OCCUPATIONAL FRAMEWORK

SECTION E: WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES

DIVISION 36: WATER COLLECTION, TREATMENT AND SUPPLY

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Occupational Framework
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ABSTRACT

An Occupational Framework (OF) is the result of the analysis performed to determine the work scope of the occupational areas in terms of skills. This document is used to identify the relevant occupational fields that either demand the development of new skill-training programmes or the review and improvement of already-existing programmes. The OF was developed using three main approaches: document analysis, focus group discussion and survey (questionnaire). The document analysis involves a thorough analysis of the research literature that exhibits an overview of the industry relevant to the needs and requirements of industrialisation that are covered by the data collected using this method. The focus group discussion (FGD) was facilitated by an in-depth discussion on the industry employment status of the water industry, stakeholders, the development of occupational structures (OS), and the identification of the critical job titles for this industry as well as the occupational descriptions (OD) for the job titles. In summary, 22 job areas were identified, with 113 job titles and 33 as critical job titles. All these 33 critical jobs are relevant to IR, with another 67 other job titles. Then, a survey was conducted to gather the four important pieces of information for this study, skills in demand, jobs in demand, emerging skills, and related issues, utilising online surveys via Google Forms. The responders who are targeted are E36 industry players at level 4 or higher. The survey was distributed to all industry players to get the most up-to-date situations on the critical job classifications, qualifications and skills needed to fit the current workload, style and technology. Apart from these, the emerging skills that are expected to grow in the industry and the needed attribute for workers for E36 and other related issues were asked as well. The surveys have also covered the skills needed for critical tasks, academic qualifications and skills needed to fulfil the task, work style and the latest technology. 47 respondent has shared their feedback, and the demography and reliability have been measured. It has come to light that the major risk and concern for this industry is the knowledge gaps among the workers. The main reasons are a mixture of technology advancements in the hardware and software used. However, the handler's skill is slow to catch up, lack of knowledge transfer programmes between senior members and junior members and an outdated syllabus for training. Thus, a mapping between the OS, OD and any available NOSS training has been mapped for further action.

ABSTRAK

Kerangka Pekerjaan (OF) adalah hasil analisis yang dilakukan untuk menentukan skop kerja bidang pekerjaan dari segi kemahiran. Dokumen ini digunakan untuk mengenal pasti bidang pekerjaan yang sama ada memerlukan pembangunan program latihan kemahiran baharu, atau memerlukan semakan dan penambahbaikan program sedia ada. OF ini dibangunkan dengan menggunakan tiga pendekatan utama iaitu analisis dokumen, perbincangan kumpulan berfokus dan tinjauan (soalselidik). Analisis dokumen melibatkan analisis menyeluruh terhadap kajian literatur penyelidikan yang mempamerkan gambaran keseluruhan industri yang relevan dengan keperluan perindustrian bidang ini.. Perbincangan Kumpulan Berfokus (FGD) pula, digunakan untuk memudahkan perbincangan mendalam dan terfokus, mengenai status pekerjaan bagi industri air dan pemegang taruh, pembangunan Struktur Pekerjaan (OS), dan pengenalpastian perjawatan kritikal bagi industri ini serta Deskripsi Pekerjaan (OD) untuk jawatan-jawatan tersebut. Secara ringkasnya, 22 bidang pekerjaan telah dikenal pasti dengan 113 perjawatan. Di antara 113 perjawatan itu, 33 darinya dikenal pasti sebagai perjawatan kritikal. Kesemua 33 perjawatan kritikal ini juga releven dengan revolusi industri, disamping 67 perjawatan lain. Kemudian, satu soal selidik dibangun dan dijalankan untuk mengumpulkan empat maklumat penting untuk kajian ini; iaitu kemahiran dan perjawatan dengan permintaan yang tinggi, kemahiran baru muncul, dan isu-isu berkaitan. Soal selidik ini menggunakan borang dalam talian dengan Google Forms. Responden yang disasarkan adalah semua pemegang taruh industri E36 aras 4 atau lebih tinggi. Soal selidik ini juga telah diedarkan kepada pihak industri bagi mendapatkan keadaan dan keperluan untuk jenis-jenis tugas yang kritikal, kelayakan adademik dan kemahiran yang diperlukan bagi memenuhi beban kerja, gaya kerja dan teknologi terkini di E36. Seramai 47 responden telah menjawab, dan demografi serta kebolehpercayaan respon telah diukur. Didapati, risiko terbesar dan juga kebimbangan industri ini adalah jurang pengetahuan (dan kemahiran) antara pekerja. Punca utama masalah ini merupakan gabungan perubahan dan kemajuan teknologi perkakasan dan perisian yang digunakan, tidak seiring dengan kemahiran pekerja yang menguruskan atau menggunakan perkakasan dan perisian tersebut. Jurang ini juga terhasil dari kekurangan program pemindahan pengetahuan antara pekerja berpengalaman dengan pekerja baru serta silibus latihan yang sudah lapuk. Oleh tu, pemetaan antara OS dan OD yang baru dengan program NOSS sedia ada telah dilakukan bagi tindakan seterusnya oleh pihak JPK.

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ABBREVIATION

1.	ALC	Active Leakage Control
2.	DMA	District Meter Area
3.	DMZ	District Meter Zone
4.	DSD	Department of Skills Development
5.	GDP	Gross Domestic Product
6.	GIS	Geographical Information System
7.	IoT	Internet of Things
8.	IR	Industrial Revolution
9.	MASCO	Malaysia Standard Classification Of Occupations
10.	MoHR	Ministry of Human Resources
11.	MOSQF	Malaysia Occupational Skills Qualification Framework
12.	MSIC	Malaysia Standard Industrial Classification
13.	MWA	Malaysia Water Association
14.	NOSS	National Occupational Skills Standards
15.	NRW	Non-Revenue Water
16.	OD	Occupational Description
17.	OF	Occupational Framework
18.	OS	Occupational Structure
19.	SPAN	*Suruhanjaya Perkhidmatan Air Negara*

GLOSSARY

1.	Absorption	The process of taking up a substance into its physical structure by physical or chemical action, but without a chemical reaction.
2.	Acidity	The quantitative capacity of water to neutralize an alkali or base.
3.	Adsorption	The process whereby one substance adheres to the surface of another substance.
4.	Alkalinity	The quantitative capacity of water to neutralize an acid.
5.	Bacteria	Microscopic single-celled organisms lack defined nuclear membranes and other specialised functional cell parts and reproduce cell division or spores.
6.	Catchment	An area where water is collected by the natural landscape.
7.	Check valve	A simple mechanical device used to prevent the reverse flow of a fluid.
8.	Chlorination	The application of chlorine or chlorine compounds to water for the purpose of disinfection. It can also be sued for chemical oxidation and odour control.
9.	Chlorine	A gas (Cl2) widely used in the disinfection of drinking water as well as an oxidising agent for organic matter, iron, manganese and hydrogen sulphide.
10.	Dechlorination	The intentional reduction or removal of chlorine disinfectants from a water supply.
11.	Deionization (DI)	The process of removing all ionized substances (minerals, slats, gases) from water.
12.	Demineralization	Describes any process that removes minerals from water.
13.	Desalination	The removal of dissolved inorganic salts from water produces a liquid free from dissolved salts. Reverse osmosis or distillation are two forms of a desalination process.
14.	Distillation	The process where water is converted into a vapour state by heating. The resulting vapour is collected, cooled and condensed to a liquid state for use.
15.	Effluent	Typically, the outflow of water after it has passed through a treatment system.
16.	Evaporation	The process by which a substance is changed from the liquid to the vapour state.
17.	Groundwater	Water in the saturated zone is found under hydrostatic pressure. Body of water beneath the surface of the ground, typically stored in an aquifer.

CHAPTER I

INTRODUCTION

1.1. Research Background

Water is a precious resource that is essential to sustain life, economic development and ecosystems. The water collection, treatment and supply sector incorporate activities related to water management, including the collection of water from various sources, treating the water and distributing it by various means for household and industrial needs. For these services, we are proud that Malaysia's water industry is known as one of the most organised infrastructures in Southeast Asia (Melvin Leong, 2018). The implementation of integrated water resources management to ensure the sustainable management of Malaysia's water resources became stronger with the launching of The National Water Resources Policy in March 2012 (*Akademi Sains Malaysia*, 2015).

However, the increasing water demand with raw water extraction is 15,784 million litres per day but consumed as much as 10,044 million litres per day (Institute of Labour Market Information and Analysis (ILMIA) & Ministry of Human Resources, 2020; *Suruhanjaya Perkhidmatan Air Negara*, 2021) had us experience recurring water shortages and led to water rationing in some state (Shahrizaila Abdullah, 2016). On top of this, the recurring flash flood has been the focus as well, but a new stormwater management manual has been published to contain this (Zakaria et al., 2004).

Not only that, but this industry is also facing an ageing infrastructure with lots of maintenance needed for repairing or replacing pipe leakage. Millions of money were put aside for this purpose and upkeeping the technology to survive the changes in Industrial

Revolution (IR). The increase in Non-Revenue Water (NRW) needs a special task force to handle them. It is reported that the reduction of Non-Revenue Water (NRW) will be intensified while water infrastructure and services in urban areas will be strengthened (Melvin Leong, 2018; *Suruhanjaya Perkhidmatan Air Negara*, 2021).

The unsustainable water tariff, which differs from state to state, was also a problem as some states revised it as long as 39 years ago (Pahang) and as latest as 2016 (Melaka). (*Suruhanjaya Perkhidmatan Air Negara*, 2021).

The sector is generally a natural monopoly, which usually results in it being run as a public service by a public utility owned by the local or national government. However, the organisation of the industry, which tends to be highly regulated, differs across countries with varying levels of public and private sector involvement. As natural environments, water sources, and quality differ across countries, national practices for this industry also differ. Malaysia's water resources, for example, came in many forms, as shown in Figure 1.1.

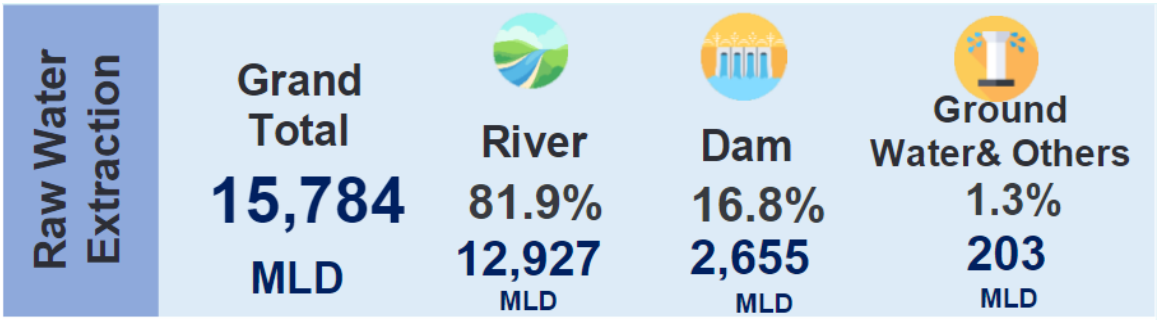

Figure 1.1: Sources of raw water extraction for Malaysia. MLD is Million litres per Day
Source: Suruhanjaya Perkhidmatan Air Negara, 2021

Therefore, it is crucial to plan, strategies and manage the whole ecosystem in water collection, treatment and supply correctly. Over the years, the industry has undergone many changes, including the management bodies, water sources, usage and technology involved. Therefore, gaps in skills between senior workers and juniors need to be closed. In-house training might not be suitable as some training involve special equipment, which is expensive and not available at every site. So, a centralised training centre is preferable (*Suruhanjaya Perkhidmatan Air Negara*, 2021), or a smart partnership among operators for special training

is expected. The workforce and issues and skills have also been investigated by (the Institute of Labour Market Information and Analysis (ILMIA) & Ministry of Human Resources, 2020).

While identifying the workforce and skills gap, the technology change of technology used and its relevance to the IR needs to be identified to ensure that our water industry is sustainable. Occupational Framework (OF), previously known as Occupational Analysis, must be carried out. The OF is an outcome of an occupational analysis and research work carried out on a particular industry sector. The contents of an OF include a proper Occupational Structure (OS), which identifies the generic job titles across the same industry, complete with its IR relevancy and skills needed, and highlight the critical job with its Occupational Descriptions (OD).

1.2. Problem Statement

The existing Occupational Structure that is prepared for the water collection, treatment and supply industry, defined by the MSIC 2008, has a few things that could be improved. The OS developed by Human Resource Development Corporation (HRDC) in their report focus on the water supply area, which includes water treatment, distribution and Non-Revenue Water only (Human Resource Development Corporation, 2020). On the other hand, the OF for E36 published by the Department of Skills (2016), guided by the developed NOSS and needed to be completed with the critical jobs, is outdated as it is unrelated to the IR. During the focus group discussions with the industry players, concerns regarding different job titles with similar job titles amongst operators and states were also raised. Therefore, the OS contained the generic job titles for all similar tasks across companies and mapped them into MOSQF (Malaysian Occupational Skills Qualifications Framework, 2021).

On top of this, some industries in Malaysia are still stuck at Industry 3.0, mainly due to the initial expensive and huge capital investment and the availability of cheap and legal foreign workers option (Raj et al. 2020). Furthermore, there are reports regarding the need for job titles in the water collection, treatment & supply industry relevant to the Industrial Revolution (IR). This has come into the limelight since the listing of advanced and

innovative technology for this industry was listed as a research topic in the National Integrated Resource Management Plan (Abdullah et al., 2016).

Thus, a thorough study of the relevancy and technology used in the E36 to the Industrial Revolution needs to be revisited and updated. This is important to ensure that the industry is not left behind in terms of getting into emerging industries related to the Industrial Revolution. In addition, only 30% of overall manufacturers are aware of the IR concept (Ling, Abdul Hamid, and Chuan, 2020).

Next, due to the limited attention paid to the quality of the match between a worker's education and skills that are required in the workplace, there are value chain impact factors such as 'causes & effects' and significant to the skills mismatch of the relevant industries (Battu & Zakariya 2015). This is likely to occur in various industries, including the water collection, treatment & supply industry.

This led to critical jobs for E36 not be adequately defined. Even in the latest list of critical jobs, only two (2) job titles were identified as critical jobs (Critical Skills Monitoring Committee, 2020). Therefore, there is a need to determine the critical jobs and the occupational description in the water collection, treatment and supply industry.

1.3. Objective of Study

The objective of this research is to develop the Occupational Framework for the E36 industry, which contains:

a) To develop an Occupational Structure (OS) in water collection, treatment and supply industry based on MSIC 2008;
b) To determine the jobs titles for water collection, treatment and supply, and relevance to IR;
c) To determine the skills in demand of water collection, treatment and supply industry;
d) To determine the critical jobs in water collection, treatment and supply industry; and
e) To determine Occupational Descriptions (OD) of water collection, treatment and supply for critical jobs based on developed OS.

1.4. Scope of Study

This scope is in tandem with a description of Division 36 under Section E: This division includes the catchment, treatment and distribution of water for domestic and industrial needs. Catchment of water from various sources, water treatments including sludge, and distribution by trucks or tankers are also included.

This research focuses on the industry players of water collection, treatment and supply industry representatives under MSIC 2008 Division E36 in Peninsular Malaysia and Labuan. The industry representatives from 37 companies and other stakeholders for E36 will be responding to this analysis.

1.5. Limitation of study

MSIC 3-digit, group 360 includes water collection, treatment and distribution activities for domestic and industrial needs. Thus, the provision of irrigation services through sprinklers, and similar agricultural support services, are not included. Similarly, the treatment and distribution of water for water supply purposes, including the operation of irrigation canals, were also out of scope. Treating wastewater to prevent pollution and (long-distance) transport of water via pipelines are also excluded.

1.6. Structure of Chapters

This chapter concludes with a brief overview of the entire study, which includes:

a) Chapter 1

   This chapter summarised the motivation of this study, the objectives, scope and limitations of the study.

b) Chapter 2

This chapter comprises document analysis, which analyses past reports and the needs for OS, job titles, relevancy to IR, critical jobs and occupational descriptions. Various reviews from the industry's stakeholders, government policies, market intelligence and relation with Industrial Revolution will be academically discussed. Then it will be summarised to develop a holistic approach to achieving the objectives stated in chapter one.

c) Chapter 3

This chapter includes an explanation of the methodology implemented in this study in order to obtain the results. It entails the steps to catch the latest problem, condition, job title and other related information needed for this study. The planned methodology ensures that all information can be collected from as many sources as possible with good and trustworthy quality. It is also to ensure that the engagement, meetings, surveys etc., were not to be repeated due to lack of preparation and foreseen events.

d) Chapter 4

This chapter includes the result of the analysis from chapter 3. It tackles the objectives listed earlier, which are the validated Occupational Structure, skills in demand, job titles, critical jobs and occupational descriptions for the E36 industry.

e) Chapter 5

This chapter includes the discussion and conclusion of the findings and other related information obtained from the industry. This chapter also contains suggestions or recommendations to be considered for future and related research based on the finding.

1.7. Summary

From the overview of the current situation and trends in the E36: water collection, treatment and supply industry, the motivation for having a well-develop occupational framework for this industry can be seen. The OF will be the framework for the industry to identify their jobs, skills, and level of importance, as well as to foresee the positions and skills that need to be prepared or trained beforehand. Therefore, a thorough study of the government's plan and any policies, campaigns, reports and technology used by all the stakeholders will need to be present in chapter 2. Input from the industry players is also significant to ensure the developed OF is practical and can help to improve the E36 industry. Existing practices should be put into consideration, so changes and further alignment are possible. This paper will be structured and discussed according to the objectives.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Based on the definition, the Occupational Framework is a document that guides the holistic occupational structure, including the job titles that are mapped to its competency level and specific to a particular industry in Malaysia. Thus, the OF developed must be based on the MSIC 2008 (Department of Statistics, 2011) because this classification was based on the International Standard of Industry Classification Revision 4. It has been the main reference for the Economic Planning Unit and the Implementation and Performance Management Unit for the nation's skills and workforce data (Department of Skills Development & Ministry of Human Resources, 2020).

This chapter reviews acts, legislations, policies, initiatives, relevant frameworks, standards, types of training, key stakeholders, and a list of National Occupational Skills Standards (NOSS) relevant to MSIC E36. This will also include an overview of several other countries in relation to the E36 industry as a comparison and benchmarking. Findings in this chapter were obtained primarily through literature reviews, shaping a deeper understanding of the OF and the industry.

The OF consist of the Occupational Structure (OS) and Occupational Descriptions (OD). The OS is a matrix that shows the occupational areas and contains the generic job title(s) for all similar tasks across companies and mapped into the skill levels for a particular occupation following the Malaysian Qualification Agency (2021). These identified job titles and skill levels will further investigate to know the relevancy to IR and understand the

overall idea for each particular occupational area. This allows us to classify critical job titles and the skills requirements, to prepare and fill in the skills gaps and shortages in the workforce. The job area, responsibilities, skills, attitude and knowledge needed for these critical jobs will be documented as the OD.

The OS and OD will be used to prepare the country for a better plan in sustaining skillsets and labour force for the E36 industry and Malaysia's economy. This OF would also be used to ensure a reliable source of information for developing relevant NOSS, certification and training requirements (Department of Skills Development & Ministry of Human Resources, 2020)

2.2 The Background of Water Collection, Treatment and Supply Industry

The water industry is very important for the nation's well-being and the economy globally. The World Water crisis, which has been given delayed attention (Zhang et al., 2021), has shown its effect as unorganised, unplanned or un-strategised use of water has become more than affordable by the water sources (Shahrizaila Abdullah, 2016). Based on current data, it is predicted that the severity of water supply and demand in the year 2030 will be 40% (Will Sarni, 2019).

Therefore, the United Nations has launched the Sustainable Development Goals over the last two decades. In addition, the World Water Council has charted the Integrated Water Resource Management plan for securing the sustainability of world water resources (Agarwal & Global Water Partnership., 2000). Malaysia has then formally adopted the IWMR and developed the roadmap and guidelines tailored to Malaysia's condition has been developed (Abdullah et al., 2016).

Luckily, the steady increase in water treatment plant capacity and production in Figure 2.1 indicates the healthy growth of Malaysia's water industry. The decreasing pattern for the reserve margins shows that the treatment planta is becoming more efficient in utilising its capacity and most probably uses IR technology in doing so.

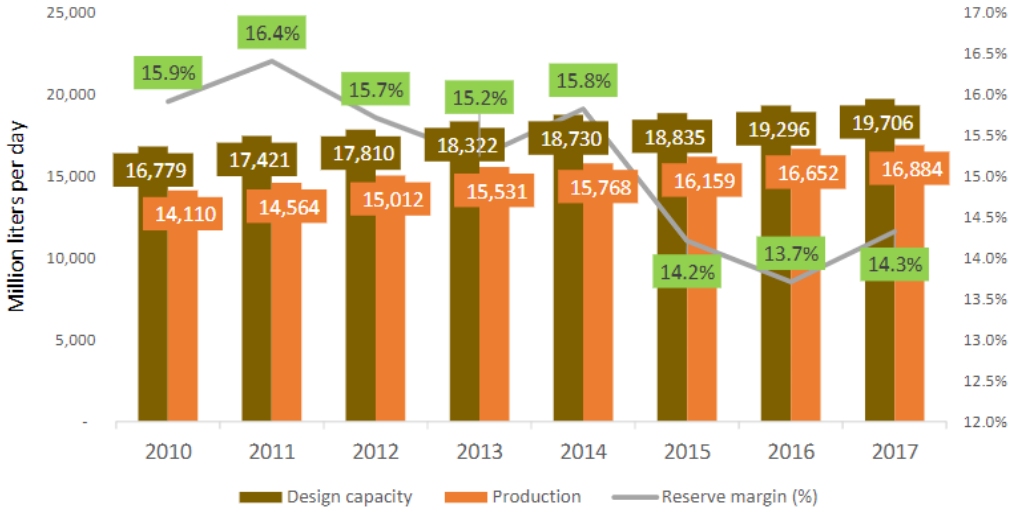

Figure 2.1: Water treatment Plant capacity and Production, 2010-2017

Source: ILMIA, 2020

Malaysia's water industry also faced an unsustainable water tariff (*Suruhanjaya Perkhidmatan Air Negara*, 2021). Not only tariffs differed from state to state as different water operators manage them, the reviews on existing tariffs needed to be updated. Pahang, for example, is still using the last 39 years' tariff, while the latest review was on Melaka state, which was in 2016. However, this issue has been put into a plan for a rationalised tariff setting in the Vision 2020 National Transformation Programme (Shahrizaila Abdullah, 2016). Hopefully, it will be picked up by the government for reinvestigation for its relevancies and put into implementation.

The water industry has been consistently growing, by looking at the increasing pattern of the number of staff employed. The E360 workers 13575 (2015) increased to 19162 (2017) with annual GDP (2015) of 5.27 billion (Institute of Labour Market Information and Analysis (ILMIA) & Ministry of Human Resources, 2020). Then, 19,162 staff were employed in 2017 compared to 16,133 in 2015. Out of these numbers, only 14% were at the management level. Figure 2.2 below shows the employment trends in the water and sewerage industry. In addition to an increased projection rate of employment, there are also identified water skill shortages, as shown in Figure 2.3. There is also a need for energy management techniques and skills demand, as water utilities consume energy to operate (Wilson et al., 2021). Similarly, the need for system engineering-related skills for water was also in place (Lund, 2020).

Based on the Annual Economic Survey (AES) 2017 published by the Department of Statistics Malaysia (DOSM), Malaysia's water industry recorded a gross output of RM 6,779,685 in 2017. The gross output shows an increase of RM 727,716 compared to the gross output in 2015, which is RM 6,051,969.

The value of intermediate input of the water supply sector increased from RM 2,560,281 in 2015 to RM 2,833,579 in 2017. The value added recorded for the water supply sector in the AES 2017 shows an increase of RM 454,471. The value added in 2015 was RM3,491,689, while the added value in 2017 was RM 3,946,106. In conclusion, the water supply sector showed significant growth from 2015 to 2017.

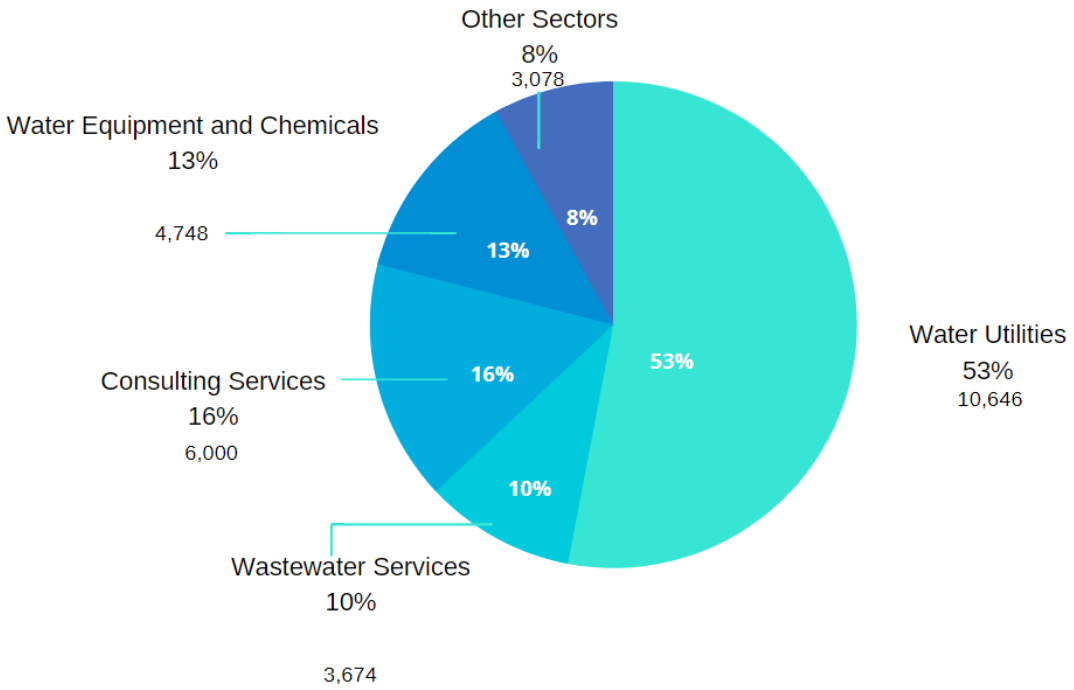

Figure 2.2: Employment trends for water and sewerage for the year 2020

Source: Human Resource Development Corporation, 2020

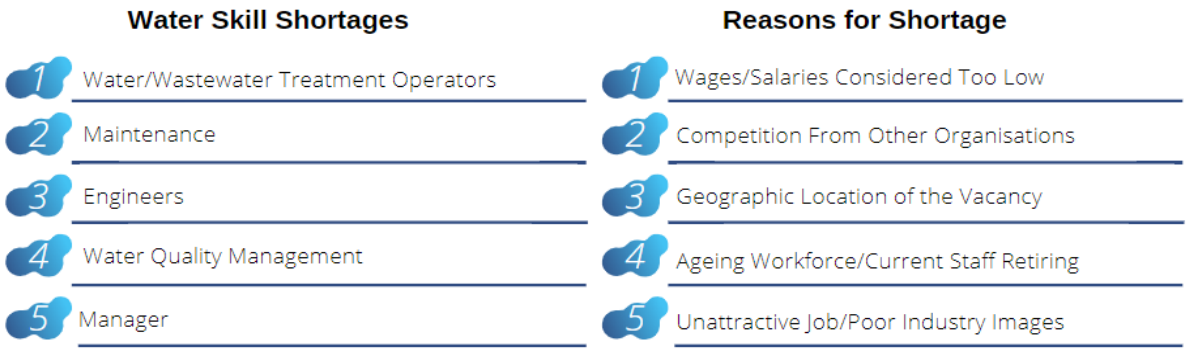

Figure 2.3: Skills shortage projection for 2024 in the water industry

Source: Human Resource Development Corporation, 2020

The forecasted skills and knowledge, as well as the critical jobs, sought-after work or hard-to-fill positions in the water industry, will enable the government to prepare beforehand. Plan for special training, knowledge transfer, protégé as well, as including certain items in the school syllabus can warrant a good candidate to fill those positions promptly (Brown & Washburn, 2020). This is why the development of the OF, which will be the basis for NOSS development, is very important. The complete cycle of the ecosystem for the Malaysian Skills Certification System is shown in figure 2.4 below.

Figure 2.4: Cycle of Malaysian Skills Certification System Ecosystem

Source: Department of Skills Development

In order to carry out all the planned guidelines and road maps, all industry players must be included in this research. They can either affect or be affected by the organisation's actions, objectives and policies. In Malaysia, the water collection, treatment and supply stakeholders comprise government agencies, regulatory bodies, industry associations, water operators, professional bodies and training centres of the water industry. Thus, before embarking on the legislative items and stakeholders, the definition, inclusion and exclusion criteria of E36: water collection, treatment and supply industry need to be understood.

2.2.1. Malaysia Standard Industrial Classification (MSIC) 2008 Definition

The MSIC 2008 is intended to be the standard classification of productive economic activities. Its main purpose is to provide a set of activity categories that can be utilised for collecting and presenting statistics according to such activities. Therefore, MSIC aims to present this set of activity categories that entities can be classified according to the economic activity they carry out. For international comparability purposes, the MSIC 2008 Version 1.0 conforms closely to the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, published by the United Nations Statistics Division, with some modifications to suit national requirements.

The MSIC 2008 provides a standard framework for classifying establishments and other statistical units in the given industry in all official statistics. It also serves as a standard reference to users of official statistics on the type of economic activities included under the various categories of industries. This section defines the MSIC 2008 based on the Department of Statistics Malaysia (DOSM) and the criteria for this study’s title selection.

The objective of an industrial classification system is to classify data regarding the economy according to categories of activities and the characteristics of which will be similar. The MSIC is a classification of all types of economic activities and is neither a classification of goods and services nor a classification of occupations (Department of Statistics, 2011).

In order to review that the scope of the water collection, treatment and supply industry is comprehensively covered in this Occupational Framework research, the

definition of water collection, treatment and supply has to be spelt out clearly. Under MSIC, the area being researched falls under the Section and Division listed in Table 2.1 below, up until Class 3600 (coloured as grey only).

Table 2.1: MSIC 2008 by Section, Division, Group, Item and Class

Section	E	Water Supply; Sewerage, Waste Management and Remediation Activities
Division	36	Water collection, treatment and supply
Group	360	Water collection, treatment and supply
Class	3600(1)	Water collection, treatment and distribution activities for domestic and industrial needs
Items	36001	Purification and distribution of water for water supply purposes (2)
	36002	Desalting of sea or ground water to produce water as the principal product of interest (3)
(1) Includes:		distribution of water by trucks
Excludes:		operation of irrigation equipment for agricultural purposes see 01610 treatment of waste water in order to prevent pollution see 37000 (long-distance) transport of water via pipelines see 49300
(2) Includes:		operation of irrigation canals
(3) Includes:		potable water production by evaporation of saline water)

2.2.2. Key Stakeholders

A key stakeholder is among the most important stakeholders for a company. Key stakeholders are highly interested in the particular industry's success, as they are most affected by its business. A stakeholder, either an individual or group, has an interest in any decision or activity of the industry. In this OF, the stakeholder that was listed is from the government agencies, regulatory bodies, industry associations, professional bodies and training centres.

a) Government Agencies, Regulatory Bodies, Policies and Initiatives

The water services industry in Malaysia is considered one of the essential services. The roles of government agencies and regulatory bodies are developing a policy, regulating industrial activity, establishing standards and ensuring consistent compliance. In addition, government policies and initiatives are plans of action adopted or pursued by the government in order to increase the growth of the sector. In Malaysia, the government agencies / regulatory bodies/legislation/policy/initiatives related to the water collection, treatment and supply industry are listed in Table 2.2.

Table 2.2: Relevant regulator bodies, policies or initiatives for water collection, treatment and supply

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
1.	Ministry of Natural Resources, Environment and Climate Change (NRECC)	1) Perform administrative and financial services, human resource management, information technology and development project monitoring. 2) Prepare and implement policy planning, regulations and programs of the Ministry. 3) Determine environmental protection policies, strategies and programs as well as climate change adaptation and mitigation actions at the national, regional and international levels. 4) Formulate the overall policy direction and strategy of the water service industry. 5) Establish and review the regulatory framework for the water services industry.
2.	National Water Service Commission (SPAN)	1) Advise the Minister on all matters in relation to the national policy objectives of water supply services laws and implement and promote the national policy objectives. 2) Implement and enforce the water supply services laws and consider and recommend reforms to the water supply services laws. 3) Ensure the water supply and sewerage services industry's productivity and monitor operator compliance with stipulated standards, contractual obligations and relevant laws and guidelines.

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
		4) Increase concerted efforts towards improving the industry's operational efficiency, particularly the reduction of non-revenue water through short-term, medium-term and long-term programmes. 5) Ensure the national development goals pertaining to coverage, supply and access to water supply services are achieved. 6) Ensure long-term sustainability of quality of water services through continued capital works development. 7) Carry out any function conferred upon it under any other law. 8) Advise Minister generally on matters relating to water supply services.
3.	Ministry of Human Resources (MoHR)	1) Developing competent, productive, responsive & resilient human capital in the labour market to increase national productivity. 2) Ensuring the smooth operation of the nation's labour market. 3) Increasing employability and employment rate of the local workforce to meet the national labour market needs. 4) Ensuring harmonious and conducive industrial relations. 5) Prioritising the aspect of occupational safety and health. 6) Ensuring comprehensive, dynamic and progressive social safety net.
4.	Department of Skills Development (DSD)	1) Coordinating and controlling the implementation of the skills training system to produce K-Workers for employment needs and recognition at the national and international levels. 2) Conduct research and develop the National Occupational Skills Standards (NOSS) to continuously improve the quality of skilled human resources to contribute to the country's economic growth.

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
5.	Department of Irrigation and Drainage	1) Implementation of development and management of flood and drought forecast system, management of hydrological data and information and assessment and management of National Water Resources. 2) Development of planning and management of river basins. 3) Managing and regulating the implementation of Stormwater in Town Areas Management Programs.
6.	Department of Environment (DOE)	1) River water monitoring study and new programs, namely regulating programs, performing monitoring, QA/QC, the payment process for monitoring station study services and formulating regulations related to rivers, groundwater, marine & environment. 2) River data management, data validation, data analysis, data interpretation, information dissemination (EQR), storage and security. 3) Water pollution inventory for Point Sources and Non-Point Sources (NP and NPS), inland pollution, water pollution study and solution measures. 4) Provides IRBM implementation study, IRWM and river study action plan. 5) Update data by river basin, manage and supervise the entry of inventory data of Point Sources by the State DOE. 6) Groundwater monitoring programs (industries, government and private agencies, etc.). 7) Formation of new programs (criteria standards and indices), review of monitoring stations.
7.	Water Asset Management Company (PAAB)	1) Work closely with the respective stakeholders in the planning of new water infrastructure. 2) Design and develop new water infrastructure, i.e., Water Treatment Plant, Reservoir, and Pipelines.

