ARA-Centro
Administração Regional de Águas do Centro

WATERSCHAP
Hunze en Aa's

Concessions for discharges of waste water in Mozambique

A study performed under the project WATPLAG

Client:
ARA Centro
Partners for Water

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COLOPHON

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Future Water
Waterschap Hunze en Aa's
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CONTENT

ANNEXES

1. INTRODUCTION

The role of ARA Centro

ARA Centro is responsible for the water management of surface water and ground water (quality and quantity). ARA Centro provides clean and sufficient water whereby is taken into account the different interests of nature, industry and agriculture. So everyone in the area of ARA Centro can benefit and profit from the water. The giving out of concessions for discharges for waste water of companies and cities is one of the formal tools that fall under the jurisdiction of ARA Centro to control the water quality of the rivers.

Main subjects of the study

ARA Centro wants to develop a system for concessions for discharges. In this study the Mozambican laws and regulations are studied and used to make a proposal for a concession system. The development of a water quality concession for the Waste Water Treatment Plant (ETAR) of Beira was used as a pilot to test the system. ARA Centro also wants to start with a fee system to charge the dischargers a fee for their polluting discharge on the surface water.

During the study some other subjects came up that are related to the water quality concessions. One subject is the measuring of Mercury in the surface water and sediment of the rivers Pungwe and Buzi to know about the current situation. Another subject is finding laboratory facilities for analysing waste water samples and surface water samples for ARA Centro.

A third subject was the positioning of water quality and role of ARA Centro.

2. CONCESSION SYSTEM FOR DISCHARGING WASTE WATER

Preventing the surface water from polluting. That´s the target of the project with which ARA Centro is intending to start a concession system for discharges of waste water on surface water. The meaning of this system is to ensure a good water quality to all users. Within this system the companies are expected to appeal for a concession to discharge their waste water on the surface water. By giving out these concessions ARA Centro knows exactly what substances can be discharged by each company. Through the concession ARA Centro can prescribe extra treatment to limit the total effect on the surface water. This will prevent the river water from poisoning or polluting. In this way the surface water can always be used for agriculture purposes, drinking water, fishing etc.

Concessions for discharging waste water in the Mozambique law

The first step was to explore the possibilities of a concession system for water discharges within the Mozambique laws.

The protection of the surface water, giving out of concessions and jurisdiction is arranged in:

- Water law, nr. 16/91 de 3 de August; general law on water affairs
- Decree nr. 26/91 de 14 de November + Decree ministerial 43/2007 de 30 de October; Statutes discharges effluent and licensing of water uses and effluent discharges and its monitoring Art. 22 and art. 65 nr. 1; Requests for private use and water use or discharge of effluents will be submitted to the ARA´s.
- Water Policy 46/2007 de 21 de August; guidelines environmental protection, environmental flows and protection zones. This law designate certain areas who need special protection.
- Regulation of licences and concessions for water use + model Decree Ministerial 43/2007
- Environmental law (20/97 de 1 de October); general law on environmental affairs
- Regulation of standards of environmental quality and effluent discharges (decree 18/2004, de 2 de June)

The overall conclusion is that everything around the concession system is well arranged in the Mozambican laws, except for the application form and a format for a concession for discharging waste water.

Concession for an ETAR as a pilot

To start with this concession system ARA Centro had the intention to make a concept concession for an ETAR for discharging treated waste water on surface water. This concept concession is used as a pilot in this study.

To collect the necessary data for this concession ARA Centro and Hunze en Aa´s visited the General director of the Sewer system and Waste Water Treatment Plant and the Plant manager of the ETAR Beira. In this way we received technical information about the design and functioning of the plant. With these data we have prepared a concession. However some information is still lacking:

- At the point of measuring we need more information about frequencies, monitoring system and measuring methods. We also need more knowledge about the influent and effluent figures
- For a concession an environmental impact assessment can be required (Environmental law de 7 de October 1997, art. 15). If it needs to be done depends on the ecological impact of the company. An “A” company needs to do a complete environmental impact assessment which needs approval of the minister. A “B” company can do a environmental simplified study which needs approval of the provincial environmental department and a “C” company hasn´t any ecological impact and therefore don´t need a study. A waste water treatment plant like ETAR Beira needs to do an environmental impact assessment to get a concession of the Ministry of Environmental Affairs (Micoa). For the ETAR Beira the environmental impact assessment has been made for the upgrade of the whole drainage system of Beira of which the new ETAR was a part. However after that study the design of the ETAR changed from a system with sedimentation ponds into a system with Activated Sludge Treatment. For this changed design was no separate environmental study or assessment executed, so this study is lacking.

The procedure to get to a concession

The procedure to get to a concession contains the following information:

1. Application

To get a concession a company has to fill in an application form and send that to an ARA. The application form describes the information that the company has to deliver. With this information an ARA can prepare a concession.
As application form for water discharges we translated and transformed a Dutch application form for water discharges into a useful Mozambican example. This form we discussed with ARA Centro and afterward the form was adapted to their proposals (see Annex 1.1).

As there is no application form yet for the discharging the ARA's together with DNA will have to discuss this proposal and make a choice to use this form and then it need to be approved by the minister.

2. Concession

The concession needs to contain the Best Available Technics (BAT), the implementation of these techniques, the effects on the surface water and discharging standards. The documents to use are: surface water figures, The Regulation on standards of environmental quality and effluent discharges (Regulation annexes III and IV with minimum standards for effluent discharging). The Decree Ministerial (7/2010 de 6 de January) is used as a form for concessions for water use. We have adapted this form into a form for concessions for discharges. The added information is displayed in red (see Annex 1.2). There are some articles added from the Water law. These are about the need for a concession, the application, attachments, procedure and jurisdiction. The section "Terms and conditions" contains the technical information which is unique for this company. This contains information about the company, the waste water flows, the treatment, the discharging, the measuring methods used for the discharged waste water and the figures of the measured water quality parameters. But also the discharging standards to which the company has to comply. These adapted Decree ministerial 7/2010 de 6 de January can be found in annex 1.2.

The advice is to use this adapted Decree ministerial 7/2010 de 6 de January as form for a concession for discharges because it looks like the original one for water use, so people are used to work with this and it will give the least problems to formalize it.

3. FEES FOR DISCHARGING WASTE WATER

When we started reading the Mozambique laws we checked them as well on the possibilites of charging fees for discharging companies. This according to the polluter pays principle.The meaning of this principle is to stimulate companies to lower the amount of pollution they discharge and lessen their effect on the environment.

The charging of a fee for discharged waste water at the surface water and jurisdiction is arranged in:

- Water law (16/91 de 3 de August); This law defines that all water users must pay for the water and that the discharge of effluents can be charged.
  Art. 42, nr. 3 Establish tariffs by the National Water Council
  Art. 43, nr 1 + 61 Determine the pollution units discharged with the waste water.

- Water tariff policy Government resolution (60/98 de 23 de December);Subjects in this resolution are: user pays, polluter pays, environmental protection, financial sustainability, equity, efficient use and involvement of stakeholders
  This policy defines tariff systems for specific objectives, criteria and a tariff structure.

- Decree Ministerial with Tariffs. Resolution nr 1/2009 de 30 de December

AC Statutes 196/2004

- Tariffs for effluent discharges are very important for the management and sustainability of AC
- AC should be self-financed by water fees
- Prices and tariffs must be such that revenues are sufficient to cover operation costs, support investments and promote an adequate level of self-sustainability

A Decree ministerial is needed that defines the tariffs for the various categories of users and effluent dischargers. This Decree Ministerial should be based on the Water Tariff Policy.

When the companies have concessions their discharge situation is known and then they can be charged for the type and amount of discharge of their waste water on surface water.

Our advice is to start with the communication with DNA and with the other ARA's about this subject. In a next step a Decree ministerial with tariffs have to be made and have to be approved on ministerial level.
When all companies have a concession for discharging waste water on surface water, the ARA's can start with charging of fees.

4. MEASURING MERCURY

At the seminar in Chimoio (October 2013) the agricultural enterprise Vanduze claims they don´t want to pay for the use of irrigation water because of the possible presence of Mercury in the surface water. Therefore the Vanduze fears that they can´t export their products to the European Union countries anymore in the near future. To see if the presence of Mercury is truly a problem we made a measuring plan on the Buzi and Pungwe. In May 2014 at ARA Centro's we organized a short training for two employees of ARA Centro in taking samples. For this we made two sampling forms; one for sediment and one for surface water (annexes 2.1 and 2.2). We also made a field form annex 2.3. After the training these employees went in the field with a map with sample points on 25 and 26 May 2014. They came back with sediment and water samples. The nine samples were taken to the laboratory of Waterboard Hunze and Aa's in the Netherlands.

Conclusions about mercury measurements

May is normally rather dry in the region of ARA Centro. In 2014 however the discharges in the river Pungwe were not very low. The results of the analyses (annex 2.5) show for May 2014 no Mercury in the surface water nor in the sediment. All samples are below the determination level for Mercury. For the metals there is no surface water standard. The Water quality advisor from Hunze and Aa's has interpreted these figures as well and his overall conclusion was that the figures are below our drinking water standards. Other things he mentioned were:

- Al and Fe are a bit high on two samples for more than 80 % this is connected to the amount of undissolved components;
- The Oxygen level was at some measuring point very high 14,8mg/l (point nr. 4) and at another point very low 0,1 mg/l (point nr. 9 where no fish could live).

Point nr. 4 at de Nhamucuarara river contains too much undissolved components 643 mg/l to be used as irrigation water according to the standard of <500 mg/l in the Regulation (Regul Padroes de Qualidade Ambiental e Emissao de efluentes. Ardigo 12.b)

These figures can be used to the stakeholders, to show them that in the period around May 2014 (April-June) they can use the water for irrigation purposes without any risk of mercury on their crops.

