TOOLKIT **EDITION 1** 2018

CITIES' **INFRASTRUCTURE**
DELIVERY AND
MANAGEMENT SYSTEM

CIDMS

MODULE 12
Enablers

MODULE PURPOSE

This module describes the enablers that need to be implemented to ensure a well-functioning cities infrastructure delivery and management system that meets stakeholder expectations, deliver value-for-money, and promotes and facilitates continuous learning and improvement. These enablers are:

1. Asset management leadership and teams

2. Asset management plans

3. Asset management information systems

4. Service provision models

5. Audit, review and improvement

WHY

Leaders interpret organisational objectives and stakeholder requirements, and establish the asset management purpose and direction through the asset management policy, the strategic asset management plan and asset management objectives. There are a number of ways in which services can be delivered, and choices must be made on the most appropriate options, based on organisational constraints, capabilities, risks, opportunities and preferences. Capable teams, functioning in a value-centric culture, are required to implement asset management decisions, programmes, projects and activities. Asset management information systems support business processes by providing work flow management capabilities, and by providing data and information for decision making and control purposes. The asset management system should periodically be reviewed and audited, to provide assurance that it meets stakeholder expectations, that it is able to consistently perform as required, and to identify opportunities for improvement.

OUTPUTS OF MODULE 12:

1. Organisational structure for asset management, inclusive of a central asset management unit.

2. A competency framework and professional registration requirements for asset management practitioners and professional service providers.

3. Decisions on the number and scope of asset management plans to be prepared.

4. An asset management information system that meets the requirements of GRAP, mSCOA and of asset management.

5. Scope of CIDMS practices, and methodology for assessment of current practice and planning for improvements in practice.

KEY RELEVANT NATIONAL REGULATIONS, POLICIES AND STRATEGIES:

1. Local Government: Municipal Finance Management Act, No.56 of 2003

2. Municipal Systems Act, No. 32 of 2000

3. Municipal Standard Chart of Accounts (mSCOA) published in Government Gazette no. 37577, read together with MFMA Circular 80 providing guidelines on minimum business processes and system requirements, as well as the National Treasury Transversal Tender, RT25-2016.

4. SABS: South African National Standard 55000: Asset management – Overview, principles and terminology.

5. SABS: South African National Standard 55001: Asset management – Management systems – Requirements.

6. SABS: South African National Standard 55002: Asset management – Guidelines for the application of ISO 55001.

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CITIES' **INFRASTRUCTURE DELIVERY** AND **MANAGEMENT** SYSTEM **CIDMS**

IV

12.1   PURPOSE OF THIS MODULE

A system for the management of assets was described in **Module 2,** and key asset management planning processes were described in **Modules 3 – 6,** culminating in asset management plans and a strategic asset management plan in **Module 7,** that in turn provide planned programmes and projects as outputs. These are subjected to investment appraisal and decision-making, dealt with in **Module 8.** Approved programmes and projects are implemented in the infrastructure delivery system presented in **Modules 9 – 11.**
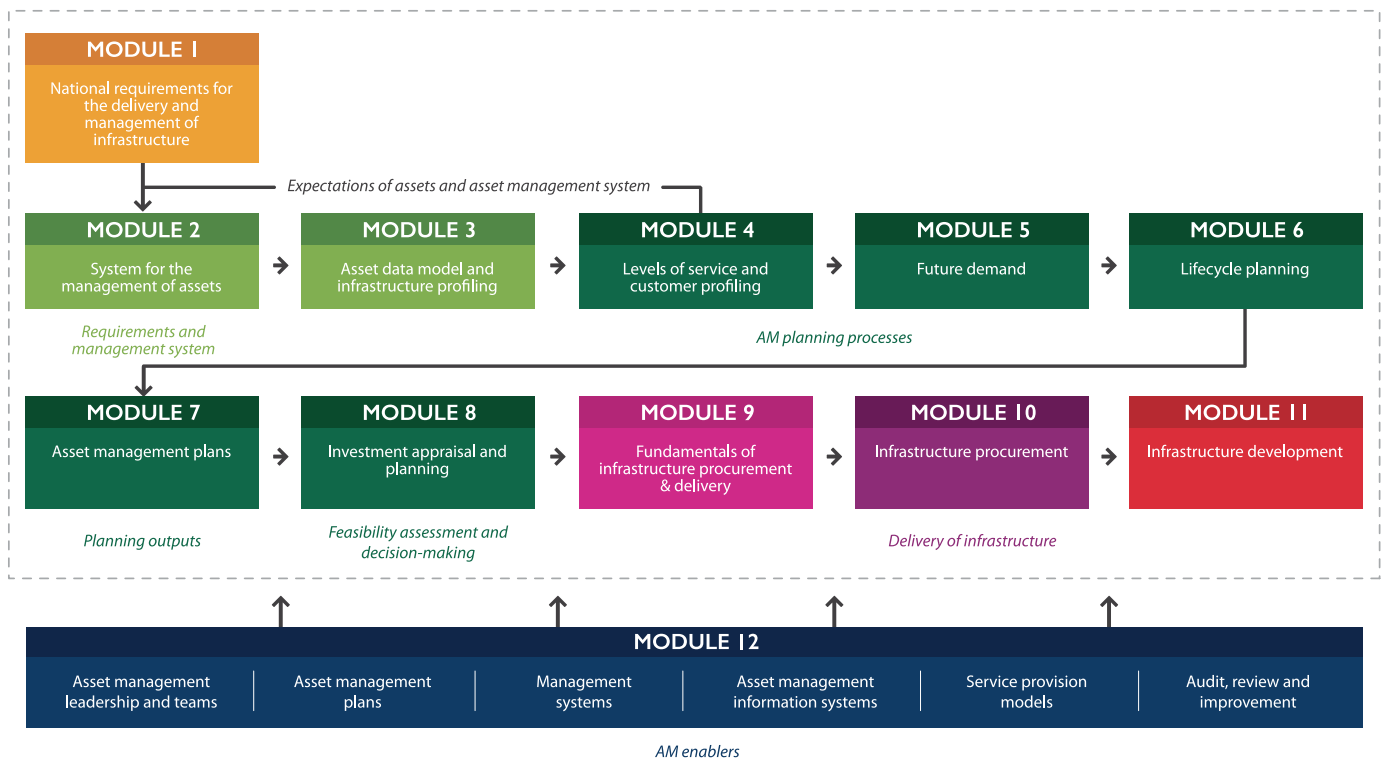
FIGURE 12.1: *Enablers supporting key asset management processes*

Figure 12.1 above identifies the enablers for management of assets, and for delivery value from those assets.

These enablers are:
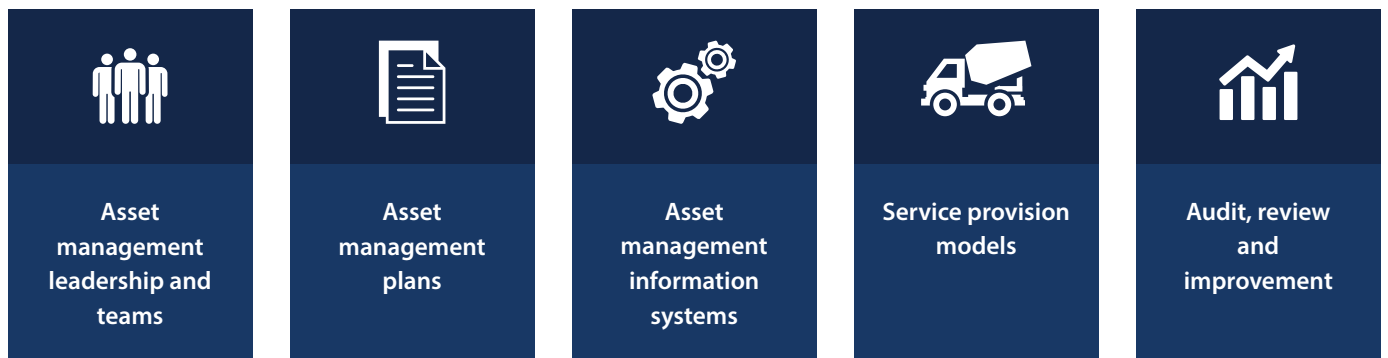
This module provides guidance on developing the enabling environment with respect to each of the enablers listed above.

12.2 ASSET MANAGEMENT LEADERSHIP, ORGANISATION, AND PEOPLE

12.2.1 The role of a leader

Leadership and organisational culture are both critical enablers and determinants of the success of asset management practice in a city. Leadership involves the following:

- Creating an inspiring vision of the future (a vision is an achievable and attractive future version of where the organisation intends to find itself).
- Inspiring people and teams to contribute towards achieving that vision, a key element of which is ensuring that they understand their role in the organisation and how they can contribute towards achieving the vision and organisational objectives.
- Developing the value system (culture) which guides how the organisation goes about achieving the vision.
- Establishing measurable objectives to gauge progress towards achieving the vision.
- Empowering teams to effectively deliver on stated objectives as appropriate, which may include delegation, skills development, resource allocation and access to data and information.
- Ensuring that risks are identified and treated to acceptable levels.
- Monitoring performance and improvement and taking corrective action as necessary.
- Recognising and rewarding performance and success.

Leadership and management differ in the following respects:

MANAGEMENT	LEADERSHIP
Controls systems and performance to standards or objectives established	Establishes vision and direction
Reacts to change	Creates change
Have employees	Have followers
Organises and controls staff	Aligns people, creates teams and empowers them
Instructs and communicates	Influences, inspires and persuades
Endorses and maintains culture	Shapes culture

TABLE 12.1: *Differences between management and leadership*

Effecting organisational level change requires strong leadership at a high level, with commitment from Council, the city manager and the executive team reporting directly to the city manager. High performance organisations however feature more than strong leaders in executive positions, they are characterised by leadership at all levels and empowered teams.

12.2.2   Asset management leadership

SANS 55001 establishes the following responsibilities for asset management leadership:

- Interpret organisational objectives and stakeholder requirements, and establish the asset management purpose and direction through the asset management policy, the strategic asset management plan and asset management objectives.
- Ensure that the asset management system is established and integrated into the city's business processes (e.g. Financial, HR and IT).
- Facilitate "whole of organisation" approach and promote cross-functional collaboration, alignment and integration.
- Ensure that the asset management risk approach is aligned with the city's corporate approach to risk management.

- Ensure that sufficient resources are available for the asset management system, so that asset management objectives can be delivered.
- Communicate the importance of effective asset management and of conforming to asset management system requirements.
- Direct and support people contributing to the effectiveness of the asset management system.
- Ensure that the asset management system achieves its intended outcomes.
- Promote continual improvement in asset management practice.

12.2.3   Organisational structure

01 FACTORS SHAPING DECISIONS ON ASSET MANAGEMENT ORGANISATION STRUCTURE

There are a number of factors which shape the decision on the appropriate asset management structure and organisational arrangements for cities. These include:

- The macro organisation structure of the city.

- The availability of skilled asset management professionals as well as funding available to source such professionals if not already in the organisation.

- The use of external specialists and other service providers in the delivery of asset management capability.

- The role and function of the corporate asset manager and/or asset management committees and teams.

- Related to the above, the extent to which asset management functions are centralised or decentralised.

- The most appropriate asset management delivery model is: (1) function-based, (2) service or asset-based or (3) some combination thereof.

Considerations regarding service delivery models, meaning the degree to which functions are performed in-house or contracted out, are dealt with in **Section 12.2.5.** Regardless of the extent to which service delivery functions are outsourced, the city retains functional responsibility for the asset management system. A key consideration that arises is whether the asset management function must be centralised or decentralised.
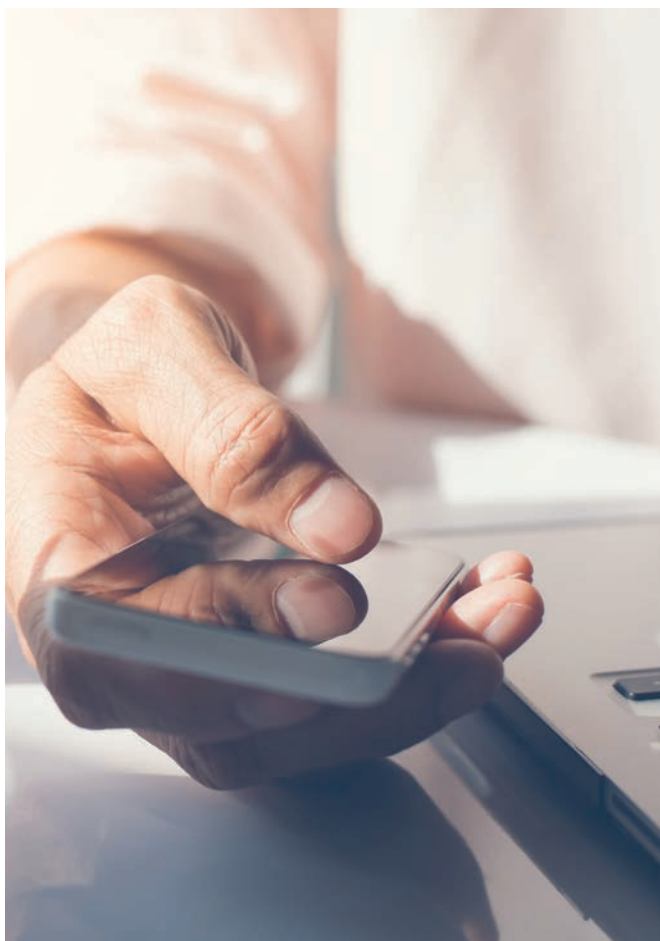
BENEFITS	DRAWBACKS
Facilitates a holistic, integrated city-wide approach to asset management	AM practitioners in the Central Asset Management Unit may not possess detailed asset-specific technical knowledge
A dedicated team of asset management expertise	If not well-integrated, the AM planning function and the operational service delivery functions may diverge
Focused on holistic asset management and forward planning, without the distractions of operational concerns and crises	The Central Asset Management Unit does not have line authority
Considering the shortage of skilled AM practitioners, this model enables the utilisation of scarce expertise	over departments and individuals on which they rely for data, other inputs and delivery

TABLE 12.2: *Benefits and drawbacks of centralised asset management*

Cities tend to have multiple asset portfolios assigned to various departments. Since asset management demands an integrated, holistic approach, some functions should be centralised. The following table indicates which functions should be centralised (performed at a corporate level, listed under the column "Central Asset Management Unit") and which functions are best performed by first line service delivery, asset intensive departments holding asset portfolios (Asset owner departments, such as the Water and Sanitation Department, or Electricity Department).

FUNCTION	NORMALLY BEST PERFORMED BY...	
	CENTRALISED	DEPARTMENTS
AM POLICY AND AM STRATEGY		
Preparation, maintenance and updating of AM policy	●	
Preparation, maintenance and updating of the strategic asset management plan	●	○
Establishment, review, updating and communication of corporate AM decisionmaking	●	○
Establishment, maintenance and updating of the corporate customer classification system	●	
Preparation, review, updating and communication of the city-level customer growth forecast model	●	
Spatial apportionment of future customer growth and communication of modelled results	●	
Sectoral interpretation of customer growth forecasts and the spatial impacts thereof, and analysing and quantifying demand for the service		●
Shutdown and outage strategy		●
ASSET DATA MODEL AND ASSET REGISTER		
Establishment, maintenance, review and updating of the asset data model	●	○
Establishment, maintenance and updating of the corporate, GRAP-compliant asset register	●	○
Establishment, maintenance and updating of a corporate electronic AM system	●	
Asset specialist studies (e.g. capacity, performance and structural assessment and deterioration studies)		●
LEVELS AND STANDARDS OF SERVICE		
Model or template for standard service attributes	●	
City customer services charter	●	
Determination, implementation, monitoring and reporting on service-specific levels and standards of service		●
ASSET MANAGEMENT PLANS		
Establishment, communication, review and updating of AM plan templates	●	
Selection of appropriate asset solutions, operating and maintenance regimes and preparation of asset lifecycle strategies	○	●
Preparation of AM plans	■	■
Implementation of AM plan		●

FUNCTION	NORMALLY BEST PERFORMED BY...	
	CENTRALISED	DEPARTMENTS
RISK MANAGEMENT		
Documented approach and methodology for immovable asset risk management aligned to corporate risk management approach, and communication thereof	●	○
City-level risk profiling of the AM system and of asset portfolios	●	○
Contingency planning	○	●
Establishment, maintenance and updating of the corporate immovable asset risk register	●	○
Asset performance and health monitoring	○	●
Monitoring and reporting compliance with the corporate immovable asset risk register, including investigation of incidences	●	○
AM system monitoring	●	
Management review, audit and assurance	●	
INVESTMENT DECISION-MAKING		
Developing sectoral and asset-specific decision-criteria aligned with the corporate AM decision-making system	○	●
Developing business cases for capital expenditure	○	●
Corporate screening, prioritisation and scheduling of capital expenditure	●	○
CAPITAL DELIVERY		
Technical standards and asset specifications		●
OPERATIONS AND MAINTENANCE		
Operations delivery (programmes, projects and activities), monitoring and reporting		●
Maintenance delivery (programmes, projects and activities), monitoring and reporting		●
Shutdown and outage management		●
Fault and incident response		●
COMPETENCE MANAGEMENT		
Establishing, reviewing and updating AM competence requirements	●	
AM skills audits and improvement planning	●	
Implementation of AM skills plans	■	■

● Lead responsibility	○ Contribute	■ Decide as appropriate

TABLE 12.3: *High-level asset management functions to be centralised or decentralised*

02 DETERMINING AM UNIT STAFFING REQUIREMENTS AND ORGANISATIONAL ARRANGEMENTS

Decisions on the type and number of human resources required for asset management will depend on the following factors:

- The complexity of the asset management system adopted for the city.
- The extent (number of), size, complexity and risk profile of asset portfolios.
- Qualifications and certifications required for particular AM functions.
- The service delivery model adopted for AM, including (1) the extent of centralisation or decentralisation and (2) functions contracted out to the private sector.

