UMNGENI-UTHUKELA WATER · AMANZI

INFRASTRUCTURE MASTER PLAN 2025
2025/2026 – 2055-2056

VOLUME 10
Wastewater

Improving Quality of Life and Enhancing Sustainable Economic Development in KwaZulu-Natal

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connect with us

Infrastructure Development Division, uMngeni-uThukela Water
310 Burger Street, Pietermaritzburg, 3201, Republic of South Africa
P.O.Box 9, Pietermaritzburg, 3200, Republic of South Africa
Tel: +27 (33) 341 1111 / Fax: +27 (33) 341 1167 / Toll free: 0800 331 820 / Email: info@uuw.co.za

For further information, please contact:

Planning Services

Infrastructure Development Division

uMngeni-uThukela Water

P.O.Box 9, Pietermaritzburg, 3200

KwaZulu-Natal, South Africa

Tel: 033 341-1522

Fax: 033 341-1218

Email: info@uuw.co.za

Web: www.umngeni-uthukela.co.za

uMngeni-uThukela Water

Infrastructure Master Plan 2025

2025/2026 – 2055/2056

June 2025

Prepared by:

Graham Metcalf

Digitally signed by Graham Metcalf
DN: cn=Graham Metcalf, o=Umgeni Water, ou=Planning Services, email=graham.metcalf@umgeni.co.za, c=ZA
Date: 2025.06.26 15:41:11 +02'00'

Graham Metcalf

Geohydrologist

Approved by:

Kevin Meier

Kevin Meier *PrEng*

Manager: Planning Services

Nkosi Cele *PrEng*

Executive: Infrastructure Development

PREFACE

This Infrastructure Master Plan 2025 describes:

- uMngeni-uThukela Water's infrastructure plans for the financial period 2025/2026 – 2055/2056, and
- Infrastructure master plans for other areas outside of uMngeni-uThukela Water's Operating Area but within KwaZulu-Natal.

It is a comprehensive technical report that provides information on current infrastructure and on future infrastructure development plans. This report replaces the last comprehensive Infrastructure Master Plan that was compiled in 2024.

The report is divided into **ten** volumes as per the organogram below.

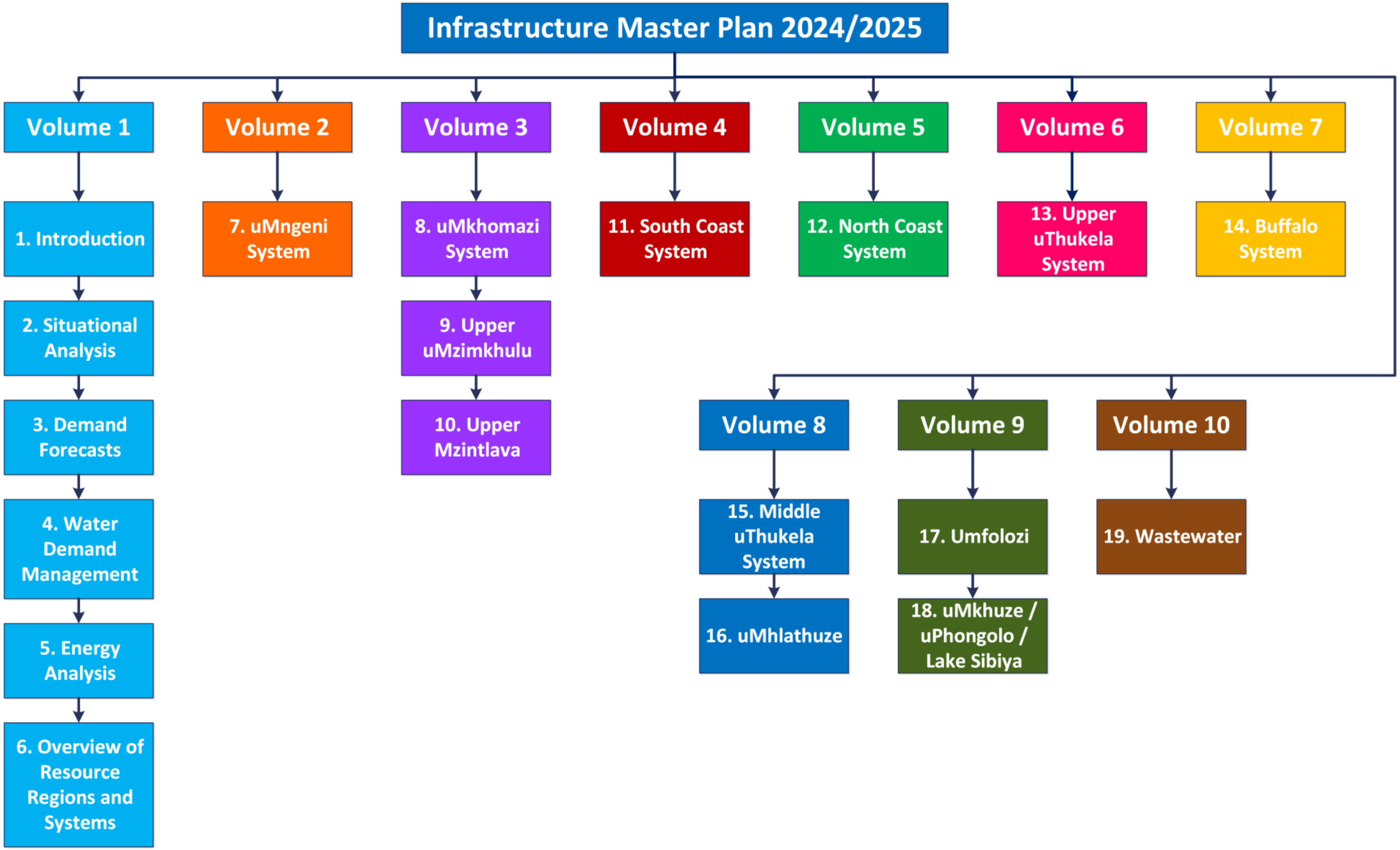
Volume 1 includes the following sections and a description of each is provided below:

- **Section 2** describes the most recent changes and trends within the primary environmental dictates that influence development plans within the province.
- **Section 3** relates only to the uMngeni-uThukela Water Operational Areas and provides a review of historic water sales against past projections, as well as uMngeni-uThukela Water's most recent water demand projections, compiled at the end of 2024.
- **Section 4** describes Water Demand Management initiatives that are being undertaken by the utility and the status of Water Demand Management Issues in KwaZulul-Natal.
- **Section 5**, which also relates to uMngeni-uThukela Water's Operational Area, contains a high level review of the energy consumption used to produce the water volumes analysed in Section 3.
- **Section 6** provides an overview of the water resource regions and systems supplied within these regions.

The next eight volumes describe the current water resource situation and water supply infrastructure of the various systems in KwaZulu-Natal, including:

- **Volume 2 Section 7** uMngeni System.
- **Volume 3 Section 8** uMkhomazi System
  Section 9 uMzimkhulu System
  Section 10 Mzintlava System
- **Volume 4-** **Section 11** South Coast System
- **Volume 5 Section 12** North Coast System
- **Volume 6 Section 13** Upper uThukela System
- **Volume 7 Section 14** Buffalo System
- **Volume 8 Section 15** Middle uThukela System
  Section 16 Mhlathuze System
- **Volume 9 Section 17** Umfolozi System
  Section 18 uMkhuze / uPhongolo / Lake Sibiya System

Volume 10, Section 19 describes the wastewater works currently operated by uMngeni-uThukela Water (shown in pale brown in the adjacent figure) and provides plans for development of additional wastewater treatment facilities. The status of wastewater treatment in WSA's that are not supplied by uMngeni-uThukela Water are also described in this section.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It is important to note that information presented in this report is in a summarised form and it is recommended that the reader refer to relevant planning reports if more detail is sought. Since the primary focus of this Infrastructure Master Plan is on bulk supply networks, the water resource infrastructure development plans are not discussed at length. The Department of Water and Sanitation (DWS), as the responsible authority, has undertaken the regional water resource development investigations. All of these investigations have been conducted in close collaboration with uMngeni-uThukela Water and other major stakeholders in order to ensure that integrated planning occurs. Details on these projects can be obtained directly from DWS, Directorate: Options Analysis (East).

The Infrastructure Master Plan is a dynamic and evolving document. Outputs from current planning studies, and comments received on this document will therefore be taken into account in the preparation of the next update.

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LIST OF ACRONYMS

AADD	Annual Average Daily Demand
AC	Asbestos Cement
ADWF	Average Dry Weather Flow
API	Antecedent Precipitation Index
AVGF	Autonomous Valveless Gravity Filter
BID	Background Information Document
BPT	Break Pressure Tank
BWL	Bottom Water Level
BWSP	Bulk Water Services Provider
BWSS	Bulk Water Supply Scheme
CAPEX	Capital Expenditure
CMA	Catchment Management Agency
CoGTA	Department of Co-operative Governance and Traditional Affairs
CWSS	Community Water Supply and Sanitation project
DAEA	Department of Agriculture and Environmental Affairs
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DM	District Municipality
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
DWAF	Department of Water Affairs and Forestry
EFR	Estuarine Flow Requirements
EIA	Environmental Impact Assessment
EKZN Wildlife	Ezemvelo KZN Wildlife
EMP	Environmental Management Plan
EWS	eThekwini Water Services
EXCO	Executive Committee
FC	Fibre Cement
FL	Floor level
FSL	Full Supply level
GCM	General Circulation Model
GDP	Gross Domestic Product
GDPR	Gross Domestic Product of Region
GVA	Gross Value Added
HDI	Human Development Index
IDP	Integrated Development Plan
IFR	In-stream Flow Requirements
IMP	Infrastructure Master Plan
IRP	Integrated Resource Plan

ISP	Internal Strategic Perspective
IWRM	Integrated Water Resources Management
KZN	KwaZulu-Natal
LM	Local Municipality
LUMS	Land Use Management System
MA	Moving Average
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MBR	Membrane Bioreactor
MMTS	Mooi-uMngeni Transfer Scheme
MMTS-1	Mooi-uMngeni Transfer Scheme Phase 1
MMTS-2	Mooi-uMngeni Transfer Scheme Phase 2
mPVC	Modified Polyvinyl Chloride
MTEF	Medium-Term Expenditure Framework
MTSF	Medium-Term Strategic Framework
MWP	Mkomazi Water Project
MWP-1	Mkomazi Water Project Phase 1
NCP-1	North Coast Pipeline I
NCP-2	North Coast Pipeline II
NCSS	North Coast Supply System
NGS	Natal Group Sandstone
NPV	Net Present Value
NRW	Non-Revenue Water
NSDP	National Spatial Development Perspective
NWSP	National Water Sector Plan
OPEX	Operating Expenditure
p.a.	Per annum
PES	Present Ecological Status
PEST	Political, Economical, Sociological and Technological
PGDS	Provincial Growth and Development Strategy
PPDC	Provincial Planning and Development Commission (KZN's)
PSEDS	Provincial Spatial Economic Development Strategy
PWSP	Provincial Water Sector Plan
RDP	Reconstruction and Development Programme
RO	Reverse Osmosis
ROD	Record of Decision
RQO	Resource Quality Objective
SCA	South Coast Augmentation
SCP	South Coast Pipeline
SCP-1	South Coast Pipeline Phase 1
SCP-2a	South Coast Pipeline Phase 2a
SCP-2b	South Coast Pipeline Phase 2b

SDF	Spatial Development Framework
SHR	St Helen's Rock (near Port Shepstone)
STEEPLE	Social/demographic, Technological, Economic, Environmental (Natural), Political, Legal and Ethical
SWRO	Seawater Reverse Osmosis
TEC	Target Ecological Category
TWL	Top Water Level
uPVC	Unplasticised Polyvinyl Chloride
UUW	uMngeni-uThukela Water
WA	Western Aqueduct
WC	Water Conservation
WDM	Water Demand Management
WMA	Water Management Area
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSNIS	Water Services National Information System
WSP	Water Services Provider
WTP	Water Treatment Plant
WWW	Wastewater Works

Spellings of toponyms have been obtained from the Department of Arts and Culture (DAC). DAC provides the official spelling of place names and the spellings, together with the relevant gazette numbers, can be accessed at http://www.dac.gov.za/content/toponymic-guidelines-map-and-other-editors.

When using any part of this report as a reference, please cite as follows:

uMngeni-uThukela Water, 2025. uMngeni-uThukela Water Infrastructure Master Plan 2025/2026 – 2055/56, Vol 1 - 10. Prepared by Planning Services, June 2025.

LIST OF UNITS

Length/Distance:	mm	millimetre
	m	metre
	km	kilometre
Area:	m^2	square metres
	ha	hectare
	km^2	square kilometres
Level/Altitude:	mASL	metres above sea-level
Time:	s	second
	min	minute
	hr	hour
Volume:	m^3	cubic metres
	Mℓ	megalitre
	million m^3	million cubic metres
	mcm	million cubic metres
Water Use/Consumption/Treatment/Yield:	ℓ/c/day	litre per capita per day
	kℓ/day	kilolitre per day
	Mℓ/day	megalitre per day
	million m^3/annum	million cubic metres per annum
	kg/hr	kilograms per hour
Flow velocity/speed:	m/s	metres per second
Flow:	m^3/s	cubic metres per second
	ℓ/hr	litres per hour
	m^3/hr	cubic metres per hour

19 WASTEWATER

19.1 Overview

uMngeni-uThukela Water (UUW) operates a number of Wastewater Works (WWW). These are shown in relation to the existing water system configurations (illustrated in the Preface) in **Figure 19.1**. uMngeni-uThukela Water owns and operates the Darvill, Ixopo, Albert Falls North and South WWWs, but manages and operates a number of other WWWs on behalf of Water Service Authorities (WSAs) (**Figure 19.2**). In addition to these WWWs, UUW owns and operates the Alkanstrand Effluent Pump Station and the effluent pipelines to this pump station in the City of uMhlathuze (CoU) Municipality. Management contracts are in place for the operation and maintenance of the Howick, Cool Air, Mpofana, Appelsbosch, Camperdown, Trust Feeds and Richmond WWW for the uMgungundlovu District Municipality (UMDM) and the Lynnfield Park WWW for the Msunduzi Local Municipality. The new Mpophomeni WWW in the UMDM, is currently being constructed and will be operated by uMngeni-uThukela Water once complete. Additionally, uMngeni-uThukela Water has recently entered into an agreement with the eThekwini Municipality to operate and maintain ten of its wastewater works. The majority of the WWWs operated use aeration basins (activated sludge) for biological nutrient removal and clarifiers for the separation process. There are, however, a few WWWs in eThekwini that also make use of biological filtration.

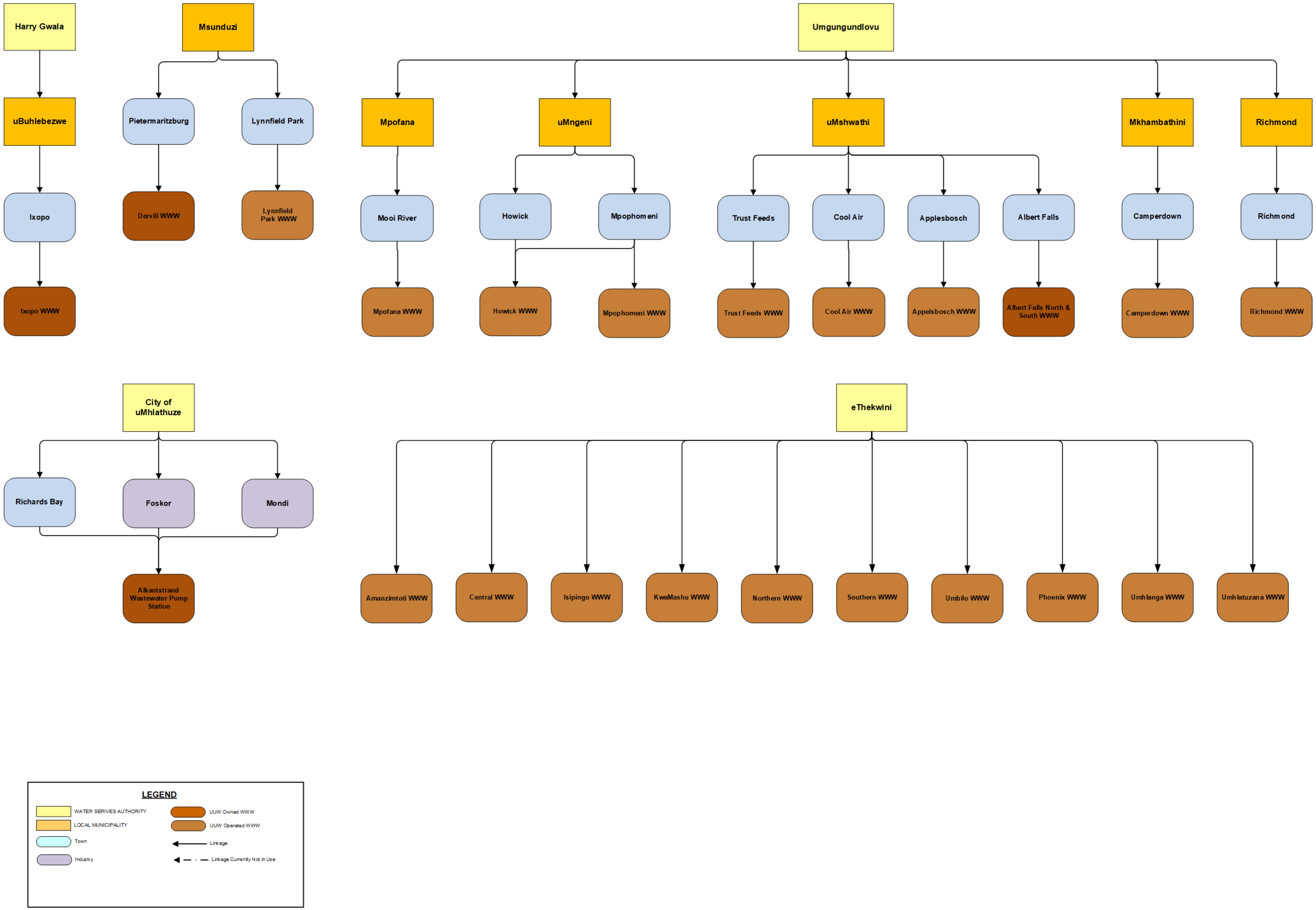

Figure 19.1 Location of uMngeni-uThukela Water operated WWWs.

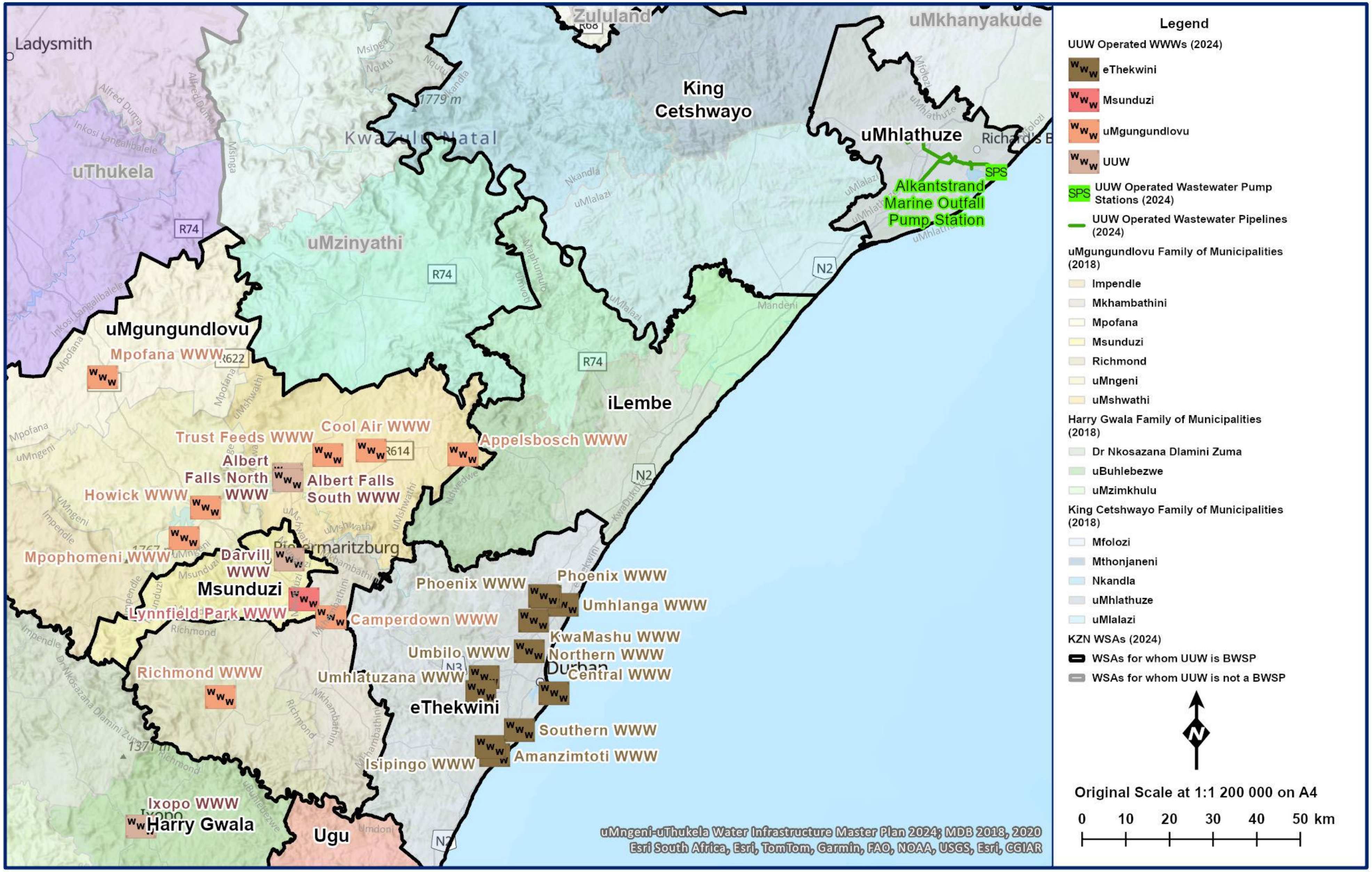

Figure 19.2 Location of WWWs operated by uMngeni-uThukela Water.

19.2 uMngeni-uThukela Water Owned Wastewater Works

19.2.1 Darvill Wastewater Works

a) Description

The Darvill WWW is the largest and most significant under uMngeni-uThukela Water's management and serves the Msunduzi Local Municipality. A summary of the characteristics of the Darvill WWW are shown in **Table 19.1** and the location of Darvill WWW in Msunduzi Municipality is shown in **Figure 19.3**.

Table 19.1 Darvill WWW infrastructure.

WWW Name:	Darvill WWW
System:	Upper uMngeni System
Maximum Design Capacity:	120 Mℓ/day
Current Utilisation:	77 Mℓ/day
Screens:	2 x Front raked bar screen followed by 3 mm stepped screen; 1 x Hand raked by-pass 25 mm screen
Balancing Tank:	10 Mℓ/day
Primary Settling Tanks:	4 (3 x 20 Mℓ/day; 2 x 40 Mℓ/day)
Settled Sewage Pump Station:	150 Mℓ/day
Aeration Basin Area:	6354 m^2
Aeration Basin Capacity:	74 415 m^3
Aerators:	Diffused aeration
Clarifier Type:	Circular scraped floor
Number of Clarifiers:	7
Total Area of all Clarifiers:	6720 m^2
Total Capacity of Clarifiers:	120 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station Capacity:	120 Mℓ/day
Primary Sludge Thickeners	2
Anaerobic Digesters:	4 (4 x4500 m^3)
Chlorine Storage Capacity:	18 x 900 kg drums
Chlorine Dosing Capacity:	7.5 mg/ℓ
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	
Wash Water Capacity:	2 Mℓ/day
Sludge Irrigation Area:	

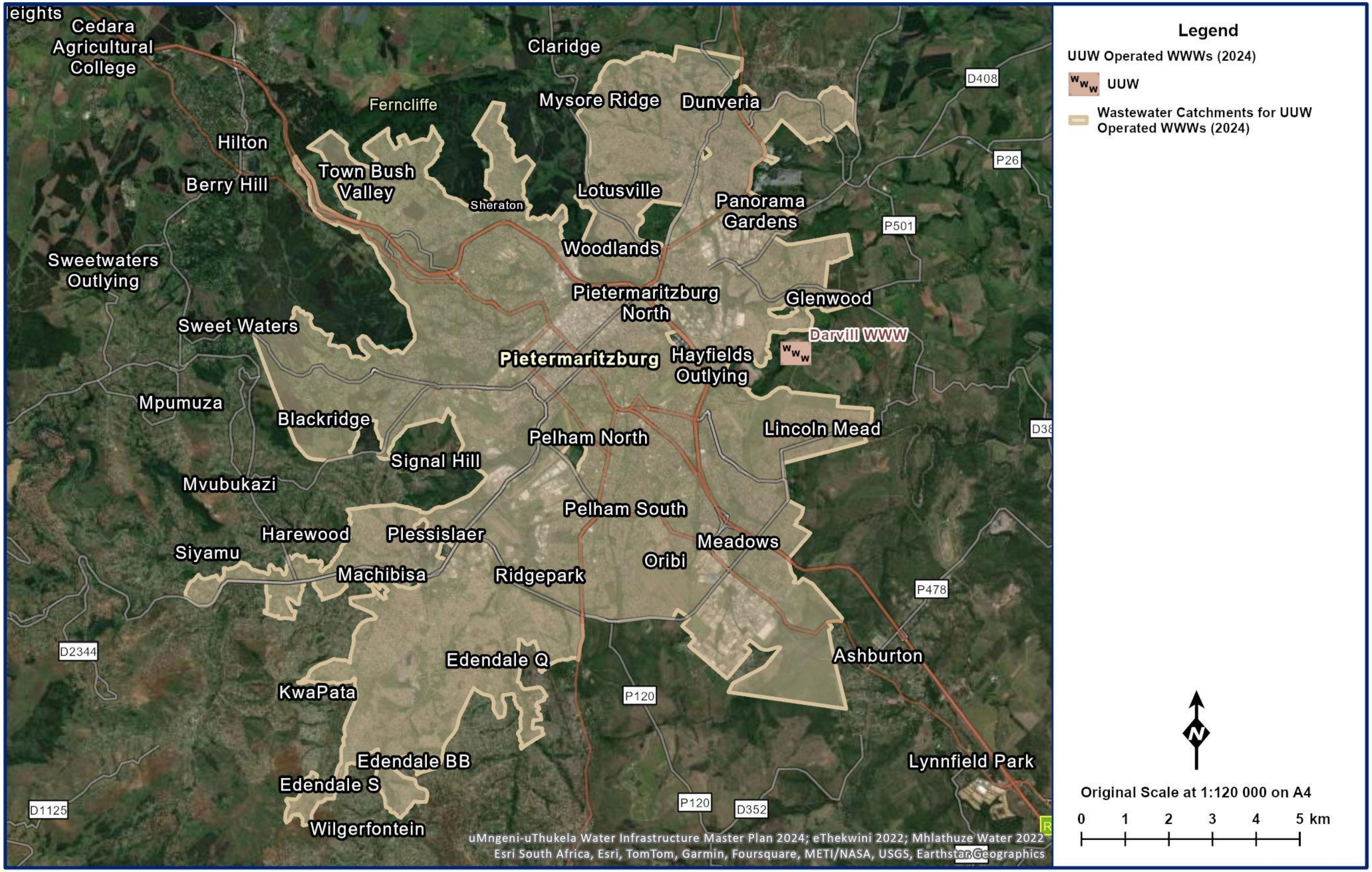

Figure 19.3 Location of Darvill WWW .

b) Status Quo

Inflows to the works have been fairly static over the last five years and have not increased in line with potable water demand increases, as would be expected (**Figure 19.4**). The 12 month moving average in Oct 2020 was 75 Mℓ/day and in Oct 2024 it was 77 Mℓ/day. This reflects a small positive increase in inflows. However, the average daily inflow for the past five years is low at 75 Mℓ/day. uMngeni-uThukela Water therefore remains concerned that not all of the wastewater return flows are reaching the WWW due to spillages and leaking sewers (see **Figure 7.16 in Volume 2**), which is resulting in losses. Losses within the Msunduzi sewer catchment are a contributing factor in why the anticipated increase in wastewater demand is not being realised.

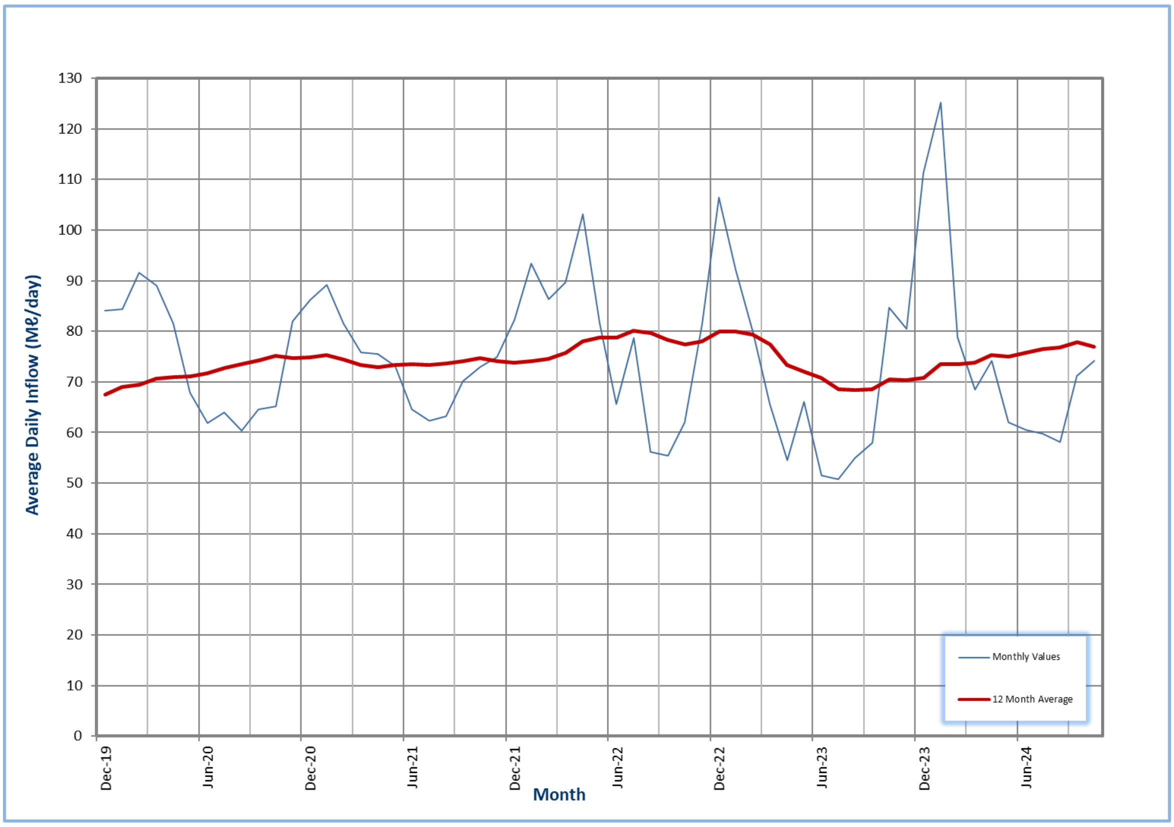

Figure 19.4 Average daily inflow (Mℓ/day) to Darvill WWW.

The plant capacity was increased by 35 Mℓ/day in 2018 from 65 Mℓ/day to 100 Mℓ/day to cope with the predicted wastewater demands (**Figure 19.5**). Average Dry Weather Flow (ADWF) within the Darvill WWW catchment was expected to grow to about 90 Mℓ/day by 2021 (**Figure 19.5**), although this is not reflected on the graph due to the sharp drop in influent in 2017. This drop was due to various construction and maintenance activities impacting on the flow. However, even since 2017, there has been no discernible increase in flow. The ADWF in 2024 was 62 Mℓ/day, which shows the marked influence of storm water ingress on flows in the rainfall season. The upgraded design allows for the majority of the processes to operate at 120 Mℓ/day with a maximum capacity of 150 Mℓ/day. Some of the proposed demand scenarios are illustrated in **Figure 19.5.**

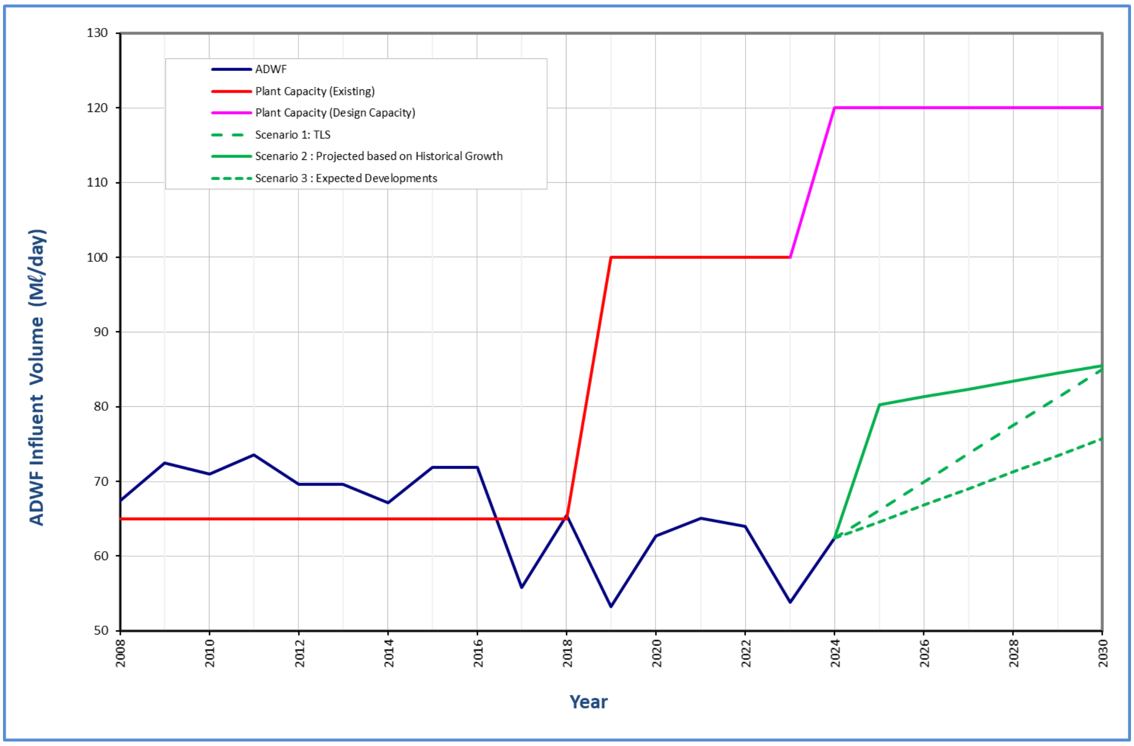

Figure 19.5 Projected ADWF inflow into Darvill WWW.

An analysis of daily historical production (November 2023 to October 2024) for the upgraded Darvill WWW is presented in **Figure 19.6.** It shows that for 17% of the time the WWW was being operated above the optimal operating capacity. The plant operated above the new 120 Mℓ/day design capacity for 9% of the time.

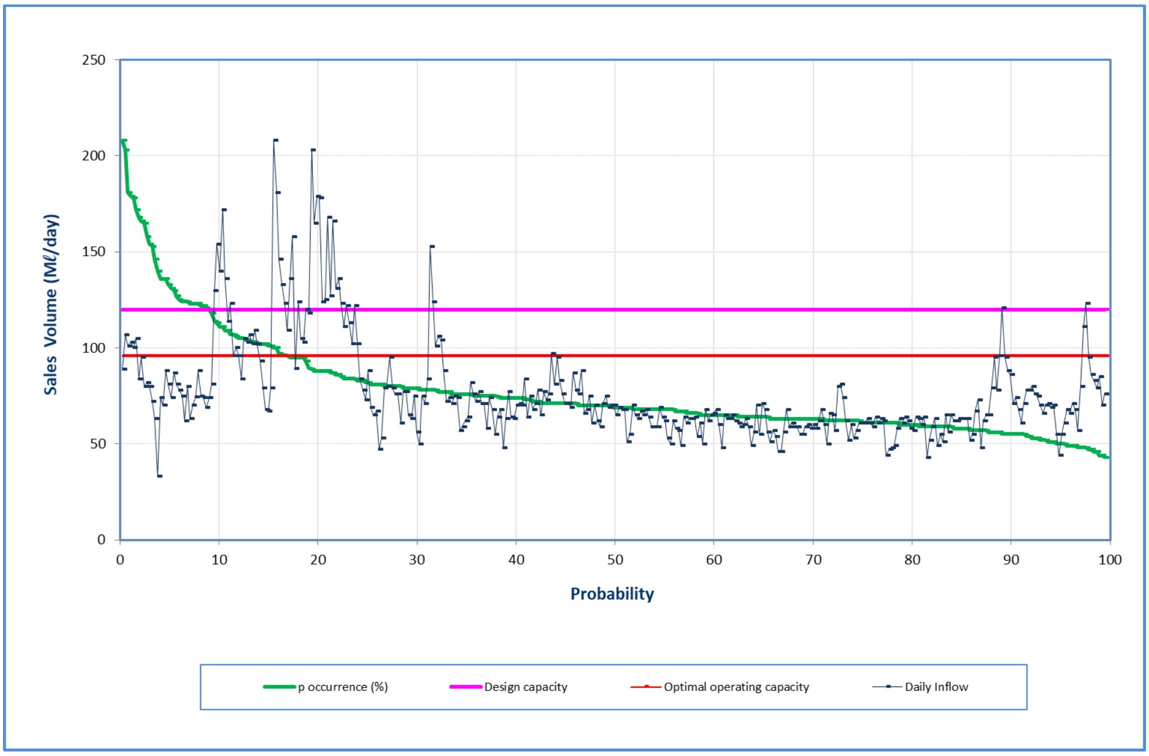

Figure 19.6 Analysis of historical production at Darvill WWW (November 2023 to October 2024).

c) Wastewater Quality

Key nutrients indicative of the quality of water discharged from wastewater works include: soluble reactive phosphorus (SRP), total inorganic nitrogen (TIN), suspended solids, and *E. coli* loads. The five-year load composition trends (kg/annum) for the various nutrients discharged from the Darvill WWW are shown in **Figure 19.7** to **Figure 19.9**. Although the SRP composition has been characterised by inter-annual variability over the last five years, there has been an overall declining trend, from 34 961 kg in 2019 to 18 684 kg in 2024. Similar to SRP, a drastic declining trend has been observed in the total inorganic nitrogen, from 269 932 kg in 2019 to 126 434 kg in 2024. Lastly, a significant decline in suspended solids has been observed, from 1 237 365 kg in 2019 to 324 508 in 2024 (). These results indicate an improvement in Darvill WWW's treatment efficiency over the last five years and this is largely due to process upgrades.

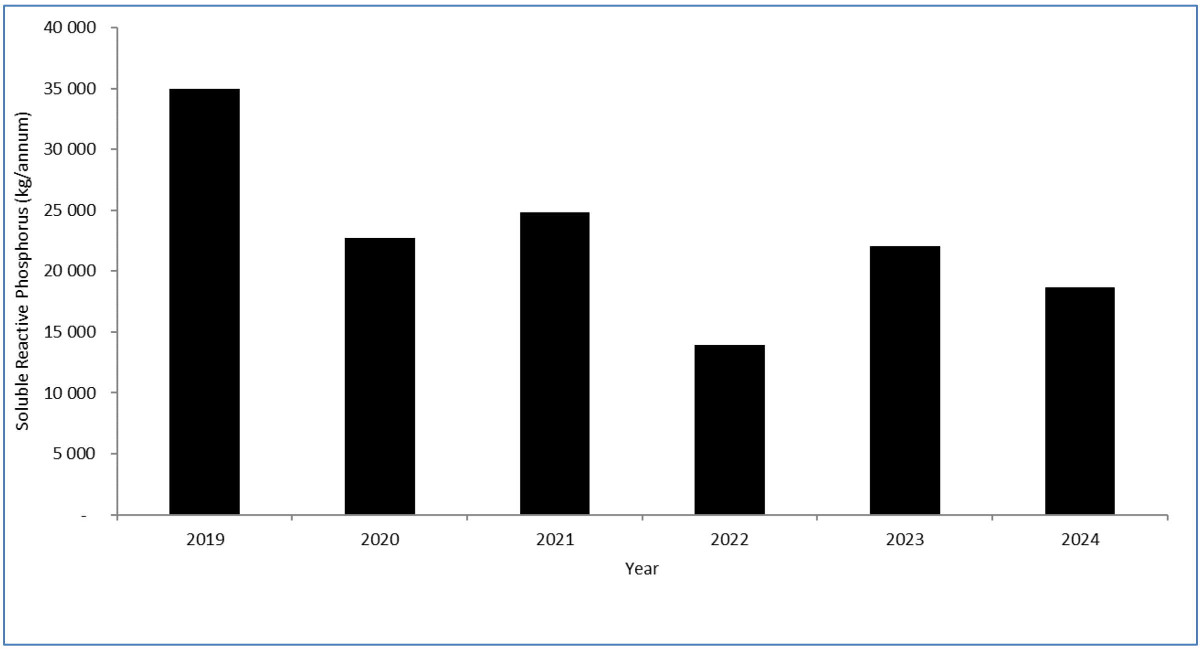

Figure 19.7 Soluble reactive phosphorus from Darvill WWW between 2019 and 2024.

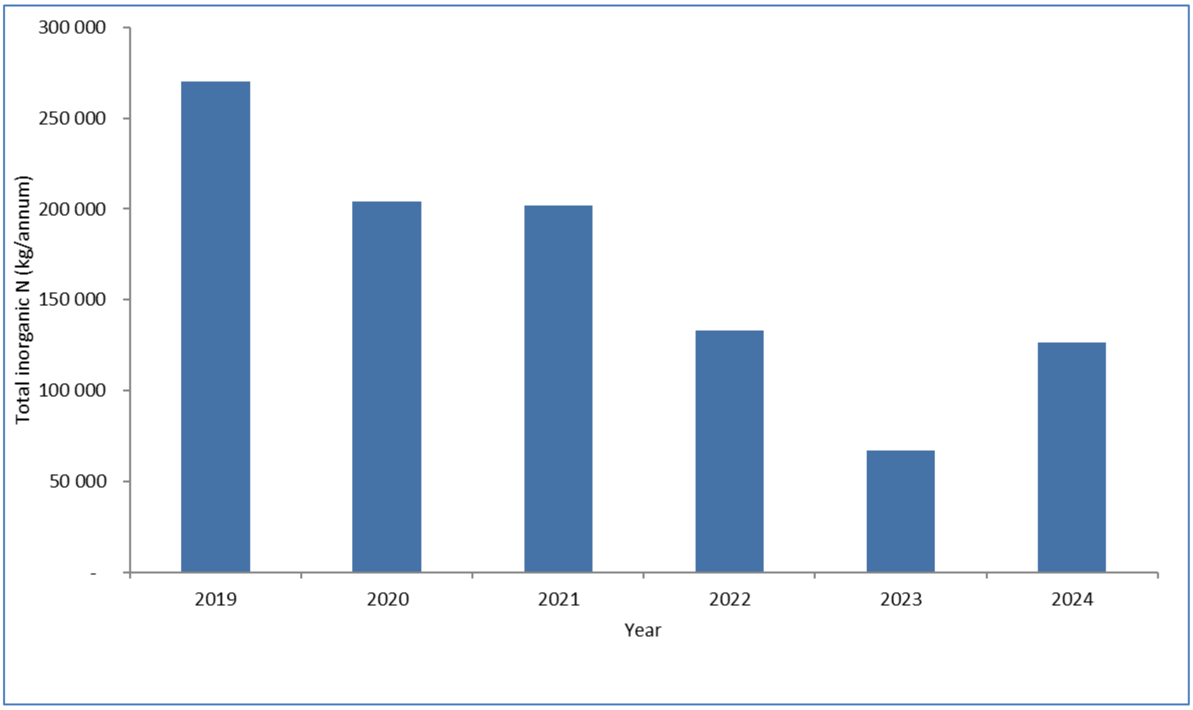

Figure 19.8 Total inorganic nitrogen from Darvill WWW between 2019 and 2024.

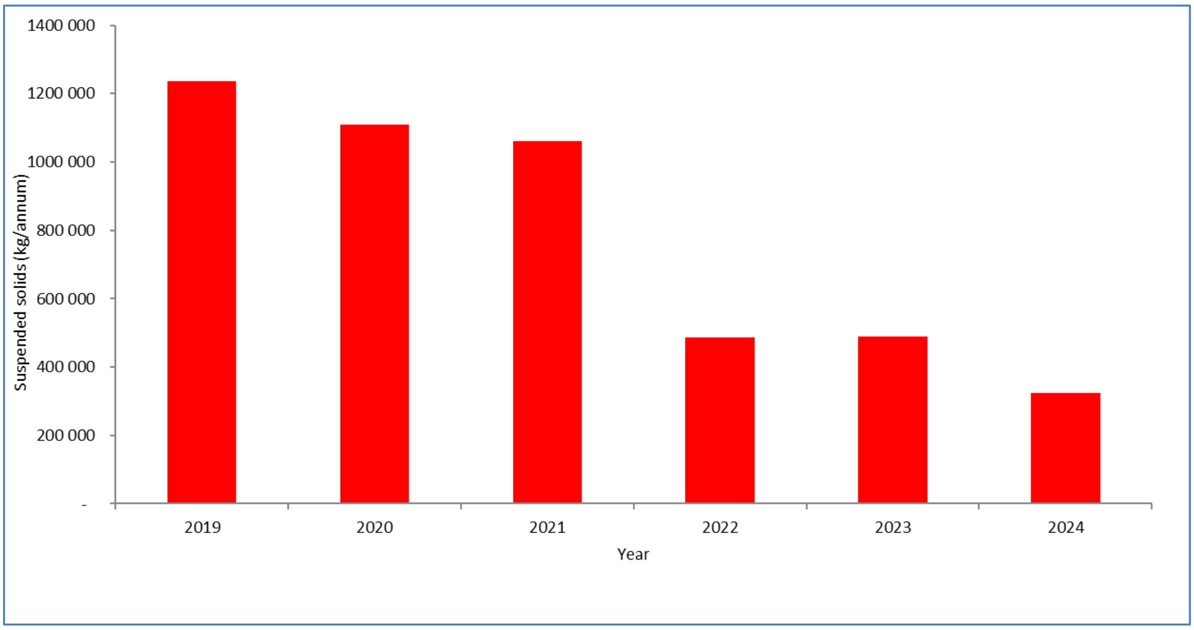

Figure 19.9 Total suspended solids from Darvill WWW between 2019 and 2024.

d) Recommendations

The upgraded WWW plant comprises the following unit processes:

- Storm water overflow and storage facility
- Excess storm water chlorination facility and storm water return pump installation
- Inlet works with Fat, Oils, Grease and Grit (FOGG) removal facility

- Primary sedimentation tanks
- Activated sludge process (anaerobic, anoxic, and aeration zones (**Figure 19.10**)
- Aluminum sulfate addition to assist phosphate removal
- Secondary clarifiers for separation and return of activated sludge
- Chlorination of final effluent
- Pre-thickener for primary sludge
- Anaerobic Digesters
- Sludge dewatering facility (linear screens) and disposal
- Wash Water Plant

The inlet works consists of two inlet channels each equipped with hand raked coarse screens, four mechanical screens (installed in pairs), four vortex flow grit separators complete with submersible centrifugal grit pumps, grit classifier and belt conveyor with screenings compactor and flow measurement. The Fat, Oils and Grease (FOG) plant is combined with grit removal as an element of the inlet works to form a Fat, Oils, Grease and Grit removal facility (FOGG).

Primary treatment consists of four primary settling tanks (PST), two 30 m in diameter and two 40 m in diameter. Primary sewage is fed from the PSTs to a balancing tank (10 Mℓ).

Primary settled sewage is transferred and lifted from the balancing tank by the main pump station to an elevated level at the activated sludge tanks inlet from where the sewage receives secondary treatment. The pump station consists of two receiving sumps with two large horizontal split casing centrifugal pumps servicing each sump. A central manifold connects the two pump sets to allow for interchangeable operation. The two pumps, per sump, operate in a full duty/standby configuration and are designed to operate in a flow range of 70 – 130 Mℓ/day.

The activated sludge plant at Darvill WWW consists of a number of pre anoxic / anoxic / anaerobic zones followed by the aeration basin. A total biological volume of 74 415 m^3 is provided in the new system. Aeration in the aerobic zone of the biological reactor is achieved with fine bubble diffused air (FBDA) aeration. Air is supplied to the system by four duty and one standby blower.

Secondary treatment consists of seven clarifiers with a Return Activated Sludge (RAS) pump station fitted with centrifugal pumps operating on variable speed drives. The effluent from the clarifiers is disinfected using a high concentration chlorine solution which is discharged into the effluent upstream of the chlorine contact tank.

The chlorine disinfection unit process is followed by a series of maturation rivers / lagoons. In total there are three rivers / lagoons with a combined volume of 20 428 m^3 giving a total retention time of 8.2 hours for the design flow of 60 Mℓ/day.

The sludge treatment system has two sources of sludge produced and subsequently processed. Primary sludge withdrawn from the underflow of the primary sedimentation tanks is forwarded to a gravity sludge thickening stage before passing through a pre-fermentation process and then onto anaerobic digestion. The pre-fermentation process produces a supernatant high in volatile fatty acids (VFA’s) which is returned to the liquid treatment phase and aids in denitrification ahead of the aeration basis.

The methane gas generated by the anaerobic digestion process will, in future, be utilised in a co-generation plant to produce electricity. The co-generation gas engines will be cooled by water and this water will be utilised in the digesters for heating purposes. The digested sludge will pass into the post thickeners and then be dewatered and treated with lime to provide a stable product which may be used for agricultural purposes or landfill cover.

The second sludge phase is the wasting of activated sludge. At Darvill WWW mixed liquor is wasted directly from the activated sludge reactor upstream of the final clarifiers. The waste mixed liquor will gravitate to a new building housing linear screens where it will be thickened to 6%. The sludge to the linear screens will be dosed with a cationic polyacrylamide conditioning polyelectrolyte. Thereafter it will be blended with the digested sludge and disposed of on the sludge lands adjacent to the WWW site.

The high pressure water system will operate at a pressure of 8 bar with two duty and one standby pumps. The high pressure water system will draw treated water directly from the wash water treatment plant.

Figure 19.10 Darvill Aeration Basin.

19.2.2 Ixopo Wastewater Works

a) Description

Ixopo WWW serves the town of Ixopo in the Harry Gwala District Municipality and is a Class D accredited WWW. It is located next to the R612 regional road and downstream of the Home Farm Dam, which supplies the raw water to uMngeni-uThukela Water's Ixopo WTP (**Figure 19.11**).

The Ixopo WWW process train follows a typical extended aeration process consisting of an inlet works, one reactor with three aerators on timers and two clarifiers (**Figure 19.12**), five drying beds and chlorine contact channels. Sludge is dried on beds and disposed of on a local farm owned by Harry Gwala District Municipality. The characteristics of the Ixopo WWW are shown in **Table 19.2**.

Table 19.2 Ixopo WWW infrastructure.

WWW Name:	Ixopo WWW
System:	uMkhomazi System
Maximum Design Capacity:	1 Mℓ/day
Current Utilisation:	0.55 Mℓ/day
Balancing Ponds:	3 Mℓ
Raw Sewage Pump Station:	N/A
Screens:	1 x Hand raked, 2.5 cm gaps
Grit Chambers:	2 x Constant velocity grit channel
Aeration Basin Area:	471 m^2
Aeration Basin Capacity:	1150 m^3
Aerators:	3 x 18.5 kW slow speed aerators
Clarifier Type:	1 x scraped floor (12.5 m), 1 x suction lift (14.5 m)
Number of Clarifiers:	2
Total Area of all Clarifiers:	274 m^2
Total Capacity of Clarifiers:	6.6 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station Capacity:	N/A
Chlorine Storage Capacity:	8 x 68 kg cylinders
Chlorine Dosing Capacity:	0 – 1 kg/h
Total Capacity of Chlorine Contact Tanks:	62 m^2
Total Capacity of Sludge Treatment Plant:	N/A
Anaerobic Ponds:	None
Sludge Drying Beds Area:	720 m^2

Figure 19.11 Location of Ixopo WWW.

Figure 19.12 Clarifier No. 1 Ixopo WWW.

b) Status Quo

The average daily inflow to the Ixopo WWW is shown in **Figure 19.13**.

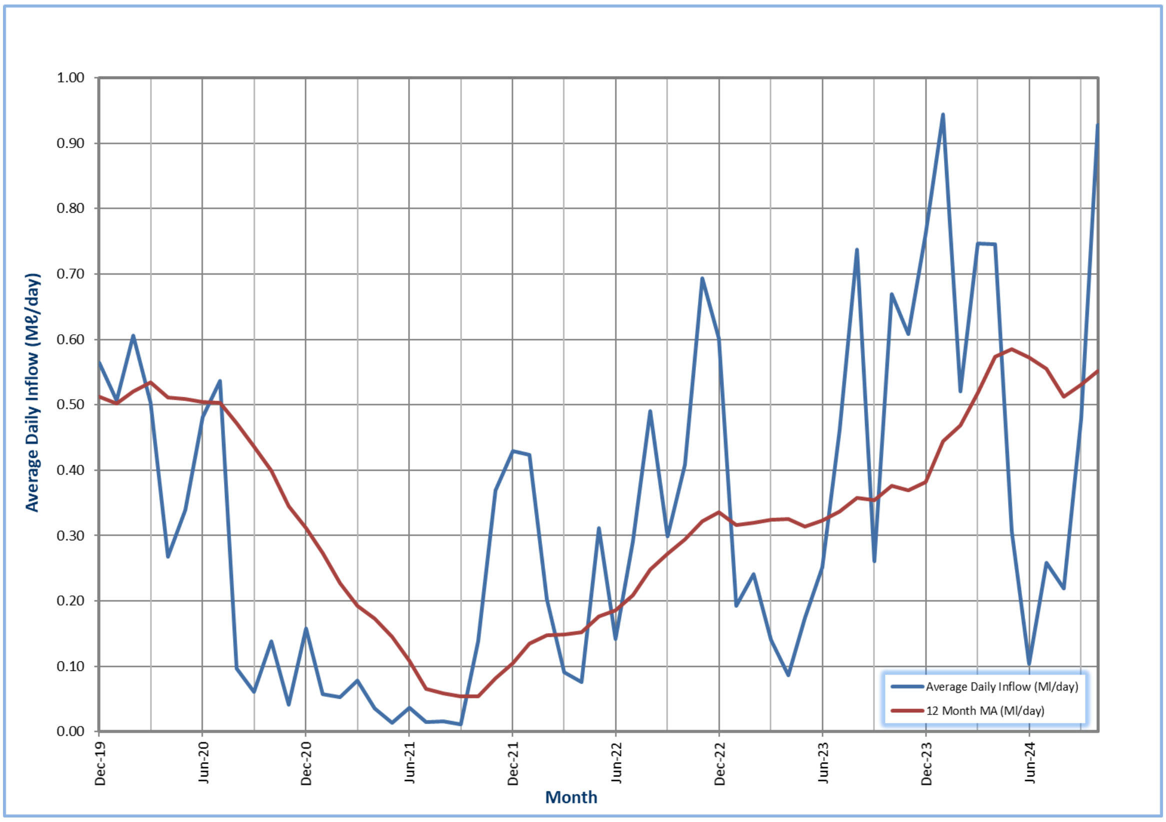

Figure 19.13 Average daily inflow (Mℓ/day) for Ixopo WWW.

Flows to the WWW have, for many years, been reduced as a result of blockages in the Ixopo sewer network and non-operational pump stations. Since November 2021, the situation has improved somewhat as evidenced in **Figure 19.13**. The Municipality has actively been attending to blockages and repairing sewage pump-stations. Additionally, the sewer network has been improved with additional pipelines, which has been a positive contributing factor. The anticipated return flows are approximately 1.3 Mℓ/day, so the improvement is still substantially less than required in order for the sewer system to be operating effectively.

Of concern is that sewage meant for the works is undoubtedly spilling into the environment and polluting water resources as well as placing communities at risk. Sampling from uMngeni-uThukela Water's Home Farm Dam indicates elevated ammonia and phosphorous levels as a direct result of pollution from sewage (**Section 7.2.1(b)(iv)**). Operationally the low flows cause significant difficulties for process stability and this impacts negatively on achieving compliance with discharge standards.

An analysis of daily historical production (November 2023 to October 2024) for the Ixopo WWW is presented in **Figure 19.14.** It shows that for 34 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above the design capacity 10 % of the time. This is a dramatic change from previous years when the plant was heavily underutilised. The improved flows warrant a closer look at the capacity of the plant to meet future demands.

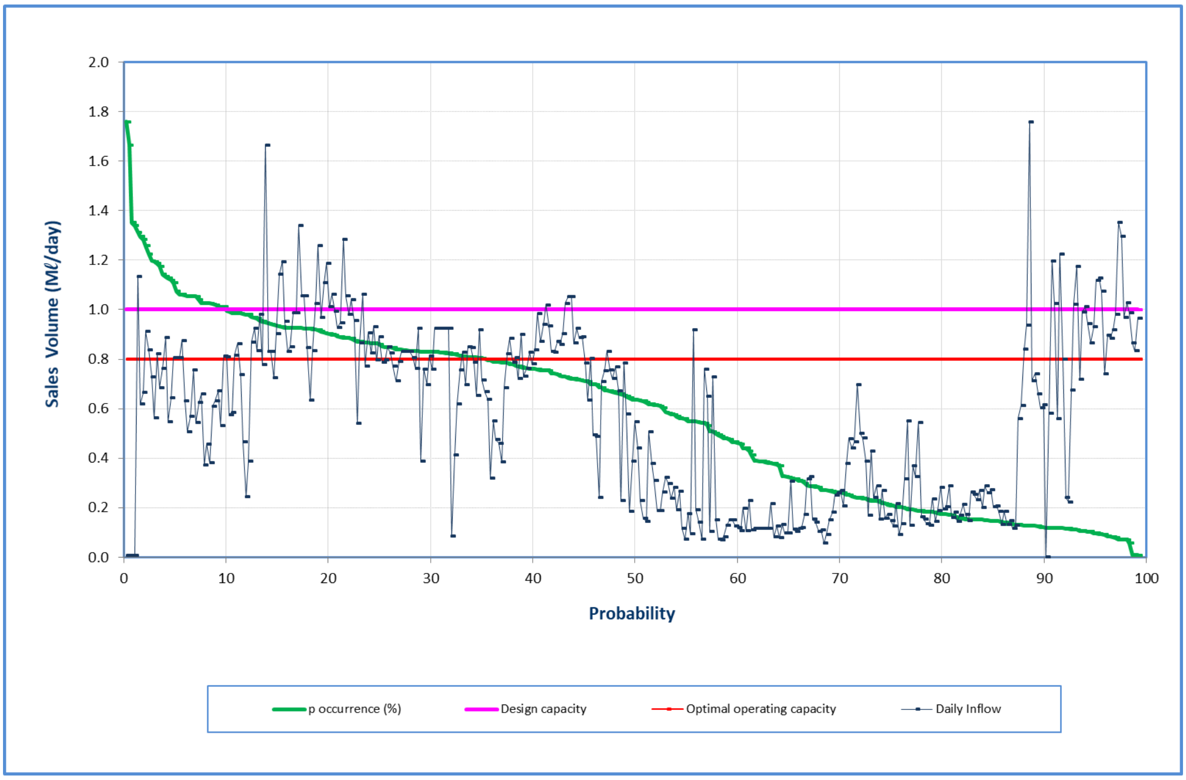

Figure 19.14 Analysis of historical production at Ixopo WWW (November 2023 to October 2024).

c) Wastewater Quality

Figure 19.15, **Figure 19.16** and **Figure 19.17** show annual composition of soluble reactive phosphorus (SRP), total inorganic nitrogen (TIN) and suspended solids in the discharge from the Ixopo WWW between 2019 and 2024. There has been a significant decline in soluble reactive phosphorus in the Ixopo WWW over the last five years, from 286 kg in 2019 to 49 kg in 2024. However, there was also change from 126 kg to 230 kg between 2022 and 2023. This is mainly as a result of fluctuations in flow and complications with sludge management. There has been great variability in the total inorganic nitrogen content over the last five years. The TIN from Ixopo WWW declined from 1 460 kg in 2019 to 487 kg in 2022, before increasing to 662 kg and 1 284 kg in 2023 and 2024, respectively. A similarly erratic trend has been observed for the suspended solids discharged from Ixopo WWW, declining from 3 114 kg in 2019 to 453 kg in 2022, before an increase to 2 013 kg and 3 229 kg in 2023 and 2024, respectively. The low TIN and suspended values observed during 2021 and 2022 in the Ixopo WWW were due to low inflow into the plant.

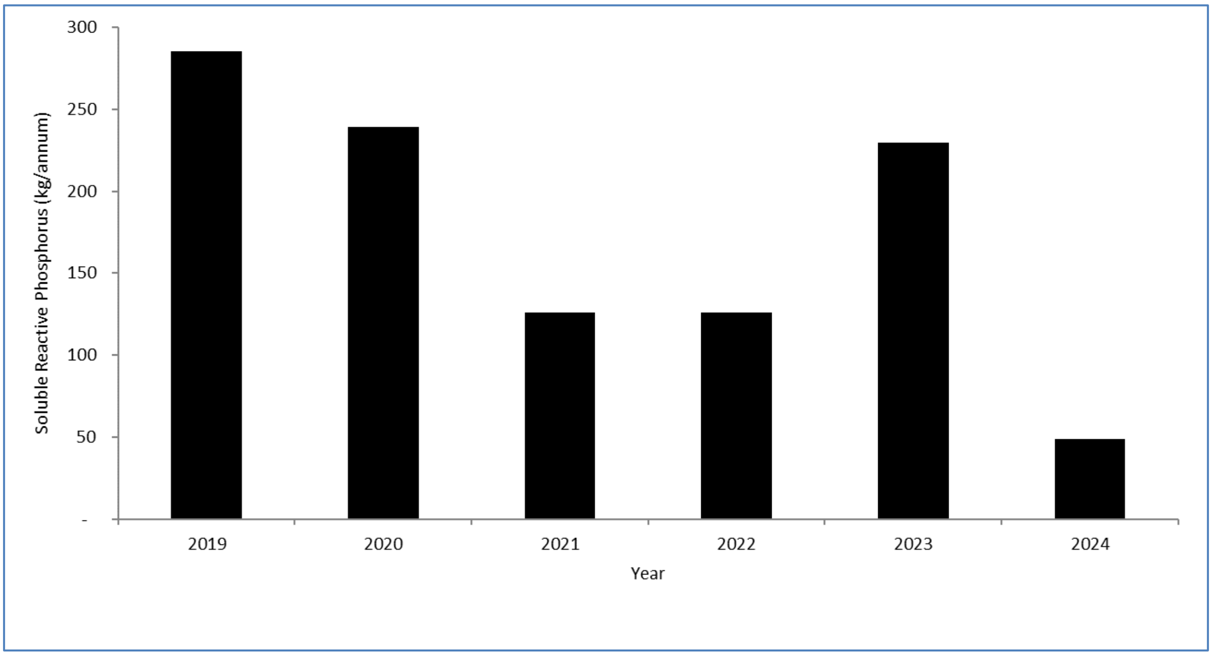

Figure 19.15 Soluble reactive phosphorus from Ixopo WWW between 2019 and 2024.

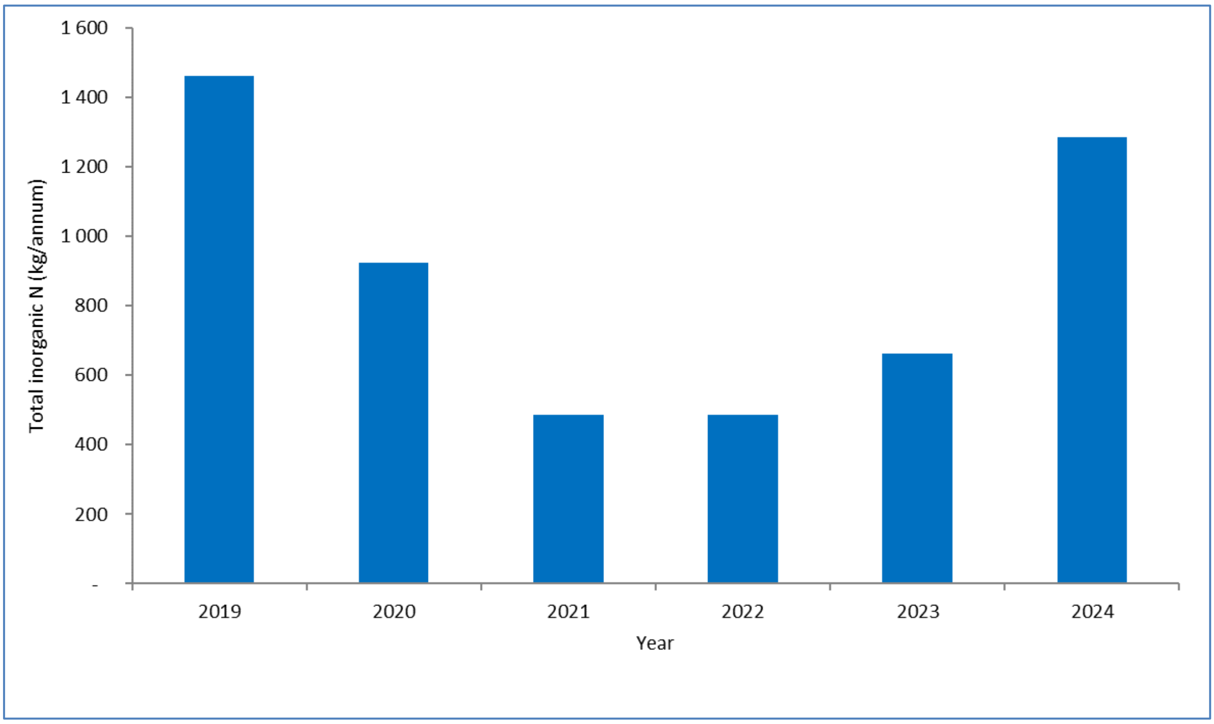

Figure 19.16 Total inorganic nitrogen from Ixopo WWW between 2019 and 2024.

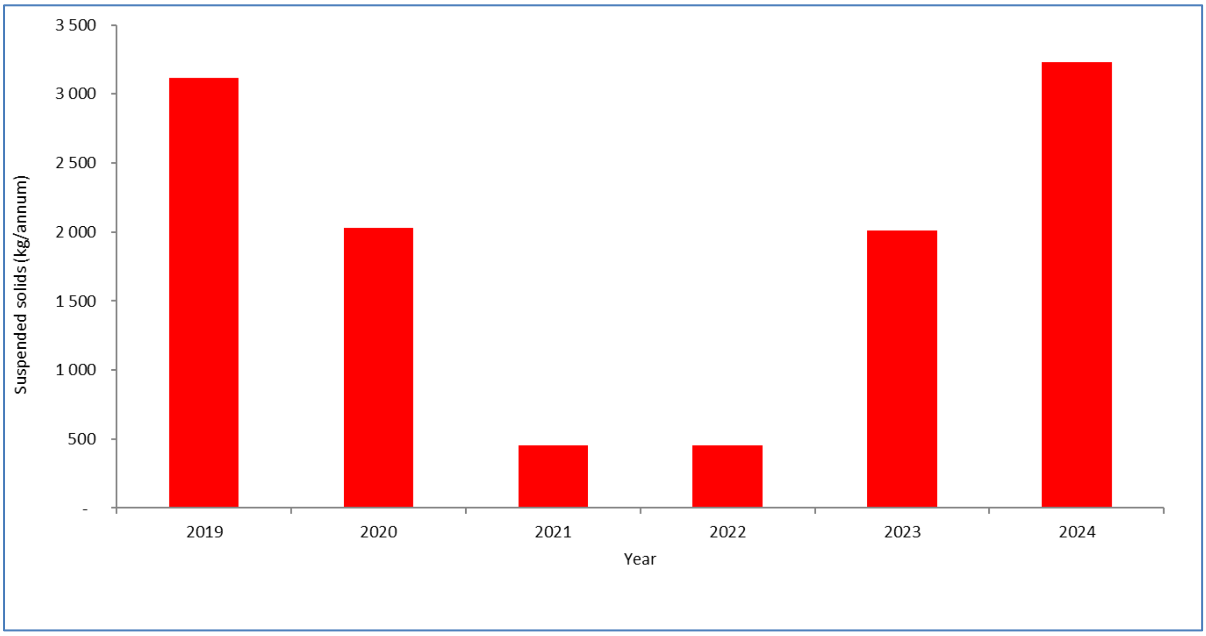

Figure 19.17 Suspended solids from Ixopo WWW between 2019 and 2024.

d) Recommendations

The underutilisation of the plant makes the operation of the plant uneconomical and results in many operational problems. For example, without a consistent inflow the aeration of the biological reactor is difficult to maintain at the correct level. The biomass is also difficult to sustain as there is a limited food source resulting in process issues. The low flows also result in settling in the inlet channels.

19.2.3 Albert Falls North and South Wastewater Works

a) Description

Albert Falls North (**Figure 19.18**; **Figure 19.19**) and South WWW (**Figure 19.19**) are aerobic sequencing batch reactors (SBRs) with design capacities of 55 m^3/day and 40 m^3/day respectively. Raw sewage from the staff quarters, surrounding households and tankers is fed into the reactor via two grit channels at the Northern works and through a sump at the Southern works. Equalisation, biological treatment and secondary clarification are performed in a single tank using a timed control sequence.

The system is fitted with diffusers for oxygen supplied by two blowers for biological nutrient removal. Solid-liquid separation occurs in the reactor during an idle period when no diffusion or mixing takes place, allowing the solids to settle and a sludge-blanket to form. The diffusion occurs when the actuator valve is in a closed position and decanting occurs after the diffusion process is completed. Supernatant flows through a chlorination unit including a contact tank for disinfection. The chlorinated effluent then gravitates to a maturation pond for further stabilization and polishing. After the maturation pond the final effluent is discharged to the environment**.**

The available clarifiers are no longer in use for clarification but serve as a safe guard for over spill during actuator valve failure and pipe blockages. Waste Activated Sludge (WAS) is discharged to the neighbouring sludge drying beds. The characteristics of the Albert Falls North and South WWW are shown in **Table 19.3** and **Table 19.4** respectively.

Figure 19.18 Sequencing Batch Reactor (SBR) Albert Falls North WWW.

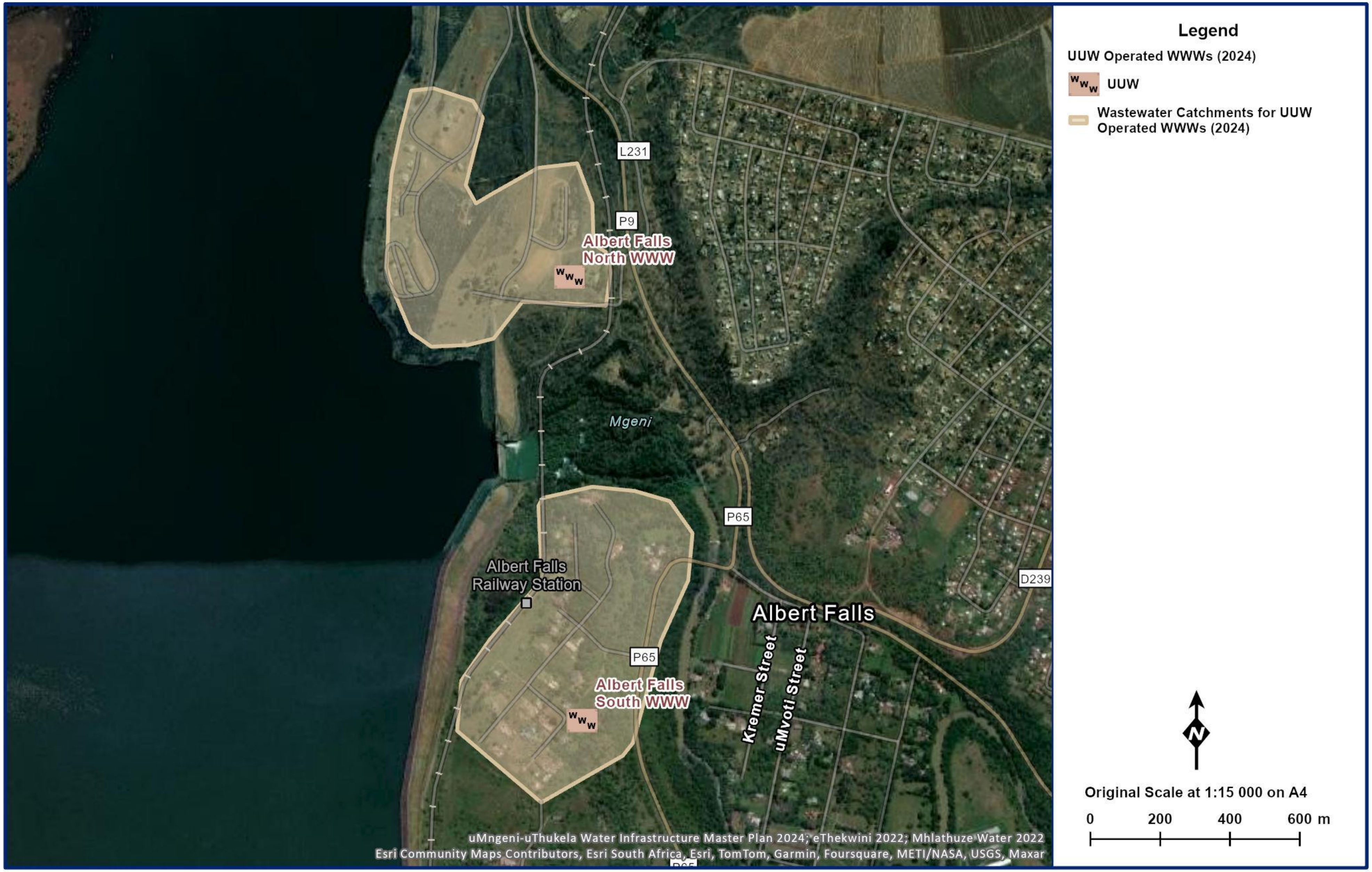

Figure 19.19 Location of Albert Falls North and South WWW.

