TOOLKIT **EDITION 1** 2018

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

CIDMS

MODULE 3

Asset data model and infrastructure profiling

national treasury
Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

cities SUPPORT PROGRAMME

IUDF INTEGRATED URBAN DEVELOPMENT FRAMEWORK

2030 NDP

MODULE PURPOSE:

This module describes the asset data models that have been adopted as the foundation to implement the asset management system contemplated in Module 2. It identifies the scope of data required and provides the rationale for the structuring and nature of the models that have been adopted, and are to be applied consistently to all immoveable assets across the various sectors in the city. The data model underpins strategic, tactical and operational management.

Key elements of the module are:

1. A standardised asset and location hierarchy inter-alia defining how the portfolios are broken down to a consistent level of component detail at which the modelling takes place, and is also used to roll-up data for planning and reporting purposes;
2. A standardised scope and design of data attributes on each of the components that inform asset management processes;
3. Interpretation of data to inform cost, value, performance and risk profiling.

WHY:

A common and appropriately configured asset data model is essential for the management of infrastructure across a city to be effectively integrated. It fosters consistent and holistic reporting, improved understanding, planning, decision-making and more effective and efficient implementation. It also provides a firm foundation to inform the pursuit of ongoing improvement in infrastructure management practice as well as service performance, within and across the cities.

OUTPUTS OF MODULE 3:

1. A fully-fledged asset hierarchy to support asset componentisation for all immovable asset portfolios, to the level necessary to support accounting/financial requirements for asset recognition and measurement and strategic asset management.
2. A defined rule set for segmenting or grouping assets, as appropriate, in accordance with a defined functional location hierarchy.
3. Valuation models appropriate for the city's various asset classes, to:
   - Fairly reflect asset values in the Statement of Financial Position;
   - Support risk analysis and lifecycle planning; and
   - Enable depreciation at levels sufficient to maintain the capital stock of the organisation.
7. A schedule of expected useful lives and residual values as appropriate for all assets.
8. Formal conventions for locating, recording and reporting on assets.
9. A formal system indicating the extent measurement to apply to each component type, which enables determination of the replacement cost of the component as well as its capacity/extent.
10. A formal asset identification system that enables assets to be readily identified.
11. A formal asset failure mode grading system that supports analysis of the likelihood of failure.
12. A system for grading the criticality of assets.
13. A data confidence grading system indicating the level of confidence in asset valuation and attribute data.
14. A consolidated asset register that presents "one single version of the truth", able to reliably support the requirements of accounting recording, financial reporting, and strategic asset management decisionmaking.
15. Formal processes to ensure that the asset register complies with all relevant accounting standards, and that the asset position stated in it is a reasonable reflection of reality.
16. The city's asset register enables comprehensive accounting and financial data analysis and reporting, in line with statutory requirements, accounting standards and other stakeholder requirements.
17. The organisation's asset register supports strategic asset management decision-making. This module describes the asset data models that have been adopted as the foundation to implement the asset management system contemplated in Module 2. It then shows how applying these models supports infrastructure profiling.

KEY RELEVANT NATIONAL REGULATIONS, POLICIES AND STRATEGIES:

1. Municipal Finance Management Act, No. 56 of 2008
2. SABS: South African National Standard 55001: Asset Management – Management Systems – Requirements
3. Generally Recognised Accounting Practice
4. Spatial Planning and Land Use Management Act, No. 16 of 2013
5. Municipal Standard Chart of Accounts
6. The reporting frameworks of the National Energy Regulator of South Africa and the Department of Water and Sanitation

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3.1 INTRODUCTION

Managing infrastructure and the delivery of services require information about assets, particularly about the following aspects:

01 ASSETS OWNED AND CONTROLLED BY THE CITY

Knowledge on the scope, extent and location of assets is a precondition for asset management planning. Data on assets owned and controlled by a city should be included in the asset register of the city.

02 ASSET CONDITION

Knowledge on asset condition indicating the remaining useful lives of assets is necessary for determining: the depreciated replacement cost of assets (this will be explained in detail in this module), asset impairment, the probability of asset failure and to predict maintenance and renewal requirements.

03 UTILISATION AND CAPACITY

Knowledge on asset utilisation and capacity allows infrastructure planners to determine whether strategic redundancy, that is, spare capacity to ensure continuous supply if something happens, exists in engineering systems as necessary to cope with risk events. It informs decisions on whether sufficient capacity exists, and where this is not the case, it prompts planning to upgrade or add to existing assets. It also indicates where scope exists to rationalise asset portfolios, moving towards the optimisation of assets.

04 COST OF OPERATIONS

Cost of operations often indicate obsolescence as well as scope for asset optimisation.

05 PERFORMANCE

Performance is the ability of an asset to produce at a required standard of service. Performance data informs decisions on target standards of service and is necessary to determine the effectiveness of operating, maintenance and capital works programmes. For some assets, an agreed minimum performance level triggers capital works such as renewal to improve the condition of the asset to a point where it is able to perform accordingly to agreed standards.

06 ABILITY TO PREDICT ASSET FAILURE

Condition, utilisation and capacity, cost of operations and performance are all failure modes, or ways in which assets can fail. Knowledge on the current failure mode status of assets is a good starting point for asset management planning. But it is equally important to understand how and when assets may in future fail either to provide services or to reach their expected useful lives. This provides a firm context for life-cycle planning.

The asset data models and infrastructure profiling approach adopted should:

- be documented;
- be applied consistently across all infrastructure (and building) portfolios;
- support integrated reporting and planning across all infrastructure (and building) portfolios;
- support effective strategic asset management of infrastructure in line with SANS 55 001;
- support the preparation of GRAP-compliant asset registers;
- facilitate effective budgeting and expenditure control in line with mSCOA; and
- support spatial reporting and planning in line with SPLUMA

Elements which are considered essential in achieving the above are:

- to break down the asset portfolios to an appropriate level of detail – defining all items considered to be of management significance (components) – and stipulating the required value, attribute and spatial data (to inform all disciplines – financial, strategic and operational asset management, corporate planning and spatial planning);
- to provide explicit definitions of what capital and non-capital life-cycle expenditure is, and link to stated life-cycle strategies for all component types (across all sectors – roads, storm-water, water, sanitation, electricity etc.);
- to define failure modes, criticality and risk exposure for all component types (that can be measured against defined risk tolerances);
- the ability to reliably track confidence in the input data (that can be measured against targets that are set based on benefit-cost considerations);
- the ability to determine life-cycle needs (both capital and non-capital) at component level and to forecast for different development scenarios; and
- the ability to roll up all data on the basis of area and/or infrastructure type from component to city level

"...to define failure modes, criticality and risk exposure for all component types...."

A fundamental point of departure adopted for all the asset data models in the CIDMS toolkit has been to adopt, at the highest level (which applies to the city), a model that is well understood by all users, can be readily, completely and consistently implemented across the sectors, departments and entities in the organisation, and provides the opportunity for selective drill-down to increase the level of sophistication where relevant to the business value added (ie the model is "scalable"). This over-arching umbrella is critical for effective integrated decision-making, and to promote effective management as an essential context for determining the required asset data and modelling integrity. The arrangement is illustrated in **Figure 3.1.**

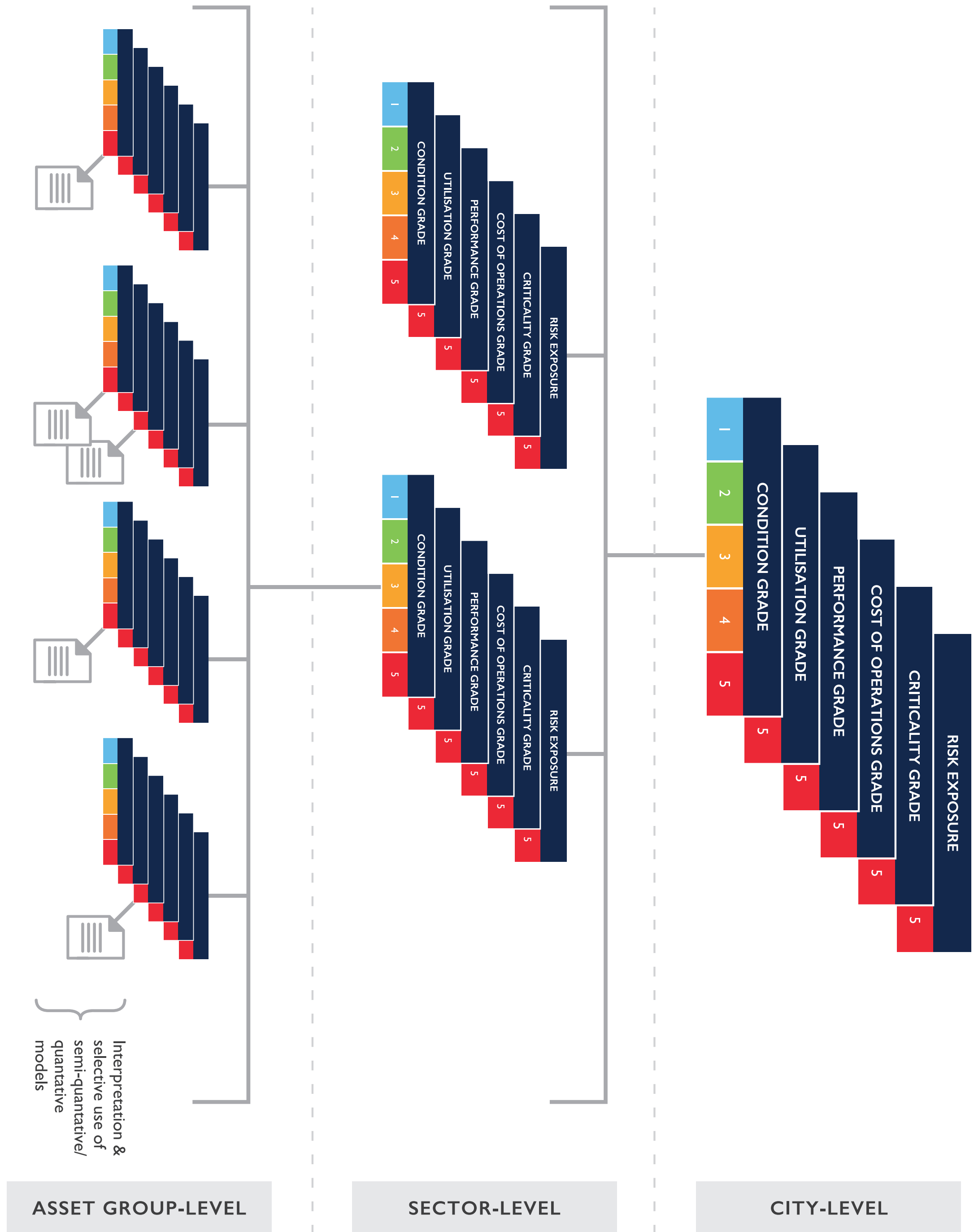


FIGURE 3.1: *Consistent organisation-wide application of the asset data model structure*

3.2 ASSET DATA MODELS

The scope of asset data models described in this module is shown below, each of which are described in detail in the following subsections. Used in combination, they will enable the generation of asset knowledge necessary to support robust asset management planning:

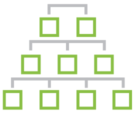
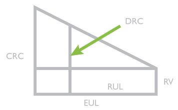
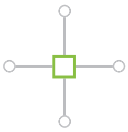
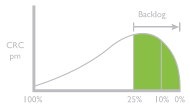
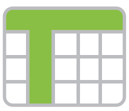
	**ASSET HIERARCHY** A framework to divide up an asset base into appropriate classifications. The asset hierarchy can be based on asset function, asset type, or a combination of the two.
	**VALUATION MODEL** The method and data to determine the worth of an asset, accumulated depreciation, remaining useful life and current replacement cost.
	**ATTRIBUTE DATA** Attributes refer to the specific properties of an asset component, such as type, size, class, expected useful life and remaining useful life.
	**IDENTIFICATION REFERENCING** A system to identify the asset component, both in terms of physical location and location within the asset hierarchy.
	**FAILURE MODES AND MODELS** Failure modes are ways in which assets can fail in relation to required levels and standards of service, and expected useful life. These trigger asset management planning and potentially investment decision making.
	**DATA ACCURACY** Not all asset data has the same level of accuracy. By necessity, some elements of data are estimated, some gathered from cursory inspection, and some developed following detailed technical assessment. A data confidence model is included which attaches a data confidence grade to the level of accuracy of asset component attribute data.
	**ASSET REGISTER** A record of asset information considered worthy of separate consideration for both asset accounting purposes and strategic management purposes. It includes inventory, historical, condition and construction, technical and financial information about each asset record.

TABLE 3.1: *Scope of asset data models*

3.2.1 Componentisation and asset hierarchy

COMPONENTISATION

At a facility, network or engineering systems level, urban infrastructure assets are generally considered to be "assets in perpetuity": they are intended to service current and future generations. A key feature of infrastructure and buildings is that they are considered to be complex assets comprised of multiple components.

DEFINITION OF A COMPONENT:

A component (Note 1) is a specific part of a complex item (Note 2) that has independent physical or functional identity and specific attributes, such as different life expectancy, maintenance and renewal requirements and regimes, risk or criticality.

Note 1: A component is separately recognised and measured (valued) in the organisation's asset register as a unique asset record, in accordance with the requirements of GRAP 17 to componentise assets.

Note 2: A complex item is one that can be broken down into significant components. Infrastructure and buildings are considered complex items.

To ensure services continue, it is necessary to replace significant components of these complex assets on a continuous and progressive basis. A key part of strategic infrastructure asset management is to optimise the life-cycle treatment of the constituent components that are considered significant. This is to determine the form of maintenance that will economically maximise the life span of each component, and to plan in time for its replacement. **Recognised good practice in asset management is therefore to:**

- Identify significant components that are normally replaced on a regular basis; and
- Prepare life-cycle strategies which document the prevailing approach to maintenance and link this to the typical interval between renewals (replacement).

The GRAP standard that applies to infrastructure, municipal operational buildings and most community facilities is titled GRAP 17: Property, Plant and Equipment (PPE). **GRAP 17 states that an item must meet the following criteria to be recognised as an asset:**

- It must have a useful life unique to it, or a useful life separate that of the parent asset of which it forms part
- It must be possible to determine the value of the asset
- The asset must have service potential or economic benefits embedded in it, for a period of longer than twelve months.

A component of infrastructure that is defined as a significant item becomes a "unit of account" – or, for all intents and purposes, the "asset" for the asset management system. The "asset" is then given a value and recorded in the city's asset register in accordance with the principles stated in relevant standards of generally recognised accounting practice (GRAP). Once significant items have been defined, by implication, those items that do not constitute a defined component are not considered significant – they are treated as consumables. This process of segmenting complex assets into significant items or components is referred to as asset componentisation. Accountants often refer to the process of componentisation as "asset unbundling".

City assets can be thought of as community wealth. Any investment in municipal infrastructure and social facilities, through capital expenditure (CAPEX), increases community wealth through enlarged service potential and economic benefit. For this reason capital expenditure is recorded in a city's asset register, and the carrying value of assets in the asset register is reported on in the City's Statement of Financial Position.

THE DEFINITION OF CAPEX IS AS FOLLOWS:
Expenditure used to create new assets, increase the capacity of existing assets beyond their original design capacity or service potential, or to return the service potential of the asset or expected useful life of the asset to that which it had originally. CAPEX increases the value of capital asset stock.

Infrastructure and buildings are considered to be complex assets, and as we have seen, are required to be broken down into components. If any such component is renewed, this would mean the return of its original service potential and expected useful life – and is therefore capital in nature. The renewal action can take the form of replacement or rehabilitation. Once assets have been commissioned, they must be used so that value is derived from them. They should also be maintained to reach their expected useful lives. These activities are considered operational expenditure (OPEX) and are expensed. Such expenses are reported on in the Statement of Financial Performance.

THE DEFINITION OF MAINTENANCE IS AS FOLLOWS:
All actions intended to ensure that an asset performs a required function to a specific performance standard(s) over its expected useful life by keeping it in as near as practicable to its original condition, including regular recurring activities to keep the asset operating, but specifically excluding renewal.

Note: Maintenance also specifically excludes restoring the condition or performance of an asset following a recognised impairment event, which would be classified as either renewal or upgrading, depending on the circumstances.

In short, significant items or components are recognised as assets and capitalised. Expenditure at subcomponent level is treated as operating expenditure.

GRAP allows some measure of judgement to be exercised on the degree to which infrastructure assets are broken down or componentised, and therefore a range of prevailing practices can be found (including, in many instances, the initial adoption of separate engineering, financial and even spatial registers).

ASSET HIERARCHY: PRINCIPLES AND CONCEPTS RELATING TO LIFE-CYCLE MANAGEMENT OF ASSETS
Regardless of the methodology adopted to componentise assets, it is necessary to adopt a standard system of componentisation, referred to as an asset hierarchy, to ensure consistency on the classification, manner and depth of componentisation, across asset portfolios and over time.

DEFINITION OF AN ASSET HIERARCHY:
A framework for segmenting an asset base into appropriate classifications. The asset hierarchy can be based on asset function, asset type, or a combination of the two.

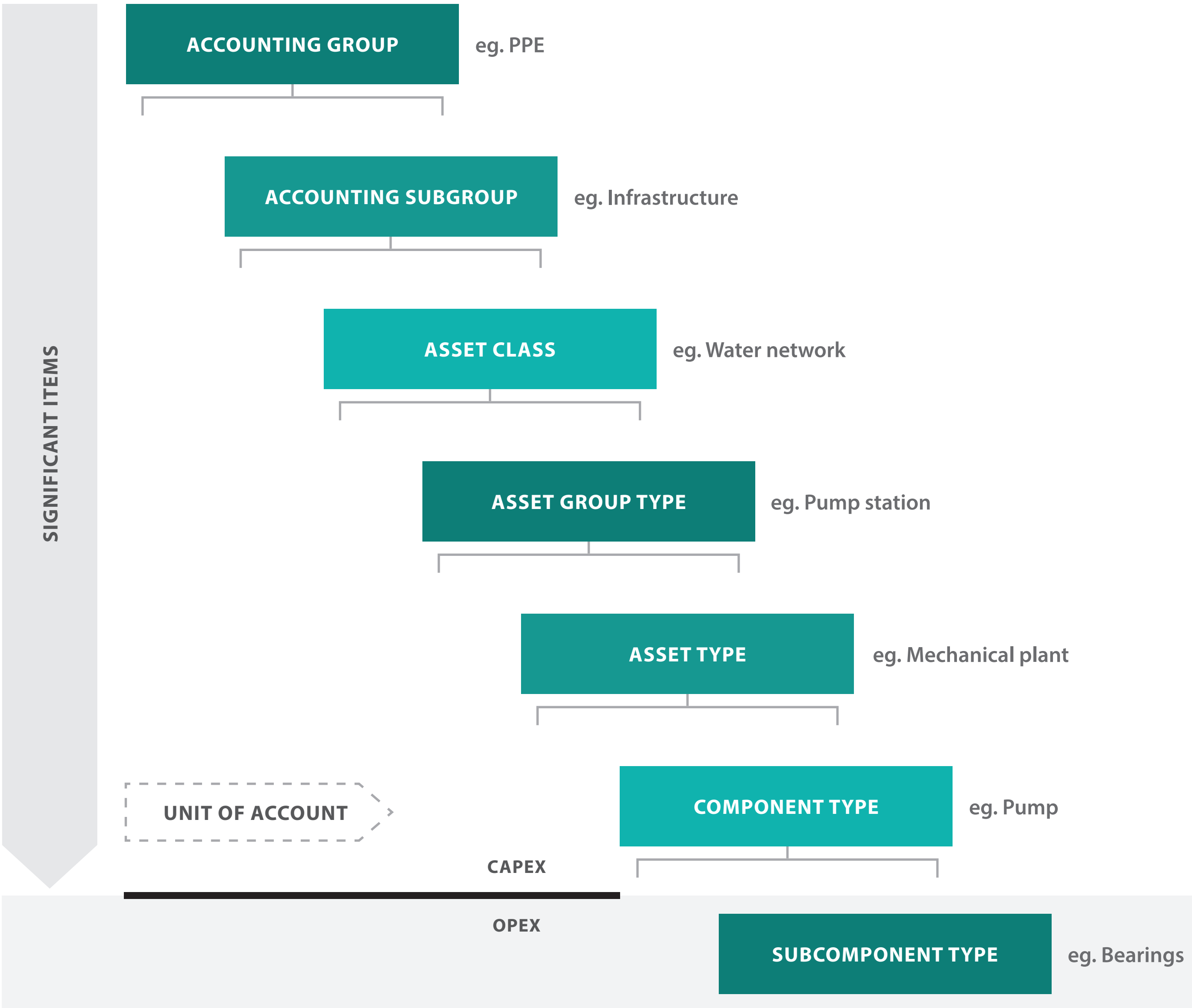


FIGURE 3.2: *Structure of the asset hierarchy adopted for the CIDMS toolkit*

The following points explain the structure and logic of the asset hierarchy shown in Figure 3.1 above:

- **The asset hierarchy is of the combination type (function and asset type), for use in both accounting and strategic asset management.** The asset hierarchy consists of six levels of significant items. The upper levels are of the functional asset hierarchy type. This enables the asset hierarchy to report on assets per asset class and accounting group, as required by GRAP. It also reports on assets in the "function" segment of the municipal Standard Chart of Accounts (mSCOA). The asset hierarchy can be used for very diverse services and asset portfolios such as different engineering systems, community facilities, heritage assets and investment properties. The lower levels of the asset hierarchy are of the asset "type" sort. They include facilities (asset group type) such as electrical substations, reservoirs, sewerage treatment works, landfill sites, fire and ambulance stations and parks, and even the components that comprise these facilities.
- **Items at the component-type level assume asset status.** In the example provided in **Figure 3.1**, a pump would be recognised as an asset, as would other components comprising the pump station, such as the motor driving the pump. Each asset is then recognised (recorded in the asset register), measured (assigned a value) and depreciated over its useful life. The renewal or replacement of a component automatically qualifies as CAPEX.
- **Items at the component level kept in stores are considered capital spares.** Examples of capital spares are pumps, motors, generators and transformers. Such components are also considered to be assets. They are recorded in the asset register and are depreciated even when not in active use.
- **Any expenditure at subcomponent level is considered OPEX.** Examples of subcomponents include, in relation to **Figure 3.1**, the impeller or bearings.

Once the asset hierarchy is defined down to component level, an explicit basis is established to model the aggregated (capital and operational) life-cycle needs of all the components that make up the entire system or portfolio. It can also be used to forecast future needs.

To illustrate how to apply this approach, one could consider the water and sewerage network indicated in **Figure 3.3**. The entire system could be viewed as a whole, but what would be its expected useful life? The dam wall could last for, say 200 years, whereas the pipe work only, perhaps, 60 years. In the meantime, the city may grow to the extent that the treatment works need to have new modules added and new pipe reticulation is required, while some sections might also have been replaced. Then, what is the expected useful life? The logical response is to consider each one of these items as a separate unit, with its own life expectancy based on the maintenance that is carried out, and the portions that are replaced.

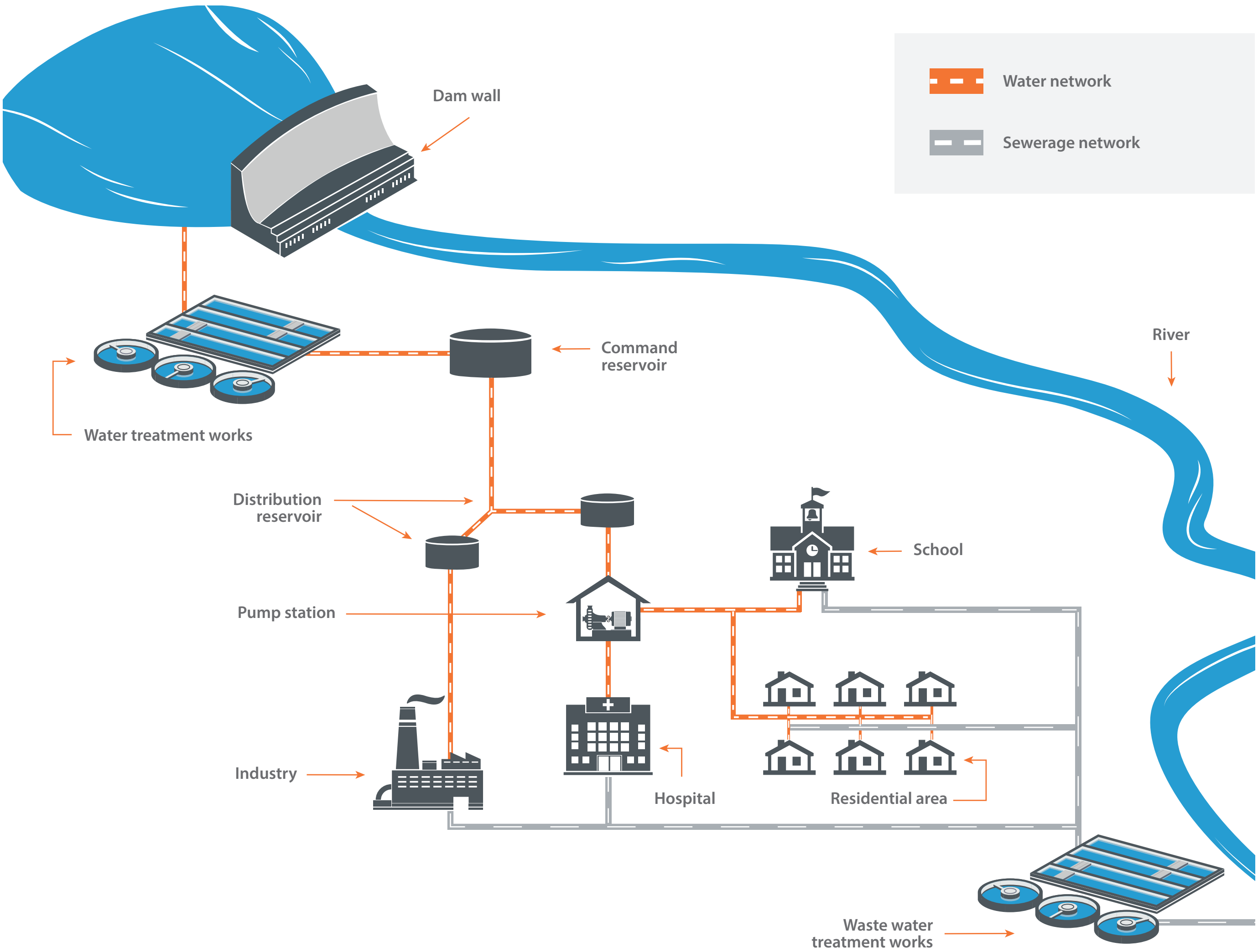


FIGURE 3.3: *Schematic representation of a water and sewerage network*

If one then considers one of these elements, the pump station, similar challenges are presented. **Figure 3.4** illustrates the components typically found in a pump station, again each with their own life expectancy, while the need for the pump station will not end.

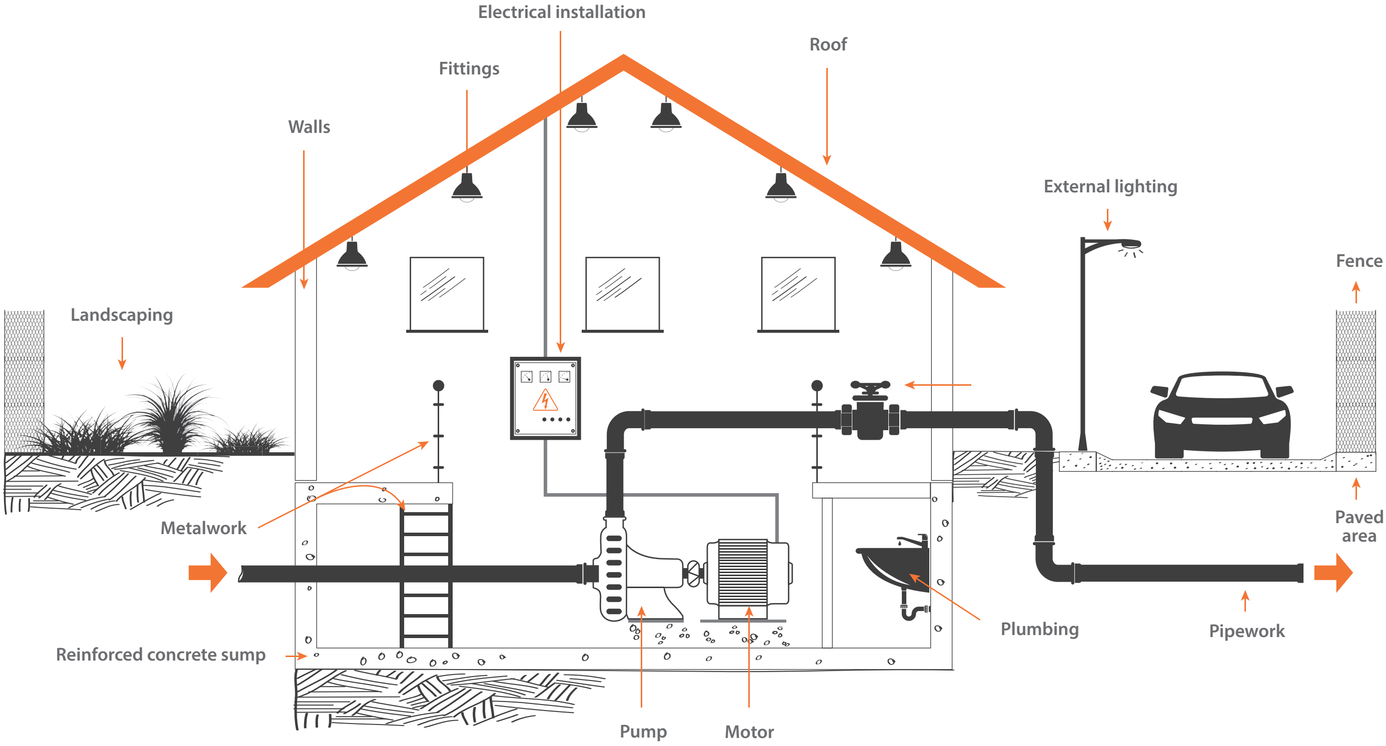


FIGURE 3.4: *Example of components in a pump station*

Table 3.2 indicates the components of the pump station with illustrative replacement values, age, remaining useful life (RUL) and annualised depreciation. The expected useful lives of the components range from 15 to 80 years. The weighted average expected useful life is 32 years, and based on this and an age of 18 years, the remaining useful life of the overall facility would be 14 years.

