# UTILITY PLATFORM

## For Strengthening Partnerships of Municipal Utilities Worldwide

### 6th INTERNATIONAL NETWORKING EVENT

### 25TH TO 26TH OF MAY 2023

# INSIGHTS ON CAPACITY DEVELOPMENT IN BUFFALO CITY METROPOLITAN MUNICIPALITY SOUTH AFRICA

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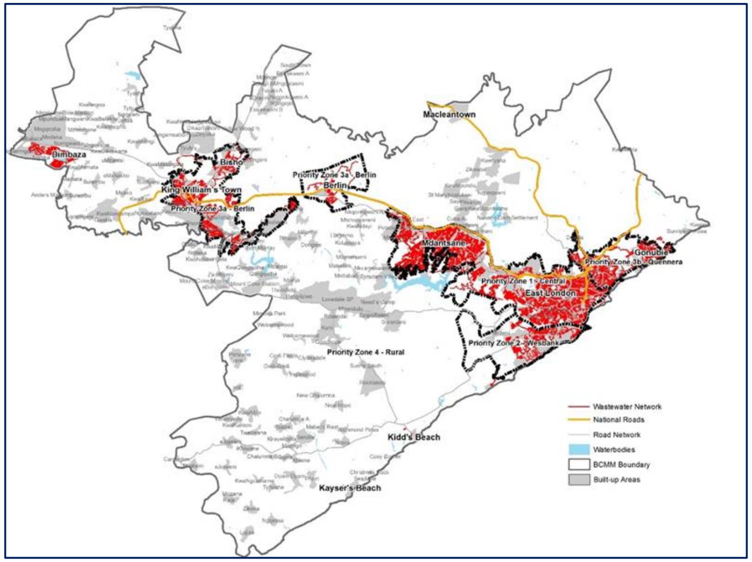
26th May 2023

# CONTENTS

1. Background on the Partnership
2. Context of Capacity Development
3. Developing Wastewater Training Library
4. Progress Made So Far
5. Peer to Peer Job Shadowing

## 1. BACKGROUND ON THE PARTNERSHIP

- Buffalo City is approximately 2752 km$^2$
- 253 478 households and a population of 834 997
- 59% Urban and 41% rural communities, 25% of households on informal settlements
- 3555 km of water and 2442 km of sewerage reticulation
- Bulk water from 6 surface dams, 4 water treatment plants and 15 wastewater treatment plants
- Average Daily Water Consumption at 167 Ml/d during 2021-2022 FY
- Non-Revenue Water between 36% and 46% last 5 years
- Water & Wastewater Infrastructure Assets at approximately R12.7 billion (606 million €)
- 98% access to water and 94% access to sanitation

# Utility Platform: 6th International Networking Event – 25th to 26th May 2023 in Berlin

## INSIGHTS ON CAPACITY DEVELOPMENT IN BUFFALO CITY MUNICIPALITY SOUTH AFRICA

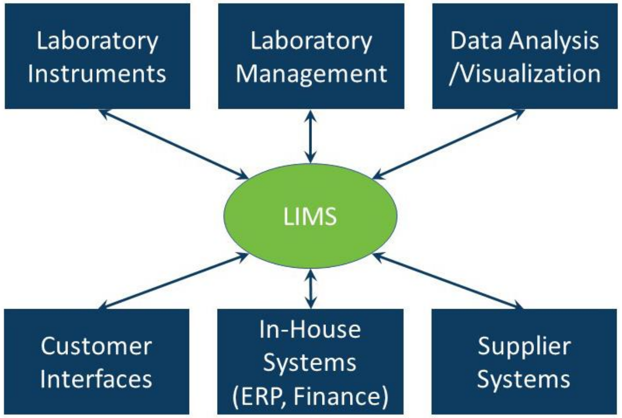
## 1. BACKGROUND ON THE PARTNERSHIP

- **Buffalo City – OOWV – Wupperverband Partnership**
  - Partnership formed in May 2022
  - 4 Work Packages identified for the pilot project
  - Monthly virtual progress meetings

- **Identified Work Packages**
  - Water Conservation and Environmental Awareness
  - Water Quality Management and Bulk Water Supply
  - Wastewater Treatment
  - ICT and Data Management

