INTEGRATED WATER SECTOR SKILLS INTERVENTION MAP BASED ON A SECTOR SKILLS GAP ANALYSIS

Report to the
WATER RESEARCH COMMISSION

by

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It would be preferable if the research did not result in a once off snap-shot of a particular institution but instead embedded an approach that was found useful and could be used on an ongoing basis. This research is a study of a handful of institutions to understand present skills audit initiatives and to test if the methodology developed under this research is workable and can be adopted as best practice. If so, individual institutions would need to be convinced to adopt the best practice methodology and embed it in their institutions.

Prof. Alvin Lagardien, Reference Group Member, 2nd Reference Group meeting.

EXECUTIVE SUMMARY

This Water Research Commission (WRC) Project, INTEGRATED WATER SECTOR SKILLS INTERVENTION MAP BASED ON A SECTOR SKILLS GAP ANALYSIS (Number K5/2113), was commissioned by the WRC on behalf of the Department of Water and Sanitation (DWS) in response to repeated declarations that the water sector in South Africa was lacking (and losing) skills necessary to plan for and maintain the supply of water services to the public. The project was commissioned in the face of a lack of readily accessible objective data to confirm or refute the declarations.

This research project provided a technologically up-to-date method of arriving at the evidence required to take management decisions on the situation described. It considers both the institutional capacity and individual skills aspects, where capacity is the number of staff required per job title in a water sector institution (WSI) and the skills are the competence needed by individuals in the jobs.

With regard to the institutional capacity aspect, the project provides a review of WSIs' legal mandates linked to the size of responsibility per mandate. This enables a calculation of capacity requirements with regards to staff numbers per job title. The research project developed and initiated an online staff skills audit survey system that provides a live and repeatable process for measuring individual skills which is rolled up to an institutional competence level.

This report provides a record of the capacity and skills assessments carried out with four public water sector institutions (WSIs), namely: DWS, the Breede-Overberg Catchment Management Agency (BOCMA), Umgeni Water, and Moses Kotane Local Municipality (LM) as a Water Services Authority (WSA). These detailed assessments are referred to as the "Level 1 assessments". This report also provides findings from the "Level 2 assessments" of 18 WSIs conducted on-site in every Province across the country. These assessments include both general human resources (HR) and water sector-specific technical quantitative surveys, wherein the relevant information to verify the responses was gathered in documentation

form and studied by the research team. The Level 2 assessments did not include the capacity and skills audits of the Level 1 assessments.

A further 21 WSIs were interviewed telephonically using the same survey that was used for Level 2. The difference between level 2 and level 3 was that the level 3 WSIs were not asked to provide evidence in support of their responses.

This research only considered public WSIs. Within the WSIs only technical positions were assessed. Therefore Finance and HR posts were excluded. Even within technical departments only semi-skilled and skilled staff were assessed and general workers, who make up approximately 50% of the staff complement, were also excluded.

This research has generated new knowledge related to measuring capacity and skills gaps in WSIs and, following a sector consultation workshop in May 2014, was adopted as best practice in the water sector. Initial recommendations included a concrete plan on how to roll out the methodologies to all WSIs nationally. At the workshop the delegates acknowledged the challenge of persuading all WSIs to employ these methods.

Innovative products produced under the research were:

1. A **Capacity Gap Method** which compares required capacity with supply of capacity in WSIs.
2. A **Water Sector Competency Framework** containing over 2 500 technical skills.
3. A **Skills Matrix** providing required skills per job title in the water sector.
4. A **Skills Gap Method** which compares required skills with supply of skills per job.
5. An **Online Skills Audit Survey System** to gather skills of individuals and their self-rating at www.waterskills.co.za

The Capacity Gap Method

The Capacity Gap is the difference between the demand for capacity and the supply of capacity. Determining this gap is more complex than it might at first appear, and relies on the technical nature of the sector.

The process of determining the demand for capacity in WSIs begins by analysing their mandate as defined in the relevant legislation, in this case the National Water Act (No. 36 of 1998) and/or the Water Services Act (No. 108 of 1997). These mandates are mapped onto the institutions' organograms, and then to individual job titles. Once the mandates from the Acts are mapped into the institutions' job titles, the time it would take to deliver on the mandates is calculated. The detail as to how often tasks related to a mandate would occur in a year along with the time in days to perform that task once, is drawn from experience, as well as the extent of the physical dimensions of the tasks. Discussion with technical staff regarding time-consuming mandates is a valuable added dimension. The total time in days per annum to deliver on mandates would be the product of the number of tasks multiplied by the time to perform the task. This time is divided by 220 working days per annum to determine the number of staff required per job title.

In addition to looking at demand for capacity from a workforce planning point of view, the project also looked at demand for capacity from a qualification and years of experience point of view. The minimum qualification requirements and years of experience for full competence are obtained from job profiles.

The process of determining the supply of capacity in WSIs begins by analysing existing organograms along with staff tables exported from the relevant HR Management Information System (HRMIS), payroll system or hard copy file which lists department, job title, whether a position was vacant or filled, incumbents' name, gender, race and highest qualification. The staff list, itemised by staff member, is aggregated to provide the final figure of the number of staff per job title.

The capacity gap in WSIs is determined by taking the demand for capacity per job title and subtracting the supply per job title. The results can be presented graphically for all job titles and/or mandates.

The above capacity gap method was applied to three WSIs. The method returned reasonable results for the capacity gap at a CMA and a WSA, namely BOCMA and Moses Kotane LM. However, for the water board – Umgeni Water, the method returned a lower

number for staff required than the water board actually had, and thus a negative capacity gap. This led the researchers to question the accuracy of the capacity gap method when applied to a water board. It was recommended that further work be undertaken with other water boards to establish appropriate staffing norms (i.e. the number of staff per job title per unit of measure of work) for these WSIs.

Applying the Capacity Gap method in three WSIs returned the following results:

Institution	No. of technical staff required	No. of technical staff available (all)	Capacity Gap	No. of technical staff with minimum qualifications	Revised Capacity Gap
BOCMA	16	9 (56%)	7 (44%)	9 (56%)	7 (44%)
Umgeni Water	205	413 (201%)	*-208 (-101%)	298 (145%)	*-93 (-45%)
Moses Kotane LM	82	34 (42%)	48 (58%)	6 (7%)	76 (92%)

**Negative value indicates possible inappropriate staffing norms when determining required number of staff.*

The Skills Gap Method

The skills gap is the difference between the skills requirements of the institution (as per the Skills Matrix) and the actual skills held by staff (from the online skills audit). In other words the skills gap would be the difference between the demand and supply of skills.

The process of determining the demand for skills in a WSI begins by using the Water Sector Competency Framework and Skills Matrix. The Competency Framework lays out all aspects of water sector functions (from water resources, environmental protection through to water services operations and maintenance) and expands each function out through competency cluster, competency and individual skills levels. The Competency Framework was developed by the research team in consultation with invited sector specialist professionals.

The demand for skills per job title is drawn up from the Competency Framework by selecting a subset of skills required for each particular job title. In addition to determining the subset or demand for skills per job title a rating of the level of competence is also required. Completely independent of an incumbents competence at the skill, the task requires full

competence if it is to be performed properly. Therefore the rating assigned to the level of competence while determining the demand for a skill is 5, in the rating scale of 1 to 5, which means full evidence of competence in the skill.

In HR terminology the assembly of all required skills per job title in one spreadsheet is referred to as the Skills Matrix of a WSI.

The process of determining the supply of skills in a WSI begins with availing the full list of skills in the Competency Framework to all technical staff who are each required to identify the skills they hold followed by them providing a rating of their competence in each skill from 1 to 5. The meanings of the ratings 1 to 5 are provided to the WSI and each individual.

When complete, the self-assessments are forwarded to line managers for their verification of the individuals' subset of skills and ratings. If the two assessments are different, a meeting between the individual, the line manager, a subject matter expert (if the line manager is not an expert) and an HR representative is convened to discuss the difference and agree a final rating. The final ratings of each individual are forwarded to the skills development facilitator (SDF), and a summary of ratings for all staff forwarded to management for their skills planning information.

Dealing with multiple WSIs, individuals, job titles, sets of skills and ratings is best performed with up-to-date information and communications technology (ICT) to gather, analyse and disseminate the results. This project conceptualised and developed an online skills audit survey system which contained the full list of skills in the water sector competency framework for individual line managers and SDFs to access, and can be found at www.waterskills.co.za.

The skills gap per skill per individual is determined by taking the demand for a skill (a value of 5) and subtracting the supply of that skill, which is deemed to be the final rating. Numerical values for both demand and supply are summated to competency, competency cluster and function level to provide the skills gap graph per individual, which gap informs the individual's training intervention required. Then all the individual ratings are combined

per skill and rolled up to a total score for competency, competency cluster and function for the whole WSI. Thus a skills gap graph for the institution is presented.

The skills gap method was applied to four WSIs. The method returned highly reliable results for the skills gap at a CMA and a WSA, namely BOCMA and Moses Kotane LM. Due to the inability to establish the demand for skills at DWS resulting from research budget limitations, i.e. a skills matrix, only the supply of skills was determined. Whether these skills meet DWS's requirements is unknown. The results of the survey at the water board (Umgeni water) were anomalous. Even though individual staff are highly skilled, the skills gap from the method turned out to be large. This led the researchers to question the accuracy of the Umgeni Water skills matrix, i.e. the demand for skills, which over-selected the number of skills per job title, setting the bar too high.

With the very slow internet connections at the four WSIs, the online skills audit survey system was slow. This challenge needs to be considered should the methodology be applied to other WSIs. The only other option is to provide offline skills audit surveys for individuals to complete on their local computer. Other features that could be coded into the online skills audit survey system are almost endless, but it is recommended that the following features be prioritised:-

- automated data analysis
- production of skills gap reports
- export of data directly to Workplace Skills Plans templates.

Applying the Skills Gap method described above, four WSIs returned the following results for the skills gaps:

Institution	Demand for skills (total value)	Supply of skills (total value)	Skills Gap (total value)	Supply of skills (percentage)	Skills Gap (percentage)
DWS	Not determined	51 646	Not determined	*72%	Not determined
BOCMA	3 020	1 939	1 081	64%	36%
Umgeni Water	25 790	10 237	15 553	40%	60%
Moses Kotane LM	5 125	2 299	2 826	45%	55%

** The 71% rating for DWS reflects staff members' own rating of their own skills, and not against the required skills.*

HR staff are central to the capacity gap and skills gap methods applied at WSIs, and thus these methods should be implemented concurrently with assessing and addressing the skills of HR staff to do HR planning, manage skills audits, analyse results and match training to staff needs.

Level 2 and 3 Assessments

From a sample of 18 WSIs visited across the country, the technical-related research returned interesting information regarding the percentage of master planning, detailed design, construction and operations and maintenance (O&M) work that is done in-house by WSIs. Very little water resources- or water services planning work is done in-house by WSIs. Out of the 18 WSIs, only two did a small percentage of this work in-house, 10% and 20% respectively, otherwise 100% of planning work is outsourced to the private sector by WSIs. A similar result was found with detailed design, construction work and water quality testing – almost 100% was outsourced to the private sector. It was only with O&M that this trend was reversed with approximately 80% of O&M work being done in-house by WSIs and 20% related to the O&M of specialised components was outsourced to the private sector.

The HR-related research also returned interesting information regarding HR management at WSIs. For example, many WSIs reported having completed skills audits in the past five years but in most cases WSIs were merely referring to completing a Workplace Skills Plan (which is not a skills audit). Most WSIs have up to date organograms, however fewer carried out

resource planning on a regular basis. Most WSIs used a combination of two HRMIS systems to house payroll and staff data. WSIs have job profiles but the standard of the profiles varied greatly. Vacancies in technical departments averaged 24%. Retention strategies for technical staff were uncreative in half (50%) of institutions as they cited only medical aid, bursaries and learnerships as their primary strategies. Race equity has almost been achieved in technical posts in the water sector with 81%, 6%, 0% and 13% of staff being Black, Coloured, Indian and White respectively. In technical posts, gender equity has not been achieved: 85% of staff are male.

Supply of Graduates to South Africa

A further aspect of the research was an assessment of whether the Higher Education system in South Africa was producing enough qualified people to fill the capacity gaps identified. Data from the Department of Higher Education and Training (DHET)'s management information system (HETMIS) was received in 76 spreadsheets for the entire higher education sector. The data showed that the number of Civil Engineering graduates has doubled over the past five years from approximately 1000 to 2000 graduates per year. The graduation numbers in a handful of other relevant engineering and science qualifications that can apply to the water sector have also increased dramatically in the past 5 years, with there no longer being a shortage of science graduates. Further research is required to determine the percentage of graduates that enter the water sector as opposed to other sectors. And, of the graduates that enter the water sector, the percentage that enter the public sector as opposed to the private sector also needs to be determined.

In addition, the websites and other publications of 17 Public Universities, 3 Private Universities, 6 Public Universities of Technology and 50 FET Colleges were examined to determine whether courses offered addressed the needs of the sector. While many institutions offered generic engineering, science and technology qualifications that could be applied in the sector, only two (2) public Universities (Venda and University of the North) have specific water-related courses and qualifications.

Stakeholder Consultation Workshop

This research project was funded by the DWS and the WRC, who wished the results of the research to be disseminated and consulted on widely inside and outside of the water sector. A consultation workshop was held in May 2014, with over 91 representatives from various institutions. The Capacity Gap and Skills Gap methods were presented and debated. The result was that the sector endorsed the methodology and proposed adoption as best practice in the sector.

A Best Practice Capacity Gap and Skills Gap Methods for the Water Sector

The culmination of this three-year research project with its findings and sector consultation, is a recommendation that DWS, in partnership with the Energy and Water Sector Education and Training Authority (EWSETA), take the lead under the guidance of the Water Services Leadership Group to roll-out the Capacity Gap and Skills Gap methods to all WSIs in South Africa. By using these standard methodologies across all WSIs the capacity gaps and the individual and institutional skills gaps can be combined to give a complete nationwide picture of the capacity gap and skills gap in the sector to Government. Repeating the process at regular intervals will allow monitoring of the improvement in the situation over time.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ARC	Agricultural Research Council
ARCS ISCW	ARC's Institute for Soil, Climate and Weather
BOCMA	Breede-Overberg Catchment Management Agency
CBE	Council for the Built Environment
CE	Chief Executive
CEO	Chief Executive Officer
CESA	Consulting Engineers South Africa
CGS	Council for Geoscience
CMA	Catchment Management Agency
CME	Compliance Monitoring and Enforcement
CMS	Catchment Management Strategy
CoGTA	Department of Cooperative Governance and Traditional Affairs
CSIR	Council for Scientific and Industrial Research
DBSA	Development Bank of Southern Africa
DHET	Department of Higher Education and Training
DM	District Municipality
DoL	Department of Labour
DPSA	Department of Public Service and Administration
DWS	Department of Water and Sanitation
ECSA	Engineering Council of South Africa
ETD	Education, Training and Development
EWSETA	Energy and Water Sector Education and Training Authority
FET	Further Education and Training
FETWater	Framework for Education and Training in Water
GIS	Geographical Information System
HR	Human Resources
HRMIS	Human Resources Management Information System
HRP	Human Resource Planning
ICT	Information and Communication Technology
IDP	Integrated Development Plan
IMESA	Institute of Municipal Engineering of Southern Africa
IOPSA	Institute of Plumbing South Africa

Km	Kilometre/s
KOBWA	Komati Basin Water Authority
LG	Local Government
LGSETA	Local Government Sector Education and Training Authority
LM	Local Municipality
NICHE	Netherlands Initiative for Capacity Development in Higher Education
NT	National Treasury
NWRS	National Water Resources Strategy
O&M	Operations and Maintenance
OFO	Organised Framework of Occupations
PMU	Project Management Unit
QCTO	Quality Council for Trades and Occupations
RPL	Recognition of Prior Learning
SAICE	South African Institution of Civil Engineering
SALGA	South Africa Local Government Association
SAQA	South African Qualifications Authority
SAWS	South African Weather Service
SDBIP	Service Delivery and Budget Implementation Plan
SETA	Sector Education and Training Authority
TCTA	Trans-Caledon Tunnel Authority
ToR	Terms of Reference
WARMS	Water Use Authorisation and Registration Management System
WISA	Water Institute of Southern Africa
WR	Water Resources
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSI	Water Sector Institution
WSP	Water Services Provider
WSP	Workplace Skills Plan
WTW	Water Treatment Works
WUA	Water User Association
WWTW	Wastewater Treatment Works

DEFINITIONS

Term	Definition
Behavioural Attributes	➢ refers to personal characteristics that are important for performance, e.g. being excellence orientated or showing honesty and integrity.
Capacity	➢ refers to a whole institution's staff requirements by job title with predetermined minimum qualification requirements per job title, e.g. ten plumbers with N2/NTC II with a trade test, and four sewer master planners with BSc. Eng. (Civil).
Competence	➢ the *ability* (in general) to do a particular activity or task to a prescribed standard.
Competency	➢ is a set of defined *knowledge, skills* and *behaviours* that are required to perform a job to a prescribed standard. ➢ Tests can be carried out to assess knowledge and skills/ability.
Competency Cluster	➢ represents a cluster of competencies.
Competency Framework	➢ is a structured way of presenting the knowledge, skills and behaviours, i.e. competencies across each function within a sector, e.g. the Water Sector. ➢ is structured as a four column table with titles Function, Competency Cluster, Competency and Skill. An example of this could be Water Resources Planning/Feasibility Studies or Strategy Development/Catchment Management Strategy Development/Conduct a scoping study.
Job Description	➢ is a list of general tasks or functions, roles and responsibilities of a position or job title.
Job Profile	➢ is made up of the job description, minimum qualification and experience requirements, Key Performance Areas for a specific position and behavioural competencies.
Qualitative Research	➢ is primarily exploratory research. It is used to gain an understanding of **underlying reasons, opinions and motivations**. It provides insights into the problem and helps to develop ideas or hypotheses for potential quantitative research. Qualitative Research is also used to uncover trends in thought and opinions, and dives deeper into the problem. Qualitative data collection methods vary using unstructured and semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews and participation/observation. The sample size is typically small and respondents are selected to fulfil a given quota.
Quantitative Research	➢ is used to quantify the problem by way of generating numerical data or data that can be transformed into useable statistics. It is used to quantify attitudes, opinions, behaviours and other defined variables – and gives generalised results from a large sample. Quantitative research uses **measurable data to formulate facts** and uncover patterns. Quantitative data collection methods are much more structured than qualitative data collection methods. Quantitative data collection methods include online

Term	Definition
	surveys, paper surveys, mobile surveys, kiosk surveys, face-to-face interviews, telephone interviews, website interceptors, online polls, and systematic observations.
Skill	➢ is an *ability* acquired through deliberate, systematic, and sustained effort to carry out activities or tasks involving *cognitive, technical* and *interpersonal dimensions.* ➢ refers to the practical and technical skills required to do a job, such as designing a bridge.
Skills Audit	➢ a process to measure the knowledge, skills and behavioural competencies of an individual.
Skills Audit: Consultant Approach	➢ skills audit ratings for an individual are completed by an external consultant through interviews with both employees and line managers. The consultant may review performance and related documentation.
Skills Audit: One-on-one Approach	➢ is similar to a performance appraisal except that an individual is rated by their line manager who will hold a discussion with the employee to agree on skills audit ratings, i.e. only two people are involved.
Skills Audit: Panel Approach	➢ skills audit ratings for an individual are completed through discussion between the individual and a panel, which is normally made up of the line manager, a subject matter expert and HR staff member, and includes group feedback with the employee.
Skills Matrix	➢ consists of a list of skills, and a rating system, with a definition of what it means to be at a particular level for a given skill. ➢ is presented in table form with the list of skills down the left hand column and the institution's job titles across the top row. Where a job title requires skills from the list, a rating is entered in the cell where the skills row and job title column intersect.
Staffing Norms	➢ staffing norms are the standards which are calculated based on the specific quality, quantity and risk requirements of a specific job or task. ➢ is the number of staff per job title required per unit of measure of work, e.g. one plumbing team required per 160 km of pipeline and one construction project manager per R60 million of capital works.
Technical Skills	➢ refers to engineering skills (including scientific skills) in this research context and would thus include technical posts and top management posts, if these posts are deemed to require engineering and/or scientific skills. Technical skills by their nature would not be required by HR staff, institutional and social development staff, drivers, heavy equipment operators, assistants and general workers, but would be required process controllers.

1 INTRODUCTION

1.1 Purpose of the Final Report

The purpose of this Final Report is to inform the reader of the objectives of the research project, survey methods designed, research results and new knowledge generated. The final report also serves to provide electronic copies of ten other reports that were produced under this research project, the website training manual and the coded computer programme. (The other 10 reports, manuals and computer programme are provided in electronic format on a disk attached to the rear cover of the Final Report).

The Final Report makes conclusions and provides the Water Research Commission (WRC) with recommendations in the light of findings.

1.2 Background and Motivation for the Research

There have been repeated declarations from water sector institutions (WSIs) to the Department of Water and Sanitation (DWS) that these institutions have a desperate need for competent staff in order to sustain their businesses, plan for and maintain the supply of water services to the public.

DWS, acknowledging the importance of human resource capacity within the water sector, commissioned the WRC to manage a project entitled AN INTEGRATED WATER SECTOR SKILLS INTERVENTION MAP BASED ON A SECTOR SKILLS GAP ANALYSIS. The project was to determine the capacity[1] and skills[1] gaps and make recommendations on how to address the gaps.

Besides responding to the declaration of a shortage of skills in the water sector, DWS noted the following:

- There are various initiatives and projects that address analysing the skills gaps and identifying training needs. However, the delivery of training against the identified

[1] See **Definitions** at the beginning of the report for the difference between capacity and skills.

gaps is isolated and varied. The impact of training is also minimal and slow resulting in the supply of skilled human resources falling well short of demand.

- No comprehensive, integrated plan exists that strategically outlines ways in which to define the gap, build capacity and grow skills for both water and sanitation services and water resource management.

Noting the two matters above DWS wished to obtain, in the face of a lack of readily accessible objective data, a clear picture of the capacity and skills gaps in WSIs. From the gaps identified, an intervention map with recommendations to build capacity and skills was to be produced. It should be noted that the research was not required to assess existing education, training and development (ETD) in the sector nor measure the success of ETD.

In researching the capacity gaps and skills gaps in WSIs, including DWS themselves, the terms of reference (ToR) for the research was advertised, requesting that the following be addressed and discussed:

- the impact of the ageing workforce
- institutional upsizing or downsizing
- the shrinking talent pool
- the attractiveness of the sector
- the different values of generation X and Y
- specific skills and competencies required for professional registration
- current training budgets for training and development

Furthermore, the ToR requested that the following water sector institutions be included in the research:

- National government (the regulator and policy maker)
- Water and wastewater service providers (water boards and local government (LG))

- Water resources management institutions (catchment management agencies (CMAs), water users associations (WUA) and bulk infrastructure providers such as the Trans-Caledon Tunnel Authority (TCTA))
- Research institutions such as the Council for Scientific and Industrial Research (CSIR), the Agricultural Research Council (ARC), ARC's Institute for Soil, Climate and Weather (ISCW), the South African Weather Service (SAWS) and the Council for Geoscience (CGS), but excluding academic institutions.

The ToR also outlined that the research should include:

- Management job titles
- Technical jobs titles[2]
- Enabling or support systems such as laboratories and Information and Communications Technology (ICT) but excluding service providers and consultants.

1.3 Statement of Objectives

The **general** objective of the research as per the ToR was to develop an integrated water sector skills intervention map based on the findings of a capacity and skills sector wide audit.

The **specific** objectives were to:

1. Review all existing completed work on the needs and *status quo* of human capacity and competence in the sector and identify information and/or knowledge gaps.
2. Complete a sector wide capacity and skills audit on the existing situation including the current sector skills requirements within the various institutions.

[2] See **Definitions** at the beginning of the report for the meaning of technical skills.

3. Determine the scarce, critical and priority skills gaps for the different "skills sets[3]" and "skills areas[4]" of the water sector and prioritise them into immediate, medium and long term priorities.
4. Develop an integrated water sector skills intervention map which includes:
    a. A summary of the capacity and skills gaps, needs and recommended interventions
    b. Resources and support systems required to intervene.
    c. Definition of roles, responsibilities and targets for intervention.

[3] "Skills sets" was used in the ToR and is equivalent to occupational sets, e.g. engineers or scientists.
[4] "Skills areas" was used in the ToR and is equivalent to areas of specialisation for occupational sets, e.g. for engineers, areas of specialisation are civil, mechanical, chemical and electrical.

2 RESEARCH METHODOLGY

In response to the ToR in May 2011, the research team submitted a proposal in which they outlined a method for a sector wide capacity and skills audit.

The hypothesis designed by the research team from the ToR was that:

Water sector institutions were lacking and losing capacity[5] and skills[5] necessary to plan for, operate and maintain (O&M), the supply of water services to the public.

To prove or disprove the above hypothesis the following four sets of quantitative data were required:

- The **capacity necessary** and **capacity available** to manage water resources and services
- The **skills necessary** and **skills available** to manage water resources and services

The **capacity** and **skills gaps** were to be determined by subtracting the supply from the demand, expressed in the following formulae:

Capacity Gap = Capacity Demand – Capacity Supply

and

Skills Gap = Skills Demand – Skills Supply

The above formulae can be depicted with a bar chart as follows:

[5] See **Definitions** at the beginning of the report for the difference between capacity and skills.

2.1 Determination of the Demand for Capacity

The demand for capacity is generally deemed to be the number of staff per job title as indicated in a WSI's organogram and corresponding list of posts. This assumes the WSI completed a human resource planning (HRP) exercise and obtained approval for all required posts from management. However, approaches to HRP differ from WSI to WSI and thus produce different staffing norms[6].

The alternative method proposed by this research project to determine the demand for capacity is to create staffing norms based on a WSI's function and size of responsibility. In other words:

- the functions of a WSI are examined from legislation and the size of the functions are determined from technical information. [The size of the technical function is described through a logical "unit of measure" which is either physical or financial, e.g. kilometres (km) of sewer pipeline, or length in km of rivers or Rand in million], and,
- A relationship is proposed between the "unit of measure" of a function and the number and type of job titles required, e.g. 1 Project Manager (BSc. Civil Engineering with 10 years of experience) per R30m of capital projects.
- A decision is taken on the minimum qualification requirements per job title.

An example of the format in which the demand for capacity is presented is shown in **Table 1** where only a few job titles have been selected for demonstration purposes.

[6] See **Definitions** at the beginning of the report for the meaning of staffing norms.

Table 1 Format in which the demand for capacity is presented

FUNCTION	JOB TITLE	QUALIFICATION REQUIRED	YEARS OF EXPERIENCE REQUIRED	NUMBER REQUIRED
O&M	Technician: Instrumentation	N6 Certificate or equivalent (Instrumentation)	5 years	4
Design	Technician: Design	S4 Diploma (Civil Engineering)	5 years	20
Construction	Project Manager	BSc. Eng. (Civil Engineering)	5 years	15
Construction	Project Manager	BSc. Eng. (Civil Engineering)	10 years	10
Water Quality	Laboratory Technician: Microbiology	National Diploma (Microbiology)	3 years	7

The decision to use the staffing norms method on this research project was to ensure that a common or standard calculation of the demand for capacity, based on the size of technical responsibility, was used across all WSIs. As such, the capacity gap in one WSI could be more fairly compared to the capacity gap in another WSI.

(Designing institutions, of which staffing norms forms a part, is a structured process. To understand more about institutional design and staffing norms, the researchers consulted the Department of Public Service and Administration's (DPSA) *Guide and Toolkit of Institutional Design* which was found on their website).

While calculating the demand for capacity, an understanding of the work or technical responsibilities that the WSI outsources to the private sector is required. Any work that is outsourced will decrease the number of staff required within the WSI, but conversely will mean that the staff at the WSI managing these private sector contracts will need to have a higher level of experience. To determine what work is outsourced, interviews with technical managers were held.

2.2 Determination of the Supply of Capacity

Section 2.1 outlines the determination of the demand for capacity. This section outlines the determination of the supply of capacity.

The supply of capacity is the staff employed at a WSI. However as mentioned above, using staffing norms, the supply must be described by the type of post (i.e. Job Title), the qualification per incumbent and the summary total of supply per Job Title; not merely by overall numbers employed. As such, data collected during the research from Human Resources (HR) staff at WSIs included a list of technical staff along with their actual qualification and years of experience. The information was requested in spreadsheet format. The spreadsheet column headings were as follows:

1. Institution type (DWS, CMA, WUA, LM, DM)[7]
2. Institution Name
3. Division
4. Section
5. Job Title
6. Whether the post is technical or not
7. Post Level
8. Filled or Vacant
9. Highest qualification of incumbent
10. Years of relevant experience of incumbent
11. Race
12. Gender

An example of the format in which the supply of capacity is presented is shown in **Table 2** where only a few job titles have been selected for demonstration purposes.

[7] CMA – Catchment Management Agency
WUA – Water Users Association
LM – Local Municipality
DM – District Municipality

Table 2 Format in which the supply of capacity is presented

DIVISION	SECTION	JOB TITLE	ACTUAL QUALIFICATION	ACTUAL YEARS OF EXPERIENCE
Planning and Design	Design	Technician: Design	S4 Diploma (Civil Eng.)	3 years
Infrastructure Provision	South Region	Project Manager	BSc Eng. (Civil)	5 years
Infrastructure Provision	North Region	Project Manager	BSc Eng. (Civil)	15 years
Operations	Water	Technician: Instrumentation	N6 Certificate or equivalent (Instrumentation)	7 years
Water Resources Management	Water Quality	Laboratory Technician:- Microbiology	National Diploma (Chemistry)	1 year

Table 1 and **Table 2** show a very small selection of entries but typically the amount of data received runs into hundreds if not thousands of lines and is usually exported from a combination of the payroll and other human resources management information systems (HRMIS). The data in these systems is usually not "clean" and the wording of a qualification inconsistent in each entry. For example one entry might say the qualification is BSc. Eng. (Civil) and another might say BSc. Civil Engineering. The process of data cleaning is described hereunder.

The staff lists obtained are compared with the approved organogram to ensure that there are no "ghost" staff being paid who do not exist.

Staff data is kept in HRMIS of which there are many different software packages in South Africa, for example:- CS, SAMRAS and BIQ. It is of note that these software packages do not automatically produce organograms. And, vice versa, software packages that produce organograms do not automatically export a list of posts. Instead of relying on either the staff list or the organogram, much time is spent ensuring that the two sources of information correlate.

To be able to subtract the supply of capacity from the demand for capacity, the two tables containing the respective data must be joined[8]. Following on the examples above, this would mean joining the data in **Table 1** with the data in **Table 2**. The following steps are required to be able to complete the table join:

- The data in the supply of capacity table must be cleaned[9] to ensure that all job titles match the exact spelling or wording of the same job title in the demand for capacity table.
- The supply of capacity table must be expanded to include a column on function.
- The function must be manually assigned to each staff member (the function under which that staff member falls is inferred from the organogram).
- The supply of capacity table must be pivoted[10] on function, job title and years of experience fields.
- The demand for capacity table must also be pivoted in the same manner and then the two tables joined.

By way of example, using **Table 1** and **Table 2** above, a join would be presented as shown in **Table 3**.

[8] A join is a means for combining fields from two tables by using a field common to each. A programmer writes a join statement to identify the records for joining. If the evaluated predicate is true, the combined record is then produced in the expected format, or temporary table.

[9] Data cleaning is the process of detecting and correcting (or removing) corrupt or inaccurate records from a table or database. Used mainly in databases, the term refers to identifying incomplete, incorrect, inaccurate, irrelevant, inconsistent, etc. parts of the data and then replacing, modifying or deleting the dirty data.

[10] A pivot is a program tool that allows you to reorganise and summarise selected columns and rows of data in a spreadsheet or database table to obtain a desired report.

Table 3 Format in which a joined table of demand for- and supply of capacity is presented

FUNCTION	JOB TITLE	QUALIFICATION REQUIRED	YEARS OF EXPERIENCE REQUIRED	NUMBER REQUIRED	DIVISION	SECTION	ACTUAL QUALIFICATION	ACTUAL YEARS OF EXPERIENCE	SUPPLY OF CAPACITY (COUNT)
O&M	Technician: Instrumentation	N6 Certificate or equivalent (Instrumentation)	5 years	4	Operations	Water	N6 Certificate (Instrumentation)	7 years	1
Design	Technician: Design	S4 Diploma (Civil Eng.)	5 years	20	Planning and Design	Design	S4 Diploma (Civil Eng.)	3 years	0
Construc-tion	Project Manager	BSc Eng. (Civil)	5 years	15	Infrastruc-ture Provision	South Region	BSc Eng. (Civil)	5 years	1
Construc-tion	Project Manager	BSc Eng. (Civil)	10 years	10	Infrastruc-ture Provision	North Region	BSc Eng. (Civil)	15 years	1
Water Quality	Laboratory Technician: Microbiology	National Diploma (Microbiology)	3 years	7	Water Resources Manage-ment	Water Quality	National Diploma (Chemistry)	1 year	0

Demand for Capacity (from **Table 1**)

Supply of Capacity (from **Table 2**)

2.3 Determination of the Capacity Gap

As mentioned previously, the capacity gap is the difference between the demand for capacity and the supply of capacity. By way of example, this would be the data in **Table 1** subtracted from the data in **Table 2**, and would be presented as shown in **Table 4**.

Table 4 Format in which the capacity gap is presented

FUNCTION	JOB TITLE	REQUIRED QUALIFICATION	REQUIRED YEARS OF EXPERIENCE	DEMAND FOR CAPACITY	SUPPLY OF CAPACITY (COUNT)	CAPACITY GAP
O&M	Technician: Instrumentation	N6 Certificate or equivalent (Instrumentation)	5 years	4	1	**3**
Design	Technician: Design	S4 Diploma (Civil Eng.)	5 years	20	0	**20**
Construc-tion	Project Manager	BSc Eng. (Civil)	5 years	15	1	**14**
Construc-tion	Project Manager	BSc Eng. (Civil)	10 years	10	1	**9**
Water Quality	Laboratory Technician: Microbiology	National Diploma (Microbiology)	3 years	7	0	**7**

The capacity gap shown in **Table 4** above is presented graphically in **Figure 1**.

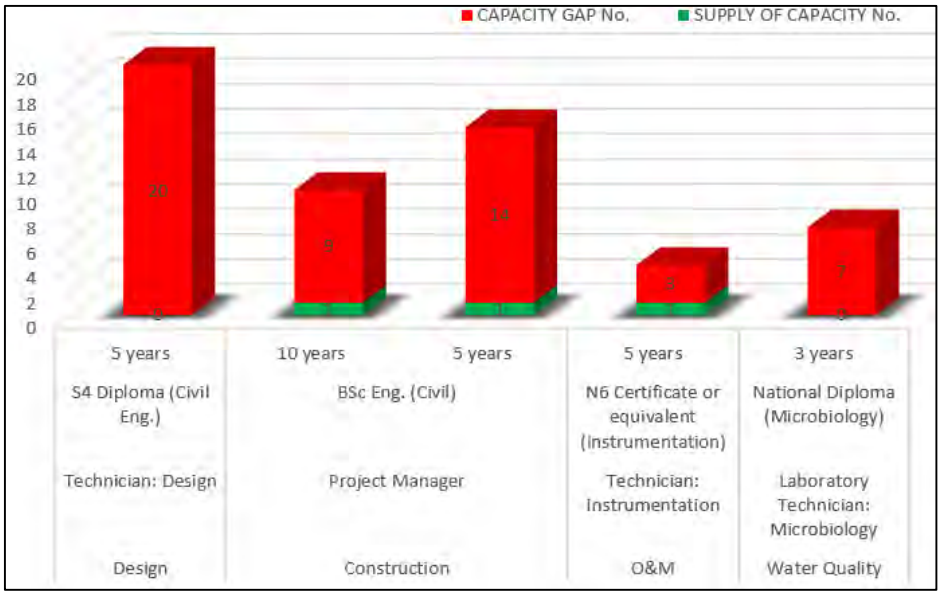


Figure 1 Format in which the capacity gap is graphically presented

2.4 Determination of the Demand for Skills

Sections 2.1 to 2.3 described the demand, supply and gap in capacity for an institution. The report now describes the demand, supply and gap of skills in an individual.

The demand for skills is deemed to be the skills required by job titles at WSIs.

The research ToR discussed previously did not envision the research to include an assessment of the skills of individuals. However, the research proposal submitted was innovative in proposing a method to measure individual skills as well as institutional competence.

Four concepts are introduced in order to determine the demand for technical skills:-

- understanding of different types of skills
- understanding of a competency framework to ensure exact wording of skills across the audit
- understanding of a skills matrix, and;
- the use of a rating scale.

Each of these concepts is discussed below.

Types of skills

Skills are made up of technical skills[11], non-technical skills, knowledge areas and behavioural competencies and attributes. An example of each of these skills in provided in **Table 5**.

[11] See **Definitions** at the beginning of the report for the meaning of Technical Skills

Table 5 Example of different types of skills

TYPE OF SKILL	EXAMPLES
Technical Skills	Install pressure control valves. Conduct harvest surveys. Identify wetland and aquatic animal species. Design clarifiers. Maintain electrical switchgear. Construct a drainage soakaway. Analyse concrete cube test results. Determine bedding class. Identify leakage points. Prepare a water safety plan. Manage fluctuating water levels and pressures. Write safety specifications.
Non-Technical Skills	Writing, reading and language skills. Typing skills. Computer skills. Mathematical skills. Vocational skills (HR, finance, research, etc.).
Knowledge areas	Knowledge of sector legislation. Knowledge of institutional supply chain management rules. Knowledge of relevant South African labour legislation. Knowledge of survey technologies. Knowledge of installation rules as per SANS 10142.
Behavioural Competencies	Communication skills. Negotiation skills. Planning skills. Problem solving skills.
Attributes	Result-oriented. Patient. Love for people. Detail-oriented. Quick decision making. Ability to work under pressure.

Due to limited funding, the research only focused on the technical skills and knowledge areas. The online skills survey system did contain a list of behavioural skills, but the researchers did not obtain the demand for (or required) behavioural skills from line managers. Without the demand, the behavioural skills gap could not be determined.

Competency Framework

In order to aggregate skills from an individual level to a WSI level and then to a national level, it is imperative that the wording and spelling for a skill be identical throughout the

collection of data. To ensure that all skills were identically worded, a World-first **Water Sector Competency Framework**[12] with a Skills Bank was developed, although unfunded.

Skills Matrix

Each job title requires a unique set of skills which will be a subset of skills from the Water Sector Competency Framework. With the skills in the Competency Framework down one axis (the vertical axis) of a spreadsheet and all the job titles across another axis (the horizontal axis), a skills matrix for all job titles in a WSI is established. In other words, the skills matrix is deemed to be the predefined subsets of skills required per job title, or the demand for skills for a particular job title.

Skills Rating Scale

In order to work with numbers when determining the skills gap a rating scale is employed. The rating scale employed on this project is outlined in **Table 6**. If a skill is required for a job then the level of competence required from the rating scale is *full evidence of competence*. The demand for that skill is thus a score of five (5) which is entered against that skill in the Competency Framework.

Table 6 Rating scale to indicate level of skill

RATING	DESCRIPTION	DESCRIPTION (IN THE FIRST PERSON)
1	No evidence of competence.	I do not demonstrate competence in the skill. I require formal training and exposure in the workplace to the skill.
2	Some evidence of competence, needs further training and workplace exposure.	I demonstrate part competence in the skill. I definitely need further formal training and further workplace exposure to the skill.
3	Evidence of competence, needs further training.	I demonstrate competence in the skill but I need further formal training in the skill. I am at a lower level than the position requires.
4	Evidence of competence, needs more workplace exposure.	I demonstrate competence and have relevant formal training in the skill. I need further workplace exposure to ensure improvement and full competence.
5	Full evidence of competence.	I demonstrate full competence and have all the relevant formal training and workplace exposure to the skill. I am at the level required by the position.

[12] See **Definitions** at the beginning of the report for the meaning of Competency Framework and skills bank.

An example of the format in which the demand for skills is presented is shown in **Table 7,** where only a few skills from one job title have been selected for demonstration purposes.

Table 7 Format in which the demand for skills is presented

JOB TITLE: LABORATORY TECHNICIAN (MICROBIOLOGY)				
FUNCTION	**COMPETENCY CLUSTER**	**COMPETENCY**	**SKILL**	**REQUIRED SCORE (demand for skill)**
Water Resources Environmental and Scientific Services	Laboratory Work	Equipment/ Instrumentation Care	Implement care procedures for sterilisation equipment.	5
		Sub Total for Competency		5
		Sample Analysis and Interpretation	Adhere to client service level agreements.	5
			Analyse microbiological samples according to procedures.	5
			Capture results and operate a laboratory information management system (LIMS).	5
			Conduct controls to assess quality of results from samples.	5
			Follow "good laboratory practice".	5
			Follow safety procedures.	5
			Interpret results of microbiological sample testing.	5
			Maintain documentation of results according to procedures.	5
			Use all equipment correctly and according to the quality control system.	5
			Undertake a jar test (beaker test).	0
			Analyse and interpret soil samples.	0
		Sub Total for Competency		45
		Sample Collection and Preservation	Collect and preserve microbiological samples.	5
		Sub Total for Competency		5
	Sub Total for Competency Cluster			55
Sub Total for Function				**55**

2.5 Determination of the Supply of Skills

The supply of skills is the sum total of skills held by incumbents and these are measured through the online skills audit survey system. A skills audit is a process of measuring and recording the skills of an individual or group and, in this way, the skills and knowledge that individuals and WSIs currently have are identified.

Determining the supply of skills is conducted in such a way as to enable comparison with the demand for skills. Therefore the list of skills provided to individuals against which to rate themselves is the same list used when determining the demand for skills.

The approach to recording the skills of individuals must ensure that results returned are accurate and valid. In the field of HR, approaches to skills audits include the following:

- panel approach
- consultant approach
- one-on-one approach.

A short description of each approach is provided in **Definitions** at the beginning of the report.

In each approach there is ratification by a second party of the skills and ratings selected by an individual. This ratification process is *the* step that increases the likelihood of the skills audit results being accurate and valid. However, the ratification process increases the duration and cost of the skills audit process so there is a price to pay for increased accuracy. WSIs who neglect to ratify, and only use the individual's selection of his/her skills and ratings, risk an overall skills audit result of "invalid".

This research employed the panel approach, believing it to be the most valid and fair method to conduct a skills audit. A process diagram of the steps followed in the panel approach is presented in **Figure 2**.

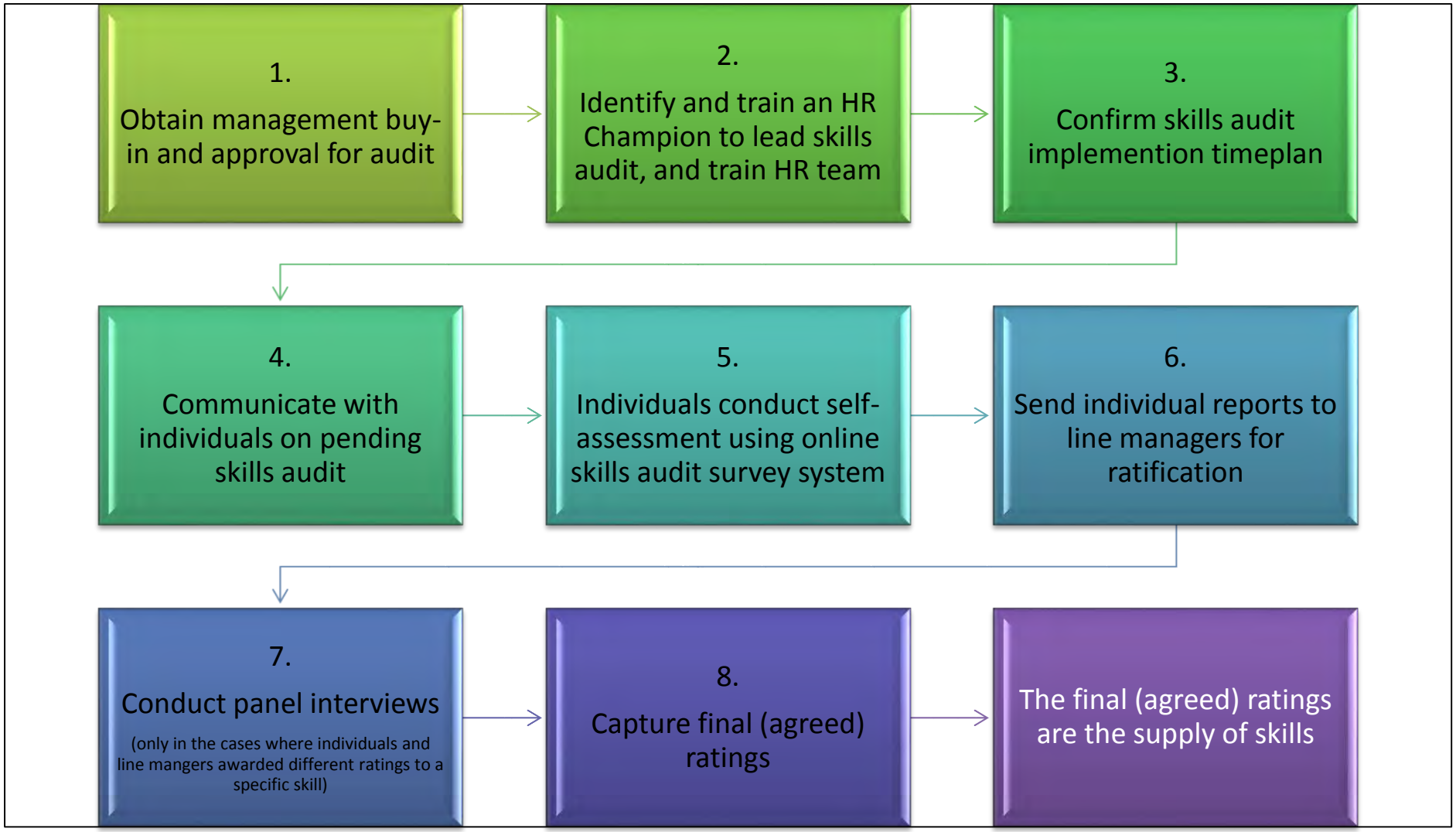


Figure 2 **Skills audit process to determine the supply of skills**

The first step in the skills audit is for management to be aware of the pending skills audit and understand how the results will be used. Thereafter, management needs to select the HR person who will champion the skills audit. This champion in turn needs to identify HR colleagues who will form part of the skills audit team. The HR champion and the skills audit team require training in the online skills audit survey system. Once the team is aware of the time required to implement the audit the implementation timeplan is adopted.

Skills audits tend to raise fear and apprehension in staff and thus the fourth step deals with staff perceptions of the audit. Staff and line managers need to be provided with information regarding the purpose of the skills audit, how the audit will be conducted and what input is required from staff and line managers.

Individual staff members then complete their self-assessment using the online skills audit survey system. Individual staff firstly need to locate the skills they hold on the Competency Framework. Thereafter staff need to consider and enter a self-rating for each skill. The HR skills audit team need to be available at all times to support individuals to complete the audit.

As individuals submit their completed set of chosen skills with their self-ratings, HR staff email these reports to the individual's line manager for ratification. The report sent to the line manager includes the required skills for the job title (demand for skills) as well as the skills chosen by the individual. The line manager then rates the individual on each skill in the report and sends the report with his/her rating back to the HR skills audit team. The HR team will establish panels for cases where the line manager's rating differed from the individual's self-assessment rating.

After the panel discussion, the final (agreed) score is entered in the database by the HR skills audit team. With all the information on ratings in the database, the supply of skills is known. An example of the format in which the supply of skills is presented is shown in **Table 8,** where only a few skills from one job title have been selected for demonstration purposes.

Table 8 Format in which the supply of skills is presented

JOB TITLE: LABORATORY TECHNICIAN (MICROBIOLOGY) INDIVIDUAL: AN OTHER						
FUNCTION	**COMPETENCY CLUSTER**	**COMPETENCY**	**SKILL**	**INDIVIDUAL'S RATING**	**LINE MANAGER'S RATING**	**FINAL AGREED RATING (supply of skills)**
Water Resources Environmental and Scientific Services	Laboratory Work	Equipment/ Instrumentation Care	Implement care procedures for sterilisation equipment.	5	5	5
		Sub Total for Competency		5	5	5
		Sample Analysis and Interpretation	Adhere to client service level agreements	4	4	4
			Analyse microbiological samples according to procedures.	4	5	5
			Capture results and operate a laboratory information management system (LIMS).	2	3	2
			Conduct controls to assess quality of results from samples.	4	4	4
			Follow "good laboratory practice".		5	5
			Follow safety procedures.		5	5
			Interpret results of microbiological sample testing.	4	4	4
			Maintain documentation of results according to procedures.	5	5	5
			Use all equipment correctly and according to the quality control system.	5	5	5
		Sub Total for Competency		28	40	35
		Sample Collection and Preservation	Collect and preserve microbiological samples.	5	4	5
		Sub Total for Competency		5	4	5
	Sub Total for Competency Cluster			38	44	45
Sub Total for Function				**38**	**44**	**45**

Skills marked in red are skills where the individual's self-rating and the line manager's rating differed. Only these skills are addressed in the panel discussion.

2.6 Determination of the Skills Gap

The skills gap is the difference between the demand for skills and the supply of skills. By way of example, this would be the data in **Table 7** less the data in **Table 8**, and would be presented as shown in **Table 9**.

Information on the skills gap enables the WSI to compile a comprehensive and meaningful training intervention plan per individual and the WSI as a whole. The skills gap information may also be used for:

- development of the workplace skills plan (WSP)
- internal employee selection to ensure that the correct person is deployed to each position
- performance management
- succession planning.

Table 9 Format in which the skills gap is presented

FUNCTION	COMPETENCY CLUSTER	COMPETENCY	SKILL	REQUIRED SCORE	FINAL (AGREED) RATING	SKILLS GAP
Water Resources Environmental and Scientific Services	Laboratory Work	Equipment/ Instrumentation Care	Implement care procedures for sterilisation equipment.	5	5	0
		Sub Total for Competency		5	5	0
		Sample Analysis and Interpretation	Adhere to client service level agreements.	5	4	1
			Analyse microbiological samples according to procedures.	5	5	0
			Capture results and operate a laboratory information management system (LIMS).	5	2	3
			Conduct controls to assess quality of results from samples.	5	4	1
			Follow "good laboratory practice".	5	5	0
			Follow safety procedures.	5	5	0
			Interpret results of microbiological sample testing.	5	4	1
			Maintain documentation of results according to procedures.	5	5	0
			Use all equipment correctly and according to the quality control system.	5	5	0
		Sub Total for Competency		45	39	6
		Sample Collection and Preservation	Collect and preserve microbiological samples.	5	5	0
		Sub Total for Competency		5	5	0
	Sub Total for Competency Cluster			55	49	6
Sub Total for Function				**55**	**49**	**6**

3 INSTITUTIONS THAT FORMED PART OF THE RESEARCH SAMPLE

3.1 Level 1 Assessment

The level 1 assessment included a capacity gap analysis and skills gap analysis. The level 1 assessment also included interviews with one technical and one HR manager. The interviews were conducted according to standard questionnaires which can be found in **Appendix A** and **Appendix B.**

There were five (5) WSIs identified to be part of the level 1 assessment:-DWS, Breede Overberg Catchment Management Agency (BOCMA), Umgeni Water, Moses Kotane LM, Chris Hani DM. At the end of the project the 5 institutions had participated differently in the various sub aspects of the assessment as shown in **Table 10**.

Table 10 Institutions that formed part of the level 1 assessments

Level of Asessment	Type of Institution	Type of Municipality	Name of Institution	Count	Demand for Capacity	Supply of Capacity	Capacity Gap	Demand for Skills	Supply of Skills	Skills Gap
Level 1	National		DWA	1	Not in ToR	Not in ToR	Not in ToR	✗	✓	✗
	CMA		BOCMA	1	✓	✓	✓	✓	✓	✓
	Water Board		Umgeni Water	1	✓	✓	✓	✓	✓	✓
	Municipality	LM	Moses Kotane LM	1	✗	✓	✗	✓	✓	✓
	Municipality	DM	Chris Hani DM	1	✗	✗	✗	✗	✗	✗
Total Level 1				**5**	**2**	**3**	**2**	**3**	**4**	**3**

At a meeting held with the WRC during the project, it was agreed that determining the **capacity gap** at DWS would be an extensive exercise and should not have been included in the research scope of work as outlined in the ToR. Furthermore the **demand for skills** (and subsequently the skills gap) could not be determined at DWS due to the limited research budget, and the fact that job profiles did not include skills requirements which could be used to develop a skills matrix for DWS. With DWS being a large institution, this would require a separate project.

At Moses Kotane LM, the **demand for capacity** could not be determined as the municipality could not provide technical information or maps on the extent of responsibility of the municipality, e.g. length of pipelines, classification of works, etc.

With regards to Chris Hani DM, it was decided with the WRC and DWS that funding of R800 000 for the level 1 assessments was insufficient to include Chris Hani DM.

3.2 Level 2 Assessment

The level 2 assessment included a capacity gap analysis only. The level 2 assessment also included interviews with one technical and one HR manager. The interviews were conducted according to the same standard questionnaires as used for the level 1 assessment and can be found in **Appendix A** and **Appendix B**. The level 2 assessments also included capturing the WSI organograms in SMARTDRAW organogram software.

There were 18 WSIs identified to be part of the level 2 assessment. An error had occurred by including DWS in the level 2 assessment, and this brought down the sample size to 17. At the end of the project 17 WSIs had participated differently in the various sub aspects of the level 2 assessment as shown in **Table 11**.

Table 11 Institutions that formed part of the level 2 assessments

Level of Assessment	Type of Institution	Type of Municipality	Name of Institution	Count	Demand for Capacity	Supply of Capacity	Capacity Gap
Level 2	National		DWS	1			
	CMA		Prototype CMA	1			
	WUA		Groenland WUA	1			
			Oranje-Riet WUA	1			
	Water Board		Amatola Water	1			
			Botshelo Water	1			
	Municipality	Metro	Tshwane Metro	1			
		DM	Capricorn DM	1			
			Ehlanzeni DM (not a WSA)	1			
			Ngaka Modiri Molema DM	1			
			iLembe DM	1			
		LM	Blue Crane Route LM	1			
			Cape Agulhas LM	1			
			Ditsobotla LM (not a WSA)	1			
			Maluti-a-Phofung LM	1			
			Newcaste LM	1			
			Sol Plaatje LM	1			
			Thabazimbi LM	1			
Level 2 Total				**18**	**0**	**14**	**0**

Of the 17 institutions in the sample, three (3) did not take part bringing the sample size down to 14. These three institutions were ILembe DM and Thabazimbi LM, who both chose not to participate, and the prototype CMA. It was decided that the prototype CMA would not be included in the research sample as the number of CMAs that DWS would establish was under discussion at the time of the research (seemingly changing from 19 CMAs to 9 CMAs).

The **demand for capacity** was not completed for the remaining 14 WSIs because, although the interviews with technical managers were conducted, the research team failed to get sufficient information or maps on the extent of responsibility for these 14 WSIs, e.g. length of pipelines, classification of works, etc. As the demand for capacity was not determined, the **capacity gap** could not be calculated.

3.3 Level 3 Assessment

The level 3 assessment did not include a capacity gap analysis or a skills gap analysis. The level 3 assessment only included telephonic interviews with one technical and one HR manager. The interviews were conducted according to the same standard questionnaire as used for the level 1 assessment and can be found in **Appendix A** and **Appendix B**. However, unlike the level 1 and 2 assessments where WSIs were requested to provide information, under the level 3 assessment WSIs were merely asked, if contacted at a later date, whether they would be able to provide the information.

There were 21 WSIs identified to be part of the level 3 assessment. At the end of the project 11 institutions had participated in the technical questionnaire and 17 in the HR questionnaire as shown in **Table 12**.

Table 12 Institutions that formed part of the level 3 assessments

Level of Asessment	Type of Institution	Type of Municipality	Name of Institution	Count	Responded to Technical Survey	Responded to HR Survey
Level 3	WUA		Nzhelele WUA	1	✓	✗
	Water Board		Lepelle Northern Water	1	✗	✓
	Municipality	DM	Dr Ruth Mompati/Bophirima DM	1	✓	✓
			Greater Sekhukhune DM	1	✗	✗
			Sisonke DM	1	✗	✓
			Zululand DM	1	✗	✓
			OR Tambo DM	1	✗	✓
		LM	!Kai! Garib LM	1	✓	✓
			Emfuleni LM	1	✓	✓
			Kareeberg LM	1	✓	✓
			Kopanong LM	1	✓	✓
			Kou-Kamma LM	1	✓	✓
			Matzikama LM	1	✓	✓
			Nama Khoi LM	1	✗	✓
			Polokwane LM	1	✗	✓
			Ventersdorp LM	1	✓	✓
			Victor Khanye LM	1	✓	✓
			Breede River/Winelands LM	1	✗	✓
			Oudsthoorn LM	1	✓	✓
			Nala LM	1	✗	✓
			Msukaligwa LM	1	✓	✓
Level 3 Total				**21**	**12**	**19**

With 4 institutions finally partaking in the level 1 assessment, 19 institutions in the level 2 assessment and 17 institutions in level 3 assessment the total number of WSIs that took part in the research came to 37. With approximately 350 public water sector institutions in South Africa, the research covered a sample of 10% of the total number as shown in **Table 13** overleaf.

Table 13 Total number of WSIs that participated in the research and the percentage related to the total number of WSIs in South Africa

	Type of Institution					
Level of Asssessment	**DWS**	**CMA**	**WUA**	**Water Board**	**WSA**	**Total**
Level 1	1	1	-	1	1	4
Level 2	-	-	2	2	10	14
Level 3	-	-	1	1	17	19
Total in research	**1**	**1**	**3**	**4**	**28**	**37**
Total in SA	1	9	165	13	162	350
% in research	**100%**	**11%**	**1%**	**31%**	**17%**	**10%**

The geographical distribution of WSIs who finally participated in the level 1, 2 or 3 assessments is shown in **Figure 3** overleaf.

