Agenda Item No: 26.D

STAFF REPORT

Report To: Board of Supervisors **Meeting Date:** May 21, 2020

Staff Contact: Darren Schulz, Public Works Director

Agenda Title: For Discussion Only: Presentation of a summary report for the Asset Management Needs Assessment and Software Solutions Evaluation. (Darren Schulz, DSchulz@carson.org; Dan Stucky, DStucky@carson.org; and Matt Lawton, MLawton@carson.org)

Staff Summary: As part of the Carson City Asset Management Program, Atkins - an independent asset management consultant - has concluded an organizational needs assessment and provided guidance with evaluation and assessment of five Enterprise Asset Management (EAM) software systems. Tasks included an assessment of the City's current asset inventory data and stakeholder business needs, performance of stakeholder interviews, identification of functional and technical requirements, recommendation of a best practice strategy, and provision of a summary report of findings with analysis of appropriate EAM software solutions.

Agenda Action: Other / Presentation **Time Requested:** 15 minutes

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Proposed Motion
N/A

Board's Strategic Goal
Sustainable Infrastructure

Previous Action
On December 5, 2019, the Board of Supervisors approved a contract with Atkins, a qualified independent asset management consultant, to conduct the Asset Management needs assessment and software solutions evaluation for Carson City. On January 16, 2020, the contract was amended to include the evaluation of up to five Asset Management software solutions.

Background/Issues & Analysis
The purpose of the Carson City Asset Management Needs Assessment and Software Solutions Evaluation was to provide the Carson City Public Works Department with an assessment of the City's organizational needs and provide guidance, evaluation, and assessment that would help the City improve financial performance and reliability, reduce risk, and enhance sustainability. While the results of the software evaluation identified two robust EAM platforms that most satisfied the functional requirements developed for the City, given current budget conditions, the results of a qualitative staff poll, and established integration and departmental use, the LLumin READYAsset platform was considered the best fit for the City to most cost effectively advance the asset management program goals over the next two to five years. It is recommended that the City implement LLumin READYAsset on a broader spectrum, including increased licensing to facilitate bringing City Facilities and Parks staff onboard the system and working with the vendor to build an integration with the City's Tyler Technologies ERP financial system. The anticipated funding required to broaden licensing and configuration of

the City's LLumin READY Asset system is approximately $105,000. At a future Board meeting, staff plans to present a contract with LLumin for possible action. Funding for the EAM software was approved by the Board on May 7, 2020, as part of the Capital Improvement Program for FY 2021 from the Capital Projects Fund ($90,000), Stormwater ($1,250), Water ($14,000), and Wastewater ($9,750) Utility Funds.

Applicable Statute, Code, Policy, Rule or Regulation
N/A

Financial Information
Is there a fiscal impact? No

If yes, account name/number: N/A

Is it currently budgeted? No

Explanation of Fiscal Impact: N/A

Alternatives
N/A

Attachments:
CC EAM Software Evals.pdf

EAM Cost Comparison Summary.pdf

Board Action Taken:

Motion: _____	1) _____	Aye/Nay
	2) _____	_____
		_____
		_____
		_____
		_____

_____
(Vote Recorded By)

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ATKINS
Member of the SNC-Lavalin Group

Carson City Asset Management Needs Assessment and Software Solutions Evaluation

Summary Report

1 May 2020

Notice

This document and its contents have been prepared and are intended solely as information for and use in relation to developing functional requirements based on the needs of Carson City for the purpose of evaluating 5 asset management platform vendors software solutions.

Atkins North America, Inc. assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 134 pages including the cover.

Document history

Document title: Summary Report

Document reference: 100069001

Revision	Purpose description	Originated	Checked	Reviewed	Authorized	Date
Rev 1.0	Summarize project results	BAJ	RT, MC	DH	DD	5/1/20

Client signoff

Client	Carson City
Project	Carson City Asset Management Needs Assessment and Software Solutions Evaluation
Job number	100069001
Client signature/date	

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Executive Summary

The purpose of the Carson City Asset Management Needs Assessment and Software Solutions Evaluation (Project) was to provide the Carson City (City) Public Works Department (Public Works) with an assessment of the City's organizational needs and provide guidance, evaluation, and assessment that would help the City improve financial performance and reliability, reduce risk, and enhance sustainability.

Public Works is currently using the LLumin READYAsset platform for their computerized maintenance management system (CMMS) and Tyler Technologies Munis Enterprise Resource Planning (ERP) platform for financial and capital asset management. READYAsset has been integrated with the City's Esri ArcGIS Enterprise Geographic Information System (GIS) for water, sanitary sewer, stormwater, and some transportation assets. The City has not integrated READYAsset with the ERP solution, Tyler Technologies Munis ERP platform.

This Project will help the City identify an integrated Enterprise Asset Management software solution (EAM platform) that defines the roles, responsibilities, policies and systems necessary to ensure continuous asset reliability and economical operations and maintenance, as well as provides forecasting based upon useful life, depreciation, replacement cost, and reserve funding requirements at the asset level.

Atkins' approach to the Project started with identifying a comprehensive Project team (**Table 1**) that represented all of the major Public Works departments that would be most affected by the selection of an EAM platform. After the team was identified, a thorough fact-finding process was initiated where each step in the process built on the information gathered in the previous step (**Figure 1**). The first step in the process focused on identifying the business needs specific to the City. This was accomplished with a series of 8 grouped stakeholder meetings with the Project team. The workshops identified key components or features that the stakeholders required from an optimal EAM platform. The data gathered in the workshops was then compiled into business needs summaries and used to develop a draft list of functional requirements which was again reviewed with the Project team and finalized. Each functional requirement was also assigned a priority that was used to qualitatively identify how important each was for the EAM platform to contain. The 4 priorities used in order of importance were; mandatory, critical, important, and desirable. Mandatory requirements were used to develop the pre-screening questionnaire and determine which EAM vendors would be invited to perform a demonstration. Critical and important requirements were used to develop the user stories and scoring matrix used to evaluate the vendor demonstrations. Not all requirements could be used for the demonstration due to time constraints; however, a sufficient cross section was able to be achieved. Desirable requirements were documented for the purposes of this Project but were generally not used in the EAM platform evaluations.

A pre-screening questionnaire was sent to each vendor that had contacted Public Works between July 2017 and the release of the Request for Proposal (RFP) associated with this Project as well as several additional vendors that were anticipated to be a good fit for the City. Based on the results of the questionnaire, AssetWorks, VueWorks, and Lucity were identified by the City as the 3 additional EAM platform demonstrations desired in addition to READYAsset and Tyler EAM. The vendor for each EAM platform was provided the demonstration script and notified that the City evaluators would be scoring the demonstration based on that script. All 5 demonstrations were held over the course of a 3-day period and the City evaluators consisted of 14 representatives from the Project team (one from each group identified in **Table 1**). The exception to that was that the City Executives did not score the demonstrations and the Asset Management group had two evaluators. In addition to the scoring matrix used, a qualitative poll was taken after each demonstration asking the City evaluators which EAM platform they felt would be best for the City. This was done to determine if there was any information that should be considered in addition to the raw scores.

The results of the demonstrations showed that VueWorks (first) and AssetWorks (second) were both robust EAM platforms that most satisfied the functional requirements developed for the City. READYAsset scored less than both of these platforms; however, given current budget conditions, the results of the qualitative poll, and that READYAsset is already integrated with the City's GIS and is in use by some departments, READYAsset was considered the best fit for the City to move forward with in the short term. These results are summarized in **Figure 3**. It is recommended that the City implement LLumin READYAsset on a broader spectrum and if after a year or two they feel that additional functionality is required, the City consider moving to VueWorks or AssetWorks.

1. Introduction

The purpose of the Carson City Asset Management Needs Assessment and Software Solutions Evaluation (Project) was to provide the Carson City (City) Public Works Department (Public Works) with an assessment of the City's organizational needs and provide guidance, evaluation, and assessment that would help the City improve financial performance and reliability, reduce risk, and enhance sustainability.

1.1. Background

Public Works is currently using the LLumin READYAsset platform for their computerized maintenance management system (CMMS) and Tyler Technologies Munis Enterprise Resource Planning (ERP) platform for financial and capital asset management.

Prior to their conversion to LLumin READYAsset, Public Works had been using the eRPortal CMMS for approximately 8 years. At the outset of this Project, Public Works had approximately 130,000 linear, vertical, and fleet assets (along with work order history, recurring preventative maintenance work order information, parts and equipment inventories, and asset descriptions) in their CMMS system which was accessed by over 100 users within Public Works.

Public Works has integrated READYAsset with the City's Esri ArcGIS Enterprise Geographic Information System (GIS) for water, sanitary sewer, stormwater, and some transportation assets. The City has not integrated READYAsset with the ERP solution, Tyler Technologies Munis ERP platform.

This Project will help the City identify an integrated Enterprise Asset Management software solution (EAM platform) that defines the roles, responsibilities, policies and systems necessary to ensure continuous asset reliability and economical operations and maintenance, as well as provides forecasting based upon useful life, depreciation, replacement cost, and reserve funding requirements at the asset level.

1.2. Approach

To ensure that the Project considered the needs of a wide range of Public Works staff, the Project team was developed by incorporating several members from each City department. **Table 1** is a summary of the staff that participated in the initial stakeholder workshops as well as the vendor EAM platform demonstrations. The City Executives and several other Public Works staff (not listed in the table) were involved in the workshops but did not participate in the demonstrations.

Atkins began this Project by assessing the City's current asset inventory data and stakeholder business needs. Business needs were determined through a series of 8 workshops that creatively got attendees to identify their top priorities. Next, these workshops were summarized and evaluated to identify a list of functional requirements that an EAM platform would ideally satisfy to meet the stakeholders' business needs. Preliminary features identified by the City were; asset inventory, status, and tracking; work order management; preventative maintenance scheduling and tracking; parts and equipment inventory management; reporting; capital planning and analysis; reserve analysis and cost forecasting; GIS integration; SCADA/IoT integration; field access and mobile device support; work request management; and citizen request management. Five vendors were invited to demonstrate their EAM platform and how it would satisfy the City's functional requirements. Each vendor was given a demonstration script and user stories to identify what the City was interested in and their demonstrations were scored by City evaluators using a scoring matrix.

Concurrently with the development of the City's functional requirements, Atkins' International Organization for Standardization (ISO) expert reviewed the City's current state and developed a best practice strategy aligned with the ISO standards for Asset Management Systems (standards 55000, 55001 and 55002).

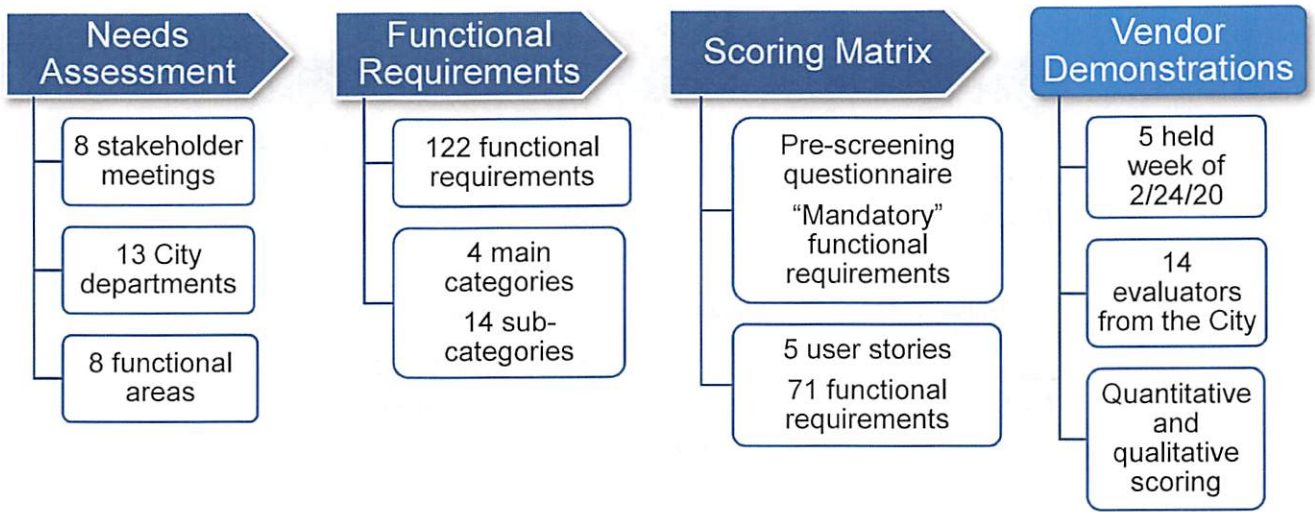
The approach to this Project was formulated such that each task would build on the information developed in the previous task to provide a comprehensive assessment of the City's asset systems and business needs, evaluate

potential EAM platforms, and ultimately identify an EAM platform as the best fit for the City. This process is generally summarized in **Figure 1** and described in detail in the following sections of this report.

Table 1 - Project Team

Team Member	Group
Atkins	
Brian Janes	Project Manager
Marc Cavallaro	GIS Professional
Ryen Tarbet	ISO 55000 Standards Expert
McKenna Temen	Stakeholder Engagement Lead
Carson City Public Works	
Matt Lawton	Project Manager (Asset Management)
Tyler Jesse	Asset Management
Darren Schulz	City Executives
Stephanie Hicks	City Executives
Dan Stucky	City Executives (Facilities Alternate)
Curt Horton	City Executives (Sewer Alternate, Warehouse/Inventory/Landfill Alternate)
Mike Thicke	Water Distribution
Eddy Quaglieri	Water Distribution and Production (Alternate)
Justin Tiearney	Sewer
Kelly Hale	Environmental
Mark Irwin	Environmental (Alternate)
Brandon Mathiessen	Water Production
Jeff Bradshaw	Wastewater
Andy Hummel	Wastewater (Alternate)
James Jacklett	Control Systems
Doug Fong	Control Systems (Alternate)
Rich Hardcastle	Fleet
Lucia Maloney	Fleet (Alternate)
Rick Cooley	Warehouse/Inventory/Landfill
Ron Reed	Facilities
Paul Griffitts	Parks
Dan Kastens	Parks (Alternate)

Figure 1 - Process



2. Needs Assessment

To better understand the City's financial, operational, administrative, regulatory and strategic requirements for an EAM solution, Atkins performed a needs assessment by engaging stakeholders through a series of 8 functionally specific workshops. Workshops included stakeholders from functional business areas including; Executive Management, Finance & IT, Linear Assets, Control Systems, Fleet, Plant Assets, Facilities, and Inventory & Warehouse Systems. The following lists the workshop session with the corresponding stakeholder department/division in attendance.

- Executive Management – City Manager's Office and Public Works
- Finance & IT – Finance, IT, and Public Works
- Linear Assets – Asset Management, Water Utility (Production & Distribution), Wastewater (Sanitary Sewer, Treatment Plant, Environmental Control), Street Maintenance, and Engineering
- Control Systems – Control Systems (Communications and Intelligent Transportation Systems)
- Fleet – Fleet Services and Transportation Management
- Plant Assets – Water Production, Wastewater Treatment, and Engineering
- Facilities – Facilities Maintenance, Parks & Open Space, and Landfill
- Inventory & Warehouse Systems – Warehouse Management, Fleet, and Public Works Business Management

To set the stage and to increase stakeholder engagement, questionnaires were prepared and published online prior to the workshop for attendees to access and answer specific questions about business requirements and expectations for an EAM solution. Three separate questionnaires were created for which the questions in each were tailored to stakeholder groups, including, Executive Management, Finance & IT, and asset stakeholders' groups that addressed the remaining business areas. Prior to conducting the workshops, the questionnaire results were reviewed, and notes were compiled identifying key business requirements and re-occurring themes.

Each workshop followed a structured format designed to creatively elicit participation and capture key requirements and themes. Like the questionnaires, the formats for the workshops were tailored to reflect the business focus for the respective stakeholder groups. At the beginning of each workshop attendees were asked if clarification was needed for any of the pre-workshop questionnaires.

For the Executive Management, Finance & IT workshops, following introductions, attendees were asked to write down a list of tasks and responsibilities that are essential to the City's asset management. The workshop facilitator then wrote out each of the responses on the whiteboard. A round table discussion then followed discussing the merits of each of the responses. Next, attendees were asked to summarize in one sentence, their short term and long-term vision for asset management within the City. Each attendee then read their responses aloud and the group weighed in on each, offering their perspective, and once a consensus was reached, the result was written on the whiteboard by the facilitator (stakeholder engagement lead). Finally, the group was asked what key things that they'd like to see come out of the other workshops. These responses were then posted to the whiteboard for group discussion.

For the asset stakeholder workshops, following introductions, the group was asked to write down 3 answers (in 2-3 words) to the question: "What features does the EAM platform need to have to make work life easier, more efficient, documentable, and reliable?". Each attendee then took their top response and posted to the whiteboard on a sticky note. The workshop facilitator then guided the group on aggregating the responses into similar pairs. Attendees were then asked to add any other answers not already represented on the board and were instructed to place them either under an existing pair or to place as a standalone. Each answer cluster was then reviewed, discussed aloud with the group and then answers were aggregated, moved, or removed based on the consensus of the group. The group was then asked to title each answer cluster. The workshop facilitator then re-read the workshop question, using the titles of the answer clusters to answer the question. The facilitator then asked the group if they felt confident in their answer, have any hesitations, and if they think the answers are actionable.

At the conclusion of each workshop, all responses, notes, photos, and questionnaire answers were compiled into a series of workshop outcome writeups (**Appendix A**).The writeups included the current business requirements to be improved, implementation and asset data/information, and a listing of business requirements with associated timescales. The business requirements identified in each of the workshop writeups were later compiled into a comprehensive functional requirements list and duplicates/overlapping requirements were removed.

3. Enterprise Asset Management (EAM) Functional Requirements

Following the conclusion of the stakeholder workshops, the writeups were used to develop a list of functional requirements for the City. Additionally, the City's asset inventory and current practices were evaluated in reference to ISO 55000 standards.

3.1. Functional Requirements

The approach to developing the City's EAM software functional requirements was carried out using a 'top down bottom up' process designed to relate actual software features and functions to stated goals, objectives, and business needs of the City. This 'top down bottom up' process included stakeholders from executive City management, department level management and supervisors, and non-management operations staff.

After the initial workshops, Atkins developed a comprehensive list of EAM functional requirements that are typical among local governments of the size and scope of the City. This list was developed based on the business needs

identified by the stakeholders in the initial workshops as a guide to select from several thousand EAM functional requirements Atkins has accumulated from past projects. Where needed, functional requirements were edited to more specifically represent the business needs of the Carson City. The City was then asked to review the functional requirements in preparation for a second round of workshops aimed at finalizing and prioritizing the functional requirements.

The second round of workshops were held with the same 3 groups. A draft list of functional requirements and corresponding priorities were presented to the stakeholders. During these workshops, the stakeholders were engaged to determine whether the functional requirements and priorities accurately represented the City's current business needs. During the workshops an emphasis was made to ensure functional requirements were not overly granular and/or so numerous as to become unwieldy, checking that nothing was missed and/or needed modification. At the conclusion of the workshops, a finalized list of EAM functional requirements was identified (**Appendix B.1**).

The final prioritized EAM functional requirements were used to generate the following items:

1. Vendor questionnaires to be sent to vendors for the City's discovery into the capabilities of commercially available EAM software platforms
2. Demonstration scripts to be used by the demonstrating EAM software vendors
3. The scoring matrix used to evaluate and rank the EAM software that was demonstrated

3.2. ISO 55000

The international standard for asset management is ISO 55000, produced by the International Standards Organization, Geneva, Switzerland. The standard is consensus based and is the result of over 10 years of collaboration from more than 100 countries. ISO 55000 lays out the core principles of what an asset management system is and the best practices for its implementation. There is a wide and ever-growing body of literature, guidance materials, certification programs, and technical manuals that provide a great deal of supporting information beyond the contents of the ISO 55000 standard itself. These supporting materials come from a number of international organizations focused on the advancement and maturity of the field of asset management as well as government entities and the private sector. Two prominent organizations are The Institute for Asset Management (also called the IAM) and International Public Works Europe & Australasia (IPWEA), both of which produce what is considered the most definitive supporting guidance and educational materials.

An asset management system as defined by ISO 55000 is an actual management system composed of tools, including policies, business plans, organizational change management, audit and controls, business processes and information systems, which are integrated to enable the organization as a whole to coordinate its efforts in deriving value from its assets. While an EAM platform helps facilitate asset management, it is not an asset management system. An asset management system begins with a formal asset management policy. The policy lays out the high-level objectives for asset management. An asset management policy may address the following questions:

1. What is the current state of our systems assets?
2. What is our targeted level of service?
3. Which assets are critical to sustained performance?
4. What are our minimum life cycle costs?
5. What is our best long-term funding strategy?

An important part of an asset management system is the strategic asset management plan (SAMP). This plan lays out the specific activities that must be carried out to make the policy operational and identifies the decision-making criteria. Within the SAMP, specific target levels of service for each asset will be defined and individual asset management plans (AMPs) will be detailed to identify what activities are needed to meet the level of service targets.

Appendix B.2 includes a best practices writeup developed for the City which discusses, ISO 55000, the difference between asset management and managing assets, policy, developing a strategic asset management plan, and

best management practices for asset hierarchies. The intent of the writeup was to provide the City with a recommended best practice strategy for implementation of an EAM platform that is appropriate for the City.

4. Scoring Matrix

The objective of the scoring matrix (**Appendix C.1**) was to provide the City evaluators with an easy to use tool that would facilitate objective scoring of the EAM platform demonstrations. To support the scoring matrix, a demonstration script was developed for the vendors which would provide guidance to the vendors on items the City would be evaluating during the demonstration.

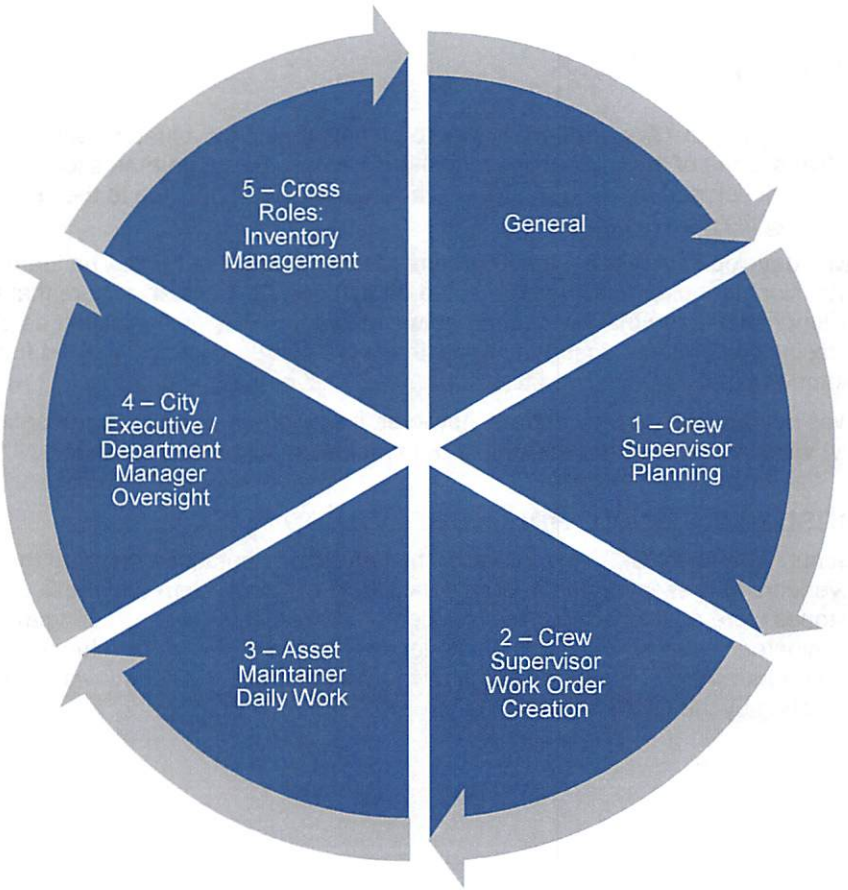
The scoring matrix was developed with the 2-hour demonstration constraint in mind. The team wanted to ensure that as many of the functional requirements were touched on as possible, but also ensure that the vendors could achieve a sufficient demonstration so that the scoring between vendors was as consistent as possible. The finalized scoring matrix included 45 demonstration items that were related back to 71 of the functional requirements. Each demonstration item related to one or more functional requirements.

The scoring matrix was not provided to the vendors; however, it was organized into five user stories (and a general functionality category) which were used to develop the demonstration script for the vendors.

4.1. Demonstration Script and User Stories

The demonstration script (**Appendix C.2**) developed for the vendor presentations mirrored the scoring matrix and focused guiding the vendors to present on the general functionality of the system and the five user stories shown in **Figure 2**. The user stories were developed to group the demonstration items in the scoring matrix into logical work flows that the City anticipated to use as well as to guide vendors on the EAM platform functionality that was important to the City. Vendors were not required to follow the demonstration script but were encouraged to in order to facilitate effective scoring by the City evaluators.

Figure 2 - User Stories



The script associated with the general functionality of the system was intended to show the EAM platform's support of single sign-on, user-defined security levels, differing user rolls and responsibilities, general approach to drop down lists, user interface, etc. Additionally, this story attempted to determine how the system utilized GIS and non-GIS assets.

The crew supervisor planning story (user story 1) focused on the ability of the system to support a crew supervisor in planning and scheduling activities. The goal of this user story was to identify how the EAM platform allowed a supervisor to review pending work, maintenance, and inspections, and how work orders could be tracked. This story also requested demonstration of the platform's ability to set user-defined triggers for alerts and/or emails as well and the platform's ability to perform bulk data entry.

User story 2 asked the vendors to demonstrate on the EAM platform's process for creating and grouping work orders. Auto population and reduction of repetitive work was important to the City to preserve valuable work time for more important tasks. The script asked vendors to demonstrate how to make fields mandatory, how to attach equipment, how to group work orders, field customization, etc.

User story 3 was focused on the City staff that are in the field on a daily basis maintaining the assets. The user story was focused around the ease of use and user experience of the EAM platform, especially from the mobile platform. The script requested vendors demonstrate how assets and work orders were shown on mobile platforms, what mobile platforms were supported, and how a user would close out a work order and receive new work orders in the field. Additionally, the user story requested the vendor demonstrate on how the mobile platform worked in

both a connected and disconnected state. This was important to ensure that Wi-Fi connectivity was not essential while maintainers were in the field conducting daily work.

The City executive / department manager user story (user story 4) was developed to identify how an EAM platform supports prioritization of assets, tracks investment, utilizes the EAM asset register, records user actions, etc. An important functionality associated with this user story was the EAM platform's ability and versatility in creating summary reports and how those reports are linked to information within the platform.

User story 5 was focused on inventory management and how inventory is utilized across differing roles and departments. The City's interest was for an EAM platform that had real-time inventory monitoring, mobile warehouses, and could track dates, costs, and other critical and variable inventory data. An important aspect of this user story was the EAM platform's ability to track serialized components and use bar code and/or radio-frequency identification (RFID) technology. The City also desired a platform flexible enough to support last in first out/first in first out (LIFO/FIFO) inventory costing.

4.2. Pre-screening Questionnaire

A 'pre-screening' questionnaire (**Appendix C.3**) was developed for the purpose of enabling the City to down-select from the initial listing of 17 EAM software vendors to 5 finalist vendors to be invited to provide software demonstrations. The pre-screening questionnaire asked vendors to respond to their EAM solution's ability to satisfy the mandatory functional requirements of the City. City review of the pre-screening questionnaire enabled the City to directly assess the market's response to the City's needs and provide a basis upon which the City developed its finalist selection for vendor demonstrations.

5. EAM Software Platform Evaluations

A list of prospective vendors was created from prior contacts the City has had and from leading vendors in the EAM arena. Vendors were sent the pre-screening questionnaire and the responses were used as the basis for narrowing down the list to join LLumin READYAsset and Tyler EAM in presenting their solutions to the City. Vendors whose responses best demonstrated their product's ability to meet the minimum mandatory requirements were selected to present their solution through web demonstration to an evaluation committee comprised of a cross-section of stakeholders from the various Public Works departments/divisions. **Table 2** summarizes the vendors chosen by the City that were invited to demonstrate their EAM platforms. The order of the vendors in the table is based on the order in which demonstrations were performed.

Table 2 - EAM Platform Vendors

Vendor	EAM Platform
AssetWorks	AssetWorks
DTS	VueWorks
Central Square Technologies	Lucity
Tyler Technologies	Tyler EAM
LLumin	READYAsset

Prior to the demonstrations, the demonstration script and user stories were provided to each vendor to maintain consistency in the demonstrations, so that the evaluation committee could effectively score the products, and to provide a fair and equitable demo environment for the vendors. Vendors were requested to provide any questions related to the format of the evaluations prior to the demos.

