INFRASTRUCTURE ASSET MANAGEMENT

INFORMATION SYSTEMS ASSESSMENT AND IMPROVEMENT

VUTHELA ILEMBE LED PROGRAMME

IMQS

T +27 (0)21 880 2702 F +27 (0)21 880 0686 TOLL FREE 080 123 IMQS WWW.IMQS.CO.ZA

UNIT D, OCTO PLACE, 2ND FLOOR, ELECTRON STREET, TECHNOPARK, STELLENBOSCH, SOUTH AFRICA, 7599 | PO.BOX 814 STELLENBOCH, 7599, SOUTH AFRICA

CONFIDENTIAL AND COPYRIGHT NOTICE

The information contained in this document is the exclusive property of iLembe District Municipality, Mandeni Local Municipality, and KwaDukuza Local Municipality and any respective copyright owners. This work is protected under South African copyright law and other international copyright treaties and conventions.

The information it contains is considered confidential and should only be in your possession is given to you by an authorised person. If you are unsure if you are authorised to view this document, please contact the respective municipality.

DOCUMENT MANAGEMENT

CLIENT	**VUTHELA ILEMBE**
Project Description	Systems Assessment and Improvement Plan
Prepared by	Masheke Mukwamataba and Caroline van Heerden
Preparation Date	29 April 2019
Version	Ver 3.0

PREPARED FOR

APPROVAL AND CHANGE HISTORY

DOCUMENT VERSION CONTROL:

DOCUMENT	DATE	PREPARED BY	DESCRIPTION
Systems Assessment and Improvement Plan	29 April 2019	Caroline van Heerden and Masheke Mukwamataba	Discussion of the current asset management processes followed by the municipality and proposed AM Practices Enhancements.
Systems Assessment and Improvement Plan	02 August 2019	Caroline van Heerden	Update the effective date following the close out meeting.
Systems Assessment and Improvement Plan	19 August 2019	Caroline van Heerden	Include all project stockholder logos and project background.

By signing this document, Vuthela Ilembe LED Programme indicates that the information it contains is as complete and accurate as possible.

APPROVED:

Name: Masheke Mukwamataba
Organisation: IMQS
Designation: Chief Innovation Officer
Signature: _____
Date: 20-Aug-19

Name: Monja Eesterhuizen
Organisation: Vuthela iLembe LED programme
Designation: Project Sponsor
Signature: _____
Date:

Name: Gugu Tywabi
Organisation: iLembe Distict Municipality
Designation: ICT Manager
Signature: _____
Date:

Name: Samuel Kuber
Organisation: KwaDukuza Local Municipality
Designation: ICT Manager
Signature: _____
Date:

Name: Phumlani Ntanzi
Organisation: Mandeni Local Municipality
Designation: ICT Manager
Signature: _____
Date:

Document effective at: 02 August 2019

ABBREVIATIONS

AMIS	Asset Management Information Systems
AMP	The Asset Management Plan
AMS	Asset Management System
AR	Asset Register
BOQ	Bill of Quantise
BPMN2	Business Process Model and Notation 2
CAPEX	Capital Expenditure
COGTA	Department of Cooperative Governance and Traditional Affairs
DM	District Municipality
EUL	Expected Useful Life
FAR	Fixed asset register
GIS	Geographic Information System
HOD	Head of Department
FIS	Financial Information System
IDP	Integrated Development Planning
ISD	Internal Social Officer
KPI	Key Performance Indicators
KZN DETEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
LM	Local Municipality
MIC	Municipal Infrastructure Grant
MM	Municipal Manager
NT	National Treasury
OPEX	Operational Expenditure
PMU	Project Management Unit
PMS	Pavement management system
PRV	Pressure Regulating Valve
RUL	Remaining Useful Life

SECO	Switzerland State Secretariat for Economic Affairs
SCM	Supply Chain Management
SOW	Scope of Work
TAR	Technical Asset Register
WIP	Work in Progress

EXECUTIVE SUMMARY

The objective of this report is to document the processes currently followed for each asset management activity conducted by each of the three municipalities. This is them used to develop Recommendations for an Electronic AMIS as part of the Vuthela-Ilembe LED Programme. This project covers three municipalities each responsible for different infrastructure. Mandeni and KwaDukuza Local Municipalities maintains roads and electrical infrastructure, while iLembe District Municipality maintains water and sewer infrastructure.

Currently, each of the municipalities uses predominantly manual or hard copy process. This can greatly be enhanced by implementing as a centralised computerised system that will ensure accurate reporting and an enriched data set to super decision making. Mandeni LM utilises Excel for the following processes: project planning, project management and the asset register. ESRI is utilised to capture As-Built drawings and Sage Pastel is user for a finance information system. KwaDukuza LM utilises Excel for the following processes: customer connection, project planning and project management. While Baudnext is used for the movable and immovable asset register, MunSoft for fleet utilisation and ESRI to capture As-Built drawings. While iLembe DM utilises Excel for the following processes: project planning, project management and the asset register. MunSoft is used together with Excel to manage the asset register. ArcGIS is utilised to capture As-Built drawings.

It is proposed to implement additional systems to address gaps and integrate with the existing system to ensure that the whole asset life cycle can be facilitated, including asset creation, operation, maintenance, renewal and ultimately disposal of assets is required.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION AND APPROACH TO THE ASSESSMENT

1.1 PROJECT INTRODUCTION AND BACKGROUND

This report is the Close-Out Report for the contract to deliver the following documentation - Portion A: asset management plans & Portion B: scoping study for an asset management system for iLembe District and KwaDukuza, Mandeni Local Municipalities as set out in the Scope of Work (SoW).

The project forms part of the Vuthela LED Programme which was officially launched on 29 November 2017 by the iLembe District Municipality, together with the Switzerland State Secretariat for Economic Affairs (SECO) and the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN DETEA).

The Vuthela iLembe LED Programme footprint comprises the iLembe District Municipality (IDM) and its local municipalities of KwaDukuza (KDM), Mandeni (MLM), Ndwedwe and Maphumulo. The primary purpose of the programme is improvement of the economic future of the iLembe District residents through sustainable economic growth of the local economy and the creation of higher, better and more inclusive employment and income generating opportunities. The programme comprises five components, namely:

- Public Financial Management Component.
- Municipal Infrastructure Component.
- Private Sector Development Component.
- Building Inclusive Growth Component.
- Partnership and Coordination Component.

This contract falls under the Municipal Infrastructure Component (MIC). The MIC focuses on the improvement and development of municipal infrastructure and services and has three sub-components:

- Reduced infrastructure constraints (improved scope and quality of basic infrastructure services);
- Increased planning capacity and financing strategies for an integrated and systematic expansion of (urban) infrastructure, as a basis for sustainable development of regional centres; and
- Enhanced planning and management of key infrastructure sectors.

The initial project was conducted as part of the Inception Phase of the Vuthela LED Programme, which focussed on the scoping, preparation and assessment of implementation-readiness for support projects during the Implementation Phase.

PROJECT CONSULTANT AND SUB-CONSULTANTS / CONTRACTORS

The project consultant was IMQS Software (Pty) Ltd and the Sub-Contractor was Amaqhawe Asset Management Solution. The workshare percentage split was 90/10 respectively.

OBJECTIVES OF THE ASSIGNMENT AS PER THE TOR

The appointment is for two particular assignments, consisting of Portion A for the development of asset management plans and Portion B for the scoping of an asset management system. Both assignments relate to the particular infrastructure functions of the IDM, KDM and MLM.

Objectives of the Asset Management Plan (AMP)

The Asset Management Plan (AMP) should enable the municipality to have an overview of its infrastructure assets' worth, condition and suitability to meet current and future service requirements based on the assets' life cycle. The AMP should

enable the development of a strategy to support the optimal, functional management of existing assets whilst considering the financial and technical decision-making aspects for future service requirements.

The AMP should assist in project identification and selection, thereby integrating planning and development needs to ensure efficient and effective budgeting and implementation of projects. It should aid project prioritisation when considering available budget, service levels and required service levels.

The AMP should further be aligned to the available budget and revenue of the municipality and the development objectives of the municipality.

Objectives of the Asset Management System

References in this document to an Asset Management System (AMS), are considered as reference to each participating municipality's AMS. It was assumed at the time of writing the scope of work for this assignment, that there will be separate, but similar systems planned, designed and implemented in each municipality. Cognisance should however be given to the potential of information sharing, across platforms and between municipalities.

The AMS should enable the municipality to have access to detailed information on infrastructure assets' worth, condition and suitability to meet current and future service requirements based on the assets' life cycle. This means the incorporation or maintenance of the asset register, for financial and technical compliance and planning.

The AMS should enable the development of an Asset Management Plan (AMP) and strategy to support the optimal, functional management of existing assets whilst considering the financial and technical decision-making items for future services.

The AMS, through the AMP, should assist with project identification and prioritisation when considering available budget, existing service levels and required service levels. The AMS should further allow for integration with the financial management and planning of the municipality.

MAIN PROJECT COMPONENTS OR DELIVERABLES

The main deliverables as extracted on the tender document page 30 are as follows:

C.1.8 Deliverables and Outputs

The following is a summary of the list of the deliverables; refer to the prior sections for more detail.

1. Inception Report.
2. iLembe District Municipality AMP, three hard copies, one electronic copy.
3. KwaDukuza Local Municipality AMP, three hard copies, one electronic copy.
4. Mandeni Local Municipality AMP, three hard copies, one electronic copy.
5. Workshop per municipality, to discuss the financial plan and prioritisation, for inclusion in the municipal budget.
6. Workshop per municipality (IDM, KDM, MLM) to present and discuss the final AMP & results of the Scoping for an asset management system.
7. Scoping report, for the design and implementation of an Asset Management System (applies to three municipalities).
8. Attendance of tri-weekly progress meetings and provision of meeting notes.
9. Submission of weekly progress reports.
10. Close-out report.
11. Presentation to the Municipal Infrastructure Forum.
12. Presentation to the Vuthela Programme PSC.

CONTRACTUAL DATES

IMQS Software (Pty) Ltd was officially appointed on the 08th August 2018. Project duration was for 5 months.

1.2 PURPOSE

This report documents the current Infrastructure Asset Management (AM) process and the corresponding Asset Management Information Systems (AMIS) used by each of the three municipalities. This was conducted as part of the Vuthela-Ilembe LED Programme. An overview is provided of the process followed the documented processes and the proposed enhancement AMIS requirements.

The primary goal of the infrastructure AM process and information system analysis phase is to investigate and documents the current Infrastructure Asset Management (AM) process and the corresponding Asset Management Information Systems (AMIS) used by each of the three municipalities. Then based on current processes the system requirements of the three selected municipalities and propose more efficient and effective alternatives to the current infrastructure AM processes and system landscape. This document outlines the statuesque system processes (As-Is Analysis), the proposed Asset Management improvement solution (To-Be recommendations) for the selected three municipalities, which will afford the municipalities the benefit of an **integrated enterprise asset management system.** Such a system environment will enable improved AM practices in line with recognised good practice and establish one singular, centralised information system to provide standardised, relevant and up to date info to meet the needs of users across the municipality (engineers, finance, planners). As a foundation for the improvement of infrastructure management practice, and in turn the optimised performance of infrastructure, and thereby improved service delivery. A secondary objective to have a similar systems solution across all to support operational

expediency and coordination in the district. In addition to this encourage mutual learning opportunities to assist in advancing levels of practice. More specifically, the document seeks to achieve the following objectives:

- Produce comprehensive requirements list which encapsulates process and AMIS requirements,
- Investigate and report on proposed system integration opportunities which would alleviate the system related problems identified and reported on during the As-Is analysis phase,
- Investigate and propose process improvement opportunities,
- Document a proposed high-level conceptual solution based on (1) the requirements gathered from key personnel, (2) industry best practice, and (3) the AM practices assessment document.

The As-Is Analysis was an exercise performed to understand and document the current business processes in place at a municipality. The exercise was done for each of the three municipalities and documented as such. The primary goal of performing this exercise was to identify gaps within the current business processes. For this reason, it was of utmost importance that all stakeholders were present and honest about the processes currently in place. The interviews conducted covered the entire asset life cycle (**Figure 1-1**).

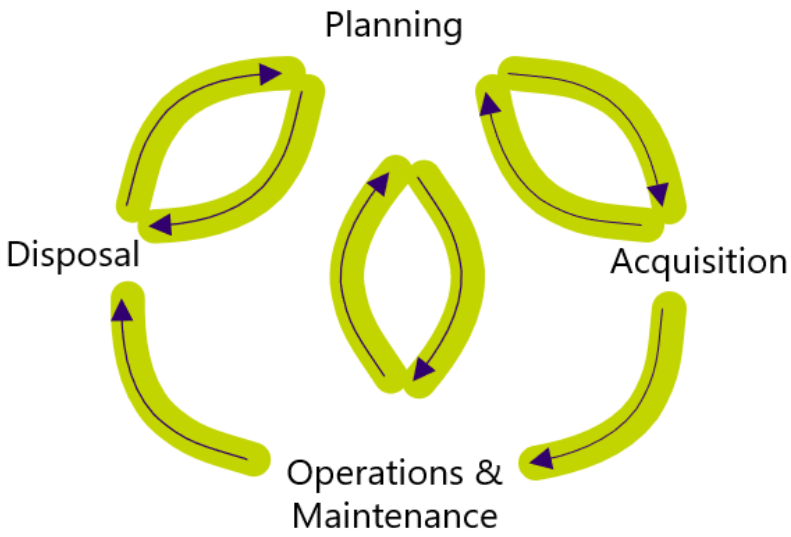

Figure 1-1: Asset Life Cycle

The To-Be analysis proposes and demonstrates process improvements that meet the challenges identified from the As-Is process. The proposed solutions are not limited to the use of existing and/or new software systems, improvements may also be achieved through the implementation of new standard operating procedures where required.

The proposed solution design will ensure one common data set that fulfils the needs of operational managers, project managers, planners, spatial planners, and accountants. Therefore, this dataset should cater to the functional requirements for operational, tactical and strategic management levels. The integrated system will facilitate access to appropriately structured and accurate data to be established and maintained by the relevant teams. The enablement of data management processes will support organisational decision making to support effective service delivery, **Figure 1-2**.

