

**EVALUATION OF EFFLUENT DISCHARGE LICENSING IN
SOUTH AFRICA**

Submitted By

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CONFIDENTIALITY CLAUSE

June 2003

TO WHOM IT MAY CONCERN

RE: CONFIDENTIALITY CLAUSE

Due to the strategic importance of this research it would be appreciated if the contents remain confidential and not be circulated for a period of ten years.

Sincerely

M. Naidoo (Miss)

DECLARATION

This research has not been previously accepted for any degree and is not being currently submitted in candidature for any degree.

Signed.....

Date..... 6 JUNE 2003

I declare that this dissertation is my own work. It is being submitted for the degree of Master of Business Administration at the University of Natal, South Africa. It was never submitted for any other degree or examination in any other University. All the references used or quoted have been acknowledged by means of referencing.


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NAIDOO M

6/06/03
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ABSTRACT

Water is life. In South Africa it is a crucial element in the battle against poverty, the cornerstone of prosperity and a limiting factor to growth. As a fundamental and indispensable natural resource, no regional or national development plan can take shape without giving primary consideration to water. Due to water being an essential component to human and ecological life the scarcity has focused the Department of Water Affairs and Forestry (DWAF) to converge into the protection, use development, conservation, management and control of water resources.

The Water Act (Act No. 54 of 1956) encompassed various shortcomings and therefore was replaced with the National Water Act (Act No. 36 of 1998) (NWA). The promulgation of the NWA gave effect to Section 24 of the Constitution, which entitles “everyone to an environment that is not harmful to their health or well-being”. Therefore the government has an obligation to protect the water resources. In order to address this problem, government introduced the Licensing System. Therefore the “polluter pays” concept was introduced, a waste discharge fee is charged to the user. This was introduced to deter users from wasting the resources and to promote sustainable development.

The information was presented in the form of a case study between the Department of Water Affairs and Forestry and Mhlathuze Water. An evaluation and assessment was conducted of the current licensing procedure for Mhlathuze Water and recommendations were made for the process to occur efficiently. The License is a legal document between the government and the water user and it stipulates conditions that should be complied with all the time. It is valid for forty years, however will be reviewed every five years by the relevant authority. Monitoring and auditing will be conducted on a regular basis. In the conditions stipulated are not complied with, the license will be revoked.

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1. CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

These guiding principles recognize the basic human needs of present and future generations, the need to protect water resources, the need to share some water resources with other countries, the need to promote social and economic development through the use of water and the need to establish suitable institutions in order to achieve the purpose of the Act. Continued deterioration of water quality in some parts of South Africa has lead the Department to adopt a more comprehensive approach to controlling different water uses. It stands to reason that if we consume a fixed supply of non-renewable resources at a constant rate, eventually we'll use up all the economically recoverable reserves. There are many warnings in the environmental literature that our extravagant depletion of non-renewable resources sooner or later will result in catastrophe.

1.2 BACKGROUND OF THE STUDY

In a pioneer or frontier economy, methods for harvesting resources and turning them into useful goods and services tend to be inefficient and wasteful. This may not matter, however, if the supply of resources exceeds the demand for them. Scarcity can actually serve as a catalyst for innovation and change. Apart from the core duties of the Department of Water Affairs and Forestry, Licensing is an adhoc activity, which is of highest priority. The management of South Africa's water resource entails finding the right balance between using the water resource for the public benefit and protecting the water resource against the potential harmful impact of such use and also to include the management of water resources of South Africa in a sustainable way for the benefit of the whole nation and for future generations.

The National Water Act was promulgated on 1 October 1998 and was fully operational on the 1st October 1999. The NWA introduces several new concepts, and regulates all water-related aspects in South Africa based on the Constitutional rights. The

fundamental Principles support the objectives of sustainability and equity, which underpin the entire NWA as central guiding principles in the protection, use, development, conservation, management, and control of our water resources (Stein, 1999:7). The NWA entails a licensing system for 11 water uses.

Now, water users will have to pay for using the water, this will give a whole new meaning to ownership. Water users will stop abusing and wasting water. Industries will have to use cleaner technology in their production processes in order to prevent and minimize waste from occurring.

1.3 MOTIVATION FOR THE STUDY

Licenses have been increasing at an alarming rate and many bottlenecks have cropped up along the way. These bottlenecks cause inefficiencies in the process. The Department currently has a licensing framework procedure, however many find it complex due to certain shortcomings in the National Water Act. Therefore the researcher proposes to evaluate the licensing procedure of the Department's and improve it with several recommendations. In order to achieve the principle of the National Water Act, licensing requires a structured approach. The current licensing procedure is just a framework. According to Garside (1998) the overall objective for most businesses is to sustain a viable operation through generating profit and meet all stakeholders' expectations. In government, the objective is similar. Instead of profit the aim is to achieve Service Delivery. He also goes on to mention that people are the most valuable asset in a business because they have the knowledge, the commitment and the determination to succeed. Working in teams, people can achieve much more than as individuals. Therefore, it is incumbent upon management to appoint a business team and create a working environment capable of winning. He further argues that the core processes together with the staff support activities have been broadly defined, providing a template for managers facing the challenges of implementing more effective business processes.

1.4 VALUE OF THE STUDY

The Department of Water Affairs and Forestry is currently bombarded with license applications. Influxes of applications are due to the fact that water users do not want to be fined for late applications. Currently the Department is under going a high turnover of staff and the human capacity required to evaluate applications are limited. Staff members become highly stressed and demotivated since there are loopholes in the licensing framework.

This study will help the Department of Water Affairs and Forestry identify the current bottlenecks, regarding the licensing process. It will also evaluate the present licensing process and identify potential loopholes and amend the procedure by applying the recommendations. This will enhance an amplified value chain, which will result in proficient service delivery. This will have an impact on management decisions in the Department of Water Affairs and Forestry. The implication of not conducting this research will permit bottlenecks to incessantly be existent in the Licensing process.

1.5 PROBLEM STATEMENT

The regulations of the NWA of 1998 are proving difficult to implement in practice, as the current methodological framework does not accommodate environmental dynamism in any way, given the rigid prescription one may expect of a statute.

However, it is clearly evident that the regulations, specifically licensing, will prove difficult if not impossible to implement because of consumer resistance and government department incapacity. It is believed that these shortcomings can be corrected through evaluating the currently procedure and analysing the loopholes. This will create the necessary system for regulatory implementation, affecting as it does both consumers and government departments.

Will the evaluation of the current water-licensing framework be able to create a more effective approach to the water licensing?

According to the National Water Act, the objective is managing quantity, quality and reliability of water resources to achieve optimum, long-term environmentally sustainable social and economic benefit for society. Thus, fundamental rethinking and radical redesign of the licensing procedure is essential to achieve dramatic improvements in critical, contemporary resources of performance such as cost, quality, service and speed in order to achieve the above.

1.6 OBJECTIVES OF THE STUDY

The objectives are the following:

- To evaluate the current licensing framework procedure and identify the bottlenecks in the process
- To isolate the loopholes in the National Water Act (Act No. 36 of 1998)
- To apply the recommendations made of the evaluation to the current water licensing framework and in so doing establish the potential improvement that can be crafted to the system.

It is anticipated that this will demonstrate a framework for enhanced service delivery in the application of the NWA Act.

1.7 RESEARCH METHODOLOGY

This study will be conducted as a qualitative research, which encompasses a case study on the evaluation of water use licenses in the DWAF-Kwa-Zulu Natal Region. The case study was preferred as an appropriate study since emphasis on detail provides valuable insight for problem solving and evaluation of the current licensing procedure (Cooper and Emory, 1991: 142). This detail is secured from multiple sources of information, which permit the verification of evidence and avoidance of missing data. This method is relevant in that it focuses on one case, which is studied thoroughly before conclusions are made. All the data gathered in this case study is relevant to the case being studied. The advantages of a case study method includes:-

- The targeted organisations, this is, the Department of Water Affairs and Forestry and Mhlathuze Water will be studied carefully and all data sources between the two organisations will be analysed.
- The study will focus on the License agreement issued to Mhlathuze Water by the Department of Water Affairs and Forestry. It will also exclude all irrelevant information that has no benefit for this study.

A search on the Internet and the Department's Intranet will be conducted for the latest information of legislation amendments. The following documents will be analysed for relevant information:

- Buoyant and Dense Effluent System: License Application Background Report.
- Mhlathuze Water, Buoyant and Dense Effluent System: License Application Motivation.

1.7.1 Ethical Standards

Ethical standards should be adhered to in every research. The following ethical guidelines will be adhered to in this study:

- The respondents will be asked for their consent prior to commencement of the interview.
- The researcher will ensure that the information obtained from all respondents should be treated confidential and only be used for research purposes.
- All participants will be treated with respect and concern for their well-being.
- The researcher will ensure that any person providing such information does not suffer distress and are protected from risk of any kind (Heiman, 1995).

1.7.2 Definition of Concepts

The following definitions will assist in understanding various aspects in this study.

- **Legislation**

The process of law-making, by passing policies through Parliament and making them Acts.

- **Sustainable development**

Providing for the needs of the present without impairing the ability of future generations to meet their own needs.

1.8 LIMITATIONS

- The case study chosen for this study only focuses on the DWAF-KZN Areas. In order for a representative research to be conducted more case studies in other areas or regions should be performed.
- Licensing is a new development in the water regulation strategy, therefore no formal licensing literature available.
- Reluctance of staff to share information/experience.

1.9 STRUCTURE OF THE STUDY

The chapters in this study are as follows:

Chapter one

Chapter one is the introductory chapter that presents the problem to be investigated, the aims of the study and the hypotheses will be the guide for this study.

Chapter two

Chapter two is the chapter that deals with relevant literature and previous studies on water quality management.

Chapter three

Chapter three deals with research methods, a case study of the organization and limitations.

Chapter four

Chapter four presents the evaluation of the organization against the results as well as their analysis.

Chapter five

Chapter five discusses the findings of this study as well as the conclusion and recommendations.

1.10 SUMMARY

This chapter has indicated clearly the critical questions to be answered as well as the aims of the study. The main problem highlighted is the environmental impact of water, therefore the introduction of licensing. Past studies will be looked at in the next chapter. DWAF used several approaches prior to the Licensing system, however these approaches had several approaches.

CHAPTER TWO

LITERATURE REVIEW

2.1. INTRODUCTION

Water is one of the key and probably the most fundamental and indispensable of natural resources, fundamental to life, the environment, food production, hygiene, industry and power generation. Water is fundamental to the overall quality of life. Water, although renewable, is also a finite resource, distributed unevenly both geographically and through time. Even when it is bountiful there is often serious inequity in its distribution and availability. Water can also be a limiting factor on economic growth and social development (Basson *et al.*, 1997).

South Africa is a semi-arid country, with an average rainfall for the country of about 450 mm per year, well below the world average of about 860 mm per year. Our rivers are small in comparison with other countries. The Orange River carries only about 10% of the volume of water flowing annually down the Zambezi River, and about 1% of the flow in the Congo River. Furthermore, many of our larger rivers, such as the Orange/Senqu and the Limpopo, are shared with other countries (DWAF, 2002).

South Africa's resources are in global terms scarce and extremely limited in extent. In some areas in South Africa, water scarcity is closely related to hunger, disease and poverty. Prosperity for South Africa depends upon the sound management and utilization of many resources, with water playing a pivotal role. Based on present trends in water use and population growth, availability and utilization, South Africa will reach the limits of its economically usable, land based fresh water resources during the first half of the next century (Basson *et al.*, 1997). The judicious and most beneficial utilization of the country's water in a wise and environmentally sustainable manner will thus undoubtedly constitute a critical success factor in the 21st century, while equitable sharing of common river basins and regional resources will play a key role in avoiding conflict and maintaining peace and prosperity.

The deterioration in the quality of South African surface waters has drawn the attention of water managers and planners during the last decade. As urbanization and development continues and limited water resources are increasingly used and re-used, this deterioration appears to be unavoidable. Across the country, on a daily basis, organisations and individuals impact on the water quality in our rivers and streams, our groundwater and our wetlands. Major water quality problems in South Africa include high salt and nutrient loads, sediments caused by erosion, contamination by bacteria, acidic water and the presence of toxic substances.

Section 24 of the Constitution of the Republic of South Africa Act 108 of 1996 provides that 'Every person shall have the right to an environment which is not detrimental to his or her health or well-being'. The national government has the obligation to guarantee this constitutional right of the public and hence has to manage and police the quality of our water resources. Protecting surface water in an integrated manner is central to successfully managing the countries resources. The National Water Act (Act 36 of 1998) (NWA) provides the necessary framework within which to protect, use, develop, conserve, manage and control our water resources.

Through the nature of their business, the biggest impactors on water resources are large-scale water and land users. These include agriculture, mining, industry, urban areas and settlements. All large-scale water users inevitably generate waste or wastewater. Although much progress has been made in terms of reuse and recycling of waste and wastewater, many large-scale users are not able to reuse all their waste products and wastewater, thus have to release it back into the environment. The NWA recognizes that it is neither practical nor realistic to expect that all impacts on water quality can be avoided. The Act classifies water uses according to the potential for impact they may have on water resources, and provides the regulatory framework for managing these risks and it introduces the concept of a 'license'. License users are those activities that, if not controlled, would have a high potential for unacceptable impact, such as discharging waste into a watercourse. Such users must apply for a license to use water.

This literature review looks at the role of the National Government and the Water Act in the quest to provide clean drinking water. The aim of the literature review is to evaluate a new concept of water discharge licensing, promulgated in the NWA. This license allocation has the aim of sustaining and protecting the water resources of our country. In this review, the historical role of the national government in water licensing as well as the framework of the NWA are introduced together with the basic principles of Discharge Effluent Licensing.

2.2. BACKGROUND OF THE STUDY

South Africa is a water scarce region therefore reuse of effluent is a vitally important to supplement freshwater resources. Effluent, with the accompanying pollutants, must therefore be returned to the natural water bodies for reuse (DWAF, 1991). Previously, the Water Act (Act 54 of 1956) was taken into account. The Water Act is no longer valid due its shortcomings; the legal mandate of DWAF is now the National Water Act (Act 36 of 1998).

At present the population level around 40 million, there is just over 1200 kilolitres per person per year of available fresh water (Glazewski, 2000). This places South Africa on the threshold of the internationally used definition of “water stress”. As demands on water increase with growing population regionally and globally, coupled with rapidly changing socio-economic conditions in South Africa, concern is increasingly being focused on water supply limitations, which are likely to be encountered in the early part of the twenty-first century (Lee, 1999). The effects of polluted water on human health, on the ecology and on various sectors of the economy, including agriculture, industry and recreation can be disastrous. Moreover, deteriorating water quality leads to increased treatment costs of potable and industrial process water and decreased agricultural yields due to increased salinity of irrigation water (Bergstrom, 2001).

Economic activity was freed, dramatically increased and became known as the Industrial Revolution. Subsequent governmental restrictions of economic freedom were not in check with the remarkable growth in industrialisation. The limits to this growth will be

reached when exploitation of the resources exceeds the carrying capacity of the earth. To ensure continued growth, a constant availability of resources is required.

The NWA recognizes that it is neither practical nor realistic to expect that all impacts on water quality can be avoided. Without impacts there could be no socio-economic growth. The challenge is to marry development for socio-economic growth such as agriculture, mining, industry power generation and urban settlement with maintaining water that is fit for use by other users, and protection of the aquatic ecosystem (DWAF, 2002). This is the principle of sustainability, which is the foundation of Agenda 21, of South Africa's Constitution, Bill of Rights, the NWA and the National Environmental Management Act (Act No. 107 of 1998).

The NWA repeals and replaces over one hundred previous Acts dealing with water so that we now have two consolidated acts, the NWA and the Water services Act (Glazewski, 2000). The following two subsections examine the National governments role in water quality management and the history of water quality management in South Africa. These findings form the reasoning behind the water quality management concepts in the NWA.

2.2.1 Role of National Government in Water Quality Management

The water resources of South Africa are recognized as a critically important national asset. Accordingly, they must be managed effectively and efficiently so as to bring maximum long-term benefit to the country as a whole. The Department of Water Affairs and Forestry is recognized as the custodian of these resources and has a national responsibility to ensure that both the basic (survival) needs of the people are met, together with those additional needs for water required to sustain the current needs of users and the anticipated growth in the national economy.

The role of the department in relation to the water sector can be segmented into two distinct but closely related, functional areas:

- Providing equitable access to the resource to ensure optimal economic and social development, including access to water and sanitation services for all citizens. This is the Department's main priority and takes precedence over any economic development objectives; and
- Managing the resource, as well as the demands made on the resource, both to protect the resource and to ensure sustainable and equitable use by current and future generations. This is reflected in the Department's mission statement of "ensuring some for all, ...forever".

The department has an important leadership role and responsibility to set in place national strategies for long-term water resource management. The department provides leadership, technical guidance and a resource management framework, based on important principles such as standards, environmental protection, and waste minimization. Provincial governments and local authorities are expected to address local and regional issues and to take appropriate responsibility for decisions within this management framework (DWAF, 1996).

Water Affairs is the custodian of this limited national resource, which has to be judiciously managed to ensure continued adequate water supplies of acceptable quality for all recognized uses. Maintenance of the fitness for use of South Africa's water resources on a sustained basis is thus Water Affairs' major over all water quality management goal.

Until recently Water Affairs applied the Uniform Effluent standards approach to water pollution control by enforcing compliance with the General and Special effluent standards. To counter continuing deterioration of water quality and to meet the challenges of the future, Water Affairs changed to the Receiving water Quality Objectives approach for non-hazardous substances and to the Pollution Prevention approach for hazardous substances. The Receiving Water Quality objectives approach focuses on the fundamental water quality management goal, namely maintaining fitness for use.

However, applied without the necessary precaution, the Receiving Water Quality Objectives approach, as defined, will inevitably lead to the deterioration of water resources to the point where they will be marginally fit for the recognized uses (DWAF, 1991).

To counter the limitations of this approach and to be consistent with environment policy development worldwide, Water Affairs decided to embody in its water quality management policy aspects of the anticipatory or precautionary principle to environmental protection. This principle encompasses all types of action to avert danger and minimize risk to the environment.