Following the completion of the vendor demonstrations, the scoring matrices were collected and tabulated and writeups were compiled detailing the vendors ability to demonstrate their product to meet requirements outlined in the demonstration scripts. Each user story was evaluated to determine if the vendor was successful in demonstrating how well the product meets the requirements within the story. The following is a brief summary for each vendors demonstration, full demonstration summaries are available in **Appendix D** of this document.

5.1. AssetWorks

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets. Overall the system appears very robust with a well thought out design. Access to asset information, creating/viewing work orders, integration with GIS, and mobile capabilities are all well executed. Most key elements of the user stories were addressed. This vendor's demonstration writeup is included in **Appendix D.1**.

5.2. VueWorks

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets. Overall the system appears very robust with a well thought out design. Access to asset information, creating/viewing work orders, integration with GIS, and mobile capabilities are all well executed. The strength of the system stems from its workflow management capabilities that provide a broad base for the platform. Another strength of the system is that it is highly self-serviceable and configurable, requiring less direct support from the vendor. The seamless connected/disconnected capabilities in the mobile application was also the most advanced of all the vendors. This vendor's demonstration writeup is included in **Appendix D.2**.

5.3. Lucity

The vendor did not adequately tailor their demonstration to follow the provided demo script. The demonstration bounced around to various aspects of the system, which did not allow participants to follow along with their scoring sheets. The vendor mainly demonstrated the systems capability using sewer assets, which did not provide a comprehensive cross section of capability. The wandering nature of demo made it difficult to score the system against the scoring criteria. This left many of the participants frustrated. The execution of tasks throughout of the demonstration were manual (cut & paste), which is not desirable, and the mobile applications capabilities are limited. However, several aspects of the system that were demonstrated were appealing, specifically the simplicity of navigating/creating work orders and managing asset information. This vendor's demonstration writeup is included in **Appendix D.3**.

5.4. Tyler EAM

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets. However, the vendor openly stated that their system did not meet many of the requirements, therefore many user story items were not sufficiently addressed.

Overall the platform is visually appealing with well executed interfaces and GIS integration. However, the modular nature of the system created a somewhat disjointed workflows and integration between them. The vendor's inability to demonstrate the mobile application led to the conclusion that desired mobile capabilities were lacking. The platform also lacked Esri integration. This vendor's demonstration writeup is included in **Appendix D.4**.

5.5. READYAsset

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets. Overall the system has an intuitive design, access to information within work orders and assets is easy to navigate. The risk assessment module functionality is appealing, and the inventory module is comprehensive. However, the mobile application is light on capability and the system doesn't have a strong GIS capability. Additionally, no information pertaining to fleet management was referenced throughout the demonstration. This vendor's demonstration writeup is included in **Appendix D.5**.

5.6. Post-demonstration Information Request

After the conclusion and scoring of the vendor demonstrations, the City decided to contact AssetWorks, DTS, Tyler Technologies, and LLumin and requested approximate licensing and implementation costs and details. The City identified the planned number of users and the number of potential third-party interfaces to assist the vendors. Vendors were requested to provide information such as the licensing agreement, technical support agreement, a range of likely costs, implementation information, potential implementation schedule, etc. This information was provided directly to the City and is not included with this report as much of it is proprietary and/or sensitive information.

6. Results

Scoring matrices were collected from all 14 evaluators from the City which represented 8 functional areas as shown in **Table 3**. Each evaluator utilized the scoring matrix which was aligned with the vendor demonstration script and user stories to rate how vendors addressed each functional requirement. Scoring for each demonstration item was assigned on a basis of 0 to 3 points based on the evaluator's perception of the EAM platform capabilities.

Scoring Choices:

- 0 = Not Addressed
- 1 = Does Not Meet Needs
- 2 = Meets Needs
- 3 = Exceeds Needs

The demonstration script included 45 demonstration items which could result in a maximum score of 135 for each evaluator (1,890 total). However, some evaluators chose not to score some demonstration items due to unfamiliarity with the subject or workday related interruptions during the demonstration. In these instances, the unscored item was removed for all vendors for that evaluator only, reducing the maximum possible score to 1,731 from all 14 evaluators.

Additionally, each of the 45 demonstration items were generally related to one or more of 71 related functional requirements developed from the business needs analysis. When demonstration script scores were applied to all related functional requirements, the maximum possible score increased to 213 for each evaluator (2,982 for all evaluators).

The raw scores were used to make the recommendation of the best fit EAM platform; however, scores were also analyzed in several different ways as described in the following sections to determine if there was a result that differed from the raw scores.

Table 3 - Evaluators by Functional Area

Evaluator	Functional Area	Total Possible Raw Score
Fleet	Fleet	132
IT	IT	132
Parks	Vertical Assets	135
Facilities		135
Landfill/Warehouse/Inventory		135
Environmental	Environmental	93
Control Systems	Control Systems	135
Water Distribution	Linear Assets	129
Sewer		129
Streets		105
Asset Management (2)	Asset Management	108
		135
Water Production	Plant Assets	126
Wastewater		102

6.1. Evaluation of Raw Scores

The scoring data from the EAM platform demonstrations were summarized in 3 ways to begin the evaluation of the results.

First, the raw score from each scoring matrix from each City evaluator was totaled and assigned to the EAM platform as the demonstration score. Next, the scores from each demonstration item were applied to the related functional requirements identified on the scoring matrix and the scores were totaled. Lastly, after each EAM platform demonstration, the evaluators were polled and asked to qualitatively vote for which EAM platform they felt was a best fit for Public Works, given the scoring matrix and any other factors they felt were important. The results from all 3 of these evaluations are presented in **Figure 3**. **Figure 4** has also been included to visually show the variation in scores between evaluators.

As shown in **Figure 3**, evaluators of the vendor demonstrations scored VueWorks the highest EAM platform in both the demonstration score which also translated to the functional requirements. However, AssetWorks and READYAsset scored very close as well. When the qualitative poll was taken of the evaluators, READYAsset received the most votes for the best EAM platform for Carson City with VueWorks and AssetWorks second and third respectively.

Tyler EAM ranked fourth and was likely due to the lack of maturity with some of the functional requirements. Lucity ranked last in score largely due to the fact that they did not follow the demonstration script making it challenging for the evaluators to score the demonstration items. The last place ranking in the qualitative poll also confirmed that Lucity was not the best fit for the City as well. If the evaluators had difficulty scoring the demonstration but felt the EAM platform was a good fit for the City we would expect to see a disparity in the raw scores and the qualitative poll, but we did not see that disparity.

Figure 3 - Overall Scoring Results

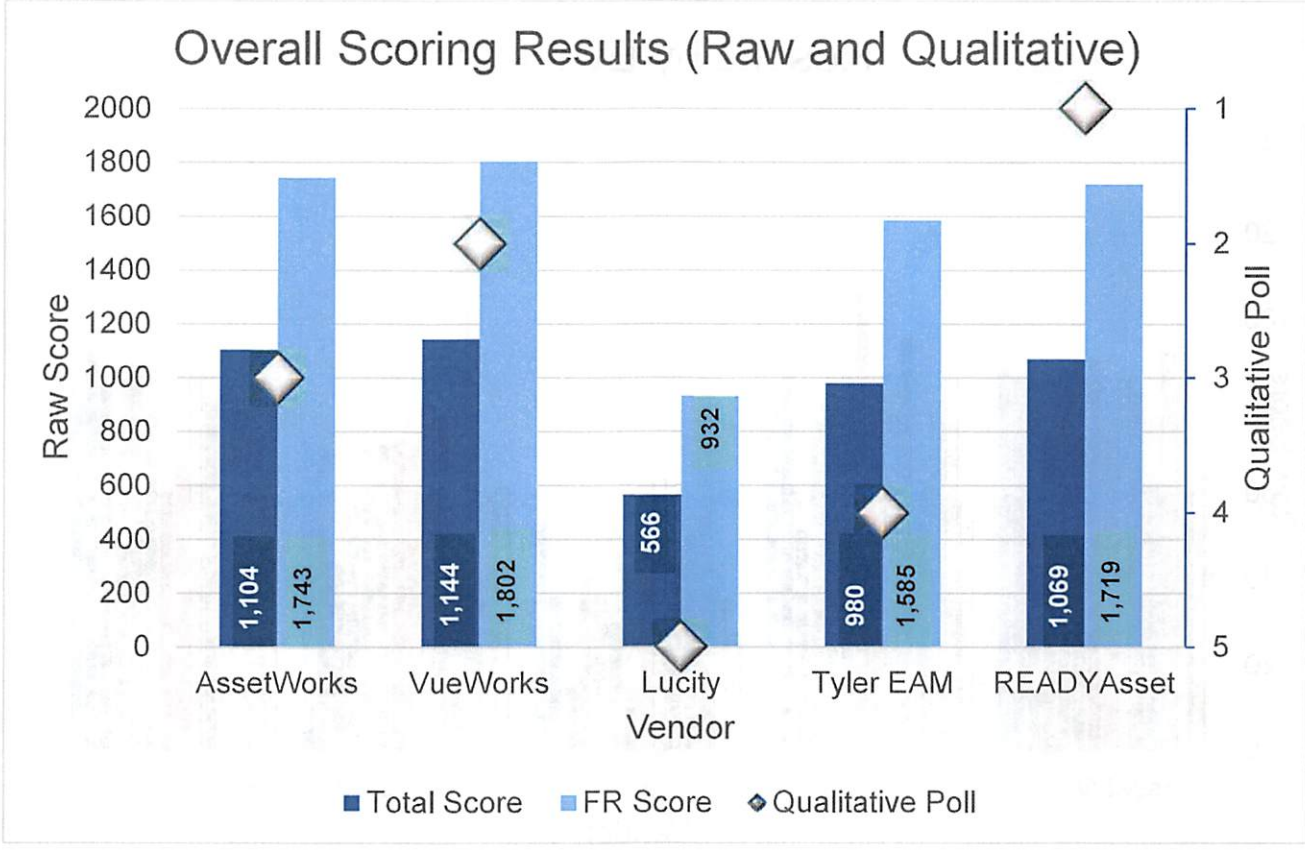
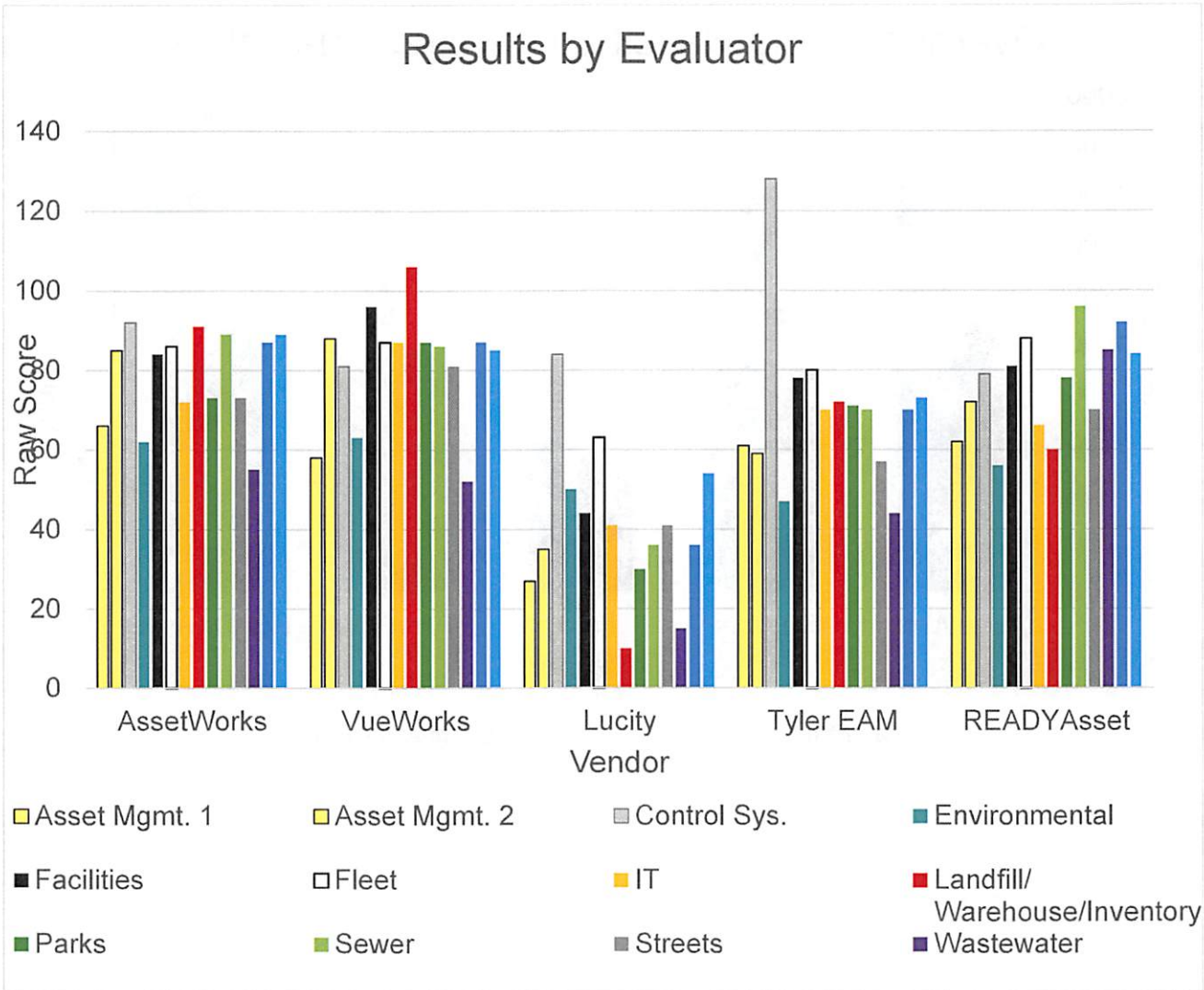


Figure 4 - Raw Score Results by Evaluator



6.2. Detailed Analysis

To evaluate whether the raw scores were representative of the true ranking of the EAM platforms, the raw scoring data was baselined, and the 14 evaluators were reduced to 8 functional areas (**Table 3**). Raw scores for each evaluator were reduced to a percentage of total possible points based on the number of demonstration items scored by each evaluator. To minimize bias in the overall results, the grouping and baselining was incorporated by:

1. Grouping multiple evaluators from similar asset classes into a single functional area to identify if functional areas had more influence on scoring than a single asset class (e.g. linear assets of water distribution, sewer, and streets scores were grouped and set equal to a single asset class, environmental).

2. Using percentages helped evaluate whether evaluators who skipped questions influenced the results by reducing total possible points (e.g. parks evaluator scored all 45 demonstration items, 135 possible points, while environmental evaluator scored 31 demonstration items for 93 possible points).

After the grouping of functional areas and baselining the scores, the scoring percentages assigned to the functional requirements were evaluated in 3 ways to determine whether the outcome would be similar to the raw scoring or whether there would be differences.

1. Scores for all 71 functional requirements were evaluated.
2. Scores for the 44 functional requirements, prioritized as critical were evaluated.
3. Scores for the 27 functional requirements, prioritized as important were evaluated.

Table 4 summarizes the results of these 3 evaluations. Bold numbers indicate a top ranking (or a tie) by the EAM platform within that functional area. When looking at all functional requirements, AssetWorks was a favorite with the Asset Management staff, while VueWorks was a favorite with IT, Vertical Assets, and Environmental. Tyler was a heavy favorite with Control Systems, and LLumin was a favorite of Fleet, Linear Assets, and the Plant Assets functional areas.

When evaluating just the critical functional requirements, the functional area favorites changed some; however, the relative number of top rankings remained similar. The same number of top rankings were observed when just the important functional requirements were evaluated.

Overall, when baselined and grouped by functional area, VueWorks had the most top rankings by functional area, followed by LLumin. However, when looking at the composite percentages across each evaluation, the ranking from the top EAM platform down (in all 3 evaluations) was VueWorks, AssetWorks, LLumin, Tyler, and Lucity.

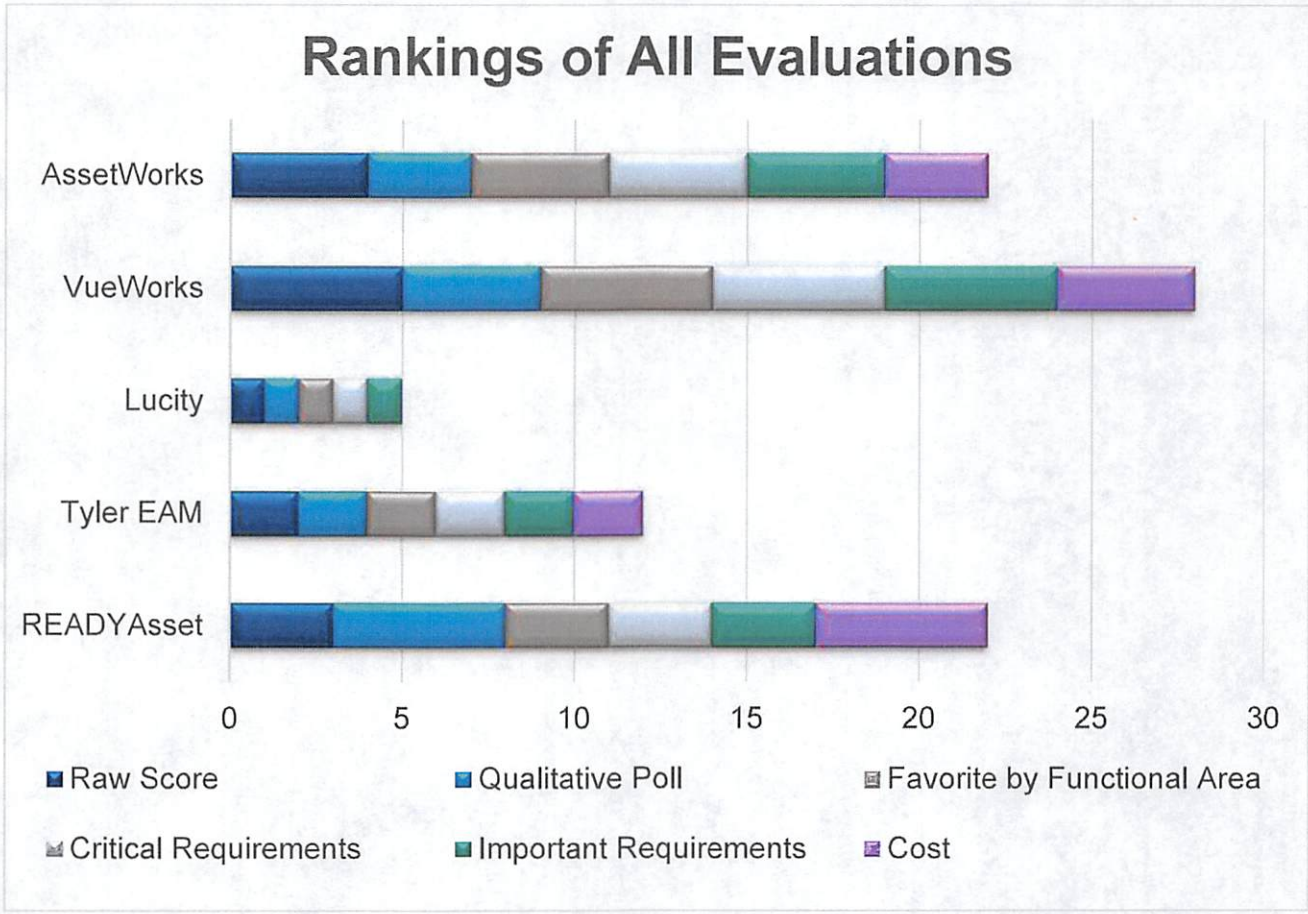
In addition to scoring results, the City reached out to the EAM platform vendors previously identified for procurement, implementation, and configuration cost feedback. Again, because much of this information is sensitive and proprietary, it is not discussed in detail in this report; however, it was factored in by the City.

A final summary of both raw results and the detailed analysis is presented in **Figure 5**. This figure summarizes the ranking of each EAM platform evaluated based on the 6 different evaluations that were completed. The rankings were scored inversely to the number of vendors (e.g. a number 1 ranking earned 5 points, while a number 5 ranking earned 1 point). As shown in the figure, VueWorks and LLumin were the top two EAM platforms with AssetWorks a close third. Note that cost and implementation data was not solicited from Lucity.

Table 4 - Baselined Scoring Results by Functional Area

EAM Platform	Functional Requirement Priority	Fleet	IT	Vertical Assets (parks, facilities, Landfill/Warehouse/Inventory)	Environmental	Control Systems	Linear Assets (water dist., sewer, streets)	Asset Management	Plant Assets (water prod., wastewater)	Number of Top Rankings
AssetWorks	All	65%	55%	61%	67%	68%	69%	**62%**	63%	1
	Critical	**65%**	53%	62%	45%	67%	61%	52%	53%	1
	Important	64%	59%	58%	**42%**	74%	66%	**62%**	51%	2
VueWorks	All	66%	**66%**	**71%**	**68%**	60%	70%	60%	60%	3
	Critical	**65%**	**64%**	**71%**	**46%**	64%	**63%**	**53%**	47%	6
	Important	65%	**68%**	**70%**	**42%**	60%	65%	55%	52%	3
Lucity	All	48%	31%	21%	54%	62%	31%	26%	30%	0
	Critical	45%	27%	23%	41%	67%	25%	19%	24%	0
	Important	48%	38%	22%	32%	58%	34%	35%	33%	0
Tyler EAM	All	61%	53%	55%	51%	**95%**	54%	49%	51%	1
	Critical	60%	55%	56%	33%	**98%**	48%	47%	44%	1
	Important	60%	51%	56%	35%	**95%**	53%	48%	43%	1
READYAsset	All	**67%**	50%	54%	60%	59%	**71%**	55%	**74%**	3
	Critical	**65%**	45%	57%	42%	61%	**63%**	49%	**63%**	3
	Important	**67%**	49%	55%	37%	64%	**67%**	53%	**65%**	3

Figure 5 - Category Scoring



6.3. EAM Platform Recommendation

Based on the results from the raw scores, the qualitative poll, and the detailed analysis, it appears that VueWorks is the EAM platform that best satisfies the business needs of the City. However, given current budget conditions, and the results of the qualitative poll, READYAsset may be the best EAM platform to move forward with in the short term.

LLumin READYAsset is already integrated with the City's GIS and is in use by some departments. It is recommended that the City leverage this platform in the short term to incorporate more of the City's departments and work flows. As the City's processes mature and the need for a more robust EAM platform is necessitated, VueWorks (or AssetWorks) should be considered as a more comprehensive asset management system.

Appendices

Appendix A. Stakeholder Meetings

A.1. Control Systems

Workshop 3 Outcomes: Control Systems

Atkins held a facilitated workshop with stakeholders representing the City's management of control systems. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Asset included in the workshop were:

- ITS: signals, specialized crosswalks, school zones, radar signs, beacons, central software
- Citywide plant conduit, fiber optic & copper interconnects, microwave radios, switches, routers, software
- Utility electrical and automation: core network, racks, servers, storage, virtual machines, firewalls, software applications,
- Switchgear, motor control centers, fixed and portable generators, automatic transfer switches, control cabinets, PLCs, instruments, sensors, motors, motor controllers, SCADA system
- Radio consoles, paging, repeaters, control stations, filtering systems, command vehicle equipment

Outcomes of the Control Systems EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Work Automation & Efficiency:** A clear take-away from the workshop is the overall need for increases in work efficiency. There are many specific components driving this need such as (but not limited to):
    - Poor mobile performance of Llumin when deployed in the field via cellular network
        - Considered the cause of, or signficant contributor to, cascading inefficiencies down stream
    - Sheer number of disparate software systems used to manage assets and work
        - Llumin, Trafficware's Advanced Transportation Management Systems (ATMS), Paessler PRTG Network Monitor, Carson Connect, SmartSheet, Request Tracker (RT), Excel
        - Not to mention additional systems used to manage IT / IS assets and needs
    - Sheer variety of assets, many of which are not owned by Control Systems thus creating a wide variety of asset registers and hierarchies to work with
    - Resource constraints dictate the EAM system provide workflow automation tools instead of human – Llumin does not adequately provide this
    - No material reporting capability is currently set up (previously had some PowerBI...which notably is not a Llumin capability)

- Critical need for ITS is invoicing to customer agencies. Current context of poor/no ITS inventory (parts/materials costs), time recording after work is done (poor mobile performance) adds up to time/resource hogging when generating defensible invoices.
- Control Systems is responsible for many assets that are managed in a run to fail, reactive mode. Many assets are critical to multiple downstream business functions and/or have significant safety issues when not functioning properly. In the resource constrained environment, with poor field performance driving poor recording of work/time/cost/condition/criticality, and no work automation tools...a feedback loop has emerged that tends to dis-enable work efficiency regardless of the desire to change things.

- **Reporting:** A common theme across all of the workshops is the lack of robust reporting and user friendly / intuitive reporting from Llumin. Control Systems is no different. Currently, there is almost no reporting coming out of Llumin, instead it is Excel based exports. A large need exists for robust reporting to support monthly billings to customer agencies (which feeds back to other dis-enablers mentioned above). Realtime dashboarding is desired.

- **Asset Hierarchies:** Control Systems is responsible for servicing assets owned by other departments and outside agencies. Within the scope of Carson City's assets, and to the extent Control Systems can influence (or develop a related and linked hierarchy) customers' hierarchies, there is a need for the new EAM system to work with multiple hierarchies.
  - To the extent Control Systems desires (future state) to extend work orders to greater levels of detail beyond 'functional locations' or 'whole systems' (e.g. Traffic Signal), asset hierarchies will need to be further developed and supported in the new EAM solution.

- **GIS:** GIS enabled work scheduling (efficient routing, estimates of drive/windshield time, jurisdictions) and more matured GIS asset inventories are desired. GIS inventories are progressing.

- **Mobility:** There is a strong desire to have robust mobile capabilities. This includes a system that performs well over poor cellular data rates (e.g. mobile optimized data architecture) as well as access to critical EAM functions beyond those offered in overly light weight apps. Notably, the ability to work in a connected or disconnect mode, with full feature capability is desired. The ability for mobile features to work in a disconnected state and then sync-up when connected is desired.

- **Capital Planning, Condition, Criticality:** As stated in the pre-workshop questionnaire and discussed in the workshop, for the most part there is no data driven and methodical capital planning. Assets are effectively ran to failure with the exception of certain components that time driven. Asset criticality is based largely on institutional knowledge. A business requirement exists to enable this to change so adequate funding can be developed for replacement and ultimately to gain control over reactive work demands.

Implementation & Asset Data/Information

- **Workflow Automation:** The EAM system should have a proven integration with the City's SCADA platform, Wonderware. Establishing triggers based on SCADA and other events is desired. This is a common feature among EAM systems, and will require access to, and a link or data feed from, the historian(s). For customer agencies, this will require planning and roll-out over time; IT/IS resources to monitor and maintain. For critical assets, a fall back may be needed if the triggering capability goes off line for some reason.

- **Accurate Work History & Time Tracking:** Regardless of the current Llumin shortcomings (e.g. poor mobile performance) that contribute to 'after the fact' data entry, capturing accurate work history and time tracking will entail a significant cultural change. As much this information is needed and desired, trade-offs in feel, function, complexity will have to be made when selecting the new EAM system. End user / operator buy-in and adoption is critical, and any trade-offs made should be done with their input and collaboration (e.g. cultural changes tend to be more successful when everyone is involved and invested early on).

- **Work Prioritization & Requestor Transparency:** Most EAM solutions have mature capabilities to apply prioritization rules and/or workflows to scheduled work and reactive/ad-hoc work requests. Given the resource constraints within Control Systems it is likely there will not be a dedicated person for administration of work orders and their priority. Given the reactive nature of the work, the fact that certain work is done for outside customer agencies, and that in some cases safety/liability issues exist, it will be important to develop some level of audit and control over work prioritization when using EAM automation heavily. This could be addressed through designating certain staff (or roles) to provide administration, audit, and control over a small and specific number of work prioritization situations/contexts and to roll this up to a real time operations dashboard.

- **Work Scheduling:** This is a common feature in EAM systems, however the level of sophistication varies a great deal. Work scheduling is contingent on there being some level of a work plan with resources allocated against it. Establishing this in a robust, production environment where the benefits of work scheduling can be realized is typically a moderate to heavy resource intensive task – as someone has to be cognizant of the operational context and then administer the schedules while constant changes occur. This is not to say some level of auto/semi-automated work scheduling is not possible with a well implemented EAM straight away. In the current reactive work environment where use of existing work orders in real time is not business as usual, the implementation of work scheduling should be done in phases over time (e.g. most of it will happen over the years post-implementation).