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
		3) Pipe rehabilitation and replacement programme of ageing pipes to arrest water leakage.
8.	Badan Kawal Selia Air (BKSA) Negeri[1]	1) Supervise and regulate raw water supply services, including determining raw water quality standards and enforcing related laws. 2) Ensure optimal raw water supply with reasonable charges and ensure the quality of water supplied is safe. 3) Serve as an advisory body to the State Authority on any matter related to the supply of raw water. 4) As a booster and intensify the supply of raw water for the purpose of advancing the economic development of the State of Melaka.* 5) Monitor the licensee to carry out the obligations imposed on him under the Enactment as well as other regulations made and also ensure that the licensee can finance the activities allowed by his licence. 6) Ensure the licensee pays the raw water abstraction charge according to the set charge. 7) Regulate and monitor pollution of water sources and raw water.
9.	Bahagian Bekalan Air (BBA)	1) Coordinating and monitoring water supply development programs throughout the country funded by loans from the Federal Government. 2) Plan, monitor and manage the implementation of water supply development projects across the country that are directly funded by the Federal Government. 3) Planning, monitoring and managing the implementation of water resource development and research programs in Peninsular Malaysia and W.P. Labuan.

[1] *https://www.melaka.gov.my/ms/jkmm/bahagian-unit/timbalan-setiausaha-kerajaan-pembangunan-1/badan-kawal-selia-air-bksa

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
		4) Planning, maintaining and managing water supply facilities in W. P. Labuan. 5) Plan, implement and monitor the National NRW program. 6) Plan and implement safety monitoring and inspection of water supply dams and other high-risk water infrastructure. 7) Coordinate and monitor the water quality control program in Sabah and Sarawak. 8) Provide technical advisory services to the Ministry and other agencies on water supply engineering.
10.	Water Services Industry Act 2006 (Act 655)	1) This Act aims to establish a licensing and regulatory framework for regulatory intervention to promote the national policy objectives for the water supply services industry.
11.	Water Services Industry (Licensing) Regulations 2007	1) These Regulations prescribe all matters relating to the issuance of individual licences and registration of class licences granted under the Water Services Industry Act. 2) The Regulations provide the form and manner in which applications for individual or class licences shall be made, including the eligibility of persons applying for licences, licence fees for different types of licences and licensed activities, the duration of the licences, the forms of licences, the standard conditions of the licences, renewal fees and other processing charges.
12.	Water Services Industry (Compounding of Offences) Regulations 2008	1) These Regulations prescribe the offences which may be compounded and the forms to be used and set out methods and procedures for compounding offences.
13.	Water Services Industry (Prohibited Effluent) Regulations	1) These Regulations stipulate that no person shall discharge or permit discharging any prohibited effluent as specified in the Schedule of the

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
	2021	Regulations to a public sewage system or public sewage treatment plant without the approval of the National Water Services Commission (SPAN). Applications for approval on the discharge of wastewater must be made in a manner to be determined by SPAN. Prohibited effluent includes, amongst other things, any discharge and substance that affects the disposal of sewage sludge as an organic compound and discharges having a toxic effect in the watercourse that constitute a hazard to humans or animals.
14.	Water Services Industry (Bulk Water Supply Agreement) Rules 2015	1) These Rules, consisting of 4 Sections and 2 Schedules, prescribe all matters relating to the bulk water supply agreement. "bulk water supply agreement" means an agreement to supply water in bulk entered into by service licensees and includes a bulk water supply agreement which has been renewed and a supplemental agreement to a bulk water supply agreement. 2) Bulk water supply agreement shall be in writing. A bulk water supply agreement— (a) shall contain the salient terms provided in the Schedules, (b) shall contain any conditions which may be imposed by the National Water Service Commission before the registration of the bulk water supply agreement; and (c) may contain the terms agreed by the purchaser and the supplier subject to the approval of the Commission.
15.	Water Services Industry (Permit) Rules, 2007	1) These Rules prescribe all matters relating to the issuance of permits granted under the Water Services Industry Act, including the procedures for application, fees, forms, conditions and duration of the permits.
16.	Water Services Industry (Licensing)	1) This Order, consisting of 4 Sections, is enacted in accordance with Water Services Industry Act,

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
	(Exemption) Order 2007	2006. It prescribes exemptions from holding a licence under the Act. 2) The Federal Government shall be exempted from holding an individual license and a class licence under the Act. The State Government shall be exempted from holding a class licence under the Act. The extent of the exemption is stipulated in Section 4.
17.	The Occupational Safety and Health (Amendment) Act 2022	1) The Act is aimed at providing workers with a better quality, safe, and healthy environment and also welfare. Directors must be aware of their individual, joint and several liabilities for occupational health violations.
18.	The Employment (Amendment) Act 2022	1) The Act is aimed at increasing and improving the protection and welfare of employees. Ensuring that labour law provisions are in accordance with international labour standards. All private sector employees entering the contract of service should be protected and benefit from the Employment Act 1955. Maximum working hours of 45 hours per week.
19.	Minimum Wages Order 2022	1) The Malaysian Minimum Wages Order 2022 comes into operation. The Order increases the minimum monthly wage of employees to RM1,500. The Order applies to all employees except domestic servants.
20.	Uniform Technical Guidelines Water Reticulation and Plumbing Rules 2014	1) Establishes the general planning and design principles that are applied in the development of new external reticulation (distribution) systems, inclusive of metering, control, monitoring and surveillance facilities. The specific components of the water distribution system include suction tanks, pumping stations, pumping mains, rising mains and falling mains (gravity mains), service

No.	Government agencies / Regulatory bodies / Policy / Initiative	Roles, function and responsibilities
		reservoirs, supply mains, external reticulation network systems, sampling stations, district meters, valves, off-take ferrules/tee connections, communication pipes, bulk meters, sub-meters, service pipes, internal storage tanks, distribution pipes, flow control valves and particular fittings and appliances located within buildings. The water supply system encompassing the above components shall convey and distribute potable water to various categories of end users, including residential, commercial, institutional, industrial and social and religious premises.[2]
21.	Design of Water Treatment Plants and Related Water Supply System Components	1) Provided for planners, developers, consultants, competent persons, qualified persons, contractors and water facilities licenses to facilitate the planning and design of intakes and water treatment plants. This guideline is applicable to all water industry practitioners in the planning and design of water supply systems to be operated by either an Individual or Class License under the Water Services Industry Act 2006 (Act 655) of Malaysia. This guideline describes the Water Commission's set of technical aspects on the planning and designs of the water supply system that is accepted as good practice (knowledge, norms, tools and techniques).[3]

[2] Uniform Technical Guidelines Water Reticulation and Plumbing. First Edition (2014). Publish by: National Water Service Commission (SPAN)

[3] Uniform Technical Guidelines for the Design of Water Treatment Plants and Related Water Supply System Components. First Edition (2021). Publish by: National Water Service Commission (SPAN)

b) Industry Associations and Professional Bodies

The industry association and professional bodies for water service in Malaysia are responsible for regularly sharing information, discussing issues, developing standards and establishing rules for best practices within the water industry. The leading industry association and professional bodies and their function in Malaysia's water collection, treatment and supply industry are listed in Table 2.3.

Table 2.3: List of industry associations / professional bodies for water collection, treatment and supply

No.	Industry Associations / Professional Bodies	Roles, function and responsibilities
1.	Malaysian Water Associations (MWA)	1) Promote and advance the science and practice of engineering and management in the water supply and wastewater industries. 2) Provide advice and information on water supply and wastewater to public and private bodies as well as the public in general. 3) Publicise new technologies and promote the use of appropriate technology in the water supply and wastewater industries. 4) Provide a forum for the exchange of views among various sectors making up the water and wastewater industries, including water authorities, research bodies, consultants, manufacturers, suppliers and contractors. 5) Gather and disseminate through publications and other appropriate means information on water supply and wastewater with prior approval of the relevant authority. 6) Promote and update standardisation in water supply and wastewater practices, and also in goods, equipment and fittings used in the water supply and wastewater industries. 7) Promote training, research and development in the science and practice of engineering and management in the water supply and wastewater industries. 8) Cooperate, as may seem conducive to any of the above objects, with national and international organisations and support and complement their activities.

No.	Industry Associations / Professional Bodies	Roles, function and responsibilities
2.	Malaysia Water Partnership (MyWP)	1) Provide strategic advice to the Government and relevant stakeholders on water and water-related matters with particular emphasis on the adoption of Integrated Water Resources Management (IWRM) principles and practices. 2) Promote greater awareness of IWRM among all stakeholders, including the public, water users and potential polluters. 3) Provide and disseminate synthesized knowledge and experience on best management practices (BMPs) in IWRM. 4) Foster interaction among its members by promoting cross-sectional and multi-stakeholder dialogues at local, river basin, state and national levels to meet critical needs. 5) Provide support in capacity building and training programmes and activities related to IWRM. 6) Provide support for research and development initiatives related to IWRM. 7) Act as the focal point and coordinating centre for collaborative action with similar or related organisations locally, regionally and internationally.[4]
3.	Water and Energy Consumer Association of Malaysia (WECAM)	1) Improve the implementation of sustainable use of water and energy in Malaysia. 2) Provide objective and functional solutions and recommendations for creating sustainable water and energy use in Malaysia. 3) Create awareness, build capacity and solve problems related to the use of water, energy, and renewable and non-renewable resources through collaboration with the government, the private sector, the public and international organisations. 4) Lead Non-Governmental bodies in advocating the Sustainable Use of water and energy in

[4] Retrieved from https://www.mywp.org.my/malaysian-water-partnership-mywp/

No.	Industry Associations / Professional Bodies	Roles, function and responsibilities
		Malaysia and internationally for domestic and industrial users.[5]
4	Malaysia Real Estate and Housing Developers' Association (REHDA)	1) Provide industry-relevant training and events for the real estate and property development industry with the aim to improve productivity, innovate new ideas towards achieving the highest standards of professionalism and advance best practices for the industry. 2) Spearheaded industry-relevant research to drive improvements in the industry's best practices, research contents for members' consumption and contribute positively to the overall development of Malaysia. This is achieved through the production of industry-relevant research papers, compilation and analysis of research data, publications and analysis of current issues. 3) Working hand in hand with tertiary institutions, REHDA Institute aspires to work on Executive Programmes for middle and senior management of the industry to groom future leaders of the industry. This Executive Programmes industry is relevant to improve the value and skill set of those involved in the industry.
5	National Water Research Institute of Malaysia (NAHRIM)	1) Conduct basic and applied research within the water sector, such as river basin, water resources and climate change, coastal and oceanography, hydrogeology and water quality and environment. 2) Provide expert consultancy services pertaining to water and its environment for the public and private sectors. 3) Provide advisory role in water-related fields. 4) Act as a referral centre for water and environment-related research at the national

[5] Retrieved from https://www.fomca.org.my/v1/index.php/tentang-kami/persatuan-pengguna-air-dan-tenaga-malaysia

No.	Industry Associations / Professional Bodies	Roles, function and responsibilities
		level as well as participating actively in bilateral or multilateral research at the international level.
6	International Water Association (IWA)	1) Catalyst for innovation, knowledge and best practice to the sector, external organisations and opinion leaders. 2) Provide experience and leadership in transitioning to sustainable water solutions that are robust and flexible in the face of global change pressures. 3) International reference and source of knowledge for sustainable water solutions that are robust and flexible in the face of global change pressures. 4) Support the global community to pursue their ambitions in relation to water-related Sustainable Development Goals.

c) Training Centre

There are many established training centres related to the water collection, treatment and supply industry. These training centres are among the main training provider in this industry. The training centre is listed in Table 2.4.

Table 2.4: List of training centres for water collection, treatment and supply

No.	Training Centre	Roles, function and responsibilities
1.	Penang Water Services Academy (PWSA)	1) Equip new hires with the basic skills required to enable them to perform the job effectively and efficiently. 2) Produce a skilled and competent workforce for the company. 3) Assist Human Resource Division in assigning the personnel to the right job based on the competency-based selection criteria (Systematic Job placement).

No.	Training Centre	Roles, function and responsibilities
		4) Compliant with the requirement of the Water Services Industry Act 2006 (Act 655) on competent personnel and minimum qualification before allowing them to operate, maintain and manage the water supply system.
2.	Malaysian Water Academy (MyWA)	1) Provide institutional support for government initiatives towards the development of a quality workforce for increasing global competitiveness and liberalisation of the water industry. 2) Provide integrated and accredited education and training for all stakeholders across the public and private divide of the water and wastewater sector. 3) Provide a strategic platform for collaborative research and innovations between academia and industry, local and foreign experts. 4) Safeguard professionals' standards of the water and wastewater sector education and training. 5) Become a one-stop Centre for the sourcing of expertise in the water and wastewater sectors.
3.	Melaka Water Institute (MWI)	1) As a platform to create a Training Centre that focuses on training and competence related to the water industry for the development of water management, especially in Malaysia. 2) The main mover and assisted by MWI's strategic partner in training 23,000 workforces by implementing skills training programs for the workforce needs of the air industry. 3) Develop competence and train the staff of water operators, contractors and plumbers in the water industry in Malaysia. 4) Utilize the facilities and facilities available at SAMB. 5) Committed to bringing the aviation industry in Malaysia and specifically in Malacca to a more productive, quality, complete and capable level and increasing the development of human resources.

No.	Training Centre	Roles, function and responsibilities
4.	Water Analysis and Research Centre (ALIR)	1) Enhance the quality of water through research, training, consultancy and analytical services. 2) Conduct research on water analysis, chemistry, environmental health and treatment. 3) Provide course programme of Training, Research and Laboratory Testing. 4) Provide *Skim Akreditasi Makmal Malaysia* (SAMM) Accredited, MS ISO 17025.[6]
5.	Research Centre for Sustainable Process Technology	1) Explore and develop innovative ideas on sustainable process technology through effective research. 2) Train competent researchers that able to contribute to society and industry. 3) Disseminate knowledge in order to educate and enrich society and industry. 4) Establish a network, research collaboration and cooperation nationally and globally.[7]
6.	Centre for Environmental Sustainability and Water Security (IPASA)	1) Stimulate, encourage and enhance research programs in areas related to environmental sustainability and water security. To establish collaboration among academics in various disciplines related to environmental sustainability and water security towards enhancing research programs. 2) Establish and enhance collaboration between UTM and various universities and agencies (local and international) in related activities. 3) Provide advisory and consultancy services to public and private agencies on environmental sustainability and water security issues. 4) Provide facilities for strengthening postgraduate programs in environmental and water-related studies. 5) Enhance environmental awareness in society by organising awareness programs at various levels of society.

[6] Retrieved from https://www.ukm.my/alir/introduction/
[7] Retrieved from https://www.ukm.my/cespro/about-us/mission/

No.	Training Centre	Roles, function and responsibilities
		6) Provide services on environmental quality testing and modelling.[8]

[8] Retrieved from https://www.utm.my/ipasa/about-ipasa/vision-and-mission/

2.2.3. Business Value Chain

A value chain is the full range of commercial operations carried out to bring a good or service from inception to delivery. These activities include design, production, marketing, and distribution. The value chain for industries that produce items begins with the raw materials used to create the products and includes everything done before the product is distributed to consumers. Value chain analysis identifies flaws in these procedures and hastens time to market while reducing costs and increasing quality.

The analysis is a tool to visualize a firm's productivity by identifying the thousands of discrete activities involved. Based on the value chain model of water companies displayed in Figure 2.5, the water industry is divided into four (4) main sections, which are the water resources function; water production function; delivery/collection function; and consumption function. The resource function liaises with identifying, managing and maintaining water resources, while the production function is mostly on treating water until usable or consumable quality. The delivery/collection function serves to deliver the treated water to consumers, while the consumption function deals with customer feedback and complaints.

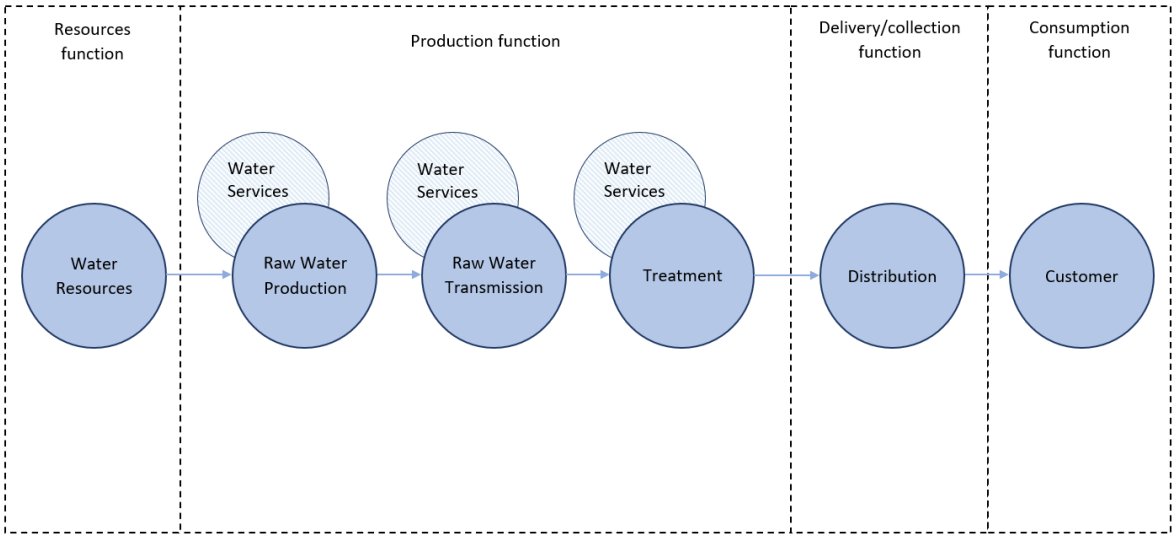

Figure 2.5: Value chain model of water companies

Adapted from: M. Spiller et al., 2009

2.3 Occupational Structure

Occupational structure refers to the aggregate distribution of occupations in certain industries, mapped into its skill level. The distribution of occupations is represented with the job titles, according to the occupation categories under Malaysia Standard Classification of Occupation (MASCO) or area defined under Malaysia Standard Industrial Classification (MSIC) 2008. The skill levels are defined by the Malaysian Occupational Skills Qualification Framework (MOSQF).

MOSQF refers to the policy framework that satisfies both the nationally and internationally recognized qualifications. It consists of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Elements of the qualification's framework indicate the achievement of each qualification title. It also provides progression routes for all the graduates in the respective occupational fields. The MOSQF has eight levels of qualifications in three sectors, and it is supported by lifelong education pathways. The definition for each level of skills qualification is specified in the Malaysian Occupational Skills Qualification Framework (MOSQF), which can be referred to in Annex 1. Table 2.5 shows the level of aptitudes descriptor (Knowledge, attitude and skills).

Table 2.5: Level of aptitudes descriptor (Knowledge, attitude and skills)

Level	Work Activities	Knowledge	Attitude (R&A) (Responsibility Autonomy)	Skills
8	Develop original understanding	Substantial professional or organisational change. Understanding of relevant theoretical and methodological perspective and how they affect the field of knowledge or	R for development of a field of work or knowledge, or for creating substantial professional or organisational change	Initiating, designing and undertaking research, development or strategic activities

		work.		
7	Reformulate	Substantial change or development. Understand theoretical & relevant methodological perspectives.	R for planning & developing course of action. Broad A & judgment.	Problematic situations.
6	Refine	Substantial change or development. Understand different perspectives, approaches, school of thought & theories	R for planning & developing course of action. Broad A & judgment.	Complex problems & limited definition.
5	Broad scope/ unexpected	Analysis, Diagnosis, Design, Planning, Implementation, Evaluation	Very high R & A. Responsible for others' work. Resource distribution.	Complex principles & techniques.
4	Broad scope/ Context		High R & A. Responsible for others work. Resource distribution.	Technical & Professional.
3	Broad/ Context		Considerable R & A. Control/guiding others.	Complex & non-routine.
2	Varied/ Context		R & A	Non-routine.
1	Varied			Routine & Predictable.

The Human Resource Development Corporation had listed the career path structure, which is similar to the Occupational structure. In the report, the Job title and description for part of the water industry, which is the water treatment, water distribution and non-revenue water, were also listed.

Apart from this, the Department of Skills Development, Ministry of Human Resources (2016) has also analysed the occupational structure for E36 and E37. However, the OS at that time were developed based on the available NOSS, not the other way around; thus, 115 job titles and 50 critical jobs were identified for E36 and E37.

2.4 IR Relevancy for E36

The Fourth Industrial Revolution is used to describe the emergence of the Digital Economy and the use of automation and data exchange in industrial technologies. Commonly referred to as the catchphrase Industrial Revolution, it also included the Internet of Things (IoT) and collaboration between network machines and human beings in decision-making.

Technology experts talk about the future industrial revolution as one that has the potential to disrupt every industry in every country due to the exponential pace that is the nature of the digital revolution, which is at the heart of the Industrial Revolution. This is already happening in businesses and industries as robotics and artificial intelligence can take over jobs traditionally manned by human labour, particularly technical processes that can easily be computerized. Figure 2.6 depicts the progression of the industrial revolutions.

According to the job vacancy data, generic skills that are needed are communication, problem-solving, computer literacy, planning and detailed oriented, as summarised in Figure 2.6 (Human Resource Development Corporation, 2020). These, indeed, are the area that has rapidly changed following the IR waves. For example, communication in the form of water billing has long changed from posted letters to e-bills and now a simple short messaging system straight to the user’s phone. Similarly, communication in the customer service department has been passed over, although partly, into an avatar on the websites.

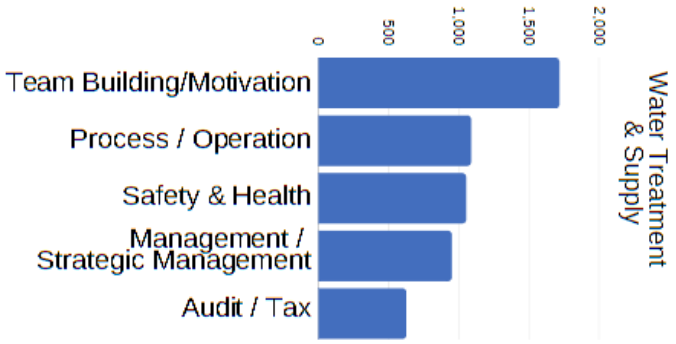

Figure 2.6: Top 5 skills area for water treatment & supply

Source: HRDC, 2020

The technology used in water utilities, facilities, or plant were also migrating into newer and better solutions. The new hardware and devices certainly require the operators to upgrade and reskill themselves to ensure their relevancy to the job. These hardware and devices usually come together with a system, software or apps which is managed by IT persons. Automation in the water industry is rapidly evolving, and there is a pressing need for the IR technology-savvy worker placed in every part of the water industry pipeline.

As shown in Figure 2.7, all sorts of IR, including IoT, AR, cybersecurity, data analytics, cloud and AI, are connected to the water industry. Therefore, the worker's and decision-makers skills and knowledge in this industry need to be updated occasionally.

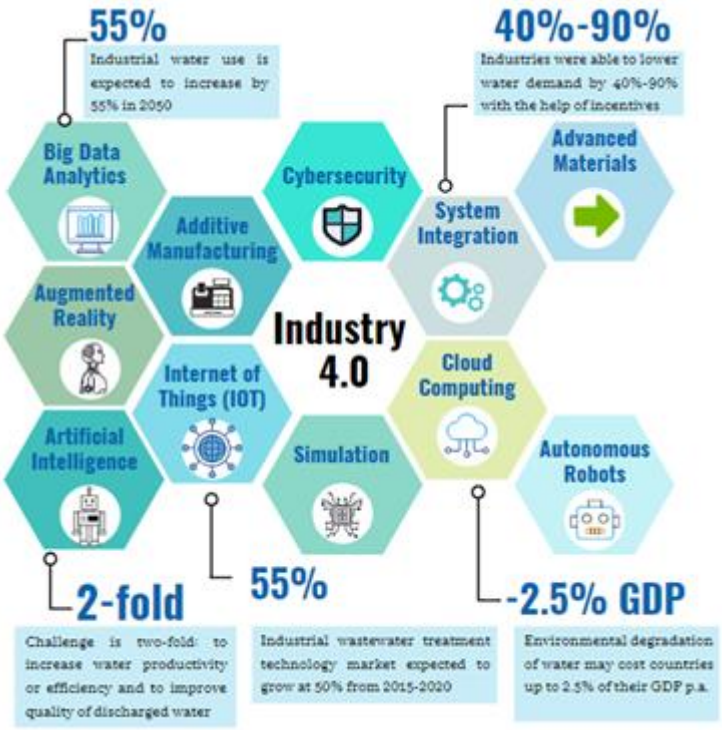

Figure 2.7: IR related to the water industry

IR is a technological revolution which starts from the First Industrial Revolution during the 18th century. Briefly, the First Industrial Revolution used water and steam power to mechanise production. The Second revolution used electric power to create mass production. The Third used electronics and information technology to automate production. The Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion and convergence of technologies that cut across the physical, digital, and biological spheres.

According to the Ministry of International Trade and Industry (MITI), there are nine (9) pillars of the Industrial Revolution which actually reflect more on the different technologies used in an Industrial Revolution environment, are shown in Figure 2.8.

Figure 2.8: 9 Pillars of Technological Advancement in the Industrial Revolution
Source: Kadir, Bzhwen. (2020). Designing new ways of working in the Industrial Revolution

The elements of IR that are related to the water sector are the Internet of Things (IoT), Big Data, Cloud Computing, and Supply Chain. For the past few years, technologies have begun to enter the industry, gradually changing how infrastructures are designed, monitored, operated and maintained. These technologies, including meter reading and billing devices, digitalised customer services and big data in the command centre, are the factor that revolutionises the industry entirely. Therefore, this research will look into training and certifications.

2.5 Relevant Skills Related to E36

National Skills Development Act 2006 (Act 652) came into effect on 1st September 2006 after it was officially gazette on 29th June 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected therewith. Act 652 is significant because, for the first time in the history of skills training in Malaysia, national legislation

has been enacted solely and exclusively for skills training and development.

In addition, the meaning and scope of skills training has been clarified and given a statutory interpretation that can be used to distinguish it from other components of the country's national education and training system. Act 652 also provides for the implementation of a Malaysian Skills Certification System, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1, 2, and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma[9]. Malaysia Occupational Skills Qualification Framework (MOSQF).

2.5.1 National Occupational Skills Standards (NOSS)

National Occupational Skills Standards (NOSS) is defined as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level and pathway to achieve the competencies and was gazetted in Part IV of the National Skills Development Act 652. Standards are developed by industry experts based on the needs of the industry and are utilised as the main tool in the implementation of the Malaysian Skills Certification System, in which the performance of existing industry workers and trainees are assessed based on Standards for awarding of Malaysian Skills Certificate[10].

2.5.2 Malaysia Skills Certification System

Malaysian Skills Certification is one of the main functions of the Department of Skills Development (DSD). This certification offers five (5) levels of authentication:

i) Malaysian Skills Certificate (SKM) Level 1;
ii) Malaysian Skills Certificate (SKM) Level 2;
iii) Malaysian Skills Certificate (SKM) Level 3;
iv) Malaysian Skills Diploma (DKM); and

[9] National Skills Development Act 652 (2022, October 20) retrieved from http://www.agc.gov.my/agcportal/index.php
[10] Department of Skills Development (2022, October 20) retrieved from https://www.dsd.gov.my/jpkv4/index.php/my/

v) Malaysian Advanced Skills Diploma (DLKM).

The Malaysian Skills Certification may be obtained through three (3) methods:

i) Through Training in a Recognised Institution – Through training programmes at JPK-accredited centres for specific fields and skill levels that have been accredited.

ii) Through Industry-Oriented Training (SLDN) – Through an apprenticeship with the National Dual Training System (SLDN) conducted by industries and skills training institutes.

iii) Through Accreditation of Prior Achievement (PPT) – Obtaining the Malaysian Skills Certification through past experience (work or training). The candidate is required to submit proof of his skills competency, which will be assessed by the Assessing Officer and approved by the External Verification Officer appointed by DSD.

2.5.3 NOSS Relevant to MSIC 2008 Section E, Division 36

Currently, there are 21 National Occupational Skills Standards (NOSS) developed by the Department of Skills Development (DSD) that are relevant to the sub-sectors and areas in the Water collection treatment and supply Industry. The details of the existing relevant NOSS are in Table 2.6.

Table 2.6: Summary of NOSS developed under Group 360

Source: NOSS Registry September 2022

MSIC Group	Corresponding NOSS/ Level	
360 – Water collection, treatment and supply	1. C331-003-3:2017	Water Treatment Facility Supervision L3
	2. C331-003-2:2017	Water Treatment Facility Maintenance L2
	3. E360-001-3:2016	Water Treatment Quality Control And Testing (Laboratory) L3
	4. E360-001-2:2016	Water Treatment Quality Control (Laboratory) L2
	5. E360-002-5:2016	Non-Revenue Water (NRW) Technical Management L5

	6. E360-002-4:2016	Non-Revenue Water (NRW) Operation And Technical Control L4
	7. CM-022-3:2016	Non-Revenue Water Operation Control L3
	8. CM-022-2:2016	Non-Revenue Water Operation L2
	9. CM-022-1:2016	Non-Revenue Water Operation L1
	10. E360-003-5:2019	Water Supply Instrumentation Management L5
	11. E360-003-4:2019	Water Supply Instrumentation Operation Management L4
	12. E360-003-3:2019	Water Supply Instrumentation Supervision L3
	13. E360-003-2:2019	Water Supply Instrumentation Application L2
	14. CM-021-5:2014	Water Distribution Management L5
	15. CM-021-4:2014	Water Distribution Operation Management L4
	16. CM-021-3:2014	Water Distribution Supervision L3
	17. CM-021-2:2014	Water Distribution Operation L2
	18. CM-060-5:2012	Water Treatment Plant Operation Management L5
	19. CM-060-4:2012	Water Treatment Plant Operation Management L4
	20. CM-060-3:2012	Water Treatment Operation Supervision L3
	21. CM-060-2:2012	Water Treatment Operation Services L2

2.5.4 Occupational Comparison Between Malaysia and Selected Countries

As the water industry is one of the main industries that are essential to the economy in most of the countries in the world, we can see how it has grown and affected the economy and created more jobs for the people. This industry has provided jobs to millions of people. Therefore, this section provides an overview of the water collection, treatment and supply for Singapore, the United States of America and Australia.

a) Singapore

The water industry in Singapore has grown much stronger as there were 200 water companies with 25 research institutes in 2018. They have attracted investment and generated SD2.5 billion annually. The jobs created are approximately 14,400 for the small country, compared to ours 19, 192 workers in E36.

b) United States of America

Based on U.S. Geological Survey (USGS, 2009), a total of approximately 410 billion gallons per day (BGD) of water are withdrawn from groundwater and surface water in the United States (U.S). The withdrawals were distributed to eight water use categories: public supply; domestic self-supply; irrigation; livestock; aquaculture; industrial; mining (including oil and gas extraction); and thermoelectric power. The distribution indicates that water industries in the U.S. is a crucial input, and the overall economy is directly or indirectly dependent on it.

c) Australia

According to estimates, Australia spends $6 billion annually on water and wastewater treatment services. The overall spending of 20% goes toward equipment upkeep and direct capital purchases. There are 26 million people living in Australia, and 94% of them have access to a main water supply. In Australia, there are about 300 urban water utilities. The largest 22 utilities serve about 70% of the population. Fewer people are served by the 200 smallest utilities as a whole (13% of the population) compared to Sydney Water, the biggest utility in Australia. In 2016 – 2017, users in the Australian economy used about 16,500 gigalitres of water, which is equivalent to 33 times the volume of Sydney Harbour.[11] In Australia's cities and towns, about 196 organisations and local governments provide water and wastewater services. Numerous smaller licensees also offer specialised and local services, even in isolated communities.

[11] Australian Bureau of Statistics 2019

2.6 Critical Jobs for E36

Often, we hear about unemployment. However, even in E36, there are jobs created, but very few to no candidates are suitable for the post at certain times. Thus, the Government of Malaysia has commissioned the Critical Occupations List, which has been published annually since 2015 for all sectors[12]. The list is defined according to three main criteria, which are skilled, sought-after and strategic, as shown in Figure 2.10. For E36-related jobs, there are seven jobs listed as critical (Critical Skills Monitoring Committee 2020a, 2020b) which are Water Management Engineer, Database Designer and Administrator and Steam Engine and boiler operator (water treatment).

Figure 2.9: Definition of critical jobs
Source: ILMIA & Ministry of Human Resources 2017

By identifying the critical jobs, policymakers can make an informed decision on how best to mitigate the skills gap and policy-related issues. Identifying critical jobs also enables the government to prepare a perfect upskilling and reskilling training plan and realign targets for filling in shortages of certain labours. A study by ILMIA (2020) reveals that the shortage of skilled manpower is mainly from the lack of capacity building and regulatory enforcement, as detailed in Figure 2.10.

[12] CSC, 2020. Critical occupations List 2019/2020 Technical Report

Figure 2.10: Causes of skilled manpower shortage

Source: ILMIA 2020

2.7 Conclusion

Based on the literature review findings, the area of water collection, treatment and supply is seen as one of the main contributors to Malaysia's economic performance and foreign investment. Currently, several government agencies and industry associations (i.e., SPAN, MWA) are involved in developing and monitoring the industry in terms of compliance with the relevant acts and regulations.

In order to fight the NRW issues, the E36 industry player must be ready to use the IR tools as well as empower their workers with these gadgets. Tools like water sensors for leaking, water level, ammonia detector and many others can be utilised. Thus, additional areas for occupational structure are not yet been studied before being carried out. The existing OS and occupational descriptions were also mapped to this study to prepare a reference completely and updated references for NOSS development and industry layer.

In order to increase employee mobility in the workforce, it is imperative that the occupational areas are redefined in the Occupational Structure. This allows the scalability of skills and accommodates the emerging skills required in the current Industrial Revolution (IR). Segmentation of the industry based on the MSIC 2008 is also considered to be in sync with data on labour demographics from the Department of Statistics Malaysia.

CHAPTER III

METHODOLOGY

3.1 Introduction

This study focuses on the water collection, treatment and supply industry. Hence, this section provides a detailed description of the research methodology utilized for the study. It encompasses the overall review of the research design, overall research approach and summary. This study used a mixed method using a multi-approach consisting of a combination of quantitative and qualitative approaches to understand the water industry's current growth better. The quantitative methods are the focus group discussions (FGD) and document analysis, whereas the surveys (questionnaires) are the qualitative method. The details of the methodologies used are described.

3.2 Research Design

The design of this study is based on a semi-quantitative approach, whereas qualitative research using FGD as a methodology allows the selection of expert panellists to be made on purpose (Patton, 2002), where the respondents participating are experts in domains related to the water industry. The design is based on a combination of systematic literacy highlighting, focus group brainstorming (FGD), and in-depth interviews on each subject to satisfying the scope and objectives of the research. Table 3.1 provides an overview of the research technique used to carry out the goals and parameters of the study. This study is carried out in three phases in the prescribed order (sequential). The next section discusses information regarding how each phase is put into practice.

3.2.1 Research Framework

There are three main stages to the overall process of creating the OF for E36 Water collection, treatment and supply. Every phase was conducted using qualitative and quantitative analysis as a technique to accomplish all objectives. Phase 1 focuses on gathering qualitative data via document analysis, and the results were utilised to create a pre-built questionnaire that went through face validation. In order to accomplish the goals of the OF, phase 2 recorded the qualitative point of view and consensus from industry experts using FGD. Phase 3 of the created OF is the verification and usability stage. The research framework shown in Figure 3.1 describes each approach used in each phase.