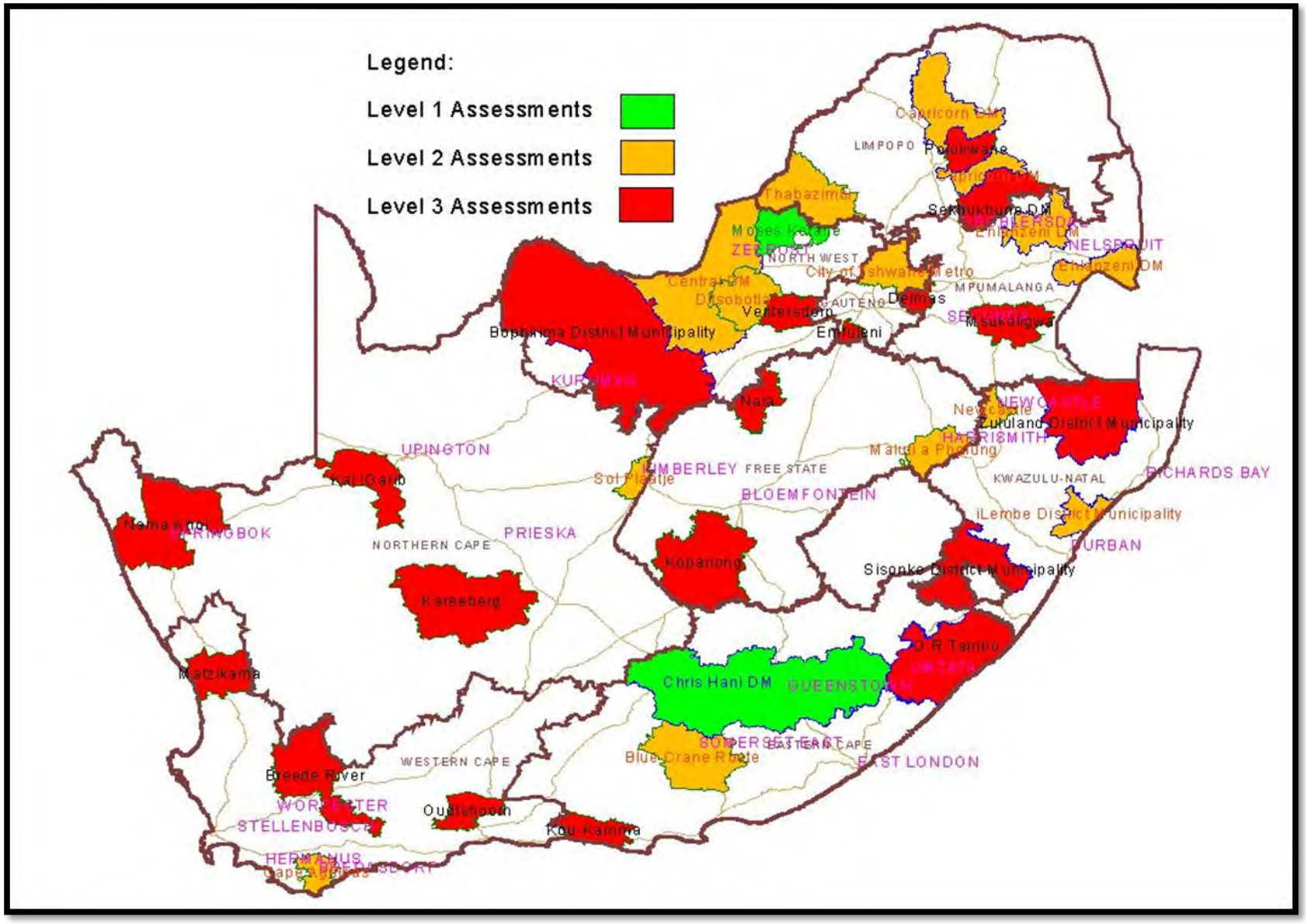


Figure 3 Map showing distribution of WSAs chosen for level 1, 2 and 3 assessments

4 RESEARCH FUNDING

The scope of any research will always be limited to the research funding available.

With over 380 public water sector institutions and approximately 28 000 staff in the public water sector, the scope of the research had to be managed to meet funding. The research was thus limited to a small selection of WSIs.

Total research funding was just under R2.3m. Key conclusions to note regarding expenditure are:

- the largest expenditure was on the level 1 assessments at approximately **R0.8m**. With four (4) institutions assessed the costs amounted to approximately R200 000 per institution;
- the next largest expenditure was on the level 2 assessment at approximately **R0.5m**. With fourteen (14) institutions assessed the costs amounted to approximately R35 000 per institution;
- the level 3 assessment cost approximately **R0.2m**. With twenty one (21) institutions assessed the costs amounted to approximately R9 500 per institution;
- the remaining **R0.8m** was spent on five (5) reports which were the literature review, inception report, supply side research, consultation report and final report. The costs amounted to approximately R160 000 per report.

A detailed breakdown of the deliverables and the reports produced with accurate costs can be found in **Table 14**. Similar information is presented in the infographic[13] in **Figure 4**. In reading the infographic it is advised to read one line or row at a time. There are 7 (seven) lines or pieces of information in the infographic as follows:

[13] Information graphics or infographics are graphic visual representations of information, data or knowledge intended to present complex information quickly and clearly. They can improve cognition by utilising graphics to enhance the human visual system's ability to see patterns and trends.

Line 1: Name of deliverable

Line 2: Expenditure (rounded up)

Line 3: Number of institutions to which the capacity gap method was applied (total of 17)

Line 4: Number of individuals who participated in the online skills survey (total of 235)

Line 5: Other institutions that were contacted for information (total of 19)

Line 6: Duration in months of each deliverable

Line 7: Calendar

Table 14 Record of research project deliverables, reports produced and expenditure

DELIVERABLE NUMBER	DELIVERABLE NAME	ADDITIONAL COMMENT	NAME OF REPORT SUMBITTED	COUNT OF REPORTS	COST	PERCENTAGE OF TOTAL COST	NUMBER OF INSTITUTIONS IN ASSESSMENT	ROUNDED PRICE PER INSTITUTION
1	**LITERATURE REVIEW**	-	Literature Review	1	R 100 000	4%		
2	**INCEPTION REPORT**	-	Inception Report	1	R 100 000	4%		
3	**LEVEL 1 ASSESSMENT**	Launching of web-enabled site	-	-	R 785 750	34%	4	R 200 000
5		First 50%	Level 1 (a) BOCMA	1				
			Level 1 (b) DWS	1				
9		Second 50%	Level 1 (c) Moses Kotane LM	1				
			Level 1 (d) Umgeni Water	1				
4	**LEVEL 2 ASSESSMENT**	First 50%	Level 2 Report	1	R 481 500	21%	14	R 35 000
7		Second 50%						
8	**LEVEL 3 ASSESSMENT**	-	Level 3 Report	1	R 232 626	10%	19	R 12 000
6	**SUPPLY SIDE RESEARCH**	-	Supply Side Report	1	R 80 800	4%		
10	**CONSULTATION REPORTS**	-	Consultation Report	1	R 300 000	13%		
12	**FINAL REPORT AND SKILLS MAP**	Draft Skills Map	Final Report	1	R 214 250	9%		
11		Final report						
	TOTAL			**11**	**R 2 294 926**	**100%**		

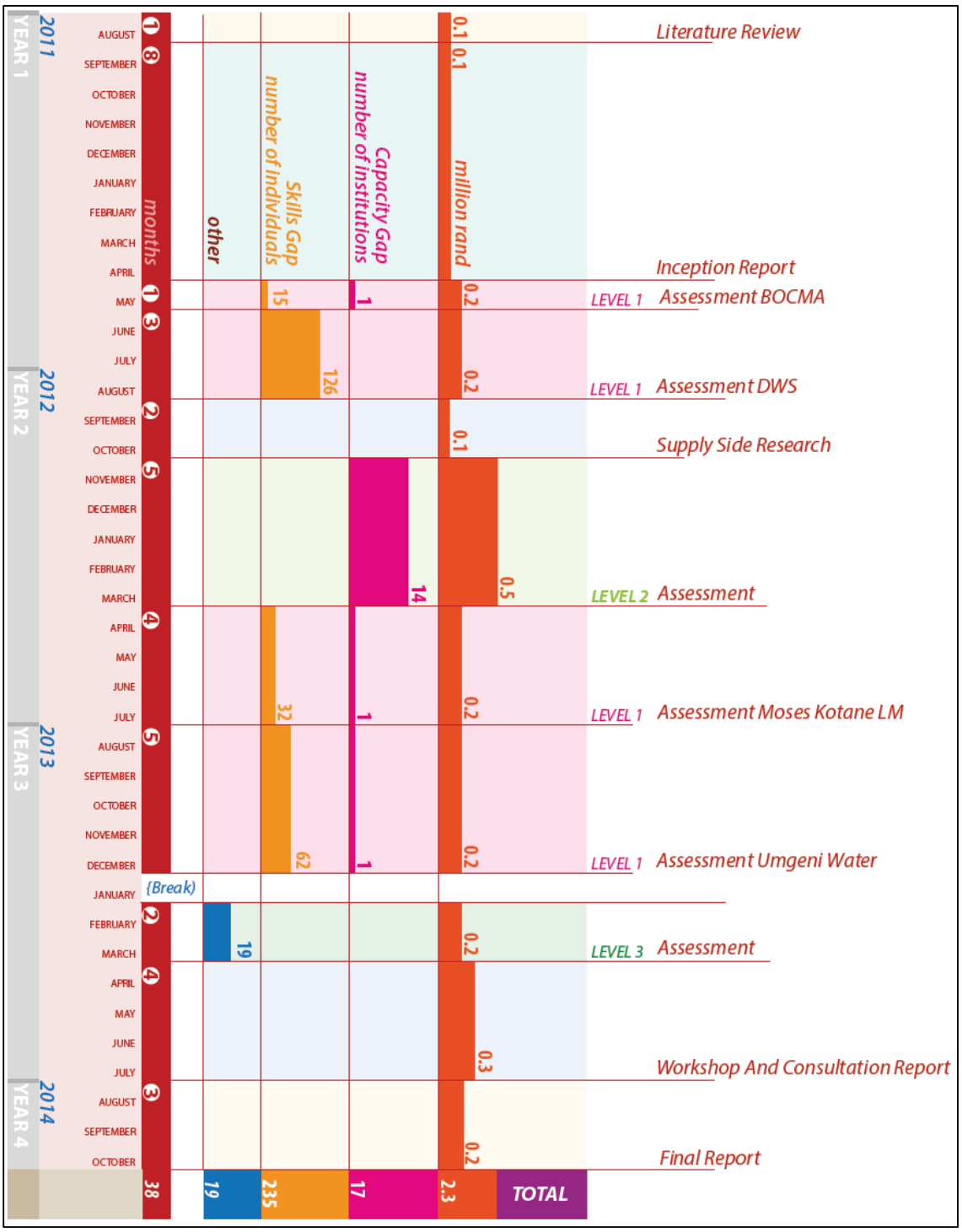


Figure 4 Infographic showing deliverables, expenditure, timeline and number of institutions and individuals in research sample

5 FINDINGS

As mentioned in **Section 4,** 10 reports were produced on the project prior to this Final Report. Each of these 10 reports discussed research methodology and findings pertaining to the work completed for the respective deliverable. This section of the Final Report restates briefly the most pertinent findings from the other 10 research reports. The research report in which the findings, repeated here, were originally written is provided in a grey-shaded information box.

5.1 Literature Review

Relevant report:
Deliverable 1 – Review of Existing or Completed Work Relevant to the Sector

For the review of existing or completed works on capacity and skills relevant to the water sector, 57 documents were reviewed and numerous phone calls were made to WSIs for information on capacity and skills work that was ongoing. **Table 15** overleaf presents a list of the documents reviewed with the document author, the year of publication and the length of the document in pages. A total of 4 371 pages were read and reviewed.

A two page review was written of each document under the following headings:

- Summary of the document
- Summary of information relevant to skills development in the water sector
- Analysis of information and/or gaps specifically relevant to this project

The reviews can be found in the report mentioned in the grey information box above.

Table 15 List of documents reviewed

NO.	TYPE	DOCUMENT NAME	AUTHOR	YEAR	NO OF PAGES
1	Edu. WR	Project Proposal: CPUT/UWC & Wageningen Uni - Capacity Building for IWRM	Netherlands Initiative for Capacity Dev in Higher Education (NICHE)	2010	31
2	Edu. WS	Project Proposal: TUT & Delft Uni - Enhancing Institutional Capacity for Water and Waste Water Treatment	Netherlands Initiative for Capacity Dev in Higher Education (NICHE)	2010	29
3	Financial	Determining the Monetary and Strategic Value of National Water Monitoring Programmes	DWS	2008	47
4	Financial	The Financial Component of the Capacity Gap, Managing the Water Quality Effects of Settlements	DWS	2001	57
5	Gender	Towards The Criteria Necessary for the Career Success of Women in the Water Sector	WRC Report No 1762/1/10	2010	119
6	HR	2025 Vision for Human Resource Development for the Water Sector	DWS	2008	70
7	HR	A Guide to using the Organising Framework for Occupations (OFO)	Department of Labour	2009	27
8	HR	Beneficial Use of Water Network Capacity Audit	FETWater	2005	26
9	HR	EWSETA Sector Skills, Plan, 2011	eSETA	2011	132
10	HR	Framework for the National Skills Development Strategy 2011/12 to 2015/16, First Draft for Consultation	Department of HE&T	2010	27
11	HR	Guidelines on Remuneration of Managers in Local Government	DPLG	2001	4
12	HR	Human Resources Development Strategy of South Africa, 2010 to 2030	Department of Labour	2010	62
13	HR	Human Resources Handbook - A Guideline, 2002	DWS	2002	128
14	HR	Local Government Skills Audit Questionnaire	CoGTA	2010	15
15	HR	National Water Skills Strategy Business Plan: An Action Plan for Meeting the Australian Water Sector's Workforce Capacity Needs.	AWA	2010	74
16	HR	Numbers and Needs in Local Government: Civil Engineering. Addressing the Critical Profession for Service Delivery	Allison Lawless	2007	361
17	HR	Retired Engineers Filling a Crucial Gap, Engineering News	Engineering News	2008	4
18	HR	South African Standard Occupations Classification (SASOC Codes)	StatsSA website	2005	176
19	HR	State of Local Government in South Africa, Overview Report	CoGTA	2009	89
20	HR	The Impact of Structural and Production Method Changes on Employment Growth of Occupational Groups in SA	HSRC	Undated	55
21	HR WR	TCTA Annual Report 2009/10	TCTA	2009	180
22	Prov GDS	Employment Growth and Development Strategy, 2009 - 2014 Gauteng	GP Provincial Government	2009	80
23	Prov GDS	Limpopo Employment, Growth and Development Plan, 2009 - 2014	Limpopo Provincial Government	2009	86
24	Prov GDS	Provincial Growth and Develoment Strategy Free State	FS Provincial Government	2010	31
25	Prov GDS	Provincial Growth and Development Strategy, 2004 - 2014 North West	NW Provincial Government	2004	32
26	Prov GDS	Provincial Growth and Development Strategy, 2004 to 2014 updated in 2008, Mpumalanga	MP Provincial Government	2008	83
27	Prov GDS	Provincial Growth and Development Strategy, Draft White Paper 2007 Western Cape	WC Provincial Government	2007	100
28	Prov GDS	Provincial Growth and Development Strategy, Undated Northern Cape	NC Provincial Government	2010	18
29	Prov GDS	Provincial Spatial Growth and Development Framework, Parts 1 and 2 February 1997 KZN	KZN Provincial Government	1997	12
30	Prov GDS	Strategy Framework for Growth and Development, 2004 - 2014 Eastern Cape	EC Provincial Government	2004	56
31	Prov WSP	Limpopo Water Strategy, 2010	DWS	2010	40
32	Prov WSP	Provincial Water Plan, 2006 Gauteng	DWS GP	2006	29
33	Prov WSP	Provincial Water Sector Plan 2007/8 to 2011/12, Eastern Cape	DWA EC	2003	38
34	Prov WSP	Provincial Water Sector Plan, 2009 Western Cape	DWS Western Cape	2009	44
35	Prov WSP	Provincial Water Sector Plan, 2010 Draft Review, KZN	DWSDKZN	2010	47
36	Prov WSP	Provincial Water Sector Plan, 2010 Free State	DWS Free State	2010	49
37	Prov WSP	Provincial Water Sector Plan, 2010 North West	DWS NW	2010	62
38	Prov WSP	Provincial Water Sector Plan, Northern Cape	DWS Northern Cape	2010	19
39	Prov WSP	Water Sector Plan, Strategic Outline 2006 Mpumalanga	DWS MP	2006	26
40	WR	Establishing A Catchment Management Agency: Guide 1 in the CMA/WUA Guide Series (Strategic Considerations for the Establishment of CMAs)	DWS	2000	40
	WR	IWRM Guideline for Capacity Building: Overview Assessment - Generic Overview	DWS	2004	42
	WR	IWRM Guideline for Capacity Building: Overview Assessment - Specific Requirements	DWS	2004	57
41	WR	IWRM Guideline for Capacity Building: Summary	DWS	2004	23
42	WR	National Audit of Capacity for Determination of Resource Directed Measures for Protection of WR in SA	FETWater	2003	74
43	WR	National Water Skills Audit Report, June 2008 (Australia)	ICE WaRM	2008	93
44	WR	NWRS (Capacity Building section)	DWS	2011	13
45	WR	The Capacity Gap in Local Government, Managing the Water Quality Effects of Settlements	DWS	2001	19
46	WR	The Framework Programme for Research Education and Training in Water (FETWater). A Guideline. Fourth Edition.	Republic of South Africa, WRC.	2008	18
47	WR	Towards a Strategy on Human Capacity Building for IWRM and Service Delivery	UNESCO	Undated	42
48	WR & WS	A Coordinated Approach to Skills Development: Coordinating Skills Development Initiatives in the Water Sector	WSLG, Skills Task Team	2010	159
49	WR & WS	A Draft Education and Training Strategy, A Response to Water for Growth and Development	DWS	2009	73
50	WR & WS	Achieve Green Drop Status! Critical Success factors	WIN-SA, Sarah Slabbert Associates	2011	20
51	WR & WS	Assessment of Training Programmes and Capacity Needs for the Water Sector	WRC Report No K8/664 (TT 306/07)	2007	225
52	WR & WS	Assessment of Training Programmes and Capacity Needs for the Water Sector: Review of the Current State of Capacity	Afrosearch (report to WRC)	2007	73
53	WR & WS	DWA Annual Report 2008/09	DWS	2010	390
54	WR & WS	Engineering Professionals Crucial Key to Development and Growth in South Africa, Scarce Skills Project	Department of Labour	2008	124
55	WS	NW Municipal Waste Water Treatment, Base Information for Targeted Risk-Based Regulation, Executive Summary	DWS	2009	51
56	WS	SA Plumbers' Handbook	Institute of Plumbers, South Africa	2004	265
57		Opportunities in the Global Sector	Paul R Houser	Undated	5
		TOTAL			**4371**

Although there were 57 documents reviewed, there were at least a dozen more that appeared to be relevant. These were not reviewed because the documents:

- could not be traced, or
- the budget available for the literature review was fully expended on the 57 documents located.

The literature review report concluded with an overall impression of the documents reviewed as follows:

"Actual skills audit work does seem to have been done in various sector institutions. Via a lengthy series of phone calls several situations were identified where individual WSIs had attempted to do their own audits, but the results of these activities were not immediately available to the research team. In this early stage of the project, time was insufficient to have these institutions document and share their methodologies but in discussion it appeared that some audits comprised good HR practice".

The research team found it useful to categorise the available documents into four logical groups:

- National Strategy or Framework Documents
- Provincial Growth and Development Strategies and Water Sector Plans
- Handbooks, Guideline Documents and Technical Assessments
- Proposals on Funded Programmes

A summary of the usefulness to this project of the documents in these categories follows:

<u>National Strategy or Framework Documents</u>

The Department of Higher Education and Training (DHET) developed a useful system to approach occupational classification and this project worked with this, targeting the subset for the water sector, to ensure alignment with national processes. The

Department of Labour (DoL) Human Resources Development Strategy and the National Skills Development Strategy provide an organised framework of occupations that any sector might require to be able to approach skills development audits and initiatives.

From these generic national level documents the next step was to delve into DWS's strategies. Three were relevant but the concern is that they are all unmanageable – too large and unwieldy. One, *A Coordinated Approach to Skills Development in the Water Sector DWS 2010*, provided extensive information on policies, laws, strategies, existing initiatives, graduate numbers, etc. and no further work was required on these general aspects.

While most of the strategic documents reviewed touched the tip of the iceberg with respect to skills audits none of them gave any guidance on how this was to be accomplished.

The team discovered differences in the understanding of the term "skills audit" amongst the documents reviewed. The Australian and EWSETA documents used the term audit simply in terms of numbers of people employed, and vacant posts. This simple approach explained how the Australian "audit" was able to be completed in just five weeks.

Most of the national level documents reviewed had little facility for this research project.

<u>Provincial Growth and Development Strategies and Water Sector Plans</u>

Because the research project addresses future growth of skills needs in the sector it was determined that the Provincial Growth and Development Strategies and their attendant Water Sector Plans would provide a logical starting point. It was decided to investigate whether the Water Sector Plans considered the growth initiatives in the Provinces and, from those, took on the implications for the water sector. The documents reviewed all espoused the principles of water for growth and skills for growth but none went beyond the statement of principle to even enumerate the numbers gap, let alone the actual

abilities and skills innate (or indeed lacking) in the water sector workforce. There were no mentions of skills audits at all in any of the strategies/plans reviewed so, again, for the literature review phase of the research project their usefulness was limited.

Handbooks, Guideline Documents and Technical Assessments

None of this category of documents reviewed addressed skills audits in any respect. They were all developed and written around "Functional Area" needs, e.g. *Guidelines to Establish a CMA*, rather than career path issues or detailed skills requirements. The technical assessments however could have been useful in that even though they had done assessments on infrastructure, not people, they did indicate/confirm a general lack of skills and/or competency at some level in operations and management. This in turn would invariably indicate a lack of skills which could be identified through a skills audit.

Proposals on Funded Programmes

The Framework for Education and Training in Water (FETWater) and Netherlands Initiative for Capacity Development in Higher Education (NICHE) documents reviewed demonstrated an extremely narrow focus – namely developing course materials and teaching capacity within two specific academic institutions only. FETWater did conduct a process assessing competencies required for specific water resource processes (water allocation) but these were at a high level and did not go down to specific skills that would be required for detailed job description development.

A special mention: Numerous documents reviewed expressed opinions on the lack of progress in implementing recommendations and plans on skills development from previous processes. Indeed the review team found themselves reading several documents espousing identical issues (usually at "strategic" level) repeating the same mantra of the need for action, with sometimes years between publication of the documents.

Finally, it appeared from the documents reviewed that there were at least two other skills audit and gap analyses currently underway, one a WRC project and the other the

Department of Cooperative Governance and Traditional Affairs (CoGTA)'s GAPSKILL. It was necessary to coordinate between the research team, WRC staff and the other research team to ensure there is no redundancy (overlap or possibly even conflict) between these projects.

5.2 Level 1 Assessment – DWS

5.2.1 Determination of the Demand for Capacity

As mentioned previously in **section 3.1**, it was agreed that determining the **demand for capacity** at DWS was a large exercise and should not have been included in the scope of work in the ToR. The demand for capacity at DWS was thus not determined under this research project.

5.2.2 Determination of the Supply of Capacity

Likewise, it was agreed that determining the **supply of capacity** at DWS was a large exercise and should not have been included in the scope of work in the ToR.

5.2.3 The Capacity Gap

As both the demand for- and supply of capacity was not determined for DWS, the **capacity gap** at DWS could not be calculated.

5.2.4 Determination of the Demand for Skills

The **demand for skills** at DWS could not be determined due to the limited research budget. DWS was just too large an institution to interview all technical line managers for all job titles in DWS and establish a skills matrix. It was hoped the DWS job descriptions would provide evidence of skills required, however it was found that job descriptions were too generic. It is recommended that a separate project be established to set up a skills matrix for all DWS technical job titles.

5.2.5 Determination of the Supply of Skills and the Skills Gap

The **supply of skills** was determined for DWS as per the method outlined in **section 2.5**. However, as the demand for skills was not determined, the skills gap

– which is the demand for skills less the supply of skills – could not be determined for DWS.

Determining the supply of skills at DWS was a substantial process in which a sample size was chosen based on fair distribution across Chief Directorates and job titles. There were 350 staff selected to be part of the skills audit but only 126 staff finally submitted completed survey forms on the online system.

The tables and graphs of results that follow represent only the supply of skills as selected by respondents. These are not necessarily the skills as required by job titles at DWS.

The gaps presented in the tables and graphs that follow are the gaps due to staff having rated themselves at less than a 5 (fully competent) for the set of skills chosen by themselves (which is not necessarily the set of skills required by DWS).

Tables 16 to 19 and **Figures 5 to 7** were produced from the data provided by the individual staff members as recorded in the online skills audit survey system. Database analysis formulae were written by the research team which drew information from various parts of the database to compile each results table. While the tables that follow contain results describing the supply of skills and gaps the outputs are best viewed in graphs where the extent of skills, competencies and gaps is immediately apparent and makes a lasting impression.

Results are consistently shown in the order of Functions and Competencies in the Water Sector Competency Framework.

The following results are presented for DWS:

Example analysis of an individual at Skill level showing further training required

Table 16 shows the Personal Development Plan, referred to as "training Intervention Required", for an anonymous individual technical staff member using the agreed scores for the individual as compared to the required scores for the job from the skills matrix. The left hand column indicates where the individual is fully competent, where formal training or further workplace exposure to the skill is required, or where skills are completely lacking. The columns to the right of this indicate which function, competency cluster, competency and skill are under consideration.

*Example analysis of an <u>individual</u> at **Competency** level*

Table 17 and **Figure 5** show the results of the analysis for the same individual at a Competency level, rather than individual skill level. The results are presented by percentage.

Analysis across the <u>institution</u> sample by Function then Competency Cluster

Table 18 and **Figure 6** combine the results for all technical staff at Competency Cluster level to show the Competency across the WSI as a whole. The results are presented by percentage. For example the Competency Cluster of Water Resources Planning/Hydrology shows a skills gap of 34% for the institution.

Analysis of competence across institution sample by <u>job title</u>

Table 19 and **Figure 7** combine the results for technical staff with the same job title to show the competence across the institution sample for each job title. The results are presented by percentage. For example, for the job title of Water Control Officer, competence is at 84% and the gap is 16%.

Table 16 Analysis of an anonymous DWS technical staff member by Training Intervention Required

Training Action Required	FUNCTION	COMPETENCY CLUSTER	COMPETENCY	SKILL
Competent - No action required (5)	Water Resources Infrastructure	WR Construction	Contract Administration	Conduct site inspections.
Further workplace exposure required (4)	Functional Management	Business Management	Strategic Thinking	Manage the technical department/s.
	Water Resources Infrastructure	WR Construction	Building/Bricklaying	Read drawings and understand technical building terms.
			Construction management (Hydropower Generation Systems, Mass Concrete Dams, Earth & Rockfill Dams, Pipelines, Canals, Tunnels, Pump Stations)	Backfill including operating vibrators.
				Compact backfill in layers to control moisture content and densities.
				Construct manholes.
				Construct valve chambers.
				Excavate pipeline trenches.
				Excavate site.
				Fill trenches with bedding material up to invert level.
				Fit anchor bolts.
				Grout cement or chemical bond roof bolts.
				Join threaded pipes and associated fittings.
				Join VJ coupled pipes and associated fittings.
				Join welded pipes and associated fittings.
				Lay pipes according to SANS standards.
				Place pipeline route markers.
				Screed concrete.
			Contract Administration	Approve contractor payment certificates.
				Calculate contract price adjustment.
				Issue site instructions and variation orders.
				Maintain a summary expenditure record for the project.
				Manage subcontractor agreements.
				Organise and allocate workforce to various tasks.
				Recruit workforce.
				Select appropriate plant and equipment for works.
				Verify minimum qualifications and experience of site staff e.g. foreman and artisans.
			Health, Safety, Environmental and Quality Management (SHEQ)	Report accidents and injuries to relevant authorities.
			Operating Construction Equipment	Operate a concrete vibrator.
				Operate a crane.
Formal training required (3)	Functional Management	Business Management	Strategic Thinking	Control, evaluate and adjust a business strategy.
				Formulate a business strategy.
				Implement a business strategy.
	Water Resources Infrastructure	WR Construction	Construction management (Hydropower Generation Systems, Mass Concrete Dams, Earth & Rockfill Dams, Pipelines, Canals, Tunnels, Pump Stations)	Backfill with bedding material to several diameters above pipe.
				Construct anchor blocks.
				Erect shutters and place reinforcement.
				Excavate tunnel addits.
				Join flanged pipes and associated fittings.
				Place concrete including vibrating concrete.
				Record new connections.
				Tension roof bolts.
			Contract Administration	Compile a practical completion certificate.
				Compile a project closure report.
				Compile and a manage defects list.
				Facilitate small subcontractor development.
				Identify, record and mitigate construction risks.
				Implement project management principles (construction activities, human resources and cash flow).
				Interpret and price the bill of quantities for a construction project.
				Manage a maintenance/guarantee period.
				Set up, maintain and audit tools, equipment, materials and site.
				Train workforce.
				Use project management software to plan and balance resources.
				Verify quantities claimed and value of interim contractor payment certificates.
			Health, Safety, Environmental and Quality Management (SHEQ)	Conduct health and safety audits.

Table 17 Analysis of an anonymous DWS technical staff member by Competency

FUNCTION	COMPETENCY CLUSTER	COMPETENCY	Supply of Skills (Using User Score) (%)	Skills Gap (Using User Score) (%)
Functional Management	**Business Management**	Strategic Thinking	54%	46%
Water Resources Infrastructure	**WR Construction**	Building/Bricklaying	80%	20%
		Construction Management (Boreholes only)	40%	60%
		Construction management (Hydropower Generation Systems, Mass Concrete Dams, Earth & Rockfill Dams, Pipelines, Canals, Tunnels, Pump Stations)	67%	33%
		Contract Administration	69%	31%
		Health, Safety, Environmental and Quality Management (SHEQ)	60%	40%
		Operating Construction Equipment	80%	20%
		Tender Management, Bid Adjudication and Placing of Contracts	52%	48%
Grand Total			**65%**	**35%**

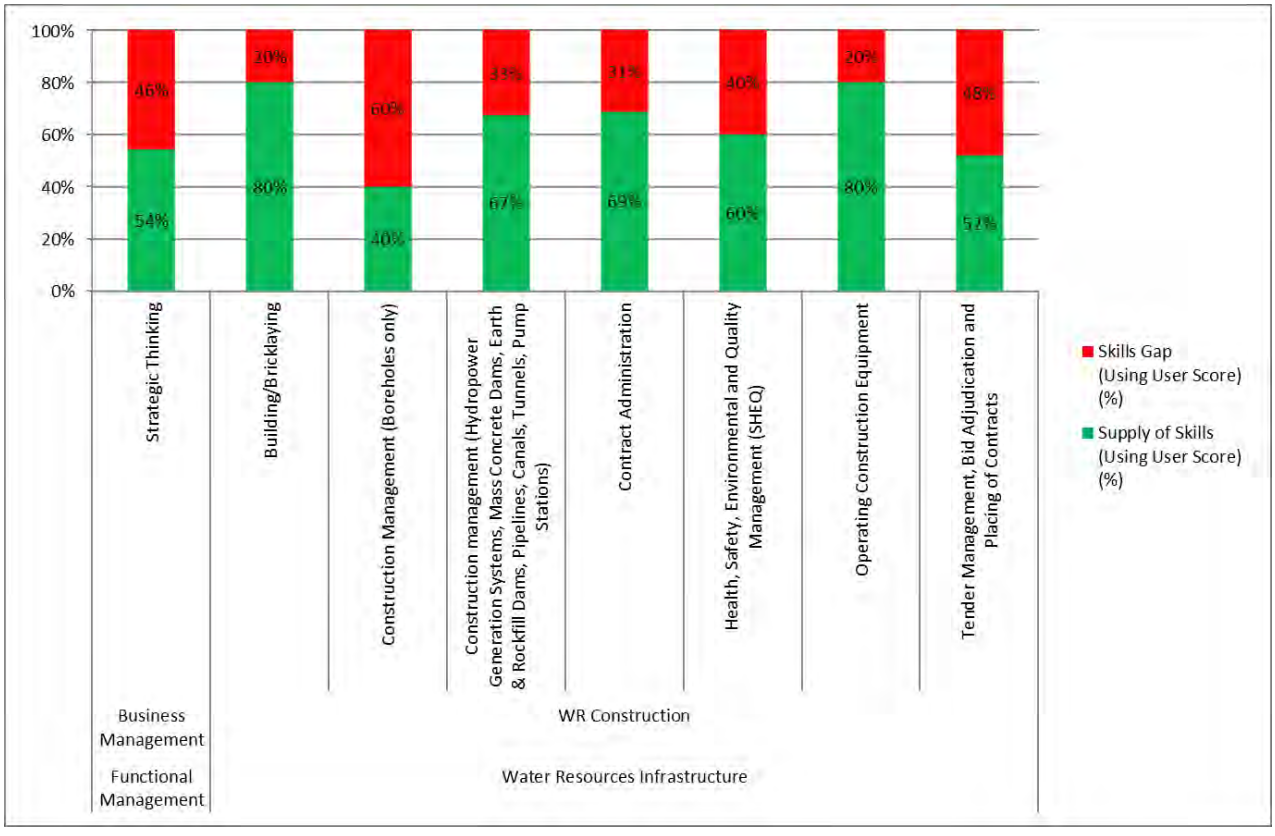


Figure 5 Graph showing analysis of an anonymous DWS technical staff member by Competency

Table 18 Analysis across the DWS sample by Function then Competency Cluster

Function/Competency Cluster	Supply of Skills (Using User Score) (%)	Skills Gap (Using User Score) (%)
Functional Management	**70%**	**30%**
Business Management	70%	30%
Water Resources Planning	**66%**	**34%**
Hydrology	66%	34%
Water Resources including Scientific Information Management	64%	36%
WR Strategies, Studies and Plans	68%	32%
Water Resources Infrastructure	**76%**	**24%**
WR Construction	78%	22%
WR Design	66%	34%
Water Resources Regulation	**73%**	**27%**
Water Conservation and Water Demand Management (WC&WDM)	64%	36%
WR Authorisation	77%	23%
WR Compliance Monitoring and Enforcement	74%	26%
WR Policy and Guidelines	72%	28%
Water Resources O&M/ Use Management	**75%**	**25%**
Irrigation, Industrial, Mining and Power Generation Water O&M	76%	24%
WR Incident Management	71%	29%
WR Inter-basin Transfers	76%	24%
Water Resources Environmental / Scientific Services	**72%**	**28%**
Aquatic Ecology	68%	32%
Environmental Science	70%	30%
Laboratory Work	69%	31%
Water Quality Management	81%	19%
Water Services Planning	**59%**	**41%**
WS Hydraulics	63%	37%
WS Information Management	53%	47%
WS Strategies, Studies and Plans	60%	40%
Water Services Infrastructure	**68%**	**32%**
WS Construction	70%	30%
WS Design	63%	37%
Grand Total	**72%**	**28%**

Figure 6 Graph showing analysis across the DWS sample by Function then Competency Cluster

Table 19 Analysis of competence across the DWS sample by job title

JOB TITLE	Supply of Skills (Using User Score) (%)	Skills Gap (Using User Score) (%)
ARTISAN	84%	16%
ARTISAN CHIEF	74%	26%
ARTISAN FOREMAN	91%	9%
ARTISAN PRODUCTION	89%	11%
ASSISTANT DIRECTOR: HEALTH AND SAFETY	72%	28%
ASSISTANT DIRECTOR: WATER QUALITY (CMA)	67%	33%
ASSISTANT DIRECTOR: WATER SERVICES	68%	32%
BIODIVERSITY OFFICER CONTROL	81%	19%
DEPUTY DIRECTOR: CATCHMENT MANAGEMENT AREA	56%	44%
DEPUTY DIRECTOR: DAM SAFETY OFFICE	64%	36%
DEPUTY DIRECTOR: INSTITUTIONAL DEVELOPMENT	84%	16%
DEPUTY DIRECTOR: TECHNICAL SUPPORT	69%	31%
DEVELOPMENT EXPERT PRINCIPAL	65%	35%
ENGINEER CHIEF	71%	29%
ENGINEER SPECIALIST	71%	29%
ENGINEERING TECHNICIAN CONTROL	69%	31%
ENGINEERING TECHNICIAN PRODUCTION	67%	33%
ENVIRONMENTAL OFFICER CONTROL	71%	29%
ENVIRONMENTAL OFFICER PRODUCTION	67%	33%
ENVIRONMENTAL OFFICER SPECIALISED PRODUCTION	77%	23%
GISC PROFESSIONAL PRODUCTION	66%	34%
INDUSTRIAL TECHNICIAN	58%	42%
INDUSTRIAL TECHNICIAN CHIEF	79%	21%
INDUSTRIAL TECHNICIAN CONTROL	82%	18%
SCIENTIFIC TECHNICIAN CONTROL	64%	36%
SCIENTIFIC TECHNICIAN PRODUCTION	56%	44%
SCIENTIST	64%	36%
SCIENTIST MANAGER	76%	24%
SCIENTIST PRODUCTION	59%	41%
SCIENTIST SPECIALIST	81%	19%
SURVEY OFFICER	52%	48%
SURVEY OFFICER PRINCIPAL	74%	26%
WATER CONTROL OFFICER	84%	16%
WATER CONTROL OFFICER CHIEF	83%	17%
WATER CONTROL OFFICER SENIOR	72%	28%
WATER PLANT CONTROL SUPERINTENDENT	79%	21%
Grand Total	**71%**	**29%**

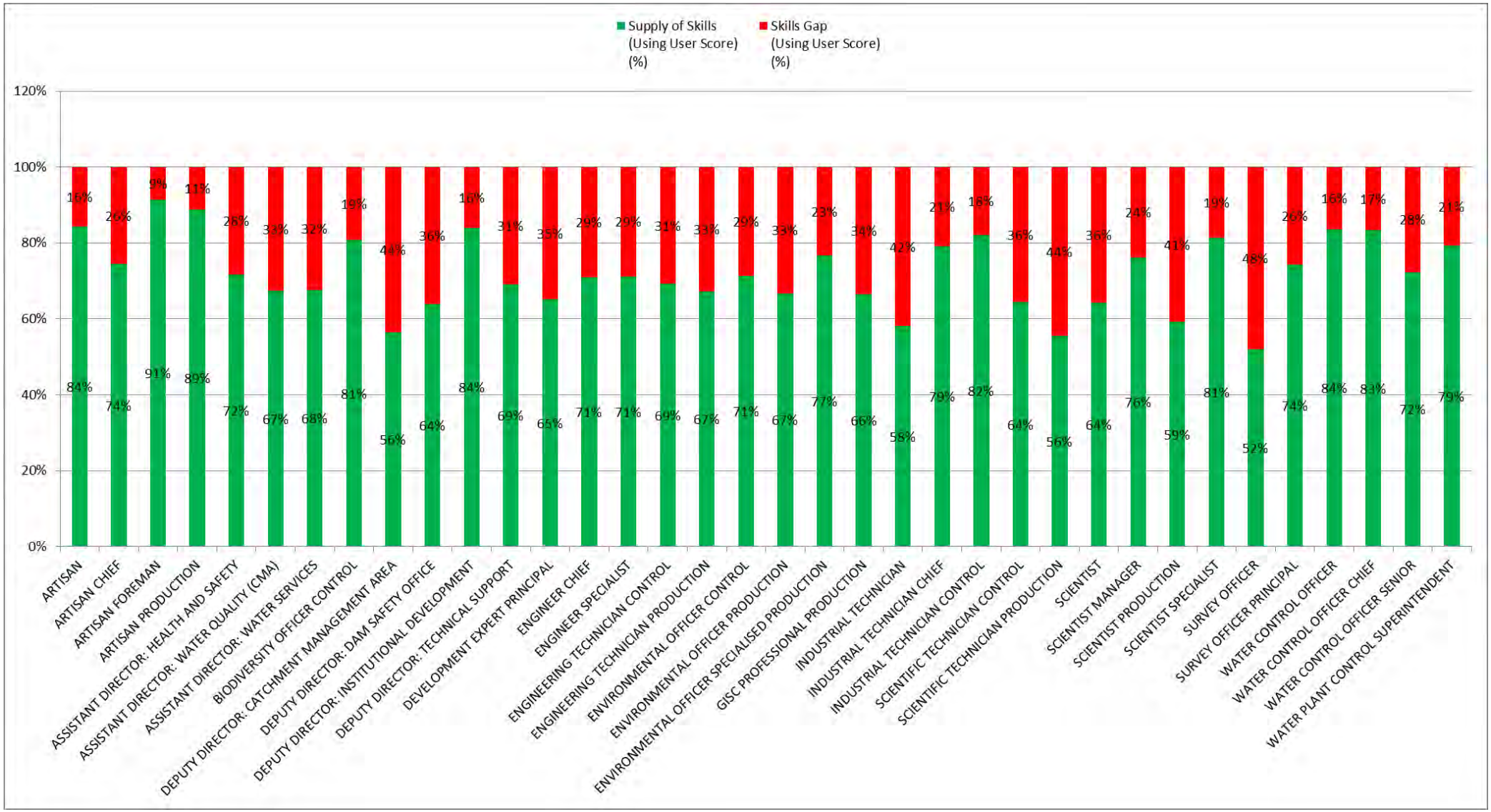


Figure 7 Graph showing analysis of competence across the DWS sample by job title

5.3 Level 1 Assessment – BOCMA

Relevant report:

Deliverable 5a – Report on the Level 1 Assessment: Breede-Overberg CMA

5.3.1 Determination of the Demand for Capacity

The National Water Act and it Mandates

The *National Water Ac*t, No. 36 of 1998 was reviewed and responsibilities or mandates allocated to CMAs in Chapters 2 to 14 of the Act were identified. **Figure 8** overleaf outlines the chapters of the Act and the implied mandates.

In inferring mandates for CMAs from the National Water Act the booklet *A Guide to the National Water Act (DWS)* was found useful.

The colours in **Figure 8** are used for aligning CMA mandates to the relevant chapter in the Act, and to facilitate cross checking from **Figure 8** to **Figure 9**.

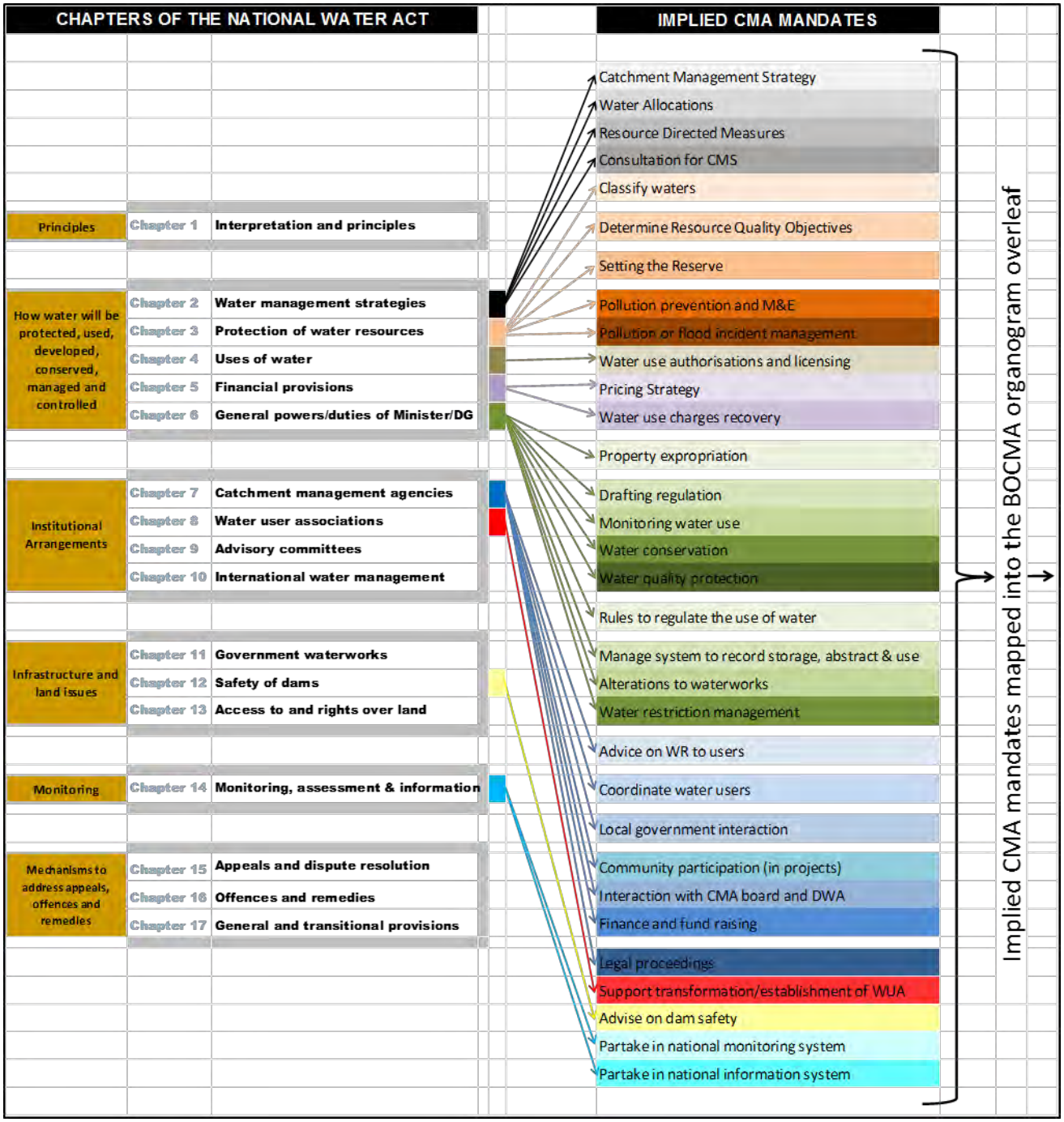


Figure 8 Implied mandates for CMAs as taken from the National Water Act

The CMA responsibilities or mandates above were allocated to departments in the BOCMA organogram (see **Figure 9**).

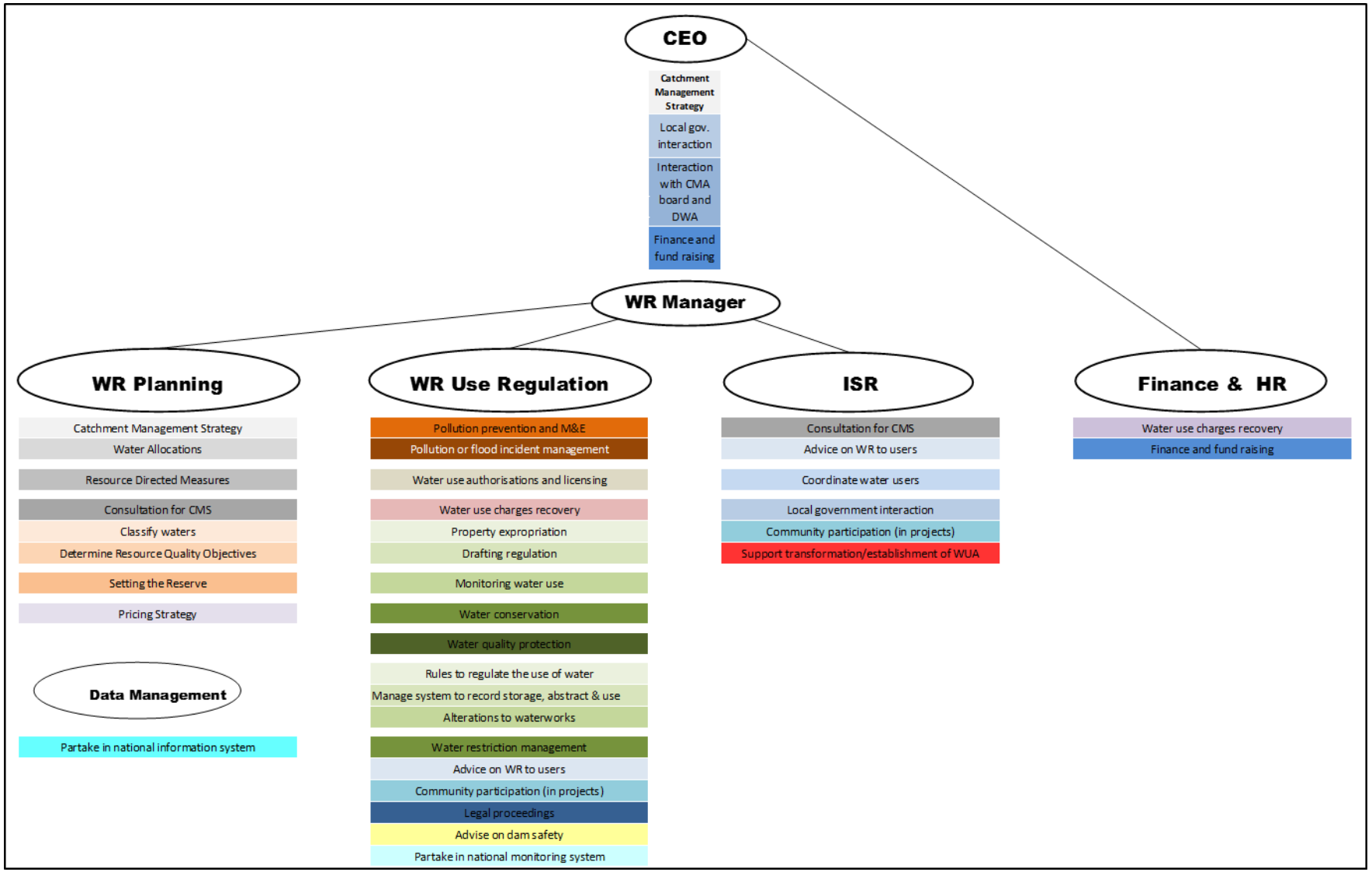


Figure 9 CMA mandates allocated to departments in BOCMA's organogram

Table 20 presents the mandates above in tabular form while allocating mandates to job titles and sorting the table in alphabetical order on job titles in order to prepare for allocating numbers to tasks. It should be noted that some mandates are performed in two departments, e.g. the Catchment Management Strategy (CMS) is the responsibility of the Chief Executive Officer (CEO) and the Water Resources (WR) Planner.

Table 20 CMA mandates allocated to job titles

Mandate	Department	Allocation to Job Title (Preferred)
Catchment Management Strategy	CEO	CEO
Local government interaction	CEO	CEO
Interaction with CMA board and DWA	CEO	CEO
Finance and fund raising	CEO	CEO
Water use charges recovery	CEO	CFO
Catchment Management Strategy	WR Planning	WR Planner
Water Allocations	WR Planning	WR Planner
Resource Directed Measures	WR Planning	WR Planner
Consultation for CMS	WR Planning	WR Planner
Classify waters	WR Planning	WR Planner
Determine Resource Quality Objectives	WR Planning	WR Planner
Setting the Reserve	WR Planning	WR Planner
Pricing Strategy	WR Planning	WR Planner
Partake in national information system	WR Planning	Data Officer
Pollution or flood incident management	WR Use Regulation	Water Use Specialist
Water use authorisations and licensing	WR Use Regulation	Water Use Specialist
Property expropriation	WR Use Regulation	Water Use Specialist
Drafting regulation	WR Use Regulation	Water Use Specialist
Rules to regulate the use of water	WR Use Regulation	Water Use Specialist
Alterations to waterworks	WR Use Regulation	Water Use Specialist
Water restriction management	WR Use Regulation	Water Use Specialist
Community participation (in projects)	WR Use Regulation	Water Use Specialist
Legal proceedings	WR Use Regulation	Water Use Specialist
Advise on dam safety	WR Use Regulation	Water Use Specialist
Partake in national monitoring system	WR Use Regulation	Water Use Specialist
Pollution prevention and M&E	WR Use Regulation	Water Use Officer
Monitoring water use	WR Use Regulation	Water Use Officer
Water conservation	WR Use Regulation	Water Use Officer
Water quality protection	WR Use Regulation	Water Use Officer
Manage system to record storage, abstract & use	WR Use Regulation	Water Use Officer
Advice on WR to users	WR Use Regulation	Water Use Officer
Consultation for CMS	ISR	Manager: ISR
Coordinate water users	ISR	Manager: ISR
Local government interaction	ISR	Manager: ISR
Advice on WR to users	ISR	Water Liaison Officer
Community participation (in projects)	ISR	Water Liaison Officer
Support transformation/establishment of WUA	ISR	Water Liaison Officer

Extent of Responsibility

Once the mandates from the Act were mapped into BOCMA's organogram and further to job titles, the time it would take to deliver on the mandate was calculated. An assumption was made as to how often tasks related to a mandate would occur in a year along with the time in days to perform that task once. The time to deliver on the mandate would be the product of the number of tasks multiplied by the time to perform the task. This can be expressed in the following formula:

Total Time to meet mandate (days)	**=**	**Number of tasks**	**X**	**Time to perform task**

By way of example, if the mandate is to "set the ecological reserve", it was assumed through professional experience that this would happen once (1) for all rivers in the catchment and that this would take 40 days of one person's time. The total time to achieve this mandate would thus be: 1 task X 40 days = 40 days.

In conjunction with the above steps, other relevant documents and information were reviewed to assist in assessing the demand for capacity, as follows:-

Catchment Management Strategy: The *BOCMA Catchment Management Strategy (CMS) (2011*) was reviewed. The CMS contained a multitude of "strategic actions" in line with the NWA. This was a useful starting point in relating the strategic actions to the mandates and then to specific job titles. The CMS also provided the reader with a sense of the volume of work that the institution had to carry out in order to meet its mandate. The CMS also plotted a proposed timeline for each of the strategic actions from 2011 to 2016. With this timeline a calculation could be made on how long the staff had to perform a strategic action, responsibility or mandate.

In looking at the mandates and strategic actions the number of times a task needed to occur had to be estimated. The CMS provided information of the water volumes in the BOCMA area and the number of stakeholders, e.g. industry, farming, water service authorities (WSA). Separately, using Geographical Information Systems (GIS) technology and data, the number of farms in the BOCMA area was counted along with river lengths. All these figures were broadly considered in calculating the number of tasks and how often they would need to occur.

Number of Stakeholders: BOCMA's stakeholders include 7 LMs, 2 DMs and 30 Irrigation Boards currently in the process of transforming into 16 WUAs (see **Table 21** and **Figure 10**). Together with interacting with DWS and community projects, BOCMA are managing some 32 ongoing stakeholder relationships.

Table 21 Stakeholders with whom BOCMA engages

Number	Type of Institution	Names
2	National government	DWS Head Office DWS Western Cape
7	Local municipalities (all WSAs)	Witzenberg LM Breede Valley LM Langeberg LM Theewaterskloof LM Overstand LM Cape Agulhas LM[14] Swellendam LM
2	District municipalities (not WSAs)	Cape Winelands DM Overberg DM
16	WUAs (previously 30 irrigation boards)	Postal address in town of: Bonnievale (2) De Doorns (1) Hermanus (1) Riviersonderend (1) Robertson (10) Worcester (1)
5	Community Projects	(Various)
32	**TOTAL**	

[14] Cape Agulhas LM is also part of this project as part of the level 2 assessment.

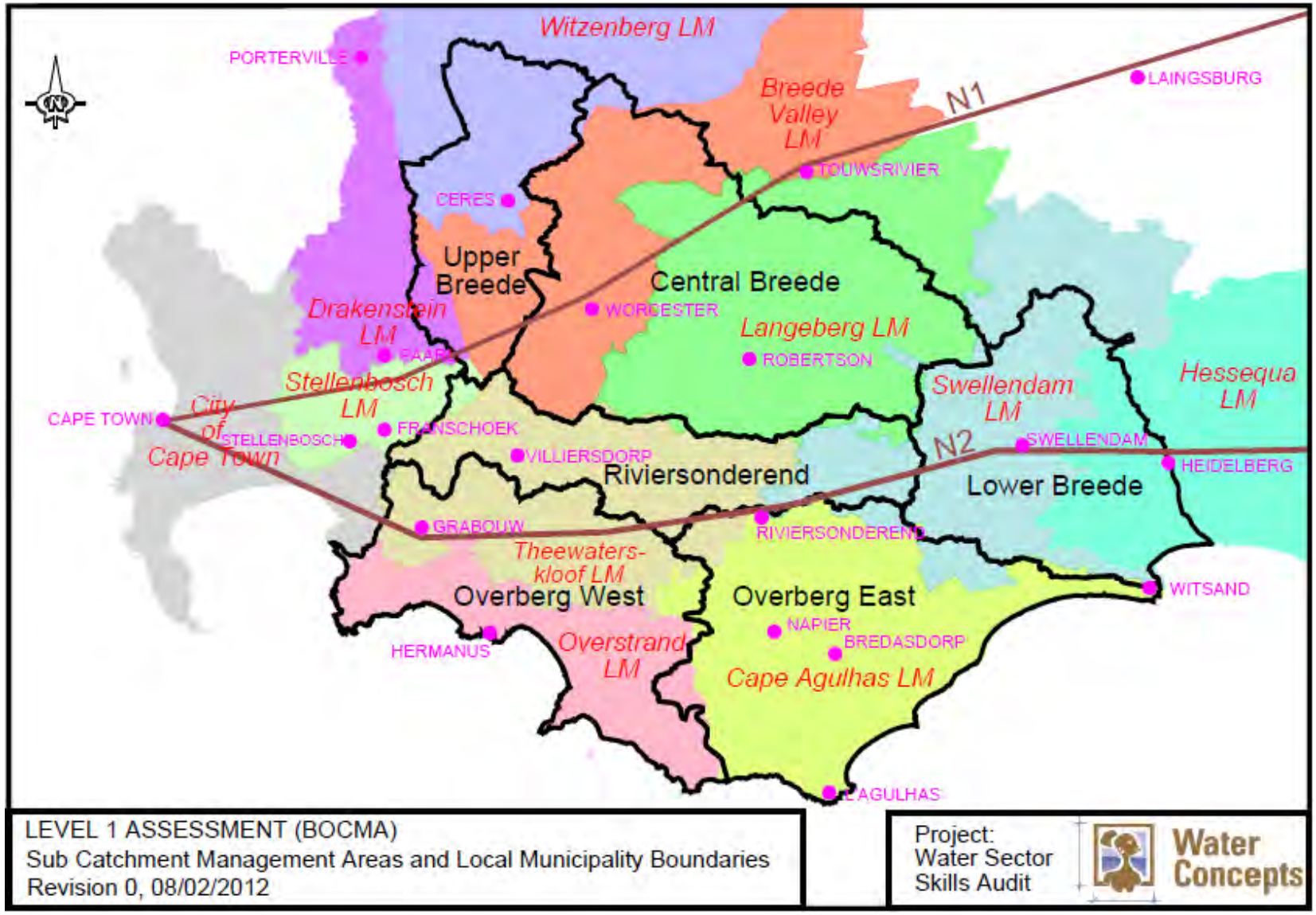


Figure 10 BOCMA Sub catchment management areas and local municipality boundaries

Possible Number of Water Licenses: There are approximately 10 875 farms in BOCMA (see **Table 22** and **Figure 11**).