The role of the National Government in water quality management has dynamically changed in the advent of new legislation and international policies since the early 1900's. These changes were seen in light of alleviating the effect of pollution and the resultant consequences on our water resources.

2.2.2 History of Water Quality Management in South Africa

As society in South Africa developed, water quality management evolved. In the early 1950s, the main focus was on sewage disposal. The Public Health Act (Act 36 of 1919) prevented sewage effluent from being disposed on into watercourses. From 1950's onwards, the pollution control approach was used (Uniform Effluent Standards), due to the increase in mining and industrial activities from the agricultural based activities. The Uniform Effluent Standards approach aimed to control the input of pollutants to the water environment by requiring that effluents comply with uniform standards. The underlying philosophy was that minimum pollution (from point sources) was the desirable ultimate goal.

Accordingly these uniform standards should have been set to achieve levels of effluent pollutant concentration that would have resulted from applying “ best available technology not entailing excessive cost”. Aspects of this approach have been adopted by

the European Community in the past and have formed the basis of pollution control activities by Water Affairs.

The approach, however, has several drawbacks:

- It is focused on effluent and effluent treatment technology and largely ignores the impact on the quality of the receiving waters.
- Where there are multiple point sources or high background levels of pollution arising from diffuse sources, application of Uniform Effluent Standards may fail to protect the quality of water resources.
- The approach is also not necessarily cost effective because it requires all the effluent to comply with the same standards, irrespective of variations of the assimilative capacity of the receiving waters and regardless of the costs involved
- There is no incentive for industry to locate at the most environmentally advantageous location.
- It provides no framework for control of non-point sources and consequently cannot guarantee that quality objectives in receiving waters will continue to be met.

There are however two main advantages:

- It is simple, understandable and straightforward to enforce.
- Frequent updating of the standards to incorporate the latest and best pollution abatement technology should have the effect of minimizing pollution from point sources.

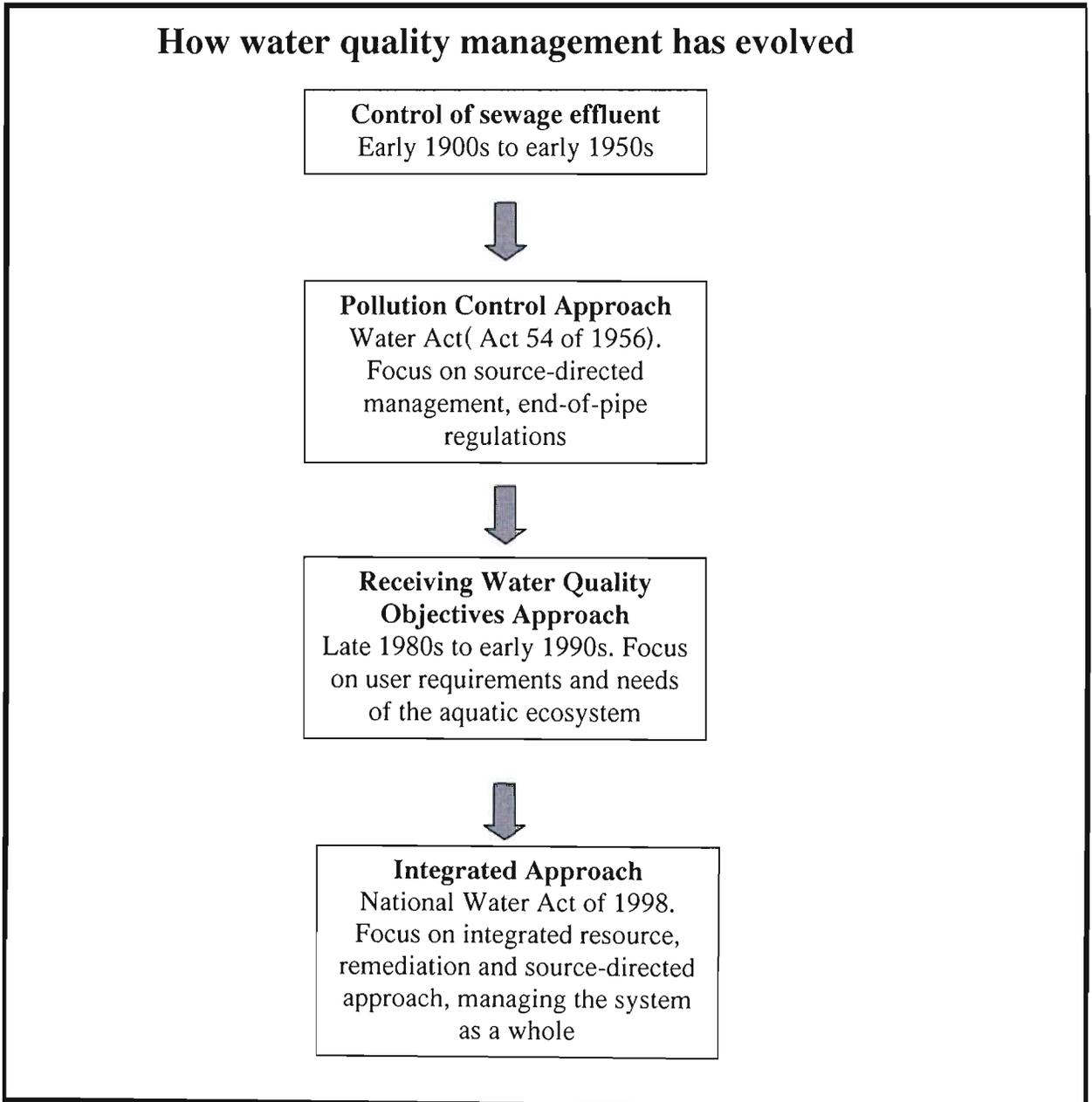
Draw back from the regulatory point of view is-

- Application is technologically more demanding because thorough understanding is needed of the fate of pollutants and of their impacts on the water environment.

The need to manage water quality rather than only to control point sources of pollution has led to the development of the Receiving Water Quality Objectives approach for non-hazardous substances and to the Pollution Prevention approach for hazardous substances.

The Receiving Water Quality objectives approach focused on the fundamental water quality management goal, namely maintaining fitness for use. However, applied without the necessary precaution, the Receiving Water Quality Objectives approach, as defined, will inevitably lead to the deterioration of water resources to the point where they will be marginally fit for the recognized uses (DWAF, 1991).

Figure 2.1: The evolution of Water Quality Management



Two previous commissions of inquiry into water matters concluded that the re-use of effluent would have to play a vital role in reconciling water supply with demand. Economically South Africa has a unique mixture of undeveloped, developing and developed components. This places some constraints on the options available for resource protection. It is sometimes argued that because of their need for economic development to improve standards of living, developing countries cannot afford to place the same priority on environmental protection as developed countries do. South Africa is in the process of undergoing fundamental political, social, economic and constitutional changes, which may drastically alter the present dispensation regarding water quality management.

2.2.3 Hierarchy of water quality management goals

Decisions with regard to water quality management are made in terms of a hierarchy of principles outlined below and are specifically aimed at marrying the protection and use of water resources¹.

⇒Prevention of Pollution

Prevent waste production and pollution of water resources wherever possible.
“Prevention is better than cure.”

⇒Minimisation of pollution at source

Minimise unavoidable waste production through:

- Recycling/re-use of waste or water containing waste;
- Detoxifying;
- Neutralisation; and/or
- Treatment of waste streams; and/or
- Introduction of cleaner technologies and best management practices (“Housekeeping”).

⇒Disposal of waste and/or discharge of water containing waste according to the precautionary principle

If there are no alternatives to the disposal of waste and/or the discharge of water containing waste, the precautionary principle applies.

- In the instance of the discharge of water containing waste, the Waste Discharge Standards apply as the minimum requirement.

Such discharge of water containing waste will be allowed only if the receiving water environment has the capacity to assimilate the additional waste load. With the promulgation of the NWA, the focus is on an integrated resource, remediation and source-directed approach, which manages the water resource system as a whole and tries to achieve the above-mentioned goals.

Due to the shortcomings of the above two approaches; the Licensing System was developed. It closely focuses of the NWA goals and the Water Management hierarchy. License uses are those activities that, if not controlled, would have a high potential for unacceptable impact, such as discharging effluent into a watercourse. Such users must apply for a license to use water. Licenses are subject to stringent conditions, including conditions that specify the quality of water containing waste being discharged or disposed of in order to maintain the requirements of the resource.

2.3 THE FRAMEWORK OF THE NWA

The theoretical preamble to the National Water is as follows:

- It recognizes that water is a scarce and unevenly distributed national resource which occurs in many different forms which are all part of a unitary, interdependent cycle;
- It recognizes that while water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources.
- It acknowledges the National Government's overall responsibility for and authority over the nation's water resources and their use, including the equitable allocation of water for beneficial use, the redistribution of water, and international water matters;
- It recognizes that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users;

- It recognizes that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users;
- And it recognizes the need for the integrated management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate (NWA, 1998).

The NWA introduces several new concepts, the following which are relevant when considering an application for a water use License in a generic and harmonized authorisation protocol that will lead to a decision regarding the impact of such use on the water resource:

2.3.1 The scientific indivisibility of water as part of the hydrological cycle is recognised and the *water resource* is defined to be all water found in the various phases of this hydrological cycle, including that portion of the water found underground. This ensures that the water resource is treated in an integrated fashion and is a resource common to all.

2.3.2 National Government, through the Minister of Water Affairs and Forestry, as the *public trustee* of this resource, must establish a *national water resource strategy* for the protection, use, development, conservation, management, and control of water resources. DWAF will therefore be accountable for ensuring that decisions do not adversely affect the integrity of the resource, but are made in a **just and equitable** manner that promotes sustainability.

2.3.3 To achieve effective **resource protection**, two distinct but integrated sets of measures are introduced, namely *resource-directed* and *source-directed* measures. Resource-directed measures set clear objectives for the desired level of protection for each component of the resource through, *inter alia*, a resource classification system. Source-directed measures aim to control the source of potential impacts on the water resource.

2.3.4 In the NWA, use of water is no longer limited to consumptive use such as abstraction of water, but includes non-consumptive use, such as recreation. The NWA provides for tiered regulatory control over 11 water uses as identified in the NWA. Since

resource quality includes the quality of all the aspects of a water resource, such as hydrological characteristics, flow, physical, chemical and biological characteristics, riparian habitat and aquatic biota, all 11 water uses have an impact on the resource quality. The NWA furthermore recognises water as a valuable commodity (an “economic good”), since all authorised use of water will be charged for through a pricing strategy for water use charges under.

2.3.5 Source directed measures, such as the conservation of water is strongly emphasised in the NWA, for example the requirement contained in which stipulates that that persons using water may not waste such water.

2.3.6 The concept of “*the Reserve*”, which comprises that quantity and quality of water required to satisfy basic human needs and to protect aquatic ecosystems, in order to ensure ecologically-sustainable water development and use, is introduced. This concept is based on the Constitution. “The quantity, quality and reliability of water required to maintain the ecological functions on which humans depend shall be **Reserved** so that the human use of water does not individually or cumulatively compromise the long-term sustainability of aquatic and associated ecosystems”.

2.3.7 After providing for the Reserve and international obligations, the basis for granting authorisation to use the available water quantity and/or quality in an area will be for the achievement of beneficial use in the public interest. This is also known as “**optimum use**”, i.e. use which achieves the most desirable combination of social, economic and environmental objectives, irrespective of whether such use is consumptive or nonconsumptive. All water uses will be authorized only if they are a **beneficial use in the public interest**, and will be subject to a system of allocation that promotes use that is optimal for the achievement of equitable and sustainable economic and social development.

2.3.8 On the basis of the constitutional obligation to **protect** the environment, stringent **pollution prevention** measures and the “**polluter pays**” principle are incorporated into the NWA. “Water quality management options shall include the use of economic incentives and penalties to reduce pollution; and the possibility of irretrievable environmental degradation as a result of **pollution shall be prevented**”. In fulfillment of

this principle “waste discharge charges”, as intended the NWA can be set for uses that may impact on the resource quality.

2.3.9 The NWA recognizes that management of water must take place at the *catchment* level, which is the basic management unit for the water resource. It therefore provides for the progressive establishment of *catchment management agencies* (CMA’s) by the Minister within the framework of the national water resource strategy referred to above. This will have the purpose of delegating the management of the water resource to the appropriate level (water management area) and facilitating the involvement of local stakeholders in the management of water resources. Until such time as CMA’s have been established, the Minister of Water Affairs and Forestry will exercise the power and duties of CMA’s in all water management areas in South Africa. The NWA provides for *public consultation* processes in the establishment of strategies and the making of decisions, and guarantees the right to appeal against such (DWAF, 2000).

Table 2.1: Water Uses

s21(a):	taking water from a water resource;
s21(b):	storing water;
s21(c):	impeding or diverting the flow of water in a watercourse;
s21(d):	engaging in a stream flow reduction activity (currently only commercial afforestation);
s21(e):	engaging in a controlled activity – activities which impact detrimentally on a water resource (activities identified in s37(1) or declared as such under s38(1)) namely: <ul style="list-style-type: none"> ▪ irrigation of any land with waste or water containing waste which is generated through an industrial activity or a waterwork; ▪ an activity aimed at the modification of atmospheric precipitation; ▪ a power generation activity which alters the flow regime of a water resource; or ▪ intentional recharge of an aquifer with any waste or water containing waste
s21(f):	discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
s21(g):	disposing of waste or water containing waste in a manner which may detrimentally impact on a water resource;
s21(h):	disposing in any manner of water which contains waste from, or has been heated in, any industrial or power generation process;
s21(i):	altering the bed, banks, course or characteristics of a watercourse;
s21(j):	removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
S21(k):	using water for recreational purposes

The overall purpose of the Act in general terms is to ensure that, in managing and controlling the nation's water resources, a number of factors are taken into consideration. "...meeting basic human needs of present and future generations; promoting equitable access to water; redressing the result of past racial and gender discrimination; promoting the efficient, sustainable and beneficial use of water in public interest; facilitating social and economic development; providing for growing demands for water use; protecting aquatic and associated ecosystems and their biological diversity; reducing and preventing pollution and degradation of water resources; meeting international obligations; promoting dam safety and managing floods and droughts".

One of the basic concepts on which the NWA is founded, is the fact that the "water resource" is defined in terms of the indivisibility of the hydrological cycle. This means that the water resource includes watercourses, surface water, estuaries and aquifers, which must be managed in an integrated manner. The NWA identifies 11 consumptive and non-consumptive water uses (shown in above table), which must be authorized under a tiered authorization system, which include Schedule uses, General Authorisations or Licenses. Effluent discharge is classified as a water use in the NWA (1998) and hence requires a 'License'.

2.4 THE PRINCIPLES OF EFFLUENT DISCHARGE LICENSING

South Africa's water resource management policy seeks to find the right balance between using the water resource for the public benefit and protecting the water resource against the potential harmful impact of such use. The NWA makes provision for resource-directed measures as well as source-directed controls in order to achieve this balance between protection and use of the resource. These aspects are both taken into consideration in the evaluation of an application for a license to use water.

Since discharge effluent licensing is regarded as a water use by the NWA, it has to comply with the same set of guidelines laid down for all water use licensing. In issuing general authorizations and licenses for use of water, the responsible authority must take into account all relevant factors, including existing lawful water uses, the need to redress

the results of past racial and gender discrimination, socio-economic, impacts of the water use, any applicable catchment management strategy, the effect of the water use on other users.

Since the Act abolishes the common law historical distinction between public and private water, persons cannot in general own water and all water use is now subject to a system of licensing in common with many other countries. A license is not required, if stipulated under the following conditions.

- Under a general authorization
- In terms of an existing lawful water use
- Use of water under Schedule 1, reasonable domestic used, domestic gardening, animal watering, fire-fighting and recreational use of water.

2.4.1 Water Use Licenses

Licenses give existing or prospective water users formal authorisation to use water for productive or beneficial purposes. A License to use water may only be issued by a "responsible authority" to which a prospective user must apply.

2.4.1.1 A License :

- Replaces all previous entitlements, if any, to use water for the purpose specified in the License;
- Is specific to the user to whom it is issued, and to a particular property or area;
- Is specific to the use or uses for which it is issued;
- Is valid for a specified time period, which may not exceed 40 years;
- May have a range of conditions attached to it; and
- Must be reviewed by the responsible authority at least every five years.

The following applies with regard to applications for Licenses:

- Applications may be made individually, or generally as part of a compulsory licensing process.

- In general individual License applications will be for new users, existing users who wish to increase or change their use, and existing users who wish to continue their use in terms of an existing limited duration authorisation. Most existing users will acquire Licenses during compulsory licensing.
- A detailed procedure has been established for individual License applications. Applicants can request technical, administrative and financial assistance from the responsible authority to make their applications.

2.4.1.2 Compulsory licensing

Compulsory licensing will apply if it is desirable that water use in respect of one or more water resources within a specific geographic area be licensed:

- To achieve a fair allocation of water from a stressed water resource;
- When it is necessary to review prevailing water use to achieve equity in allocations;
- To promote beneficial use of water in the public interest;
- To facilitate efficient management of the water resource and to protect water resource quality.

The process for compulsory licensing will be as follows:

- Existing use and its lawfulness is verified.
- The responsible authority issues a notice calling for License applications to all registered water users and potential users.
- Users and prospective users prepare and submit License applications.
- The responsible authority evaluates all License applications.
- The responsible authority develops possible solutions for reconciling water requirements with water availability.
- The responsible authority prepares, publishes and invites public comment on a proposed allocation schedule.
- After considering all comments on the proposed allocation schedule, and making necessary amendments, a preliminary allocation schedule must be published.

- The preliminary allocation schedule is amended in the light of successful appeals to the Water Tribunal.
- The responsible authority publishes the final allocation schedule in the Government Gazette.
- As soon as reasonably practicable after the final allocation schedule has been published, the responsible authority must issue Licenses to water users in accordance with its provisions.

2.4.1.3 Evaluation of License Applications

All License applications, whether individual or compulsory, must be evaluated against the factors specified in section 27 of the Act. A detailed procedure is being developed to facilitate evaluation of License applications.