Table 3.1: Research Objectives Mapped to Methodology

Objective	Data Information	Method	Sources/ Criteria	Method of Analysis
a) To develop an Occupational Structure (OS) in water collection, treatment and supply industry based on MSIC 2008.	Primary	• Focus Group Discussion (FGD1). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Water collection, treatment and supply industry experts in Malaysia. • Verification from DSD. • Technical category & Human Resources and above (decision-making group) in industry. • DOSM & SOCSO.	• Brainstorming session. • Consensus evaluation & review of water collection, treatment and supply industry experts. • Review & evaluation based on MSIC 2008. • Check/refer to MOSQF.
b) To determine the skills in demand of water collection, treatment and supply industry.	Primary	• Focus Group Discussion (FGD2). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Water collection, treatment and supply industry experts in Malaysia. • Verification from DSD. • Technical category & Human Resources and above (decision-making group) in industry. • DOSM & SOCSO.	• Brainstorming session. • Consensus evaluation & review of water collection, treatment and supply industry experts. • Review & evaluation based on MSIC 2008. • Check/refer to MOSQF.
c) To determine the job titles for water collection, treatment and supply, and relevancy to IR.	Primary	• Focus Group Discussion (FGD2). • Nominal Group Technique (NGT). • Specific Interview Protocol.	• Water collection, treatment and supply industry experts in Malaysia. • Verification from DSD. • DOSM & SOCSO.	• Brainstorming session. • Consensus evaluation & review of water collection, treatment and supply industry experts.
	Primary	• Research Questionnaires.	• Distribution to the water collection, treatment and supply industry in Malaysia. • Technical category & Human Resources and above (decision-making group) in industry.	• Face Analysis & Contents Validity. • Review Questionnaires Reliability (Pilot Test). • SPSS (Cronbach Alpha).

Objective	Data Information	Method	Sources/ Criteria	Method of Analysis
d) To determine the critical jobs in water collection, treatment and supply industry.	Primary	• Research Questionnaires. • Specific Interview Protocol.	• Distribution to the water collection, treatment and supply industry in Malaysia. • Technical category & Human Resources and above (decision-making group) in industry.	• SPSS Analysis: Mean and Median.
e) To determine Occupational descriptions (OD) of water collection, treatment and supply industry for critical jobs based on developed OS.	Primary	• Focus Group Discussion (FGD2). • Nominal Group Technique (NGT). • Expert view. • Specific Interview Protocol.	• Water collection, treatment and supply industry experts in Malaysia. • Verification from DSD. • Technical category & Human Resources in Industry. • DOSM & SOCSO.	• Brainstorming session. • Consensus evaluation & review of water collection, treatment and supply industry experts. • Review & evaluation based on MSIC 2008. • Check/refer to MOSQF.

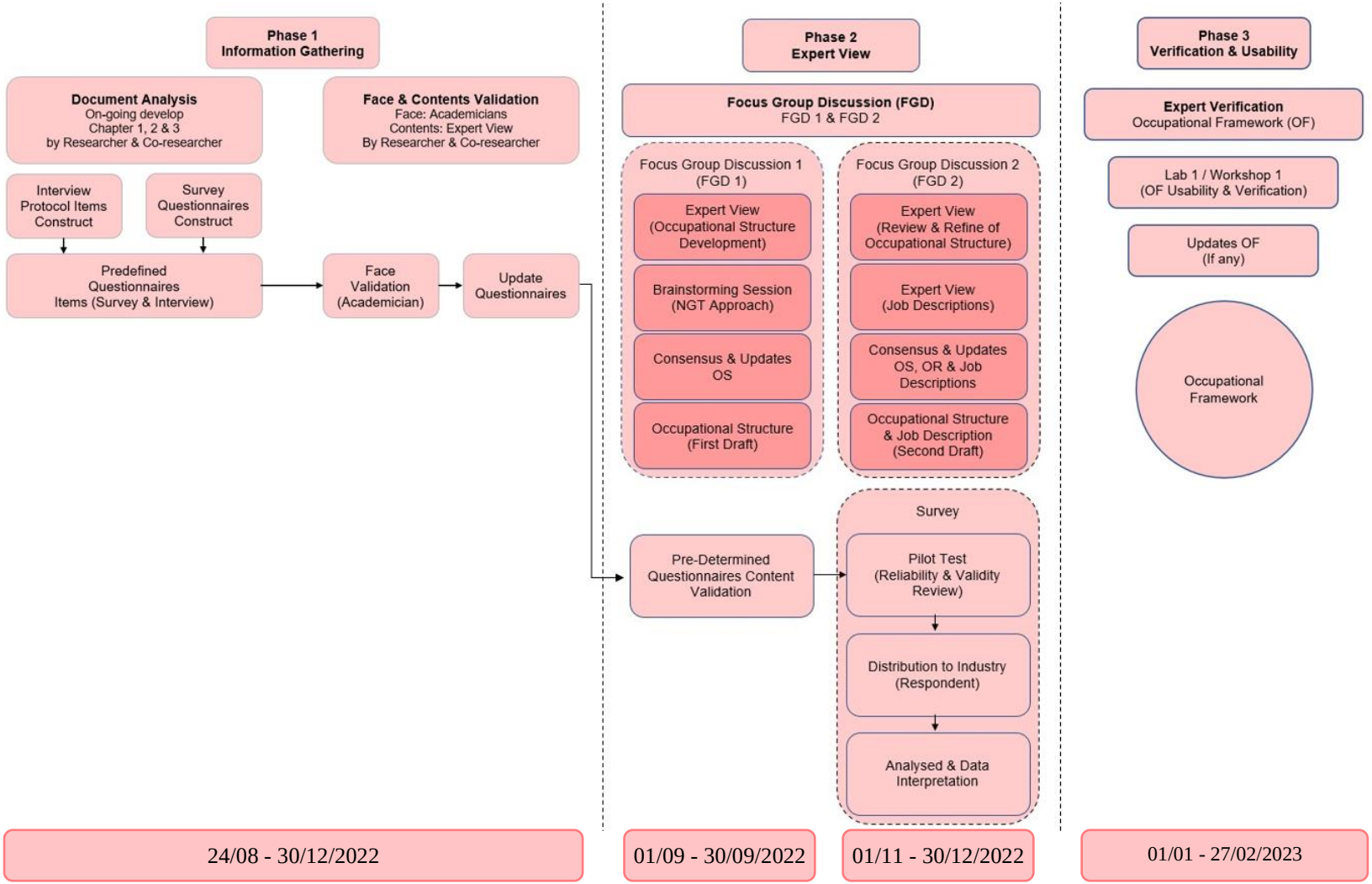

Figure 3.1: Research Framework OF E36 – Water collection, treatment and supply

3.2.2 Procedures & Phases of Research Implementation

This research involves three (3) main phases, which are carried out sequentially as follows:

Phase 1 - Information Gathering

Phase 1 focuses on the data collection on the research problem with regards to occupational in water collection, treatment and supply industries and the identification of objectives. It also involves the gathering of information in a literature review by reviewing current sources like articles, written reports, journals, websites and guidelines. All the information was used to construct a predefined survey questionnaire and semi-structured questions for the interview protocol. The semi-structured questions that are prepared in line with the objectives were discussed with industry experts during FGD. All qualitative data via document analysis and the pre-built questionnaire went through face validation by the selected academicians.

This research is closely related to the industry; thus, it needed several sessions of industrial engagement and data analysis and cleaning in between. The processes involved in gathering all relevant and up-to-date information are illustrated in Figure 3.1 below. As depicted in the figure, three steps involving industrial engagement were carried out after the document analysis and literature review. The three (3) steps were Focus group discussion (FGD) 1 and 2, as well as surveys, as shown in Figure 3.1.

Phase 2 - Experts View

Phase 2 is the information and knowledge extraction from the experts via FGD. In this research, two (2) stages of FGD were conducted, in which objectives of this research differentiated each FGD stage. The water collection, treatment and supply industry experts were brought to the purpose of engaging the Nominal Group Technique (NGT) in both FGD stages.

FGD 1 focuses on the development of OS and discussion on semi-structured questions. The brainstorming technique used to obtain the expert's point of view is NGT, in which all the ideas, suggestions and recommendations on the development of OS in the water collection, treatment and supply industry were recorded. Next, a consensus from experts was obtained, and updates on the developed OS were made. Eventually, the first draft of OS was constructed. During this session, the predefined questionnaire built by researchers from the document analysis also went for content validation by panels.

FGD 2, on the other hand, focuses on discussion and obtaining consensus on the developed OS, identification of critical jobs, jobs relevant to the Industrial Revolution (IR), as well as OR and occupational description. The first draft of OS developed in FGD 1 was reviewed and revised back during the NGT session. Next, industry expert views and consensus on OR, occupational description and also semi-structured questions were recorded. At this stage, the second draft of OS was constructed. Besides, the pilot test of the questionnaire was conducted on the prospective target respondents in order to further validate and test on reliability to be used in the actual field survey.

The validated questionnaire was distributed to industry players, and all the survey output from respondents was recorded and analysed. Data from the survey were analysed by using SPSS Statistics software. Meanwhile, findings from the discussion of semi-structured questions were cross-checked with the gathered information and data from document analysis.

Phase 3 - Verification and Usability

The final phase of OF development focuses on the verification and usability of the developed OF to the stakeholders. An engagement session with the invited water collection, treatment and supply industry experts and stakeholders was conducted to verify all the findings obtained and test the document's usability. The input and recommendations of experts and stakeholders were recorded, and the OF documents went for final updates and editing before the official documents were disseminated to prospective users.

3.3 Research Approach

There are three (3) main approaches to data collecting are chosen for the current research to be effectively utilised, as in Figure 3.2 below. Every phase was conducted using qualitative and quantitative analysis as a technique to accomplish all objectives. Phase 1 focuses on gathering qualitative data via document analysis, and the results were utilised to create a pre-built questionnaire that went through face validation. In order to accomplish the goals of the OF, phase 2 recorded the qualitative point of view and consensus from industry experts using FGD. Phase 3 of the created OF is the verification and usability stage. The research framework shown in Figure 3.2 describes each approach used in each phase.

This research is closely related to the industry; thus, it needed several sessions of industrial engagement and data analysis and cleaning in between. The processes involved in gathering all relevant and up-to-date information are illustrated in Figure 3.1 below. As depicted in the figure, three steps involving industrial engagement were carried out after the document analysis and literature review were carried out. The three (3) steps were Focus group discussions 1 and 2, as well as surveys, as shown in Figure 3.2.

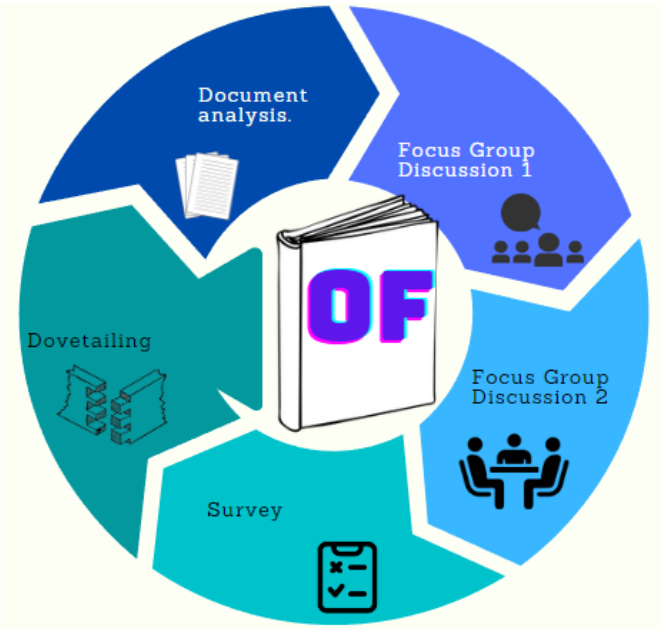

Figure 3.2: Research framework for E36 OF development

3.3.1 Document Analysis

This approach calls for a thorough analysis of the body of research that responds to a specific question. The review thoroughly searches, identifies, collects, evaluates, and synthesises document research evidence found in related journals and academic papers. The information gathered using this method addresses an overview of the industry pertinent to Industrial Revolution requirements and industrial needs.

a) Data Collection Strategy

Basically, document analysis involves two main sources of data and information:

i) Economic Census.

The information related to Malaysia's labour markets or demand is highly relevant to this study. Thus, the information from the Department of Statistics Malaysia (DOSM) - MSIC and Occupation categories at 1-digit MASCO, 11th Malaysia Plan, National Budget and Talent Corporation must be gathered, analysed and reported. Information from the Economic Census serves two purposes:

- To provide a snapshot of the water collection, treatment and supply industry landscape and outlook.
- To serve as control figures and baselining database when assessing data obtained from the online survey.

ii) Official Reports and Databases from Relevant Public and Private Agencies.

In addition to the Economic Census reports, a database from other government agencies (local and international agencies) that are relevant to the water collection, treatment and supply industry was gathered and analysed. Based on initial observation, the following databases contain relevant information for the industry:

- Local database – Department of Skills Development (DSD) and SOCSO (Social Security Organisation)
- International database – Organisation for Economic Co-operation and Development (OECD), World Bank, and European Union (EU).

Additionally, data and information published by local and international agencies in the form of online resources were collected.

b) Data Analysis Procedure

Based on the two sources of data and information, the following data analysis procedures are expected to be carried out:

i) Examining the economic performances of the industry by looking at several macroeconomic indicators (such as GDP, employment and output).
ii) Analysing the industry outlook in relation to regional and global perspectives.
iii) Determining the profile of the current and future workforce (such as occupations, salaries and wages).
iv) Reviewing technological development in the industry (such as robotics & automation as well as an element of IR).

3.3.2 Focus Group Discussion

A series of industry engagements based on focus group discussion (FGD) was conducted to enable in-depth discussions on the issues of the industry workforce status. The FGD is divided into two (2) sessions. The first FGD session involves a discussion on the background of the water industry, key stakeholders, legislations, training programs and the development of occupational structure (OS).

The FGD panellist is the expert in their fields, whereby they have to have at least a 5-year experience in this industry, hold a senior position in the organisation and have been managing and communicating with different fields and bodies in this industry. On top of that, the panellist's commitment to this study must be acknowledged and permitted by the organisation formally.

For the second FGD session, it involves a discussion on the occupational description, demand for the skills, job titles, industrial revolution, potential workforce challenges, future outlook and strategic recommendations to be proposed.

The first focus group discussion involved eight (8) industry experts who were selected and appointed, while 12 panellists were in the second FGD. An experienced researcher conducted the focus group discussion to encourage dialogue among the panels and, at the same time controlling the discussion. At the same time, the industry experts must have at least five (5) years of industry experience and work with a company registered with Suruhanjaya Syarikat Malaysia (SSM).

The semi-structured questions developed for FGD were based on occupational structure, occupational description, demand for skills, job titles, the industrial revolution, and other related issues.

Five main semi-structured questions were constructed as follows:

1. What will be the industry occupational structure (OS) look like?
2. What will be the occupational descriptions for each job title?
3. How to determine the demand for industry skills?
4. How to determine the relevant job title that is in line with IR?
5. How to determine the critical jobs for the industry.

a) Data Collection Strategy

In the process of gathering the input, the brainstorming technique was adopted and attended by development panel members who discussed the different sub-sectors and areas. The Nominal Group Technique (NGT) was used during the discussion to obtain relevant information from the panel. Facts obtained during the document analysis were also discussed and presented to the development panel members. The information gathered was then used as input to the Occupational Framework of the said sub-sector. Workshops and interviews were conducted during the development of the Water Collection, Treatment and Supply industry Occupational Framework (OF). Follow-up discussions with the expert panel members were done in smaller groups to verify the findings of the OF. See Figure 3.3 for the FGD flow chart.

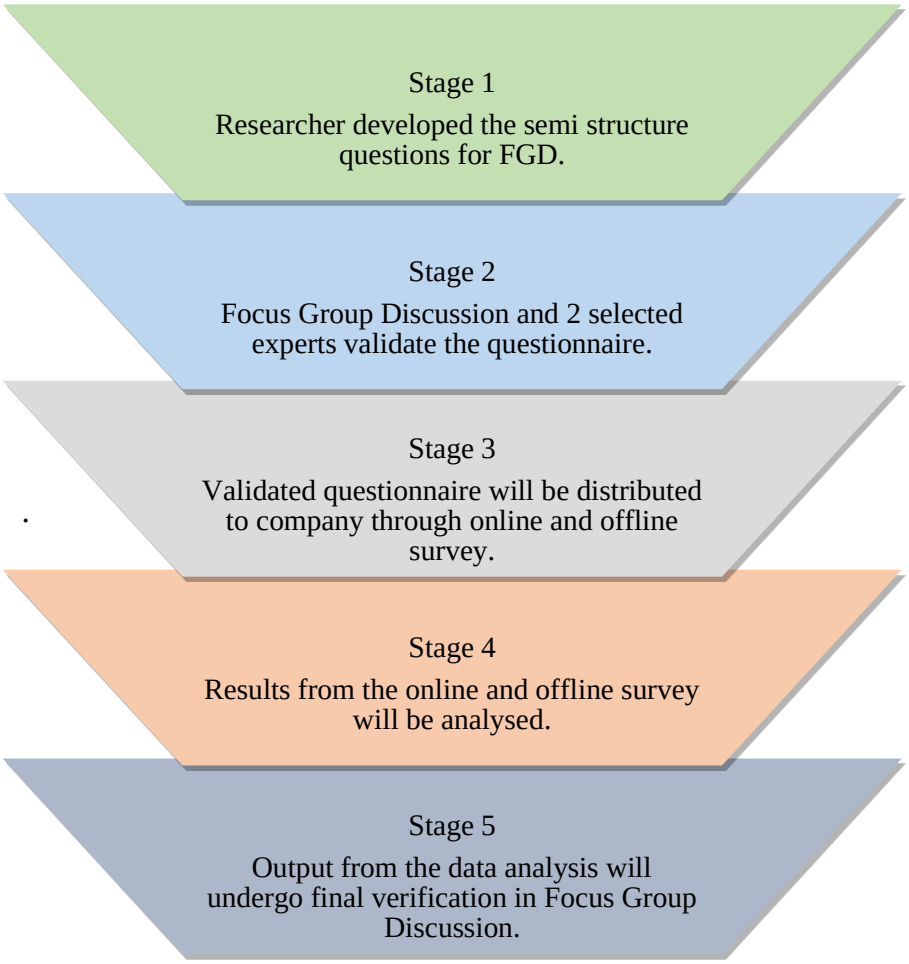

Figure 3.3: Focus Group Discussions Flow Chart

b) Data Analysis Procedure

The following analyses are expected to be carried out for FGD sessions:

i) Review initial findings obtained from the online survey.

ii) Assess the potential workforce challenges faced by the industry.

iii) Highlight any important sub-sectors of the industry.

iv) Examine the demand and supply of talent in the water collection, treatment and supply industry according to NOSS and MQA standards.

v) Review the curriculum and training program relevant to the water collection, treatment and supply industry workforce occupations in coordination with accreditation (MQA and JPK) and training providers, comprising local academic institutions (universities or colleges), vocational and other training entities.

vi) Analysis of the future trend of the occupational demand by various skill categories, including TVET-related occupations.

3.3.3 Survey

This study also employs online surveys to achieve the four (4) keys of critical information, which are skills in demand, jobs in demand, emerging skills and related issues. The targeted respondents are level 4 and above for all industry players of E36. Responses are on a volunteer basis, and a link has been forwarded through panels as well as the Malaysia Water Associations. Google Forms was used as a platform for the survey.

Section 1: Critical Job Classification

The classification suggested was based on the Malaysia Standard Industrial Classification. The questions in this section are related to the respondent's own work area. In this section, we defined 'hard to fill job' and asked questions related to the issue. This section also asked about the competitive job area in the near future.

Section 2: Occupational Qualification & Skills

This section intended to identify the skills and qualifications in demand for E36. Several references were brought forward in this section to capture the critical skills and academic qualifications in this industry. The first competency asked was based on the occupational skills defined by the Department of Skill Development. The academic qualifications, as well as the technical and vocational qualifications, were also asked. Lastly, based on the category of skill defined by MASCO, we try to capture the demand for certain skill sets related to the industry. Example skill sets include marketing and promotion, troubleshooting, accounting, analytical, risk management and information technology literacy.

In addition, this section also aims to get feedback from respondents on any skill gaps in the industry, as well as the reasons for them. We also took advantage of the situation by asking questions about improving skill gaps.

Section 3: Emerging Skills

Emerging Skills are predicted to be imperative to the industry in the near future based on recent development, trend or study. In this section, the focus is on the skills related to the Industrial Revolution. The respondents were given the definition of IR in short, which is the use of automation and data exchange in industrial technologies. This includes the use of the Internet of Things (IoT) and collaboration between networks, machines and human beings in making an informed decisions.

Questions are directly targeting the awareness of the usage and impact of the nine (9) technology pillars as depicted in Figure 2.6, to the areas in the water collection, treatment and distribution industry. The technology drives or pillars of IR are listed and the respondents have to decide the relevancy of each element in their line of duty.

In addition, the basic prerequisite skill sets related to information and communication technology in the current working environment for each area in the industry were also asked.

Section 4: Attributes needed

This section is an addition to help in completing the OD for required job titles. It basically tries to map the attributes needed -based on competency level (Malaysian Occupational Skills Qualification Framework (Malaysian Qualification Agency, 2021); for each level of skill in the OS.

Each competency level was defined in the question, and the respondents were asked to judge if the attributes listed were needed for the said level. Examples of attributes include honesty, integrity, teamwork, safety awareness, ability to follow orders and a few more.

Section 5: Related Issues

This section explores the common issues surrounding the industry. The respondents are asked to suggest ways of overcoming those issues.

a) Population and Sampling procedure

The population of this study consists of companies in Malaysia. According to the MSIC Group, there are 37 companies in Malaysia (See Table 3.2). This constitutes the population of this study.

The unit of analysis is consistent with the research problems, questions and objectives. This study used the organisation as a unit of analysis and the respondents were among the owner/managers of the companies in Malaysia. Owner/managers are chosen because they are usually involved in day-to-day running of the businesses, and therefore they are in a better position to provide the needed, available and accurate information about their companies (Brush and Vanderwerf, 1992; and Chandler and Hanks, 1994).

Table 3.2: Number of Targeted Companies According to MSIC Group

MSIC Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities	Number of Sample Establishment	Number of Targeted Company
MSIC Division	36 – Water collection, treatment and supply	37	37
MSIC Group	360 – Water collection, treatment and supply		

b) Questionnaire design

For this study, the questionnaires are designed based on the feedback from focus group discussion. These are based on the four key critical pieces of information, which are skills in demand, jobs in demand, emerging skills and related issues.

To increase the response rate and consistent responses, the questionnaires are designed based on close-ended questions based on an interval scale appropriate to the instrument.

c) Measures and Instrumentation

Establishing the validity and reliability of the survey questionnaire before it can be used is important because it can determine the accuracy of the results as well as increase the credibility of the research findings (Saunders et al., 2000). The developed questionnaire has undergone a few validities test to ensure its reliability.

The first is face validity, which aims to see how suitable the set of questions seems to be on the surface. It is to make sure that the intended objectives are represented in the questionnaire as well as to ensure that the method of measurement makes sense or fits the defined concept (Pallant, 2007). Three senior academicians from Universiti Pendidikan Sultan Idris (UPSI) and University Tun Hussein Onn (UTHM) were asked to carry out this responsibility. They are Ts. Dr. Mohd Ridhuan B. Mohd Jamil, PM Dr. Mohamed Nor Azhari B. Azman and PM Dr. Mimi Mohaffyza Bt. Mohamad. The questionnaire managed to get a high face validity.

Construct validity is about ensuring that the measurement method matches the construct intended to measure. Each is the extent to which the scale correctly measures what it is intended to measure. During the construct validity, the choices of options given, as well as the measurement used, are checked to make sure it is relevant to the existing knowledge or represented area. Construct validity can be determined by using factor analysis (Hair et al., 2010). The analysis determined if the measures or items were loaded on the appropriate factors as identified by previous researchers. Factor analysis helps reduce the number of variables to a meaningful, interpretable and manageable set of factors (Cavana, Delahaye & Sekaran, 2001).

Content validity, on the other hand, aims to ensure that the set of questions is representative of all objectives that need to be measured. Questions were grouped into

sections for better management and to simplify things for users. This survey underwent the first content validity during the first technical meeting with DSD and the technical committee on 12th October 2022. The second content validity was carried out on 3rd December 2022 with the FGD 2 panels. Once everyone was satisfied with the content validity, the survey was launched using Google Forms through emails and WhatsApp notifications.

Reliability is defined as the extent to which an item or a set of items is consistent with what it is intended to measure. It is also defined as the level of consistency or stability of the measuring instruments over time. Stability means the instrument yields the same result if the study is repeated at different times (Neuman, 2011). A more reliable instrument will show greater consistency than the less reliable instruments (Hair et al., 2010).

The recommended technique for estimating the reliability of the test instrument is provided by Cronbach's coefficient Alpha (Churchill, 1988). The Alpha values indicate the reliability of the instruments. Generally, an Alpha coefficient of 0.8 and above is considered good, and Alphas of at least 0.70 are deemed acceptable (Nunnally & Bernstein, 1994). However, Hair et al. (2010) suggested that an Alpha value of 0.60 to below 0.70 is moderate and still acceptable and reliable as constructs used in the study.

The questionnaire is divided into five sections, namely: Section 1, Section 2, Section 3, Section 4 and Section 5.

Section 1 gathers information on critical job classification. The identification of critical job titles from the job areas has been generated from the group discussion with the industry expert panel. Based on eight (8) major areas, the respondent has to choose the job area that is hard to fill. The following question categorised the job title according to the category of skill level, which are Managerial level, Supervisory level or General worker / Crew level.

Meanwhile, Section 2 aimed to expand the information for occupational qualifications & skills and had to use five (5) academic qualifications as an option which are 1 (Certificate), 2 (Diploma), 3 (Degree), 4 (Master), and 5 (PhD). For the technical and

vocational qualifications, the options are 1 (Certificate), 2 (Skill Diploma), 3 (Technical/Skill Colleges), 4 (Skill Advanced Diploma (Technical/Skill Colleges)) or 4 (Others). This section also determines the skills in demand for these water activities. The skills to identify are water collection activities, water supply activities, water treatment activities, quality assurance – systems, etc.

Section 3, on the other hand, collects in-depth information related to Emerging skills discussed in this section. It contains close-ended questions and questions that use the seven (7) major job areas in measuring the important prerequisite and skills for IR in the water collection, treatment and supply industry.

On the other hand, Section 4 helps in completing the OD for required job titles. It basically tries to map the attributes needed to the major job areas of this industry- based on competency level. The options are 1 (Knowledge About ICT (KA)), 2 (Ability to Work with Data (AW)), 3 Technical Know-How (TK)) and 4 (Personal Skills (PS)).

Lastly, Section 5 aims to catch on to other related issues regarding the industry discussed and four (4) interval scales ranging from 4 (Strongly Agree), 3 (Agree), 2 (Disagree) and 1 (Strongly disagree) measuring the key issues in water collection, treatment and supply industry.

d) Data Collection Strategy

The water industry's population is enormous and requires a significant financial budget if a nationally representative survey is the primary target. The cost that may influence determining a primary survey's sampling size is important to consider. The consultation with related associations concluded that more than a nationally representative survey is needed.) Instead of aiming for a nationally representative sample, our survey aims to increase participation rates from industries.

There are three approaches to data collection:

i) Approaching the related associations' members. The secretariat of each association has agreed to distribute the questionnaire.

ii) Industry engagements/interviews/visits were scheduled to seek their assistance in distributing the online survey to the members of respective associations.

iii) Assistance from MWA & SPAN may also be required to provide institutional support when engaging the selected company.

e) Data Analysis Procedure

The following analyses are expected to be performed for the online survey:

i) Descriptive analysis of employment profiles and other variables are included in the questionnaire.

ii) Analysis of critical occupations identified by the industry.

3.3.4 Implementation of Phase 3 – Expert Verification

The final phase of OF development focuses on the verification and usability of the developed OF to the stakeholders. An engagement session with the invited water industry experts and stakeholders was conducted with the aim of verifying all the findings obtained and testing the usability of the document. The input and recommendations of experts and stakeholders have been recorded. The OF documents were then amended with final updates and editing before the official documents were disseminated to the prospective users. The Industrial Engagement was conducted on 17 January 2023 at Bangi Resort Hotel. The invited panels and stakeholders are listed in Table 3.3.

Table 3.3: List of Industry Expert Panels during Industrial Engagement

No.	NAME	POSITION	ORGANISATION / COMPANY
1.	Kamariah binti Yusof	Human Resources Manager	Ranhill SAJ Sdn. Bhd.
2.	Siti Nur'aina Kaharudin	Executive	Ranhill SAJ Sdn. Bhd.
3.	Fareast Zainal	Head Of Department	Ranhill SAJ Sdn. Bhd.
4.	Mohd Fikri bin Shariff	Manager	Ranhill SAJ Sdn. Bhd.
5.	Mohd Zulkifli Abd Hamid	Head of Division (Human Resource)	Perbadanan Bekalan Air Pulau Pinang Sdn. Bhd.
6.	Teo Kah Cheong	Senior Executive	Perbadanan Bekalan Air Pulau Pinang Sdn. Bhd.
7.	Noorfariza binti Samsudin	Senior Executive	Perbadanan Bekalan Air Pulau Pinang Sdn. Bhd.

3.4 Conclusion

Document analysis is chosen due to its efficient and effective way of gathering data because documents are manageable and practical resources. Documents come in a variety of forms, making them very accessible. Documents, too, are written reports which will be the plan, paraphrased and checked carefully before its being published and disseminated. Thus, documents are a reliable source of data, especially when the authors are mentioned as well. Obtaining and analysing documents is often far more cost-efficient and time efficient than conducting research and experiment. Document analysis is a suitable method for this research because this research requires more information, such as current statistics for related industries and the growth of the industry.

More than that, focus group discussion is deployed in this research due to free and open discussion among the panels, resulting in generating new ideas that can be very useful for decision-making. It is also a fast way to gain the needed information regarding occupational framework in the related industry. This approach is quick, effective and able to gather up-to-date information from the panels. The NGT techniques applied during the FGDs have helped in making conclusions faster, and eventually, discussion from topic to topic was not dragged and flowed smoothly.

The survey (questionnaire) is deployed in this research because questionnaires may be taken individually. This method may be more effective for gathering sensitive information or when statistical data about what the majority of a certain group of people think is of concern. The shorter and more concise questionnaire with a specific group of the targetted respondent, the results will be more effective.

Finally, the documentation of this report, as well as the research methodology to achieve all of its stated objectives, were evaluated twice against a set independent technical panel consisting of academics, industry players, and the representatives of related departments from the Ministry of Human Resources and regulatory bodies as well. This ensures that the research output is scientific, valid, neutral and up-to-date.

CHAPTER IV

FINDINGS

4.1 Introduction

This chapter will present the finding that has been validated from each method laid out in the research approach in Chapter 3.

4.2 Document Analysis Findings

Document analysis findings have been reported in detail in Chapter 2. Based on the analysis of existing documents and resources, it has been concluded that there is a pressing need to develop an updated OF for the water collection, treatment and supply industry. The OS developed by HRDC in their report includes only on which includes water treatment, distributions and non-revenue water only (Human Resource Development Corporation, 2020). While the OF for E36, published by the Department of Skills (2016), was guided by the developed NOSS (which is the other way round) and was not complete with the critical jobs, as well was outdated as it has not been checked against the IR.

In addition to this, concerns regarding different job titles with similar job titles amongst operators and states were also raised. Thus a generic jobs title(s) for all similar tasks across companies is needed. In addition, due to the expensive and huge capital investment needed, many in the industry are still stuck in IR 3. However, the E36 industry player must be ready to use the IR tools as well as empower their workers with this technology, especially to fight the NRW battle and optimise integrated water resource management. Next, there are

value chain impact factors such as ‘causes & effects’ and significantly to the skills mismatch of the relevant industries, which leads to critical jobs for E36 not being properly defined.

Thus, the development of the E36 OF will be closely linked with the industry player through a series of Focus Group Discussions and questionnaires or surveys for wider respondents, as reported in Chapter 3.

4.3 FGD 1 Findings

The Focus Group Discussion 1 was carried out on 17 and 18 September 2022 at Bangi Resort Hotel with eight (8) invited panels managed to make it, as in Figure 4.1 and Table 4.1. This activity aims to brainstorm and discuss the occupational structure of the water collection, treatment and supply industry.

Figure 4.1: FGD 1 panels for E36

Table 4.1: List of panels attended the FGD 1

No.	Name	Position & Organisation
1	Arni Shahrina Shaharum	Director Suruhanjaya Perkhidmatan Air Negara (SPAN)
2	Muhammad Razzi Isnin	Engineer Senei Associates Sdn Bhd.
3	Major Mohd Nizam Omar	Head of Department Perbadanan Bekalan Air Pulau Pinang Sdn Bhd
4	ChM. Khairul Hasrol Abdul Razak	Head of M&E Unit Pengurusan Air Pahang Berhad (PAIP)
5	Kamariah Yusof	Human Resources Manager Ranhill SAJ Sdn Bhd
6	Shahzatul Irwan Omar	Plant Manager Ranhill SAJ Sdn Bhd
7	Mazurah Mat Diah	Head of Department Syarikat Air Melaka Berhad (SAMB)
8	Noor Faizal Nayan	Executive Syarikat Air Darul Aman (SADA)

4.3.1 The Occupational Structure (OS)

Based on the focus group discussion with the industry expert panel from the water collection, treatment and supply activities, there are eight (8) major areas for this industry, which are:

Table 4.2: Job area description for water collection, treatment and supply

Major Area	Area	Description
Water Resources Management	Water resources management	The job scope to access water sources and manage various types of water resources such as underground water sources, waterfalls, dams, rivers etc.
	Water resources operation	The job scope is to ensure the quality and standard of raw water, safe water and water resources.
Water Treatment	Water Treatment	Focused on the treatment of raw water from the water resource to meet the standard quality of treated water.
Water Distribution	Water Distribution	Responsible for pipelines from the treated water or main pump to the housing /developer area.

Major Area	Area	Description
	Water Network (Reticulation)	Responsible for pipelines from the main pipeline to the private user or within the developer's area.
Non-Revenue Water (NRW)	NRW (District Meter Zone (DMZ), District Meter Area (DMA) and Active Leakage Control (ALC))	The sub-area acts as an indicator of the operational performance of a water company.
	NRW data analysis	The sub-area was responsible for analysing both asset performance and the company's overall financial performance. The lower level of NRW indicates that higher revenues are billed or that operating costs are low.
Command Centre	Command Centre	The sub-area includes the management of water crises, risks and decision-making on the water industry activities.
Water Infrastructure Development	Water infrastructure planning and design	The sub-area that is responsible for the improvement of water distribution systems and water network systems.
	Water infrastructure asset management	The sub-area includes the management of water assets such as facilities, tools, systems etc.
	Water infrastructure project management	The sub-area is responsible for new project development.
Customer Services Management	Meter reading and billing	The sub-area includes meter reading activities and billing.
	Meter testing	The sub-area is responsible for checking and monitoring the existing and new meters.
	Investigation and enforcement	The sub-area is responsible for monitoring the housing area's water activities, preventing water theft etc.
	Customer services operation	The sub-area is responsible for dealing with a customer with questions, concerns, or complaints services.
	Digital customer engagement	The sub-area is responsible for developing and testing the user-friendly interface of water service application software.
Support Services	Mechanical maintenance	The sub-area is responsible for keeping machinery and mechanical equipment in good working order. It includes routine inspections, servicing, repairs and replacement.
	Electrical maintenance	The sub-area is responsible for ensuring the electrical equipment is kept in good working order. It includes inspecting, testing, and repairing electrical equipment as necessary to

Major Area	Area	Description
		prevent problems that could lead to a loss of power, etc.
	Instrumentation maintenance	The sub-area is responsible for ensuring that all equipment is safe to use and up to quality standards, including calibrating, maintaining, installing, repairing, etc.
	Water quality field sampling	The sub-area is responsible for characterising the water quality from the water resources by identifying the presence of any contaminants in the water which can lead to health issues or disturb the environment, potentially threatening an ecosystem.
	Water quality laboratory	The sub-area that is responsible for running the water quality test in the laboratory. The parameters that may be tested include temperature, pH, turbidity, salinity, nitrates and phosphates.
	Geographical Information System (GIS)	The sub-area includes the use of specialised computer systems, engineering measures, and geological concepts to process land, geographic, and geospatial information into visually detailed digital maps and geo-models of a reservoir.