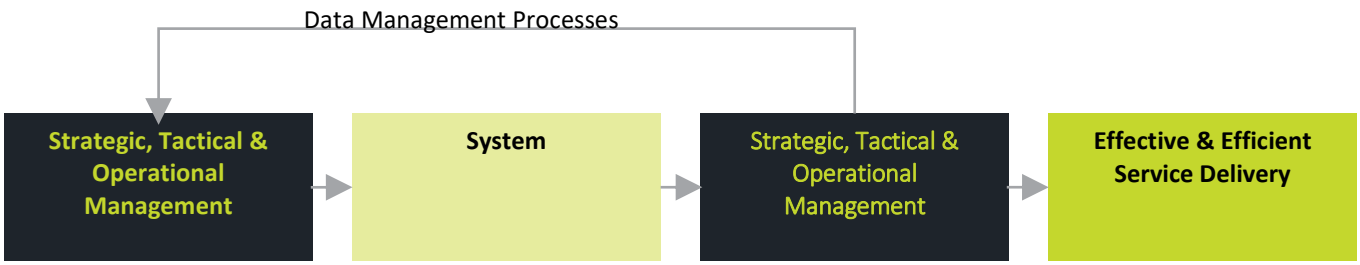

Figure 1-2: Ideal Integrated Process

1.3 BACKGROUND

The programme has three beneficiary municipalities: Mandeni Local Municipality (MLM), KwaDukuza Local Municipality (KDM), and iLembe District Municipality (IDM). IMQS was appointed on the Vuthela iLembe LED Programme (VILP/I/010) to develop asset Management Plans and conduct System Scoping for iLembe District Municipality, Mandeni Local Municipality, and KwaDukuza Local Municipality. The full scope can be seen in **Figure 1-3**. The scope item covered in this document is highlighted in green. The portion of the scope addressed in this document is the development of *AM Systems Scoping,* which included *AMS ICT Architecture, User Specifications* and *Recommendations for Electronic AMIS*.

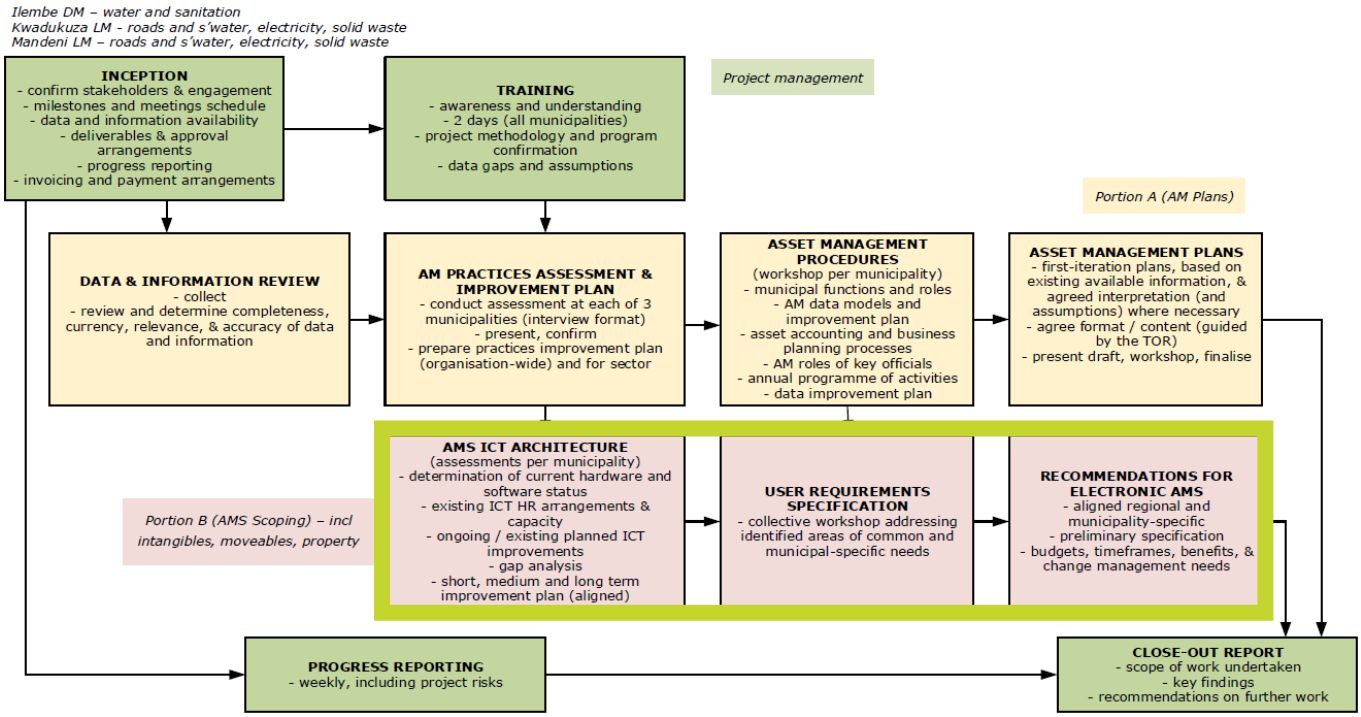

Figure 1-3: Project Scope

Form the analysis it was evident that the system implementation maturity was similar across the participating municipalities, and the technical sectors (electricity, roads and storm-water, and water and sanitation). As manual or stand-alone process is used by each of the sectors, Error! Reference source not found. to Error! Reference source not found. provides an overview of systems used at each municipality. Initial findings proposed integrated AMIS requirements were presented and confirmed with representatives of the participating municipalities during the workshop held at the Ocean Reef Hotel in Zinkwazi on 28 February 2019.

Table 1-1: Summary of Systems Used at Mandeni

		AM Department			
		Operations	**Finance**	**Planning**	**GIS**
Process	**Planning**			Project Planning	
	Asset Creation			Project Management	
	Asset Capturing		Asset Register		Capture As-Built esri
	Maintenance and operation	PMS	Human Resource costing Sage Pastel Accounting		
	Asset Renewal			Project Management	
	De-recognition Process		Asset Register		

Table 1-2: Summary of Systems Used at KwaDukuza

		AM Department			
		Operations	**Finance**	**Planning**	**GIS**
Process	**Planning**	Customer Connections		Project Planning	
	Asset Creation			Project Management	
	Asset Capturing		Asset Register BAUDNEXT Asset Management Solutions		Capture As-Built esri
	Maintenance and operation	Elec Maintenance ON KEY asset management | switched on	Fleet utilisation MUNSOFT municipal financial software		
	Asset Renewal			Project Management	
	De-recognition Process		Asset Register BAUDNEXT Asset Management Solutions		

Table 1-3: Summary of Systems Used at iLembe

		AM Department			
		Operations	**Finance**	**Planning**	**GIS**
Process	**Planning**			Project Planning	
	Asset Creation			Project Management	
	Asset Capturing		Asset Register MUNSOFT municipal financial software		Capture As-Built ArcGIS
	Maintenance and operation				
	Asset Renewal			Project Management	
	De-recognition Process		Asset Register		

1.4 APPROACH

A series of interviews with the different departments at each of the three municipalities were conducted and from there, the current processes and the details thereof were identified. The processes identified have been documented in this document at the lowest level possible, which was dictated by the information that was available during the interview sessions. Most of the processes were clearly understood by the stakeholders participating in the interview sessions.

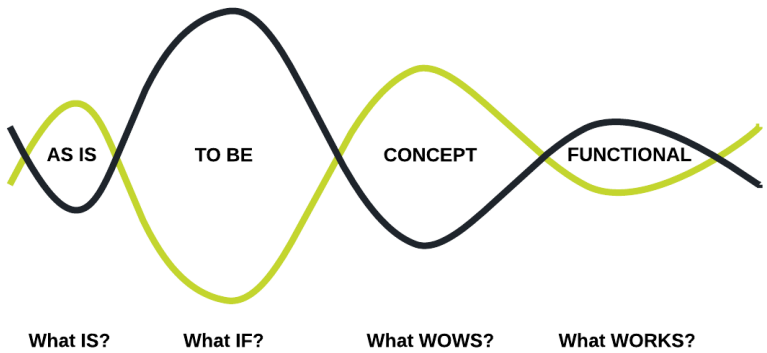

Figure 1-4: Analysis Process

The processes have been merged into single processes to identify the "golden thread" activities between different departments, which makes finding missing activities easier as well as identifying pockets of excellence which may have been implemented by specific departments.

A structured 4 step business and systems analysis process was followed, with related supporting tasks.

STEP 1: AS-IS ASSESSMENT

- Assess current organisational environment, technology, applications and data structures;
- Understand the current business context;

- Review collected data; and
- Provide high-level findings

The As-Is landscape was identified through a series of interviews and workshops conducted with each municipality and key members from each of the relevant departments. **Figure 1-5** illustrates each of the functions included in the investigation. The result will be discussed in **Section 2**.

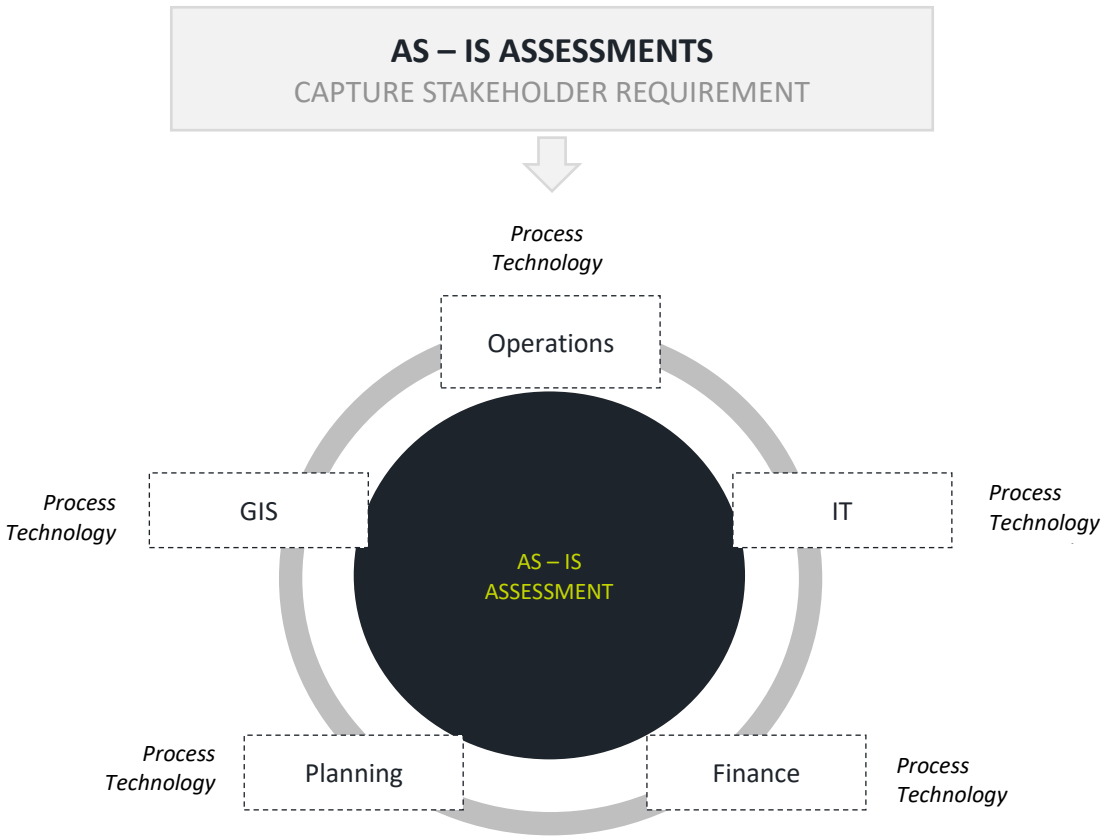

Figure 1-5: As-Is Assessment Process

STEP 2: TO-BE ASSESSMENT AND GAP ANALYSIS

- Analyse integration opportunities;
- Review existing processes, tools, and documentation; and
- Assess findings and perform gap analysis benchmarks and frameworks.

The results are discussed in **Section 2.5**.

STEP 3: CONCEPTUAL DESIGN

- Define and workshop guiding principles for integration design;
- Validate As-Is findings;
- Produce conceptual frameworks and designs;
- Identification and mapping of the key new business processes.

Figure 1-6 illustrates the principles used to define the conceptional design. The As-Is findings were validated during the workshop held at Ocean Reef Hotel on 28 February and 1 March 2019. The conceptual design will be discussed in **Section 5**.

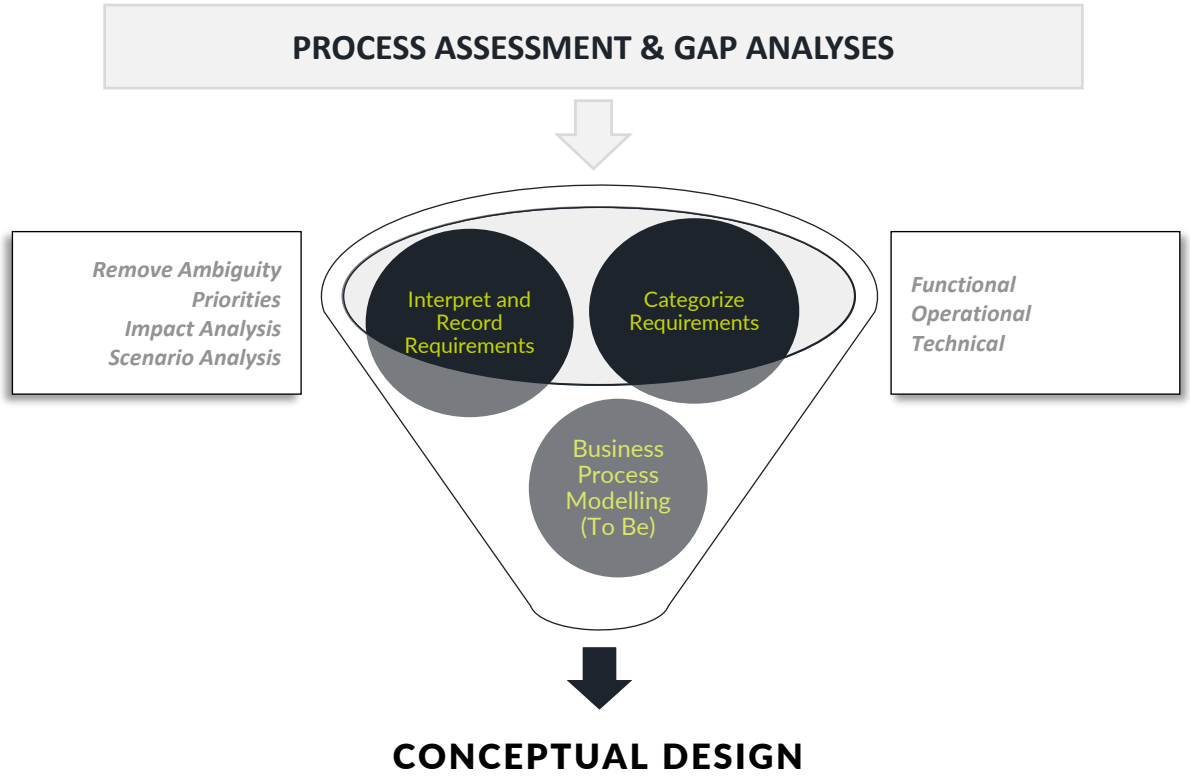

Figure 1-6: Conceptual Design Process

STEP 4: IMPLEMENTATION ROADMAP

- Develop the functional specifications required; and
- Develop a roadmap for the implementation of system integration.