Table 22 Number of farms in the BOCMA area

Sub Catchment	Number of farms
Upper Breede	1 413
Central Breede	3 772
Lower Breede	979
Sub Total	6 164
Riviersonderend	857
Overberg West	2 725
Overberg East	1 129
Sub Total	4 711
TOTAL	**10 875**

BOCMA could not possibly carry out nearly eleven thousand license applications in one year. It was assumed that a ten year period would suffice giving approximately tasks per year. This figure was used in the calculations for the mandate Water Use Authorisations and Licensing (see **Table 24**). This is a good example of the need to develop the demand for capacity with the experienced and qualified managers in the WSI. They are the ones with the knowledge of how long a task takes and what resources are required to conduct it.

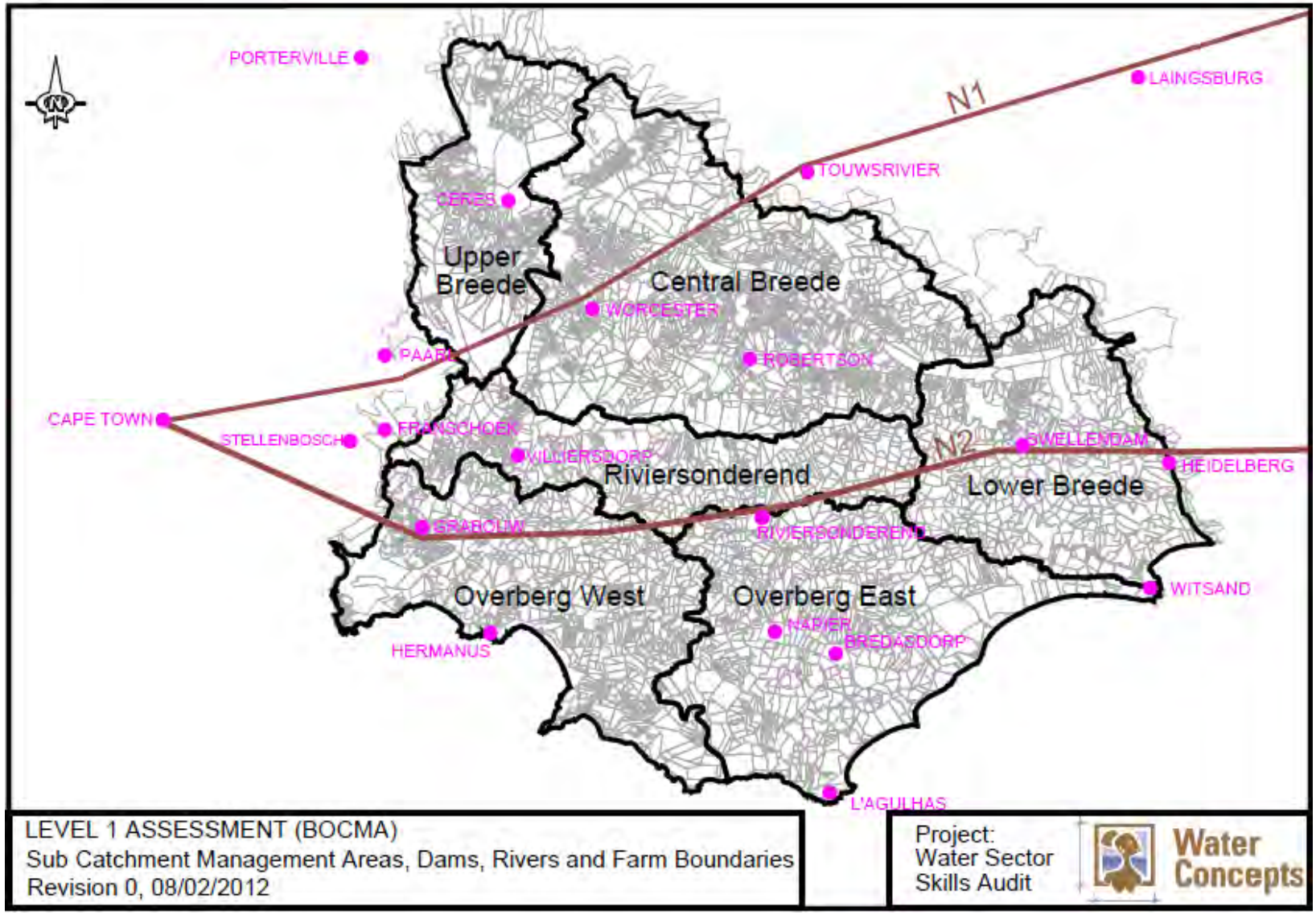


Figure 11 BOCMA Sub catchment showing rivers and farm boundaries

Dams and Inter-basin transfers: BOCMA's area is organised into 6 sub catchments (see **Figure 11**) all of which are involved in inter-basin transfer schemes and are home to major dams.

Total Length of Rivers: The length of the major rivers in the BOCMA area totals just over 800km (see **Table 23**)

Table 23 Length of major rivers in the BOCMA area

RIVER	LENGTH (m)
Bot	51 094
Bree	313 531
De Hoop Vlei	26 010
Heuningnes	29 378
Kars	82 861
Klein	54 597
Nuwejaar	35 197
Palmiet	63 345
Riviersonderend	156 792
Grand Total	**812 804**

Water quality monitoring points: At present BOCMA's website only displays information on five monitoring points adjacent to major towns (see **Figure 12**)

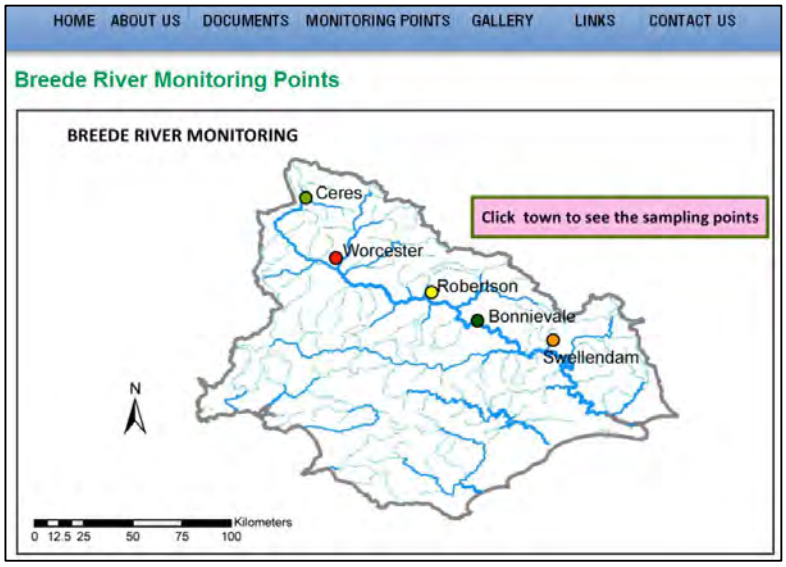


Figure 12 Location of BOCMA's five water quality monitoring points from BOCMA's website

These five monitoring points are along the Bree River which is approximately 300km in length which means one monitoring point per 60km. This demand for capacity exercise used the assumption of one monitoring point per 50km (50 being an easier number by which to divide), i.e. 16 monitoring points in total in the BOCMA area.

Interview with BOCMA Technical and HR Staff

An interview was held with a BOCMA technical staff member to understand what work was done in-house and what work was outsourced or still done by DWS. A copy of the technical questionnaire can be found in **Appendix A**. An interview was also conducted with the HR Specialist to understand processes inhibiting the growth of the institution. A copy of the HR questionnaire can be found in **Appendix B**.

The following feedback was received during an interview held with a BOCMA technical staff member with the job title of Water User Specialist:

Although BOCMA has been established for a while, most technical staff were only appointed from 2008 onwards. It is thus a very young institution of 3 to 4 years. Out of 23 staff, only 7 are technical. BOCMA has not advertised any new technical positions for over a year. The Water Resources Planner and Water Use Manager positions are not being advertised, in effect putting this workload on the Water Use Specialists or at times the Senior Manager: WR Management. The technical staff find there is a lot of work creep, and are finding the workload heavy and unmanageable.

BOCMA is solely responsible for the following:

- *implementing projects through community groups to clean rivers or raise awareness on river pollution (about 5 projects at any one time)*

- *interacting with stakeholders to raise awareness on water demand management and water conservation, including advising on alien plant/tree removals.*
- *water quality sampling*
- *pollution control*
- *consideration of wetlands/riparian zones*
- *rezoning applications from the Department of Agriculture*
- *rezoning applications from the municipalities*
- *identifying and reporting illegal activities to DWS*
- *processing water license applications, and*
- *information related to DWS's Water User Authorisation and Regulation Management System (WARMS).*

Of the interaction with stakeholders mentioned above, none is outsourced:- 100% of Stakeholder Management is done by BOCMA.

BOCMA are also responsible for, but do not themselves implement:

- *water resources planning (BOCMA relies on past reports from DWS)*
- *catchment management strategies (consultants were appointed to develop the CMS with participation from BOCMA and DWS staff)*
- *validation and verification of water use (consultants will be appointed)*
- *water quality management, and*
- *the issuing of licenses.*

BOCMA is not responsible for, and thus is not involved in:

- *design of any water resources schemes*
- *construction of any water resources schemes*
- *operations and maintenance of any water resources schemes, and*
- *issuing of invoices for levying (but wish to take this function over from DWS).*

Work that takes up most of the technical staff time relates to:

- *the number of water users or number of bodies with licenses, and the number of bodies applying for licenses or license renewals*
- *the geographical density of water quality and pollution monitoring, and*
- *"spare" available water that needs to be managed.*

Time consuming tasks are:

- *compliance monitoring and enforcement (CME) because of inspections, finding or arguing over illegal use, policing, verifying all licenses and general authorisations*
- *water resources planning which is complex as the catchment covers six sub areas and deals with major stakeholder groups which takes time, and*
- *dealing with 16 WUAs who all "demand" time.*

BOCMA's total 2011/2012 WRM budget is only R8.787m. Of this, R5m is for the Validation and Verification tender to be advertised and other capital projects, which only leaves R3.787m for WRM. The Stakeholder Management budget is R0.49m.

The following feedback was received during an interview held with the BOCMA HR Specialist:

Although BOCMA has been established for a few years, no skills audit has been conducted to date.

The organogram provided by BOCMA was last updated in 2011. The structure is reviewed on an annual basis as part of their resource planning in line with their budget review and financial year end processes. At the time of engaging with BOCMA for this research, BOCMA were in the process of reviewing the

organogram. The 2011 organogram highlighted a number of technical vacancies. As also mentioned by the technical staff member interviewed, no recruitment interventions had been initiated to fill these technical positions. The primary reason cited for this was budget constraints and the fact that some technical responsibilities, in terms of the BOCMA mandate, were still residing with DWS. This effectively means that until DWS reallocates these responsibilities there are no grounds to motivate for additional staffing budgets and no requirement for recruitment interventions to be implemented.

The data provided in the organogram and from the payroll system correlated and was kept up-to-date. BOCMA is using two systems to house their staffing data, namely:- all payroll data is housed in Pastel and all other HR-related information like qualifications and performance management reviews, are being maintained in VIP HRMIS. No limitations were identified in terms of the VIP HRMIS as the system was still new and not fully tested. With regards to the payroll system, Pastel, the only constraint identified was that the system changed regularly and therefore constant training was required.

The recruitment and selection process had an average turn-around time of one month and no apparent process inhibitors were identified. Due to the low/ non-existent staff turn-over, background checks were outsourced. Currently BOCMA make no use of vendors to support them with their recruitment needs due to the location of agencies in relation to BOCMA. The primary reasons cited for difficulties in sourcing suitable technically skilled staff was as follows:

- *Location, and;*
- *Lack of expertise in Water Resources outside of DWS.*

The only position that was replaced since BOCMA's establishment was the CEO role which was a contract post.

BOCMA has all the necessary job profiles for all the positions that are currently active but no job profiles exist for the other roles. Existing job profiles were very detailed in terms of unpacking the job roles and responsibilities as well as the minimum requirements for the relevant job. No intentional deviations were ever made from the minimum requirements.

No Training and Development Policy exists, however, an annual budget of R400 000 was allocated for training.

The following retention strategies have been instituted by BOCMA for technical staff, namely:

- *Scarce skills allowance*
- *Housing allowance*
- *Training and development interventions in the form of formal training; and*
- *Employee Assistance Programme (approval is pending).*

Calculations on Number of Staff Required by Job Title

Taking into account the number of Strategic Actions per job title, the number of farms, length of rivers, number of stakeholders, and comments of the technical staff member interviewed on what affects work volume, the task numbers and task times assumed are shown in **Table 24** overleaf.

Table 24 Calculation of time required per job title to complete a mandate at BOCMA

Mandate	Allocation to Job Title (Preferred)	No. of Tasks	Assumed Time to Complete One Task (Days)	Total Time (Days)
Catchment Management Strategy	**CEO**	1	20	20
Local government interaction	CEO	10	4	40
Interaction with CMA board and DWA	CEO	2	5	10
Finance and fund raising	CEO	3	5	15
Water use charges recovery	CFO	12	4	48
Catchment Management Strategy	WR Planner	1	20	20
Water Allocations	WR Planner	1	50	50
Resource Directed Measures	WR Planner	1	20	20
Consultation for CMS	WR Planner	1	20	20
Classify waters	WR Planner	1	20	20
Determine Resource Quality Objectives	WR Planner	1	20	20
Setting the Reserve	WR Planner	1	40	40
Pricing Strategy	WR Planner	1	10	10
Partake in national information system	Data Officer	1	20	20
Pollution or flood incident management	Water Use Specialist	2	5	10
Water use authorisations and licensing	Water Use Specialist	1000	1	1000
Property expropriation	Water Use Specialist	1	2	2
Drafting regulation	Water Use Specialist	1	10	10
Rules to regulate the use of water	Water Use Specialist	6	1	6
Alterations to waterworks	Water Use Specialist	20	1	10
Water restriction management	Water Use Specialist	6	1	6
Community participation (in projects)	**Water Use Specialist**	5	20	100
Legal proceedings	Water Use Specialist	5	20	100
Advise on dam safety	Water Use Specialist	20	0.1	2
Partake in national monitoring system	Water Use Specialist	12	2	24
Pollution prevention and M&E	Water Use Officer	10	5	50
Monitoring water use	Water Use Officer	16	2	32
Water conservation	Water Use Officer	6	20	120
Water quality protection	Water Use Officer	6	20	120
Manage system to record storage, abstract & use	Water Use Officer	1	2	2
Advice on WR to users	Water Use Officer	100	1	100
Consultation for CMS	**Manager: ISR**	1	20	20
Advice on WR to users	**Water Liaison Officer**	100	1	100
Coordinate water users	Manager: ISR	32	5	160
Local government interaction	**Manager: ISR**	9	5	45
Community participation (in projects)	Water Liaison Officer	15	5	75
Support transformation/establishment of WUA	Water Liaison Officer	16	10	160

The above indicates the time, in number or working days, required to complete mandates over a period of one year.

The accumulated time to complete tasks per job title is represented graphically in **Figure 13** overleaf.

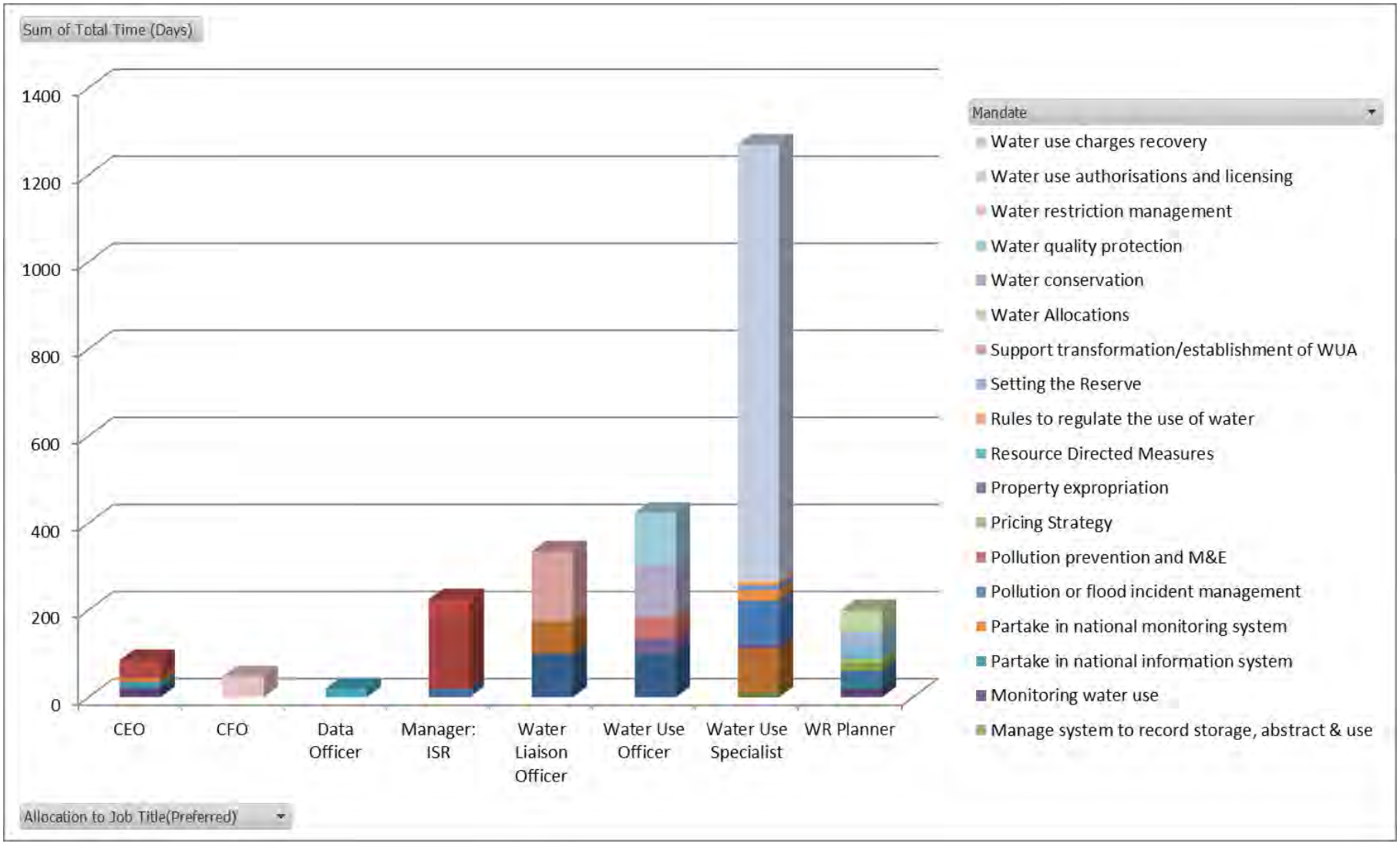


Figure 13 BOCMA – Graph showing the total time, in work days, required per job title to complete mandates in a year

Figure 13 above shows that Water Use Specialists have a large task in assessing water licensing applications. For only 1 000 applications the Water Use Specialist would require over 1 000 days for all their tasks. With 220 working days in a year, 6 Water Use Specialists will be required. 2 Water Use Specialists at BOCMA is thus deemed inadequate.

The Water Use Officers require 400 days. As there are 4 Water User Officers or 880 working days available to BOCMA, the work can be fitted into a year and BOCMA has spare capacity in this job title. The results of all these calculations are presented in **Table 25**.

Table 25 Demand for Capacity at BOCMA

FUNCTION	JOB TITLE	QUALIFICATION REQUIRED	YEARS OF EXPERIENCE REQUIRED	NUMBER REQUIRED
CEO	CEO	Master's Degree	20 years	1
WR Planning	WR Planner	National Diploma/BSc./BEng.	15 years	1
WR Planning	Data Officer	National Diploma/BSc. (GISc.)	5 years	1
Water Use	Water Use Specialist	National Diploma/BSc.	10 years	6
Water Use	Water Use Officer	National Diploma/BSc.	3 years	2

BOCMA Job Profiles and Required Minimum Qualification

Besides looking at demand for capacity numbers from a workforce planning point of view, the project looked at demand for capacity from a qualification requirement and area of specialisation point of view. The minimum qualification requirements with areas of specialisation were obtained from BOCMA's job titles and are provided in **Table 26** overleaf. However, job titles only existed for filled posts and not vacant posts. For vacant posts the researchers allocated minimum qualification requirements.

Table 26 BOCMA job titles with minimum qualification requirements

No.	Technical/Scientific	Division/ Department	Section	Job title	Level	Minimum Qualification Type	Minimum Qualification (Required)	Area of Specialisation (Required)	Years Appropriate Experience (Required)	Cost to Company (2009/10) for 32 posts	Status: Filled/ Vacant
1	Yes	CEO's Office	CEO's Office	CEO	14	Masters Degree	**Masters**				Filled
2	No	CEO's Office	CEO's Office	Exec. PA to CEO	10	Diploma/Degree	National Diploma	Not stated	Not stated		Filled
3	No	Finance	Finance	CFO	13	Degree	BCom	Accounting	5 years		Filled
4	No	Finance	Finance	Finance Manager	11	Degree	BCom	Accounting, Finance Management	5 years		Filled
5	No	Finance	Finance	Finance Officer	9	Diploma/Degree	National Diploma/BCom	Not stated	4 years		Filled
7	No	Finance	Finance	Finance Clerk	7	Diploma	National Diploma	Accounting, Finance Management	5 years		Filled
6	No	Finance	Finance	Admin Officer	7	National Senior Certificate	Matric		2 years		Vacant
8	No	Finance	Finance	Receptionist	5	National Senior Certificate	Matric	Not applicable	2 years		Filled
9	No	Human Resources	Human Resources	HR Manager	11	Diploma/Degree	National Diploma/Bachelors Degree	Human Resources, Public Management, Behavioural Sciences	5 years		Filled
10	No	Human Resources	Human Resources	HR Admin Clerk	7	Diploma/Degree	National Diploma/Bachelors Degree	Not stated	3-5 years		Filled
11	No	IT	IT	IT Manager	12	Diploma/Degree	National Diploma/ Bachelors Degree		**5 years**		Filled
12	No	Marketing	Marketing	PR & Marketing Officer	10	Degree	Bachelors Degree	Markeitng, Communicaitons, PR	5 years		Vacant
13	Yes	Water Resources	Management	Senior Mang.:WRM	13	Degree	BSc/BEng	Civil, Environmental, Science	**12 years**		Filled
14	Yes	Water Resources	Planning	Water Resource Planner	12	Degree	National Diploma/BSc/BEng		10 years		Vacant
15	Yes	Water Resources	Planning	CMS Coordinator	10	Diploma/Degree	National Diploma/BSc/BEng		7 years		Vacant
16	Yes	Water Resources	Planning	Water Allocation Reform Officer	8	Diploma/Degree	National Diploma/BSc/BEng		7 years		Vacant
17	Yes	Water Resources	Regulation	Water Use Manager	12	Degree	BSc/BEng		10 years		Vacant
18	Yes	Water Resources	Regulation	Water Use Officer	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology, Environmental Science	3 - 5 years		Filled
19	Yes	Water Resources	Regulation	Water Use Officer	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology, Environmental Science	3 - 5 years		Filled
20	Yes	Water Resources	Regulation	Water Use Officer	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology, Environmental Science	3 - 5 years		Filled
21	Yes	Water Resources	Regulation	Water Use Officer	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology, Environmental Science	3 - 5 years		Filled
22	Yes	Water Resources	Regulation	Water Use Specialist	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology	7 years		Filled
23	Yes	Water Resources	Regulation	Water Use Specialist	OSD	Diploma/Degree	National Diploma/BSc	Chemistry, Biochemistry, Microbiology	7 years		Filled
24	No	Water Resources	Regulation	Licensing Clerk	7	National Senior Certificate	Matric	Not applicable	3 years		Filled
25	No	ISR	ISR	Institutional&Stakeholder Mng	11	Degree	BA/BSocSc/BSc	Social Science or Natural Science	Not stated		Filled
26	No	ISR	ISR	Water Liaison Officer	8	Diploma/Degree	BA/BSocSc/BSc	Social Science or Natural Science	Not stated		Filled
27	No	ISR	ISR	Water Liaison Officer	8	Diploma/Degree	BA/BSocSc/BSc	Social Science or Natural Science	Not stated		Filled
28	No	ISR	ISR	Water Liason Officer	8	Diploma/Degree	BA/BSocSc/BSc	Social Science or Natural Science	Not stated		Filled
29	Yes	Water Resources	Data Management	Information Systems Manager	12	Diploma/Degree	National Diploma/Bachelors Degree	IT, Information Management Systems, Computer Science	5 years		Vacant
30	Yes	Water Resources	Data Management	Water Data Officer	9	Diploma/Degree	National Diploma/Bachelors Degree	GISc	3 years		Filled
31	Yes	Water Resources	Data Management	Data Capturer	7	National Senior Certificate	Matric (with Maths)		2 years		Vacant
32	Yes	Water Resources	Data Management	Data Capturer	7	National Senior Certificate	Matric (with Maths)		2 years		Vacant
32	**Total**									**R 9 418 167**	

Note: Grey shading indicates vacant positions.

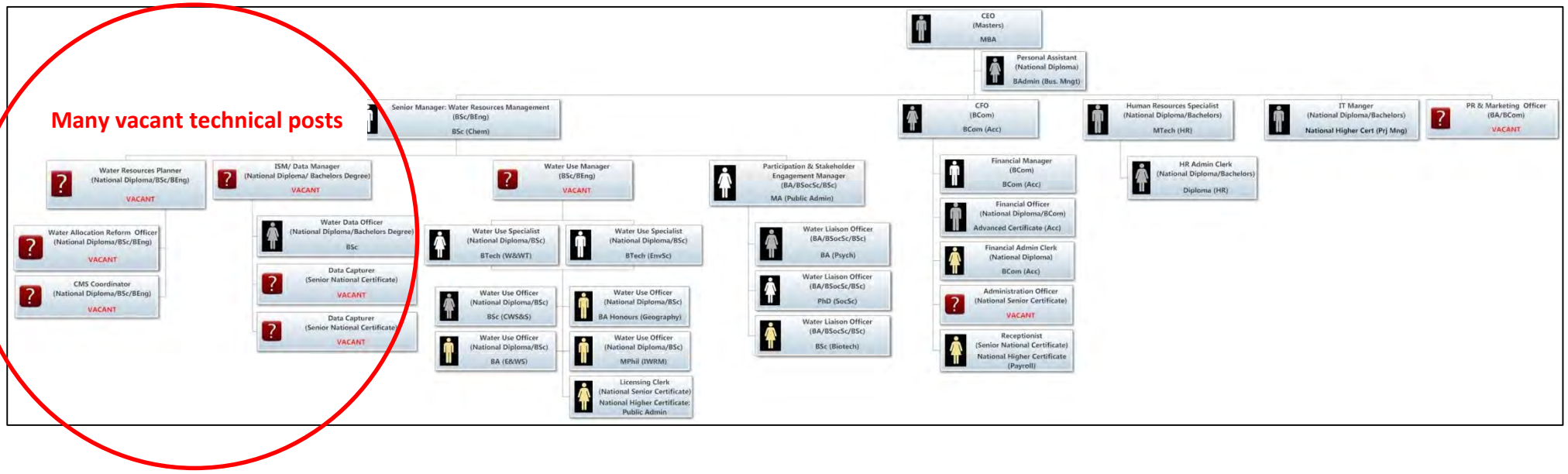
5.3.2 Determination of the Supply of Capacity

BOCMA has 32 positions on its organogram but the supply of staff is at 23, i.e. a 28% vacancy rate. Of the 32 positions half are technical positions but the supply of technical staff is at nine out of 16 (44% vacancy) (see **Table 27** and **Figure 14**). For the non-technical positions 14 out of 16 posts are filled (13% vacancy).

Table 27 Number of filled and vacant positions at BOCMA (technical only)

Technical/ Scientific	Status: Filled/ Vacant	Division/ Department	Section	Job title	Total		% Vacancy
Yes	Filled	CEO's Office	CEO's Office	CEO	1	Technical/Scientific	44%
		Water Resources	Management	Senior Mang.:WRM	1		
			Data Management	Water Data Officer	1		
			Regulation	Water Use Officer	4		
				Water Use Specialist	2		
	Filled Total				**9**		
	Vacant	Water Resources	Planning	CMS Coordinator	1		
				Water Allocation Reform Officer	1		
				Water Resource Planner	1		
			Data Management	Data Capturer	2		
				Information Systems Manager	1		
			Regulation	Water Use Manager	1		
	Vacant Total				**7**		
Yes Total					16		

Figure 14 BOCMA organogram showing filled and vacant posts



BOCMA has three technical sub-divisions namely: WR Planning, Water Use Management/Regulation and Information Systems Management. The sub-division heads for WR Planning and Water Use Management are vacant, leaving two crucial positions open. In fact, the planning sub-division with three positions has no planning staff (see **Figure 14** above).

BOCMA in essence has seven technical staff broken down as follows:

- *1 Senior Manager: Water Resources Management*
- *2 Water Use Specialists*
- *4 Water Use Officers*

The other two posts which have been analysed as technical posts are the CEO and Data Officer although they are not core technical staff.

All BOCMA staff meet the minimum qualification requirements (see **Table 28**) and can thus be counted in on the supply side of the capacity equation.

Table 28 Verification of BOCMA staff qualifications against required qualifications

Technical/Scientific	Division/ Department	Section	Job title	Level	Employee (Name & Surname)	Race	Gender	Line Manager	Highest Qualification as sent by BOCMA	Actual Qualification Name (as per audit)	Specialisation (as per audit)	Does Actual Qualification Meet Minimum Requiremer
Yes	CEO's Office	CEO's Office	CEO	14		A	M	Board	MBA	MBA	Business Management	✓
No	CEO's Office	CEO's Office	Exec. PA to CEO	10		A	F	CEO	B Administration	BAdmin	Business Management	✓
No	Finance	Finance	CFO	13		A	F	CEO	B Com	BCom	Accounting	✓
No	Finance	Finance	Finance Manager	11		W	M	CFO	B Com	BCom	Accounting	✓
No	Finance	Finance	Finance Officer	9		A	M	Finance Manager	Certified Accounting Technician	Advanced Certificate?	Accounting	✓
No	Finance	Finance	Finance Clerk	7		C	F	Finance Manager	B Com Accounting	BCom	Accounting	✓
No	Finance	Finance	Receptionist	5		C	F	Finance Manager	National Certificate in Payroll Administration	National Higher Certificate	Payroll	✓
No	Human Resources	Human Resources	HR Manager	11		A	M	CEO	Masters in Human Resources Management	MTech	Human Resources	✓
No	Human Resources	Human Resources	HR Admin Clerk	7		A	F	HR Specialist	Diploma in Human Resources Management	Diploma	Human Resources	✓
No	IT	IT	IT Manager	12		A	M	CEO	National Certificate Project Management	National Higher Certificate	Project Management	✓
Yes	Water Resources	Management	Senior Mang.:WRM	13		W	M	CEO	MBA	BSc	Chemistry	✓
Yes	Water Resources	Regulation	Water Use Officer	OSD		C	M	Senior Mang.:WRM	B A	MPhil	IWRM	✓
Yes	Water Resources	Regulation	Water Use Officer	OSD		A	F	Senior Mang.:WRM	B Sc in Community Water Services and Sanitation	BSc	Community Water Services and Sanitation	✓
Yes	Water Resources	Regulation	Water Use Officer	OSD		C	M	Senior Mang.:WRM	BA Honours	BA (Hons)	Geography	✓
Yes	Water Resources	Regulation	Water Use Officer	OSD		C	M	Senior Mang.:WRM	B A	BA	Environmental and Water Sciences	✓
Yes	Water Resources	Regulation	Water Use Specialist	OSD		W	M	Senior Mang.:WRM	B Tech Environmental Health	BTech	Environmental Sciences	✓
Yes	Water Resources	Regulation	Water Use Specialist	OSD		W	F	Senior Mang.:WRM	B Tech Water Care	BTech	Water and Wastewater Treatment	✓
No	Water Resources	Regulation	Licensing Clerk	7		C	F	Senior Mang.:WRM	National Certificate in HR Management	National Higher Certificate	Public Administration	✓
No	ISR	ISR	Institutional&Stakeholder Mng	11		W	F	Senior Mang.:WRM	Masters in Public Administration	MA	Public Administration	✓
No	ISR	ISR	Water Liaison Officer	8		W	F	Institutional &Stakeholder Manager	Ph.D in Social Sciences	PhD	Social Science	✓
No	ISR	ISR	Water Liaison Officer	8		A	F	Institutional &Stakeholder Manager	B Degree in Psychology	BA	Psychology	✓
No	ISR	ISR	Water Liason Officer	8		C	F	Institutional &Stakeholder Manager	B Degree in Biotechnology	BSc	Biotechnology	✓
Yes	Water Resources	Data Management	Water Data Officer	9		A	F	Senior Mang.:WRM	Bachelor of Science	BSc	Other	✓

Note: Black text indicates demand side information as obtain from BOCMA HR department. Blue text indicates supply side information as obtained from responses on the online audit.

Of the nine technical staff there is an equal distribution of African, Coloured and White staff (three of each) but BOCMA has employed no Indian staff (see **Table 29**). The current racial demographic was appropriately representative for the region (Western Cape).

Table 29 BOCMA – Sample representivity by race

Race	Technical/Scientific	Not Technical/Scientific	Total
African	3 (33%)	7 (50%)	10 (44%)
Coloured	3 (33%)	4 (29%)	7 (30%)
White	3 (33%)	3 (21%)	6 (26%)
Indian	0	0	0
TOTAL	**9 (40%)**	**14**	**23**

Of the 9 technical staff 20% are female (see **Table 30**). This is low in relation to the 57% presence in BOCMA as a whole, yet reflective of the engineering and technical sector challenges in South Africa generally.

Table 30 BOCMA – Sample representivity by gender

Gender	Technical/Scientific	Not Technical/Scientific	Total
Female	3 (20%)	10 (70%)	13 (57%)
Male	6 (80%)	4 (30%)	10 (43%)
TOTAL	**9**	**14**	**23**

Of the sample of technical staff that participated in the survey, none were disabled (see **Table 31**).

Table 31 BOCMA – Sample representivity by disability

Disability	Count in relation to Disability
Hearing	0
Physical	0
Sight	0
Other	0
None	23
TOTAL	**23**

5.3.3 The Capacity Gap

From subtracting the demand for capacity from the supply of capacity at BOCMA, the technical skills gap is 44%, which is seven out of 16 staff and is distributed over the qualifications of Bachelor's Degree/National Diploma.

5.3.4 Determination of the Demand for Skills

The demand for skills is presented in a skills matrix. The full skill matrix for BOCMA can be found in the relevant report. An excerpt of the skills matrix for BOCMA technical skills is shown in **Table 32**. For BOCMA, a skills matrix for HR positions was also drawn up and can be found in the relevant report.

Table 32 Demand for skills per job title, i.e. the BOCMA Technical Skills Matrix

				JOB TITLE					
FUNCTION	**COMPETENCY CLUSTER**	**COMPETENCY**	**SKILL**	WRM: Senior Manager	Water Use Specialist	Water Use Officer	Data Officer	ISR Manager	Water Liaison Officer
Functional Management									
	Business Management								
		Strategic Thinking	Formulate business strategy.	5					
			Implement business strategy.	5					
			Control, evaluate and adjust business strategy.	5					
			Manage the day-to-day business.	5					

FUNCTION	COMPETENCY CLUSTER	COMPETENCY	SKILL	WRM: Senior Manager	Water Use Specialist	Water Use Officer	Data Officer	ISR Manager	Water Liaison Officer
Water Resources Planning									
	Hydrology								
		Surface Water Hydrology							
			Outline meteorological data required and interpret information.		5	5			
			Assess and classify ground conditions regarding runoff volumes/percentages.		5				
			Forecast meteorological, technical and environmental information.		5	5			
			Assess assurance of supply.	5					
			Conduct hydrological modelling and analysis.						
		Groundwater Hydrology/Geohydrology							
			Outline geological information required and interpret information.		5	5			
			Select geohydrological investigation/siting methods appropriate to the geology.	5		5			
			Site boreholes using various investigation/siting methods.	5	5				
			Conduct pump testing and determine safe yields.		5	5			
			Use monitoring borehole information to determine interdependence of borehole water.	5	5	5			
		Water Demand Calculations							
			Calculate instream flow requirements.						
			Calculate reserve determination for a catchments, wetlands and estuaries.						
			Calculate water demands for domestic and industrial use.						
			Calculate water demands for stock watering.	5	5	5			
			Calculate water demands for agricultural crop.	5	5	5			
			Model irrigation-water management regimes for agriculture.	5					
	Environmental and Aquatic Science								
		Water Quality							
			Set water quality criteria / objectives.	5	5	5			
			Classify water resources based on water quality.	5					
			Interpret water quality results.	5	5	5			
			Outline possible effects of water quality on agriculture.	5	5	5			
			Outline possible effects of water quality on environmental resources (plants, animals, wetlands, ecosystems etc.)	5	5	5			
		Water Quantity							
			Set environmental objectives.						
			Classify environmental resources.						
			For pre-determined environmental objectives, determine ecological water reserves.						
	Feasibility Studies/Catchment Strategies								
		Policy							
			Develop policy statements and policy options.	5	5				
			Advocate policy options.	5	5	5			
			Manage a structured process to obtain consensus on preferred policy positions.	5	5	5			
			Write (a) policy for a Catchment Management Agency or a Water User Association.	5	5	5			
			Manage the compilation of, and edit, a National Water Resources policy.						
			Write a National Water Resources policy.						
		Situation Assessments and Options Analysis							
			Conduct a scoping study.	5	5				
			Conduct a pre-feasibility and/or feasibility study.	5	5				
			Define options in feasibility studies with regards to technical, financial, environmental, social aspects etc.	5	5				
			Analyse options in feasibility studies/preliminary designs considering technical, financial, environmental, social aspects etc.	5					
			Do preliminary designs including locating and costing various elements (dams, weirs, pump stations, treatment works, pipelines).						
		Strategy							
			Implement integrated water resources planning.						
			Manage intergovernmental relations according to relevant legislation.	5	5				
			Manage the compilation of, and edit, a National Water Resources Strategy.						
			Write a National Water Resources Strategy.						
			Manage the development of a Catchment Management Strategy.	5					
			Write a Catchment Management Strategy.	5					
			Provide specific technical input into a Catchment Management Strategy.	5	5	5			
			Develop a work plan that reflects and ensures implementation of policies and strategies.	5	5				

				JOB TITLE					
FUNCTION	**COMPETENCY CLUSTER**	**COMPETENCY**	**SKILL**	WRM: Senior Manager	Water Use Specialist	Water Use Officer	Data Officer	ISR Manager	Water Liaison Officer
Water Resources Infrastructure									
	WR Design								
		Design of Dams and Weirs							
		Design of Pipelines							
		Design of Canals and Tunnels							
		Design of Pump Stations							
		Design of Hydro Generation Systems							
	WR Construction								
		Tender Management and Bid Adjudication							
		Contract Management							
		Health, Safety and Quality Management							
		Surveying							
		Construction Management (Boreholes only)							
		Construction Management (Dams, Pipelines, Canals, Pump Stations, Hydro-power Generation, Tunnels etc.)							

FUNCTION	COMPETENCY CLUSTER	COMPETENCY	SKILL	WRM: Senior Manager	Water Use Specialist	Water Use Officer	Data Officer	ISR Manager	Water Liaison Officer
Water Resources Environmental / Scientific Services									
	Water Quality Management								
		Pollutant Source and Pathway Identification							
			Analyse water quality trends in order to identify problematic catchments.		5	5			
			Plan and undertake a catchment/site assessment.	5	5				
			Identify point and diffuse sources for pollution.	5	5	5			
			Analyse the land/aquatic interface to identify pollution pathways.		5	5			
			Prioritise pollutants and pollution sources using risk-based and quality standards criteria.		5	5			
		Pollution Sources Evaluation and Control							
			Identify the chemical, physical, microbiological and ecological impact of different pollutants on the aquatic environment.	5	5	5			
			Identify the chemical, physical, microbiological and ecological impact of different pollutants on the human environment.	5	5	5			
			Decide when, and issue warnings to affected water users to refrain from using polluted water.	5	5	5			
			Identify and manage legal contraventions.						
			Implement emergency control measures in the case of accidental spillage.	5	5	5			
			Recommend immediate pollution control measures.	5	5	5			
			Identify and make recommendations for changes to policy, legislation and water use authorisation procedures.	5	5	5			
			Recommend environmental management plans for activities with a water pollution risk.	5	5	5			
		Water, Wastewater and Industrial Water Analysis							
			Identify relevant ISO standards for sample taking and identify sampling points.		5	5			
			Plan and collect routine samples through fieldwork outside laboratory using relevant ISO standards.	5	5	5			
			Maintain the cold chain to ensure integrity of samples.			5			
			Select appropriate laboratory for analysis.	5					
			Prepare samples for analysis.						
			Create and develop procedures and data management techniques which highlight norms, trends and abnormal patterns.	5					
			Determine validity and accuracy of aquatic analytical data (biological, physical and chemical) and interpret conditions.						
			Conduct time and spatial scale studies.		5	5			
			Safeguard records and communicate results to appropriate persons.						
		Water Resource Awareness Promotion							
			Analyse water resource problems and link human behaviour to the problem.						
			Obtain community participation and input in awareness programs.						
			Analyse culture and language of target community to incorporate relevant aspects into training and awareness programs.						
			Design training and awareness programs to increase knowledge and promote behavioural change.						
			Implement training and awareness programmes.						
			Evaluate the outcome of training and awareness programs.						

5.3.5 Determination of the Supply of Skills and the Skills Gap

The **supply of skills** was determined for BOCMA as per the method outlined in **section 2.5**. The results of the supply of skills and skills gap at BOCMA is shown in **Tables 33 to 36** and **Figures 15 to 17** below.

The results show the supply of skills at BOCMA to be 64% and the skills gap to be 36%.

Tables 33 to 36 and **Figures 15 to 17** were produced from the data provided by the individual staff members as recorded in the online skills audit survey system. Database analysis formulae were written by the research team which drew information from various parts of the database to compile each results table. While the tables that follow contain results describing the supply of skills and gaps the outputs are best viewed in graphs where the extent of skills, competencies and gaps is immediately apparent and makes a lasting impression.

Results are consistently shown in the order of Functions and Competencies in the Water Sector Competency Framework.

The following results are presented for BOCMA:

*Example analysis of an individual at **Skill level** showing further training required*

Table 33 shows the Personal Development Plan, referred to as "training Intervention Required", for an anonymous individual technical staff member using the agreed scores for the individual as compared to the required scores for the job from the skills matrix. The left hand column indicates where the individual is fully competent, where formal training or further workplace exposure to the skill is required, or where skills are completely lacking. The columns to the right of this indicate which function, competency cluster, competency and skill are under consideration.

*Example analysis of an individual at **Competency** level*

Table 34 and **Figure 15** show the results of the analysis for the same individual at a Competency level, rather than individual skill level. The results are presented by percentage.

*Analysis across the institution sample by Function then **Competency Cluster***

Table 35 and **Figure 16** combine the results for all technical staff at Competency Cluster level to show the Competency across the WSI as a whole. The results are presented by percentage. For example the Competency Cluster of Water Resources Planning/Hydrology shows a skills gap of 66% for the institution.

Analysis of competence across institution sample by job title

Table 36 and **Figure 17** combine the results for technical staff with the same job title to show the competence across each job title for the institution sample. The results are presented by percentage. For example, for the job title of Water Use Specialist, competence is at 66% and the gap is 44%.

Table 33 Analysis of an anonymous BOCMA technical staff member by Training Intervention Required

Training Action Required	FUNCTION	COMPETENCY CLUSTER	COMPETENCY	SKILL
Competent - No action required (5)	Functional Management	Business Management	Strategic Thinking	Control, evaluate and adjust business strategy.
				Formulate business strategy.
				Implement business strategy.
				Manage the day-to-day business.
	Water Resources Planning	Environmental and Aquatic Science	Water Quality	Set water quality criteria / objectives.
		Feasibility Studies/Catchment Strategies	Strategy	Develop a work plan that reflects and ensures implementation of policies and strategies.
				Manage the development of a Catchment Management Strategy.
	Water Resources Regulation	WR Authorisation	Authorisations Management	Include correct volumes and qualities in authorisations.
			WR Authorisation Guideline and Process Management	Determine staff, financial and infrastructure resources required for regulation.
			WR Licence Applications and Assessments	Apply legislation related to authorisation and licensing.
				Approve individual water user applications.
				Calculate water demand.
				Validate requested volumes.
		WR Compliance Monitoring and Enforcement	Compliance Monitoring	Apply legislation related to compliance.
			WR Compliance and Enforcement Strategy Development	Determine staff, financial and infrastructure resources required for regulation.
Further workplace exposure required (4)	Water Resources Planning	Environmental and Aquatic Science	Water Quality	Interpret water quality results.
				Outline possible effects of water quality on agriculture.
				Outline possible effects of water quality on environmental resources (plants, animals, wetlands, ecosystems etc.)
		Feasibility Studies/Catchment Strategies	Strategy	Manage intergovernmental relations according to relevant legislation.
				Provide specific technical input into a Catchment Management Strategy.
				Write a Catchment Management Strategy.
		Hydrology	Groundwater Hydrology/Geohydrology	Use monitoring borehole information to determine interdependence of borehole water.
			Surface Water Hydrology	Assess assurance of supply.
			Water Demand Calculations	Calculate water demands for agricultural crop.
				Calculate water demands for stock watering.
	Water Resources Regulation	WR Authorisation	Authorisations Management	Define and specify monitoring and reporting requirements.
				Reconcile all existing registered water uses.
				Write and issue authorisation or licence.
				Write guidelines and formats for various types of authorisations.
			WR Authorisation Guideline and Process Management	Develop a business process/system to allocate and authorise water use.
				Develop water allocation guidelines.
			WR Licence Applications and Assessments	Conduct a risk assessment of authorisation decisions.
				Register all new water uses.
		WR Compliance Monitoring and Enforcement	Compliance Monitoring	Monitor compliance with environmental reserve requirements.
				Monitor water quality compliance.
				Monitor water use quantity compliance.
				Write letters and directives.
			WR Compliance and Enforcement Strategy Development	Develop a business process/system to monitor and regulate water use.
				Develop water use monitoring and enforcement guidelines.
Formal training required (3)	Water Resources Planning	Environmental and Aquatic Science	Water Quality	Classify water resources based on water quality.
		Feasibility Studies/Catchment Strategies	Policy	Advocate policy options.
				Develop policy statements and policy options.
				Manage a structured process to obtain consensus on preferred policy positions.
				Write (a) policy for a Catchment Management Agency or a Water User Association.

Table 34 Analysis of an anonymous BOCMA technical staff member by Competency

FUNCTION	COMPETENCY CLUSTER	COMPETENCY	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Functional Management	**Business Management**	Strategic Thinking	100%	0%
Water Resources Planning	**Environmental and Aquatic Science**	Water Quality	80%	20%
	Feasibility Studies/Catchment Strategies	Policy	60%	40%
		Situation Assessments and Options Analysis	20%	80%
		Strategy	88%	12%
	Hydrology	Groundwater Hydrology/Geohydrology	40%	60%
		Surface Water Hydrology	80%	20%
		Water Demand Calculations	60%	40%
Water Resources Regulation	**Institutional and Stakeholder Relations**	Stakeholder Participation Management	0%	100%
	WR Authorisation	Authorisations Management	84%	16%
		WR Authorisation Guideline and Process Management	87%	13%
		WR Licence Applications and Assessments	93%	7%
	WR Compliance Monitoring and Enforcement	Compliance Monitoring	84%	16%
		WR Compliance and Enforcement Strategy Development	87%	13%
Water Resources Environmental/Scientific Services	**Aquatic Ecology**	Botanical Science	0%	100%
		Chemical Weed Control	0%	100%
		Riparian Zone Delineation and Protection	0%	100%
		South African Scoring System (SASS)	0%	100%
		Wetland Delineation and Protection	0%	100%
		Zoological Science	0%	100%
	Environmental Science	Environmental Impact Assessments	0%	100%
	Water Quality Management	Pollutant Source and Pathway Identification	0%	100%
		Pollution Sources Evaluation and Control	0%	100%
		Water, Wastewater and Industrial Water Analysis	0%	100%
Grand Total			**44%**	**56%**

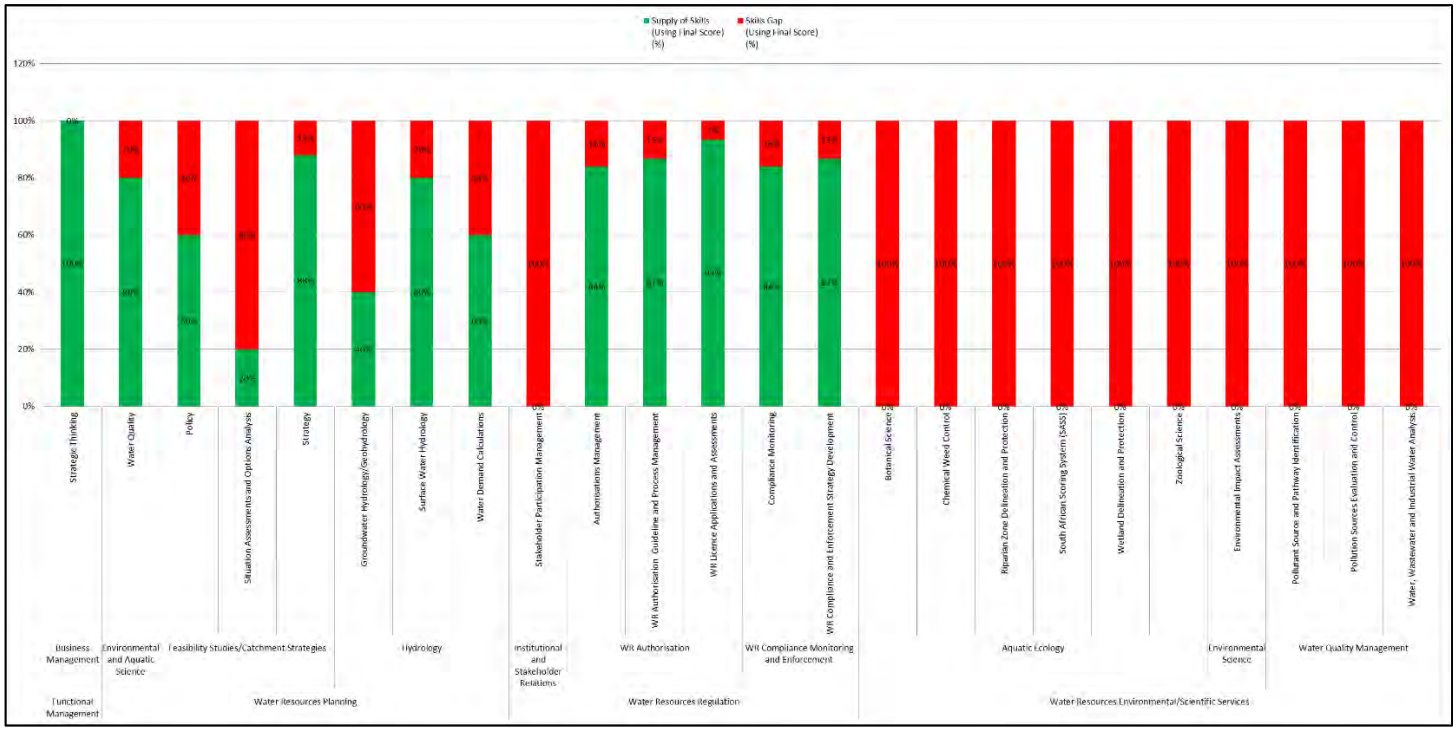


Figure 15 Graph showing analysis of an anonymous BOCMA technical staff member by Competency

Table 35 Analysis across BOCMA by Function then Competency Cluster

FUNCTION/COMPETENCY CLUSTER	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Functional Management	**100%**	**0%**
Business Management	100%	0%
Water Resources Planning	**49%**	**51%**
Environmental and Aquatic Science	86%	14%
Feasibility Studies/Catchment Strategies	44%	56%
Hydrology	34%	66%
Water Resources Regulation	**73%**	**27%**
Institutional and Stakeholder Relations	56%	44%
WR Authorisation	77%	23%
WR Compliance Monitoring and Enforcement	88%	12%
Water Resources Environmental/Scientific Services	**65%**	**35%**
Aquatic Ecology	55%	45%
Environmental Science	71%	29%
Water Quality Management	74%	26%
Grand Total	**64%**	**36%**

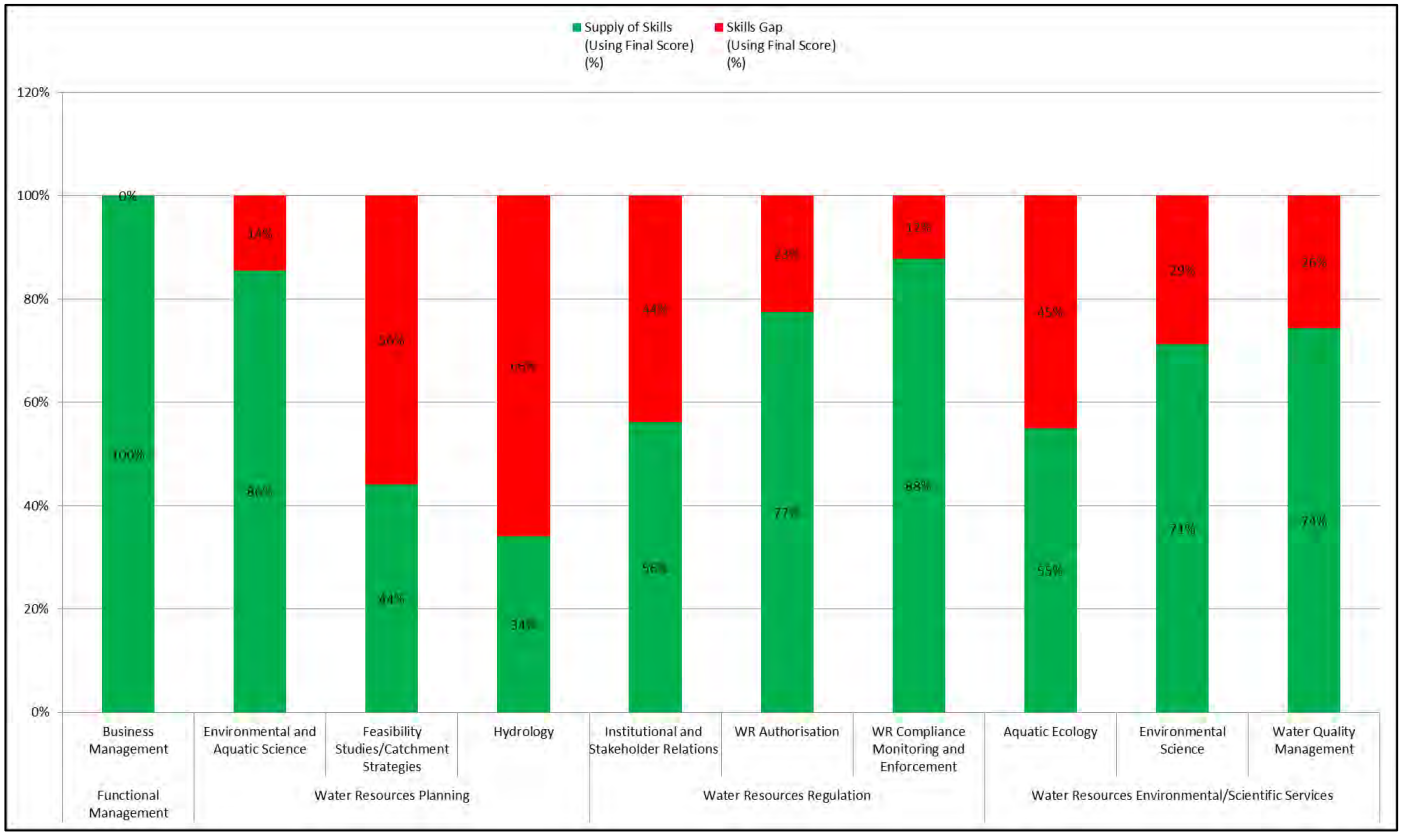


Figure 16 Graph showing analysis across BOCMA by Function then Competency Cluster

Table 36 Analysis of competence across BOCMA by technical job title

JOB TITLE/Function/Competency Cluster	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Water Use Specialist	**66%**	**34%**
Water Resources Planning	**36%**	**64%**
Environmental and Aquatic Science	88%	13%
Feasibility Studies/Catchment Strategies	32%	68%
Hydrology	17%	83%
Water Resources Regulation	**83%**	**17%**
Institutional and Stakeholder Relations	82%	18%
WR Authorisation	78%	22%
WR Compliance Monitoring and Enforcement	93%	7%
Water ResourcesEnvironmental/Scientific Services	**70%**	**30%**
Aquatic Ecology	59%	41%
Environmental Science	66%	34%
Water Quality Management	87%	13%
WRM: Senior Manager	**44%**	**56%**
Functional Management	**100%**	**0%**
Business Management	100%	0%
Water Resources Planning	**62%**	**38%**
Environmental and Aquatic Science	80%	20%
Feasibility Studies/Catchment Strategies	58%	42%
Hydrology	54%	46%
Water Resources Regulation	**56%**	**44%**
Institutional and Stakeholder Relations	0%	100%
WR Authorisation	89%	11%
WR Compliance Monitoring and Enforcement	85%	15%
Water ResourcesEnvironmental/Scientific Services	**0%**	**100%**
Aquatic Ecology	0%	100%
Environmental Science	0%	100%
Water Quality Management	0%	100%
Water Use Office	**69%**	**31%**
Water Resources Planning	**53%**	**47%**
Environmental and Aquatic Science	86%	14%
Feasibility Studies/Catchment Strategies	48%	53%
Hydrology	39%	61%
Water Resources Regulation	**73%**	**27%**
Institutional and Stakeholder Relations	63%	38%
WR Authorisation	74%	26%
WR Compliance Monitoring and Enforcement	86%	14%
Water ResourcesEnvironmental/Scientific Services	**73%**	**27%**
Aquatic Ecology	61%	39%
Environmental Science	79%	21%
Water Quality Management	83%	17%
Grand Total	**64%**	**36%**

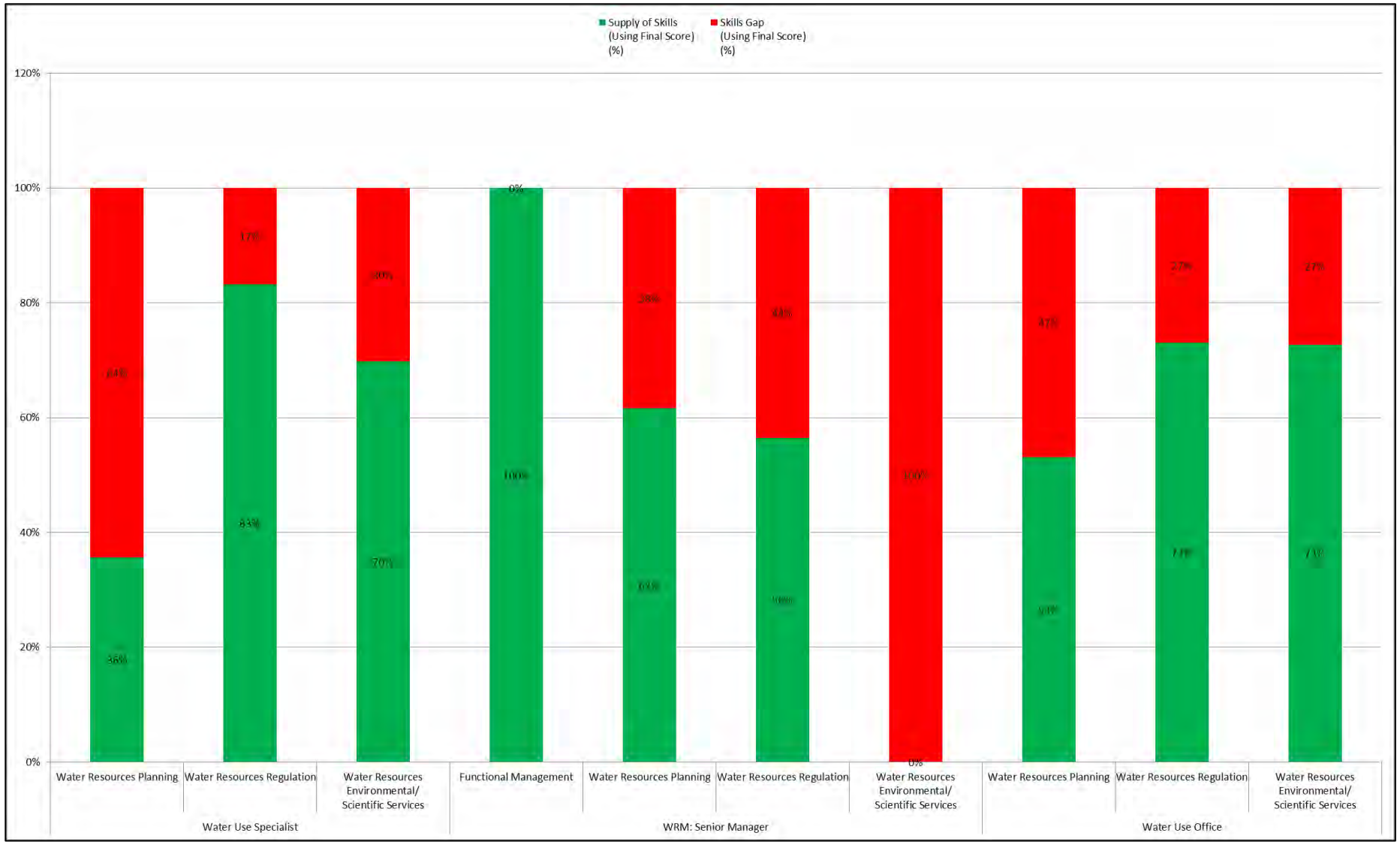


Figure 17 Graph showing analysis of competence across BOCMA by technical job title

5.4 Level 1 Assessment – Umgeni Water

Relevant report:

Deliverable 5a – Report on the Level 1 Assessment: Umgeni Water

5.4.1 Determination of the Demand for Capacity

The Water Services Act and its Mandates

The Water Services Act, No. 108 of 1997 was reviewed and 72 mandates or responsibilities appropriate to water boards in Chapters 2 and 6 of the Act were identified. **Figure 18** overleaf sketches the chapters of the Act along with the implied mandates for water boards.