Based on these major areas, the industry expert panel has come up with a total of 22 sub-areas with 113 job titles related to this industry. All areas do not have job titles for levels 7 and 8, as anything involving exercising broad autonomy is out of the E36 scope. In addition to that, consultancies and trainers within the company or outside are called for reskilling and upskilling the needed modules for Level 1 to level 6. Levels 7 and 8 bear the jurisdictions and autonomies which come from the ministries. On another note, some areas do not have job titles for level 1, as no routine and predictable tasks are needed. This can be seen in Table 4.3.

During the Industrial Engagement (IE) by the JPK on the 5th of October 2022, the drafted OS has been shared with the participant for E36 to get their comments. Many new insights and references were highlighted and shared, as the E36 have their own organisation (Malaysian Water Organisation), and its human resource groups always engage, discuss and share among themselves. One of the issues raised is the title “engineer”, which is not clearly stated in the drafted OS. There is a lot of discussion on why it should and why it should not.

All concerns regarding this matter have been brought forward to FGD 2 for deeper consideration with the panels.

Another interesting discussion was the fact that there was a developed OS by the HRDC in 2020, so the participant was concerned if it was conflicting or wasted. However, this is already known, and the OS developed during the FGD 1 is basically complementing the existing one. As mentioned in sub-topic 1.2, the OS developed by HRDC (2020) covers only three (3) work areas in this industry.

The IE session has also brought forward the fact that private water operations such as PETRONAS and commercial agriculture companies also exist in this industry. However, to date, they have everything under their own control, training and setups. Similarly, the same condition applies to Sarawak and Sabah water operators.

4.4 FGD 2 Findings

The ten (10) panels were invited to contribute actively to the OD development on the 3rd and 4th of December 2022 at the Hilton Inn, Puchong. There are three (3) main goals to achieve in this FGD, which are to double-check the relevance of the questionnaire, to identify the critical job title and its relevance to IR, and to detail the occupational descriptions for each critical job. The panels are in Figure 4.2 and Table 4.3.

Figure 4.2: FGD2 panels for E36

The in-depth discussion during FGD 2 has also brought forward the concern on skills needed for a career path in this industry. Some job titles are responsible in two (2) areas as the work is closely related. Some other job titles require upgraded skill, knowledge and probably certain certifications, which need to be taken into account for upgrading the staff's job or skill level. This can be seen clearly in the Job Descriptions.

Table 4.3: List of panels for FGD2 E36

No.	Name	Position & Organisation
1	Arni Shahrina Shaharum	Director Suruhanjaya Perkhidmatan Air Negara (SPAN)
2	Mohd Tahir Ab Talib	Administrative Officer Lembaga Urus Air Selangor (LUAS)
3	Muhammad Razzi Isnin	Engineer Senei Associates Sdn Bhd.
4	Noorfariza Samsudin	Senior Executive Perbadanan Bekalan Air Pulau Pinang Sdn Bhd
5	Teo Kah Cheong	Senior Executive Perbadanan Bekalan Air Pulau Pinang Sdn Bhd
6	ChM. Khairul Hasrol Abdul Razak	Head of M&E Unit Pengurusan Air Pahang Berhad (PAIP)
7	Kamariah Yusof	Human Resources Manager Ranhill SAJ Sdn Bhd
8	Shahzatul Irwan Omar	Plant Manager Ranhill SAJ Sdn Bhd
9	Mazurah Mat Diah	Head of Department Syarikat Air Melaka Berhad (SAMB)
10	Noor Faizal Nayan	Executive Syarikat Air Darul Aman (SADA)

4.4.1 The Surveys Relevance

Each question and the options have been gone through the panel to gauge the respondent's feedback. Upon completion of the survey validation, it has come to light that the skill sets are only relevant if the executives answer it for that particular sub-area only. In those questions, options 'not related' were given to show that the options given were to their sub-area and should be excluded from the analysis.

The Likert scale used was also questioned, as no neutral options were given. Thus, an explanation that neutral options can be seen as an escape route or dumping ground, panels

have agreed that executive levels can answer these questions seriously. The survey was published on 5th December 2022 until 14th January 2023. Forty-seven (47) respondents from 10 targeted organisations have answered.

4.4.2 Skills in demands

Skills are one of the requirements for a critical job. The limitation encountered in fulfilling the requirement of demanding occupation is competency skills of talent. Besides, competency upskilling and knowledge enhancement are needed for the sake of worker improvement. To do that, it is necessary to first identify the job-related talents that are in demand. Based on the focus group discussion with the expert panel from the water collection, treatment and supply industry, the skills in demand in the water collection, treatment and supply industry are identified and listed in Table 4.4. This list is included in the survey, which is distributed to the respondents to get information regarding the skills in demand in the industry.

Table 4.4: Competencies in demand in water collection, treatment and supply industry

Competencies in demand
• Water collection knowledge • Water treatment knowledge • Water supply knowledge • Operation and maintenance • Troubleshooting/problem solving skills • Communication & Interpersonal skills • Planning and forecasting abilities • Competent in using electronic or mechanical devices and tools • Analytical skills • Green technology skills • Administration skills • Leadership skills

4.4.3 Critical Jobs and relevancies to IR

Panels are presented with the developed OS, and the importance of identifying critical jobs and the IR relevancies to the job were presented. The definition of a critical job is *"jobs in demand but **hard to fill** and are always short of supply due to the nature of the jobs which require a certain set of skills."*(ILMIA, 2021). Panels were also reminded about the nine pillars of IR, as in Figure 2.9, so the job title can be considered IR-related or not.

The developed OS, as shown in Table 4.5, was presented, and the panels were navigated through each job title in every available level, area by area; to discuss if that particular job title is critical to the industry and if it is related to IR (currently and in the near future). The critical job titles were marked with *, and jobs related to IR were marked with **. Thus, a critical job related to IR was marked ***.

Therefore, Table 4.5, which presented the OS, will be used to present the identified critical job titles and job titles related to IR of both. The yellow-coloured box depicted job titles commonly carried out by the same person in the company, as for now. The reasons for this can be found in 4.4.4 Occupational Responsibilities.

Table 4.5: Group 360 Occupational Structure (1 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities				
Division	36 – Water Collection, Treatment and Supply				
Group	360 – Water Collection, Treatment and Supply				
Area / Level	Water Resources Management	Water Resources Operation	Water Treatment	Water Distribution	Water Network (Reticulation)
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Water Resources Manager	Senior Production Technical Manager**	Senior Production Technical Manager**	Senior Distribution Technical Manager**	Senior Distribution Technical Manager**
Level 5	Water Resources Senior Executive**	Production Technical Manager**	Production Technical Manager**	Distribution Technical Manager**	Distribution Technical Manager**
Level 4	Water Resources Executive**	Plant Executive***	Plant Executive***	Distribution Executive***	Network Executive***
Level 3	Water Resources Technician**	Water Treatment Technician***	Water Treatment Technician***	Distribution Technician***	Network Technician***
Level 2	Water Resources Operator	Water Resources Operator	Water Treatment Operator***	Pump Operator***	Network Fitter***
Level 1	No Job Title	Water Resources Crew	Water Treatment Crew	Distribution Crew	Network Crew

Note: *Critical Job Titles
**Jobs relevant to IR
*** Critical Job Titles and Jobs relevant to IR
Highlighted cells indicate titles/areas commonly held by the same person

Table 4.5: Group 360 Occupational Structure (2 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities				
Division	36 – Water Collection, Treatment and Supply				
Group	360 – Water Collection, Treatment and Supply				
Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ALC)	Non-Revenue Water (NRW) Data Analysis	Planning and Design	Asset Management	Project Management
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Senior NRW Technical Manager**	Senior NRW Technical Manager**	Planning and Development Senior Manager**	Asset Management Senior Manager**	Project Management Senior Manager**
Level 5	NRW Technical Manager**	NRW Technical Manager**	Planning and Development Manager**	Asset Management Manager**	Project Management Manager**
Level 4	NRW Executive***	NRW Executive***	Planning and Development Executive***	Asset Management Executive***	Project Management Executive**
Level 3	NRW Technician***	No Job Title	Planning and Development Technician***	Asset Management Technician***	Project Management Technician**
Level 2	NRW Fitter***	No Job Title	No Job Title	No Job Title	No Job Title
Level 1	NRW Crew	No Job Title	No Job Title	No Job Title	No Job Title

Note: *Critical Job Titles
**Jobs relevant to IR
*** Critical Job Titles and Jobs relevant to IR
Highlighted cells indicate titles/areas commonly held by the same person

Table 4.5: Group 360 Occupational Structure (3 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities					
Division	36 – Water Collection, Treatment and Supply					
Group	360 – Water Collection, Treatment and Supply					
Area / Level	Command Centre	Meter Reading and Billing	Meter Testing	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Senior Command Centre Technical Manager**	Customer Service Senior Manager**	Metering Senior Manager**	Customer Service Senior Manager**	Customer Service Senior Manager**	Digital Customer Service Senior Manager**
Level 5	Command Centre Technical Manager**	Customer Service Manager**	Metering Manager**	Customer Service Manager**	Customer Service Manager**	Digital Customer Service Manager**
Level 4	Command Centre Executive***	Customer Service Executive**	Metering Executive**	Enforcement Executive**	Customer Service Executive**	Digital Customer Service Executive**
Level 3	Command Centre Technician***	Meter Reader Supervisor**	Meter Testing Technician**	Enforcement Technician**	Customer Service Supervisor**	Digital Customer Service Supervisor**
Level 2	No Job Title	Meter Reader**	Meter Testing Assistant Technician**	Enforcement Assistant Technician**	Customer Services Officer**	Digital Customer Services Officer**
Level 1	No Job Title	No Job Title	No Job Title	Enforcement Crew	No Job Title	No Job Title

Note: *Critical Job Titles
**Jobs relevant to IR
*** Critical Job Titles and Jobs relevant to IR
Highlighted cells indicate titles/areas commonly held by the same person

Table 4.5: Group 360 Occupational Structure (4 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities					
Division	36 – Water Collection, Treatment and Supply					
Group	360 – Water Collection, Treatment and Supply					
Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Mechanical, Electrical and Instrumentation Senior Manager**	Mechanical, Electrical and Instrumentation Senior Manager**	Mechanical, Electrical and Instrumentation Senior Manager**	Water Quality Senior Manager**	Water Quality Senior Manager**	GIS Senior Manager**
Level 5	Mechanical Manager**	Electrical Manager**	Instrumentation Manager**	Water Quality Manager**	Water Quality Manager**	GIS Manager**
Level 4	Mechanical Executive***	Electrical Executive***	Instrumentation Executive***	Water Quality Executive***	Water Quality Executive***	GIS Executive***
Level 3	Mechanical Technician***	Electrical Technician***	Instrumentation Technician***	Water Quality Technician***	Laboratory Technician***	GIS Technician***
Level 2	Mechanical Assistant Technician**	Electrical Assistant Technician**	Instrumentation Assistant Technician**	Water Sampler**	Laboratory Assistant**	No Job Title
Level 1	Mechanical Crew	Electrical Crew	Instrumentation Crew	No Job Title	Laboratory Crew	No Job Title

Note: *Critical Job Titles
**Jobs relevant to IR
*** Critical Job Titles and Jobs relevant to IR
Highlighted cells indicate titles/areas commonly held by the same person

4.4.4 The Occupational Responsibilities (OR)

The two-day workshop with panels during the first FGD was fully utilised. The panel were resourceful and highly cooperative, enabling the first two objectives of the first FGD to be completed before the end of day 1.

In order to establish The Occupational Responsibilities, we navigate the OS area by area and understand the responsibilities that fall under each particular area. During this discussion, the fine boundaries between job areas are getting clearer as panels with human resources backgrounds explain the expected work in each area, while technical panels share their work, concerns and limitation within their job area responsibilities. This is where the understanding of the reasons a job title can cover two job areas.

Having the job area boundaries clearly marked, the job titles in each area were discussed, starting from the top level to the bottom. Basically, the responsibilities of work, equipment, processes and physical boundaries of the same job area are the same across the level. However, the stark difference is the level of authority, complexity and reporting. The OR were discussed in detail, particularly to understand the nature of works, which will bring us to the set of skills needed for each OR. Finally, the agreed OR is shown in Table 4.6.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Water Resources Manager** 1) Plan and direct water resources management. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Plan water resources disaster recovery action. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water catchment asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the organisation regarding technology concerns.	**Senior Production Technical Manager** 1) Plan and direct water resources operation. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Plan water resources disaster recovery action. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water catchment asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the organisation regarding technology concerns.	**Senior Production Technical Manager** 1) Plan and direct water treatment operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Plan water resources disaster recovery action. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water treatment asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the organisation regarding technology concerns.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 5	**Water Resources Senior Manager** 1) Ensure the security of water. 2) Monitor valve operation and repair work. 3) Monitor operational sustainability, such as Chemical supply. 4) Monitor water quality. 5) Prepare dam safety and water resource monitoring reports. 6) Implement actions based on dam safety and water resource monitoring reports. 7) Plan work schedule and resources. 8) Verify disruption and damage reports and records. 9) Monitor expenses.	**Production Technical Manager** 1) Manage water demand. 2) Ensure the security of water. 3) Monitor water quality and optimise water resources operation. 4) Develop water resources operation policy, procedure, regulatory compliance, safety, health, environment and quality assurance. 5) Manage and monitor water resources operation assets and finances. 6) Manage water resources operation water risk and crisis. 7) Manage water resources operation refurbishment. 8) Improve manpower and revise programmes in water resources operation. 9) Prepare dam safety and water resource monitoring reports. 10) Implement actions based on dam safety and water resource monitoring reports. 11) Verify disruption and damage reports and records. 12) Monitor valve operation and repair work. 13) Monitor operational sustainability, such as Chemical supply. 14) Plan work schedule and resources.	**Production Technical Manager** 1) Manage water demand. 2) Ensure the security of water. 3) Monitor water quality and optimise the water treatment process. 4) Develop water treatment plant operation policy, procedure, regulatory compliance, safety, health, environment and quality assurance. 5) Manage and monitor water treatment plant assets and finances. 6) Manage water treatment plant water risk and crisis. 7) Manage water treatment plant refurbishment. 8) Improve manpower and revise programmes in the water treatment plants. 9) Prepare dam safety and water treatment monitoring reports. 10) Implement actions based on dam safety and water treatment monitoring reports. 11) Verify disruption and damage reports and records. 12) Monitor valve operation and repair work. 13) Monitor operational sustainability, such as Chemical supply. 14) Plan work schedule and resources.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 4	**Water Resources Executive** 1) Monitor valve operation. 2) Analyse dam safety and water resource monitoring reports. 3) Implement actions based on dam safety and water resource monitoring reports. 4) Monitor maintenance work. 5) Communicate with other subordinates and management. 6) Plan work schedule.	**Plant Executive** 1) Monitor valve operation. 2) Analyse dam safety and water resource monitoring reports. 3) Implement actions based on dam safety and water resource monitoring reports. 4) Monitor maintenance work. 5) Communicate with other subordinates and management. 6) Plan work schedule. 7) Manage water resources operation. 8) Manage raw water intake operation. 9) Manage water resources operation control and monitoring system. 10) Manage water resources operation facilities maintenance. 11) Implement water resources operation safety, health, environmental and quality assurance.	**Plant Executive** 1) Monitor valve operation. 2) Analyse dam safety and water resource monitoring reports. 3) Implement actions based on dam safety and water resource monitoring reports. 4) Monitor maintenance works. 5) Communicate with other subordinates and management. 6) Plan work schedule. 7) Manage water treatment process. 8) Manage raw water intake operation. 9) Manage water treatment plant control and monitoring system. 10) Manage water treatment plant facilities maintenance. 11) Implement water treatment plant safety, health, environmental and quality assurance. 12) Manage sludge handling and disposal.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 3	**Water Resources Assistant Manager** 1) Supervise valve operation. 2) Check and report water sampling records. 3) Check dam safety parameters records. 4) Check water resource parameters records (rainfall). 5) Supervise repair work. 6) Prepare work schedule. 7) Prepare dam safety and water resource monitoring reports. 8) Report pollution issues to superior.	**Water Resources Technician** 1) Supervise valve operation. 2) Check and record the water level of the river/reservoir. 3) Check and report water sampling records. 4) Check dam safety parameters records. 5) Check water resource parameters records (rainfall). 6) Supervise repair work. 7) Prepare work schedule. 8) Perform supervision function. 9) Perform water resources operation maintenance activities. 10) Prepare dam safety and water resource monitoring reports. 11) Report any pollution issues or abnormality in water resources equipment to superior.	**Water Treatment Technician** 1) Supervise raw water process and pre-treatment process. 2) Supervise clarification and filtration process. 3) Supervise treated water post-dosing process. 4) Supervise treated water flow. 5) Supervise sludge handling. 6) Supervise water treatment plant. 7) Supervise valve operation. 8) Check the availability of the chemical solution. 9) Check and record the water level of the river/reservoir. 10) Perform water treatment plant maintenance activities. 11) Check water treatment plant safety parameters records. 12) Prepare work schedule. 13) Perform supervision function. 14) Prepare dam safety and water treatment monitoring reports. 15) Check and report water sampling records. 16) Report any pollution issues or abnormality in water treatment equipment to superior.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 2	**Water Resources Operator** 1) Operate valves. 2) Compiling Reports and reporting daily dam safety parameters. 3) Record water resource parameters (rainfall). 4) Record water rate level and flow rate. 5) Perform water quality monitoring. 6) Repair minor defects. 7) Inform superior of pollution issues. 8) Perform water sampling.	**Water Resources Operator** 1) Operate valves. 2) Compiling Reports and reporting daily dam safety parameters. 3) Record water resource parameters (rainfall). 4) Record water rate level and flow rate. 5) Perform water sampling and water quality testing. 6) Collect and record data. 7) Perform water quality monitoring. 8) Repair minor defects. 9) Inform superior of pollution issues. 10) Assist in water resources operation maintenance activities.	**Water Treatment Operator** 1) Operate valves. 2) Perform raw water process and pre-treatment process. 3) Perform clarification and filtration process. 4) Perform treated water post-dosing process. 5) Perform treated water flow. 6) Perform sludge handling. 7) Perform cleaning work (intake, tanks and filters). 8) Perform water sampling and water quality testing. 9) Assist in water treatment plant maintenance activities. 10) Compiling reports and reporting daily water treatment plant safety parameters. 11) Record water rate level and flow rate. 12) Perform water quality monitoring. 13) Collect and record data. 14) Repair minor defects. 15) Inform superior of pollution issues.

Table 4.6: Group 360 Occupational Responsibilities (area 1 of 8)

Area / Level	Water Resources Management	Water Resources Operation	Water Treatment
Level 1	No Job Title	**Water Resources Crew** 1) Assist in operating valves. 2) Assist in water sampling. 3) Collect and record reading water resource parameters (rainfall). 4) Collect and record reading water rate level and flow rate. 5) Assist in repairing minor defects. 6) Read water and pump meters. 7) Record water quality monitoring. 8) Carry out housekeeping work. 9) Report and record any power outages to superior.	**Water Treatment Crew** 1) Prepare and handle the chemical solution. 2) Assist in water sampling. 3) Assist in repairing minor defects. 4) Record water quality monitoring. 5) Carry out housekeeping works and filter backwash. 6) Report and record any power outages to superior.

Table 4.7: Group 360 Occupational Responsibilities (area 2 of 8)

Area / Level	Water Distribution	Water Network (Reticulation)
Level 8	No Job Title	No Job Title
Level 7	No Job Title	No Job Title
Level 6	**Senior Distribution Technical Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water distribution asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Senior Distribution Technical Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water distribution asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.7: Group 360 Occupational Responsibilities (area 2 of 8)

Area / Level	Water Distribution	Water Network (Reticulation)
Level 5	**Distribution Technical Manager** 1) Manage water distribution operation and maintenance. 2) Manage water distribution planning and development. 3) Manage water distribution NRW programme. 4) Ensure compliance with audit water regulations. 5) Develop a water distribution business plan. 6) Manage water distribution customer service. 7) Manage water distribution risk and crisis. 8) Review and validate water distribution customer service. 9) Review and validate water distribution risk and crisis. 10) Oversee water distribution asset management.	**Distribution Technical Manager** 1) Manage water distribution operation and maintenance. 2) Manage water distribution planning and development. 3) Manage water distribution NRW programme. 4) Ensure compliance with audit water regulations. 5) Develop water distribution business plan. 6) Manage water distribution customer service. 7) Manage water distribution risk and crisis. 8) Review and validate water distribution customer service. 9) Review and validate water distribution risk and crisis.
Level 4	**Distribution Executive** 1) Supervise water distribution operation and maintenance administration. 2) Assist water hydraulic engineering design. 3) Supervise Water distribution planning and development programme. 4) Coordinate water distribution customer service. 5) Propose water distribution department budget. 6) Identify and evaluate water supply risk action plan. 7) Manage asset management.	**Network Executive** 1) Supervise water distribution operation and maintenance administration. 2) Assist water hydraulic engineering design. 3) Supervise water distribution planning and development programme. 4) Coordinate water distribution customer service. 5) Propose water distribution department budget. 6) Identify and evaluate water supply risk action plan. 7) Manage asset management.

Table 4.7: Group 360 Occupational Responsibilities (area 2 of 8)

Area / Level	Water Distribution	Water Network (Reticulation)
Level 3	**Distribution Technician** 1) Coordinate water reservoir and booster pump house. 2) Water system maintenance planning. 3) Analyse treated water quality. 4) Supervise water distribution installation equipment operation. 5) Ensure water distribution installation equipment is operating efficiently and safely. 6) Supervise adjustment of controls and/or valves on equipment and regulate and set operations of the system. 7) Supervise activation of valves to maintain required amounts of water. 8) Check readings on gauges, meters, and charts to detect operations and detect malfunctions. 9) Verify on-site incident reports, daily logs of operation, maintenance, and safety activities. 10) Arrange for repairs and daily maintenance activities and arrange with equipment manufacturers when necessary to resolve equipment problems. 11) Coordinate water distribution site security.	**Network Technician** 1) Control water meter arrangement and water piping system. 2) Analyse treated water quality and non-revenue water data. 3) Coordinate and supervise water distribution installation equipment operation. 4) Ensure water distribution installation equipment is operating efficiently and safely. 5) Supervise adjustment of controls and/or valves on equipment and regulate and set operations of the system. 6) Supervise activation of valves to maintain required amounts of water. 7) Supervise activities at the distribution system, including repair and maintenance. 8) Verify on-site incident reports, maintenance, and safety activities. 9) Coordinate water distribution site security.

Table 4.7: Group 360 Occupational Responsibilities (area 2 of 8)

Area / Level	Water Distribution	Water Network (Reticulation)
Level 2	**Pump Operator** 1) Operate water distribution installation equipment. 2) Ensure water distribution installation equipment is operating efficiently and safely. 3) Adjust controls and/or valves on equipment to provide power and to regulate and set operations of the system. 4) Observe readings on gauges, meters, and charts. 5) Record daily logs of operation, maintenance, and safety activities. 6) Activate valves to maintain the required amounts of water. 7) Perform service and maintenance activities. 8) Report on-site incident. 9) Ensure water distribution site security.	**Network Fitter** 1) Determine pipe sizes, pipe specifications, pipe threaders and benders. 2) Perform measurement of pipes for cutting and threading. 3) Perform excavation process. 4) Perform testing installed systems and pipelines using pressure gauge, hydrostatic testing, observation, or other methods. 5) Perform monitoring pipe maintenance. 6) Operate water meter installation. 7) Install and connect water piping.
Level 1	**Distribution Crew** 1) Assist to operate water distribution equipment. 2) Assist to operate controls and/or valves on equipment to provide power to regulate and set operations of the system. 3) Assist in valve maintenance and pump maintenance activities. 4) Perform daily housekeeping work.	**Network Crew** 1) Assist to identify other utility locations. 2) Assist in taking the measurement of pipes for cutting and threading. 3) Assist in the excavation process. 4) Assist in testing installed systems and pipelines using pressure gauge, hydrostatic testing, observation, or other methods. 5) Assist to open and close valves. 6) Perform housekeeping work.

Table 4.7: Group 360 Occupational Responsibilities (area 2 of 8)

Area / Level	Water Distribution	Water Network (Reticulation)
	The responsibilities and job boundaries between water distributions and water networks both fall under the water supply system, also known as water distribution work. Figure 4.3 below are the general guidelines, but some changes are expected from operators as it depends on the size of the supply systems. Water distributions physically start from the flowmeter plant to the balancing plant, pump house and service tank and its assets and facilities. (See Figure 4.3). While water networks physically start from the service tank flowmeter outlet to the consumer's water meter, including its respective assets and facilities. (See figure 4.3)	

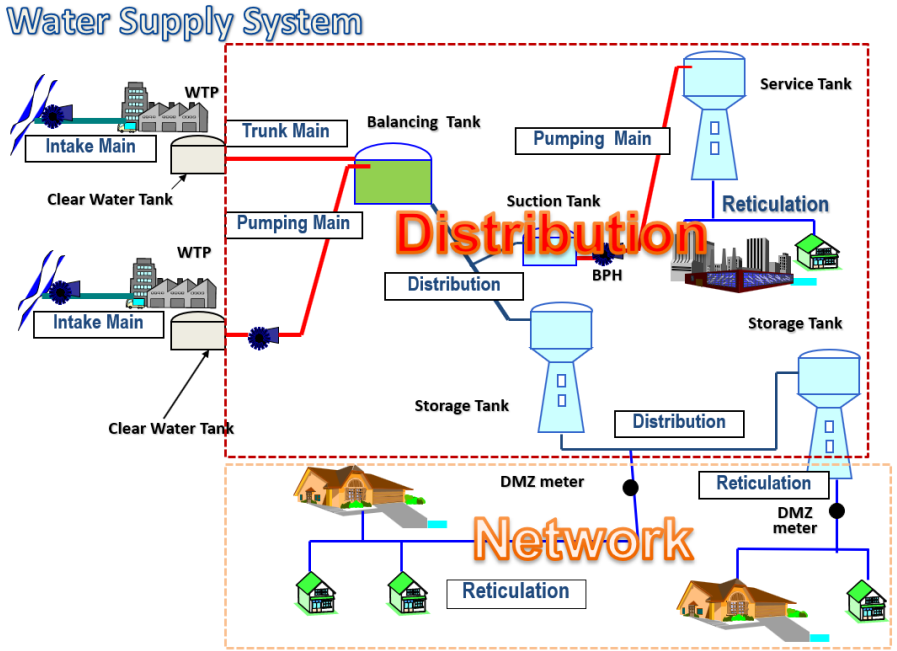

Figure 4.3: The physical job boundaries between water distributions and water networks area, as explained by the FGD panels

Table 4.8: Group 360 Occupational Responsibilities (area 3 of 8)

Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis
Level 8	No Job Title	No Job Title
Level 7	No Job Title	No Job Title
Level 6	**Senior NRW Technical Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water NRW asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Senior NRW Technical Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water NRW asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.8: Group 360 Occupational Responsibilities (3 of 8)

Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis
Level 5	**NRW Technical Manager** 1) Verify NRW water balance report. 2) Manage NRW's holistic countermeasure plan. 3) Establish and manage Pressure Management Area (PMA). 4) Develop meter replacement policy. 5) Develop NRW asset management system. 6) Evaluate NRW asset maintenance performance. 7) Manage NRW effectively and develop ways to lower the NRW level for the state. 8) Manage the contractor's work activities. 9) Plan, manage and control the annual budget for the NRW unit. 10) Manage PAV (Pressure, Altitude Valve & Valve) work activities. 11) Prepare NRW Unit monthly and regulatory report. 12) Calculate the percentage of NRW and certified by management. 13) Monitor the Job Management System (JMS) for repair work. 14) Plan activities in the NRW unit. 15) Provide all data and information for internal audit, SPAN and SIRIM. 16) Verify/review monthly reports for each section and activities related to the District Monitoring Area (DMA) Unit. 17) Assist in planning the purchasing of tools and equipment for the NRW unit.	**NRW Technical Manager** 1) Review and validate NRW water balance report. 2) Monitor District Meter Area (DMA) zone. 3) Verify Active Leakage Control programme. 4) Analyse Pressure Management Area (PMA) data. 5) Validate SCADA and telemetry data. 6) Plan and design hydraulic model. 7) Provide solutions for the problems and issues within the stipulated response time (i.e. solve the main burst in a zone). 8) Monitor the Step Test that the team had performed. 9) Check leak complaints are keyed into the SMART system. 10) Approve the budget for the NRW analysis unit. 11) Providing monthly analysis reports and submit to superior. 12) Monitor the leakage and maintenance works. 13) Liaise with a third party for purchasing spare parts. 14) Planning the purchasing of tools and equipment for the NRW unit.

Table 4.8: Group 360 Occupational Responsibilities (3 of 8)

Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis
Level 4	**NRW Executive** 1) Manage and ensure District Meter Area (DMA) zone contributing to leakage is lessened, the DMA region has minimum pressure, and DMA is below the set baseline. 2) Create a new DMA zone and provide reports for the new zone. 3) Manage commercial loss. 4) Develop NRW maintenance programme. 5) Monitor PAV (Pressure, Altitude Valve & Valve)work activities. 6) Proficient use of all NRW fittings. 7) Verify that leak complaints are keyed into the SMART system. 8) Verify that the team carries out the work of Visual Inspection and Sounding (VIS). 9) Supervise mapping activities and 'proving' work to identify affected zones. 10) Supervise the budget for the NRW operation unit. 11) Assist in providing monthly performance reports for each team member. 12) Prepare leakage and maintenance-related reports.	**NRW Executive** 1) Prepare NRW water balance report. 2) Manage District Meter Area (DMA) zone. 3) Develop Active Leakage Control programme. 4) Analyse Pressure Management Area (PMA) data. 5) Analyse SCADA and telemetry data. 6) Analyse and build the hydraulic model. 7) Solve problems and issues within stipulated response time (i.e. solve the main burst in a zone). 8) Analyse the Step Test that the team had performed. 9) Analyse leak complaints are keyed into the SMART system. 10) Supervise the budget for the NRW analysis unit. 11) Arrange to purchase of spare parts. 12) Assist in providing monthly analysis reports for each team member. 13) Analyse leakage and maintenance.

Table 4.8: Group 360 Occupational Responsibilities (3 of 8)

Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis
Level 3	**NRW Technician** 1) Perform control pipeline pressure. 2) Create a single feeder District Metering Area (DMA). 3) Propose NRW level countermeasure. 4) Coordinate NRW step test operation. 5) Coordinate DMA asset and equipment maintenance. 6) Prepare NRW commercial loss report. 7) Compile water assets Geo-coordinate Positioning. 8) NRW administrative function. 9) Compile site technical report.	No Job Title
Level 2	**NRW Fitter** 1) Set up water pressure logger and control equipment. 2) Carry out District Metering Area (DMA). 3) Perform NRW step test. 4) Monitor Smart Water Systems and carry out Active Leakage Control (ALC) detection. 5) Monitor and carry out DMA asset and equipment maintenance. 6) Investigate NRW Commercial loss. 7) Assist in controlling the loss of water due to Non-Revenue Water. 8) Perform housekeeping work. 9) Observe the repair work by contractors. 10) Prepare site technical report.	No Job Title

Table 4.8: Group 360 Occupational Responsibilities (3 of 8)

Area / Level	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis
Level 1	**NRW Crew** 1) Assist pressure data logger installation. 2) Assist pressure data logger collection. 3) Assist District Metering Area (DMA) data collection. 4) Assist Active Leakage Control (ALC) inspection. 5) Assist NRW commercial loss visual inspection. 6) Perform housekeeping works.	No Job Title

Table 4.9: Group 360 Occupational Responsibilities (area 4 of 8)

Area / Level	Planning and Design	Asset Management	Project Management
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Planning and Development Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Asset Management Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Project Management Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.9: Group 360 Occupational Responsibilities (area 4 of 8)

Area / Level	Planning and Design	Asset Management	Project Management
Level 5	**Planning and Development Manager** 1) Verify water development project plans. 2) Verify water supply and demand data. 3) Evaluate distribution development project. 4) Evaluate financial and technical viability. 5) Monitor water distribution development project plan. 6) Interpret operation and maintenance information and data. 7) Evaluate water distribution system planning and development program report. 8) Rectify operation and maintenance problems. 9) Perform water source work data verification. 10) Evaluate asset performance after operation and maintenance programme. 11) Evaluate treatment work, distribution, mechanical and electrical, and instrument conceptual design.	**Asset Management Manager** 1) Identify water distribution asset management requirements. 2) Develop policies and procedures for an asset management system. 3) Monitor asset management system implementation. 4) Assess asset management system report. 5) Measure asset depreciation and projection. 6) Validate documentation for land matters & legislative requirements. 7) Validate asset management system report. 8) Conduct user acceptance test (UAT). 9) Conduct asset management training.	**Project Management Manager** 1) Manage all aspects of the development and implementation of assigned projects and provides a single point of contact with internal resources, clients, and third-party/vendor for those projects. 2) Define project scope and objectives to develop detailed work plans, schedules, project timelines and resource plans. 3) Escalate potential risks/issues together with proposed mitigation plans and/or recommendations. 4) Produce relevant documentation in compliance with project governance requirements and standards. 5) Deliver completed solutions to clients and perform regular checks on the solution's performance. 6) Ensure proper project close-out, including lessons learnt, evaluations and conducting a face-to-face review with the project team on performance.

Table 4.9: Group 360 Occupational Responsibilities (area 4 of 8)

Area / Level	Planning and Design	Asset Management	Project Management
Level 4	**Planning and Development Executive** 1) Perform water source work data analysis. 2) Perform water supply and demand data analysis. 3) Perform feasibility study. 4) Perform water distribution development project plan. 5) Perform water distribution development project. 6) Perform treatment work, distribution, mechanical and electrical, and instruments conceptual design. 7) Perform required new water supplies development. 8) Organise require procurement documents.	**Asset Management Executive** 1) Identify water distribution assets. 2) Perform water distribution assets categorisation. 3) Review water distribution asset system. 4) Perform user acceptance test (UAT). 5) Oversee and categorize water supply assets. 6) Implement, review and evaluate the water supply asset system. 7) Rectify asset management issues and propose control measures.	**Project Management Executive** 1) Managing daily administrative functions of a project. 2) Coordinate internal resources and third parties/vendors for the flawless execution of projects. 3) Liaising with internal resources to define outcomes and timelines. 4) Work hand in hand with project managers to mitigate risks in the project. 5) Resolve the problems/challenges faced during the implementation progress and report to the project manager. 6) Provide project updates on a consistent basis to superior. 7) Create and maintain project documentation. 8) Perform other related duties as assigned.