The proposed roadmap will be discussed in **Section 6**.

2 AS-IS ASSESSMENT

The objective of this section is to define the end-to-end process and the related transactions/events currently performed by Mandeni LM, iLembe DM and KwaDukuza LM in the context of integrated asset management, which has an impact on the central technical asset register (TAR) and financial asset register (FAR). In order to clearly represent the processes, they have been documented in the Business Process Model and Notation 2 (BPMN2) notation.

Currently, each of the municipalities uses predominantly manual or hard copy process. This can greatly be enhanced by implementing as a centralised computerised system that will ensure accurate reporting and an enriched data set to super decision making. The systems used at each municipality is summarised in **Table 1-1**, **Table 1-2** and

Table 1-3.

2.1 DIAGRAM LEGEND

The following legend defines the symbols used in the business process diagrams.

Table 2-1: BPMN2 Diagram Legend

Process Icon	Description
	The action which initiates the process to begin
	A conditional event, which may or may not occur
	A timed event which occurs at fixed time intervals
	The end of the process
	A loop task which happens repeatedly
	A sub-process task within the process
	A manual, human-initiated task which takes place within the process
	An automatic task carried out by the system and requires no human involvement
	An exclusive gateway wherefrom only a single decision can be taken
	A parallel gateway wherefrom several steams can run in parallel
	An inclusive gateway wherefrom more than one path can be taken
	A document artefact
	Automatic integration between two systems

2.2 ASSET ACQUISITION

The asset acquisition process has been documented in two sub-processes: the first is project realisation and the second is asset capitalisation. No significant differences were identified between the three municipalities, the minor differences are indicated in the relevant process steps.

PROJECT IDENTIFICATION, EXECUTION AND REALISATION

The details of the project realisation process are shown in **Figure 2-1** and explained in **Table 2-2.**

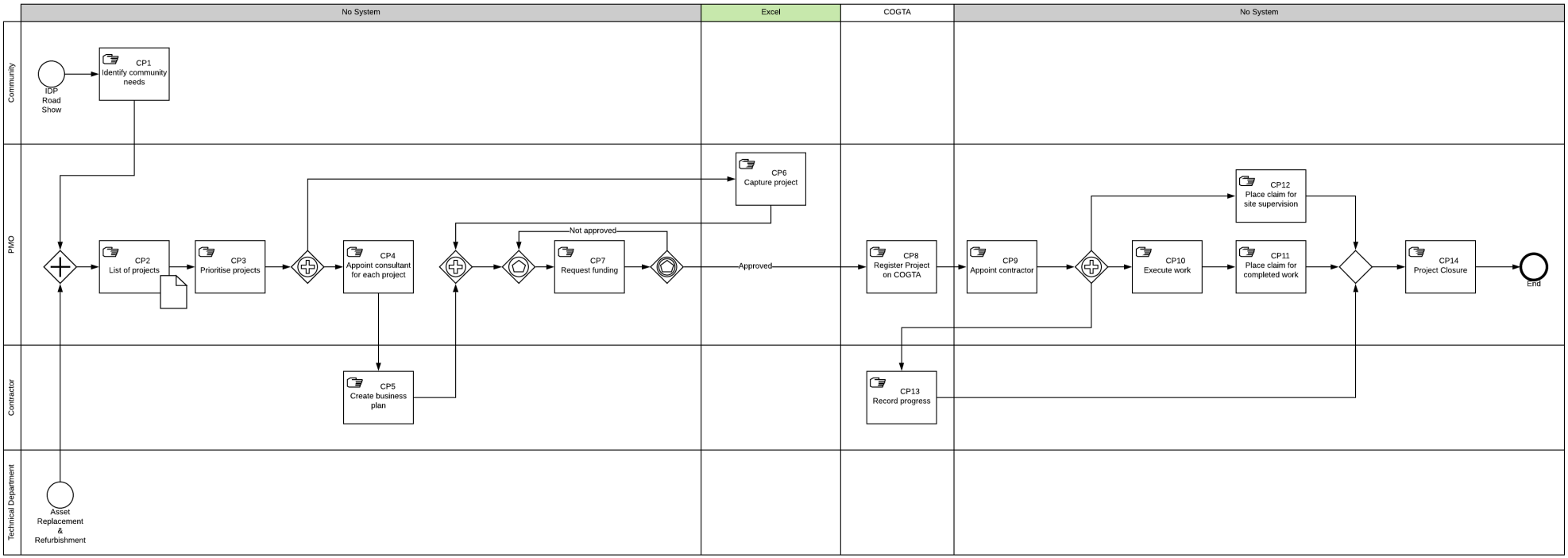

Figure 2-1: Project Identification, Execution and Realisation

Table 2-2: Project Identification, Execution and Realisation

ID	Task	System	Description
CP1	Identify community needs	No System	The community needs are identified base on feedback received during IDP roadshows
CP2	List of projects	No System	The community needs together with the replacement and refurbishment requirements received from technical departments are used to generate a list of required projects. The technical department's requirements are based on asset condition assessments reports done by specialist contractors.
CP3	Prioritise projects	No System	This list of projects is then prioritised. The projects are prioritised based on the backlog and human settlement projects, a project linked to past human settlement projects are given priority, for example tarring a road to a completed urban development area. The prioritisation of projects is captured in an Excel sheet.
CP4	Appoint consultant for each project	No System	Appoints consult to conduct the feasibility for the project.
CP5	Create a business plan/ feasibility study	No System	The consultant is tasked to prepare a business plan or feasibility study at risk. This includes the required investigation followed in designs.
CP6	Capture project	Excel	The prioritised excel list is used to register and track the project progress based on milestone completion.
CP7	Request funding	No System	This step is only relevant in cases where the project cannot be funded by the municipality. Once the extent and details of the project have been proposed by the consultant and approved by the municipality the municipality can request for funding. In some cases (iLembe and KwaDukuza) the municipality may have sufficient budget for projects but for most of the projects, external funding sources need to be identified. The projects and project requirements are presented to MIG COGTA to request for the required funding.
CP8	Register Project on COGTA	COGTA system	This step is only relevant in cases where the project cannot be funded by the municipality. Once a project is approved it is captured on the COGTA reporting framework.
CP9	Appoint contractor	No System	Once the project is registered with COGTA or other funding is confirmed the municipality can put out a tender for the execution of the project.

Table 2-2: Project Identification, Execution and Realisation Continued

ID	Task	System	Description
CP10	Execute work	No System	The municipality does the following to manage the contractor completing and project: • Technicians do site inspections • Facilitate the technical progress meetings with the contractors • ISD (Internal social officer) – This may be specific to Mandeni • Present progress at the project steering committee meeting, which is attended by Ward committee member, Portfolio committee chair, Contractor, Consultant and Technical services • The purpose of the meeting is to discuss social issues regarding the project • Progress reports are provided by consultants on a monthly basis, these are attached to invoices. • Within the municipality progress is monitored at the following meetings: – *This may be specific to Mandeni.* • Portfolio Committee Meetings are held monthly, the following topics are covered • Progress and challenges on the project • Initialisation of grants • IGR (Inter-Governmental infrastructure forum) • Report on grant-funded projects Progress is presented during the Top ManCo and ManCo meetings as well at ExCo and council if there are any problems with projects.
CP11	Place claim for completed work	No System	On completion of agreed milestones, the contractors submit claims for the completed work.
CP12	Place claim for site supervision	No System	The municipal project management office submits claims of the time spent on site supervision. This is included in the total project costs.
CP13	Record progress	Excel	Throughout the project, progress is tracked on the milestone level using excel.
CP14	Project Closure	No System	A project can only be closed once the maintenance department has confirmed hand over. The closeout report includes the following documents: • Completion certificate • As -built (for KDM: hard copy and a soft copy on CD) • Maintenance reports • BOQ (including unit rates for KDM) • Commissioning test results • Minutes of progress meetings • Invoices

ASSET CAPITALISATION

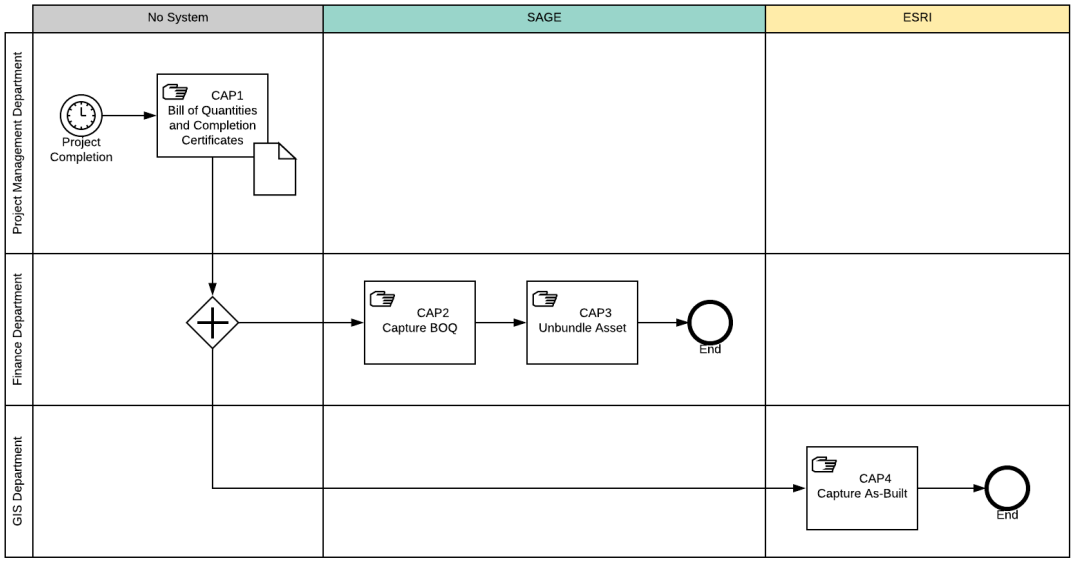

Figure 2-2: Mandeni Asset Capitalisation

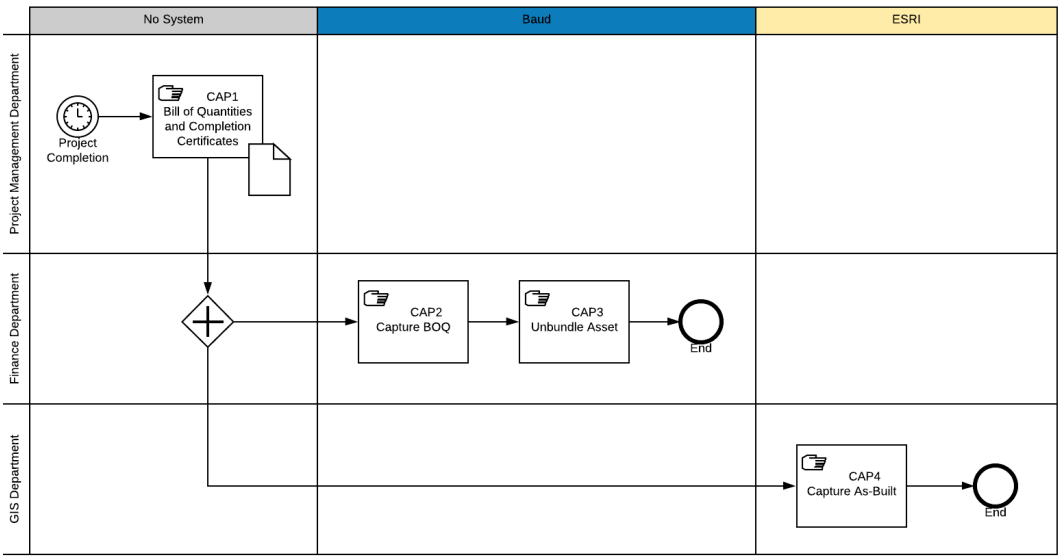

Figure 2-3: KwaDukuza Asset Capitalisation

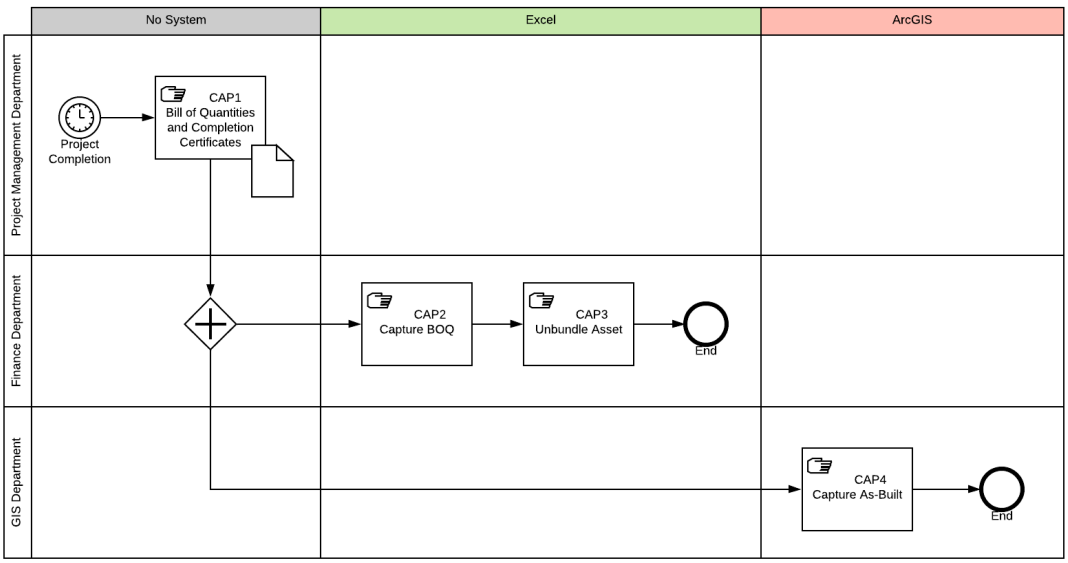

Figure 2-4: iLembe Asset Capitalisation

Table 2-3: Asset Capitalisation

ID	Task	System	Description
CAP1	Bill of Quantities and Completion Certificate	No System	On the final project completion, the project closure report is compiled by the project management office. The report includes the BOQ (including unit rates for KDM) and completion certificate. This is then provided to the finance team.
CAP2	Capture BOQ	Mandeni: Sage KwaDukuza: Baud iLembe: Excel	Capture the BOQ in the relevant finance system. Once complete finance retains the following: • BOQ • Payment claims/vouchers • Completion certificates • Invoices received throughout the project
CAP3	Unbundle Asset	Mandeni: Sage KwaDukuza: Baud iLembe: Excel	The unbundling of the assets is done in the relevant finance system, which is different for each municipality. The apportionment is done by consultants. The municipalities receive a priced BOQ from the consultants.
CAP4	Capture As-Built	Mandeni: Sage KwaDukuza: Baud iLembe: Excel	Once the asset has been created in the asset register the As-Builts are captured on the GIS platform.