2.4.1.4 Requirements for Licenses and License Conditions

Sections 28 and 29 of the Act describe, respectively, the essential information that must be included in a License, and the conditions under which the water use is authorised. As far as possible conditions of use will be determined by negotiation and agreement with users, and every case will be decided on its individual merits. One of the most important attributes of a License is its period of validity. The evaluation procedure for License applications will contain broad guidelines for determining the License period. In addition to the License period, water use may be subject to a range of other conditions, which are jointly intended to ensure that the total use from a particular water resource does not unreasonably prejudice the integrity of the resource, that individual uses do not unreasonably prejudice other users, and that water resources are effectively managed.

2.4.1.4 Review and Amendment of Licenses

Conditions attached to Licenses will not necessarily remain unchanged throughout the life of the License. Any condition, except the License period, may be amended on review (at least every five years) if such amendments are necessary to maintain the integrity of the water resource, to achieve a balance between available water and water requirements, or to accommodate changes in water use priorities. License conditions for all similar

uses from the same water resource must be reviewed together, and amended in an equitable manner. At each general review the responsible authority may, after considering all relevant factors, extend the License period, but only by the length of a single review period.

2.4.1.5 Compliance with Conditions of Water Use

All water users are required to adhere to the conditions of use attached to permitted water uses and responsible authorities are required to ensure that they do so. A responsible authority may issue a notice directing the user to rectify the contravention. If the user fails to comply with the notice, the responsible authority may suspend or withdraw the entitlement to use water. Failure to comply with any condition of use is an offence under the Act, and the responsible authority may choose to prosecute an offending user.

It can be seen that the rules and regulations set down by the National Water Act are lengthy and detailed. It is envisaged that these guidelines if enforced will lead to stringent and effective water quality management.

2.5 THE PEST ANALYSIS

In the pest analysis, the political, economical, social and technological aspects will be discussed in accordance to licensing.

2.5.1 Political Aspect

Under the apartheid government, the environmental management system was poorly resourced, lacked public support, it was generally ineffective in halting environmental degradation and denied vast sectors of the population access to basic resources, including water. This deficiency is evident mainly in the rural areas, where women in particular bear the brunt of the burden of obtaining water. DWAF, who administers water law, has made significant strides in redressing these past social imbalances while respecting the constitutional right to property and while taking cognizance of the public environmental interest. The enactment of the NWA, reflects the new democratic spirit by giving effect to the constitutional right of access to water. It declares the national government to be

the public trustee of the nation's water resources and prioritizes socio-economic and environmental needs. The overall purpose of the Act is "...to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled".

In addition, the Act makes specific provision for the redistribution of water. The responsible authority can require applications for licenses (including from those who have an existing lawful use) in a specific geographic area. The authority then prepares an allocation schedule determining how much water will be allocated to applications in order to, amongst other things, redress the results of past inequalities in access to water resources is likely to be closely linked to the land reform process.

The advent of a democratic South Africa has brought about the promulgation of new legislation, which provides the country with a unique opportunity to develop harmonized decision-making mechanisms. With regard to the water resource component of the environment, the NWA was promulgated to give effect to Section 24 of the Constitution. The Constitution of the Republic of South Africa, Act 108 of 1996 compels all to ensure the fundamental rights of the citizens of South Africa. Section 24 of the Constitution has caused a paradigm shift towards a new environmental policy for South Africa.

2.5.1.1 The Constitution

In the Bill of Rights chapter of the South African Constitution 108 of 1996, there is an inclusion of an environmental clause. It states:

Section 24. Everyone has the right –

- (a) to an environment that is not harmful to their health or well-being; and
- (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
 - (i) prevent pollution and ecological degradation;
 - (ii) promote conservation; and
 - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

After Section 24 (b) a duty is placed on government to act. It is clear that it has the duty to pass appropriate legislation. Section 24 (b) is a reason for the existence of a general environmental awareness, rather than its cause. The main value of Section 24(b) lies in its empowerment of the community as part of the phenomenon of the devolution of effective power. A community need not wait for or rely on government to act. It can initiate the steps that it deems necessary. Invoking Section 24(b) can now force the hand of government. If challenged because it refuses to develop an environmental measure, it will not have the easy task explaining why it did nothing. It will have the difficult task of explaining why the measure should not become law.

A further important feature of the Act is that it emphasizes public participation in the various norms and procedures, which it lays down, and a significant innovation is that the Act includes specific measures providing for community involvement and gender representation in water management institutions (Barnard, 1999).

On this basis, new statutory requirements, which are based on the internationally accepted principles of sustainability, National Environmental Management Act, No 107 of 1998 (NEMA), was promulgated to give legal effect to these principles and furthermore requires the harmonization of decision-making mechanisms aimed at managing the environment.

NEMA lays down principles for environmental governance, some of which relate directly to water quality management.

- Sustainable development, and employing the best practicable environmental option
- The precautionary principle
- Pollution prevention and waste minimization, and the “polluter pays” principle
- Transparent and participative management.

The department considers applications for water use licenses, accounting also for the NEMA principles and in particular the principle of transparent and cooperative management, by involving other government departments and interested and affected parties.

Public awareness and concern has increased drastically since 1994, on how the environment is impacted upon, by industry and businesses. The entrenchment of an environmental constitutional right and the re-introduction of South Africa to the global community have resulted in a public ethos which now increasingly perceives pollution to be a crime. Where traditionally our courts would have lent in favour of business in instances where there was any doubt that they were causing harm, today they appear to be adopting a more cautious and socially aware approach by giving the environment and public health the benefit of the doubt.

NEMA which was enacted a year before the Promotion of Access to Information Act 2 of 2000, contains detailed provisions regarding access to information. Firstly the environmental principles described in chapter 4 of NEMA, include the principle that “decisions must be taken in an open and transparent manner and access to information must be provided for in accordance with the law. Secondly, in section 31 of NEMA, contained in part 2 of chapter 7, which is entitled “ Information, Enforcement and Compliance”, deals with access to environmental information and protection of whistle blowers.

By including an environmental right in the Constitution, the constitution makers have acknowledged environmental concerns into the various priorities, which the new government is obliged to provide. Similarly, the legislature which, given the “injustice of our past and apartheid’s environmental legacy, is obliged to ensure an environment of a decent quality and to put in place a comprehensive body of environmental law under section 24(b).

2.5.1.2 Transparency and Access to Information

The Department has responsibilities under the NWA to make water-related information available to the public, particularly in respect of actual or potential disasters and emergency situations. The Promotion of Access to Information Act (No. 3 of 2000) (PAIA) gives effect to the constitutional right of access to any information held by the Department that is required for the protection of any rights. Section 15 enables the Department to make certain information automatically available without a person having to request access in terms of the PAIA. The Department will define and declare automatically available information, which is expected to include the majority of water-related information.

Section 32 allows access to “any information held by the state “as well as any information that is held by any another person and that is required for the exercise or protection of any rights”. Its main value is that it allows access to the available research and detailed information necessary to substantiate demands for improved environmental performance. An important constraint on environmental action is the prohibitive cost of the research needed to obtain reliable information. Yet a staggering wealth of research on environmentally related aspects can be found in the files of both the public and private sectors. This section opens the door to this information. It will usually be information emanating from the bodies causing the environmental degradation. This will facilitate acceptance of the correctiveness thereof (Glazewski, 2000).

2.5.1.3 Administrative Justice

Section 33 enshrines “just administrative action” that is “lawful”, reasonable and procedurally fair”. Previously our administrative law as a general rule stated, “... the court may not venture to question the merits or wisdom of any administrative decision that may be in dispute”. The inclusion of the requirement of reasonableness in Section 33 changed the position. It means that decisions may be tested against an objective standard namely that of reason. If it does not meet this standard, the decision must be set aside. The merits must therefore be investigated. It is not clear what the content of the objective standard of reasonableness will be. The long history of judicial dispute and academic

writing regarding the concept of reasonableness indicates that it will not be simple to lay down the guidelines. What is clear is that an official may be called upon to explain to a court why he made a decision. If it appears under cross-examination that the reasons why he made the decision are not good enough, the decision may be set aside.

The NWA provides rights of appeal to the Water Tribunal but the matters on which an appeal can be made are limited to those specified in the Act. The PAJA applies to all administrative actions and reinforces the necessity for water resource managers to apply their minds to every aspect of the decision-making process and to ensure that deliberations take every relevant aspect into consideration. Alleged breaches of administrative procedures that are beyond the scope of the NWA will be adjudicated by the courts and not by the Water Tribunal. All relevant provisions of the PAJA will apply to Catchment management agencies and water user associations.

2.5.2 Economic Aspect

The need for international trade and economic growth, population factors, national needs and macro-economic and sectoral policies, are driving forces which all exert pressure on the environment through increased demand for resources and ecosystem services, which in turn leads to exploitation and depletion of these resources. Currently there is a shift away, from a command and control bias to environmental governance, towards an innovative hybridization of multiple instruments and tools, illustrated below (Du Plessis *et al*, 2001).

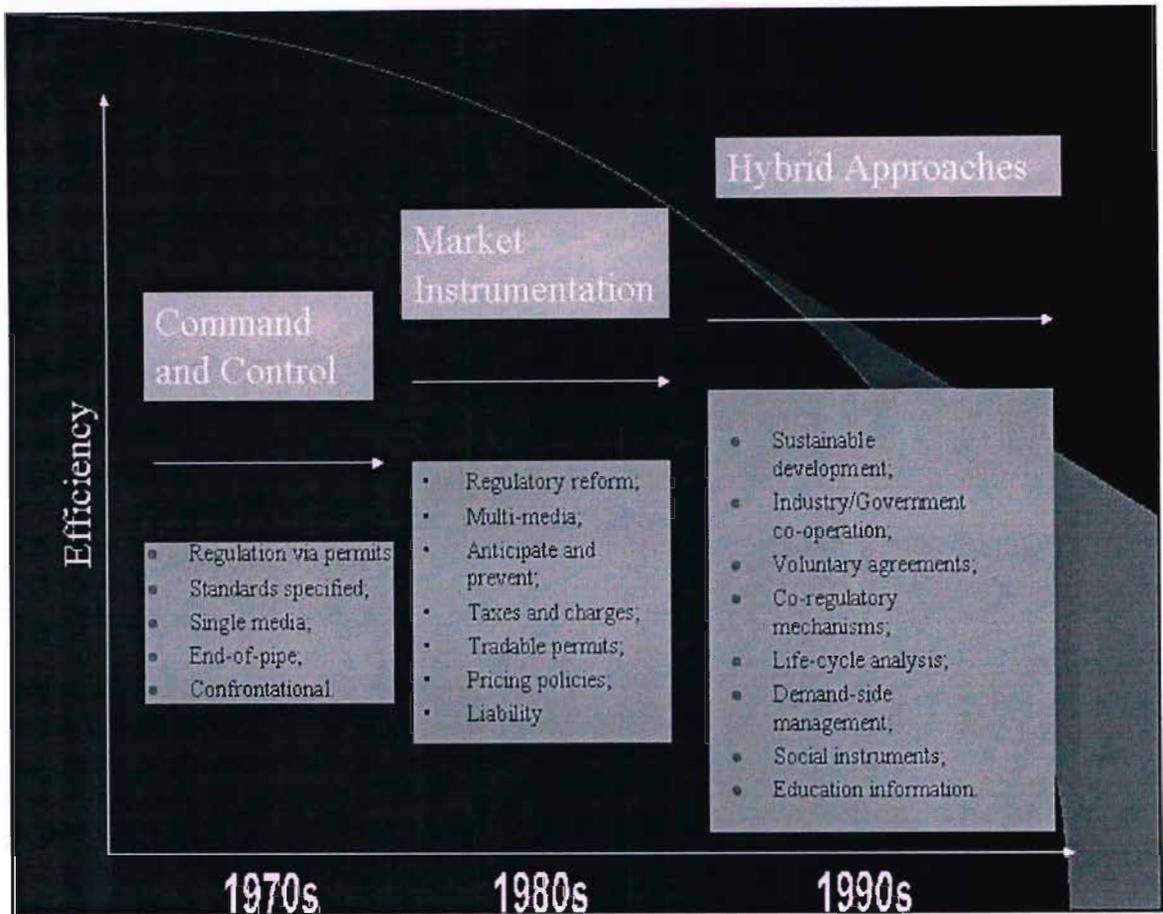


Figure 2.2 Shift from command and control to hybrid use of multiple instruments

The need for economic growth drives up the demand for resources in order to meet the required production levels. With a growing national and global population and the need for equitable distribution and access to resources in South Africa, the demand for resources is increasing exponentially. For example, the demand for water has grown so significantly that all major rivers in South Africa have been dammed or modified. Furthermore, the demand for water is expected to increase by more than 50% over the next 30 years (Ballance *et al*, 1999). At the moment, the amount of water allocated for environmental functions is lower than that allocated to any other use. Although this allocation will be increased, the increase in demand from other users means there will not be sufficient freshwater to meet the demand from all user groups.

Table 2.2: Summaries of Sectoral Water Requirements for 1996 and 2030

SECTOR	% Contribution to GDP	1996 (million cubic meters/yr)	2030 (million cubic meters/yr)	Percentage Increase
Urban % domestic	-	2171	6936	219,5%
Mining&Industrial	37%	1598	3380	111,5%
Irrigation & Forestry	6%	12344	15874	28,6%
Environmental	-	3932	4225	7,5%
Total	-	20045	30415	51,7%

Previously subsidies were given on water, this made it very cheap for industrial, agricultural and domestic users and hence there was no incentive to use them conservatively, to recycle effluent or to re-use water. The removal of the subsidies from water will encourage users to conserve more. Only by making users pay the consequences in rands and cents can the government effectively reverse the culture of wasting resources. At present we are living off our capital instead of the interest because the current national accounting system does not make the value of resources explicit.

The critical factor in pollution behaviour is that people tend to maximize their personal welfare, balancing private benefits against private costs. The inefficiency of this market arrangement can be expressed in terms of a distinction between social costs and private costs. In fact external costs are equal to the difference between the social and private costs, that is:

External costs = social costs – private costs
--

When external costs are present, the market mechanism won't allocate resources efficiently. This is a case of market failure (Schiller, 2000). In order to overcome these externalities government has promulgated the NWA, which has introduced a radical new pricing structure to reflect the true cost of water to users and it also makes provision for a minimum allowance for human consumption.

Also on the basis of the constitutional obligation to protect the environment, stringent pollution prevention measures and the “polluter pays” principle are also incorporated into the NWA. According to Fundamental Principle 16: “Water quality management options shall include the use of economic incentives and penalties to reduce pollution and the possibility of irretrievable environmental degradation as a result of pollution shall be prevented (WRC, 1998). In fulfillment of this principle “waste discharge charges”, as intended under Section 56(5) of the NWA can be set for uses that may impact on the resource quality.

The Minister of DWAF may from time to time, after public consultation, establish a pricing strategy, which may differentiate among geographical areas, categories of water users or individual water users. The achievement of social equity is one of the considerations in setting differentiated charges. Water use charges are to be used to fund the direct and related costs of water resource management, development and use, and may also be used to achieve an equitable and efficient allocation of water. In addition, they may also be used to ensure compliance with prescribed standards and water management practices according to the user pays and polluter pays principles. Water use charges will be used as a means of encouraging reduction in waste, and provision is made for incentives for effective and efficient water use. Non-payment of water use charges will attract penalties, including the possible restriction or suspension of water supply from a waterworks or of an authorisation to use water.

The NWA states in Section 56 the pricing strategy for water use charges

- (2) The pricing strategy may contain a strategy for setting water use charges -
 - (a) for funding water resource management, including the related costs of -
 - (i) gathering information;
 - (ii) monitoring water resources and their use;
 - (iii) controlling water resources;
 - (iv) water resource protection, including the discharge of waste and the protection of the Reserve; and

- (v) water conservation;
- (b) for funding water resource development and use of waterworks, including -
 - (i) the costs of investigation and planning;
 - (ii) the costs of design and construction;
 - (iii) pre-financing of development;
 - (iv) the costs of operation and maintenance of waterworks;
 - (v) a return on assets; and
 - (vi) the costs of water distribution; and
- © for achieving the equitable and efficient allocation of water.

(3) The pricing strategy may -

- (a) differentiate on an equitable basis between -
 - (i) different types of geographic areas;
 - (ii) different categories of water use; and
 - (iii) different water users;
- (b) provide for charges to be paid by either -
 - (i) an appropriate water management institution; or
 - (ii) consumers directly;
- (c) provide for the basis of establishing charges;
- (d) provide for a rebate for water returned to a water resource; and
- (e) provide on an equitable basis for some elements of the charges to be waived in respect of specific users for a specified period of time.

(4) The pricing strategy may differentiate under subsection (3)(a) -

- (a) in respect of different geographic areas, on the basis of -
 - (i) socio-economic aspects within the area in question;
 - (ii) the physical attributes of each area; and
 - (iii) the demographic attributes of each area;
- (b) in respect of different types of water uses, on the basis of -
 - (i) the manner in which the water is taken, supplied, discharged or disposed of;

- (ii) whether the use is consumptive or non-consumptive;
 - (iii) the assurance and reliability of supply and water quality;
 - (iv) the effect of return flows on a water resource;
 - (v) the extent of the benefit to be derived from the development of a new water resource;
 - (vi) the class and resource quality objectives of the water resource in question; and
 - (vii) the required quality of the water to be used; and
- (c) in respect of different water users, on the basis of -
- (i) the extent of their water use;
 - (ii) the quantity of water returned by them to a water resource;
 - (iii) their economic circumstances; and
 - (iv) the statistical probability of the supply of water to them.

(5) The pricing strategy may provide for a differential rate for waste discharges, taking into account -

- (a) the characteristics of the waste discharged;
- (b) the amount and quality of the waste discharged;
- (c) the nature and extent of the impact on a water resource caused by the waste discharged;
- (d) the extent of permitted deviation from prescribed waste standards or management practices

It is sometimes not financially or even technologically feasible to reduce pollution to a level required to ensure adequate protection of the environment. In such cases, Water Affairs has to seek trade offs between water quality objectives of not only the polluter but also of the region of origin of the pollution and of the country as a whole.

Economic development should not take place at the expense of environmental degradation. However, sustained economic development is a prerequisite for achieving other national goals, which include the ability to afford protection of the environment.

Water Affairs adopts a holistic approach to conservation of resources, which includes the country's capital resources.