Table 4.9: Group 360 Occupational Responsibilities (area 4 of 8)

Area / Level	Planning and Design	Asset Management	Project Management
Level 3	**Planning and Development Technician** 1) Perform water source, treatment, and pipe distribution data collection. 2) Perform mechanical, electrical and instrument installation requirement assessment. 3) Perform new water supplies approval documents. 4) Perform technical procurement documents. 5) Prepare water supply systems planning design compliance and parameters preparation and documentation. 6) Perform asset inventory, asset economics, life costing, asset replacement, asset condition monitoring and asset updating. 7) Utilise GIS and IT applications. 8) Prepare land ownership & legislative requirements documentation.	**Asset Management Technician** 1) Check and update asset inventory. 2) Evaluate asset condition, life costing and economics. 3) Record asset replacement and disposal program. 4) Prepare documentation for land matters & legislative requirements. 5) Perform water supply systems asset management documentation. 6) Perform approval of new water supplies preparation. 7) Perform design compliance and parameter preparation. 8) Utilise GIS and IT applications.	**Project Management Technician** 1) Assist in daily administrative functions of a project. 2) Assist in coordinate internal resources and third parties/vendors for the flawless execution of projects. 3) Identify the problems/challenges faced during the implementation progress and report to the project manager. 4) Provide project updates on a consistent basis to superior. 5) Assist in maintain project documentation. 6) Perform other related duties as assigned.
Level 2	No Job Title	No Job Title	No Job Title
Level 1	No Job Title	No Job Title	No Job Title

Table 4.10: Group 360 Occupational Responsibilities (area 5 of 8)

Area / Level	Command Centre	Meter Reading and Billing	Meter Testing
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Senior Command Centre Technical Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Customer Service Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Metering Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.10: Group 360 Occupational Responsibilities (area 5 of 8)

Area / Level	Command Centre	Meter Reading and Billing	Meter Testing
Level 5	**Command Centre Technical Manager** 1) Propose and strategies a plan for upgrading based on data analysis. 2) Identify, manage and resolve complex risks and issues. 3) Major decision-making. 4) Manage the Command Centre (incident managers, incident coordinators) in the coordination of end-to-end incident management. 5) Drive the overall efficiency and effectiveness of the Major Incident Management process. 6) Proactively manage major incidents or potential major incidents. 7) Take lead in major incident conference calls or war rooms. 8) Update communications to stakeholders in accordance with processes and procedures.	**Customer Service Manager** 1) Handling customer service and operation/documentation. 2) Lead and provide guidance to a team of customer service and operation members. 3) Monitoring the work quality, accuracy, completeness and timeliness of the team. 4) Handling complaints, offering solutions and mitigate losses on claims and trouble cases. 5) Provide costs, quotations and/or solutions for inquiries. 6) Building and maintaining good relationships with consumers. 7) Improvise work process and ensure compliance with HQ guidelines, policies and work procedures from the relevant personnel.	**Metering Manager** 1) Manage and directs the District's water meter testing program. 2) Verify water manometers, gauges, pitot tubes, water and flow measurement, and pump testing equipment are in good condition. 3) Direct water meter flows measurements and calibrations both in the field and at the District's meter calibration and testing facility. 4) Manage and directs the annual performance testing of distribution pumps. 5) Manipulates distribution system utilizing the motor control panel and telemetry system as required to isolate equipment to be tested. 6) Propose an annual department budget.

Table 4.10: Group 360 Occupational Responsibilities (area 5 of 8)

Area / Level	Command Centre	Meter Reading and Billing	Meter Testing
Level 4	**Command Centre Executive** 1) Manage data centre system. 2) Analyse and validate water quality data. 3) Verify and coordinate action plan inter-department. 4) Identify, manage and resolve routine risks and issues. 5) Supervise and oversee technicians.	**Customer Service Executive** 1) Maintain a positive and professional attitude and response toward consumers at all times. 2) Handling all types of complaints using the concept of one-face-to-customer from all channels. 3) Liaise with internal logistics or third-party logistics in resolving all complaints on pre- and post-delivery issues. 4) Liaise with the respective head of department to response promptly to enquiries from social media or online platforms about product information, pricing, availability, etc. 5) Resolve customer issues on ordering, promotion code and payment to ensure the orders are captured correctly, and products are delivered promptly. 6) Keep records of customer interactions, transactions, comments, and complaints. 7) Monitor and resolve any return requests from consumers. 8) Handle, record and response promptly to all incoming calls, emails and instant messaging from consumers.	**Metering Executive** 1) Coordinate, operate and maintains the District's water meter testing program. 2) Installs, operates, maintains, repairs, and calibrates water manometers, gauges, pitot tubes, water and flow measurement, and pump testing equipment. 3) Conducts water meter flow measurements and calibrations both in the field and at the District's meter calibration and testing facility, including the calibration and repair of headworks water metering devices. 4) Coordinate the annual performance testing of distribution pumps. 5) Reads maps and interprets land descriptions. 6) Assists in the preparation of the department's annual budget.

Table 4.10: Group 360 Occupational Responsibilities (area 5 of 8)

Area / Level	Command Centre	Meter Reading and Billing	Meter Testing
Level 3	**Command Centre Technician** 1) Monitor data collecting system. 2) Track reservoir output. 3) Monitor and coordinate action plans intra-department. 4) Collect and analyse water quality data. 5) Collect pH reading and Chlorine reading.	**Meter Reader Supervisor** 1) Perform and supervise reading of water consumption meters. 2) Check data in hand-held computers /equipment. 3) Verify readings in cases where consumption appears to be abnormal and record possible reasons for fluctuations. 4) Supervise inspection of meters for unauthorized connections, defects, and damage. 5) Supervise and conduct connection and disconnection of utility services at specific locations. 6) Report to service departments any problems such as meter irregularities, damaged equipment, maintenance or equipment problems.	**Meter Testing Technician** 1) Test and repair water meters to ensure accurate operation of water meters. 2) Install new meters, repair and replace existing meters when necessary (leaks, complaints, erroneous readings, new construction and exchanging meters). 3) Test various meter reading units and repair as necessary. 4) Test and diagnose electronic transmitting devices when problems occur. 5) Assist utility workers in operations and maintenance of water systems on an as-needed or emergency basis.

Table 4.10: Group 360 Occupational Responsibilities (area 5 of 8)

Area / Level	Command Centre	Meter Reading and Billing	Meter Testing
Level 2	No Job Title	**Meter Reader** 1) Perform reading of water consumption meters. 2) Enter data in hand-held computers /equipment. 3) Record cases where consumption appears to be abnormal. 4) Inspect meters for unauthorized connections, defects, and damage. 5) Connect and disconnect utility services at specific locations. 6) Report to service departments any problems such as meter irregularities, damaged equipment, maintenance or equipment problems.	**Meter Testing Assistant Technician** 1) Installs, repairs and inspects water meters, meter pits and meter reading equipment, valves, pressure regulators and flow testing meters. 2) Responds to customer service requests, not limited to connections, disconnects, rereading meters, checking for leaks, etc. 3) Ensures proper inventory of meter-related equipment and parts. 4) Maintains records of work performed and materials used. 5) Contributes to the efficiency and effectiveness of the unit's service to its consumers.
Level 1	No Job Title	No Job Title	No Job Title

Table 4.11: Group 360 Occupational Responsibilities (area 6 of 8)

Area / Level	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Customer Service Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Customer Service Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Digital Customer Service Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.11: Group 360 Occupational Responsibilities (area 6 of 8)

Area / Level	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 5	**Customer Service Manager** 1) Handling customer service and operation/documentation. 2) Lead and provide guidance to a team of customer service and operation members. 3) Monitoring the work quality, accuracy, completeness and timeliness of the team. 4) Handling complaints, offering solutions and mitigate losses on claims and trouble cases. 5) Provide costs, quotations and/or solutions for inquiries. 6) Building and maintaining good relationships with consumers. 7) Improvise work process and ensure compliance with HQ guidelines, policies and work procedures from the relevant personnel.	**Customer Service Manager** 1) Handle customer service and operation/documentation. 2) Lead and provide guidance to a team of customer service and operation members. 3) Monitoring the work quality, accuracy, completeness and timeliness of the team. 4) Handling complaints, offering solutions and mitigate losses on claims and trouble cases. 5) Provide costs, quotations and/or solutions for inquiries. 6) Building and maintaining good relationships with consumers. 7) Improvise work process and ensure compliance with HQ guidelines, policies and work procedures from the relevant personnel.	**Digital Customer Service Manager** 1) Evaluate website traffic according to metrics such as the number of visitors, visitor demographics, session length, conversion rate, new customer acquisition cost, and more. 2) Use a digital experience platform to assess customer feedback, data, and analytics, as well as improve the overall digital experience and customer experience based on analytics and derived insights. 3) Create an e-commerce strategy and other digital sales strategies. 4) Analyse consumer behaviour on current platforms. 5) Manage and access the customer life cycle and the digital experience life cycle. 6) Monitor customer interactions for insights and data. 7) Create the digital experience strategy and assist with the customer experience strategy. 8) Coordinate efforts with the human resources department, operations manager, project management teams, and more departments as needed.

Table 4.11: Group 360 Occupational Responsibilities (area 6 of 8)

Area / Level	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 4	**Enforcement Executive** 1) Maintain a positive and professional attitude and response toward consumers at all times. 2) Handling all types of complaints using the concept of one-face-to-customer from all channels. 3) Liaise with internal logistics or third-party logistics in resolving all complaints on pre- and post-delivery issues. 4) Liaise with the respective head of department to response promptly to enquiries from social media or online platforms about product information, pricing, availability, etc. 5) Keep records of customer interactions, transactions, comments, complaints, action plan taken and turnaround time to resolve the complaint and submit the report to superior for productivity improvements. 6) Monitor and resolve any return requests from consumers. 7) Handle, record and response promptly to all incoming calls, emails and instant messaging from consumers.	**Customer Service Executive** 1) Maintain a positive and professional attitude and response toward consumers at all times. 2) Handling all types of complaints using the concept of one-face-to-customer from all channels. 3) Liaise with internal logistics or third-party logistics in resolving all complaints on pre- and post-delivery issues. 4) Liaise with the respective head of department to response promptly to enquiries from social media or online platforms about product information, pricing, availability, etc. 5) Keep records of customer interactions, transactions, comments, complaints, action plan taken and turnaround time to resolve the complaint and submit the report to superior for productivity improvements. 6) Monitor and resolve any return requests from consumers. 7) Handle, record and response promptly to all incoming calls, emails and instant messaging from consumers.	**Digital Customer Service Executive** 1) Assist digital consumers with any questions or issues that arise with the accounts via phone, email, and webinars. 2) Demonstrations and training for the user on digital products. 3) Handle inbound calls, emails, and support, and respond efficiently to customer questions. 4) Interact with other departments to solve representative and customer problems/ concerns. 5) Formulation of strategies to build a lasting digital connection with consumers. 6) Plan and monitor the ongoing company presence on social media. 7) Collaborate with designers to improve user experience.

Table 4.11: Group 360 Occupational Responsibilities (area 6 of 8)

Area / Level	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 3	**Enforcement Technician** 1) Read meters and record consumers' water consumption for periodic billing and establishing and terminating service. 2) Complete shut-off notices and post them at consumers' residences to alert occupants of the impending termination of water service. 3) Patrol the areas with a high probability of water theft. 4) Prepare and submit a report of water activities to superior.	**Customer Service Supervisor** 1) Perform a comprehensive solution for the complaint/report regarding the services. 2) Adhere to policies and procedures and customer service. 3) Communicate with other departments/divisions/units. 4) Arrange a customer service representative to assist with all complaints/reports. 5) Perform consumer education programs/activities. 6) Provide customer information regarding services. 7) Perform communication handling tasks.	**Digital Customer Service Supervisor** 1) Supervise data entry for accounts creation, billing, payment receipts, miscellaneous debit & credit notes, customer data maintenance. 2) Supervise meter reading daily scheduling. 3) Supervise downloading of billing data for meter readings in handheld computers. 4) Supervise uploading of billing data from handheld computers after meter reading. 5) Supervise uploading of consolidated payment data from payment centres. 6) Check the suspended accounts listing. 7) Coordinate clearance of suspense accounts listing with senior meter readers. 8) Resolve data entry errors by Customer Accounts Clerk. 9) Inform Customer Accounts Executive of job sheet requests on new items/item changes/item removal in the water billing software application. 10) Communicate with User Accounts Clerk, Executive and other related units.

Table 4.11: Group 360 Occupational Responsibilities (area 6 of 8)

Area / Level	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 2	**Enforcement Assistant Technician** 1) Assist in recording consumer water consumption. 2) Perform water cut-off of the consumer with a delinquent account. 3) Assist in patrolling the areas with a high probability of water theft. 4) Record and report the water activities. 5) Ensure the consumer is kept informed of the progress of the complaint review and communicate the results of the investigation.	**Customer Services Officer** 1) Provide timely solutions and support to all consumer requests via various communication channels such as inbound calls, emails, live chat etc. 2) Collect and record all relevant information accurately into the Intake system. 3) Report details of all complaints within the time frame to the department/personnel in charge. 4) Ensure consumer is kept informed of the progress of the complaint review and communicate the results of the investigation. 5) Prepare daily reports of concerns received from consumers. 6) Achieve individual performance expectations and development. 7) Perform any necessary tasks assigned by the superior from time to time.	**Digital Customer Services Officer** 1) Perform data entry for accounts creation, billing, payment receipts, miscellaneous debit and credit notes, special bills, including disconnection bills, customer data maintenance. 2) Maintain meter reading daily scheduling. 3) Download billing data for meter readings in handheld computers. 4) Upload billing data from handheld computers after meter reading. 5) Upload consolidated payment data from payment centres. 6) Inform superior of data entry errors.
Level 1	**Enforcement Crew** 1) Prepare tools and equipment for the water cut-off process. 2) Assist in perform water cut-off of consumers with a delinquent account. 3) Perform housekeeping.	No Job Title	No Job Title

Table 4.12: Group 360 Occupational Responsibilities (area 7 of 8)

Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Mechanical, Electrical and Instrumentation Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Mechanical, Electrical and Instrumentation Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Mechanical, Electrical and Instrumentation Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.

Table 4.12: Group 360 Occupational Responsibilities (area 7 of 8)

Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance
Level 5	**Mechanical, Electrical and Instrumentation Manager** 1) Coordinate mechanical production activities. 2) Ensure water production is made efficiently and meets company standards. 3) Plan and implement policies and legislation. 4) Determine, implement and monitor production strategies, policies and plans. 5) Plan, direct and coordinate activities concerning the production of water. 6) Ensure the efficient use of resources and the fulfilment of production quotas.	**Mechanical, Electrical and Instrumentation Manager** 1) Provide electrical operations recommendations and technical support on electrical surveys, strategic plans, and projects. 2) Allocate budget, resource planning, and schedule. 3) Manage unit and development cost estimates and assist in determining affordable and reliable material sources. 4) Ensure timely electricity production. 5) Coordinate production by meeting compliance and safety guidelines. 6) Verify and evaluate quality requirements as well as test and solve production problems. 7) Set up technical standards in reviews, documentation, and design. 8) Manage the electrical team and other electrical personnel. 9) Plan and implement policies and legislation. 10) Ensure efficient use of resources and meet production quotas.	**Mechanical, Electrical and Instrumentation Manager** 1) Plan, manage and control plant instrumentation engineering activities. 2) Ensure equipment maintained according to standards. 3) Develop, evaluate and implement new manufacturing technologies and operational excellence projects in plant & process and control & instrumentation systems. 4) Review and ensure good operational effectiveness of existing processes and work practices related to management and maintenance of the plant. 5) Develop and manage a maintenance management system that includes preventive and predictive maintenance, parts inventory control, control of maintenance cost, manpower control, etc. 6) Work out plans to achieve overall equipment effectiveness (OEE). 7) Liaise with other departments/ plants for standardization or critical work execution. 8) Always adhere to and enforce company rules, policies and regulations. 9) Review the quality system procedures and work instructions for the department.

Table 4.12: Group 360 Occupational Responsibilities (area 7 of 8)

Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance
Level 4	**Mechanical Executive** 1) Read and interpret technical drawings, schematics, or computer-generated reports. 2) Design, evaluate, install, operate or maintain mechanical products, equipment, systems or processes to meet requirements standards. 3) Confer with engineers or other personnel to implement operating procedures, resolve system malfunctions or provide technical information. 4) Develop, coordinate, or monitor all aspects of production, including a selection of manufacturing methods, fabrication or operation of product designs. 5) Analyse equipment failures or difficulties to diagnose faulty operations and recommend remedial actions. 6) Design mechanical and thermal devices or subsystems using analysis and computer-aided design. 7) Recovering damage and recommending solutions. 8) Analyse test results and modify the design or system according to requirements standards. 9) Oversee the water process for the machine or equipment.	**Electrical Executive** 1) Plan and design the manufacture and installation of electric power equipment and facilities. 2) Determine the type and arrangement of circuits, transformers, circuit breakers, transmission lines and other equipment. 3) Advise on and design systems for electrical motors, electric traction devices and other equipment or domestic electrical appliances. 4) Interpret specifications, standards and regulations relating to electric power equipment and use. 5) Organise and manage resources used in electrical components, machines, appliances and equipment. 6) Establish delivery and installation schedules for machines, switchgear, cables and fittings. 7) Supervise the operation and maintenance of power stations, transmission and distribution systems and industrial plants. 8) Establish control standards and procedures to ensure efficient functioning and safety of electrical generating and distribution systems. 9) Locate and correct malfunctions.	**Instrumentation Executive** 1) Read and interpret technical drawings, schematics, or computer-generated reports. 2) Design, evaluate, install, operate, or maintain equipment, systems or processes to meet requirements standards. 3) Confer with engineers or other personnel to implement operating procedures, resolve system malfunctions, or provide technical information. 4) Develop, coordinate, or monitor all aspects of production, including a selection of manufacturing methods, fabrication, or operation of product designs. 5) Investigate equipment failures or difficulties to diagnose faulty operations and recommend remedial actions. 6) Design mechanical and thermal devices or subsystems using analysis and computer-aided design. 7) Recovering damage and recommending solutions. 8) Analyse test results and modify the design or system according to requirements standards. 9) Oversee the manufacturing process for the device.

Table 4.12: Group 360 Occupational Responsibilities (area 7 of 8)

Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance
Level 3	**Mechanical Technician** 1) Provide technical assistance in research and development work concerning machine tools, vehicle engines, aircraft, heating, ventilating and refrigerating installations and other mechanically functioning plant and equipment. 2) Install and perform diagnostic tests on mechanical systems. 3) Develop and implement mechanical maintenance plans to prevent costly equipment breakdowns. 4) Update and troubleshoot mechanical malfunctions and breakdowns, as well as perform repairs. 5) Ensure compliance with rules and procedures. 6) Follow the project through the testing and production phases. 7) Plan and organise site activities, scheduling and controlling on progress of works. 8) Supervise daily operation activities.	**Electrical Technician** 1) Install, maintain, and repair electrical control, wiring, and lighting systems. 2) Read and interpret technical diagrams and blueprints. 3) Carry out inspection, servicing and maintenance. 4) Troubleshoot electrical issues using appropriate testing devices. 5) Inspect transformers, circuit breakers, and other electrical components. 6) Construct and fabricate parts using hand tools and specifications. 7) Advise management on continued use of unsuitable equipment, appliances, and apparatus.	**Instrumentation Technician** 1) Manage the list of instrumentation facilities and equipment. 2) Handle work order management system from the job identification, resource planning and scheduling, work preparation, execution and completion related to infrastructure. 3) Participate and collaborate in the investigation and root cause analysis of electrical and instrument equipment failure and propose corrective and preventive actions. 4) Assign and oversee subordinates for calibration jobs. 5) Coordinate with the process department regarding any engineering issues. 6) Interpret arising technical problems to management.

Table 4.12: Group 360 Occupational Responsibilities (area 7 of 8)

Area / Level	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance
Level 2	**Mechanical Assistant Technician** 1) Install, repair and maintain mechanical equipment for facilities, machines and systems. 2) Operate mechanical equipment. 3) Inspect, troubleshoot and maintain mechanical systems, facilities and equipment. 4) Perform other repair works or maintenance projects. 5) Perform mechanical test parts to ensure efficiency and make improvements accordingly.	**Electrical Assistant Technician** 1) Read and interpret electrical and electronic circuit blueprints, diagrams, and schematics. 2) Install, maintain and repair electrical equipment in facilities. 3) Fitting, adjust and repair various kinds of electrical parts and related equipment in industrial machines and other appliances or electrical apparatus. 4) Assemble, evaluate, test and maintain electrical or electronic wiring, equipment, appliances, and apparatus. 5) Assist in troubleshoot and repair electrical issues using appropriate testing devices.	**Instrumentation Assistant Technician** 1) Responsible to test, calibrate, install, repair, and inspect monitoring devices. 2) Perform general maintenance on the equipment and design new measuring and recording equipment. 3) Maintain and plan all shutdowns and preventive maintenance works. 4) Follow up and update the daily checklist. 5) Identify all the breakdowns, inspect and carry out root cause analysis for problems.
Level 1	**Mechanical Crew** 1) Assist in install, repair and maintain mechanical equipment for facilities, machines and systems. 2) Assist in operate mechanical equipment. 3) Assist in inspect, troubleshoot and maintenance mechanical systems, facilities and equipment. 4) Assist in perform other repair works or maintenance projects. 5) Assist in perform test mechanical parts to ensure efficiency.	**Electrical Crew** 1) Assist in install, maintain and repair electrical equipment in facilities. 2) Assist in fitting, adjust and repair various kinds of electrical parts and related equipment. 3) Perform basic electrical troubleshooting. 4) Prepare the tools and equipment to be used for maintenance work. 5) Perform electrical housekeeping.	**Instrumentation Crew** 1) Assist in test, calibrate, install, repair, and inspect monitoring devices. 2) Assist in perform general maintenance on the equipment and design new measuring and recording equipment. 3) Assist in maintain and shutdowns and preventive maintenance works. 4) Update daily checklist. 5) Identify the breakdown and carry out root cause analysis for problems.

Table 4.13: Group 360 Occupational Responsibilities (area 8 of 8)

Area / Level	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 8	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title
Level 6	**Water Quality Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water quality asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**Water Quality Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Water quality asset and resources management. 9) Plan and direct the general functions of the organisation. 10) Lead subject matter expert within the company regarding technology concerns.	**GIS Senior Manager** 1) Plan and direct operations. 2) Determine objectives, strategies, policies and programmes for the organisation. 3) Review the operations and results of the organisation and report to the board of directors and governing bodies. 4) Apply budget, control expenditure, and cost-saving plan. 5) Assess and manage potential risk and security threats. 6) Disaster recovery plan. 7) Develop and ensure compliance with policies, regulations, rules and procedures. 8) Plan and direct the general functions of the organisation. 9) Lead subject matter expert within the company regarding technology concerns.

Table 4.13: Group 360 Occupational Responsibilities (area 8 of 8)

Area / Level	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 5	**Water Quality Manager** 1) Acknowledge and report water quality results. 2) Review budget for water quality surveillance program. 3) Plan and coordinate resources. 4) Plan and project sustainability for water quality equipment. 5) Liaise with related agencies and regulatory bodies. 6) Carry out internal audit.	**Water Quality Manager** 1) Acknowledge and report water quality results. 2) Review budget for water quality surveillance program. 3) Plan and coordinate resources. 4) Plan and project sustainability for water quality equipment. 5) Liaise with related agencies and regulatory bodies. 6) Carry out internal audit.	**GIS Manager** 1) Manage the development of GIS software packages. 2) Evaluate the functionality of systems. 3) Purchase new equipment to improve project efficiency. 4) Keep up to date with new technology. 5) Ensure projects keep to pre-determined deadlines. 6) Identify new GIS applications. 7) Manage budgets and project costs. 8) Supervise, review, and evaluate the work of the GIS project. 9) Manage projects, including planning, statements of work, budgets and schedules. 10) Develop and implement new and innovative methods, techniques, and procedures.

Table 4.13: Group 360 Occupational Responsibilities (area 8 of 8)

Area / Level	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 4	**Water Quality Executive** 1) Approve water sampling schedule. 2) Verify water quality results. 3) Plan and propose a budget for the water quality surveillance program. 4) Manage resources. 5) Plan, calibrate and validate water testing equipment.	**Water Quality Executive** 1) Approve water sampling schedule. 2) Verify water quality results. 3) Plan and propose a budget for the water quality surveillance program. 4) Manage resources. 5) Plan, calibrate and validate water testing equipment.	**GIS Executive** 1) Analyse spatial data through the use of mapping software. 2) Discover patterns and trends through spatial mapping of data. 3) Design digital maps with geographic data and other data sources. 4) Produce maps showing the spatial distribution of various kinds of data, including crime statistics and hospital locations. 5) Develop mapping applications and tools. 6) Convert physical maps into a digital form for computer usage. 7) Perform data munging and cleaning to convert data into its desired form. 8) Produce reports on geographic data utilizing data visualizations. 9) Manage a digital library of geographic maps in various file types.

Table 4.13: Group 360 Occupational Responsibilities (area 8 of 8)

Area / Level	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 3	**Water Quality Technician** 1) Supervise water sample preservative preparation. 2) Supervise water quality sampling. 3) Supervise water sample collection, in-situ test, distribution, storage and record. 4) Scheduling water sampling task. 5) Ensure water sample and reagent waste disposal. 6) Analyse water quality results. 7) Perform water testing equipment calibration and validation.	**Laboratory Technician** 1) Perform water quality laboratory physical testing and record. 2) Perform water quality laboratory chemical testing and record. 3) Perform water quality laboratory microbiological testing and record. 4) Perform instrumental analytical quality control. 5) Supervise water quality activities.	**GIS Technician** 1) Compile geographic information in the form of satellite images, geographical surveys, and aerial photographs. 2) Research and verify geographic data. 3) Enter new data into the GIS database. 4) Draw maps using advanced computer software. 5) Ensure maps are annotated and compiled with the correct information. 6) Compile reports using all available GIS and GPS data sources. 7) Maintain the GIS database and troubleshoot data issues. 8) Travel to geographic sites to conduct land surveys.

Table 4.13: Group 360 Occupational Responsibilities (area 8 of 8)

Area / Level	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 2	**Water Sampler** 1) Water sampling station housekeeping. 2) Prepare water sample preservative. 3) Perform water quality sampling. 4) Perform water sample collection, in-situ test, distribution, storage and record. 5) Carry out water samples and reagent waste disposal.	**Laboratory Assistant** 1) Register water sample. 2) Assist in water quality laboratory physical testing. 3) Assist in water quality laboratory chemical testing. 4) Assist in water quality laboratory microbiological testing. 5) Assist in instrumental analytical quality control. 6) Prepare samples for testing using various laboratory equipment. 7) Clean and sterilize equipment and work area. 8) Collect and prepare research and information needed for studies.	No Job Title
Level 1	No Job Title	**Laboratory Crew** 1) Perform lab cleaning, housekeeping, and sterilise equipment and work area. 2) Prepare lab apparatus and equipment. 3) Perform waste disposal. 4) Prepare samples for testing using various laboratory equipment. 5) Collect and prepare research and information needed for studies.	No Job Title

4.4.5 The Occupational Descriptions (OD)

The rest of the workshop time for FGD 2 was used to develop the occupational description for each identified Critical Job. From the OR, a discussion on the knowledge, skill and attribute needed for the job titles, which were considered critical, were carried out. The skills, attitude and knowledge for developing the occupational description for critical jobs were discussed based on the level of competencies as well as from the surveys. The occupational descriptions obtained are listed in Annex 6.

4.5 Survey findings

For survey findings, only 47 respondents, mostly from Ranhill SAJ and Air Selangor, have responded to this survey. Although only 47 responses were recorded, the job areas covered are enough, as the same person owns some job titles. The distribution of respondents' work areas is shown in Figure 4.4. It can be seen that most of our respondents are from Water Distributions, followed by Water Treatment and Non-Revenue Water.

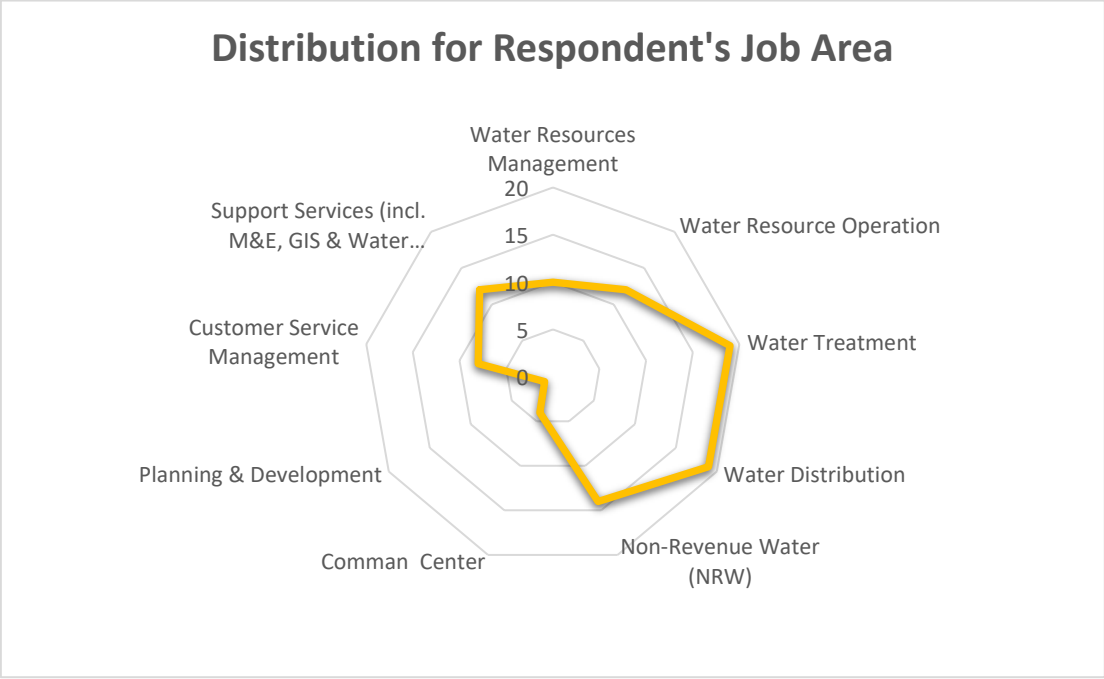

Figure 4.4: Distributions of Respondent's Job Area

4.5.1 Critical Job Classifications

The first section of the survey is to identify the job area which is considered critical and is seen to be competitive in the near future. In this section, respondent was asked to answer to their respective job area(s) only as they are expected to be in full knowledge of their area.

One of the questions asks the respondent to choose the hardest set of skills to be recruited in their job area. This is represented by the yellow line in Figure 4.5 below. In order to capture the respondent's views on the competitive area in the near future, respondents are able to choose more than one area. In Figure 4.5, it is depicted as the blue line.

It can be seen that the critical skills and competitiveness of the area are directly related, although it is understandably a gap for NRW. This tallies with the document analysis findings that NRW is becoming more of a serious issue with ageing facilities and infrastructure. Thus, lots of maintenance work, plus upgrading facilities, are needed, which requires workers to reskill and learn new knowledge.

On top of this, the gap between NRW being the critical job area with the competitiveness in the near future could be a hint that the current available NOSS for NRW needs a revisit to map its relevancy to the skillset needed in its level of competency.

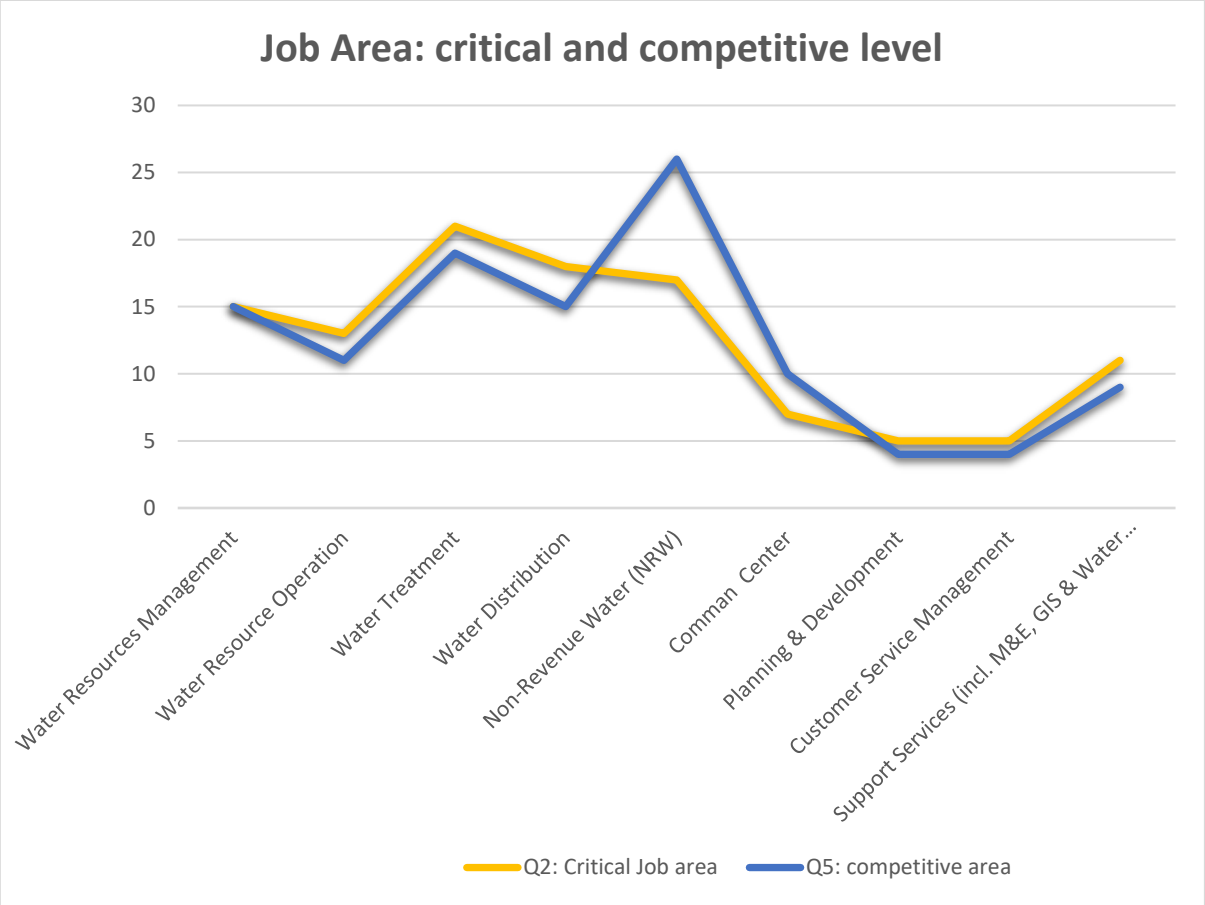

Figure 4.5 Critical job area and the competitiveness in near future

Apart from these two, respondents were asked to choose or suggest job title categories that are hard to fill, as well as the most sought-after skill sets. These are represented with the word cloud diagram in Figure 4.6 (a) and (b). The word cloud diagram shows the frequency of words in the form of font size. The bigger font means a higher frequency of its occurrences. From Figure 4.6, it can be concluded that somehow managers are the job title categories that are hard to fill, followed closely by technicians and supervisors. While for a critical job title that requires a specific skill set, data analyst domineers the vote, followed by the electrical and mechanical technician.

What can be interpreted from this situation is the need to empower and upgrade the data analysis skills and knowledge of current managers and executives level to fill in the manager position later, as well as part of the career path for them.