One possible high-level functional structure for a central asset management unit in a small metropolitan city is presented in **Figure 12.2** below.
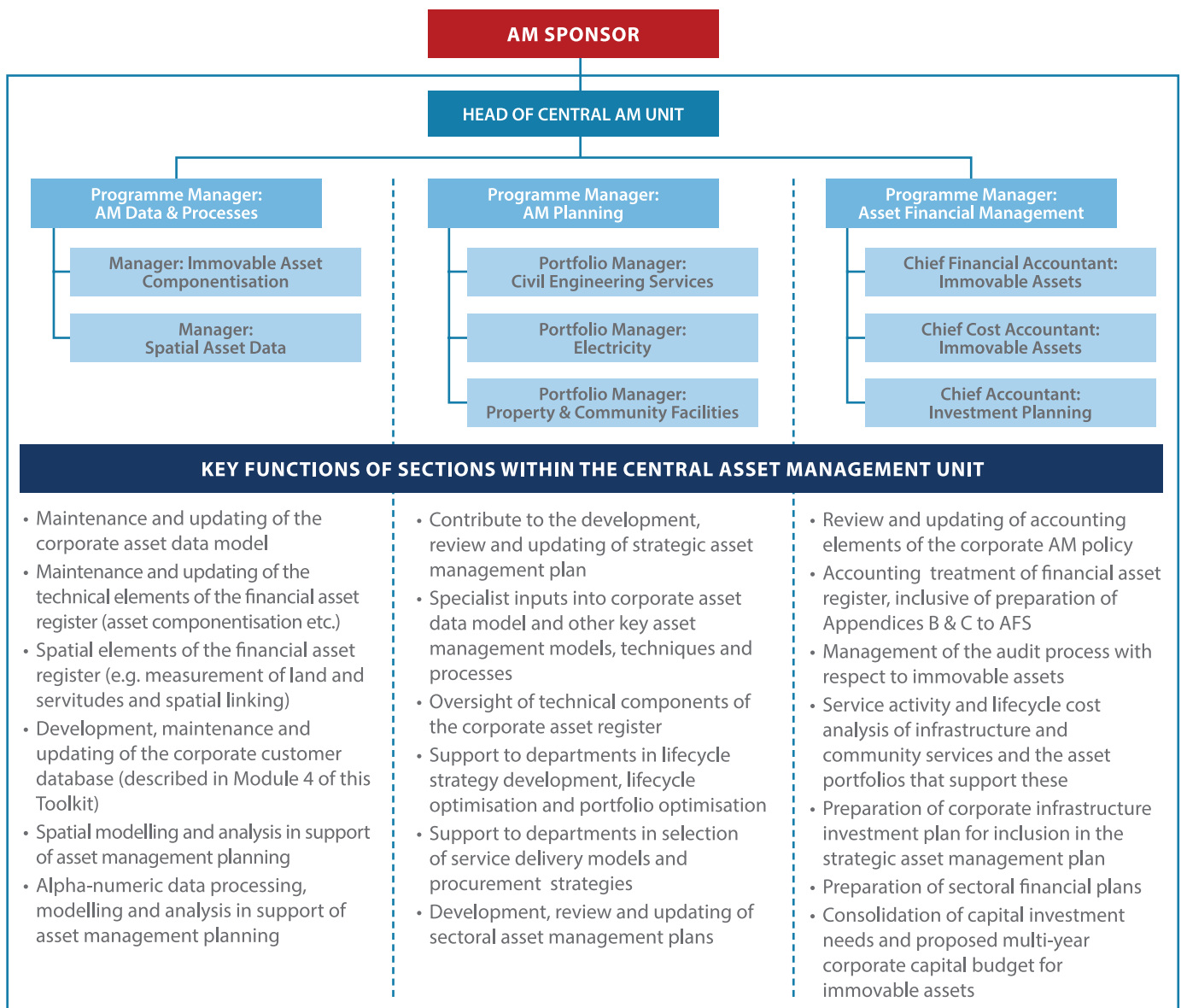
FIGURE 12.2: *High-level structure of a central asset management unit*

In this structure, the central asset management unit is responsible for the asset management policy, strategic asset management plan, sectoral asset management plans, the corporate asset register, and the models, techniques and processes that generate these outputs. **Note the following:**

- The section responsible for asset management data specialises in both alpha-numeric and spatial data.
- The section responsible for asset management planning has programme managers based on discipline and type of expertise, e.g. civil engineering asset portfolios such as potable water, roads and stormwater, sanitation and solid waste, electricity and, finally, property and community facilities. These broadly correspond with professional disciplines such as civil engineering, electrical engineering and, in the case of properties and communities, either civil engineering, architecture, urban planning or property valuation.

- Depending on the number, extent and complexity of asset portfolios, the section for asset management planning may need to be expanded to include asset management planners for specific asset portfolios, for example by appointing an asset management planner responsible for the water and sanitation asset portfolios, an asset management planner for the roads, stormwater, bridges and public transport infrastructure, and so on.
- The section responsible for asset financial management focusses on three main areas, these being (1) asset accounting services, (2) cost and management accounting services in relation to infrastructure assets and services and (3) asset financial management, including investment planning and budgeting.

A possible refinement to the model is the deployment of sectoral specialist asset management coordinators to various departments to strengthen linkages and coordination between the central asset management unit and functional departments, and to improve support to these departments whilst staying in touch with real operational issues and asset-specific dynamics.

03   INTEGRATION AND COORDINATION

No matter which functions are centralised or decentralised, AM still requires integration and coordination, not just with service delivery departments but also with various other departments and functions, such as:

- Urban planners (responsible for IDP, MSDF and human settlements development) to ensure that asset management supports and informs strategic spatial thinking and plans, and that urban planning considers asset delivery risks, capacities and costs. Other key interfaces here include customer growth models, the future spatial allocation of growth and the capital investment framework which legally must be included in the MSDF.

- Finance, to (1) ensure alignment of financial plans and budgets with the asset management plans prepared and the city infrastructure investment plan presented in the strategic asset management plan, (2) to coordinate matters relating to the production, maintenance and updating of a GRAP compliant asset register and (3) to develop, implement and improve upon business processes, methodologies and techniques supportive of mSCOA.

- Both service delivery departments and the project/programme management unit to ensure that capital works delivery, operations and maintenance support AM objectives.

- Corporate services department, on matters relating to (1) the establishment of competency and other professional requirements, (2) organisational resourcing arrangements for AM, (3) skills audits and improvement plans and (4) alignment and coordination on matters of corporate risk management. Alignment and coordination for asset management at corporate level is best achieved through an AM steering committee comprised of representatives of theabove departments, as shown below:

EXECUTIVE MANAGEMENT TEAM	Demonstrate continued commitment to AM through formal policy and strategy endorsement, the appointment of a corporate AM sponsor who regularly apprises the executive management team, and by appointing a dedicated corporate asset manager.
City manager and Section 57 managers reporting directly to the city manager	

CORPORATE AM SPONSOR	The corporate asset management champion ensures that: • AM matters are given the proper priority • Resources are available • AM programmes are effectively implemented
A member of the executive management team who reports directly to the city manager	

AM STEERING COMMITTEE	
• Corporate asset manager (chairperson) • Asset managers (functional & departmental) • Urban planning/IDP/human settlements • Finance • Service delivery departments • Information technology & data services • Corporate services	The AM steering committee enables co-ordination, alignment and integration across departments and functions. It provides direction, appoints project teams and sub-committees to drive AM implementation and improvement and monitors progress.

FIGURE 12.3: *AM organisational arrangements for integration and coordination*

The corporate AM sponsor is normally not an asset management professional, and is not engaged in asset management on a full time basis. Rather than a dedicated post in the organisational structure, it is a role performed by an executive manager reporting directly to the city manager. In a large city, this role can ideally be performed by a deputy city manager responsible for strategy, infrastructure or finance. In a medium-sized city this role can be performed by an executive director of a portfolio concerned with strategy and planning, finance or infrastructure.

The corporate asset manager, who serves as the chairperson of the AM steering committee, is the business manager of the Central Asset Management Unit. This is a full time AM professional tasked with leading the central asset management unit and managing the asset management system introduced in **Module 2.** This is a dedicated post in the organisational structure, at a post level equivalent to that of an executive director in a large city, director in a medium-sized city, or general manager in a small metro. Typical functions of the corporate asset manager include:
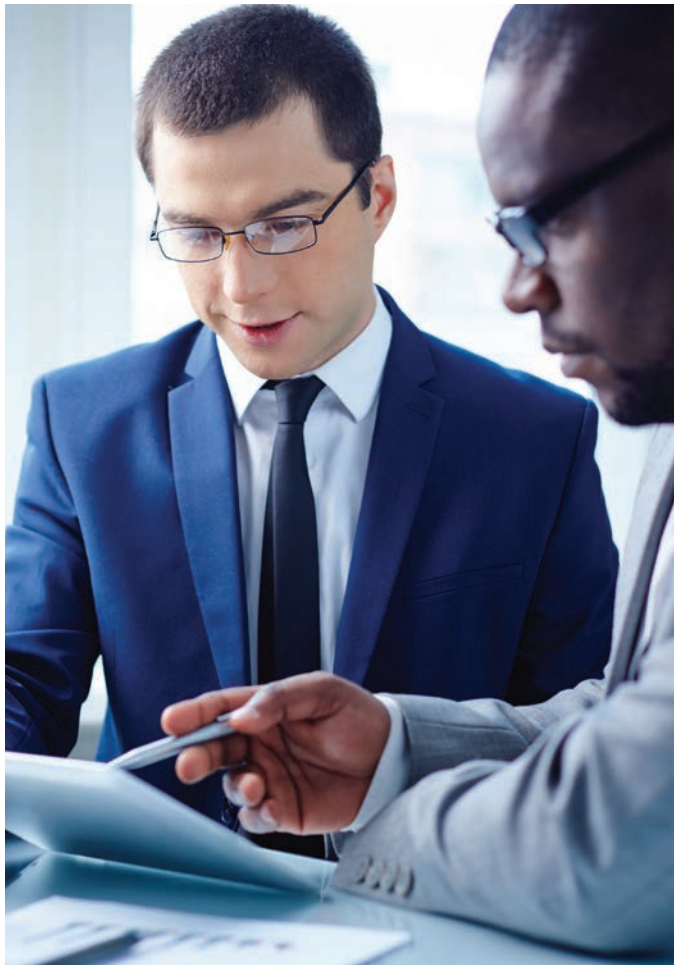
- Stakeholder analysis and identification of their needs with respect to asset management.
- Development of the corporate asset management policy, strategy and AM objectives, including the design of the asset management system and determination of the implementation programme and resource requirements.
- Implementing the Central Asset Management Unit and the asset management system described in the strategic asset management plan, and ongoing development of AM capability in the city.
- Convening the AM steering committee and coordinating with other departments on asset management matters.
- Coordinating the development of AM plans and improvement programmes.
- Monitoring, reviewing and reporting on AM progress and achievements, and undertaking of further improvement planning as necessary.

The AM steering committee is responsible for the following:

1. Corporate coordination, alignment and integration of AM, both within the AM system and of AM with other corporate processes.

2. Corporate support for AM.

3. Development of policy, strategy and practices that are holistic, integrated and therefore standardised across the city.

4. Facilitate and encourage information sharing across departments.

5. Coordination of strategic, financial and technical planning and AM activities.

6. Governance, including accountability for achieving AM objectives and communication of results.

7. Reviewing policy, strategy, AM objectives and practices with a view towards continual improvement.

Participation in the AM steering committee should be carefully considered. Representatives from other departments should be at a sufficient level of seniority to adequately represent their departments, with a full view of the strategic concerns, objectives, capabilities and programmes of their departments. They should however not be so senior that they are too far removed from a reasonable depth of understanding of relevant functional processes, or that there are ongoing difficulties to procure their participation due to multiple other committee engagements. Ideal representation should therefore in a large city be at the level of director or one level below that of director.

The role of the AM steering committee will likely change over time, and the committee structure and participation therein needs to be reviewed based on the phase of AM in the city. **These phases normally are:**

1. Development of the AM policy, strategy and objectives.

2. Implementation of the AM system (of which an electronic information system is one component).

3. Development of AM plans.

4. Implementation of AM plans.

5. Ongoing review and improvement.

It normally takes several years to fully develop and embed asset management in a city. From some point onwards, there will simultaneously be development, implementation, ongoing operations, as well as review and improvement in multiple focus areas. To deal with the differing requirements of development projects, implementation programmes and ongoing activities, it is proposed that special focus sub-committees and project team are established. Sub-committees normally fulfil a more permanent, repetitive role that includes elements of decision-making and reporting. It is proposed that cities establish at least the following two subcommittees: (1) investment appraisal and budget development, and (2) demand analysis.

Project teams have a more time-bound focus with specific, unique outputs. Some examples of project teams include the following:

- Asset data model project team. This team customises the asset data model for specific application in the city, a key aspect of which includes establishing unit cost rates at the asset component level.
- Asset information system project team. This team surveys asset information stakeholder requirements, business process requirements, associated systems and the need for data sharing or integration, develops functional requirements, and prepares a tender specification.

All AM roles and functions should be clearly documented and communicated, including temporary assignments to project teams.

12.2.4   *Asset management capability development*

Asset management leadership provides the strategic direction, systems, resources and enabling environment. Individuals and teams (whether units, committees or project teams) implement and generate meaningful results, driving the city to excellence, provided that they are competent, clearly understand the expectations of them and how they contribute to organisational success, are empowered and sufficiently resourced.

01   EVOLVING AND EXPANDING CAPABILITY REQUIREMENTS

For many years the asset management function was seen as a "silo" type function. Finance staff undertook asset accounting and were responsible for asset registers. Engineering or technical staff, with their asset-specific knowledge and expertise, focused on asset care activities (maintenance and renewal). The formalisation, evolution, expansion and integration of asset management approaches, documented in ISO 5500X and SANS 5500X, changed the capability requirements for asset management professionals. Some of these changes include:

- A shift from focus on particular lifecycle activities (e.g. maintenance), to full asset lifecycle optimisation and, beyond that, optimisation across the asset portfolio.

- The adoption of a management systems approach, and the need to coordinate and align with other organisational functions (e.g. finance).

- A shift from single objective optimisation (e.g. performance optimisation), to the adoption of a risk based approach that optimises performance relative to risk and cost considerations.

- Reorientation from assets to how assets support organisational objectives.

- Acknowledging the importance of engaging with customers and stakeholders in setting AM objectives, requiring more robust relationship management, facilitation and negotiation skills.

- The proliferation of service delivery options and innovations in procurement, with asset managers needing to better understand and evaluate risks, opportunities, benefits and costs associated with various delivery mechanisms.

- Advances in good governance, including transparency, and the need to adopt robust, documented decision making techniques to evaluate and recommend projects and programmes. This includes developing understanding of economic and financial concepts, and competence in investment appraisal techniques.

02 COMPETENCY FRAMEWORK FOR ASSET MANAGEMENT

AM capability development should include all staff involved in asset management in the city, not just those in the central asset management unit. Officials at various levels have different competency requirements. The following competency framework sketches positions and key roles in asset management, broadly aligned to the Asset Management Landscape published by the Global Forum for Maintenance and Asset Management (GFMAM).

This framework can be used to:

Identify roles, functions and competencies required when developing or reviewing AM job descriptions.	**Assess AM skills, identify gaps and develop an AM skills improvement plan.**	**Select appropriate training packages to develop AM skills for targeted groups.**

PRACTITIONER LEVEL

- **AM sponsor**
  - Member of executive management team

- **Head of AM**
  - Head of corporate AM unit
  - Functional heads in other departments

- **AM planner**
  - AM professional
  - Engineering professional
  - Urban planning professional
  - Financial professional
  - Etc.

- **AM team leader**
  - Functional responsibility team leader

- **AM candidate**
  - Graduate/intern (the built environment, finance etc.) with < 3 years experience

ROLES

- Direct
- Lead
- Perform independency
- Contribute

COMPETENCY AREAS

1. Policy, strategy and planning
2. Implementing AM plans
3. AM capability development
4. Risk management & performance improvement
5. Asset information management

FIGURE 12.4: *High-level view of the AM competency framework*

The AM framework comprises three elements, these being (1) levels of AM practitioners, (2) roles and (3) competency areas. Not all practitioners require an equal level of ability in all five areas of competency, and, depending on their level (and even functional position in the city), their roles with respect to the different competency areas will differ. The competency framework provides for four types of roles, as follows:

1. Directing. Directing involves high-level steer, motivating, inspiring and championing.

2. Leading. For purposes of this framework, leading comprises all activities associated with planning, organising, leading and controlling resources, as well as guiding and training others (mentoring).

3. Performing independently. The ability to execute tasks without guidance, though it may require or involve contributions from others.

4. Contributing. Performing tasks under supervision and with guidance.

In general, the competency framework expects higher levels of competence at the levels of AM practitioner, since they are expected to perform complex tasks such as AM planning independently. Increasingly at the level of Head of AM upto AM sponsor the competencies required change to a more strategic nature. Multiple roles (e.g. directing and contributing) are possible for a given level of practitioner. **Appendix 12.A** presents a detailed mapping of the competencies required for each position.

03 PROFESSIONAL REGISTRATION

There is a global drive towards the professionalisation of asset management, and GFMAM member countries have or are in the process of registering professional registration or certification systems. There are three types of professional registration within the asset management domain, as follows:

CERTIFICATION TYPE	CERTIFICATION	OFFERED BY...
Holistic asset management aligned with ISO 5500X, certifies that the individual is a competent practitioner at a particular level with mastery of x number of AM subject areas	• Certified Fellow of Asset Management (CFAM) • Certified Senior Practitioner in Asset Management (CSAM), • Certified Practitioner in Asset Management (CPAM) • Certified Associate in Asset Management (CAAM)	Asset Management Council, Australia Similar certification system being pursued by the South African Asset Management Association (SAAMA). SAAMA will offer the CSAM designation from 2018 onwards
Certification as an asset management assessor, component to assess or review the state of AM practice	Certified Asset Management Assessor (CAMA)	World Partners in Asset Management
Certification as a competent maintenance and reliability practitioner	Certified Maintenance and Reliability Professional (CMRP)	Society for Maintenance and Reliability Professionals, USA

TABLE 12.4: *Asset management certification/professional registration*

The following figure maps asset management certification against position levels in a city, and indicates the minimum relevant experience required at various levels:

ROLE	CERTIFICATION LEVEL	MINIMUM YEARS EXPERIENCE
AM SPONSOR		
Directs and plans the work of others and of teams		
	CERTIFIED FELLOW IN AM	**12 YEARS +**
HEAD OF AM	**CERTIFIED SNR PRACTIONER IN AM**	**8 YEARS +**
Leads the work of others		
AM PLANNER/TEAM LEADER	**CERTIFIED PRACTIONER IN AM**	**5 YEARS +**
Undertakes work independently		
AM NEW ENTRANT/GRADUATE	**CERTIFIED ASSOCIATE IN AM**	**2 YEARS +**
Contributes to the work of others		

FIGURE 12.5: *Target AM certification for various levels of practitioners*

This Toolkit recommends that staff in the Central Asset Management Unit hold appropriate AM certification against their level of position, indicated in **Figure 12.5** above, together with core functional discipline registration or certification. For example, if the city appointed a civil engineer as an asset management planner for the water and sanitation asset portfolios, then that engineer should ideally hold registration as a Pr. Eng (Civ) as well as registration as a CPAM or CSAM.