ASSET TAKE-ON

Asset takes on occurs if assets are built by a private entity and transferred to the municipality, or assets that are identified in the field but are not in the asset register. These are assets that have been purchased or constructed in the past but are not included in the asset register.

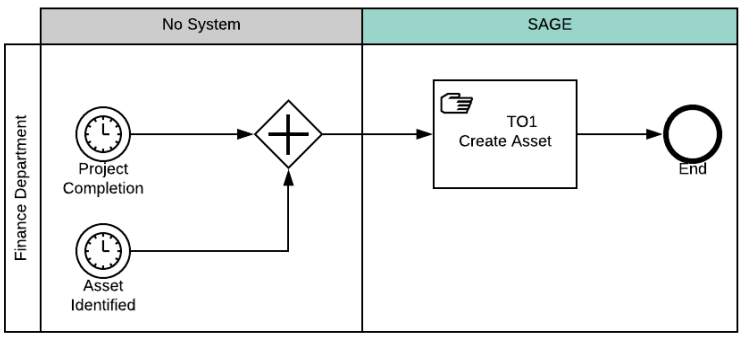

Figure 2-5: Mandeni Asset Take-on Process

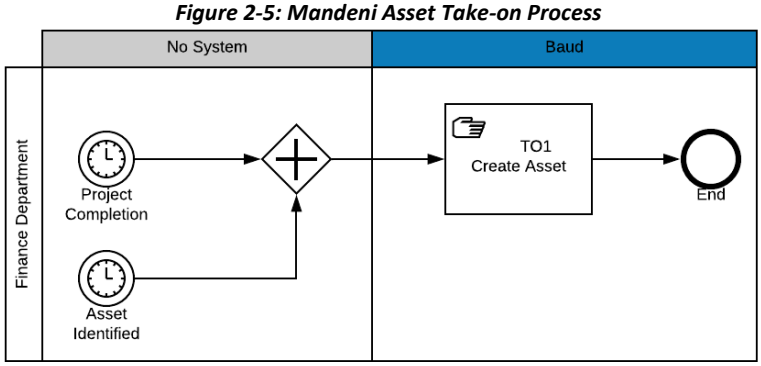

Figure 2-6: KwaDukuza Asset Take-on Process

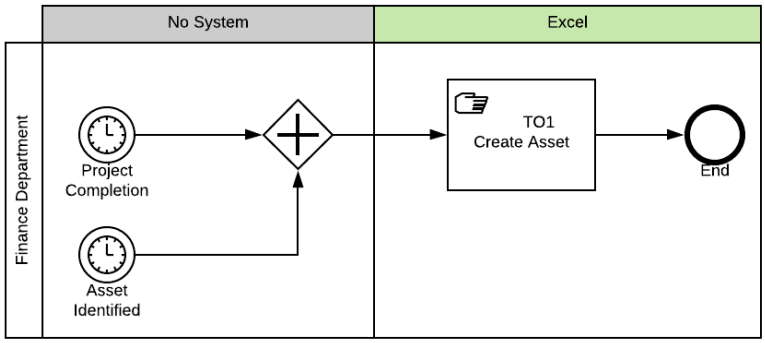

Figure 2-7: iLembe Asset Take-on Process

Table 2-4: Asset Take-on

ID	Task	System	Description
TO1	Create asset	Mandeni: Sage KwaDukuza: Baud iLembe: Excel	Once the asset has been identified it is captured in the asset register at fair value.

2.3 FINANCIAL ASSET TRANSACTIONS

ASSET DEPRECIATION

Depreciation is the decrease in an asset's value due to its natural wear and tear.

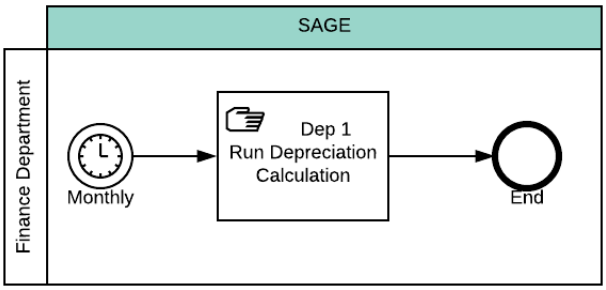

Figure 2-8: Mandeni Asset Depreciation Process

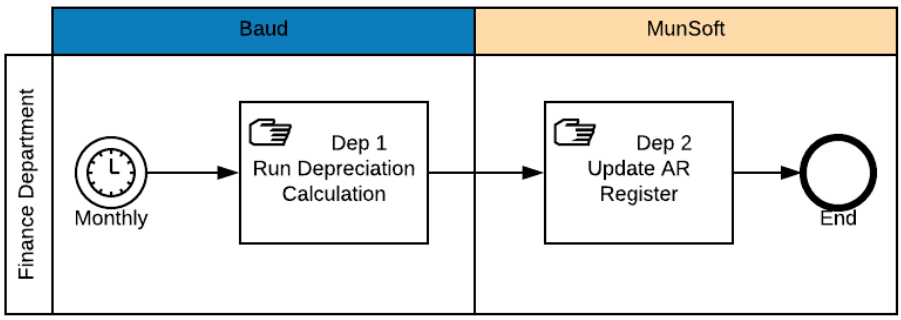

Figure 2-9: KwaDukuza Asset Depreciation Process

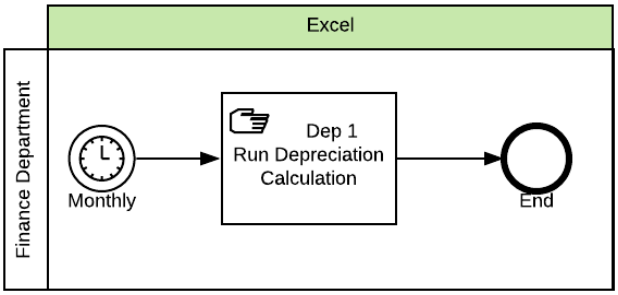

Figure 2-10: iLembe Asset Depreciation Process

Table 2-5: Asset Depreciation Process

ID	Task	System	Description
Dep 1	Run Depreciation Calculation	Mandeni: Sage KwaDukuza: Baud iLembe: Excel	The depreciation is done manually within the relevant finance system. For Mandeni the depreciation calculations use straight-line depreciation based on RUL. It is assumed that the same deprecation method is used at the other municipalities. In the case of KDLM excel is also used to verify the Baud results.
Dep 2	Update AR Register	KwaDukuza: MunSoft	MunSoft is updated with the results of the depreciation run.

ASSET IMPAIRMENT

Impairments have an impact in reducing the carrying value of assets, which is reversed when the cause of the impairment has been removed. Impairment is often due to damage that occurred to the asset.

At KwaDukuza Local Municipality the impairment indicators are reviewed in excel based on the results of the manual condition assessments and asset verification. This is done annually by finance often without input from engineering. If needed the relevant financial system is updated accordingly. The need for reversals is assessed at the same time as impairments.

ASSET RE-EVALUATION

For KwaDukuza re-evaluation only occurs on investment properties. This is done annually by an external person. It is assumed that the same process is followed by the other municipalities using the cost method.

2.4 TECHNICAL ASSET OPERATIONS

CONDITION VERIFICATION

The condition verification process is initiated based on indicators of assets performance, such as the frequency of unplanned outages. *This process may be specific to Mandeni.*

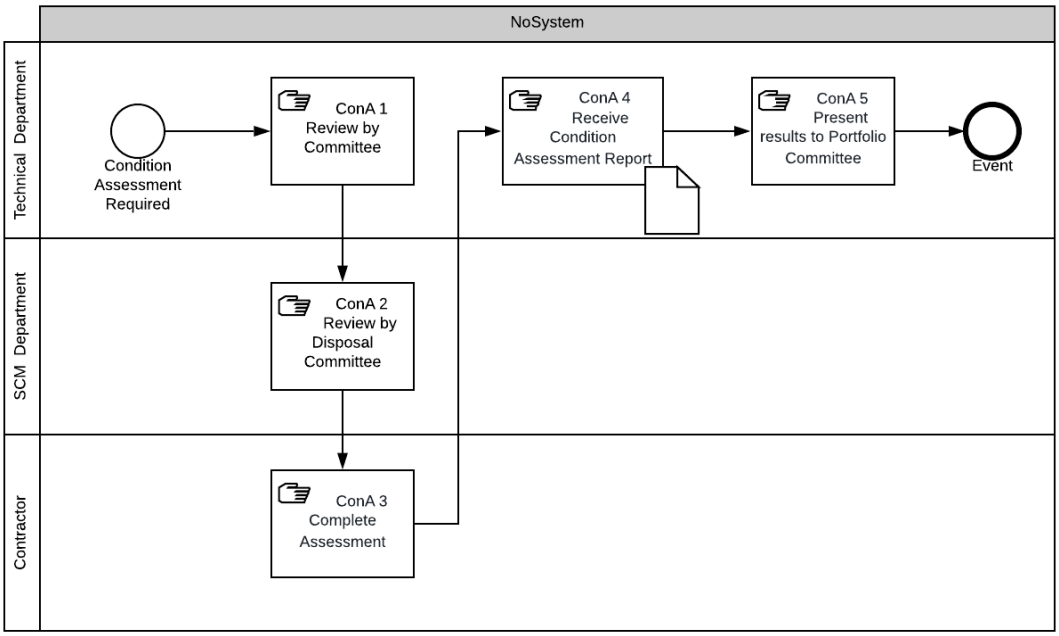

Figure 2-11: Condition Verification

Table 2-6: Condition Verification

ID	Task	System	Description
ConA 1	Review by Portfolio Committee	No System	The requirement of condition assessments is informed by an increase in the frequency of unplanned outages. This is then reviewed by the portfolio committee.
ConA 2	Appoint Contractor	No System	On approval, a contractor is appointed to conduct the assessments
ConA 3	Complete Assessment	No System	The contractors will conduct the condition assessment of the assets in the field.
ConA 4	Receive Condition Assessment Report	No System	Once complete the contractors will compile an assessment report is given to the municipality.
ConA 5	Present results to Portfolio Committee	No System	The results of the condition assessment are presented to the portfolio committee. In cased were replacement or refurbishment is required the findings are used to motivate the incitation of the required project.

REACTIVE MAINTENANCE MANAGEMENT

Maintenance is performed to preserve components' intended use, of which two types exist:

Scheduled maintenance which is planned for and performed to optimize the asset's life span. These schedules are sourced from the asset care plans as provided by the employed consultant on asset take on.

Unplanned maintenance which is required when an asset has already broken down. The aim of which is to restore the asset to an operational state. In some case, these maintenance activities can be planned to be completed at a later date based on resource availability.

The maintenance conducted at each municipality is predominately reactive.
In the case of KwaDukuza and iLembe, a large portion of the reactive maintenance work is done by contractors. The contractors are approved as part of a panel appointment that allows the municipality to issue work to them on an ad-hoc basis. Small scale maintenance is done internally.