(a) *Hard to fill job title categories* *(b) Job titles with hard to fill skill sets in E36*

Figure 4.6: Frequency of votes for hard-to-fill job title categories (a) and the job titles with the hard-to-fill skill sets (b)

4.5.2 Occupational Qualification & Skills

Section two of the survey aims to capture the **skills and qualifications in demand** for E36-Water Collection, Treatment and Supply Industry, based on the occupational level. Based on the responses, the most critical competency for E36 is to apply fundamental principles and complex techniques across wide and often unpredictable contexts. The full list of competencies is listed here and coded with [a-h] for cleaner representation. Figure 4.7 shows that 'e' is the critical competency, followed closely by 'f' and 'g' with an even number of votes, and 'a'. The definition of 'e, f, g' and 'a' is bolded in the list below.

a) Competent performing a range of varied/routine/predictable activities.

b) Competent performing significant range of varied/non-routine/responsibility/autonomy activities.

c) Competent performing varied/complex/non-routine, responsibility/autonomy & guidance of others required.

d) Competent performing complex technical/professional with a substantial degree of personal responsibility & autonomy.

e) Competent applying a fundamental principles & complex technique across wide and often unpredictable contexts. Very substantial personal autonomy & personal accountabilities for analysis, diagnosis, planning, execution & evaluation.

f) Competent performing in reflection of the ability to refine & relevant understanding/methods/skills to address complex problems includes able to underpin

substantial change/development & exercising broad autonomy & judgement.

g) Competent to reformulate & use relevant understanding/methods/skills to address problematic situations including responsibility for planning & developing activities. Also reflects of theoretical & relevant methodological perspective & area of work.

h) Competent to develop original understanding & extend an area of knowledge/professional practice. Involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for development a field of work or knowledge, reflects a critical understanding of relevant theoretical & methodological perspective and how they affect the field of knowledge or work. The most critical competency is 'Competent applying a fundamental principles & complex technique across a wide and unpredicted event. Then the competencies in performing in reflection of ability, as well as to reformulate and use relevant understanding.

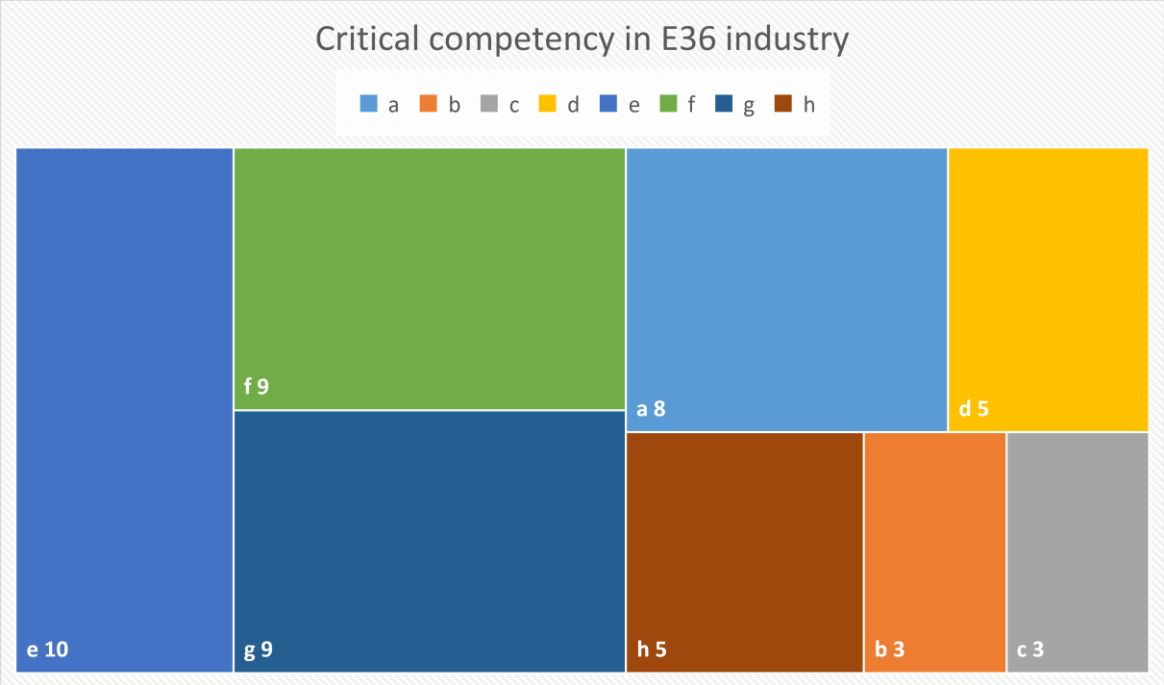

Figure 4.7: Critical competency for E36

Then, mapping the academic qualification needed in each job area for E36 shows that a degree holder is the most frequently hired and needed, followed by a diploma holder. Degree are mostly needed for the NRW area, while diploma are mostly needed in the Water Distribution job area. The whole landscape of academic qualifications mapped to each job area in E36 is shown in Figure 4.8.

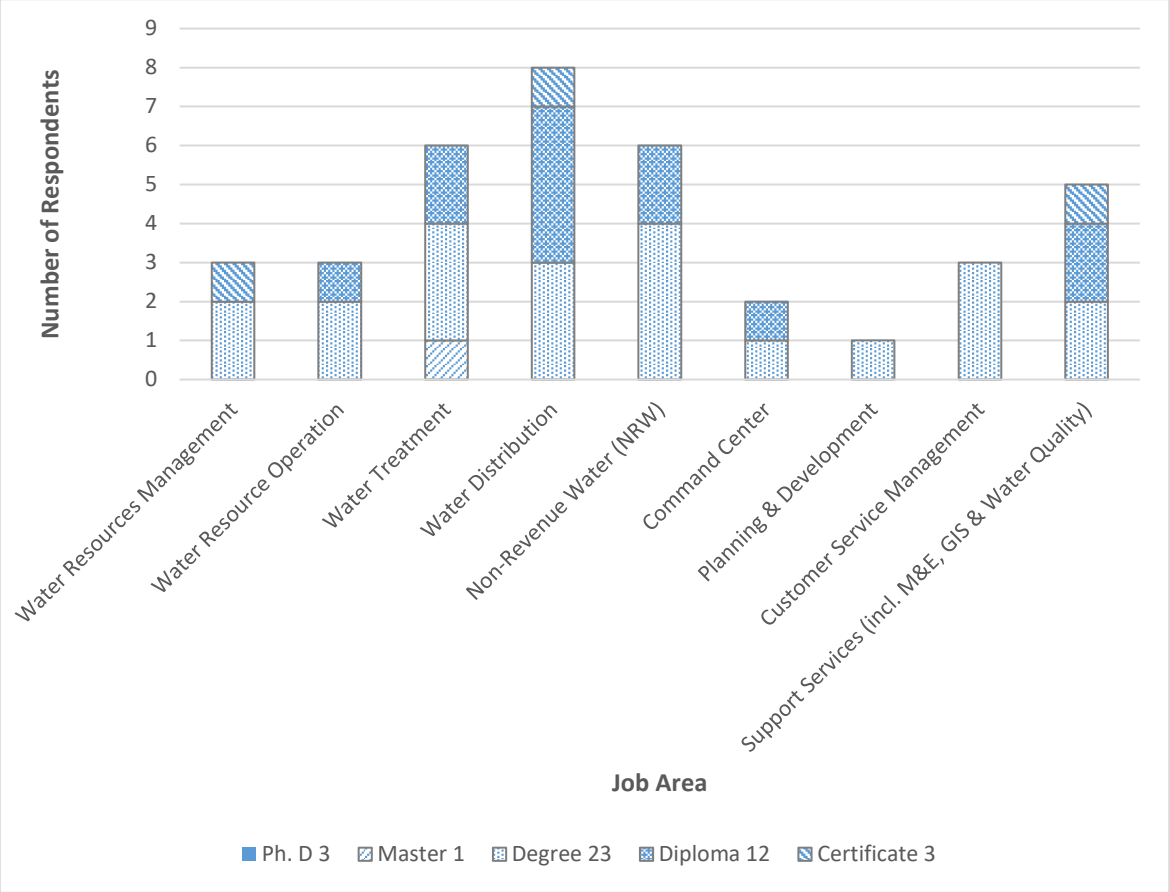

Figure 4.8: The academic qualification that critical for a smoother operation in each job area

Similarly, the Technical & Vocational qualifications that are critical in each job area were mapped, as shown in Figure 4.9. The most needed certification is a skill diploma, mostly in water distribution and NRW water job area.

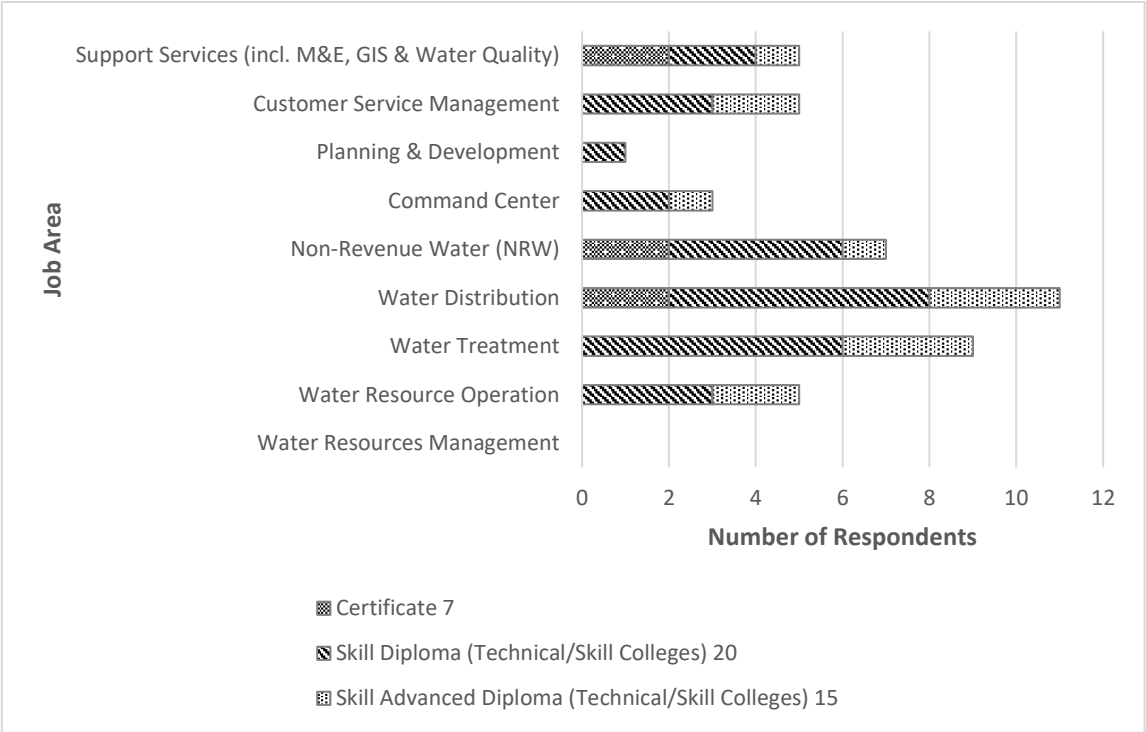

Figure 4.9: Technical and Vocational certificates critical rate for each job area in E36

The classification for a critical category of skills for E36 was the Supervisory level (13 votes) and Managerial level (12 votes), while the General Worker / Crew level had no vote at all. Then the demand for certain skill sets according to the level of skills was also mapped, as shown in Figure 4.10. It can be concluded that skill sets are required at all levels of competency, but the importance is becoming more pressing across the level. The distributions of skill set for ‘highly required’ and ‘required’ are increasing in semi-skilled worker.

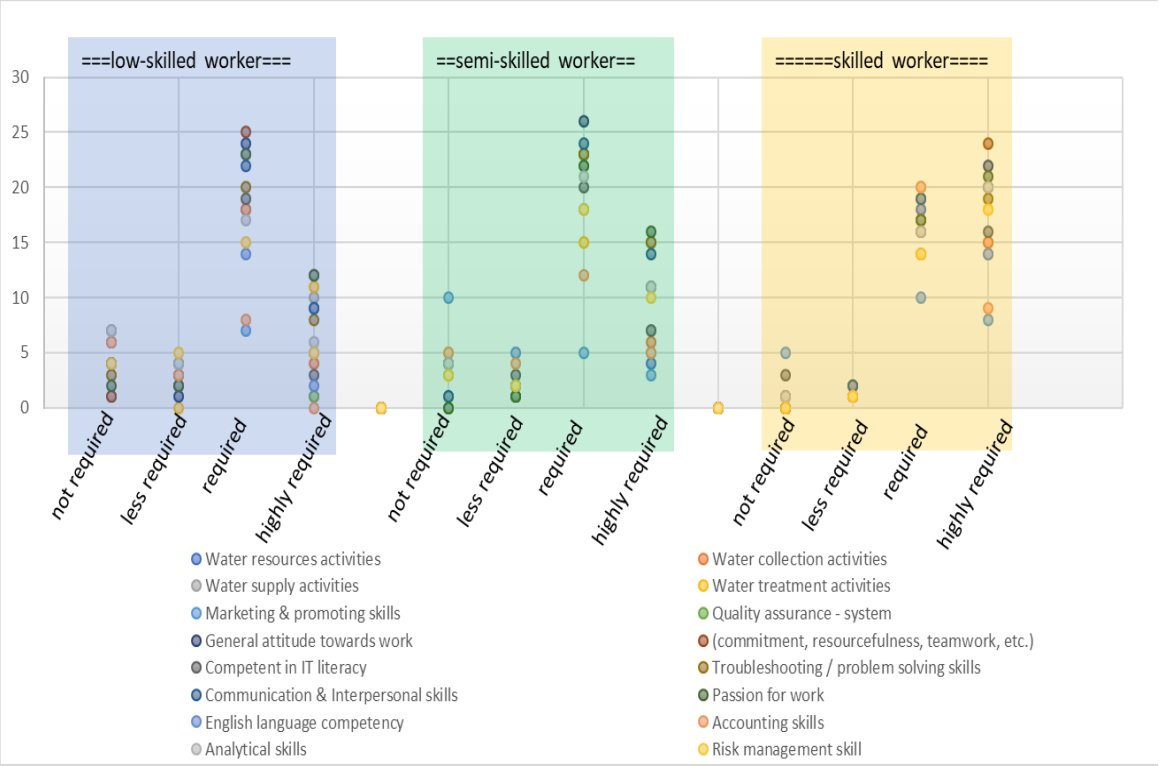

Figure 4.10: Skill sets demands mapped onto level of skills

Based on the surveys, possible reasons for the skill gaps are mostly from the technology advancement, a **mismatch between the job title and job scope,** an **outdated syllabus for training, and a lack of knowledge,** which can also be grouped with the outdated syllabus for training. This is shown in detail in Figure 4.11, where the solid bars are items that can be grouped together as skill gaps.

Thus, steps that are believed to be able to solve these issues are **mostly related to continuous learning** (which is related to training syllabus, mentoring, upskilling etc.), followed by acknowledgement. The E36 workers are mostly pleased with the current workload management. The detailed votes, as well as the ratio of the grouped items to improve current situations, are shown in Figure 4.12.

However, only one respondent thought that the current pool of workers in the job area did not possess the required skill. The reliability of the responses for this skillset mapping, measured with Cronbach Alpha, is 0.97788, which is excellent.

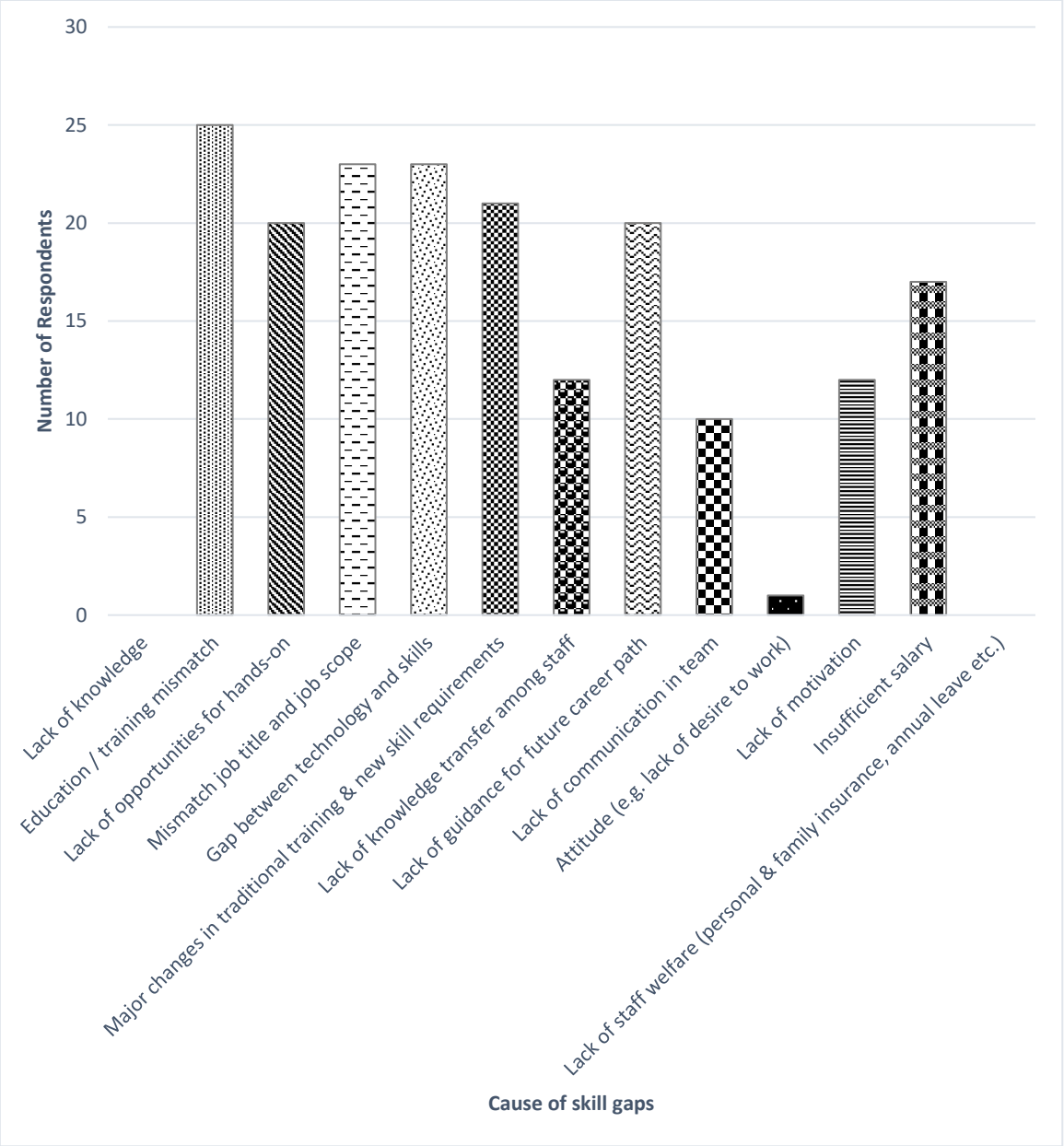

Figure 4.11: Reasons for skill's gap in E36

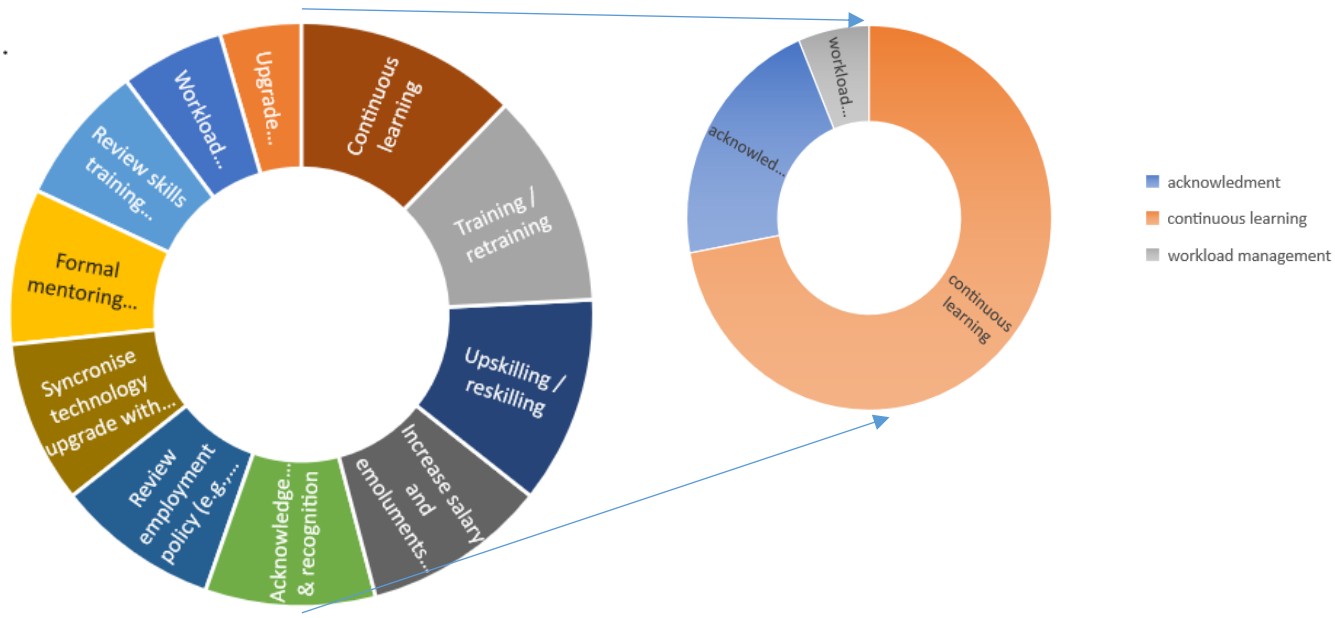

Figure 4.12: Reasons for skill's gap in E36 and its group

4.5.3 Emerging Skills

The Industrial Evolution has evolved from the first IR (industrialisation era) to the fifth IR now. The industry is ready to cope with the changes, as well as future changes, as all respondents believe the IR would make an impact, except for one in the NRW job area. Therefore, the effect of the nine (9) technology pillars of IR, as coded in Table 4.14, was mapped to each job area to better understand its relationship. Figure 4.13 shows that water treatment is the most vulnerable job area to the changes that IR has brought forward.

Table 4.14: Codes used to represent the 9 pillars of IR

A	Autonomous Robots (coordinated and automated actions of robots to complete tasks, with minimal human input)
B	Big Data Analytics (the analysis of ever larger volumes of data and allowing real-time decision-making process)
C	Cloud Computing (storing and accessing data and programs over the Internet)
D	Internet of Things (all machines and systems connected to the production plant (as well as other systems) must be able to collect and exchange data)
E	Additive Manufacturing (3D Printing) (use in prototyping, design iteration and small-scale production)
G	Augmented Reality (Augmented-reality-based systems support workers with real-time information)

H	Simulation (Simulations will leverage real-time data to mirror the physical world in a virtual model)
I	New Business Models (Business model is a combination of two functions: the process of value creation and the process of value capture. The process of value creation refers to the process of creating value for the target consumer. The process of value capture refers to converting market opportunities into performance outcomes for the firm, which then justifies value creation)

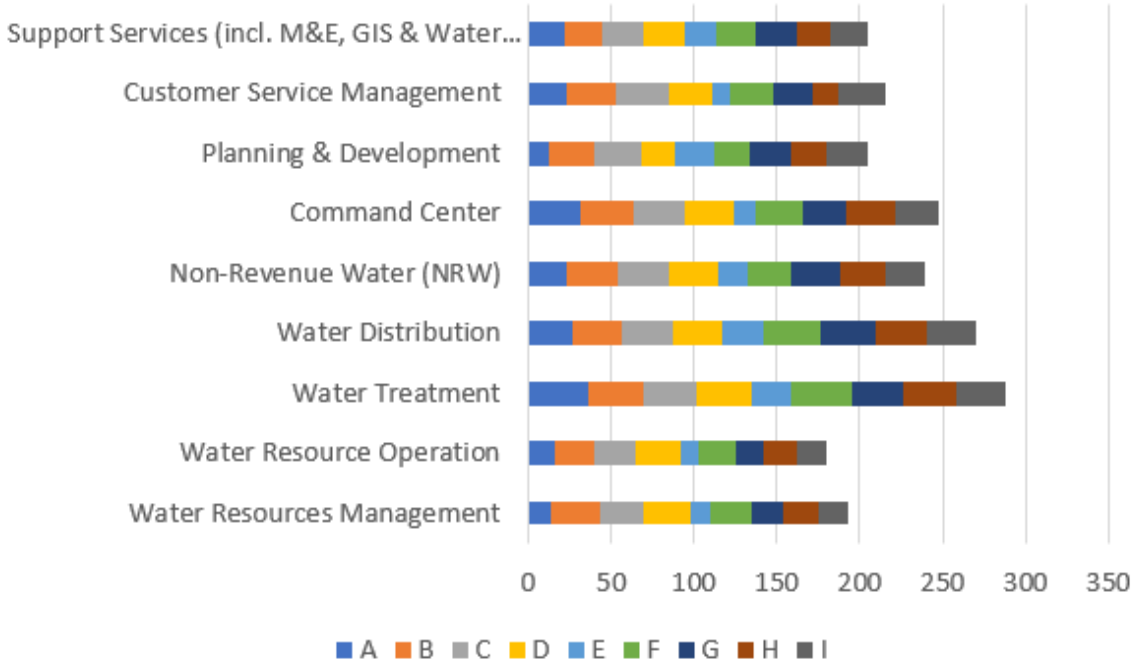

Figure 4.13: The impact of these IR pillars on each job area

Figure 4.14 shows the pre-requisite set of ICT skills that is relevant to the job area. ICT skills refer to digital literacy in using ICT applications to solve cognitive tasks and communication at work. It can be seen clearly that knowledge about ICT is very important across all job areas, while command centres do not really need the rest of the skills. This is tally with the emerging technologies of IR where computing and the internet were used in all sectors. Workers are using tools to carry out their routine tasks. These tools, equipment or systems are mostly ready now with sensors to read and record data. Thus, basic ICT skills such as using a computer to fill in spreadsheet and word processing, as well as searching and managing records, is a must. Similarly, technical know-how is also important as the tools are simple enough. Personal skills, also known as soft skills that are not easy to teach due to experience and alike, are the least important in all job areas.

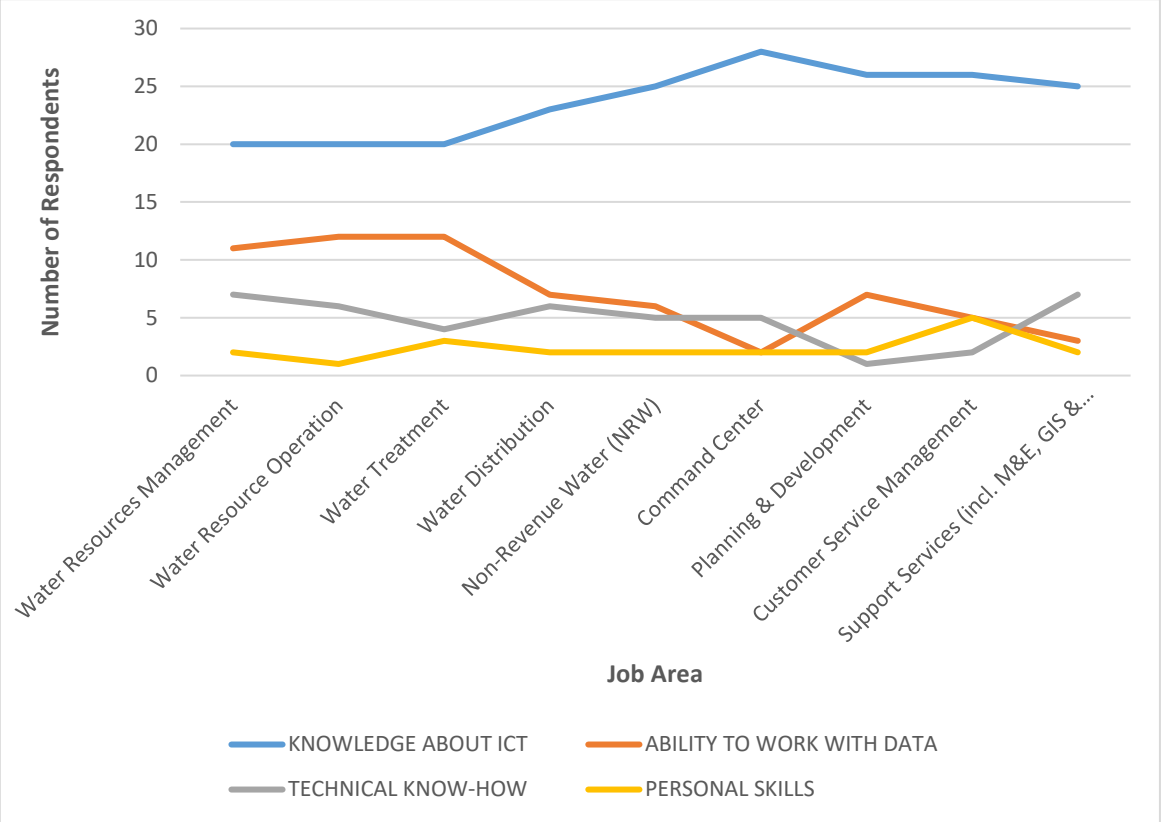

Figure 4.14: Pre-requisite skill mapped to job areas

4.5.4 Attributes Needed

The next section of the survey captures the attributes or personal characteristics that are needed for each competency level. For each level of competency in Figure 4.15, it can be seen that all attributes are needed, with different weightage. The least required attributes are for level 1. The attributes were as follows:

A: Honest and Diplomatic

B: Communicative and Collaborative
C: Respects the opinions and beliefs of others
D: High degree of integrity
E: Possesses qualities of loyalty
F: Critical thinking
G: Problem-solving
H: Team building and high level of commitment.
I: Adhere to safety, health and environment
J: Passion for work
K: Able to work under constant pressure
L: Able to follow orders
M: Able to work long hours

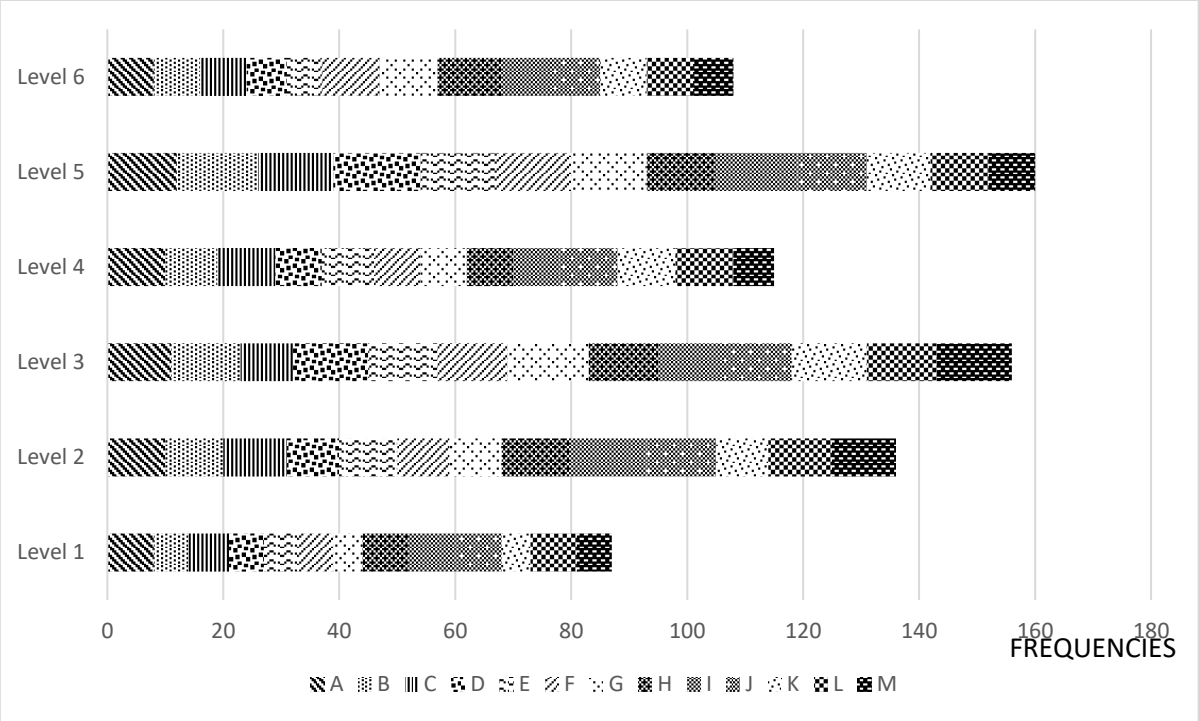

Figure 4.15: Weightage of attributes needed for each competency level

4.5.5 Related Issues

Figure 4.16 shows the respondent's agreement, on the Likert scale, on issues related to E36. The focus would be on the red coloured bar as its high value shows that it should be a concern to the industry. The reliability score for these responses, using the Cronbach Alpha, is measured as 0.8896, which is good, bordering to excellent.

In general, Figure 4.16 shows that all of the issues raised were still under control as the distribution of the answers is mainly agree (red) or disagree(disagree). Both of these options are medium weightage and not strong compared to answers with blue and green, which are strongly agree or strongly disagree.

The main issues were Labour costs, Youth involvement and Social Skills & Social Values, followed closely by Reluctancy to adopt in ICT application and Technological change. The E36 industry, however, does not rely on foreign labour but has certain concerns about knowledge transfer among staff, as can be seen in the first four graphs in the last line/row of Figure 4.16. The detailed survey result is shown in Figure 4.16.

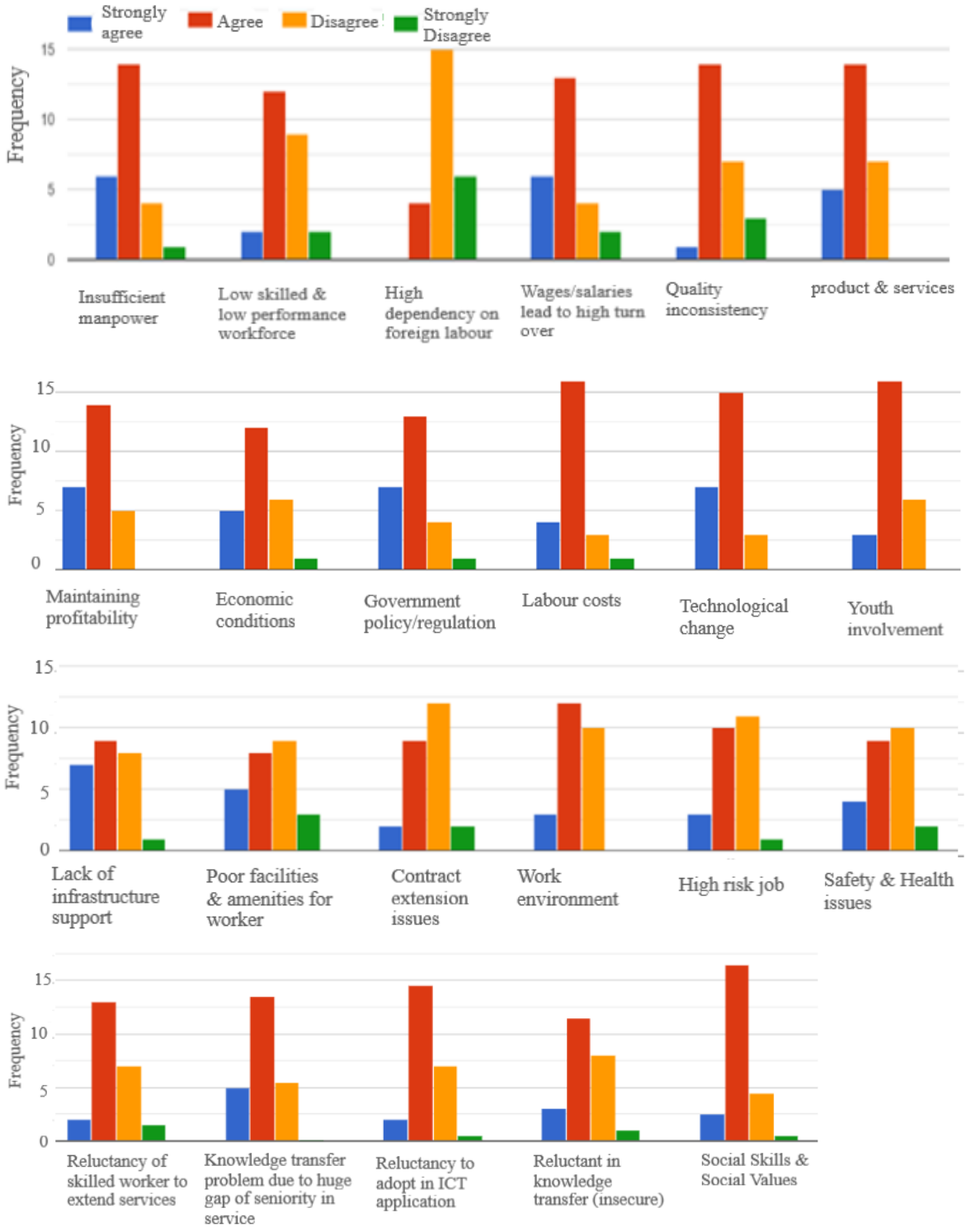

Figure 4.16: Related issues in E36

4.6 Discussion of Findings and Conclusions

The need for the development of the new and updated OF is no question from the literature review process. Thus, during the Focus Group Discussion 1, it can be seen that industry E36 is very wide, and the developed OS were created with up to 8 major job areas, 22 sub-areas and 113 job titles.

