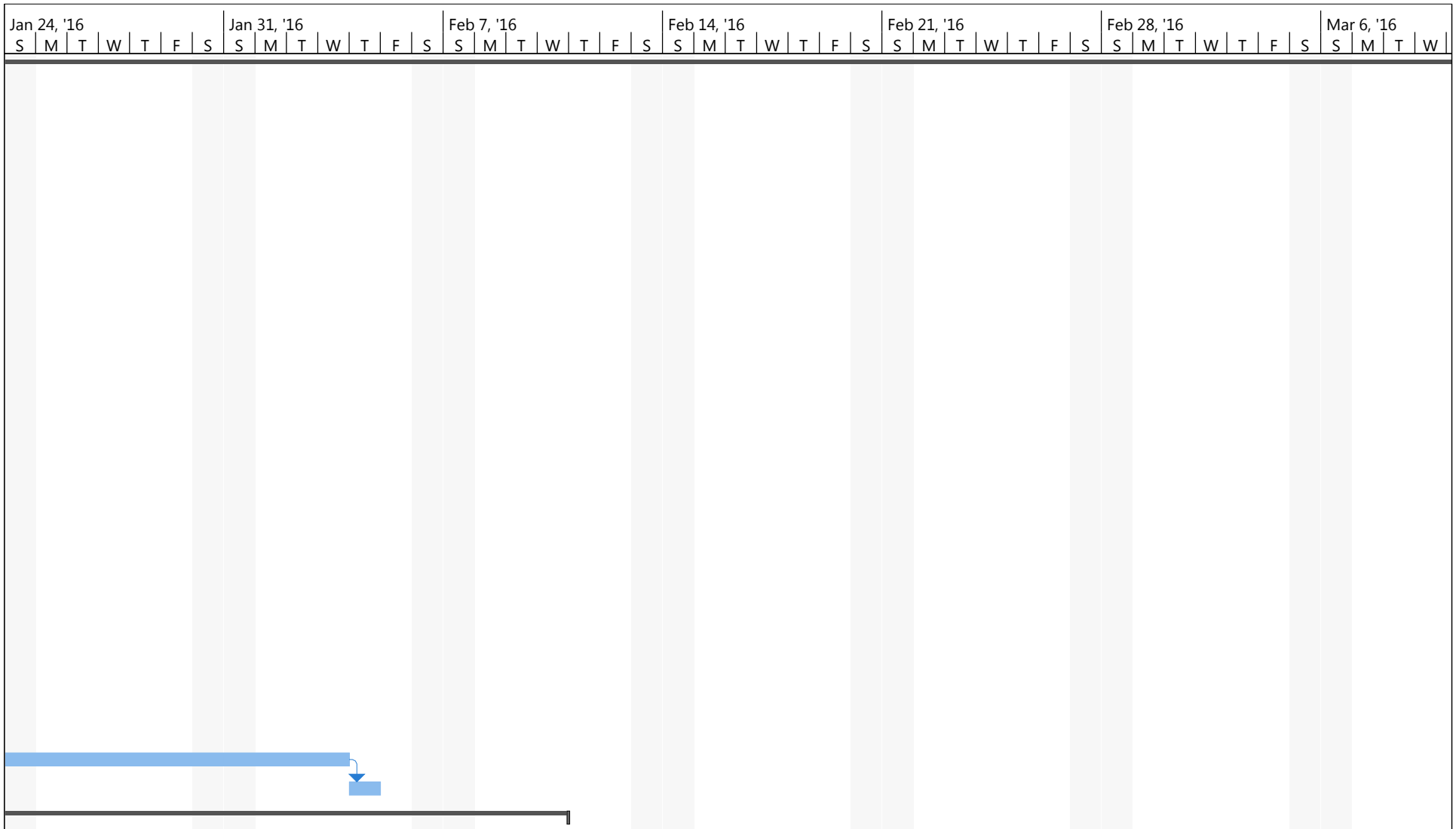

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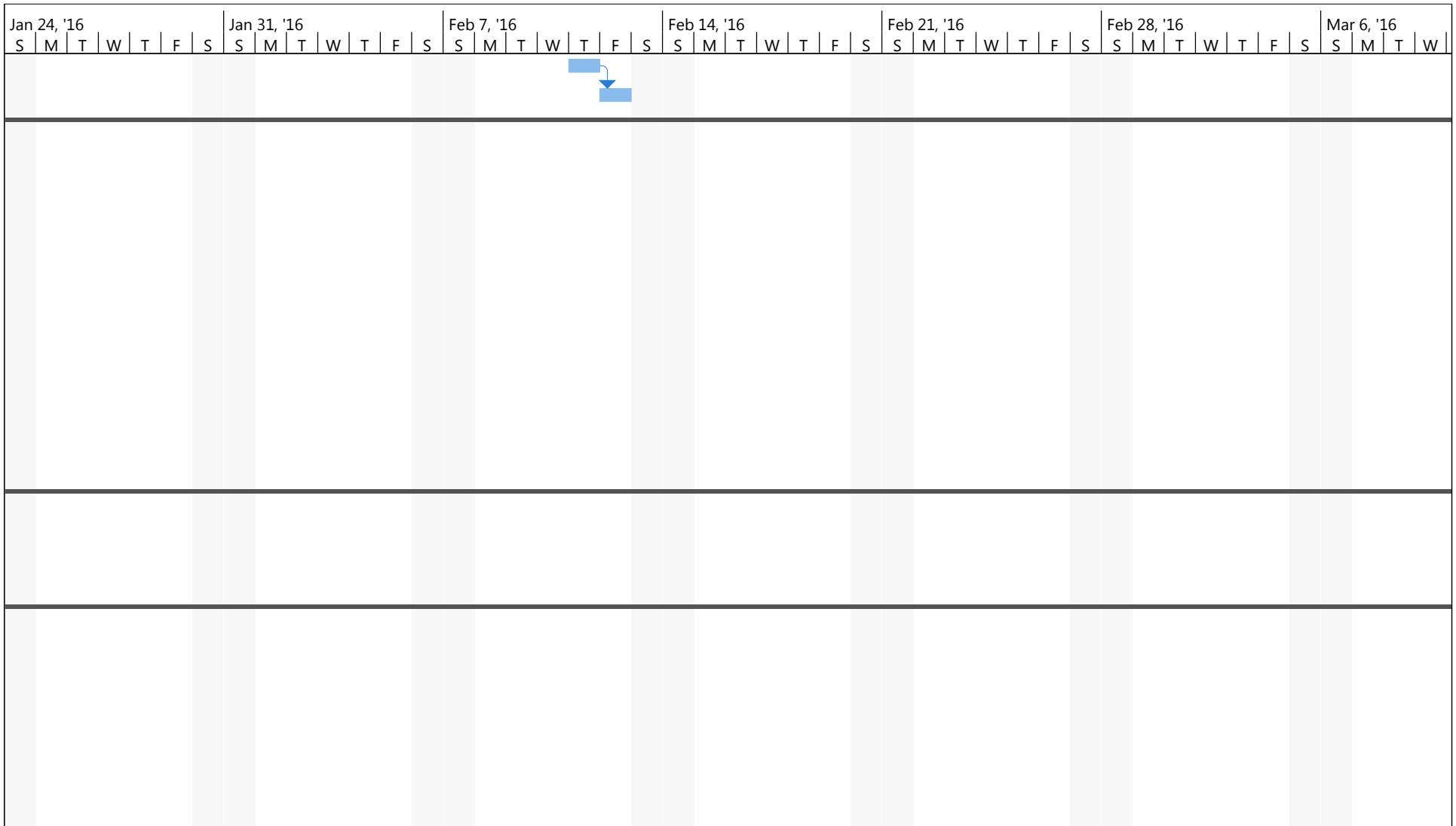

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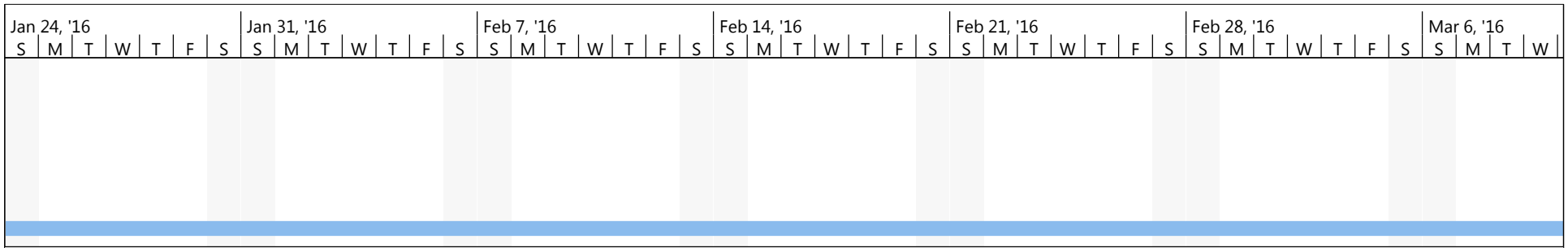

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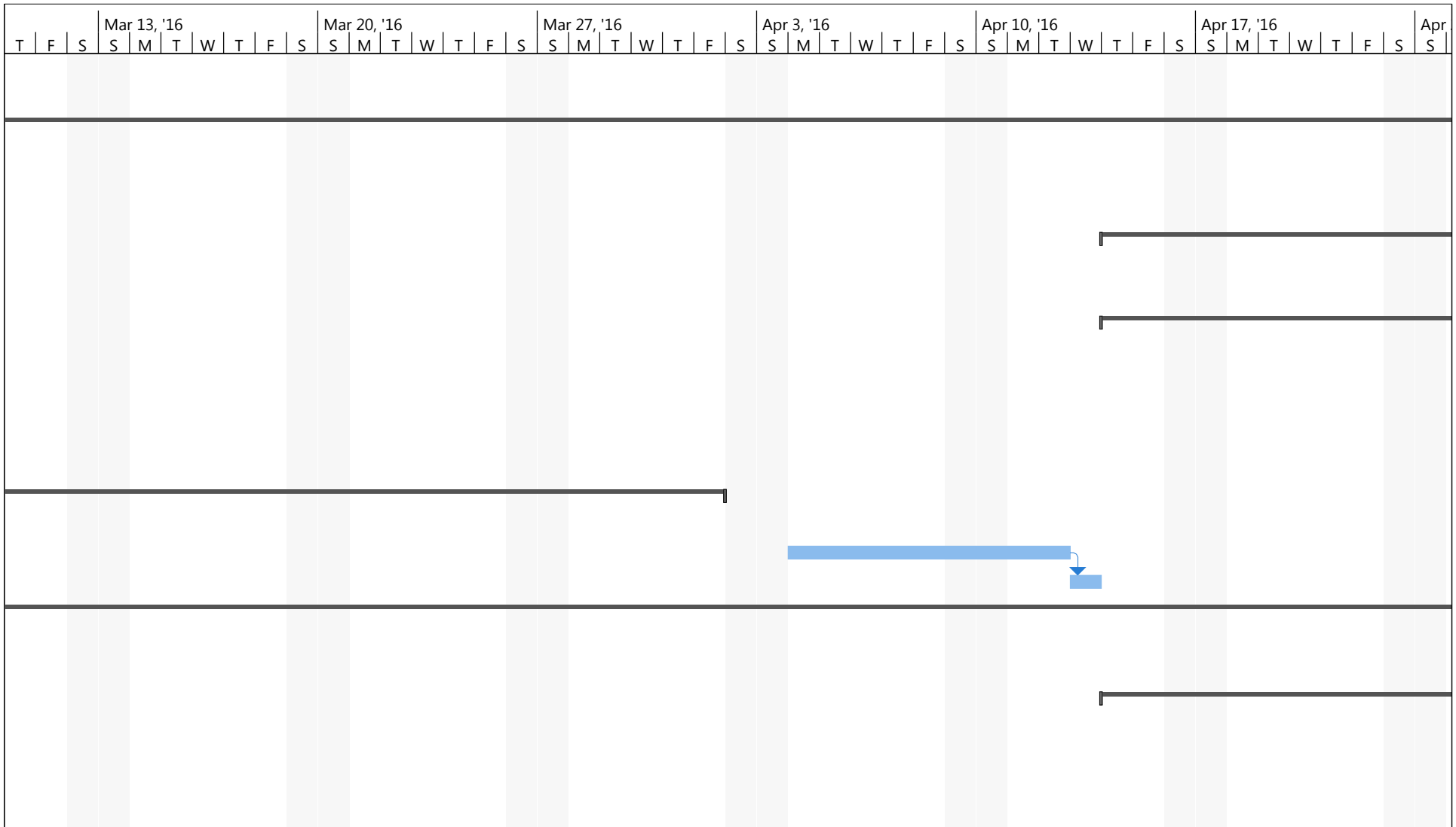

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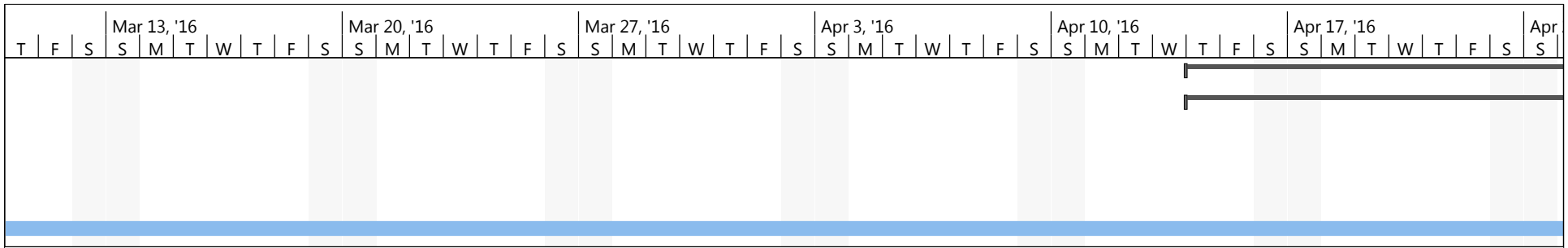

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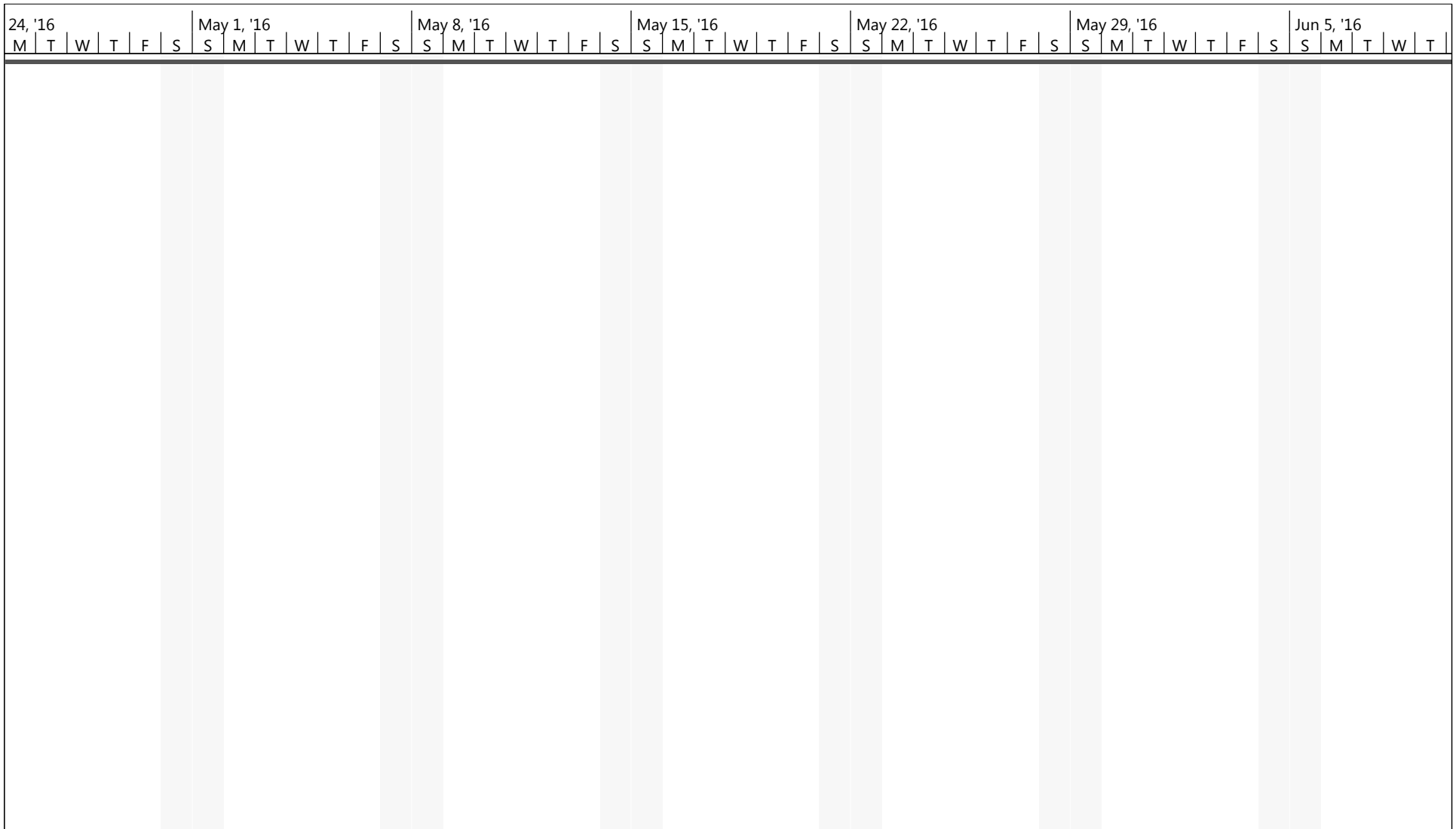

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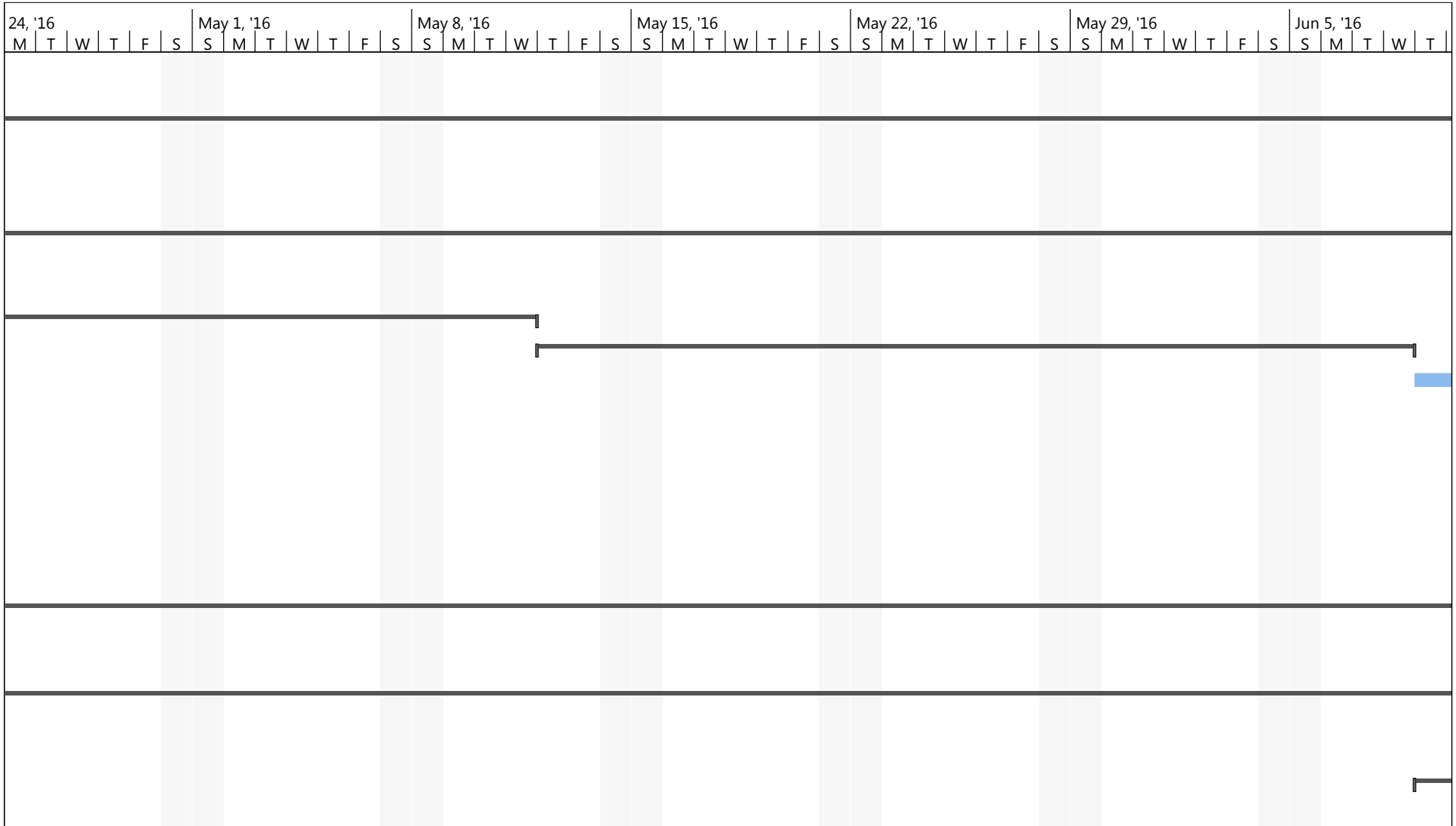

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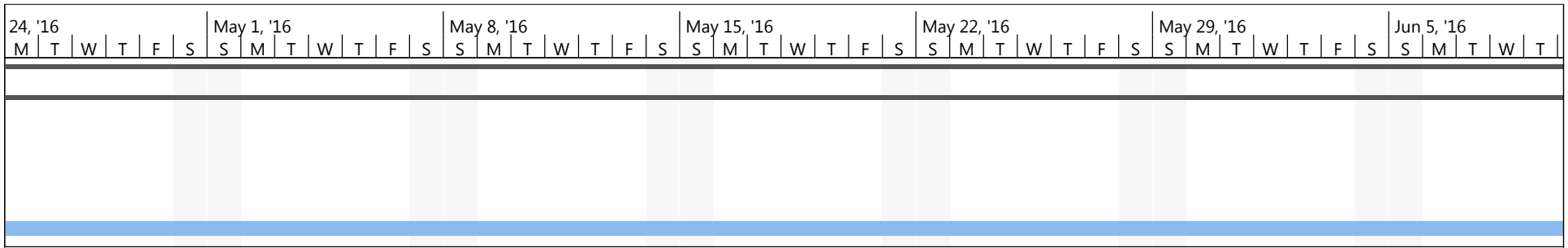

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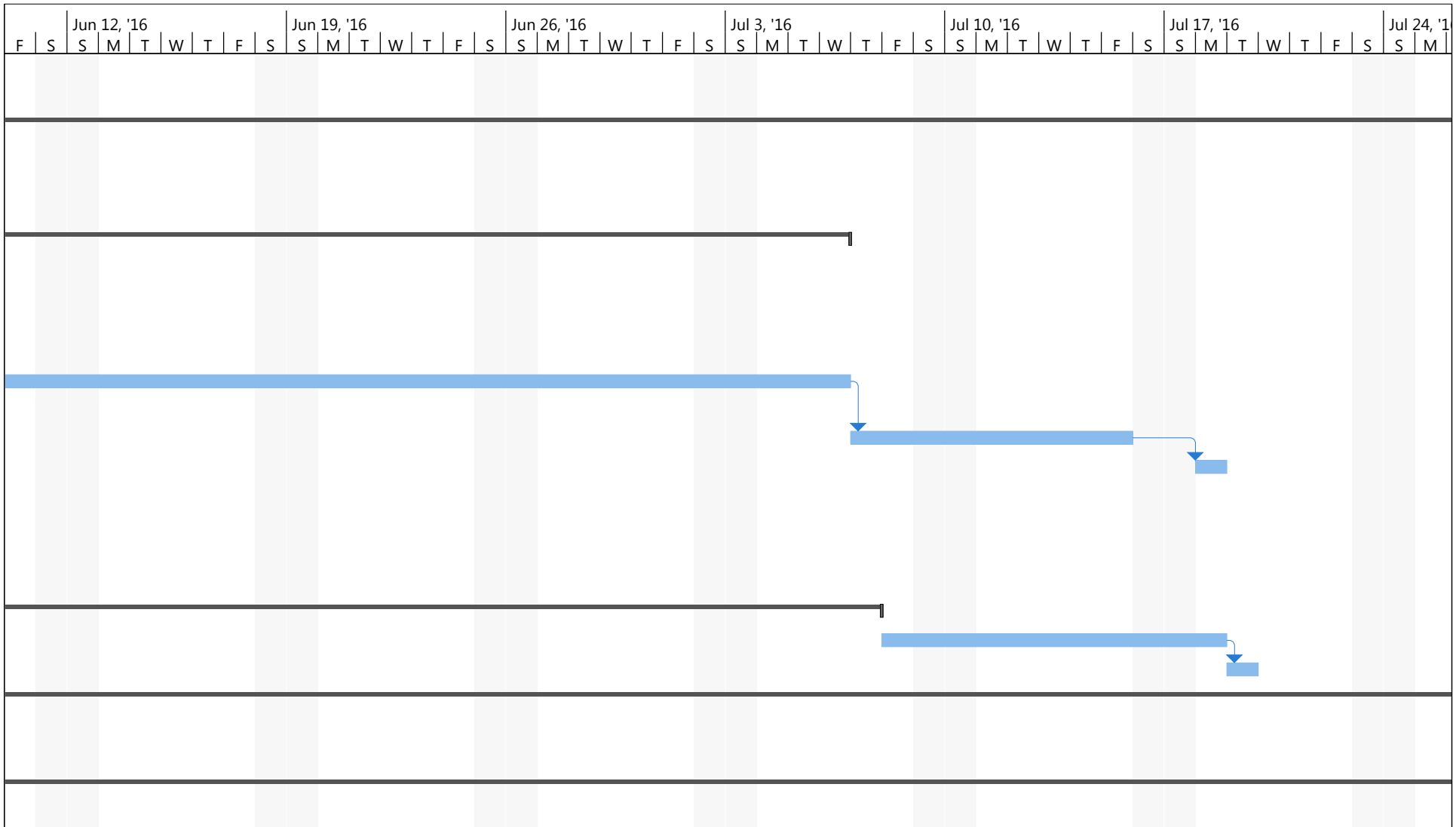

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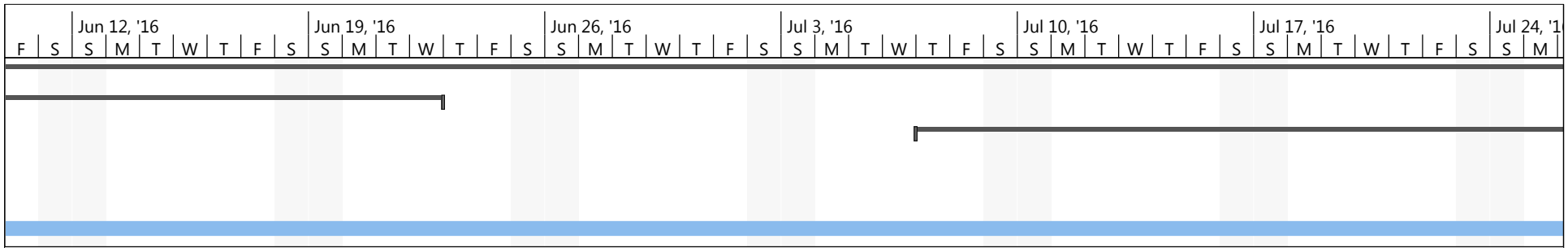

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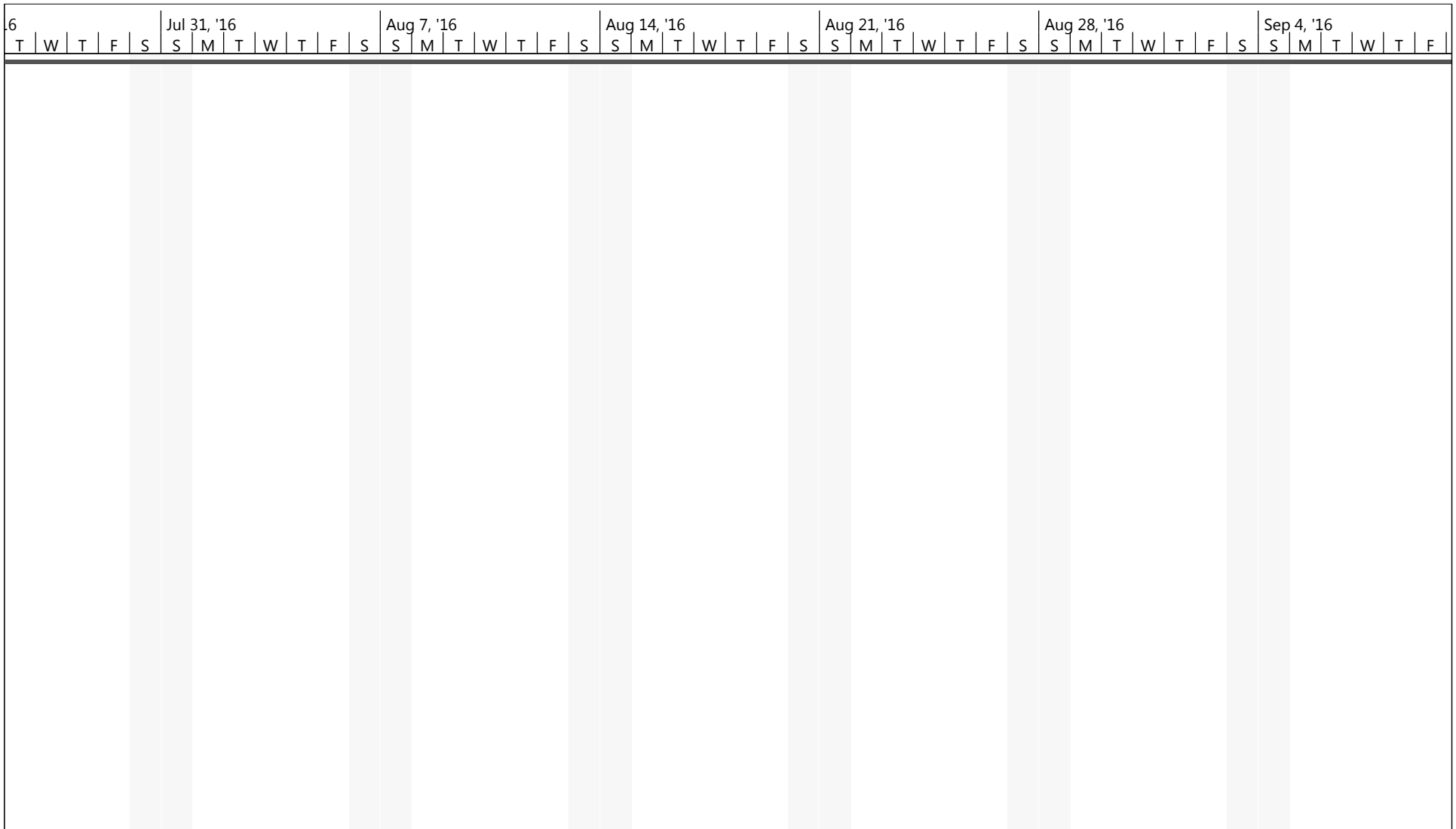

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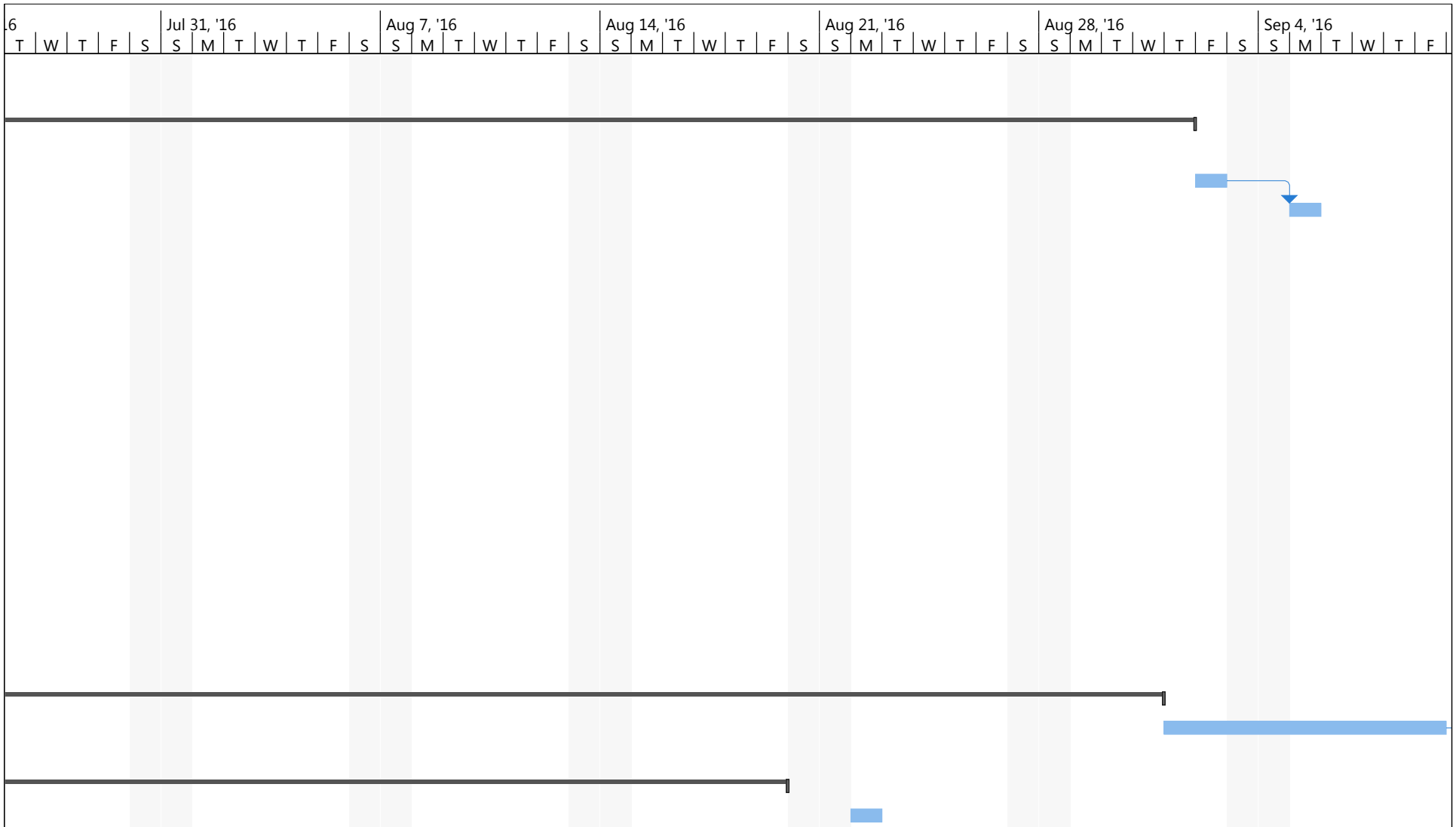

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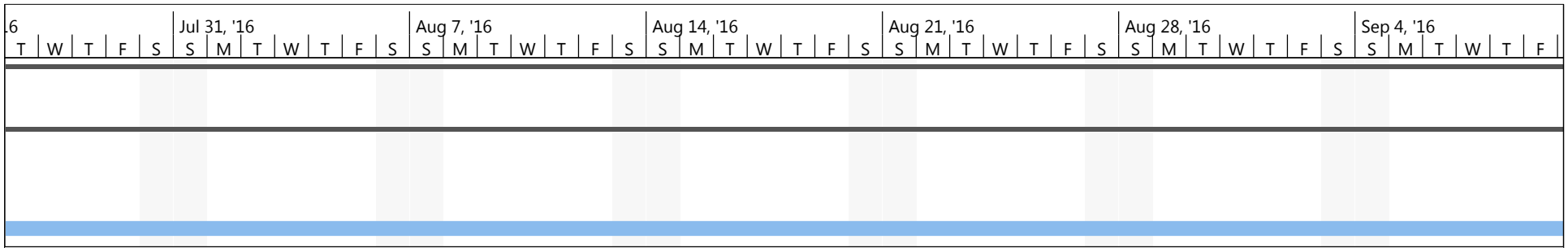

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Project Summary		Manual Summary		Manual Progress	
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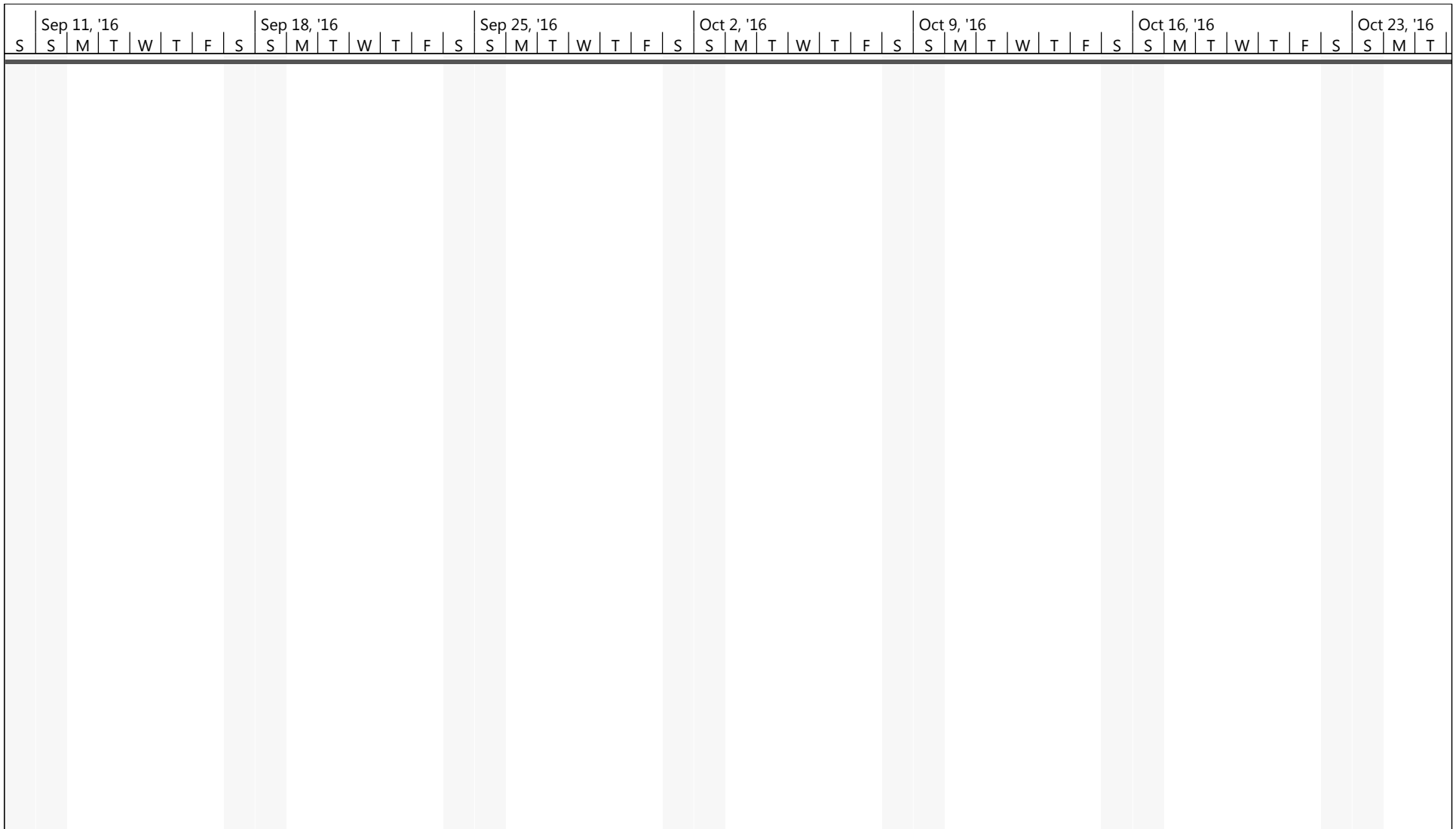

Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

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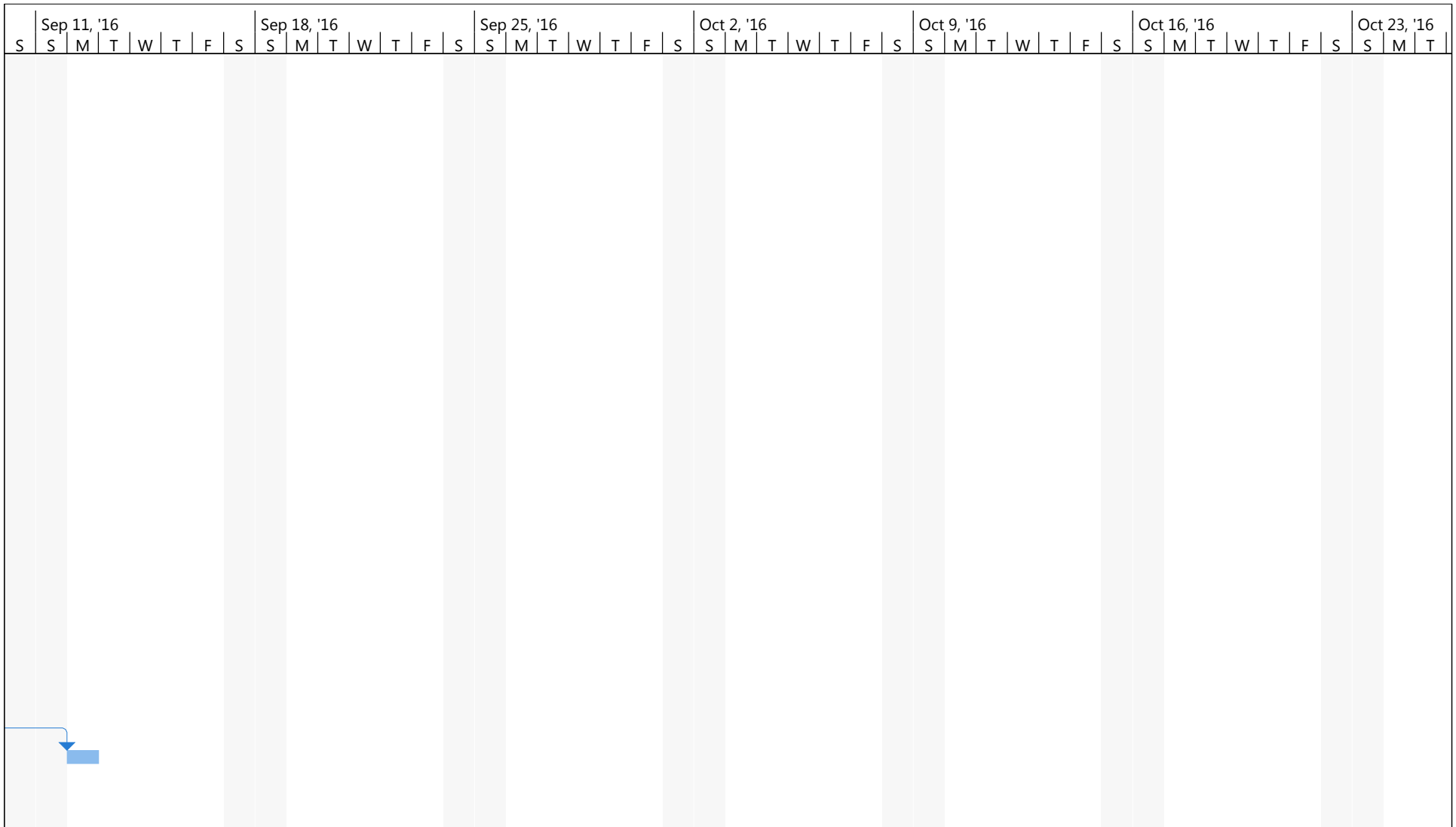

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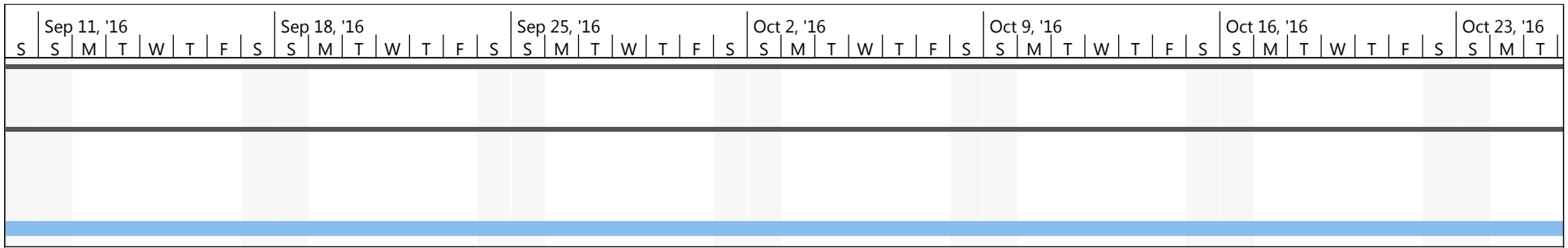

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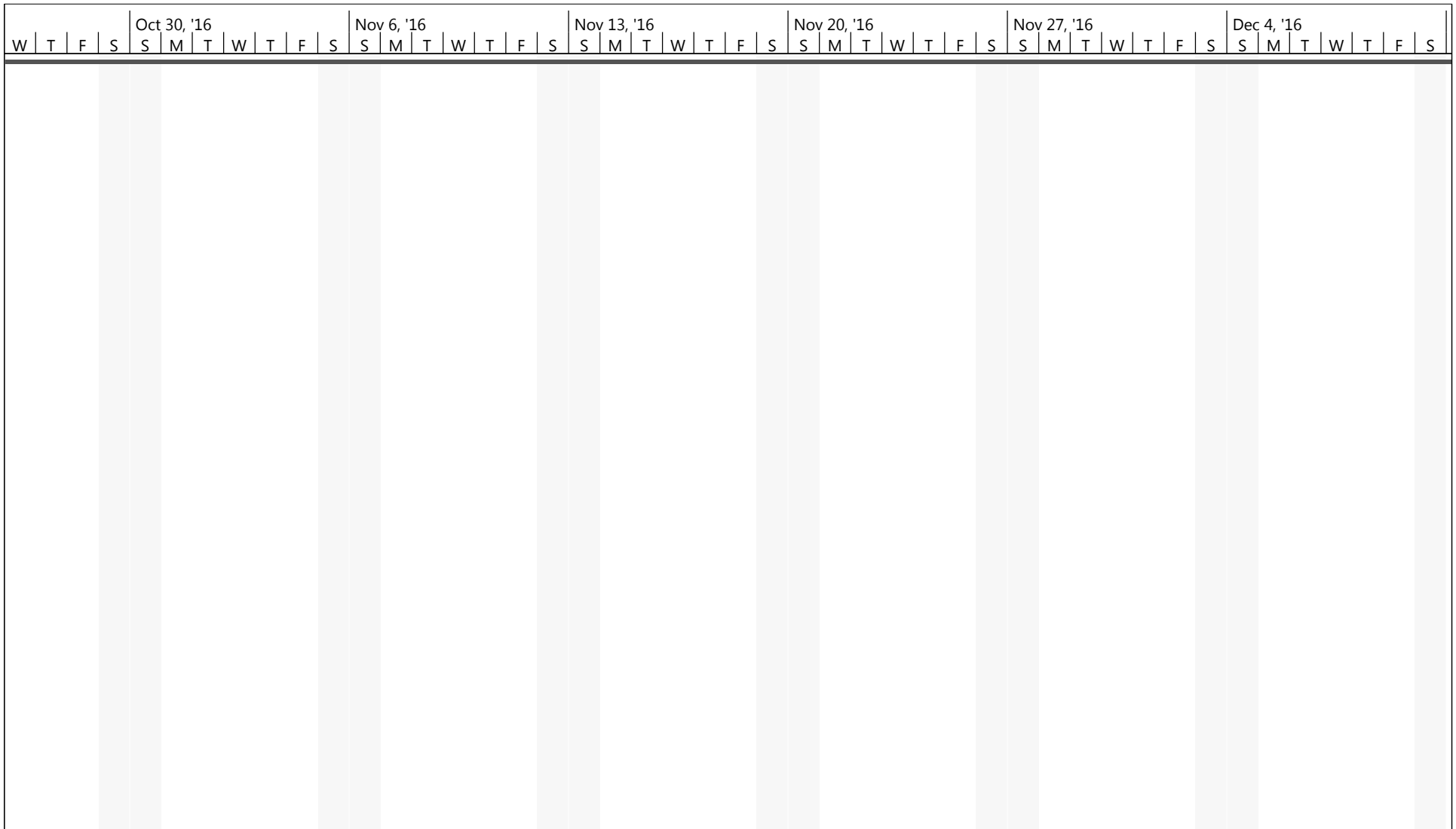

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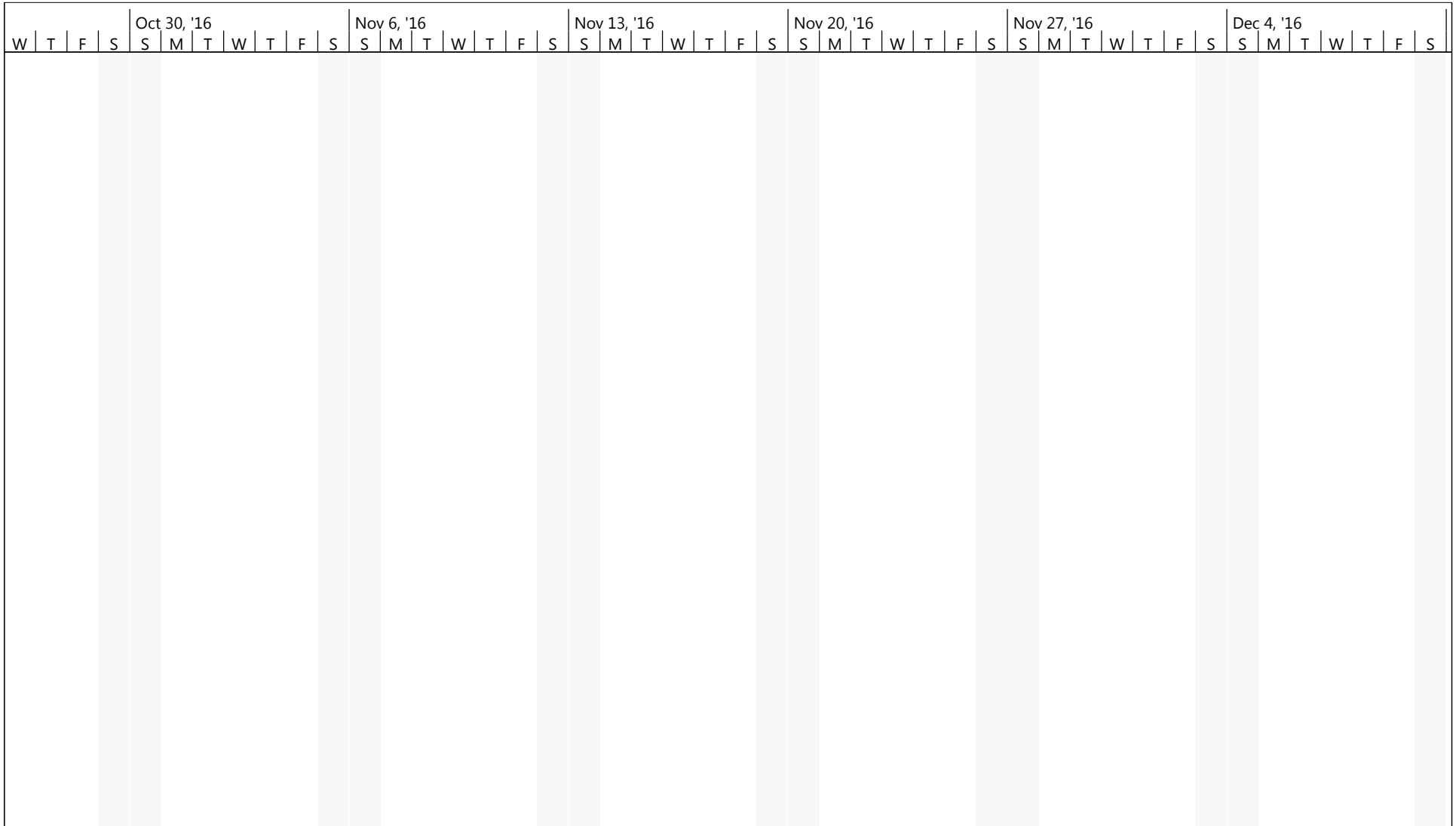

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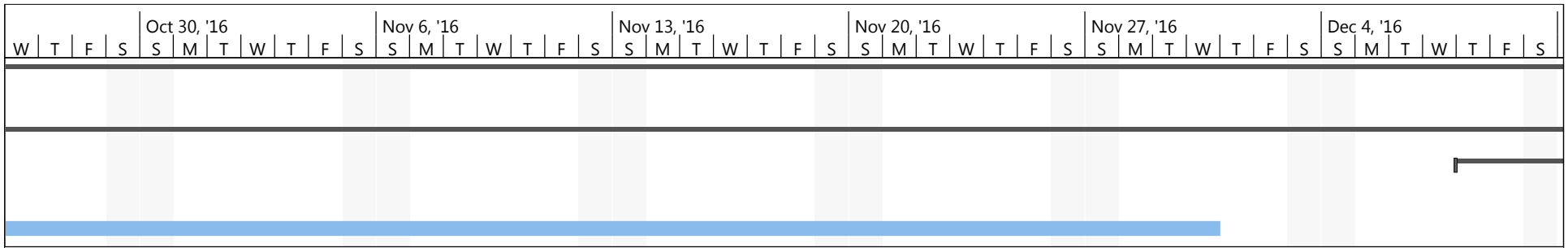

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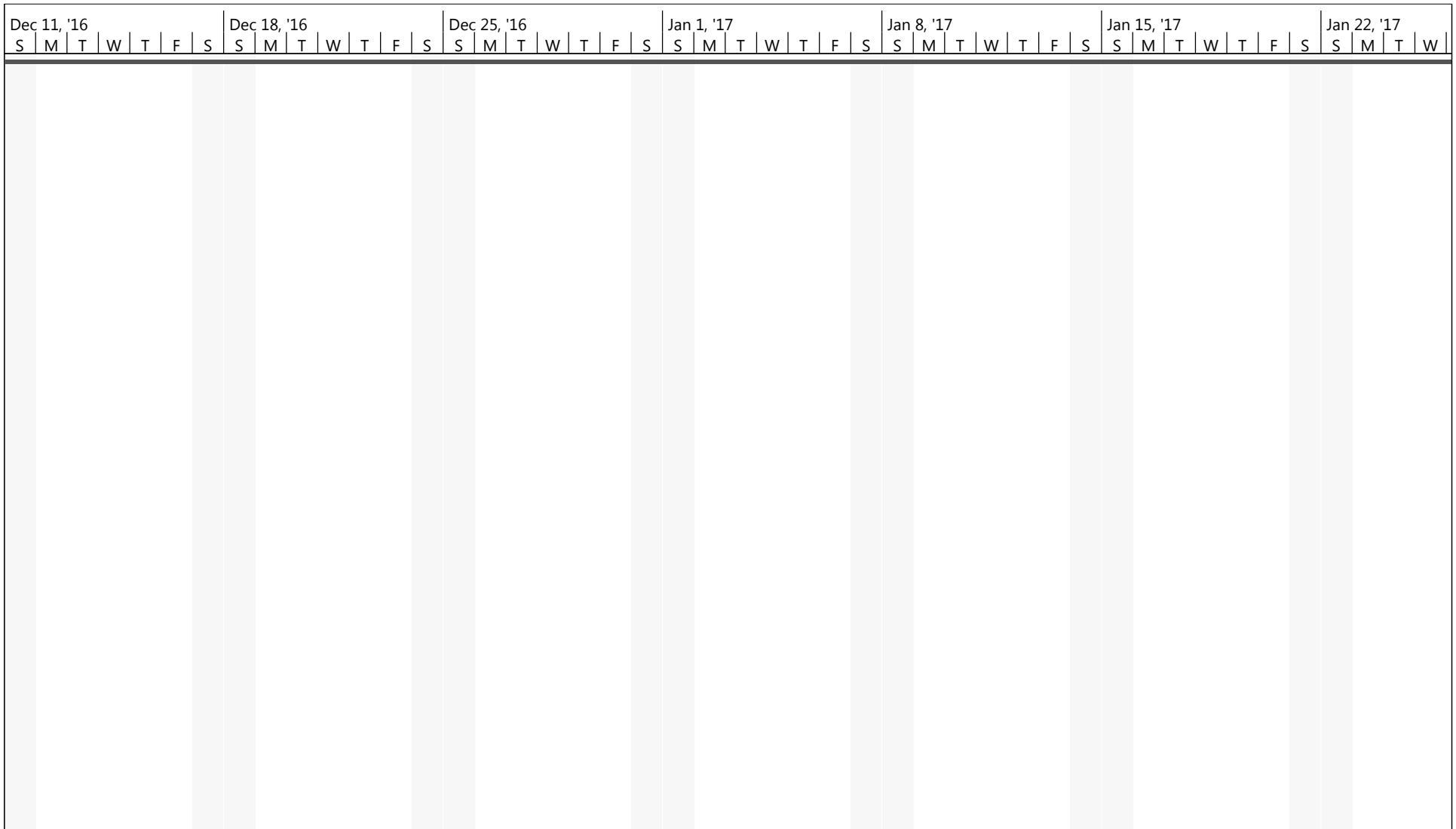

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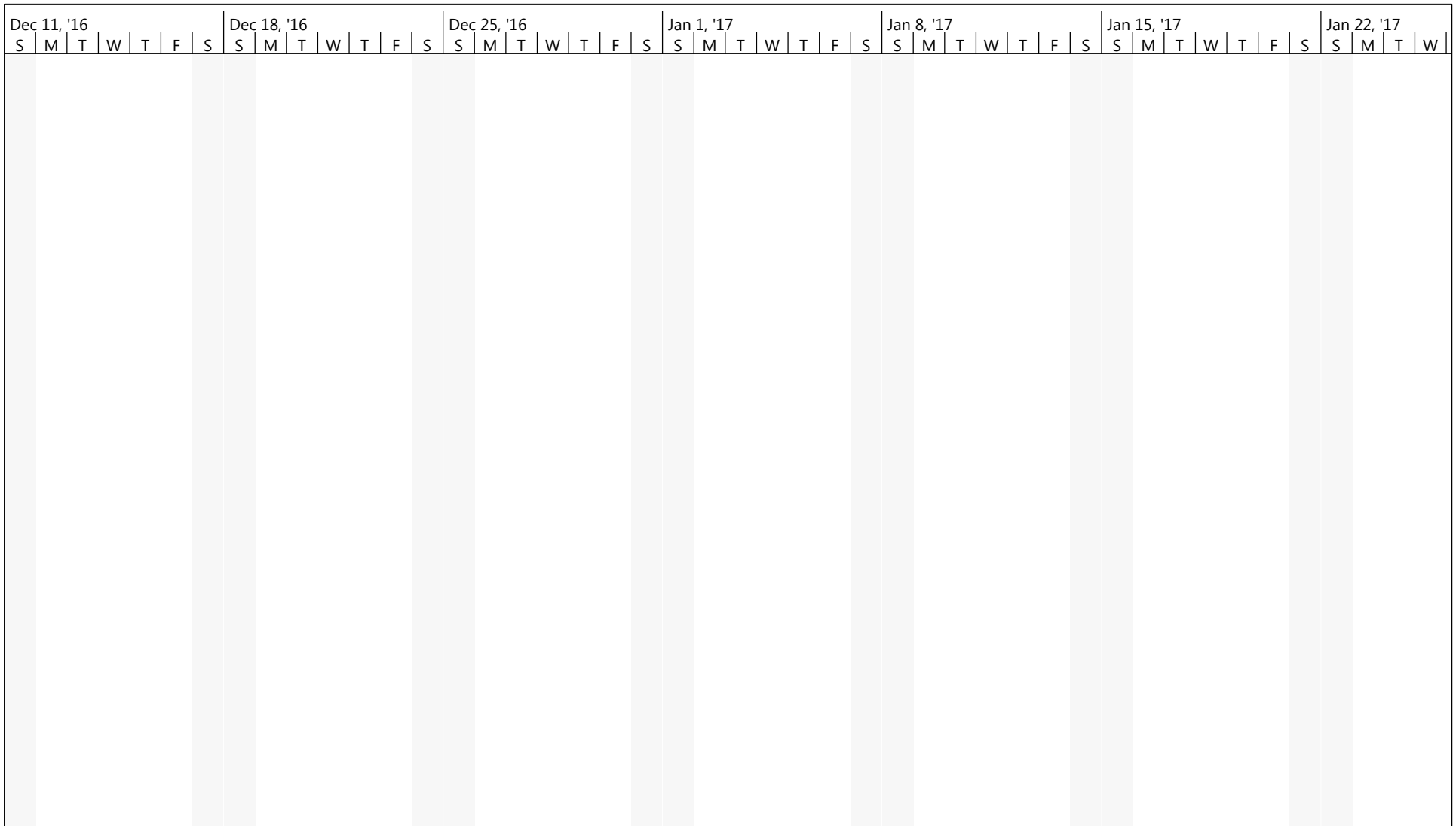

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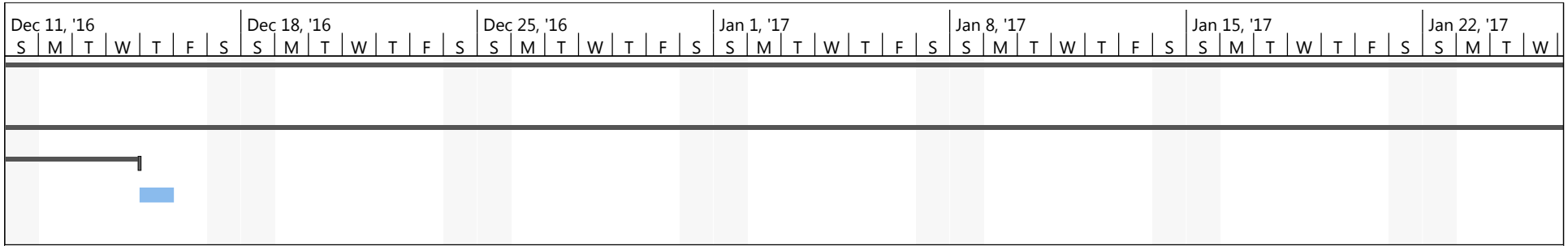