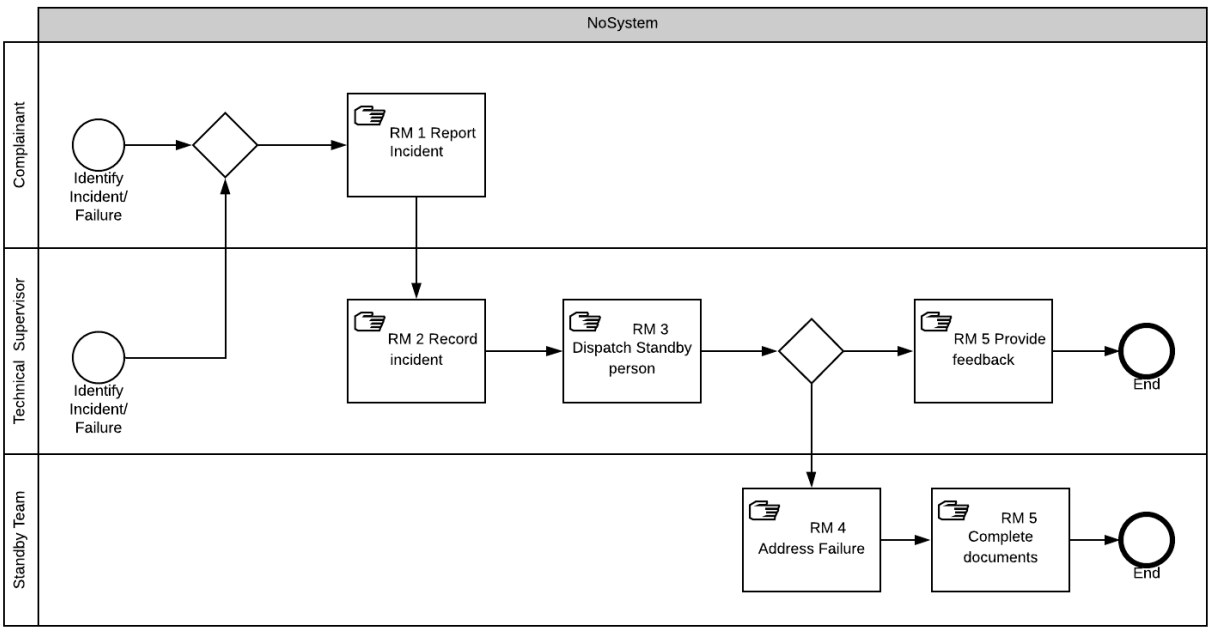

Figure 2-12: Reactive Maintenance Management (Mandeni, KwaDukuza roads, iLembe)

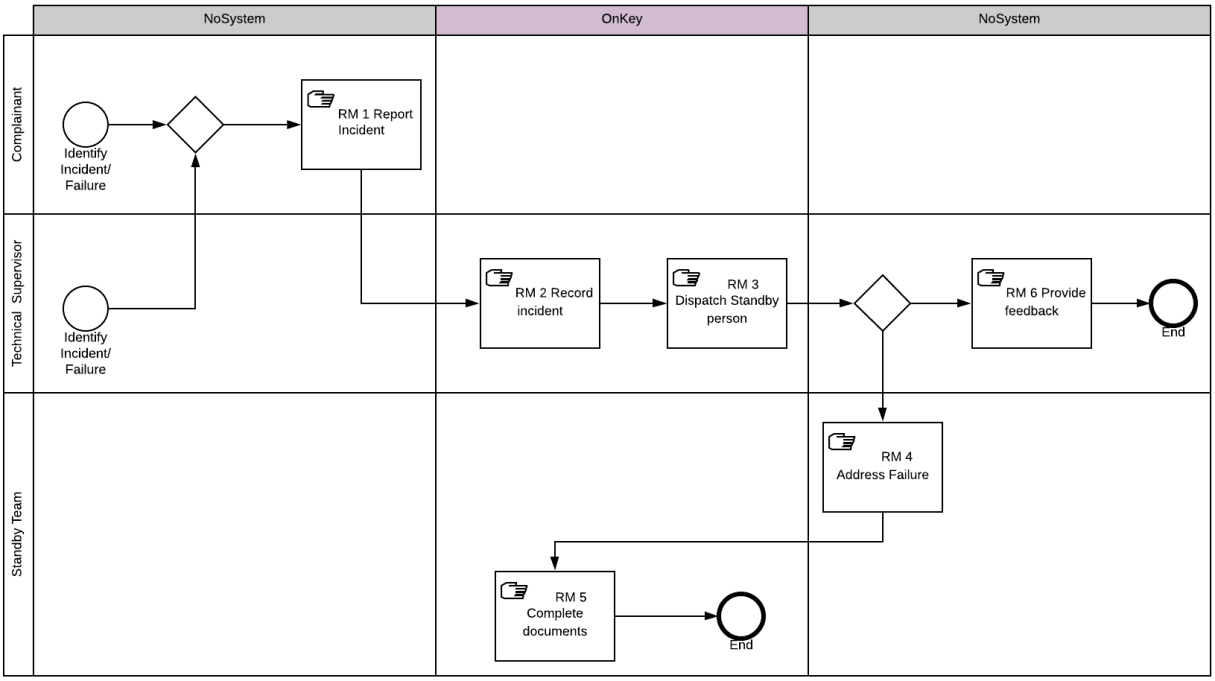

Figure 2-13: Reactive Maintenance Management (KwaDukuza Electricity)

Table 2-7: Reactive Maintenance Management

ID	Task	System	Description
RM 1	Report Incident	No System	Incidents are reported verbally to the relevant supervisor or to a central call centre (in the case of iLembe and KwaDukuza electricity). If a member of the public phones the municipality, the message is carried over to the supervisor. Alternately the incidents are identified by the supervisors while doing their routine inspections.
RM 2	Record incident	Most: No System KwaDukuza Elec: OnKey	Record the incident in the format used by the department. In most cases, this is manual job cards. For KwaDukuza electrical department OnKey is used for job carding.
RM 3	Dispatch Standby person	No System	The supervisor then dispatches the relevant stand by person or team.
RM 4	Address Failure	No System	The artisan will inspect the failure, mitigate risks or minimise the consequences of the incident. Then drive to the store to collect the required spares before returning to finalize repairs to the failure. When possible, the supervisor will also attend the incident to monitor.
RM 5	Complete documents	No System	The artisan on duty the permit to work (for Mandeni electrical) or job card (for iLembe and KwaDukuza) to record. Capturing the following ○ Start and end time ○ Isolation point (for electrical) ○ Asset detail, for example, 120mm pipe or transformer
RM 6	Provide feedback	No System	When possible, the supervisor then phones the original complainant to provide feedback

Note:
The Mandeni ICT department currently uses Spiceworks for ICT tickets and they are in the process of investigating customising the solution for infrastructure job card system where the following will be captured for each job:

- Time
- Km
- Used for only planned

- Material used
- What was done

PLANNED MAINTENANCE

The required planned maintenance activities and frequency are based on the results of condition assessments conducted by consultants. For each of the municipalities with road infrastructure, their respective department makes use of a Pavement Management System (PMS) that provides outputs to guide the required work. In the case of Mandeni, the PMS output is in an electronic format and they have a management information system for the results. KwaDukuza receives the assessment report as a hard copy. iLembe is not responsible for road infrastructure and therefore does not conduct a PMS assessment. In both Mandeni and KwaDukuza, the electrical maintenance is determined by results of condition assessment done on the high voltage infrastructure. KwaDukuza is not responsible for electrical infrastructure.

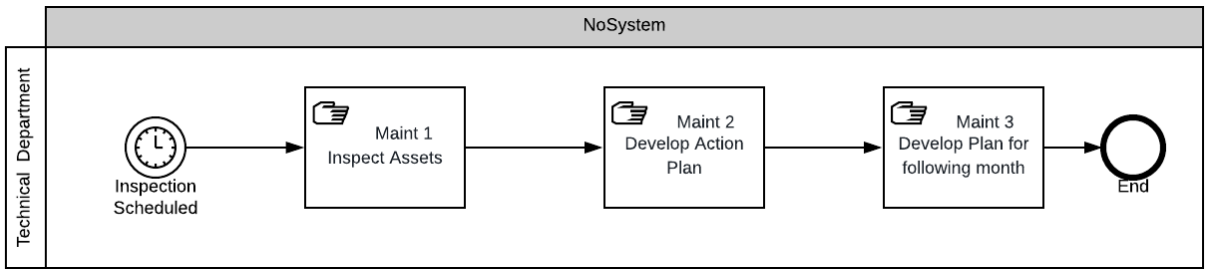

Figure 2-14: Planned Maintenance Management (KwaDukuza Road, Mandeni)

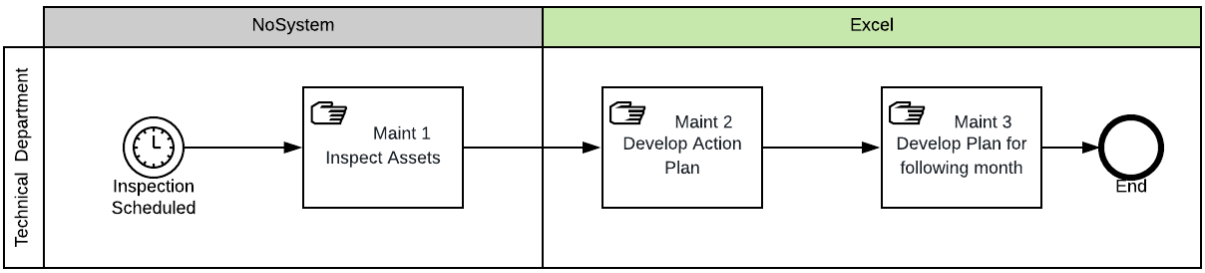

Figure 2-15: Planned Maintenance Management (KwaDukuza Elec, iLembe)

Table 2-8: Planned Maintenance Management

ID	Task	System	Description
Maint 1	Inspect Assets	No System	The preventative maintenance is based on the results of condition assessments conducted by contractors or faults found during routine inspections done by the technical team.
Maint 2	Develop an Action Plan	Most: No System KwaDukuza Elec, iLembe: Excel	Based on the condition assessment results, determine what needs to be done and what the priority is of each activity.
Maint 3	Develop Plan for the following month	No System	Create job cards for the following month's work.

ROTABLE ASSETS AND REFURBISHMENTS

Some assets for example transformers and pumps can be removed from operation, refurbished and re-used.

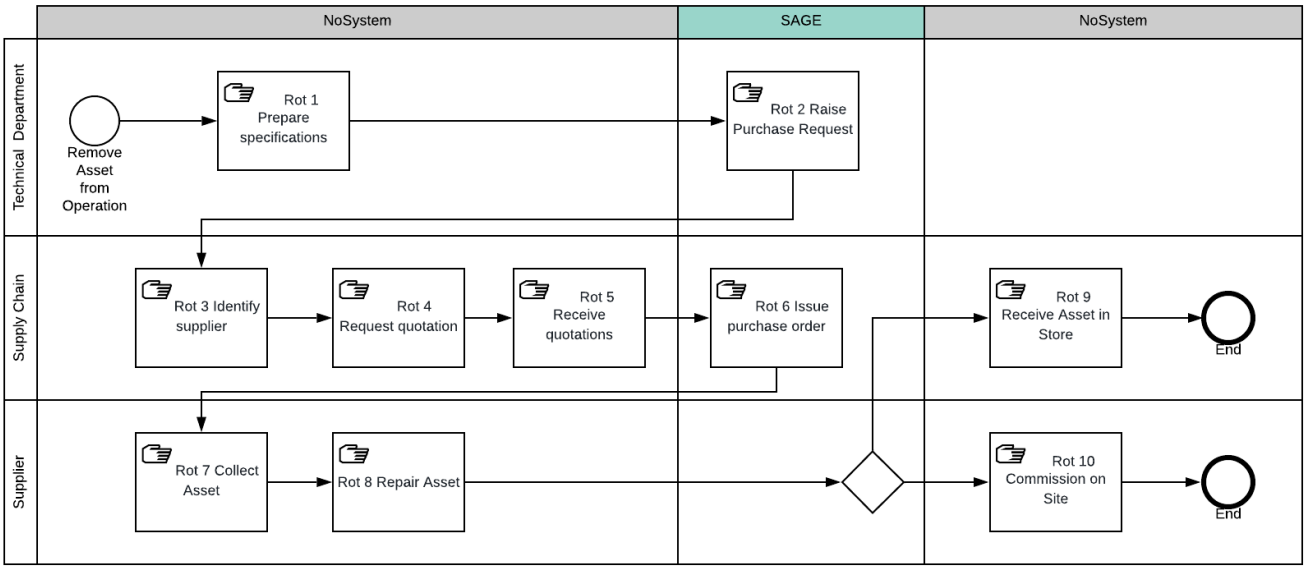

Figure 2-16: Mandeni Component Re-use

Table 2-9: Component Re-use

ID	Task	System	Description
Rot 1	Prepare specifications	No System	The maintenance department should prepare the specification of what needs to be done.
Rot 2	Raise Purchase Request	Mandeni: Sage KwaDukuza: MunSoft	Based on the technical requirement a purchase request is raised for the required work.
Rot 3	Identify supplier	No System	The supply chain department identifies suitable suppliers for the work, based on the refurbishment specifications.
Rot 4	Request quotation	No System	The supply chain department request quotations for the suppliers.
Rot 5	Receive quotations	No System	The supply chain department receives and reviews the quotations.
Rot 6	Issue purchase order	Mandeni: Sage KwaDukuza: MunSoft	The purchase order is then issued to the preferred supplier.
Rot 7	Collect Asset	No System	The suppliers then collect the asset or component from site or stores. If the purchase order includes decommissioning or dissembling the supplier will decommission or dissembling the asset before removing it from the site.
Rot 8	Repair Asset	No System	The asset or component is then refurbished.
Rot 9	Receive Asset in Store	No System	The asset or component is then returned to the store.
Rot 10	Commission on Site	No System	If the purchase order includes commissioning, the contractor will be required to install and commissions the asset on site.

2.5 ASSET DISPOSAL

Assets that are no longer usable are candidates for disposal. The current disposable process used is largely based on the Asset Management policy. The asset to be disposed of are identified based on the results of condition assessment done by contractors and the maintenance teams.

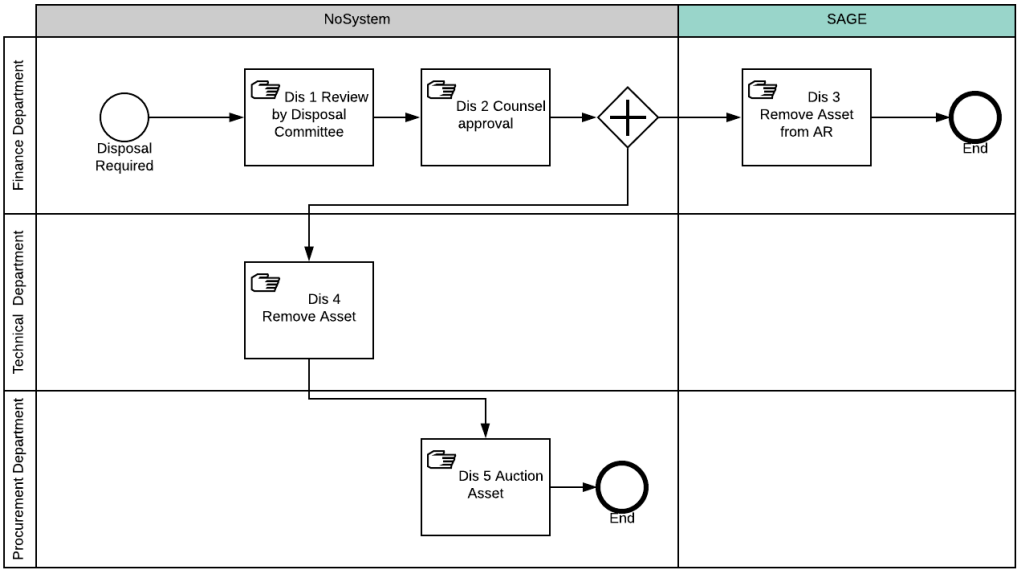

Figure 2-17: Mandeni Asset Disposal

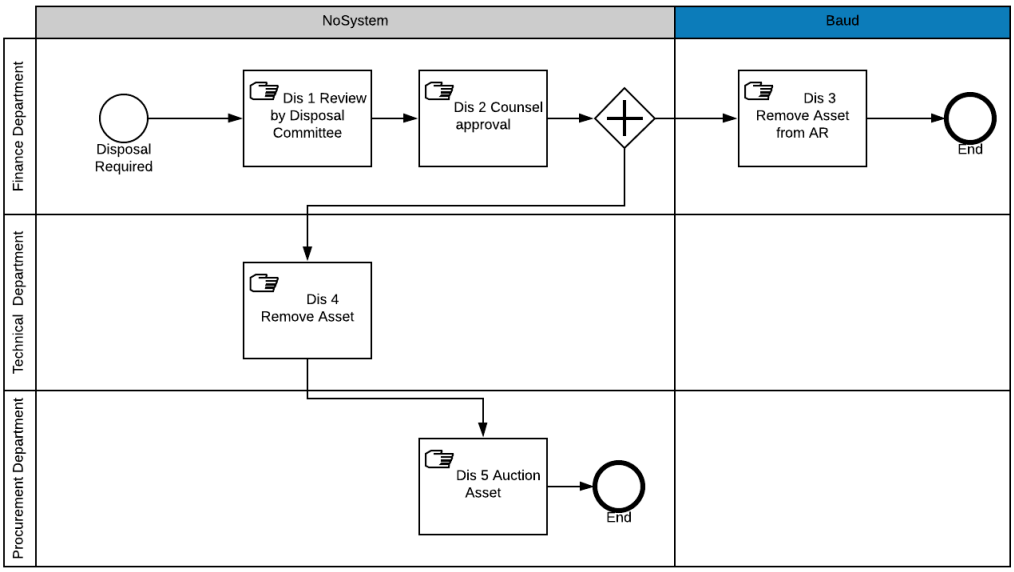

Figure 2-18: KwaDukuza Asset Disposal

KwaDukuza is in the process of enhancing the asset disposal controls. The current process has been documented, not the enhanced process.

Table 2-10: Asset Disposal

ID	Task	System	Description
Dis 1	Review by Disposal Committee	No System	The list of required disposals compiled by the technical and finance department and is submitted for review to the disposal committee.
Dis 2	Council approval	No System	Once the disposal committee has approved the proposed list it is submitted to counsel for approval.
Dis 3	Remove Asset from AR	Relevant Asset Register	The asset can then be removed from the relevant asset register system.
Dis 4	Remove Asset	No System	Following approval, the maintenance team can then remove the asset from the operation and place it in the storeroom.
Dis 5	Auction Asset	No System	All disposed of assets will be auctioned.

3 CHALLENGES AND OPPORTUNITIES

During the interview and documentation phase of this process, the perceived challenges were documented. Instead of treating the challenges as show-stoppers within the process improvements phase, we identified the opportunities that are exposed by the challenges experienced. Opportunities act as the driver for change and improvement.

3.1 CHALLENGES - MANDENI

This section contains a bullet-point list of all the challenges reported and identified as part of the current processes being followed.

CAPITAL PROJECT CHALLENGES

- The GIS department is only included in the project once the project has been closed out. Often the information provided by suppliers is not sufficient to capture accurate GIS information. Contractors tend not to respond or provide additional information when the project is closed, and final payments made.
- Coordinates are often written on paper not recorded digitally.
- There is limited funding available to replace the assets.

ASSET TRANSACTION CHALLENGES

- Impairment is still a challenge when using SAGE which is a new system for the municipality.

INCIDENT AND MAINTENANCE CHALLENGES

- Limited conditional assessment data is available. No conditional assessment has been done of the Stormwater network.
- A large portion of the electrical assets has reached their expected useful life.
- A number of transformers are currently bypassed placing additional strain on the functional assets, this intern reduces the life of the remaining transformers.
- 27 of the required 30 transformers are functional.
- Transformer maintenance has not been taking place, the last maintenance on transformers was in 2011.
- Limited budget is set aside for maintenance, as the focus is set on capital grants.
- The maintenance department is short staffed and has limited equipment and material.
- Failure reports take two days to produce when requested for the annual report.
- When assets are changed as part of maintenance activities, no data is sent to the finance or GIS departments on project completion.

OTHER CHALLENGES

- Due to the lack of support and urgency in collecting supporting documents stakeholders tend to be frustrated.
- The Excel documents are stored on an individual's laptop, not a central location.

3.2 OPPORTUNITIES - MANDENI

- Asset maintenance inspections should be conducted based on a schedule in line with the defined maintenance strategy.
- Development of a technical asset register (TAR) to consolidate engineering data pertaining to assets.
- Centralise asset master data for both financial (FAR) and engineering (TAR) needs. The integrated data must include GIS representation and condition, utilization, performance and criticality data.

- At the time of analysis, the maintenance plan for electricity was in draft format. This needs to be reviewed and implemented. The use of an electronic maintenance scheduling system to track the effectiveness of the maintenance plan is required.
- Implementation of a computerised Job carding system to enable the tracking and logging of failure statistics to be evaluated.
- Implementation of a CRM system to log client requests and activities including incidents and connection requests. This will be the single point of contact with the citizens.
- Review of the budget & resource planning process to ensure affordable budget allocation. A balance must be achieved between demand growth strategy and asset-lifecycle needs.

3.3 CHALLENGES – KWADUKUZA

CAPITAL PROJECT CHALLENGES

- The municipality has two separate asset registers, one for finance and one for technical.
- The official asset register lies with the finance department, with little alignment to the asset data maintained by the technical department.
- The appointment of consultants to maintain the register results in a unique asset number received from consultants are not always maintained or consistent.
- The GIS department does not receive all the information required to capture the assets of the GIS platform.
- The capitalisation process is manually done with limited controls and validation.

ASSET TRANSACTION CHALLENGES

- MunSoft is not currently MSCOA compliant, currently, a project is in progress to resolve. Key areas of concerns below:
    - Treatment of completed projects
    - Reassessment of RUL
    - Depreciation Calculation
    - The integration between MunSoft and Baud is currently manual

INCIDENT AND MAINTENANCE CHALLENGES

- Only high-level condition assessments are done on the road and electrical infrastructure, especially transformers.
- Incident information can only be captured in the office, but the team are in the field when receiving and attending to phone calls.
- The PMS results were provided in a hardcopy report. The lack of an electronic Pavement Management System makes it difficult to clearly interpret the result and track asset rehabilitation initiatives.
- Limited budget availability of maintenance
- OnKey only provides the number of incidents, the duration of the outage, duration of worked and resources used cannot be reported using OnKey.
- A system is required to manage the planned maintenance and related resource optimization.
- The maintenance system should link to the finance system.

OTHER CHALLENGES

- Due to the lack of support and interdepartmental integration, stakeholders tend to be frustrated and are not synchronised.

3.4 OPPORTUNITIES - KWADUKUZA

- Develop a standard asset definition that is embedded in the policy and procedures and enforces all consultants adhere to the asset definition and structure.
- Development of a technical asset register (TAR) in order to consolidate engineering data pertaining to assets.
- Centralise asset master data for both financial (FAR) and engineering (TAR) needs. The integrated data must include GIS representation and condition, utilization, performance and criticality data.
- Centralise asset master data for both financial (FAR) and engineering (TAR) needs. The integrated data must include GIS representation and condition, utilization, performance and criticality data.
- The use of an electronic maintenance scheduling system to track the effectiveness of the maintenance plan is required.
- Implementation of a computerised Job carding system to enable the tracking and logging of failure statistics to be evaluated.
- Implementation of a CRM system to log client requests and activities including incidents and connection requests. This will be the single point of contact with the citizens.
- Review of the budget & resource planning process to ensure affordable budget allocation. A balance must be achieved between demand growth strategy and asset-lifecycle needs.

3.5 CHALLENGES – ILEMBE

CAPITAL PROJECT CHALLENGES

- The municipality has two separate asset registers, one for finance and one for technical.
- The official asset register lies with the finance department, with little alignment to the asset data maintained by the technical department.
- The GIS department does not receive all the drawings required to capture the assets of the GIS platform.

INCIDENT AND MAINTENANCE CHALLENGES

- The call centre has only one phone with three incoming lines, due to call volume, not all call can be answered.
- The department's budget for planned maintenance is regularly rejected.
- There is no early warning system, faults are only identified when someone reports the issue. For example, if a pump fails the reservoir will run dry, with no electronic alarms.
- When there are claims resulting from work done the stack of hard copy job cards needs to be manually searched to find the relevant job card required to provide the detail of the fault needed for the insurance claim.
- For reporting the hard copy job cards need to be manually aggregated.
- There is no control of the information captured on job cards resulting in inconsistencies in the failure history captured.
- The hard copy job cards are not sufficient for audit purposes as there are no controls in place.
- Better visibility of the stock levels is required, artisans drive to stores to find out that the spares required for the incident are out of stock.
- The stores regularly run out of stock of material required for repairs.
- Lack of asset data results in inefficient maintenance activities as staff cannot plan parts required prior to an onsite visit.
- There is no SLA between maintenance and stores departments.
- The municipality does have JOAT PRV's with flow and pressure measurement. The results of these measurements are not integrated. The department needs to log into the JOAT site to view the measurements.

3.6 OPPORTUNITIES - ILEMBE

- Develop a standard asset definition that is embedded in the policy and procedures and enforces all consultants to adhere to the asset definition and structure.
- Development of a technical asset register (TAR) in order to consolidate engineering data pertaining to assets.
- Centralise asset master data for both financial (FAR) and engineering (TAR) needs. The integrated data must include GIS representation and condition, utilization, performance and criticality data.
- Centralise asset master data for both financial (FAR) and engineering (TAR) needs. The integrated data must include GIS representation and condition, utilization, performance and criticality data.
- The use of an electronic maintenance scheduling system to track the effectiveness of the maintenance plan is required.
- Implementation of a computerised Job carding system to enable the tracking and logging of failure statistics to be evaluated.
- Integration between the municipal store system and the maintenance management system.

4 AS-IS CONCLUSION

The challenges identified in the analysis phase have been summarised making reference to the high-level asset life cycle process illustrated in **Figure 4-1**.

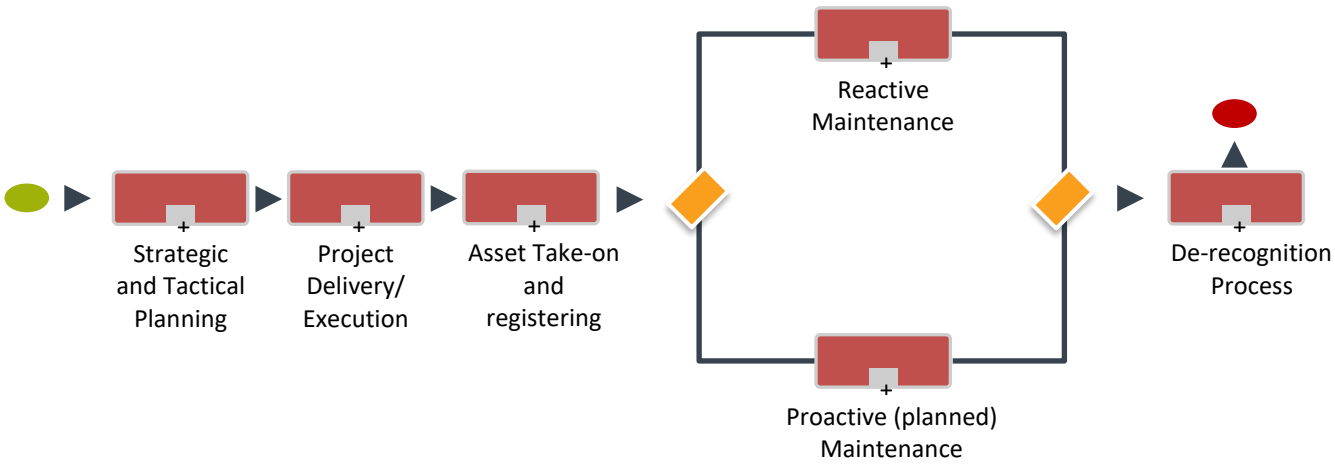

Figure 4-1: High-level asset life cycle process

4.1 STRATEGIC AND TACTICAL PLANNING

Lack of consolidated planning data which results in:

- Numerous manual extracts and reports are utilized for planning
- No single source of the truth for asset management planning
- Multiple disparate datasets across departments (Technical vs Finance)
- Planning across infrastructure categories and/or departments is not integrated e.g. this has resulted in:
- Skewed planning data
- Duplication of work
- A silo approach to planning
- Budget constraints

4.2 PROJECT DELIVERY/ EXECUTION

- Numerous sub-systems in the project delivery process
- Lack of system integration
- Lack of physical progress tracking alongside financial progress
- Excel tracking outside of the financial system
- Parallel project management approaches
- No single system where physical progress and financial progress is adequately tracked
- The process not formalised & standardised
- Reporting and dashboarding cumbersome and inadequate for decision support processes

- No clear management of project artefacts (drawings, BOM, payment certificates)
- MSCOA budget compliance

4.3 ASSET TAKE-ON AND REGISTERING

- Manual asset handover phase between operations and planning departments
- No standardized definition of what an asset is
- Hierarchy changes with each new contractor awarded
- No ownership of asset definitions and therefore inadequate asset capitalization
- Infrastructure is inconsistently defined, typically at a project level
- No clear asset level performance models to assess infrastructure health and fit for purpose
- Assets are defined by asset verification every year by different consultants with a different definition
- Financial asset register does not have a spatial reference
- No formal process governing GIS and asset creation
- The asset register is maintained in Excel and then uploaded into the financial system.
- The consistency of EUL and data models

4.4 REACTIVE MAINTENANCE

- Asset Register is set often at a high level and not linked to a level required for maintenance.
- The limited relationship between maintenance and asset register
- Maintenance costs are not captured against specific assets
- Inspections results are not captured against specific assets
- Misalignment between condition assessment results obtained by finance and technical departments.
- Hardcopy artefacts are used
- Processes not formalised
- Asset nearing/beyond the estimated end of life
- Limited budget and resource availability for maintenance
- MSCOA life-cycle budgeting not possible