During Focus Group Discussion 2, the criticality of the job for all 113 job titles was evaluated. However, only job titles for 12 sub-areas were covered to identify the occupational Responsibilities, as well as the Occupational description. This is due to the time limitation, as this industry covers a wide range of job areas.

For the surveys, not many responses were received, although emails and WhatsApp reminder has been passed through the companies and the Malaysia Water Industry Association. Even though the surveys only took 10 minutes at most, it might attract more responses if some token of appreciation, apart from the thank you note, can be distributed as well.

The research carried out and planned to develop the occupational framework for water collection, treatment, and supply has been carefully designed to ensure it can be used as a guide for the industry. It has been closely developed with the industry players and linked to the current trend in economy and industry, which is the industrial revolution blended with the Covid-19 post-pandemic socio activities and technology adaptation.

CHAPTER V

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Discussion

The Occupational Framework for the Water Collection, Treatment and Collection (E36) industry has been successfully developed with good and reliable procedures and sources. The input from the industrial experts and a lot of discussions and resource sharing with the research teams have been very useful content to develop the OF.

However, it has come to light that this industry's major risk and concern is the knowledge gaps among the workers. This finding has become clearer with each step taken in the research approach. The gaps could be between a worker in the same company, as well as across levels of competency in different organisations. The main reasons are a mixture of technological advancement in the hardware and software used, but the handler's skills are slow to catch up, lack of knowledge transfer programme between senior members to junior members and outdated syllabus for training.

This industry is unique, as each state has its own water distribution organisation, but water tariff is governed by the government. It also has a sort of ranking/hierarchy of job scope and uses the water location as the boundary. For example, water from various sources, including underwater, river and lake, were governed by Lembaga Urus Air Selangor (and its likes for each state), while water contained in a dam and the dam operations are taken care of by other entities. The pipelines from the water resources to the main pipelines to the population (e.g., housing and industrial area) are managed by the Water Distribution parties, while from these main pipelines to individual users are under the water network team.

However, the whole process, at every level in the hierarchy, is regulated by the *Suruhanjaya Perkhidmatan Air Negara* (SPAN). The Institutional of water can be seen in Figure 5.1.

Figure 5.1 clearly defines tasks and areas in the water industry. It also indicated why levels 8 and 7 are unnecessary for the water operators as it falls under different jurisdictions. This can be seen in Figure 5.2.

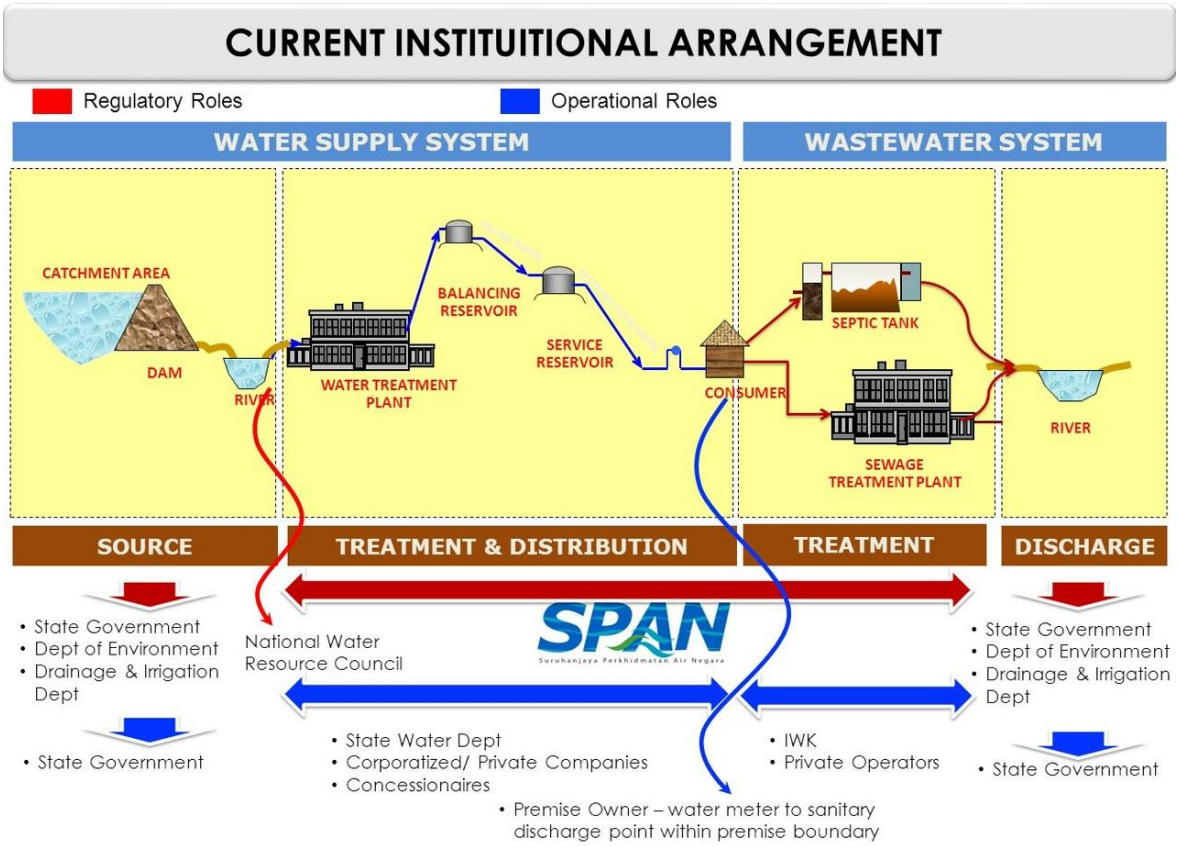

Figure 5.1: Current Institutional arrangement for E36 in Malaysia showing physical arrangement or area for each regulator or operators

Source: *Suruhanjaya Perkhidmatan Air Negara*

Body	Area of responsibility	Description
Federal Government	Policy matters	Development of a holistic water policy for the country by setting policy directions.
State Government	Water resources matters	Manage existing water basins with the view of protecting the quality of raw water and identifying new water basins when required.
National Water Resources Council (NWRC)	Governance matters	Ensures coordination with the various State Governments in the management of the water resources.
Suruhanjaya Perkhidmatan Air Negara (SPAN)	Regulatory matters	Regulate the whole water industry based on the policy directions set out by the Federal Government. Promote an efficiency driven regime

Figure 5.2: The responsibility bodies in different jurisdictions for E36 industry

Although the industry is big, this industry does not work in a silo. There is an organisation called the Malaysia Water Association which will discuss issues and technological advancement in this industry with all of its members to ensure everyone is up to date.

In addition, our Water Collection, Treatment and Collection Industry are strong, sustainable and competitive as they do not depend on foreign workers and expertise. This can be seen from the literature studies, FGDs, as well as in the survey (in the related issues section). They have also adapted well to the new technologies but stronger and planned support to ensure continuous learning from seniors to junior workers, as well as from the expert operators of new technology in the form of hardware, software or equipment; to the new apprentice, happens.

5.2 Recommendations

The current OD and OS are now completed with this OS being developed, as previously, only three (3) areas were covered. By identifying the skill in demand as well as the critical jobs. Malaysia, especially industry E36, can be well prepared to supply a correct training, reskilling and upscaling programme for this industry. However, during knowledge

acquisition, it has come to light, on several occasions, that these items need a quick response:

5.2.1 Naming convention

The correct term used and suggested by the industry is Water catchment, treatment and supply instead of water collection, treatment and distribution currently. The newly suggested name was also suitable, grammatically, as water is an unquantified noun. It is hoped that one day, the classification in MSIC can change this and update each sector accordingly.

5.2.2 Closing the gaps

As highlighted before, knowledge and skill gaps are of concern in the industry. Therefore, it is crucial that the training syllabus, including certification, is updated. In light of this, a mapping between the developed OS and NOSS is shown here. The coming NOSS should focus on updating and adapting existing NOSS to the OS, then only develop a new set of NOSS for the area which has not been developed yet, following the guide in the OF.

Therefore, a mapping of occupational structure and available NOSS were presented in table 5.1. Based on the Standard Registry Version 12 September 2022, a total of 22 available NOSS are identified.

The use of the OF can also be a good reference to the employee as well as the job seeker to standardise the job titles following the OR and OD, as this can reduce the job and qualification miss match.

Table 5.1: Group 360 OS Mapping to Available NOSS (1 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities				
Division	36 – Water Collection, Treatment and Supply				
Group	360 – Water Collection, Treatment and Supply				
Area	Water Resources Management	Water Resources Operation	Water Treatment	Water Distribution	Water Network (Reticulation)
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Water Resources Manager	Senior Production Technical Manager	Senior Production Technical Manager	Senior Distribution Technical Manager	Senior Distribution Technical Manager
Level 5	Water Resources Senior Manager	Production Technical Manager	CM-060-5:2012 Water Treatment Plant Operation Management	CM-021-5:2014 Water Distribution Management	Distribution Technical Manager
Level 4	Water Resources Manager	Plant Executive	CM-060-4:2012 Water Treatment Plant Operation Management	CM-021-4:2014 Water Distribution Operation Management	Network Executive
Level 3	CM-082-3:2016 Dam Safety Management & Supervision	Water Resources Technician	CM-060-3:2014 Water Treatment Operation Supervision	CM-021-3:2014 Water Distribution Supervision	Network Technician
Level 2	CM-082-2:2016 Dam Safety Management & Operation	Water Resources Operator	CM-060-2:2014 Water Treatment Operation Services	CM-021-2:2014 Water Distribution Operation	Network Fitter
Level 1	CM-082-1:2016 Dam Safety Management & Operation	Water Resources Crew	Water Treatment Crew	Distribution Crew	Network Crew

Table 5.1: Group 360 OS Mapping to Available NOSS (2 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities				
Division	36 – Water Collection, Treatment and Supply				
Group	360 – Water Collection, Treatment and Supply				
Area	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	Non-Revenue Water (NRW) Data Analysis	Planning and Design	Asset Management	Project Management
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Senior NRW Technical Manager	Senior NRW Technical Manager	Planning and Development Senior Manager	Asset Management Senior Manager	Project Management Senior Manager
Level 5	E360-002-5:2016 NRW Technical Management	NRW Technical Manager	Planning and Development Manager	Asset Management Manager	Project Management Manager
Level 4	E360-002-4:2016 NRW Operation And Technical Control	NRW Executive	Planning and Development Executive	Asset Management Executive	Project Management Executive
Level 3	CM-022-3:2016 NRW Operation Control	No Job Title	Planning and Development Technician	Asset Management Technician	Project Management Technician
Level 2	CM-022-2:2016 NRW Operation	No Job Title	No Job Title	No Job Title	No Job Title
Level 1	CM-022-1:2016 NRW Operation	No Job Title	No Job Title	No Job Title	No Job Title

Table 5.1: Group 360 OS Mapping to Available NOSS (3 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities					
Division	36 – Water Collection, Treatment and Supply					
Group	360 – Water Collection, Treatment and Supply					
Area	Command Centre	Meter Reading and Billing	Meter Testing	Investigation and Enforcement	Customer Services Operation	Digital Customer Engagement
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Senior Command Centre Technical Manager	Customer Service Senior Manager	Metering Senior Manager	Customer Service Senior Manager	Customer Service Senior Manager	Digital Customer Service Senior Manager
Level 5	Command Centre Technical Manager	Customer Service Manager	Metering Manager	Customer Service Manager	Customer Service Manager	Digital Customer Service Manager
Level 4	Command Centre Executive	Customer Service Executive	Metering Executive	Enforcement Executive	Customer Service Executive	Digital Customer Service Executive
Level 3	Command Centre Technician	Meter Reader Supervisor	Meter Testing Technician	Enforcement Technician	Customer Service Supervisor	Digital Customer Service Supervisor
Level 2	No Job Title	Meter Reader	Meter Testing Assistant Technician	Enforcement Assistant Technician	Customer Services Officer	Digital Customer Services Officer
Level 1	No Job Title	No Job Title	No Job Title	Enforcement Crew	No Job Title	No Job Title

Table 5.1: Group 360 OS Mapping to Available NOSS (4 of 4)

Section	E – Water Supply; Sewerage, Waste Management and Remediation Activities					
Division	36 – Water Collection, Treatment and Supply					
Group	360 – Water Collection, Treatment and Supply					
Area	Mechanical Maintenance	Electrical Maintenance	Instrumentation Maintenance	Water Quality Field Sampling	Water Quality Laboratory	Geographical Information System (GIS)
Level 8	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 7	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title	No Job Title
Level 6	Mechanical, Electrical and Instrumentation Senior Manager	Mechanical, Electrical and Instrumentation Senior Manager	Mechanical, Electrical and Instrumentation Senior Manager	Water Quality Senior Manager	Water Quality Senior Manager	GIS Senior Manager
Level 5	Mechanical Manager	Electrical Manager	E360-003-5:2019 Water Supply Instrumentation (WSI) Management	Water Quality Manager	Water Quality Manager	GIS Manager
Level 4	Mechanical Executive	Electrical Executive	E360-003-4:2019 WSI Operation Management	Water Quality Executive	Water Quality Executive	GIS Executive
Level 3	Mechanical Technician	Electrical Technician	E360-003-3:2019 WSI Supervision	Water Quality Technician	E360-001-3:2016 Water Treatment Quality Control And Testing	GIS Technician
Level 2	Mechanical Assistant Technician	Electrical Assistant Technician	E360-003-2:2019 WSI Application	Water Sampler	E360-001-2:2016 Water Treatment Quality Control	No Job Title
Level 1	Mechanical Crew	Electrical Crew	Instrumentation Crew	No Job Title	Laboratory Crew	No Job Title

5.3 Conclusion

This research has managed to achieve all of its objectives, which is to develop the OF for E36: Water collection, treatment and distribution industry as closely as possible with the industry. The developed OF is the most practical and economical approach to making sure that this industry is up-to-date, equipped, and well-prepared to adapt to the changes in industrial revolutions.

The sub-objectives achieved is the developed OS, which has seen that the E36 has been divided into eight (8) major job areas with 22 sub-areas in total. Then the job titles, which are generic, but representative of each sub-area and level of competencies, were presented as well. A total of 113 job titles have been extracted. The OS can be seen in Table 4.4.

Then, the critical job, relevancy to the IR and skills in demand for each job title was also presented. Thirty-three (33) job titles have been identified as critical job titles for E36. On top of this, all 33 critical job titles were also identified as relevant to IR, along with the other 67 job titles. The job title's criticality and relevancy to IR are shown in Table 4.4 as well.

Following the developed OS, the occupational responsibilities for each identified job title have been laid down in Table 4.5. Finally, the occupational descriptions for the identified critical jobs were also presented and attached as Annex 6. The occupational descriptions contain the main responsibility for the said job and the knowledge needed to carry out the responsibilities. On top of that, the skills and attributes needed by a particular candidate for this job title were also mentioned.

As an additional output from this study, the mapping between the job title and available NOSS for E36 was mapped. It is hoped that this OF can be a useful guide for the industry, policymakers and training agencies in preparing the E36 industry for the upcoming challenges in economic and technological changes.

The trustworthiness, accuracy and relevancy of this developed OF can be relied upon, and the development has active involvement from the E36 industry panels and research team, led by academically qualified researchers. On top of that, the research has been monitored twice for its methodology and output by the Technical Committee appointed by the Department of Skill Development, consisting of stakeholders in the E36 industry. The panel of this technical committee can be found in Annex 3.

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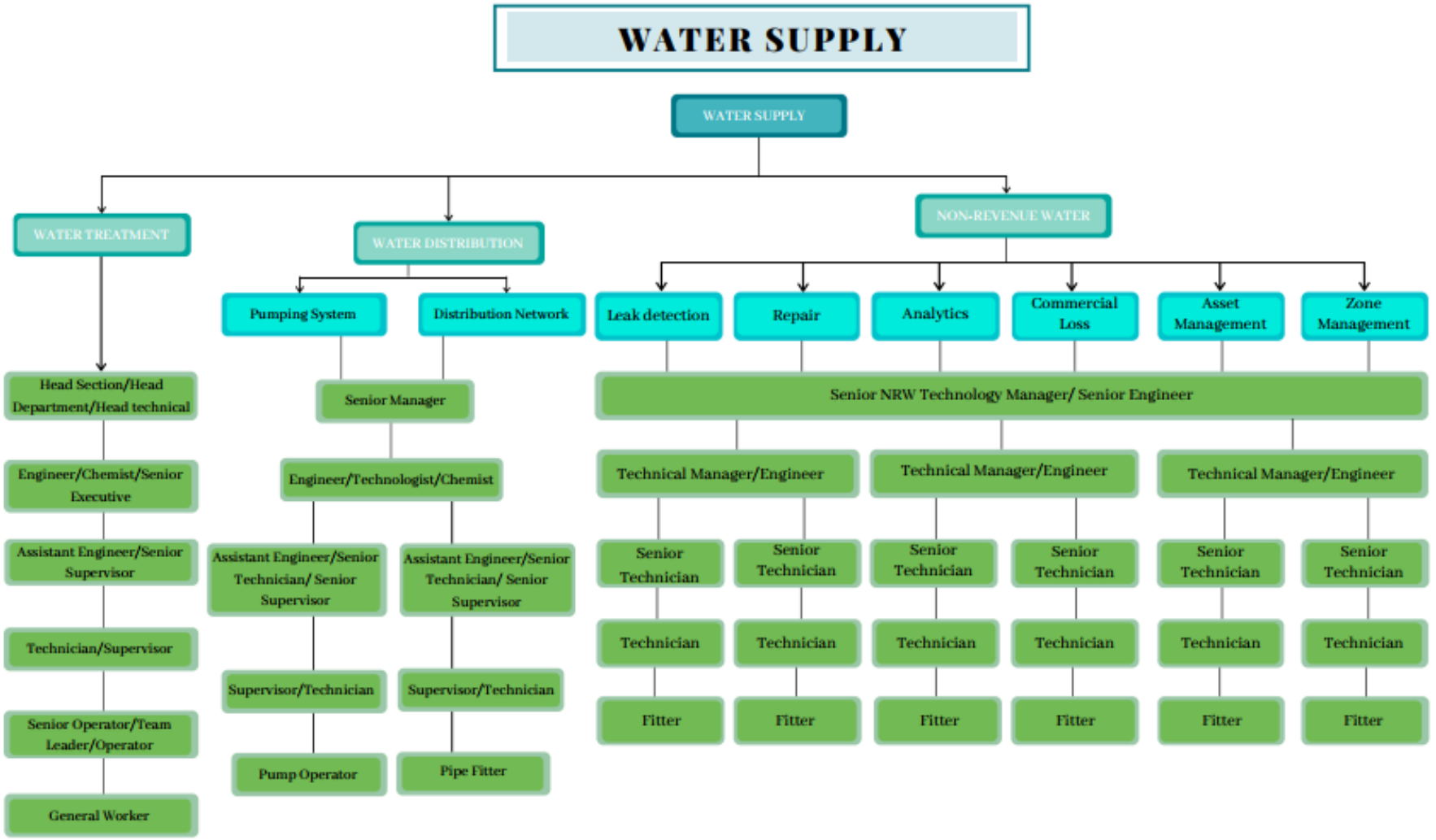
ANNEX 1: CAREER PATHWAYS FOR E36 BY HRDC 2020

CAREER PATHWAYS FOR E36 BY HRDC 2020



ANNEX 2: MOSQF LEVEL DESCRIPTORS

Malaysian Occupational Skills Qualification Framework (MOSQF) Level Descriptor

(Source: Department of Skills Development)

Level	Level Descriptors
8	Achievement at this level reflects the ability to develop original understanding and extend a sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complexes, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge, or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.
7	Achievement at this level reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many interacting factors. It includes taking responsibility for planning and developing courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work.
6	Achievement at this level reflects the ability to refine and use relevant understanding, methods and skills to address complex problems that have limited definition. It includes taking responsibility for planning and developing courses of action that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of different perspectives, approaches of schools of thought and the theories that underpin them.
5	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address broadly-defined, complex problems. It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgment within broad parameters. It also reflects understanding of different perspectives, approaches or schools of thought and the reasoning behind them.
4	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgment within fairly broad parameters. It also reflects under-standing of different perspective or approaches within a sub-area of study or work.
3	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to complete task and address problems that

Level	Level Descriptors
	are well defined with a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgments within limited parameter. It also reflects awareness of different perspectives or approaches within a sub-area of study or work.
2	Achievement at this level reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problem. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgment subject to overall direction or guidance.
1	Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to complete routine and predictable tasks that include responsibility for completing tasks and procedures subject to direction or guidance.

ANNEX 3: LIST OF CONTRIBUTORS

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4.	Ts. Dr. Afzan binti Adam	Researcher	PFH Resources (M) Sdn. Bhd.
5.	Amir Asyraf bin Abdul Rahman	Assistant Researcher	PFH Resources (M) Sdn. Bhd.
6.	Mazlina binti Ahmad	Proof-reader Team	PFH Resources (M) Sdn. Bhd.

ANNEX 4: SUMMARY OF JOB TITLES

No	Job Area	Level								Total Identified Job Titles	Total Critical Job	Total Job Related to IR
		1	2	3	4	5	6	7	8			
360 – Water Collection, Treatment and Supply												
1.	Water Resources Management	NJT	1	1	1	1	1	NJT	NJT	5	NA	3
2.	Water Resources Operation	1	1	1	1	1	1	NJT	NJT	6	2	4
3.	Water Treatment	1	1	1	1	1	1	NJT	NJT	6	3	5
4.	Water Distribution	1	1	1	1	1	1	NJT	NJT	6	3	5
5.	Water Network (Reticulation)	1	1	1	1	1	1	NJT	NJT	6	3	5
6.	Non-Revenue Water (NRW) (DMZ, DMA, ACL)	1	1	1	1	1	1	NJT	NJT	6	3	5
7.	Non-Revenue Water (NRW) Data Analysis	NJT	NJT	NJT	1	1	1	NJT	NJT	3	1	3
8.	Planning and Design	NJT	NJT	1	1	1	1	NJT	NJT	4	2	4
9.	Asset Management	NJT	NJT	1	1	1	1	NJT	NJT	4	2	4
10.	Project Management	NJT	NJT	1	1	1	1	NJT	NJT	4	NA	4
11.	Command Centre	NJT	NJT	1	1	1	1	NJT	NJT	4	2	4
12.	Meter Reading and Billing	NJT	1	1	1	1	1	NJT	NJT	5	NA	5
13.	Meter Testing	NJT	1	1	1	1	1	NJT	NJT	5	NA	5

No	Job Area	Level								Total Identified Job Titles	Total Critical Job	Total Job Related to IR
		1	2	3	4	5	6	7	8			
14.	Investigation and Enforcement	1	1	1	1	1	1	NJT	NJT	6	NA	5
15.	Customer Services Operation	NJT	1	1	1	1	1	NJT	NJT	5	NA	5
16.	Digital Customer Engagement	NJT	1	1	1	1	1	NJT	NJT	5	NA	5
17.	Mechanical Maintenance	1	1	1	1	1	1	NJT	NJT	6	2	5
18.	Electrical Maintenance	1	1	1	1	1	1	NJT	NJT	6	2	5
19.	Instrumentation Maintenance	1	1	1	1	1	1	NJT	NJT	6	2	5
20.	Water Quality Field Sampling	NJT	1	1	1	1	1	NJT	NJT	5	2	5
21.	Water Quality Laboratory	1	1	1	1	1	1	NJT	NJT	6	2	5
22.	Geographical Information System (GIS)	NJT	NJT	1	1	1	1	NJT	NJT	4	2	4
Overall Total of Identified Job Titles										**113**	**33**	**100**

Note: NJT: No Job Title
NA: Not Available

ANNEX 5: QUESTIONNAIRE

:: OCCUPATIONAL FRAMEWORK SURVEY ::
E*36 - Water collection, treatment & supply*

Dear Sir / Madam,

Assalamualaikum w.b.t. and Salam Sejahtera,

The Department of Skills Development (DSD), Ministry of Human Resources; through the selected company (PFH Resources) is conducting an analysis on Occupational Framework (OF) for the water collection, treatment and supply industry in Malaysia.

This survey will be used as field data in order to conduct a comprehensive analysis of the industry's OF. The target respondents (group) are the executive level onwards in each organisation as the industry player in E36.

We would like to extend our heartfelt gratitude upon your cooperation in answering this survey. All the information given will be used for the purpose of this survey only and will be strictly kept confidential. If you need any clarification regarding the survey, kindly contact:
Dr. Afzan binti Adam : afzan@ukm.edu.my
Mr Amir Asyraf: amir950213@gmail.com

Thank you and have a nice day!

*Required

Demographic

Respondents ranges from executives levels onwards, in all job area under water collection, treatment and supply industry organisation.

1. Name: *

2. Position: *

3. Company/Organisation: *

4. Company email: (if differs from logged in)

There are 5 sections in this 10-minute survey.

Please answer all questions below in the space provided.

Section 1 : Critical Job Classifications

Section 2: Occupational Qualification & Skills

Section 3: Emerging Skills

Section 4: Attributes Needed

Section 5: Related Issues

SECTION 1: Critical Job Classification

(Referring to Malaysia Standard Industrial Classification-MSIC)

5. 1.1 Which area in E36 is your main job area? *

Tick all that apply.

- [ ] Water Resources Management
- [ ] Water Resource Operation
- [ ] Water Treatment
- [ ] Water Distribution
- [ ] Non-Revenue Water (NRW)
- [ ] Command Center
- [ ] Planning & Development
- [ ] Customer Service Management
- [ ] Support Services (incl. M&E, GIS & Water Quality)

6. *"Critical jobs are jobs in demand but **hard to fill** and are always short of supply due to nature of the jobs which required a certain set of skills."* *

1.2 Which of these job area is **critical** in E36?

Tick all that apply.

- [ ] **Water Resources Management**
- [ ] **Water Resource Operation**
- [ ] **Water Treatment**
- [ ] **Water Distribution**
- [ ] **Non-Revenue Water (NRW)**
- [ ] **Command Center**
- [ ] **Planning & Development**
- [ ] **Customer Service Management**
- [ ] **Support Services (incl. M&E, GIS & Water Quality)**

7. *"A hard-to-fill position is **a vacancy that most recruiters find challenging to find a perfect fit**."* *

1.3 Which of these **Job Titles categories** is hard to fill in your organisation?

Mark only one oval.

- ◯ **Manager**
- ◯ **Executives**
- ◯ **Supervisor**
- ◯ **Technician**
- ◯ **Operator**
- ◯ **General worker/Crew**
- ◯ Other: _____

8. *"A hard-to-fill position is **a vacancy that most recruiters find challenging to find a perfect fit**."* *

1.4 Which of the **job title** requires a certain **set of skills that are hardest to fill** in your industry?

Mark only one oval.

- ◯ Chemist
- ◯ GIS Technician
- ◯ Mechanical Technician
- ◯ Electrical Technician
- ◯ Instrumentation Technician
- ◯ Data analyst
- ◯ Fitter
- ◯ Other: _____

9. 1.5 Which job area in E36 need to be more **competitive** in the future? *

Tick all that apply.

- ☐ Water Resources Management
- ☐ Water Resource Operation
- ☐ Water Treatment
- ☐ Water Distribution
- ☐ Non-Revenue Water (NRW)
- ☐ Command Center
- ☐ Planning & Development
- ☐ Customer Service Management
- ☐ Support Services (incl. M&E, GIS & Water Quality)

SECTION 2 : Occupational Qualification & Skills

(identifying the skills and qualification in demand for E36-Water Collection, Treatment and Supply Industry - based on occupational level)

10. 2.1 Which of these level of skills, defined by Department of Skill Development, are **critical** in your organisation? *

Tick all that apply.

- [ ] **Level 1: Competent performing a range of varied/routine/predictable activities**
- [ ] **Level 2: Competent performing significant range of varied/non-routine/responsibility/autonomy activities**
- [ ] **Level 3: Competent performing varied/complex/non-routine, responsibility/autonomy & guidance of others required**
- [ ] **Level 4: Competent performing complex technical/professional with a substantial degree of personal responsibility & autonomy**
- [ ] **Level 5: Competent applying a fundamental principles & complex techniques across a wide & often unpredictable contexts. Very substantial personal autonomy & personal accountabilities for anlysis, diagnosis, planning, execution & evaluation**
- [ ] **Level 6: Competent performing in reflection of ability to refine & relevant understanding/methods/skills to address complex problems, includes able to underpin substantial change/development & exercising broad autonomy & judgement.**
- [ ] **Level 7: Competent performing to reformulate & use relevant understanding/methods/skills to address problematic situations including responsibility for planning & developing activities. Also reflects of theoretical & relavant methodological perspective & area of work.**
- [ ] **Level 8: Competent to develop original understanding & extend to area of knowledge/professional practice. exercise of broad autonomy, judgement and leadership , reflects a critical understanding of relevant situations and how they affect the field of knowledge or work.**

11. 2.2 Which of these **academic qualifications is** critical in your job area for a smooth operation in your industry? *

Mark only one oval.

- ◯ **Certificate**
- ◯ **Diploma**
- ◯ **Degree**
- ◯ **Master**
- ◯ **Ph. D**

12. 2.3 Which of these **Technical & Vocational qualifications are critical** in your job area? *

Mark only one oval.

- ◯ **Certificate**
- ◯ **Skill Diploma (Technical/Skill Colleges)**
- ◯ **Skill Advanced Diploma (Technical/Skill Colleges)**
- ◯ Other: _____

13. 2.4 Which of the classification is **critical category of skills** in E36? *

Mark only one oval.

- ◯ **Managerial level**
- ◯ **Supervisory level**
- ◯ **General Worker / Crew level**

14. 2.5 a) Below are list of skillsets. Rate the level of demand for **General workers / Crew level** in your job area, to have this skillset; using the Likert scale below. *

CHOOSE 3 if the item is **not related** to your job area.

Mark only one oval per row.

	not required	less required	not related	required	highly required
Water resources activities skill	◯	◯	◯	◯	◯
Water collection activities skill	◯	◯	◯	◯	◯
Water supply activities skill	◯	◯	◯	◯	◯
Water treatment activities skill	◯	◯	◯	◯	◯
Marketing & promoting skills	◯	◯	◯	◯	◯
Quality assurance - system	◯	◯	◯	◯	◯
Competent in IT literacy	◯	◯	◯	◯	◯
Troubleshooting / problem solving skills	◯	◯	◯	◯	◯
Communication & Interpersonal skills	◯	◯	◯	◯	◯
English language	◯	◯	◯	◯	◯

competency					
Accounting skills	⬭	⬭	⬭	⬭	⬭
Analytical skills	⬭	⬭	⬭	⬭	⬭
Risk management skill	⬭	⬭	⬭	⬭	⬭

15. 2.5 b) Below are list of skillsets. Rate the level of demand for **Supervisory level** in your job area, to have this skillset; using the Likert scale below. *

CHOOSE 3 if the item is **not related** to your job area.

Mark only one oval per row.

	not required	less required	not related	required	highly required
Water resources activities skill	◯	◯	◯	◯	◯
Water collection activities skill	◯	◯	◯	◯	◯
Water supply activities skill	◯	◯	◯	◯	◯
Water treatment activities skill	◯	◯	◯	◯	◯
Marketing & promoting skills	◯	◯	◯	◯	◯
Quality assurance - system	◯	◯	◯	◯	◯
Competent in IT literacy	◯	◯	◯	◯	◯
Troubleshooting / problem solving skills	◯	◯	◯	◯	◯
Communication & Interpersonal skills	◯	◯	◯	◯	◯
English language	◯	◯	◯	◯	◯

competency					
Accounting skills					
Analytical skills					
Risk management skill					

16. 2.5 c) Below are list of skillsets. Rate the level of demand for **Managerial level** in your job area, to have this skillset; using the Likert scale below. *

CHOOSE 3 if the item is **not related** to your job area.

Mark only one oval per row.

	not required	less required	not related	required	highly required
Water resources activities skill	◯	◯	◯	◯	◯
Water collection activities skill	◯	◯	◯	◯	◯
Water supply activities skill	◯	◯	◯	◯	◯
Water treatment activities skill	◯	◯	◯	◯	◯
Marketing & promoting skills	◯	◯	◯	◯	◯
Quality assurance - system	◯	◯	◯	◯	◯
Competent in IT literacy	◯	◯	◯	◯	◯
Troubleshooting / problem solving skills	◯	◯	◯	◯	◯
Communication & Interpersonal skills	◯	◯	◯	◯	◯
English language	◯	◯	◯	◯	◯

competency					
Accounting skills	⬭	⬭	⬭	⬭	⬭
Analytical skills	⬭	⬭	⬭	⬭	⬭
Risk management skill	⬭	⬭	⬭	⬭	⬭

17. 2.6 What might be the **reason(s)** for any skill gaps in your organisation? *

Tick all that apply.

- ☐ Lack of knowledge
- ☐ Education / training mismatch
- ☐ Lack of opportunities for hands-on
- ☐ Mismatch job title and job scope
- ☐ Gap between technology and skills
- ☐ Lack of knowledge transfer among staff
- ☐ Major changes in traditional training & new skill requirements
- ☐ Lack of guidance for future career path
- ☐ Lack of communication in team
- ☐ Attitude (e.g. lack of desire to work)
- ☐ Lack of motivation
- ☐ Insufficient salary
- ☐ Lack of staff welfare (personal & family insurance, annual leave etc.)
- ☐ Other: _____

18. 2.7 What could be the **solution(s)** for the skill gaps, would you recommend? *

Tick all that apply.