Infrastructure asset management is widely considered to be an interdisciplinary practice drawing on principles, skills and techniques from the management, financial and accounting, engineering and planning sciences. A key question then is: what type of person to appoint? It is the position of several member countries of the Global Forum on Maintenance and Asset Management that an asset manager will have a degree and proven experience and expertise in a sufficient number of asset management knowledge areas, evidenced by professional registration or certification normally formally assessed through examination.

In practice this means that asset management is not the exclusive domain of any traditional profession (e.g. finance or engineering). The best candidate for the position, all things being equal, is one with demonstrated competence, evidenced by certification such as that of Certified Senior Practitioner in Asset Management (CSAM). As at 2016 the asset management certification systems in place are fairly recent creations, and it is expected that it may take three to five years to generate a competent pool of certified practitioners. In the meantime, cities may wish to appoint on the basis of a discipline-specific professional registration (e.g. Pr. Eng, CA(SA) or Pr. Pln), and to implement a phased programme of asset management certification for relevant staff.

Table 12.5 provides guidance on the ideal profile of the Head of the Central Asset Management Unit, which may assist in developing a job description.

Qualification/ education:	Infrastructure asset management is widely considered to be an interdisciplinary practice drawing on principles, skills and techniques from the management, financial and accounting, engineering and planning sciences. Accordingly, the incumbent will have any one of the following degrees: • BCom degree or higher, with specialisation in accounting, cost accounting or finance; or • Degree in Engineering or higher, with a strong preference for specialisation in either structural, civil or electrical engineering; or • Degree in urban planning or higher.
	All other considerations being equal, preference should be given to incumbents with advanced degrees in the above fields
Professional registration requirements:	AM registration: • Preferred: Certified Senior Practitioner in Asset Management (CSAM), it's equivalent or higher • Advantageous: Certification as a Certified Asset Management Assessor (CAMA) Preferably plus: Primary discipline registration: • Professional registration with one of the following bodies: • Chartered Accountant registered with SAICA (the South African Institute of Chartered Accountants) (CA(SA)) • Chartered Management Accountant registered with the Chartered Institute of Management Accountants (CIMA) • Professional Engineer registered with the Engineering Council of South Africa (Pr. Eng registered with ECSA) • Professional Planner registered with the South African Council of Planners (Pr. Pln registered with SACPLAN) Other registrations/certifications (advantageous): • Registration as a Project Management Professional (PMP) or Construction Project Manager (Pr. CPM)
	The most important registration is that Certified Senior Practitioner in Asset Management, and all things being equal, it is the registration which counts most heavily. In the absence of registered CSAMs (or equivalent) in the short to medium term, consider primary discipline registration and develop a programme for AM registration/ certification for staff in the Central Asset Management Unit
Reasons for essential qualification and registration:	Asset management is the fusion of management, finance and accounting sciences on the one hand, and built environment sciences on the other. The incumbent will require grounding in at least one of these disciplines. Additionally, Government's drive for the adoption of minimum standards of competence for defined areas of practice, together with sectoral legislation and codes published by statutory bodies such as ECSA and SACPLAN require the incumbent to hold professional registration in one of the professions listed above. Additionally, the incumbent must display understanding of and competence in the scope of asset management and the relationships and contributions of the various disciplines to the interdisciplinary practice of asset management.
Experience:	A minimum of 8 years' proven senior management experience, of which At least 2 years' must be demonstrated experience in at least some aspects described in this job description in the local government environment, preferably in a metropolitan municipality.

TABLE 12.5: *Profile of the Head of the Central Asset Management Unit*

04 REQUIREMENTS FOR ASSET MANAGEMENT PROFESSIONAL SERVICES' PROVIDERS

Cities are advised to require the following when procuring asset management professional services:
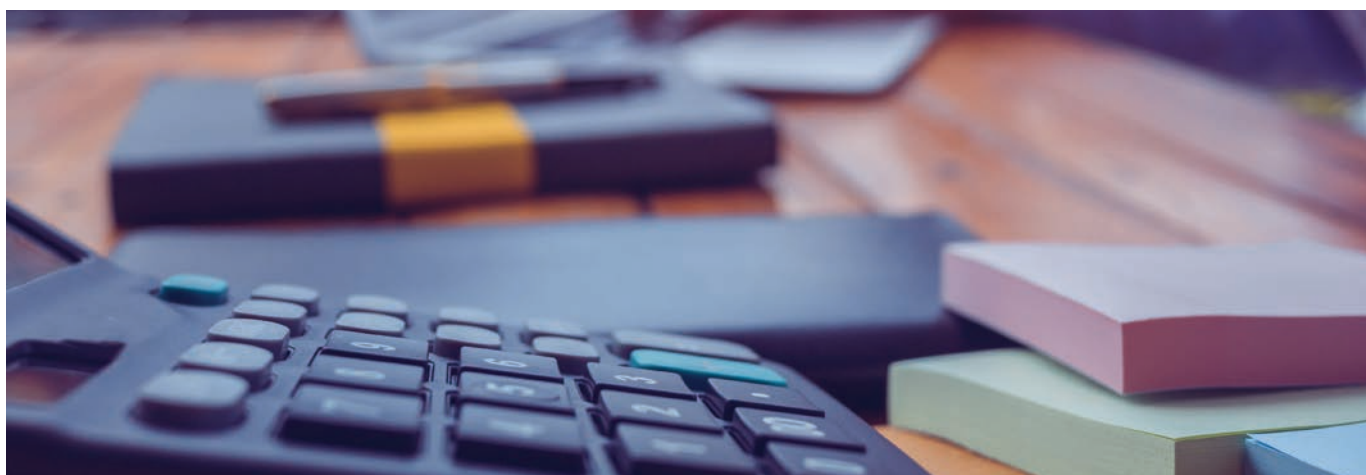
NATURE/SCOPE OF WORK	REQUIREMENTS
01 **Assessment, review or auditing of city asset management system/ CIDMS system**	1. The team leader/lead assessor or reviewer should be a person who holds the Certified Asset Management Assessor (CAMA) designation, awarded by the World Partners in Asset Management, indicating that the person has demonstrated the minimum knowledge and understanding required for the assessment or audit of asset management practices, activities and methodologies, as outlined in ISO17021 Part 5, and the GFMAM Specification for an ISO 55001. Auditor-Assessor. 2. Such a person should have a minimum of five (5) years demonstrable experience in the metropolitan municipality environment. 3. The lead assessor should have demonstrable experience in the scope of the city asset management system and of the asset portfolios being assessed, reviewed or audited, or should be supported by a team of specialists which has the required breath of expertise and experience.

02
Design or improvement of a city asset management system/ CIDMS system
	1. The team leader/lead designer should:
	  • Be registered at a minimum as a Certified Senior Asset Management (CSAM) practitioner as well as a
	  • Certified Asset Management Assessor (CAMA); and should furthermore;
	  • Have at least five (5) years proven experience in asset management in the metropolitan municipality environment.
	2. Such a team leader should be supported by a multi-disciplinary team able to design a complete asset management system as described in this CIDMS Toolkit, encompassing all asset portfolios, and interfacing with all other relevant municipal policies, systems and processes.

03 **Preparation, maintenance or updating of GRAP compliant componentised asset register based on the asset data model presented in Module 3**	**The professional services team should at least include the following professionals:** 1. A Chartered Accountant (CA) registered with the South African Institute for Chartered Accountants (SAICA); 2. At least one Professional Engineer (Pr. Eng) or Professional Engineering Technologist (Pr. Eng (Tech)) registered with the Engineering Council of South Africa (ECSA), with specialisation in civil infrastructure; 3. At least one Professional Engineer (Pr. Eng) or Professional Engineering Technologist (Pr. Eng (Tech)) registered with the Engineering Council of South Africa (ECSA), with specialisation in electrical infrastructure; 4. A valuer, registered with the South African Council for the Property Valuers Profession; and 5. A Professional GISc Practitioner, registered with the South African Council for Professional and Technical Surveyors.
04 **Preparation, maintenance or updating of a spatially based customer profile and spatial apportionment of future growth**	**The professional services team should at least include the following professionals:** 1. A Professional Planner (Pr.Pln), registered with the South African Council for Planners (SACPLAN); and 2. A Professional GISc Practitioner, registered with the South African Council for Professional and Technical Surveyors.
05 **Preparation of asset management policy**	**The professional services team should at least include the following professionals:** 1. A person registered at a minimum as a Certified Senior Asset Management (CSAM) practitioner to ensure compliance with matters relating to SANS 55001; 2. A Chartered Accountant (CA) registered with the South African Institute for Chartered Accountants (SAICA), for matters relating to GRAP compliance; 3. At least one Professional Engineer (Pr. Eng) or Professional Engineering Technologist (Pr. Eng (Tech)) registered with the Engineering Council of South Africa (ECSA), with specialisation in civil infrastructure, for estimation of useful lives and residual values of civil engineering asset components; and 4. At least one Professional Engineer (Pr. Eng) or Professional Engineering Technologist (Pr. Eng (Tech)) registered with the Engineering Council of South Africa (ECSA), with specialisation in electrical infrastructure, for estimation of useful lives and residual values of electrical engineering asset components.

NATURE/SCOPE OF WORK	REQUIREMENTS
06 **Preparation of strategic asset management plan and/or asset management plan(s)**	**The professional services team should at least include the following professionals:** 1. The team leader should be registered at a minimum as a Certified Senior Asset Management (CSAM) practitioner; 2. A Chartered Accountant (CA) registered with the South African Institute for Chartered Accountants (SAICA), or Chartered Management Accountant registered with the Chartered Institute of Management Accountants (CIMA); 3. A Professional Planner (Pr.Pln), registered with the South African Council for Planners (SACPLAN); 4. A Professional Engineer (Pr. Eng) or Professional Engineering Technologist registered with the Engineering Council of South Africa (ECSA), experienced in the scope of assets that form the focus of the plan; and 5. A Professional GISc Practitioner, registered with the South African Council for Professional and Technical Surveyors.
07 **Combination work packages (any combination of work packages 1 – 6 above)**	1. The team leader should be registered at a minimum as a Certified Senior Asset Management (CSAM) practitioner; and 2. Additional team members should meet the requirements as specified for each work package included in the overall scope of work.

TABLE 12.6: *Requirements for asset management professional services*

PROFESSIONAL DESIGNATION	REQUIREMENT EFFECTIVE FROM
Chartered Accountant (CA(SA))	From date of publication of CIDMS Toolkit
Certified Asset Management Assessor (CAMA)	From date of publication of CIDMS Toolkit
Certified Senior Asset Management Practitioner (CSAM)	Effective 01 January 2019
Certified Fellow of Asset Management (CFAM)	Effective 01 January 2019
Chartered Management Accountant (CIMA)	From date of publication of CIDMS Toolkit
Professional Engineer (Pr.Eng)	From date of publication of CIDMS Toolkit
Professional Engineering Technologist (Pr.Eng (Tech))	From date of publication of CIDMS Toolkit
Professional GISc Practitioner	From date of publication of CIDMS Toolkit
Professional Planner (Pr.Pln)	From date of publication of CIDMS Toolkit
Professional Valuer	From date of publication of CIDMS Toolkit

TABLE 12.7: *Requirements for asset management professional services*

12.3   SERVICE DELIVERY MODELS

There is a range of models which can be employed to support service delivery, of which performing work inhouse is but one option. SANS 55001 requires the following:

- Clause 6.2.2: The organisation should determine what will be done, and how resources will be used.
- Clause 7.1: The organisation should determine and provide resources for the AM system, and to meet AM objectives, considering both internal and external resources.
- Clause 8.3: The organisation must specify and control outsourced resources and assess associated risks.

The starting point in considering the most appropriate service delivery model is to define core services and assets. **Module 2, Section 2.2.2** provides guidance on the identification of core services and asset portfolios. The next step is to consider options for service delivery in relation to services rendered and asset portfolios employed.

| Full in-house delivery | Contracting for goods and services | Partnerships and shared services | Establishing a municipal entity | Outsourcing of functions to the private sector |

Least extreme ⟵ Service delivery model options ⟶ **Most extreme**
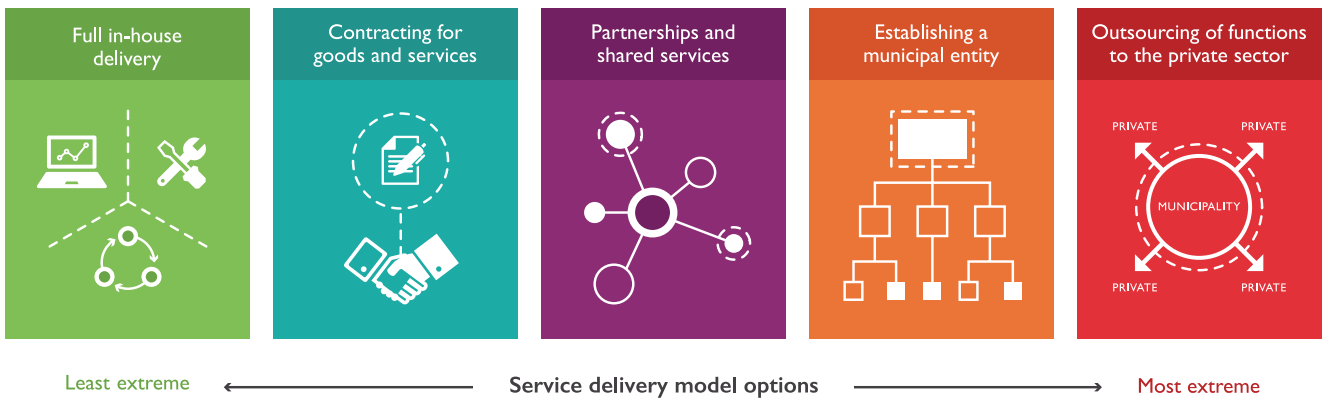
↑ KEY CONSIDERATIONS INCLUDE THE FOLLOWING:

- Benefits and costs related to the various delivery model options
- Current and expected market conditions
- Regulatory restrictions or enablers
- Labour market conditions (availability of appropriately skilled people and labour relations environment)
- Political appetite for private sector involvement
- Availability of funding

- Desired level of control over core services and assets
- The nature of the service for which delivery options are considered (e.g. revenue-generating or non-revenue generating)
- The city's risk appetite
- In-house capacities (facilities & equipment, systems, competence etc.)
- Drivers such as the need for job creation and local economic development

FIGURE 12.6: *Service delivery model options and key considerations*
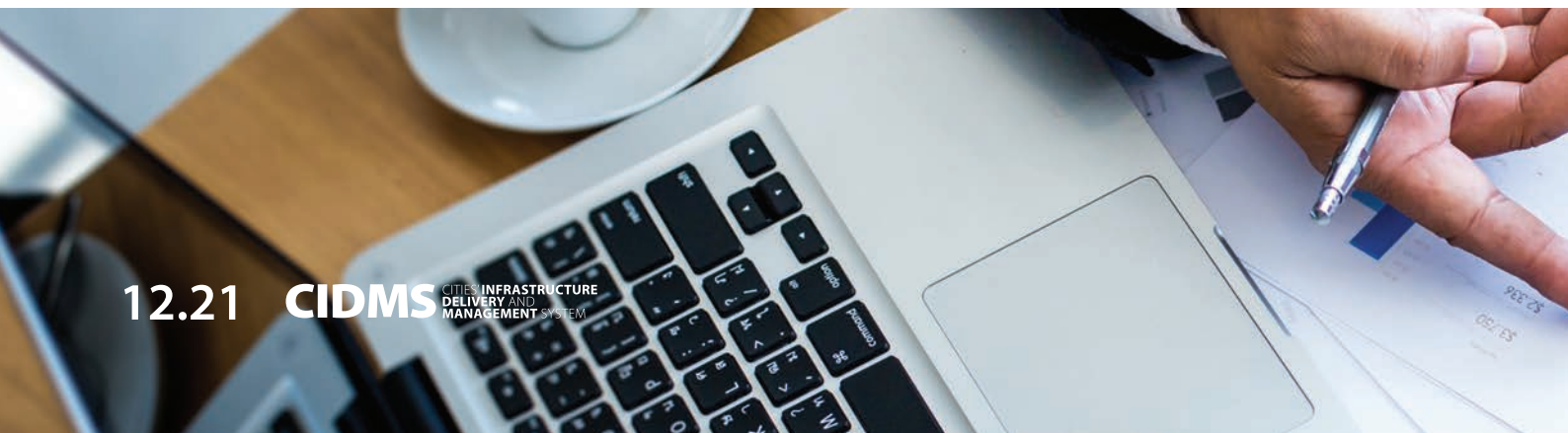
Figure 12.6 lists service delivery model options on a continuum, starting on the left with providing services and assets internally, considered the least extreme option, and moving to the outsourcing of functions to the right of the continuum, considered the most extreme model option. Note that there are multiple considerations in determining the appropriate model.

Additionally, when considering the choice of appropriate service delivery model, be clear about opportunities, risks and constraints, and the value required from the service delivery model. Value is often not limited to the core service or asset itself, and is not necessarily the lowest cost option. As a responsible city, also consider the impact of choice of service delivery model on both the organisation and on the market. The deliberation of appropriate service delivery options, the motivation for the options selected, as well as procurement methods, should be documented in the construction procurement strategy, dealt with in **Module 10.** Regardless of the choice of delivery model exercised, the city must ensure that it maintains appropriate control over delivery.

12.4 ASSET MANAGEMENT INFORMATION SYSTEM

01 INTRODUCTION

An asset management information system encompasses not only a software package, but also the hardware on which it is hosted and operated from, the processes that dictate procedures, work flows and data flows, and the data and information held on the system, as well as interfaces with other systems.

Since the implementation of the Municipal Finance Management Act in 2003, National Treasury has implemented a range of local government financial and budgetary reforms aimed at improving governance, accountability, transparency and the management of public funds. These reforms significantly improved financial management and reporting processes by focusing predominantly on financial and system shortcomings and streamlining specific business processes in the broader sense, with an acute emphasis on compliance and reporting outcomes.