- **Inventory:** setting up and managing inventory will require some level of dedicated resourcing (percent of FTE) either from within Control Systems for from a supporting group. The improvements gained in invoice generation times and invoice cost accuracy may justify the resource. Because the workflow and best practices around inventory management are agnostic to the inventory itself, Control Systems may be able to 'outsource' or share inventory management with another department that will also be using the new EAM system's inventory capabilities (e.g. fleet, etc.).

- **Time Scales:** The above listed business requirements from this stakeholder group are most likely to be fully met over a period of several years after the initial implementation. It will be important for the Control Systems stakeholders to work out in advance of implementation what their short, medium, and long term goals are each of them and to critically assesses the internal blockers (training, culture, lack of adequate tools/technology, executive support, etc.) to meeting these goals.

Stakeholder Business Requirements

The business requirements developed from the linear asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Capital planning tools that incorporate condition and risk/criticality.	Medium-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Automation of work order creation, scheduling, transparency, closing, archiving for reporting / analysis / invoicing	Near-term	
O.2	Real-time visibility into operations, work prioritization	Near-term	
O.3	Work scheduling and work transparency (e.g. robust auto-notification between requestor and provider regarding status, priority, etc.).	Near-term	
O.4	KPIs around nature of work (e.g. # reactive work orders 'critical – safety' / # available staff resources....measure of critical response capability) available in dashboard(s) and reporting (calculated fields in reports)	Near-term	
O.5	Report creation can be done by average system user (e.g. not require a report specialist; intuitive); can be connected to an advanced stand-alone reporting system such as PowerBI, Cognos, Tableau, etc.) to offer additional flexibility	Near-term	
O.6	Able to perform well with nominally low internet speeds – web optimized – perform in a disconnected state	Near-term	
O.7	Can be applied to all assets (asset agnostic) across all lifecycle phases – global system – out of the box with no customization	Near-term	
O.8	Seamless GIS integration and ability to leverage GIS for work efficiencies (e.g. routing, quickly locating assets, capturing assets, etc.).	Near-term	
O.9	Either specific capabilities that support an invoicing/billing process, or demonstrated flexibility to configure it	Near-term	
O.10	Mature inventory capability linked directly to work orders	Near-term	
O.11	Ability to set triggers (work orders, inspections, notifications, etc.) using internal and external sources (e.g. time since last work order, SCADA, etc.). Related to O.1 above.	Near-term	

O.12	Open platform with APIs to enable integration with various 3rd party systems	Near-term	
O.13	Support a flexible asset hierarchy that can roll up or roll down in granularity.	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	System has high uptime and robust pre-release bug testing	Near-term	
A.2	Long term technical support available	Near-term	
	Strategic Business Requirements		
S.1	Simple and efficient mobile capability across entire service area used by all staff as work is performed (eliminate 'after the fact' work recording)	Near-term	
S.2	Easy to understand (across all stakeholders internal or external) and easy to access (e.g. dashboard) visibility into how/why work is prioritized (e.g. critical/high risk assets, resource availability, accessibility of asset (remote location, customer jurisdiction) across internal and external customers.	Near-term	
S.3	Establish a robust inventory system seamlessly linked to billing	Near-term	
	Regulatory		
	ISO 55000		
I.1	For assets where Control Systems is a service provider (does not own the asset): • Reconcile internal capabilities (Control Systems) with level of service goals (asset owners) and resource Control Systems accordingly – drop contracts that cannot match value of the service with cost to provide • Asset owners leverage Control Systems as strategic data source for their own CIP planning	Long-term	
I.2	Control Systems develop a strategic asset management plan that spells out how it manages its own assets consistent with stated goals of objectives of the Control Systems business. • To include goals and objectives for providing services to non-City entities – do you want to be in this business, how does this help the City meets its own Strategic Plan.	Near-term	
I.3	Executive support and enablement for I.1 and I.2	Long-term	

A.2. City Executives

Workshop Outcomes: Executives

Atkins held a facilitated workshop with stakeholders representing the City's Executive management team. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new Enterprise Asset Management (EAM) system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state what a victory (for EAM implementation) would look like in 1 and 5 years. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current systems and processes. The goal of the Executives workshop was to identify City wide issues as well as strategic requirements.

Outcomes of the Executives EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Fixed Asset Register:** Asset register is manually created and reconciled. It is desired to link the accounting fixed asset register to the EAM system's register of physical assets (a.k.a. 'asset register') for the purposes of:
    - Simplifying the update and maintenance of either registers – when capital projects are completed the two registers do not align; when dedications occur; etc.
    - Enable the financial business function to have visibility into the realities of physical asset consumption and concomitant funding levels over forward looking time horizons.
    - Create alignment between the financial and non-financial business functions so both functions are working together to get the most value from the City's assets.

- **Information/Data Access:** Asset information access & aggregation is laborious and time consuming. Departments store data in different formats and systems. It currently takes too long to answer questions. The EAM solution (via functional capabilities and well thought out implementation) needs to improve the current state.

- **Communication Silos:** Silos across departments restrict the flow of asset related information.

- **IT Resources:** The IT department's capacity to support the new system needs to be considered by the Executive team. Noting that there is a difference between ***technical support*** of the EAM solutions (technical environment the system exists within: installing patches, upgrades, database back-ups, network storage, etc.) and the ***administration of the actual EAM system*** (the EAM system itself: creating new forms, designing new work orders and/or work flows, ensuring consistent use of the system and auditing for this, running asset management related analysis). The City's asset management program manager may be most appropriate to administer the actual EAM system. The Executive team will need to enable organizational roles (not exclusive to IT, this was a 'for instance' and applies generally).

- **Work Automation & Efficiency:** Current asset management practices are inefficient, departments collect and track information using different methods and systems. Overall need for increasing efficiencies for managing and tracking assets.

- **User Experience:** Supporting workflows through automation is desired to streamline the user experience and drive adoption.

- **Reporting/Data Access:** Current systems/process lack the ability to quickly and easily provide meaningful reporting. Segregated systems/processes for managing and tracking assets requires challenges to information extraction and dissemination.

- **GIS:** GIS enabled work scheduling (efficient routing, estimates of drive/windshield time, jurisdictions) and more matured GIS asset inventories are desired. GIS inventories are progressing.

- **Mobility:** Current systems do not support mobile access, a system with a robust mobile capability is highly desired.

- **Capital Planning, Condition, Criticality:** For the most part there is no data driven and methodical capital planning. Assets are effectively ran to failure with the exception of certain components that are time driven. Asset criticality is based largely on institutional knowledge. The new EAM system needs to have life cycle cost and 'what if' budget scenario forecasting capabilities that allow different service levels to be connected to costs and the timing & timescales of those costs (noting that GIS can add location to these costs).

Implementation & Asset Data/Information

- **Strategic Plan Support:** "Sustainable Infrastructure" is identified as one of the pillars of the City's Strategic Plan. An EAM should support objectives laid out within the plan. During implementation it will be important for the City to develop implementation milestones that reflect strategic goals becoming operationalized in the EAM. This will connect EAM workflows and data (people on the front line) to outcomes and delivery of value (achieving strategic plan objectives). This 'line of sight' is important to prevent the EAM from becoming merely a work management system, and will keep the executive management team actively engaged in the implementation and the long term use of the system.

- **Reporting/Data Access:** The stakeholder group desires the ability to access and report on data, including automated reports and ability to drill down into data. Data access across department is desired to reduce silos and increase communication. The executive team will be required to enable City staff (via training, time, priorities, expansion of authority, new policies, etc.) to break down silos that traditionally did not share (or understand, or were aware of) data with/from other silos.

- **User Experience:** Supporting workflows through automation is desired to streamline the user experience and drive adoption.

- **Mobility:** An EAM should provide mobile capabilities allowing staff to input data and review previously collected asset information.

- **Finance Integration:** Align fixed asset register with physical assets to support annual reconciliation.

- **Budgeting:** Support smart budgeting decisions. Provide data driven insight into where funding can be placed for the most critical needs and provide fairness across departments.

- **Capitol Planning, Condition, Criticality:** Provide data driven and methodical capital planning. Enable this to change so adequate funding can be developed for replacement and ultimately to gain control over reactive work demands. The executive team may consider requiring the implementation process to deliver a basic yet fully configured capital planning capability that is based on first principles. While the end deliverable will not be mature, it offers a step change in how *all* stakeholders in the EAM system understand their own important parts within the larger whole, and a clear roadmap to progress the capital planning capability.

- **Time Scales:** Most of the above listed business requirements from this stakeholder group are most likely to be fully met over a period of several years after the initial implementation; however, the City executives have a higher focus on medium to long-term requirements (as compared to other stakeholders). Medium and long-term requirements will be based on development/maturing of the City's asset management program and organizational change.

Stakeholder Business Requirements

The business requirements developed from the City executives stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Integration of Fixed Asset Register with physical assets	Medium-term	
F.3	Capital planning tools that incorporate condition and risk/criticality.	Medium-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	KPIs around nature of work (e.g. # reactive work orders 'critical – safety' / # available staff resources....measure of critical response capability) available in dashboard(s) and reporting	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	System has high uptime and robust pre-release bug testing	Near-term	
A.2	Long term technical support available	Near-term	
	Strategic Business Requirements		
S.1	Capital reserve policy and fund that is demonstrably connected to asset renewal needs.	Mid-term	
S.2	Robust physical asset inventory (register) and asset hierarchy	Near-term	
	Regulatory		
	ISO 55000		
I.1	Connect the City's strategic plan to tactical activities spanning both operations and maintenance and capital planning.	Near-term	
I.2	Change from the budget and budget process determining the level of service provided – to a service level driven budget.	Long-term	
I.3	Develop and implement decision criteria for the management of assets that are aligned to the life cycles of the assets and the timescales over which the City and its constituents experience value from them. E.g. create a framework that operates beyond political time scales.	Long-term	

A.3. Facilities

Workshop 7 Outcomes: Facilities

Atkins held a facilitated workshop with stakeholders representing the City's facility assets. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Asset included in the workshop were:

- Government buildings/facilities
- Parks and recreation
- Landfill

Outcomes of the facilities assets EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Asset Tracking:** parks and recreation currently use Smartsheet (cloud based system) to track assets. WASP is used to track equipment and maintenance. WASP includes a maintenance log, sends email reminders, and utilizes bar coding. WASP is generally viewed as adequate for staff's needs. They also use OpenTreeMap.org for the City's tree inventory and GIS. Faithful + Gould staff are currently completing an inventory of facilities that is intended to be integrated into the new EAM system.
- **Maintenance Reporting/tracking:** landfill equipment is maintained by the equipment vendor. Landfill staff know what maintenance has been performed, but there is currently no way for fleet staff to view status of equipment maintenance. Landfill staff track preventative maintenance on trucks for fleet. Facilities staff tracks preventative maintenance using Request Tracker (based mostly on calendar time, hour limit usually not met).
- **Accounting/budgeting:** staff discussed that time and materials/equipment may be charged to different accounts for work performed. An EAM system would need to accommodate that flexibility.
- **Parts Tracking:** small parts (screws, etc.) are not tracked. Fastenal tracks PPE for parks and recreation staff and refills when vending machine indicates supplies are low. No need for an EAM system to perform this function.
- **System performance:** facilities staff uses Ascent Compass to track performance of HVAC systems. Parks and recreation staff uses Rain Master and Weather Tracker.

Implementation & Asset Data/Information

- Facilities uses a variety of software tools (iTree, WASP, 3rd party (Fastenal, landfill vendor), Ascent Compass, Rain Master, and Weather Tracker. There may be an opportunity to evaluate these systems and rationalize them into fewer (pros/cons of doing so).

- **Reporting:** This stakeholder group desires the ability to access and report on data from within the business area to support regulatory reporting at the landfill, budget reporting, maintenance reporting, and include permit and inspection reminders.
    - Dashboards and daily logs would be useful to users.
    - Reporting time spent per charge account and split by department would be beneficial.

- **User Friendly:** There is a desire for the new EAM system to be easy to use for the end user and incorporate bulk data entry. Users may not spend a lot of time on a computer with technology and need a system where work performed and asset data can be input efficiently. Additionally, given the lack of asset data for this stakeholder group and the current documentation effort underway by facilities, a bulk entry process would be desirable.

- **Field Access/Mobility:** Recommend the City require actual field demonstrations, with City field crew participation. Ability to work in a disconnected mode and sync-up when connected is desired; work over slow and/or low bandwidth internet connected is desired.

- **Environmental Control Systems Integration:** Facilities staff currently uses Ascent Compass to monitor control systems. An EAM system would not replace this function but could integrate data feeds into the system for tracking desirable items like error codes for a piece of equipment (e.g. error codes and recurrence is logged in the EAM system).

- **Capital Forecasting:** The asset value of this stakeholder group is larger and therefore the City would benefit from an EAM system that can base depreciation on actual asset condition assessments. Staff would like the ability to track asset depreciation and prioritize capital planning. Useful life management is also beneficial for facilities and equipment.

- **Inventory Control:** Each stakeholder group has some inventory and ordering responsibilities. It would be beneficial for an EAM system to include inventory control, ordering capabilities, tracking of parts on hand and tracking of inventory for safety compliance. Safety compliance may be a low priority due to the use of the Fastenal system which appears to be working well for staff.

- **Time Scales:** Scale-ability is important for this stakeholder group. Staff currently have processes that meet basic needs. Intent is to improve reporting and grow to meet future needs.

Stakeholder Business Requirements

The business requirements developed from the facilities asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Ability to split maintenance time and materials/equipment between multiple charge accounts	Near-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Ability to improve asset data quality and quantity without vendor support	Near-term	
O.2	Mobile support for field operations and inspections	Near-term	
O.3	EAM platform includes environmental control systems integration	Near-term	
O.4	Ability to track preventative maintenance requirements (schedules, wrench timer, performance, etc.)	Near-term	
O.5	Auto mailing feature for inspections and permitting	Near-term	
O.6	Inventory control and parts order tracking	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	Reporting capability that can access data from any/all modules of the application, as well as data from sources outside the application.	Near-term	
A.2	Reporting tools that are easy to learn for individual system users.	Near-term	
A.3	Reporting tools that allow for complex reports to be created but can be saved and shared across the organization for easy use.	Near-term	
A.4	System has high uptime and robust pre-release bug testing	Near-term	
A.5	Long term technical support available	Near-term	
A.6	Reporting that supports regulatory requirements	Near-term	
	Strategic Business Requirements		
S.1	Incorporates condition assessment-based asset depreciation	Near-term	
	Regulatory		
	ISO 55000		
I.1	Asset register that aligns with other vertical/facility/plant business units w/in the City	Near-term	
I.2	Connection of CIP decision criteria with City's strategic plan	Near-term	
I.3	Connection of trends in maintenance and operations over time as result of service level driven CIP programming	Near-term	

A.4. Finance and IT

Workshop Outcomes: Finance & IT

Atkins held a facilitated workshop with stakeholders representing the City's Finance and IT Departments. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new Enterprise Asset Management (EAM) system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current systems and processes.

Outcomes of the Finance and IT EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Fixed Asset Register:** Asset register is manually created and reconciled. It is desired to link the asset register to physical assets in order to simplify update of the register and to have access to a "living" register throughout the year.
- **Data Access/Reporting:** Current processes for data collection are burdensome. Tracking expenses and project end dates, and vehicle builds in process.
- **IT Resources:** The level of support that the new system requires should be considered. Cloud based systems require less support but come with an added cost.
- **Asset Prioritization:** Cost based prioritization for asset tracking is not currently possible.
- **Mobility:** Current systems do not support mobile access, a system with a robust mobile capability is highly desired.

Implementation & Asset Data/Information

- **System Integration:** EAM must have a proven integration with Tyler Munis. In general, ERP systems do not allow 3rd party systems much control over what and how to integrate. It may be necessary to stage data outside Munis.
- **Software Platform:** EAM platform should utilize modern web-based technologies such as HTML 5.
- **Product Maturity:** System should be a mature product with a deployment history within similar organizations.
- **System Stability/Redundancy:** The system should have a proven battle tested code base and have built in redundancies to reduce downtime.

- **Inventory:** Provide ability to track vehicles, including all the parts that are attached to the vehicle and provide support for fuel utilization tracking. Fleet has similar needs, collaboration between this stakeholder group and Fleet may reveal strong common 'must haves'.

- **Depreciation Tracking:** The platform should provide the ability to track depreciation of the physical condition for assets. During implementation, it will be important to introduce work order and/or inspection work flows that collect actual physical condition(s) in order to plot and estimate their deterioration over time (e.g. continual improvement of best estimates). Key to alignment between financial and physical asset registers is for the financial staff to understand that assets experience loss of asset 'value' though a number of modalities: condition, efficiency, capacity, obsolescence, etc., each of which may occur at different rates and may trump the other given contextual circumstances.

- **Capitalization Tracking and Forecasting:** The EAM platform should provide mechanisms to
  - Identify when projects should be capitalized by tracking project status.
  - Support budgeting by tracking capital needs year to year.
  - Support budgeting by tracking maintenance needs year to year.

- **Mobility:** The EAM should provide mobile capabilities allowing staff to input data and review previously collected asset information. Operating in a disconnected mode is desired given internet connectivity can vary greatly across the City's service areas.

- **Financial Integration:** Integration between Accounting's fixed asset register and the EAM's asset register for work order management is required. The City should consider whether it desires this to be an implementation deliverable or a work item to take on post implementation (pros and cons both ways).

- **User Experience:** Supporting workflows through automation is desired to streamline the user experience and drive adoption.

- **Reporting/Data Access:** The system should provide the ability to access and report on data, including automated reports and ability to drill down into data. Functional end user reporting that provides actionable information is important.

- **Time Scales:** The above listed business requirements from this stakeholder group are most likely to be fully met over a period of several years after the initial implementation. Integrating the fixed asset register with the physical assets may be a requirement that requires additional time to fully test, adjust City procedures, and fully implement.

Stakeholder Business Requirements

The business requirements developed from the finance and IT asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are

general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Integration of Fixed Asset Register with physical assets	Medium-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Track the depreciation of physical asset	Near-term	
O.2	Mobile support for in field use	Near-term	
O.3	Proven integration with Tyler Munis	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	System has high uptime and robust pre-release bug testing	Near-term	
A.2	Long term technical support available	Near-term	
A.3	Minimization for level of support by IT is desired	Near-term	
A.4	System should be a mature product with a deployment history within similar organizations	Near-term	
A.5	Based on modern web platform (i.e. HTML 5)	Near-term	
A.6	Redundancy built into system architecture	Near-term	
ID	Strategic Business Requirements		
ID	Regulatory		
ID	ISO 55000		
I.1	Alignment between the financial and physical asset registers – so the City as a whole shares a common definition of what is an asset, and all business functions can work towards their optimal management.	Medium-term	

A.5. Fleet

Workshop 3 Outcomes: Fleet

Atkins held a facilitated workshop with stakeholders representing the City's Fleet . The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Asset included in the workshop were:

- Fleet vehicles
- Fleet inventory
- Fleet facilities / shops / yards
- Fueling System(s)

Outcomes of the fleet EAM solution needs assessment workshop

A key outcome from the fleet workshop is the recognition that business requirements for fleet (maintenance, operations, procurement, warranty management, inventory control, internal and external billing, fuel management, etc.) contain specialized needs separate from the asset management needs of traditional municipal physical infrastructure. Examples of specialized fleet business requirements include:

- **Pooled Assets:** Shared fleet across multiple departments and/or divisions requiring cost allocation
- **Dual Nature Assets:** Fleet are both consumable equipment as well as assets to be managed
- **Inventory Procurement & Management:** Parts are often not held in inventory and are ordered on an as-needed basis (fleet specific software packages can integrate with parts ordering systems inclusive of PO management)
- **Internal Service:** Fleet plays a role as an internal service provider to the City and its departments/divisions and as a result has reporting and KPI needs for showing how it provides best value to other departments as well as showing its own operating and capital needs (ex: utilization rates, internal rental rates, uptime/downtime, fleet assets that are fully depreciated yet are not close to actual physical disposal, etc.)
- **Insurance**

Current business requirements desired to be improved by the new EAM system

- **Asset Information and Tracking:** Fleet requires asset information across multiple domains including (but not limited to):
    - Usage: miles/hours on the machine, down time, utilization rates
    - Technical details around the context of the machine failure as well as machine data capture in course of normal use:
        - Times, temperatures, speeds, locations, vehicle load, electrical specs, pressures, temperatures, velocities, wave forms, etc.

- Vehicle and parts warranty and warranty coverage (is the part/machine a candidate for a warranty replacement)
- Problem/Failure diagnostic "Flow Chart" documentation – key to ensuring the right fix for the right problem; key to correctly identifying the causal problem in the first place.
- Fuel utilization (critical to many aspects of a Fleet operation: need it current and absolutely accurate)

- **Reporting:** Fleet requires the ability to report vertically and horizontally through all fleet information, meaning that all data (asset information) against a fleet asset can be accesses by a single reporting interface. This includes inventory, warranty, insurance, repair and PM history (and projected), accumulated lifetime costs (labor, parts), depreciation, book value and purchase price, condition (current and historic), up/downtime, fuel usage, and more.
  - Standard/repetitive reports
  - Analytical reports – ability to calculate
  - Ad-hoc/ exploratory/data mining to determine trends, answer new questions

- **Integration:** Two clear business requirements that will require some form of integration are:
  - Fuel System – either a fuel management system is included in the fleet capabilities or a robust, well supported and documented integration to 3rd party fueling systems is available.
  - ERP/Accounting – fleet faces the unique requirement of constantly evaluating the current accumulated cost against an asset, nature of the costs (PM or failures), projected costs based on historic data, and proximity to obsolescence against the current salvage value of the asset and its current replacement cost.

- **User Experience:** Ready Asset is not a fleet management specific application and has been adapted to the needs of Fleet as best as possible (common in City gov't). During the workshop, a large number of comments centered around fleet specific business needs such as:
  - P.O. tracking: creation, issuance, tracking, fulfillment, close and verification of payment
  - OEM parts, part numbers, part manuals, parts cross referencing, tech service bulletins
  - Fuel tracking
  - Inbuilt fleet specific workflows (e.g. fleet specific architecture to how the software hangs together as opposed to a work order centric flow or a facility centric flow per se)
  - Numerous additional

  Collectively, the above contribute to another business need the current Ready Asset system is inadequate for: an intuitive, user friendly experience. It was acknowledged and discussed in the workshop that while EAM systems available on the market do have fleet management capabilities, there are also a number of very mature fleet specific products available and in general EAM systems tend to be less mature in their fleet management capabilities than fleet specific systems. Therefore, the City should have modest expectations for the most preferable EAM systems to also be the most preferable fleet management systems (e.g. consider getting a **fleet specific** system).

- **Capital Planning:** Fleet assets have much shorter useful lives than many other traditional municipal assets. In addition, fleet is significantly affected by obsolescence due to OEMs no longer providing replacement parts for otherwise functional fleet as well as changes in fleet technology and regulation (such as hybrid vehicles, electric vehicles). Fleet also needs to be vigilant in determining whether it is better to lease versus own. The fleet stakeholders need both the right software tools to enable these decision making processes, as well as the asset information and other contextual information to support the underlying analysis.

- **Automation / Feedback Loops:** Automation for common fleet management activities such as inspections, fuel/mileage/hours driven PMs, warranty notifications, parts ordering, etc.

- **Mobility:** Native inbuilt mobile capabilities specific to fleet management are desired in order to improve efficiency such as fleet specific condition inspection apps, fuel apps, part lookup apps, etc.

- **System Stability / Maturity:** The current EAM system presents challenges through its lack of system robustness (e.g. bugs, lack of maturity around features, reliability). A clear long term support plan is a clear business requirement of the new EAM system.

Implementation & Asset Data/Information

- **Asset Information:** The current Ready Asset system is not a fleet specific system and is limited regarding the types and amounts of fleet information it is designed to hold. At this time, it is not clear how much fleet asset information is managed in Ready Asset or outside (e.g. via Excel, other databases, ad-hoc systems, paper). As well, asset information around fleet includes actual maintenance work orders as well as a wide variety of non-maintenance information (warranty, insurance, various ERP data, various parts related information, fuel, etc.).

  Give these two realities, prior to evaluating a fleet management system, the City should consider its 'fleet information business process'. This would entail developing a high level workflow for how all key fleet asset information is generated (who, how, why, when) and the information products that need to be derived from it (reports, analysis, etc.). This would enable all stakeholders (fleet and non-fleet such as ERP, consumers of fleet services such as other City departments) to have a common and documented understanding of fleet information requirements when evaluating possible solutions (EAM or Fleet Specific) as well as an understanding of the level of effort and time scales to fully implement a system against these needs.

- **Reporting:** Reporting is a function of the data available to report against. Regardless of where fleet data resides (single system, multiple systems) there is a strong need for deeper reporting and data analysis. Given that fleet has wide ranging reporting needs, it may be necessary to nominate one or two individuals to become report 'experts'. Ease of use is clearly desired by fleet, however in practice reporting more complex data, especially data from multiple business areas (ERP and Fleet), requires a level of knowledge and understanding of BOTH the reporting tool as well as the various data types (to understand the limits of the data, accuracy, temporality, etc.).

- KPI's - Many reporting systems include the ability to build calculations. This is desirable.

- **User Experience:** As with many of the stakeholder workshops, this was a key component of the acceptance of a new EAM platform and should be ranked high when evaluating platforms. Overall, the group associated the following with a positive user experience: keep it simple, ease of use, streamlined, not overcomplicated, intuitive, and flexibility.

- **Mobility:** Recommend the City require actual field demonstrations, with City field crew participation.

- **System Stability and Support:** Recommend the City specifically ask EAM vendors how they test their software, number of developers employed, and if they offer any performance incentives (e.g. bug resolution in 24 hours, frequency of updates, access to live support technicians, etc.).
  - Staff feel current support lacks responsiveness
  - Staff feel they are sometimes beta testers of the application / system lacks the level of reliability (e.g. bugs) desired

- **Time Scales:** Given the current system has significant limits in its fleet management capabilities (technical features, fleet asset information management), any new system that meets the expressed needs of Fleet is likely to require some level of re-engineering of current business processes to fully leverage the capabilities of a new system. While the development of new/enhanced processes to accompany a new and enhanced fleet system may be welcome, there are likely to be a number of internal capabilities and/or enablers that need to be further developed before the new business process or software feature(s) can be brought into production use.

Stakeholder Business Requirements

The business requirements developed from the fleet asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Integrate with ERP for book value, salvage value, deprecation, reconciliation (PO's, cost allocations, useful life, etc.)	Medium-term	
F.3	Purchase order capability	Medium-term	
F.4	Fleet specific capital planning tools or equivalent capability	Medium-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Ability to automate tasks	Near-term	
O.2	See current data at all times (e.g. dashboards, apps)	Near-term	
O.3	Streamlined data entry process for repetitive tasks	Near-term	
O.4	Feedback Loops	Near-term	
O.5	Contain or integrate with fuel management system	Near-term	
O.6	Robust parts management, ordering, OEM manual, TSB capabilities	Near-term	
O.7	Warranty management	Near-term	
O.8	Mobile apps for typical fleet management tasks	Near-term	
O.9	Designed to support fleet specific KPIs and user defined KPIs	Near-term	
O.10	Customer portal (internal and external facing capability)	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	Reporting capability that can access data from any/all modules and fields within the application, as well as data from sources outside the application.	Near-term	
A.2	Reporting tools that are easy to learn for individual system users.	Near-term	
A.3	Reporting tools that allow for complex reports to be created but can be saved and shared across the organization for easy use.	Near-term	
A.4	System has high uptime and robust pre-release bug testing	Near-term	
A.5	Long term technical support available	Near-term	
	Strategic Business Requirements		
	Regulatory		
R.1	Possible state/federal requirements on fleet fuel efficiency, emissions	Near-term	
	ISO 55000		
I.1	Continual monitoring of lease vs. own — total costs and liabilities	Near-term	
I.2	Define fleet asset as same thing between Fleet and all other entities internal and external	Near-term	
I.3	Define the asset management strategy for Fleet such that it is in alignment with the stated needs of fleet 'users' (stakeholders/customers)	Near-term	
I.4	KPI development that connects Fleet management to defined asset outcomes	Near-term	
I.5	Connection of CIP decision criteria with City's strategic plan	Near-term	
I.6	Connection of trends in maintenance and operations over time as result of service level driven CIP programming	Near-term	

A.6. Inventory and Warehousing

Workshop 8 Outcomes: Inventory and Warehousing

Atkins held a facilitated workshop with stakeholders representing the City's inventory and warehousing functions. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Assets and Stakeholders included in the workshop were:

- General warehousing and inventory
- Fleet warehousing and inventory
- Public Works Fiscal Analyst (Stakeholder)

Outcomes of the inventory and warehousing EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Functional Workflow:** Llumin is currently used and does not appear to be supported by staff. Audits/inventory requires approximately 1 day per month for finance staff and 5 days per year for warehouse staff. Fleet staff spend 3 to 4 days annually to inventory and 2 to 3 days to reconcile. A real time inventory is not available due to the need to audit periodically.
- **Inventory Control:** Staff is required to do a lot of manual work to maintain. Additionally, there is a challenge tracking first in/first out (FIFO) and how that affects accounting when cost per item varies from purchases.
- **Reporting:** Reporting appears to be completed largely based on manual input at this time.
- **User Experience:** The current system presents challenges around general ease of use for staff due to the need for manual data manipulation and inventory reconciliation.