- [ ] Workload management
- [ ] Upgrade trainer qualification
- [ ] Training / retraining
- [ ] Formal mentoring and/or coaching
- [ ] Review skills training curriculum
- [ ] Acknowledgement & recognition
- [ ] Upskilling / reskilling
- [ ] Continuous learning
- [ ] Increase salary and emoluments (bonus, allowance, promotion)
- [ ] Syncronise technology upgrade with training
- [ ] Review employment policy (e.g., enhance skilled workers incentives)
- [ ] Other: _____

19. 2.8. Based on your observation, do you think the current pool of workers in your job area, **possess the required skills**? *

Mark only one oval.

- ◯ Yes
- ◯ No

SECTION 3: EMERGING SKILLS -based on Industrial Revolution

Note: Emerging Skills
are skills that are predicted to be imperative to the industry in the near future
based on recent development, trend or study

Industrial Revolution (IR) in short is the use of automation and data exchange in industrial technologies. This include the use of Internet of Things (IoT) and collaboration between network, machines and human beings in making an informed decision.

20. 3.1 Do you think Industry Revolution (eg: Digitalization) would give an impact to the economic activities of E36?

Mark only one oval.

- Yes
- No

21. 3.2 a) Which job area is likely to be affected by these 9 technology pillars of IR?

Tick all that apply.

	Water Resources Operation	Water Resources Management	Water Treatment	Water Distribution
Autonomous Robots (coordinated and automated actions of robots to complete tasks , with minimal human input)	☐	☐	☐	☐
Big Data Analytics (the analysis of ever larger volumes of data and allow real-time decision-making process)	☐	☐	☐	☐
Cloud Computing (storing and accessing data and programs over the Internet)	☐	☐	☐	☐
Internet of Things (all machines and systems connected to the	☐	☐	☐	☐

production plant (as well as other systems) must be able to collect, exchange data)				
Additive Manufacturing (3D Printing) (use in prototyping, design iteration and small scale production)	☐	☐	☐	☐
Cybersecurity (protect critical industrial systems and manufacturing lines)	☐	☐	☐	☐
Augmented Reality (Augmented-reality-based systems support workers with real-time information)	☐	☐	☐	☐
Simulation (Simulations will leverage real-time data to mirror the physical world	☐	☐	☐	☐

in a virtual model)				
New Business Models (Business model is a combination of two functions: the process of value creation and the process of value capture. The process of value creation refers to the process of creating value for the target consumer. The process of value capture refers to converting market opportunities into performance outcomes for the firm, which then justifies value creation)	☐	☐	☐	☐

22. 3.2 b) Which job area is likely to be affected by these 9 technology pillars of IR?

Tick all that apply.

	Non-Revenue Water (NRW)	Command Center	Planning & development	Customer Services Management	Support Services
Autonomous Robots (coordinated and automated actions of robots to complete tasks , with minimal human input)	☐	☐	☐	☐	☐
Big Data Analytics (the analysis of ever larger volumes of data and allow real-time decision-making process)	☐	☐	☐	☐	☐
Cloud Computing (storing and accessing data and programs over the Internet)	☐	☐	☐	☐	☐
Internet of Things (all machines and systems connected to	☐	☐	☐	☐	☐

the production plant (as well as other systems) must be able to collect, exchange data)					
Additive Manufacturing (3D Printing) (use in prototyping, design iteration and small scale production)	☐	☐	☐	☐	☐
Cybersecurity (protect critical industrial systems and manufacturing lines)	☐	☐	☐	☐	☐
Augmented Reality (Augmented-reality-based systems support workers with real-time information)	☐	☐	☐	☐	☐
Simulation (Simulations will leverage real-time data to mirror the physical world	☐	☐	☐	☐	☐

in a virtual model)					
New Business Models (Business model is a combination of two functions: the process of value creation and the process of value capture. The process of value creation refers to the process of creating value for the target consumer. The process of value capture refers to converting market opportunities into performance outcomes for the firm, which then justifies value creation)	☐	☐	☐	☐	☐

23. 3.3 Based on the pre-requisite set of skills below, select the ones that are relevant to your job area.

Prerequisite & Skills	Knowledge About ICT	Ability to Work with Data	Technical Know-How	Personal Skills
Details	▪ Basic Information Technology Knowledge ▪ Ability to Use and Interact with Computers And Smart Machines Like Robots, Tablets Etc. ▪ Understanding Machine to Machine Communication, It Security & Data Protection	▪ Ability to Process and Analyze Data and Information Obtained from Machines ▪ Understanding Visual Data Output & Making Decisions ▪ Basic Statistical Knowledge	▪ Inter-Disciplinary & Generic Knowledge About Technology ▪ Specialized Knowledge About Warehouse and Storage Activities and Processes in Place ▪ Technical Know-How of Machines to Carry Out Maintenance Related Activities	▪ Adaptability & Ability to Change ▪ Decision Making ▪ Working in Team ▪ Communication Skills ▪ Mindset Change for Lifelong Learning

Tick all that apply.

	KNOWLEDGE ABOUT ICT	ABILITY TO WORK WITH DATA	TECHNICAL KNOW-HOW	PERSONAL SKILLS
Water Resources Operation	☐	☐	☐	☐
Water Resource Management	☐	☐	☐	☐
Water Treatment	☐	☐	☐	☐
Water Distribution	☐	☐	☐	☐
Non-Revenue Water (NRW)	☐	☐	☐	☐
Command Center	☐	☐	☐	☐
Planning & Development	☐	☐	☐	☐

Customer Services Management	☐	☐	☐	☐
Support Services (incl. M&E, GIS & Water Quality)	☐	☐	☐	☐

Section 4: Attributes needed -based on competency level (Malaysian Occupational Skills Qualification Framework (Malaysian Qualification Agency, 2021)

24. 4.0 For level 1, 2 & 3, which attributes are needed to carry on the responsibilities?

Level	Description
Level 3:	Competent in performing a broad range of varied work activities, performed in a variety of contexts, **most of which are complex and non-routine**. There is considerable responsibility and autonomy and control or guidance of others is often required.
Level 2:	Competent in performing **a significant range of varied work activities**, performed in a variety of contexts. Some of **the activities are non-routine** and required individual responsibility and autonomy.
Level 1:	Competent in **performing a range of varied work activities**, most of which are routine and predictable.

Tick all that apply.

	Level 1	Level 2	Level 3
Honest and Diplomatic	☐	☐	☐
Communicative and Collaborative	☐	☐	☐
Respects the opinions and beliefs of others	☐	☐	☐
High degree of integrity	☐	☐	☐
Possesses qualities of loyalty	☐	☐	☐
Critical thinking	☐	☐	☐
Problem-solving	☐	☐	☐
Teamwork and high level of commitment.	☐	☐	☐
Adhere to safety, health	☐	☐	☐

and environment			
Passion for work	☐	☐	☐
Able to work under constant pressure	☐	☐	☐
Able to follow orders	☐	☐	☐
Able to work long hours	☐	☐	☐
Resourcefulness	☐	☐	☐

25. 4.0 For level 4 & 5, which attributes are needed to carry on the responsibilities?

Level	Description
Level 6:	Competent in this level reflects the ability to **refine** and use relevant understanding, methods and skills to address **complex problems that have limited definition.** It includes taking responsibility for planning and developing courses of action **that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment.** It also reflects an understanding of different perspectives, **approaches of schools of thought and the theories that underpin them.**
Level 5:	Competent in applying a significant range of **fundamental principles and complex techniques** across a wide and often unpredictable variety of contexts. Very **substantial personal autonomy** and often significant responsibility for the work of others and for the allocation of substantial resources features strongly, as do personal accountabilities for analysis, diagnosis, planning, execution and evaluation.
Level 4:	Competent in performing a broad range of **complex technical or professional work activities performed** in a wide variety of contexts and with **a substantial degree of personal responsibility and autonomy**. Responsibility for the work of others and allocation of resources is often present.

Tick all that apply.

	Level 4	Level 5	Level 6
Honest and Diplomatic	☐	☐	☐
Communicative and Collaborative	☐	☐	☐
Respects the opinions and beliefs of others	☐	☐	☐
High degree of integrity	☐	☐	☐
Possesses qualities of loyalty	☐	☐	☐
Critical thinking	☐	☐	☐
Problem-solving	☐	☐	☐

Team building and high level of commitment.	☐	☐	☐
Adhere to safety, health and environment	☐	☐	☐
Passion for work	☐	☐	☐
Able to work under constant pressure	☐	☐	☐
Able to follow orders	☐	☐	☐
Able to work long hours	☐	☐	☐
Resourcefulness	☐	☐	☐

SECTION 5: RELATED ISSUES

Please answer according to your relevant job area.

26. 5.0 What is/are the key issue/s related to **your job areas** in E36? Please rate ALL the key issues by using the scale below.

Tick all that apply.

	Strongly Agreed	Agree	Disagree	Strongly Disagree
Insufficient manpower	☐	☐	☐	☐
Low skilled & low performance workforce	☐	☐	☐	☐
High dependency on foreign labour	☐	☐	☐	☐
Wages/salaries lead to high turn over	☐	☐	☐	☐
Quality inconsistency	☐	☐	☐	☐
(product & services)	☐	☐	☐	☐
Maintaining profitability	☐	☐	☐	☐
Economic conditions	☐	☐	☐	☐
Government policy/regulation	☐	☐	☐	☐
Labour costs	☐	☐	☐	☐
Technological change	☐	☐	☐	☐
Youth involvement	☐	☐	☐	☐

Lack of infrastructure support	☐	☐	☐	☐
Poor facilities & amenities for worker	☐	☐	☐	☐
Contract extension issues	☐	☐	☐	☐
Work environment	☐	☐	☐	☐
High risk job	☐	☐	☐	☐
Safety & Health issues	☐	☐	☐	☐
Reluctancy of skilled worker to extend services	☐	☐	☐	☐
Knowledge transfer problem due to huge gap of seniority in service	☐	☐	☐	☐
Reluctancy to adopt in ICT application	☐	☐	☐	☐
Reluctant in knowledge transfer (insecure)	☐	☐	☐	☐
Social Skills & Social Values	☐	☐	☐	☐

==========End of Questionaire==========

ANNEX 6: OCCUPATIONAL DESCRIPTION

MSIC GROUP : 360
AREA : Water Resources Operation
JOB TITLE : Plant Executive
LEVEL : 4

Responsibilities

Plant Executive is responsible to monitor valve operation, analyse dam safety and water resource monitoring reports, implement actions based on dam safety and water resource monitoring reports, monitor maintenance work, communicate with other subordinates and management, plan work schedules, manage water resources operation, manage raw water intake operation, manage water resources operation control and monitoring system, manage water resources operation facilities maintenance and implement water resources operation safety, health, environmental and quality assurance.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water statistical analysis.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Water Resources Operation
JOB TITLE : Water Resources Technician
LEVEL : 3

Responsibilities

Water Resources Technician is responsible to supervise valve operation, check and record the water level of the river/reservoir, check and report water sampling records, check dam safety parameters records, check water resource parameters records (rainfall), supervise repair work, prepare work schedule, perform supervision function, perform water resources operation maintenance activities, prepare dam safety and water resource monitoring reports and report any pollution issues or abnormality in water resources equipment to superior.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operating a variety of power tools and equipment.
- Skills in inventory management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Treatment
JOB TITLE : Plant Executive
LEVEL : 4

Responsibilities

Plant Executive is responsible to monitor valve operation, analyse dam safety and water resource monitoring reports, implement actions based on dam safety and water resource monitoring reports, monitor maintenance works, communicate with other subordinates and management, plan work schedules, manage water treatment process, manage raw water intake operation, manage water treatment plant control and monitoring system, manage water treatment plant facilities maintenance, implement water treatment plant safety, health, environmental and quality assurance and manage sludge handling and disposal.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of conventional & non-conventional water treatment processes.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Water Treatment
JOB TITLE : Water Treatment Technician
LEVEL : 3

Responsibilities

Water Treatment Technician is responsible to supervise raw water process and pre-treatment process, supervise clarification and filtration process, supervise the treated water post-dosing process, supervise treated water flow, supervise sludge handling, supervise water treatment plant, supervise valve operation, check the availability of chemical solution, check and record the water level of the river/reservoir, perform water treatment plant maintenance activities, check water treatment plant safety parameters records, prepare work schedule, perform supervision function, prepare dam safety and water treatment monitoring reports, check and report water sampling records and report any pollution issues or abnormality in water treatment equipment to superior.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operating a variety of power tools and equipment
- Skills in inventory management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Treatment
JOB TITLE : Water Treatment Operator
LEVEL : 2

Responsibilities

Water Treatment Operator is responsible to operate valves, perform raw water process and pre-treatment process, perform clarification and filtration process, perform treated water post-dosing process, perform treated water flow, perform sludge handling, perform cleaning work (intake, tanks and filters), perform water sampling and water quality testing, assist in water treatment plant maintenance activities, compiling report and reporting daily water treatment plant safety parameters, record water rate level and flow rate, perform water quality monitoring, collect and record data, repair minor defects, inform superior of pollution issues.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, documentation and communication.
- Skills in operating a variety of power tools and equipment.
- Skills in inventory administration.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Distribution
JOB TITLE : Distribution Executive
LEVEL : 4

Responsibilities

Distribution Executive is responsible to supervise water distribution operation and maintenance administration, assist Water hydraulic engineering design, supervise Water distribution planning and development programme, involve in non-revenue water, coordinate water distribution customer service, propose water distribution department budget, identify and evaluate water supply risk action plan, manage asset management.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Water Distribution
JOB TITLE : Distribution Technician
LEVEL : 3

Responsibilities

Distribution Technician is responsible to coordinate the water reservoir and booster pump house, water system maintenance planning, analyse treated water quality, supervise water distribution installation equipment operation, ensure water distribution installation equipment is operating efficiently and safely, supervise adjustment of controls and/or valves on equipment and to regulate and set operations of the system, supervise activation of valves to maintain required amounts of water, check readings on gauges, meters, and charts to detect operations and detect malfunctions, verify the on-site incident report, daily logs of operation, maintenance, and safety activities, arrange for repairs and daily maintenance activities and arrange with equipment manufacturers when necessary to resolve equipment problems, coordinate water distribution site security.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operating a variety of power tools and equipment.
- Skills in inventory management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Distribution
JOB TITLE : Pump Operator
LEVEL : 2

Responsibilities

Pump Operator is responsible to operate water distribution installation equipment, ensure water distribution installation equipment is operating efficiently and safely, adjust controls and/or valves on equipment to provide power, and to regulate and set operations of the system, observe readings on gauges, meters, and charts, record daily logs of operation, maintenance, and safety activities, activate valves to maintain required amounts of water, perform service and maintenance activities, report on-site incident, ensure water distribution site security.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, documentation and communication.
- Skills in operating a variety of power tools and equipment.
- Skills in inventory administration.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Network (Reticulation)
JOB TITLE : Network Executive
LEVEL : 4

Responsibilities

Network Executive is responsible to supervise water distribution operation and maintenance administration, assist water hydraulic engineering design, supervise water distribution planning and development programme, involve in non-revenue water, coordinate water distribution customer service, propose water distribution department budget, identify and evaluate water supply risk action plan, manage asset management.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360

AREA : Water Network (Reticulation)

JOB TITLE : Network Technician

LEVEL : 3

Responsibilities

Network Technician is responsible to control water meter arrangement and water piping system, analyse treated water quality and non-revenue water data, coordinate and supervise water distribution installation equipment operation, ensure water distribution installation equipment is operating efficiently and safely, supervise adjustment of controls and/or valves on equipment and to regulate and set operations of the system, supervise activation of valves to maintain required amounts of water, supervise activities at distribution system include repair and maintenance, verify the on-site incident report, maintenance, and safety activities, coordinate water distribution site security.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operating a variety of power tools and equipment
- Skills in inventory management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Network (Reticulation)
JOB TITLE : Network Fitter
LEVEL : 2

Responsibilities

Network Fitter is responsible to determine pipe sizes, pipe specifications, pipe threaders and benders, perform measurement of pipes for cutting and threading, perform excavation process, perform testing installed systems and pipelines, using pressure gauge, hydrostatic testing, observation, or other methods, perform to monitoring pipe maintenance, operate water meter installation, install and connect water piping.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of water supply systems.
- Knowledge of water distribution operation
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, documentation and communication.
- Skills in operating a variety of power tools and equipment
- Skills in inventory administration.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360

AREA : Non-Revenue Water (NRW) (DMZ, DMA, ACL)

JOB TITLE : NRW Executive

LEVEL : 4

Responsibilities

NRW Executive is responsible to manage and ensure District Meter Area (DMA) zone contributing to leakage is lessened, DMA region have minimum pressure and DMA is below the set baseline, create a new DMA zone and provide reports for the new zone, develop Active Leakage Control programme, manage commercial loss, develop NRW maintenance programme, monitor PAV (Pressure, Altitude Valve & Valve)work activities, solve problems and issues within stipulated response time (i.e. solve main burst in zone), proficient use of all NRW fittings, analyse the Step Test which the team had performed, verify that leak complaints are keyed into the SMART system, verify that the team carries out the work of Visual Inspection and Sounding (VIS), supervise mapping activities and 'proving' work to identify affected zones, supervise the budget for the NRW unit, arrange purchasing of spare parts, assist in providing monthly performance reports for each team member, prepare leakage and maintenance related reports.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in Non-Revenue Water environmental, sustainability practices and green technology
- Skills in Non-Revenue Water planning and management.
- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Non-Revenue Water (NRW) (DMZ, DMA, ACL)
JOB TITLE : NRW Technician
LEVEL : 3

Responsibilities

NRW Technician is responsible to perform control pipeline pressure, create a single feeder District Metering Area (DMA), propose NRW level countermeasures, coordinate NRW step test operation, coordinate DMA asset and equipment maintenance, prepare NRW commercial loss report, compile water assets Geo-coordinate Positioning, NRW administrative function, compile site technical report.

Knowledge:

- Knowledge of the whole piping system and within the DMA.
- Knowledge of Non-Revenue Water implementation.
- Knowledge of water statistical data collection.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental and sustainability considerations.

Skills:

- Skills in Non-Revenue Water environmental, sustainability practices and green technology.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory and risk management.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Non-Revenue Water (NRW) (DMZ, DMA, ACL)
JOB TITLE : NRW Fitter
LEVEL : 2

Responsibilities

NRW Fitter is responsible to set up water pressure logger and control equipment, carry out District Metering Area (DMA), perform NRW step test, monitor Smart Water Systems and carry out Active Leakage Control (ALC) detection, monitor and carry out DMA asset and equipment maintenance, investigate NRW Commercial loss, assist in controlling the loss of water due to Non-Revenue Water, perform housekeeping work, observe the repair work by contractors, prepare site technical report.

Knowledge:

- Knowledge of the whole piping system and within the DMA.
- Knowledge of Non-Revenue Water implementation.
- Knowledge of water statistical data collection.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental and sustainability considerations.

Skills:

- Skills in Non-Revenue Water environmental, sustainability practices and green technology.
- Skills in analytical, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360

AREA : Non-Revenue Water (NRW) Data Analysis

JOB TITLE : NRW Executive

LEVEL : 4

Responsibilities

NRW Executive is responsible to prepare the NRW water balance report, manage District Meter Area (DMA), develop Active Leakage Control programme, analyse Pressure Management Area (PMA) data, analyse SCADA and telemetry data, analyse and build hydraulic model, monitor PAV (Pressure, Altitude Valve & Valve)work activities, solve problems and issues within stipulated response time (i.e. solve main burst in a zone), proficient use of all NRW fittings, analyse the Step Test which the team had performed, verify that leak complaints are keyed into the SMART system, verify that the team carries out the work of Visual Inspection and Sounding (VIS), supervise mapping activities and 'proving' work to identify affected zones, supervise the budget for the NRW unit, arrange to purchase of spare parts, assist in providing monthly performance reports for each team member, prepare leakage and maintenance related reports.

Knowledge:

- Knowledge of NRW commercial loss & physical loss.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in Non-Revenue Water environmental, sustainability practices and green technology
- Skills in Non-Revenue Water planning and management.
- Skills in analytical, leadership, documentation and communication.

- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Planning and Design
JOB TITLE : Planning and Development Executive
LEVEL : 4

Responsibilities

Planning and Development Executive is responsible to perform water source work data analysis, perform water supply and demand data analysis, perform feasibility study, perform water distribution development project plan, perform water distribution development project, perform treatment work, distribution, mechanical and electrical, and instruments conceptual design, perform required new water supplies development, organise require procurement documents.

Knowledge:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Planning and Design
JOB TITLE : Planning and Development Technician
LEVEL : 3

Responsibilities

Planning and Development Technician is responsible to perform water source, treatment, and pipe distribution data collection, perform mechanical, electrical and instrument installation requirement assessment, perform new water supplies approval documents, perform technical procurement documents, prepare water supply systems planning design compliance and parameters preparation and documentation, perform asset inventory, asset economics, life costing, asset replacement, asset condition monitoring and asset updating, utilise GIS and IT applications, prepare land ownership & legislative requirements documentation.

Knowledge:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.

Skills:

- Skills in operating a variety of power tools and equipment.
- Skills in working as part of a team.
- Skills in communicating with other team members.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Asset Management
JOB TITLE : Asset Management Executive
LEVEL : 4

Responsibilities

Asset Management Executive is responsible to identify water distribution assets, perform water distribution asset categorisation, review water distribution asset system, perform user acceptance test (UAT), oversee and categorise water supply assets, implement, review and evaluate water supply asset system, rectify asset management issue and propose control measure.

Knowledge:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Asset Management
JOB TITLE : Asset Management Technician
LEVEL : 3

Responsibilities

Asset Management Technician is responsible to check and update asset inventory, evaluate asset condition, life costing and economics, record asset replacement and disposal program, prepare documentation for land matters & legislative requirements, perform water supply systems asset management documentation, perform approval of new water supplies preparation, perform design compliance and parameters preparation, utilise GIS and IT applications.

Knowledge:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.

Skills:

- Skills in operating a variety of power tools and equipment.
- Skills in working as part of a team.
- Skills in communicating with other team members.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Command Centre
JOB TITLE : Command Centre Executive
LEVEL : 4

Responsibilities

Command Centre Executive is responsible to manage the data centre system, analyse and validate water quality data, verify and coordinate action plans inter-department, identify, manage and resolve routine risks and issues, supervise and oversee technicians.

Knowledge:

- Knowledge of types of water resources and water works.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in analytical, leadership, documentation and communication.
- Skills in operation analysis.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Command Centre
JOB TITLE : Command Centre Technician
LEVEL : 3

Responsibilities

Command Centre Technician is responsible to monitor the data collecting system, track reservoir output, monitor and coordinate action plans intra-department, collect and analyse water quality data, collect pH readings and Chlorine readings.

Knowledge:

- Knowledge of water reservoirs.
- Knowledge of water quality standards.
- Knowledge of safe water, raw water and water treatment processes.
- Knowledge of water statistical analysis.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in operating a variety of power tools and equipment.
- Skills in working as part of a team.
- Skills in communicating with other team members.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Mechanical Maintenance
JOB TITLE : Mechanical Executive
LEVEL : 4

Responsibilities

Mechanical Executive is responsible to read and interpret technical drawings, schematics, or computer-generated reports, research, design, evaluate, install, operate or maintain mechanical products, equipment, systems or processes to meet requirements standard, confer with engineers or other personnel to implement operating procedures, resolve system malfunctions or provide technical information, develop, coordinate, or monitor all aspects of production, including selection of manufacturing methods, fabrication or operation of product designs, analyse equipment failures or difficulties to diagnose faulty operation and recommend remedial actions, design mechanical and thermal devices or subsystems, using analysis and computer-aided design, recovering damage and recommending solutions, develop and test prototypes of devices, machine or equipment designed, analyse test results and modify the design or system according to requirements standard, oversee the water process for the machine or equipment.

Knowledge:

- Knowledge of the practical application of water operation engineering
- Knowledge of design techniques, tools, and principles involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of machines and tools, including designs, uses, repair and maintenance
- Knowledge of dynamics of rivers, lakes, and coastal areas.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in collect and analyse information, problem-solve, and making decisions.
- Skills in manufacturing and repairing machines and devices.
- Skills in building machines that replicate human actions.

- Skills in the design and use of machines, tools and technical equipment.
- Skills in using technology, programs, robotics or processes to achieve outcomes with minimal human input.
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Mechanical Maintenance
JOB TITLE : Mechanical Technician
LEVEL : 3

Responsibilities

Mechanical Technician is responsible to provide technical assistance in research and development work concerning machine tools, vehicle engines, aircraft, heating, ventilating and refrigerating installations and other mechanically functioning plant and equipment, install and perform diagnostic tests on mechanical systems, develop and implement mechanical maintenance plans to prevent costly equipment breakdowns, update and troubleshoot mechanical malfunctions and breakdowns, as well as performing repairs, ensure compliance to rules and procedures, follow the project through the testing and production phases, plan and organise site activities, scheduling and controlling on progress of works, supervise daily operation activities.

Knowledge:

- Knowledge of the practical application of water operation engineering
- Knowledge of techniques, tools, and principles involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of machines and tools, including uses and maintenance
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in collect and analyse information, problem-solve, and making decisions.
- Skills in repairing and maintaining machines and devices.
- Skills in operating machines and tools and technical equipment.
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Electrical Maintenance
JOB TITLE : Electrical Executive
LEVEL : 4

Responsibilities

Electrical Executive is responsible to plan and design the manufacture and installation of electric power equipment and facilities, determine the type and arrangement of circuits, transformers, circuit breakers, transmission lines and other equipment, advise on and design systems for electrical motors, electric traction devices and other equipment or domestic electrical appliances, interpret specifications, standards and regulations relating to electric power equipment and use, organise and manage resources used in electrical components, machines, appliances and equipment, establish delivery and installation schedules for machines, switchgear, cables and fittings, supervise the operation and maintenance of power stations, transmission and distribution systems and industrial plants, establish control standards and procedures to ensure efficient functioning and safety of electrical generating and distribution systems, locate and correct malfunctions, perform related tasks, enhance knowledge and coordinating work performance.

Knowledge:

- Knowledge of computer hardware and software, including applications and programming.
- Knowledge of the practical application of water operation engineering.
- Knowledge of design techniques, tools, and principles involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of electrical tools and devices, including designs, uses repair and maintenance.
- Knowledge of dynamics of rivers, lakes, and coastal areas.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in collect and analyse information, problem-solve, and make decisions.
- Skills in using commercial computer-aided design (CAD) and drafting software applications.
- Skills in the electrical installation of cabling and associated devices such as switches, distribution boards, sockets and light fitting in the facilities.
- Skills in using circuit design that focuses on signal fidelity, amplification and filtering.
- Skills in building computer hardware and software, including applications and programming.
- Skills in manufacturing and repairing a diverse range of electrical and electronic machines and devices.
- Skills in the design and use of machines, tools and technical equipment.
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Electrical Maintenance
JOB TITLE : Electrical Technician
LEVEL : 3

Responsibilities

Electrical Technician is responsible for install, maintain, and repair electrical control, wiring, and lighting systems, read technical diagrams and blueprints, carry out inspections, service and maintain (based on field or specialisation such as electrical, troubleshooting electrical issues using appropriate testing devices, inspecting transformers, circuit breakers, and other electrical components, assemble, evaluate, test, and maintain electrical or electronic wiring, equipment, appliances, and apparatus, troubleshoot and repair malfunctioning equipment, appliances, and apparatus, construct and fabricate parts, using hand tools and specifications, read and interpret electrical and electronic circuit blueprints, diagrams, and schematics, advise management on continued use of unsuitable equipment, appliances, and apparatus.

Knowledge:

- Knowledge of computer hardware and software, including applications and programming.
- Knowledge of the practical application of water operation engineering
- Knowledge of techniques, tools, and principles involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of electrical tools and devices, including uses and maintenance
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in collect and analyse information, problem-solve, and make decisions.
- Skills in the electrical installation of cabling and associated devices such as switches, distribution boards, sockets and light fitting in the facilities.
- Skills in using circuit design that focuses on signal fidelity, amplification and filtering.

- Skills in the use of computer hardware and software, including applications and programming.
- Skills in repairing and maintaining electrical and electronic machines and devices.
- Skills in using machines, tools and technical equipment.
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Instrumentation Maintenance
JOB TITLE : Instrumentation Executive
LEVEL : 4

Responsibilities

Instrumentation Executive is responsible to read and interpret technical drawings, schematics, or computer-generated reports, research, design, evaluate, install, operate, or maintain mechanical products, equipment, systems or processes to meet requirements standard, confer with engineers or other personnel to implement operating procedures, resolve system malfunctions, or provide technical information, develop, coordinate, or monitor all aspects of production, including a selection of manufacturing methods, fabrication, or operation of product designs, investigate equipment failures or difficulties to diagnose faulty operation and recommend remedial actions, design mechanical and thermal devices or subsystems, using analysis and computer-aided design, recovering damage and recommending solutions, develop and test prototypes of devices they design, analyse test results and modify the design or system according to requirements standard, oversee the manufacturing process for the device

Knowledge:

- Knowledge of the practical application of water operation engineering
- Knowledge of instrumentation, tools, and principals involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of instrumentation, including uses, repair and maintenance
- Knowledge of dynamics of rivers, lakes, and coastal areas.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in building machines that replicate human actions.
- Skills in manufacturing and repairing the instrumentation.
- Skills in design and use of instrumentation and technical equipment.

- Skills in using technology, programs, robotics or processes to achieve outcomes with minimal human input
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Instrumentation Maintenance
JOB TITLE : Instrumentation Technician
LEVEL : 3

Responsibilities

Instrumentation Technician is responsible to manage the list of instrumentation facilities and equipment, handle the work order management system from the job identification, resource planning and scheduling, work preparation, execution and completion related to infrastructure, participate and collaborate in investigation and root cause analysis of electrical and instrument equipment failure and propose corrective and preventive actions, assign and oversee subordinate for calibration job, coordinate with process department regarding any engineering issues, interpret arising technical problems to management.

Knowledge:

- Knowledge of the practical application of water operation engineering
- Knowledge of instrumentation, tools, and principals involved in water operation of precision technical plans, blueprints, drawings, and models.
- Knowledge of instrumentation, including uses, repair and maintenance
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in using machines and instrumentation.
- Skills in repairing and maintaining the instrumentation.
- Skills in using instrumentation and technical equipment.
- Skills in inventory, supply chain and risk management.
- Skills in analytical, leadership, documentation and communication.
- Skills in water conservation methods and best practices.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Quality Field Sampling
JOB TITLE : Water Quality Executive
LEVEL : 4

Responsibilities

Water Quality Executive is responsible to approve the water sampling schedule, verify water quality results, plan and propose a budget for water quality surveillance program, manage resources, plan, calibrate and validate water testing equipment.

Knowledge:

- Knowledge of field water sampling techniques and methods.
- Knowledge of raw materials, sampling processes and quality control.
- Knowledge of tools and equipment, including uses and maintenance.
- Knowledge of conventional & non-conventional water treatment processes.
- Knowledge of water supply systems & water treatment processes.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in performing field water sampling.
- Skills in operating, repairing and maintaining tools and equipment.
- Skills in handling and operating machinery safely.
- Skills in carrying out daily work in a safe environment.
- Skills in designing and building or using tools and technical equipment.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Water Quality Field Sampling
JOB TITLE : Water Quality Technician
LEVEL : 3

Responsibilities

Water Quality Technician is responsible to supervise water sample preservative preparation, supervise water quality sampling, supervise water sample collection, in-situ test, distribution, storage and record, scheduling water sampling tasks, ensure water sample and reagent waste disposal, analyse water quality results, perform water testing equipment calibration and validation.

Knowledge:

- Knowledge of field water sampling techniques and methods.
- Knowledge of raw materials, sampling processes and quality control.
- Knowledge of tools and equipment, including uses and maintenance.
- Knowledge of water supply systems & water treatment processes.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in performing field water sampling.
- Skills in operating and maintaining tools and equipment.
- Skills in handling and operating machinery safely.
- Skills in carrying out daily work in a safe environment.
- Skills in using tools and technical equipment.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Water Quality Laboratory
JOB TITLE : Water Quality Executive
LEVEL : 4

Responsibilities

Water Quality Executive is responsible to approve the water sampling schedule, verify water quality results, plan and propose a budget for water quality surveillance program, manage resources, plan, calibrate and validate water testing equipment.

Knowledge:

- Knowledge of laboratory water sampling techniques and methods.
- Knowledge of raw materials, sampling processes and quality control.
- Knowledge of tools and equipment, including uses and maintenance.
- Knowledge of water supply systems & water treatment processes.
- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in performing laboratory water sampling.
- Skills in operating, repairing and maintaining tools and equipment.
- Skills in handling and operating machinery safely.
- Skills in carrying out daily work in a safe environment.
- Skills in designing and building or using tools and technical equipment.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360

AREA : Water Quality Laboratory

JOB TITLE : Laboratory Technician

LEVEL : 3

Responsibilities

Laboratory Technician is responsible to perform water quality laboratory physical testing and record, perform water quality laboratory chemical testing and record, perform water quality laboratory microbiological testing and record, perform instrumental analytical quality control, supervise water quality activities.

Knowledge:

- Knowledge of laboratory water sampling techniques and methods.
- Knowledge of raw materials, sampling processes and quality control.
- Knowledge of tools and equipment, including uses and maintenance.
- Knowledge of water supply systems & water treatment processes.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in performing laboratory water sampling
- Skills in operating and maintaining tools and equipment.
- Skills in handling and operating machinery safely.
- Skills in carrying out daily work in a safe environment.
- Skills in using tools and technical equipment.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.

MSIC GROUP : 360
AREA : Geographical Information System (GIS)
JOB TITLE : GIS Executive
LEVEL : 4

Responsibilities

GIS Executive is responsible to analyse spatial data through the use of mapping software, discover patterns and trends through spatial mapping of data, design digital maps with geographic data and other data sources, produce maps showing the spatial distribution of various kinds of data, develop mapping applications and tools, convert physical maps into a digital form for computer usage, perform data munging and cleaning to convert data into its desired form, produce reports on geographic data utilizing data visualizations and manage a digital library of geographic maps in various file types.

Knowledge:

- Knowledge of geographic water resources.
- Knowledge of dynamics of rivers, lakes, and coastal areas.
- Knowledge of water conservation methods and best practices.
- Knowledge of water demand forecasting, soil erosion and sediment control.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in the geographic analysis of water resources.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Communicative and collaborative.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.
- Critical thinking and problem-solving.

MSIC GROUP : 360
AREA : Geographical Information System (GIS)
JOB TITLE : GIS Technician
LEVEL : 3

Responsibilities

GIS Technician is responsible to compile geographic information in the form of satellite images, geographical surveys, and aerial photographs, research and verifying geographic data, enter new data into the GIS database, draw maps using advanced computer software, ensure maps are annotated and compiled with the correct information, compile reports using all available GIS and GPS data sources, maintain the GIS database and troubleshooting data issues and travel to geographic sites to conduct land surveys.

Knowledge:

- Knowledge of geographic water resources.
- Knowledge of dynamics of rivers, lakes, and coastal areas.
- Knowledge of water conservation methods and best practices.
- Knowledge of environmental, sustainability practices and green technology.

Skills:

- Skills in the geographic analysis of water resources.
- Skills in analytical, leadership, documentation and communication.
- Skills in inventory, supply chain and risk management.
- Skills in water conservation methods and best practices.
- Skills in environmental, sustainability practices and green technology.

Attributes (Attitude/Safety/Environmental):

- Adhere to Occupational Safety, Health and Environment regulations.
- Critical thinking and problem-solving.
- High level of commitment, degree of integrity and dedication to the implementation and perpetuation of values and ethics.