4.5 PROACTIVE (PLANNED) MAINTENANCE

- Planned Maintenance is done by consultants:
- Cannot adequately determine root cause when maintenance occurs at a high level
- Replacements occur in accordance with the consultant judgement and recurring issues are hard to track and prioritise
- Maintenance plans are not available in all departments
- No clear visibility on Planned Maintenance data as it is managed and maintained in 3rd Party consultant systems
- Maintenance results and condition input does not feedback into a centralised asset register

4.6 DE-RECOGNITION PROCESS

- Disposals are not consistently transacted and process is not standardised

- Due to assets being captured at the project level, sub-assets are removed/replaced with no formal process
- Replaced assets may be duplicated in the register as the replaced asset is not disposed
- Cannot perform de-commissioning / impairment and manage assets on an asset level as assets are captured at a facility/project level
- No clear asset RUL tracking and effectively leads to infrastructure not being suitable for habitation e.g. condition, accessibility etc.
- Asset processes are not standardised
- Depreciation is not automated
- Manual calculation in Excel
- Manual import into the electronic AR system
- Impairments are challenging in the current electronic AR system

4.7 OTHER CHALLENGES

- Shortage of technical systems
- Not all asset spatial information is logged in GIS
- No centralisation of asset register – technical and mSCOA compliant
- Large data gaps between Technical Asset and Financial Asset
- Lack of standardisation of asset management processes
- Poor asset maintenance planning
- Poor budgeting and prioritisation
- Poor project and budget transparency
- Lack of specialised technical systems
- Lack of trust between departments
- Transparency
- Inefficient team and organization-wide communication
- Data difficult to report on, with a tendency to analyse manual Excel extracts
- Audit trails
- Difficult to monitor asset history/lifecycle
- Lack of employee accountability

5 RECOMMENDATIONS FOR ELECTRONIC AMIS

The proposed solution design has been selected to address the challenges summarised in **Section 4**. Through an integrated system landscape, core asset life-cycle processes can be coordinated, and efficiency gains achieved for the organisation. **Figure 5-1** illustrates the conceptual solution of an integrated asset life-cycle system. This approach centralises the asset data and provides a single source of the truth for all stakeholders.3

The utilisation of a standard systems response across all sectors and municipalities in the distance will assist in knowledge and encourage mutual learning opportunities to assist in advancing levels of practice. By providing all professional disciplines with the data and information required to implement recognised good AM practice. This is also in line with the findings of the AM Practices Improvement plan.

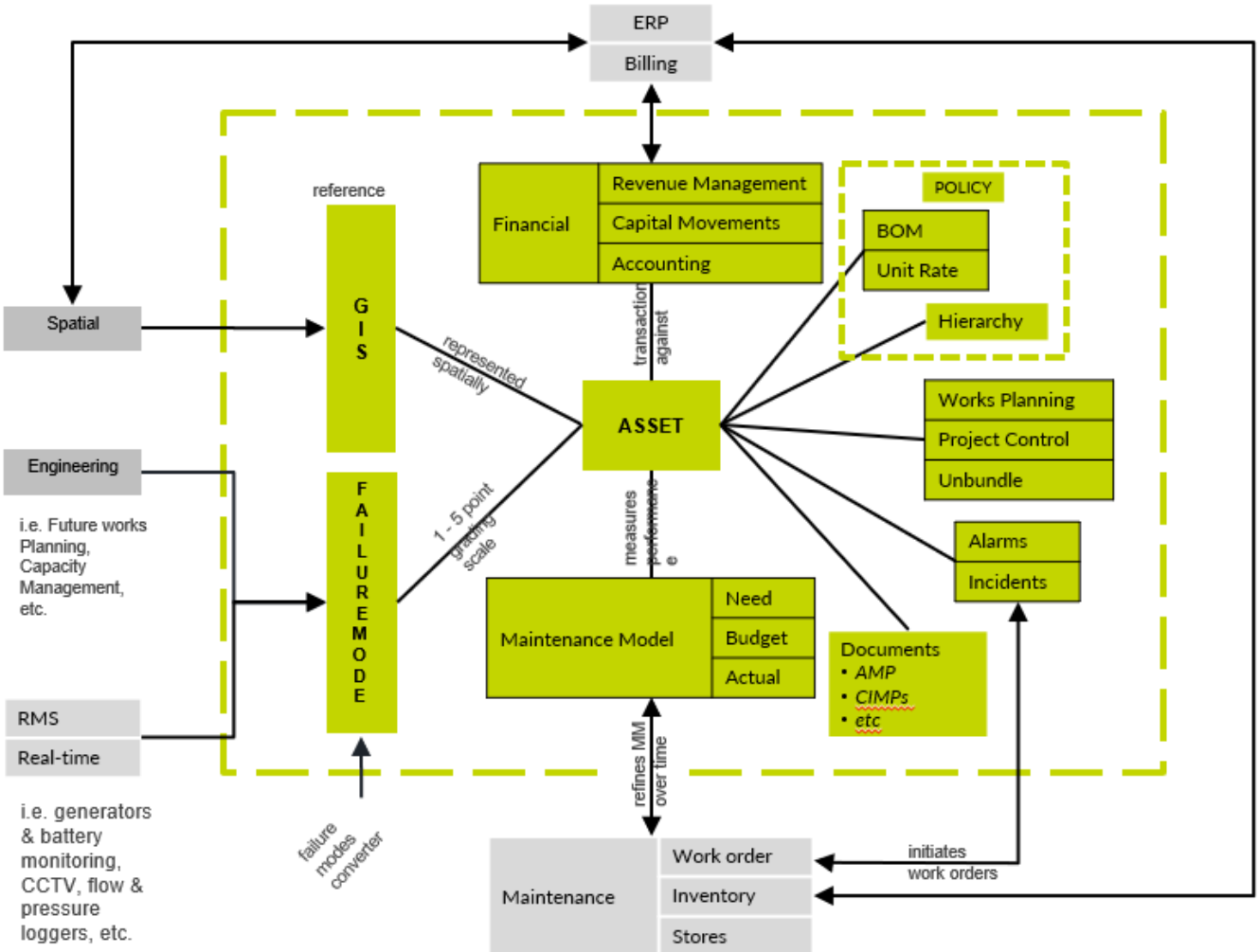

Figure 5-1: Conceptual layout of an integrated system

Central to achieving this is ensuring all the systems and sub-systems used in each municipality are fully integrated and supported be relevant business processes and controls **(Figure 5-2)**.

5.1 GENERAL

The AMIS should meet all the following requirements:

a) The solution shall operate within the municipalities' current IT environment (servers, PC's, operating system, LAN etc.).
b) The solution shall provide data validation on entry, data integrity checking and audit trails for quality assurance purposes.
c) The solution shall provide password protection managed by a System Administrator that prevents unauthorised changes to the data while allowing approved users viewing and report generation capability. Security for different user levels shall be available.
d) The solution shall operate as a centralised corporate solution that can manage all municipal infrastructure assets.
e) Be compliant with MSCOA.

5.2 FINANCIAL ASSET MANAGEMENT

ASSET REGISTER

The Asset Register is the core of the AMIS. Through authorisation, controls manage all asset financial transactions and can integrate with various financial systems. Assets are created in the asset register through integration with a Work in Progress (WIP). The asset register should also seamlessly integrate with various finance systems at the relevant level needed by the finance system to ensure accurate reporting and MSCOA compliance. The asset register stores all asset related data including structural, dimensional and cost attributes.

Asset accounting practices shall take place against the asset register.

a) The solution shall be MSCOA compliant.
b) Model all infrastructure assets owned and operated by the municipality and record the physical details (attributes) for each asset type (such as size, extent, material, and type).
c) Record the necessary details to clearly identify and locate the assets. Also, be able to integrate with a GIS system to have access to the special information.
d) Record the necessary attribute details such as custodianship, condition rating, criticality, performance, utilisation, and data confidence.
e) Allocate unique asset ID numbers.
f) Use hierarchies to establish parent-child relationships between assets and their place in the overall delivery of service.
g) Allow entry and maintenance of asset data on existing assets but only by users given access rights to do so.
h) Use lookup tables to control and validate data entry into the asset register.
i) Maintain an audit trail that records a change history. The audit trail shall include a record of what the attribute was changed from, the date of the change, and the name of the user who made the change.
j) Extend the data model to include new asset types and/or additional attributes (fields).
k) Aggregate data through the use of the hierarchies, groups and spatial relationships both vertically and horizontally.
l) Query and report on each asset type using one or more attributes.
m) Aggregate report within the asset hierarchies/groups.
n) Spatial representation of the asset register.
o) Identify assets for which the As-Built's have not been captured in the GIS platform.

CONDITION MONITORING

Condition Monitoring is about the ongoing inspection of assets and the recording and reporting of condition data. The recorded data may result from one-off inspections that have been requested or are done as part of normal repair and maintenance activities. Inspections may also be regularly scheduled. The condition data must be sufficient for the asset type or class being

inspected and must also be sufficient in order to rank or calculate a condition grading for the asset. The AMIS Condition Monitoring functionality shall include the ability to:

a) Record condition data and condition rating to the actual asset in the asset register.
b) Score the degree of distress (condition rating) exhibited for each distress mode.
c) Apply a weighting factor to the condition rating to indicate the degree to which each distress mode impacts on the asset's ability to perform the level of service required.
d) Calculate an overall condition score (condition grading) using the multiples of condition ratings and weighting factors.
e) Enable these scores to be made available for use with other AMIS solution functionality such as:
   - Asset Accounting
   - Performance Management
   - or other external or third party analytical software.
f) Enable condition gradings for assets to be depicted in the GIS by use of colour coding and be able to display the related condition data.
g) Enable the GIS to depict which assets have been inspected.
h) Link images to inspection records.
i) Report using a range of criteria such as asset type, distress mode and condition grading (individual and range) etc.
j) Aggregated report results within the asset hierarchy.

ASSET ACCOUNTING

Asset Accounting entails performing financial transactions against assets. This included recognition, derecognition, impairment, revelation and depreciation of assets. It will also account for asset related capital improvements. The ability to account against the asset hierarchy down to component level is required. This can be implemented as part of the asset register or integrate with the current financial system.

a) Group and report assets in accordance with the categories and hierarchies.
b) Record asset accounting information including but not limited to:
   - ownership
   - acquisition date
   - supplier
   - funding source
   - disposal date
   - historic (initial) cost
   - useful life
   - remaining useful life
   - residual value
   - gross replacement cost
   - revaluation data
   - depreciated replacement cost
   - annual depreciation.
c) Calculate financial information for each category including the total replacement cost, depreciation and the average remaining useful life etc.
d) Maintain tables for unit rate replacement costs and useful lives for asset types.
e) Maintain a history of previous financial information.
f) Query and report on asset accounting information to provide such reports as:
   - detailed asset valuation reports
   - summary asset valuation reports

- detailed changes reports
- summary changes reports.

g) Aggregate query and report results within the asset hierarchies.

PERFORMANCE MANAGEMENT

Performance Management is used to assess the functionality and operation of the assets. Performance may be related to the following: condition, capacity, performance and utilisation. The AMIS Performance Management functionality shall include the ability to:

a) Identify the performance ratings from the asset register or classifications of assets.
b) Grade the degree of performance being exhibited by the asset for each of the failure modes/performance indicators.
c) Flag when an asset exceeds or falls below the identified limits.
h) Import asset condition and performance data generated from external or third-party software.
i) Predict when failure is most likely to occur and accommodate scenarios e.g. high or low probability, for each of the above failures.
j) Accept input from associated activities, for example:
   - condition monitoring activities
   - maintenance records (failure records and analysis)
   - asset utilisation.

LIFE CYCLE COSTING

Life cycle costing is used for the purpose of calculating all the costs of owning assets or future project for assessing asset acquisition options, monitoring actual costs against budget and analyse future AM strategy options and identify optimum approach. The functionality should allow capturing all cost data relating to the ownership of an asset and calculate annual and total life-cycle costs. The AMIS shall include the ability to:

a) Record all costs against an asset or facility including:
   - Capital costs
   - Operational costs
   - Maintenance costs
   - Rehabilitation/works costs
   - Disposal costs
   - Depreciation costs
b) Record all costs associated with each option including the timing of those costs. These costs include:
   - Planning (feasibility studies, research, programming)
   - Design and documentation
   - Construction / acquisition (purchase, construction, contract management);
   - Operations (personnel, training, energy)
   - Maintenance (personnel, scheduled and unscheduled maintenance, spares, training)
   - Disposal (decommissioning, sale, site decontamination)
   - Income projections.
c) Extract relevant data from other AMIS solution functions including:
   - Maintenance Management
   - Works Planning functions
   - Asset Accounting.
d) Report all costs against the asset.

5.3 O&M SYSTEM

MAINTENANCE MANAGEMENT

All assets need to be maintained in order to ensure all asset reaches the required operating objectives. An O&M system that does preventative and reactive maintenance performed by the municipality staff and contractors. This system should be integrated with the GIS data set to ensure the job card contains the relevant spatial data. The engineering systems must be utilised to provide teams with relevant technical data. O&M system must be integrated with the asset register to ensure the accurate tracking of failure history and cost of operational data.

The following functionality is required for an O&M System:

- Job card management
- List of all outstanding job cards
- Assigning job cards to individuals or teams
- Link completed work to compotes
- Record resource (material, equipment, employees and tools) utilisation against component and job card
- Personnel strength

The following integration interfaces are required:

- Material management system
- Stock items
- Stock level
- Material costs
- Clocking system

The AMIS Maintenance Management functionality shall include the ability to:

a) Manage unplanned and planned maintenance.
b) Generate work orders for all unplanned and planned maintenance activities.
c) Record against an asset (via work orders) details of all repairs and maintenance activities carried out on that asset. Details to be included should include:
   - the nature of the repair or maintenance activity carried out
   - completion date and duration of the repair or maintenance activity
   - name of the person/contractor who did the work
   - the cost of doing the work – contractor, labour, materials, equipment and tools.
   - purchase order / cost centre identification
d) Map based display of the location of faults and repairs and be able to display the related fault or repair data.
e) Link in with and provide relevant data to other AMIS functionality including:
   - Condition Monitoring and Impairment
   - Contract Management
   - Performance Management of assets.
f) Monitor and report on performance including but not limited to:
   - the target level of service
   - cost
   - contractor performance.
g) Provide data needed to conduct perform maintenance optimisation:
   - cause of the level of service reduction analysis
   - failure analysis

- mean time between failures
- maintenance cash flows/cost reports.

h) Report based on a range of criteria such as fault or repair type, cost of maintenance etc.