The colours in **Figure 18** are used for aligning water board mandates to the relevant chapter in the Water Services Act and to facilitate cross-checking from **Figure 18** to **Figure 19**.

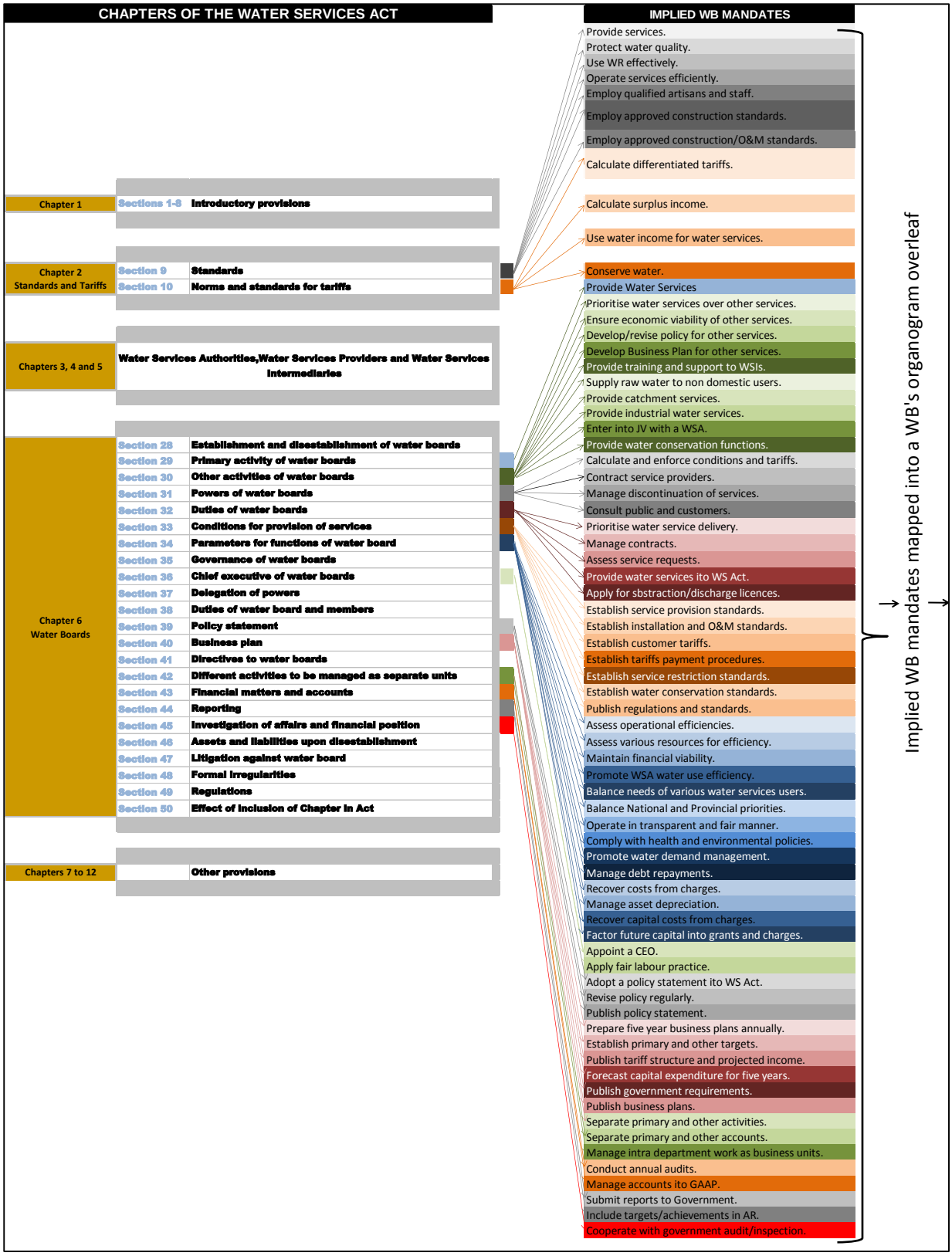


Figure 18 Implied mandates for water boards as taken from the Water Services Act

The water board responsibilities or mandates above were allocated to departments in the Umgeni Water organogram (see **Figure 19**).

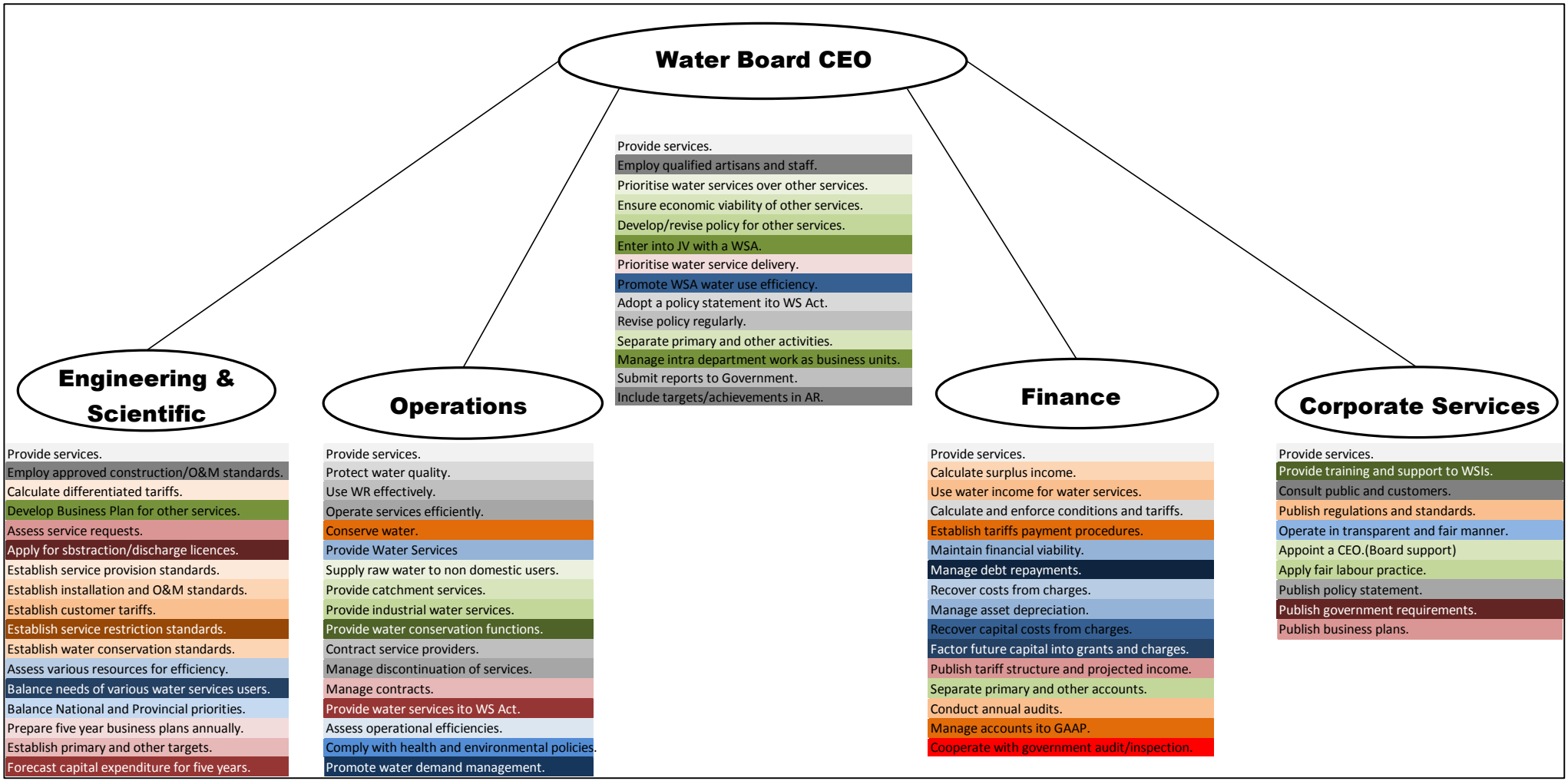


Figure 19 Water board mandates allocated to departments in Umgeni Water's organogram

Allocation of mandates to job titles

Although the mandates were allocated to the Umgeni Water organogram the more detailed step of further allocating mandates to job titles was not undertaken. This step would involve significant time to search the detailed organogram and allocate mandates to all the relevant job titles in each department. The research budget was insufficient to meet this cost, therefore for the purposes of this research it was felt that allocation to departments was adequate for Umgeni Water.

Extent of Responsibility

Once the mandates from the Act were mapped into Umgeni Water's organogram, the time it would take to deliver on the mandate was calculated.

With regards to calculation of resources required using the unit of time (i.e. days), an assumption was made as to how often tasks related to a mandate would occur in a year along with the time in days to perform that task once. The time to deliver on the mandate would be the product of the number of tasks multiplied by the time to perform the task. This can be expressed by the following formula:

Total Time to meet mandate (days)	**=**	**Number of tasks**	**X**	**Time to perform task**

The staff required for a particular job title would be the total time in days divided by the number of work days in a year which is 220 days.

The number of staff required for water treatment works (WTW) and wastewater treatment works (WWTW) are guided by *Regulations Relating to Compulsory National Standards for Process Controllers and Water Services Works (DWS 2013)* and not time. These regulations specify the minimum numbers and grades of staff that should be available to operate and maintain WTWs and WWTWs.

The method used to calculate the number of staff required for pipeline O&M was also not the time-based method. After extensive interviews with operational

managers at the City of Tshwane, a method which calculates the required number of plumbing teams based on length of pipeline was chosen.

In conjunction with the above steps, relevant documents were reviewed to assist in assessing the extent of responsibility and thus demand for capacity. Before assumptions could be made on how often tasks needed to be performed, information which alluded to the potential volumes of work had to be obtained. The public documents available for this purpose were the Umgeni Water Annual Reports and Infrastructure Business Plans, which contain technical information.

Figure 20 below, taken from Umgeni Water's annual report 2013, shows the geographical positioning of Umgeni Water's bulk operations by providing the routes of bulk pipelines and location of WTWs owned or managed by Umgeni Water in KwaZulu-Natal (KZN).

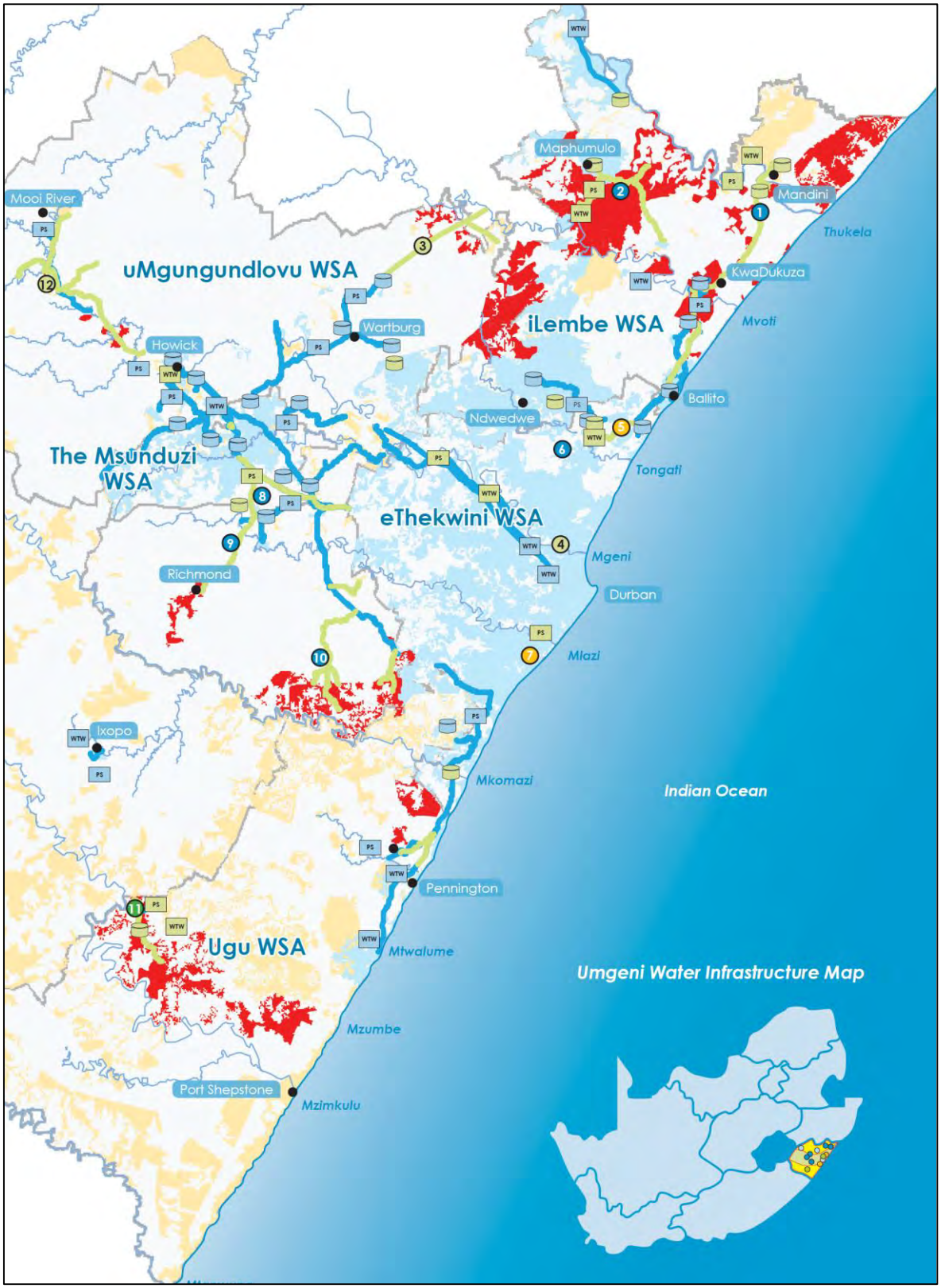


Figure 20 Illustration of Umgeni Water's bulk infrastructure and service area in KZN

Extent of Planning Responsibility

Umgeni Water's current area of operations extends from the Thukela River in the North, the Mtamvuna River in the South, the Indian Ocean in the East and the Drakensberg Mountains in the West, an area of approximately 21 555 km^2. Umgeni Water supplies 423 million m^3 of potable water per annum to its six Water Services Authority (WSA) customers (Ugu DM, Sisonke DM, eThekwini Metro, Msunduzi LM, Umgungundlovu DM and Ilembe DM), serving a population of approximately 6.1 million people or 1.68 million households. eThekwini Metro is one of the six metropolitan municipalities in the country. The other WSAs in the Umgeni Water area include both formal towns and many rural settlements.

On a management level Umgeni Water has divided its area into two regions – namely Inland and Coastal. This research therefore assumed that two planning regions are relevant for the demand for capacity calculations.

Extent of Detailed Design Responsibility

In determining the extent of responsibility with regard to detailed design this research project adopted an industry norm based upon the size of the capital budget for water services for a year. For detailed design the staffing norm of R30 million per annum per design engineer was used. From the Umgeni Water Business Plan 2012 the water services capital budget for 2012 to 2016 was R4.048 billion. For purposes of the project this was taken as R809 million per annum.

Extent of Infrastructure Responsibility

As for detailed design, the Infrastructure responsibility was based upon the size of the capital budget for water services for a year. For infrastructure provision the same staffing norm of R30 million per annum per project manager was used. As mentioned above, from the Umgeni Water Business Plan 2012 the water services capital budget for 2012 to 2016 was R4 048 billion. For purposes of the project this was taken as R809 million per annum.

Extent of Dams Responsibility

Umgeni Water owns or manages thirteen (13) dams, of which five (5) are managed on behalf of the DWS and two (2) on behalf of the Ugu DM. During the supply side section of this research project it was discovered that there are no staffing norms for dams, either in South Africa or internationally. Due to this it was not possible to apply a unit of measure with any confidence. The research team is of the opinion that the classification of the works associated with the dam could form a sensible basis of a staffing norm.

Extent of WTW and WWTW Responsibility

In summary there are eleven (11) WTWs, of which two (2) are managed on behalf of the Ugu DM. In addition, eighteen (18) small WTWs and nineteen (19) borehole schemes are managed on behalf of the iLembe DM.

Umgeni Water treats bulk wastewater totaling 31.8 million m^3 per annum (87 Mℓ/d) and in support of this operates five (5) WWTWs, of which one (1) is managed on behalf of the uMgungundlovu DM.

Table 37 overleaf shows the classification of each of the works managed by Umgeni Water.

Table 37 Classification of Umgeni Water WTWs and WWTWs

Name	Works Classification (A-E) as per draft Regulation 181 (Schedule 2 and 3) to the National Water Act 1998	Number of shifts worked per day. (12 hours per shift)
Water Treatment Works		
Ixopo	C	2
Midmar	B	2
D V Harris	B	2
Wiggins	B	2
Durban Heights	B	2
Maphephetwa	C	2
Mtwalume	C	2
Umzinto	C	2
Amamzimtoti	B	2
Maphumulo	B	2
Mvoti	B	2
Hazelmere	B	2
Water Treatment Works		
Darvill	A	2
Howick	C	2
Ixopo	D	1 (No night shift, 1 attendant on standby)
Albert Falls North	D[1]	No attendants
Albert Falls South	D[1]	No attendants

Notes to table 36.

1. Albert Falls North and Albert Falls South have not been formally classified.
2. Since April 2014, Umgeni Water has been operating Lynnfield Park WWTW through a management contract with Msunduzi LM. It is a Class D works which has not been formally classified.

Extent of Water Distribution Responsibility

The unit of measure for extent of responsibility for O&M of water pipelines used by this research project was length of pipelines, in kilometres (km). Umgeni Water reports in their Annual Report 2012/13 that they are responsible for approximately 746km of pipelines and 66km of tunnels. The project combined these to give 812km.

Extent of Sewer Collection Responsibility

As was the case for water pipelines this project based the sewer collection responsibility on the length of sewer mains feeding the treatment works, in km. Umgeni Water did not provide this information so for purposes of completing the ***project the team assigned a nominal length of 350km***, to be able to complete the process.

Calculations on Number of Staff Required by Job Title, i.e. demand for capacity

To create relationship between extent of work and staff numbers (sometimes referred to as staffing norms) several methods were used:-

Chief Executive's (CE) Office

The research team considers that in a large institution that deals with only one service, such as a water board, the following posts/divisions would be required:

- *Manager Finance*
- *Manager Corporate Services and*
- *Manager Legal.*

Even though the three divisions noted above are required they are not included in the analyses in this research as they are not deemed to be technical[15] posts. However as the CE's post has been deemed a technical position it has been included.

[15] See **Definitions** on at the beginning of the report for the definition of a technical post.

The calculations carried out from **page 95** to **page 101** are summarised in **Table 44** on **page 102** and show the demand for capacity per job title in Umgeni Water.

Table 38 and **Figure 21** overleaf show the amount of time assumed to be allocated by the CE to discrete mandates as drawn from the Water Services Act. The functions omitted from this analysis are those which are methodological in nature. For example – "Prioritise Water Services Delivery". Furthermore, in addition to the discrete tasks from the Water Services Act shown above a CE will spend a lot of time concentrating on the "Business" business of the institution, as opposed to the "Water" business. The analysis thus presents a slightly skewed impression of the amount of time a CE needs to fulfil his/her function, skewed toward the "water" business.

Table 38 Calculation of time required of the Umgeni Water CE

Mandate (In short)	Department	Section	Extent	Extent Unit	Time	Time Unit	No of Days	Total No of Days/ Annum
Develop/revise policy for other services.	CEO	CEO	1	annual	5	days/annum	5	
Enter into JV with a WSA.	CEO	CEO	6	WSA	5	days/WSA	30	
Promote WSA water use efficiency.	CEO	CEO	6	functions	5	days/function/WSA	30	
Adopt a policy statement ito WS Act.	CEO	CEO	1	annual	5	days	5	
Revise policy regularly.	CEO	CEO	1	annual	5	days	5	
Submit reports to Government.	CEO	CEO	4	reports	20	days/report	80	
Include targets/achievements in AR.	CEO	CEO	1	annual	20	days/report	20	175

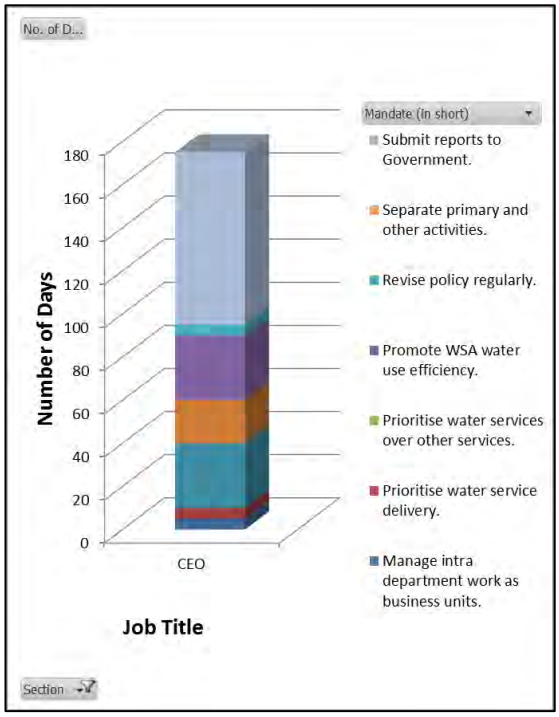


Figure 21 Graph showing time required of the Umgeni Water Chief Executive

Planning Staff

From research conducted under the level 2 assessments of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of one planning engineer per region was used for Umgeni Water. Therefore for two regions, Inland and Coastal, two (2) planning engineers are assumed to be required. The planning engineers would need to be supported by technologists, draughts persons, a Geographical Information Systems (GIS) operative and surveyors, and these staff have been included in the job titles of required staff in summary **Table 44.** Furthermore, this team would report to a planning manager and this demand for capacity is also included in summary **Table 44.**

A time based method was also completed for planning engineers in Umgeni Water in order to compare the "region-based" method to the "time-based" method. The time based method turned out to be very conservative showing only 168 days of planning time required or 1 (one) planning engineer (see **Table 39** and **Figure 22** overleaf). This method was thus discarded.

Table 39 Allocation of Umgeni Water planning staff to mandates (using the time-based method)

Mandate (In short)	Department	Section	Extent	Extent Unit	Time	Time Unit	No of Days	Total No of Days/ Annum
Calculate differentiated tariffs.	ESS	Planning Services	1	annual	20	days	20	
Establish customer tariffs.	ESS	Planning Services	1	standard sets	1	days/standard	1	
Apply for abstraction/discharge licences.	ESS	Planning Services	6	applications	2	days/application	12	
Establish service provision standards.	ESS	Planning Services	2	standard sets	5	days/standard	10	
Establish service restriction standards.	ESS	Planning Services	1	standard sets	5	days/standard	5	
Assess various resources for efficiency.	ESS	Planning Services	2	assessments	10	days/region	20	
Balance needs of various water services users.	ESS	Planning Services	6	assessments	5	days/assessment/WSA	30	
Balance National and Provincial priorities.	ESS	Planning Services	1	projects	5	days/annum	5	
Prepare five year business plans annually.	ESS	Planning Services	1	annual	60	days/annum	60	
Establish water conservation standards.	ESS	Planning Services	1	standard sets	5	days/standard	5	168

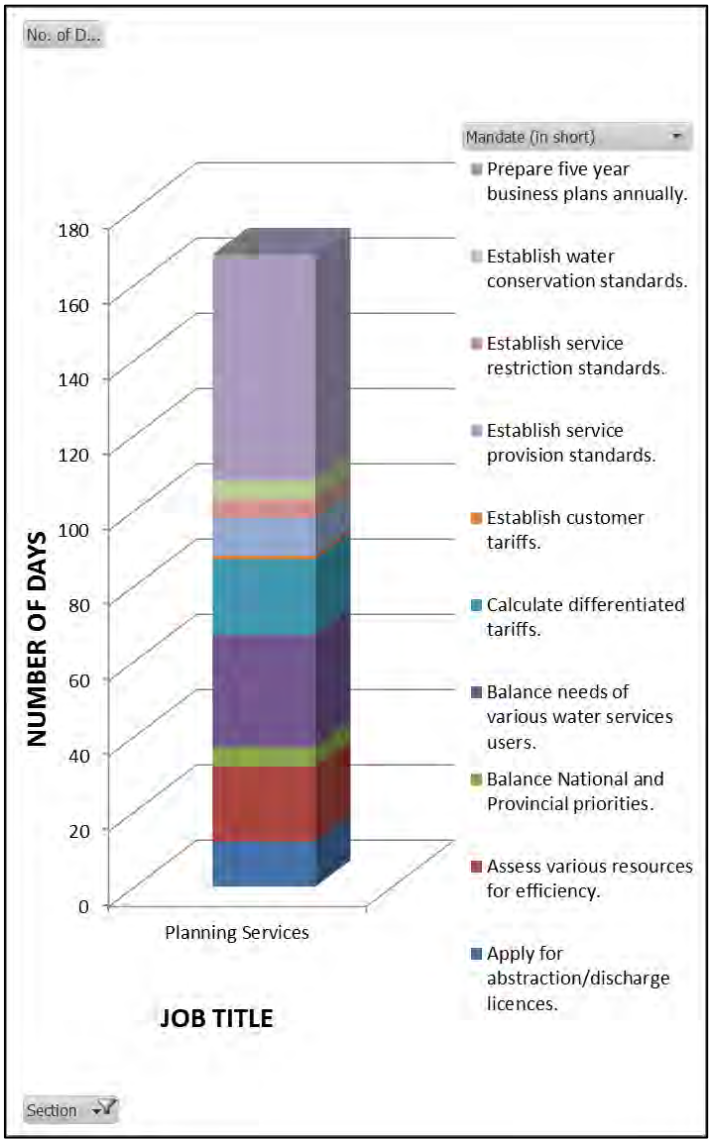


Figure 22 Graph showing time required of the Umgeni Water planning staff

Detailed Design Staff

Calculating the number of engineering services or design staff according to the time based method is shown in **Table 40** below. This calculation shows that only 1 design engineer is required as the mandated tasks only total 70 days per year. This is clearly out of kilter with the extent of responsibilities that Umgeni Water holds.

Table 40 Allocation of Umgeni Water project staff to mandates (using the R(m) method)

Mandate (In short)	Department	Section	ALLOCATION TO JOB TITLE	Extent	Extent Unit	Time	Time Unit	No of Days	Total No of Days/ Annum
Develop Business Plan for other services.	ESS	Project Office	Engineering Services	1	Annual	10	days/annum	10	
Establish primary and other targets.	ESS	Project Office	Engineering Services	1	Annual	30	days/annum	30	
Forecast capital expenditure for five years.	ESS	Project Office	Engineering Services	1	annual	30	days/annum	30	70

An alternative method of determining project management staff was described above in ***Extent of Responsibility/ Extent of Detailed Design Responsibility***. By this method, using R30m/design engineer, and with a capital budget of R809.6m the number of design staff required amounts to 27. This demand for capacity has been included in summary **Table 44**.

Infrastructure Provision Staff

The method to calculate the number of infrastructure provision or project office staff was described in ***Extent of Responsibility/Extent of Infrastructure Responsibility***. By this method, using R30m/project engineer, and with a capital budget of R809.6m the number of project managers required amounts to 27. This demand for capacity has been included in summary **Table 44**.

Water Pipeline O&M staff

From research conducted under the level 2 assessments of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of one maintenance team per 160km of pipeline was used for Umgeni Water. For the total of 812km of water supply pipes the result was that five (5) maintenance teams are required. As shown in **Table 41** below each team consists of a plumber (or Artisan: Plumber or Fitter), a tradesman assistant (in effect a general worker) and a second general worker. Five (5) plumbers report to one (1) foreman. As this project is not concerned with general workers they are not included in summary **Table 44**.

Table 41 Umgeni Water O&M staff required for water pipeline maintenance (using the teams/km method)

CALCULATOR TO DETERMINE THE NUMBER OF O&M PIPELINE STAFF REQUIRED FOR MAINTENANCE		
INPUT DATA:		
Enter the Total Length of Pipelines	812	km
Enter the Length of Kilometers per Team	160	km
Enter the Number of General Workers per Team	2	
Enter the Number of Tradesman Assistants per Team	1	
Enter the Number of Plumbers per Team	1	
Enter the Number of Teams a Foreman Manages	6	
Enter the Number of Foreman a Technician can manage	3	
Enter the Number of Technicians and Technologist/Engineer can manage	2	
RESULTS: Total O&M Staff required		
For this total length of pipelines, practical amount of teams:	5	teams
Technologist/Engineer	0	
Technician	0	
Foreman	1	
Plumbers	5	
Tradesman Assistants	5	

Sewer Pipeline O&M staff

From research conducted under the level 2 study of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of 1 maintenance team per 160km of sewer pipeline was used for Umgeni Water. For the total of 350km of sewer pipelines assigned to Umgeni Water two maintenance teams are required, as shown in **Table 42** below. These numbers have been included in summary **Table 44.**

Table 42 Umgeni Water O&M staff required for sewer pipeline maintenance (using the teams/km method)

CALCULATOR TO DETERMINE THE NUMBER OF O&M PIPELINE STAFF REQUIRED FOR MAINTENANCE		
INPUT DATA:		
Enter the Total Length of Pipelines	350	km
Enter the Length of Kilometers per Team	160	km
Enter the Number of General Workers per Team	2	
Enter the Number of Tradesman Assistants per Team	1	
Enter the Number of Plumbers per Team	1	
Enter the Number of Teams a Foreman Manages	6	
Enter the Number of Foreman a Technician can manage	3	
Enter the Number of Technicians and Technologist/Engineer can manage	2	
RESULTS: Total O&M Staff required		
For this total length of pipelines, practical amount of teams:	2	teams
Technologist/Engineer	0	
Technician	0	
Foreman	0	
Plumbers	2	
Tradesman Assistants	2	

WTW and WWTW provision staff

The numbers of staff required to operate the WTWs and WWTWs under Umgeni Water's management are governed by DWS regulations. The staff requirements are shown overleaf in **Table 43.** Water and sewage effluent quality should be monitored by appropriate scientific and technical staff, including chemical and biological specialists, with support staff. This demand for capacity has been included in summary **Table 44**.

Table 43 Number of Umgeni Water staff required per treatment works

	Water Treatment Works													Wastewater Treatment Works					
	1	2	3	4	5	6	7	8	9	10	11	12	Total	1	2	3	4	5	Total
	Ixopo	Midmar	D V Harris	Wiggins	Durban Heights	Maphephetwa	Mtwalume	Umzinto	Amanzimtoti	Maphumulo	Mvoti	Hazelmere		Darvill	Howick	Ixopo	Albert Falls North	Albert Falls South	
Classification of Works[1]	C	B	B	B	B	C	C	C	B	B	B	B		A	C	D	D	D	
Class 1 Operator													0						0
Class 2 Operator													0			2	2	2	6
Class 3 Operator	2					2	2	2					8		2				2
Class 4 Operator		2	2	2	2				2	2	2	2	16	2					2
Electrician	1	1	1	1	1	1	1	1	1	1	1	1	12	1	1	1	1	1	5
Fitter	1	1	1	1	1	1	1	1	1	1	1	1	12	1	1	1	1	1	5
Instrumentation Technician	1	1	1	1	1	1	1	1	1	1	1	1	12	1	1	1	1	1	5
Class 5 Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	12	1	1	1	1	1	5
Totals[2]	6	6	6	6	6	6	6	6	6	6	6	6	72	6	6	6	6	6	30

Notes

1. Works Classification as per REGULATIONS RELATING TO COMPULSORY NATIONAL STANDARDS FOR PROCESS CONTROLLERS AND WATER SERVICES WORKS, as published by the Department of Water Affairs in 2013.

2. Totals are required Class of operator/supervisor x number of shifts.

3. Electricians, Fitters and Instrumentation Technicians do not have to be at the works all the time but must be available to attend. Can be staff or outsourced. Counted as staff for purposes of this project.

Summary of Staff Required by job title, i.e. demand for capacity

Table 44 is a summary of all staff required, or in demand, from the calculations carried out from **page 95** to **page 101**. The total shows a demand for 205 staff.

Table 44 Summary of minimum required technical staff per job title at Umgeni Water

Div	Infra Type (A	Meaningful Job Title (Adie)	Required No.
CEO	CEO	Chief Executive	1
		Manager (Strategy and Special Projects)	
		Manager Senior (Strategic Support)	
CEO Total			**1**
ESS	GM: ESS	GM (Engineering and Scientific Services)	
	Planning	Manager (Planning Services)	1
		Scientist (Planning Analyst)	
		Engineer (Planning)	2
		Technologist (Planning)	2
		Technician (Planning)	
		Hydrologist	
		Geohydrologist	
		Hydrologist Assistant	
		Project Manager	
		Surveyor	1
		GIS Officer	1
		Draughtsperson	1
	Planning (Scie	Manager (Water and Environment Services)	
		Scientist (Water and Environment)	
		Environmental Officer	
		Programme Co-ordinator	
		Project Manager: WQ	
		Scientific Assistant (Sampling)	
		Sampling Services Co-ordinator	
		Sampling Officer	
		Project Co-ordinator (Working for Water)	
	Eng Serv./Des	Manager (Engineering Services)	
		Engineer (Civil) Mentoring	
		Engineer (Schedule and Costing)	
		Engineer/Technologist (Structural)	
		Engineer (Civil)	27
		Technician (Civil and Mechanical)	
		Technician (Unaccounted for Water)	
		Inspector of Works	
		Q and TS Officer	
		Project Manager	
		Surveyor	
		Draughtsperson	
	Project Office	Manager (Projects Office)	
		Engineer (Schedule and Costing)	
		Project Manager	27
	Process	Technician (Process)	
		Scientist Senior (R&D)	
		Scientist/Engineer (R&D)	
		Engineer	
		Scientist (Process)	
		Engineer (Process)	
		Technologist (Process)	
		Technologist (Process)	
		Technician (Process) Senior	
		Technician (Process) Senior	
	Scientific	Manager (Laboratory Services)	
		Manager (Quality Assurance)	
		Manager (Process)	
		Co-ordinator (LIMS)	
		Section Head (Biological Sciences)	
		Section Head (Chemistry)	
		Scientist/Engineer (R&D)	
		Supervisor (Laboratory Technical)	
		Technician (Laboratory Microbiology)	
		Technician (Laboratory)	
ESS Total			**62**

Div	Infra Type (A\	Meaningful Job Title (Adie)	Required No.
OPS	Business Dev	Technical Officer (Social Bus Dev) (Household Sanitation)	
		Technical Officer (Social Bus Dev) (School Sanitation)	
	Dam	Superintendant (Dams)	
		Superintendant Assistant	
		Chargehand	
	Pipelines	Regional Manager	
		Area Manager	
		Manager (Production)	
		Manager (Systems)	
		Manager (SHEQ)	
		Engineer (Construction)	
		Manager (Process and Quality)	
		Manager (Special Projects)	
		Engineer (Maintenance)	
		Engineer (Reliability)	
		Technician	
		Technician (Civil Contracts)	
		Technician (Civil)	
		Technician (Electrical)	
		Technician (Instrumentation)	
		Technician (Mechanical)	
		Technician (Process and Quality)	
		Technician (Process)	
		Technician (Reliability)	
		Technician (Telemetry)	
		Telemetry/Radio Specialist	
		Supervisor (Reticulation)	
		Team Leader	
		Foreman	5
		Foreman (Civil)	
		Technician (Electrical and Instrumentation)	
		Technician Civil (In-Training)	
		Foreman (Electrical and Instrumentation)	
		Foreman (Electrical)	
		Foreman (Mechanical)	
		Foreman (Vehicles)	
		Artisan (Boilermaker)	
		Foreman (Civil or Mechanical)	
		Foreman (Instrumentation)	
		Artisan (Electrician)	17
		Artisan (Fitter)	17
		Artisan (Instrumentation)	17
		Artisan (Mechanic)	
		Artisan (Pipelines	
		Artisan (Plumber)	35
		Artisan (Telemetry)	
		Artisan (Welder)	
		Inspector of Works	
		Operator	
		SHEQ Co-ordinator	
		Apprentice (Electrical)	
		Apprentice (Mechanical or Fitting)	
		Surveyor	
		Draughtsperson	
	Reservoir	Superintendant	
		Superintendant Assistant	
		Labour Supervisor	
	WTW	Superintendant (WTP)	
		Superintendant (WWTP)	
		Technician (Process and Quality)	
		Technician (Process)	
		Superintendant	17
		Technician Senior	
		Foreman	
		Artisan (Plumber)	
		Maintenance Repairman	
		Operator Senior	
		Operator	24
		Sampling Officer	
		SHEQ Co-ordinator	
		Operator (WWTP and WTP)	
	WWTW	Superintendant (WWTP)	
		Operator	10
		Operator (Multiskilled)	
	OPS	GM (Operations)	
		Manager (Ops Support)	
OPS Total			**142**
Grand Total			**205**

Umgeni Water Job Profiles and Required Minimum Qualification

Besides looking at demand for capacity from a workforce planning point of view, the project looked at demand for capacity from a qualification requirement and years of experience point of view. The minimum qualification requirements with areas of specialisation were obtained from Umgeni Water's job profiles. Minimum qualification requirements were inserted into **Table 45**.

Table 45 Umgeni Water job titles with minimum qualification requirements

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Minimum Qualification Required	Area of Specialisation	Years of appropriate experience required
CEO	CEO	Chief Executive	BSc Engineering or equivalent and MBA	Business Management	25
		Manager (Strategy and Special Proje	BSc	Civil Engineering	11
		Manager Senior (Strategic Support)	BSc and post grad qualification	Civil/Mechanical/Electrical and Business Management	20
CEO Total					
ESS	GM: ESS	GM (Engineering and Scientific Servi	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
	Planning	Draughtsperson	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
		Engineer (Planning)	BSc Engineering	Civil Engineering	11
		Geohydrologist	BSc Honours	Hydrology (Geology/Hydrogeology/Hydrology)	4
		GIS Officer	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
		Hydrologist	BSc	Hydrology	5
		Hydrologist Assistant	BSc	Hydrology	5
		Manager (Planning Services)	BSc Eng (or equivalent)	Civil	7
		Project Manager	BSc/Btech	Civil Engineering	7
		Scientist (Planning Analyst)	BSc Honours	Hydrology/Geography	5
		Surveyor	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
		Technician (Planning)	S4 Diploma	Civil Engineering	5
		Technologist (Planning)	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
	Planning (Scientific)	Environmental Officer	BSc	Chemistry/Environmental Science	2
			N5 Certificate	Environmental Science/Chemistry/Related	3
		Manager (Water and Environment Se	BSc Honours	Chemistry	7
		Programme Co-ordinator	Diploma	Project Management	5
		Project Co-ordinator (Working for Wa	Diploma	Project Management	5
		Project Manager: WQ	BSc/Btech	Civil Engineering	7
		Sampling Officer	NQF Grade 12/Full NTC 3/N3 Certificate	Maths&Science/Biology & Water and Wastewater	1
		Sampling Services Co-ordinator	NQF Grade 12/Full NTC 3/N3 Certificate	Maths&Science/Biology & Water and Wastewater	5
		Scientific Assistant (Sampling)	National Diploma	Water and Wastewater	1
		Scientist (Water and Environment)	BSc (Hons)/BSc (Eng)	Environmental Science/Chemistry/Related	4
	Eng Serv./Design.	Draughtsperson	National Diploma (or equivelant qualification)	Draughting	3
		Engineer (Civil)	BSc	Civil Engineering	7
		Engineer (Civil) Mentoring	BSc	Civil Engineering	30
		Engineer (Schedule and Costing)	BSc Engineering	Civil Engineering	11
		Engineer/Technologist (Structural)	National Diploma	Engineering	7
		Inspector of Works	S4 Diploma	Civil/Mechanical	5
		Manager (Engineering Services)	BSc (equivalent)	Civil Engineering	8
		Project Manager	BSc/Btech	Civil Engineering	7
		Surveyor	BSc/Btech	Land Surveying	8
		Technician (Civil and Mechanical)	S4 Diploma	Civil/Mechanical	5
		Technician (Unaccounted for Water)	Grd 12 or S3, or T4	Civil Engineering	5
	Project Office	Engineer (Schedule and Costing)	BSc/Btech/HND	Engineering/Quantity Surveying	11
		Manager (Projects Office)	BSc/Btech or PMP	Engineering/Project Management	8
		Project Manager	BSc/Btech	Civil Engineering	7
	Process	Engineer	BSc	Chemical Engineering	11
		Engineer (Process)	BSc	Chemical Engineering	4
		Scientist (Process)	BSc Honours/BSc Chem. Eng or equivalent	Chemistry	4
		Scientist Senior (R&D)	BSc Hons/B Eng or equlivalent	Water/WTW Research	4
		Scientist/Engineer (R&D)	BSc Hons/B Eng or equlivalent	Water/WTW Research	4
		Technician (Process) Senior	National Diploma	Chemical Engineering	3
		Technician (Process)	National Diploma	Chemical Engineering	3
		Technician (Process) Senior	National Diploma	Chemical Engineering	3
		Technologist (Process)	Btech	Chemistry	5
		Technologist (Process)	Btech	Chemistry	5
	Scientific	Co-ordinator (LIMS)	National Diploma	Chemistry/Microbiology/Biology	5
		Manager (Laboratory Services)	BSc Hounours	Chemistry	7
		Manager (Process)	BSc	Chemical Engineering	11
		Manager (Quality Assurance)	Degree (or equivalent education)	Quality Management	6
		Scientist/Engineer (R&D)	BSc Hons/B Eng or equlivalent	Water/WTW Research	4
		Section Head (Biological Sciences)	BSc Honours	Biology	6
		Section Head (Chemistry)	BSc Honours	Chemistry	6
		Technician (Laboratory)	BSc or Diploma	Chemistry/Analytical Checmistry	5
			National Diploma	Biology	3
				Chemistry	3
				Chemistry/Microbiology/Biology	3
		Supervisor (Chemical Laboratory)	BSc or NHD/BTech	Chemistry	5
		Supervisor (Microbiology Laboratory)	BSc or NHD/BTech	Microbiology	5
ESS Total					

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Minimum Qualification Required	Area of Specialisation	Years of appropriate experience required
OPS	Dam	Chargehand	NQF Grade 8 ABE Level 2 or equivelant education	Handyman	1
		Superintendant (Dams)	N5 or T3/S4	Civil/Electrical or Mechanical, Water Care and Water	5
		Superintendant Assistant	Diploma (or equivalent), DWAF certificate etc and Auditors	Supervisory, Dam Control/WRM/WM/WD and Basic Sa	0
	OPS	GM (Operations)	BSc Engineering and Diploma (or equivalent)	Civil and Business Management	20
		Manager (Ops Support)	BSc	Civil/Mech/Elec and Buiness Management	11
	Pipelines	Area Manager	Bsc Eng	Civil Engineering	10
		Artisan (Boilermaker)	N2 Certificate and Trade Test	Boilermaker	5
		Artisan (Electrician)	N2 Certificate and Trade Test	Electrical	5
		Artisan (Fitter)	N2 Certificate and Trade Test	Fitting and Turning	5
		Artisan (Instrumentation)	N2 Certificate and Trade Test	Instrumentation	5
		Artisan (Mechanic)	N2 Certificate and Trade Test	Mechanical	5
		Artisan (Pipelines	N2 Certificate and Trade Test	Plumber/Bricklayer/Carpenter	2
		Artisan (Plumber)	N2 Certificate and Trade Test	Plumber/Bricklayer/Carpenter	2
		Artisan (Telemetry)	N2 Certificate and Trade Test	Telemetry	5
		Artisan (Welder)	N2 Certificate and Trade Test	Boilermaker	5
		Draughtsperson	National Diploma (or equivelant qualification)	Draughting	3
		Engineer (Construction)	BSc/Btech	Civil Engineering	6
		Engineer (Maintenance)	BSc/Btech, Prof registration & Govt Certificate of Competer	Electrical Engineering	6
		Engineer (Reliability)	BSc Engineering	Civil Engineering	11
		Foreman (Civil or Mechanical)	N5 Certificate and Trade Test	Civil/Mechanical	5
		Foreman (Civil)	N5 Certificate and Trade Test	Civil	5
		Foreman (Electrical and Instrumenta	N5 Certificate (or equivalent)	Electrical	5
		Foreman (Electrical)	N5 Certificate, Trade Test and Licence Certificate	Electrical	5
		Foreman (Instrumentation)	N5 Certificate (or equivalent)	Electrical Engineering	5
		Foreman (Mechanical)	N5 Certificate	Mechanical	5
		Foreman (Vehicles)	N5 Certificate, Trade Test and Licence Certificate	Engine Mechanic	5
		Inspector of Works	S4 Diploma	Civil/Mechanical	5
		Manager (Process and Quality)	BSc	Chemical Engineering	10
		Manager (Production)	BSc	Civil Engineering	11
		Manager (SHEQ)	National Diploma and First Aid Certificate	Safety Management	11
		Manager (Special Projects)	BSc	Civil Engineering	11
		Manager (Systems)	BSc (Hons)/BSc/Btech and M+2 Certificate	Engineering/Water Science and Business Management	7
		Operator	NQF Grade 9 (or equivalent) Code 10 Licence with PDP an	TLB machine care, operation and maintenence	2
		Regional Manager	BSc and post grad qualification	Civil/Mechanical/Electrical and Business Management	20
		SHEQ Co-ordinator	National Diploma and First Aid Certificate	Safety Management	3
		Supervisor (Reticulation)	N5 (or equivalent) and Trade Test	Civil Engineering	5
		Surveyor	BSc/Btech	Land Surveying	8
		Technician	BSc/Btech	Civil Engineering	5
		Technician (Civil Contracts)	S4 Diploma	Civil Engineering	5
		Technician (Civil)	S4 Diploma	Civil Engineering	5
		Technician (Electrical and Instrumen	N5, T3/S4 and N6	Electrical Engineering	5
		Technician (Electrical)	S4 Diploma and Trade Test	Electrical Engineering	5
		Technician (Instrumentation)	N6 Certificate or equivalent	Instrumentation	5
		Technician (Mechanical)	S4 Diploma	Mechanical Engineering	5
		Technician (Process and Quality)	S4 Diploma and N6	Water Care/Analytical Chemistry/Chemical Engineering	4
		Technician (Process)	S4 Diploma	Electrical Engineering	3
		Technician (Reliability)	BSc	Civil Engineering	5
			N5, T3/S4 and N5	Civil Engineering	5
		Technician (Telemetry)	National Diploma	Telemetery	5
		Technician Civil (In-Training)	S4 Diploma	Civil Engineering	0
		Telemetry/Radio Specialist	BSc/Btech	Telemetry Engineering	15
	Reservoir	Labour Supervisor	NQF Grade 8 ABE Level 3	Supervisory	1
		Superintendant	T3 or S4 National Diploma and post grad general managem	Chemical Engineering/Water Care	6
		Superintendant Assistant	Diploma (or equivalent), DWAF certificate etc and Auditors	Supervisory, Dam Control/WRM/WM/WD and Basic Sa	0
	WTW	Artisan (Plumber)	N2 Certificate and Trade Test	Plumber/Bricklayer/Carpenter	2
		Foreman	N5 Certificate, Trade Test and Licence Certificate	Civil	5
		Maintenance Repairman	NQF Grade 8	Repairs	0.5
		Operator	Grd 12 or Full NTC3/N3 Water	Maths&Science/Bio	1
					5
			NQF Grade 12/Full NTC 3/N3/National Certificate	Maths ad Science/Biology/Water/Water Care	5
		Operator Senior	NQF Grade 12/Full NTC 3/N3/National Certificate	Maths ad Science/Biology/Water/Water Care	3
		SHEQ Co-ordinator	National Diploma and First Aid Certificate	Safety Management	3
		Superintendant	T3 or S4 National Diploma and post grad general managem	Chemical Engineering/Water Care	6
		Superintendant (WTP)	T3 or S4 National Diploma and post grad general managem	Chemical Engineering/Water Care	6
		Superintendant (WWTP)	T3 or S4 National Diploma and post grad general managem	Chemical Engineering/Water Care	6
		Technician (Process and Quality)	S4 Diploma and N3	Water Care/Analytical Chemistry/Chemical Engineering	4
			S4 Diploma and N4	Water Care/Analytical Chemistry/Chemical Engineering	4
		Technician (Process)	S4 Diploma and N3	Water Care/Analytical Chemistry/Chemical Engineering	4
			S4 Diploma and N5	Water Care/Analytical Chemistry/Chemical Engineering	4
	WWTW	Operator	Grd 12 or Full NTC3/N3 Water	Maths&Science/Bio	1
		Operator (Multiskilled)	NQF Grade 8 ABET Level 3 (or equivalent) & Code 08 Lice	Driving	1.5
		Superintendant (WWTP)	T3 or S4 National Diploma and post grad general managem	Chemical Engineering/Water Care	6
OPS Total					

Table 44 together with **Table 45** conclude the determination of demand for capacity at Umgeni Water showing how much capacity or staff are required (205 staff) and the nature of the capacity, i.e. job title with concomitant minimum qualifications.

5.4.2 Determination of the Supply of Capacity

Section 5.4.1 dealt with determining the demand for capacity by job title at Umgeni Water. This section deals with determining the supply of capacity at Umgeni Water, i.e. the number of actual technical staff at Umgeni Water.

From the export of Umgeni Water's staff database provided to the researchers a summary of the positions and vacancies was compiled, as shown in **Table 46**.

Table 46 Number of filled and vacant positions at Umgeni Water

	Total	Filled (SUPPLY)	Vacant
Technical	469	413	56
Non-Technical	293	266	27
Total	**762 (100%)**	**679 (89%)**	**83 (11%)**

56 vacant technical posts of the total number of technical posts of 469 is a vacancy rate of 12%. 27 vacant non-technical posts of the total number of non-technical posts of 293 is a low vacancy rate of 9%.

The supply of capacity by job title, as provided by the 413 employed technical staff, is shown in **Table 47** overleaf, in the same format as the demand for job titles in summary **Table 44** on **page 102** for Umgeni Water. In **Table 47** the "Filled (SUPPLY)" column above is expanded in **Table 48** to show Umgeni Water current staff complement according to their job titles and allocated as closely as possible to the "meaningful" (i.e. consistent across different WSIs) job titles that this project adopted in order to provide consistency across the various levels and areas of responsibility within the water sector.