Table 19.3 Albert Falls North WWW infrastructure.

WWW Name:	Albert Falls North WWW
System:	Upper uMngeni System
Maximum Design Capacity:	0.055 Mℓ/day
Current Utilisation:	Unknown (No inflow meter)
Screens:	None
Grit Chambers:	2 x grit channels
Aeration Basin:	1 x Sequencing Batch Reactor
Aeration Basin Capacity:	165 m^3
Aeration:	8 x Fine Bubble Diffuses
Blowers:	2 x 7.5 kW
Clarifier Type:	Used as overflow tank
Number of Clarifiers:	2
Total Area of all Clarifiers	NA
Total Capacity of Clarifiers:	20 m^3
Chlorine Storage Capacity:	Calcium Hypochlorite tablets
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	51 m^2
Maturation Pond Capacity:	475 m^3

Table 19.4 Albert Falls South WWW infrastructure.

WWW Name:	Albert Falls WWW
System:	Upper uMngeni System
Maximum Design Capacity:	0.055 Mℓ/day
Current Utilisation:	Unknown (No inflow meter)
Screens:	None
Grit Chambers:	2 x grit channels
Aeration Basin:	1 x Sequencing Batch Reactor
Aeration Basin Capacity:	115 m^3
Aeration:	6 x Fine Bubble Diffuses
Blowers:	2 x 7.5 kW
Clarifier Type:	Used as overflow tank
Number of Clarifiers:	2
Total Area of all Clarifiers:	NA
Total Capacity of Clarifiers:	20 m^3
Chlorine Storage Capacity:	Calcium Hypochlorite tablets
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	46 m^2
Maturation Pond Capacity:	140 m^3

b) Status Quo

The current Albert Falls North and South sanitation systems are very small without any significant bulk reticulation to be considered. Existing stands in this area are primarily serviced by waterborne sewage in the north and by septic tanks in the south.

c) Wastewater Quality

There is a lack of reliable flow data at the Albert Falls North and South WWWs. As a result, quality results are based on estimates. Commensurate to their relatively small nature, the amount of nutrients in the discharge from Albert Falls North and South WWWs is insignificant when compared with other UUW operated plants. There has been a general decrease in SRP at the Albert Falls South WWW between 2019 and 2024, while an increase has been observed at the Albert Falls North (**Figure 19.20**). There has been an increase in the total inorganic nitrogen content from both plants over the last five years (**Figure 19.21**). The suspended solids results were not included in this report and will be include in the 2026 Infrastructure Master Plan.

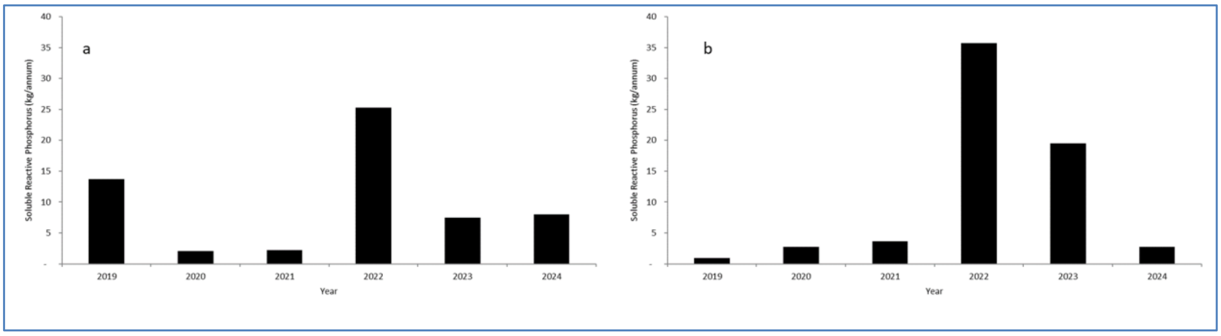

Figure 19.20 Soluble reactive phosphorus from Albert Falls South (a) and Albert Falls North (b) WWW between 2019 and 2024.

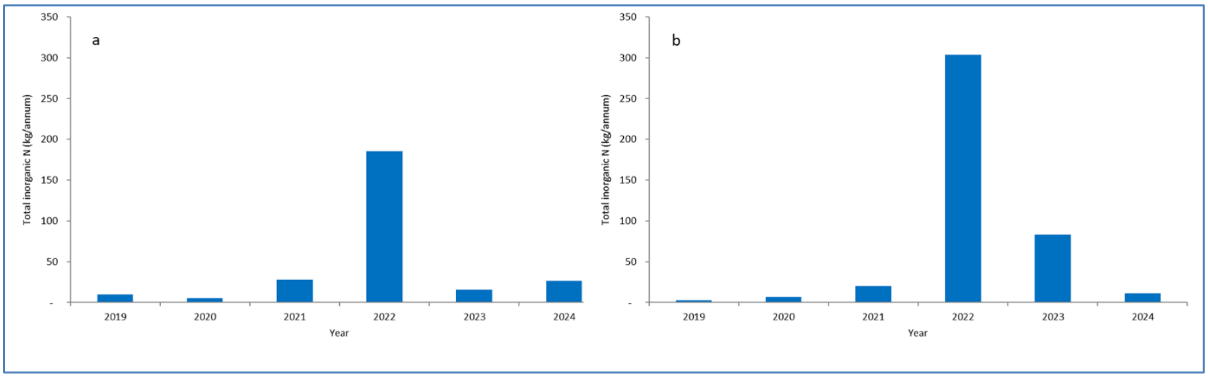

Figure 19.21 Total inorganic notrogen from Albert Falls South (a) and Albert Falls North (b) WWW between 2019 and 2024.

d) Recommendations

The main infrastructure elements to be upgraded/added include:

- New mains are proposed within the range of 250 mmø - 200 mmø in pipe size to service the conversion of the neighbouring peri-urban area of Thokozani. In addition to these future mains, the flow will need to be diverted from Albert Falls North to a new proposed WWW. The conversion of the southern septic tanks (approximately 163 stands) to waterborne sanitation will also result in the flow from Albert Falls South being diverted in future. However, no additional future mains other than those specified above will be required for the septic tank conversion.

- It is estimated that the ultimate flow contribution from the Msinsi Bon Accorde Resort, the development in the surrounding Albert Falls North area and the conversion of Thokozani which is currently serviced by VIPs will be approximately 977 kℓ/day which significantly exceeds the current capacity of Albert Falls North and Albert Falls South works. Therefore, it is proposed that a new WWW, with design capacity 1000 kℓ/day, be implemented to accommodate future flows. The existing Albert Falls North and South plants should be decommissioned with existing flows being diverted to the new proposed plant.

This project will be triggered when development of the future development areas (FDAs) listed above occurs. Both conversion of the peri-urban area Thokozani and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.2.4 Alkantstrand Wastewater System

a) Description

Industrial and domestic effluent from the Richards Bay area is disposed at sea by pipelines running from the Alkantstrand Wastewater Pump Station, which is owned and operated by uMngeni-uThukela Water. Richards Bay has no sizeable wastewater treatment works and so all effluent (industrial and domestic) is transferred to Alkantstrand for dilution with seawater (**Figure 19.24**) and disposal in the ocean. The disposal capacity is 120 million m^3 per annum (328 Mℓ/day) and the effluent is discharged approximately 4 km offshore.

The scheme is operated in compliance with the requirements of the Coastal Waters Discharge Permit, as issued by the Department of Forestry, Fisheries and Environment, in terms of the National Environmental Management: Integrated Coastal Management Act (Act No 24 of 2008). The permit allows for the discharge of 200 Mℓ/day. Regular inspections and laboratory tests are conducted to ensure that discharges are within the compliance permit limits and marine effluent discharge pipeline annual inspections are undertaken as required in terms of the permit to ensure that the marine environment is not being adversely affected.

There are three disposal pipelines at Alkantstrand:

- **A-line**: The existing, buoyant effluent, A-line comprises four main sections and terminates at the Alkantstrand Wastewater Pump Station.
- **B & C lines**: The 'B and C' lines are for the disposal of dense effluent such as gypsum from industry (such as Foskor) and, in future, Nyanza Light Metals. However, a mechanical fault means that the offshore B-line is currently not operational.

It is noted that the additional 20 Mℓ/day of effluent from Nyanza Light Metals will approximately double the effluent volume in this line. It is therefore recommended that a thorough investigation be undertaken to verify that the B-line has sufficient capacity for these additional flows (Mhlathuze Water, 2022:8)

A total of 31 324 659 m^3 was disposed offshore through the Wastewater Disposal System in Financial Year 2021/22. Seventy-six (76%) of this volume was discharged through the buoyant pipeline and 24% through the dense pipeline, which represented an approximate 10% decrease from the previous financial year

The Alkantstrand Wastewater Disposal System is illustrated in **Figure 19.22**.

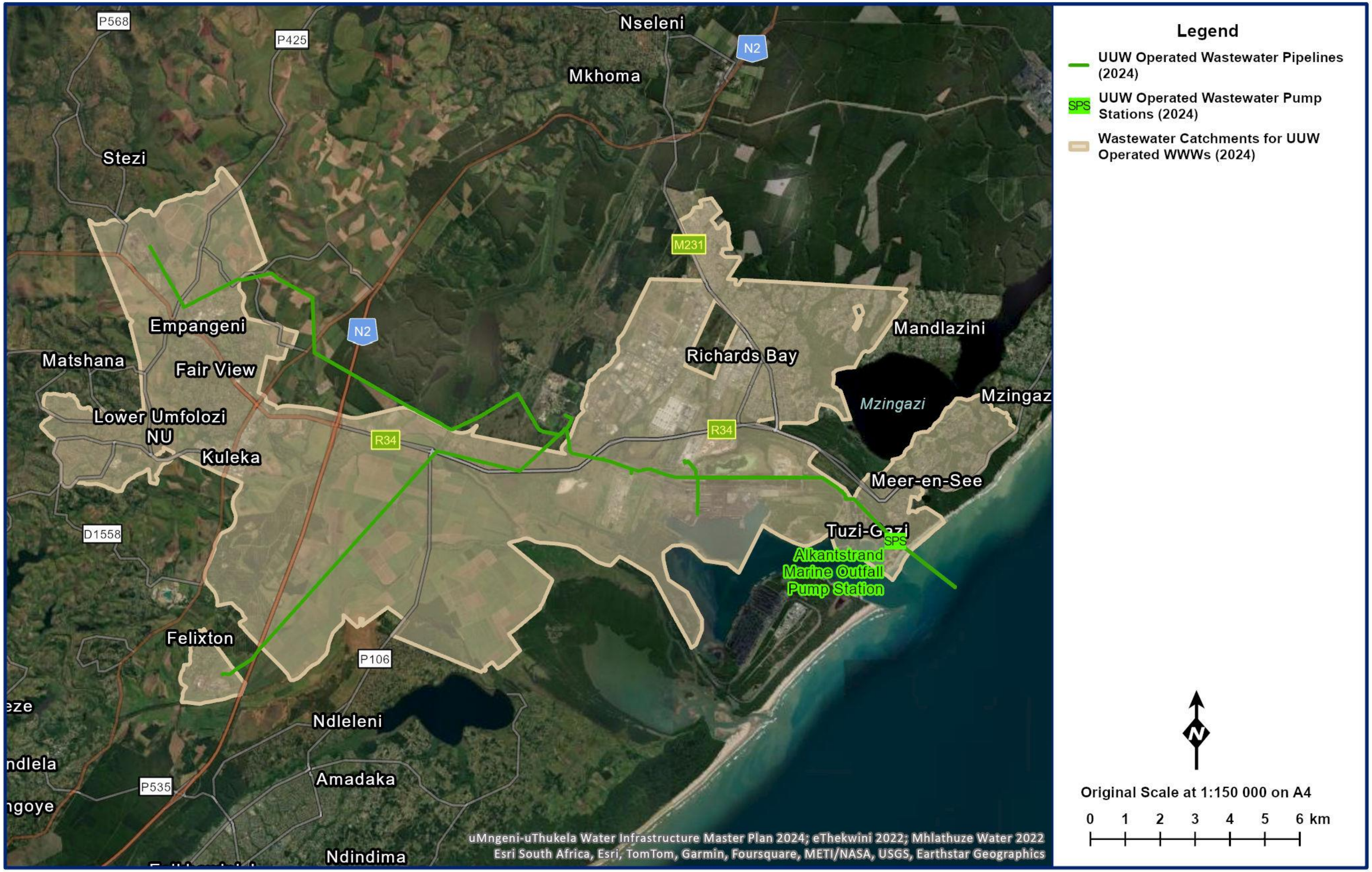

Figure 19.22 Alkantstrand Wastewater Disposal System.

b) Status Quo

Effluent Land Pipeline: Buoyant A-line
The existing, buoyant effluent, A-line comprises four main sections and terminates at the Alkantstrand Wastewater Pump Station. The existing pipeline services a number of effluent producers including Mondi, City of Mhlathuze (CoU) Arboretum Macerator, CoU Alton Macerator, CoU John Ross Macerator, Mpact, South 32, Foskor, Tronox, Isizinda and Nsezi WWW sludge. It transports buoyant effluent for disposal at sea.

The A-line is a pressurised gravity sewer system with a pressure rating of PN12.5. It is constructed of HDPE pipes of various diameters (**Table 19.5**) and is 40 years old as it was commissioned in 1982. The four main sections of the A-line effluent (buoyant) disposal pipeline are as follows:

Table 19.5 A-line Buoyant Effluent Pipeline Details

Section	Location	Pipe Specifications	Length (m)
1	Tronox to Collecting Chamber	DN315 HDPE	16 050
2	Collecting Chamber to Surge Tower 2	DN1200 HDPE	8 000
3	Surge Tower 2 to WWDS Pump Station	DN900 HDPE	2 800
4	Surge Tower 2 to WWDS Pump Station	DN900 HDPE	2 800
			29 650

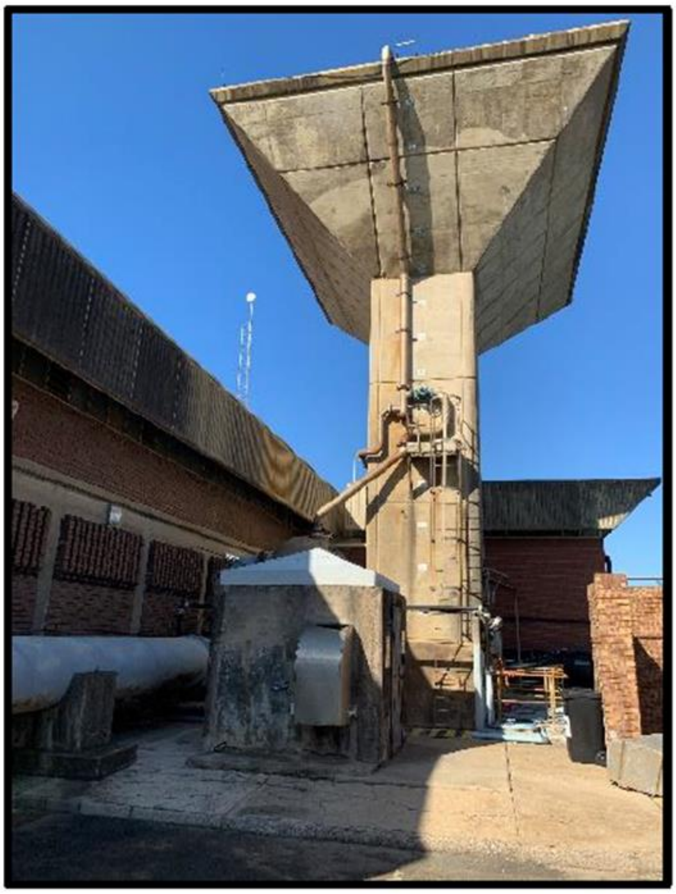

Figure 19.23 Surge tower (Mhlathuze Water 2022: 22).

The existing A-line was designed for a maximum capacity of 160 Mℓ/day; but is currently operating at an average flow rate of 157 M ℓ/day (Mhlathuze Water: Terms of Reference (TOR MW/46/8/2019) –

Appointment of a contractor for design and construction of Wilmar Effluent Disposal. February 2022. Page 4), which means there is excess capacity of 2Mℓ/day. On average, 76% of the total effluent is transferred through the buoyant A-line onshore pipeline.

Effluent Land Pipeline: Dense B-line

The existing, dense effluent, B-line (**Table 19.6**) is for the disposal of dense effluent such as gypsum from industrial producers, such as Foskor.

Table 19.6 B-line Dense Effluent Pipeline Details

Section 1	Location	Pipe Specifications	Length (m)
1	Foskor to WWDS Pump Station	DN450 GRP	6 400

On average, 24% of the total effluent is transferred through the dense B-line on-land pipeline. The majority of the dense effluent (gypsum) that passes through the B-line at the Alkantstrand Pump Station (**Figure 19.25**) is currently produced by Foskor.

Figure 19.24 Alkantstrand seawater dilution infrastructure (Mhlathuze Water 2022: 53).

Figure 19.25 Alkantstrand B-Line pump sets (not operational) (Mhlathuze Water 2022: 53).

Effluent Offshore Pipelines: Buoyant A-line and Dense B & C lines
Prior to disposal at sea, the dense and buoyant effluent is diluted with sea water at the pump station. Three offshore disposal pipelines are used to dispose the effluent offshore at sea (**Table 19.7**).

Table 19.7 Offshore Effluent Disposal Pipeline Details

Line	Effluent Type	Operational	Pipe Specifications	Length (m)
A	Buoyant	Operational	DN1000 HDPE	7 600
B	Dense (Gypsum)	Not Operational*	DN900 HDPE	2 600
C	Dense (Gypsum)	Operational	DN1000 HDPE	4 300
				14 500

*A mechanical component of the Offshore B-line is currently not operational (Mhlathuze 2022)

Current Effluent Disposal Volumes
Inflows to the Alkantstrand SPS are separated in buoyant and dense effluent. Dense effluent averages 14 Mℓ/day and buoyant effluent 67 Mℓ/day over the last year (**Figure 19.18**).

The largest producer of buoyant effluent is Mondi, who has a contractual effluent volume of 110 Mℓ/day. However, flow records indicate that on average they are producing less than 50% of this volume on a daily basis.

The existing A-line was designed for a maximum capacity of 160 Mℓ/day (Mhlathuze Water: Terms of Reference (TOR MW/46/8/2019) – Appointment of Contractor for design and construction of Wilmar Effluent Disposal. February 2022. Page 4); the flow records indicate that it is operating well within its design capacity.

As Foskor is the only significant contributor to effluent in the dense effluent line, the assumption used is that all the measured effluent is attributable to Foskor. As the existing B and C-lines were designed for, at least a capacity of 30 Mℓ/day; the flow records indicate that it is operating well within its design capacity.

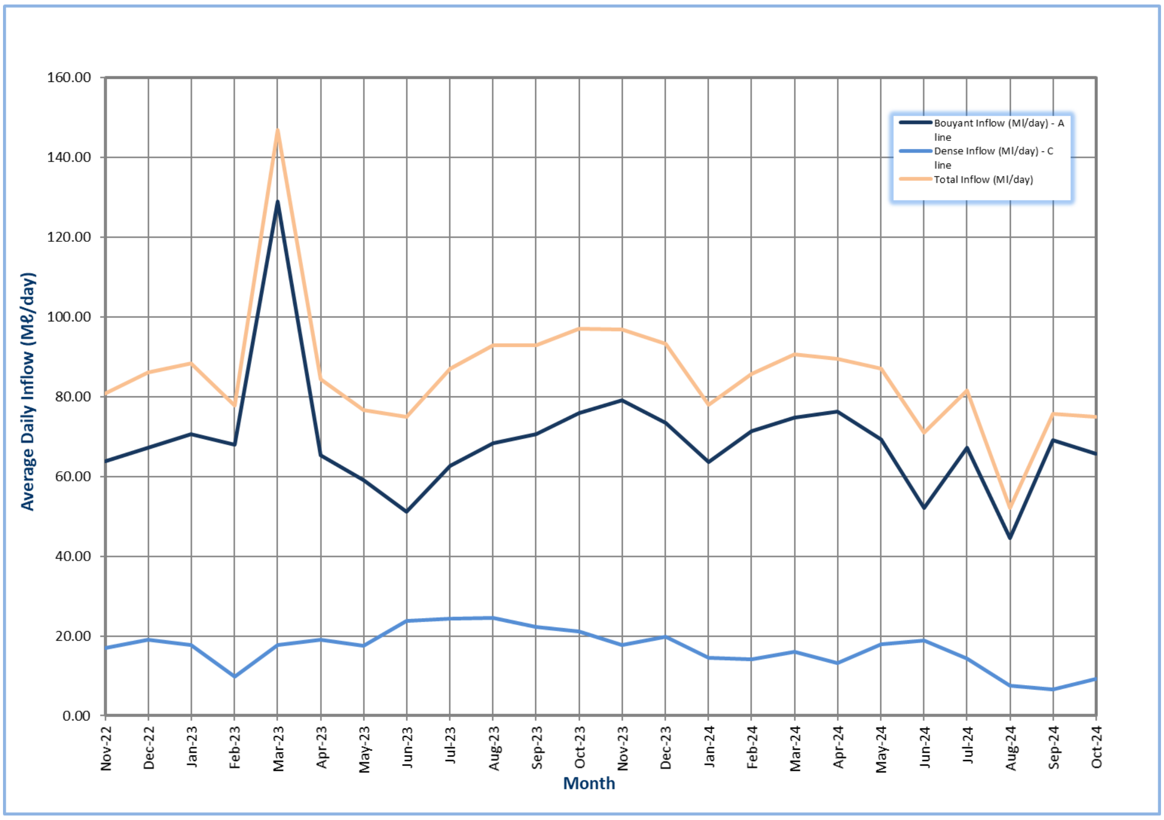

Figure 19.26 Average Daily Inflow for Alkantstrand Sewage Pump Station (Mℓ/day).

c) Recommendations

This infrastructure is operating within its design parameters and hence there is no recommendation at this time.

19.3 uMngeni-uThukela Water Operated Wastewater Works

uMngeni-uThukela Water is responsible for the operation and maintenance of six wastewater works (Mpophomeni WWW is currently decommissioned) within the UMDM. Additionally, uMngeni-uThukela Water operates the Lynnfield Park WWW on behalf of the Msunduzi Local Municipality.

19.3.1 Howick Wastewater Works

a) Description

Howick WWW (**Figure 19.28**) is situated in the town of Howick in the Natal Midlands. It is owned by UMDM and operated by uMngeni-uThukela Water. The WWW is a Class C accredited WWW with an extended aeration process consisting of three separate reactors and four clarifiers. All reactors follow the Johannesburg Process configuration and are fitted with mechanical mixers in the anoxic and anaerobic zones and with surface aerators in the aerobic zones. Mixed liquor from the basins is settled in four downstream clarifiers. Waste activated sludge from the reactors is dewatered in drying beds and treated effluent is disinfected using chlorine (**Figure 19.27**) before being discharged to the uMngeni River. Howick WWW is operating within its overall design capacity for the biological removal of COD, ammonia and phosphate.

Figure 19.27 Howick WWW Chlorine Contact Tank.

The characteristics of the Howick WWW are summarised in **Table 19.8**.

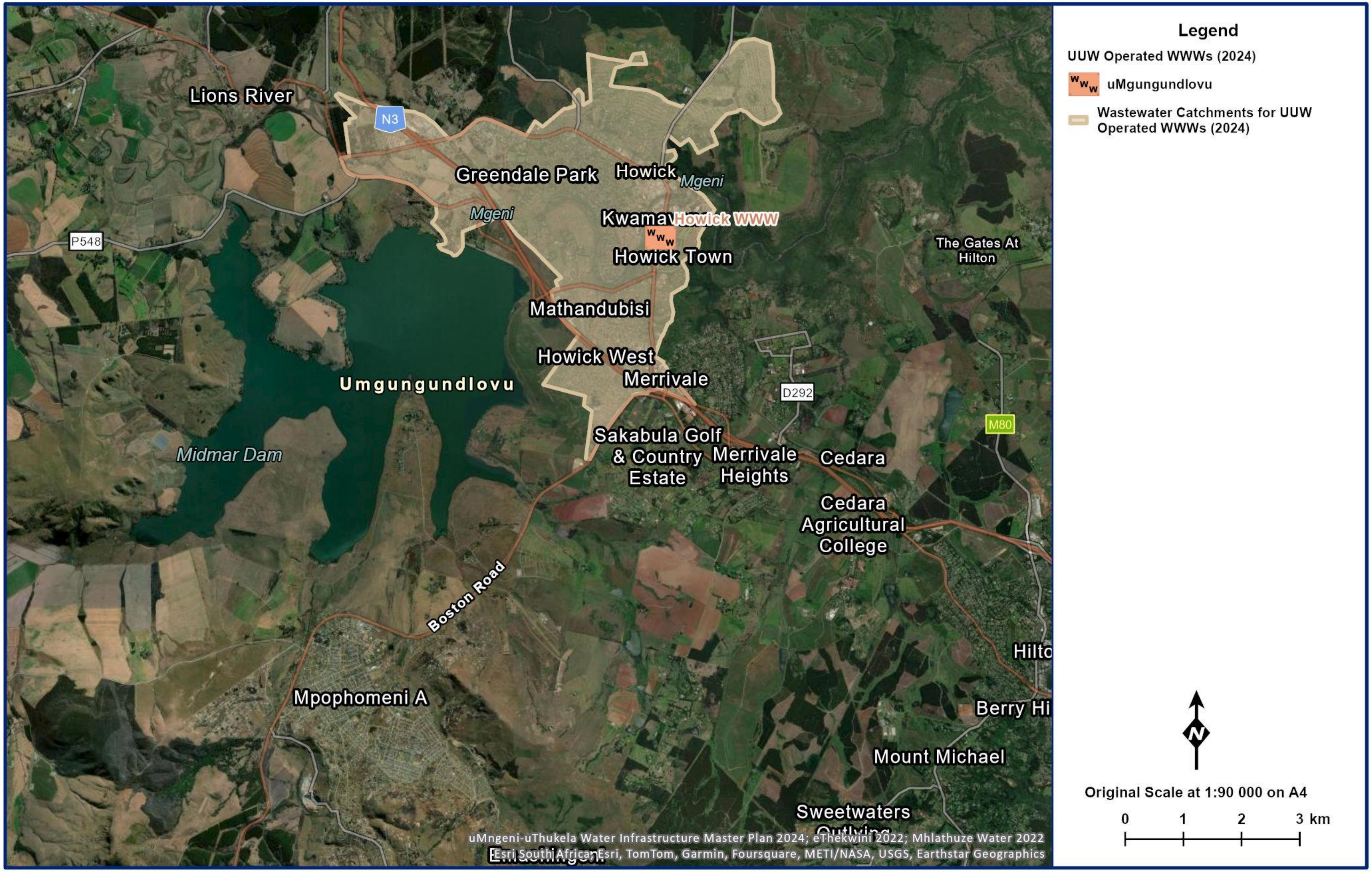

Figure 19.28 Location of Howick WWW.

Table 19.8 Howick WWW infrastructure.

WWW Name:	Howick WWW
System:	Upper uMngeni System
Maximum Design Capacity:	6.8 Mℓ/day
Current Utilisation:	5.0 Mℓ/day
Raw Sewage Pump Station:	Bridge Road Pump-station. Gorman Rupp pumps ± 46 ℓ/s
Screens:	2 x Hand Raked, 5.5 cm 1 x Mechanical Screen Raker, 1 cm (Huber); 0.75 kW Motor (Bauer)
Screw Press:	Rotary Screw Conveyor; 0.55 kW Motor (Flender)
Grit Chambers:	2 x Vortex Degritters
Degritter Pump:	2 x Airlift; 7.5 kW (Wade)
Anaerobic Basin Mixers:	6 x 1.5 kW, 3 x 2.2 kW Mixers
Anoxic Basin Mixers:	9 x 2.2 kW Mixers
Aerators:	3 x 15.5 kW (Hansen) 3 x 18.5 kW (WEG), 4 x 30 kW (Hansen)
Anaerobic Basin Area:	575 m^2
Anoxic Basin Area:	640 m^2
Aeration Basin Area:	1790 m^2
Aeration Basin Capacity:	1.7 Mℓ/day , 1.7 Mℓ/day and 3.4 Mℓ/day (9850 m^3)
Clarifier Type:	2 x Suction Lift, 2 x Mechanically Scraped
Number of Clarifiers:	4
Total Area of all Clarifiers:	830 m^2
Total Capacity of Clarifiers:	20 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	N/A
Chlorine Storage Capacity:	68 kg Cylinder
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	9 Mℓ/day
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Dewatering:	2 x Mechanical Screw Presses (Max. 5 m^3/h)
Sludge Drying Beds Area:	1920 m^2

Howick WWW (**Table 19.8**) has a design capacity of 6.8 Mℓ/day and is currently treating 5.01 Mℓ/day (**Figure 19.29**) based on a 12-month moving average. This includes (2 – 3 Mℓ/day) of wastewater pumped from the decommissioned Mpophomeni WWW (**Section 19.3.2**). The flows have recovered over the last year since the low flows caused by load shedding.

b) Status Quo

An analysis of daily historical production (November 2023 to October 2024) of the Howick WWW is presented in **Figure 19.30.** It shows that for 32% (36% in 2023) of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 10% (13% in 2023) of the time.

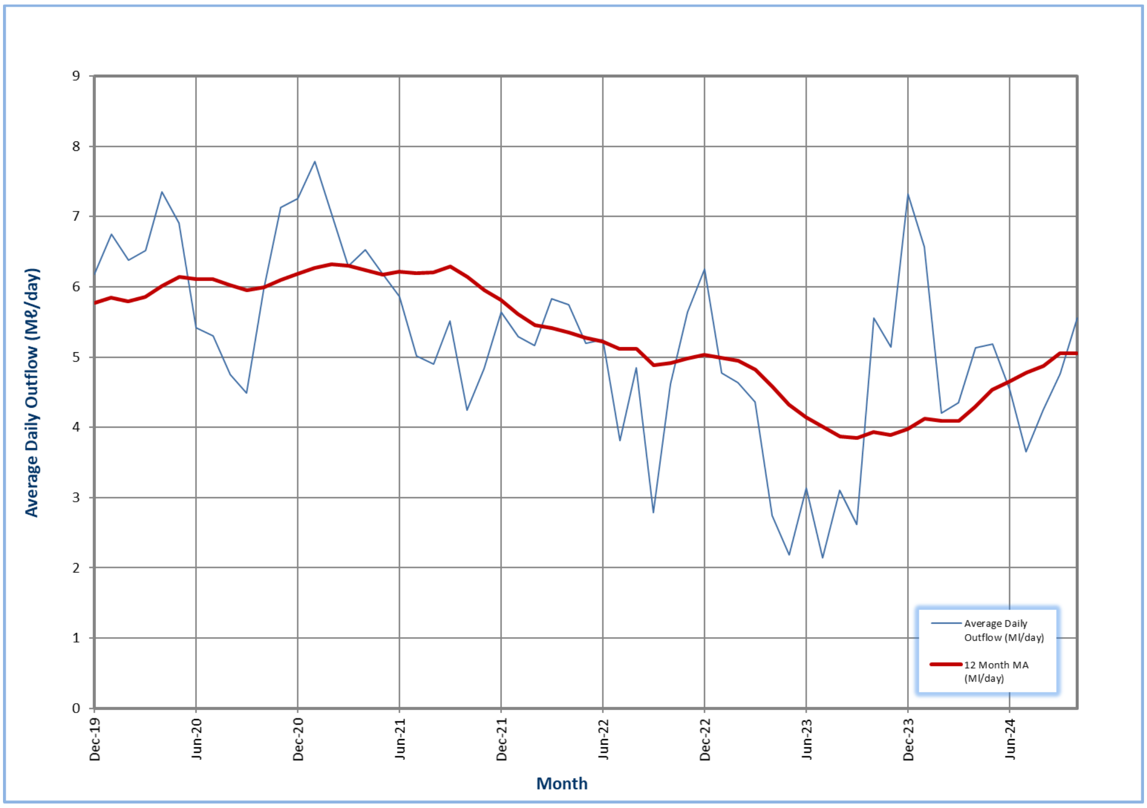

Figure 19.29 Howick WWW average daily outflows (Mℓ/day).

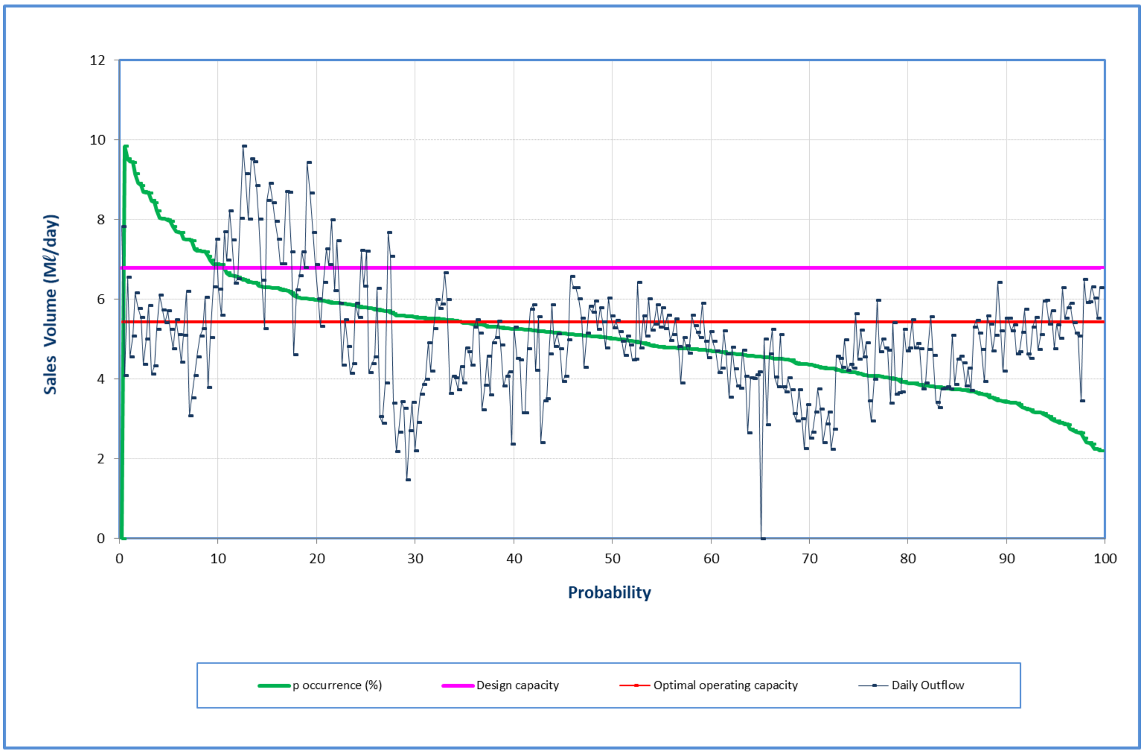

Figure 19.30 Analysis of historical production at Howick WWW (November 2022 to October 2023).

There has been a significant drop in the over-utilisation of the plant. This was largely down to the implementation of ESKOM load-shedding, which resulted in Bridge Road (and other) sewage pump stations not operating for large periods. Subsequently the flows into the works were reduced. uMngeni-uThukela Water has installed a stand-by generator system at Bridge Road to alleviate this problem in future.

c) Wastewater Quality

There has been a generally declining trend in SRP content in discharge from the Howick WWW from 942 kg in 2019 to 586 kg in 2024. However, there was an increase in SRP between 2021 (1 311 kg) and 2022 (1 794 kg) due to high rainfall and increased inflow of trade effluent (**Figure 19.31**). The TIN content is generally stable at Howick WWW, with the 12 123 kg recorded in 2024 being comparable to 12 836 kg estimated in 2019 (**Figure 19.32**). However, there are two anomalies to note: (i) a low of 7 458 kg in 2020 and (ii) a high of 15 096 kg in 2023. There was a general decrease in suspended solids between 2019 and 2022, before a significant increase in 2023 and 2024 (**Figure 19.33**). This is due to higher inflows and industrial effluent.

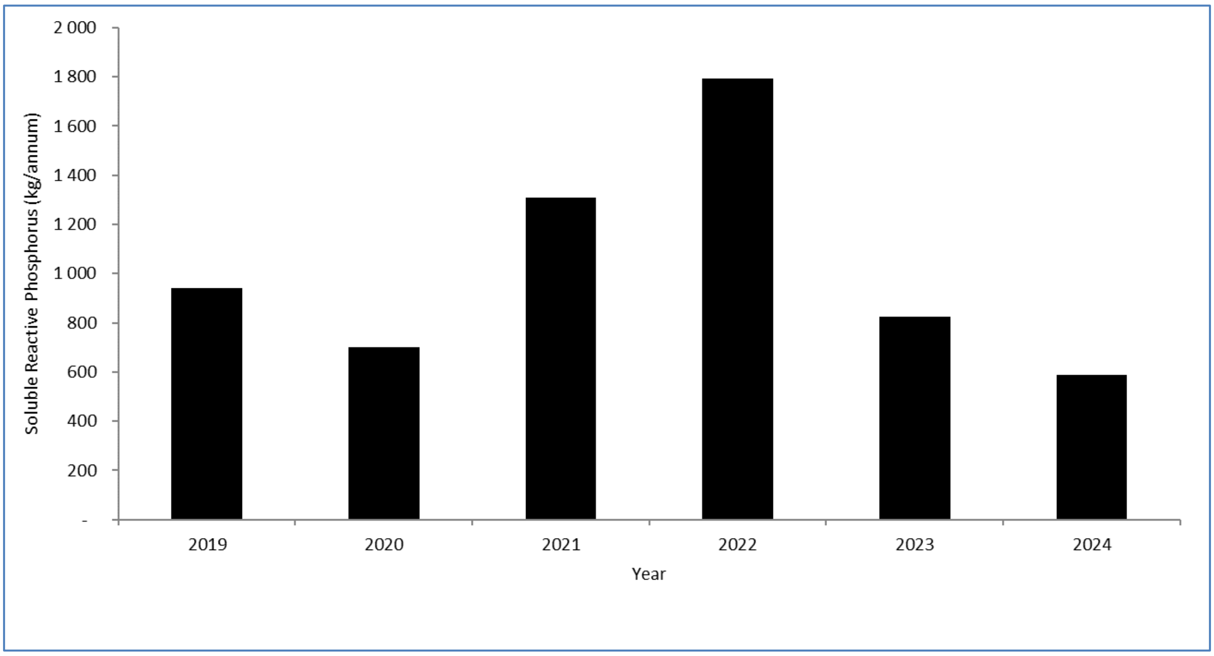

Figure 19.31 Soluble reactive phosphorus from Howick WWW between 2019 and 2024.

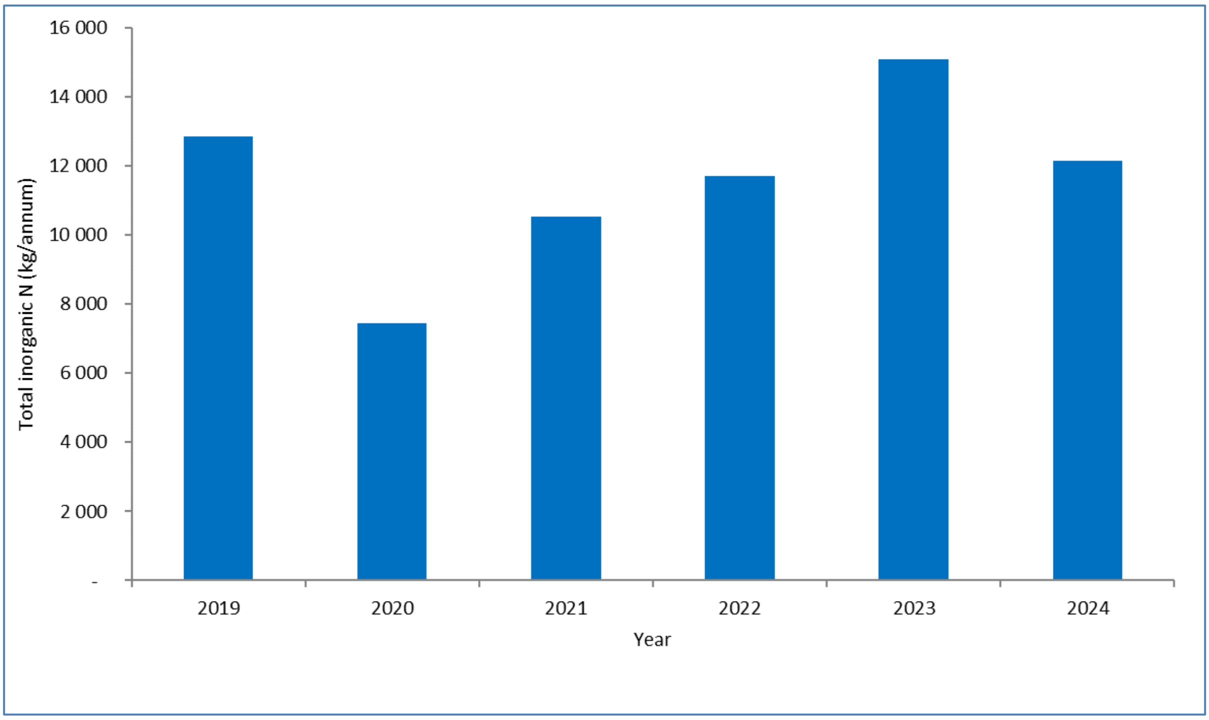

Figure 19.32 Total inorganic nitrogen from Howick WWW between 2019 and 2024.

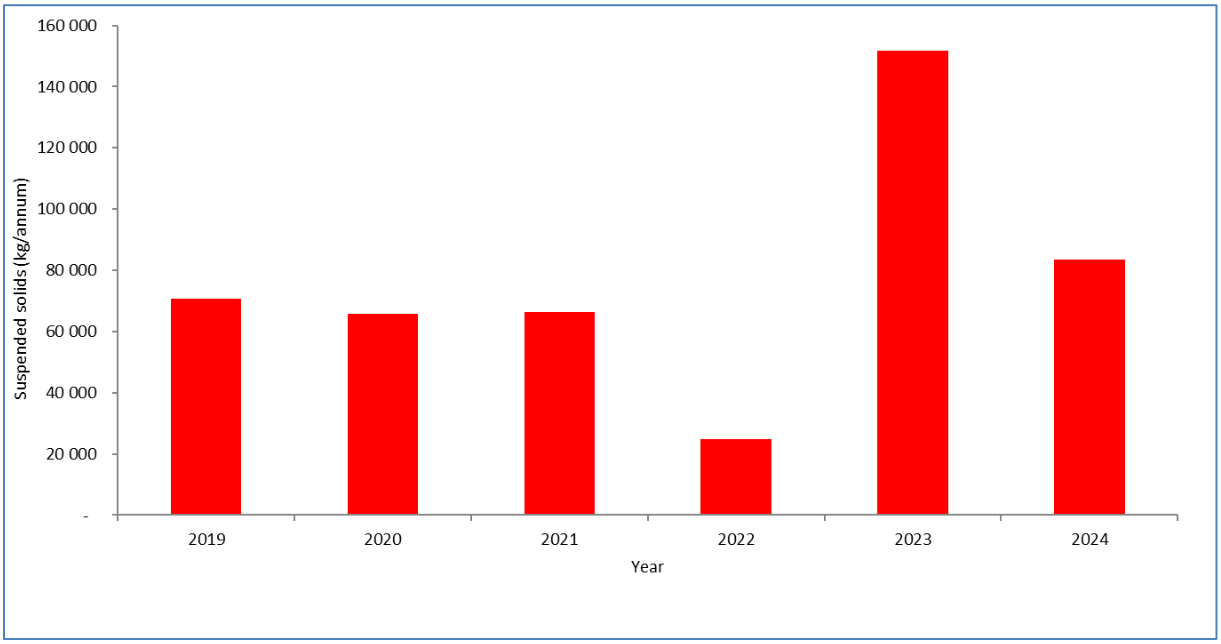

Figure 19.33 Suspended solids from Howick WWW between 2019 and 2024.

d) Recommendations

The upgrading of major existing bulk infrastructure between the intersection of Main Road/Harvard Street and the Howick WWW, including the works, will be required because of upstream development. Septic tank conversions will also play a role in the required sizing.

The main infrastructure elements to be upgraded include:

i) The outfall between the intersection of Main Road/Harvard Street and Bridge Road Pump Station;
ii) Bridge Road Pump Station and 770 mm rising main to the works;
iii) Upgrading of Howick WWW and inlet works.

These upgrades should be triggered when relative spare capacity remaining in the bulk infrastructure elements nears 30%.

The ultimate capacity of Howick WWW will be 17 Mℓ/day if those areas currently served by septic tanks are converted to water borne sewage. This ultimate capacity accounts for all future developments in and around Howick as well as projected growth in demand. The availability of additional land is an issue since the current site is not well utilized in terms of treatment capacity per hectare. There are two options available one being elaborated on hereunder. The second option is to decommission the existing drying beds to avail space for additional units or different technology that will accommodate the proposed additional capacity.

In discussions with the DM, it was confirmed that the land parcel immediately north of the works is municipal land. This land must be secured as soon as possible and reserved for the expansion of the WWW.

The Howick WWW is situated on Erf 997 due south from the CBD. This Erf has a size of approximately 72837 m^2 (7.28 ha). There are various land users/ coverages at and around the Howick WWW site. The fenced off area has an extent of 3.77 ha, encompassing all the current treatment processes. There is fenced and unfenced land that form part of Erf 997. Also, some portion of Erf 997 (northeast) has been taken up by an informal settlement (in the extent of 17614 m^2 or 1.76 ha). The area not taken up by informal settlements is therefore 5.52 ha. The land north of Howick WWW is approximately 2.41 ha and would be an ideal option to expand the plant to.

19.3.2 Mpophomeni Wastewater Works

a) Description

Presently wastewater from Mpophomeni Township is pumped from the site of the decommissioned Mpophomeni WWW (**Figure 19.34**) to Howick WWW (**Section 19.3.1**), a distance of approximately 11 km. The existing wastewater pumping and conveyance system, with an estimated operating capacity of 4.3 Mℓ/day, is inadequate to pump the projected ADWF of 5.9 Mℓ/day. uMngeni-uThukela Water started construction of a new WWW in Mpophomeni in mid-2020 (**Section 19.4.2**). The new WWW has been designed to treat 6 Mℓ/day with the possibility of increasing the capacity to 12 Mℓ/day. The site has adequate land available for a WWW of at least 20 Mℓ/day. The existing WWW infrastructure is listed in **Table 19.9**, some of which will be retained as part of the new plant.

Table 19.9 Mpophomeni WWW infrastructure.

WWW Name:	Mpophomeni WWW
System:	Upper uMngeni System
Maximum Design Capacity:	3.5 Mℓ/day
Current Utilisation:	Decommissioned
Balancing Ponds:	2.25 Mℓ/day wet weather storage pond
Raw Sewage Pump Station:	N/A
Screens:	1 x 30 mm Manually raked 1 x Mechanical Screen Raker (Huber)
Grit Chambers:	2 x Vortex
Primary Settling Tank:	2
Rotating Biofilters:	2 x 454 m^2
Clarifier Type:	
Number of Clarifiers:	1 x 18 m diameter
Total Area of all Clarifiers	255 m^2
Total Capacity of Clarifiers:	6 Mℓ/day
Upflow Velocity:	1 m/h
Cold Digesters:	2 x 600 kℓ
Supernatant Tank:	1 x 450 kℓ
Humus Tanks:	3
RAS Pump Station:	N/A
Chlorine Storage Capacity:	N/A
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Dewatering Facility:	N/A
Sludge Drying Beds Area:	8

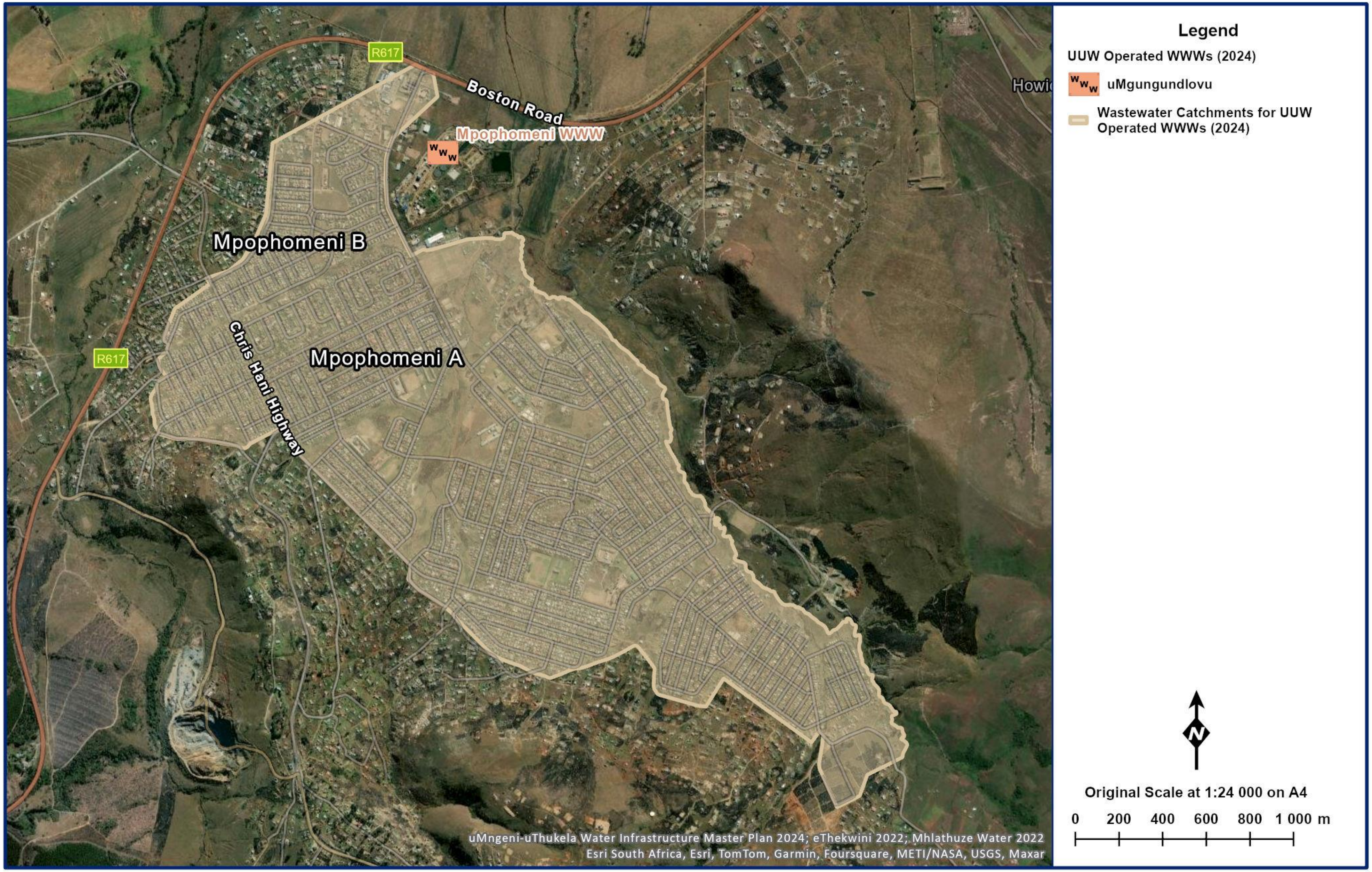

Figure 19.34 Location of decommissioned Mpophomeni WWW.

b) Status Quo

As indicated in **Section 19.3.2 a)**, wastewater from Mpophomeni Township is pumped from the site of the decommissioned Mpophomeni WWW (**Figure 19.34**) to Howick WWW. Therefore refer to **Section 19.3.1b)** for the status quo.

c) Recommendations

Brookdales development just north of Howick Airfield and shooting range is likely to be constructed before (estimated 2026) any other future developments in the Mpophomeni wastewater catchment. The internal sewer infrastructure, sewer outfall and pump station (PS), which is situated approximately 500 m north of the development, have already been designed.

A new bulk main from the Brookdales pump station (PS) to the Mpophomeni WWW is required. This will comprise a 3 km rising main from the PS, to the natural watershed located approximately 1.2 km north-east of the works along the R617. From this point a new future main will gravitate all sewage to the WWW.

As the Brookdales PS is located at the lowest point, other proposed developments adjacent to the R617 will be able to naturally drain towards the PS.

19.3.3 Lynnfield Park Wastewater Works

a) Description

The Lynnfield Park WWW is a small (0.5 Mℓ/day) works that services part of the Ashburton area (**Figure 19.35**). uMngeni-uThukela Water took over the operation of the works on behalf of the Msunduzi Local Municipality in April 2014.

The WWW was upgraded in 2016 with the addition of a new Sequencing Batch Reactor (SBR). The old extended aeration activated sludge reactors were decommissioned and are now used as balancing tanks and chlorine contact tanks. The Head of Works (HOW) was upgraded and comprises two channels comprising manual and mechanical screening (**Figure 19.36**).

The addition of a duplicate SBR (0.5 Mℓ/day) is planned and this would increase the capacity of the plant to 1 Mℓ/day. Any upgrades to the works are being funded by a private developer and thus the increase in capacity is being timed to coincide with planned property developments in the area. Further upgrades to 2 and 4 Mℓ/day are planned based on expected future requirements.

The characteristics of the Lynnfield Park WWW are shown in **Table 19.10**.

Table 19.10 Lynnfield WWW infrastructure.

WWW Name:	Lynnfield WWW
System:	Upper uMngeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.21 Mℓ/day
Balancing Ponds:	Storm Dam
Screens:	New 1 x Mechanical raked screen, 6 mm aperture New standby 1 x Hand raked screen, 12 mm aperture
Grit Chambers:	1 x vortex
Aeration Basin:	2 x Sequencing Batch Reactor
Aeration Basin Capacity:	500 kℓ/day
Aeration:	Fine Bubble Diffused Aeration
Blowers:	2 x 9.5 kW
Clarifier Type:	
Number of Clarifiers:	2 (decommissioned)
Total Area of all Clarifiers:	
Total Capacity of Clarifiers:	
Upflow Velocity:	
Chlorine Storage Capacity:	25 ℓ tank Liquid Sodium Hypochlorite (NaOCL)
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	Geofabric dewatering bag contained in a disposable skip

Figure 19.35 Location of Lynnfield Park WWW.

Figure 19.36 Lynnfield Park WWW head of works showing manual and mechanical screening channels.

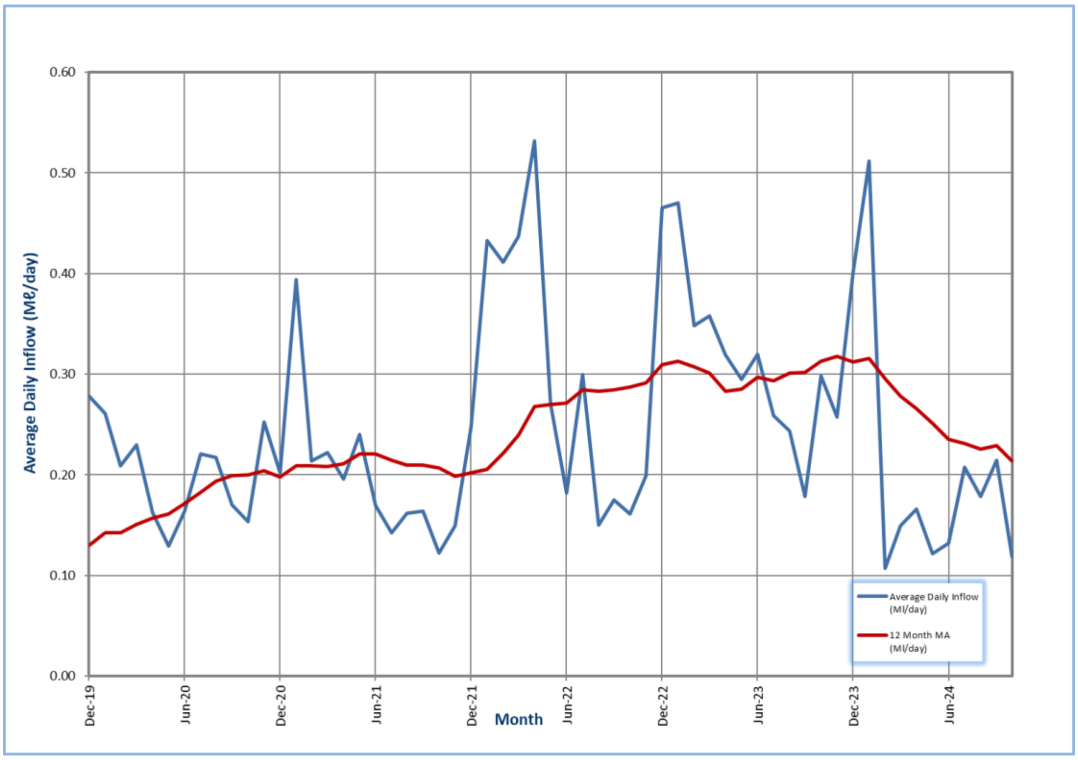

Figure 19.37 Lynnfield Park WWW average daily inflows (Mℓ/day).

b) Status Quo

The twelve-month moving average inflow to the works is 0.21 Mℓ/day (**Figure 19.37**), down from 0.31 Mℓ/day the previous year. This is an unexpected decline in flow as the inflow had been increasing progressively for the last four years. It is not clear why this decline has occurred.

An analysis of daily historical production (November 2023 to October 2024) of the Lynnfield Park WWW is presented (**Figure 19.38).** It shows that for 8.5 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 4.0 % of the time.

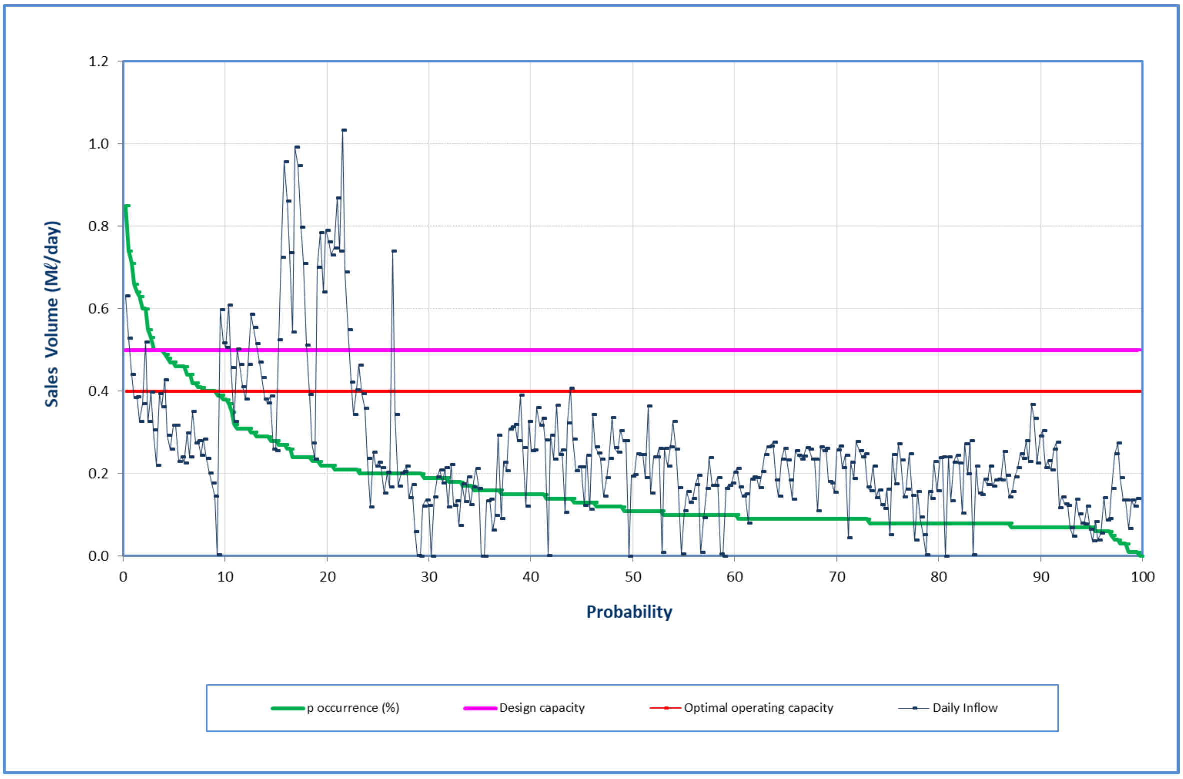

Figure 19.38 Analysis of historical production at Lynnfield Park WWW (November 2023 to October 2024).

c) Wastewater Quality

The soluble reactive phosphorus content from the Lynnfield Park WWW varies from year to year, with a maximum of 206 kg and a minimum of 128 kg being estimated for 2021 and 2022, respectively (**Figure 19.39**). There has been a general increase in TIN over the last five years, with 610 kg and 719 kg being estimated for 2019 and 2024, respectively (**Figure 19.40**). Similarly, there is an increasing trend in suspended solids from the plant, ranging from 761 in 2016 to 2 694 in 2023 (**Figure 19.41**).

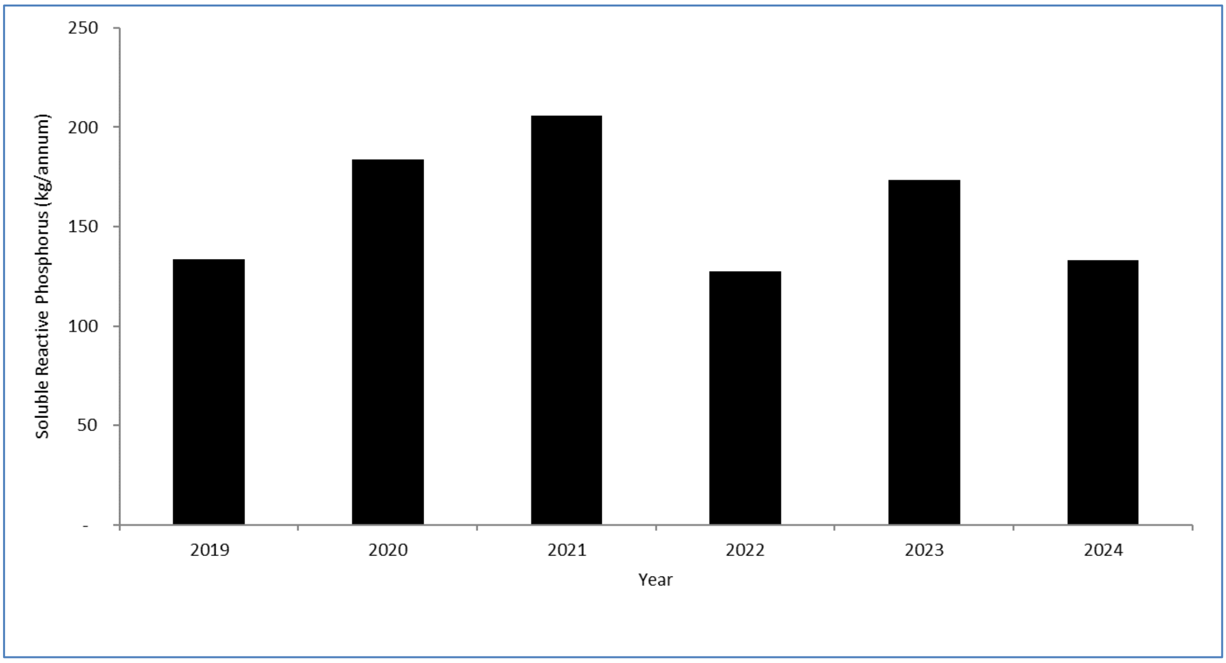

Figure 19.39 Soluble reactive phosphorus from Lynnfield Park WWW between 2019 and 2024.

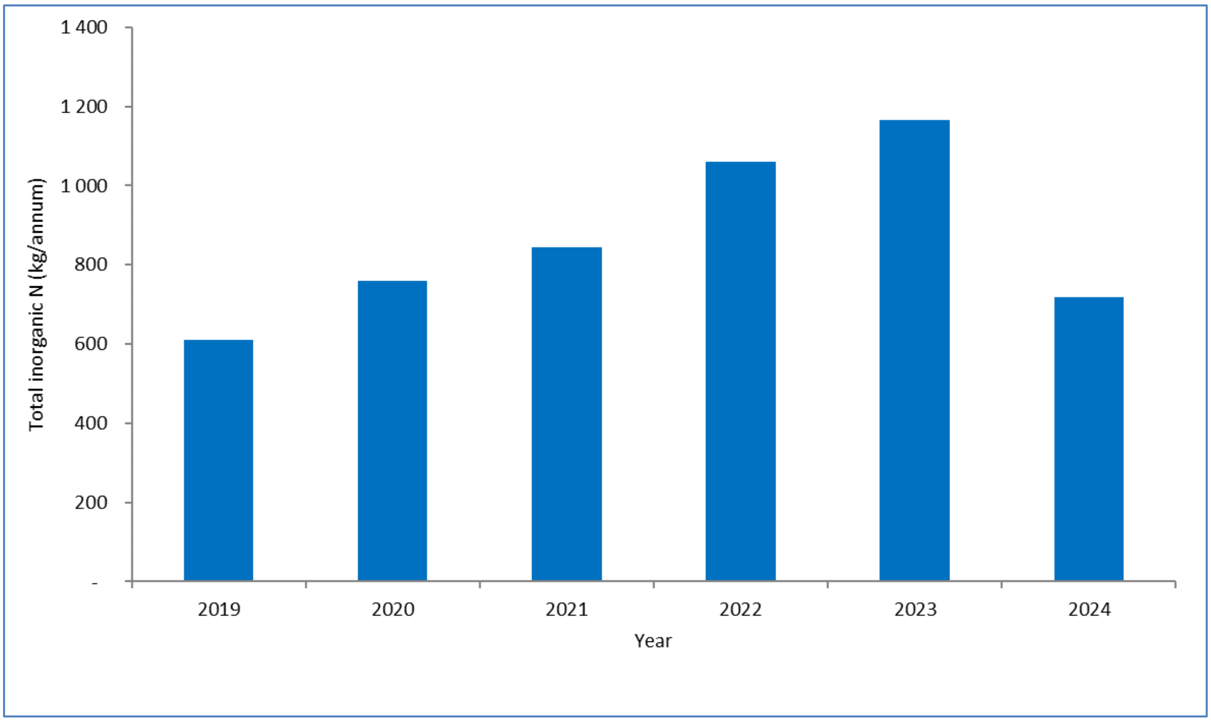

Figure 19.40 Total inorganic nitrogen from Lynnfield Park WWW between 2019 and 2024.

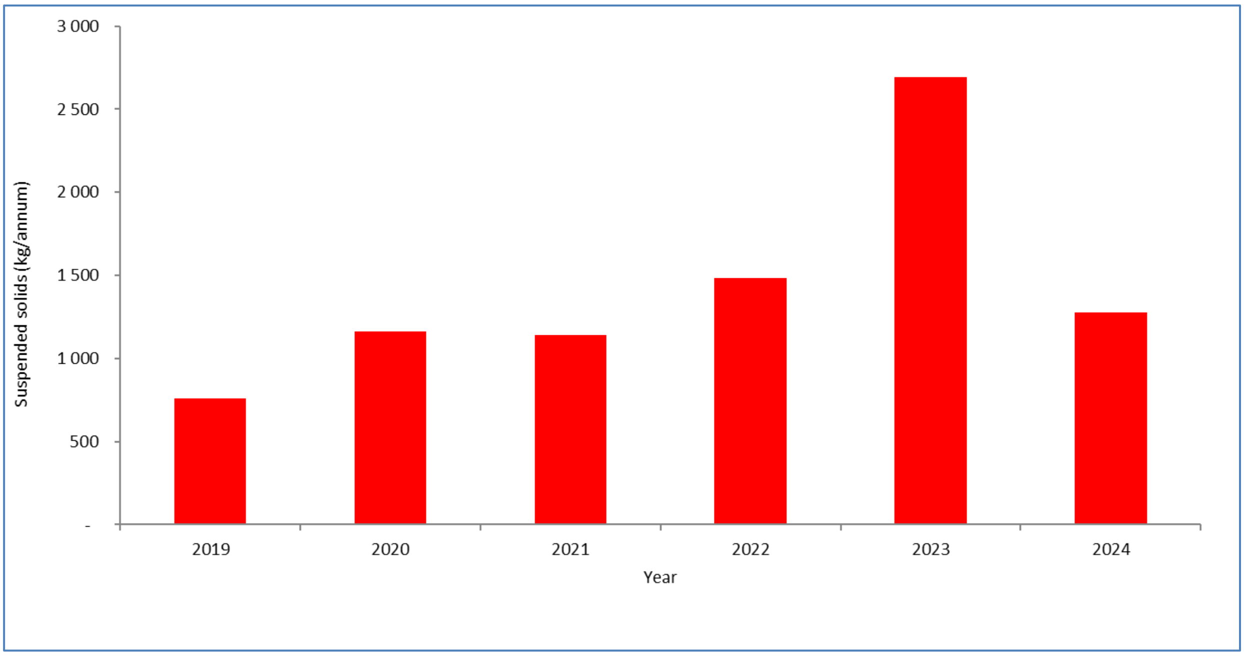

Figure 19.41 Suspended solids from Lynnfield Park WWW between 2019 and 2024.

d) Recommendations

The WWW is operating well within its capacity and there is therefore no need for an upgrade in the near future. The upward trend in demand has tailed off unexpectedly since February 2024.

19.3.4 Mpofana Wastewater Works

a) Description

uMngeni-uThukela Water operates the Mpofana WWW (**Figure 19.42**) on behalf of UMDM. The wastewater works services the town of Mooi River, and adjacent township of Bruntville (**Figure 19.43**). Sewage from Mooi River flows into the works by gravity whilst catchment sewage is pumped to the wastewater works by eight pump stations.

Figure 19.42 Mpofana WWW head of works.