There are essentially two ways in which the increasing gap between the demand for and supply of water can be closed. The first involves supply-side management, which simply means to continue to expand supply to meet ever-increasing demand. It will result in significant increases in the costs of water, as favourable sources further afield have to be developed. These rising costs would ultimately have to fall on all water users. Before these costs are incurred, it is important to make sure that the water already available is used efficiently and it not wasted. This is best achieved by introducing demand-side measures to manage our water resources. By encouraging all water sectors to use water more efficiently, demand management provides a more sustainable long-term solution to the problem of water scarcity than do supply-side measures, because it takes into account the value of water in relation to its cost of provision, thereby treating it more like commodity (WRC, 1998).

Economic incentive approaches ensure that pollution control efforts are in the financial interests of polluters, as long as the cost of pollution is sufficiently low. Hence these mechanisms provide ongoing incentives for polluters to develop and adopt newer, better and cheaper pollution control technologies (Henderson, 1995).

2.5.2.1 Globalization

Government's intervention has a positive affect. A business related reason to take heed of the impact of globalization in an environmental context, is the increased "greening" of business (Sampson, 2000). This aspect has at least two subsets. The first is that may competitors oversea, particularly in Western countries, face strict environmental standards and laws in the operation of their businesses. This will, often in short to medium-term at least, have increased their costs of production, as they have to install cleaner technology, reduce their impact on traditionally used natural resources and substantially reduced their waste-streams. Where South African companies producing similar products and services wish to sell these overseas, they are increasingly being

called upon to show that they have adhered to similar environmental standards. This is not only to ensure that the importing country is satisfied that we are not unnecessarily harming the environment but is also for purely business reasons to ensure that the “playing fields” are level and that their industry can compete fairly with ours. The second subset is the impact which “greening” business has on investment in our local market. Green issues are big business overseas. Political parties win elections on these tickets. First world companies in particular appear increasingly to prefer to do business with environmentally like-minded companies in other countries (Hill, 2002).

Pollution control also places administrative duties on companies. This involves companies being obliged to obtain permits, certificates, Licenses and authorizations for various activities impacting on the environment. These administrative measures are increasingly becoming the most widely used techniques by governments to prevent environmental harm. Most Licensing controls are not designed to eliminate all pollution or risk but rather serve to control serious pollution and reduce its levels as much as possible. Licensing in all its guises is important to companies, without them a company cannot operate. They are becoming increasingly onerous with government authorities stipulating strict requirements for obtaining a License and then attaching equally strict conditions to the continued validity once the License is issued. It is therefore a proactive rather than reactive approach to pollution management.

2.5.2 Social aspect

Social factors such as dense urbanization and improving socio-economic conditions further pressurize resources through changes in attitudes among the population. Lifestyles become more consumptive and wasteful (with a predominance of waste products that are persistence in the environment) and lack of contact with the natural environment distances people from understanding the importance of environmental resources and services.

The financial effects of water pollution are seen in the increased costs of water supply and waste treatment, loss of revenue derived from recreational use of water and effects on

property values in the neighbourhood of polluted water. Where the costs of treating wastewater before discharge are borne by a manufacturer, this may be reflected in higher prices to the customers (McKnight *et al*, 1974). High levels of unemployment and poverty are driving the present need for job creation. The sectors, which are targeted for job creation, the types of employment and the degree of technological innovation will determine whether this is complementary to, or in conflict with sustainable development.

Prior to 1994, South Africa did not have a national institution responsible for ensuring equitable and sustainable access to water supply and sanitation services. In order to rectify this situation, the following programmes and policies were developed to support water supply and sanitation service delivery²:

- The Reconstruction and Development Programme, which identified the lack of access to adequate water supply and sanitation services as a priority for government intervention.
- The White Paper on Water Supply and Sanitation (1994) that outlined the strategy to achieve this goal of providing water services to 12 million people who did not have access to these services and 18 million people without sanitation.
- The National Constitution guaranteeing everyone a right to access to basic water supply and sanitation services necessary for human health and well-being.
- The recent White Paper on Household Sanitation, which committed government to clearing the sanitation backlog in the country within the next ten years. In order to achieve this, government has committed to providing a budget of 360 million per year over this period. The vision is for improved health, dignity and quality of life for all South African through improved sanitation and hygiene.
- The Water Services Act of 1997 provides a developmental regulatory framework for the provision of water services and clearly defines the roles and responsibilities of the different spheres of government. This Act has been designed to protect the poor and to make sure that they can take advantage of new development opportunities.

- In 2000 the government announced a policy of free basic water policy, which is designed to ensure that the poor household have access to safe drinking water. In July 2001 this policy was officially implemented, most local authorities are making every effort to provide free basic water to their customer³.

It is widely acknowledged that in the rural areas, women play a key role in the collection and safeguarding of water for domestic and in many cases agricultural use, but they have a much less influential role than men in management, problem analysis and in the decision-making process related to water resources.

The gender division of labor in many societies allocates to women the responsibility for collecting and storing water, caring for children and the sick, cooking, cleaning, and maintaining sanitation. The availability of a decent water supply and sanitation system goes a long way to improving the quality of life for poor women and their families. In many parts of the region, the arduous task of walking long distances over difficult terrain to fetch water falls to women, often with the help of their daughters. Women care for the sick, who are often children suffering diseases caused directly by contaminated water, example, *Vibrio Cholera*. Providing clean and dependable water close to the home can substantially reduce women's workloads, and free up time for women to engage in economic activities to improve household incomes. For girls, the time saved can be used to attend school. Hence, providing water supply and sanitation is pivotal to improving both the social and economic status of women, while simultaneously addressing gender and poverty concerns.

2.5.4 Technology aspect

Using cleaner technology in industrial processes will not only comply with conditions within the Licensing process but also decreases the fee for industrial effluent discharge. The positive spin off from cleaner technology is that it saves time and effort and is likely to save energy (Kirkwood *et al*, 1995).

Consequently because of legislation, typified by the National Water Act in South Africa, companies are being set stricter standards to which they have to conform. In order to stay in business they are having either to improve their processes to reduce waste or at the very least reduce the impact of their wastes by using treatment techniques. Chemical processes, which operate on a large scale and manufacture low cost products, cannot afford to waste either material or energy if they are to remain competitive. Therefore historically there has been an incentive to develop specific processes with complicated recycles for energy and unconverted raw materials, which generate the minimum of by-products.

Consequently where the cost can be absorbed by the business, environmentally based projects are being implanted. Where they cannot, it is possible that some manufactures will cease. Many companies compelled by these factors to make investments to reduce their environmental impact, are actually experiencing a greater pay back than expected because to hitherto unrecognized benefits.

2.5.4.1 The need for an even playing field

Legislation drives towards clean technology, which is even-handed and applied globally. This cleaner technology will result in continued improvement, provided the customer is willing to pay (Gouldon *et al*, 1993). The danger comes from unilateral strong action, which it could be argued will cause one company/country to be disadvantaged compared to another. This has two effects:

- (1) It gives an excuse to those inclined to do so to procrastinate whilst contesting the need for 'such stringent measures', whilst

- (2) It can disadvantage those who are compliant to such an extent that they can no longer afford to be in business. The net result could be self-defeating.

The concept encompasses the identification of new active materials, the process and formulation development, the manufacturer, use and after care. For the majority of such manufacturers the cost of waste in the past has not been the prime concern and they have not been naturally driven towards the use of clean technology.

The cost of waste is now being given a much higher profile and companies are beginning to see that waste minimization programmes are having a positive effect on their profitability. Often there is little or no capital expenditure required in achieving some of these savings. The overall tightening of controls for disposal of waste are increasing the cost of waste disposal, thus giving impetus for investment in technologies that enable manufacture without waste. There is a need for research and development in many areas so that we understand the biology of the systems we wish to control.

2.6 CONCLUSION

Mainly attributable to the high population growth and the concomitant need for employment and economic activity, together with the striving towards improved standards of services and socio-economic well-being, rapid growth in the requirements for water is experienced across the country. Based on current trends and utilisation patterns, projections are that the country's conventional water resources will likely be fully utilised before 2030, and that dramatic changes in water usage, with resultant large economic and social impacts, will then be forced upon the country over a relatively short period. As the overall water requirements in the country are considered against the total resource capability, this situation is bound to occur regardless of where the growth is experienced.

There are several options available to alleviate the situation and to ensure the sufficient availability of water in support of the long term sustainable prosperity of the country. To achieve this requires that timeous, judicious and purposeful changes be made to the

ways in which water is currently being utilised. It will not be possible to maintain water supplies indefinitely to sub-optimal uses, and the sooner the necessary directional changes are made, the more gradual and less traumatic the changes will be. This is the basis for the current licensing system that is promulgated in the National Water Act.

Due to South Africa's political history, emphasis is placed on eradicating the imbalances of the past. Section 24 of the Constitution gives right to the public, to an environment that is not harmful to their health or well-being. Therefore one cannot discharge effluent legally without having a License. Initially a supply-side management was used, which simply stood for continuing to expand supply to ever increasing demand. Now the focus has changed to demand-side management. Therefore, industries have to place more focus on cleaner production facilities. To address the past imbalances, government implemented several projects and projects.

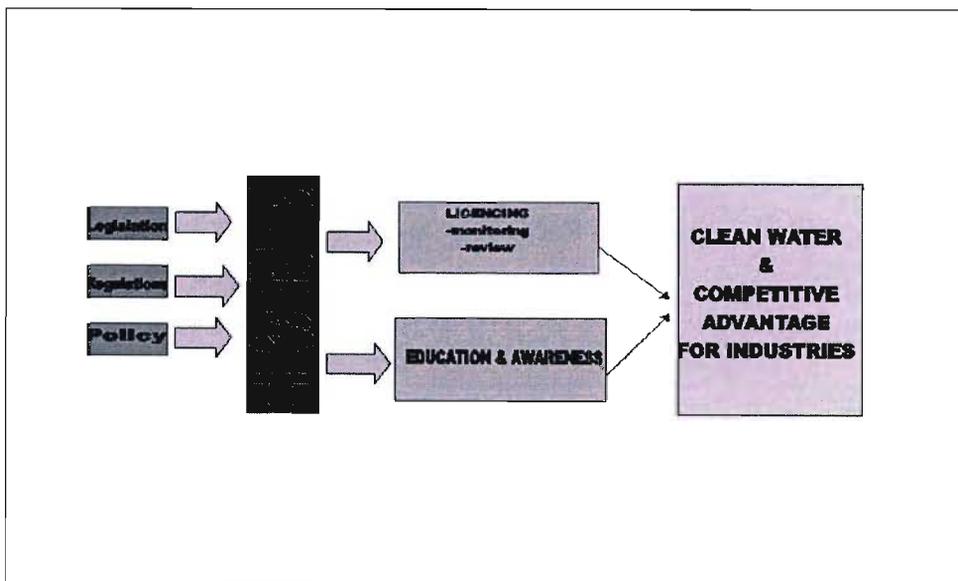


Figure 2.3: Model for clean water strategy

CHAPTER THREE

CASE STUDY

3.1 INTRODUCTION

This study reviews a specific case that has huge financial and environmental implications amongst Mhlathuze Water (a Water Board) (MW), several Industries (in the North Catchment) and the Department of Water Affairs and Forestry. Previously, under the old Water Act (Act 54 of 1956), exemptions and permits were issued to MW as well as all the contributors, to discharge to sea via the sea outfall pipelines. However, this was a complex situation since MW was responsible for the discharges through the sea outfalls but DWAF controlled what was discharged into the pipeline. Since Foskor, a contributor to the pipeline would be expanding their operation and consequently the industry and MW will soon exceed their permit conditions in terms of both volume and possibly concentration, in terms of the NWA (Act 36 of 1998), DWAF was to issue the license to MW, instead of the individual contributors to the pipeline. The reason for this approach is that DWAF needed to have direct control over all the discharges in order to manage the water cycle as a whole and to ensure proper control over the sea outfalls and the industries. The license application of MW will be put forward in terms of a case study that can be analyzed for valuable information regarding policy decisions. This method is relevant in that it focuses on one case and the study is thoroughly analyzed before conclusions are made. All the data gathered is relevant to this particular case study.

3.2 DATA COLLECTION

The targeted organizations, that is, the Department of Water Affairs and Forestry and Mhlathuze Water License Application are studied carefully and all the data sources between the two organizations are analyzed. The study focuses of the License aspect between the two organizations and excludes irrelevant information that has no benefit for this study.

3.2.1 Existing Exemptions

Previously, Exemption 1458B in terms of the Water Act, 1956 (Act 54 of 1956) was granted to MW on the 19 August 1991 for accepting effluent from the specified industries and waste water treatment facilities and to discharge this effluent to sea via the Mhlathuze Water Buoyant and Dense sea outfall pipelines.

Important conditions of this exemption relevant to the B-line are:

- The quantity discharged through diffuser 2 at the end of the 4.3km dense sea outfall shall be maintained at a constant 86 400m³ per day.
- The requirements of the General Standards as prescribed by the Minister of Water Affairs and Forestry in terms of Section 21 (1)(a) of the Water Act, 1956 (Act 54 of 1956) and published in Government Notice 991 of 18 May 1984, as amended from time to time, are waived.
- The effluent shall be of such a quality that the sea water quality outside the discharge zone of the pipeline shall meet with the Water Quality Criteria for the South African Coastal Zone, Report No. 94 of the South African National Scientific Programmes.
- Annual monitoring of the sea environment in the area of the sea outfall pipelines shall be carried out by the CSIR at the cost of the Exemptee, being MW,
- Annual diving inspection of pipelines A and B to be carried out for maintenance.

Exemption 1470B in terms of the Water Act, 1956 (Act 54 of 1956) was granted to Foskor on the 16 August 1991 (Attached as Appendix C) for the disposal of unpurified industrial effluent via the Mhlathuze Water Effluent Disposal System.

Allowable discharges specified in the exemption for disposal via the B-line are as follows:

- 5200 tons of gypsum (calculated as CaSO_4).
- 52 tons of fluoride (calculated as F)
- 16 300m³/day of water used for the slurring of the gypsum.

The Department of Water Affairs and Forestry requested MW to apply for a license in terms of the National Water Act (Act 36 of 1998) as it had been agreed that the total Mhlathuze Effluent Disposal System should be managed and controlled with one license. This implies that the license will replace the existing individual exemptions of the contributors to the effluent pipelines and that MW will be responsible for the control of discharges into the pipelines.

Furthermore, Foskor was in the process of increasing production with the resultant increase in discharge via the B-line to the sea. The potential impacts from this proposed expansion have been assessed through a formal Environmental Impact Assessment. The relevant authorities, namely the Kwa-Zulu Natal Department of Agriculture and Environmental Affairs (DAEA) and DWAF have approved the expansion. The license application is therefore, also to formalize the approval of the increased volumes and loads in the B-line.

3.2.2 Description of Area

A description of the locality, climate, surface water and ground water sources are given in detail below.

3.2.2.1 Locality

Richards Bay is situated 160km north of Durban and roughly 300km south of Maputo on the East Coast. This area is a fast growing industrial region with its important harbour and coal terminal. The high rainfall coastal strip comprises largely of sugar cane fields and timber plantations. The coastal dunes are rich in titanium group minerals.

3.2.2.2 Climate

Richards Bay has a hot, wet climate. The average daily maximum temperature is approximately 28⁰C in midwinter. The long term average annual rainfall for the area is approximately 1 200mm with most of the rainfall occurring between January and May. Extreme rainfall events, resulting in extensive flooding, caused by tropical cyclones can occur but infrequently. High humidity levels are the norm.

3.2.2.3 Surface Water Sources

The Richards Bay is unique in terms of its aquatic resources. It contains one of Kwa-Zulu Natal's largest river, four unique, freshwater coastal lakes and several important estuaries, the Mhlathuze Sanctuary, Mlalazi and Nhlabane. The area falls within the catchments of three rivers, the Nhlabane, Mhlathuze and Mlalazi. The Mhlathuze being the major source of water for urban and agricultural uses in the greater Richards Bay area. The four major freshwater lakes are Lake Nsezi, Cubhu, Mzingazi and Nhlabane. There are numerous seepage pans, swamps and marches as well.

3.2.2.4 Ground water sources

The unconsolidated and semi-consolidated sedimentary units around Richards Bay provide a vast storage area for ground water. The area is situated on the southern end of the Zululand coastal plain, which is regarded as one of South Africa's largest aquifer systems (Esterhuizen, 2001).

3.2.3 Effluent Systems

MW was established in the 1980 and has been in operation for 21 years. The effluent disposal system has been in place for 18 years and MW is responsible for accepting effluent discharges from seven contributors into the pipeline and the eventual disposal thereof into the sea.

The effluent disposal system consists of two separate pipelines, namely the buoyant effluent line (A-line) and the dense effluent line (B-line). The A-line consists of some 10km pipeline on-shore and 5.5km pipeline offshore. The A-line commences at a collecting chamber adjacent to the Mondi Kraft (Richards Bay) effluent treatment facility and delivers effluent by gravity to MW pump station No 1 at Alkantstrand. At this pump station, seawater is added to the effluent and the mixture is pumped through the A-line for discharge through diffusers located 5.5km out to sea at a depth of 30m.

The A-line combines effluent from Mondi Kraft (Richards Bay), Mondi Felixton and sludge or wastewater from Nsezi water treatment plant in a collecting chamber near the Mondi Kraft site. Before reaching surge tower 1 (ST1, indicated in Figure 3.1) additional effluent is pumped directly into the A-line from Bayside Aluminium and domestic sewage from the uMhlathuze Municipality's Alton station macerator. This effluent then gravitates to surge tower 2 (ST2). Effluent from Foskor (Pty) Ltd (previously known as Indian Ocean Fertilizers) and macerator is pumped into the line. Mixed effluent in the pipeline is drawn off at pump station No 2, located at ST1 and pumped to Foskor to slurry the gypsum for transportation via the B-line. The daily discharge to sea via the A-line is 160 000m³/day. Mondi Kraft and uMhlathuze Municipality are the largest contributors, contributing approximately 90 000m³/day and 20 000m³/day, respectively.

As mentioned in the previous paragraph effluent is drawn off at ST1 from the A-line and is pumped to the Foskor plant where it is used to slurry the gypsum. The slurry is then pumped to Pump Station No 1 at Alkantstrand via the B-line or dense effluent line. At this pump station the slurry is further diluted by the addition of seawater before being pumped out to sea via the B-line offshore section, which ends 4.3km from the pump station with a diffuser system at a depth of 25m.

Currently the daily discharge via the B-line is 86 400m³/day. As a result of the increased production at the Foskor plant (80% increase in production), the B-line has been upgraded to transport a maximum volume of 129 600m³/day. The current gypsum load is 5200t/day (calculated as CaSO₄) on average and a maximum of 7600t/day. With the

expansion this will increase to 13 340t/day of gypsum (calculated as CaSO_4) on average and a maximum of 14 300t/day.

Pump station 2 at ST 1 pumps effluent from the A-line via the C-line to Foskor for slurring the gypsum. This slurry is discharged to sea via the B-line as described above. Pipeline D has been designed to transport $7800\text{m}^3/\text{d}$ of effluent containing up to $92\text{t}/\text{d}$ of fluorine from Foskor to the A-line, which enters the A-line at a point immediately downstream of ST 1, described in Figure 3.1 below.

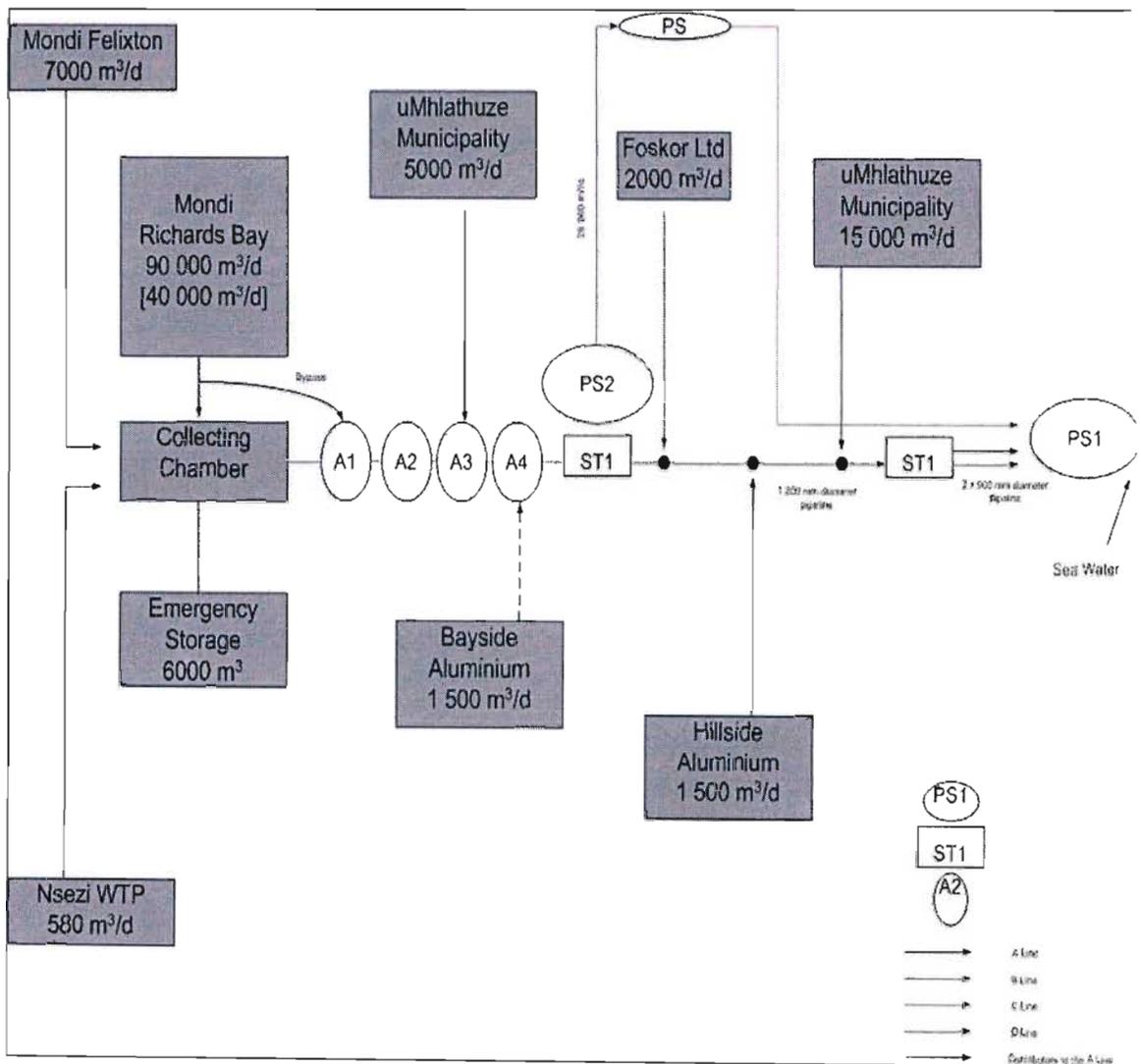


Figure 3.1: Buoyant & Dense Effluent Systems

3.2.4 Contributors to the System

This section describes each contributor to the pipelines exemption requirements, current disposal volumes and quality as well as their committed volumes and qualities as agreed with MW.

3.2.4.1 Mondi Kraft (Richards Bay)

Table 3.1: Mondi Kraft (Richards Bay) discharge summary

STATUS	VOLUME	QUALITY
Exemption 1074B	75 000 m ³ /d (Ave) 95 000 m ³ /d (Max)	Colour : 3100 Pt/Co units Ph: 2 – 9.5 Temp: 56 °C COD : 2000 mg/l SS: 600mg/l
Current – Average for October 2001	75 000 m ³ /d	Colour : 1635 Pt/Co units Ph: 8.7 Temp: 37.1 °C COD : 2 011 mg/l SS: 323 mg/l
Agreement with MW	90 000 m ³ /d 40 000 m ³ /d (option)	

3.2.4.2 Mondi Felixton

Table 3.2: Mondi Felixton discharge summary

STATUS	VOLUME	QUALITY
Exemption 1329B *	70 000 m ³ /d	Colour : 21000 Hazen units pH: 5 – 9.5 COD : 17 500 mg/l SS: 4000 mg/l
Current – Average for October 2001	5 864 m ³ /d	Colour : 18 600 Hazen units pH: 8.1 COD : 18 337 mg/l SS: 3 997 mg/l
Agreement with MW	7 000 m ³ /d	

3.2.4.3 Foskor (Pty) Ltd

Table 3.3: Foskor discharge summary

STATUS	VOLUME	QUALITY
Exemption 1470B	A Line: 7 600 m ³ /d B Line: 16 300 m ³ /d	A Line: 140t/day of fluoride Temp.: 45 °C B Line: 52t/day of fluoride 5 200t/d of CaSO ₄
Current – Average for October 2001	A Line: 664 m ³ /d B Line: 11 488 m ³ /d	A Line: 9.39t/day of fluoride B Line: 22.9t/day of fluoride 4 072 t/d of CaSO ₄
Agreement with MW	2 000 m ³ /d	

3.2.4.4 Bayside Aluminium

Table 3.4: Bayside Aluminium discharge summary

STATUS	VOLUME	QUALITY
Exemption 429B	55 000 m ³ /d	pH: 5 – 10 Temp: 45 ⁰ C COD: 110 mg/l SS: 25mg/l OA: 15mg/l
Current – Average for October 2001	1 500 m ³ /d	
Agreement with MW	1 500 m ³ /d	

3.2.4.5 Hillside Aluminium

Table 3.5: Hillside Aluminium discharge summary

STATUS	VOLUME	QUALITY
Exemption 2109B	384 m ³ /d	General standard
Current – Average for October 2001	1 500 m ³ /d	
Agreement with MW	1 500 m ³ /d	

096950

3.2.4.6 uMhlathuze Municipality

Table 3.6: uMhlathuze Municipality discharge summary

STATUS	VOLUME	QUALITY
Exemption 353B	10 000 m ³ /d	Grease, oils : 750 mg/l pH: 6 – 12 Temp.: 45 °C Sulphide: 25 mg/l
Current – Average for September 2001	20 000 m ³ /d	Arboretum Macerator: Grease, oils : 359.2 mg/l pH: 7.6 Temp.: 22.6 °C Sulphide: 0.1 mg/l Fluorides: 0.6 mg/l Phenols: 0.1 mg/l Ammonia: 48.6 mg/l Alton Macerator Grease, oils : 344.9 mg/l pH: 8.3 Temp.: 22.2 °C Sulphide: 0.1 mg/l Fluorides: 1.3 mg/l Phenols: 0.1 mg/l Ammonia: 14.6 mg/l
Agreement with MW	20 000 m ³ /d	

3.2.4.7 Nsezi Water Treatment Plant

Table 3.7: Nsezi discharge summary

STATUS	VOLUME	QUALITY
Exemption - No Exemption		
Current – Average for October 2001	580 m ³ /d	
Agreement with MW		

3.2.5 Public Involvement

A public participation process was held and it included presenting and discussing the license application process with key role-players. A wider public involvement process was not followed because the activity in question was an existing activity. An initial meeting was held on the 12 September 2001 with identified stakeholders. This meeting was used to indicate to the role-players the new strategy envisaged and the reasons for the new strategy (one license and one responsible institution). Furthermore, their concerns and issues that needed to be addressed were captured. A formal public meeting was arranged for the 4 December 2001. An advertisement was placed in the Zululand Observer inviting anybody to register as an interested and affected party. The results of the impact quantification investigation were presented at the meeting and all the attendees were requested to comment on the process and results. A third meeting was arranged in early 2002, where the progress was reported and the previous concerns and issues were addressed.

3.2.5 Quantification of Assimilative Capacity

The general conditions of both the A-line and B-line are discussed below.

3.2.6.1 General Conditions in the A-line buoyant effluent

In the calculation of the allowable loads that can be discharged via the A-line, it was accepted that the discharge will be constant, in other words fluctuations will be accommodated by adding sea water at the final pumping station. It was furthermore accepted that the end point concentration outside the mixing zone must comply with the SA Water Quality Guidelines for coastal marine waters.

The permissible load that may be discharged, will depend on:

- The maximum allowable concentration outside the mixing zone,
- The natural background concentration, and
- The dilution that can be achieved.

The dilution that can be achieved in turn depends on:

- The nature of the effluent (dense or buoyant),
- The water depth over the diffuser,
- The diameter of the ports (nozzles) through which the effluent is discharged,
- The conditions in the sea.

In the case of the A-line, the effluent is buoyant, the water depth over the diffuser is 30m, the port diameter is 75mm and the discharge velocity is about 4.5 m/s.

There are, in principle three sea conditions that have to be considered (see Figure 3.2) namely:

- Unstratified stagnant
- Stratified stagnant and
- Stratified flowing

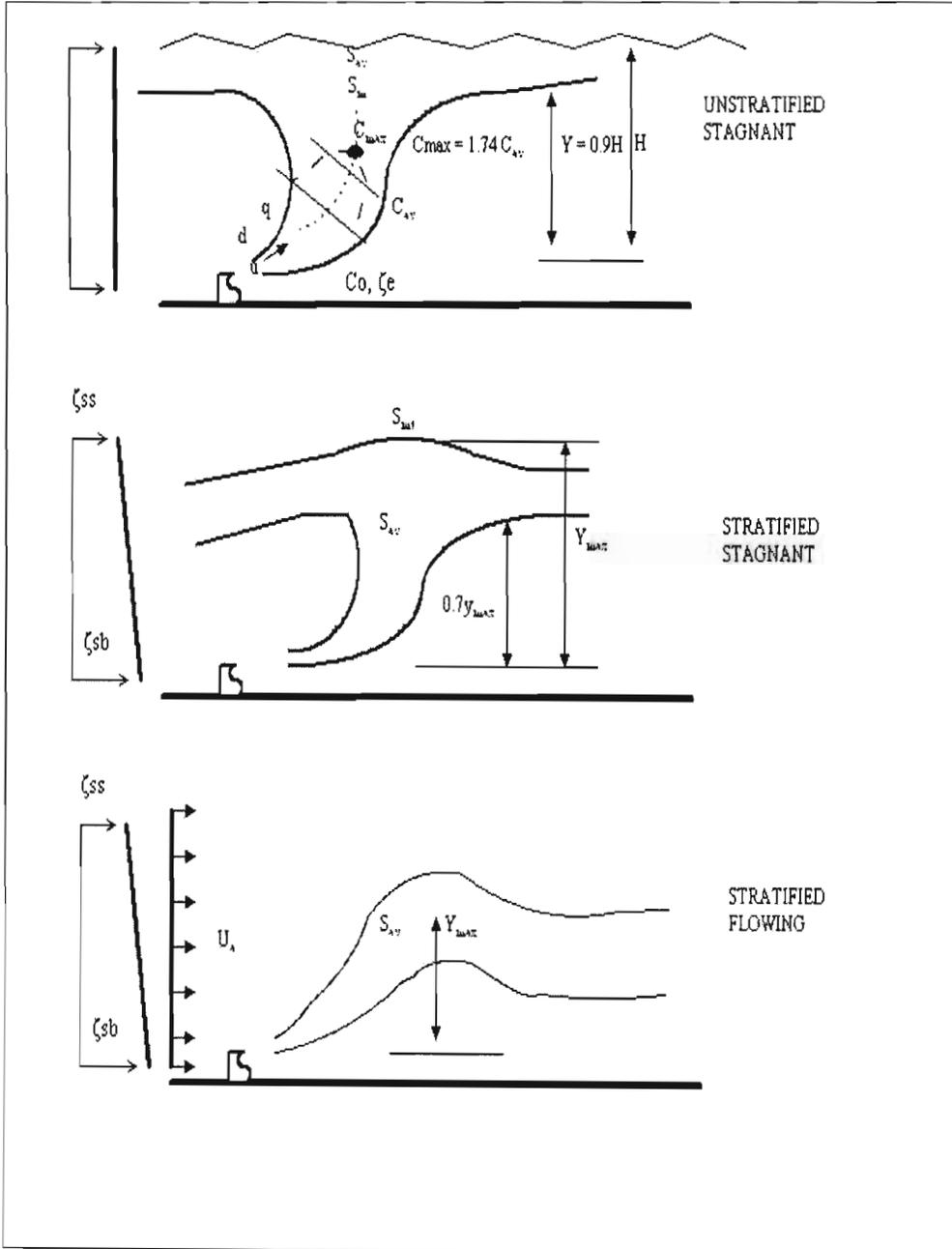


Figure 3.2: Initial Dilution of a Buoyant Effluent

3.2.6.2 B-line Buoyant effluent

Fluoride has been identified as the critical variable for the B-line and if the fluoride concentrations comply with the set targets, the effluent will have a negligible impact on the marine environment. Unfortunately, effective separation of gypsum and fluoride was never achieved because of the degree of complexity and cost (R30 M). The result is that all gypsum effluent containing fluoride is discharged via the B-Line.

3.2.7 Monitoring

A monitoring and auditing system will be proposed, which MW intends implementing.

3.2.8.1 Quantity

The flow of the water containing waste discharged via both sea outfall pipelines will be metered continuously at pump station no 1 at Alkantstrand. The flow meter will be placed such that only the effluent stream will be measured before dilution with seawater. The diluted discharge via the –line will be kept constant at 200 000m³/d and for the B-line at 129 600m³/d to ensure that the calculated dilutions will be achieved at all times. MW will also ensure that all contributors to the Mhlathuze Water Buoyant and Dense Effluent System monitor for flow at a point just before discharge into the A-line and B-line. MW will audit the results and monitoring equipment of the individual contributors on a regular basis.

3.2.8.2 Quality

It is impossible to monitor all variables that describe water quality, therefore, a limited number is chosen to be monitored. The variables of concern were identified based on the recognized water uses, of which the marine environment has been identified as the most critical, as well as what potentially could be discharged into the pipelines.

It is proposed that the quality of the water containing waste discharged via both sea outfall pipelines be monitored by taking grab samples at the no 1 pump station at Alkantstrand before it is diluted with sea water.

The water containing waste will be analyzed daily by taking a grab sample for the following variables:

- pH
- Ammonia (free and saline as N)
- Suspended solids
- Electrical Conductivity
- Chemical Oxygen Demand
- Fluoride (as F)
- Calcium Sulphate (CaSO₄)

The water containing waste will be analyzed every month by taking a grab sample for the following variables:

- Colour
- Temperature
- Oxygen Absorbed
- Soap, oil and grease

The water containing waste will be analyzed every third month by taking a grab sample for the following variables:

- Arsenic
- Total chromium (as Cr)
- Copper (as Cu)
- Lead (as Pb)
- Sulphide (as S)
- Mercury (as Hg)

MW will further ensure that each contributor implement a monitoring programme of the individual discharges into the pipeline. MW will present a compliance report of the discharge qualities of all the contributors of the pipelines on a six monthly basis to the Mhlathuze Pipeline Forum. At the forum meetings initiatives taken by MW and the

contributors with regard to waste minimization, cleaner technology and pollution prevention measures will be reported.

3.2.8.3 Monitoring of the receiving environment

MW will inspect the sea once a week by using the Portnet helicopter for discolouration caused by the sea outfall. Records will be kept of any sightings and actions taken to rectify the discolouration. Prior to the construction of the pipelines, a research programme was implemented to assess the status of various aspects of the environment in the vicinity of the pipelines. Since the initial assessment, two surveys per year have been undertaken to assess the impact of the discharge at the diffusers. The frequency was later reduced to an annual assessment. These surveys considered the chemical and bacteriological status of benthic macrofauna and fish species on a grid over the diffusers. Furthermore, toxicity testing has been carried out on the effluent of all major contributors on a three monthly basis. MW will continue with these assessments at the same frequency.

MW also carries out annual underwater inspections of both pipelines for maintenance ensuring that potential pipe failures are repaired and blockages are cleared. MW will continue conducting annual underwater inspections of the pipelines (Esterhuizen, 2002).

3.3 APPROVAL OF TEMPORARY AMENDMENT TO EXEMPTION

Considering that the increased flows and loads' potential impact on the marine environment has been quantified and found to be acceptable and that MW has already applied for a license, approval that the specific conditions in the respective exemptions be amended to reflect the following was issued. (The proposed amendments are in bold).

Exemption 1458B, condition 1.2 be amended:

The quantity discharged through diffuser 2 shall be maintained at a constant **129 600 (one hundred and twenty nine thousand and six hundred) m³** per day, which shall consist

of effluent discharged into the 6 300 m dense landline and sea-water make-up at Pump Station 1.

Exemption 1470B, condition 1.2.1 be amended:

Discharges via the Dense sea outfall pipeline of **Mhlathuze Water**:

(a) **12 340t/day of gypsum (calculated as CaSO₄) on average and a maximum of 14 300t on any one day.**

(b) **62t/day of fluoride (calculated as F) on average and a maximum of 72 t/day of fluoride on any one day.**

129 600 (one hundred and twenty nine thousand and six hundred) m³ per day which shall consist of effluent discharged into the 6 300 m dense landline and sea water make-up at Pump Station 1.

The license to MW was issued by the DWAF on the 6 September 2002. The conditions of the license are attached to the appendix.

3.4 CONCLUSION

The license issued to MW by DWAF is relevant to both parties because it constitutes a legal agreement. This agreement needs to be abided by MW and monitored by DWAF. The above case study will be analyzed in the next chapter. An evaluation of the license procedure, using the MW license application as an example, will be discussed.

CHAPTER FOUR

ANALYSIS OF DATA AND DISCUSSIONS OF FINDINGS

4.1 INTRODUCTION

According to the water user authorization process, a set procedure has to be followed in order for the licenses to be issued. The first step is that of administration followed by assessment and estimation of potential impacts of the water resource. The last step is the evaluation of the application through comparison with relevant regulatory criteria. The outcome of this evaluation leads to a decision.

The Constitution, Section 32, Access to information, gives DWAF a right, which is immense for an assessment and decision-making mechanism. In its nature and on the basis of the provisions of section 41 of the NWA, in which DWAF can obtain all the information it requires to evaluate a license application; great care have to be taken in the gathering of information. Also, the Justice administration action act gives the right to administration action that is lawful, reasonable and procedurally fair and everyone whose rights have been adversary affected by administrative action has the right to be given written reasons. In terms of this right, all administrative actions of civil servants, including assessment and decision-making processes, must be within the law, always reasonable and always unbiased. Any action taken by a civil servant can be made subject to judicial review, in which case the official must be able to defend the actions and decisions on the grounds of fairness, lawfulness and reason. For this reason, the NWA makes provision for an appeal procedure against decisions made in relation to license applications and the establishment of a water tribunal.

4.2 DOCUMENT ANALYSIS

The application will be analyzed, below.

4.2.1 Water Authorisation Process

The NWA contains various provisions that must be considered during the process of licensing. In accordance with Chapter 4 of the NWA, source directed measures (SDM) must be implemented by the applicant (e.g. waste minimization techniques, infrastructure, etc) must be taken into consideration when evaluating license applications and determining license conditions. The interfaces between the assessment of the potential impact on the water use and the decision regarding the application for a water use license, based on the assessment of the application in the context of the provisions of the NWA, is schematically illustrated in Figure 4.1 below.

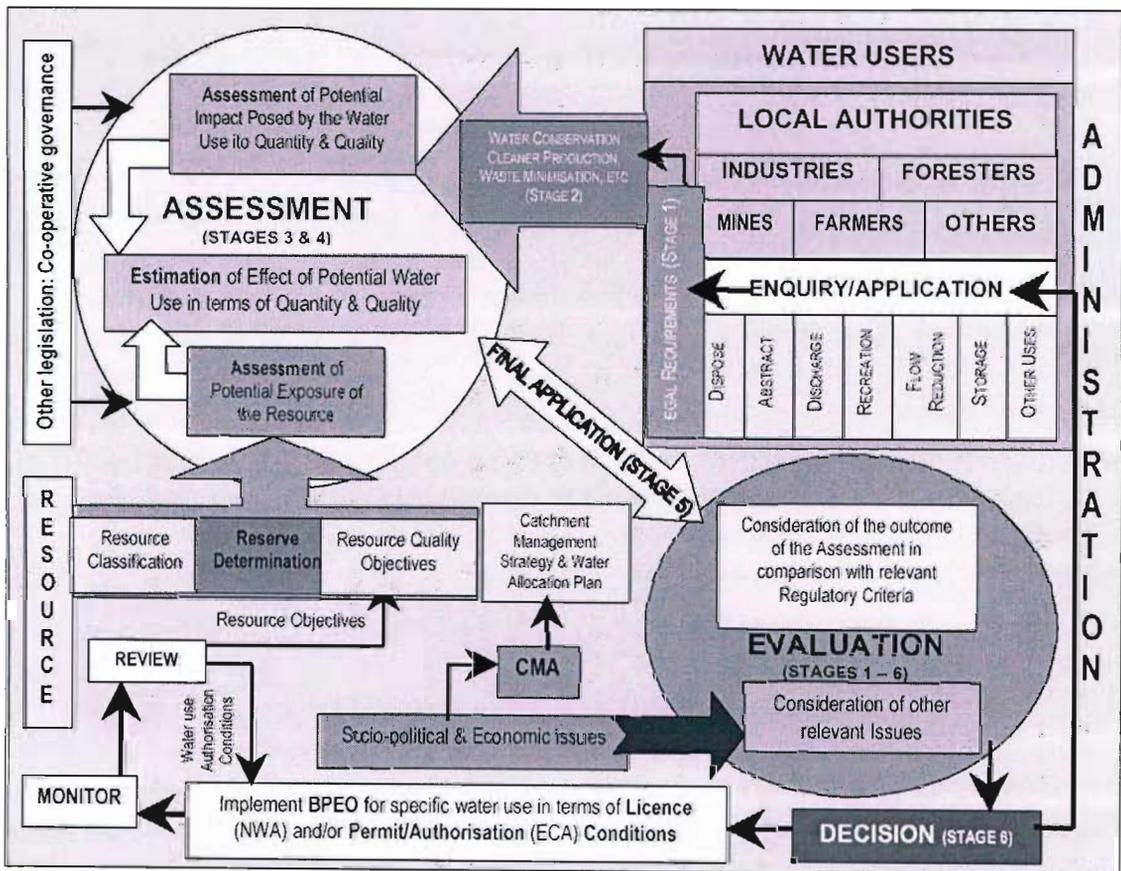


Figure 4.1: Conceptual Assessment and Decision-making Framework

4.2.2 Conceptual Authorisation Framework

The process to authorize the use of water under to s21 of the NWA consists of three **integrated** components, namely:

- a procedure for the **administration** of the application for a license to use water.
- a procedure to generate sufficient information regarding the **assessment** of potential impacts in terms of quantity and quality that would facilitate the **estimation** of potential impacts of the use against the resource requirements;
- a procedure for the **evaluation** of the application in order to reach a **decision** regarding whether to authorize a water use or not.

4.2.2.1 The Administration Process

MW sent a license application to the Department of Water Affairs and Forestry for the correct water use as described in section 21(h) of the Act, to dispose in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process. The license application forms DW 770, DW 778, were completed. Through the **administration of the process**, the intention by MW was recorded. The WARMS has been developed and is currently being optimized to facilitate the administration of applications for and the management of water use authorizations. In this regard, it must be noted that the **registration** of current water uses on WARMS does not authorize the water use, but is merely an administrative step to obtain information and build a database with regard to current water use, which will assist in facilitating the prioritization of future authorization of such use. This application initiated the formal administrative process at DWAF and included information on the planned process to be followed. The initial meeting was held on the 12 September 2001. At the meeting it was concluded that Mhlathuze Water could continue with the application process and that a final motivational report for the applied volumes and qualities for discharge can be compiled and submitted for approval. An administrative fee of R114.00 was paid to DWAF for the application to be captured onto the WARMS database.

The 1996 Constitution allows for universal adult suffrage to ensure accountability, responsiveness and openness of elected representatives. Section 195 of the 1996 Constitution spells out the values and principles of public administration that includes the encouragement of public participation and responsiveness to public need. The Batho Pele principles encourage all government departments to consult the public about current services and the provision of new services. The NWA makes reference to public participation to the process of water management throughout the Act. Section 5, 8, 13, 16, 35, 38, 41, 56, 67, 69, 78, 88, 92, and 96 all require that notices seeking written comments on the relevant issues to be published by the Government Gazette. The administration aspect was concisely done.

4.2.2.2 The Assessment and Estimation Process

Assessments are conducted from a **technical** perspective and in accordance with relevant **legislation**, which aims to **estimate** the impact of the use (assessment done by MW) on the water resource. The decision on whether to issue a license is influenced by various factors, but a key component is the outcome of the technical assessment conducted by the applicant on the potential effects of the water use on the resource quality. The outcome of this **assessment** will determine whether such use will be sustainable or will pollute the water resource on the basis of the characteristics of the source and the environmental conditions (exposure of the resource). The impact of any water use on all the different aspects of the resource quality must therefore be assessed.

Asante-Duah (1993:112) states that provision should be made for different **levels of assessments**, namely qualitative, semi-quantitative, or quantitative, depending on circumstances such as the urgency of the decision, the severity of the impact, and the amount and quality of information provided. The procedures for each tier of assessment should, however, be the same, in order to facilitate an integrated decision regarding the BPEO to be implemented. Each progressive tier should require a more detailed investigation aimed at the gathering of **information**, in order to prove that the nature of

the impact is of a lesser extent than that presumed by the conservative assumption, and on which decisions can be based.

MW implemented a research programme to assess the status of various aspects of the environment in the vicinity of the pipelines. Since the initial assessment, two surveys per annum have been conducted to assess the impact of the discharge. The frequency was later reduced to an annual assessment. These surveys considered the chemical and bacteriological status of the water column and seabed as well as assessing the health status of benthic marofauna and fish species. Furthermore, a toxicity testing has been carried out on the effluent of all major contributors.

According to the Environmental Studies in the “*Richards Bay Offshore Outfall Region, Report No. 13, surveys made in 1999*”, the two surveys of the offshore stations demonstrated excellent water quality, with the exception of Station E5 during the May cruise, when some contamination from the effluent plume was evident, and the bacterial count downgraded the water to a Class II classification. However it was of such a dilute nature that it presented no threat to the bathing beaches of Richards Bay. In October 1999 water in the harbour mouth showed higher contamination, being rated Class III, indicating that the harbour is a nearer and often more contaminated risk to water quality at the main bathing beach of Richards Bay, than the pipeline. In the two surveys conducted on the shoreline, the stations in the harbour and all the beach stations showed excellent water quality. The Bhizolo Canal and Mhlathuze estuary samples for May were not rich in coliforms but both tested positive for Salmonellae. This was again the case for the Mhlathuze estuary in October 1999. However these systems remain relatively free of faecal contamination. Overall, the surveys of the sea in the vicinity of Richards Bay show that the marine environment was not microbiologically impaired as a consequence of the pipeline discharges. The water quality of the bay and harbour stations demonstrates some impact from terrestrial runoff.

The benthic macrofauna study results, showed the usual tendency for the samples to be muddier in the deeper water on the seaward side of the sampling grid. In past surveys

this has resulted in more abundant and diverse communities offshore as well. The 1999 survey revealed an unusually rich community compared with all past years surveys. Thus while benthic macrofaunal counts and taxonomic diversity was still low compared with the Durban and Umkomass, suggesting that conditions in the months leading up to the May 1999 surveys were particularly favorable to the benthos.

While there has been a general improvement in the macrofaunal community structure of Richards Bay, some stations close to the B-line diffuser, were relatively impoverished. This perpetuates the pattern in past surveys that the B line discharge is exerting a moderate negative influence on the benthic community close to its diffuser. In contrast to the macrofauna, the sandy samples were richer in meiofauna (animals smaller than 1mm) than the muddy samples. The combined analysis is thus very useful as the two communities compliment each other. Apart from close to the B-line, healthy communities prevailed and the state of the benthos was satisfactory.

The water chemistry in the vicinity of the pipeline is good. No trace metal values exceeded the Water Quality Guideline recommendations for the South African coastal marine environment. Fluoride concentrations in offshore waters were generally at the normal seawater background of about 1.3 to 1.5 mg/l.

A similar picture was described for sediments, with no values of trace metals in sediments reaching levels known to cause adverse impact to benthic communities living in the sediments. This confirms the results of the community studies, described above. All metals in the fish examined were less or about similar to 1998 levels, with the exception of copper and, to a lesser extent, zinc. All compared well with material from other parts of the world. Measured levels of fluoride in the backbones of fishes were slightly increased from 1998, continuing the observed trend of a slight but steady increase over the past 18 years. These values, despite the currently observed increase, compare very favourably with levels in Antarctic fish of 616-1207 g/g wet mass².

The otter trawl catches for 1999/2000 were similar to or slightly better than the past 10 years of sampling, with no evidence in the records from the past eighteen years to suggest that the marine outfalls have exerted any negative impact on the catches at the three trawl sites. There has been a notable increase in the number of pleuronectiform fishes (sole, flounder and tongue fish) since 1990, a trend that continued in 1999.

Toxicity testing of all major components to the pipeline indicated that most of the components maintained similar toxicity to that recorded in 1998. Two exceptions were the Alusaf fluoride effluent and the Alton sewage effluent. In the latter case, this may be related to increasing volumes of industrial effluent being discharged into the sewerage system, and that it should be investigated further if the trend continues.

These surveys concluded that there is no evidence of a continuous build-up of gypsum or trace metals in the area surrounding the pipeline diffusers. All qualities were within accepted limits and there was no evidence of excessive accumulation of trace metal in the fishes collected in the vicinity of the pipeline. Though toxicity testing of the individual waste streams has indicated in general that the effluents are not toxic (Connell, 2000).

⇒ **A-line Diffuser**

Richards Bay falls in the upper portion of what is known as the Natal bight, where the relatively wide continental shelf forces the Agulhas current further away from the shore. This means that the A-line diffuser is situated well inshore of the Agulhas current and that coastal flow takes the form of counter-currents, transient eddies and generally variable conditions.

It has been accepted that the worst-case conditions (unstratified stagnant), will occur for a significant part of the time. This has therefore been accepted as “the sea condition” that will be used to calculate the dilution. In order to calculate the permissible load (in tons/day), the volume and concentration that will be allowed must be known. The current permissible volume is 160 000 m³/day, but the pipeline and the pumps can achieve a

volume of 200 000 m³/day. The concentration in turn depends on the ambient background concentration, and the allowable maximum concentration:

$$C_{eff} = (Dilution + \frac{C_{sea}}{C_{target} - C_{sea}})$$

where C = concentration

The dilution that can be achieved for the conditions as described in the previous paragraphs is :

$$Dilution = 0.186F[1.6 + 5(y/dF) + (Y/dF)^2]^{5/6}$$

where F = Froude number

Y = Effective depth (90% of water depth)

D = Port Diameter (75 mm)

The Froude number is a function of the relative densities of the two fluids and the discharge velocity. Two values for the density of the effluent have been reported, namely 1,001 and 1,002. the density of seawater is 1,025.

Using the above information and relationships, the probable range of dilution can be calculated as shown in Table 4.1. It should be noted that physical observations elsewhere suggest that the dilution may be underrated by a factor of between 2 and 3. this means that the calculations that follow are extremely conservative and have built-in safety factor.

Table 4.1: Range of dilution for the A line diffuser

Effluent Density (kg/l)	Velocity at Nozzles (m/s)	Froude No	Dilution Achieved	
			Average	Minimum
1,001	4	30	471	271
1,001	5	38	432	248
1,001	6	45	406	233
1,002	4	31	467	269
1,002	5	38	429	247
1,002	6	46	403	232

The minimum dilution that can be expected will therefore vary between 230 and 270, whereas the average dilution will vary between 400 and 470. The minimum dilution will occur along the centre line of the plume.

The higher the discharge rate, the higher will be the nozzle velocity and the lower the dilution that will be achieved. This problem can be overcome by increasing the length of the diffuser, thereby providing more ports and reducing the flow velocity through the individual ports. However, it has been accepted that the diffuser will not be modified. The density of the effluent, whether it is 1.001 or 1.002 has very little effect on the dilution that is achieved.

For a discharge velocity of 4.5 m/s (160 000m³/day) the minimum dilution is 250, while for a discharge velocity of 5,6 m/s (200 000 m³/day) the minimum dilution will be 240. this is a very narrow range, and a dilution of 250 can be accepted for the purposes of load calculations, especially seen in the light of the very conservative approach that has been taken in the calculations.

From this the permissible loads can now be calculated.

Table 4.2: Permissible loads for the A – line diffuser

Substance	C Seawater (mg/l)	C Target (mg/l)	Dissolved Fraction	Permissible Load (ton/day)	
				@ 160 000 m ³ /day	@ 200 000 m ³ /day
Fluoride	1.5	5.0	0.9	156	195
Copper	0.0009	0.005	1.0	0.164	0.205
Zinc	0.0066	0.025	1.0	0.737	0.922
Lead	0.00015	0.012	1.0	0.474	0.593
Chromium	0.000 071	0.008	1.0	0.317	0.396
COD	5.0	75	0.9	3501	3890

The above calculations were made and the permissible loads were then incorporated into the license agreement for the A-line diffuser.

⇒ **B-line Dense Effluent**

Based on Foskor’s expansion, it was requested by them to increase their load of fluoride from 52t/day to 72t/day. Therefore additional information was asked for, before making the decision. The information was information based on a **more detailed investigation** for the **quantitative determination** of actual or potential risks, for which MW could make use of predictive models, simulations, fault trees etc, to provide an accurate estimation of the actual or potential estimated impact.

The specialist’s study: *“Determination of a maximum permissible effluent discharge into the Foskor’s dense disposal line with the use of chemical modeling and kinetic experiments”*, was conducted. *CSIR Report ENV-P-C 2001-078, dated February 2001*, assessed the impact of fluoride the expanded marine outfall will have on the marine environment. The study concluded: “The projected fluoride concentration at seabed under expanded operations is 2.6mg/l, which is much lower than the limit imposed upon

Foskor by DWAF. There is no obvious reason to decrease the limit of 52t F per day in the B-line. Furthermore, a later report dated 20 January 2002: *“Relationship between fluoride loading in the dense effluent (B-) line of Richards Bay and the concentration of soluble fluoride at sea bed-Systems Dynamic Simulation Model”* prepared by Dr Wade for Foskor, to quantify the maximum fluoride load that can be discharging while still complying to the target marine water quality requirement concluded that: “Under the “worst case” scenario of a stagnant sea and assuming the “time of flight” of the dense effluent plume from ejector nozzle to sea bed of 12 seconds, a fluoride loading of 200 tons/day in the dense (B-) line is anticipated to be permissible. Thus the required 72t/day fluoride should not impact the marine environment negatively.

As each progressive tier of assessment reduces the level of uncertainty, **the level of judgment** required in the decision is also reduced, to ensure an administratively fair and just procedure. In instances where large sums of money will have to be spent in order to remedy the situation, it will be worthwhile to conduct a detailed quantitative investigation before deciding on the most cost-effective option for implementing a specific water use. The more quantitative the investigation, the less the level of uncertainty. From this, it is evident that the assessment of the potential impacts of the water use, are in order to reach a decision regarding the application. This can be an iterative process.

Since these assessments can be costly, it is of utmost importance that the assessment be conducted at the appropriate level of detail. The authorization process is therefore a staged process, with each stage having a particular purpose and objective, involves a specific type of **assessment**, and has an outcome that is the result of a **decision** regarding the application.

4.2.2.3 The Decision Process

When the effect of the water use had been estimated, the application can be **evaluated** through comparison with relevant regulatory criteria. The outcome of this evaluation leads to a **decision**. It is important to note that such decision could be either to inform MW that the application progresses to the next stage, that further information is required,

or that the water use would not be authorized based on the information generated during the assessment and estimation. It must be noted here that the responsible official dealing with the application can make decisions regarding the submission of additional information, or regarding progress to a next stage. However, decisions regarding whether or not to allow the water use by the issuing or refusal of a license, may only be taken by officials delegated (Delegated Authority: DA) to do so by the Minister of Water Affairs and Forestry. Where appropriate, members of the public must be able to request that the optimum exposure levels for a specific area or action be made less strict or stricter than national regulatory criteria. This involvement of interested and affected parties is done as part of the evaluation of the application during decision-making and not as part of the technical assessment of the impact, but may lead to the re-assessment of the impact of a specific water use license application.

DWAF could not issue MW with a license for a sea-outfall pipeline. In fact a legal vacuum exists and no license or permission can be granted under any current law. The NWA defines a water resource as including a watercourse, surface water, estuary or aquifer. This definition therefore implies that the NWA is not applicable to the marine environment as a water resource and that DWAF does not or should not perform the function of lead agent with regard to the marine environment. But, the NWA also defines a water resource through a pipe, canal, sewer, **sea outfall**, or other conduit. A person may only initiate or continue with such a water use if that water use is a continuation of an existing lawful use or if that water use is authorized by a license in terms of the NWA. It is clear that there is a contradiction in the NWA with regard to control over discharges to the marine environment via sea outfall pipelines.

Due to Foskor's expansion, Foskor would be non-compliant. Foskor wrote a letter containing information on the process followed by Foskor, approvals received for the expansion project and critical dates for the initiation of the expansion. The letter further mentioned the implication of a license not being issued, would mean that Foskor will not be able to sell their product to overseas markets because they will not comply with the strict import requirements of other countries.

According to Legal Services in DWAF, the permits do not allow for amendment of the exemptions, due to the new legislation, the NWA. The exemption of Foskor can also not just be withdrawn since it covers more than just the discharge to the pipeline. Foskor and MW wanted assurance that DWAF would not prosecute, should Foskor then increase production which will result in non-compliance, by having higher flows and loads being discharged via the B-line with their, as well as the MW. Therefore there was an urgent need to amend the exemptions of the MW and Foskor to reflect the higher flows and loads. DWAF then decided to issue a temporary amendment to the exemption, until the license was issued to MW. This was done in accordance to Section 27 of the NWA, which specifies that some factors must be taken into consideration when considering a water use authorization, such as:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a license;
- Alignment with the catchment management strategy;
- The impact of the water use, resource directed measures;
- Investments made by the applicant in respect of the water use in question.

If the license was not issued, many industries in the Richards Bay area would be out of compliance hence they would have to close their factories and thousands of jobs will be lost.

MW did not implement the hierarchy of waste principles. Prevention, minimization, reuse and recycle were not made mention of. In order to reduce environmental degradation, MW needs to implement these principles in its day-to-day practices. With Foskor expanding its operation to an increase of 80 %, alternatives should have been considered for the gypsum disposal. The case study mentioned that “ *the effective separation of gypsum and fluoride was never achieved because of the degree of complexity and cost (R30M). The result is that all the gypsum effluent containing fluoride is discharged via the B-line.*”

Huntsman Tioxide (South Coast), also produces gypsum as a by product. Their gypsum process was modified to remove iron from the waste acid. The significant step changed the gypsum from white to red and has actually enhanced the product's properties. This by-product is sold for agricultural purposes, construction and soil remediation. A similar research programme should be considered at Foskor, where the by-product is sold instead of it causing environmental degradation.

Cleaner production methods were also not mentioned. By not taking these factors into account MW, has to bare the costs at the end of the pipeline. The higher the waste load and concentration, the higher the waste discharge fee that has to be paid. Therefore, MW should strive to minimize the costs of the operation. MW should stipulate to the industries that higher costs would be charged to them if the above principles are not in place. A more efficient raw material utilization and a decrease in the amount of waste generated are key factors which will encourage industry to minimize its environmental impact (quote from Prof. Thomson's handout). Avoiding these losses improves both the business and environmental performance of a company.

Monitoring was also a key issue that was not touched on adequately. DWAF issued the license, however, stipulated in the license conditions that need to be noted by MW. In Section 3, 4 and 5 of the license, monitoring of both quality and quantity will be done. The frequency and methods are included in the license. The monitoring programme will include the variables that will be analyzed, the frequency of monitoring and the number and positions of monitoring points.

The objectives of the monitoring programme will be to:

- Determine the compliance with the stipulated license conditions,
- confirm that the discharge does not impact negatively on the marine environment, and
- audit the monitoring conducted by the individual contributors of the pipelines.

Section 7 states that investigations should be conducted, with regard to the waste minimization practices (according to the license conditions in Appendix 1).

The license agreement between MW & DWAF expires on the 31 January 2042. However, the license will be reviewed every five years. Regular monitoring will occur from DWAF's part to ensure that MW is complying with the license. If MW is not complying, DWAF will have to revoke the license.

4.3 CONCLUSION

The above procedure was discussed in conjunction with the license application motivation sent to DWAF. Due to the studies of presented by MW, which indicated non-pollution of sea-outfalls and also due to the socio-economic structure of the Richards Bay area, a license was granted on the 6 September 2002. In order for Foskor to be complaint in the export markets, DWAF granted a temporary amendment to MW, till the license was in place. Once the license was issued, several conditions were attached, that had to be heeded by MW. The license is valid for 40 years however it will be reviewed every five years and monitoring by DWAF will occur regularly. If MW does not comply with the license, the license will be withdrawn and the industries would be closed. A co-operative approach rather than an adversial approach is used to sort pollution problems. Charges are only laid as a last resort where the offender is willfully or negligently violating the requirements of the National Water Act and is unwilling to take the necessary steps to comply.

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

There are several recommendations and conclusions were made in general, regarding licensing. These recommendations should be considered and implemented carefully, to ensure an efficient and effective flow of licensing at the Department of Water Affairs and Forestry.

5.2 RECOMMENDATIONS

- ✓ There should be better co-operation between DWAF who issues licenses for source control and DEAT, who is the custodian of the resource, the sea. This will result in better-integrated pollution control and quicker identification by the regulators when remediation is necessary.
- ✓ Research should also be ongoing on monitoring techniques to ensure that all the outfalls and effluents are monitored by the latest technological standards so as to alert timeously to any environmental risk.
- ✓ The fiscal authorities could grant reductions in taxes for the negative incentives. For example, Westin notes that Arkansas exempts from its sales and use taxes on any sale of pollution control equipment, which has the effect of reducing the cost of complying with environmental standards. The state of Louisiana grants property tax on pollution control facilities. This provision is similar to the tax on pollution but is done in reverse as the taxpayer starts with a fixed tax burden that can be reduced by environmental compliance. Studies should be conducted and this approach can be adopted by South Africa.
- ✓ Allowances as well as subsidies can be granted for capital expenditure on cleaner technology. This will reduce the cost that the consumer would have to pay and it will motivate industries to purchase cleaner technology.

- ✓ Industrial effluents constitute possibly the biggest threat via Richards Bay sea outfalls. Priority areas have to be closely looked at to ensure that industrial effluents entering the pipelines are fully controlled. In the outfalls' catchments those source categories that require special attention need inventories to be compiled and maintained. Following from here, comprehensive programmes for the reduction and elimination of these sources is needed. Action plans should include Best Available Techniques (BAT), Best Environmental Practice (BEP), the Precautionary Principle and Integrated Pollution Prevention and Control.
- ✓ At the national level, policies and legislation aimed at reducing the rate of resource depletion include the NWA (which has introduced a radical new pricing structure to reflect the true cost of water users and makes provision for a minimum allowance per person per day). Making the user pay the full cost of inputs such as water and energy will deter users from wasting the resources and will go a long way towards promoting sustainable use. Licensing systems are already in place to control access to and harvesting of many marine resources but the effectiveness of these systems is uncertain, due to shortages in policing capacity. Despite these problems with monitoring and effectiveness, it is certain that they can only succeed if there is political will, financial commitment, continued support and sufficient staff capacity to implement, police and enforce compliance with laws and regulations. The plethora of new Acts and restructuring of DWAF requires political and financial commitment to ensure they are operational; otherwise they merely serve to lip service to environmental issues. Setting standards for emissions to air and water and setting penalties for non-compliance with these is also meaningless unless there is the staff capacity and funding too monitoring discharges and enforce regulations.
- ✓ The exponential population growth is the underlying cause of rapid transformation, loss of biodiversity, resource depletion, generation of waste and pollution and impaired ecosystem functioning. The growth rate of population needs to be slowed and stabilized at 80 million by 2100. If population growth can be slowed, the use of resources at a sustainable rate and conservation of sufficient levels of resources for future generations, are more tangible outcomes.

- ✓ Even though the Constitution is present, many (especially the severely affected community members) are not aware of their rights. DWAF should establish an advisory section that educates and creates awareness of the above act to the disadvantaged. Also, an education and awareness programme and stringent water conservation measures, need to be implemented in order to reduce demand to a reasonable level. These are positive steps towards an improved culture of stakeholder participation and will in the long term contribute to the success of schemes for sustainable resource use. Methods of supplying this reduced demand should be investigated.
- ✓ Various frameworks and sectoral policies also tackle waste and pollution at a national level, including the Dumping At Sea Control Act, the National Coastal Management Policy, the Energy White Paper, the Atmospheric Pollution prevention Act, the National Water Act and the National Environmental Conservation Act. Perhaps the most over-arching is the Constitution, which states that everyone has the right to an environment, which is not harmful to his or her health or well-being. This empowers communities and individuals to protect their environments from pollution and waste and to prosecute offenders through the Constitutional court. In practice this may not be effective as it is in principle, due to shortages in capacity and awareness. However, these too need resources in order to operate effectively. Despite NEMA's purpose of establishing co-operative environmental governance by establishing principles for decision-making matters affecting the environment, these principles are rarely put into practice. Greater need and emphasis needs to be established in order for better decisions to be made.
- ✓ The NWA is perhaps the most revolutionary of all South Africa's legislation, as it makes provision for an "ecological reserve" which is the minimum amount of water which must remain in the river or water body, for it to function normally. There are technicalities still to be finalized in terms of this Act, such as the exact amount of the reserve and how the relevant authorities will regulate preservation of the reserve. This will contribute to improved water quantity and quality in future for both human and environmental uses.

- ✓ The implementation of technologically and managerially more demanding policies and strategies requires better-qualified and more experienced personnel. The availability of experienced consultants and of sufficient suitably qualified personnel in Water Affairs has to be addressed.
- ✓ Water quality managers and the public need to be trained, developed and educated on water quality issues therefore appropriate communications, negotiation and decision-making forums and procedure, need to be established.
- ✓ The water quality staff in the KZN DWAF region has decreased by 50%. A retention policy needs to be developed and implemented to retain expertise within the department.
- ✓ Continuous evaluation and where necessary amendment of the National Water Act needs to be addressed in order to meet changing times and circumstances.
- ✓ A significant inadequacy of NEMA is the fact that roles, responsibilities and authorities of different environmentally related line functions as well as between various spheres of government are not clearly define. For example both NEMA and NWA make provision for the control of emergency incidents. This can give rise to conflict between the different departments if one or the other department or a private person decides to investigate the incident through a specific department in order to negate or reduce the other department's authority. Another problem that needs to be addressed is formalizing procedural arrangements between departments that have joint jurisdiction over an activity. NEMA is not explicit on how to pro-actively make arrangements to avoid conflict.
- ✓ The licensing task should be devolved to local Catchment management agencies that are currently being established. This will relieve pressure on the available manpower resources at central government level, then it may be more appropriate to enforce license conditions. The advantages of this are that responsibility, accountability and authority are held at the catchment level.
- ✓ Transferable water licenses should be considered. Transferability of water licenses is pertinent to the transfer of land. In the past, water rights were generally automatically with transfers in land. However, the position is now different, as water rights are now no longer real rights but personal rights.

- ✓ There should be discussions of the situation and options on an inter-departmental basis to coordinate the strategies and actions of the Department of Water Affairs and Forestry with the national development strategies and priorities.
- ✓ There is a need to improve the monitoring and database on water use as well as the estimates of future water requirements. Both surface and groundwater should be included. Also, to improve the assessments of water requirements to sustain an appropriate level of natural environmental health.
- ✓ There should be further discussions and possible negotiations with respect to the importation of water.
- ✓ Keep abreast of developments with respect to desalination of sea, weather modification and the towing of icebergs.
- ✓ National needs are economic growth, employment, peace, stability and security, alleviation of poverty, fair access to resources and provision of infrastructure and services. Failure to ensure that ecosystem functioning is not impaired will only further reduce the capability to meet national needs, as human development is dependant on environmental services and resources. We therefore have to ensure that habitat loss and fragmentation is stopped, that resources are not depleted or polluted and that diversity is maintained, in order to ensure proper ecosystem functioning and ability to provide for the needs of the human population.

5.3 CONCLUSIONS

Mainly attributed to the high population growth and the concomitant need for employment and economic activity, together with the striving towards improved standards of service and socio-economic well-being, rapid growth in the requirements for water is experienced across the country. Water sustains life. Without water, life will cease to exist. Will there be sufficient water of appropriate quality? Therefore the term sustainable development crept in. DWAF had to step in to manage the resource, as well as the demands made on this resource whilst protecting it and ensuring sustainable and equitable use by current and future generations. How was DWAF going to ensure that sustainable development occurs? Despite DWAF using the Uniform Effluent Standards and Receiving Water Quality Objectives, these approaches did not perform to their

expectations and they had their shortcomings. The above approaches changed due to an increase in mining and industrial activities from the agricultural based activities. The licensing system was then introduced.

Licensing ensures the regulation of water use, which encompasses redressing past imbalances of water allocation, socio-economic impacts of decisions made, efficient and beneficial use of water in the public interest, as well as the impact of the water use. Water was being abstracted from watercourses only to be contaminated by industrial processes and thereafter the effluent was discharged back into these water resources creating a major deterioration of water quality. With the licensing system, conditions are stipulated within the license and is monitored by the applicant and audited by DWAF regularly. This license is valid for forty years but is reviewed every five years by DWAF. If the conditions are not compliance, the license will be revoked and the industry will not be legitimate.

Previously, water was not allocated in a democratic fashion. The enactment of the NWA reflects the new democratic spirit by giving effect to the constitutional right of the access to clean water. The NWA was promulgated to give effect to Section 24 of the Constitution, entitling everyone to an environment that is not harmful to his or her health and well-being. The government has an obligation to the public to manage the resource effectively and efficiently. If this is not done procedurally correct, the public can take the government to task. The problem with this however, is that many (especially the affected) are not aware of this constitutional right.

The mind set of the water users had to be changed, where initially water was plentiful but now, it is limited. Therefore the water pricing strategy was developed to dissuade water users from abusing this resource. The greater the quantity and concentration of effluent being discharged the higher the fee. This economic incentive approach ensures that pollution control efforts are in the financial interests of polluters, as long as the cost of pollution is low. This also creates a sense of ownership on the resource. There are both negative and positive spin-offs of this economic incentive. Firstly, these rising costs

would ultimately fall on the water users. Therefore the consumers bare the brunt of these costs.

Secondly this affects globalization. This will create a decrease in Foreign Direct Investments (FDI's) but the positive being that the natural resources will not be over exploited, as in the past. A source of concern of free trade, which encourages firms from advanced nations to move manufacturing facilities offshore to less developed countries that lack adequate regulations to protect labour and the environment from abuse by the unscrupulous. Globalisation critics often argue that adhering to labour and environmental regulations significantly increases the costs of manufacturing enterprises and puts them at a competitive disadvantage in the global market place verses firms based in developing nations that do not have to comply with such regulations. Therefore firms deal with this cost disadvantage, by moving their production facilities to nations that do not have such burdensome regulations they have on their books. Free trade can lead to an increase in pollution and result in firms from advanced nations exploiting the labour of less developed nations. An example, were this argument was used repeatedly by those who apposed the 1994 formation of the North American Free Trade Agreement (NAFTA) between Canada, Mexico and the United States. US manufacturing firms moved to Mexico in droves so that they would be free to pollute the environment employ child labour and ignore workplace safety and health issues, all in the name of higher profits. Tougher regulations and stricter labour standards go hand in hand with economic progress.

The imposition of the incentives would impact adversely on those activities and on the economy as a whole. An example is, for the South African mining industry it has been estimated that a 20% reduction in carbon dioxide emissions from major coal consumers would imply a reduction in coal sales of at least 30 million tons of coal per year. This would translate into a loss of revenue to mines of about one billion Rand and a loss of about 13 000 employment opportunities.