Table 47 Number of Umgeni Water technical staff by job title

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Actual_No.
CEO	CEO	Chief Executive	1
		Manager (Strategy and Special Projects)	1
		Manager Senior (Strategic Support)	1
CEO Total			**3**
ESS	GM: ESS	GM (Engineering and Scientific Services)	1
	Planning	Manager (Planning Services)	1
		Scientist (Planning Analyst)	1
		Engineer (Planning)	5
		Technician (Planning)	1
		Hydrologist	1
		Geohydrologist	1
		Hydrologist Assistant	1
		Project Manager	1
	Planning (Scientific)	Manager (Water and Environment Services)	1
		Scientist (Water and Environment)	8
		Environmental Officer	8
		Programme Co-ordinator	1
		Project Manager: WQ	1
		Scientific Assistant (Sampling)	2
		Sampling Services Co-ordinator	1
		Sampling Officer	11
		Project Co-ordinator (Working for Water)	1
	Eng Serv./Design.	Manager (Engineering Services)	1
		Engineer (Civil) Mentoring	1
		Engineer (Schedule and Costing)	1
		Engineer/Technologist (Structural)	1
		Engineer (Civil)	7
		Technician (Civil and Mechanical)	6
		Technician (Unaccounted for Water)	2
		Inspector of Works	12
		Q and TS Officer	1
		Project Manager	2
		Surveyor	1
		Draughtsperson	2
	Project Office	Manager (Projects Office)	1
		Engineer (Schedule and Costing)	
		Project Manager	8
	Process	Technician (Process)	11
		Scientist Senior (R&D)	1
		Scientist/Engineer (R&D)	3
		Engineer	1
		Scientist (Process)	2
		Engineer (Process)	3
		Technologist (Process)	1
		Technologist (Process)	1
		Technician (Process) Senior	2
		Technician (Process) Senior	
	Scientific	Manager (Laboratory Services)	1
		Manager (Quality Assurance)	1
		Manager (Process)	1
		Co-ordinator (LIMS)	1
		Section Head (Biological Sciences)	2
		Section Head (Chemistry)	2
		Scientist/Engineer (R&D)	1
		Technician (Laboratory)	19
		Supervisor (Chemical Laboratory)	3
		Supervisor (Microbiology Laboratory)	2
		Technician (Microbiology Laboratory	1
ESS Total			**152**

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Actual No.
OPS	Business Dev.	Technical Officer (Social Bus Dev) (Household Sanitation)	1
		Technical Officer (Social Bus Dev) (School Sanitation)	1
	Dam	Superintendant (Dams)	3
		Superintendant Assistant	2
		Chargehand	1
	Pipelines	Regional Manager	
		Area Manager	5
		Manager (Production)	2
		Manager (Systems)	4
		Manager (SHEQ)	1
		Engineer (Construction)	1
		Manager (Process and Quality)	1
		Manager (Special Projects)	
		Engineer (Maintenance)	2
		Engineer (Reliability)	1
		Technician	
		Technician (Civil Contracts)	1
		Technician (Civil)	3
		Technician (Electrical)	2
		Technician (Instrumentation)	4
		Technician (Mechanical)	3
		Technician (Process and Quality)	3
		Technician (Process)	3
		Technician (Reliability)	2
		Technician (Telemetry)	1
		Telemetry/Radio Specialist	1
		Supervisor (Reticulation)	1
		Team Leader	1
		Foreman	
		Foreman (Civil)	1
		Technician (Electrical and Instrumentation)	1
		Technician Civil (In-Training)	1
		Foreman (Electrical and Instrumentation)	3
		Foreman (Electrical)	2
		Foreman (Mechanical)	3
		Foreman (Vehicles)	2
		Artisan (Boilermaker)	2
		Foreman (Civil or Mechanical)	3
		Foreman (Instrumentation)	1
		Artisan (Electrician)	13
		Artisan (Fitter)	22
		Artisan (Instrumentation)	6
		Artisan (Mechanic)	5
		Artisan (Pipelines	13
		Artisan (Plumber)	3
		Artisan (Telemetry)	
		Artisan (Welder)	1
		Inspector of Works	1
		Operator	4
		SHEQ Co-ordinator	4
		Apprentice (Electrical)	3
		Apprentice (Mechanical or Fitting)	3
		Surveyor	
		Draughtsperson	1
	Reservoir	Superintendant	1
		Superintendant Assistant	
		Labour Supervisor	
	WTW	Superintendant (WTP)	2
		Superintendant (WWTP)	1
		Technician (Process and Quality)	2
		Technician (Process)	2
		Superintendant	4
		Technician Senior	2
		Foreman	1
		Artisan (Plumber)	1
		Maintenance Repairman	2
		Operator Senior	19
		Operator	58
		Sampling Officer	
		SHEQ Co-ordinator	4
	WWTW	Superintendant (WWTP)	1
		Operator	1
		Operator (Multiskilled)	1
		Umgeni Municipality (Howick)	6
	OPS	GM (Operations)	1
		Manager (Ops Support)	1
OPS Total			**258**
Grand Total			**413**

Verifying if staff in supply meet minimum qualification requirements

Table 47 above showed the current technical staff complement at Umgeni Water. However, the method to determine the capacity gap includes an additional step of ensuring that staff meet the minimum qualification and experience requirements as per job profiles. Should the incumbent not meet the minimum qualification requirements (including years of experience), this staff member is not included in the count of supply of capacity until such time that this staff member has been through an assessment process of recognising prior learning (RPL) and given a qualification to match their ability, or gained further qualifications and/or years of experience.

Table 48 below anonymously compares required qualification per job title with the incumbents' actual qualifications and years of experience requirements. **Table 48** was only done for the sample of staff that were part of the online skills audit survey system and that part of the sample that were technical staff, which gave a sample size of 53. The result is that 16 of the 53 staff did not meet either the minimum qualification required or the years of experience required, giving a capacity gap of 30% for the sample. In converse, 70% of staff met both criteria.

If the above 30% is extrapolated to the entire technical staff of 413 this would result in 124 staff (30%) not meeting the criteria, with 289 (70%) that did. The research team randomly selected 289 positions that could thus be counted as supply of capacity as shown in **Table 49** in the "Qual Y/N" column.

Table 48 Umgeni Water sample by technical job title and actual qualifications

Meaningful Job Title (Adie)	Minimum Qualification Required	Area of Specialisation	Years of appropriate experience required	Incumbent's Highest Qualification	Incumbent's Area of Specialisation	Incumbent's Years of Exp.	Meets min Qual?	Meets min exp?	Total
Area Manager	Bsc Eng	Civil Engineering	10	National Diploma and MBA	Water & Waste Water Treatment and Water Management	10	0	1	1
Artisan (Electrician)	N2 Certificate and Trade Test	Electrical	5	NTC (N3/NTCIII)	Industrial Engineering	5	1	1	1
				NTC (N6/NTC VI)	Electrical Engineering	4	1	0	1
Artisan (Fitter)	N2 Certificate and Trade Test	Fitting and Turning	5	National Diploma and Certificate	Fitting and Turning and Welding	9	1	1	1
				Trade Test	Fitting and Turning	11	1	1	1
Artisan (Pipelines	N2 Certificate and Trade Test	Plumber/Bricklayer/Carpenter	2	NTC (N2/NTC II) and Trade Test	Plumbing	2	1	1	1
Artisan (Welder)	N2 Certificate and Trade Test	Boilermaker	5	Trade Test	Boilermaking	26	1	1	1
Engineer (Civil)	BSc	Civil Engineering	7	BSc (Eng)	Civil Engineering	2	1	0	1
				BSc Eng	Agricultural Engineering	6	1	0	1
Engineer (Civil) Mentoring	BSc	Civil Engineering	30	BSc (Hons) Eng	Civil Engineering	33	1	1	1
Engineer (Planning)	BSc Engineering	Civil Engineering	11	Btech and Post Grad Diploma	Civil Engineering and Management	14	1	1	1
Engineer/Technologist (Structural)	National Diploma	Engineering	7	BTech	Structural Engineering	7	1	1	1
Environmental Officer	N5 Certificate	Environmental Science/Chemistry/Related	3	BSc (Hons) Eng	(blank)	20	1	1	1
Foreman	N5 Certificate, Trade Test and Licence Certificate	Civil	5	NTC (N5/NTCV)	Fitting and Turning	5	1	1	1
Foreman (Electrical)	N5 Certificate, Trade Test and Licence Certificate	Electrical	5	NTC (N5/NTCV)	Electrical Engineering	16	1	1	1
Geohydrologist	BSc Honours	Hydrology (Geology/Hydrogeology/Hydrology)	4	MBA and BSc	Water Management and Hydrology	20	1	1	1
Hydrologist	BSc	Hydrology	5	BSc (Hons) and Post Grad Diploma	Hydrology & Water Resources and Marketing	Did not responsd	1	0	1
Inspector of Works	S4 Diploma	Civil/Mechanical	5	National Diploma	Fitting and Turning	5	1	1	1
Manager (Engineering Services)	BSc (equivalent)	Civil Engineering	8	None	None	28	0	1	1
Manager (Ops Support)	BSc	Civil/Mech/Elec and Buiness Management	11	B Eng and MBL	Electronics and Management	10	1	0	1
Manager (Planning Services)	BSc Eng (or equivalent)	Civil	7	MSc	Agricultural Engineering	9	1	1	1
Manager (Process)	BSc	Chemical Engineering	11	BSc (Hons)	Water Utilisation	25	1	1	1
Manager (Production)	BSc	Civil Engineering	11	BSc	Water and Waste Water Treatment	41	1	1	1
Manager (Quality Assurance)	Degree (or equivalent education)	Quality Management	6	BTech and National Diploma	Other and Biotechnology	15	1	1	1
Manager (SHEQ)	National Diploma and First Aid Certificate	Safety Management	11	Btech	Environmental Health	5	1	0	1
Manager (Systems)	BSc (Hons)/BSc/Btech and M+2 Certificate	Engineering/Water Science and Business Management	7	BSc (Eng) (Hons)	Water and Waste Water Treatment	7	1	1	1
Operator	Grd 12 or Full NTC3/N3 Water	Maths&Science/Bio	1	National Diploma	Chemical Engineering	3	1	1	1
Project Manager	BSc/Btech	Civil Engineering	7	BSc (Hons)	Civil Engineering	6	1	0	1
				Btech	Civil Engineering	3	1	0	1
Sampling Officer	NQF Grade 12/Full NTC 3/N3 Certificate	Maths&Science/Biology & Water and Wastewater	1	Matric (without Maths)	Other	1	0	1	1
Scientist (Planning Analyst)	BSc Honours	Hydrology/Geography	5	MSc and Post Grad Diploma	Hydrology & Water Resources and Management	16	1	1	1
Scientist/Engineer (R&D)	BSc Hons/B Eng or equlivalent	Water/WTW Research	4	BSc (Eng) (Hons)	Chemical Engineering	4	1	1	1
				BSc (Hons)	Water Utilisation	7	1	1	1
Section Head (Biological Sciences)	BSc Honours	Biology	6	BSc (Hons) and BSc (Eng) (Hons)	Microbiology and Water Utilisation	11	1	1	1
Superintendant	T3 or S4 National Diploma and post grad general man	Chemical Engineering/Water Care	6	NTC (N5/NTCV)	Mechanical, electrical, strenghts of materials and structure	29	1	1	1
Superintendant (Dams)	N5 or T3/S4	Civil/Electrical or Mechanical, Water Care and Water	5	Advanced Certificate	Management	22	1	1	1
Superintendant (WTP)	T3 or S4 National Diploma and post grad general man	Chemical Engineering/Water Care	6	Btech and Diploma	Management and Chemical Engineering	6	1	1	1
Superintendant Assistant	Diploma (or equivalent), DWAF certificate etc and Au	Supervisory, Dam Control/WRM/WM/WD and Basic Safety	0	NTC (N3/NTCIII)	Water and Waste Water Treatment	38	0	1	1
Supervisor (Microbiology Laboratory)	BSc or NHD/BTech	Microbiology	5	-	Biotechnology and Management	5	1	1	1
Surveyor	BSc/Btech	Land Surveying	8	National Diploma	Surveying	15	0	1	1
Technician (Civil Contracts)	S4 Diploma	Civil Engineering	5	Btech	Civil Engineering	1	1	0	1
Technician (Laboratory)	National Diploma	Biology	3	Btech	Biotechnology	3	1	1	1
				National Diploma	Chemistry	2	1	0	1
					Laboratory Analytics	5	1	1	1
		Chemistry	3	BSc	Chemistry	3	1	1	1
Technician (Mechanical)	S4 Diploma	Mechanical Engineering	5	Degree and National Diploma	Mechanical Engineering and Business Management	20	1	1	1
Technician (Process and Quality)	S4 Diploma and N6	Water Care/Analytical Chemistry/Chemical Engineering and '	4	BSc (Hons)	Water Utilisation	11	1	1	1
Technician (Process)	National Diploma	Chemical Engineering	3	National Diploma	Chemical Engineering	5	1	1	1
Technician (Process) Senior	National Diploma	Chemical Engineering	3	Btech	Chemical Engineering	10	1	1	1
				MSc (Eng)	Chemical Engineering	4	1	1	1
Technician (Unaccounted for Water)	Grd 12 or S3, or T4	Civil Engineering	5	National Diploma	Fitting and Turning	20	1	1	1
Technologist (Process)	Btech	Chemistry	5	Mtech	Chemical Engineering	8	1	1	1
Technologist (Process)	Btech	Chemistry	5	BSc	Chemical Engineering	3	0	0	1
Grand Total									**53**
							47	**42**	

Table 49 Number of Umgeni Water technical staff meeting minimum required qualifications per job title

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Actual No.	Qual Y/N No.	Online audit response No.
CEO	CEO	Chief Executive	1	1	
		Manager (Strategy and Special Projects)	1	0	
		Manager Senior (Strategic Support)	1	1	
CEO Total			3	2	
ESS	GM: ESS	GM (Engineering and Scientific Services)	1	0	
	Planning	Manager (Planning Services)	1	1	1
		Scientist (Planning Analyst)	1	1	1
		Engineer (Planning)	5	5	1
		Technologist (Planning)			
		Technician (Planning)	1	1	
		Hydrologist	1	1	1
		Geohydrologist	1	1	1
		Hydrologist Assistant	1	1	
		Project Manager	1	0	
		Surveyor			
		GIS Officer			
		Draughtsperson			
	Planning (Scientifi	Manager (Water and Environment Services)	1	1	
		Scientist (Water and Environment)	8	7	
		Environmental Officer	8	6	1
		HandH Co-ordinator (Household Sanitation)	1	1	
		Programme Co-ordinator	1	1	
		Project Manager: WQ	1	1	
		Scientific Assistant (Sampling)	2	2	
		Sampling Services Co-ordinator	1	0	
		Sampling Officer	11	9	1
		Project Co-ordinator (Working for Water)	1	0	
	Eng Serv./Design.	Manager (Engineering Services)	1	0	1
		Engineer (Civil) Mentoring	1	1	1
		Engineer (Schedule and Costing)	1	1	
		Engineer/Technologist (Structural)	1	1	1
		Engineer (Civil)	7	7	2
		Technician (Civil and Mechanical)	6	4	
		Technician (Unaccounted for Water)	2	2	1
		Inspector of Works	12	7	
		Q and TS Officer	1		
		Project Manager	2	2	1
		Surveyor	1	0	1
		Draughtsperson	2	1	
	Project Office	Manager (Projects Office)	1	1	
		Engineer (Schedule and Costing)			
		Project Manager	8	6	1
	Process	Technician (Process)	11	8	1
		Scientist Senior (R&D)	1	1	
		Scientist/Engineer (R&D)	3	2	2
		Engineer	1	0	
		Scientist (Process)	2	1	
		Engineer (Process)	3	3	
		Technologist (Process)	1	1	1
		Technologist (Process)	1	0	1
		Technician (Process) Senior	2	2	2
		Technician (Process) Senior			
	Scientific	Manager (Laboratory Services)	1	1	
		Manager (Quality Assurance)	1	1	1
		Manager (Process)	1	1	1
		Co-ordinator (LIMS)	1	1	
		Section Head (Biological Sciences)	2	1	1
		Section Head (Chemistry)	2	1	
		Scientist/Engineer (R&D)	1	1	
		Technician (Laboratory)	19	16	4
		Supervisor (Chemical Laboratory)	3	2	
		Supervisor (Microbiology Laboratory)	2	2	1
		Technician (Microbiology Laboratory	1	0	
ESS Total			153	117	31

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Actual No.	Qual Y/N No.	Online audit response No.
OPS	Business Dev.	Technical Officer (Social Bus Dev) (School Sani	1	1	
	Dam	Superintendant (Dams)	3	3	1
		Superintendant Assistant	2	1	1
		Chargehand	1	0	
	Pipelines	Regional Manager			
		Area Manager	5	4	1
		Manager (Production)	2	1	1
		Manager (Systems)	4	2	1
		Manager (SHEQ)	1	1	1
		Engineer (Construction)	1	0	
		Manager (Process and Quality)	1	1	
		Manager (Special Projects)			
		Engineer (Maintenance)	2	2	
		Engineer (Reliability)	1	1	
		Technician			
		Technician (Civil Contracts)	1	1	1
		Technician (Civil)	3	1	
		Technician (Electrical)	2	2	
		Technician (Instrumentation)	4	4	
		Technician (Mechanical)	3	2	1
		Technician (Process and Quality)	3	3	1
		Technician (Process)	3	3	
		Technician (Reliability)	2	2	
		Technician (Telemetry)	1	1	
		Telemetry/Radio Specialist	1	0	
		Supervisor (Reticulation)	1	0	
		Team Leader	1		
		Foreman			
		Foreman (Civil)	1	1	
		Technician (Electrical and Instrumentation)	1	1	
		Technician Civil (In-Training)	1	1	
		Foreman (Electrical and Instrumentation)	3	2	
		Foreman (Electrical)	2	2	1
		Foreman (Mechanical)	3	3	
		Foreman (Vehicles)	2	2	
		Artisan (Boilermaker)	2	2	
		Foreman (Civil or Mechanical)	3	1	
		Foreman (Instrumentation)	1	0	
		Artisan (Electrician)	13	8	2
		Artisan (Fitter)	22	14	2
		Artisan (Instrumentation)	6	4	
		Artisan (Mechanic)	5	4	
		Artisan (Pipelines	13	9	1
		Artisan (Plumber)	3	2	
		Artisan (Telemetry)			
		Artisan (Welder)	1	1	1
		Inspector of Works	1	1	1
		Operator	4	2	
		SHEQ Co-ordinator	4	3	
		Apprentice (Electrical)	3	1	
		Apprentice (Mechanical or Fitting)	3	2	
		Surveyor			
		Draughtsperson	1	0	
	Reservoir	Superintendant	1	1	
		Superintendant Assistant			
		Labour Supervisor			
	WTW	Superintendant (WTP)	2	2	1
		Superintendant (WWTP)	1	1	
		Technician (Process and Quality)	2	1	
		Technician (Process)	2	1	
		Superintendant	4	4	1
		Technician Senior	2	2	
		Foreman	1	1	1
		Artisan (Plumber)	1	1	
		Maintenance Repairman	2	1	
		Operator Senior	19	9	
		Operator	58	43	1
		Sampling Officer			
		SHEQ Co-ordinator	4	2	
	WWTW	Superintendant (WWTP)	1	1	
		Operator	1	1	
		Operator (Multiskilled)	1	1	
		Umgeni Municipality (Howick)	6	3	
	OPS	GM (Operations)	1	1	
		Manager (Ops Support)	1	1	1
OPS Total			**257**	**179**	**22**
Grand Total			**413**	**298**	**53**

5.4.3 The Capacity Gap

The capacity gap is calculated by subtracting the supply of capacity (**Table 49** on **page 112**) after considering minimum qualification requirements, i.e. 298 staff from the demand for capacity, i.e. 205 staff (**Table 44** on **page 102**). These calculations and the capacity gap for Umgeni Water are shown in **Table 50**. The final **Capacity Gap** is **minus 93** or **minus 45%.**

In **Table 50** the "Qual Y/N" column was subtracted from the "Required No." column to provide the gap. It should again be noted that those who met the minimum qualification and years of experience was extrapolated randomly. For example, in **Table 50** under ESS/Scientific/Technician (Laboratory) it shows that only 16 out of the 19 technicians met the criteria. This however, might not actually be the case and that in the extrapolation this job title was randomly chosen three times not to meet the criteria.

The negative numbers in the gap column means that the number of staff required for a job title using the method described in this document returned less staff required than Umgeni Water actually has. This led the researchers to question the appropriateness or accuracy of the method when applied to a water board. A water board is a more sophisticated business than a small CMA or small water services authority and thus has many "niche" job titles and posts that would not be found in a small municipality.

It is recommended that the method to determine capacity by job title be improved or adjusted to more accurately reflect the staff requirements of water boards before being applied to other water boards.

Table 50 Capacity gap at Umgeni Water after considering minimum qualification requirements

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Required No.	Actual No.	Qual Y/N No.	Gap No.
CEO	CEO	Chief Executive	1	1	1	0
		Manager (Strategy and Special Projects)		1	0	0
		Manager Senior (Strategic Support)		1	1	-1
CEO Total			1	3	2	-1
ESS	GM: ESS	GM (Engineering and Scientific Services)		1	0	0
	Planning	Manager (Planning Services)	1	1	1	0
		Scientist (Planning Analyst)		1	1	-1
		Engineer (Planning)	2	5	5	-3
		Technologist (Planning)	2			
		Technician (Planning)		1	1	-1
		Hydrologist		1	1	-1
		Geohydrologist		1	1	-1
		Hydrologist Assistant		1	1	-1
		Project Manager		1	0	0
		Surveyor	1			
		GIS Officer	1			
		Draughtsperson	1			
	Planning (Scientifi	Manager (Water and Environment Services)		1	1	-1
		Scientist (Water and Environment)		8	7	-7
		Environmental Officer		8	6	-6
		HandH Co-ordinator (Household Sanitation)		1	1	-1
		Programme Co-ordinator		1	1	-1
		Project Manager: WQ		1	1	-1
		Scientific Assistant (Sampling)		2	2	-2
		Sampling Services Co-ordinator		1	0	0
		Sampling Officer		11	9	-9
		Project Co-ordinator (Working for Water)		1	0	0
	Eng Serv./Design.	Manager (Engineering Services)		1	0	0
		Engineer (Civil) Mentoring		1	1	-1
		Engineer (Schedule and Costing)		1	1	-1
		Engineer/Technologist (Structural)		1	1	-1
		Engineer (Civil)	27	7	7	20
		Technician (Civil and Mechanical)		6	4	-4
		Technician (Unaccounted for Water)		2	2	-2
		Inspector of Works		12	7	-7
		Q and TS Officer		1		0
		Project Manager		2	2	-2
		Surveyor		1	0	0
		Draughtsperson		2	1	-1
	Project Office	Manager (Projects Office)		1	1	-1
		Engineer (Schedule and Costing)				
		Project Manager	27	8	6	21
	Process	Technician (Process)		11	8	-8
		Scientist Senior (R&D)		1	1	-1
		Scientist/Engineer (R&D)		3	2	-2
		Engineer		1	0	0
		Scientist (Process)		2	1	-1
		Engineer (Process)		3	3	-3
		Technologist (Process)		1	1	-1
		Technologist (Process)		1	0	0
		Technician (Process) Senior		2	2	-2
		Technician (Process) Senior				
	Scientific	Manager (Laboratory Services)		1	1	-1
		Manager (Quality Assurance)		1	1	-1
		Manager (Process)		1	1	-1
		Co-ordinator (LIMS)		1	1	-1
		Section Head (Biological Sciences)		2	1	-1
		Section Head (Chemistry)		2	1	-1
		Scientist/Engineer (R&D)		1	1	-1
		Technician (Laboratory)		19	16	-16
		Supervisor (Chemical Laboratory)		3	2	-2
		Supervisor (Microbiology Laboratory)		2	2	-2
		Technician (Microbiology Laboratory		1	0	0
ESS Total			62	153	117	-60

Div	Infra Type (AV)	Meaningful Job Title (Adie)	Required No.	Actual No.	Qual Y/N No.	Gap No.
OPS	Business Dev.	Technical Officer (Social Bus Dev) (School Sanitation)		1	1	-1
	Dam	Superintendant (Dams)		3	3	-3
		Superintendant Assistant		2	1	-1
		Chargehand		1	0	0
	Pipelines	Regional Manager				
		Area Manager		5	4	-4
		Manager (Production)		2	1	-1
		Manager (Systems)		4	2	-2
		Manager (SHEQ)		1	1	-1
		Engineer (Construction)		1	0	0
		Manager (Process and Quality)		1	1	-1
		Manager (Special Projects)				
		Engineer (Maintenance)		2	2	-2
		Engineer (Reliability)		1	1	-1
		Technician				
		Technician (Civil Contracts)		1	1	-1
		Technician (Civil)		3	1	-1
		Technician (Electrical)		2	2	-2
		Technician (Instrumentation)		4	4	-4
		Technician (Mechanical)		3	2	-2
		Technician (Process and Quality)		3	3	-3
		Technician (Process)		3	3	-3
		Technician (Reliability)		2	2	-2
		Technician (Telemetry)		1	1	-1
		Telemetry/Radio Specialist		1	0	0
		Supervisor (Reticulation)		1	0	0
		Team Leader		1		0
		Foreman	5			
		Foreman (Civil)		1	1	-1
		Technician (Electrical and Instrumentation)		1	1	-1
		Technician Civil (In-Training)		1	1	-1
		Foreman (Electrical and Instrumentation)		3	2	-2
		Foreman (Electrical)		2	2	-2
		Foreman (Mechanical)		3	3	-3
		Foreman (Vehicles)		2	2	-2
		Artisan (Boilermaker)		2	2	-2
		Foreman (Civil or Mechanical)		3	1	-1
		Foreman (Instrumentation)		1	0	0
		Artisan (Electrician)	17	13	8	9
		Artisan (Fitter)	17	22	14	3
		Artisan (Instrumentation)	17	6	4	13
		Artisan (Mechanic)		5	4	-4
		Artisan (Pipelines		13	9	-9
		Artisan (Plumber)	35	3	2	-2
		Artisan (Telemetry)				
		Artisan (Welder)		1	1	-1
		Inspector of Works		1	1	-1
		Operator		4	2	-2
		SHEQ Co-ordinator		4	3	-3
		Apprentice (Electrical)		3	1	-1
		Apprentice (Mechanical or Fitting)		3	2	-2
		Surveyor				
		Draughtsperson		1	0	0
	Reservoir	Superintendant		1	1	-1
		Superintendant Assistant				
		Labour Supervisor				
	WTW	Superintendant (WTP)		2	2	-2
		Superintendant (WWTP)		1	1	-1
		Technician (Process and Quality)		2	1	-1
		Technician (Process)		2	1	-1
		Superintendant	17	4	4	13
		Technician Senior		2	2	-2
		Foreman		1	1	-1
		Artisan (Plumber)		1	1	-1
		Maintenance Repairman		2	1	-1
		Operator Senior		19	9	-9
		Operator	24	58	43	-19
		Sampling Officer				
		SHEQ Co-ordinator		4	2	-2
	WWTW	Superintendant (WWTP)		1	1	-1
		Operator	10	1	1	9
		Operator (Multiskilled)		1	1	-1
		Umgeni Municipality (Howick)		6	3	-3
	OPS	GM (Operations)		1	1	-1
		Manager (Ops Support)		1	1	-1
OPS Total			142	257	179	-77
Grand Total			**205**	**413**	**298**	**-138**

5.4.4 Determination of the Demand for Skills

The demand for skills is presented in a skills matrix. As Umgeni Water has over 60 technical job titles, their skills matrix is too large to include in this document. The reader is referred to the relevant report for the Umgeni Water skills matrix. However, an example of a skills matrix for BOCMA can be found in **section 5.3.4**.

5.4.5 Determination of the Supply of Skills and Skills Gap

The **supply of skills** was determined for Umgeni Water as per the method outlined in **section 2.5**. The results of the supply of skills and skills gap at Umgeni Water is shown in **Tables 51 to 55** and **Figures 23 to 26** that follow.

The results show the supply of skills at Umgeni Water to be 40% and the skills gap to be 60%. The research team does not have confidence in this result. Two reasons which could lead to this probable false result are:

- *the line managers set the bar high when choosing or compiling the set of required skills per Job Title*
- *the individuals who answered the online audit found it took too long to rate themselves on all the required skills (as this would require working through the entire skills bank) and thus stopped rating themselves once they thought they had covered most of their skills.*

Tables 51 to 55 and **Figures 23 to 26** were produced from the data provided by the individual staff members as recorded in the online skills audit survey system. Database analysis formulae were written by the research team which drew information from various parts of the database to compile each results table. While the tables that follow contain results describing the supply of skills and gaps the outputs are best viewed in graphs where the extent of skills, competencies and gaps is immediately apparent and makes a lasting impression.

Results are consistently shown in the order of Functions and Competencies in the Water Sector Competency Framework.

The following results are presented for Umgeni Water:

*Example analysis of an individual at **Skill** level showing further training required*

Table 51 shows the Personal Development Plan, referred to as "Training Intervention Required", for an anonymous individual technical staff member using the agreed scores for the individual as compared to the required scores for the job from the skills matrix. The left hand column indicates where the individual is fully competent, where formal training or further workplace exposure to the skill is required, or where skills are completely lacking. The columns to the right of this indicate which function, competency cluster, competency and skill are under consideration.

*Example analysis of an individual at **Competency** level*

Table 52 and **Figure 23** and, **Table 53** and **Figure 24,** show the results of the analysis for the same individual at a competency level, rather than individual skill level. The results are presented by score and then by percentage. The results using scores paint a more realistic picture of the relative total score per competency. The results using percentage set competencies at 100%, which belies a situation where that competency only has one required skill (5 points) but another had many more required skills (possibly 50 points).

*Analysis across the institution sample by Function then **Competency Cluster***

Table 54 and **Figure 25** and, **Table 55** and **Figure 26,** combine the results for all technical staff at Competency Cluster level to show the Competency across the WSI as a whole. The results are presented by score and then by percentage. The results using scores paint a more realistic picture of the relative total score per competency. The results using percentage set competencies at 100%, which belies a situation where that competency only has one required skill (5 points) but another had many more required skills (possibly 200 points). The average of the total Competency scores for all staff measured against the required Competency scores as per the job titles provides the Skills Gap for the institution.

Table 51 Analysis of an anonymous Umgeni Water technical staff member by Training Intervention Required

Training Intervention Required	Function	Competency_Cluster	Competency	Skill
Competent - No action required (5)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Backwash filters.
				Calculate annual operating, maintenance and repair budgets.
				Commission new and modified equipment.
				Interpret water quality results to identify adjustments to chemical additives and plant operations.
				Maintain plant performance and maintenance process records.
				Maintain site e.g. paint buildings, cut grass, repair fences, repair walkways and roads.
				Manage a WTW to achieve Blue Drop Certification.
				Manage the overall WTW function (to comply with legislation).
				Monitor and adjust pump and clarifier performance to match inflows.
				Monitor and identify problems with the telemetry system.
				Operate a sludge treatment plant.
				Order and control use of chemicals and maintain stores inventory.
				Organise and manage corrective maintenance activities (breakdowns) as required.
				Paint machinery and pipe work in regulation colours.
				Remove silt, clarifier, sedimentation and filter sludge.
				Set dosages and chemical feed rates in line with inflow rates and water quality.
				Set plant flow rates in line with inflows.
				Treat clarifier and filter sludge.
			Scientific Services	Analyse raw water quality to determine treatment requirements.
				Develop statistical process control charts.
				Recommend adjustments to treatment processes.
				Test raw water influent to WTW.
				Test treated water to ensure compliance with potable water quality standards.
Further workplace exposure required (4)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Check operation of all valves and valve stem packing.
				Implement preventative maintenance servicing of pumps and motors according to specifications.
			Scientific Services	Interpret statistical process control charts.
Formal training and worklace exposure required (0)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Clean grit channels.
				Knowledge of relevant legislation and regulations.
				Remove accumulated sludge.
			Scientific Services	Knowledge of ISO 9000 Quality Management System.

Table 52 Analysis of an anonymous Umgeni Water technical staff member by Competency presented by score

Function	Competency Cluster	Competency	Supply of Skills (Using Final Score) (Score)	Skills Gap (Using Final Score) (Score)
Functional Management	**Business Management**	Strategic Thinking	47	8
Water Resources Planning	**WR Strategies, Studies and Plans**	Catchment Management Strategy Development	19	6
		WR Feasibility Study Management	25	0
		WR Policy Development	4	1
		WR Reconciliation Study Management	8	12
		WR Strategy Development	6	9
Water Resources Infrastructure	**WR Construction**	Contract Administration	14	1
		Tender Management, Bid Adjudication and Placing of Contracts	25	5
	WR Design	Design of Pipelines	92	3
		Design of Pump Stations	37	3
Water Resources Regulation	**Water Conservation and Water Demand Management (WC&WDM)**	Domestic, Municipal and Water Services WC&WDM	0	30
	WR Authorisation	WR Charges Determination	3	7
Water Services Planning	**WS Hydraulics**	Water Demand Calculations	15	5
	WS Strategies, Studies and Plans	WS Appropriate Technology Assessment	0	20
		WS Policy Development	5	0
Water Services Infrastructure	**WS Construction**	Construction Management (WTWs, Reservoirs, Pumps Stations, Pipelines)	74	86
		Contract Administration	90	40
		Health, Safety, Environmental and Quality Management (SHEQ)	7	3
		Tender Management, Bid Adjudication and Placing of Contracts	26	14
	WS Design	Design of Bulk Infrastructure	18	2
		Design of Reservoirs	57	8
		Design of Water Distribution Networks and Pump Stations	101	14
Water Services Regulation	**WS Policy and Guidelines**	WS Guideline Development	0	10
Grand Total			**673**	**287**

The required score would be 5 points for each skill required. For example, if there are 11 required skills in the Competency of “Strategic Thinking”, the required score would be 55. In the table above the individual rated him/herself to a total of 47 points for “Strategic Thinking”. The skills gap is thus 8 points or 15% (8*100/55).

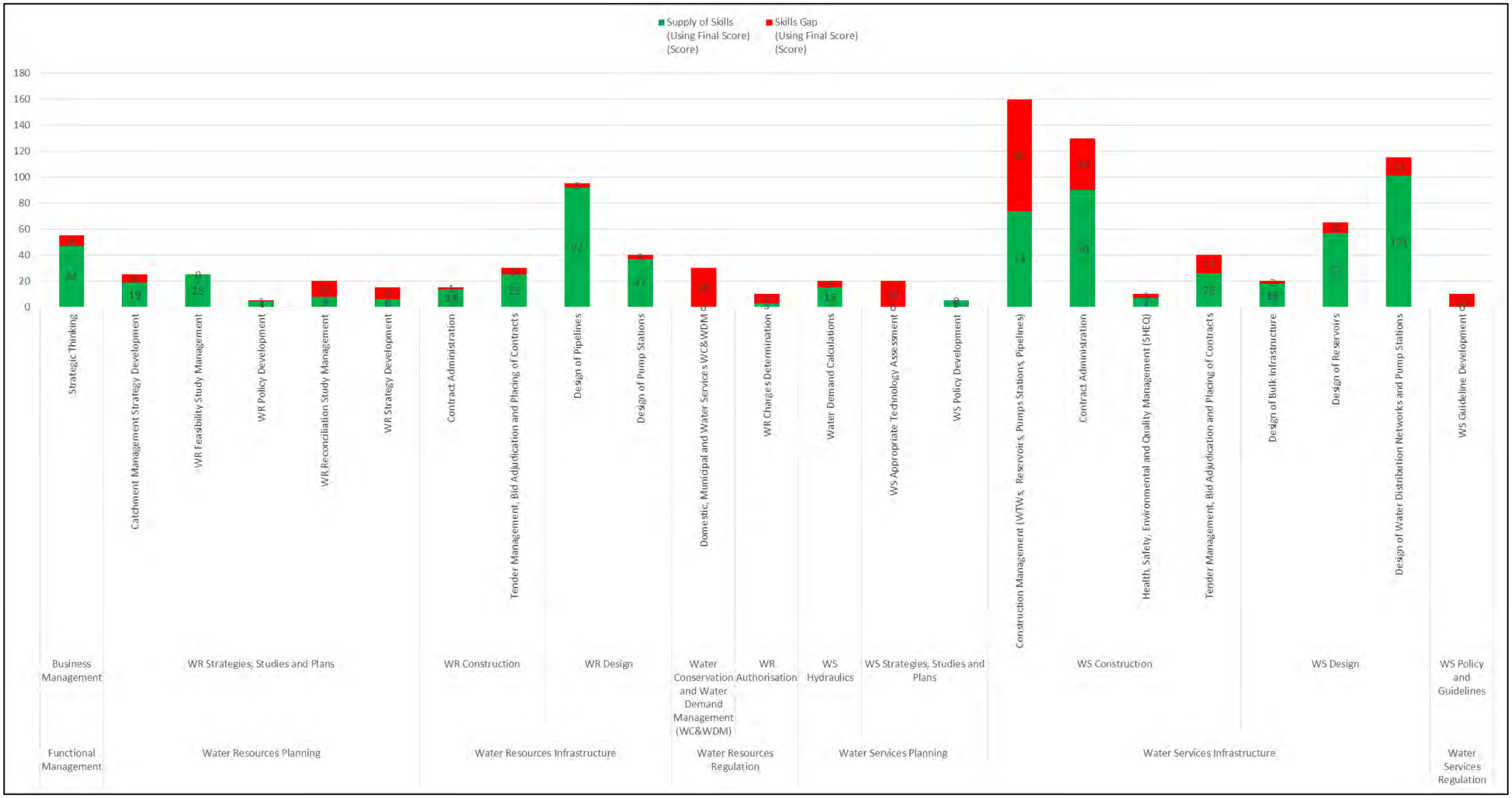


Figure 23 Graph showing analysis of an anonymous Umgeni Water technical staff member by Competency presented by score

Table 53 Analysis of an anonymous Umgeni Water technical staff member by Competency presented by percentage

Function	Competency Cluster	Competency	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Functional Management	**Business Management**	Strategic Thinking	85%	15%
Water Resources Planning	**WR Strategies, Studies and Plans**	Catchment Management Strategy Development	76%	24%
		WR Feasibility Study Management	100%	0%
		WR Policy Development	80%	20%
		WR Reconciliation Study Management	40%	60%
		WR Strategy Development	40%	60%
Water Resources Infrastructure	**WR Construction**	Contract Administration	93%	7%
		Tender Management, Bid Adjudication and Placing of Contracts	83%	17%
	WR Design	Design of Pipelines	97%	3%
		Design of Pump Stations	93%	8%
Water Resources Regulation	**Water Conservation and Water Demand Management (WC&WDM)**	Domestic, Municipal and Water Services WC&WDM	0%	100%
	WR Authorisation	WR Charges Determination	30%	70%
Water Services Planning	**WS Hydraulics**	Water Demand Calculations	75%	25%
	WS Strategies, Studies and Plans	WS Appropriate Technology Assessment	0%	100%
		WS Policy Development	100%	0%
Water Services Infrastructure	**WS Construction**	Construction Management (WTWs, Reservoirs, Pumps Stations, Pipelines)	46%	54%
		Contract Administration	69%	31%
		Health, Safety, Environmental and Quality Management (SHEQ)	70%	30%
		Tender Management, Bid Adjudication and Placing of Contracts	65%	35%
	WS Design	Design of Bulk Infrastructure	90%	10%
		Design of Reservoirs	88%	12%
		Design of Water Distribution Networks and Pump Stations	88%	12%
Water Services Regulation	**WS Policy and Guidelines**	WS Guideline Development	0%	100%
Grand Total			**70%**	**30%**

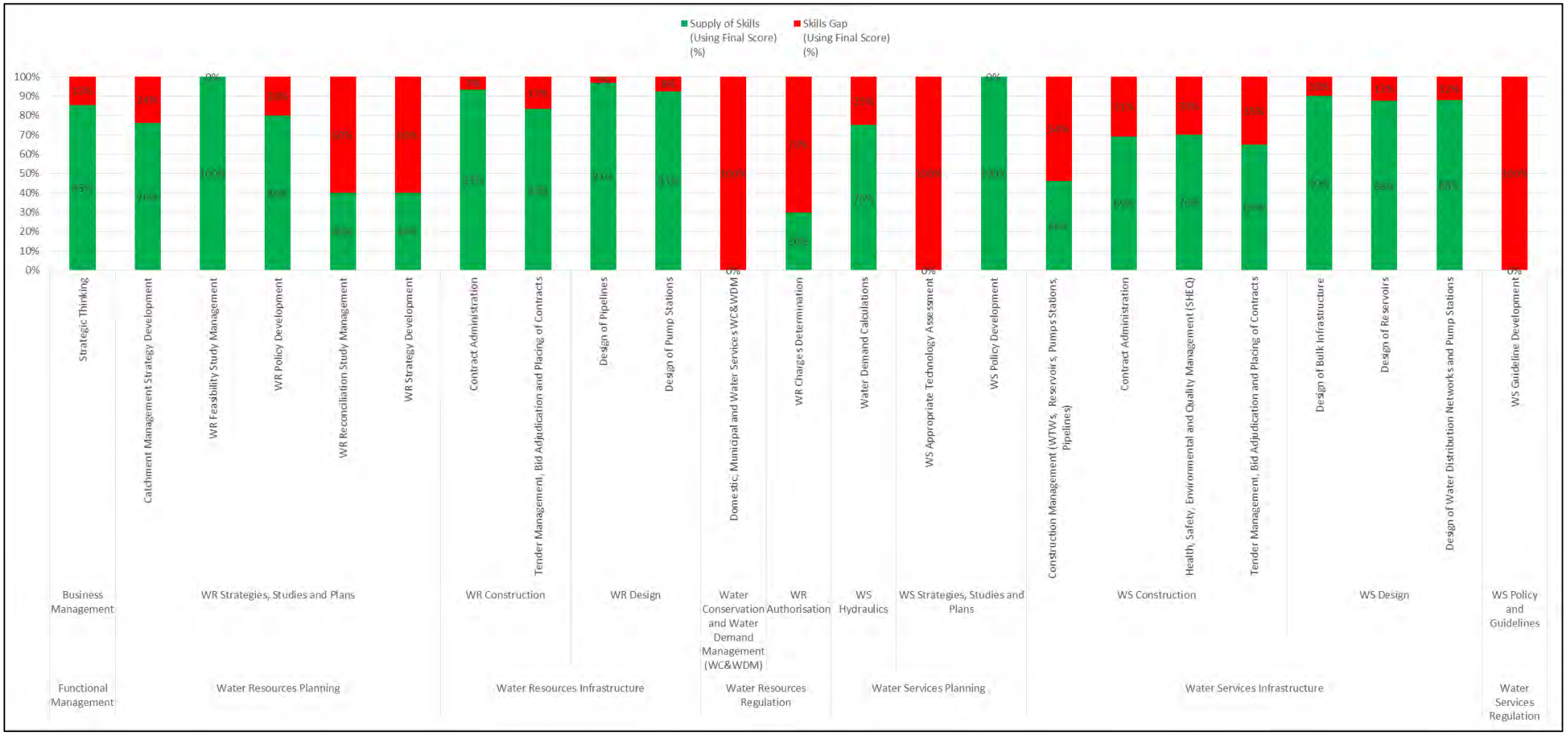


Figure 24 Graph showing analysis of an anonymous Umgeni Water technical staff member by Competency presented by percentage

Table 54 Analysis across the Umgeni Water sample by Function then Competency Cluster presented by score

Function/Competency Cluster	Supply of Skills (Using Final Score) (Score)	Skills Gap (Using Final Score) (Score)
Functional Management	**422**	**278**
Business Management	422	278
Water Resources Planning	**674**	**441**
Hydrology	116	79
Water Resources including Scientific Information Management	225	150
WR Strategies, Studies and Plans	333	212
Water Resources Infrastructure	**288**	**237**
WR Construction	115	70
WR Design	173	167
Water Resources Regulation	**147**	**233**
Water Conservation and Water Demand Management (WC&WDM)	19	96
WR Authorisation	58	117
WR Compliance Monitoring and Enforcement	70	20
Water Resources O&M/ Use Management	**868**	**1177**
Irrigation, Industrial, Mining and Power Generation Water O&M	475	530
WR Incident Management	81	104
WR Inter-basin Transfers	312	543
Water Resources Environmental / Scientific Services	**1134**	**771**
Aquatic Ecology	23	97
Environmental Science	54	16
Laboratory Work	819	526
Water Quality Management	238	132
Water Services Planning	**601**	**739**
WS Hydraulics	164	136
WS Information Management	221	154
WS Strategies, Studies and Plans	216	449
Water Services Infrastructure	**2173**	**4527**
WS Construction	1181	3179
WS Design	992	1348
Water Services Regulation	**133**	**667**
WS Compliance Monitoring and Enforcement	89	496
WS Policy and Guidelines	3	52
WS Regulation or Bylaws	41	119
Water Services O&M	**2484**	**3756**
WS Bulk O&M	1614	1891
WS Incident Management	182	538
WS Networks O&M	688	1327
Sanitation/ Wastewater Planning	**110**	**375**
S/WW Strategies, Studies and Plans	29	286
WW Hydraulics	81	89
Sanitation/ Wastewater Infrastructure	**299**	**846**
S/WW Construction	0	165
S/WW Design	299	681
Sanitation/ Wastewater Regulation	**203**	**432**
S/WW Compliance Monitoring and Enforcement	144	361
S/WW Policy and Guidelines	26	4
S/WW Regulation or Bylaws	33	67
Sanitation/ Wastewater O&M	**701**	**1074**
Dry Sanitation O&M	24	6
S/WW Incident Management	98	222
Wastewater Bulk O&M	301	694
Wastewater Networks O&M	278	152
Grand Total	**10237**	**15553**

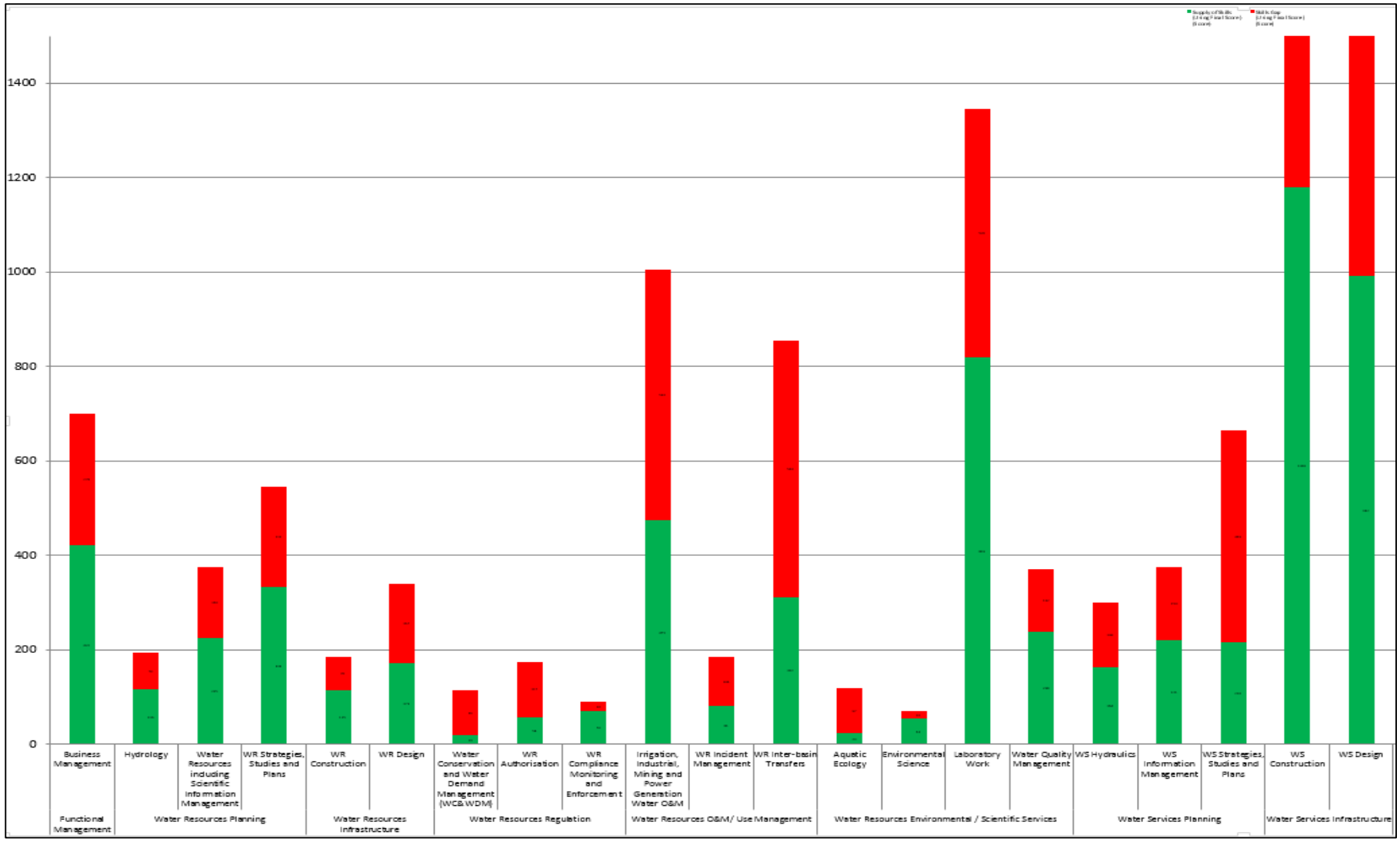


Figure 25 Graph showing analysis across the Umgeni Water sample by Function then Competency Cluster presented by score

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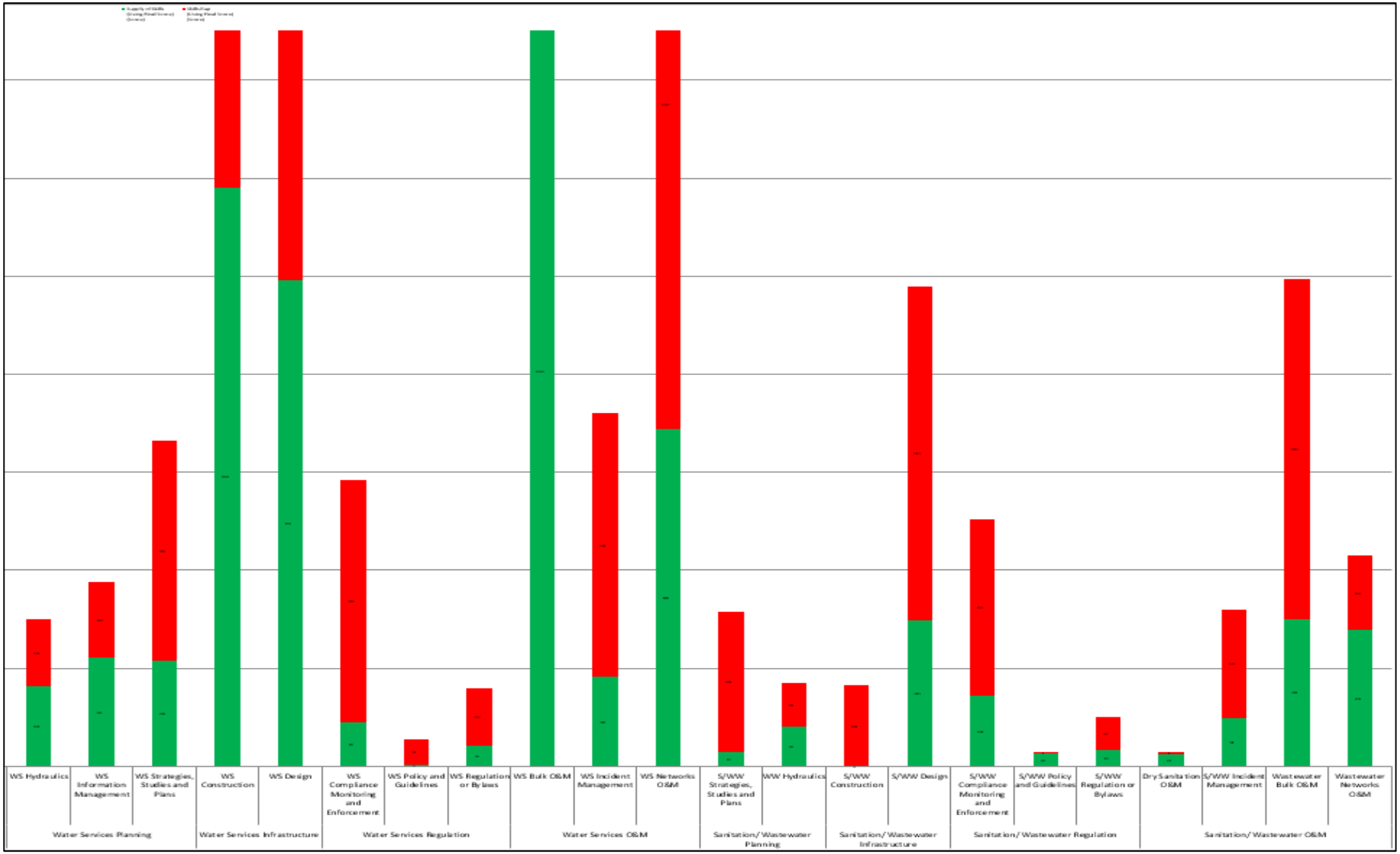

Table 55 Analysis across the Umgeni Water sample by Function then Competency Cluster presented by percentage

FUNCTION/COMPETENCY CLUSTER	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Functional Management	**60%**	**40%**
Business Management	60%	40%
Water Resources Planning	**60%**	**40%**
Hydrology	59%	41%
Water Resources including Scientific Information Management	60%	40%
WR Strategies, Studies and Plans	61%	39%
Water Resources Infrastructure	**55%**	**45%**
WR Construction	62%	38%
WR Design	51%	49%
Water Resources Regulation	**39%**	**61%**
Water Conservation and Water Demand Management (WC&WDM)	17%	83%
WR Authorisation	33%	67%
WR Compliance Monitoring and Enforcement	78%	22%
Water Resources O&M/ Use Management	**42%**	**58%**
Irrigation, Industrial, Mining and Power Generation Water O&M	47%	53%
WR Incident Management	44%	56%
WR Inter-basin Transfers	36%	64%
Water Resources Environmental / Scientific Services	**60%**	**40%**
Aquatic Ecology	19%	81%
Environmental Science	77%	23%
Laboratory Work	61%	39%
Water Quality Management	64%	36%
Water Services Planning	**45%**	**55%**
WS Hydraulics	55%	45%
WS Information Management	59%	41%
WS Strategies, Studies and Plans	32%	68%
Water Services Infrastructure	**32%**	**68%**
WS Construction	27%	73%
WS Design	42%	58%
Water Services Regulation	**17%**	**83%**
WS Compliance Monitoring and Enforcement	15%	85%
WS Policy and Guidelines	5%	95%
WS Regulation or Bylaws	26%	74%
Water Services O&M	**40%**	**60%**
WS Bulk O&M	46%	54%
WS Incident Management	25%	75%
WS Networks O&M	34%	66%
Sanitation/ Wastewater Planning	**23%**	**77%**
S/WW Strategies, Studies and Plans	9%	91%
WW Hydraulics	48%	52%
Sanitation/ Wastewater Infrastructure	**26%**	**74%**
S/WW Construction	0%	100%
S/WW Design	31%	69%
Sanitation/ Wastewater Regulation	**32%**	**68%**
S/WW Compliance Monitoring and Enforcement	29%	71%
S/WW Policy and Guidelines	87%	13%
S/WW Regulation or Bylaws	33%	67%
Sanitation/ Wastewater O&M	**39%**	**61%**
Dry Sanitation O&M	80%	20%
S/WW Incident Management	31%	69%
Wastewater Bulk O&M	30%	70%
Wastewater Networks O&M	65%	35%
Grand Total	**40%**	**60%**

Figure 26 Graph showing analysis across the Umgeni Water sample by Function then Competency Cluster presented by percentage

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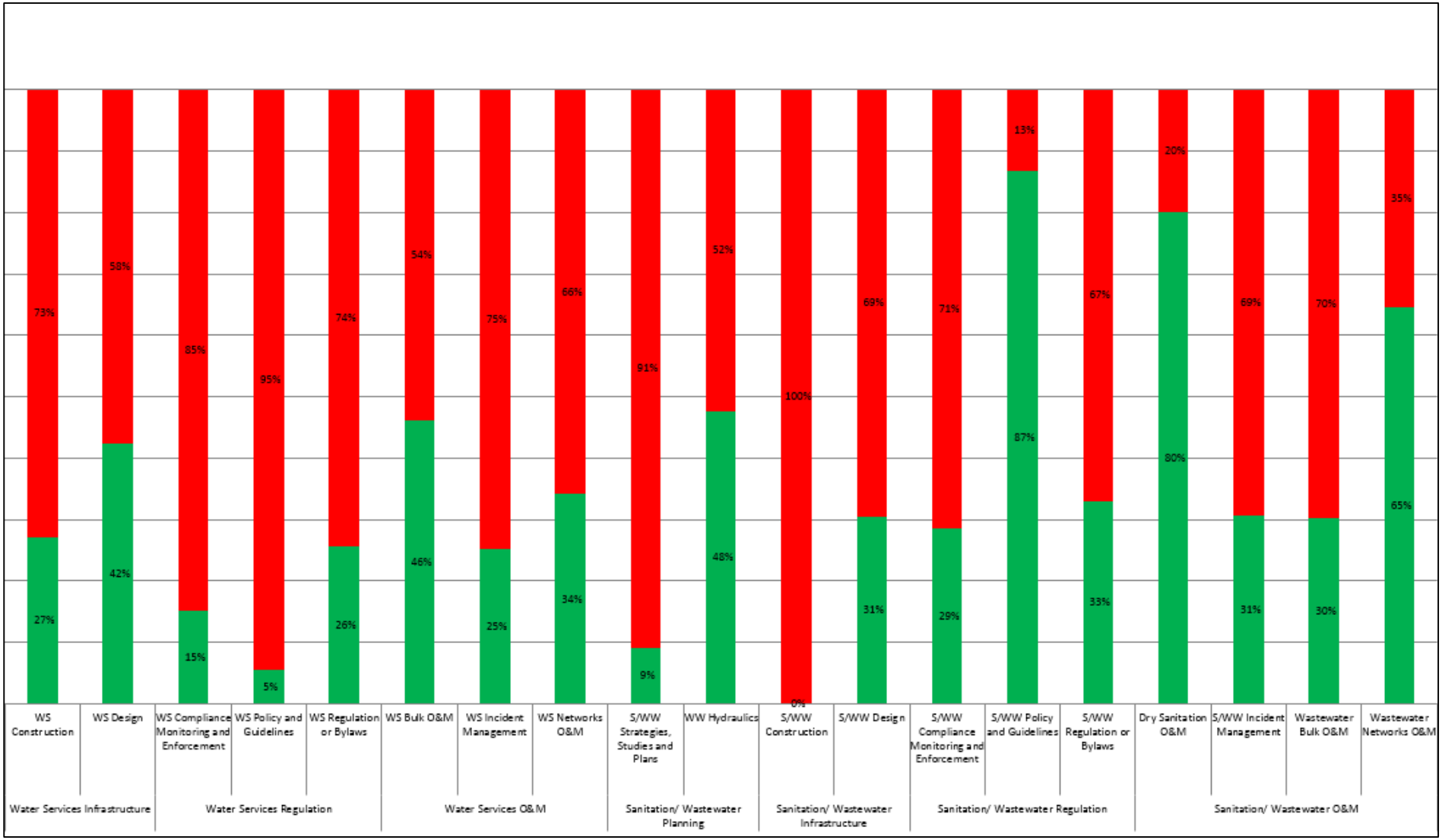


5.5 Level 1 Assessment – Moses Kotane LM

Relevant report:

Deliverable 5c – Report on the Level 1 Assessment: Moses Kotane LM

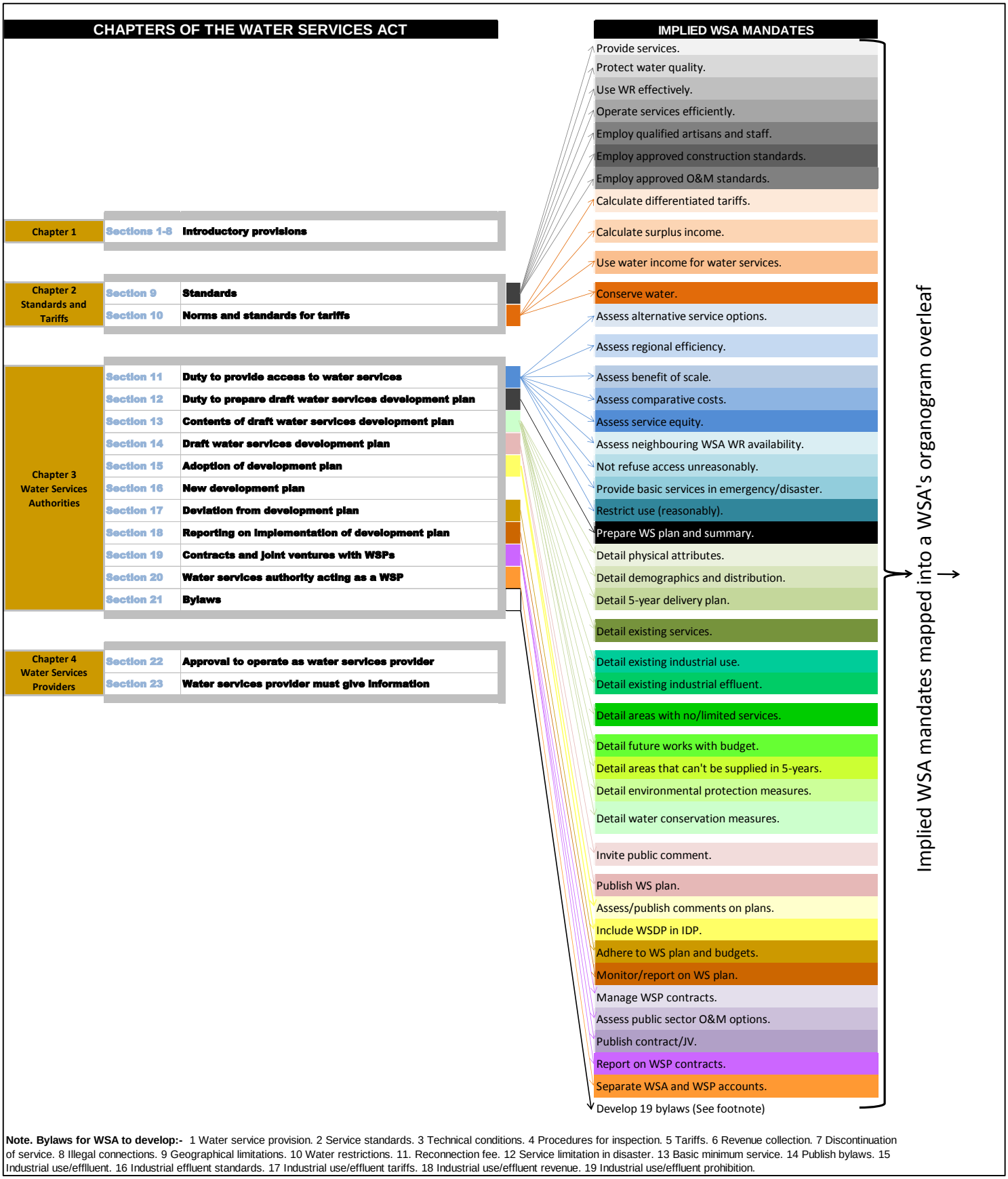
5.5.1 Determination of the Demand for Capacity

The Water Services Act and its Mandates

The Water Services Act (Act 108 of 1997) was reviewed and 62 mandates or responsibilities for Water Services Authorities (WSAs) in Chapters 2 and 3 of the Act identified. (See **Figure 27** overleaf). These WSA mandates or responsibilities were allocated to departments in the Moses Kotane LM organogram (see **Figure 28**).