> " *These reforms significantly improved financial management and reporting processes"*

However, comparisons within the local government sphere and throughout the whole of government was still hampered by data inconsistency at the transaction level, resulting in ambiguous results at an aggregated level. With SCOA already implemented at a provincial and national level, the regulation of the Municipal Standard Chart of Accounts (mSCOA) through Government Gazette no. 37577, focuses on the municipal accountability cycle as a whole and is designed as an organisational reform aimed at standardising processes within the planning, budgeting, implementation, monitoring and reporting cycles.

In support of this organisation wide reform, MFMA Circular 80 provides guidelines on the minimum business processes and system requirements as regulated through Chapter 3 of the Municipal Regulations on Standard Chart of Accounts. With compliance set as the seamless integration of the general ledger, billing, supply chain management, asset management, inventory and stores, budgeting and planning and human resources and payroll within the mSCOA chart and its seven segments at a posting level, fifteen major business process have been defined, namely:
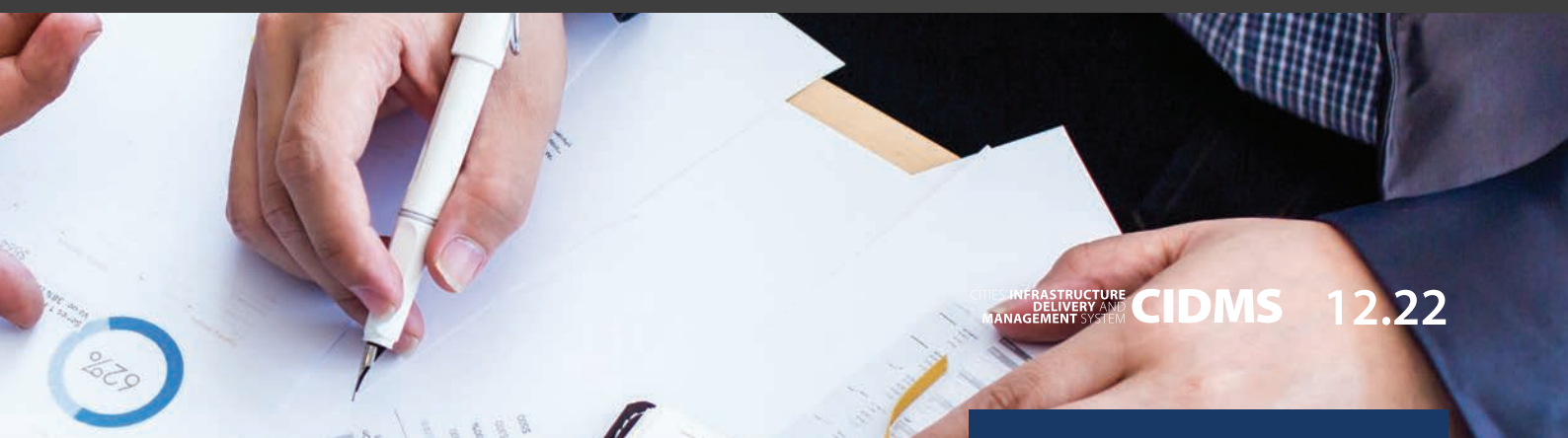
- Corporate governance;
- Municipal budgeting, planning and modelling;
- Financial accounting;
- Costing and reporting;
- Project accounting;
- Treasury and cash management;
- Procurement cycle: supply chain management, expenditure management, contract management and accounts payable;
- Grant management;
- Full asset life cycle management including maintenance management;
- Real estate and resources management;
- Human resource and payroll management;
- Customer care, credit control and debt collection;
- Valuation roll management;
- Land use and building control; and
- Revenue cycle billing.

Each of these business processes are underpinned by a range of sub-processes, which formed the basis for the technical specifications as noted in the National Treasury Transversal Tender, RT25-2016. Accordingly, mSCOA requires the following:

- A financial management system that is considered the "first tier" system, and contains the general ledger.
- Asset management is considered to be a sub-system.
- It must be possible to query a sub-system (such as asset management), from the general ledger.
- A sub-system (such as asset management) must be able to query, inform and extract information both horizontally (other sub-systems) and vertically (general ledger).
- Sub-systems must feature transaction capability. In the case of asset management, examples of transactions include processing of work-in-progress, capitalisation of assets, depreciation, accounting and asset impairment transactions. However, transactions involving procurement, that is the raising of purchase orders, are excluded from the scope of transactions in the asset management system. Where the supply chain is involved, the asset management system must interact with the supply chain system.
- The asset management system must interact with other subsystems as appropriate.

02 SCOPE OF THE ELETRONIC ASSET MANAGEMENT SYSTEM

The scope of functionality of the asset management system includes:

- an asset register, inclusive of work-in-progress (WIP), a staging functionality to componentise and value assets, and the financial asset register;
- lease register;
- borrowings register;
- grants register;
- capital works management;
- maintenance management; and
- strategic asset management functionality.

Detailed functional requirements are provided in the following sub-sections.

03 MAJOR CONSIDERATIONS IN DEVELOPING OR ACQUIRING, AND IMPLEMENTING AN ASSET MANAGEMENT INFORMATION SYSTEM

When acquiring or otherwise developing an electronic asset management system, be sure to address the following:

1. The main business drivers necessitating the need for the system, inclusive of the process and information requirements for asset management. Information requirements should be documented in approved data and information standards, which should be communicated, periodically reviewed and subjected to a formal change control process.

2. Scalability and the ability to meet longer term needs. Asset management is ever-evolving and, following the logic of the maturity approach, one can reasonably expect that over time more functionality and a greater level of sophistication will be required.

3. Efficiency, benefit and ease-of-use of the system to users thereof.

4. Integration requirements. As discussed in **Module 2,** the asset management system must interact, align and integrate with other relevant business processes in the city, therefore the asset management information system must interface with other software systems in the city as appropriate.

5. Resources required to implement, operate and maintain the system.

6. Business processes and documentation. Will the implementation require the development and/or reconfiguration of existing processes? These must be documented, and all stakeholders must understand these changes and where appropriate be trained in the use of new processes.

7. Strong governance and control systems to ensure that the system delivers benefits as required.

04 KEY BUSINESS DRIVERS

Following are some of the key business drivers for an asset management information system:

1. Establishment, maintenance and updating of a GRAP compliant asset register. This includes asset recognition (componentisation), measurement (valuation), treatment subsequent to asset take-on (e.g. depreciation and impairment), such actions as are necessary to establish closing balances at financial year-end to support the preparation of annual financial statements and reporting.

2. Supporting the requirements of mSCOA with respect to assets.

3. Support of asset lifecycle planning and management, inclusive of the identification of asset failure mode status and asset criticality, asset profiling, maintenance and renewal budget requirements, and the identification of assets nearing end of useful life.

4. Efficient data management, inclusive of asset data confidence grading, and protection of data integrity through (amongst others) built-in data diagnostics, control points, an audit trail and data backup arrangements.

05 FUNCTIONALITY REQUIREMENTS

There are a great number of functions that could be required of an asset management information system. The most important functional sets of requirements however center around an asset register, and the ability of the system to interrogate the asset register and draw reports to support asset accounting and asset lifecycle management needs. These functional requirements are explained in this sub-section. First, though, it is necessary to differentiate between different types or stages of asset registers, as follows:

VALUATION ASSET REGISTER (VAR)	
WHAT IS IT?	**PURPOSE/APPLICATION**
A valuation asset register, sometimes referred to as a technical asset register, is a cost establishment or a revaluation register. It draws on all available data, procured through electronic submissions, desktop data collection or field assessments. Accounting valuation techniques and engineering principles are applied in this version of a register as much of the monetary values are informed by the client data model unit rates, residual values and expected useful life of each asset. The remaining useful life algorithm is applied in order to determine the approximate depreciated replacement cost. The valuation register allows for a certain amount of flexibility when it comes to data establishment and refinements and is not as rigid as the financial asset register environment.	1. When there is a change in the recognition model (asset hierarchy structure) or in the valuation model. 2. When multiple new assets are transferred to the city, e.g. when municipal boundaries are expanded or adjacent municipalities incorporated and assets transferred to the city. 3. When asset data is exported from the financial asset register and revalued on the basis of depreciated replacement cost for purposes of asset lifecycle planning and budgeting.
WORK IN PROGRESS REGISTER (WIP)	
WHAT IS IT?	**PURPOSE/APPLICATION**
The work-in-progress register (WIP) is a separate register comprising of project information on assets not yet available for use and therefore not capitalised into the financial asset register. Project value is primarily informed by actual expenditure and supporting project invoices. Completed projects are componentised based on the information provided in bills of quantity, technical drawings and other supporting documentation. Upon completion the project is capitalised from the WIP register to the FAR.	1. To separately account for assets not yet available for use. 2. To track capital expenditure progress and performance.
FINANCIAL ASSET REGISTER (FAR)	
WHAT IS IT?	**PURPOSE/APPLICATION**
The financial asset register (FAR) is the official asset record reflecting the asset position of the city.	1. Complete financial record of all assets of the city. 2. It is in this environment that all asset financial movements are processed (e.g. asset impairment, provision adjustments and revaluation adjustments). 3. Reports on the financial position of assets.

TABLE 12.8: *Types or stages of asset registers*

With the above in mind, the following are key functional requirements for an asset management information system:

TABLE 12.9: *Asset management information system functionality*

OVERARCHING FUNCTIONAL REQUIREMENTS:
1. Accommodates a six-level asset hierarchy allowing asset componentisation, valuation, analysis and reporting at multiple levels (accounting group through to component type), for all immovable and movable assets found in the city environment
2. Enables identification of the asset component through the use of an unique asset ID, both in terms of physical location and location within the asset hierarchy
3. Facilitates the following asset valuation or measurement models: historic cost model, revaluation model, and specifically within the revaluation model, the depreciated replacement cost model
4. Provides full functionality as required to produce, maintain and update a GRAP compliant asset register, including the production of Appendices B & C to the Annual Financial Statements
5. Supports asset lifecycle analysis, planning and management through failure mode status reporting, asset criticality grading, and asset maintenance and renewal needs profiling
6. Supports mSCOA reporting requirements
7. Comprehensive data management functionality, inclusive of access control, data integrity and an audit trail
8. The ability to store documents and images against specific assets (e.g. as-built drawings, warrantees or photos)
9. Reporting capability, inclusive of reports in tabular or graphical format
10. The ability to spatially view assets against a variety of backdrops, including satellite imagery, aerial photography, asset topographical maps or cadastre maps, at various spatial scales
11. The ability to represent asset data both textually (alpha-numerically) and graphically, not only in terms of asset attributes, but also in terms of failure mode status and asset criticality (see **Figure 12.7** for an example)
12. Interface with other corporate systems as appropriate
ASSET RECOGNITION
1. Capitalisation through WIP Register:
• Unique project referencing/tracking
• Transaction processing
• Linking projects to capitalisation functionality and applying capital cost unit rates to capitalisation (shadow valuation) and recognising additions
• Journal function for –
• Allocation/correction of expenditure per project
• WIP impairment
• WIP transfer (capitalisation journals)
2. Capitalisation through VAR (asset take-on at calibrated unit rates)
TREATMENT SUBSEQUENT TO MEASUREMENT
1. Revaluation adjustments and accounting for effect on movements (derecognition & impairment of revalued assets) at any given point throughout the year
2. Impairment and impairment reversal at any given point throughout the year
3. RUL adjustments
4. EUL adjustments
5. Residual value adjustments
6. Depreciation calculation at any given point in time during the year
7. Profit/loss calculation
8. Annual fair value adjustment (Investment properties)
9. Account for changes in provisions relating to assets (landfill site rehabilitation provisions)

SAFEGUARDING OF ASSETS

1. The system shall enable the identification of asset custodians, including the date of commencement and hand-over
2. The system shall enable the identification of insurance, including:
   - The type of insurance;
   - Insurance contract reference;
   - Conditions; and
   - Insurance coverage.
3. The system shall enable the identification of warranties, including:
   - Extent and timeframe of warranty;
   - Operating conditions; and
   - Direct linking to warranty documentation through document management system.

ASSET VERIFICATION, REMAINING USEFUL LIFE ASSESSMENT AND IMPAIRMENT TESTING

1. Tablet application for field verification of assets
2. Production of schedules of assets with a remaining useful life of less than 3 years, and assets with no or negative remaining useful life
3. Failure mode status recorded against assets

ASSET DATA INTEGRITY

1. Provision for data confidence grading for all asset records and data items against each record
2. Robust asset data diagnostic system – see **Table 12.10** for typical diagnostics
3. Asset data process quality control and assurance system

ASSET DERECOGNITION

1. Resulting from renewal, to be identified through capitalisation, as at the date of asset take-on of replacement component
2. Scrapping or alienation

ROLL-OVER AND ROLL FORWARD FUNCTIONALITY

1. Roll-over from VAR to FAR
2. FAR annual roll forward functionality i.e. decreasing RUL and creating opening balances in the new financial period which agree with the prior period closing balances

SPATIAL FUNCTIONALITY

1. Spatial linking of both point and linear assets, and the ability to access spatial views of the asset being queried directly from the asset record in the register
2. Displaying background maps as appropriate to data analysis, at various scales, inclusive of:
   - Satellite imagery/aerial photography
   - Topographical maps
   - Cadastre/street maps
   - Combination maps
3. Viewing asset connectivity/location within the network or system of assets of which it forms part of
4. Viewing by layer
5. Viewing asset status spatially, e.g. failure mode status or criticality
6. Measurement functionality: linear and square

FINANCIAL REPORTING

1. AR financial summary
2. Appendices B & C to the Annual Financial Statements
3. Prior period corrections
4. Reclassification of assets
5. FAR reports at various levels within the asset hierarchy

STRATEGIC ASSET MANAGEMENT

1. CRC/DRC overview and analysis
2. Asset extent summary
3. Presentation of risk matrix by failure mode or RUL, at asset group type level, indicating likelihood and risk treatment cost
4. Production of asset age and renewal profiles, and initial renewals programme
5. Maintenance budget production at asset group type level and tracking of maintenance budget performance

CAPITAL WORKS MANAGEMENT

1. Supports workflow management as per the infrastructure delivery framework stipulated in the SIPDM, inclusive of gate approvals required
2. Ability to manage either internal or external capital works
3. Registration of programmes and projects, inclusive of:
   - mSCOA registration of projects/programmes (across mSCOA segments)
   - Contract number(s) of suppliers executing works, and scope of each
   - Phases, activities, deliverables and timeframes
   - Control budget for project/programme as a whole, per phase/deliverable/total
   - Specific conditions, e.g. procurement objectives, statutory compliance requirements, sureties, warrantees and retention
4. In the event of internal capital works, linkages through the costing segment that in turn links to the HR system (labour costs) and supply chain system (materials, goods and equipment to be installed, as well as for accessing construction vehicles and plant) - these could be activity-based charges or recoveries to internal users
5. Project/programme risk assessment and risk register
6. Tracking project/programme progress, and performance analysis and reporting, inclusive of:
   - Budget at completion (BAC)
   - Actual cost (AC)
   - Percentage complete (PC)
   - Planned value (PV)
   - Earned value (EV)
   - Cost variance (CV)
   - Cost performance index (CPI)
   - Schedule variance (SV)
   - Schedule performance indicator (SPI)
   - Estimate at completion (EAC)
   - Estimate to completion (ETC)(original estimate was flawed)
7. Generation of notices to contractors or suppliers

MAINTENANCE MANAGEMENT – PLANNING AND BUDGETING COMPONENT

1. Performance requirements for assets, linked at multiple levels in the asset hierarchy
2. Provision for basic global parameters and adjustment of these e.g.:
   • Load times
   • Travel speeds
   • Corporate efficiencies
   • Annual working hours
3. Reference data set for vehicle and plant costs
4. Reference data set for employee costs per hour
5. Task information for preventative maintenance activities for each component type as well as the frequency thereof
6. Human resources required in terms of skill types (e.g. fitter & turner, plumber or electrician), levels, number of resources and duration
7. Maintenance task priority (and if it is statutory or not)
8. There shall be two types of statutory requirements, as follows:
   • Maintenance work required in terms of law or by a national standard, e.g. periodic hydraulic inspection and testing; and
   • Statutory requirements to be observed in executing maintenance activities, e.g. observing safety procedures as determined for a particular facility or equipment such as in a live electricity chamber
9. Plant and tooling requirements to complete task
10. Suggested transport vehicle
11. Materials, inventory and consumables required
12. Financial needs based on the asset register and the task information for each task, represented in project packages, categorising the following detail:
    • Resource cost allocation (costing segment detail)
    • Labour
    • Vehicle, plant and equipment
    • Material
    • Contracted allocation
    • Function
    • Asset group type and name
    • Asset type
    • Asset location (regional indicator)
13. Financial needs reports compiled in various different ways
    • Departmental reports
    • Portfolio reports
    • Component reports
    • Priority reports
    • Resource cost reports
14. Estimated employees required in order to carry out work

MAINTENANCE MANAGEMENT – WORKS

1. Standard fault codes and the ability to store standard maintenance work packages for routine maintenance work
2. Flagging of restrictions on internal maintenance due to the asset being under warrantee and/or service plan with supplier/provider
3. Issuing of job cards. A job card should display the following information:
   - Description of problem or required maintenance
   - Description of the asset(s) to be maintained, including asset ID and description
   - A map/location information of the assets for which maintenance work is required
   - The most appropriate tools, spares, vehicle and safety requirements for the task. These options must be changeable on the job card to allow for user flexibility.
   - Input fields for data collection based on task type (inspections having fields for condition and potential problem indicators etc.)
   - Input fields for date and time of completion of tasks
   - Input fields for spares and materials used
4. Uploading job cards back into the system and storing of data
5. Raising of new jobs for reactive maintenance based on call-ins/inspections
6. Produce user-defined management reports about work done or backlogs in maintenance work
7. Performance management reports indicating the following for individual asset components, or rolled up at higher levels in the asset hierarchy, or per area:
   - Number of failures per annum
   - Mean time between failures
   - Mean down time
8. Allow for the updating and changing of rule sets for indicating when material samples should be taken for testing
9. The facility to cater for maintenance events that turn into renewals due scope of the maintenance
10. Links to asset schemata, manufacturer/designer manuals and standard operating procedures as appropriate
11. Budget vs. actual performance reports for each project package, per project package category:
    - Resource cost allocation (costing segment detail);
      - Labour;
      - Vehicle, plant and equipment;
      - Material; and
      - Contracted allocation.
    - Function
    - Asset group type and name
    - Asset type
    - Asset location (regional indicator)

LEASE REGISTER

1. Recognition of different forms of lease agreements (operational and finance leases)
2. Lower of fair value or amortised value
3. Amortisation of leases, considering:
   - variable repayment terms;
   - variable and incremental interest rates;
   - balloon payments;
   - recapitalisation of lease;
   - lease termination, (planned, early and staggered); and
   - recognition at lower of fair value or present value of future payments
4. Financial disclosure of leases in accordance with GRAP 13; including:
   - AFS disclosures;
   - variable periods;
   - repayment schedules;
   - encumbered assets;
   - lessors; and
   - per segment and user defined fields and dates.

GRANTS REGISTER

1. Recognition of different forms of grants (unconditional, conditional etc.)
2. Grant identifier (e.g. USDG or MIG)
3. Condition
4. Amount
5. Date received
6. Tracking of condition milestones
7. Associated revenue votes
8. Linked investments
9. Financial and management reporting:
   - AFS disclosures, per loan, condition and consolidated;
   - Milestone status;
   - Associated investments; and
   - Per segment and user defined field and dates.

BORROWINGS REGISTER

1. Recognition of different forms of loan agreements
2. Name of borrower
3. Principal amount
4. Date of commencement of loan
5. Loan conditions
6. Interest calculations, including;
   - period of repayment;
   - beginning or end of period interest calculation;
   - compounding interest at any interval;
   - recapitalisation of interest and or loan;
   - annuity, staggered, variable or balloon payments; and
   - loan termination (planned, early and staggered)
7. Financial and management reporting, including:
   - AFS disclosures;
   - variable periods, interest and capital (including user defined dates);
   - repayment schedules and forecasts;
   - encumbered asset or group of assets, including current replacement cost, condition; depreciated replacement cost of asset and revenue generating history (GRAP 26 and budgeting); and
   - per segment and user defined fields and dates.

GRANTS REGISTER

1. Enables multiple users simultaneous access to the system
2. Access via the local area network or through internet access for remote sites, or executives that require out-of-office access
3. User customisable reports

SYSTEM SECURITY

1. Access control to ensure that only authorised personnel have access to the system
2. Access to the system shall be directed by permission rights that can be allocated on the basis of viewing rights, data entry, data correction, data authorisation, or full system administrator rights. The system shall feature the ability to allocate permission
3. rights on the basis of components of user functionality, asset portfolio, geographic asset scope or some combination of both
4. Security controls must provide for both user identification and a password mechanism. The system shall furthermore limit the number of incorrect access attempts
5. The system shall feature an audit trail, of both current and previous period

Figure 12.7 demonstrates spatial reporting, from within an asset management information system, for roads within an area in Buffalo City. All coloured lines represent roads, and each colour depicts a particular condition grade. Views of this nature assist asset management planners to quickly determine the need for a structured renewals programme for specific areas.

Table 12.10 provides a limited extract of asset register diagnostics supporting quality assurance. Ideally the system should interrogate the asset register database with these queries and isolate asset records where discrepancies or gaps are found, for review and further action. This is necessary both to ensure the integrity of asset data, and to avoid potential audit queries.
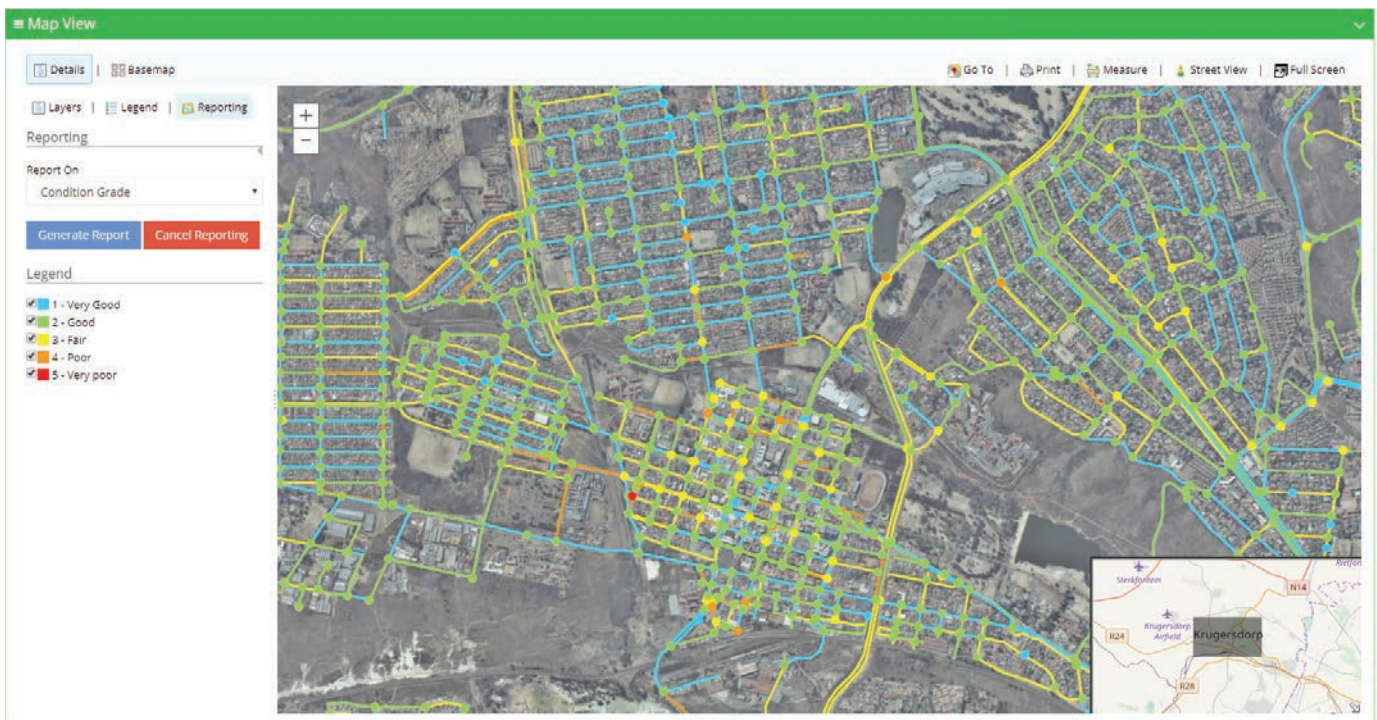
FIGURE 12.7: *Spatial view of assets enriched by database linkages on matters such as condition grade*

ITEM	DIAGNOSTIC CHECK
CRC	Are there any empty/null/zero CRCs?
	Are there any CRC < DRC?
Land and servitudes	Check that DRC=CRC, RUL is NA, RV is NA
DRC/carrying value	Check that there are no DRC or carrying values of amounts less than RV
RUL	Are there any RULs with negative values?
SG codes	Are SG codes provided for all land and investment properties?
	Are SG codes carried through all items related to any given property?

TABLE 12.10: *Sample asset management information system diagnostics*
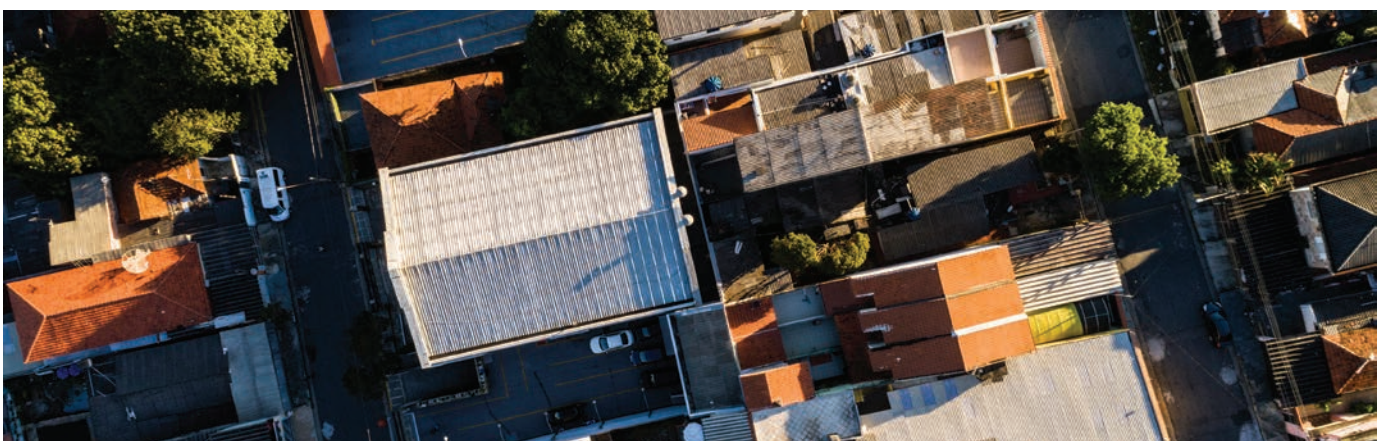
12.5 ASSET MANAGEMENT PLANS

Module 3 provides the techniques for profiling infrastructure and determining the needs associated with those assets. **Modules 4 – 6** offer asset management planning techniques, whilst **Module 7** describes the content and processes to develop asset management plans. **Module 8** provides decision-making criteria for options generated in or incorporated into asset management plans.

There are a number of options available for deciding on the number of asset management plans, the most common of which are shown in **Figure 12.8.** Consider the following factors in deciding how to cluster asset management plans, presented in no particular order:

- Allowing sufficient focus on the issues relating to a service or asset portfolio. Lumping too many services and asset portfolios into one plan diffuses the focus.
- Some functions and asset portfolios lend themselves to clustering, an example of which is roads, storm water and bridges. Some don't, such as combining electricity with sport and recreation facilities.
- Resourcing requirements and available skills – the more asset management plans there are to be prepared, the greater the resourcing requirements. How many competent asset management planners are there, and what are the cost implications?
- Aligning the service and asset portfolio scope to organisational structuring and budget allocation arrangements.

Developing an asset management plan is a sizeable effort. Be sure of the choice of the option selected, as changes in future years are likely to lead to significant rework. Also be sure to document the approach and methodology employed in preparing the asset management plans, all assumptions made, and securely store all models and analyses used in generating the plans, for future review and updating.

Option 1:
Grouping of main
function types of a
similar nature

Water and sanitation	Roads, stormwater and bridges	Electricity & Energy
Parks and public amenities	Municipal operational buildings	Investment property
Solid waste		

- Clustering of functional expertise
- Reasonable balance between in-depth service/asset portfolio focus and cost of preparing AM plans

Option 2:
AM plan for each
function or asset
portfolio

Water	Sanitation	Roads
Bridges	Stormwater	Electricity & Energy
Parks and open space	Sports & recreation facilities	Community halls and centers
Municipal operational buildings	Investment property	Solid waste

- Allows great depth of focus on each service/asset portfolio
- Can easily be linked to budget structures
- Requires greater level of resourcing and cost to prepare

Option 3:
AM plan for each asset
owner department

Department	Asset portfolio(s)
Electricity & energy	Electricity
Environmental Management	Solid waste
	Parks and open space
Real Estate	Investment property
	Operational buildings
Roads and Transport	Roads
	Stormwater
	Bridges
	Public transport facilities
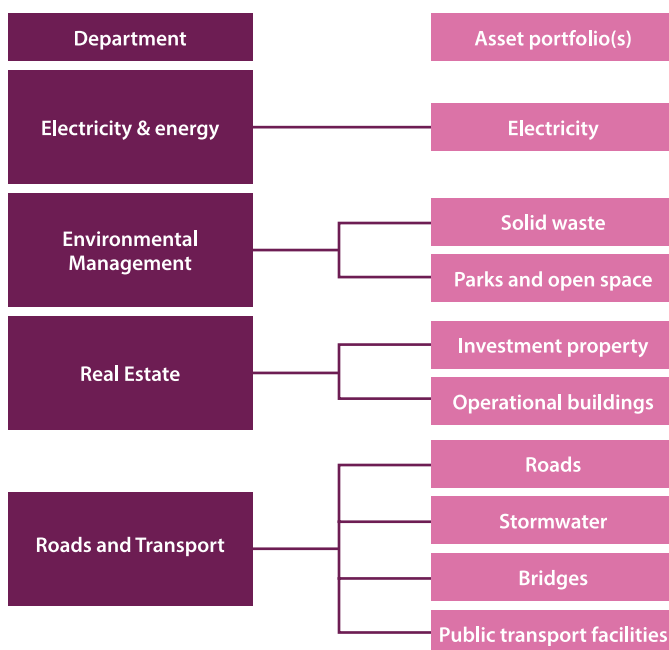
- Strong alignment with organisation and budget structure

FIGURE 12.8: *Options for deciding on the number and clustering of AM plans*

12.6 AUDIT, REVIEW AND CONTINUOUS IMPROVEMENT

01 ASSET MANAGEMENT SYSTEM AUDITING

Auditing is by its nature a governance function, intended to provide assurance. In the case of an asset management system, an audit confirms that the system:

- conforms to the requirements for an asset management system as defined in SANS 55001, in this CIDMS Toolkit and any additional requirements for such system established by the city itself; and that
- the system is effectively implemented, operated and maintained.

SANS 55001 requires internal audits at planned intervals. A city may further elect to commission an external audit for purposes of certification of compliance with the requirements of SANS 55001, to provide assurance to the community, financiers and investors that its asset management practices are robust.

02 MANAGEMENT REVIEW

SANS 55001 further requires top management to review the asset management system at planned intervals. The purpose of the management review is to ensure that the asset management system remains suitable, adequate and effective.

The following considerations form part of the scope of the management review:

- status of actions from previous management reviews and/or improvement plans;
- changes in the external and internal environment relevant to the asset management system;
- changes in the profile of risks and opportunities;
- asset management performance information and trends, including non-conformities and corrective actions, monitoring and measurement results and audit results;
- asset management activity; and
- opportunities for continual improvement.

The management review should be documented, and such documentation should be retained as evidence for a period not less than five years unless otherwise determined by the National Archives and Record Services of South Africa Act. The asset management system management review document shall include any decisions related to continual improvement opportunities as well as any changes required in the asset management system.

03 IMPROVEMENT

SANS 55001 states requirements for improvement, and differentiates between "improvement" and "continual improvement" as follows:

- Whenever a nonconformity or incident occurs, whether in an asset, asset management or the asset management system, the city shall take suitable action to control and correct the

- nonconformity or incident, deal with the consequences (e.g. environmental clean-up following a pollution event), evaluate the need for action to eliminate or mitigate the causes of non-conformity in future or elsewhere, and implement such actions as needed, and review the effectiveness of any corrective action taken.

- The city is also expected to establish processes to proactively identify potential failures in asset performance, to take appropriate steps to avoid or mitigate risks as appropriate, and to review the effectiveness of preventative measures taken.

- Continual improvement is an ongoing commitment and process to improve the suitability, adequacy and effectiveness of the city's asset management and of its asset management system.

04 ASSESSING THE ASSET MANAGEMENT SYSTEM AND ASSET MANAGEMENT PRACTICES

Both the auditing and management review of asset management and the asset management system will involve assessment of the current state of the asset management system, inclusive of the asset management practices and processes comprising the system. **Such an assessment requires the following:**

- Defined scope of the asset management system, its fundamentals and processes;

- An assessment methodology that is credible and replicable, and suitably robust to pinpoint shortcomings, nonconformities and improvement opportunities; and

- Capable asset management assessors – such assessments should be carried out by Certified Asset Management Assessors (CAMA) registered with the World Partners in Asset Management and who have applicable experience in the metropolitan municipality environment.

The scope of the asset management system contained in this CIDMS Toolkit is outlined in **Appendix 12.B,** and summarised in **Table 12.11** below. **The assessment comprises two parts, these being:**

- Part 1: Asset management fundamentals. The focus of Part 1 is to assess conformity to the requirements of SANS 55001 – Asset management – Management systems – Requirements.

- Part 2: Asset management practices and processes. Part 2 assesses more detailed practices giving effect to the general requirements of SANS 55001 and more specific requirements of this CIDMS Toolkit.

Each part consists of categories, sub-categories, and criteria.

CATEGORY		SUB-CATEGORY	
PART 1: FUNDAMENTALS OF ASSET MANAGEMENT			
1	**Context of the organisation**	1.1	Understanding the organisation and its context
		1.2	Stakeholder needs & requirements
		1.3	AM system
2	**Leadership**	2.1	Leadership and commitment
		2.2	AM policy
		2.3	Organisational roles, responsibilities and authorities
3	**Planning the AMS**	3.1	Addressing risks and opportunities for the AMS
		3.2	AM objectives and planning to achieve them
4	**Support**	4.1	Resources
		4.2	Competence
		4.3	Awareness and communication
5	**Information**	5.1	Information specifications
		5.2	Documented information
6	**Operation**	6.1	Operational planning and control
		6.2	Outsourcing
7	**Performance evaluation**	7.1	Monitoring and evaluation
		7.2	Internal audit
		7.3	Management review
8	**Improvement**	8.1	Non-conformity and corrective action
		8.2	Preventative action

TABLE 12.11: *Summarised scope of asset management fundamentals and practices to be assessed*

PART 2: ASSET MANAGEMENT PRACTICES AND PROCESSES			
1	**Asset data**	1.1	Asset data model
		1.2	Asset register
		1.3	Asset data mining, analysis and reporting
2	**Customer profiling and LOS**	2.1	Customer classification system and profiling
		2.2	Levels and standards of service
3	**Demand**	3.1	Customer growth forecast
		3.2	Current demand
		3.3	Future demand
		3.4	Demand management
4	**Lifecycle planning**	4.1	Determining lifecycle needs, commitments, dependencies, risks, opportunities and constraints
		4.2	Lifecycle strategies
		4.3	Lifecycle plans
5	**Asset management planning**	5.1	General
		5.2	iAMPs
		5.3	SAMP
6	**Investment appraisal and financial planning**	6.1	Policy and process
		6.2	Investment appraisal processes
		6.3	Investment appraisal techniques and systems
		6.4	Financial planning
		6.5	Budget prioritisation
7	**Lifecycle delivery**	7.1	Delivery management strategy
		7.2	Contracting strategy
		7.3	Procurement gateway & control system
		7.4	Programme abd project packaging and scheduling
		7.5	Maintenance
		7.6	O&M contract management
		7.7	Shutdowns, outages and incidents

The assessment methodology to be used is that of the measurement framework for process capability in ISO 15504-3, shown in **Table 12.12** below.

CAPABILITY LEVEL		LEVEL OF PROCESS DEFINITION
0	Incomplete process	The process is not implemented, or fails to achieve its process purpose
1	Performed process	The implemented process achieves its process purpose
2	Managed process	The previously described work process is now implemented in a managed fashion and its work products are appropriately established, controlled and maintained
3	Established process	The previously described managed process is now implemented using a defined process capable of achieving its process outcomes
4	Predictable process	The previously described established process now operates within defined limits to achieve its process outcomes
5	Optimising process	Predictable process is now continuously improved to meet relevant current and projected business goals

TABLE 12.12A: *Capability levels*

	CAPABILITY LEVEL	INCOMPLETE PROCESS	PERFORMED PROCESS	MANAGED PROCESS	ESTABLISHED PROCESS	PREDICTABLE PROCESS	OPTIMISING PROCESS
		0	1	2	3	4	5
Process attributes	Process performance		■	■	■	■	■
	Performance management			■	■	■	■
	Work product management			■	■	■	■
	Process definition				■	■	■
	Process deployment				■	■	■
	Process measurement					■	■
	Process control					■	■
	Process innovation						■
	Process optimisation						■

TABLE 12.12B: *Process attributes required at different capability levels*

05 DEVELOP AN ASSET MANAGEMENT SYSTEMS IMPROVEMENT PLAN

Each city should prepare an asset management practices improvement plan as part of its asset management systems strategy. It is very likely that the first improvement plan will identify dozens of improvement activities and projects. Not all of these can or should be implemented simultaneously. Some elements of the asset management system must be in place which in turn direct the development of other elements – it requires a skilled asset management assessor or asset management systems designer to logically sequence development work on the asset management system. The cost of undertaking all improvement activities in a short timeframe, and the organisational capacity to drive, absorb and implement the asset management system are also real considerations. The improvement plan should consider these limitations, and prioritise proposed improvements on the basis of logical sequencing, regulatory requirements (non-discretionary compliance required), cost-benefit analysis and/or following a risk mitigation approach. The improvement plan should also attend to organisational impact, organisational change requirements and securing support from key stakeholders. The asset management practices improvement plan should contain the following:

- Scope of asset portfolios and activities in the asset management system, including a description of which activities are of a corporate nature, and which are devolved to respective sector departments (e.g. Roads and Stormwater Department, or Electricity Distribution Department)
- Current level of maturity in practice of each activity
- Expected level of maturity in practice for each activity
- A business case for each improvement activity, including the following:
  - The activity identified for improvement and current level of practice
  - The need for improvement, the level of expected practice, outputs and outcomes
  - Options considered for improvement, and motivation for the selected improvement option
  - Impact(s) on stakeholder expectations, other activities, processes, policies and systems, within and external to the asset management system
  - The scope of work involved to implement the improvement
  - The expected cost and timeframe
  - Who will be responsible
  - A benefit-cost analysis
  - Recommendations

The asset management practices improvement plan should be prepared for each infrastructure service and included in the asset management plan for that service. The city should also prepare a corporate-level asset management systems improvement plan, which should be included in the city's strategic asset management plan. Asset management plans and the strategic asset management plan are described in **Module 7.**

12.7   CONCLUSION

The asset management system presented in this Toolkit is a bespoke design for cities faced with the need for urban reform to facilitate economic growth, social inclusion and upliftment, and to adjust to new climate realities. It presents a framework, processes, techniques and enablers to assist cities to sustainability manage large and varied asset portfolios to achieve city strategic objectives. The enablers described in this module are critical for success in asset management.

Especially important is recognising the role of leadership, people and culture, and to imbed a robust system that becomes the city's way of doing asset management in a consistent way, to ensure that objectives are achieved, that the city becomes a learning organisation continuously striving for improvement, and that appropriate practice and culture are transmitted through successive generations of political decision-makers and practitioners.

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APPENDIX 12.A: AM COMPETENCY FRAMEWORK

12.A.1 Normative framework

This competency framework is informed and guided by the following documents:

- ISO/SANS 5500x Asset Management
- The Asset Management Landscape, version 2, GFMAM
- The IAM Competences Framework, Part 1 and Part 2, IAM
- The International Infrastructure Management Manual, 2011
- This CIDMS Toolkit
- Professional certification requirements of GFMAM member countries

12.A.2 How it works

01 OVERVIEW

This competency framework identifies five levels of AM practitioners and five competency areas for asset management, broadly aligned with the six knowledge areas of the Asset Management Landscape, as shown below in **Figure 12A.1** below. The sixth knowledge area within the Asset Management Landscape is AM decision-making, not separately reflected in this competency framework.

PRACTITIONER LEVEL

AM sponsor	• Member of executive management team
Head of AM	• Head of corporate AM unit • Functional heads in other departments
AM planner	• AM professional • Engineering professional • Urban planning professional • Financial professional • Etc.
AM team leader	• Functional responsibility team leader
AM candidate	• Graduate/intern (the built environment, finance etc.) with < 3 years experience

ROLES

Direct

Lead

Perform independency

Contribute

COMPETENCY AREAS

1. Policy, strategy and planning

2. Implementing AM plans

3. AM capability development

4. Risk management & performance improvement

5. Asset information management

FIGURE 12A.1: *Competency framework*

Whilst decision-making can rightly be considered a knowledge area in its own right, it is also inextricably embedded in other knowledge areas. Consider policy, strategy and planning. Policy involves deciding upon the principles according to which the AM strategy will be developed. AM strategy involves decisions about AM objectives to be achieved, the path the city will take to get there, and AM plans involve decision-making about the "how" aspects thereof.

02 COMPETENCY CLASSIFICATION SYSTEM

The competence framework incorporates a hierarchy or classification system for competencies, as demonstrated in the figure below. Each of the five competency areas (CAs) are disaggregated into competency sub-areas (CSAs), each of which consists of a number of competencies (Cs), which consists of a number of Units of Competency (UOCs). "Measure the technical and organisational dimensions of resilience", which is a unit of competence forming part of the competency "Resiliency analysis and planning" under the competency area "Strategy and planning", would be referenced as CA 1/CSA 3/C 3/UOC 4.

COMPETENCY AREA (CA)	CA 1. Strategy and planning

COMPETENCY SUB-AREA (CSA)	CSA 3. AM planning

COMPETENCY (C)	C 3. Resiliency analysis and planning

UNITS OF COMPETENCY (UOC)

UOC 1. ID critical customers and locations, and determine their minimum service requirements

UOC 2. Define resilience levels of service

UOC 3. Establish the scope of resilience assessment

UOC 4. Measure the technical and organisational dimensions of resilience

UOC 5. Design for resilience

UOC 6. Implement resilience decisions and monitor the effectiveness thereof

FIGURE 12A.2: *Competency hierarchy and classification system*

03 PRACTITIONERS AND THEIR ROLES

Five levels of AM practitioners are specified, these being:

1. **AM sponsor,** who is typically a member of the executive management team reporting directly to the city. The AM sponsor is not an AM practitioner per se. This person functions as a champion for asset management at executive level. As such, no specialist AM skills are required. However, in order to champion AM, the AM sponsor requires a thorough understanding of the scope, fundamentals and value of AM.

2. **Head of AM.** This person is formally appointed as the manager in charge of the central asset management unit. In **Figure 12.2,** which shows a possible structure for a central asset management unit, this is the Head of the Central AM Unit. The Head of AM requires strong abilities in leading most work activities related to the AM system, and must be able to independently undertake the development of AM policy, AM objectives and AM strategy.

3. **AM planner.** The AM planner can be either an asset portfolio specialist, or a function specialist within the ambit of asset management. An asset portfolio specialist generally undertakes planning for specific asset portfolios and produces asset management plans for those asset portfolios. A function specialist could be a specialist in any of the competencies listed in this appendix, for example asset accounting. Key requirements of AM planners are that they are able to independently perform in their specialist areas, have an understanding of the total AM system, and are able to contribute to most competency areas as required.

4. **AM team leader.** AM team leaders are typically sectional or divisional managers charged with specific responsibility areas, though they could also be project team leaders. AM team leaders in **Figure 12.2** are the programme managers for (1) AM data and processes, (2) AM planning and (3) asset financial management.

5. **AM candidate.** This is typically a recent graduate serving an internship on the way to becoming an AM planner.

Depending on the subject or competency area, each of the five levels of practitioners, except for AM candidates, can fulfil several roles, these being to:

1. **Direct.** Directing involves high-level steer, motivating, inspiring and championing.

2. **Lead.** for purposes of this framework, leading comprises all activities associated with planning, organising leading and controlling resources, as well as guiding and showing others (mentoring).

3. **Perform independently.** The ability to execute tasks without guidance, though it may require or involve contributions from others.

4. **Contribute.** Performing tasks under supervision and with guidance.

The following table lists all units of competency, and indicates the typical role of each level of practitioner in relation to each unit of competency.

COMPETENCY AREA	COMPETENCY SUB-AREA		COMPETENCY	
	REF	DESCRIPTION	REFERENCE	DESCRIPTION
CA 1: Strategy & planning	CA 1/CSA 1	AM policy development	CA 1/CSA 1/C 1	Analyse AM policy requirements
			CA 1/CSA 1/C 2	Develop AM policy
	CA 1/CSA 2	AM strategy development	CA 1/CSA 2/C 1	Analyse strategic requirements
			CA 1/CSA 2/C 2	Forecast and analyse future customer requirements and demand
			CA 1/CSA 2/C 3	Develop AM strategy
			CA 1/CSA 2/C 4	Plan AM strategy implementation
	CA 1/CSA 3	AM planning	CA 1/CSA 3/C 1	Apply lifecycle principles and develop lifecycle strategies and plans
			CA 1/CSA 3/C 2	Plan for contingencies
			CA 1/CSA 3/C 3	Resilience analysis and planning
			CA 1/CSA 3/C 4	Prepare business cases for lifecycle expenditure projects and programmes
			CA 1/CSA 3/C 5	Develop and communicate AM plan(s)
CA 2: Implementing AM plans	CA 2/CSA 1	Capital activities	CA 2/CSA 1/C 1	Create/acquire/upgrade assets
			CA 2/CSA 1/C 2	Renew assets
	CA 2/CSA 2	Operating activities	CA 2/CSA 2/C 1	Design and manage operations
			CA 2/CSA 2/C 2	Design and manage maintenance
	CA 2/CSA 3	Asset optimisation	CA 2/CSA 3/C 3	Asset optimisation
	CA 2/CSA 4	Asset decommissioning & disposal	CA 2/CSA 4/C 1	Asset decommissioning & disposal
CA 3: AM capability development	CA 3/CSA 1	AM organisational development and deployment	CA 3/CSA 1/C 1	Design and manage AM organisational architecture
			CA 3/CSA 1/C 2	Develop and deploy AM practitioners and teams
			CA 3/CSA 1/C 3	Sculpt the desired AM culture
	CA 3/CSA 2	Supplier development and management	CA 3/CSA 2/C 1	Supplier development and management
CA 4: Risk management and performance improvement	CA 4/CSA 1	Risk management	CA 4/CSA 1/C 1	Design and implement risk management processes and procedures
			CA 4/CSA 1/C 2	Manage risk
	CA 4/CSA 2	Fault and incident response	CA 4/CSA 2/C 1	Responding to faults and incidences
			CA 4/CSA 2/C 2	Investigation of faults and incidences
	CA 4/CSA 3	AM system performance	CA 4/CSA 3/C 1	AM system monitoring
			CA 4/CSA 3/C 2	AM system improvement planning
			CA 4/CSA 3/C 3	Management review, audit and assurance
CA 5: Asset information management	CA 5/CSA 1	Asset information strategy	CA 5/CSA 1/C 1	Assessment of asset information requirements
			CA 5/CSA 1/C 2	Develop asset information standards
			CA 5/CSA 1/C 3	Develop asset information strategy
	CA 5/CSA 2	Manage asset information	CA 5/CSA 2/C 1	Establish asset information system
			CA 5/CSA 2/C 2	Data and information management

TABLE 12A.1: *CIDMS units of competency summarised*

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 1	**Strategy & planning**					
CSA 1	**AM policy development**					
Competence 1	**Analyse AM policy requirements**					
CA 1/CSA 1/C 1/UOC 1	Identify regulatory requirements for AM policy	D	P	C	C	C
CA 1/CSA 1/C 1/UOC 2	Identify the corporate objectives the AM policy must support	D	P	C	C	C
CA 1/CSA 1/C 1/UOC 3	Identify internal and external stakeholders	D	P	C	C	C
CA 1/CSA 1/C 1/UOC 4	Define stakeholder requirements to be addressed by the AM policy	D	P	C	C	C
CA 1/CSA 1/C 1/UOC 5	Define opportunities and constraints to be considered in the AM policy	D	P	C	C	C
CA 1/CSA 1/C 1/UOC 6	Identify organisational requirements for policy establishment and approval	D	P	C	C	C
CA 1	**Strategy & planning**					
CSA 1	**AM policy development**					
Competence 2	**Develop AM policy**					
CA 1/CSA 1/C 2/UOC 1	Determine the decision criteria for selecting between policy alternatives	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 2	Appraise policy alternatives using agreed decision criteria	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 3	Define policy principles and implications	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 4	Define roles and responsibilities in implementing and reviewing AM policy	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 5	Ensure alignment between AM policy and other corporate policies	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 6	Effectively use internal and expertise in AM policy development	D	P	C	C	C
CA 1/CSA 1/C 2/UOC 7	Ensure that stakeholders are appropriately engaged in AM policy development	D	P	C	C	C
CA 1	**Strategy & planning**					
CSA 2	**AM strategy development**					
Competence 1	**Analyse strategic requirements**					
CA 1/CSA 2/C 1/UOC 1	Identify the AM policy principles and objectives the AM strategy must achieve	D	L	S	C	C
CA 1/CSA 2/C 1/UOC 2	Define all risks, opportunities and constraints the AM strategy must consider	D	L	S	C	C
CA 1/CSA 2/C 1/UOC 3	Define the implications of the current state of assets and projected future failure mode status for AM strategy development	D	L	S	C	C
CA 1/CSA 2/C 1/UOC 4	Analyse current and future customer requirements to be addressed by the AM strategy	D	L	S	C	C
CA 1/CSA 2/C 1/UOC 5	Define legal, social, economic, financial and environmental factors and trends the AM strategy must consider	D	L	S	C	C
CA 1/CSA 2/C 1/UOC 6	Define the stakeholder groups the AM strategy must respond to	D	L	S	C	C
CA 1	**Strategy & planning**					
CSA 2	**AM strategy development**					
Competence 2	**Forecast and analyse future customer requirements and demand**					
CA 1/CSA 2/C 2/UOC 1	Use effective tools to quantify, locate and categorise customers		L	S	C	C
CA 1/CSA 2/C 2/UOC 2	Project growth or decline for all customer categories		L	S	C	C
CA 1/CSA 2/C 2/UOC 3	Apportion growth in customers spatially		L	S	C	C
CA 1/CSA 2/C 2/UOC 4	Quantify current demand per customer category		L	S	C	C
CA 1/CSA 2/C 2/UOC 5	Identify factors and trends driving or influencing future demand, including changes in required levels of service		L	S	C	C
CA 1/CSA 2/C 2/UOC 6	Consider current and future asset capacities, extent and failure mode status		L	S	C	C
CA 1/CSA 2/C 2/UOC 7	Calculate future net additional demand		L	S	C	C
CA 1/CSA 2/C 2/UOC 8	Consider the impacts of net future additional demand on future risk, capacity, condition, performance and cost of operations		L	S	C	C
CA 1/CSA 2/C 2/UOC 9	Cost the impacts of future demand		L	S	C	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 1	**Strategy & planning**					
CSA 1	**AM policy development**					
Competence 3	**Develop AM strategy**					
CA 1/CSA 2/C 3/UOC 1	Define AM objectives and aims of the AM strategy		L	S	C	C
CA 1/CSA 2/C 3/UOC 2	Prepare key strategies for the AM system, service delivery, infrastructure investment and asset portfolios		L	S	C	C
CA 1/CSA 2/C 3/UOC 3	Define expected AM outputs and outcomes	D	L	S	C	C
CA 1/CSA 2/C 3/UOC 4	Prepare key strategies for the AM system and asset portfolios		L	S	C	C
CA 1/CSA 2/C 3/UOC 5	Ensure that stakeholders are appropriately engaged in AM strategy development	D	L	S	C	C
CA 1/CSA 2/C 3/UOC 6	Effectively use internal and expertise in AM strategy development	D	L	S	C	C
CA 1	**Strategy & planning**					
CSA 2	**AM strategy development**					
Competence 4	**Plan AM strategy implementation**					
CA 1/CSA 2/C 4/UOC 1	Define, prioritise and optimise the AM strategy		L	S	C	C
CA 1/CSA 2/C 4/UOC 2	Define roles and responsibilities for implementation of the AM strategy		L	S	C	C
CA 1/CSA 2/C 4/UOC 3	Prepare cost estimates and financial projections for implementing the AM strategy		L	S	C	C
CA 1/CSA 2/C 4/UOC 4	Develop AM strategy business plans		L	S	C	C
CA 1/CSA 2/C 4/UOC 5	Sell AM strategy business plans		L	S	C	C
CA 1/CSA 2/C 4/UOC 6	Define how effectiveness of the AM strategy will be measured and monitored		L	S	C	C
CA 1	**Strategy & planning**					
CSA 3	**AM planning**					
Competence 1	**Apply lifecycle principles and develop lifecycle strategies and plans**					
CA 1/CSA 3/C 1/UOC 1	Define lifecycle strategies responsive to AM objectives, asset portfolio capabilities and risks, and support requirements		L	P	P	C
CA 1/CSA 3/C 1/UOC 2	Specify methodologies for determining lifecycle costs		L	P	P	C
CA 1/CSA 3/C 1/UOC 3	Prepare lifecycle plans and quantify the costs associated with each lifecycle activity		L	P	P	C
CA 1/CSA 3/C 1/UOC 4	Ensure that appropriate tools to support effective decision-making are available and applied		L	P	P	C
CA 1/CSA 3/C 1/UOC 5	Undertake asset lifecycle optimisation		L	P	P	C
CA 1/CSA 3/C 1/UOC 6	Undertake asset portfolio optimisation		L	P	P	C
CA 1/CSA 3/C 1/UOC 7	Identify projects and programmes at the appropriate levels in the asset hierarchy and package sensibly (e.g. per region)		L	P	P	C
CA 1/CSA 3/C 1/UOC 8	Smooth lifecycle expenditure plans as appropriate, with due consideration to risks, opportunities and constraints		L	P	P	C
CA 1	**Strategy & planning**					
CSA 3	**AM planning**					
Competence 2	**Plan for contingencies**					
CA 1/CSA 3/C 2/UOC 1	Identify the events, incidents and disasters to which the city needs to swiftly respond and demonstrate resilience to	D	L	S	S	C
CA 1/CSA 3/C 2/UOC 2	Identify the stakeholders involved and their respective roles and needs	D	L	S	S	C
CA 1/CSA 3/C 2/UOC 3	Engage as necessary with responders, establish responsibility and processes, and command structure per type of event	D	L	S	S	C
CA 1/CSA 3/C 2/UOC 4	Develop and document emergency management plans, business continuity plans, and incident and contingency plans	D	L	S	S	C
CA 1/CSA 3/C 2/UOC 5	Conclude written and signed agreements between all relevant parties	D	L	S	S	C
CA 1/CSA 3/C 2/UOC 6	Undertake regular response tests to evaluate the processes and preparedness of personnel	D	L	S	S	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 1	**Strategy & planning**					
CSA 1	**AM planning**					
Competence 3	**Resilience analysis and planning**					
CA 1/CSA 3/C 3/UOC 1	Identify critical customers and locations, and determine their minimum service requirements	D	L	S	S	C
CA 1/CSA 3/C 3/UOC 2	Define resilience levels of service	D	L	S	S	C
CA 1/CSA 3/C 3/UOC 3	Establish the scope of a resilience assessment	D	L	S	S	C
CA 1/CSA 3/C 3/UOC 4	Measure the technical and organisational dimensions of resilience	D	L	S	S	C
CA 1/CSA 3/C 3/UOC 5	Design for resilience	D	L	S	S	C
CA 1/CSA 3/C 3/UOC 6	Implement resilience decisions and monitor the effectiveness thereof	D	L	S	S	C
CA 1	**Strategy & planning**					
CSA 3	**AM planning**					
Competence 4	**Prepare business cases for lifecycle expenditure projects and programmes**					
CA 1/CSA 3/C 4/UOC 1	Analyse business needs for asset lifecycle expenditure needs (e.g. creation or renewal) based on AM plan requirements		L	P	P	C
CA 1/CSA 3/C 4/UOC 2	Specify project input, output and outcome indicators		L	P	P	C
CA 1/CSA 3/C 4/UOC 3	Identify risks in the commissioning phase and assess their impacts on operations and AM activities		L	P	P	C
CA 1/CSA 3/C 4/UOC 4	Appraise the benefits, costs and risks of project alternatives		L	P	P	C
CA 1/CSA 3/C 4/UOC 5	Prepare business cases stating the problem/opportunity and alternative solutions, appraisal results and recommended solution		L	P	P	C
CA 1/CSA 3/C 4/UOC 6	Prioritise proposed projects using approved decision-making criteria		L	P	P	C
CA 1/CSA 3/C 4/UOC 7	Propose an appropriate construction procurement strategy to deliver the optimum solution		L	P	P	C
CA 1	**Strategy & planning**					
CSA 3	**AM planning**					
Competence 1	**Develop and communicate AM plan(s)**					
CA 1/CSA 3/C 5/UOC 1	Define objectives and performance indicators for all AM activities, projects & programmes needed to achieve the AM strategy		L	P	P	C
CA 1/CSA 3/C 5/UOC 2	Articulate and motivate asset lifecycle strategies		L	P	P	C
CA 1/CSA 3/C 5/UOC 3	Specify, cost and schedule AM activities, projects and programmes to achieve the AM strategy		L	P	P	C
CA 1/CSA 3/C 5/UOC 4	Develop the AM plan that describes objectives, planned action, costs and resources, and evaluation arrangements		L	P	P	C
CA 2	**Implementing AM plans**					
CSA 1	**Capital activities**					
Competence 1	**Create/acquire/upgrade assets**					
CA 2/CSA 1/C 1/UOC 1	Prepare design specifications to achieve optimum customer, organisational and lifecycle requirements		D	P	L	C
CA 2/CSA 1/C 1/UOC 2	Prepare specifications for the acquisition and installation of assets inclusive of supporting resource requirements		D	P	L	C
CA 2/CSA 1/C 1/UOC 3	Ensure that assets are created or acquired in accordance with specifications, budget and time constraints		D	P	L	C
CA 2/CSA 1/C 1/UOC 4	Ensure correct installation and testing of assets		D	P	L	C
CA 2/CSA 1/C 1/UOC 5	Ensure correct commissioning of assets, inclusive of handover of documentation as appropriate		D	P	L	C
CA 2	**Implementing AM plans**					
CSA 1	**Capital activities**					
Competence 2	**Renew assets**					
CA 2/CSA 1/C 2/UOC 1	Develop and motivate the optimal renewal strategy based on the AM strategy		D	P	L	C
CA 2/CSA 1/C 2/UOC 2	Identify and plan renewal projects and programmes, and associated risk controls		D	P	L	C
CA 2/CSA 1/C 2/UOC 3	Manage the implementation of renewal projects and programmes, and risk control actions		D	P	L	C
CA 2/CSA 1/C 2/UOC 4	Evaluate the effectiveness of renewal projects and programmes, and risk control actions		D	P	L	C