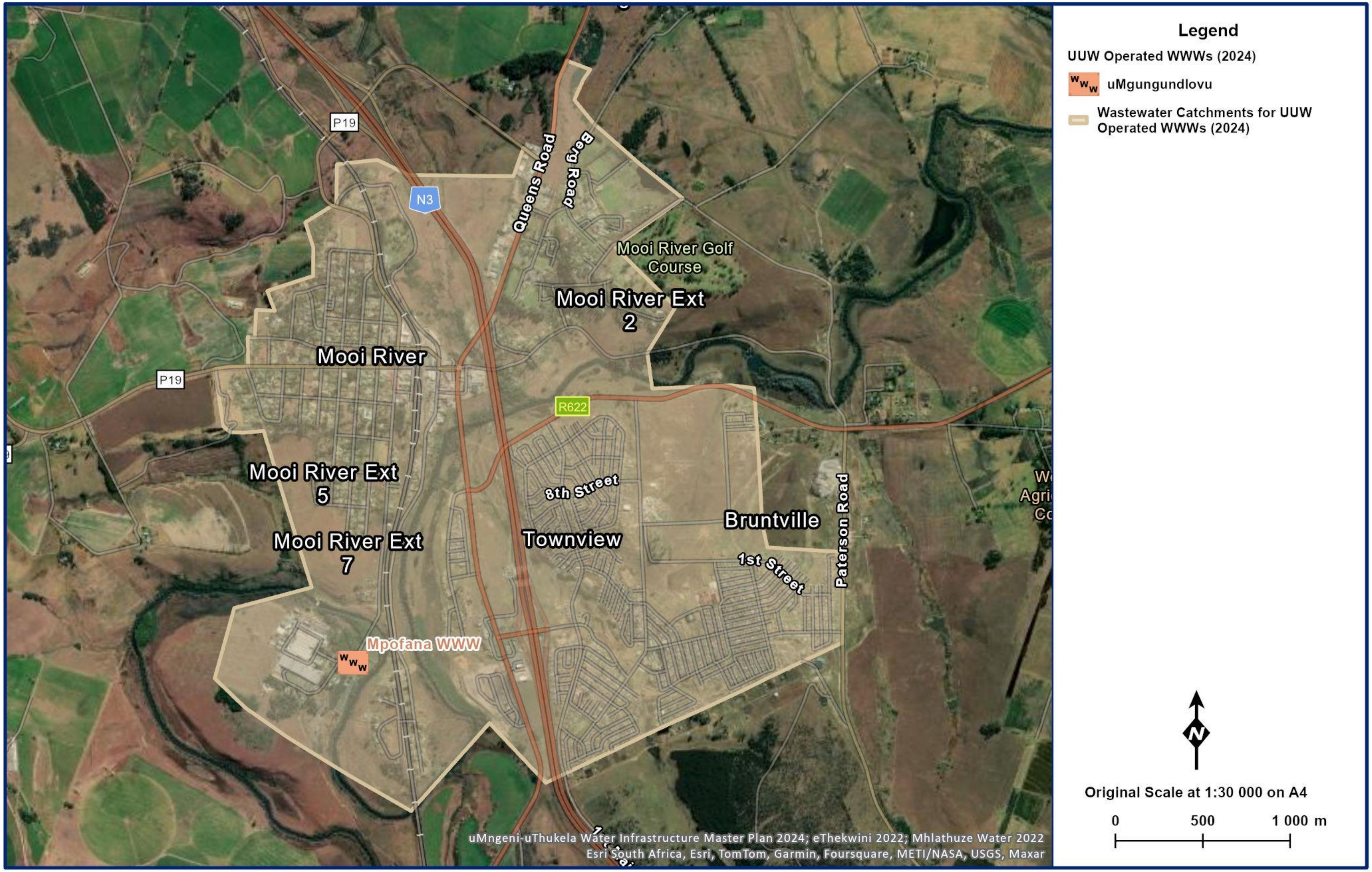

Figure 19.43 Location of the Mpofana WWW.

The characteristics of the Mpofana WWW are shown in **Table 19.11.**

Table 19.11 Mpofana WWW infrastructure.

WWW Name:	Mpofana WWW
System:	Mooi System
Maximum Design Capacity:	3.5 Mℓ/day
Current Utilisation:	2.83 Mℓ/day
Balancing Ponds:	Combined 75 000 m^3
Raw Sewage Pump Station:	375 Mℓ/day @ velocity of 2.3 m/s
Screens:	3 x Hand-raked bar screen
Grit Chambers:	None
Aeration Basin:	2 x Activated sludge (1 x not operational)
Aeration Basin Capacity:	Operational 4500 m^3
Aerators:	3 x Hansen QVPD-3_UDN (45kW, 1480 rpm) 3 x SEW Eurodrive (not operational)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	2 x 20 m diameter
Total Area of all Clarifiers:	628 m^2
Total Capacity of Clarifiers:	15 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	None (gravity)
Chlorine Storage Capacity:	Wallace & Tiernan, S10k Gas Chlorinator 68 kg cylinder
Chlorine Dosing Capacity:	Max. allowable 2.0 kg/h (existing)
Total Capacity of Chlorine Contact Tanks:	25m^3
Total Capacity of Sludge Treatment Plant:	5 m^3/hr
Dewatering Facility:	Operational
Sludge Drying Beds Area:	None

b) Status Quo

The works has a design capacity of 3.5 Mℓ/day and is currently treating 2.83 Mℓ/day based on a twelve-month moving average (**Figure 19.44**). The works did receive approximately 1.2 Mℓ/day of industrial influent from the adjacent textile industry until it suffered a major fire in October 2019. The factory currently remains closed.

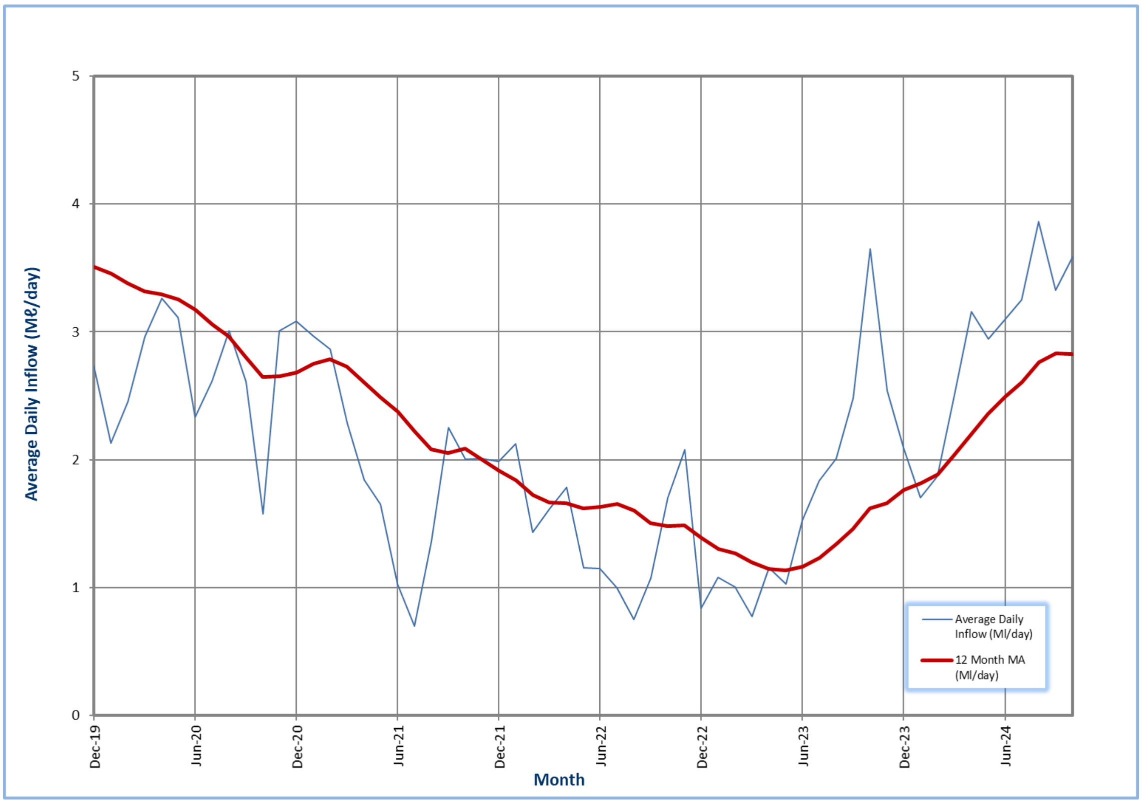

Figure 19.44 Mpofana WWW average daily inflows (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Mpofana WWW is presented in **Figure 19.45.** It shows that for 57% (4% in 2023) of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 37% (3% in 2023) of the time. This is significant change from previous years, which can be attributed to the increased potable water supply following the commissioning of the Spring Grove WTP in June 2023.

The Detailed Feasibility Study (DFS) for the upgrade of the works was suspended following a review of the project (**Section 19.4.5**). However, a number of operational issues have been identified at the works (mainly due to aging infrastructure) and these will be scheduled for refurbishment or replacement under a new project. The refurbishment project will increase the capacity of the works to meet demands and improve the treatment process sufficiently to meet effluent discharge standards.

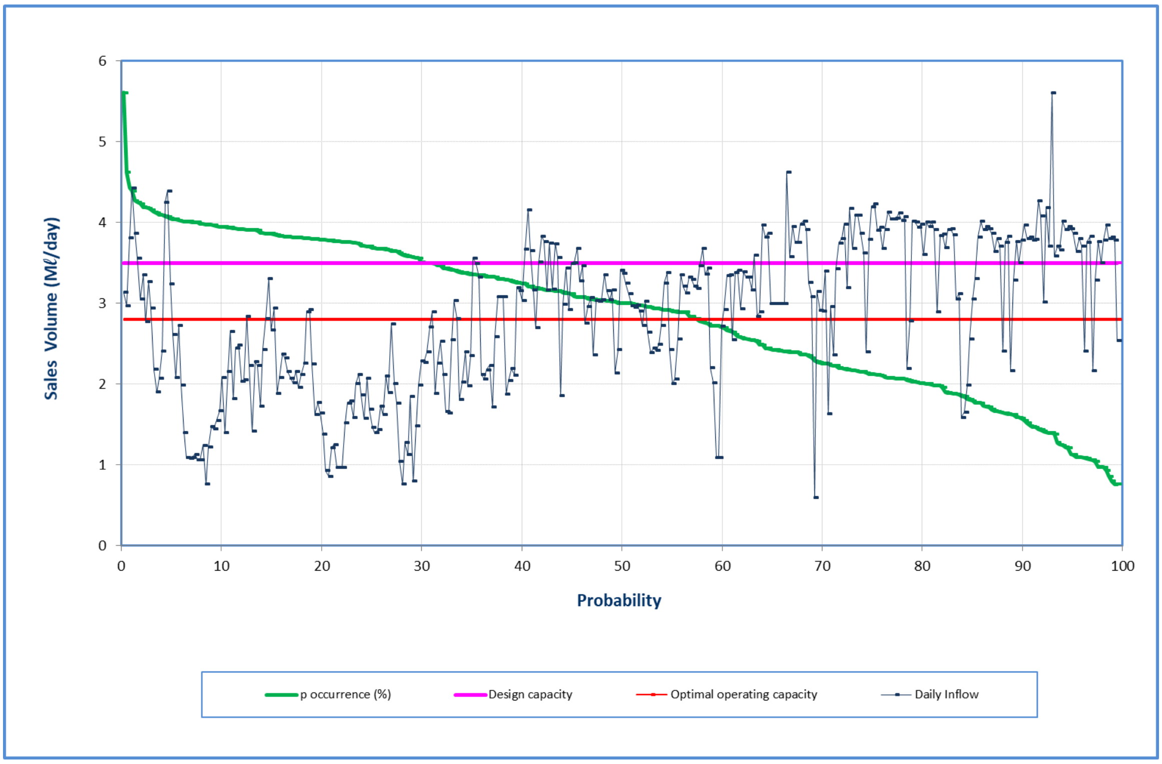

Figure 19.45 Analysis of historical production at Mpofana WWW (November 2023 to October 2024).

c) Wastewater Quality

The Mpofana WWW has shown a general decline in SRP, from 4 294 kg in 2019 to 1 472 kg in 2024 (**Figure 19.46**). Similarly, a general declining pattern is observed for TIN content in the discharge from this plant, from total TIN of 18 404 kg in 2019 to 9 163 in 2024 (**Figure 19.47**). The total suspended solids in discharge from the Mpofana WWW has also significantly declined from 28 386 kg in 2019 to 17 501 kg in 2024 (**Figure 19.48**). Although there is a general improvement in the quality of water from the Mfofana WWW, there has been notable inter-annual variability in the different nutrients due to inflow fluctuations.

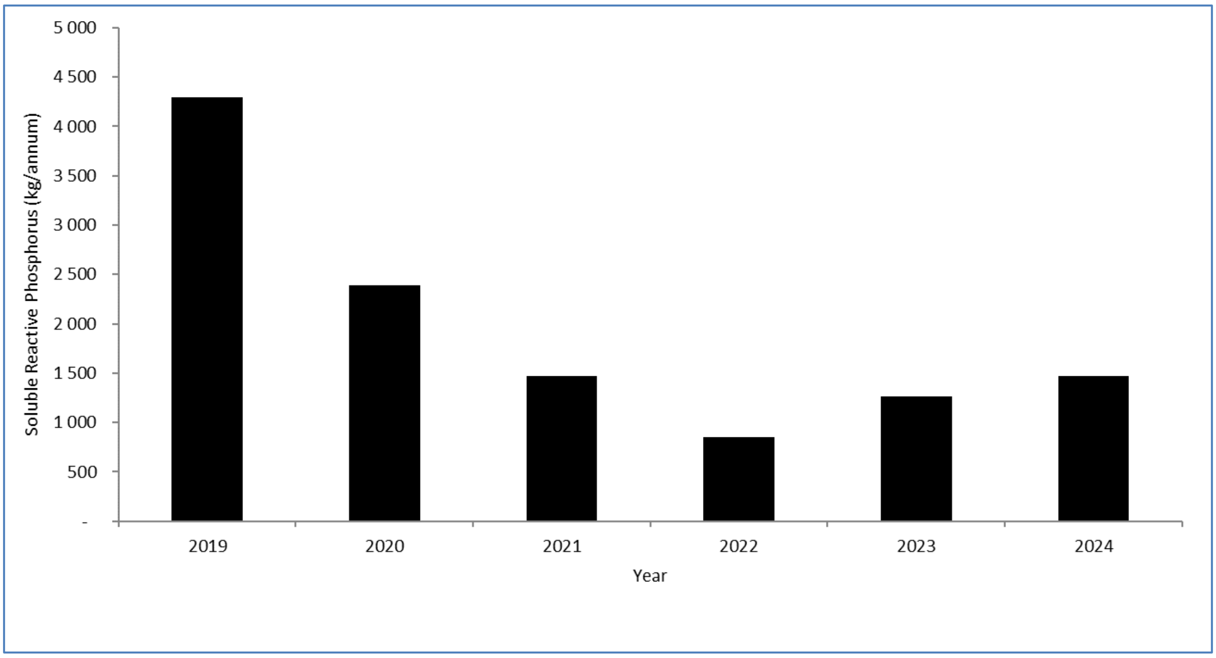

Figure 19.46 Soluble reactive phosphorus from Mpofana WWW between 2019 and 2024.

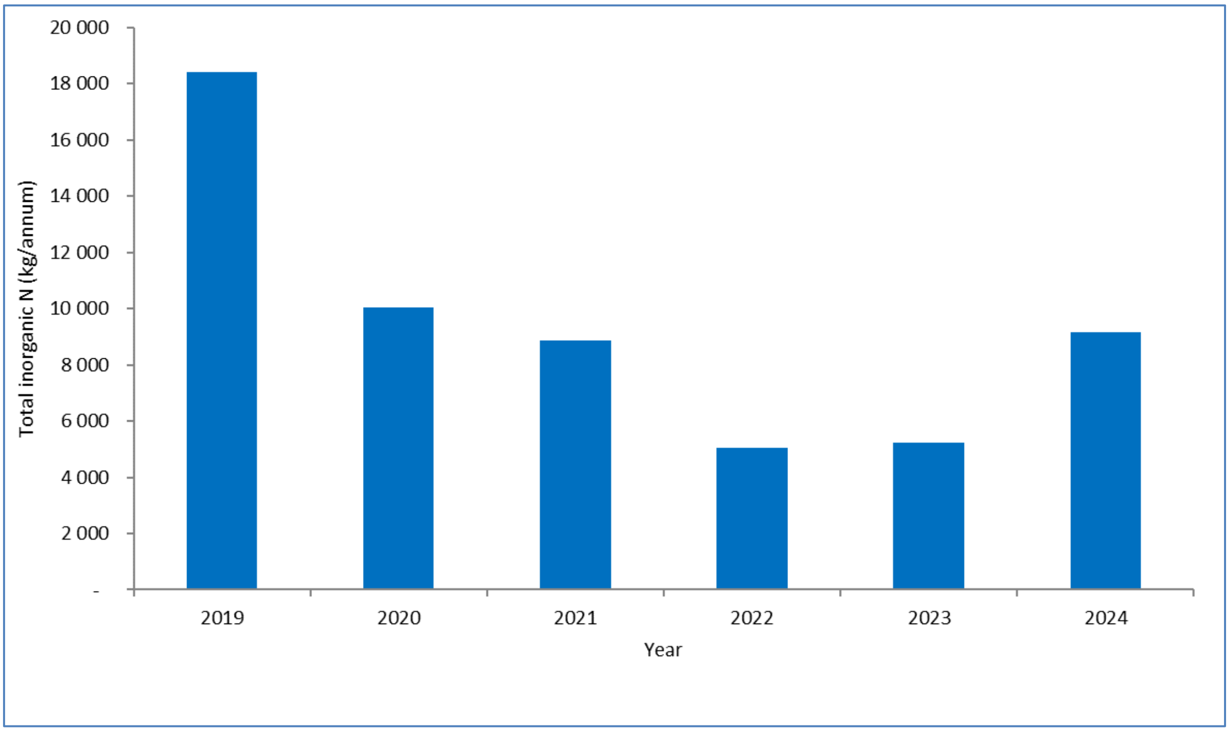

Figure 19.47 Total inorganic nitrogen from Mpofana WWW between 2019 and 2024.

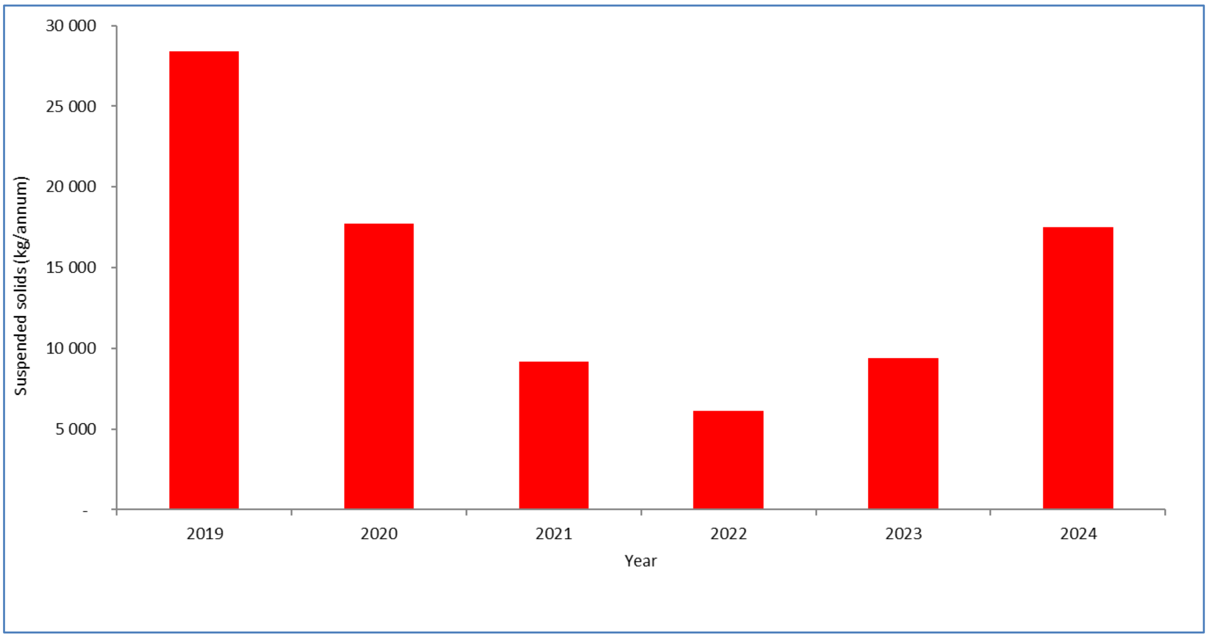

Figure 19.48 Suspended solids from Mpofana WWW between 2019 and 2024.

d) Recommendations

A number of future development areas (FDAs) have been identified in Mooi River through various sources. Proposed projects include those that would address backlogs as well as new developments. The resultant increase in demand requires that the main outfall that leads to the WWW be upgraded. The upgrade, therefore caters to all developments in the Mooi River town and Bruntville township area.

The Mpofana WWW outfalls with an existing nominal diameter of 300 mm were simulated under the theoretical zoning and future development demands associated with this development scenario. The results showed that the bulk outfalls will require upgrades within the range of 525 mm- 400 mm in pipe size.

Additionally, analysis showed that the section of the outfall directly after the rising main, is a flatter slope than the pipes upstream and downstream, and due to this flat slope, the hydraulic model indicates that the pipe be upgraded to 400 mm.

There are three main areas in the Mpofana scheme boundary that are serviced by septic and conservancy tanks, namely Penningdale, Brickyards and Mooi River Industrial Area. Penningdale is located adjacent the Mpofana WWW, where the western side of converted septic tanks could drain directly into the main outfall for the Mpofana WWW. Furthermore, with the main outfall for the Mpofana WWW already catering for the larger flows from Mooi River town and Bruntville Township, the additional flow from these three areas will not be significant enough to trigger a larger upgrade to the outfall other than what is already specified.

These projects will be triggered when development of FDAs, listed above, occurs. Both conversion of the peri-urban areas and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.3.5 Appelsbosch Wastewater Works

a) Description

The Appelsbosch WWW is situated in Appelsbosch in the uMshwathi Municipality (**Figure 19.49**). The WWW comprises a single rectangular aeration tank fitted with turbine aerators (**Figure 19.50**), a clarifier, three anaerobic ponds and a chlorine contact tank. The current treatment capacity is reported as 0.5 Mℓ/day. The plant receives sewerage from the Hospital, College and Appelsbosch Waterworks, although the Waterworks was decommissioned in November 2019. The plant is classified as a Class D works requiring a Class 1 operator onsite and a Class V supervisor available who does not necessarily have to be onsite. The characteristics of the Appelsbosch WWW are shown in **Table 19.12**.

b) Status Quo

The Appelsbosch WWW flows are represented in the graph (**Figure 19.51**) and it is apparent that the flows are very small with a 12 month moving average of 0.07 Mℓ/day in October 2024.

Figure 19.49 Location of the Appelsbosch WWW.

Figure 19.50 Appelsbosch WWW Oxidation Ditch (Aeration Tank).

Table 19.12 Appelsbosch WWW infrastructure.

WWW Name:	Appelsbosch WWW
System:	Upper uMngeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.07 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	1 x Hand Raked
Grit Chambers:	None
Aeration Basin:	1 x Oxidation Ditch
Aeration Basin Capacity:	667 m^3
Aerators:	2 x Brush Aerators
Clarifier Type:	Scraped Floor
Number of Clarifiers:	1
Total Area of all Clarifiers	38 m^2
Total Capacity of Clarifiers:	0.9 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	N/A
Chlorine Storage Capacity:	N/A
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	None
Anaerobic Ponds:	3 (35 m x 10 m)
Sludge Drying Beds Area:	Not operational

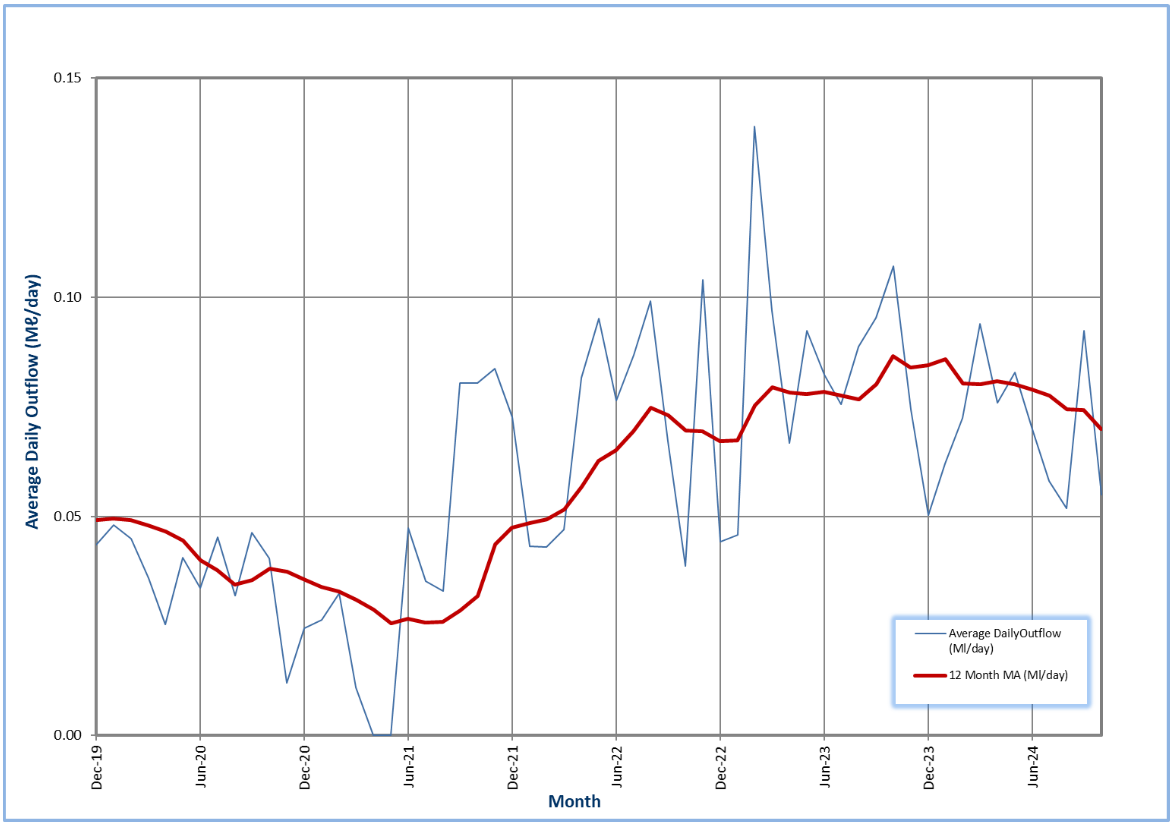

Figure 19.51 Appelsbosch WWW average daily outflows (Mℓ/day)

c) Wastewater Quality

There is a general decline in SRP, TIN and suspended solids in the discharge from the Appelsbosch WWW between 2019 and 2024 (**Figure 19.52, Figure 19.53, Figure 19.54**). However, there was an increase in all nutrients in 2022 and 2023. This is mainly due to the heavy rainfall received in the area during this period.

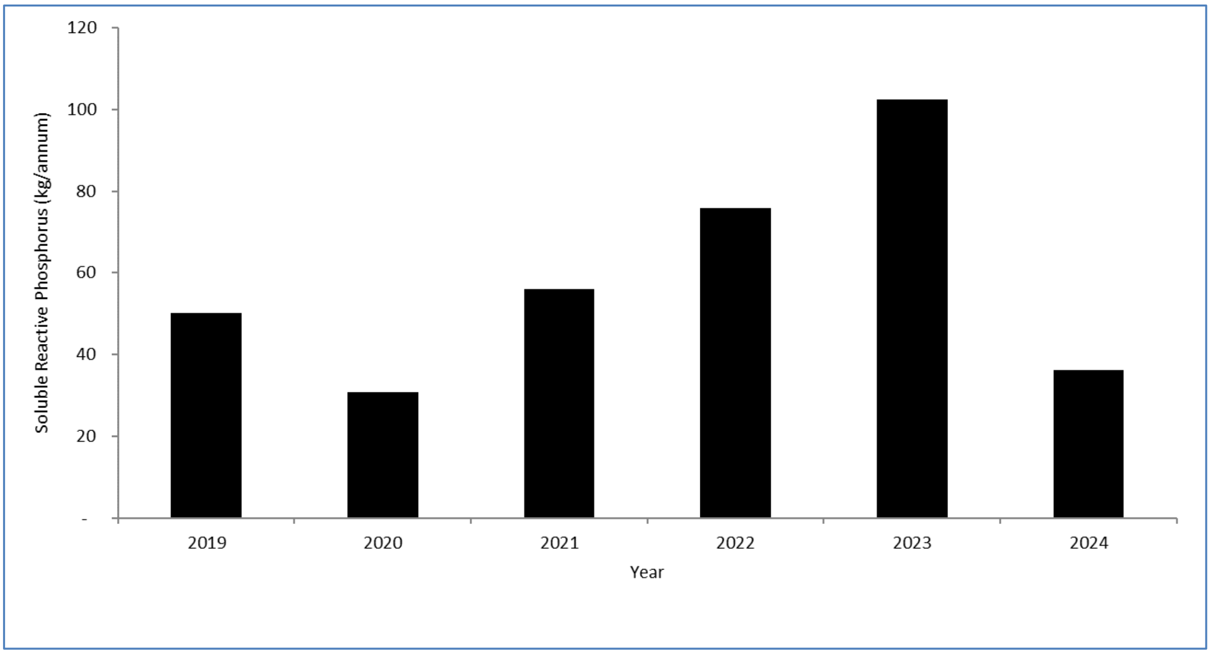

Figure 19.52 Soluble reactive phosphorus from Appelsbosch WWW between 2019 and 2024.

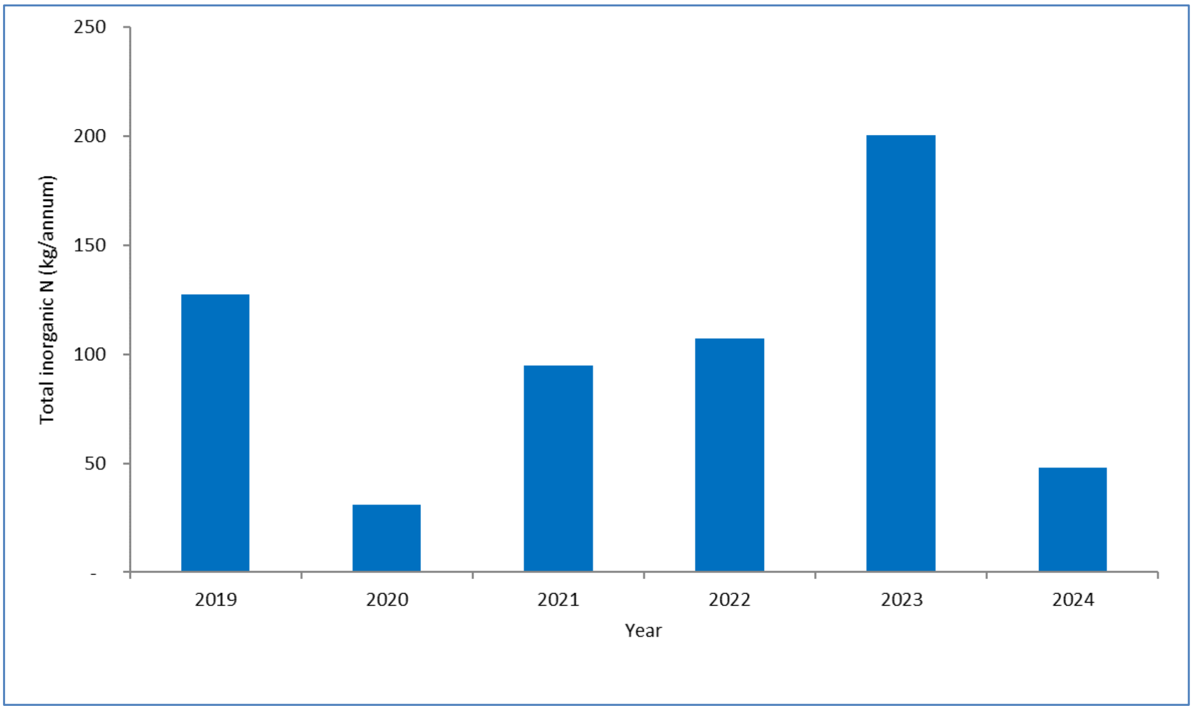

Figure 19.53 Total inorganic nitrogen from Appelsbosch WWW between 2019 and 2024.

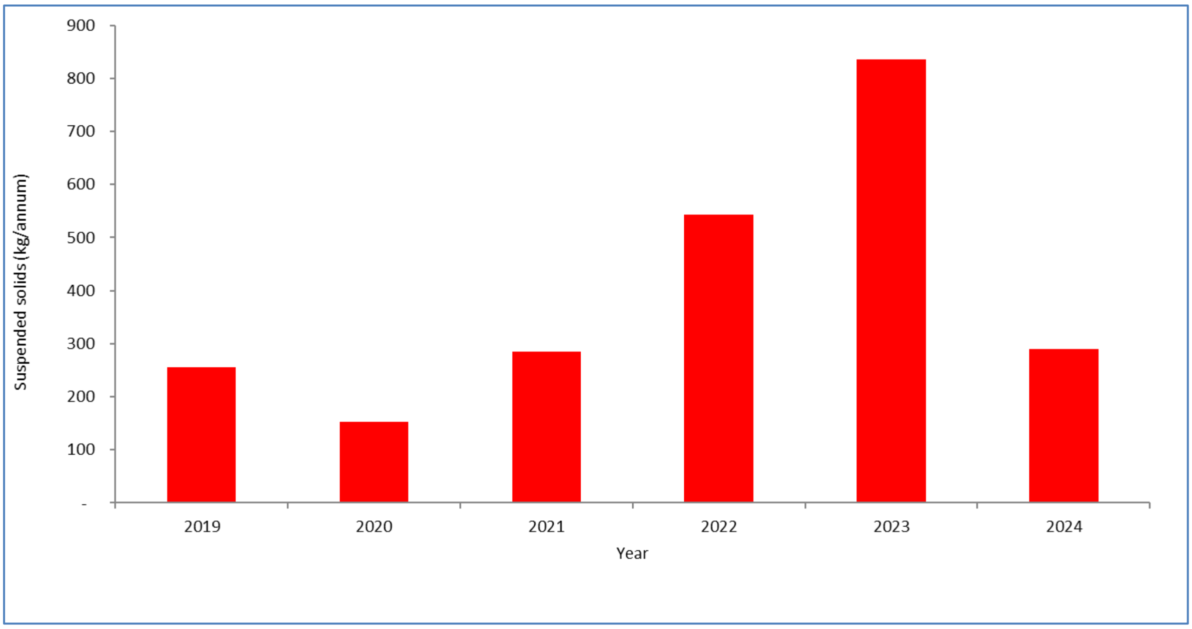

Figure 19.54 Suspended solids from Appelsbosch WWW between 2019 and 2024.

d) Recommendations

The flows are within the design capacity of the WWW and therefore there are no identified recommendations presently.

19.3.6 Cool Air Wastewater Works

a) Description

The Cool Air WWW is situated near the Cool Air Township (**Figure 19.55**) in the uMshwathi Local Municipality. The plant is owned by UMDM and operated by uMngeni-uThukela Water. The plant is classified as a Class C and is required to have a Class 3 Operator, and a Class V Supervisor available. These staff do not necessarily have to be on the plant all of the time.

The WWW is an extended aeration activated sludge process (**Figure 19.56**) with two rectangular aeration tanks, two clarifiers and a chlorine contact tank. The characteristics of the Cool Air WWW are shown in **Table 19.13.**

Table 19.13 Cool Air WWW infrastructure.

WWW Name:	Cool Air WWW
System:	Upper uMngeni System
Maximum Design Capacity:	1.5 Mℓ/day
Current Utilisation:	0.57 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	Hand raked 1 x 3.5 cm, 1x2.0 cm
Grit Chambers:	None
Aeration Basin:	2 x Extended aeration
Aeration Basin Capacity:	2 x 883 m^3
Aerators:	2 x 4.48 kW, 2 x 7.5 kW
Clarifier Type:	1 x suction lift, 1 x scraped
Number of Clarifiers:	2
Total Area of all Clarifiers:	129 m^2
Total Capacity of Clarifiers:	3.12 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	2 x Archimedes Screw Pumps
Chlorine Storage Capacity:	68 kg cylinder chlorine gas
Chlorine Dosing Capacity:	0 – 1 kg/h
Total Capacity of Chlorine Contact Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	None
Anaerobic Ponds:	None
Sludge Drying Beds Area:	835 m^2

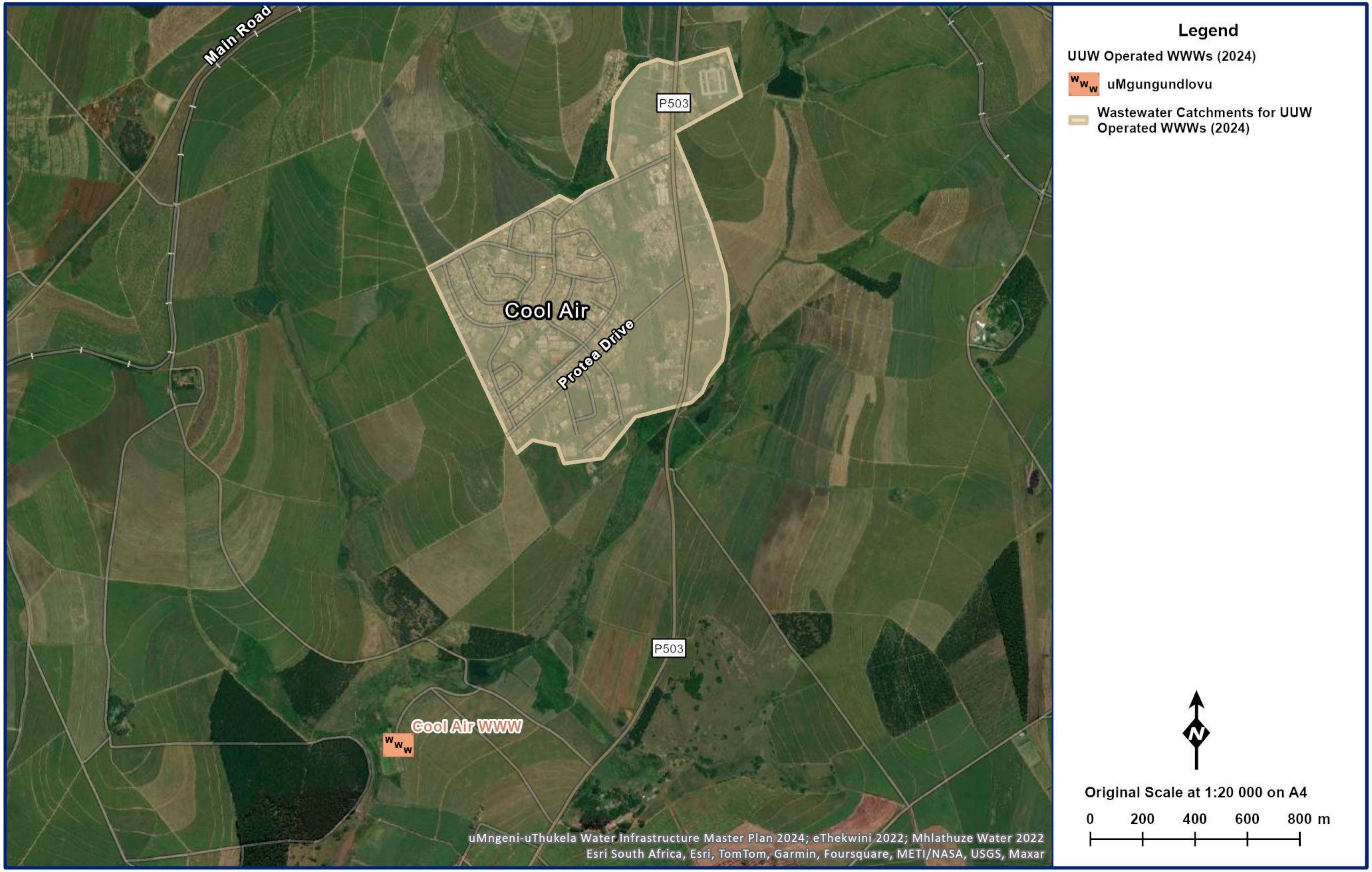

Figure 19.55 Location of the Cool Air WWW.

Figure 19.56 **Different Mechanical Surface Aerators in Cool Air Reactor 1 and 2.**

b) Status Quo

Cool Air WWW has a design capacity of 1.5 Mℓ/day and is currently treating 0.57 Mℓ/day (**Figure 19.57**) based on a 12-month moving average. This is still well below the historical average and is possibly attributable to blockages in the sewer network. The issue has been raised as a concern with the uMgungundlovu District Municipality.

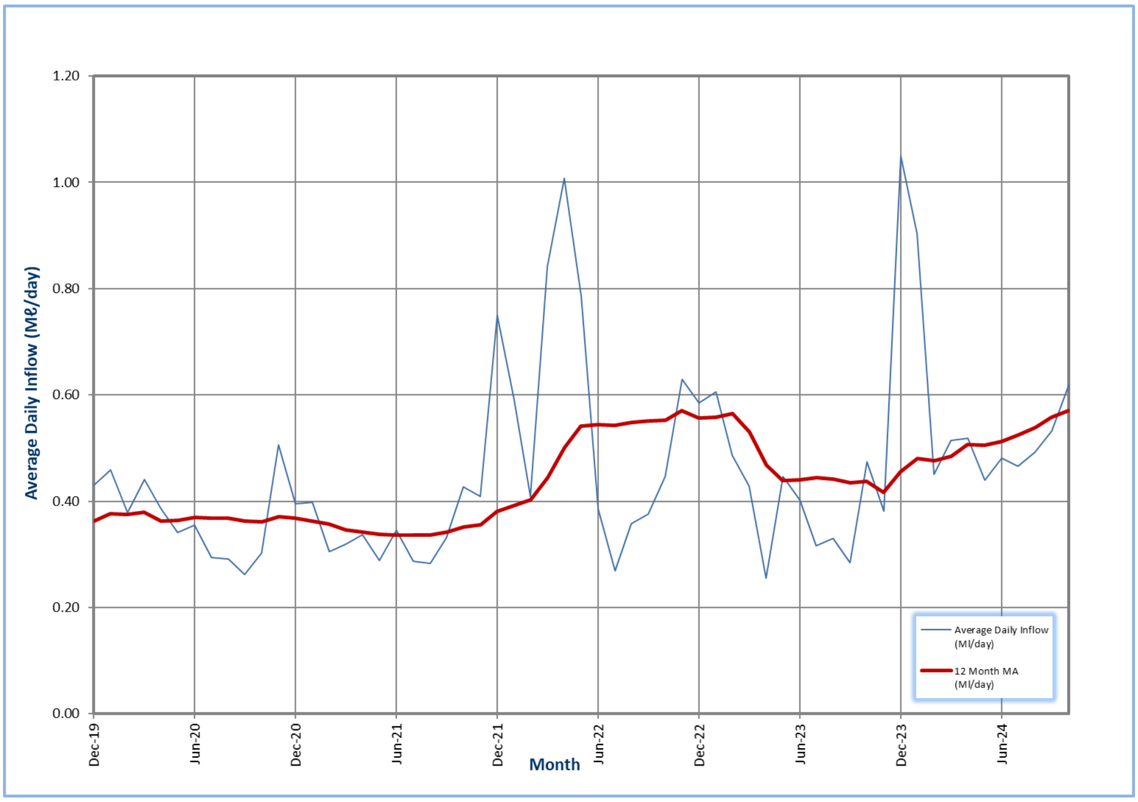

Figure 19.57 **Average daily inflows to Cool Air WWW (Mℓ/day).**

An analysis of daily historical production (November 2023 to October 2024) of the Cool Air WWW is presented in **Figure 19.58.** It shows that for 5.7 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 3.0 % of the time.

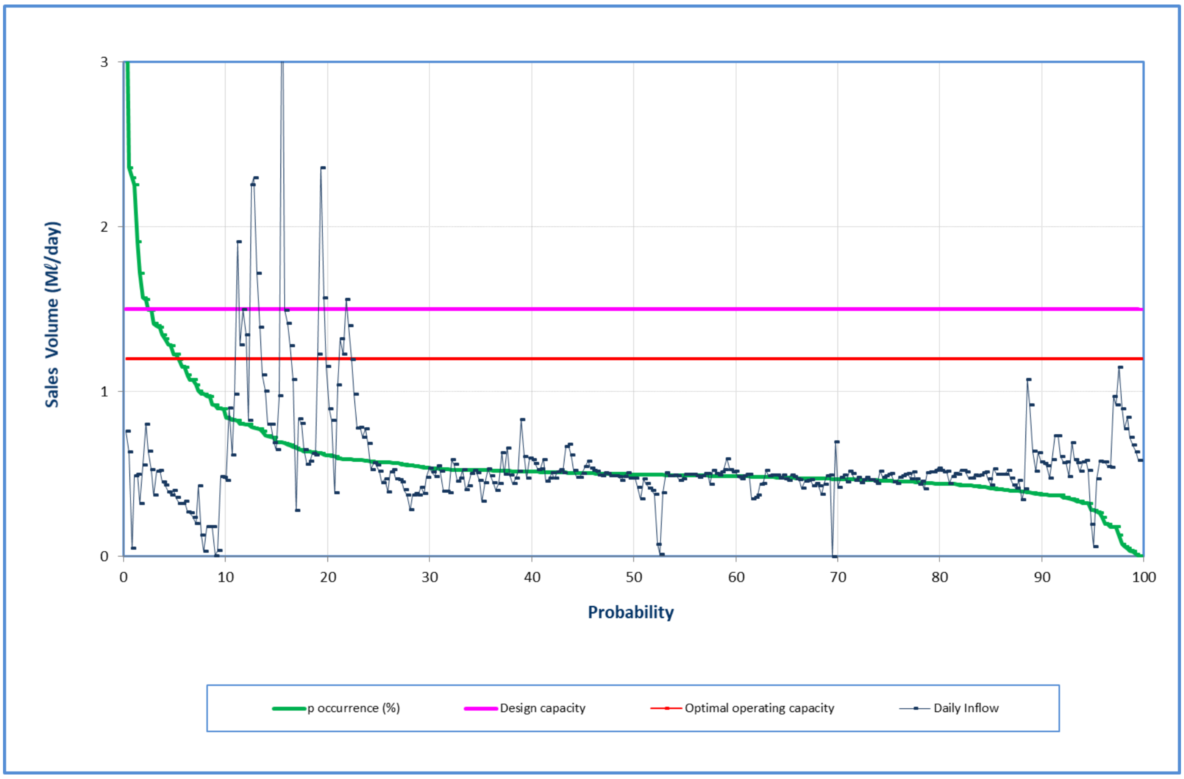

Figure 19.58 Analysis of historical production at Cool Air WWW (November 2023 to October 2024).

c) Water Quality

Contrary to the performance of most WWWs, discharge from the Cool Air plant has shown an increase in SRP, TIN and total suspended solids between 2019 and 2024 (**Figure 19.59**, **Figure 19.60**, **Figure 19.61**). The total suspended solids, in particular, have increased from 1 459 kg in 2019 to 1 976 kg in 2024, with an extremely high total of 12 115 kg in 2023 (**Figure 19.61**).

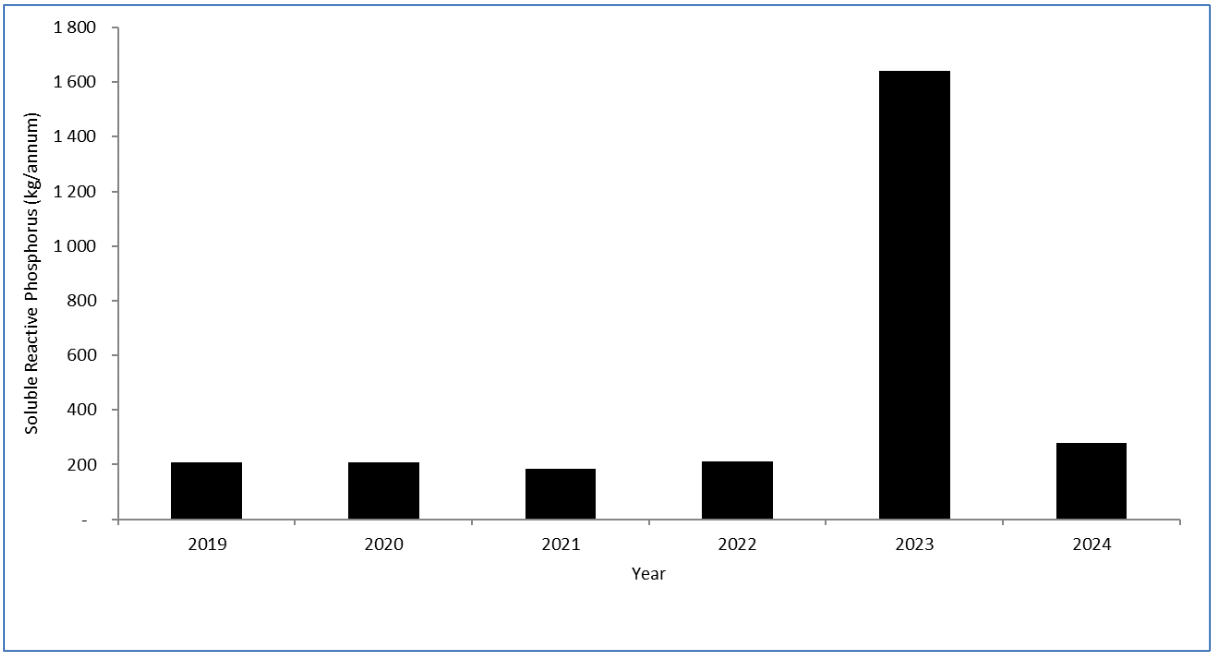

Figure 19.59 Soluble reactive phosphorus from Cool Air WWW between 2019 and 2024.

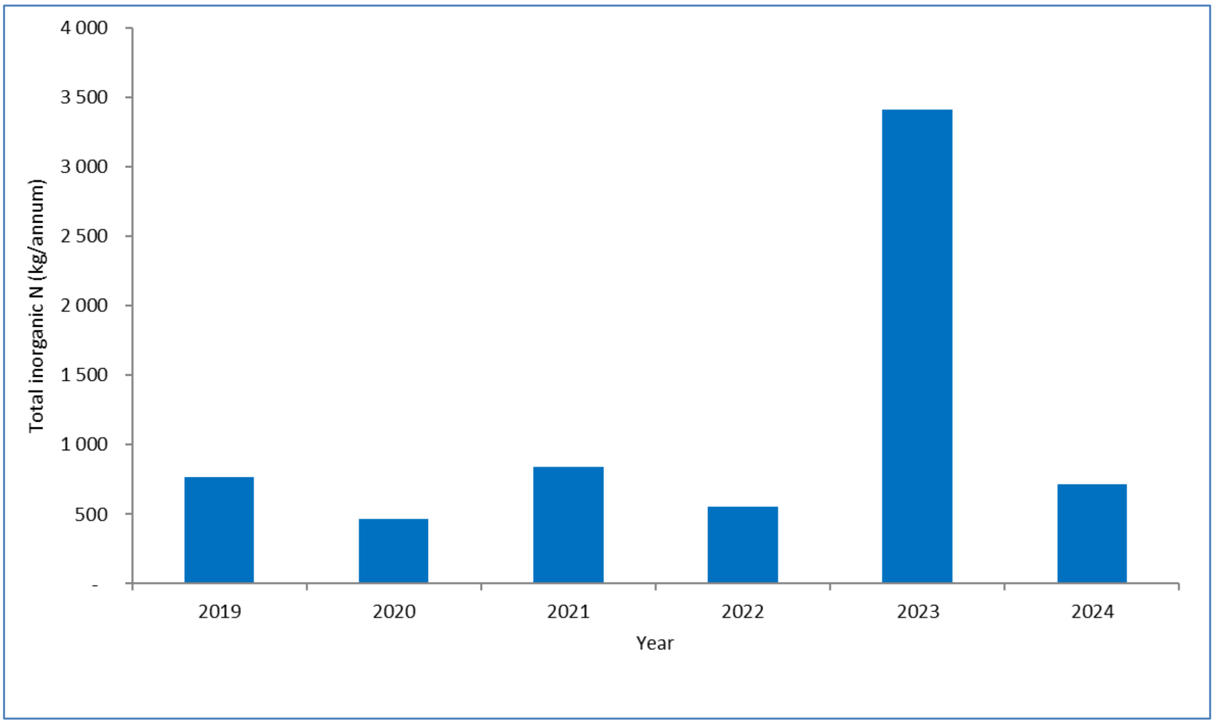

Figure 19.60 Total inorganic nitrogen from Cool Air WWW between 2019 and 2024.

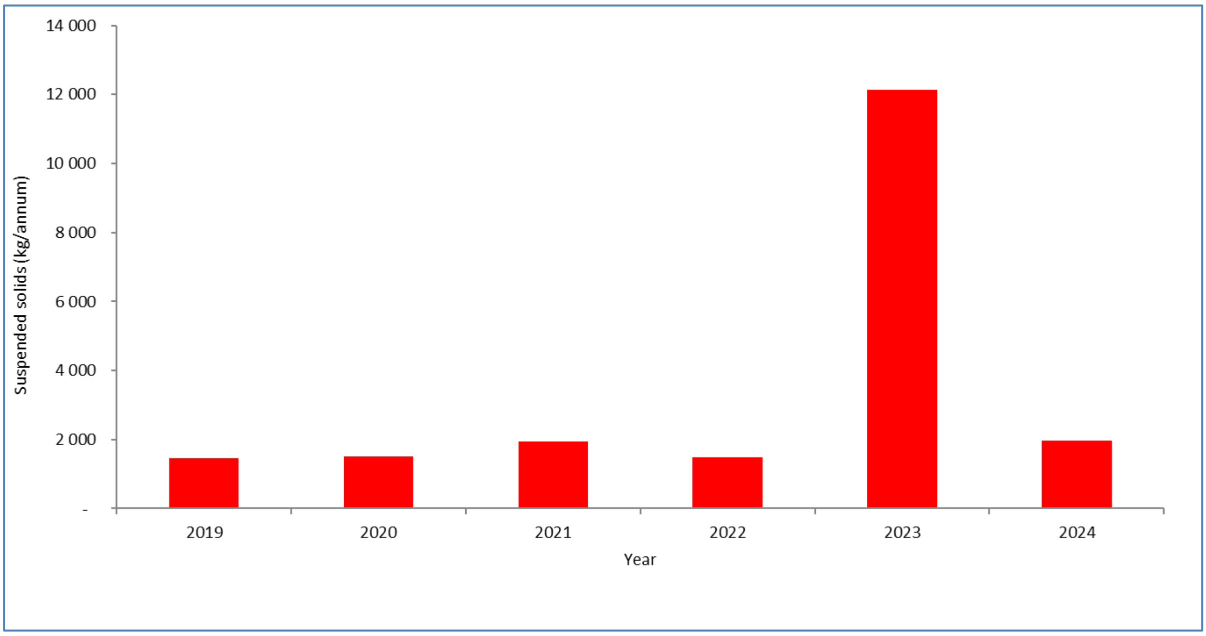

Figure 19.61 Suspended solids from Cool Air WWW between 2019 and 2024.

d) Recommendations

The main Cool Air outfall leading to the Cool Air WWW steadily gravitates alongside the Mhlalane River from the North to the South through the centre of the Cool Air scheme boundary. The sewer network consists of 13 km of sewer reticulation. All gravity sewers in Cool Air have sufficient spare capacity when analysed according to the existing demand scenario and evaluation criteria. Additionally, as detailed above the metered inflows are far below the design capacity of the WWW.

The village of Dalton lies to the north of Cool Air and it is primarily serviced by septic tanks. To improve the level of service, septic tank conversations to water borne sewage is proposed for the existing 109 stands. To accommodate the Dalton Septic tanks in the areas which naturally drain North-Easterly as opposed to draining towards the WWW in the South, a pump station will be required. The proposed pump station will be accompanied by a proposed rising main leading to the Cool Air outfall. The proposed rising main will be approximately 930 m in length and 110 mm.

It is estimated that the ultimate flow contribution from the Cool Air town and the future developments areas (FDA) will be approximately 1750 kℓ/day. Therefore, the future capacity of Cool Air WWW should have a design capacity of 2000 kℓ/day to accommodate future flows. This project will be triggered when development of FDAs occurs, estimated around 2026 to 2041.

19.3.7 Camperdown Wastewater Works

a) Description

Camperdown WWW is situated in Camperdown (**Figure 19.62**) approximately half-way between Pietermaritzburg and Cato Ridge. The WWW falls within the Mkhambathini Local Municipality and UMDM, which is the WSA for the area. The plant is owned by UMDM and is operated by uMngeni-uThukela Water. The plant is classified as a Class E works requiring a Class 1 Operator onsite and a Class V Supervisor available but not necessarily onsite.

The WWW has an extended aeration activated sludge process using a rectangular aeration tank and two scraped clarifiers. The characteristics of the Camperdown WWW are shown in **Table 19.14.**

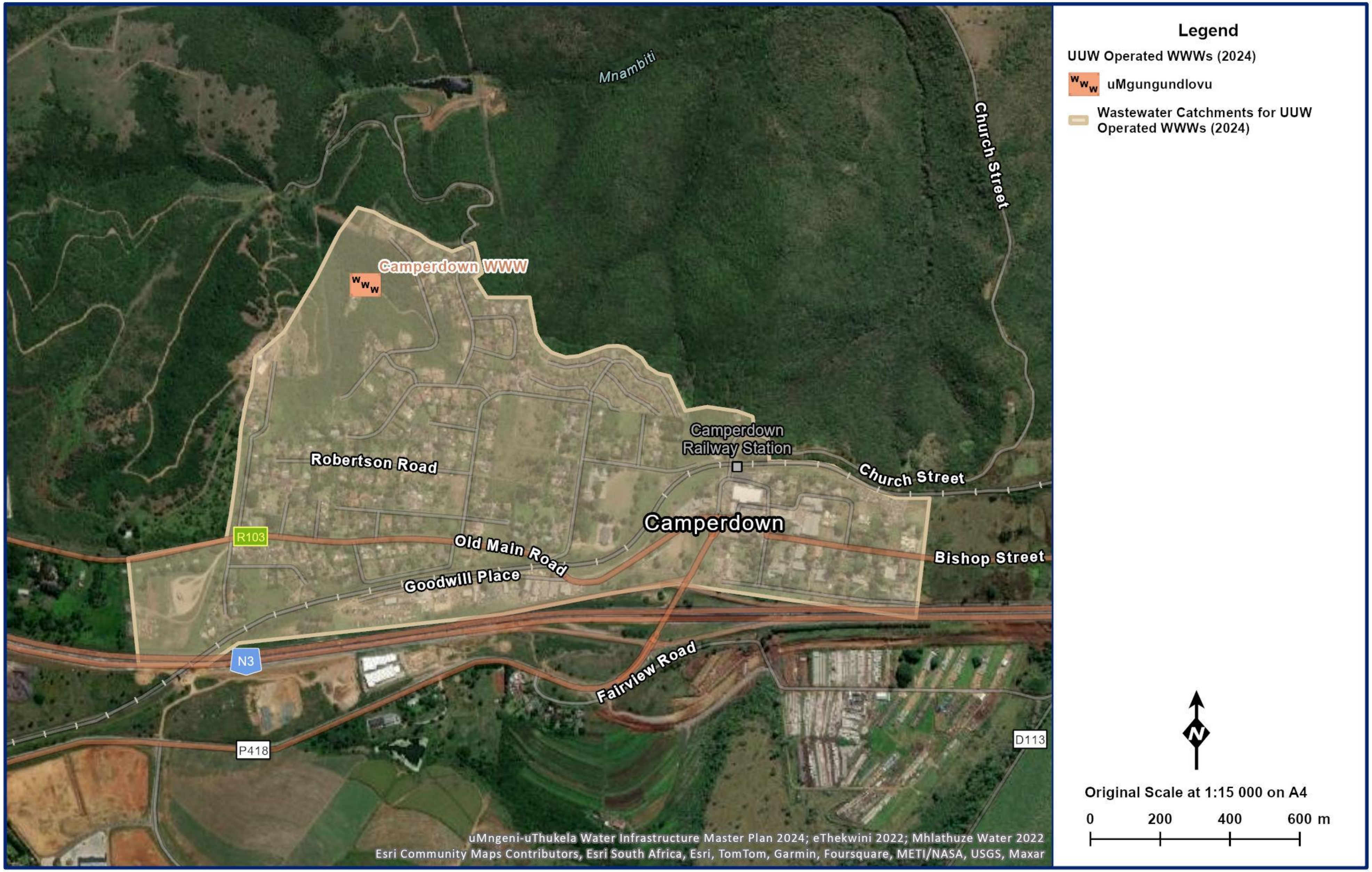

Figure 19.62 Location of the Camperdown WWW.

Table 19.14 Camperdown WWW infrastructure.

WWW Name:	Camperdown WWW
System:	Lower uMngeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.1 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	1 x Hand Raked, 2.5 cm Gaps
Grit Chambers:	1 x Vortex Degritter
Aeration Basin:	1
Aeration Basin Capacity:	234 m^3
Aerators:	2 x 5.5 kW
Clarifier Type:	Scraped Floor
Number of Clarifiers:	1
Total Area of all Clarifiers:	28 m^2
Total Capacity of Clarifiers:	1 x 85 m^3 (New Steel)) , 6.72 Mℓ/day,
Upflow Velocity:	1 m/h
RAS Pump Station:	N/A
Chlorine Storage Capacity:	Sodium Hypochlorite
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Anaerobic Ponds:	1 x 30 m^2
Sludge Drying Beds Area:	130 m^2

b) Status Quo

Camperdown WWW (**Figure 19.64**) has a reported design capacity of 0.5 Mℓ/day and is currently treating 0.1 Mℓ/day (**Figure 19.63**) based on a 12-month moving average (0.08 Mℓ/day in 2023). The inflow to the works over the last year has been low, but stable.

An analysis of daily historical production (November 2023 to October 2024) of the Camperdown WWW is presented in **Figure 19.58.** It shows that for 1.9 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 1.6 % of the time.

The inflow data is not a true reflection of the volume of wastewater being produced in the catchment, as only a limited portion of sewage is actually reaching the plant. It is, however, clear that the capacity of the works is more than sufficient for the foreseeable future as the average daily inflow is low in comparison to the works capacity. Currently the sewage network serves only a portion of Camperdown and this has been a constraint on development in the area (**Figure 19.63**). A detailed design has been completed for a new 2 Mℓ/day wastewater works named Mkhambathini WWW, to be located west of the N3 freeway (**Section 19.4.6**). This project requires that the UMDM first upgrade and expand the sewer reticulation network to accommodate all existing and future demand.

uMngeni-uThukela Water is engaging with UMDM in investigating alternative funding mechanisms for the project.

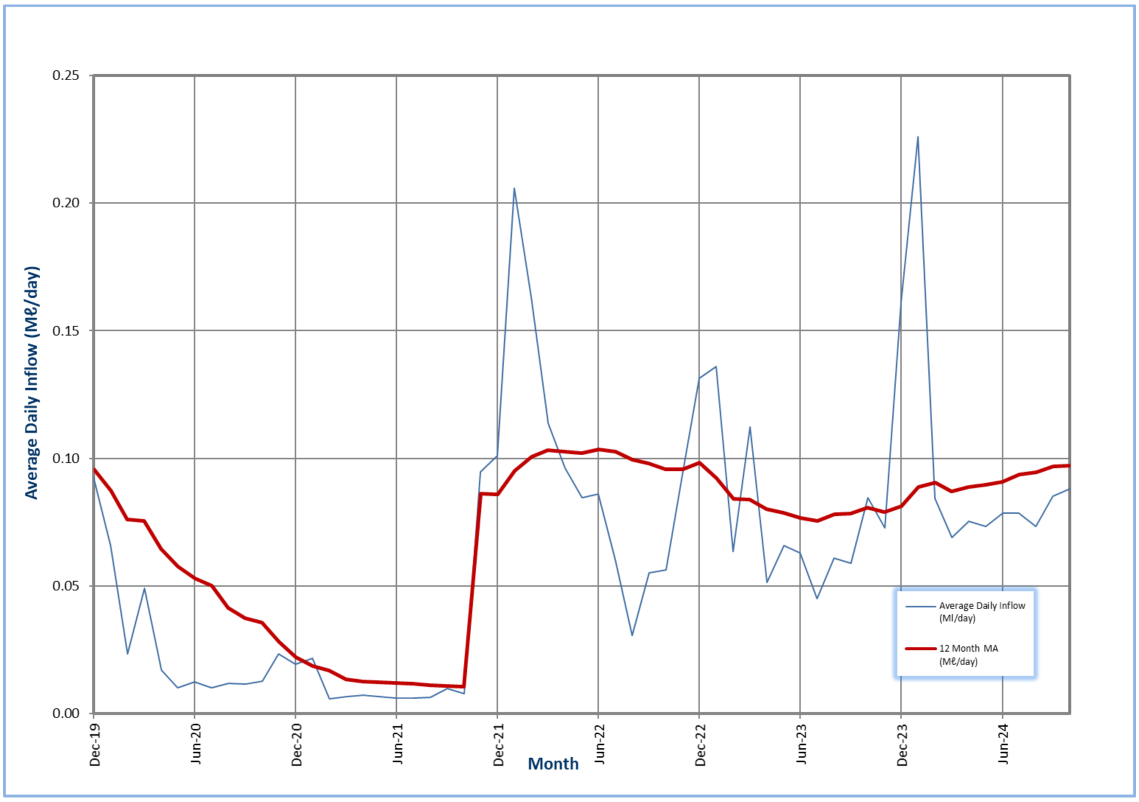

Figure 19.63 Average daily inflows to Camperdown WWW (Mℓ/day).

Figure 19.64 Camperdown Clarifier No. 2.

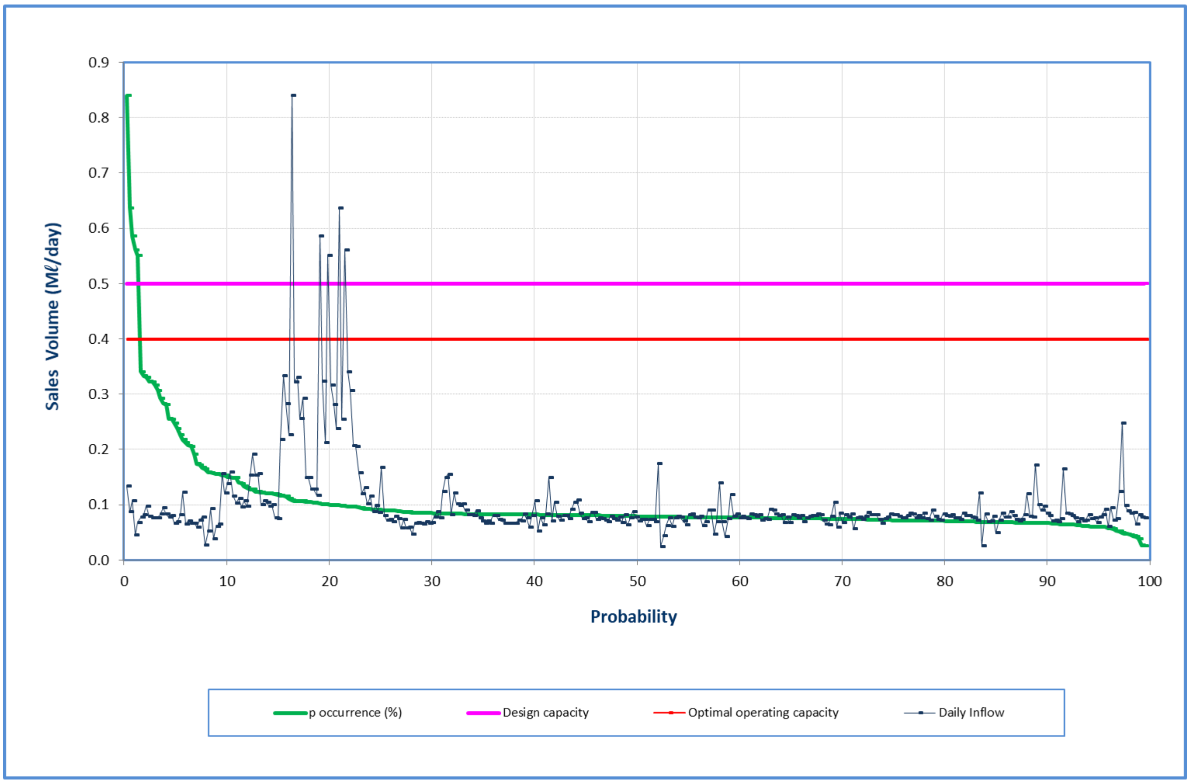

Figure 19.65 Analysis of historical production at Camperdown WWW (November 2023 to October 2024)

c) Wastewater Quality

There has been a general decline in soluble reactive phosphorus in discharge from the Camperdown WWW, with the annual total decreasing from 190 kg in 2019 to 103 kg 2024 (**Figure 19.66**). Similarly, a decline has been observed in both the TIN (**Figure 19.67**) and total suspended solids (**Figure 19.68**) in this plant. However, there was an increase in all nutrients during 2021 and 2022, which may be partly due to the heavy rainfall observed during this period.

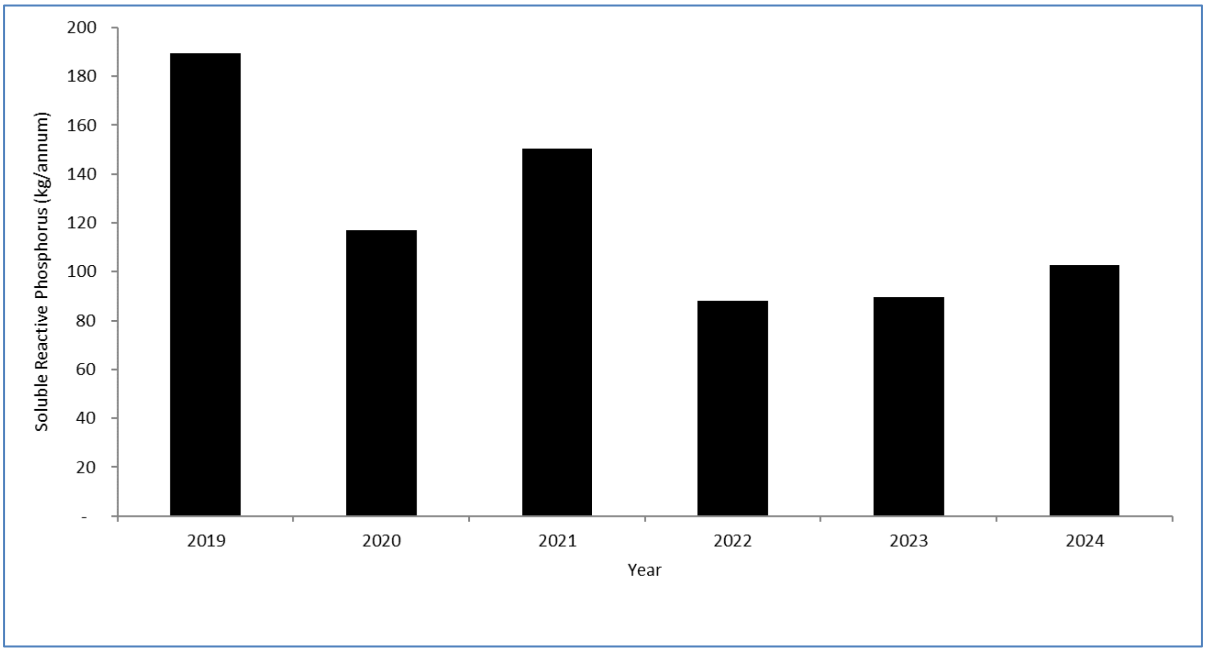

Figure 19.66 Soluble reactive phosphorus from Camperdown WWW between 2019 and 2024.

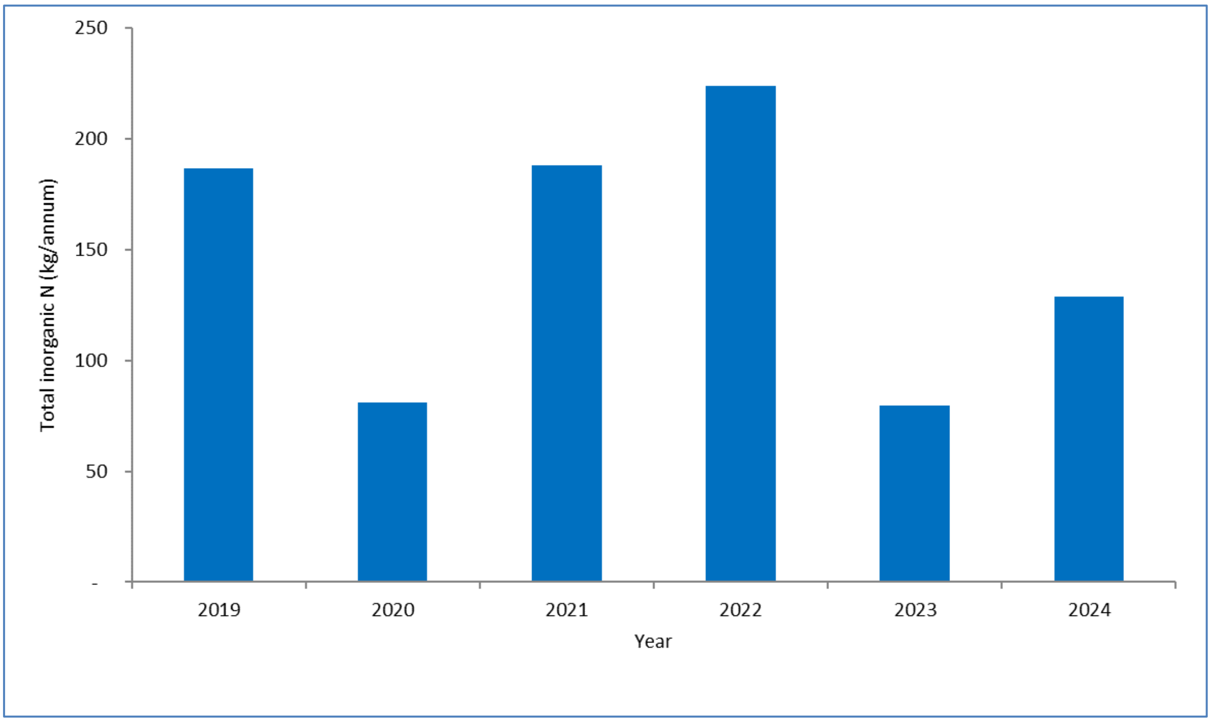

Figure 19.67 Total inorganic nitrogen from Camperdown WWW between 2019 and 2024.

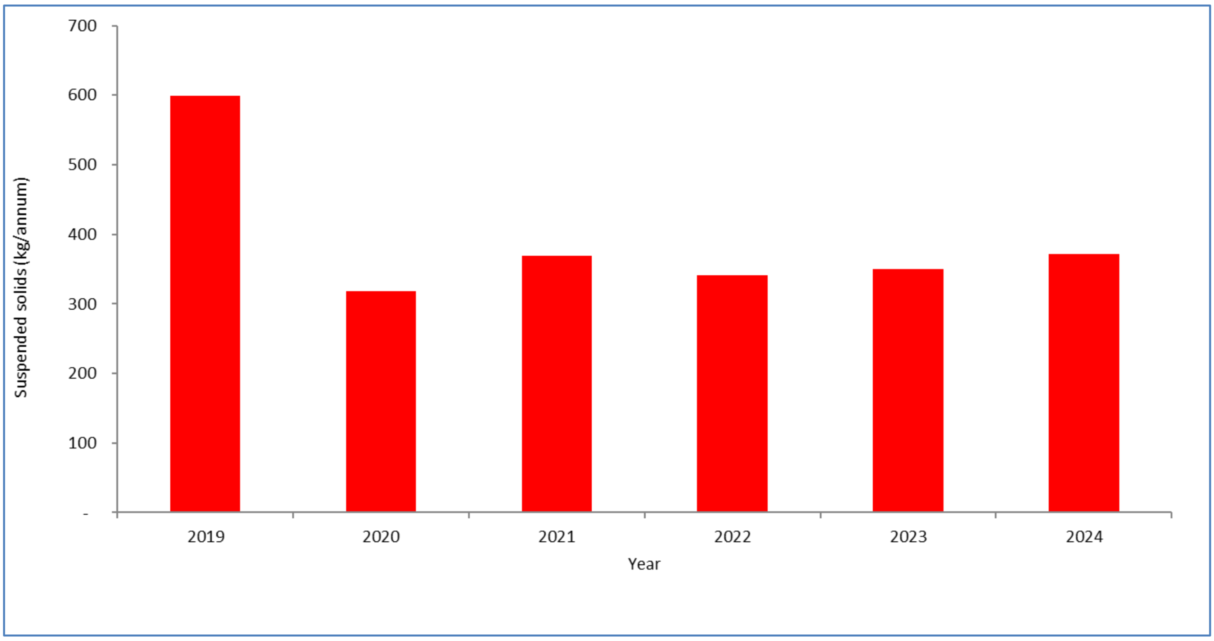

Figure 19.68 Suspended solids from Camperdown WWW between 2019 and 2024.

d) Recommendations

The existing Camperdown scheme will, in future, expand considerably to cater for vast expected future development along the N3 corridor. Additionally, the small existing Camperdown works is not located in a suitable position to cater for this and as such should be decommissioned. A new interim Mkhambathini and ultimate Mkhambathini works at two different locations are proposed.

The interim Mkhambathini WWW **(Section 19.4.4**) was proposed a decade ago and is based on 10 potential future development areas (FDAs) directly south of the existing scheme and N3 freeway. The proposed design capacity of the Mkhambathini WWW is 2 Mℓ/day. However, an additional 12 potential FDA's have been identified in the Sanitation Master Plan study, some of which are downstream of the proposed WWW location. A future wastewater works of much larger capacity (28 Mℓ/day) it thus proposed to meet the ultimate demand in the area.

The decommissioning of the existing Camperdown WWW must include the construction of a pump station (Camperdown PS 1), and a 650 m rising main to pump all sewage generated from the existing scheme to the watershed, located near the intersection of Alfred Storm Street and Horizon Place. Thereafter, a 3.1 km gravity main will be required to deliver sewage to the proposed low lift Camperdown PS 2. This PS and short rising main will pump sewage to the Mkhambathini (interim) WWW. This infrastructure will also cater for the service level upgrade (septic tanks to waterborne) for approximately 130 existing stands immediately south of the existing scheme.

The majority of this project will be required regardless of whether the Municipality opt for the interim WWW site or not, as most infrastructure will also be included in the ultimate operational configuration (excluding the works and low lift PS) and will therefore be triggered when any development occurs, expected around 2026.

19.3.8 Richmond Wastewater Works

a) Description

uMngeni-uThukela Water operates the Richmond WWW on behalf of UMDM. The wastewater works services the town of Richmond (**Figure 19.69**), but does not include the adjacent township of Ndaleni. Sewage from Richmond flows by gravity to the wastewater works.

The plant is an extended aeration activated sludge process consisting of an inlet works, a single rectangular aeration tank fitted with two surface aerators and a suction lift clarifier (**Figure 19.70**). Final treated wastewater is disinfected using chlorine gas.

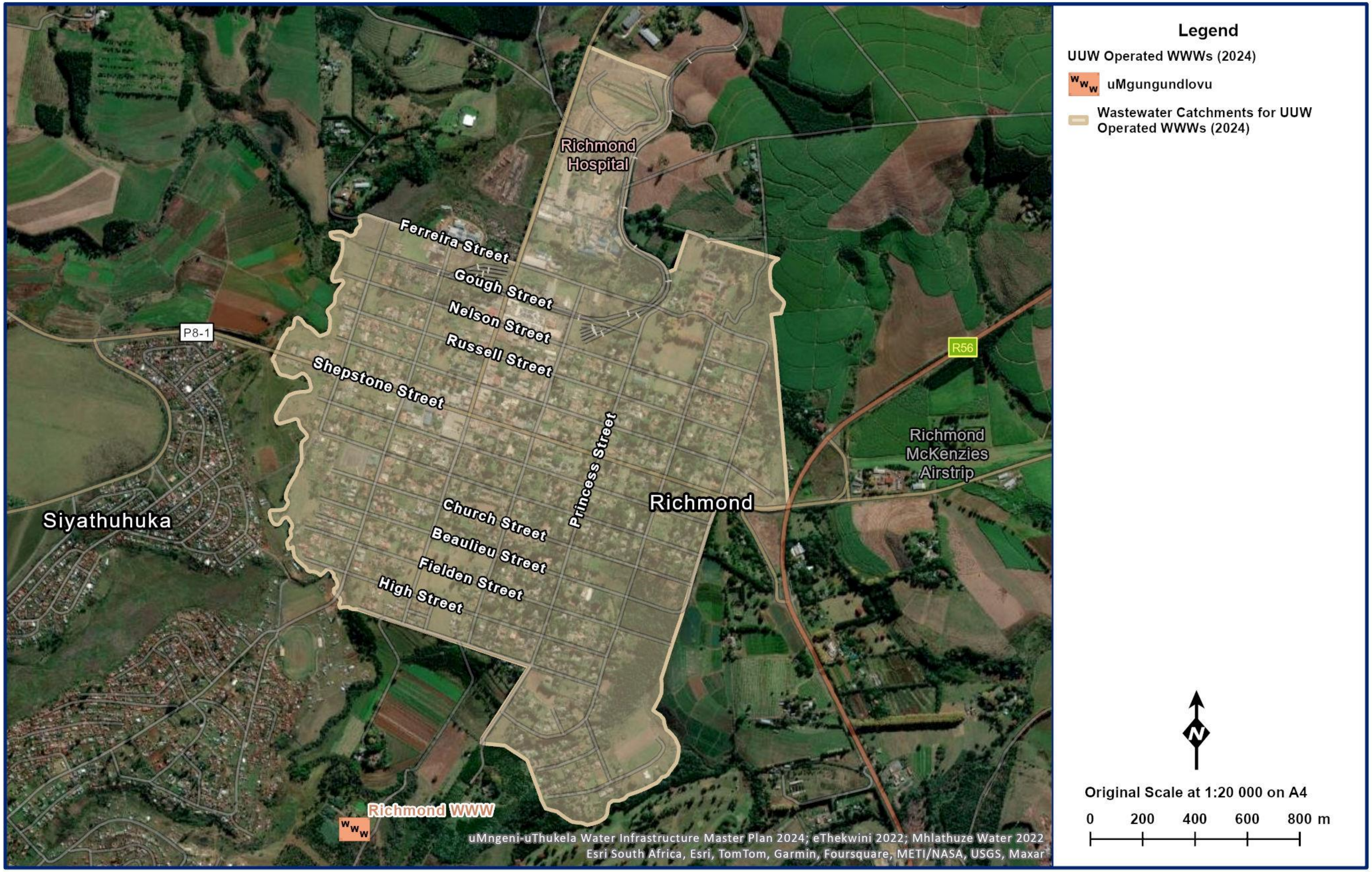

Figure 19.69 Location of the Richmond WWW.

Figure 19.70 Richmond WWW clarifier.

The works was designed for ADWF of 1 Mℓ/day with a COD loading of 740 kg/day. The WWW is classified as a Class E works requiring a Class 1 Operator onsite, and a Class V Supervisor available, but not necessarily onsite. The characteristics of the Richmond WWW are shown in **Table 19.15.**

Table 19.15 Richmond WWW infrastructure.

WWW Name:	Richmond WWW
System:	Upper uMngeni System
Maximum Design Capacity:	1 Mℓ/day (Based on ADWF) 2.9 Mℓ/day
Current Utilisation:	0.33 Mℓ/day
Raw Sewage Pump Station:	T-series Gormann Rupp
Screens:	Hand-raked 11 mm gap bar screen
Grit Chambers:	Two
Aeration Basin:	Activated sludge
Aeration Basin Capacity:	1110 m^3
Aerators:	Two slow speed Hansen Patent (18.5 kW each)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	1
Total Area of all Clarifiers:	95 m^2
Total Capacity of Clarifiers:	2.28 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	T-series Gormann Rupp
Chlorine Storage Capacity:	68kg cylinder
Chlorine Dosing Capacity:	Max. allowable 2.5 kg/h
Total Capacity of Chlorine Contact Tanks:	25m^3
Total Capacity of Sludge Treatment Plant:	Sludge lagoon (volume unknown)
Sludge Drying Beds Area:	500 m^2 (not used)

b) Status Quo

Richmond WWW has a design capacity of 1.0 Mℓ/day and is currently treating 0.33 Mℓ/day based on a 12-month moving average (**Figure 19.71**). This is a substantial drop in inflow from 0.72 Mℓ/day (October 2023). Although not confirmed by the Municipality this appears to be the result of operational issues with one of the two Sewage Pump Stations (SPS). An upgrade of the works to 2 Mℓ/day (**Section 19.4.4**) was planned but this is currently on hold.

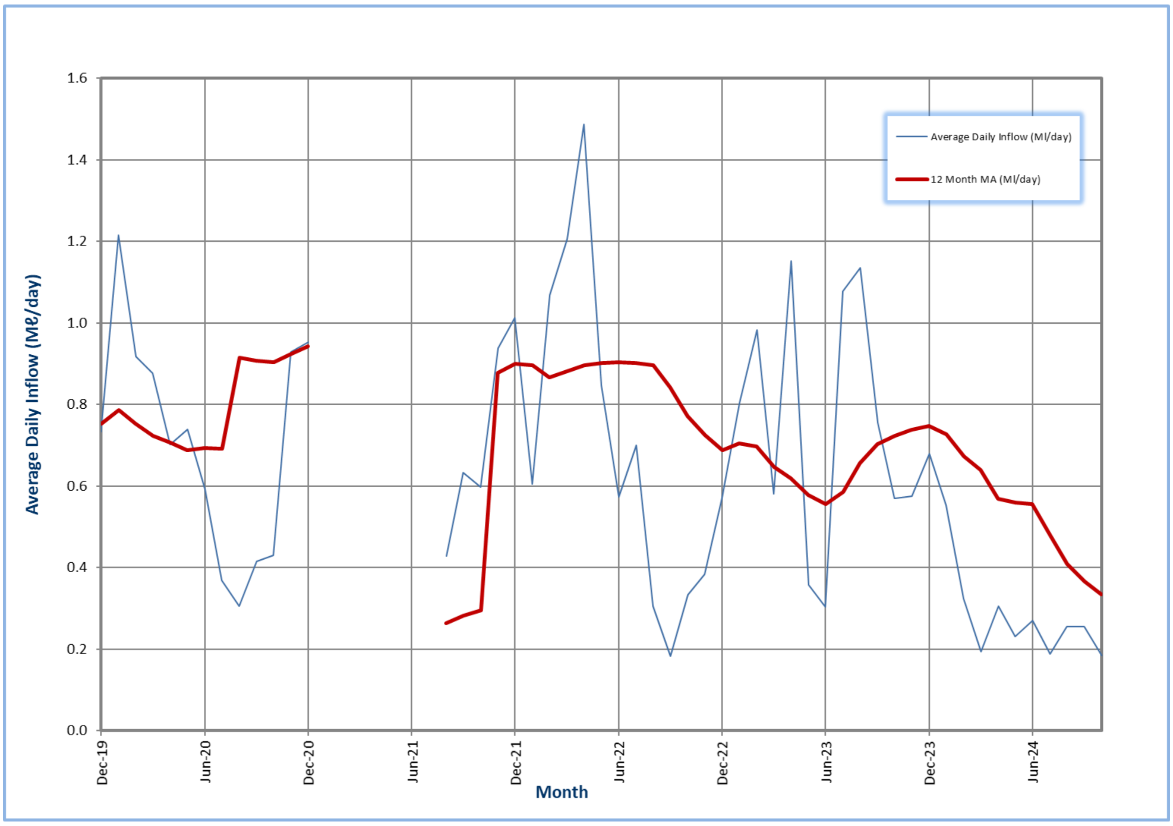

Figure 19.71 Average daily inflows to Richmond WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Richmond WWW is presented in **Figure 19.72.** It shows that for 12 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 4 % of the time. It would appear that the plant is operating above its optimum operating and design capacity beyond what is acceptable, however, the average daily inflow remains low at 0.33 Mℓ/day. Metering reading inaccuracies may, however, be distorting the picture, especially during storm events when they are prevalent during summer.

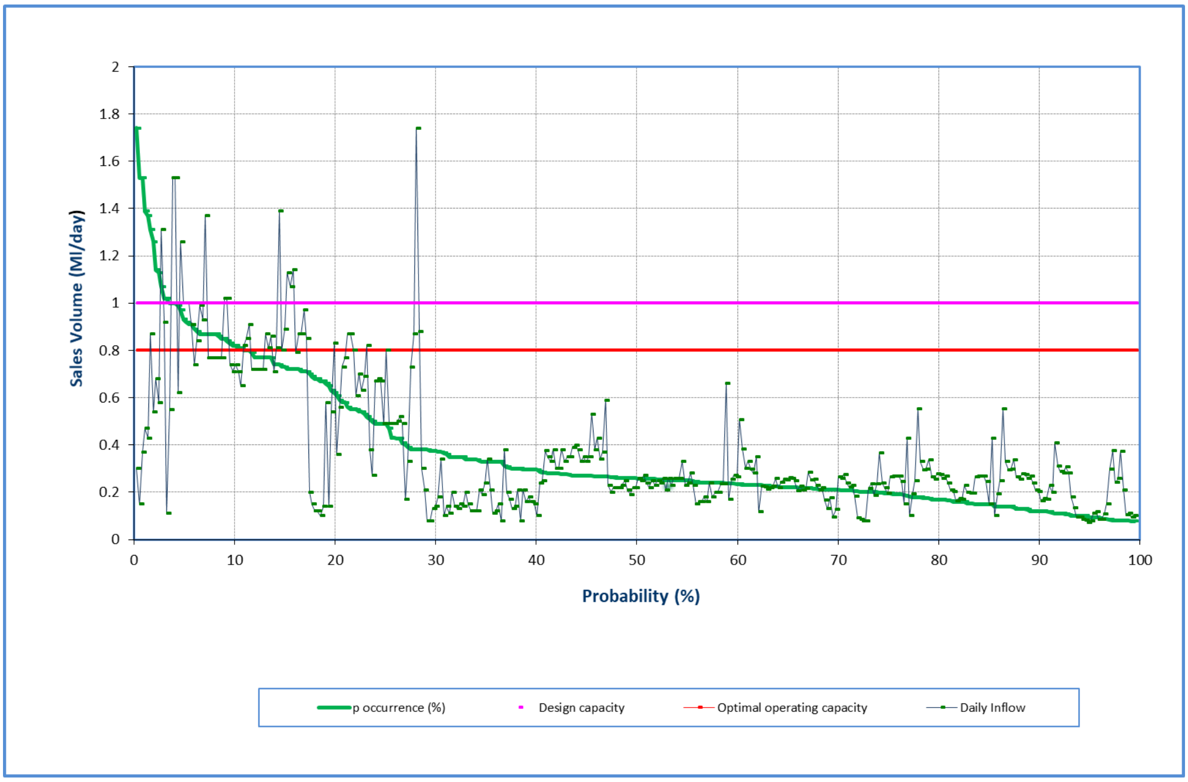

Figure 19.72 Analysis of historical production at Richmond WWW (November 2023 to October 2024.

c) Wastewater Quality

A general increase has been observed in the quality of water from the Richmond WWW between 2019 and 2024, with the total soluble reactive phosphorus decreasing from 443 kg to 140 kg during this period (**Figure 19.73**). Similarly, the total annual TIN (**Figure 19.74**) and suspended solids (**Figure 19.75**) declined by nearly 67% and 79%, respectively, over the last five years. Similar to most plants, there was an increase in all nutrients between 2022 and 2023 due to the heavy rainfall received during this period.

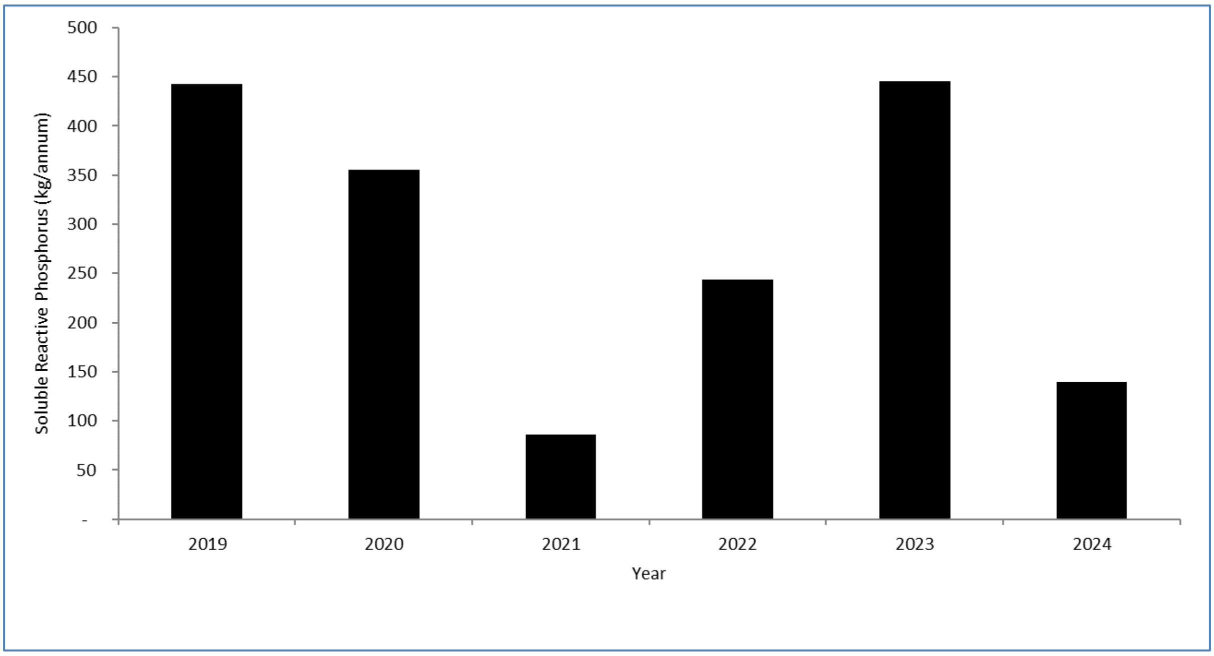

Figure 19.73 Soluble reactive phosphorus from Richmond WWW between 2019 and 2024.

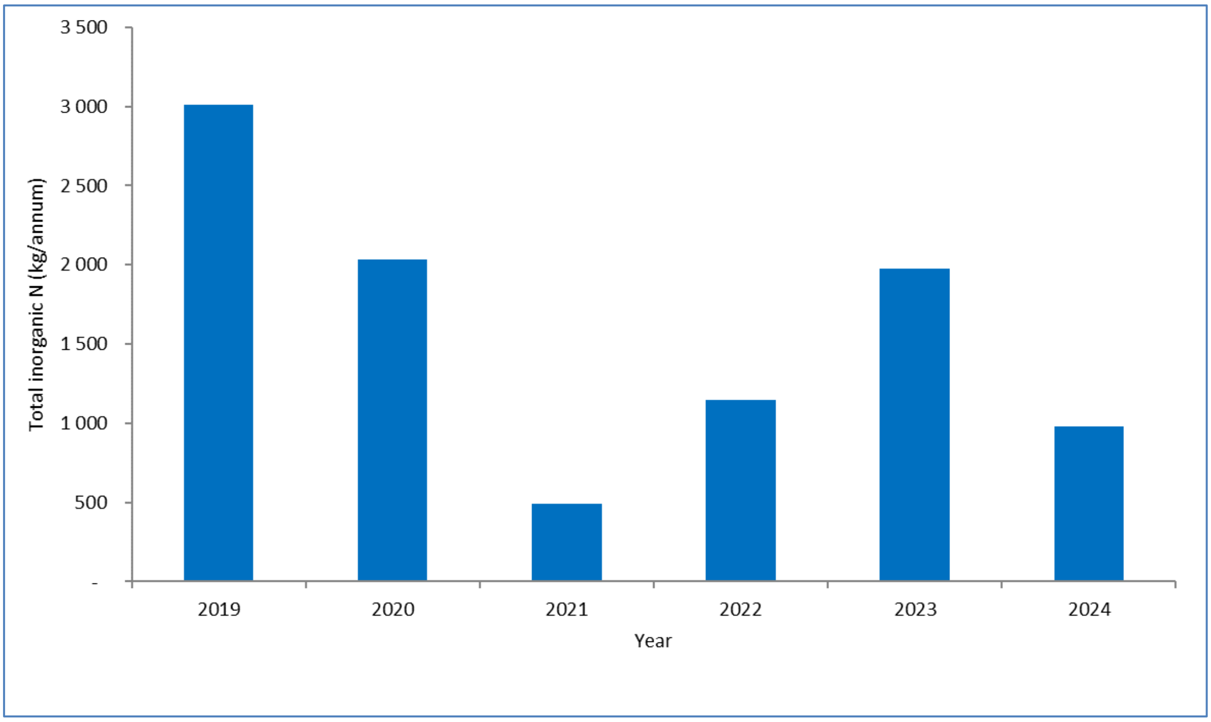

Figure 19.74 Total inorganic nitrogen from Richmond WWW between 2019 and 2024.

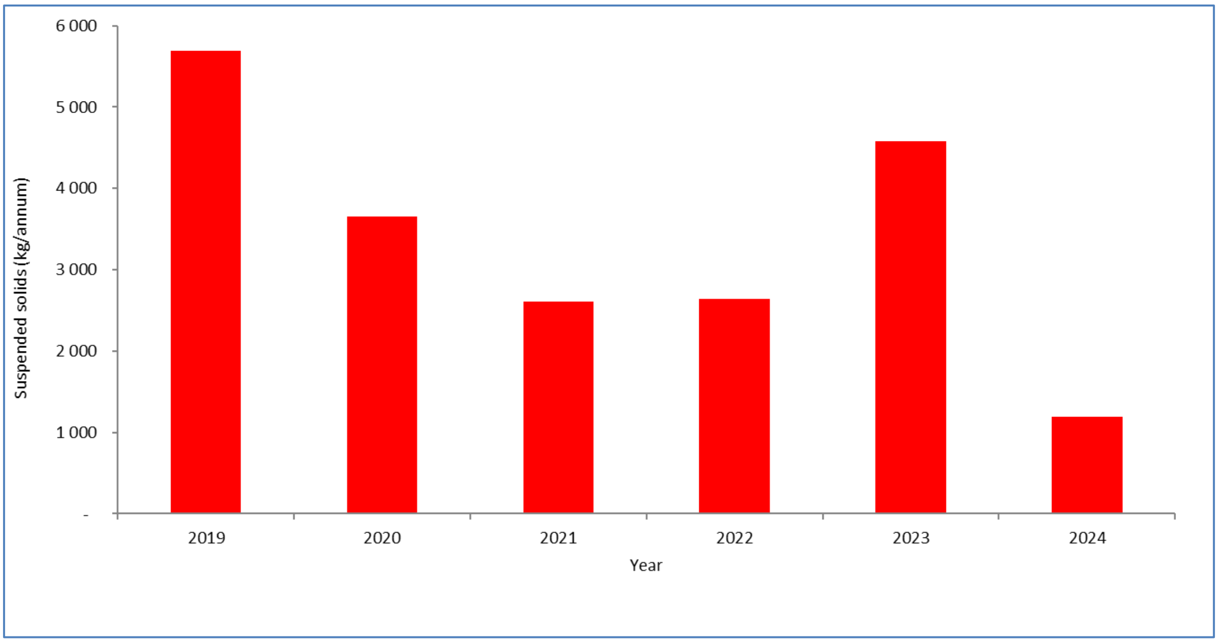

Figure 19.75 Suspended solids from Richmond WWW between 2019 and 2024.

d) Recommendations

The existing Richmond scheme will expand to cater for future development areas located on the outskirts of town, and additionally, existing stands currently serviced by septic tanks may also be catered for within future waterborne schemes. These FDAs will require upgrades of the existing bulk infrastructure including the sewer outfalls and pump stations.

The following sections of existing sanitation network have insufficient capacity when analysed against the existing demand scenario and evaluation criteria and will need to be upgraded:

- The final 450 m section of 100 mmØ sewer pipe gravitating along Nelson and Pine Streets into Richmond A PS to a 160 mmØ.
- The final 100m section of 100mmØ sewer pipe gravitating along Pine and Albert Streets into Richmond B PS to a 160 mmØ.
- The 1.2km section of 200mm Ø outfall gravitating to the works to 350 mmØ.

These projects will be triggered when development of FDAs listed above occurs. Both conversion of the peri-urban areas and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.3.9 Trust Feeds Wastewater Works

a) Description

Construction of the Trust Feeds Wastewater Works and ancillary infrastructure is complete. Practical completion was achieved on 20 October 2020. The plant was handed over to uMngeni-uThukela Water on 11 December 2020. The wet commissioning will, however, only be done once 500 low cost houses have been built and occupied.

The wastewater works will serve the existing Trust Feeds community as well as the new uMshwati Ridge housing development (). The ultimate capacity of the wastewater works will be 2 Mℓ/day, although initially only half the capacity has been constructed (1 Mℓ/day).

The WWW is located approximately 4 km north west of Wartburg, on the eastern periphery of the uMshwathi Local Municipality boundary within Ward 8 of uMshwathi Local Municipality.

The WWW will serve the following developments:

- The existing semi-formal low income housing development known as Trust Feeds, which comprises approximately 800 houses.
- The uMshwati Ridge development is a 3000-unit low-income development, which has been approved by the Department of Human Settlements to eliminate the housing backlog within the region. The new development is adjacent to Trust Feeds and 500 units (Phase 1) will be constructed initially.

The plant is an extended aeration activated sludge process consisting of an inlet works including a mechanical screen, vortex grit chamber and flume type flow meter (**Figure 19.76**). The Biological Nutrient Removal (BNR) process consists of an activated sludge tank with return activated sludge (RAS) and waste activated sludge (WAS) pumping systems. Two circular 15 m diameter secondary clarifiers and chlorine disinfection complete the treatment process. The sludge is pumped to 15 rectangular drying beds.

Figure 19.76 Head of Works Trust Feeds WWW.

The characteristics of the Trust Feeds WWW are shown in **Table 19.16.**

Table 19.16 Trust Feeds WWW infrastructure.

WWW Name:	Trust Feeds WWW
System:	Upper uMngeni System
Maximum Design Capacity:	1 Mℓ/day (Based on ADWF)
Current Utilisation:	0.0 Mℓ/day
Raw Sewage Pump Station:	T-series Gormann Rupp
Screens:	Hand-raked 50 mm bar course screen and 10 mm Rotamat-type Huber fine screen
Grit Chambers:	Two vortex de-gritting systems
Aeration Basin:	Activated sludge (3-stage Phoredox)
Aeration Basin Capacity:	2830 m^3
Aerators:	Three slow speed mechanical aerators (30 kW each)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	2
Total Area of all Clarifiers:	158 m^2
Total Capacity of Clarifiers:	2.28 Mℓ/day
Upflow Velocity:	0.53 m/h
RAS Pump Station:	T-series Gormann Rupp
Chlorine Storage Capacity:	2 x 1000 ℓ tanks
Chlorine Dosing Capacity:	10 mg/ℓ Sodium Hypochlorite
Total Capacity of Chlorine Contact Tanks:	70 m^3
Sludge Treatment Process	Mechanical dewatering
Total Capacity of Sludge Treatment Plant:	Sludge Load Max 90 kgDS/hour, Hydraulic Load Max 4 m^3/h
Sludge Drying Beds Area:	1134 m^2 (backup)

b) Status Quo

Trust Feeds WWW has a design capacity of 1.0 Mℓ/day and is currently treating 0.00 Mℓ/day.

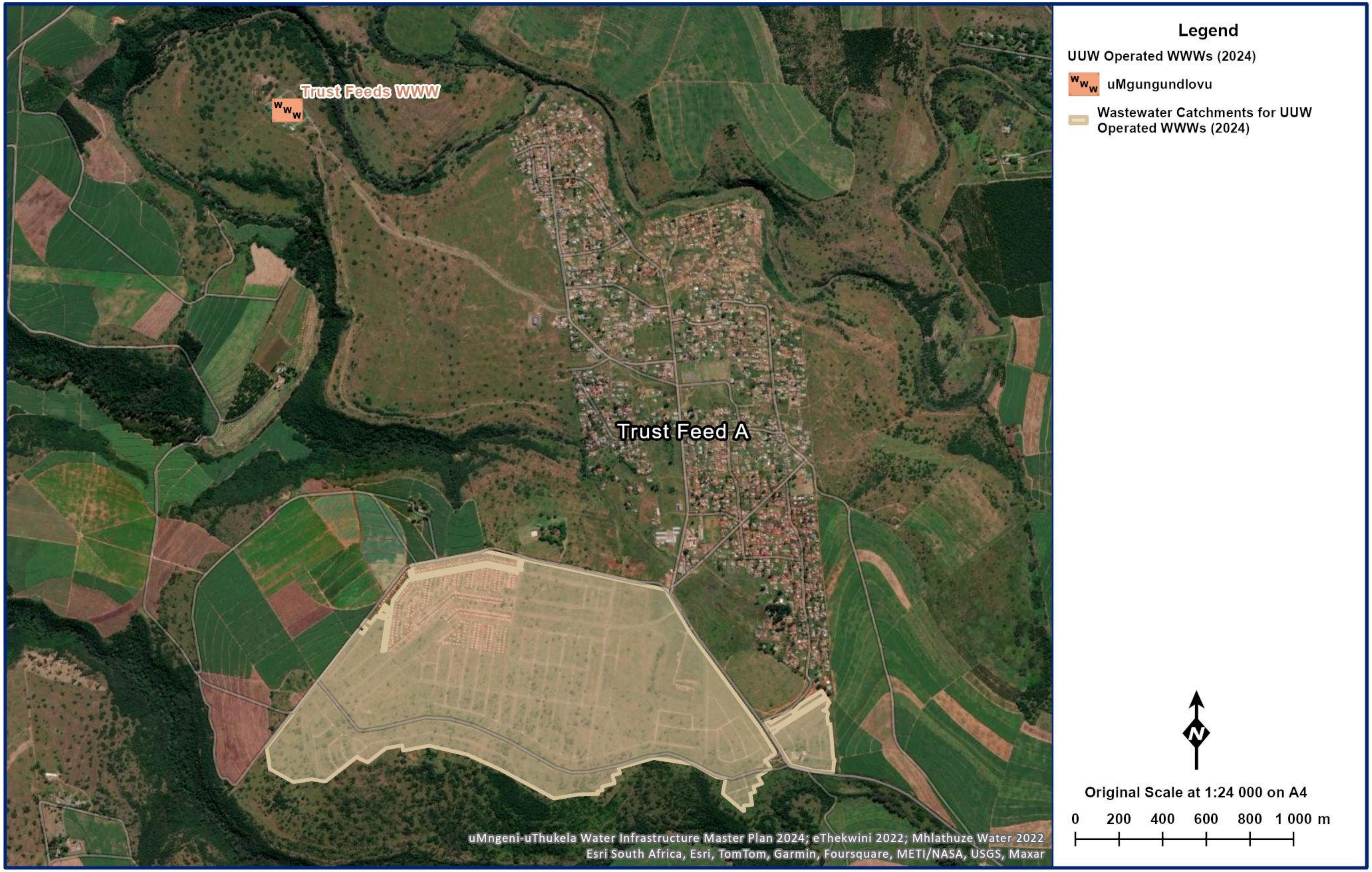

Figure 19.77 Location of Trust Feeds Wastewater Works.

c) Recommendations

The informal township of Trust Feeds lies adjacent to the Ridge Housing project and is currently serviced by VIPs. The area is considered peri-urban with potential to be converted to waterborne sanitation in future.

The main infrastructure elements to be upgraded/added include:

- A new main of 315 mm⌀ will be required to cater for the flow generated from the township once converted.
- The Trust Feeds township is situated on a terrain that allows the future internal reticulation to gravitate towards the township's lowest point. At this lowest point the collected sewerage will need to be pumped across to the Trust Feeds WWW due to topological constraints. Therefore, a new pump station is proposed to cater for the flow generated from the township. The proposed pump station will have a pump duty flow of 37 ℓ/s.
- The pump station proposed in the section above will be accompanied by a proposed rising main leading to the Trust Feeds WWW. The proposed rising main will be approximately 1033 m in length and 200 mm⌀ in size.

This project will be triggered when development of FDAs occurs. Conversion of peri-urban areas have been given a 30-year priority in the phasing approach employed. These works are therefore estimated to occur around 2051.

19.3.10 Amanzimtoti Wastewater Works

a) Description

Amanzimtoti WWW is a conventional aeration activated sludge plant located in the Amanzimtoti area within the towns of Isipingo and Lotus Park, in the Southern Coastal region of eThekwini Municipality. The site is just off the N2 National Road and lies approximately 2.3 km upstream of a large estuary system of the Embokodweni River.

The wastewater flow of this plant is regulated by a balancing tank. The flow is then screened and degritted. These processes remove large pollutants and fine solid particles. The WWW is then split into the East and West Plants with equal effluent volume being fed to both sides by a distribution chamber. From there the flow arrives at the primary settling tanks, this part of the treatment process helps reduce the velocity of the wastewater flow by allowing heavier organic solids to settle. Thereafter the effluent and waste activated sludge is separated. The effluent is directed into the aeration basins which removes dissolved gasses and oxidizes dissolved metals by mixing air with the wastewater. The effluent is than separated from the sludge and clarified. From there the effluent is disinfected in two chlorine contact chambers. Waste activated sludge is thickened by two DAF units before undergoing primary and secondary digestion. Sludge digestion is a biological process in which organic solids is decomposed into stable substances by enzymes and micro-organisms, thus reducing the amount of organic matter, destroys pathogens and makes it easier to dewater the sludge. Digested sludge is stored in a sump.

The effluent obtained during the treatment process is discharged into Embokodweni River. The activated sludge is currently transported to the Southern WWW and thereafter it is disposed into the sea via an outfall. A future upgrade is for a mechanical thermal sludge drying process to be implemented. The Amanzimtoti WWW process flow is summarised in **Figure 19.78**.

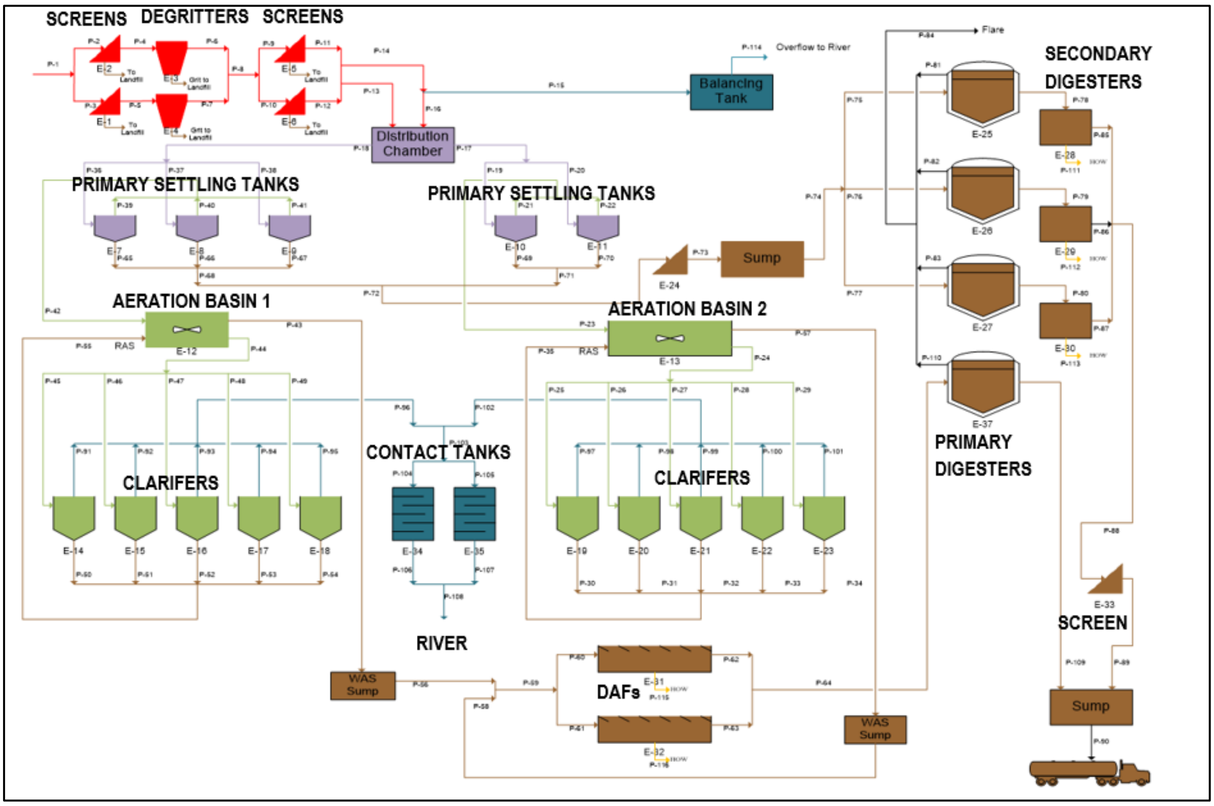

Figure 19.78 Amanzimtoti WWW Process Flow Diagram

The Amanzimtoti WWW catchment is illustrated in **Figure 19.79**.

The characteristics of the Amanzimtoti WWW are described in **Table 19.17**.

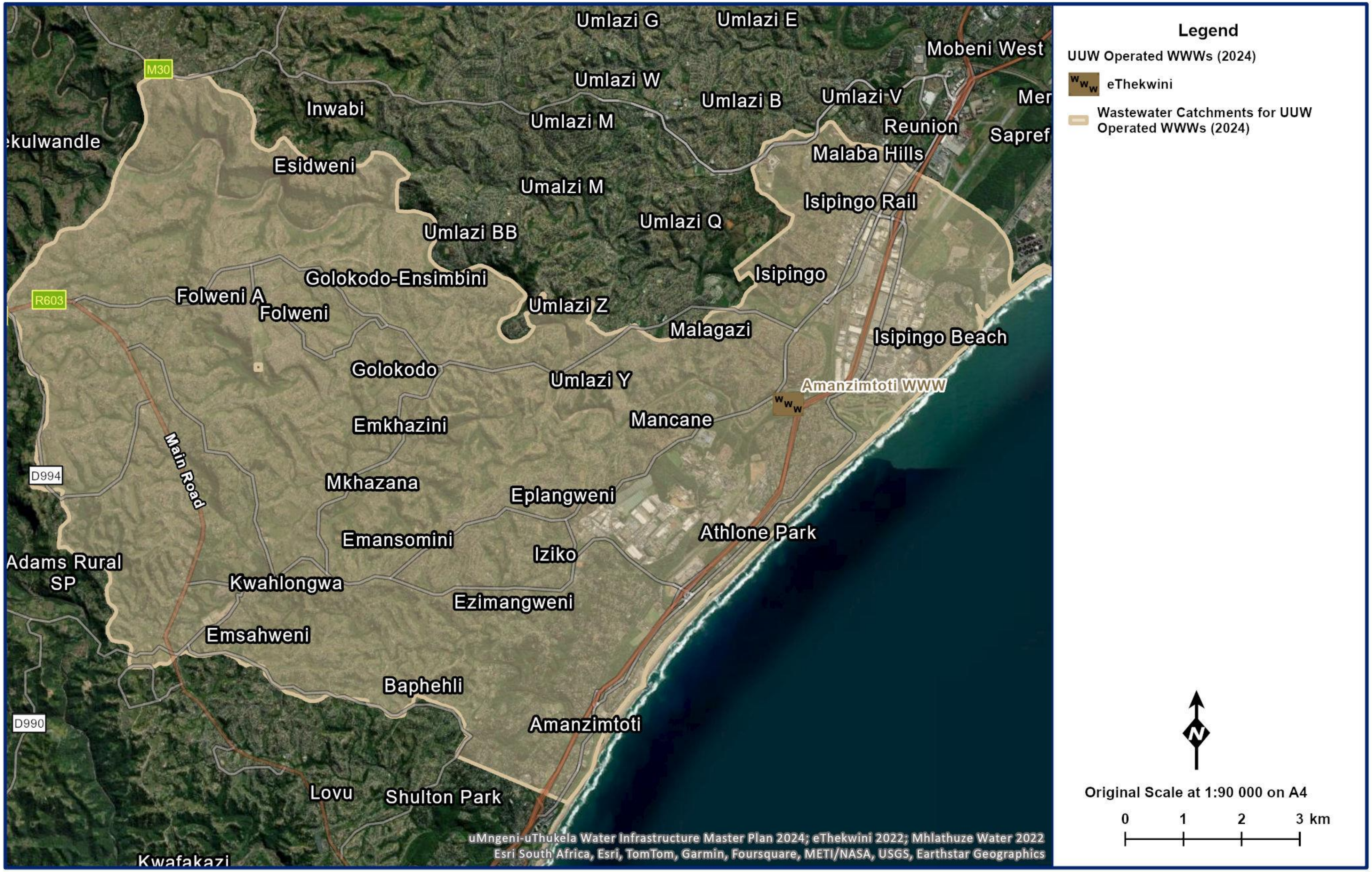

Figure 19.79 Amanzimtoti WWW catchment.

Table 19.17 Amanzimtoti WWW infrastructure.

WWW Name:	Amanzimtoti WWW
System:	Southern
Maximum Design Capacity:	30 Mℓ/day
Current Utilisation:	19 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	One chain driven mechanical screen
Grit Chambers:	One Vortex Degritter and one Geiger Degritter Tank
Grit Clarifier Type	Screw
Number of PSTs	5
Total Area of PSTs	1570 m^2
Total Capacity of PSTs	56 Mℓ/day
Upflow Rate:	1.5 m/h
Aeration Basin:	Activated Sludge
Number of Aeration Basins	Two (6 lanes per basin)
Aeration Basin Capacity:	32 068 m^3
Aerators:	48 slow speed Hansen patent (30, 22, 18.5, 22 kW per lave)
Total Aeration Capacity	34 Mℓ/day
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	10
Total Area of all Clarifiers:	3141 m^2
Total Capacity of Clarifiers:	56 Mℓ/day
Upflow Velocity:	0.75
RAS Pump Station:	6 x T-series Gormann Rupp
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	2970 kg
Chlorine Dosing Capacity:	10 kg/h
Chlorine Contact Tanks	2 x contact tanks
Total Capacity of Chlorine Contact Tanks:	504 m^3
Contact Time	0.588 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

At the Head of Works (HoW) one mechanical screen is offline. The Screw conveyor on one degritter is also offline which means that one classifier cannot be used. Grit and screenings are currently being buried onsite as opposed to a landfill, which poses an environmental risk e.g. groundwater contamination. One PST has been offline for five years.

Eighteen surface aerators are offline due to either gearbox or motor problems. This has been the case for some time. Aeration capacity is thus severely reduced resulting in the mixed liquor suspended solids (MLSS) concentration being high in both the East and West reactors. Wasting has not occurred for months due to sludge removal bottlenecks as two RAS pumps are offline. Two secondary settling tanks (SSTs) are offline due to bridge motor breakdowns.

Amanzimtoti WWW has a design capacity of 30 Mℓ/day and is currently treating 17 Mℓ/day based on the average flow over the last 12-months (**Figure 19.80**).

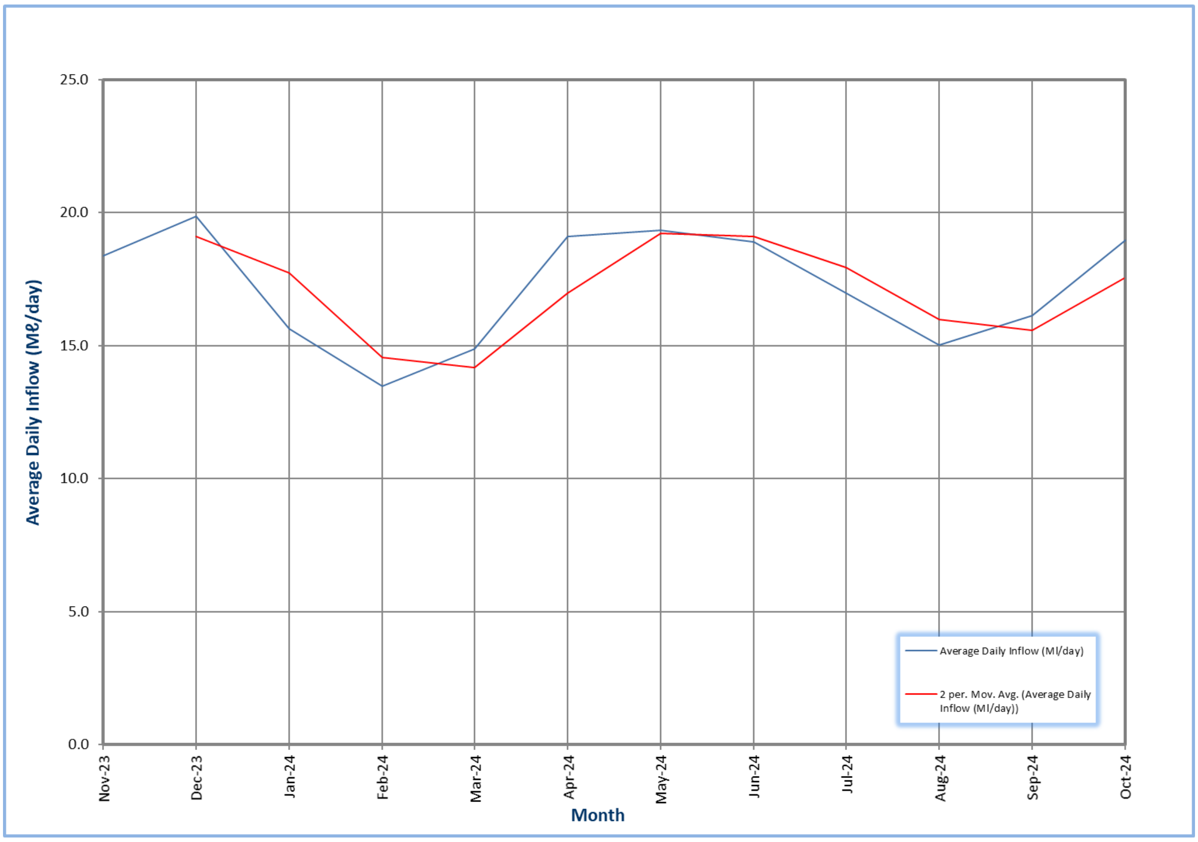

Figure 19.80 Average daily inflows to Amanzimtoti WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Amanzimtoti WWW is presented in (**Figure 19.81**). It shows that for 2.5 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 1.6 % of the time. The plant currently has ample capacity in relation to the current demand.

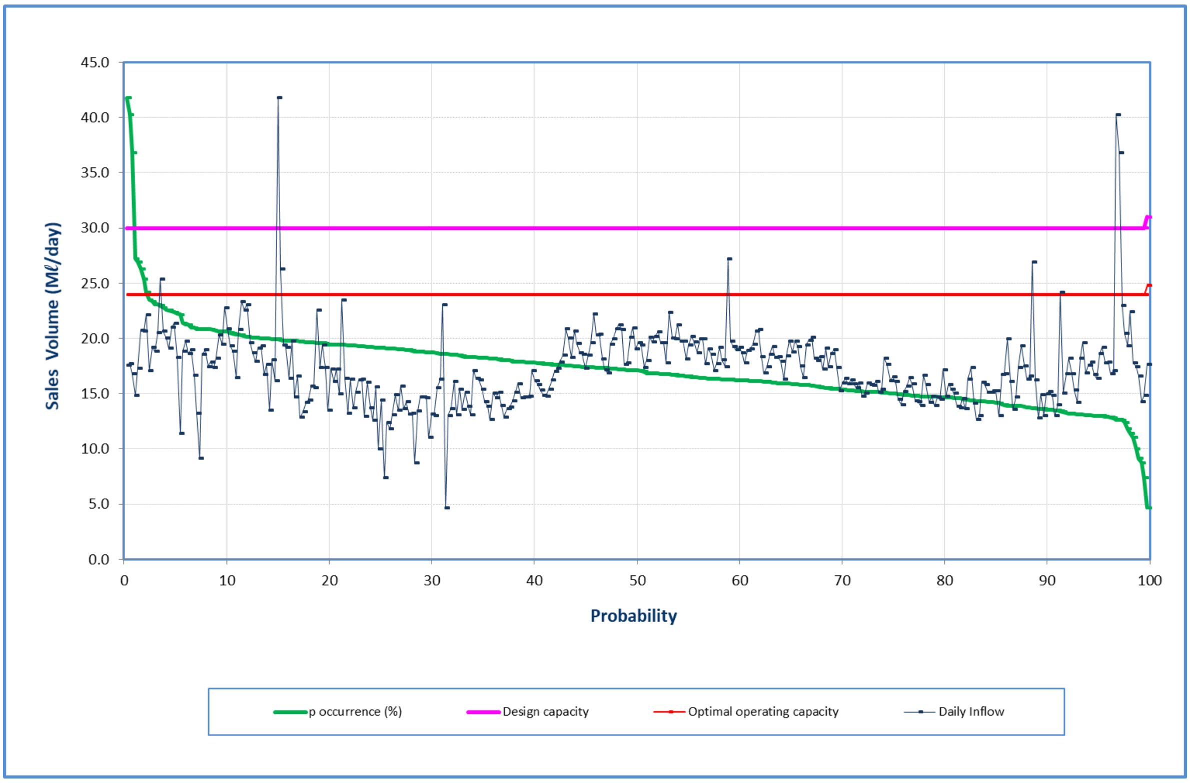

Figure 19.81 Analysis of historical production at Amanzimtoti WWW (November 2023 to October 2024)

c) Recommendations

eThekwini Water Services undertook various regionalisation studies culminating in a 2021 EWS report. The most favourable regionalisation alternative would be to decommission both the Isipingo and Kingsburgh WWW and centralise the wastewater treatment activities at the Amanzimtoti WWW. Based on the three EWS growth scenarios the capacity of Amanzimtoti WWW will be exceeded by 2036, therefore planning should be initiated to increase the capacity of the works.

19.3.11 Central Wastewater Works

a) Description

This plant has a maximum design capacity of 135 Mℓ/day with a utilisation is 75Mℓ/day and spare capacity of 60Mℓ/day. There are no biological processes implemented within this WWW. The wastewater flow is firstly distributed through hand rake and mechanical screens. Thereafter the screened sewage is pumped into vortex degritters. These type of degritter consists of a cylindrical tank in which the flow enters tangentially, creating a vortex flow pattern. Grit settles to the bottom and the effluent exits at the top of the tank. The degritted sewage is then moved to a primary settling tank which remove fats to produce primary effluent. The primary effluent and raw sludge is combined and then discharged into the sea. The plan for the future sludge disposal is a mechanical thermal sludge drying process. The Central WWW process flow is summarised in **Figure 19.82**.

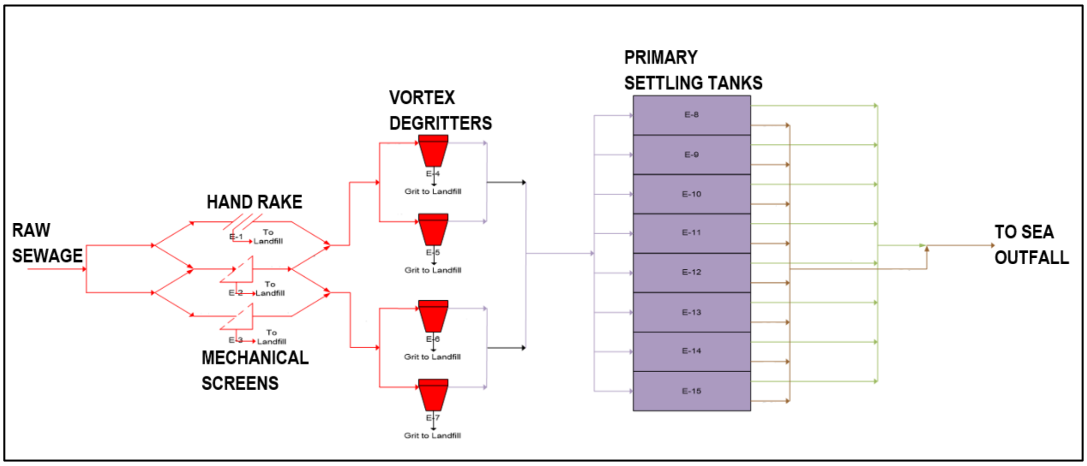

Figure 19.82 Central WWW Process Flow Diagram.

The Central WWW catchment is illustrated in **Figure 19.83**. The characteristics of the Central WWW are described in **Table 19.18**.

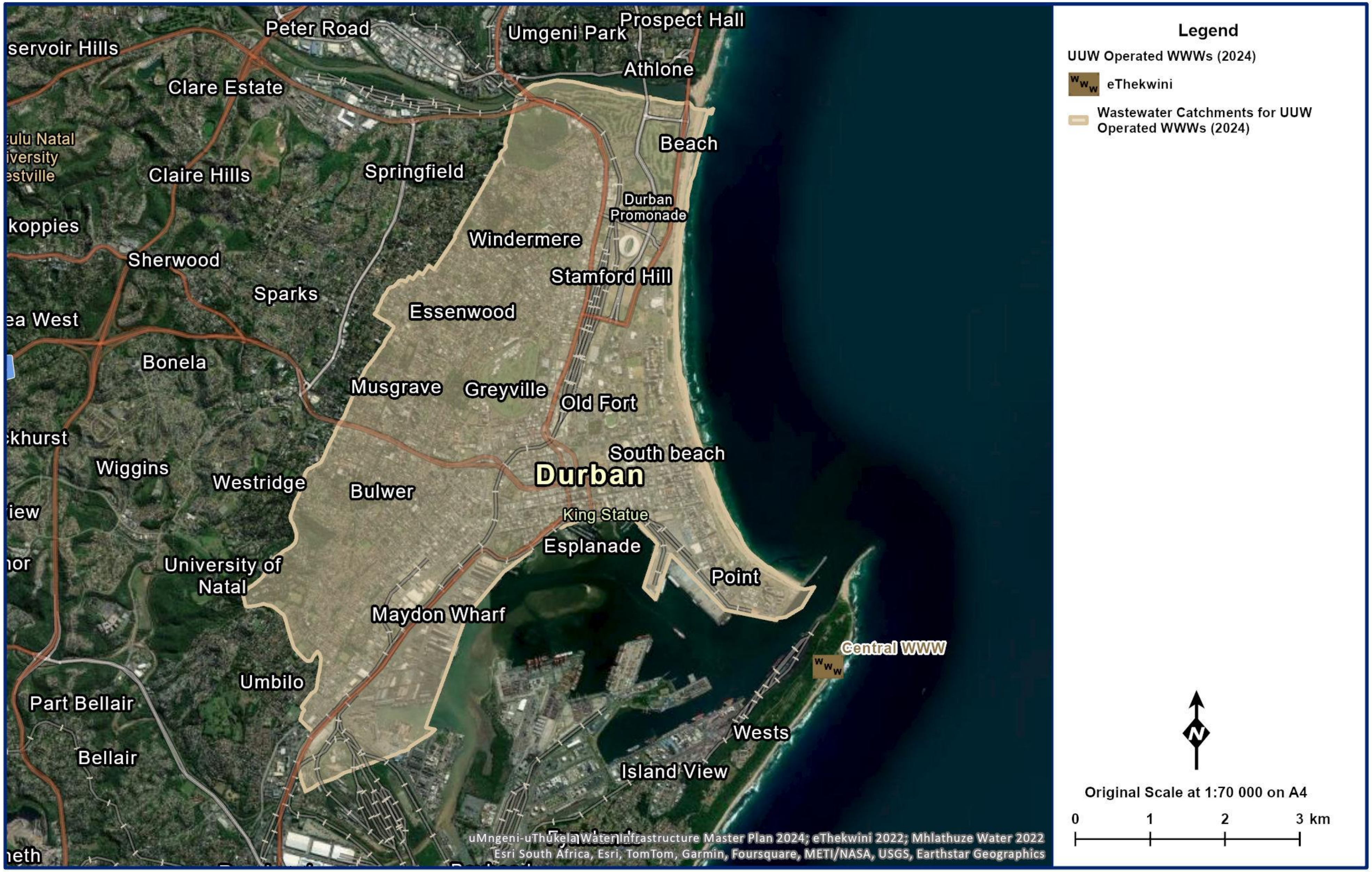

Figure 19.83 Central WWW catchment.

Table 19.18 Central WWW infrastructure.

WWW Name:	Central WWW
System:	Central
Maximum Design Capacity:	135 Mℓ/day
Current Utilisation:	68 Mℓ/day
Raw Sewage Pump Station:	N/A
Screens:	1 x hand rake; 2 x mechanical
Grit Chambers:	4 vortex degritters
Number of PSTs	10
Total Area of PSTs	4356 m^2
Total Capacity of PSTs	59780 m^3
Upflow Rate	1.5 m/h
Aeration Basin:	N/A
Aeration Basin Capacity:	N/A
Aerators:	N/A
Clarifier Type:	N/A
Number of Clarifiers:	N/A
Total Area of all Clarifiers:	N/A
Total Capacity of Clarifiers:	N/A
Upflow Velocity:	N/A
RAS Pump Station:	N/A
Chlorine Storage Capacity:	N/A
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

No mechanical screens are operational and the screens are cleaned manually. Two vortex degritters and one classifier is offline. Grit and screenings are currently buried at Isipingo WWW. None of the ten primary settling tanks are operational.

Central WWW has a design capacity of 135 Mℓ/day and is currently treating 68 Mℓ/day based on the average flow over the last 12-months **Figure 19.84.** Flows in the summer months are high, more than double the flows during winter. This would suggest a large storm water component in the influent to the works.

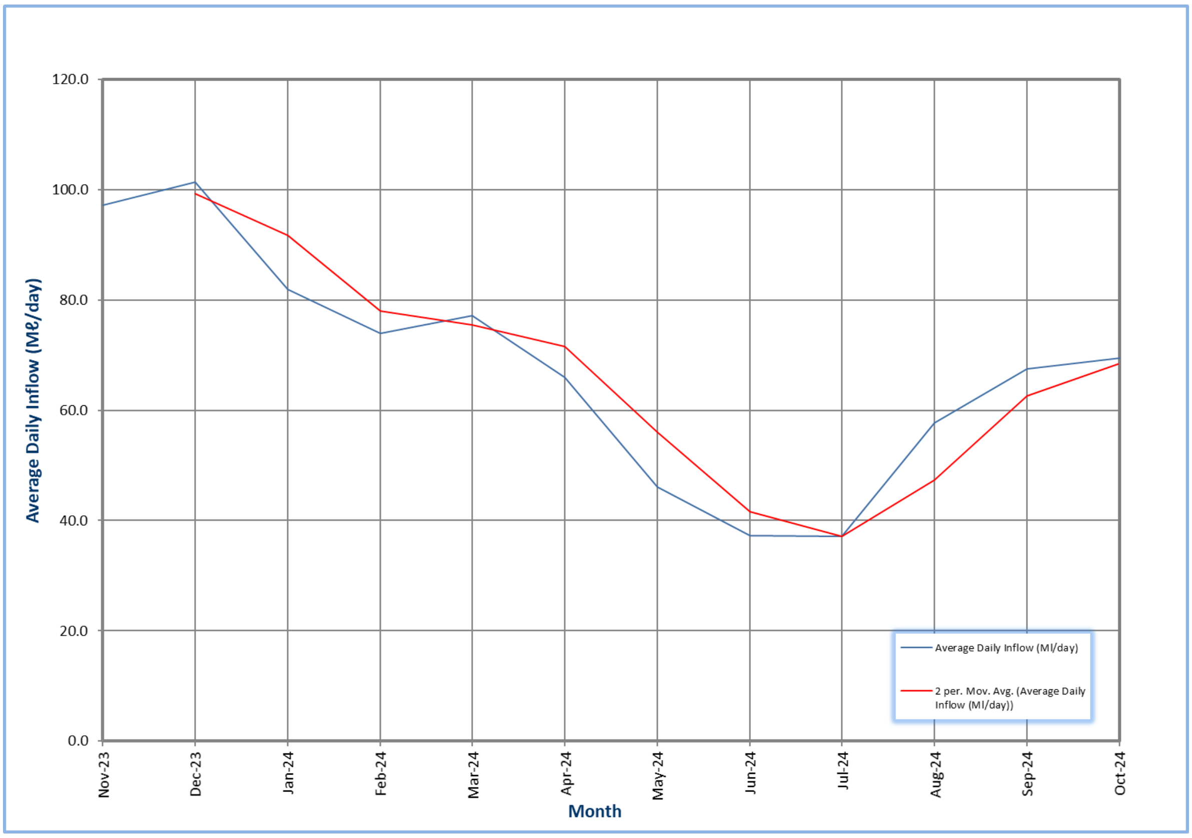

Figure 19.84 Average daily inflows to Central WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Central WWW is presented in (**Figure 19.85**). It shows that for 9 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 4 % of the time. The plant currently has ample capacity in relation to the current demand.

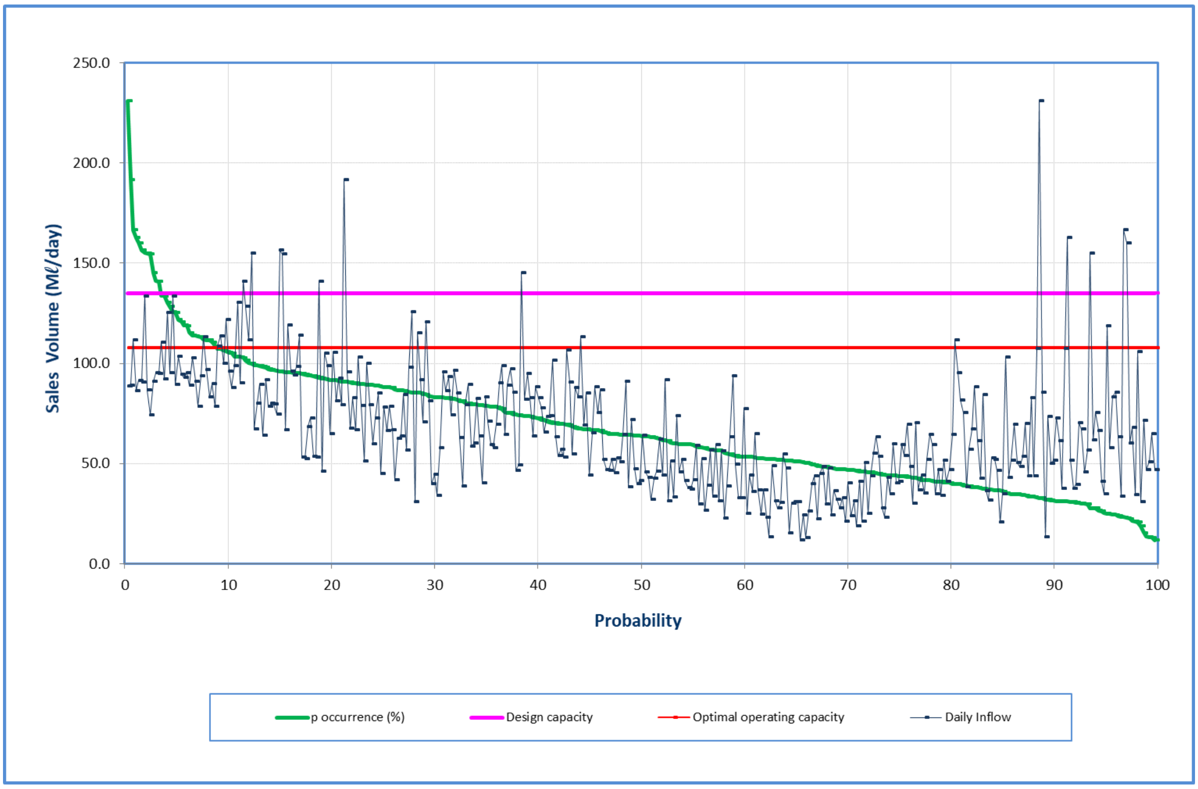

Figure 19.85 Analysis of historical production at Central WWW (November 2023 to October 2024)

c) Recommendations

The Central WWW catchment area is completed built up and therefore there is no expected development. Growth will therefore be solely population based at a growth rate of 1.8 %/yr. Demand is not expected to exceed supply in the 25-yr planning horizon.

19.3.12 Isipingo Wastewater Works

a) Description

Isipingo WWW is a Biofiltration plant located in the Isipingo area within the Southern Coastal region of eThekwini Municipality. The maximum design capacity is 18.8 Mℓ/day with a utilisation of 11.8 Mℓ/day and a spare capacity of 7 Mℓ/day. Raw sewage entering the works is screened and then degritted via degrit channels before it is distributed to six Dortmund tanks. Here raw sludge is settled out and is digested in primary and secondary digesters before it is dewatered by a number of drying beds. The primary effluent leaving the Dortmund tanks are distributed evenly to the trickling filters. Treatment occurs as the primary effluent runs over the biofilm attached to the packing material within the filters. Biofilter effluent exits via the exit drains and enters the humus tanks where the biomass is settled out. This is returned to the head of works. The secondary effluent is then disinfected using chlorine gas at the end of a maturation chamber and discharged into the river. The process flow is summarised in **Figure 19.86**.

The final effluent is discharged into the Isipingo River when the flow is normal. However, when the flow is relatively high, the excess gets diverted into the Embokodweni estuary. Currently the sludge is being used for agricultural purposes. The future sludge disposal upgrade plan is the inclusion of mechanical thermal drying and transport to centralised sludge drying process plant at Southern WWW.

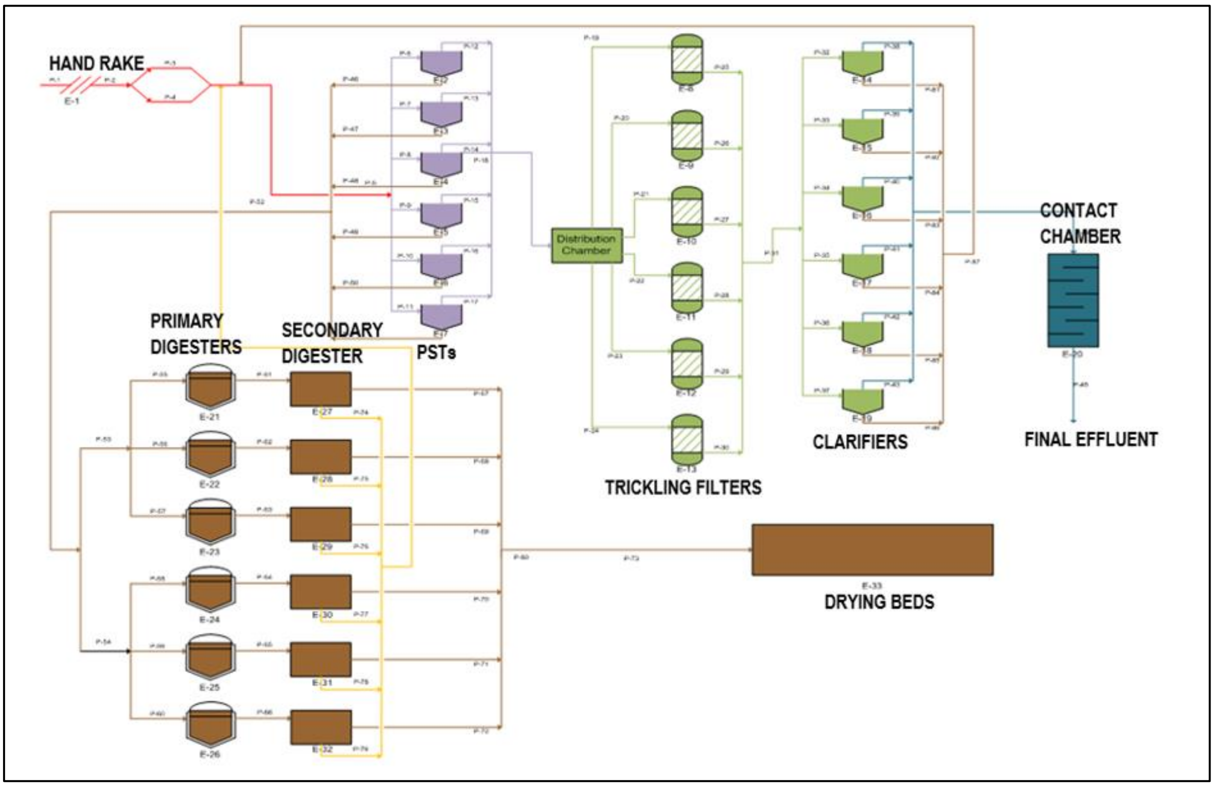

Figure 19.86 Isipingo WWW Process Flow Diagram.

The Isipingo WWW catchment is illustrated in **Figure 19.87**.

The characteristics of the Isipingo WWW are described in **Table 19.19**.