The colours in **Figure 27** are used for aligning WSA mandates to the relevant chapter in the Water Services Act and to facilitate cross checking from **Figure 27** to **Figure 28**.

The reason why only 44 mandates are listed in **Figure 27** is that 19 of the original 62 mandates all related to bylaws and were thus grouped into one mandate by the researchers.



Note. Bylaws for WSA to develop:- 1 Water service provision. 2 Service standards. 3 Technical conditions. 4 Procedures for inspection. 5 Tariffs. 6 Revenue collection. 7 Discontinuation of service. 8 Illegal connections. 9 Geographical limitations. 10 Water restrictions. 11. Reconnection fee. 12 Service limitation in disaster. 13 Basic minimum service. 14 Publish bylaws. 15 Industrial use/effluent. 16 Industrial effluent standards. 17 Industrial use/effluent tariffs. 18 Industrial use/effluent revenue. 19 Industrial use/effluent prohibition.

Figure 27 Implied mandates for WSAs as taken from the Water Services Act

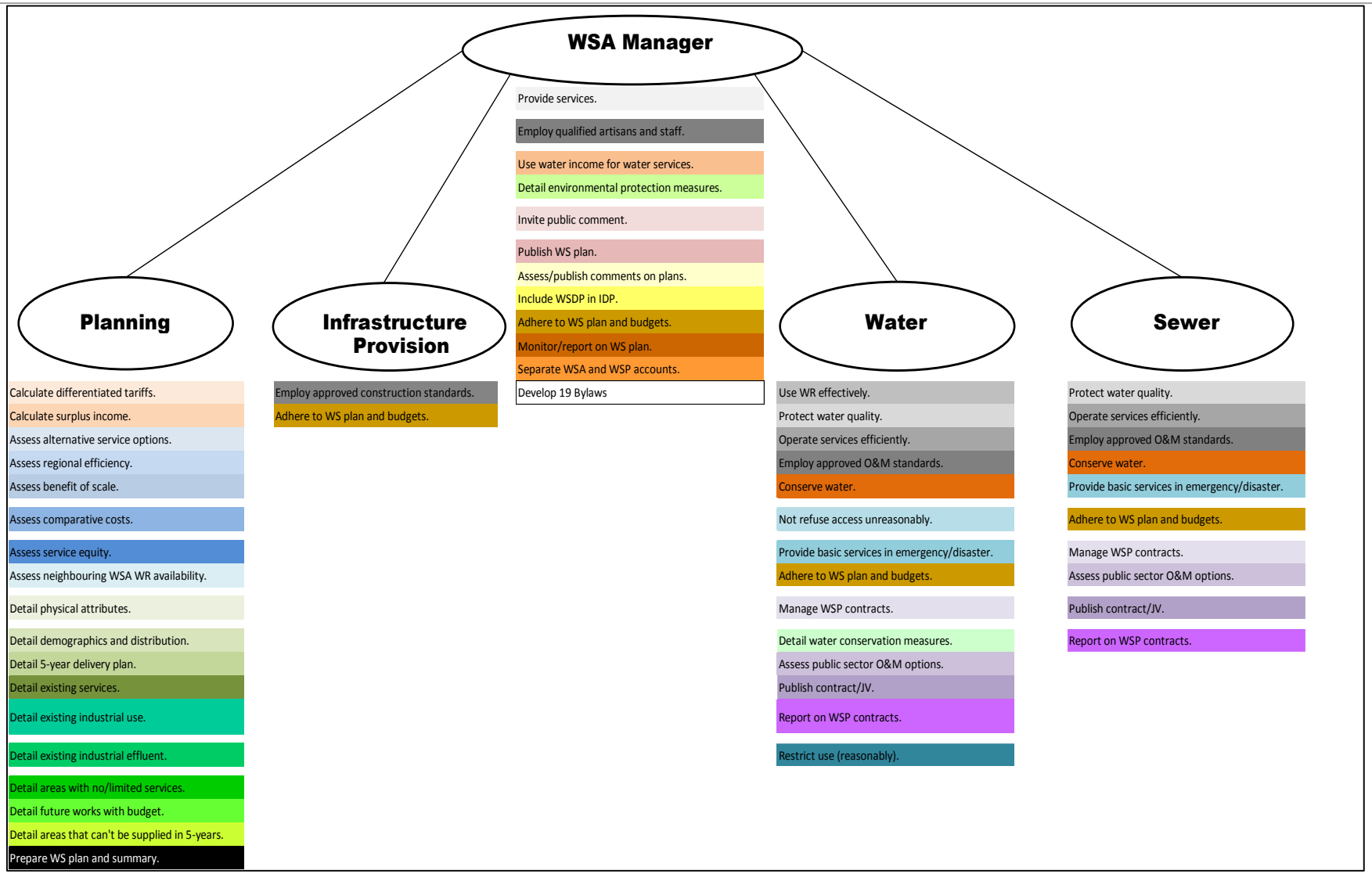


Figure 28 WSA mandates allocated to departments in Moses Kotane LM's organogram

Once the mandates from the Act were mapped into the Moses Kotane LM's departments, time- or staff-resources to deliver on the mandate were calculated.

With regards to calculation of resources required using the unit of time (i.e. days), an assumption was made as to how often tasks related to a mandate would occur in a year along with the time in days to perform that task once. The time to deliver on the mandate would be the product of the number of tasks multiplied by the time to perform the task. This can be expressed in the following formula:

Total Time to meet mandate (days)	**=**	**Number of tasks**	**X**	**Time to perform task**

The staff required for a particular Job Title would be the total time in days divided by the number of work days in a year which is 220 days.

The staff resources required for WTWs and WWTWs were guided by *Regulations Relating to Compulsory National Standards for Process Controllers and Water Services Works (DWS 2013).* These regulations specify the minimum numbers and grades of staff that should be available to operate and maintain Water Treatment Works and Wastewater Treatment Works.

The method to calculate staff-resources required for pipeline operations and maintenance was also not the time-based method. After extensive interviews with operational managers at the City of Tshwane, a method which calculates the number of plumbing teams required based on length of pipeline was chosen.

Allocation of mandates to job titles

Once mandates were allocated to departments, they were further allocated to job titles. **Table 56** below shows the number of mandates that were allocated to each job title. Note that some mandates are not included as they are continuous or methodological ways of working – for example "Comply with National Standards",

which is not a discrete action but rather an issue to be considered at all times by relevant staff. The others not allocated are:- Provide Services; Employ approved construction standards; Use water resources efficiently; Not refuse service unreasonably; Restrict use reasonably; Conserve water; Provide sustainable services and Comply with National standards. On the other hand some mandates are repeated as they apply to both water and sewer.

Table 56 WSA mandates allocated to job titles

Org. Order	Mandate (in short)	Department_Small_Muni	ALLOCATION TO JOB TITLE (Current)_Small_Muni
47	Adhere to WS plan and budgets.	Infrastructure Provision	PMU Manger
9	Employ approved construction standards.	Infrastructure Provision	Project Manager
13	Calculate differentiated tariffs.	Planning	Planning Engineer
14	Calculate surplus income.	Planning	Planning Engineer
19	Assess alternative service options.	Planning	Planning Engineer
20	Assess regional efficiency.	Planning	Planning Engineer
21	Assess benefit of scale.	Planning	Planning Engineer
22	Assess comparative costs.	Planning	Planning Engineer
23	Assess service equity.	Planning	Planning Engineer
24	Assess neighbouring WSA WR availability.	Planning	Planning Engineer
29	Prepare WS plan and summary.	Planning	Planning Engineer
30	Detail physical attributes.	Planning	Planning Engineer
31	Detail demographics and distribution.	Planning	Planning Engineer
32	Detail 5-Year delivery plan.	Planning	Planning Engineer
33	Detail existing services.	Planning	Planning Engineer
34	Detail existing industrial use.	Planning	Planning Engineer
35	Detail existing industrial effluent.	Planning	Planning Engineer
36	Detail areas with no/limited services.	Planning	Planning Engineer
37	Detail future works with budget.	Planning	Planning Engineer
38	Detail areas that can't be supplied in 5-years.	Planning	Planning Engineer
49	Adhere to WS plan and budgets.	Sewer	HOU: Water and Santitation
4	Protect water quality.	Sewer	Technician: Networks (Sewer)
7	Operate services efficiently.	Sewer	Technician: Networks (Sewer)
11	Employ approved O&M standards.	Sewer	Technician: Networks (Sewer)
17	Conserve water.	Sewer	Technician: Networks (Sewer)
27	Provide basic services in emergency/disaster.	Sewer	Technician: Networks (Sewer)
53	Manage WSP contracts.	Sewer	Technician: Networks (Sewer)
55	Assess public sector O&M options.	Sewer	Technician: Networks (Sewer)
57	Publish contract/JV.	Sewer	Technician: Networks (Sewer)
59	Report on WSP contracts.	Sewer	Technician: Networks (Sewer)
48	Adhere to WS plan and budgets.	Water	HOU: Water and Santitation
3	Protect water quality.	Water	Technician: Distribution Networks
5	Use WR effectively.	Water	Technician: Distribution Networks
6	Operate services efficiently.	Water	Technician: Distribution Networks
10	Employ approved O&M standards.	Water	Technician: Distribution Networks
16	Conserve water.	Water	Technician: Distribution Networks
25	Not refuse access unreasonably.	Water	Technician: Distribution Networks
26	Provide basic services in emergency/disaster.	Water	Technician: Distribution Networks
28	Restrict use (reasonably).	Water	Technician: Distribution Networks
40	Detail water conservation measures.	Water	Technician: Distribution Networks
52	Manage WSP contracts.	Water	Technician: Distribution Networks
54	Assess public sector O&M options.	Water	Technician: Distribution Networks
2	Provide services.	WSA Manager	WSA Manager
8	Employ qualified artisans and staff.	WSA Manager	WSA Manager
15	Use water income for water services.	WSA Manager	WSA Manager
39	Detail environmental protection measures.	WSA Manager	WSA Manager
41	Invite public comment.	WSA Manager	WSA Manager
42	Publish WS plan.	WSA Manager	WSA Manager
43	Assess/publish comments on plans.	WSA Manager	WSA Manager
44	Include WSDP in IDP.	WSA Manager	WSA Manager
46	Adhere to WS plan and budgets.	WSA Manager	WSA Manager
50	Monitor/report on WS plan.	WSA Manager	WSA Manager
56	Publish contract/JV.	WSA Manager	WSA Manager
58	Report on WSP contracts.	WSA Manager	WSA Manager
60	Separate WSA and WSP accounts.	WSA Manager	WSA Manager
61	Develop bylaws	WSA Manager	WSA Manager
74	Publish bylaws.	WSA Manager	WSA Manager

Out of interest, the mandates were summated per job title. The number of mandates per job title can be seen in **Table 57**.

Table 57 Number of WSA mandates per job title

Job Title	Number of Mandates
Water Services Manager	12
Planning Engineer	18
PMU Manager	1
Project Manager in the PMU	1
Head of Unit or Depot	2
Technician: Distribution Networks including WTWs	14
Technician: Distribution Networks including WWTWs	10

Extent of Responsibility

Before assumptions could be made on how often tasks needed to be performed information which alluded to the potential volumes of work had to be obtained. The only public documents available for this purpose are municipal Water Services Development Plans (WSDP) and, hopefully, a water and sewer master plan which contains more technical information than the WSDP. However, many municipalities do not have Master Plans over and above the WSDP. As the WSDPs are five year planning documents, of more interest is the more-internal Service Delivery and Budget Implementation Plan (SDBIP) document, which is a requirement of National Treasury, and outlines the proposed capital and operational expenditure for all projects, with water and sanitation projects being of interest to this research.

The Moses Kotane WSDP did not contain much information usable by this project. Moses Kotane LM does not have any water or sewer master plans, and it was not possible to locate the SDBIP.

Extent of Planning Responsibility

Moses Kotane LM is a small municipality with a total population of some 376 000 people in six urban centres and 132 rural villages. On a management level the water department has divided the area into two regions – namely East and West. This research therefore takes it that two planning regions are required. The location of Moses Kotane LM in North West Province and its relative size in relation to other LMs within Bojanala District around it is shown in **Figure 29**.

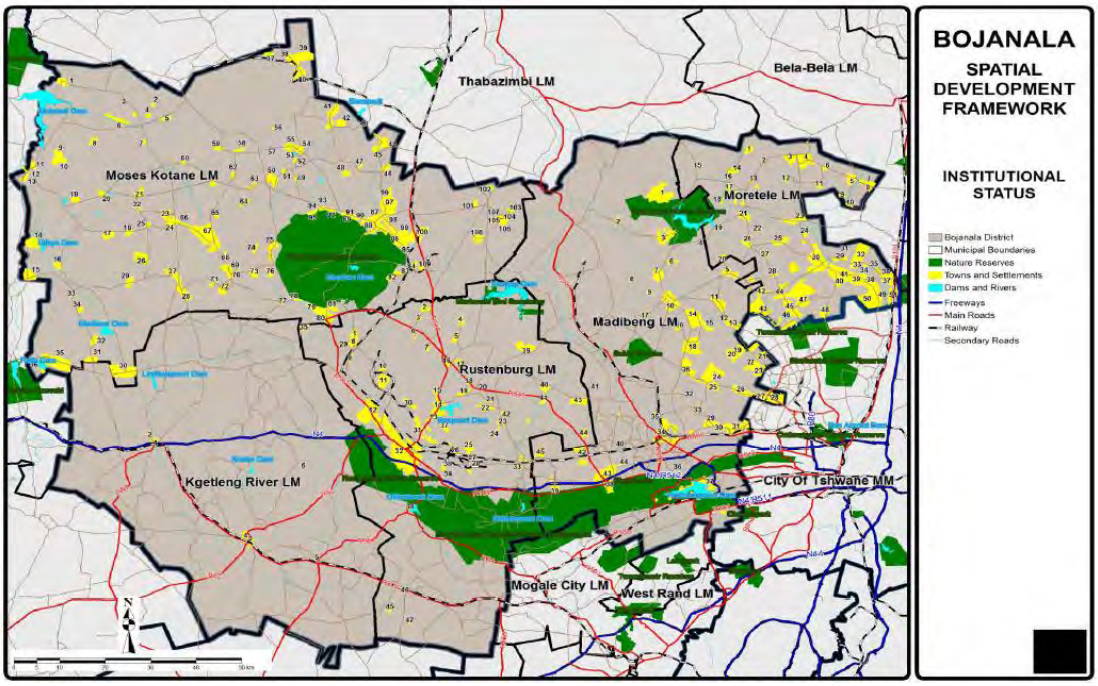


Figure 29 Map showing the relative size of Moses Kotane LM to its neighbouring LMs

Extent of Infrastructure Responsibility

The Infrastructure responsibility is based upon the size of the capital budget for water services for a year. From the 2011 Moses Kotane LM Integrated Development Plan (IDP) the water services capital budget for 2011 was almost R104 000 000 of a total capital budget for the Municipality of R108 000 000.

Extent of Water Treatment Works (WTW) Responsibility

This is discussed in slightly more detail below but, in summary there are three conventional works with rapid sand filtration and chlorination. Their capacity is not known but is likely to be under 5 Mℓ/d, i.e. they are classified as small.

Extent of Water Distribution Responsibility

The unit of measure for extent of responsibility for (O&M) of water pipelines used by this research project is length of pipelines, in kilometres (km). Moses Kotane LM could not provide this information so for purposes of completing the project the team assigned a nominal length of 1 000km, to be able to complete the process.

Extent of Dry Sanitation and Sewer Collection Responsibility

From the Moses Kotane LM IDP for 2011 the extent of dry sanitation in the municipality was 77 249 households of a total of 83 236, i.e. 93%. As was the case for water pipelines this project bases the sewer collection responsibility on the length of sewer mains feeding the treatment works, in kilometres. Moses Kotane LM could not provide this information so for purposes of completing the project the team assigned a nominal length of 500km, to be able to complete the process.

Extent of Wastewater Treatments Works (WWTW) Responsibility

This is discussed in slightly more detail below but, in summary there are two works, one of which is conventional Activated Sludge and one is an “oxidation ponds”. The capacity of the activated sludge plant is believed to be 4 Mℓ per day.

Interview with Moses Kotane LM Technical Staff

An interview was held with the Moses Kotane technical staff to determine the extent of work or responsibilities that are outsourced. The following feedback was received during an interview with Moses Kotane LM Head of Water and Sanitation:-

- *Planning: The staff member responsible for Master Planning is the head of Technical Services. Master planning work is 100% outsourced to consultants. Consultants compiled an assets register and WSDP under a contract from DWS. The recently-tendered Water Master Plan was also awarded to Consultants. The budget for this Master Plan is R2m. Moses Kotane LM staff review the consultants' WSDPs and Master Plans.*
- *As-built drawings are also outsourced to engineers. The capacity to produce them internally does not exist in the municipality.*
- *New Infrastructure Provision: 100% is outsourced to contractors. The Project Management Unit (PMU) manages this, even in the absence of a Head of Unit. However, staff would like to be able to undertake construction work in-house.*
- *WTWs: There are three works in the municipality, at Madikwe, Moletedi and Pella. The capacities of the WTWs were not readily accessible.*
- *Water distribution: Bulk water is purchased from Magalies Water. The extent of the distribution systems in kilometres were not readily accessible.*
- *Waste Water Treatment Works: Mogwase WWTWs has a capacity of 4 Mℓ/d. There are "oxidation ponds" as well, and everywhere else in the LM is dry sanitation.*
- *Water Loss Management/Operations and Maintenance: It is not clear whether or not a preventative maintenance plan exists for the services. 80% of maintenance work is done in-house. The remaining 20% is outsourced specialist services such as electromechanical and laboratory work.*
- *Service level and backlogs: the Moses Kotane LM WSDP for 2012/16 quotes the water and sanitation service level and backlogs.*

In addition the Moses Kotane LM WSDP was consulted, and revealed that substantial backlogs in service provision remain as shown in **Table 58**.

Table 58 Water services levels and backlogs in Moses Kotane LM

	Total No. Households	Households below RDP level	Households at RDP level	Households above RDP level
Water	83 236	11 828	48 625	22 783
Sanitation	83 236	74 237	30 12	5 987

From the interview it became clear that Moses Kotane LM outsources 100% of its planning, design, construction and water quality work. This would reduce the demand for staff which is calculated below.

Interview with Moses Kotane LM HR Staff

The project leader interviewed the HR Manager at Moses Kotane LM and the Skills Development Facilitator. The following issues were noted:

- *CoGTA Skills Audit. They reported that they had conducted this audit in 2009/10 but felt that it was not as accurate; for example it did not measure technical competencies. They were not able to share a copy of the CoGTA questionnaire and process methodology.*
- *Organogram. Moses Kotane LM has an organogram of the Water Services Department and this was provided to the research team. It was reported that the organogram is updated on an on-going basis as and when staff change.*
- *Resource Planning. It was confirmed that they do conduct resource planning and that they use Payday – Payroll and HR for their HRMIS needs. They keep and have readily available details of qualifications, biographical data and salaries, but Performance Management information is not kept. A limitation of the existing system was reported to be that all training is kept manually; updates are done on employee request.*
- *Recruitment and Selection Policy. It was confirmed that the municipality has a recruitment and selection policy and procedure, but that it is experiencing problems due to a moratorium on recruitment. Vacancies are reported to have been there for three to six months. Key challenges in recruiting technical staff were reported as budget, salaries and lack of formal qualifications.*

- *Job profiles/detailed descriptions: These were reported to be available for some positions (including some technical) and these were provided.*
- *Training and Development. A training and development policy exists at the municipality. There are however problems with study leave days allocated and a lack of clarity around bursaries versus skills programmes. The municipality has a total training and development budget of R1.6 million. Technical training is difficult as there are no facilities to do so in-house. The municipality Googles the Construction Sector Education and Training Authority (SETA) to source training.*
- *Management and financial training is readily available via the South Africa Local Government Association (SALGA) and National Treasury.*
- *Recognition of Prior Learning (RPL). 25 staff have gone through the RPL process (10 in water and sanitation and 15 in finance). The 10 water and sanitation staff were all Process Controllers.*
- *Staff Retention Strategy. The municipality's retention strategy relies on a bursary programme and learnerships.*

Calculations on Number of Staff Required by Job Title

To create relationship between extent of work and staff numbers (sometimes referred to as staffing norms) several methods were used:-

WSA Manager

It was assumed that a WSA Manager is required to head the water department. In Moses Kotane LM no such position exists and the responsibility is taken by the Head of Department (Infrastructure and Technical). The time based method was used to determine how much time a Head of Department should spend on each water services mandate and a total of 189 days are required per annum based on the assumptions made in **Table 59** and **Figure 30** overleaf.

From the calculations it shows that a fulltime WSA Manager is required at Moses Kotane LM (demand for capacity).

Table 59 Calculation of time required of a WSA Manager

Mandate (In short)	Department_ Small_Muni	ALLOCATION TO JOB TITLE	Extent	Extent_ Unit	Time	Time_Unit	No. of Days
Provide services.	WSA Manager	WSA Manager					0
Employ qualified artisans and staff.	WSA Manager	WSA Manager	20	applications	2	days/application	40
Use water income for water services.	WSA Manager	WSA Manager	12	tasks	1	day per task	12
Detail environmental protection measures.	WSA Manager	WSA Manager	12	tasks	1	day per task	12
Invite public comment.	WSA Manager	WSA Manager	4	tasks	1	day per task	4
Publish WS plan.	WSA Manager	WSA Manager	1	documents	10	days	10
Assess/publish comments on plans.	WSA Manager	WSA Manager	1	documents	10	days	10
Include WSDP in IDP.	WSA Manager	WSA Manager	1	documents	10	days	10
Adhere to WS plan and budgets.	WSA Manager	WSA Manager	12	tasks	2	days per task	24
Monitor/report on WS plan.	WSA Manager	WSA Manager	1	documents	5	days	5
Publish contract/JV.	WSA Manager	WSA Manager	1	tasks	2	days	2
Report on WSP contracts.	WSA Manager	WSA Manager	1	tasks	10	days	10
Separate WSA and WSP accounts.	WSA Manager	WSA Manager	12	tasks	1	day per task	12
Develop bylaws	WSA Manager	WSA Manager	19	bylaws	1	day each	19
Publish bylaws.	WSA Manager	WSA Manager	19	bylaws	1	off	19

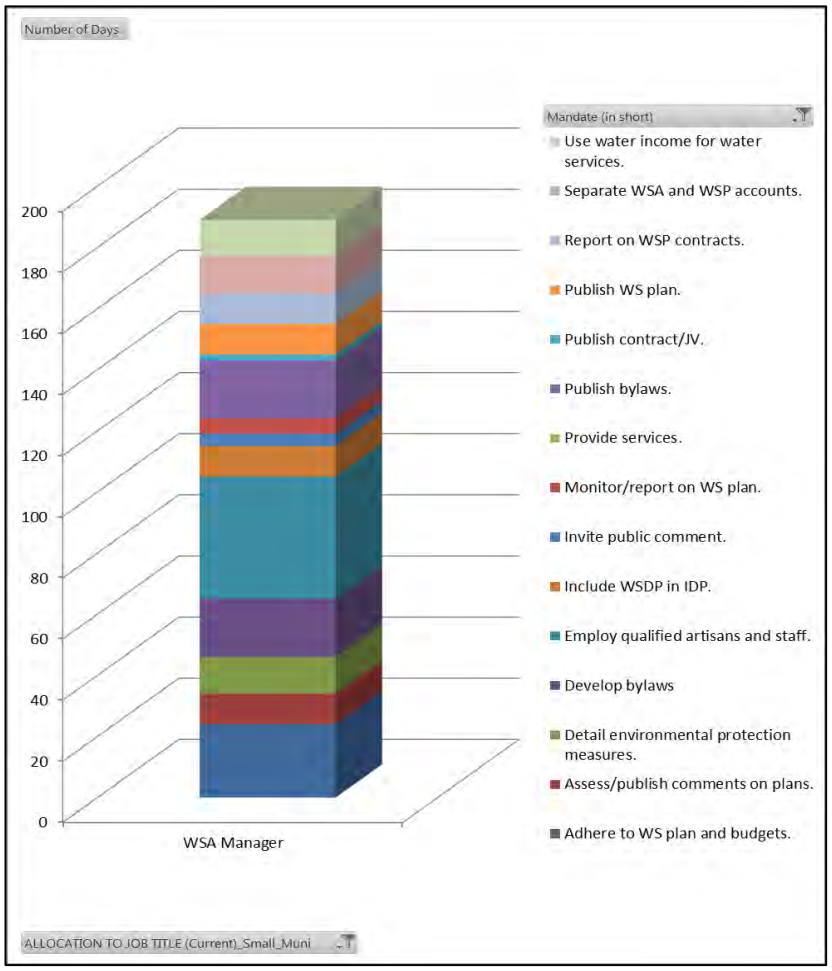


Figure 30 Graph showing time required of a WSA Manager

Planning Staff

From research conducted under the level 2 study of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of one planner per region was used for Moses Kotane LM. Therefore for two regions (East and West), two planners are required. A portion of a staff member was allocated to each planning-related mandate to ensure a result of one planner per region. **Table 60** and **Figure 31** illustrate this:-

Table 60 Allocation of Moses Kotane LM planning staff to mandates

Mandate (in short)	Department_ Small_Muni	ALLOCATION TO JOB TITLE	Extent	Extent_ Unit	Staff	Time_Unit	No. of Staff
Calculate differentiated tariffs.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Calculate surplus income.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess alternative service options.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess regional efficiency.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess benefit of scale.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess comparative costs.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess service equity.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Assess neighbouring WSA WR availability.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Prepare WS plan and summary.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail physical attributes.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail demographics and distribution.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail 5-Year delivery plan.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail existing services.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail existing industrial use.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail existing industrial effluent.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail areas with no/limited services.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail future works with budget.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1
Detail areas that can't be supplied in 5-years.	Planning	Planning Engineer	2	Regions	0.05	staff/region	0.1

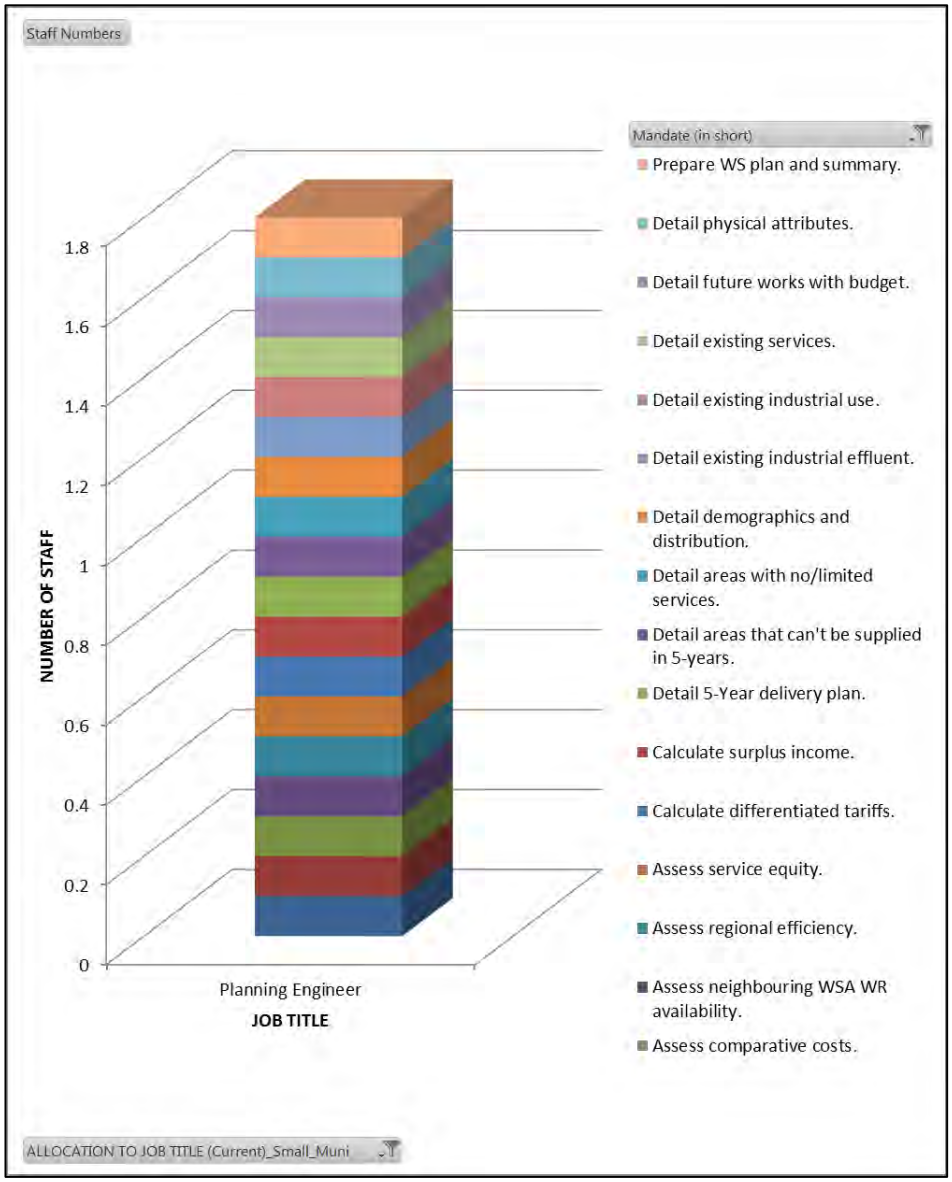


Figure 31 Graph showing time required of the Moses Kotane LM planning staff

The two planners are assumed to report directly to the WSA manager, so no Planning Manager position is included. The planning engineers would need to be supported by Technologists, draughtspersons, a GIS operative and surveyors, so these job titles have been included in summary **Table 65** on **page 149.**

Infrastructure Provision Staff

For infrastructure provision the staff norm of R30m per annum per project manager was used. As the capital budget quoted is R104 000 000 Moses Kotane LM needs three and a half Project Managers. As a portion of a human being is not possible, the calculations rounded this figure up to four Project Engineers. As water and sanitation provision are in substantial backlogs we assume that the Project Managers will have a senior as head of the PMU. This is illustrated in **Table 61** and **Figure 32**.

Table 61 Allocation of Moses Kotane LM PMU staff time to mandates

Mandate (in short)	Department_Small_Muni	ALLOCATION TO JOB TITLE	Extent	Extent_Unit	Staff	Time_Unit	No. of Staff
Adhere to WS plan and budgets.	Infrastructure Provision	PMU Manger	1	PMU Dept	1	PMU Manager	1
Employ approved construction standards.	Infrastructure Provision	Project Manager	R 104	million Rands	R 30	million Rands per PM	4

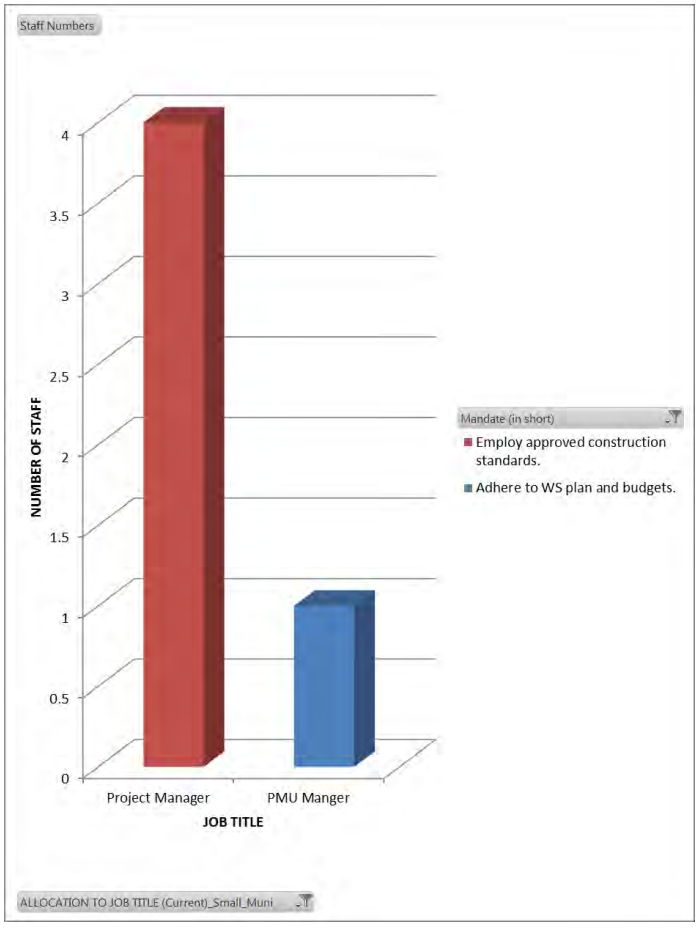


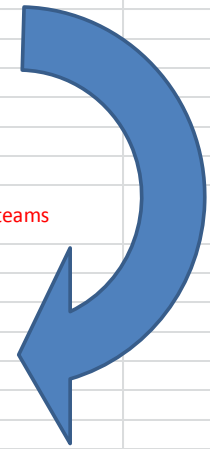
Figure 32 Graph showing time required of the Moses Kotane LM PMU staff

Water Pipeline O&M Staff

From research conducted under the level 2 study of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of one "maintenance team" per 160km of pipeline was used for Moses Kotane LM. For an assumed total of 1 000km of water supply pipes the result was six maintenance teams are required. As shown in the calculator below each team consists of one plumber, one assistant and two general workers. As this project is not concerned with general workers only the foreman, plumbers and assistant are included in **Table 62**.

Table 62 Moses Kotane LM O&M staff required for water pipeline maintenance (using the teams/km method)

CALCULATOR TO DETERMINE THE NUMBER OF O&M PIPELINE STAFF REQUIRED FOR MUNICIPALITIES		
INPUT DATA:		
Enter the Total Length of Pipelines	1000	km
Enter the Length of Kilometers per Team	160	km
Enter the Number of General Workers per Team	2	
Enter the Number of Tradesman Assistants per Team	1	
Enter the Number of Plumbers per Team	1	
Enter the Number of Teams a Foreman Manages	6	
Enter the Number of Foreman a Technician can manage	3	
Enter the Number of Technicians and Technologist/Engineer can manage	2	
RESULTS: Total O&M Staff required		
For this total length of pipelines, practical amount of teams:	6	teams
Technologist/Engineer	0	
Technician	0	
Foreman	1	
Plumbers	6	
Tradesman Assistants	6	
General Workers	130	

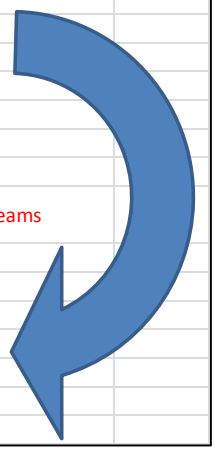


Sewer pipeline O&M Staff

From research conducted under the level 2 study of this project, and especially based on Tshwane Metropolitan Municipality staffing norms for planning, a norm of one "maintenance team" per 160km of sewer pipeline was used for Moses Kotane LM. For an assumed total of 500km of sewer pipes the result was:- three maintenance teams are required. As shown in the calculator below each team consists of one plumber, one assistant and two general workers. As this project is not concerned with general workers only the foreman, plumbers and assistant are included in **Table 63.**

Table 63 Moses Kotane LM O&M staff required for sewer pipeline maintenance (using the teams/km method)

CALCULATOR TO DETERMINE THE NUMBER OF O&M PIPELINE STAFF REQUIRED FOR MUNICIPALITIES		
INPUT DATA:		
Enter the Total Length of Pipelines	500	km
Enter the Length of Kilometers per Team	160	km
Enter the Number of General Workers per Team	2	
Enter the Number of Tradesman Assistants per Team	1	
Enter the Number of Plumbers per Team	1	
Enter the Number of Teams a Foreman Manages	6	
Enter the Number of Foreman a Technician can manage	3	
Enter the Number of Technicians and Technologist/Engineer can manage	2	
RESULTS: Total O&M Staff required		
For this total length of pipelines, practical amount of teams:	3	teams
Technologist/Engineer	0	
Technician	0	
Foreman	1	
Plumbers	3	
Tradesman Assistants	3	
General Workers	130	



In the summary table, **Table 65,** the water and sewer pipeline teams are combined and show as three foremen and nine plumbers/assistants.

Mechanics and support staff are usually required to keep water department vehicles functioning and a minimum of one per district is included in **Table 65.**

WTWs and WWTWs staff

For WTWs and WWTWs staff the 2013 DWS regulation on staff numbers was used. Based on these regulations the staff required at Moses Kotane LM has been provided in **Table 64**.

Table 64 Number of Moses Kotane LM staff required per treatment works

	Water Treatment Works				Wastewater Treatment Works		
	1	2	3	**Total**	1	2	**Total**
	Madikwe	**Moletedi**	**Pella**		**Madikwe**	**Mogwase**	
Classification of Works[5, 7]	C	D	D		E	C	
Class 1 Operator					1		1
Class 2 Operator		1	1	2			
Class 3 Operator	1			1		1	1
Class 4 Operator							
Electrician	1	1	1	3	1	1	2
Fitter	1	1	1	3	1	1	2
Instrumentation Technician	1	1	1	3	1	1	2
Class 5 Supervisor	1	1	1	3	1	1	2
Totals[6]	5	5	5	**15**	5	5	**10**

Notes: *5. Works Classification as per REGULATIONS RELATING TO COMPULSORY NATIONAL STANDARDS FOR PROCESS CONTROLLERS AND WATER SERVICES WORKS, as published by the Department of Water Affairs in 2013.*

6. Ref.- Telephonic discussion with DWS Blue/Green Drop Provincial Coordinator, Ipotseng Mokino, 15 September 2014. Ph. 018 387 9594 E.mokinob@DWS.gov.za

7. Totals are required Class of operator/supervisor x number of shifts.

Water and sewage effluent quality should be monitored by appropriate scientific and technical staff, including chemistry and biological specialists, with support staff. Moses Kotane LM does not have any such staff and, reportedly, outsources all such work. The minimum requirements are shown in **Table 65**.

Table 65 Summary of minimum required technical staff per job title at Moses Kotane LM

Meaningful Job Titles for Water Sector	Moses Kotane LM Job Titles	
		Required
Water Services Authority Manager	HoD Infrastructure and Technical	1
Planning and Design Office		
Engineer		2
Technologist		2
Technician (Civil)		
Process Engieer		
Process Technologist		
Process Technician		
Draughtsperson		2
GIS Operator		1
Engineering Surveyor		1
Engineering Surveyor Assistant		1
Infrastructure Provision	Head of Unit PMU	1
Engineer: Project Manager	Technician PMU	4
Technologist: Project Manager		
Technician: Project Manager		
Operations		
Engineer	Head of Unit	2
Technologist	Technician Water Loss Management	1
Technician (Civil)	Technician Distribution networks	4
Technician (Instrumentation)		
Foreman (Networks)	Supervisor networks (inc. Sewers)	2
Artisan (Plumber)	Artisan Distribution Networks	9
Handyman (Plumber)	Artisan Sewer Treatment	
Artisan Assistant (Plumber)	Special Workman Plumbing	9
Foreman (Mech/Civil)	Supervisor Water Loss	
Artisan (Mech Pipelines)		
Artisan (Mech Fitter)		5
Handyman (Fitter)		
Artisan Assistant (Mech Fitter)		5
Artisan Asssistant (Mech Pipelines)		
Foreman (Instrumentation)		
Artisan (Instrumentation)		5
Foreman (Electrical)		
Artisan (Electrical)		5
Handyman (Electrical)		
Artisan Asssistant (Electrical)		
SHEQ Co-ordinators		
Dams/Water Treatment		
Superindentendant (Dams)	Supervisor Water Treatment	2
Assistant Superintendant (Dams)		
Plant Superintendant		
Process Controller / Operator	Artisan Water Treatment	9
Shift Attendant		
Scientific Services		
Hydrobiologist	Technician Water Quality	2
Microbiologist	Scientist	1
Chemist		1
Quality Assurance Manager		
Laboratory Technician		1
Laboratory Assistant	Laboratory Assistant	1
Sampling Officers		
Fleet Management		
Mechanic		2
Handyman Mechanic		
Assistant Mechanic		2
TOTAL		**83**

Moses Kotane LM Job Profiles and Required Minimum Qualification

Besides looking at the demand for capacity numbers from a workforce planning point of view, the project looked at demand for capacity from a qualification requirement and area of specialisation point of view. The minimum qualification requirements with areas of specialisation should have been obtained from the LM's Job Profiles however, it was established that the LM did not have job profiles for technical posts. Minimum qualification requirements were thus inserted into **Table 66** from similar job titles at Umgeni Water.

Table 66 Moses Kotane LM job titles with minimum qualification requirements

Technical/ Scientific	Division/ Department	Job title	Level	Minimum Qualification Required	Area of Specialisation	Years of appropriate experience required
Scientific	Infrastructure & Technical Services	Laboratory Assistant	12-14	Standard 10, Computer literacy	(blank)	1
		Scientist	15-16	Degree/Hons	Science or Engineering	4
Technical	Infrastructure & Technical Services	PMU Manager	17-18	B.Tech/Pr Tech	Civil	7
		PMU Technician	15-16	S4 Diploma	Civil or Mechanical	4
		PMU Data Capturer	10-12	B.TECH	Science	2
		HOU: Water and Santitation (East)	18-25	BTech or Degree	Engineering/business Management	7
		Technician: Water Quality	17-18	Degree or B.Tech	Chemistry or microbiology	5
		Technician: Distribution Networks	17-18	Degree or B.Tech	Civil	5
		Technician: Water Loss Management	17-18	Degree or B.Tech	Civil	5
		Supervisor: Distribution Networks	15-16	N5 and Trade Test	Civil	5
		Supervisor: Networks (Sewer)	15-16	N5 and Trade Test	Civil	5
		Supervisor: Water Loss	15-16	NHD or B.Tech	Civil	5
		Supervisor: Water Treatment	12-14	NHD or B.Tech	Chemistry or microbiology	5
		Supervisor: Sewer Treatment	15-16	NHD or B.Tech	Chemistry or microbiology	5
		Artisan: Distribution Networks	9	N2 Certificate and Trade Test	Plumbing	2
		Special Workman: Plumbing	12-14	Trade Test	Plumbing	3
		Artisan: Water Treatment	12-14	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2
		Artisan: Sewer Treatment	12-14	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2
		Engine Mechanic Assisstant	10-12	Trade Test	Mechanical Engineeering	3
			1-5	Trade Test	Mechanical Engineeering	3
		Engine Mechanic	12-14	Trade Test	Mechanical Engineeering	5

5.5.2 Determination of the Supply of Capacity

Background on the Moses Kotane Organogram of Staff

Moses Kotane LM water services department has three technical sub divisions namely: PMU, Services West and Services East. The Services West unit includes positions for a Scientist and a Laboratory Assistant, but both of these positions are vacant. The Services East unit includes Water Loss Management positions but three out of the four in this category are vacant, including the Technician to head the unit. Other than the Water Loss Technician post, five of the other six key Technician positions (immediately under the Heads of Unit East and West) are also vacant. The sub division head for PMU is also vacant, although one Technician under this post is in place. Despite the allocation of nineteen strategic actions to a Planning Engineer there is no planning division or staff in Moses Kotane LM water department. It is understood that the municipality relies on the private sector for all its water services planning needs.

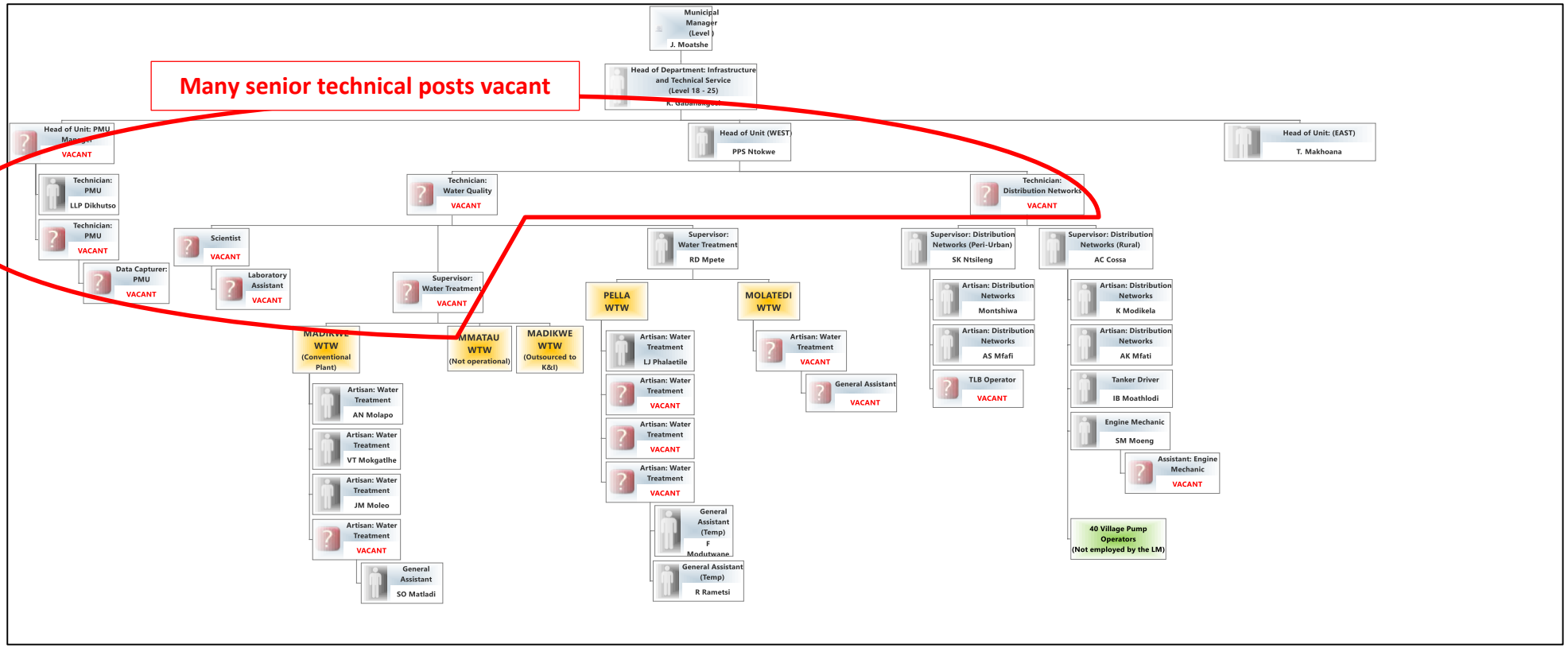


Figure 33 **Moses Kotane LM organogram, west depot only, showing vacant posts**

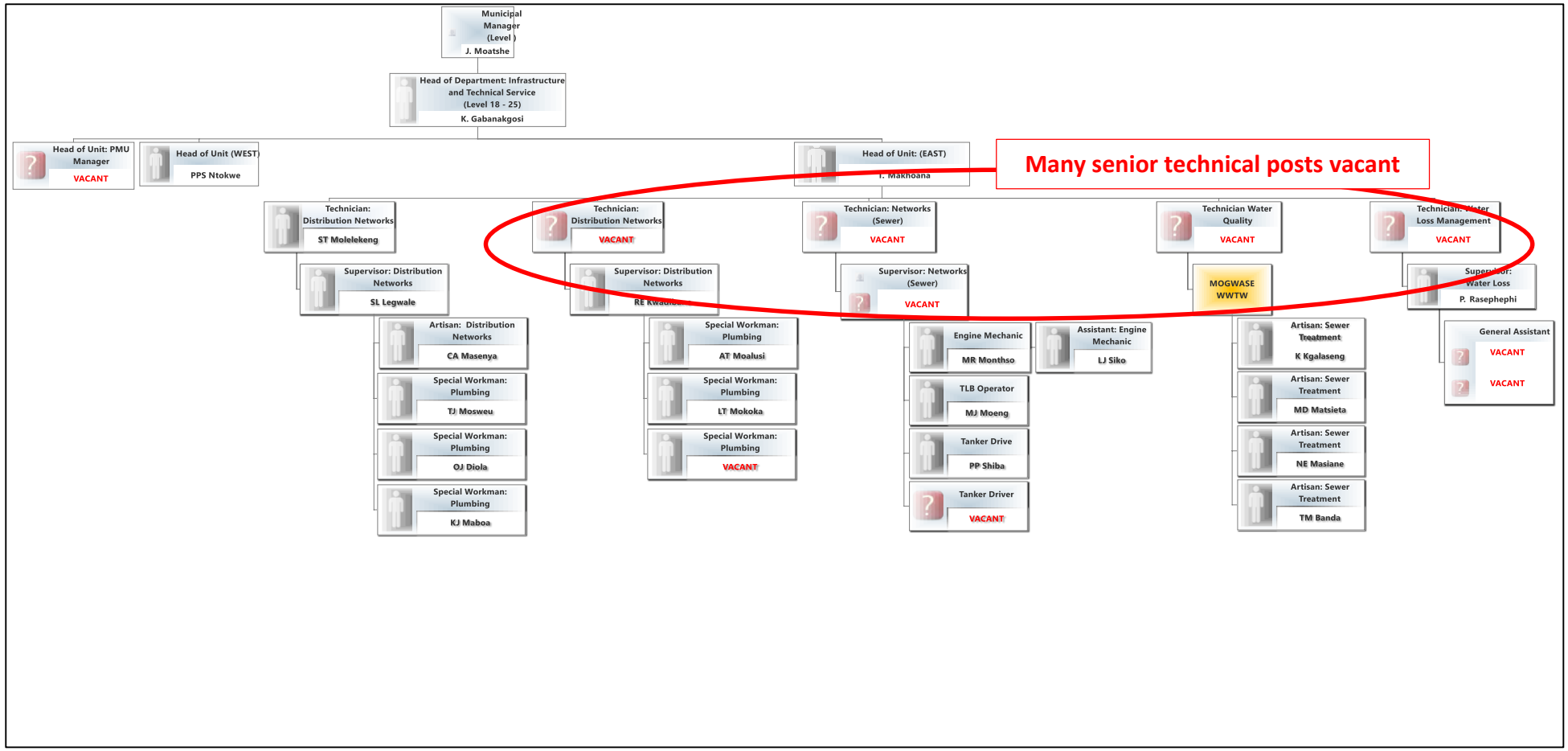


Figure 34 Moses Kotane LM organogram, east depot only, showing vacant posts

Calculations on Number of Staff in Supply by Job Title

Table 67 shows that Moses Kotane LM has 56 positions but the supply of staff is at 34, i.e. a 39% vacancy rate.

Table 67 Number of filled and vacant positions at Moses Kotane LM (technical only)

	Total	Filled (SUPPLY)	Vacant
Technical	54	34	20
Scientific	2	0	2
Total	**56 (100%)**	**34 (61%)**	**22 (39%)**

The Filled (SUPPLY) column in **Table 67** is expanded in **Table 68** below to show Moses Kotane LM current staff complement according to their job titles and allocated as closely as possible to the "meaningful" (i.e. consistent across different WSIs) job titles that this project adopted in order to provide consistency across the various levels and areas of responsibility within the water sector.

Table 68 Number of Moses Kotane LM technical staff by job title

Meaningful Job Titles for Water Sector	Moses Kotane LM Job Titles	
		Actual
Water Services Authority Manager	HoD Infrastructure and Technical	1
Planning and Design Office		
Engineer		
Technologist		
Technician (Civil)		
Process Engieer		
Process Technologist		
Process Technician		
Draughtsperson		
GIS Operator		
Engineering Surveyor		
Engineering Surveyor Assistant		
Infrastructure Provision	Head of Unit PMU	
Engineer: Project Manager	Technician PMU	
Technologist: Project Manager		
Technician: Project Manager		
Operations		
Engineer	Head of Unit	2
Technologist	Technician Water Loss Management	
Technician (Civil)	Technician Distribution networks	1
Technician (Instrumentation)		
Foreman (Networks)	Supervisor networks (inc. Sewers)	3
Artisan (Plumber)	Artisan Distribution Networks	3
Handyman (Plumber)	Artisan Sewer Treatment	
Artisan Assistant (Plumber)	Special Workman Plumbing	8
Foreman (Mech/Civil)	Supervisor Water Loss	2
Artisan (Mech Pipelines)		
Artisan (Mech Fitter)		
Handyman (Fitter)		
Artisan Assistant (Mech Fitter)		
Artisan Asssistant (Mech Pipelines)		
Foreman (Instrumentation)		
Artisan (Instrumentation)		
Foreman (Electrical)		
Artisan (Electrical)		
Handyman (Electrical)		
Artisan Asssistant (Electrical)		
SHEQ Co-ordinators		
Dams/Water Treatment		
Superindentendant (Dams)	Supervisor Water Treatment	2
Assistant Superintendant (Dams)	Supervisor Sewer Treatment	1
Plant Superintendant		
Process Controller / Operator	Artisan Water Treatment	5
Shift Attendant	Artisan Sewer treatment	4
Scientific Services		
Hydrobiologist	Technician Water Quality	
Microbiologist	Scientist	
Chemist		
Quality Assurance Manager		
Laboratory Technician		
Laboratory Assistant	Laboratory Assistant	
Sampling Officers		
Fleet Management		
Mechanic		2
Handyman Mechanic		
Assistant Mechanic		
TOTAL		**34**

Verifying if staff in supply meet minimum qualification requirements

Table 68 above showed the current staff complement at Moses Kotane LM's water department. However, the method to determine the capacity gap includes an additional step of ensuring that staff meet the minimum qualification and experience requirements as per Job Profiles. Should the incumbent not meet the minimum qualification requirements, this staff member is not included in the count of "supply of capacity" until such time that this staff member has been through an assessment process of RPL and given a qualification to match their ability.

Table 69 overleaf anonymously compares required qualifications per job title with the incumbents' actual qualifications. The results are that only seven of the 34 staff (including the Head of Department) meet the minimum qualification and years of experience requirements. (In the **Table 69**, where the entry for *Incumbents Highest Qualification* reads "(blank)", this means that the position is vacant and thus no incumbent qualification applies).