TABLE A.12.1: *CIDMS units of competency - continued*

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 2	**Implementing AM plans**					
CSA 2	**Operating activities**					
Competence 1	**Design and manage operations**					
CA 2/CSA 2/C 1/UOC 1	Prepare risk-based implementation objectives and plans based on asset lifecycle strategies		D	P	L	C
CA 2/CSA 2/C 1/UOC 2	Review and update existing operations' strategy		D	P	L	C
CA 2/CSA 2/C 1/UOC 3	Develop operations' work and resource plans, allowing for unplanned work		D	P	L	C
CA 2/CSA 2/C 1/UOC 4	Assess and select options for measuring asset utilisation and cost-ofoperations		D	P	L	C
CA 2/CSA 2/C 1/UOC 5	Review and update operations' business processes		D	P	L	C
CA 2/CSA 2/C 1/UOC 6	Manage the delivery of work plans, including the impacts of unplanned work		D	P	L	C
CA 2/CSA 2/C 1/UOC 7	Monitor asset utilisation and cost-of-operations and take action as appropriate		D	P	L	C
CA 2/CSA 2/C 1/UOC 8	Manage change related to assets and systems		D	P	L	C
CA 2	**Implementing AM plans**					
CSA 2	**Operating activities**					
Competence 2	**Design and manage maintenance**					
CA 2/CSA 2/C 2/UOC 1	Prepare risk-based implementation objectives and plans based on asset lifecycle strategies		D	P	L	C
CA 2/CSA 2/C 2/UOC 2	Review and update existing maintenance strategy		D	P	L	C
CA 2/CSA 2/C 2/UOC 3	Develop maintenance work and resource plans, allowing for unplanned work		D	P	L	C
CA 2/CSA 2/C 2/UOC 4	Determine the approach to the management of tools, spares management and inventory requirements		D	P	L	C
CA 2/CSA 2/C 2/UOC 5	Plan the distribution of tools, spares and supplies		D	P	L	C
CA 2/CSA 2/C 2/UOC 6	Identify, assess and select appropriate condition assessment techniques		D	P	L	C
CA 2/CSA 2/C 2/UOC 7	Review and update maintenance business processes		D	P	L	C
CA 2/CSA 2/C 2/UOC 8	Assess asset condition and performance and modify maintenance plans and practices as appropriate		D	P	L	C
CA 2/CSA 2/C 2/UOC 9	Identify and evaluate options for extending asset life		D	P	L	C
CA 2	**Implementing AM plans**					
CSA 3	**Asset optimisation**					
Competence 1	**Asset optimisation**					
CA 2/CSA 3/C 1/UOC 1	Monitor and review asset utilisation, performance and cost-of-operation trends and scope optimisation opportunities		D	P	L	C
CA 2/CSA 3/C 1/UOC 2	Review design standards to identify the scope for elimination of overdesign		D	P	L	C
CA 2/CSA 3/C 1/UOC 3	Develop an asset optimisation strategy, taking into account current and likely future requirements		D	P	L	C
CA 2/CSA 3/C 1/UOC 4	Define asset optimisation actions, projects and programmes (e.g. elimination of excess assets, system reconfiguration…)		D	P	L	C
CA 2/CSA 3/C 1/UOC 5	Assess and decide on asset optimisation actions, projects and programmes using a structured cost/ risk-benefit framework		D	P	L	C
CA 2/CSA 3/C 1/UOC 6	Ensure asset optimisation actions, projects and programmes are implemented and subjected to postinvestment appraisal		D	P	L	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 2	**Implementing AM plans**					
CSA 4	**Asset decommissioning & disposal**					
Competence 1	**Asset decommissioning & disposal**					
CA 2/CSA 4/C 1/UOC 1	Develop an appropriate end-of-life strategy considering legislative requirements, repurposing or disposal		D	P	L	C
CA 2/CSA 4/C 1/UOC 2	Identify assets to be decommissioned, repurposed or disposed, and plan appropriate action, projects or programmes		D	P	L	C
CA 2/CSA 4/C 1/UOC 3	Manage the implementation of decommissioning, repurposing or disposal actions, projects and programmes		D	P	L	C
CA 2/CSA 4/C 1/UOC 4	Evaluate the effectiveness of decommissioning, repurposing or disposal action, projects and programmes		D	P	L	C
CA 2/CSA 4/C 1/UOC 5	Ensure that assets are decommissioned and disposed of in accordance with environmental and safety regulations		D	P	L	C
CA 3	**AM capability development**					
CSA 1	**AM organisational development and deployment**					
Competence 1	**Design and manage AM organisational architecture**					
CA 3/CSA 1/C 1/UOC 1	Review the effectiveness of current organisational architecture to support AM policy, strategy and plans	D	L	C	L	C
CA 3/CSA 1/C 1/UOC 2	Identify necessary changes to organisational structure, functions, roles and responsibilities to implement the AM system	D	L	C	L	C
CA 3/CSA 1/C 1/UOC 3	Implement changes to organisational structure, teams and individual jobs to effectively implement the AM system	D	L	C	L	C
CA 3/CSA 1/C 1/UOC 4	Monitor, periodically review, calibrate and optimise organisational arrangements as necessary	D	L	C	L	C
CA 3	**AM capability development**					
CSA 1	**AM organisational development and deployment**					
Competence 2	**Develop and deploy AM practitioners and teams**					
CA 3/CSA 1/C 2/UOC 1	Identify AM functions and staffing requirements based on complexity and workload to implement AM strategy	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 2	Specify competency requirements for AM functions, work activities and staff	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 3	Prepare skills development plans for AM staff and ensure that these are implemented	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 4	Assign appropriate competent people and teams to AM functions, work activities, committees and project teams	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 5	Direct and coordinate the activities of AM teams	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 6	Develop and support the performance of AM staff	D	L	C	L	C
CA 3/CSA 1/C 2/UOC 7	Challenge resource constraints and justify appropriate funding for AM capability	D	L	C	L	C
CA 3	**AM capability development**					
CSA 1	**AM organisational development and deployment**					
Competence 3	**Sculpt the desired AM culture**					
CA 3/CSA 1/C 3/UOC 1	Promote the need for, goals and benefits of AM	D	L	C	L	C
CA 3/CSA 1/C 3/UOC 2	Define the organisational culture necessary to live the AM policy and achieve the AM strategy	D	L	C	L	C
CA 3/CSA 1/C 3/UOC 3	Plan and implement changes to organisation culture as required	D	L	C	L	C
CA 3/CSA 1/C 3/UOC 4	Monitor the effectiveness of organisational culture to live upto the AM policy principles and achieve the AM strategy	D	L	C	L	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 3	**AM capability development**					
CSA 2	**Supplier development and management**					
Competence 1	**Supplier development and management**					
CA 3/CSA 2/C 1/UOC 1	Identify the products and services to be supplied to the city	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 2	Define the criticality of products and services to the AM strategy and AM plans	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 3	Specify requirements for sourced products and services	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 4	Develop tailored service delivery models and procurement strategies for products and services	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 5	Specify appropriate forms of contract, terms and conditions for achieving AM strategy and plans	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 6	Issue tenders and quotations, evaluate and appoint suppliers	D	L	S	L	C
CA 3/CSA 2/C 1/UOC 7	Manage suppliers and improve supplier capabilities as appropriate	D	L	S	L	C
CA 4	**Risk management and performance improvement**					
CSA 1	**Risk management**					
Competence 1	**Design and implement risk management processes and procedures**					
CA 4/CSA 1/C 1/UOC 1	Decide the scope of the city's infrastructure AM risk framework, considering services, assets and legislative requirements	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 2	Identify and review the effectiveness of current risk controls	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 3	Identify critical failure modes	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 4	Decide on the most appropriate techniques for assessing asset and nonasset risk (assets, AM system and external risks)	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 5	Develop or update the city's infrastructure AM risk framework (policy, strategy, risk register and processes)	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 6	Align corporate, tactical (AM) and operational risks and risk registers	D	L	P	S	C
CA 4/CSA 1/C 1/UOC 7	Implement and monitor the effectiveness of the city's infrastructure AM risk framework	D	L	P	S	C
CA 4	**Risk management and performance improvement**					
CSA 1	**Risk management**					
Competence 2	**Manage risk**					
CA 4/CSA 1/C 2/UOC 1	Differentiate between risk types and identify asset and non-asset risks related to various risk types		L	S	S	C
CA 4/CSA 1/C 2/UOC 2	Identify critical assets		L	S	S	C
CA 4/CSA 1/C 2/UOC 3	Assess the consequences of failure or of risks materialising using qualitative or quantitative means as appropriate		L	S	S	C
CA 4/CSA 1/C 2/UOC 4	Assess the probability of failure or of risks materialising using qualitative or quantitative means as appropriate		L	S	S	C
CA 4/CSA 1/C 2/UOC 5	Calculate the level of risk exposure ito "gross" or inherent risk and current risk		L	S	S	C
CA 4/CSA 1/C 2/UOC 6	Identify appropriate risk treatment options and calculate residual risk of each treatment option		L	S	S	C
CA 4/CSA 1/C 2/UOC 7	Develop risk treatment plan		L	S	S	C
CA 4/CSA 1/C 2/UOC 8	Implement approved risk controls, including updating the risk register and monitoring effectiveness of implementation		L	S	S	C
CA 4	**Risk management and performance improvement**					
CSA 2	**Fault and incident response**					
Competence 1	**Responding to faults and incidences**					
CA 4/CSA 2/C 1/UOC 1	Identify potential faults and incidents, and design appropriate systems to detect these		D	S	L	C
CA 4/CSA 2/C 1/UOC 2	Develop appropriate plans and processes to deal with faults and incidents, for both temporary and permanent repairs		D	S	L	C
CA 4/CSA 2/C 1/UOC 3	Ensure integration of response plans across departments as necessary		D	S	L	C
CA 4/CSA 2/C 1/UOC 4	Implement fault and response plans and processes, and monitor the effectiveness thereof		D	S	L	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 4	**Risk management and performance improvement**					
CSA 2	**Fault and incident response**					
Competence 2	**Investigation of faults and incidences**					
CA 4/CSA 2/C 2/UOC 1	Investigate failures or incidents, analyse the causes thereof and document findings		P	S	S	C
CA 4/CSA 2/C 2/UOC 2	Investigate the appropriateness of current assets and the asset management system in preventing the fault or incident		P	S	S	C
CA 4/CSA 2/C 2/UOC 3	Investigate the appropriateness of current assets and the asset management system in dealing with the fault or incident		P	S	S	C
CA 4/CSA 2/C 2/UOC 4	Develop and implement improvement plan as appropriate		P	S	S	C
CA 4	**Risk management and performance improvement**					
CSA 3	**AM system performance**					
Competence 1	**AM system monitoring**					
CA 4/CSA 3/C 1/UOC 1	Read and understand AM system documentation, inclusive of AM policy, strategy and objectives	D	L	S	S	C
CA 4/CSA 3/C 1/UOC 2	Assess whether the AM system is fit for purpose relative to AM strategy and objectives	D	L	S	S	C
CA 4/CSA 3/C 1/UOC 3	Assess whether the processes and decision-making criteria established through the AM system are consistently applied	D	L	S	S	C
CA 4/CSA 3/C 1/UOC 4	Assess whether the outcomes of the AM processes deliver the expected AM outcomes	D	L	S	S	C
CA 4	**Risk management and performance improvement**					
CSA 3	**AM system performance**					
Competence 2	**AM system improvement planning**					
CA 4/CSA 3/C 2/UOC 1	Establish or review AM objectives	D	L	S	S	C
CA 4/CSA 3/C 2/UOC 2	Assess current state of practice and measure gaps to achieving AM objectives	D	L	S	S	C
CA 4/CSA 3/C 2/UOC 3	Establish achievable milestones or phased improvements in practice	D	L	S	S	C
CA 4/CSA 3/C 2/UOC 4	Develop and justify practice improvement plans	D	L	S	S	C
CA 4/CSA 3/C 2/UOC 5	Implement and monitor the effectiveness of practice improvement plans	D	L	S	S	C
CA 4	**Risk management and performance improvement**					
CSA 3	**AM system performance**					
Competence 3	**Management review, audit and assurance**					
CA 4/CSA 3/C 3/UOC 1	Design audit policies and processes, inclusive of specifications for reviewers and auditors	D	L	S	S	C
CA 4/CSA 3/C 3/UOC 2	Appoint or assign reviewers or auditors	D	L	S	S	C
CA 4/CSA 3/C 3/UOC 3	Execute reviews or audits, including documenting scope, schedules and procedures followed	D	L	S	S	C
CA 4/CSA 3/C 3/UOC 4	Documenting and communicating review or audit findings	D	L	S	S	C
CA 5	**Asset information management**					
CSA 1	**Asset information strategy**					
Competence 1	**Assessment of asset information requirements**					
CA 5/CSA 1/C 1/UOC 1	Identify the information needs of the AM system and for specific asset portfolios	D	L	S	S	C
CA 5/CSA 1/C 1/UOC 2	Determine data quality and information requirements for components of the AM system and of asset portfolios	D	L	S	S	C
CA 5/CSA 1/C 1/UOC 3	Perform a gap analysis of current data and information capabilities relative to needs	D	L	S	S	C
CA 5/CSA 1/C 1/UOC 4	Perform a benefit/cost analysis of closing data and information gaps	D	L	S	S	C
CA 5/CSA 1/C 1/UOC 5	Document the information system requirements necessary to support AM business process and information needs	D	L	S	S	C
CA 5/CSA 1/C 1/UOC 6	Consider current organisational projects and programmes to improve business processes and/or asset information	D	L	S	S	C