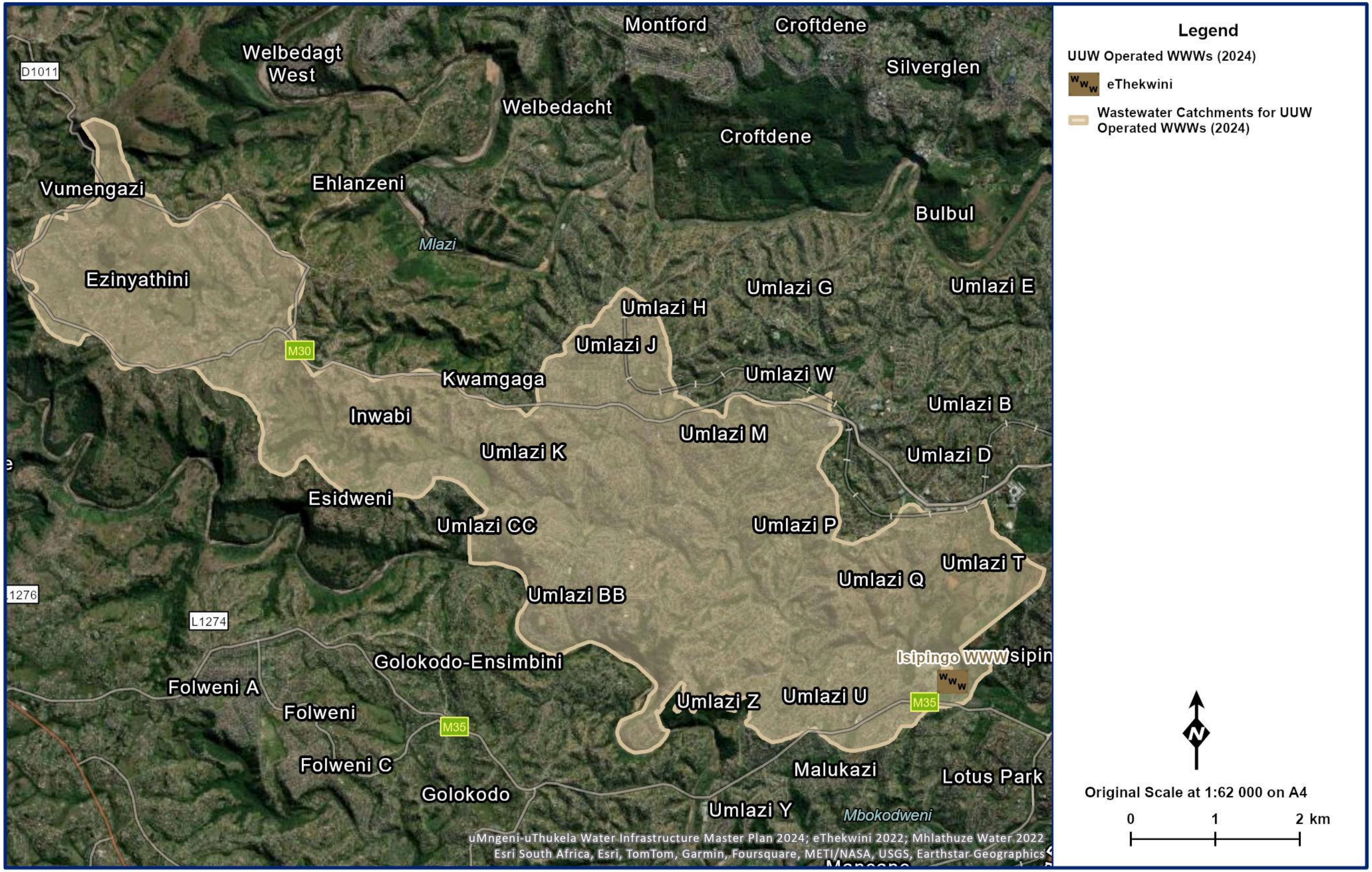

Figure 19.87 Isipingo WWW catchment.

Table 19.19 Isipingo WWW infrastructure.

WWW Name:	Isipingo WWW
System:	Southern
Maximum Design Capacity:	18.8 Mℓ/day
Current Utilisation:	6.2 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	Bar screen
Grit Chambers:	Three grit channels
Grit Clarifier Type	N/A
Number of PSTs	6
Total Area of PSTs	678 m^2
Total Capacity of PSTs	24 Mℓ/day
Upflow Rate:	1.5 m/h
Aeration Basin:	Biofilter
Number of Aeration Basins	6
Aeration Basin Capacity:	N/A
Aerators:	N/A
Total Aeration Capacity	N/
Clarifier Type:	Humus Tanks
Number of Clarifiers:	6
Total Area of all Clarifiers:	678 m^2
Total Capacity of Clarifiers:	16 Mℓ/day
Upflow Velocity:	1.0 m/h
RAS Pump Station:	2 x submersible Pumps
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	1980 kg
Chlorine Dosing Capacity:	4 kg/h
Chlorine Contact Tanks	1 contact tank
Total Capacity of Chlorine Contact Tanks:	20 439 m^3
Contact Time	35 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The infrastructure is considered aged as is evident from corrosion of the concrete in the inlet channel adjacent to the manual (hand-raked) screen. Two PSTs are offline due to problems with desludging and scum removal valves. All the bio-filters are online, however, the effluent quality is poor. Similarly with the secondary effluent from the clarifiers, which is not clear due to high turbidity. The maturation ponds are in a poor condition, with sludge and duckweed present. The digesters are not mixed, as there are no working PRVs and the gas holder is dilapidated (not used for years which means biogas escapes to the atmosphere without being flared). The drying bed structural integrity appears to be deteriorating, which poses a contamination risk to groundwater.

Isipingo WWW has a design capacity of 18 Mℓ/day and is currently treating 6.2 Mℓ/day based on the average flow over the last 12-months (**Figure 19.88**).

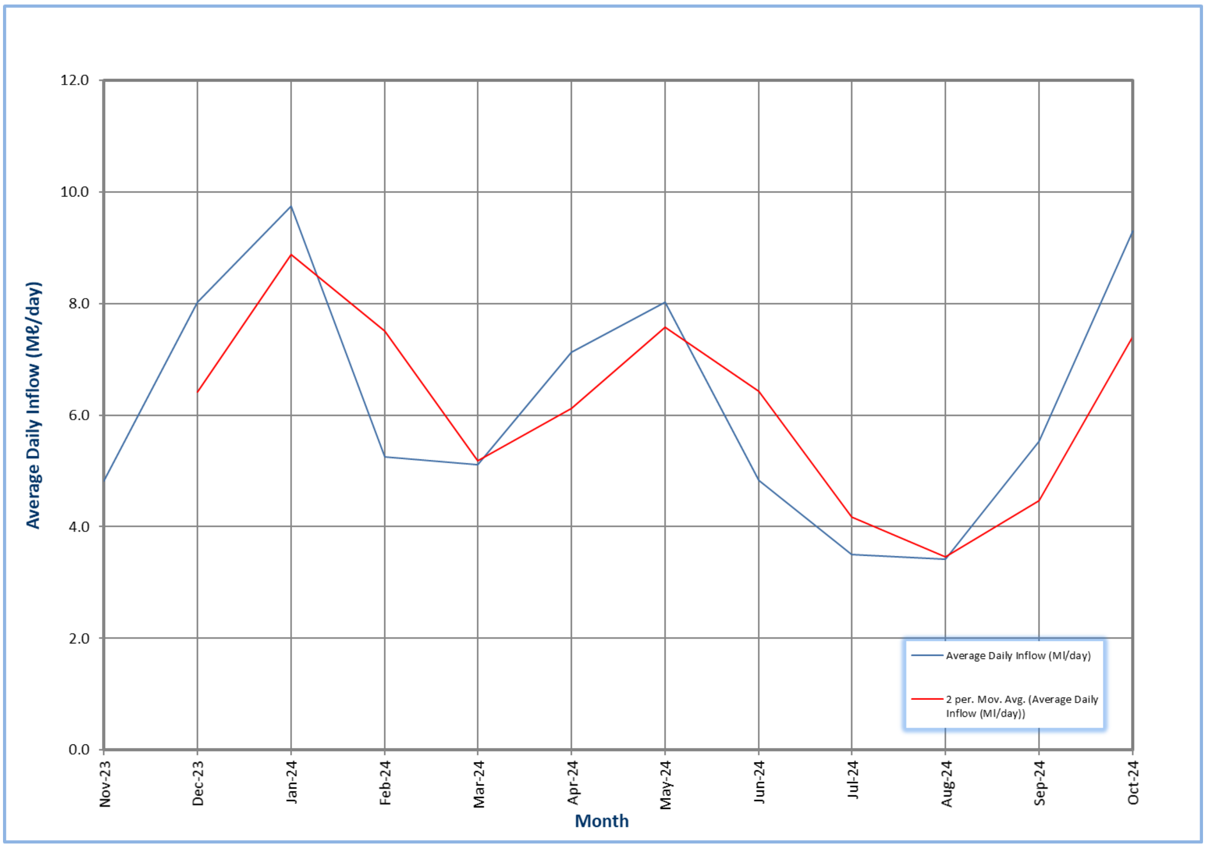

Figure 19.88 Average daily inflows to Isipingo WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Isipingo WWW is presented in (**Figure 19.89**). It shows that for 1.6 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 0.8 % of the time. The plant currently has ample capacity in relation to the current demand.

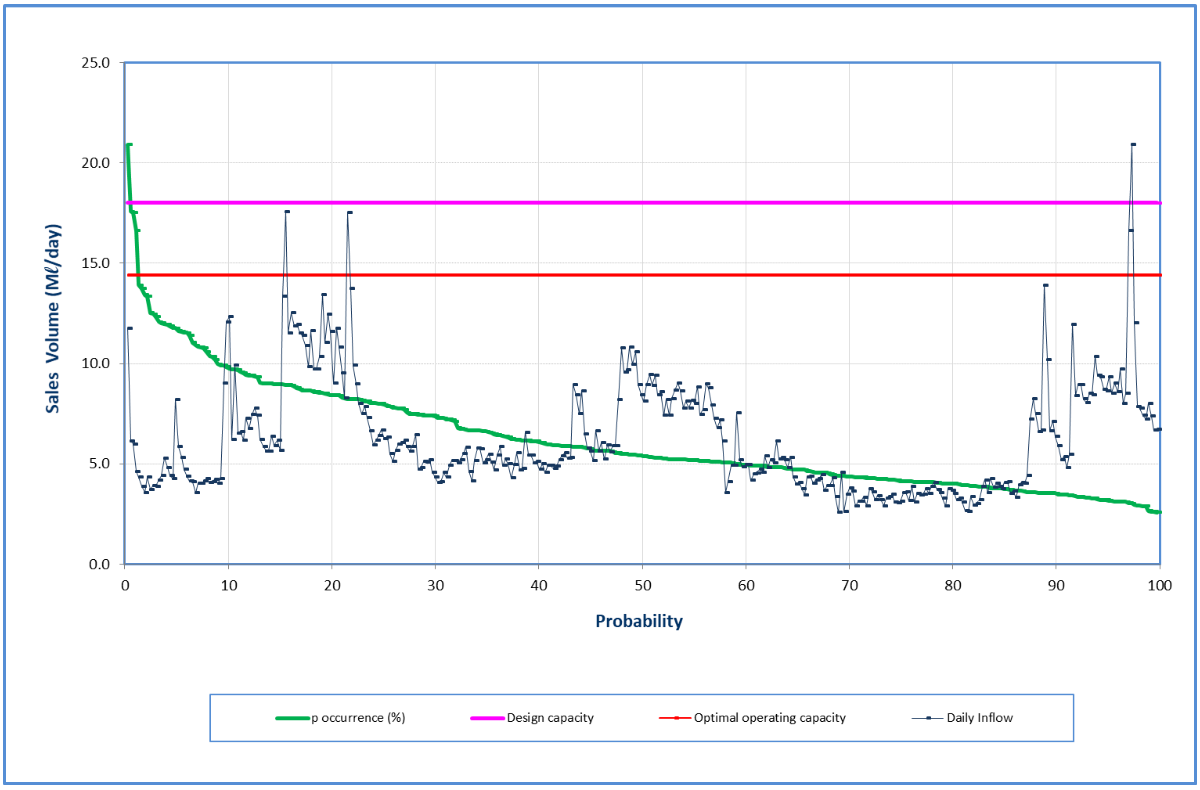

Figure 19.89 Analysis of historical production at Isipingo WWW (November 2023 to October 2024)

c) Recommendations

The works is operating inefficiently which includes, but is not limited to the following:

- screening and grit removal process units
- scum removal process units
- primary settling process units
- flow balancing process units
- biological treatment process units.
- sludge removal bottlenecks
- malfunctioning equipment

In terms of EWS planning and regionalisation strategy, it is proposed that Isipingo WWW be decommissioned and the effluent be transferred to Amanzimtoti WWW. However, based on three growth scenarios developed by EWS, the demand will not exceed the design capacity of Isipingo WWW until 2047. Decommissioning of Isipingo WWW is therefore not recommended at present.

19.3.13 KwaMashu Wastewater Works

a) Description

KwaMashu Wastewater Works (WWW) is a 55 Mℓ/day plant. It has a current utilisation of 70 Mℓ/day and is thus being operated well above capacity. This plant consists of two components running in parallel, which is made up of a new activated sludge plant and an older bio-filter plant.

The incoming raw sewage is screened and degritted. Raw sewage entering the new plant undergoes primary treatment. Primary effluent is fed into an aeration basin. Raw sludge from the PST's enters the thickeners and is dewatered by two Huber screw presses before entering the fluidised bed reactor plant. The activated sludge is settled out in the clarifiers. Settled activated sludge is sent to the DAF unit where it is thickened and later dewatered by a belt press. This sludge is then tankered away.

Raw sewage entering the old plant is distributed to four Dortmund tanks. This is where raw sludge is settled out and is digested in primary and secondary digesters before it is dewatered by a belt press and tankered away. The primary effluent leaving the Dortmund tanks are distributed evenly to the trickling filters at which pre-settled wastewater is continuously sprayed (trickled) over the filter. Treatment occurs as the primary effluent runs over the biofilm attached to the packing material within the filters. Biolfilter effluent exits via the exit drains and enters the humus tanks where the biomass is settled out. This is returned to the head of works. Secondary effluent from both the clarifiers and the humus tanks enters the pond system where it is disinfected. Thereafter the effluent is discharged into a river. The old plant has however been offline for a number of years and is unlikely to be operational in the near future. The process flow is summarised in **Figure 19.90**.

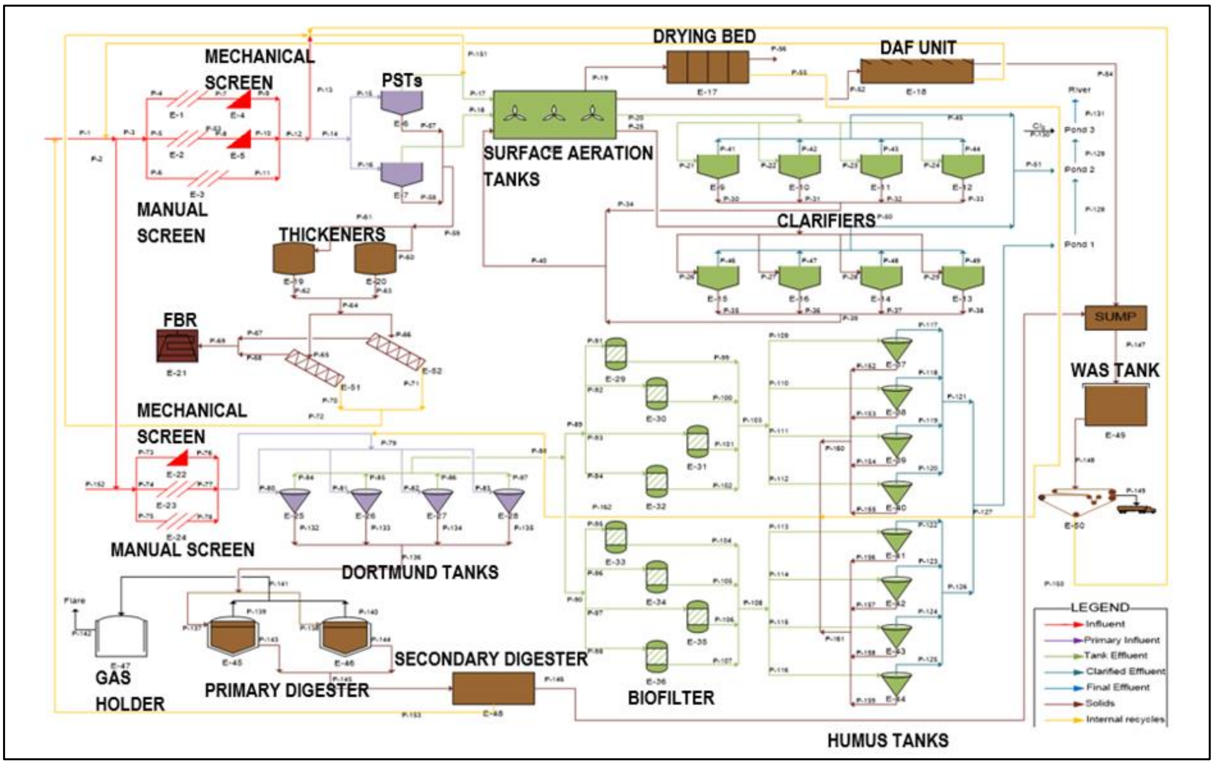

Figure 19.90 KwaMashu WWW Process Flow Diagram

The KwaMashu WWW catchment is illustrated in **Figure 19.91**.

The characteristics of the KwaMashu WWW are described **Table 19.20**.

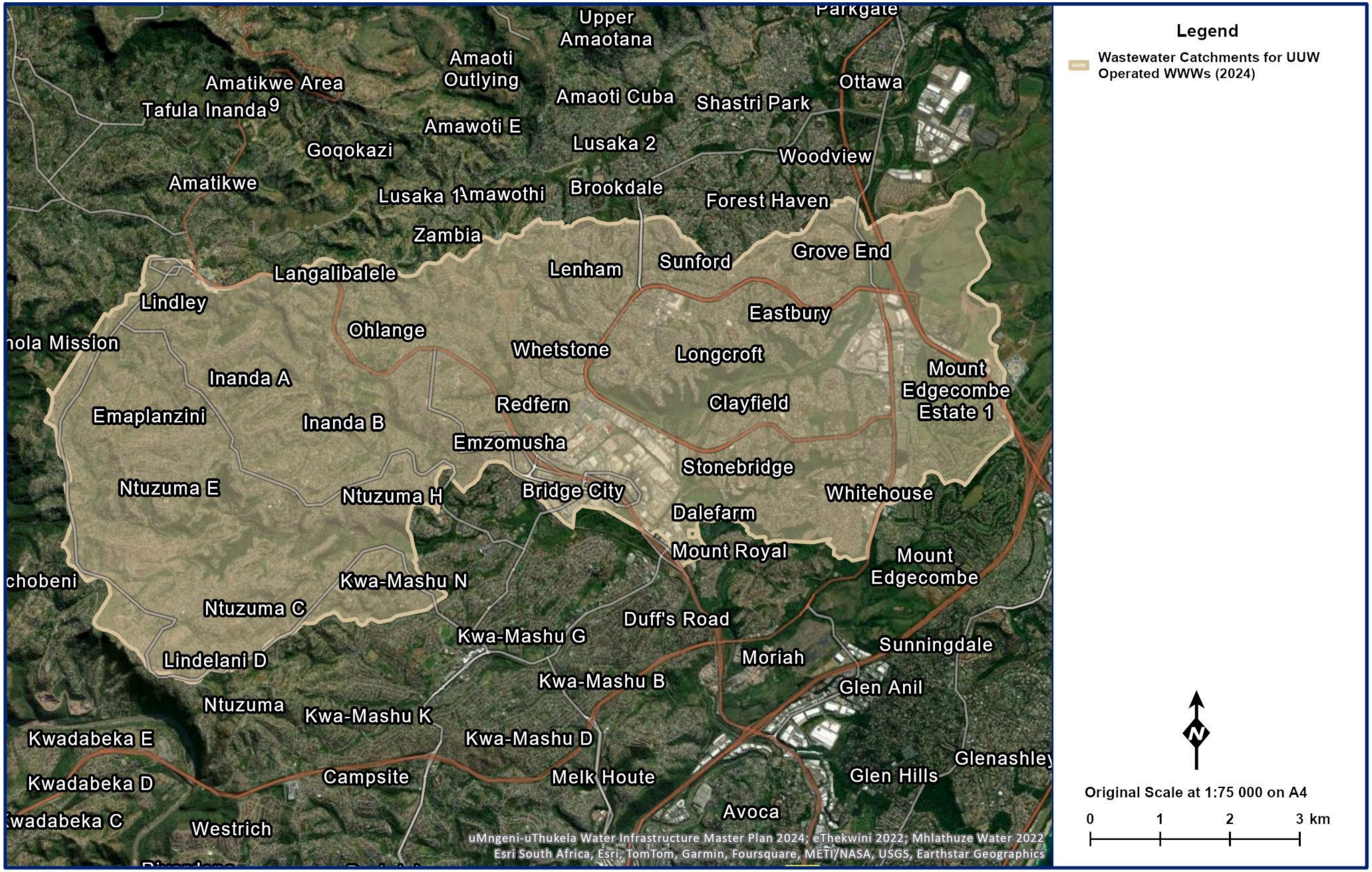

Figure 19.91 KwaMashu New WWW catchment.

Table 19.20 KwaMashu New WWW infrastructure.

WWW Name:	KwaMashu WWW
System:	Northern
Maximum Design Capacity:	55 Mℓ/day
Current Utilisation:	38 Mℓ/day
Raw Sewage Pump Station:	5 (submersible)
Raw Sewage Pump Capacity	N/A
Screens:	3 chain driven mechanical screens
Grit Chambers:	2 grit chambers with air blowers
Grit Clarifier Type	Screw
Number of PSTs	2
Total Area of PSTs	NA
Total Capacity of PSTs	90 Mℓ/day
Upflow Rate:	1.5 m/h
Aeration Basin:	Activated Sludge
Number of Aeration Basins	One (4 lanes)
Aeration Basin Capacity:	20 160 m^3
Aerators:	16 aerators (each 55 kW)
Total Aeration Capacity	55 Mℓ/day
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	8
Total Area of all Clarifiers:	7263 m^2
Total Capacity of Clarifiers:	152 Mℓ/day
Upflow Velocity:	0.875
RAS Pump Station:	4 (submersible pumps)
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	7520 kg
Chlorine Dosing Capacity:	10 kg/h
Chlorine Contact Tanks	5 x ponds
Total Capacity of Chlorine Contact Tanks:	23 944 m^3
Contact Time	10.45 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

All the mechanical screens are off-line and therefore the manual screens are being used. All the washers and compactors and the grit removal system is off-line, which is negatively impacting downstream processes. Both PSTs are functional, however, the process units are subject to a relatively high inflow of screenings (that are not removed at the Head of Works). One surface aerator and two RAS pumps are off-line. Excessive carryover was observed from the clarifiers, reported by the works as a result of sludge removal bottlenecks experienced at the plant.

The old works (bio-filter plant) is completely offline. The old digesters including the flare, heat exchangers and gas holder are offline. There is currently no plan on refurbishing /reusing these units. This could provide additional solids treatment capacity for the works.

Isipingo WWW has a design capacity of 55 Mℓ/day and is currently treating 38 Mℓ/day based on the average flow over the last 12-months (**Figure 19.92**). There is a distinct drop in inflow during the dry winter months, which increases during the summer rainfall season. This increase is most likely due to storm water ingress into the sewer network.

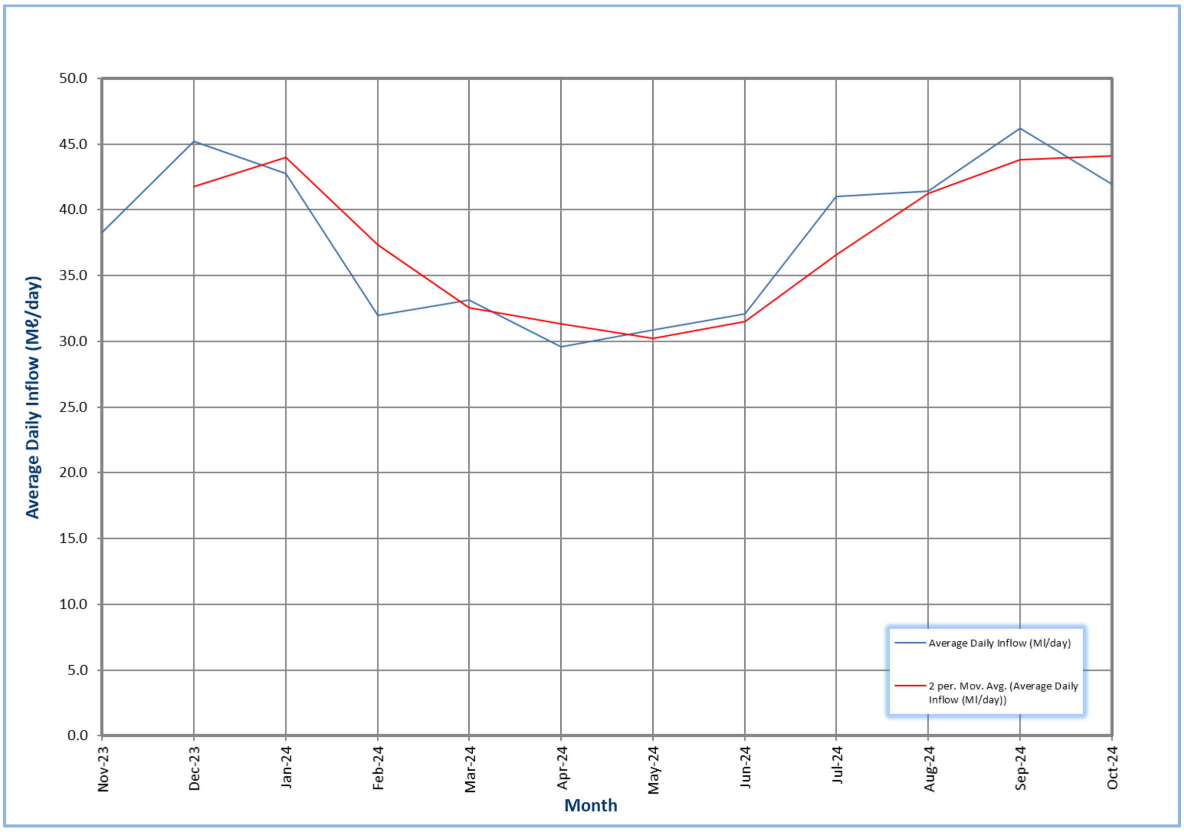

Figure 19.92 Average daily inflows to KwaMashu WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the KwaMashu WWW is presented in (**Figure 19.93**). It shows that for 4 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 1.6 % of the time. The plant currently has ample capacity in relation to the current demand.

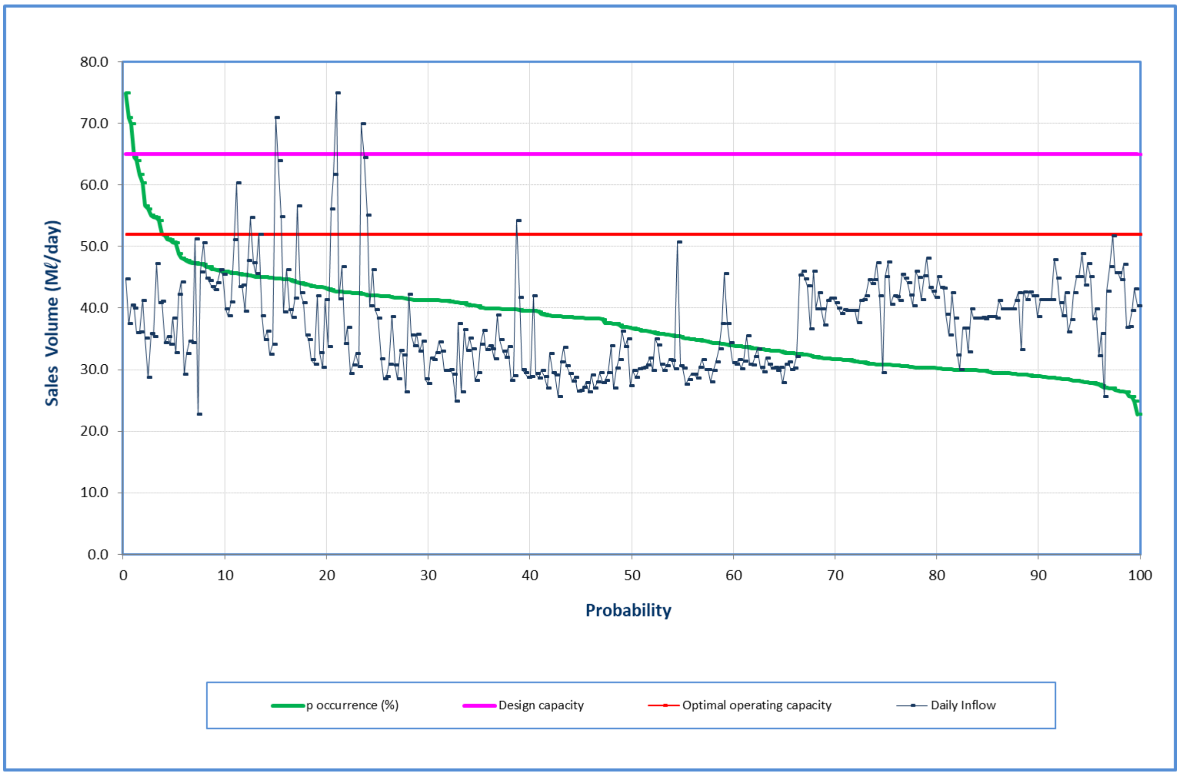

Figure 19.93 Analysis of historical production at KwaMashu WWW (November 2023 to October 2024)

c) Recommendations

The screening process is inefficient because the mechanical screens are not operating, requiring manual removal of screenings. The inadequate sludge removal processes are impacting negatively on the overall treatment process and final effluent water quality.

Based on the three EWS growth scenarios the KwaMashu WWW capacity would be exceeded by 2022, and the plant would require an upgrade to 82 Mℓ/day. The current inflow exceeds the working capacity of the plant and therefore an upgrade to the plant is overdue.

19.3.14 Northern Wastewater Works

a) Description

Northern WWW is a 53 Mℓ/day activated sludge plant. The utilisation of this plant is 19 Mℓ/day with a spare capacity of 34 Mℓ/day. The incoming wastewater is primarily domestic with a small amount of industrial effluent. The biological treatment used is activated sludge, which utilises two compartments one 20 Mℓ/day and another 50 Mℓ/day. Incoming sewage is screened and degritted before undergoing primary treatment. Primary effluent feeds into a 50 Mℓ/day surface aeration basin and 20 Mℓ/day diffused aeration basin. The activated sludge is settled out in the clarifiers. Secondary effluent then enters the five-pond system where it is disinfected using chlorine gas at the exit. Raw sludge from the PST's enters the thickeners and waste activated sludge is thickened by the DAF unit. Sludge is digested and dewatered before it is disposed of onsite. The effluent obtained during the treatment process is discharged into the uMngeni River. The process flow is summarised in **Figure 19.94**.

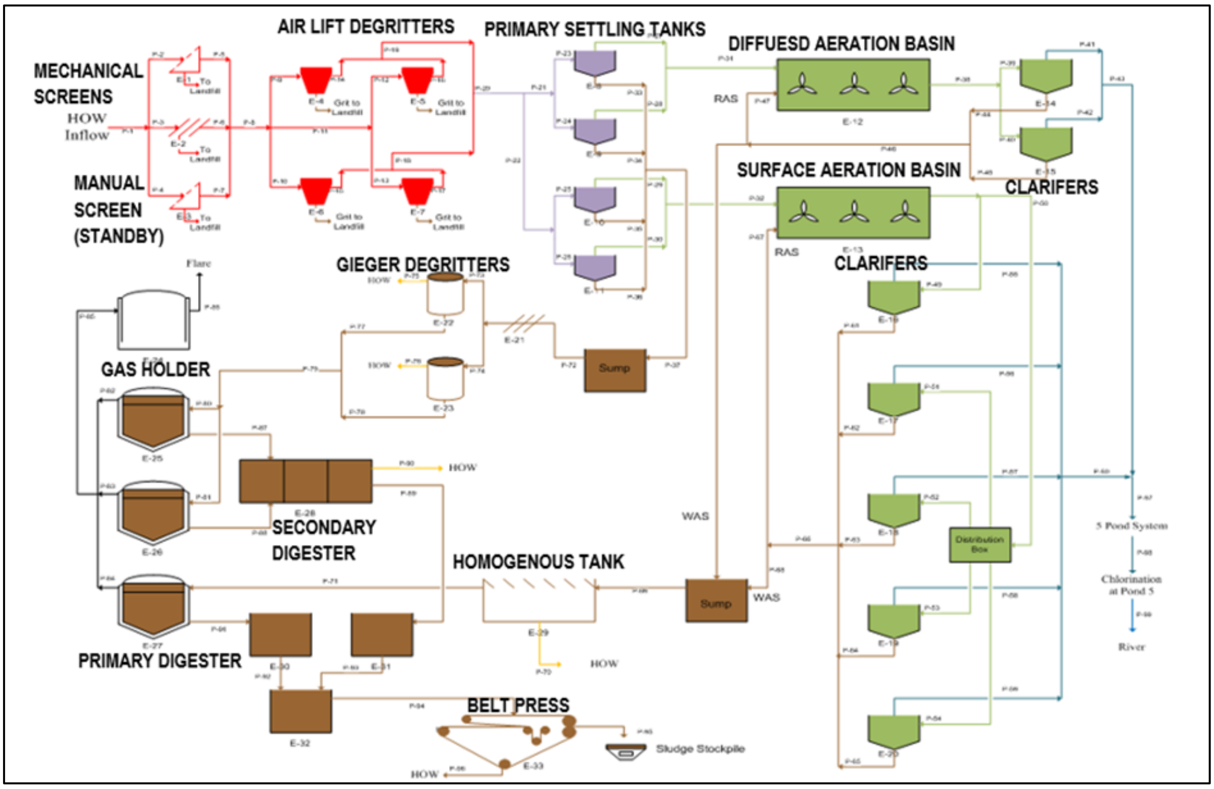

Figure 19.94 Northern WWW Process Flow Diagram.

The Northern WWW catchment is illustrated in **Figure 19.95**.

The characteristics of the Northern WWW are described in **Table 19.21**.

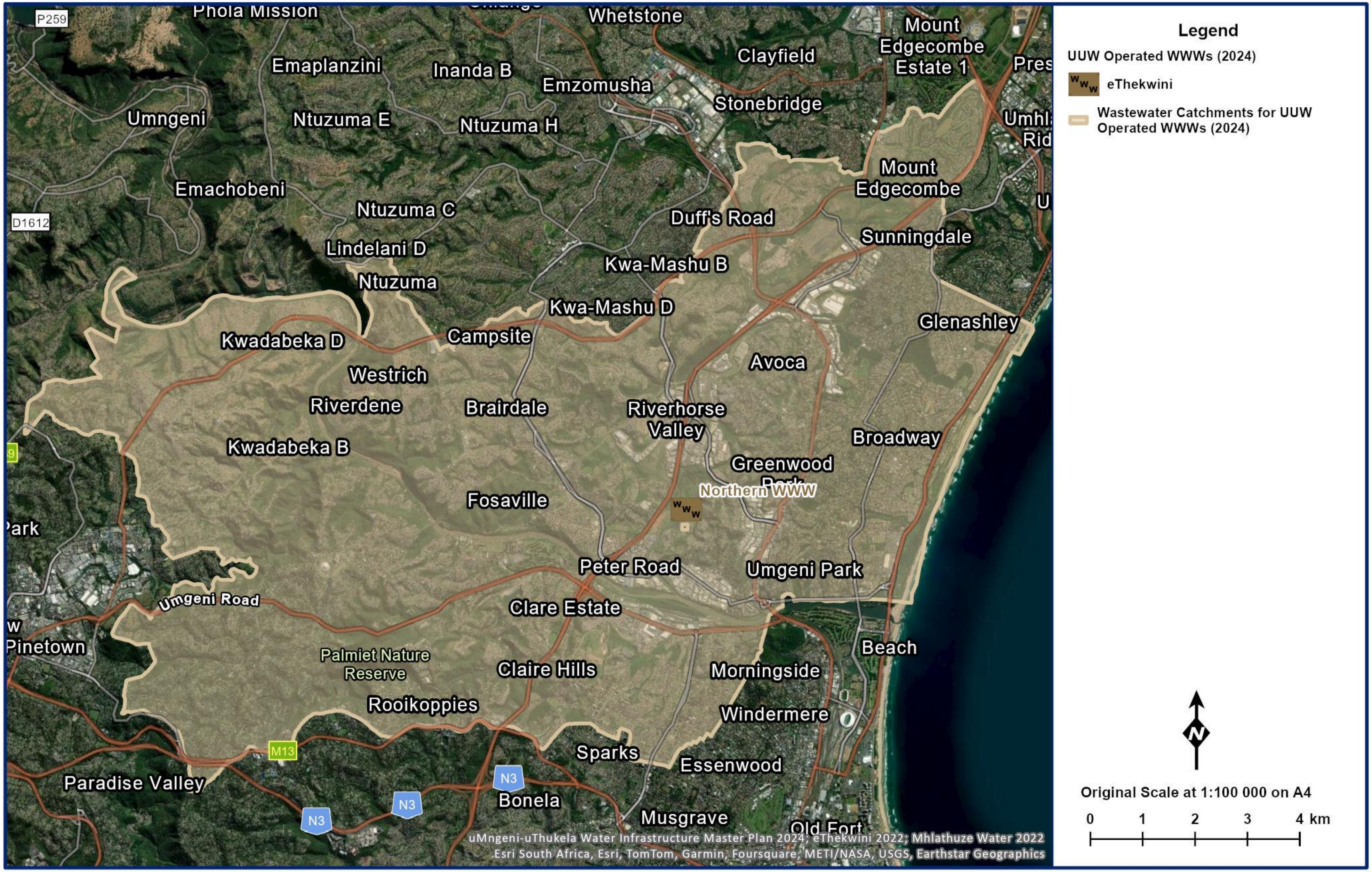

Figure 19.95 Northern WWW catchment.

Table 19.21 Northern WWW infrastructure.

WWW Name:	Northern WWW
System:	Northern
Maximum Design Capacity:	53 Mℓ/day
Current Utilisation:	31 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	Two chain driven mechanical screens
Grit Chambers:	Two grit chambers - air blowers and Two Geiger Degritter Tanks
Grit Clarifier Type	Screw
Number of PSTs	4
Total Area of PSTs	NA
Total Capacity of PSTs	117 Mℓ/day
Upflow Rate:	1.5 m/h
Aeration Basin:	Activated Sludge
Number of Aeration Basins	One (4 lanes)
Aeration Basin Capacity:	39 984 m^3
Aerators:	24 aerators (each 55 kW)
Total Aeration Capacity	53 Mℓ/day
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	5
Total Area of all Clarifiers:	5089 m^2
Total Capacity of Clarifiers:	128 Mℓ/day
Upflow Velocity:	0.75
RAS Pump Station:	3 x Screw Pumps
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	3760 kg
Chlorine Dosing Capacity:	4 kg/h
Chlorine Contact Tanks	5 x ponds
Total Capacity of Chlorine Contact Tanks:	N/A
Contact Time	N/A
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

One mechanical screen is offline and the manual screen is used in place of this. The entire grit removal system is offline, resulting in sand ingress, which is negatively impacting downstream processes. The scum removal system on PSTs 3 and 4 is not functional. Mixed liquor suspended solids are high in both the aerobic reactors due to sludge removal bottlenecks. Twelve aerators are in the two aeration compartments combined, which is likely to reduce the treatment capacity of the works significantly. There is no dedicated chlorine contact tank dosing, it is done in the ponds at the end of the final pond. The chlorine gas dosing system requires servicing. There is a significant accumulation of sludge in the ponds which is likely to negatively impact final effluent quality. There is water hyacinth proliferation in the pond. Many of the solids treatment unit processes are off-line, including the old DAF unit, one anaerobic digester, gas holder, one belt-press, and one poly system.

Northern WWW has a design capacity of 53 Mℓ/day and is currently treating 31 Mℓ/day based on the average flow over the last 12-months (**Figure 19.96**). There is a distinct drop in inflow during the dry winter months, which increases during the summer rainfall season. This increase is most likely due to storm water ingress and groundwater infiltration into the sewer network.

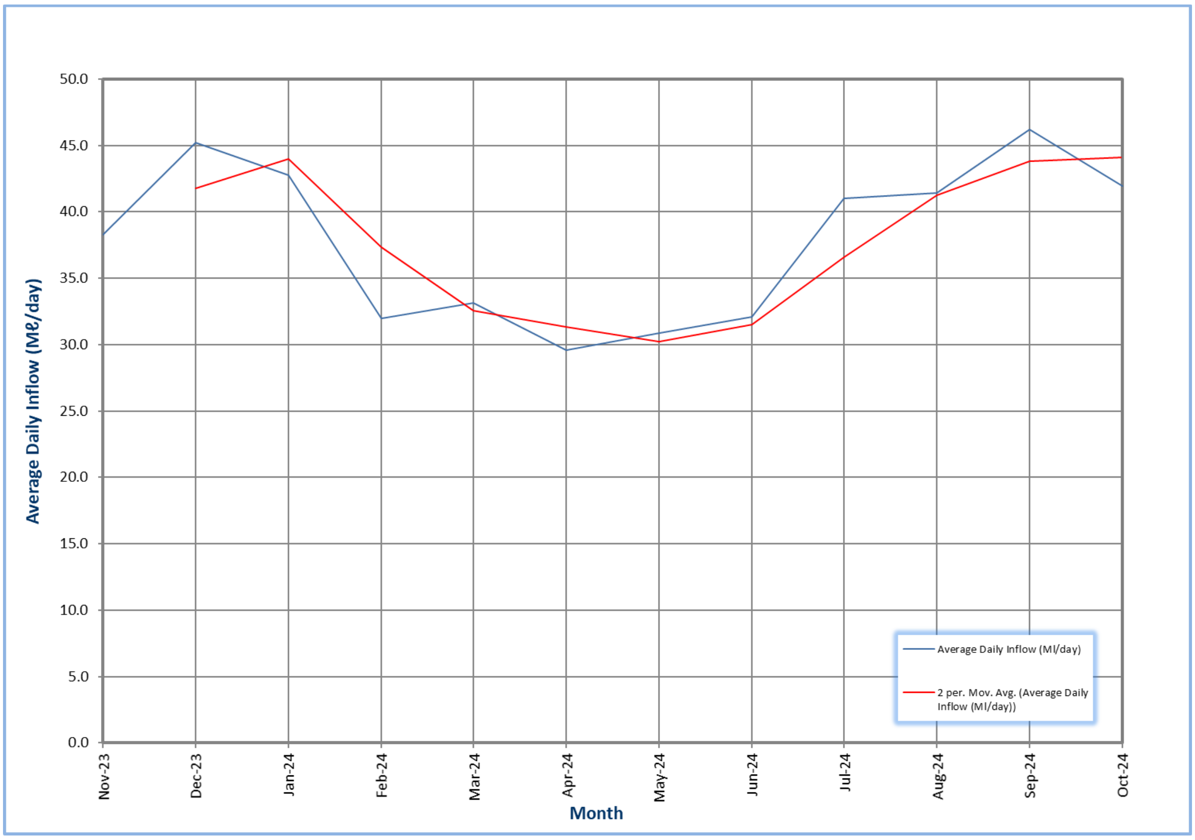

Figure 19.96 Average daily inflows to Northern WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Northern WWW is presented in (**Figure 19.97**). It shows that for 5.5 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 2.7 % of the time. The plant currently has ample capacity in relation to the current demand.

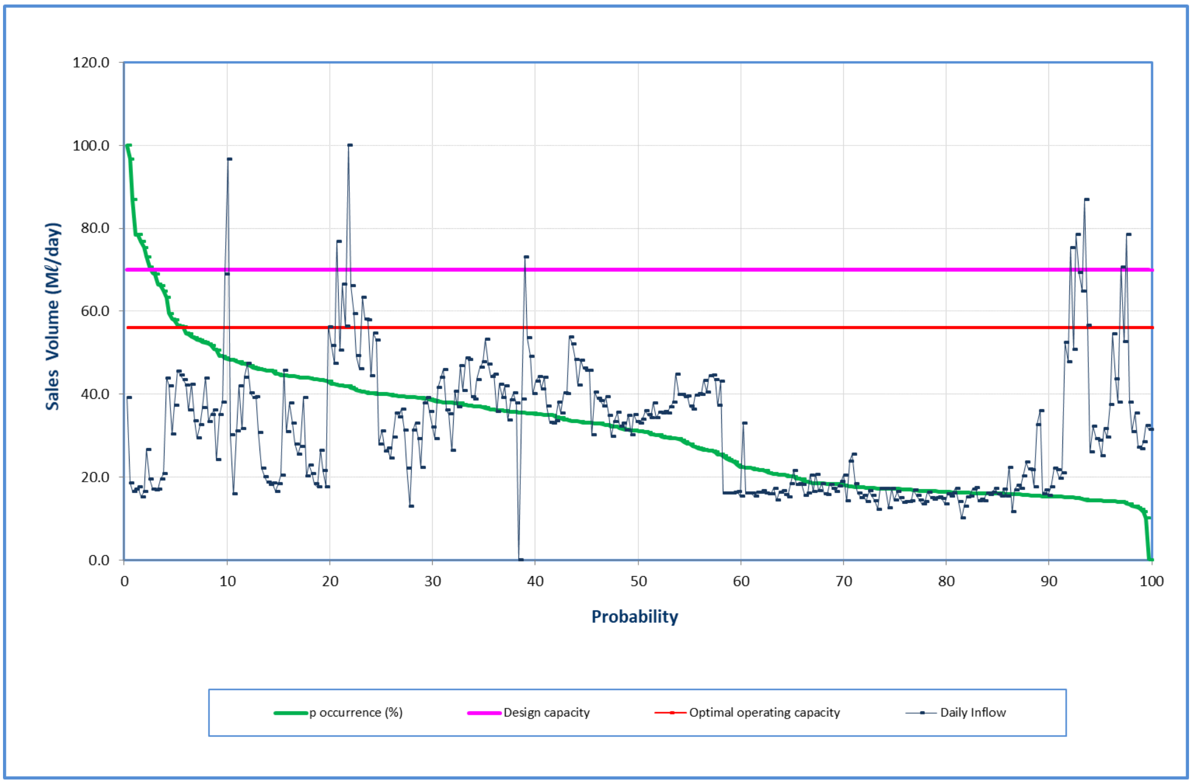

Figure 19.97 Analysis of historical production at Northern WWW (November 2023 to October 2024)

c) Recommendations

The screening process is inefficient because the mechanical screens are not operating, requiring manual removal of screenings. The inadequate sludge removal processes are impacting negatively on the overall treatment process and final effluent water quality

Based on the three EWS growth scenarios the Northern WWW capacity will be exceeded by 2031. An upgrade to the WWW is therefore required fairly urgently.

19.3.15 Southern Wastewater Works

a) Description

The Southern WWW is located in the Central Coastal region of eThekwini Municipality. The Southern WWW, which is the city's largest treatment plant has a design capacity of 230 Mℓ/day. The utilisation is 173 Mℓ/day leaving the plant with a spare capacity of 57 Mℓ/day. There is no biological treatment implemented at this plant. The raw sewage from the Chatsworth line is treated and sold to Veolia Water. This plant receives domestic and industrial wastewater.

It has two head of works with incoming raw sewage. Sewage is screened and degritted before entering two primary settling tanks. The primary effluent which has been treated to industrial standards is then sent to the Durban Wastewater Recycling Plant (DWRP). This plant supplies Mondi and SAPREF with high quality treated water for industrial use. The raw sludge produced is discharged at sea.

Incoming raw sewage from the Jacobs Line, Badulla Line, Tanker discharge and Refinery Road pump station discharge is received at the second head of works. Sewage is screened and degritted using vortex degritters. The final effluent and sludge are disposed into the sea via the Southern outfall.

The process flow is summarised in **Figure 19.98**.

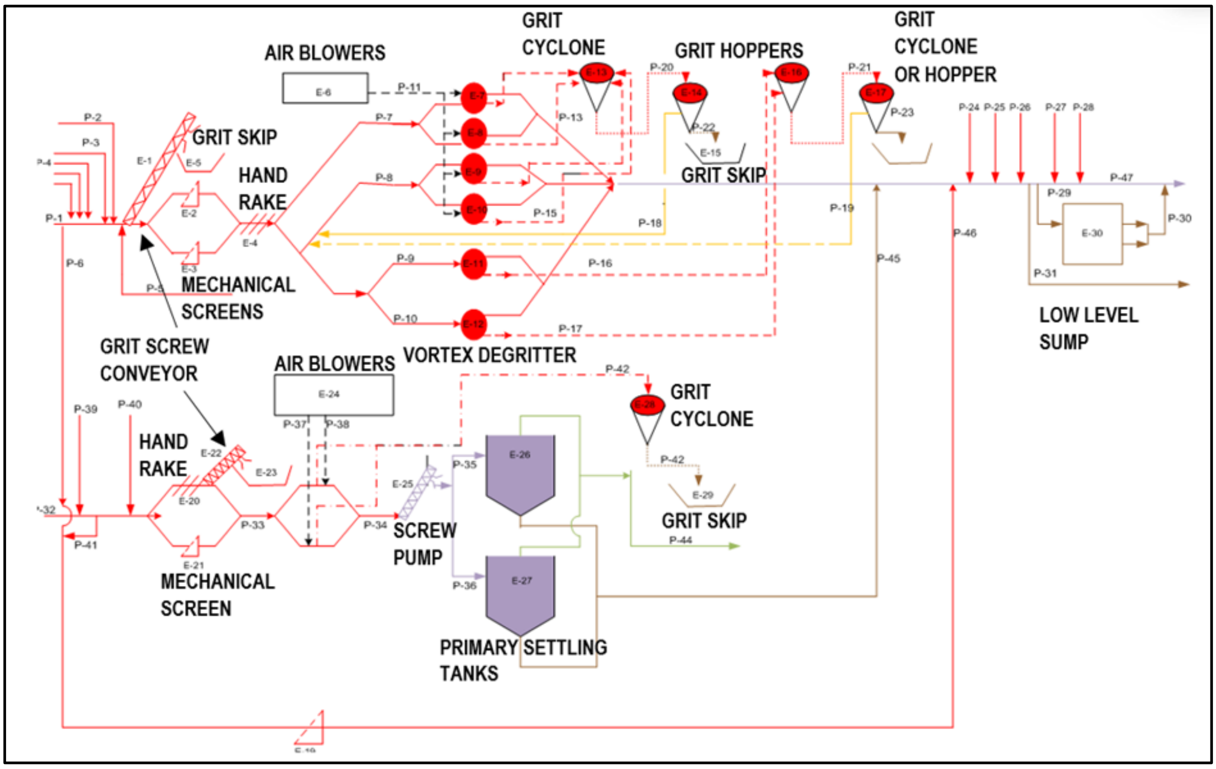

Figure 19.98 Southern WWW Process Flow Diagram

The Southern WWW catchment is illustrated in **Figure 19.99**.

The characteristics of the Southern WWW are described in **Table 19.22**.

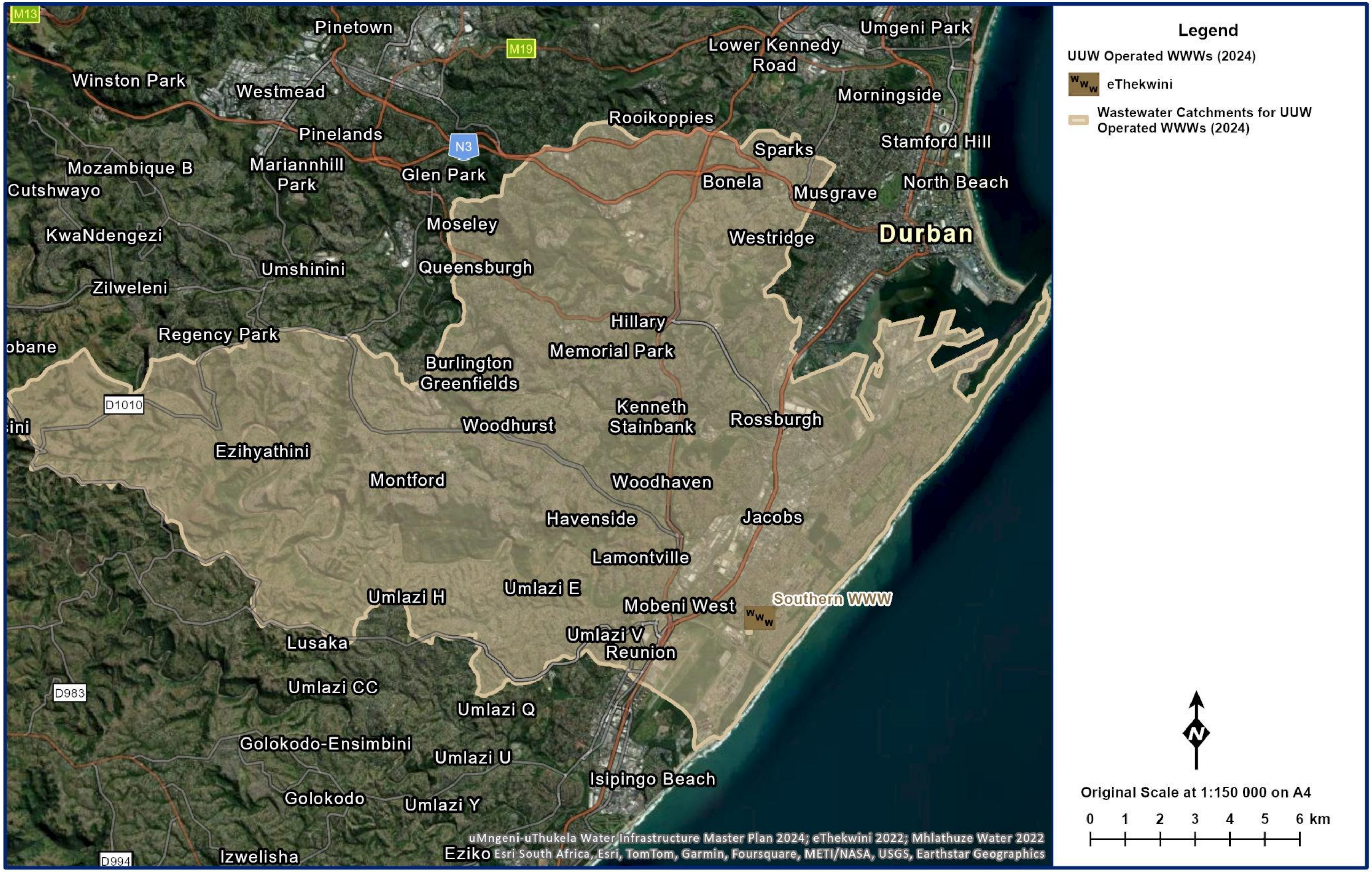

Figure 19.99 Southern WWW catchment.

Table 19.22 Southern WWW infrastructure.

WWW Name:	Southern WWW
System:	Southern
Maximum Design Capacity:	135 Mℓ/day
Current Utilisation:	101 Mℓ/day
Raw Sewage Pump Station:	N/A
Screens:	1x hand raked, 3 x mechanical
Grit Chambers:	6 vortex degritters, 4 grit hoppers
Number of PSTs	2
Total area of PSTs	1630 m^2
Total capacity of PSTs	19792 m^3
Upflow Rate	1.5 m/h
Aeration Basin:	N/A
Aeration Basin Capacity:	N/A
Aerators:	N/A
Clarifier Type:	N/A
Number of Clarifiers:	N/A
Total Area of all Clarifiers:	N/A
Total Capacity of Clarifiers:	N/A
Upflow Velocity:	N/A
RAS Pump Station:	N/A
Chlorine Storage Capacity:	N/A
Chlorine Dosing Capacity:	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The Genset is operational but does not cover the low level sump pumps. This is a concern as it poses a health and environmental risk to the public in the event of a power outage. No mechanical screens are currently operational on both the Jacobs and Chatsworth lines. Challenges with the mechanical screens have been a long-standing item. This is serious concern for downstream processes and the receiving environment. All primary settling tanks are operational. One (1) out of four (4) low level sump pumps are operational

Southern WWW has a design capacity of 135 Mℓ/day and is currently treating 101 Mℓ/day based on the average flow over the last 12-months (**Figure 19.100**). There is a distinct drop in inflow during the dry winter months, which increases during the summer rainfall season. This increase is most likely due to storm water ingress and groundwater infiltration into the sewer network

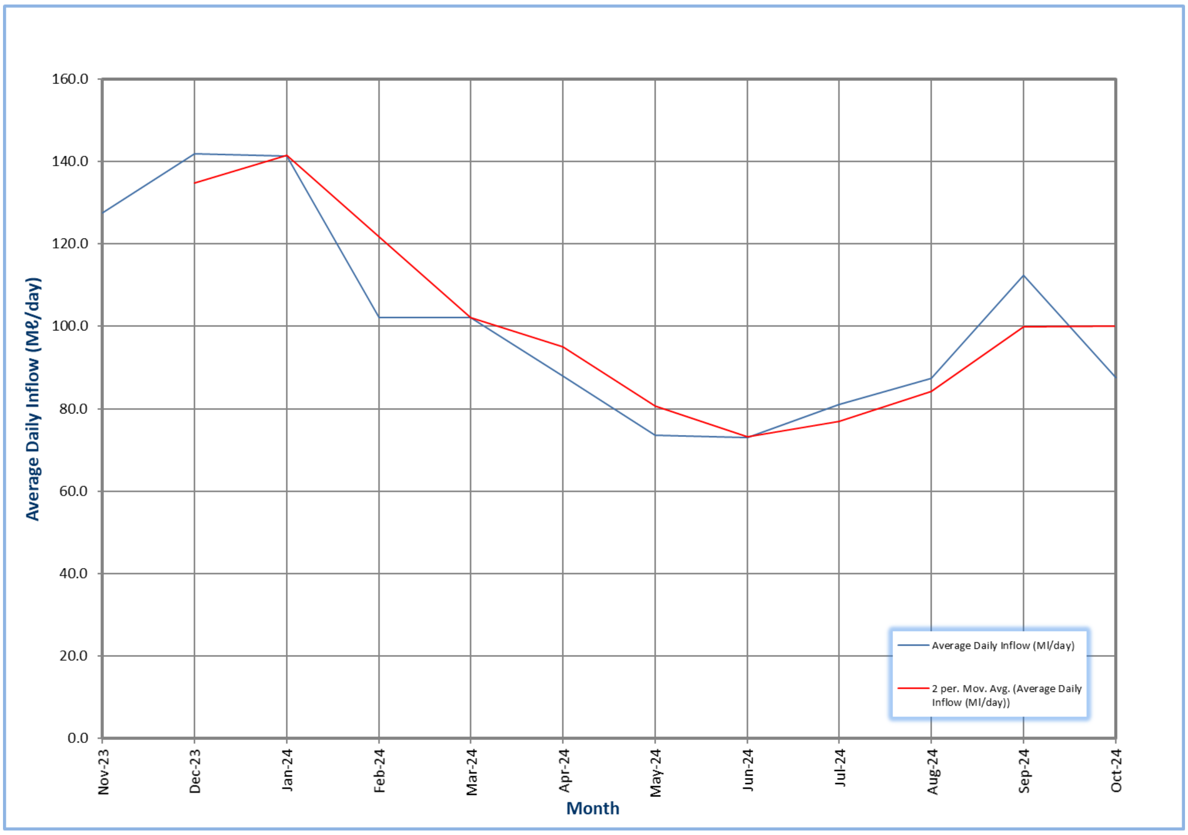

Figure 19.100 Average daily inflows to Southern WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Southern WWW is presented in (**Figure 19.101**). It shows that for 3.0 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 0.8 % of the time. The plant currently has ample capacity in relation to the current demand.

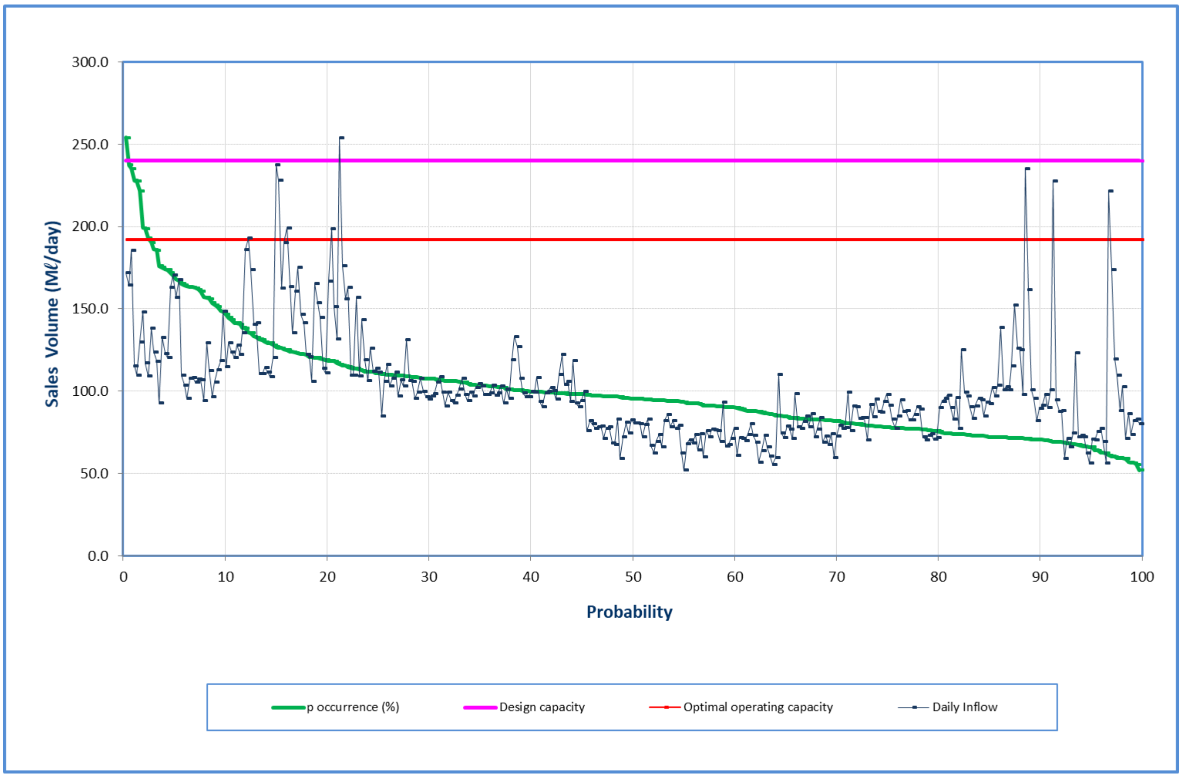

Figure 19.101 Analysis of historical production at Southern WWW (November 2023 to October 2024)

c) Recommendations

The mechanical equipment is in serious need of repair and or replacement.

The Southern WWW has a design capacity of 230 Mℓ/day. The future growth analysis indicated that the WWW would require a future upgrade in 2040 based on the population growth scenario. However, it was noted by EWS that the southern WWW catchment area is currently very densely populated and it is not envisaged that the population would increase substantially within the next 25 years. Therefore, no upgrade is required for the Southern WWW for the foreseeable future.

19.3.16 Umbilo Wastewater Works

a) Description

The Umbilo WWW is located in the Central Coastal area of eThekwini Municipality. Umbilo WWW treats mainly domestic effluent from the surrounding residential areas. It is a 23 Mℓ/day plant consisting of a new portion as well as an old. The current utilisation is 9.9 Mℓ/day and spare capacity is 13 Mℓ/day. The new plant (West) is an activated sludge plant and the old plant (East) is a biofilter plant.

The incoming raw sewage is screened and degritted. Raw sewage entering the new plant undergoes primary treatment. Primary effluent feeds into an aeration basin. The activated sludge is settled out in the clarifiers. Secondary effluent leaving the clarifiers is disinfected using chlorine within an underground contact chamber.

Raw sewage entering the old plant is distributed to six Dortmund tanks. Here raw sludge is settled out and primary effluent leaving the Dortmund tanks are distributed to the trickling filters. Treatment occurs as the primary effluent runs over the biofilm attached to the packing material within the filters. Biofilter effluent exits through the exit drains and enters the humus tanks where the biomass is settled out. This is returned to the Dortmund tank distribution box. Secondary effluent from the humus tanks enters an underground contact chamber where it is disinfected. Raw sludge from the PST's is combined with waste activated sludge that is thickened by a DAF unit. This stream is further combined with the raw sludge produced by the Dortmund tanks. The sludge is digested in primary and secondary digesters. The process flow is summarised in **Figure 19.102**.

The effluent is discharged into the Umbilo River. The sludge is currently being dewatered via a belt press and taken to a landfill or stockpiled on site when the landfill is not available.

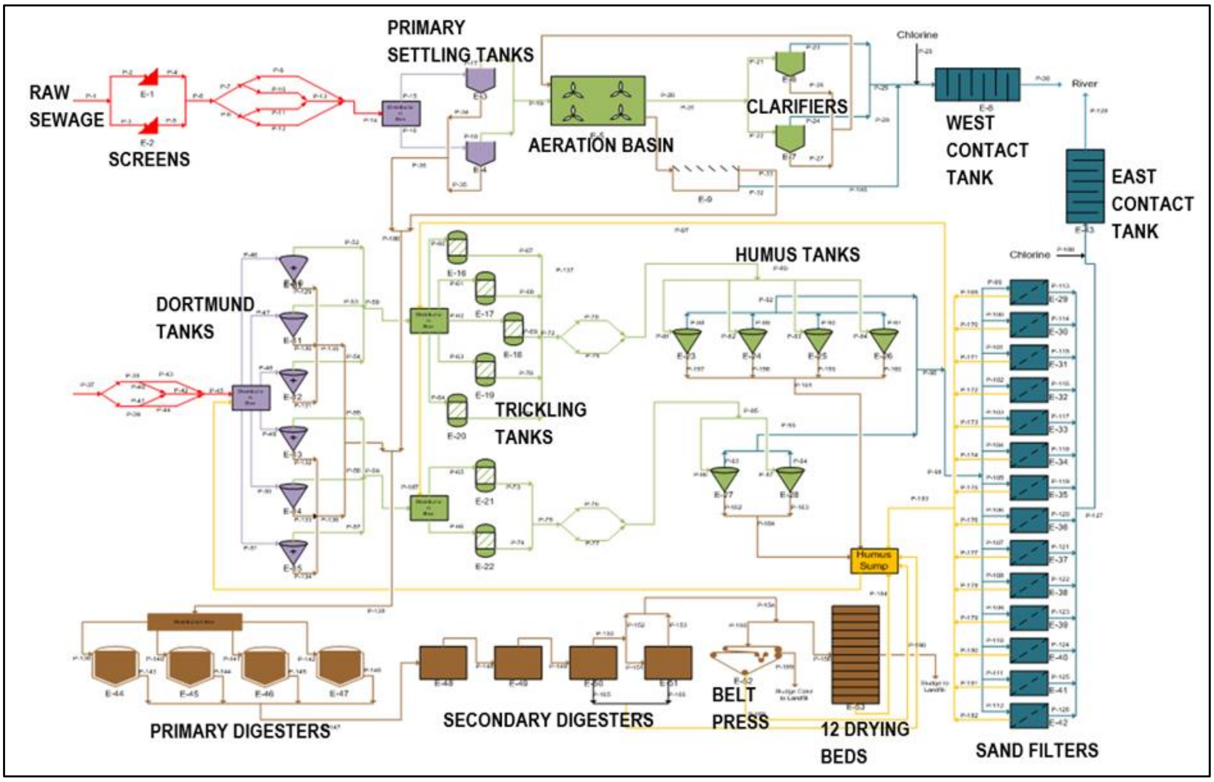

Figure 19.102 Umbilo WWW Process Flow Diagram.

The Umbilo WWW catchment is illustrated in **Figure 19.103**. The characteristics of the Umbilo WWW are described in **Table 19.23**.

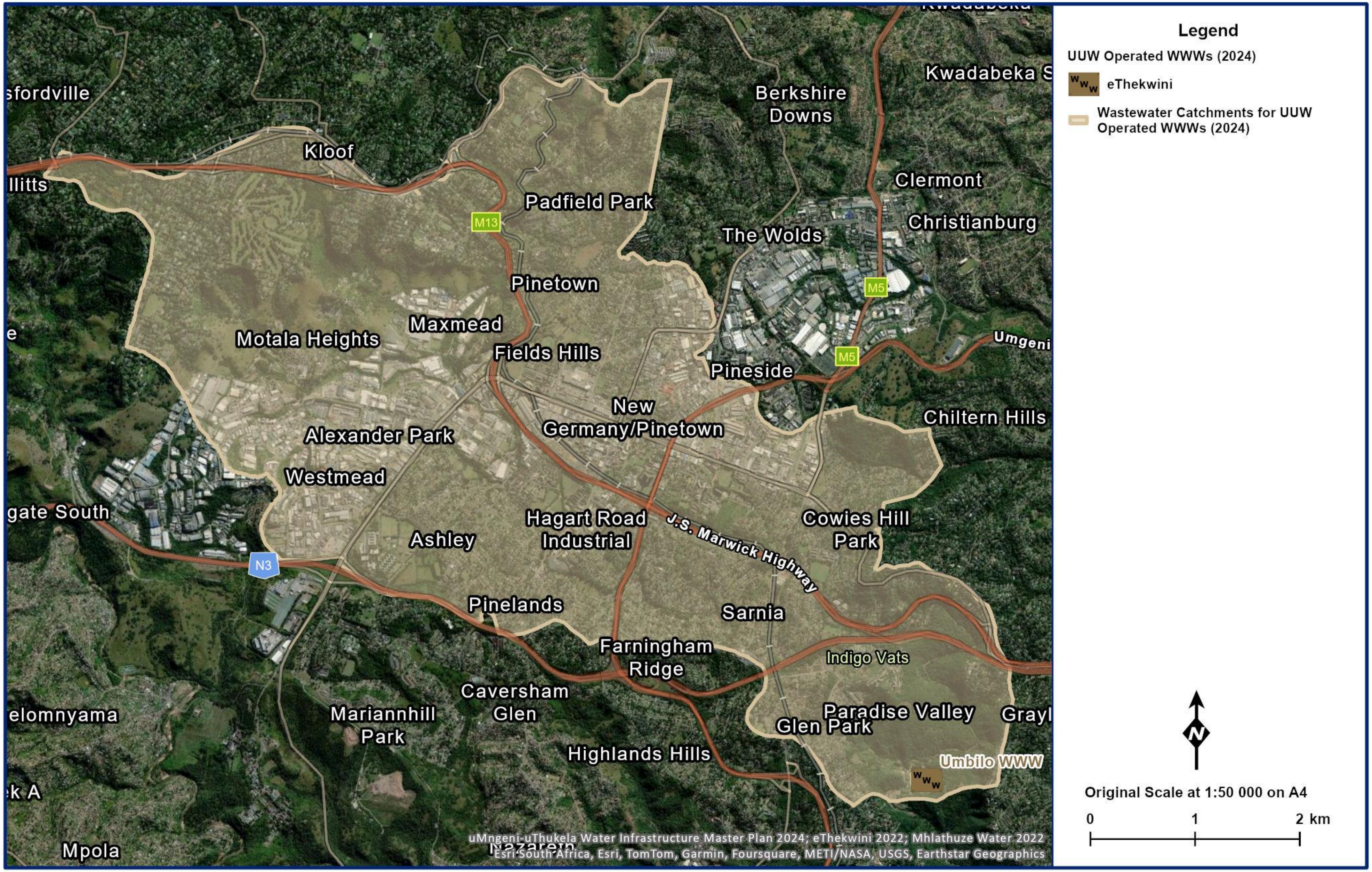

Figure 19.103 Umbilo WWW catchment.

Table 19.23 Umbilo WWW infrastructure.

WWW Name:	Umbilo WWW
System:	Southern
Maximum Design Capacity:	23 Mℓ/day
Current Utilisation:	9.9 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	One hand-racked 11 mm gap bar screen (old plant) One mechanical step screen (new plant)
Grit Chambers:	Six grit channels (3 each)
Grit Clarifier Type	N/A
Number of PSTs	10
Total Area of PSTs	1306 m^2
Total Capacity of PSTs	47 Mℓ/day
Upflow Rate:	1.5 m/h
Aeration Basin:	Biofilters (old plant), Activated Sludge (new plant)
Number of Aeration Basins	One (2 lanes) – new plant
Aeration Basin Capacity:	13 770 m^3
Aerators:	4 aerators (each 75 kW)
Total Aeration Capacity	10 Mℓ/day
Clarifier Type:	Humus Tanks (old plant), Suction Lift Clarifier (new plant)
Number of Clarifiers:	6 x Humus Tanks, 2 x Clarifiers
Total Area of all Clarifiers:	570 m^2 (Humus Tanks) and 1608 m^2 (Clarifiers)
Total Capacity of Clarifiers:	28 and 29 Mℓ/day
Upflow Velocity:	1 and 0.75 m/h
RAS Pump Station:	2 (T-series Gormann Rupp) and 2 x Screw Pumps (new plant)
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	2970 kg
Chlorine Dosing Capacity:	10 kg/h (for each plant)
Chlorine Contact Tanks	N/A
Total Capacity of Chlorine Contact Tanks:	N/A
Contact Time	N/A
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The mechanical screens at both East and West Plants have been offline for a long period of time. The two manual screens on the East Plant and one manual screen on the West Plant are currently used by operations staff for removal of screenings. Screenings are collected in skips and buried on site. Grit is removed from the three manual grit channels on the East Plant and four manual grit channels on the West Plant. Grit is collected in wheelbarrows and buried on site with screenings. The disposal of screenings and grit at the Works is against environmental regulations and may lead to groundwater contamination.

In the East Plan three of the six Dortmund tanks are offline. One of the PSTs on the West plant is off-line due to problems with the bridge. There has been significant accumulation of sludge in the PSTs and Dortmund tanks due to the desludging and dewatering bottlenecks at the plant. As a result, the primary sludge has become septic.

Three of the biofilters are not operational. Screenings have caused blockages in the biofilters media, resulting in ponding. The effluent is not efficiently distributed by the rotating arms. Three of the humus tanks are off-line. The quality of the secondary effluent is poor due to the high concentration of solids.

In the West plant only one aerator out of four is working. The lack of aeration has had a detrimental effect on the sludge. The high sludge age due to dewatering bottlenecks as well as a lack of aeration has resulted in the sledge turning pitch black in colour and producing an offensive odour. One of the Archimedes screw pumps is also off-line. The clarifiers are also producing effluent with high suspended solids.

Sludge is not being digested as there is minimal desludging of PSTs. Three of the four mixing pumps in the primary digesters are off-line. Only one of the primary digesters has a scouring facility and there is no gas flare at the works. The belt press is also not operational.

Umbilo WWW has a design capacity of 23 Mℓ/day and is currently treating 9.9 Mℓ/day based on the average flow over the last 12-months (**Figure 19.104**).

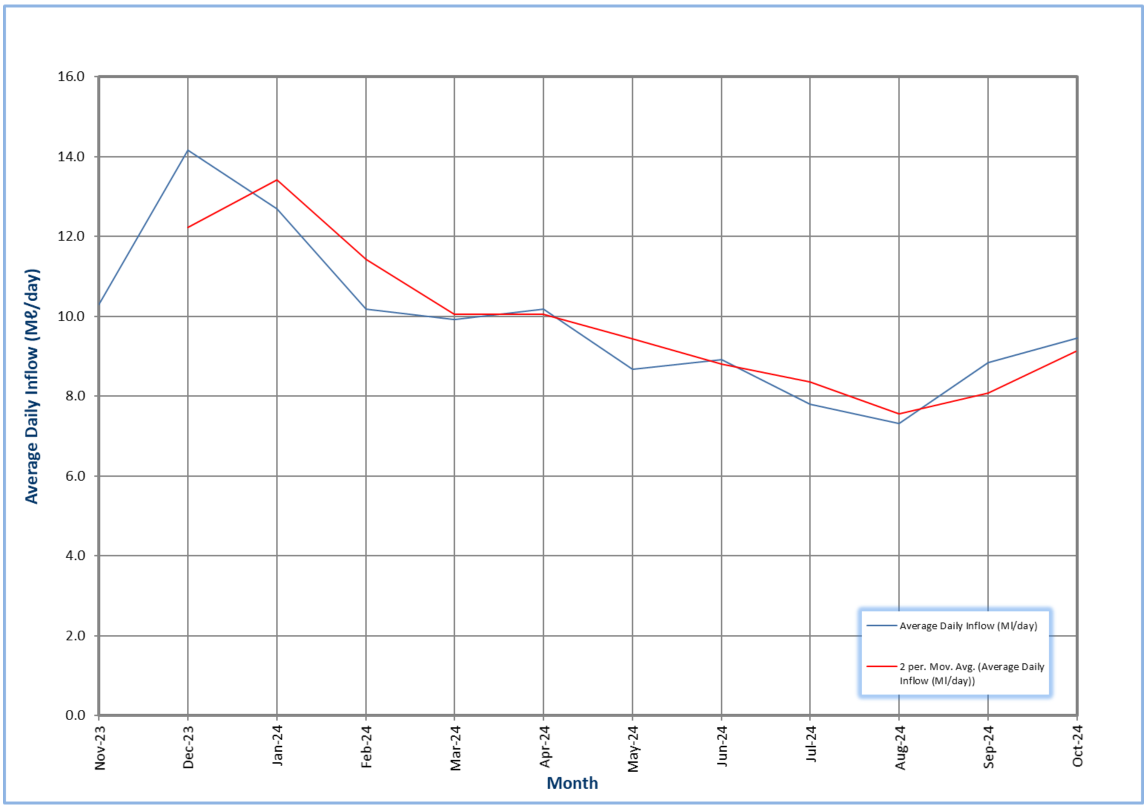

Figure 19.104 Average daily inflows to Umbilo WWW (Mℓ/day).

The new plant (West) receives 70% of the flow, with an average influent of only 2.2 Mℓ/day entering the old (East) plant.

An analysis of daily historical production (November 2023 to October 2024) of the Umbilo WWW is presented in (**Figure 19.105**). It shows that for 3.0 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 1.6 % of the time. The plant currently has ample capacity in relation to the current demand.

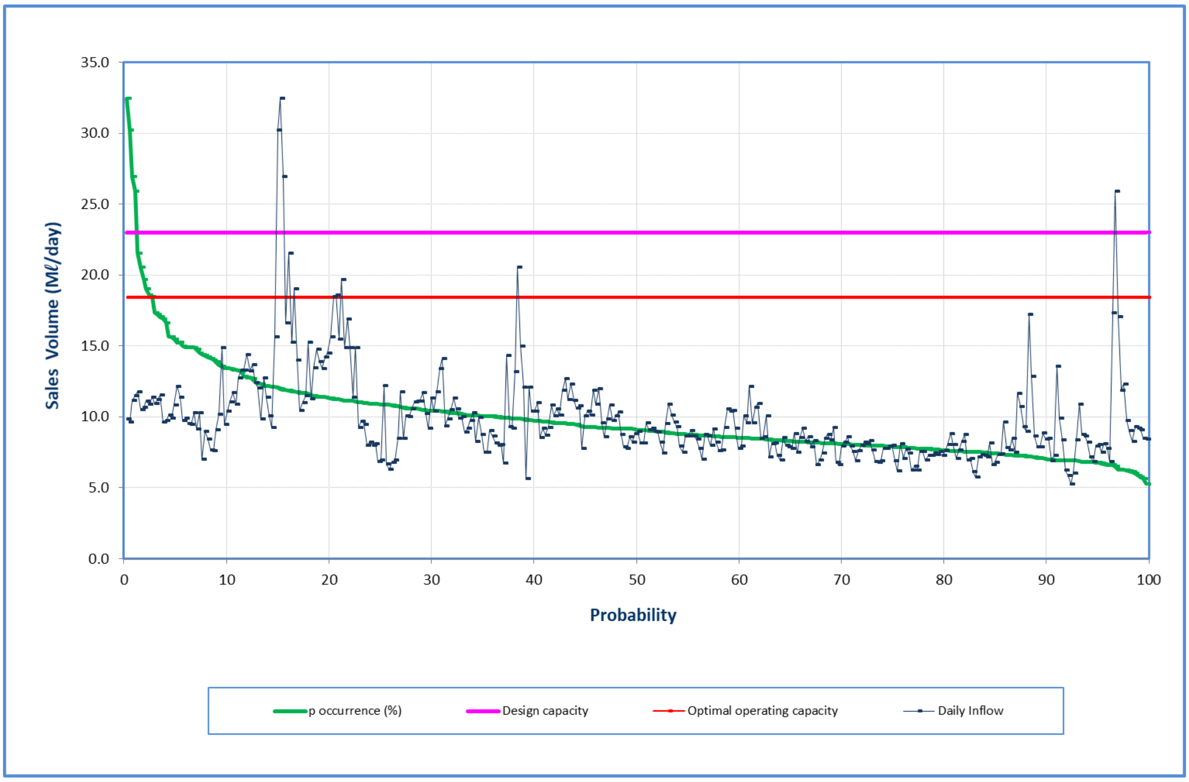

Figure 19.105 Analysis of historical production at Umbilo WWW (November 2023 to October 2024)

c) Recommendations

The plant is in need of a major intervention to return unit processes back to work. The lack of adequate sludge removal and management is preventing the proper function of the plant, which is resulting in poor effluent quality.

Based on the EWS future growth analysis, Umbilo WWW will not require an upgrade for the next 25 years.

19.3.17 Umhlanga Wastewater Works

a) Description

The Umhlanga Wastewater Works is an extended aeration activated sludge plant. The plant has a maximum design capacity of 6.8 Mℓ/day and is located in the Umhlanga area within the Northern Coastal area of eThekwini Municipality. The Umhlanga WWW catchment is illustrated in **Figure 19.107**. Raw sewage entering the works is screened and then degritted via degrit channels before it enters the aerations basins. Mixed liquor then enters two clarifiers where the sludge is settled out. The secondary effluent overflows into a pond system where it is disinfected using chlorine gas before it is discharged to Ohlanga River/Estuary. Any sewage above the design capacity is pumped to Phoenix WWW. Some of the settled sludge in the clarifiers is returned to the aeration basins. The remaining sludge is wasted to a centrifuge where it is dewatered and sent to Phoenix WWW. The process flow is summarised in **Figure 19.106**.

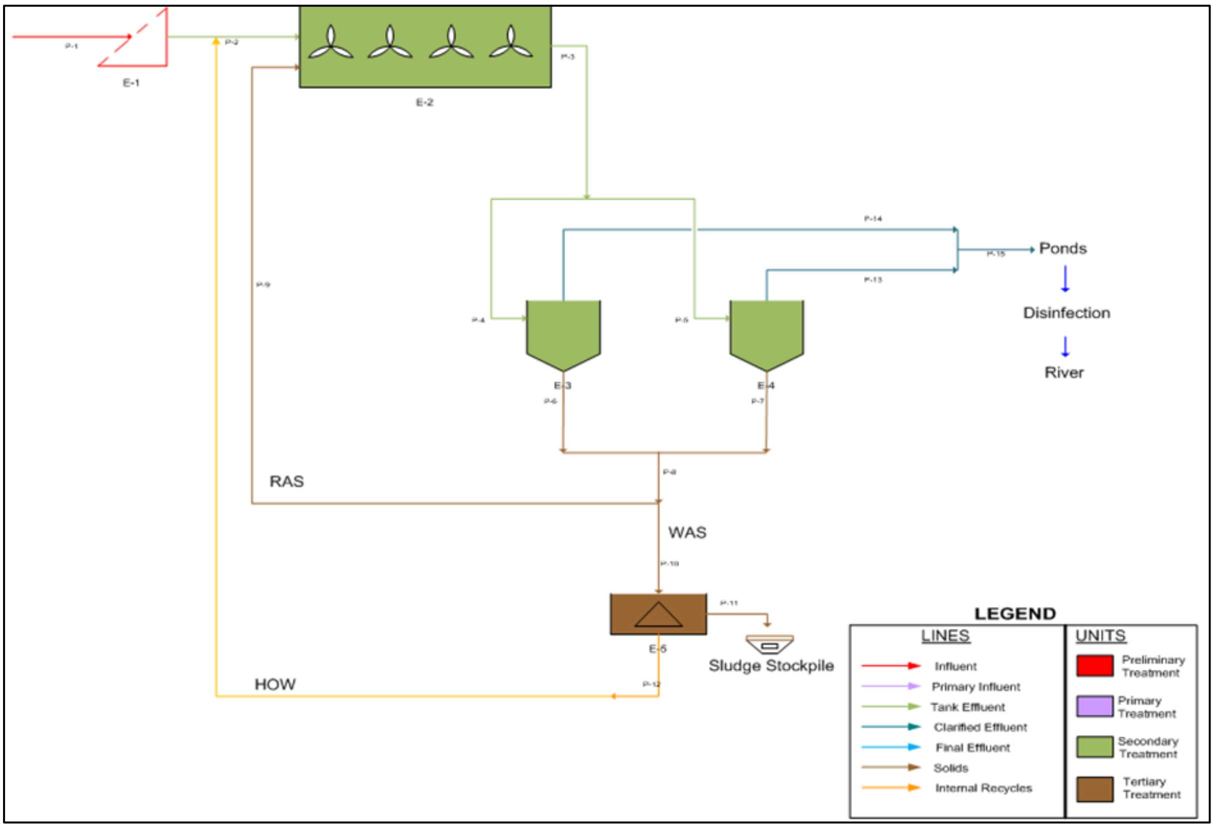

Figure 19.106 Umhlanga WWW Process Flow Diagram.

The characteristics of the Umhlanga WWW are described in **Table 19.24**.

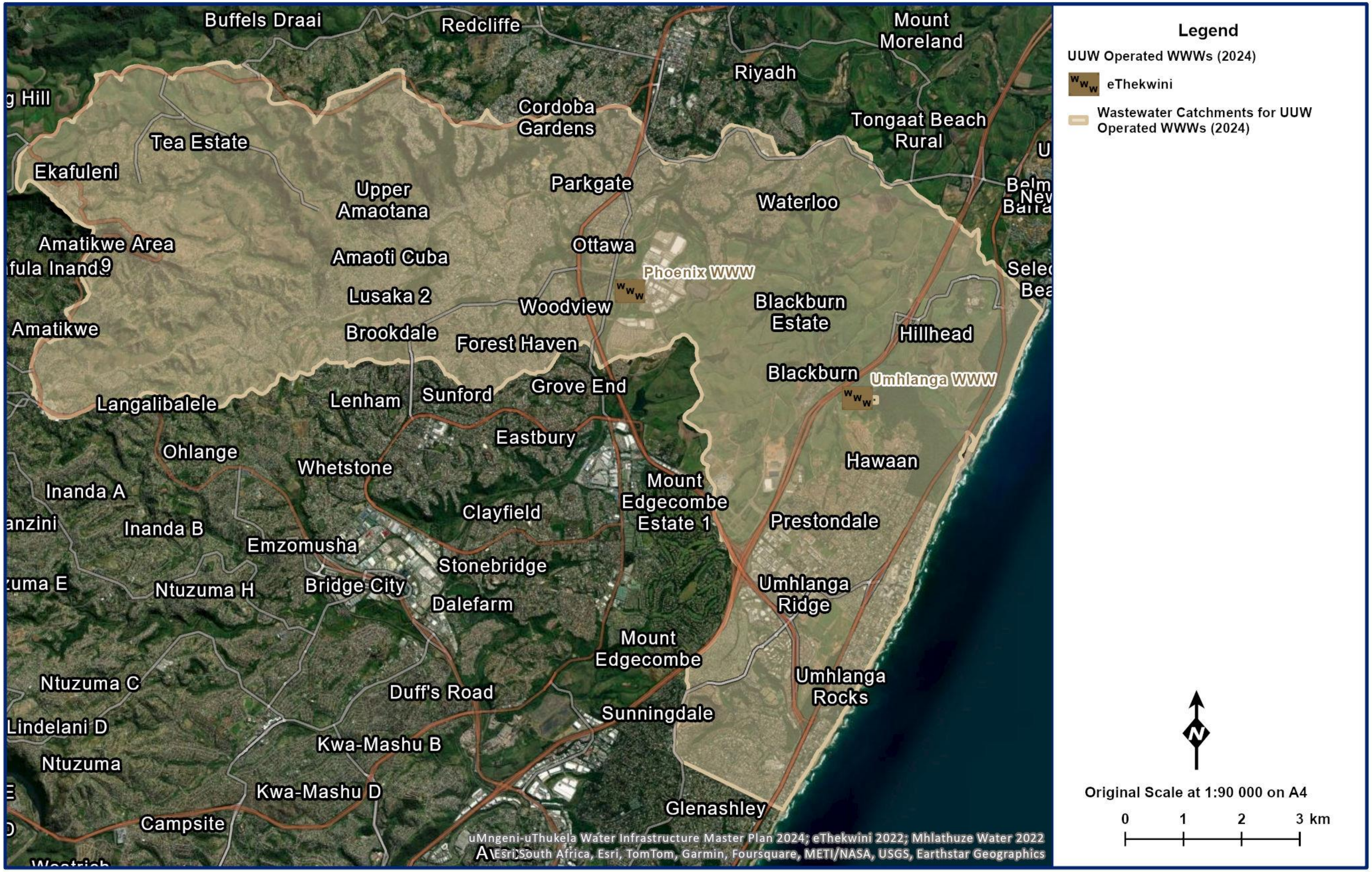

Figure 19.107 Phoenix/Umhlanga WWW catchment.

Table 19.24 Umhlanga WWW infrastructure.

WWW Name:	Umhlanga WWW
System:	Northern
Maximum Design Capacity:	6.8 Mℓ/day
Current Utilisation:	1.31 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	Two hand-raked 11 mm bar screens
Grit Chambers:	Inlet channels (4 No) operated as grit channels
Aeration Basin:	Activated sludge
Number of Aeration Basins	Two (2 lanes per aeration basin)
Aeration Basin Capacity:	7400 m^3
Aerators:	12 aerators (each 22 kW)
Total Aeration Capacity	6.8 Mℓ/day
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	2
Total Area of all Clarifiers:	628 m^2
Total Capacity of Clarifiers:	9.4 Mℓ/day
Upflow Velocity:	0.625 m/h
RAS Pump Station:	2 (screw pumps)
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	140 kg
Chlorine Dosing Capacity:	2 kg/h
Chlorine Contact Tanks	4 x Maturation Ponds (which are dosed)
Total Capacity of Chlorine Contact Tanks:	3477 m^2
Contact Time	12.17 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The wastewater works is running at 25% capacity having not been operational since the April 2022 floods, which caused severe damage to the works. Since taking over the operation of the works, UUW has implemented a number of improvements that have brought the works back online, although at a reduced capacity. Considerable work still needs to be undertaken to get the works back to its design capacity. Currently only one of the two clarifiers is operational and several of the mechanical surface aerators are not working. The maturation ponds are in a poor state. The floods resulted in the massive deposition of dune sand into the ponds, which has rendered them largely dysfunctional. UUW is currently excavating the ponds in order to return them to working order.

Umhlanga WWW has a design capacity of 6.8 Mℓ/day and is currently treating 1.3 Mℓ/day based on the average flow over the last 12-months (**Figure 19.108**). The plant became operational in March 2024 (following flood damage) when uMngeni-uThukela Water began operating it.

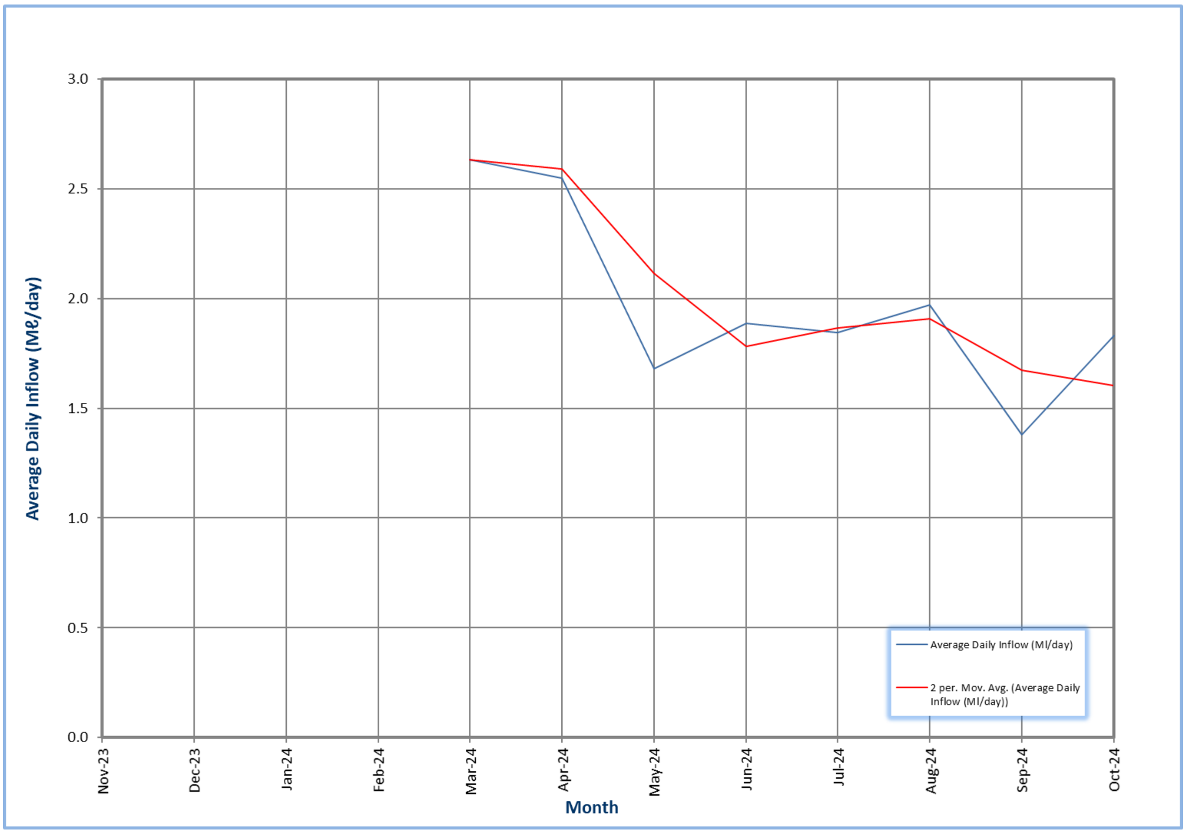

Figure 19.108 Average daily inflows to Umhlanga WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Umhlanga WWW is presented in (**Figure 19.109**). It shows that for 0.0 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 0.0 % of the time. The plant currently has ample capacity in relation to the current demand.

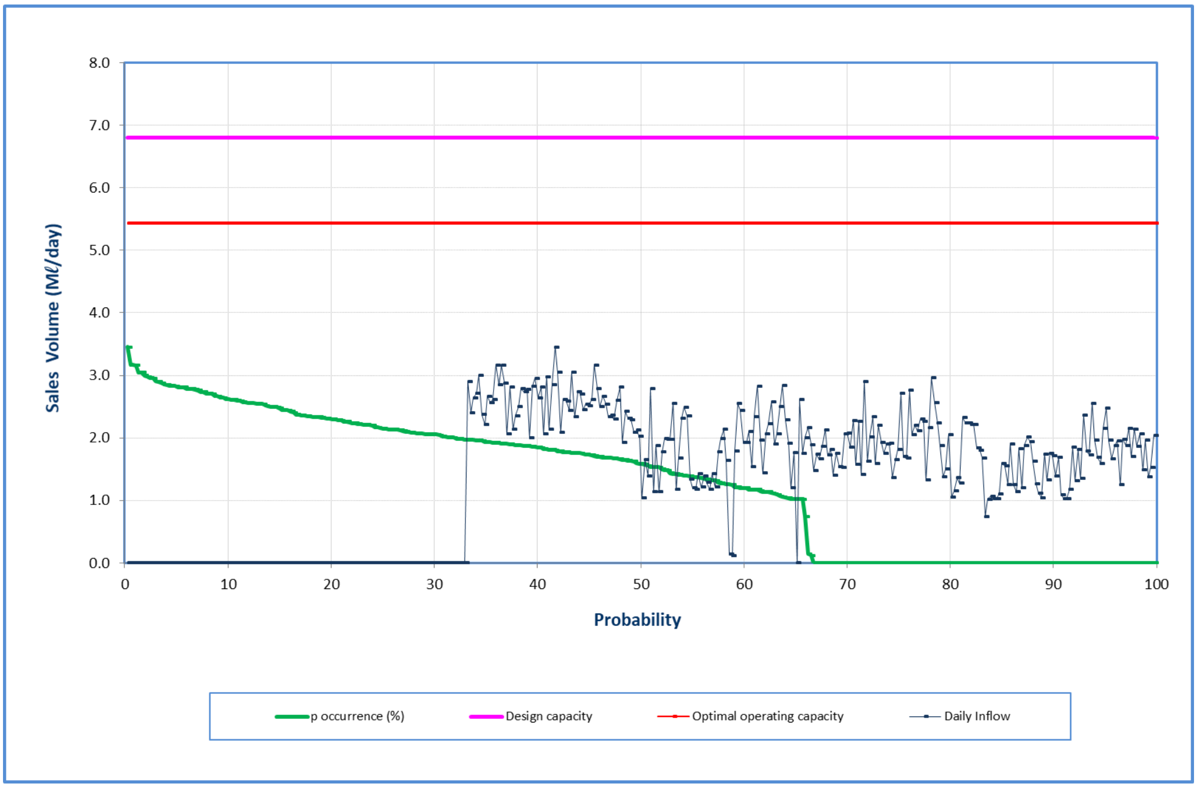

Figure 19.109 Analysis of historical production at Umhlanga WWW (November 2023 to October 2024

c) Recommendations

UUW continues to undertake refurbishment of the Umhlanga Wastewater Works in order to return it to full operational capacity.

Based on the EWS future growth analysis, Umhlanga WWW will exceed its 5 Mℓ/day treatment capacity by 2035. It is recommended that the remaining flow growth in the catchment is pumped to Phoenix WWW.

19.3.18 Phoenix WWW

a) Description

Phoenix WWW is a conventional aeration activated sludge plant with Digestion located in the Ottawa area within the Northern Coastal area of eThekwini Municipality. It is approximately 35 km north of Durban, bounded by the Ohlanga River and the Cornubia Business Park. The Phoenix WWW catchment is illustrated in **Figure 19.111**.

The maximum design capacity for this plant is 50 Mℓ/day. The treatment process is biological nutrient removal using Activated Sludge. Incoming sewage is screened and degritted before undergoing primary treatment. Primary effluent feeds into a surface aeration basin. The activated sludge is settled out in the clarifiers. Secondary effluent then enters the three-pond system where it is disinfected at the exit before entering the river. Raw sludge from the PST's and waste activated sludge is digested and dewatered via belt press before it is disposed of onsite. The process flow is summarised in **Figure 19.110**.

The effluent is currently discharged into Umhlangana River thereafter it flows into the uMngeni estuary. Currently the sludge from this site is being used for agricultural purposes. A Future Disposal Plan for the plant is to be constructed for sludge drying and composting.

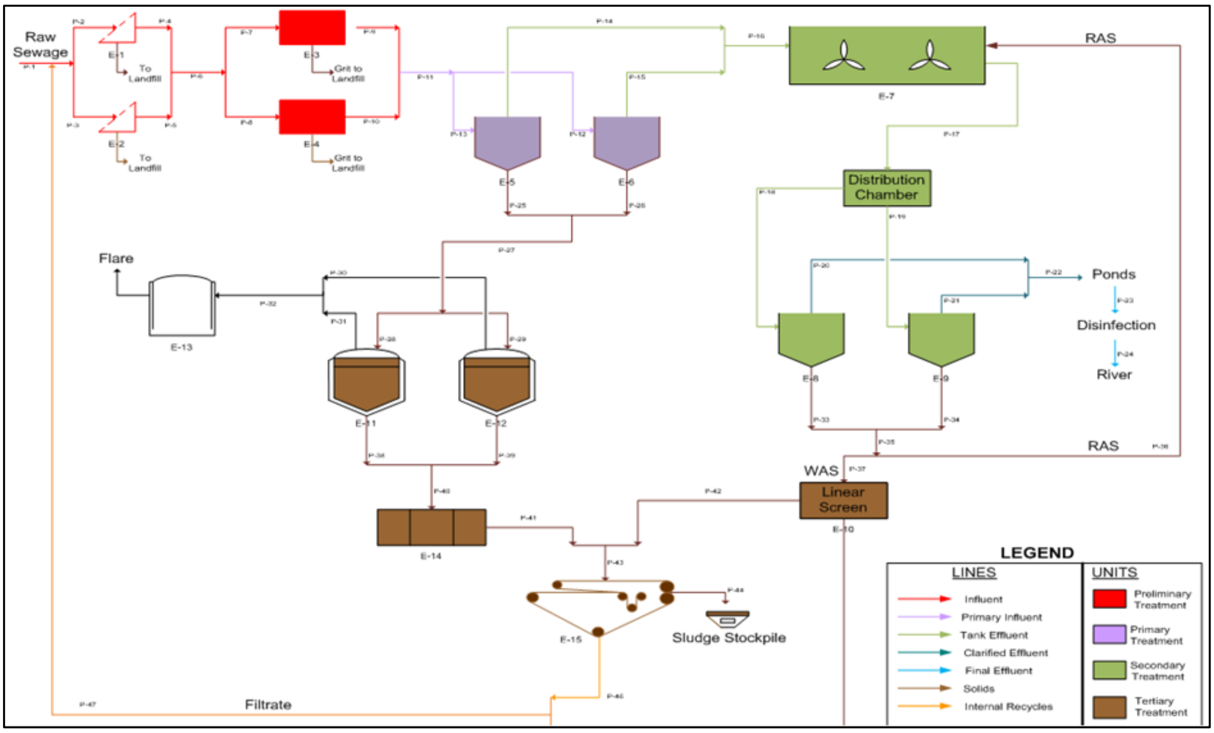

Figure 19.110 Phoenix WWW Process Flow Diagram.

The characteristics of the Phoenix WWW are described in **Table 19.25**.

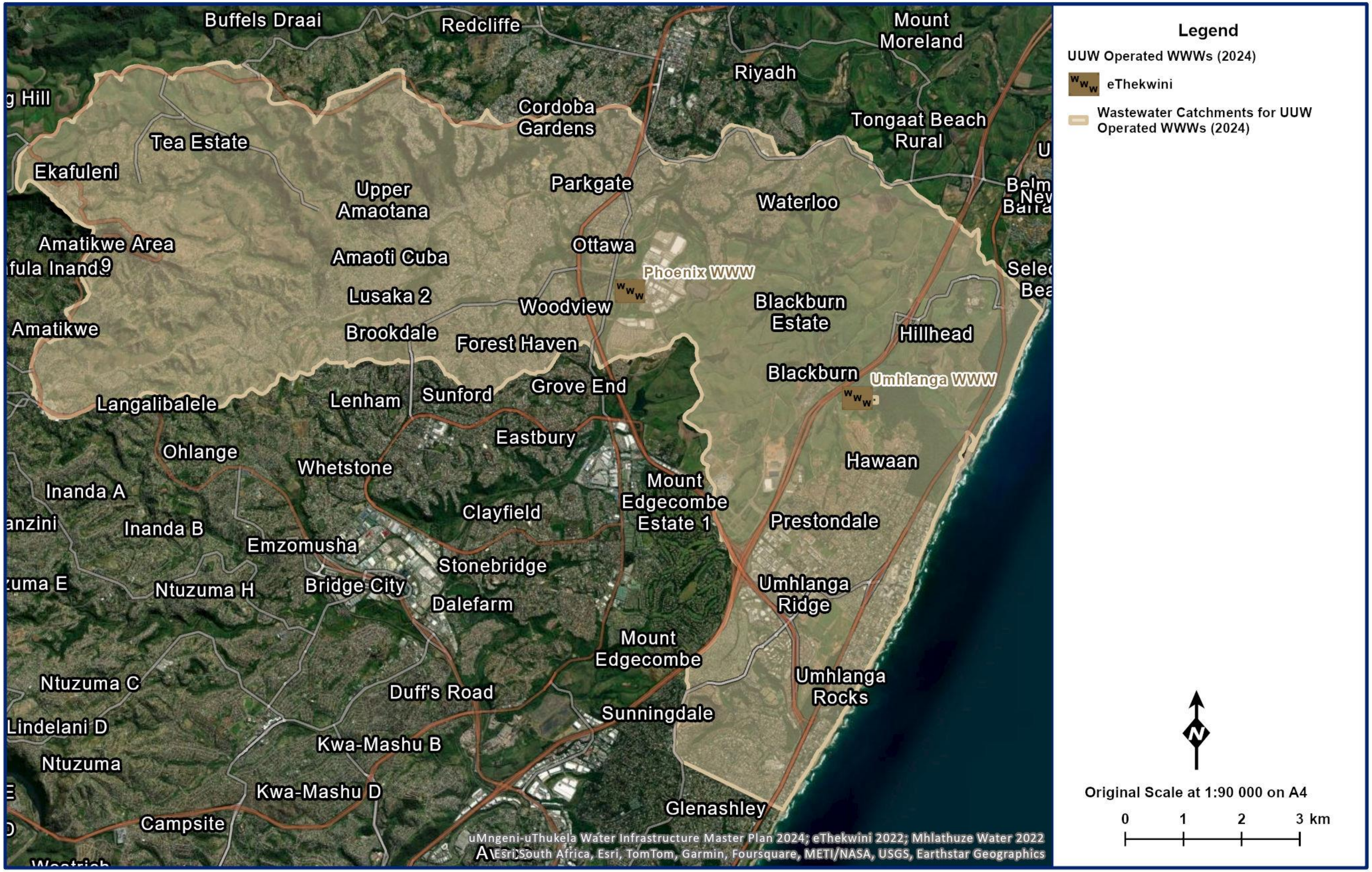

Figure 19.111 Phoenix WWW catchment.

Table 19.25 Phoenix WWW infrastructure.

WWW Name:	Phoenix WWW
System:	Northern
Maximum Design Capacity:	50 Mℓ/day
Current Utilisation:	19 Mℓ/day
Raw Sewage Pump Station No.	4
Screens:	Chain driven Mechanical Screens (2 No.)
Grit Removal:	Two Grit Chambers – Air blowers
Number of PSTs	4
Total Area of PSTs	2160 m^2
Total Capacity of PSTs	88 Mℓ/day
Upflow Rate	1.5 m/h
Aeration Basin:	Activated Sludge (BNR)
Number of Aeration Basins:	4
Total Area of Aeration Basins	6253 m^2
Aeration Basin Capacity:	50 Mℓ/day
Aeration Basin Volume:	29819 m^3
Aerators:	16 slow speed Hansen Patent (75, 75, 55, 55 kW per lane)
Clarifier Type:	Suction Lift
Number of Clarifiers:	6
Total Area of all Clarifiers:	5447 m^2
Total Capacity of Clarifiers:	114 Mℓ/day
Upflow Velocity:	0.875 m/h
RAS Pumps No:	3
RAS Pump Capacity (per pump)	25 Mℓ/day
Chlorine Storage Capacity:	7520 kg
Chlorine Dosing Capacity:	10 kg/h
Total Capacity of Chlorine Contact Tanks/Ponds	8092 m^3
Contact Time:	4 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The works is in need of refurbishment following the April 2022 flooding. When last reported on (2023) the two Primary Settling Tanks (PSTs) were off-line. In the activated sludge reactor 7 of 16 aerators are not working. There have been challenges with acquiring chlorine gas for dosing. HTH is often used for primary dosing. The second class water supply pumps are problematic. This affects second class water supply across the works. There is a significant accumulation of sludge in the ponds which has a negative impact on final effluent quality. There is also proliferation of flora in the ponds. As the ponds serve as the chlorine contact chamber their condition is not conducive to effective disinfection.

Phoenix WWW has a design capacity of 50 Mℓ/day and is currently treating 19.3 Mℓ/day based on the average flow over the last 12-months (**Figure 19.112**).

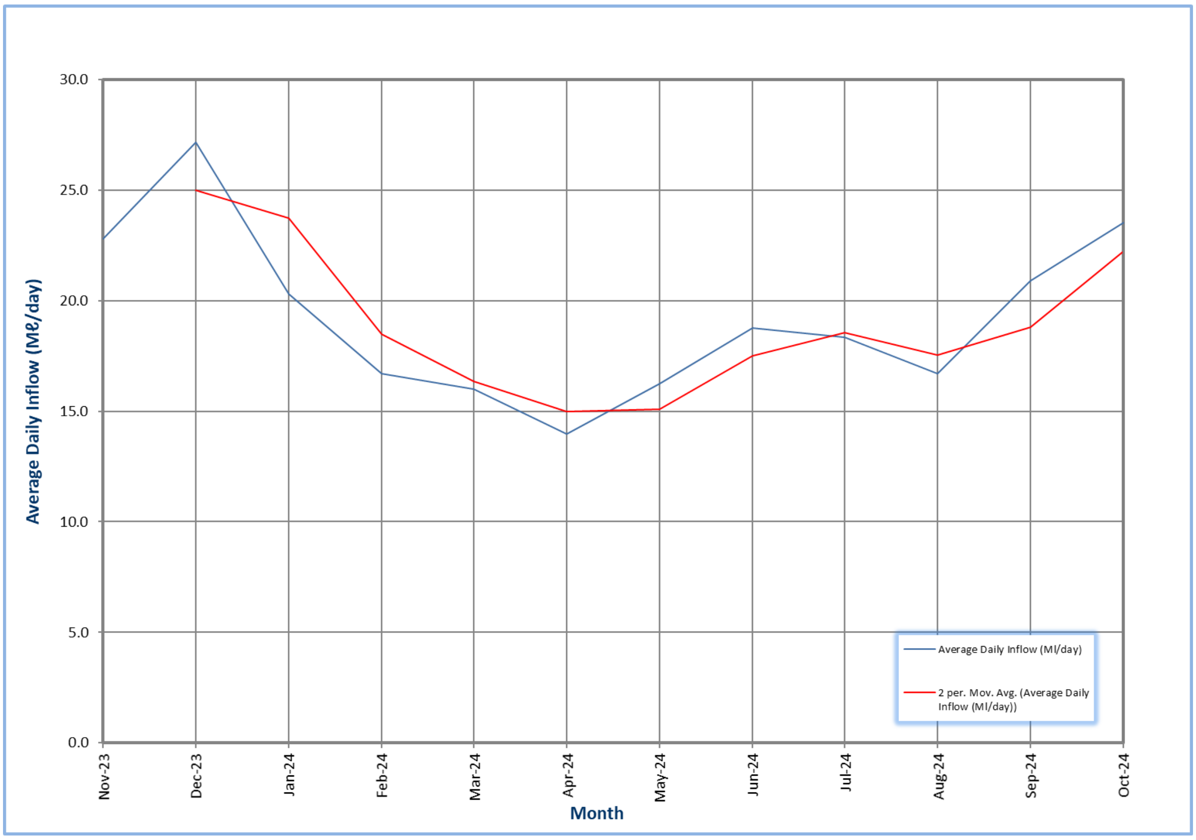

Figure 19.112 Average daily inflows to Phoenix WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Phoenix WWW is presented in (**Figure 19.113**). It shows that for 0.82 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 0.0 % of the time. The plant currently has ample capacity in relation to the current demand.

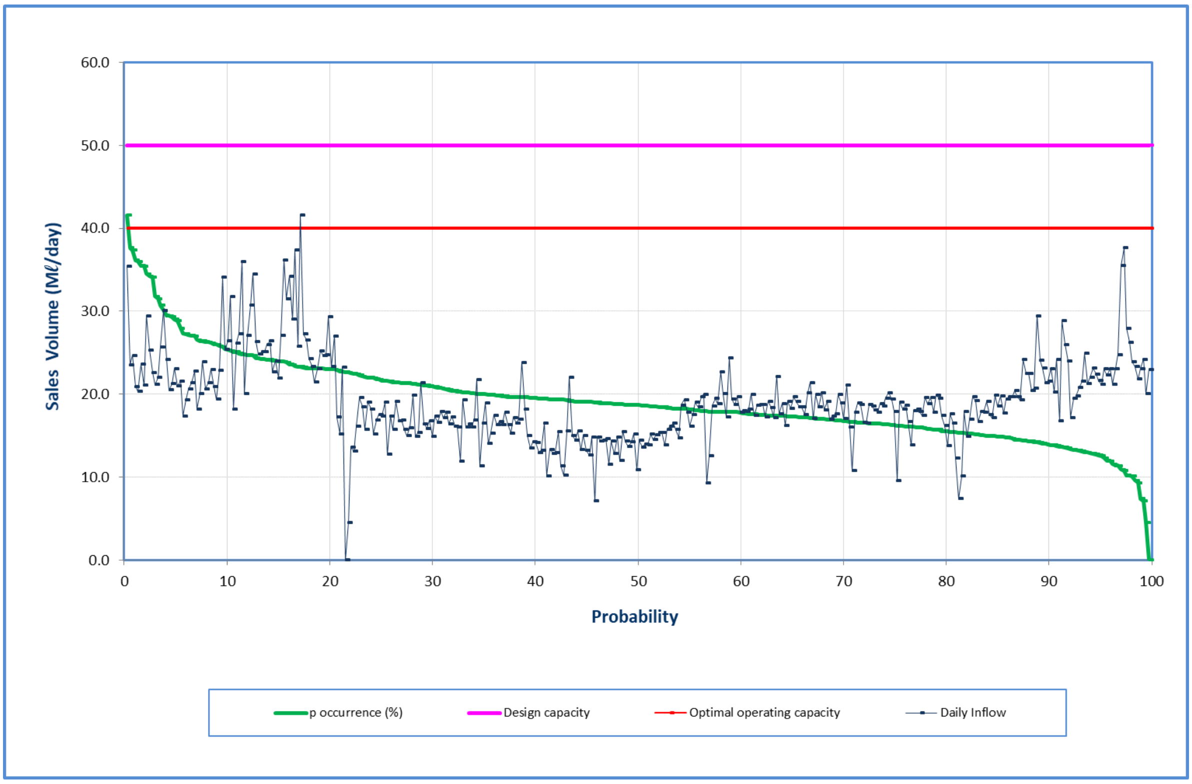

Figure 19.113 Analysis of historical production at Phoenix WWW (November 2023 to October 2024.

c) Recommendations

Based on the EWS future growth analysis, Phoenix WWW will be required to double in capacity by 2046. This substantial increase in capacity will be required in order to cater for planned developments and also to accommodate the flows that cannot be treated at Umhlanga WWW.

19.3.19 Umhlatuzana Wastewater Works

a) Description

Umhlatuzana WWW is an extended aeration activated sludge plant located in the Shallcross area within the Central Coastal region of the eThekwini Municipality. This WWW consists of two extended aeration plants (Marian Ridge and Shallcross). It has a maximum design capacity of 10 Mℓ/day with utilisation of 0.68 Mℓ/day. The incoming wastewater is primarily domestic with small amounts of industrial effluent. Incoming sewage is screened and degritted before entering the aeration basins. The activated sludge is settled out in the clarifiers. Secondary effluent then enters a small contact chamber where it is disinfected using chlorine gas prior to entering a pond. Final effluent is discharged into the Umhlatuzana River. The process flow is summarised in **Figure 19.114**

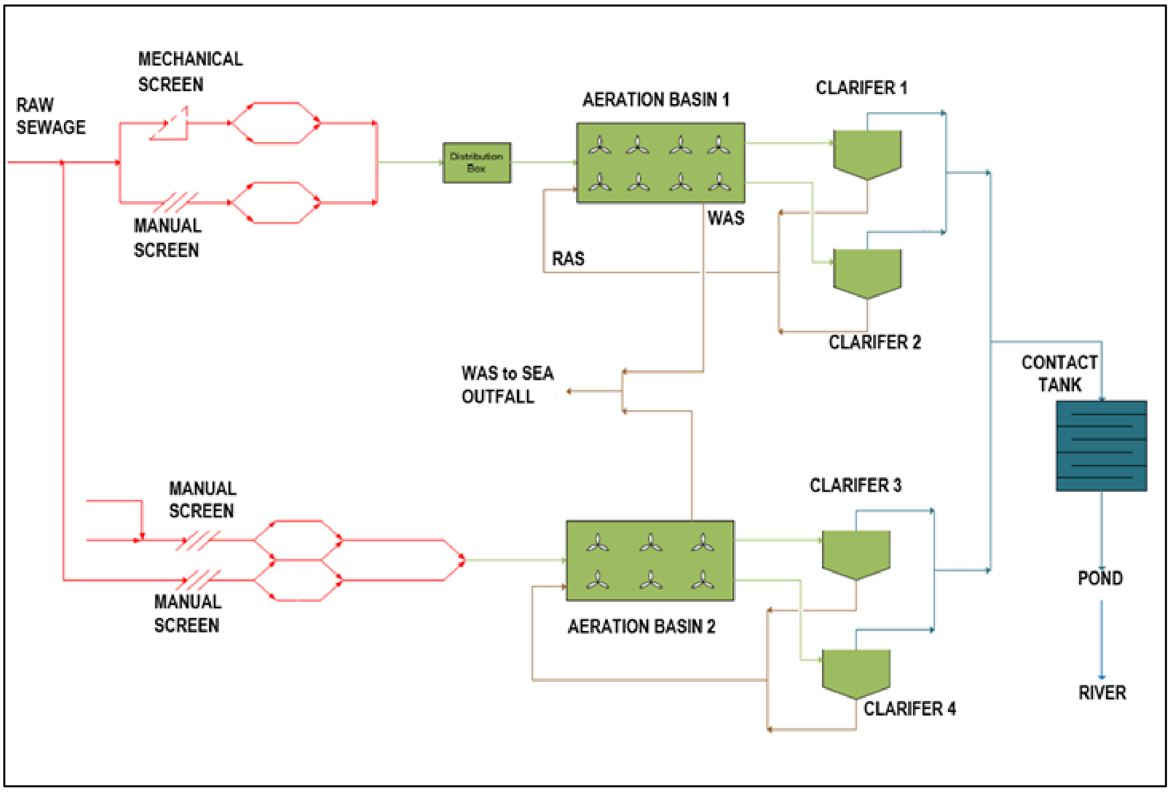

Figure 19.114 Umhlatuzana WWW Process Flow Diagram.

The Umhlatuzana WWW catchment is illustrated in **Figure 19.115**.

The characteristics of the Umhlatuzana WWW are described in **Table 19.26**.

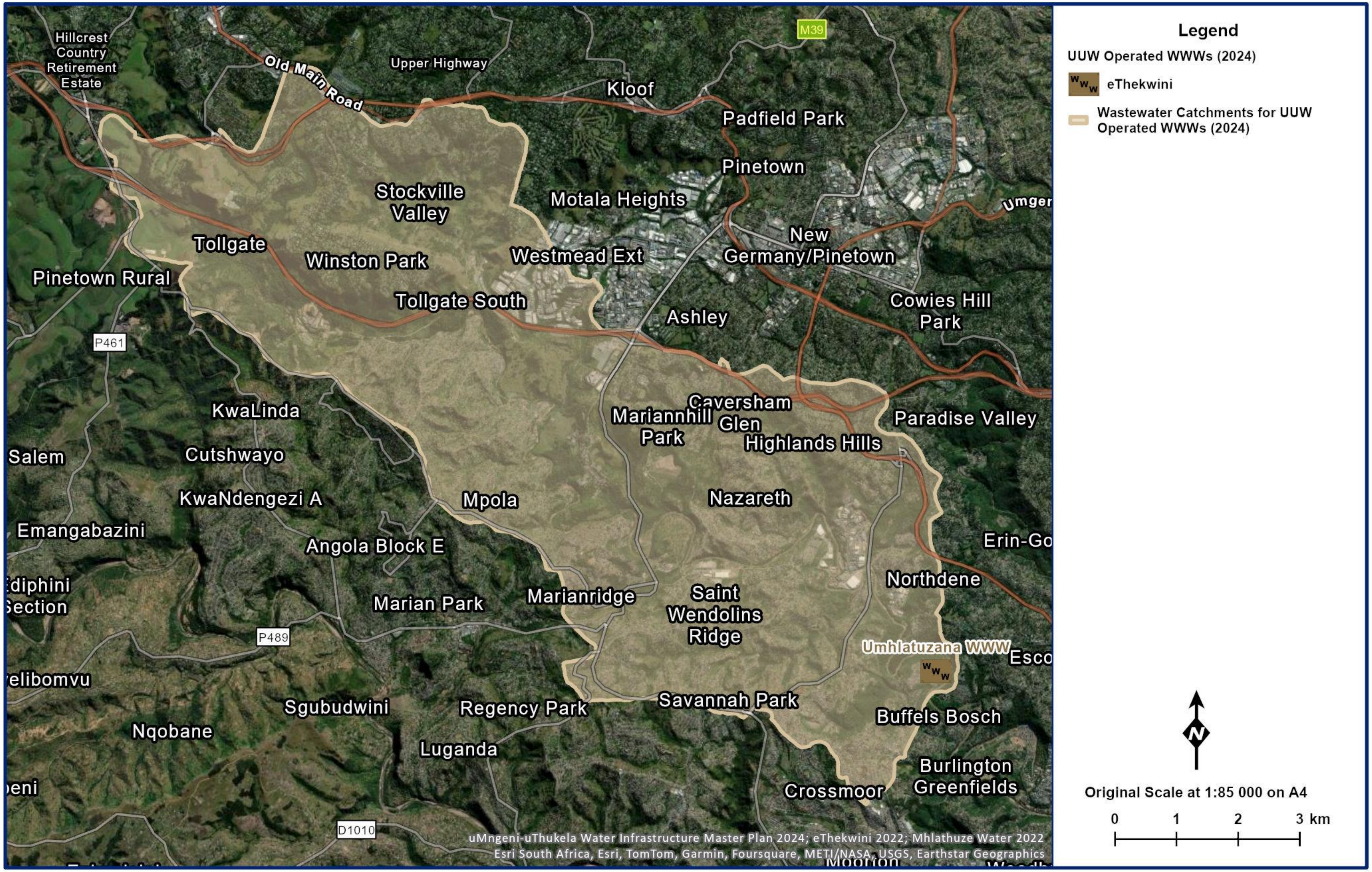

Figure 19.115 Umhlatuzana WWW catchment.

Table 19.26 Umhlatuzana WWW infrastructure.

WWW Name:	Umhlatuzana WWW (Marian Ridge & Shallcross)
System:	Central
Maximum Design Capacity:	10 Mℓ/day
Current Utilisation:	1.24 Mℓ/day
Raw Sewage Pump Station:	N/A
Raw Sewage Pump Capacity	N/A
Screens:	One Mechanical Step Screen, One bar screen
Grit Chambers:	Three grit channels ,Two grit channels
Grit Clarifier Type	N/A
Number of PSTs	N/A
Total Area of PSTs	N/A
Total Capacity of PSTs	N/A
Upflow Rate:	N/A
Aeration Basin:	Activated Sludge
Number of Aeration Basins	One
Aeration Basin Capacity:	13 770 m^3 and 18 298 m^3
Aerators:	8 aerators (each 55 kW) and 6 aerators (each 22kW)
Total Aeration Capacity	8 Mℓ/day, 2 Mℓ/day
Clarifier Type:	Suction Lift Clarifiers
Number of Clarifiers:	4 (2 each)
Total Area of all Clarifiers:	1608 m^2 and 1061 m^2
Total Capacity of Clarifiers:	24 Mℓ/day and 15 Mℓ/day
Upflow Velocity:	0.625
RAS Pump Station:	4 (2 x Screw Pumps each)
RAS Pump Capacity (per pump)	N/A
Chlorine Storage Capacity:	1980 kg
Chlorine Dosing Capacity:	10 kg/h, 6 kg/h
Chlorine Contact Tanks	2 (1 pond each)
Total Capacity of Chlorine Contact Tanks:	4434 m^3
Contact Time	10.64 h
Sludge Treatment Process	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Sludge Drying Beds Area:	N/A

b) Status Quo

The mechanical screens at the plant have been have been offline for a decade. There is no redundancy for screening at the Head of Works. Manual screens are inefficient as their screenings are present in downstream processes. The Marian Ridge plant if completely off-line and the Shallcross plant is operating at reducing treatment capacity. Four of six aerators are off-line and one of four clarifiers is on-line at the Shallcross plant. One Archimedes screw conveyor offline on each plant. There are two maturation ponds one of which is completed dysfunctional and covered in vegetation.

Umhlatuzana WWW has a design capacity of 10 Mℓ/day and is currently treating 1.24 Mℓ/day based on the average flow over the last 12-months (**Figure 19.116**).

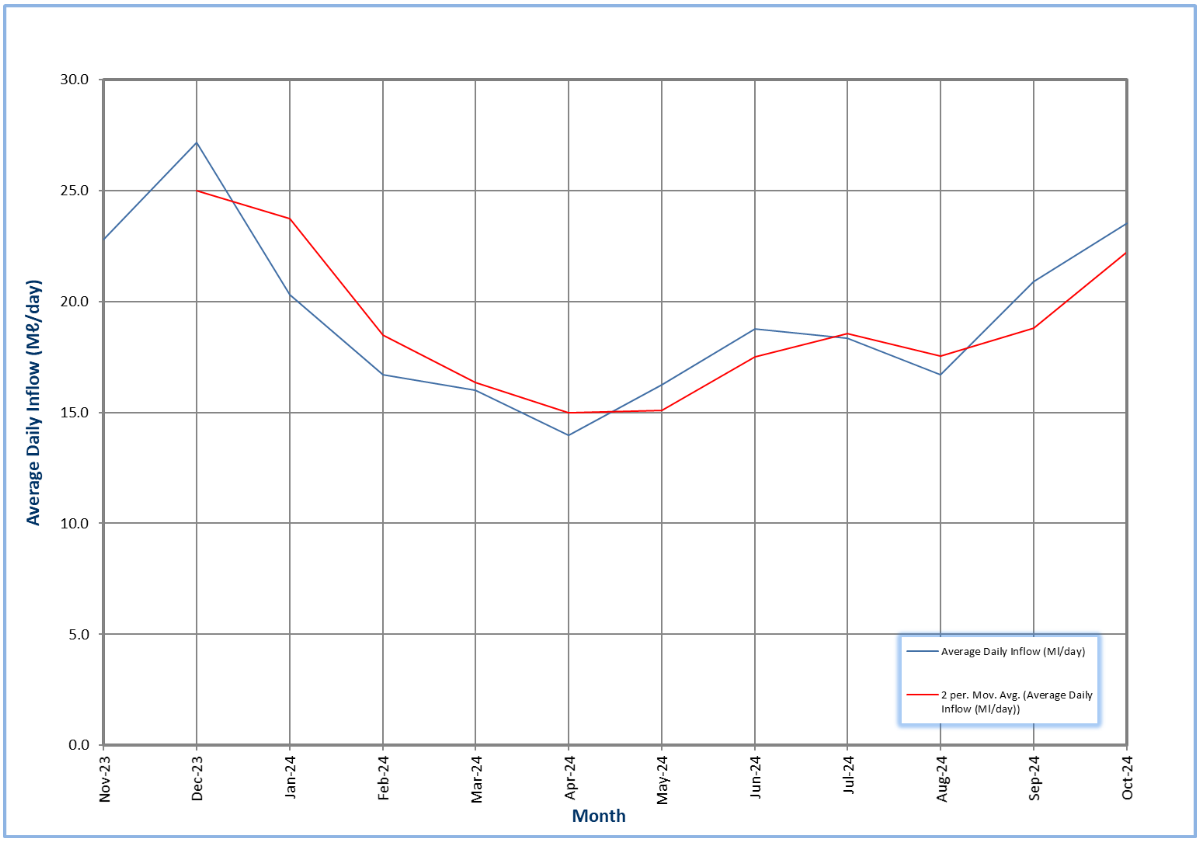

Figure 19.116 Average daily inflows to Umhlatuzana WWW (Mℓ/day).

An analysis of daily historical production (November 2023 to October 2024) of the Umhlatuzana WWW is presented in (**Figure 19.117**). It shows that for 0.0 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 0.0 % of the time. The plant currently has ample capacity in relation to the current demand.

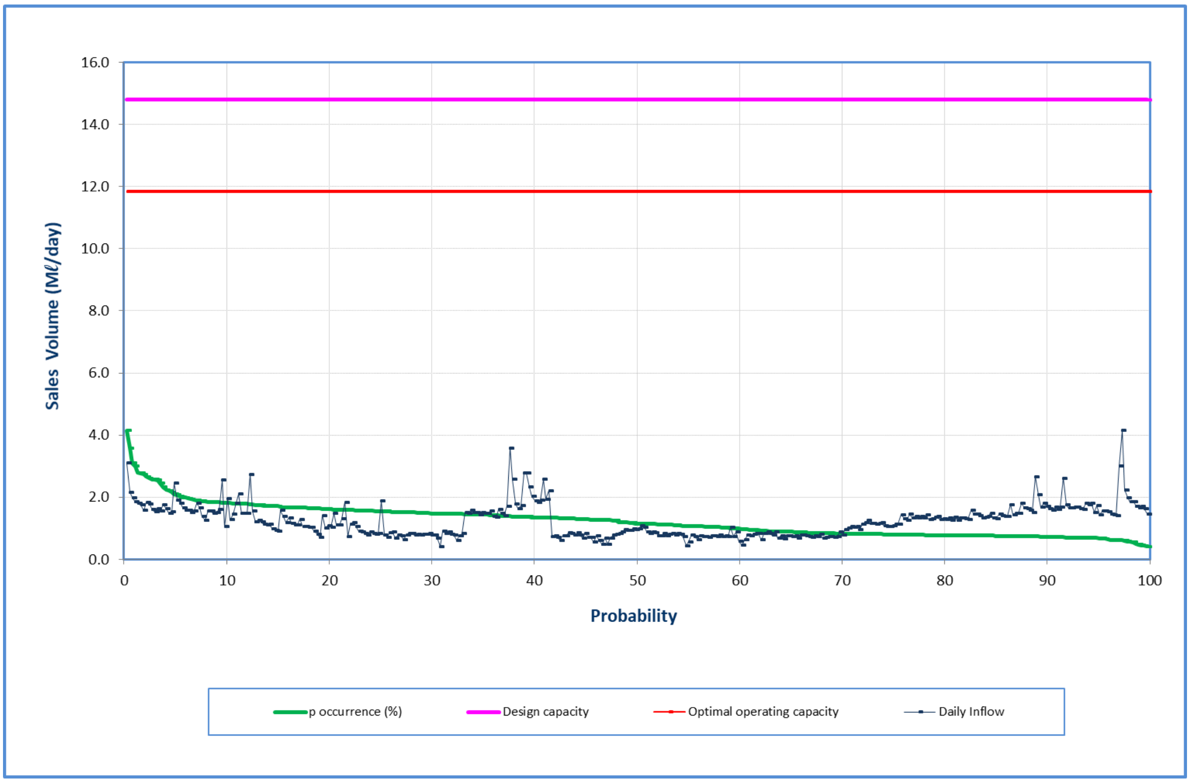

Figure 19.117 Analysis of historical production at Umhlatuzana WWW (November 2023 to October 2024.

c) Recommendations

From a regionalisation perspective it may be economical to upgrade the Umhlatuzana WWW to 30 Mℓ/day and decommission both the Hillcrest and Ntshongweni WWW. This, however, requires significant capital investment and for the foreseeable future the works should be retained as it has spare capacity. Actual planned developments do not exceed the existing capacity of the works. This relates primarily to the fact that the Umhlatuzana catchment is well developed.

19.4 Recommended Projects

19.4.1 Mpophomeni Wastewater Works Upgrade

Planning No.	610.1
Project No.	UI0801A
Project Status	Detailed Design Complete

(a) Project Description

The Mpophomeni WWW is currently not operational and sewage from Mpophomeni Township is pumped to the Howick WWW for treatment. The demand at Mpophomeni has increased to the extent that, on occasion, the flow exceeds the volume of effluent that the Howick WWW can treat. Additionally, there are a number of planned developments that will increase this flow significantly over the next few years. It was therefore proposed by UMDM that the Mpophomeni WWW be upgraded to treat 6 Mℓ/day with the possibility of upgrading the works to 12 Mℓ/day. The site has space for a plant of at least 20 Mℓ/day (**Figure 19.118**).

The following development initiatives by the municipality will be serviced by the Mpophomeni WWW, *viz*.:

- Refurbishment of the existing sewage reticulation system in Mpophomeni Township will increase wastewater flows to the works (ADWF 3.6 Mℓ/day);
- The development of the Khayelisha social housing development on the banks of Midmar Dam (ADWF 1.3 Mℓ/day); and
- Planned light/mixed industrial development park (3 Mℓ/day).

The effluent from the works will be pumped and disposed of to the Sakubula stream adjacent to the national road (N3) in Howick. The pumping main will be approximately 6.8 km in length and of various diameters.

Key information on this project is summarised in **Table 19.27**.

Table 19.27 Project information: Mpophomeni Wastewater Works Upgrade.

Project Components:	• Inlet Works including a mechanical screen and vortex grit tanks (2No). • Two 14 m diameter primary settling tanks. • Primary sludge pump station. • Refurbished digesters with new heating and sludge circulating system. • Mechanical equipment to dewater digested primary and activated sludge. • 6 Mℓ/d (BNR Activated Sludge Treatment Plant. • Return Activated Sludge (RAS) pumping system. • Waste Activated Sludge (WAS) pumping system. • RAS and Storm Flow Recycle Refurbished Pump Station • Sludge and Storm Flow Recycle Mechanical/Electrical Plant. • Refurbished 2.25 Mℓ Storm bypass pond. • One 25 m diameter secondary clarifier. • One refurbished 18 m diameter secondary clarifier. • Aluminium sulphate, lime and chlorine chemical dosing systems. • Recycle pump station, pumping plant and pumping main from Maturation Ponds.

	• Chlorine contact tank. • Disposal pipeline (6.8 km) of various diameters. • Pump station (2 duty, 1 stand-by)
Capacity:	6 Mℓ/day Plant

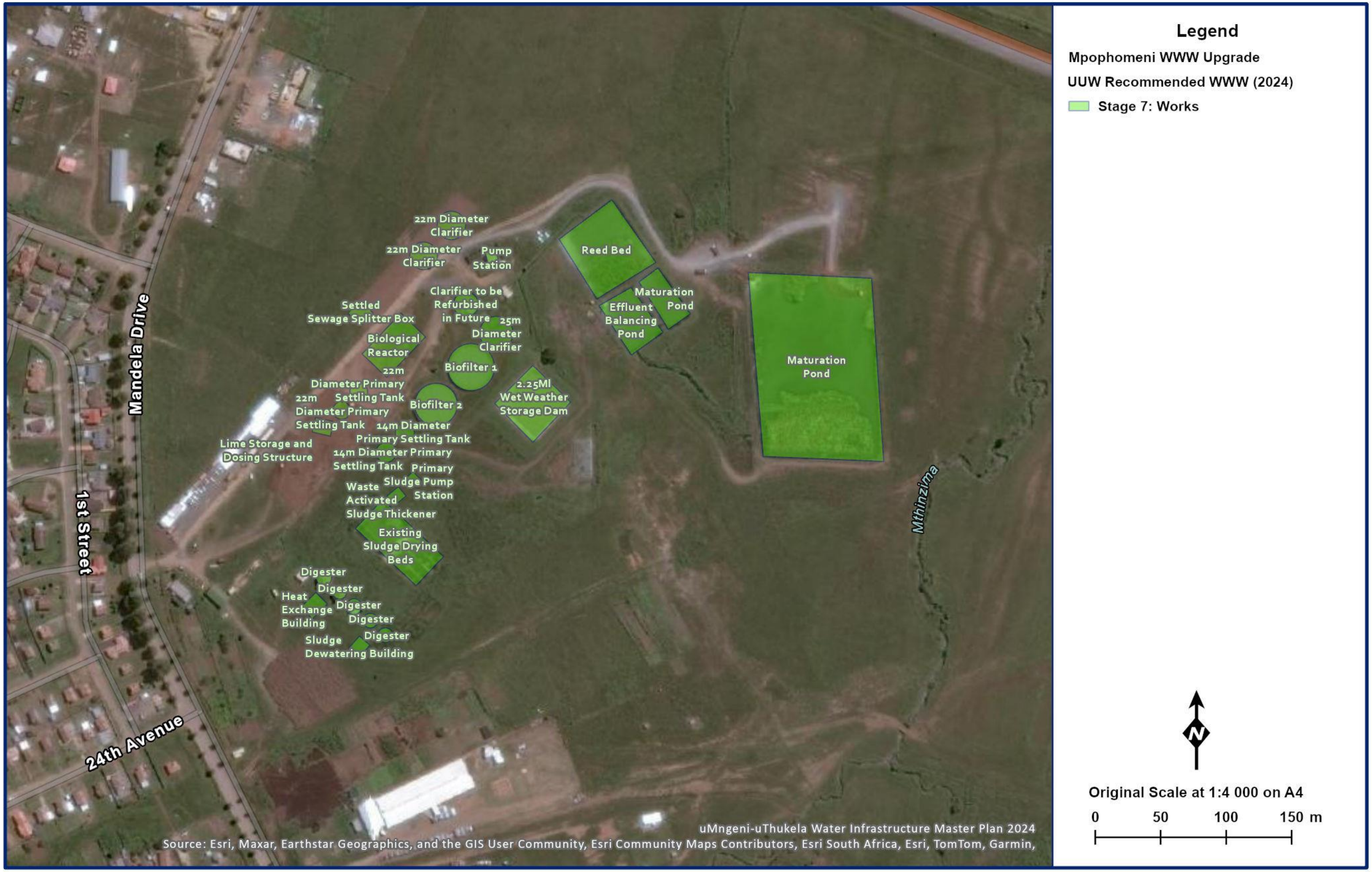

Figure 19.118 Upgrade of Mpophomeni WWW.

(b) Institutional Arrangements

uMngeni-uThukela Water will operate the plant on behalf UMDM under a twenty-year management contract. uMngeni-uThukela Water is responsible for funding any capital improvements required by the plant. uMngeni-uThukela Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and this fee includes capital redemption.

(c) Beneficiaries

UMDM and uMngeni Local Municipality are the main beneficiaries of the upgrade.

(d) Implementation

The construction is currently 97 % complete. The project is behind programme due to the COVID lockdown, civil unrest, local labour issues and changes in scope. The changes in scope have resulted in a number of Variation Orders (VOs). The following points highlight the remaining major works which are now at various stages of completion:

- Dismantling the existing HOW can only start once the plant is commissioned as the old inlet is still being used.
- Chlorine contact tank construction is 100% complete.
- Completion of the maturation ponds is 100%.
- The Digesters / Heat Exchanger pipe work will be completed shortly (**Figure 19.119**).
- The PLC programming for the Digesters is outstanding.
- The HVAC system will be complete by April 2025.

Hot commissioning will be undertaken in February and the construction will be completed by April 2025. Thereafter the process will be commissioned, which can take up to six months.

The estimated cost of the project is R275 million at 2020 prices.

Figure 19.119 Anaerobic Digesters pipework being connected.

19.4.2 Richmond Wastewater Works Upgrade

Planning No.	610.3
Project No.	UI0939A
Project Status	Detailed Design

(a) Project Description

The Richmond WWW cannot currently cater for the peak demands placed on the infrastructure. As a result, UMDM have requested that uMngeni-uThukela Water upgrade the Richmond WWW (**Figure 19.120**). The existing WWW serves the town of Richmond but not the low income settlements of Siyathuthuka and Lusaka that currently make use of pit latrines for basic sanitation. Once UMDM implements water borne sanitation in these low income areas then additional demand will be placed on the Richmond WWW. There are also some residential units located within the existing Richmond residential area that still need to be connected to the existing sewer network.

The proposed new extensions will cater for Biological Excess Phosphorous Removal with back-up chemical dosing facility. An increase in capacity of 1 Mℓ/day to 2 Mℓ/day is proposed.

Key information on this project is summarised in **Table 19.28**.

Table 19.28 Project information: Richmond Wastewater Works.

Project Components:	• New inlet works including a mechanical screen, mechanical degritters, screenings conveyor and compactor and venture flume • 2 No additional aeration basins • Return Activated Sludge (RAS) pumping system • Waste Activated Sludge (WAS) pumping system • 1 No additional circular 18 m diameter secondary clarifier • New chlorine contact channel • Upgrade the existing chlorine dosing building and chlorine dosing equipment • New mechanical sludge handling equipment and housing building • New sludge drying beds and scum trap • New ferric dosing equipment • Refurbishment of sewage retention pond • Refurbishment of all ancillary facilities • New SCADA system
Capacity:	5 Mℓ/day Plant

(b) Institutional Arrangements

uMngeni-uThukela Water will operate the plant on behalf of UMDM under a twenty-year management contract. uMngeni-uThukela Water is responsible for funding any capital improvements required by the plant. uMngeni-uThukela Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and capital redemption is included in this fee.

(c) Beneficiaries

UMDM and Richmond Local Municipality are the main beneficiaries of the upgrade.

Figure 19.120 Richmond WWW upgrade.

(d) Implementation

The estimated project cost is R127 million at 2020 prices. This figure includes the cost of all project phases: Planning, Design, Tender Preparation and Construction. uMngeni-uThukela Water has shifted this project outside the five-year CAPEX window, which means that the project is on hold until further notice. This project will be revived once agreement can be reached with the Municipality on the financial viability of the project.

19.4.3 Mpofana Wastewater Works Upgrade

Planning No.	610.2
Project No.	UI0940A
Project Status	Tender

(a) Project Description

uMngeni-uThukela Water has a management contract with UMDM to operate and maintain the Mpofana WWW and two large sewage pump stations. The WWW services the town of Mooi River, which includes the adjacent township of Bruntville (**Figure 19.121**). The majority of the wastewater received by the works is domestic sewerage but there is also a large industrial component of between 1 to 2 Mℓ/day received from a textile factory situated adjacent to the works.

The works has a design capacity of 3.5 Mℓ/day and a reported operating capacity of 5 Mℓ/day. The works was receiving average dry weather inflows (AADW) of 6 Mℓ/day and was therefore operating above capacity. The demand has, however, reduced due to the temporary closing of the textile factory because of fire damage. Operational issues, as a result of aging infrastructure, have been identified at the works and these are being addressed. uMngeni-uThukela Water has identified the need for increasing the treatment capacity to meet the future demands of Mooi River.

A PSP was appointed in 2018 to undertake the detailed feasibility and detailed design for the upgrade of the wastewater works.

(b) Institutional Arrangements

uMngeni-uThukela Water currently operates the plant on behalf of UMDM under a twenty-year management contract. uMngeni-uThukela Water is responsible for funding any capital improvements required at the plant. uMngeni-uThukela Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and capital redemption is included in this fee.

(c) Beneficiaries

UMDM and Mpofana Local Municipality are the main beneficiaries of the upgrade.

(d) Implementation

The detailed feasibility study, including the environmental impact assessment and associated environmental specialist studies, was completed in December 2020. Following an assessment of the estimated costs of the upgrade (R350 - R400 million) the Project Steering Committee collectively agreed to suspend the study. In these difficult economic times, it was considered more prudent for the existing works to be refurbished at far lower cost. The Mpofana WWW will thus be refurbished with upgraded process capacity that will ensure efficient treatment and compliance with the regulated effluent discharge standards.

The results of the feasibility study will not be lost and will be shelved for use at a later date if needed.

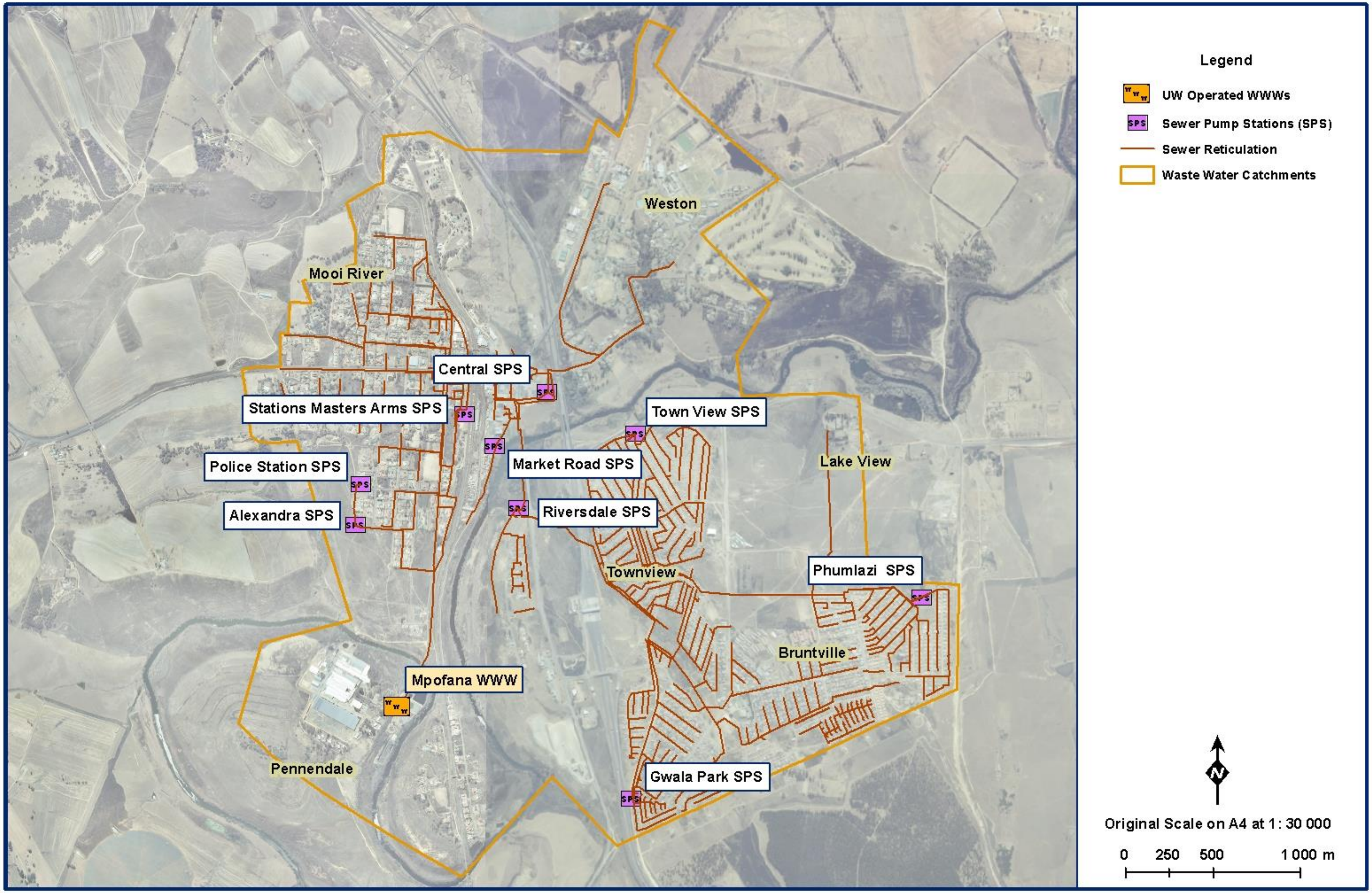

Figure 19.121 Mpofana WWW upgrade.

19.4.4 Mkhambathini Wastewater Works Upgrade

Planning No.	610.6
Project No.	
Project Status	Detailed Design

(a) Project Description

uMngeni-uThukela Water has a management contract with UMDM to operate and maintain the Camperdown WWW. The WWW has a small demand (0.2 Mℓ/day) as a limited number of households are connected to the sewer reticulation network (**Figure 19.122**). The majority of households and businesses in the town still make use of on-site sanitation, such as septic tanks.

A feasibility study was undertaken which identified the need for a new WWW that would service all existing households and businesses as well as cater for future developments. A site west of the N3 freeway was identified (**Figure 19.122)** and detailed designs for a WWW and new bulk sewer network were completed.

The proposed works will include the construction of a bulk sewer network inclusive of three pump stations, as well as a 2Mℓ capacity wastewater treatment plant that will service the local population.

The proposed infrastructure (**Figure 19.123**) associated with the treatment process will consist of the following:

- Head of Works with mechanical screening and degritting, and a flow meter.
- Aeration Tank.
- Settling Tank (clarifier) to settle out and return the activated sludge back to the aeration tank.
- Chlorine dosage with contact tank, or Ultraviolet (UV) Irradiation for disinfection.
- Sludge Drying Beds for dewatering of activated sludge.

(b) Institutional Arrangements

uMngeni-uThukela Water currently operates the Camperdown WWW on behalf of UMDM under a twenty-year management contract. It was identified by the feasibility study that Camperdown requires a new WWW that can serve the entire population and future development. As the existing WWW has insufficient capacity to meet future growth uMngeni-uThukela Water will fund the construction and implementation of a new WWW from its CAPEX budget. uMngeni-uThukela Water will charge a monthly management fee to the Municipality to cover the CAPEX and operation and maintenance of the new WWW once commissioned.

(c) Beneficiaries

UMDM and Mkhambathini Local Municipality are the main beneficiaries of the upgrade.

(d) Implementation

The detailed design phase is complete, but work has been temporality suspended until such time as funding is available. The new WWW requires the construction of a new sewage network and sewage pump stations, and this is the responsibility of UMDM. The estimated cost for the construction of the WWW is R99 million at 2020 prices. UMDM recently submitted a proposal to the Department of Trade and Industry (DTI) to fund the bulk sewer reticulation component of the project.

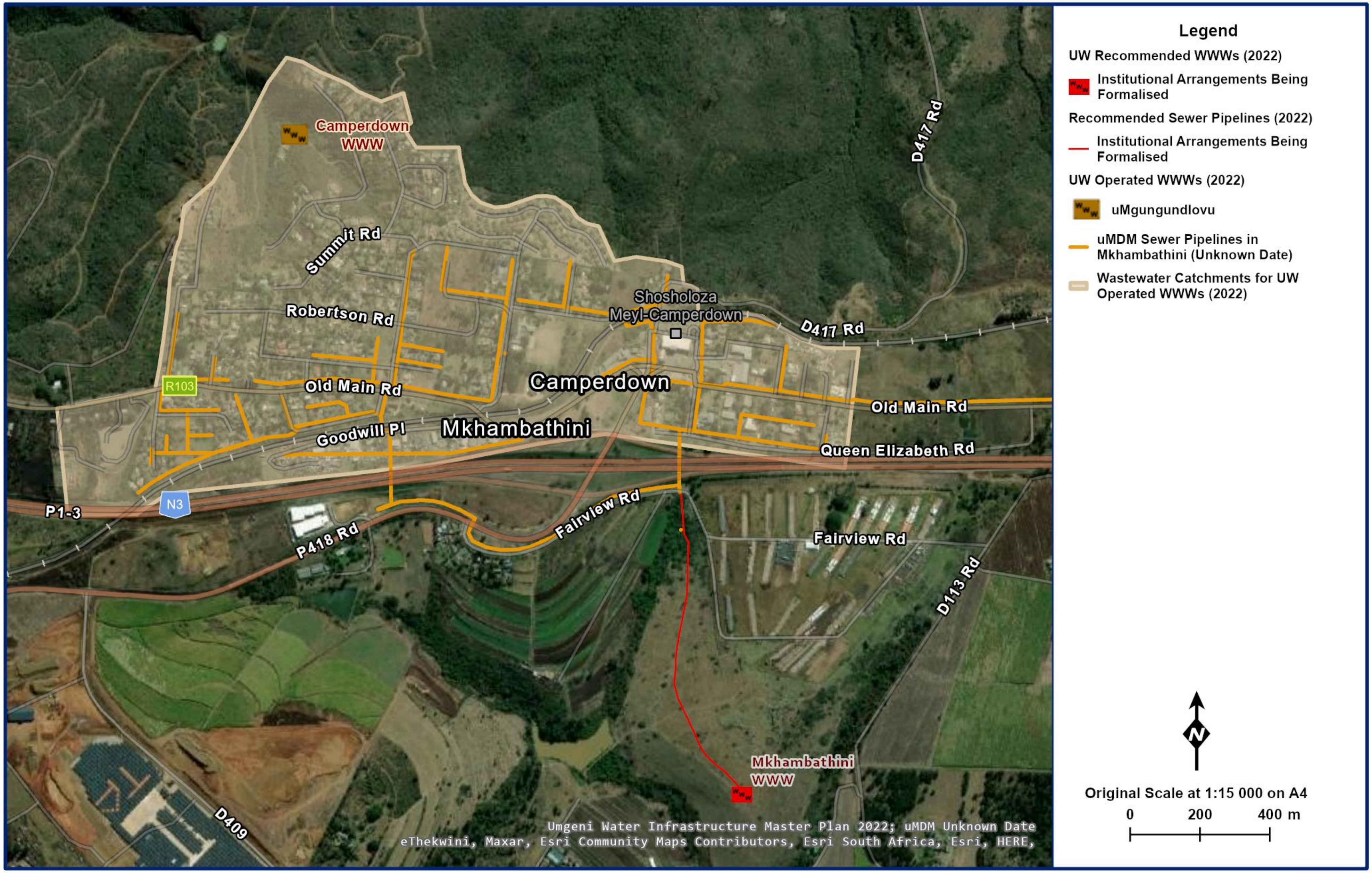

Figure 19.122 Location of the proposed Mkhambathini WWW in relation to the existing Camperdown WWW.

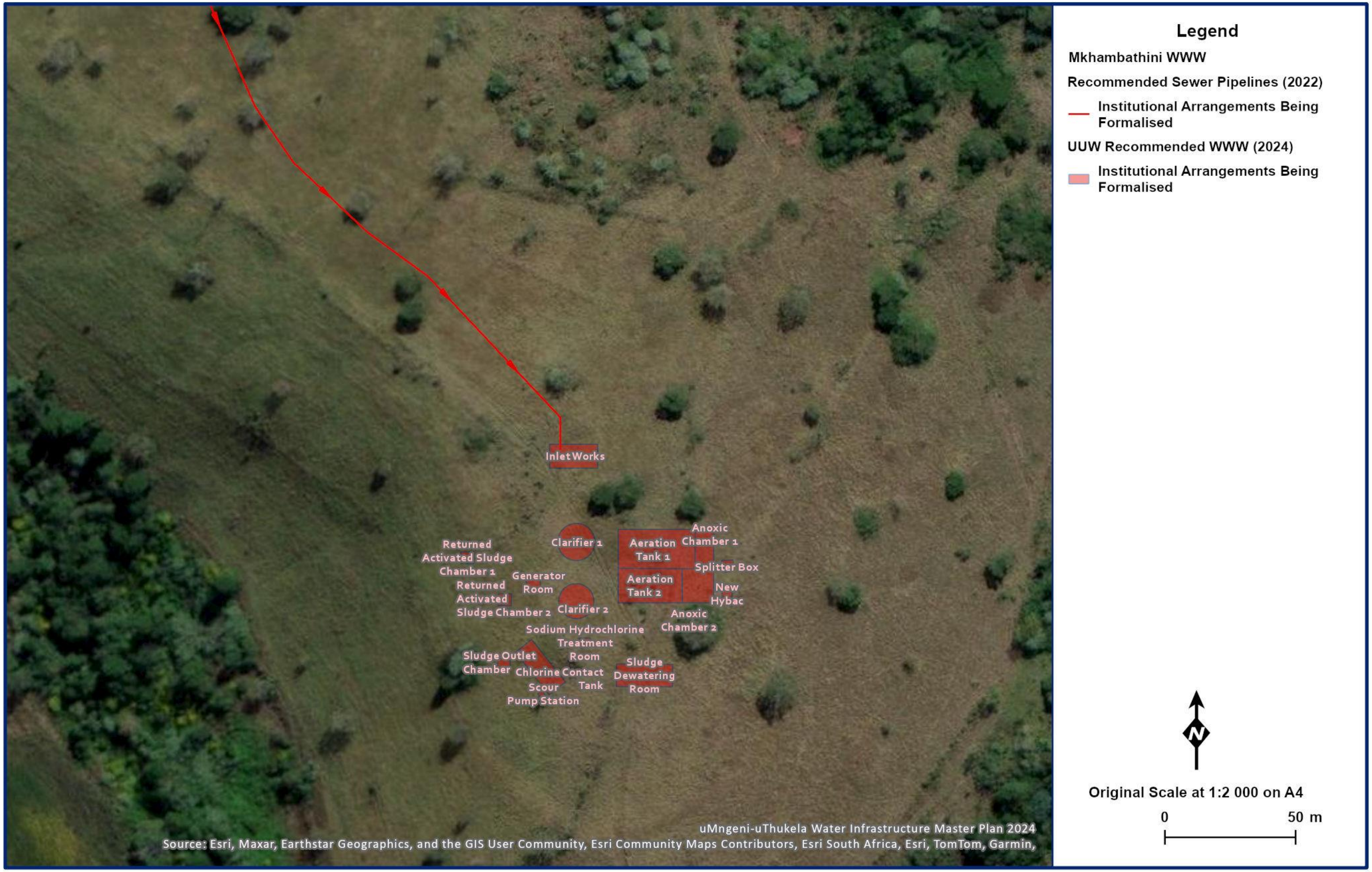

Figure 19.123 Proposed Mkhambathini WWW layout.

19.4.5 Hilton Bulk Wastewater Scheme

Planning No.	610.8
Project No.	FA2020/011/04
Project Status	Detailed Feasibility

(a) Project Description

The study area of Hilton consists primarily of “old Hilton” (existing built up village) and “new Hilton” (area between the N3 national road and Hilton College). The greater Hilton area also includes the adjacent locality of Cedara.

There is a huge potential for commercial and residential property development within this greater area, which is located at a strategic location within the KwaZulu-Natal Midlands. To allow for the development potential to be unlocked, more wastewater treatment capacity will have to be developed. Currently, the existing sanitation infrastructure is primarily septic tanks with a few independent wastewater treatment package plants (WWTPP) and the Cedara WWW.

A pre-feasibility study for sub-regional bulk wastewater for the greater Hilton area within the uMngeni Local Municipality (LM) was completed in March 2019. Various bulk wastewater options were identified as well as a new wastewater works adjacent to Hilton College (**Figure 19.124**). Approval has now been obtained to take this study to detailed feasibility.

This project will investigate the feasibility of providing water borne sanitation, as a solution to deal will the increased sewage generation

The detailed feasibility study (DFS) will include the following:

- Assessment of town planning and spatial development planning;
- Determination of sewage flows;
- Land and geotechnical survey;
- Layout and longitudinal profiles of sewer outfall pipelines;
- Positioning of Waste Water Treatment Works (WWTW);
- Preliminary process design of WWTW;
- Estimating of Capital Costs; and
- Environmental Impact Assessment.

As this project is in its infancy, it will still be a number of years before implementation is undertaken. In the interim, there is a pressing need for sanitation services and uMngeni-uThukela Water is addressing this through the construction of a 2 Mℓ/day WWW, commonly referred to as the “N3 Corridor WWW”. The WWW will be constructed approximately 2 km from the Hilton Life Hospital in land obtained from Mondi. The WWW will be modular in nature with an initial treatment capacity of 1 Mℓ/day, upgradable to 2 Mℓ/day. The WWW should address the immediate and medium term sanitation needs of the area allowing development to expand.

(b) Institutional Arrangements

uMngeni-uThukela Water operates many WWW on behalf of UMDM under a twenty-year management contract. As this is only a feasibility study there are, as yet, no institutional arrangements regarding this project.

(c) Beneficiaries

UMDM and uMngeni Local Municipality are the main beneficiaries of the study.

(d) Implementation

Preliminary investigations favoured the construction of two WWW in Hilton, one at the existing Cedara WWW and the other at the new N3 corridor package plant. The demand model indicates that these WWW should be designed in a modular fashion to cater for the current demand, but be upgradable to meet future demand.

Detailed investigations taking into to considering pipelines routes, energy usage (pump stations) and environmental impact now point to the construction of only one WWW. The preferred location is adjacent to the Cedara WWW.

Specialist environmental studies are currently being undertaken on this preferred site. The following specialist studies have already been completed;

- Agricultural & Soil,
- Heritage & Palaeontology,
- Wetland,
- Terrestrial.

The EAP is presently preparing for the pre-application meeting with the Department of Forestry, Fisheries and Environment (DFFE). Additional specialist studies will be initiated once the meeting has taken place as the Department will have input into the nature of these studies based on the information presented.

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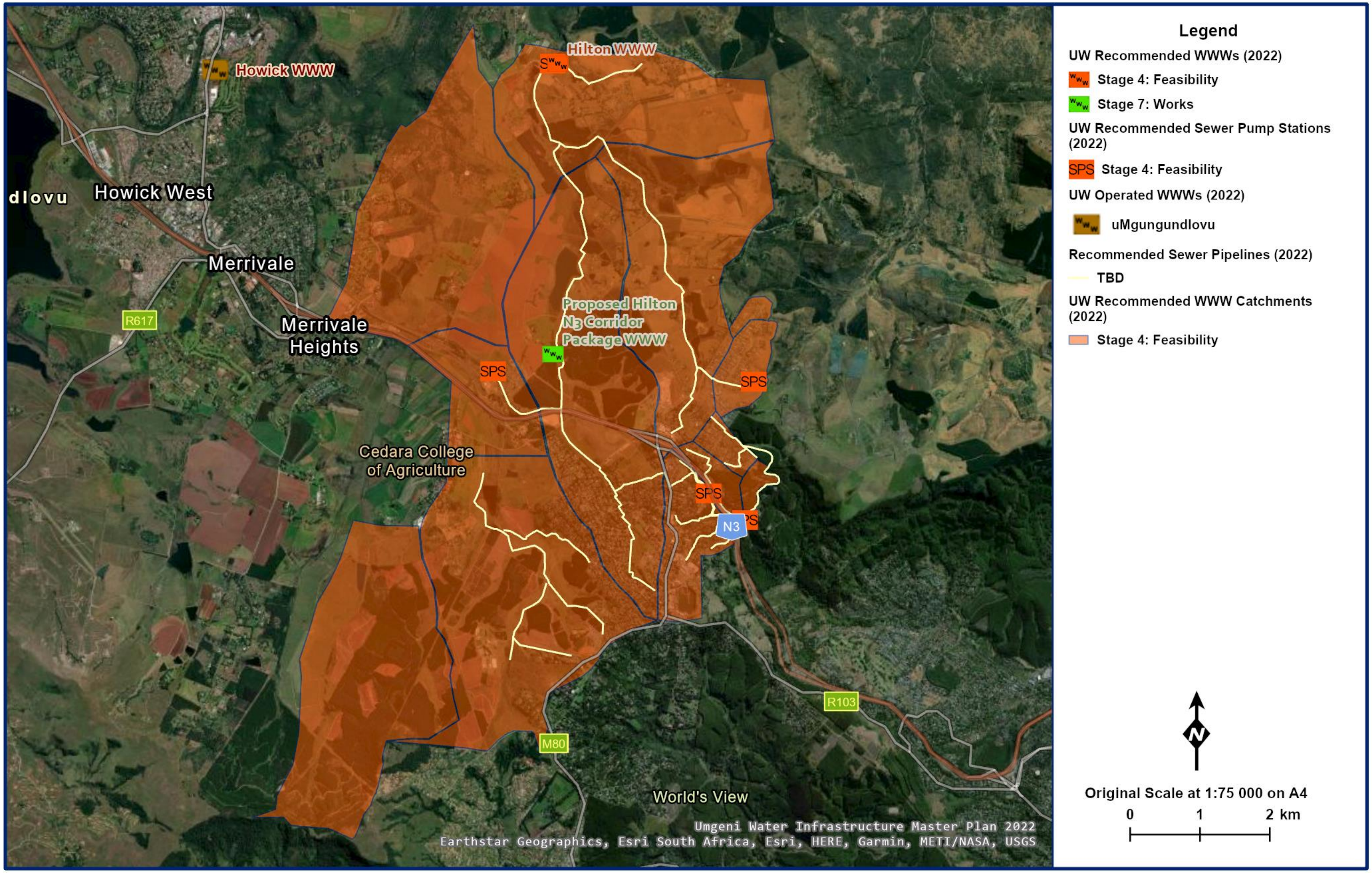

Figure 19.124 Proposed Hilton WWW.

19.5 New Areas

New areas can be defined as those KZN WSAs for whom uMngeni-uThukela Water is not the Bulk Water Service Provider (**Figure 19.1**) i.e. areas in KZN outside the uMngeni-uThukela Water traditional area of supply. In some of these areas, uMngeni-uThukela Water has received a mandate from the District Municipality to provide bulk water services, King Cetshwayo District Municipality being one of those. uMngeni-uThukela Water's services are, at this stage, limited to potable water provision and no bulk wastewater infrastructure is presently being managed. The organisation's knowledge of the status of the bulk sanitation infrastructure throughout the province is thus limited to existing reports. uMngeni-uThukela Water is committed to providing bulk water and sanitation throughout the province and therefore is in the process of obtaining as much sanitation information as possible from existing sources. With time, this information will have to be verified by site visits and possibly process audits so that the necessary infrastructure planning can take place. In the interim, however, the focus will be on identifying all the wastewater works within KZN and providing the salient infrastructure details.

The class of wastewater works is defined as A, B, C, D or E according to a scoring system derived from draft regulations published by the Department of Water and Sanitation. In general, the greater the capacity and the more sophisticated the treatment process the higher the class. A large WWW with a complex treatment process may be classified as Class A. Smaller more rudimentary WWW, only using saturation ponds, will be classified as Class E, such as Winterton (DWS, 2013).

19.5.1 uThukela District Municipality

a) Overview of the WWWs in uThukela District Municipality

The uThukela District Municipality (DM) has nine wastewater works, eight of which are operational (**Figure 19.125**). The capacity of the WWW ranges from very small (0.1 Mℓ/day) serving the small town of Winterton to relatively large (12 Mℓ/day) serving the large towns of Ladysmith, Estcourt and Ezakeni. A list of the WWW in the uThukela DM is provided in **Table 19.29** and a summary of each is provided in the sections hereafter

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in the **Table 19.30**.

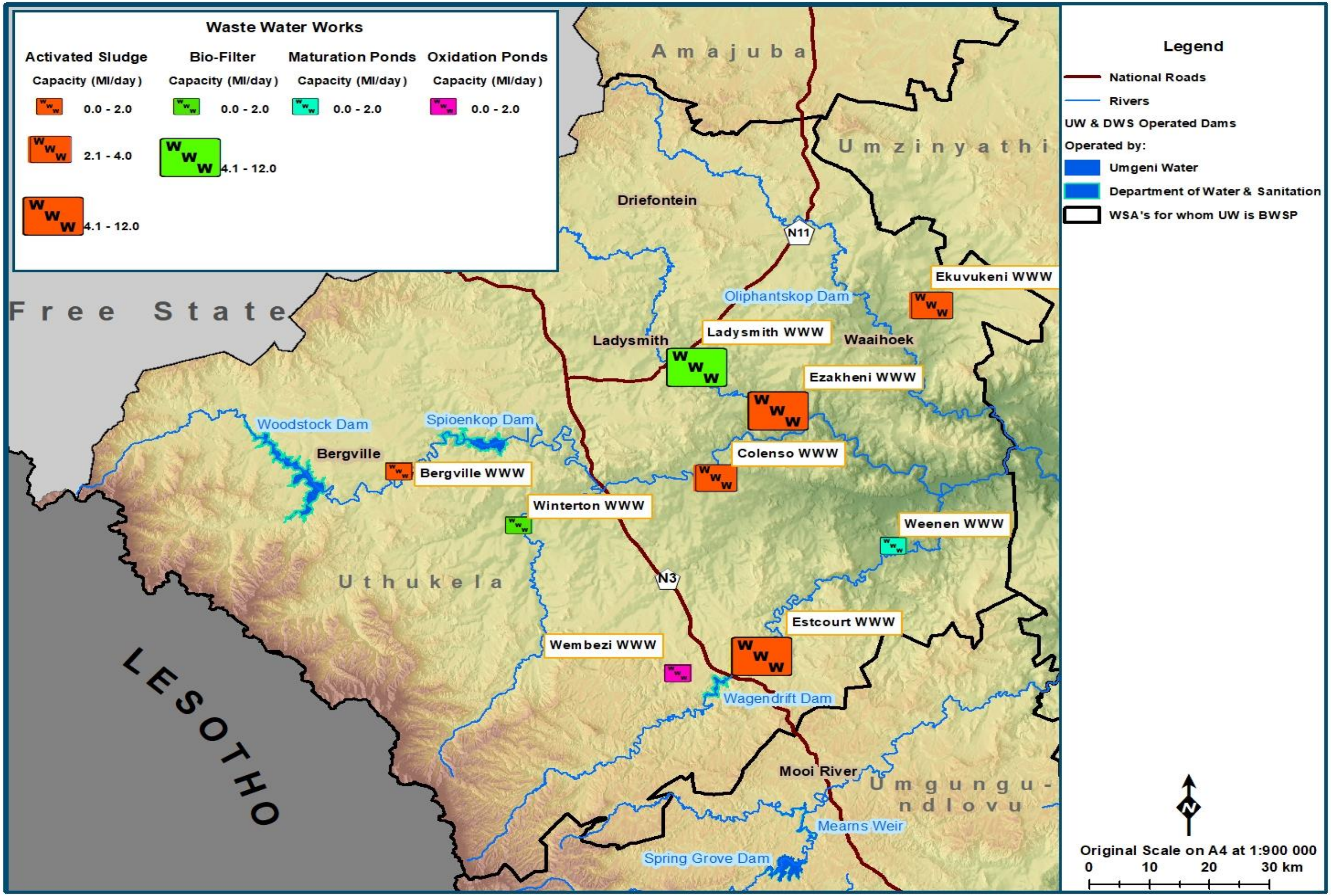

Figure 19.125 Location of uThukela DM Wastewater Works

Table 19.29 uThukela District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Ezakeni	Activated Sludge	uThukela DM	C	Y	12.0	38750	Y	Poor	R 24 500 000
Ekuvukeni	Activated Sludge	uThukela DM	D	Y	2.4	8750	N	Dysfunctional	R 33 000 000
Bergville	Activated Sludge	uThukela DM	E	Y	0.4	500	Y	Fair	R 800 000
Colenso	Activated Sludge	uThukela DM	E	Y	3.2	6250	Y	Poor	R 3 200 000
Ladysmith	Bio-filter	uThukela DM	C	Y	12.0	26250	Y	Poor	R 27 500 000
Estcourt	Activated Sludge	uThukela DM	D	Y	12.0	10000	N	Dysfunctional	R 16 200 000
Weenen	Activated Sludge	uThukela DM	E	Y	0.1	131	N	Dysfunctional	R 15 000 000
Winterton	Activated Sludge	uThukela DM	E	N	1.25	188	Y	Fair	R 5 600 000
Wembezi	Activated Sludge	uThukela DM	E	N	0.11	2500	Y	Fair	R 2 500 000

Table 19.30 MIG funded Sanitation Projects in uThukela District Municipality (CoGTA KwaZulu-Natal,2024)

Project	Status
Waterborne Sanitation Project Bergville Phase 2 (Waterborne)	Completed
Ezakheni Sanitation Project Phase 2 (Waterborne)	Completed
Weenen – Ezitendeni Sanitation Project	Construction 61%
Sanitation Coverage in Alfred Duma, Inkosi Langalibalele and Okhahlamba	Construction 61%
Winterton Sanitation Supply Scheme – Construct a new 3.4 Mℓ/day WWW (Planning)	Completed

b) Estcourt Wastewater Works

The Estcourt WWW services the town of Estcourt which is mostly on waterborne sanitation while surrounding townships are mostly serviced with VIPs. According to the Bigen Africa WSMP (2017) and the UTDM Backlog Study, there are 2 910 households falling within the scheme footprint (**Figure 19.126**). Effluent flows predominantly to the Estcourt Sewer Pumping Station under gravity from where it is pumped via a bulk line to the WWW.

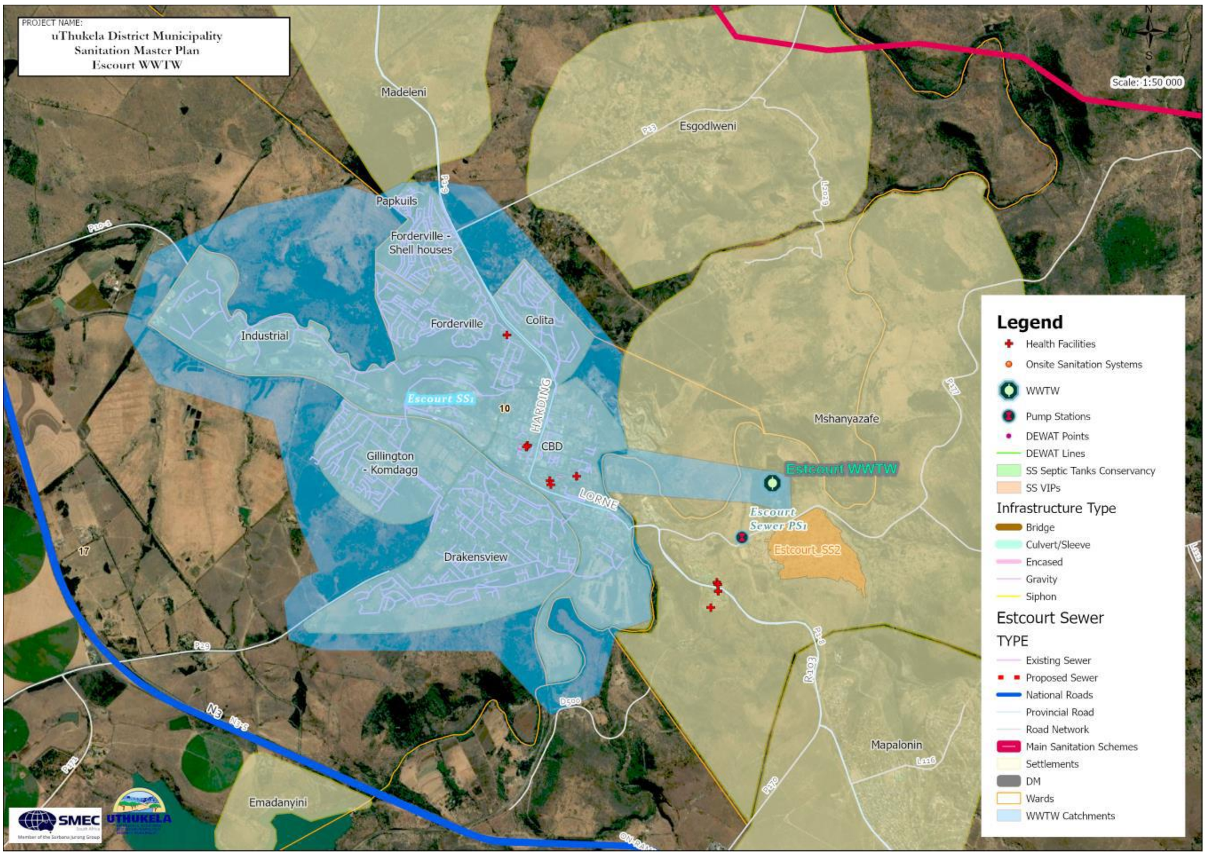

Figure 19.126 Estcourt Wastewater Works Catchment Area

The Estcourt WWTW has two process streams that work in parallel (**Figure 19.127**). The streams are an aeration and biofiltration stream each to treat reticulated effluent as well as sludge from the surrounding townships employing on-site sanitation. Inflow to the works is a combination of residential, commercial and industrial wastewater. The influent has been noted as poor quality mainly due to the discharge from the Flamingo Moon Coffee Factory. At the works the biofiltration process is currently not operational due to many of the components requiring refurbishment, these include the primary settling tanks, the biofilters, humus tanks, anaerobic digesters, drying beds and internal pump stations. The aeration process stream handles the total inflow to the works. However, the intention for the future is for both streams to be working in conjunction to treat the inflow. At the head of the works conventional mechanical screening, grit removal and flow measurement is employed. Inflow to the works occurs at intervals as a result of automated control at the upstream pump station. Effluent is then treated in the mechanical aerator tank which has eight aerators of which five are operational, three require refurbishment. Further treatment is then intended at the two secondary clarifiers however both of which are not operational thereby reducing the effectiveness of the aeration process stream. As the last step in the process, the effluent passes through a maturation/polishing pond and the treated effluent is discharged via two Asbestos Cement pipes

(300mm and 450mm diameter) to the Bushman's River. Should the biofiltration stream receive the necessary refurbishment to full operational capacity then a portion of the effluent which passes through the inlet channel and screening will be treated at three primary settling clarifiers. In which process the sludge will be separated and pumped to two anaerobic digesters from which the solids will be sent to drying beds and the liquid component back to the head of the works to be re-cycled. After primary settlement, effluent will be pumped to an elevated biofilter tank after which it will pass through two stone filter tanks and humus tanks before being pumped back to the head of works to be recycled through the process. No contact tank for disinfection is provided and chlorination does not take place. Final treatment occurs at a single polishing pond before being discharged to the Bushman's River. The process flow is summarised in **Figure 19.127**.

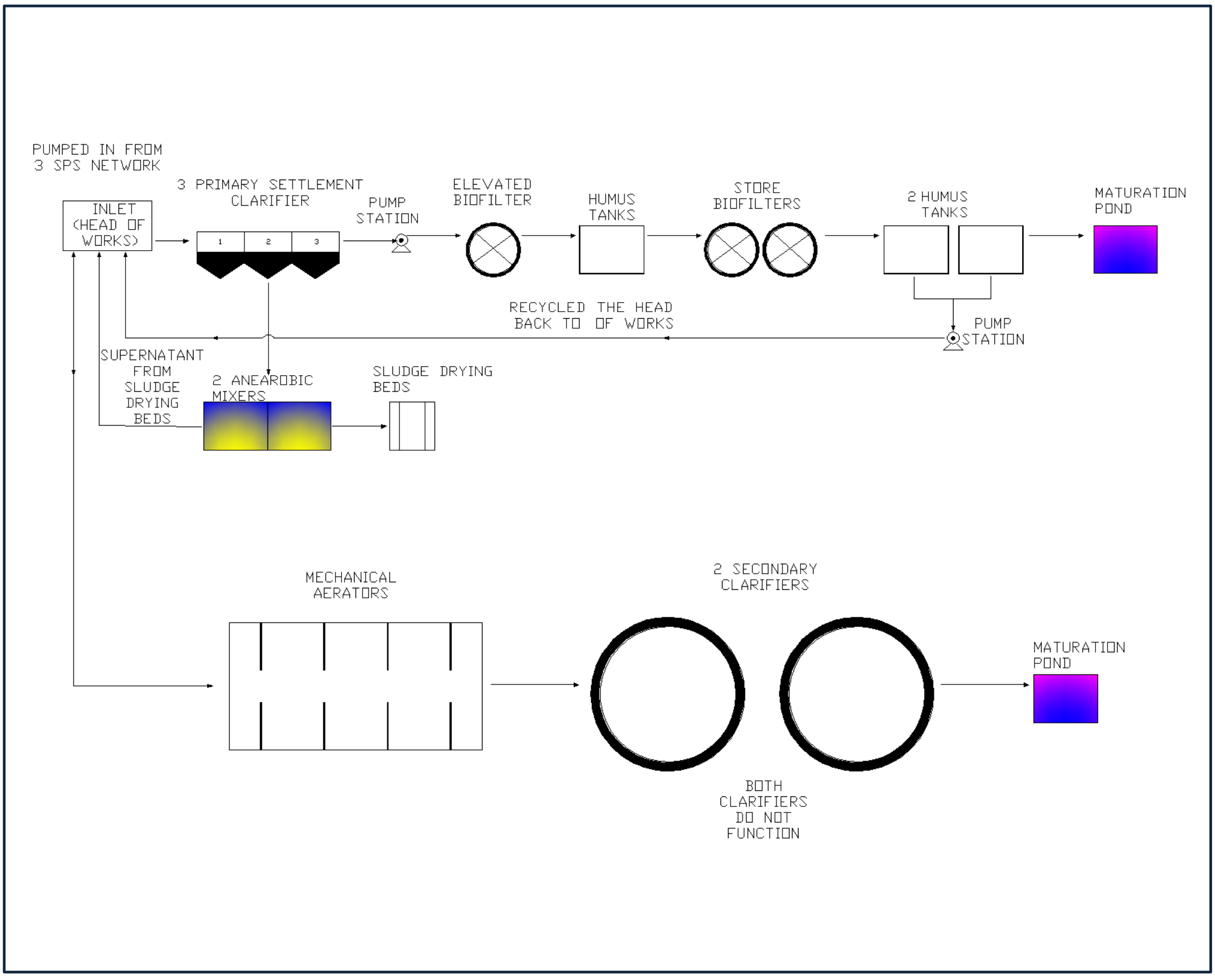

Figure 19.127 Estcourt Wastewater Process Flow Diagram

c) Wembezi Wastewater Works

The Wembezi WWW services portions of the township of Wembezi only (**Figure 19.128**). According to the Backlog Study referenced in the Bigen-Africa WSMP (2017), there are 299 households falling within the scheme footprint. Portions of Wembezi are serviced by a waterborne sewerage system whilst the remaining portions are assumed to currently be serviced by VIPs or septic tanks. Effluent flows to the Wembezi WWW under gravity as well as from one main pump station. The pump station is not operational, and the rising main is damaged resulting in raw sewage flowing into the Little Bushman's River.

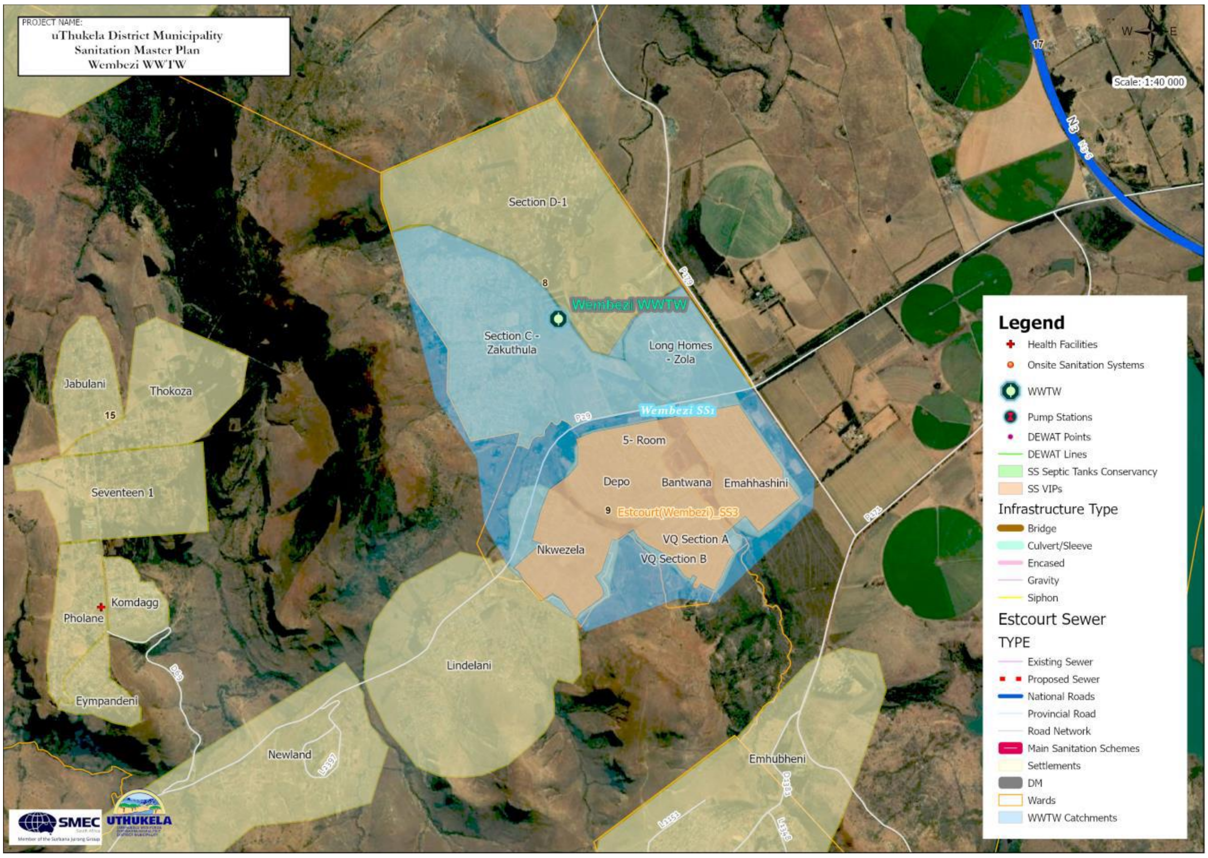

Figure 19.128 Wembezi Wastewater Works Catchment Area

The Wembezi WWW receives residential influent only. The treatment process consists of three settling ponds (**Figure 19.129**). Influent passes through mechanical screening at the inlet from which it is distributed amongst three primary settling ponds. At the time of inspection, the manhole to one of the ponds was blocked and therefore the first pond was the only one receiving the flow. Thereafter the wastewater passes through all three maturation ponds in series before chlorination and ultimately discharge.

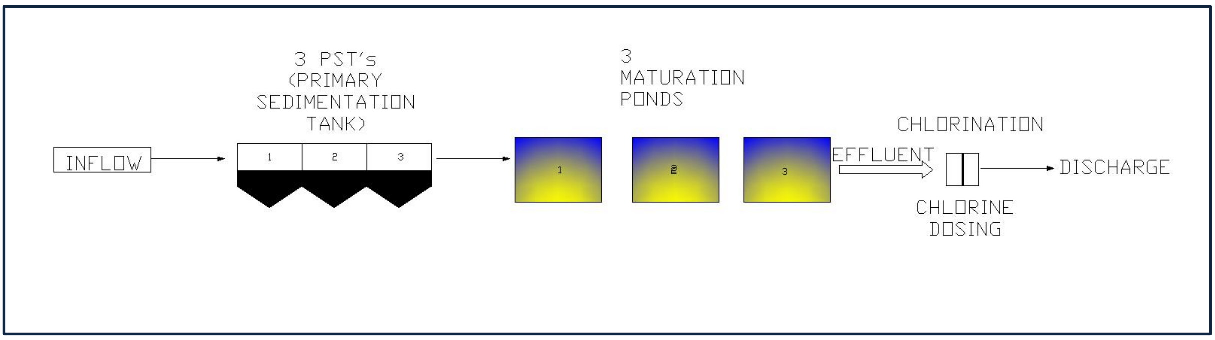

Figure 19.129 Wembezi Wastewater Works Process Flow Diagram

d) Weenen Wastewater Works

The Weenen sanitation scheme services the town of Weenen and the neighbouring township of KwaNobamba (**Figure 19.130**). According to the BA WSDP 2017 and its reference Backlog Study, there are 894 households falling within the scheme footprint. Weenen Town and KwaNobamba/Ezitendeni are currently serviced by septic tanks with the Weenen ponds receiving effluent from tankers only.

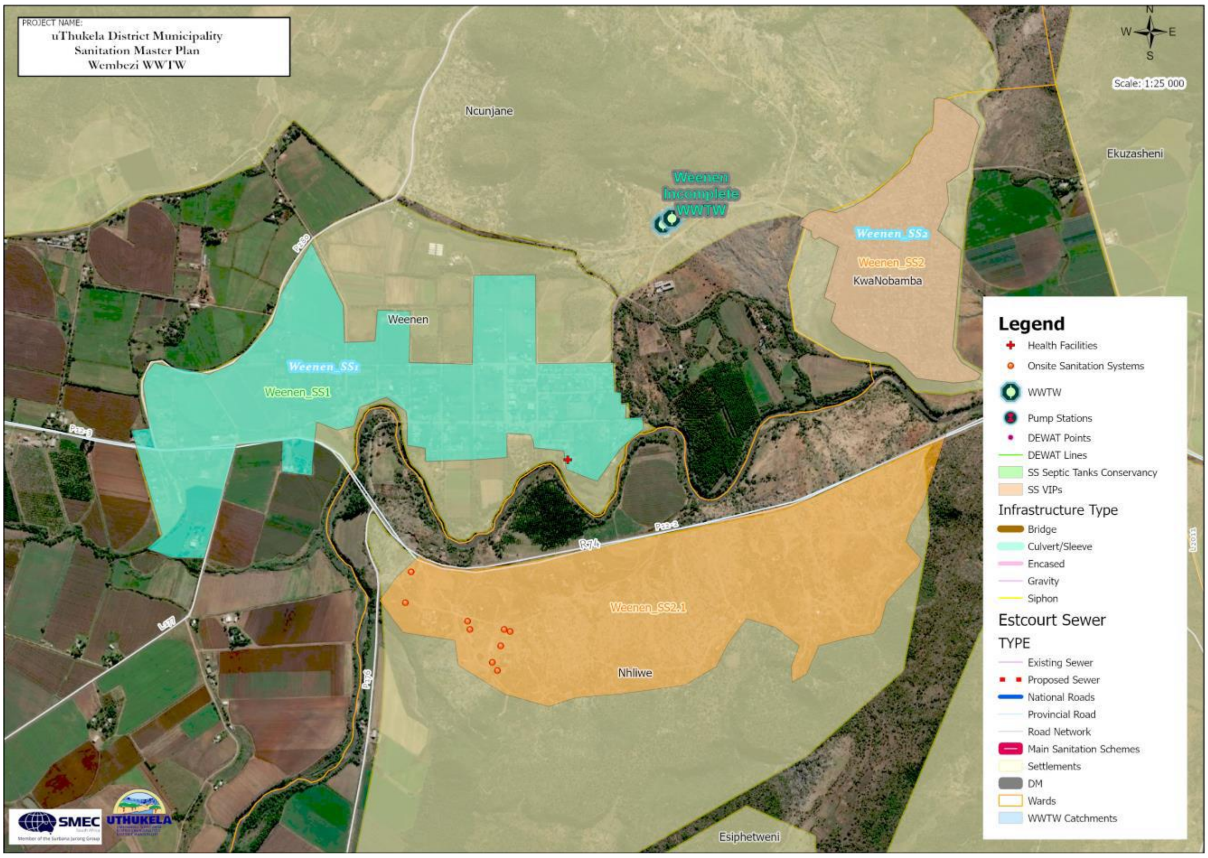

Figure 19.130 Weenen Wastewater Works Catchment Area

The WWTW consists of two concrete lined ponds and one plastic lined pond (**Figure 19.131**). The plastic lining is no longer in place. Indications are that the original design of the system was for a conventional process i.e., anaerobic digestion followed by aerobic treatment. However, due to underutilization, the treatment ponds are acting aerobically to treat the effluent.

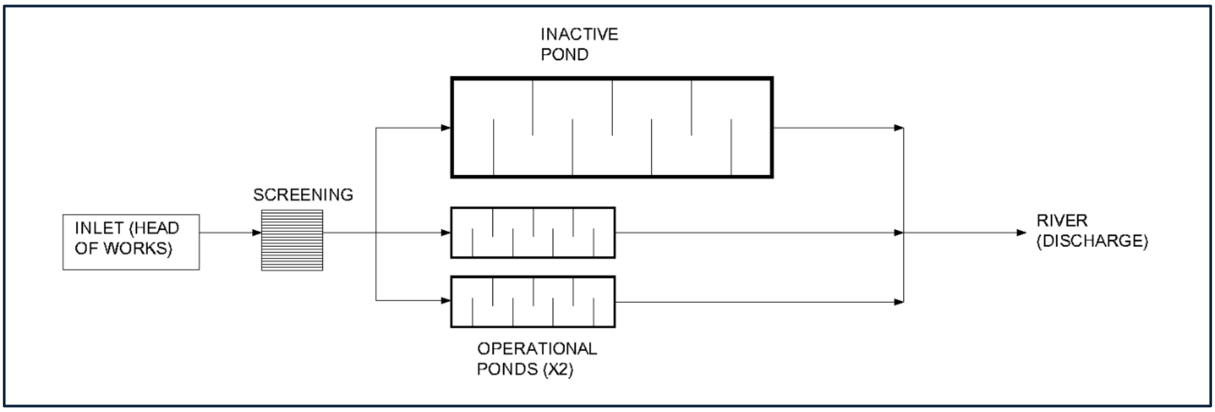

Figure 19.131 Weenen Wastewater Works Process Flow Diagram

e) Ezakeni Wastewater Works

The Ezakheni sanitation scheme services the township of Ezakheni only (**Figure 19.132**). According to the BA WSMP 2017 and its referenced Backlog Study, there are 10 864 households falling within the scheme footprint. As per discussions with the Alfred Duma Superintendent, the Ezakheni WWW was built in the 1970s to treat domestic waste only. The development of the Ithala industrial area in the 1980s, has required process changes at the WWW to deal with the addition of industrial effluent. A sewer pump station with a 350mm diameter steel rising main pumps sewage to the Ezakheni WWW from the Ithala industrial area.

Ezakheni is serviced by a waterborne sewerage system. Effluent flows to the Ezakheni WWW under gravity as well as from nine sewage pumping stations all operated by the UTDM. Only sewerage from the Section B area gravitates to the Ezakheni WWW.

The WWW utilizes the combined process of activated sludge and bio filtration to treat effluent in a so-called Biological Nutrient Removal (BNR) process (**Figure 19.133**). It consists of holding tanks, screening, de-gritting channels, drying beds, two anaerobic ponds, humus tank, a backup generator, flow splitter, disinfection process and anaerobic digestion for sludge. There are six aerators, with only two in operation. There are three mixers, with only one in operation. There are two secondary settlement clarifiers and chlorine dosing tanks. The sludge pump house and control room consist of four pumps. The works received some refurbishment and upgrading by Talbot and Talbot in 2017 and is coping with the inflow. As per discussions with the superintendent, there is a huge shortage of houses in the Ezakheni area. New developments have been halted due to the shortfalls in the sewerage system.

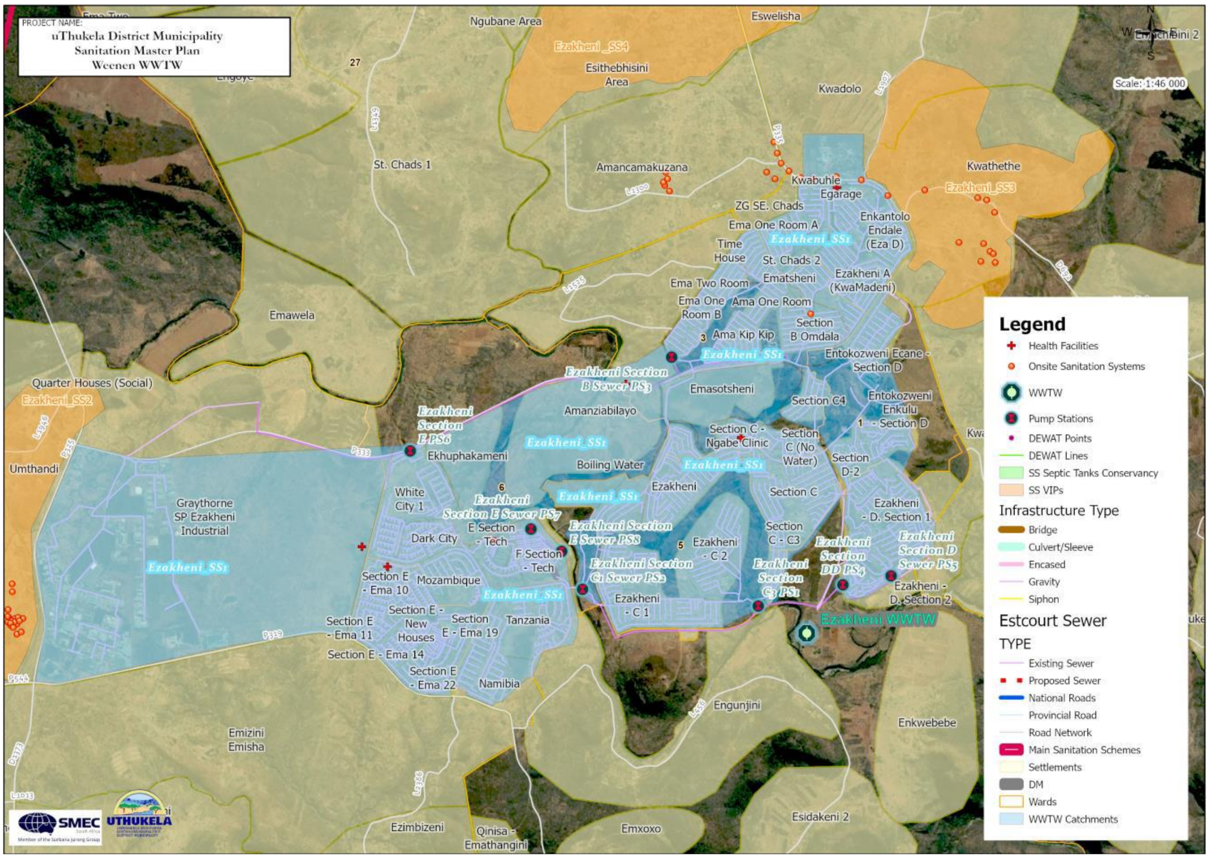

Figure 19.132 Ezakheni Wastewater Works Catchment Area

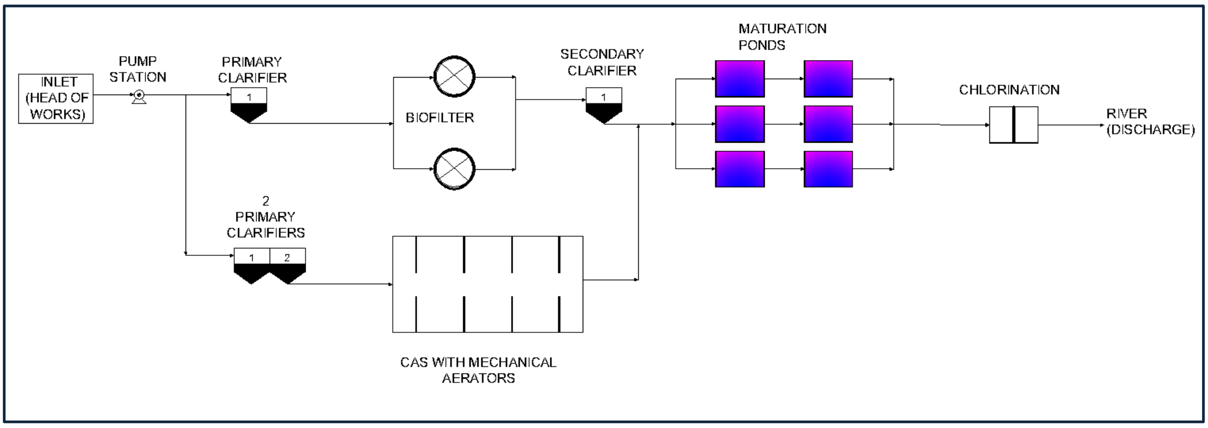

Figure 19.133 Ezakheni Wastewater Works Process Flow Diagram

f) Ekuvukeni Wastewater Works

The Ekuvukeni sanitation scheme services the township of Ekuvukeni only (**Figure 19.134**). According to the BA WSMP 2017 and its referenced Backlog Study, there are 2 602 households falling within the scheme footprint. Ekuvukeni is serviced by a waterborne sewerage system. The WWTW receives effluent under gravity flow as well as from tankers. Only 30% of Ekuvukeni's sewerage is connected (piped) to the WWTW.

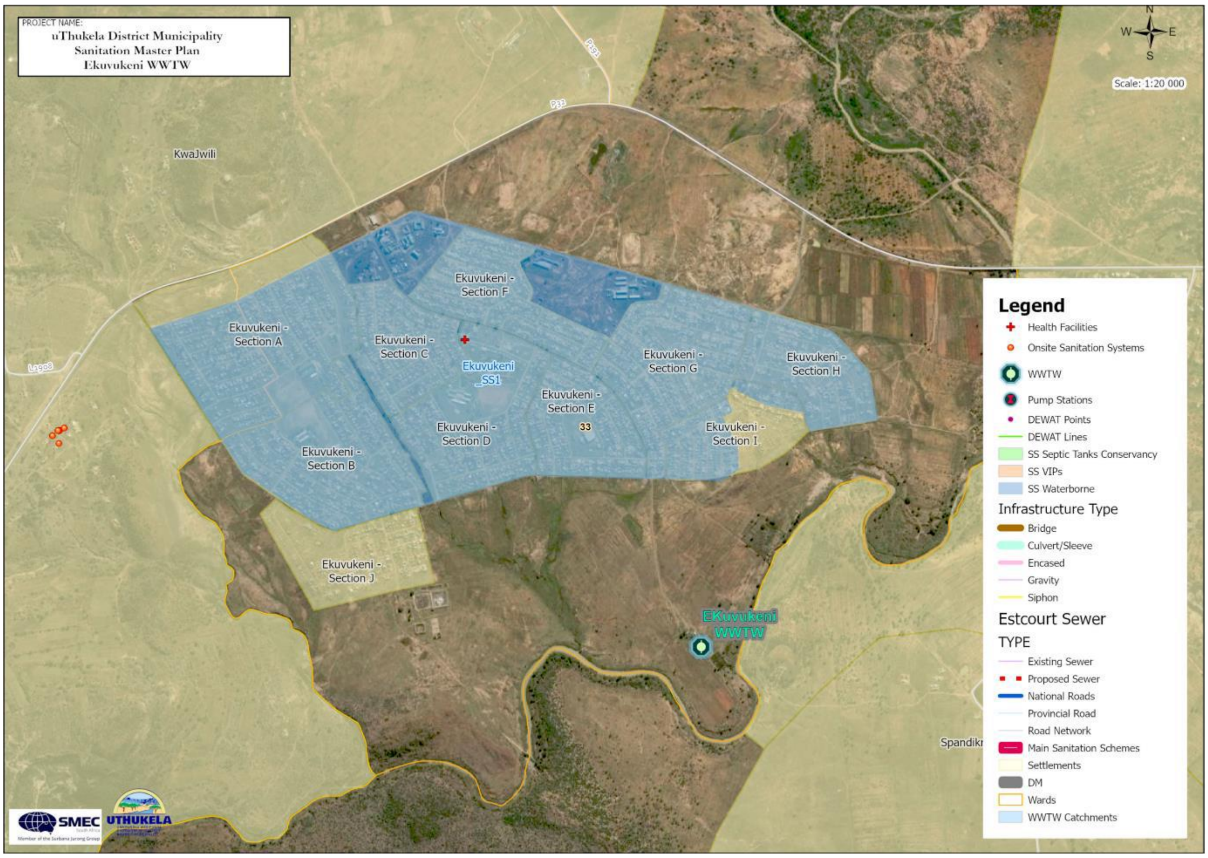

Figure 19.134 Ekuvukeni Wastewater Works Catchment Area

The WWTW utilizes a combined process of extended aeration and activated sludge with biological nutrient removal to treat the sewerage influent (**Figure 19.135**). The works consists of screens, de-gritter channels, biological nutrient removal, a single clarifier/scraper bridge, a return sludge pump, gas chlorination, maturation ponds, two mixers, axial flow rec pump, three aerators and waste sludge pump.

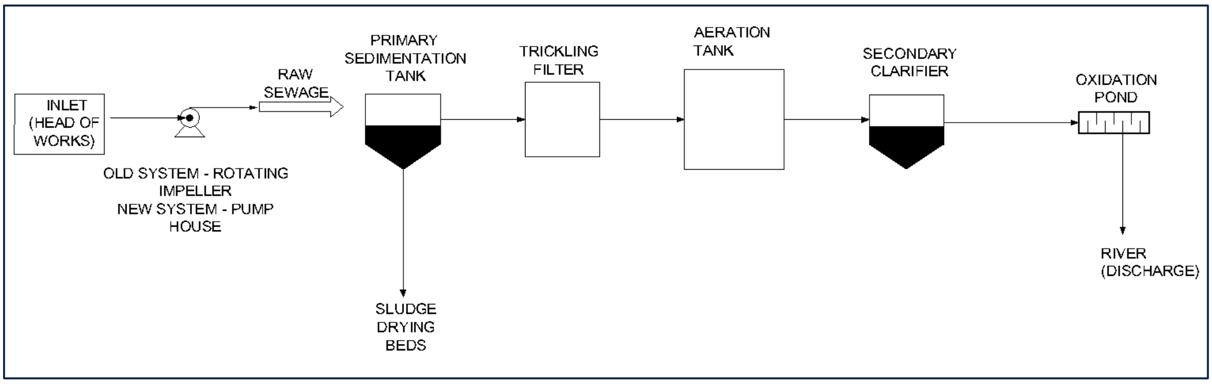

Figure 19.135 Ekuvukeni Wastewater Works Process Flow Diagram

g) Ladysmith Wastewater Works

The Ladysmith sanitation scheme services the town of Ladysmith and the neighbouring township of Steadville (**Figure 19.136**). According to the BA WSMP 2017 and its referenced Backlog Study, there were 9 522 households falling within the scheme footprint in 2017. Ladysmith and Steadville are serviced by a waterborne sewerage system. Effluent flows to the Ladysmith WWTW under gravity as well as from nineteen pump stations.

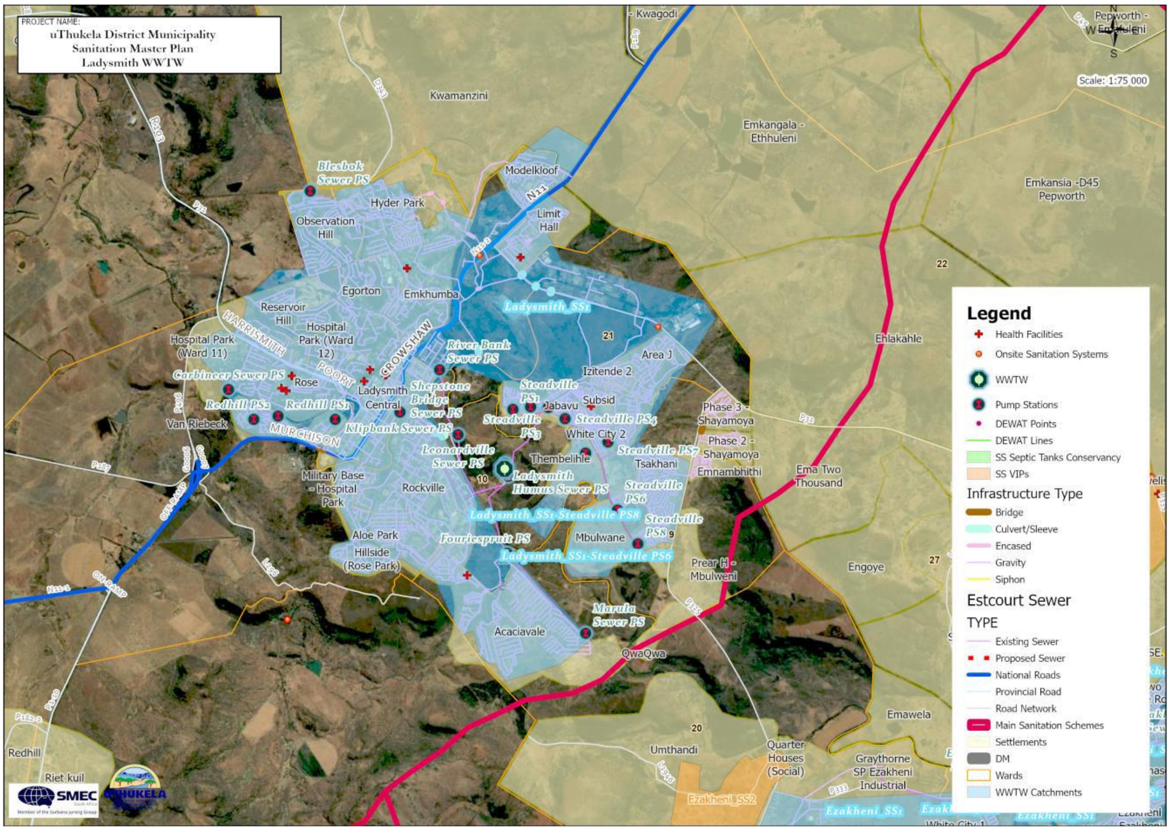

Figure 19.136 Ladysmith wastewater Works Catchment Area

The WWTW utilizes various treatment processes comprising of holding tanks, screening, de-gritting channels, flow measurement, flow splitting and disinfection. The bio filtration section of the plant is comprised of bio filters, humus tanks, anaerobic digesters, sludge digesters and maturation ponds (**Figure 19.137**).

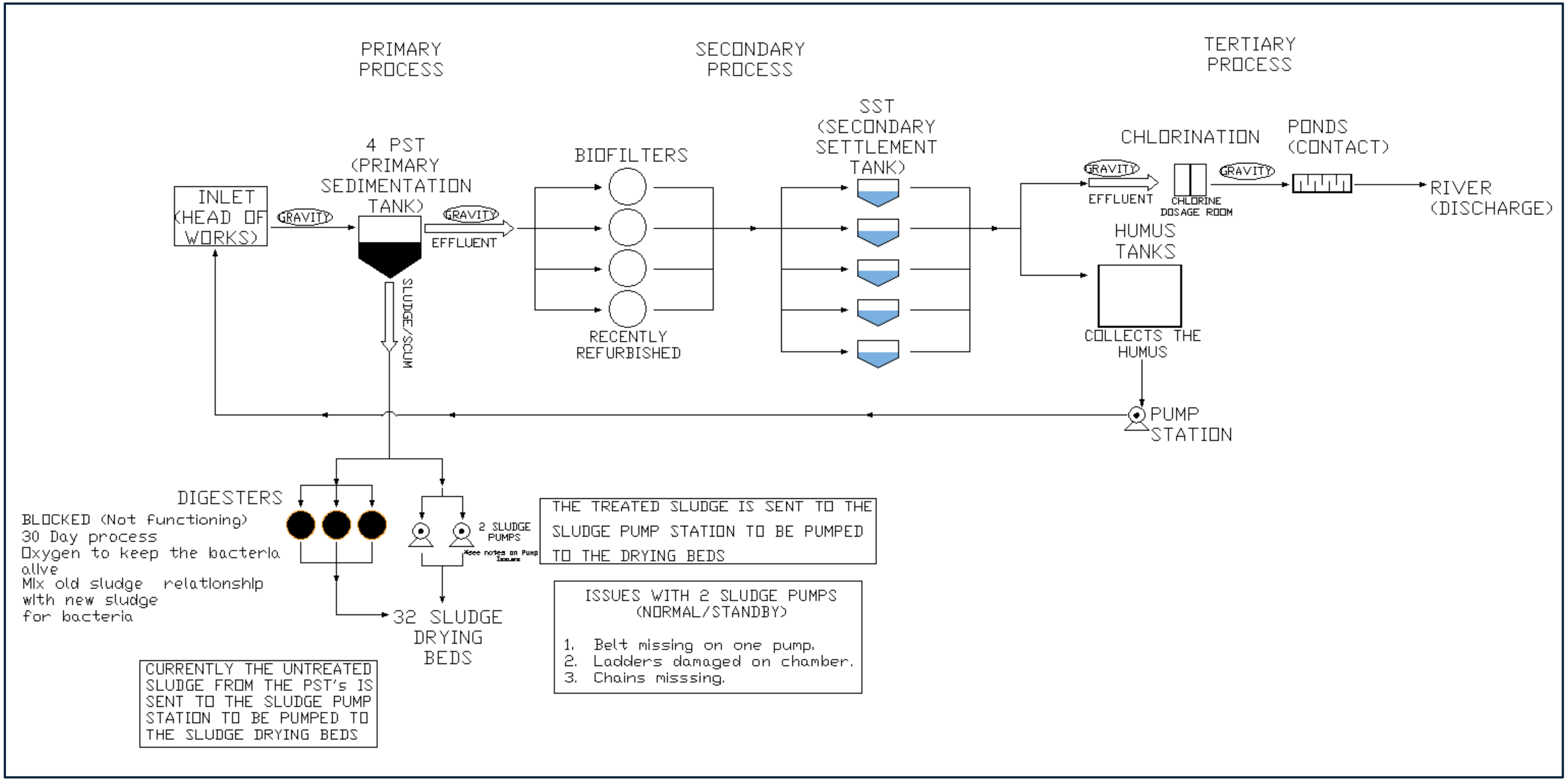

Figure 19.137 Ladysmith Wastewater Works Process Flow Diagram

h) Colenso Wastewater Works

The Colenso sanitation scheme services the town of Colenso and the neighbouring township of Inkanyezi (**Figure 19.138**). According to the BA WSMP 2017 study and its referenced Backlog Study, there were 1 350 households falling within the scheme footprint in 2017. Colenso and Inkanyezi are serviced by a waterborne sewerage system. Effluent flows to the Colenso WWTW under gravity as well as from seven pump stations.

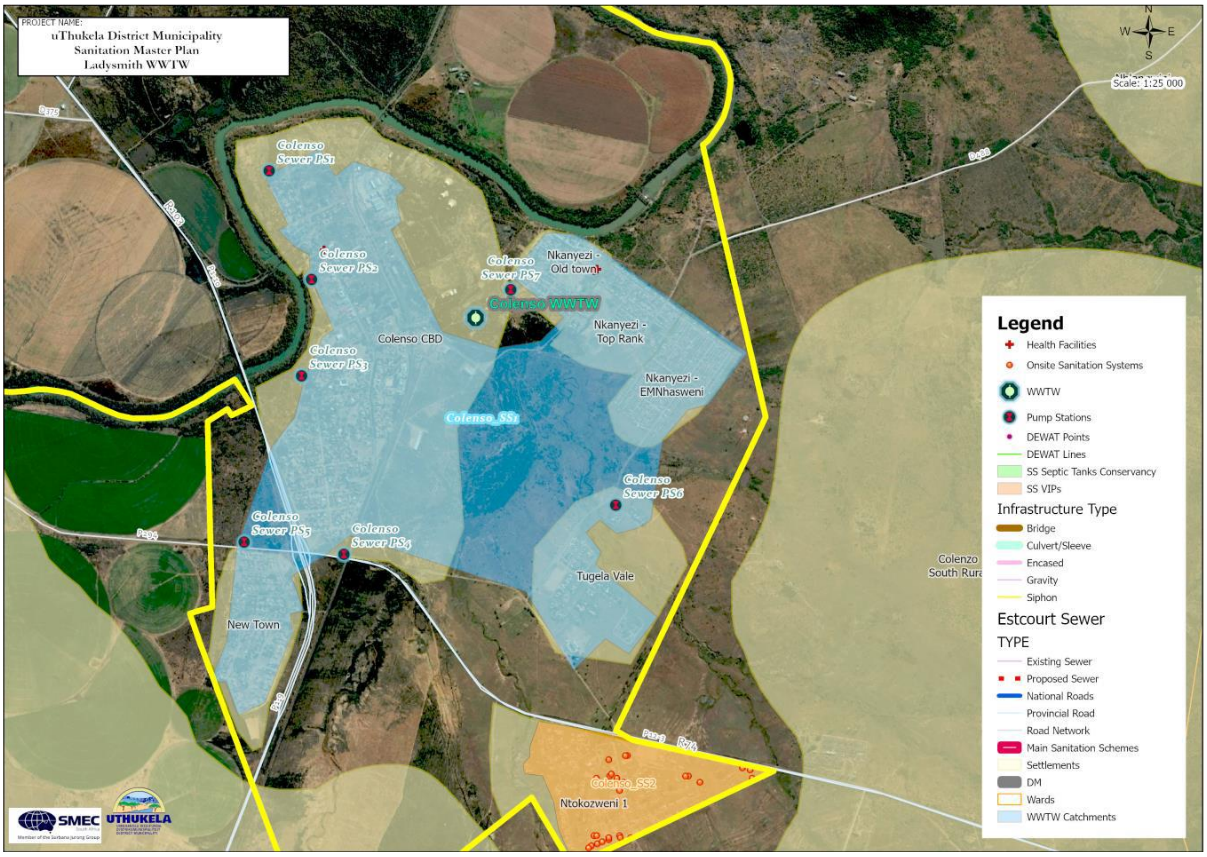

Figure 19.138 Colenso Wastewater Works Catchment Area

The WWW process consists of an activated sludge system and utilizes combined screening, de-gritting, activated sludge, secondary settling, sludge drying and disinfection (**Figure 19.139**). Limited flow enters the works as a result of the various pump stations that are non-operational. The flow that does reach the works cannot be transferred to the next unit process when the screw pumps are not working. Two aerators and a RAS system are provided but occasional breakdown and overall mechanical malfunctioning reduces the plant's effectiveness.

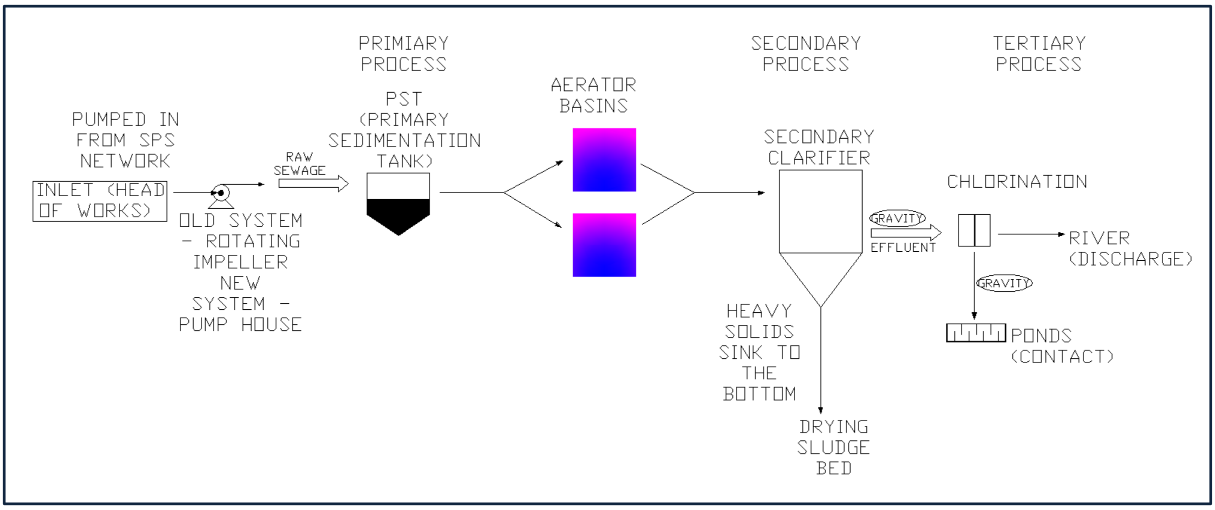

Figure 19.139 Colenso Wastewater Works Process Flow Diagram

i) Bergville Wastewater Works

The Bergville sanitation scheme services the town of Bergville only. According to the Backlog Study, there are 228 households falling within the scheme footprint (**Figure 19.140**). Bergville is currently serviced by septic tanks with the Bergville WWW receiving effluent from tankers only. The works also accepts effluent from tankers from the nearby town of Winterton.

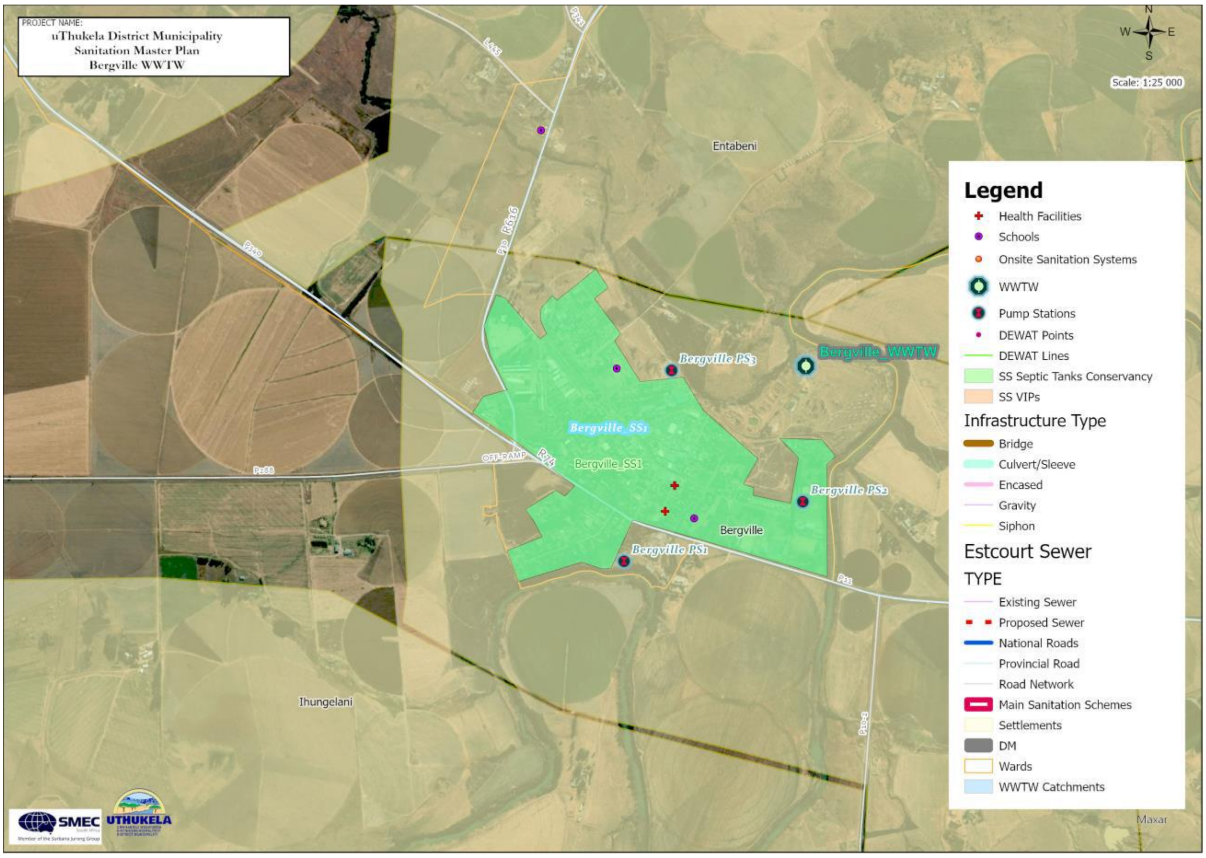

Figure 19.140 Bergville Wastewater Works Catchment Area.

The existing WWW utilizes a series of oxidation ponds (**Figure 19.141**). Tankers discharge into a sump that flows through a screened inlet works to the ponds. The first two ponds are extremely silted up with limited process capacity. A floating aerator is located in the last pond but is non-operational. The effluent from the oxidation ponds is meant to flow to a system of four maturation ponds but these are also severely silted up and the effluent flows directly into the uThukela River. No provision for disinfection of the effluent is made.

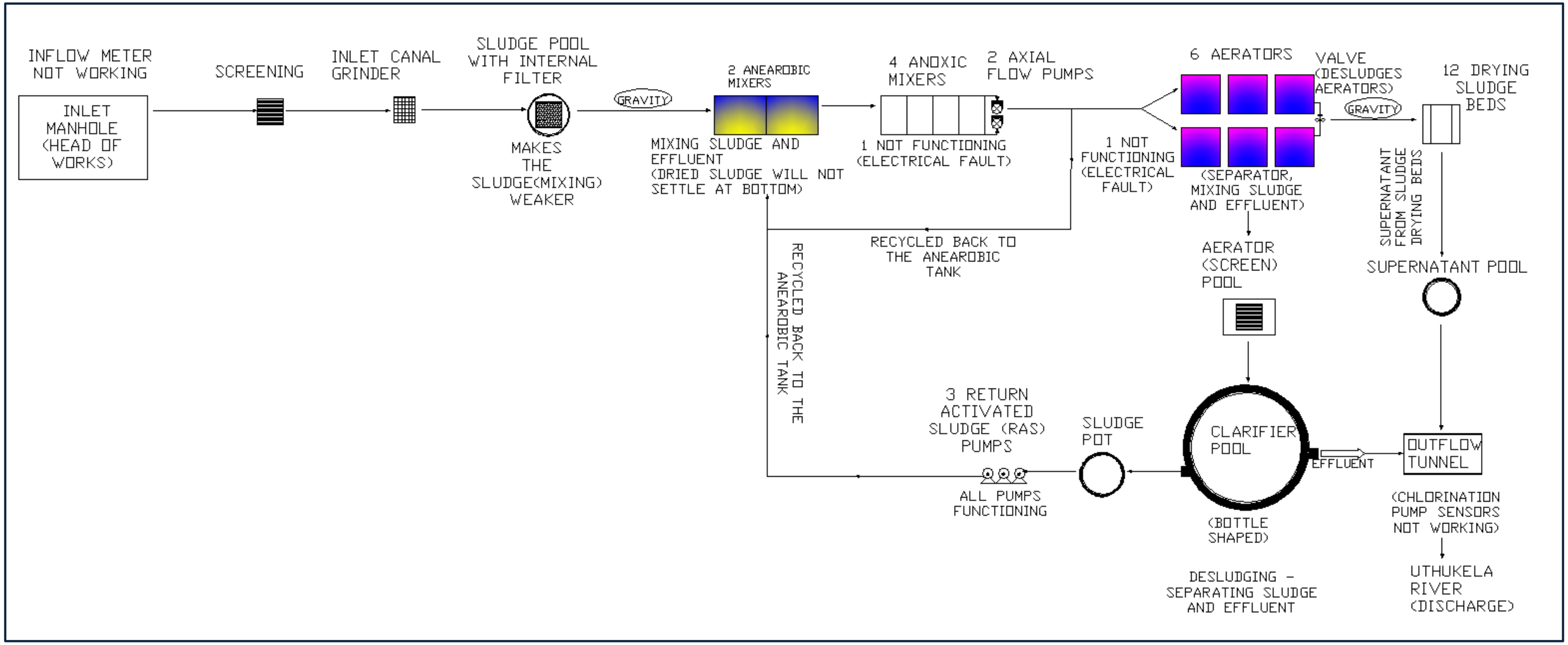

Figure 19.141 Bergville Wastewater Works Process Flow Diagram.

j) Winterton Wastewater Works

The Winterton scheme services the town of Winterton and the neighbouring township of Khethani. According to the Backlog Study, there are 146 households falling within the scheme footprint (**Figure 19.142**). Winterton and Khethani are mostly serviced by a waterborne sewerage system although some areas are believed to have septic tanks. Effluent flows to the Winterton WWW under gravity as well as from one pump station.

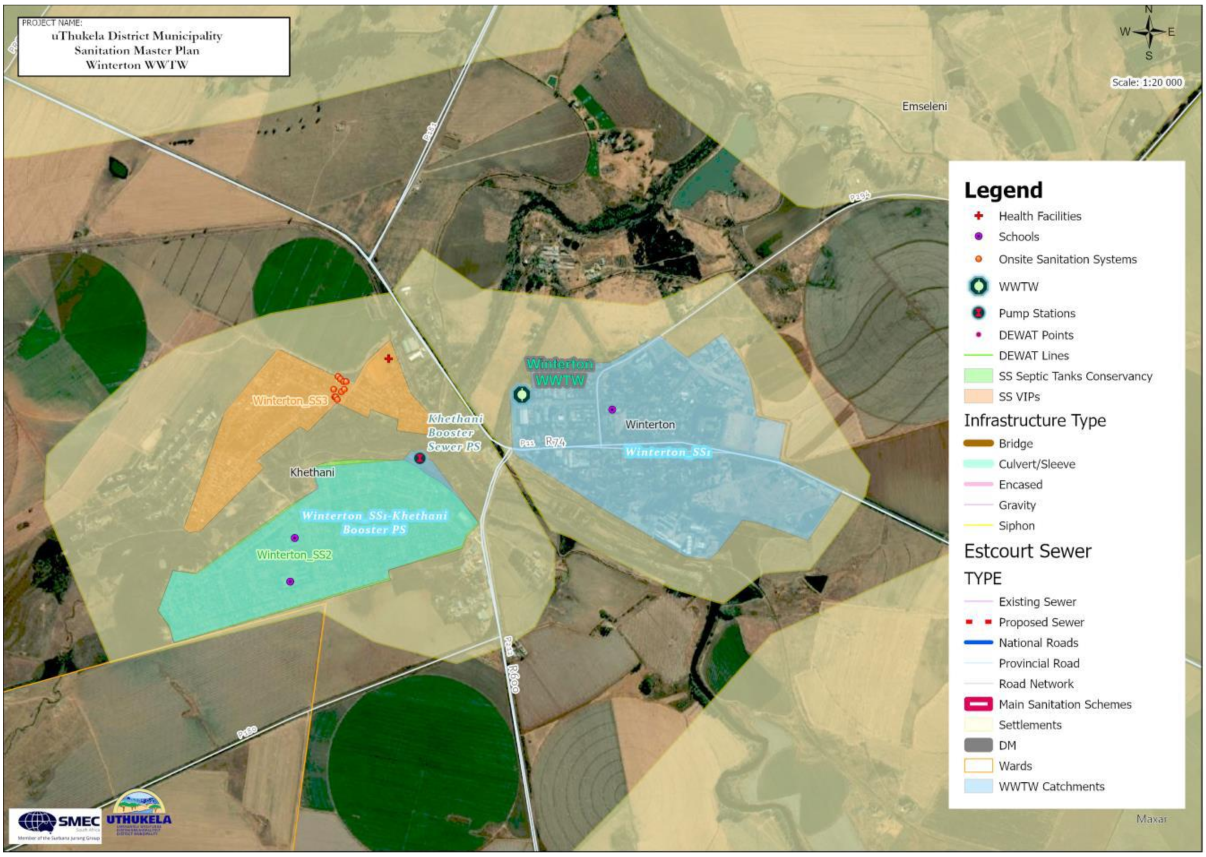

Figure 19.142 Winterton Wastewater Works Catchment Area.

The WWW process consists of an inlet works and a poorly constructed flume. The effluent then enters an open septic tank before being pumped to a small stone biofilter. The biofilter underflow is then pumped to an aeration basin. Four drying beds are present but have not been utilized in a long time. A container-based chlorination system is provided (**Figure 19.143**).

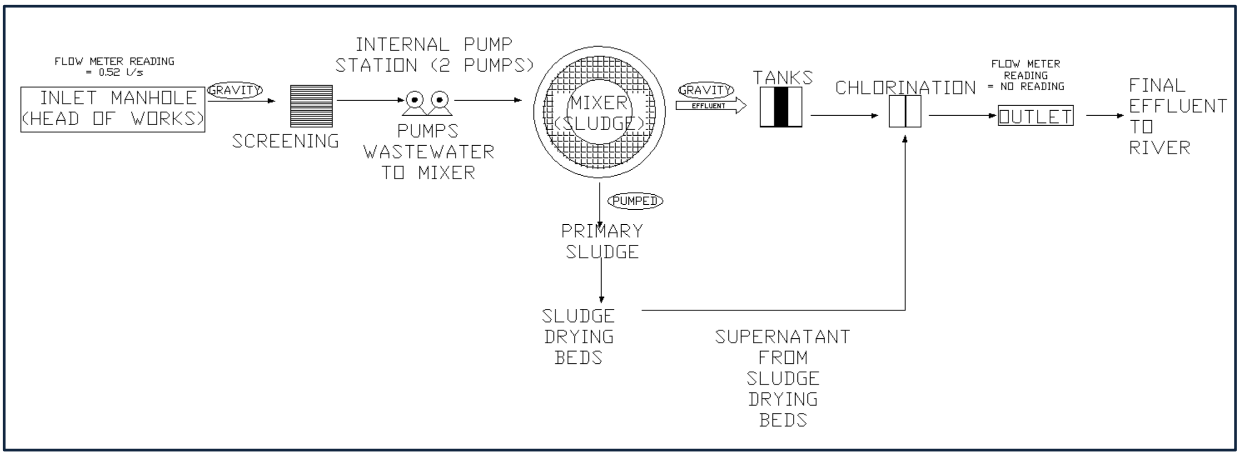

Figure 19.143 Winterton Wastewater Works Process Flow Diagram.

19.5.2 uMzinyathi District Municipality

The uMzinyathi District Municipality has nine WWW, seven of which are operational (**Figure 19.144**). The capacity of the WWWs range from very small (0.25 Mℓ/day) serving the community of Wasbank to small (3.2 Mℓ/day) serving the town of Greytown. A list of the WWW in the uMzinyathi DM is provided in **Table 19.31**.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.32**.

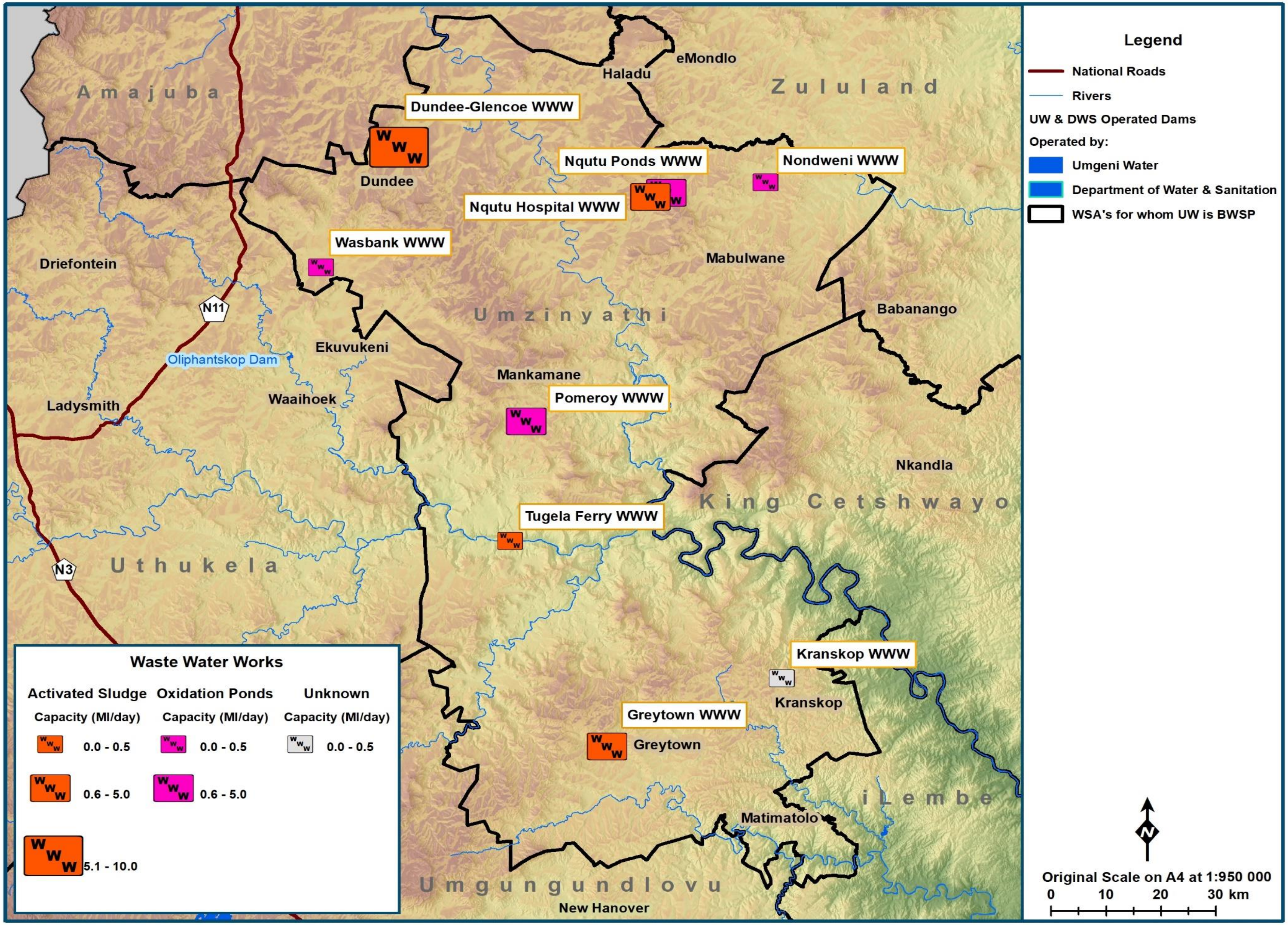

Figure 19.144 Location of uMzinyathi Wastewater Works

Table 19.31 uMzinyathi District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020) *(SMEC, 2025)
Tugela Ferry	Activated Sludge	uThukela Water	D	N	0.5	625	Y	Fair	R 918 500
Dundee-Glencoe	Activated Sludge	uThukela Water	B	Y	10	12500	Y	Fair	R 11 000 000*
Greytown	Activated Sludge	uThukela Water	D	N	3.2	4000	Y	Good	R 480 500
Kranskop	None	uThukela Water	E	N	0.0	63	N	Fair	R 337 500
Nondweni	Oxidation Ponds	uThukela Water	D	Y	0.0	625	N	Unknown	Unknown
Nqutu Hospital	Activated Sludge	uThukela Water	D	Y	2.0	2500	Y	Uunknown	Unknown
Nqutu Ponds	Oxidation Ponds	uThukela Water	E	Y	3.0	Unknown	Y	Fair	R 125 000
Pomeroy	Oxidation Ponds	uThukela Water	D	Y	1.0	1250	Y	Fair	R1 003 000
Wasbank	Activated Sludge	uThukela Water	D	Y	0.25	625	Y	Unknown	Unknown

Table 19.32 MIG funded Sanitation Projects in uMzinyathi District Municipality (CoGTA KwaZulu-Natal, 2024)

Project	Status
Eradication of Sanitation Backlogs Umvoti LM	Completed
Nquthu North Eastern Waterborne Sanitation Project	Completed
Eradication of Msinga Sanitation Backlog	Construction 81%
Eradication of Nquthu Sanitation Backlogs	Construction 8

19.5.3 iLembe District Municipality

The iLembe District Municipality (DM) has 15 WWW including two that are operated by Siza Water (Frasers and Shakaskraal). All the wastewater works are reported operational with the exception of Melville, which has yet to be commissioned (**Figure 19.145**). The capacity of the WWW's range from very small (0.05 Mℓ/day) serving Ntunjambili Hospital to relatively large (12 Mℓ/day) serving the Sundumbili community. A list of the WWW in the iLembe DM is provided in **Table 19.33**.

19% of the population of iLembe DM still do not have access to basic sanitation. The urban areas have proper waterborne sanitation systems, but the peri-urban and rural areas rely on pit latrines or no system at all. Plans are currently in place to construct a regional wastewater scheme (in planning phase) in KwaDukuza to address the current infrastructure limitations of the area. Proposed wastewater works are planned for Ndwedwe, Mandeni, Maphumulo and various parts of KwaDukuza.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.34**.

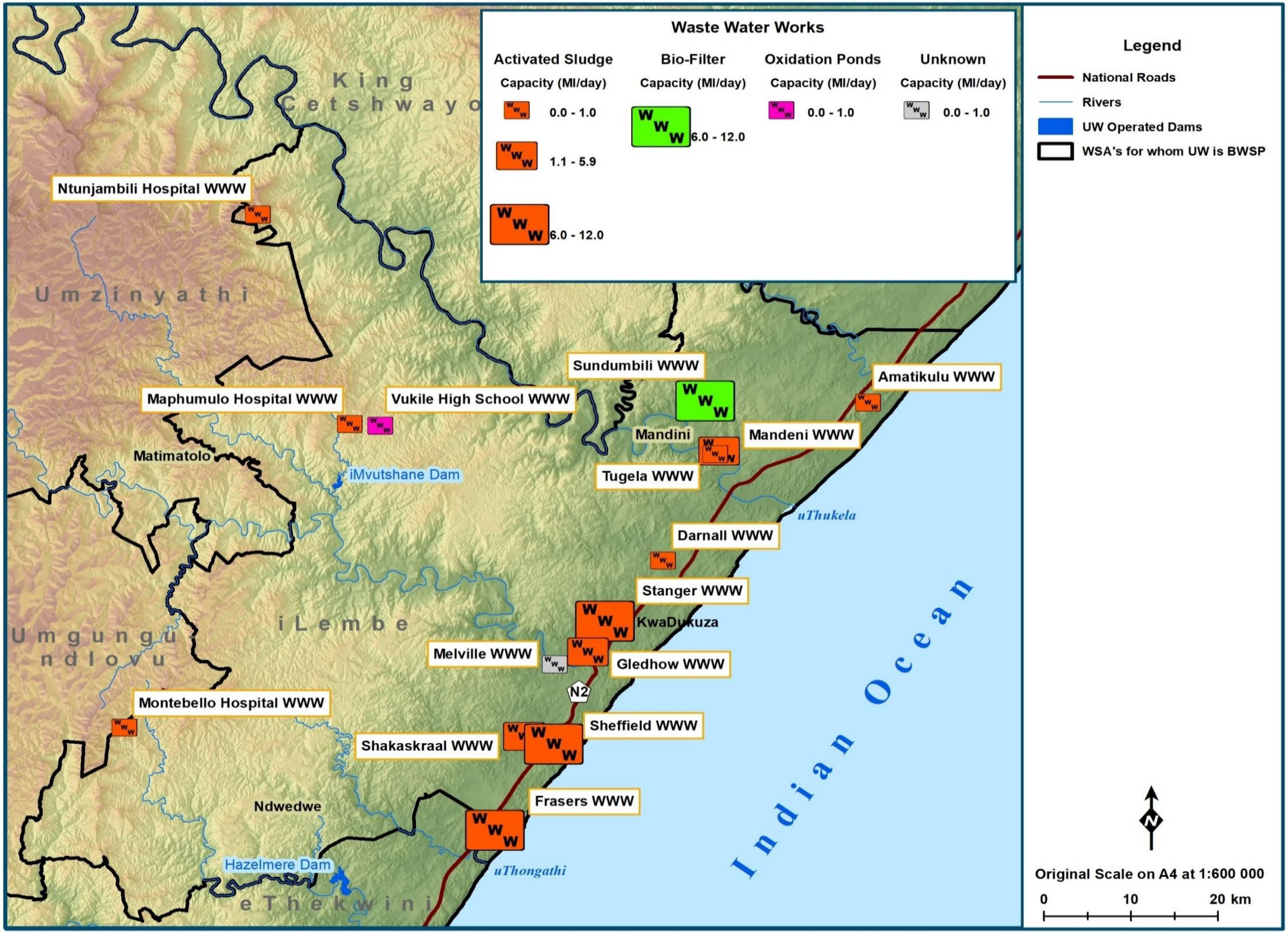

Figure 19.145 Location of iLembe District Municipality Wastewater Works.

Table 19.33 iLembe District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Sundumbili	Bio-filter	iLembe DM	B	N	12.0	15000	Y	Poor	R 3 080 800
Frasers	Activated Sludge	Siza Water	C	Y	12.0	15000	Y	Poor	R 540 000
Mandeni	Activated Sludge	iLembe DM	D	Y	1.3	1500	Y	Poor	R 3 310 000
Darnall	Activated Sludge	iLembe DM	D	Y	0.33	375	Y	Poor	R 2 360 000
Shakaskraal	Activated Sludge	Siza Water	D	Y	1.6	1500	Y	Poor	R 540 000
Stanger	Activated Sludge	iLembe DM	D	Y	10.0	12500	Y	Poor	R 2 810 500
Tugela	Activated Sludge	iLembe DM		Y	0.75	750	Y	Fair	R 810 000
Maphumulo Hospital	Activated Sludge	iLembe DM	D	Y	0.15	37	Y	Fair	R 360 00
Amatikulu	Activated Sludge	iLembe DM	D	Y	0.25	250	Y	Poor	R 930 000
Gledhow	Activated Sludge	iLembe DM	C	Y	3.0	250	Y	Poor	R 2 450 000
Melville	Not commissioned	iLembe DM		Y	0.06	0	N	Fair	R 320 000
Montebello Hospital	Activated Sludge	iLembe DM	D	Y	0.15	188	Y	Poor	R 3 110 000
Ntunjambili Hospital	Activated Sludge	iLembe DM	D	Y	0.05	375	Y	Poor	R 1 280 000
Sheffield	Activated Sludge	iLembe DM		Y	6.0	Unknown	Y	Fair	R 120 000
Vukile High School	Oxidation Ponds	iLembe DM		Y	0.03	Unknown	Y	Fair	R 350 000

Table 19.34 MIG funded Sanitation Projects in iLembe District Municipality (CoGTA KwaZulu-Natal, 2024)

Project	Status
Inyoni Housing Development Bulk Sewer Project	Construction 80%
Mandeni Sanitation Master Business Plan	Completed
Ndwedwe Sanitation Master Business Plan	Construction 81%
Darnall Sewer Upgrade within Ward 2 of KwaDukuza Municipality	Completed
Maphumulo Town WWW and Sewer Reticulation Phase 1	Planning & Design
Groutville D Sanitation Project Phase 2	Construction 91%
Lindelani Upgrading of Sewer Reticulation Network	Completed
KwaDukuza Regional Wastewater Works	Design & Tender
Mandafarm Waterborne Sanitation – Planning Phase (Mandeni Ward 7)	Design
Construction of 10142 VIPs within Mandeni Municipality	Construction 81%
Construction of 840 VIPs in Ndwedwe Ward 15	Construction
Sundamuili Wastewater Works Addendum: Fees for Detailed Design	Design
Frasers Wastewater Works Upgrade – Planning Phase	Design
KwaDukuza Town Bulk Sewer Replacement and Upgrade	Construction 41%

19.5.4 Harry Gwala District Municipality

The Harry Gwala District Municipality (HGDM) has ten WWW, nine of which are operational (**Figure 19.146**). The capacity of the WWW's range from very small (0.1 Mℓ/day) serving the community of Franklin to small (1 Mℓ/day) serving the town of Ixopo. A list of the WWW in the Harry Gwala DM is provided in **Table 19.35**.

The municipality reported that sanitation backlogs have been eradicated in the Greater Kokstad Local Municipality. The municipality is working to eradicate sanitation backlogs in the remaining three local municipalities i.e. Dr Nkosazana Dlamini-Zuma, uMzimkhulu and uBuhlebezwe. The total sanitation backlog equates to 22 % of the households in HGDM without basic RDP sanitation.

A number of sanitation projects have been implemented, are under construction or are proposed in the HGDM. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.36**.

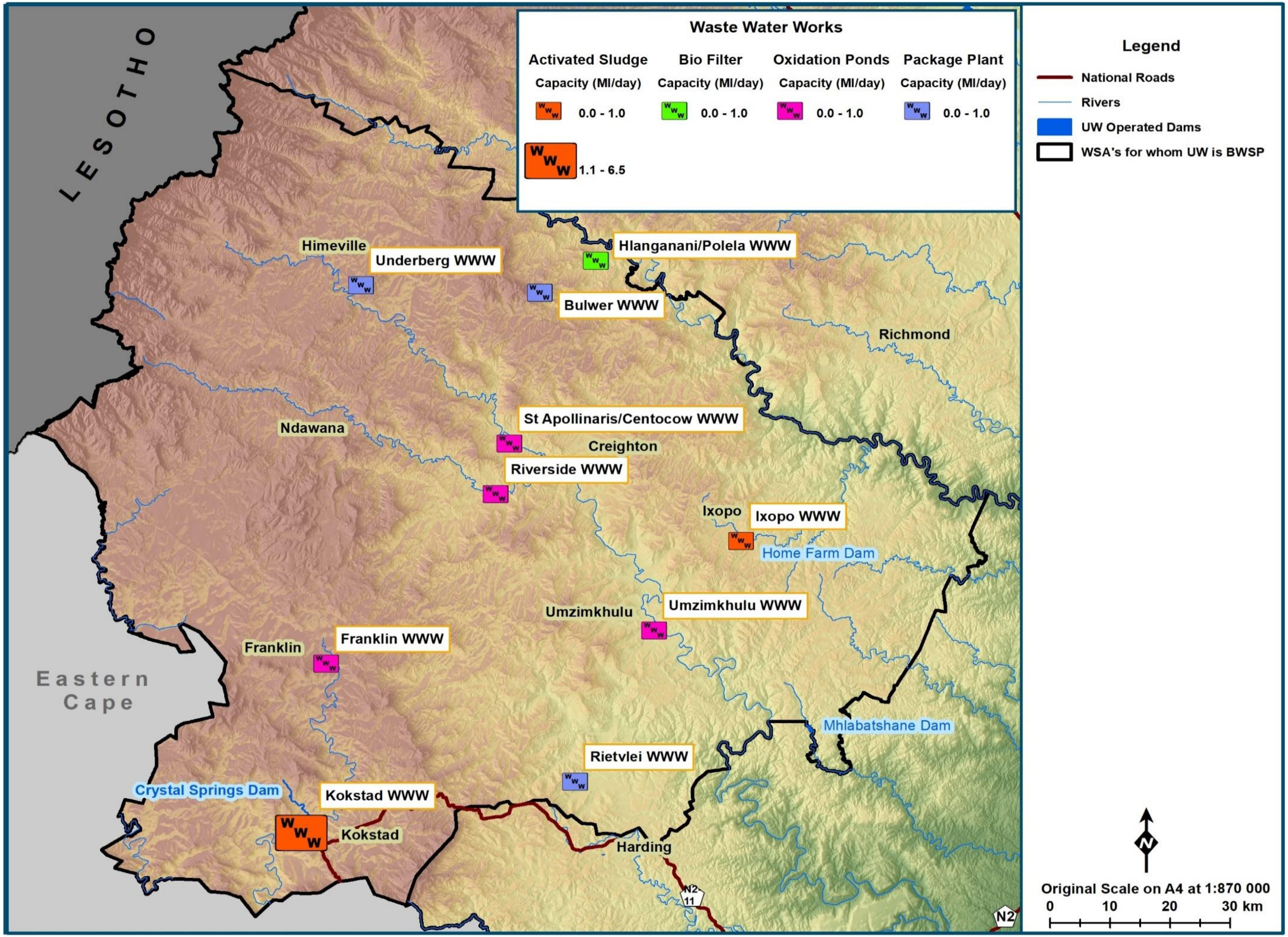

Figure 19.146 Location of Harry Gwala District Municipality Wastewater Works

Table 19.35 Harry Gwala District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class: Harry Gwala	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Ixopo	Activated Sludge	uMngeni-uThukela Water	C	Y	0.95		Y	Good	-
Kokstad	Activated Sludge	Harry Gwala DM	C	Y	6.4	22500	Y	Poor	R 8 920 000
Underberg	Package Plant	Harry Gwala DM	D	N	0.1	125	Y	Good	R 130 000
Bulwer	Package Plant	Harry Gwala DM	C	Y	0.08	125	Y	Fair	R 2 540 000
Franklin	Oxidation Ponds	Harry Gwala DM	D	Y	0.1	125	Y	Poor	R 3 380 000
Hlanganani/Polela	Bio-filter	Harry Gwala DM	D	Y	0.22	313	N	Fair	R 370 000
Riverside	Oxidation Ponds	Harry Gwala DM	E	Y	0.36	500	N	Dysfunctional	R 5 940 000
St Apollinaris/Centocow	Oxidation Ponds	Harry Gwala DM	D	Y	0.09	125	Y	Poor	R6 550 000
Umzimkhulu	Oxidation Ponds	Harry Gwala DM	C	Y	0.56	750	Y	Fair	R 1 790 000
Rietvlei	Package Plant	Harry Gwala DM	D	Y	Unknown	625	N	Dysfunctional	R 24 460 000

Table 19.36 MIG funded Sanitation Projects in Harry Gwala District Municipality (CoGTA KwaZulu-Natal, 2024)

Project	Status
Upgrade of Fairview and Ixopo Sewer System - Pumpstation	Practical Completion
Horseshoe Sanitation Project Phase 2	Practical Completion
Mbizweni Main Sewer Collector Upgrade in Umzimkhulu Town (Ward 16)	Construction 81%

19.5.5 Ugu District Municipality

The Ugu District Municipality (DM) has 16 WWW, the majority of them small. All but one of them are reported as being operational (**Figure 19.147**). The capacity of the WWWs range from very small (0.2 Mℓ/day) serving the community of Eden Wilds to relatively large (12 Mℓ/day) serving the large town of Port Shepstone. A list of the WWW in the DM is provided in **Table 19.37**.

The urban areas within Ugu are located predominantly within a narrow coastal strip comprising erven occupied by a combination of permanent residents and local tourists who descend on the area during holiday periods. The Sanitation Services Master Plan (SSMP) (SSI, 2005) suggests that the water demand (and hence wastewater flows) in the peak December/January period is typically 33% higher than the annual average values. Although largely “residential” most urban areas include some “commercial” activity and there are some “light and/or service industrial” nodes particularly at Port Shepstone (Marburg) and at Park Rynie to a lesser extent. The urban sanitation comprises a combination of waterborne sewerage linked to wastewater works as well as a system of septic tanks and conservancy tanks in the less densely populated areas.

Most of the treatment facilities are owned and managed by Ugu although there are also a number of privately owned and managed, small sewage treatment plants,– mostly “package” plants. With the exception of Gamalakhe, the sewerage coverage of formal, urban areas, which have a municipal water connection, is approximately 30%.

A total estimated capital investment (2014) of the order of R 3 billion is required to reticulate and upgrade sanitation within the urban strip. The urban strip are areas adjoining the coastal and by nature of their density should be provided with reticulated, waterborne sewerage as opposed to a basic level of service *viz*. septic tanks.

A number of sanitation projects have been implemented, are under construction or are proposed in Ugu. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.38**.

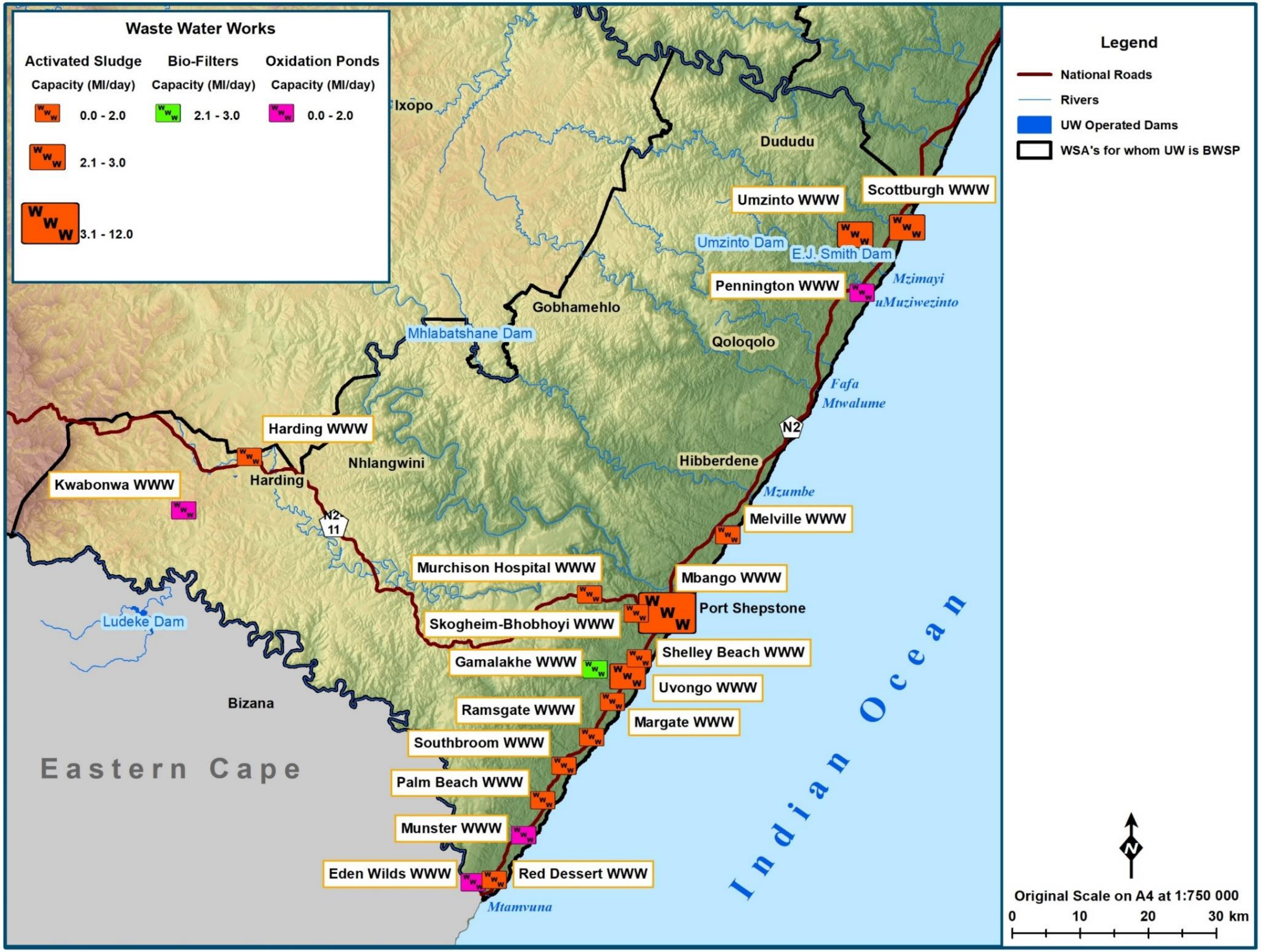

Figure 19.147 Location of Ugu District Municipality Wastewater Works.

Table 19.37 Ugu District Municipality Wastewater Works Specifications.

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Kwabonwa	Oxidation Ponds	Ugu DM	D	Y	0.6	63	Y	Fair	R 4 710 000
Gamalakhe	Bio-filter	Ugu DM	C	Y	3.0	2500	Y	Fair	R 7 280 000
Ramsgate	Activated Sludge	Ugu DM	C	N	1.2	1125	Y	Poor	R 3 110 000
Uvongo	Activated Sludge	Ugu DM	B	Y	2.4	1875	Y	Fair	R 2 640 000
Palm Beach	Activated Sludge	Ugu DM	C	Y	0.7	750	Y	Poor	R 3 490 000
Umzinto	Activated Sludge	Ugu DM	C	Y	2.5	2000	Y	Fair	R 10 051 500
Shelley Beach	Activated Sludge	Ugu DM	C	N	0.75	875	Y	Fair	R 9 860000
Scottburgh	Activated Sludge	Ugu DM	B	Y	2.3	2250	Y	Poor	R 11 780 000
Margate	Activated Sludge	Ugu DM	B	Y	0.6	6250	Y	Fair	R 4 970 000
Murchiston Hospital	Activated Sludge	Ugu DM		Y	0.2	2500	Y	Fair	R 12 740 000
Eden Wilds	Oxidation Ponds	Ugu DM	D	Y	0.2	188	Y	Fair	R 2 570 000
Southbroom	Activated Sludge	Ugu DM	D	Y	0.2	63	N	Dysfunctional	R 6 480 000
Harding	Activated Sludge	Ugu DM	C	Y	1.6	563	Y	Fair	R 1 510 000
Hibberdene	Oxidation Ponds	Ugu DM	C	Y	0.28		N	Decommissioned	
Mbango	Activated Sludge	Ugu DM	B	N	12.0	11250	Y	Poor	R 10 290 000
Melville	Activated Sludge	Ugu DM	C	Y	0.28	344	Y	Fair	R 7 570 000
Munster	Oxidation Ponds	Ugu DM	D	Y	0.25	225	Y	Poor	R 5 680 000

Pennington	Oxidation Ponds	Ugu DM	C	N	2.0	750	Y	Fair	R 4 260 000
Red Dessert	Activated Sludge	Ugu DM	D	Y	0.6	563	Y	Fair	R 2 250 000
Skogheim-Bhobhoyi	Activated Sludge	Ugu DM	D	Y	0.14	150	Y	Unknown	R 590 000

Table 19.38 MIG funded Sanitation Projects in Ugu District Municipality (CoGTA KwaZulu-Natal, 2024).

Project	Status
Kwalatshoda Water and Sanitation Project	Construction 80%
Extension (5.5 Ml/day)to uMbango WWW Planning Phase	Completed
New 1.5 Ml/day Melville WWW Planning Phase	Completed
Masinenge/uVongo Sanitation Project	Construction
Umzinto WWW and Outfall Sewers Upgrade and Rehabilitation	Construction 20%
Hibiscus Coast Sanitation Project - VIPs	Practical Completion
Refurbishment of Scottburgh WWW – Phase 1	Registered
Margate Extension 3 & 7 Sanitation Scheme – Ward 6	Construction 41%
Park Rynie Sewer Reticulation and Bulk Outfall Sewer – Ward 10	Design
Refurbishment And Upgrade of Margate Storm-Damaged Infrastructure, Wastewater Treatment Works Phase1	Design
Pennington Waterborne Sanitation Phase 3	Registered
Refurbishment of Sanitation Infrastructure : O&M - Phase 2	Registered

19.5.6 uMkhanyakude District Municipality

The uMkhanyakude District Municipality (UKDM) has 11 WWWs all of which are 1 Mℓ/day and smaller in capacity (**Figure 19.148**). A list of the WWW in the DM is provided in **Table 19.39**. The provision of appropriate sanitation in the DM is a serious issue with massive backlogs.

The percentage of households in the district with access to a flush toilet (connected to either a sewerage system or a septic tank) is only 13%, a figure significantly lower than the 45% at provincial level. About 18 % of households in UKDM do not have access to any form of sanitation facilities compared to only 6.3% at provincial level. The dominant forms of sanitation infrastructure in the district include ventilated improved pit latrines (25% of households) and unimproved pit toilets (19% of households).

The sanitation access backlogs were determined utilising a combination of Census 2011 and the Stats SA 2016 Community Survey. The sanitation backlog for the district was 43% in 2016 compared to 45% in 2011. This shows a very slow pace in the eradication of sanitation backlogs which can be attributed to the municipality's main focus on water provision. In accordance with the 2016 Community Survey, a total of 65 675 households have below minimum level of service in terms of sanitation access.

The sanitation eradication backlog cost is estimated at R 985 million assuming dry sanitation to all those households without access at present. Similar to the water backlogs eradication cost, this figure does not account for maintenance backlogs as there are some households which were previously served but their schemes are currently dysfunctional due to prolonged lack of maintenance.

A number of sanitation projects have been implemented, are under construction or are proposed in UKDM. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.40.**

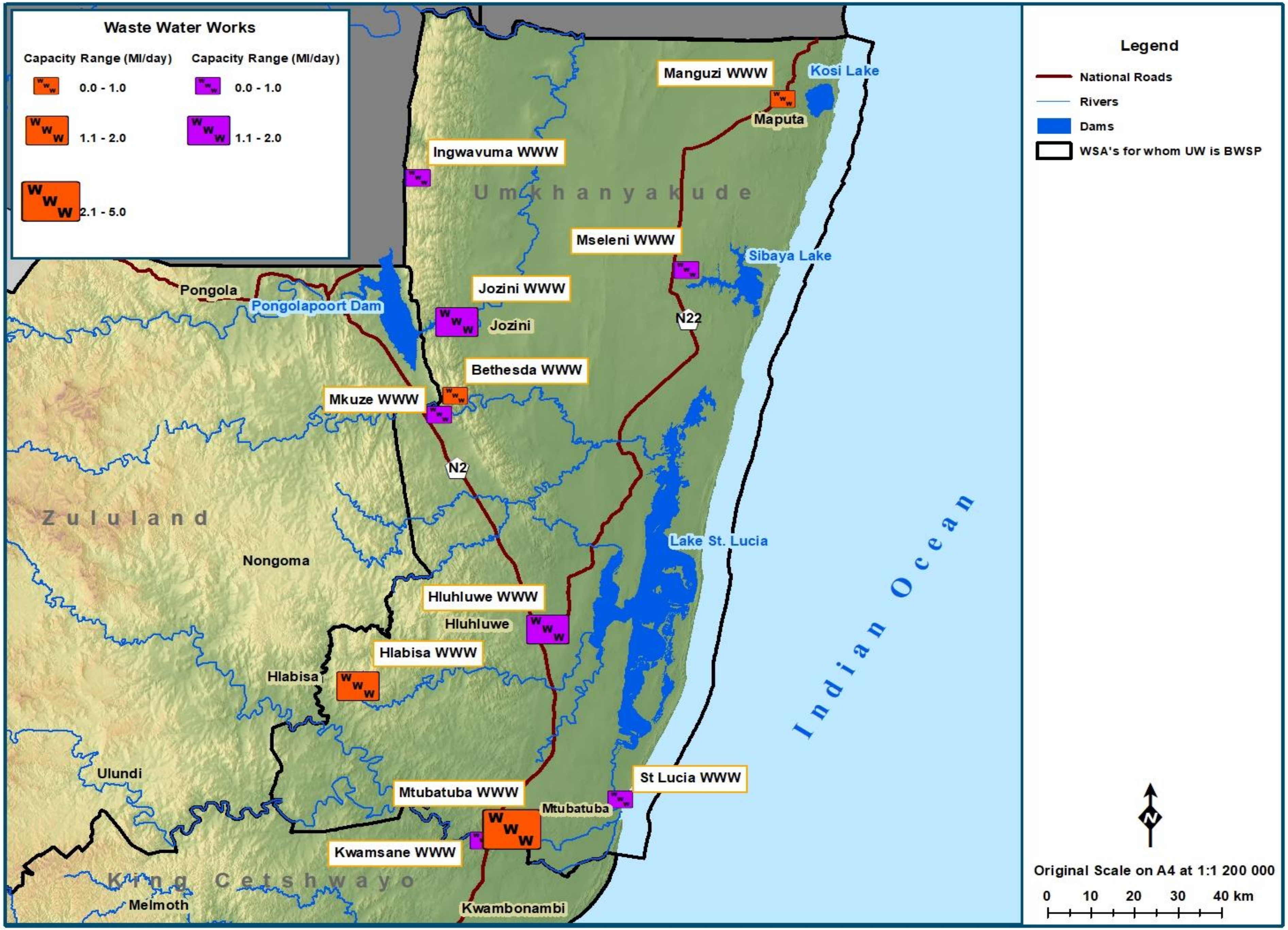

Figure 19.148 Location of uMkhanyakude District Municipality Wastewater Works.

Table 19.39 uMkhanyakude District Municipality Wastewater Works Specifications (DWS, 2011).

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Jozini	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Fair	R 1 770 000
Hluhluwe	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	0.75	250	N	Dysfunctional	R 4 570 000
Mtubatuba	Activated Sludge	uMkhanyakude DM	E	Y	0.7	2500	Y	Poor	R 1 668 500
Hlabisa Hospital	Activated Sludge	uMkhanyakude DM	E	Y	0.75	625	N	Dysfunctional	R 560 500
St Lucia	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	1.0	1250	Y	Fair	R 1 740 000
Mseleni	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	0.7	625	Y	Fair	R 1 740 000
Bethesda	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	375	Y	Fair	R 2 030 000
Ingwavuma	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Good	R1 740 000
KwaMsane	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	1250	Y	Poor	R 3 650 500
Manguzi Hospital	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	625	Y	Poor	R 1 700 000
Mkuze	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Fair	R 1 740 000

Table 19.40 MIG funded Sanitation Projects in uMkhanyakude District Municipality (CoGTA KwaZulu-Natal, 2024).

Project	Status
Thembalethu Sanitation Project (Waterborne)	Construction 61%
Upgrade of Hlabisa Town Sanitation System (Reticulation)	Design
Ibisi Sanitation Phase 2 (Ward 11, Reticulation, Bulk Lines and Pumpstation and Refurbishments	Construction 81%
Construction of Nordale Sewer System within Mtubatuba under Ward 4	Design
Construction of Manguzi Wastewater Treatment Works within Mhlabuyalingana under ward 4	Design
Construction of St Luciai Wastewater Treatment Works within Mtubatuba under Ward 1	Design

19.5.7 King Cetshwayo District Municipality

The King Cetshwayo District Municipality (KCDM) has 20 WWW, the majority of them small, all of which are reported operational (**Figure 19.150)**. The capacity of the WWWs range from very small (0.08 Mℓ/day) serving the community of KwaBadda to relatively large (14.5 Mℓ/day) serving the town of Empangeni. A list of the WWW in the DM is provided in **Table 19.41**.

The King Cetshwayo DM consists of largely rural areas where dry sanitation systems predominate due to the scattered nature of settlements. The exception is the City of uMhlathuze Municipality (CoU) that includes towns such as Empangeni and the industrial centre of Richards Bay. The bulk sanitation system in the CoU Municipality is managed by the City of uMhlathuze (CoU). The seven bulk sewerage sub-systems that together make up the CoU's existing (current) bulk sewerage system are listed in **Figure 19.149**.

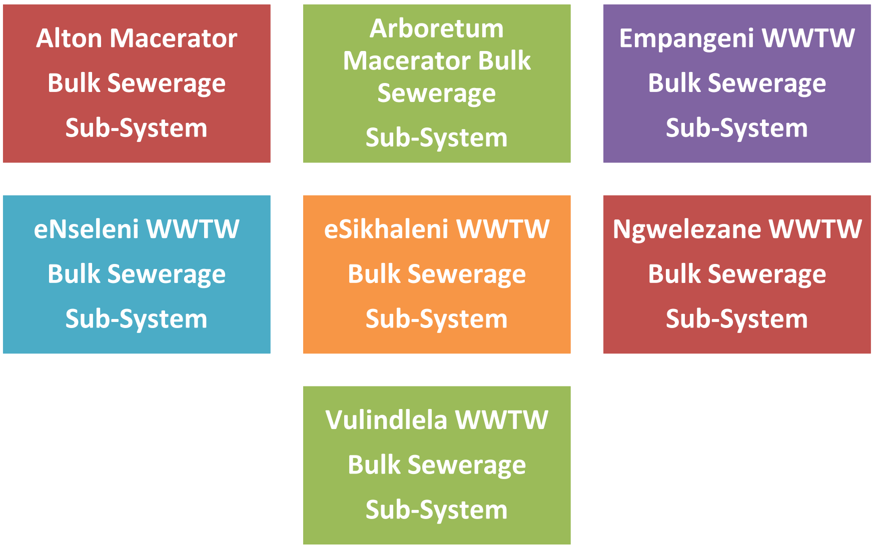

Figure 19.149 City of uMhlathuze existing bulk sewerage sub-systems

It is important to note that, because of the City's proximity to the sea, some wastewater only receives primary treatment in the form of maceration and is then discharged directly to sea via sewer outfalls. Thus, a large proportion of the City's wastewater remains relatively untreated. It is estimated that the capacity of the Alton and Arboretum macerators is 7 and 12 Mℓ/day respectively.

Based on planned and approved developments, augmentation of the Alton and Arboretum systems is proposed by 7 and 5 Mℓ/day respectively. Present indications are that spare capacity exists at the Empangeni, eNseleni, eSikhaleni and Ngwelezane WWW and no augmentation is currently required.

The City of uMhlathuze is considering closing the Vulindlela WWW for operational reasons. In that event, sewage/wastewater could be transferred into the bulk.

A number of sanitation projects have been implemented, are under construction or are proposed in the CoU. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.42.**

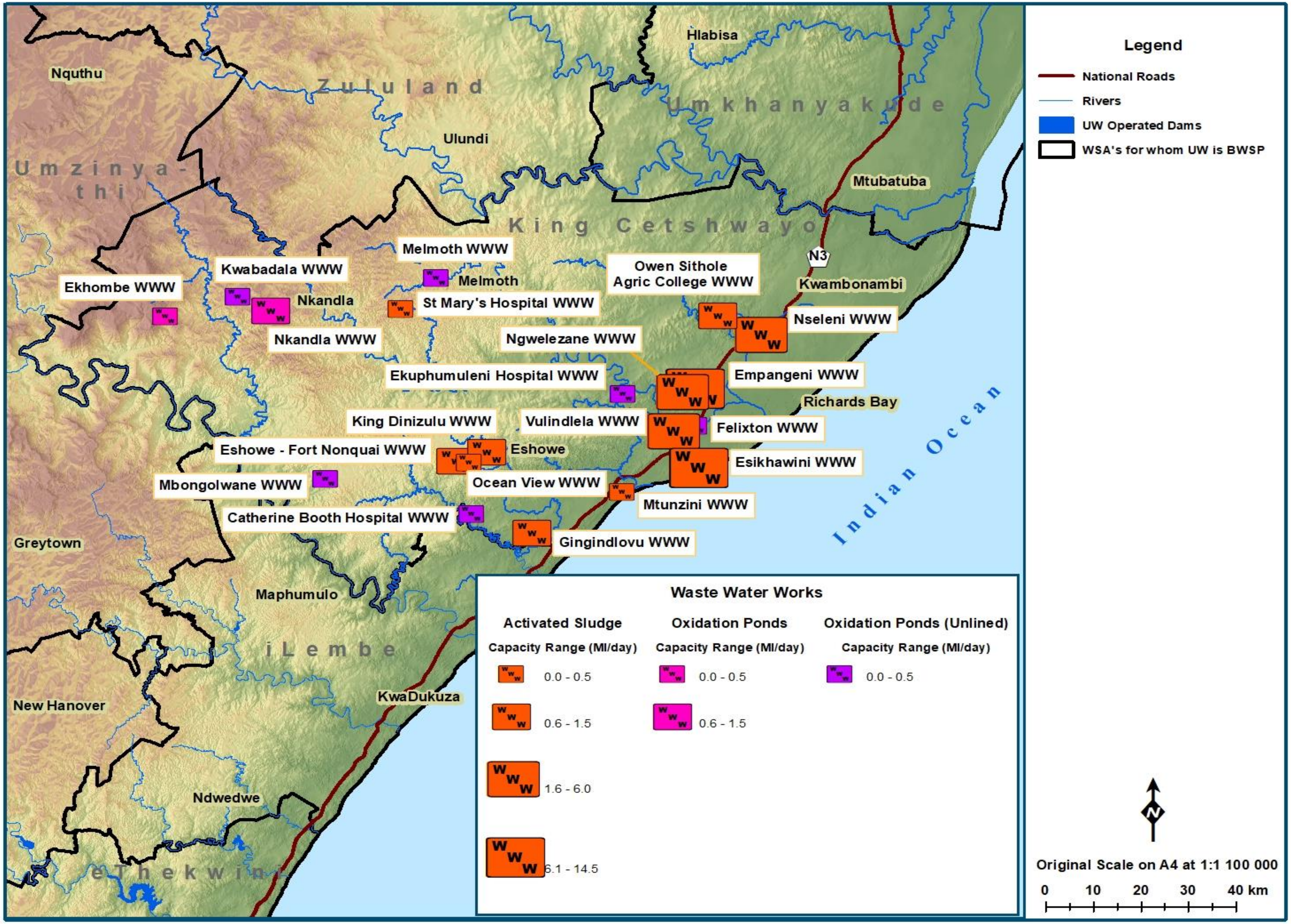

Figure 19.150 Location of King CetshwayoKing Cetshwayo District Municipality Wastewater Works.

Table 19.41 King Cetshwayo District Municipality Wastewater Works Specifications (DWS, 2011).

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Vulindlela	Activated Sludge	CoU	D	Y	3.0	Unknown	Y	Fair	R 2 410 000
Esikhawini	Activated Sludge	CoU	C	N	12.5	Unknown	Y	Fair	R 2 090 000
Ekhombe	Unknown	KCDM	E	N	0.15	1250	Y	Poor	R 410 000
Empangeni	Activated Sludge	CoU	B	Y	14.5	Unknown	Y	Fair	R 500 000
Ngwelezane	Activated Sludge	CoU	C	Y	5.8	Unknown	Y	Fair	R 3 760 000
Eshowe	Unknown	KCDM	E	N	1.5	875	Y	Fair	R 8 620 000
King Dinizulu	Unknown	KCDM	D	Y	0.7	1875	Y	Poor	R 1 070 000
Melmoth	Unknown	KCDM	E	Y	0.4	500	Y	Fair	R 550 000
Mtunzini	Unknown	KCDM	E	Y	0.32	375	Y	Fair	R 420 000
Nkandla	Unknown	KCDM	E	Y	0.8	1050	Y	Fair	R 210 000
Nseleni	Activated Sludge	CoU	C	Y	3.0	Unknown	Y	Fair	R 1 150 000
Catherine Booth Hospital	Unknown	KCDM	E	Y	0.15	138	Y	Poor	R 860 000
Mbongolwane	Unknown	KCDM	E	Y	0.2	270	Y	Poor	R 1 227 000
Gingindlovu	Unknown	KCDM	E	N	0.8	1000	Y	Poor	R 429 995
Felixton	Transferred to Vulindlela WWW	CoU		Y	0.0		Y	Unknown	Transfer Pipeline
Ekuphumuleni Hospital	Unknown	KCDM	E	Y	0.1	563	Y	Poor	R 860 000
Kwabadala	Unknown	KCDM	E	Y	0.08	89	Y	Dysfunctional	R 109 100

Ocean View	Unknown	KCDM	E	Y	0.5	1050	Y	Fair	R 1 120 000
Owen Sithole Agric College	Unknown	KCDM	E	Y	1.5	44	Y	Poor	R 3 360 000
St Mary's Hospital	Unknown	KCDM	E	Y	0.45	0	Y	Fair	R 260 000

Table 19.42 MIG funded Sanitation Projects in King Cetshwayo District Municipality (CoGTA KwaZulu-Natal, 2024).

Project	Status
Nkandla VIP Sanitation Area Business Plan	Completed
Umlalazi Sanitation Area Business Plan	Practical Completion
Upgrade of Sewer Infrastructure Eshowe	Practical Completion
Upgrade of Sewer Infrastructure for Melmoth Phase 1	Practical Completion

19.5.8 Zululand District Municipality

The Zululand District Municipality (ZDM) has 19 WWWs (**Figure 19.151**), the majority of them being very small and rudimentary in nature (Class E). Fourteen of the wastewater works are reported as operational. The capacity of the WWW's range from very small (0.08 Mℓ/day) serving the Thlasizwe Hospital to relatively large (16 Mℓ/day) serving the town of Klipfontein. A list of the WWW in the ZDM is provided in **Table 19.43**.

In terms of sanitation, 34,973 or 19% of households have no access to sanitation. éDumbe carries the highest percentage with Nongoma (24%) and AbaQulusi and Ulundi at 22% respectively. Investment of R1.064 billion is required to eradicate the sanitation backlog.

Over the years the number of households and non-domestic customers with sanitation, in the district, has steadily increased – from 105 077, in the year 2011/12, to 117 228 in 2015/16. The number of ventilated pit-latrines has also steadily increased over the same period – from 69 475 to 84 105.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.44**.

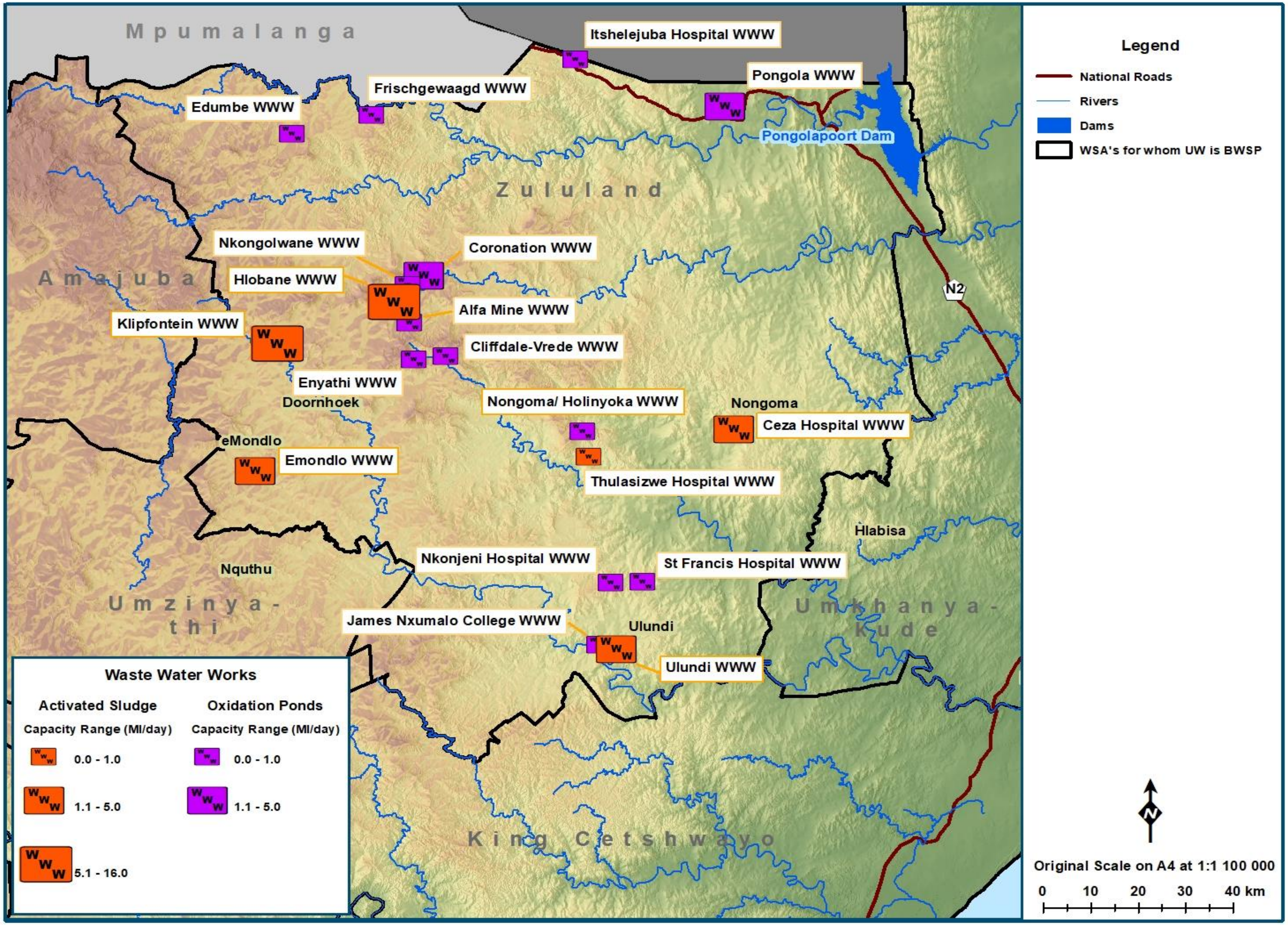

Figure 19.151 Location of Zululand District Municipality Wastewater Works.

Table 19.43 Zululand District Municipality Wastewater Works Specifications (DWS, 2011).

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Frishgewald	Oxidation Ponds	Zululand DM		Y	0.15	0	Y	Unknown	R 520 000
St Franics Hospital	Oxidation Ponds	Zululand DM	E	N	0.12	250	Y	Poor	R 4 930 000
Ceza Hospital	Activated Sludge	Zululand DM	E	N	0.2	250	Y	Poor	R 1 260 000
Nonggoma/Holiyoka	Oxidation Ponds	Zululand DM	C	Y	3.0	3750	N	Poor	R 2 880 000
Thlasizwe Hospital	Oxidation Ponds	Zululand DM	E	Y	0.08	103	N	Poor	R 770 000
Itshelejuba Hospital	Oxidation Ponds	Zululand DM	E	N	0.18	225	Y	Poor	R 1 290 000
Pongola	Oxidation Ponds	Zululand DM	D	N	2.0	2500	Y	Fair	R 1 920 000
James Nxumalo College	Oxidation Ponds	Zululand DM	E	N	0.17	213	Y	Fair	R1 370 000
Nkojeni Hospital	Oxidation Ponds	Zululand DM	E	Y	0.14	170	Y	Unknown	R 230 000
Ulundi	Activated Sludge	Zululand DM	C	Y	5.0	6250	Y	Poor	R 4 810 000
Emondlo	Activated Sludge	Zululand DM	B	Y	4.0	5000	Y	Unknown	R 3 840 000
Alfa Mine	Oxidation Ponds	Zululand DM	E	Y	0.0	0	N	Unknown	R 800 000
Cliffdale-Vrede	Oxidation Ponds	Zululand DM	E	Y	0.2	250	N	Unknown	R1 90 000
Coronation	Oxidation Ponds	Zululand DM	D	N	2.0	2500	N	Dysfunctional	R 24 000 000
Edumbe	Oxidation Ponds	Zululand DM	E	Y	0.2	250	Y	Fair	R 560 000
Enyathi	Oxidation Ponds	Zululand DM	E	Y	0.0	0	N	Poor	R 1 160 000

Hlobane	Activated Sludge	Zululand DM	C	Y	6.0	7500	Y	Poor	R 1 675 500
Klipfontein	Activated Sludge	Zululand DM	B	Y	16.0	20000	Y	Poor	R 4 962 000
Nkongolwane	Oxidation Ponds	Zululand DM	E	Y	0.3	0	Y	Poor	R 4 547 000

Table 19.44 MIG funded Sanitation Projects in Zululand District Municipality (CoGTA KwaZulu-Natal, 2024).

Project	Status
Zululand Rural Sanitation: Phase 2D	Completed
Zululand Rural Sanitation: Phase 3A	Registered

19.5.9 Amajuba District Municipality

The Amajuba District Municipality (DM) has ten WWW, nine of which are reported as being operational (**Figure 19.152)**. The capacity of the WWWs are generally 2 Mℓ/day and lower, however, the municipality is unique in that it has four wastewater exceeding 10 Mℓ/day in capacity with the largest servicing Newcastle at 25 Mℓ/day. A list of the WWW in the DM is provided in **Table 19.45**

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About 58% (Community Survey 2016) of the households in Amajuba DM area have flush toilets that are connected to a sewerage system of some type. This is an improvement of 4% when compared to figures from Census 2011. The 2016 figures also indicate that only 41% of households in the ADM do not have any form of sanitation. There are, however, wide variations within the district.

- 74% of households in the eMadlangeni municipality do not have access to any form of toilet i.e. pit with no ventilation, other (home built or none)
- 7% of households within the Dannhauser municipality are below the basic level of service (backlog).
- Out of the three municipal areas, the highest level of service is found in Newcastle Municipality where over 68% of households have either flush or chemical toilets or pit latrines

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.46**.

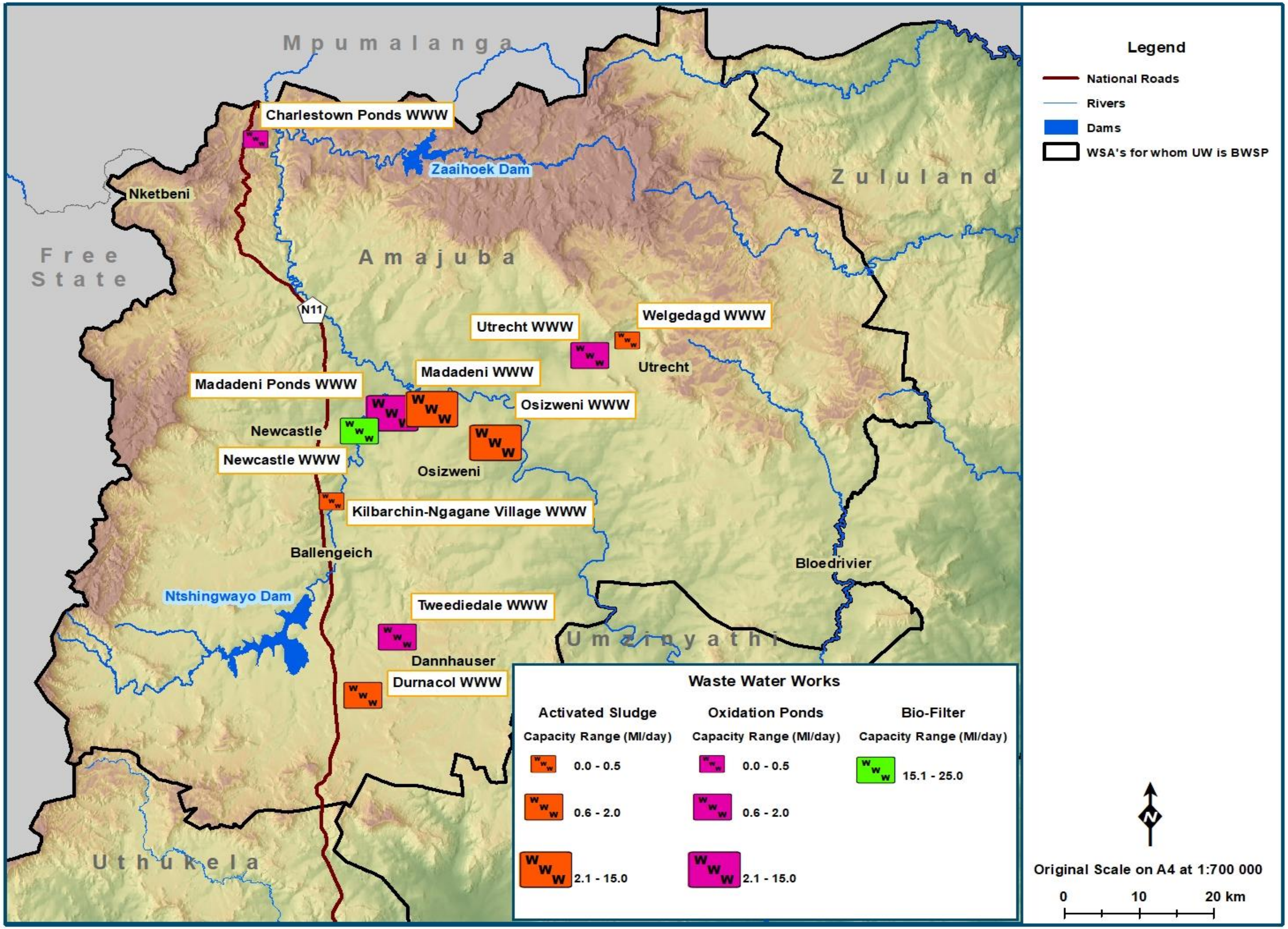

Figure 19.152 Location of Amajuba District Municipality Wastewater Works.

Table 19.45 Amajuba District Municipality Wastewater Works Specifications (DWS, 2011).

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (SMEC, 2025)
Utrecht	Oxidation Ponds	uThukela Water	D	Y	1.0	1250	N	Dysfunctional	R 3 170 000
Charslestown Ponds	Oxidation Ponds	uThukela Water	E	Y	0.5		Y	Poor	R2 230 000
Durnacol	Activated Sludge	uThukela Water	D	Y	2.0	2500	Y	Fair	R3 030 000
Tweediedale	Oxidation ponds	uThukela Water	D	Y	2.0	2500	Y	Poor	R 2 660 000
Kilbarchin-Ngagane Village	Activated Sludge	uThukela Water	C	N	0.5		Y	Fair	R 4 780 000
Osizweni	Activated Sludge	uThukela Water	B	N	15.0		N	Dysfunctional	R9 200 000
Madadeni	Activated Sludge	uThukela Water	B	N	12.0		N	Dysfunctional	R10 220 000
Newcastle	Bio-filter	uThukela Water	B	Y	25.0		N	Dysfunctional	R12 130 000
Welgedagd	Activated Sludge	uThukela Water	D	Y	0.5	625	N	Dysfunctional	R2 070 000
Madadeni Ponds	Oxidation ponds	uThukela Water	E	N	Unknown-		Y	Poor	Unknown

Table 19.46 MIG funded Sanitation Projects in Amajuba District Municipality (CoGTA KwaZulu-Natal, 2024).

Project	Status
Goedehoop Bulk Water and Sanitation Phase 2	Construction 35%
Staffordhill Waterborne Sewage Refurbishment of Toilet Structures (Phase 5	Construction 61%
Viljoenpark Bulk Services (Phase 2)	Construction 21%
Upgrade and Refurbishment of Bulk Sewer Pipeline from Siyahlala-la to Voortrekker Pump station	Design

Newcastle LM Sewerage Pump Stations Operations and Maintenance (Ward 20, 22 and 26)	Construction 61%
Dannhauser Housing Development Bulk Water and Sanitation	Practical Completion
eMadlangeni Sanitation Infills Wards 1,3,4,5,6	Construction 81%

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Kevin Meier,
MANAGER: PLANNING SERVICES