Implementation & Asset Data/Information

- **Functional Workflow:** This stakeholder group identified the need for automated tracking, redundancy (options if system is down), status alerts, barcode ready, scanner ready, low usage tagging, ease of inventory, and real time/active inventory as the most beneficial capabilities of an EAM system.
    - Information on data such as pending development or capital projects would be useful so staff could advance order needed parts to support that infrastructure. Additionally, budgeting ahead of these developments or projects is necessary to ensure funds are available to respond to needs.
    - Financial functionality such as cost averaging may be beneficial from an EAM system to avoid FIFO reconciliation with cost of inventory (at time of purchase vs. time of use).
- **Inventory Control:** An EAM system should have a mature FIFO model, be accurate, integrate with ERP for finance, include a cost averaging option, be reliable, have a mature inventory model, and be secure.

- **Reporting:** This stakeholder group desires the ability to access and report on data from within and across business areas, to include accounting (MUNIS) and elements of fleet data.
    - Reporting needs to be transparent for users outside the business area. However, there should be a mechanism to control which data is protected and which can be viewed by others.
    - Reporting needs to include a cycle report.
    - Trend reporting should be included.
    - Real-time inventory reporting is required.
    - Integration with the fleet fuel system is required.

- **User Experience:** Generally, City staff want the system to be easier to use, have simpler data entry and be more efficient.

- **Time Scales:** Of the above listed business requirements from this stakeholder group, requirements around inventory, tracking, and reporting are desired to be met in the first couple years to support budgeting and regulatory financial reporting/audit requirements.

Stakeholder Business Requirements

The business requirements developed from the inventory and warehousing stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
F.2	Ability to cost average inventory	Near-term	
F.3	Mature FIFO model	Near-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Real-time inventory	Near-term	
O.2	Barcode and scanner support	Near-term	
O.3	Inventory tools such as low usage and cycle report	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	Reporting capability that can access data from any/all modules of the application, as well as data from sources outside the application.	Near-term	
A.2	Reporting tools that are easy to learn for individual system users.	Near-term	
A.3	Reporting tools that allow for complex reports to be created but can be saved and shared across the organization for easy use.	Near-term	
A.4	System has high uptime and robust pre-release bug testing	Near-term	
A.5	Long term technical support available	Near-term	
	Strategic Business Requirements		
S.1	Connection into CIP projects for cost capture – bill to project	Near-term	
	Regulatory		
R.1	Capability to compare year-end inventory counts to financial records to support the annual audit review process mandated by Nevada Revised Statutes (NRS).	Near-term	
	ISO 55000		
I.1	Inventory used on capital projects presents an opportunity to capture asset or component level data important for operations and maintenance (manufacturer, date of manufacture, part #, cost, expected useful life can be required for certain inventory items)	Near-term	
I.2	Inventory items that are considered actual assets when put into use, or are critical to resolving asset failures, should be part of that department's risk and redundancy plan.	Near-term	

A.7. Linear Assets

Workshop 3 Outcomes: Linear Assets

Atkins held a facilitated workshop with stakeholders representing the City's linear assets. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Asset included in the workshop were:

- Streets
- Sewer
- Environmental

Outcomes of the linear assets EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Reporting:** the current EAM / CMMS system(s) does not produce adequate reporting capability (access to data, ease of use) across business areas and sometimes within a business area. It is recognized by the stakeholders that current reporting shortfalls are partially the result of how the current system(s) are implemented and the current level of maturity in developing cross-department data linkages.
- **User Experience:** The current system presents challenges around general ease of use for field and office staff due to poor transitions from one area the software to another, certain workflows not being intuitive, poor data entry experience, inability to automate certain tasks, speed or performance of the system over the internet, and a lack of desired levels of visibility into real time data to enable easy/simple access to situational awareness (e.g. live dashboards). Specifically, there are linear asset management needs (e.g. pavement maintenance, stripping, sign maintenance, sewer and water main flushing) that are not well supported by the current system
- **Accessibility (Mobility):** the linear asset stakeholders expressed desire for connected and disconnected mobile capabilities, mobile tools to access asset information of all types (work order, condition, documents, etc.), operator ease of use, and performance across various mobile devices (e.g. iPad compatibility). Ability to run mobile tools in a disconnected state and sync-up when connected is desired.
- **System Stability:** the current EAM system presents challenges through its lack of system robustness (e.g. bugs, lack of maturity around features, reliability). A clear long term support plan is a clear business requirement of the new EAM system. Staff sometimes feel like beta testers.

Implementation & Asset Data/Information

- **Reporting:** This stakeholder group desires the ability to access and report on data from within and across business areas, to include accounting (MUNIS) and potentially elements of fleet data. Key to reporting across business areas is:
    - The understanding of how (and which) data from different business areas inter-relate; both technically and from a business reporting and analysis perspective, this should be mapped out prior to system implementation and drive implementation deliverables
    - Data governance/quality, Data temporality – when reporting across business areas the level of rigor in collecting accurate and precise data will vary for a wide variety of reasons; the temporal currency of data will vary. This does not preclude accessing and reporting against this data; it provides a maturity road map and sets expectations for how the data can be used currently and expand over time.
    - Executive leadership's commitment during and on-going post implementation to break down organizational and technical silos to link these data for reporting and analytical purposes.
    - Given the above, implementation of the new system should be done against an asset information maturity road map. Defining what the mature future state of the City looks like with respect to reporting will enable the new system to be implemented to meet near term goals while also being able to meet mid-term and long-term goals as the City's asset data and information maturity grows.

- **User Experience:** There is a desire for the new EAM system to be more intuitive, automate tasks, be simpler to use, and to transition across asset types and business areas more seamlessly.
    - The new EAM system should be implemented against 'as-is' and 'to-be' business process workflows (typically done during implementation in the early phases and signed off by the City prior to actual software configuration and tested prior to acceptance). Even the most intuitive and user friendly EAM system can, in practice, not be intuitive or easy use when the business requirement or processes the software is attempting to meet are not clearly understood by either/both the City or the implementer.

- **Accessibility (Mobility):** Recommend the City require actual field demonstrations, with City field crew participation; test over poor cellular connections; look for ability to function in a disconnected state.

- **System Stability and Support:** Recommend the City specifically ask EAM vendors how they test their software, number of developers employed, and if they offer any performance incentives (e.g. bug resolution in 24 hours, frequency of updates, access to live support technicians, etc.).

- **Time Scales:** Of the above listed business requirements from this stakeholder group, requirements around data access and reporting are most likely to be fully met over a period of several years after the initial implementation. Initially, it is expected that the City will meet some requirements; however, asset data quality and ongoing data collection efforts as well as City workflow refinements will occur over a period of several years.

Stakeholder Business Requirements

The business requirements developed from the linear asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Ability to automate tasks	Near-term	
O.2	See current data at all times (e.g. dashboards, apps)	Near-term	
O.3	Streamlined data entry process for repetitive tasks	Near-term	
O.4	Able to navigate all modules of the system in a seamless, easy to use flow.	Near-term	
O.5	Able to perform well with nominally low internet speeds	Near-term	
O.6	Can be applied to all assets (asset agnostic) across all lifecycle phases – global system – out of the box with no customization	Near-term	
O.7	EAM solution needs to have a mature system for linear assets, a stable version testing methodology, and readily available support.	Near-term	
O.8	Mobile component must support iOS and preferably be platform independent.	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	Reporting capability that can access data from any/all modules of the application, as well as data from sources outside the application.	Near-term	
A.2	Reporting tools that are easy to learn for individual system users.	Near-term	
A.3	Reporting tools that allow for complex reports to be created but can be saved and shared across the organization for easy use.	Near-term	
A.4	System has high uptime and robust pre-release bug testing	Near-term	
A.5	Long term technical support available	Near-term	
	Strategic Business Requirements		
S.1	Performance (condition, capacity, efficiency, obsolescence) and risk driven CIP process	Near-term	
	Regulatory		
	ISO 55000		
I.1	Asset register architecture aligns with other business units w/in the City	Near-term	
I.2	Connection of CIP decision criteria with City's strategic plan	Near-term	
I.3	Connection of trends in maintenance and operations over time as result of service level driven CIP programming	Near-term	

A.8. Plant Assets

Workshop 6 Outcomes: Plant Assets

Atkins held a facilitated workshop with stakeholders representing the City's plant assets. The goal of the workshop was to solicit from this group of stakeholders the capabilities required of a new EAM system. The process of soliciting EAM capabilities was done through an interactive thought exercise where each stakeholder was tasked to state the top two (2) or three (3) features or capabilities they feel are required of the new EAM. These responses were then explored against the backdrop of current business requirements and activities that are not met, or are poorly met, with the current EAM system. Asset included in the workshop were:

- Wastewater/sewer treatment plant
- Water treatment plant
- Wells
- Environmental inspection

Outcomes of the plant assets EAM solution needs assessment workshop

Current business requirements desired to be improved by the new EAM system

- **Asset Data:** the asset data for these assets appears to require both data capture and hierarchy review. Wastewater data is present in GIS; however, based on feedback from the users, the data hierarchy needs to be overhauled. Data associated with the water treatment plant and wells is limited to just the facilities.
- **Reporting:** this group of asset users have a diverse reporting requirement (environmental permitting, well testing, water rights, etc.) that are not supported by any of the City's current systems. Currently reporting is mainly accomplished by conglomerating inspection or testing data or requesting support from Tyler Jesse. The environmental staff reports on inspection results using customized forms for each inspectable facility. Currently this is accomplished on paper forms in the field and then input into the Llumin system when staff returns to the office. Currently environmental staff are limited to reviewing just the last inspection results.
- **Mobility:** environmental staff currently use Llumin for field inspections; however, plant personnel do not have access to mobile asset data, EAM, or CMMS. Mobile performance via low bandwidth connections (cellular or wifi) is important. Mobile capability in a disconnected state desirable.
- **Customer Support:** this group felt that the asset data was generally immature for the assets. Tyler Jesse is planned to improve asset data and asset management processes once a new EAM system could be implemented that freed time from "firefighting" issues.
- **CIP Planning:** Currently water treatment related CIPs are planned for by choosing a dollar value needed. There's very little or no data available to make actionable decisions. Capturing asset condition, risk, and service levels is desired to enable a data driven CIP process.

Implementation & Asset Data/Information

- **Plant Asset Hierarchy:** given the immaturity of the data available for these assets, the group felt that a key feature of the new EAM platform would need to include integration of new asset data/data collection and an overhaul of the existing asset data hierarchy, organizing that hierarchy into an ISO standard for plant operations.
    - This group desired that initial data specifications (what data, format of data) and asset hierarchy design be an implementation requirement due to the immaturity of their data and need to organize it into a new hierarchy prior to integration into an EAM platform. If the EAM vendor cannot complete this task or it is not cost effective, a third party consultant/vendor should be considered to organize the data hierarchy prior to integration.
    - ISO 14224 and ISO 55010 were recommended as references for developing facility asset hierarchies, and both are compatible the F&G asset hierarchy that will result from their facility assessments offering an opportunity for alignment and continuity across departments.

- **Bulk Data Entry:** bulk data entry is a desired feature for these assets to support future data collection efforts.

- **Actionable Reporting:** this stakeholder group desires the ability to access and report on data from within the business area to support staff decisions as well as comply with regulatory reporting. Key requirements for reporting were determined to be:
    - Reports must be user friendly and easy for the end user.
    - Graphic displays would be valuable to identify KPIs such as "wrench time".
    - Reporting needs to support financial tracking and financial based decisions. Ultimately CIP budgets should be able to be estimated based on staff experience, historic expenditures, and asset performance (condition, efficiency, capacity, obsolescence, etc.).
    - The group has various regulatory reporting requirements and desires an EAM platform that will support those reporting needs and eliminate or minimize manual formulation of reports.
    - Staff reports on water rights or volume of water used from each well.
    - Water quality reporting support was determined to be beneficial to staff. Well water is lab tested and historic data should be available to be reported on.
    - Additional information pertinent to reporting is included in user customization and document repository below.

- **User Customization:** this stakeholder group requires a large number of user created/defined forms for inspections. These forms will be customized for many different uses, however simple to use "drag drop" form building is desired (e.g. little or no reliance on complex, expensive, difficult to support customization) to support their business needs.
    - Environmental staff inspect and permit various non-City assets and uses customized forms. Staff would benefit from both mobile support (see below) and user defined form templates. Each facility inspected requires a unique form for its inspection.
    - The entire group desired data entry customization, user defined fields, report customization, and customization of both input and output data/reports.

- **Document Repository:** The entire group indicated that they would benefit from an EAM system that had the ability to upload various files (O&M documents, photos for inspections, warranty tracking data, etc.) and associate those files to the asset and system.

- **Field Mobility:** The group indicated that the EAM system should include a mobile component and that it is mobile device friendly (accessible from phones, ipads, etc.). GPS is a necessity to ensure correct location and support future data capture.
    - Field printable permits/forms would be beneficial for environmental staff.
    - Ability to work in a disconnected mode that can sync-up when connected
    - Ability to work over low bandwidth and/or slow internet connections

- **User Experience:** As with many of the stakeholder workshops, this was a key component of the acceptance of a new EAM platform and should be ranked high when evaluating platforms. Overall, the group associated the following with a positive user experience: keep it simple, ease of use, streamlined, not overcomplicated, intuitive, and flexibility.

- **Maintenance Prioritization:** this stakeholder group's business requirements include several features involving data collection and work order performance.
    - SCADA must be integrated as well as the preventative maintenance associated with SCADA.
    - An auto mailing feature for environmental inspections/permitting would be beneficial
    - Group needs to track preventative maintenance schedules and performance
    - EAM platform should auto generate work order checklists
    - Work orders should have access to standard operating practice manuals
    - Work orders should include a "wrench timer" to track duration of maintenance performed

- **Customer Suport:** Recommend the City specifically ask EAM vendors how they will support their software, cost of tech support, and location of tech support. The stakeholder group desired that the EAM platform incorporates updates/versioning easily, that the product has maturity, and that tech support is available.
    - Currently, City staff feel they are acting as beta testers in some sense when updates or new versions are released. The City desires an EAM platform that has been on the market for a reasonable amount of time, has existing/similar clients, and has a process for testing new releases prior to user acceptance.
    - Tech support should also be available and local if possible.

- **Time Scales:** Of the above listed business requirements from this stakeholder group, most requirements are desired to be met within the first couple years. Asset data collection and asset hierarchy review will likely cause requirements to be met several years out.

Stakeholder Business Requirements

The business requirements developed from the plant asset stakeholder workshop are listed below. A comprehensive listing of business requirements from all workshops will be developed and duplicates will be dropped. Timescales for each business requirement have been provided, these are general

timescales gleaned from the workshop and are provided to help set expectations of what the City can expect upon completion of EAM implementation and what the City should expect to occur over time separately from implementation. However, the EAM will need to support all of these business requirements and be implemented with them in mind from the start.

ID	Financial Business Requirements	Delivery horizon	Priority
F.1	Enable the identification of capital assets	Near-term	
ID	Operational Business Requirements	Delivery horizon	
O.1	Ability to improve asset data quality and quantity without vendor support	Near-term	
O.2	Diverse and customizable reporting	Near-term	
O.3	Mobile support for field operations and inspections	Near-term	
O.4	Module specifically designed for plant asset management	Near-term	
O.5	Ability to customize fields on asset screens and inspection forms	Near-term	
O.6	Ability to upload/attach documents to assets or systems	Near-term	
O.7	Initial EAM setup includes hierarchy review and data integration	Near-term	
O-8	EAM platform includes SCADA integration	Near-term	
O.9	Ability to track preventative maintenance requirements (schedules, wrench timer, performance, etc.)	Near-term	
O.10	Access to SOP manuals for plant operations/equipment	Near-term	
O.11	Auto mailing feature for inspections and permitting	Near-term	
O.12	Ability for bulk data entry of assets	Near-term	
ID	Administrative Business Requirements	Delivery horizon	
A.1	Reporting capability that can access data from any/all modules of the application, as well as data from sources outside the application.	Near-term	
A.2	Reporting tools that are easy to learn for individual system users.	Near-term	
A.3	Reporting tools that allow for complex reports to be created but can be saved and shared across the organization for easy use.	Near-term	
A.4	System has high uptime and robust pre-release bug testing	Near-term	
A.5	Long term technical support available	Near-term	
A.6	Reporting that supports regulatory requirements	Near-term	
A.7	Reporting for environmental permitting	Near-term	
A.8	Reporting for water rights	Near-term	
A.9	Reporting for water quality	Near-term	
	Strategic Business Requirements		
S.1	Performance (condition, risk, efficiency, capacity, obsolescence) capture	Near-term	
S.2	Risk (probability of failure, consequence of failure) and criticality capture and use in O&M planning and CIP planning	Near-term	
S.3	Performance and risk based CIP budget development and forecasting	Near-term	
	Regulatory		
	Various reports for local, state, and federal entities	Near-term	
	ISO 55000		
I.1	Asset register that aligns with other verical/facility/plant business units w/in the City	Near-term	
I.2	Connection of CIP decision criteria with City's strategic plan	Near-term	
I.3	Connection of trends in maintenance and operations over time as result of service level driven CIP programming	Near-term	

Appendix B. Functional Requirements

B.1. Functional Requirements

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

Requirement			Priority			
Section	Sub-section	Total # of Requirements	Mandatory	Critical	Important	Desirable
Administrative Requirements	System Performance	11	2	5	4	0
	Integration	9	0	5	2	2
Financial Requirements	Asset Identification and Tracking	6	0	3	0	3
	Capital Planning	16	0	0	0	16
Reporting Requirements	Standard	9	3	3	1	2
Operational Requirements	Asset Inventory and Hierarchy	5	1	3	1	0
	Data Entry	6	0	2	4	0
	Work Orders & Work Tracking	22	1	8	11	2
	Inventory	16	2	4	7	3
	Prioritization	5	0	4	0	1
	Automation	1	0	1	0	0
	Notifications and Triggers	4	0	1	2	1
	Mobile	8	1	2	5	0
	Fleet	4	0	1	1	2
	Totals	**122**	**10**	**42**	**38**	**32**

Priority Definitions:	
Mandatory:	Required and non-negotiable
Critical:	Functionality is critical to the City's core business and EAM goals
Important:	Functionality is directly related to the City's core business and aids overall efficiency and/or effectiveness
Desirable:	Functionality is a "nice to have", but not critical to the City's business

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

1		**Administrative Requirements**	
1.1		**System Performance**	**Priority**
	1.1.1	Provide a system with a deployment history within similar organizations and applications.	Mandatory
	1.1.2	Provide a mature system and methodology for version testing, quality control, release procedures, and technical support.	Mandatory
	1.1.3	Supports permission and security levels based on staff roles (e.g., supervisor, mechanic, contractor, etc.),including third party contractors	Critical
	1.1.4	Provide a system that minimizes the need for City IT support.	Important
	1.1.5	Provide ability to support multiple assets and workflow operations (linear assets, water/sewer plant assets, fleet, warehousing and inventory, facilities, etc.)	Critical
	1.1.6	Allow the user the ability to navigate all screens/modules of the system in a seamless, easy to use flow (e.g. less clicks, intuitive).	Important
	1.1.7	Provide a platform capable of performing well with nominally low internet speeds (web optimized) and in a disconnected state when internet is not available for mobile access. Redundancy should be included to ensure updates during a disconnected state are not lost when reconnected.	Important
	1.1.8	Records all system transactions by user by date to support full transaction audit.	Critical
	1.1.9	System can seamlessly use GIS as the asset register	Critical
	1.1.10	System supports non-GIS asset (e.g. for complex vertical assets) that can be linked to GIS (e.g. building footprint)	Critical
	1.1.11	Support single sign-on	Important
1.2		**Integration**	**Priority**
	1.2.1	Provide an open platform with APIs to enable seamless integration with various 3rd party systems	Critical
	1.2.2	Provide examples of past/current integration with Tyler Munis	Critical
	1.2.3	Support integration with SCADA systems (Wonderware)	Critical
	1.2.4	Support integration with environmental control systems (Ascent Compass)	Desirable
	1.2.5	Support integration with fleet fueling system (Pilot Thomas Logistics)	Critical
	1.2.6	Support integration with vehicle and equipment tracking system (Geotab for Automated Vehicle Location)	Important
	1.2.7	Support integration with the City's public facing (Carson City Connect) system	Desirable
	1.2.8	Support integration with the City's Lightweight Directory Access Protocol (LDAP) system	Important
	1.2.9	Provides library of APIs	Critical
2		**Financial Requirements**	
2.1		**Asset Identification and Tracking**	**Priority**
	2.1.1	Provide the ability to query, filter, visualize on GIS, add to dashboards, all assets participating in a budget forecast scenario as well in a defined project created from budget forecast scenario. (Must be able to query, filter, visualize asset attributes as well as data/calcs from scenarios and projects).	Desirable
	2.1.2	Ability to join or link or integrate Fixed Asset Register (MUNIS) with physical assets in CMMS (book value, salvage value, depreciation, remaining life, etc.); report across MUNIS and CMMS on these data.	Critical
	2.1.3	Allow inventory to be valued at an average cost, LIFO, or FIFO	Critical
	2.1.4	Provide option for inventory to be charged/costed on work orders by any of: average cost, LIFO, or FIFO (via picklist or configuration)	Critical
	2.1.5	Provide capability to initiate and track purchase orders	Desirable
	2.1.6	Provide the capability to capture all associated documentation for contracted maintenance work, non-inventory parts and services, including quotes, invoices, etc. so that it can be recovered by work order (for reporting purposes) by asset number, component number, vendor number/name, or purchase order	Desirable
2.2		Capital Planning	Priority
	2.2.1	Provide capital planning tools that support "if-then" scenarios that calculate the performance (service levels) of the included assets given any combination of: budgets, useful lives, deterioration curve(s), types of interventions, intervention triggers, effect of interventions, cost of interventions, location of assets, and open ended user defined parameters.	Desirable
	2.2.2	Capital planning tools interactive with GIS: can show scenario outputs on map, can interact with outputs using GIS tools (query, select, etc.)	Desirable
	2.2.3	Ability to save "if-then" scenarios, share, compare	Desirable
	2.2.4	Provide the ability to include risk and criticality in "if-then" forecast scenarios for prioritization ability. (See section for *Prioritization*)	Desirable

	2.2.5	Ability to create projects (CIPs) from "if-then" scenarios; filter, sort, add, remove assets to project; over-ride scenario outputs; full interaction with GIS	Desirable
	2.2.6	Project capabilities are integrated with map / GIS.	Desirable
	2.2.7	Ability to forecast "if-then" scenarios over user defined time horizons	Desirable
	2.2.8	Provide ability to track/charge expenses (e.g. maintenance time, material cost, equipment cost, etc.) to multiple accounts.	Desirable
	2.2.9	Track the depreciation of physical asset using multiple options (timeline, condition, etc.)	Desirable
	2.2.10	Provide ability to prepare an integrated capital and operating budget	Desirable
	2.2.11	Provide the ability to display multiple capital program "trend lines" based on different scenarios	Desirable
	2.2.12	Provide the capability to develop charts and graphs from capital program data; ability to feed "if-then" and project data to dashboards	Desirable
	2.2.13	Support connection of capital improvement projects (CIPs) for cost capture – bill to project.	Desirable
	2.2.14	Allow allocation of capital material by funding source and capital project number	Desirable
	2.2.15	Support optimization of expenditures to multiple-assets through multiple budget sources (Federal, state, local, capital, operating and various fund sources within these types of funds)	Desirable
	2.2.16	Either specific capabilities that support an invoicing/billing process, or demonstrated flexibility to configure it	Desirable
3		**Reporting Requirements**	
3.1		Standard	Priority
	3.1.1	Support wide range of calculations within reports (E.g. (Field_1 / Field_2) X Field_3).	Mandatory
	3.1.2	Highly customizable report formatting with report engine having access all tables in the system. Examples: Generate reports that support environmental permitting workflows (e.g. inspections performed, results, status). Generate reports that support water rights decisions (e.g. water use at wells). Generate reports that summarize water quality data (e.g. lab results for wells).	Mandatory
	3.1.3	Support capability to report against combinations of CMMS data, linked/joined/integrated data, project data, 'if-then' forecast data, and GIS data	Critical
	3.1.4	Provide both standard and user definable dashboards capable of displaying metrics, KPIs (calculated values), user defined time periods (e.g. daily, weekly, monthly, etc.), and have access to entire CMMS database, linked/joined/integrated databases.	Critical
	3.1.5	Allow for both internal and external facing access (customer/public portal) for reporting	Desirable
	3.1.6	Provide extensive standard management reports covering assets, inspections, fleet/equipment units, work orders, parts, operations cost, utilization exception reports, inspections, operations, etc.	Desirable
	3.1.7	Provide a user-friendly (average user) ad-hoc reporting capability allowing for access to all EAM management functions (e.g. assets, fleet/equipment, work orders, preventive maintenance, repair history, fuel, inventory and warehousing, etc.).	Critical
	3.1.8	Supports reporting through Esri Portal and/or ArcGIS Online web applications	Important
	3.1.9	Reports can be shared, cloned, and managed by roles and groups	Mandatory
4		**Operational Requirements**	
4.1		Asset Inventory and Hierarchy	Priority
	4.1.1	Provide a flexible/extensible asset data repository to support managing all types of assets and various levels of asset hierarchy (class, system, and location) across each of the City's agencies and transportation modes	Mandatory
	4.1.2	Provide hierarchical views of parent-child asset relationships; the asset hierarchies must be definable by asset class and type; the hierarchy must also be able to extend to the components or parts from which the asset is constructed or created (bill-of-material, BOM), and to define the parts and components that are acceptable to be installed or used for an asset.	Critical
	4.1.3	Provide streamlined data entry processes for repetitive tasks (e.g. drop down menus, bulk entry, fewer screens and clicks, etc.).	Critical
	4.1.4	Support different views against the asset hierarchy based on role and/or group (e.g. requirement for "sandboxing" of data to be set by asset type and role permissions)	Important
	4.1.5	Support serialized assets, components, and parts.	Critical
4.2		Data Entry	Priority
	4.2.1	Support batch upload of data to the system from standard spreadsheet file formats to import various types of data from vendors (e.g., assets, forms, configurations, parts, work orders, etc.)	Important
	4.2.2	Ability for user to improve/add asset data quality and quantity without vendor support.	Critical

	4.2.3	Support self service (without vendor support) ability to customize fields on asset screens and inspection forms without affecting other users views.	Important
	4.2.4	Support the ability to upload/attach documents individually or in bulk to assets, asset systems, work orders, inspections, GIS features, etc.	Important
	4.2.5	Provide streamlined data entry processes for repetitive tasks (e.g. drop down menus, bulk entry, shortcuts, fewer screens and clicks, etc.).	Important
	4.2.6	Seamless GIS integration and ability to leverage GIS for data entry efficiencies: bulk edit an attribute via GIS and/or CMMS queries, bulk edit work orders (example) via GIS query/selection, etc.	Critical
4.3		Work Orders & Work Tracking	Priority
	4.3.1	Provide a display/report of overdue PMs	Critical
	4.3.2	Provide ability to track preventative maintenance requirements performance (wrench timer, days in status, etc.)	Important
	4.3.3	Provide ability to track and identify systems, assets, or components due for PM	Critical
	4.3.4	Support at various preventive maintenance (PM) schedules and time units (time, hours, use, etc.) applicable to each major facility, asset system, asset, component, or piece of equipment.	Critical
	4.3.5	Support hierarchical scheduling of PMs (e.g., if an A, B, C methodology is used, when a C is done it is assumed an A and B have been done and automatically reschedules all three)	Important
	4.3.6	Provide an option to automatically "roll-up" PM jobs due at the same time into one PM workorder based on user-defined criteria	Important
	4.3.7	Provide links to view work/PM/inspection histories, open work including campaigns and projects, current PM/inspection schedules, asset usage/meter readings (including fluids, mileage, hours)	Desirable
	4.3.8	Provide the capability to display inspection, PM, and renewal work histories from linear assets and their features	Important
	4.3.9	Provide project machinery/workstation, tool, and equipment requirements for PM jobs	Important
	4.3.10	Support integration with and link out to manufacturer manuals and part catalogs of selected manufacturers from multiple points including asset records, asset configuration, work planning and tracking, parts catalogs (for fleet, operations equipment, plant equipment, etc.)	Important
	4.3.11	Drag/Drop work order form builder (no coding) that creates work order templates that can be copied, shared, imported, exported.	Desirable
	4.3.12	Ability to link service requests to work orders, when one closes have option to automatically close other	Important
	4.3.13	Ability to pre-define work order assignments and routing based work order activity types	Important
	4.3.14	Ability to auto-populate work orders with default information based on work order activity types	Important
	4.3.15	Ability to control what type of asset(s) a work order can be attached to	Critical
	4.3.16	Ability to require work order fields (any field, to include configured/custom fields) to be required	Critical
	4.3.17	Ability to attach a single asset or multiple assets to a work order	Mandatory
	4.3.18	Ability to see work orders on calendar, drag / drop work orders across calendar, auto-check for resource conflicts	Important
	4.3.19	Ability to trigger work orders from internal and external triggers (elapsed time, SCADA, fueling systems, email, etc.)	Critical
	4.3.20	Ability to set flags, notifications, alerts, internal and external auto-generated emails	Important
	4.3.21	Ability to embed condition inspection and risk assessment forms into work order that populate the condition and risk application features	Critical
	4.3.22	Ability to designate assets that can be used as equipment on a work order	Critical
4.4		Inventory	Priority
	4.4.1	Provide ability to record account numbers and cost centers for all inventory transactions and link to billing	Critical
	4.4.2	Maintain audit trails for all inventory transactions	Critical
	4.4.3	Provide multiple value/cost fields including purchase price, issue cost, return value (see Inventory Valuation Sub-Category for additional requirements)	Critical
	4.4.4	Provide ability to record shelf life designation and time limits to expiration	Important
	4.4.5	Provide ability to view purchase information from the item record including date/quantity last ordered, date/quantity last received, previous vendors and PO numbers with purchase prices	Important
	4.4.6	Provide ability to store lead time for replenishment	Desirable
	4.4.7	Provide the capability of tracking item by multiple item types and/or sub-types including serial number (if a serialized component), heat/lot/batch number	Important
	4.4.8	Maintain part warranty information by part number, vendor number and date last purchased	Desirable
	4.4.9	Allow hierarchy of inventory items for sub-assemblies and relate to parent item	Important

	4.4.10	Provide ability to change a bin location for an asset stock number and generate bin labels on demand(description, part number, OEM part number, bin location, hazardous material rating)	Important
	4.4.11	Support warranty related management activities (e.g. time tracking, invoicing, repair, inventory transactions, etc.).	Important
	4.4.12	Provide real-time monitoring of inventory, monitoring/tracking of inventory on active and future pending work orders	Critical
	4.4.13	Integrate with bar code technology and RFID technology	Important
	4.4.14	Provide flags on items to allow/deny purchase activity and support depleting stock through issue transactions without triggering or allowing further purchase	Desirable
	4.4.15	Provide full inventory interaction / transactions on work orders.	Mandatory
	4.4.16	Provide average cost, LIFO, and FIFO	Mandatory
4.5		Prioritization	Priority
	4.5.1	Provide the ability to prioritize assets (for replacement, inspection, work orders, etc.) based on risk, condition, or both	Critical
	4.5.2	Provide the ability to prioritize and track investment across the organization, including viewing the operating and capital outlook across organization	Critical
	4.5.3	Trigger work orders, inspections, electronic notifications based on: condition, risk, remaining life, work order count, accumulated work order costs	Critical
	4.5.4	Allow an authorized user to adjust the priority of a work order moving a work order up in the work queue	Desirable
	4.5.5	Seamless GIS integration with condition and risk allowing asset selections to be made for adding to work orders, projects, "if-then" forecast scenarios	Critical
4.6		Automation	Priority
	4.6.1	Provide ability to create user-defined business rules to automate workflows (work order creation, scheduling, closing, archiving, invoicing, etc.) based on recent work performed, condition, time, etc.	Critical
4.7		Notifications and Triggers	Priority
	4.7.1	Allow the user to set user-defined (time, condition, inventory count, etc.) triggers for alerts/emails related to inspections, permitting, ordering, etc.	Critical
	4.7.2	Provide work scheduling and work transparency (e.g. robust auto-notification between requestor and provider regarding status, priority, etc.).	Desirable
	4.7.3	Provide ability to specify user-defined criteria for (work orders, inspections, notifications, etc.) triggers using internal and external sources (e.g. time since last work order, SCADA, etc.). Related to automated work order creation.	Important
	4.7.4	Create or trigger work orders or inspections from a condition or set of conditions; from risk or set of risks (consequences or probabilities of failure).	Important
4.8		Mobile	Priority
	4.8.1	Mobile component must support iOS and preferably support Windows/Android as well	Mandatory
	4.8.2	Support access to the system for any role via multiple technologies including PCs, laptops, tablets, smartphones, kiosks	Critical
	4.8.3	Support fully featured inspections (condition, risk, custom forms) and work orders when in disconnected state - sync data up to system & receive new work coming down to device; attaching & viewing documents works in connected and disconnected states	Important
	4.8.4	Support real-time counts using bar code readers (see Inventory RF Bar Code Processing Sub-Category) and mobile devices/ handhelds	Important
	4.8.5	Provide the capability to identify assets and maintain asset information and attributes (add, edit, record location, move, assign/reassign, record measurements, etc.) in real-time using mobile devices with bar code, RFID readers, and/or similar survey/geolocation technology	Important
	4.8.6	Support capture of facilities / vertical assets inspection on mobile device (connected and disconnected)	Important
	4.8.7	Mobile apps are integrated with GIS - Ex can see work orders on GIS map via mobile app; GIS feature works in connected and disconnected states.	Critical
	4.8.8	Mobile component must recover "gracefully" when transitioning from a disconnected state to a connected state	Important
4.9		Fleet	Priority
	4.9.1	Calculate the remaining mileage and mileage percentage for different fleet types based on actual mileage that are entered for each configuration and the total mileage allowance for the month	Critical
	4.9.2	Ability to treat fleet similar to traditional assets for purpose of extending capital tools and project tools to Fleet.	Desirable
	4.9.3	Ability to combine additional fleet data into capital planning such as: projected service miles by fleet series, estimated vehicle life in miles and in years, depreciation, current vehicle age	Desirable
	4.9.4	Provide for unlimited warehouses and mobile warehouses (e.g. inventory on fleet trucks)	Important

B.2. ISO 55000

Best Practices in Asset Management to Consider When Implementing an EAM System

Guidance: Applying ISO 55000

January 20th, 2020

ATKINS

Member of the SNC-Lavalin Group

VERSION HISTORY

Version #	Updated By	Revision Date	Reason
0.1	Ryen Tarbet	January 20th, 2020	Supporting documentation.

DOCUMENT ROLES AND RESPONSIBILITIES

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REFERENCED DOCUMENTS

Document	Version	Date
ISO 55000 series of standards	v.2	*2018 Release*

Table of Contents

1 Introduction to ISO 55000

The international standard for asset management is ISO 55000, produced by the International Standards Organization, Geneva, Switzerland. The standard is consensus based and is the result of over 10 years of collaboration from more than 100 countries. The American National Standards Institute (ANSI) is the national standards body for the United States, and it is ANSI that houses the US technical advisory group (TAG), which is charged with developing the position and input to the standard for the United States. The national standards bodies of other countries interface with ISO to contribute their input. All of these standards bodies field delegates that meet several times a year in order to collaborate with each other while actively adding to and revising the ISO 55000 standard.

ISO 55000 lays out the core principles of what an asset management system is and the best practices for its implementation. There is a wide and ever-growing body of literature, guidance materials, certification programs, and technical manuals that provide a great deal of supporting information beyond the contents of the ISO 55000 standard itself. These supporting materials come from a number of international organizations focused on the advancement and maturity of the field of asset management as well as government entities and the private sector. Two prominent organizations are The Institute for Asset Management (also called the IAM) and International Public Works Europe & Australasia (IPWEA), both of which produce what is considered the most definitive supporting guidance and educational materials.

It is very important to make the distinction between an asset management system as defined by ISO 55000 and what is commonly called an "asset management system" when referring to various software systems. The term "asset management system" in reference to software is a misnomer. An asset management system as defined by ISO 55000 is an actual management system composed of tools, including policies, business plans, organizational change management, audit and controls, business processes and information systems, which are integrated to enable the organization as a whole to coordinate its efforts in deriving value from its assets. Software is a wonderful tool, or enabler, within an asset management system but it is NOT the management system itself.

1.1 Difference between Asset Management and Managing Assets

For as long as humans have owned physical objects that required some form of management, we have been managing assets. The act of managing assets can be, and very often is, done without consideration to the overall context of the organization and its goals and objectives. This is seen when an EAM software system is implemented one business unit or function at a time (e.g. implement work orders for the water department, then parks & rec., etc.) and for a subset of that function that is not concerned with getting value FROM the asset but is more interested in tracking labor, equipment, and materials.

Asset management has a broader focus than managing assets. Asset management occurs when the organization as a whole (not silo'ed departments) understands how the use of its assets generate value to its stakeholders and implements formal processes to ensure assets are managed to this end. As a result, asset management is a top down process that requires the support and engagement of executive management to be truly effective.

Figure 1 provides specific examples of the difference between Asset Management and the Management of Assets.

Managing Assets	Asset Management
Your **colleagues** are focused on: • Asset data, location and condition assessment • Current KPIs • Department budget	Your **colleagues** are focused on: • Information supported decisions (strategic context and related to customer needs) • Strategies to select and exploit assets over their lifecycles to support business aims • Collaboration across departments to optimise resources allocated and activities
Your **stakeholders** are focused on: • Costs • Current performance • Response to failures / maintaining function	Your **stakeholders** are focused on: • Triple bottom line and value • Clarity of purpose of the organization • Focus on impact of activities on organization's objectives
Your **top management** is focused on: • Short term gain / loss • Departmental / individual performance • Savings, especially OPEX	Your **top management** is focused on: • Long term value for the organization • Developing competence and capability across workforce • Business risks understood and mitigated
Your **suppliers** are focused on: • Short term contracts and performance • Service level agreements are focused on contract specifications	Your **suppliers** are focused on: • Long term contracts and/or partnering relationships in support of client value and objectives • Understanding client strategy and needs in 5-10 years

Figure 1: Managing Assets versus Asset Management

Carson City is well positioned to implement any new EAM system to meet the needs of both managing assets as well as asset management.

1.2 Core Components of an Asset Management System

The core components of any asset management system are:

- Asset Management Policy
- Strategic Asset Management Plan
- Asset Management Plan(s)

It is through these three mechanisms that top management, which is ultimately responsible for delivery of value to the organization's stakeholder, is connected to the activities and decisions performed at the asset level. This is called "line of sight".

1.3 Asset Management Policy

An asset management system begins with a formal asset management policy. The policy lays out the high-level objectives for asset management. The policy is drafted by top management, approved by the board and/or top stakeholders, signed, and made widely accessible. Asset management policies should be concise and are often not more than a few pages at most (one page is not uncommon).

The asset management policy from the City of Portland (OR) Bureau of Transportation (PBOT) can be found here: https://www.portlandoregon.gov/transportation/article/456762 as an example. Figure 2.a below shows an excerpt from the policy that succinctly captures the high-level asset management objectives of the Bureau.

"Asset management is the strategy that allows us to make the right amount of investment in the right asset at the right location at the right time. It is through evidence-based decisions that PBOT spends our financial resources to manage our physical assets for the best long-term benefit."

Figure 2.a: Sample excerpt from Portland Bureau of Transportation asset management policy

1.4 Strategic Asset Management Plan

The strategic asset management plan (SAMP) lays out what the specific activities are that must be carried out in order for the policy to be made operational. These activities are the goals and objectives of the asset

management system (which support the goals and objectives of the organization as a whole, and as stipulated in the asset management policy). The SAMP also defines the asset management decision making criteria.

Decision Criteria

For example, in the above policy the high-level goals include "....investment in the right asset at the right location at the right time...". What falls out from this are the 5 broad asset management questions and the related activities that will be carried out to support answering the questions. The broad activities listed are the asset management objectives and will cascade into more sub-activities that will be detailed further in the SAMP. To answer each of the asset management questions, decision criteria must be determined, and specific asset information will be needed to support the criteria.

Regarding the specific asset information required to support decision criteria, this often is 'condition' information. For example, pavement condition index (PCI) scores, facility condition index scores (FCI), pipeline assessment scores (PACP), and a whole variety of condition, performance, fit for purpose, obsolescence, safety, and other scores / asset information are used to support decision making. The cost to collect this information should be justified by its value to the organization in its decision making process and its robustness and transparency.

Levels of Service

A critical component of the SAMP is explicitly defining target levels of service for (the City's) assets (figure 2.a, box 2). Best practice is to connect measurable elements / characteristics of the asset to a target level of service (LOS). Two good examples are:

1. Pavement – pavement condition measurements are well understood and can be clearly connected to the driver's experience. By connecting ranges of pavement condition scores to service level targets (e.g. 90% of arterial collectors to have PCI score >=70) we make a clear connection between how the asset is managed and the value (nice smooth road, safer road, better draining road, less vehicle wear, better traffic flow, etc.) we get from it. When arterial collectors fall below a PCI score of 70, a criterion has been met that can trigger asset management decisions (e.g. pavement renewal).

2. Neighbourhood Park – condition scores (as well as scores for an asset's obsolescence, fit for purpose, capacity, etc.) can be developed for individual components of the park, and roll-up to an overall park score. As with pavement, by connecting score ranges to service levels, we can set a target service level and then manage the components of the park (or a portfolio of parks) to meet the target.

Asset Information Requirements

A best practice to point out is the concept of asset information requirements. As mentioned above under Decision Criteria, asset information requirements should follow from Policy to Strategy. The time and money spent collecting, storing, and analysing raw data that can become actionable information is driven by top down needs and connected to the creation of value to stakeholders. Too often our local governments attempt to launch an asset management program only to wind up spending tremendous amounts of money

on data collection; where the stakeholders driving the decision of what data to collect and to what level of detail are mentally engaged with "managing assets" and not "asset management". The result can run the risk of collecting very expensive data that cannot drive the asset management decision making process; or enable "...investing in the right asset at the right location at the right time...".

The converse can also happen, where a small and focused data collect is performed to meet a narrow need and the opportunity to expand the collect against clear asset management data needs is missed.

Both scenarios provide a rational for formally creating an Asset Manager role in the organization and to create a process that forces data collection activities to be coordinated through the asset management office. Similar interfacing between engineering, operations, maintenance, information technology, and finance & accounting all have a rational and need for an Asset Manager and an asset management office.

The SAMP has many other facets. However, best practice dictates the SAMP is a living document and can grow as the maturity of the asset management program grows over time. One need not feel compelled to create an exhaustive SAMP that is not proportional to the asset management system in practice. This can be frustrating and time-wasting exercise that is easily avoided.

The PBOT policy contains elements of the their SAMP within it (e.g. the 1 – 5 activities). There is no right or wrong regarding some level of overlap. The benefit of this overlap is that the general public can get a deeper sense of what PBOT does regarding asset management than if they only saw the policy statement.

1.5 Asset Management Plan (AMP)

Asset management plans (AMP) should lay out the near term, tactical activities that will be performed against an asset or group of assets in order to meet the service level targets. This includes maintenance programming, inspections, reporting, capital renews, and data analysis and reporting.

The AMP should consider the context surrounding the asset (e.g. park in a neighbourhood that is growing older, the AMP may call for running the basketball courts at a lower LOS while it prepares to reconfigure them to pickle-ball). The context of the asset provides a connection to its strategic management and its practical day to day management. As with the pickle-ball example, a City may let certain roads deteriorate a great deal and then convert them to gravel because a new road alignment will cut nearly all traffic.

The AMP lays out actual CIP planning, near-term (next 5 years) operations, maintenance, and capital investment plans for the asset(s).

A best practice when developing asset management plans is to look across asset classes and types. An example is for the roads department to coordinate its pavement renewal programming with the water and sewer departments. By looking across asset types within a spatial and temporal window, opportunities present to combine assets into single CIP programs.

Figure 2.b: Sample table of contents for an Asset Management Plan

2 Best Practices for Asset Hierarchies

The development of an asset hierarchy is often one of the most challenging steps in the implementation of an asset management system as well as in the implementation of an EAM software system. One reason for this, especially in local government, is the very different physical configuration of various types of assets. This section will provide common practices in developing asset hierarchies for a few common asset classes found in local government.

2.1 Fleet and Reliability Centered Maintenance

One of the most widely used standards for creating asset hierarchies in the fleet management and reliability centered maintenance fields (manufacturing, aerospace, petroleum, nuclear, etc.) is ISO 14224. The asset hierarchy is developed from a systems (engineering) perspective, where a system boundary delineates the asset from the larger 'asset system' (e.g. turbine on the plane = asset, plane itself = asset system). The asset has components or sub-systems (e.g. pump has a transmission, turbine has gas compressor). Each component is broken down to what is known as the "lowest maintainable unit" or LMU. This is where no more subdivision occurs and if a failure happens or a poor condition is found, the LMU is simply removed and another one is installed.

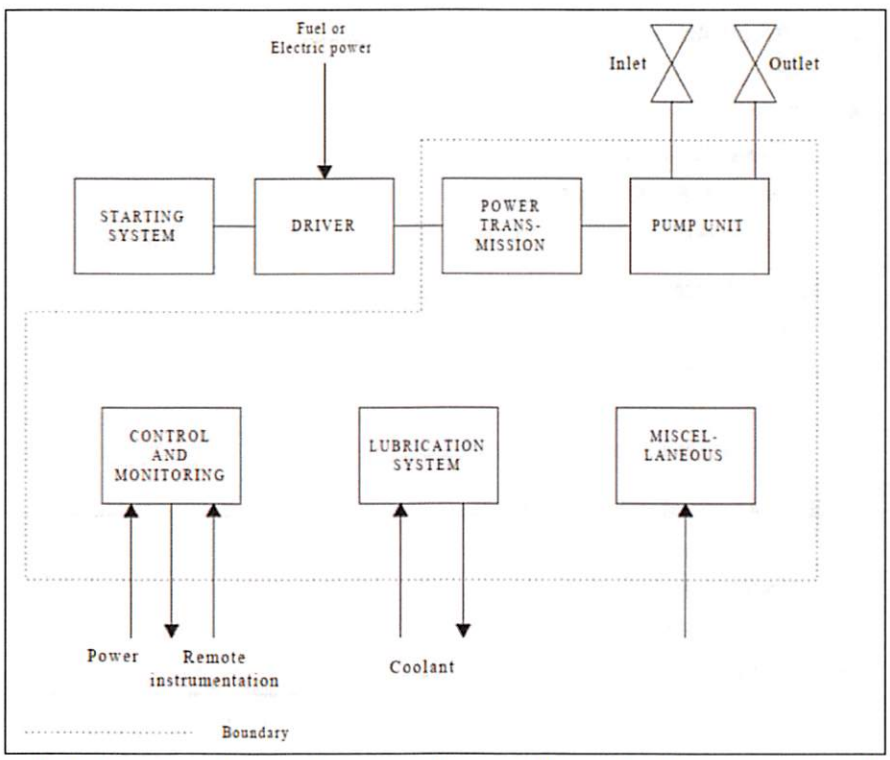


Figure 3: Example of a boundary diagram for a pump (pump is the asset with components making it up)

The great benefit of this of the ISO 14224 approach to building asset hierarchies is that it is directly connect to inventory and the supply chain. For fleet and more industrial type facilities this is very important.

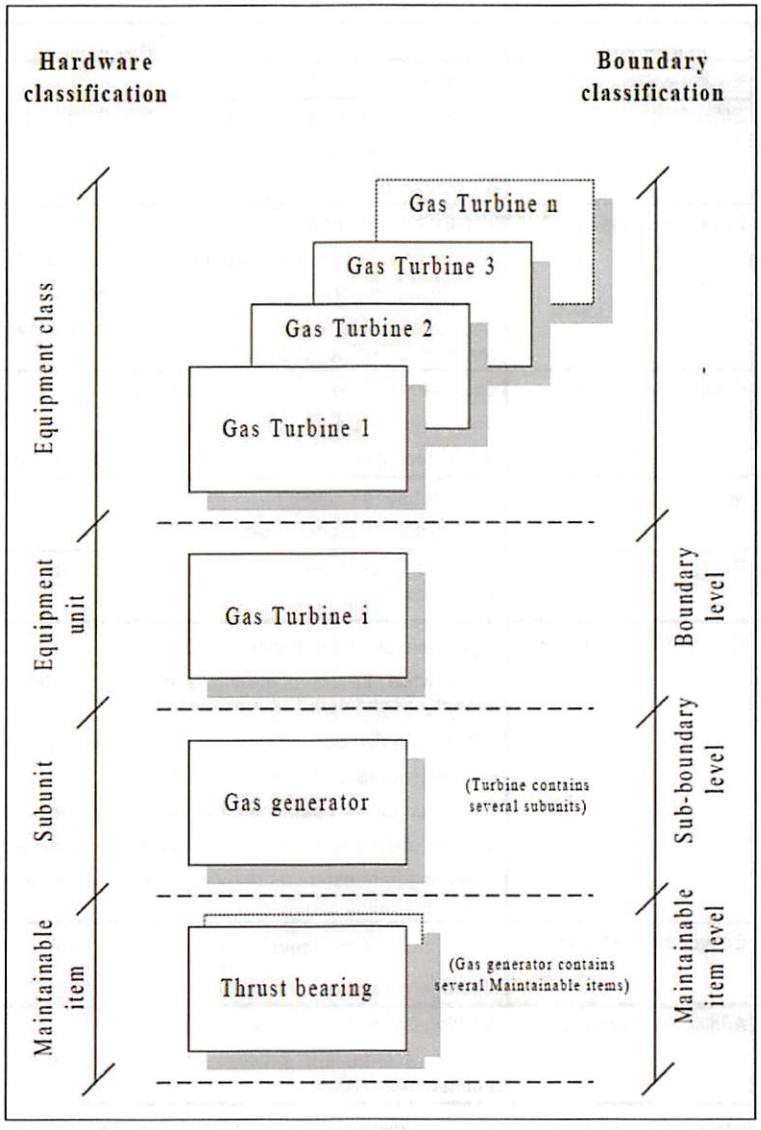


Figure 4: Example asset hierarchy (ISO 14224) [asset is referred to as 'equipment' in this standard]

Another benefit of the ISO 14224 approach to building asset hierarchies is the accompanying asset information data schema to support formal reliability centered maintenance (RCM).

Main categories	Subcategories	Data
Identification	Equipment location	Equipment tag number (*)
	Classification	Equipment unit class, e.g. compressor (see annex A) (*) Equipment type (see annex A) (*) Application (see annex A)(*)
	Installation data	Installation code or name (*) Installation category, e.g. platform, subsea, refinery (*) Operation category, e.g. manned, remote controlled (*) Geographic area, e.g. Southern North Sea, Adriatic Sea, Gulf of Mexico, continental Europe, Middle East
	Equipment unit data	Equipment unit description (nomenclature) Unique number, e.g. serial number Subunit redundancy, e.g. number of redundant subunits
Design	Manufacturer's data	Manufacturer's name (*) Manufacturer's model designation (*)
	Design characteristics	Relevant for each equipment class, e.g. capacity, power, speed, pressure, see annex A (*)
Application	Operation (normal use)	Equipment unit redundancy, e.g. 3 × 50 % Mode while in the operating state, e.g. continuous running, standby, normally closed/open, intermittent Date the equipment unit was installed or date of production start-up Surveillance period (calendar time)(*) The accumulated operating time during the surveillance period Number of demands during the surveillance period as applicable Operating parameters as relevant for each equipment class, e.g. operating power, operating speed, see annex A
	Environmental factors	Ambient conditions (severe, moderate, benign) [a] Interior environment (severe, moderate, benign) [b]
Remarks	Additional information	Additional information in free text as applicable Source of data, e.g. process and instrumentation diagram, data sheet, maintenance system

[a] Features to be considered, e.g. degree of protective enclosure, vibration, salt spray or other corrosive external fluids, dust, heat, humidity.

[b] Features to be considered, e.g. for compressor, benign (gas - clean and dry), moderate (some droplets corrosion), severe (sour gas, high CO_2, high particle content).

Figure 5.a: ISO 14224 asset (called 'equipment' in the standard) data schema

Table 2 — Failure data

Category	Data	Description
Identification	Failure record (*)	Unique failure identification
	Equipment location (*)	Tag number
Failure data	Failure date (*)	Date of failure detection (year/month/day)
	Failure mode (*)	At equipment unit level (see annex A)
	Impact of failure on operation	Zero, partial or total (safety consequences may also be included)
	Severity class (*)	Effect on equipment unit function: critical failure, non-critical failure
	Failure descriptor	The descriptor of the failure (see Table B.1)
	Failure cause	Cause of the failure (see Table B.2)
	Subunit failed	Name of subunit that failed (see examples in annex A)
	Maintainable item(s) failed	Specify the failed maintainable item(s) (see annex A)
	Method of observation	How the failure was detected (see Table B.3)
Remarks	Additional information	Give more details, if available, on the circumstances leading to the failure, additional information on failure cause, etc.

Table 3 — Maintenance data

Category	Data	Description
Identification	Maintenance record (*)	Unique maintenance identification
	Equipment location (*)	Tag number
	Failure record (*)	Corresponding failure identification (corrective maintenance only)
Maintenance data	Date of maintenance (*)	Date when maintenance action was undertaken
	Maintenance category	Corrective maintenance or preventive maintenance
	Maintenance activity	Description of maintenance activity (see Table B.4)
	Impact of maintenance on operation	Zero, partial or total, (safety consequences may also be included)
	Subunit maintained	Name of subunit maintained (see annex A) [a]
	Maintainable item(s) maintained	Specify the maintainable item(s) that were maintained (see annex A)
Maintenance resources [b]	Maintenance man-hours, per discipline [b]	Maintenance man-hours per discipline (mechanical, electrical, instrument, others)
	Maintenance man-hours, total	Total maintenance man-hours
Maintenance time	Active maintenance time	Time duration for active maintenance work on the equipment [c]
	Down time	Time interval during which an item is in a down state
Remarks	Additional information	Give more details, if available, on the maintenance action, e.g. abnormal waiting time, relation to other maintenance tasks

[a] For corrective maintenance, the subunit maintained will normally be identical with the one specified on the failure event report (see 7.2).

[b] For subsea equipment, the following apply:

— type of main resource(s) and number of days used, e.g. drilling rig, diving vessel, service vessel (*);

— type of supplementary resource(s) and number of hours used, e.g. divers, ROV/ROT, platform personnel.

[c] This information is desirable for RAM and RCM analyses. It is currently infrequently recorded in the maintenance management systems. The reporting of this information shall be improved.

Figure 5.b: ISO 14224 asset (called 'equipment' in the standard) data schema

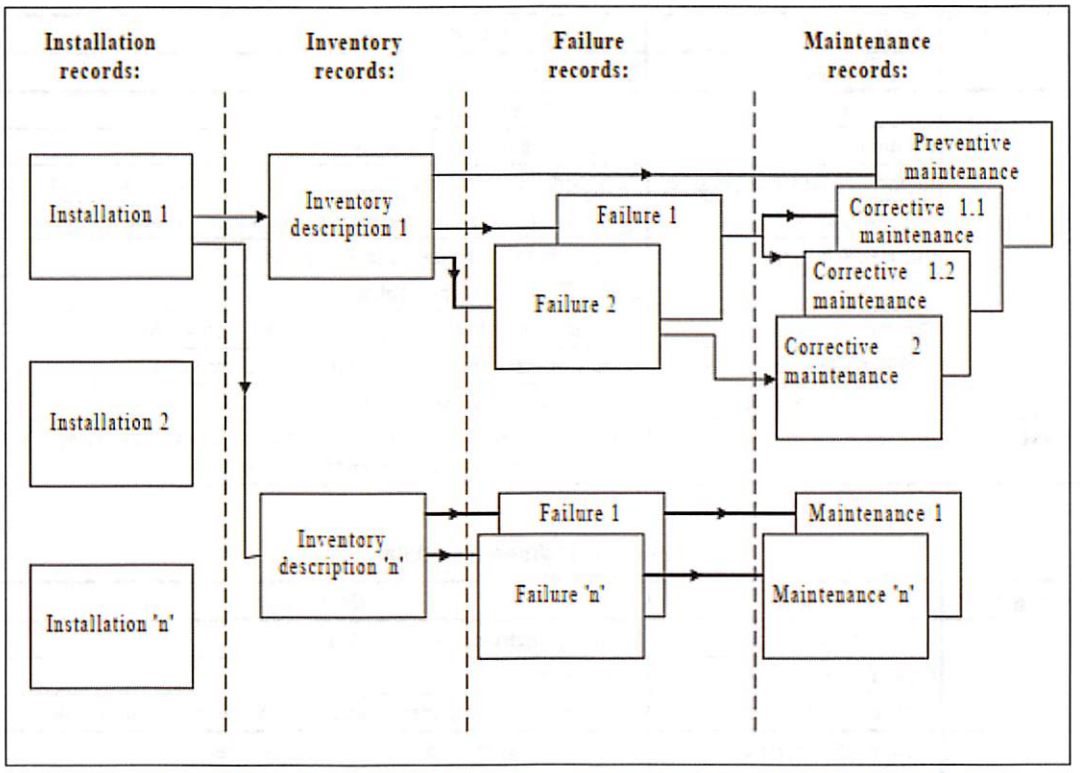


Figure 5.c: ISO 14224 asset (called 'equipment' in the standard) database structure

2.2 Pavement

One the most common asset hierarchies for pavement is the Network, Branch, Section model. This model was developed by the US Army Corps of Engineers, Engineer Research and Development Center, Construction Engineering Research Laboratory (CERL) at Colorado State University. This simple hierarchy is widely used across North America in federal, state, and local government and is also a common hierarchy standard used by the commercial pavement inspection industry. The model is here:
https://www.pdhexpress.com/pdhcourse/pdf/pavement_maintenance2.pdf

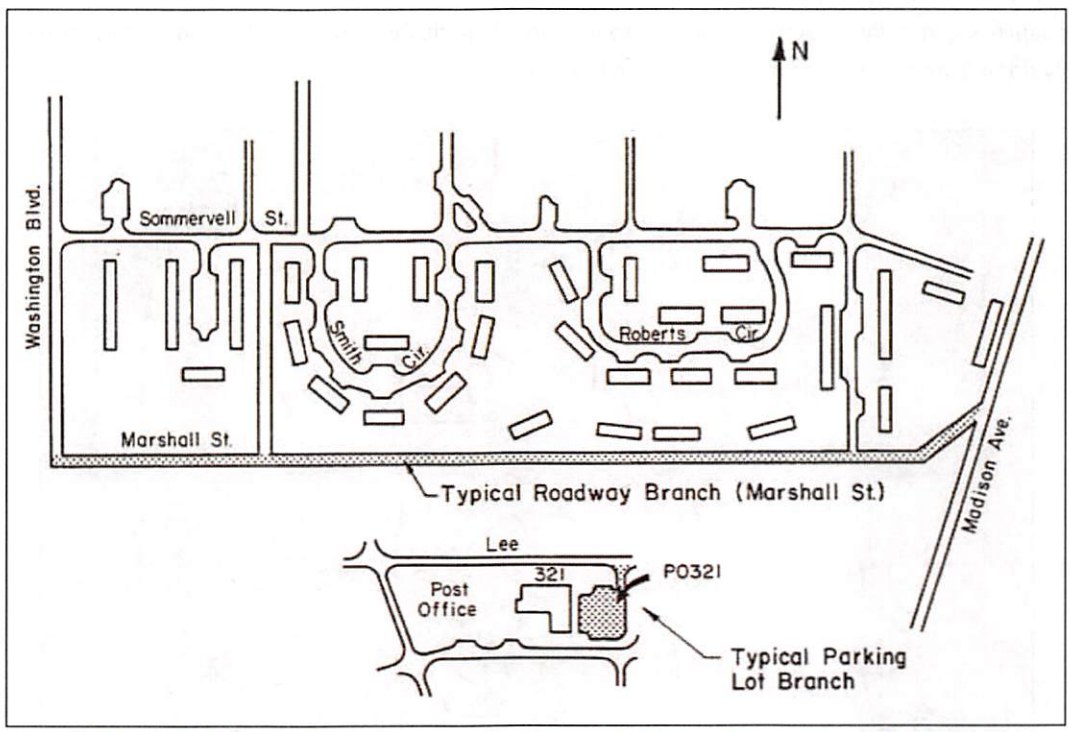


Figure 6: Example of pavement network (whole thing) and branch (as called out)

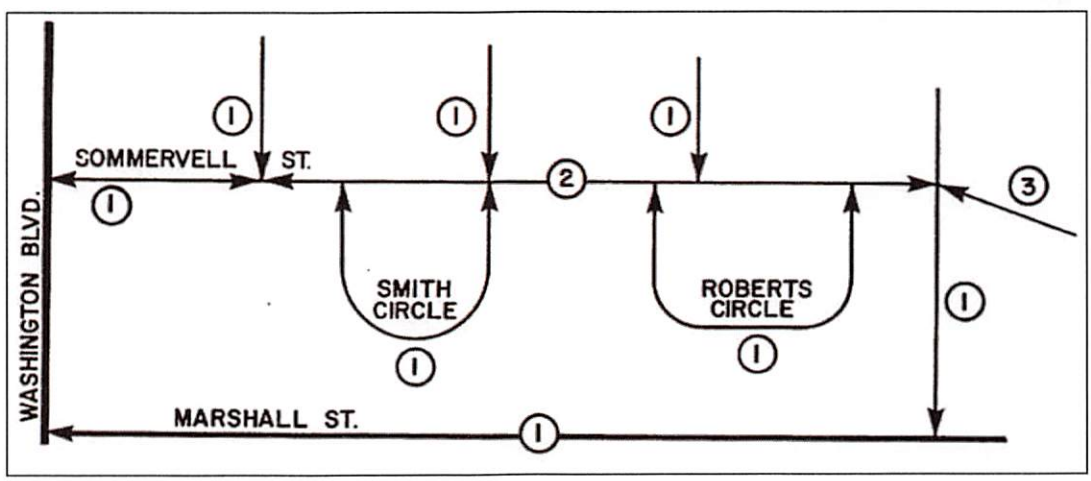


Figure 7: Example of pavement sections (numbered).

2.3 Sewer and Storm

Sewer and storm systems asset hierarchies often predicated on how these systems are condition inspected. The most common condition inspection approach is to inspect from the upstream manhole to the downstream manhole and assign that length of piping a score. Manholes themselves are separate point assets with their own condition scores (and work orders).

This creates a rather flat hierarchy, where typically groups of pipes and manholes will belong to zones or areas. This form of hierarchy lends itself very well to both maintenance and capital planning. As maintenance is generally done from manhole to manhole (e.g. flushing, pigging, etc.) and capital projects are typically done from manhole to manhole as a minimum size.

Figure 8: Example of sewer system broken up from manhole to manhole; Green to Red symbolizes Good to Poor condition.

2.4 Water Systems

Developing an asset hierarchy for water systems can be challenging because in a pressurized system where water can flow in either direction, there is not a natural segmentation to the pipelines like there is with sewer and storm. Furthermore, how water mains are condition inspected does not typically result in a discrete score assigned to a corresponding discrete run of pipe as it does with sewer, storm, and pavement.

Common methods for creating an asset hierarchy for water systems include:

1. Valve to valve; diameter to diameter; material to material; combinations thereof
2. Entire pressure zone is the asset; work (operating or capital) is done on components that are either valve to valve, intersection to intersection, etc.
3. Modeled after the Network, Branch, Section approach used for pavement; requires asset data to enable delineation of sections in a similar fashion that pavement does.

Valves, ARVs, PRVs, meters, meter pits, curb-stops, laterals are commonly all their own assets.

2.5 Buildings & Facilities, Plant

Uniformat II provides a robust and commonly used hierarchy for buildings. This hierarchy is widely used in the insurance, property assessment and valuation industries for calculating the Facility Condition Index score.

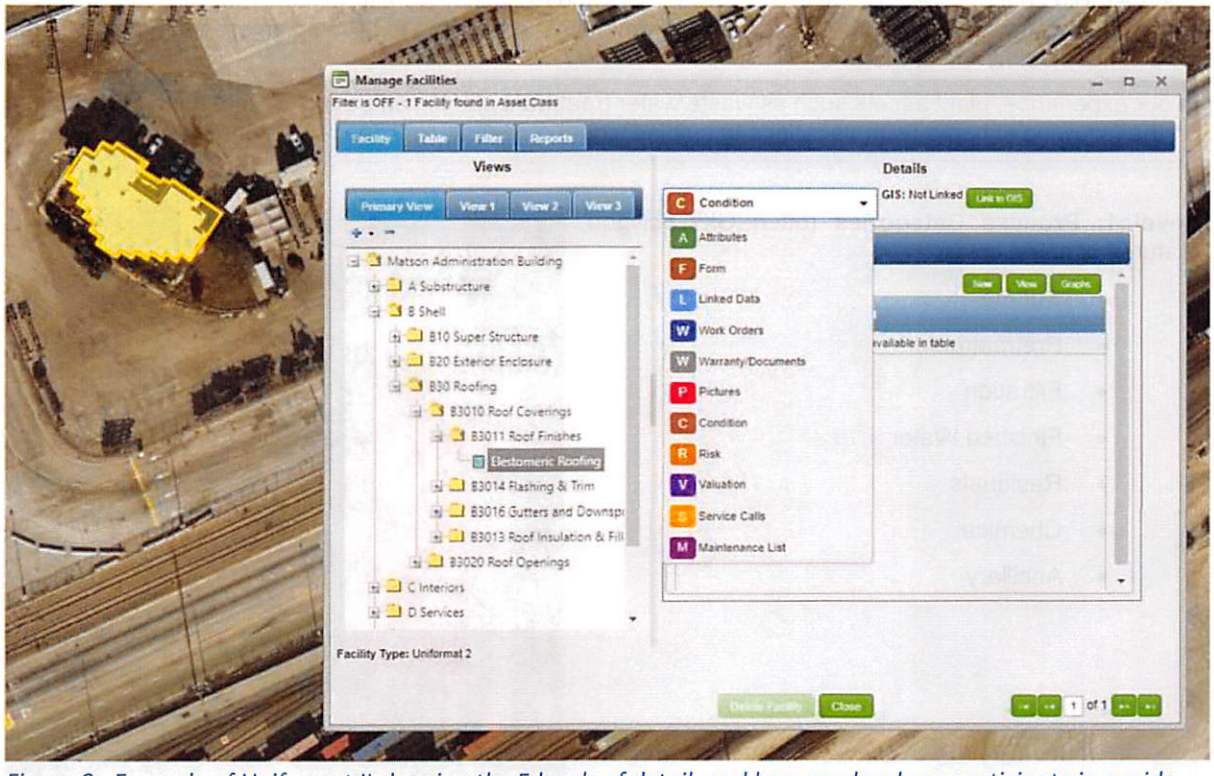


Figure 9: Example of Uniformat II showing the 5 levels of detail, and how any level can participate in a wide variety of EAM activities (e.g. work orders, condition inspections, risk assessment, document attachment, etc.).

A key benefit of Uniformat II is that it allows very granular assets to be defined, and they can roll-up to higher level building systems, providing information at different scales with a single building and across a whole portfolio of buildings. Furthermore, the RSMeans nationwide facility costing database follows Uniformat II.

Building System	Estimated Cost	Percentage of Total Cost
B20 Exterior Enclosure	$5,192	0.4%
C10 Interior Construction	$2,943	0.2%
C30 Interior Finishes	$282,852	21.4%
D20 Plumbing	$18,900	1.4%
D30 HVAC	$26,700	2.0%
D40 Fire Protection Systems	$451,653	34.1%
D50 Electrical Systems	$536,888	40.5%
Total	**$1,325,128**	**100%**

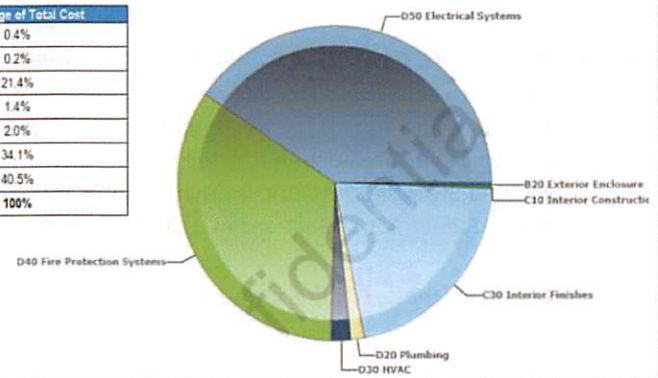


Figure 9: Cost estimates generated by linking RSMeans to the inspection results of a building (Uniformat II)

2.6 Plant Assets

We are calling out plant assets separately from "Fleet and Reliability Centered Maintenance" and "Buildings & Facilities". The reason for this is because a common best practice is to develop an asset hierarchy based on a conceptual hybrid of the two.

In our experience, plant assets such as waste/water treatment plants can be broken into a hierarchy based on the following schema (with variations to suit individual organizational needs):

Level 1: Process Categories (often GIS polygon features of same color)

- Source
- Pretreatment
- Filtration
- Finished Water
- Residuals
- Chemical
- Ancillary

Level 2 – Sub-Process (often GIS polygon features of different colors)

- Chemical Systems
  - Chlorine Dioxide Generators
  - Hydrochloric Acid System
  - Sodium chlorite System
  - PACL System
  - Caustic System
  - Sodium Hypochlorite System
  - Liquid Ammonium Sulfate System
- Ancillary
  - Sanitary Lift Station
    - HVAC – Uniformat II
    - Buildings - Uniformat II
    - Electrical - Uniformat II
    - Etc.

Level 3 – Assets

Level 4 – Components

NOTE: work orders, inspections, costs, risk, etc. can be captured at either the asset or component level. Best practice is to capture at the lowest level and roll-up to the asset level.

Example:

Carson City Treatment Plant #43

Level 1: Chemical

Level 2: Hydrochloric Acid System

Level 3: Instrumentation

Level 3: Peristatic Pumps

Level 4: Hydrochloric Acid Feed Pump (Asset ID: HCAFP-1234)

Level 5: Pump Motor (lowest maintainable unit, inventory item)

Level 5: Pump Gearbox

Level 5: Input/Output Power Control Unit

Level 3: Tanks

Level 3: Automatic Valves

3 ISO 55000 - Findings and Recommendations for Carson City

The level of awareness and understanding of "what is" asset management is relatively mature at Carson City compared to most local governments in the US. This assessment is made based on pre-workshop discussions with City stakeholders, the actual workshops, and findings and outcomes from the workshops to include the City's own prioritized EAM functional requirements (that are reflective of a relatively more mature understanding of and desire for asset management).

While the City desires to implement an asset management program that will mature over time, currently it is focused on replacing or reimplementing the existing CMMS system. This is a pressing need that stems from the City's inability to smoothly manage day to day operations and maintenance, inspections, and capture and report cost and activity information across departments. Improving these business functions is a key enabler for the City to progress/mature asset management capabilities.

3.1 Value Framework

Atkins held a workshop with the City's top management to explore and capture leadership's understanding of how EAM software can enable the City to best deliver value to its citizens and stakeholders. The following value themes were captured:

- Sustainable Infrastructure: leadership re-affirmed the 'sustainable infrastructure' goal within the City's Strategic Plan. Sustainable infrastructure is the continual provision of services (clean water, mobility [streets], etc.) at a cost for service that is well understood and achievable over any planning horizon.
- Asset Investment Planning Transparency: City leadership desires more data driven decision making in the capital budgeting and planning process. Specifically, the ability to connect asset investment needs (e.g. poor condition city street needs 1 inch pavement overlay) to delivery of stated City goals (e.g. safe and efficient transportation).
- Financial Alignment: Connecting the financial asset register to the physical asset register to achieve a common understanding of 'what is an asset' across finance, accounting, engineering, operations, and maintenance; enabling the City as whole to apply the capabilities from all business areas to the optimal management of assets.

City leadership recognizes that the time scales over which the above values can be reflected in the implementation and use of an EAM software system are longer than the implementation (or re-implementation) of an EAM software system. However, these values are reflected in the EAM functional requirements developed between Atkins and the City, were presented in the vendor questionnaires, and influenced the demonstration script content and scoring.

Importantly, and in reference to the current ability of the City to implement and operationalize these values in the form of software features and business processes, Atkins and the City gave careful consideration to not becoming overly focused on EAM features/functions that outpaced the City's capability to use them in the near to mid-term.

3.2 Asset Management Maturity Assessment and Roadmap

Conducting an asset management maturity assessment will provide the City with a robust framework connecting the new (or re-implemented) EAM software system to the mission and goals of the City as a whole. This is important because it is common, and difficult to prevent, EAM software implementation to be focused on the immediate and internal needs of individual business functions. When EAM software is not connected to larger Citywide goals, and is instead focused on meeting the immediate needs of individual users and/or silos, the physical implementation of the software often reinforces or repeats past shortcomings where data from one department is not easily shared to or combined with data from other departments to enable realization of the City's values (section 3.1).

Asset management maturity assessments come in many shapes and sizes ranging from self-assessments to highly detailed assessments performed by 3rd parties. An example of the output of the Institute for Asset Management's self-assessment tool (web-based tool) is shown below.

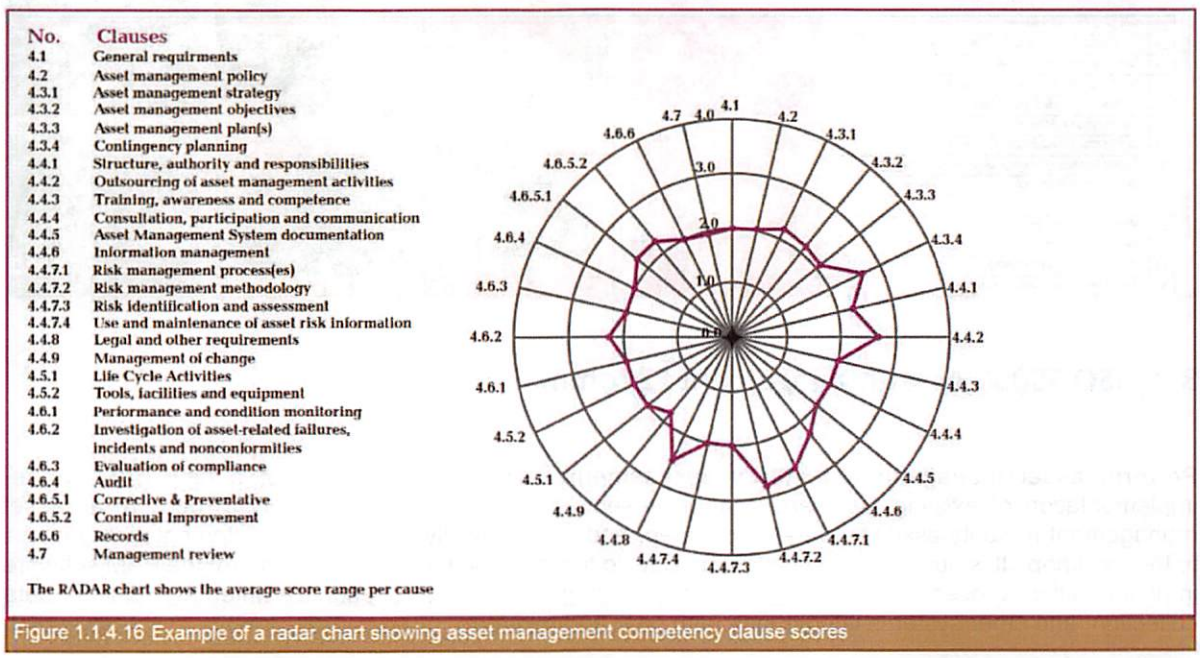
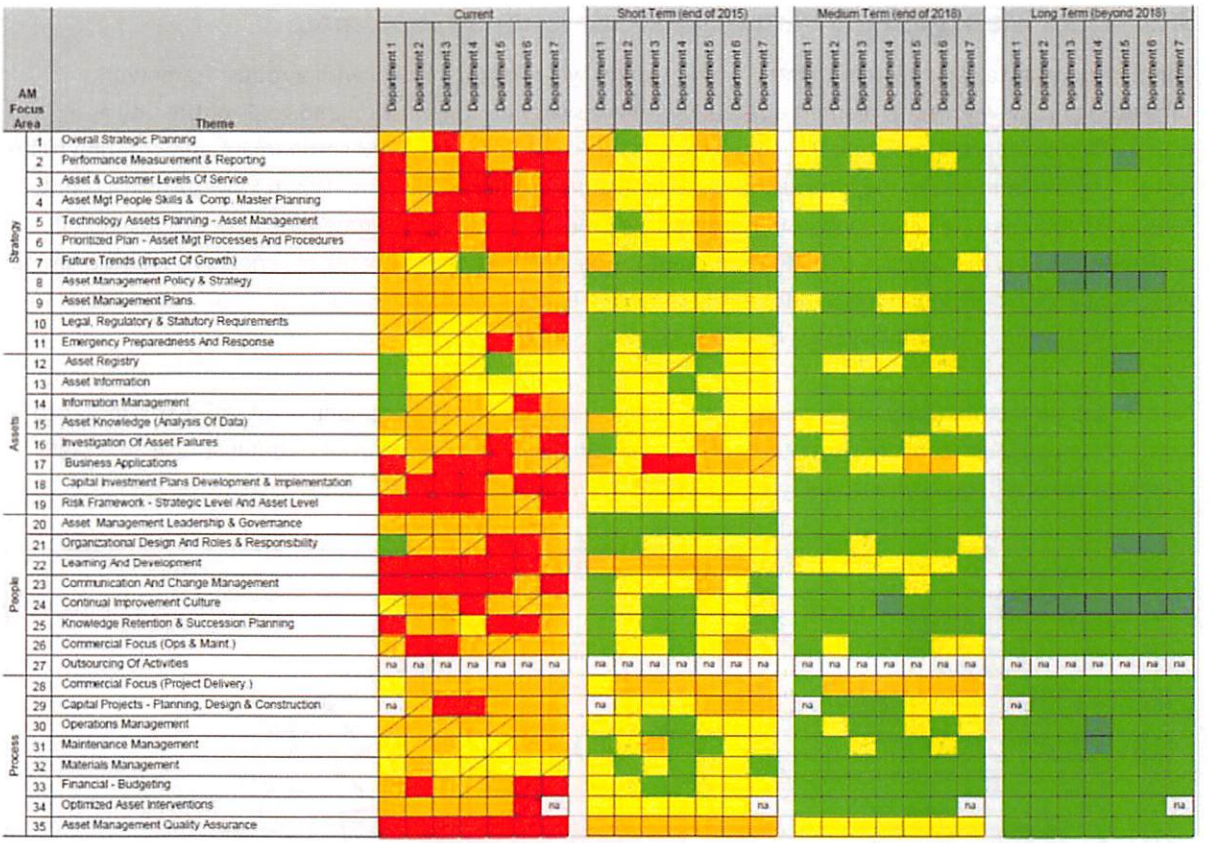


Figure 1.1.4.16 Example of a radar chart showing asset management competency clause scores

When the implementation of an EAM software system is viewed against the breadth and depth of what goes into an asset management system – where EAM software is one tool among many – it becomes easier to understand that EAM software requires the presence of other business elements and processes to be truly successful. Often there is an unspoken assumption that an EAM software system can be successful in a vacuum of other supporting business systems.

The following figure shows how the City can lay out step-wise asset management maturity roadmap, broken out by departments (columns) and by asset management capability area (rows); where each department can have its own goals and objectives and time horizons. Connecting the near, mid-term, and long-term implementation of an EAM software system to this kind of road map can be invaluable in ensuring the EAM software meets BOTH the granular needs of individual users/business areas as well as the larger needs of the City and delivering value.



3.3 ISO 55000 Asset Management Recommendations

Perform asset management maturity assessment: The implementation of a new EAM (or re-implementation of existing) software system presents an opportunity for the City to perform an asset management maturity assessment and roadmap, and to specifically connect the implementation process to the roadmap. It is our recommendation the City do this and use the outcome to inform the EAM software implementation process, inform organizational change, inform and prioritize internal training, data collection, and other systems integrations both near and mid-term.

Develop asset management policy: Developing an asset management policy will enable top management at the City to articulate its value principles both internally and externally; will allow the EAM software system to be directly connected 'how' these values are achieved; and will provided the basis for driving cross department alignment and reduce tendencies to siloed business processes.

Developing a strategic asset management plan and individual asset management plans we recommend to be future state activities at this time.

Appendix C. Scoring Matrix

C.1. Scoring Matrix

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

Admin				
G.	Demonstrations	Functional Requirements	Comment	Score
G.1.	Demonstrate how the system supports single sign-on and user-defined security levels based on staff roles; different users & rolls see different things.	1.1.3, 1.1.11		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
G.2.	Demonstrate how the system supports both GIS assets and non-GIS assets (e.g. assets within a building/plant such as pumps, HVAC, pretreatment equipment, etc.)	1.1.10		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
G.3.	Demonstrate how dropdown/pick lists, field names, and other UI controls can be renamed, added, removed, and modified without vendor support. Please show this for asset screens, work orders, inspection forms, and other elements of the UI.	4.2.3		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
User Story 1 - Crew Supervisor (CS) Planning				
As a CS I need the ability to plan and schedule work for the AM that I supervise. My daily routine consists of reviewing and planning work orders (inspections, repairs, preventative maintenance, etc.), creating work orders, prioritizing work orders, assigning work orders to the AM, and asset/work order data entry.				
1.1.	Preventative Maintenance Scheduling & Planning	Functional Requirements	Comment	Score
1.1.1.	Demonstrate how I can navigate to an asset, and review all asset related work, maintenance, inspections, etc. including related assets, sub-components, and/or serialized objects.	4.3.7, 4.3.8		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.1.2.	Demonstrate how the system supports various preventative maintenance schedules and time units for recurring work (fixed interval [every month], fixed interval since last time [did on 3rd day of month, next PM is 3rd of following month], triggered [hit X reading from external or internal source].	4.3.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.1.3.	Demonstrate how the system supports hierarchical scheduling of preventative maintenance (e.g., if an A, B, C methodology is used, when a C is done it is assumed an A and B have been done and automatically reschedules all three).	4.3.5		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.1.4.	Demonstrate whether the system supports grouping preventative maintenance jobs/tasks into a single work order based on user-defined criteria.	4.3.6		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.2.	Notification, Triggers & Prioritization	Functional Requirements	Comment	Score
1.2.1.	Demonstrate how alerts/emails can be triggered related to inspections, work orders, permitting, ordering, etc.	4.7.1		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.2.2.	Demonstrate how work orders and inspections can be created or triggered from a user-defined condition or set of conditions; if-then scenarios; risk or set of risks (consequences or probabilities of failure).	4.7.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

1.2.3.	Demonstrate how work orders/flags/emails can be triggered based on both internal and external (e.g. Wonderware SCADA, Tyler Munis ERP, Pilot Thomas Logistics, Power BI, LDAP, etc.) user-defined criteria.	4.5.3, 4.7.3, 4.3.19, 4.3.20		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.3.	**Data Entry**	**Functional Requirements**	**Comment**	**Score**
1.3.1	Demonstrate how the system streamlines data entry for repetitive tasks using drop down menus, bulk entry, fewer screens and clicks, etc.	4.1.3, 4.2.5		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.3.2	Demonstrate how a user can improve asset data quality and add asset data quantity to the system without vendor support.	4.2.2		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.3.3.	Demonstrate how a user can upload/attach documents individually or in bulk to assets, asset systems, work orders, inspections, GIS features, etc.	4.2.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.3.4.	Demonstrate whether the system can batch import AND export data from/to standard spreadsheet file formats; show this capability against types of data (e.g. assets, forms, configurations, parts, work orders, etc.)	4.2.1		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
1.3.5.	Demonstrate how the system enables bulk edit of GIS data attributes and for work orders.	4.2.6		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

User Story 2 - Crew Supervisor (CS) Work Order Creation				
As a CS I need the ability to efficiently create work orders for the AM that I supervise. I pre-plan some work orders but also need the ability to respond to equipment/asset failures with work orders that can be received by field crews in real-time. I also need the ability to efficiently review data that will summarize critical information (e.g. work order status, equipment used, time spend, materials used, etc.), and receive notifications when work orders are completed.				
2.1.	**Work Orders & Work Tracking**	**Functional Requirements**	**Comment**	**Score**
2.1.1.	Demonstrate how I will pre-plan work orders in the system and whether the system can auto-populate (based on activity type) work order assignments, routing, and equipment required for the task	4.3.9, 4.3.13, 4.3.14, 4.6.1		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.2.	Demonstrate how I can require certain fields to be mandatory for work orders.	4.3.16		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.3.	Demonstrate how I can embed/attach forms (inspection, risk assessment, etc.) into work orders.	4.3.21		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.4.	Does the system support links to manufacturer manuals and parts catalogs for work orders?	4.3.10		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.5.	Demonstrate how the system will allow me to link single or multiple assets to a work order and how work order type can be used to limit/control the type of asset(s) able to be linked.	4.3.15, 4.5.5		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.6.	Demonstrate how the system will allow me to use assets as equipment on work orders.	4.3.22		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.7.	Demonstrate how the system may link work orders together (parent – parent, parent-child) and prompt the user to close a work order when another is closed.	4.3.12		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.8.	Does the system allow me to view work orders in calendar view, support drag/drop, and check against resourcing limitations?	4.3.18		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
2.1.9.	Demonstrate if the system has multiple hierarchical views of parent-child asset relationships and whether these can be managed/vary based on role and/or group.	4.1.2, 4.1.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

User Story 3 - Asset Maintainer (AM) Daily Work

As an AM I need the ability to perform inspections and work orders efficiently, documenting asset condition, equipment and material used, etc. I may not have a lot of familiarity with or enjoy using digital equipment. It's important that my mobile platform is easy to use and requires minimal navigation between screens. I need the mobile platform to be quick/responsive and intuitive to ensure I can complete my work efficiently.