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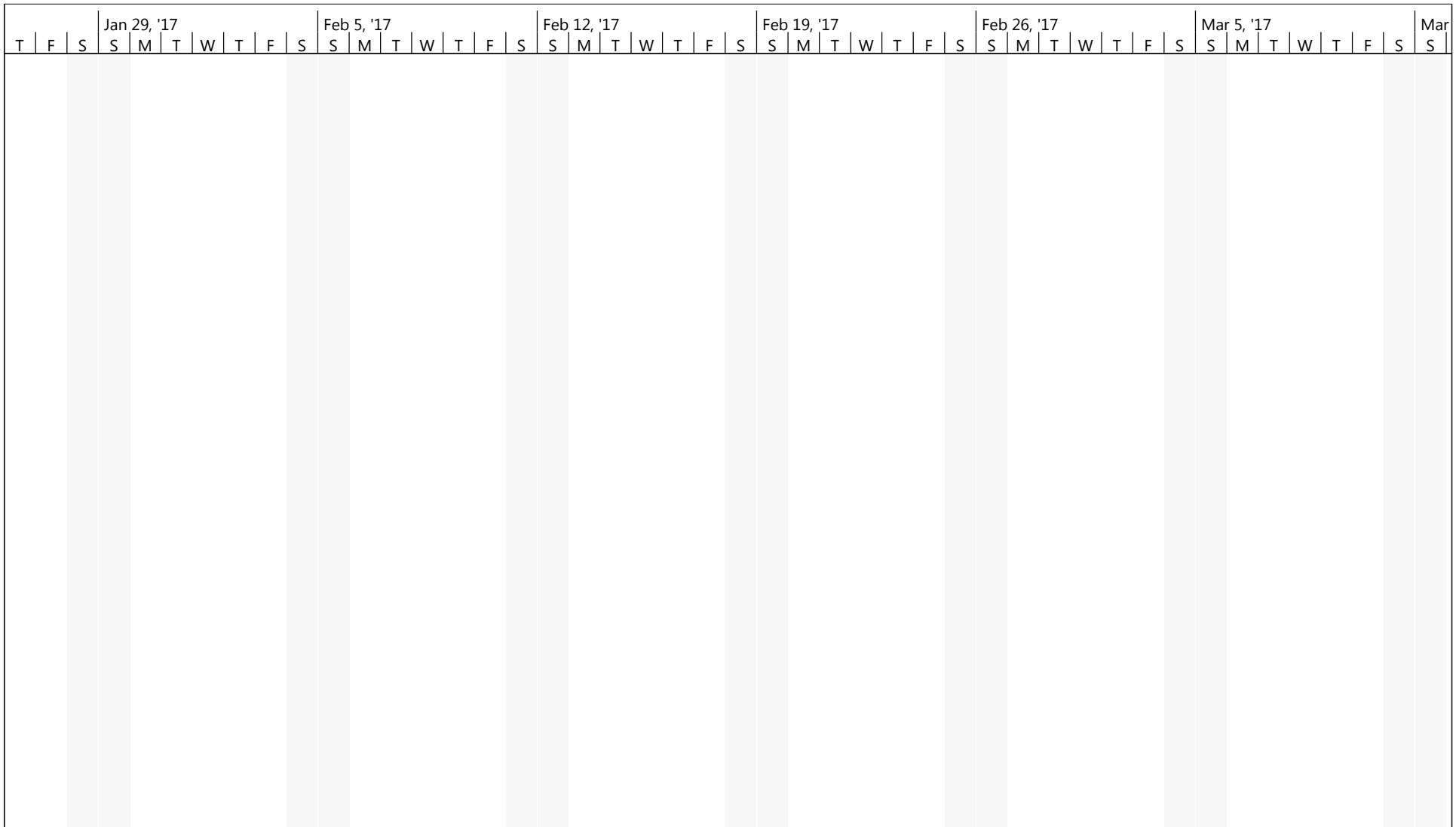

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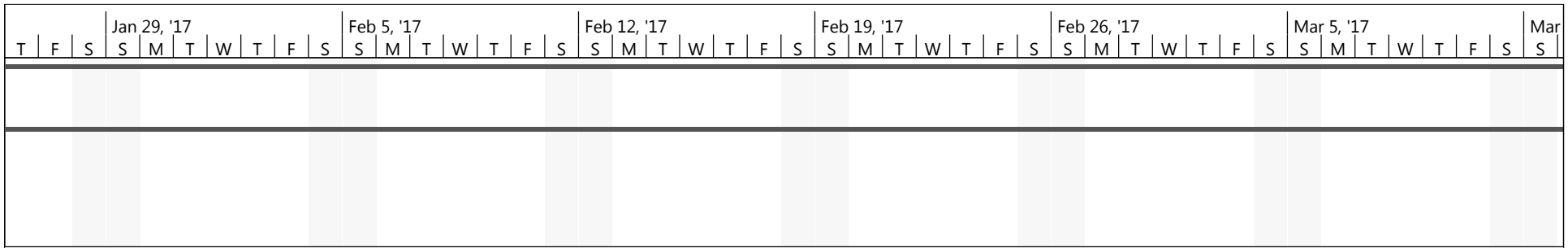

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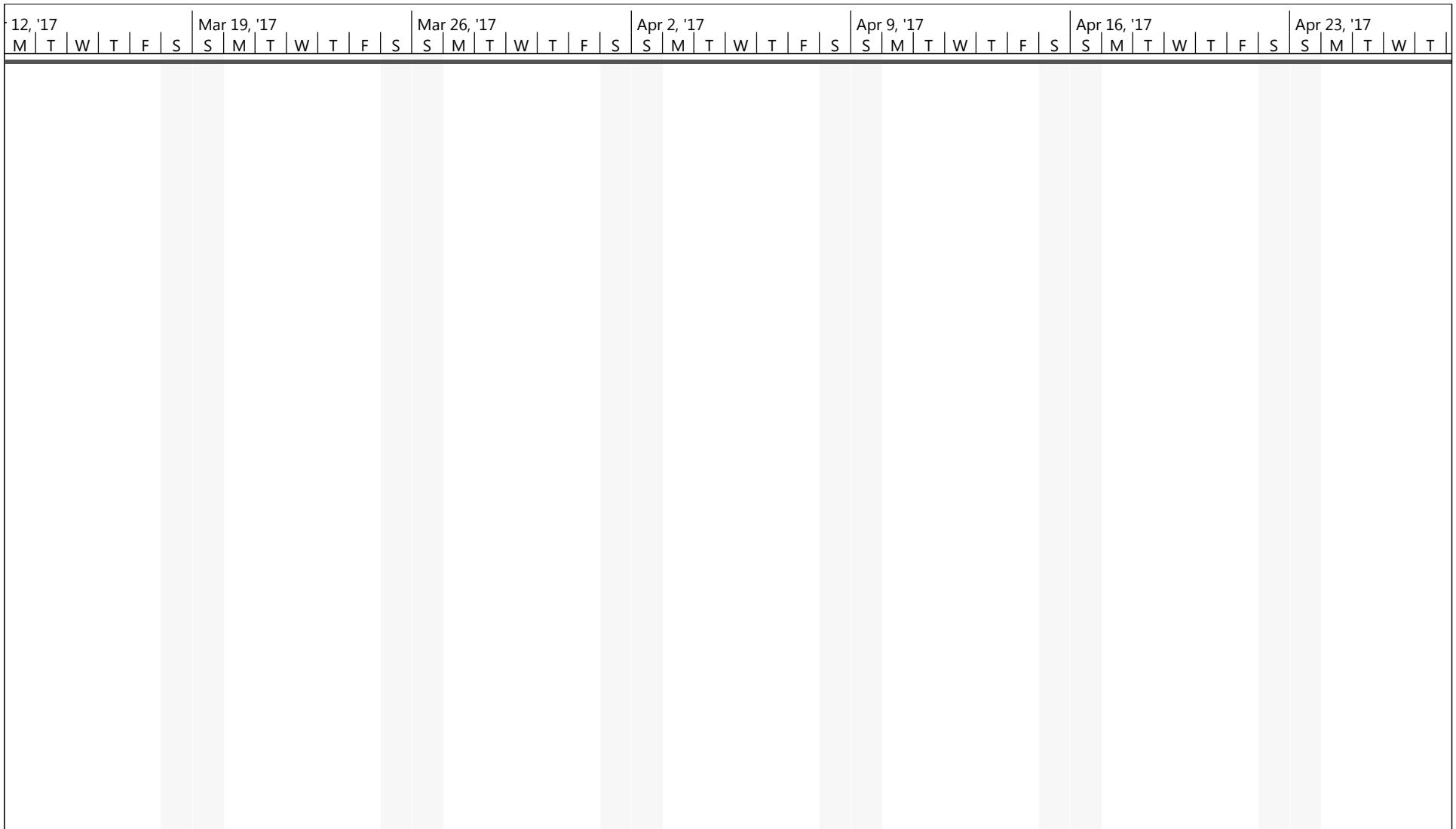

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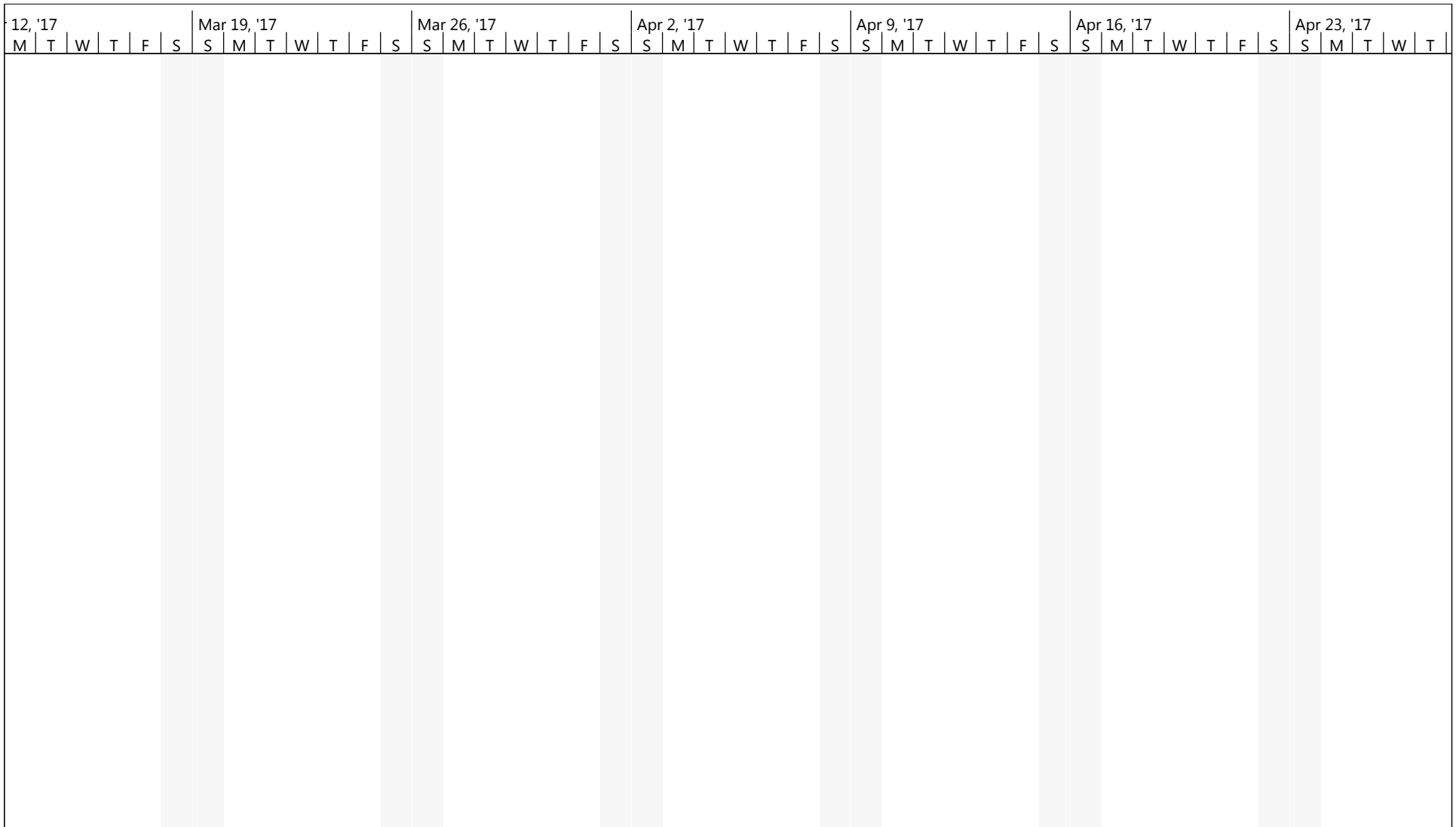

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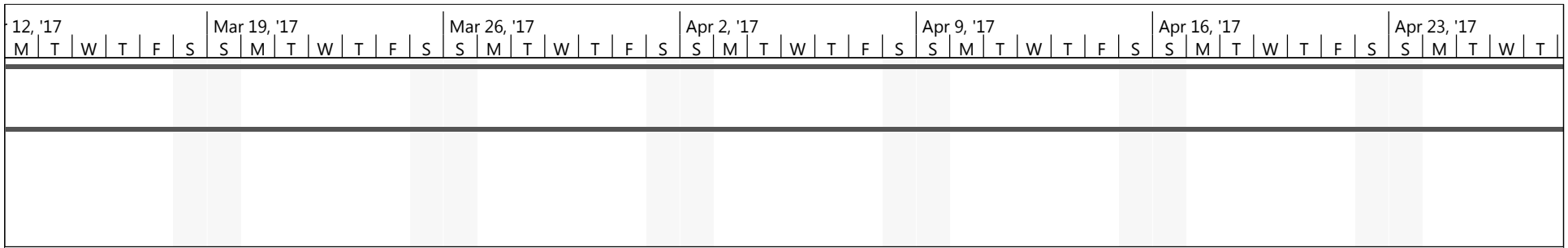

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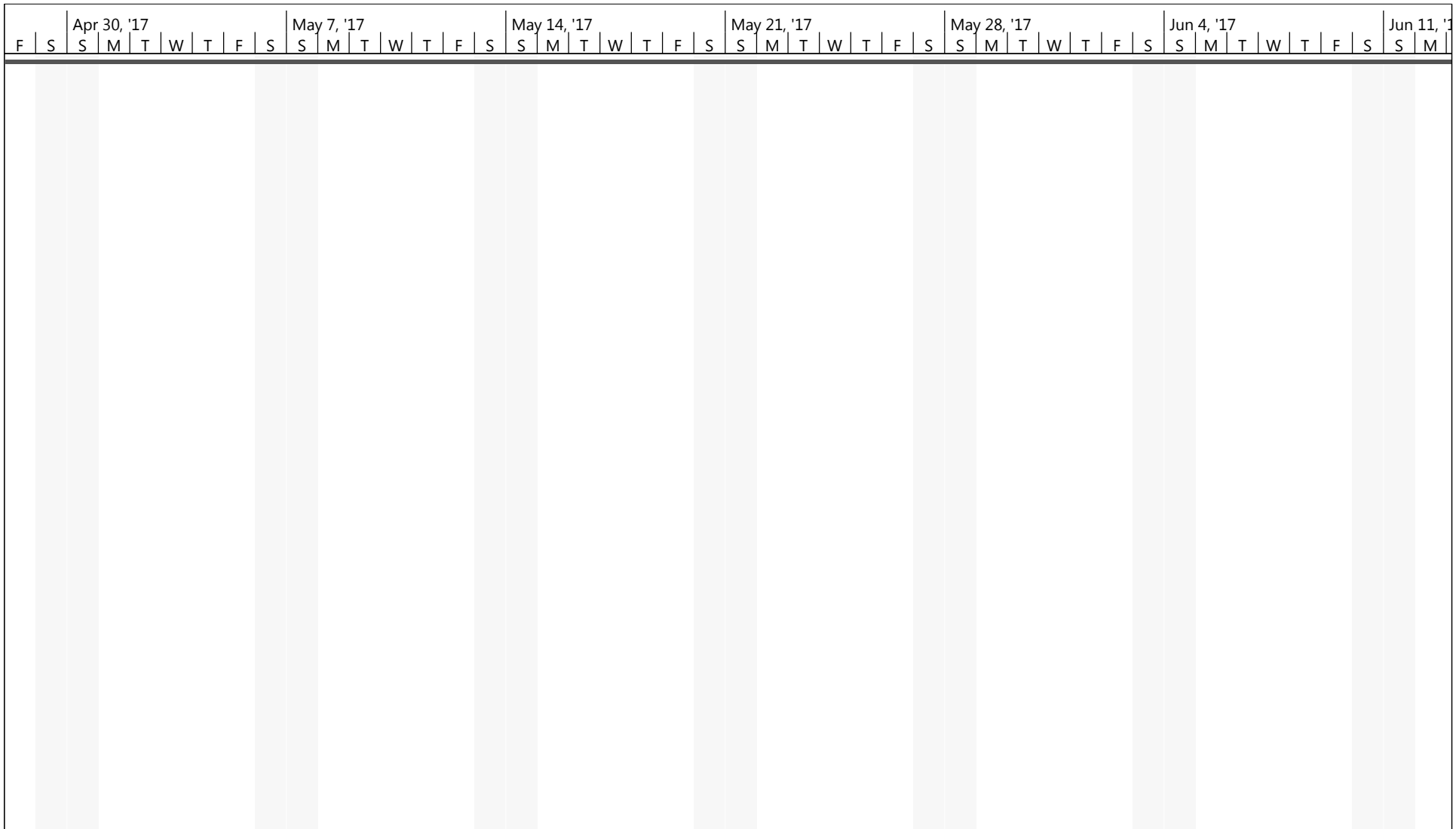

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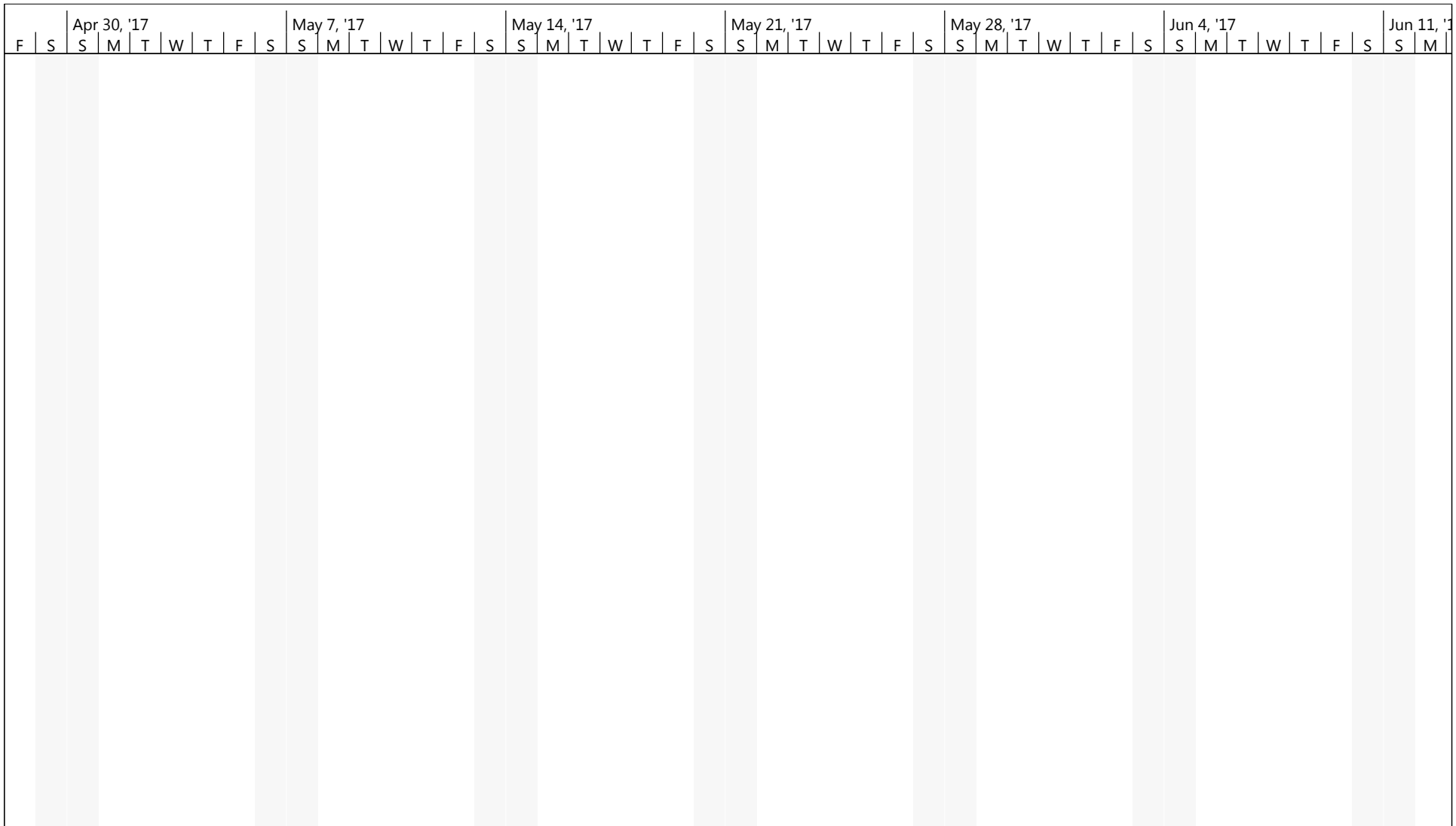

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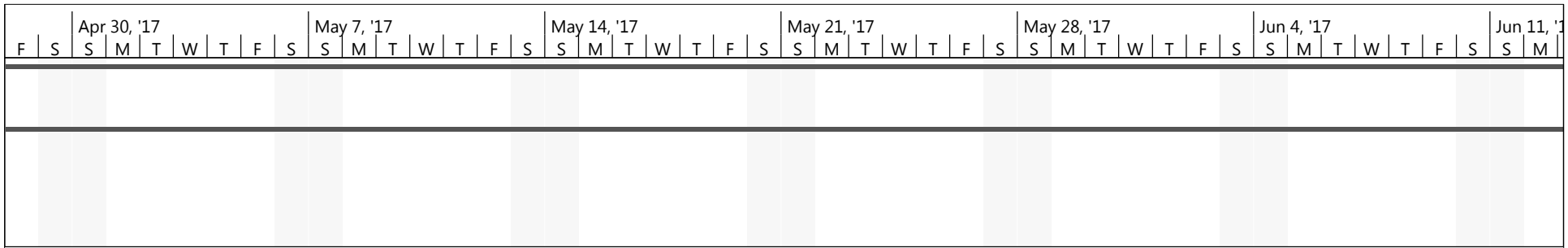

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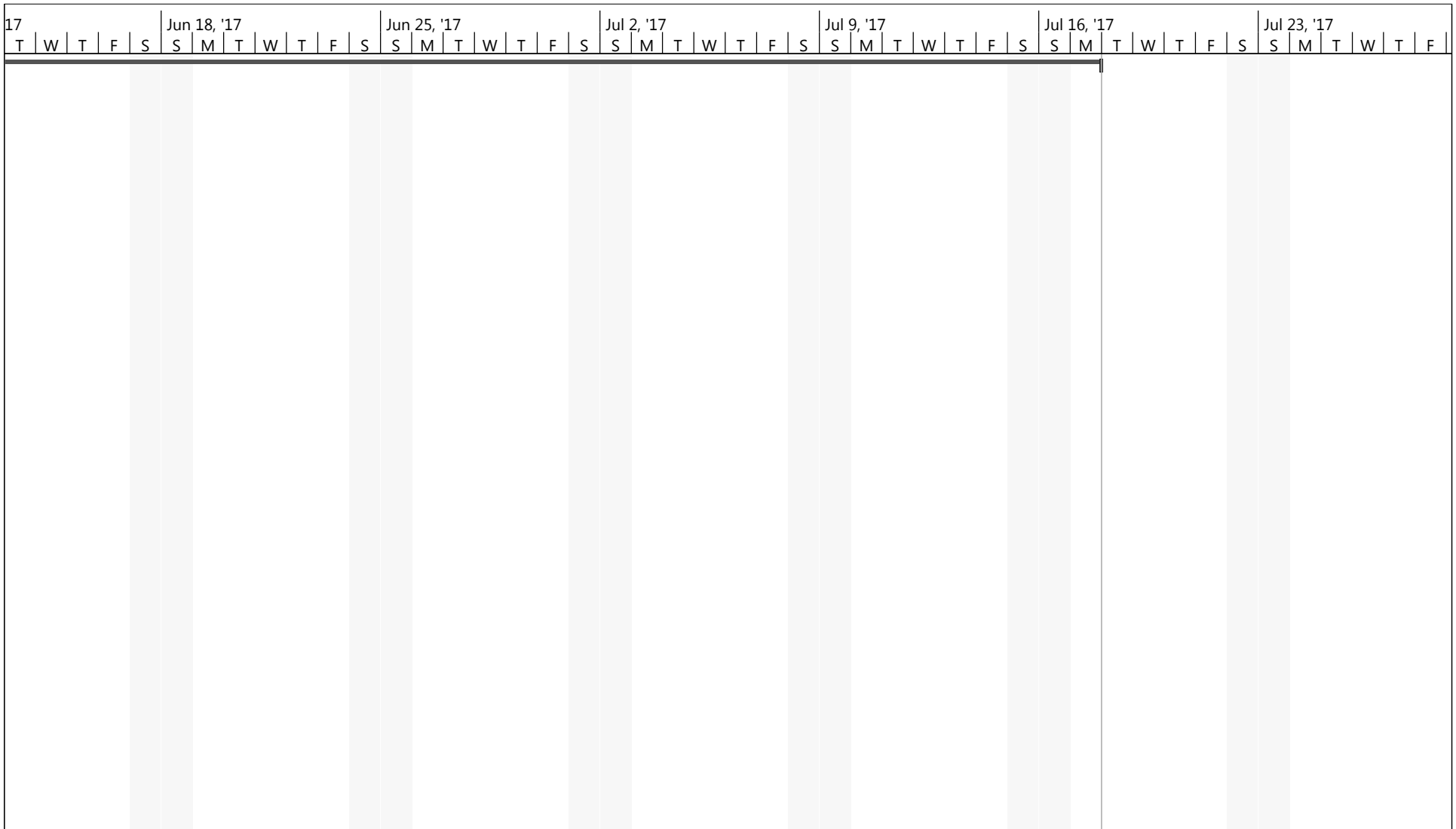

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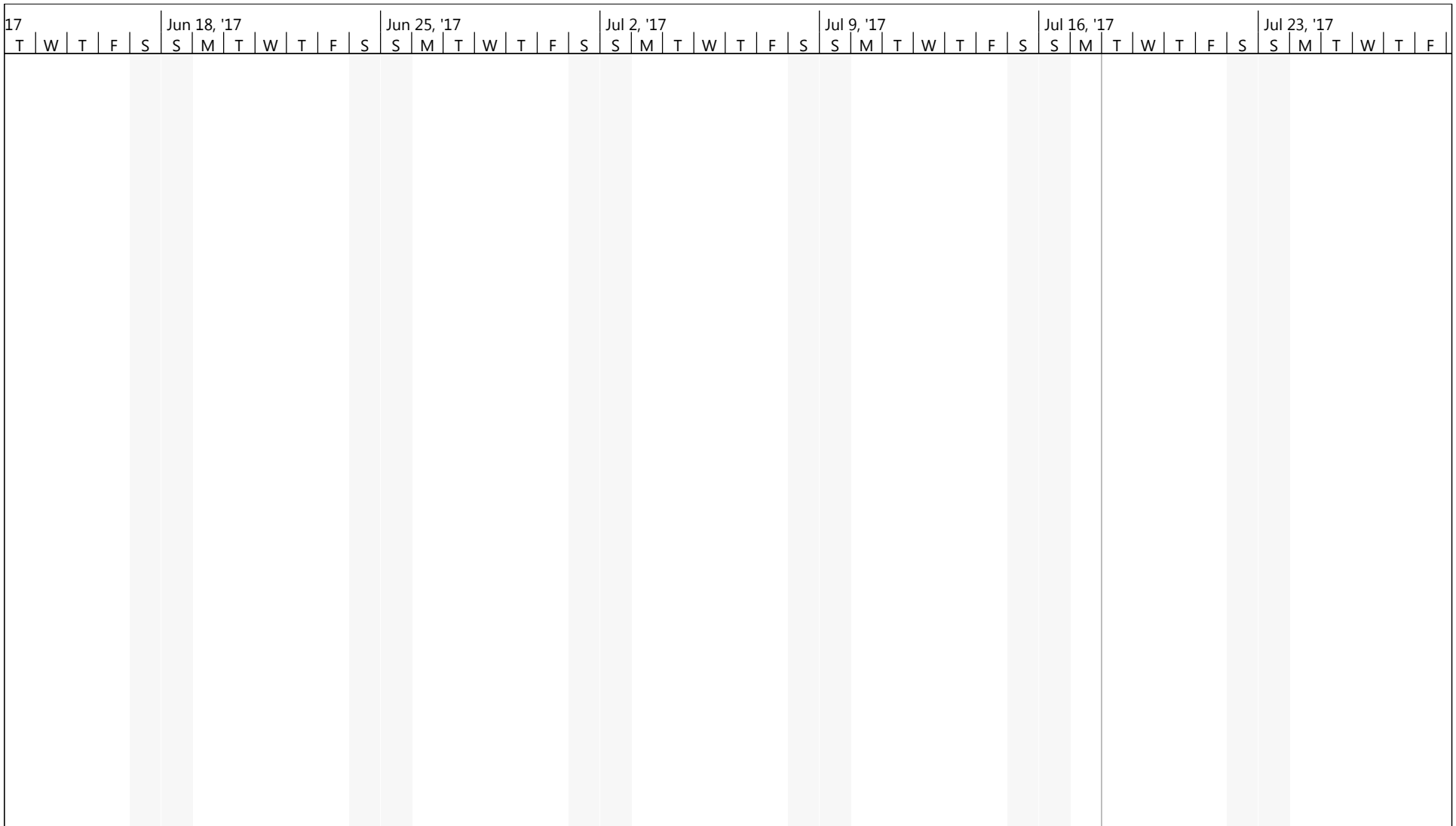

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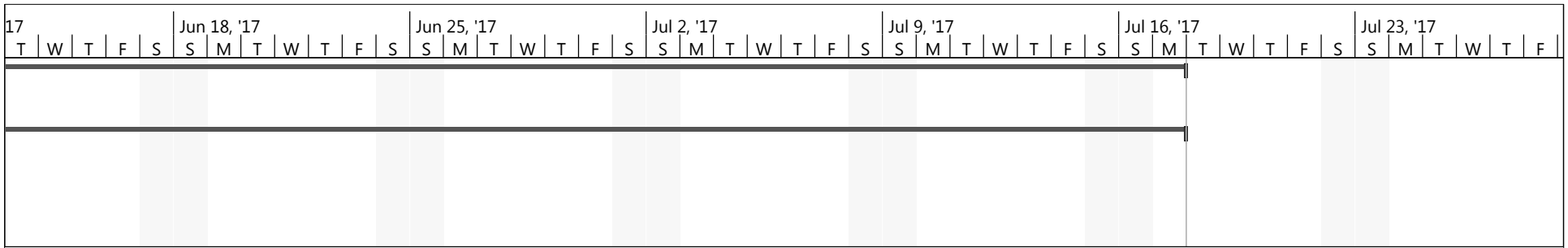

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Michigan Department Of Transportation

Enterprise Asset Management System Business Process Document

FINAL REPORT

February 24, 2014

Business Process Master List

1 Road Network Management

"As-Is"

- Update Road Network
- Publish Road Network
- Access Road Network Spatial Data
- Locate Business Data for Asset Management

"To-Be"

Phase 1 EAMS implementation

- Update Road Network
- Publish Road Network
- Access Spatial Road Network Data
- Locate Business Data for Asset Management

Future Vision

- Update and Publish Road Network
- Locate Business Data for Asset Management

2 Maintenance

"As Is"

MDOT Direct Forces

- Maintenance Program Budget Planning
- Routine Highway Maintenance by MDOT Direct Forces
- Routine Bridge Maintenance by MDOT Direct Forces
- Maintenance Reporting by MDOT Direct Forces

Local Agencies

- Routine Highway Maintenance by Local Agencies
- Maintenance Reporting by Local Agencies

"To-Be"

MDOT Direct Forces

- Maintenance Program Budget Planning
- Routine Highway Maintenance by MDOT Direct Forces
- Routine Bridge Maintenance by MDOT Direct Forces
- Maintenance Reporting by MDOT Direct Forces

Local Agencies

- Routine Highway Maintenance by Local Agencies Phase 1
- Maintenance Reporting by Local Agencies Phase 1

3 Sign Maintenance

"As Is"

- Annual Sign Program
- Unplanned Sign Maintenance

1. Road Network Management

1.1 As-is Road Network Management Business Processes

The following business processes have been modeled for the purposes of explaining MDOT's and DTMB's approach to road network management:

- Update Road Network
- Publish Road Network
- Access Road Network Spatial Data
- Locate Business Data for Asset Management

MDOT EAMS
Business Process Description

Process Stage: As-Is

Process Name: Update Road Network

Parent Business Process / Facet: Location Referencing Management

Process Owner: DTMB / CSS in cooperation with MDOT

Primary Deliverables / Products: Revisions to the Michigan Geographic Framework (MGF):

- Road network spatial data & attributes
- MGF PR-MP Event tables

Primary Client: MDOT

Process Cycle and Duration: As required, based upon update requests received during each calendar year

Description:
The Update Road Network business process is used to make changes to the Michigan Geographic Framework (MGF) spatial database based upon change requests received from Michigan stakeholders including MDOT. These changes are made within an Oracle Spatial edit environment operated by the Department of Technology, Management and Budget Center for Shared Solutions (DTMB / CSS) by DTMB and MDOT staff. All changes to the MDOT trunkline network component of the MGF are made by the MDOT Trunkline Specialist in order to ensure that Route and Control Section definitions, attributes and associated Linear Referencing Methods are correctly handled to ensure the ongoing integration of MDOT business data based upon LRS locations.

This process is triggered by a change request. Changes are processed throughout the year until a cut-off date is reached for publication of the next MGF version (release). Subsequent change requests will be held for processing against the new MGF version once it is published.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Data Source	Identify trunkline network change and submit change request
MDOT	Network Editor	Verify and process trunkline network changes to update the MGF
DTMB	Network Editor	Process non-trunkline network changes to update the MGF

Department / Agency	Actors	Description of Role
DTMB	Staff (various)	Identify non-trunkline network change and submit change request; accept change requests; forward trunkline change requests to MDOT Network Editor; verify non-trunkline network changes and assign to a DTMB Network Editor; monitor status of requests through completion.
External Agency	Various	Identify non-trunkline network change and submit change request. External agencies may include other State of Michigan agencies, Counties and Municipalities.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Request for Change	A request for change is submitted by an MDOT Data Source. These requests will go directly to the MDOT Network Editor.
1E	Request for Change	A request for change is submitted by a DTMB Staff person. These requests will be sent to a DTMB staff coordinator.
1F	Request for Change	A request for change is submitted by an External Agency. These requests will be sent to a DTMB staff coordinator.
2D	Source Data	Data supporting the change request is supplied by DTMB staff. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
2E	Verify Request & Assign Editor	DTMB staff verifies the request and assign a Network Editor.
2F	Source Data	Data supporting the change request is supplied by an External Agency. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
3B	Verify Request	Trunkline requests will be verified by the MDOT Network Editor.
3E	Trunkline Network?	If the request involves the trunkline network, it is forwarded to the MDOT Network Editor (**3B**). Otherwise, it is sent to a DTMB Network Editor (**4D**).
4A	Source Data	Data supporting the change request is supplied by an MDOT Data Source. Most (90%) of source data is supplied as CAD files, although some GPS survey data is also received.
4B	Update Geometry & Basic Attributes	MGF trunkline road network geometry changes and basic attributes are entered by the MDOT Network Editor.

Index	Process Step	Description
4D	Update Geometry & Basic Attributes	MGF non-trunkline road network geometry changes and basic attributes are entered by a DTMB Network Editor.
5D	Road PR Segment?	If the change involves a road segment that contains PR-MP linear referencing, this data must be updated (**6D**). Otherwise, the change proceeds to final processing (**9D**).
6B	Update PR-MP attributes & MALI	The MDOT Network Editor updates the PR-MP attributes for the affected trunkline MGF PR Segments. These changes are used to update PR Segment data contained within the MALI database.
6C	MALI	The MALI database is updated through process steps 6B and 6D to reflect MGF PR Segment changes.
6D	Update PR-MP attributes & MALI	The DTMB Network Editor updates the PR-MP attributes for the affected non-trunkline MGF PR Segments. These changes are used to update PR Segment data contained within the MALI database.
7B	Update Road Classification Data	The MDOT Network Editor updates the road classification attributes for the affected trunkline MGF road centerline features.
8B	Update CS, Route & other MDOT Data	The MDOT Network Editor updates the Route, CS-MP and other MDOT attributes for the affected trunkline MGF PR Segments.
9A	Sufficiency Database	The MDOT Sufficiency database is used as input to the Sufficiency Reconciliation process step (**9B**). Any required updates to the CS-MP data residing within this database are posted as an output from this process step.
9B	Sufficiency Reconciliation	The MGF CS-MP data is reconciled with that residing within the Sufficiency database. The MGF and Sufficiency CS-MP attributes are updated as required.
9D	Save Road Network Changes	The DTMB Network Editor carries out final Q/C checks and commits the non-trunkline road network geometry and attribute changes to the MGF database.
10B	Save Road Network Changes	The MDOT Network Editor carries out final Q/C checks and commits the trunkline road network geometry and attribute changes to the MGF database. PR-MP locations of any MGF event features associated with the revised PR Segments are then updated by DTMB (step **11C**).
10C	MGF	The edit environment MGF database is updated by process steps **9D** and **10B** to reflect changes in road network spatial data.
10D	Road PR Segment?	If the road network change impacts a PR Segment, process step **11C** is completed. Otherwise the change request is closed out (**12C**).

Index	Process Step	Description
11C	Update Framework Event PR-MP Locations	The DTMB Network Editor updates the PR-MP locations of any MGF event features associated with the revised PR Segments.
11D	MGF	The edit environment MGF database is updated by process step **11C** to reflect changes in event data PR-MP locations.
12C	Done	The change request is closed out.

Change Log:

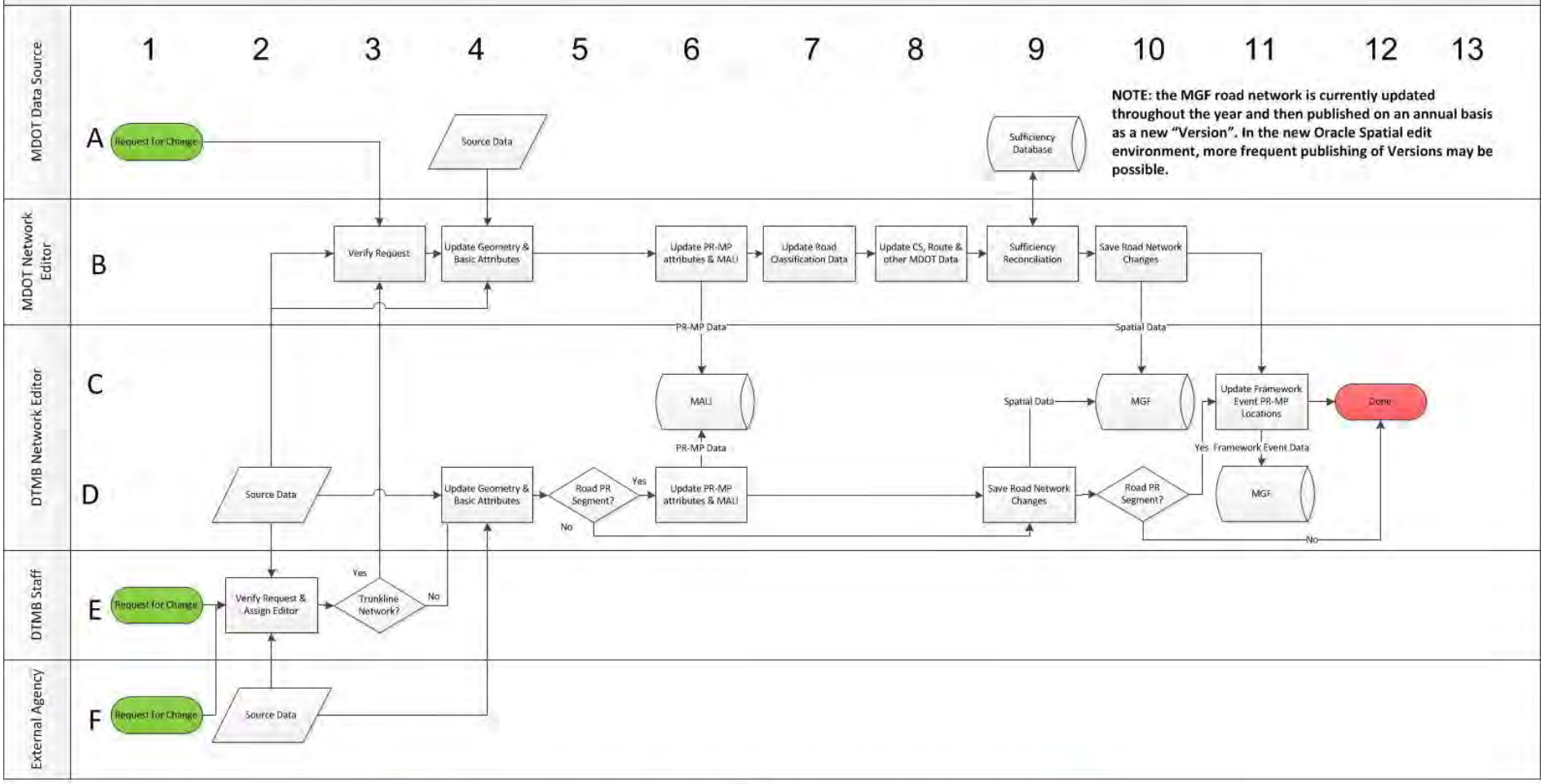
Version	Authors	Description	Date
1	Dave Loukes (OPUS) John MacNaughton (OPUS)	First Draft for internal review and submission to MDOT – process map only	20-Aug-2013
2	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map only	27-Aug-2013
3	Dave Loukes (OPUS)	Final process map and draft process description for submission to MDOT	4-Sept-2013
4	Dave Loukes (OPUS)	Final process map and process description for submission to MDOT	22-Sept-2013

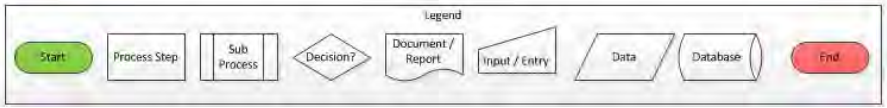
Attached:

1. As-Is Business Process Map: Update Road Network (Version 4) dated 22-Sept-2013.

MDOT "As-Is" Location Referencing Management: Update Road Network (Version 4)

22-Sept-2013





MDOT EAMS
Business Process Description

Process Stage:	As-Is
Process Name:	Publish Road Network
Parent Business Process / Facet:	Location Referencing Management
Process Owner:	DTMB / CSS in cooperation with MDOT
Primary Deliverables / Products:	1. A new (Version x) of the Michigan Geographic Framework (MGF) database. 2. Migration files to enable the update of MDOT GIS and business application databases to MGF Version x. 3. Version x MS SQL Spatial SDE database for MDOT GIS users. 4. Version x Oracle Spatial SDE (GLOBAL) database for MDOT GIS users. 5. Version x TMS, MAP and other MDOT business application databases containing updated PR-MP and CS-MP location references.
Primary Client:	MDOT
Process Cycle and Duration:	Yearly at present. The cut-off date is normally at the end of February, and the new MGF Version is available for MDOT use in April.

Description:
The Publish Road Network business process is used to create a new production release (Version x) of the Michigan Geographic Framework (MGF) spatial database that reflects changes made within the past year based upon requests received from Michigan stakeholders including MDOT. MGF Version x is published from an Oracle Spatial edit environment operated by the Department of Technology, Management and Budget Centre for Shared Services (DTMB / CSS) by DTMB and MDOT staff. Migration files generated by this process are used by DTMB business application and spatial support staff, and by MDOT GIS staff, to create new Version x spatial and textual databases for use by MDOT business users.

This process is triggered by a specified cut-off date that locks down the MGF edit environment. At present, it is run annually commencing at the end of February. In addition to new Version x spatial databases that reflect the updated road network along with numerous other feature classes, PR-MP and CS-MP locations within MDOT business applications are updated to reflect the Version x network. This is accomplished through custom migration scripts that are specific to each application database that is migrated. A number of transportation LRS event tables are included within the core MGF product.

Participants:

Department / Agency	Actors	Description of Role
MDOT	GIS Team	Create MGF Version x shape files and MS SQL Spatial SDE databases for MDOT GIS application users, and migration files to assist in the TMS migration process step.
DTMB	Spatial Support Team	Create MGF Version x Oracle Spatial SDE database and ArcGIS Server tile caches for MDOT GIS and business application use.
DTMB	Business Application Support	Migrate PR-MP and CS-MP locations within MDOT business application databases to MGF Version x.
DTMB	MGF Team	Carry out year-end processes to create and publish MGF Version x.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1H	Lock Down Edit Environment	The process begins with a directive to lock down the MGF edit environment in preparation for creation of the Version x MGF database.
2G	MALI	The Michigan Accident Location Index (MALI) database is used as input to process step **2H**. This database contains logical PR Segment network definitions.
2H	Validate Against MALI Data	The MGF PR Segment lengths are validated against the MALI PR Segment lengths. Any discrepancies are resolved to ensure that the two databases are synchronized.
2I	MGF	The MGF edit environment database is used as input to process step **2H**. This database contains spatial PR Segment network definitions.
3F	Sufficiency Database	The current Sufficiency database contains CS-MP logical network section definitions and associated lengths that have been adjusted throughout the year as MGF updates occur. It is used as input to the final Sufficiency Reconciliation process step (**4H**) that occurs prior to publishing MGF Version x.
3H	Re-Mile Point MGF Data	All Mile Points along each PR Segment within the MGF database are recalculated using the latest segment lengths.
4F	Sufficiency Database (Version x)	This database contains CS-MP logical network section definitions and associated lengths that have been updated by the Sufficiency Reconciliation process step (**4H**).

Index	Process Step	Description
4H	Sufficiency Reconciliation	This process step compares the logical CS-MP network stored in the Sufficiency database against the spatial CS-MP network stored within the MGF edit environment database. Any discrepancies are resolved to ensure that the two databases are synchronized. Once it is completed, the Sufficiency Database has been updated to Version x.
5G	MGF Version x	The MGF Version x database is created as the output from the Publish process step (**5H**). It forms the basis for the generation of subsequent Framework migration files and the creation of MDOT Version x spatial databases for GIS and business application use.
5H	Publish MGF Version x	The DTMB MGF Team creates the MGF Version x spatial database (**5G**) and the Framework migration files associated with it.
6A	Create Shapefiles	The MDOT GIS Team creates new Version x Shapefiles (**6B**) using the MGF Version x Migration Files (**6H**) as input.
6B	MDOT Version x Shapefiles	The MDOT Version x Shapefiles contain MGF Version x spatial data for use by MDOT business users and applications.
6H	MGF Version x Migration Files	The migration files include the following: • MGF Statewide Files • Old and new MALI files • Working Transactions • Migration Table • Metadata and MGF appendices • PR/CS Equivalency Table Sufficiency Working and Report Files with full PR and CS Referencing
7A	MGF Version x MS SQL Spatial Migration	The MDOT GIS Team creates a new MS SQL SDE database (**8B**) for use by MDOT business users and applications. MDOT Business LRMs (process step **8A)** and TMS Migration Files (process step **9A)** are also created.
8A	Build PR-MP, CS-MP & Route-MP Routes	ArcGIS LRS Route systems are created for the PR-MP, CS-MP and Route-MP LRMs and stored within the Version x MS SQL SDE database (**8B**).
8B	MGF Version x MS SQL Spatial SDE	The Version x MS SQL SDE database contains the MGF Version x road network database, boundary layers, other MGF features, and MGF core LRS events. Other MDOT business data is linked to the road network through PR-MP and CS-MP LRMs.
8E	TMS Framework Migration	The TMS Framework Migration process step creates a new transitional TMS Version x Database (**9E**) using the current TMS Database (**8F**), MDOT Version x TMS Migration Files (**9B**) and MGF Version x Migration Files (**6H**) as inputs. Once this is completed, the TMS-Sufficiency Update (process step **10F**) is carried out. There are two sub-processes executed: • TMS Foxpro migration programs • TMS Oracle migration procedures

Index	Process Step	Description
8F	TMS Database	The current TMS database is used as input to the TMS Framework Migration process (step **8E**).
9A	Create TMS Migration Files	The MDOT GIS Team creates migration files (**9B**) for use by the TMS Framework Migration process step (**8E**).
9B	MDOT GIS Version x TMS Migration Files	These files include updated City Boundary, Zip Code and Lane Quantity PR-MP locations.
9E	TMS Version x Database (Post Migration)	This transitional database contains updated PR-MP locations for business tables. It is created by process step **9A** and used as input to the TMS-Sufficiency Update process step (**10F**).
9F	Sufficiency File (post reconcile with MGF)	This file contains Version x CS-MP LRM data following completion of the Sufficiency Reconciliation process step (**4H**).
10D	MGF Version x Oracle Spatial Migration	This step initiates the process to create the MGF Version x Oracle Spatial SDE (**11C**). Shapefiles are extracted from the MGF Version x MS SQL Server Database (**8B**) and converted to SDO. TMS business events are input from the Version x Sufficiency Database (**10E**), the Version x MAP Database (**11E**) and other MDOT Version x business application databases (**12E**).
10E	TMS Version x Database (Post Migration, Post Sufficiency)	Once the TMS - Sufficiency Update process step (**10F**) has been completed, the TMS Database contains MGF Version x CS-MP locations.
10F	TMS – Sufficiency Update	This process step creates Version x Sufficiency tables within the final TMS Version x database (**10E**).
11E	MAP Database	The MAP Database contains business table PR-MP locations that are updated to Version x following completion of the MAP Framework Migration process step (**11F**).
11F	MAP Framework Migration	This step uses the MGF Version x Migration Files (**6H**) to update MAP Database (**11E**) PR-MP locations to Version x.
11C	MGF Version x Oracle Spatial SDE (GLOBAL)	This database contains MGF Version x Oracle Spatial SDE data that is created through process steps **10D** and **11D**.
11D	Build PR-MP, CS-MP & Route-MP Routes	The PR-MP, CS-MP and Route-MP LRM Routes are created using the MGF Version x road network feature attributes and stored in the MGF Version x Oracle Spatial SDE Database (**11C**).
12C	MGF Version x Tile Cache	These files are accessed by ArcGIS Server applications to optimize map draw times for MGF Version x base layers.

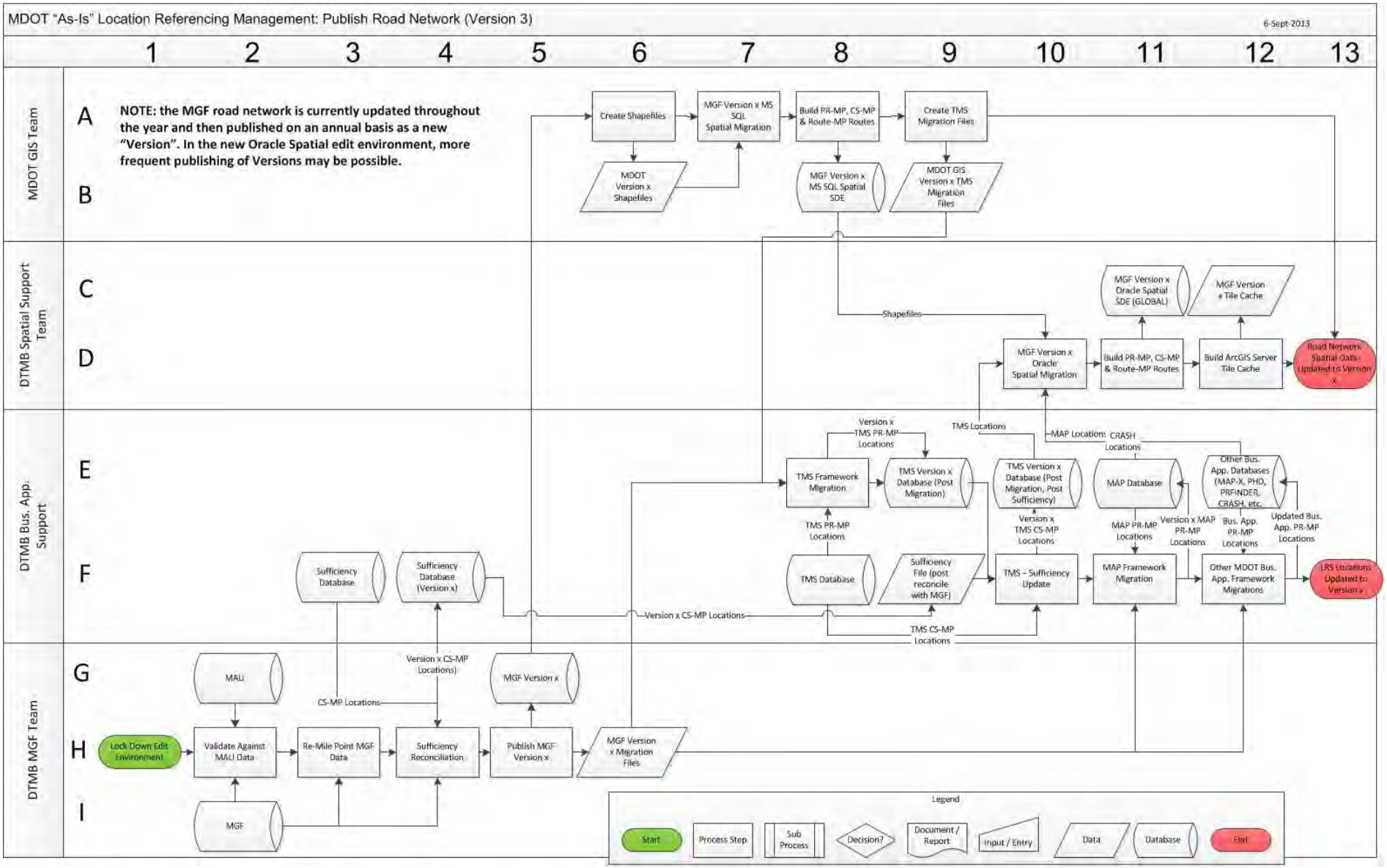
Index	Process Step	Description
12D	Build ArcGIS Server Tile Cache	This is a second process step as part of the MGF Version x Spatial Migration (**10D**) and uses the SDO shapefiles to create an ArcGIS Server tile cache (**11C**).
12E	Other Bus. App. Databases (MAP-X, PHD, PRFINDER, CRASH, etc.	Other MDOT business application database table PR-MP locations are updated to Version x following completion of the MAP Framework Migration process step (**11F**). These databases include MAP-X, PHD, PRFINDER and CRASH.
12F	Other MDOT Bus. App. Framework Migrations	This step uses the MGF Version x Migration Files (**6H**) to update PR-MP locations within other MDOT business application databases (**12E**) to Version x.
13D	Road Network Spatial Data Updated to Version x	All MDOT spatial data has been updated to MGF Version x.
13F	LRS Locations Updated to Version x	LRS locations within selected MDOT business applications have been updated to MGF Version x.

Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS) John MacNaughton (OPUS)	First Draft for internal review and submission to MDOT – process map only	20-Aug-2013
2	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map only	27-Aug-2013
3	Dave Loukes (OPUS)	Final process map and draft process description for submission to MDOT	6-Sept-2013

Attached:

1. As-Is Business Process Map: Publish Road Network (Version 3) dated 6-Sept-2013.


MDOT "As-Is" Location Referencing Management: Publish Road Network (Version 3)
6-Sept-2013
1 2 3 4 5 6 7 8 9 10 11 12 13
MDOT GIS Team
DTMB Spatial Support Team
DTMB Bus. App. Support
DTMB MGF Team
A
B
C
D
E
F
G
H
I
NOTE: the MGF road network is currently updated throughout the year and then published on an annual basis as a new "Version". In the new Oracle Spatial edit environment, more frequent publishing of Versions may be possible.
Create Shapefiles
MGF Version x MS SQL Spatial Migration
Build PR-MP, CS-MP & Route-MP Routes
Create TMS Migration Files
MDOT Version x Shapefiles
MGF Version x MS SQL Spatial SDE
MDOT GIS Version x TMS Migration Files
MGF Version x Oracle Spatial SDE (GLOBAL)
MGF Version x Tile Cache
Shapefiles
MGF Version x Oracle Spatial Migration
Build PR-MP, CS-MP & Route-MP Routes
Build ArcGIS Server Tile Cache
Road Network Spatial Data Updated to Version x
Version x TMS PR-MP Locations
TMS Locations
MAP Locations
CRASH Locations
TMS Framework Migration
TMS Version x Database (Post Migration)
TMS Version x Database (Post Migration, Post Sufficiency)
MAP Database
Other Bus. App. Databases (MAP-X, PHD, PRFINDER, CRASH, etc.
TMS PR-MP Locations
Version x TMS CS-MP Locations
MAP PR-MP Locations
Version x MAP PR-MP Locations
Bus. App. PR-MP Locations
Updated Bus. App. PR-MP Locations
Sufficiency Database
Sufficiency Database (Version x)
TMS Database
Sufficiency File (post reconcile with MGF)
TMS – Sufficiency Update
MAP Framework Migration
Other MDOT Bus. App. Framework Migrations
LRS Locations Updated to Version x
Version x CS-MP Locations
TMS CS-MP Locations
MALI
Version x CS-MP Locations)
MGF Version x
CS-MP Locations
Lock Down Edit Environment
Validate Against MALI Data
Re-Mile Point MGF Data
Sufficiency Reconciliation
Publish MGF Version x
MGF Version x Migration Files
MGF
Legend
Start
Process Step
Sub Process
Decision?
Document / Report
Input / Entry
Data
Database
End

MDOT EAMS
Business Process Description

Process Stage: As-Is

Process Name: Access Spatial Road Network Data

Parent Business Process / Facet: Location Referencing Management

Process Owner: MDOT

Primary Deliverables / Products: Spatial road network data available for use within MDOT GIS and business applications

Primary Client: MDOT

Process Cycle and Duration: As required to support MDOT GIS and business applications

Description:
The Access Spatial Road Network Data business process is used by MDOT staff to access MDOT road network spatial data in support of asset management. Access is enabled through various software applications including web browser clients, desktop GIS and ArcGIS Server. Web access is enabled by web / map services provided via ArcGIS Server.

This process is triggered by a spatial data access request from an MDOT software application.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Business User	Access spatial data to meet asset management business needs.
MDOT	GIS Team	Access spatial data to meet asset management and user support business needs; maintain MDOT spatial data; create / maintain ArcGIS Server web / map services.
DTMB	Spatial Support Team	Maintain MDOT spatial data.

Process Map: (See Attached)

Process Steps Descriptions:

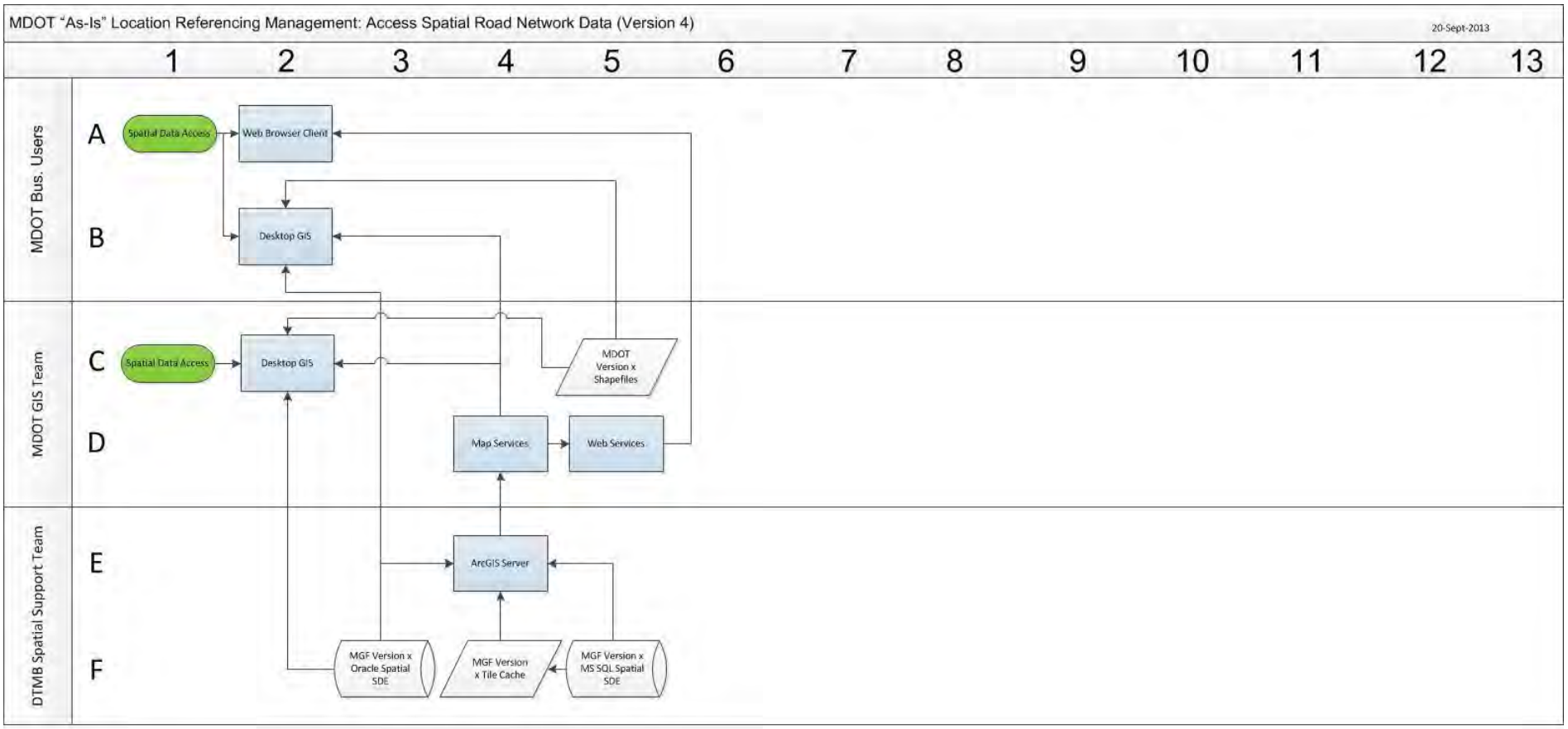
Index	Process Step	Description
1A	Spatial Data Access	A spatial data access request is initiated by an MDOT business user through a web client (**2A**) or desktop GIS (**2B**).
1C	Spatial Data Access	A spatial data access request is initiated by an MDOT GIS Team individual through desktop GIS (**2D**).
2A	Web Browser Client	A web browser client application is employed by an MDOT business user to access spatial data through ArcGIS Server (**4E**).
2B	Desktop GIS	A desktop GIS application is employed by an MDOT business user to access spatial data through ArcGIS Server Map Services (**4D**), or to access shapefiles directly (**5C**).
2C	Desktop GIS	A desktop GIS application is employed by an MDOT GIS Team individual to access spatial data through ArcGIS Server Map Services (**4D**) or to access shapefiles (5C) or Oracle Spatial SDE (**3F**) directly.
3F	MGF Version x Oracle Spatial SDE	MDOT spatial data stored in Oracle Spatial is accessed via SDE directly or through ArcGIS Server Map Services (**4D**).
4D	Map Services	MDOT ArcServer Map Services are used by Desktop GIS clients (2B, 2C) or ArcServer Web Services (5D) to access spatial data.
4E	ArcGIS Server	An ArcGIS Server application is employed to provide Oracle Spatial SDE (**3F**), Tile Cache (**4F**) and MS SQL SDE (**5F**) spatial data to published MDOT Map Services (**4D**) and Web Services (**5D**).
4F	MGF Version x Tile Cache	Tile Cache data is created from MS SQL SDE feature layers (5F), and is accessed through ArcGIS Server. Tile caches are used to improve the performance of map redraws at various map scales.
5C	MDOT Version x Shapefiles	MDOT spatial data stored as Shapefiles is directly accessed by Desktop GIS applications (**2B**, **2C**).
5D	Web Services	MDOT ArcServer Web Services are used by Web Browser clients (2A) to access spatial data.
5F	MGF Version x MS SQL Spatial SDE	MDOT spatial data stored in MS SQL is accessed via SDE through ArcGIS Server (**4E**). This data is also used to create Tile Cache data (**4F**).

Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS) John MacNaughton (OPUS)	First Draft for internal review and submission to MDOT – process map included as part of Publish Road Network process map	20-Aug-2013
2	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map included as part of Publish Road Network process map	26-Aug-2013
3	Dave Loukes (OPUS)	Separate process map and draft process description for submission to MDOT	5-Sept-2013
4	Dave Loukes (OPUS)	Final process map and process description for submission to MDOT	20-Sept-2013

Attached:

1. As-Is Business Process Map: Access Spatial Road Network Data (Version 4) dated 20-Sept-2013.


MDOT "As-Is" Location Referencing Management: Access Spatial Road Network Data (Version 4)
20-Sept-2013
1
2
3
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5
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7
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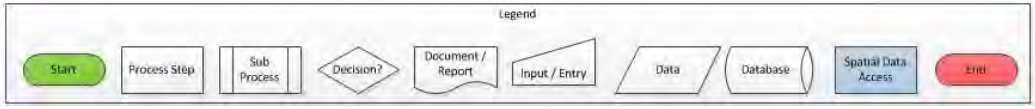
9
10
11
12
13
MDOT Bus. Users
MDOT GIS Team
DTMB Spatial Support Team
A
B
C
D
E
F
Spatial Data Access
Web Browser Client
Desktop GIS
Spatial Data Access
Desktop GIS
MDOT Version x Shapefiles
Map Services
Web Services
ArcGIS Server
MGF Version x Oracle Spatial SDE
MGF Version x Tile Cache
MGF Version x MS SQL Spatial SDE


Legend
Start
Process Step
Sub Process
Decision?
Document / Report
Input / Entry
Data
Database
Spatial Data Access
End

MDOT EAMS
Business Process Description

Process Stage: As-Is

Process Name: Locate Business Data for Asset Management

Parent Business Process / Facet: Location Referencing Management

Process Owner: MDOT

Primary Deliverables / Products: Business asset locations

Primary Client: MDOT

Process Cycle and Duration: As required, varies by business unit

Description:
The Locate Business Data for Asset Management business process is used to capture the location of MDOT road network assets from field inventory surveys and store this information within MDOT business application databases in a form suitable for use in asset management. A key underlying assumption is that asset locations will be initially captured in a format that is compliant with MDOT location referencing standards.

This process is triggered by a request for an inventory survey. Some asset inventories are updated annually (for example: Sufficiency) while others are undertaken as needed to meet business unit needs (for example: culverts).

Participants:

Department / Agency	Actors	Description of Role
MDOT	Inventory Collection Staff – Region Staff	Collect asset inventory in the field upon request using MDOT approved and business specific survey methods.
MDOT	GIS Staff	Collect asset inventory in the field upon request from a business unit using MDOT approved and business specific survey methods; process inventory files to verify and translate location references as needed to meet business needs; load assets and location references into MDOT GIS and business application databases; migrate spatial data.
DTMB	CSS	Provide LRS translation services; create and load spatial data into MDOT GIS databases; migrate spatial data.
DTMB	Business Application Support	Translate LRS locations; load asset locations into MDOT business applications; migrate asset locations.
MDOT	Business Application User	Access spatial and textual business application databases.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Inventory Survey Request	An MDOT business unit issues a request for an asset inventory survey. This request may be sent to unit staff or to the MDOT GIS Group.
2A	Capture Asset Location	An asset location is captured by MDOT business unit staff and entered into an inventory file.
2B	Capture Asset Location	An asset location is captured by MDOT GIS staff and entered into an inventory file.
3A	Inventory File	An inventory file is created by business unit staff and forwarded to the MDOT GIS Unit staff. Asset locations and other attributes are contained within this file.
3B	Inventory File	An inventory file is created by MDOT GIS Unit staff. Asset locations and other attributes are contained within this file.
3E	Error Report	If no valid location references are recorded for an asset, an error report is created. A new request for survey will be raised (process step **1A**).
4B	PR-MP Location Exists?	If a PR-MP location exists, spatial data (process steps **8C**, **8D**) and asset data (process step **9E**) records are created. Otherwise, another logic check is made (process step **4C**).
4C	Coordinates Exist?	If a coordinate location exists, logic check **5C** is made. Otherwise, logic check **4E** is made.
4E	CS-MP Location Exists?	If a CS-MP location exists, it is translated into a PR-MP location (process step **5E**). Otherwise, an error report is generated (process step **3E**).
5C	LRS Location Req'd?	If a coordinate location exists and a LRS location is required, the coordinate location is translated to a PR-MP location (process step **6C**or **6D**). Otherwise, the coordinate location is used directly to create MDOT (process step **8C**) and / or Oracle (process step **8D**) spatial data records.
5E	Translate CS-MP Location to PR-MP (Application Scripts)	The CS-MP location is translated to a PR-MP location by an application script, utilizing the CS-PR Equivalency Table.
5F	CS-PR Equivalency Table	The CS-PR Equivalency Table contains data that enables translation between the CS-MP and PR-MP Linear Referencing Methods.

Index	Process Step	Description
6C	Translate Location to PR-MP (ArcGIS Tools)	MDOT GIS staff utilize ArcGIS tools to translate a coordinate location reference into a PR-MP coordinate location reference. Alternatively, a DTMB / CSS LRS translation service may be used (process step **6D**).
6D	Translate Location to PR-MP (LRS Services)	DTMB / CSS provides a LRS translation service that may be used to translate a coordinate location reference to a PR-MP location reference.
7B, 7E	PR-MP Location	A PR-MP asset location reference is available for subsequent processing (steps **8C**, **8D**, **8E**).
8C	Create MDOT Spatial Data	MDOT GIS staff create shapefile (**10B**) and MS SQL SDE (**11C**) spatial data asset records using either coordinate or PR-MP locations.
8D	Create Oracle Spatial Data	DTMB/CSS staff create Oracle Spatial SDE (**9D**) spatial data records.
8G	Access Spatial Data	MDOT business application users access spatial data from shapefile (**10B**), MS SQL SDE (**11C**) and Oracle Spatial SDE (**9D**) GIS databases.
9D	MDOT GIS Databases (Oracle Spatial SDE)	MDOT spatial data stored in Oracle Spatial is accessed via SDE. At present, this data is stored in the GLOBAL database.
9E	Store Asset Location	The asset PR-MP location is stored along with other attributes in an MDOT business application asset database
9F	Asset Databases (TMI, PHD, GLOBAL, Sufficiency, etc.)	MDOT business application asset databases contain textual data and may be stored in either MS SQL or Oracle. Examples include TMI, PHD, GLOBAL, and Sufficiency.
9G	Access Asset Data	MDOT business application users access textual asset data from asset databases (**9F**).
10B	Shapefiles	MDOT shapefile GIS databases contain asset data that are accessed via ArcGIS desktop and ArcGIS Server web tools.
10D	New MGF Version Avail?	If a new MGF Version is available, Oracle Spatial SDE data is migrated to the new Version (process step **11D**). Otherwise, the spatial data is ready for use (process step **13D**).
10E	New MGF Version Avail?	If a new MGF Version is available, asset locations are migrated to the new Version (process step **10F**). Otherwise, the asset database is ready for use (process step **12E**).

Index	Process Step	Description
10F	Migrate Asset Data	DTMB business application support staff migrate MDOT business application asset database locations to the new Version. Refer to the *Publish Road Network Data* business process for details concerning this migration.
11C	MDOT GIS Databases (MS SQL SDE)	MDOT spatial data stored in MS SQL is accessed via SDE. At present, this data contains various asset feature classes such as Mile Markers, Guardrails, Signs, Culverts, Freeway Lights, Lane Miles and Roadside Facilities in addition to PR-MP, CS-MP and Route-MP LRM Routes.
11D	Migrate Oracle Spatial Data	DTMB/CSS staff migrate MDOT Oracle Spatial SDE asset locations to the new Version. Refer to the *Publish Road Network Data* business process for details concerning this migration.
12B	Migrate MDOT Spatial Data	MDOT GIS staff migrate MDOT MS SQL SDE asset locations to the new Version. Refer to the *Publish Road Network Data* business process for details concerning this migration.
12C	New MGF Version Avail?	If a new MGF Version is available, MS SQL SDE data is migrated to the new Version (process step **12B**). Otherwise, the spatial data is ready for use (process step **13D**).
12E	Asset Databases Ready for Use	The process is completed. The new asset LRM locations have been stored within MDOT business application databases and are ready for use.
13D	Spatial Data Ready for Use	The process is completed. The new asset spatial data features have been stored within MDOT spatial databases and are ready for use.

Change Log:

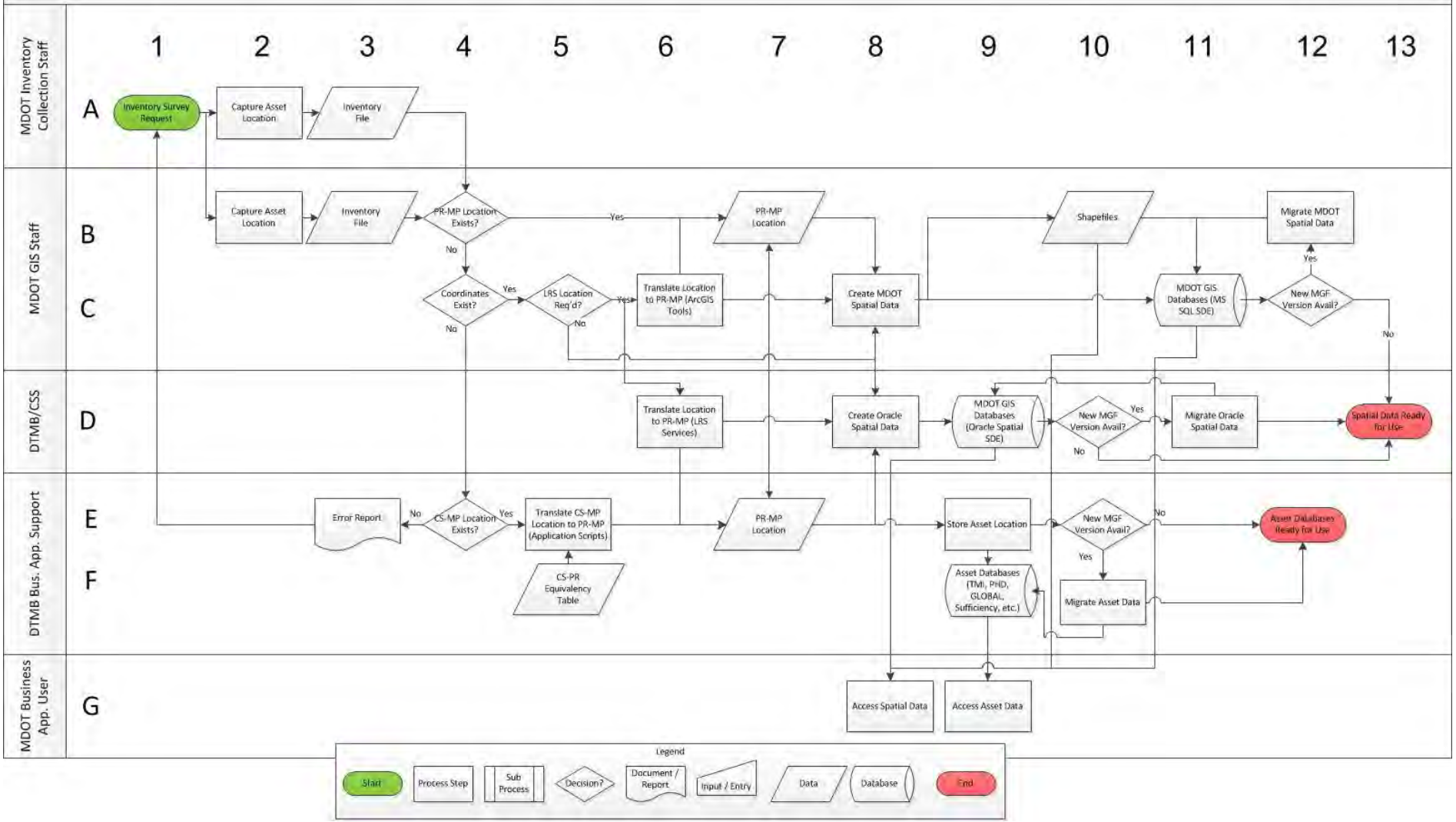
Version	Authors	Description	Date
1	Dave Loukes (OPUS) John MacNaughton (OPUS)	First Draft for internal review and submission to MDOT – process map only	20-Aug-2013
2	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map only	26-Aug-2013
3	Dave Loukes (OPUS)	Final process map and draft process description for submission to MDOT	5-Sept-2013
4	Dave Loukes (OPUS)	Final process description incorporating MDOT feedback.	20-Sept-2013

Attached:

1. As-Is Business Process Map: Locate Business Data for Asset Management (Version 3) dated 5-Sept-2013.

MDOT "As-Is" Location Referencing Management: Locate Business Data for Asset Management (Version 3)

5-Sept-2013



1.2 To-Be Road Network Management Business Processes

MDOT and DTMB with the MGF are going to implement the road network management functionality of the EAMS gradually, consequently processes have been broken into two groups.

Phase 1 EAMS implementation

- Update Road Network
- Publish Road Network
- Access Spatial Road Network Data
- Locate Business Data for Asset Management

Future Vision

- Update and Publish Road Network
- Locate Business Data for Asset Management

Note that the “To-Be” business processes are considered to be a vision of future requirements and therefore subject to change in subsequent EAMS project phases

MDOT EAMS
Business Process Description

Process Stage:	To-Be
Process Name:	Update Road Network – Phase 1
Parent Business Process / Facet:	Location Referencing Management
Process Owner:	DTMB / CSS in cooperation with MDOT
Primary Deliverables / Products:	Revisions to the Michigan Geographic Framework (MGF): • Road network spatial data & attributes • MGF PR-MP Event tables
Primary Client:	MDOT
Process Cycle and Duration:	As required, based upon update requests received during each calendar year

Future Vision - To Be Determined

Description:
The Update Road Network business process is used to make changes to the Michigan Geographic Framework (MGF) spatial database based upon change requests received from Michigan stakeholders including MDOT. These changes are made within an Oracle Spatial edit environment operated by the Department of Technology, Management and Budget Center for Shared Solutions (DTMB / CSS) by DTMB and MDOT staff. All changes to the MDOT trunkline network component of the MGF are made by the MDOT Trunkline Specialist in order to ensure that Route and Control Section definitions, attributes and associated Linear Referencing Methods are correctly handled to ensure the ongoing integration of MDOT business data based upon LRS locations.

This process is triggered by a change request. Changes are processed throughout the year until a cut-off date is reached for publication of the next MGF version (release). Subsequent change requests will be held for processing against the new MGF version once it is published.

The EAMS Phase 1 business process is identical to the existing (As-Is) process. This has been recommended and agreed to avoid risk to the project during the initial implementation. The future vision for EAMS road network management is to implement COTS functionality for road network editing that will enable changes to MDOT Linear Referencing Methods (LRMs) and associated LRS event locations to be updated as they occur. Refer to the *Update and Publish Road Network – Future Vision* business process description for details regarding how this is anticipated to be implemented at a future date.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Data Source	Identify trunkline network change and submit change request
MDOT	Network Editor	Verify and process trunkline network changes to update the MGF
DTMB	Network Editor	Process non-trunkline network changes to update the MGF
DTMB	Staff (various)	Identify non-trunkline network change and submit change request; accept change requests; forward trunkline change requests to MDOT Network Editor; verify non-trunkline network changes and assign to a DTMB Network Editor; monitor status of requests through completion.
External Agency	Various	Identify non-trunkline network change and submit change request. External agencies may include other State of Michigan agencies, Counties and Municipalities.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Request for Change	A request for change is submitted by an MDOT Data Source. These requests will go directly to the MDOT Network Editor.
1E	Request for Change	A request for change is submitted by a DTMB Staff person. These requests will be sent to a DTMB staff coordinator.
1F	Request for Change	A request for change is submitted by an External Agency. These requests will be sent to a DTMB staff coordinator.
2D	Source Data	Data supporting the change request is supplied by DTMB staff. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
2E	Verify Request & Assign Editor	DTMB staff verifies the request and assign a Network Editor.
2F	Source Data	Data supporting the change request is supplied by an External Agency. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
3B	Verify Request	Trunkline requests will be verified by the MDOT Network Editor.
3E	Trunkline Network?	If the request involves the trunkline network, it is forwarded to the MDOT Network Editor (**3B**). Otherwise, it is sent to a DTMB Network Editor (**4D**).

Future Vision - To Be Determined

Index	Process Step	Description
4A	Source Data	Data supporting the change request is supplied by an MDOT Data Source. Most (90%) of source data is currently supplied as CAD files, although some GPS survey data is also received. **Note:** in the future, it is anticipated that an increasing amount of source data will be supplied as GPS survey files.
4B	Update Geometry & Basic Attributes	MGF trunkline road network geometry changes and basic attributes are entered by the MDOT Network Editor.
4D	Update Geometry & Basic Attributes	MGF non-trunkline road network geometry changes and basic attributes are entered by a DTMB Network Editor.
5D	Road PR Segment?	If the change involves a road segment that contains PR-MP linear referencing, this data must be updated (**6D**). Otherwise, the change proceeds to final processing (**9D**).
6B	Update PR-MP attributes & MALI tables	The MDOT Network Editor updates the PR-MP attributes for the affected trunkline MGF PR Segments. These changes are used to update PR Segment data contained within the MALI database tables.
6C	MGF	The MALI database tables within the MGF database are updated through process steps 6B and 6D to reflect MGF PR Segment changes.
6D	Update PR-MP attributes & MALI tables	The DTMB Network Editor updates the PR-MP attributes for the affected non-trunkline MGF PR Segments. These changes are used to update PR Segment data contained within the MALI database tables.
7B	Update Road Classification Data	The MDOT Network Editor updates the road classification attributes for the affected trunkline MGF road centerline features.
8B	Update CS, Route & other MDOT Data	The MDOT Network Editor updates the Route, CS-MP and other MDOT attributes for the affected trunkline MGF PR Segments.
9A	Sufficiency Database	The MDOT Sufficiency database is used as input to the Sufficiency Reconciliation process step (**9B**). Any required updates to the CS-MP data residing within this database are posted as an output from this process step.
9B	Sufficiency Reconciliation	The MGF CS-MP data is reconciled with that residing within the Sufficiency database. The MGF and Sufficiency CS-MP attributes are updated as required.
9D	Save Road Network Changes	The DTMB Network Editor carries out final Q/C checks and commits the non-trunkline road network geometry and attribute changes to the MGF database.

Future Vision - To Be Determined

Index	Process Step	Description
10B	Save Road Network Changes	The MDOT Network Editor carries out final Q/C checks and commits the trunkline road network geometry and attribute changes to the MGF database. PR-MP locations of any MGF event features associated with the revised PR Segments are then updated by DTMB (step **11C**).
10C	MGF	The edit environment MGF database is updated by process steps **9D** and **10B** to reflect changes in road network spatial data.
10D	Road PR Segment?	If the road network change impacts a PR Segment, process step **11C** is completed. Otherwise the change request is closed out (**12C**).
11C	Update Framework Event PR-MP Locations	The DTMB Network Editor updates the PR-MP locations of any MGF event features associated with the revised PR Segments.
11D	MGF	The edit environment MGF database is updated by process step **11C** to reflect changes in event data PR-MP locations.
12C	Done	The change request is closed out.

Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS)	First Draft for submission to MDOT – process map only	25-Sep-2013
2	Dave Loukes (OPUS)	Final process map and draft process description for submission to MDOT	26-Nov-2013

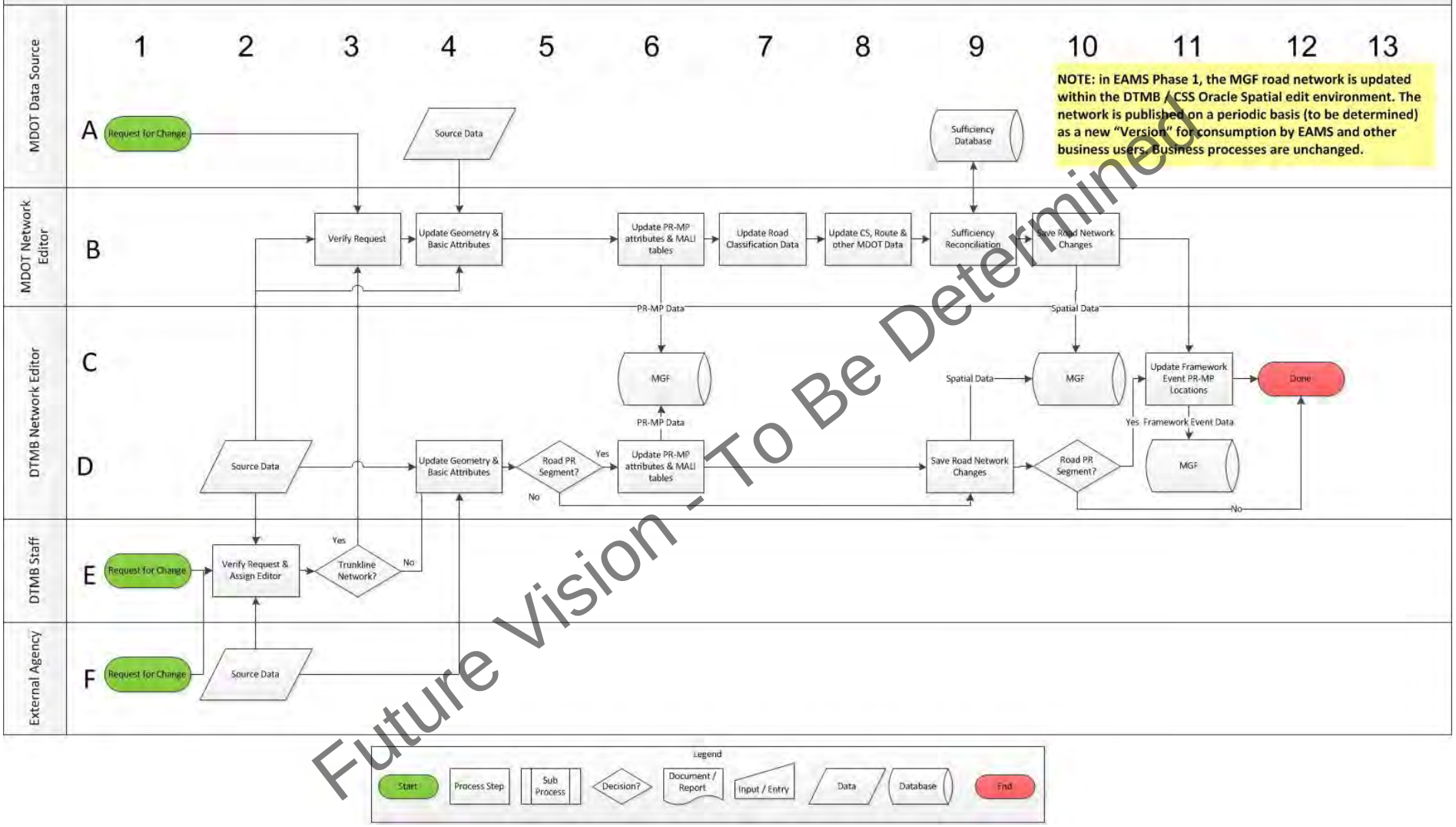
Attached:

1. MDOT EAMS "To-Be" Location Referencing Management: Update Road Network – Phase 1 (Version 2) dated 3-Oct-2013.

Future Vision - To Be Determined

MDOT EAMS "To-Be" Location Referencing Management: Update Road Network – Phase 1 (Version 2)

3-Oct-2013



Future Vision - To Be Determined

MDOT EAMS
Business Process Description

Process Stage: To-Be

Process Name: Publish Road Network – Phase 1

Parent Business Process / Facet: Location Referencing Management

Process Owner: DTMB / CSS in cooperation with MDOT

Primary Deliverables / Products:

1. A new (Version x) of the Michigan Geographic Framework (MGF) database.
2. Migration files to enable the update of MDOT GIS and business application databases to MGF Version x.
3. Version x MDOT Geospatial Data Repository (MGDR) database for MDOT EAMS and other GIS users.
4. Version x Oracle Spatial SDE (GLOBAL) database for MDOT GIS users.
5. Version x EAMS database tables containing updated PR-MP and CS-MP location references.
6. Version x TMS, MAP and other MDOT business application databases containing updated PR-MP and CS-MP location references.

Primary Client: MDOT

Process Cycle and Duration: Yearly at present. The cut-off date is normally at the end of February, and the new MGF Version is available for MDOT use in April.

Future Vision - To Be Determined

Description:
The Publish Road Network business process is used to create a new production release (Version x) of the Michigan Geographic Framework (MGF) spatial database that reflects changes made within the past year based upon requests received from Michigan stakeholders including MDOT. MGF Version x is published from an Oracle Spatial edit environment operated by the Department of Technology, Management and Budget Centre for Shared Services (DTMB / CSS) by DTMB and MDOT staff. Migration files generated by this process are used by DTMB business application and spatial support staff, and by MDOT GIS staff, to create new Version x spatial and textual databases for use by MDOT business users.

This process is triggered by a specified cut-off date that locks down the MGF edit environment. At present, it is run annually commencing at the end of February. In addition to new Version x spatial databases that reflect the updated road network along with numerous other feature classes, PR-MP and CS-MP locations within MDOT business applications are updated to reflect the Version x network. This is accomplished through custom migration scripts that are specific to each application database that is migrated. A number of transportation LRS event tables are included within the core MGF product.

In EAMS Phase 1, the MGF road network is updated within the DTMB / CSS MGF edit environment and published on a periodic basis (to be determined) as a new “Version” for consumption by EAMS and other business users.

Existing business processes are revised to consume the MGF Version x migration files within the EAMS environment and update the road network, MDOT LRMs and EAMS asset LRS locations to Version x. This will also include the updating of LRS locations within any foreign tables that are managed by EAMS (to be determined).

Business processes for the updating of LRS locations within MDOT business applications that are not managed by EAMS are unchanged.

Participants:

Department / Agency	Actors	Description of Role
MDOT	EAMS Support Team	Create MGF Version x MGDR database for MDOT GIS application users, and migration files to assist in the TMS migration process step.
DTMB	Spatial Support Team	Create MGF Version x Oracle Spatial SDE database and ArcGIS Server tile caches for MDOT GIS and business application use.
DTMB	Business Application Support	Migrate PR-MP and CS-MP locations within MDOT business application databases to MGF Version x.
DTMB	MGF Team	Carry out year-end processes to create and publish MGF Version x.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1H		The process begins with a directive to lock down the MGF edit environment in preparation for creation of the Version x MGF database.
2H		The MGF PR Segment lengths are validated against the Michigan Accident Location Index (MALI) PR Segment lengths. Any discrepancies are resolved to ensure that the two databases are synchronized.
2I		The MGF edit environment database is used as input to process step **2H**. This database contains spatial PR Segment network definitions and MALI data tables.
3F		The current Sufficiency database contains CS-MP logical network section definitions and associated lengths that have been adjusted throughout the year as MGF updates occur. It is used as input to the final Sufficiency Reconciliation process step (**4H**) that occurs prior to publishing MGF Version x.

Future Vision - To Be Determined

Index	Process Step	Description
3H	Re-Mile Point MGF Data	All Mile Points along each PR Segment within the MGF database are recalculated using the latest segment lengths.
4F	Sufficiency Database (Version x)	This database contains CS-MP logical network section definitions and associated lengths that have been updated by the Sufficiency Reconciliation process step (**4H**).
4H	Sufficiency Reconciliation	This process step compares the logical CS-MP network stored in the Sufficiency database against the spatial CS-MP network stored within the MGF edit environment database. Any discrepancies are resolved to ensure that the two databases are synchronized. Once it is completed, the Sufficiency Database has been updated to Version x.
5G	MGF Version x	The MGF Version x database is created as the output from the Publish process step (**5H**). It forms the basis for the generation of subsequent Framework migration files and the creation of MDOT Version x spatial databases for GIS and business application use.
5H	Publish MGF Version x	The DTMB MGF Team creates the MGF Version x spatial database (**5G**) and the Framework migration files associated with it (**6H**).
6B	EAMS Database	The EAMS database contains tables with LRS Event locations referencing assets and other business data against the current road network.
6E	EAMS Framework Migration	This step uses the MGF Version x Migration Files (**6H**) to update EAMS Database (**6B**) PR-MP LRS Event locations to Version x. This process is performed using back end database scripts similar to those used for the migration of LRS Event locations within other MDOT business databases such as TMS and MAP.
6H	MGF Version x Migration Files	The migration files include the following: • MGF Statewide Files • Old and new MALI files • Working Transactions • Migration Table • Metadata and MGF appendices • PR/CS Equivalency Table • Sufficiency Working and Report Files with full PR and CS Referencing
7A	Process GeoData	The MDOT EAMS Support Team accesses the MGF Version x database (**5G**) to create a new road centerline and other MGF basemap layers within the MDOT ArcGIS environment. These layers are used as input to the MGF Version x Spatial Migration process (step **8A**).
7B	MDOT Geospatial Data Repository	The MGDR contains spatial data feature layers used by EAMS and other business applications. Ii is accessible via ArcSDE and ArcGIS Server.

Future Vision - To Be Determined

Index	Process Step	Description
8A	MGF Version x EAMS Spatial Migration	The MDOT GIS Team saves the existing MGF feature layers, associated LRM Routes and LRS event feature geometry as history layers. The new MGF Version x feature layers including the road centerline network and other basemap layers (administrative boundaries, etc.) are then stored within the updated MGDR (**9B**) for use by MDOT business users and applications. MDOT Business LRMs (process step **9A**), LRS Event spatial features (step **10A**), and TMS Migration Files (process step **12A)** are also created.
8E	TMS Framework Migration	The TMS Framework Migration process step creates a new transitional TMS Version x Database (**9E**) using the current TMS Database (**8F**), MDOT Version x TMS Migration Files (**12B**) and MGF Version x Migration Files (**6H**) as inputs. Once this is completed, the TMS-Sufficiency Update (process step **10F**) is carried out. There are two sub-processes executed: • TMS Foxpro migration programs • TMS Oracle migration procedures
8F	TMS Database	The current TMS database is used as input to the TMS Framework Migration process (step **8E**).
9A	Build PR-MP, CS-MP & Route-MP Routes	ArcGIS LRS Route systems are created for the PR-MP, CS-MP and Route-MP LRMs and stored within the Version x MS SQL SDE database (**9B**).
9B	MGF Version x MDOT Geospatial Data Repository	The MGF Version x MGDR contains the MGF Version x road network database, boundary layers, other MGF features, LRM Routes and MGF core LRS events. Other MDOT business data is linked to the road network through PR-MP and CS-MP LRMs.
9E	TMS Version x Database (Post Migration)	This transitional database contains updated PR-MP locations for business tables. It is created by process step **8E** and used as input to the TMS-Sufficiency Update process step (**10F**).
9F	Sufficiency File (post reconcile with MGF)	This file contains Version x CS-MP LRM data following completion of the Sufficiency Reconciliation process step (**4H**).
10A	Relocate EAMS LRS Events	The updated LRS locations within the EAMS database (**10B**) are used as input to create new LRS event features which are stored within the MGF Version x MGDR (**11B**).
10B	EAMS Database	As per **6B**. Following completion of process step **6E**, this database now has LRS locations within business tables updated to MGF Version x.
10D	MGF Version x Oracle Spatial Migration	This step initiates the process to create the MGF Version x Oracle Spatial SDE (**11C**). Shapefiles are extracted from the MGF Version x MGDR (**9B**) and converted to SDO. TMS business events are input from the Version x Sufficiency Database (**10E**), the Version x MAP Database (**11E**) and other MDOT Version x business application databases (**12E**).

Future Vision - To Be Determined

Index	Process Step	Description
10E	TMS Version x Database (Post Migration, Post Sufficiency)	Once the TMS - Sufficiency Update process step (**10F**) has been completed, the TMS Database contains MGF Version x CS-MP locations.
10F	TMS – Sufficiency Update	This process step creates Version x Sufficiency tables within the final TMS Version x database (**10E**).
11B	MGF Version x MDOT Geospatial Data Repository	The MGDR now contains MGF Version x LRS event features.
11C	MGF Version x Oracle Spatial SDE (GLOBAL)	This database contains MGF Version x Oracle Spatial SDE data that is created through process steps **10D** and **11D**.
11D	Build PR-MP, CS-MP & Route-MP Routes	The PR-MP, CS-MP and Route-MP LRM Routes are created using the MGF Version x road network feature attributes and stored in the MGF Version x Oracle Spatial SDE Database (**11C**).
11E	MAP Database	The MAP Database contains business table PR-MP locations that are updated to Version x following completion of the MAP Framework Migration process step (**11F**).
11F	MAP Framework Migration	This step uses the MGF Version x Migration Files (**6H**) to update MAP Database (**11E**) PR-MP locations to Version x.
12A	Create TMS Migration Files	The MDOT GIS Team creates migration files (**12B**) for use by the TMS Framework Migration process step (**8E**).
12B	MDOT GIS Version x TMS Migration Files	These files include updated City Boundary, Zip Code and Lane Quantity PR-MP locations.
12C	MGF Version x Tile Cache	These files are accessed by ArcGIS Server applications to optimize map draw times for MGF Version x base layers.
12D	Build ArcGIS Server Tile Cache	This is a second process step as part of the MGF Version x Spatial Migration (**10D**) and uses the SDO shapefiles to create an ArcGIS Server tile cache (**11C**).
12E	Other Bus. App. Databases (MAP-X, PHD, PRFINDER, CRASH, etc.	Other MDOT business application database table PR-MP locations are updated to Version x following completion of the MAP Framework Migration process step (**11F**). These databases include MAP-X, PHD, PRFINDER and CRASH.
12F	Other MDOT Bus. App. Framework Migrations	This step uses the MGF Version x Migration Files (**6H**) to update PR-MP locations within other MDOT business application databases (**12E**) to Version x.

Future Vision - To Be Determined

Index	Process Step	Description
13D	Road Network Spatial Data Updated to Version x	All MDOT spatial data has been updated to MGF Version x.
13F	LRS Locations Updated to Version x	LRS locations within EAMS and other selected MDOT business applications have been updated to MGF Version x.

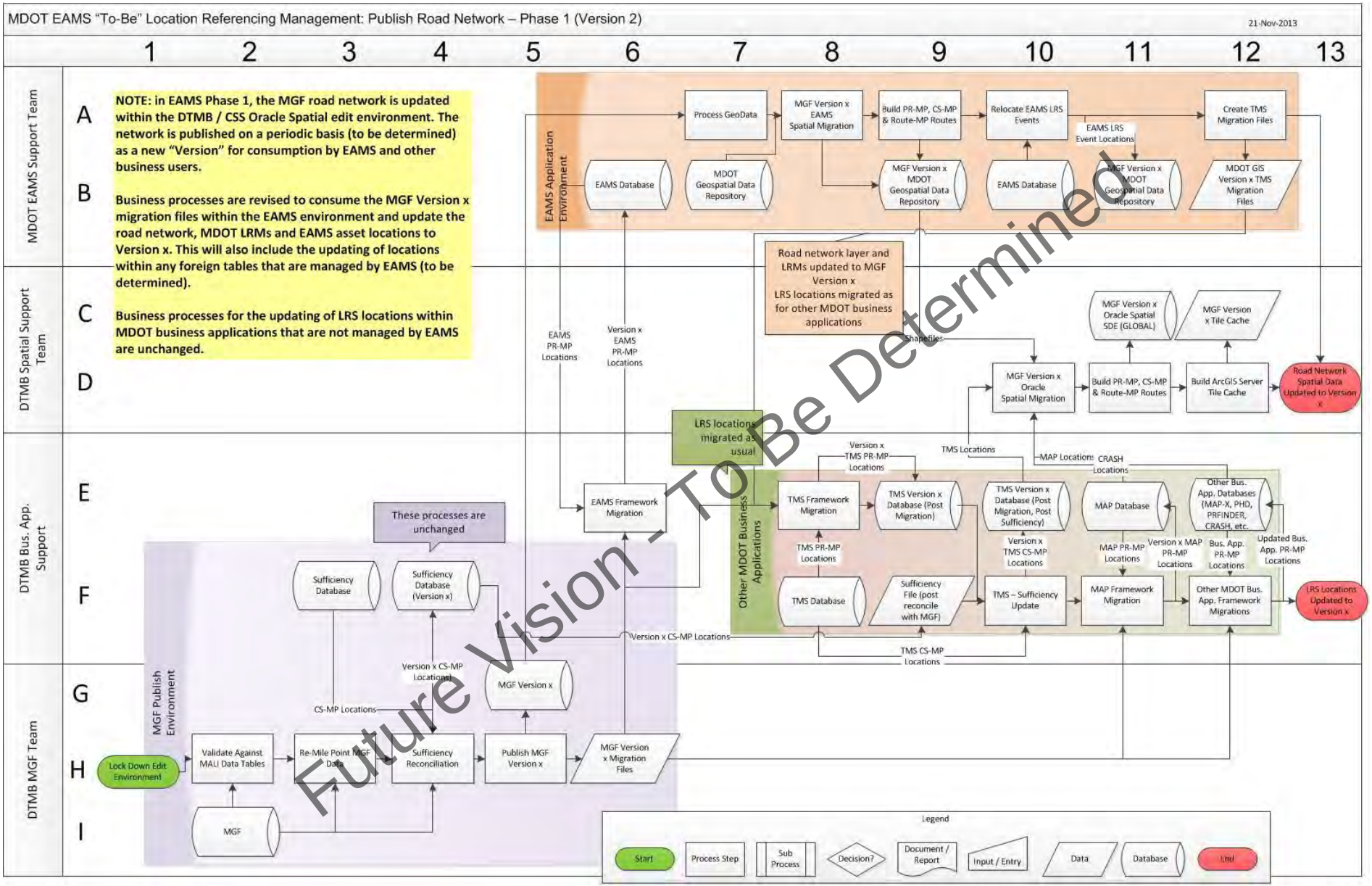
Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS)	First Draft for submission to MDOT – process map only	25-Sept-2013
2	Dave Loukes (OPUS)	Second Draft for internal review and discussion – process map only	8-Oct-2013
3	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map and process description	26-Nov-2013

Attached:

1. To-Be Business Process Map: Publish Road Network – Phase 1 (Version 3) dated 21-Nov-2013.

Future Vision - To Be Determined



Future Vision - To Be Determined

MDOT EAMS
Business Process Description

Process Stage: To-Be

Process Name: Access Spatial Road Network Data

Parent Business Process / Facet: Location Referencing Management

Process Owner: MDOT

Primary Deliverables / Products: Spatial road network data available for use within MDOT GIS and business applications

Primary Client: MDOT

Process Cycle and Duration: As required to support MDOT GIS and business applications

Description:
The Access Spatial Road Network Data business process is used by MDOT staff to access MDOT road network spatial data stored within the MDOT Geospatial Data Repository (MGDR) in support of asset management. Access is enabled through various software applications including web clients, desktop GIS and ArcGIS Server Map Services and Map Services.

This process is triggered by a spatial data access request from an MDOT software application.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Business User	Access spatial data to meet asset management business needs.
MDOT	GIS Team	Access spatial data to meet asset management and user support business needs; maintain MDOT spatial data.
DTMB	Spatial Support Team	Maintain MDT spatial data.

Process Map: (See Attached)

Future Version - To Be Determined

Process Steps Descriptions:

Index	Process Step	Description
1A	Spatial Data Access	A spatial data access request is initiated by an MDOT business user through a web client (**2A**), desktop GIS (**2B**) or mobile device (**2C**).
1D	Spatial Data Access	A spatial data access request is initiated by an MDOT EAMS Team individual through desktop GIS (**2D**).
2A	Web Clients	A web client software application is employed by an MDOT business user to access spatial data through Web Services (**4E**).
2B	Desktop GIS	A desktop GIS application is employed by an MDOT business user to access spatial data through Map Services (**3E**).
2C	Mobile Device	A mobile device is employed by an MDOT business user to access spatial data through Map Services (**3E**).or Web Services (**4E**).
2D	Desktop GIS	A desktop GIS application is employed by an MDOT EAMS Team individual to access spatial data through Map Services (**3E**).or ArcSDE directly (**2G**).
2G	ArcSDE	ArcSDE is used to access MDOT spatial data stored in the MDOT Geospatial Data Repository (MGDR).
2H	MDOT Geospatial Data Repository	MDOT vector spatial data used by EAMS is stored within the MGDR, which contains the MGF road network layer and associated Linear Referencing Methods (LRMs), MDOT LRS Events, other MGF basemap feature layers, and other layers used by MDOT business applications.
3E	Map Services	ArcGIS Server Map Services are used by desktop and mobile client applications to access spatial data feature layers stored within the MGDR.
3F	ArcGIS Server	An ArcGIS Server application is employed to provide Map Services (**3E**) and Web Services (**4E**) to permit access to MGDR spatial data.
3H	MGF Version x Tile Cache	Tile Cache data is created from MGDR feature layers (**2H**), and is accessed through ArcGIS Server Map Services (**3E**) and Web Services (**4E**). Tile caches are used to improve the performance of map redraws at various map scales.
4E	Web Services	ArcGIS Server Web Services are used by web browser client and mobile device applications to access spatial data stored within the MGDR.

Future Vision - To Be Determined

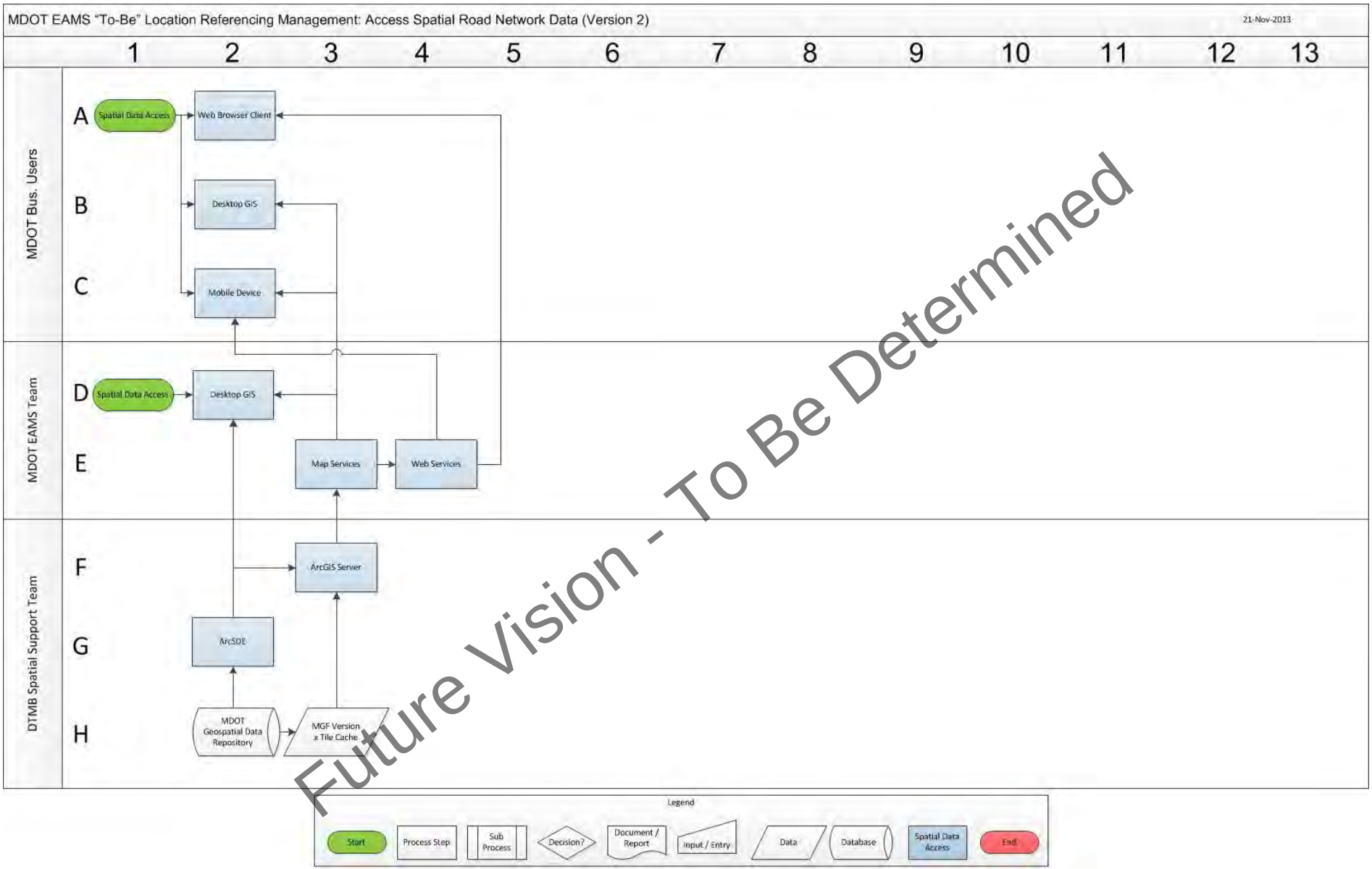
Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS)	First Draft for submission to MDOT – process map only	25-Sept-2013
2	Dave Loukes (OPUS)	Second Draft for submission to MDOT – process map and draft process description	26-Nov-2013

Attached:

1. To-Be Business Process Map: Access Spatial Road Network Data (Version 2) dated 21-Nov-2013.

Future Vision - To Be Determined



Future Vision - To Be Determined

MDOT EAMS
Business Process Description

Process Stage:	To-Be
Process Name:	Locate Business Data for Asset Management – Phase 1
Parent Business Process / Facet:	Location Referencing Management
Process Owner:	MDOT
Primary Deliverables / Products:	EAMS asset locations
Primary Client:	MDOT
Process Cycle and Duration:	Project based, for Design and Construction projects Work Order based, for Maintenance activities

Future Vision - To Be Determined

Description:

The EAMS Phase 1 Locate Business Data for Asset Management business process is used to capture the location of MDOT road network assets from existing MDOT business activities. There are two main business process streams involved:

1. Design and Construction Projects.
2. Maintenance Activities.

The key underlying assumptions are that:

1. Asset locations will be initially captured in a format that is compliant with MDOT field survey standards.
2. CAD data layering standards and attribute coding conventions have been established that will enable the transfer of assets into the EAMS GIS environment.
3. Asset locations (and attributes) will be captured as a by-product of existing business processes – asset specific inventory surveys will no longer be required.

Design and Construction Projects

Asset locations are captured from field surveys and stored within Design and Construction Engineering Data files in a format suitable for use with MDOT roadway design software.

This process is triggered by a request for a field survey. These surveys are carried out as required to support MDOT Design and Construction projects. The transfer of new asset locations and supporting attributes to EAMS from As-Built Data files is enabled by MDOT standards for location referencing and CAD layer coding.

Maintenance Activities

Asset locations are captured as a by-product of routine maintenance activities using mobile technologies.

This process is triggered by a maintenance work order issued by MDOT or Local Agency staff.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Field Survey Staff	Collect asset inventory in the field upon request to support Design and Construction projects using MDOT approved survey methods; create initial CAD files.
MDOT	Design Staff	Create new assets using MDOT design software; create additional Design CAD files and drawings to support Construction activities.
MDOT	Construction Staff	Conduct field inspections; update Design CAD files to create electronic CAD As-Built drawing files; liaise with EAMS support staff to support transfer of asset locations from CAD to GIS.
MDOT	EAMS Team	Facilitate transfer of asset locations from CAD to EAMS; facilitate transfer of asset locations from maintenance files to EAMS.
MDOT/DTMB	Application Support	Host / support the EAMS application environment.
MDOT	Maintenance Staff	Issue work orders; complete maintenance activities; verify local agency maintenance work.
Local Agency	Maintenance Staff	Issue work orders; complete maintenance activities.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1C	Field Survey Request	A request for a field survey is issued by MDOT Design project staff.
1L	Work Order	A Maintenance Work Order is issued by MDOT Maintenance staff.
1N	Work Order	A Maintenance Work Order is issued by a Local Agency.
2A	Capture Assets (GPS, LiDAR, Total Station)	Assets are captured by MDOT field survey staff using approved survey procedures and equipment (GPS, LiDAR, total stations) and stored in Survey Files (**2B**).
2B	Survey Files	MDOT Survey Files contain asset coordinate locations and attributes in a format suitable for the creation of initial CAD Files (process step **3A**) and Engineering Data files (process step **4A**).
2I	EAMS Database (Assets, Plans, Accomplishments, etc)	The EAMS database includes LRS Event tables containing locations of assets, work plans, accomplishments and other information required in support of MDOT maintenance and asset management activities.

Future Vision - To Be Determined

Index	Process Step	Description
2L	Complete Maintenance Activity	A maintenance activity is completed by MDOT Maintenance staff in fulfillment of a Work Order (**1L**). The location(s) of any affected assets are captured as a by-product of this activity (**2M**) in addition to accomplishment data.
2M	Affected Asset Locations	The location(s) of any affected assets are captured as a by-product of the MDOT maintenance activity (**2L**). Locations are captured as coordinates to MDOT standards using GPS embedded within mobile technologies.
2N	Complete Maintenance Activity	A maintenance activity is completed by Local Agency staff in fulfillment of a Work Order (**1N**)
3A	Create CAD Files	Initial Engineering Data files (**4D**) are created using MDOT CAD software by field survey staff. These are used to create new assets (process step **4C**).
3B	CAD Files (2D, 3D, Alignment, DTM)	The initial CAD files include: two-dimensional (2D), three-dimensional (3D), Alignment and Digital Terrain Model (DTM).
3I	MDOT Geospatial Data Repository	The MDOT Geospatial Data Repository (MGDR) contains spatial data used by EAMS and other MDOT business applications. These data include the MGF road centerline network, Linear Referencing Method (LRM) definitions and associated LRS Event locations, and other MGF basemap layers.
4C	Create New Assets (CAD)	New assets are created by MDOT Design staff using CAD design software. These assets are added to project Engineering Data files (**4D**).
4D	Engineering Data (Alignment, Construction, Drainage, DTM, 3D Model,, etc.)	Project Engineering Data files include: Alignment, Construction, Drainage and other CAD layers. These are used as input to the Construction Inspection process step (**5E**).
4L	Verified Asset Locations	Verified asset locations resulting from a Local Agency Maintenance activity (**2N**) are stored for subsequent processing.
4M	Verify Work	MDOT maintenance staff verify the work completed under a Local Agency Work Order. As part of this process step, associated asset locations are verified.
4N	Affected Asset Locations	The location(s) of any affected assets are captured as a by-product of the Local Agency maintenance activity (**2N**). **Note:** at this point, the assumption is made that at least some Local Agencies will capture locations as coordinates to MDOT standards using GPS embedded within compatible mobile technologies.
5E	Construction Inspection	MDOT Construction staff conduct field inspections and create a Construction Inspection Survey File (**5F**). **Note: as part of this process step, checks will need to be made to determine whether any existing assets have been removed / abandoned or replaced.**

Future Vision - To Be Determined

Index	Process Step	Description
5F	Construction Inspection Survey File	The Construction Inspection Survey File records the As-Built location of the roadway and its associated assets. It is used as input to the Update Assets process step (**6E**).
5K	Process Asset Location Records	The MDOT EAMS Team receives Affected Asset Locations (**4N**) and Verified Asset Locations (**4L**) from MDOT Maintenance and processes them. Each location record is then subjected to a series of logic checks commencing with step **6K**.
5M	MDOT Geospatial Data Repository	The MGDR is used to assist in the maintenance work verification process step (**4M**).
6E	Update Assets	Assets and their locations are updated using data from the Construction Inspection Survey File (**5F**) and stored within the As-Built Project Data files (**6F**).
6F	As-Built Project Data (Alignment, Drainage, Asset Layers, DTM, 3D Model, etc.)	The As-Built Project Data files contain the final locations of assets resulting from the Construction project.
6J	Retire Asset Location	If the location relates to an asset that has been removed or abandoned, then the asset location is retired (end dated) in the MGDF (**7I**).
6K	Removed / Abandoned Asset?	If the asset has been removed or retired, then the location is removed (step **6J**). Otherwise, the next logic check is carried out (**7K**).
7E	File Project Data	Related project data is filed in an MDOT projects database as part of closing out the project. A notification (**7F**) is sent to the EAMS Team.
7F	Notify EAMS Team	The EAMS Team is notified via email that a new Construction As-Built Project Data file (**6F**) has been created.
7I	MDOT Geospatial Data Repository	New and modified asset locations are stored within the MGDR. Assets that have been retired or abandoned have their locations retired (end dated).
7J	Retire Asset Location	If the location relates to an asset that has been replaced, then the location of the replaced asset is retired (end dated) in the MGDF (**7I**). A new asset location is then created (process step **8J**).
7K	Replaced Asset?	If the asset has been replaced, then the old location is retired (step **7J**). Otherwise, the next logic check is carried out (**8K**).
8G	Import As-Built Asset Locations	The EAMS Team accesses the As-Built Project Data files (**6F**) and extracts the asset records for the recently completed project. This data is processed (step **9G**) to capture new and revised asset locations.

Future Vision - To Be Determined

Index	Process Step	Description
8J	Create New PR-MP Asset Event feature	A new asset PR-MP event feature is created and saved within the MGDR (**7I**).
8K	New Asset?	If the asset is new or has been replaced, the location is used to create a new event feature (step **8J**). Otherwise, a check is made to see if the locational accuracy of an existing asset has been improved (process step **9K**).
9G	Process Asset Records	Individual asset location records are examined within each asset layer to determine whether a new asset (process step **10G**) or an improved asset location (process step **10H**) has been captured.
9K	Improved Location Accuracy?	If the asset location has been improved, it is stored in the MGDR (**7I**) along with updated metadata. Otherwise, a check is made to see if there are additional records (step **11J**).
10G	New Asset?	If the As-Built location is for a new asset, a new event feature is created ((process step **11G**). Otherwise, a check is made to see whether the accuracy of an existing asset location has been improved (process step **10H**).
10H	Improved Location Accuracy?	If the accuracy of an existing asset location has been improved, the asset location and associated metadata is saved within the MGDR (step **12H**). Otherwise, the next asset record is processed (step **9G**).
10K	Update Asset Location & Metadata	The updated asset location and metadata are saved to the MGDR (**7I**).
11G	Create New PR-MP Asset Event feature	A new As-Built asset PR-MP LRS Event feature is created and saved within the MGDR (**12I**). A check for more records is then made (step **12G**).
11J	More Records?	If more maintenance asset records exist, the next record is processed (step **5K**). Otherwise, the maintenance asset location stream is completed (step **12J**).
12G	More Records?	If additional As-Built asset records exist, the next asset record is processed (step **9G**). Otherwise, the Design and Construction stream is completed (step **13G**).
12H	Update Asset Location & Metadata	If the location of an existing asset has been improved, the new location and its associated metadata is used to update the MGDR (**12I**).
12I	MDOT Geospatial Data Repository	The MGDR contains EAMS asset LRS Event locations captured through field survey and maintenance processes.
12J	Done	Storing of the asset location along with any associated attributes ends the Maintenance stream of the business process.
13G	Done	Storing of the asset location along with any associated attributes ends the Design and Construction stream of the business process.

Future Vision - To Be Determined

Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS)	First Draft for submission to MDOT – process map only	1-Oct--2013
2	Dave Loukes (OPUS)	Final Draft for submission to MDOT – process map and description	26-Nov-2013

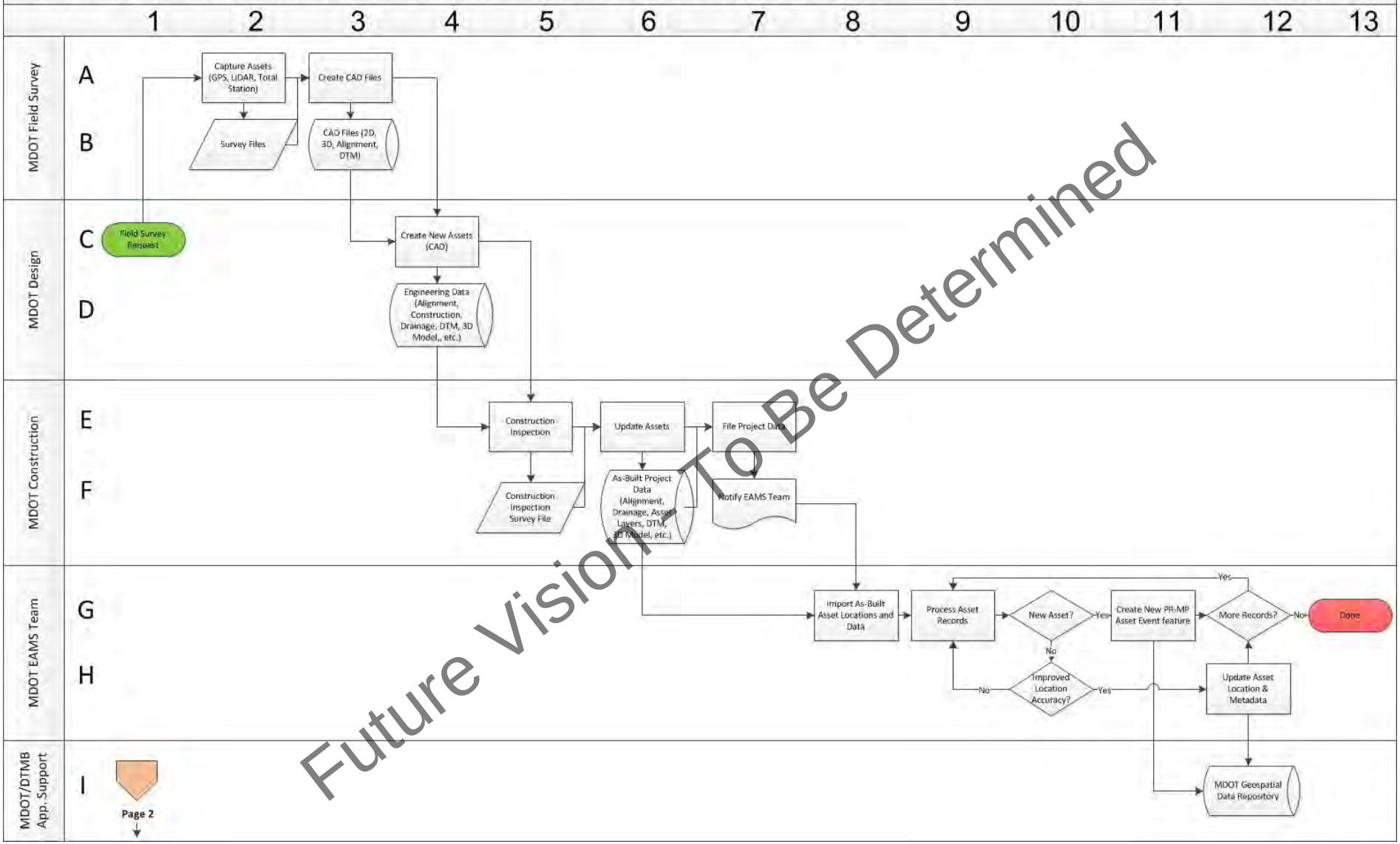
Attached:

1. EAMS To-Be Business Process Map: Locate Business Data for Asset Management – Phase 1 (Version 2) dated 21-Nov-2013.

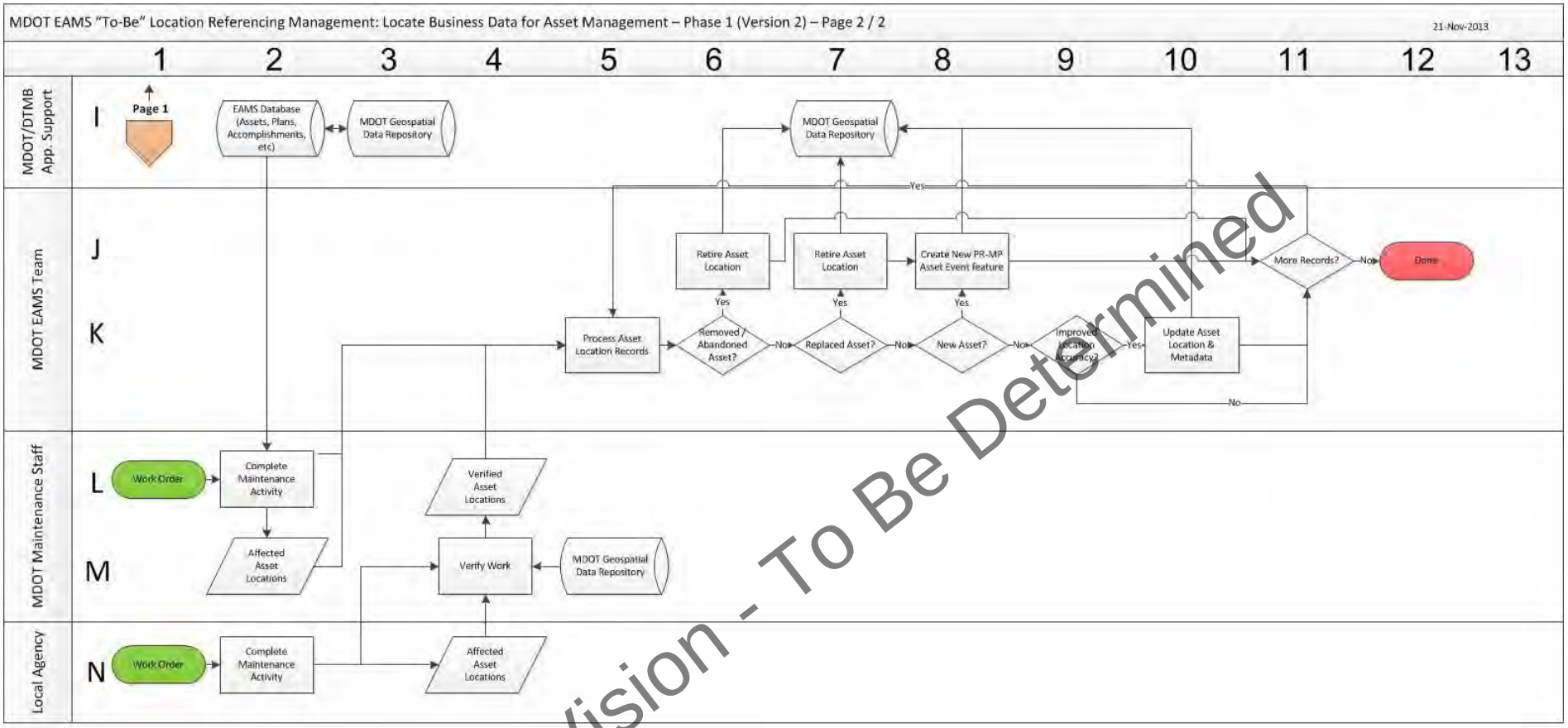
Future Vision - To Be Determined

MDOT EAMS "To-Be" Location Referencing Management: Locate Business Data for Asset Management – Phase 1 (Version 2) – Page 1 / 2

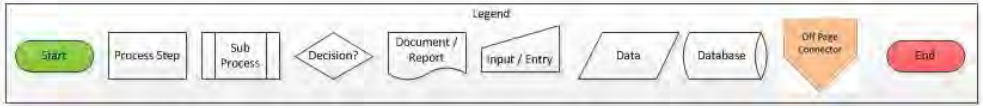
21-Nov-2013



Future Vision To Be Determined



Future Vision - To Be Determined



MDOT EAMS
Business Process Description

Process Stage: To-Be

Process Name: Update & Publish Road Network – Future Vision

Parent Business Process / Facet: Location Referencing Management

Process Owner: MDOT in cooperation with DTMB / CSS

Primary Deliverables / Products:

1. Michigan Geographic Framework (MGF) Revisions:
   - Road network spatial data & attributes
   - MGF PR-MP Business Linear Referencing Method (LRM)
   - MGF PR-MP Event table locations
   - Michigan Accident Location Index (MALI) PR-MP Event table locations
2. MDOT LRS Data:
   - MDOT Business LRMs (CS-MP, Route-MP, etc.)
   - MDOT EAMS LRS Event table locations
   - MDOT other business application LRS Event table locations (registered with EAMS)
3. MDOT Geospatial Data Repository (MGDR):
   - MGF road network updates replicated
   - LRM changes replicated
   - Business LRS Event locations replicated
4. MGF Version Publications:
   - A new (Version x) of the Michigan Geographic Framework (MGF) database.
   - Migration files to enable the update of non-MDOT GIS and business application databases to MGF Version x.
   - Version x Oracle Spatial SDE (GLOBAL) database for MDOT GIS users.
   - Version x MDOT business application databases containing updated PR-MP and CS-MP location references – for those applications whose LRS locations are not managed by EAMS.