CUSTOMER REQUEST

Customer requests, complaints and notifications relating to assets will be logged, tracked and reported on through the AMIS. Note that 'Customer' can refer to both internal (municipal staff) and external customers. The AMIS "Customer Service Requests functionality shall include the ability to:

a) Record the details of the service request including:
   - Customer name, address and contact phone number
   - Time and date of receipt (automatically entered)
   - Type of service request
   - Description of the service request
   - Location of the asset to which the service request relates
   - The priority of the service request populated based on the nature of the request.

b) Automatically assign a unique service request number.

c) Generate and, if required, issue a works order which includes the above information plus the following:
   - Name of maintenance team or Contractor to which the job has been assigned
   - Completion due time/date populated based on the nature of the request.

d) Record details of the response to the service request including:
   - Time of response
   - Work team attending the service request
   - Record of the action taken in response to the request (e.g. make safe, maintenance work)
   - Identification of the asset to which the service request relates
   - Cause of failure
   - Record any follow-up action or repairs required

e) Track status of service request.

f) Link multiple service requests which relate to the same fault so that the fault is identified as a single event in the database.

CONTRACTOR MANAGEMENT

Contract management is about providing the functionality to manage contracts. This includes the capturing of contracts in the AMIS, the monitoring of contracts including variations, the management of work orders and the performance of contractors under the contract. The AMIS solution functionality shall include the ability to:

a) Create a bill of quantities (work schedules) when specified, for the issue to contractors.

b) Record the contractor's business details.

c) Monitor and report against work orders associated with contracts.

d) Monitor and report on the performance of contracts.

e) Issue notices to contractors for:
   - rectification of unsatisfactory work
   - variations
   - completion of works.

f) Provide contractor security in the event the contractor is given access to the functionality i.e. the contractor can only see and edit information relating to their contract.

INVENTORY MANAGEMENT

Part of asset management involves the application of spare parts and stock to the repair, renewal and replacement of assets. In many cases, these items are required for normal planned or preventative maintenance activities. The AMIS system should incorporate inventory control functionality for the use of in-house business units or Contractors required to hold the stock against emergency. By the interfacing, the inventory control functionality with the other key functionality (maintenance management and job resource management etc.) jobs and activities can be fully integrated. The will allow the work schedule to be based on resource availability and accurate asset maintenance calculation. The AMIS solution functionality shall include the following capabilities:

a) Provide an inventory of all spare parts and materials normally available in-store or through suppliers.
b) The functionality shall provide the ability to:
   - record all details of the spares and inventory items as necessary to fully identify them
   - record current stock levels
   - allow manual updating of current stock levels (stock-take) and to record discrepancies in the form of an audit report
   - order of specialist items (one-off)
   - issue inventory against work orders directly to employees
   - accept returned (unused) stock
   - identify the location of the stock
   - booking of materials required for jobs
   - monitor inventory usage and costs
   - record unit costs;
   - complete report summaries on suppliers/items, etc.
c) Link in with and provide relevant data to other AMIS functionality including:
   - Maintenance Management
   - Procurement component of FIS.

JOB AND RESOURCE MANAGEMENT

The effectiveness of job/resource allocation and management is important to the efficiency of carrying out maintenance operations. When scheduling maintenance operations it is important to know that staff and equipment are available (or when they will be available) to do the job. The AMIS functionality shall include the following:

a) Job identification, accepting data input from:
   - Maintenance management component
     - Scheduled maintenance/inspections
     - Emergency and/or unplanned.
   - Customer service request component:
     - Complaints/requests from the public
     - Jobs identified by staff.
   - Operations;
     - Operational activities.
b) Maintaining a record of the available resources
   - Employees
     - Leave taken history
     - Fitness for duty history
     - Employee skill levels
   - Vehicle and equipment

- List of vehicles and equipment issued to each employee
- List of vehicles and equipment available

5.4 ENGINEERING SYSTEMS

Engineering systems that provide detailed technical information, where necessary, eg linking data to the periodic PMS, electrical and hydraulic modelling assessments captured in the asset register, GIS system, master plan and PMS. This allows one central view of all the relevant technical information.

INFRASTRUCTURE MANAGEMENT

Engineering Infrastructure Management system provided the technical details of assets at a level suitable for O&M activities. The AMIS Engineering Infrastructure Management functionality shall include the ability to:

a) Map based view of all technical infrastructure.
b) Interface with:
   - GIS, to allow for the capturing of As-Built drawings
   - SCADA and telemetry systems, to show live data readings
   - Asset Register, to identify misalignment between As-Built and AR data
   - Demand Management, to allow an easy view of the current and proposed infrastructure
   - PMS, electrical and hydraulic modelling assessments results
c) Provide specialist water network tools as:
   - Upstream trace, to identify the water source
   - Isolate pipe, to easily identify the valves that needed to be closed to isolate the selected pipe
   - Affected stands, identify the stands directly linked to the selected pipe
d) Provide specialist sewer network tools as:
   - Downstream trace, to identify the affected works
   - Affected stands, identify the stands directly linked to the selected pipe
e) Themed display of all technical infrastructure. For example, displaying pipes in different colours based on the pipe size

DEMAND MANAGEMENT

Demand Management is about the storage and use of data for managing and understanding the current and future demands on assets. This may include the outputs from hydraulic modelling and capacity of dams and reservoirs etc. The AMIS Demand Management functionality shall include the ability to:

f) Link or record at an appropriate level within asset hierarchies or groups, data related to understanding and managing current and future demands on assets. Data may include:
   - levels for dams and reservoirs
   - water billing/flow meter measurements
   - outputs from demand analysis models – these may override the need for some of the above data
   - outputs of hydraulic modelling (future demand or capacity need), as well as current asset utilisation and capacity.
g) Link in with and provide relevant data to other AMIS functionality including:
   - Works Planning
   - Performance Management.

5.5 PROJECT CONTROL SYSTEM (PCS)

Project Control System (PCS) that is used to manage any capital project through the contract period, in line with mSCOA. The use of data to undertake the long term and short-term planning of works is essential. The system shall monitor all works activity

for the following work types: rehabilitation/renewal works, asset replacement, asset acquisition and asset disposal. The AMIS Project Control System functionality shall include the ability to:

a) Record all proposed work tasks for all work types against an asset over its life cycle detailing:
   - task description
   - year to start
   - start date
   - end date
   - cost of task
   - type of contractor/resource required to undertake the task
   - comments on strategy.

b) Integrated with Work in Progress (WIP) to create and unbundle assets in the asset register on completion of projects.

c) Report on project milestones as well as KPI.

d) Integrate with the FIS for cost reporting.

e) Allow asset owners to monitor asset acquisitions costs against budgets.

f) User right control to ensure each step in the workflow can only be done by authorised employees.

5.6 INTEGRATION REQUIREMENTS

The AMIS solution functionality identified in **Sections 5.3 to 5.2** shall be integrated in a seamless manner (**Figure 5-2**). The AMIS solution must also be capable of integrating with other corporate systems without intervention and impact from or to either system's users. Other corporate systems include:

a) **Geographic Information System** (GIS) – Esri ArcGIS and ESRI.

b) **Financial Information System** (FIS) – MunSoft, Baud.

c) **Telemetry** (SCADA) – JOAT sensors and any other systems implemented in the future.

d) **Pavement Management System** (PMS) – Specialist engineering system that indicated the asset condition.

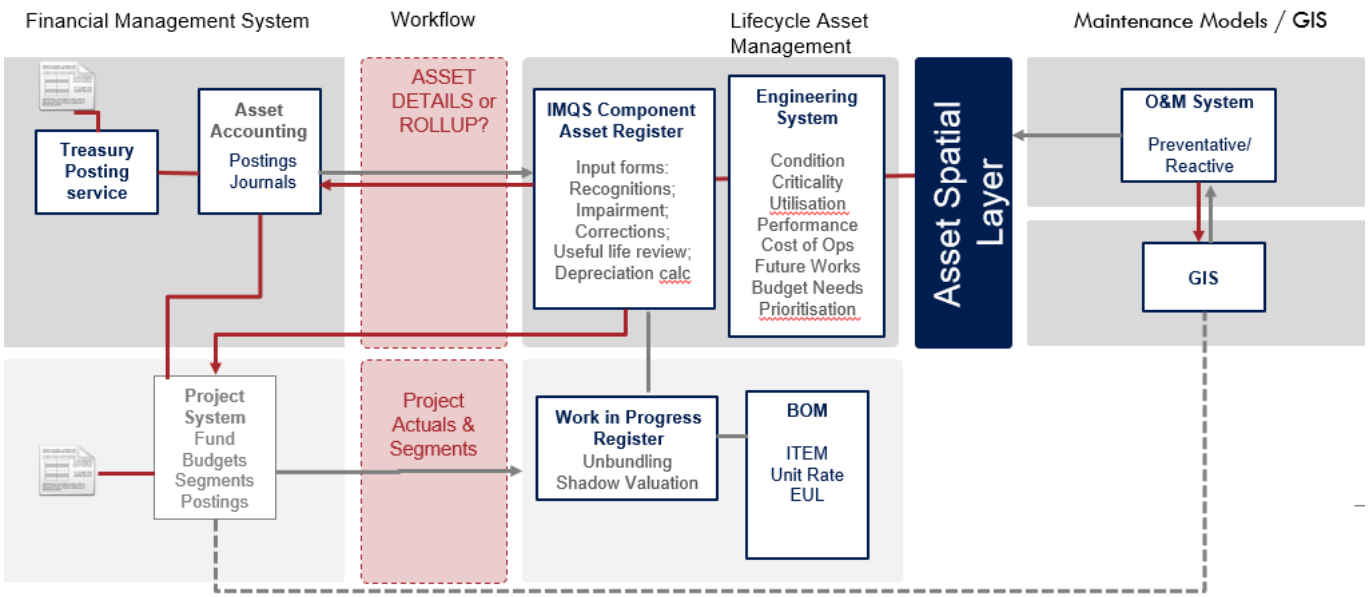

Figure 5-2: System Integration

6 SOLUTION ROADMAP

It is prosed to phase the implementation over a three-year period, **Figure 6-1**. The first phase entails the implementation and configuration of a maintenance management system – as this is likely to have the maximum impact on service delivery (refer to the AM Practices Assessment and Improvement Plan). This includes work order management, incident management and inventory management with integration with a stores system. The second phase entails a review of the asset register, implementation of the asset register system, integration with the finance and GIS systems. Finally, in the third phase, the implementation of the specialist systems. This includes each of the relevant engineering systems relevant to the municipality and the project management system. This will also include integration with real-time sensors (for example on JOAT's PRVs). During this phase, the asset management documents will be revised.

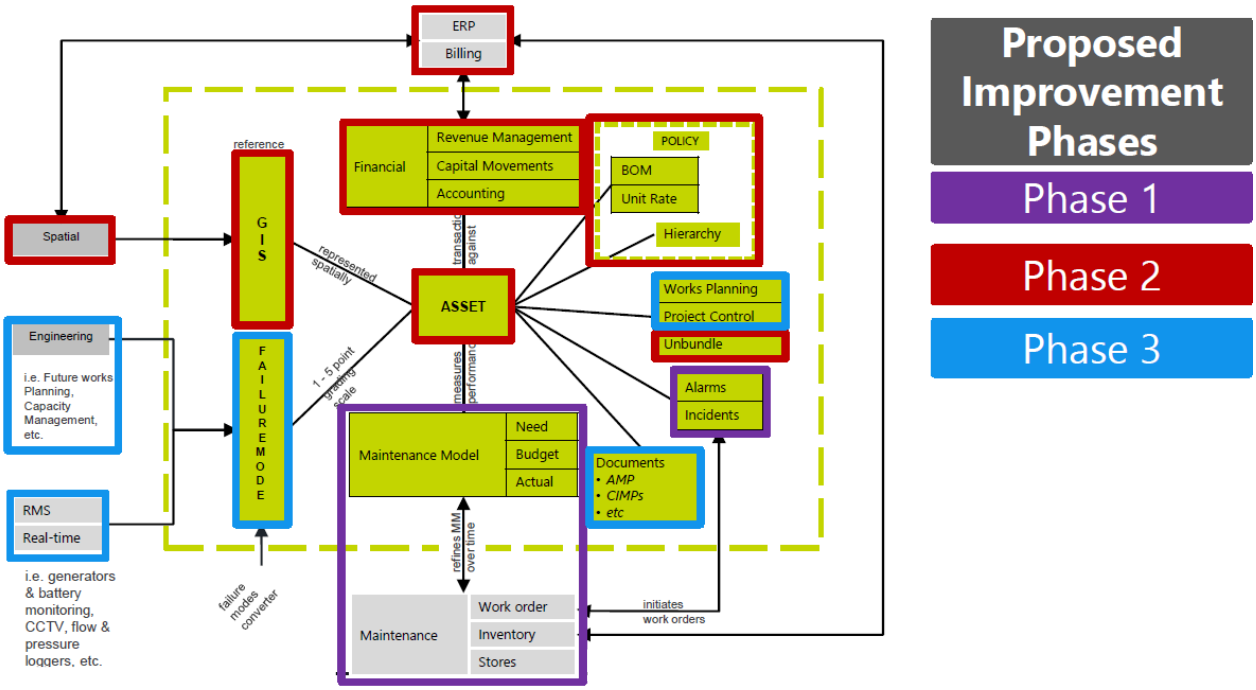

Figure 6-1: Roadmap

7 CONCLUSION

Infrastructure assets are, more often than not, expected to perform over a long period of time. All assets go through a lifecycle that starts with planning, then procurement or construction, operations and maintenance, renewal and ultimately disposal. These key areas have been the focus of the As-Is Assessment. While it is clear that many of the issues expressed in this document are tied to poor data integration and sharing, this is only the symptom. It is important to identify the root cause of the current state of data and all procedures impacting the creation and modification thereof. The causes were identified as:

- No structured data models.
- No data validation as most of the business processes are manual.
- Data and system duplication results in multiple interpretations of what should be viewed as the truth.
- Unclear communication and education to help provide an understanding as to the value added by each department in asset lifecycle management (big picture view).
- A lack of computerised systems.

Lifecycle asset management is an integrator of different functions and disciplines within Mandeni, KwaDukuza and iLembe. There is a clear need to have the processes in place, to have integrated systems to facilitate the processes and to implement strategic change management.