COMPONENT	REPLACEMENT VALUE	EXPECTED USEFUL LIFE	AGE (YRS)	RUL (YRS)	DEPRECIATION PA	PORTION OF FACILITY DEPRECIATION
Roof	450 000	40	18	22	11 250	15%
Walls	900 000	60	18	42	15 000	20%
Electrical installa-tion	270 000	30	18	12	9 000	12%
Fittings	67 500	15	18	-3	4 500	6%
External lighting	9 000	45	18	27	200	0%
Landscaping	27 000	30	18	12	900	1%
Fence	110 400	30	18	12	3 680	5%
Paved area	9 000	20	18	2	450	1%
Reinforced concrete	162 000	50	18	32	3 240	4%
Metal work	27 000	80	18	62	338	0%
Pipe work	22 500	80	18	62	281	0%
Pump 1	60 000	15	18	-3	4 000	5%
Pump 2	60 000	15	18	-3	4 000	5%
Motor 1	140 000	15	18	-3	9 333	12%
Motor 2	140 000	15	18	-3	9 333	12%
Valves	17 000	20	18	2	850	1%
Total	**2 471 400**	**32**	**18**	**14**	**76 355**	

TABLE 3.2: *Example of components in a pump station*

Note: *The intention of **Table 3.2** is not to condone the practice of carrying negative RULs, but rather to illustrate relative life status and replacement needs of the facility at year 18. In practice it will be necessary to adjust either the EUL or RUL in such instances.*

Figure 3.5 illustrates when each of the significant items need to be replaced. After 18 years, several items should already have been replaced. Were these capital replacements that extended the life of the pump station, or not? If the pump station had not been broken down into components, the replacement items may or may not have been capitalised, and the life may or may not have been extended. If the life was extended, by how long? In this example, it is evident how asset registers rapidly lose touch with reality if they are not effectively componentised.

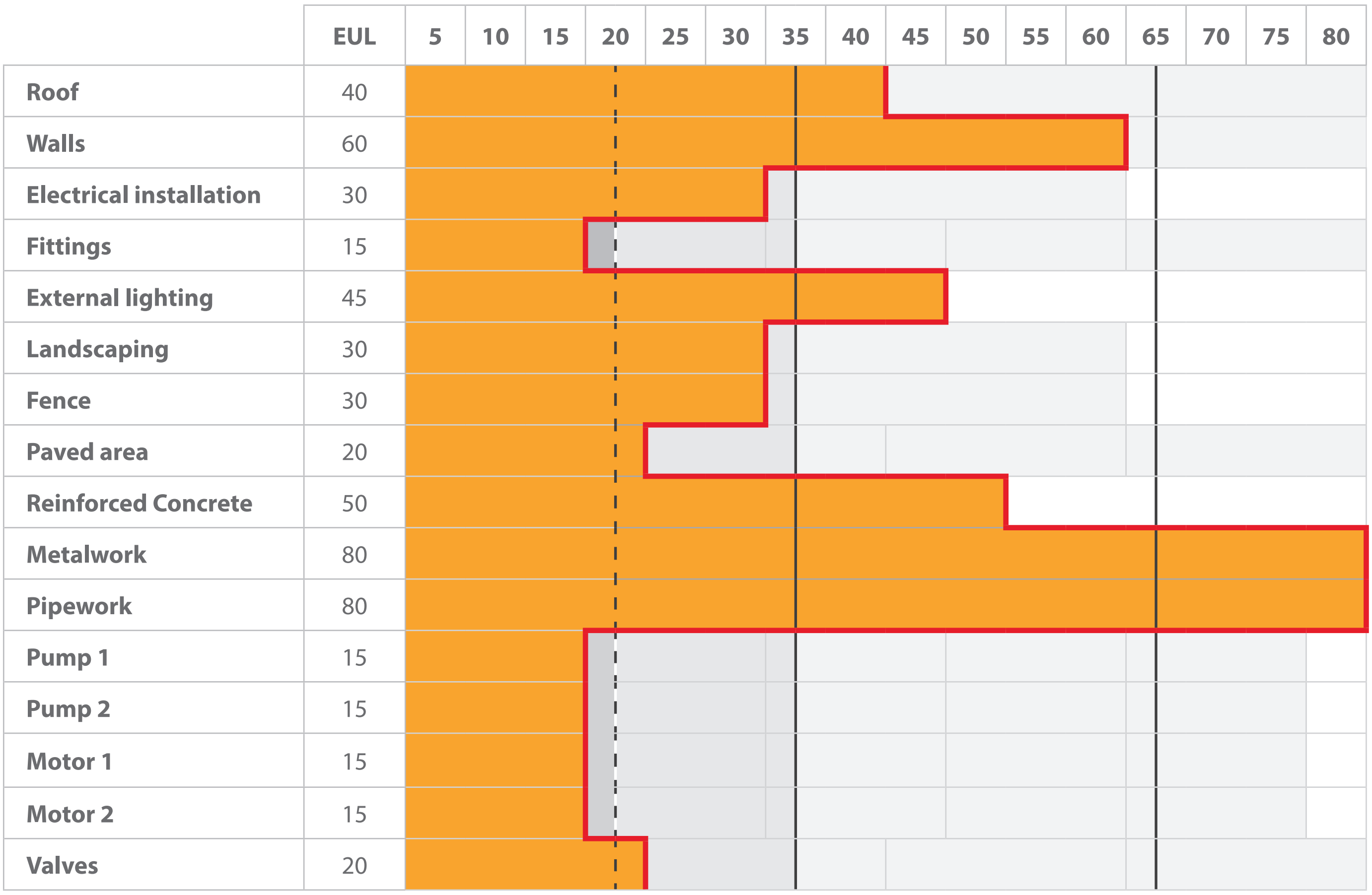


FIGURE 3.5: *Timing of the replacement of the components of the pump station*

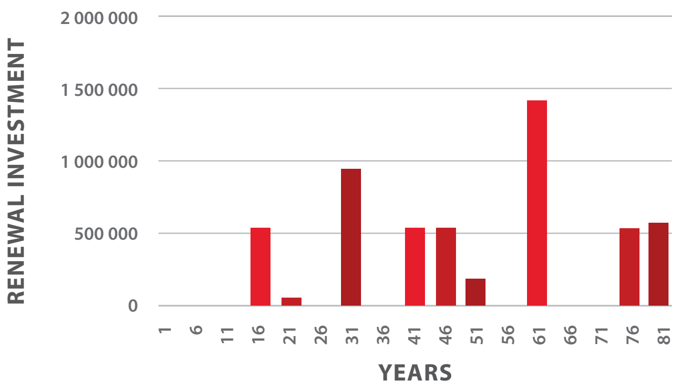


FIGURE 3.6(A): Component renewal profile
The cost and timing of the replacement of each of the components is indicated.

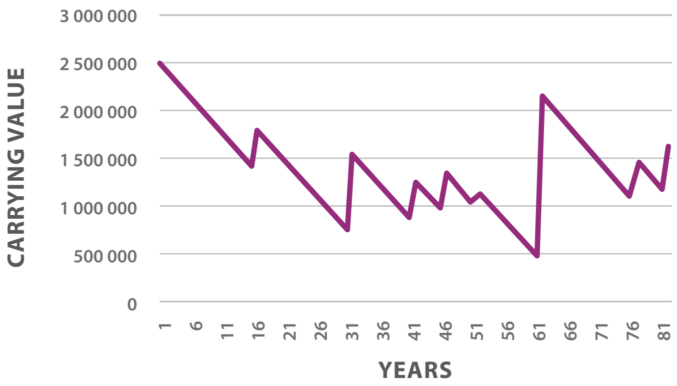


FIGURE 3.6(B): Component-based depreciation
The depreciation of the components and their derecognition and replacement at end of life is evident in this portrayal of the aggregated carrying value for the facility (the sum of the carrying values of all of the components).

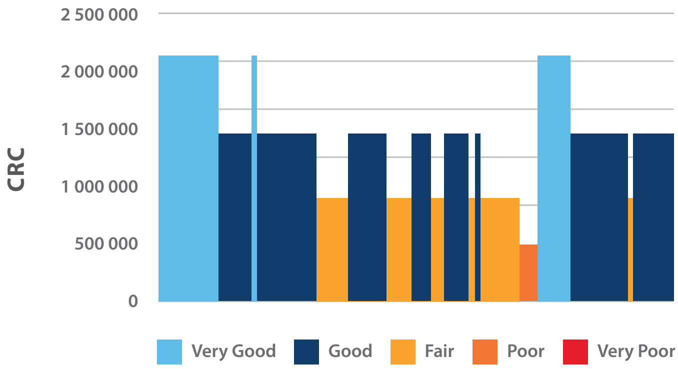


FIGURE 3.6(C): Weighted condition grade of the facility
The average condition grade of the overall facility is illustrated (weighted based on CRC), based on the progressive replacement of components (as noted above). If the pump station were to be considered as a single facility, it is evident that an assessment, at any stage other than when it is new, to determine a singular condition grade could not reliably inform its remaining useful life, or its life-cycle needs.

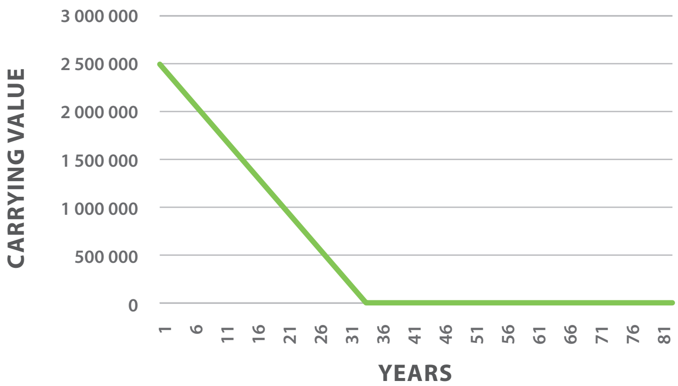


FIGURE 3.6(D): Depreciation of the facility considered as a single asset
This figure illustrates the depreciation of the facility if it was to be considered as a single unit without the option to derecognise items and without capitalisation of replacements. The carrying value reduces to a nominal value and remains in this position despite ongoing use of the facility. It is on this basis that many asset registers have multiple assets with nominal values and meaningless remaining useful lives, as well as miscellaneous projects capitalised and no derecognitions. And as noted above, there is no useful way of determining life-cycle needs, nor modelling future budget needs using this approach.

Effective componentisation is therefore at the heart of designing an effective asset data model. **In this way:**

- Capital renewal actions are explicit – not open to varied interpretation of what qualifies;
- CAPEX and OPEX budgeting is structured and definitive;
- Expenditure control (again of CAPEX and OPEX) is definitive;
- Modelling of life-cycle needs, optimisation and priorities across the portfolio is more robust;
- There is a structured way to assess the merits of new life-cycle treatment options for components;
- An annual review of condition and useful life becomes a reliable and replicable process; and
- The need for repeated out-of-system calculations (to reliably determine facility-level remaining life) is removed.

ASSET HIERARCHY: MORE ON ITS RULES, STRUCTURE AND APPLICATION

The hierarchy considered in this toolkit caters only for immovable assets (i.e. not for movable assets). Computer equipment whose function is directly associated with an item of immovable infrastructure (such as the control of SCADA equipment) is considered to be included with the parent component, and is not considered separately (and will not, for example, be considered under movable assets). Since some types of components are found in many different facilities (e.g. land, buildings, roads), the component design and useful-life models can be applied consistently across each of these applications.

The model is defined down to the level of component types. Indeed, to give effect to the principle of components being the "unit of account", ALL assets are defined down to this level (irrespective of how simple or complex they are), so that the various models contemplated in this toolkit can be consistently applied at this level. If necessary, cities may track the replacement of component parts (which, as previously noted, are by definition not considered to be significant), to schedule effectively and track maintenance activities relating to components. **Table 3.3** indicates the top three levels of the asset hierarchy, and **Tables 3.4 and 3.5** illustrate the middle and lower levels respectively (on a sample basis). The full asset hierarchy is provided in **Annexures 3A and 3B.**

<table>
<tr><th>ACCOUNTING GROUP</th><th>ACCOUNTING SUBGROUP</th><th>ASSET CLASS</th></tr>
<tr><td rowspan="13">Property, plant and equipment</td><td rowspan="9">Infrastructure assets</td><td>Roads infrastructure</td></tr>
<tr><td>Storm-water infrastructure</td></tr>
<tr><td>Water-supply infrastructure</td></tr>
<tr><td>Sanitation infrastructure</td></tr>
<tr><td>Electrical infrastructure</td></tr>
<tr><td>Rail infrastructure</td></tr>
<tr><td>Information and communications infrastructure</td></tr>
<tr><td>Solid-waste infrastructure</td></tr>
<tr><td>Coastal infrastructure</td></tr>
<tr><td rowspan="2">Community assets</td><td>Community facilities</td></tr>
<tr><td>Sport and recreation facilities</td></tr>
<tr><td rowspan="2">Other assets</td><td>Operational buildings</td></tr>
<tr><td>Housing</td></tr>
<tr><td rowspan="5">Heritage assets</td><td rowspan="5">Heritage assets</td><td>Monuments</td></tr>
<tr><td>Historic buildings</td></tr>
<tr><td>Works of art</td></tr>
<tr><td>Conservation areas</td></tr>
<tr><td>Other heritage</td></tr>
<tr><td rowspan="2">Intangible assets</td><td rowspan="2">Intangible assets</td><td>Servitudes</td></tr>
<tr><td>Licences and rights</td></tr>
<tr><td>Investment property</td><td>Investment property</td><td>Investment property</td></tr>
</table>

TABLE 3.3: *High-level asset hierarchy (levels 1 – 3)*

ASSET CLASS	ASSET GROUP TYPE
Roads infrastructure	Roads
	Road structures
	Road furniture
	Capital spares
Storm-water infrastructure	Drainage collection
	Storm-water conveyance
	Attenuation

TABLE 3.4: *Middle-level asset hierarchy – asset subcategory to asset group (sample – full table in Annexure 3A) (levels 3 – 4)*

ASSET GROUP TYPE	ASSET TYPE
ROADS INFRASTRUCTURE	
Roads	Land
	Pavements
	Earthworks
Road structures	Road bridges
	Pedestrian bridges
	Civil structures
Road furniture	Road furniture
	Traffic signals
Capital spares	As applicable

TABLE 3.5: *Lower-level asset hierarchy – asset group to asset type (sample – full table in Annexure 3B) (levels 4 – 5)*

SEGMENTATION AND GROUPING

The level of detail adopted in defining the scale (or "grain size") of the components is guided by their value and importance, and the scope/extent of a typical renewal project when the components reach end of life. The approach to segmentation and grouping becomes an essential part of the definition of the scope of the component when considering its life-cycle treatment (and by implication when applying the definition of capital renewal and maintenance). For example, the resurfacing of a portion of a road surface within a street block would not be considered capital in nature as the whole component could not reasonably be considered to have new life. Similarly, the replacement of a single damaged road sign, single toilet in an ablution block, or single street light pole would not be considered capital and would therefore be expensed.

Large facilities (polygons or point assets) or linear assets are split into segments, and smaller items in operational use are grouped (see grouping rates below). Only components that are reflected per item when operational are considered as capital spares (when taken out of service but retained for future use), other items (that are grouped when in service) are considered consumable inventory if taken out of service and not disposed.

Segmentation rules

- Facilities (such as treatment works) – per process element as applicable;
- Urban roads, storm-water and water pipes – per street block;
- Sewers – manhole to manhole;
- Bulk storm water – node to node;
- Rural roads, bulk water pipes, and rail lines – between intersections or changes in attributes;
- Electricity conductors / cables – per transformer supply area;
- Buildings – per floor and functional area; and
- Servitudes – per parent infrastructure component (e.g. pipe length).

The location of all assets can therefore be represented in the form of polygons (areas), point assets, or lines. Accordingly, alpha-numeric asset data (in the register) is linked to spatial data, an example of which is illustrated in **Figure 3.7.** The following is a summary of the level of detail that has been adopted (items not indicated below are considered per item):

Grouping rules

- Road/rail furniture: per segment (as defined above);
- Road lighting: per road element (as defined above);
- Valves, hydrants and consumer connections on small pipes (<300mm): per pipe segment;
- Equipment in buildings – per segment (as defined above); and
- Consumer meters – per township extension.

FIGURE 3.7: *Example of spatial referencing and reporting of components*

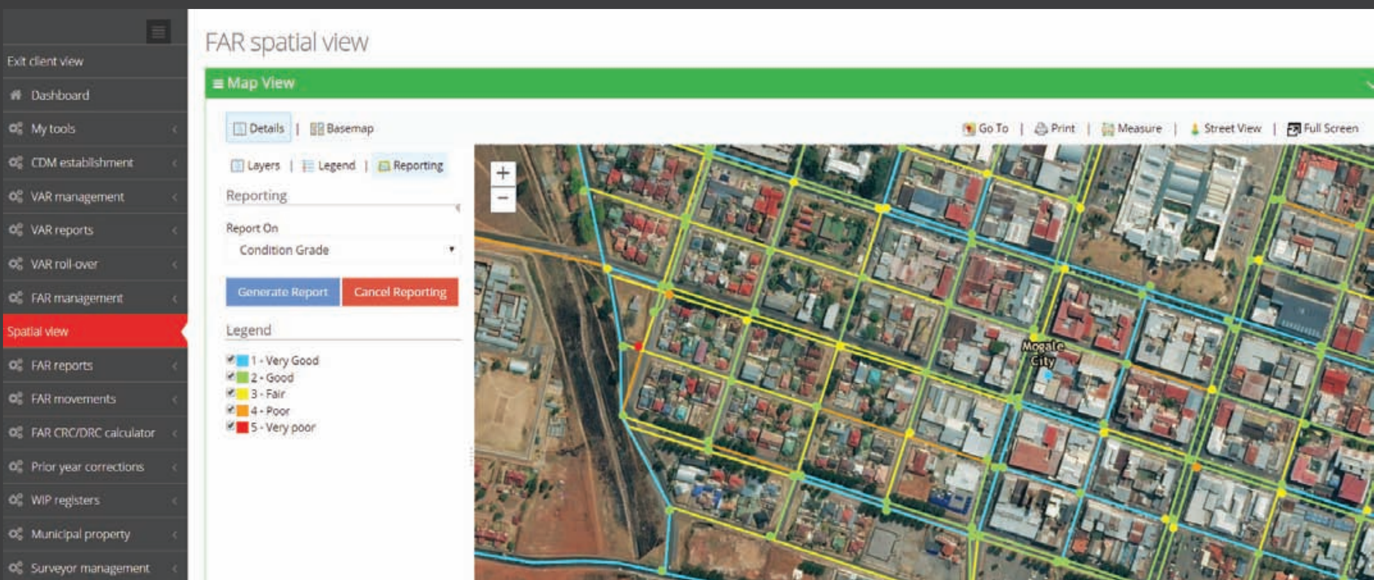


FIGURE 3.8: *Functional location data linked to the asset hierarchy*

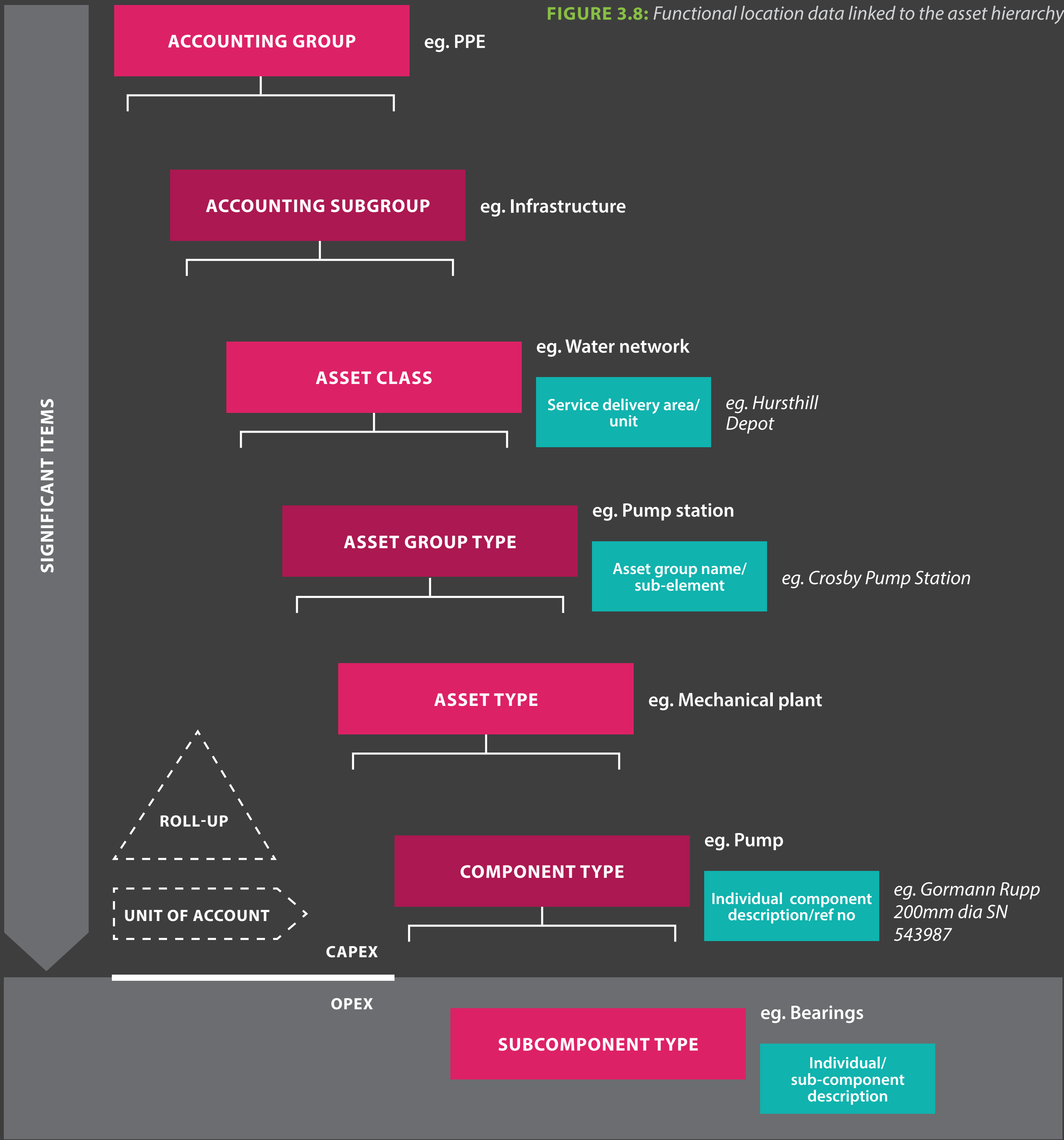


Figure 3.8 illustrates the manner in which the asset hierarchy is supplemented with a functional location hierarchy, which locates components in facilities or asset groups (portions of networks), and management areas.

AREA OF BENEFIT: REGIONAL SEGMENT

mSCOA requires that the geographic areas are identified where customers benefit from any given asset investment. Cities have discretion on the choice of a regional segmentation system. In the case of engineering reticulation infrastructure, customers will normally benefit from infrastructure in the ward where they live. In the case of bulk infrastructure, such as water treatment works, or regional social amenities, such as regional or metropolitan parks and stadia, customers over multiple wards will benefit from those facilities – see **Figure 3.9.** In these cases, it would be inappropriate to link the facility to a particular ward. Guidance on how to develop a spatial segmentation system is provided in **Module 4.** The spatial segmentation system adopted should be documented in the city's asset management policy and strategy.

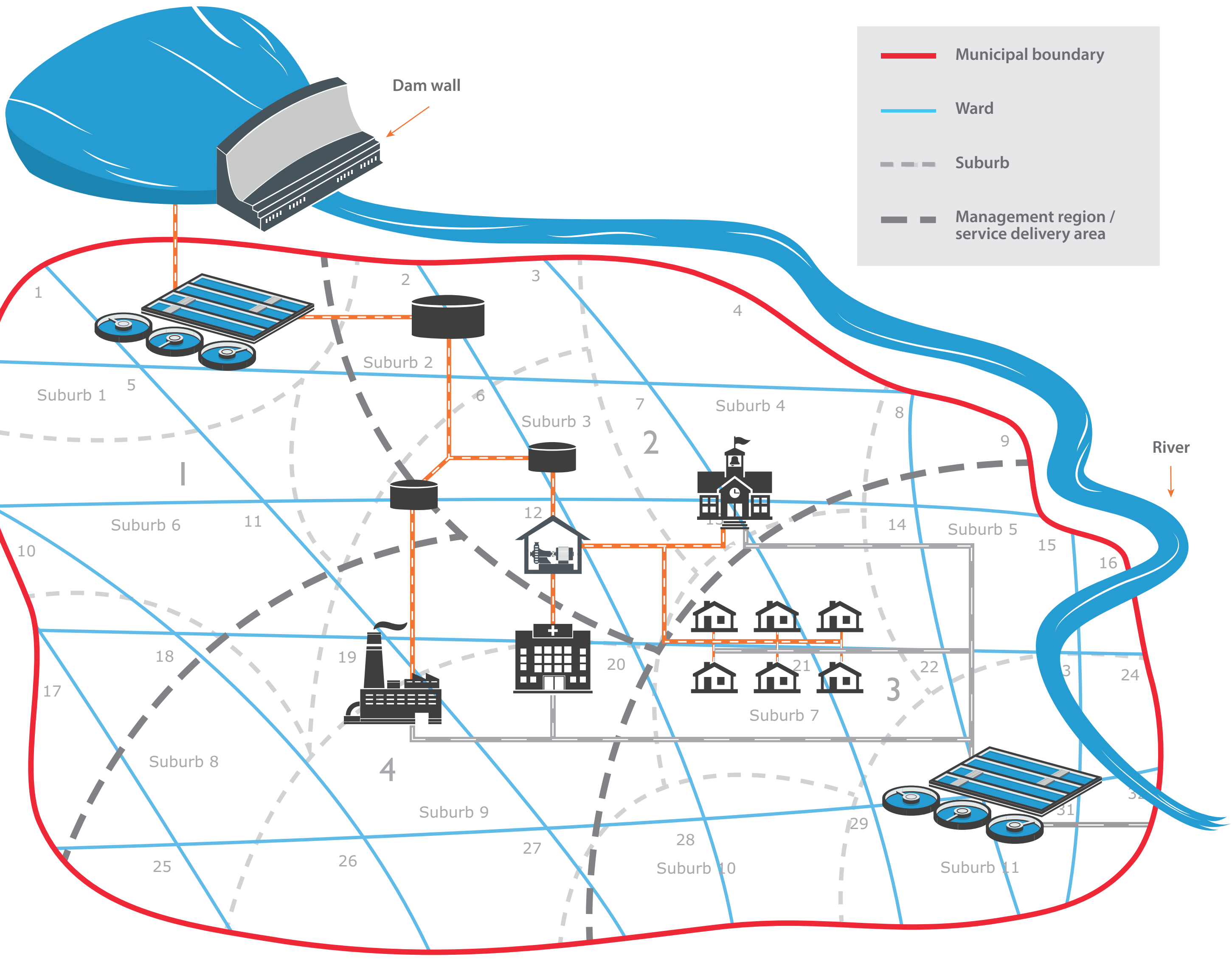
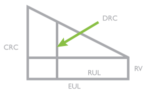


FIGURE 3.9: *Spatial location and distribution of infrastructure benefits*

3.2.2 Valuation model



WHY VALUE ASSETS?

Municipalities are legally obliged to value their immovable assets and report thereon in the Statement of Financial Position.