- **Wastewater Treatment**
  - Laboratory Information Management Systems (LIMS)
  - Wastewater Operation Monitoring System (Wastewater Logbook)
  - Wastewater Operation Training & Learning Material (Wastewater Library)

## 1. BACKGROUND ON THE PARTNERSHIP (CONT.)




### ❑ Laboratory Information Management System (LIMS)

- Efficient management of monitoring sample results.
- LIMS installed in 2017; however, not customised
- Partnership to complete customization of LIMS for BCMM

### ❑ Wastewater Operation Monitoring System (Wastewater Logbook)

- Development of daily wastewater operations monitoring logbook.
- The digital logbook summary of daily operational parameters measured on site using probes.
- East Bank WWTW was selected for piloting of the wastewater logbook.
- A customized software system compatible with existing SCADA and Telemetry.

### ❑ Wastewater Operation Training and Learning Material (Training Library)

- Development of a Training Library for WWTW operators.
- The partnership to collect existing training material.
- The partnership to develop new material on identified gaps.
- Training to be interactive, online, tracking individual progress.

| Date | Influent Characteristics City Pump Station | | | | Influent Characteristics Ihlanza Pump Station | | | | Recycle Flows | | Re Chara |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow (Ml/d) | COD (mg/l) | $NH_3$ (mg/l) | P (mg/l) | Flow (Ml/d) | COD (mg/l) | $NH_3$ (mg/l) | P (mg/l) | a-recycle (Ml/d) | s-recycle (Ml/d) | DO (mg/l |
| 01 July 2022 | 28 | 670 | 56 | 23 | 28 | 670 | 56 | 23 | 55 | 30 | 1.8 |
| 02 July 2022 | 28 | 568 | 45 | 34 | 28 | 568 | 45 | 34 | 55 | 30 | 2 |
| 03 July 2022 | 28 | 708 | 59 | 31 | 28 | 708 | 59 | 31 | 55 | 30 | 1.5 |
| 04 July 2022 | 28 | 645 | 66 | 32 | 28 | 645 | 66 | 32 | 55 | 30 | 1.8 |
| 05 July 2022 | 34 | 456 | 44 | 28 | 34 | 456 | 44 | 28 | 55 | 30 | 2.1 |
| 06 July 2022 | 32 | 567 | 58 | 24 | 32 | 567 | 58 | 24 | 55 | 30 | 0.9 |
| 07 July 2022 | 31 | 670 | 66 | 32 | 31 | 670 | 66 | 32 | 55 | 30 | 1.9 |
| 08 July 2022 | 28 | 708 | 59 | 31 | 28 | 708 | 59 | 31 | 55 | 30 | 1.5 |
| 09 July 2022 | 28 | 708 | 59 | 31 | 28 | 708 | 59 | 31 | 55 | 30 | 1.5 |
| 10 July 2022 | 28 | 645 | 66 | 32 | 28 | 645 | 66 | 32 | 55 | 30 | 1.8 |
| 11 July 2022 | 34 | 456 | 44 | 28 | 34 | 456 | 44 | 28 | 55 | 30 | 2.1 |
| 12 July 2022 | 32 | 567 | 58 | 24 | 32 | 567 | 58 | 24 | 55 | 30 | 0.9 |
| 13 July 2022 | 28 | 708 | 59 | 31 | 28 | 708 | 59 | 31 | 55 | 30 | 1.5 |
| 14 July 2022 | 28 | 645 | 66 | 32 | 28 | 645 | 66 | 32 | 55 | 30 | 1.8 |
| 15 July 2022 | 34 | 456 | 44 | 28 | 34 | 456 | 44 | 28 | 55 | 30 | 2.1 |
| 16 July 2022 | 32 | 567 | 58 | 24 | 32 | 567 | 58 | 24 | 55 | 30 | 0.9 |
| 17 July 2022 | 28 | 708 | 59 | 31 | 28 | 708 | 59 | 31 | 55 | 30 | 1.5 |
| 18 July 2022 | 28 | 645 | 66 | 32 | 28 | 645 | 66 | 32 | 55 | 30 | 1.8 |
| 19 July 2022 | 34 | 456 | 44 | 28 | 34 | 456 | 44 | 28 | 55 | 30 | 2.1 |