An exception is the Nhamucuarara river because of the undissolved components.

It is advisable to repeat the measurements at least one time at the end of the dry season, but preferably also once during the rainy season.

5. POSITIONING OF WATER QUALITY

With ARA Centro we visited FIPAG and the ETAR of the Municipality of Beira. At both locations we discussed the quality of surface water.

FIPAG is using the surface water as raw material for processing their drinking water and so they have a direct interest in good surface water. Therefore they have a great awareness of preventing the surface water from polluting.

With the people from the Municipality of Beira responsible for ETAR we talked about how much households of Beira are connected to the ETAR and how much waste water is discharged from Beira straight into the river. One of the problems the ETAR has to deal with is the amount of influent water during the rainy season. In this period it is possible that the maximum influent is reached and the overflow starts to work. That means that untreated waste water is discharched to the estuary of the river Pungwe. The ETAR deals with this by saying that the discharge waste water is very strongly diluted by the rain water and that at least some of the waste water is treated. That of course is true but eventually all the waste water must be treated before discharged.

By these two conversations ARA Centro has showed FIPAG and the Municipality her task in caring for the quality of the surface water and preventing the surface water from pollution. By meeting, ARA Centro creates awareness about discharging on the surface water.

Advise

To create this awareness also among other companies ARA Centro can start to visit and communicate with companies who are discharging to the river. To reach this awareness and responsibility shown by the companies communication may be a good in between solution, before concessions can be applied. This shows the companies they are being watched by ARA Centro and creates for ARA Centro a stronger position as water quality authority.

6. LABORATORY FACILITIES

The compliance of concessions has to be checked. This checking takes place by inspection of the location and the taking of waste water samples in the effluent discharge of companies. To monitor the rivers it´s also important to measure at several places in the rivers. Important parameters to be analysed are:

- Total Nitrogen
- Total Phosphate
- Chemical Oxygen Demand
- Biological Oxygen Demand
- Undissolved components
- pH
- Heavy metals: Zn,Pb,Cu,Cr,Ni
- “Black list” heavy metals: Cd, As, Hg

Next to the conversation about discharging we talked with both FIPAG and ETAR about their lab facilities. In annex 3 there’s a summary of the parameters they can analyse.

Probably the lab of the ETAR will be the most useful in analysing the surface water and waste water samples of companies. When ARA Centro wants to work with this lab some kind of agreement will have to be made with this laboratory. This is a challenge for both the Municipality and ARA Centro.

7. CONCLUSION AND WAY FORWARD

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7.1 Way forward

We suggest the following steps to ARA Centro to establish their role as water quality authority.

1. Develop a vision on the organisation of ARA Centro related to water quality. How to get the quality task embedded in the current organisation.
2. Start with a measuring plan to measure the water quality before and after discharging points of towns and industries. Also measure before and after agriculture zones. With a good measuring plan the current status of the river can be mapped and this gives insight in the possible risks for the use of drinking water.
3. Companies and towns can be visited to talk about their discharged effluent and the measures to take and the possible developments to minimize the effects of their effluent on the surface water.
4. When this concept concession is accepted then it should be discussed with the other ARA's and DNA.
5. When all organisations agree ARA Centro can start giving out concessions.
6. When the companies have a concession ARA Centro needs to control the compliance of them.
7. Also a system for fees should be discussed with the other ARA´s and DNA.
8. A proposal for applying the system of concessions and fees for discharging waste water should be send to the ministry for approval.
9. With the knowledge of the effluent discharge of the companies, ARA Centro can start with charging fees for polluting the surface water. This will push the companies into cleaning their waste water before discharging.

ANNEXES

1.The concession system
- 1.1 Application form; translated Dutch application form
- 1.2 Concession to an ETAR

2. Measuring Mercury
- 2.1 Sampling sediment
- 2.2 Sampling surface water
- 2.3 Field form
- 2.4 Sampling preparation
- 2.5 Sampling points and map
- 2.6 Analyses results of the water samples
- 2.7 Filled in field form

3. Some Laboratory facilities in Beira

Annex 1: The concession system

Annex 1.1: Application form

APPLICATION FORM

(translated from the Dutch forms)

1. General data

Please fill out all questions preferably with ***black ink*** .

Introduction

Please fill out this part of the application. When there is an explanation (i) or an attachment (!) to the question this is indicated. Explanatory notes (i) are on separate sheets.

> *Please enter the data of the person in whose name the concession to come: organization/company or private*

1 Details of the applicant (the intended concession holder)

Organization/company:	|
Name and initial (s):	| Mr/Ms |
Address:	|
Postal code and place:	|
Telephone Number:	|
E-mail address:	|

> *To effect the future payment of the fees, you can specify how this concession within your organization is known and who cares for the payment.*

Billing information and/or different billing address

For optimization of bills and fees and if the account should not be in the name of the applicant.

Your attribute/job no:	|
Company name/Department:	|
Contact, Tel	| Mr/Ms |
Creditors-address:	|
Postal code and place:	|

2 Details of the contact person or consultant of the applicant

Name and initial (s):	| Mr/Ms |
Function:	|
Telephone Number:	|
E-mail address:	|

> *Send a warranty with the concession*

3 Data of the warrant (submit the application on behalf of the applicant)

Name and initial (s): | Mr/Ms |

Address: |

Post code and city |

Telephone Number: |

E-mail address: |

4 Location of activities

Address: |

Postal code and place: |

Other location data:

Name of surface-water: |

X/Y-coordinates: |

Side (N/S/E/W/Le/Ri): |

5 Period of the activities

5aWhat is the scheduled start and end date of the proposed activities?

Activity: |

Start date: dd/mm/yyyy: | Finish date: dd/mm/yyyy: |

Activity: |

Start date: dd/mm/yyyy: | Finish date: dd/mm/yyyy: |

Activity: |

Start date: dd/mm/yyyy: | Finish date: dd/mm/yyyy: |

If necessary, provide an explanation

6 Activities

6aDescribe the nature of the activities

6bDescribe the reason/the purpose of the activities

7 Contact/consultation with ARA Centro and type of application

7aHas there been a contact/consultation about this application?
❍No
❍▶ Yes with whom from ARA Centro? (name): _____

7bIs it a new application or a modification of an existing concession?

❍New application

❍Application for modification of an existing concession, namely:

Authorisation number/attribute: | Date: |

Granted by/competent authority: |

Overview on sheet attachments O1

>*Provide the attachments to the correct number*

Question	Required Annex	Notes	Number
4	Situation drawing, map or photo	Use a situation drawing, map, photo or other appropriate means to the precise location of the activities relative to the environment. Drawing and map are equipped with a north arrow. The map scale is 1: 10.000, but after consultation with the competent authority the applicant may use a different scale.	O1-4
5a	Start and end date activities	If necessary a continuation from the dates mentioned under question 5a can be attached	O1-5a

2. Choice activities and signature

Introduction

Please fill always out this part of the application. Then fill in the application sheets. Finally, sign and send in the application with the attachments. It's possible that you may need other concessions in addition to the water concession.
Read more about this in the explanatory notesExplanatory notes (i) state on a separate sheet.

1 Choice of activities

1aYour application is for discharging waste water into surface water.

❍Yes

❍► No (for discharging on a sewer system check with your municipality or the competent authority)

2 Signature

2aSign this application if you have answered all applicable questions
I declare this form filled out truthfully.

Date: |

Place: |

Signature applicant: |

>*Only if you have warrant*

Authorized signature: |

Number of attachments: |

3 Send application

3aSend the complete application including the attachments in four copies (unless the ARA indicates otherwise) to ARA Centro.

>***Make a copy for your own use***

3. Discharge effluent into surface water

Introduction

This part contains the necessary information about the discharge of wast water/effluent with polluting or harmful substances directly into a surface water such as a water corridor, pond, river, canal or lake.

Please note!
For large discharges; start a consultation with ARA Centro before you submit the application officially.

1 Operating Activities

1aAdd as an attachment: a report on the business activities, processes, installations and facilities

1bAdd as an attachment: a business plan with the classification of the company

1 c Add as an attachment: a listing of all substances and products and their attributes that you can have in storage, as far as they can get in to the surface water.

2 Is the company, activity or branch named in the Regulamento Padroes de Qualidade Ambiental e emissao de efluentes:

2a ANNEX III

❍Yes

❍► No proceed to question 3a

2b What is the specific category?

3 Unusual events/unforeseen discharges

3a Do you have a safety report/environmental study?

❍Yes ► Add as an attachment: the results of the environmental study or safety report, and go to question 3c

❍No

3b Carry out a risk assessment when within the company are risky materials for surface water present in large quantities (check with ARA Centro)?
http://www.helpdeskwater.nl/algemene-onderdelen/structuur-pagina'/zoeken-site/@18101/safety_practices/

❍Yes ► Add as an attachment: the results of the risk assessment, and go to question 3 c

❍No ► Add as an attachment: the results of the risk assessment when there aren't any risks, and go to question 4

3cFill in the table that installations and discharge scenarios in which carry the greatest risks

Installation	Scenario	Probability of failure (1/year)	Volumeconta-tion (m^3)	Measure

3d Do you have an emergency response plan?

❍Yes ► add here, as an attachment, your emergency response plan in consultation with ARA Centro

❍No

4 Company Sewerage

4aAdd as an attachment: a company sewerage map with the rain sewer and waste water sewer

4b Are there any other companies or houses connected to the company sewerage? If so, which company/companies and how many houses?

❍Yes, namely:

name company or companies:

number of houses:

❍No

5 Wastewater Flows

5aFill in the types and amounts of waste water you want to discharge on the surface water

Type of waste water		Influent				
		Origin[1]	*Discharge -point* [2]	*Continuous or discontinuous (C or D)*	*Quantity in m³/year*	*Determined according to*[3]
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
Total						

1) indicate the origin of the water; D = drinking water, S = surface water, G= groundwater, R= rain, W=waste water, E = else
2) mark with a letter the discharge point where waste water is discharged (use the same letters as on the sewerage map)
3) at any amount which the volume flow of the different types of waste water is provided; (W) water meter,
(F) flow meter, (S) from specification, (E) estimated, (A) in a different way

When the influent is W = Waste water; add as an attachment: a report of the analyses of the influent

5bWhich effluent point will discharge at which surface water

Effluent Point	Surface water name

5 c Which pollutants in what quantities are edited during normal operating conditions to the discharged water (CIW 42000-05assessment_of_substances)
http://www.helpdeskwater.nl/algemene-onderdelen/structuur-pagina'/zoeken-site/@1406/ciw_4_2000-05/

>*Use the same numbering as in 5a*

Type of waste water		Pollutants that can be released	Quantity in kg/year	Concentration in mg/l	Discharge temperature in ° C / F (cooling water)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

5 d Add here, as an attechment, the calculation of the heat load of the cooling water as mentioned in question 5 c

5eAdd here, as an attachment: results of the analysis of the composition of the part flows as mentioned in questions 5a and c and of the composition of waste water per discharge/measuring point

5fAre there specific operating conditions which affect the composition of the discharge as described in question 5 c?

❍Yes ► Add as an attachment: a description of the nature and duration of the operating conditions and as accurately as possible estimate of the composition of the discharge water during this period

❍No

5 g Describe how you want to measure the discharge (frequency of measurement, measuring method, measurement facilities), register and how you want to report

6 Measures and research to limit discharges

Preventive measures and re-use

6a Does your company take preventive measures and/or investigations to prevent the discharge of waste water?

❍Yes ► describe the preventive measures and/or investigations in a separate attachment

❍No

6b Is it possible to re-use waste water flows and/or substances?

❍Yes ► describe the re-use of waste streams and/or materials in a separate attachment

❍No

Treatment facilities

6 c Specify below which (waste) water (part) passes a treatment facility before the discharge takes place

Supply	Type	Capacity	Waste Water Stream
Oil/water separator			
Grease separator			
Sewerage treatment plant			
Sedimentation			
Flotation			
Other supplies:			

6 d Add here, as an attachment: the characteristics of the treatment facilities as at 6 c named.

7 Negative effects on the aquatic environment

7aAdd as an attachment in consultation with the competent authority, a description of the significant negative effects on the aquatic environment (immissioncheck) Use the following documents:

- Regulation on standards of environmental quality and effluent discharges.
- Water policy 46/2007

8 Developments

8aWhat are the expected developments (for example, expansion plans) in or around your company, which may have implications for the nature and scope of the discharges?

❍Yes:

❍No

9 Summary

9aEnter a short summary of the content of the application

Nature and scope of the company

Global process description

Description of the business location and the name of the surface water

Description of the discharge: nature, size, continuous/discontinuous, measures (prevention) and treatment facilities

Period of concession

Overview attachments

Question	Required Annex	Notes	Documents	Number
1a	Activity Report	Description of all (changed) activities, processes, installations and facilities within the company. Also add flow diagrams.		1 a
1b	Business Map	With at least: the loading and unloading points, storage for raw and auxiliary materials and intermediate and end products, the place of the treatment facilities. Shading the parts where potentially contaminated rain water is discharged.		1 b
1 c	Substances and products overview	List of all raw and auxiliary materials and intermediate and end products. Per substance or product the following characteristics must be appointed: -Storage capacity (kg or tons), -Method of storage and location -Use (kg/year or tons/year) -Water hazard (1 to 12) and the consolidation effort (A, B or C) or the substance properties (composition in the case of a preparation, R-phrases, acute toxicity, degradability, solubility, log POW) under the Assessment of substances.	CIW 42000-05 assessment_of_substances	1 c
2 c	BAT-report	Listing and description of applied measures and techniques that meet the definition of ' best available techniques ' (BAT)		2 c
3a	Environmental Study	Part of the safety report		3 a
3b	Risk assessment	Result of assessment under annex 2 of the report	CIW ' integrated approach to risks of unplanned discharges '	3 b
3c	List greatest risks	Installations and discharge scenarios that carry the greatest risks		3 c
3d	Emergency Response Plan			3 d
4a	Sewerage Drawing	A complete overview of the companies sewer system, with which industrial waste water, domestic waste water, (possible polluted) rainwater, etc. is drained. Showing all regular, but also accidental drainage routes. With the discharge points, observation wells and/or direction of flow measurement facilities, as well as the location of the treatment facilities. Please mark the different waste water flows.		4 a
5a	List	List of waste water flows Influent is W = Waste water a report of the analyses of the influent		5 a
5 d	Cooling water heat load calculation	Calculating heat load as described in the notes		5 d
5e	Analysis Results	The composition of the separate waste water flow per discharge/measuring point		5 e
5f	Description operating conditions	Information about the composition of the discharge water during determining operating conditions/circumstances		5 f
6a	Description of preventive measures	List of measures		6 a
6b	Description of re-use waste water			6 b
6 d	Treatment facilities	Description (possibly schematic flow diagrams), design principles, capacity calculations, effectiveness, drawings		6 d
7a	Immission check	Check the effluent figures with two documents	Regulation on standards of environmental quality and effluent discharges. Water policy 46/2007	7 a
8a	Developments	Description of developments relevant to the nature and extent of discharges		8 a

Annex 1.2:Concession to an ETAR for discharging waste water based on the (adapted) Decree ministerial 43/2007, of 30 October and 7/2010 de 6 de January

(adaptions are indicated in red and come from the Dutch form for this type of concession)

CONCESSION FOR THE USE, APPROPRIATION AND DISCHARGING OF WATER

(Adapted Decree ministerial 43/2007)
Law no. 16/91, of 3 August, and Decree 43/2007, of 30 October)
Title holder:
Resources included:
.....

Date of issue:
.....

Valid until:
.....

IDENTIFICATION OF CONCESSION
Concession no. _____
Purpose _____
Cadastre no. _____

IDENTIFICATION OF TITLE HOLDER
Name/trade name _____
Domiciled in _____
ID / Residence permit no. ___
issued at _____ on __ /__ /__
Registered under no. _____ at
the Registrar for Legal Entities
Indication of other licences / concessions
and date of validity

IDENTIFICATION OF SOURCE
Identification of source_____
River _____
Location _____
District _____
Province _____
Hydrographic basin of _____

Point from which water is derived_____
Geographic coordinates
Latitude _____ Longitude

WATER USE
Form of capture _____
Average monthly volume _____
Average annual volume _____
Period _____
Measuring system _____

WATER DISCHARGE
Activities _____
Characteristics of return/discharge water_____
Place of return/discharge _____
Conditions of return/discharge_____
Average monthly volume_____
Average annual volume_____
Measuring system_____
Geographic coordinates of the place of return
Latitude _____ Longitude
Type of treatment for residual/waste water _____

APPLICATION
(Article 71 Decree 43/2007 of 30 october)
(Contents of title deeds relating to the discharge of effluents)
1. Concession title deeds relating to the discharge of effluents shall comply with the provisions of the previous article, with an indication that these do not confer acquired rights, because of the fact that concessions are subject to modifications and restrictions to be introduced after the fact, as a result of public, environmental and ecological needs.
2. Concession title deeds relating to the discharge of effluents shall also refer to:
a. Required treatment, equipment and methods of treating effluents, volumes, types and qualities of the same, their place of discharge, the system for security their quality, as well as the minimum quality of the receiving bodies of water, and of the effluents;
b. The concentration of contaminants and pollutants, their physical and chemical characteristics, and an identification, per unit volume, of construction works and equipment required for the operation of the system, and for the treatment of the effluents, including the measuring of effluents and their technical characteristics;
c. The obligation imposed by the Regional Water Administration to immediately terminate those contaminating discharges which place the environment, public health or third parties at risk;
d. The obligation to draft emergency plans, and plans for staff training, for accidents, including the installation of an efficient alarm system;
e. The determination of objective civil liability principles set out in the Water Law

ATTACHMENTS
- Businessplan, activities, installations, processes and facilities
- A list of all substances/products that can enter the surface water
- Environmental study

- A company sewer map with the rain sewer and the waste water sewer
- Effluent figures and if the waste water is treated the influent figures as well
- Preventive measures and research to limit discharges
- A study on the negative effects of the discharge on the aquatic environment
- Future developments
- DUAT(an authenticated copy of the document proving the existence of the right, even if provisional, to use and benefit from the land on which the water will be appropriated, or its registration certificate)

PROCEDURE

At _date__ there has been contact with ARA Centro and stakeholders about this concession.

Processing of applications

(Article28 of Law 16/91, of 3 August)
(Submission of applications)
1. An application for the use and appropriation of water, or for the discharge of effluents, shall be presented, duly substantiated, to a Delegation of the Regional Water Administration, or, should this not exist, at the head office of the Regional Water Administration.
2. The application shall immediately be registered in a book for this purpose, in the presence of the applicant or his representative, who shall sign the entry.
3. The record shall contain the date and time of presentation, and shall contain a summary of documents submitted.
4. Receipt shall be confirmed on a copy of the application, and the date and time of submission shall be recorded, along with the name and category of the employee who received it. The receipt shall be authenticated with the stamp in use.

WATER USES

(Article 6 of Law 16/91, of 3 August)
(Water uses)
1. The use and appropriation of water shall be classified as common, or private.
2. Common use is that essentially aimed at satisfying the domestic, personal and family needs of the user.
3. Private use and appropriation, as well as the discharge of effluents, shall be regulated by law or by the licences and concessions authorising it.

GOVERNMENTAL JURISDICTION

(Article 22 of Law 16/91, of 3 August)
(Applications for the use and appropriation of water, or the discharge of effluents)
1. Applications for the private use and appropriation of water, or for the discharge of effluents, shall be submitted for decision by the Regional Water Administrations having jurisdiction over the respective hydrographic basin, and shall contain:
a. Complete identification, and the head office or domicile address, of the applicant;
b. Identification of the source of supply, and the area in which it the use and appropriation will be located;

c. Objective of the appropriation or of the discharge, the methods with which it will be undertaken, volumes of water to be extracted or discharged, derived from or returned to the source of origin, as well as an indication of the periods during which this will take place, and the intended duration of the use and appropriation;
d. Methods and equipment to be utilised for the extraction, derivation or pumping of water, and for its use and appropriation. This information shall also be required for the discharge of effluents;
e. Method proposed for the measuring of the volume of water to be extracted or derived, and for measuring effluents;
f. An indication of users of the same source of supply, if known;
g. Schemes and diagrams of proposed appropriations, discharges, works, equipment and installations, as well as the exact location of the beneficiary building, drafted by technicians qualified for this purpose;
h. An indication of the time period to which the private use and appropriation of the land is subject, except in the cases referred to in the Land Law.

USER RIGHTS
(Article 28 of Law 16/91, of 3 August),
(no. 2 and 3 of article 49 of Decree
43/2007, of 30 October)
1. A right of private appropriation grants its title holder the entitlement to use water for the determined purpose, and to construct suitable works, and, on terms which come to be established, temporarily occupy neighbouring land, and to constitute the necessary servitudes;
2. This right is issued with the preservation of pre-existing common uses, and of the rights of third parties.
3. The utilisation entitlement may be revised when equipment for the capture and conducting of water is insufficient, or when there is an unforeseeable diminution of the flow or volume of water which is the object of the right of utilisation, or an error of calculation in the evaluation of the flow;
4. The characteristics of the concession may only be modified with the prior and express authorisation of the granting entity

USER OBLIGATIONS
(article 30 of Law 16/91, of 3 August)
(article 7 and no. 2 of article 49 of
Decree 43/2007, of 30 October)
1. To respect the conditions set out in the act which was constitutive of the right;
2. To use water in a rational and economic manner, and only for the defined purpose;
3. To pay set tariffs and financial charges punctually;
4. To participate in tasks of common interest, in particular, in those aimed at avoiding the deterioration of the quantity and quality of water in the soil;
5. To provide requested information, to comply with obligations imposed by the competent entities, and to be subject to necessary inspections;
6. To guarantee the minimization of environmental impact, and, especially, to strive for the retention of water quality;
7. To respect the rights of other legitimate water users.

TRANSFER OF THE RIGHT OF USE AND APPROPRIATION

(article 29 of Law 16/91, of 3 August)
(article 45 of Decree 43/2007, of 30 October)

1. Water concessions granted for agricultural or industrial purposes transfer together with the right to use and benefit from land on which such developments have been erected, and on the same conditions;
2. Without prejudice to the provisions of the previous number, a right of private water use and appropriation shall transfer, *inter vivos,* by way of the express authorisation of the Minister of Public Works and Housing, and, on the death of the title holder, to his spouse and heirs, in terms of the civil law;
3. The transfer of a right of water use and appropriation shall not result in an extension of the time period of the concession.

REVISION AND EXTINCTION OF CONCESSION

(article 38 and 39 of Law 16/91, of 3 August)
(article 73 and 75 of Decree 43/2007,of 30 October)

1. The concession may be revised:
a) When the presuppositions which determined its allocation have changed;
b) In the case of *vismaior,* and at the request of the concessionary;
c) When it is necessary to adjust water development plans.
2. The concession is extinguished:
a) At the end of the period for which it is in force, or of its renewals;
b) By agreement between the parties, or by the rescission of its titleholder;
c) When the need for the appropriation disappears, or the resource dries up, i.e., degradation of its characteristics;
d) By revocation, and by surrender. All cases omitted herefrom shall be dealt with in terms of the Water Law, and its Regulations on Water Licences and Concessions.

TERMS AND CONDITIONS

General

1. The title holder has to designate one or more persons in particular to ensure compliance with this concession. Title holder shall, within one month after the concession comes into force, give to ARA Centro, the name (s), address(es), and telephone number (s) of the person (s) that is (are) designated by or on behalf of her. Changes must be reported within one week.

Discharge requirements

2. The purified waste water may only be discharged when consisting exclusively of effluent from ETAR Beira and the waste water overflow when the maximum influent of the treatment plant is exceeded.

3. The purified waste water must be brought exclusively on surface water by the discharge point in the canal towards the Pungwe as shown on the map from googlemaps (no. 1).

4. The amount of treated wastewater brought on surface water can be up to 7500 m3/hour.
5. The purified waste water referred to in regulation 4 may not exceed discharge standards (table 1) at the effluent sample location.

Table 1

parameter	Limit Value *	Method of determination
Color	1:20	
Smell	1:20	
COD	150 (mg/l)	(A)
N-total **	15 (mg/l)	(B)
P-total	10 (mg/l)	(B)
Undissolved components	60 (mg/l)	(A)

*: Anexo 17, Regulamento dos SistemasPublicos de Distribuicao de Agua e de Drenagem de AguasResiduais

**: N-total is defined as the sum of total Kjeldahl nitrogen, nitrite and nitrate;

A: the limit value applies a 24 hours volume proportional sample

B: the limit value applies to the average concentration, expressed as the weighted moving average concentration in the samples taken volume proportional twenty-four hours in a calendar year.

6. The acidity (expressed in pH units) must be at least 6 and must not exceed 9.

7. The temperature may not exceed 35 degrees Celsius.

8. The sedimented waste water referred to in regulation 2 may only be brought on the surface water by the discharge point in the canal as shown on the map from googlemaps (no. 1).

9. The waste water overflow may only be in use six times a year.

Control supply and sampling

10. Sampling facility (sample)
    1. The influent and effluent should be sampled at any time. The effluent should be led through a control facility that is suitable for sampling purposes. This facility requires the approval of ARA Centro.
    2. The device referred to in the previous paragraph should be placed, in a matter that it can be properly and safely accessed.

11. Measuring facility (day sample)
    1. The quantity and quality from the effluent needs to be measured accurately by title holder, but there must also be a possibility for ARA Centro to do the measuring. The effluent needs to pass the measure and sample facility.
    2. The location, design, construction and operation of the measuring and sample facility, as well as the sampling method of flow measurement, sampling and analysis requires the approval of ARA Centro.
    3. If by or on behalf of ARA Centro at the location of the measurement and sampling supply measurements and/or sampling be carried out, carries the company on his behalf care for the presence of electric energy of 220V and other auxiliary facilities for the measurement and/or sampling equipment.
    4. The measurement and sampling equipment should be in good condition to maintain good functioning.

12. Obligation sampling by title holder
    1. The quantity and quality of the effluent and influent have to be measured by or on behalf of the title holder by representative measurement and sampling procedures which are monitored and recorded. This check concerns the amount of discharge water every day and the analysis of the parameters shown in table 2, in compliance with the indicated frequency and method of sampling:

Table 2

Parameter	Frequency per month	Method of measurement	
		Influent	Effluent
COD	2	(A)	(B)
N-total *	2	(A)	(B)
P-total	2	(A)	(B)
Undissolved components	2	(A)	(B)
PH	2	(A)	(B)
Temperature	2		(A)

*: N-total is defined as the sum of total Kjeldahl nitrogen, nitrite and Nitrate;
A: Insert Sampling
B: volume proportional

    2. The measurement and analysis results should within 1 month after each calendar quarter be provided to ARA Centro.
    3. The method of reporting requires the approval of ARA Centro.

Overflow

13.1. The overflow needs to contain measuring and recording devices. This measuring and recording devices should measure the time of onset, duration and total volume of discharged waste water. The applied equipment shall require the approval of ARA Centro.

2. Within three months after the end of the calendar year in which the measurements as referred to in regulation 13.1 have taken place, the results should be reported to ARA Centro. The method of reporting requires the approval of ARA Centro.

Log

14. ETAR Beira should keep a log, in which at least the following data are collected:

The results of the measurements taken to monitor the influent and effluent quality.
The amount of discharged effluent every day.
The moments of overflow and discharge of influent because of the exceeding amount of waste water during the rain period.
The emergencies or exceptional circumstances.

15. The title holder should give at any time, access to the log to the competent employees of ARA Centro.

16. The title holder should keep the collected data for three years.

Emergencies

17. If as a result of an emergency or other exceptional circumstances the effluent does not meet the requirements, which are established by this concession, title holder will immediately take measures in order to adversely affect the proper functioning and operation of the ETAR and/or to prevent or limit the effect on the quality of the receiving surface water.

Of such emergencies or special circumstances, title holder has to notify ARA Centro immediately: (03-324153/324167/324168/324170). If ARA Centro wants the title holder needs to make a report within a certain period. This report contains:

- the cause of the emergency
- the date and time of start and termination of the emergency
- the measures taken after the emergency
- the impact on the quality of the effluent
- taken the appropriate measures to prevent recurrence

This report should be send to ARA.centro@teledata.mz

A copy of this concession will be sent to:

1. ETAR
2. Beira Municipality
3. DNA
4.
5.

Beira, 20 June 2014

on behalf of the Management Board,

Mrs C. Machava
General director of ARA Centro

Annex 2:Measuring Mercury; May 2014

Annex 2.1: Sampling sediment

SAMPLING SEDIMENT PROTOCOL

Goal
Obtain samples of sediment that are representative of the sampled layer of sediment to determine the presence or absence of mercury.

Principle
Sampling the flood deposit on a uniform and high-quality manner in such a way that all relevant properties and components stay unchanged in the sample .

Responsibilities
The field officer is responsible for properly performing all the steps in the fieldwork.

Equipment and material
Use of equipment, materials and tools:
-ruler and measure tape
-GPS
-camera
-plastic disposable gloves
-appropriate glass sample bottles
-scoop
-bucket
-small scoop
-water
- equipment to condition samples in the field and during the transport to the laboratory (e.g. cool box or refrigerator)

Method
Taking soil samples for analysis of non-to moderate-volatile compounds and physical-chemical soil characteristics.
1 Dig smoothly through the sediment layer and measure the thickness of the layer of silk to the ground with the ruler.
2 Measure the distance from the waterline up to the point where the digging in the sediment took place.
3 Determine the point with GPS. GPS device accuracy is up to 5 m under ideal conditions.
4 Wear Gloves at the taking of samples to prevent sludge comes into contact with your hands.
5 Take ten samples of the sediment around this point with at least 1 meter between the points (there should be no ground material in it).
6 Do the ten samples in the bucket and mix it with the small scoop to one homogeneous sample.
7 Fill one glass sample with the small scoop as completely as possible.
8 Close the sample container well (remove any ground from the screw thread and from the outside of the container).
9 The field worker ensures that the scoop, the small scoop and bucket used, cleaned with drinking water for the next sampling.

Sample Coding
Make sure that from the samples at least the following details are known:
-project code
-name of location
-sediment sample code
-field worker (s)
-date

Annex 2.2: Sampling surface water

Sampling surface water protocol

1 Topic
This document defines the procedure for taking a random sample from surface water.

2 purpose and scope
This sample procedure is applicable when taking a random sample of surface water.
The samples are taken in order to give an image of the surface water quality.

3 Definitions
Water Sample:
A water sample that represents the composition of the water at that time and place.

4 Principle
Taking a random sample shall be carried out by the sampling scoop on a predetermined place in the river to fill and evenly distribute over the sample bottles, so that a representative sample is taken.

5 equipment and tools
5.1 Sampling scoop with monster cup
Suitable for the filling of the sample bottle.
Alternatively, a bucket of 10 litres can be used.
5.2Camera
5.3Plastic gloves
5.4 Multi-field meter
5.5GPS
5.6 Fridge
5.7Permanent marker
5.8 Bottles
a. Undissolved components bottle (plastic)
b. Heavy metal bottle (plastic) contains acid
5.9 Field form

6 Working method
6.1 preparation
- The Multi field meter must be controlled and calibrated before taken.
- Take the required bottles and stick labels on them.
- Take the map with the sampling points and field forms .
- GPS, camera, permanent marker, sampling stick with two monster cups, refrigerator and plastic gloves.
6.2 field work
- The measuring map gives the order of the sample points. To verify if each point is sampled from every point the coordinates and photo should be taken. In this way can be ensured that the correct point is sampled.
-Before a sample is taken the monster cup is rinsed twice with the water from the river.
- Fill the sampling scoop at a depth of 10 to 50 cm, in the Middle of the River. In shallow water the monster can be taken on the half depth in such a way that no sludge is whirled.
- Check visual if the sampled water is representative of the sampled point. If not take a new sample.
-On the sampling place the bottles for unresolved components and heavy metals should be filled for 90%. Note: the heavy metal jar contains acid.
- Take for measuring with the Multi field meter a separate monster and measure it with the Multi field meter.
- If it isn't possible to sample in the middle of a river, there should be an explicit choice made for the left or right bank of the river.
- Measure the following parameters on site and take them over on the field form (EC, pH, oxygen content, oxygen saturation, temperature, turbidity, colour, odour and clarity).
-The date and time of sampling and details (dirt, oil, etc.) can also be described on the field form.
-Save the samples cooled and in the dark during transport.
6.3 Sample delivery and-registration
- Make sure the samples be well conserved and if necessary be treated.
- Store the samples in the cold store.
- Store the field forms in the appropriate folder. Store the information on the field form and the photos in the computer with the project name.

Annex 2.3:Field form

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	
Field equipment:	Conform protocols or not conform
Sample nr:	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	
Sample GPS and pictures:	
Sample color:	
Sample smell:	
Sample brightness:	
Sample Oxygen:	
Sample temperature:	
Thickness sludge blanket:	

Is the field form with the pictures stored in the computer. Yes/No

Date:

Signature:

Annex 2.4:Sampling preparation

Sampling preparation

- Look if there aren't any crocodiles or hippo's around, care for your own safety first!
- Put on the gloves
- Write the location number on the sample bottles
- Place the bottles on stable/flat ground
- Lay the caps next to the bottles
- Number the field form conform the map/bottles
- Take the monster stick with monster cup out of the car and make sure the monster cup is fit properly to the stick
- Rince the monster cup twice with the water, which has to be sampled (prevent the water from whirling)

Annex 2.5:Sampling points and map

Surface water sampling

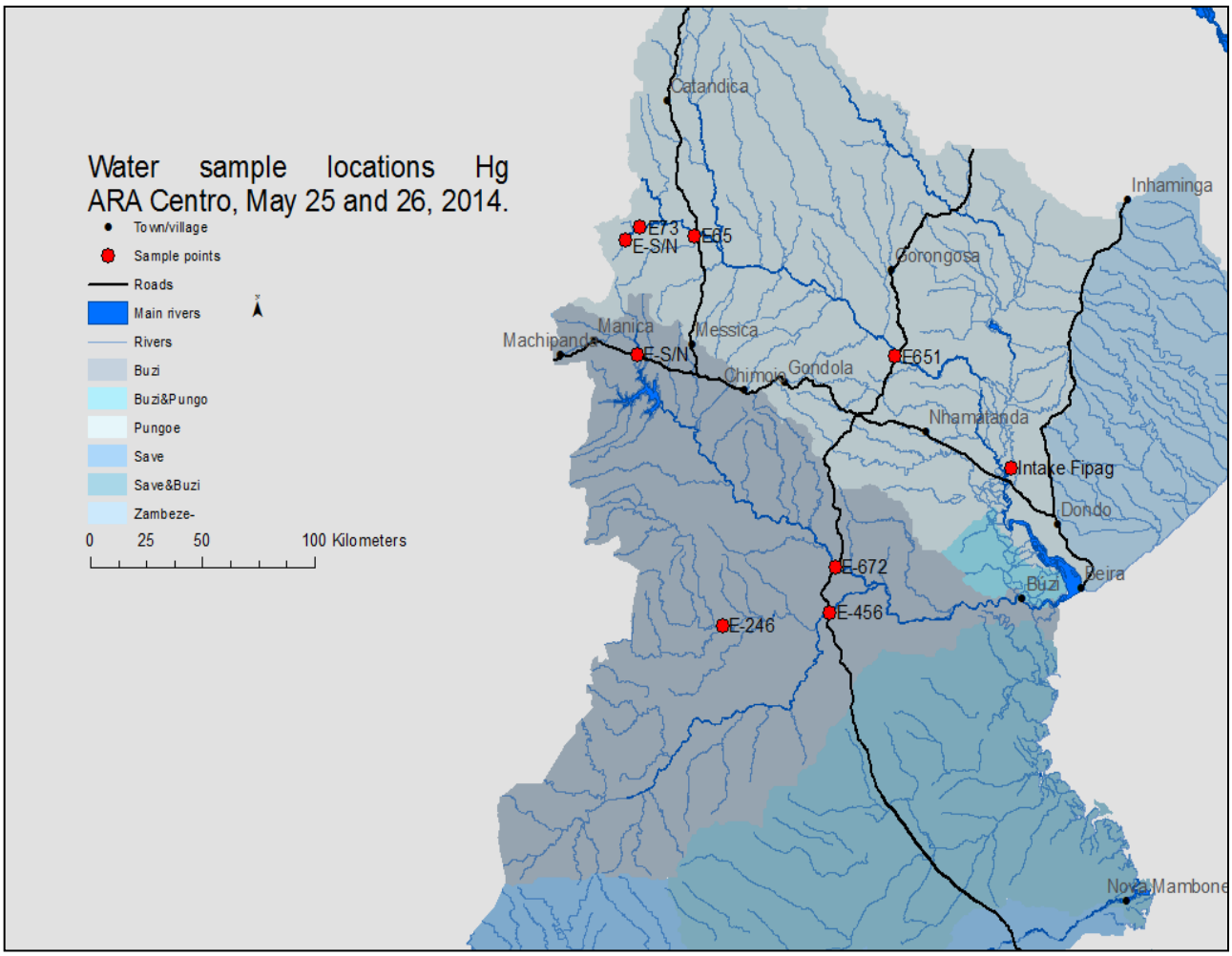
Point nr.	Code AC	Code HAS	Coordinates
1	Captacas Fipag	IHAS0597	$19^{0}24^{1}10$; $034^{0}33^{1}21$
2	E-65 Pungwe	IHAS0592	$18^{0}33^{1}08,9^{11}$;$33^{0}16^{1}48,8^{11}$
3	E-73 Honde river	IHAS0595	$18^{0}31^{1}15,7^{11}$;$33^{0}03^{1}08,8^{11}$
4	E-S/N Nhamucuarara	IHAS0587	$18^{0}33^{1}57,8^{11}$;$33^{0}00^{1}09,6^{11}$
5	E-S/N Revue, N7	IHAS0590	$18^{0}59^{1}10,2^{11}$;$33^{0}02^{1}58,7^{11}$
6	E-246 Lucite Dombe	IHAS0600	$19^{0}58^{1}39,3^{11}$;$33^{0}23^{1}35,5^{11}$
7	E-672 Revue	IHAS0589	$19^{0}45^{1}53,2^{11}$;$33^{0}50^{1}48,8^{11}$
8	E-456 Buzi Gonda	IHAS0594	$19^{0}55^{1}53,2^{11}$;$33^{0}49^{1}36,6^{11}$
9	E-651 Pungwe	IHAS0598	$18^{0}59^{1}37,2^{11}$;$34^{0}05^{1}08,4^{11}$