Valuation data serves the following purposes:

- It reflects the investment made by the community in the service-delivery capacity or economic potential of a municipality;
- To achieve accountability and transparency objectives;
- When using the depreciated replacement cost methodology, valuation data will provide valuable data on depreciation (and therefore renewals funding requirements);
- To indicate whether or not the entity is solvent and can operate as a going concern;
- The value of immovable assets strengthens the financial position of the municipality, and the organisation can use this strength to secure loans (balance sheet leveraging).

ASSET VALUATION MODELS AND TECHNIQUES

GRAP allows the use of various valuation models and techniques. **These are summarised below.**

Measurement model	Cost model	*GRAP .33*	Revaluation model	*GRAP .34 - .40*
Measurement technique	Historic cost	Reproduction cost	Depreciated replacement cost	Market value
Definition	Cost at initial recognition	The cost of reproducing the asset with exactly the same appearance, character and materials, where available, or where these could be specially manufactured	The replacement cost of an asset less accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired benefits of the asset	The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction
Best suited for the following asset classes	Movable assets and short life assets	Heritage assets	Infrastructure assets and other complex assets characterised by longevity and for which no active market exists	Land and buildings
Use when	Initial recognition of asset where actual costs are known	Typically for the valuation of heritage assets	There is no market-based evidence of fair value because of the specialised nature of assets (e.g. infrastructure) Preferred method for infrastructure life-cycle planning and long term financial planning Establishing the cost of transferred assets Apportioning actual costs to components using the shadow DRC valuation method Measuring the impairment of assets when using the value-in-use impairment method for non-cash-generating assets Benchmarking the adequacy of infrastructure spending	There is market-based evidence of fair value Calculating impairment using the "fair value less costs to sell" method
	Preferred method for strategic asset management purposes → (Depreciated replacement cost)			

FIGURE 3.10: *Asset valuation models and techniques*

From an asset accounting perspective, cities can adopt either the cost model or the revaluation model in reporting the value of their assets.

COST MODEL

The cost method is the benchmark treatment. This means that the value of assets written in the asset register expresses their actual historic cost, based on proven records of expenditure that are reconciled and audited each year. Each of the items is then depreciated over its expected useful life. In the case of municipal infrastructure, this can be as long as 100 years or more.

Using this method, items on the asset register will be reflected with values based on their cost several decades before. Though hopefully arithmetically correct and balancing, these values will be not be all that useful in reporting the status of the portfolio, nor in offering any reasonable basis to determine life-cycle needs. Worse still, rather than accepting that the values are not representative (especially of assets acquired a long time before), there is a risk that benchmarks for life-cycle costing are founded on wildly unrepresentative data.

In short, valuing long-life assets on the basis of historic cost will not result in fair representation of the financial position of a city. Cost-based tariffs will be set at levels that are insufficient to fund future asset renewal or replacement. And since historic costs rapidly lose track with actual costs, it is not suitable for use in benchmarking, asset management planning and budgeting. But the cost model suffers from other shortcomings as well. As a valuation method, it can't be used in isolation. Construction-type contracts generate project documentation that report on cost items such as labour, materials, professional and general fees and provisions, as opposed to conveniently packaged and costed components ready for recording in the asset register. To apportion costs to component level it is necessary to conduct a shadow valuation using the Depreciated Replacement Cost (DRC) method. The cost method is also not suited for asset impairment calculations: to perform these it is necessary to apply fair value methods (market value and DRC).

Lastly, the cost model is of no value in what are referred to as non-exchange transactions. Non-exchange transactions are events where a city acquires assets without paying for them. Such transactions regularly happen in city spaces. Developers are often required, as a condition for the approval of a development, to transfer land to the municipality, construct infrastructure or to both contribute land and infrastructure. Assets may also be acquired through other processes that include the transfer of assets from other organs of state, through expropriation or through means of redemarcation of municipal boundaries. GRAP 17 requires that the revaluation model (either market value or DRC) is used to measure assets acquired through non-exchange transactions. In these instances, such valuation, though using the revaluation model, is considered to be measurement to establish costs, rather than an attempt to revalue the new asset.

MARKET VALUE

In circumstances where there is a free and active market of items being acquired and sold by different parties, a method of valuation which is typically employed is to monitor actual sales prices and trends of similar items, and this is considered the "fair value". While portions of municipal land and perhaps non-specialist buildings (such as offices) may be considered to be part of a broader and active property market, the vast majority of municipal infrastructure assets do NOT generally form part of what could reasonably be considered an active market – i.e. one where there are enough sales of items of similar value to give reliable statistical results. This includes buildings that have been designed, constructed, and/or located for specialist use by a community.

The preceding paragraphs noted the shortcomings of both the cost method and the market value method with respect to specialised buildings and infrastructure. This leaves two options, these being (1) the reproduction cost method and (2) the DRC method, both of which are allowed by GRAP 17. In fact, GRAP 17.34 states that after recognition, an item of PPE whose fair value cannot be reliably determined shall be carried at a revalued amount.

"...A method of valuation that is typically employed is to monitor actual sales prices and trends of similar items, and this is considered the "fair value"."

REPRODUCTION COST

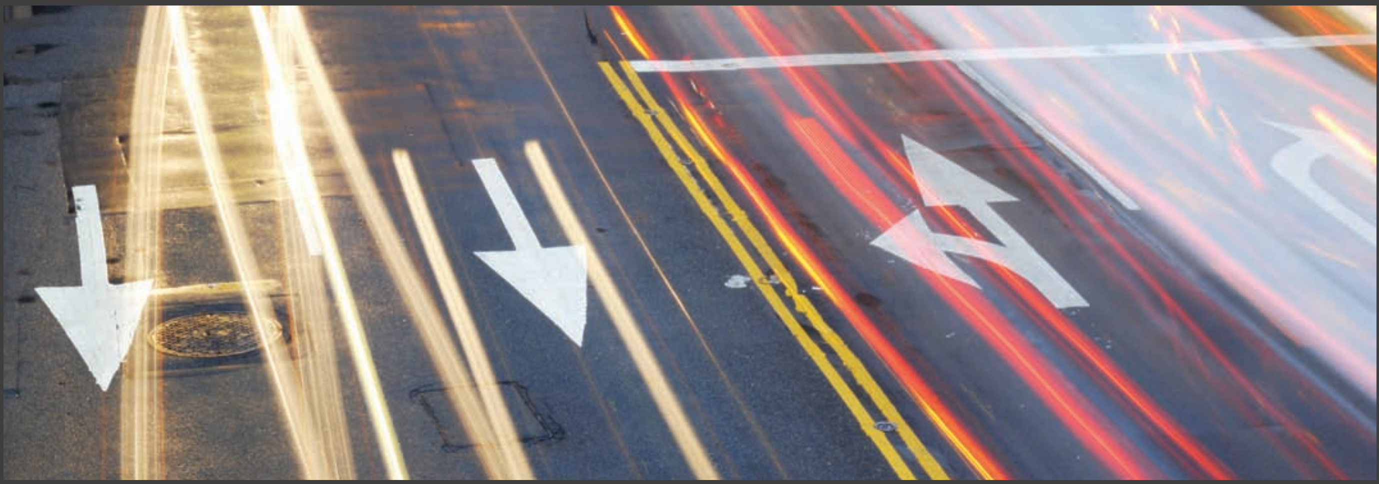
The reproduction cost method has merit in some limited instances, notably those cases where buildings or other community assets have been constructed in previous eras with particular materials (e.g. sandstone walls as opposed to brick walls). This means that not only the function, but also the particular historic or cultural appearance of the asset is deemed to be of value.

In most instances, though, the value of immovable assets such as engineering systems lie in their utility value as opposed to their physical appearance, for example the ability of a sewerage treatment works to process and safely discharge treated waste into the natural environment. Additionally, communities are concerned that such assets are fit for purpose, efficient and cost effective. While most members of the community will not know the best engineering solution to serve their needs, these expectations stand, and they measure effectiveness in this regard by the quality of services they receive and the impact on municipal tariffs. The field of engineering is a dynamic and responsive one: there are constant advances in construction materials and infrastructure technologies, leading to new assets and solutions. It is therefore very likely that a city will generally replace existing assets with modern equivalent assets (MEAs). An MEA is the most cost-effective asset currently available that will provide equivalent functionality to the asset that will be replaced.

TABLE 3.6: *Examples of components used in the past now replaced with MEAs*

ASSET PORTFOLIO	PREVIOUS GENERATION TYPE	MODERN EQUIVALENT TYPE
Water	Asbestos cement pipe	uPVC/ mPVC pipe (up to 500mm)
Sanitation	Cast- iron pipe	HDPE pipe
Sanitation	Earthenware pipe	uPVC pipe (up to 300mm)
Electricity	Oil-filled switchgear	Gas-insulated switchgear
Roads	Tar (coal-based) binder and prime	Bituminous binder and prime

For this reason reproduction cost is generally not a suitable method for valuing infrastructure assets.



DEPRECIATED REPLACEMENT COST: THE MECHANICS OF THE METHOD

The DRC method is widely considered to be the most appropriate method of valuation for infrastructure assets and other complex assets used for service-delivery purposes, since it is useful for strategic asset management and accounting.

THE DEFINITION OF DRC IS AS FOLLOWS:
The replacement cost of an asset less accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired economic benefits of the asset.

The "replacement cost" portion of DRC is based on the Current Replacement Cost (CRC) of an asset. As its name suggests, it is the value based on an assessment of how much it will cost to replace the item in current-day terms.

"...Value based on an assessment of how much it will cost to replace the item in current-day terms."

THE FULL DEFINITION OF CRC IS AS FOLLOWS:
The cost the entity would incur to acquire the asset on the reporting date. The cost is measured by reference to the lowest cost at which the gross future economic benefits could be obtained in the normal course of business, or the minimum it would cost to replace the existing asset with a new modern equivalent asset with the same economic benefits, allowing for any differences in the quantity and quality of output and in operating costs.

The DRC approach requires information on the expected useful life (EUL), residual value (RV), current replacement cost (CRC) and remaining useful life (RUL) of each of the asset components. DRC is then calculated as follows (assuming that the straight-line method of depreciation applies):

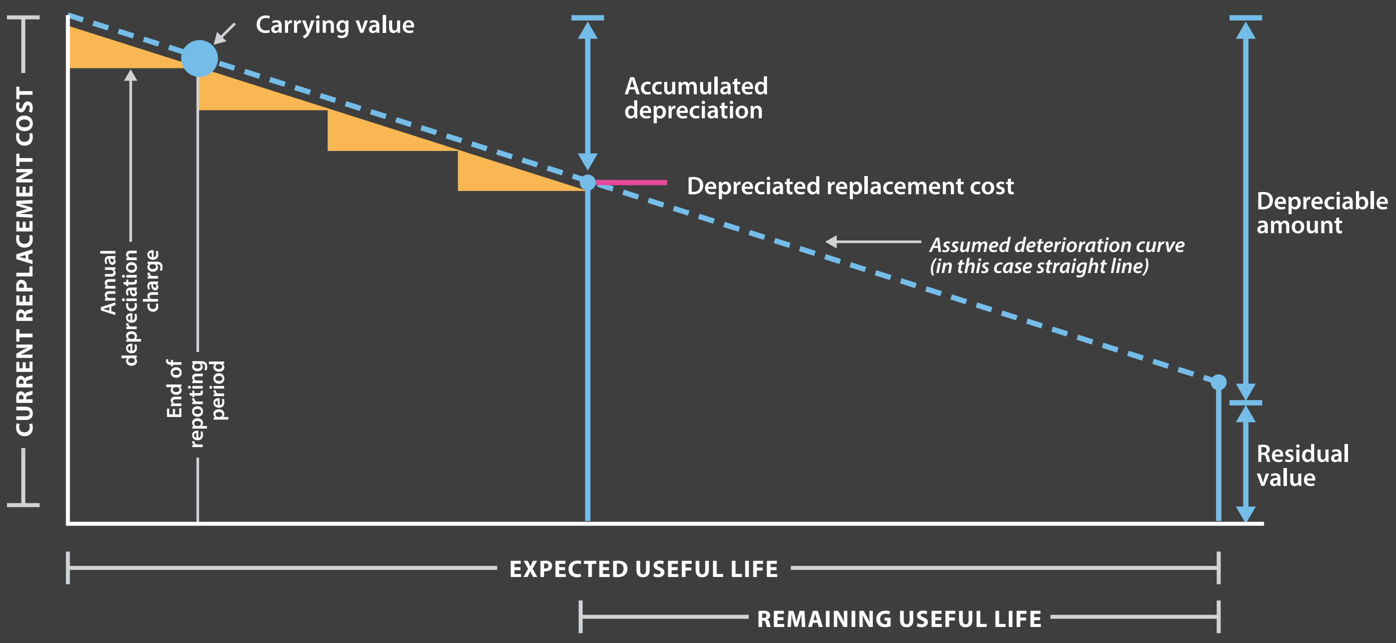


FIGURE 3.11: *Calculating DRC*

$$DRC = \frac{RUL}{EUL} \times (CRC\text{-}RV) + RV$$

Where:

CRC: Current replacement cost (as determined by the product of a unit rate and extent measure)

DRC: Depreciated replacement cost

EUL: Expected useful life (as indicated in Annexure 3E)

RUL: Remaining useful life (as determined by the algorithm indicated in **Section 3.3.5**)

RV: Residual value

Note: *An RV of zero can be used in the above formula to determine the DRC of assets that do not have an RV.*

Example:

A roof has an expected useful life from new of 40 years. It is 225 m^2 in extent, the unit rate (including all qualifying costs at the report date) is R2,000 per m^2, there is no residual value; and the remaining useful life (based on a condition assessment) was determined to be 22 years.

DRC = (225 x 2,000 x 22 – 0) / 40 = R247,500

Here's more guidance on how to apply the DRC formula:

A CURRENT REPLACEMENT COST (CRC)

The CRC is the product of an appropriate unit rate and the extent of the component, and represents the cost of replacing the asset. The unit rate is based on the cost of replacing the asset under consideration with a modern equivalent asset, which has the same functional capacity. Unit rates are established at the asset component level.

GRAP 17 states that the cost of an item includes the following elements:

- Its purchase price, including import duties and non-refundable purchase taxes, after deducting trade discounts and rebates;
- Any costs directly attributable to rendering the asset to the location and condition necessary for it to be capable of operating in the intended manner; and
- The initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located. This can occur when an entity acquired the item or uses it during a particular period for purposes other than to produce inventories during that period.

Examples of *directly attributable* costs include:

- Cost of employee benefits (as defined in the Standard of GRAP on Employee Benefits) arising directly from the construction or acquisition of the item
- Site preparation costs
- Initial delivery and handling costs
- Installation and assembly costs
- Cost of testing whether the asset is functioning properly (e.g. pressure testing of pipes to ensure that there are no leakages), after deducting the net proceeds from selling any items produced while bringing the asset to that location and condition
- Professional fees.

The following costs are *excluded from the costs of assets* (these costs do not form part of the value of assets and are instead expensed in the Statement of Financial Performance):

- Cost of opening a new facility
- Cost of introducing a new product or service, including the cost of advertising or promotional activities)
- Cost of conducting business in a new location or with a new class of customers, including the cost of staff training
- Administration and other general overhead costs.

B EXPECTED USEFUL LIFE (EUL)

The EUL of an asset is influenced by a wide range of factors such as the operating environment and standard of manufacture or construction. It will always require judgement as EUL is a prediction of potential future service-delivery performance. The degree of confidence in EUL can, however, be increased by relevant data on influencing factors in the operating environment and/or historic performance (where statistical analyses can be carried out). Where there is little reliable historical performance data available, industry norms are used as a guide, supplemented with insight of sector experts and officials familiar with the assets. The expected useful lives are indicated in **Annexure 3E** of this document for reference. Usually useful life depends on the types of material used, but other parameters can also be reliably modelled, such as the exposure of steel products.

Over time, the cities' AM systems will capture data on actual life realised. This will help establish trends as a scientific basis for estimating the expected useful lives of assets and possibly determining other key influencing factors. The EULs should be informed by documented life-cycle strategies for each component type. Guidance on the development of life-cycle strategies, including examples, is provided in **Module 6: Life cycle planning**

The EULs of component types stated in **Annexure 3E** are considered generally to be within a reasonable tolerance of what may be normally expected given the operating regime in the cities. However, certain component types are susceptible to significant differences in expected life in certain situations – for example mild steel in corrosive (e.g. coastal) areas, or gravel roads in areas with high rainfall. These specific but significant influencing factors are indicated in the Annexure.

Land assets and (normally) servitudes are considered to have infinite lives and are not depreciated.

> *"The EUL of an asset is influenced by a wide range of factors such as the operating environment and standard of manufacture or construction."*

C RESIDUAL VALUE (RV)

Provision is made in the asset register to record the residual values of assets. The figures indicated in Annexure 3E are similar to the EULs in that they have initially been based on industry norms and expert judgement. The residual values are expressed as a percentage of the CRC. Once again, these figures will be able to be reviewed from time to time in the future, based on actual data, as this is accumulated in the cities.

D REMAINING USEFUL LIFE (RUL)

Assessment of the RUL of assets is a critical element of a valuation and indeed for forecasting renewal needs. It is typically influenced by the age of an asset and its condition, though it may also be influenced by commitment to replace or dispose based on capacity or performance considerations. For example hydraulic modelling and master-planning may indicate that a pipe might need an upgrade to cater for increased flows before it is at end of life. The approach to determine remaining useful life needs to be informed by the availability, and relative accuracy, of data on these parameters. The algorithm that has been adopted is indicated in **Figure 3.16.**

Even when the entity must measure (value) an existing asset for the first time, such as when the asset in question has been transferred to one entity from another entity, but the age of the asset is not known, it still remains possible to calculate DRC. In such a case, the condition of the asset is assessed using the asset condition-rating scale described in the Maintenance Planning Guideline for Public Buildings. **Each condition grade carries an indicative median RUL, allowing for calculation of the DRC, as follows:**

Example:

The asset's age is unknown, but assets of this type have an estimated useful life of 20 years (240 months), a CRC of R110 000, and a RV of R10 000. The condition of the asset is assessed, and a condition grading of "good" is attached to the asset. The median of the RUL range for a condition grade of "good" is 58%. The RUL of the asset is then 139 months, or 11 years and 6 months (EUL of 20 years x 58%).

DRC = (110 000–10 000) x 139/240 = R57 917

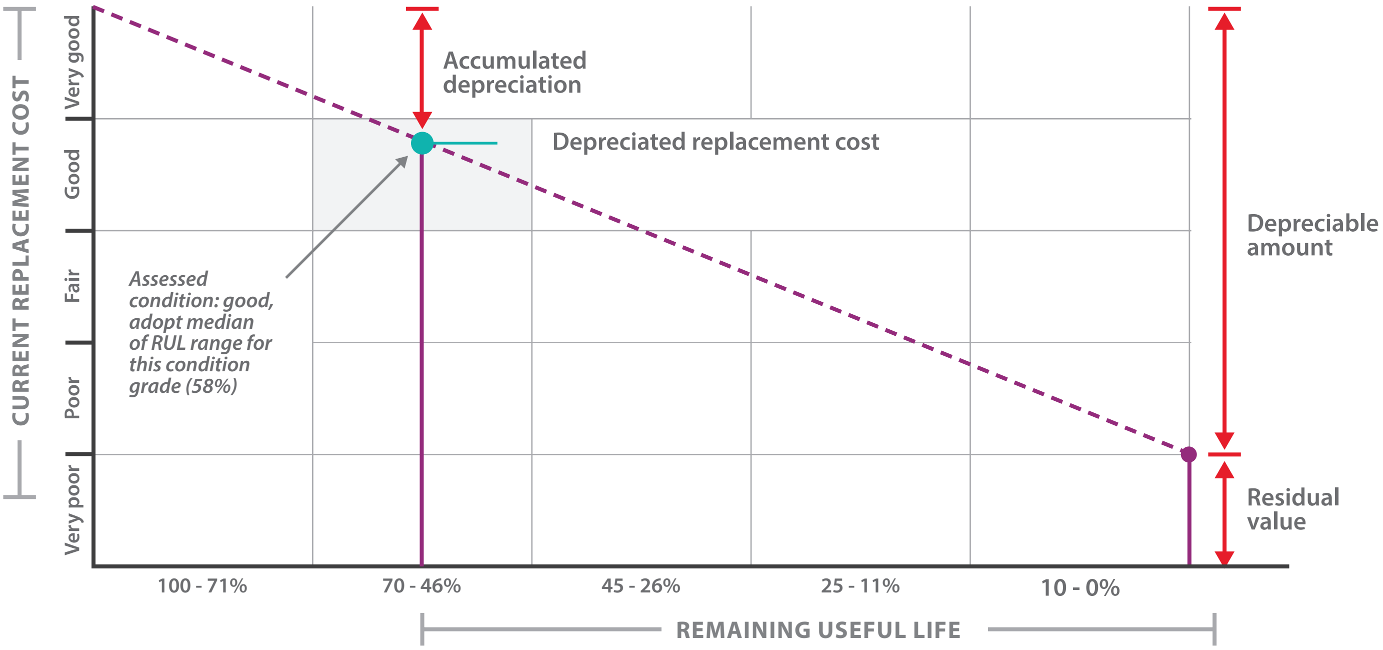


FIGURE 3.12: *Using DRC to determine RUL and carrying value where the age of the asset is unknown*

MULTIPLE APPLICATIONS OF DRC

The DRC method is considered the most appropriate measurement basis for immovable assets applied for service-delivery purposes, for the following reasons:

A FAIR VALUE PRESENTATION

The carrying value of an asset maintains the positive attribute of being a fair representation of the remaining value of the asset, regardless of the length of time that the asset has been in use or will remain in use.

B SUFFICIENT PROVISION FOR FUTURE RENEWAL OF ASSETS

The level of depreciation is determined by the current replacement cost of the asset, the expected useful life, and the current condition of the asset. As a result, there is at any time sufficient provision for depreciation to fund asset renewal or replacement, assuming of course that depreciation is included in cost-reflective tariffs.

C ASSET LIFE-CYCLE PLANNING

The DRC method is ideal for determining asset value, risk exposure and asset renewal needs at the asset component level, or at rolled-up levels. This means it is suitable for both asset accounting reporting and asset life-cycle planning. To appreciate this statement, have a look at the final sections on infrastructure profiling in this module: all profiles have been prepared using the CRC/DRC methodology.

D VALUING ASSETS WHOSE INITIAL AGE OR VALUE IS UNKNOWN

The DRC method is particularly useful when dealing with assets whose initial values or age have not been recorded, or when dealing with assets whose aggregate values cannot easily be compared against market values.

E PROJECT UNBUNDLING

A further benefit of using a structured DRC valuation methodology is that it is a reliable and effective way to assign actual cost data to components in a scientific manner. There is no longer a need for cumbersome and often inconsistent and unreliable analysis of how costs are allocated to components.

F IMPAIRMENT TESTING

Since the DRC method employs condition assessment of assets, it also lends itself to impairment testing at the asset level. The DRC methodology is required in terms of GRAP provisions to be employed in determining the value of impairment of infrastructure assets (where the principle objective of the assets is not to generate cash). More on the application is provided in **Section 3.3.5.**

To appreciate the superiority of DRC over the cost model to fairly present asset value and provide for depreciation, consider the following example:

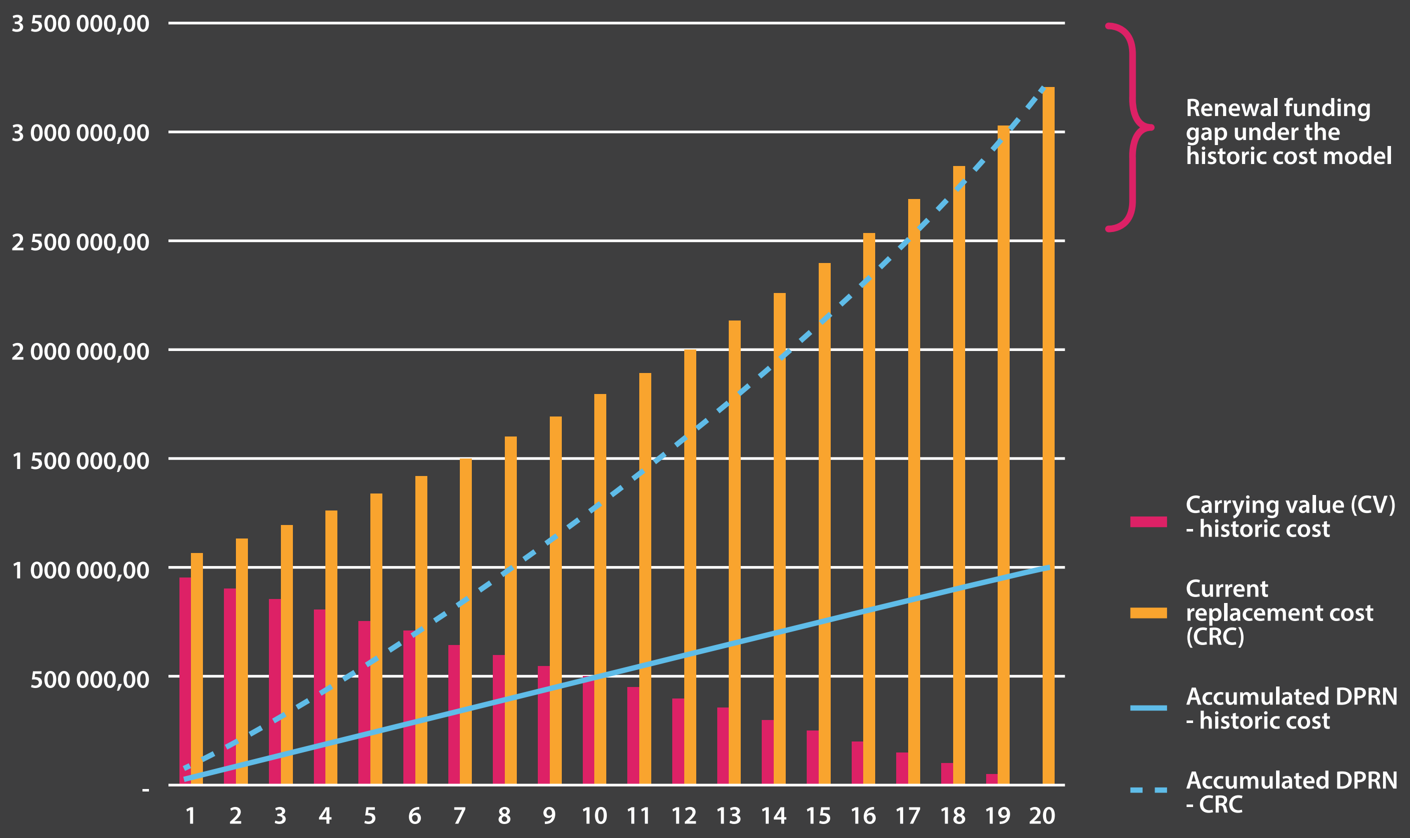
CASE STUDY 1:

The superiority of the DRC method over historic cost

FACT SHEET AND CALCULATIONS:

A 300 kℓ reservoir was constructed in 1993 at a cost of R 890 526. The current replacement cost (CRC) of the reservoir as at 30 June 2013 would have been in the order of R 2 856 038. **The financial position of the reservoir at this reporting date would have been:**

MEASUREMENT BASIS	CARRYING VALUE	ACCUMULATED DEPRECIATION	ANNUAL DEPRECIATION
DRC (fair valuation)	1 457 602	1 398 437	73 089
Componentised historic cost	463 876	426 650	22 790
Bundled historic cost	454 170	436 356	24 044



ANALYSIS AND CONCLUSION:

Measured against the life spans of its longer-life, high-value components (pipe work 80 years, civil structures of about 50 years), about a third of the life of the reservoir has been consumed by 2013. At that point the CRC was close to R 2.9 million – more than three times the original acquisition cost – and will continue to rise over the next 40 years until replacement of the reservoir. Yet the total amount available for asset renewal or replacement through depreciation provisions using the historic cost method would forever remain fixed at R 890 526. This amount is woefully insufficient to replace the reservoir now or at any point in the future. Accounting for the reservoir using the DRC mechanism, on the other hand, would ensure that sufficient provision for replacement is made through depreciation charges that continually keep track with escalation in CRC.

VALUATION ACCURACY

A data confidence grading is given to the accuracy of each entry into the valuation and accuracy calculated for the overall valuation (the scale adopted is indicated in **Section 3.3.6**). It is not necessary or appropriate to pursue 100 per cent accuracy in all data, but rather to consider the required accuracy to support effective reporting, planning and decision making. The target overall accuracy for valuations should be a minimum of 90 per cent ("minor inaccuracies"). It is noted that the accuracy of data deteriorates over time (it is estimated at up to six per cent per year), and that cities need to use robust processes on a continuous basis to maintain the desired level of data accuracy.

3.2.3 Attribute data

The need for effective componentisation, the design of the asset hierarchy, asset location and the approach to valuation have been described in the previous sections of this module. The specific properties of any given component type, for example its extent, size or material, are also often necessary to model its value or useful life. Other information is likely to be needed, at least in some circumstances, to identify exactly which component it is (for example Pump No 5) or record its serial number.

The following categories of component attribute data are relevant:

- Location (of the component in the facility) – **Table 3.7;**
- Extent – **Table 3.8;**
- Nature – characterised as: type, size, class, and a general descriptor;
- Value – for asset accounting (Cost, Carrying Value, Accumulated Depreciation, and FY Depreciation) as well as CRC, DRC and CRC-based annualised depreciation;
- Criticality – **Table 3.9;**
- Expected and remaining useful life; and
- Failure mode status.

TABLE 3.7: *Location data*

COMPONENT TYPE	WARD	SUBURB	SERVICE-DELIVERY AREA	STAND (SG CODE)	MAP FEATURE ID	ADDRESS	COORDINATES
Site-based	Desirable	Desirable	Desirable	Essential	Essential	Essential	Desirable – per site
Linear infrastructure	Desirable	Essential	Desirable	Desirable where applicable	Essential	Optional	Optional (indicative)
Grouped infrastructure	Desirable	Essential	Desirable	Optional	Essential	Optional	Optional (indicative)
Infrastructure land	Desirable	Essential	Desirable	Essential	Essential	Optional	Optional (indicative)

"The specific properties of any given component type...are also often necessary to model its value or useful life."

Table 3.8 illustrates an example of the data fields for recording attribute data, as well as the units of measurement – according to the component type. The cells highlighted in grey are compulsory fields as they are used to determine EUL or unit rates. The data fields required for all component types are provided in **Annexure 3D – Asset attribute data.**

TABLE 3.8: *Example of the approach to provide attribute data*

COMPONENT TYPE	DESCRIPTOR TYPE	DESCRIPTOR SIZE	UNIT SIZE	DESCRIPTOR CLASS	EXTENT	EXTENT MEASURE	UNIT RATE (VALUE) MEASURE
Air conditioning	Type of installation					Sqm aircon area	Sqm aircon area
Channel	Type of installation		m width			Sqm face	Sqm face
Control panel	Type of installation					No	No
Earth structure						Cum	Cum
Earthworks	Terrain			Construction type		Sqm plan	Sqm plan
Gearbox			kW			No	No
Landscaping	Type of installation					Sqm	Sqm
Lifts						Lift floors	Lift floors
Masonry structure	Type of installation					Cum bwk	Cum bwk
MV cable	Material		A	Sqmm		Linear m	Linear m
MV transformer	Type		kVA			No	No
Pipe – sewer	Material		mm			Linear m	Linear m
Pipe – storm-water	Material		mm			Linear m	Linear m
Pipe - water	Material		mm			Linear m	Linear m
RC structure						Cum	Cum
Road bridge substructure	Material					Sqm	Sqm
Road bridge superstructure	Material					Sqm	Sqm
Road structural layer				Road class		Sqm	Sqm
Road surface		width (m)		Road class		Linear m	Sqm
Street lights	Type					Linear m	Linear m
Tank	Material					kℓ	kℓ
Tennis court	Type					No	No
Timber pole structure	Type					Linear m	Linear m
Transformer NER				A		No	No
Valve - water			mm			No	No
Walls	Type			Type of building		Sqm floor area	Sqm floor area

The approach to the "criticality grading" of components is indicated in **Table 3.9.** Criticality shows the potential impact should the component fail. It is purposefully presented in a generic and qualitative form for ease of application across a large number of components. Cities may initially elect to use default data (such as large pipes are assumed to be more critical than others etc.), or apply a more scientific (qualitative or semi-qualitative) approach in terms of their overarching risk management framework (for example modelling the aggregate customer down-time in the event of failure).

TABLE 3.9: *Criticality grading*

CRITICALITY GRADE	CRITICALITY DESCRIPTION	CONSEQUENCE OF FAILURE	QUALITATIVE DESCRIPTION
1	Cursory	Insignificant	Is readily absorbed under normal operating conditions
2	Non-critical	Minor	Can be managed under normal operating conditions
3	Important	Moderate	Can be managed but requires additional resources and management effort
4	Critical	Major	Will have a prolonged impact and extensive consequences
5	Most critical	Catastrophic	Irreversible and extensive impacts, or significantly undermining key business objectives

An optional, more advanced, (semi-qualitative) criticality grading is indicated in **Annexure 3F** – which helps to better quantify risk, which in turn will aid better decision making.

3.2.4 Identification referencing

It is a good idea to physically label the component location and also the component (where relevant) for ready identification. The facility and component location reference codes should reflect the functional location hierarchy. The components should reflect the asset hierarchy and, where applicable, a serial number. Asset referencing codes will be system specific.

ABOVE-GROUND FACILITIES:

- Roads generally already have names and sign boards (and will not therefore need additional referencing);
- Facilities and buildings – it is common practice at facilities with public access to provide signage on building names and numbers, and this should also be applied at all facilities and buildings – this will generally be enough, i.e. it will not be necessary to label components such as the roof, floors etc.);
- Process units and elements/equipment positions (for example at treatment works, substations etc.) should have clearly displayed names and/or block numbers, and the equipment plinths marked with the functional location (unless under water, when an alternative location can be used for the label).

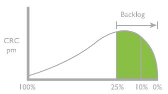
BELOW-GROUND INFRASTRUCTURE:

- Pipes, cables – ideally location points should be marked during construction (e.g. marked on kerbs), and large infrastructure with marker posts.

Robust labels (for example with serial numbers) should also be attached to equipment that is sometimes moved, possibly to another location, or for repairs.

3.2.5 Failure modes and criticality models

FAILURE MODES



Assets and components fail in a variety of ways. In the context of this model, "failure" is considered anything that may cause a city to replace/renew, upgrade or decommission an asset. In order to be able to collect data and information (especially when combined with the criticality data to establish risk exposure), there is a need to standardise categories of failure. **Accordingly, the following four failure modes have been adopted:**

- Condition
- Capacity (based on utilisation)
- Performance
- Cost of operation (which can be interpreted in some applications as obsolescence)

The failure mode status is reported in the form of a five-point grading scale. As with the other grading scales, the data can be entered based on high-level reviews (for example through interviews with officials who are familiar with the assets) or based on scientific reports, detailed inspections and analysis. Some failure modes will tend to be more dominant than others depending on the operating environment and component types (for example, capacity tends to be a dominant failure mode for electricity supply, whereas the condition of roads tends to be a dominant trigger for renewal interventions). Of course, one has to monitor all the relevant failure modes, as one may dominate over the other in certain instances (for example, electrical equipment may simply get too old, or roads may be in good condition, but may need to be widened to increase capacity, or reconfigured to reduce accident frequency – i.e. performance). **Table 3.10** indicates the generic (integration and reporting level) grading scales for the failure modes.

TABLE 3.10(A): *Failure mode grading scales*

GRADE	UTILISATION GRADES	COST-OF-OPERATION GRADES	PERFORMANCE GRADES
	DESCRIPTION		
1	Not used	Substantially below norm	Substantially exceeds requirements
2	Underused	Moderately below norm	Moderately exceeds requirements
3	Normal use (including strategic redundancy)	Within norm	Meets requirements
4	At capacity	Moderately exceeds norm	Moderate non-compliance
5	Overloaded	Substantially exceeds norm	Substantial non-compliance

TABLE 3.10(B): *Condition grading scale*

GRADE	DESCRIPTION	DETAILED DESCRIPTION	INDICATIVE RUL
1	Very good	Sound structure, well maintained. Only normal maintenance required.	71 – 100% EUL
2	Good	Serves needs but minor deterioration (< 5%). Minor maintenance required.	46 – 70% EUL
3	Fair	Marginal, clearly evident deterioration (10–20%). Significant maintenance required.	26 – 45 % EUL
4	Poor	Significant deterioration of structure and/or appearance. Significant impairment of functionality (20–40%). Significant renewal/upgrade required.	11 – 25% EUL
5	Very poor	Unsound, failed needs reconstruction/replacement (> 50% needs replacement).	0 – 10% EUL

These generic grading scales need to be interpreted for different component types, as illustrated in **Tables 3.11 to 13**. The parameters and measures that are adopted need to be in line with the monitoring regime adopted by the respective cities, with updating based on how accurate the data needs to be. The failure mode status should also be aligned with the corporate objectives of the respective cities and their corporate performance and risk management framework.

UTILISATION GRADE	DESCRIPTION	PIPE VELOCITY (M/S)
1	Not used	Nil
2	Underused	≤0.05
3	Normal use	>0.05≤0.7
4	At capacity	>0.7≤1.5
5	Overloaded	>1.5

TABLE 3.11: *Example of specific grading scale – utilisation of water distribution pipes*

PERFORMANCE GRADE	DESCRIPTION	NO. OF BURSTS OVER LAST 3 YEARS (WEIGHTED 50/30/20)
1	Substantially exceeds requirements	<3
2	Exceeds requirements moderately	>3 ≤ 5
3	Meets requirements	>5 ≤ 7
4	Moderate non-compliance	>7 ≤ 10
5	Substantial non-compliance	>10

TABLE 3.12: *Example of specific grading scale – performance of water reticulation*

GRADE	CONDITION	DESCRIPTION	TYPICAL ACTIONS REQUIRED
1	Very good	Very few slight surfacing defects or no surfacing defects.	None
2	Good	Few surface defects. Slight evidence of surface cracking/surface failures/aggregate loss. Severity of defects is low.	None
3	Fair	Intermittent/scattered/general occurrence of surfacing defects with moderate severity. Binder becoming dull and brittle/ distinct surface cracks visible from moving vehicle with some spalling/aggregate loss becoming easily discernable from moving vehicle/significant surface failure diameters of ~ 150mm. More severe surfacing defects are only localised in extent.	Sealing of wider non-structural cracks/patching of surface failures
4	Poor	A general more frequent occurrence of surfacing defects with high severity. Binder dull and brittle/surface cracks opening up with spalling/aggregate loss easily discernable from moving vehicle/significant surface failure diameters of ~ 200mm.	Sealing of wider non-structural cracks/patching of surface failures/diluted emulsion
5	Very poor	An extensive occurrence of surfacing defects with high severity. Binder very dull and brittle/surface cracks open with severe spalling/general disintegration of surface layer/surface failure diameters of ~ 300mm over large areas.	Sealing of wider non-structural cracks/patching of surface failures followed by new surfacing (Reseal/ thin overlay)

TABLE 3.13: *Example of specific grading scale – condition of road surface*

EXPOSURE TO FAILURE RISKS

The failure mode data can be combined with the criticality data to work out risk of failure. This can be at component level, rolled up for certain component types, or in geographic areas. While this could be done at a basic arithmetic level using Failure Mode Grade x Criticality Grade, the risk exposure of a new critical component is in a higher bracket than a non-critical asset in very poor condition. Consequently the risk matrix in **Figure 3.13** has been adopted.

FIGURE 3.13: *Risk matrix*

LIKELIHOOD \ IMPACT	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	Medium	Very high	Very high	Very high
Likely	Medium	Medium	High	Very high	Very high
Moderate	Low	Low	Medium	High	Very high
Unlikely	Very low	Low	Low	High	High
Rare	Very low	Very low	Low	High	High

A more sophisticated (semi-qualitative) criticality and likelihood method is illustrated in **Annexure 3F**, which cities may decide to adopt.

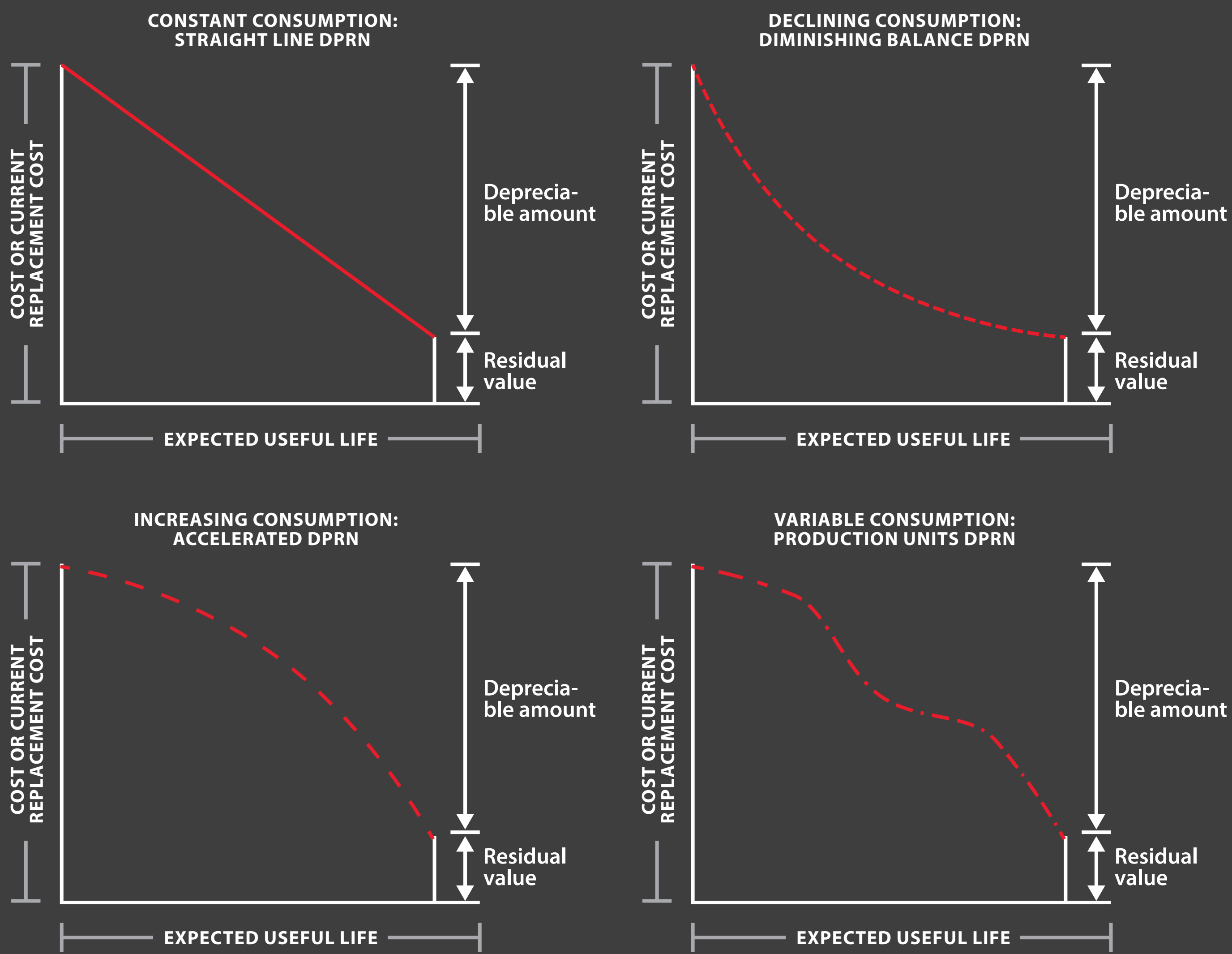
DETERMINING REMAINING USEFUL LIFE

In determining the Remaining Useful Life (RUL) of a component, start by considering its condition, and then relate this to its expected useful life (which, as previously noted, is linked to the respective life-cycle strategy). When there is no definitive data (or it is uncertain), age data may be considered as an alternative. There are also scenarios where components may be relatively new, and in reasonable condition, but master-planning indicates a need for upgrading (or possible decommissioning). In this case, the RUL will be dictated by any commitment to any such works in the MTEF period. The algorithm used for determining RUL is shown in **Figure 3.15.** The RUL data is key to valuation and financial reporting. It is also a critical aspect of life-cycle modelling, and used as a basis for determining capital renewal needs, priorities and forecasts.

Determining RUL by assessing an asset's condition is a vital aspect of the model. Different assets may deteriorate following different patterns over time, or based on varying levels of, or frequency of, production (i.e. a large pump whose life may be measured in the number of times it is switched on, as opposed to years in operation). These different patterns of consumption and corresponding depreciation methods are shown in **Figure 3.14.**

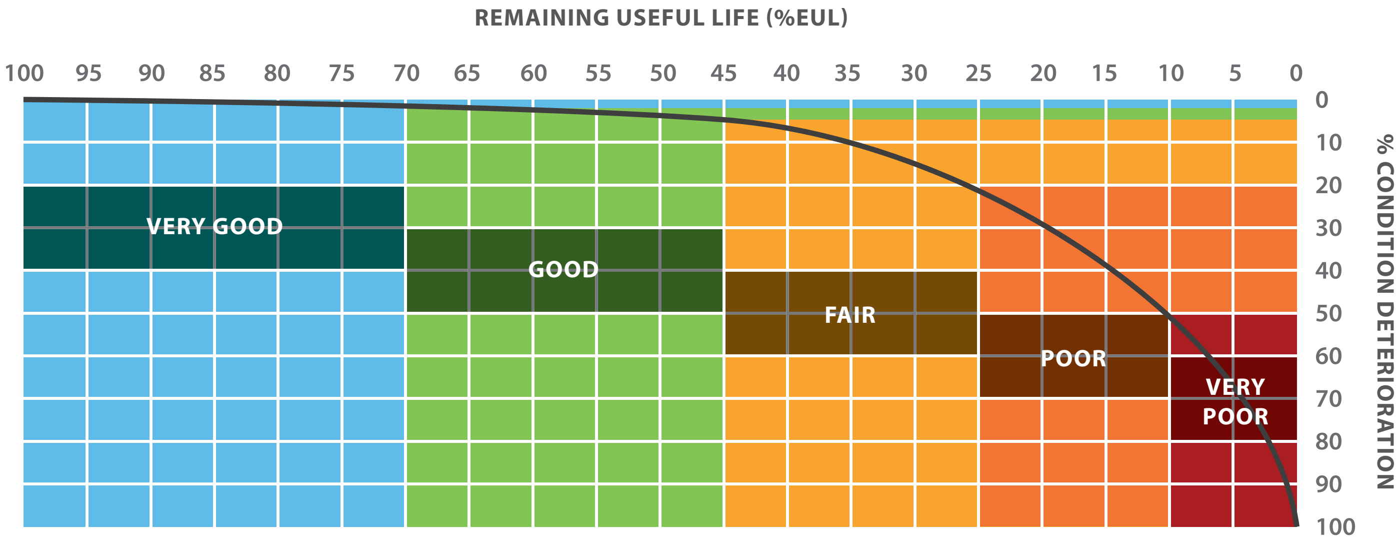
> *"Different assets may deteriorate following different patterns over time, or based on varying levels of, or frequency of, production."*

FIGURE 3.14: *Asset consumption patterns and depreciation methods*



A typical parabolic pattern of condition deterioration is assumed over the expected life of a component, as illustrated in **Figure 3.15.** The curve generally represents most infrastructure components, civil components in particular, and informs the condition grading scale presented in **Table 3.10.b.** Where reliable data is available, and it is possible to recognise different patterns of deterioration relating to specific component types, cities should adjust their data models accordingly. Note that though the deterioration curve is parabolic, the method of depreciation adopted in such instances is the straight-line method.

FIGURE 3.15: *Component deterioration curves*

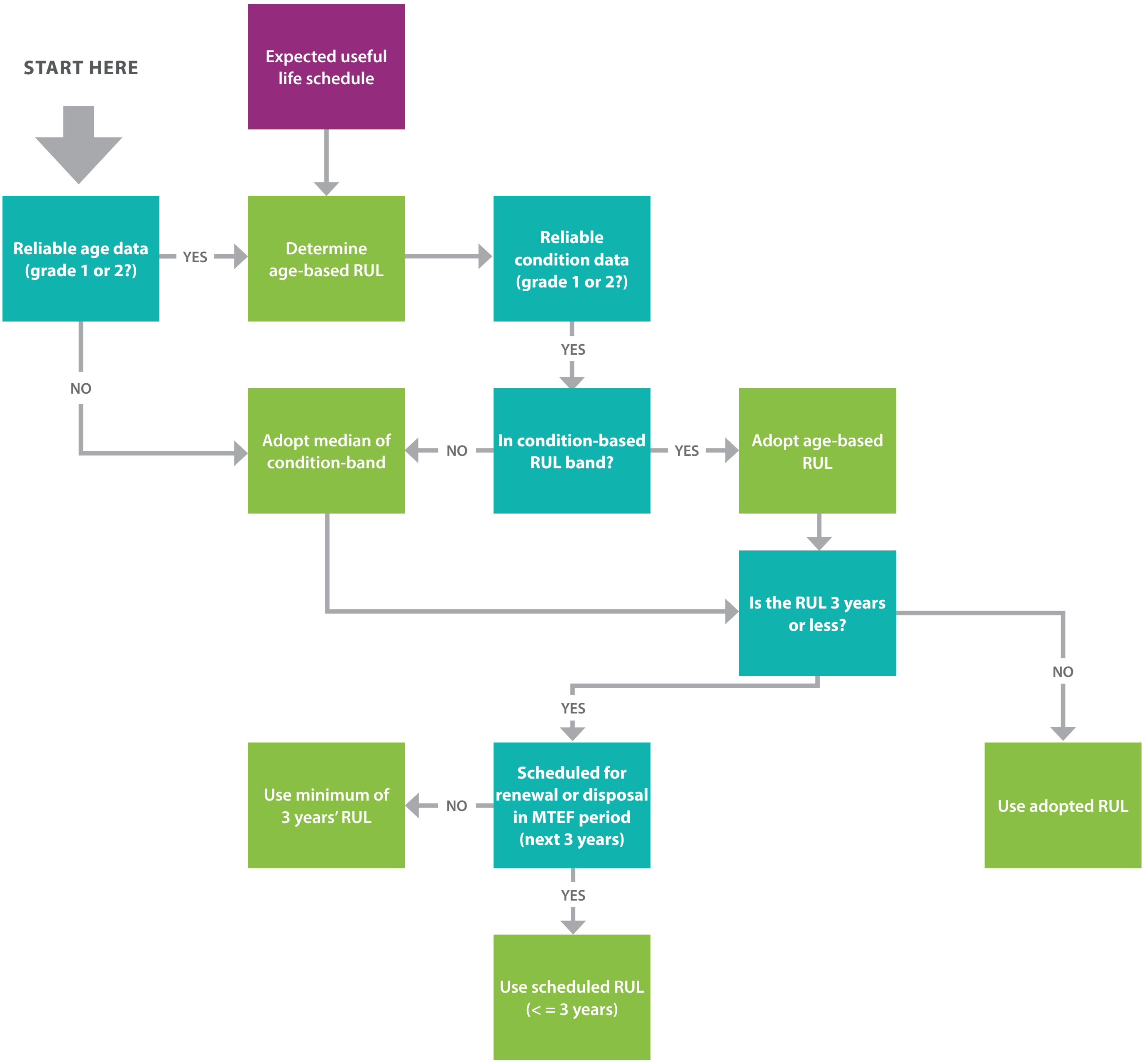


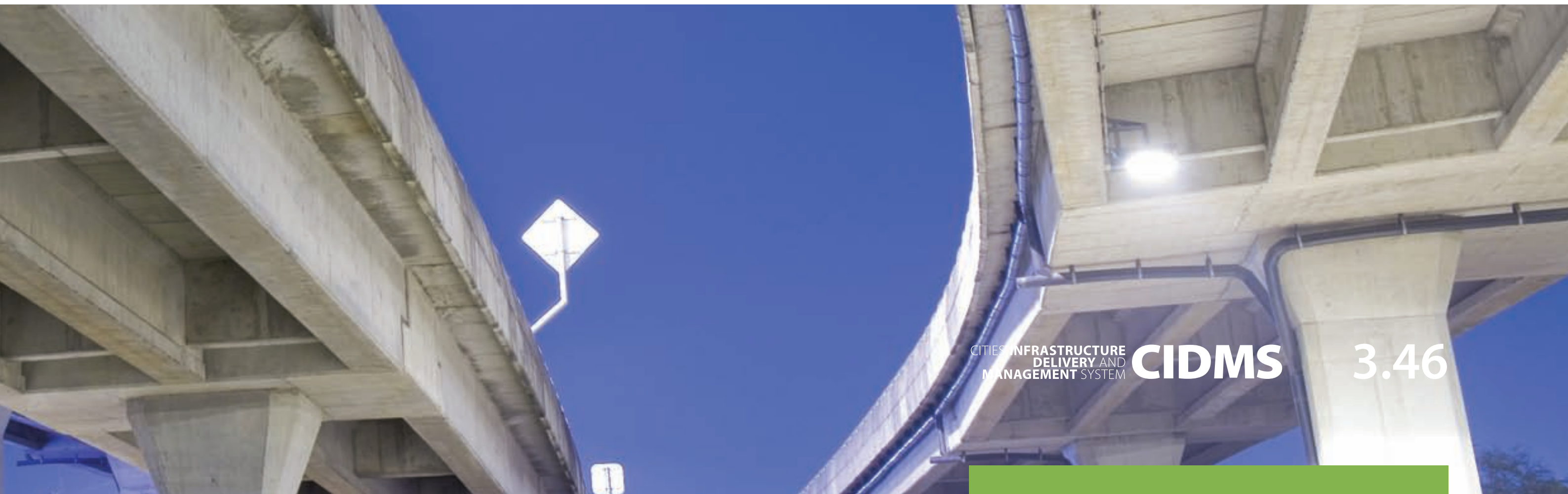
This may appear to be strange reasoning. However, this can be explained with the example of a reservoir with a 50-year life span and constant demand. Users of the reservoir in the first 10 years will consume 20 per cent of the value (service potential or economic benefits) of the asset, and users in the last 10 ten years of the life of the asset will also consume 20 per cent of the value of the asset. Over the life span of the reservoir no single generation of users consume either more or less of the value of the reservoir than another. Each is therefore obligated to contribute to the cost of renewal or replacement of the reservoir at the end of its useful life. Hence depreciation is calculated on a straight-line basis.

In scenarios where the age of the existing asset is uncertain, the remaining useful life can be worked out by assessing its condition, and allocating it the average of the assessed condition band. For example, a road surface of unknown age is assessed to be in fair condition. The median, or average, of the condition band is 35% of the EUL. If the EUL is 12 years, the RUL can be determined as four years.

This same model is adopted to determine the remaining useful life in annual reviews – this recognises that while the majority of components will follow the expected deterioration pattern and pace, there will often be exceptions. For example, some new assets may be found to be in poor condition (for example due to poor construction or abuse), and some old items may still be in good condition due to materials that were used that are no longer affordable. If the age-based RUL is within the assessed condition band, it is not adjusted. However, if it is outside the condition band, the median of the condition-based RUL is adopted.

FIGURE 3.16: *RUL algorithm*





IMPAIRMENT

THE DEFINITION OF IMPAIRMENT IS AS FOLLOWS:
The loss of future economic benefits or service potential of an asset over and above the systematic recognition of the loss of the asset's future economic benefits or service potential through depreciation. Phrased more simply, impairment is what happens when there is an unexpected loss in the value of the asset at a particular date. The impairment loss is calculated as the difference between the carrying value (the value of the asset recorded in the asset register, less accumulated depreciation), and how much the asset would be worth if disposed of at the date that the impairment is recorded – see the figure below:

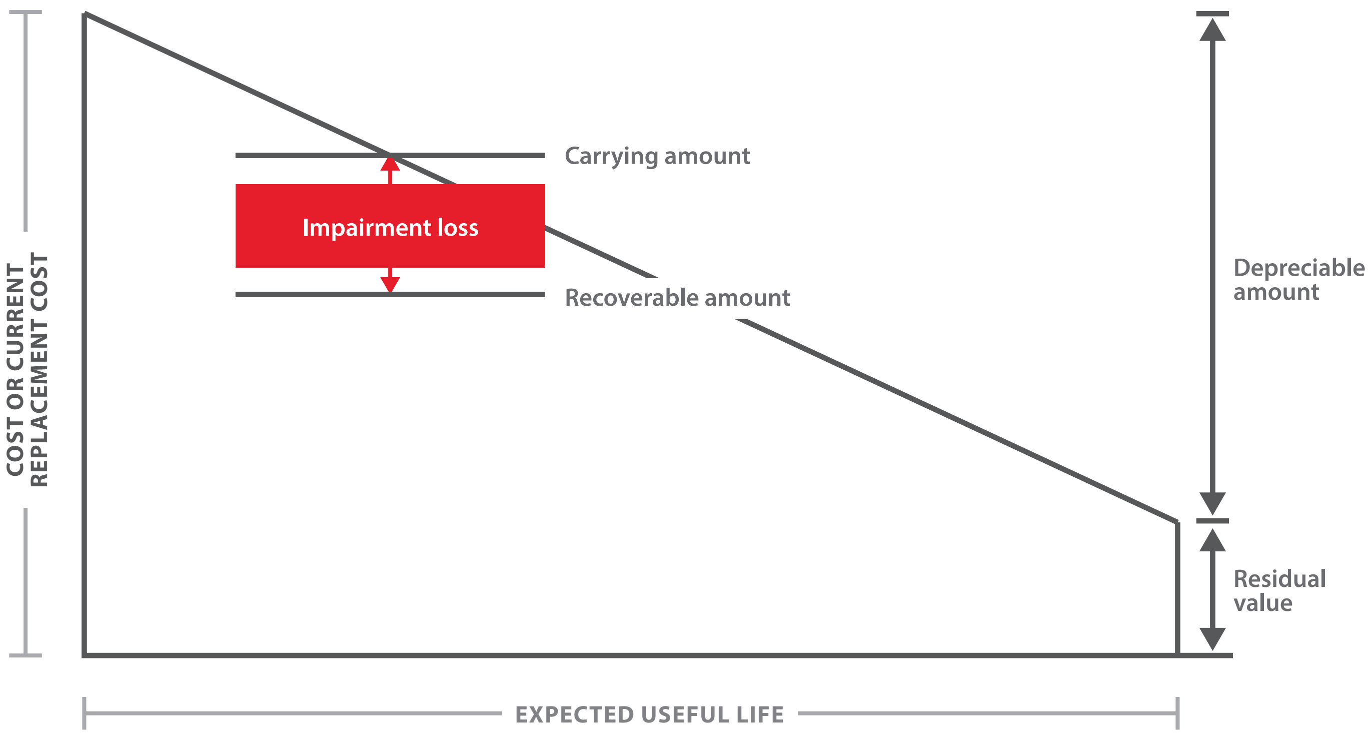


FIGURE 3.17: *Visual presentation of impairment from an accounting point of view*

In the case of infrastructure in the municipal environment, an unforeseen event or one that was not catered for during its design can lead to this loss in functional performance. Impairment events are identified – such as a wash-away of an abutment during a storm, a fire in a building, or occupation by squatters. As previously noted, municipal infrastructure (with the exception possibly of some building facilities) is generally regarded as specialist in nature and therefore commercial valuation methodologies are not appropriate. The items are also generally considered as non-cash generating (i.e. the primary objective is to provide services, not financial returns). Accordingly, the value of an impaired item (component or group of components in a facility) is determined by establishing its value-in-use (in the impaired state at the report date). This is then compared to its carrying value. If the value-in-use is less than the carrying value, the item is impaired accordingly. If the failure mode data is regularly and effectively updated, it can be used as an initial indicator of impairment (e.g. damage affecting the condition, or capacity/performance being impaired and the changes reflected in the respective failure mode grades). The value-in-use is calculated using the Optimised Depreciated Replacement Cost (ODRC) method or the cost-of-damage approach (in cases where this is appropriate).

3.2.6 Data confidence

The model requires that a data confidence grade is attached to all data entry fields in the asset register. Some attribute data may be known to fine levels of accuracy (for example the size of a component), whereas there may be less certainty of the accuracy of other data (such as the length and/or age of an underground cable). In some cases, the data is inherently a judgement call (albeit, hopefully, informed). For example, unit rates are not absolute measures - rather they must be a reasonable reflection of expected actual cost of renewal, given the unpredicatability of competitive tender prices. Condition grades are also not absolute measures, even if based on detailed surveys. **Table 3.14** provides the data accuracy grading system used. Observe that, for the reasons above, the maximum accuracy accorded to data is 95 per cent.

On a cost benefit basis, extremely accurate data is not required, nor even desirable for some data fields (for example condition data on each and every water-reticulation pipe), whereas it is essential that accurate data is maintained, for example, on critical components. Judgement needs to be exercised on how to obtain and maintain data of sufficient accuracy to support the required reporting and modelling. The model also recognises that data confidence diminishes with time. As such, one must make an effort to do periodic reviews, including annual risk-based reviews of changes in remaining useful life in line with GRAP requirements, to ensure accuracy. Using this scale, the target overall data accuracy is over 90 per cent.

GRADE	DESCRIPTION	ACCURACY	EXAMPLES
1	Accurate	95%	Site measurements/detailed technical inspections/tests
2	Minor inaccuracies	90%	Cursory inspections
3	Some estimation	75%	Estimates from aerial photography
4	Significant data estimated	60%	Third-party observations
5	All data estimated	45%	Generic models

TABLE 3.14: *Data accuracy grading*

Data confidence grades are recorded for the following input data:

- Extent;
- Unit rate;
- Age (based on year constructed or last renewed);
- Expected useful life;
- Condition grade;
- Criticality grade;
- Operations cost grade;
- Utilisation grade; and
- Performance grade.

From this, the confidence grade of the valuation and attribute data is determined per component (as indicated in **Table 3.15**) – which can be rolled up (weighted on CRC) per asset, class, or the entire portfolio.

CONFIDENCE GRADE (CG)	METHOD
RUL CG	Average of the implicit accuracy of the greatest of condition and age CG and EUL CGs, converted back into a CG (nearest on 1– 5 scale)
CRC CG	Average of the unit rate and extent CGs, converted back into a combined CG (nearest on 1– 5 scale)
DRC CG	Average of the RUL and CRC CGs, converted back into a combined CG (nearest on 1– 5 scale)
Annual depreciation CG	Average of the CRC and EUL CGs, converted back into a CG (nearest on a 1– 5 scale)
Valuation accuracy	Average of data accuracy grade (in % terms) of (highest of condition and age), (unit rate), (extent), and (EUL)
Attribute accuracy	Average of accuracy grade (in % terms) of CGs for criticality, performance, ops cost, and utilisation grades and coordinates
Overall data accuracy	Weighted (based on CRC) average of valuation accuracy and attribute accuracy

TABLE 3.15: *Derived data confidence grades*

CASE STUDY 2:

Improvement of asset data confidence at Johannesburg Water

As part of its Asset Management Improvement Programme, Johannesburg Water (JW) has improved the confidence in its asset data from 67 per cent to over 90 per cent. A phased approach was adopted, initially leveraging existing data sources, and, where applicable, data emanating from other committed initiatives. Other actions were motivated on a cost-benefit basis. Asset data accuracy has been pegged as a key performance indicator.

Without active management, the potential deterioration of data accuracy has been estimated at 6 per cent per year. It has been recognised that budget is required to maintain the target data accuracy to adequately inform statutory financial reporting as well as to show the portfolio is being well managed with the added benefit of information that appropriately informs future planning.

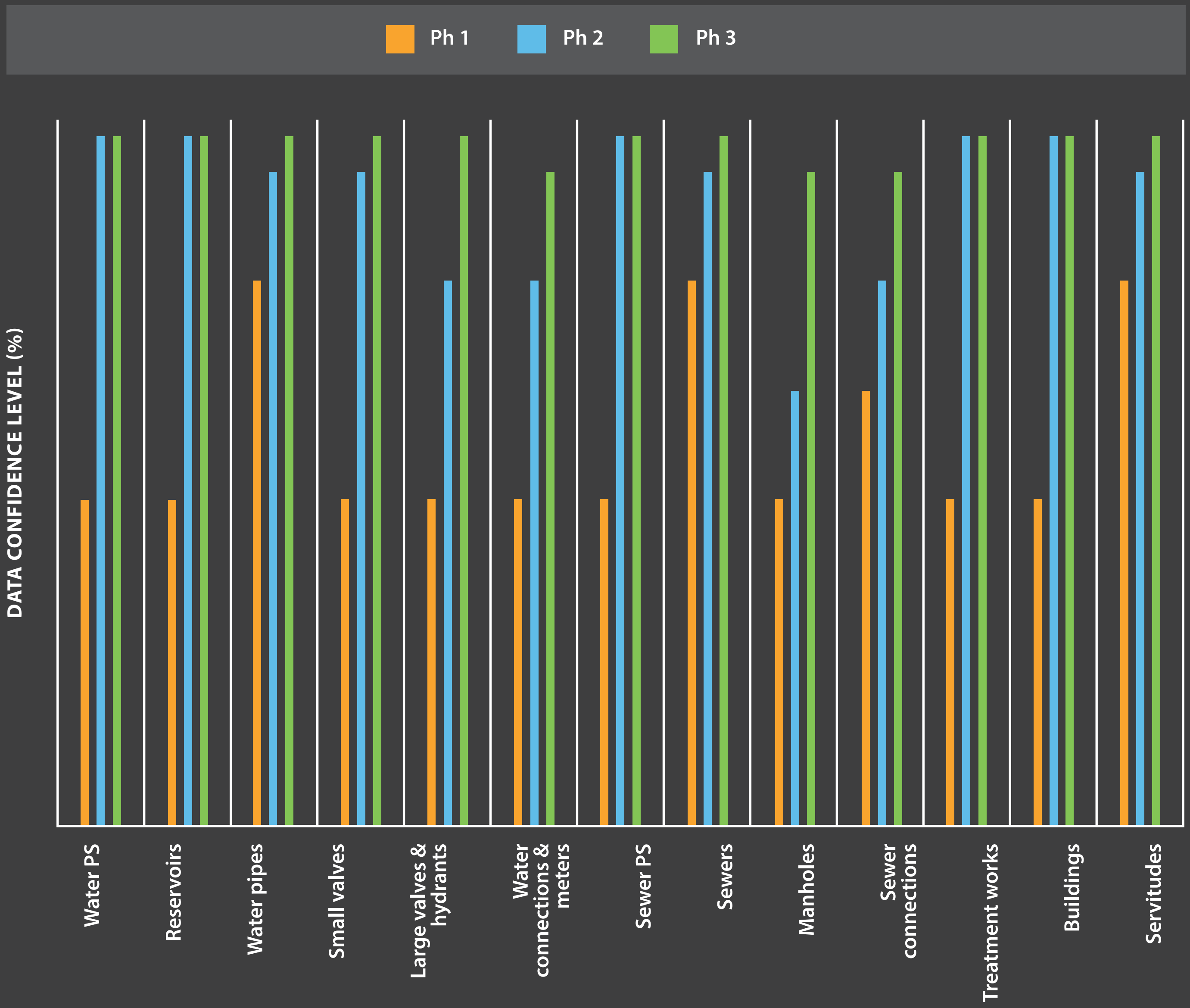


FIGURE: *Improvement in data confidence at Johannesburg Water*

3.2.7 Asset register

To record and report asset data for initial take-on and/or valuation purposes, data is required on the nature, extent, location, and value of the assets, as well as the accuracy of the data. Data established in these conditions is normally first compiled in a Valuation Asset Register (VAR), and signed-off by the valuer and asset custodians. A summary of data to be included in the VAR is presented in **Table 3.16** below, with more detailed requirements listed in **Annexure 3G**. The VAR records the status at a given reporting date. The data fields need to be aligned with the associated reporting and management requirements, and in particular the data models presented in this module.

DATA GROUPS	DATA DESCRIPTION
Description	Overview of the nature, extent, location and classification of the component
Life-cycle status	Information that informs strategic asset management planning – failure mode status, criticality, maintenance needs
Valuation	Current replacement value, depreciated replacement cost, expected and remaining useful life, residual values, impairments
Accuracy	Summary of data accuracy

TABLE 3.16: *Overview of data fields in a Valuation Asset Register (VAR)*

The VAR data is used to establish or update the Financial Asset Register (FAR) as applicable. The FAR, however, needs to hold more data fields as it deals with data movement, such as the remaining life, depreciation, impairments that occur from time to time, change in failure mode status etc. **Table 3.17** indicates the groups of data fields required in the FAR, and the detail is provided in **Annexure 3F.**

DATA GROUPS	DATA DESCRIPTION
Description	Overview of the nature, extent, location and classification of the component
Ownership	Data relating to the responsible department and asset custodian, and control
Opening and closing balances	Financial summary data (that is carried forward to the AFS)
Life-cycle management	Information that informs strategic asset management planning – failure mode status, criticality, replacement value, maintenance needs
Additions	Notes the nature and value of the works that led to the establishment of the item
Impairment	Notes any impairments during the financial year
Depreciation	Notes the depreciation during the year, including review of remaining life/residual values
Reclassification	Summarises the impact in cases where items have been reclassified
Revaluation	Notes the data relating to revaluation (when this option has been adopted)
Derecognition	Notes the treatment and any costs/proceeds of the item as it is derecognised

TABLE 3.17: *Overview of data fields in a Financial Asset Register (FAR)*

3.3 INFRASTRUCTURE PROFILING

This section showcases the possibilities for infrastructure profiling using the asset data model described in **Section 3.2.** These profiles should ideally be generated and presented in Asset Management Plans (AMPs) and the City's Strategic Asset Management Plan (SAMP) (previously titled the comprehensive municipal infrastructure plan in the Department of Cooperative Governance's Local Government Infrastructure Asset Management Guidelines), and they form the basis for the preparation of, amongst other, asset life-cycle plans to be prepared.

The profiles presented in this section focus on:

1. **Portfolio overview:** scope, extent and value of assets, as well as asset consumption
2. **Asset risk profiles,** presented in terms failure mode status and likelihood of failure
3. **Asset renewal profiles** (unmoderated): expected failure patterns and level of investment in renewal required per annum.

Collectively these initial profiles provide the insight necessary to undertake asset life-cycle planning, which is the subject of **Module 6: Life cycle planning.**

3.3.1 Portfolio overview

SCOPE OF INFRASTRUCTURE PROFILES LINKED TO THE SCOPE OF ASSETS BEING MANAGED

Infrastructure profiling starts with an overview of the asset portfolio(s) under consideration. Asset management plans (AMPs) are usually prepared at the level of asset portfolios, but, at the discretion of each city, the scope of an AMP may include interrelated or linked services. It is also possible that the scope of an asset management plan reflects the management control of a particular department, directorate or unit, with similar types of assets supporting multiple services. **The following are general guidelines on how to prepare asset profiles and asset management plans:**

- **As a general rule, infrastructure profiles and asset management plans are prepared for each asset portfolio.**

  Examples of asset portfolios include:

  1. Electrical infrastructure;
  2. Solid waste infrastructure;
  3. Potable water infrastructure;
  4. Roads infrastructure; and
  5. Operational buildings. Each of these asset portfolios have unique characteristics, configurations, service expectations, demand, life-cycle needs, revenue and expenditure profiles and organisational responsibilities, and so are treated separately.

> *"It is also possible that the scope of an AM plan reflects the management control of a particular department, directorate or unit..."*

- **Some asset portfolios can be combined to do infrastructure profiling, analysis and asset management planning, and therefore such asset portfolios can be combined in the scope of an asset management plan.**

  Examples of such combinations include:

  - Combining potable water and sanitation
  - Combining roads (inclusive of signage and road furniture), bridges and storm water, together with other transport-related infrastructure such as railway tracks (unless, of course, those railway tracks are dedicated tracks to supply municipal-owned coal-fired power stations with coal supplies, in which case those railway tracks are included in the electricity asset portfolio)

- **Combining asset portfolios of either similar nature or to reflect management responsibility.** This is typically the case with amenities such as parks, sports and recreation facilities, and other cultural facilities. There are numerous such amenity types, and the task of preparing individual AMPs for each type of amenity may become difficult – in such a case asset portfolios are often combined into one amenities AMP.

Each city's asset management strategy (see **Module 2**) will dictate whether asset portfolios are to be treated individually, or combined with other asset portfolios for asset management planning. The scope of the SAMP includes all asset portfolios managed by a city.

CONTENT AND FOCUS OF PORTFOLIO OVERVIEW

The first part of an AMP or a SAMP includes a portfolio overview with information on the following items:

- Nature of the asset portfolio(s) being considered (e.g. potable water infrastructure);
- Current replacement cost of the asset portfolio(s), excluding the value of land;
- Depreciated replacement cost of the asset portfolio(s);
- Level of asset consumption (for the asset portfolio, calculated as follows: DRC/CRC);
- Annual depreciation of the asset portfolio(s);
- Extent of assets.

An example of a portfolio overview for a city, including all asset portfolios, is presented in Table 3.16. Note the following conventions:

- All asset portfolios are presented on a particular date, normally the end of a financial period (30 June 20xx).
- Each asset portfolio is presented, but grouped to a consolidated infrastructure portfolio, and a consolidated community facilities and operational buildings portfolio respectively.
- In turn, the consolidated portfolios are summarised to reflect the total replacement value, accumulated asset consumption, annual depreciation and extent of assets for the city as a whole.
- Due to the high value of asset portfolios, all amounts are rounded to the nearest R million.

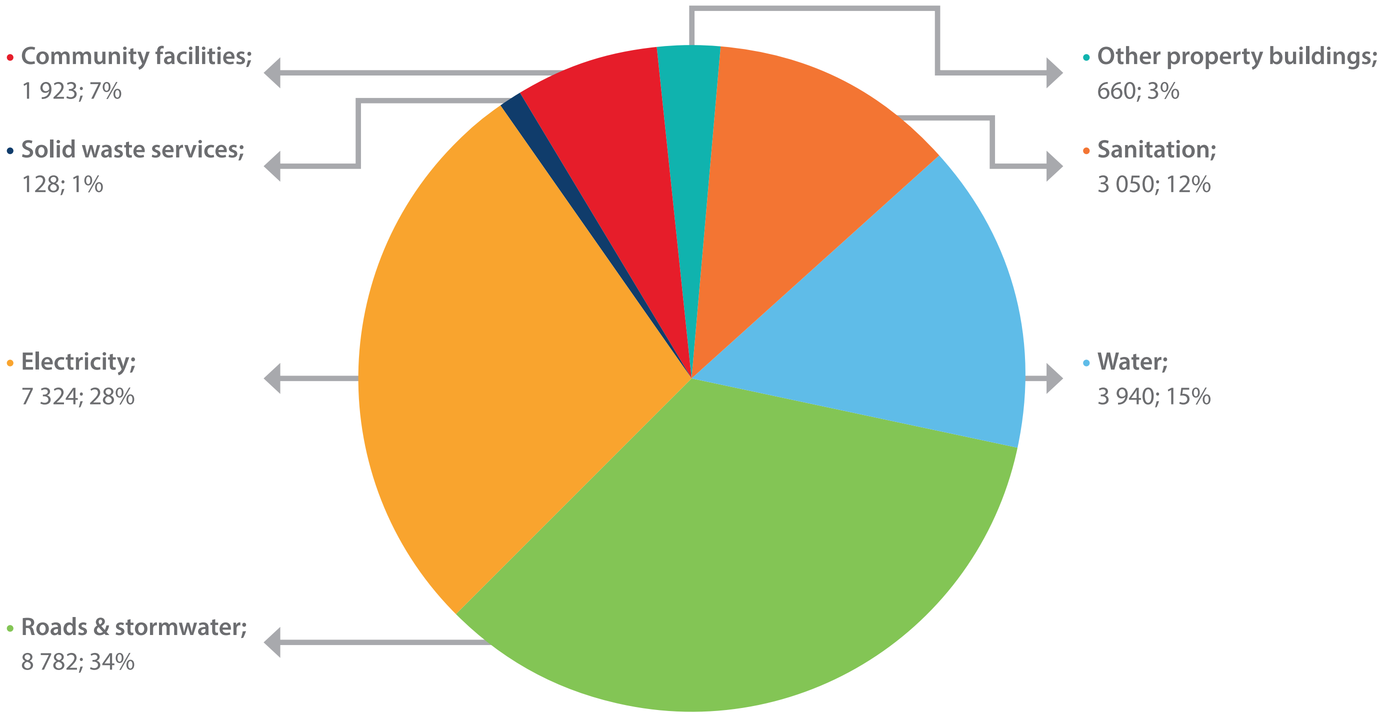


FIGURE 3.18: *Composition of BCMM asset portfolios (R million, % value of combined asset portfolios)*

Due to the large number of asset portfolios presented, it is also useful to present the information in **Table 3.16** in graphical format, example of which is shown in **Figure 3.17:**

Infrastructure portfolio: 30 June 2014	**Sanitation**	Current replacement cost excl. land	R 2.969 billion
		Overall level of asset consumption	60,1%
		Annual depreciation	R 60.55 million
		Number of fixed-point assets	109
	Water	Current replacement cost excl. land	R 3.573 billion
		Overall level of asset consumption	65,8%
		Annual depreciation	R 62.97 million
		Number of fixed-point assets	179
	Roads and storm water	Current replacement cost excl. land	R 8.78 billion
		Overall level of asset consumption	50,2%
		Annual depreciation	R 205.1 million
		Extent of linear assets	3697.9 km
		Number of fixed-point assets	55 631
	Electricity	Current replacement cost excl. land	R 4.394 billion
		Overall level of asset consumption	62,0%
		Annual depreciation	R 90 million
		Number of fixed point assets	15 579
	Solid waste services	Current replacement cost	R 127.8 Million
		Overall level of asset consumption	40,5%
		Extent of linear assets	1.8 km
Community facilities, and operational buildings portfolio: 30 June 2014	**Community property**	Current replacement cost excl. land	R 1.9 billion
		Overall level of asset consumption	47,0%
		Annual depreciation	R 67.6 million
		Extent of linear assets	0
		Number of fixed-point assets	485
	Other property: Buildings	Current replacement cost excl. land	R 0.66 billion
		Overall level of asset consumption	50,0%
		Annual depreciation	R 25.5 million
Buffalo City asset portfolios	**All asset portfolios**	Current replacement cost excl. land	R 22.4038 billion
		Overall level of asset consumption	55,9%
		Annual depreciation	R 513 million
		Number of fixed-point assets	72 196

TABLE 3.18: *Example of an asset portfolio overview profile: Buffalo City Metropolitan Municipality*

Infrastructure profiles provide information to analysts, infrastructure planners, management and other decision makers. Following are some pointers of what to look for in a portfolio overview, and how to assess the information presented, with reference to **Figure 3.17** and **Table 3.16:**

- **Take note of the scope of asset portfolios.** Ensure that all asset portfolios are presented, as would be expected for a city.
- **Consider the average investment per household, measured in CRC.** This serves as both a check on the reasonability of asset values presented, and of the extent to which the municipality invests in service delivery. At the time, Buffalo City had a population of 236 288 households, and the average level of investment in infrastructure per household was therefore in the order of R 109 218. This is more or less in line with what could be expected. Obviously the level of investment per household will depend on multiple factors such as: the geographical size of the municipal area; number of settlements and intensity of densification; age of settlements; size of the local economy; income levels of residents; and other factors. Analysis of several cities, however, shows that the level of investment in infrastructure per household should generally be above the R 95 000 mark. In the event that the level of investment falls below this mark, it is likely that asset value calculations require refinement, or that some asset portfolios (or portions thereof) have been omitted, or both. Excessively high asset values are also questionable, and may indicate either optimistic unit rates or estimates of asset extent, or calculation errors. Of course the possibility exists that the city either underinvested in assets, or overinvested in assets, which itself is valuable information and worthy of further investigation.

- **Analyse the level of investment in the respective asset portfolios. Note the following:**
  1. The roads asset portfolio should generally be the largest by value, accounting for between 30 to 40 per cent of the replacement value of all immovable assets. Any lower, and the municipality is likely to have a constrained economy, latent property market and constrained property rates income base. Any higher, and the municipality will face financial sustainability concerns as the roads portfolio does not directly generate income but accounts for substantial capital investment and operating expenditure. In light of this, the 34 per cent contribution of the Buffalo City roads portfolio is on the mark. For comparative purposes, the corresponding figure for Ekurhuleni is 38 per cent.
  2. The electricity asset portfolio is the single largest revenue generator for the municipality, and should account for close to 30 per cent of replacement value. In the case of Buffalo City 28 per cent is therefore a reasonable investment, especially considering the large rural areas in the metropolitan boundaries served directly by Eskom.
  3. Water and sanitation are also revenue-generating services, and should together constitute the third largest investment in immovable assets. There is no absolute ideal range of investment, given that various cities have different supply and delivery arrangements: some cities take direct responsibility for potable water treatment and eventual waste-water treatment and discharge, while others, in part or wholly, depend on municipal entities or water boards to provide these functions.

- **Next, analyse the level of asset consumption per asset portfolio.** Whenever the level of consumption of an asset portfolio exceeds 50 per cent, there is cause for specific management attention, and generally a need for a structured programme of renewals.

- **Finally, focus on the annual depreciation charge for the city as a whole.** The level of investment in asset renewal should more or less equal the annual depreciation charge, otherwise there is depletion of asset wealth and productive capacity, posing future sustainability or going-concern risks.

The above profile was presented for a whole city, in this case the Buffalo City Metropolitan Municipality. In the event that the profile was presented for a single asset portfolio, such as in an AMP, detail should be presented at the "asset group type" level (typically a facility type, such as pump stations – refer to **Figure 3.1**). Following is an example of a single asset portfolio profile, in this case the potable water infrastructure of the Ekurhuleni Metropolitan Municipality:

ASSET GROUP	EXTENT		CRC (RAND)	DRC (RAND)	DRC/CRC	ANNUAL CONSUMPTION (RAND)
Bulk mains	1 089 618	Linear M	1 636 063 382	771 400 025	47,15%	20 454 660
Distribution	10 357 935	Linear M	3 857 239 742	1 919 502 825	49,76%	107 620 409
PVR stations	7	No	2 945 431	1 551 170	52,66%	110 435
Pump stations	41	No	74 258 630	36 285 605	48,86%	4 036 793
Reservoirs	105	No	628 099 429	328 312 338	52,27%	13 482 163
Total			**6 198 606 614**	**3 057 051 963**	**49,32%**	**145 704 460**

TABLE 3.19: *Example of an asset portfolio overview profile: Ekurhuleni potable water infrastructure*

3.3.2 Asset risk profiles

Risk is the likelihood or probability of an adverse event happening, or phrased differently, the effect of uncertainty on objectives. Asset managers are particularly concerned with risk events that may compromise the ability of the city to deliver on strategic asset management objectives and service commitments. Asset failure models and criticality models were presented in **Section 3.2.5.** Asset risk profiles are developed from the application of these models. Following are some examples:

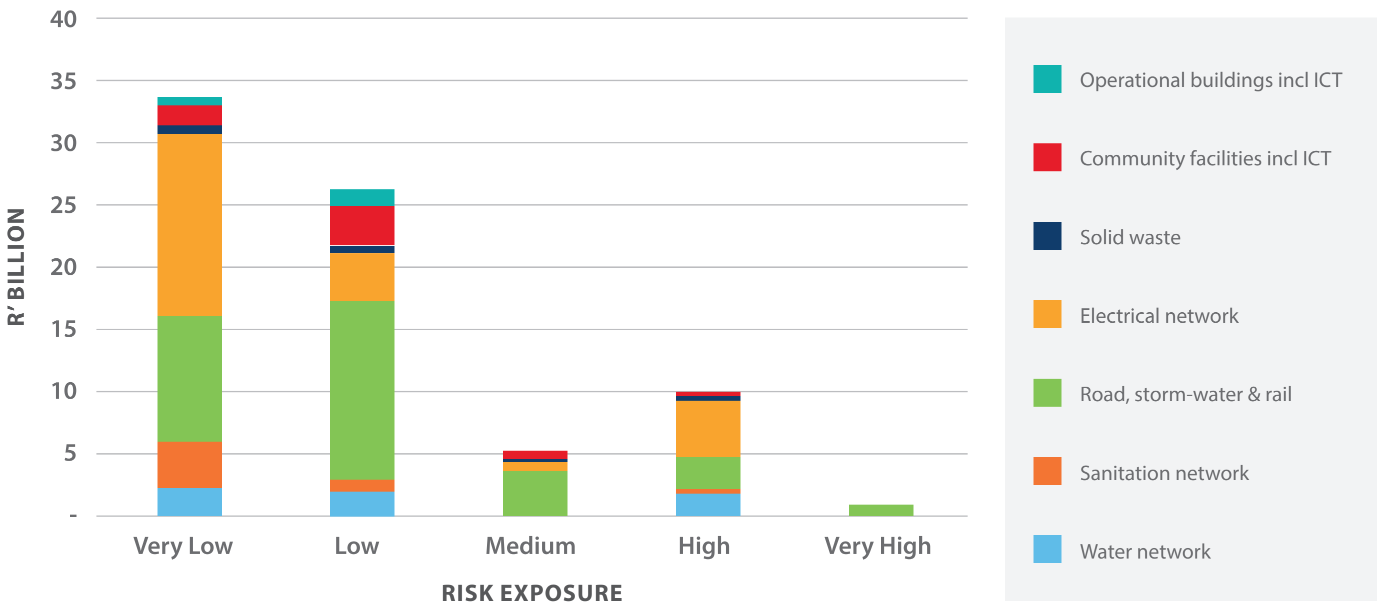


FIGURE 3.19: *Asset risk profiles: Organisation-level condition-based risk (Ekurhuleni)*

An entity-wide condition-based risk profile such as the one presented in **Figure 3.19** is informative on the overall level of condition-based risk exposure, and also on which asset portfolios are at risk. Ultimately, though, more detail is required. **Following is a condition-based risk profile for the potable water asset portfolio:**

FIGURE 3.20: *Asset risk profiles: potable water asset portfolio condition-based risk (Ekurhuleni)*

			INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
BULK MAINS	LIKELIHOOD	Almost certain	-	-	-	670,745	-	670,745
		Likely	-	-	338,865	2,256,113	-	2,594,978
		Moderate	-	-	4,042,620	8,720,596	-	12,763,216
		Unlikely	-	-	7,014,639	24,051,591	-	31,066,230
		Rare	-	-	271,584,602	1,317,383,611	-	1,588,968,213
Total			-	-	282,980,726	1,353,082,656	-	**1,636,063,382**
DISTRIBUTION	LIKELIHOOD	Almost certain	-	1,839,157	1,129,395	-	-	2,968,552
		Likely	-	7,889,982	667,164,186	-	-	675,054,168
		Moderate	-	56,310,765	12,532,427	-	-	68,843,192
		Unlikely	-	49,040,823	8,977,968	-	-	58,018,791
		Rare	-	2,113,051,508	939,303,531	-	-	3,052,355,039
Total			-	2,228,132,235	1,629,107,507	-	-	**3,857,239,742**
PRV STATIONS	LIKELIHOOD	Almost certain	-	-	256	-	-	256
		Likely	-	-	113,338	-	-	113,338
		Moderate	-	-	451,847	-	-	451,847
		Unlikely	-	-	1,271,768	-	-	1,271,768
		Rare	-	-	1,108,222	-	-	1,108,222
Total			-		2,945,431	-	-	**2,945,431**
PUMP STATIONS	LIKELIHOOD	Almost certain	-	--	452,200	-	-	452,200
		Likely	2,631,354	-	16,130,944	-	-	18,762,298
		Moderate	472,402	-	32,369,858	-	-	32,842,260
		Unlikely	39,754	-	13,707,247	-	-	13,747,001
		Rare	144,452	-	8,310,419	-	-	8,454,871
Total			3,287,962	-	70,970,668	-	-	**74,258,630**
RESERVOIRS	LIKELIHOOD	Almost certain	93,349	-	405,360	-	-	498,709
		Likely	2,622,465	36,624	6,516,357	-	-	9,175,446
		Moderate	-	70,000	55,765,492	-	-	55,835,492
		Unlikely	187,035	123,680	75,408,067	-	-	75,718,782
		Rare	34,520	-	486,833,105	3,375	-	486,871,000
Total			2,937,369	230,304	624,928,381	3,375	-	**628,099,429**
WATER SUPPLY	LIKELIHOOD	Almost certain	93,349	1,839,157	1,987,211	670,745	-	4,590,462
		network	5,253,819	7,926,606	690,263,690	2,256,113	-	705,700,228
		Moderate	472,402	56,380,765	105,162,244	8,720,596	-	170,736,007
		Unlikely	226,789	49,164,503	106,379,689	24,051,591	-	179,822,572
		Rare	178,972	2,113,051,508	1,707,139,879	1,317,386,986	-	5,137,757,345
Total			6,225,331	2,228,362,539	2,610,932,713	1,353,086,031	-	**6,198,606,614**

It is often not enough to determine risk exposure at the asset group type level. Cities develop over time. Infrastructure assets, facilities and networks or systems forming part of the overall asset portfolio are constructed and renewed in phases spanning decades. Some areas tend to be more prone to condition-based risk, for example due to: vehicle overloading on certain routes, higher levels of vandalism, or because they are prone to floods.