UNITS OF COMPETENCE		AM SPONSOR	HEAD OF AM	AM PLANNER	AM TEAM LEADER	AM CANDIDATE
REF	**DESCRIPTION**					
CA 5	**Asset information management**					
CSA 1	**Asset information strategy**					
Competence 2	**Develop asset information standards**					
CA 5/CSA 1/C 2/UOC 1	Develop and publish an asset management dictionary that defines terminology used in the AM system		L	P	C	C
CA 5/CSA 1/C 2/UOC 2	Define and document the asset hierarchy applicable to all asset portfolios of the city		L	P	C	C
CA 5/CSA 1/C 2/UOC 3	Define and document asset attribute data and acceptable value ranges		L	P	C	C
CA 5/CSA 1/C 2/UOC 4	Define and document the asset referencing system, both ito physical location and location in the asset hierarchy		L	P	C	C
CA 5/CSA 1/C 2/UOC 5	Define and document failure modes, data requirements and algorithms		L	P	C	C
CA 5/CSA 1/C 2/UOC 6	Define and document valuation models, data requirements and necessary calculations		L	P	C	C
CA 5/CSA 1/C 2/UOC 7	Define and document the data confidence model		L	P	C	C
CA 5/CSA 1/C 2/UOC 8	Prepare asset verification and assessment guides		L	P	C	C
CA 5/CSA 1/C 2/UOC 9	Define and document the structure of the financial asset register, inclusive of data rules		L	P	C	C
CA 5/CSA 1/C 2/UOC 10	Define the customer classification system used for services planning		L	P	C	C
CA 5/CSA 1/C 2/UOC 11	Define the spatial units of analysis for infrastructure asset management planning and reporting		L	P	C	C
CA 5/CSA 1/C 2/UOC 12	Define the rules for determining and analysing access to services, inclusive of spatial analysis and reporting		L	P	C	C
CA 5/CSA 1/C 2/UOC 13	Define and document the formats and data rules for corporate reports on assets and asset management		L	P	C	C
CA 5	**Asset information management**					
CSA 1	**Asset information strategy**					
Competence 3	**Develop asset information strategy**					
CA 5/CSA 1/C 3/UOC 1	Define improvement activities (processes, information systems and data) to deliver on asset information standards		L	P	C	C
CA 5/CSA 1/C 3/UOC 2	Define how alignment will be achieved with other corporate processes, systems and data		L	P	C	C
CA 5/CSA 1/C 3/UOC 3	Assign responsibilities and accountabilities for information management		L	P	C	C
CA 5	**Asset information management**					
CSA 2	**Manage asset information**					
Competence 1	**Establish asset information system**					
CA 5/CSA 2/C 1/UOC 1	Identify asset information system stakeholders and determine asset information system functional and technical requirements		D	P	S	C
CA 5/CSA 2/C 1/UOC 2	Evaluate asset information system options, inclusive of lifecycle cost analysis and benefit/cost analysis		D	P	S	C
CA 5/CSA 2/C 1/UOC 3	Plan the implementation and integration with other systems and processes in the city		D	P	S	C
CA 5/CSA 2/C 1/UOC 4	Develop asset information system governance arrangements related to the acquisition and implementation of the system		D	P	S	C
CA 5/CSA 2/C 1/UOC 5	Develop and implement system ongoing governance arrangements		D	P	S	C
CA 5	**Asset information management**					
CSA 2	**Manage asset information**					
Competence 2	**Data and information management**					
CA 5/CSA 2/C 2/UOC 1	Demonstrate appropriate use of information systems in supporting execution of AM strategy and plans		L	S	S	C
CA 5/CSA 2/C 2/UOC 2	Ensure that AM information systems effectively produce relevant data and reports		L	S	S	C
CA 5/CSA 2/C 2/UOC 3	Apply and adhere to asset information governance arrangements		L	S	S	C

APPENDIX 12.B:
SCOPE OF AM SYSTEM FOR PURPOSES OF PRACTICES ASSESSMENT AND IMPROVEMENT PLANNING

12.B.1   Part 1: Fundamentals of asset management

The focus of Part 1 is to assess conformity to the requirements of SANS 55001 – Asset management – Management systems – Requirements.

CATEGORY		SUB-CATEGORY		CRITERIA	
1	Context of the organisation	1.1	Understanding the organisation and its context	1.1.1	Organisational scan
1	Context of the organisation	1.1	Understanding the organisation and its context	1.1.2	Alignment of AM objectives to organisational objectives
1	Context of the organisation	1.2	Stakeholder needs & requirements	1.2.1	Stakeholder identification
1	Context of the organisation	1.2	Stakeholder needs & requirements	1.2.2	Determining stakeholder requirements
1	Context of the organisation	1.2	Stakeholder needs & requirements	1.2.3	Criteria for AM decision-making
1	Context of the organisation	1.3	AM system	1.3.1	Scope of AM system
1	Context of the organisation	1.3	AM system	1.3.2	AM system establishment, maintenance and improvement
1	Context of the organisation	1.3	AM system	1.3.3	AM system documented in SAMP
2	Leadership	2.1	Leadership and commitment	2.1.1	AM policy, AM objectives & SAMP compatible with organisational objectives
2	Leadership	2.1	Leadership and commitment	2.1.2	Integration of AM system requirements into organisational business processes
2	Leadership	2.1	Leadership and commitment	2.1.3	Ensuring appropriate resourcing for AM system
2	Leadership	2.1	Leadership and commitment	2.1.4	Communicating the importance of effective AM and conforming to AM system requirements
2	Leadership	2.1	Leadership and commitment	2.1.5	Ensuring that the AM system achieves its intended outcomes
2	Leadership	2.1	Leadership and commitment	2.1.6	Directing & supporting people to contribute to the effectiveness of the AM system
2	Leadership	2.1	Leadership and commitment	2.1.7	Promoting cross-functional collaboration
2	Leadership	2.1	Leadership and commitment	2.1.8	Promoting continual improvement
2	Leadership	2.1	Leadership and commitment	2.1.9	Supporting other management roles to demonstrate leadership
2	Leadership	2.1	Leadership and commitment	2.1.10	Alignment of the AM risk management approach to organisation's approach
2	Leadership	2.2	AM policy	2.2.1	Scope and appropriateness
2	Leadership	2.2	AM policy	2.2.2	Consistency
2	Leadership	2.2	AM policy	2.2.3	Commitments
2	Leadership	2.2	AM policy	2.2.4	Availability and communication
2	Leadership	2.2	AM policy	2.2.5	Implementation
2	Leadership	2.2	AM policy	2.2.6	Currency
2	Leadership	2.3	Organisational roles, responsibilities and authorities	2.3.1	Functional definition and appropriate organisational structure
2	Leadership	2.3	Organisational roles, responsibilities and authorities	2.3.2	Assignment and communication of AM roles and responsibilities
3	Planning the AMS	2.4	Addressing risks and opportunities for the AMS	3.3.1	Identification of risks and opportunities for the AMS
3	Planning the AMS	2.4	Addressing risks and opportunities for the AMS	3.3.1	Planning to address risks and opportunities

CATEGORY		SUB-CATEGORY		CRITERIA	
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.1	Establishment of AM objectives
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.2	Defined and documented planning processes, methods and decision criteria for developing AMP(s) to achieve AM objectives
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.3	AM related RM processes
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.4	Integration and alignment with other planning activities
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.5	Planning horizon for SAMP and AMPs
3	Planning the AMS	3.2	AM objectives and planning to achieve them	3.2.6	Review period for SAMP and AMPs
4	Support	4.1	Resources	4.1.1	Resources for the AM system
4	Support	4.1	Resources	4.1.2	Resources for meeting AM objectives
4	Support	4.2	Competence	4.2.1	Ensuring necessary AM competence
4	Support	4.3	Awareness and communication	4.3.1	Awareness
4	Support	4.3	Awareness and communication	4.3.2	Communication
5	Information	5.1	Information specifications	5.1.1	Information specifications
5	Information	5.2	Documented information	5.1.2	Scope, extent and document management
7	Performance evaluation	7.1	Monitoring and evaluation	7.1.1	Monitoring and evaluation
7	Performance evaluation	7.2	Internal audit	7.2.1	Planning internal audits
7	Performance evaluation	7.3	Management review	7.3.1	Management review
8	Improvement	8.1	Non-conformity and corrective action	8.1.1	Non-conformity and corrective action
8	Improvement	8.2	Preventative action	8.2.1	Preventative action

12.B.2   Part 2: Asset management practices and processes

Part 2 assesses more detailed practices giving effect to the general requirements of SANS 55001 and more specific requirements of this CIDMS Toolkit, as outlined below:

CATEGORY		SUB-CATEGORY		CRITERIA	
1	Asset data	1.1	Asset data model	1.1.1	Asset hierarchy
1	Asset data	1.1	Asset data model	1.1.2	Asset data segmentation and grouping rule set
1	Asset data	1.1	Asset data model	1.1.3	Valuation model
1	Asset data	1.1	Asset data model	1.1.4	EULs and RVs
1	Asset data	1.1	Asset data model	1.1.5	Attribute data: location
1	Asset data	1.1	Asset data model	1.1.6	Attribute data: extent
1	Asset data	1.1	Asset data model	1.1.7	Attribute data: identification referencing (asset IDs)
1	Asset data	1.1	Asset data model	1.1.8	Attribute data: Failure modes
1	Asset data	1.1	Asset data model	1.1.9	Attribute data: asset criticality
1	Asset data	1.1	Asset data model	1.1.10	Data confidence
1	Asset data	1.2	Asset register	1.2.1	One version of the truth
1	Asset data	1.2	Asset register	1.2.2	Maintenance and updating of FAR
1	Asset data	1.2	Asset register	1.2.3	Credibility
1	Asset data	1.3	Asset data mining, analysis and reporting	1.3.1	Accounting and financial data analysis and reporting
1	Asset data	1.3	Asset data mining, analysis and reporting	1.3.2	Infrastructure data analysis and AM reporting
2	Customer profiling and LOS	2.1	Customer classification system and profiling	2.1.1	Customer classification system, corporate customer database and customer profile
2	Customer profiling and LOS	2.1	Customer classification system and profiling	2.2.1	LOS profiling
2	Customer profiling and LOS	2.2	Levels and standards of service	2.2.2	Levels of service
2	Customer profiling and LOS	2.2	Levels and standards of service	2.2.3	Standards of service
2	Customer profiling and LOS	2.2	Levels and standards of service	3.1.1	Customer service charter
3	Demand	3.1	Customer growth forecast	3.1.2	Corporate customer growth forecast
3	Demand	3.1	Customer growth forecast	3.2.1	Forecasting horizon
3	Demand	3.2	Current demand	3.2.2	Quantify current demand
3	Demand	3.2	Current demand	3.3.1	Calculation of net current additional demand
3	Demand	3.3	Future demand	3.3.2	Future demand projections
3	Demand	3.3	Future demand	3.3.3	Planning for future demand
3	Demand	3.3	Future demand	3.3.4	Strategic approach in responding to demand
3	Demand	3.3	Future demand	3.3.5	Future proofing and climate change adaptation
3	Demand	3.3	Future demand	3.3.6	Spatial management of demand for costefficiencies
3	Demand	3.4	Demand management	3.4.1	Demand management tactics
4	Lifecycle planning	4.1	Determining lifecycle needs, commitments, dependencies, risks, opportunities and constraints	4.1.1	ID of commitments. dependencies, risks, opportunities and constraints
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.1	City-wide lifecycle strategy guiding sectoral lifecycle planning efforts
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.2	Sectoral lifecycle strategies consider strategic issues
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.3	Sectoral lifecycle plans feature componentlevel lifecycle strategies
4	Lifecycle planning	4.3	Lifecycle plans	4.3.1	Lifecycle coverage
4	Lifecycle planning	4.3	Lifecycle plans	4.3.2	Identification, costing and timing of programmes and projects

CATEGORY		SUB-CATEGORY		CRITERIA	
4	Lifecycle planning	4.3	Lifecycle plans	4.3.3	Planning horizon and level of accuracy
4	Lifecycle planning	4.3	Lifecycle plans	4.3.4	Asset optimisation
4	Lifecycle planning	4.1	Determining lifecycle needs, commitments, dependencies, risks, opportunities and constraints	4.1.1	ID of commitments. dependencies, risks, opportunities and constraints
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.1	City-wide lifecycle strategy guiding sectoral lifecycle planning efforts
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.2	Sectoral lifecycle strategies consider strategic issues
4	Lifecycle planning	4.2	Lifecycle strategies	4.2.3	Sectoral lifecycle plans feature componentlevel lifecycle strategies
4	Lifecycle planning	4.3	Lifecycle plans	4.3.1	Lifecycle coverage
4	Lifecycle planning	4.3	Lifecycle plans	4.3.2	Identification, costing and timing of programmes and projects
4	Lifecycle planning	4.3	Lifecycle plans	4.3.3	Planning horizon and level of accuracy
4	Lifecycle planning	4.3	Lifecycle plans	4.3.4	Asset optimisation
5	iAMPs	5.1	General	5.1.1	Scope
5	Asset management planning	5.1	iAMPs	5.1.2	Standardisation
5	Asset management planning	5.1	iAMPs	5.1.3	Level of sophistication/performance
5	Asset management planning	5.2	SAMP	5.2.1	Scope
5	Asset management planning	5.2	SAMP	5.2.2	AM objectives
5	Asset management planning	5.2	SAMP	5.2.3	Service delivery strategy
5	Asset management planning	5.2	SAMP	5.2.4	AM system strategy
5	Asset management planning	5.2	SAMP	5.2.5	Infrastructure investment strategy
5	Asset management planning	5.2	SAMP	5.2.6	Organisation change strategy
6	Investment appraisal and financial planning	6.1	Policy and process	6.1.1	Decision-making criteria
6	Investment appraisal and financial planning	6.1	Policy and process	6.1.2	Formal investment appraisal process
6	Investment appraisal and financial planning	6.2	Investment appraisal processes	6.2.1	Problem or opportunity statements
6	Investment appraisal and financial planning	6.2	Investment appraisal processes	6.2.2	Identification of potential solutions and project packaging
6	Investment appraisal and financial planning	6.2	Investment appraisal processes	6.2.3	Screening of potential solutions to a given stated problem/opportunity
6	Investment appraisal and financial planning	6.2	Investment appraisal processes	6.2.4	Determining benefits and costs
6	Investment appraisal and financial planning	6.2	Investment appraisal processes	6.2.5	Preparing cash flows
6	Investment appraisal and financial planning	6.3	Investment appraisal techniques and systems	6.3.1	Investment appraisal analysis
6	Investment appraisal and financial planning	6.3	Investment appraisal techniques and systems	6.3.2	Accounting for risk and uncertainty
6	Investment appraisal and financial planning	6.4	Financial planning	6.4.1	Financial analysis
6	Investment appraisal and financial planning	6.4	Financial planning	6.4.2	Appropriate funding arrangements
6	Investment appraisal and financial planning	6.4	Financial planning	6.4.3	Sensitivity analysis

CATEGORY		SUB-CATEGORY		CRITERIA	
6	Investment appraisal and financial planning	6.4	Financial planning	6.4.4	Consolidated long-term infrastructure financial plan
6	Investment appraisal and financial planning	6.5	Budget prioritisation	6.5.1	Multi-criteria analysis (MCA) system
6	Investment appraisal and financial planning	6.5	Budget prioritisation	6.5.2	Annual guidance for budget prioritisation
7	Lifecycle delivery	7.1	Delivery management strategy	7.1.1	Analysis informing delivery management strategy
7	Lifecycle delivery	7.1	Delivery management strategy	7.1.2	Procurement objectives
7	Lifecycle delivery	7.1	Delivery management strategy	7.1.3	Strategic delivery management decisions
7	Lifecycle delivery	7.2	Contracting strategy	7.2.1	Contracting arrangements
7	Lifecycle delivery	7.2	Contracting strategy	7.2.2	Procurement arrangements
7	Lifecycle delivery	7.3	Procurement gateway & control system	7.3.1	Control framework
7	Lifecycle delivery	7.4	Programme and project packaging and scheduling	7.4.1	Efficient packaging
7	Lifecycle delivery	7.4	Programme and project packaging and scheduling	7.4.2	Attractive packaging
7	Lifecycle delivery	7.4	Programme and project packaging and scheduling	7.4.3	Packaging to meet financial reporting obligations
7	Lifecycle delivery	7.5	Maintenance	7.5.1	Maintenance objectives and triggers
7	Lifecycle delivery	7.5	Maintenance	7.5.2	Maintenance strategies
7	Lifecycle delivery	7.5	Maintenance	7.5.3	Risk-based maintenance strategies
7	Lifecycle delivery	7.5	Maintenance	7.5.4	Design for maintainability
7	Lifecycle delivery	7.5	Maintenance	7.5.5	O&M procedures, manuals and schemata
7	Lifecycle delivery	7.5	Maintenance	7.5.6	Response to emergency failures
7	Lifecycle delivery	7.5	Maintenance	7.5.7	Critical events and critical asset failures
7	Lifecycle delivery	7.5	Maintenance	7.5.8	Committed maintenance response times
7	Lifecycle delivery	7.5	Maintenance	7.5.9	Customer call center
7	Lifecycle delivery	7.6	O&M contract management	7.6.1	Management of contractors' performance
7	Lifecycle delivery	7.6	O&M contract management	7.6.2	Auditing of contractors' performance
7	Lifecycle delivery	7.6	O&M contract management	7.6.3	O&M data management
7	Lifecycle delivery	7.6	O&M contract management	7.6.4	Asset performance monitoring
7	Lifecycle delivery	7.7	Shutdowns, outages and incidents	7.7.1	Shutdown & outage management
7	Lifecycle delivery	7.7	Shutdowns, outages and incidents	7.7.2	Design and documentation of incident responses
7	Lifecycle delivery	7.7	Shutdowns, outages and incidents	7.7.3	Post incident evaluation

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