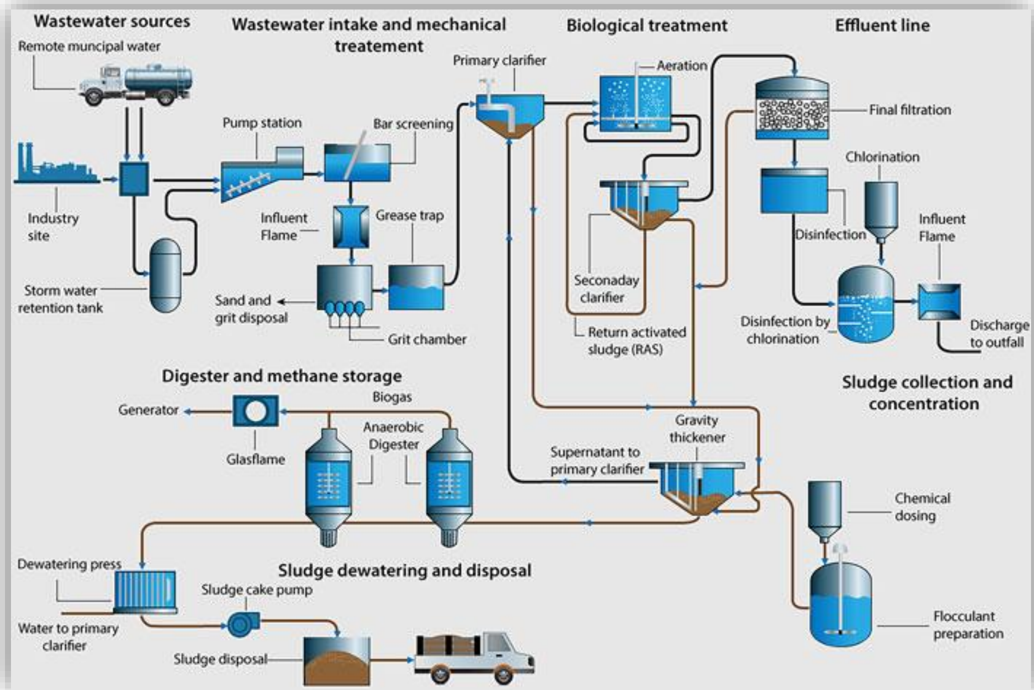
## 2. CONTEXT FOR CAPACITY DEVELOPMENT

- **Buffalo City Operates 15 Wastewater Treatment Works**
  - 4 Oxidation Ponds Systems
  - 5 Biological Trickling Filter Systems
  - 5 Activated Sludge Systems
  - 1 Marine Discharge System

- **Stringent Legislative Requirements**
  - Legislated effluent quality requirements
  - Classification of for Process Controllers
  - Minimum requirements for staffing of treatment works
  - Existing staff with low education levels

- **Community Awareness on Environmental Impacts**
  - Local communities very aware of protection of environment
  - Municipalities taken to court for non-compliance
  - Annual national government compliance audits

## 2. CONTEXT FOR CAPACITY DEVELOPMENT (CONT.)




### ❑ Activated Sludge Systems Complex

- Mechanical preliminary treatment
- Biological treatment technical
- Sludge treatment complex to operate

### ❑ Skilled Staff Key to Compliance

- Personnel skills key to compliance
- Low education levels a challenge.

### ❑ Existing Training Options Generic

- Formal university education
- Local Training Institutions
- Learnership Programmes
- Appointing training service providers

### ❑ Need to Develop Targeted Training

- Need for a tailor-made training programme
- Training disruptive to normal operations
- Developing Training Library through partnership
- Identified 12 focus areas

# 3. DEVELOPING WASTEWATER TRAINING AND LEARNING MATERIAL (TRAINING LIBRARY)

## Module 1: Introduction

- Introduction To Wastewater Treatment
- Legislative Framework
- Basic Wastewater Chemistry
- Wastewater Characterization
- Fundamental Measurement Units
- Typical Basic Calculations
- Self Evaluation Questions

## Module 2: Preliminary Treatment

- Introduction to Preliminary Treatment
- Types of Preliminary Treatment Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 3: Primary Sedimentation

- Introduction to Primary Sedimentation
- Types of Primary Sedimentation Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 4: Oxidation Ponds Treatment Systems

- Introduction to Oxidation Ponds Systems
- Types of Oxidation Ponds Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 5: Biological Trickling Filters

- Introduction to Biofilter Systems
- Types of Biofilter Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 6: Activated Sludge Treatment Systems

- Introduction to Activated Sludge Systems
- Types of Activated Sludge Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

# 3. DEVELOPING WASTEWATER TRAINING AND LEARNING MATERIAL (TRAINING LIBRARY)

## Module 7: Clarifiers
- Introduction to Clarifiers
- Types of Clarifiers
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 8: Disinfection
- Introduction to Disinfection
- Types of Disinfection Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 9: Sludge Treatment
- Introduction to Sludge Treatment
- Types of Sludge Treatment Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 10: Sludge Dewatering
- Introduction to Sludge Dewatering
- Types of Sludge Dewatering Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 11: SCADA & Telemetry
- Introduction to SCADA & Telemetry
- Types of SCADA & Telemetry Systems
- Design Considerations
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## Module 12: Maintenance of Equipment
- Introduction to Maintenance of Equipment
- Critical Mechanical & Electrical Equipment
- Operation and Maintenance
- Troubleshooting Guide
- Self Evaluation Questions

## 3. DEVELOPING WASTEWATER TRAINING AND LEARNING MATERIAL (TRAINING LIBRARY)

**MODULE 1: INTRODUCTION**

- ❑ Introduction to Wastewater Treatment
- ❑ Wastewater Legislative Framework
- ❑ Basic Wastewater Chemistry
- ❑ Wastewater Characterization
  - Biological Oxygen Demand
  - Chemical Oxygen Demand
  - Biodegradable & Unbiodegradable COD
  - Soluble & Particulate COD Fractions
  - Wastewater Nutrients (Nitrogen / Phosphates)
- ❑ Fundamental Measurement Units
- ❑ Typical Basic Calculations
- ❑ Self Evaluation Questions

**MODULE 2: PRELIMINARY TREATMENT**

- ❑ Introduction to Preliminary Treatment
- ❑ Types of Preliminary Treatment Systems
  - Screenings Removal Systems
  - Grit Removal Systems
  - Flow Measurement Systems
  - Odour Control Systems
- ❑ Design Considerations
- ❑ Operation and Maintenance
- ❑ Troubleshooting Guide
- ❑ Self Evaluation Questions

# 3. DEVELOPING WASTEWATER TRAINING AND LEARNING MATERIAL (TRAINING LIBRARY)

## 1. Basic Level

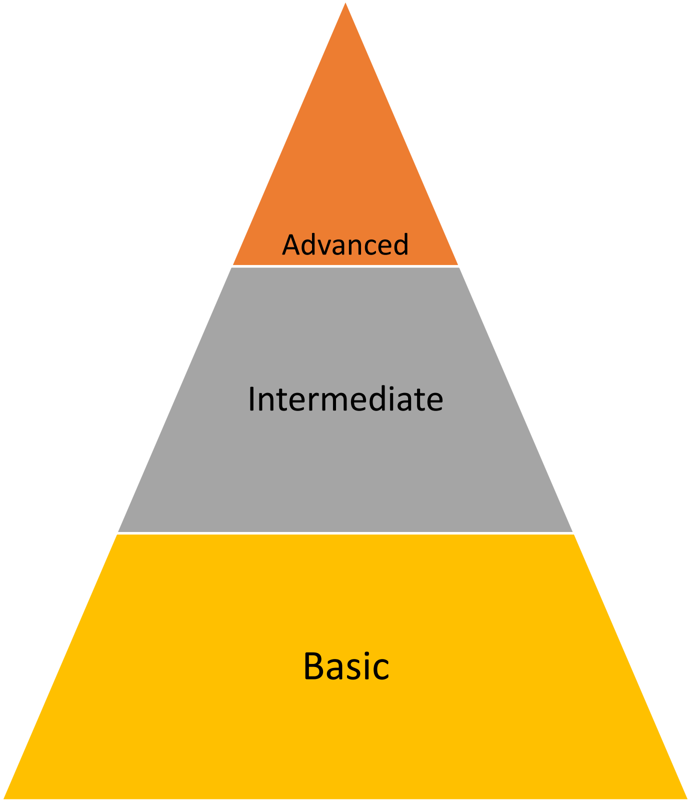
Basic principles of wastewater treatment, focused on operational level, fundamental basic operation calculations, operation and maintenance of equipment, and diagnostic troubleshooting guide.