It is, therefore, also useful to present asset failure mode status spatially, as shown below. This allows the city to develop spatially nuanced service commitments and asset life-cycle strategies, and informs regional spatial development plans on matters such as infrastructure needs in areas targeted for upgrading, infill or urban renewal:

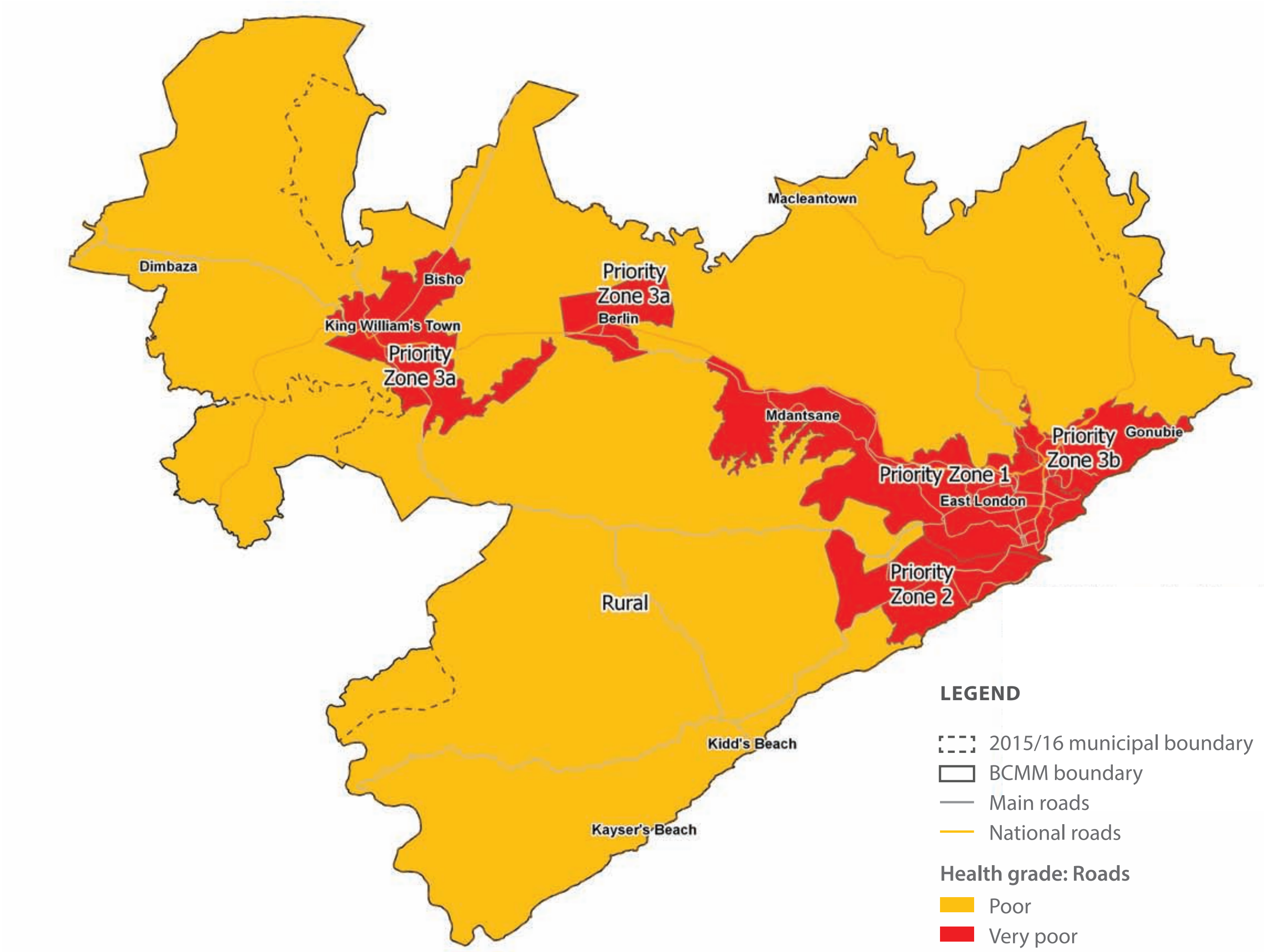
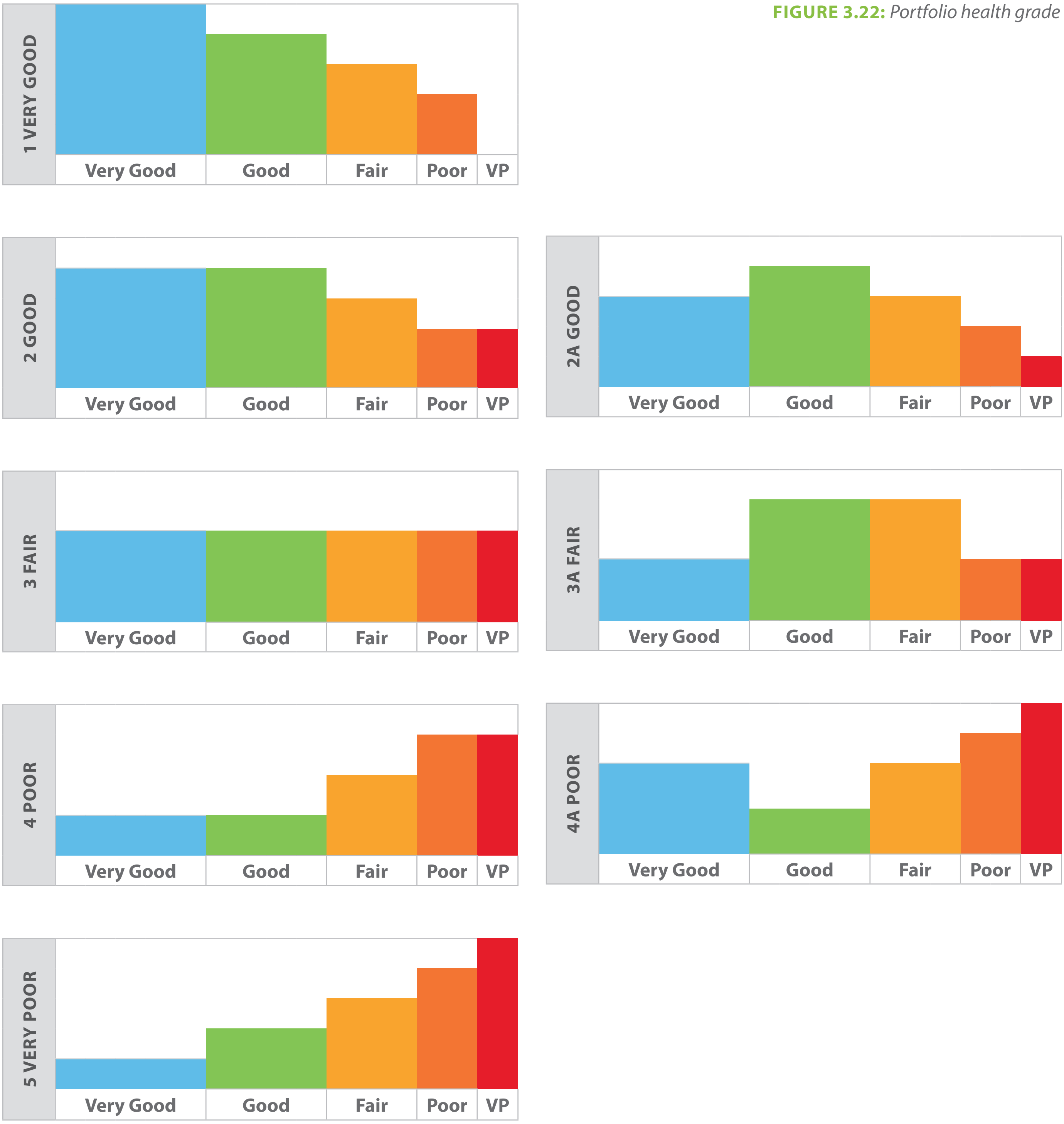


FIGURE 3.21: *Roads condition health status per management region in Buffalo City*

Developing a profile such as the one presented in **Figure 3.21**, required a condition health grade model. This was to classify and interpret condition grade (what does a health grade 2 mean, for example?), and it is this grading that we are consistently applying across asset portfolios and over time. The current condition status of the asset portfolio is characterised by how condition is distributed. It is expressed in the form of a health index as illustrated in **Figure 3.22.**

FIGURE 3.22: *Portfolio health grade*



As can be seen in the figure, for a portfolio to be considered to have a "Very Good" health grade, it should have many more assets in good and better condition, than in poor (or worse) condition. This is typically the position if there has been significant investment in capital programmes (new and renewal works) and there has been sufficient maintenance so that assets are reaching, or exceeding their expected useful life.

These patterns can be characterised in financial terms - the annualised CRC-based depreciation characterises the deterioration of a portfolio. And the ratio of the depreciated value to the new value is indicative of the overall health grade – as depicted in **Table 3.20.**

INFRASTRUCTURE HEALTH GRADE	PORTFOLIO HEALTH DESCRIPTION	(DRC-RV)/(CRC-RV)
1	Very good	61% or more
2	Good	54% to 61%
3	Fair	47% to 54%
4	Poor	40% to 47%
5	Very poor	Less than 40%

TABLE 3.20: *Equating DRC/CRC ratios to portfolio health grade*

Note that the profiles presented in this subsection focused on one failure mode, namely condition. The principles and style of presentation are, however, similar for all failure modes, and the asset data models presented in this module allow for this. Cities should therefore ideally prepare profiles for all failure modes.

3.3.3 *Asset remaining useful life and renewal profiles*

Knowing the current condition of assets is only the departure point. For purposes of renewal programme planning, investment planning and budgeting, it is also necessary to anticipate when assets will reach the end of their useful lives, and the funding required to undertake renewals. These forecasts can be presented in several ways, either in specific periods, such as shown in **Table 3.21** or **Figure 3.23**, or per annum, as shown in **Figure 3.24** and **Figure 3.26.**

ASSET GROUP	REMAINING USEFUL LIFE (CRC AMOUNTS) (R'000)				
	0–5 YEARS	6–10 YEARS	11–20 YEARS	> 20 YEARS	TOTAL CRC
Bulk mains	3 266	12 763	31 066	1 588 968	1 636 063
Distribution	678 023	68 843	58 019	3 052 355	3 857 240
Other	18 876	33 294	15 019	10 015	77 204
Reservoirs	9 305	55 835	75 719	487 241	628 100
Total	709 470	170 735	179 823	5 138 579	6 198 607
Composition	11,45%	2,75%	2,90%	82,90%	100,00%

TABLE 3.21: *Ekurhuleni potable water asset portfolio remaining useful life (replacement value per category)*

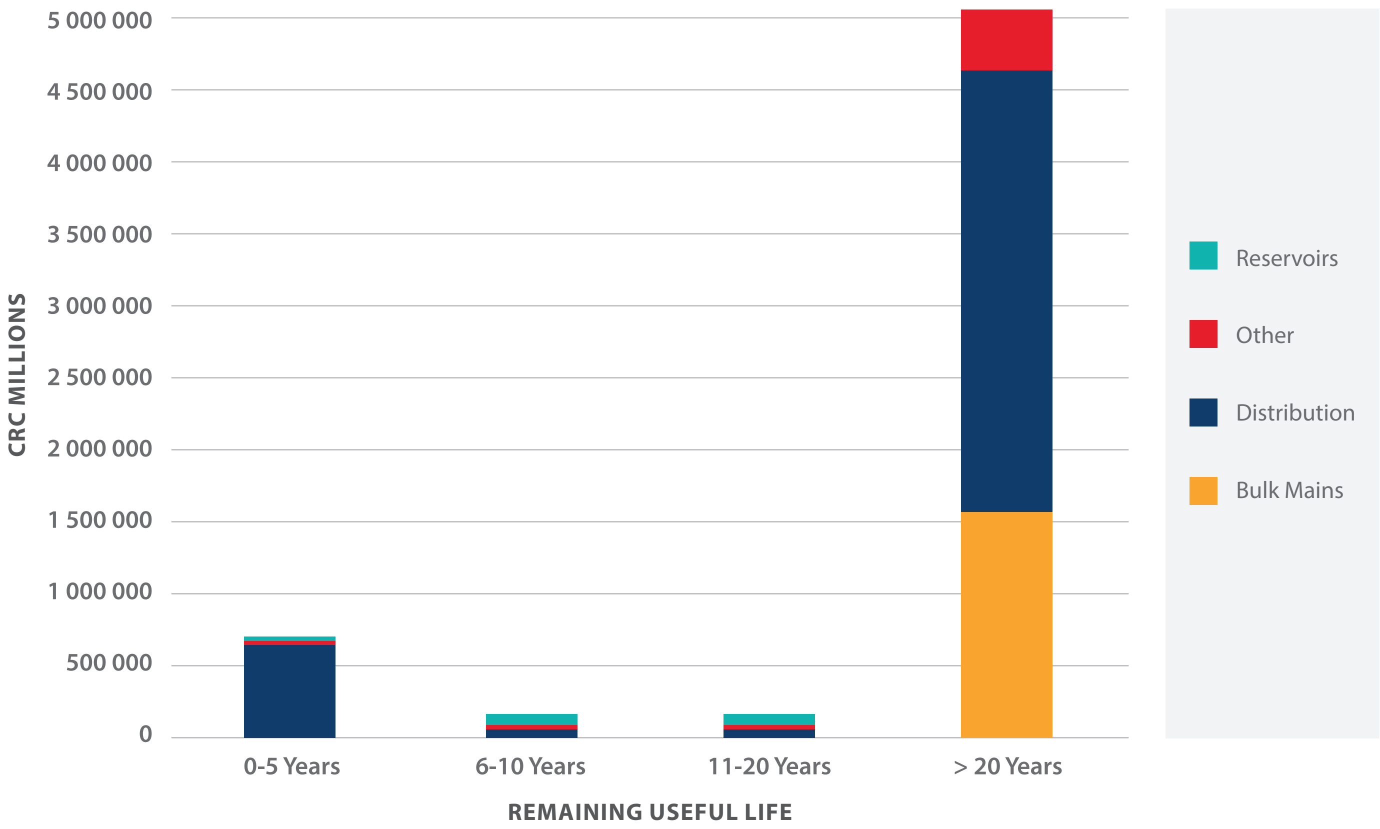


FIGURE 3.23: *Ekurhuleni potable water asset portfolio remaining useful life (replacement value per category)*

Figure 3.24 demonstrates the replacement value of existing assets of Ekurhuleni (all immovable asset portfolios) coming to end of life each year for a hundred-year period. Such a graph can be directly generated from the asset register provided that the asset data model described in this module has been implemented, and is the type of profile that an asset management planner would develop before beginning life-cycle planning. However, to demonstrate some important points for organisation sustainability, a city's fiscal stability and asset management planning, a more advanced graph is presented below. This also shows the renewal needs of future assets to be created, based on an assessment of future demand.

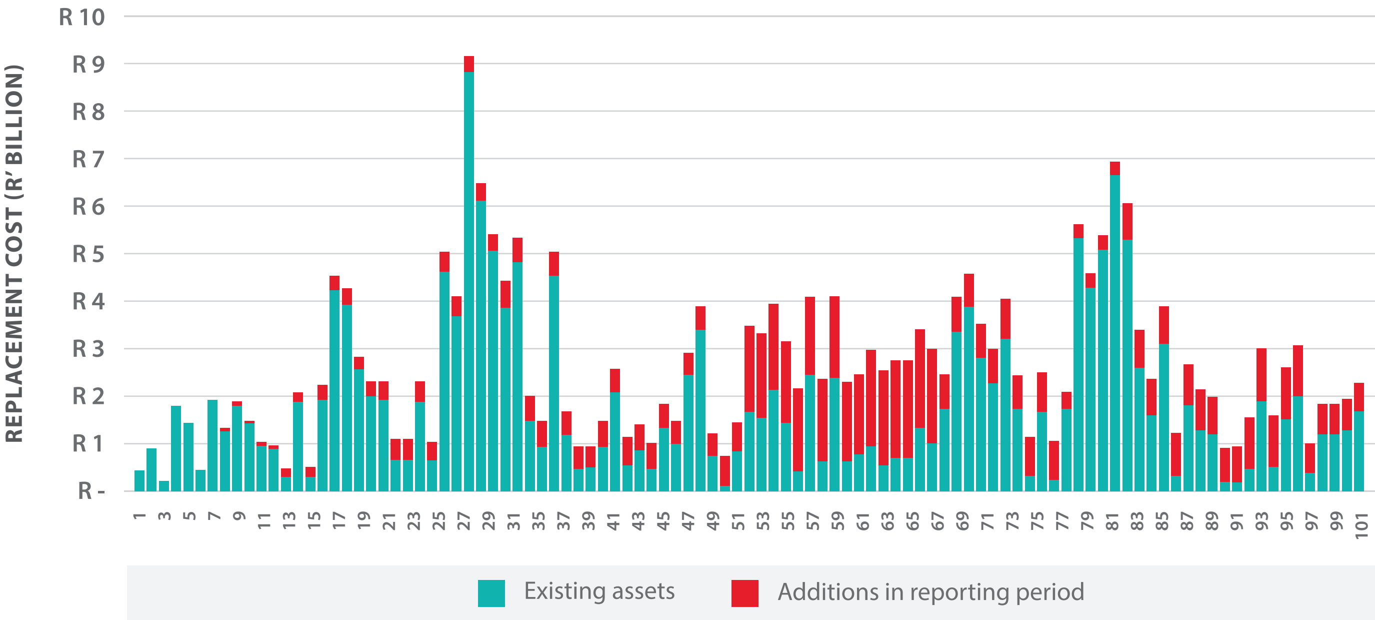


FIGURE 3.24: *Ekurhuleni infrastructure renewal needs per annum for a hundred-year period (R' billion)*

The first important point demonstrated by this graph is the uneven, lumpy character of renewals. In some periods, the renewal needs appear quite manageable (in year 50, for example, it is less than R 1 billion). In others, though, the renewal needs are staggering (consider year 29, when the renewal need is an estimated R 8.8 billion). A key challenge for the asset management planner is to develop a smoother renewals programme. This programme should even out the extreme peaks and troughs to avoid financial distress, sudden and sharp increases in rates and tariffs, and overloading of the ability of the city to implement and manage renewal programmes. The second, closely related point is that renewal needs tend to increase over time, as first and then second generation infrastructure reaches end of life, and new infrastructure is created at scale that in time also requires renewals. A key purpose of a renewals profile, such as the one presented in **Figure 3.24** is to identify a coming renewals bow-wave, and to proactively plan for and manage it.

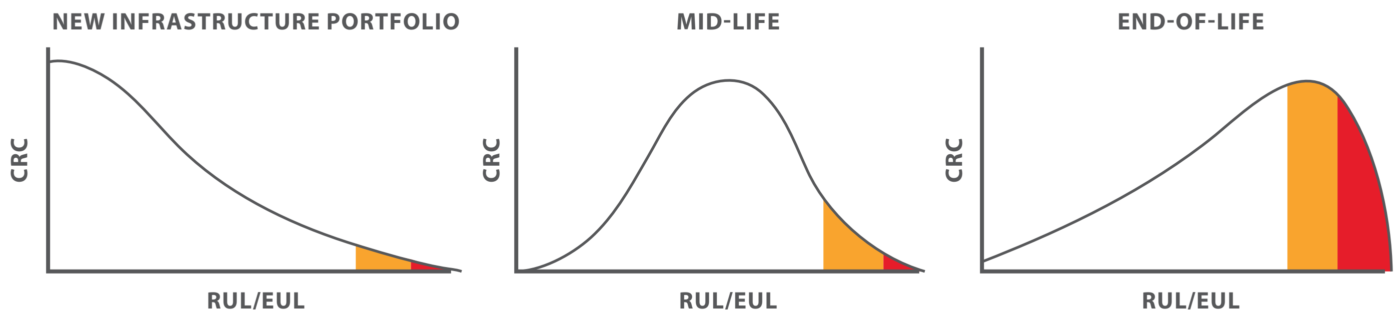


FIGURE 3.25: *Slow but certain arrival of the bow-wave of capital renewal needs*

A more refined profile of renewal needs over time is presented below, indicating renewal needs per annum, but per type of facility, in this case for a potable water services asset portfolio:

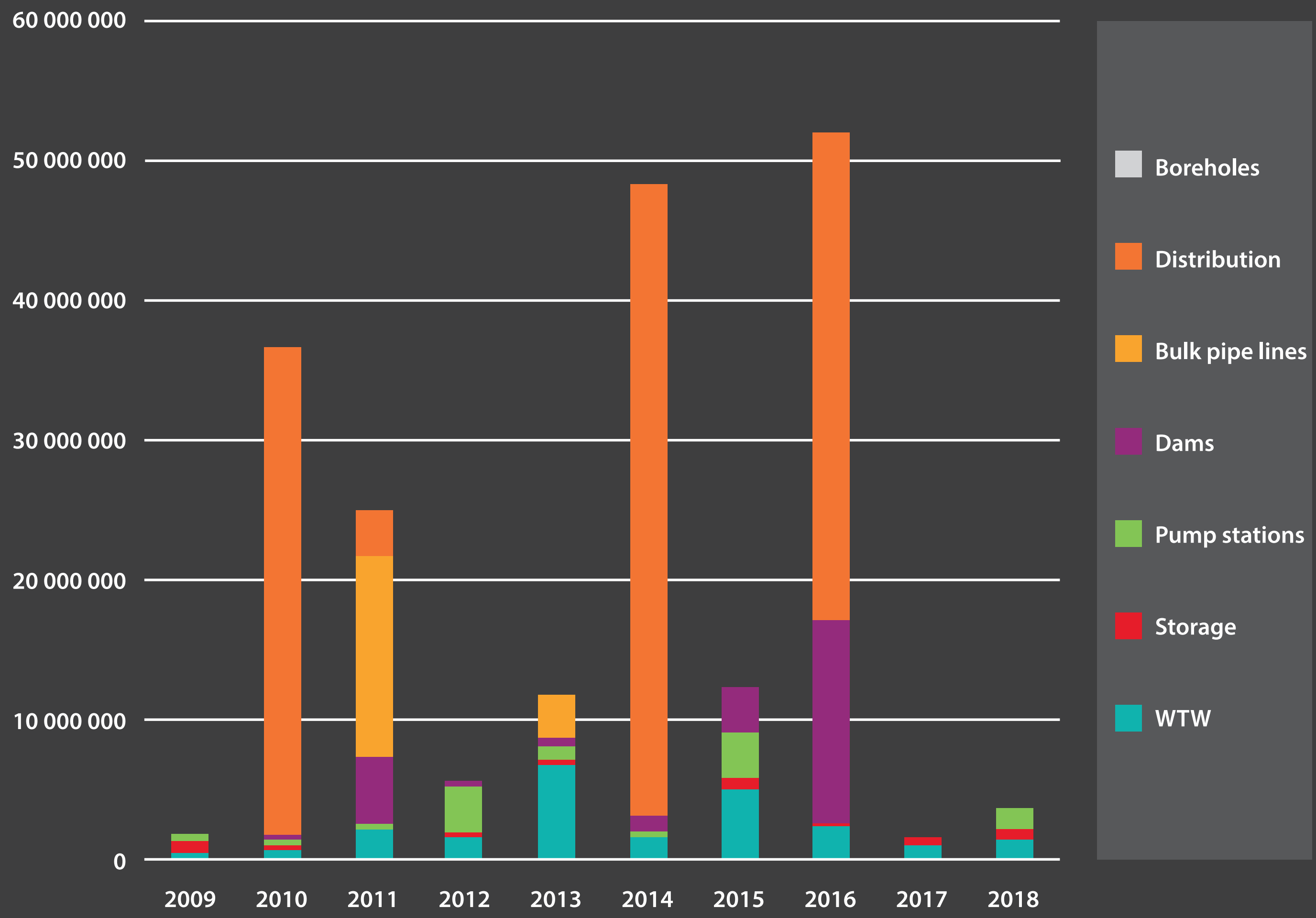


FIGURE 3.26: *Potable water asset portfolio renewal needs by facility type*

3.4 QUALITY MANAGEMENT

Module 3's asset data models can be effectively applied through aligned and consistent application. This requires field guides, tools and training. The models will also need to be periodically reviewed and updated to leverage the data captured by the respective cities and improve the practice.

3.5 SUMMARY

This module provides asset data models that show how to report infrastructure status, underpin compliant financial reporting on assets, and establish a robust platform for integrated asset management planning, budgeting and expenditure control. The benefits to each of the respective cities is noted, as well as the added mutual value of collaboration of the cities in identifying and sharing good practice, and through further development of the models over time. It is noted that the models are considered to be at a level higher than the minimum acceptable. This is in line with the benefits that the approach will provide to cities in under-pinning more holistic, accurate and relevant status reporting. It will also help assess and prioritise needs, and optimise the planning of infrastructure portfolios.

Future versions of this Toolkit will likely also provide detailed guidance on planning for the preparation of an asset register and how to maintain and update asset registers.

REFERENCES

Relevant standards of generally recognised accounting practice, with specific reference to GRAP 17: Property, Plant and Equipment.

ANNEXURES

3A Hierarchy – linking asset hierarchy levels 3 and 4

ASSET CLASS (3)	ASSET GROUP TYPE (4)
Roads infrastructure	Roads
	Road structures
	Road furniture
	Capital spares
Storm-water infrastructure	Drainage collection
	Storm-water conveyance
	Attenuation
	Capital spares
Water-supply infrastructure	Boreholes
	Bulk mains
	Dams and weirs
	Distribution
	Pump stations
	Reservoirs
	PRV stations
	Water treatment works
	Capital spares
Sanitation infrastructure	Outfall sewers
	Pump stations
	Reticulation
	Toilet facilities
	Waste-water treatment works
	Capital spares
Electrical infrastructure	Power plants
	HV substations
	HV switching stations
	HV transmission conductors
	MV substations
	MV switching stations

ASSET CLASS (3)	ASSET GROUP TYPE (4)
Electrical infrastructure	MV networks
	LV networks
	Capital spares
Rail infrastructure	Rail lines and sidings
	Rail structures
	Rail furniture
	Drainage collection
	Storm-water conveyance
	Attenuation
	MV substations
	MV switching stations
	MV networks
	LV networks
	Capital spares
Information and communications infrastructure	Data centres
	Distribution layers
	Capital spares
Solid waste infrastructure	Landfill sites
	Waste-transfer stations
	Waste-processing facilities
	Waste drop-off points
	Waste-separation facilities
	Electricity-generation facilities
	Capital spares
Coastal infrastructure	Sand pumps
	Piers
	Revetments
	Promenades
	Capital spares

ASSET CLASS (3)	ASSET GROUP TYPE (4)
Community facilities	Halls
	Centres
	Crèches
	Clinics/care centres
	Fire/ambulance stations
	Testing stations
	Museums
	Galleries
	Theatres
	Libraries
	Cemeteries/crematoria
	Police
	Parks
	Public open space
	Nature reserves
	Public ablution facilities
	Markets
	Stalls
	Abattoirs
	Airports
	Taxi ranks/bus terminals
	Capital spares
Sport and recreation facilities	Indoor facilities
	Outdoor facilities
	Capital spares
Monuments	All as applicable
Historic buildings	All as applicable
Works of art	All as applicable
Conservation areas	All as applicable

ASSET CLASS (3)	ASSET GROUP TYPE (4)
Other heritage	All as applicable
Operational buildings	Municipal offices
	Pay/enquiry points
	Building plan offices
	Workshops
	Yards
	Stores
	Laboratories
	Training centres
	Manufacturing plant
	Depots
	Capital spares
Housing	Staff housing
	Social housing
	Capital spares
Servitudes	Servitudes
Licences and rights	Water rights
	Effluent licences
	Solid waste licences
Investment property	Improved property
	Unimproved property

3B Hierarchy – linking asset hierarchy levels 4 and 5

ASSET GROUP TYPE (4)	ASSET TYPE (5)
ROADS INFRASTRUCTURE	
Road	Land
	Pavements
	Earthworks
Road structures	Road bridges
	Pedestrian bridges
	Civil structures
Road furniture	Road furniture
	Traffic signals
Capital spares	As applicable
STORM-WATER INFRASTRUCTURE	
Drainage collection	Land
	Civil structures
	Drainage
	Earthworks
	Metal work
	External facilities
	Pipe work
Storm-water conveyance	As above
Attenuation	As above
Capital spares	As applicable
WATER SUPPLY INFRASTRUCTURE	
Boreholes	Land
	Civil structures
	Earthworks
	Electrical equipment
	External facilities
	Mechanical equipment
	Pavements

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Boreholes	Pipe work
	Service connection on site
Bulk mains	Pipe work
	Pipe bridge
	Electrical equipment
Dams and weirs	Land
	External facilities
	Buildings
	Civil structure
	Earthworks
	Electrical equipment
	Mechanical equipment
	Metal work
	Pavements
	Pipe work
	Service connections on site
Distribution	Municipal service connections
	Pipe work
	Pipe bridges
Distribution points	Communal standpipes
	Pipe work
Pump stations	Land
	External facilities
	Buildings
	Civil structures
	Earthworks
	Electrical equipment
	Mechanical equipment
	Metal work

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Pump stations	Pavements
	Pipe work
	Service connections on site
Reservoirs	Same as pump stations
PRV stations	Same as pump stations
Water treatment works	Same as pump stations
Capital spares	As applicable
SANITATION INFRASTRUCTURE	
Outfall sewers	Civil structures
	Pipe work
	Pipe bridges
Pump stations	Same as pump stations
Reticulation	Civil structure
	Pipe work
	Pipe bridge
	Municipal service connection
Toilet facilities	Communal sanitation
Waste-water treatment works	Same as pump stations
Capital spares	As applicable
ELECTRICITY INFRASTRUCTURE	
Power plant	Boiler plant
	Turbine equipment
	Turbine generators
	Control and instrumentation
	Electrical equipment
	Pipe work
	Metal work
	DC systems
	HV transformers

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Power plant	MV transformers
	HV switching station equipment
	MV switching station equipment
	Mechanical equipment
	Land
	Buildings
	External facilities
	Pavements
	Earthworks
	Civil structures
	Service connections on site
HV substations	HV transformers
	HV switching station equipment
	DC systems
	Electricity bulk meter
	Control and instrumentation
	Communication equipment
	MV substation equipment
	Land
	Buildings
	External facilities
	Civil structure
	Metal work
	Earthworks
	Pavement
	Service connection on site
HV switching stations	HV switching station equipment
	DC systems
	Electricity bulk meter

ASSET GROUP TYPE (4)	ASSET TYPE (5)
HV switching station	Control and instrumentation
	MV substation equipment
	Control and instrumentation
	Communication equipment
	Land
	Buildings
	External facilities
	Civil structures
	Metal work
	Earthworks
	Pavements
	Service connections on site
HV transmission conductors	HV cables
	HV overhead lines
MV substation	MV transformers
	MV substation equipment
	DC systems
	MV mini-substations
	MV network equipment
	Electricity bulk meter
	Control and instrumentation
	Communication equipment
	Land
	Buildings
	External facilities
	Civil structures
	Metal work
	Earthworks

ASSET GROUP TYPE (4)	ASSET TYPE (5)
MV substation	Pavement
	Service connectio nns on site
MV switching stations	MV switching station equipment
	DC systems
	Electricity bulk meters
	Control and instrumentation
	Communication equipment
	Land
	Buildings
	External facilities
	Civil structures
	Metal work
	Earthworks
	Pavements
	Service connections on site
MV network	MV network equipment
	MV conductors
	MV mini-substations
	MV transformers
LV network	LV conductors
	Public lighting
	Municipal service connections
	Electricity meters
Capital spares	As applicable
RAIL INFRASTRUCTURE	
Rail lines	Land
	Rail lines and ballast
	Earthworks

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Rail structures	Rail bridges
	Pedestrian bridges
	Civil structures
Rail furniture	Rail furniture
Drainage collection	Civil structures
	Drainage
	Earthworks
	Metal work
	External facilities
	Pipe work
Storm-water conveyance	As drainage collection
Attenuation	As drainage collection
MV substations	Same as MV substations, under electricity infrastructure
LV networks	Same as LV networks, under electricity infrastructure
Capital spares	As applicable
INFORMATION AND COMMUNICATIONS INFRASTRUCTURE	
Data centres	Buildings
	Electrical equipment
Core layers	Buildings
	Civil infrastructure
	Electrical equipment
	Communications equipment
Distribution layers	Communications equipment
Capital spares	As applicable
SOLID WASTE INFRASTRUCTURE	
Landfill site	Same as halls
Waste-transfer stations	Same as halls
Waste-processing facilities	Same as halls
Waste drop-off points	Same as halls

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Waste-separation facilities	Same as halls
Electricity-generation facilities	Same as power generation plant
Capital spares	As applicable
COASTAL INFRASTRUCTURE	
Sand pumps	Same as pump stations
Piers	Civil structures
	Electrical equipment
	Metal work
Revetments	Civil structures
	Earthworks
Promenades	Same as halls
Capital spares	As applicable
COMMUNITY FACILITIES	
Halls	Land
	Buildings
	External facilities
	Civil structures
	Earthworks
	Electrical equipment
	Mechanical equipment
	Metal work
	Pavements
	Service connection on site
Centres	Same as halls
Crèches	Same as halls
Clinics/care centres	Same as halls
Fire/ambulance stations	Same as halls
Testing stations	Same as halls
Museums	Same as halls

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Galleries	Same as halls
Theatres	Same as halls
Libraries	Same as halls
Cemeteries/crematoria	Same as halls
Police	Same as halls
Parks	Same as halls
Public open spaces	Same as halls
Nature reserves	Same as halls
Public ablution facilities	Same as halls
Markets	Same as halls
Stalls	Same as halls
Abattoirs	Same as halls
Airports	Same as halls
Taxi ranks/parking/bus terminals	Same as halls
Capital spares	As applicable
SPORT AND RECREATION FACILITIES	
Indoor facilities	Same as halls
Outdoor facilities	Same as halls
	Sports facilities
Capital spares	As applicable
OPERATIONAL BUILDINGS	
Municipal offices	Same as halls
Pay/enquiry points	Same as halls
Building plan offices	Same as halls
Workshops	Same as halls
Yards/depots	Same as halls
Stores	Same as halls
Laboratories	Same as halls
Training centres	Same as halls

ASSET GROUP TYPE (4)	ASSET TYPE (5)
Manufacturing plant	Same as halls
Capital spares	As applicable
HOUSING	
Staff housing	Same as halls
Social housing	Same as halls
Capital spares	As applicable
SERVITUDES	
Servitudes	Servitudes
LICENCES AND RIGHTS	
Water rights	Water rights
Effluent licences	Effluent licences
Solid waste licences	Solid waste licences
INVESTMENT PROPERTY	
Improved property	Improved property
Unimproved property	Unimproved property

3C Hierarchy - linking asset hierarchy levels 5 and 6

Note: Component types indicated are considered typical for the asset tpe, but others may be used.

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
ROADS INFRASTRUCTURE		
Roads	Land	Road reserve
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
Road structures	Road bridges	Road bridge abutment
		Road bridge side barrier
		Road bridge substructure
		Road bridge superstructure
	Pedestrian bridges	Pedestrian bridge substructure
		Pedestrian bridge superstructure
		Pedestrian bridge railing
	Civil structures	Anchored wall
		Retaining wall
		RC structure
		Steel structure
		Tunnel bore structure
Road furniture	Road furniture	Billboard
		Commuter shelter
		Footpath/paving
		Guard rail
		Mini roundabout
		Speed hump
		Street rubbish bin
		Traffic island
		Sign – regulatory
		Sign – general

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Road furniture	Civil structure	Steel structure
	Traffic signals	Traffic signal units
Capital spares	As applicable (from above)	As applicable (from above)
STORM-WATER INFRASTRUCTURE		
Drainage collection	Land	Storm-water reserve
	Civil structures	Gabions
		Earth structure
		Masonry structure
		RC structure
	Drainage	Channel
		Culvert
		Kerb
		Kerb inlet
		Grid inlet
		Subsoil drains
	Earthworks	Earthworks
	Metal work	Fabricated steel
	External facilities	See community facilities
	Pipe work	Pipe storm-water
Storm-water conveyance	See drainage collection	
Attenuation	See drainage collection	
Capital spares	As applicable	As applicable
WATER INFRASTRUCTURE		
Borehole	Land	Land
	External facilities	See operational buildings
	Civil structures	RC structure
		Timber pole structure
		Steel structure
		Tank

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Borehole	Electrical equipment	Control panel
		Motor
	Control and instrumentation	Telemetry
		SCADA
	Mechanical equipment	Engine
		Pump – water
		Pump – submersible
		Pump – hand
		Well
	Metal work	Fabricated steel
	Pipe work	Water meter
		Pipe – water
		Valve – water
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
Bulk mains	Pipe work	Water meter
		Pipe – water
		Valve – water
	Pipe bridges	Pipe bridge abutment
		Pipe bridge substructure
		Pipe bridge superstructure
		Pipe bridge railing
	Electrical equipment	Cathodic protection
Dams and weirs	Land	Land
	Buildings	See community facilities
	External facilities	See community facilities

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Dams and weirs	Civil structures	Earth structure
		Masonry structure
		RC structure
	Metal work	Fabricated steel
	Mechanical equipment	Crane
	Electrical equipment	Control panel
		Motor
		Capacitor bank
		Reactor
		LV circuit breaker
	Control and instrumentation	SCADA
		Telemetry
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Pipe work	Water meter
		Pipe – water
		Valve – water
	LV conductors	See LV conductors
	Service connections on site	Electrical service connection
		Pipe – sewer
		Pipe – water
Distribution	Pipe work	Hydrant
		Water meter
		Pipe – water
		Valve – water

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Distribution	Pipe bridges	Pipe bridge abutment
		Pipe bridge substructure
		Pipe bridge superstructure
		Pipe bridge railing
Pump stations	Municipal service connections	Water meter
		Pipe – water
	Communal standpipes	Communal standpipe
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Civil structures	Earth structure
		Masonry structure
		RC structure
	Mechanical equipment	Engine
		Generator
		Pump – water
	Metal work	Fabricated steel
	Electrical equipment	Motor
		Capacitor bank
		Reactor
		LV circuit breaker
		Control panel
	Control and instrumentation	Telemetry
		SCADA
	MV mini-substations	See MV networks
	MV transformers	See MV transformers
	MV switching station equipment	See MV switching stations

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Pump stations	Pipe work	Water meter
		Pipe – water
		Valve – water
	LV conductors	See LV networks
	Service connections on site	Electrical service connection
		Pipe – sewer
		Pipe – water
Reservoirs	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Civil structures	Earth structure
		Masonry structure
		RC structure
		Timber pole structure
		Steel structure
		Tank
	Mechanical equipment	Pump – water
	Metal work	Fabricated steel
	Electrical equipment	Motor
		Capacitor bank
		Reactor
		LV circuit breaker
		Control panel
	Control and instrumentation	Telemetry
		SCADA
	MV mini-substations	See MV networks

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Reservoirs	MV transformers	See MV networks
	MV switching station equipment	See MV switching stations
	LV conductors	See LV networks
	Pipe work	Water meter
		Pipe – water
		Valve – water
	Service connections on site	Electrical service connection
		Pipe – sewer
		Pipe – water
PRV station	Land	Land
	Buildings	See operational buildings
	Civil structures	Masonry structure
		RC structure
	Metal work	Fabricated steel
	Electrical equipment	Telemetry
	Pipe work	Water meter
		Pipe – water
		Valve – water
Water treatment works (WTW)	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Civil structures	Earth structure
		Filter media
		Masonry structure
		RC structure
		Tank

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Water treatment works (WTW)	Mechanical equipment	Doser
		Engine
		Gearbox
	Mechanical equipment	Generator
		Pump – submersible
		Pump – water
	Metal work	Fabricated steel
		Pressure vessel
	Electrical equipment	Motor
		Capacitor bank
		Reactor
		LV circuit breaker
		Control panel
	MV substation equipment	See MV substations
	DC systems	See MV substations
	MV mini-substations	See MV networks
	MV transformers	See MV transformers
	MV conductors	See MV conductors
	LV conductors	See LV conductors
	Control and instrumentation	Telemetry
		SCADA
	Pipe work	Water meter
		Pipe – water
		Valve – water
	Service connection on site	Electrical service connection
		Pipe – sewer
Capital spares	As applicable (from above)	As applicable (from above)

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
SANITATION INFRASTRUCTURE		
Outfall sewers	Civil structure	Masonry structure
		RC structure
	Pipe work	Pipe – sewer
Toilet facilities	Communal sanitation	Chemical toilet
		Septic tank
		VIP latrine (excluding structure)
		Small building/enclosure
Pump stations	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Civil structures	Earth structure
		Masonry structure
		RC structure
	Metal work	Fabricated steel
	Mechanical equipment	Engine
		Generator
		Pump – sewer
	Electrical equipment	Motor
		Capacitor bank
		Reactor
		LV circuit beaker
		Control panel
	Control and instrumentation	SCADA
		Telemetry

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Pump stations	Pipe work	Water meter
		Pipe – sewer
		Valve – water
	MV substation equipment	See MV substations
	DC systems	See MV substations
	MV mini-substations	See MV networks
	MV transformers	See MV networks
	MV conductors	See MV networks
	LV conductors	See LV networks
	Service connections on site	Electrical service connection
		Pipe – sewer
		Pipe – water
Reticulation	Civil structures	Masonry structure
		RC structure
	Pipe work	Pipe – sewer
	Pipe bridges	Pipe bridge abutment
		Pipe bridge substructure
		Pipe bridge superstructure
		Pipe bridge railing
	Municipal service connections	Pipe – sewer
Waste-water treatment works (WWTW)	Land	Land
	Buildings	ee operational buildings
	External facilities	See operational buildings
	Pavements	See WTW
	Earthworks	See WTW
	Civil structures	See WTW
		Flare stack

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Waste-water treatment works (WWTW)	Mechanical equipment	Doser
		Compressor
		Engine
		Gearbox
		Generator
		Pump – sewer
		Crane
		Winch
		Extraction blower
		Engine – gas
	Metal work	Fabricated steel
		Cast iron
		Pressure vessel
	Electrical equipment	Motor
		Capacitor bank
		Reactor
		LV circuit breaker
		Control panel
	Pipe work	Water meter
		Pipe – sewer
		Valve – water
		Pipe – gas
		Pipe – steam
		Valve – gas
	Service connections on site	Electrical service connection
		Pipe – water

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Waste-water treatment works (WWTW)	Control and instrumentation	Gasometer
		Distributed process control system
		Telemetry
		SCADA
	MV substation equipment	See MV substations
	DC systems	See MV switching stations
	MV mini-substations	See MV networks
	MV conductors	See MV networks
	LV conductors	See LV networks
Capital spares	As applicable (from above)	As applicable (from above)
ELECTRICAL INFRASTRUCTURE		
HV switching stations	HV switching station equipment	HV busbar indoor
		HV busbar outdoor
		Voltage transformer
		Current transformer
		Surge arrestor
		Lightning mast and shield wiring
		Station earthing – mat and electrodes
		Reactor
		Capacitor bank
		GIS busbar
		GIS switchgear
		Control panel
		HV circuit breaker
		HV compact circuit breaker, isolator, and current transformer unit

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
HV switching stations	HV switching station equipment	HV isolator
		HV earth switch
	MV substation equipment	See MV substations
	Electricity bulk meters	Electricity bulk meter
	DC systems	Battery charger
		Batteries
	Control and instrumentation	See power plants
	Communication equipment	See information and communications equipment
	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Civil structure	See WTW
	Metal work	See WTW
	Earthworks	See WTW
	Pavements	See WTW
	Service connections on site	See WTW
HV substations	HV transformers	HV transformer
	HV switching station equipment	See HV switching stations
	MV substation equipment	See MV substations
	MV transformers	MV transformer
	Electricity bulk meter	Electricity bulk meter
	DC systems	Battery charger
		Batteries
	Control and instrumentation	See power plants
	Communication equipment	See information and communications infrastructure
	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
HV substations	Civil structure	See WTW
	Metal work	See WTW
	Earthworks	See WTW
	Pavements	See WTW
	Service connections on site	See WTW
HV transmission conductors	HV cables	HV cable
		Control cable
	HV overhead lines	HV overhead line support structure
		HV overhead line conductor
MV substations	MV transformers	MV transformer
	MV substation equipment	Current transformer
		Voltage transformer
		MV circuit breaker
		MV isolator
MV substations	MV substation equipment	Control panel
		Reactor
		Transformer NER
		Transformer NECRT
		Surge arrestor
		MV compact circuit breaker, isolator and current transformer unit
		MV earth switch
		Auxiliary equipment
		Capacitor bank
		Load control set
		Ring main unit
	DC systems	Battery charger
		Batteries
	MV mini-substations	See MV networks

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
MV substations	MV network equipment	See MV networks
	Electricity bulk meters	Electricity bulk meter
	Control and instrumentation	See power plants
	Communication equipment	See information and communications infrastructure
	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Civil structures	See WTW
	Metal work	See WTW
	Earthworks	See WTW
	Pavements	See WTW
	Service connections on site	See WTW
MV switching stations	MV switching station equipment	MV circuit breaker
		MV isolator
MV switching stations	MV switching station equipment	Control panel
		Auto-recloser
		Ring main unit
	DC systems	Battery charger
		Batteries
	Electricity bulk meters	Electricity bulk meter
	Control and instrumentation	See power plants
	Communication equipment	See information and communications infrastructure
	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Civil structures	See WTW
	Metal work	See WTW
	Earthworks	See WTW

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
MV switching stations	Pavements	See WTW
	Service connection on site	See WTW
MV networks	MV mini-substations	MV transformer
		Ring main unit
MV networks	MV network equipment	Auto-recloser
		Capacitor bank
		Reactor
		Ring main unit
		Sectionaliser
	MV transformers	MV transformer
	MV conductors	MV cable
		Control cable
		MV overhead line
LV networks	LV conductors	LV cable
		Control cable
		LV overhead line
	Public lighting	Street lights
		High mast light
	Municipal service connections	LV cable
		LV overhead line
		LV kiosk
		LV pole top box
		Vending station
		Control panel
		LV breaker
	Electricity meters	Conventional electricity meter
		Automated electricity meter
		Prepaid electricity meter

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Power plants	Boiler plants	Boiler
		Economiser
		Oil burner
		Reheater
		Super heater
		Boiler feed pump
		Condenser
	Turbine equipment	Turbine
	Turbine generators	Exciter
		Generator
		Generator breaker
	Control and instrumentation	Generator busbar
		Generator transformer
		Process instrumentation
	Electrical equipment	Motor
		Precipitator
		Uninterrupted power supply
		Capacitor bank
		Reactor
	Pipe work	Water meter
		Pipe – sewer
		Pipe – water
		Pipe – steam
		Pipe – fuel
		Pipe – gas
		Valve – water
		Valve – steam
		Valve – fuel
		Valve – gas

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Power plants	DC systems	See MV switching stations
	MV transformers	See MV switching stations
	HV transformers	See MV switching stations
	HV switching station equipment	See MV switching stations
	MV substation equipment	See MV substations
	MV switching station equipment	See MV switching stations
	Metal work	Fabricated steel
		Cast iron
		Pressure vessel
	Mechanical equipment	Gearbox
		Fan
	Mechanical equipment	Crane
		Winch
		Turbine
		Conveyor belt
		Pulveriser
		Pump – water
	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Pavements	See WTW
	Earthworks	See WTW
	Civil structures	See WTW
	Service connections on site	Electrical service connection
		Pipe – water
		Pipe – sewer
Capital spares	As applicable (from above)	As applicable (from above)

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
RAIL INFRASTRUCTURE		
Rail lines	Land	Land
	Rails and ballast	Rail lines
		Points (rail)
		Ballasts
	Earthworks	Earthworks
Rail structures	Rail bridges	Rail bridge abutments
		Rail bridge side barrier
		Rail bridge substructure
		Rail bridge superstructure
	Pedestrian bridges	Pedestrian bridge substructure
		Pedestrian bridge superstructure
Rail structures	Civil structures	Anchored wall
		Retaining wall
		RC structure
		Timber pole structure
		Steel structure
Rail furniture	Rail-side furniture	Signalling
		See external facilities
Drainage collection	Civil structures	Gabions
		Earth structure
		Masonry structure
		Anchored wall
		Retaining wall
		RC structure
	Drainage	Channel
		Culvert
	Earthworks	Earthworks

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Drainage collection	Metal work	Fabricated steel
	Pipe work	Pipe – storm water
MV substations	MV transformers	See MV substations
	MV substation equipment	See MV substations
	DC systems	See MV substations
	MV mini-substations	See MV substations
	MV network equipment	See MV substations
	Electricity bulk meters	See MV substations
	Control and instrumentation	See MV substations
	Communication equipment	See MV substations
	Land	Land
	Buildings	See Operational buildings
	External facilities	See Operational buildings
MV substations	Civil structures	See WTW
	Metal work	See WTW
	Earthworks	See WTW
	Pavements	See WTW
	Service connection on site	See WTW
MV switching stations	MV switching station equipment	See MV switching stations
	DC systems	See MV substations
	Control and instrumentation	See MV substations
	Communication equipment	See MV substations
	Electricity bulk meters	See MV substations
	Buildings	See operational buildings
	External facilities	See operational buildings
	Civil structures	See WTW
	Metal work	See WTW
	Earthworks	See WTW

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
MV switching stations	Pavements	See WTW
	Service connections on site	See WTW
MV networks	MV mini-substations	See MV mini-substations
	MV transformers	See MV transformers
	MV conductors	See MV networks
	MV network equipment	See MV network equipment
LV networks	LV conductors	See LV networks
	Public lighting	See public lighting
	Municipal service connections	See municipal service connections
	Electricity meters	See LV networks
Capital spares	As applicable (from above)	As applicable (from above)
INFORMATION AND COMMUNICATIONS INFRASTRUCTURE		
Data centres	Buildings	See operational buildings
	Electrical equipment	Generator
		Uninterrupted power supply
Core layers	Buildings	See operational buildings
	Civil structures	See WTW
	Electrical equipment	Uninterrupted power supply
	Communications equipment	Radio infrastructure
		Communication cable
		Fibre-optic cable
		Switch
		Storage area network
		PABX
		Multiplexer
		Router
		Server

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Distribution layers	Communications equipment	Communications switch
		Router
		Wireless access point
Capital spares	As applicable (from above)	As applicable (from above)
SOLID WASTE INFRASTRUCTURE		
Waste transfer stations, processing facilities, and landfill sites	Land	Land
	Buildings	See operational buildings
	External facilities	See operational buildings
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
Waste transfer stations, processing facilities, and landfill sites	Road furniture	Guard rail
		Speed hump
		Traffic island
	Civil structures	Earth structure
		Subsoil drain
		Lining – landfill
		Masonry structure
		RC structure
		Flare stack
	Mechanical equipment	Baler
		Generator
		Compactor
		Pump – submersible
		Pump – water
		Weighbridge
		Well
		Extraction blower
		Compressor

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Waste transfer stations, processing facilities, and landfill sites	Mechanical equipment	Engine – gas
		Heat exchanger
		Generator
	Engine – gas	Fabricated steel
	Heat exchanger	Pressure vessel
	Generator	Water meter
	Fabricated steel	Pipe – water
	Pressure vessel	Pipe – storm water
	Water meter	Pipe – gas
	Pipe – water	Pipe – steam
	Pipe – storm water	Valve – water
	Pipe – gas	Valve – gas
	Drainage	Channel
		Subsoil drains
		Kerb
		Kerb inlet
	Service connections on site	LV overhead line
		LV cable
		Pipe – sewer
		Pipe – water
	Electrical equipment	Control panel
		Motor
		Capacitor bank
		Reactor
	Provisions	Landfill restoration
	Process control and instrumentation	Distributed control system
		Gasometer
		SCADA
	MV mini-substations	See MV mini-substations

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
Waste transfer stations, processing facilities, and landfill sites	MV transformers	See MV transformers
	MV conductors	See MV networks
	LV conductors	See LV networks
	Public lighting	See public lighting
Capital spares	As applicable (from above)	As applicable (from above)
COASTAL INFRASTRUCTURE		
Sand pumps	Same as pump stations	See pump stations
Piers	Civil structures	See WTW
	Electrical equipment	See WTW
	Metal work	See WTW
Revetments	Civil structures	See WTW
	Earthworks	See WTW
Promenade	Same as operational buildings	See operational buildings
Capital spares	As applicable (from above)	As applicable (from above)
COMMUNITY FACILITIES, OPERATIONAL BUILDINGS, SPORTS AND RECREATIONAL FACILITIES AND HOUSING		
General buildings and open spaces – halls, crèches, clinics, museums cemeteries, parks, public open space, ablution facilities, markets, taxi ranks, indoor and outdoor sports facilities, municipal offices, depots etc. and buildings and external facilities under the infrastructure asset category	Land	Land
	Buildings	Air conditioning
		Chiller
		Earthworks
		Electrical installation (building)
		Finishes, fixtures and fittings
		Fire protection
		Gas-bank installation
		Lifts
		Plumbing
		Floor
		Security system
		Septic tank

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
General buildings and open spaces – halls, crèches, clinics, museums cemeteries, parks, public open space, ablution facilities, markets, taxi ranks, indoor and outdoor sports facilities, municipal offices, depots etc. and buildings and external facilities under the infrastructure asset category	Buildings	Walls
		Roof
	External facilities	External furniture
		External lighting
		Paving
		Irrigation
		Landscaping
		Perimeter protection
	External facilities	Sign – general
		Carport
		Small building/enclosure
	Pavements	Road surface
		Road structural layer
	Earthworks	Earthworks
	Civil structures	Earth structure
		Masonry structure
		Timber pole structure
		RC structure
		Tank
	Metal work	Fabricated steel
	Mechanical equipment	Compressor
		Generator
	Electrical equipment	Capacitor bank
		Reactor
		Uninterrupted power supply
	MV mini-substations	See MV mini-substations
	MV transformers	sSee MV transformers
	MV conductors	See MV networks
	MV switching station equipment	See MV switching stations

ASSET GROUP TYPE	ASSET TYPE (5)	COMPONENT TYPE (6)
General buildings and open spaces – halls, crèches, clinics, museums cemeteries, parks, public open space, ablution facilities, markets, taxi ranks, indoor and outdoor sports facilities, municipal offices, depots etc. and buildings and external facilities under the infrastructure asset category	LV conductors	See LV networks
	Public lighting	See Public lighting
	Service connections on site	LV overhead line
		LV underground cable
		Pipe – sewer
		Pipe – water
	Sports facilities	Tennis court
		Basketball court
	Sports facilities	Bowling green
		Jukskei court
		Sports field
		Swimming pool
		Squash court
		Golf course
		Spectator stand
Capital spares	As applicable (from above)	As applicable (from above)
	SERVITUDES	
Servitudes	Servitudes	Electricity servitude
		Storm-water servitude
		Water servitude
		Sewerage servitude