Sediment sampling

Point nr.	Code AC	Code HAS	Coordinates
1	Captacas Fipag		$19^{0}24^{1}10$; $034^{0}33^{1}21$
2	E-65 Pungwe	IHAS0593	$18^{0}33^{1}08,9^{11}$;$33^{0}16^{1}48,8^{11}$
3	E-73 Honde river	IHAS0596	$18^{0}31^{1}15,7^{11}$;$33^{0}03^{1}08,8^{11}$
4	E-S/N Nhamucuarara	IHAS0588	$18^{0}33^{1}57,8^{11}$;$33^{0}00^{1}09,6^{11}$
5	E-S/N Revue, N7	IHAS0591	$18^{0}59^{1}10,2^{11}$;$33^{0}02^{1}58,7^{11}$
6	E-246 Lucite Dombe	IHAS0601	$19^{0}58^{1}39,3^{11}$;$33^{0}23^{1}35,5^{11}$
7	E-672 Revue		$19^{0}45^{1}53,2^{11}$;$33^{0}50^{1}48,8^{11}$
8	E-456 Buzi Gonda	IHAS0602	$19^{0}55^{1}53,2^{11}$;$33^{0}49^{1}36,6^{11}$
9	E-651 Pungwe	IHAS0599	$18^{0}59^{1}37,2^{11}$;$34^{0}05^{1}08,4^{11}$

Codes HAS

Point nr	Sample	Bottle nr	Sample nr
1	water	IHAS0597	M1407066
	sediment		
2	water	IHAS0592	M1407061
	sediment	IHAS0593	M1407062
3	water	IHAS0595	M1407064
	sediment	IHAS0596	M1407065
4	water	IHAS0587	M1407056
	sediment	IHAS0588	M1407057
5	water	IHAS0590	M1407059
	sediment	IHAS0591	M1407060
6	water	IHAS0600	M1407069
	sediment	IHAS0601	M1407070
7	water	IHAS0589	M1407058
	sediment		
8	water	IHAS0594	M1407063
	sediment	IHAS0602	M1407291
9	water	IHAS0598	M1407067
	sediment	IHAS0599	M1407068


Water sample locations Hg
ARA Centro, May 25 and 26, 2014.
Town/village
Sample points
Roads
Main rivers
Rivers
Buzi
Buzi&Pungo
Pungoe
Save
Save&Buzi
Zambeze-
0 25 50 100 Kilometers
Catandica
Inhaminga
E73
E-S/N
E65
Gorongosa
Manica
Messica
Machipanda
E-S/N
E651
Chimoio
Gondola
Nhamatanda
Intake Fipag
Dondo
E-672
Beira
Buzi
E-456
E-246
Nova Mambone

Annex 2.6:Analyses results of the water samples

LABORATORIUM

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400607
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

IHAS0587	Mozambique E-S/N Nhamucuarara River
IHAS0589	Mozambique E-672 Revue River
IHAS0590	Mozambique E-S/N Revue River N7
IHAS0592	Mozambique E-65 Pungue River
IHAS0594	Mozambique E-456 Buzi River Gonda

			M1407056*	M1407058*	M1407059*	M1407061*	M1407063*
Lab. nummer							
Meetpuntcode			IHAS0587	IHAS0589	IHAS0590	IHAS0592	IHAS0594
Monstertype			opp. water	opp. water	opp. water	opp. water	opp. water
Datum monstername			26-05-2014	26-05-2014	26-05-2014	25-05-2014	26-05-2014
Tijd monstername			15:57	14:53	08:48	17:20	14:10
Bemonsteringsmethode			steek	steek	steek	steek	steek
Datum ontvangst op laboratorium			02-06-2014	02-06-2014	02-06-2014	02-06-2014	02-06-2014
VELDGEGEVENS							
Bemonsterd door		-	extern	extern	extern	extern	extern
Watertemperatuur Temperature		°C	22.0	23.0	21.0	21.0	23.0
Zuurstof (meter) Oxygen		mg/l	14.8	0.9	0.7	13.8	1.7
Zuurstofverzadiging (meter) Oxygen saturation		%	138	11	11	113	21
Kleur Color		-	bruin	bruin	bruin	bruin	bruin
Geur Odor		-	reukloos	reukloos	reukloos	reukloos	reukloos
ALGEMEEN CHEMISCHE GEGEVENS							
Onopgeloste bestanddelen (membraan) Undissolved components	Q	mg/l	643	<5	243	37	12
METALEN							
Zilver (ICP) Ag	Q	mg/l	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium (ICP) Al	Q	mg/l	11	<0.10	9.6	2.4	1.2
Barium (ICP) Ba	Q	mg/l	0.068	0.024	0.031	0.014	0.015
Boor B	U	mg/l	<0.020	<0.020	<0.020	<0.020	<0.020
Calcium (ICP) Ca		mg/l	3.4	8.5	9.4	3.2	5.7
Cadmium (ICP) Cd	Q	mg/l	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt (ICP) Co	Q	mg/l	<0.010	<0.010	0.011	<0.010	<0.010
Chroom (ICP) Cr	Q	mg/l	0.039	<0.010	0.17	<0.010	<0.010
Koper (ICP) Cu	Q	mg/l	0.014	<0.010	0.026	<0.010	<0.010
IJzer (ICP) Fe	Q	mg/l	31	0.44	30	4.4	2.7
Kwik (Koude damp) Hg	Q	ug/l	<0.15	<0.15	<0.15	<0.15	<0.15
Kalium (ICP) K		mg/l	1.1	0.98	0.38	0.40	0.33
Magnesium (ICP) Mg		mg/l	2.0	4.1	8.2	1.3	2.9
Mangaan (ICP) Mn	Q	mg/l	0.38	0.025	0.43	0.060	0.039
Molybdeen (ICP) Mo	Q	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
Natrium (ICP) Na		mg/l	2.8	6.1	3.3	2.1	2.7
Nikkel (ICP) Ni	Q	mg/l	<0.020	<0.020	0.062	<0.020	<0.020
Lood (ICP) Pb	Q	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Antimoon (ICP) Sb	Q	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Tin (ICP) Sn	Q	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Titaan (ICP) Ti	Q	mg/l	0.37	<0.050	0.34	0.074	<0.050
Vanadium (ICP) V	Q	mg/l	0.073	0.012	0.082	0.014	0.015
Zink (ICP) Zn	Q	mg/l	0.019	<0.010	0.016	<0.010	<0.010

TESTEN RvA L 221

Dit rapport mag alleen in zijn geheel worden gepubliceerd.
De begeleidende brief vormt een integraal onderdeel van het rapport.
De met een Q gemerkte analyses zijn door de Raad voor Accreditatie (RvA) geaccrediteerd.
De met een U gemerkte analyses zijn uitbesteed aan een extern laboratorium.
Aanbevelingen en interpretaties van de resultaten vallen buiten de scope van de accreditatie.
* Monster en/of resultaat is voorzien van een opmerking; zie de bijlage

Hoofd Laboratorium
R. Billing

LABORATORIUM

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400037
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

IHAS0595 Mozambique E-73 Honde River
IHAS0597 Mozambique Cuptacas Fipag, Pungue river
IHAS0598 Mozambique E-551 Pungue river
IHAS0600 Mozambique E-246 Lucite River Dombe

			M1407064*	M1407066*	M1407067*	M1407069*
Lab. nummer						
Meetpuntcode			IHAS0595	IHAS0597	IHAS0598	IHAS0600
Monstertype			opp. water	opp. water	opp. water	opp. water
Datum monstername			26-05-2014	23-05-2014	26-05-2014	26-05-2014
Tijd monstername			14:56	14:00	16:36	12:43
Bemonsteringsmethode			steek	steek	steek	steek
Datum ontvangst op laboratorium			02-06-2014	02-06-2014	02-06-2014	02-06-2014
VELDGEGEVENS						
Bemonsterd door		-	extern	extern	extern	extern
Watertemperatuur temperature		°C	21.0		22.0	21.0
Zuurstof (meter) Oxygen		mg/l	10.5		0.1	0.5
Zuurstofverzadiging (meter) Oxygen saturation		%	130		1	4
Kleur Color		-	bruin	bruin	bruin	bruin
Geur Odor		-	reukloos	reukloos	reukloos	reukloos
ALGEMEEN CHEMISCHE GEGEVENS						
Opgelloste bestanddelen (membraan) Undissolved components	Q	mg/l	272	47	14	25
METALEN						
Zilver (ICP) Ag	Q	mg/l	<0.010	<0.010	<0.010	<0.010
Aluminium (ICP) Al	Q	mg/l	6.5	1.9	1.0	2.6
Barium (ICP) Ba	Q	mg/l	0.033	0.042	0.018	0.014
Boor B	U	mg/l	<0.020	<0.020	<0.020	<0.020
Calcium (ICP) Ca		mg/l	4.2	6.1	4.1	3.2
Cadmium (ICP) Cd	Q	mg/l	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt (ICP) Co	Q	mg/l	<0.010	<0.010	<0.010	<0.010
Chroom (ICP) Cr	Q	mg/l	0.018	<0.010	<0.010	<0.010
Koper (ICP) Cu	Q	mg/l	<0.010	<0.010	<0.010	<0.010
IJzer (ICP) Fe	Q	mg/l	16	3.3	1.9	5.2
Kwik (Koude damp) Hg	Q	ug/l	<0.15	<0.15	<0.15	<0.15
Kalium (ICP) K		mg/l	0.69	1.4	0.41	0.24
Magnesium (ICP) Mg		mg/l	2.1	2.7	1.0	1.7
Mangaan (ICP) Mn	Q	mg/l	0.19	0.097	0.032	0.061
Molybdeen (ICP) Mo	Q	mg/l	<0.05	<0.05	<0.05	<0.05
Natrium (ICP) Na		mg/l	3.5	4.8	2.3	1.9
Nikkel (ICP) Ni	Q	mg/l	<0.020	<0.020	<0.020	<0.020
Lood (ICP) Pb	Q	mg/l	<0.10	<0.10	<0.10	<0.10
Antimoon (ICP) Sb	Q	mg/l	<0.10	<0.10	<0.10	<0.10
Tin (ICP) Sn	Q	mg/l	<0.10	<0.10	<0.10	<0.10
Titaan (ICP) Ti	Q	mg/l	0.15	0.11	<0.050	0.001
Vanadium (ICP) V	Q	mg/l	0.044	0.016	0.015	0.013
Zink (ICP) Zn	Q	mg/l	<0.010	<0.010	<0.010	<0.010