Primary Client: MDOT

Process Cycle and Duration:

1. *MGF Road Network Revisions, MDOT LRS Data, MGDR*: continuous, based upon update requests received during each calendar year.
2. *MGF Version Publication*: to be determined, based upon non-MDOT client requirements

Future Vision - To Be Determined

Description:
The Update & Publish Road Network business process will be used to make changes to the Michigan Geographic Framework (MGF) spatial database road network layer based upon change requests received from Michigan stakeholders including MDOT. These changes will be made using the functionality contained within the EAMS Road Network Management module, within an agreed spatial edit environment to be determined at a future date beyond EAMS Phase 1. This environment will be hosted by the Department of Technology, Management and Budget Center for Shared Solutions (DTMB / CSS) and shared by DTMB and MDOT staff responsible for road network updates.

All changes to the MDOT trunkline network component of the MGF will be made by the MDOT Trunkline Specialist in order to ensure that Route and Control Section definitions, attributes and associated LRMs are correctly handled to enable the ongoing integration of MDOT business data based upon LRS locations.

This process is triggered by a change request. Changes are processed as received until a cut-off date is reached for publication of the next MGF version (release). Subsequent change requests will be held for processing against the new MGF version once it is published. However, it is expected that these delays will be minimal.

Publication of MGF Versions will still be required for consumption by non MDOT users. It is expected that these process tasks will be simplified as integration of County files is no longer required (as of 2013). Furthermore, no reconciliation with MALI and Sufficiency is required as LRM definitions and MGF / MDOT event locations are updated by the EAMS Road Network Management module as network changes occur.

Note: implementation of this future vision EAMS business process and the associated MGF edit environment tools will require further discussion between MDOT and DTMB / CSS.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Data Source	Identify trunkline network change and submit change request
MDOT	Network Editor	Verify and process trunkline network changes to update the MGF
MDOT	EAMS Application	Host the road network editing environment
DTMB	Network Editor	Process non-trunkline network changes to update the MGF
DTMB	Staff (various)	Identify non-trunkline network change and submit change request; accept change requests; forward trunkline change requests to MDOT Network Editor; verify non-trunkline network changes and assign to a DTMB Network Editor; monitor status of requests through completion.
External Agency	Various	Identify non-trunkline network change and submit change request. External agencies may include other State of Michigan agencies, Counties and Municipalities.

Process Map: (See Attached)

Future Vision - To Be Determined

Process Steps Descriptions:

Index	Process Step	Description
1A	Request for Change	A request for change is submitted by an MDOT Data Source. These requests will go directly to the MDOT Network Editor.
1F	Request for Change	A request for change is submitted by a DTMB Staff person. These requests will be sent to a DTMB staff coordinator.
1G	Request for Change	A request for change is submitted by an External Agency. These requests will be sent to a DTMB staff coordinator.
2E	Source Data	Data supporting the change request is supplied by DTMB staff. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
2F	Verify Request & Assign Editor	DTMB staff verifies the request and assigns a Network Editor.
2G	Source Data	Data supporting the change request is supplied by an External Agency. Source data may be received in the form of shape files, orthophotos, field / GPS surveys, CAD files, or other media formats.
3B	Verify Request	Trunkline requests will be verified by the MDOT Network Editor.
3E	Trunkline Network?	If the request involves the trunkline network, it is forwarded to the MDOT Network Editor for further verification (step **3B**). Otherwise, it is sent to a DTMB Network Editor for further verification (step **4E**).
4A	Source Data	Data supporting the change request is supplied by an MDOT Data Source. Most (90%) of source data is currently supplied as CAD files, although some GPS survey data is also received. **Note:** in the future, it is anticipated that an increasing amount of source data will be supplied as GPS survey files.
4B	Update Geometry & Basic Attributes	MGF trunkline road network geometry changes and basic attributes are entered by the MDOT Network Editor.
4D	EAMS / MGF Edit Environment Spatial Database	The EAMS / MGF Edit Environment Spatial Database contains the MGF road network features, other MGF layers, EAMS LRM Route definitions, and MGF / EAMS Event locations that are registered against the edit environment MGF road network.
4E	Update Geometry & Basic Attributes	MGF non-trunkline road network geometry changes and basic attributes are entered by a DTMB Network Editor.
5E	Road PR Segment?	If the change involves a road segment that contains PR-MP linear referencing, this data must be updated (**6E**). Otherwise, the change proceeds to final processing (**9E**).

Future Vision - To Be Determined

Index	Process Step	Description
6B	Update PR-MP attributes & Segment Definitions	The MDOT Network Editor updates the PR-MP attributes for the affected trunkline MGF PR Segments. These changes are then used by the EAMS Road Network Management module to update Business LRM definitions (Subprocess step **6C**) and associated LRS Event locations (Subprocess step **7C**) within the EAMS / MGF Edit Environment Spatial Database (**6D**).
6C	Update Business LRM Definitions	The EAMS Road Network Management module uses the PR Segment attributes to update the PR-MP LRM and other MDOT Business LRMs (Route-MP, CS-MP, etc.) within the EAMS / MGF Edit Environment Spatial Database (**6D**).
6D	EAMS / MGF Edit Environment Spatial Database	The EAMS / MGF Edit Environment Spatial Database now contains updated MGF road network geometry, attributes, LRM definitions and LRS Event locations based upon the edits made.
6E	Update PR-MP attributes & Segment Definitions	The DTMB Network Editor updates the PR-MP attributes for the affected non-trunkline MGF PR Segments. These changes are then used by the EAMS Road Network Management module to update Business LRM definitions (Subprocess step **6C**) and associated LRS Event locations (Subprocess step **7C**) within the EAMS / MGF Edit Environment Spatial Database (**6D**).
7B	Update Road Classification Data	The MDOT Network Editor updates the road classification attributes for the affected trunkline MGF road centerline features. This data is used to update associated LRS Event locations in Subprocess **7C**.
7C	Update MGF / MALI / MDOT Event Locations	The EAMS Road Network Management module updates LRS Event locations in the EAMS / MGF Edit Environment Spatial Database (**6D**), MALI Tables (**8E**) and other MDOT business applications that are registered with EAMS (**8A**).
8A	MDOT Business Applications (TMS, MAP, Sufficiency, etc.)	Other MDOT business applications that have LRS Events registered with EAMS will have their LRS locations updated by the Road Network Management module as network changes occur.
8E	MALI Tables	Crash locations and any other LRS Events contained within the MALI tables are updated as network changes occur.
9B	Close Change Request	The change request is closed out by the MDOT Network Editor and the MGF Audit Database (**9C**) is updated.
9C	MGF Audit Database	The MGF Audit Database tracks all revisions and associated change requests. **Note: the functionality to update this database may or may not be imbedded within EAMS. Further discussion is required with the DTMB / CSS MGF Team as to how this should best be implemented.**
9E	Close Change Request	The change request is closed out by the DTMB Network Editor and the MGF Audit Database (**9C**) is updated.

Future Vision - To Be Determined

Index	Process Step	Description
10C	Replicate Changes to MDOT Geospatial Data Repository	Changes made to MGF road network geometry / attributes, LRMs and associated LRS Event spatial locations, and other MGF basemap features are replicated to the MGDR database (**10D**) so that they are available for use by EAMS and other MDOT business applications. This ends the road network update component of this process. A check is made (**11C**) to see if a new MGF Version should be published at this time.
10D	MDOT Geospatial Data Repository	The MGDR contains EAMS road network geometry / attributes, business LRMs and associated LRS Event spatial feature locations, and other MGF basemap features. It also contains other MDOT enterprise spatial data required to support business applications.
10F	Lock Down Edit Environment	If a new MGF Version is to be published at this time, the Edit environment is locked down to prevent further updating.
11C	Publish MGF Version?	If a new MGF Version should be published at this time, the Publish component of this process is initiated (step **10F**). Otherwise, the process is terminated (step **13E**).
11F	Publish MGF Version x	This process step publishes a new MGF Version. A Version x spatial database (**12F**) and associated migration files (**13F**) are generated. **Notes:** **1. It is expected that custom processing required prior to publishing the Version x files should be minimal as no LRS database reconciliations are needed.** **2. The specific details concerning tasks required will need to be determined as part of the planning / requirements definition for this future EAMS state.**
12F	MGF Version x	The MGF Version x database contains updated spatial basemap features. It is currently produced annually, but could be produced more frequently if needed to support non-MDOT client business requirements.
13E	Done	The Update & Publish Road Network process is completed.
13F	MGF Version x Migration Files	The migration files include the following: • MGF Statewide Files • Old and new MALI files • Working Transactions • Migration Table • Metadata and MGF appendices **Note: it is assumed that the following files will no longer be required, as MDOT applications including Sufficiency that use CS-MP LRM location referencing will be registered with EAMS and have their LRS Event locations updated as changes occur:** • PR/CS Equivalency Table • Sufficiency Working and Report Files with full PR and CS Referencing

Future Vision - To Be Determined

Change Log:

Version	Authors	Description	Date
1	Dave Loukes (OPUS)	First Draft for submission to MDOT – process map only	25-Sep-2013
2	Dave Loukes (OPUS)	Final draft process map and description for submission to MDOT	26-Nov-2013

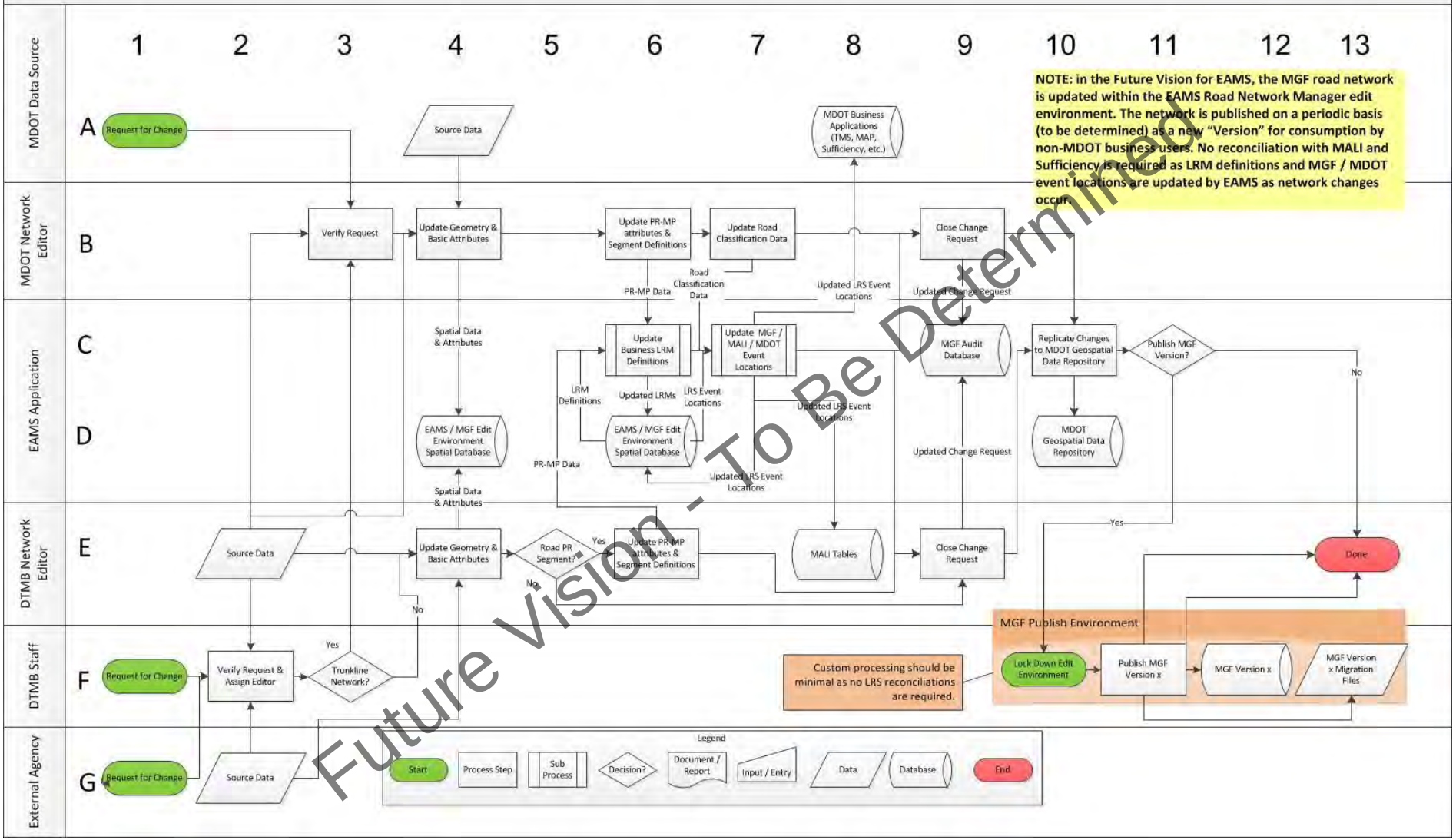
Attached:

1. MDOT EAMS "To-Be" Location Referencing Management: Update & Publish Road Network – Future Vision (Version 2) dated 26-Nov-2013.

Future Vision - To Be Determined

MDOT EAMS "To-Be" Location Referencing Management: Update & Publish Road Network – Future Vision (Version 2)

26-Nov-2013



Future Vision - To Be Determined

MDOT EAMS
Business Process Description

Process Stage:	To-Be
Process Name:	Locate Business Data for Asset Management – Future Vision
Parent Business Process / Facet:	Location Referencing Management
Process Owner:	MDOT
Primary Deliverables / Products:	EAMS asset locations Enhanced Geospatial Data Repository (MGDR)
Primary Client:	MDOT
Process Cycle and Duration:	Project based, for Design and Construction projects Work Order based, for Maintenance activities

Future Vision - To Be Determined

Description:

In the Future Vision for the EAMS Locate Business Data for Asset Management business process, selected Design and Construction spatial data is stored within the MDOT Geospatial Data Repository (MGDR) as additional feature layers. When a Survey Request is issued, spatial data is checked out from the MGDR for the project area and downloaded onto mobile devices for use by field crews. **Note: these are the only changes from the EAMS Phase business process.**

This business process is used to capture the location of MDOT road network assets from existing MDOT business activities. There are two main business process streams involved:

1. Design and Construction Projects.
2. Maintenance Activities.

The key underlying assumptions are that:

1. Asset locations will be initially captured in a format that is compliant with MDOT field survey standards.
2. CAD data layering standards and attribute coding conventions have been established that will enable the transfer of assets into the EAMS GIS environment.
3. Asset locations (and attributes) will be captured as a by-product of existing business processes – asset specific inventory surveys will no longer be required.

Design and Construction Projects

Asset locations are captured from field surveys and stored within Design and Construction Engineering Data files in a format suitable for use with MDOT roadway design software. Prior to the commencement of the field survey, existing data for the project area is extracted from the MGDR for use by the field crew.

This process is triggered by a request for a field survey. These surveys are carried out as required to support MDOT Design and Construction projects. The transfer of new asset locations and supporting attributes to EAMS from As-Built Data files is enabled by MDOT standards for location referencing and CAD layer coding.

Maintenance Activities

Asset locations are captured as a by-product of routine maintenance activities using mobile technologies.

This process is triggered by a maintenance work order issued by MDOT or Local Agency staff.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Field Survey Staff	Collect asset inventory in the field upon request to support Design and Construction projects using MDOT approved survey methods; create initial CAD files.
MDOT	Design Staff	Create new assets using MDOT design software; create additional Design CAD files and drawings to support Construction activities.
MDOT	Construction Staff	Conduct field inspections; update Design CAD files to create electronic CAD As-Built drawing files; liaise with EAMS support staff to support transfer of asset locations from CAD to GIS.
MDOT	EAMS Team	Facilitate transfer of asset locations from CAD to EAMS; facilitate transfer of asset locations from maintenance files to EAMS.
MDOT/DTMB	Application Support	Host / support the EAMS application environment.
MDOT	Maintenance Staff	Issue work orders; complete maintenance activities; verify local agency maintenance work.
Local Agency	Maintenance Staff	Issue work orders; complete maintenance activities.

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1C	Field Survey Request	A request for a field survey is issued by MDOT Design project staff.
1L	Work Order	A Maintenance Work Order is issued by MDOT Maintenance staff.
1N	Work Order	A Maintenance Work Order is issued by a Local Agency.
2A	Check Out Project Spatial Data	As an initial step, the MDOT Field Survey crew extracts spatial data for the project area (**2B**) from the MGDR (**12I**).
2B	Project Spatial Data	Project data extracted from the MGDR may include As-Built data layers such as Alignment, Drainage, Assets, DTM, 3D Models and other information.

Future Vision - To Be Determined

Index	Process Step	Description
2I	EAMS Database (Assets, Plans, Accomplishments, etc)	The EAMS database contains LRS Event tables containing locations of assets, work plans, accomplishments and other information required in support of MDOT maintenance and asset management activities.
2L	Complete Maintenance Activity	A maintenance activity is completed by MDOT Maintenance staff in fulfillment of a Work Order (**1L**). The location(s) of any affected assets are captured as a by-product of this activity (**2M**) in addition to accomplishment data.
2M	Affected Asset Locations	The location(s) of any affected assets are captured as a by-product of the MDOT maintenance activity (**2L**). Locations are captured as coordinates to MDOT standards using GPS embedded within mobile technologies.
2N	Complete Maintenance Activity	A maintenance activity is completed by Local Agency staff in fulfillment of a Work Order (**1N**)
3A	Capture Assets (GPS, LiDAR, Total Station)	Assets are captured by MDOT field survey staff using approved survey procedures and equipment (GPS, LiDAR, total stations) and stored in Survey Files (**3B**).
3B	Survey Files	MDOT Survey Files contain asset coordinate locations and attributes in a format suitable for the creation of CAD Files (process step **4A**) and initial Engineering Data files (process step **5A**).
3I	MDOT Geospatial Data Repository	The MDOT Geospatial Data Repository (MGDR) contains spatial data used by EAMS and other MDOT business applications. These data include the MGF road centerline network, Linear Referencing Method (LRM) definitions and associated LRS Event locations, and other MGF basemap layers.
4A	Create CAD Files	Initial Engineering Data files (**5D**) are created using MDOT CAD software by field survey staff. These are used to create new assets (process step **5C**).
4B	CAD Files (2D, 3D, Alignment, DTM)	The initial CAD files include: two-dimensional (2D), three-dimensional (3D), Alignment and Digital Terrain Model (DTM).
4L	Verified Asset Locations	Verified asset locations resulting from a Local Agency Maintenance activity (**2N**) are stored for subsequent processing.
4M	Verify Work	MDOT maintenance staff verify the work completed under a Local Agency Work Order. As part of this process step, associated asset locations are verified.
4N	Affected Asset Locations	The location(s) of any affected assets are captured as a by-product of the Local Agency maintenance activity (**2N**). **Note:** at this point, the assumption is made that at least some Local Agencies will capture locations as coordinates to MDOT standards using GPS embedded within compatible mobile technologies.

Future Vision - To Be Determined

Index	Process Step	Description
5C	Create New Assets (CAD)	New assets are created by MDOT Design staff using CAD design software. These assets are added to project Engineering Data files (**5D**).
5D	Engineering Data (Alignment, Construction, Drainage, DTM, 3D Model,, etc.)	Project Engineering Data files include: Alignment, Construction, Drainage and other CAD layers. These are used as input to the Construction Inspection process step (**5F**).
5K	Process Asset Location Records	The MDOT EAMS Team receives Affected Asset Locations (**4N**) and Verified Asset Locations (**4L**) from MDOT Maintenance and processes them. Each location record is then subjected to a series of logic checks commencing with step **6K**.
5M	MDOT Geospatial Data Repository	The MGDR is used to assist in the maintenance work verification process step (**4M**).
6E	Construction Inspection	MDOT Construction staff conduct field inspections and create a Construction Inspection Survey File (**6F**). **Note: as part of this process step, checks will need to be made to determine whether any existing assets have been removed / abandoned or replaced.**
6F	Construction Inspection Survey File	The Construction Inspection Survey File records the As-Built location of the roadway and its associated assets. It is used as input to the Update Assets process step (**7E**).
6J	Retire Asset Location	If the location relates to an asset that has been removed or abandoned, then the asset location is retired (end dated) in the MGDF (**7I**).
6K	Removed / Abandoned Asset?	If the asset has been removed or retired, then the location is removed (step **6J**). Otherwise, the next logic check is carried out (**7K**).
7E	Update Assets	Assets and their locations are updated using data from the Construction Inspection Survey File (**6F**) and stored within the As-Built Project Data files (**7F**).
7F	As-Built Project Data (Alignment, Drainage, Asset Layers, DTM, 3D Model, etc.)	The As-Built Project Data files contain the final locations of assets resulting from the Construction project.
7I	MDOT Geospatial Data Repository	New and modified asset locations are stored within the MGDR. Assets that have been retired or abandoned have their locations retired (end dated).
7J	Retire Asset Location	If the location relates to an asset that has been replaced, then the location of the replaced asset is retired (end dated) in the MGDF (**7I**). A new asset location is then created (process step **8J**).
7K	Replaced Asset?	If the asset has been replaced, then the old location is retired (step **7J**). Otherwise, the next logic check is carried out (**8K**).

Future Vision - TO Be Determined

Index	Process Step	Description
8E	File Project Data	Related project data is filed in an MDOT projects database as part of closing out the project. A notification (**8F**) is sent to the EAMS Team. **In the Future Vision business process, selected spatial data layers (to be determined) are stored within the MGDR for subsequent use by MDOT staff.**
8F	Notify EAMS Team	The EAMS Team is notified via email that a new Construction As-Built Project Data file (**7F**) has been created.
8G	Import As-Built Asset Locations	The EAMS Team accesses the As-Built Project Data files (**6F**) and extracts the asset records for the recently completed project. This data is processed (step **9G**) to capture new and revised asset locations.
8J	Create New PR-MP Asset Event feature	A new asset PR-MP event feature is created and saved within the MGDR (**7I**).
8K	New Asset?	If the asset is new or has been replaced, the location is used to create a new event feature (step **8J**). Otherwise, a check is made to see if the locational accuracy of an existing asset has been improved (process step **9K**).
9E	MDOT Geospatial Data Repository	The MGDF contains As-Built data for Construction projects.
9G	Process Asset Records	Individual asset location records are examined within each asset layer to determine whether a new asset (process step **10G**) or an improved asset location (process step **10H**) has been captured.
9K	Improved Location Accuracy?	If the asset location has been improved, it is stored in the MGDR (**7I**) along with updated metadata. Otherwise, a check is made to see if there are additional records (step **11J**).
10G	New Asset?	If the As-Built location is for a new asset, a new event feature is created ((process step **11G**). Otherwise, a check is made to see whether the accuracy of an existing asset location has been improved (process step **10H**).
10H	Improved Location Accuracy?	If the accuracy of an existing asset location has been improved, the asset location and associated metadata is saved within the MGDR (step **12H**). Otherwise, the next asset record is processed (step **9G**).
10K	Update Asset Location & Metadata	The updated asset location and metadata are saved to the MGDR (**7I**).
11G	Create New PR-MP Asset Event feature	A new As-Built asset PR-MP LRS Event feature is created and saved within the MGDR (**12I**). A check for more records is then made (step **12G**).
11J	More Records?	If more maintenance asset records exist, the next record is processed (step **5K**). Otherwise, the maintenance asset location stream is completed (step **12J**).

Future Vision - To Be Determined

Index	Process Step	Description
12G	More Records?	If additional As-Built asset records exist, the next asset record is processed (step **9G**). Otherwise, the Design and Construction stream is completed (step **13G**).
12H	Update Asset Location & Metadata	If the location of an existing asset has been improved, the new location and its associated metadata is used to update the MGDR (**12I**).
12I	MDOT Geospatial Data Repository	The MGDR contains EAMS asset LRS Event locations captured through field survey and maintenance processes. In the Future Vision business process, it also contains selected As-Built feature layers (to be determined).
12J	Done	Storing of the asset location along with any associated attributes ends the Maintenance stream of the business process.
13G	Done	Storing of the asset location along with any associated attributes ends the Design and Construction stream of the business process.

Change Log:

Version	Authors	Description	Date
1	n/a	Not issued	n/a
2	Dave Loukes (OPUS)	Draft for submission to MDOT – process map and description. **Note: Version 2 used to keep in synch with other BP diagrams and descriptions.**	26-Nov-2013

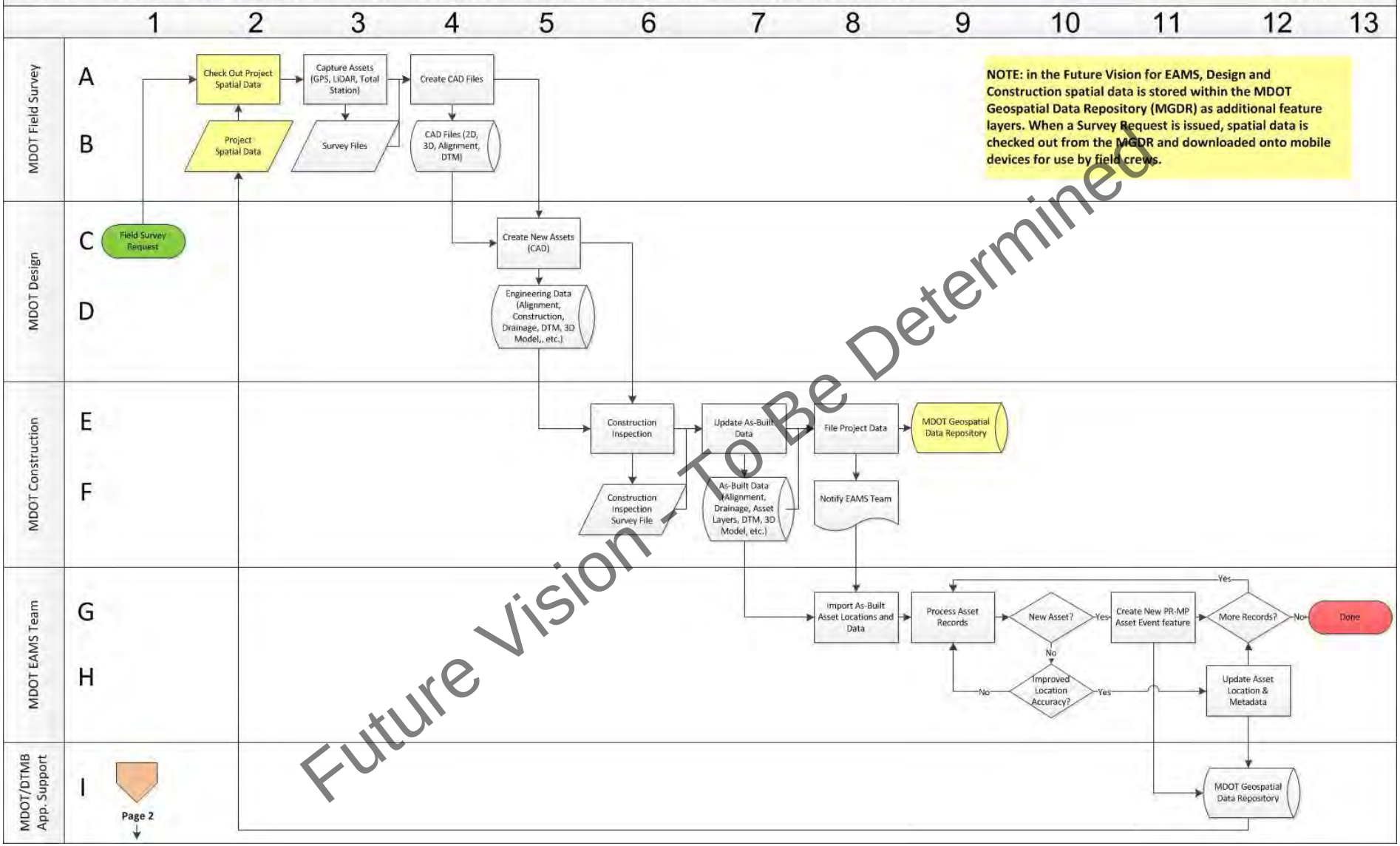
Attached:

1. EAMS To-Be Business Process Map: Locate Business Data for Asset Management – Future Vision (Version 2) dated 21-Nov-2013.

Future Vision - To Be Determined

MDOT EAMS "To-Be" Location Referencing Management: Locate Business Data for Asset Management – Future Vision (Version 2) – Page 1 / 2

21-Nov-2013

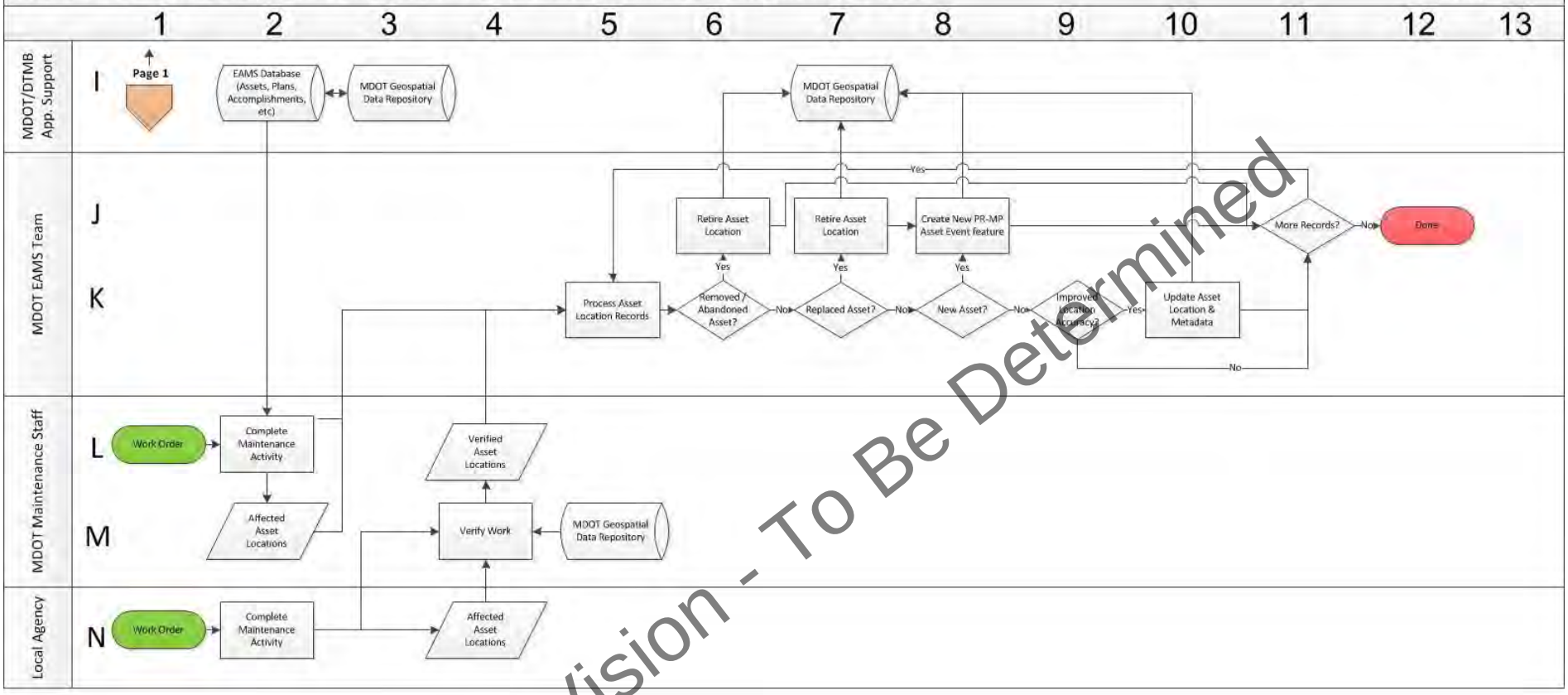


NOTE: in the Future Vision for EAMS, Design and Construction spatial data is stored within the MDOT Geospatial Data Repository (MGDR) as additional feature layers. When a Survey Request is issued, spatial data is checked out from the MGDR and downloaded onto mobile devices for use by field crews.

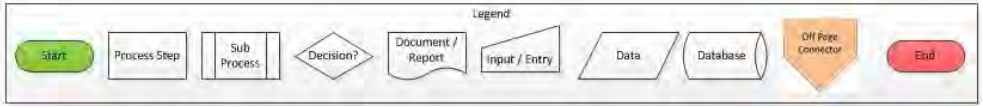
Future Vision - To Be Determined

MDOT EAMS "To-Be" Location Referencing Management: Locate Business Data for Asset Management – Future Vision (Version 2) – Page 2 / 2

21-Nov-2013



Future Vision - To Be Determined



2. Maintenance

2.1 As – Is Maintenance Processes

The business processes involved with managing maintenance are the main focus for the EAMS. The following processes have been documented to further describe the requirements:

MDOT Direct Forces

- Maintenance Program Budget Planning
- Routine Highway Maintenance by MDOT Direct Forces
- Routine Bridge Maintenance by MDOT Direct Forces
- Maintenance Reporting by MDOT Direct Forces

Local Agencies

- Routing Highway Maintenance by Local Agencies
- Maintenance Reporting by Local Agencies

MDOT
Business Process

Process Stage: As-Is

Process Name: Maintenance Program Budget Planning

Parent Business Process / Facet: Highway Maintenance

Process Owner: Region

Primary Deliverables / Products: Allocated Budget

Primary Client: Region and Central Office

Process Cycle and Duration: Annual

Description:

Budget Planning for highway maintenance is carried out on an annual basis and involves all levels of management within MDOT as well as Office of Administration, Statewide Services.

Participants:

Department / Agency	Actors	Description of Role
Office of Administration, Statewide Services		Budget Monitoring
MDOT	Highway Operations, Statewide Maintenance Budget Team	Budget Allocation to the Regions
	Regions	
	Transportation Service Centers	
	Garage Supervisor	Day to Day Management of MDOT Maintenance Garage

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Receives Overall Budget Appropriation	The Office of Administration, Statewide Services receives the overall budget appropriation for statewide highway maintenance.
1B	Calculates Contingency	The Statewide Budget Team calculates the contingency to be held back for the state. A. Additional winter maintenance contingency is assigned to the budget by the regions on the basis

Index	Process Step	Description
		of 30% of the previous 5 year winter average maintenance costs. for the entire state. Regions and OAS have varying amounts of winter contingency to fulfill the 30% statewide winter contingency.
1C,E, F	Heavy/Other Maintenance Needs	The Region, TSC and Garage Supervisor compile a list of their heavy maintenance and other needs to be considered later in the processes.
2B	Allocate the Budget to OAS OFS and 7 Regions	The Statewide Budget Team allocates the budget to OAS OFS and 7 Regions.
2C	Build Responsibility Budget	The Region builds the Responsibility Budget by organization codes and expenditure type
3C	Responsibility Budget	The responsibility budget
4A	Budget	Budget data is available for loading into WebFancy
4D	Receive Budget Allocation	The Transportation Service Center receives their budget allocation.
5A	Load Budget into WebFANCY	The budget data is loaded into WebFancy.
5D	LAPS Budgets	Budgets are created for local agencies.
6A	Budget Monitoring	The OAS occasionally monitors the budget.
6C	Budget Monitoring	The Region monitors the budget on a regular basis.
6D	Customizes Maintenance Plan at Activity Level	The TSC customizes the maintenance plan at the activity level for TSC / Garages and contract agencies.
6E	Budget Monitoring	The TSC monitors the budget on a regular basis
7A	Winter Maintenance Contingency	In the spring, based on the severity of the winter season, the winter maintenance contingency is redistributed to the Regions,

Index	Process Step	Description
		OAS and OFS based on winter overruns, critical maintenance projects and other statewide needs.
7D	Adjustments Made based on Winter Season, other Needs	Adjustments are made to the maintenance plan as necessary.
8B	Allocate Revised Budget	Highway Operations Statewide Maintenance Budget Team allocate the “revised” budget to central office and 7 regions.
9C	Revised Budget Allocated to Region and Central Office	Budget revised and allocated.

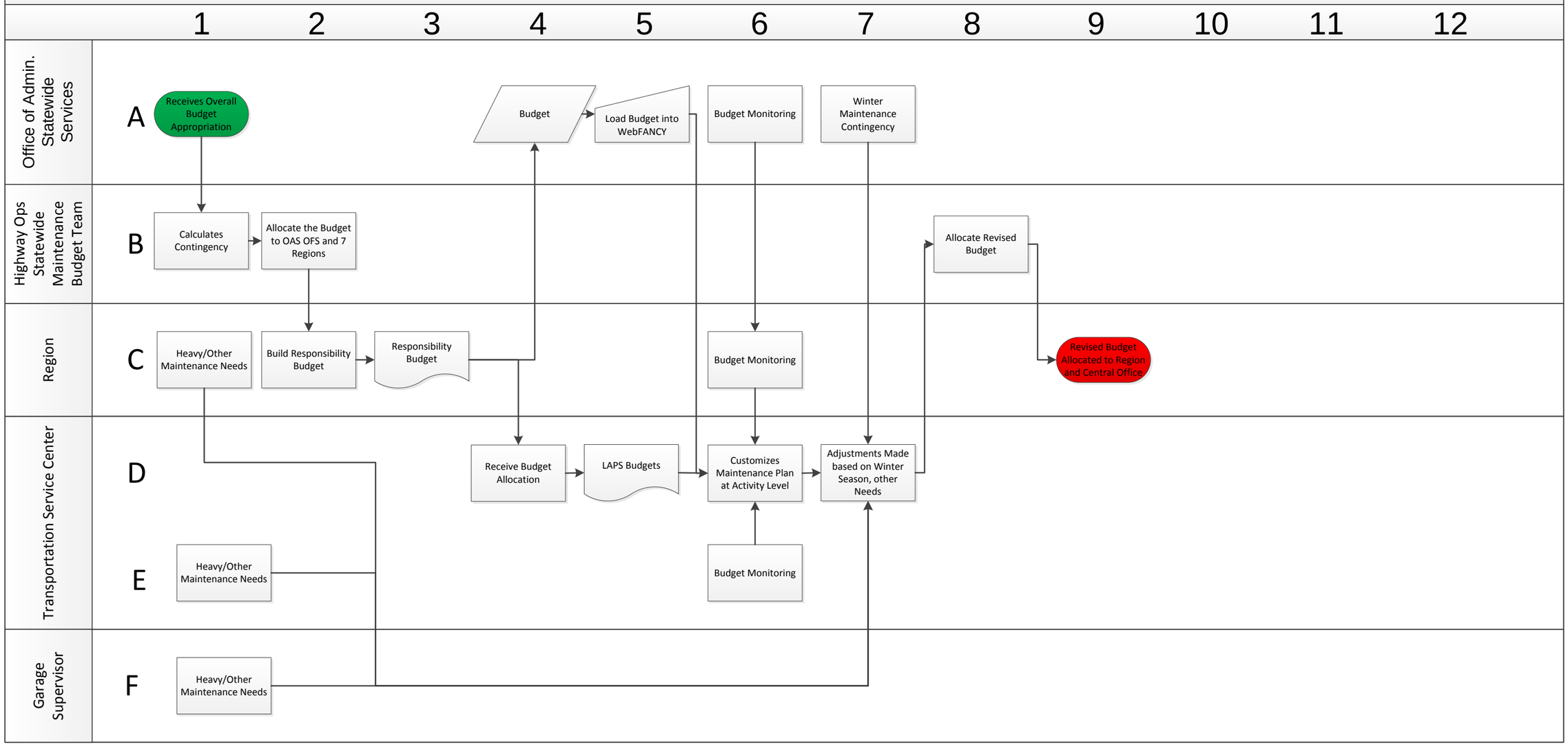
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	06-Sep-2013

Attached:

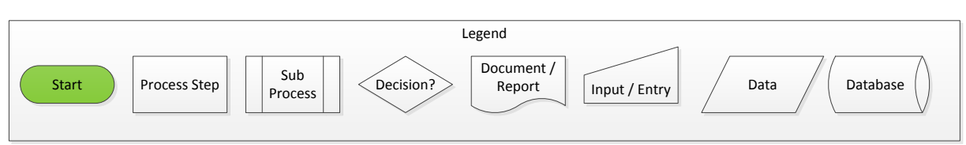
MDOT: Maintenance Program Budget Planning (Version 3)

14-Aug-2013



Forms and Reports

Responsibility Budget



MDOT
Business Process

Process Stage: As-Is

Process Name: Routine Highway Maintenance by MDOT

Parent Business Process / Facet: Highway Maintenance

Process Owner: Garage Supervisor

Primary Deliverables / Products: Completed Highway Maintenance

Primary Client: Region / Public

Process Cycle and Duration: Daily or Weekly

Description:

MDOT has it's own crews to perform highway maintenance. The Garage Supervisor performs road inspections weekly or daily depending on the need and type of road. The inspections are then used to plan and carry out work either by the crew itself or by region or statewide forces depending on whether it is capital, maintenance or electrical work. The TSC may engage a contractor for capital preventative maintenance.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Garage Supervisor	Inspects highways, plans and carries out work
	Region	Capital work
	Region or Statewide crew	Performs Electrical work
	Transportation Service Center	Planning
Public		Registers Complaints, Inquiries or Requests

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1B	Daily or Weekly Roadway Inspection	The Garage Supervisor carries out daily and weekly highway inspections.
1F	Complaint, Inquiry or Request	The public may register a complaint, inquiry or request. This may trigger a roadway inspection.

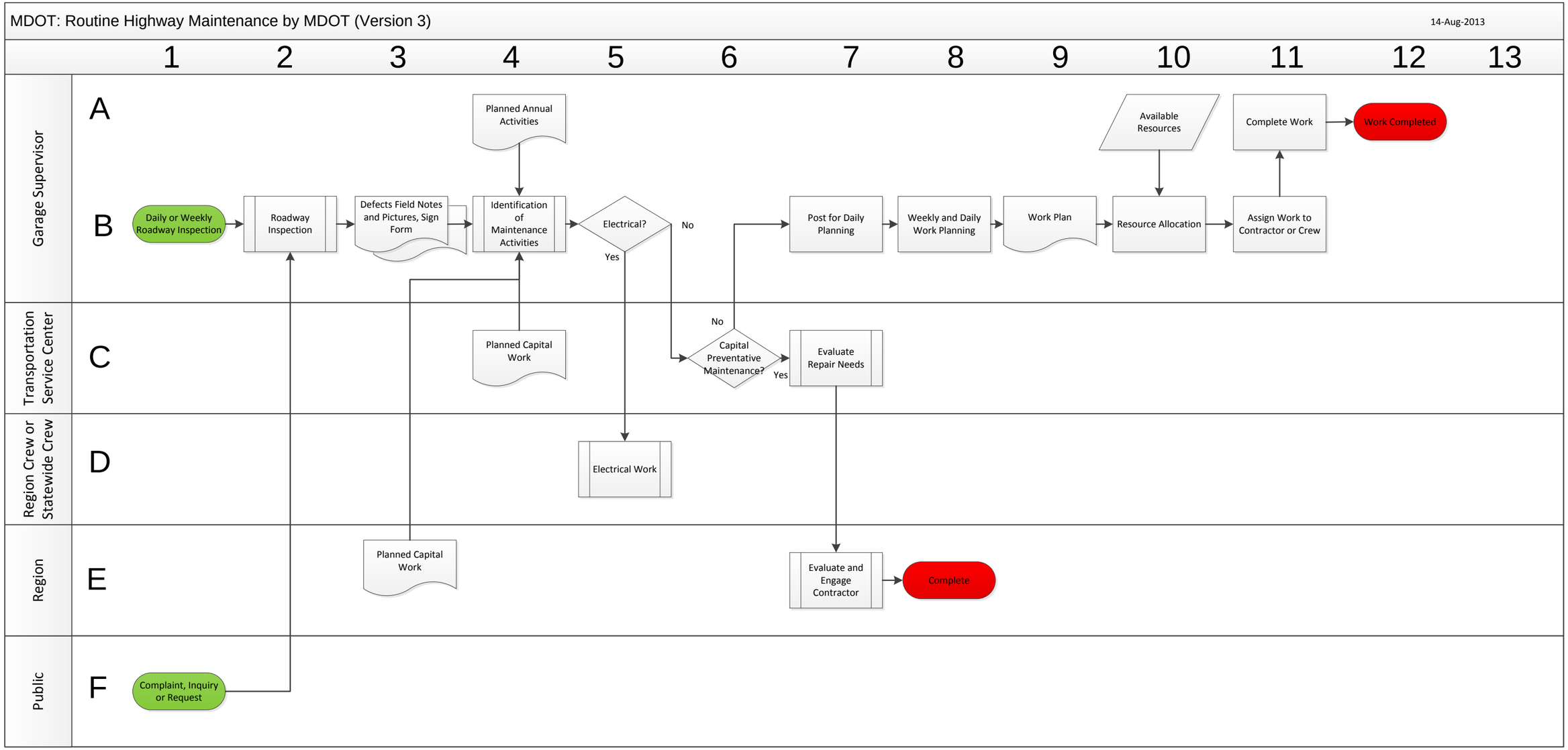
Index	Process Step	Description
2B	Roadway Inspection	Roadway inspections is done on a regular daily and weekly cycle.
3B	Defects Field Notes and Pictures, Sign Form	Defects, field notes and pictures as well as a sign form are all collected in the inspection.
3E	Planned Capital Work	Capital Work that has been planned by the Region is also considered in the identification of activities.
4A	Planned Annual Activities	Annual Maintenance activities are included in the identification of maintenance activities.
4B	Identification of Maintenance Activities	Maintenance needs identified by road inspection, annual planned activities, and capital work identified either by the region or the TSC is considered in the identification of activities by the Garage Supervisor.
4C	Planned Capital Work	The TSC has capital work planned that has to be considered in the identification of maintenance activities.
5B	Electrical?	Highway needs are assessed by the local agency contract supervisor to see if there are any electrical requirements. If so those are sent to the Region or Statewide electrical crew.
5D	Electrical Work	Electrical work is performed by the Region Crew or the Statewide Crew.
6C	Capital Preventative Maint?	The Transportation Service Center evaluates the needs resulting from the inspections. Any Capital preventative maintenance is handled by the TSC, otherwise the local agency handles the repairs.
7B	Post for Daily Planning	Repairs are posted for daily planning.
7C	Evaluate Repair Needs	The capital preventative maintenance repair needs are evaluated by the TSC.
7E	Evaluate and Engage Contractor	The capital preventative maintenance repair needs are evaluated by the Region and a contractor is engaged to complete the work.
8B	Weekly and Daily Work Planning	Work is planned on a weekly basis and modified daily.

Index	Process Step	Description
8E	Complete	Preventative Maintenance is complete.
9B	Work Plan	Weekly Work plan.
10A	Available Resources	Resources which are available to the garage supervisor such as fleet, equipment, materials and labor.
10B	Resource Allocation	The Garage supervisor matches the work plan with the resources that are available to complete the work.
11A	Complete Work	The work is completed according to plan.
11B	Assign Work to Contractor or Crew	Work is assigned to the contractor or crew.
12A	Work Completed	The Highway Maintenance work is completed.

Change Log:

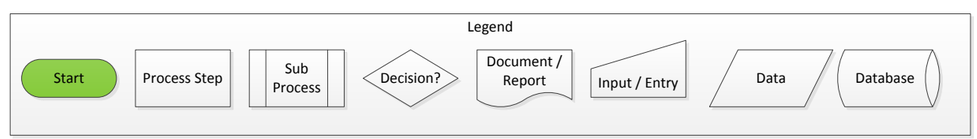
Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	10-Sep-2013

Attached:



Forms and Reports

Sign Maintenance Form



MDOT
Business Process

Process Stage: As-Is

Process Name: Routine Bridge Maintenance

Parent Business Process / Facet: Highway Maintenance

Process Owner: Garage Supervisor

Primary Deliverables / Products: Completed Maintenance activities

Primary Client: Public

Process Cycle and Duration: Annual

Description:

MDOT has an annual inspection program that feeds the development of planned maintenance and capital planning activities on bridges. Repairs, maintenance are carried out by the garage staff while capital work is done through the region under contract.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Regional Bridge Inspectors	Perform Annual Inspections on Bridges
	Regoinal Bridge Engineer	
	Region Crew or Statewide Crew	
	Transportation Service Center	
	Bridge Supervisor	
Public		

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Bi-Annual Inspection Cycle	Bridges are inspected by trained bridge inspectors on a bi-annual cycle.
1G	Complaint, Inquiry or Request	Complaints, inquires and requests are submitted by the public about deficiencies or safety concerns with regards to bridges.

Index	Process Step	Description
2A	Bridge Inspections	Bridges are inspected using the National Bridge Inspection standard.
3A	Bridge Inspection Form & Photos	Bridge inspections are recorded on a form for loading into MBIS. Photos are kept regionally in individual photo logs.
3D	Planned Annual Activities	The garage plans annual maintenance activities based on knowledge and experience.
3E	Defects Field Notes and Pictures, Sign Form	Information from the bridge inspection is made available to the Garage Supervisor, including defects, field notes pictures and signing form.
4A	Input into MBIS	Bridge inspection data is entered into MBIS (Pontis) from the form. This may be live loaded in some cases.
4B	Plan Capital Work	The Regional bridge engineer uses MBIS to create a capital program.
4E	Identification of Maintenance Activities	The Garage Supervisor puts together the information from the inspections, and the planned activities to identify a program of activities for the year.
5A	Bridge Inventory and Condition	Bridge inventory and condition data is used through MBIS for capital planning activities.
5E	Electrical?	Activities that are electrical in nature are identified and separated from the program and are not under the contract of the local agency given to a regional or statewide crew with that capability.
6B	Capital Preventative Maintenance?	The Bridge Engineer then examines the activity program to identify any preventative maintenance on bridges and separates it from the program.
7B	Evaluate and Engage Contractor	The Regional Bridge Engineer will evaluate preventative maintenance needs identified by the TSC and engage a contractor to complete the work.
7C	Evaluate Repair Needs	The TSC evaluates the repair needs that are considered preventative maintenance and sent to the Regional Bridge Engineer.
7E	Post for Daily Planning	Activities are posted to the Garages for weekly and daily work planning.
8B	Complete	Electrical work is completed by contractor.

Index	Process Step	Description
8E	Weekly and Daily Work Planning	The Garage Supervisor plans their work for the day and the next week, using the maintenance activities which were posted.
9E	Work Plan	The Garage Supervisors daily and weekly planning results in a work plan.
10D	Available Resources	Resources which are available to the garage supervisor such as fleet, equipment, materials and labor.
10E	Resource Allocation	The Garage supervisor matches the work plan with the resources that are available to complete the work.
11D	Complete Work	The work is completed according to plan.
11E	Assign Work to Contractor or Crew	Work is assigned to the contractor or crew.
12D	Work Completed	The Bridge Maintenance work is completed.

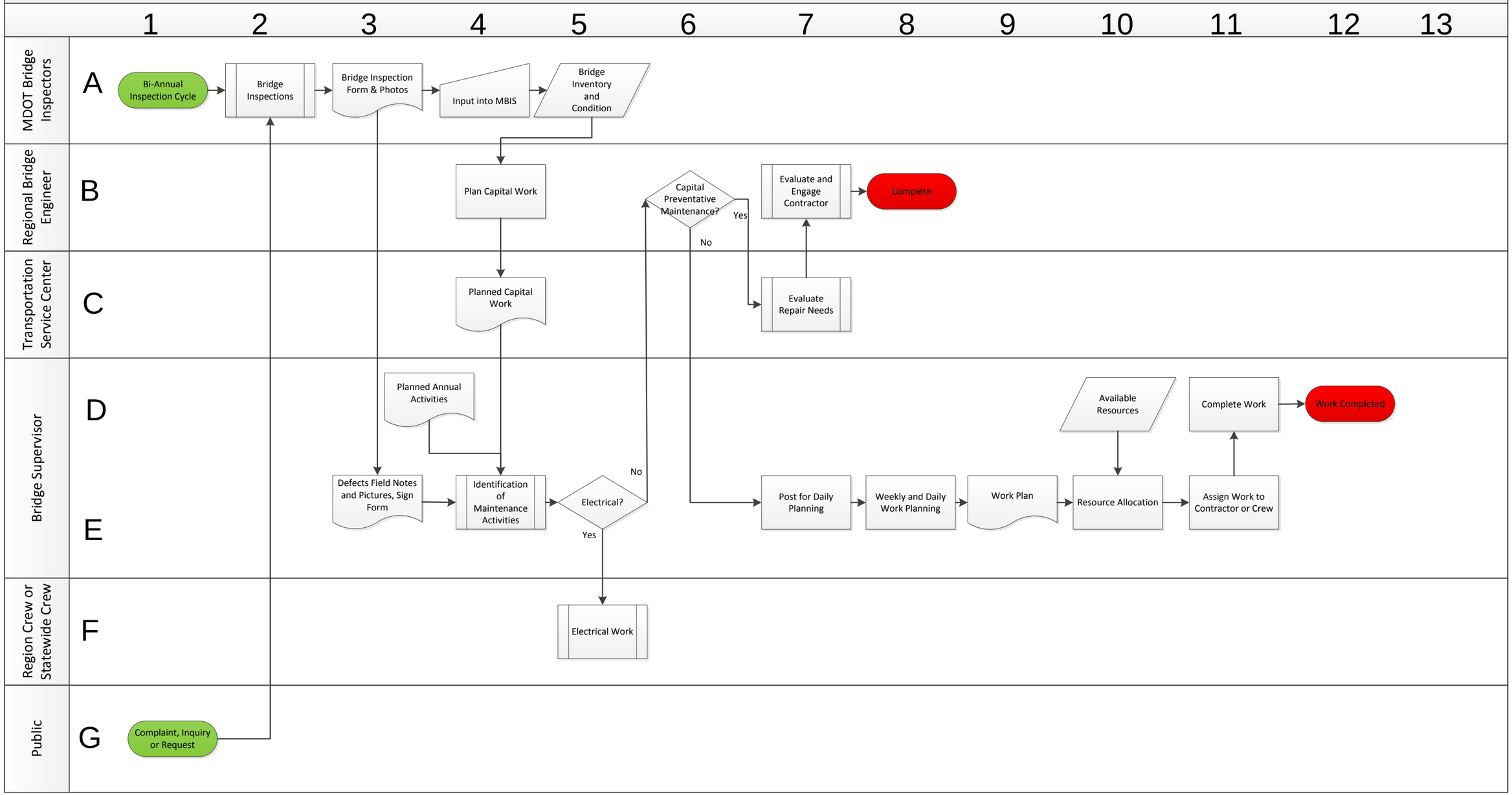
Change Log:

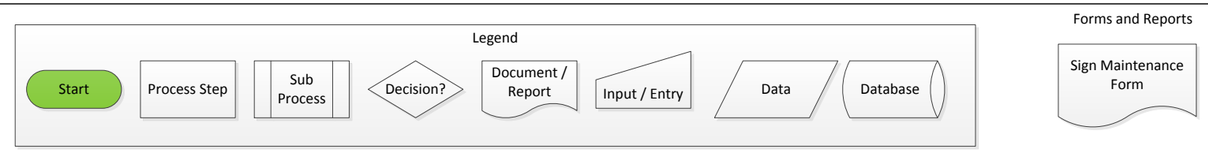
Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	09-Sep-2013
1	John MacNaughton (OPUS)	Minor edits from 06-Nov-2013 Meeting	18-Nov-2013
1	John MacNaughton	Minor edits from Greg B.	27-Nov-2013

Attached:

MDOT: Routine Bridge Maintenance by MDOT (Version 3)

27-Nov-2013





MDOT
Business Process

Process Stage: As-Is

Process Name: Maintenance Reporting by MDOT

Parent Business Process / Facet: Highway Maintenance

Process Owner: MDOT Garage Supervisor

Primary Deliverables / Products: Weekly Expenditure data

Primary Client: Finance / Office of Administrative Services

Process Cycle and Duration: Weekly

Description:

MDOT's Direct Forces perform highway maintenance work and record expenditures that must be entered into MAIN and MIDB for budget comparison and tracking of expenses.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Garage Supervisor	Is responsible for the day to day management of the Maintenance Garage
	Region	
	Transportation Service Center	
	Employee	
Office of Administrative Services		
Finance		

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1D	Daily Work Completed	Work is completed on a daily basis.
1H	Bi-Weekly Timesheet	A Bi-Weekly Timesheet is created from DCDS.

Index	Process Step	Description
2C	Records Labour, Equipment, Materials & Acc. By Route In Timesheet Or DCDS	The Garage Supervisor records Labour, Equipment, Materials and Acc. By route in timesheet or DCDS.
2H	Timekeeper Enter Labour, Equipment actuals into DCDS	The Timekeeper in the TSC enters Labour, Equipment actuals into DCDS.
3D	Send Non-Payroll, Non-Stores expenses For approval	Non-Payroll / Non-Stores expenses are sent for approval. These may be hired equipment or purchased materials.
4D	Materials From Stores Entered into MaintStar (Stores)	Materials that have been issued from stores are entered into MaintStar (stores system).
4E	Approve?	The Garage Supervisor has to approve the non-payroll items.
4F	Approve?	The Garage Supervisor has to approve labour and equipment in DCDS.
4H	DCDS	DCDS is the interface for MIDB to enter labor and equipment expenses for highway maintenance.
5D	MaintStar	MaintStar is the Fleet Management Program that MDOT uses to track the inventory and services of all MDOT owned vehicles and equipment. MaintStar is also used to create work orders for needed equipment services and repairs and calculates our cost of maintaining our equipment fleet.
5E	Certified Non-Payroll expenditures (Materials)	After non-payroll expenditures are approved they are considered “certified”. A report is created and they are keyed into MAIN.
6D	Weekly Export File	A weekly export file is created from MaintStart with all the materials from stores used in maintenance activities to import into MAIN.
6E	Enter into MAIN	Certified non-payroll expenditures are entered into MAIN.
7D	MAIN	MAIN is the interface for entering information into MIDB for Materials and non-payroll expenses.
7G	MIDB	Michigan Information Database (MIDB) is the central financial database for the state.

Index	Process Step	Description
8G	Weekly Expenditure Data	MIDB updates WebFancy on a weekly basis through a database update.
9A	Comparison to Plans	The Office of Administrative Services (OAS) will compare actuals and annual budgets.
9B	Comparison to Plans	The Region will compare actuals and annual budgets.
9G	WebFancy	WebFancy is a financial reporting system that runs on the Web. It was developed for, and is used by, employees at MDOT. WebFancy will create a wide variety of financial reports with varying levels of expenditure and budget detail.
10G	Complete	Reporting is complete.