3D Asset attribute data

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Air conditioning	Type of installation					Sqm aircon area	Sqm aircon area
Anchored wall	Type of installation					Face sqm	Face sqm
Automated electricity meter	Type of installation			Single or 3 phase		No	No
Auto recloser			kV			No	No
Baler	Type of installation					No	No
Ballast						cum	cum
Basketball court			Sqm			No	No
Batteries	Type of installation		Amp-hours			No. of bays	No. of bays
Battery charger			A			No	No
Billboard	Material		Sqm			No	No
Boiler	Material		cum			No	No
Boiler feed pump			kW			No	No
Bowling green			Sqm			No	No
Capacitor bank	Type of installation		kV			No. of banks	No. of banks
Carport	Type of installation					No. of bays	No. of bays
Cast iron			kg			No	No
Cathodic protection	Type of installation		VA			No	No
Channel	Type of installation					Sqm face	Sqm face
Chemical toilet						No	No
Chiller			kW			No	No
Communal standpipe	Type of installation					No	No
Communication cable						m	m
Communications switch						No	No
Commuter shelter	Material					Sqm	Sqm
Compactor	Type of installation		Tonne			No	No

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Compressor	Type of installation		kW			No	No
Condenser	Type of installation		Sqm	kJ/kg		No	No
Control cable	Type of installation					Linear m	Linear m
Control panel	Type of installation					No	No
Conventional electricity meter	Type of installation			Single or 3 phase		No	No
Conveyor belt	Type of installation		width m			Linear m	Linear m
Crane	Type of installation					Tonne capacity	
Culvert	Material		Perim-eter m			Linear m	Linear m
Current transformer	Type of installation		kV			No	No
Distributed control system						No	No
Doser	Capacity		ℓ			No	No
Earth structure						cum	cum
Earthworks	Terrain			Construc-tion type		Sqm	Sqm
Economiser			kg	Degrees C		No	No
Electrical installation (building)						Sqm floor area	Sqm floor area
Electrical service connection				Single or 3 phase		No	No
Electricity bulk meter	Type of installation		kVA			No	No
Electricity meter	Type of installation			Single or 3 phase		No	No
Electricity servitude				Adjacent zoning		Linear m	Sqm
Engine			kW			No	No
Engine – gas			kW			No	No
Exciter			kVA			No	No
External furniture	Type of installation					No	No
External lighting	Type of installation					No	No

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Extraction blower				kW		No	No
Fabricated steel	Material			Exposure		kg	kg
Fan				kW		No	No
Fibre-optic cable				Core		Linear m	Linear m
Filter media	Material					cum	cum
Finishes, fixtures and fittings	Type of installation					Sqm	Sqm
Fire protection	Type of installation					Sqm floor area	Sqm floor area
Footpath	Material		Width (m)			Linear m	Sqm
Flare stack	Material		Height (m)			No	No
Floor	Material					Sqm floor area	Sqm floor area
Gabions	Type of installation					cum	cum
Gasometer			kpa			No	No
Gearbox			kW			No	No
Generator			kVA			No	No
Generator breaker			A			No	No
Generator busbar			A			No	No
Generator transformer			MVA			No	No
GIS busbar	Type of installation		kV			No. of bays	No. of bays
GIS switchgear			kV			No	No
Golf course	Type of installation		Holes			No	No
Grid inlet						No	No
Guard rail	Type of installation					Linear m	Linear m
Heat exchanger			kW			No	No
High mast light			Height (m)			No	No
HV busbar indoor	Type of installation		A			Substation	Substation

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
HV busbar outdoor	Type of installation		A			Substation	Substation
HV cable	Type of installation		A	Sqmm		Linear m	Linear m
HV circuit breaker			A			No	No
HV compact circuit breaker, isolator and current transformer unit			A			No	No
HV earth switch			A			No	No
HV isolator			A			No	No
HV overhead line conductor			A	Sqmm		Linear m	Linear m
HV overhead line support structure			A			Linear m	Linear m
HV transformer			MVA			No	No
Hydrant			mm dia			No	No
Irrigation	Type of installation					Sqm	Sqm
Jukskei court			Sqm			No	No
Kerb	Type					Linear m	Linear m
Kerb inlet	Type					No	No
Land	Type of use			Zoning		Sqm	Sqm
Landfill restoration						Sqm	Sqm
Landscaping	Type					Sqm	Sqm
Lifts						Lift floors	Lift floors
Lightning mast and shield wiring		m				No	No
Lining – landfill	Material					Sqm	Sqm
Liquid gas installation	Type of installation					Sqm	Sqm
LV breaker			A			No	No
LV cable	Material		A	Sqmm		Linear m	Linear m

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
LV kiosk						No	No
LV overhead line	Material		A	Single or 3 phase		Linear m	Linear m
LV pole top box						No	No
Masonry structure	Type of installation					cum bwk	cum bwk
Mini roundabout						Sqm	Sqm
Motor			kVA			kW	kW
Multiplexer	Types of installation		No. of ports			No	No
MV busbar indoor			A			Linear m	Linear m
MV busbar outdoor			A			Linear m	Linear m
MV cable	Material		A	Sqmm		Linear m	Linear m
MV circuit breaker	Type of installation		A			No	No
MV compact circuit breaker, isolator and current transformer unit	Type of installation		A			No	No
MV earth switch			A			No	No
MV isolator	Type of installation		A			No	No
MV overhead line	Material		A	Sqmm		Linear m	Linear m
MV transformer	Type (indoor, floor-mount, pole-mount)		kVA			No	No
Oil burner				kg/h		No	No
PABX	Type of installation		No. of Lines			No	No
Paving	Material					Sqm	Sqm
Pedestrian bridge abutment	Material					No	No
Pedestrian bridge substructure	Material					Sqm	Sqm
Pedestrian bridge superstructure	Material					Sqm	Sqm

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Pedestrian bridge railing	Material					Linear m	Linear m
Perimeter protection	Type of installation		height m			Linear m	Linear m
Pipe bridge abutment	Material					No	No
Pipe bridge substructure	Material					Sqm	Sqm
Pipe bridge superstructure	Material					Sqm	Sqm
Pipe bridge railing	Material					Linear m	Linear m
Pipe – fuel	Material		mm			Linear m	Linear m
Pipe – gas	Material		mm			Linear m	Linear m
Pipe – sewer	Material		mm			Linear m	Linear m
Pipe – storm-water	Material		mm			Linear m	Linear m
Pipe – steam	Material		mm			Linear m	Linear m
Pipe – water	Material		mm			Linear m	Linear m
Plumbing						Sqm wet floor area	Sqm wet floor area
Points (rail)	Type of installation					No	No
Precipitator	Type of installation		V/cm			No	No
Prepaid electricity meter	Type of installation			Single or 3 phase		No	No
Pressure vessel	Material		cum			No	No
Process instrumentation	Type of installation					No	No
Pulveriser			mm diame-ter			No	No
Pump – hand						No	No
Pump – sewer			mm outlet			No	mm outlet
Pump – submersible			kW			No	No
Pump – water			mm outlet			No	mm outlet
Radio infrastructure	Type of installation					No. of stations	No. of stations
Rail bridge abutment						No lanes wide	No lanes wide

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Rail bridge side barrier						Linear m	Linear m
Rail bridge substructure						Sqm	Sqm
Rail bridge super-structure						Sqm	Sqm
Rail line						m	M
RC structure	Type					cum	cum
Reactor			kVA			No	No
Reheater			kg	Degrees C		No	No
Retaining wall	Type					Sqm of wall face	Sqm of wall face
Ring main unit	Type of installation		kVA	kV		No	No
Road bridge abutment	Material					No lanes wide	No lanes wide
Road bridge side barrier	Material					Linear m	Linear m
Road bridge substructure	Material					Sqm	Sqm
Road bridge superstructure	Material					Sqm	Sqm
Road reserve						Sqm	Sqm
Road structural layer				Road class		Linear m	Sqm
Road surface	Material		width (m)	Road class		Linear m	Sqm
Roof	Material					Sqm roof area	Sqm roof area
Router						No	No
SCADA						No	No
Sectionaliser			kV			No	No
Security system	Type of installation					No	No
Septic tank	Material		cum			No	No
Server			Gb			No	No
Sewerage servitude				Adjacent zoning		Linear m	Sqm

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Sign – general	Type		Sqm			No	No
Sign – regulatory	Type		Sqm			No	No
Signalling (trains)	Type					No signal units	No signal units
Small building / enclosure	Material					Sqm floor area	Sqm floor area
Spectator stand	Type					No. of seats	No. of seats
Speed hump	Type					No	No
Sports field	Type					No	No
Squash court	Type					No	No
Station earthing – mat and electrodes			A			Sqm	Sqm
Steam turbine	Pressure rating		MW			No	No
Steel structure	Corrosion protection type					kg	Kg
Storm-water servitude				adjacent zoning		Linear m	Sqm
Street lights	Type					Linear m	Linear m
Street rubbish bin	Material					No	No
Subsoil drain	Material		mm dia			Linear m	Linear m
Super-heater	Type of installation		De-grees C			No	No
Surge arrestor						No	No
Swimming pool	Type		Sqm			No	No
Tank	Material					kℓ	kℓ
Telemetry						No	No
Tennis court	Type					No	No
Timber pole structure	Type					Linear m	Linear m
Traffic island	Material					Sqm	Sqm
Traffic signal units	Type (C1, C2, C3)					No signal units	No signal units
Transformer NECRT			A			No	No

COMPONENT TYPE	DESCRIPTOR: TYPE	DESCRIPTOR: SIZE	SIZE UNIT	DESCRIPTOR: COMPONENT CLASS	EXTENT AMOUNT	EXTENT UNIT	UNIT RATE (VALUE) UNIT
Transformer NER			A			No	No
Tunnel bore structure	Geotechnical conditions	Diameter	m			Linear m	Linear m
Uninterrupted power supply			kVA			No	No
Valve – water			mm			No	No
Valve – fuel			mm			No	No
Valves – gas			mm			No	No
Valves – steam			mm			No	No
Vending station			Sqm			No	No
VIP latrine	Type of installation (excl. structure)					No	No
Voltage transformer	Type			kV		No	No
Walls	Type			Type of building		Sqm floor area	Sqm floor area
Water meter	Type		mm			No	No
Water servitude				Adjacent zoning		Linear m	Sqm
Weighbridge	Type		Tonne			No	No
Well						Linear m	Linear m
Winch	Type		Tonne			No	No
Wireless access point						No	No

	Compulsory fields – informs EUL, R, and/or unit rate.

3E Expected useful lives and residual values

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Air conditioning	8		0	
Anchored wall	50		0	
Automated electricity meter	10		0	
Auto recloser	45		0	
Baler	15		0	
Ballast	80		50	
Basketball court	20		0	
Batteries	20		0	
Battery charger	10		0	
Billboard	15–30		0	
Boiler	60		0	
Boiler feed pump	15		0	
Bowling green	20		0	
Capacitor bank	15		0	
Carport	7		0	
Cast iron	50		0	
Cathodic protection	15		0	
Channel	20		0	
Chemical toilet	10		0	
Chiller	10		0	
Communal standpipe	10		0	
Communication cable	15		0	
Communications switch	5		0	
Commuter shelter	15–30	Aggressive climate	0	
Compactor	15		0	
Compressor	10		0	
Condenser	30		0	
Control cable	5–10		0	
Control panel	50		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Conventional electricity meter	20		0	
Conveyor belt	10		0	
Crane	20		0	
Culvert	60		0	
Current transformer	45		0	
Distributed control system	15		0	
Doser	15		0	
Earth structure	50	Aggressive climate	50	
Earthworks	100	Aggressive climate, material quality	50	
Economiser	50		0	
Electrical installation (building)	30		0	
Electrical service connection	50		0	
Electricity bulk meter	10		0	
Electricity meter	20		0	
Electricity servitude	NA		NA	
Engine	10–20		0	
Engine – gas	10–20		0	
Excitor	20		0	
External furniture	20		0	
External lighting	30		0	
Extraction blower	15		0	
Fabricated steel	10–40		0	
Fan	15		0	
Fibre-optic cable	50		0	
Filter media	10		0	
Finishes, fixtures & fittings	15		0	
Fire protection	20		0	
Footpath	20–40		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Flare stack	30		0	
Floor	50		0	
Gabions	40–80	Aggressive climate	0	
Gasometer	15		0	
Gearbox	15		0	
Generator	20		0	
Generator breaker	45		0	
Generator busbar	45		0	
Generator transformer	45		0	
GIS busbar	50		0	
GIS switchgear	50		0	
Golf course	50		30	
Grid inlet	30		0	
Guard rail	25	Aggressive climate	0	
Heat exchanger	30		0	
High mast light	50		0	
HV busbar indoor	60		0	
HV busbar outdoor	50		0	
HV cable	50		0	
HV circuit breaker	50		0	
HV compact circuit breaker, isolator and current transformer unit	50		0	
HV earth switch	45		0	
HV isolator	50		0	
HV overhead line conductor	50		0	
HV overhead line support structure	50		0	
HV transformer	50		0	
Hydrant	20		0	
Irrigation	10		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Jukskei court	20		0	
Kerb	50		0	
Kerb inlet	20		0	
Land	NA		0	
Landfill restoration	As applicable		0	
Landscaping	30–50		0	
Lifts	30		0	
Lightning mast and shield wiring	50		0	
Lining – landfill	50		0	
Liquid gas installation	20		0	
LV breaker	30		0	
LV cable	60		0	
LV kiosk	45		0	
LV overhead line	45		0	
LV pole top box	20		0	
Masonry structure	50		0	
Mini roundabout	20		0	
Motor	15		0	
MV busbar indoor	60		0	
MV busbar outdoor	50		0	
MV cable	50		0	
MV circuit breaker	45		0	
MV compact circuit breaker, isolator and current transformer unit	45		0	
MV earth switch	45		0	
MV isolator	44		0	
MV overhead line	45		0	
MV transformer	45		0	
Oil burner	30		0	
PABX	10		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Paving	20–40		0	
Pedestrian bridge abutment	30-50		0	
Pedestrian bridge substructure	30–50		0	
Pedestrian bridge superstructure	30–50		0	
Pedestrian bridge railing	30–50		0	
Perimeter protection	15–30		0	
Pipe bridge abutment	30-50		0	
Pipe bridge substructure	30-50		0	
Pipe bridge superstructure	30-50		0	
Pipe bridge railing	30-50		0	
Pipe – fuel	25		0	
Pipe – gas	20		0	
Pipe – sewer	30–100		0	
Pipe – storm water	50		0	
Pipe – steam	15		0	
Pipe – water	40–80		0	
Plumbing	20		0	
Points (rail)	15		0	
Precipitator	30		0	
Prepaid electricity meter	10		0	
Pressure vessel	60		0	
Process instrumentation	15		0	
Pulveriser	20		0	
Pump – hand	15		0	
Pump – sewer	15		0	
Pump – submersible	12		0	
Pump – water	15		0	
Radio infrastructure	10		0	
Rail bridge abutment	80		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Rail bridge side barrier	80		0	
Rail bridge substructure	80		0	
Rail bridge superstructure	80		0	
Rail lines	50		0	
RC structure	50–80		0	
Reactor	50		0	
Reheater	50		0	
Retaining wall	40–60		0	
Ring main unit	45		0	
Road bridge abutment	50–80	Aggressive climate	0	
Road bridge side barrier	50–80	Aggressive climate	0	
Road bridge substructure	50–80	Aggressive climate	0	
Road bridge superstructure	50–80	Aggressive climate	0	
Road reserve	NA		NA	
Road structural layer	30–80		0	
Road surface	3–20		0	
Roof	30–40		0	
Router	10		0	
SCADA	15–25		0	
Sectionaliser	45		0	
Security system	5–10		0	
Septic tank	40		0	
Server	10		0	
Sewerage servitude	NA		NA	
Sign – general	15		0	
Sign – regulatory	7		0	
Signalling (trains)	15		0	
Small building/enclosure	20–50	Aggressive climate	0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
Spectator stand	50		0	
Speed hump	50		0	
Sports field	15–30		0	
Squash court	30		0	
Station earthing – mat and electrodes	45		0	
Steam turbine	45		0	
Steel structure	60	Aggressive climate	0	
Storm-water servitude	NA		NA	
Street lights	45		0	
Street rubbish bin	10–20		0	
Subsoil drains	50		0	
Super-heater	30 – 60		0	
Surge arrestor	5		0	
Swimming pool	20		0	
Tank	15–30		0	
Telemetry	15		0	
Tennis court	15		0	
Timber pole structure	15		0	
Traffic island	30		0	
Traffic signal units	15		0	
Transformer NECRT	45		0	
Transformer NER	45		0	
Tunnel bore structure	80		0	
Uninterrupted power supply	15		0	
Valve – water	45		0	
Valve – fuel	25		0	
Valves – gas	20		0	
Valves – steam	15		0	
Vending station	15		0	

COMPONENT TYPE	EXPECTED USEFUL LIFE (YEARS)	EUL LOCAL INFLUENCING FACTOR	RV	RV LOCAL INFLUENCING FACTOR
VIP latrine	3–10		0	
Voltage transformer	45		0	
Walls	60		0	
Water meter	10		0	
Water servitude	NA		NA	
Weighbridge	15		0	
Well	30		0	
Winch	15		0	
Wireless access point	10		0	

3F Advanced risk management model

LIKELIHOOD GRADE	LIKELIHOOD	DESCRIPTION	PROBABILITY
5	Almost certain	This risk is expected to occur within 1 year	0.99
4	Likely	This risk is expected to occur between 1 and 5 years	0.333
3	Moderate	This risk is expected to occur between 6 and 20 years	0.077
2	Unlikely	This risk is expected to occur between 21 and 50 years	0.033
1	Rare	This risk is expected to occur after 51 years	0.013

LEVELS OF IMPACT	FINANCIAL	NON-FINANCIAL		
		SERVICE DELIVERY		
Catastrophic	> R100 million loss and or inability to be a sustainable business	Non-achievement of legislative and business mandate	Enduring disruptions to national economy	Non-achievement of agreed service-level performance leading to interruption of service to multiple communities or commercial/ institutional users exceeding a period of 48 hours
Major	R31 to R99 million loss	Non-achievement of annual targets, objectives and strategies	Disruptions to the national economy	Non-achievement of agreed service-level performance leading to interruption of service to a community or commercial/ institutional user exceeding a period of 48 hours
Moderate	R1 to R30 million loss	Negative impact on achievement of 6-monthly targets and objectives, and possibly also strategies	Disruptions to the regional economy	Non-achievement of agreed service-level performance leading to interruption of service to a community or commercial / institutional users exceeding a period of 24 hours
Minor	R200k to R999k loss	Negative impact on achievement of quarterly targets	Disruptions to the local economy (scheme level)	Non-achievement of agreed service-level performance leading to interruption of service to users exceeding a period of 6 hours
Insignificant	R1k to R199k loss	Negligible impact on the achievement of monthly activities	Nominal disruptions to the local economy	Non-achievement of agreed service-level performance leading to interruption of service to users for a period less than 6 hours

NON-FINANCIAL					ASSUMED RISK COST
REPUTATION			ENVIRONMENTAL		
Complete loss of confidence in the credibility of the City by all stakeholders	Major international and national media coverage, including TV. Matter discussed in Parliament. Loss of public trust	Multiple fatalities	Closure/major reduction in business due to disasters and or gross negligence	Irrevocable damage to the environment	**R150 million**
Damaging complaints raised by stakeholders, staff and customers as a result of non-achievement of targets, objectives and strategy	Major national media coverage, including TV. Loss of public trust	Single fatality and/or multiple injuries requiring hospitalisation	Sanctions/legal actions	Major environmental damage, loss of animal or plant life	**R65 million**
Damaging complaints raised by stakeholders, staff and customers that reflects their lack of confidence in the City	Incidental national media coverage – matter can be rationally explained to the satisfaction of interested parties	Serious injury or illness that may result in permanent impairment of health, or disability	Formal management/ stakeholder complaints	Moderate environmental damage, loss of animal or plant life	**R15 million**
Complaints raised by stakeholders, staff and customers that has limited impact on the City	Regional negative news coverage	Minor injuries or illness requiring hospitalisation - full recovery expected	Repetitive queries	Some environmental rehabilitation effort required	**R600k**
Occasional complaints that have no negative impact on the City	Expression of frustration by local community members. Local media coverage	Minor single injury	Occasional queries	Some damage, from which the environment will naturally recover without any corrective measures required	**R100k**

3G Asset register data requirements

3G.1: Valuation asset register

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Description	Component ID	Unique identifier code – system generated
	Alternative code	Reference to other coding – e.g. in other system, or previous coding
	Accounting group	In line with asset hierarchy
	Accounting subgroup	In line with asset hierarchy
	Asset class	In line with asset hierarchy
	Asset group type	In line with asset hierarchy
	Asset group name	In line with functional location hierarchy
	Asset group subname 1	In line with functional location hierarchy (optional)
	Asset group subname 2	In line with functional location hierarchy (optional)
	Asset type	In line with asset hierarchy
	Component type	In line with asset hierarchy
	Descriptor – type	If required (based on component type)
	Descriptor – size	If required (based on component type)
	Descriptor – size measure	Prescribed based on component type
	Descriptor – class	If required (based on component type)
	Descriptor – general	In line with functional location hierarchy (optional)
	Descriptor – general 2	In line with functional location hierarchy (optional)
	Extent	Number
	Extent Unit	Prescribed based on component type
	Extent CG	Grade 1–5
	Unit rate	Based on model calibrated to the respective city on report date
	Unit rate unit	Prescribed based on component type
	Unit Rate CG	Grade 1–5 in line with model
	Responsible department code	Cost allocation code
	Responsible department	Name
	Label	Barcode or alternative
	Serial No	Serial number of component (where applicable)
	Map feature id.	Spatial reference

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Description	Location – erf	Spatial reference
	SG code	Spatial reference
	Location – address	Spatial reference
	Latitude	Spatial reference
	Longitude	Spatial reference
	Coordinate CG	Grade 1–5 in line with model (integer)
	Region (SDA)	Service-delivery area (e.g. depot, works name)
	Suburb	Township extension (Name/number)
	Ward number	Spatial reference (may change from time to time)
	Year asset first constructed	Year asset group or facility established
	Component start year	Year current component installed – if known
	Component start year CG	Grade 1–5 in line with model (integer)
	Funding type	From prescribed list of types (e.g. own, loan, grant etc.)
	Funding source	Name of institution, where applicable
	Leased/owned?	Note as applicable
Life-cycle status	Condition grade	Grade 1–5 in line with model (integer)
	Condition grade CG	Grade 1–5 in line with model (integer)
	Criticality grade	Grade 1–5 in line with model (integer)
	Criticality CG	Grade 1–5 in line with model (integer)
	Performance grade	Grade 1–5 in line with model (integer)
	Performance grade CG	Grade 1–5 in line with model (integer)
	Ops cost grade	Grade 1–5 in line with model (integer)
	Ops cost grade CG	Grade 1–5 in line with model (integer)
	Utilisation grade	Grade 1–5 in line with model (integer)
	Utilisation grade CG	Grade 1–5 in line with model (integer)
Valuation	CRC	Calculated field – based on model (extent, unit rate / type / size / class) – updated each year
	CRC CG	Calculated – as per model
	Impairment	Value (damage, missing subcomponents)
	DRC	Based on adjusted RUL and RV

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Valuation	DRC CG	Calculated – as per model
	Risk exposure	Based on risk exposure matrix, worst failure mode
	Annualised maintenance % CRC	Based on model (calibrated)
	Annual maintenance budget need	Based on model – rand amount
	Residual value (R)	Based on model
	EUL (years)	From model – 2 decimal points
	EUL CG	Grade 1–5 in line with model (integer)
	RUL (years)	Last year's RUL closing (Note: in the VAR this is based on the algorithm)
	RUL CG	Calculated – highest of age or condition data confidence grade
Accuracy	Valuation accuracy	As per data accuracy model
	Attribute accuracy	As per data accuracy model
	Overall data accuracy	As per data accuracy model

3G.2: Financial asset register

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Description	Component ID	Unique identifier code – system generated
	Alternative code	Reference to other coding – e.g. in other system, or previous coding
	Accounting group	In line with asset hierarchy
	Accounting subgroup	In line with asset hierarchy
	Asset class	In line with asset hierarchy
	Asset group type	In line with asset hierarchy
	Asset group name	In line with functional location hierarchy
	Asset group subname 1	In line with functional location hierarchy (optional)
	Asset group subname 2	In line with functional location hierarchy (optional)
	Asset type	In line with asset hierarchy
	Component type	In line with asset hierarchy
	Descriptor – type	If required (based on component type)

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Description	Descriptor – size	If required (based on component type)
	Descriptor – size measure	Prescribed based on component type
	Descriptor – class	If required (based on component type)
	Descriptor – general	In line with functional location hierarchy (optional)
	Descriptor – general 2	In line with functional location hierarchy (optional)
	Extent	Number
	Extent unit	Prescribed based on component type
	Extent CG	Grade 1–5
	Unit rate	Based on model calibrated to the respective city on report date
	Unit rate unit	Prescribed based on component type
	Unit rate CG	Grade 1–5 in line with model
	Responsible department code	Cost allocation code
	Responsible department	Name
	Label	Barcode or alternative
	Serial no.	Serial number of component (where applicable)
	Map feature id.	Spatial reference
	Location – erf	Spatial reference
	SG code	Spatial reference
	Location – address	Spatial reference
	Latitude	Spatial reference
	Longitude	Spatial reference
	Coordinate CG	Grade 1–5 in line with model (integer)
	Region (SDA)	Service delivery area (e.g. depot, works name)
	Suburb	Township extension (name/number)
	Ward number	Spatial reference (may change from time to time)
	Year asset first constructed	Year asset group or facility established
	Component start year	Year current component installed– if known
	Component start year CG	Grade 1–5 in line with model (integer)
	Funding type	From prescribed list of types (e.g. own, loan, grant etc.)

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Description	Funding source	Name of institution, where applicable
	Treasury code	Model – in line with SCOA
	Cost centre	Model – in line with SCOA
	General ledger code	Model – in line with SCOA
	Related project reference	Where applicable – WBS, contract number or WIP register reference
	Last verification date	Date – as applicable
Ownership	Leased/owned?	Note as applicable
	Asset custodian	Name of post
	Debt security applicable	Note if component has been used in this manner – Y/N
	Debt security expiry date	Where applicable
	Supplier	Name
	Consultant	Name – where applicable
	Subsequent measurement model	As per AM policy (determines if periodic revaluation)
	Insurance cover	Yes/no
	Insurance policy no	Name where applicable
	Basic municipal service?	Yes/no
Opening and closing balances	Reporting date	30 June/year
	Cost opening	Take-on cost (where applicable based on shadow valuation) or revalued cost under revaluation model
	Accumulated depreciation – opening	Carried forward from last year
	Opening balance – impairment	From previous FY
	Carrying value – opening	Carried forward from last year
	Cost closing	Cost plus any upgrade (or revalued amount – where applicable based on policy)
	Accumulated depreciation – closing	Opening plus FYTD
	Accumulated impairment – closing	Calculated
	Carrying value – closing	Depends on measurement approach (Cost: carrying value opening, plus FY upgrading cost, less FY depreciation, FY impairment, derecognition)
Life-cycle management	Condition grade	Grade 1–5 in line with model (integer)
	Condition grade CG	Grade 1–5 in line with model (integer)
	Criticality grade	Grade 1–5 in line with model (integer)

DATA GROUP	COLUMN HEADER	DESCRIPTION OF DATA
Life-cycle management	Criticality CG	Grade 1–5 in line with model (integer)
	Performance grade	Grade 1–5 in line with model (integer)
	Performance grade CG	Grade 1–5 in line with model (integer)
	Ops cost grade	Grade 1–5 in line with model (integer)
	Ops cost grade CG	Grade 1–5 in line with model (integer)
	Utilisation grade	Grade 1–5 in line with model (integer)
	Utilisation grade CG	Grade 1–5 in line with model (integer)
	Valuation accuracy	Grade 1–5 – calculated
	Attribute accuracy	Grade 1–5 – calculated
	Overall data accuracy	Grade 1 – 5 – calculated
	Adjusted CRC (closing)	Calculated field – based on model (extent, unit rate/type/size/class) – updated each year
	CRC CG	Calculated – as per model
	Adjusted DRC (closing)	Based on adjusted RUL and RV
	DRC CG	Calculated – as per model
	Risk exposure	Based on risk exposure matrix, worst failure mode
Life-cycle management	Forecast replacement year	Based on RUL
	Annualised maintenance % CRC	Based on model (calibrated)
	Annual maintenance budget need	Based on model – rand amount
	Actual budget allocated (% need)	Apportioned – based on actual budget allocated
	Maintenance expenditure	Apportioned – based on actual expenditure
Additions	Nature of addition	New, upgrading, rehabilitation, replacement, donation (determines method to establish new value)
	Cost of addition	Actual cost linked to the GL
	Take-on date	Date capitalised into AR
Impairment	Cash/non-cash generating unit	As per AM policy (determines impairment calculations)
	Value in use	Calculated – default is adjusted DRC for non-cash generating assets
	Fair value less cost to sell	Calculated (outside system) where applicable (generally NA – assumed less than value-in-use for infrastructure assets where there is generally no active market)
	Recoverable amount	Greater of 2 items above
	Date of impairment	Data entry

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