## 2. Intermediate Level

Fundamental principles of wastewater treatment, focused on technical support level, treatment process improvement, maintenance of equipment at asset management level, and diagnostic troubleshooting guide.

## 3. Advanced Level

Fundamental principles of wastewater treatment at an advanced level, in relation to treatment process assessments, equipment and technology upgrading needs assessment, civil, mechanical, and electrical infrastructure improvement advisory level.




**FOCUS ON THE BASIC AND INTERMEDIATE LEVELS ONLY.**

## 4. PROGRESS MADE ON DEVELOPING WASTEWATER TRAINING LIBRARY

1. Identify Wastewater Training Areas
2. Establish Training Levels
3. Collect Training Material from Existing Sources
4. Identify Training Gaps from Collected Material
5. Appoint Service Provider to Package Training Material
6. Production of New Material on Identified Gaps
7. Editing and Packaging Training Material to Modules
8. Digitalization and Timer-Based Online Links to Training Material
9. Pilot Online Training Modules


- Currently on Step 3: Collecting Training Material from Existing Sources
- Target date to complete training material is June 2024

## 5. PEER TO PEER JOB SHADOWING

### ❑ BCMM Personnel Job Shadowing in Germany

As part of the professional development of BCMM employees, 6 BCMM employees will be sent to Germany in July or August 2023 for an on-the-job training programme for a period of two weeks.

### ❑ Structuring of the Training

- 1-day Job Shadowing: During this Job Shadowing the BCMM personnel will shadow one of our employees at work. They will be familiarized with the day-to-day work at our wastewater treatment plants.
- 3-days On-The- Job: Training: During these three days BCMM personnel will get hands-on experience of operating our wastewater treatment plants, with a German colleague by the side.
- 1-day Application: On the last day of the week BCMM personnel will operate the plant themselves, being shadowed by our employees.

### ❑ OOWV / Wupperverband Personnel Job Shadowing in South Africa

German wastewater operators to do Job Shadowing in South Africa .
To learn on implementation and peer to peer learning on other areas of interest

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## INSIGHTS ON CAPACITY DEVELOPMENT IN BUFFALO CITY MUNICIPALITY SOUTH AFRICA



**Betreiberpartnerschaften**

| | |
|---|---|
| **Gelsenwasser AG,** Emschergenossenschaft/Lippeverband, Eigenbetrieb WABAU, Baruth/Mark | Lukanga Water and Sewerage Company, Kabwe, Sambia |
| **Stadtentwässerung Dresden,** ZWAV Plauen, Fernwasserversorgung Elbaue-Ostharz, Torgau | Luapula Water and Sewerage Company, Mansa, Sambia (GWOPA EU-WOP) |
| **Stadtentwässerung Dresden, Berliner Wasser-betriebe, Stadtentwässerungsbetriebe Köln** | Lvivvodokanal, TernopilVodokanal, NadvirnaVodokanal, Ukraine |
| **Hamburg Wasser,** Hanse Wasser/Bremen | Miyahuna, Amman, Jordanien |
| **Hamburg Wasser,** Netze BW/Stuttgart | Kahama Shinyanga Water Supply and Sanitation Authority (KASHWASA) / KUWASA, Tansania |
| **Hamburg Wasser** | eThekwini Metropolitan Municipality, Südafrika (GWOPA EU-WOP) |
| **Hamburg Wasser** | KiyvVodokanal, Ukraine |
| **Oldenburgisch-Ostfriesischer Wasserverband (OOWV), Wupperverband** | Buffalo City Metropolitan Municipality, Südafrika |
| **Oldenburgisch-Ostfriesischer Wasserverband (OOWV)** | SumyVodokanal; ChernihivVodokanal, Ukraine |
| **MVV-Netze Mannheim** | ChernivtsiVodokanal, Ukraine |


BUFFALO CITY

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WUPPERVERBAND
für Wasser, Mensch und Umwelt