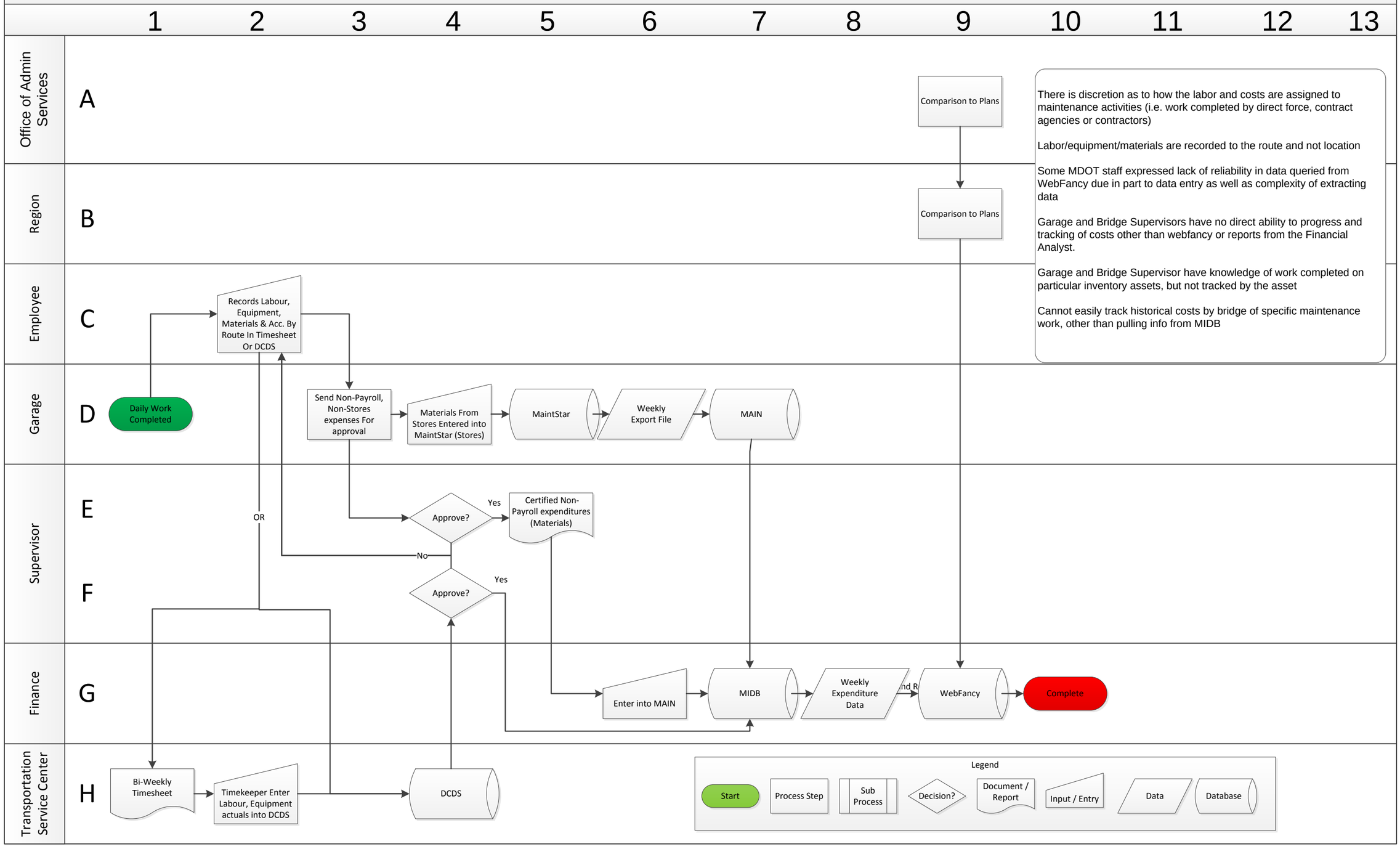
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	09-Sep-2013
2	John MacNaughton (OPUS)	Edits from 6-Nov-2013 Meeting	18-Nov-2013

Attached:

MDOT: Maintenance Reporting by MDOT (Version 3)

18-Nov-2013



MDOT
Business Process

Process Stage: As-Is

Process Name: Routine Hwy Maintenance by Local Agencies

Parent Business Process / Facet: Highway Maintenance

Process Owner: Local Agency

Primary Deliverables / Products: Completed Highway Maintenance

Primary Client: Transportation Service Center

Process Cycle and Duration: Daily / Weekly

Description:

Highway maintenance in Michigan is often carried out by local agencies such as a county or city. These agencies work as an extension to MDOTs own forces under contract.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Region	Capital work
	Region or Statewide crew	Performs Electrical work
	Transportation Service Center	Planning
Local Agency	Local Agency Contract Supervisor	
Public		Registers Complaints, Inquiries or Requests

Process Map: (See Attached)

Process Steps Descriptions:

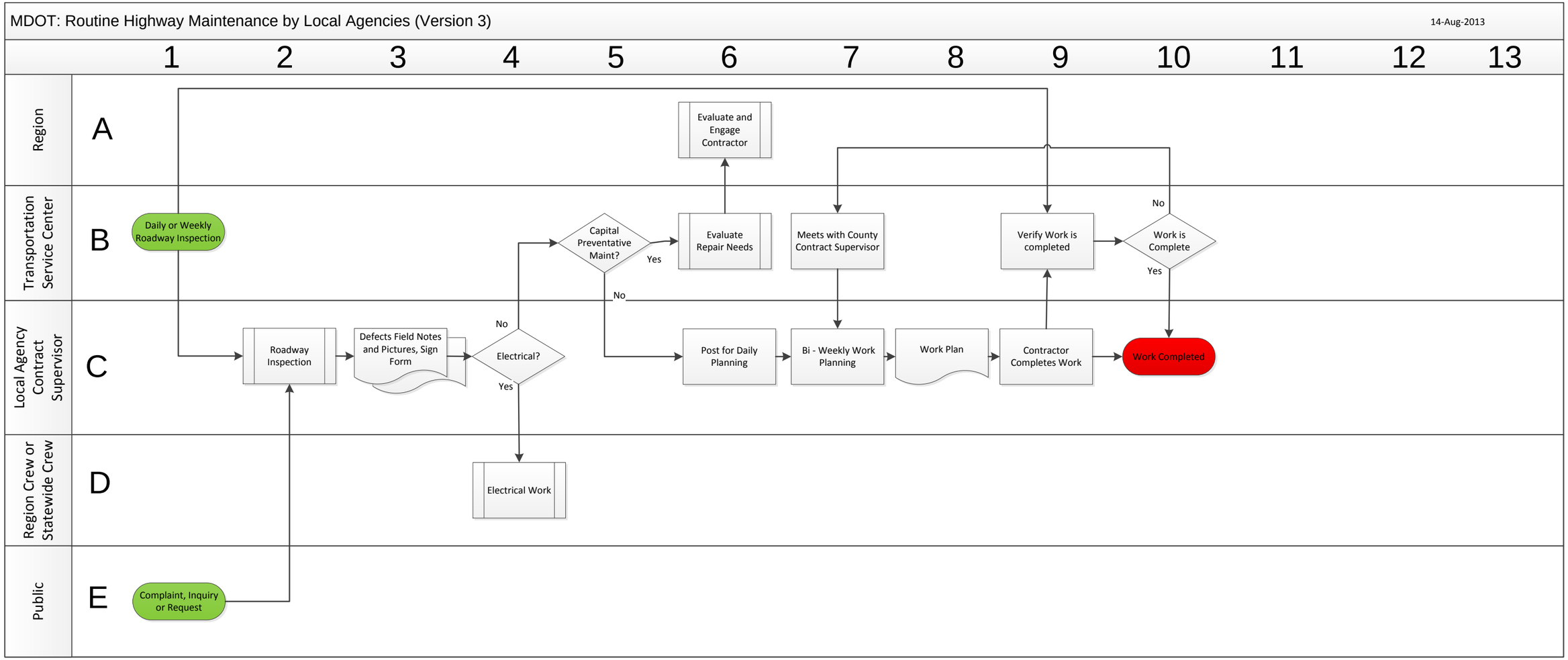
Index	Process Step	Description
1B	Daily or Weekly Roadway Inspection	The Transportation Service Center carries out daily and weekly highway Inspections.
1E	Complaint, Inquiry or Request	A complaint Inquiry or request is made by the public regarding a highway.

Index	Process Step	Description
2C	Roadway Inspection	A roadway inspection is done on a regular daily and weekly cycle.
3C	Defects Field Notes and Pictures, Sign Form	Defects, field notes and pictures as well as a sign form are all collected in the inspection.
4C	Electrical?	Highway needs are assessed by the local agency contract supervisor to see if there are any electrical requirements. If so those are sent to the Region or Statewide electrical crew.
4D	Electrical Work	Electrical work is performed by the Region Crew or the Statewide Crew.
5B	Capital Preventative Maint?	The Transportation Service Center evaluates the needs resulting from the inspections. Any Capital preventative maintenance is handled by the TSC, otherwise the local agency handles the repairs.
6A	Evaluate and Engage Contractor	The capital preventative maintenance repair needs are evaluated by the Region and a contractor is engaged to complete the work.
6B	Evaluate Repair Needs	The capital preventative maintenance repair needs are evaluated by the TSC.
6C	Post for Daily Planning	Repairs are posted for daily planning.
7B	Meets with County Contract Supervisor	The TSC meets with the County Contract Supervisor to plan work on a bi-weekly basis.
7C	Bi - Weekly Work Planning	The local agency has a bi-weekly work plan based on it's meetings with The TSC.
8C	Work Plan	The work plan is a two week plan that encompasses all the highway maintenance the supervisor will undertake.
9B	Verify Work is completed	The TSC verifies that work is completed.
9C	Contractor Completes Work	The contractor completes the work.
10C	Work Completed	Work is completed according to plan.

Change Log:

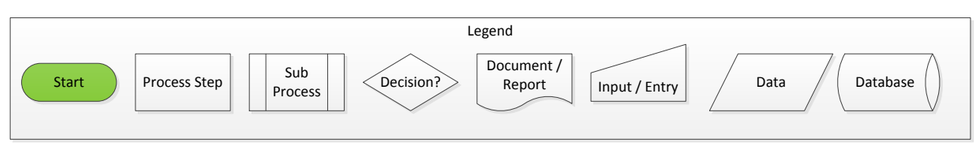
Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	09-Sep-2013

Attached:



Forms and Reports

Sign Maintenance Form



MDOT
Business Process

Process Stage: As-Is

Process Name: Maintenance Reporting by Local Agencies

Parent Business Process / Facet: Highway Maintenance Reporting

Process Owner: MDOT Maintenance Coordinator

Primary Deliverables / Products: Local agencies expenditure data

Primary Client: Office of Admin Services

Process Cycle and Duration: Weekly

Description:

MDOT often contracts maintenance work to local agencies such as a county. The activity costing must be collected for this work in terms of labor equipment and materials. The local agency provides this information and it is loaded through LAPS for inclusion into MIDB for loading into WebFancy, comparison to budgets, and generating payables to counties as well as recoverable from the Federal Government.

Participants:

Department / Agency	Actors	Description of Role
Local Agency	Accounts Receivable	
MDOT	Maintenance Coordinator – Transportation Service Center	Responsible for maintenance coordination in a geographic region
	Region	Monitor Maintenance Plans and actuals
Office of Admin Services		Monitor Maintenance Plans and actuals

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1C	Report Labour, Equipment & Materials	The Local Agency completes work and submits a weekly report with the Labour Equipment and Materials.

Index	Process Step	Description
1E	Activity Report / Invoice	An activity report is sent to the MDOT Maintenance Coordinator at the TSC.
2C	Enter Accomplishment into Activity Report	Enter accomplishment, and resource usage information into an Activity Report.
2E	Approve?	The Maintenance Coordinator reviews the activity report for approval.
3E	Key activity data into LAPS	The Maintenance Coordinator keys the information into LAPS. Most Local Agencies will include # hours Equipment and materials. Some do not, particularly when work is contracted out.
4E	LAPS	Local Agency Payments System (LAPS) Streamlines the payment process for local agency maintenance contracts. It is a cross-functional information system consisting of five modules to track and process billing information. The system is primarily responsible for collecting routine and non-routine bills submitted by local contract agencies; validating billing transactions against MDOT data; assisting in review and approval of bills; auditing bills; generating vouchers for payment; and maintaining and forecasting budgets.
5E	Approve Billing?	The Maintenance Coordinator at the TSC reviews the billing data for approval.
6E	MIDB	Michigan Information Database (MIDB) is the central financial database for the state.
7E	Weekly Expenditure Data	Data from MIDB is used to update WebFancy on a weekly basis.
8E	WebFancy	WebFancy is a financial reporting system that runs on the Web. It was developed for, and is used by, employees at MDOT. WebFancy will create a wide variety of financial reports with varying levels of expenditure and budget detail.
9A	Comparison With Monthly, Quarterly and Annual Plans	The Office of Administrative Services (OAS) will compare actuals and annual budgets. Counties are compared on a monthly basis, while cities are compared on a quarterly basis.
9B	Comparison With Monthly, Quarterly and Annual Plans	The Region will compare actuals and annual budgets. Counties are compared on a monthly basis, while cities are compared on a quarterly basis.
9E	Comparison	WebFancy can generate a comparison of actuals and budgets for monitoring.

Index	Process Step	Description
10A	Complete	The reporting cycle is complete.

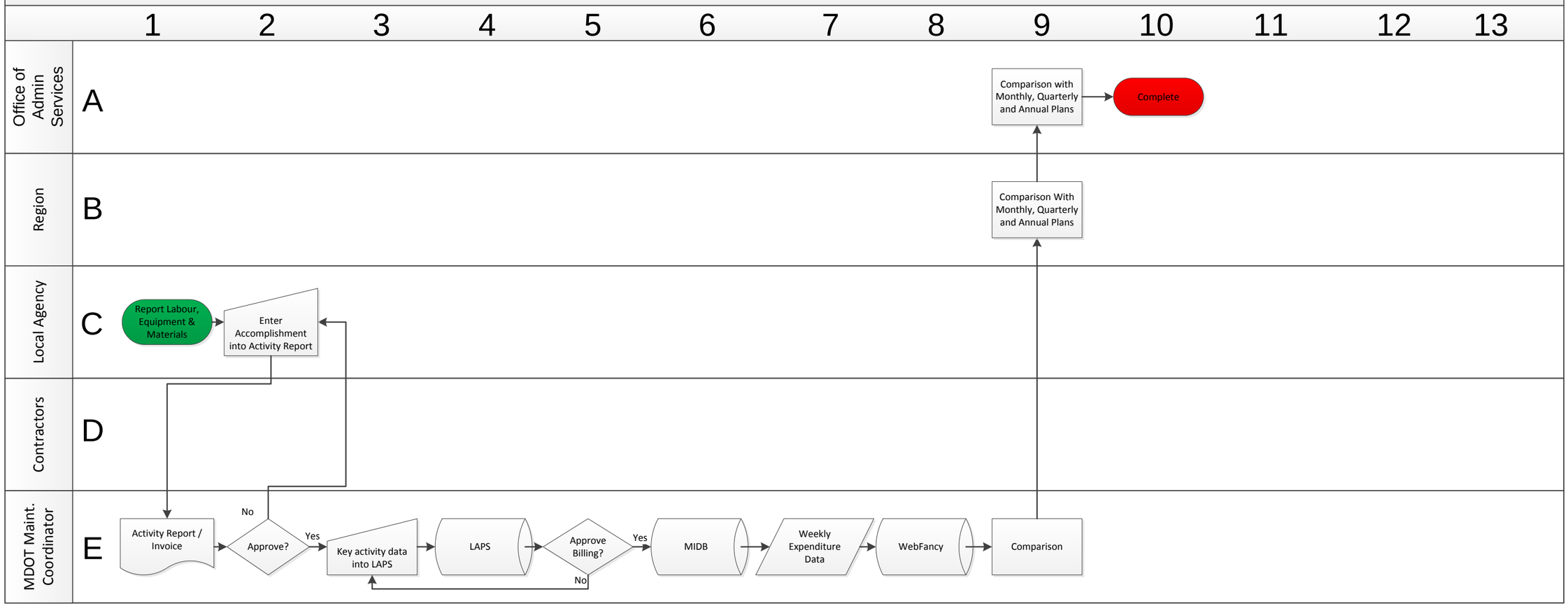
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	06-Sep-2013
1	John MacNaughton (OPUS)	Minor Edits from the 06-Nov-2013 Meeting	18-Nov-2013

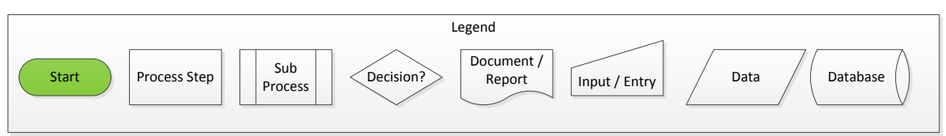
Attached:

18-Nov-2013

MDOT: Maintenance Reporting by Local Agencies (Version 3)



Forms and Reports



2.2 To-Be Maintenance Processes

The To-Be processes are how MDOT envisions the process with the addition of a new EAMS. The Same processes as in section 2.1 have been modeled and are included in this section

MDOT Direct Forces

- Maintenance Program Budget Planning
- Routine Highway Maintenance by MDOT Direct Forces
- Routine Bridge Maintenance by MDOT Direct Forces
- Maintenance Reporting by MDOT Direct Forces

Local Agencies

- Routing Highway Maintenance by Local Agencies
- Maintenance Reporting by Local Agencies

MDOT
Business Process

Process Stage: To-Be

Process Name: Maintenance Program Budget Planning

Parent Business Process / Facet: Highway Maintenance

Process Owner: Region

Primary Deliverables / Products: Allocated Budget

Primary Client: Region and Central Office

Process Cycle and Duration: Annual

Description:

Budget Planning for highway maintenance is carried out on an annual basis and involves all levels of management within MDOT as well as Office of Administration, Statewide Services.

Participants:

Department / Agency	Actors	Description of Role
Office of Administration, Statewide Services		Budget Monitoring
MDOT	Highway Operations, Statewide Maintenance Budget Team	Budget Allocation to the Regions
	Regions	
	Transportation Service Centers	
	Garage Supervisor	Day to Day Management of MDOT Maintenance Garage

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Receives Overall Budget Appropriation	The Office of Administration, Statewide Services receives the overall budget appropriation for statewide highway maintenance.

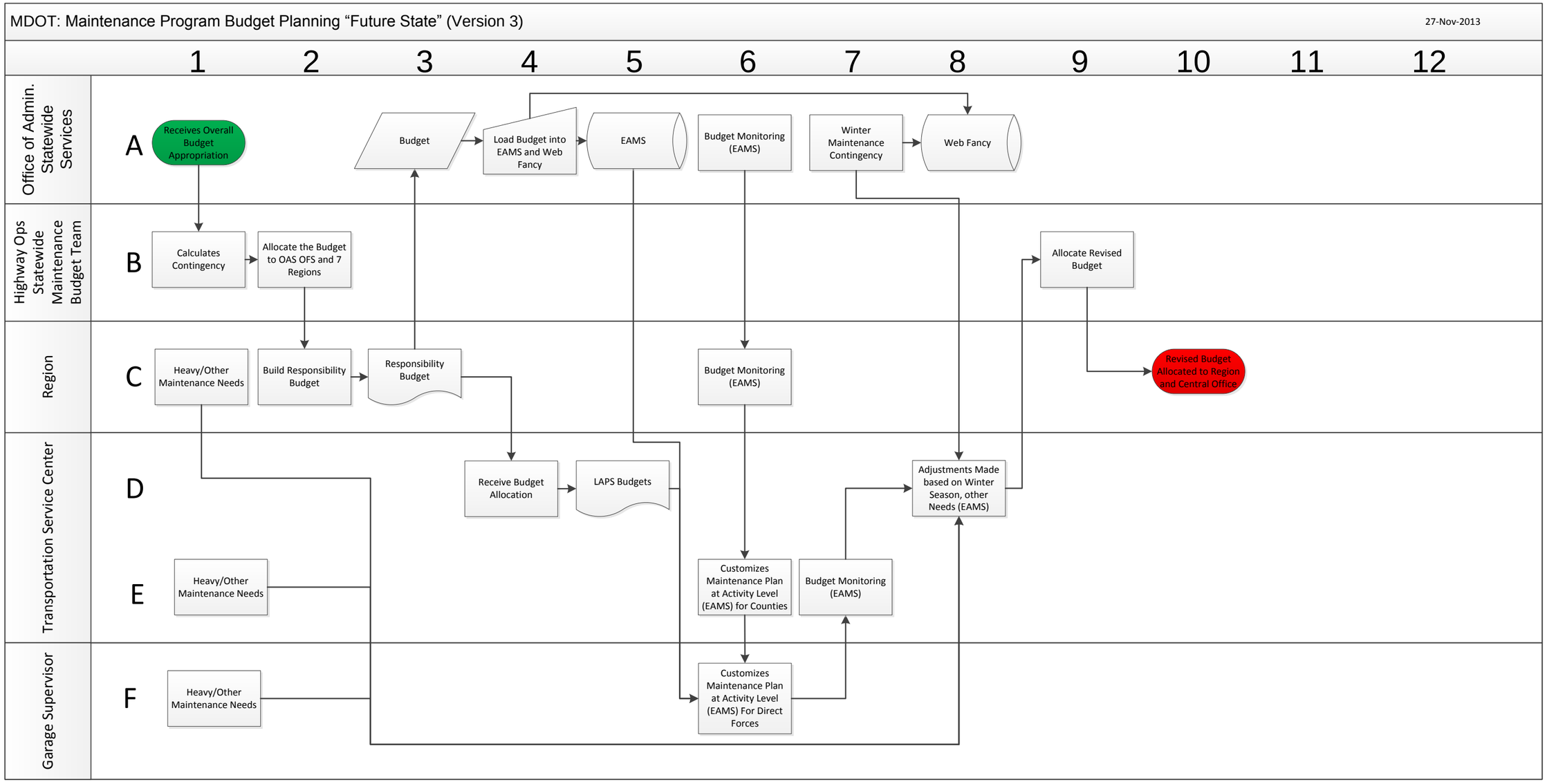
Index	Process Step	Description
1B	Calculates Contingency	The Statewide Budget Team calculates the contingency to be held back for the state. A. Additional winter maintenance contingency is assigned to the budget by the regions on the basis of 30% of the previous 5 year winter average maintenance costs. for the entire state. Regions and OAS have varying amounts of winter contingency to fulfill the 30% statewide winter contingency.
1C,E, F	Heavy/Other Maintenance Needs	The Region, TSC and Garage Supervisor compile a list of their heavy maintenance and other needs to be considered later in the processes.
2B	Allocate the Budget to OAS OFS and 7 Regions	The Statewide Budget Team allocates the budget to OAS OFS and 7 Regions.
2C	Build Responsibility Budget	The Region builds the Responsibility Budget by organization codes and expenditure type
3A	Budget	Budget data is available for loading into WebFancy
3C	Responsibility Budget	The responsibility budget
4A	Load Budget into EAMS and Web Fancy	The budget data is loaded into WebFancy.
4D	Receive Budget Allocation	The Transportation Service Center receives their budget allocation.
5A	EAMS	EAMS accepts the Budget.
5D	LAPS Budgets	Budgets are created for local agencies.
6A	Budget Monitoring (EAMS)	The OAS occasionally monitors the budget.
6C	Budget Monitoring (EAMS)	The Region monitors the budget on a regular basis.

Index	Process Step	Description
6E	Customizes Maintenance Plan at Activity Level (EAMS) for Counties	The TSC customizes the maintenance plan at the activity level for TSC / Garages and contract agencies.
6F	Customizes Maintenance Plan at Activity Level (EAMS) for Counties	The Garages and contract agencies customizes the maintenance plan at the activity level.
7A	Winter Maintenance Contingency	In the spring, based on the severity of the winter season, the winter maintenance contingency is redistributed to the Regions, OAS and OFS based on winter overruns, critical maintenance projects and other statewide needs.
7E	Budget Monitoring (EAMS)	The TSC monitors the budget on a regular basis.
8D	Adjustments Made based on Winter Season, other Needs (EAMS)	Adjustments are made to the maintenance plan as necessary.
9B	Allocate Revised Budget	Highway Operations Statewide Maintenance Budget Team allocate the “revised” budget to central office and 7 regions.
10C	Revised Budget Allocated to Region and Central Office	Budget revised and allocated.

Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	27-Nov-2013-2013

Attached:


MDOT: Maintenance Program Budget Planning "Future State" (Version 3)
27-Nov-2013
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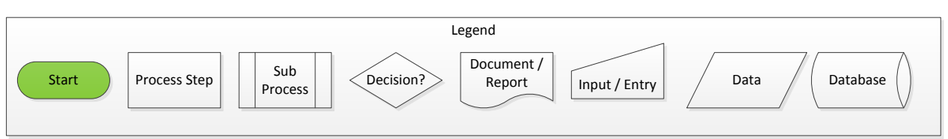
Office of Admin. Statewide Services
Highway Ops Statewide Maintenance Budget Team
Region
Transportation Service Center
Garage Supervisor
A
B
C
D
E
F
Receives Overall Budget Appropriation
Budget
Load Budget into EAMS and Web Fancy
EAMS
Budget Monitoring (EAMS)
Winter Maintenance Contingency
Web Fancy
Calculates Contingency
Allocate the Budget to OAS OFS and 7 Regions
Allocate Revised Budget
Heavy/Other Maintenance Needs
Build Responsibility Budget
Responsibility Budget
Budget Monitoring (EAMS)
Revised Budget Allocated to Region and Central Office
Receive Budget Allocation
LAPS Budgets
Adjustments Made based on Winter Season, other Needs (EAMS)
Heavy/Other Maintenance Needs
Customizes Maintenance Plan at Activity Level (EAMS) for Counties
Budget Monitoring (EAMS)
Heavy/Other Maintenance Needs
Customizes Maintenance Plan at Activity Level (EAMS) For Direct Forces


Legend
Start
Process Step
Sub Process
Decision?
Document / Report
Input / Entry
Data
Database

Forms and Reports
Responsibility Budget
LAPS Budgets

MDOT
Business Process

Process Stage: To-Be

Process Name: Routine Highway Maintenance by MDOT

Parent Business Process / Facet: Highway Maintenance

Process Owner: Garage Supervisor

Primary Deliverables / Products: Completed Highway Maintenance

Primary Client: Region / Public

Process Cycle and Duration: Daily or Weekly

Description:

MDOT has it's own crews to perform highway maintenance. The Garage Supervisor performs road inspections weekly or daily depending on the need and type of road. The inspections are then used to plan and carry out work either by the crew itself or by region or statewide forces depending on whether it is capital, maintenance or electrical work. The TSC may engage a contractor for capital preventative maintenance.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Garage Supervisor	Inspects highways, plans and carries out work
	Region	Capital work
	Region or Statewide crew	Performs Electrical work
	Transportation Service Center	Planning
Public		Registers Complaints, Inquiries or Requests

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1B	Daily or Weekly Roadway Inspection	The Garage Supervisor carries out daily and weekly highway inspections.
1F	Complaint, Inquiry or Request	The public may register a complaint, inquiry or request. This may trigger a roadway inspection.

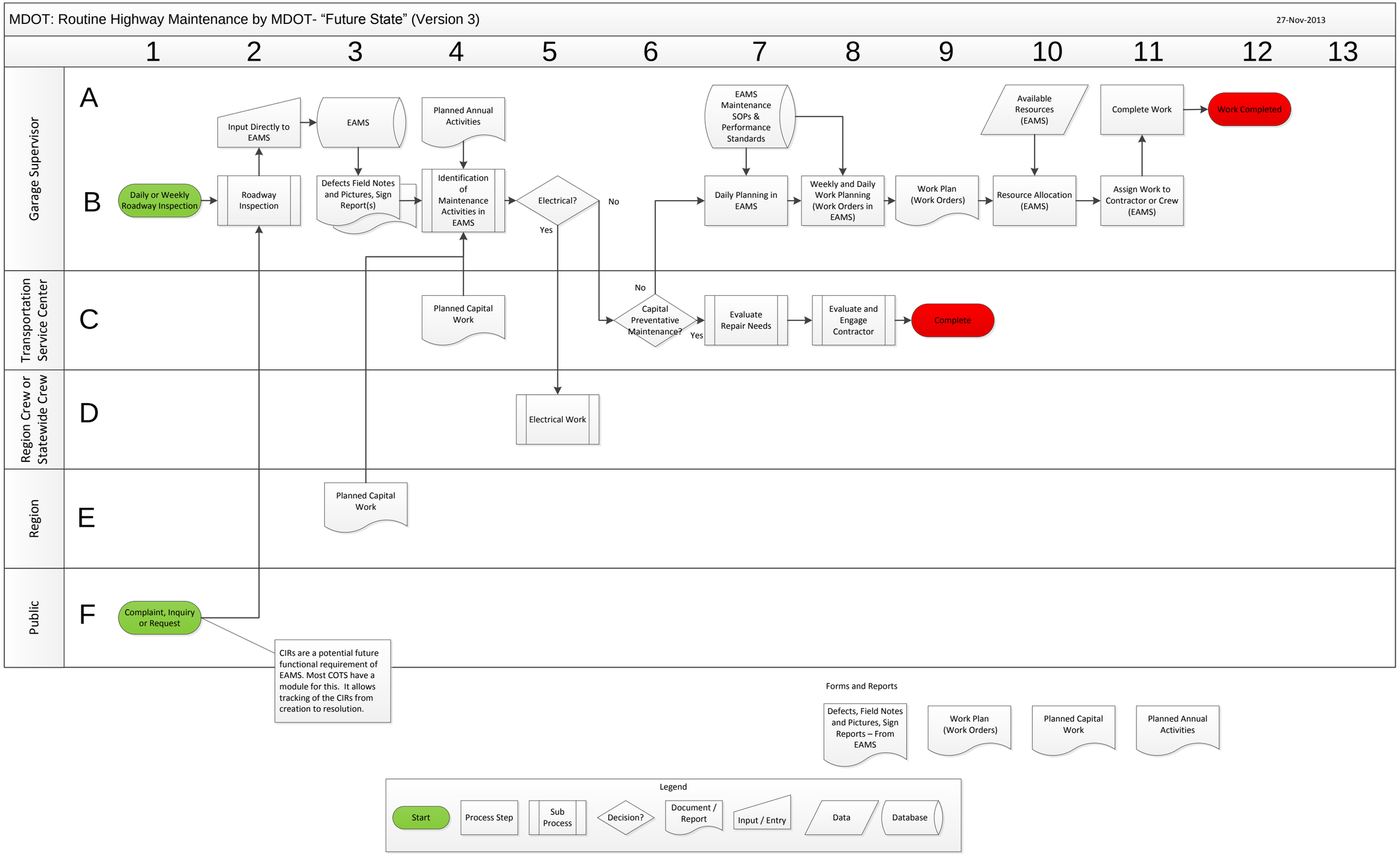
Index	Process Step	Description
2A	Input Directly to EAMS	Roadway Inspections can be entered directly into EAMS.
2B	Roadway Inspection	Roadway inspections is done on a regular daily and weekly cycle.
3A	EAMS	The EAMS accepts the inspection data, and provides it in the form of reports.
3B	Defects Field Notes and Pictures, Sign Report(s)	Defects, field notes and pictures as well as a sign form are all collected in the inspection.
3E	Planned Capital Work	Capital Work that has been planned by the Region is also considered in the identification of activities.
4A	Planned Annual Activities	Annual Maintenance activities are included in the identification of maintenance activities.
4B	Identification of Maintenance Activities in EAMS	Maintenance needs identified by road inspection, annual planned activities, and capital work identified either by the region or the TSC is considered in the identification of activities by the Garage Supervisor.
4C	Planned Capital Work	The TSC has capital work planned that has to be considered in the identification of maintenance activities.
5B	Electrical?	Highway needs are assessed by the local agency contract supervisor to see if there are any electrical requirements. If so those are sent to the Region or Statewide electrical crew.
5D	Electrical Work	Electrical work is performed by the Region Crew or the Statewide Crew.
6C	Capital Preventative Maint?	The Transportation Service Center evaluates the needs resulting from the inspections. Any Capital preventative maintenance is handled by the TSC, otherwise the local agency handles the repairs.
7A	EAMS Maintenance SOPs & Performance Standards	EAMS supplies supervisors with standard operating procedures and performance standards which aid the planning and monitoring of work.
7B	Daily Planning in EAMS	Repairs are posted for daily planning.

Index	Process Step	Description
7C	Evaluate Repair Needs	The capital preventative maintenance repair needs are evaluated by the TSC.
8B	Weekly and Daily Work Planning	Work is planned on a weekly basis and modified daily.
8C	Evaluate and Engage Contractor	The capital preventative maintenance repair needs are evaluated by the Region and a contractor is engaged to complete the work.
9B	Work Plan (Work Orders)	Weekly Work plan.
9C	Complete	Preventative Maintenance is complete.
10A	Available Resources (EAMS)	Resources which are available to the garage supervisor such as fleet, equipment, materials and labor.
10B	Resource Allocation (EAMS)	The Garage supervisor matches the work plan with the resources that are available to complete the work.
11A	Complete Work	The work is completed according to plan.
11B	Assign Work to Contractor or Crew (EAMS)	Work is assigned to the contractor or crew.
12A	Work Completed	The Highway Maintenance work is completed.

Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	27-Nov -2013

Attached:


MDOT: Routine Highway Maintenance by MDOT- "Future State" (Version 3)
27-Nov-2013
1 2 3 4 5 6 7 8 9 10 11 12 13
Garage Supervisor
Transportation Service Center
Region Crew or Statewide Crew
Region
Public
A
B
C
D
E
F
Daily or Weekly Roadway Inspection
Roadway Inspection
Input Directly to EAMS
EAMS
Defects Field Notes and Pictures, Sign Report(s)
Planned Annual Activities
Identification of Maintenance Activities in EAMS
Electrical?
Yes
No
Planned Capital Work
Capital Preventative Maintenance?
No
Yes
Evaluate Repair Needs
Evaluate and Engage Contractor
Complete
Electrical Work
Planned Capital Work
EAMS Maintenance SOPs & Performance Standards
Daily Planning in EAMS
Weekly and Daily Work Planning (Work Orders in EAMS)
Work Plan (Work Orders)
Available Resources (EAMS)
Resource Allocation (EAMS)
Assign Work to Contractor or Crew (EAMS)
Complete Work
Work Completed
Complaint, Inquiry or Request
CIRs are a potential future functional requirement of EAMS. Most COTS have a module for this. It allows tracking of the CIRs from creation to resolution.
Forms and Reports
Defects, Field Notes and Pictures, Sign Reports – From EAMS
Work Plan (Work Orders)
Planned Capital Work
Planned Annual Activities
Legend
Start
Process Step
Sub Process
Decision?
Document / Report
Input / Entry
Data
Database

MDOT
Business Process

Process Stage: To-Be

Process Name: Routine Bridge Maintenance

Parent Business Process / Facet: Highway Maintenance

Process Owner: Garage Supervisor

Primary Deliverables / Products: Completed Maintenance activities

Primary Client: Public

Process Cycle and Duration: Annual

Description:

MDOT has an annual inspection program that feeds the development of planned maintenance and capital planning activities on bridges. Repairs, maintenance are carried out by the garage staff while capital work is done through the region under contract.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Regional Bridge Inspectors	Perform Annual Inspections on Bridges
	Regoinal Bridge Engineer	
	Region Crew or Statewide Crew	
	Transportation Service Center	
	Bridge Supervisor	
Public		

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1A	Bi-Annual Inspection Cycle	Bridges are inspected by trained bridge inspectors on a bi-annual cycle.
1G	Complaint, Inquiry or Request	Complaints, inquires and requests are submitted by the public about deficiencies or safety concerns with regards to bridges.

Index	Process Step	Description
2A	Bridge Inspections	Bridges are inspected using the National Bridge Inspection standard.
3A	Bridge Inspection Form & Photos	Bridge inspections are recorded on a form for loading into MBIS. Photos are kept regionally in individual photo logs.
3D	Planned Annual Activities	The garage plans annual maintenance activities based on knowledge and experience.
3E	Defects Field Notes and Pictures, Sign Form	Information from the bridge inspection is made available to the Garage Supervisor, including defects, field notes pictures and signing form.
4A	Input into MBIS	Bridge inspection data is entered into MBIS (Pontis) from the form. This may be live loaded in some cases.
4B	Plan Capital Work	The Regional bridge engineer uses MBIS to create a capital program.
4C	Planned Capital Work	The TSC has a listing of planned capital work that is compiled from the MIBridge.
4E	Identification of Maintenance Activities	The Garage Supervisor puts together the information from the inspections, and the planned activities to identify a program of activities for the year.
5A	Bridge Inventory and Condition	Bridge inventory and condition data is used through MBIS for capital planning activities.
5D	EAMS	EAMS accepts the Maintenance Activities from the identification process.
5E	Electrical Not in Contract?	Activities that are electrical in nature are identified and separated from the program and are not under the contract of the local agency given to a regional or statewide crew with that capability.
5F	Electrical Work	Electrical Work is given to the statewide or regional crew.
6B	Capital Preventative Maintenance?	The Bridge Engineer then examines the activity program to identify any preventative maintenance on bridges and separates it from the program.
7B	Evaluate and Engage Contractor	The Regional Bridge Engineer will evaluate preventative maintenance needs identified by the TSC and engage a contractor to complete the work.

Index	Process Step	Description
7C	Evaluate Repair Needs	The TSC evaluates the repair needs that are considered preventative maintenance and sent to the Regional Bridge Engineer.
7E	Daily Planning in EAMS	Activities are posted to the Garages for weekly and daily work planning.
8B	Complete	Electrical work is completed by contractor.
8E	Weekly and Daily Work Planning (Work Orders in EAMS)	The Garage Supervisor plans their work for the day and the next week, using the maintenance activities which were posted.
9E	Work Plan	The Garage Supervisors daily and weekly planning results in a work plan.
10D	Available Resources (EAMS)	Resources which are available to the garage supervisor such as fleet, equipment, materials and labor.
10E	Resource Allocation (EAMS)	The Garage supervisor matches the work plan with the resources that are available to complete the work.
11D	Complete Work	The work is completed according to plan.
11E	Assign Work to Contractor or Crew (EAMS)	Work is assigned to the contractor or crew.
12D	Work Completed	The Bridge Maintenance work is completed.

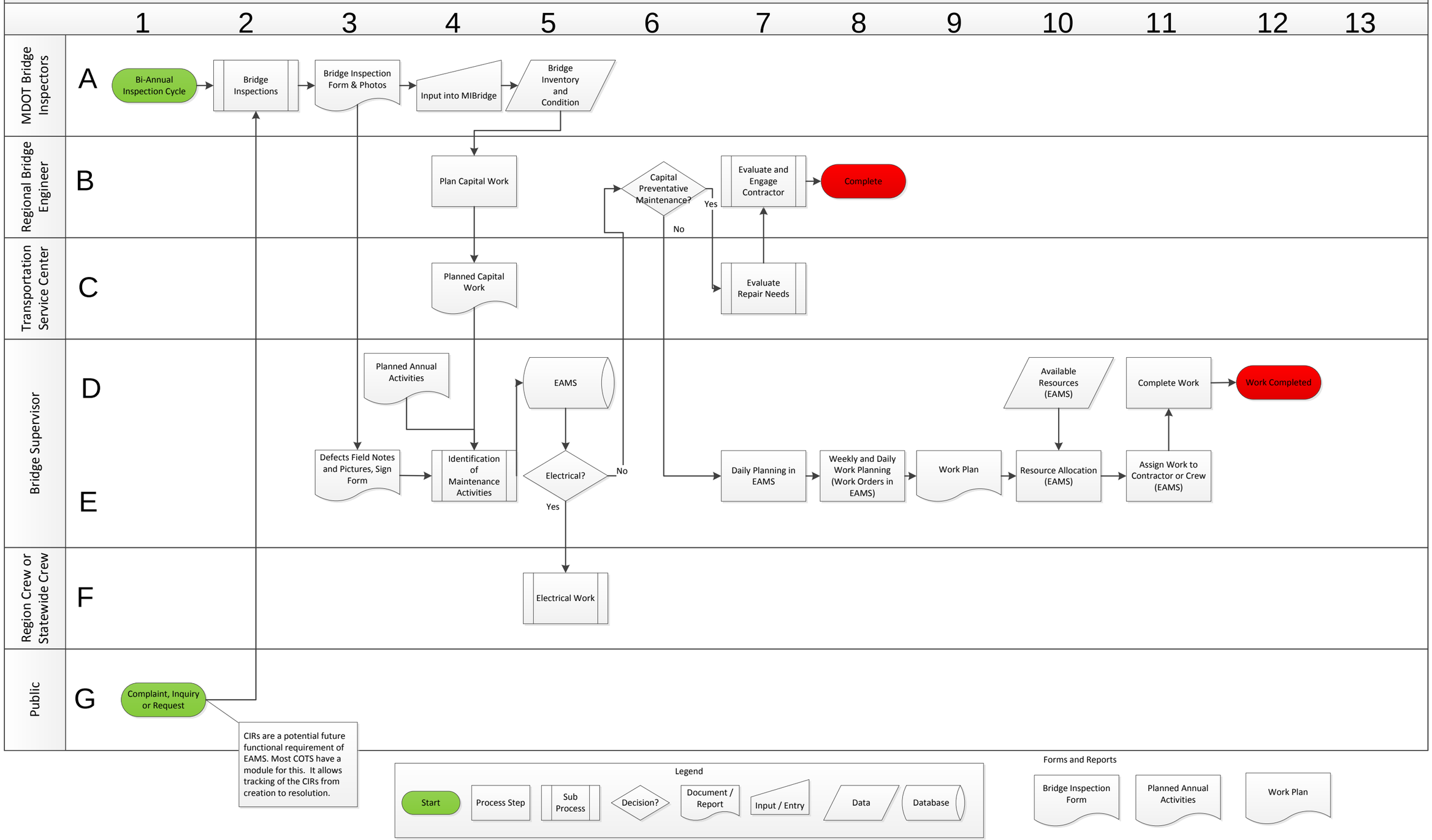
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	09-Sep-2013

Attached:

MDOT: Routine Bridge Maintenance by MDOT "Future State" (Version 3)

27-Nov-2013



MDOT
Business Process

Process Stage: To-Be

Process Name: Maintenance Reporting by MDOT

Parent Business Process / Facet: Highway Maintenance

Process Owner: MDOT Garage Supervisor

Primary Deliverables / Products: Weekly Expenditure data

Primary Client: Finance / Office of Administrative Services

Process Cycle and Duration: Weekly

Description:

MDOT's Direct Forces perform highway maintenance work and record expenditures that must be entered into EAMS and transferred to MAIN and MIDB for budget comparison and tracking of expenses.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Garage Supervisor	Is responsible for the day to day management of the Maintenance Garage
	Region	
	Transportation Service Center	
	Employee	Performs maintenance work and can enter timesheet information
Office of Administrative Services		
Finance		

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1C	Daily Work Completed	Work is completed on a daily basis.

Index	Process Step	Description
2C	EAMS	EAMS accepts the Labour, Equipment Materials & Acc By Route
2D	Records Labour, Equipment, Materials & Acc. By Route In Timesheet Or DCDS	The Garage Supervisor records Labour, Equipment, Materials and Acc. By route in timesheet or DCDS.
2H	TimeSheet Report For Entry into DCDS From EAMS	A Bi-Weekly Timesheet is created from EAMS for Input into DCDS.
3B	DCDS	DCDS Accepts Non-Labor data from EAMS
3C	Send Non-Payroll, Non-Stores expenses For approval	Non-Payroll / Non-Stores expenses are sent for approval. These may be hired equipment or purchased materials.
3G	Timekeeper Input	The Timekeeper keys in the information from the report into DCDS. In the future this could be automated to be transferred directly to DCDS from EAMS.
3H	Employee Time Input into DCDS	The Employee will key the labor information into DCDS. In the future this could be automated.
4C	Materials From Stores Entered into MaintStar (Stores)	Materials that have been issued from stores are entered into MaintStar (stores system).
4D	Approve?	The Garage Supervisor has to approve the non-payroll items.
4E	Approve?	The Garage Supervisor has to approve labour and equipment in DCDS.
4F	DCDS	DCDS is the interface for MIDB to enter labor and equipment expenses for highway maintenance.
5C	MaintStar	MaintStar is the Fleet Management Program that MDOT uses to track the inventory and services of all MDOT owned vehicles and equipment. MaintStar is also used to create work orders for needed equipment services and repairs and calculates our cost of maintaining our equipment fleet.
6C	Weekly Export File	A weekly export file is exported from MAIN and transferred to MIDB.

Index	Process Step	Description
6F	Non-Payroll, Non-Stores expenses Transferred to MIDB	Non-Payroll, Non Stores expenses are sent to MIDB after they have been approved by the supervisor.
7C	MAIN	MAIN is the interface for entering information into MIDB for Materials and non-payroll expenses.
8F	MIDB	Michigan Information Database (MIDB) is the central financial database for the state.
9A	Comparison to Plans	The Office of Administrative Services (OAS) will compare actuals and annual budgets.
9B	Comparison to Plans EAMS	The Region will compare actuals and annual budgets.
9F	Weekly Export File	A weekly export file is created from MaintStart with all the materials from stores used in maintenance activities to import into MAIN.
10F	WebFancy	WebFancy is a financial reporting system that runs on the Web. It was developed for, and is used by, employees at MDOT. WebFancy will create a wide variety of financial reports with varying levels of expenditure and budget detail.
12F	Complete	Reporting is complete.

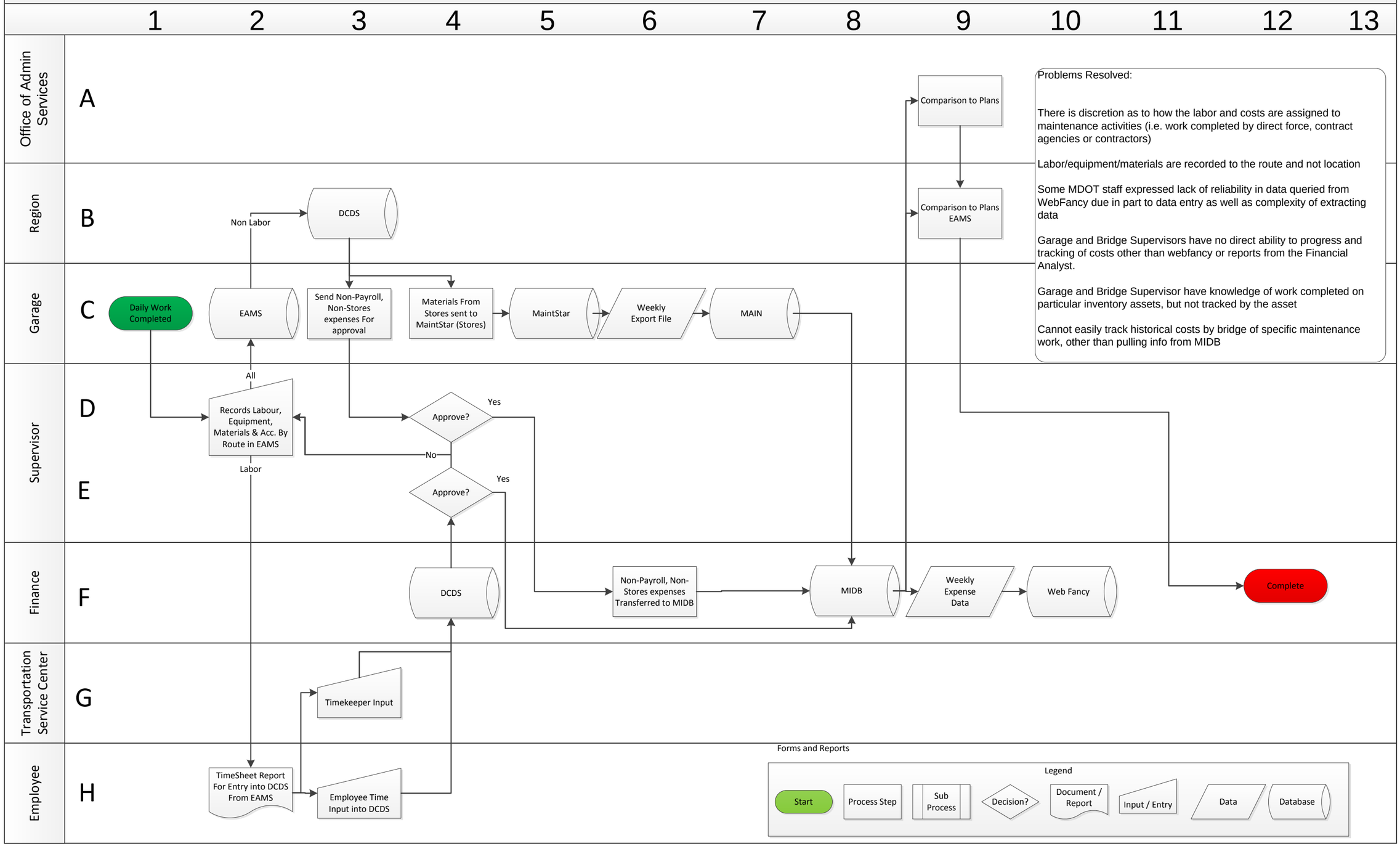
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	27-Nov-2013

Attached:

MDOT: Maintenance Reporting by MDOT "Future State" (Version 3)

27-Nov-013



Problems Resolved:

There is discretion as to how the labor and costs are assigned to maintenance activities (i.e. work completed by direct force, contract agencies or contractors)

Labor/equipment/materials are recorded to the route and not location

Some MDOT staff expressed lack of reliability in data queried from WebFancy due in part to data entry as well as complexity of extracting data

Garage and Bridge Supervisors have no direct ability to progress and tracking of costs other than webfancy or reports from the Financial Analyst.

Garage and Bridge Supervisor have knowledge of work completed on particular inventory assets, but not tracked by the asset

Cannot easily track historical costs by bridge of specific maintenance work, other than pulling info from MIDB

MDOT
Business Process

Process Stage: To-Be

Process Name: Routine Hwy Maintenance by Local Agencies

Parent Business Process / Facet: Highway Maintenance

Process Owner: Local Agency

Primary Deliverables / Products: Completed Highway Maintenance

Primary Client: Transportation Service Center

Process Cycle and Duration: Daily / Weekly

Description:

Highway maintenance in Michigan is often carried out by local agencies such as a county or city. These agencies work as an extension to MDOTs own forces under contract.

Participants:

Department / Agency	Actors	Description of Role
MDOT	Region	Capital work
	Region or Statewide crew	Performs Electrical work
	Transportation Service Center	Planning
Local Agency	Local Agency Contract Supervisor	
Public		Registers Complaints, Inquiries or Requests

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1B	Daily or Weekly Roadway Inspection	The Transportation Service Center carries out daily and weekly highway Inspections.
1G	Complaint, Inquiry or Request	A complaint Inquiry or request is made by the public regarding a highway.

Index	Process Step	Description
2D	Roadway Inspection	A roadway inspection is done on a regular daily and weekly cycle.
3D	EAMS	EAMS accepts the roadway inspection data.
3E	Defects Field Notes and Pictures, Sign Report	Defects, field notes and pictures as well as a sign information is made available in a report for planning.
4E	Electrical Not in Contract?	Highway needs are assessed by the local agency contract supervisor to see if there are any electrical requirements which are not in the contract scope. If so those are sent to the Region or Statewide electrical crew.
4F	Electrical Work	Electrical work is performed by the Region Crew or the Statewide Crew.
5B	Capital Preventative Maint?	The Transportation Service Center evaluates the needs resulting from the inspections. Any Capital preventative maintenance is handled by the TSC, otherwise the local agency handles the repairs.
6A	Evaluate and Engage Contractor	The capital preventative maintenance repair needs are evaluated by the Region and a contractor is engaged to complete the work.
6B	Evaluate Repair Needs	The capital preventative maintenance repair needs are evaluated by the TSC.
6C	Create and Assign Work order in EAMS	Create and assign work orders in EAMS. These work orders can be created by the TSC and assigned to the Local Agency Contract Supervisor.
6D	Daily Planning in EAMS	The Supervisor can do his or her daily planning in EAMS. Standard operating procedures and performance standards are available in EAMS to aid in planning and monitoring of projects.
7A	Work Completed	The contractor who is engaged completes the work.
7B	Meets with County Contract Supervisor	The TSC meets with the County Contract Supervisor to plan work on a bi-weekly basis.
7D	Bi - Weekly Work Planning (EAMS)	The local agency has a bi-weekly work plan based on it's meetings with The TSC. This can all be done within EAMS.
8D	Work Plan	The work plan is a two week plan that encompasses all the highway maintenance the supervisor will undertake.

Index	Process Step	Description
9B	Verify Work is completed (EAMS)	The TSC verifies that work is completed.
9D	Contractor Completes Work	The contractor completes the work.
10B	Work is Complete	If the work is verified complete the Work order can be closed.
10C	Work Completed	Work is completed according to plan.

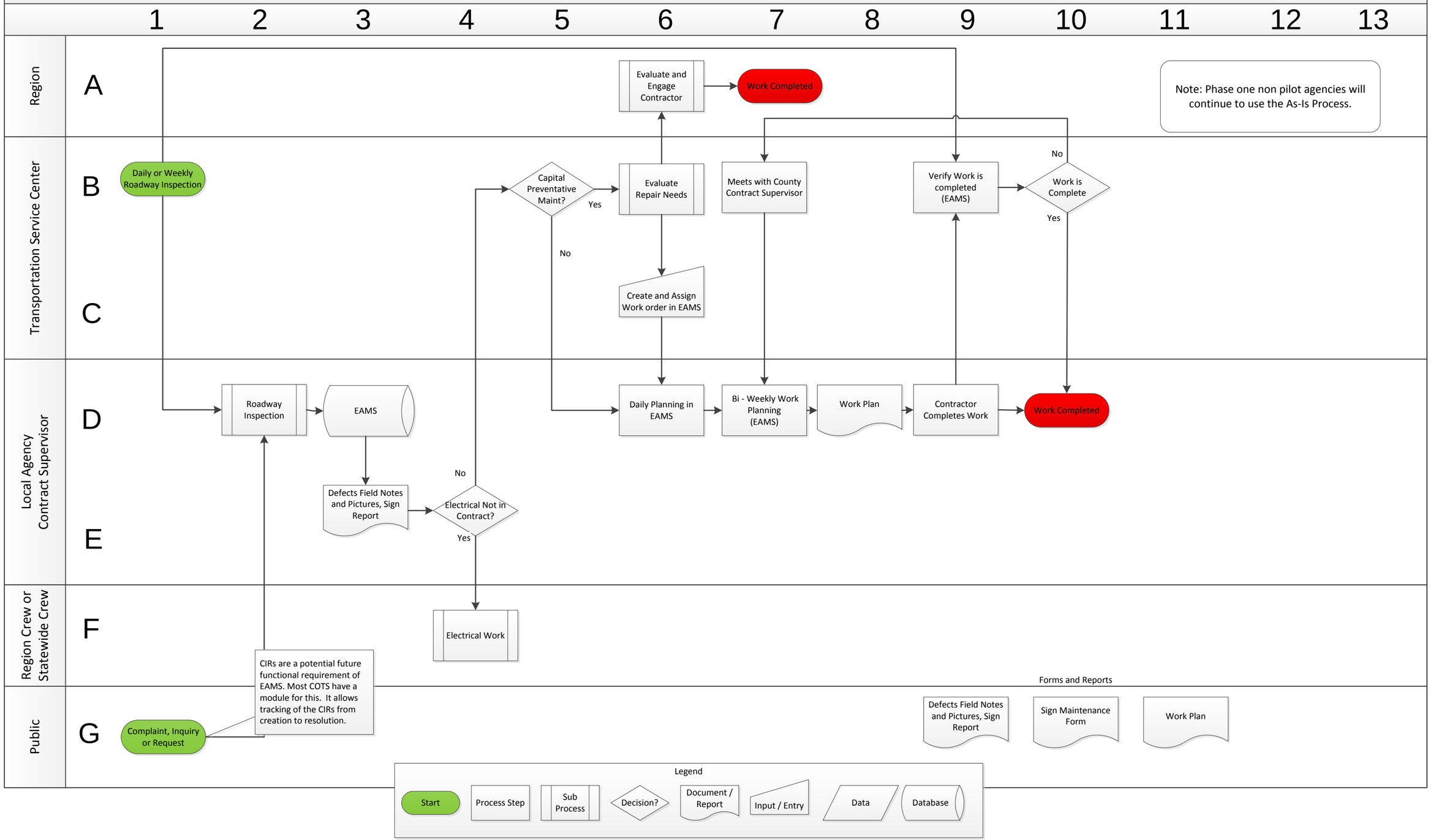
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	27-Nov -2013

Attached:

MDOT: Routine Highway Maintenance by Local Agencies “Future State” (Version 3) Phase 1 Pilot Counties Only

27-Nov-2013



MDOT
Business Process

Process Stage: To-Be

Process Name: Maintenance Reporting by Local Agencies

Parent Business Process / Facet: Highway Maintenance Reporting

Process Owner: MDOT Maintenance Coordinator

Primary Deliverables / Products: Local agencies expenditure data

Primary Client: Office of Admin Services

Process Cycle and Duration: Weekly

Description:

MDOT often contracts maintenance work to local agencies such as a county. The activity costing must be collected for this work in terms of labor equipment and materials. The local agency provides this information and it is loaded through EAMS and LAPS for inclusion into MIDB for loading into WebFancy, comparison to budgets, and generating payables to counties as well as recoverable from the Federal Government.

Participants:

Department / Agency	Actors	Description of Role
Local Agency	Accounts Receivable	
MDOT	Maintenance Coordinator – Transportation Service Center	Responsible for maintenance coordination in a geographic region
	Region	Monitor Maintenance Plans and actuals
Office of Admin Services		Monitor Maintenance Plans and actuals

Process Map: (See Attached)

Process Steps Descriptions:

Index	Process Step	Description
1C	Report Labour, Equipment & Materials	The Local Agency completes work and submits a weekly report with the Labour Equipment and Materials.

Index	Process Step	Description
1E	EAMS	EAMS accepts Accomplishment from Local Agencies.
2C	Enter Accomplishment into Activity Report	Enter accomplishment, and resource usage information into an Activity Report.
2E	Activity Report / Invoice	An activity report is sent to the MDOT Maintenance Coordinator at the TSC.
3E	Approve?	The Maintenance Coordinator reviews the activity report for approval.
4E	Send Accomplishment Data to LAPS	The Maintenance Coordinator Triggers a Transfer of the information into LAPS from EAMS. Most Local Agencies will include # hours Equipment and materials. Some do not, particularly when work is contracted out.
5E	LAPS	Local Agency Payments System (LAPS) Streamlines the payment process for local agency maintenance contracts. It is a cross-functional information system consisting of five modules to track and process billing information. The system is primarily responsible for collecting routine and non-routine bills submitted by local contract agencies; validating billing transactions against MDOT data; assisting in review and approval of bills; auditing bills; generating vouchers for payment; and maintaining and forecasting budgets.
6E	Approve Billing?	The Maintenance Coordinator at the TSC reviews the billing data for approval.
7E	MIDB	Michigan Information Database (MIDB) is the central financial database for the state.
8E	Weekly Expenditure Data	Data from MIDB is used to update WebFancy on a weekly basis.
9E	WebFancy	WebFancy is a financial reporting system that runs on the Web. It was developed for, and is used by, employees at MDOT. WebFancy will create a wide variety of financial reports with varying levels of expenditure and budget detail.
10A	Comparison With Monthly, Quarterly and Annual Plans	The Office of Administrative Services (OAS) will compare actuals and annual budgets. Counties are compared on a monthly basis, while cities are compared on a quarterly basis.
10B	Comparison With Monthly, Quarterly and Annual Plans	The Region will compare actuals and annual budgets. Counties are compared on a monthly basis, while cities are compared on a quarterly basis.

Index	Process Step	Description
10E	Comparison	WebFancy can generate a comparison of actuals and budgets for monitoring.
11A	Complete	The reporting cycle is complete.

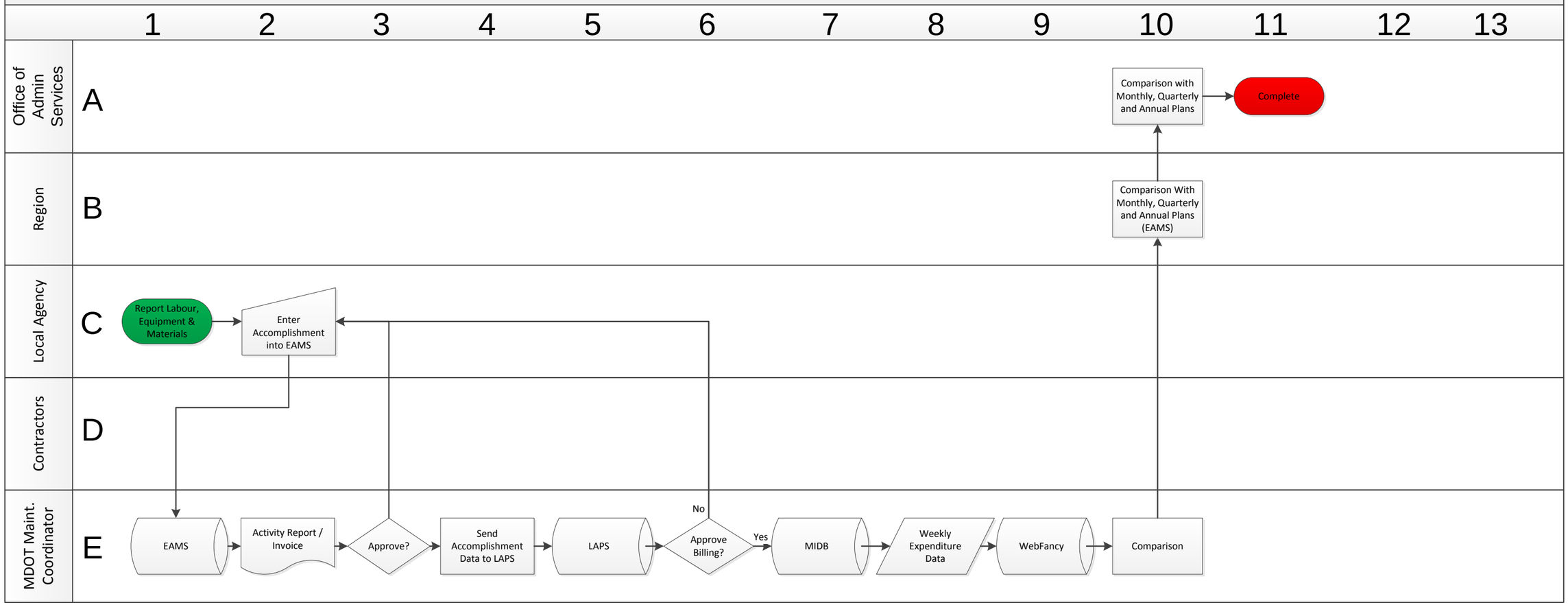
Change Log:

Version	Authors	Description	Date
1	John MacNaughton (OPUS)	First Draft	27-Nov-2013

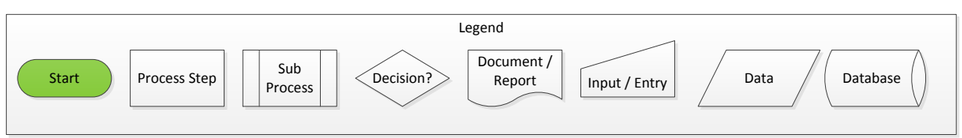
Attached:

MDOT: Maintenance Reporting by Local Agencies “Future State” (Version 3)

27-Nov-2013



Forms and Reports



3. Sign Maintenance

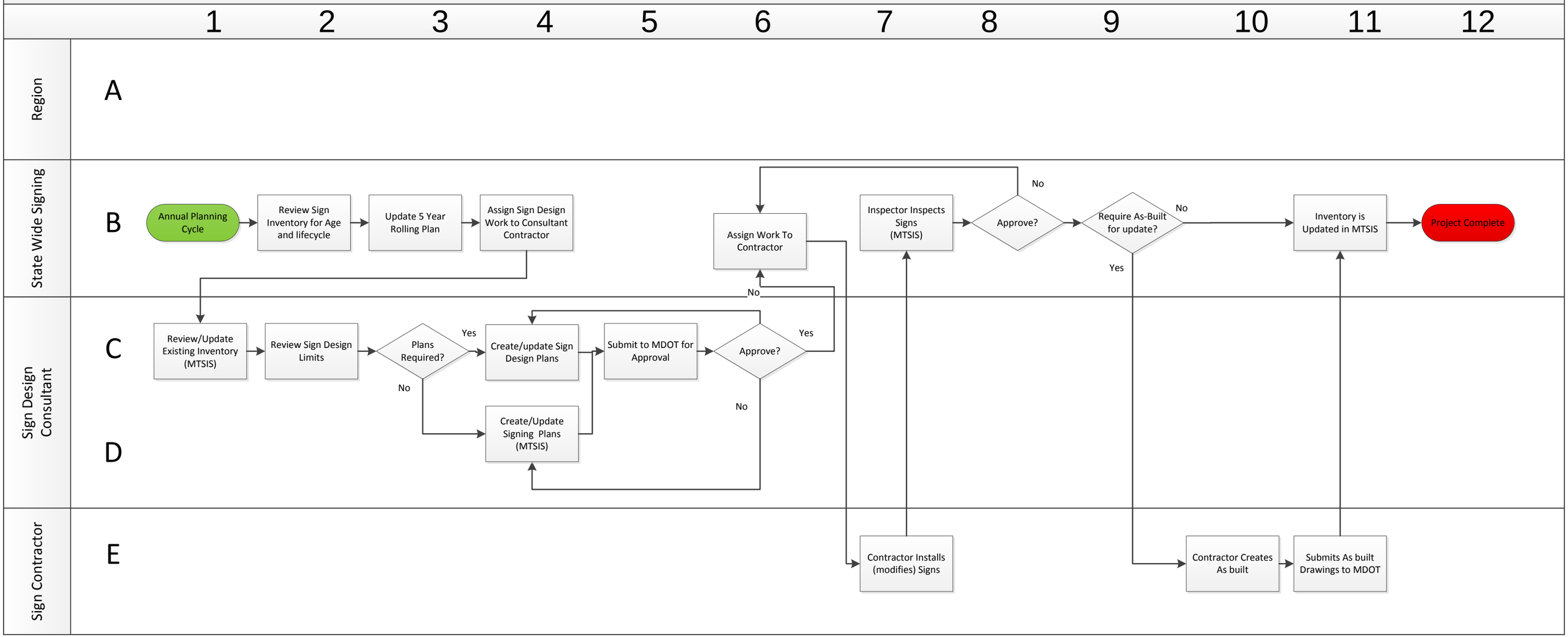
3.1 As – Is Sign Maintenance Processes

The business processes involved with maintenance of signs are included in the EAMS. The following processes have been documented to further describe the requirements:

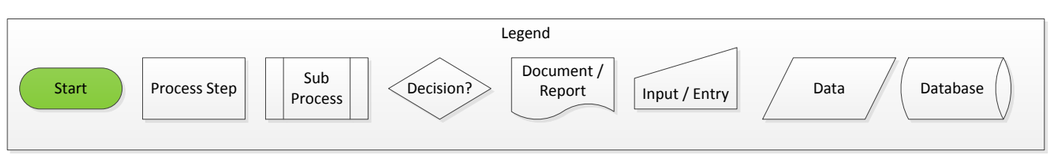
- Annual Sign Program
- Unplanned Sign Maintenance

MDOT: Annual Sign Program Plans (Version 1)

17-Dec-2013

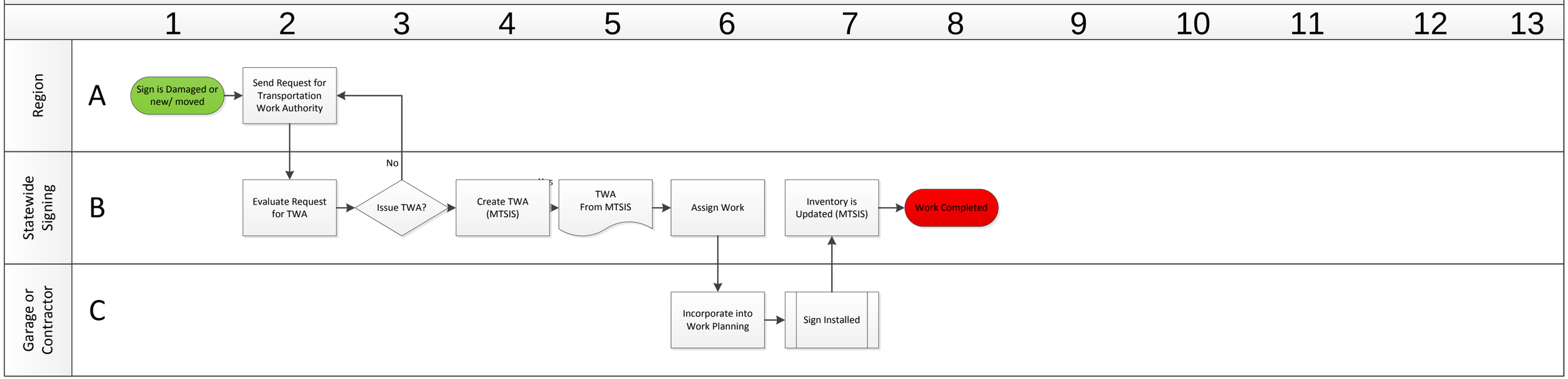


Forms and Reports

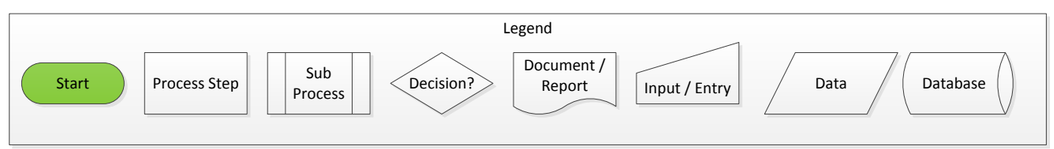


MDOT: Unplanned / Sign Maintenance (Version 1)

17-Dec-2013



Forms and Reports



Michigan Department Of Transportation

Attachment A – Solution Requirements
Enterprise Asset Management System

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6. Technical Requirements 78

EAMS Solution Requirements

This document contains functional and technical requirements for the EAMS COTS solution that is being procured through this Phase 1 RFP. The following instructions are intended for vendors who must complete this document and submit it as part of their proposal.

Each of the requirements requires a response from the vendor. They have been prioritized and weighted by importance by MDOT, and labeled within the column **M/ H- L** with one of the following ratings:

M – **M**andatory, requirement must be met by the proposed solution;

H – **H**igh, requirement is highly desirable and should be met by the proposed solution;

L – **L**ow, requirement is desirable to provide additional value within the proposed solution.

NOTE: BIDDERS ARE ADVISED THAT FAILURE TO MEET THE MINIMUM MANDATORY REQUIREMENTS LISTED WITHIN THIS DOCUMENT WILL RESULT IN DISQUALIFICATION FROM FURTHER CONSIDERATION IN THIS BID PROCESS.

Vendors must complete the two shaded columns for each requirement as follows:

a) If your proposed COTS solution complies with all aspects of the requirement and is currently a standard feature, place a "**Y**" in the column labeled "**Y-N-M**" and provide the following information:

   - In the "**Description of Solution**" column, describe in sufficient detail how the proposed solution fully complies with the requirement. If required, you may also provide additional supporting information and screen shots to demonstrate the functionality. This additional supporting information is to be included in an appendix that is directly referenced to the functional requirement number.

b) If your proposed COTS solution does **NOT** fulfill this requirement, place an "**N**" in the column labeled "**Y-N-M**" and provide the following information:

   - In the "**Description of Solution**" column, describe the impact of not meeting the requirement.

c) If your proposed COTS solution does not currently comply with the requirement, but could be modified through configuration, programming or source code changes which, in your opinion, would result in the solution reaching full compliance with the requirement, place an "**M**" in the column labeled "**Y-N-M**" and provide the following information:

   - In the "**Description of Solution**" column, clearly describe the modification, how it will be accomplished, and how it will comply with the requirement. The clarity of this explanation may affect the scoring of your proposal.

   - All such modifications are considered to be part of the solution being proposed and included in the bid price. If the modification will not be complete by the implementation date, Contractor must specify an anticipated date when the modification would be added to the solution, at no additional cost to the State. The State reserves the right to reject the Contractor's proposed date and consider the solution not in compliance.

- Contractor must provide assurance that the proposed modification will be fully supported in future releases of the underlying COTS software at no additional cost to the State beyond any applicable software and maintenance fees related to the license.

Note: Your response to each requirement should contain adequate information for evaluation by the joint evaluation committee (JEC) without referencing other responses in your proposal. The JEC will be the final judge on whether or not the solution meets the requirement.

Below, a check list for minimum mandatory requirements has been provided to ensure that Bidders have provided their responses to these mandatory requirements.

Minimum Mandatory Requirements Checklist

The Mandatory Requirements Checklist is to ensure that the Bidder answers each mandatory (M) requirement as outlined in Article 3 Section 3.021 Step 1: Minimum Mandatory Requirements.

1.1 Manage Users, and Roles, Access by Module, Admin Unit (Manage Users)

No Mandatory Requirements.

1.2 Reporting

No.	Requirement	M/ H-L	Answered
1.2.1	*Use of standard, configurable reports.*	*M*	Y
1.2.2	*Ability to construct user defined and permanent reports using imbedded application tools.*	*M*	Y

1.3 GIS

No.	Requirement	M/ H-L	Answered
1.3.1	*Mapping within the EAMS application is compatible with ArcGIS Server.*	*M*	Y

1.4 UX – User Experience

No.	Requirement	M/ H-L	Answered
1.4.1	*The system will provide access to the User Guide from each screen using context-sensitive help.*	*M*	Y

1.5 Mobile Access

No.	Requirement	M/ H-L	Answered
1.5.1	*Ability to use the mobile interface for accessing the EAMS for creating and managing work orders.*	*M*	Y
1.5.2	*Ability to use the mobile interface for accessing the EAMS for inspections. Users should be able to Create, Read, Update Deactivate / Delete inspections as per the user's permission.*	*M*	Y

1.6 Manage Configuration of Codes, Fields, UI Elements, Workflows

No.	Requirement	M/ H-L	Answered
1.6.1	*Ability for an administrator, using in application tools, to create, update, deactivate, user interface elements for standard and configurable functionality, attribute fields etc.*	*M*	Y
1.6.2	*Ability for an administrator to create, update, deactivate/delete MDOT specific codes, terminology, choice lists, labels, verification domains, etc. using tools within the application.*	*M*	Y

1.7 Manage Digital Documents, Drawings and Images

No Mandatory Requirements.

1.8 Contractors and Local Agencies

No.	Requirement	M/ H-L	Answered
1.8.1	*Function as an autonomous business unit, having access to the software in a similar fashion to MDOT Garages, but with access limited to the agencies' or contractors' area of responsibility and the assets therein.*	*M*	Y

2.1 General Location Referencing

No.	Requirement	M/ H-L	Answered
2.1.1	*The solution must provide support for imperial units (feet, miles) linear measures for:* • *Datum definition* • *LRM section lengths* • *Inquiry and reporting of measures*	*M*	Y

2.2 Temporal Data Management

No Mandatory Requirements.

2.3 Multiple LRM Support

No.	Requirement	M/ H-L	Answered
2.3.1	*Support for MDOT LRMs – The solution must support the following specific LRMs as defined within the MDOT Location Referencing Standards:* • *PR Segment – Mile Point (PR-MP)* • *Control Section – Mile Point (CS-MP)* • *Route – Mile Point (Route-MP)*	*M*	Y

2.4 Location Translation

No Mandatory Requirements.

2.5 Road Network Reporting

No Mandatory Requirements.

2.6 Support for MDOT Location Referencing Business Processes

No Mandatory Requirements.

3.1 Manage Asset Inventory Library

No.	Requirement	M/ H-L	Answered
3.1.1	*Create, Read, Update Deactivate/Delete (CRUD) Asset types. Nonstandard asset types will be fully configurable and have the same behavior characteristics as standard asset types.*	*M*	Y
3.1.2	*Have the ability to define the attributes associated with each type of asset. Attributes will be any data type, with the ability to manage in excess of 100 unique attributes per asset type.*	*M*	Y
3.1.3	*Define complex assets with multiple elements, each with its own set of attributes. Attributes for elements will be configurable, be of any data type. The system will be able to manage in excess of 100 attributes per component.*	*M*	Y

3.2 Field Data Integration

No.	Requirement	M/ H-L	Answered
3.2.1	*The solution should provide functionality to enable EAMS assets to be updated and time stamped as changes occur through integrated business process workflows that capture changes using GPS enabled field data collection systems. The Vendor is requested to specify whether additional software modules are needed to meet this requirement and if additional licensing costs are incurred.*	*M*	Y

3.3 Manage Inspections and Condition Information

No.	Requirement	M/ H-L	Answered
3.3.1	*Define condition inspections for asset types*	*M*	Y
3.3.2	*Define Regulatory inspections for asset types*	*M*	Y
3.3.3	*Record individual Condition Inspections on Assets, include asset specific and user condition indices, date, time, inspector. These will be linked to assets in the asset inventory.*	*M*	Y

4.1 Maintenance Program and Budget Planning

No.	Requirement	M/ H-L	Answered
4.1.1	*Create, Read, Update Deactivate/Delete (CRUD) Programs with multiple sub budgets, to which projects and Work Orders can be assigned.*	*M*	Y
4.1.2	*Define preventative and scheduled maintenance on asset types. Set cycle time*	*M*	Y

No.	Requirement	M/ H-L	Answered
	for inspections, operations activities, maintenance etc.		
4.1.3	*Prioritize maintenance activities and compare planned maintenance with accomplishments in order to determine deferred maintenance at the end of the year to support budget requests.*	*M*	Y
4.1.4	*Create, read, update, delete / deactivate annual work plans based on need identified through planned work orders. Plans should be Tied to budgets and hierarchical.*	*M*	Y
4.1.5	*Create, read, update, delete / deactivate flexible schedules (daily, weekly, bi-weekly, monthly) for maintenance activities based on annual work plan*	*M*	Y

4.2 Manage Work Orders

No.	Requirement	M/ H-L	Answered
4.2.1	*Ability to Create, Read, and Deactivate/Delete work orders.*	*M*	Y
4.2.2	*Attach work orders to specific assets or to a location along a linear asset such as a highway.*	*M*	Y
4.2.3	*Users can choose a work order type and debit the expenses to a particular budget item and program. Costs show up as committed for planned work orders and expenditures for costs actually incurred.*	*M*	Y
4.2.4	*Use work orders to assign staff, crews, equipment and vehicles.*	*M*	Y
4.2.5	*Use work orders to plan the use of materials.*	*M*	Y
4.2.6	*Use work orders to plan the use of contract labor, equipment and crews.*	*M*	Y
4.2.7	*Use work orders to estimate the budget of a project by calculating the expenditures automatically from the estimated use of either standard plans or individually entered plans (labor, equipment and materials)*	*M*	Y
4.2.8	*Use work orders to record accomplishment in terms of a pre-defined configurable quantity.*	*M*	Y
4.2.9	*Use work orders to record use of labor, equipment, vehicles, materials and hired contractors*	*M*	Y
4.2.10	*Use work orders to track the actual expenditures on a project.*	*M*	Y

4.3 Manage Work Orders – Sign Specific Requirements

No Mandatory Requirements.

4.4 Manage Workers and Crews

No.	Requirement	M/ H-L	Answered
4.4.1	*Create, Read, Update and Deactivate/Delete crew types, crews.*	*M*	Y
4.4.2	*Assign Workers to Crews, admin units, regions etc.*	*M*	Y

4.5 Manage Fleet and Equipment

No.	Requirement	M/ H-L	Answered
4.5.1	*Create, Read, Update and Deactivate/Delete Equipment type, vehicle types and vehicles*	*M*	Y
4.5.2	*Ability to assign equipment or vehicles to a particular admin unit or crew.*	*M*	Y

4.6 Manage Customer Service

No Mandatory Requirements.

4.7 Performance

No.	Requirement	M/ H-L	Answered
4.7.1	*Record, track and report on performance of maintenance activity achievements and Level of Service.*	*M*	Y
4.7.2	*Use analytical tools to compare performance to standard levels of service for accomplishment, quality and budget, at the work order, crew, garage, region and statewide levels.*	*M*	Y

5.1 Road Network Application Integration

No Mandatory Requirements.

5.2 External Application Integration

No Mandatory Requirements.

6.1 System Architecture

No.	Requirement	M/ H-L	Answered
6.1.1	*The system employs web architecture using browser accessing a central database through software on a server.*	*M*	Y

6.2 Software Licensing

No Mandatory Requirements.

6.3 RDBMS / Applications / Database Management

No Mandatory Requirements.

6.4 Security

No Mandatory Requirements.

6.5 General Commercial Software Considerations

No Mandatory Requirements.

6.6 Reporting

No.	Requirement	M/ H-L	Answered
6.6.1	*The software delivers standard reports.*	*M*	Y
6.6.2	*The system includes user defined query and reporting using state standard tools that allow the user to examine asset data and patterns in asset data.*	*M*	Y

6.7 Auditing

No Mandatory Requirements.

The business requirements have been structured into specific categories that align with the strategic, tactical and operational need of the EAMS solution (see Table 1). Each area subsequently includes a series of process requirements that identify what the product should do in order to fulfill the business need.

Table 1: EAMS Phase 1 Requirement Area Categories

No.	Category	Priority Area	Description
1.0	Functional	General	Functionality that is applicable to the overall EAMS solution across all modules
2.0	Functional	Road Network Management	Functionality that is applicable to the EAMS Road Network Management module
3.0	Functional	Asset Inventory Management	Functionality that is applicable to the EAMS Asset Inventory Management module
4.0	Functional	Maintenance Management	Functionality that is applicable to the EAMS Maintenance Management module
5.0	Functional	Application Integration	Functionality that is applicable to integration
6.0	Technical	All	Operational capability that is required to meet state standards for security, usability etc.

1. General

This section describes EAMS functionality that is needed across all application modules.

1.1. Manage Users, and Roles, Access by Module, Admin Unit (Manage Users)

Administrators need to be able to add, modify and de-activate users as well as assign them specific roles and permissions according to groups such as administrative unit and send broadcast messages to all users.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.1.1	Create, Read, Update, Deactivate/Delete (CRUD) user defined user roles for controlling access to functionality within the system. Roles should be based on the user's position within MDOT and their required use of the system.	H	Y	Accomplished through 'Setup Users' in the Administration menu (See Appendix 1 General [Part 1 of 2] for screenshot page 2). This is a standard feature.
1.1.2	Create, Read, Update, Deactivate/Delete (CRUD) user defined, administration units, for the use of controlling permissions to access data related to geographic areas (Regions) or sub Areas (Maintenance Responsibility Areas) for direct forces, as well as establish separate admin units for contract forces.	H	Y	Use 'Setup Users' and create roles based upon geographically named regions (See Appendix 1 General [Part 1 of 2]for screenshot page 3). This is a standard feature.
1.1.3	Assign specific end users roles, and Administrative Units to users either individually based on their position or as a group based on the administrative unit or position within MDOT.	H	Y	Done through 'Setup Users' (See Appendix 1 General [Part 1 of 2] for screenshot page 4). This is a standard feature.
1.1.4	Manage Attributes regarding user's employment information. Specifically information from the global database that includes their name, position, admin unit, geographic area, rates, collective bargaining agreement, and any other information required.	H	Y	Accomplished in Resource Manager -> Personnel. Configure the personnel form to store additional required attributes. Attach the agreements as

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				document attachments to the personnel records. (See Appendix 1 General [Part 1 of 2] for screenshot page 5). This is a standard feature of Resource Manager which is included in our proposed solution.
1.1.5	Produce a User Activity Report. At minimum the report will show the last time a user was logged in.	H	Y	System Administrators have access to this through 'Setup Users' (See Appendix 1 [Part 1 of 2] General for screenshot page 6). This is a standard feature.
1.1.6	The system will let administrators add or remove a broadcast message.	H	Y	Standard feature (See Appendix 1 [Part 1 of 2] General for screenshot page 7)
1.1.7	When a broadcast message is added, it will appear to all users immediately and at login. It will require users to dismiss it.	H	Y	Standard feature (See Appendix 1 [Part 1 of 2] General for screenshot page 8)
1.1.8	When adding a broadcast message, the administrator can choose to send a warning email to users in selected user groups or TSC(s).	H	Y	Standard feature (See Appendix 1 [Part 1 of 2] General for screenshot page 9)

1.2. Reporting

Reporting in the EAMS should be enabled by a report design engine that will enable a user or administrator to design a report based on their knowledge of the information available to them within the interface. Those reports should be managed and made available either to the group or individually based on their roles and administrative unit permissions. Use of real-time statistics as well to supply desktop widget style information (i.e. dashboards) to supervisors, managers, and executive based on periodic (daily, weekly, monthly) Key Performance Indicators (KPIs).

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.2.1	*Use of standard, configurable reports.*	*M*	Y	VUEWorks contains an internal 'Dynamic Reports' engine with a robust report designer. (See Appendix 1 General [Part 1 of 2] for screenshot page 10). This is a standard feature.
1.2.2	*Ability to construct user defined and permanent reports using imbedded application tools.*	*M*	Y	VUEWorks contains an internal 'Dynamic Reports' engine with a robust report designer. (See Appendix 1 General [Part 1 of 2] for screenshot page 11). This is a standard feature.
1.2.3	Ability to use industry standard tools such as Crystal Reports to construct reports that are resident within the application as well as externally available.	H	Y	VUEWorks' database contains a series of standard SQL views that are used to connect to 3rd party reporting tools (See Appendix 1 General [Part 1 of 2] for screenshot page 12). This is a standard feature.
1.2.4	Hierarchical reporting of budgets, planned work, assets, accomplishments, expenditures, service requests, work orders, labor costs, vehicle costs, condition summaries, urgent work, etc.	H	Y	VUEWorks Dynamic Reporting supports unlimited grouping (See Appendix 1 General [Part 1

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				of 2] for screenshot page 13). This is a standard feature.
1.2.5	Reports will be secured to the various business unit, contractor or local agency. For example: users from a specific entity will only be able to produce reports with data that belongs to it.	H	Y	Access to report templates can be secured by individual user or role (See Appendix 1 General [Part 1 of 2] for screenshot page 14). This is a standard feature.
1.2.6	Reporting will be flexible by date range. Choose fiscal year, month, week, day, etc. Historical data within the system will be available for all reporting.	H	Y	Accomplished through the use of date filters (See Appendix 1 General [Part 1 of 2] for screenshot page 15). This is a standard feature.
1.2.7	Reporting will be flexible by location. Choose LRS, administrative area, user defined polygon etc. Historical data within the system will be available for all reporting.	H	Y	Reports can be tied to VUEWorks selection sets, which in turn can be created spatially or through LRS queries (See Appendix 1 General [Part 1 of 2] for screenshot page 16). This is a standard feature.
1.2.8	Ability for system to generate predefined “canned” reports.	H	Y	VUEWorks can be configured with an unlimited number of canned reports (See Appendix 1 General [Part 1 of 2] for screenshot page 17). This is a standard feature.
1.2.9	Ability to capture and report specific heavy maintenance project information as requested by SPMAC (Statewide Pavement Management Advisory Committee)	H	Y	Users can connect to external databases such as

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				MicroPAVER to import pavement and project data for analysis and reporting in VUEWorks (See Appendix 1 General [Part 1 of 2] for screenshot page 18). This is a standard feature.
1.2.10	Ability to provide real time data on operational performance measures and quantities from the data contained in the EAMS using desktop style widgets. These may include but are not limited to: overtime hours by region, salt used by snow event, miles of road cleared by class by snow event, cost of treatment by km by crew, etc.	H	Y	Users can create an unlimited number of dashboard widgets (gadgets), which in turn can be made available by user or role. (See Appendix 1 General [Part 1 of 2] for screenshot page 19). This is a standard feature.
1.2.11	The desktop style widgets provide high level statistics, but will provide direct access to more detailed data or reports depending on the context (drill down statistics). For example: an overtime report for a Region should provide functionality to drill down to the Garage level and then to the Employee level.	H	Y	Drill down ability is available as a standard feature in the Facilities module (See Appendix 1 General [Part 1 of 2] for screenshot page 20).
1.2.12	The desktop style widgets are supplied as part of the COTS and can be constructed easily using imbedded application tools and MDOT standard development tools	H	Y	The software contains the ability to construct dashboard widgets through the User Interface (See Appendix 1 General [Part 1 of 2] for screenshot page 21). This is a standard feature.
1.2.13	Access to data will be based on user, role and administrative unit. Certain reports should only report the data available to the person (role) requesting the report by their admin unit or geographic area.	H	Y	Access to report templates can be secured by individual user or role (See

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				Appendix 1 General [Part 1 of 2] for screenshot page 22). This is a standard feature.

1.3. GIS

The management of geographic information as pertaining to the assets and work events within the system. These will be absolute references, linear references or both. This usually entails interfacing with a commercial GIS Software solution.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.3.1	*Mapping within the EAMS application is compatible with ArcGIS Server.*	*M*	Y	VUEWorks utilizes ArcGIS Server for all mapping operations (See Appendix 1 General [Part 1 of 2] for screenshot page 23).. This is a standard feature.
1.3.2	The EAMS has an ArcGIS for Desktop extension for viewing and query of data.	L	Y	VUEWorks is browser-based and access to GIS data is available to all users vie REST services. (See Appendix 1 General [Part 1 of 2] for screenshot page 24). This is a standard feature.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.3.3	Imbedded application mapping has basic navigation including but not limited to: • Zoom • Pan • View attributes • Select by attributes • Select by feature • Measure distance • Measure area • Zoom to asset • Zoom to an area of Interest (County, City, Region, TSC) • Zoom to an address • Search for asset by attribute • Zoom to LRS location in any defined LRM • Display the LRS location at a specified network location in any defined LRM	H	Y	All basic mapping functions are provided. Search pages can be configured by the user or implementer using the User Interface to accomplish more advanced queries of the GIS and the LRS VUEWorks / Esri Roads and Highways includes a REST API for translating LRS locations from one LRM to another. This will be leveraged in the display of an asset's LRS locations within VUEWorks All standard features (See Appendix 1 General [Part 1 of 2] for screenshot pages 25-26).
1.3.4	Imbedded application advanced functionality: • Create a work order on a selected asset spatial representation • Find location based on linear reference • Find work orders based on proximity	H	Y	The map is always accessible for spatial selection. (See Appendix 1 General [Part 1 of 2] for screenshot page 27). This is a standard feature.
1.3.5	Create, read, update deactivate/delete work orders and service requests directly from the spatial view	H	Y	The map is always accessible for spatial selection. (See Appendix 1 General [Part 1 of 2] for screenshot page 28-29). This is a standard feature.
1.3.6	Create, read, update deactivate/delete assets and groups of assets and other	H	Y	The map is always

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	features such as work orders from the spatial view			accessible for spatial selection (See Appendix 1 General [Part 1 of 2] for screenshot pages 28-29). This is a standard feature.
1.3.7	Produce a Quick Map for printing including the information that is displayed in the current spatial view	H	Y	Always available through the User Interface - Print Map button. (See Appendix 1 General [Part 1 of 2] for screenshot page 30). This is a standard feature.
1.3.8	Provide a mobile version of the spatial functionality	H	Y	Full VUEWorks application can be used on mobile devices as a standard feature that support a browser, such as tablets and laptops. The native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets. This is a standard feature.
1.3.9	Mobile Mapping: Show the current location on the mobile map using the device's GPS	H	Y	The native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets. This is a standard feature.
1.3.10	Mobile Mapping: Use the GPS to geotag pictures and snap them to a nearby asset.	H	Y	This depends on the device that is used. Photos can be

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				linked to geospatial asset features (See Appendix 1 General [Part 1 of 2] for screenshot page 31). This is a standard feature.
1.3.11	Mobile mapping has basic navigation including but not limited to: • Zoom • Pan • View attributes • Select by attributes • Select by feature • Measure distance • Measure area • Zoom to asset • Search for asset by attribute	H	Y	Full VUEWorks application can be used on mobile devices that support a browser, such as tablets and laptops (See Appendix 1 General [Part 1 of 2] for screenshot page 32). This is a standard feature. Esri Mobile apps support this as a standard feature.
1.3.12	Mobile Mapping: Use the GPS location to search for nearby work orders, service requests and assets based on the device's GPS position.	H	Y	MobileVUE provides this capability on multiple mobile devices such as phones and tablets. These are standard features for the Work Order module, the Service Request module and Core. All of these products are included in this proposal.
1.3.13	Mobile Mapping: Create, read, update deactivate/delete work orders and service requests directly from the spatial view	H	Y	MobileVUE provides this capability on multiple mobile devices such as phones and tablets. The Work Order and Service Request modules include these as standard features

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				respectively. Both modules are part of the proposed solution.
1.3.14	Mobile Mapping: Create, read, update deactivate/delete assets and groups of asset attributes from the spatial view	H	Y	Full VUEWorks application can be used on mobile devices that support a browser, such as tablets and laptops a standard feature. Esri Mobile apps support this as a standard feature
1.3.15	Mobile Mapping: Produce a Quick Map for printing including the information that is displayed in the current spatial view	H	Y	The full VUEWorks application can be used on mobile devices that support a browser, such as tablets and laptops (See Appendix 1 General [Part 1 of 2] for screenshot page 33). This is a standard feature.

1.4. UX – User Experience

A person's perceptions and responses that result from the use or anticipated use of a product, system or service. Not confined to functionality, but also the behavior that would result in the use of the product.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.4.1	*The system will provide access to the User Guide from each screen using context-sensitive help.*	*M*	Y	Standard feature accessible from the Main Module Interface which is available from every screen. (See Appendix 1 General [Part 2 of 2] for

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				screenshot page 2)
1.4.2	The system will provide a visual indicator, such as an hourglass or progress bar, when the user needs to wait longer than 3-4 seconds for the system to finish processing a request.	H	Y	Common behavior throughout the application. (See Appendix 1 General [Part 2 of 2] for screenshot page 3). This is a standard feature.
1.4.3	The system will provide useful error messages, explaining in plain language the problem that occurred and what the user should do to recover from the error.	H	Y	Common behavior throughout the application. (See Appendix 1 General [Part 2 of 2] for screenshot page 4). This is a standard feature.
1.4.4	The system will not require the user to remember information from one screen to the next in the same session. For example, if they enter a Control Section (CS) # on the first screen, the system should remember the CS # on future screens.	H	Y	The main map view within VUEWorks works independently of each module, therefore keeping track of the information as the user moves between screens. This is a standard feature.
1.4.5	Important functions/features of the system (as determined during design) will be available from a common menu that is available on all screens (e.g., the user does not have to navigate to a different screen to find the menu).	H	Y	Common feature throughout the application (See Appendix 1 General [Part 2 of 2] for screenshot page 5). This is a standard feature.
1.4.6	The system will be in compliance with the Section 508 Federal Accessibility Standards for ADA compliance.	H	M	Screens can be edited to gain full compliance including text tags
1.4.7	The system will be in compliance with the e-Michigan web standards.	H	M	Screens can be edited to gain full compliance. For

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				instance we can use text tags rather than color alone as an information indicator. Additionally we could use text instead of images for page titles and other areas based upon the wishes of MDOT.
1.4.8	Color coding alone will not be used to signify information (ADA standard).	H	Y	Screens can be edited to use text tags to identify information.
1.4.9	The system will not require users to scroll horizontally to see an entire screen.	H	Y	The application conforms to the resolution of the client machine. (See Appendix 1 General [Part 2 of 2] for screenshot page 7). This is a standard feature.
1.4.10	When there is an option to print, the information will be put into a printer-friendly format: no color, cleanly fits on an 8x10 page, date and time stamp.	H	Y	Common behavior throughout the application (See Appendix 1 General [Part 2 of 2] for screenshot page 8). This is a standard feature.
1.4.11	The system will provide a visual indicator denoting required fields.	H	Y	A combination of glyphs, bold, italic, boxing and color is used to signify information, such as required fields. (See Appendix 1 General [Part 2 of 2] for screenshot page 9). This is a standard feature.
1.4.12	When there are sequential tasks using multiple screens to complete, a visual	H	Y	Common behavior

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	indicator will be used to show the user where they are in the process and how much farther they have to go.			throughout the application (See Appendix 1 General [Part 2 of 2] for screenshot page 10). This is a standard feature.
1.4.13	The software will immediately acknowledge the user's commands. Overall the response to each action a user takes should be met with little or no lag time. Provide feedback that the specified task is getting accomplished	L	Y	Common behavior throughout the application. This is a standard feature.
1.4.14	The software will be designed in such a way that data entry screens can be easily used to enter screen data without the user of a mouse.	L	Y	Entry field navigation using Tab and Shift-Tab and arrow keys is common behavior throughout the application. (See Appendix 1 General [Part 2 of 2] for screenshot page 11). This is a standard feature.
1.4.15	The software will have aspects of its interface that help a user with their specific way of working. (e.g., Remember directories, settings etc.) so the user doesn't have to repeat things in their workflow every instance	L	Y	The user's current state is restored the next time they log into the system. The user can also set up preferences for most parts of the application (See Appendix 1 General [Part 2 of 2] for screenshot page 12). These are standard features.
1.4.16	Dual Screens can increase productivity. The software should have some aspects, e.g. Mapping, where dual screens can be taken advantage of.	L	Y	The application can be used across multiple screens. (See Appendix 1 General [Part 2 of 2] for screenshot page 13). This is a standard feature.
1.4.17	Data input by the user should be verified as being valid. Where possible utilize	L	Y	Common behavior

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	look up controls such as drop boxes, or pick lists, auto fill may also be beneficial.			throughout the application. (See Appendix 1 General [Part 2 of 2] for screenshot page 14). This is a standard feature.

1.5. Mobile Access

Users of an EAMS are operational and therefore mobile by nature. Mobile access to the EAMS should be focused on providing the user with a user experience tailored to a tablet, with the appropriate field functionality. It should be available on widely available consumer and ruggedized hardware.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.5.1	*Ability to use the mobile interface for accessing the EAMS for creating and managing work orders.*	*M*	Y	The full VUEWorks application standard feature can be used on mobile devices that support a browser, such as tablets and laptops. The standard native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets
1.5.2	*Ability to use the mobile interface for accessing the EAMS for inspections. Users should be able to Create, Read, Update Deactivate / Delete inspections as per the user's permission.*	*M*	Y	The full VUEWorks application standard feature can be used on mobile devices that support a browser, such as tablets and laptops. The standard native VUEWorks mobile application, MobileVUE, provides this capability on

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				multiple mobile devices such as phones and tablets (See Appendix 1 General [Part 2 of 2] for screenshot pages 15-16)
1.5.3	Ability to use the mobile interface for accessing the Asset Library to collect inventory, create, read, update and deactivate / delete records etc.	H	Y	The full VUEWorks application standard feature can be used on mobile devices that support a browser, such as tablets and laptops. The standard native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets (See Appendix 1 General [Part 2 of 2] for screenshot pages 17-19)
1.5.4	Ability to use the mobile interface for managing service requests.	H	Y	The full VUEWorks application standard feature can be used on mobile devices that support a browser, such as tablets and laptops. The standard native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets
1.5.5	Ability to use the mobile interface to capture the GPS coordinates of assets,	H	Y	The native VUEWorks

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	work activities and other maintenance related data items.			mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets (See Appendix 1 General [Part 2 of 2] for screenshot page 20-22). This is a standard feature.
1.5.6	Take geotagged and directional photos of assets and attach directly to an inspection, work order, asset record, service request etc.	H	Y	The native VUEWorks mobile application, MobileVUE, provides this capability on multiple mobile devices such as phones and tablets (See Appendix 1 General [Part 2 of 2] for screenshot page 23). This is a standard feature.

1.6. Manage Configuration of Codes, Fields, UI Elements, Workflows

A COTS EAMS needs to be highly configurable and easily customized by the organization, letting administrators, power users and end users do most of the changes to the software themselves.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.6.1	*Ability for an administrator, using in application tools, to create, update, deactivate, user interface elements for standard and configurable functionality, attribute fields etc.*	*M*	Y	VUEWorks is a highly configurable application that is configured through the User Interface by users who have the proper permissions (See Appendix 1 General [Part 2 of 2] for screenshot page 24). This

No.	Requirement	**M/ H-L**	Y-N-M	Description of Solution
				is a standard feature.
1.6.2	*Ability for an administrator to create, update, deactivate/delete MDOT specific codes, terminology, choice lists, labels, verification domains, etc. using tools within the application.*	*M*	Y	VUEWorks is a highly configurable application that is configured through the User Interface by users who have the proper permissions (See Appendix 1 General [Part 2 of 2] for screenshot page 25). This is a standard feature.
1.6.3	Workflows are customizable, in that MDOT business process may be facilitated and enhanced by using workflows within the software. Process sequence, approval gates, automatic notification and triggering of automated functions.	L	Y	Common behavior throughout the application. (See Appendix 1 General [Part 2 of 2] for screenshot page 26). This is a standard feature.
1.6.4	The system will not allow blank code numbers, blank descriptions, or duplicate values to be created in code tables.	H	Y	Standard feature available only to users who have the proper permissions.
1.6.5	The system will only let administrators add or change code values when it does not affect the referential integrity of existing data in the system.	H	Y	Only available to users who have the proper permissions. Cannot delete configuration items that are in use, maintaining integrity of the system. (See Appendix 1 General [Part 2 of 2] for screenshot page 27). This is a standard feature.
1.6.6	The system will not allow a code value to be removed from any code table if that value was used in the business data earlier.	H	Y	Cannot delete configuration items that are in use, maintaining integrity of the system. (See Appendix 1

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				General [Part 2 of 2] for screenshot page 27). This is a standard feature.
1.6.7	The system will provide a way for administrators to determine the sort order of each code table.	H	M	Currently the system only supports alphabetic sorting. Planned feature enhancement will allow Administrators to determine the sort order - alphabetic ascending, descending or in the order entered into the system. This will be a standard feature.
1.6.8	The system will let administrators attach a picture to code table values e.g., arrows).	H	Y	VUEWorks utilizes icons throughout the application that can reference another image file to meet this requirement. This is a standard feature.

1.7. Manage Digital Documents, Drawings and Images

Assets, Inspections, Work Orders and many other objects within the EAMS have documents associated with them. They need to be stored and managed in a way that they are readily available both system wide and in the individual objects.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.7.1	Ability to attach documents such as text, MS Word, PDF, scans, engineering drawings, images etc. to entities within the EAMS.	H	Y	Document attachment is a common feature through the application. Documents can be attached to Assets, work orders, service requests, Condition Assessment records, etc. (See Appendix 1 General

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				[Part 2 of 2] for screenshot page 28). This is a standard feature.
1.7.2	Attach documents to assets and other events simultaneously (e.g., if you attach a digital image to an inspection of a bridge, it is also attached to the bridge).	H	Y	This is a standard feature.
1.7.3	Search for images via asset or event such as an inspection or a work order, date, location or other attribute.	H	Y	Manage Document Links provides the ability to search for documents attached to all elements within the system. (See Appendix 1 General [Part 2 of 2] for screenshot page 29). This is a standard feature.
1.7.4	Display document in a convenient interface that can be viewed by event, or date, or asset.	H	Y	Manage Document Links provides the ability to search for documents attached to all elements within the system. (See Appendix 1 General [Part 2 of 2] for screenshot page 30). This is a standard feature.
1.7.5	Many documents will be pre-viewable with the EAMS, native applications will be called to open the documents.	H	Y	This is controlled by the mime type mapping of the Web server. (See Appendix 1 General [Part 2 of 2] for screenshot page 31). This is a standard feature.
1.7.6	CRUD permissions will be controlled by user, role, and administrative unit.	H	Y	Only users with proper permissions can make modifications to the attached documents. By

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				using these permissions, users can be granted access to different Document Libraries, and locked out of others. (See Appendix 1 General [Part 2 of 2] for screenshot page 32). This is a standard feature.
1.7.7	Version control on documents	L	Y	VUEWorks can track specific versions of documents that are stored locally or in a document management system. This is a standard feature.

1.8. Contractors and Local Agencies

MDOT uses both contractors and local agencies that need to function as an autonomous unit within the EAMS. They need to be restricted to seeing their own data, on the trunk-line assets within their area of responsibility. They have their own resources that must be managed in the system similar to MDOT staff and equipment.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
1.8.1	*Function as an autonomous business unit, having access to the software in a similar fashion to MDOT Garages, but with access limited to the agencies' or contractors' area of responsibility and the assets therein.*	*M*	Y	Controlled access by individual user or role. (See Appendix 1 General [Part 2 of 2] for screenshot page 33). This is a standard feature.
1.8.2	Record Accomplishment for invoicing of MDOT	H	Y	Recording of accomplishments is done through work orders (See Appendix 1 General [Part 2 of 2] for screenshot page 34). This is a standard feature of the Work Order module which is included as part of this proposal.
1.8.3	Management of Work Orders and Crews, Materials and Equipment within the EAMS but with autonomy from other business units.	H	Y	Controlled access by individual user or role. Users in the particular contractor role will only have access to resources available to that role (permission group). (See Appendix 1 General [Part 2 of 2] for screenshot page 35). These are standard features of the Work Order and Resource Manager modules respectively. Both modules are included in this

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				proposed solution.
1.8.4	Gives the Maintenance Supervisor within MDOT the ability to monitor and interact with the contractor or local agency regarding planned work, service requests, budgets, programs, work orders etc.	H	Y	Supervisors can be given access to contractor roles, thus giving them visibility into the work done and managed by the contractor. (See Appendix 1 General [Part 2 of 2] for screenshot page 36). These are planned features of a number of VUEWorks modules, all of which are included in this proposal.

2. Road Network Management

This section describes functionality that is needed in support of the Road Network Management priority area.

2.1 General Location Referencing

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.1.1	*The solution must provide support for imperial units (feet, miles) linear measures for:* • *Datum definition* • *LRM section lengths* • *Inquiry and reporting of measures*	*M*	Y	Datum definition is supported through the Roads and Highways Centerline feature class. LRM section lengths are supported through the LRS Network route geometry. Query and reporting of measures is supported through the Roads and Highways REST API and the Identify Route Locations Tool. (See Appendix 2 Road Network Management for more detail pages 2 to 6) These are standard features.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.1.2	The solution should provide support for 3-D geometry and specific functionality to: • Load 3-D network geometry as part of network definition. • Build and maintain 3-D network topology. • Maintain 3-D spatial arc distances as a basis for linear datum definition and interpolation of offset position.	L	Y	Roads and Highways supports the ArcGIS Topology model as well as digital terrain models for applying 3-D length to the measure values of routes (See Appendix 2 Road Network Management for more detail page 6)
2.1.3	The solution must support the following generic forms of linear referencing within a Linear Referencing Method (LRM): • Route – Measure (distance from origin) • Reference Point - Measure	H	Y	Roads and Highways supports both interpolative and referent offset LRMs. (See Appendix 2 Road Network Management for more detail pages 6-7)
2.1.4	The solution must support the specification of a Cross Sectional Position (XSP) as a component of any defined LRM: • As a user defined XSP code (e.g., Left, Centerline, Right) • As an absolute perpendicular distance measurement	H	Y	Roads and Highways supports an extensible data model that can capture and maintain XSP attributes. (See Appendix 2 Road Network Management for more detail 7-8)
2.1.5	The solution should be capable of offsetting a LRS Event feature position from the road centerline based upon its XSP definition. Vendors are specifically requested to describe in detail how this is accomplished.	L	M	XSP events can be offset if they are registered as external R&H events or if they are located using core ArcGIS functionality, which can be enhanced or automated using Python scripting. (See Appendix 2 Road Network Management for more detail pages 8-9)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.1.6	The solution must support concurrent road network editing such that: • Multiple concurrent edit sessions against a specific database are possible. • Feature locking is enabled to prevent multiple users from making concurrent changes to any LRM section or any associated road network spatial feature or linear datum element.	H	Y	Roads and Highways supports concurrent edit sessions through the ArcGIS versioning model. In addition to this, Roads and Highways prevents editors of routes and events to edit against routes that are already being edited in another version until those edits are complete. (See Appendix 2 Road Network Management for more detail pages 9-10)
2.1.7	The solution must be capable of storing both a LRS location and coordinate location for any LRS Event feature.	H	Y	Roads and Highways event data stores both geometry (x,y) and measure information for all routes and events. (See Appendix 2 Road Network Management for more detail page 10)
2.1.8	The solution must be capable of fully supporting the MDOT Location Referencing Standards, which are attached with this RFP.	H	Y	Roads and Highways extends and enhances the NCHRP 20-27 model suggested by the MDOT Location Referencing Standards. (See Appendix 2 Road Network Management for more detail page 10-11)

2.2 Temporal Data Management

The solution must provide functionality to manage the location of highway assets throughout the asset life cycle (support temporal data management) through integrated workflows within the EAMS Road Network Management module.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.2.1	Road Network Features - road network spatial features are updated and time stamped as changes occur. Spatial history is retained and accessible through system date specification.	H	Y	LRS history is tracked and managed through Roads and Highways time-aware LRS and augmented by ArcGIS editor tracking and geodatabase archiving. (See Appendix 2 Road Network Management for more detail page 11-13)
2.2.2	Linear Referencing Methods (LRMs) - Associated LRM definitions are updated to reflect geometric changes and other situations such as Route renumbering. LRM history is retained and accessible through system date specification.	H	Y	Temporality is maintained through the Roads and Highways time-aware LRS for all types of highways changes. (See Appendix 2 Road Network Management for more detail pages 13-14)
2.2.3	Linear Event Features - Associated LRS event feature locations are updated to reflect geometric changes. Business rules are applied at the asset class level to determine whether assets are retired or relocated when changes occur. Event history is retained and accessible through system date specification.	H	Y	Event locations are managed through Roads and Highways event behavior and are temporally linked to the configuration of the route through route editing activities. (See Appendix 2 Road Network Management for more detail pages 14-17)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.2.4	Cross Reference Polygons – area spatial features that are used for aggregation and reporting of assets (e.g., MDOT Regions, political boundaries) are updated and time stamped as changes occur. Spatial history is retained and accessible through system date specification.	H	M	A geoprocessing model can be created with COTS ArcGIS geoprocessing tools to generate and maintain spatially derived event data. Once created, the geoprocessing model can be made available inside of ArcGIS Desktop for users or can be published as a web service to be consumed by any external applications that can make a request to the web service. (See Appendix 2 Road Network Management for more detail pages 17-18)
2.2.5	The solution should have both batch loaders and core asset load functionality included within the software to load business data against the road network at any point in time for which the network is defined – not just the current network date.	H	M	A geoprocessing model can be created with COTS ArcGIS geoprocessing tools to batch load event data based on one temporal view of the LRS and then update event measures based on the current temporal view of the LRS. (See Appendix 2 Road Network Management for more detail pages 18-19)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.2.6	The solution should have the capability to maintain an audit log of changes that can be accessed through a system inquiry function and either directly printed or exported to a report file in PDF, HTML, XML, or CSV file format. This audit log should be available for changes made to Anchor Section geometry, LRMs and business data events.	L	Y	Roads and Highways maintains an LRS Edit Log table that tracks all edits, who made them, when they were made and what type of edit was performed. (See Appendix 2 Road Network Management for more detail pages 19-20)

2.3 Multiple LRM Support

The solution must provide functionality to integrate and manage roadway location data from MDOT business applications that encompass multiple LRMs into the MGF PR Segment based LRS network datum through integrated workflows within the EAMS Road Network Management module.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.3.1	*Support for MDOT LRMs – The solution must support the following specific LRMs as defined within the MDOT Location Referencing Standards:* • *PR Segment – Mile Point (PR-MP)* • *Control Section – Mile Point (CS-MP)* • *Route – Mile Point (Route-MP)*	*M*	Y	Supported through the configuration and maintenance of Roads and Highways LRS Networks. (See Appendix 2 Road Network Management for more detail page 20). This is a standard feature.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.3.2	MDOT business LRMs are registered against the PR Segment linear datum and managed as changes occur. New LRMs are defined as needed using the same approach.	H	Y	New LRMs can be added to the ALRS network and have data loaded against them. The Remove Centerline Geometry Duplication ensures that one and only one centerline feature is used to generate route geometries at any given location. (See Appendix 2 Road Network Management for more detail page 20)
2.3.3	MDOT LRS business events are located against the PR Segment linear datum and then can be reported / analyzed against any defined LRM. Locations are managed and updated as changes occur.	H	Y	Event data is materialized as a feature class and can be analyzed against other event data from other LRMs through spatial overlay. (See Appendix 2 Road Network Management for more detail page 21)
2.3.4	LRM Gaps - The solution must support the following LRM Gap functionality: • Measures may continue across the gap. • Measures may be discontinuous across the gap (length of gap not included in measure values beyond it).	H	Y	Gaps are fully supported in Roads and Highways. Gaps may be configured for calibration purposes to continue across the gap or be discontinuous through a step value, an addition of an arbitrary length, or an addition of a Euclidian distance. (See Appendix 2 Road Network Management for more detail page 22)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.3.5	LRM Overlaps - The solution must support the following LRM Overlap functionality: • Multiple Routes may exist along any section of geometry. • Assets may be reported against any overlapping Route. • A Route (LRM) may be assigned priority for reporting of assets where overlaps occur.	H	Y	Overlaps are fully supported in Roads and Highways. Route priority can be configured in Roads and Highways by creating route dominance rules to determine what happens to events when the underlying, overlapping route changes. (See Appendix 2 Road Network Management for more detail page 22-23)

2.4 Location Translation

The solution should provide functionality to translate asset location references amongst the various MDOT business LRMs and the MGF PR-MP LRM, and between LRMs and other geospatial referencing methods (coordinates, indirect referencing) through integrated workflows within the EAMS Road Network Management module.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.4.1	Translation between defined LRMs is available to all EAMS applications.	H	Y	The Roads and Highways Server REST API provides endpoints to translate route measures from one LRM to another. (See Appendix 2 Road Network Management for more detail page 24)
2.4.2	Translation between coordinates and LRMs is available to all EAMS applications and batch loaders.	H	Y	The Roads and Highways Server REST API provides (See Appendix 2 Road Network Management for more detail page 24)
2.4.3	Translation between indirect location references and coordinates / LRMs is	L	Y	Translation from route and

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	available to all EAMS applications. An indirect location reference is defined as a reference to the identifier of an existing spatial feature (e.g., a Property ID or Bridge Number).			measure plus offset, x,y plus offset, feature or event location plus offset are all supported by leveraging the Roads and Highways Server REST endpoint for obtaining a route location and then adding or subtracting the requisite offset. (See Appendix 2 Road Network Management for more detail pages 24-25)

2.5 Road Network Reporting

The solution should provide functionality to visualize / analyze / map / report road network assets through integrated workflows within the EAMS Road Network Management module.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.5.1	EAMS users can visualize / analyze / map / report on road network assets against any defined LRM using both spatial and textual database tools.	H	Y	Roads and Highways events are materialized as feature classes which have full support for creating the spatial overlays used in generating feature based reports. They also store route and measure information that can support tabular based reports. (See Appendix 2 Road Network Management for more detail page 25)
2.5.2	EAMS users can produce customized Straight Line Diagrams (SLDs) encompassing specific assets against any defined LRM.	H	Y	Road Analyzer is Transcend's Straight Line Diagramming (SLD) solution. Road Analyzer contains a database driven, interactive straight-line diagramming environment, with an integrated location map and video log display. All data displayed on the screen is placed using basic linear referencing methods from a relational database. Road Analyzer supports the ability to utilize multiple LRMs and can convert between LRMs on

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				the fly (See Appendix 2 Road Network Management for more detail pages 25-31).
2.5.3	Dynamic Segmentation – the solution must provide functionality to segment the road network for analysis and reporting purposes based upon changes in specified attribute value within one or more linear event classes (e.g., segment the network based upon changes in Functional Class and surface type).	H	Y	The Roads and Highways Roadway Characteristics Editor has a Return Attribute Set option that dynamically segments event layers and returns an individual record for each contiguous, unique occurrence of event attribute combinations. (See Appendix 2 Road Network Management for more detail page 32-33)
2.5.4	Cross References - the solution should provide functionality to define and maintain linear cross reference feature classes (e.g., Highway Classification, Traffic Section) as linear events. Cross references are used to dynamically segment the network for user inquiry, display and reporting purposes. It must be possible to specify the location of cross references using any defined LRM.	L	Y	Roads and Highways supports the interrogation and reporting of cross reference events through the Roads and Highways Server REST API. Additionally, the Translate Events from LRM to LRM geoprocessing tool can support creating additional publication layers across multiple LRMs. (See Appendix 2 Road Network Management for more detail pages 33-34)

2.6 Support for MDOT Location Referencing Business Processes

The Road Network Management module of the EAMS solution should provide functionality to replicate and where possible improve existing and proposed MDOT business processes associated with location referencing management through integrated workflows.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.6.1	The Vendor should describe how their proposed COTS Road Network Management module can support and improve upon the following EAMS Phase 1 “To-Be” Location Referencing business processes:: • Update Road Network • Publish Road Network • Locate Business Data for Asset Management In particular, the Vendor is requested to comment on how their software can consume periodic published versions of the Michigan Geographic Framework (MGF) road centerline network spatial data and associated migration files so that LRS data stored in EAMS can remain synchronized with the MGF.	H	Y	Roads and Highways redlining capability combined with ArcGIS Workflow Manager and the ArcGIS Detect Feature Changes geoprocessing tool. (See Appendix 2 Road Network Management for more detail pages 34-35)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
2.6.2	The Vendor should describe how their proposed COTS Road Network Management module can support and improve upon the following EAMS *Future Vision* "To-Be" Location Referencing business processes: • Update & Publish Road Network • Locate Business Data for Asset Management In particular, the Vendor is requested to comment on how their software can be effectively integrated within an enterprise geospatial technology architecture hosted by DTMB for maintaining the MGF.	H	Y	Integration with MGF will follow a specific process flow: 1. Routes are updated in MGF 2. Redlines are pushed to Roads and Highways 3. Routes are updated in Roads and Highways 4. EAMS event locations are automatically synchronized to route edits 5. EAMS routes and events are published 6. Publication data is distributed to the enterprise (See Appendix 2 Road Network Management for more detail page 35-36)

3. Asset Inventory Management

This section describes functionality that is needed in support of the Asset Inventory Management priority area.

3.1 Manage Asset Inventory Library

Managing an asset registry, attribute information, component element information as well as hierarchical asset relationships across multiple asset types.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
3.1.1	*Create, Read, Update Deactivate/Delete (CRUD) Asset types. Nonstandard asset types will be fully configurable and have the same behavior characteristics as standard asset types.*	*M*	Y	Fully supported for both spatial (GIS) assets as well as vertical assets (Facilities). (See Appendix 3 Asset Inventory Management for screenshot page 2) This is a standard feature.
3.1.2	*Have the ability to define the attributes associated with each type of asset. Attributes will be any data type, with the ability to manage in excess of 100 unique attributes per asset type.*	*M*	Y	Fully supported for both spatial (GIS) assets as well as vertical assets (Facilities). (See Appendix 3 Asset Inventory Management for screenshot page 3). This is a standard feature.
3.1.3	*Define complex assets with multiple elements, each with its own set of attributes. Attributes for elements will be configurable, be of any data type. The system will be able to manage in excess of 100 attributes per component.*	*M*	Y	Fully supported by the Facilities module. (See Appendix 3 Asset Inventory Management for screenshot page 4). This is a standard feature.
3.1.4	Define the type of location referencing used for each type of asset (absolute, linear or both), compatible with MDOT GIS technology. (Esri)	H	Y	Fully supported for both spatial (GIS) assets as well as vertical assets (Facilities

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				module).
3.1.5	Define allowable association of assets in a hierarchical Parent / Child relationship. These relationships are to be usable for roll up reporting, queries, budgeting etc. Referential integrity will not allow a Parent asset to be deleted or deactivated without dealing first with the Child assets, or all at the same time.	H	Y	Fully supported by the Facilities module. (See Appendix 3 Asset Inventory Management for screenshot page 5)
3.1.6	Store, retrieve and display documents (images, drawings, etc.) associated to an asset.	H	Y	Document attachment is a common feature through the application. Documents can be attached to both spatial (GIS) assets and vertical assets (Facilities). (See Appendix 3 Asset Inventory Management for screenshot page 6)
3.1.7	Assign user and system unique IDs to assets. Once an asset has been referenced, this ID should either remain static or be changed in all references to the asset.	H	Y	Fully supported for both spatial (GIS) assets as well as vertical assets (Facilities). (See Appendix 3 Asset Inventory Management for screenshot page 7)
3.1.8	Search assets by name, ID or other attributes, both by type and globally, by administrative unit or by parent asset.	H	Y	Fully supported for both spatial (GIS) assets as well as vertical assets (Facilities). (See Appendix 3 Asset Inventory Management for screenshot page 8)
3.1.9	Facilitates the bulk loading of assets, attributes and locations easily.	H	Y	Configurable import utilities are part of the system. (See Appendix 3 Asset Inventory Management for screenshot

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				page 9)
3.1.10	The system will let administrators lock individual attribute fields for an asset type.	H	Y	Although VUEWorks does not provide field-level security within the application, it can inherit security configurations managed within ArcGIS Server.
3.1.11	Control access to CRUD rights for the asset library through both user roles and administrative units. Rights will extend down to individual attributes, or groups of attributes within an asset type.	H	Y	Configurable through user control administration (See Appendix 3 Asset Inventory Management for screenshot page 10)

3.2 Field Data Integration

The Road Network Management module of the EAMS solution should provide functionality to capture changes to roadway assets as a by-product of on-going construction and maintenance activities using GPS enabled field data collection systems and CAD integration.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
3.2.1	*The solution should provide functionality to enable EAMS assets to be updated and time stamped as changes occur through integrated business process workflows that capture changes using GPS enabled field data collection systems. The Vendor is requested to specify whether additional software modules are needed to meet this requirement and if additional licensing costs are incurred.*	*M*	Y	VUEWorks can display the timestamp recorded against GIS data by exposing the data fields that are managed in the geodatabase. The fields are stored as attributes in the geodatabase and will update as the geodatabase is edited over time. ArcGIS for Server is leveraged by both the VUEWorks and Roads and

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				Highways solution. ArcGIS for Server supports the capability to track edits through web feature services. These web feature services can facilitate receiving updated information on EAMS assets that are the result of GPS field data collection systems. As a quality control measure, Esri's COTS Data Reviewer and Workflow Manager extension products for Desktop (delivered as part of the Roads and Highways solution) can be used to define data quality checks, review changes and manage the overall workflows between field-based data collection through GPS and the EAMS assets.
3.2.2	The solution should provide functionality for loading of road network LRM asset data using configurable batch loaders, including comprehensive validation and full error reporting. The following location options should be supported: • LRM location • Coordinate location – translated to LRM location as part of load process The Vendor is requested to document the functionality provided, including input data requirements, to ensure that coordinate locations are snapped to the correct road network geometry.	H	M	A geoprocessing model can be created with COTS ArcGIS geoprocessing tools to batch load event data based on one temporal view of the LRS and then update event measures based on the current temporal view of the LRS.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				(See Appendix 3 Asset Inventory Management for screenshot pages 11-12)
3.2.3	The solution should provide functionality to enable EAMS assets to be updated and time stamped as changes occur through integrated business process workflows that capture changes in CAD. The Vendor is requested to specify whether additional software modules are needed to meet this requirement and if additional licensing costs are incurred.	L	Y	VUEWorks can display the timestamp recorded against GIS data by exposing the data fields that are managed in the geodatabase. The fields are stored as attributes in the geodatabase and will update as the geodatabase is edited over time. As CAD data is updated, the resulting conversion to geodatabase format will capture this information. ArcGIS Data Reviewer and Workflow Manager extension products for Desktop (delivered as part of the Roads and Highways solution) can be leveraged to filter and detect changes to assets initiated by edits performed in CAD. The solution would consume CAD layers either through WMS web services or directly through the periodic loading of native CAD files. Changes detected can be flagged for inclusion into the EAMS asset

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				database. This process can be automated and governed by Workflow Manager while incorporating data quality and review/approval checks.

3.3 Manage Inspections and Condition Information

Manage Inspections, inspection data both general and specific to asset types.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
3.3.1	*Define condition inspections for asset types*	*M*	Y	Fully configurable condition forms, which can be associated with Asset Types (See Appendix 3 Asset Inventory Management for screenshot page 13). This is a standard feature.
3.3.2	*Define Regulatory inspections for asset types*	*M*	Y	Accomplished through condition forms and/or work order forms. (See Appendix 3 Asset Inventory Management for screenshot page 14). These are standard features.
3.3.3	*Record individual Condition Inspections on Assets, include asset specific and user condition indices, date, time, inspector. These will be linked to assets in the asset inventory.*	*M*	Y	Condition forms can be configured to support this. Condition records are associated with assets over

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				time. (See Appendix 3 Asset Inventory Management for screenshot page 15). This is a standard feature of the Condition module which is included in this proposed solution.
3.3.4	Define Performance inspections for work performed by work order or contract which include but are not limited to, accomplishment verification, quality of work and defects/non-compliance recording.	H	Y	Accomplished through work order forms and workflows. (See Appendix 3 Asset Inventory Management for screenshot page 16)
3.3.5	Asset specific condition recording (e.g., highways require linear referenced condition information, bridges require component information and Bridge Condition Index calculations, signs require retro reflectivity).	H	Y	An unlimited number of configurable condition forms can be created to capture different condition information specific to certain Asset Types. (See Appendix 3 Asset Inventory Management for screenshot pages 17-19)
3.3.6	Search for inspections by type, asset, inspector, date, other inspection attributes.	H	Y	Condition records can be queried using the Condition Filter page. (See Appendix 3 Asset Inventory Management for screenshot page 19)
3.3.7	Provide ability to create standard and user defined queries within the system to show assets in order of condition, or in groups of condition classes by most recent inspection.	H	Y	Saved filters can be created and managed using the Condition Filter page. (See Appendix 3 Asset Inventory Management for screenshot page 20)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
3.3.8	Provide ability to create standard and user defined queries within the system to show contract non-compliances. Summarize the current outstanding by contractor.	L	Y	Saved filters can be created and managed using the Condition Filter page. These filters can be applied to select non-compliance assets which can in turn be displayed on the map, in the Facility Manager and/or reported against. (See Appendix 3 Asset Inventory Management for screenshot page 21)

4. Maintenance Management

This section describes functionality that is needed in support of the Maintenance Management priority area.