My daily routine consists of reviewing work order(s) assigned to me, checking out equipment needed for my day, deploying to the field, completing and recording my work order(s), checking in equipment, and completing the daily log to close out my work order(s). Most of my work orders are pre-planned by the CS; however, I also need the ability to receive real-time information in the field on emergency work orders that are generated and to create work orders on the fly.

I often work in areas where I have no connection to the internet but still need the mobile applications to function and reconnect without interrupting my work.

3.1.	Mobile	Functional Requirements	Comment	Score
3.1.1.	Demonstrate how mobile devices integrate with GIS, how work orders are viewed on a GIS map, how the GIS updates, how attaching and viewing documents is performed, and how bar code readers can be used.	4.8.3, 4.8.4, 4.8.7		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
3.1.2.	Does the system support multiple technologies (e.g. PCs, laptops, tablets, smart phones, etc.)?	4.8.2		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
3.1.3.	Demonstrate how my mobile device works whether I'm in a connected or disconnected state while performing field work, how data is retained in the disconnected state, and how transition between states occurs.	1.1.7, 4.8.8		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
3.1.4.	Demonstrate how (manual, bar code, RFID) I can capture/add assets to the system/GIS when I encounter new assets in the field and how I can edit asset information/attributes.	4.8.5, 4.8.6		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

User Story 4 - City Executive (CE) and Department Manager (DM) Oversight

As a CE I need tools to help me understand if I am getting the best value from my asset portfolio so that I can make informed strategic decisions. I need to see how asset level information.

As a DM I need to have operational data integrity and make critical operational decisions based on data within the system and report to the CEs (with evidence) on the critical aspects of my department. I need to be able to determine the need for short/medium/long term funding, review key performance indicators (inspections performed, inspections outstanding, time spent per work order, closed and open work orders, etc.), update actual asset condition, and estimate future asset condition.

As a DM I need a system that will support a wide range of standard and customizable reporting that helps me plan work, answer budgeting questions for the CEs, and support my daily workflow tracking (e.g. inspection performed, results, status, etc.), and importantly to provide a common operating picture for all stakeholders.

As a DM I track fleet related information. I need to keep track of mileage on vehicles, services due, and mileage projections.

4.1.	Asset & Inventory Review & Planning	Functional Requirements	Comment	Score
4.1.1.	Demonstrate how the system can prioritize assets for replacement, inspection, work orders, etc. based on risk, condition, work order history.	4.5.1		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.2.	Demonstrate whether the system can track/calculate remaining mileage and mileage percentage for different fleet types based on actual mileage that are entered for each configuration and the total mileage allowance for the month.	4.9.1		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.3.	Demonstrate how the system will help a CE prioritize and track investment across the organization, including viewing the operating and capital expenditure outlook.	4.5.2		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.4.	Demonstrate how the EAM asset register, based on GIS, can be linked and/or reconciled to the City's Fixed Asset Register so that CEs have the confidence that asset financial information is being reported correctly	1.1.9, 2.1.2		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.5.	Demonstrate the reporting capabilities available that will allow DM the most flexibility to summarize information quickly. How can a user specify date ranges? How can a user filter and sort? Can filtering and sorting be done based on any field and multiple fields at once?	3.1.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.6.	Demonstrate how the system records actions/transactions by user and date to support DM audit/managerial needs.	1.1.8		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.7.	Demonstrate how CE/DM can share and clone reports and manage access by user role and group across all EAM management functions (e.g. (e.g. assets, fleet/equipment, work orders, preventive maintenance, repair history, fuel, inventory and warehousing, etc.).	3.1.7		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.8.	Demonstrate how reporting or dashboard capabilities can display/track critical information (e.g. overdue preventative maintenance, wrench time, days in status, assets due maintenance/inspection, etc.)	4.3.1, 4.3.2, 4.3.3		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
4.1.9.	Demonstrate how the system can report against combinations of CMMS data, linked/joined/integrated data, project data, 'if-then' forecast data, and GIS data.	3.1.3		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

4.1.10.	Demonstrate whether the system can report through Esri Portal and/or ArcGIS online web applications.	3.1.8		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

Carson City Enterprise Asset Management (EAM) Platform Functional Requirements

User Story 5 - Cross Roles: Inventory Management

As an inventory manager I need to ensure correct processes are followed to order inventory, receive inventory, warehouse inventory, provision inventory, maintain inventory counts and controls, and reconcile inventory with the financial system. Across all these activities, I need to report and would like to have a live dashboard providing real-time or near real-time information.

As a consumer of inventory, I need to reserve inventory, add inventory to work orders, create assemblies, check unused inventory back into the warehouse, charge different rates for inventory when a recovery fee is applied to the work and materials.

5.1.	Inventory	Functional Requirements	Comment	Score
5.1.1.	Demonstrate how the system provides real-time inventory monitoring by tracking inventory: used on work orders, bin location and location changes, shelf life, expiration date, warranty dates/times, serial numbers, heat/lot/batch numbers, hierarchy of item and sub-assembly, etc.	4.4.4, 4.4.7, 4.4.9, 4.4.10, 4.4.11, 4.4.12		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.2.	Demonstrate how the system tracks dates and quantities of historic inventory orders and supports multiple value/cost fields (e.g. purchase price, issue cost, return value, etc.).	4.4.3, 4.4.5		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.3.	Demonstrate whether the system can maintain an audit trail by recording account numbers and cost centers for all inventory transactions and link to billing for instances where inventory costs are recovered.	4.4.1, 4.4.2		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.4.	Demonstrate whether the system supports serialized assets, components, and parts.	4.1.5		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.5.	Demonstrate whether the system supports bar code and RFID technology.	4.4.13		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.6.	Demonstrate whether the system supports unlimited warehouses and mobile warehouses. (e.g. inventory on fleet trucks)	4.9.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs
5.1.7.	Demonstrate how the system supports inventory to be valued at an average cost, LIFO, or FIFO, and how inventory can be charged/costed to work orders.	2.1.3, 2.1.4		☐ 0 - Not Addressed ☐ 1 - Does Not Meet Needs ☐ 2 - Meets Needs ☐ 3 - Exceeds Needs

C.2. Demonstration Script and User Stories

ATKINS
Member of the SNC-Lavalin Group

Carson City EAM Vendor Demonstration Script

User Role	Description
City Executive (CE)	I am responsible for making short and long-term staffing and budgeting planning decisions within the Public Works department.
Department Manager (DM)	I am responsible for the operations and maintenance associated with departments such as water production/distribution, wastewater treatment, stormwater and sanitary sewer collection, road maintenance, building and parks maintenance, or fleet operations.
Crew Supervisor (CS)	I am responsible for scheduling asset inspections and work orders for my crew(s).
Asset Maintainer (AM)	I am responsible for performing and recording asset inspections and work orders performed on assets and equipment.

User Story Format

1. Role/need
    a. Specific need 1
    b. Specific need 2
        i. Internal use – applicable functional requirement

Demonstrate Based on Provided User Stories

Please demonstrate against the backdrop of each of the below user stories. The demonstration should be done using a workflow typical of your system when carrying out the activities in each user story. In the course of your user story-based demonstration you must address each of the functional requirements. The order in which the functional requirements are addressed is up to the presenter. If the requirement is not available in the COTS product but can be achieved via additional configuration or customization, please point this out during the demonstration so it can be accounted for in the final scoring.

NOTE: We have provided high level user stories to provide latitude in how to best structure the presentation of functional requirements in your software. It is important to address each of the functional requirements in your demonstration. As noted above, the order in which you address each functional requirement is up to the presenter. However, it is most helpful to the scorers if each user story is presented in order.

Carson City EAM User Stories

Admin

These scoring criteria are to be included in the user story demonstrations where the vendor deems appropriate.

1. General system configuration
    1. Demonstrate how the system supports single sign-on and user-defined security levels based on staff roles; different users & rolls see different things. (FR 1.1.3, 1.1.11)
    2. Demonstrate how the system supports both GIS assets and non-GIS assets (e.g. assets within a building/plant such as pumps, HVAC, pretreatment equipment, etc.) (FR 1.1.10)
    3. Demonstrate how dropdown/pick lists, field names, and other UI controls can be renamed, added, removed, and modified without vendor support. Please show this for asset screens, work orders, inspection forms, and other elements of the UI. (FR 4.2.3)

User Story 1. Crew Supervisor (CS) Planning

As a CS I need the ability to plan and schedule work for the AM that I supervise. My daily routine consists of reviewing and planning work orders (inspections, repairs, preventative maintenance, etc.), creating work orders, prioritizing work orders, assigning work orders to the AM, and asset/work order data entry.

Please demonstrate the listed functional requirements based on the user story above.

1. Preventative Maintenance Scheduling & Planning
    1. Demonstrate how I can navigate to an asset, and review all asset related work, maintenance, inspections, etc. including related assets, sub-components, and/or serialized objects. (FR 4.3.7, 4.3.8)
    2. Demonstrate how the system supports various preventative maintenance schedules and time units for recurring work (fixed interval [every month], fixed interval since last time [did on 3rd day of month, next PM is 3rd of following month], triggered [hit X reading from external or internal source]. (FR 4.3.4)
    3. Demonstrate how the system supports hierarchical scheduling of preventative maintenance (e.g., if an A, B, C methodology is used, when a C is done it is assumed an A and B have been done and automatically reschedules all three). (FR 4.3.5)
    4. Demonstrate whether the system supports grouping preventative maintenance jobs/tasks into a single work order based on user-defined criteria. (FR 4.3.6)
2. Notification, Triggers & Prioritization
    1. Demonstrate how alerts/emails can be triggered related to inspections, work orders, permitting, ordering, etc. (FR 4.7.1)

2. Demonstrate how work orders and inspections can be created or triggered from a user-defined condition or set of conditions; if-then scenarios; risk or set of risks (consequences or probabilities of failure). (FR 4.7.4)
3. Demonstrate how work orders/flags/emails can be triggered based on both internal and external (e.g. Wonderware SCADA, Tyler Munis ERP, Pilot Thomas Logistics, Power BI, LDAP, etc.) user-defined criteria. (FR 4.5.3, 4.7.3, 4.3.19, 4.3.20)

3. Data Entry
    1. Demonstrate how the system streamlines data entry for repetitive tasks using drop down menus, bulk entry, fewer screens and clicks, etc. (FR 4.1.3, 4.2.5)
    2. Demonstrate how a user can improve asset data quality and add asset data quantity to the system without vendor support. (FR 4.2.2)
    3. Demonstrate how a user can upload/attach documents individually or in bulk to assets, asset systems, work orders, inspections, GIS features, etc. (FR 4.2.4)
    4. Demonstrate whether the system can batch import AND export data from/to standard spreadsheet file formats; show this capability against types of data (e.g. assets, forms, configurations, parts, work orders, etc.) (FR 4.2.1)
    5. Demonstrate how the system enables bulk edit of GIS data attributes and for work orders. (FR 4.2.6)

User Story 2. Crew Supervisor (CS) Work Order Creation

As a CS I need the ability to efficiently create work orders for the AM that I supervise. I pre-plan some work orders but also need the ability to respond to equipment/asset failures with work orders that can be received by field crews in real-time. I also need the ability to efficiently review data that will summarize critical information (e.g. work order status, equipment used, time spend, materials used, etc.), and receive notifications when work orders are completed.

Please demonstrate the listed functional requirements based on the user story above.

1. Work Orders & Work Tracking
    1. Demonstrate how I will pre-plan work orders in the system and whether the system can auto-populate (based on activity type) work order assignments, routing, and equipment required for the task (FR 4.3.9, 4.3.13, 4.3.14, 4.6.1)
    2. Demonstrate how I can require certain fields to be mandatory for work orders. (FR 4.3.16)
    3. Demonstrate how I can embed/attach forms (inspection, risk assessment, etc.) into work orders. (FR 4.3.21)
    4. Does the system support links to manufacturer manuals and parts catalogs for work orders? (FR. 4.3.10)
    5. Demonstrate how the system will allow me to link single or multiple assets to a work order and how work order type can be used to limit/control the type of asset(s) able to be linked. (FR 4.3.15, 4.5.5)
    6. Demonstrate how the system will allow me to use assets as equipment on work orders. (FR 4.3.22)

7. Demonstrate how the system may link work orders together (parent – parent, parent-child) and prompt the user to close a work order when another is closed. (FR 4.3.12)
8. Does the system allow me to view work orders in calendar view, support drag/drop, and check against resourcing limitations? (FR 4.3.18)
9. Demonstrate if the system has multiple hierarchical views of parent-child asset relationships and whether these can be managed/vary based on role and/or group. (FR 4.1.2, 4.1.4)

User Story 3. Asset Maintainer (AM) Daily Work

As an AM I need the ability to perform inspections and work orders efficiently, documenting asset condition, equipment and material used, etc. I may not have a lot of familiarity with or enjoy using digital equipment. It's important that my mobile platform is easy to use and requires minimal navigation between screens. I need the mobile platform to be quick/responsive and intuitive to ensure I can complete my work efficiently.

My daily routine consists of reviewing work order(s) assigned to me, checking out equipment needed for my day, deploying to the field, completing and recording my work order(s), checking in equipment, and completing the daily log to close out my work order(s). Most of my work orders are pre-planned by the CS; however, I also need the ability to receive real-time information in the field on emergency work orders that are generated and to create work orders on the fly.

I often work in areas where I have no connection to the internet but still need the mobile applications to function and reconnect without interrupting my work.

Please demonstrate the listed functional requirements based on the user story above.

1. Mobile
    1. Demonstrate how mobile devices integrate with GIS, how work orders are viewed on a GIS map, how the GIS updates, how attaching and viewing documents is performed, and how bar code readers can be used. (FR 4.8.3, 4.8.4, 4.8.7)
    2. Does the system support multiple technologies (e.g. PCs, laptops, tablets, smart phones, etc.)? (FR 4.8.2)
    3. Demonstrate how my mobile device works whether I'm in a connected or disconnected state while performing field work, how data is retained in the disconnected state, and how transition between states occurs. (FR 1.1.7, 4.8.8)
    4. Demonstrate how (manual, bar code, RFID) I can capture/add assets to the system/GIS when I encounter new assets in the field and how I can edit asset information/attributes. (FR 4.8.5, 4.8.6)

User Story 4. City Executive (CE) and Department Manager (DM) Oversight

As a CE I need tools to help me understand if I am getting the best value from my asset portfolio so that I can make informed strategic decisions. I need to see how asset level information

As a DM I need to have operational data integrity and make critical operational decisions based on data within the system and report to the CEs (with evidence) on the critical aspects of my department. I need to be able to determine the need for short/medium/long term funding, review key performance indicators (inspections performed, inspections outstanding, time spent per work order, closed and open work orders, etc.), update actual asset condition, and estimate future asset condition.

As a DM I need a system that will support a wide range of standard and customizable reporting that helps me plan work, answer budgeting questions for the CEs, and support my daily workflow tracking (e.g. inspection performed, results, status, etc.), and importantly to provide a common operating picture for all stakeholders.

As a DM I track fleet related information. I need to keep track of mileage on vehicles, services due, and mileage projections.

Please demonstrate the listed functional requirements based on the user story above.

1. Asset & Inventory Review & Planning
    1. Demonstrate how the system can prioritize assets for replacement, inspection, work orders, etc. based on risk, condition, work order history. (FR 4.5.1)
    2. Demonstrate whether the system can track/calculate remaining mileage and mileage percentage for different fleet types based on actual mileage that are entered for each configuration and the total mileage allowance for the month. (FR 4.9.1)
    3. Demonstrate how the system will help a CE prioritize and track investment across the organization, including viewing the operating and capital expenditure outlook. (FR 4.5.2)
    4. Demonstrate how the EAM asset register, based on GIS, can be linked and/or reconciled to the City's Fixed Asset Register so that CEs have the confidence that asset financial information is being reported correctly (FR 1.1.9, 2.1.2).
    5. Demonstrate the reporting capabilities available that will allow DM the most flexibility to summarize information quickly (FR 3.1.4).
        1. How can a user specify date ranges?
        2. How can a user filter and sort?
        3. Can filtering and sorting be done based on any field and multiple fields at once?
    6. Demonstrate how the system records actions/transactions by user and date to support DM audit/managerial needs. (FR 1.1.8)
    7. Demonstrate how CE/DM can share and clone reports and manage access by user role and group across all EAM management functions (e.g. (e.g. assets, fleet/equipment, work orders, preventive maintenance, repair history, fuel, inventory and warehousing, etc.). (FR 3.1.7)

8. Demonstrate how reporting or dashboard capabilities can display/track critical information (e.g. overdue preventative maintenance, wrench time, days in status, assets due maintenance/inspection, etc.) (FR 4.3.1, 4.3.2, 4.3.3)
9. Demonstrate how the system can report against combinations of CMMS data, linked/joined/integrated data, project data, 'if-then' forecast data, and GIS data. (FR 3.1.3)
10. Demonstrate whether the system can report through Esri Portal and/or ArcGIS online web applications. (FR 3.1.8)

User Story 5. Cross Roles: Inventory Management

As an inventory manager I need to ensure correct processes are followed to order inventory, receive inventory, warehouse inventory, provision inventory, maintain inventory counts and controls, and reconcile inventory with the financial system. Across all these activities, I need to report and would like to have a live dashboard providing real-time or near real-time information.

As a consumer of inventory, I need to reserve inventory, add inventory to work orders, create assemblies, check unused inventory back into the warehouse, charge different rates for inventory when a recovery fee is applied to the work and materials.

Please demonstrate the listed functional requirements based on the user story above.

1. Inventory
    1. Demonstrate how the system provides real-time inventory monitoring by tracking inventory: used on work orders, bin location and location changes, shelf life, expiration date, warranty dates/times, serial numbers, heat/lot/batch numbers, hierarchy of item and sub-assembly, etc. (FR 4.4.4, 4.4.7, 4.4.10, 4.4.11, 4.4.12)
    2. Demonstrate how the system tracks dates and quantities of historic inventory orders and supports multiple value/cost fields (e.g. purchase price, issue cost, return value, etc.). (FR 4.4.3, 4.4.5)
    3. Demonstrate whether the system can maintain an audit trail by recording account numbers and cost centers for all inventory transactions and link to billing for instances where inventory costs are recovered. (FR 4.4.1, 4.4.2)
    4. Demonstrate whether the system supports serialized assets, components, and parts. (FR 4.1.5)
    5. Demonstrate whether the system supports bar code and RFID technology. (FR 4.4.13)
    6. Demonstrate whether the system supports unlimited warehouses and mobile warehouses. (e.g. inventory on fleet trucks) (FR 4.9.4)
    7. Demonstrate how the system supports inventory to be valued at an average cost, LIFO, or FIFO, and how inventory can be charged/costed to work orders. (FR 2.1.3, 2.1.4)

C.3. Pre-Screening Questionnaire

ATKINS
Member of the SNC-Lavalin Group

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Carson City Public Works Enterprise Asset Management

30 January 2020

Dear Vendor

The Carson City Public Works Department (Carson City, Nevada) is seeking to implement an Enterprise Asset Management (EAM) System to help the City improve financial performance reliability, reduce risk, and enhance sustainability for the citizens and residents of the Consolidated Municipality of Carson City (City). The implementation of the EAM system will be aligned to best practice in asset management as defined by the ISO 55000 series of standards. The City is requesting several vendors complete the following pre-screening questionnaire associated with the mandatory functional requirements list.

Requirement - Provide a system with a deployment history within similar organizations and applications.

Please describe specific examples of the deployment history of your EAM product with organizations of similar size to Carson City, NV and similar application to function areas (water production/distribution, wastewater treatment, stormwater and sanitary sewer collection, road maintenance, building and parks maintenance, and fleet operations) for which the EAM would support.

Please provide specific information about your company including: years in business, number of employees, number of customers, etc.

Requirement - Provide a mature system and methodology for version testing, quality control, release procedures, and technical support.

Describe the methodologies that are employed to ensure system stability and reliability of the EAM product through your product development processes including version testing, quality control, release procedures, and technical support.

Please describe how many staff you have dedicated to customer support, your customer support structure (hours of operation or 24-hour support), and whether customer support is included in the product cost or an extra charge.

Please describe how many staff you have dedicated to product development, and whether customers have access to the development team (e.g. is there an annual conference, is there a direct daily contact, etc.). Is access to the development team included in the product cost or an extra charge?

Requirement – Provide an open platform with APIs to enable seamless integration with various 3rd party systems.

Describe how the EAM platform fully integrates GIS into all aspects of the platform.

Describe how the EAM platform integrates with systems including but not limited to: Wonderware SCADA, Tyler Munis ERP, Pilot Thomas Logistics, Power BI, Lightweight Directory Access Protocol (LDAP), etc.

Requirement - Highly customizable report formatting with report engine having access all tables in the system. Examples: Generate reports that support environmental permitting workflows (e.g. inspections performed, results, status). Generate reports that support water rights decisions (e.g. water use at wells). Generate reports that summarize water quality data (e.g. lab results for wells).

Describe the EAM report engine and report configuration capabilities with emphasis on how basic report creators (non-power users) and advanced report creators (power users) go about building reports. Including any pre-developed report templates, implementation configuration for functional area reports, ad-hoc report configuration tools, dashboarding, and combining data from linked databases and GIS into a single report.

Describe how report tables in the EAM platform are accessible to external tools such as: Power BI, Esri Insights, etc. (for custom report integration).

Requirement - Support wide range of calculations within reports (E.g. (Field_1 / Field_2) X Field_3).

Describe how the EAM product's report capabilities supports advanced configurations to include calculations and aggregations.

Describe how report tables in the EAM platform are accessible to external tools such as: Power BI, Esri Insights, etc. (for custom report integration).

Requirement - Reports can be shared, cloned, and managed by roles and groups.

Describe how the EAM product supports role and group security and distribution of reports, including how configured and ad-hoc reports can be shared and managed, and how reports can be cloned and/or copied for the purpose of making edits / changes and saved as a new report.

Describe how reports can be segregated by user role (e.g. operator, supervisor, executive, etc.).

Requirement - Provide a flexible/extensible asset data repository to support managing all types of assets and various levels of asset hierarchy (class, system, and location) across each of the City's agencies and transportation modes

Describe the asset hierarchies supported by the EAM product, including the following:

- Full integration with GIS (please include which GIS platforms are supported) and non-GIS assets
- Organization of assets by class, system, and location
- Flexibility/extensibility of organizing and supporting asset structures across multiple diverse functional areas, including; water production/distribution, wastewater treatment, stormwater

and sanitary sewer collection, road maintenance, building and parks maintenance, and fleet operations.

Requirement - Ability to attach a single asset or multiple assets to a work order

Describe the EAM product's ability to attach assets to work orders (single or multiple), including detection for assets that are attached to multiple open workorders and preventing the user from attaching the wrong assets to the work order (e.g. cannot attached a fire hydrant to a sewer main flushing work order).

Describe the EAM product's general ability to segregate assets, parts, components, and equipment across work functions and organizational roles.

Requirement - Provide full inventory interaction / transactions on work orders.

Describe the EAM product's capacity to provide interaction/transactions for the full inventory of assets within workorders and the ease for power users and system administrators to access the full transaction log for purposes of troubleshooting and auditing.

Describe the capability of work orders to interact with basic and advanced inventory features, such as unused inventory on a work order being returned back to inventory, the ability to reserve inventory on scheduled/pending work orders, the ability to pull inventory from pre-defined warehouses, etc.

Requirement - Provide average cost, LIFO, and FIFO

Describe the system's inventory costing capabilities, specifically does the system support LIFO, FIFO, or average cost. Can inventory consumed on work orders follow a cost structure that is different from the inventory accounting methods (e.g. cost of valve used on a mutual-aid work order is 2x the FIFO cost). Please describe any capabilities provided to support inventory control, annual counts, and reconciliation with the Tyler's Munis ERP financial system.

Requirement - Mobile component must support iOS and preferably support Windows/Android as well

Describe the EAM product's mobile application framework (native app, HTML5, Xamarin, etc.). Including the types and versions of mobile OS that it supports.

Please also describe how mobile application versions/updates are related to platform versions (separate or tied to specific versions).

Please describe disconnected mobile capabilities for work orders, inspections, GIS, and any other mobile features supported in a fully disconnected mode.

Based on responses to the above requirements, the City will identify 3 vendors that will be invited to conduct a follow-up remote demonstration for the City. The demonstration script will include several user stories that address the major functional requirements of the EAM system and will be distributed to vendors prior to the demonstration, giving vendors time to prepare. Demonstrations are currently

planned for the week of February 24th and are anticipated to last no more than 3 hours. More information will follow if selected for a demonstration.

Please return the questionnaire and functional requirement list by close of business February 5th to Ryen Tarbet at ryen.tarbet@atkinsglobal.com.

Thank you, we look forward to receiving your responses and discussing this opportunity with you further.

Kind regards

Ryen Tarbet

Appendix D. Vendor Demonstrations

D.1. AssetWorks

Vendor: AssetWorks
Product: AssetWorks

Introduction

This document summarizes the vendors demonstration of their system in relation to the provided demo scripts. This summary describes the system's ability to address mandatory and critical functional requirements within each user story. Each element of the systems capability described below is followed by the corresponding user story section/subsection.

Demonstration

The vendor performed a good job of tailoring their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets.

User Stories

Admin

The vendor adequately demonstrated the system's ability to address all the user story elements within this section. The vendor demonstrated the systems authentication methods and role-based security, G.1. The demonstration also highlighted the system's ability to support unlimited hierarchical assets, supporting spatial (GIS) and non-spatial asset, G.2. The system's Admin Mode allows self-service support for modifications of forms, lists and the underlying database through a GUI tool, G.3.

User Story 1. Crew Supervisor (CS) Planning

Preventative Maintenance and Scheduling

Vendor adequately demonstrated the system's ability to address all the user story elements within this subsection. Asset navigation is facilitated via map or list interface, WOs can be directly created on an asset, including generation of WO on multiple maintenance items, 1.1.1. Scheduled maintenance is created/accessible on the individual asset or through a list of all scheduled maintenance for the type of assets. The system tracts recurring maintenance that is coming due and can autogenerate WO's, 1.1.2. Maintenance can be initiated through triggers that create assignments and push the assignments to staff. Additionally, necessary equipment and materials ordering can also be triggered for the assigned maintenance, 1.1.3. The system supports multi-asset work order generation. Assets can also be assigned to existing WOs. Assets are added to WOs through drill down selection or can be added through single or multi-feature selection within the map interface, 1.1.4.

Notification, Triggers and Prioritization

The system was adequately demonstrated in its ability to address most the user story elements in this subsection. In App messaging, email, and text notifications are all available to

communicate information to staff. Auto messaging for WOs was discussed as well as notifications for recurring events, 1.2.1 & 1.2.3. Triggers can spawn WOs for assets based on values assigned to the asset. Asset, task, and service requests can be prioritized, partially 1.2.2 & 1.2.3. If then-scenarios were not addressed in this portion of the demonstration. The system utilizes MaxQ for building integration with other systems, this was not demonstrated but it was explained to be a robust integration engine, 1.2.3.