Table 69 Moses Kotane LM sample by technical job title and actual qualifications

Job title	Minimum Qualification Required	Area of Specialisation	Years of appropriate experience required	Incumbent's Highest Qualification	Incumbent's Area of Specialisation	Incumbent's Years of Exp.	Count	Does Incumbent Meet Min Qual Reqd?		Does Incumbent Meet Min Experience Reqd?	
Artisan: Distribution Networks	N2 Certificate and Trade Test	Plumbing	2	Standard 2		30	1	✗	0	✓	1
	N2 Certificate and Trade Test	Plumbing	2	N2 Certificate	Plumbing	14	1	✓	1	✓	1
	N2 Certificate and Trade Test	Plumbing	2	Standard 8		20	1	✗	0	✓	1
	N2 Certificate and Trade Test	Plumbing	2	(blank)		(blank)	1	✗	0	✗	0
	N2 Certificate and Trade Test	Plumbing	2	Standard 2		30	1	✗	0	✓	1
Artisan: Distribution Networks Total							**5**		**1**		**4**
Artisan: Sewer Treatment	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (without Maths)		13	1	✗	0	✓	1
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (with Maths)		1	1	✗	0	✗	0
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (without Maths)		21	1	✗	0	✓	1
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (without Maths)		16	1	✗	0	✓	1
Artisan: Sewer Treatment Total							**4**		**0**		**3**
Artisan: Water Treatment	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	National Diploma (TUT)	Chemistry	12	1	✓	1	✓	1
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Standard 5		20	1	✗	0	✓	1
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (with Maths)		13	1	✗	0	✓	1
	N2 Certificate and Trade Test	Chemical Engineering / Water Care	2	Matric (without Maths)		1	1	✗	0	✗	0
Artisan: Water Treatment Total							**4**		**1**		**3**
Engine Mechanic	Trade Test	Mechanical Engineeering	5	Matric (without Maths)		1	1	✗	0	✗	0
	Trade Test	Mechanical Engineeering	5	N2 Certificate	Diesel Mechanic	19	1	✓	1	✓	1
Engine Mechanic Total							**2**		**1**		**1**
HOU: Water and Santitation (East)	BTech or Degree	Engineering/business Management	7	National Diploma (CPUT)	Civil Engineering	1	1	✓	1	✗	0
HOU: Water and Santitation (East) Total							**1**		**1**		**0**
HOU: Water and Santitation (West)	BTech or Degree	Engineering/business Management	7	(blank)		(blank)	1	✗	0	✗	0
HOU: Water and Santitation (West) Total							**1**		**0**		**0**
PMU Manager	B.Tech/Pr Tech	Civil	7	(blank)		(blank)	1	✗	0	✗	0
PMU Manager Total							**1**		**0**		**0**
PMU Technician	S4 Diploma	Civil or Mechanical	4	(blank)		(blank)	1	✗	0	✗	0
PMU Technician Total							**1**		**0**		**0**
Special Workman: Plumbing	Trade Test	Plumbing	3	Standard 8		1	1	✗	0	✗	0
	Trade Test	Plumbing	3	Matric (without Maths)		23	1	✗	0	✓	1
	Trade Test	Plumbing	3	Standard 8		8	1	✗	0	✓	1
	Trade Test	Plumbing	3	Certificate		21	1	✗	0	✓	1
	Trade Test	Plumbing	3	Grade 2		25	1	✗	0	✓	1
	Trade Test	Plumbing	3	Matric (without Maths)		1	1	✗	0	✗	0
Special Workman: Plumbing Total							**6**		**0**		**4**
Supervisor: Distribution Networks	N5 and Trade Test	Civil	5	National Diploma	Motor Mechanics	20	1	✓	1	✓	1
	N5 and Trade Test	Civil	5	Matric (without Maths)		23	1	✗	0	✓	1
	N5 and Trade Test	Civil	5	Trade Test	Plumbing	18	1	✓	1	✓	1
	N5 and Trade Test	Civil	5	Matric (without Maths)		24	1	✗	0	✓	1
Supervisor: Distribution Networks Total							**4**		**2**		**4**
Supervisor: Sewer Treatment	NHD or B.Tech	Chemistry or microbiology	5	Matric (without Maths)		24	1	✗	0	✓	1
Supervisor: Sewer Treatment Total							**1**		**0**		**1**
Supervisor: Water Loss	NHD or B.Tech	Civil	5	Standard 9 (with Maths)		23	1	✗	0	✓	1
Supervisor: Water Loss Total							**1**		**0**		**1**
Supervisor: Water Treatment	NHD or B.Tech	Chemistry or microbiology	5	Matric (with Maths)		1	1	✗	0	✗	0
	NHD or B.Tech	Chemistry or microbiology	5	N1 Certificate	W&WW Treatment	20	1	✗	0	✓	1
Supervisor: Water Treatment Total							**2**		**0**		**1**
Technician: Distribution Networks	Degree or B.Tech	Civil	5	Matric (without Maths)		24	1	✗	0	✓	1
Technician: Distribution Networks Total							**1**		**0**		**1**
Grand Total							**34**		**6**		**23**

Table 70 summarises the information in **Table 69** for the current technical staff complement, i.e. the supply of capacity

Table 70 Number of technical staff meeting minimum required qualifications per job title at Moses Kotane LM

Meaningful Job Titles for Water Sector	Moses Kotane LM Job Titles		
		Actual	Qual Y/N
Water Services Authority Manager	HoD Infrastructure and Technical	1	1
Planning and Design Office			
Engineer			
Technologist			
Technician (Civil)			
Process Engieer			
Process Technologist			
Process Technician			
Draughtsperson			
GIS Operator			
Engineering Surveyor			
Engineering Surveyor Assistant			
Infrastructure Provision	Head of Unit PMU		
Engineer: Project Manager	Technician PMU		
Technologist: Project Manager			
Technician: Project Manager			
Operations			
Engineer	Head of Unit	2	1
Technologist	Technician Water Loss Management		
Technician (Civil)	Technician Distribution networks	1	0
Technician (Instrumentation)			
Foreman (Networks)	Supervisor networks (inc. Sewers)	3	2
Artisan (Plumber)	Artisan Distribution Networks	3	1
Handyman (Plumber)			
Artisan Assistant (Plumber)	Special Workman Plumbing	8	0
Foreman (Mech/Civil)	Supervisor Water Loss	2	0
Artisan (Mech Pipelines)			
Artisan (Mech Fitter)			
Handyman (Fitter)			
Artisan Assistant (Mech Fitter)			
Artisan Asssistant (Mech Pipelines)			
Foreman (Instrumentation)			
Artisan (Instrumentation)			
Foreman (Electrical)			
Artisan (Electrical)			
Handyman (Electrical)			
Artisan Asssistant (Electrical)			
SHEQ Co-ordinators			
Dams/Water Treatment			
Superindentendant (Dams)	Supervisor Water Treatment	2	0
Assistant Superintendant (Dams)	Supervisor Sewer Treatment	1	0
Plant Superintendant			
Process Controller / Operator	Artisan Water Treatment	5	1
Shift Attendant	Artisan Sewer treatment	4	0
Scientific Services			
Hydrobiologist	Technician Water Quality		
Microbiologist	Scientist		
Chemist			
Quality Assurance Manager			
Laboratory Technician			
Laboratory Assistant	Laboratory Assistant		
Sampling Officers			
Fleet Management			
Mechanic		2	1
Handyman Mechanic			
Assistant Mechanic			
TOTAL		**34**	**7**

General Information on Race, Gender and Disability

While conducting the Skills Audit it was necessary to gather biographical information on the staff in the water department. This enabled a view of the demographics of the department to be assessed, which can be repeated from time to time, to assist the department to monitor its compliance with legislative requirements. For example **Table 71**, **Table 72** and **Table 73** were extracted from the data gathered and are reproduced here to demonstrate additional advantages of the skills audit methodology.

Table 71 Moses Kotane LM – Sample representivity by race

Race	Number	Percentage
African	32	100%
Grand Total	**32**	**100%**

Table 72 Moses Kotane LM – Sample representivity by gender

gender	Number	Percentage
Female	1	3%
Male	31	97%
Grand Total	**32**	**100%**

Table 73 Moses Kotane LM – Sample representivity by disability

disability	disability Other _2	Number	Percentage
None	(blank)	27	84%
None Total		**27**	**84%**
Yes	Physical	1	3%
	Asthma	1	3%
	Cancer	1	3%
	Epilepsy	1	3%
	Hearing	1	3%
Yes Total		**5**	**16%**
Grand Total		**32**	**100%**

5.5.3 The Capacity Gap

The capacity gap is calculated by subtracting the supply of capacity (**Table 70** on **page 159**) after considering minimum qualification requirements from the demand for capacity (**Table 65** on **page 149**). The capacity gap for Moses Kotane LM is shown in **Table 74** overleaf.

In summary **Moses Kotane LM water department has a Skills Gap of 76 staff, or 92%.** This demonstrates at least one aspect that contributes to Moses Kotane LM's failure to achieve either Blue or Green Drop status in recent years, one of its obligations as a WSA.

Table 74 Capacity gap at Moses Kotane LM after considering minimum qualification requirements

Meaningful Job Titles for Water Sector	Moses Kotane LM Job Titles	Required	Actual	Qual Y/N	Gap
Water Services Authority Manager	HoD Infrastructure and Technical	1	1	1	
Planning and Design Office					
Engineer		2			2
Technologist		2			2
Technician (Civil)					
Process Engieer					
Process Technologist					
Process Technician					
Draughtsperson		2			2
GIS Operator		1			1
Engineering Surveyor		1			1
Engineering Surveyor Assistant		1			1
Infrastructure Provision	Head of Unit PMU	1			1
Engineer: Project Manager	Technician PMU	4			4
Technologist: Project Manager					
Technician: Project Manager					
Operations					
Engineer	Head of Unit	2	2	1	1
Technologist	Technician Water Loss Management	1			1
Technician (Civil)	Technician Distribution networks	4	1	0	4
Technician (Instrumentation)					
Foreman (Networks)	Supervisor networks (inc. Sewers)	2	3	2	
Artisan (Plumber)	Artisan Distribution Networks	9	3	1	8
Handyman (Plumber)					
Artisan Assistant (Plumber)	Special Workman Plumbing	9	8	0	9
Foreman (Mech/Civil)	Supervisor Water Loss		2	0	
Artisan (Mech Pipelines)					
Artisan (Mech Fitter)		5			5
Handyman (Fitter)					
Artisan Assistant (Mech Fitter)		5			5
Artisan Asssistant (Mech Pipelines)					
Foreman (Instrumentation)					
Artisan (Instrumentation)		5			5
Foreman (Electrical)					
Artisan (Electrical)		5			5
Handyman (Electrical)					
Artisan Asssistant (Electrical)					
SHEQ Co-ordinators					
Dams/Water Treatment					
Superindentendant (Dams)	Supervisor Water Treatment	2	2	0	2
Assistant Superintendant (Dams)	Supervisor Sewer Treatment		1	0	
Plant Superintendant					
Process Controller / Operator	Artisan Water Treatment	9	5	1	8
Shift Attendant	Artisan Sewer treatment		4	0	
Scientific Services					
Hydrobiologist	Technician Water Quality	2			2
Microbiologist	Scientist	1			1
Chemist		1			1
Quality Assurance Manager					
Laboratory Technician		1			1
Laboratory Assistant	Laboratory Assistant	1			1
Sampling Officers					
Fleet Management					
Mechanic		2	2	1	1
Handyman Mechanic					
Assistant Mechanic		2			2
TOTAL		**83**	**34**	**7**	**76**

5.5.4 Determination of the Demand for Skills

The demand for skills is presented in a skills matrix. As Moses Kotane LM has over 15 technical job titles, their skills matrix is too large to include in this document. The reader is referred to the relevant report for the Moses Kotane LM skills matrix. However, an example of a skills matrix for BOCMA can be found in **section 5.3.4**.

5.5.5 Determination of the Supply of Skills and the Skills Gap

The **supply of skills** was determined for Moses Kotane LM as per the method outlined in **section 2.5**. The results of the supply of skills and skills gap at Moses Kotane LM is shown in **Tables 75 to 79** and **Figures 35 to 38** that follow.

Table 79 shows the supply of skills at Moses Kotane LM to be 45% and the skills gap to be 55%.

Tables 75 to 79 and **Figures 35 to 38** were produced from the data provided by the individual staff members as recorded in the online skills audit survey system. Database analysis formulae were written by the research team which drew information from various parts of the database to compile each results table. While the tables that follow contain results describing the supply of skills and gaps the outputs are best viewed in graphs where the extent of skills, competencies and gaps is immediately apparent and makes a lasting impression.

Results are consistently shown in the order of Functions and Competencies in the Water Sector Competency Framework.

The following results are presented for Moses Kotane LM:

*Example analysis of an individual at **Skill** level showing further training required*

Table 75 shows the Personal Development Plan, referred to as "training Intervention Required", for an anonymous individual technical staff member using the agreed scores for the individual as compared to the required scores for the

job from the skills matrix. The left hand column indicates where the individual is fully competent, where formal training or further workplace exposure to the skill is required, or where skills are completely lacking. The columns to the right of this indicate which function, competency cluster, competency and skill are under consideration.

*Example analysis of an <u>individual</u> at **Competency** level*

Table 76 and **Figure 35**, and **Table 77** and **Figure 36,** show the results of the analysis for the same individual at a competency level, rather than individual skill level. The results are presented by score and then by percentage. The results using scores paint a more realistic picture of the relative total score per competency. The results using percentage set competencies at 100%, which belies a situation where that competency only has one required skill (5 points) but another had many more required skills (possibly 50 points).

*Analysis across the <u>institution</u> sample by Function then **Competency Cluster***

Tables 78 and **Figure 37,** and **Table 79** and **Figure 38,** combine the results for all technical staff at Competency Cluster level to show the Competency across the WSI as a whole. The results are presented by score and then by percentage. The results using scores paint a more realistic picture of the relative total score per competency. The results using percentage set competencies at 100%, which belies a situation where that competency only has one required skill (5 points) but another had many more required skills (possibly 200 points). The average of the total Competency scores for all staff measured against the required Competency scores as per the job titles provides the Skills Gap for the institution.

Table 75 Analysis of an anonymous Moses Kotane LM technical staff member by Training Intervention Required

Training Intervention Required	Function	Competency Cluster	Competency	Skill
Competent - No action required (5)	Water Services O&M	WS Networks O&M	O&M of Networks including Pumps	Provide customer connections, valves and meters.
				Repair pipe breaks in reticulation network.
Further workplace exposure required (4)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Check operation of all valves and valve stem packing.
				Maintain plant performance and maintenance process records.
		WS Networks O&M	O&M of Networks including Pumps	Construct and repair manholes.
				Inspect equipment.
				Inspect water mains pipe connections.
				Inspect water mains.
				Refurbish and replace infrastructure.
Formal training required (3)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Maintain electrical switchgear.
				Organise and manage corrective maintenance activities (breakdowns) as required.
		WS Networks O&M	O&M of Networks including Pumps	Calculate annual operating, maintenance and repair budgets.
				Commission flow meters and Telemetry System.
				Ensure flushing and disinfection of repaired sections to meet potable water standards.
				Inspect pipe bridges.
				Install flow meters and Telemetry Systems.
				Maintain pumps and valves.
				Manage fluctuating water levels and pressures.
				Read and record flow measuring equipment.
				Supervise assets.
				Test and replace flow measuring equipment.
				Undertake audits of tools and equipment.
				Verify and sign off subcontractors completed work.
Formal training and FURTHER workplace exposure required (2)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Commission new and modified equipment.
				Implement preventative maintenance servicing of pumps and motors according to specifications.
		WS Networks O&M	O&M of Networks including Pumps	Implement shut down procedures for all pumps.
				Implement start up procedures for all pumps.
				Write shut down procedures for all pumps.
				Write start up procedures for all pumps.
Formal training and workplace exposure required (1)	Water Services O&M	WS Bulk O&M	O&M of WTWs	Calculate annual operating, maintenance and repair budgets.
				Manage a WTW to achieve Blue Drop Certification.
				Manage the overall WTW function (to comply with legislation).
				Monitor and adjust pump and clarifier performance to match inflows.
Formal training and worklace exposure required (0)	Water Services O&M	WS Networks O&M	O&M of Networks including Pumps	Construct and repair inspection chambers.
				Inspect manholes.
			Water Loss Management	Encourage public to report water losses from municipal systems
				Ensure flushing and disinfection of repaired sections to meet potable water standards.

Table 76 Analysis of an anonymous Moses Kotane LM technical staff member by Competency presented by score

Function	Competency Cluster	Competency	Supply of Skills (Using Final Score) (Score)	Skills Gap (Using Final Score) (Score)
Water Services O&M	**WS Bulk O&M**	O&M of WTWs	12	18
	WS Networks O&M	O&M of Networks including Pumps	67	43
		Water Loss Management	0	10
Grand Total			**79**	**71**

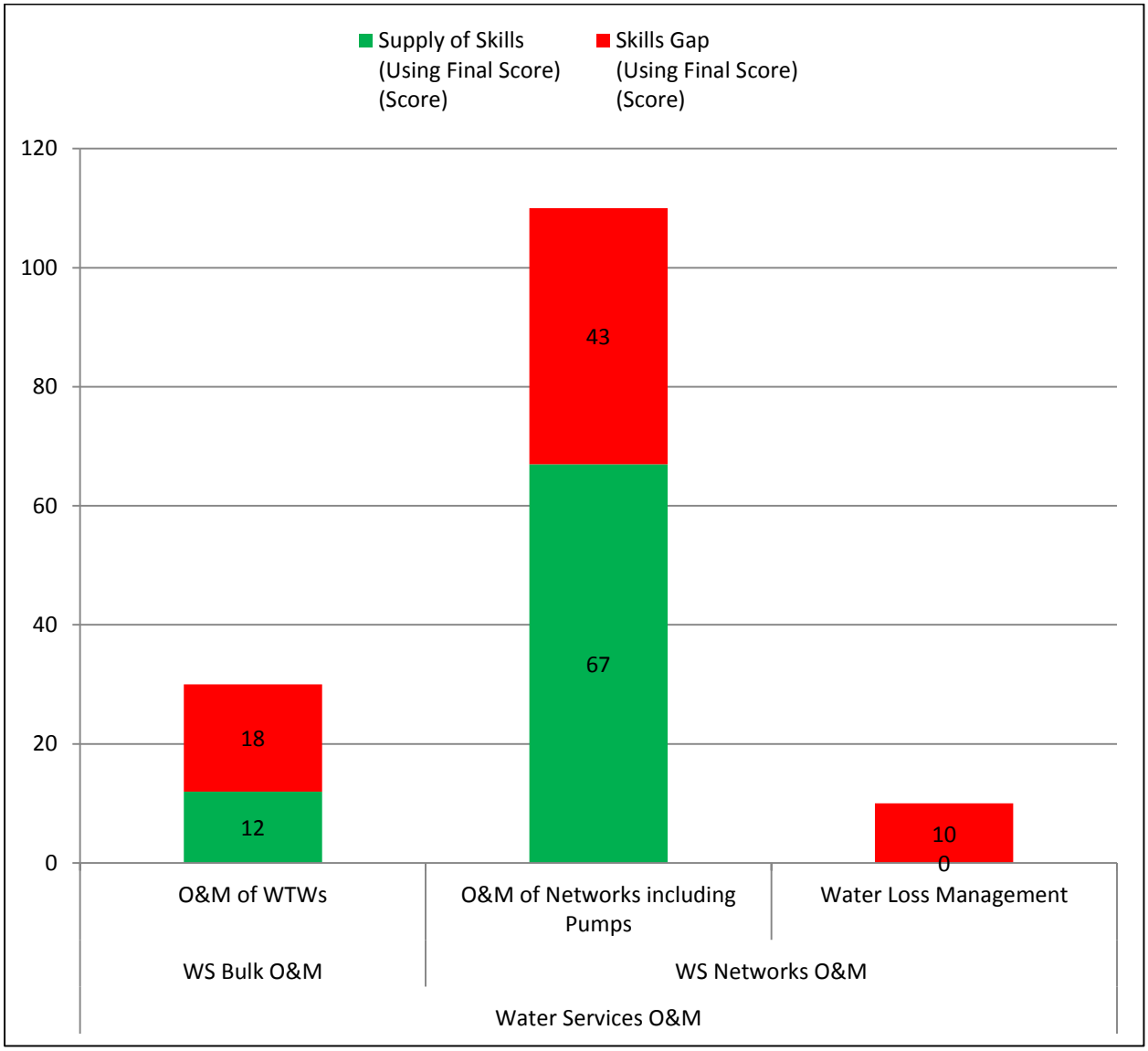


Figure 35 Graph showing analysis of an anonymous Moses Kotane LM technical staff member by Competency presented by score

Table 77 **Analysis of an anonymous Moses Kotane LM technical staff member by Competency presented by percentage**

Function	Competency Cluster	Competency	Supply of Skills (Using final Score) (%)	Skills Gap (Using Final Score) (%)
Water Services O&M	**WS Bulk O&M**	O&M of WTWs	40%	60%
	WS Networks O&M	O&M of Networks including Pumps	61%	39%
		Water Loss Management	0%	100%
Grand Total			**53%**	**47%**

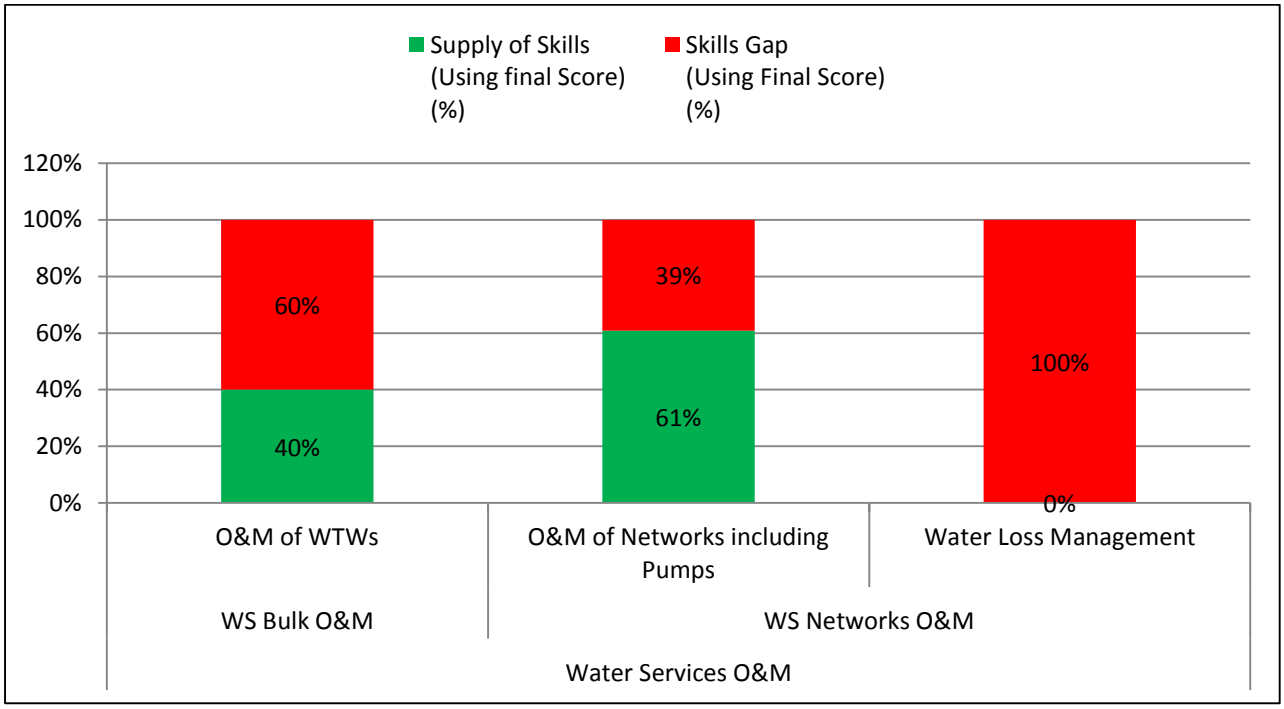


Figure 36 **Graph showing analysis of an anonymous Moses Kotane LM technical staff member by Competency presented by percentage**

Table 78 Analysis across the Moses Kotane LM sample by Functions then Competency Cluster presented by score

FUNCTION/COMPETENCY CLUSTER	Supply of Skills (Using Final Score) (Score)	Skills Gap (Using Final Score) (Score)
Functional Management	**24**	**26**
Water Services Regulation	**42**	**253**
WS Policy and Guidelines	0	40
WS Regulation or Bylaws	8	67
WS Compliance Monitoring and Enforcement	34	146
Water Services O&M	**1918**	**1587**
WS Bulk O&M	432	423
WS Networks O&M	1475	1010
WS Incident Management	11	154
Sanitation/ Wastewater Regulation	**12**	**38**
S/WW Regulation or Bylaws	12	18
S/WW Compliance Monitoring and Enforcement	0	20
Sanitation/ Wastewater O&M	**303**	**922**
Dry Sanitation O&M	0	30
Wastewater Networks O&M	37	323
Wastewater Bulk O&M	266	414
S/WW Incident Management	0	155
Grand Total	**2299**	**2826**

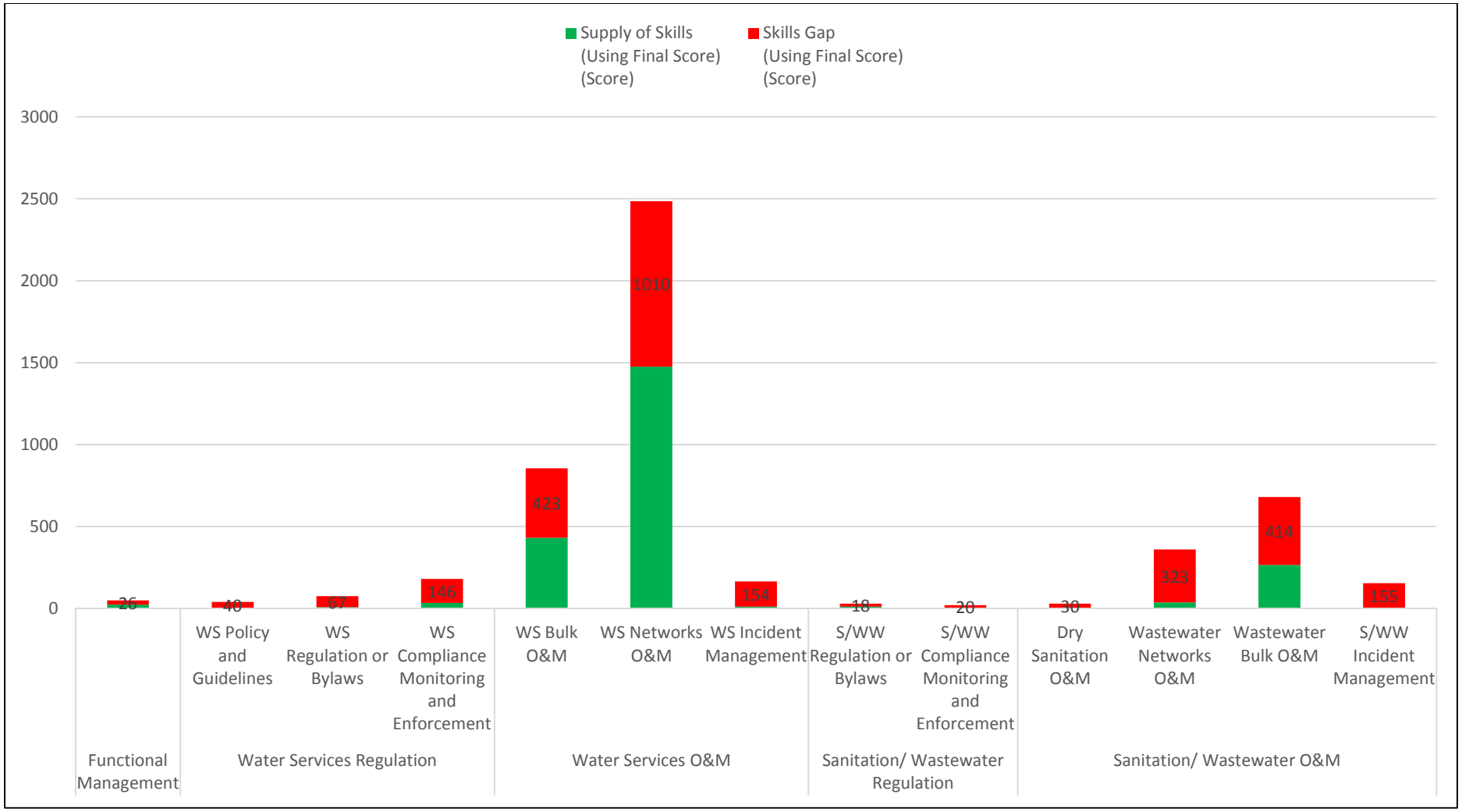


Figure 37 Graph showing analysis across the Moses Kotane LM sample by Function then Competency Cluster presented by score

Table 79 Analysis across the Moses Kotane LM sample by Function then Competency Cluster presented by percentage

FUNCTION/COMPETENCY CLUSTER	Supply of Skills (Using Final Score) (%)	Skills Gap (Using Final Score) (%)
Functional Management	**48%**	**52%**
Water Services Regulation	**14%**	**86%**
WS Policy and Guidelines	0%	100%
WS Regulation or Bylaws	11%	89%
WS Compliance Monitoring and Enforcement	19%	81%
Water Services O&M	**55%**	**45%**
WS Bulk O&M	51%	49%
WS Networks O&M	59%	41%
WS Incident Management	7%	93%
Sanitation/ Wastewater Regulation	**24%**	**76%**
S/WW Regulation or Bylaws	40%	60%
S/WW Compliance Monitoring and Enforcement	0%	100%
Sanitation/ Wastewater O&M	**25%**	**75%**
Dry Sanitation O&M	0%	100%
Wastewater Networks O&M	10%	90%
Wastewater Bulk O&M	39%	61%
S/WW Incident Management	0%	100%
Grand Total	**45%**	**55%**

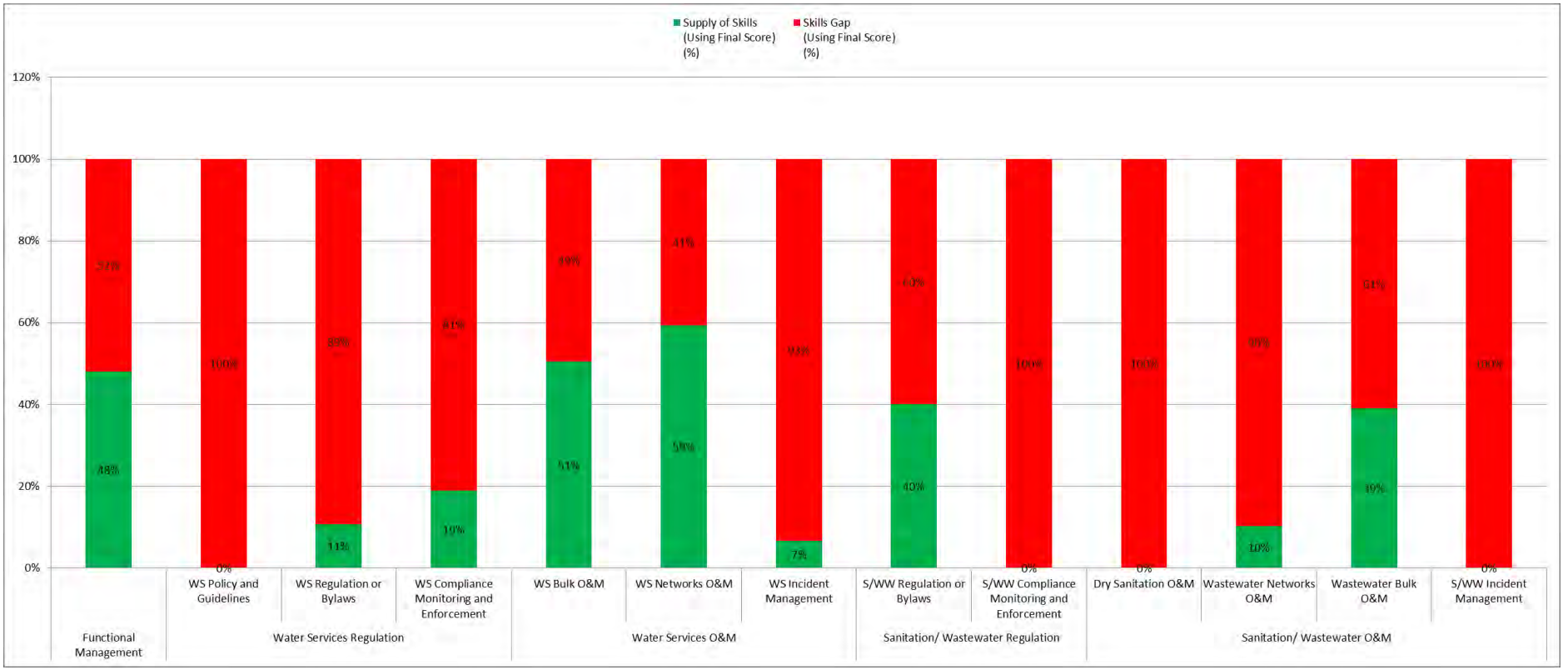


Figure 38 Graph showing analysis across the Moses Kotane LM sample by Function then Competency Cluster presented by percentage

5.6 Level 2 Assessments: Technical Findings

Relevant report:

Deliverables 4 and 7: – Report on the Level 2 Assessment

5.6.1 Determining the Demand for Capacity

The demand for capacity for 18 WSIs was to be carried out as per the method outlined in **section 2.1**. However, due to a limited research budget, it was only possible to interview the technical managers. The research team had assumed the following information would be accessible at WSIs but it turned out that the assumption was incorrect.

- *planning: number of planning regions;*
- *infrastructure provision: water and sanitation capital budget per annum;*
- *WTWs: a listing of WTWs works with their class;*
- *water distribution: length of water pipelines in kilometers (kms);*
- *sewer collection and dry sanitation: length of sewer pipelines in kilometers (kms) and number of dry sanitation units respectively;*
- *WWTWs: a listing of WWTWs works with their class.*

A few institutions said they could not provide the information. Although other institutions said they could and would provide some or all of the information, the information was in the end not obtained. The extent of responsibility could thus not be determined.

As the demand for capacity was not determined in the 18 level 2 assessment institutions, findings could not be extrapolated to determine the demand for capacity nationally.

None the less, the interviews with technical managers which provided information of which responsibilities are outsourced to the private sector was obtained. The information obtained in these interviews is reported on hereunder.

The collection of information took place during face-to-face interviews with relevant technical managers or staff at the institutions' water divisions. The technical questionnaire used to guide discussions can be found in **Appendix A**. Interviews where held with the following individuals on the date/s indicated in **Table 80**.

Table 80 Level 2 – Names of technical managers interviewed and dates of interviews

	Type of Institu-tion	Name of Institution	Position of Interviewee	Date of Interview
1	DWS	DWS		
2	CMAs	"Prototype" CMA		
3	WUAs	1. Oranje-Riet WUA (NC)	CEO, and Financial Manager and Head of Operations	02 Mar 2012 and 2013
		2. Groenland WUA (WC)	CEO	01 Feb 2012 and 2013
4	Water Boards	3. Amatola Water (EC)	IWRM Manager	31 Jan 2012 and 2013
		4. Botshelo Water (NW)	Manager: Treatment Plants	07 Feb 2012
5	WSAs	5. Tshwane Metro (GP)	Manager: Operations	21 Feb 2012 and 2013
		6. Capricorn DM (LP)	Manager: Planning	19 Feb 2012
		7. Ngaka Modiri Molema DM	WSA Manager	07 Feb 2012
		8. Ehlanzeni DM (MP)	Deputy Manager: Water Sector Support	15 Feb 2012
		9. iLembe DM (KZN)	Planning Staff	27 Jan 2012
		Thabazimbi LM (LP)	*	*
		Ditsobotla LM (NW)	*	*
		10. Newcastle LM (KZN)	WSA Manager	26 Jan 2012
		11. Maluti-a-Phofung LM (FS)	MAP Water Engineer	25 Jan 2012
		12. Sol Plaatje LM (NC)	WSA Manager	02 Mar 2012 and 2013
		13. Cape Agulhas LM (WC)	Manager: Solid Waste & WQ	01 Feb 2012 and 2013
		14. Blue Crane Route (EC)	Technical Manager	31 Jan 2012 and 2013
	TOTAL	**PARTICIPANTS: 14**		

***** *Institutions which did not participate or withdrew from the process with regards to the technical aspects of the project.*

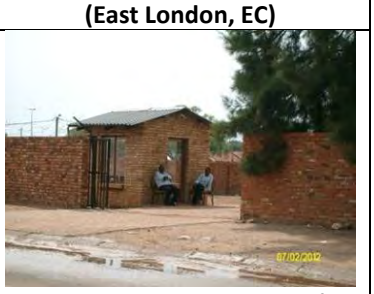
Oranje-Riet Offices
(Jacobsdal, NC)

CEO Mr Theo Lotter
Groenland WUA
(Grabouw, WC)

Mr Sig Rossouw
Amatola Water
(East London, EC)

Botshelo Water offices
(Mahikeng, NW)

Capricorn DM offices
(Polokwane, LP)



Ngaka Modiri Molema DM's
Water Office
(Mmabatho, NW)

Mr Moses Makhwenyane
(Ehlanzeni DM, MP))

Satellite water office for
iLembe DM
(Stanger, KZN)

Maluti-a-Phofung Water
(Harrismith, KZN)

Mr Derick Karsten
Sol Plaatje LM
(Kimberley, NC)

Mr Walter Linnert
Cape Agulhas LM
(Bredasdorp, WC)

Mr Luzuko Ntlabezo
Blue Crane Route LM
(Somerset East, EC)

Figure 39 Photos taken during visits to institutions in the level 2 assessment

Master Planning

Table 81 shows that just under 100% of master planning work is being outsourced by public WSIs to the private sector or, conversely stated, almost no master planning work is being done in-house by public WSIs. Minimal master planning staff would thus be required inside the public sector institutions however, either the Water Services Authority Manager or a deputy master planning engineer/ technologist/ technician with the required skills, would still be required to manage the outsourced master planning contracts and quality of work.

Table 81 Level 2 – Percentage of master planning work not performed in-house by WSIs

Institutional Type	No. of Respon-dent	Institution Name	Master Planning/ WR Planning	
			In-house	Outsourced
WUA	1	Oranje-Riet WUA (NC)		n/a
	2	Groenland WUA (WC)		n/a
Water Board	3	Amatola Water (EC)	10%	90%
	4	Botshelo Water (NW)		Not being done
WSA	5	Tshwane Metro (GP)	20%	80%
	6	Capricorn DM (LP)		100%
	7	Ngaka Modiri Molema DM		100%
	8	Ehlanzeni DM (MP) (not a WSA)		Support LMs
	9	iLembe DM (KZN)		100%
	10	Newcastle LM (KZN)		Not being done
	11	MAP Water (Maluti-a-Phofung LM (FS))		100%
	12	Sol Plaatje LM (NC)		100%
	13	Cape Agulhas LM (WC)		100%
	14	Blue Crane Route (EC)		100%

Standard Drawings and Design Guidelines and As-built drawing and Information Management

None of the WSIs, except Tshwane Metro, could provide a booklet showing their design guidelines and standard drawings, although it is believed that Amatola Water might have these documents.

As can be seen in **Table 82** the matter of whether the institution has a drawing office with appropriate software to check electronic drawings received from consultants varied from institution to institution. However, except for Tshwane Metro and Amatola Water, water schematic of schemes layouts and as-built drawings could not easily be provided on disk to the research team. It would take the institutions a long time to give an overview of the water and sewer systems from a combination of hard copy plans, provide the information verbally or phone around to private sector consultants for the information.

Table 82 Level 2 – Handling of standard drawings, design guidelines, management of as-built drawings and general information

No. of Respon-dent	Institution Name	Standard Drawings, Design Guidelines, Mgt of As-built Drawings and Information			
		Design Guidelines	Standard Drawings	Management of As-built	Information Management
1	Oranje-Riet WUA (NC)				Drawing office uses CADDIE. WAS system is used a lot.
2	Groenland WUA (WC)			Only kept on hard copy.	No drawing office.
3	Amatola Water (EC)				Drawing office uses Civil Designer.
4	Botshelo Water (NW)			Only kept on hard copy.	
5	Tshwane Metro (GP)	Yes.	Yes.	All electronic submissions from consulants are checked.	Drawing office uses AutoCAD and GIS.
6	Capricorn DM (LP)				No drawing office.
7	Ngaka Modiri Molema DM				One person can use GIS.
8	Ehlanzeni DM (MP) (not a WSA)				Still suppoting LMs to establish drawing offices.
9	iLembe DM (KZN)			Consultants submit on disk but electronic drawings not checked.	No drawing office.
10	Newcastle LM (KZN)				
11	Maluti-a-Phofung LM (FS)				MAP Water uses Planet GIS.
12	Sol Plaatje LM (NC)				Drawing office uses CADDIE.
13	Cape Agulhas LM (WC)				No drawing office.
14	Blue Crane Route (EC)			Only kept on hard copy.	No drawing office.

Detailed Design

Table 83 shows that only WUAs get by with making their own decisions regarding detailed design. In the case of water boards and municipalities just under 100% of detailed design work is being outsourced by public WSIs to the private sector or, conversely stated, very little detailed design work is being done in-house by public WSIs. Minimal design staff would thus be required inside the public WSIs however, either the Water Services Authority Manager or a deputy projects engineer/ technologist/ technician with the required skills, would still be required to manage the outsourced design contracts and quality of work.

Table 83 Level 2 – Percentage of detailed design work not performed in-house by WSIs

No. of Respon-dent	Institution Name	Detailed Design	
		In-house	Outsourced
1	Oranje-Riet WUA (NC)	100%	
2	Groenland WUA (WC)	100%	
3	Amatola Water (EC)	20%	80%
4	Botshelo Water (NW)		100%
5	Tshwane Metro (GP)	20%	80%
6	Capricorn DM (LP)	10%	90%
7	Ngaka Modiri Molema DM		100%
8	Ehlanzeni DM (MP) (not a WSA)		Support LMs
9	iLembe DM (KZN)		100%
10	Newcastle LM (KZN)		100%
11	MAP Water (Maluti-a-Phofung LM (FS))		100% outsourced by PMU
12	Sol Plaatje LM (NC)		100%
13	Cape Agulhas LM (WC)		100%
14	Blue Crane Route (EC)		100%

Construction

Table 84 shows that only WUAs are self-sufficient regarding having the personnel and equipment to manage 100% of construction work in-house. In the case of water boards and municipalities, besides a small municipality in the Western Cape and Tshwane Metro who have small in-house construction teams who do 30% and 20% of respectively, all other WSAs outsource 100% of construction work to private sector contracts or, conversely stated, very little construction work is being done in-house by public WSIs. No construction staff would thus be required inside the public WSIs however, either the WSA Manager, a deputy projects engineer/technologist/technician or works inspectors with the required skills, would still be required to manage the outsourced construction contracts and quality of work.

Table 84 Level 2 – Percentage of construction work not performed in-house by WSIs

No. of Respon-dent	Institution Name	Construction	
		In-house	Outsourced
1	Oranje-Riet WUA (NC)	100%	
2	Groenland WUA (WC)	100%	
3	Amatola Water (EC)		100%
4	Botshelo Water (NW)		100%
5	Tshwane Metro (GP)	20%	80%
6	Capricorn DM (LP)		100%
7	Ngaka Modiri Molema DM		100%
8	Ehlanzeni DM (MP) (not a WSA)		Support LMs
9	iLembe DM (KZN)		100%
10	Newcastle LM (KZN)		100%
11	MAP Water (Maluti-a-Phofung LM (FS))		100% outsourced by PMU
12	Sol Plaatje LM (NC)		100%
13	Cape Agulhas LM (WC)		100%
14	Blue Crane Route (EC)	30%	70%

Operations and Maintenance

Almost all master planning, detailed design and construction is outsourced by public WSIs to the private sector, except for WUAs who do all planning, detailed design and construction in-house. However, the trend is reversed with operations and maintenance. **Table 85** shows that most public water sector institutions do most operations and maintenance in-house with only specialised work being outsourced. Only one of fourteen institutions outsourced a large part of operations and maintenance and that was iLembe DM in KZN.

Table 85 Level 2 – Percentage of O&M work not performed in-house by WSIs

No. of Respon-dent	Institution Name	Operations and Maintenance	
		In-house	Outsourced
1	Oranje-Riet WUA (NC)	100%	
2	Groenland WUA (WC)	100%	
3	Amatola Water (EC)	90%	10%
4	Botshelo Water (NW)	95%	5%
5	Tshwane Metro (GP)	80%	20%
6	Capricorn DM (LP)		100% outsourced to LMs.
7	Ngaka Modiri Molema DM	80%	20%
8	Ehlanzeni DM (MP) (not a WSA)		Support LMs
9	iLembe DM (KZN)	Dry sanitation: 100%	Processes services outsourced to WSSA. Ops outsourced to Siza Water. Bulk Water outsourced to Umgeni Water.
10	Newcastle LM (KZN)		100% outsourced to Uthukela Water (municipal entity).
11	Maluti-a-Phofung LM (FS)		100% outsourced to MAP Water (municipal entity).
12	Sol Plaatje LM (NC)	70%	30%
13	Cape Agulhas LM (WC)	60%	40%
14	Blue Crane Route (EC)	90%	10%

Water Quality Testing

Table 86 shows that except for the two large institutions, Tshwane Metro and Amatola Water, almost no other institutions have their own laboratories and thus use private laboratories to conduct their water quality testing.

Table 86 Level 2 – WSIs who have own laboratory or use private laboratories for water quality testing

Institutional Type	No. of Respon-dent	Institution Name	Water Quality Testing	
			Own lab	Use private labs
WUA	1	Oranje-Riet WUA (NC)		Yes
	2	Groenland WUA (WC)		Yes
Water Board	3	Amatola Water (EC)	Yes	Yes
	4	Botshelo Water (NW)		Yes
WSA	5	Tshwane Metro (GP)	Yes	Yes
	6	Capricorn DM (LP)		Yes
	7	Ngaka Modiri Molema DM		Yes
	8	Ehlanzeni DM (MP) (not a WSA)		Yes
	9	iLembe DM (KZN)		Yes
	10	Newcastle LM (KZN)		Yes
	11	Maluti-a-Phofung LM (FS)		Yes
	12	Sol Plaatje LM (NC)	Yes	Yes
	13	Cape Agulhas LM (WC)		Yes
	14	Blue Crane Route (EC)		Yes

5.6.2 Determination of the Supply of Capacity

The supply of capacity was obtained per WSI through the HR work for the level 2 assessment in the form of spreadsheets from each WSI with the fields outlined in **section 2.2**. Organograms were also obtained, recaptured in SMARTDRAW organogram software and checked against the staff lists obtained in the form of spreadsheets mentioned.

Even though the supply of capacity per WSI was obtained, the totals per job title in supply for the entire sample could not be summated. This was due to the job titles varying from WSI to WSI for the same job. For example in WSI #1 there were two plumbers in supply but the entry in the spreadsheet showed "Network Plumber". In WSI #2 there were four plumbers in supply but in that WSIs spreadsheet the entries showed two as "Special Workman: Water" and two as "Artisan: Pipelines". The research team did not have the time or budget to interrogate all the variations and align the job titles. As a sample total could not be obtained it was not possible to extrapolate to national level.

5.6.3 The Capacity Gap

On a WSI level the supply of capacity was determined but not the demand for capacity. As the demand for capacity was not determined, it was not possible to subtract the supply to determine the capacity gap.

With regards to the sample of 14 WSIs the demand for capacity could not be determined due to a lack of information relating to the extent of responsibility. With regards to the supply of capacity this could not be totaled for reasons provided in **section 5.6.2** above. With no demand and no supply figures for the sample no gap could be determined. Neither could these be extrapolated to a national level.

5.7 Level 2 Assessments: HR-Related Findings

Capacity is directly affected by the enabling or disabling environment created by the WSI as a whole. As such the research team interviewed HR managers for information relating to past skills audits, HR Resource Planning and organograms, vacancies, job profiles, HR-related policies, training budgets, HR information systems, required qualifications, gender, race and disability.

The HR questionnaire used at each WSI was the same standard questionnaire used for the institutions in the level 1 assessment and can be found in **Appendix B**.

The HR work under the level 2 assessment only included 14 institutions as a final sample as listed in **Table 87**.

Table 87 Level 2 – List of institutions who participated in the HR part of the assessment

	Type of Institu-tion	Name of Institution	Position of Interviewee	Date of Interview
1	DWS	DWS		
2	CMAs	"Prototype" CMA		
3	WUAs	Oranje-Riet WUA Groenland WUA	CEO and Financial Manager CEO	02 Mar 2012 01 Feb 2012
4	Water Boards	Amatola Water Botshelo Water	HRD Manager HR Manager and SDF	31 Jan 2012 08 Feb 2012
5	WSAs	Tshwane Metro Capricorn DM (LP) Ngaka Modiri Molema DM (NW) Ehlanzeni DM (MP) iLembe DM (KZN) Thabazimbi LM (LP) Ditsobotla LM (NW) Newcastle LM (KZN) Maluti-a-Phofung LM (FS) Sol Plaatje LM (NC) Cape Agulhas LM (WC) Blue Crane Route (EC)	W&S Office Admin & Support Acting HR Manager HR Manager and SDF SDF * * HR Controller and SDF HR Development Office* Acting HR Manager and Director: CS SDF HR Manager and SDF SDF	21 Feb 2012 17 Feb 2012 08 Feb 2012 15 Feb 2012 * * 08 Feb 2012 26 Jan2012* 26 Jan 2012 02 Mar 2012 01 Feb 2012 30 Jan 2013
	TOTAL	**PARTICIPANTS: 14**		

***** *Institutions which did not participate or withdrew from the process with regards to the HR aspects of the project*

5.7.1 Skills Audits

It was identified that, of the 14 institutions that participated in this phase of the research, 10 had conducted a skills audit in the last five years. Of these 10 institutions, six (6) also participated in the CoGTA skills audit. One institution cited that the final report of their skills audit was rejected by management. Reasons for the rejection were not provided. Only four (4) institutions have not conducted a skills audit within the last five years.

Seven (7) institutions indicated that they conduct their own internal skills audits on an annual basis. The procedure consists of a manual process that involves either the use of interviews or questionnaires and the information is then captured into the Workplace Skills Plan (WSP). Copies of their actual skills audit questionnaire and process methodology were only provided by one institution. As a result, further in-depth analysis of whether training needs were specific to the job title, linked to skills gaps, and whether the process was effective or not, could not be determined. Where information was provided, the institution indicated that line managers conduct a competency assessment on staff members and this information is captured in CAPMAN, the HRMIS, and then drawn into the WSP. It seems that each institution follows their own methodology, and details of the processes followed are provided in **Table 88** overleaf.

Based on the different processes followed by the various institutions, a need exists to use a standardised instrument to assess employees at all levels in order to develop an effective skills development approach thereby enabling the compilation of a comprehensive and national skills database and to gain commitment from all institutions towards this process.

Table 88 Level 2 – Summary of skills audits carried out per WSI

Institution	Skills audit conducted?	Process followed
Oranje-Riet WUA	No	Not applicable
Groenland WUA	No	No need due to the limited staff.
Amatola Water Board	Yes	Not specified
Botshelo Water Board	Yes	In-house skills audits are done annually as part of the WSP process. A manual process is followed where individual interviews are conducted by the Skills Development Facilitator (SDF). Training that was completed is listed and further training needs are identified. A draft WSP is then presented to the training committee and the HR Manager. The HR Manager and union representative signs off the final document.
Tshwane Metro	Yes	Questionnaires were sent out to assess skill levels. Skills levels and training gaps were identified and training interventions were designed but only for specific groups.
Capricorn DM	Yes	The municipality participated in the CoGTA skills audit project.
Ngaka Modiri Molema DM	Yes	The municipality participated in the CoGTA skills audit in 2009/2010.
Ehlanzeni DM	Yes	The municipality conducted an internal skills audit and also participated in the CoGTA skills audit. In terms of the internal process, an e-mail is sent out with a form asking what training individuals require and this information is then used to inform the WSP.
Ditsobotla LM	Yes	A skills audit is conducted annually and the municipality also participated in the CoGTA skills audit in 2009/2010. In terms of the internal skills audit, individual interviews are conducted with all staff. Questionnaires are paper based and filed per department. Common needs are identified and then a draft WSP is presented to the training committee. The approved WSP is then submitted.
Newcastle LM	No response received	Not applicable.
Maluti-a-Phofung LM	No	The municipality is considering appointing a consultant to conduct a skills audit.
Sol Plaatje LM	Yes	The municipality participated in the CoGTA skills audit and conduct their own audit annually. Line managers conduct a competency assessment on each employee. The information is then captured on CAPMAN and drawn into the WSP.
Cape Agulhas LM	Yes	A skills audit is done on an annual basis. Each staff member is interviewed and the interview is linked to the IDP for the municipality. This information is then captured into the WSP.
Blue Crane Route LM	Yes	The municipality participated in a questionnaire distributed by SALGA.

5.7.2 Organograms

All WSIs in the sample indicated that they have organograms for the Technical/Engineering/Water and Services departments. Of the 14 institutions that submitted their organograms there was a diversity of management and structural change underway. The period of time lapsing between structured

reviews of the organograms ranged from those taking place on a monthly to a yearly basis, or every five years or as and when restructuring takes place (four WSIs have implemented structural changes in the last four years).

In terms of resource planning, seven (7) institutions indicated that they do resource planning, five (5) indicated that they do not carry out resource planning and one (1) institution presented that they were not sure.

Of the institutions that perform this function, four (4) indicated that this is done annually, two (2) were busy with the process and the last institution indicated that they only do resource planning for high level positions.

Table 89 provides a summary of which institutions have organograms and which carry out resource planning.

Table 89 Level 2 – Summary of WSIs in the sample with organograms and those who carry out human resource planning

Institution	Organograms	Last updated? How often updated?	Resource planning	How often? When was the last time?
1. Oranje-Riet WUA	Yes			
2. Groenland WUA	Yes			
3. Amatola Water Board	Yes	Updated every financial year.	Yes	Updated on a yearly basis. Last updated in July 2011.
4. Botshelo Water Board	Yes	Updated in 2011.	Yes	Current review has been outsourced.
5. Tshwane Metro	Yes			
6. Capricorn DM	Yes	Last update was done in December 2009.	Yes	Annually. Last updated in 2011.
7. Ngaka Modiri Molema DM	Yes	Last updated in 2009.	Yes	Supposed to be done annually, last done in 2009.
8. Ehlanzeni DM	Yes			
9. Ditsobotla LM	Yes			
10. Newcastle LM	Yes		Yes	Currently busy.
11. Maluti-a-Phofung LM	Yes	Regularly updated.	Yes	Done only at high level.
12. Sol Plaatje LM	Yes			
13. Cape Agulhas LM	Yes	Updated every 5 years. Last updated in August 2011.	Yes	Annually. Last updated in June 2011.
14. Blue Crane Route LM	Yes			

Empty cells in the Table indicate that no response was received.

It is good HR practice to have alignment between human resource planning and structured reviews of the organogram. Of the 14 WSIs in the sample, only

Amatola Water Board, the Ngaka Modiri Molema DM and the Cape Agulhas LM each show this alignment. All organograms obtained were recaptured in SMARTDRAW by the research team and can be found in the relevant report.

In terms of the organograms, there are inconsistencies in how the data is stored. The following inconsistencies were observed:

- *the job titles in the job profiles do not match the information contained in the biographical data or the information in the organograms*
- *there are job profiles with incumbents' names but there are no details of these positions on the organograms or in the biographical data*
- *the job levels/grades indicated on the organograms do not correlate with the biographical data*
- *organograms differ per department within the same institution in terms of how the information is presented. For example:*
- *some positions provide details of the job grade and level whereas this detail is omitted in an organogram for another department*
- *some organograms provide the gender as well as the highest qualification of the job incumbent, whereas others do not.*

5.7.3 Vacancies

From the HR interviews conducted, more than 50% of the participating institutions stated that they had more than 20 vacancies within the Technical/ Engineering/Water and Sanitation Department.

The separation between technical and non-technical positions was determined from the job profiles provided. However, where no job profiles were provided, the job titles and the hierarchical position of the job within each institution was used to determine if the job was technical or not. General workers, artisan aids and similar positions were considered to be non-technical for the purpose of this research.

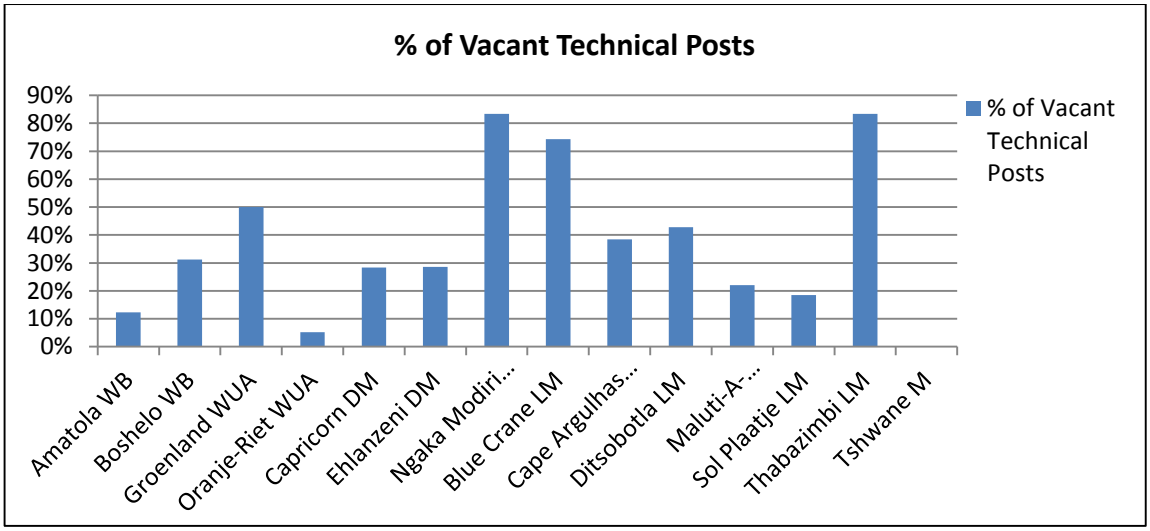


Figure 40 Level 2 – Percentage of vacant technical posts per WSI

In terms of the biographical data provided, the percentages of technical vacancies range between 5% and 83% with Oranje-Riet WUA with the lowest percentage of vacancies and Ngaka Modiri Molema DM in the North West province and Thabazimbi LM in Limpopo province both with a vacancy percentage of 83%.