4.1 Maintenance Program and Budget Planning

Budget Planning for highway maintenance is carried out on an annual basis with Region, TSC and Garages identifying their preventative and scheduled maintenance needs and developing alternative programs based on budget allocations. Programs and projects have budget allocations which need to be compared to actual expenditures on a daily, weekly, monthly and annual basis. Budgets are broken down into sub budgets and allocated to different administrative units such as a region or garage. Non Maintenance Program projects also have budgets that must be tracked whether they are capital, disaster recovery, or accident repairs.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.1.1	*Create, Read, Update Deactivate/Delete (CRUD) Programs with multiple sub budgets, to which projects and Work Orders can be assigned.*	*M*	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 2). This is a standard feature of the Budget Forecasting module which is included in the proposed solution.
4.1.2	*Define preventative and scheduled maintenance on asset types. Set cycle time for inspections, operations activities, maintenance etc.*	*M*	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 3). This is a standard feature of the Work Order module which is included in the proposed solution.
4.1.3	*Prioritize maintenance activities and compare planned maintenance with accomplishments in order to determine deferred maintenance at the end of the year to support budget requests.*	*M*	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2]

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				for screenshot page 4). This is a standard feature of the modules which are included in the proposed solution.
4.1.4	*Create, read, update, delete / deactivate annual work plans based on need identified through planned work orders. Plans should be Tied to budgets and hierarchical.*	*M*	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 5). This is a standard feature of the modules which are included in the proposed solution.
4.1.5	*Create, read, update, delete / deactivate flexible schedules (daily, weekly, bi-weekly, monthly) for maintenance activities based on annual work plan*	*M*	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 6). This is a standard feature of the modules which are included in the proposed solution.
4.1.6	Flexible hierarchical budget structure. MDOT has Statewide, Region, Transportation Service Center, Garages, County Road Commissions, Municipalities, and other local agencies. They must fit in a budget and financial accounting structure.	H	Y	Fully supported by the work order system. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 7)
4.1.7	Control access to CRUD rights for the budgets, Programs, and PCA Codes through both user roles and administrative units.	H	Y	Configurable through user administration control (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 8)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.1.8	Option to pre-fill the planning tool using multi-year averages of either accomplishment or hours (constrained, unconstrained, and deferred) to create new needs-based plan with the ability for user to modify as needed.	H	Y	This information can be configured in the Budget Forecasting and Projects modules and used to plan for maintenance activities and cost.
4.1.9	Provide suggested list of preventative and scheduled maintenance based on asset type and date of last scheduled maintenance of that type.	H	Y	Supported by work order system. As these critical dates are loaded, the user can query the "Pending" work orders created to satisfy the life-cycle maintenance plan for this asset.
4.1.10	Linkage to work orders, and inspections to reset the schedule time when completed.	H	Y	All work orders have the ability to be associated with a project that is defined in the Projects module.
4.1.11	Determine performance based budgets between regions, counties, garages, etc.	H	Y	Standard and ad hoc reporting will support this analysis. Also dashboards can be set up on a Region, County or Garage-level to compare performance data.
4.1.12	Determine maintenance needs systematically based on condition	H	Y	Fully supported by work order and condition system (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 9)
4.1.13	Create, read, update, delete / deactivate constrained and unconstrained work plans at any time throughout the year and graph resource needs (labor, equipment and materials) for both constrained and unconstrained work plans,	H	Y	The creation of the work plan is completed in VUEWorks' Budget

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	and track changes			Forecasting and Projects modules, but the reporting function and the analysis would occur outside the VUEWorks application (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 10).
4.1.14	Compare plans to actual work completed to calculate deferred maintenance.	H	Y	Fully supported in the Projects module (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 11)

4.2 Manage Work Orders

Use Work Orders to package up tasks that are carried out on a particular asset or group of assets. Work is planned as a work order, then scheduled, resources are allocated, and accomplishment is recorded along with project cost and effort information. Materials equipment and vehicles used are charged. The work order is then debited to a specific project/program. Staff timekeeping can also be generated from work orders.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.2.1	*Ability to Create, Read, and Deactivate/Delete work orders.*	*M*	Y	Fully supported by and a standard feature of the Work Order module. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 12). The Work Order module is included in this proposed solution.
4.2.2	*Attach work orders to specific assets or to a location along a linear asset such*	*M*	Y	Work orders can be attached to specific assets

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	as a highway.			in the system or dynamic segments can be created for work along a linear asset. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot). This is a standard feature of the Work Order module which is included as part of this proposed solution.
4.2.3	*Users can choose a work order type and debit the expenses to a particular budget item and program. Costs show up as committed for planned work orders and expenditures for costs actually incurred.*	*M*	Y	Supported as Funding sources and estimated vs. actual costs. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 13). This is a standard feature of the modules which are included as part of this proposed solution.
4.2.4	*Use work orders to assign staff, crews, equipment and vehicles.*	*M*	Y	Fully supported by and a standard feature of the Work Order module. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 14). The Work Order module is included as part of this proposed solution.
4.2.5	*Use work orders to plan the use of materials.*	*M*	Y	Fully supported by and a standard feature of the Work Order module. (See Appendix 4 Maintenance

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				Management [Part 1 of 2] for screenshot page 15). The Work Order module is included as part of this proposed solution.
4.2.6	*Use work orders to plan the use of contract labor, equipment and crews.*	*M*	Y	Fully supported by and a standard feature of the Work Order module. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 16). The Work Order module is included as part of this proposed solution.
4.2.7	*Use work orders to estimate the budget of a project by calculating the expenditures automatically from the estimated use of either standard plans or individually entered plans (labor, equipment and materials)*	*M*	Y	Fully supported by and a standard feature of the Projects and Work Order modules. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 17). These modules are included as part of this proposed solution.
4.2.8	*Use work orders to record accomplishment in terms of a pre-defined configurable quantity.*	*M*	Y	Fully Supported by and a standard feature of the Projects and Work Order Modules (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 18). These modules are included as part of the proposed solution.
4.2.9	*Use work orders to record use of labor, equipment, vehicles, materials and*	*M*	Y	Fully supported by and a

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	hired contractors			standard feature of the Work Order module. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 19)
4.2.10	*Use work orders to track the actual expenditures on a project.*	*M*	Y	Work orders can be associated with a project for rollup reporting and tracking. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 20). This is a standard feature of the Work Order module which is included as a part of this proposed solution.
4.2.11	Assign Work Orders to a responsible supervisor.	H	Y	Work orders can be assigned to an individual user or a role. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 21)
4.2.12	Use work orders to plan and schedule work. Work orders will be as easy to move around for a supervisor as and outlook calendar.	H	Y	Fully supported by the Work Order module (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 22)
4.2.13	Create Read, Update Deactivate /Delete (CRUD) Work Order types. Nonstandard work order types will be fully configurable (Attributes, interface etc) and have the same behavior characteristics as standard types.	H	Y	An unlimited number of work order forms can be created and associated with different work activities. (See Appendix 4 Maintenance Management

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				[Part 1 of 2] for screenshot page 23)
4.2.14	Work Orders can contain one or more PCA Codes which will be used to code labor equipment and materials cost and effort.	H	Y	This can be supported by fields on a work order form. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 24)
4.2.15	Use work orders to compare planned work to actual in terms of expenditures, labor, equipment, materials usage.	H	Y	Accomplished by linking work orders to projects. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 25)
4.2.16	Use work orders to gather together work performed on a group of assets, either as a long term program or budget, or as a short term work plan.	H	Y	Work orders can be attached to assets and projects. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 26)
4.2.17	Show work orders spatially on a map for a given time interval.	H	Y	Accomplished through work order points on the map. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 27)
4.2.18	Search spatially for work orders.	H	Y	Work orders can be selected on the map spatially. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 28)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.2.19	Use the number of assets or the length of the assets when they are linear to pro-rate the labor, equipment, and materials expenditures within a work order or group project. Allow the supervisor to weight the assets if one asset required more work than others.	H	Y	Fully supported by the Work Order module (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 29)
4.2.20	Ability to track all costs associated with emergency response work for a particular incident (e.g., flooding, storm damage, high load hit, etc.).	H	Y	Can be accomplished by establishing an emergency response Project and then all work done through work orders can be associated with this Project. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 30)
4.2.21	Ability to query/view hours spent on each activity by location on the highway network per pay period for Direct Forces and Contract Maintenance (as available).	H	Y	Fully supported by the core searching features (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 31)
4.2.22	Ability to apply, reference, and generate standard operating procedures as well as performance standards for a work order type.	H	Y	Accomplished by defining a Work Flow and associating it with a Work Order Type (Form). (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 33)
4.2.23	Evaluation tool to measure how efficiently crews perform when compared to planned performance.	H	Y	This is handled using Find/Manage/Report functionality in VUEWorks.
4.2.24	Search for work order by assignment, asset, date, type, administrative unit, budget etc.	H	Y	Fully query capability across all work orders is supported on the Work Order Filter tab. Common

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				queries can be saved to named filters, making searching much more efficient. (See Appendix 4 Maintenance Management [Part 1 of 2] for screenshot page 34)

4.3 Manage Work Orders – Sign Specific Requirements

Sign maintenance either occurs as a result of the annual sign maintenance program, an event such as an accident that knocks down a sign, or through other maintenance or capital work where signs need to be removed, modified or re-arranged. Planned sign maintenance involves both a five year and annual plan that results in consultants developing a "design" before a contract is let. Planned sign maintenance projects have Job #s. Unplanned sign work requires a Transportation Work Authorization (TWA) after which work is usually carried out by MDOT forces. Job #s are not assigned for unplanned work. After completion of the contract or the maintenance work, the sign inventory is updated to reflect the changes.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.1	When more than one sign is selected for a sign installation, the system will automatically arrange the cluster of signs according to MDOT's Roadside Installation Grid.	L	Y	Fully supported by VUEWorks Core (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 2)
4.3.2	The system will show when an asset in inventory is included in an active contract, TWA or maintenance Project.	H	Y	Each project, work order and work activity is accessible at the asset level.
4.3.3	The system will provide read-only information from MDOT's SafeStat (Oracle) database for signal data which may impact the TWA or contract design. Information will include Signal Head, Pedestrian Signal, Case Sign and Turn Arrow information for normal status records.	L	Y	Fully supported through data linking (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 3)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.4	The system will let users attach one or more pictures to a contract showing any installation changes. The inventory will be updated with the picture(s) when the contract is complete.	L	Y	Fully supported through data linking (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 4)
4.3.5	When user first views a map, the mapping technology will automatically zoom in to the CS-MP or PR-MP location identified on the Job # or TWA.	L	Y	Fully supported by VUEWorks Core (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 5)
4.3.6	The system will interface with MDOT's MAP (Oracle) database to pull in Job # data and the associated CS-MP and/or PR-MP locations.	H	Y	Configurable through data linking (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 6)
4.3.7	If the project has a Job# then the system will interface with MDOT's MAP (Oracle) database to check for changes in CS-MP data since the contract was last updated.	H	M	Although this is handled through Data Linking, a custom integration would have to be built to handle how often the integration activity would occur (e.g. hourly, weekly, monthly).
4.3.8	The system will limit the inventory which can be included in a contract to the CS-MP range defined on the Job # or project # or a job-level defined distance from the range.	H	Y	During the import process the "Quantity" of a Job can be set up for the Work Order.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.9	The system will provide a warning message if an inventory record which is already included in another active contract, TWA or maintenance project is selected for inclusion in the contract	H	M	Currently, quantities are tracked and reported based on inventory availability. This would be a simple modification to track inventory or materials that are “reserved”.
4.3.10	The inspector can update a contract when actual asset specifications vary from the contract specifications, but are acceptable.	H	Y	Fully supported through Condition module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 8)
4.3.11	The system will provide a report which details the deviations from the design found during inspection.	L	Y	Fully supported through Condition module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 9)
4.3.12	The system will allow inspection information to be entered over a period of time as the project progresses.	H	Y	Fully supported through Condition module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 10)
4.3.13	The system will require entry of the inspector’s name when closing a contract.	L	Y	Fully supported through Condition module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 11)
4.3.14	When the inspector records that the inspection is complete, they must select a contractor.	L	Y	The contractor selection can be made “Required”, so the Condition record cannot be closed until a contractor is selected.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.15	When an inspection is marked complete, the system will update the inventory information based on the contract specifications.	H	Y	The materials used will be tracked within the Work Order, so this information will be available.
4.3.16	The system will let users close only part of a contract, by selecting one or more CS's.	L	Y	This is a workflow defined by the client and VUEWorks can handle Parent-Child relationships within the Work Order module. Part of a Contract can be held open as other parts are closed.
4.3.17	When a user closes only part of a contract, the inventory will update the portion of the contract that was closed.	L	Y	Once inventory usage is copied to "Actuals" it is removed from the current count.
4.3.18	For each part of a contract that is closed, another inspection and inspector's name will be required.	L	Y	These are fields that can be set to "Required" on the form.
4.3.19	The system will provide a confirmation message when a user tries to close a contract, verifying that they actually want to close the contract.	H	Y	This functionality exists as part of the Core and Work Order products.
4.3.20	When a contract is closed, the system will send an email to the creator of a contract, administrators, anyone who has the authority to change the contract, the assigned consultant, and the assigned contractor to notify them of the closing.	L	Y	Fully supported through the Work Order module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 14)
4.3.21	If the project has a job number then the system will provide the date of closing to MDOT's MAP (Oracle) database which will trigger the closing of the job in the MAP database.	H	M	This is a project-specific function that will be defined and implemented as part of this project.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.22	Once a contract is closed, it cannot be reopened in the future.	L	Y	This is controlled by permissions in the “Setup Users” portion of VUEWorks Core.
4.3.23	The system will keep closed contract records for a configurable amount of time, which can be set by administrators. Once the time expires, the records will be permanently deleted from the database.	H	M	This is typically handled by the batch routine that is synchronizing this data from the Oracle database. For example, any contract older than xxxx – exclude from the synchronization process.
4.3.24	The system will allow the creation of a model design to plan out a future contract, which can be converted into a contract when a Job # becomes available.	L	Y	VUEWorks can plan out projects using the Budget Forecasting and Projects module. These can then be converted into actual contracts once a Job # is available.
4.3.25	The system will let the administrator and the creator of the model design modify the model design.	H	Y	These are completely configurable in the Work Order – Form Designer.
4.3.26	The system will let the administrator and the creator of the model design add users with modify authority on the model design.	H	Y	Users can be added as part of the “Notification” list which grants them access to the Contract.
4.3.27	The system will let users highlight the use of non-standard assets in the model design.	L	Y	Any GIS or Facility Asset can be added to the model design.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.28	The system will provide information from MDOT's TCS (Oracle) database for traffic control orders which may impact the model design. Information will include CS, Begin and End MP, Zone Type, Speed Limit, To and From Street Names, Status of TCO and access to the signed TCS .pdf document (currently stored in ProjectWise).	L	M	The Oracle database connection will be handled through Data Linking and a custom transaction tool to synchronize data between databases.
4.3.29	The system will provide an informational message if an inventory record on the model design is part of an active contract, TWA or maintenance job.	H	M	This is a minor modification to the existing functionality that tracks inventory "on-hand", but will be set up to notify the user of inventory "Reserved".
4.3.30	Model designs can be modified or deleted by the administrator or users with modify authority on the model design.	H	Y	VUEWorks – Setup Users will handle the users and their access.
4.3.31	When a user tries converting a model design to a contract, the system will check if selected asset installations are part of an active contract, TWA or maintenance project. If found, a warning message will be displayed.	H	M	This is a minor modification to the existing functionality that tracks Assets, but will be set up to notify the user of Assets that are "Reserved".
4.3.32	When a user tries converting a model design to a contract, the system will check if selected asset installations have changed in inventory since being pulled into the model. If changed, an error message will be displayed and the model design will not be converted to a contract.	H	Y	Assets can be added to a Project and then verified before converting to a contract.
4.3.33	When a user tries converting a model design to a contract, the system will check if selected asset installations fall within CS/MP range of job#. If assets do not fall within range, an error message will be displayed and the model design will not be converted to a contract.	H	M	The Oracle database connection will be handled through Data Linking and a custom transaction tool will be written to synchronize data between databases.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.3.34	If the user receives any errors while converting a model design to a contract, they have the option to modify the model design to fix the errors, to close the design, or to exit without making any changes.	H	M	This is a Workflow design, which is future functionality for VUEWorks (4Q 2014).
4.3.35	When a model design becomes a contract, the system will delete the model design.	L	Y	The user has the option to delete or not-delete the model during the conversion process.

4.4 Manage Workers and Crews

Workers are resources used within the EAMS. Their Time is charged to work orders by supervisors. Workers can belong to a particular crew and charged to a work order or a task as a group. Workers can be loaned or borrowed from one crew to another if required. Temporary Crews can be created to accommodate a seasonal requirement.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.4.1	*Create, Read, Update and Deactivate/Delete crew types, crews.*	*M*	Y	This is a standard feature of the Resource Manager and Work Order modules which fully support the management and use of crews. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 17). These modules are included in this proposed solution.
4.4.2	*Assign Workers to Crews, admin units, regions etc.*	*M*	Y	Fully supported through and a standard feature of the Work Order and Resource Manager modules (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				page 18). These modules are included in this proposed solution.
4.4.3	Assign multiple rates for use on work orders when recording labor performed by a worker. These will be flexible enough to cover all types of collective agreements	H	Y	Resource Manager supports an unlimited number of rate types. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 19)
4.4.4	Ability to transfer a worker from one Crew/Admin Unit/Region to another	H	Y	This can be recorded through Time Recorder and doesn't need to be associated with a work order. A worker can be moved through the Resource Manager module.
4.4.5	Record Leave of all types as well as non-work order time, debit a program or budget	H	Y	Fully supported through Work Order module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 20)
4.4.6	Track a Worker's qualifications and course work. Alert a supervisor when a worker's qualifications are running out.	L	Y	The Personnel portion of the Resource Manager module can track specific certifications and their expiration.
4.4.7	Ability to loan and borrow workers between Crews/Admin Units/Regions etc.	H	Y	Workers can be utilized on another Unit/Region's work orders. A user with access to the resources of another Unit/Regions can cross-associate. (See Appendix 4 Maintenance Management

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				[Part 2 of 2] for screenshot page 21)

4.5 Manage Fleet and Equipment

Manage information regarding the vehicles and equipment that are to be used against work orders.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.5.1	*Create, Read, Update and Deactivate/Delete Equipment type, vehicle types and vehicles*	*M*	Y	Fully supported through the connection between the Facilities and Resource Manager modules (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 22). This is a standard feature of these modules which are included in this proposed solution.
4.5.2	*Ability to assign equipment or vehicles to a particular admin unit or crew.*	*M*	Y	Fully supported ability to assign equipment to a worker or particular crew. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 23). This is a standard feature.
4.5.3	Ability to store rates, either based on classification or individual vehicle for use in project cost accounting in work orders.	H	Y	Equipment can have an unlimited number of Rate Types associated with it. When the equipment is used on a work order or Time Record, the rate type

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				can be selected. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 24)

4.6 Manage Customer Service

MDOT has both internal and external complaints, inquiries and requests that need to be tracked, considered in planning of activities and resolved. These are tracked in a logical work flow.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.6.1	Track customer Complaint Inquiry or Requests as well as response time and resolutions.	H	Y	Fully supported through the Service Request module. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 25)
4.6.2	Track customer contact information.	H	Y	Fully supported through the Service Request module (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 26)
4.6.3	Tie Customer complaints to specific locations, linear or absolute, on the trunk highways and/or attached to specific assets as well.	H	Y	Service requests can be spatially referenced either by a spatial point or by associating them with specific assets. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 27)
4.6.4	Create a service request from a CIR and assign it to staff to resolve.	H	Y	Service requests can be assigned to individuals or a

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				role. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 28)
4.6.5	Provide real-time statistics on service requests. i.e. open, closed in a particular period, average time to resolution etc.	H	Y	All resolution information is tracked with each service request and is available to be queried on the Service Request Filter form. All fields, including durations, are available for filtering and reporting. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 29)
4.6.6	Allow anyone with access to the system to enter a service request and assign it to be reviewed i.e. if staff identify a need and wish to put it in the system to be considered for maintenance or heavy maintenance.	H	Y	Any user of the system can be granted permission to enter service requests.
4.6.7	Service Requests should carry an urgency rating and a description of the problem	H	Y	The Service Request Form is fully configurable to include whatever information the agency deems necessary. All fields on a Service Request are available for filtering and reporting.
4.6.8	Service Requests should have the ability to be converted to a Work Order with a complete estimate on cost and effort.	H	Y	Work orders can be generated from service requests. The type of work order can be associated with the particular service request issue type and can be automatically generated.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				(See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 30)

4.7 Performance

Through the use of software tools and analytics, supervisors, managers and executive can compare business units, and Regions with one another, standard operating procedures and performance standards.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
4.7.1	*Record, track and report on performance of maintenance activity achievements and Level of Service.*	*M*	Y	Robust reporting of all data within the system is available. (See Appendix 4 Maintenance Management [Part 2 of 2] for screenshot page 31)
4.7.2	*Use analytical tools to compare performance to standard levels of service for accomplishment, quality and budget, at the work order, crew, garage, region and statewide levels.*	*M*	Y	Level-of-Service can be set in the Budget Forecasting module.
4.7.3	Linkage to Performance Guide Resource Material for each Activity which are available within the work order for use planning, estimating, and recording work accomplishment. It can also be used to compare a work order to the expected accomplishment and show differences.	H	Y	These materials can be stored as a Linked Document and attached to an Asset, Facility, Service Request or Work Order record in VUEWorks.

5. Application Integration

This section describes functionality that is needed in support of the Application Integration priority area.

5.1 Road Network Application Integration

The Road Network Management module of the EAMS solution should provide functionality to integrate with other EAMS modules to support advanced asset management capabilities within MDOT.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
5.1.1	Full location management functionality as previously specified is available to support the EAMS Phase 1 implementation across all modules.	H	Y	Requirements are met. The EAMS solution is built on Esri's Roads and Highways and fully integrated within VUEWorks AMS/MMS core which enables full location management natively and can be leveraged across all EAMS modules without any additional configuration required.
5.1.2	Full location management functionality as previously specified is available to support subsequent EAMS implementation phases and application modules. The Vendor should specify additional COTS modules that can be integrated with EAMS to support advanced asset management capabilities.	L	Y	Requirements are met. The EAMS solution is built on Esri's Roads and Highways and fully integrated within VUEWorks AMS/MMS core which enables full location management natively and can be leveraged across all EAMS modules without any additional configuration required. New or additional COTS modules added to the EAMS solution are already available with full

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				location management functionality and include strategic asset management components such as Condition, Risk, Valuation, Budget Forecasting and Projects modules.
5.1.3	The solution should provide functionality to manage and automatically update location references associated with business data events stored in external business application databases. The Vendor should specify in detail how this is accomplished.	H	Y	Roads and Highways supports the concepts and management of centralized roadway LRS management so business systems don't duplicate effort managing copies of an LRS. Published web services from Roads and Highways are available and open to any external business system that can consume these web services so the external business application databases can be integrated to keep measures in alignment with roadway edits.
5.1.4	The solution should provide functionality to inquire, analyze and report against business data events stored in external business application databases. The Vendor should specify in detail how this is accomplished.	H	Y	Requirement are met – Roads and Highways supports an open data model and configuration that supports access, display, query and reporting against business data events that are either

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				stored in the geodatabase "Internal Events" or stored outside of the geodatabase in a separate database "External Events". Business data events stored in an external business application database can be registered with the Roads and Highways Advanced Linear Referencing System (ALRS). Once these external business events are registered with the ALRS, a read-only connection is established to the external data source, allowing Roads and Highways to access, display, query and report on this data as either a single query or combined query with multiple other event data sources. This can be particularly beneficial when a certain question or need arises to see the relationship between multiple data sources and layers, such as pavement, traffic volumes, functional classification, crashes and

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
				road maintenance history.

5.2 External Application Integration

The EAMS solution should provide functionality to integrate with other MDOT corporate applications.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
5.2.1	Allows for the interfacing with other systems by using a strategy of Database linking directly, or with intermediate tables	H	Y	The Data Linking functionality of the system allows the association of external data with all assets in the system. This external data can be queried, viewed and reported against. VUEWorks' SQL Server based database is open architected. The database also contains a series of standard SQL views which can be used by other systems. (See Appendix 5 Application Integration for screenshot page 3)
5.2.2	Allows for the interfacing with other systems by using a strategy of passing parameters to another system to execute or accept in a command.	H	Y	Data linking is a standard feature and can be extended to connect VUEWorks to other systems programmatically. (See Appendix 5 Application Integration for screenshot page 4)

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
5.2.3	Allows for the interfacing with other systems by using a strategy of a standard vendor supplied API.	H	Y	The system provides a series of Web Services that can be used by other systems for 2-way data communication (See Appendix 5 Application Integration for screenshot page 4-5).
5.2.4	Allows for the interfacing with other systems by using a strategy using services in a Services Oriented Architecture (SOA) or similar solution.	H	Y	The system provides a series of Web Services that can be used by other systems for 2-way data communication.
5.2.5	Allows for the interfacing with other systems by using a strategy using Electronic Data Interchange (EDI) i.e. batch text file processing.	H	M	Feature not currently available, but could be built as a custom piece of the solution.

6. Technical Requirements

This section describes technical requirements needed in support of the EAMS Solution.

6.1 System Architecture

The platform and architecture being used, as well as the capacity and compatibility with the State's current technologies.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.1.1	*The system employs web architecture using browser accessing a central database through software on a server.*	*M*	Y	VUEWorks is a web-enabled GIS-integrated enterprise asset management solution. This is inherent so considered standard.
6.1.2	The system places no limit on record size (no. of records).	H	Y	There are no limits on the size of a geodatabase other than any limitations specific to the supported RDBMS to be used. There are general guidelines and best practices for querying and returning business data using ArcGIS Server, however. In general, returns on web-based queries should be limited 1,000 geospatial records or fewer for optimum performance (Best Practice).
6.1.3	The software is expandable and portable, with specific reference to the system capacity requirements presented in this RFP.	H	Y	Since VUEWorks is web-based, it can scale within an organization very easily.
6.1.4	The system is fully self-contained and capable of being operated by State staff	H	Y	VUEWorks can be

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	with no dependency on Vendor services for its routine operation.			maintained by non-technical IT resources.
6.1.5	The system server is compatible with the State's technical architecture and is sized suitable for the system specified.	H	Y	VUEWorks' specifications are based on the required concurrent user count and IT architecture as provided by the State.
6.1.6	The system is an open system, with no dependency on the use of specific models or models of equipment operating systems.	H	Y	MS Windows Server OS required
6.1.7	The system keeps a log of each transaction which alters the database. Logs are date and time stamped to allow the system to reconstruct activity for any period.	H	M	Planned feature enhancement
6.1.8	The system is capable of using multiple database servers in a load balancing configuration.	H	Y	ArcGIS Server and SQL Server
6.1.9	The system is capable of using multiple application servers in a load balancing configuration for the purposes of scaling up the number of users.	H	Y	This is true of the entire VUEWorks solution.

6.2 Software Licensing

Specifics about the licensing and Royalty arrangement.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.2.1	The software license is for perpetual use for a fixed fee without additional royalties or service fees, except for ongoing software maintenance.	H	Y	
6.2.2	The system offers Application Programming Interfaces (APIs) that enable the State to develop custom interfaces to all modules.	L	Y	APIs consist of database views and Web Services that are fully documented.

6.3 RDBMS / Applications / Database Management

Outlines the State's requirements for the software to operate on preferred relational database technology.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.3.1	The system is available with State's standard relational database management system.	H	Y	MS SQL Server
6.3.2	Full-text indexing and a full-text database search feature are available to provide easy retrieval of records.	L	Y	Available through standard tools within SQL Server
6.3.3	All computer information systems and applications operate in a secure manner and comply with State Enterprise IT Security Policy and Procedures as found on the website: http://www.michigan.gov/dmb/0,1607,7-150-56355-107739--,00.html	H	Y	VUEWorks can be set up to run with an HTTPS: prefix to encrypt data passing between the application server and the user desktop.
6.3.4	The system must ensure that the integrity and confidentiality of data is protected by safeguards to prevent release of information without proper consent.	H	Y	VUEWorks permission module is used to control access on a user basis. Application database is secured by policies set directly on the server.
6.3.5	The system must ensure that the integrity and confidentiality of data accessed from mobile devices meets with policy 1315.00 Storage of Sensitive Information on Mobile Devices and Portable Media.	H	Y	All mobile access is secured by an authentication layer that is set up against each user accessing the application remotely.

6.4 Security

The state has standards for security including access control, passwords, and Activity Logging

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.4.1	The system will provide secure access at database level and integrate with MDOT Systems Access Manager (SAM) and provide security at application and individual operator levels.	H	Y	VUEWorks can integrate with Active Directory at the agency level.
6.4.2	The system will integrate with State Single Sign-on (SSO) system and provide secure access control based upon unique user login.	H	Y	Standard and configurable
6.4.3	The system to integrate with SSO and use the SAM feature to check each user's access privileges at login, and automatically disable or enable client functions (in real time) based upon the user's profile.	H	Y	Standard and configurable
6.4.4	The system to integrate with MDOT's SAM system and provide varying levels of access within the application, such as administrators, view only, or scheduling only.	H	M	Connection to our user/role permissions.
6.4.5*	The system provides an enforced minimum length for passwords.	H	M	Can be added with minor modification.
6.4.6*	The system provides an enforced requirement for user passwords to be automatically prompted for change after a defined period has passed, such as 30, 60 or 90 days.	H	M	Can be added with minor modification.
6.4.7*	The system provides users with the capability to change their own passwords.	H	Y	Done through the User Interface
6.4.8*	The system provides its feature to disable user IDs after a specified number (3) of consecutive invalid login attempts.	H	M	After 3 failures, the session is terminated, but the User ID is not disabled
6.4.9*	The system enters passwords in a non-display field.	H	Y	Standard and configurable
6.4.10*	The system encrypts passwords when they are routed over the network.	H	Y	Standard and configurable
6.4.11*	The system encrypts passwords in system storage.	H	Y	Standard and configurable
6.4.12*	Logs unauthorized access attempts by date, time, User ID, device and location.	L	M	Can be added
6.4.13	The system maintains an audit trail of all security maintenance performed by date, time, user ID, device and location, with easy access to information.	L	M	Can be added

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.4.14	Provides security reports of users and access levels.	L	M	Can be added, report of users and role permissions
6.4.15	Provides detailed reports of backups completed and backups failed.	L	M	This is a feature of SQL Server

if a vendor answers yes to 6.4.1 through 6.4.4 then simply answer Y to these requirements and comment SSO compatible in the Solution Description. If the solution does not conform or must be modified, indicate solution in typical fashion.

6.5 General Commercial Software Considerations

The State has specific requirements for Commercial Off the Shelf (COTS) packages.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.5.1	The software uses an industry standard relational database management system.	H	Y	The VUEWorks COTS asset management system solution supported database is SQL Server 2005 and newer
6.5.2	The Vendor will provide complete data model and schema details for the purposes of report interface development, including: Entity Relationship diagrams, a system model and a physical model.	H	Y	This information will be provided to the State
6.5.3	The software will operate effectively on State and non-state hardware as defined by Vendor with Vendor-supplied upgrade recommendations.	H	Y	The DTS Team will comply with this
6.5.4	The software operates in a recognized industry standard operating environment.	H	Y	The VUEWorks COTS asset management system solution supported operating systems are Windows Server 2003 and newer
6.5.5	The software provides a Graphical User Interface (GUI) that is user-friendly and provides data, calculation, reporting, and communication capabilities to State users.	H	Y	All browser-based.
6.5.6	The system is modular in design to accommodate phased implementation and	H	Y	Can be phased by module

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	future expansion.			and by agency group/unit
6.5.7	The modularity allows the capabilities of the core systems to function without the entire system complement.	H	Y	Standard feature of VUEWorks
6.5.8	Additional modules may be integrated into the system without a major impact to the installed components.	H	Y	Standard feature of VUEWorks
6.5.9	All modules of the system are integrated and designed to work together using a single input and a common database with no redundant data entry or data storage.	H	Y	Standard feature of VUEWorks
6.5.10	The system supports paperless processing through the use of electronic documents that are routed for electronic signatures through user-defined approval paths.	H	M	Service request and work order workflow is currently under development.
6.5.11	The system prevents transaction data from being posted in the system unless all members on the approval path have approved the associated electronic document.	H	M	Workflow capabilities are currently under development.
6.5.12	The system has the ability to accept and output transactions in standard electronic data interchange (EDI) formats.	H	M	Can be developed
6.5.13	The system has the ability to accept batch entry from external sources while ensuring the same edits and validations as the online system.	H	M	This would be custom to the specific application that is being integrated.
6.5.14	Response times, at local and remote sites, for the major on-line processes stated above will meet business requirements.	H	Y	Dependent upon network connection speeds at each location.
6.5.15	The software provides the capability of transferring data to and from the host/server to the client for processing on other software packages.	H	Y	Most data exchange formats are supported.
6.5.16	The system provides the capability to access scanned images that are attached to various elements of the database.	H	Y	Done through document linking
6.5.17	The system provides the capability for expansion in order to take advantage of technology such as optical scanning and imaging in order to reduce data entry workload.	H	Y	Done through document linking
6.5.18	The system includes comprehensive field edits to prevent incomplete or	H	Y	Combination of required

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	incorrect data from entering the system.			fields and field validation
6.5.19	The system ensures data integrity and controls processing without hard-coded logic	H	Y	Combination of required fields and field validation
6.5.20	The system must ensure that all errors are written to an error log.	H	Y	Can be viewed in the Event Viewer in the application
6.5.21	The system must allow for an administrator to view, filter, sort, and search the error log.	H	M	View only, no filtering
6.5.22	The system must allow for an administrator to archive error log entries based upon user-defined criteria.	L	M	Can be added
6.5.23	The system must allow for a user to define an alert message to be executed upon the occurrence of an error.	H	M	Can be added
6.5.24	The system has the ability to provide point-in-time recovery of data to the last completed transaction.	H	Y	SQL Server provides this ability.
6.5.25	The system has the ability to allow for continued use of the system during backup.	L	Y	SQL Server provides this ability.
6.5.26	The system has the ability to provide a complete backup and recovery process for all database tables and system files.	L	Y	SQL Server provides this ability.
6.5.27	The system has the ability to create on request backups.	L	Y	SQL Server provides this ability.
6.5.28	The backup and archival features of the system proposed can be initiated automatically or by manual request.	H	Y	SQL Server provides this ability.
6.5.29	For any information not hosted on State sites or facilities, the Vendor will provide full daily database backup with hourly incremental backup. Daily backups must be stored at an offsite facility for a minimum of 7 days.	H	Y	The DTS Team will comply with this requirement
6.5.30	The system must comply with DTMB and MDOT standards for data archiving and purging.	H	Y	The DTS Team will comply with this requirement

6.6 Reporting

Standards for reporting, reporting technology and administration.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.6.1	*The software delivers standard reports.*	*M*	Y	Through a robust Dynamic Report system. This is a standard feature.
6.6.2	*The system includes user defined query and reporting using state standard tools that allow the user to examine asset data and patterns in asset data.*	*M*	Y	VUEWorks SQL Server based database is open architected. The database also contains a series of standard SQL views which can be used by other systems or in SQL Server Management Studio directly. This is a standard feature.
6.6.3	The online query capability enables non-technical end-users to extract information from EAMS to allow for further analyses of the data using other software tools.	H	Y	All reports and filter results can be exported to various data formats, including Excel.
6.6.4	The standard (e.g., regularly scheduled, recurring) reporting environment allows standard reports to be scheduled, executed, viewed on-line, printed (centrally or remotely) and dispersed (including the use of report distribution management software)	H	Y	Through Crystal Reports or SQL Server Reporting Services
6.6.5	The standard (e.g., regularly scheduled, recurring) reporting environment allows offices and work locations to control which standard reports they do and do not receive.	H	Y	Standard part of reporting tools
6.6.6	The standard (e.g., regularly scheduled, recurring) reporting environment allows the State to control the information that appears on standard reports so that data security is maintained.	H	Y	Standard part of reporting tools
6.6.7	The system provides methods for retaining and modifying previously built queries.	H	Y	Called Saved Filters. These can be managed and access granted to users and roles
6.6.8	The system provides security and control mechanisms that limit the abuse of ad	H	Y	A maximum number of

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
	hoc queries (e.g., attempted access to restricted data, attempted execution of a query that would run for several hours, etc.).			records requested can be set against an ad hoc query.
6.6.9	The system provides the use of transaction databases, external files, or a "data warehouse" for user defined reporting.	H	Y	As long as user-access is granted, this information will be available to the user.
6.6.10	The System can provide reports in a number of standard formats including but not limited to: PDF, MS Word, MS Excel, CSV, Text).	H	Y	Large list for Dynamic Reports

6.7 Auditing

Requirements regarding auditing of the database for both security and monitoring.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.7.1	The system enables the user to modify data entry transactions that have already been posted to the database while maintaining an audit trail of the change.	H	M	Can be added
6.7.2	The system's internal control functionality ensures that the data entry and processing associated with a business event has been completed before updating the database.	H	M	Can be added
6.7.3	The system has the ability to maintain a historical record of all changes made to any item within the system (e.g., data element, business rule, process control, software program), the ID of the person or process that made the change, the before images of the affected data records, and the date and time the change was made.	H	M	Can be added
6.7.4	The system must ensure that all system events for software, hardware, interfaces, operating system, network, etc. are written to a system event log in a manner that facilitates debugging of all system problems.	H	Y	All VUEWorks errors are posted to the Event Viewer
6.7.5	The system offers the ability to query, view, filter, and sort the system audit trail. The system is able to store the queries.	H	M	This is currently only available using the database tools in SQL/Oracle.

No.	Requirement	M/ H-L	Y-N-M	Description of Solution
6.7.6	The system has the ability to identify and track data back to its input source (e.g., imaged document, keyed from form, interface file, etc.).	H	M	Can be developed
6.7.7	The system has the ability to audit all override of edits and audits and identify the login ID, date, and time.	H	M	Can be developed

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Table 1: Project Cost Summary

No.	Project Cost(s)	Cost ($)
A.	**COTS Software Acquisition** (includes COTS and any third party software) Give breakdown in Table 2.	$ 656,344.00
B.	**Project Initiation Services** (includes Project Kick-off Meetings and COTS Software Orientation Workshop) Give breakdown in Table 5	$ 85,400.00
C.	**Requirements and Solution Architecture Validation Services** (includes EAMS Software Requirements Validation and Solution Configuration Specifications) Give breakdown in Table 5	$ 322,568.00
D.	**Installation and Configuration Services** (includes EAMS Software Installation and COTS Configuration) Give breakdown in Table 5	$ 676,298.00
E.	**Implementation Services** (includes Data Conversion / Migration, Interfaces/Integration, Testing, Production Go-live and Performance Warranty Period) Give breakdown in Table 5	$ 1,516,009.00
F.	**Training/Knowledge Transfer/Transition** Give breakdown in Table 6	$ 176,728.00
G.	**Documentation** Give breakdown in Table 6	$ 35,610.00
H.	**Maintenance and Support** Give breakdown in Table 7	$ 566,436.00
I.	**Reserved** Give breakdown in Table 8	$ -
J.	**Other Services** Give breakdown in Table 9	$ 207,500.00
	Total Project Cost	**$ 4,242,893.00**

Note: The above amounts will be subject to hold back as referenced to Article 1, Section 1.600 of the Contract.

Table 2: Breakdown of COTS Software License Costs – including Third Party Software – EAMS Phase 1

No.	Software License(s) Cost	Product Name and Version	Unit Cost ($)	Proposed Licenses	Total Cost ($)
	Commercial Off The Shelf (COTS)				
	Road Network Management	ArcGIS Server and Desktop Software (See quotation for license detail)	$ 111,344.00	Enterprise	$ 111,344.00
	Asset Inventory Management	VUEWorks Web-based AMS	$ 250,000.00	Enterprise	$ 250,000.00
	Maintenance Management	VUEWorks Web-based MMS	$ 180,000.00	Enterprise	$ 180,000.00
	Other (specify):				$ -
	Straight Line Diagram	Road Analyzer V 2.20	$ 60,000.00	Enterprise	$ 60,000.00
	Video Log Interface	Video Log Module for Road Analyzer V 2.20	$ 25,000.00	Enterprise	$ 25,000.00
	Roads and Highways Productivity Tools	Roads and Highways Productivity Tools V 1.0	$ 30,000.00	Enterprise	$ 30,000.00
	Total COTS Software License Costs				**$ 656,344.00**
	Third Party Software				
	Report writers	N/A			$0
A.	Testing tools: (such as issues tracking, defect testing, load/stress testing, configuration management (List and provide cost separately for each item)	Free - Agile-based Web software available to MDOT and project team for defect tracking, and transparent monitoring of all implementation tasks			
	1	Not applicable			$0
	2	Not applicable			$0
	3	Not applicable			$0
	Other system utilities (such as backup and disaster recovery, etc.)				
	1	Not applicable			$0
	2	Not applicable			$0
	Server software	Not applicable			$0
	Any other software (List):				
	1	Not applicable			$0
	2	Not applicable			$0
	Total Cost of Software Licenses including COTS and Third Party Software **(transfer total to Row A of Table 1)**				**$ 656,344.00**

Table 3: Reserved

Table 4: Reserved

Table 5: COTS Implementation Services and Deliverables Costs

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	Project Initiation Services	Project Manager	120	$ 22,200.00
		Single Point of Contact	16	$ 1,920.00
		AMS Subject Matter Expert	40	$ 7,600.00
		Assistant Project Manager	40	$ 6,000.00
		Systems/Application Leader	40	$ 6,000.00
		AMS Technical Leader	40	$ 8,000.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist		$ -
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -
B.	*(Project Kick-off Meetings, COTS Software Orientation Workshop)*	LRS/SLD Project Manager	56	$ 10,640.00
		LRS/SLD Business Analyst		$ -
		LRS/SLD Technical Architect		$ -
		LRS/SLD Senior Developer		$ -
		R&H Implementation Lead	50	$ 12,800.00
		AMS Business Process Expert		$ -
		R&H Implementation Lead		$ -
		R&H Project Manager	40	$ 10,240.00
		R&H Database Lead		$ -
		R&H Implementation Specialist		$ -
		AMS Business Process Expert		$ -
				$ -
				$ 85,400.00
				(transfer total to Table 1 - B)

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
		Project Manager	240	$ 44,400.00
		Single Point of Contact	40	$ 4,800.00
		AMS Subject Matter Expert	120	$ 22,800.00
		Assistant Project Manager	80	$ 12,000.00
		Systems/Application Leader	40	$ 6,000.00
		AMS Technical Leader	40	$ 8,000.00
		Systems/Application Manager	40	$ 6,000.00
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -
C.	**Requirements and Solution Architecture Validation Services** *(EAMS Software Requirements Validation, Solution Configuration Specifications)*	LRS/SLD Project Manager	100	$ 19,000.00
		LRS/SLD Business Analyst	240	$ 42,000.00
		LRS/SLD Technical Architect	60	$ 11,400.00
		LRS/SLD GIS Analyst	40	$ 4,400.00
		LRS/SLD Senior Developer	40	$ 5,800.00
		LRS/SLD Database Administrator	40	$ 6,200.00
		LRS/SLD Data Analyst		$ -
		R&H Implementation Lead	240	$ 61,440.00
		R&H Project Manager	60	$ 15,360.00
		R&H Database Lead	28	$ 5,768.00
		R&H Implementation Specialist	200	$ 41,200.00
		AMS Business Process Expert		$ -
				$ 322,568.00 **(transfer total to Table 1 - C)**

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	Installation and Configuration Services			**Contractor must provide individual implementation costs by category below and then transfer the combined total to Table 1 - D**
D.	**Software Installation**	Project Manager	240	$ 44,400.00
		Single Point of Contact	40	$ 4,800.00
		AMS Subject Matter Expert	40	$ 7,600.00
		Assistant Project Manager	80	$ 12,000.00
		Systems/Application Leader	40	$ 6,000.00
		AMS Technical Leader	200	$ 40,000.00
		Systems/Application Manager	40	$ 6,000.00
		Sr. Systems Integration Specialist	20	$ 3,000.00
		Systems Integration Specialist	160	$ 20,800.00
		System Architect	150	$ 19,500.00
		Business Analyst	420	$ 46,200.00
		Implementation Specialist	420	$ 58,800.00
		AMS Configuration/Developer		$ -
		LRS/SLD Project Manager	16	$ 3,040.00
		LRS/SLD Business Analyst	46	$ 8,050.00
		LRS/SLD Technical Architect	26	$ 4,940.00
		LRS/SLD GIS Analyst	42	$ 4,620.00
		LRS/SLD Senior Developer	4	$ 580.00
		LRS/SLD Developer	30	$ 2,850.00
		LRS/SLD Database Administrator	60	$ 9,300.00
		LRS/SLD Data Analyst	8	$ 880.00
		R&H Implementation Lead	16	$ 4,096.00
		R&H Project Manager	4	$ 1,024.00
		R&H Database Lead	20	$ 4,120.00
		R&H Implementation Specialist	20	$ 4,120.00
		AMS Business Process Expert		$ -
				$ 316,720.00

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	COTS Configuration	Project Manager	240	$ 44,400.00
		Single Point of Contact	30	$ 3,600.00
		AMS Subject Matter Expert	40	$ 7,600.00
		Assistant Project Manager	80	$ 12,000.00
		Systems/Application Leader	40	$ 6,000.00
		AMS Technical Leader	120	$ 24,000.00
		Systems/Application Manager	40	$ 6,000.00
		Sr. Systems Integration Specialist	20	$ 3,000.00
		Systems Integration Specialist	160	$ 20,800.00
		System Architect	80	$ 10,400.00
		Business Analyst	100	$ 11,000.00
		Implementation Specialist	300	$ 42,000.00
		AMS Configuration/Developer	300	$ 33,000.00
		LRS/SLD Project Manager	20	$ 3,800.00
		LRS/SLD Business Analyst	24	$ 4,200.00
		LRS/SLD Technical Architect	40	$ 7,600.00
		LRS/SLD GIS Analyst	80	$ 8,800.00
		LRS/SLD Senior Developer	40	$ 5,800.00
		LRS/SLD Developer	60	$ 5,700.00
		LRS/SLD Database Administrator	60	$ 9,300.00
		LRS/SLD Data Analyst	10	$ 1,100.00
		LRS/SLD Tester/Technical Writer	36	$ 4,140.00
		R&H Implementation Lead	90	$ 23,040.00
		R&H Project Manager	80	$ 20,480.00
		R&H Database Lead	43	$ 8,858.00
		R&H Implementation Specialist	160	$ 32,960.00
		AMS Business Process Expert		$ -
				$ 359,578.00
	D.1 Combined Total Installation and Configuration Costs			**$ 676,298.00**

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	Implementation Services			**Contractor must provide individual implementation costs by category below and then transfer the combined total to Table 1 - E**
	E.1 Data Conversion / Migration	Project Manager	60	$ 11,100.00
		Single Point of Contact	16	$ 1,920.00
		AMS Subject Matter Expert	16	$ 3,040.00
		Assistant Project Manager	16	$ 2,400.00
		Systems/Application Leader	40	$ 6,000.00
		AMS Technical Leader		$ -
		Systems/Application Manager	24	$ 3,600.00
		Sr. Systems Integration Specialist	80	$ 12,000.00
		Systems Integration Specialist	160	$ 20,800.00
		System Architect	80	$ 10,400.00
		Business Analyst	32	$ 3,520.00
		Implementation Specialist		$ -
		AMS Configuration/Developer	120	$ 13,200.00
		LRS/SLD Project Manager	24	$ 4,560.00
		LRS/SLD Business Analyst	65	$ 11,375.00
		LRS/SLD Technical Architect	36	$ 6,840.00
		LRS/SLD GIS Analyst	60	$ 6,600.00
		LRS/SLD Senior Developer		$ -
		LRS/SLD Developer	80	$ 7,600.00
		LRS/SLD Database Administrator	150	$ 23,250.00
		LRS/SLD Data Analyst	40	$ 4,400.00
		LRS/SLD Tester/Technical Writer	18	$ 2,070.00
		R&H Implementation Lead	21	$ 5,376.00
		R&H Project Manager	20	$ 5,120.00
		R&H Database Lead	50	$ 10,300.00
		R&H Implementation Specialist	320	$ 65,920.00
		AMS Business Process Expert		$ -
				$ 241,391.00

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	Interfaces/Integration	Project Manager		$ -
		Single Point of Contact		$ -
		AMS Subject Matter Expert		$ -
		Assistant Project Manager		$ -
		Systems/Application Leader		$ -
		AMS Technical Leader		$ -
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist		$ -
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -
		LRS/SLD Project Manager		$ -
		LRS/SLD Business Analyst		$ -
		LRS/SLD Technical Architect		$ -
		LRS/SLD GIS Analyst		$ -
		LRS/SLD Senior Developer		$ -
		LRS/SLD Developer		$ -
		LRS/SLD Database Administrator		$ -
		LRS/SLD Data Analyst		$ -
		LRS/SLD Tester/Technical Writer		$ -
		R&H Implementation Lead		$ -
		R&H Project Manager		$ -
		R&H Database Lead		$ -
		R&H Implementation Specialist		$ -
		AMS Business Process Expert	80	$ 13,600.00

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	MiBridge:			$
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00
	MIDB (LAPS):			
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	TMS (GLOBAL):			$
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00
	MainStar:			$
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	PA:			$
		Project Manager		$ -
		Single Point of Contact		$ -
		AMS Subject Matter Expert		$ -
		Assistant Project Manager		$ -
		Systems/Application Leader		$ -
		AMS Technical Leader		$ -
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist		$ -
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -
	PDRP:			$
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	PAB:			
		Project Manager		$ -
		Single Point of Contact		$ -
		AMS Subject Matter Expert		$ -
		Assistant Project Manager		$ -
		Systems/Application Leader		$ -
		AMS Technical Leader		$ -
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist		$ -
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -
	M5 FleetFocus:			
		Project Manager	32	$ 5,920.00
		Single Point of Contact	8	$ 960.00
E.		AMS Subject Matter Expert	24	$ 4,560.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	16	$ 2,400.00
		AMS Technical Leader	16	$ 3,200.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer	24	$ 2,640.00

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	SCAS:			
		Project Manager	16	$ 2,960.00
		Single Point of Contact	8	$ 960.00
		AMS Subject Matter Expert	12	$ 2,280.00
		Assistant Project Manager	6	$ 900.00
		Systems/Application Leader	8	$ 1,200.00
		AMS Technical Leader	8	$ 1,600.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	20	$ 3,000.00
		Systems Integration Specialist	40	$ 5,200.00
		System Architect	16	$ 2,080.00
		Business Analyst	16	$ 1,760.00
		Implementation Specialist	20	$ 2,800.00
		AMS Configuration/Developer	12	$ 1,320.00
	ProjectWise:			
		Project Manager		$ -
		Single Point of Contact		$ -
		AMS Subject Matter Expert		$ -
		Assistant Project Manager		$ -
		Systems/Application Leader		$ -
		AMS Technical Leader		$ -
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist		$ -
		Systems Integration Specialist		$ -
		System Architect		$ -
		Business Analyst		$ -
		Implementation Specialist		$ -
		AMS Configuration/Developer		$ -

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	ArcGIS Server / ArcSDE:			
		Project Manager	160	$ 29,600.00
		Single Point of Contact	40	$ 4,800.00
		AMS Subject Matter Expert	80	$ 15,200.00
		Assistant Project Manager	40	$ 6,000.00
		Systems/Application Leader	20	$ 3,000.00
		AMS Technical Leader		$ -
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	20	$ 3,000.00
		Systems Integration Specialist	40	$ 5,200.00
		System Architect	10	$ 1,300.00
		Business Analyst		$ -
		Implementation Specialist	20	$ 2,800.00
		AMS Configuration/Developer	20	$ 2,200.00
	Other (specify):			$
	E.2 Total Interfaces / Integration			**$ 396,680.00**

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
		Project Manager	24	$ 4,440.00
		Single Point of Contact		$ -
		AMS Subject Matter Expert	30	$ 5,700.00
		Assistant Project Manager	12	$ 1,800.00
		Systems/Application Leader	24	$ 3,600.00
		AMS Technical Leader	24	$ 4,800.00
		Systems/Application Manager		$ -
		Sr. Systems Integration Specialist	80	$ 12,000.00
		Systems Integration Specialist	80	$ 10,400.00
		System Architect	12	$ 1,560.00
		Business Analyst	12	$ 1,320.00
		Implementation Specialist	40	$ 5,600.00
		AMS Configuration/Developer		$ -
		LRS/SLD Project Manager	24	$ 4,560.00
		LRS/SLD Business Analyst	12	$ 2,100.00
		LRS/SLD Technical Architect	12	$ 2,280.00
		LRS/SLD GIS Analyst	40	$ 4,400.00
		LRS/SLD Senior Developer	24	$ 3,480.00
		LRS/SLD Developer		$ -
		LRS/SLD Database Administrator	40	$ 6,200.00
		LRS/SLD Data Analyst	40	$ 4,400.00
		LRS/SLD Tester/Technical Writer	24	$ 2,760.00
		R&H Implementation Lead	20	$ 5,120.00
		R&H Project Manager	20	$ 5,120.00
		R&H Database Lead	50	$ 10,300.00
		R&H Implementation Specialist	100	$ 20,600.00
		AMS Business Process Expert		$ -
	E.3 Pilot Projects			**$ 122,540.00**

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	E.4 Testing: (i.e. Unit, System, Integration,	Project Manager	200	$ 37,000.00
		Single Point of Contact	80	$ 9,600.00
		AMS Subject Matter Expert	320	$ 60,800.00
		Assistant Project Manager	80	$ 12,000.00
		Systems/Application Leader	320	$ 48,000.00
		AMS Technical Leader	160	$ 32,000.00
		Systems/Application Manager	80	$ 12,000.00
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	120	$ 15,600.00
		System Architect	80	$ 10,400.00
		Business Analyst	240	$ 26,400.00
		Implementation Specialist	240	$ 33,600.00
		AMS Configuration/Developer	80	$ 8,800.00
	Performance (load and stress), Parallel Testing, User Acceptance Testing (UAT), and other)	LRS/SLD Project Manager	20	$ 3,800.00
		LRS/SLD Business Analyst	40	$ 7,000.00
		LRS/SLD Technical Architect	20	$ 3,800.00
		LRS/SLD GIS Analyst	60	$ 6,600.00
		LRS/SLD Senior Developer	32	$ 4,640.00
		LRS/SLD Developer	54	$ 5,130.00
		LRS/SLD Database Administrator	20	$ 3,100.00
		LRS/SLD Data Analyst	40	$ 4,400.00
		LRS/SLD Tester/Technical Writer	80	$ 9,200.00
		R&H Implementation Lead	20	$ 5,120.00
		R&H Project Manager	16	$ 4,096.00
		R&H Database Lead	60	$ 12,360.00
		R&H Implementation Specialist	100	$ 20,600.00
		AMS Business Process Expert		$ -
				$ 402,046.00

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	E.5 Production Go-Live	Project Manager	80	$ 14,800.00
		Single Point of Contact	40	$ 4,800.00
		AMS Subject Matter Expert	40	$ 7,600.00
		Assistant Project Manager	40	$ 6,000.00
		Systems/Application Leader	80	$ 12,000.00
		AMS Technical Leader	32	$ 6,400.00
		Systems/Application Manager	16	$ 2,400.00
		Sr. Systems Integration Specialist	40	$ 6,000.00
		Systems Integration Specialist	120	$ 15,600.00
		System Architect	32	$ 4,160.00
		Business Analyst	24	$ 2,640.00
		Implementation Specialist	120	$ 16,800.00
		AMS Configuration/Developer	80	$ 8,800.00
		LRS/SLD Project Manager	20	$ 3,800.00
		LRS/SLD Business Analyst	16	$ 2,800.00
		LRS/SLD Technical Architect	40	$ 7,600.00
		LRS/SLD Senior Developer	20	$ 2,900.00
		LRS/SLD Database Administrator	16	$ 2,480.00
		LRS/SLD Data Analyst	54	$ 5,940.00
		LRS/SLD Tester/Technical Writer	4	$ 460.00
		R&H Implementation Lead	24	$ 6,144.00
		R&H Project Manager	24	$ 6,144.00
		R&H Database Lead	80	$ 16,480.00
		R&H Implementation Specialist	100	$ 20,600.00
		AMS Business Process Expert		$ -
				$ 183,348.00

Table 5

No.	Category	Resources Required (Contractor to identify IT classification)	Total # of hours (Contractor to identify # of hours per resource)	Total cost ($) (Contractor must transfer category totals to Table 1)
	E.6 Performance Warranty Period	Project Manager	80	$ 14,800.00
		Single Point of Contact	80	$ 9,600.00
		AMS Subject Matter Expert	60	$ 11,400.00
		Assistant Project Manager	40	$ 6,000.00
		Systems/Application Leader	60	$ 9,000.00
		AMS Technical Leader		$ -
		Systems/Application Manager	60	$ 9,000.00
		Sr. Systems Integration Specialist	60	$ 9,000.00
		Systems Integration Specialist	120	$ 15,600.00
		System Architect	60	$ 7,800.00
		Business Analyst	60	$ 6,600.00
		Implementation Specialist	160	$ 22,400.00
		AMS Configuration/Developer		$ -
		LRS/SLD Project Manager	24	$ 4,560.00
		LRS/SLD Business Analyst	32	$ 5,600.00
		LRS/SLD Technical Architect	24	$ 4,560.00
		LRS/SLD GIS Analyst	16	$ 1,760.00
		LRS/SLD Senior Developer	16	$ 2,320.00
		LRS/SLD Developer	16	$ 1,520.00
		LRS/SLD Database Administrator	16	$ 2,480.00
		LRS/SLD Data Analyst	40	$ 4,400.00
		LRS/SLD Tester/Technical Writer	20	$ 2,300.00
		R&H Implementation Lead	20	$ 5,120.00
		R&H Project Manager	20	$ 5,120.00
		R&H Database Lead	20	$ 4,120.00
		R&H Implementation Specialist	24	$ 4,944.00
		AMS Business Process Expert		$ -
				$ -
				$ 170,004.00
	Totals E:			**$ 1,516,009.00**
	Combined Total Implementation Services and Deliverables Costs (totals from rows B, C, D.1, E.1, E.2, E.3, E.4, E.5, E.6)			**$ 2,600,275.00**

Table 5

Table 6: Breakdown of Training and Documentation Cost

No.	Category	Cost ($)
F.	**Train the Trainer Training**	
	Technical training	$ 25,500.00
	System Administrator training	$ 18,450.00
	End User training: Road Network Editor	$ 28,188.00
	End User training: Asset Editor	$ 15,240.00
	End User training: Maintenance Editor	$ 12,440.00
	End User training: SLD	$ 6,580.00
	End User training: Road Analyzer	$ 15,810.00
	End User training: R&H/R&H Productivity Tools	$ 29,420.00
	End User training: Inquiry User	$ 10,400.00
	Other Proposed Training (List):	
	1 Field Maintenance Tools (on site with Maintenance Offices)	$ 14,700.00
	2	
	3	
	Total Training Cost	**use cell below**
	(transfer total to Table 1 - F)	**$ 176,728.00**
G.	**Training Documentation**	**use cell below**
	(transfer total to Table 1 - G)	**$ 35,610.00**
	Total Training and Documentation Cost	**$ 212,338.00**

Table 7: Recurring Costs: Software License and Maintenance and Support*

*See Article 1, Section 1.601, Subsection 2 for annual summary of costs.

No.	Cost Categories	Proposed Licenses	Annual Cost ($)					Total Cost ($)
			Year 1	Year 2	Year 3	Year 4	Year 5	
H.	**Annual Software License Costs**							
	COTS Software License Costs by Module							
	Commercial Off The Shelf (COTS)							
	Road Network Management	Enterprise	$0	$ 30,609.00	$ 30,609.00	$ 30,609.00	$ 30,609.00	$ 122,436.00
	Asset Inventory Management	Enterprise	$0	$ 50,000.00	$ 50,000.00	$ 50,000.00	$ 50,000.00	$ 200,000.00
	Maintenance Management	Enterprise	$0	$ 36,000.00	$ 36,000.00	$ 36,000.00	$ 36,000.00	$ 144,000.00
	Other (specify):	N/A						
	Straight Line Diagram	Enterprise	$0	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 40,000.00
	Video Log Interface	Enterprise	$0	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 20,000.00
	Roads and Highways Productivity Tools	Enterprise	$0	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 40,000.00
	Total COTS Software License Cost							**$ 566,436.00**
	Third Party Software							
	Report writers							$ -
	Testing tools: (such as issues tracking, defect testing, load/stress testing, configuration							
	1 Not Applicable							$ -
	2 Not Applicable							$ -
	3 Not Applicable							$ -
	Other system utilities (such as backup and disaster recovery, etc.)							
	1							$ -
	2							$ -
	Server software							$ -
	Any other software (List):							
	1 Not Applicable							$ -
	2 Not Applicable							$ -
	Total Third Party Software License Cost							**$ -**
	Total Software License Recurring Cost							**$ 566,436.00**
	Software Maintenance and Support Cost *(includes helpdesk)*		don't	use	this	row		**$ -**
	Total Software and Maintenance and Support Recurring Cost **(transfer total to Table 1 - H)**							**$ 566,436.00**

Notes for Completion of Table 7:

1. Within each cost category, the Total Cost is computed as the sum of the Annual Costs (Year 1 through Year 5).
2. The Total COTS Software License Cost is computed as the sum of the Total Cost for each proposed software module.
3. The Total Third Party Software License Cost is computed as the sum of the Total Cost for each proposed software module.
4. The Total Software License Recurring Cost is computed as the sum of the Total COTS Software License Cost and the Total Third Party Software License Cost.
5. The Total Software and Maintenance and Support Recurring Cost is computed as the sum of the Total Software License Recurring Cost and the Total Cost for Software Maintenance and Support.
6. The anniversary date for the billing of annual Software License and Maintenance and Support costs shall be established at the day following the completion of the Warranty Period.

Table 8: Reserved

Table 9: Other Services Rate Card – Key Staff

No.	Staffing Category	Name(s) of Key Staff	Firm Fixed Hourly Rate	Est. Hours (5 year total)	Extended Price ($) (Rate x Hours)
J.	Project Manager	Sangeeta Reddy	$ 185.00	500	$ 92,500.00
	System Architect	Kirsten Koehn	$ 130.00	500	$ 65,000.00
	Trainer	Charles Brown	$ 100.00	500	$ 50,000.00
	Key Staff Rate Card Estimated Cost (transfer total to Table 1 - J)	N/A	N/A	1,500	**$ 207,500.00**

Table 10: Other Services Rate Card – Other Staff

No.	Staffing Category	Name(s) of Key Staff	Firm Fixed Hourly Rate
J.	Single Point of Contact	Greg Yarbrough	$ 120.00
	Assistant Project Manager	William Land	$ 150.00
	AMS Subject Matter Expert	Jason Amadori	$ 190.00
	Systems/Application Leader	Brian Sovik	$ 150.00
	AMS Technical Leader	Dave Paine	$ 200.00
	Systems/Application Manager	Kim Hubble	$ 150.00
	Sr. Systems Integration Specialist	Jeff Germain	$ 150.00
	Systems Integration Specialist	Bob Binckes	$ 130.00
	Business Analyst	Julie Wilson	$ 110.00
	Implementation Specialist	Andrew Carr	$ 140.00
	AMS Configuration/Developer	Max Cutrell Jeremy Folds Steve Railsback Nick Volpe	$ 110.00
	LRS/SLD Project Manager	Jesse Jay	$ 190.00
	LRS/SLD Business Analyst	Bill Schuman Bryan Kelley	$ 175.00
	LRS/SLD GIS Analyst	Rakesh Patel	$ 110.00
	LRS/SLD Technical Architect	Steve Korzekwa	$ 190.00
	LRS/SLD Senior Developer	Rusty Green	$ 145.00
	LRS/SLD Developer	Deepa Kini Yu Luo Jodie Locklear	$ 95.00
	LRS/SLD Database Administrator	Kristi Barry	$ 155.00
	LRS/SLD Data Analyst	Chris Kerr	$ 110.00
	LRS/SLD Tester/Technical Writer	Janet McGrath	$ 115.00
	R&H Implementation Lead	Adrian Litton	$ 256.00
	R&H Project Manager	Jackie Magnant	$ 256.00
	R&H Database Lead	Sylvia Casas	$ 206.00
	R&H Implementation Specialist	Mathew Kabak	$ 206.00
	AMS Business Process Expert	Robert Cooney	$ 170.00
	Future Enhancement/Rate Card Estimated Cost	N/A	N/A

Notes for Tables 9 and 10:

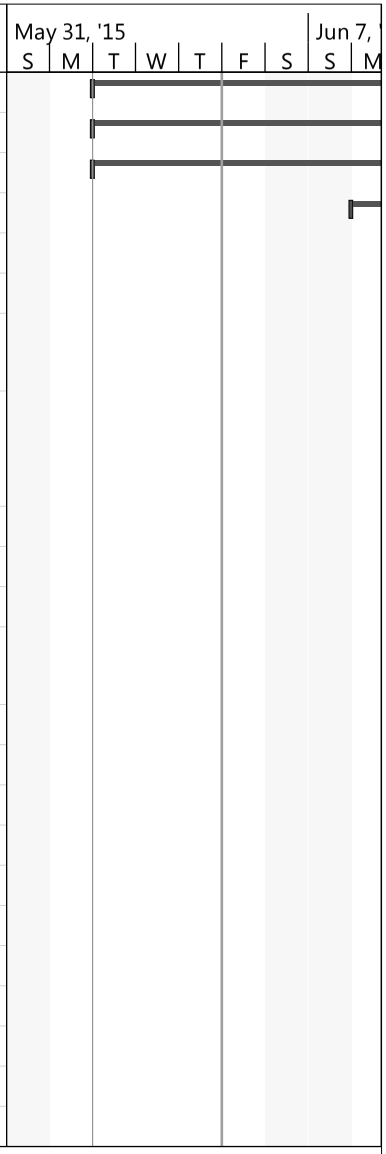
1. Hourly rates quoted are firm, fixed, all inclusive rates for the duration of the contract. Travel and other expenses will not be reimbursed.
2. The State intends to establish funding for up to 1,500 hours over the five year life of the application as a contingency for other services. Actual funding will occur on a yearly basis, and there is no guarantee as to the level of funding, if any, available to the project.

3. Within Table 9, the State has provided representative "Estimated Hours" for Key Staff. Contractor is advised that both the "Estimated Hours" and "Extended Price" derived from this estimate are non-binding and will be used at the State's discretion to determine best value to the State.

4. The parties agree that the Services/Deliverables to be rendered by Contractor using the Table 9 and Table 10 rate cards applicable to this Contract will be defined and described in detail in separate Statements of Work. Contractor shall not be obliged or authorized to commence any work to implement a Statement of Work until authorized via a purchase order issued against this Contract.

5. Unless otherwise agreed by the parties, each Statement of Work will include each item listed in Article 1, Section 1.601 for new work.

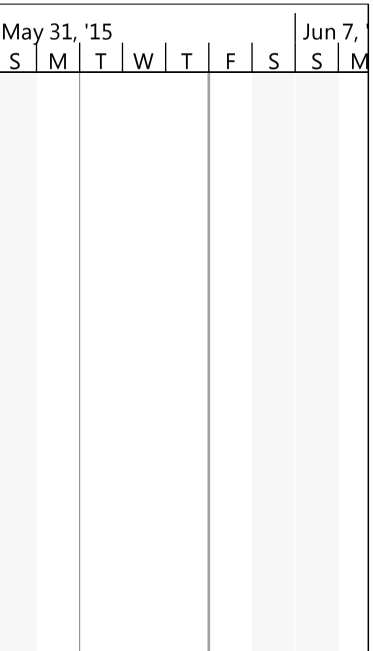
ID		Task Name	Duration	Start	Finish	Predecessors
1		**EAMS Implementation Plan**	**555 days**	**Tue 6/2/15**	**Mon 7/17/17**	
2		**GATE 1**	**23 days**	**Tue 6/2/15**	**Thu 7/2/15**	
3		**COTS Software Acquisition**	**6 days**	**Tue 6/2/15**	**Tue 6/9/15**	
6		**Project Initiation Services**	**19 days**	**Mon 6/8/15**	**Thu 7/2/15**	
17		MDOT Plan Review and Acceptance	5 days	Fri 7/3/15	Thu 7/9/15	16
18		GATE 1 Acceptance	1 day	Fri 7/10/15	Fri 7/10/15	
19		**GATE 2 - Requirements and Solution Architecture Validation Services**	**44 days**	**Mon 7/13/15**	**Thu 9/10/15**	
25		MDOT Roadway Network Management Requirements Document and Solution Architecture Review and Acceptance	14 days	Fri 9/11/15	Wed 9/30/15	24
26		GATE 2 Acceptance	1 day	Thu 10/1/15	Thu 10/1/15	25
27		**GATE 3 - Installation and Configuration Services**	**25 days**	**Mon 7/13/15**	**Fri 8/14/15**	
34		GATE 3 Acceptance	1 day	Mon 8/17/15	Mon 8/17/15	33
35		**GATE 4 COTS System Focused Configurations (Tier II)**	**112 days**	**Tue 8/18/15**	**Wed 1/20/16**	
36		**GATE 4a Lane Inventory**	**27 days**	**Tue 8/18/15**	**Wed 9/23/15**	
44		GATE 4a Acceptance	1 day	Thu 9/24/15	Thu 9/24/15	43
45		**GATE 4b Signs**	**27 days**	**Fri 9/25/15**	**Mon 11/2/15**	
53		GATE 4b Acceptance	1 day	Tue 11/3/15	Tue 11/3/15	52
54		**GATE 4c Guardrails**	**27 days**	**Wed 11/4/15**	**Thu 12/10/15**	
62		GATE 4c Acceptance	1 day	Fri 12/11/15	Fri 12/11/15	61
63		**GATE 4d Culverts**	**27 days**	**Mon 12/14/15**	**Tue 1/19/16**	
71		GATE 4d Acceptance	1 day	Wed 1/20/16	Wed 1/20/16	70
72		MDOT Tier II Final Testing and Acceptance	10 days	Thu 1/21/16	Wed 2/3/16	71
73		Gate 4 Acceptance	1 day	Thu 2/4/16	Thu 2/4/16	72
74		**Gate 5 - SLD Design and Implementation**	**134 days**	**Fri 8/7/15**	**Wed 2/10/16**	



Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

Task		Inactive Summary		External Tasks	
Split		Manual Task		External Milestone	
Milestone		Duration-only		Deadline	
Summary		Manual Summary Rollup		Progress	
Project Summary		Manual Summary		Manual Progress	
Inactive Task		Start-only			
Inactive Milestone		Finish-only			

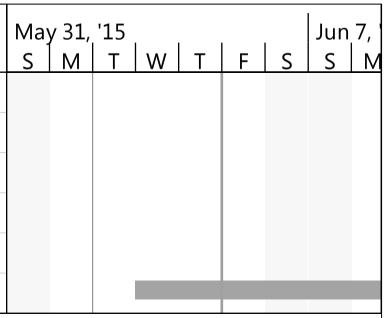
ID		Task Name	Duration	Start	Finish	Predecessors
80		MDOT SLD Testing and Acceptance	1 day	Thu 2/11/16	Thu 2/11/16	79
81		Gate 5 Acceptance	1 day	Fri 2/12/16	Fri 2/12/16	80
82		**Gate 6 - Esri Roads and Highways Design and Implementation**	**280 days**	**Fri 8/7/15**	**Thu 9/1/16**	
87		MDOT Testing	1 day	Fri 9/2/16	Fri 9/2/16	86
88		Gate 6 Acceptance	1 day	Mon 9/5/16	Mon 9/5/16	87
89		**Gate 7 - FINAL: Module Level Configuration: Recheck for any conflicts in all Processes across Modules**	**60 days**	**Thu 4/14/16**	**Wed 7/6/16**	
90		**Maintenance Management**	**20 days**	**Thu 4/14/16**	**Wed 5/11/16**	
95		**Asset Management Modules**	**20 days**	**Thu 5/12/16**	**Wed 6/8/16**	
105		FINAL: SLD Configuration: Recheck for any conflicts in all processes	20 days	Thu 6/9/16	Wed 7/6/16	104
106		MDOT Testing and Acceptance	7 days	Thu 7/7/16	Fri 7/15/16	105
107		Gate 7 Acceptance	1 day	Mon 7/18/16	Mon 7/18/16	106
108		**Gate 8 - Implementation Services - Interfaces and Integration**	**165 days**	**Mon 8/17/15**	**Fri 4/1/16**	
119		MDOT Testing and Acceptance	7 days	Mon 4/4/16	Tue 4/12/16	118
120		Gate 8 Acceptance	1 day	Wed 4/13/16	Wed 4/13/16	119
121		**Gate 9 - ArcGIS Server/ArcSDE & Roads & Highwa**	**240 days**	**Fri 8/7/15**	**Thu 7/7/16**	
127		MDOT Testing and Acceptance	7 days	Fri 7/8/16	Mon 7/18/16	126
128		Gate 9 Acceptance	1 day	Tue 7/19/16	Tue 7/19/16	127
129		**Gate 10 - Pilot Projects**	**100 days**	**Thu 4/14/16**	**Wed 8/31/16**	
134		MDOT Testing and Acceptance	7 days	Thu 9/1/16	Fri 9/9/16	133
135		Gate 10 Acceptance	1 day	Mon 9/12/16	Mon 9/12/16	134
136		**Gate 11 - Training**	**52 days**	**Thu 6/9/16**	**Fri 8/19/16**	
146		Gate 11 Acceptance	1 day	Mon 8/22/16	Mon 8/22/16	145



Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

Task		Inactive Summary		External Tasks	
Split		Manual Task		External Milestone	
Milestone		Duration-only		Deadline	
Summary		Manual Summary Rollup		Progress	
Project Summary		Manual Summary		Manual Progress	
Inactive Task		Start-only			
Inactive Milestone		Finish-only			

ID		Task Name	Duration	Start	Finish	Predecessors
147		**Gate 12 - Documentation**	**328 days**	**Thu 4/14/16**	**Mon 7/17/17**	
148		**Documentation**	**50 days**	**Thu 4/14/16**	**Wed 6/22/16**	
154		**Maintenance and Support**	**268 days**	**Thu 7/7/16**	**Mon 7/17/17**	
161		**Knowledge Transfer**	**5 days**	**Thu 12/8/16**	**Wed 12/14/16**	
164		Gate 12 Acceptance	1 day	Thu 12/15/16	Thu 12/15/16	163
165		**Reserve Bank of Hours/Other Services**	**391 days**	**Wed 6/3/15**	**Wed 11/30/16**	**4**



Project: MDOT_TAMS_Schedule
Date: Fri 6/5/15

Task		Inactive Summary		External Tasks	
Split		Manual Task		External Milestone	
Milestone		Duration-only		Deadline	
Summary		Manual Summary Rollup		Progress	
Project Summary		Manual Summary		Manual Progress	
Inactive Task		Start-only			
Inactive Milestone		Finish-only			

Attachment D - Breakdown of Hardware and Related Software

Table 1: Hardware

Item	Brand, Model # and Description	Specifications	Cost ($): State will provide from existing Contracts	Comments
Computers	N/A	Dual Core Windows Desktop with 4 GB of RAM	$3,000	VUEWorks® runs in a web browser
Storage		N/A		At least 10Gb free on machine for performance
CD/DVD Backup Device		N/A		Not required to run VUEWorks solution
Rack w/ Power Supply		N/A		Not required to run VUEWorks solution, but recommended if purchasing a server
Screen	N/A	Vertical resolution greater than 768	$500	Any recent monitor can be used.
Any other Hardware (list)	N/A	Quad Core Server with GB 16 of RAM for both ArcGIS Server Machine and SQL Server Machine	$15,000	Server specifications are for optimal performance, but the most recent technology is recommended.
		TOTAL	**$18,500**	

Table 2: Related Software

Software Component License	Product Name and Version	# of Licenses	Cost ($): State will provide from existing Contracts	Comments
Report writers		N/A		VUEWorks ships with a royalty-free report designer. 3rd party reporting tools are supported but not required such as Crystal Reports, Websphere, etc.
Testing tools (such as issues tracking, defect tracking, load/stress testing, configuration management.)		N/A		Recommended as per the MDOT IT policies. VUEWorks utilizes agile web software for testing and defect tracking (Redmine, SilverCatalyst, etc.), but can use as per MDOT IT policies
Other system utilities		N/A		
Server software	SQL Server 2008R2 or newer	1		SQL Server is the VUEWorks database server. VUEWorks provides integrated data linking for any other ODBC compliant database as well such as Oracle, DB2, Access, etc.

Attachment D - Breakdown of Hardware and Related Software

PC Software		N/A		
Any other software (list)	Esri Roads and Highways for Server Enterprise Standard Windows Up to Four Cores License	1	$9,000	
	Esri Roads and Highways for Server Enterprise Standard Windows Additional Cores License	8	$18,000	
	Esri Roads and Highways for Server Enterprise Standard for Windows Up to Four Cores Staging Server License	1	$4,836	
	Esri Roads and Highways for Server Enterprise Standard for Windows Additional Cores Staging Server License	4	$4,836	
	Esri Roads and Highways for Desktop Concurrent Use License	4	$36,000	
	ArcGIS Workflow Manager for Server Enterprise Standard (Windows) Up to Four Cores License	1	$9,000	
	ArcGIS Workflow Manager for Server Enterprise Standard (Windows) Additional Core License	8	$18,000	

Attachment D - Breakdown of Hardware and Related Software

	ArcGIS Data Reviewer for Server Enterprise Standard for Windows Up to Four Cores License	1	$9,000	
	ArcGIS Data Reviewer for Server Enterprise Standard Additional Core License	8	$18,000	
	ArcGIS Workflow Manager for Server Enterprise Standard (Windows) Up to Four Cores Staging Server License	1	$4,836	
	ArcGIS Data Reviewer for Server Enterprise Standard for Windows Up to Four Cores Staging Server License	1	$4,836	
	VUEWorks Asset Management Software	Enterprise	$250,000	
	VUEWorks Maintenance Management Software	Enterprise	$180,000	
	Road Analyzer V 2.20	Enterprise	$60,000	
	Video Log Module for Road Analyzer V. 2.20	Enterprise	$25,000	
	Roads and Highways Productivity Tools V 1.0	Enterprise	$30,000	
		TOTAL	**$681,344**	

Michigan Department Of Transportation

Enterprise Asset Management System (EAMS) Attachment E – Location Referencing Standards

FINAL VERSION 1.0

July 26, 2013

KPMG

cutting through complexity™

Document Revision History

Ver.	Made By	Date	Section	Description
0.1	Dave Loukes	2013-05-26		First draft for internal team review
0.2	Dave Loukes	2013-05-30		Draft submitted to MDOT for review
0.3	Dave Loukes	2013-06-27		Final draft submission incorporating feedback from MDOT June 10 workshop
1.0	Dave Loukes	2013-07-26		Final submission incorporating feedback from MDOT July 10 workshop

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1. Introduction

1.1 Background

The Michigan Department of Transportation (MDOT or the Department) is working in cooperation with the Department of Technology, Management and Budget (DTMB) to analyze, procure, and implement an enterprise-wide Enterprise Asset Management System (EAMS).

The purpose of this overall project is to develop an EAMS to improve the business processes and enabling information systems that support the management of MDOT's assets. This EAMS will also support the Department in adopting a performance-based operational system (PBOS) to deliver the Department's core highway maintenance services. An effective EAMS will help MDOT maximize the value of its assets by improving utilization, increasing performance, reducing capital and operating costs, and extending life. Additionally, the proposed EAMS will enable the whole-life optimal management of MDOT's assets. This applies to both physical assets such as equipment and infrastructure as well as non-physical assets such as computer and accounting systems. An EAMS supports the Department's goal of adopting a performance-based approach to delivering highway maintenance services.

The EAMS implementation is being done incrementally. The initial project includes the following functional areas:

a) Road Network Management

b) Asset Inventory Management

c) Highway Maintenance Management

d) Integration Support

Fundamental to the successful implementation of the EAMS is the integration of business data across both existing and proposed application system boundaries. It is envisioned that this integration will be facilitated by consistent location referencing data management. This functionality will be imbedded in the Road Network Management module of EAMS. This module will:

- Manage the location of highway assets throughout the asset life cycle (support temporal data management);
- Integrate roadway data from multiple Linear Referencing System (LRS) networks into the Michigan Geographic Framework (MGF) Physical Road (PR) segment based LRS network;
- Translate asset location references amongst the various MDOT business Linear Referencing Methods (LRMs) and the MGF PR Segment - Mile Point (PR-MP) LRM, and between LRMs and other geospatial referencing methods (coordinates, indirect referencing);
- Visualize / analyze / map / report road network assets, including the capability to produce customized Straight Line Diagrams (SLDs);
- Support MDOT and DTMB standards for location metadata fields; and
- Operate in the enterprise geospatial technology architecture hosted by DTMB in support of MDOT Geographic Information System (GIS) enabled applications deployment.

MDOT / DTMB have well established road network management processes. The intent for this initial project is to align the planned EAMS functionality and workflows with these established processes as appropriate.

To support the overall data integration objectives of EAMS, MDOT has approved the development of updated corporate location referencing data standards. These standards will include:

- *LRS standards* – to locate infrastructure assets, incidents, and roadway characteristics that are referenced against MDOT trunkline highways;
- *Coordinate location referencing standards* - for the location of MDOT data that is referenced against the Michigan coordinate system and the statewide GIS base map standard defined by the MGF, a dataset provided by the Center for Shared Solutions (CSS), a unit in the Center for Shared Solutions and Technology Partnerships (CSSTP) of DTMB;
- *Indirect location referencing standards* - for the location of MDOT data relative to the position of political and administrative areas (for example: MDOT Regions, State House Districts) and other digital map features (for example: bridges); and
- *Data lineage standards* – to incorporate feature level metadata attributes for inventory locations.

The above location referencing data standards will be periodically updated to reflect changes in State of Michigan and MDOT spatial data management policy and to ensure that the Department can effectively leverage new GIS and data collection technologies.

1.2 Purpose of This Document

This document defines overall standards for location referencing in MDOT as applicable for use in Department IT applications. They have been developed based upon existing MDOT standards and enhanced where necessary to support the Department's EAMS implementation. The standards are intended to maximize the potential for information integration and sharing both in MDOT and between MDOT and other agencies. In particular, they will support the ongoing collaboration between MDOT and DTMB/CSSTP in the maintenance of the MGF.

The standards contained in this document apply to new MDOT computer applications, and for the coding of data to be recorded into application databases that are expected to be integrated in support of the EAMS initiative. They have been approved for use by MDOT management. These standards are intended to be used by applications designers and developers as well as MDOT staff responsible for maintaining inventory data in support of overall asset management practice in the Department.

Field procedures manuals will be developed to help ensure that data collected by MDOT crews and external agencies / contractors meets departmental requirements for location accuracy and data quality. As these are developed, they will be referenced in subsequent versions of this document.

1.3 MDOT Location Management Vision

MDOT's long term vision for location management in support of enterprise asset management and other business needs is to:

- Capture location references at the source as a component of normal business processes;
- Share location information widely through integrated location management applications, tools and business practices; and

- Retain the accuracy of coordinate locations as captured in the field through state plane coordinates or geographic coordinates for use within MDOT's IT application environment to support business needs.

In support of this vision, MDOT will work with DTMB and other stakeholders to incrementally move toward improved spatial accuracy in EAMS as more accurate statewide GIS base mapping becomes available.

The standards in this document have been developed to support the level of accuracy currently attainable in the existing MGF statewide road network spatial database. They will be updated over time as improved mapping becomes available.

1.4 Document Contents

This document contains the following sections:

- *Section 1.0: Introduction (this section)* provides background, describes the document purpose, and outlines its content;
- *Section 2.0: Location Referencing Overview* presents an overview of location referencing methods that are commonly used in Geographic Information Systems;
- *Section 3.0: Coordinate Location Referencing Standards* describes the coordinate location referencing standards for use in MDOT;
- *Section 4.0: Linear Location Referencing Standards* describes the linear location referencing standards for use in MDOT;
- *Section 5.0: Indirect Location Referencing Standards* describes the indirect location referencing standards for use in MDOT;
- *Section 6.0: Data Lineage Standards* describes the data lineage standards that are to be used in association with the location referencing standards described previously;
- *Appendix A: Data Coding Tables* contains tables of standard codes to be assigned as part of the MDOT location data standards;
- *Appendix B: Michigan GeoRef Coordinate System Specifications* contains the specifications for the Michigan GeoRef coordinate system framework; and
- *Appendix C: NCHRP Data Model* contains a brief description of the NCHRP 20-27-2 linear data model.

1.5 Related Documents

The following documents are intended for use in support of the location referencing data standards contained herein (Note: version numbers reflect the status of standards in use as of May 2013):

1. *The Michigan Geographic Framework Program and Product Prospectus*, MGF Version 12, May 25, 2012 (CSS).
2. *Standards for Establishing & Modifying Physical Road Numbers, Mile Points & Point Identifiers in the Michigan Geographic Framework Transportation Referencing System*, document produced in cooperation with the Michigan Center for Geographic Information, November 14, 2005.
3. *Framework Standards for Representing Divided Roads*, MDOT internal undated document.
4. *PR Referencing Standards for Roundabouts*, CSS online webpage document.

5. *Michigan Geographic Framework Field Definitions (Arc Attribute Table)*, MGF Version 12b, May 30, 2012 (CSS).

1.6 Department Contacts

1.6.1 Document Contact

This document is subject to revision. For further information concerning these standards, or to obtain the latest version of this document, please contact:

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1.6.2 Technical Contacts

For technical assistance with respect to the location referencing standards contained in this document, please contact:

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2. Location Referencing Management

2.1 Location Referencing Overview

Location referencing in modern GIS enabled asset management systems falls into three general classes or methods:

- *Coordinate referencing* – assets are located using geographic (Lat / Long) or projected (X, Y) coordinates with elevations to define their absolute position;
- *Linear referencing* – assets are located along a constrained path (road or Route) using measured distances from known points (Linear Reference Points); and
- *Indirect referencing* – assets are located by reference to the identifier of an existing spatial feature (for example: a Property ID or Bridge Number).

There are advantages and disadvantages to each of the above methods in support of transportation asset management systems as summarized in Table 1.

Table 1: Comparison of Referencing Methods for Transportation Asset Management

Method	Advantages	Disadvantages
Coordinates	Native referencing method in GIS Directly supports Global Positioning System (GPS) based field data collection Best supports the collection of highly accurate engineering and asset data with elevations Enables the collection of asset data from As-Built Computer-aided Design (CAD) files	Support for multiple road network attributes may require excessive segmentation in order to capture all changes Analysis involving multiple asset classes (such as crashes on paved roads) based upon location may require buffered spatial overlay
Linear	Best supports network based data integration, analysis and reporting GIS dynamic segmentation techniques eliminate the need for excessive road network segmentation Does not require GIS for many table based inquiries	Requires GIS dynamic segmentation functionality (varies by vendor) Requires ongoing synchronization of spatial (GIS) and logical LRS data models as changes occur Location data collection may be cumbersome and error prone without GPS Elevations are not normally collected
Indirect	Location inherited from linked feature	Location accuracy is relative to the coverage area bounded by / included in the linked feature

Each of the above categories of location referencing is further described in the following sections.

2.2 Coordinate Location Referencing

Coordinate referencing is the simplest method of assigning location to a data record. This is accomplished by storing the map coordinates in the record and then using these coordinates to display the data location on a digital map. Coordinates may be expressed either in terms of latitude and longitude, or as X and Y (Easting and Northing, respectively) distance offsets in a defined system of measure (feet, meters, etc.) from a defined point of origin in a rectangular coordinate system. Increasingly, elevations are included as part of coordinate referencing to support three-dimensional (3-D) analyses in CAD and GIS.

2.3 Linear Location Referencing

Linear referencing involves the location of road features such as signs and other phenomena such as accident locations through the use of linear measurements from a known reference point. These are collectively referred to as events. An LRS consists of the following components:

- A linear set or datum of anchor points and anchor sections. These are often referred to as nodes and links. The anchor sections or links are sections of road between the anchor points or nodes. Within MDOT, the PR Segments defined within the MGF serve as the linear datum.
- One or more groups or networks of links and nodes that are constructed from the linear datum. An example network would be the set of all MDOT trunkline roads.
- One or more LRMs that are based upon ordered sets of links and nodes. These ordered sets introduce the concept of direction of travel or traversal. Within MDOT, Control Sections were historically used as a primary LRM. The PR Segment – Mile Point (PR-MP) LRM is the current standard for linear referencing of business data within MDOT. It is based upon locations defined relative to the beginning of individual PR Segments.

The above definition of a LRS is based upon the work done as part of the US Department of Transportation National Co-operative Highway Research Program (NCHRP) Project 20-27-2, which defined a generic data model for transportation network linear referencing. Figure 1 depicts the components of a LRS based upon this terminology. A synopsis of the NCHRP 20-27-2 data model is contained in Appendix C of this document. A more comprehensive description of this data model is contained in the final NCHRP project report[1].

[1] National Cooperative Highway Research Program. *A Generic Linear Model Data Model for Linear Referencing Systems. NCHRP 20-27-2: NCHRP Research Results Digest 218*, September 1997.

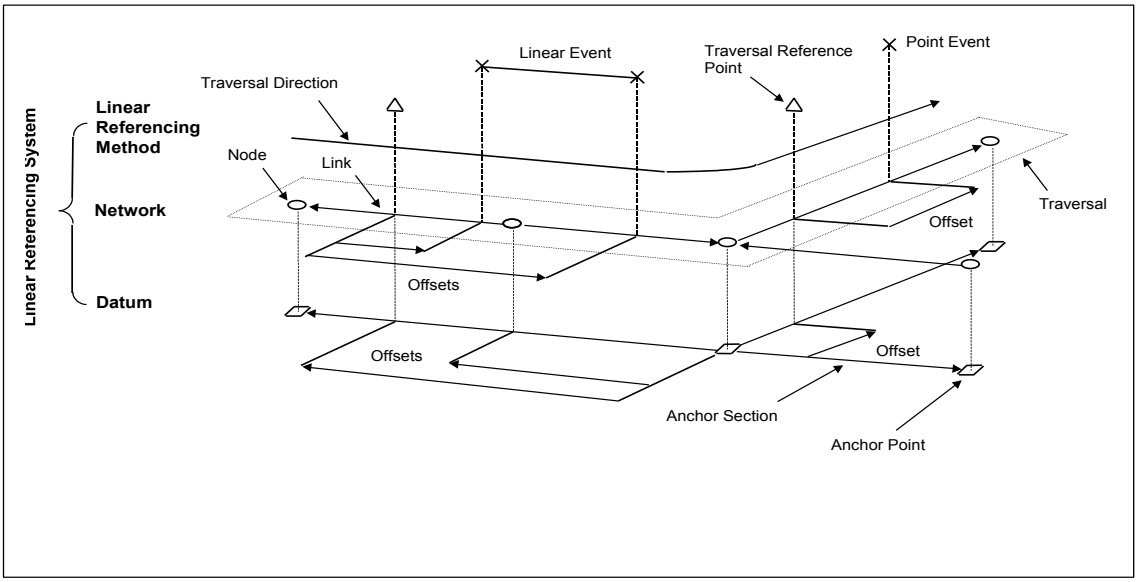

Figure 1: Linear Referencing System

Note also that both a cardinal direction (traversal direction) and a system of measurement units form part of each LRM.

2.3.1 Reference Points

In an LRS, Linear Reference Points (LRPs) may be established along a Route or Traversal as intermediate points from which distance offset measurements may be made. In the existing MDOT PR Segment – Mile Point (PR-MP) LRS, LRPs are defined at the Beginning Mile Point (BMP) and Ending Mile Point (EMP) locations of each PR Segment. These are normally established at physically identifiable (both in the field and on a digital road network map) locations that are unlikely to change (such as major intersections), although in some cases PR Segments break at County boundaries as well.

In addition to these formally established LRPs, individual inventory features may be used as secondary reference points as necessary for the convenience of field staff and / or for compatibility with legacy LRMs. Examples may include mile markers and administrative boundary points.

2.3.2 LRS Events

Road inventory, associated condition ratings, and specific time based activities or occurrences (such as project locations or accidents) that are located along a transportation network using LRS offset measurements are known as events. Events in a LRS are divided into two distinct categories:

- Point events occur at a finite position along the network, and are therefore located using only a single offset measurement from a reference point. Examples of point events include sign and signal locations, culverts, catch basins, and accidents.
- Linear events occur along a continuous section of road, and are therefore located using two offset measurements (beginning and end) from a reference point. Examples of linear events include guide rail, median barriers, curb and gutter sections, speed zones, road surface type, and contract limits.

Figure 2 illustrates the location of point events along a route. Figure 3 shows how linear events are similarly located.

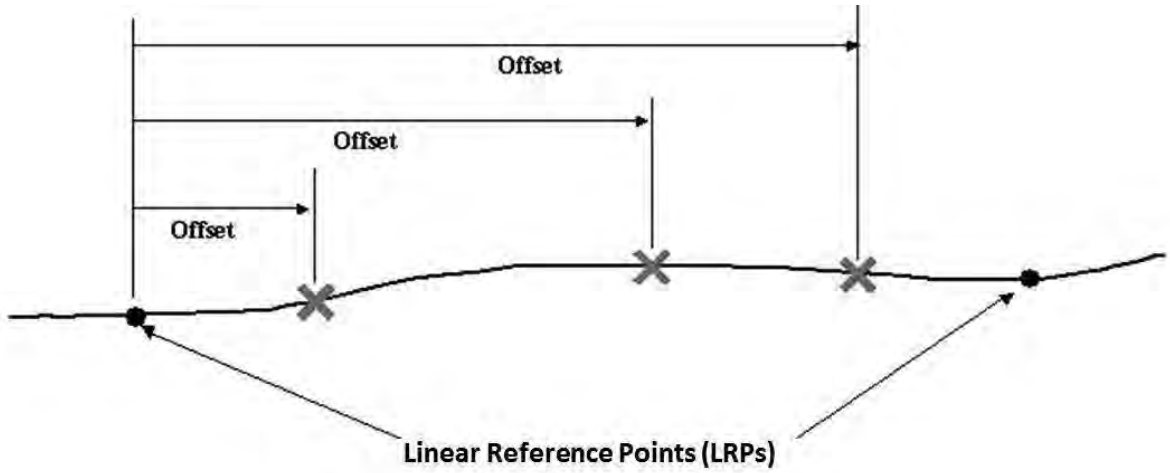

Figure 2: Location of Point Events

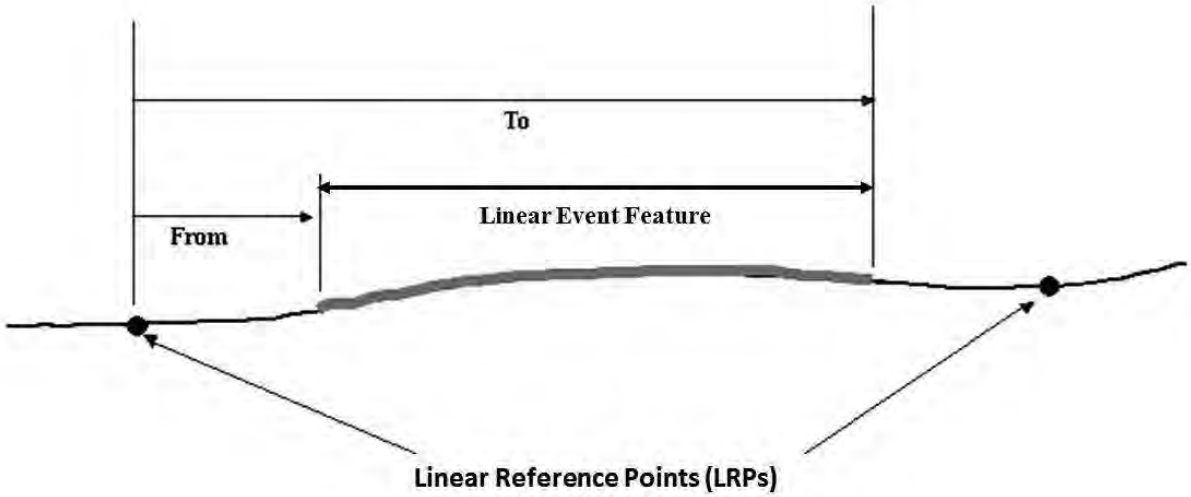

Figure 3: Location of Linear Events

2.4 Indirect Location Referencing

Indirect referencing links data to a GIS map through a feature key. The unique identifier that forms the feature key is stored both in the GIS map and the attribute database record that is to be linked to it. Figure 4 illustrates this concept using a bridge feature example.

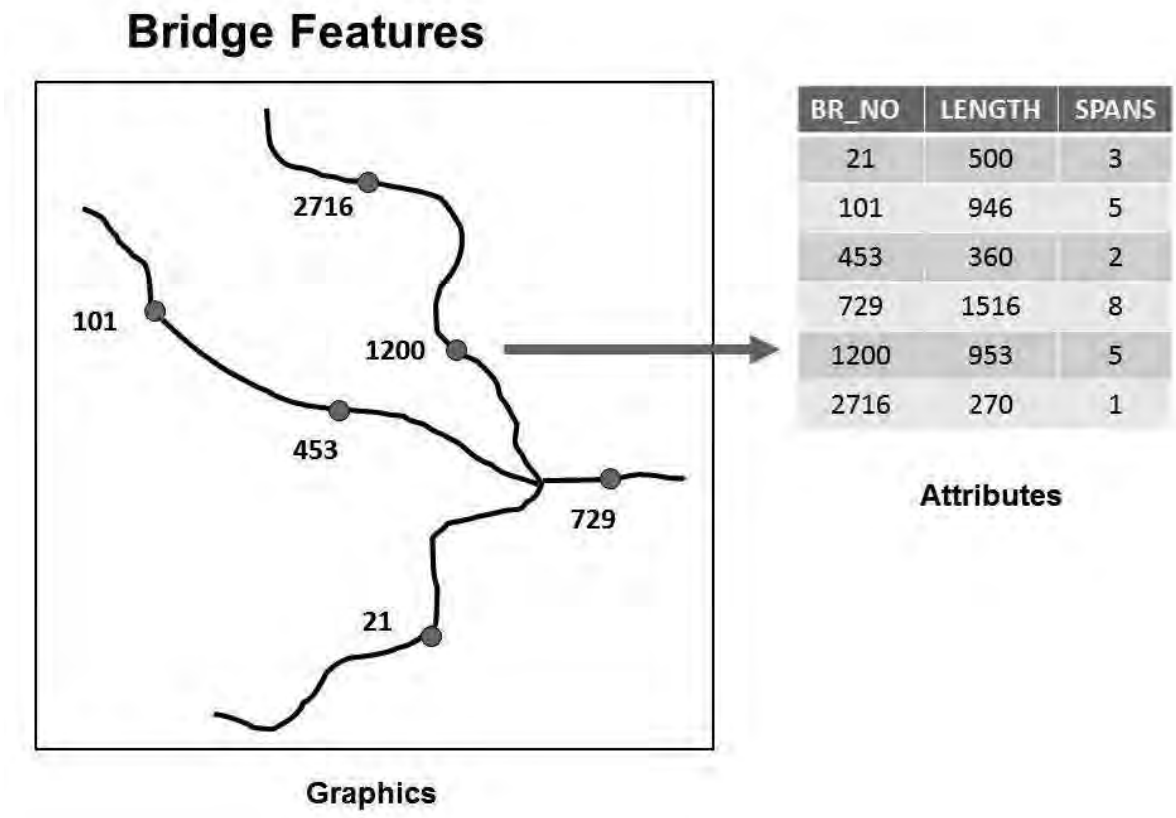

Figure 4: Indirect Reference Example

Table 2 lists some possible examples of indirect referencing location references for spatial data feature layers currently being used in MDOT, along with the agency responsible for maintenance (Data Custodian), the authoritative database location, and a description of content.

Table 2: Examples of Indirect Referencing Feature Layers

Feature Layer	Type	Custodian	Location	Content
Bridge Locations	Point	MDOT	MGF	MDOT bridge locations (mid-point)
MDOT Regions	Polygon	MDOT	MGF	MDOT regional boundary areas
MDOT Transportation Service Centers	Polygon	MDOT	MGF	MDOT TSC boundary areas
State House Districts	Polygon	DTMB	MGF	Michigan State House Districts

2.5 Location Referencing in Transportation Agencies

Linear Referencing Systems (LRS) have been commonly used in transportation agencies worldwide for many years. Prior to the widespread use of coordinate systems, the advent of GIS, and widespread use of digital mapping, LRS provided a convenient approach to locating road assets along transport agency networks based upon a logical network definition that utilized a one-dimensional coordinate system – offset measurement from a known point along a constrained linear path (the road centerline).

In the absence of coordinate based field survey location methods, LRS initially relied upon the establishment and maintenance of field Linear Reference Points that were defined by physical road features (for example: bridge abutments, road intersections), signs, and / or pavement markings. The locations of these LRPs were established using precisely calibrated Distance Measuring Instruments (DMIs) to measure the distance from the beginning of the road or from the previous RP.

In a LRS framework that must support field data collection using DMIs, the density of LRPs depends upon the desired accuracy of asset location. As the requirement for accuracy increases, so does the corresponding density of Reference Points. As an example, the New Zealand Transport Agency (NZTA) LRS Standard SM051 was established to provide an accuracy of +/- 10 meters in asset location at any point along the State Highway network. To support this requirement, NZTA has established precisely located LRPs (known as Reference Stations, or RS) at a maximum spacing of 16 kilometers along each road included in the State Highway system. In addition to this, the following additional LRPs are also provided:

- Intermediate Reference Points (known as Extended Reference Points, or ERP) at intervals of 3 kilometers or less between RS – these locations are precisely measured from the prior RS;
- Kilometer Posts (KP) at approximately each kilometer along the road – these are not as precisely measured and are classified as secondary RPs not to be utilized as a starting point for precise linear measurement.

Other transportation agencies have historically adopted similar approaches, although most LRS have not been implemented with Linear Reference Points as extensive as defined in SM051. The tradeoff in these instances has been reduced asset location accuracy for a decreased level of field LRPs. This has implications for road asset management practice.

2.6 LRS Support for Road Asset Management

Irrespective of the capabilities of modern GIS software to directly analyze road network data using spatial overlay techniques, LRS continues to provide essential support for road asset management as LRS locations serve as the key to integrate data across multiple asset management applications. This has been recognized for many years in transportation agencies that have been early adapters of life cycle road asset management frameworks. These frameworks require supporting asset management systems applications that incorporate extensive data mining to develop optimal intervention strategies. Accurate and consistent location measurement is needed to support these analyses.

With the increasing use of Global Positioning Systems (GPS) in recent years, GPS based data collection systems now offer an alternate approach for locating assets and works projects in the field. This is further discussed below. However, irrespective of the location method taken for field data collection, it is accepted as current best practice that LRS is still required to support asset management systems data storage, integration, reporting and analysis. Additionally, experienced asset management practitioners can easily relate to a LRM location as it references business data relative to a position along a roadway.

2.7 LRS Current Practice

The following trends have been identified through prior international experience and are summarized here for the benefit of MDOT staff.

2.7.1 GPS as Primary Field Asset Location Method

Many transportation agencies have indicated that GPS has now replaced, or will replace in the next few years, DMI as the primary field asset location method. They also feel that these technologies will provide superior location accuracies.

2.7.2 Road Centerline Databases

Road centerline databases are the most commonly used method for locating transportation agency assets. Ramps, interchanges, roundabouts, and bridges are also typically included in these databases. In general, these databases are being collected to an accuracy of +/- 10 meters or better. In some countries, national specifications for road network databases are being developed that are sufficiently accurate for use in road asset management applications.

Increasingly and as the accuracy of digital mapping improves, the road network lengths as derived from the GIS spatial data are being utilized to establish the linear distance between Linear Reference Points as an alternative to measuring these distances in the field using DMIs. Recent studies undertaken by transportation agencies and others in the US and Canada have confirmed that the differences between ground measured DMI distances and those derived from the road centerline spatial data are insignificant, even when the spatial data is planimetric (elevations not included). Furthermore, errors in position are evenly distributed across the network whereas with DMI measurements positional errors increase as the distance from the LRP increases.

Roadway realignments require the adjustment of all subsequent roadway segments which creates challenging data updates and historical data management.

2.7.3 Linear Referencing

Irrespective of the move toward GPS based asset location, linear referencing will continue to be required in transportation agencies. LRS provides necessary support to legacy applications and facilitates database inquiry and reporting. In other words, there is a continuing requirement to translate between GPS coordinates and various agency LRMs.

Agencies seeking new application solutions for asset location management should include LRM – LRM and LRM - coordinate translation in their functional requirements.

2.7.4 Multiple Linear Referencing Methods

Many agencies have now developed LRS (and broader location referencing) standards in an attempt to encourage consistent practice in asset location collection and reporting. However, it is likely that LRS application management solutions will continue to require support for multiple LRMs in order to address both legacy databases / applications and to best support field data collection, analysis and reporting business processes.

2.7.5 Integrated Network History Management

Modern asset management systems incorporating GIS technologies have recognized a requirement to maintain referential integrity between the logical road network data model and its GIS spatial representation. Specifically, as network changes occur the logical and spatial models must be synchronized, and changes in network length must be propagated across all associated LRMs. These changes must also be reflected in LRM based locations in business application databases.

Furthermore, network changes must be time stamped so that these changes can be tracked and data related to the network at any point in time. The complexity of managing these changes has led to the development of commercial LRS management software solutions that support history management, maintain network integrity, and support multiple LRMs.

3. Coordinate Referencing Standards

This section describes the coordinate location referencing standards that are recommended for use in MDOT in support of EAMS and other applications. In general, these are based upon existing State standards.

3.1 Data Fields and Coding Conventions

This section and others in this document contain coding standards for location referencing database elements in tabular form. The table columns and associated coding conventions are as follows:

- *Field Name* – contains the recommended database field name for the database element. These names are compliant with the DTMD approved standards[2] and abbreviations[3] for field names in IT applications
- *Type* – the type of data field:
  - *N* – Numeric field, used for numbers containing a decimal point
  - *I* – Integer field
  - *C* – Character (text) field
  - *D* – Date field
- *Size* – the size of the field:
  - For Numeric fields, specified as *n*,*d*, where
    - *n* is the maximum number of digits contained in the field including the decimal point
    - *d* is the number of digits to the right of the decimal point

    Example: 8,3 indicates a maximum number of 9999.999
  - For Integer fields, specified as *n*, where *n* is the maximum number of digits contained in the field. Example: 5 indicates a maximum number of 99999
  - For Character fields, specified as *n*, where *n* is the maximum number of characters contained in the field. Example: 5 indicates a maximum of 5 characters
  - For Date fields, size is not specified. The format for entering dates is yyyy-mm-dd. Example: 2013-04-09

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[2] Michigan Department of Information Technology at Michigan Department of Transportation, *Data Standards*, 08/04/2009.
[3] Michigan Department of Information Technology at Michigan Department of Transportation, internal document **AbbrFinal_11232009.pdf**.

- *Coding Rules* – contains specific instructions for entering data into the field
- *Code Table* – provides a reference to a code table in Appendix A that specifies the domain of valid values for this field, **if applicable**. If this column is blank for a specific field name entry, there is no associated code table.

3.2 Digital Basemap Coordinate Framework

Digital map standards for EAMS use should be consistent with those being employed or considered by MDOT for use in other enterprise GIS applications, or as recommended by CSS in order to ensure ongoing compatibility with the Michigan Geographic Framework. The currently recommended GIS coordinate framework is the Michigan GeoRef standard. It is based upon a custom projection for Michigan, as follows:

Horizontal Datum:	North American Datum of 1983 (NAD83)
Vertical Datum:	North American Vertical Datum of 1988 (NAVD 88)
Ellipsoid:	Geodetic Reference System1980 (GRS80)
Projection:	Hotine Oblique Mercator
Units:	Meters

Further information concerning the Michigan GeoRef standard is contained in Appendix B.

3.3 Projected Coordinate Standards

A known limitation of the GeoRef projection is that coordinate accuracy may be reduced to 3 meters at the state boundaries. MDOT supports other coordinate projections for use where higher accuracy is required to meet business needs. These are described below.

3.3.1 Other Supported Projections

MDOT currently supports the Michigan State Plane Coordinate System for use in field survey, CAD and other business requirements where higher accuracy is needed. It is based upon a 3 zone Lambert projection for Michigan, as follows:

Horizontal Datum:	NAD83
Vertical Datum:	NAVD 88
Ellipsoid:	GRS80
Projection:	Lambert Conformal Conic
Units:	Meters
Zones:	North, Central, South

Further information concerning the Michigan State Plane Coordinate System standard is contained in Appendix B.

Information regarding both the Michigan GeoRef and the state plane coordinate system is available at:

http://www.michigan.gov/documents/DNR_Map_Proj_and_MI_Georef_Info_20889_7.pdf

Coordinate locations stored in other supported projections must be translated into GeoRef for use within MDOT GIS database applications. Coordinate translation is discussed in Section 3.7 below.

3.3.2 Database Projected Coordinate Coding Standards

When projected coordinates are maintained in database tables associated with MDOT applications, the following field layout and coding standards are to be used as described in Table 3 below.

Location metadata fields associated with projected coordinate positions are shaded in light green.

Table 3: Projected Coordinate System Data Coding Standards

Field Name	Type	Size	Coding Rules	Code Table
X_COORD	N	10,2	The X coordinate in meters to the nearest 0.01 meter.	
Y_COORD	N	10,2	The Y coordinate in meters to the nearest 0.01 meter	
ELEVATION	N	6,1	The elevation in meters to the nearest 0.1 meter. **Note: use of the ELEVATION field is optional. However, elevation data should be included as part of coordinate location references wherever possible.**	
PROJECTION_CD	C	3	The coordinate projection, from the code table.	Table A-1
The following location metadata fields are included with each location reference. See Section 6 of this document for a description of these fields.				
HORZ_POS_ACUR	I	3	An integer number that represents the estimated horizontal positional accuracy of the location, in meters.	
VERT_POS_ACUR	I	3	An integer number that represents the estimated vertical positional accuracy of the location, in meters. **Note: use of this field is required only if the ELEVATION field is used.**	
SRC_POS	I	2	Source Position. The referencing method used to digitize/capture the feature position, from the code table.	Table A-2
DT_POS_SRC	DATE		The date when the feature was collected in accordance with the Source Position specified above.	
DT_FE_ADD	DATE		This field will be updated with the current date when a new feature is added to the database.	

Field Name	Type	Size	Coding Rules	Code Table
DT_POS_ED	DATE		This field will be updated with the current date when the position associated with an existing database feature is edited.	
DT_POS_RET	DATE		The date when the feature was retired.	
POS_COLL_AGN	I	2	The organization responsible for the collection of the feature, to be recorded for new or modified geometry. Select a code from the code table. Select "01" (MDOT) if the data was collected by MDOT staff.	Table A-3
COLL_AGN_NAME	C	50	The name of the organization responsible for the collection of the feature position, to be recorded for new or modified geometry. The agency name is a free format text field. **Note: use of this field is optional.**	

Notes:

1. Horizontal datum is NAD83.
2. Vertical datum is NAVD 88.

3.4 Geographic Coordinate (Latitude / Longitude) Standards

When coordinate values are stored as geographic (latitude / longitude) coordinates, they must adhere to CSS horizontal and vertical datum standards. These are as follows:

Horizontal Datum: North American Datum of 1983 (NAD83)

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)

Ellipsoid: GRS 1980

Locations that are captured as geographic coordinates using GPS will need to be transformed into the recommended coordinate framework as per the standards described in Section 3.2 above in order to be integrated into MDOT GIS data layers. In these cases, it is recommended that the original geographic coordinate values should also be retained as feature attributes for possible future use (in the event that the coordinate framework changes at some later date).

Geographic coordinates that are not related to the above datum must be converted using coordinate transformation software. See Section 3.5 below for information regarding coordinate transformation software standards.

When geographic coordinates are maintained in data base tables associated with MDOT applications, the following field layout and coding standards are to be used as described in Table 4 below.

Table 4: Geographic Coordinate System Data Coding Standards

Field Name	Type	Size	Coding Rules	Code Table
LATITUDE	F	11,8	The geographic North latitude coordinate in decimal degrees to the nearest 0.00000001 degree.	
LONGITUDE	F	12,8	The geographic West longitude coordinate in decimal degrees to the nearest 0.00000001 degree.	
ELEVATION	F	6,1	The elevation in meters to the nearest 0.1 meter. **Note: use of the ELEVATION field is optional. However, elevation data should be included as part of coordinate location references wherever possible.**	
The following location metadata fields are included with each location reference. See Section 6 of this document for a description of these fields.				
HORZ_POS_ACUR	I	3	An integer number that represents the estimated horizontal positional accuracy of the location, in meters.	
VERT_POS_ACUR	I	3	An integer number that represents the estimated vertical positional accuracy of the location, in meters. **Note: use of this field is required only if the ELEVATION field is used. However, elevation data should be included as part of coordinate location references wherever possible.**	
SRC_POS	I	2	The referencing method used to digitize/capture the feature position, from the code table.	Table A-2
DT_POS_SRC	DATE		The date when the feature was collected in accordance with the Source Position specified above.	
DT_FE_ADD	DATE		This field will be updated with the current date when a new feature is added to the database.	
DT_POS_ED	DATE		This field will be updated with the current date when the position associated with an existing database feature is edited.	
DT_POS_RET	DATE		The date when the feature was retired.	
POS_COLL_AGN	I	2	The organization responsible for the collection of the feature, to be recorded for new or modified geometry. Select a code from the code table. Select “01” (MDOT) if the data was collected by MDOT staff.	Table A-3

Field Name	Type	Size	Coding Rules	Code Table
COLL_AGN_NAME	C	50	The name of the organization responsible for the collection of the feature position, to be recorded for new or modified geometry. The agency name is a free format text field. **Note: use of this field is optional.**	
Notes: 1. Horizontal datum is NAD83. 2. Vertical datum is NAVD 88.				

3.5 Other Related Coordinate Standards

No other coordinate standards are recommended for MDOT use at this time.

3.6 Field Survey Procedures

This document is not intended to be a field survey procedures manual. Refer to the MDOT Design Survey Manual[4] for procedures and specifications to be used for field surveys. Additional field survey reference documents that are available for use in the State of Michigan are:

1. *Survey Feature Codes* – a list of the valid feature codes for use in field data collection and in MDOT CAD files.

Further information pertaining to MDOT design survey and CAD standards may be obtained online through the MDOT Design Services Resources webpage[5] or by contacting:

Design Survey Manual and Standards

John P. Lobbestael, P.S.
Phone: 517-335-5550
lobbestaelj@michigan.gov

CAD Standards

Rachelle Van Deventer, P.E.
Phone: 517-335-1927
vandeventerr@michigan.gov

[4] Michigan Department of Transportation, Design Survey Manual, available online at: http://mdotcf.state.mi.us/public/design/surveymanual/
[5] Michigan Department of Transportation, Design Services Resources, Manuals & Guides: http://mi.gov/mdot/0,1607,7-151-9625_21540_36037---,00.html

3.7 Coordinate Transformation Software

Software tools for coordinate system transformations exist in the ESRI ArcGIS software used at MDOT. Coordinate data transformations have a pervasive impact on the LRS and as such must be done with care and understanding. Staff involved with analyzing and implementing coordinate transformations must be trained accordingly.

3.7.1 GIS Support

MDOT staff that have a need to transform coordinates in order to conform to MDOT data standards for GIS use as described above are advised to contact DTMB:

Laura Blastic
Geo-Framework Services Manager
Department of Technology, Management & Budget
Michigan Center for Shared Solutions
Phone: (517) 373-7910
Email: blasticl@michigan.gov

3.7.2 Design – Survey Support

MDOT staff that have a need to transform coordinates for use in field survey and design applications are advised to contact:

John P. Lobbestael, P.S.
Phone: 517-335-5550
lobbestaelj@michigan.gov

4. Linear Referencing Standards

This section describes the linear location referencing standards that are to be used in MDOT for EAMS related GIS / IT applications and databases. Terminology used in this section is consistent both with the NCHRP-20-27-2 report[1] and the International Standards Organization (ISO) LRS standards[6].

The contents in this section are organized as follows:

- *Section 4.1 MDOT Network Scope* defines the extent of the MDOT network;
- *Section 4.2 Spatial Network Datum* defines the spatial road network datum for the LRS standards;
- *Section 4.3 MDOT Linear Referencing System (MLRS)* defines the entities comprising the MLRS and specifies the rules for coding the entity identifiers;
- *Section 4.4 PR Segment – Mile Point (PR-MP) LRM* defines the primary LRM used for linear referencing in MDOT IT applications and specifies the rules for coding LRM location fields;
- *Section 4.5 Secondary Linear Referencing Methods* defines secondary MDOT business LRMs used for linear referencing in MDOT IT applications and specifies the rules for coding LRM location fields. These secondary LRMs are:
    - Control Section – Mile Point (CS-MP)
    - Route – Mile Point (Route-MP)
- *Section 4.6 Special Situations* contains business rules for handling special situations in the MLRS and its associated LRMs.

4.1 MDOT Network Scope

The linear referencing standards described in this chapter are intended for use by MDOT staff to locate features on the portion of the MGF road network that may need to be analyzed or reported on by agency staff. The scope of this network includes:

- *Trunkline Roads*: roads or portions of roads that are owned by MDOT; and
- *Federal Aid Roads*: include additional roads or portions or roads that are not owned by MDOT but required to be reported upon as part of the US Department of Transportation (USDOT) Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS).

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[6] International Organization for Standardization, *Geographic information — Location based services — Linear referencing system*, International Standard ISO/DIS 19148, ICS 35.240.70, 2012-02-20.

4.2 Spatial Network Datum

The GIS database that is used as the spatial road network datum for the MDOT LRS and associated LRMs is the Michigan Geographic Framework database[7] that is maintained by the Department of Technology, Management, and Budget, Center for Shared Solutions and Technology Partnerships (DTMB/CSSTP) through CSS. A new version of this database is released annually.

In addition to road centerline data, the MGF contains other features such as rivers, lakes, streams, railroads, political jurisdiction boundaries, and other miscellaneous features. There are currently 21 feature classes in the dataset, including bridges and railroad crossings which are stored as point features. MDOT administrative boundaries are maintained as polygon features in the MGF. This facilitates spatial inquiry, analysis and reporting to meet MDOT business needs.

The MGF road network linear datum is based upon Physical Road (PR) Segments. The MDOT standards document for PR Segment definition[8] contains comprehensive business rules governing the creation and modification of these datum sections. The primary characteristics of PR Segments are briefly summarized as follows:

- PR Segments are continuous with no gaps or overlaps. Unconnected segments cannot have the same PR Segment identifier.
- PR Segments have one beginning and one end. The beginning is assigned the zero mile point. PR Segments have only one direction.
- PR Segments have no branches or loops. PR Segments never extend from a point or converge on a point along more than two paths.
- Each PR Segment refers to a unique link of the transportation system, and no link has more than one PR Segment.
- In general, PR Segments begin and end at road intersections although on MDOT trunkline roads PR Segments are broken at County boundaries. Additional special cases exist in the MGF although these are relatively few in number.
- PR Segments are defined at the individual road centerline (carriageway) level. Divided highways are represented by individual PR Segments for each direction of travel.
- Ramps and Roundabouts are included as PR Segments.
- If a PR Segment is retired, its number cannot be reused. This is done to ensure that an audit trail of network history is properly maintained.

[7] Department of Technology, Management and Budget, Center for Shared Solutions and Technology Partnerships, *The Michigan Geographic Framework Program and Product Prospectus*, MGF Version 12, May 25, 2012.
[8] Michigan Department of Transportation, *Standards for Establishing & Modifying Physical Road Numbers, Mile Points & Point Identifiers in the Michigan Geographic Framework Transportation Referencing System*, document produced in cooperation with the Michigan Center for Geographic Information, November 14, 2005.

In addition to the above, special case business rules exist for dealing with divided / undivided trunkline highway sections[9] and Roundabouts[10].

PR Segment beginning and end points are coincident with underlying road network spatial nodes. This is further described in Section 4.3.1 below.

MDOT and MGF attributes that are defined as LRS event features are stored against the network using a Link – Offset Linear Referencing Method (LRM). This is known as the PR Segment – Mile Point (PR-MP) LRM and is the current MDOT standard for linear referencing of business data in IT application databases. Further information concerning this LRM is provided in Section 4.4 below.

4.3 MDOT Linear Referencing System (MLRS)

MDOT has enterprise standards for LRS use in IT applications. These standards also apply to EAMS. These standards are collectively referred to as the MDOT Linear Referencing System (MLRS) and are described below.

4.3.1 MLRS Overview

The MLRS is based upon a statewide standard Link - Offset LRM that is used on all roads contained in the MGF. The MDOT trunkline roads are a subset of the MGF network. The MLRS logical network data model consists of the following entities:

- MLRS Anchor Point (MAP)
- MLRS PR Segment
- MLRS Route Branch
- MLRS Control Section Branch
- MDOT Control Section
- MDOT Highway
- MDOT Network
- MLRS Reference Point (MRP)
- MLRS Intersection / Interchange
- MLRS Ramp
- MLRS Event

The naming conventions used for the logical data model are as follows:

[9] Michigan Department of Transportation, *Framework Standards for Representing Divided Roads*, internal undated document.
[10] CSS, *PR Referencing Standards for Roundabouts*, online standards document available at: http://www.michigan.gov/cgi/0,4548,7-158-52927_53037_12759_14194---,00.html

- Where MLRS is used as part of the name, the entity is directly associated with or is a component part of a linear reference; and
- Where MDOT is used as part of the name, the entity is a level of aggregation for network inventory reporting purposes.

For example, MLRS Control Section Branches are used to locate business data against the CS-MP LRM, whereas MDOT Control Sections are used to aggregate business data across all associated Control Section Branches.

Figure 5 presents the conceptual data model for the MLRS and illustrates the relationship between the logical network model and the corresponding MGF spatial database that comprises the linear datum. The model includes the following secondary LRMs that are used for business purposes in MDOT:

- Control Section – Mile Point (CS-MP) LRM; and
- Route – MP LRM.

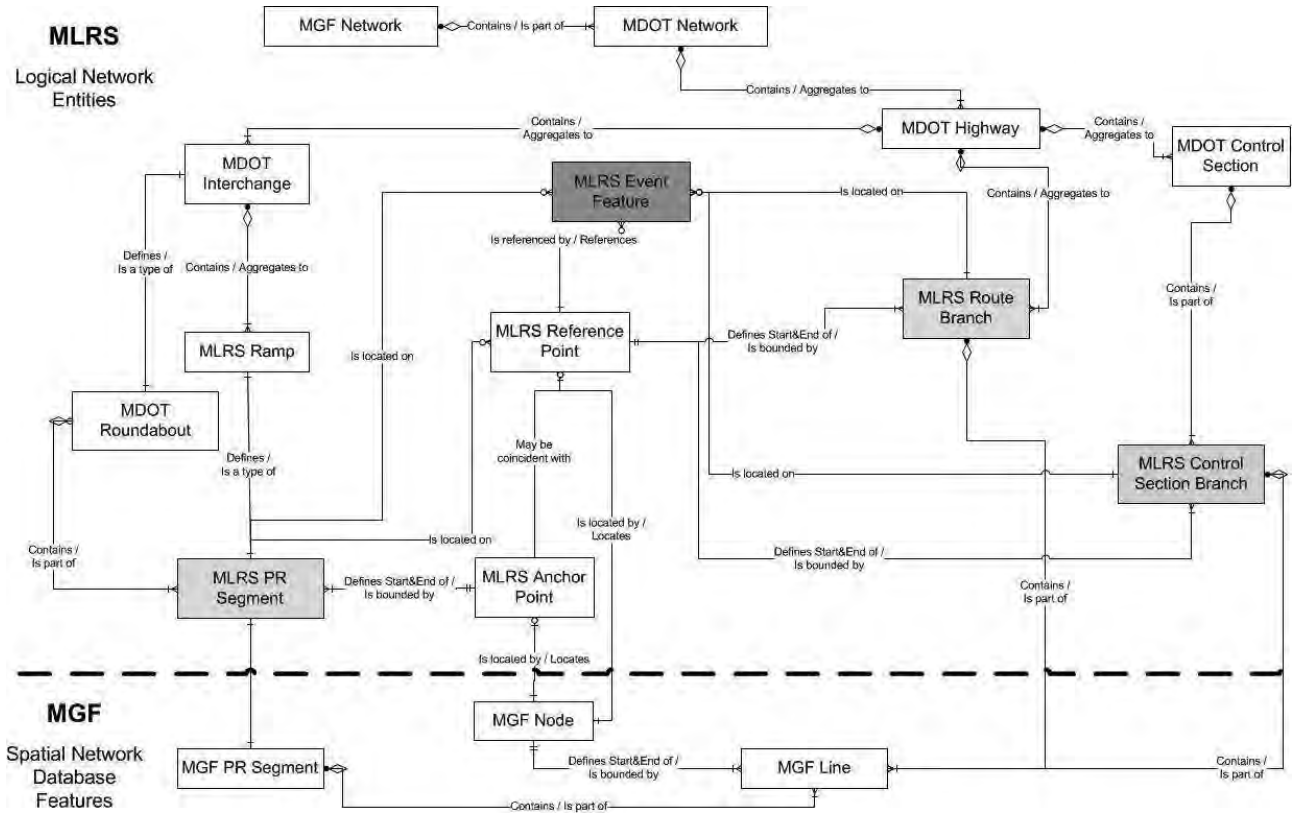

Figure 5: MLRS Conceptual Data Model

In the above diagram, the following color coding conventions are used:

- Entities colored in light green are associated with the PR-MP LRM;
- Entities colored in pink are associated with secondary LRMs; and
- Entities colored in blue are associated with business data that is referenced to a MLRS LRM.

Table 5 includes a summary definition for each of the above entities and also relates them to the NCHRP 20-27-2 data model terminology.

Table 5: MLRS Entity Definitions

Entity	Definition	20-27-2 Term
MLRS Anchor Point (MAP)	A point that defines the start or end of a MDOT PR Segment. The spatial location of each MAP is represented by a MGF Node. The complete set of MDOT Anchor Points is defined by those bounding all PR Segments included in the MDOT Network.	Anchor Point
MLRS PR Segment (PR)	A road network segment that is defined by the spatial location of a MGF PR Segment. The complete set of MLRS PR Segments is defined by those included as part of the MDOT Network. Since the PR-MP LRM is the standard for linear referencing in MDOT IT applications, MLRS PR Segments are both Anchor Sections and Traversals.	Anchor Section, Traversal
MLRS Reference Point (MRP)	A point on a MLRS PR Segment that is used as a starting point for linear measurement along the roadway centerline. MLRS Anchor Points are a subset of MRPs.	Traversal Reference Point
MLRS Ramp	A special case of a MLRS PR Segment that permits traffic to flow between two MDOT Highways, or between a MDOT Highway and another road.	Traversal
MDOT Interchange	A collection of MLRS Ramps at a location where two or more MDOT Highways intersect, or where a MDOT Highway intersects with another MGF road. In the MLRS, an Interchange is used as a means of aggregation for reporting purposes.	Network
MDOT Roundabout	A collection of MLRS PR Segments comprising a Roundabout at a location where two or more MDOT Highways meet, or where a MDOT Highway meets with another MGF road. In the MLRS, a Roundabout is used as a means of aggregation for reporting purposes.	
MDOT Control Section	The collection of Control Section Branches. MDOT Control Sections are used as a means of aggregation for reporting purposes.	
MLRS Control Section Branch	A contiguous carriageway section of a MLRS Control Section that is used as a basis for linear location referencing against the Control Section – Mile Point (CS-MP) LRM. A MLRS Control Section Branch encompasses one or more MGF Lines and begins / ends at either a MLRS Anchor Point or a MLRS Reference Point.	Traversal

Entity	Definition	20-27-2 Term
MLRS Route Branch	A contiguous carriageway section of a MLRS Route that is used as a basis for linear location referencing against the Route - MP LRM. A MLRS Route Branch encompasses one or more MGF Lines and begins / ends at a MLRS Anchor Point or a MLRS Reference Point.	Traversal
MDOT Highway	The collection of MLRS Route Branches, Interchange / Intersections and Roundabouts in the scope of an MDOT Highway. MDOT Highways are used as a means of aggregation for reporting purposes. MDOT Control Sections also aggregate to an MDOT Highway.	
MDOT Network	The collection of MDOT Highways that define the extent of the MDOT trunkline road network.	Network
MLRS Event	A physical feature, incident or highway characteristic that is located in the MLRS based upon a distance measurement along a MLRS PR Segment, Control Section Branch or Route Branch from a MLRS Reference Point. There are two subclasses of MLRS Event: • A MLRS Point Event exists at a distinct point and is located using a single distance measurement • A MLRS Linear Event exists at a contiguous section of road and is located using two distance measurements that define its start and end	Event Point Event Linear Event
MGF Node	A spatial node that defines the start or end of a MGF Line in the MGF database. Most MGF Nodes occur at topological intersection points although some may also be placed at County boundaries and other special case locations. MLRS Anchor Points are a subset of MGF nodes.	
MGF Line	A linear spatial feature that is bounded by two MGF Nodes.	
MGF PR Segment	A composite spatial linear feature in the MGF that is comprised of one or more MGF Lines.	Anchor Section

MLRS PR Segments are components of carriageway level road centerlines in an overall MDOT trunkline route that meet the following criteria:

1. Each MLRS PR Segment begins and ends at a MLRS Anchor Point (MAP) that has the following characteristics:
    a. It is physically and uniquely identifiable in the field.
    b. It is precisely located and reconciled with a MGF Node in the MGF digital mapping base.
    c. Most MAPs will be located at road intersections. However, in the MDOT trunkline network County boundaries are also used as MAPs. It is also noted that other special situations