Data Entry

Vendor adequately demonstrated the system's ability to address most of the user story elements in this subsection. The systems workflows and layouts provide access to asset information in an intuitive fashion. The system contains typical data entry tools such as dropdown menu and is also capable of bulk data entry satisfying, 1.3.1. Asset class information can also be managed through lists that can be managed by a power user, 1.3.2. Bulk data loading is facilitated through an Excel based program that requires manual manipulation prior to execution. Screens, lists and reports can be directly exported using the export buttons located throughout the system, both 1.3.3 & 1.3.4. Editing of GIS attributes was not demonstrated and likely not supported. Bulk editing of Fleet asset information was demonstrated, but WOs were not addressed.

User Story 2. Crew Supervisor (CS) Work Order Creation

Work Orders and Work Tracking

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. Pre-planning WOs can be created based on user, role, and workflow. Priority can be assigned to tasks. There appeared to be more depth in the system, but the demonstration did not delve into it. Admin mode, as demonstrated earlier in the demo, provides the capability to manage data requirements such as mandatory fields, 2.1.2. Attachments can be added automatically added to WOs based on the task or can be manually attached to the task, 2.1.3. Document linking is available, to provide access to manufacturer manuals etc., however it is not truly integrated with online parts catalogs, partially 2.1.4. Support for multiple assets per WO was demonstrated and is a simple process. Task types can be configured for specify types of assets, which then limits which assets show up on a WO, 2.1.5. Equipment, hours, and venders can be added to WOs by task or in bulk, 2.1.6. Linking WOs together (parent-child) is supported, partially satisfying 4.3.12. The system can identify WOs by person, crew, or vendor in a list or through the calendar view, partially 2.1.8. Drag and drop in calendar no available or at least not demonstrated. All elements, including assets and WOs within the system are controlled by the role-based permission structure, 2.1.9.

User Story 3. Asset Maintainer (AM) Daily Work

Mobile

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. Mobile functionality is achieved through a mobile device

application (iOS, Android, and Windows) GIS information and WOs are accessible as well as documents associated to them. The mobile application operates in both connected and disconnected modes. This is achieved through a disconnected que, which is automatically managed without the requirement of the user to intervene. All role-based configurations setup for the main web system are perpetrated to the mobile forms. Built in work flows can be configured to support querying WOs, inspections, or test results. Recommended device size is 10" screen size or larger. GIS assets can be created within the app and are put into a que for review before pushing into the GIS database. Bar code reading via devices camera is supported, RFID detection is not supported. User story sections 3.1.1-3.1.4 were addressed in this portion of the demo.

User Story 4. City Executive (CD) and Department Manager (DM)

Asset & Inventory Review and Planning

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The system can provide performance-based tracking of assets. Assets and tasks are assigned priorities. Notifications are spawned based on scores and recommended tasks are identified, 4.1.1. Fleet Focus tool for fleet management was discussed but not demonstrated. The Capitol Planning Portal provides performance replacement planning capabilities, including the ability to view decay curves, for both historical and future projections of an assets lifecycle and are adjusted based on the last condition. Tracking use vs. project funding is included and a project approval workflow, 4.1.3. Linking to the Fixed Asset Register was not addressed in the demonstration. The system was demonstrated to have the ability to sort and summarize information based on several data fields, 4.1.5. Reports are managed by the same role-based management as the rest of the system and can be shared directly to users or groups. Report cloning was not demonstrated but it appeared capable of doing so, 4.1.7. All transactions are traced by user and date, 4.1.6. The system utilizes Crystal Report engine and includes 400 template reports. Reports are fully configurable and ad-hoc report creation is available. Dashboard can be created from reports and are shared in the same way, 4.1.8.

User Story 5. Cross Roles: Inventory Management

Inventory

Vendor was not able to demonstrate the system's ability to address user story elements in this section due to lack of remaining time. Following the QA portion of the demonstration the vendor was given the opportunity to use the remaining time to cover items from this section. System demonstration was light, most items were spoken to. The inventory module supports many of the requirements in this section, including the ability to provide real-time inventory monitoring and tracking. The system supports bar codes for inventory items and can be configured for RFID. Inventory locations are unlimited, and the system can handle the transfer of parts and equipment. The system supports both LIFO and FIFO inventory models, and the system manages the receiving of inventory.

Conclusion

Overall the system appears very robust with a well thought out design. Access to asset information, creating/viewing work orders, integration with GIS, and mobile capabilities are all well executed.

D.2. VueWorks

Vendor: DTS
Product: VueWorks

Introduction

This document summarizes the vendors demonstration of their system in relation to the provided demo scripts. This summary describes the system's ability to address mandatory and critical functional requirements within each user story. Each element of the systems capability described below is followed by the corresponding user story section/subsection.

Demonstration

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets.

User Stories

Admin

The vendor adequately demonstrated the system's ability to address all the user story elements within this section. The vendor demonstrated the systems authentication methods and role-based security, which supports Active Directory, SAML 2.0. The permissions are applied to asset types as well as content and capabilities, G.1. The demonstration highlighted the system's ability to support unlimited hierarchical assets, supporting spatial (GIS) and non-spatial assets. GIS assets are accessed through the map interface, access to non-GIS assets was facilitated through an asset management pane, G.2. The systems administrative capabilities were demonstrated, which provide full admin capabilities, including adding new fields/picklists, modifying existing fields/pick lists, modifying forms, workflows, and permissions, G.3

User Story 1. Crew Supervisor (CS) Planning

Preventative Maintenance and Scheduling

Vendor adequately demonstrated the system's ability to address all the user story elements within this subsection. The system utilizes a map centric approach, with expandable tabs/panes. Asset information is displayed and linked to features in the map. Non-spatial assets are also navigated via the expandable tabs/panes, 1.1.1. Preventative maintenance can be configured as needed, or from templates. Recurrence can be set by time, calendar, ranges or by exclusions, 1.1.2. The system supports hierarchical scheduling and criteria set when configuring PMs, 1.1.3. Grouping PM tasks is achieved through shared/required tasks that are setup within WO type templates. Multiple tasks can also be assigned within a WO, 1.1.4.

Notification, Triggers and Prioritization

The system was adequately demonstrated in its ability to address all the user story elements in this subsection. The system can be triggered to send alerts/notifications as individual emails, as

a watch list, or distribute to an email notification list. The triggers can be user defined, or set to automatically run based on criteria, 1.2.1. WO creation through triggering by external data integration (Scada) was demonstrated, conditions and scenarios, and risks partially available and are slated for future releases, 1.2.2. Mileage within fleet module demonstrated to trigger WO based off of mileage, 1.2.3

Data Entry

Vendor adequately demonstrated the system's ability to address most of the user story elements in this subsection. Accessing information such as asset data and WOs is performed through collapsible tabs and the map interface. Forms can be simple or complex, all controls are modifiable by the administrator, 1.3.1. Asset data can be added through the GIS map or through the asset tree for non-spatial assets,1.3.2. Any file can either be added or linked via URL to assets or WOs. Attachments can also be added to groups of assets, 1.3.3. All information can be exported to Excel, and data can also be loaded from excel or by connecting to an external database through ODBC, 1.3.4. The system provides the ability to edit GIS data through the map interface. Multiple assets can be selected at one time and edited in bulk. Work Orders can also be edited in bulk, 1.3.5.

User Story 2. Crew Supervisor (CS) Work Order Creation

Work Orders and Work Tracking

Vendor adequately demonstrated the system's ability to address all the user story elements within this section. Pre-planning work orders is achieved through templates configured by activity type. The templates can be configured to prepopulate the WOs and can be scheduled too, 2.1.1. The administration tool provides full capability for setting required fields, changing field names, and adding new fields, 2.1.2. The system supports attaching any type of file to assets and WOs, 2.1.3. Documents such as manuals or links to manufacturers catalogs can be tied to assets and WOs, 2.1.4. The system supports adding one or more assets to WOs, 2.1.5. Thy system fully supports adding any asset in the asset registry to WOs as equipment, 2.1.6. The system allows linking WOs (parent-child). Future releases will also allow to link based on status, 2.1.7. Work orders can be viewed in a calendar and it can be displayed by the persons assignments or by the type of work, 2.1.8. The system stores assets in a vertical relationship hierarchy. It also has templates for facilities and assets within them, 2.1.9.

User Story 3. Asset Maintainer (AM) Daily Work

Mobile

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The systems mobile capabilities include a native application that supports all form factors and operating systems (iOS, Android, Windows). The mobile application has both form and GIS functionality. It operates in connected and disconnected modes seamlessly. An indicator button notifies the user when the device has lost connectivity and it stores all edits made while offline. Once the device is back online the button changes

color and the user then tap the button to sync the offline changes. Capturing new GIS assets is performed in Esri's ArcGIS Collector application. Once changes are pushed to the GIS database, the mobile application can then access the new assets. Barcode scanning is supported within the application; however, RFID is not. 3.1.1, 3.1.2, 3.1.3, 3.1.4.

User Story 4. City Executive (CD) and Department Manager (DM)

Asset & Inventory Review and Planning

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. Prioritization of replacement for assets is managed through the systems Risk Module, which tracks assets failure mode, 4.1.1. The systems fuel services integration capabilities allow it to consume vehicle information for calculation of remaining asset mileage, 4.1.2. Investment tracking and prioritization is managed though a stepped decision tree within a wizard that can analyze one or multiple assets, 4.1.3. Integration with a financial management system provides the financial asset codes for linking/reconciling the fixed asset registers, 4.1.4. Reporting is achieved through canned reports; however, the system has full report builder for ad-hoc/custom reports. Reports can be run against internal or external data, 4.1.5. System actions/transactions are recorded through a change log that tracks the user, time of change and the changed item, 4.1.6. Reports are shareable to individuals or to roles/groups, 4.1.7. The systems dashboards are configurable through a wizard driven builder and are interactive. Charts and dashboard elements are directly linked to WOs and assets, 4.1.8. Access to the system data from Esri Portal/ArcGIS online is facilitated through rest services, providing capability of utilizing Esri's web applications/dashboard tools, 4.1.10

User Story 5. Cross Roles: Inventory Management

Inventory

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The systems Inventory module contains many capabilities for monitoring and tracking inventory, 5.1.1. Inventory info (dates, quantities, historic orders) including purchase and issue costs are all available within the module, 5.1.2. The system can maintain an audit trail through the reconcile change log, however it would require some configuration, 5.1.3. The module supports serialized assets and can track throughout their lifecycles, 5.1.4. Barcode scanning is supported; however, RFID is either not available or it was missed in the demonstration, 5.1.5. Inventory may be assigned to WOs and can manage inventory across multiple ware houses and mobile warehouses/part trucks, 5.1.6. The system fully supports average cost, LIFO, FIFO and costs can be billed against WOs, 5.1.7.

Conclusion

Overall the system appears very robust with a well thought out design. Access to asset information, creating/viewing work orders, integration with GIS, and mobile capabilities are all well executed. The strength of the system stems from its workflow management capabilities that provide a broad base for the platform. The vendor also demonstrated a Fleet workflow that

is specifically tailored managing fleet assets/inventory. Another strength of the system is that it is highly self-serviceable and configurable, requiring less direct support from the vendor. The seamless connected/disconnected capabilities in the mobile application was also the most advanced of all the vendors.

D.3. Lucity

Vendor: Central Square
Product: Lucity

Introduction

This document summarizes the vendors demonstration of their system in relation to the provided demo scripts. This summary describes the system's ability to address mandatory and critical functional requirements within each user story. Each element of the systems capability described below is followed by the corresponding user story section/subsection.

Demonstration

The vendor did not tailor their demonstration to follow the demo script. The demonstration bounced around to various aspects of the system, which did not allow participants to follow along with their scoring sheets. The vendor mainly demonstrated the systems capability using sewer assets, which did not provide a good cross section of capability. Therefore, the summary below will reflect what could be documented against the demo script. Many aspects of the system will be left out as they could not be captured adequately against the criteria of the user stories.

User Stories

Admin

The vendor adequately demonstrated the system's ability to address two of the three the user story elements within this section. The vendor demonstrated the systems authentication methods and role-based security, G.1. The system allows self-service support for modifications of fields, forms, lists and fields, G.3.

User Story 1. Crew Supervisor (CS) Planning

Preventative Maintenance and Scheduling

Vendor partially demonstrated the system's ability to address three of the four user story elements within this subsection. Asset navigation is facilitated via map or list interface, WOs can be directly created on an asset. Also, one or more assets can be added to a WO, 1.1.1. Preventative maintenance scheduling and hierarchical scheduling of PMs is supporting within the system. PMs can be grouped, linked and tied to affected assets. 1.1.2, 1.1.3, 1.1.4

Notification, Triggers and Prioritization

Vendor partially demonstrated the system's ability to address two of the three user story elements within this subsection. Email and text notifications are all available to communicate information to staff. Notifications can be trigged based on values assigned to the asset or WOs, 1.2.1 & 1.2.2 Custom integrations would have to be developed, no integration engine included.

Data Entry

Vendor partially demonstrated the system's ability to address three of the five user story elements within this subsection. GIS attachments are supported through the map interface, partial 1.3.3. Export is supported to Excel and users can manually import into the system form Excel, partial 1.3.4. Direct edits in GIS are supported and the system also provides redline capability which store the redlines in the GIS database, 1.3.5.

User Story 2. Crew Supervisor (CS) Work Order Creation

Work Orders and Work Tracking

Vendor partially demonstrated the system's ability to address two of the nine user story elements within this subsection. Within the map interface assets can be selected and a WO can be generated off the selected assets (one or many), partial 2.1.5. The demonstration with regards to this section was very light and the system was not shown to be able to address many of the functional requirements.

User Story 3. Asset Maintainer (AM) Daily Work

Mobile

Vendor partially demonstrated the system's ability to address two of the three user story elements within this subsection. Mobile functionality is achieved through a mobile device application available on tables and smart phone devices. GIS information and WOs are accessible, 3.1.1 & 3.1.2. The mobile application operates in both connected and disconnected modes. However, the disconnected mode must be planned, data must be pre-downloaded, 3.1.3. Bar code and RFID capability not demonstrated.

User Story 4. City Executive (CD) and Department Manager (DM)

Asset & Inventory Review and Planning

Vendor partially demonstrated the system's ability to address two of the ten user story elements within this subsection. The system provides reporting capabilities and contains 2,000 premade report templates, 4.1.5. The systems dashboards are modern and are configurable, however they appear to only be graphical, not interactive. 4.1.8. The demonstration with regards to this section was very light and the system was not shown to be able to address many of the functional requirements.

User Story 5. Cross Roles: Inventory Management

Inventory

Vendor partially demonstrated the system's ability to address two of the seven user story elements within this subsection. The system was demonstrated in this section to have the ability to read bar codes for inventory items, 5.15, The system can locate inventory items within multiple warehouses and parts trucks, including the locations within the warehouse, 5.1.6. The system supports average cost, LIFO/FIFO, and can be charged to WOs. 5.1.7

Conclusion

The wandering nature of demo made it difficult to score the system against the scoring criteria. This left many of the participants frustrated. The execution of tasks throughout of the demonstration were manual (cut & paste), which is not desirable, and the mobile applications capabilities are limited. However, several aspects of the system that were demonstrated were appealing, specifically the simplicity of navigating/creating WOs and managing asset information.

D.4. Tyler EAM

Vendor: Tyler Technologies
Product: Tyler EAM

Introduction

This document summarizes the vendors demonstration of their system in relation to the provided demo scripts. This summary describes the system's ability to address mandatory and critical functional requirements within each user story. Each element of the systems capability described below is followed by the corresponding user story section/subsection.

Demonstration

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets. However, the vendor openly stated that their system did not meet many of the requirements, therefore many user story items were not addressed.

User Stories

Admin

The vendor partially demonstrated the system's ability to address two of the three user story elements within this section. The system supports single sign on, Active Directory and LDAP authentication methods, implementing role/user-based security, G.1. The systems asset registry is accessed and managed through the Asset Registry module, G.2. Modification of dropdown/pick lists and fields (adding new, renaming, etc.) is possible but it is a complicated process. Vendor mainly demonstrated how users can turn on and off pre-defined fields. Setting mandatory fields outside of the pre-defined configuration is not currently supported.

User Story 1. Crew Supervisor (CS) Planning

Preventative Maintenance and Scheduling

Vendor partially demonstrated the system's ability to address two of the four user story elements within this subsection. Asset navigation is facilitated within the Field Work module via map or list interface, WOs can be directly created on an asset, including generation of WO on multiple maintenance items, 1.1.1. Preventative maintenance can be setup and scheduled by configuring PM criteria for the assets within PM creation module. 1.1.2. The system does not support hierarchical scheduling, 1.1.3, nor does it support PM task grouping, 1.1.4.

Notification, Triggers and Prioritization

Vendor partially demonstrated the system's ability to address most of the user story elements in this subsection. Email and text notifications are all available to communicate information through an event scheduler configuration, 1.2.1. The system supports the tracking the probability and consequences of failure for assets, however it does not support if-then

scenarios, 1.22. The system supports some integration capabilities with outside systems, specifically, it has purpose-built integration with Tyler's other platform, Munis. The system can also integrate with fuel systems, Power BI and LDAP. However, integration with Scada systems is not supported out of the box and development would be required to satisfy this requirement, 1.2.3.

Data Entry

Vendor partially demonstrated the system's ability to address several of the user story elements in this subsection. The system streamlines repetitive task through work order templates organized by activity types that can be configured and shared to preset list of users for use in creating WOs, 1.3.1. Using the Asset Registry module, users can import or create assets. The module also employs a wizard to guide users through the process. Asset creation/management is bi-directional w/Esri. Utilizes Esri collector to create new assets in the field, where additions are put into a pending que for review. 1.3.2. Attachments can be added to WOs and assets through a content management system which is part of Munis. However, it can only add one at a time, bulk attachments are not supported, 1.3.3. Import/Export from/to Excel and other file types is supported across the entire system, 1.3.4. The system does not support bulk edits of GIS data, preference is to utilize Esri's tools.

User Story 2. Crew Supervisor (CS) Work Order Creation

Work Orders and Work Tracking

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The system utilizes work order templates pre-planning activities. WOs can be created with or without assets and can be pre-populated based on activity type, however, it doesn't appear that the templates are configurable beyond turning on/off pre-assigned fields, 2.1.1. Setting fields to mandatory is not currently supported. Documents, pictures, and files can all be attached WOs and assets, 2.13. Manuals and part catalogs can be uploaded as attachments, but the system does not support live links online catalogs. Multiple assets can be assigned to a WO, but they must be the same type of asset, 2.1.5. Assets can be added to WO as equipment required to complete the work, 2.1.6. WOs cannot be linked to each other but multiple tasks (aka sub-work order) per WO are allowed, 2.1.7. The Work Manager module is a calendar-based tool for viewing WOs. The module supports drag and drop, tracks certifications, time off, and tracking resource commitments, 2.1.8. Asset hierarchy is accessed through the Asset Registry module. Vendor did not demonstrate how the display of the module is modified based on user role, though it likely has this capability, 2.1.9.

User Story 3. Asset Maintainer (AM) Daily Work

Mobile

Vendor adequately demonstrated the system's ability to address three of the four user story elements within this section. The vendor demonstrated two components that support in-the field access to WO/Asset data. The Field Work module and the Field Sheets app work together to provide this capability. The Field Work module is a browser-based web application like all the

other web application modules demonstrated. This module is only accessible when the device has an internet connection. For a true mobile experience, the Field Sheets application works on tablets and smart phones. It supports photo attachments, voice to text, bar code reading and operates in a disconnected state. However, the mobile application does not support GIS/Esri, therefore there is not map component or access to GIS data, 3.1.1, 3.1.2, 3.1.3. Unfortunately, the vendor could not get Field Sheets application to function, therefore a demonstration of its capabilities was not given.

User Story 4. City Executive (CD) and Department Manager (DM)

Asset & Inventory Review and Planning

Vendor partial demonstrated the system's ability to address five of the nine user story elements within this section. The system does not have the capability of prioritizing assets based on risk, condition or work history, it can only show some analytics such as types of asset assigned to departments, cost history, mx type etc. The system can track reported mileage and display the analytics but cannot calculate remaining mileage. The system utilizes the Munis Capital Asset module to reconcile with the fixed Asset Register, however the asset registers don't appear to be live linked. 4.1.4. The system utilizes pre-configured reports that have limited configuration capabilities. No ad-hoc reporting capability, vendor suggested utilizing SQL Server Report Services for custom reports, 4.1.5. The system tracks transactions by user and date stamp, 4.1.6. Reports can be saved, scheduled and distributed to users/roles, 4.1.7. The systems dashboards are accessible through the Hub feeds in a separate module. This module is visually appealing, but the feeds are somewhat limited and cannot be modified/configured. 4.1.8. The system does not support combining CMMS data, integrated data, if-then forecasts, or GIS data, backend database manipulation was suggested by the vendor.

User Story 5. Cross Roles: Inventory Management

Inventory

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The system utilizes the Inventory module for the management of inventories. The module supports integration with Munis and EAM, providing access to purchasing info and inventory supply. The system tracks cost of inventory items and can issue with adjusted cost, 5.1.3. The system fully supports serialized assets, components and parts, 5.1.4. Barcode scanning is supported; however, RFID is not supported, 5.1.5. The system supports multiple warehouses as well as part trucks/mobile warehouses, 5.1.6. The Inventory module supports average cost, LIFO and an few other cost models, however it does not support FIFO, 5.1.7

Conclusion

The vendor adequately followed the demo script provided and was upfront about where the software had deficiencies in relation to the script. Overall the platform is visually appealing, with well executed interfaces and GIS integration. However, the modular nature of the system

created a somewhat disjointed workflows and integration between them. The mobile capabilities were lacking, however the inability to demonstrate the app and it's lack of Esri integration, contributed to this conclusion.

D.5. READYAsset

Vendor: Llumin
Product: Llumin

Introduction

This document summarizes the vendors demonstration of their system in relation to the provided demo scripts. This summary describes the system's ability to address mandatory and critical functional requirements within each user story. Each element of the systems capability described below is followed by the corresponding user story section/subsection.

Demonstration

The vendor adequately tailored their demonstration to follow the demo script closely, which allowed scoring participants to follow along with their scoring sheets.

User Stories

Admin

The vendor adequately demonstrated the system's ability to address all the user story elements within this section. The vendor demonstrated the systems authentication methods and role-based security, which supports LDAP, Active Directory, SAML 2.0. The permissions are applied to asset types as well as content and capabilities, G.1. The system supports GIS based assets by asset class and can support unlimited asset classes. Non-spatial assets were not demonstrated; however, they are likely supported, G.2. Existing fields and pick list values can be modified, set to required, and forms can be modified. Unclear if new fields/pick lists can be added, G.3

User Story 1. Crew Supervisor (CS) Planning

Preventative Maintenance and Scheduling

Vendor adequately demonstrated the system's ability to address all the user story elements within this subsection. Assets are navigated through an asset hierarchy tree call the Asset Finder. Navigation is intuitive and assets can be organized by department, however no map navigation was demonstrated, 1.1.1. The system supports various preventative maintenance schedule options, including various units of time and triggers, 1.1.2. The system supports banding PMs together or to make them dependent upon one another, 1.1.3. Multiple assets can be assigned to a work order and are not limited by the type of asset,1.1.4.

Notification, Triggers and Prioritization

The system was adequately demonstrated in its ability to address all the user story elements in this subsection. The system has full capabilities to set triggers for alerts to be sent to individuals or groups by either by text message (SMS) or email, 1.2.1. Work order triggers can be configured to be initiated on a datapoint such as recorded vehicle mileage and a configured set

of conditions, 1.2.2. Triggers can also be configured off external data such as SCADA. Integration through OPC allows for robust integration with external systems 1.2.3.

Data Entry

Vendor adequately demonstrated the system's ability to address most of the user story elements in this subsection. Data entry within the system is fairly streamlined, access to asset information and WO forms nicely laid out. Utilizes standard data quality and efficiency tools such as drop downs etc. Bulk data entry was demonstrated with relation to personnel utilization, 1.3.1. New asset data can be easily added individually or in bulk using an Excel import template. The import template also included validation tools, 1.3.2. Individual attachments as well as bulk uploaded through the import template,1.3.3. Various types of data can also be exported to Excel, 1.3.4. Editing GIS data was not demonstrated and it appears to be unsupported.

User Story 2. Crew Supervisor (CS) Work Order Creation

Work Orders and Work Tracking

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The system utilizes templates for setting up and scheduling preventative maintenance. PMs can be viewed in either grid or calendar views, 2.1.1. Modifications to requirements of field population is managed through the administration interface, 2.1.2. The system can attach documents to assets and work orders, 2.1.3. Documents, such as manuals, can be linked but there is no capability to link to external catalogs. WOs can contain many assets and they are not limited by asset type. Additionally, all asset information can be navigated via "cards" within the WOs, 2.1.5. Some assets, such as vehicles can be added to the WO, but they are not specifically listed as equipment, 2.1.6. WOs cannot be linked or have dependencies. The vendor however did demonstrate creating follow-up WOs from an existing WO, 2.1.7. WOs can be viewed in a calendar and some summary capabilities, such as WO by month. However, the system does not support drag/drop, or resource management, 2.1.8. The system has basic parent-child WO hierarchy and asset information carries through, 2.1.9.

User Story 3. Asset Maintainer (AM) Daily Work

Mobile

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The vendor demonstrated the systems mobile capabilities mainly through the web application, which requires internet connectivity. The web application does scale well on an tablet device. The vendor also demonstrated a simple native iOS mobile application provides access to WO and asset information, but no GIS functionality. The app works offline with a sync capability, however it requires download prior to going offline. The mobile application has the ability to scan barcodes for assets and can also upload pictures and

other file types. Assets can be created in the mobile application, however location/GIS info cannot be captured, 3.1.1, 3.1.2, 3.1.3, 3.1.4.

User Story 4. City Executive (CD) and Department Manager (DM)

Asset & Inventory Review and Planning

Vendor adequately demonstrated the system's ability to address most of the user story elements within this section. The system supports asset prioritization based on risk, condition and history through the Capital Asset Planning and Risk Assessment module. The module can calculate risk, estimate replacement and determine criticality of replacement, 4.1.1 & 4.1.3 The system has the capability of tracking recorded mileage, however it cannot calculate allowance or against remaining mileage, 4.1.2. The system contains a number of canned reports and also utilizes a report builder for builder for new or ad-hoc reports, 4.1.5. Reports can also be cloned and changed, 4.1.7. Simple chart capabilities were shows but no dashboards or dashboard builder was demonstrated.

User Story 5. Cross Roles: Inventory Management

Inventory

Vendor was not able to demonstrate the system's ability to address user story elements in this section due to lack of remaining time. Inventory monitoring and tracking is achieved through the systems inventory module, which appeared fairly comprehensive, 5.1.1. The module supports a full historical view of inventory, including in/out dates and historical quantities, 5.1.2. Inventory items can be tracked and issue POs/requisitions to refill based on need (triggers), 5.1.3. The system fully supports serialized assets etc, 5.1.4. Inventory can be read via bar code or RFID, and labels can be printed from the scanned items, 5.1.5. The inventory module supports unlimited warehouses including mobile warehouses, 5.1.6. The module supports all value models (average cost, LIFO, FIFO) and a full history can be mined for inventory items 5.1.7

Conclusion

Overall the system has an intuitive design, access to information within WOs and assets is easy to navigate. The risk assessment module functionality is appealing, and the inventory module is comprehensive. However, the mobile application is light on capability and the system doesn't have a strong GIS capability. Additionally, no information pertaining to fleet management was referenced throughout the demonstration.

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EAM Cost Comparison Summary

FY21 EAM (Revised)

Vendor	Procurement	Implementation*	Configuration**	Total
AssetWorks	$80,250.00	$260,350.00	$95,940.00	$436,540.00
DTS VueWorks	$135,000.00	$360,000.00	$166,500.00	$661,500.00
Llumin	$94,500.00	$0.00	$10,000.00	$104,500.00
Tyler***	$199,803.00	$400,140.00	$22,850.00	$622,793.00

Ongoing (Revised)

Vendor	Annual Licensing	Year 2 - Year 5	5 Year Cumulative****
AssetWorks*****	$71,254.00	$279,252.00	$715,792.00
DTS VueWorks	$27,000.00	$108,000.00	$769,500.00
LLumin	$29,088.00	$116,352.00	$220,852.00
Tyler******	$69,059.00	$257,124.00	$879,917.00

*On-premise deployment across 11 functional areas, incl training and travel

**Third-party interfaces

***Includes $44,000 contingency for implementation

****Setup and licensing through Year 5

*****Max annual maint over 5 years; actual is $68,180 Year 2 to $71,254 Year 5

******Max annual maint over 5 years; actual is $59,656 Year 2 to $69,059 Year 5 (with 5% annual increase)