Dit rapport mag alleen gelezen in samenhang met de documentatie van het kwaliteitssysteem (zoals Productie- en Dienstenspecificaties, Proefbeschrijvingen).
De begeleidende brief vormt een integraal onderdeel van het rapport.
De met een Q gemerkte analyses zijn door de Raad voor Accreditatie (RvA) geaccrediteerd.
De met een U gemerkte analyses zijn uitbesteed aan een extern laboratorium.
Aanbevelingen en interpretaties van de resultaten vallen buiten de scope van de accreditatie.
* Monster en/of resultaten voorzien van een opmerking zie de bijlage

Hoofd laboratorium
F. Billing

LABORATORIUM

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400607
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

Opmerkingen bij monsters en/of analyses

Opmerkingen per monster

M1407056	EGV 52 us/cm, pH 6,7 Veldmetingen uitgevoerd in Mozambique.
M1407058	EGV 174 us/cm, pH 8,6 Veldmetingen uitgevoerd in Mozambique.
M1407059	EGV 110 us/cm, pH 8,4 Veldmetingen uitgevoerd in Mozambique.
M1407061	EGV 38 us/cm, pH 6,8 Veldmetingen uitgevoerd in Mozambique.
M1407063	EGV 131 us/cm, pH 7,8 Veldmetingen uitgevoerd in Mozambique.
M1407064	EGV 49 us/cm, pH 6,94 Veldmetingen uitgevoerd in Mozambique.
M1407066	Veldmetingen uitgevoerd in Mozambique.
M1407067	EGV 100 us/cm, pH 7,9 Veldmetingen uitgevoerd in Mozambique.
M1407069	EGV 94 us/cm, pH 7,6 Veldmetingen uitgevoerd in Mozambique.

Voor monsternemingen die niet zijn uitgevoerd door medewerkers van het laboratorium, hebben de analyseresultaten alleen betrekking op de aangeboden monsters.

LABORATORIUM

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400606
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

IHAS0588	Mozambique E-S/N Nhamucuarara River Slib
IHAS0591	Mozambique E-S/N Revue River N7 slib
IHAS0593	Mozambique E-65 Pungue River slib
IHAS0596	Mozambique E-73 Honde River slib
IHAS0599	Mozambique E-651 Pungue River Slib

Lab. nummer				M1407057*	M1407060*	M1407062*	M1407065*	M1407068*
Meetpuntcode				IHAS0588	IHAS0591	IHAS0593	IHAS0596	IHAS0599
Monstertype				waterbodem	waterbodem	waterbodem	waterbodem	waterbodem
Datum monstername				25-05-2014	26-05-2014	25-05-2014	26-05-2014	26-05-2014
Tijd monstername				15:57	08:48	17:20	14:56	16:36
Bemonsteringsmethode				steek	steek	steek	steek	steek
Datum ontvangst op laboratorium				02-06-2014	02-06-2014	02-06-2014	02-06-2014	02-06-2014
VELDGEGEVENS								
Bemonsterd door			-	extern	extern	extern	extern	extern
ALGEMEEN CHEMISCHE GEGEVENS								
Indamprest	S	Q	%	62.0*	63.9	54.1*	56.5*	81.0*
METALEN								
Kwik (Koude damp) Hg d		Q	mg/kg ds	<0.1	<0.1	<0.1	<0.1	<0.1

TESTEN RvA L 221

Dit rapport moet worden gelezen in samenhang met de documenten van het kwaliteitssysteem (zoals Producten- en Dienstencatalogus, Prestatiekenmerken).
De begeleidende brief vormt een integraal onderdeel van het rapport.
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* Monster en/of resultaat is voorzien van een opmerking; zie de bijlage

Hoofd Laboratorium
R. Dilling

LABORATORIUM

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400606
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

IHAS0601 Mozambique E-246 Lucite River Dombe slib
IHAS0602 Mozambique E-456 Buzi River Gonda Slib

Lab. nummer				M1407070*	M1407291
Meetpuntcode				IHAS0601	IHAS0602
Monstertype				waterbodem	waterbodem
Datum monstername				26-05-2014	26-05-2014
Tijd monstername				12:43	00:00
Bemonsteringsmethode				steek	steek
Datum ontvangst op laboratorium				02-06-2014	05-06-2014
VELDGEGEVENS					
Bemonsterd door			-	extern	extern
ALGEMEEN CHEMISCHE GEGEVENS					
Indamprest	S	Q	%	61.6*	93.7*
METALEN					
Kwik (Koude damp) Hg		Q	mg/kg ds	<0.1	<0.1

Dit rapport moet worden gelezen in samenhang met de documenten van het kwaliteitssysteem (zoals Producten- en Dienstencatalogus, Prestatiekenmerken).
De begeleidende brief vormt een integraal onderdeel van het rapport.
De met een Q gemerkte analyses zijn door de Raad voor Accreditatie (RvA) geaccrediteerd.
De met een U gemerkte analyses zijn uitbesteed aan een extern laboratorium.
Aanbevelingen en interpretaties van de resultaten vallen buiten de scope van de accreditatie
* Monster en/of resultaat is voorzien van een opmerking; zie de bijlage

Hoofd Laboratorium
R. Dilling

L A B O R A T O R I U M

WATERSCHAP Hunze en Aa's

Rapportcode: RAP1400606
Versie: 001.000
Datum: 25-06-2014

Overzicht analyseresultaten

Opdrachtgever: Waterschap Hunze en Aa's

Opmerkingen bij monsters en/of analyses

Opmerkingen per monster

M1407057	Sedimentlaag 12 cm.
M1407060	Sedimentlaag: 5 cm.
M1407062	Sedimentlaag: 6 cm.
M1407065	Sedimentlaag: 5 cm.
M1407068	Sedimentlaag: 5 cm.
M1407070	Sedimentlaag: 6 cm.

Opmerkingen per resultaat

M1407057 Indamprest	* Overschrijding conserveringstermijn met 9 dagen.
M1407062 Indamprest	* Overschrijding conserveringstermijn met 3 dagen.
M1407065 Indamprest	* Overschrijding conserveringstermijn met 9 dagen.
M1407068 Indamprest	* Overschrijding conserveringstermijn met 8 dagen.
M1407070 Indamprest	* Overschrijding conserveringstermijn met 8 dagen.
M1407291 Indamprest	* Overschrijding conserveringstermijn met 8 dagen.

* Het analyseresultaat is hierdoor mogelijk beïnvloed.

Voor monstermemingen die niet zijn uitgevoerd door medewerkers van het laboratorium, hebben de analyseresultaten alleen betrekking op de aangeboden monsters.
De met een S gemerkte analyses zijn geaccrediteerd volgens het AS3000 schema.

Annex 2.7: Filled in field form

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	DELTON NHARI
Field equipment:	Conform protocols or not conform
Sample nr: CAPTACAO FIPAG, PUNGWE RIVER	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	23.05.2014 (14:00 H)
Sample GPS and pictures:	19° 24' 10"; 034° 33' 21" alt = 5m
Sample color:	Brown
Sample smell:	no smell
Sample brightness:	
Sample Oxygen:	NO water quality anylis (in situ)
Sample temperature:	
Thickness sludge blanket:	NO sediment sampling

Is the field form with the pictures stored in the computer. Yes/No

Date: 27.5.2014

Signature:

FIPAG Water Intake

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	DELTON NAMIA e TANASIO OMEGA
Field equipment:	Conform protocols or not conform
Sample nr: E-65 PUNGUE RIVER, Pungu Sul	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	25; May, 2014 (17:20H)
Sample GPS and pictures:	18° 33' 08,9"; 33° 16' 48,8" alt=462 m
Sample color:	Brown
Sample smell:	No smell
Sample brightness:	
Sample Oxygen:	13,8 mg/l ; 112,8 %
Sample temperature:	20,8 °C CE 38 µS/cm ; PH = 6,8
Thickness sludge blanket: sediment	6 cm

Is the field form with the pictures stored in the computer. Yes/No

Date: 25. May. 2014

Signature:

E-65 Pungue ive/Pungue Sul

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCÍSIO OMEGA e DEITON NHAIA
Field equipment:	Conform protocols or not conform
Sample nr: E-73 HONDE	Contains three jars – Unresolved components; Metals; Sludge RIVER
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	25.5.2014 (~~[illegible]~~) (14:56H)
Sample GPS and pictures:	18° 31' 15,7" 33° 03' 08,8" alt=543m
Sample color:	Brown
Sample smell:	No smell
Sample brightness:	
Sample Oxygen:	10,47 mg/l ; 129,6 %
Sample temperature:	21°C ; CE 49 MS/CM ; PH=6,94
Thickness sludge blanket: Sediment	5cm

Is the field form with the pictures stored in the computer. Yes/No

Date:

Signature: 25-5-14

E-73 Honde River

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCÍSIO OMEGA e DELTON NHAMIA
Field equipment:	Conform protocols or not conform
Sample nr: E-S/N NHAMUCUARARA RIVER	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	25, May, 2014 (15:57H)
Sample GPS and pictures:	18° 33' 57,8" 33° 00' 09,6" alt=602m
Sample color:	BROWN
Sample smell:	NO smell
Sample brightness:	
Sample Oxygen:	14,8 mg/l ; 138,4 %
Sample temperature:	22°C ; CE 52 µS/cm ; PH= 6,7
Thickness sludge blanket: Sediment	12 cm

Is the field form with the pictures stored in the computer. Yes/No

Date: 25.5.14

Signature:

E S/N Nhamucuarara River

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	DELTON NAMA e TARCÍSIO OMEGA
Field equipment:	Conform protocols or not conform
Sample nr: E-S/N REVUE	Contains three jars – Unresolved components; Metals; Sludge RIVER, N7
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	26.5.2014 (08:48 H)
Sample GPS and pictures:	18° 59' 10,2" ; 33° 02' 58,7 alt=618m
Sample color:	Brown
Sample smell:	No Smell
Sample brightness:	
Sample Oxygen:	10,8% ; 0 74 mg/l ;
Sample temperature:	20,8' ; CE = 110 µS/cm ; PH=8,4
Thickness sludge blanket: sediment	5 cm

Is the field form with the pictures stored in the computer. Yes/No

Date: 26.5.14

Signature:

E-672 Revue River N7

Field form

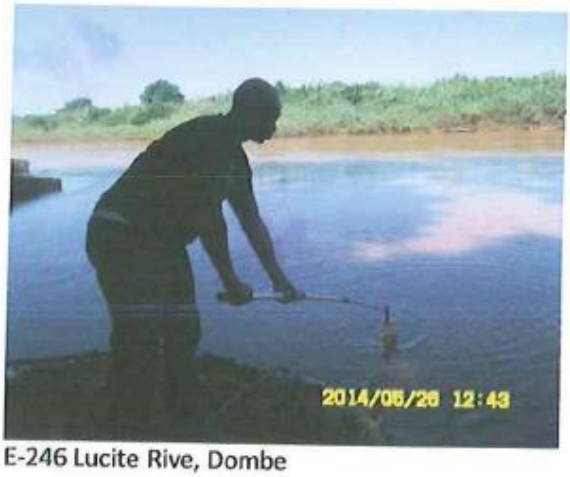
Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCISIO OMEGA e DEITON NHAIA
Field equipment:	Conform protocols or not conform
Sample nr: E-246 Lucite RIVER, DOMBE	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	26, may, 2014 (12:43H)
Sample GPS and pictures:	19° 58' 39,3"; 33° 23' 35,5" alt=124 m
Sample color:	Brown
Sample smell:	No Smell
Sample brightness:	
Sample Oxygen:	4% ; 0,53 mg/l
Sample temperature:	20,8°C ; CE = 94 µs/cm ; PH = 7,6
Thickness sludge blanket: Sediment	6 cm

Is the field form with the pictures stored in the computer. Yes/No

Date: 26.5.14

Signature:



E-246 Lucite Rive, Dombe

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCISIO OMEGA & DEITON NHAIA
Field equipment:	Conform protocols or not conform
Sample nr: E-672 REVUE-RIVER	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	26, may, 2014 (14:53 H)
Sample GPS and pictures:	19° 45' 53,2"; 33° 50' 48,8"
Sample color:	Brown
Sample smell:	No Smell
Sample brightness:	
Sample Oxygen:	10,7% ; 0,89 PPM
Sample temperature:	23,2°C ; CE = 174 MS/cm ; PH = 8,6
Thickness sludge blanket:	No Sampling sediment

Is the field form with the pictures stored in the computer. Yes/No

Date: 26.5.14

Signature:

E-672 Revue River N1

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCISIO OMEGA e DETOH NHAMA.
Field equipment:	Conform protocols or not conform
Sample nr: E 456 BUZI-RIVER, GONDA	Contains three jars – Unresolved components; Metals; Sludge
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	26, May, 2014 (14:10 H)
Sample GPS and pictures:	19° 55' 53,2"; 33° 49' 36,6 alt=533m
Sample color:	Brown
Sample smell:	NO Smell
Sample brightness:	
Sample Oxygen:	20,7% ; and 1,66 mg/l
Sample temperature:	22,8°c, CE = 131 µS/cm ; PH = 7,8
Thickness sludge blanket: sediment	4 cm

Is the field form with the pictures stored in the computer. Yes/No

Date: 26-5-14

Signature:

E- 465 Buzi River, Gonda

Field form

Mission is to measure on 10 points in the river Pugwe the presence or absence of Mercury in the surface water and the sludge conform the two protocols (sampling surface water and fieldwork sludge research)

Field worker:	TARCÍSIO OMEGA e DELTON NHAMA
Field equipment:	Conform protocols or not conform
Sample nr: E-651	Contains three jars – Unresolved components; Metals; Sludge PUNGUE RIVER
Delivery date:	
Sample data:	surface water and sludge
Sample date and time:	26, may, 2014 (16:36H)
Sample GPS and pictures:	18° 59' 37,2"; 34° 05 08,4" alt=68 m
Sample color:	Brown
Sample smell:	No smell
Sample brightness:	
Sample Oxygen:	1,1% and 0,08 PPM
Sample temperature:	22,2°C ; CE = 100 MS/CM ; PH = 7,9
Thickness sludge blanket: Sediment	5 cm

Is the field form with the pictures stored in the computer. Yes/No

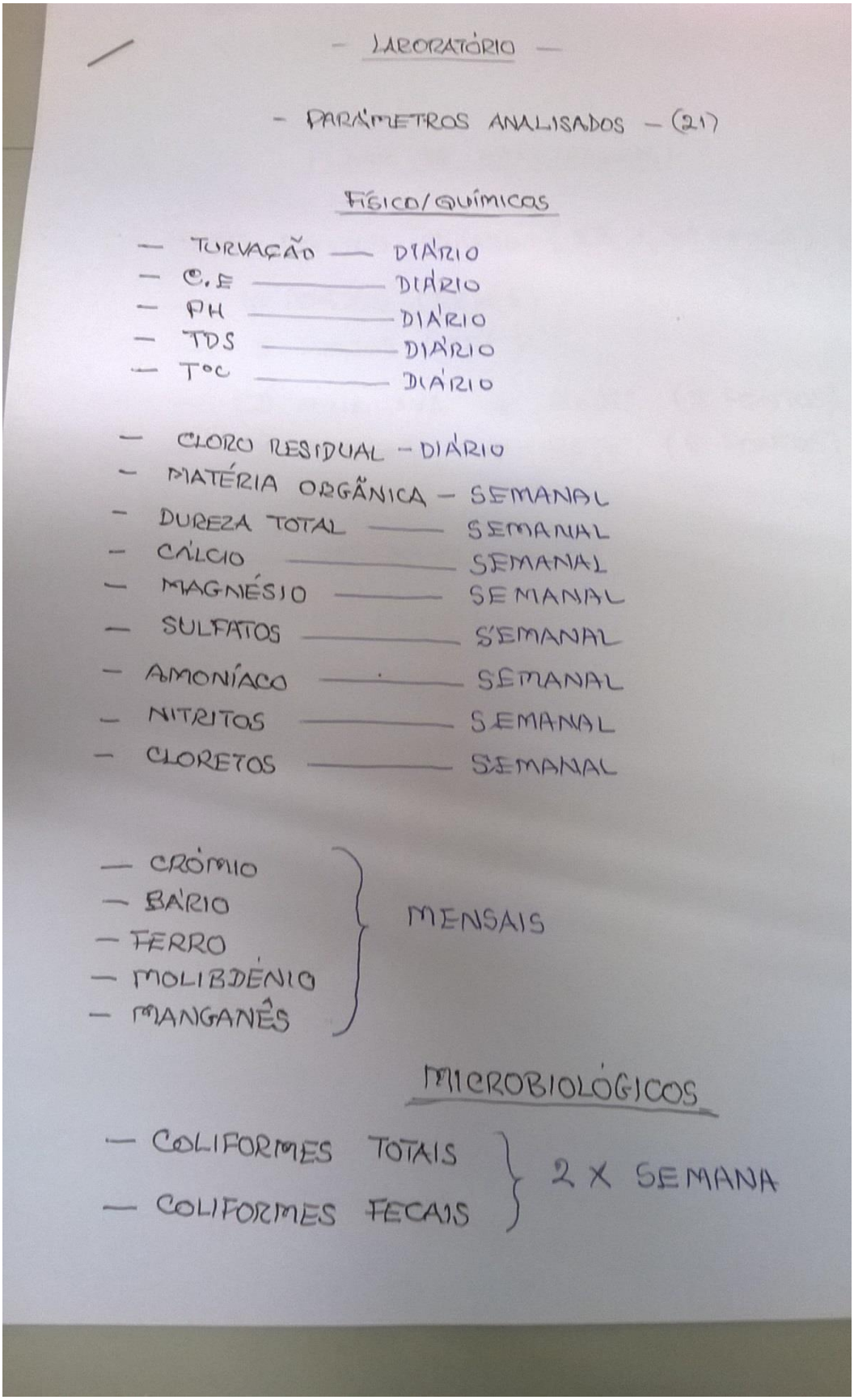
Date: 26.5.2014

Signature:

E-651 Pungue River

Annex 3: Some Laboratory facilities in Beira

The Laboratory of FIPAG is able to analyse the following parameters:



The Laboratory of the ETAR Beira is able to analyse the following parameters:

Aluminio
Cadmio
Chumbo
Cloretos
Cloro, livre, combinado e total
Cobre
Cromio
Dureza
Ferro
Fosforo
Fluoretos
Manganês
Nitratos
Nitritos
Azoto
Zinco