Despite various programmes and policies being implemented there is still a high demand of river water by the rural community. In the year 2001, when the cholera epidemic hit South Africa many people died with this bacterial infection. A study was conducted by DWAF, which concluded that the community members preferred drinking water from rivers and boreholes, than drinking water from reservoirs.

Many companies are still not keen on cleaner technology due to cost implications. More emphasis should be placed on Cleaner production since it can be an advantage to both the environment and it can add a competitive advantage to the industry. However the consumer would have to bear the increased rise in costs. Although licensing is a necessary, it will not be successful if there is insufficient capacity to monitor it.

The successful combination of command and control strategies with empowerment of civil society also establishes a unique informal relationship between insiders and outsiders. This relationship suggests that the multiple governance system is driven by the inherent mismatch between the aspirations, skills, as well as the values and knowledge subsystems of insiders making decisions and outsiders affected by decisions. Insiders often have information about issues but they neither the mandate nor the opportunity to challenge bureaucratic behaviour patterns. Outsiders, on the other hand, may have the motivation to challenge bureaucratic behaviour but they often lack the necessary information to gain support and a sympathetic hearing. Both groups are therefore incapacitated to act as a result of their inherent inadequacies. Outsiders are now afforded access to information and other instruments, while outsiders gain access to external expertise and support systems, which are empowered to challenge issues. Innovative combination of command and control instruments with especially civil-based instruments and agreements generates a mutual dependency between insiders and outsiders. This relationship ensures that the multiple system is continually sustained and renewed when compared with single and more coercive instruments such as command and control arrangements as well as other incentives or discentives. The redundant nature of multiple outsider structures, also tend to serve as mutually support or emergency support systems,

for at least one outsider subsystem is bound to succeed, where others may fail, while it also provides an informal system of backup reliability.

DWAF has indicated its commitment to redressing the inequities of the past. The prevailing attitude is that “We will find the water where people ask for it and have a reasonable chance of using it well”. But this denies the fact that most of the water has already been allocated to established commercial sectors. One mechanism for redress is the registration and licensing process put in place by the new NWA. All users have to declare their use and requirements. This allows for a review of the “reasonableness” of existing allocations and may well free up some water. Rhetorically we may ask, “Will this water once again be locked up in deals within the established sectors under the pressures of organized demand or will some water be kept for the use of the rural poor?” because licenses do not offer permanent allocations but only for a limited duration, this water could in theory always be redirected to meet a greater need or “more deserving” user. In practice the costs, implications and practicalities of rescinding a license on which livelihoods are dependant will be a tough provision to implement. Along with the licensing of users, other mechanisms are being developed to free up water and to optimize its use. Optimization is a double-edged sword. As water is freed up or found to be available, it is, in a land of scarcity, likely to be quickly snapped up by other ready and hungry users. Typically the water trading mechanism now being considered for agriculture could lead to that water being traded into the industrial sector. Mechanisms of this nature are a prerequisite for efficiency and growth. But the other edge of the sword is that this water then becomes ever more tightly locked up. It has a new and efficient user and will, in all likelihood and despite the authority, which will have to revoke licenses, never become available again. This means that such water will never become accessible to the rural poor. DWAF needs to address this.

South Africa remains a water poor country and the wise allocation and utilization of this most vital of natural resources among competing and often conflicting requirements, is fundamental to promoting balanced economic development and improved social conditions on an environmentally sustainable basis.

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7. APPENDIX A

Attached is a copy of the License agreement between Mhlathuze Water and the Department of Water Affairs and Forestry.

1. Water User (Licensee)

The water user authorised in terms of this License is:

Mhlathuze Water

PO Box 1264

RICHARDS BAY

3900

2. Water Use

This License is issued for the following water use:

A water use as described in section 21(h) of the Act, to dispose in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process, subject to the conditions set out in Appendix I and II hereto.

3. (a) Description of the property on which the authority will be exercised

Water use:

A-line-Buoyant Effluent: From the Mondi Kraft Richards Bay collection chamber to the no1 pump station at Alkantstrand into the sea *via* the Mhlathuze Water sea outfall pipeline.

B-line-Dense Effluent: From the Foskor Limited Richards Bay Division pump station to the no1 pump station at Alkantstrand into the sea *via* the Mhlathuze Water sea outfall pipeline.

(b) Registered owner of the property is

Water use: Mhlathuze Water

The water use relates to pipelines collecting water containing waste from several contributors and discharging the effluent into the Indian Ocean. The pipelines run along existing servitudes crossing numerous properties. The pipeline routes are shown on Figure 3: Mhlathuze Effluent Disposal System: Contributors to the A-line and B-line, of the Mhlathuze Water Buoyant & Dense Effluent System: License Application Motivation, dated January 2002.

4. This License supersedes Exemption 1458B issued to Mhlathuze Water Board on the 19th of August 1991 in terms of Section 21(4) of the Water Act, 1956 (Act 54 of 1956).

5. (a) License Period
This License expires on 31 January 2042.

- (b) Review Period
As provided under section 49 of the Act, this License shall be reviewed every five years during February. Upon review of this License, any condition of the License, other than the License period, may be amended if
 - (i) it is necessary or desirable to prevent deterioration or further deterioration of the quality of the water resource;
 - (ii) there is insufficient water in the water resource to accommodate all authorised water uses after allowing for international obligations and the Reserve, the latter of which consists of the amount and quality of water necessary to satisfy basic human needs and to protect aquatic ecosystems; or
 - (iii) it is necessary or desirable to accommodate demands brought about by changes in socio-economic circumstances, and it is in the public interest to meet those demands.

This License and the amendment of this License are also subject to all the applicable procedural requirements and other applicable provisions of the Act, as amended from time to time.

6. Definitions

“Act” means the National Water Act, 1998 (Act 36 of 1998);

“Minister” means the Minister of Water Affairs and Forestry;

“Department” means the Department of Water Affairs and Forestry;

“Director-General” means the Director-General: Water Affairs and Forestry;

“Mixing zone” means the sea-water column, within a radius equivalent to twice the maximum depth of water above the diffuser, measured horizontally from any point on the diffuser, where active mixing takes place and marine water quality guidelines need not be met; and

“Regional Director” means the Regional Director: Water Resource Management, KwaZulu-Natal, Department of Water Affairs and Forestry, P.O. Box 1018, Durban, 4000.

1.1 General conditions

Below are the general conditions stipulated.

- The responsibility for complying with the provisions of the License is vested in the Licensee and may not be ceded to any other person or body.
- The License is subject to section 54 of the Act.
- In terms of section 151 of the Act, any contravention of or failure to comply with a condition of the License constitutes an offence.
- In terms of section 124 of the Act, the Minister and any person authorised by him in writing may at any time enter upon the premises of the Licensee to perform the functions contemplated in section 125(1), (2) and (3) of the Act.
- The License shall not be construed as exempting the Licensee from compliance with the provisions of the Health Act, 1977 (Act 63 of 1977), the Environment Conservation Act, 1989 (Act 73 of 1989) or any other applicable act, ordinance, regulation or by-law.
- Any incident that causes or may cause water pollution shall immediately be reported to the Regional Director or his representative.
- The Licensee shall immediately inform the Regional Director of any change in his name, address and/or premises and legal status.
- The Licensee shall in terms of Regulation No. 1352 published in Government Gazette No. 20606 in terms of section 26(1)(c) of the Act register the authorised water use.

1.2 Conditions of the License

Water Use 2: Section 21(h) of the National Water Act, 1998 (Act 36 of 1998)

DISPOSING IN ANY MANNER OF WATER WHICH CONTAINS WASTE FROM, OR WHICH HAS BEEN HEATED IN, ANY INDUSTRIAL OR POWER GENERATION PROCESS.

1.2.1 QUANTITY OF WATER CONTAINING WASTE

1.2.1.1 This License authorises:

- The disposal of a constant quantity of 73 000 000 (seventy three million) cubic metres (m³) of water containing waste per annum to the sea through the buoyant sea outfall pipeline. The discharge shall be maintained at a constant 200 000m³ per day at the end of diffuser 1, which shall consist of a maximum of 160 000m³ water containing waste measured at pump station 1 and a minimum of 40 000m³ sea-water make-up.
- The disposal of a constant quantity of 47 304 000 (forty seven million three hundred and four thousand) cubic metres (m³) of water containing waste per annum to the sea through the dense sea outfall pipeline. The discharge shall be maintained at a constant 129 600m³ per day at the end of diffuser 2, which shall consist of a maximum of 30 000m³ water containing waste measured at pump station 1 and a minimum of 99 600m³ sea-water make-up.
- The disposal of the following maximum load quantities of water containing waste via the buoyant sea outfall line, calculated as daily averages over a calendar month:
 - (a) 156 (one hundred and fifty six) tons of fluoride (calculated as F).
 - (b) 3112 (three thousand one hundred and twelve) tons of COD.
 - (c) 0.164 (one hundred and sixty four thousandths) tons of Copper (calculated as Cu).

- (d) 0.738 (seven hundred and thirty eight thousandths) tons of Zinc (calculated as Zn).
 - (e) 0.474 (four hundred and seventy four thousandths) tons of Lead (calculated as Pb).
 - (f) 0.317 (three hundred and seventeen thousandths) tons of Chromium (calculated as Cr).
 - (g) 0.156 (one hundred and fifty six thousandths) tons of Cadmium (calculated as Cd).
 - (h) 0.014 (fourteen thousandths) tons of Mercury (calculated as Hg).
 - (i) 21 (twenty one) tons of free and saline ammonia (calculated as Hg).
- The disposal of the following maximum load quantities of water containing waste via the dense sea outfall line, calculated as daily averages over a calendar month:
 - (a) 72 (seventy two) tons of fluoride (calculated as F) on any one day.
 - (b) 14 300 (fourteen thousand three hundred) tons of gypsum (calculated as CaSO₄) on any one day.

1.2 The quantities of water containing waste authorised to be discharged in terms of this License may not be exceeded.

1.2.2 QUALITY OF WATER CONTAINING WASTE

- The quality of the water containing waste discharged *via* the A sea outfall pipeline shall not exceed the maximum concentrations listed below at any time at a point before dilution with seawater:

pH	2,0 to 10,0
Chemical oxygen demand	15 600 mg/ℓ
Suspended solids	550 mg/ℓ

Soap, oil and grease	100 mg/ℓ
Colour, turbidity and clarity	2700 Pt/Co units
Free and saline ammonia (as N)	100 mg/ℓ
Hexavalent chromium (as Cr)	1,6 mg/ℓ
Copper (as Cu)	0.82 mg/ℓ
Lead (as Pb)	2,4 mg/ℓ
Sulphide (as S)	4.0 mg/ℓ
Fluoride (as F)	780 mg/ℓ
Zinc (as Zn)	3,7 mg/ℓ
Cadmium (as Cd)	0.78 mg/ℓ
Mercury (as Hg)	0.07 mg/ℓ

- The quality of the water containing waste discharged *via* the B sea outfall pipeline shall not exceed the maximum concentration listed below at any time at a point before dilution with seawater:

	Maximum Concentration on any day	Maximum Load
Fluoride (in solution)	560 mg/l	72000 kg/d
Copper	6 mg/l	187 kg/d
Cobalt	3 mg/l	90 kg/d
Zinc	5 mg/l	145 kg/d
Lead	2 mg/l	54 kg/d
Strontium	1200 mg/l	36000 kg/d
Chromium	12 mg/l	372 kg/d
Cadmium	9 mg/l	264 kg/d
pH	1.5-10	

- The water containing waste discharged shall be of such a quality and be discharged in such a manner that the sea-water outside the mixing zone of the pipeline shall comply with the Water Quality Guidelines for Coastal Marine Waters in accordance with the specific beneficial use areas (reference: Department of Water Affairs and Forestry, 1995, South African Water Quality Guidelines for Coastal Marine Waters, Volumes 1-4, First Edition).
- The water containing waste discharged shall not contain any substance which can create a nuisance on the beach or in the sea or which may have any adverse effects on bathing or other recreational uses or the marine life.

1.2.3 MONITORING

1.2.3.1 QUANTITY

- The daily flow of the water containing waste discharged *via* both sea outfall pipelines shall be calculated at the monitoring point.
- The calculation of the daily volumes shall be determined by the pump(s) capacity multiplied by the time in operation.

1.2.3.2 QUALITY

- The quality of the water containing waste discharged *via* both sea outfall pipelines shall be monitored by taking a grab sample every day at the monitoring point. Each sample shall be analysed for the following variables:

pH	
Ammonia (free and saline as N)	in mg/l
Suspended solids	in mg/l
Chemical oxygen demand	in mg/l
Fluoride	in mg/l
CaSO ₄	in mg/l

and/or any other variables as may be required from time to time by the Regional Director.

- The quality of the water containing waste discharged via both the sea outfall pipelines shall be monitored by taking a grab sample every month at the monitoring point described. Each sample shall be analysed for the following variables:

Colour	platinum-cobalt units
Temperature	in °C
Soap, oil and grease	in mg/l
Free and Saline Ammonia	in mg/l

- The quality of the water containing waste discharged via both the sea outfall pipelines shall be monitored by taking a grab sample every third month at the monitoring point. Each sample shall be analysed for the following variables:

Arsenic	in mg/l
Total chromium	in mg/l
Copper	in mg/l
Lead	in mg/l
Sulphide	in mg/l
Mercury	in mg/l
Zinc	in mg/l
Cadmium	in mg/l

and/or any other variables as may be required from time to time by the Regional Director.

1.2.4 MONITORING OF THE RECEIVING WATER

- The sea shall be inspected (land-based observation) once a week for discolouration caused by the sea outfall. Records shall be kept on a daily basis including a summary of actions taken and submitted to the Regional Director on a monthly basis.
- The Licensee shall on an annual basis, cause a program of systematic chemical, marine and biological investigations to be carried out by a suitably qualified person or body approved by the Regional Director, in order to determine the impact on the marine life in the mixing zone of the water containing waste and surrounding areas of the discharge. These investigations will include monitoring aspects such as marine sediments, bacteriological quality, waste toxicity testing, macrobenhtos, meiofauna and seawater. A copy of the report shall be submitted to the Regional Director after each investigation. If required by the Regional Director, in writing, the frequency of the sea monitoring shall be increased.
- The entire buoyant and dense sea outfall pipelines and diffusers 1 and 2 shall be inspected annually by divers or methodology approved by the Regional Director, for physical defects. Should sudden pressure drops indicate possible ruptures in the pipelines, or upon request of the Regional Director, divers shall be sent down for immediate inspection.
- A monitoring programme as agreed upon between the Regional Director and the Licensee, shall be carried out by the Licensee in the surf zone along the coastline potentially impacted by the discharge.

1.2.5 METHODS OF ANALYSIS

- Analyses shall be carried out in accordance with methods prescribed by and obtainable from the South African Bureau of Standards, in terms of the Standards Act, Act 30 of 1982, or any other method approved in writing by the Regional Director.

- The methods of analysis shall not be changed without prior notification to and written approval by the Minister or his/her delegated nominee.

1.2.6 MONITORING POINTS

Monitoring for quantity and quality shall be carried out at least at the monitoring points listed below.

- Monitoring points for quantity

☼The quantity of water containing waste discharged *via* both sea outfall pipelines shall be metered at pump station 1 at Alkantstrand.

- Monitoring points for quality

☼The quality of water containing waste discharged via both sea outfall pipelines shall be monitored at pump station 1 at Alkantstrand at a point in the pipe before dilution with seawater.

- The Regional Director may change the positions of the above monitoring points and/or add more monitoring points at any time.

1.2.7 INVESTIGATIONS

- The Licensee shall investigate means of optimising dispersion at sea, preventing discolourations and minimising the impact at sea, including diffuser modification and other waste minimisation initiatives. The Licensee shall report on the above on an annual basis to the Department.
- The Licensee shall, in conjunction with all the contributors into the pipelines, continue to implement the separation of water containing waste from stormwater systems as well as means of reuse and recycling of all streams of water containing waste and all polluted stormwater for industrial purposes. This must be reported annually to the Department.
- The Licensee shall also present a compliance report of all contributors to the pipelines on a six monthly basis to the Mhlathuze Pipeline Forum. At the forum meetings initiatives taken by the Licensee and the contributors with regard to waste minimisation, cleaner technology, and pollution prevention measures shall be reported.

1.2.8 PIPELINES

- The pipelines used for the conveyance of water containing waste shall be clearly marked, painted in a conspicuous colour or manufactured of a coloured material distinctly different from the colour of the pipelines in which drinking water is flowing to avoid the possibility of any cross-connections of the different pipelines.
- Measures shall be taken to ensure that only authorised personnel can effect changes to waste control valves.
- The Department shall have the right to inspect both sea outfall pipelines and associated structures and equipment independently and may appoint any person to do such an inspection.
- The pipelines from the Licensee's premises to the beach and the pumping facility shall be inspected on a weekly basis to check for any leaks or malfunctions and records shall be kept of such inspections.
- The Licensee shall have the full length of both sea outfall pipelines as well as the ocean bed directly above both sea outfall pipelines and the diffusers surveyed annually by methods approved in writing by the Regional Director to monitor the stability or any mechanical failure, which may develop. These methods may include a visual record of the inspection, either by photographic means or by video camera. This survey shall also be performed upon written request by the Regional Director, should reasonable doubt exist as to the condition or operation of both sea outfall pipelines or to the conditions prevailing in the sea.

1.2.9 ABNORMAL CONDITIONS

- Accurate and up-to-date records shall be kept of all system malfunctions resulting in the disposal of water containing waste not in accordance with the requirements of this License. The records shall be tabulated under the following headings with a full explanation of all the contributory circumstances:

☼Operating errors;

☼mechanical failures (including design, installation or maintenance);

☼environmental factors (e.g. floods);

☼loss of supply services (e.g. power failure); and

☼other causes.

1.2.10 REPORTING

- A summary of the details as required in terms of this License shall be submitted monthly to the Regional Director or where otherwise stated, within one month of the close of the period.
- A report on the stability, mechanical integrity and physical operation of the pipeline shall be submitted to the Regional Director as soon as it becomes available, but not later than two months after being surveyed or upon request of the Regional Director.
- The Licensee shall make a public presentation at least once per annum of the report required .
- The Licensee shall commission an independent consultant to peer review the report required.
- Incidents that are likely to cause pollution or that have resulted in pollution shall immediately be reported to the Regional Director.