Considering all positions in the sample including technical and non-technical gives a figure of 24% vacancies as shown in **Table 90**.

Table 90 Level 2 – Total number of filled and vacant posts

Status	Number	Percentage
Filled	2384	76%
Vacant	768	24%
Grand Total	**3152**	**100%**

However, if the vacancies of technical positions only is calculated one would expect the vacancies (by percentage) to be higher than when all positions are considered. However, **Table 91** shows that the vacancies for technical positions is also 24%.

Table 91 Level 2 – Number of technical filled and vacant posts

Status	Number	Percentage
Filled	884	76%
Vacant	272	24%
Grand Total	**1156**	**100%**

For non-technical posts it follows that the results are very similar as can be seen in **Table 92.**

Table 92 Level 2 – Number of non-technical filled and vacant posts

Status	Number	Percentage
Filled	1500	75%
Vacant	496	25%
Grand Total	**1996**	**100%**

The data was analysed to understand whether vacancies were greater in one type of institution or another. Although the Tshwane Metro result cannot be averaged as they were the only Metro in the sample it can be seen from **Table 93** and **Figure 41** that the vacancy rates for all institutions, irrespective of their role in water provision, are fairly consistent. **Figure 41** plots the average of 78% of technical posts being filled and then shows how each type of institution varies off this average. Of particular note is that LMs on average are closer to the average of 78% than DMs.

Table 93 Level 2 – Numbers and percentages of filled and vacant posts per type of institution

Institution Type	Status	Number	% of Institutional Type Total
WUA	Filled	38	93%
	Vacant	3	7%
WUA Total		**41**	**4%**
Water Board	Filled	271	82%
	Vacant	58	18%
Water Board Total		**329**	**28%**
Metro	Filled	139	100%
Metro Total		**139**	**12%**
DM	Filled	267	66%
	Vacant	138	34%
DM Total		**405**	**35%**
LM	Filled	169	70%
	Vacant	73	30%
LM Total		**242**	**21%**
Grand Total		**1156**	**100%**

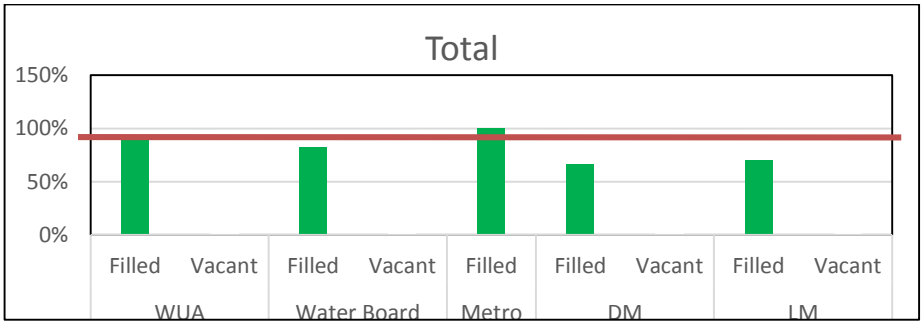


Figure 41 Level 2 – Graphical representation of percentage of filled posts per type of institution

5.7.4 Job Profiles

An analysis of the data reveals that six (6) of the institutions currently have job profiles for all of their positions. However, five (5) institutions indicated that job profiles are only available for some of their positions. One institution does not have any job profiles and another institution indicated that they have job profiles for most of their positions.

In terms of the technical positions, nine (9) institutions indicate that they have job profiles available for these positions and two (2) institutions have job profiles for some of their technical positions. One (1) institution indicated that they have job profiles for most of their technical positions whilst another indicated that they do not have any job profiles.

Of the nine (9) institutions which indicated that they have job profiles for their technical positions, only seven (7) provided profiles.

An analysis of the actual job profiles revealed that in most cases they are detailed and comprehensive, but in some instances not complete. In general, the job profiles were detailed in terms of the job roles, responsibilities as well as technical and minimum requirements but lacked behavioural competencies. Only two (2) institutions made reference to behavioural characteristics but there were no descriptions of these characteristics. For example, reference was made to "leadership and communication skills" but no further information related to this competency was provided.

For most of the institutions, there were inconsistencies in terms of the minimum requirements of the positions. For example, the minimum requirements referred to a Grade 12 or a NQF 6 for a particular position. However, a Grade 12 is equivalent to a NQF 4. Furthermore, in some job profiles the minimum requirements did not relate to the level of the position and some job profiles lack information regarding the job grade, location and department of a specific

position and in most instances there is no indication of when the job profile was completed or updated.

There was a general consistency among the job profiles within a specific institution, but formats of the job profiles differ amongst the various institutions.

In terms of the job profiles, two (2) institutions indicated that they deviated from minimum requirements and the primary reasons for deviation were cited as:

- *the need to meet employment equity targets at a management level, and;*
- *to develop staff internally, but no deviations occur with external applications.*

5.7.5 Recruitment and Selection Policies, Procedures and Process Inhibitors

Of the 14 institutions that participated in the study, 13 had Recruitment and Selection Policy and Procedure in place. The only institution that did not have a policy and procedure in place indicated that their Employment Equity policy encompassed recruitment and selection. Furthermore, this specific institution had a low staff complement and staff turnover rate and the need to fill vacancies only arose when a staff member retired or passed away.

An analysis of the actual Recruitment and Selection Policies and Procedures provided revealed that some policies are very detailed providing information even on promotions, dismissal, retrenchments while some policies are not comprehensive enough. Very few policies clarify the roles of the unions in the policy or their role with regards to Recruitment and Selection Procedure. Furthermore, there were deviations in the actual selection procedures, where some institutions allow procedures such as psychometric testing while others prohibit this.

The primary reasons cited for the process inhibitors of the policy and procedure have been identified as:

- *delays in attraction of skills and finding suitably qualified candidates*
- *meeting Employment Equity (EE) targets*
- *lack of support from management*
- *disputes with the union*
- *the approval process; and*
- *consultation processes for Section 57 posts make the process very lengthy.*

Ten (10) institutions have cited that politics influences the selection and appointment of individuals to positions. The key political role-players have been identified as unions, political parties in the area, Municipal Managers, and DWS. Two (2) institutions specifically indicated that there is political influence from Section 57 posts upwards.

Detailed job profiles which include specific job related competencies and traits could alleviate some of the above mentioned process inhibitors.

In addition to these process inhibitors, the institutions also experience certain challenges in carrying out their policies and procedures effectively, especially when it comes to sourcing suitable technical skills. The primary reasons cited for difficulties in sourcing suitable technically qualified and/or skilled staff was as follows:

- *remuneration*
- *location*
- *lack of experienced and skilled candidates.*

Other cited reasons were:

- *working conditions*
- *travelling distances*
- *competing with counter offers from the Water Services Authority*

- *lack of career growth*
- *lack of available EE candidates, and*
- *competition with the private sector.*

5.7.6 Training and Development Policies, Procedures and Process Inhibitors

Institutions were requested to provide an indication of whether they have a Training and Development Policy and Procedure in place. Eleven (11) provided copies of these policies and procedures.

An analysis of the actual Training and Development Policies and Procedures revealed that some policies are very detailed providing information even on processes such as Recognition of Prior Learning (RPL), budgeting and the role of trade unions, dispute mechanisms, grievances and induction of new employees, while some policies are not comprehensive enough. No reference is made to how individuals will be assessed to determine to what extent the training has achieved the agreed development activities, or how effective it has been in addressing the intended skills gaps. Furthermore, limited details were provided regarding the alignment of training in line with the WSP.

The primary process inhibitors of policies and procedure were identified as:

- *being unable to meet the training plan objectives/goals;*
- *lack of staff attendance due to operational requirements;*
- *lack of support from management in staff development;*
- *union influence;*
- *lengthy and time consuming procurement process; and*
- *budget constraints.*

In terms of the availability of technical training, seven (7) institutions which cited that they struggle to source service providers, said this was because service providers were not located in remote areas. As a result, this training has to be sourced from more urban areas such as Johannesburg or Cape Town, thus placing

heavy cost burdens on these institutions and increasing the general cost of training. However, all of the institutions cited that other soft skills training such as management and financial training is easily available in their respective areas.

Table 94 provides a summary of the training budget per institution. The budgets differ significantly and the figures in some instances are for the entire institution and in other cases are specifically related to the Technical/ Engineering/ Water and Sanitation departments. The budgets appear not to be allocated in relation to the proportion of positions per institution. It was therefore not possible to determine the appropriateness of the budget value provided as the data was not comparative. For example, Amatola Water allocated a budget of R 4.5 million and they have 483, whereas, Ngaka Modiri Molema DM allocated a budget of R4 million and only 193 positions.

The most notable aspect relating to budget allocation of all the institutions was the budget allocated by Oranje-Riet WUA, which is less than 1% of the payroll value. The apparent minimal budget allocated to Tshwane Metro should also be noted.

Table 94 Level 2 – Training budgets per institution

Institution	Training budget allocated
Oranje-Riet WUA	Budget is R 80 000 (just less than 1% of salaries)
Groenland WUA	No training budget provided for due to the size and nature of the institution
Amatola Water Board	R 4.5 million
Botshelo Water Board	Annual budget is +/- R 600 000 for 2011/2012
Tshwane Metro	R 350 000 for water and sanitation area
Capricorn DM	Not sure of budget
Ngaka Modiri Molema DM	R 4 million in 2011/2012
Ehlanzeni DM	R 1.1 million
Ditsobotla LM	R 1 million for 2010/2011
Maluti-a-Phofung LM	Did not provide
Sol Plaatje LM	R 1.6 million municipality training only (R 750 000 grant received)
Cape Agulhas LM	Budget = 1% of salary bill
Blue Crane Route LM	R 250 000

It has been mooted that a high return for low expenditure is to ensure that staff make use of the processes of Recognition of Prior Learning (RPL). This mechanism develops individuals through reward based upon formal certification of existing skills and knowledge, or acts as an identifier of gaps that will need to be filled in a formal manner. Three (3) institutions have had staff members go through the process, nine (9) have not had staff members go through the process and two (2) were not sure if any staff members have gone through the process.

5.7.7 Recognition of Prior Learning

Three institutions have sent a total of 28 staff members through the RPL process. The staff members came from technical disciplines and they were artisans from the roads and water departments. One institution cited that the results of the process were very poor and a number of the individuals were not able to get a formal qualification. Although a need for the education, training and development of employment prospects for positions such as artisans exists, it needs to be determined whether these processes were indeed effective and whether such a process is the best intervention, or whether other interventions such as specific sector-related educational programmes would be more successful.

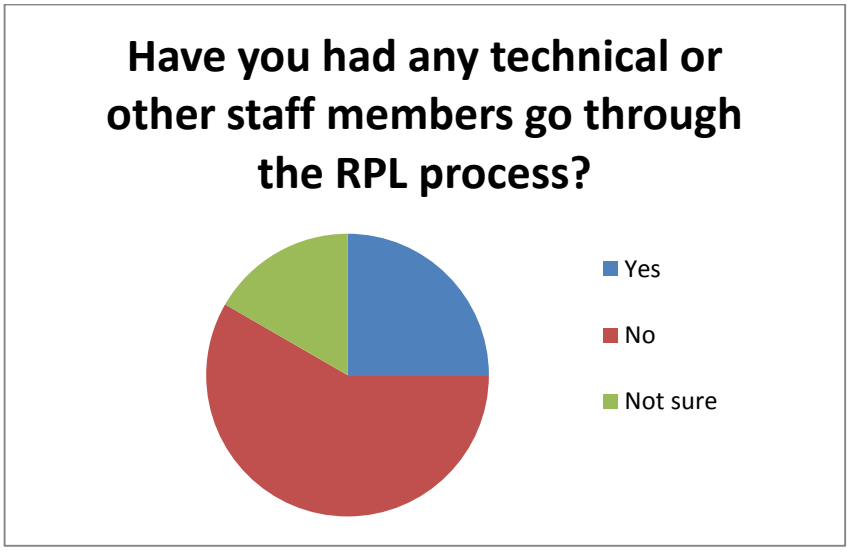


Figure 42 Level 2 – Pie chart showing institutions that have previously RPLed staff

5.7.8 Talent Management Policies, Procedures and Process Inhibitors

The institutions were requested to indicate the retention strategies they employ. The main retention strategies were cited as wellness programmes, bursaries and learnerships. Other retention strategies refer to an unstructured mentorship programme and sports forums. One institution, namely Ehlanzeni DM, have adopted a retention strategy which was endorsed in 2008. Although the strategy is not very comprehensive, its focus is on identifying turnover "hot-spots", the use of well-structured exit interviews, a risk analysis of potential resignations, recruitment, training and development, management style and lastly rewards. However, details of how the strategy was carried out were not provided.

Institutions have cited that they experience challenges in sourcing technical skills. However, there seem to have been no efforts made to link retention strategies with technical skills. A need therefore exists to develop specific retention strategies for the technical skills or to provide these positions with their own skills premium or specific remuneration treatment since remuneration has been cited as the primary challenge for sourcing technical skills.

5.7.9 HR Data Management Systems

All of the institutions are currently making use of a Payroll/HR Management Information System (HRMIS) to house their staffing and HR-related information. Five institutions are currently making use of more than one system to house various aspects relating to staff.

Major problems/limitations identified with the systems are:

- *systems are not integrated with one another;*
- *systems are not user friendly (specific systems identified were CRS, SAMRAS and BIQ);*
- *tracking training against Personal Development Plans (PDPs);*
- *six (6) institutions make use of a manual process for tracking training data via Excel/Word; and*

- *three (3) institutions make use of a manual performance management system.*

One (1) institution specifically cited that there is a lack of integration with the system that houses their staffing data and their performance management system. This lack of integration results in an inability to use the performance management system in conjunction with the WSP to identify skills gaps and specific training interventions needed to address these gaps. A need therefore exists for a system that allows for such integration. The current project provides one vehicle that would achieve this aim.

In general, there was a lack of consistency in terms of how the data is stored. The job titles in the biographical data provided from the payroll/HRMIS and the organograms did not match. A summary of data stored in HRMIS systems and their limitations is provided in **Table 95**.

Table 95 Level 2 – Details of payroll/HRMIS data stored and system limitations per WSI

Institution	HR MIS system	Data	Limitations of the system
Oranje-Riet WUA	VIP	Payroll (Biographical data, salary, leave, equity and gender), ER, EE, and training.	Currently make use of a manual performance management system which is time consuming.
Groenland WUA	MS Excel	Only for pay slips.	None.
Amatola Water Board	CRS	Payroll (Biographical data, salary, leave, equity and gender), EE, OD/Job Profiling, IR, Employee Wellness, Training and Development.	System is good in housing all the information but it is not user friendly.
Botshelo Water Board	VIP	Biographical data, salary, leave, equity and gender. Training and Development – manual process and use excel for tracking purposes.	Inability of VIP to integrate with Venus (financial system) and will therefore be changing to Pastel.
Tshwane Metro	SAP	Biographical data, salary, leave, equity, gender, qualifications, WSP and EE plan.	Tracking training against the PDP's on the system.
Capricorn DM	Payday SAP	Biographical data, salary, leave, equity and gender. Qualifications, training and development, and performance management are manually stored.	Could not comment as not all modules had been implemented.
Ngaka Modiri Molema DM	Payday	Biographical data, salary, equity and gender. Training and development, leave and job profiles are captured in Excel and Word.	System does not house any leave, training, qualification or performance management information and it is difficult to draw data out of the system.
Ehlanzeni DM	Payday	Payroll (Biographical data, salary, leave, equity and gender), EE and ER/IR.	None.
Ditsobotla LM	BIQ	Performance management data, job descriptions, Payroll (Biographical data, salary, leave, equity and gender). Training and developed is stored manually.	Difficult to use, system glitches and lack of training on the system.
Newcastle LM	Personnel Manager VIP	Biographical data, salary, leave, equity and gender, salary scales and qualifications. Salaries are housed in financial system. Training is captured in Excel.	Does not house any training data.
Maluti-a-Phofung LM	Payday e-Venus	Biographical data, salary, leave, equity and gender. e-Venus: financial data.	No training or qualification data stored in the system.
Sol Plaatje LM	CAPMAN Payday	CAPMAN: training data. Payday: Biographical data, salary, leave, equity and gender.	None.
Cape Agulhas LM	SAMRAS IGNITE	Biographical data, salary, leave, equity, gender and WSP. IGNITE is used for performance management.	Not user friendly and does not integrate with the performance management system.
Blue Crane Route LM	SAMRAS	Leave.	*Not specified.*

5.7.10 Actual Qualifications versus Required Qualifications

In **Table 96**, besides Amatola Water, Ngaka Modiri Molema DM and Oranje-Riet WUA the other 11 institutions did not provide any information on incumbents' qualifications. The results of only these three institutions mentioned can therefore be examined. At Amatola 52% meet the required qualifications for the job (see first blue shaded cell), 6% do not (second blue shaded cell) and in 42% of the cases the Amatola HR staff providing the information did not know or did not respond to the issue of staff meeting minimum qualification requirements (third blue shaded cell). The same pattern can be read from **Table 96** for Ngaka Modiri Molema DM and Oranje-Riet WUA (shaded green and orange respectively).

Table 96 Level 2 – Number and percentage per WSIs where qualifications met requirements

Does the Actual Qualifcation Meet the Minimum Requirements?	Institution Name	Number	% of Grand Total	% of the Institutions Total
Yes	AMATOLA WATER BOARD	108	12%	52%
	NGAKA MODIRI MOLEMA DM	1	0%	14%
	ORANJE-RIET WUA	23	3%	64%
Yes Total		**132**	**15%**	
NO	AMATOLA WATER BOARD	12	1%	6%
	NGAKA MODIRI MOLEMA DM	1	0%	14%
	ORANJE-RIET WUA	5	1%	14%
NO Total		**18**	**2%**	
Unknown	AMATOLA WATER BOARD	87	10%	42%
	NGAKA MODIRI MOLEMA DM	5	1%	71%
	ORANJE-RIET WUA	8	1%	22%
	BLUE CRANE ROUTE LM	9	1%	100%
	BOTSHELO WATER BOARD	64	7%	100%
	CAPE ARGULHAS LM	8	1%	100%
	CAPRICORN DM	255	29%	100%
	DITSOBOTLA LM	8	1%	100%
	EHLANZENI DM	5	1%	100%
	GROENLAND WUA	2	0%	100%
	MALUTI-A-PHOFUNG LM	81	9%	100%
	SOL PLAATJE LM	44	5%	100%
	THABAZIMBI LM	5	1%	100%
	TSHWANE METRO	139	16%	100%
Unknown Total		**720**	**83%**	
Grand Total		**870**	**100%**	

5.7.11 Ratio of Technical Posts to Non-Technical Posts

Table 97 shows that 37% of posts are technical posts. While the study is not a highly representative sample it could be an indicator that may need to be explored further in a more nuanced manner.

Table 97 Level 2 – Ratio of technical to non-technical posts in WSIs

Technical Post	Number	% of Institutions Total
YES	1156	37%
NO	1996	63%
Grand Total	**3152**	**100%**

Table 97 overleaf shows the breakdown of technical to non-technical posts per institution in the sample. Ehlanzeni DM has 88% technical posts but this is because they are not a WSA but have a water department that serves as a technical support unit for LMs in their district. Capricorn DM is a WSA but uses all its LMs to carry out O&M.

The almost fifty/fifty split between technical and non-technical for both the WUAs and the water boards is indicative of their specific mandate which requires high levels of technical capacity in relation to the structure of the institution as a whole.

Table 98 Level 2 – Percentage of technical posts per WSI

Institution Name	Technical Post	Number	% of Institutions Total
EHLANZENI DM	YES	7	88%
	NO	1	13%
EHLANZENI DM Total		**8**	**0%**
ORANJE-RIET WUA	YES	38	61%
	NO	24	39%
ORANJE-RIET WUA Total		**62**	**2%**
GROENLAND WUA	YES	3	50%
	NO	3	50%
GROENLAND WUA Total		**6**	**0%**
AMATOLA WATER BOARD	YES	236	49%
	NO	247	51%
AMATOLA WATER BOARD Total		**483**	**15%**
CAPRICORN DM	YES	356	49%
	NO	375	51%
CAPRICORN DM Total		**731**	**23%**
THABAZIMBI LM	YES	22	44%
	NO	28	56%
THABAZIMBI LM Total		**50**	**2%**
TSHWANE METRO	YES	139	43%
	NO	188	57%
TSHWANE METRO Total		**327**	**10%**
BOTSHELO WATER BOARD	YES	93	40%
	NO	141	60%
BOTSHELO WATER BOARD Total		**234**	**7%**
BLUE CRANE ROUTE LM	YES	35	31%
	NO	79	69%
BLUE CRANE ROUTE LM Total		**114**	**4%**
MALUTI-A-PHOFUNG LM	YES	104	27%
	NO	275	73%
MALUTI-A-PHOFUNG LM Total		**379**	**12%**
NGAKA MODIRI MOLEMA DM	YES	42	22%
	NO	151	78%
NGAKA MODIRI MOLEMA DM Total		**193**	**6%**
CAPE ARGULHAS LM	YES	13	20%
	NO	52	80%
CAPE ARGULHAS LM Total		**65**	**2%**
DITSOBOTLA LM	YES	14	14%
	NO	83	86%
DITSOBOTLA LM Total		**97**	**3%**
SOL PLAATJE LM	YES	54	13%
	NO	349	87%
SOL PLAATJE LM Total		**403**	**13%**
Grand Total		**3152**	**100%**

Based on knowledge that 37% of posts are technical posts in institutions in the sample; **Table 99** determined this ratio of technical to non-technical posts by the type of institution. The WUAs have 60% technical posts and the LMs only have 22% of posts being technical. **Figure 43** plots the average of 37% of posts being technical posts and then shows how each type of institution varies off this average. WUAs do well with 60% posts being technical posts. Local Municipalities are far below the average of this study (22%). This is not taking into account, of course, ideal capacity.

Table 99 Level 2 – Percentage of technical versus non-technical posts by institutional type

Institution Type	Technical Post	% of Institutional Type Total
WUA	YES	60%
	NO	40%
WUA Total		**2%**
Water Board	YES	46%
	NO	54%
Water Board Total		**23%**
Metro	YES	43%
	NO	57%
Metro Total		**10%**
DM	YES	43%
	NO	57%
DM Total		**30%**
LM	YES	22%
	NO	78%
LM Total		**35%**
Grand Total		**100%**

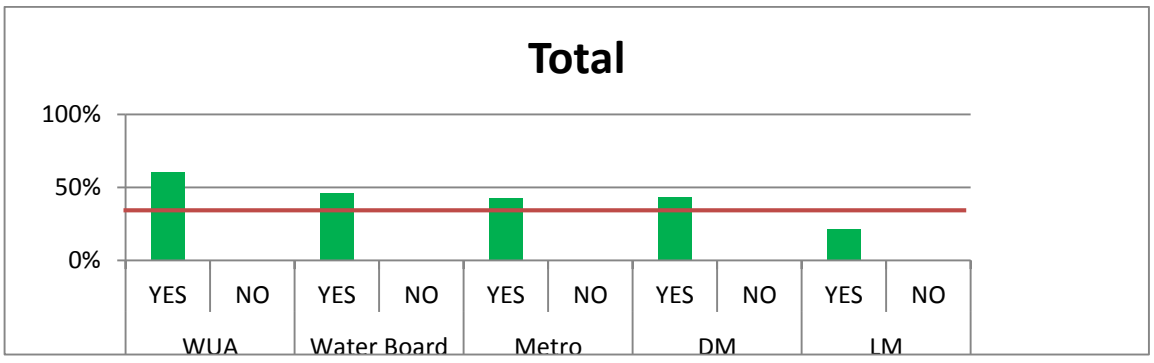


Figure 43 Level 2 – Graphical representation of percentage of technical posts by institutional type

5.7.12 Gender

Historically technical posts in the water sector have been held in the overwhelming majority by men. There is a constitutional imperative and a commitment at a national level for the historical state to be transformed. In one LM, that was not a full length participant in this study, the situation is still one of deep concern as 100% of technical posts are still filled only by men.

The average across all institutions assessed, however, reflected that despite the significant progress that has been made to date, the current representation of women still needs to be improved. This is despite numerous efforts made in the educational pipeline to entice girls and women to enter technical fields.

The current status quo in the WSIs in the sample is behind on meeting equity criteria of 52% representation of women at all levels in professional society; as can be seen in **Tables 100, 101** and **102** below:

Table 100 Level 2 – Total gender disparity in WSIs

Gender	Gender Number	Gender %
Female	320	15%
Male	1750	85%
Grand Total	**2070**	**100%**

Further, with regard to the percentage of how many technical posts are specifically filled by women, the result has delivered the following picture:

Table 101 Level 2 – Gender disparity in technical posts in WSIs

Gender	Gender Number	Gender %
Female	104	14%
Male	622	86%
Grand Total	**726**	**100%**

The situation on a technical front is however no different to that of how many posts are filled by women in the non-technical side of water service delivery.

Table 102 Level 2 – Gender disparity in non-technical posts in WSIs

Gender	Gender Number	Gender %
Female	216	16%
Male	1128	84%
Grand Total	**1344**	**100%**

This is an indicator of a deeper systemic issue which does not give credence to the narrative that the water sector is gendered in a particular way due to the historical patriarchal work-exclusion-policies and processes that result from our history as a country.

This study is only a snapshot sample of the sector, but it does show a clear trend that will require intervention to fast-track gender transformation, whilst at the same time not destabilising the provision of water. Targeted recruitment, coaching and mentoring strategies should be implemented as a matter of urgency in this regard.

This will continue the path of progress that has been made with regards to female representation in the technical sector which compares favourably with statistics in the international market with countries that otherwise have very high levels of gender representation in sectors other than engineering. This progressive approach being pursued in the water sector can result in South Africa being a world leader in this regard.

5.7.13 Race

The improved representation of black (African, Indian and Coloured) professionals is, along with gender, a source of historical inequality that also has a constitutional imperative to change. In particular technical positions were an area of exclusion due to separate educational policies which resulted in black students being excluded from tertiary institutions that offered the required courses. In this regard, transformation in the water services sector has been successful in all instances bar the inclusion of people who self-identify as Indian.

The biographical data analysis concludes that the transformation figures related to race accurately reflect population occurrence of all races except for the Indian workforce that comprise 2,6% of the population but have 0% representation from this sample.

This is a success story for this sector that should be celebrated. It may however, have implications for recruitment, as equity legislation provides for changes in affirmative action once all targets have been met.

Table 103 highlights the results across the sector and supports the overall conclusion. Africans in filled positions are slightly over-represented on the basis on an 80% population occurrence whilst Coloured and White representation is slightly under represented with national occurrence of 9% in both instances.

Table 103 Level 2 – Race representivity in WSIs

Race	Number	Percentage
African	1948	87%
Coloured	152	7%
Indian	4	0%
White	145	6%
Grand Total	**2249**	**100%**

When examining the status for technical posts the picture changes slightly in relation to filled positions, in that white representation continues to be slightly higher than the population occurrence. Africans are marginally over represented with White technical/professional over represented by 4% as reflected in **Table 104**.

Table 104 Level 2 – Race representivity in technical posts in WSIs

Race	Number	Percentage
African	687	81%
Coloured	53	6%
Indian	2	0%
White	106	13%
Grand Total	**848**	**100%**

Non-technical positions presented in **Table 105** below reflect a slightly different picture with Africans over represented by 10%. Coloureds and Whites are under represented by 2% and 6% respectively.

Table 105 Level 2 – Race representivity in non-technical posts in WSIs in the sample

Race	Number	Percentage
African	1261	90%
Coloured	99	7%
Indian	2	0%
White	39	3%
Grand Total	**1401**	**100%**

The sample is not likely to be reflective of the country as whole as in some instances such as the Capricorn LM and Ngaka Modiri Molema LM the overall representation, and thus also the technical representation, is 100% African.

This implies a requirement for further nuanced study as the outcome of a recent Constitutional ruling related to the Western Cape and affirmative action and population occurrence representation ruled against provincial population occurrences to be considered and not only national population occurrences. In other words if the Capricorn LM geographical territory is made of 100% African residents this remains a status quo situation that needs intervention irrespective of local population occurrences.

The sector may want to consider a particular targeted recruitment strategy in relation to the self-identifying Indian community. Once again consideration should be given to comparing the public to the private sector in this instance.

5.8 Level 3 Assessments

Relevant report:
Deliverable 8 – Report on the Level 3 Assessment of 21 Institutions

The work for the level 3 assessment was outlined in **section 3.3**. The level 3 assessment included telephonic interviews with one technical and one HR manager per WSI. The interviews followed the standard questionnaire as used in the level 1 and level 2 assessments and can be found in **Appendix A** and **Appendix B**.

The findings from the level 3 assessments followed a similar trend to the findings from the level 2 assessments. As the findings for the level 3 assessments were similar to what has already been reported, the reader is referred to the relevant report for level 3 where more detailed information on all institutions in the level 3 assessment is provided.

5.9 Supply Side Research

Relevant report:
Deliverable 6 – Supply Side Research

The ToR for the full project required a report on the rate of supply of qualified graduates into the sector based on past patterns and the projected supply, and the required rate of supply.

The most reliable data source that provided information on graduate numbers was the Department of Higher Education and Training's (DHET) database. The database is referred to as the Higher Education and Training Management Information System (HETMIS). The system aims to ensure that there is an integrated education and training

management information system, linking all providers of education and training into a single system, so that there is a learning record and occupation category for each and every person resident in South Africa.

The data from HETMIS was received in 76 workbooks containing many spreadsheets for the entire higher education sector. This data was analysed over several weeks. The data showed that the increase in Civil Engineering graduates has doubled over the past five years from approximately 1000 to 2000 graduates per year as shown in **Table 106** and **Figure 44**.

Table 106 HETMIS 0806 results for Civil Engineering and Technology graduates

	Undergraduate Diploma/Certificate (1, 2 or 3 years)	Postgraduate Diploma/Certificate & Post-Dip Diploma/Certificate	Undergraduate Degree (1st B Deg 3yrs)	Hons/NH Dip & Postgraduate B. Deg. & UG B. Deg. (1st B. Deg 4 yrs)	Masters and Masters Dip.	Doctorate
2005	566	17	20	363	62	8
2006	674	16	4	459	92	7
2007	800	8	15	522	61	12
2008	890	27	16	590	44	12
2009	900	17	2	690	51	9
2010	1036	22	56	878	55	10
Total	**4864**	**107**	**113**	**3502**	**363**	**58**

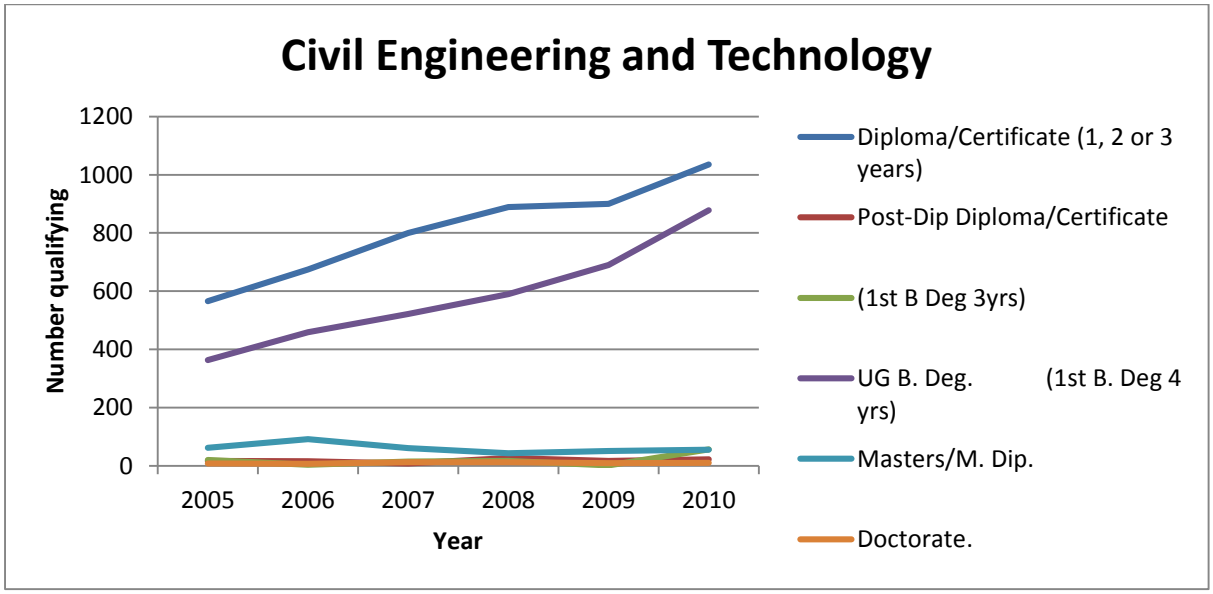


Figure 44 Graph showing HETMIS 0806 results for Civil Engineering and Technology graduates

Graduation rates have increased in all qualifications related to the water sector such as:

- Chemical Engineering and Technology
- Electrical Engineering and Technology
- Mechanical Engineering and Technology
- Biological Sciences.

For detailed figures on the increase in graduation rates, the reader is referred to the relevant report.

The supply side research report, in appendices, provided extensive information on the 67 higher education institutes in South Africa and the qualifications offered by each. This information was then "pivoted" to provide the list by qualification name and then the institutions offering the qualifications. Further research is required to determine the percentage of graduates that enter the water sector as opposed to other sectors. And, of the graduates that enter the water sector, the percentage that enters the public sector as opposed to the private sector also needs to be determined.

5.10 Draft Intervention Map and WISA Consultation Workshop

At the time when the ToR was advertised DWS and WRC stipulated that once the capacity and skills gap in the country had been determined, an Intervention Map based on the findings must be proposed. Furthermore, the ToR stated that a consultation workshop with role players from the water sector should be held to obtain support for the proposals in the Intervention Map.

The research did not actually determine the capacity and skills gap in all WSIs in South Africa. Instead, the research proposed a method to determine the gaps and tested the method in the field. The Intervention Map, written towards the end of the project, did not make proposals on how to address the capacity and skills gap in South Africa as a whole. Instead the Intervention Map proposed the adoption and roll-out of the "Capacity Gap method" and "Skills Gap method" to be applied to all WSIs in South

Africa. The roll-out was proposed to develop an empirically accurate picture for informed HR planning in the water sector from both a demand and a supply perspective.

In May 2014, a half day workshop was held with 91 representatives from various WSIs and other national role-players to consult on the Intervention Map. A list of institutions represented at the workshop can be found in **Table 107**.

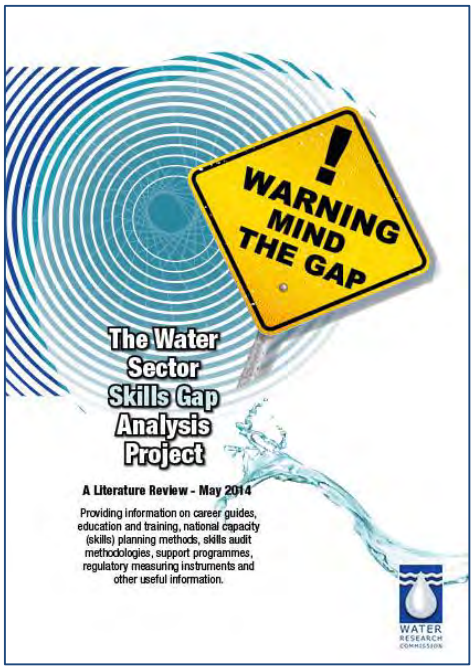
Table 107 Comparison between the 64 pre-workshop confirmations and the 91 delegates that attended the consultation workshop

		COL. C	COL. D	COL. E	COL. F
Institution Type	**Institution**	**Confirmed (pre-workshop)**		**Attended Workshop**	
National Government	DWA	13		20	
	CoGTA	0		0	
	MISA	2		0	
	NT	0		0	
	Environmental Affairs	1		0	
	Dept of Labour	0	**24**	0	**25**
	DHET	1		1	
	DPSA	2		2	
	EWSETA	3		1	
	LGSETA	2		0	
	SAQA	0		1	
National Bodies	SALGA	0		0	
National Government (Research)	ARC	2		3	
	CSIR	0	**6**	0	**4**
	WRC	4		1	
Academic Institutions		1	**2**	2	**5**
Training Institutions		1		3	
Professional Bodies	ECSA	0		0	
	SAICE	2		2	
	CESA	0		0	
	CBE	2	**8**	1	**7**
	IMESA	1		1	
	WISA	2		2	
	Plumbers (IOPSA)	1		1	
	Welders	0		0	
Water Sector Institutions	CMAs	1		3	
	WUAs	0		2	
	TCTA/KOBWA	1	**15**	3	**35**
	Waterboards	13		22	
	Municipalities	0		5	
NGOs	NGOs	2		1	
Others	Water Re-use	0		0	
	Acid Mine Drainage	0	**9**	0	**15**
	Funders (incl DBSA)	2		3	
	Others	5		11	
TOTAL		**64**		**91**	

** The pink shading indicates national institutions that did not attend the workshop-*

All representatives were sent a copy of the Intervention Map prior to the workshop.

A booklet written by Water Concepts entitled *The Water Sector Skills Gap Analysis Project – A Literature Review* was distributed at the workshop. Delegates would not have had time to read the booklet prior to workshop presentations and discussions. However, since the workshop the WRC has received numerous enquiries regarding the booklet and have thus decided to re-print the booklet.



The information in the booklet was intended to be beneficial to water sector strategists dealing with capacity and skills.

The booklet contained information on existing methodologies to determine the demand for capacity and skills, skills-audit methodologies to determine the supply of capacity and skills, career guides, education and training programmes, support programmes and regulatory/measuring instruments.

During the research, much information was obtained on the many efforts to supply skills to the sector. Less information, yet more complex, was found on methodologies that attempt to determine the demand for capacity and skills by sector. This wealth of information, which took much time to trace and much effort to piece together, was summarised in the booklet so as to make it easily accessible to practitioners in the water sector.

5.10.1 Mandate from the Water Sector

At the workshop various participants endorsed a uniform capacity and skills gap method. Participants furthermore raised no objections to the Water Sector Skills Gap method. Instead, participants expressed the need for the method to be implemented with immediate effect due to the skills crisis in the public water sector. Furthermore, there was encouraging and active engagement by

participants on the method (which resulted in many useful improvements being suggested).

Participants gave a clear indication that DWS, as sector leader, should take responsibility for ensuring the method is rolled out to the remaining 270 water sector institutions in the country. However, a decision on which institution should house the project remained inconclusive.

5.10.2 Conclusions from the Workshop

When working with the public sector, linking or networking with SETAs, other sectors, organised LG and professional bodies is a demanding task. Workshop participants identified the following bodies that should still be approached (in order of priority) so as to integrate the Water Sector Skills Gap method in their work:

1. The **LGSETA** and **EWSETA** – for their role in potentially funding the roll out and adopting the method as their standard
2. The **LGSETA** and **EWSETA** – SETAs must be involved at all stages of the roll out
3. **CoGTA** – to integrate the Water Sector Skills Gap Analysis method with other skills audits in municipalities
4. **DPSA** and **CoGTA** – for mechanisms to make the Skills Gap Analysis method compulsory for all water sector institutions either through regulations or directives
5. The **DHET's Strategic Integrated Projects (Special Projects Unit)** – for integrating their capacity method and the Water Sector Skills Gap method more closely (this is already underway)
6. **DHET** – for their FET Colleges turnaround initiative (as funding is available)
7. **FET Colleges** – for college qualifications to include water & sanitation qualifications
8. The **Construction SETA** – as plumbers fall under this SETA
9. **CESA** – for their offer of support to the roll out of the method

10. **DWS's Municipal Strategic Self-Assessment** – to include the Skills Gap Analysis method results in these assessments
11. **DWS's Green Drop and Blue Drop** – for their work on skills already underway
12. **DWS's WSDP** – to explore the possibly of results of the method, once implemented, begin incorporated into WSDPs
13. **The NWRS II** – to feed information from the method into the Strategy
14. **CoGTA** – for their work on job grading
15. **OCTO** – for their work on Occupational Profiles
16. **WISA** – for their work on job matrices for process controllers
17. **IMESA** – for their work on Asset Management
18. **NICHE** – for their method of "didactic" teaching and learning methods
19. **University of Pretoria** – to obtain past research and work done on procurement which creates an enabling environment for NGO involvement.

5.10.3 Recommendations from the Workshop

The workshop delegates recommended that the method should further include:

1. **A strong message or condition that the capacity and skills gaps analyses never be implemented without concurrently assessing and addressing the skills of HR staff to write job profiles, do HR planning, manage skills audits, analyse results and match training to staff needs.**

2. A programme time plan that will show all audits complete and the skills gap resolved by 2030
3. A programme approach that will allow for the fastest possible roll out of the method and a programme approach that demonstrates innovation
4. A programme cost estimate for the roll out of the programme
5. A programme quality control process, incorporated in the roll out programme, for cases where water sector institutions wish to implement the method unassisted.
6. Linking all job titles to the Organised Framework for Occupations
7. Aligning the project terminology to SETA terminology

8. Presenting results per institution and individual using a risk approach of the Municipal Strategic Self-Assessment project
9. Designing and distributing an interview questionnaire for water sector staff
10. Linking the results to a WSP report required by the SETAs
11. An ability to track the progression of individuals through their full career
12. Research and information on how institutions can address skills gaps in institutions and individuals determined from the method having been carried out.
13. Reviewing the de facto recruitment and selection practices of institutions over the past years (say 10 years) and highlighting practices that have deviated from the minimum qualification and experiential requirements
14. Reviewing and addressing the extent to which public institutions are unable to recruit private sector staff due to the institutions being unattractive employers
15. Stratification of the capacity and skills “demand side” requirements by taking into account the varying sizes of municipalities
16. Addressing the aspect of productivity in the Capacity Gap method.

Recommendations 1 to 7 can be assessed at little cost.

Recommendations 8 to 16 involve substantial work and it is recommended that a new phase to the project be opened to deal with these recommendations.

6 EXTENT TO WHICH CAPACITY DEVELOPMENT TOOK PLACE

The Project Leader from Water Concepts, Ms AM Vienings, registered for a Masters in Technology at the Tshwane University of Technology in January 2012, 6 months into the project. Ms Vienings was to use the research completed for determining the skills gap under the level 1 assessment for her dissertation. Ms Vienings was to submit the dissertation in December 2014.

7 CONCLUSIONS

7.1 Best Practice Capacity and Skills Gap Methods for the Water Sector

This research has generated new knowledge related to capacity gaps and skill gaps in that it provides the sector, with all its WSIs, with a best practice method to determine capacity gaps and skills gaps at WSIs.

7.2 The Capacity Gap Method

A method to determine the capacity gap in any WSI was proposed and successfully tested at three WSIs, namely:- BOCMA, Umgeni Water and Moses Kotane LM. The Capacity Gap method as finally concluded is as follows:

The process of determining the **capacity gap** in public water sector institutions begins by analysing their mandate as defined in the relevant legislation. In this case the National Water Act (Act number 36 of 1998), and/or the Water Services Act (Act number 108 of 1997). These mandates are mapped onto the institutions' organograms, and then to individual job titles. Once the mandates from the Act are mapped into the institutions' organogram, the time it would take to deliver on the mandate is calculated. The detail as to how often tasks related to a mandate would occur in a year along with the time in days to perform that task once, is drawn from experience, as well as the extent of the physical dimensions of the tasks assigned. Discussion with the technical staff concerned is a valuable added dimension. The time to deliver on the mandate would be the product of the number of tasks multiplied by the time to perform the task. This can be expressed in the following formula:

Total Time to meet mandate (days)	**=**	**Number of tasks**	**X**	**Time to perform task**

By way of example, if the mandate is to "set the ecological reserve", it can be assumed that this would happen once (1) for all rivers in a catchment and that this would take 40 days of one person's time. The total time to achieve this mandate would thus be:
1 task X 40 days = 40 days.

In addition to looking at demand for capacity from a workforce planning point of view, the project also looked at demand for capacity from a qualification and years of experience requirement point of view. The minimum qualification requirements and years of experience for full competence are obtained from job profiles.

Both steps above provide the **demand for capacity**.

To complete the capacity gap analysis the institutions' existing organogram along with a table stating the departments, job titles, whether a position was vacant or filled, incumbents' names, gender, race and highest qualification, is required.

Following completion of the skills audit (online staff assessment: see 7.2 below) the data from the online database (which would have been completed by staff members) along with the information provided by the institutions' HR department in spreadsheets is analysed. This provides the **supply of capacity** by staff number and qualification name.

By comparing the required skills (from mandate, time to complete tasks, and qualifications) with the supply of skills (from number of qualified staff) the capacity gap is obtained. The results can be presented graphically for all job titles and/or mandates.

7.3 The Skills Gap Method

A method to determine the skills gap in any individual and a WSI as a whole was proposed and successfully tested at four WSIs, namely:- DWS, BOCMA, Umgeni Water and Moses Kotane LM. The Skills Gap method as finally concluded is as follows:

The process of determining the **skills gap** in a WSI follows from the development (by this project) of a Water Sector Competency Framework and a Skills Matrix. This matrix lays out all aspects of water sector responsibilities (from water resources, environmental protection through to water services operations and maintenance) and expands each category out to competency cluster, competency and individual skills

levels. The matrix was developed by the research team with invited sector specialist professionals over a period of some weeks. The matrix was converted into an online questionnaire format which individual staff members of the institutions assessed could access and rate their skill levels against the level required. When complete the self-assessments were forwarded to line managers for their assessment of the individuals concerned. If the two assessments were different a meeting between the individual, the line manager and an HR representative was convened to discuss the difference and agree a final result. The individuals' rating record was forwarded to the skills development officer and the summary ratings for all staff forwarded to management for their skills planning information and was deemed the **supply of skills**.

Skills Matrices can be developed for each institution by drawing out skills required from job profiles or from interviewing line managers as to required skills. Furthermore, the list of skills required for the institution (and placed on the online system) would then be a summation of the skills demand in all job profiles. The Skills Matrix is deemed the **demand for skills**.

The **skills gap** is the difference between the skills requirements of the institution (as per the Skills Matrix) and the actual skills held by staff (from the online skills audit). In other words the skills gap would be the difference between the demand and supply of skills.

By the use of the skills bank and the online audit the various institutions with differing roles and responsibilities in the water sector can be evaluated against a common framework, and individual, institutional and overall sector level of skills availability determined.

7.4 Application of the Capacity Gap Method at a CMA, Water Board and WSA

The method worked well and returned reasonable results for the demand for capacity at a CMA and a WSA. However, for the water board, the method returned a lower number for staff required than the water board actually had. This led the researchers to question the appropriateness or accuracy of the capacity gap method when applied to a water board. A water board is a more sophisticated business than a small CMA or small water services authority and thus has many "niche" Job Titles and posts that would not be found in a small municipality.

The capacity gap method was successful as it was applied in the level 1 assessments. However, the capacity gap method for level 2 institutions was less successful due to lack of information on infrastructure responsibility. The lack of information was due to two factors:- information not being held by the institutions and/or a lack of time on the part of the research team to spend more time searching for and analysing the information.

7.5 Application of the Skills Gap Method at DWS, CMA, Water Board and WSA

The skills gap method worked well and returned good results for the **demand for skills** at a CMA and WSA. It also worked well for the water board except that their required skills were set too high. The demand for skills at DWS could not be obtained due to the funding limitations and the large size of the department.

The demand for skills is not readily obtained from job profiles. The demand for skills is accurately obtained through interviews with line managers.

The method work well and returned good results for the **supply of skills** at DWS, a CMA, water board and Water Services Authority. The online system used for capturing the supply of skills was slow due to slow internet connectivity at most WSIs.

The skills gap method work extremely well in determining the **skills gap** and producing plans that showed "training intervention required" per individual and the WSI as a whole.

7.6 The Capacity Gap

Using the newly design Capacity Gap method, the level 1 assessments at WSIs returned the following results:

Institution	No. of technical staff required	No. of technical staff available (all)	Capacity Gap	No. of technical staff with minimum qualifications	Revised Capacity Gap
BOCMA	16	9 (56%)	7 (44%)	9 (56%)	7 (44%)
Umgeni Water	205	413 (201%)	*-208 (-101%)	298 (145%)	*-93 (-45%)
Moses Kotane LM	82	34 (42%)	48 (58%)	6 (7%)	76 (92%)

7.7 The Skills Gap

Using the newly design Skills Gap method, the level 1 assessments at WSIs returned the following results:

Institution	Demand for skills (total value)	Supply of skills (total value)	Skills Gap (total value)	Supply of skills (percentage)	Skills Gap (percentage)
DWS	Not determined	51 646	Not determined	*72%	Not determined
BOCMA	3 020	1 939	1 081	64%	36%
Umgeni Water	25 790	10 237	15 553	40%	60%
Moses Kotane LM	5 125	2 299	2 826	45%	55%

** The 71% rating for DWS reflects staff members own rating of their own skills, and not against the required skills.*

The skills gap as per the methodology noted above is the difference between the skills requirements of the institution (as per the Skills Matrix) and the actual skills held by staff (from the online skills audit).

***As the Skills Matrix could not be established for DWS the skills gap refers to the gap against the set of skills selected by respondents and not against the set of skills required.**

7.8 Online System and Internet Speed

With the slow internet connections at most WSIs, the online system would need to be re-coded to improve its speed or the system would need to be made to work using excel spreadsheets.

7.9 Staff Acceptance of the Audit Methods

The process was well received by all who took part. It was explained and understood that this process was not a performance appraisal but rather a method to identify capacity building needs. Staff clearly appreciated this distinction. However, the time required from HR staff to manage the audit was substantial over a month or two month period.

7.10 Analysis of Data

The data analysis process has not been coded and thus needs to be done manually. This requires a high level of data management skills which will not be readily available in HR staff at WSIs.

7.11 Workplace Skills Plans and "Training Action Required"

There is a close correlation between the training action required format at a competency level of this project and the list of "Education and Training Priorities" of an institution as requested by SETAs (Form B2 of the format distributed by SETAs). It would be possible to use the information from this project to feed into WSI's Workplace Skills Plans.

7.12 HR Systems at WSIs

The level 2 and 3 assessments provided interesting information regarding HR management at WSIs in the sample. For example, many WSIs reported to have completed skills audits in the past five years but in most cases WSI were merely referring to completing a Workplace Skills Plan (which is not a skills audit). Most WSIs have up to date organograms however, fewer carried out resource planning on a regular basis. Most WSIs used a combination of two HRMIS systems to house payroll

and staff data. WSIs have job profiles but the standard of the profiles varied greatly. Vacancies in technical departments average at 24%. Race equity has almost been achieved in technical posts in the water sector with the 81%, 6%, 0% and 13% of staff being Black, Coloured, Indian and White respectively. In technical posts, gender equity has not been achieved: 85% of staff are male.

Retention strategies for technical staff were uncreative in half (50%) of institutions as they cited only medical aid, bursaries and learnerships as their primary strategies.

7.13 Supply of Graduates to South Africa

The data from HETMIS was received in 76 spreadsheets for the entire higher education sector. The data showed that the increase in Civil Engineering graduates has doubled over the past five years from approximately 1000 to 2000 graduates per year. All other graduate numbers with qualifications that apply to the water sector have also increased dramatically in the past 5 years, with there no longer being a shortage of science graduates.

7.14 Stakeholder Consultation Workshop on the Capacity and Skills Gap Methods

The consultation workshop held in May 2014, with over 91 representatives from various institutions, obtained support from the sector to roll-out the Capacity and Skills Gap methods to all WSIs.

8 RECOMMENDATIONS

Recommendations for further research, knowledge dissemination and technology transfer follow.

8.1 Best Practice Capacity and Skills Gap Methods for the Water Sector

It is recommended that DWS take the lead, under the guidance of the Water Services Leadership Group, to roll-out the capacity gap and skills gap methods to all WSIs in South Africa.

8.2 The Capacity Gap Method

The capacity gap method should be documented more thoroughly in creative ways using brochures, online media, videos, etc. so that the method is implemented consistently across all WSIs and not left open to interpretation.

Funding be made available to apply the capacity gap method to a Water User Associations (WUA).

8.3 The Skills Gap Method

The skills gap method should be documented more thoroughly in creative ways using brochures, online media, videos, etc. so that the method is implemented consistently across all WSIs and not left open to interpretation.

8.4 Application of the Capacity Gap Method at Water Boards

It is recommended that the Capacity Gap method to determine capacity by job title be improved or adjusted to more accurately reflect the staff requirements of water boards before being applied to other water boards. The method however, can be applied as is to CMAs and WSAs.

8.5 Application of the Skills Gap Method at all WSIs

The skills gap method should be applied in all WSIs, after consideration of the CoGTA GAPSKILL audit system being used in municipalities.

The skills matrix for water boards needs to be reviewed to reduce the number of skills required per job title as set by Umgeni Water.

It is recommended that further funding be made available to complete the skills matrix for the water sector for job titles that were not covered in this research. An entirely separate project is recommended to obtain a skills matrix for many unique job titles at DWS.

8.6 Online System and Internet Speed

It is recommend that the programme be re-coded to improve speed and that a parallel system be designed to operate in excel for WSIs that have slow internet connectivity.

8.7 HR Staff Skills to Implement the Methods

It is recommended that this strong message accompany any roll-out of the methods:- that the capacity and skills gaps analyses never be implemented without concurrently assessing and addressing the skills of HR staff to write job profiles, do HR planning, manage skills audits, analyse results and match training to staff needs.

8.8 Analysis of Data

The software coding should be extended to be able to analyse the supply of skills data to produce reports on the skills gap.

8.9 Workplace Skills Plans and "Training Action Required"

The software coding should be extended to convert the data captured in the online system to produce information required for Workplace Skills Plans.

8.10 Support Agency to Address the 24% Vacancies in Technical Posts

It is recommended that an agency be employed at national level to address the technical skills gaps at all WSIs and to focus on retention programmes.

8.11 Feedback and Follow Up at DWS, BOCMA, Umgeni Water and Moses Kotane LM

It is recommended that after detailed feedback is provided to the level 1 institutions on the skills gap, a follow up visit be made to observe if the information has informed their training plans, recruitment drives and retention actions.

8.12 Supply of Graduates to the Water Sector

Further research is required to determine the percentage of graduates that enter the water sector as opposed to other sectors. And, of the graduates that enter the water sector, the percentage that enter the public sector as opposed to the private sector also needs to be determined.

APPENDICES

Appendix A Technical Questionnaire

Water Resources and Water Services Interview Questionnaire

Name of Organisation :		**Province:**	
Location:		**Date of visit:**	
Type of Organisation:			
Name of Interviewee (1):		**Position/ Designation :**	
Name of Interviewee (2):		**Position/ Designation :**	
Landline / Cell / email:			
Other relevant persons:		**Designation:**	
Landline / Cell / email:			
Institutional History/comments:			

OUTLINE OF RESPONSIBILITIES THAT ARE OUTSOURCED

1. Master Planning:
2. Detailed design:
3. Construction:
4. O&M: Does a Preventative Maintenance Plan exist?
5. Handling of As-built Drawings? Software?
6. Laboratory:
7. Involvement in a CMA? (or, for a CMA/WUA: Involvement in W&S Services)
8. Customer Services:
9. Water Resources Planning (including Licensing and & In-Stream Flow Requirements):
10. Water Resources Management (Including Scientific Services):
11. WARMS:
12. Stakeholder Management:

INFRASTRUCTURE INFORMATION

13. Layout of Scheme Area and Depots:

14. Bulk Water Supplied:

15. Water Treatment Works and Capacities:

16. Length of Water Pipe per Diameter:

17. Households with Water:

18. Consumer Base:

19. Households with Sanitation:

20. Length of Sewer Pipe per Diameter

21. Wastewater Treatment Works and Capacities:

HUMAN RESOURCES

22. Do you have an Approved Organogram?

23. Do you have a More Ideal Organogram?

24. Staff Numbers:

25. Which Staff do you Find Difficult to recruit?

26. General Feedback on HR Processes:

27. Ideas Relating Staff Numbers to Mandate:

FINANCES

28. Finances

INFORMATION

29. Information Provided:

30. Additional Information Sourced by Researcher:

Appendix B HR Questionnaire

HR Interview Questionnaire

Name of Organisation :		**Type of Organisation:**	
Name of Interviewee:		**Position/ Designation :**	
Name of Interviewee:		**Position/ Designation :**	
Location:		**Date:**	

1. Have you conducted a skills audit in the last 5 years?

2. What process/ methodology did you follow?

Copy of audit questionnaire & process methodology requested: Yes/ No
Copy of audit questionnaire & process methodology received: Yes/ No

3. Do you have an organogram for the Technical/ Engineering/ W&S Services Departments? Yes/ No

Copy requested: Yes/ No Copy received: Yes/ No

4. When last or how often is the organogram updated?

5. Do you do resource planning? Yes/ No
How often? When was the last time?

6. What HR MIS system do you use?

7. What data does the system house?

Biographical data requested: Yes/ No Data received: Yes/ No

8. Limitations of the HR MIS system identified?

9. Do you have a Recruitment & Selection policy &Procedure? Yes/ No

Copy requested: Yes/ No Copy received: Yes/ No

10. What are the process inhibitors of the policy & procedure?

11. How many vacancies currently exist?

12. How long have these positions been vacant? / What is the average turn- around-time to fill vacant positions?

13. What are the key challenges in sourcing suitable technical skills?

14. To what extent does politics influence the selection and appointment of positions?

15. Do you have job profiles/ detailed descriptions for all positions? Yes/ Some/ No

16. Do you have job profiles/ detailed descriptions for the technical positions? Yes/ Some/ No

Copies requested: Yes/ No Copies received: Yes/ No

17. How detailed are these? To what extent do to you deviate from the minimum requirements?

18. Do you have a Training & Development policy &Procedure? Yes/ No

Copy requested: Yes/ No Copy received: Yes/ No

19. What are the process inhibitors of the policy & procedure?

20. What is the annual Training & Development budget?

21. Availability of technical training?

22. Availability of other training? i.e. Management, financial, etc

23. Have you had any of your technical or other staff members go through RPL process? Yes/ No

How many?

For what disciplines?

24. What retention strategies do you employ within your organisation?

General Comments: